

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



Reference

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Foreword

This ETSI Guide (EG) has been produced by ETSI User Group (USER).

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)".

Introduction

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

- a) the first 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 results and the size of the sample to be tested;
- b) the second is related to the service provision and is closely linked to the kind of use of the service. Therefore appropriate parameters have to be defined according to use;
- c) the last is intended to measure the subjective satisfaction of the customer and there is often no other means than a survey 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. Hence objective and subjective measurements may be usefully combined for a better assessment of the QoS.

Measurements of every potentially interesting parameter all the time might be very expensive and could jeopardize service performances. It is often cheaper to get them via a poll. In addition, it may be convenient to rely on a third party and also audit to carry out these measurements in order to 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.

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 business customer and a supplier of Telecommunications services such as that proposed in EG 202 009-3 [9]. It gives guidelines on how to obtain user's QoS requirements, prioritize the parameters, establish a preferred value for each of these parameters, while EG 202 009-2 [8] proposes service specific QoS parameters.

The present document was written to make available to the providers and users of any kind of telecom services (legacy network based or IP network based services) a common basis for mutual understanding about quality of service. This aims to assist users in identifying rationally their QoS requirements, helping the providers to better meet them for their mutual benefit.

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.

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

- [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] ITU-T Recommendation G.1000: "Communications Quality of Service: A framework and definitions".
- [3] ITU-T Recommendation I.350: "General aspects of quality of service and network performance in digital networks, including ISDNs".
- [4] ITU-T Recommendation M 60: "Maintenance terminology and definitions".
- [5] ETSI ETR 003: "Network Aspects (NA); General aspects of Quality of Service (QoS) and Network Performance (NP)".
- [6] ETSI EG 201 013: "Human Factors (HF); Definitions, abbreviations and symbols".
- [7] ETSI EG 201 219: "User requirements; Guidelines on the consideration of user requirements when managing the standardization process".
- [8] ETSI EG 202 009-2: "User Group; Quality of telecom services; Part 2: User related parameters on a service specific basis".

- [9] ETSI EG 202 009-3: "User Group; Quality of telecom services; Part 3: Template for Service Level Agreements (SLA)".

3 Definitions and abbreviations

3.1 Definitions

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

accuracy: faithfulness and completeness in carrying out the communication function with respect to a reference level. The reference level may be specified or may be an independent function or a function of an input

NOTE: See ETR 003 [5].

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

availability: likelihood with which the relevant components of the service function can be accessed, at the instant of request, as required by the specified conditions, in particular those related to open hours, geographic coverage and resource size aspects if any

NOTE: See ETR 003 [5] modified.

capability: ability of an item to meet a demand of a given size under given internal conditions

NOTE 1: Internal conditions refer, for example, to any given combination of faulty and not faulty sub-items.

NOTE 2: Trafficability performance and effectiveness are capabilities.

NOTE 3: Demands are of two types - service and traffic.

NOTE 4: See ITU-T Recommendation E.800 [1].

cessation: all activities associated with the cessation of a telecommunication service from the time it was requested by a customer, to the time it was completed to the satisfaction of the customer

charging/billing: all relevant activities associated with the charging and billing for a telecommunication service to a customer

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

fidelity/accuracy: faithfulness and completeness in carrying out the service facility with respect to a reference level. The reference level may be specified or may be an independent function or a function of an input (see **accuracy**)

flexibility: options required by the customer and offered by the provider in order to accommodate special requirements

NOTE: See ETR 003 [5].

network/service management by the user/customer: all activities associated with the customer's control of predefined changes to telecommunication services or network configurations

NOTE: See ETR 003 [5].

provision: all activities associated with the provision of a telecommunication service, from the time of effective contract to the time the customer is able to use the service

Quality of Service (QoS): collective effect of service performance which determines the degree of satisfaction of a user of the service

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.

NOTE 3: See ITU-T Recommendation E.800 [1] and G.1000 [2].

QoS achieved by service provider: statement of the level of quality achieved by the service provider

NOTE 1: See ETR 003 [5] and ITU-T Recommendation G.1000 [2] modified.

NOTE 2: 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 not more than 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 1: See ETR 003 [5] and ITU-T Recommendation G.1000 [2] modified.

NOTE 2: 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 [5]).

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 1: See ETR 003 [5] and ITU-T Recommendation G.1000 [2] modified.

NOTE 2: 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: a statement of the level of quality required by the applications of customers/users of a service, which may be expressed non-technically

NOTE 1: See ITU-T Recommendation G.1000 [2].

NOTE 2: These requirements may be gathered for representative groupings of users/customers. For their own use, the service provider may translate these into technical indicators easier to manage, if needed to better fulfil the requirements.

reliability: ability of an item to perform a required function under stated conditions for a given time period, ITU-T Recommendation E.800 [1] and M.60 [4]

NOTE 1: It is generally assumed that the item is in a state to perform this required function at the beginning of the time interval.

NOTE 2: In French, the term *fiabilité* is also used to denote the performance quantified by this *probability*.

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

repair: See trouble-shooting.

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

sales: all relevant activities from the time communications are established between the provider and the customer to the time the contract is signed for the provision of a service by the provider

security: ability of a service to ensure the confidentiality of the pieces of information worked out, exchanged or stored, the communication privacy, the authenticity and integrity of the information exchanged or stored as well as the protection of the user and his communication means against any type of threat (virus, spam, etc.)

service alteration: all activities associated with the alteration of a telecommunication service, from the time alteration to a service is requested by the customer to the time these alterations are carried to the satisfaction of the customer, ETR 003 [5]

Service Provider (SP): actor who provides services to its service subscribers on a contractual basis and who is responsible for the services offered. The same organization may act as a network operator and a service provider

NOTE: See TR 101 287.

service support: all activities associated with the support of a telecommunication service to enable the customer's use of the service. This includes, documentation, technical support, commercial support and customers' complaint management.

NOTE: See ETR 003 [5].

speed: performance criterion that describes the time interval required to perform a function or the rate at which the function is performed (The function may or may not be performed with the desired accuracy.)

NOTE: See ITU-T Recommendation I.350 [3].

technical upgrade: all activities associated with the technical evolution of any component of the service at the provider initiative

trafficability: ability of an item to meet a traffic demand with a given size and other characteristics, under given internal conditions

NOTE 1: See ITU-T Recommendation E.800 [1].

NOTE 2: Internal conditions refer for example to any combination of faulty and not faulty sub-items.

trouble-shooting: all activities associated with the restoration of a telecommunication service to the customer after a fault resulting in partial or complete loss of service or service features

user: individuals, including consumers, or organizations using or requesting telecommunications services available on public or private networks. The user may or may not be the person who has subscribed to the provision of the service. Without any specific addition this word is used to identify the telecommunication user community in general, e.g. end-users and IT&T managers who use products and services possibly conforming to standards.

NOTE 1: See EG 201 219 [7].

NOTE 2: Taking into account the current developing automation, a machine has to be considered as a disembodied "user".

usability: effectiveness, efficiency and satisfaction with which specified users can achieve specified goals (tasks) in a particular environment. In telecommunications, usability should also include the concepts of learnability and flexibility; and reference to the interaction of more than one user (the A and B parties) with each other and with the terminals and the telecommunications system.

NOTE 1: See EG 201 013 [6].

NOTE 2: Similar to simplicity (see ETR 003 [5]) but includes conformance to design for all, accessibility and ergonomic aspects.

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
SP	Service Provider
TQM	Total Quality Management

4 About telecommunication service QoS

Dealing with QoS of telecommunication services, assumes that, first of all, the QoS requirements are carefully identified from the user viewpoint so that a set of indicators and related reference values can be defined, Then these indicators can be measured and monitored with respect to these reference values to check whether the requirements are fulfilled. Such reference values are crucial to the management of QoS and should be defined either by European standards, by governments, by the provider as a voluntary commitment or by mutual agreement between the customer and the provider and, in any case, included in the contract between the provider and the customer.

To achieve such a QoS assessment, the following tasks have to be completed:

- Analysis of the specific 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.

It should be kept in mind that a key aspect of the Telecommunication services is that two ends are needed to provide the service. Therefore both ends may influence the QoS, including the terminal used, and these have to be taken into account to assess the QoS.

In addition, since Telecommunication services belong to the High Tech area and 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 outcome of the Perceived QoS, resulting from the difference between the QoS he expected and the achieved QoS.

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 indicators and parameters actually relevant to the Users.

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 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).

- Helpdesk 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 hardware and software up-dates.
- Documentation.
- etc.

In short, this means that QoS requirements embrace all the aspects of the service life from the preliminary information to cessation. On the first aspect, services may differ considerably from another and therefore, performance parameters have to be defined carefully on a service-by-service basis. To avoid any misunderstanding, the service functions and specifications have to be detailed in the contract between the provider and the customer, as well as the provider commitments throughout the service life. In addition, it should be reminded that the human interface to the customer is a key aspect of the QoS, in particular reliability, empathy and responsiveness.

Table 1 details the steps along the service life.

Table 1: Steps along the service life

Service life steps		Service element
Sales		Preliminary information, advertisement
		Terms and conditions of contract
Service management	Service provisioning	Installation
		Activation and acceptance
	Service alteration / Technical upgrade	Customer initiative
		Provider initiative
	Service support	Documentation for service activation and set-up
		Documentation for service use
		Technical support
		Commercial support
Repair/Troubleshooting	Complaint management	
Charging/Billing		
Cessation		
Use of Service	Network/service management by the customer	
	Service utilization	Access
		Bearer service
		Service usage
	Presentation and user interface	

NOTE: A description of the various aspects of the service life and service elements is given in clause 6.1.

6 Methodology to identify the customer's QoS requirements

Different users may be happy with different levels of QoS as well as levels 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 [5] and ITU-T Recommendation G.1000 [2] provide a useful methodology to capture the users'/customers' quality requirements. Nevertheless, since these documents were delivered, there have been some improvements in the QoS methodology. For example, ITU-T Recommendation G.1000 [2] and ETR 003 [5] use a set of 7 criteria: Speed, Accuracy, Availability, Reliability, Security, Simplicity, Flexibility. In order to allow for a better understanding between the users and the providers, it is useful to use **capability** as an additional criterion even if the users are not always able to directly perceive this criterion but rather via its consequences on speed or availability. Also **usability** is more explanatory than **simplicity**, has a broader meaning and can more easily include "design for all" aspects. Finally, using the word **fidelity** in addition to **accuracy** seems more appropriate in users' mind to express that there is no change in the information content and that such criterion apply at any service facility as well and not only to communication functions.

In addition, it is often difficult to define indicators for security and instead it would be better to rely on a provider certification on the relevant security aspect. Therefore, this criterion was kept not as a parameter but rather as a flag to identifier of the key aspects of each service where such certification is required. These criteria are defined in clause 6.1.

6.1 Matrix for the determination of communications QoS criteria

The matrix in the table 2 is an extrapolation of that of ETR 003 [5]. If explored cell by cell, it enables to consider and hence to capture a comprehensive range of QoS requirements for a specific service, the purpose being to choose for each of these cells one or several measurable parameters allowing for an overall QoS evaluation.

The usage conditions in a service contract should specify the precise conditions of use of services to enable comparisons of performance to be made when the usage conditions vary. In the definitions given above or hereafter for each cell, the words "specified conditions" refer to the contract between the customer and the provider that can be based on any national or European regulations or a mutual agreement while "stated conditions" refer to sales conditions made publicly available by the provider. Obviously, as highlighted above, it is crucial that the contract details the QoS specifications.

Table 2: Matrix to facilitate the capture of customer's QoS requirements

Service life steps		Service element	Cell ref.	Availability	Fidelity/ Accuracy	Speed	Capability	Reliability	Flexibility	Usability	Security
				X1	X2	X3	X4	X5	X6	X7	X8
1-Sales		Preliminary information, advertisement	Y1.1								
		Establishment of the contract (Terms and conditions)	Y1.2								
Service management	2-Service provisioning	Installation, activation and acceptance	Y2								
	3-Service alteration / Technical upgrade	Change at the customer initiative	Y3-1								
		Change at the provider initiative	Y3-2								
	4-Service support	Documentation	Y4.1								
		Technical support	Y4.2								
		Commercial support	Y4.3								
		Complaint management	Y4.4								
	5-Repair/Trouble-shooting		Y5								
6-Charging/Billing		Y6									
7-Cessation		Y7									
Use of Service	8-Network/service management by the customer		Y8								
	9-Service utilization	Access	Y9.1								
		Bearer service	Y9.2								
		Service usage	Y9.3								
		Presentation and user interface	Y9.4								

Header of lines and columns of table 2 are derived from ETR 003 [5]. These headers are described hereafter.

The Service life steps: On Y axis, are a set of uniquely identifiable or definable elements, which, collectively cover, all tasks associated with or those forming part, of a telecommunications service. They are detailed in clauses 6.1.1 to 6.1.9.

The Service quality criteria: On X axis, which collectively cover all quality aspects of a telecommunication service are defined below (see also clause 3.1).

X1 Availability: Likelihood with which the relevant components of the service function can be accessed as required by the specified conditions, in particular those related to open hours, geographic coverage and resource size aspects if any.

X2 Fidelity/Accuracy: Faithfulness and completeness in carrying out a service facility with respect to a reference level. The reference level may be specified or may be an independent function or a function of an input.

X3 Speed: Performance criterion that describes the time interval required to perform a function or the rate at which the function is performed. (The function may or may not be performed with the desired accuracy).

X4 Capability: Ability of an item to meet a traffic demand with a given size and other characteristics, under given internal conditions.

X5 Reliability: Ability of an item to perform a required function under specified conditions for a given time period.

X6 Flexibility: Options required by the customer and offered by the provider in order to accommodate special requirements.

X7 Usability: Ease in the application of the service function.

The content of each cell is detailed hereafter.

X8 Security: Ability of a service to ensure the confidentiality of the pieces of information worked out, exchanged or stored, the communication privacy, the authenticity and integrity of the information exchanged or stored as well as the protection of the user and his communication means against any type of threat (virus, spam, etc.).

6.1.1 Matrix line Y1 - Sales

All QoS assessments related to activities from the time communications are established between the provider and the customer to the time the contract is signed for the provision of a service by the provider. The term Telco is also intended to cover the service provider or a network provider.

Examples of relevant activities are:

- supply of information on the service;
- technical enquiries;
- feasibility; and
- study of options available.

6.1.1.1 Matrix line Y1.1 - Preliminary information/Advertisement

All QoS assessments related to information on the service provided on request of the prospect or in newspapers, magazines, booklets, etc. to help him choosing the service and provider most appropriate to his needs.

Cell reference Y1.1-X1: Preliminary information - Availability

Description: Availability requirements regarding access to the appropriate information. This includes not only the public availability of such an information but also its legibility, size of the print font, ease of reading, use of words from the common language, etc.

Cell reference Y1.1-X2: Preliminary information - Fidelity/Accuracy

Description: Requirements regarding the correctness and completeness of all relevant information on the service, normally expected by the customer before effective contract, e.g. service features, performance, charges and service support. This includes any advertising material supplied to the customer.

Cell reference Y1.1-X3: Preliminary information - Speed

Description: Requirement regarding the time taken from the initial contact between the customer and the provider to the instant the pertinent information is supplied to the customer.

Cell reference Y1.1-X4: Preliminary information - Capability

Description: Requirement about the number of customers expected to simultaneously accessing this service, density of sales offices, hours staff can be accessed, etc.

Cell reference Y1.1-X5: Preliminary information - Reliability

Description: Reliability requirements regarding the provision of the preliminary information over a given time period.

Cell reference Y1.1-X6: Preliminary information - Flexibility

Description: Options required by the customers in the provision of the preliminary information.

EXAMPLE: Provision of sales information in person, by the telephone, advertising, electronic transfer.

Cell reference Y1.1-X7: Preliminary information - Usability

Description: Requirement regarding the ease to carry out all activities associated with the preliminary information provision.

EXAMPLE 1: Ease of identification of the point of contact for sales.

EXAMPLE 2: Ease with which information supplied is understandable.

Cell reference Y1.1-X8: Preliminary information - Security

Not applicable.

6.1.1.2 Matrix line Y1.2 - Establishment of the contract (Terms and conditions)

All QoS assessments related to activities from the customer decision to contract with the provider to the time of effective contract. Establishment of the contract is meant here for agreeing to the contractual conditions, conditions of use, customer and provider commitments whether or not there is a formal signature of the contract.

Cell reference Y1.2-X1: Establishment of the contract - Availability

Description: Requirement regarding availability of access to the appropriate sales facilities. Availability includes also the legibility of the text of the contract, size of the print font, ease of reading, use of words from the common language, etc.

Cell reference Y1.2-X2: Establishment of the contract - Fidelity/Accuracy

Description: Requirement regarding conformance of the information contained in the contract to the information provided to the customer at the preliminary information stage as well as the exhaustiveness and clarity of the description of the conditions of the service use.

Cell reference Y1.2-X3: Establishment of the contract - Speed

Description: Requirement regarding the time taken from the initial contact between the customer and the provider to the instant the service contract is placed. This has to take into account the ease with which all activities associated with the establishment of the contract may be carried out with the provider.

Cell reference Y1.2-X4: Establishment of the contract - Capability

Description: Requirement regarding the number of customers expected to simultaneously accessing the sales facilities, density of sales offices, hours staff can be accessed.

Cell reference Y1.2-X5: Establishment of the contract - Reliability

Description: Requirement regarding the reliability of the establishment of the contract facilities.

Cell reference Y1.2-X6: Establishment of the contract - Flexibility

Description: Options required for the establishment of the contract.

EXAMPLE 1: Provision of sales information in person, by the telephone, advertising, electronic transfer.

EXAMPLE 2: Facility to place contract by the customer may be by fax, electronic mail, post or telephone.

Cell reference Y1.2-X7: Establishment of the contract - Usability

Description: Requirement regarding the ease with which all activities associated with the establishment of the contract should be carried out with the provider.

EXAMPLE 1: Ease of identification of the point of contact for sales.

EXAMPLE 2: Ease with which information supplied is understandable.

EXAMPLE 3: The ease with which forms can be filled and ease with which orders can be placed.

Cell reference Y1.2-X8: Establishment of the contract - Security

Description: Identification of the aspects of the establishment of the contract where the customer security, privacy or confidentiality requirements should be met by the provider.

6.1.2 Matrix line Y2 - Service provisioning

All QoS assessments related to activities associated with the provision of a telecommunication service, from the time of effective contract to the time the customer is able to use the service.

Installation: All activities associated with the installation of the equipment and the related software needed to use a telecommunication service.

Activation and acceptance: All activities associated with the activation and acceptance of the provision, e.g. test, certificate, etc.

Cell reference Y2-X1: Service provisioning - Availability

Description: Requirement regarding the availability of resources for provision: installation and acceptance.

Cell reference Y2-X2: Service provisioning - Fidelity/Accuracy

Description: Requirement regarding the correctness and completeness of the provision, installation and acceptance facilities.

Cell reference Y2-X3: Service provisioning - Speed

Description: Requirement regarding the time taken from the effective contract to the instant the service is available for use. This time has to be defined for the main aspects of the provision: installation and acceptance.

Cell reference Y2-X4: Service provisioning - Capability

Description: Requirement regarding the number of customers expected to require simultaneously the provision, installation and acceptance facilities.

Cell reference Y2-X5: Service provisioning - Reliability

Description: Requirement regarding the reliability of the provision: installation and acceptance facilities.

Cell reference Y2-X6: Service provisioning - Flexibility

Description: Options required by customer to accommodate special requirements on the provision, installation and acceptance facilities.

EXAMPLE 1: Timing of the provision of the service to suit the customer.

EXAMPLE 2: Provision of terminal equipment to match customer preferences where possible.

Cell reference Y2-X7: Service provisioning - Usability

Description: Requirement regarding the ease and convenience with which a service should be provided after effective contract.

Cell reference Y2-X8: Service provisioning - Security

Description: Identification of the aspects of the provision: installation and acceptance where the customer security, privacy or confidentiality requirements should be met by the provider.

6.1.3 Matrix line Y3 - Service alteration/Technical upgrade

This activity has been split into two lines one for modification to the service conditions at the customer initiative and the other one for technical upgrade of any service component at the provider initiative.

6.1.3.1 Matrix line Y-3.1 - Service alteration

All QoS assessments related to activities associated with the alteration of a telecommunication service, from the time alteration to a service is requested by the customer to the time this alteration is carried to the satisfaction of the customer.

Cell reference Y3.1-X1: Alteration (Change at customer initiative) - Availability

Description: Requirement regarding the availability of resources at the provider to carry out alteration to the service as requested by the customer.

Cell reference Y3.1-X2: Alteration (Change at customer initiative) - Fidelity/Accuracy

Description: Requirement regarding the correctness and completeness with which requests for alteration to service should be carried out.

Cell reference Y3.1-X3: Alteration (Change at customer initiative) - Speed

Description: Requirement regarding the time taken from request to the provider for an alteration to a service to the instant the altered service is available for use.

Cell reference Y3.1-X4: Alteration (Change at customer initiative) - Capability

Description: Requirement regarding the number of alteration requests expected simultaneously.

Cell reference Y3.1-X5: Alteration (Change at customer initiative) - Reliability

Description: Requirement regarding the reliability to carry out the alteration request.

Cell reference Y3.1-X6: Alteration (Change at customer initiative) - Flexibility

Description: Options required to accommodate special requirements relating to alteration of a service.

EXAMPLE 1: Accommodating the customer's request for reading meter at a requested time when moving to a new address.

EXAMPLE 2: Capability to accommodate a customer's request to carry his telephone number to a new address.

Cell reference Y3.1-X7: Alteration (Change at customer initiative) - Usability

Description: Requirement regarding the ease and convenience with which alteration to a service should be carried out for the customer by the provider.

Cell reference Y3.1-X8: Alteration (Change at customer initiative) - Security

Description: Identification of the aspects of service provisioning where the customer security, privacy or confidentiality requirements should be met by the provider.

6.1.3.2 Matrix line Y-3.2 - Technical upgrade

All QoS assessments related to activities associated with the technical evolution of any component of the service at the provider initiative.

Cell reference Y3.2-X1: Technical upgrade (Change at provider initiative) - Availability

Description: Requirement regarding the availability of the upgrade facility.

Cell reference Y3.2-X2: Technical upgrade (Change at provider initiative) - Fidelity/Accuracy

Description: Requirement regarding the correctness and completeness with which the technical upgrade to service should be carried out.

Cell reference Y3.2-X3: Technical upgrade (Change at provider initiative) - Speed

Description: Requirement regarding the time taken to perform all activities associated with the technical evolution of any component (hardware or software) of the service from the time the decision is taken to the time the upgrade is achieved.

Cell reference Y3.2-X4: Technical upgrade (Change at provider initiative) - Capability

Description: Requirement regarding the number of simultaneous technical upgrade to be carried out.

Cell reference Y3.2-X5: Technical upgrade (Change at provider initiative) - Reliability

Description: Requirement regarding any upgrade activity to be carried out without any performance lessening of the service.

Cell reference Y3.2-X6: Technical upgrade (Change at provider initiative) - Flexibility

Description: options required to accommodate special requirements relating to the technical upgrade of the service.

Cell reference Y3.2-X7: Technical upgrade (Change at provider initiative) - Usability

Description: Requirement regarding the ease and convenience with which the technical upgrade to a service should be carried out.

Cell reference Y3.2-X8: Technical upgrade (Change at provider initiative) - Security

Description: Identification of the aspects of service provisioning where the customer security, privacy or confidentiality requirements should be met by the provider.

6.1.4 Matrix line Y4 - Service support

All QoS assessments related to activities associated with the support of a telecommunication service to enable the customer's use of the service. This includes, documentation, technical support, commercial support and customers' complaint management.

6.1.4.1 Matrix line Y4.1 - Documentation

All QoS assessments related to activities associated with provision of documentation to install, set-up and use the various features of the service as well as to identify and fix possible troubles.

Cell reference Y4.1-X1: Documentation - Availability

Description: Requirement regarding the availability of the documentation to install and use the various features of the service with respect to the level of user knowledge.

Cell reference Y4.1-X2: Documentation - Fidelity/Accuracy

Description: Requirement regarding the correctness and completeness in the provision of the documentation.

Cell reference Y4.1-X3: Documentation - Speed

Description: Requirement regarding the speed with which the documentation should be supplied.

Cell reference Y4.1-X4: Documentation - Capability

Description: Not applicable.

Cell reference Y4.1-X5: Documentation - Reliability

Description: Requirement regarding the reliability of the documentation provision.

Cell reference Y4.1-X6: Documentation - Flexibility

Description: Customer's requirements to get a documentation suited to the user knowledge and experience (in paper or electronic format) on specific issues with the appropriate detail level.

Cell reference Y4.1-X7: Documentation - Usability

Description: Requirement regarding the ease to use the documentation provided.

Cell reference Y4.1-X8: Documentation - Security

Not applicable.

6.1.4.2 Matrix line Y4.2 - Technical support

All QoS assessments related to activities associated with the technical support of a telecommunication service to help users experiencing problems in the use of the service.

Cell reference Y4.2-X1: Technical support - Availability

Description: Requirement regarding the availability of the technical support facilities, including the hours of access as well as methods of access.

Cell reference Y4.2-X2: Technical support - Fidelity/Accuracy

Description: Requirement regarding the correctness and completeness in the provision of the technical support.

Cell reference Y4.2-X3: Technical support - Speed

Description: Requirement regarding the time taken from a request made to the provider for service support to the instant this has been provided to the satisfaction of the customer.

Cell reference Y4.2-X4: Technical support - Capability

Description: Requirement regarding the number of customers expected to require simultaneously the technical support.

Cell reference Y4.2-X5: Technical support - Reliability

Description: Requirement regarding the reliability of the technical support.

Cell reference Y4.2-X6: Technical support - Flexibility

Description: Options required by the customer to satisfy special requirements with regard to the technical support.

Cell reference Y4.2-X7: Technical support - Usability

Description: Requirement regarding the ease and convenience with which service technical support is requested and provided. For example, varying levels of service support may be required by different segments of the customer population.

Cell reference Y4.2-X8: Technical support - Security

Description: Identification of the aspects of technical support where the customer security, privacy or confidentiality requirements should be met by the provider.

6.1.4.3 Matrix line Y4.3 - Commercial support

All QoS assessments related to activities associated with the commercial support of a telecommunication service.

Cell reference Y4.3-X1: Commercial support - Availability

Description: Requirement regarding availability of the commercial support facilities, including the hours of access as well as methods of access.

Cell reference Y4.3-X2: Commercial support - Fidelity/Accuracy

Description: Requirement regarding the correctness and completeness of the commercial support facility.

Cell reference Y4.3-X3: Commercial support - Speed

Description: Requirement regarding the time taken from a request made to the provider for commercial support to the instant this has been provided to the satisfaction of the customer.

Cell reference Y4.3-X4: Commercial support - Capability

Description: Requirement regarding the number of customers expected to require simultaneously the commercial support.

Cell reference Y4.3-X5: Commercial support - Reliability

Description: Requirement regarding the reliability of the commercial support.

Cell reference Y4.3-X6: Commercial support - Flexibility

Description: Options required by the customer to satisfy special requirements with regard to commercial support.

Cell reference Y4.3-X7: Commercial support - Usability

Description: Requirement regarding the ease and convenience with which the commercial support should be requested and provided.

Cell reference Y4.3-X8: Commercial support- Security

Description: Identification of the aspects of commercial support where the customer security, privacy or confidentiality requirements should be met by the provider.

6.1.4.4 Matrix line Y4.4 - Complaint management

All QoS assessments related to activities associated with the customer's complaints to the provider about the service provided.

Cell reference Y4.4-X1: Complaint management - Availability

Description: Requirement regarding the availability of the complaint facility.

Cell reference Y4.4-X2: Complaint management - Fidelity/Accuracy

Description: Requirement regarding the correctness and completeness the complaints are dealt with.

Cell reference Y4.4-X3: Complaint management - Speed

Description: Requirement regarding the time taken from a complaint made to the provider to the instant this complaint has been processed to the satisfaction of the customer.

Cell reference Y4.4-X4: Complaint management - Capability

Description: Requirement regarding the number of customers expected to require simultaneously the complaint management facility.

Cell reference Y4.4-X5: Complaint management - Reliability

Description: Requirement regarding the reliability of the complaint facility.

Cell reference Y4.4-X6: Complaint management - Flexibility

Description: Options required to satisfy special requirements with regard to complaint address.

Cell reference Y4.4-X7: Complaint management - Usability

Description: Requirement regarding the ease and convenience complaints may be addressed to the provider.

Cell reference Y4.4-X8: Complaint management- Security

Description: Identification of the aspects of complaint management where the customer security, privacy or confidentiality requirements should be met by the provider.

6.1.5 Matrix line Y5 - Repair-Troubleshooting

All QoS assessments related to activities associated with the restoration of a telecommunication service to the customer after a fault resulting in partial or complete loss of service or service features.

Cell reference Y5-X1: Troubleshooting - Availability

Description: Requirement regarding the availability of the troubleshooting facilities by the user, including hours of access as well as methods of access.

NOTE: Space covers the geographic coverage and resource size aspects.

Cell reference Y5-X2: Troubleshooting - Fidelity/Accuracy

Description: Requirement regarding the correctness and completeness of the troubleshooting facilities.

Cell reference Y5-X3: Troubleshooting - Speed

Description: The customer's requirement for the time taken from the report of fault to the provider to the time this fault is fixed.

Cell reference Y5-X4: Troubleshooting - Capability

Description: Requirement, if any, regarding the number of customers expected to require simultaneously the troubleshooting facilities, for example in emergency situation.

Cell reference Y5-X5: Troubleshooting - Reliability

Description: Requirement regarding the reliability of the troubleshooting facility.

Cell reference Y5-X6: Troubleshooting - Flexibility

Description: Options available in carrying out repairs.

EXAMPLE: Repairs may be carried out, where possible, in the first instance, without access to customer premises. Repairs may also be carried out at customer's convenience should entry to premises be required. Alternative service may be requested if service is unusable.

Cell reference Y5-X7: Troubleshooting - Usability

Description: Requirement regarding the ease and convenience with which a fault can be reported to the provider and repair carried out.

Cell reference Y5-X8: Troubleshooting - Security

Description: Identification of the aspects of troubleshooting where the customer security, privacy or confidentiality requirements should be met by the provider.

6.1.6 Matrix line Y6 - Metering/Charging/Billing

All QoS assessments related to activities associated with the metering, charging and billing of a telecommunication service to a customer.

This could be for one call, for a specified period or for a given billing amount, depending whether its about a bill or any other type of expense information, e.g. ebill, expense signal, real time expense information on the provider website, AoC-S supplementary service, etc.

Cell reference Y6-X1: Charging/Billing - Availability

Description: Requirement regarding the availability of any type of expense information at the customer request.

Cell reference Y6-X2: Charging/Billing - Fidelity/Accuracy

Description: Requirement regarding the completeness and the accuracy of any type of expense information in reflecting actual use of the service according to the conditions of the contract in particular every tariff parameter including day time and day of the week.

Cell reference Y6-X3: Charging/Billing - Speed

Description: Requirement regarding the time taken from the end of a communication to the time the expense information is provided to the customer.

Cell reference Y6-X4: Charging/Billing - Capability

Description: Requirement regarding the number of customers expected to require simultaneously access to the various types of expense information.

Cell reference Y6-X5: Charging/Billing - Reliability

Description: Requirement regarding the reliability of any type of expense information. This particular aspect is expected to be better assessed by a commitment of the provider to conform to a code of best practices or still better by the certification of the provider charging/billing process on this particular aspect.

Cell reference Y6-X6: Charging/Billing - Flexibility

Description: Options required for:

- a) the format of the billing information made available;
- b) the time when billing information may be available;
- c) any other type of expense information.

Cell reference Y6-X7: Charging/Billing- Usability

Description: Requirement regarding the ease and convenience with which the various types of expense information are provided.

Cell reference Y6-X8: Charging/Billing - Security

Description: Identification of the aspects of any type of expense information where the customer security, privacy or confidentiality requirements should be met by the provider.

6.1.7 Matrix line Y7 - Cessation

All QoS assessments related to activities associated with the cessation of a telecommunication service from the time it is requested by a customer, to the time it is completed to the satisfaction of the customer.

Cell reference Y7-X1: Cessation - Availability

Description: Requirement regarding the availability of the facilities offered to the customers for cessation of service.

Cell reference Y7-X2: Cessation - Fidelity/Accuracy

Description: Requirement regarding the correctness and completeness in carrying out the cessation of a service and the associated activities irrespective of whether the cessation was initiated by the customer or the provider.

Comments: Cessation of a service may include the removal of associated equipment from customer premises; cessation of a service may include closing of all records and associated transactions between the customer and the provider.

Cell reference Y7-X3: Cessation - Speed

Description: Customer's requirements for the time taken from request for cessation of service to the instant cessation is carried out by the provider.

Cell reference Y7-X4: Cessation - Capability

Description: Requirement regarding the number of customers expected to require simultaneously the cessations facilities.

Cell reference Y7-X5: Cessation - Reliability

Description: Requirement regarding the reliability of the facility for the cessation of a service and the associated activities.

Cell reference Y7-X6: Cessation - Flexibility

Description: Requirement related to minimizing inconvenience during the process of cessation of a service.

Cell reference Y7-X7: Cessation - Usability

Description: Requirement regarding the ease and convenience of activities connected with cessation of a service subscription.

Cell reference Y7-X8: Cessation - Security

Description: Identification of the aspects of the cessation process where the customer security, privacy or confidentiality requirements should be met by the provider.

6.1.8 Matrix line Y8 - Network/service management by the customer

All QoS assessments related to activities associated with the customer's control of predefined changes to telecommunication services or network configurations.

Cell reference Y8-X1: Network/service management by customer - Availability

Description: Requirement regarding the availability of the networks/service management facilities.

Cell reference Y8-X2: Network/service management by customer - Fidelity/Accuracy

Description: Requirement regarding the correctness and completeness of the network or service management facilities.

Cell reference Y8-X3: Network/service management by customer - Speed

Description: Customers requirement for the time taken for access and responses to a request to the network/service management facilities.

Cell reference Y8-X4: Network/service management by customer - Capability

Description: Requirement regarding the number of customers expected to require simultaneously the network/service management facilities.

Cell reference Y8-X5: Network/service management by customer - Reliability

Description: Requirement regarding the reliability of the network/service management facilities.

Cell reference Y8-X6: Network/service management by customer - Flexibility

Description: Options required for customizations in the network/s service management facilities.

Cell reference Y8-X7: Network/service management by customer - Usability

Description: Requirement regarding the ease and convenience to access the network/service management facilities.

Cell reference Y8-X8: Network/service management by customer - Security

Description: Identification of the aspects of network/service management process where the customer security, privacy or confidentiality requirements should be met by the provider.

6.1.9 Matrix line Y9 - Service utilization

All QoS assessments related to the use of a telecommunication service, i.e. assessment of the service technical quality. The use of the service includes all the aspects of the technical quality at the transport level as well as at the service level, taking into account whether the access to the service is switched or not. All these aspects of the technical quality will be detailed for each service in EG 202 009-2 [8].

NOTE: The information given in the following cells should be tailored to the features of each service and of its specific functions. This has to take into account whether the access to the service use a switched or a always on connection. Details can be found in EG 202 009-2 [8]. Therefore, if the identification of the users' QoS requirements has to take into account various services with multiple functions, this set of cells have to be fulfilled for each of these services and functions.

Y9.1 Access technical quality: The various aspects of the technical quality at the access level.

Cell reference Y9.1-X1: Access technical quality - Availability

Description: Availability requirement including temporal and spatial conditions for the access function.

NOTE: Space covers the geographic coverage and resource size aspects.

Cell reference Y9.1-X2: Access technical quality - Fidelity/Accuracy

Description: Reference levels required for the faithfulness and completeness in carrying out the access function.

Cell reference Y9.1-X3: Access technical quality - Speed

Description: Required speed conditions for the access function.

Cell reference Y9.1-X4: Access technical quality - Capability

Description: Capability conditions required for the components of the access function if any.

Cell reference Y9.1-X5: Access technical quality - Reliability

Description: Requirements regarding the reliability of the access function over a given time period.

Cell reference Y9.1-X6: Access technical quality - Flexibility

Description: Options required in using the access function.

Cell reference Y9.1-X7: Access technical quality - Usability

Description: Requirement for the ease in the application of the access function.

Cell reference Y9.1-X8: Access technical quality - Security

Description: Identification of the aspects of the transport function where the customer security, privacy or confidentiality requirements should be met by the provider.

Y9.2 Bearer service technical quality: The various aspects of the technical quality at the transport level.

Cell reference Y9.2-X1: Bearer service technical quality - Availability

Description: Availability requirement including temporal and spatial conditions for the transport function.

NOTE: Space covers the geographic coverage and resource size aspects.

Cell reference Y9.2-X2: Bearer service technical quality - Fidelity/Accuracy

Description: Reference levels required for the faithfulness and completeness in carrying out the transport function.

Cell reference Y9.2-X3: Bearer service technical quality - Speed

Description: Required speed conditions for the transport function.

Cell reference Y9.2-X4: Bearer service technical quality - Capability

Description: Capability conditions required for the components of the transport function if any.

Cell reference Y9.2-X5: Bearer service technical quality - Reliability

Description: Requirements regarding the reliability of the transport function over a given time period.

Cell reference Y9.2-X6: Bearer service technical quality - Flexibility

Description: Options required in using the transport function.

Cell reference Y9.2-X7: Bearer service technical quality - Usability

Description: Requirement for the ease in the application of the transport function.

Cell reference Y9.2-X8: Bearer service technical quality - Security

Description: Identification of the aspects of the transport function where the customer security, privacy or confidentiality requirements should be met by the provider.

Y9.3 Service usage part technical quality: The various aspects of the technical quality of the service depending on the specific features of each service. This includes the technical quality of the possible built-in functions of the service.

Cell reference Y9.3-X1: Service usage part technical quality - Availability

Description: Availability requirement including temporal and spatial conditions for the core service function.

NOTE: Space covers the geographic coverage and resource size aspects.

Cell reference Y9.3-X2: Service usage part technical quality - Fidelity/Accuracy

Description: Reference levels required for the faithfulness and completeness in carrying out the core service function.

Cell reference Y9.3-X3: Service usage part technical quality - Speed

Description: Required speed conditions for the core service function.

Cell reference Y9.3-X4: Service usage part technical quality - Capability

Description: Capability conditions required for the components of the service if any.

Cell reference Y9.3-X5: Service usage part technical quality - Reliability

Description: Requirements regarding the reliability of the service function over a given time period.

Cell reference Y9.3-X6: Service usage part technical quality - Flexibility

Description: Options required for the use of the service.

Cell reference Y9.3-X7: Service usage part technical quality - Usability

Description: Requirements for the ease in the usage of the service function.

Cell reference Y9.3-X8: Service usage part technical quality - Security

Description: identification of the aspects of the service where the customer security, privacy or confidentiality requirements should be met by the provider.

Y9.4 Presentation and user interface quality: The various aspects of the quality of the facilities provided to make the service usage user friendly, particularly in having similar services converging in a single interface. This includes the presentation quality of the possible various built-in functions of the service.

Cell reference Y9.4-X1: Presentation and user interface quality - Availability

Description: Availability requirement for the presentation of the service to the user and the user interface.

Cell reference Y9.4-X2: Presentation and user interface quality - Fidelity/Accuracy

Description: Reference levels required for the faithfulness and completeness in carrying out the presentation of the service to the user and the user interface.

Cell reference Y9.4-X3: Presentation and user interface quality - Speed

Description: Required speed conditions for the presentation of the service to the user and the user interface.

Cell reference Y9.4-X4: Presentation and user interface quality - Capability

Description: Capability conditions required for the presentation of the service to the user and the user interface if any.

Cell reference Y9.4-X5: Presentation and user interface quality - Reliability

Description: Required conditions for the reliability of the presentation of the service to the user and the user interface over a given time period.

Cell reference Y9.4-X6: Presentation and user interface quality - Flexibility

Description: Options required for the presentation of the service to the user and the user interface.

Cell reference Y9.4-X7: Presentation and user interface quality - Usability

Description: Requirement for the ease in using the presentation of the service to the user and the user interface.

Cell reference Y9.4-X8: Presentation and user interface quality - Security

Description: Identification of the aspects of the user presentation where the customer security, privacy or confidentiality requirements should be met by the provider.

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)). 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 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. It should be kept in mind that users do not have 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.

6.2 Importance of deriving service specific QoS parameters

The next step is to define parameters that can be used to measure quantitatively the QoS of each aspect of the telecommunications services.

Some aspects of the service throughout its life cycle are more or less generic and should fit almost all services:

Delivery:

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

Help desk:

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

Billing:

- a) Timely supply.
- b) Clarity.
- c) Transparency.
- d) Compliance of the provider metering and billing system to an approval or to a best practices scheme.

Supplier-customer relationship (commercial or technical support):

- 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 the customers.
- d) Responsiveness. The willingness to help customers and provide prompt services.

For the **use of the service**, QoS parameters are service specific. In the example of switched telephony the following parameters are usual:

- a) Unsuccessful call ratio.
- b) Call set up time.
- c) Speech connection quality.
- d) Dropped call ratio.

These parameters are obviously not suited for other services such as email or SMS. Different parameters have to be chosen for fixed, mobile communications or Internet access and email services. Part 2 of this deliverable aims to help to choose the most appropriate ones.

In addition, it is also obvious that the same service may be used for different applications with different requirements. Therefore, parameters to monitor have to be chosen to take into account any particular aspect of the application using the service considered.

6.3 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. In addition, the results should be 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, or else it would be difficult to use them effectively. This is in principle the case for a survey among the general public.

6.4 Prioritization

In principle all the criteria on the X axis of the matrix given in table 1 are needed for a comprehensive assessment of the QoS. Nevertheless, taking into account that too many parameters would bring a useless management cost and that, depending on the type of service, some criteria are usually more difficult to keep at a high level, it can be sufficient to monitor only the most sensitive ones. Hence, it will be easier to come to a reasonable number of parameters to achieve the best possible compromise between the number of parameters and the accuracy of the QoS evaluation, taking care that a too few may lead to overlook some key aspects. Going through each cell of the table 1 matrix should help to study with the relevant parties involved what is the relative priority of each parameters. Such prioritization should be revised regularly according to the user experience.

Again depending on the application considered, different parameters may be chosen as the most important ones for different uses of the same service.

6.5 Preferred values

Once the parameters have been defined and prioritized, the issue of how the QoS will be evaluated by the user has to be addressed. Different situations may arise:

- 1) The user wants to compare the QoS assessment of service offers from different providers, for example before contracting. In such case, the user wants to check the balance between the prices and the QoS actually achieved for these offers in order to identify which ones best match his needs. Therefore, target values are not always required. For example if the user wants to find the best compromise between prices and performance.
- 2) The user wants to set up a Service Level Agreement (SLA); here the issue is to define which references should be taken to decide whether the QoS is acceptable or not.

The answer may be in the parameters 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 other cases, the parameters, e.g. call set-up time, is checked against a reference value; the issue is then to define this reference value. EG 202 009-2 [8] proposes some indicative values but these values have often to be adapted to take into account specific needs. Therefore, it can be useful to refer 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 an adequate 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.

6.6 QoS requirements review

Since the technology is evolving very fast, users' QoS requirements and the parameters should be reviewed periodically to take into account new services and user expectations for improvement.

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

7 Measurements

The assessment of the QoS may be evaluated against reference values. As seen above these parameters are measured either objectively via technical means or subjectively (perceived QoS) via surveys amongst the users. 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 as well as the terminals and any piece of equipment included in the communication path. Therefore, particular terminal types might be specified in order to enable comparisons between different provisions.

7.1 Objective measurements

Parameters like call set up time, call failures, interruptions can quite easily be measured with 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. As 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 made 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 communication paths and types are checked.

7.2 Subjective measurements

Subjective measurements are also needed to check the customer perception of a parameter that is monitored objectively. 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 process 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 a public authority asks a third party to perform the measurements related to their requirements and then makes the results publicly available.

8 Conclusion

The ETSI User Group hopes the present document provides useful guidance on how to get the users expectations on QoS to the standard makers, regulators and providers. It is expected also that the users themselves can find here some help, e.g. general public when choosing a provider or user organizations when formulating recommendations or business users when establishing a SLA with their preferred provider. EG 202 009-3 [9] is intended to provide additional support on this last aspect.

Annex A (informative): Bibliography

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History

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