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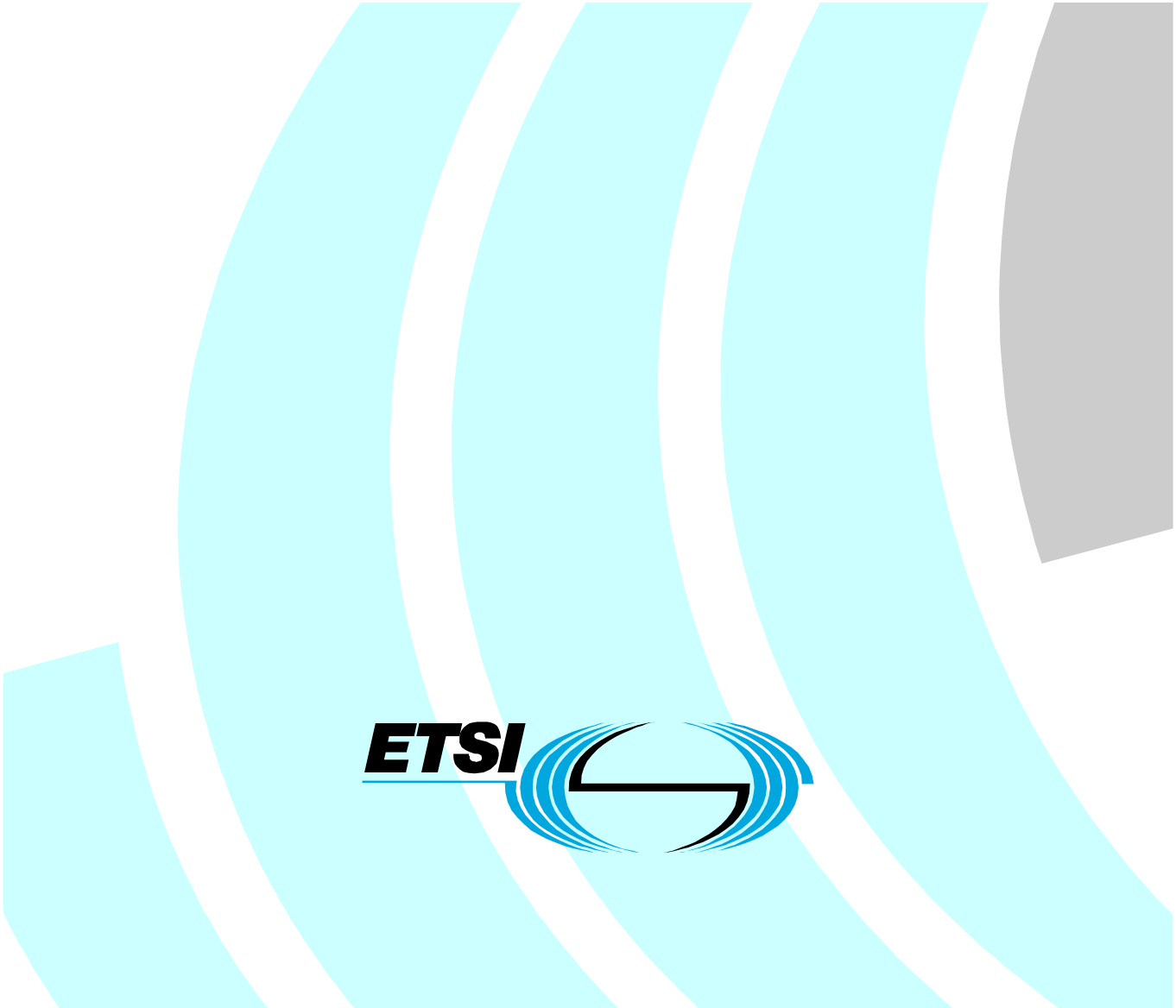
Technical Report

User Group
User's Quality of Service Criteria for Internet Access in Europe



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Contents

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Foreword

This Technical Report (TR) has been produced by ETSI User Group (USER).

Introduction

The present document describes the methodology used to determine User's Quality of Service (QoS) criteria for Internet Access in Europe, the resulting set of QoS criteria arising from the application of this methodology and recommendations for follow up work.

1 Scope

The scope of the present document is contained within the following features;

- The QoS criteria determined are those from the user's point of view. These are "designed" to be reportable by the ISPs to enable users to compare performances and ascertain the suitability of an ISP for their particular communication needs.
- The QoS criteria chosen are generic. Thus these do not cater for service specific criteria of the many services supported over the Internet and offered by the ISPs. For example the time taken for delivery of an email is not covered. The QoS criteria identified are considered applicable, in a generic sense, to most, if not all of the service supported by ISPs and accessed by the user.
- The QoS criteria identified are applicable for dial up, broadband and wireless access.
- The QoS criteria identified are meant to be defined as parameters. This is outside the scope of the present document. It is a study undertaken by another exercise and the outcome is expected to be published in a separate document, EG 202 057-4 (see bibliography). While interpreting each criterion consideration ought to be given for features applicable for each form of access. For example, while considering the criterion "number of attempts to login", this would include the call set up time plus the time taken for login in the case of dial up but only the latter in the case of broadband access.
- These QoS criteria arrived at are based on a methodology described in the present document. This includes consultations with users, regulators and ISPs in a number of European countries. However this is only a snap short of the users' requirements considered pertinent among the European Users in 2003. The applicability of these is to be reviewed when significant change/s occur in the criteria and the order of importance. Despite the fact the criteria chosen are those considered "stable" and therefore suitable for recommendation as worthy of reporting on a regular basis by ISPs, it is suggested that these be reviewed in five year's time, in year 2008.

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.

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

3 Definitions, symbols and abbreviations

3.1 Definitions

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

quality: totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs

Quality of Service (QoS) (in telecommunications): totality of (network and non-network related) characteristics of a telecommunication service on its ability to satisfy stated or implied needs

NOTE 1: These characteristics have the following features:

1) QoS is measured and expressed on an end-to-end basis.

2) These are service specific.

3) Characteristics could be network related or non-network related or a combination of these.

4) There could be separate industry and customer oriented performance measures.

5) QoS performance parameters would have different priorities for different user sectors.

6) Levels of performance may be different for different user sectors as well as among users within the same user sectors.

7) Quality requirements are not necessarily static. They are dynamic, that is priorities of parameters and their levels could vary with time.

NOTE 2: There are four viewpoints of QoS. These are:

- User's QoS requirements;
- QoS offered or planned by service provider;
- QoS achieved by the service provider;
- User's perception of QoS.

NOTE 3: In the present document the third viewpoint QoS achieved by the service provider is considered. For fuller treatment of this topic see ITU-T Recommendation G.1000.

QoS criteria: descriptive titles of performance criteria

QoS parameter: when a QoS criterion is defined with boundaries and scope unambiguously and clearly stated this then becomes a parameter

3.2 Abbreviations

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

EU	European Union
FITCE	FederatIon of Telecommunication engineers of the European Community
ISP	Internet Service Provider
ITU-T	International Telecommunications Union – Telecommunications sector
NRA	National Regulatory Authority
QoS	Quality of service
SLA	Service Level Agreement

4 Purpose

The contents of the present document is to be the basis of a document to be produced by the ETSI in which the QoS criteria for access to services provided by ISPs will be defined as parameters together with recommended methods of measurement and presentation of results. Such document could be considered by the National Regulatory Authorities (NRAs) or the European Commission as a discussion document for possible inclusion at a future date as a requirement for ISPs to report delivered quality on a regular basis in Europe. It could also be considered by ISPs to report delivered quality on a voluntary basis and for use as template for formulating SLAs with organizations on a bilateral basis.

5 Determination of QoS criteria relevant to users

5.1 Background

5.1.1 Need for Internet services

Use of the Internet supported services has pervaded commercial and residential sectors of the population of a significant proportion of the countries of the globe to the extent it is now an accepted means of transfer of information, communication by email, commercial transactions (e-commerce), interest groups communicating and discussing in the form of chat/news groups, playing games electronically and so on. In many sectors Internet is an essential part of communication infrastructure. The trend is for the Internet supported services to pervade more sectors of the population and become a major and essential part of communication methods.

Statistical data on Internet will require rapid updating. About one in ten of the population have Internet access i.e. around 600 millions or more. Europe account for around 200 millions or thereabouts. The trend is for access to be on the increase.

5.1.2 Services access

The main types of accesses are:

- Dial up.
- Broad band.
- Wireless (terrestrial and satellite).

The first two may be categorized as fixed or terrestrial and the third would embrace all forms of wireless access, including satellite access. The main cores of the network are managed by different organizations. The end-to-end quality of service experienced by the user is a sum of the contributions from the core network and access network. In addition the software quality, website characteristics would also contribute towards the quality of the user experience.

With the increasing penetration of digital networks, dial up will become less prevalent. Dial up is expected to be present in not insignificant quantities in some countries of Europe and the current EU member countries for the next 5 to 7 years. Broadband will continue to expand in penetration. More sophisticated access methods on wireless can be expected. The access is considered sufficiently stable to warrant QoS criteria to be defined and used for a few years.

5.1.3 Need for QoS

With the significant number of users, both residential and commercial it is worth considering the value of a set of Quality of service (QoS) criteria that may be reported by the ISPs for the benefit of both themselves and the users. Users will benefit by being in an informed position to determine which ISP is best suited for their communication needs from the data on delivered quality. The ISPs could benefit by identifying, in due course, the QoS requirements of the different segments of the population. This could enable them to choose the niche in the market most suited to their philosophy and resource allocation.

The present document describes a methodology to determine user's QoS criteria and recommends a list for regular reporting by the ISPs.

5.2 Methodology

The principal steps in the determination of User's QoS criteria are:

- Arrive at a primary set of QoS criteria based on work already carried out in this area and complementing these with the application of the matrix (see annex A) from ITU-T Recommendation G.1000 which is specifically intended to arrive at user's QoS criteria for any telecommunication service;
- Carry out a consultative process with user representatives, regulators and ISP representatives from a number of countries in Europe to arrive at a revised and consensual set of QoS criteria from the primary set;

- Validate the secondary set against a user population.

At the end of the customer validation, which takes the form of a survey, a final set of QoS criteria are arrived at. These are listed in clause 5.2.5. Clauses 5.2.1 through 5.2.4 describe the salient points of the methodology in action.

5.2.1 Derivation of primary set of QoS criteria - for consultation

A primary or basic set of QoS criteria which would form the basis for consultation with representatives of the users, regulators and ISPs was determined. A search over the Internet for published work in this area for the European scene resulted in identifying the work carried out for the European Commission described in a report "Quality of service Parameters for Internet Service provision" (see bibliography). Other works mainly dwelt on Network Performance vaguely masquerading under the umbrella of "Quality of Service". Such works were of benefit and information to the network providers and ISPs but of little direct use to the users.

To arrive at the users basic set of QoS criteria, a matrix intended for the identification of such criteria and published in the ITU-T Recommendation G.1000 [1] was made use of. Application of the concepts of the matrix and complementing these with the QoS criteria of the report "Quality of service Parameters for Internet Service provision" (see bibliography, also illustrated in annex B) produced the primary or basic list in annex C. The coverage of the criteria was intended to include all reasonable performance aspects of the access to the Internet. A compromise was arrived to balance between the granularity of the number of criteria to be chosen. For example use of the matrix for basic telephony can produce as many as 43 QoS criteria but for day-to-day study of QoS for this service a maximum of 13 criteria is considered adequate.

This basic set was used as the template for consultations with representatives in the European countries.

5.2.2 Summary of consultative process with user bodies, regulators and ISPs

Seven European countries were targeted as being "representative" of Europe. These were four mid-European countries, Ireland, UK, France and Germany, one Scandinavian country - Denmark, one Mediterranean country - Italy and one East European country - Poland. Personal discussions were carried out in each of these countries with representatives of the user groups, regulators and ISPs with the "primary set of QoS" in annex B in the background. Each body was asked the following questions as prelude to ensuing discussions:

1) Is it a good idea if the major ISPs in your country reported delivered (or achieved) quality levels on a regular basis?

2) If the reply was affirmative each party was asked whether these should be mandatory or voluntary.

The discussions, which followed, were iterative. Emphasis was made to ensure that it was more important to gather the local view on the reporting of QoS than acquiescence to an ETSI or European Commission directive on this matter. The following are the consensus findings from these discussions:

1) Majority of the bodies agreed that it was good or at least desirable to have ISPs to report delivered quality on a regular basis.

2) Do not make it compulsory for ISPs to report results but leave it to the NRAs to enforce or encourage reporting on a voluntary basis.

3) That there be a core set of QoS criteria which should be applicable to all countries and another set from which selected ones may be recommended on a country basis to reflect local requirement.

4) There should be no targets for QoS criteria but the ISPs should be requested to report the achieved performance level in presentable form for users to draw their own conclusions and comparisons.

5) There ought to be separate requirements for dial up, broadband and wireless types of access.

6) Produce a Europe wide agreed method of agreed definitions of parameters, methods of measurements and recommended way of resenting results to ensure comparability.

7) Do not attempt to select segments of population with different performance requirements as these would become an unmanageable exercise and be of limited value. It would also result in different segmentation in different countries with different performance requirements even for the similar segments.

8) Some performance criteria in the basic list were considered as network performance than end to end quality of service and were revised and incorporated into more user oriented criteria.

9) A new set of criteria titled "service features" incorporating many of the criteria from the basic list is incorporated.

10) When these criteria are taken to the next stage all pertinent loopholes which could lead to varying interpretations be identified to ensure that defined parameters are clear and unambiguous, thus enable all ISPs to measure and report for comparability.

Discussion:

- The market dynamics of and for the ISP in different countries of Europe varied vastly. The UK and Ireland had a fairly high level of competition. The view in these countries tended towards leaving the QoS reporting to market forces and some ISPs did not see the need for a Europe wide agreed set of QoS criteria. All other countries that had lesser level of competition than the UK and Ireland expressed the view that a Europe wide agreed set of QoS criteria would benefit both the users and the ISPs. A few ISPs have expressed concern that mandatory reporting would not be helpful. It is necessary to be sensitive to the concerns of the industry, but it is also necessary not to give undue attention to fears that are groundless. On balance it is observed that the majority would benefit if the QoS criteria were defined for use on a Europe wide basis and made available for use on a voluntary basis or at the bequest of the NRA.

- Detailed findings of the discussions with each party in the above-mentioned countries are reported elsewhere [report to the EC – being written now]. The primary set was revised taking into account the opinions of the various parties and the secondary list was developed and is listed in annex D. This formed the basis for the user survey, described in clauses 5.2.3 and 5.2.4.

5.2.3 User validation and ranking of QoS criteria – survey

The revised set of QoS criteria was put to a sample of population in Europe for validation. The validation exercise comprised of ranking of the criteria in relative terms and to suggest any criteria not included in the secondary list.

The population selected for the survey was the membership of the Federation of telecommunication engineers of the European Community (FITCE), an organization whose membership is primarily first line managers and above of service providers and consultants in the telecommunications industry across Europe. It had membership in 13 European countries. Additionally a population sample from Denmark (not a member of FITCE) was also added.

The questionnaire is given in annex D together with the instructions to fill in the requested information. The results of the survey are described in clause 5.2.4.

5.2.4 Findings of survey

The survey was sent to 2 600 FITCE members and 200 Danish members making a sample size of 2 800 in 14 countries. The number of replies received was 156 representing a return of 5,6%. This return rate is comparable with market surveys of this nature. The population sample to which survey questionnaire was sent might be considered to be knowledgeable of the QoS criteria associated with the Internet access due to the nature of their professional background.

The summary of the scores provided by the respondents is given in annex E.

The ranked QoS criteria are listed in table 1.

A graph between the mean of each criterion and its standard deviation in figure 1.

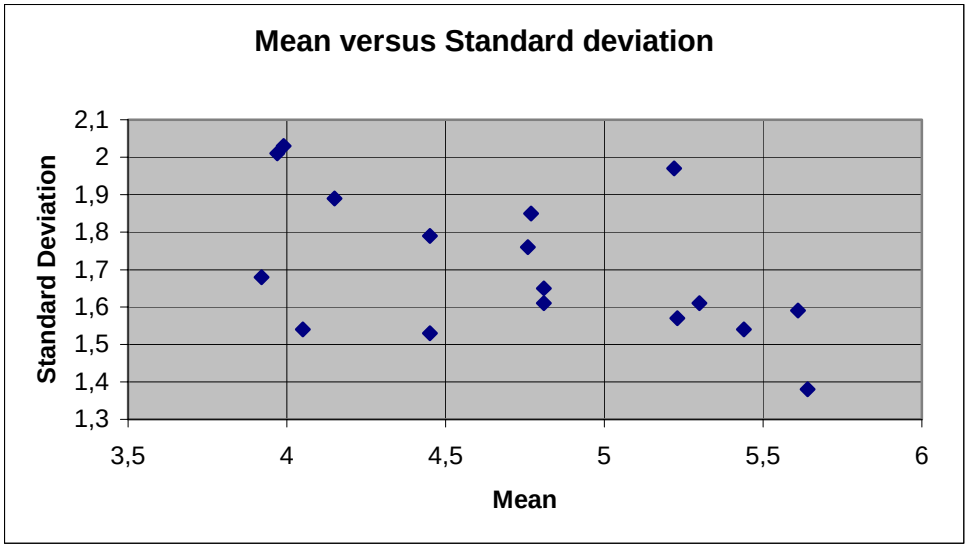

Figure 1

Graph indicating relationship between mean of the ranking scores and the corresponding standard deviation for the 17 QoS criteria. Joining the common points would indicate a slight negative slope indicating that higher the mean scores lower the standard deviation.

The following are the main conclusions from the survey:

1) Ranking of the QoS criteria appears to be within normal expectations (see table 1).

2) There appears to be more concurrence among the sample on the more highly ranked QoS criteria indicated by the lower standard deviation for these.

3) There appears to be slightly higher divergence of opinion on the ranking of the criteria considered to be of lower importance indicated by the slightly higher standard deviation of the ranking figures.

4) There were no significant additions to the QoS criteria by the population sample when asked for criteria not included in the survey form. Most of the comments were related to billing and wider options to be made available by the ISPs.

Table 1: QoS criteria ranked in the order of importance together with mean scores and corresponding standard deviation

Rank	QoS Criteria	Mean Score	Standard Deviation
1	1 or fewest number of attempts required to achieve connection (login)	5,64	1,38
2	Low frequency of connectivity loss while using service after login (also to include partial service loss)	5,61	1,59
3	High Downstream speed achieved	5,44	1,54
4	Few durations of ISP "outages" (including partial outages)	5,30	1,61
5	1 or fewest number of attempts to connect during busiest hour of the week (login)	5,23	1,57
6	Security offerings	5,22	1,97
7	Ease of commissioning of service	4,81	1,61
8	High level of professionalism on help line	4,81	1,65
9	Quality of billing promise + delivery	4,77	1,85
10	Ready availability of information on Service features and conditions of service	4,76	1,76
11	Low Latency, Packet loss and Jitter	4,45	1,54
12	Few Complaints and quickness for their resolution	4,45	1,79
13	Ease of cessation of service	4,15	1,89
14	Level of help line availability	4,05	1,54
15	Spam control offerings	3,99	2,03
16	Anti virus protection offerings	3,97	2,01
17	High Upstream speed achieved	3,92	1,68

Highest score allowable is 7 and the lowest is 1.

5.2.5 Recommended set of QoS criteria

The following QoS criteria are recommended as most pertinent for users in choosing and monitoring the performance of an ISP. Four categories have been developed for logical and presentational reasons from table 1. One criterion - the 17th - "high upstream speed to be achieved" has been omitted, as information on this is unlikely to add much value to the user. This was rated the least important in the survey.

Category A: Mainly "technical" criteria - of interest to most segments of Internet usage population

1) Number of attempts required to achieve connection (login)

(Quantitative + Qualitative reporting)

2) Frequency of connectivity loss while using service after login (also to include partial service loss)

(Quantitative + Qualitative reporting)

3) Downstream speed achieved **(Quantitative + Qualitative Reporting)**

4) ISP outages (including partial outages) **(Quantitative + Qualitative reporting)**

5) Number of attempts to connect (login) during busiest hour of the week

(Quantitative + Qualitative Reporting)

The five criteria are to form the core set. All ISPs may be encouraged to report these for the benefit of all customers.

Category B: Technical and mainly of interest to telecommunication managers of large networks (typically networks of corporate and large organizations who have their own telecommunication managers managing the network and complex communications)

1) Latency **(Quantitative reporting)**

2) Packet loss **(Quantitative reporting)**

3) Jitter **(Quantitative reporting)**

These technical criteria are of use only to users of large networks e.g. large organizations that use specialized terminal equipment to achieve sophisticated communication. These may be reported only on a bilateral basis with those organizations with which the ISP has a SLA. The points of the network at which measurements are to be carried out are to be undertaken in the next phase of the work.

Category C: Mainly "operational" criteria – of interest to most segments of Internet usage population

4) Ease of commissioning of service **(Qualitative reporting)**

5) Professionalism of help line **(Qualitative reporting)**

6) Quality of billing promise + delivery **(Quantitative + Qualitative reporting)**

7) Complaints and resolution time **(Quantitative + Qualitative reporting)**

These criteria considered "non-technical" are more of organizational nature and give e an idea of the managerial competitiveness of the ISP. These are encouraged to be reported on a regular basis by the ISPs.

Category D: Mainly for pre-subscriber consideration.

A list of Service features and Conditions of service. This list could include the following:

1) Conditions of customer membership, including tariff and options.

2) Number of email addresses.

3) Size of email, storage size, storage time and other relevant details.

4) Availability + conditions for web space.

5) Help line availability + tariff details.

6) Data protection practices.

7) Availability and conditions for control of "spam".

8) Availability and conditions for control of "virus".

9) Availability and conditions for parental control.

10) Availability and conditions for security offerings.

11) Interaction with other ISPs.

12) Residues after uninstallation of ISP software.

Topics in this list may be considered essential information to potential subscribers to enable them to make an informed choice for their particular communication needs. This list need be updated only to record amendments.

6 Recommendations and future work

The following recommendations are made as a result of this study. The time frame for these recommendations is the next 5 years.

Recommendation 1: That ETSI develops a document to:

1) define as parameters,

2) specify the method of measurement, together with any sampling size, frequency of measurement and other necessary information on methods of measurement, and

3) specify options for presentation of results,

for the criteria listed in categories **A, B and C** in clause 5.2.5.

Criteria listed in **D** are elaborated to enable ISP to be given guidance on the information users might reasonably expect to be provided before signing up. These need be updated as and when amendments are made.

The QoS parameters in categories A.B and C are defined separately, where necessary and applicable for the following access categories;

- Dial up,
- Broad band, and
- Wireless.

Recommendation 2: The document is developed in consultation with representatives from the ISPs, regulators, user groups and telecommunication industry in Europe.

Recommendation 3: The document, when approved in ETSI is offered to all national ISP associations among member countries of ETSI (in Europe). They may be encouraged to ask their members to provide delivered quality on a regular basis for their benefit and that of the users.

The NRAs should be free to add new QoS criteria should the local conditions in their own country warrant this.

Recommendation 4: The document is considered for review in five year's time, in year 2008 for:

1) the suitability of the QoS criteria,

2) for the usefulness of the reported QoS from the ISPs both from the ISP's and the Users' point of view.

Annex A (informative): Matrix from ITU-T Recommendation G.1000

		SERVICE QUALITY CRITERIA						
		Speed 1	**Accuracy 2**	**Availability 3**	**Reliability 4**	**Security 5**	**Simplicity 6**	**Flexibility 7**
SERVICE FUNCTION								
SERVICE MANAGEMENT	Sales & Pre-Contract Activities 1							
	Provision 2							
	Alteration 3							
	Service Support 4							
	Repair 5							
	Cessa-tion 6							
CONNECTION QUALITY	Connec-tion Establsh. 7							
	Infor-mation Transfer 8							
	Connec-tion Release 9							
BILLING 10								
NETWORK/ SERVICE MANAGMENT BY CUSTOMER 11								

This matrix may be used to determine user's QoS criteria for any telecommunications service

Annex B (informative): QoS criteria identified in Work carried for European Commission

According to "Quality of service Parameters for Internet Service provision" (see bibliography), the following criteria have been identified:

1) Number of attempts required achieving connection
2) Time to connect
3) Time to connect during the busiest hour of the week
4) Frequency of connection termination
5) Frequency and duration of ISP "outages"
6) Theoretical maximum speed of connection
7) Connection speed achieved
8) Latency, jitter and packet loss statistics communicating with the ISP
9) Speed of download from ISP's server(s)
10) Speed of download from ISP's mail-server
11) Ratio of ISPs' bandwidth to product of number of customers able to achieve simultaneous connection and the maximum bandwidth of those connections
12) Proportion of packets travelling through the ISP's routers that are lost
13) Proportion of designated sites connected to:
    (a) the ISP's own backbone/backbone provider(s);
    (b) to the ISP through private peering arrangements; and
    (c) through public NAPs/IXPs.
14) Proportion of time which designated sites are unreachable
15) Latency, jitter and packet loss statistics for designated sites
16) Number of NAPs connected to and the bandwidth of the connections
17) What are the bandwidth utilization figures for the ISPs NAP connections and how congested are the NAPs at which the ISP peers?
18) Cost of Internet access
19) Cost of website hosting
20) Annual supplemental cost for domain management
21) Cost of tech support

Annex C (informative): Primary or basic set of User's QoS criteria for Internet Access

(derived from application of matris in annex A and QoS criteria in annex B)

Category 1: Pre - sign up with ISP

Criterion 1: Clarity on service features e.g. number of email addresses, tariff and options, payment options, flexibility of contract with ISP, web hosted space (free and/or rented), email attachment maximum size etc.

Category 2: Joining ISP

Criterion 2: Ease of installation of software (e.g. user friendly).

Criterion 3: Documentation and technical help associated with start up.

Category 3: Alteration of terms with ISP

Criterion 4: Facility and ease of amendments with ISP on contractual and service agreements to suit the user based on realisation of actual requirements.

Category 4: Service support

Criterion 5: Help line availability (how many hours of the day, charge for service)

Criterion 6: Help line professionalism (technical knowledge, empathy and helpfulness with user's needs, promptness etc.)

Category 5: Cessation of contract

Criterion 7: Ease and smooth procedures for cessation of contract with and associated transfer of any information to new ISP or closedown procedures.

Category 6: Connection to Internet service

Criterion 8: Ergonomic design of log in procedures

Criterion 9: Number of attempts required to achieve connection

Criterion 10: Time to connect

Criterion 11: Time to connect during the busiest hour of the week

Category 7: Use of Internet - connected time

Criterion 12: Frequency of connection termination

Criterion 13: Frequency and duration of ISP "outages"

Criterion 14: Theoretical maximum speed of connection (downstream)

Criterion 15: Connection speed achieved (downstream)

Criterion 16: Latency, jitter and packet loss statistics communicating with the ISP

Criterion 17: Speed of download from ISP's server(s)

Criterion 18: Speed of download from ISP's mail-server

Criterion 19: Ratio of ISPs' bandwidth to product of number of customers able to achieve simultaneous connection and the maximum bandwidth of those connections

Criterion 20: Proportion of packets travelling through the ISP's routers that are lost

Criterion 21: Proportion of designated sites connected to:

(a) the ISP's own backbone/backbone provider(s);

(b) to the ISP through private peering arrangements; and

(c) through public NAPs/IXPs.

Criterion 22: Proportion of time that designated sites is unreachable

Criterion 23: Latency, jitter and packet loss statistics for designated sites

Criterion 24: Number of NAPs connected to and the bandwidth of the connections

Criterion 25: What are the bandwidth utilisation figures for the ISPs NAP connections and how congested are the NAPs at which the ISP peers?

Category 8: Security related

Criterion 26: Anti virus check facility

Criterion 27: Spam control

Criterion 28: Security

Criterion 29: Parental control

Category 9: Logging off from Internet service

Criterion 30: Ergonomic design of log off procedures.

Criterion 31: Time to disengage the connection after signal has been sent (click of the mouse button).

Category 10: Tariff and billing

Criterion 32: Cost of Internet access

Criterion 33: Additional cost of website hosting

Criterion 34: Annual supplemental cost for domain management

Criterion 35: Cost of technical support

Criterion 36**:** Reliability of billing

Criterion 37**:** Ease of payment

Annex D (informative): Survey on user's QoS criteria for access of services offered by ISPs

ETSI project STF 229

Notes

1) This survey is aimed, at a high level, to determine the order of importance of the QoS criteria listed and identify any others, which may be of concern to you, in the use of the services offered by ISPs.

2) Please fill this questionnaire irrespective of the type of access you have, be it dial up or broadband. Please indicate which.

Guidelines to fill in questionnaire

1) First, familiarise with the QoS criteria listed overleaf, with the help of background information given for each criterion in the attached notes.

2) Identify any additional QoS criteria and include in space provided.

3) Go through the 17 QoS criteria listed and decide on the most important and least important for your use and give these values 7 and 1 respectively. Put a tick against these criteria in the appropriate rating columns.

4) Go through the remaining criteria, choosing the next most important and the next least important and give these the next lower and higher score respectively. Repeat the process until all criteria have been given a score. Obviously some criteria will be given the same score. (The only way to avoid this is to rate on a 1 to 17 rating score). This repetition of scores for some criteria is ok. Obviously not too many will be given the same score unless you feel there is a strong reason. It is your score that matters - so please use your judgement.

April 2003

Please provide the following information:

Access: Dial up/Broadband (circle one).

Country of residence (or access if different).....

Relative importance score

1 = Lowest 7 = Highest

Criteria No.	QoS criteria	1	2	3	4	5	6	7
1	Ready availability of information on Service features and conditions of service							
2	Ease of commissioning of service							
3	Ease of cessation of service							
4	Level of help line availability							
5	High level of professionalism on help line							
6	1 or fewest number of attempts required to achieve connection (login)							
7	1 or fewest number of attempts to connect during busiest hour of the week (login)							
8	Low frequency of connectivity loss while using service after login (also to include partial service loss)							
9	Few durations of ISP "outages" (including partial outages)							
10	High Upstream speed achieved							
11	High Downstream speed achieved							
12	Low Latency, Packet loss and Jitter							
13	Few Complaints and quickness for their resolution							
14	Anti-virus protection offerings							
15	Spam control offerings							
16	Security offerings							
17	Quality of billing promize + delivery							

Other QoS criteria not listed but considered important for your use, if any:

- QoS criterion Relative importance rating

Annex E (informative): Some considerations for the next stage of work (parameter definition etc.)

While converting the recommended QoS criteria into parameters considerations should be given to identify all pertinent aspects likely to affect the understanding and comparability of the measured values by the ISPs. The following are some of the considerations. It is recommended that at the definitions stage all possible considerations be addressed and incorporated into the definitions and measurements to enable transparent comparisons to be made among different ISP reports of delivered quality.

Category A criteria:

1) Number of attempts required achieving connection (login)

   Ideally, connection would be achieved first time, every time, so both the average and the variation should be low. Dial-up customers, who consistently find they receive two or three "busy" signals are likely to become frustrated with the service, blame the ISP for the problem and ultimately switch providers. In fact the responsibility for the busy signal may not lie with the ISP and actually be caused by congestion on the telephone exchange into which the user is dialling, or some other telephone network problem, such as "flaky" lines or connections.

   It may be necessary to identify in the definitions document the factors that are likely to affect the number of attempts and provide clear information to both the ISPs and users on the boundary of responsibility between the ISPs and other network operators.

2) Frequency of connectivity loss (also include partial loss of service).

   For dial-up connections, connection termination, or line drops, will occur due to defects in the telephone system in the vast majority of cases. The reasons may also lie in the user's PC trying to multitask beyond its capability causing it to become overloaded and simply give up on the connection, or due to line interference resulting from an-other person trying to use the same line, or due to certain Intelligent Network (IN) features, such as call waiting. However, if a user is able to connect to a different ISP without such termination problems, it is reasonable for them to conclude the problem was down to the ISP, or at least associated with the ISP's particular set-up. While they may not be willing to admit it publicly to their customers or potential customers, it is possible that some network managers disconnect so-called "hogs" - people who leave their connection idle for long periods.

3) Criterion 11: Downstream speed achieved

   The theoretical maximum connection speed may not be achieved in practice. Possible reasons are:

   - Capacity of the telephony infrastructure, in particular by the customer's local loop telephone exchange,
   - older telephone exchanges simply cannot support the rates of data transfer now being demanded by Internet usage,
   - "Maxing out" the capacity of standard twin copper telephone wires leads to "flaky" connections in which the connection is more likely to be lost,

   For some newer connection technologies – such as xDSL or cable – the maximum connection speed is high but because of contention ratios further upstream, the "full" connection speed may not always be available.

4) Duration of ISP "outages" (including partial outages)

   This will give a distribution of the durations of outages over a period of year. Perhaps quoting maximum, minimum and average values.

5) Number of attempts to connect during busiest hour of the week.

   This measures the number of attempts the users attempts to connect to the ISPs server until getting logged on during the ISPs busiest hour of the week. For business users it is likely to be the start of business hours on weekdays while for home-based-users it may be weekday evenings and weekends. This parameter may be more important for SMEs – who may need to connect at specific times during the week in order to con-duct business – than for individuals who browse the Internet for recreational purposes and may object less to there being busy periods during which it is more difficult to get online.

Category B:

Latency, Packet loss and Jitter

In the next stage of study the relevance of latency, jitter and wander at the user- ISP part of the Internet are to be examined in detail. It would be necessary to know the usefulness of these performance criteria for each of the main services supported over the Internet and also the interaction with the access type. For example, for non-digital telephone lines, the data are sent in analogue form. This means that the originating modem must first convert the data into analogue form before sending these. The recipient modem must then re-convert the analogue signal into a digital message. The time taken to perform these operations is increased further by the some-time practice by telcos of themselves reconverting the analogue signal received into a digital signal to be transmitted, before it is switched back to an analogue signal prior to its destination (where it will be again converted into a digital signal to be understood by the destination computer). This can add significantly to latency for PSTN dialup connections when compared to, for example, ISDN connections.

Jitter and packet loss can be far more revealing than latency when considering the ISP's internal network. High levels of jitter suggest a busy internal network, which will adversely affect the user's Internet experience if they are using time-critical Internet applications such as on-line gaming or video-conferencing.

High levels of packet loss may reveal reliability problems with the ISP's mail-server or its DNS servers, which will be highly detrimental to Internet usage.

The definitions document, EG 202 057-4 (see bibliography), should indicate the practicality of measurements, usefulness of each of these criteria and applicability to services.

Close consultations with ISPs are recommended to result in maximum usefulness in the definitions and specification of measurement of these criteria.

Category C:

1) Ease of commissioning of service.

   This will comprize, for instance, time from the instant a service has been requested by the user to the instant a service is fully operational for use by the user, ease of resolution by the service provider of all problems associated with the installation and commissioning, quality, adequacy and user friendliness of the documentation and technical help associated with start up.

2) Help line professionalism.

   Technical knowledge, empathy and helpfulness with user's needs, promptness, whether human help is available or pre-recorded FAQ type response, etc.

3) Quality of billing.

   To comprize reliability (accuracy) of billing, other issues related to user's requirements on bills.

4) Complaints and time for its resolution.

   Number of complaints per "x" customers and the time for its resolution.

Category D:

The following list may be manicured to optimize the market dynamics in the relationship between users and the service providers. At the definitions stage it is recommended that these criteria are expanded to state specific information to be provided by the ISPs for the benefit of the user.

1) Conditions of customer membership, including tariff and options.

2) Number of email addresses.

3) Size of email, storage size, storage time and other relevant details.

4) Availability + conditions for web space.

5) Help line availability + tariff details.

6) Data protection practices.

7) Availability and conditions for control of "virus".

   It is very likely that the ISP will have access to an anti-virus software quicker than normal customers and therefore they may be in a better position to deal with a potential virus infection spreading in the network. However this could be an optional service for which the ISP may make a charge.

8) Availability and conditions for control of "spam".

   ISP to state what, if any, protection against spam is offered and the terms and conditions for these.

9) Availability and conditions for parental control.

   The terms and conditions of offer of parental control, if offered.

10) Availability and conditions for security offerings.

    Terms and conditions of any security offerings and conditions attached to these.

    Examples of security considerations are credit card information being sent over the network, Intellectual Property rights, control of undesirable information being sent over the network e.g. terrorist material or pornographic material, hacking, fraud etc.

11) Interaction with other ISPs

    An ISP ought to state whether its software may interact with software of other ISPs if the user has the software of another installed on the same PC.

12) Residues after uninstallation of ISP software.

    The ISP ought to state if any residual software is left over on the hard disk upon uninstalling the software by the user.

Annex F (informative): Bibliography

- Quality of service Parameters for Internet Service provision, Final Report prepared for European Commission, DG Information Society, August 2000 – Bannock Consulting, UK. – August 2000.
- ETSI EG 202 057-4: "Speech Processing, Transmission and Quality Aspects (STQ); User related QoS parameter definitions and measurements; Part 4: Internet Access".
- ETSI ETR 003: "Network Aspects (NA); General aspects of Quality of Service (QoS) and Network Performance (NP)".
- Quality of Intrernet Service, Project Team Final Report, CEN/ISSS Workshop, July 2001.

History

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