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Foreword

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

This is a revision of the earlier edition which included, among other contributions, parts of the University of Wollongong (AU) SLA template and guidelines have been incorporated, in particular in annex A. The current revision takes into account the changes to parts 1 and 2.

The present document is part 3 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 of Service 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 measures 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 use of the service. Therefore appropriate parameters have to be defined according to this 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; therefore standards are given as references where appropriate. They include a precise definition of what is meant as a failure: total failure, poor performance, 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 interesting parameter all the time might be very expensive and could jeopardize service performances. It is often cheaper and sufficient to get them via a poll. In addition, it may be convenient to rely on a third party to carry out these measurements to avoid any criticism from one of the involved parties.

It is worth noting that:

a)   QoS is not a quantity that can be measured using some deterministic meter. The evaluation of QoS can only be performed statistically. Statistical rules apply and to obtain a precision of 1 %, the size of the sample analysed should be as large as 1 000 units and the sample should be taken out of a population 100 or 1 000 times larger. This implies practically that the QoS assessment needs a very large number of measurements.

b)   If an operator commits himself to a 99 % or 99,9 % QoS level, this means that less than 1 item out of 100 or 1 000 is out of the specified range. Adding the traditional sampling ratios and precision of measurement ratios leads to populations as large as 10^6 or 10^7 units.

c)   An SLA that concerns units, dozens or hundreds of anything (leased lines, Frame relay circuits, etc.) with 99 % committed QoS is meaningful if and only if these units are taken out of a very big population.

d)   It is hopeless to expect that screening the "very best" units out of a poor quality population would allow guarantying high QoS level for the selected items. A poor quality product might certainly contain some high quality "nuggets" but the indicators enabling their sorting out are hazardous.

e)   The only means to obtain high level QoS products from an operator is to make sure that:

-   the purchased service is widely provided and the provider is mastering all manufacturing, installation and support processes;

-   the average QoS score of his production is close to the commitment he is intending to negotiate with you;

-   a quality insurance plan exists, has been labelled, is annually monitored and is auditable in accordance with ISO 900X standards.

QoS and Reliability in the Telecom area, concerns more and more aspects supplementary to the product or service as described in clause 6 in addition to the performance indicators.

The existence of a Quality assurance plan labelled, monitored and auditable is key to the QoS. Moreover, in some aspects like security or charging/billing there are no other means to ensure that the QoS expected is actually provided.

In this context, the achievement of a satisfying SLA requires an in depth analysis of the user needs for which guidance is given in EG 202 009-1 [7] and EG 202 009-2 [8].

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. As explained in other parts of EG 202 009 [7] and [8], the monitoring of a QoS commitment should refer to contractual values set either by governmental rules or in a mutual agreement between the provider and its customer. This is why achieving a SLA is more often perceived as the best means to meet specific QoS requirements while ensuring the optimal cost/quality ratio to the customer and the provider in a win-win perspective.

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. This part of the document defines a framework for a Service Level Agreement between a customer and a supplier of Telecommunications Services. Such framework uses the service specific QoS parameters proposed in EG 202 009-2 [8] to evaluate the Quality of Service, while EG 202 009-1 [7] gives guidance to identify the parameters relevant to the users. The following concepts are defined:

   a)   The services covered by the SLA.

   b)   The performance or quality criteria pertinent from the user point of view with reference to indicator values.

   c)   The methods to achieve the indicator values needed to measure the performance or the quality of service.

   d)   The service level that the supplier is agreeing to ensure.

In addition, a Service Level Agreement aims to define a common quality management process used by the supplier and the customer, including:

   a)   Outage management.

   b)   Statistics for prevention.

   c)   Usage statistics.

   d)   Etc.

Such framework is intended to avoid the multiple misunderstandings that, by experience, are appearing between the customer and the supplier or between different departments within the supplier company.

The main principles for the definition of this quality management process are:

   •   To define the services according to the applications performed by the user and transparent to the technical solution: for example, voice over IP is one of the many technical solutions to communicate between subscribers of the world-wide telephone network; ATM, frame Relay, IP are some of the many technical solutions to ensure a data transmission service between a terminal and a server or between networks. The quality criteria are the same, only the Service Level may be different.

   •   To define the quality criteria with respect to usage and not technique. In speech quality, users are more interested in intelligibility than in bandwidth, distortion, signal to noise ratio or lost packets. Quality criteria should be defined from the functional criteria, then translated into technical criteria. This means that different performance parameters may be used to quantify the quality, depending on those that are relevant for the technology used. In any case the criteria should take into account the effects perceived by the user and not their causes in the network.

Therefore, the present document does not intend to describe measurement techniques since specific ETSI TCs are dealing with such techniques and have the appropriate technical knowledge to develop standards in this area. The purpose of the document is rather to give guidance in using such standards in a SLA and defining indicator values.

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.112: "Vocabulary of terms for ISDNs".

[4]   ITU-T Recommendation I.113: "Vocabulary of terms for broadband aspects of ISDN".

[5]   ETSI EG 201 219: "User requirements; Guidelines on the consideration of user requirements when managing the standardization process".

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

[7]   ETSI EG 202 009-1: "User Group; quality of telecom services; Part 1: Methodology for identification of parameters relevant to the Users".

[8]   ETSI EG 202 009-2: "User Group; Quality of telecom services; Part 2: User related parameters on a service specific basis".

[9]   Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive) - (article 17).

[10]   Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive) - (article 11, 22 et annex III).

3   Definitions and abbreviations

3.1   Definitions

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

call: any connection (fixed or temporary) capable of transferring information between two or more users of a telecommunications system. In this context a user may be a person or a machine.

NOTE: See TR 102 008 .

connection: connection provides for transfer of information between endpoints

NOTE: See ITU-T Recommendation I.113-403 [4] modified.

defect: limited interruption of the ability of an item to perform a required function. It may or may not lead to maintenance actions depending on the results of additional analysis

NOTE: See ITU-T Recommendation I.113-601 [4].

fault: inability of an item to perform a required function, excluding that inability due to preventive maintenance, lack of external resources, or planned actions

NOTE: See ITU-T Recommendation I.113-603 [4].

function: set of processes defined for the purpose of achieving a specified objective

NOTE: See ITU-T Recommendation I.112-403 [3].

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

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

NOTE 2: The quality of service is characterized by the combined aspects of service support performance, service operability performance, serveability performance, service security performance and other factors specific to each service.

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: Complementary definitions on QoS requirements of the user/customer, QoS offered by service provider, QoS achieved by service provider, QoS perceived by the user/customer are given in ETR 003 [6].

service provider: actor who provides services to its service subscribers on a contractual basis and who is responsible for the services offered. The same organization may also be a network operator and a service provider

NOTE: See TR 101 287 .

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, EG 201 219 [5]

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

3.2 Abbreviations

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

AoC-S	Advice of charge - charging information at call Setup time
BER	Bit Error Rate
GSAR	Guaranteed Service Availability Ratio
GTTD	Guaranteed Time To Delivery
GTTR	Guaranteed Time To Repair
POTS	Plain Old Telephony Service
QoS	Quality of Service
SLA	Service Level Agreement
SQA	Service Quality Agreement

4   Building a Service Level Agreement (SLA)

An effective SLA acknowledges that clients and service providers have responsibilities and obligations to each other. It is important to address these points in the SLA development phase, and acknowledge them in writing. An agreement that clearly defines the roles and responsibilities of both parties will be of particular benefit if problems arise. The SLA should be used in any case as a means to improve the process and the mutual understanding and not to relieve responsibility of one party on the other party.

Parties should consist of 1 or 2 representatives from each party who may have an interest in the outcomes of the service.

An important step in the process is to identify needs and expectations for the specified services. This enables both parties to understand what service attributes are most valued by each group. A service attribute is the aspect of service quality that is most important to the client/customer.

The service provider needs to discuss its capacity and potential constraints on providing the service for the customer/client. This will assist both parties gain an understanding of each other's requirements and reduce unrealistic expectations. If there are concerns or issues regarding service levels they should be discussed at the negotiations stage, not when a SLA is close to implementation.

The critical areas of service must be identified and both client and service provider need to agree on a minimum level of service to provide client satisfaction.

It is necessary at this stage, for clients to distinguish their specific needs from broader expectations regarding service, and to appropriately prioritize service requirements. It may also be appropriate for the provider to detail the range of services they can provide. This way both parties can fully identify their needs and expectations and agree on which services will be provided.

A service level is an agreed process which may include one or more of the following elements to describe service performance:

- Service features.

- Quantitative aspects.

- Quality aspects.

- Timeliness.

- Conditions of use.

- Cost/tariff.

When both parties have established agreed service levels, the next step is to agree on methods of measurement of service level performance. It is essential to implement a system that will provide credible results; otherwise all parties within the process may lose confidence.

It is often the service provider, who puts forward ideas regarding measurement of performance, however this is not always the case. Performance can be difficult to measure in some cases and it is a good idea to keep it as simple as possible. Some lateral thinking by both parties incorporating a mix of output and outcome measures often generates the best results. One-off or periodical surveys may be all that is required to check whether performance indicators have been achieved.

As with all stages within this process, it is important that agreement is reached between client and service provider regarding service performance evaluation. If there is no provision for QoS measurement means, then the SLA will not be manageable. In particular it is of utmost importance to choose QoS indicators that are meaningful and manageable by each party.

Both parties should identify the aspects of the service provision and maintenance not covered in the agreement.

Another key aspect of SLAs is the need to incorporate an element of flexibility, in order to accommodate environmental change that is common within organizations. One way of building in flexibility is to separate the broad areas of agreement that are unlikely to change, from the details that can be altered subject to discussion.

A review process should be put in place and each party to the agreement should discuss and monitor the agreement throughout its life and state who will be responsible for reviewing performance.

It is important to define how the agreement will be monitored and the mechanisms that will be used to resolve issues that may arise during the course of the agreement. If the service levels and standards have been defined clearly, and indicators to measure performance have been established, then monitoring will be relatively easy. The agreement should build in a process for feedback between both parties, via reporting or another agreed communication method between the representatives of both parties.

As explained in EG 202 009-1 [7], an actual QoS assessment starts with the definition of the service features and options included, the next stage being the application of the set of QoS criteria to each step of the service life cycle to define the relevant QoS indicators and parameters as detailed in EG 202 009-2 [8].

Therefore it is important that in the SLA the following points are made:

- What are the QoS indicators that are pertinent to the particular service?

- What is the acceptable range of performance for the user and the provider?

- How are these to be measured?

- Who will measure it?

- What are the acceptable measuring procedures (test specification i.e. ITU-T recommendation, or ETSI standard and the frequency of measurement, sample size, confidence limits etc.)?

- In the event of a dispute or disagreement, what are the resolution procedures?

- What are the penalty clauses?

- Who will be the arbitrating body in the event of a disagreement?

The final stage consists in selecting, among the QoS parameters, the most relevant ones, the level of which will be monitored with respect to the agreed commitments as described in the SLA.

The following clauses are providing indications on the content of a Service Level Agreement, including the QoS parameters, their agreed level and their monitoring. This template endeavours to describe each step of the service life cycle relevant to an SLA, e.g. service use plus service provisioning, service alteration/technical upgrade, service support, repair/troubleshooting, charging/billing, cessation. All these items are elements of the SLA. Features of each of these have to be characterized in the SLA in order to define as accurately as possible what the service will do and will not do.

5   Description of the services terms and conditions

The definition and description of the telecommunication services: type of network and type of use, connection establishment, equipment provided, technical features of the various items should be stated here.

5.1   Content

Here should be given a general and detailed description of each service provided and of the bearer network(s) used.

1)   Type of service/network.

2)   Network structure.

3)   Grid mesh.

4)   Local loop.

5)   Type of traffics.

6)   Options included.

7)   Conditions of use.

5.2   Technical features

QoS performances have always to be checked against specifications. Therefore, technical features have to be specified for each network/service component and each type of use envisaged. Such specifications have to take into account what security features should aim at and how they should be implemented.

5.3   Geographical features, coverage

Geographical features have to be specified using maps and tables for user equipment (including nodes, satellite terminal, etc.) specifying every local agreement.

On the particular case of wireless communications there are two schools of thought: one based on the geographical coverage (including landmass and oceans for maritime and aeronautical services) and the other one based on the population. The indicator should be based on both geographical and population coverage.

5.4   Security aspects

The interconnection of private systems with the Internet as well as the more and more general use of software in every telecommunication equipment has given rise to the security concerns. Malevolence can nowadays jeopardize any system if it is not protected against attacks. Therefore, any service function has to include security protocols to ensure the integrity of the transferred data. Incidentally, such protocols should not excessively slowdown the traffic or block useful information. Since, here too, a compromise is needed between the speed and the efficiency of the security process, the customer has to define accurately his requirements in this area. Afterwards the security process has to be seen under the QoS aspect as an additional function of the main function of any service. Taking into account that a single attack in this area can lead to a collapse of the whole ICT system of a corporation, the better solution is to carefully identify the threats and then to rely on the certification by a recognized third party that all measures, protocols, standards etc. are applied by the provider to ensure the security of the users' information and to prevent any damage to someone outside the company by any employee using the company equipment.

5.5   Duration of the agreement

Here should be detailed how to deal with the following aspects:

• 　　Renewal.

• 　　Price revision.

• 　　Benchmarking during the contract.

• 　　Break up of the contract clause.

• 　　Cessation.

5.6   QoS commitments

Here should be taken into account the relevant aspects of the current regulation, e.g. the European Directives (Directive 2002/21/EC [9], Directive 2002/22/EC [10]) as well as the corresponding national regulation. In addition to the regulatory bonds, it is important, again, that in the SLA the following points are made:

- What are the QoS indicators and parameters that are pertinent to the particular service?

- What is the acceptable range of performance for the user and the provider?

- How are these to be measured?

- Who will measure it?

- What are the acceptable measuring procedures (test specification i.e. ITU-T recommendation, or ETSI standard and the frequency of measurement, sample size, probe location, confidence limits, etc.)?

EG 202 009-1[7] and EG 202 009-2 [8] give guidance on how to define these aspects. Quality features of the technical performance of the service are by essence service specific while other aspects of the service are generally common to most services. Details are given in clause 6 for each step of the service life cycle.

6   Service life cycle

In the following clauses, should be detailed:

- The procedures to achieve the tasks for each aspect of the service life cycle.

- The QoS indicators and parameters defined according to EG 202 009-1 [7] EG 202 009-2 and [8].

- The thresholds taken as targets for these QoS parameters according to the provider's QoS commitments.

The service life cycle steps are:

- Service provisioning (Installation, activation and acceptance).

- Service alteration.

- Technical upgrade.

- Service support (Documentation, technical support, commercial support and complaint management).

- Repair/Troubleshooting.

- Charging/Billing.

- Cessation.

- Use of Service - Network/service management by the customer.

- Use of Service - Technical Quality: Access, Bearer service, Service usage, Presentation and user interface.

Conditions for evolution should also be considered as well as benchmarking, release, technical update, etc.

6.1   Service provisioning

This embrace 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 (installation, activation and acceptance).

This clause should specify:

- Access and implementation in customer premises, description of provider equipment.

- Acceptance procedures.

- Installation time commitments, etc.

6.2   Service alteration

This deals with 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 this alteration is carried to the satisfaction of the customer.

This clause should specify the procedure and conditions to perform this alteration, delay required, etc.

6.3   Technical upgrade

This deals with all activities associated with the technical evolution of any component of the service at the provider's initiative.

This clause should specify the procedure and conditions for a technical upgrade by the provider of the equipment used to provide the service at the provider's as well at the customer's premises.

6.4   Service support

This deals with 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.

6.4.1   Documentation

Here should be listed the documentation needed to install, set-up and use the various features of the service as well as to identify and fix possible troubles. Such documentation is expected of course, to be user friendly and up-to-date. Therefore, this list should be updated as soon as necessary.

6.4.1.1   Documentation for service activation and set-up

Here should be detailed the documentation provided to the end-user and to user technical and management staff, if any, enabling them to activate the service.

6.4.1.2   Documentation for service use

Here should be detailed the documentation provided to the end-user and to user's technical and management staff enabling them to use and configure all the functions of the service.

6.4.1.3   Reporting

Content and date of the reports on traffic, data flows, consumption, quality of service and outage should be specified here. When provided electronically, the format of the records should be open and specified to enable the user to consolidate such information between the various possible providers. This is a key issue to allow for benchmarking.

6.4.1.3.1   Consumption reports

Here should be listed the details of the itemized bill:

- Charge records and costs per site, link, if appropriate, and for the whole network.

- Charge analysis providing indication on the trends, per site, applications, type of traffic, etc.

6.4.1.3.2   Outage reports

Here should be specified the technical reports, detailing the main causes of outage, their consequences on the traffic, means implemented to avoid their repetition, etc.

Traffic reports should provide information on congestion occurred, etc.

6.4.1.3.3   QoS reports

Report on service outages should detail statistics on their occurrence, consequences (limited to one site, one service or widespread through the whole customer system).

Statistics should be given on disturbances, microcuts, undue response times, aborted calls, excessive Bit Error Rate (BER).

Information should be given on actions to improve the QoS: Proactive actions, preventive maintenance.

6.4.1.3.4   Costs

The possible type of medium to make the report available should be specified with its corresponding price if appropriate.

Table 1: Report prices

Report	Includes	WEB price	CD ROM price	Paper price
Performance report	Launching reports Modification reports QoS reports	(generally free of charge)	(generally paying)	(generally paying)
Detailed billing	Lump detailed billing Detailed billing per site Breakdown of the traffic	On demand (generally free of charge)	(generally paying)	(generally paying)
Consumption analysis	Consumption analysis	On demand (generally free of charge)	(generally paying)	(generally paying)
Technical reports	Traffic		(generally paying)	(generally paying)

6.4.2   Technical support

Here should be detailed all activities associated with the technical support of a telecommunication service the help desk availability schedule and information exchanges for the outage process: procedures, documentation, etc.

6.4.2.1   Help Desk

The following issues have to be specified:

- Working hours and days.

- Method to process the calls.

- When answer is provided wholly automatically, e.g. by voice response systems, a provision for switching to a human operator should be proposed in all cases.

6.4.2.2   Outage management

See clause 6.5.

6.4.2.3   Maintenance

The process and conditions to perform maintenance or test should be detailed.

6.4.3   Commercial support

Here should be detailed all activities associated with the commercial support of a telecommunication service.

The following issues have to be specified:

- Working hours and days.

- Method to process the calls.

- When answer is provided wholly automatically, e.g. by voice response systems, a provision for switching to a human operator should be proposed in all cases.

- Who is responsible to take decisions when a change in the service conditions or options has an impact on costs.

- Delay for a change to take effect.

6.4.4   Complaint management

Here should be detailed all activities associated with the customer's complaints about the service provided. This clause should detail the process to deal with customer complaints when the normal customer support fails to solve a problem:

- Who is responsible for handling such issues.

- List of documents to be provided.

- Delay to get a reply.

6.5   Repair/Troubleshooting

Here should be detailed 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.

This clause should detail the process for taking into account the outages, for customer information, for common investigation and the possible constraints in accessing the customer premises, etc.

The following aspects should be specified:

- Principle of mutual information.

- Limits of liability on customer equipment.

6.5.1   Resolution process

The process should be detailed on the issues below:

- Opening of an outage record.

- Outage identification and localization.

- Possibilities of remote outage process.

- Cases where a human intervention should occur.

- Notification to the initiator of the call of the closure of the outage.

- Process to prevent the repetition of the similar outages.

6.5.2   Priority levels

Table 2 intends to define the priority level to be given according to consequences of the outage to the users (1 being the highest priority). These levels are to be used in the escalation process and possible penalties as well.

Table 2: Priority levels

Severity	Definition	Example
1	Service interruption	Inability to access the service
2	Service deterioration	Microcuts, undue response time or excessive Bit Error Rate, aborted calls, etc.
3	No impact on the user	Proactive maintenance, scheduled tests, etc.

These definitions are crucial when Guaranteed Time To Repair (GTTR) and/or Guaranteed Service Availability Ratio (GSAR) are included in the SLA.

6.5.3   Escalation process

The escalation process should define who is given the responsibility to fix the failure according to its duration.

Table 3: Escalation process timescale

Acting people	Severity 1	Severity 2	Severity 3
Responsible for customer helpdesk	1 h	2 h	4 h
Operation responsible	2 h	4 h	Next working day
Technical director	4 h	8 h	None

6.5.4   Customer information

Here should be detailed the customer information process on the outage management, e.g. how information is given on the cause of the outage, the progress of the repairing, expected end of the outage, possible backup, etc.

6.5.5   Costs

Here should be specified the tariffs of the call to the help desk and the conditions of charging for the repair activities.

6.6   Charging/Billing

Here should be detailed all relevant activities associated with the charging and billing for a telecommunication service to a customer.

Tariffs, penalties, format and billing frequency, validation and modes of payment should be detailed has far as possible to avoid any misunderstanding between the provider and the customer. Every detail should be given on the cost of the different categories of calls, in particular on incoming and outgoing calls with subscribers outside the provider network.

6.6.1   Expense monitoring

6.6.1.1   Expense information means

Service Providers are currently able to provide various means of expense information in addition to the traditional bill. These could be, AoC-S for phone call, i.e. display of the tariff on the terminal at call set-up but also e.g. expense signal when a predefined level of expense is reached. Another more generic process is to grant access to a website where the customer can get various expense information like e.g. ebill, real time consolidation of the current recorded expenses.

When included in the contract, such information should be available, accurate and time-stamped.

6.6.1.2   Charging and billing accuracy

Since the accuracy and reliability of the expense information is difficult to assess by the customer, it is crucial that the provider metering and billing process be audited and approved by a recognized third party. Such approval process has already been set-up in several European countries. It can take various agreement process, e.g. label, certification or at least self-conformance to a set of best practices defined by a formal authority so that the customer can be confident that he is not asked for more than for his own use of the service.

## 6.6.2   Validation of bills before recovery

The process of validation of the bills before recovery should be detailed here defining the timescale and how dealing with objections, disputes, etc. Who is responsible in both parties for these tasks should be clearly identified.

6.6.3   Modes of payment

E-billing is a crucial issue with the development of telecommunication services.

E-billing interest for Telecom operators stems from its capability to reduce the cost of the paper bills and accelerate the payment by the customer's bank. The E-bill being forwarded to the client a couple of weeks before payment date, the absence of customer's protest is considered by the operator as an authorization to draw the customer's bank account.

This argument is highlighted in figure 1.
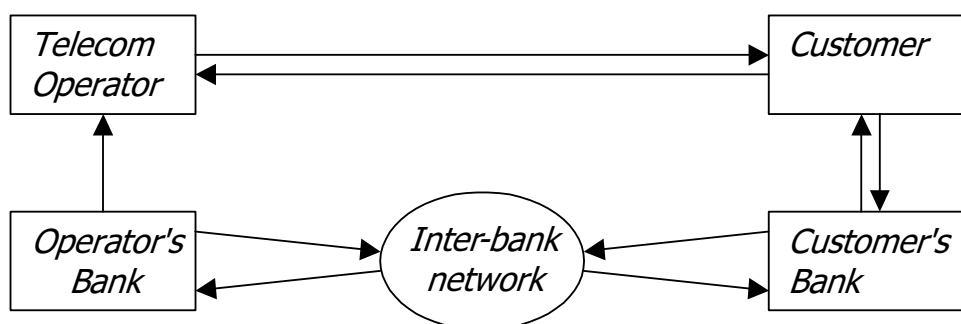
Figure 1: The electronic billing process

Since the advent of XML, new directions are investigated to avoid usage of a costly user workstation. The directions opened consist in:

- using EDI in the case of big companies with hundreds or thousands of premises;
- using XML in the case of SME's.

From a user's perspective, the advantages of E-billing is to open up some dynamic Benchmarking capabilities and easier automated management of the bill, provided appropriate interfaces are available.

6.7   Cessation

Here should be detailed all 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.

This clause should detail the conditions for cessation of the service, i.e. how and when the provider's equipment will be switched off and removed from the customer premises and related costs.

6.8   Use of Service - Network/service management by the customer

Here should be detailed all activities associated with the customer's control of predefined changes to telecommunication services or network configurations.

This clause should detail the operations the customer is allowed to perform and the conditions for that.

6.9   Use of the Service

This clause is expected to detail all the activities associated with the use of a telecommunication service. This 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.

6.9.1   Technical specifications

Since the quality features of the technical performance of the service are by essence service specific, here should be detailed the specified performance of each service, the level required for the QoS indicators and parameters defined in EG 202 009-2 [8] and the appropriate checking methods. This clause should also contain indication on the priority to be given to restore the service in case of failure (see clause 6.5.2).

EG 202 009-1 [7] gives indication on how to identify the QoS requirements relevant to each usage.

EG 202 009-2 [8] provides guidance on how to choose the appropriate indicators and related thresholds according to the type of service provided and to the type of application using it. Table 4 gives examples in this aspect on the service level expected according to the type of application. Of course, explicit reference values should be defined for each indicator according to this general guidance.

Table 4: Service level requirements

Service Level	Type of applications	Expected service quality level
1	Non critical information Like public internet without any guarantee on a minimal transmission speed	Best effort No performance management
2	Critical operational information e.g. communication with the customers or eCommerce or telecontrol, etc.	High availability, fidelity, accuracy and low delay, low lost packet rate Transit time and jitter monitored
3	Real time applications e.g. Voice, video, Visio conference	Low and stable transit time and jitter

6.9.2   Emergency operation

Should detail what is planned in case of unexpected crash: any type of back up channel, disaster recovery, emergency operation, in order to prevent any service interruption or at least to reduce its duration.

6.9.3   Commitments on means to ensure quality

As usual in quality management, appropriate means are expected to ensure the anticipated results are reached. This kind of commitment can be included in the SLA or in a specific Service Quality Agreement (SQA). Some examples are given in table 5.

Table 5: Design to ensure the QoS with respect to the requirements

Need	Impact on design
Availability	Backup routes Relief of network links and equipment
Response time	End to end transit time
Bit rate per flow	End to end guaranteed bit rate Load sharing and balance Bandwidth sharing
Stability	Network operation mechanisms

7   QoS monitoring

At this stage of the SLA, the providers' commitments on the QoS parameters level should have been specified for every step of the service life cycle. Here should be given all the additional details needed to make reliable and reproducible the measurements of the QoS parameters, in particular those related to the measurement of the technical performance:

- Number, location of probes and type of communications for the measurements of the QoS parameters.

- Who is responsible for the QoS measurements.

- Process to measure the QoS parameters (sample number, frequency of measurements, etc.).

- Content of the questionnaires to determine the MOS values.

- Principles and methods of calculation for penalties.

8   Penalties

8.1   Penalties on delay on delivery

The amount of the penalties related to the disrespect of the delivery date should be computed depending on the delay and on the service importance for the company on a case by case basis. Therefore, a table defining the rules for such a computation have to be defined in the contract.

8.2   Penalties on Guaranteed Time To Repair (GTTR)

The amount of the penalty is calculated for each month, each connection and each defect.

This amount is a percentage on the monthly price of each connection concerned. This percentage depends on the actual time to repair and on the commitment agreed between the parties. Table 6 gives an example of such calculation.

Table 6: Example of calculation of the penalty amount

Actual repair time for a 5 hour commitment	Actual repair time for a 8 hour commitment	Penalty
≤ 5 hours	≤ 8 hours	0 %
> 5 hours et ≤ 12 hours	> 8 hours et ≤ 12 hours	5 %
> 12 hours et ≤ 24 hours	> 12 hours et ≤ 24 hours	15 %
> 24 hours	> 24 hours	25 %

8.3   Penalties on Guaranteed Service Availability Ratio (GSAR)

The amount of the penalty is calculated for each month and each connection.

This amount is a percentage on the monthly price of each connection concerned. This percentage depends on the difference between the committed availability rate and the recorded one according to table 7.

Table 7: Example of calculation of the penalty amount

Difference between the target and the actual availability rate	Penalty
> 0 et ≤ 2 %	15 %
> 2 % et ≤ 4 %	30 %
> 4 %	50 %

8.4 Other penalties

Other types of penalties can be determined, if appropriate, on any QoS parameters, e.g. delay, bandwidth, response time or reliability, etc.

8.5 Payment of penalties

- Penalty on Guaranteed Time To Delivery (GTTD).

The penalty is deduced from the bill related to the service access fees.

- Penalty on GTTR et GSAR.

The penalties due to the default of corresponding commitments recorded during month M are calculated on the amount of the bill of month M-1 and deduced from the bill of month M+1.

The total amount of penalties is usually limited to 10 % of the overall monthly customer bill.

9 Revision procedures

A review process should be put in place and each party to the agreement should discuss and monitor the agreement throughout its life.

The US widely-known "How 'ya effect", according to which users are much less satisfied today with services they were completely satisfied with some years or some months ago, shows how important is the continuous analysis of customers expectations.
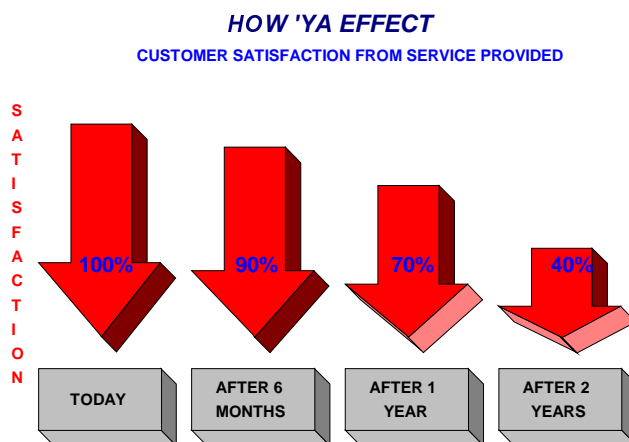
Figure 2: How 'YA effect – The decreasing customer satisfaction from service provided

Who will be responsible for reviewing performance should be stated.

If staff changes in either client or provider areas the new staff responsibilities needs to be communicated clearly to the new staff.

If new services or service features are required the agreement should be flexible enough to allow for review and change.

A program for adjustment of service levels should be agreed if there is a deviation from agreed performance.

10   Conclusion

The ETSI User Group hopes the present document provides useful guidance on the users expectations about the QoS to the standard makers, regulators and providers. It is expected also that the users themselves can find here some help, e.g. business users when establishing a SLA with their chosen provider.

Annex A (informative):
Checklist Building the Service Level Agreement (SLA)

During the SLA building process, it is useful to bear in mind the following principles:

- Keep it as simple as possible (Building a mutual understanding is more important than the document itself).

- Take it as a journey and not a destination (A SLA is a living document and has to be updated regularly).

There are five (5) main steps in developing a SLA process. These are outlined below:

- Start Up.

- Negotiation.

- Documentation.

- Review.

- Implementation.

The process is summarized in a Checklist. Parties who are developing a SLA should not attempt to start at the documentation phase, as this is a common response, but to go through the sequence set out in these guidelines.

A.1   Start Up

First of all, has someone with the appropriate competencies been appointed as SLA responsible?

A.1.1   Key parties and objectives

- Have you referred to this Guide for service level agreements?

- Have you identified the parties involved?

  - Who is the service provider?

  - Who are the clients?

- Have you clarified the main objectives of the service level agreement?

A.1.2   Identify needs and expectations

- What are the needs of the parties involved?

- Do you have a clear definition of both parties service attributes?

- Have you agreed what services will be provided?

A.2   Negotiation

To come to the user satisfaction it is crucial that the service level agreed be compatible with the supplier ability to fulfil the agreement.

A.2.1   Define service levels

- Have you discussed the service provider's capacity to provide the service?

- Have all service level concerns been raised?

- Have you identified what will provide client satisfaction?

- Have you agreed on the minimum level of service?

- Have you agreed on areas for future improvement?

A.2.2   Establish performance indicators

- Have you formulated indicators to measure the key service performance?

- Have you reached agreement on the performance indicated?

A.2.3   Confirm issues

- Are client and service provider roles and responsibilities clearly defined in writing?

- Have you established a process that will flag problems early?

- Have you established a process to resolve issues that might arise?

A.2.4   Determine costs and payment

- Have you identified what services are free of charge?

- Have you determined costs for additional services where appropriate?

- Have you agreed an appropriate cost transfer mechanism where appropriate?

- Have you agreed on the frequency of billing where appropriate?

A.3   Documentation

Agree on the document framework and content. It is often useful to start writing a draft SLA and then to amend it step by step to go to the final version getting support from all the actors involved.

- Are you using this guide?

- Does the document reflect the nature of the service relationship?

- Is it flexible enough to accommodate changes?

A.4   Review

Establish a review process:

- Who will be responsible for reviewing performance?

- Have you agreed on a mechanism for reporting?

- Have you agreed on a program for adjustment of service levels?

- How will client and service provider feedback be sought?

A.5   Implementation

Create and sign the Service Level Agreement (SLA):

- Has someone with appropriate authority signed the document?

- Have you communicated the agreement to staff from both parties?

Annex B (informative):
Bibliography

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History

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