

**Speech processing, Transmission and Quality aspects (STQ);  
QoS parameter definitions and measurements for use in  
network-to-network interconnection;  
Part 2: Physical unbundling of copper local loops**

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## Foreword

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

The present document is part 2 of a multi-part deliverable covering QoS parameter definitions and measurements for use in network-to-network interconnection, as identified below:

Part 1: "Narrowband interconnection";

**Part 2: "Physical unbundling of copper local loops".**

The present document has taken into account, as far as practicable, the following principles:

- 1) parameters should be capable of verification by independent organizations. This verification might be made by direct measurements or by audit of service provider's measurements;
- 2) the accuracy of QoS values should be set to a level consistent with measurement methods being as simple as possible with costs as low as possible;
- 3) the parameters are designed for both statistical and individual application. The statistical values should be derived by the application of a simple statistical function to the individual values. The statistical function should be specified in the standard. The standard should also contain guidelines on how statistically significant samples should be selected;
- 4) the statistical functions should be designed so QoS figures from different network operators can be compared easily by other network operators.

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# 1 Scope

The present document contains harmonized definitions and measurement methods for a range of Quality of Service (QoS) parameters that relate to physical unbundling of copper access loops.

NOTE 1: Although copper is used in the present document another metal could be used.

The purpose of these parameters is to define objective and comparable measures of the QoS delivered on unbundled local loops. The establishment of target values for QoS is beyond the scope of the present document.

The Quality of Service parameters apply only to the interconnection of physical services on unbundled local loops.

The present document applies for collocation and virtual or distant collocation, but does not include the provision of backhaul services.

NOTE 2: The present document may be extended later to include bitstream services.

Annex C provides a proforma for reporting statistics but the reporting procedures are outside the scope of the present document.

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# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

- [1] Directive 97/51/EC of the European Parliament and of the Council of 6 October 1997 amending Council Directives 90/387/EEC and 92/44/EEC for the purpose of adaptation to a competitive environment in telecommunications.
- [2] Council Directive 90/387/EEC of 28 June 1990 on the establishment of the internal market for telecommunications services through the implementation of open network provision.
- [3] ITU-T Recommendation E.800: "Terms and definitions related to quality of service and network performance including dependability".

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# 3 Definitions and abbreviations

## 3.1 Definitions

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

**bitstream services:** any bit transport service provided by the providing operator on the unbundled local loop

**copper circuit:** 2-wire, point-to-point, copper transmission path, extending between a Network Termination Point at a served end-user site and the Handover Distribution Frame (HDF)

A copper circuit comprises both a copper path and a 2-wire copper transmission path within either an internal or an external tie cable.

NOTE 1: Although copper is used in the present document another metal could be used.

**copper path:** 2-wire, point-to-point, copper transmission path, extending between a Network Termination Point at a served end-user site and the Main Distribution Frame on the site of the providing operator

NOTE 2: Although copper is used in the present document another metal could be used.

**distant collocation:** collocation where the requesting operator locates and runs its equipment on premises other than the premises of the providing operator

**handover distribution frame:** demarcation point at which the local loop is handed over to the requesting operator

**line sharing:** arrangement where the providing operator continues to provide telephone service, while the requesting operator delivers high speed data or other services over the same local loop using its own equipment

**local loop:** general term for a metallic access line

**network operator:** organization that provides a network for the provision of a public telecommunication service  
If the same organization also offers services it also becomes a service provider.

**network termination point:** physical point at which a user is provided with access to a public telecommunications network

The locations of network termination points shall be defined by the national regulatory authority and shall represent a boundary, for regulatory purposes, of the public telecommunications network; (Copied from Directive 97/51/EC [1] which amended the original ONP Directive 90/387/EEC [2]).

**physical collocation:** collocation where the requesting operator locates and runs its equipment on the premises of the providing operator

**physical services:** service where the unbundled loop may be used in any electrical or optical manner limited only by physical parameters such as power spectrum and impedance masks

**point of interconnection:** physical point at which two networks are interconnected

**providing operator:** operator who responds to a request for interconnection

NOTE 3: Equivalent to the Local Loop Provider (LLP) in the ETP's terminology.

**Quality of Service:** collective effect of service performance which determines the degree of satisfaction of a user of the service

(Taken from ITU-T Recommendation E.800 [3])

**requesting operator:** operator who requests interconnection

NOTE 4: Equivalent to the Local Loop Customer (LLC) in the ETP's terminology.

**unbundled loop:** copper circuit from the Network Termination Point to the Handover Distribution Frame

**unbundling:** process whereby a local loop owned and operated by a providing operator is made available in whole or in part to a requesting operator for the provision of services to a user

**virtual collocation:** collocation where the requesting operator locates its equipment on the premises of the providing operator but the equipment is run by the providing operator

## 3.2 Abbreviations

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

ETP	European Telecommunications Platform
HDF	Handover Distribution Frame
MDF	Main Distribution Frame
NTP	Network Termination Point
QoS	Quality of Service
STQ	Speech Transmission and Quality (Technical Committee)

## 4 General considerations

### 4.1 Services covered

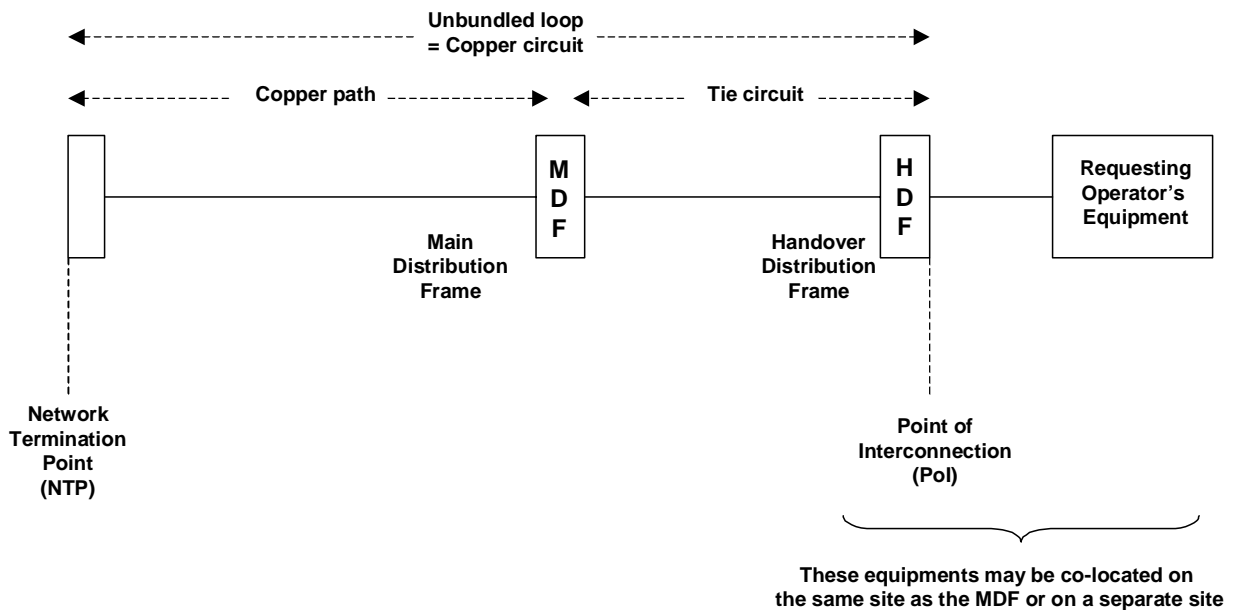
The Quality of Service parameters defined in the present document apply to the interconnection service of physical local loop unbundling on copper loops. In this service, the requesting operator obtains physical (electrical or optical) access to all or part of the local loop. There may be physical limits, such as power spectra and impedance requirements, for what is transmitted. The requesting operator may be free to choose its own transmission methods within these limits, or it may be constrained to certain options by the contract with the providing operator. These limits and constraints are normally imposed to preserve network integrity. Local loops may be unbundled either:

- in their entirety, in which case the requesting operator provides all the services on the loop;
- in part, in which case the requesting operator provides services on one physical part of the loop while the providing operator continues to provide services on the other part. An example would be unbundling for ADSL on upper frequencies, where the providing operator continues to provide basic telephony on lower frequencies.

Unbundling may take place at a concentrator or exchange site and the equipment of the requesting operator may be co-located on the site or located on a separate site nearby.

NOTE: In the terminology of ETP, this applies to collocation, virtual collocation and distant collocation.

Figure 1 shows the configuration for local loop unbundling.



**Figure 1: Configuration of physical local loop unbundling**

The unbundling covered in the present document includes line sharing where the providing operator continues to provide telephone service, while the requesting operator delivers high speed data or other services over the same local loop using its own equipment.

### 4.2 Reporting

Reporting of QoS parameters defined in the present document would normally be carried out by the providing operator.

The parameters in the present document are designed to be used either for:

- the local loop unbundling services provided to one particular requesting operator; or
- the aggregate performance provided to all interconnecting operators.

The first case could be used in interconnection agreements, the second in monitoring by a national regulatory authority.

The reporting procedures and frequency are a matter for the operators concerned and their national regulatory authority. They are outside the scope of the present document.

### 4.3 Data processing issues

Providing operators may prefer to process data on a weekly or monthly basis, discard the detailed data and use a statistical method such as that specified in annexes A and B for combining the weekly or monthly results.

For several parameters the statistic required is "the time by which the fastest X % is .....". This statistic is explained in annex B.

Providing operators should agree with other relevant parties how instances of data loss, corruption or incompleteness should be handled.

### 4.4 Data collection period

QoS data should be collected and calculated on a quarterly basis starting 1 January, 1 April etc.

Data may be provided to individual requesting operators on the quality of the services being provided to them individually, or may be published or reported to an NRA on the aggregated quality of service provided to all requesting operators.

The present document specifies if statistics should be provided for each concentrator site separately or for all sites combined.

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## 5 QoS parameters

Table 1 summarizes the QoS parameters defined in the present document. The first two columns summarize the parameters. The third column indicates the basis for any statistics produced, i.e. whether they should be based on:

- all measurements;
- sample measurements;
- customer surveys.

In general, measurement methods are preferred to customer surveys because they provide objective rather than subjective results. The fourth column indicates who should perform the measurements and collect the statistics.



**Table 1: Summary of QoS Parameters for local loop unbundling**

<b>Parameter</b>	<b>Measure</b>	<b>Measurement Method</b>	<b>Provision of statistics</b>
5.1 Supply time for initial set-up at site	a) individual results b) the times by which the fastest 90 % of interconnections are made available c) percentage of interconnections completed by the date agreed with the requesting operator	All actual  For b) and c) figures are to be aggregated across all sites	Providing operator
5.2 Supply time for individual unbundled loops at a site where unbundling has been set-up	a) individual results b) the times by which the fastest 90 % of orders for unbundled loops are completed c) percentage of orders completed by the date agreed with the requesting operator  Separate figures with and without number portability	All actual  For b) and c) figures are to be aggregated either per site or across all sites	Providing operator
5.3 Availability of unbundled loops	The average proportion of time that an unbundled loop is available	All actual  Figures should be aggregated across all sites	Providing operator
5.4 Fault report rate per unbundled loop	Average number of valid fault reports per unbundled loop per year	All actual  Figures should be aggregated across all sites	Providing operator
5.5 Fault repair time	a) Average time to repair fastest 80 % and 95 % of valid faults b) Percentage of faults cleared within the time agreed	All actual  Figures should be aggregated across all sites	Providing operator
<b>NOTE:</b> Many of the parameters have several subtleties associated with their definition, applicability and measurement. The parameters are fully explained in the relevant sub-clauses of clause 5.			

## 5.1 Supply time for initial set-up

### 5.1.1 Definition

The duration from the instant of a valid order being received by the providing operator to the instant when the interconnection is made available, i.e. the providing operator is ready to start transferring individual loops.

A valid order may be made in writing or in any other mutually agreed form.

Each site shall count as one interconnection for each requesting operator.

## 5.1.2 Measurement and statistics

The following statistics should be provided:

- a) individual results; or
- b) the times by which the fastest 90 % of interconnections are made available.

In addition, the following may be provided:

- c) percentage of interconnections completed by the date agreed with the requesting operator.

NOTE: a) and b) provide measures that can be compared between operators in the same or different countries.  
c) provides a measure that is useful in supply contracts.

The time should be measured in elapsed days (including all public holidays etc).

The figure under b) may be given for each individual site or may be calculated across many sites.

Providing operators may exclude from a) cases where delays to provision are requested by the requesting operator.

## 5.2 Supply time for individual unbundled loops at a site where unbundling has been set-up

### 5.2.1 Definition

The duration from the instant of a valid order being received by the providing operator to the instant when the unbundled circuit is handed over to the requesting operator for operational traffic.

A valid order may be made in writing or in any other mutually agreed form.

### 5.2.2 Measurement and statistics

The statistics shall be measured in terms of orders rather than circuits (more than one circuit may be covered in an order).

The following statistics should be provided:

- a) the times by which the fastest 90 % of orders for unbundled loops are completed.

In addition, the following may be provided:

- b) percentage of orders completed by the date agreed with the requesting operator.

NOTE: a) provides measures that can be compared between operators in the same or different countries.  
b) provides a measure that is useful in supply contracts.

The figure under a) may be given for each individual site or may be calculated across many sites. The time should be measured in elapsed days (including all public holidays etc).

Separate figures should be calculated for the supply time for a) where the customer's number is ported from the providing operator to the requesting operator.

Operators may exclude from a) cases where delays to provision are requested by the requesting operator.

## 5.3 Availability of unbundled loops

### 5.3.1 Definition

The proportion of time that an unbundled loop is available. An unbundled loop is considered to be available at all times except:

- periods when it is withdrawn from service by the providing operator;
- periods between the instant when a valid fault report is received by the providing operator and the instant when the providing operator reports to the requesting operator that the fault has been cleared or found to be cleared when tested.

### 5.3.2 Measurement and statistics

The average availability, during the data collection period, for the aggregate of sites should be provided.

This statistic should be calculated as:

$$(1 - (\text{total unavailable loop-time}) / (\text{total loop-time}))$$

Where:

- the total loop time is the sum over all loops of the time that each individual loop is provided;
- the total unavailable loop-time is the sum over all loops of the time that each individual loop is unavailable.

In calculating this statistic, it should be noted that the number of unbundled loops may vary during the data collection period.

Fault reports should be assumed to be valid unless there is a specific reason to consider that they are invalid. Cases where a fault that is found to be cleared when tested should be counted as a valid report unless the providing operator has reason to believe that the fault did not occur.

A report that concerns more than one unbundled loop (e.g. a damaged cable) should be counted in terms of the number of fault reports received rather than the number of lines affected. However only one fault report should be included for each unbundled loop.

**NOTE:** If a cable that contains many loops is severed, then it is likely that most users of unbundled loops will make a fault report and each of these reports will be counted. This approach should facilitate the collection of statistics. The alternative of counting the number of loops affected, i.e. including the ones for which no fault is reported, would make the collection of the statistics too complicated. The fault reports would normally be made by the requesting operator, frequently following the receipt of a customer fault report; the customer would not have a direct relationship with the providing operator.

Statistics should include all unbundled loops in the data collection period.

## 5.4 Fault report rate per unbundled loop

### 5.4.1 Definition

A fault report is a report of disrupted or degraded service that is made by the requesting operator and is attributable to an unbundled loop, and that is not found to be invalid. Faults in any equipment on the customer side of the network termination point are excluded.

Counting should be carried out on the basis of physical loops irrespective of how the loops are used.

## 5.4.2 Measurement and statistics

The average number of valid fault reports per unbundled loop per year should be provided. The average may be calculated approximately by summing the fault reports and dividing by half the sum of the number of unbundled loops at the beginning and at the end of the reporting period.

NOTE 1: More accurate calculations are not excluded.

Figures should be averaged for each individual site or may be calculated across many sites and take account of changes in the number of unbundled loops during the reporting period.

Fault reports should be assumed to be valid unless there is a specific reason to consider that they are invalid. Cases where a fault that is found to be cleared when tested should be counted as a valid report unless the providing operator has reason to believe that the fault did not occur.

A report that concerns more than one unbundled loop (e.g. a damaged cable) should be counted in terms of the number of fault reports received rather than the number of lines affected. However only one fault report should be included for each unbundled loop.

NOTE 2: If a cable that contains many loops is severed, then it is likely that most users of unbundled loops will make a fault report and each of these reports will be counted. This approach should facilitate the collection of statistics. The alternative of counting the number of loops affected, i.e. including the ones for which no fault is reported, would make the collection of the statistics too complicated. The fault reports would normally be made by the requesting operator, frequently following the receipt of a customer fault report; the customer would not have a direct relationship with the providing operator.

Statistics should include all valid fault reports in the data collection period.

## 5.5 Fault repair time

### 5.5.1 Definition

The duration from the instant a fault has been notified by the requesting operator to the agreed point of contact of the providing operator to the instant when the unbundled loop has been restored to normal working order.

### 5.5.2 Measurement and statistics

The following statistics should be provided:

- a) the time within which the fastest 80 % and 95 % of valid faults are repaired (expressed in elapsed hours).

In addition, the following may be provided:

- b) the percentage of faults cleared within the time agreed with the requesting operator.

NOTE: a) provides measures that can be compared between operators in the same or different countries.  
b) provides a measure that is useful in supply contracts.

Figures should be aggregated across all sites and take account of changes in the number of unbundled loops during the reporting period.

In addition, the providing operator should provide information on the hours during which faults may be reported.

### 5.5.3 Further considerations

Cases where:

- repair depends upon access to the premises or collocation facilities of the requesting operator and this access is not possible at the desired time; or
- the requesting operator requests a delay,

may be excluded from the statistics. When calculating the repair time, providing operators who choose to include these cases may subtract from the measured time the delay introduced by the requesting operator.

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## Annex A (informative): Combination of weekly or monthly results

Mean values and percentages produced weekly or monthly may be aggregated into quarterly statistics using one of the following formulae:

a) For weekly statistics

$$S_{\text{quarterly}} = (\sum N_i \cdot S_i) / (\sum N_i) \text{ where } i = 1, 2 \dots 13$$

and

$N_i$  = The number of events in each week

$S_i$  = The statistic for each week

b) For monthly statistics

$$S_{\text{quarterly}} = (\sum N_i \cdot S_i) / (\sum N_i) \text{ where } i = 1, 2, 3$$

and

$N_i$  = The number of events in each month

$S_i$  = The statistic for each week

For aggregating the median or the 95 %-quantile into quarterly statistics, one has to apply the same procedure as explained in annex B.

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## Annex B (informative): Further explanation of "fastest X %"

Several parameters require a statistic of the form:

"the time by which the fastest X % of <relevant event>"

This annex explains what is meant.

The measurements give a list of times recorded for the events, for example a list of supply times. This list of times should be counted and sorted into ascending order.

X % of the total number of measurements counted should be calculated giving a number, say "n" which would be rounded down to the nearest integer.

The "n"<sup>th</sup> time in the sorted ascending list will then be "the time by which the fastest X% of <relevant event>" occurred and is the statistic to be reported.

## Annex C (informative): Proforma for providing statistics aggregated across all sites

This is a sample proforma for the case where statistics are reported that are aggregated across all sites.

Parameter	Measure	Statistic for direct services
5.1 Supply time for initial set-up	Time by which the fastest 90 % of interconnections are made available	Elapsed days
	Percentage of interconnections completed by the date agreed with the requesting operator	%
5.2 Supply time for individual unbundled loops at a site where unbundling has been set-up	Time by which the fastest 90 % of orders for unbundled loops are completed	Elapsed days (no number porting) Elapsed days (with number porting)
	Percentage of orders completed by the date agreed with the requesting operator	%
5.3 Availability of unbundled loops	The average proportion of time that an unbundled loop is available	%
5.4 Fault report rate per unbundled loop	Average number of valid fault reports per unbundled loop per year	Reports per 100 lines
	Hours during which faults may be reported	Weekdays from..... to ..... Saturdays from..... to ..... Sundays from..... to .....
5.5 Fault repair time	Average time to repair fastest 80 % of valid faults	Elapsed hours
	Average time to repair fastest 95 % of valid faults	Elapsed hours
	Percentage of faults cleared within the time agreed	%



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## Annex D (informative): Bibliography

- ETP Recommendations on Local Loop Unbundling: (available from: ETP European Telecommunications Platform; c/o Fabrimetal, Diamant Building, 80, Boulevard A. Reyers, B-1030 Brussels, Belgium, Tel: +32 2 706 81 26).

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## History

<b>Document history</b>		
V1.1.1	April 2001	Membership Approval Procedure MV 20010615: 2001-04-17 to 2001-06-15