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OF ITU

TERMS AND DEFINITIONS RELATED TO THE QUALITY OF TELECOMMUNICATION SERVICES

QUALITY OF SERVICE AND DEPENDABILITY VOCABULARY

ITU-T Recommendation E.800

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation E.800 was elaborated by (former) CCITT Study Group II (now ITU-T Study Group 2) and was published in Fascicle II.3 of the *Blue Book*. This file is an extract of the *Blue Book* and therefore the formatting (layout) of the text might be slightly different from the *Blue Book* version. The cover sheet has been added by the Electronic Document Handling Service of the Telecommunication Standardization Bureau (TSB-EDH) for ITUDOC purpose.

However, the contents of this file are identical to E.800 *Blue Book* version and copyright issues remain unchanged (see below).

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Recommendation E.800[1)]

QUALITY OF SERVICE AND DEPENDABILITY VOCABULARY

CONTENTS

1 *Introduction*

2 *Related Recommendations*

3 *Performances*

3.1 Service related performances

3.2 Item related performances

4 *Interruptions*

5 *Measures of performances*

5.1 Service support performance

5.2 Service operability performance

5.3 Service accessibility performance

5.4 Service retainability performance

5.5 Serveability performance

5.6 Transmission performance

6 *Common concepts*

Annex A — Alphabetical list of definitions contained in this Recommendation

1 Introduction[2)]

A consistent set of terms and definitions is necessary for the development of Recommendations in the important areas of *quality of service* and *network performance* by the numerous Study Groups responsible for the Recommendations. Terminology standardization is also necessary to align the work of the various groups and to avoid confusing the users of Recommendations by the introduction of conflicting terms and definitions. Therefore, this Recommendation sets forth a simple set of terms and definitions relating to the concept of the quality of telecommunications services and *network performance*. These terms and definitions apply to all telecommunications services and all network arrangements used to provide the services.

The diagram in Figure 1/E.800 is intended to provide an overview of the factors which contribute collectively to the overall *quality of service* as perceived by the *user* of a telecommunication service. The terms in the diagram can be thought of as generally applying either to the quality of service levels actually achieved in practice, to objectives which represent *quality of service* goals to be achieved, or to requirements which reflect design specifications.

The diagram in Figure 1/E.800 is also structured to show that one quality of service factor can depend on a number of others. It is important to note — although it is not explicitly stated in each of the definitions to follow — that the value of a characteristic measure of a particular factor may depend directly on corresponding values of other factors which contribute to it. This necessitates, whenever the value of a measure is given, that all of the conditions having an impact on that value be clearly stated.

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1) Formerly part of Recommendation G.106, *Red Book*, Fascicle III.1

2) Terms printed in italics in the text may be found with their related definitions in Supplement No. 6 or in Recommendation E.600.

An essential aspect of the global evaluation of a service is the opinion of the users of the service. The result of this evaluation expresses the users' degrees of satisfaction. This Recommendation establishes:

1) a general framework for the *quality of service* concept

2) the relationship between quality of service and network performance

3) a set of measures for these performances.

It is obvious that a service can be used only if it is provided, and it is desirable that the provider have a detailed knowledge about the quality of the offered service. From the provider's viewpoint, *network performance* is a concept by which network characteristics can be defined, measured and controlled to achieve a satisfactory level of service quality. The interests and the viewpoints of users and providers are different, and usually require a compromise between quality and economics.

In the utilization of a *service* the *user* identifies two «bodies»:

1) the "Organization(s)", i.e., the telecommunication Administration, operating company, etc. providing the means and facilities for the access to and the utilization of the *service*;

2) the «network», i.e., the necessary means (terminals[3)], lines, switches, etc.) actually used.

The contribution of the Organization to the *quality of service* is characterized by one performance concept, *service support performance*, as shown in Figure 1/E.800.

The contribution of the network to the *quality of service* is characterized by three performance concepts, which are:

— *service operability performance*, i.e., the ease by which the *service* can be used, including the characteristics of terminal equipment, the intelligibility of tones and messages, etc.;

— *serveability performance*, the ability of a *service* to be obtained — within specified tolerances and other given conditions — when requested by the *user* and continue to be provided for the requested duration. Thus, *serveability performance* describes the response of the network during the establishment, retention and *release* of a service connection;

— *service integrity*, the degree to which a *service* is provided without excessive impairments, once obtained. Thus, *service integrity* is primarily concerned with the level of reproduction of the transmitted signal at the receiving end.

The *serveability performance* is further subdivided into two terms:

— *service accessibility performance*, the ability of a *service* to be obtained — within specified tolerances and other given conditions — when requested by the *user*, further subdivided into (1) *network accessibility*, which is the ability of the *user* to obtain access to the network for a service request, and (2) *connection accessibility*, which is the ability of the network to provide the *user* with a satisfactory connection to the intended *destination*;

— *service retainability performance*, which is the ability of the *service*, once obtained, to continue to be provided under given conditions for a requested period of time. That is, *service retainability performance* covers the proper retention of *connections* and the *release* (disengagement) when requested by the *user*.

Serveability performance is divided into *trafficability performance*, *dependability* and *propagation performance* as shown in Figure 1/E.800. The *trafficability performance* is described in purely teletraffic engineering terms (see Recommendation E.600). The *measures* are expressed in terms of losses and delay times. *Dependability* is the combined aspects of availability, reliability, maintainability and maintenance support performances and relates to the ability of an *item* to be in a state to perform a *required function* (see Supplement No. 6). *Propagation performance* refers to the ability of the transmitting medium to transmit the signal within intended tolerances.

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3) In some countries' terminals are not part of the network and are or may be customer—provided

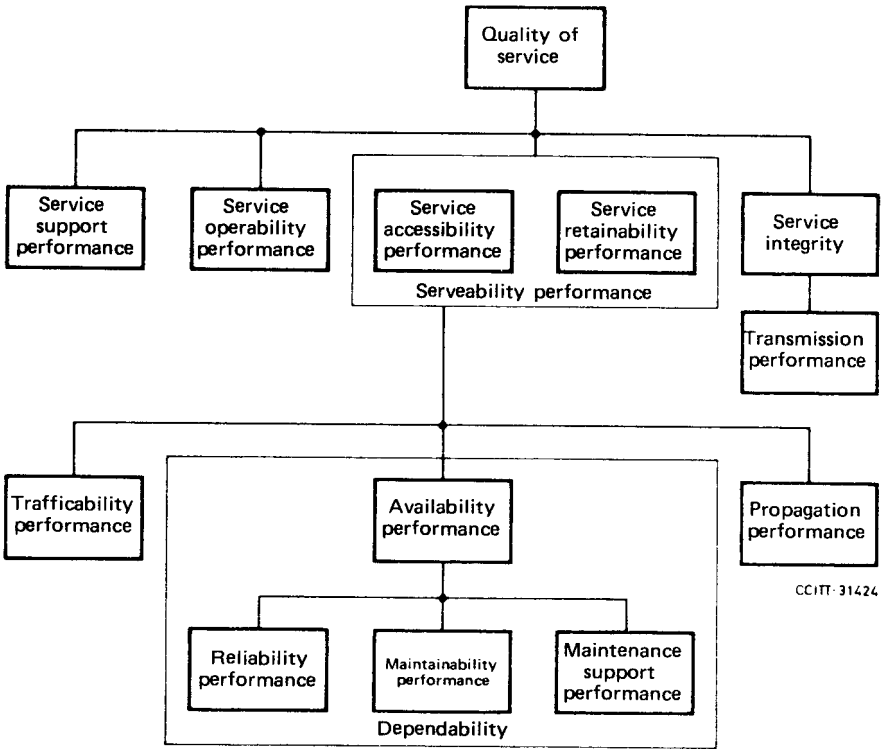

FIGURE 1/E.800

Performance concepts

Measures for all of the above performances may be related to an instant of time (instantaneous, etc.) or expressed as a mean value over a time interval. These and other recommended qualifiers (measure modifiers) are found in Supplement No. 6.

Supplement No. 6 further provides recommended statistical terms and definitions for use in the application of measures related to all performances.

While dependability is used only for a general description in non—quantitative terms, the actual quantification is done under the heading of availability performance, reliability performance, maintainability performance and maintenance support performance.

The most important of these dependability—related measures are found in Supplement No. 6, Part I. The properties expressed by these measures impact the measures related to quality of service and network performance and are thus implicitly characterizations of these performances.

Measures are connected to events (failure, restoration, etc.), states (fault, up state, down state, outage, etc.) or activities (e.g. maintenance), with their time durations.

Part I of Supplement No. 6 provides necessary identification of times, events, states and maintenance activities.

2 Related Recommendations and Supplements

Recommendation E.600: Terms and definitions of traffic engineering

Supplement No. 6: Terms and definitions for quality of service, network performance, dependability and trafficability studies.

3 Performances

3.1 *Service related performances*

3101 **quality of service**

F qualité de service

S: calidad de servicio

The collective effect of service performances which determine the degree of satisfaction of a *user* of the *service*.

Note 1 — The *quality of service* is characterized by the combined aspects of *service support performance*, *service operability performance*, *serveability performance*, *service integrity* and other factors specific to each *service*.

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

3102 **serveability performance**

F: servibilité (d'un service)

S: servibilidad (de un servicio)

The ability of a *service* to be obtained — within specified tolerances and other given conditions — when requested by the *user* and continue to be provided for a requested *duration*.

Note — Serveability performance may be subdivided into the *service accessibility performance* and the *service retainability performance*.

3103 **service accessibility performance**

F: accessibilité (d'un service)

S: accesibilidad (de un servicio)

The ability of a *service* to be obtained, within specified tolerances and other given conditions, when requested by the *user*.

Note — This takes into account the transmission tolerance and the combined aspects of *propagation performance*, *trafficability performance* and *availability performance* of the related systems.

3104 **service retainability performance**

F: continuabilité (d'un service)

S: retenibilidad (de un servicio)

The ability of a *service*, once obtained, to continue to be provided under given conditions for a requested duration.

Note — Generally this depends on the transmission tolerances, the *propagation performance* and *reliability performance* of the related systems. For some services, for example packet switching, this also depends on the *trafficability performance* and the *availability performance* of the related systems.

3105 **service support performance**

F: logistique de service

S: logística del servicio

The ability of an organization to provide a *service* and assist in its utilization.

Note — An example of *service support performance* is the ability to provide assistance in commissioning a basic service, or a supplementary service such as the call waiting service or directory enquiries service.

3106 **service operability performance**

F: facilité d'utilisation (d'un service)

S: facilidad de utilización (de un servicio)

The ability of a *service* to be successfully and easily operated by a *user*.

3107 **service integrity**

F: integrité de service

S: integridad del servicio

The degree to which a *service* is provided without excessive impairments, once obtained.

Note — This *service* is characterized by the *transmission performance* of the system.

3108 **transmission performance**

F: qualité de transmission

S: calidad de transmisión

The level of reproduction of a signal offered to a telecommunications system, under given conditions, when this system is in an *up state*.

3.2 *Item related performances*

3201 **network performance**

F: qualité technique du réseau

S: calidad de funcionamiento de la red

The ability of a network or network portion to provide the functions related to *communications* between *users*.

Note 1 — Network performance contributes to *serveability performance* and *service integrity* (see Figure 2/E.800).

Note 2 — Network performance measures are meaningful to network providers and are quantifiable at boundaries of network portions to which they apply. Quality of service measures are only quantifiable at a service access point.

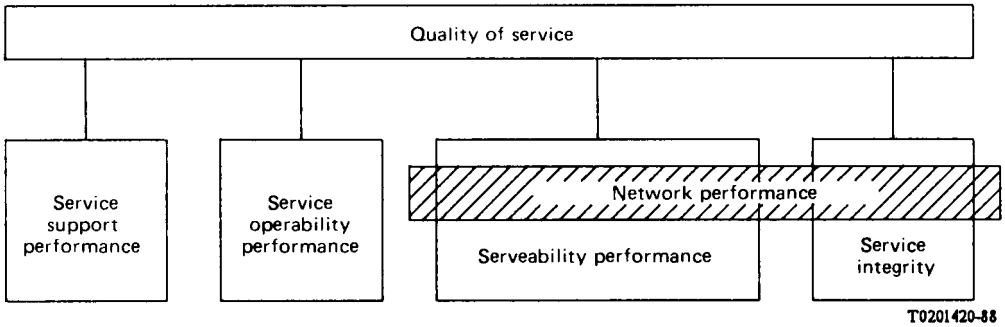

FIGURE 2/E.800

Relationship between quality of service and network performance

3202 **trafficability performance**

F: traficabilité; capacité d'écoulement du trafic

S: aptitud para cursar tráfico

The ability of an *item* to meet a traffic demand of a given size and other characteristics, under given internal conditions.

Note — Given internal conditions refer, for example, to any combination of *faulty* and not *faulty* sub—items.

3203 **capability**

F: capacité; capabilité (d'une entité)

S: capacidad

The ability of an *item* to meet a demand of a given size under given internal conditions.

Note 1 — Internal conditions refer, for example, to any given combination of *faulty* and not *faulty* sub—items.

Note 2 — This is also called *trafficability performance*.

3204 **propagation performance**

F: caractéristiques de propagation

S: característica de propagación

The ability of a propagation medium, in which a wave propagates without artificial guide, to transmit a signal within the given tolerances.

Note — The given tolerances may apply to variations in signal level, noise, interference levels, etc.

3205 **effectiveness (performance)**

F: efficacité

S: efectividad

The ability of an *item* to meet a service demand of a given size.

Note — This ability depends on the combined aspects of the *capability* and the *availability performance* of the *item*.

4 Interruptions

4101 **interruption; break (of service)**

F: interruption; coupure (d'un service)

S: interrupción (de un servicio); corte (de un servicio)

Temporary inability of a *service* to be provided persisting for more than a given *time duration*, characterized by a change beyond given limits in at least one parameter essential for the *service*.

Note 1 — An *interruption* of a *service* may be caused by *disabled states* of the *items* used for the *service* or by external reasons such as high service demand.

Note 2 — An *interruption* of a *service* is generally an *interruption* of the transmission, which may be characterized by an abnormal value of power level, noise level, signal distortion, *error* rate, etc.

4102 **time between interruptions**

F: temps entre interruptions

S: tiempo entre interrupciones

The *time duration* between the end of one *interruption* and the beginning of the next.

4103 **interruption duration**

F: durée d'interruption

S: duración de interrupción

The *time duration* of an *interruption*.

4104 **mean time between interruptions (MTBI)**

F: durée moyenne entre interruptions (DMEI)

S: tiempo medio entre interrupciones

The *expectation* of the *time between interruptions*.

4105 **mean interruption duration (MID)**

F: durée moyenne d'une interruption (DMI)

S: duración media de una interrupción

The *expectation* of the *interruption duration*.

5 Measures of performances

5.1 *Service support performance*

5101 **mean service provisioning time**

F: délai moyen pour la fourniture d'un service

S: tiempo medio de espera (para la prestación de un servicio)

The *expectation* of the *duration* between the *instant of time* a potential *user* requests that an organization provides the necessary means for a *service*, and the *instant of time* when these means are furnished.

5102 **billing error probability**

F: probabilité d'erreur de facturation

S: probabilidad de error de facturación

The *probability* of an *error* when billing a *user* of a *service*.

5103 **incorrect charging or accounting probability**

F: probabilité de taxation erronée

S: probabilidad de tarificación o de contabilidad incorrectas

The *probability* of a *call attempt* receiving incorrect charging or accounting treatment.

5104 **undercharging probability**

F: probabilité de sous—taxation

S: probabilidad de subtarificación

The *probability* that an effective *call* will be undercharged for any reason.

5105 **overcharging probability**

F: probabilité de surtaxation

S: probabilidad de sobretarificación

The *probability* that an effective *call* will be overcharged for any reason.

5106 **billing integrity** (probability)

F: (probabilité de) justesse de facturation

S: integridad de la facturación (probabilidad de)

The *probability* that the billing information presented to a *user* correctly reflects the type, destination and duration of the *call*.

5.2 *Service operability performance*

5201 **service user mistake probability**

F: probabilité d'erreur d'un usager

S: probabilidad de error de un usuario (de un servicio)

Probability of a *mistake* made by a *user* in his attempt to utilize a *service*.

5202 **dialling mistake probability**

F: probabilité d'erreur de numérotation

S: probabilidad de error de marcación

The *probability* that the *user* of a telecommunication network makes dialling *mistakes* during his *call attempts*.

5203 **service user abandonment probability**

F: probabilité d'abandon (d'accès à un service par un usager)

S: probabilidad de abandono de un servicio por un usuario

The *probability* that a *user* abandons the attempt to use a *service*.

Note — Abandonments may be caused by excessive *user* mistake rates, by excessive service access delays, etc.

5204 **call abandonment probability**

F: probabilité d'abandon (d'une tentative d'appel)

S: probabilidad de abandono de una tentativa de llamada

The *probability* that a *user* abandons the *call attempt* to a telecommunication network.

5.3 *Service accessibility performance*

5301 **service accessibility; service access probability**

F: accessibilité (d'un service)

S: accesibilidad de un servicio; probabilidad de acceso a un servicio

The *probability* that a *service* can be obtained within specified tolerances and other given operating conditions when requested by the *user*.

5302 **mean service access delay**

F: durée moyenne d'accès

S: retardo medio de acceso a un servicio; demora media de acceso a un servicio

The *expectation* of the *time duration* between an initial *bid* by the *user* for the acquisition of a *service* and the *instant of time* the user has access to the *service*, the *service* being obtained within specified tolerances and other given operating conditions.

5303 **network accessibility**

F: accessibilité (d'un réseau)

S: accesibilidad (de una red)

The *probability* that the *user* of a *service* after a request receives the proceed—to—select signal within specified conditions.

Note — The proceed—to—select signal is that signal inviting the *user* to select the desired *destination*.

5304 **connection accessibility**

F: accessibilité

S: accesibilidad de una conexión

The *probability* that a *connection* can be established within specified tolerances and other given conditions following receipt by the exchange of a valid code.

5305 **mean access delay**

F: durée moyenne d'accès

S: retardo medio de acceso; demora media de acceso

The *expectation* of the *time duration* between the first *call attempt* made by a *user* of a telecommunication network to reach another *user* or a *service* and the *instant of time* the *user* reaches the wanted other *user* or *service*, within specified tolerances and under given operational conditions.

5306 **p—fractile access delay**

F: quantile—p de la durée d'accès

S: cuantil—p del retardo de acceso; cuantil—p de la demora de acceso

The *p—fractile* value of the *duration* between the *first call attempt* made by a *user* of a telecommunication network to reach another *user* or a *service* and the *instant of time* the *user* reaches the wanted other *user* or *service*, within specified tolerances and under given operational conditions.

5307 **accessibility of a connection to be established**

F: accessibilité d'une communication à établir

S: accesibilidad de una conexión por establecer

The *probability* that a switched *connection* can be established, within specified transmission tolerances, to the correct *destination*, within a given *time interval*, when requested by the *user*.

Note 1 — For user—originated calls, it could express the *probability* of a successful call establishment on the first attempt. For operator—handled calls, it could represent the *probability* of having a satisfactory *connection* established within a given *time duration*.

Note 2 — In general, the tolerances should correspond to a level of *transmission performance* which makes the connection unsatisfactory for *service* such that, for example, a substantial percentage of *users* would abandon the *connection*.

5308 **unacceptable transmission probability**

F: probabilité d'une transmission inacceptable

S: probabilidad de transmisión inaceptable

The *probability* of a *connection* being established with an unacceptable speech path transmission quality.

5309 **no tone probability**

F: probabilité de non tonalité

S: probabilidad de ausencia de tono

The *probability* of a *call attempt* encountering no tone following receipt of a valid code by the exchange.

5310 **misrouting probability**

F: probabilité d'acheminement errone

S: probabilidad de encaminamiento erróneo

The *probability* of a *call attempt* being misrouted following receipt by the exchange of a valid code.

5.4 *Service retainability performance*

5401 **service retainability**

F: continuabilité (d'un service)

S: retenibilidad (de un servicio)

The *probability* that a *service*, once obtained, will continue to be provided under given conditions for a given *time duration*.

5402 **connection retainability**

F: continuabilité (d'une chaîne de connexion)

S: retenibilidad (de una conexión)

The *probability* that a *connection*, once obtained, will continue to be provided for a *communication* under given conditions for a given *time duration*.

5403 **retainability of an established connection**

F: continuabilité d'une communication établie

S: retenibilidad de una conexión establecida

The *probability* that a switched *connection*, once established, will operate within specified transmission tolerances without *interruption* for a given *time interval*.

5404 **premature release probability; cut—off call probability**

F: probabilité de libération prématurée

S: probabilidad de liberación prematura; probabilidad de corte de una llamada

The *probability* that an established *connection* will be released for a reason other than intentionally by any of the parties involved in the call.

5405 **release failure probability**

F: probabilité de non—libération

S: probabilidad de fallo de liberación

The *probability* that the required *release* of a *connection* will not take place.

5.5 *Serveability performance*

5501 **probability of successful service completion**

F: probabilité d'exécution correcte du service

S: probabilidad de prestación satisfactoria de un servicio

The *probability* that a *connection* can be established, under satisfactory operating conditions, and retained for a given *time interval*.

5.6 *Transmission performance*

5601 **bit error ratio (BER)**

F: taux d'erreur sur les bits (TEB)

S: tasa de errores en los bits; tasa de error en los bits (TEB)

The ratio of the number of bit errors to the total number of bits transmitted in a given *time interval*.

5602 **error free seconds (EFS)**

F: secondes sans erreur (SSE)

S: segundos sin error (SSE)

The ratio of the number of one—second intervals during which no bits are received in error to the total number of one—second intervals in the *time interval*.

Note 1 — The length of the *time interval* needs to be specified.

Note 2 — This ratio is usually expressed as a percentage.

6 Common concepts

The following concepts are used in the definitions of this Recommendation. Others used, such as probability, measure, up state, disabled state, time duration, user and connection may be found in Recommendation E.600 and in Supplement No. 6.

6001 **service**

F: service

S: servicio

A set of functions offered to a *user* by an organization.

6002 **item; entity**

F: entité; individu

S: elemento; entidad; ítem

Any part, device, subsystem, functional unit, equipment or system that can be individually considered.

Note 1 — An *item* may consist of hardware, software or both, and may also include people, e.g. operators in a telephone operator system.

Note 2 — In French, the term *entité* replaces the term *dispositif* previously used in this meaning, because the term *dispositif* is also the common equivalent for the English term “device”.

Note 3 — In French, the term *individu* is used mainly in statistics.

ANNEX A

5307 accessibility of a connection to be established
5102 billing error probability
5106 billing integrity (probability)
5601 bit error ratio
5204 call abandonment probability
3203 capability
5304 connection accessibility
4101 break (of service)
5402 connection retainability
5404 cut—off call probability
5202 dialling mistake probability
3205 effectiveness (performance)
6002 entity
5602 error free seconds (EFS)
5103 incorrect charging or accounting probability
4103 interruption duration
4101 interruption
6002 item
5305 mean access delay
4105 mean interruption duration
5302 mean service access delay
5101 mean service provisioning time
4104 mean time between interruptions
5310 misrouting probability
5303 network accessibility
3201 network performance
5309 no tone probability
5105 overcharging probability
5306 p—fractile access delay
5404 premature release probability
5501 probability of successful service completion
3204 propagation performance
3101 quality of service
5405 release failure probability
5403 retainability of an established connection
3102 serveability performance
6001 service
5301 service access probability
5301 service accessibility
3103 service accessibility performance
3107 service integrity
3106 service operability performance
5401 service retainability
3104 service retainability performance
3105 service support performance
5203 service user abandonment probability
5201 service user mistake probability
4102 time between interruptions
3202 trafficability performance
3108 transmission performance
5308 unacceptable transmission probability
5104 undercharging probability

(to Recommendation E.800)

ALPHABETICAL LIST OF DEFINITIONS CONTAINED IN THIS RECOMMENDATION