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CCITT

THE INTERNATIONAL
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CONSULTATIVE COMMITTEE

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(10/92)

TELEPHONE NETWORK AND ISDN

QUALITY OF SERVICE, NETWORK MANAGEMENT AND TRAFFIC ENGINEERING

MODELS FOR THE SPECIFICATION, EVALUATION AND ALLOCATION OF SERVEABILITY AND SERVICE INTEGRITY

Recommendation E.830

FOREWORD

The CCITT (the International Telegraph and Telephone Consultative Committee) is a permanent organ of the International Telecommunication Union (ITU). CCITT is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The Plenary Assembly of CCITT which meets every four years, establishes the topics for study and approves Recommendations prepared by its Study Groups. The approval of Recommendations by the members of CCITT between Plenary Assemblies is covered by the procedure laid down in CCITT Resolution No. 2 (Melbourne, 1988).

Recommendation E.830 was revised by Study Group II and was approved under the Resolution No. 2 procedure on the 30th of October 1992.

CCITT NOTE

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

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MODELS FOR THE SPECIFICATION, EVALUATION AND ALLOCATION OF SERVEABILITY AND SERVICE INTEGRITY

(revised 1992)

1 Introduction

This Recommendation is one of a set of closely related Recommendations comprising E.810, E.825, E.830, E.845, E.850 and E.855, concerned with the accessibility, retainability and integrity of telephone services.

The CCITT,

considering

that there is a need for having means (models) for the allocation of serveability and service integrity performance and for its evaluation from the characteristics of network components,

recommends

the use of the models described in this Recommendation. These models depend on the measure under consideration, i.e. accessibility, retainability and service integrity.

2 Description of models

In general two types of models are required: one for the allocation of the performance to the different network portions and the other for the evaluation of the overall performance from the network component characteristics.

2.1 *Allocation model*

The purpose of such a model is to apportion a given overall measure to international network and to two national networks.

Figure 1/E.830 shows the model to be used for allocation purposes.

Note – The International Switching Centres (ISCs) are included in the international portion.

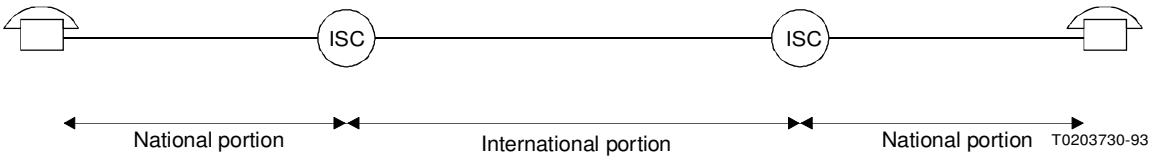

FIGURE 1/E.830
Model for the allocation

The diagram of Figure 1/E.830 should be considered for typical, 90th percentile and worst case.

For the case of retainability and service integrity, these three situations are summarized in Table 1/E.830 which gives the number of exchanges to be included in an international connection for retainability objective allocation.

TABLE 1/E.830

Number of exchanges to be included in an international connection for retainability objective allocation

	Originating network		International network	Destination network	
	National exchanges		International switching centers (ISCs)	National exchanges	
	Local	Others		Others	Local
Typical	1	1	2	1	1
90th percentile	1	2	2	2	1
Worst case	1	4	5	4	1

2.2 *Evaluation models*

The purpose of an evaluation model is to derive the overall measures from measures related to different network portions, network sections or network components.

In case of already established connection (retainability, integrity) the evaluation model is simple. In case of connections to be established (network and connection accessibility) the evaluation model requires more detailed consideration as indicated in the following.

Note – The following only refers to the derivation of overall measure from network components characteristics.

The method for combining measures related to different network portions is for further study.

2.2.1 *Models for accessibility performance evaluation*

Some call attempts fail due to the customers (busy party, no response, misnumbering), some fail due to the network. In the latter case, the causes can be:

– a lack of network capacity, in its fault free condition (poor dimensioning or heavy traffic load);

– failure of one of its components, resulting in a more or less severe congestion, depending on the role of the network component in the network.

A network model is required to describe in a simplified manner the behaviour of a (circuit switched) network under traffic load and in the presence of failures.

The probability that a call attempt fails depends on both the traffic at the time of the call attempt and the amount of resources available for the connection required at the same time.

As a consequence, in order to describe the behaviour of a network in presence of failures, it is necessary to evaluate:

– their effect, which requires the description of a logical network model in terms of traffic engineering;

– their probabilities, which require the description of a physical network model in terms of its components.

A logical network model is a means to evaluate the performance of the network in terms of traffic and particularly the effect of failures in the physical network. It is made of nodes interconnected by circuit groups (see Recommendation E.600, § 3.5), also called trunk group, in a hierarchial order. It shows the traffic load of each circuit group (busy hour).

If a circuit group is subdivided into circuit subgroups (see Recommendation E.600, § 3.6) which are routed on separate links, then the logical model must distinguish them. Thus, the consequence of failure on a link between these two nodes will result in a known reduction of the amount of circuits available between these nodes.

The derivation of the effect of each failure (link or nodes) in terms of blocking probability can be made by combining the traffic load and the reduced capacity of the network to handle the considered traffic load.

The physical network model describes the way in which the logical network model in implemented.

It is made of exchanges and of transmission links, the implementation of which is to be described in detail: multiplexers, digital sections and their length, protection rules and topology.

The failures probability of a link can be derived from the availabilities of its components, taking in account the protection measures in that link.

The physical network model should also provide information on the architecture of the exchange to allow the evaluation of the probabilities of their main failure modes.

In the case of connection accessibility, it is necessary to identify the origin and the destination of the connection to be established.

The origin and the destination may belong to different categories: a single subscriber, a number of subscribers, an exchange, a portion of network.

2.2.2 *Models for service integrity and retainability evaluation*

For the evaluation of the service integrity and retainability the relevant models are indicated in Figures A-1/E.850 and B-1/E.855.