



INTERNATIONAL TELECOMMUNICATION UNION

CCITT

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

E.712

(10/92)

**TELEPHONE NETWORK AND ISDN
QUALITY OF SERVICE,
NETWORK MANAGEMENT AND TRAFFIC
ENGINEERING**

USER PLANE TRAFFIC MODELLING



Recommendation E.712

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.712 was prepared by Study Group II and was approved under the Resolution No. 2 procedure on the 30th of October 1992.

CCITT NOTES

- 1) In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized private operating agency.
- 2) A list of abbreviations used in this Recommendation can be found in Annex A.

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Recommendation E.712**USER PLANE TRAFFIC MODELLING**

(1992)

1 Introduction

In Recommendation E.711 the user demand is characterized by means of his call demands and by the description of each type of call demand. On the basis of the information provided by this user characterization, Recommendation E.712 derives the values of the traffic parameters required for dimensioning the 1 to 3 layer resources of ISDN user plane.

The resources involved by the user plane traffic are:

- customer accesses (Basic, Primary and their multiplexes): B- and D-channels;
- resources of ISDN Exchanges: switching networks, packet handlers, etc.;
- trunk groups.

2 General approach

In ISDN, call demands with different connection characteristics can be offered to the same group of resources. Depending on the kind of resources, dimensioning may require to separately characterize the traffic components corresponding to call demands with some different connection characteristics.

First, there is a distinction of two main traffic components according to the connection characteristic information transfer mode. Each of these two components (circuit switched and packet switched) may be further split up into new components, according to the other connection characteristics of their call demands.

Thus, the approach for the modelling of the traffic offered to a group of resources is:

- to identify the call demands which make use of this group of resources;
- to identify the connection characteristics which imply the split up of the traffic due to these call demands into traffic components;
- to describe and quantify these traffic components by means of a set of parameters derived from those defined in Recommendation E.711.

This approach will be followed in § 3 to model the circuit switched traffic and in § 4 for the packet switched traffic.

3 Modelling of circuit switched traffic**3.1 Observations on the concept of group of resources**

In the first implementations of the ISDN, the number of channels or circuits reserved per call will be the same for both directions of the information flow. This number is given for each call by the direction in which the information transfer rate is higher. In this situation, the B-channels of an ISDN access or the channels (slots) of a trunk group are referred here as a group of resources, with independence of the direction of the information flow.

In further implementations of the ISDN, when the connection characteristic "Symmetry" of the call pattern takes the values unidirectional or bidirectional asymmetric, the number of channels reserved per call may be different in each direction of the information flow. In this situation, the channels carrying each direction of the information flow have to be separately dimensioned (the final dimensioning being given by the direction in which the required number of channels is higher). Thus, the channels of each direction should be considered, in the context of this Recommendation, as a different group of resources.

3.2 *Identification of call demands using a group of resources*

To identify the call demands using a group of resources the following connection characteristics should be considered:

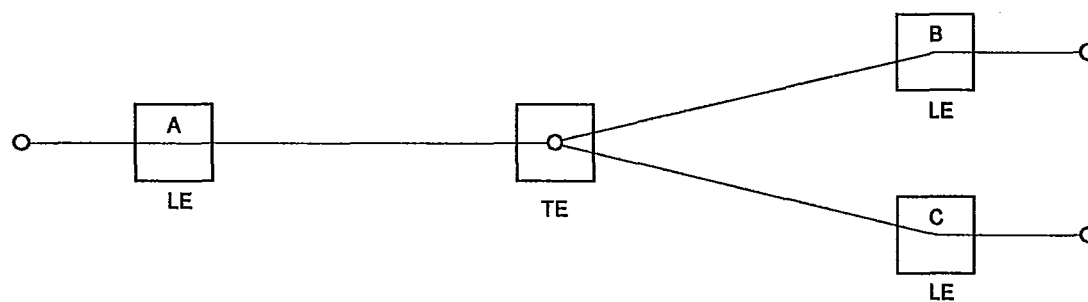
- communication configuration: This characteristic, in the wide sense considered in Recommendation E.711, § 2.2, defines the position of the end-points involved in the communication; this, together with the routing strategy, determines if a certain group of resources may be used by a call demand.
- information transfer capability;
- establishment of communication;
- information transfer rate.

The last three characteristics should be considered since different groups of resources may be provided for call demands with certain values of these connection characteristics (e.g. resources only used for single channel connections or only traffic on demand).

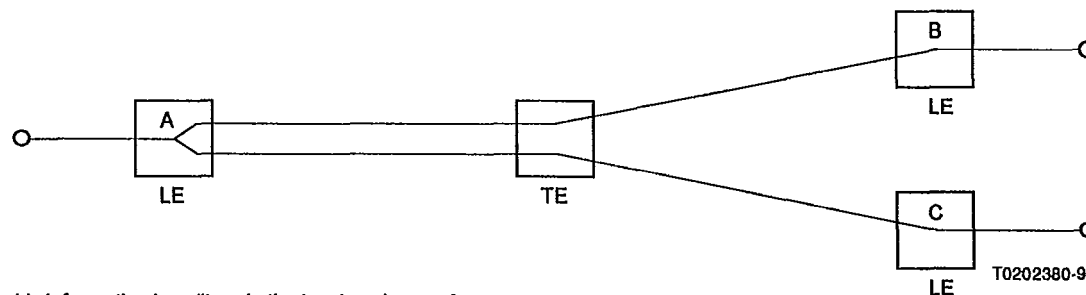
3.3 *Split up into traffic components*

When call demands with different connection characteristics share the same group of resources, different components of the offered traffic have to be separately characterized. For circuit switched traffic these components are distinguished according to the following criteria:

- a) the number of resources required per call; the connection characteristics of the call demand determining this number are:
 - the information transfer rate: in the first situation of § 3.1, it is the rate in the direction in which the rate is higher; in the second situation, it is the rate in the direction under consideration. When this rate is $n \times 64$ kbit/s, n B-channels of the ISDN access or n channels of a trunk group are required for each call;
 - the communication configuration: in multipoint connections several resources of the same group can be required by a call, depending on the place where the information is split; Figure 1/E.712 gives two examples of a three points communication; if the information transfer rate is $n \times 64$ kbit/s, n resources are required in each trunk group in example a), while in example b), $2 \times n$ resources are required in the trunk group between the local exchange A and the transit exchange, and n resources in each of the other two trunk groups;
- b) the existence of any restriction on the allocation of several resources for the same call; time-slot sequence integrity (TSSI) is required for $n \times 64$ kbit/s communications when the values of the information transfer capability is unrestricted or 8 kHz structured; one technique to obtain this integrity is to allocate the n channels (slots) on the same PCM primary multiplex, or even to assure that the n channels are contiguous; traffic components with different restrictions in the allocation should be distinguished;
- c) call routing: it is related to the general call routing strategy and to the connection characteristic "communication configuration" of the call demand, which defines the position of the end-points involved in the communication. Traffic components offered to the considered group of resources in a first choice have to be distinguished from those which only are offered if overflow from previous groups. Among the last ones, components for which the previous choices are different have also to be distinguished;



a) Information is split-up in the transit exchange



b) Information is split-up in the local exchange A

LE Local exchange
TE Transit exchange

FIGURE 1/E.712

Two examples of implementation of a three-points communication

- d) procedure for the establishment of the communication: for those resources sharing traffic of call demands with different values of this connection characteristic, the traffic components on reservation and on demand have to be separately characterized;
- e) any characteristic which could motivate a different priority or protection treatment: a different treatment (e.g. by means of service protection methods) of different traffic components can be motivated by some of the above-mentioned criteria, e.g. single slot versus multi-slot calls, first choice traffic versus overflow traffic, or calls on demand versus reserved calls. In addition, other characteristics can also motivate a different priority or protection treatment, e.g. traffic components with different GOS objectives (corresponding to different values of the general attribute/connection characteristic "Quality of Service"). Service protection methods may also be applied between traffic components corresponding to different services or to the two set-up directions of two-way trunk groups, even although these traffic components have the same GOS objectives and the same values of the other above-mentioned characteristics. The reason for this protection is to avoid that the overload of traffic component can deteriorate the GOS of the other ones. In all the cases in which a different priority or protection treatment between traffic components may be required, each of these traffic components has to be separately characterized.

The identification of other criteria, as e.g. different supplementary services, which could motivate a further distinction of traffic components is for further study.

3.4 Parameters describing each traffic component

Once the different traffic components offered to a group of resources have been distinguished according to criteria of § 3.3, each component has to be characterized.