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SERIES I: INTEGRATED SERVICES DIGITAL NETWORK (ISDN)

Overall network aspects and functions, ISDN user-network interfaces

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REFERENCE CONFIGURATIONS FOR ISDN CONNECTION TYPES

Reedition of CCITT Recommendation I.325 published in the Blue Book, Fascicle III.8 (1988)

NOTES

1 CCITT Recommendation I.325 was published in Fascicle III.8 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions 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.

Recommendation I.325

REFERENCE CONFIGURATIONS FOR ISDN CONNECTION TYPES

(Melbourne, 1988)

1 Summary

In order to apply the network performance parameters to the ISDN, some form of hypothetical reference connections (HRXs) are necessary. These HRXs should be based on appropriate reference configurations for the connection types to which the network performance parameters refer. This Recommendation shows how reference configurations can be developed for the ISDN connection types and what form such reference configurations should take.

2 Introduction

2.1 *Objective*

The general architectural model of the ISDN (see Figure 1/I.325) is given in Recommendation I.324. The detailed network capabilities of the ISDN, as described by connection types in Recommendation I.340, are described topologically by this Recommendation giving reference configurations as appropriate for (an) ISDN connection type(s). These reference configurations do not give details on the number of switching nodes, length of connection, transmission facilities used, etc. However, they do give the details on the reference configuration (or topological configuration) of all matters described by the connection type to which they refer. Therefore they should include details on the signalling, existence of switching functions, channels, etc. Based on these reference configurations, appropriate HRXs should be developed which will be particular to network performance parameters or groups of network performance (NP) parameters. The details on these HRXs will be appropriate for the NP parameters in question.

In order to keep the task of developing reference configurations and the subsequent HRXs, and the allocation of performance values to these HRXs, to manageable proportions, it is necessary to have as limited a set as possible of specific reference configurations. Consequently the ISDN connection types in Recommendation I.340 need to be arranged in different classes which differ significantly from each other such that they require a separate reference configuration model.

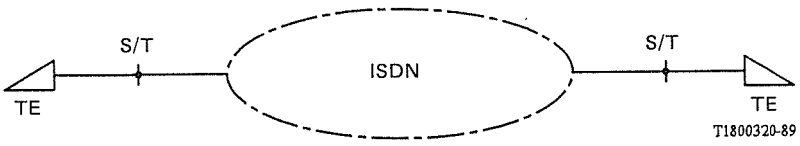


FIGURE 1/I.325

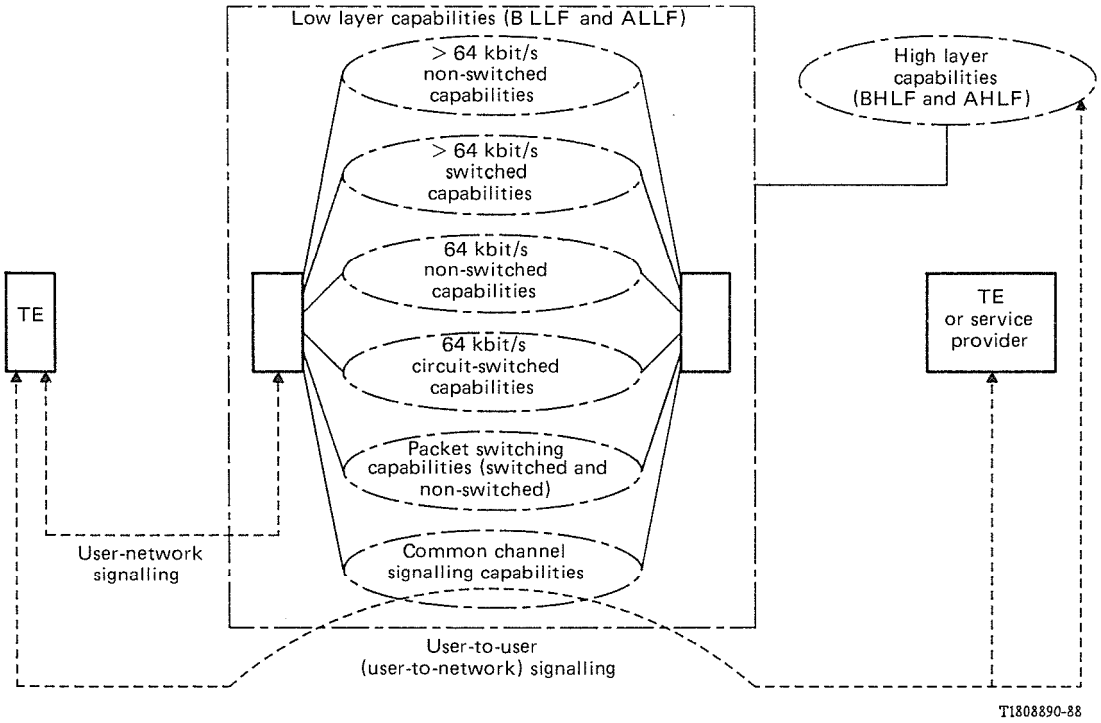
Simple cloud model of the ISDN

2.2 *Relationship to other I-series Recommendations*

The concept of reference configurations has already been used in a number of areas of standardization of the ISDN. It is therefore necessary to consider the concept of connection type reference configurations in the context of these developments.

2.2.1 *ISDN architectural model*

It should be noted that defining a set of reference configurations presupposes a particular architectural model of an ISDN (see Figure 2/I.325). The architectural model for the ISDN is contained in Recommendation I.324. In addition, Recommendation I.310 on the ISDN network functional principles, when considered together with Recommendation I.324, gives the general basis of the architecture of the ISDN from which it is possible to develop reference configurations for ISDN connection types.



BLLF Basic low layer functions
ALLF Additional low layer functions
BHLF Basic high layer functions
AHLF Additional high layer functions

FIGURE 2/I.325

Basic architectural model of an ISDN

2.2.2 *ISDN user-network interfaces*

The concept of reference configurations was first used in the ISDN work to describe the topological association of functional groupings at the user-to-network interface points. Recommendation I.411 (ISDN user-network interfaces – Reference configurations) is the complete description of these particular reference configurations. The key factors in the definition of reference configurations in Recommendation I.411 are the concepts of functional groupings and reference points.

2.2.3 *Recommendations X.30 and X.31 (1.461 and 1.462)*

Recommendations X.30 and X.32 on the adaption of X.21 and X.25 based DTEs to the ISDN also use the concept of reference configurations to explain the topological configuration of functional groupings involved in these kinds of terminals accessing the ISDN.

3 Development of the concept of reference configurations

3.1 *Definitions*

As can be inferred from Recommendation I.411, a **reference configuration** is defined to be "a conceptual configuration based on association rules of functional groupings and reference points."

3.2 *Principles for developing reference configurations for ISDN connection types*

Overall, the concept of the ISDN connection elements, as introduced in Recommendations I.324 and I.340, can be effectively used to demarcate the different sections of the reference configuration. Because of the complicated nature and evolutionary potential of the ISDN, it may not be possible to internationally specify a detailed end-to-end reference connection (such as Recommendation X.92 for data networks). Consequently a functional approach is adopted to specifying the structure of the ISDN connection types and the associated ISDN reference configurations. In order to keep the number of reference configurations manageable, only a restricted list of connection types and a limited number of models of frequently realized connection topologies are considered.

3.3 *Connection elements*

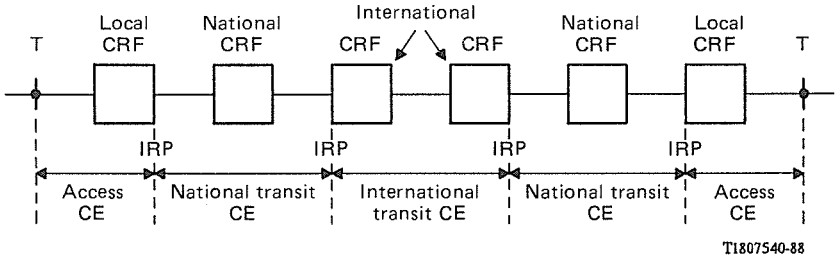
From the concepts of connection elements introduced in Recommendation I.324 a diagram, as shown in Figure 3/I.325 can be developed which can be considered as the general reference configuration of the ISDN. It is valid for all ISDN connection types. Particular ISDN connections may be local, national transit, international or international transit [i.e. transit switched through intermediate country(ies)]. In each case the appropriate parts of the general reference configuration would be involved.

Recommendation I.324 shows that three types of connection element have been defined (so far):

– access connection element;

– national transit connection element;

– international transit connection element.



IRP Internal reference point
CRF Connection related functions
CE Connection element

FIGURE 3/I.325

Reference configuration of public ISDN connection type

3.4 *Functional groupings*

As stated in the definition in § 3.1 above, in order to define reference configurations, it is necessary to define certain functional groupings and also reference points which are the conceptual points dividing these functional groupings.

In the description of the connection type reference configuration, some of the major functional groupings involved can be considered under the concept of connection related functions (CRF) as described in § 4.2.2.1 of Recommendation I.324. The concept of the CRF includes all the functional groupings involved in establishing and controlling the connections within the particular connection element. In the case of the international transit connection element, two CRFs are shown in Figure 3/I.325 in order to retain the symmetry of the diagram. The specific capabilities of each CRF are not specified in the general reference model, this is done in the reference configuration for each group of connection types. The boundary of the CRF should not be associated with the boundary of an exchange as these may not correspond to each other.

Other functional groupings which are necessary for the complete description of the connection type reference configuration include line termination (LT), digital link, packet handling (PH) function and various functions associated with the signalling network.

3.5 *Reference points*

The other element involved in the description of a reference configuration is the reference point concept. The I-series already identifies reference points S and T (in Recommendation I.411) and K_X, M, N_X and P (in Recommendation I.324). As can be seen from Figure 3/I.325, some further internal reference points need to be identified. Further study is required to see whether these and any further reference points need to be defined.

In describing the reference configuration for the ISDN connection types, an important consideration vis-à-vis the reference points is the following. In Figure 3/I.325, and the following diagrams, the end points of the overall connection is shown as being at the T reference point. The reason for this is as follows. Reference point S is identical to reference point T when the NT2 function is null (cf Recommendation I.411). When the NT2 function is non-zero, then the performance of the overall connection will be made up of the performance of the ISDN network connection (i.e. between the two interfaces at reference point T) and the sum of the performance of the customer network connections (i.e. between the interfaces at reference points S and T at each end). Recommendation G.801 also uses this approach by defining the ends of the digital HRX as being at the T reference point.

4 Specific reference configurations

This general reference model needs now to be associated with specific connection types in order to develop specific reference configurations. However, Recommendation I.340 allows for so many variations in its different attributes, leading to a very large number of potential connection types, that is necessary to consider only certain dominant attributes in order to produce a shorter list of reference configurations. For an initial analysis, only the first two of the four dominant attributes listed in Recommendation I.340 need to be considered. Therefore the “information transfer mode” and “information transfer rate” will lead to three general classes of ISDN connection types, viz:

- circuit:
  - 64 kbit/s,
  - greater than 64 kbit/s (broadband);
- packet.

The other two dominant attributes (“information transfer” and “establishment of connection”) do not require separate reference configurations but will manifest themselves by different performance values.

This limited set of connection types is subsequently modelled in the associated reference configurations taking into account a limited number of frequently realized connection topologies.

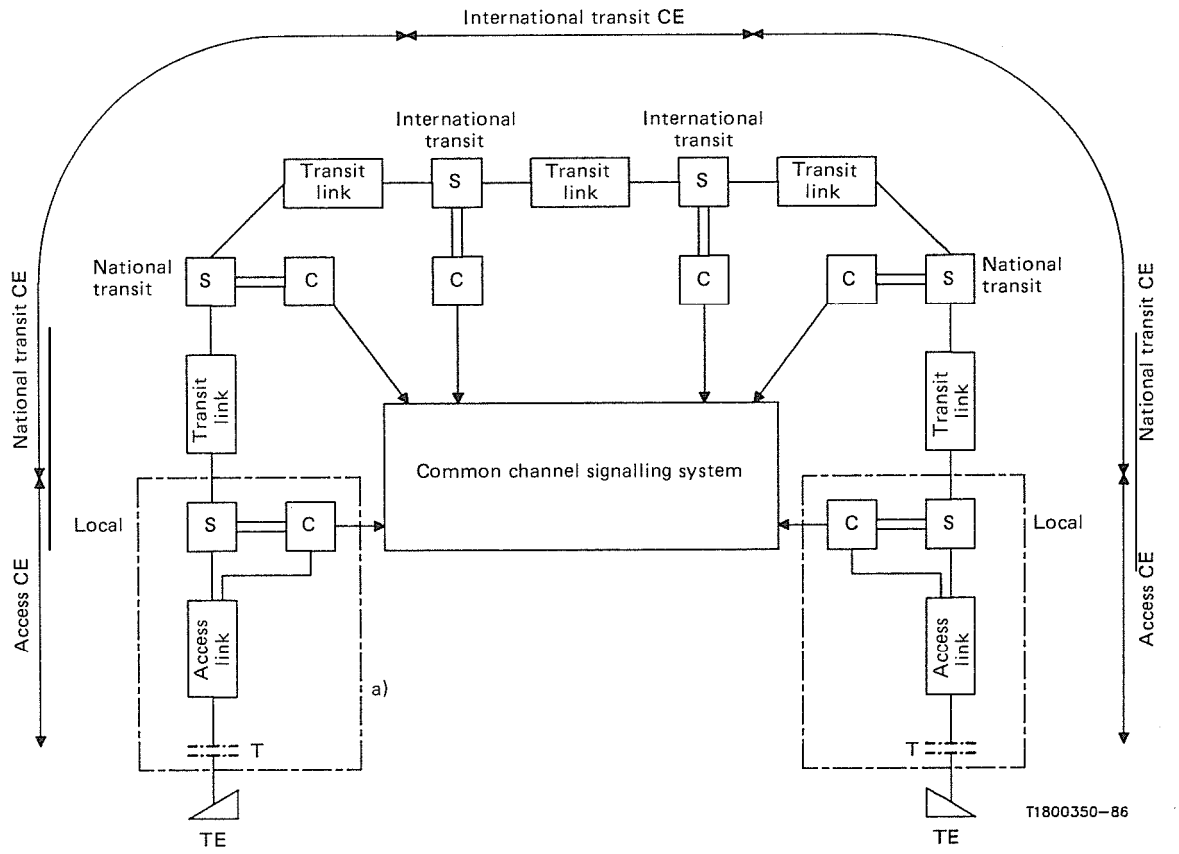
4.1 *64 kbit/s class*

This class includes connection types Al to Al2 of Table 2/I.340, i.e. unrestricted digital, speech and 3.1 kHz audio information transfer susceptances and switched semi-permanent and permanent establishments.

The variation of the information transfer capability is determined by the network performance parameter values allocated to each portion of the connection. For example, use of digital speech interpolation in the international connection element would restrict the connection type to speech or 3.1 kHz audio. Likewise, the differences between permanent connection types and switched connection types would manifest themselves in differences in the value of parameters such as connection establishment time, etc.

This approach means that there is a small number of reference configurations, but that all of the different connection types listed in Recommendation I.340 would need to be tabulated for the allocation of performance values.

Figure 4/I.325 shows the reference configuration that is proposed for this class of ISDN connection types.



S 64 kbit/s circuit switch function
C Signalling handling and exchange control functions

a) See Figure 1/Q.512.

FIGURE 4/I.325

Reference configuration – 64 kbit/s circuit group

4.2 *Packet class*

Recommendation X.31 illustrates the scenarios involved in providing packet switched capability in the ISDN. These are in fact reference configurations for the access connection element. The possible reference configurations for the B-channel access packet mode connection type class are shown in Figures 5/I.325 and 6/I.325.

It should be noted that the Recommendations in the X.130-series also use the concepts of national and international portions of the connection for the purposes of the allocation of the division of network performance parameter values. In those cases the boundary between the national and the international portions is in the middle of the International Data Switching Exchange (IDSE) [or International Switching Centre (ISC)]. Further study is required to see if this approach should be taken in the ISDN.

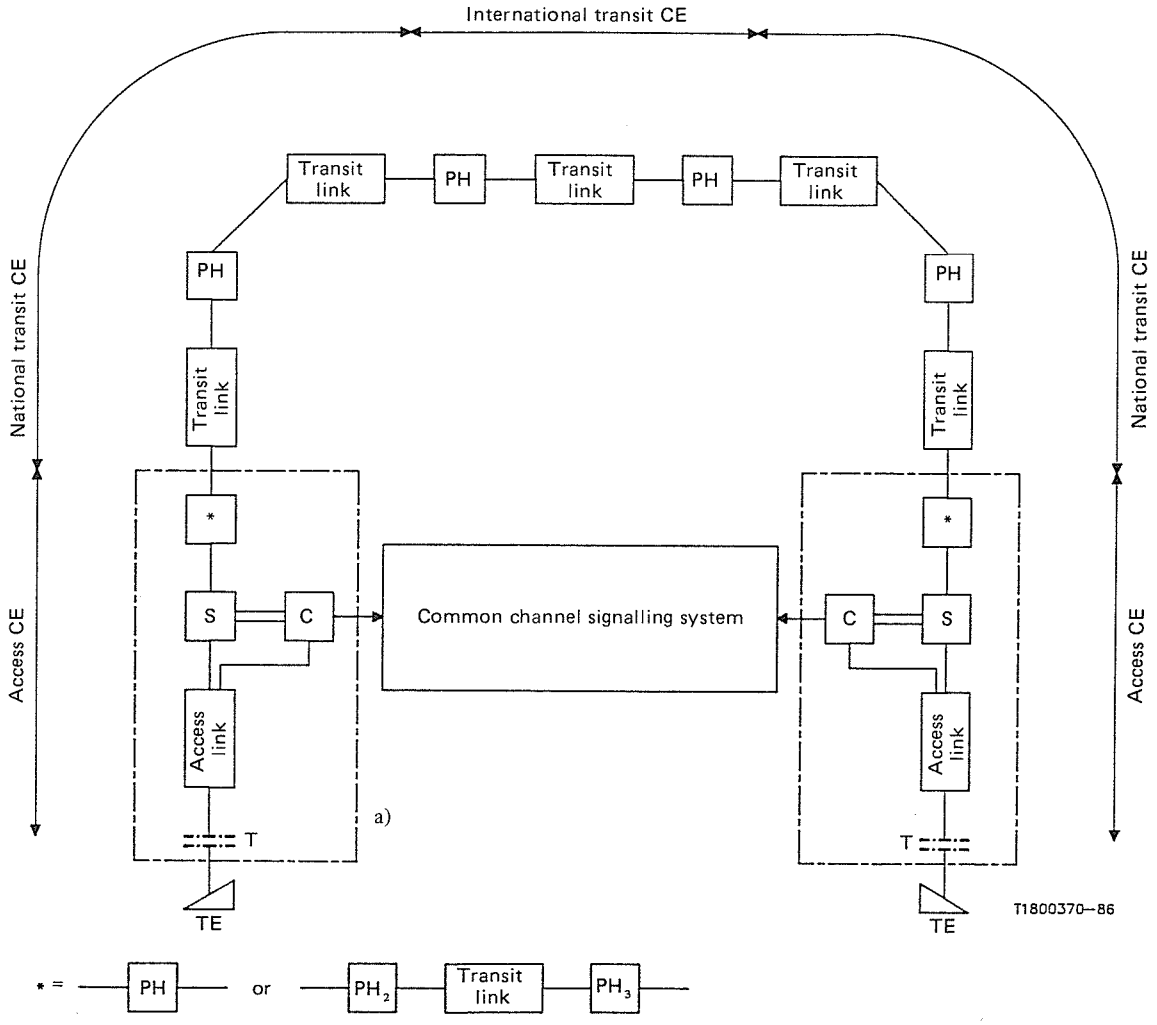


FIGURE 5/I.325

Reference configuration – packet group

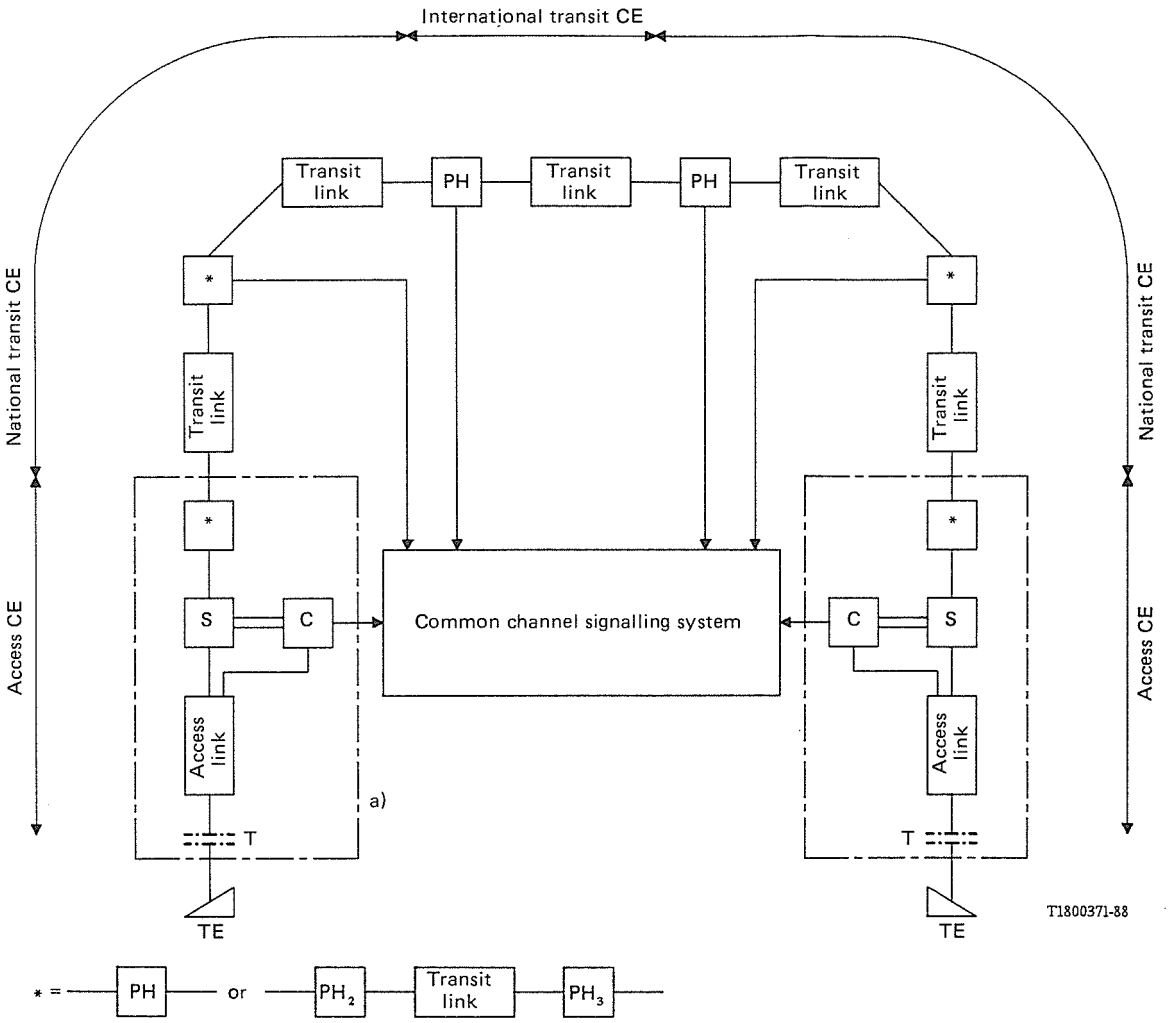


FIGURE 6/I.325

Reference configuration – packet group

4.3 *Broadband class*

Further study is required to determine what the salient features of this class of ISDN connection types are. According to Recommendation I.340 it would include permanent and semi-permanent connections at 384, 1536 or 1920 kbit/s.

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