



INTERNATIONAL TELECOMMUNICATION UNION

CCITT

I.324

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

**INTEGRATED SERVICES
DIGITAL NETWORK (ISDN)**

**OVERALL NETWORK ASPECTS
AND FUNCTIONS,
ISDN USER-NETWORK INTERFACES**

ISDN NETWORK ARCHITECTURE

Recommendation I.324



Geneva, 1991

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 I.324 was prepared by Study Group XVIII and was approved under the Resolution No. 2 procedure on the 25 of October 1991.

CCITT NOTES

- 1) In this Recommendation, the expression “Administration” is used for brevity 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 I.324

ISDN NETWORK ARCHITECTURE

(Melbourne, 1988; amended at Geneva, 1991)

1 General

1.1 Basic philosophy

The objective of this Recommendation is to provide a common understanding of the CCITT studies on the general architecture of an ISDN from the functional point of view. The model is not intended to require or exclude any specific implementation of an ISDN, but only to provide a guide for the specification of ISDN capabilities.

1.2 Definitions

A number of terms used in this Recommendation are described in more detail in other Recommendations. To assist the understanding of the reader, the following particular definitions apply in this Recommendation:

- 1) **reference configurations** are conceptual configurations which are useful in identifying various possible arrangements in an ISDN. The reference configurations are based on association rules of functional groupings and reference points. Detailed descriptions of reference configurations for ISDN connection types are given in other I-Series Recommendations. For user-to-network access they are defined in Recommendation I.411 and for interworking between networks they are defined in the I.500-Series of Recommendations.
- 2) **functional groupings** are sets of functions which may be needed in ISDN arrangements. The relationship between generic functions and specific functions allocated to particular entities (or functional groupings) in the ISDN are explained in Recommendation I.310.
- 3) **reference points** are the conceptual points at the conjunction of two functional groupings. In a particular example, a reference point may correspond to a physical interface between pieces of equipment, or in other examples, there may not be any physical interface corresponding to the reference point. Interfaces will not be defined by CCITT for an ISDN unless the corresponding reference points have been already specified.

2 General architecture of an ISDN

In practical ISDN implementations some of the ISDN functions will be implemented within the same network elements, whereas other specific ISDN functions will be dedicated to specialized network elements. Various different ISDN implementations are likely to be realized depending on national conditions.

A basic component of an ISDN is a network for circuit switching of end-to-end 64 kbit/s connections. In addition to this connection type, depending on national conditions and evolution strategies, the ISDN will or will not support other connection types, such as packet mode connection types and $n \times 64$ kbit/s circuit mode connection types, and other broadband connection types.

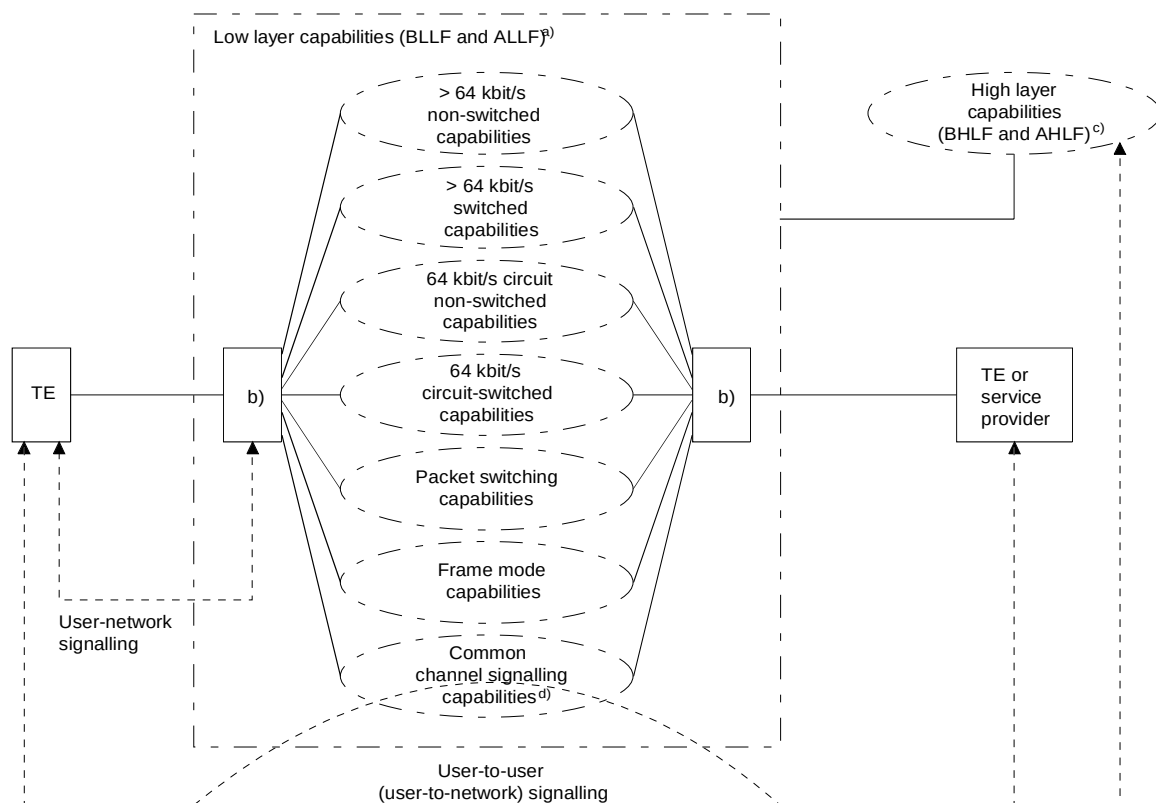
2.1 Basic architectural model

A basic architectural model of an ISDN is shown in Figure 1/I.324. This shows the eight main switching and signalling functional capabilities of an ISDN:

- ISDN local connection related functions (CRF), see § 4.2.2.1;
- 64 kbit/s circuit switched functional entities;
- 64 kbit/s circuit non-switched functional entities. (The identification and definition for 8, 16, 32 kbit/s switched or non-switched functional entities is left for further study.);
- packet switching functional entities;
- frame mode functional entities;
- common channel inter-exchange signalling functional entities, for example conforming to CCITT Signalling System No. 7;
- switched functional entities at rates greater than 64 kbit/s;
- non-switched functional entities at rates greater than 64 kbit/s.

These components need not be provided by distinct networks, but may be combined as appropriate for a particular implementation.

High layer functions (HLF) which may be implemented within (or associated with) an ISDN may be accessed by means of any of the above-mentioned functional entities. Those functional entities could be implemented totally within an ISDN or be provided by dedicated networks or specialized service providers. Both cases may provide the same ISDN teleservices (see Recommendation I.210) from the user's point of view.



TE Terminal equipment
 BLLF Basic low layer functions
 ALLF Additional low layer functions
 BHLF Basic high layer functions
 AHLF Additional high layer functions

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- In certain national situations, ALLF may also be implemented outside the ISDN, in special nodes or in certain categories of terminals.
- The ISDN local functional capabilities correspond to functions provided by a local exchange and possibly including other equipment, such as electronic cross connect equipment, muldexes, etc.
- These functions may either be implemented within ISDN or be provided by separate networks. Possible applications for basic high layer functions and for additional high layer functions are contained in Recommendation I.210.
- For signalling between international ISDNs, CCITT Signalling System No. 7 shall be used.

FIGURE 1/I.324

Basic architectural model of an ISDN

2.2 Architectural components of the ISDN

Recommendation I.310 describes the functions of an ISDN. These functions are by their nature static (i.e. time-independent). The relative distribution and allocation of these functions is the subject of the architecture of the ISDN and is described in this Recommendation. The dynamic aspects of these functions are modelled in Recommendation I.310 as executive processes.

Therefore the key components in this architectural model are: what functions are contained in the ISDN, where they are located, and what is the relative topology for their distribution in the ISDN.

3 Aspects of the architecture of the ISDN

The architecture of the ISDN includes low layer capabilities and high layer capabilities. These capabilities support services both within the ISDN and via interworking (see § 5) to other networks.

3.1 Low layer capabilities

From the main functional capabilities of the ISDN, as shown in Figure 1/I.324, four main functional capabilities require further description.

3.1.1 Circuit switching capabilities

Circuit-switched connections with information transfer rates up to 64 kbit/s are carried by B-channels at the ISDN user-network interfaces and switched at 64 kbit/s by the circuit-switching functional entities of the ISDN. Circuit switching can also be applied to information transfer rates greater than 64 kbit/s.

Signalling associated with circuit switched connections is carried by the D-channel at the ISDN user-network interface and processed by the local CRF (see § 4.2.2.1). User-to-user signalling could be carried through the common channel signalling functional entities (in the transit connection elements).

User bit rates of less than 64 kbit/s are rate adapted to 64 kbit/s, as described in Recommendation I.460, before any switching can take place in the ISDN. Multiple information streams from a given user may be multiplexed together in the same B-channel, but for circuit switching an entire B-channel will be switched to a single user-network interface. This multiplexing should be in accordance with Recommendation I.460. Furthermore, circuit switched data services with bit rates less than 64 kbit/s (in accordance with Recommendation X.1 user classes of service) may be handled by a dedicated circuit switched public data network to which the user gains access by means of an ISDN connection.

Circuit switching capabilities are based on 64 kbit/s switching. Connection types at higher bit rates could also be provided on a semi-permanent basis. Switched connections at these bit rates could also be provided by broadband switching functional entities.

3.1.2 Packet switching capabilities

A number of packet mode bearer services are described in the I.230-Series of Recommendations. Different network solutions and corresponding architectures may be adopted in different countries to support these services.