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**DIGITAL SUBSCRIBER SIGNALLING
SYSTEM No. 1 (DSS1)**

**DIGITAL SUBSCRIBER SIGNALLING
SYSTEM No. 1 (DSS1) – ISDN
USER-NETWORK INTERFACE DATA
LINK LAYER – GENERAL ASPECTS**

ITU-T Recommendation Q.920

(Previously “CCITT Recommendation”)

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T 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 World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation Q.920 was revised by the ITU-T Study Group XI (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

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 Q.920

DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1 (DSS1) ISDN USER-NETWORK INTERFACE DATA LINK LAYER – GENERAL ASPECTS

(Málaga-Torremolinos, 1984; modified at Helsinki, 1993)

1 General

NOTE – This Recommendation was originally written to describe the general aspects of the protocol and procedures specified in Recommendation Q.921 [1]. With the introduction of Recommendation Q.922 [2], it is necessary for Q.920 to evolve to a general introduction to the data link layer protocols and procedures specified in the Q.920-Series of Recommendations. It is for further study to place into proper perspective those aspects of Q.920 which apply uniquely to Q.921 in the current text.

This Recommendation describes in general terms the link access procedure on the D-channel, LAPD. The application of this protocol to other channel types is for further study. Details are provided in Recommendation Q.921 [1].

The purpose of LAPD is to convey information between layer 3 entities across the ISDN user-network interface using the D-channel.

The definition of LAPD takes into consideration the principles and terminology of:

- Recommendations X.200 [3] and X.210 [4] – Reference model and layer service conventions for Open Systems Interconnection (OSI);
- Recommendation X.25 [5] – LAPB user-network interface for packet mode terminals; and
- ISO 3309 [6] and ISO 4335 [7] – High-level Data Link Control (HDLC) standards for frame structure and elements of procedures.

In order that LAPD can be applicable for communication in a direct user-to-user situation (e.g. PBX-to-PBX communication over a leased circuit), or in a mixed public/private network situation, the user side and network side must be designated to the adjacent data link entities. In a direct user-to-user situation, a static assignment (outside of the LAPD protocol) may be used to establish the user-network relationship. In a mixed public/private network situation, the public network assumes the network side, and the private network assumes the user side.

LAPD is a protocol that operates at the data link layer of the OSI architecture. The relationship between the data link layer and other protocol layers is defined in Recommendation I.320 [8].

NOTES

1 The physical layer is currently defined in Recommendations I.430 [9] and I.431 [10] and layer 3 is defined in Recommendations Q.930 [11], Q.931 [12] and X.25 [5]. References should be made to these Recommendations for the complete definition of the protocols and procedures across the ISDN user-network interface.

2 The term “data link layer” is used in the main text of this Recommendation. However, mainly in figures and tables, the terms “layer 2” and “L2” are used as abbreviations. Furthermore, in accordance with Recommendations Q.930 [11] and Q.931 [12], the term “layer 3” is used to indicate the layer above the data link layer.

LAPD is independent of transmission bit rate. It requires a duplex, bit transparent D-channel.

The characteristics of the D-channel are defined in Recommendation I.412 [13].

Clause 2 describes basic concepts used in this Recommendation and Recommendation Q.921.

Clause 3 gives an overview description of LAPD functions and procedures.

Clause 4 summarizes the services that the data link layer provides to layer 3 and the services that the data link layer requires from the physical layer.

Clause 5 provides an overview of the data link layer structure.

2 Concepts and terminology

The basic structuring technique in the OSI reference model is layering. According to this technique, communication among application processes is viewed as being logically partitioned into an ordered set of layers represented in a vertical sequence as shown in Figure 1.

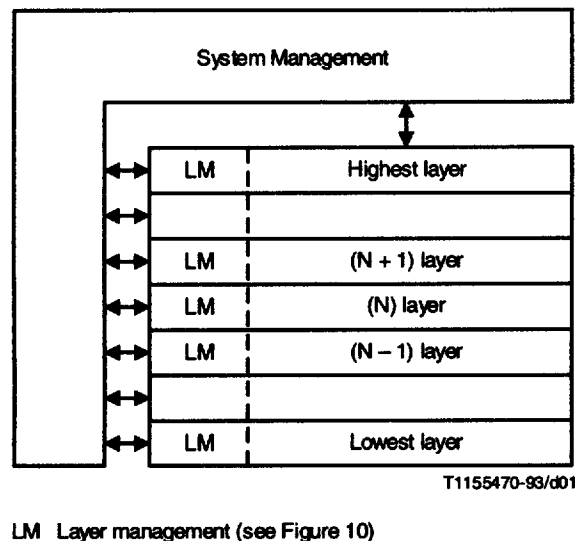


FIGURE 1/Q.920
Layering

A data link layer service access point (SAP) is the point at which the data link layer provides services to layer 3. Associated with each data link layer SAP is one or more data link connection endpoint(s). See Figure 2. A data link connection endpoint is identified by a data link connection endpoint identifier as seen from layer 3 and by a data link connection identifier (DLCI) as seen from the data link layer.

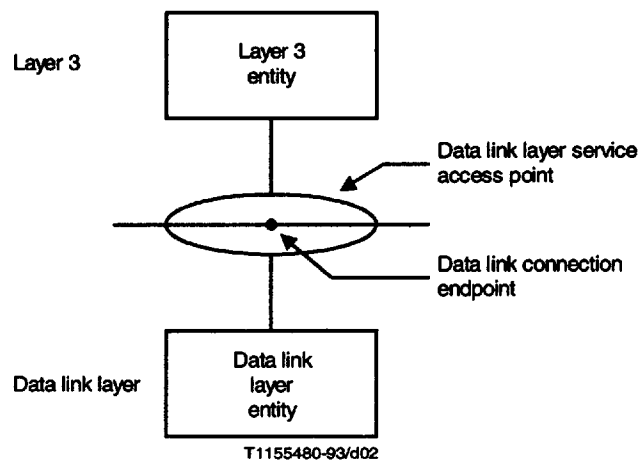


FIGURE 2/Q.920
Entities, service access points and endpoints

Entities exist in each layer. Entities in the same layer, but in different systems which must exchange information to achieve a common objective are called "peer entities". Entities in adjacent layers interact through their common boundary. The services provided by the data link layer are the combination of the services and functions provided by both the data link layer and the physical layer.

Cooperation between data link layer entities is governed by a peer-to-peer protocol specific to the layer. In order for information to be exchanged between two or more layer 3 entities, an association must be established between the layer 3 entities in the data link layer using a data link layer protocol. This association is called a data link connection. Data link connections are provided by the data link layer between two or more SAPs (see Figure 3).

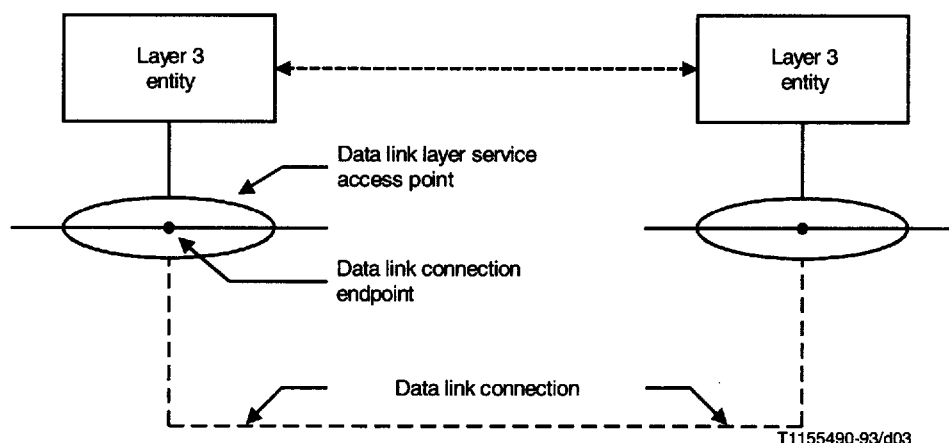


FIGURE 3/Q.920
Peer-to-peer relationship

Data link layer protocol-data-units (PDUs) are conveyed between data link layer entities by means of a physical connection, making use of physical service-data-units (SDUs).

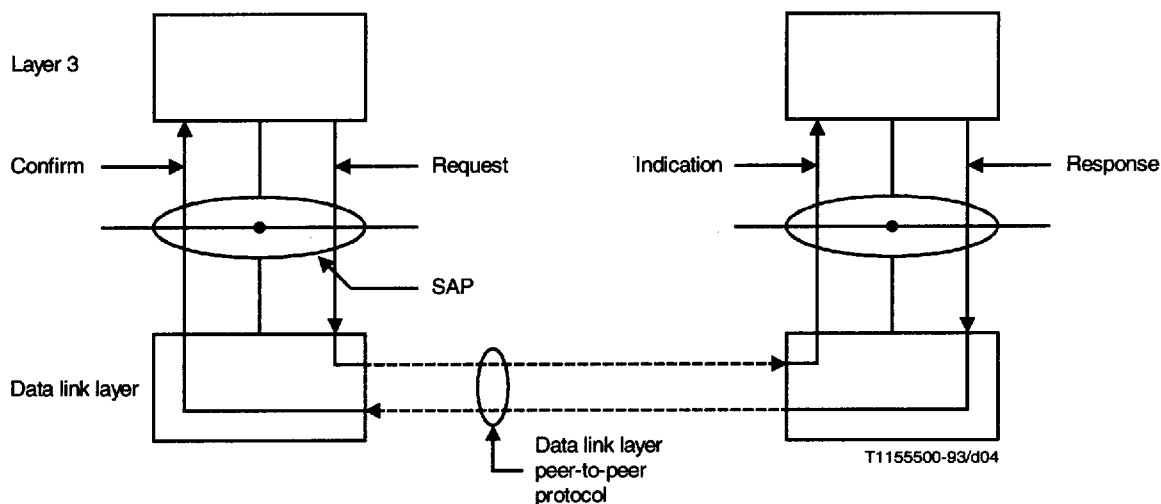
Layer 3 requests services from the data link layer via service primitives. The same applies for the interaction between the data link layer and the physical layer. The primitives represent, in an abstract way, the logical exchange of information and control between the data link layer and adjacent layers. They do not specify or constrain implementation.

The primitives that are exchanged between the data link layer and adjacent layers are of the following four types (see also Figure 4):

- a) request;
- b) indication;
- c) response; and
- d) confirm.

The request primitive type is used when a higher layer is requesting a service from the next lower layer.

The indication primitive type is used by a layer providing a service to notify the next higher layer of any specific activity which is service related. The indication primitive may be the result of an activity of the lower layer related to the primitive type request at the peer entity.



NOTE – The same principle applies for data link layer-physical interactions.

FIGURE 4/Q.920
Primitive action sequence

The response primitive type is used by a layer to acknowledge receipt, from a lower layer, of the primitive type indication.

The confirm primitive type is used by the layer providing the requested service to confirm that the activity has been completed.

Layer-to-layer interactions are specified in Recommendation Q.921 [1].

Information is transferred, in various types of data units, between peer entities and between entities in adjacent layers that are attached to a specific SAP, see 5.6/X.200 [3]. The data units are of two types:

- protocol-data-units (PDUs) of a peer-to-peer protocol; and
- interface-data-units (IDUs). These may contain information relevant to the peer entities at the ends of the connection or information of local significance such as layer-to-layer information concerning status and specialized service requests.

The PDUs of the layer 3 peer-to-peer protocol are carried by the data link connection in the form of service data units (SDUs). The contents of IDUs containing layer-to-layer information concerning status and specialized service requests, which are of local significance, are never conveyed over a data link connection or a physical connection.

This Recommendation specifies (see also Figure 5):

- a) the peer-to-peer protocol for the transfer of information and control between any pair of data link layer service access points; and
- b) the interactions between the data link layer and layer 3, and between the data link layer and the physical layer.