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Data Link (DL) Layer;  
General aspects  
(3GPP TS 44.005 version 13.0.0 Release 13)**



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## Foreword

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# 1 Scope

The present document describes in general terms the Link Access Procedures on the Dm channel, LAPDm. The application of this protocol to other channel types is for further study. Details are provided in 3GPP TS 44.006.

The purpose of LAPDm is to convey information between layer 3 entities across the GSM PLMN radio interface (MS to network interface) using the Dm channel.

NOTE 1: The term Dm channel is used for convenience to designate the collection of all the various signalling channels required in the GSM system. See also 3GPP TS 44.003.

The definition of LAPDm is based on the principles and terminology of:

- ITU-T Recommendations X.200 and X.210: the reference model for Open Systems Interconnection (OSI);
- ITU-T Recommendations Q.920 and Q.921: the specification of LAPD for the user-network interface in ISDN;
- ITU-T Recommendation X.25 LAPB: user-network interface for packet mode terminals; and
- ISO/IEC 3309 and ISO 4335: High-level Data Link Control (HDLC) standards for frame structure and elements of procedures.

LAPDm 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 below.

NOTE 2: The interface between the mobile station and external terminal equipment/terminal adapters is defined in the Technical Specifications of the GSM 07-series.

NOTE 3: The physical layer on the radio interface is defined in 3GPP TS 44.004 and layer 3 is defined in 3GPP TS 24.007, 3GPP TS 44.018, 3GPP TS 24.010 and 3GPP TS 24.011. Reference should be made to these Technical Specifications for the complete definitions of the protocols and procedures across the GSM PLMN radio interface.

NOTE 4: The term "data link layer" is used in the main text of the present document. However, mainly in figures and tables, the terms "layer 2" and "L2" are used abbreviations. Furthermore, in accordance with 3GPP TS 24.007 and 3GPP TS 44.018 the term "layer 3" is used to indicate the layer above the data link layer.

LAPDm is independent of the transmission bit rate. It requires physical channels with characteristics as defined in 3GPP TS 44.003.

Clause 2 below describes basic concepts used in the present document and 3GPP TS 44.006.

Clause 3 gives an overview description of LAPDm 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 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 44.001: "Mobile Station - Base Station System (MS - BSS) Interface General Aspects and Principles".
- [3] 3GPP TS 44.003: "Mobile Station - Base Station System (MS - BSS) Interface Channel Structures and Access Capabilities".
- [4] 3GPP TS 44.004: "Layer 1; General requirements".
- [5] 3GPP TS 44.006: "Mobile Station - Base Station System (MS - BSS) interface Data Link (DL) layer specification".
- [6] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".
- [7] 3GPP TS 44.018: "Mobile radio interface layer 3 specification; Radio Resource Control Protocol".
- [8] 3GPP TS 24.010: "Mobile radio interface layer 3; Supplementary services specification; General aspects".
- [9] 3GPP TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".
- [10] (void).
- [11] (void).
- [12] (void).
- [13] (void).
- [14] (void).
- [15] ITU-T Recommendation X.25: "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".
- [16] ITU-T Recommendation X.200: "Information technology - Open Systems Interconnection - Basic Reference Model: The basic model".
- [17] ITU-T Recommendation X.210: "Information technology - Open systems interconnection - Basic Reference Model: Conventions for the definition of OSI services".
- [18] ITU-T Recommendation Q.920: "ISDN user-network interface data link layer - General aspects".
- [19] ITU-T Recommendation Q.921: "ISDN user-network interface - Data link layer specification".
- [20] ISO/IEC 3309: "Information technology - Telecommunications and information exchange between systems - High-level Data Link Control (HDLC) procedures - Frame structure".
- [21] ISO/IEC 4335: "Information technology - Telecommunications and information exchange between systems - High-level Data Link Control (HDLC) procedures - Elements of procedures".

## 2a Concepts and terminology

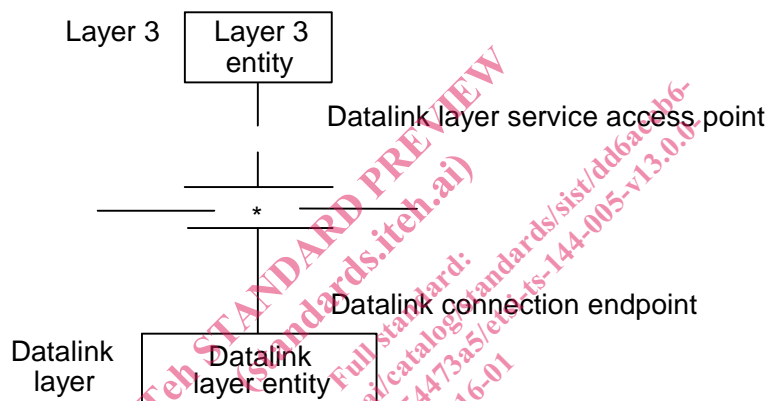
The general layering principles used in the present document and other specifications in the 44 series are given in 3GPP TS 44.001.

The data link layer is the next to lowest layer of the OSI reference model. The data link layer receives services from the physical layer and provides services to layer 3.

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.

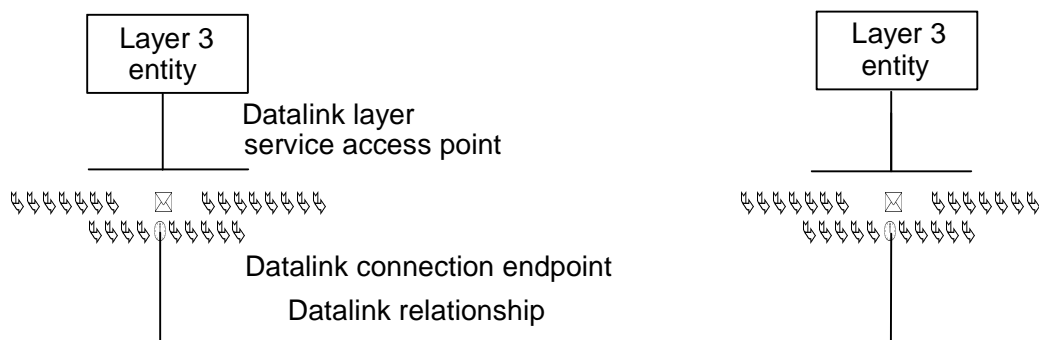
A data link layer Service Access Point (SAP) is the point at which the data link layer provides services to layer 3. The Service Access Point is identified by a Service Access Point Identifier (SAPI). One or more data link connection endpoints can be associated with each data link layer SAP. See figure 1. 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).

SAPIs and DLCIs used by LAPDm are defined in subclause 5.2.



**Figure 1: Entities, service access points and endpoints**

Co-operation between data link layer entities is governed by a peer-to-peer protocol specific to the layer. For information exchange 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 2).



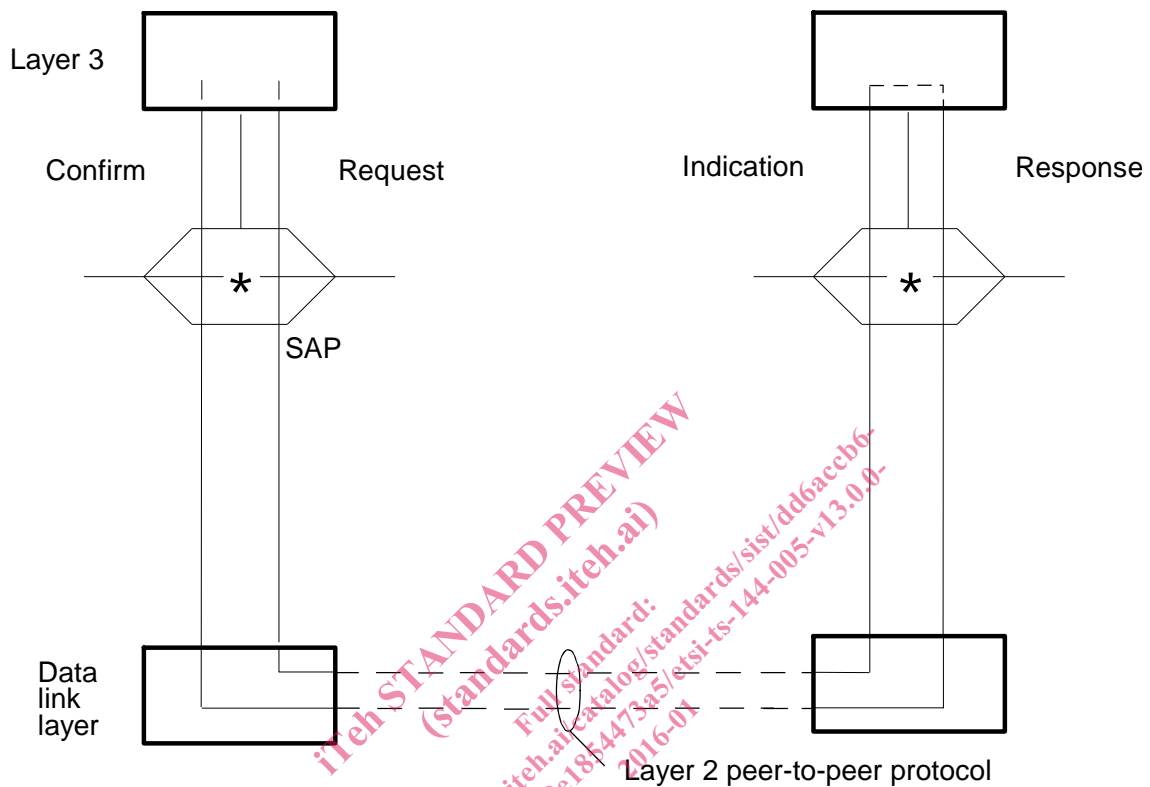
**Figure 2: Peer-to-peer relationship**

Data link layer message units are conveyed between data link layer entities by means of physical connection.



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 its adjacent layers. They do not specify or constrain implementations.

The primitives that are exchanged between the data link layer and adjacent layers are of the following four types (see also figure 3).



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

**Figure 3: Primitive action sequence**

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 activities related to the primitive type REQUEST.

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.

The precise specification of Layer-to-layer interactions is given in 3GPP TS 44.006.

Information between peer entities and between entities in adjacent layers attached to the same SAP is transferred in two different types of message units:

- message units of a peer-to-peer protocol; and
- message units that contain layer-to-layer information concerning status and specialized service requests.

The message units of the layer 3 peer-to-peer protocol are carried by the data link connection. The message units containing layer-to-layer information concerning status and specialized service requests are never conveyed over a data link connection or a physical connection.

The present document introduces (see also figure 4):

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

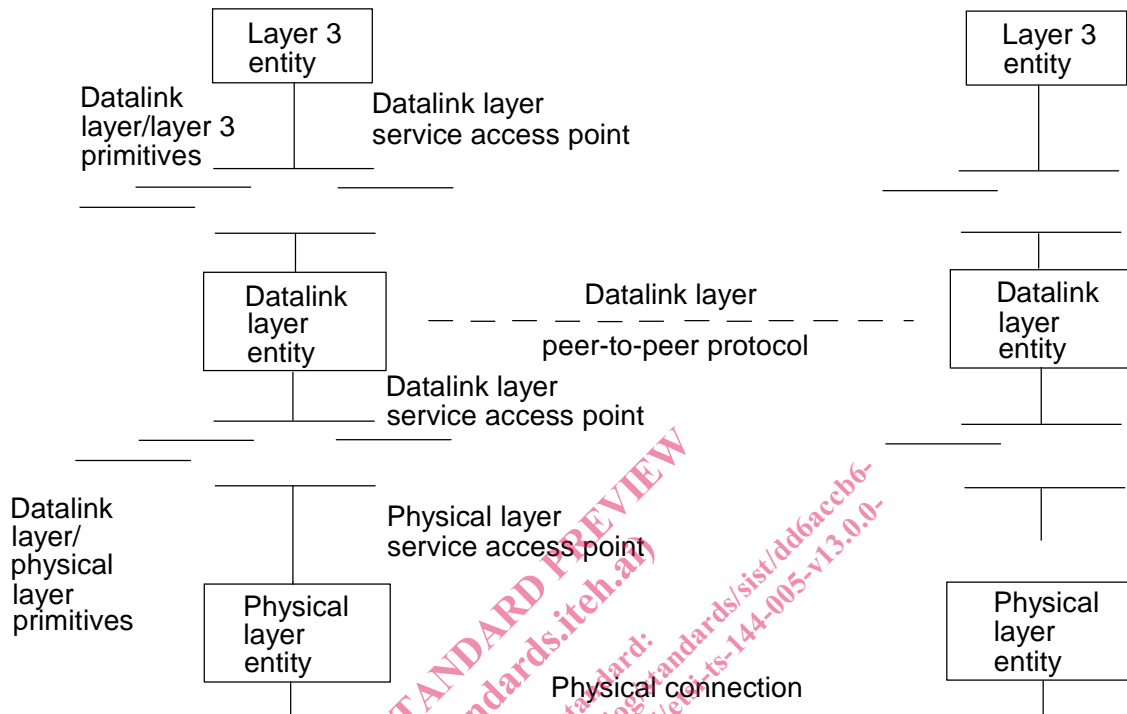


Figure 4: Data link layer reference model

## 3 Overview description of LAPDm functions and procedures

### 3.1 General

The purpose of LAPDm is to convey information between layer 3 entities across the GSM PLMN radio interface using the Dm channel. Specifically LAPDm will support:

- multiple layer 3 entities;
- multiple physical layer entities;
- broadcast control channel (BCCH) signalling;
- paging channel (PCH) signalling;
- access grant channel (AGCH) signalling;
- dedicated control channel (DCCH) signalling.

NOTE 1: The term "DCCH" designates a number of control channels (SDCCH, FACCH and SACCH) as defined in 3GPP TS 44.003.

NOTE 2: The random access channel (RACH) does not utilise LAPDm. However, for the purpose of specification, the data link layer acts as a protocol interface between layer 3 and the physical layer also for random access.