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Digital cellular telecommunications system (Phase 2+) (GSM); Data Link (DL) layer;
General aspects (GSM 04.05 version 8.0.1 Release 1999)

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European Standard (Telecommunications series)

**Digital cellular telecommunications system (Phase 2+);
Data Link (DL) layer;
General aspects
(GSM 04.05 version 8.0.1 Release 1999)**

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Special Mobile Group (SMG).

The present document defines in general terms the data link layer (layer 2) of the Mobile Station (MS) - network interface within the digital cellular telecommunications system.

The ETS from which the present document has evolved is Phase 2 GSM ETS 300 554 (GSM 04.05 version 4.0.3).

The contents of the present document is subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of the present document, it will be re-released with an identifying change of release date and an increase in version number as follows:

Version 8.x.y

where:

- 8 indicates Release 1999 of GSM Phase 2+.
- x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- y the third digit is incremented when editorial only changes have been incorporated in the specification.

The specification from which the present document has been derived was originally based on CEPT documentation, hence the presentation of the present document may not be entirely in accordance with the ETSI drafting rules.

National transposition dates

Date of adoption of this EN:	18 August 2000
Date of latest announcement of this EN (doa):	30 November 2000
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 May 2001
Date of withdrawal of any conflicting National Standard (dow):	31 May 2001

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 GSM 04.06.

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 GSM 04.03.

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

- CCITT Recommendations X.200 and X.210: the reference model for Open Systems Interconnection (OSI);
- CCITT Recommendations Q.920 and Q.921: the specification of LAPD for the user-network interface in ISDN;
- CCITT Recommendation X.25 LAPB: user-network interface for packet mode terminals; and
- ISO 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 GSM 04.04 and layer 3 is defined in GSM 04.07, 04.08, 04.10 and 04.11. 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 GSM 04.07 and 04.08 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 GSM 04.03.

Section 2 below describes basic concepts used in the present document and GSM 04.06.

Section 3 gives an overview description of LAPDm functions and procedures.

Section 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.

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

1.1 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1999 document, references to GSM documents are for Release 1999 versions (version 8.x.y).

- [1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".
- [2] GSM 04.01: "Digital cellular telecommunications system; Mobile Station - Base Station System (MS - BSS) interface General aspects and principles".
- [3] GSM 04.03: "Digital cellular telecommunications system (Phase 2+); Mobile Station - Base Station System (MS - BSS) interface Channel structures and access capabilities".
- [4] GSM 04.04: "Digital cellular telecommunications system; Layer 1 General requirements".
- [5] GSM 04.06: "Digital cellular telecommunications system; Mobile Station - Base Station System (MS - BSS) interface Data Link (DL) layer specification".
- [6] GSM 04.07: "Digital cellular telecommunications system (Phase 2); Mobile radio interface signalling layer 3 General aspects".
- [7] GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".
- [8] GSM 04.10: "Digital cellular telecommunications system; Mobile radio interface layer 3 Supplementary services specification General aspects".
- [9] GSM 04.11: "Digital cellular telecommunications system (Phase 2+); Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".
- [10] GSM 07.01: "Digital cellular telecommunications system (Phase 2+); General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".
- [11] GSM 07.02: "Digital cellular telecommunications system (Phase 2+); Terminal Adaptation Functions (TAF) for services using asynchronous bearer capabilities".
- [12] GSM 07.03: "Digital cellular telecommunications system (Phase 2+); Terminal Adaptation Functions (TAF) for services using synchronous bearer capabilities".
- [13] GSM 07.05: "Digital cellular telecommunications system (Phase 2+); Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)".
- [14] GSM 07.06: "Digital cellular telecommunications system (Phase 2); Use of the V series Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface at the Mobile Station (MS) for Mobile Termination (MT) configuration".
- [15] CCITT 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] CCITT Recommendation X.200: "Reference Model of Open Systems Interconnection for CCITT Applications".
- [17] CCITT Recommendation X.210: "Open Systems Interconnection layer service definition conventions".
- [18] CCITT Recommendation Q.920: "Integrated services digital network (ISDN) user-network interface - Data link layer General aspects".
- [19] CCITT Recommendation Q.921: "Integrated services digital network (ISDN) user-network interface - Data link layer specification".
- [20] ISO 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".

1.2 Abbreviations

Abbreviations used in the present document are listed in GSM 01.04.

2 Concepts and terminology

The general layering principles used in the present document and other specifications in the 04 series are given in GSM 04.01.

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 section 5.2.

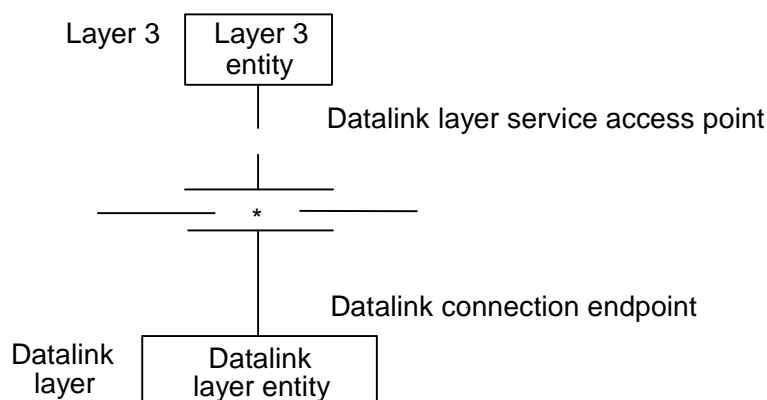


Figure 1: Entities, service access points and endpoints

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).

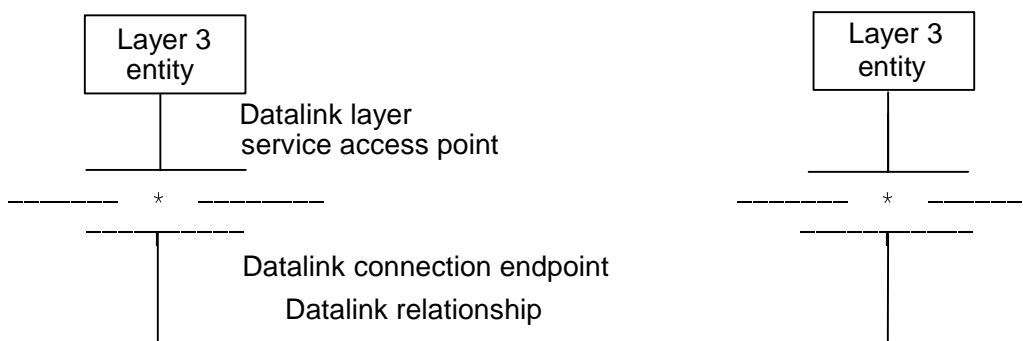
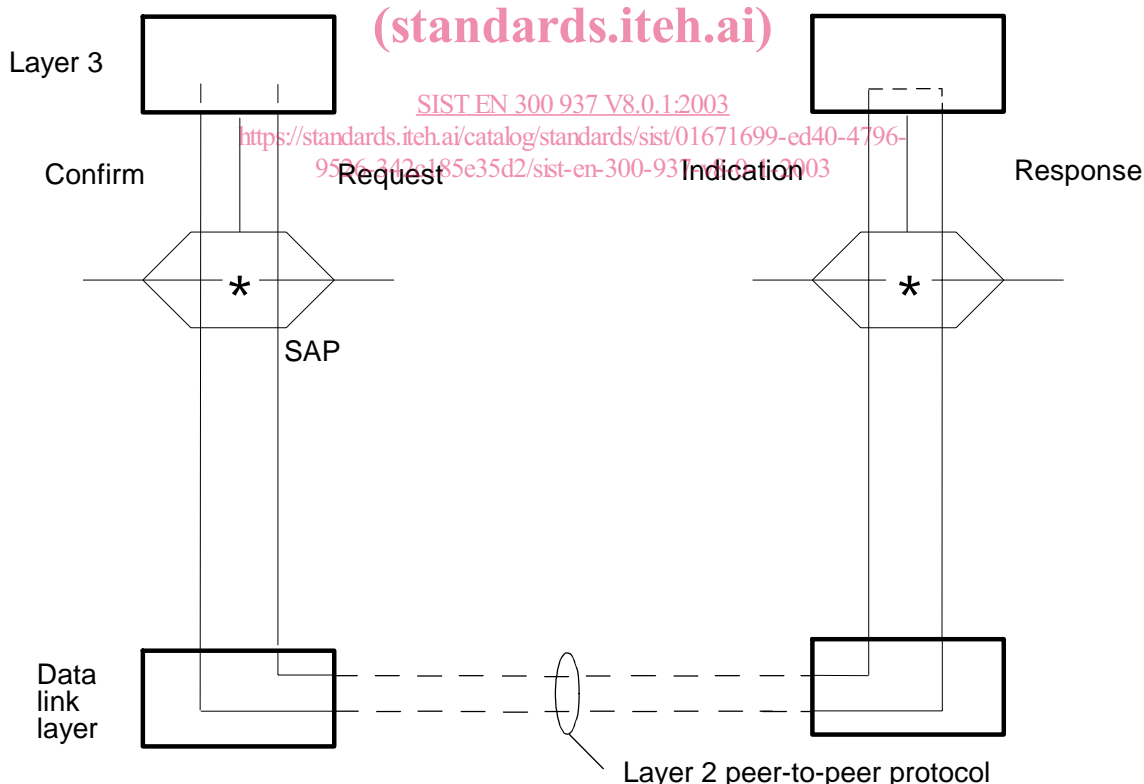


Figure 2: Peer-to-peer relationship

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 GSM 04.06.

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.

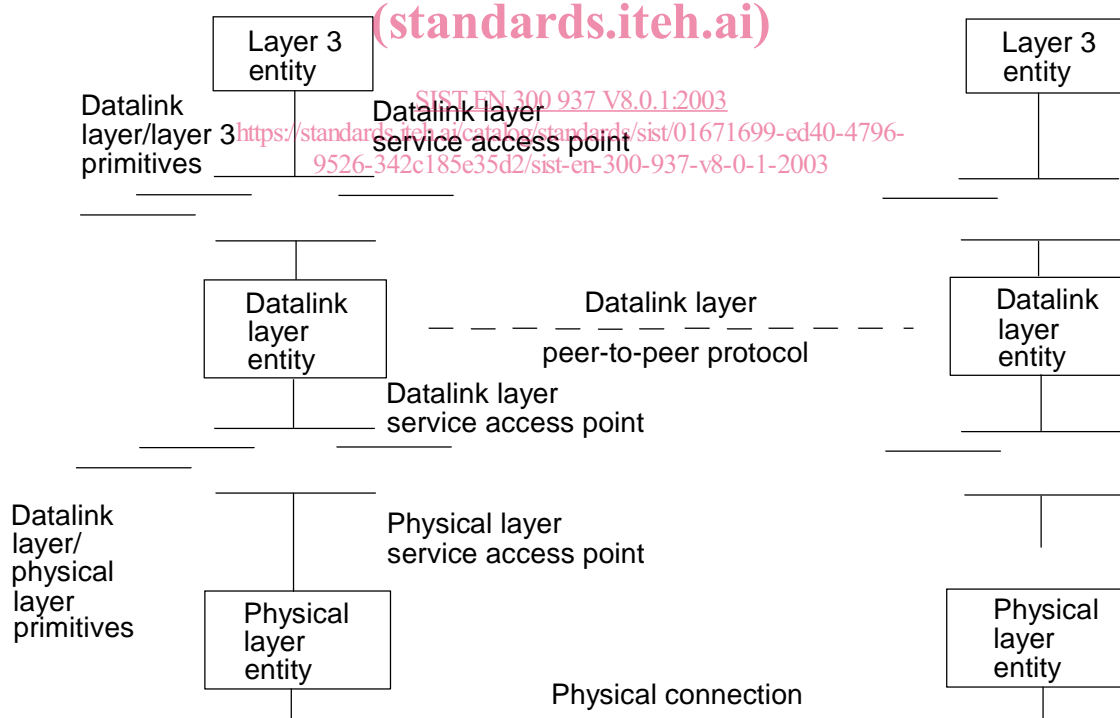


Figure 4: Data link layer reference model