Information technology —
Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements —

Part 2:
Logical link control

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseaux locaux et métropolitains — Exigences spécifiques —

Partie 2: Contrôle de liaison logique
Abstract: This standard is part of a family of standards for local area networks (LANs) and metropolitan area networks (MANs) that deals with the physical and data link layers as defined by the ISO Open Systems Interconnection Basic Reference Model. The functions, features, protocol, and services of the Logical Link Control (LLC) sublayer, which constitutes the top sublayer in the data link layer of the ISO/IEC 8802 LAN protocol, are described. The services required of, or by, the LLC sublayer at the logical interfaces with the network layer, the medium access control (MAC) sublayer, and the LLC sublayer management function are specified. The protocol data unit (PDU) structure for data communication systems is defined using bit-oriented procedures, as are three types of operation for data communication between service access points. In the first type of operation, PDUs are exchanged between LLCs without the need for the establishment of a data link connection. In the second type of operation, a data link connection is established between two LLCs prior to any exchange of information-bearing PDUs. In the third type of operation, PDUs are exchanged between LLCs without the need for the establishment of a data link connection, but stations are permitted to both send data and request the return of data simultaneously.

Keywords: local area networks, protocols; logical link control
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Specific requirements—

Part 2: Logical Link Control

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LAN MAN Standards Committee of the IEEE Computer Society

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International Standard ISO/IEC 8802-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, Information technology, Subcommittee SC 6, Telecommunications and information exchange between systems.

This third edition cancels and replaces the second edition (ISO/IEC 8802-2:1994), which has been technically revised. It also incorporates Amendment 3:1995.

ISO/IEC 8802 consists of the following parts, under the general title Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements:

— Part 1: Overview of Local Area Network Standards
— Part 2: Logical link control
— Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications
— Part 4: Token-passing bus access method and physical layer specifications
— Part 5: Token ring access method and physical layer specifications
— Part 6: Distributed Queue Dual Bus (DQDB) access method and physical layer specifications
— Part 9: Integrated Services (IS) LAN Interface at the Medium Access Control (MAC) and Physical (PHY) Layers
  Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications
— Part 12: Demand-priority access method, physical layer and repeater specifications

Annexes A and E form an integral part of this part of ISO/IEC 8802. Annexes B to D are for information only.

This International Standard is part of a family of International Standards for Local and Metropolitan Area Networks. The relationship between this International Standard and the other members of the family is shown below. (The numbers in the figure refer to ISO/IEC Standard numbers.)

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This family of International Standards deals with the Physical and Data Link layers as defined by the ISO/IEC Open Systems Interconnection (OSI) Basic Reference Model (ISO/IEC 7498-1 : 1994). The access standards define seven types of medium access technologies and associated physical media, each appropriate for particular applications or system objectives. Other types are under investigation.

The International Standards defining the access technologies are as follows:

a) ISO/IEC 8802-3, utilizing carrier sense multiple access with collision detection (CSMA/CD) as the access method.
b) ISO/IEC 8802-4, utilizing token passing bus as the access method.
c) ISO/IEC 8802-5, utilizing token passing ring as the access method.
d) ISO/IEC 8802-6, utilizing distributed queuing dual bus as the access method.
e) ISO/IEC 8802 9, a unified access method offering integrated services for backbone networks.
f) ISO/IEC DIS 8802-11, a wireless LAN utilizing carrier sense multiple access with collision avoidance (CSMA/CA) as the access method.
g) ISO/IEC DIS 8802-12, utilizing Demand Priority as the access method.


ISO/IEC 8802-2, Logical Link Control, is used in conjunction with the medium access standards to provide the data link layer service to network layer protocols.

ISO/IEC 15802-1, Medium Access Control (MAC) service definition, specifies the characteristics of the common MAC Service provided by all IEEE 802 LAN MACs. The service is defined in terms of primitives that can be passed between peer service users, their parameters, their interrelationship and valid sequences, and the associated events of the service.

ISO/IEC 15802-2, LAN/MAN Management, defines an OSI management-compatible architecture, and services and protocol elements for use in a LAN/MAN environment for performing remote management.

ISO/IEC 10038, Media Access Control (MAC) bridges, specifies an architecture and protocol for the interconnection of IEEE 802 LANs below the level of the logical link control protocol (to be renumbered 15802-3).

ISO/IEC 15802-4, System Load Protocol, specifies a set of services and protocol for those aspects of management concerned with the loading of systems on IEEE 802 LANs.

ISO/IEC 15802-5, Remote Media Access Control (MAC) bridging, specifies extensions for the interconnection, using non-LAN communication technologies, of geographically separated IEEE 802 LANs below the level of the logical link control protocol.

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(This introduction is not a part of ANSI/IEEE Std 802.2, 1998 Edition or of ISO/IEC 8802-2 : 1998.)

This standard is part of a family of standards for local and metropolitan area networks. The relationship between the standard and other members of the family is shown below. (The numbers in the figure refer to IEEE standard numbers.)

This family of standards deals with the Physical and Data Link layers as defined by the International Organization for Standardization (ISO) Open Systems Interconnection (OSI) Basic Reference Model (ISO/IEC 7498-1 : 1994). The access standards define seven types of medium access technologies and associated physical media, each appropriate for particular applications or system objectives. Other types are under investigation.

The standards defining the technologies noted above are as follows:

- IEEE Std 802  
  **Overview and Architecture.** This standard provides an overview to the family of IEEE 802 Standards.

- ANSI/IEEE Std 802.1R and 802.1k  
  **LAN/MAN Management.** Defines an OSI management-compatible architecture, and services and protocol elements for use in a LAN/MAN environment for performing remote management.

- ANSI/IEEE Std 802.1D  
  **Media Access Control (MAC) Bridges.** Specifies an architecture and protocol for the interconnection of IEEE 802 LANs below the MAC service boundary.

- ANSI/IEEE Std 802.1E  
  **System Load Protocol.** Specifies a set of services and protocol for those aspects of management concerned with the loading of systems on IEEE 802 LANs.

- ANSI/IEEE Std 802.1G  
  **Remote Media Access Control (MAC) Bridging.** Specifies extensions for the interconnection, using non-LAN communication technologies, of geographically separated IEEE 802 LANs below the level of the logical link control protocol.

- ANSI/IEEE Std 802.2  
  **Logical Link Control**

- ANSI/IEEE Std 802.3  
  **CSMA/CD Access Method and Physical Layer Specifications**

* Formerly IEEE Std 802.1A.


- ANSI/IEEE Std 802.6 [ISO/IEC 8802-6]  *Distributed Queue Dual Bus Access Method and Physical Layer Specifications*

- ANSI/IEEE Std 802.9 [ISO/IEC 8802-9]  *Integrated Services (IS) LAN Interface at the Medium Access Control (MAC) and Physical (PHY) Layers*

- ANSI/IEEE Std 802.10  *Interoperable LAN/MAN Security*

- IEEE Std 802.11 [ISO/IEC DIS 8802-11]  *Wireless LAN Medium Access Control (MAC) and Physical Layer Specifications*


In addition to the family of standards, the following is a recommended practice for a common Physical Layer technology:

- IEEE Std 802.7  *IEEE Recommended Practice for Broadband Local Area Networks*

The following additional working group has authorized standards projects under development:

- IEEE 802.14  *Standard Protocol for Cable-TV Based Broadband Communication Network*

### Conformance test methodology

An additional standards series, identified by the number 1802, has been established to identify the conformance test methodology documents for the 802 family of standards. Thus the conformance test documents for 802.3 are numbered 1802.3.


This standard contains state-of-the-art material. The area covered by this standard is undergoing evolution. Revisions are possible within the next few years to clarify existing material, to correct possible errors, and to incorporate new related material. Information on the current revision state of this and other IEEE 802 standards may be obtained from

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Information technology—
Telecommunications and information exchange between systems—
Local and metropolitan area networks—
Specific requirements

Part 2: Logical Link Control

1. Overview

1.1 Scope and purpose

This International Standard is one of a set of international standards produced to facilitate the interconnection of computers and terminals on a Local Area Network (LAN). It is related to the other international standards by the Reference Model for Open Systems Interconnection (OSI).

NOTE—The exact relationship of the layers described in this International Standard to the layers defined by the OSI Reference Model is under study.

This International Standard describes the functions, features, protocol, and services of the Logical Link Control (LLC) sublayer in the ISO/IEC 8802 LAN Protocol. The LLC sublayer constitutes the top sublayer in the data link layer (see figure 1) and is common to the various medium access methods that are defined and supported by the ISO/IEC 8802 activity. Separate International Standards describe each medium access method individually and indicate the additional features and functions that are provided by the Medium Access Control (MAC) sublayer in each case to complete the functionality of the data link layer as defined in the LAN architectural reference model.

This International Standard describes the LLC sublayer service specifications to the network layer (Layer 3), to the MAC sublayer, and to the LLC sublayer management function. The service specification to the network layer provides a description of the various services that the LLC sublayer, plus underlying layers and sublayers, offer to the network layer, as viewed from the network layer. The service specification to the MAC sublayer provides a description of the services that the LLC sublayer requires of the MAC sublayer. These services are defined so as to be independent of the form of the medium access methodology, and of the nature of the medium itself. The service specification to the LLC sublayer management function provides a description of the management services that are provided to the LLC sublayer. All of the above service specifications are given in the form of primitives that represent in an abstract way the logical exchange
of information and control between the LLC sublayer and the identified service function (network layer, MAC sublayer, or LLC sublayer management function). They do not specify or constrain the implementation of entities or interfaces.

This International Standard provides a description of the peer-to-peer protocol procedures that are defined for the transfer of information and control between any pair of data link layer service access points on a LAN. The LLC procedures are independent of the type of medium access method used in the particular LAN.

To satisfy a broad range of potential applications, three types of data link control operation are included (see clause 4). The first type of operation (see clause 6) provides a data link connectionless-mode service across a data link with minimum protocol complexity. This type of operation may be useful when higher layers provide any essential recovery and sequencing services so that these do not need replicating in the data link layer. In addition, this type of operation may prove useful in applications where it is not essential to guarantee the delivery of every data link layer data unit. This type of service is described in this International Standard in terms of “logical data links.” The second type of operation (see clause 7) provides a data-link-connection-mode service across a data link comparable to existing data link control procedures provided in International Standards such as HDLC (see ISO/IEC 13239:1997). This service includes support of sequenced delivery of data link layer data units, and a comprehensive set of data link layer error recovery techniques. This second type of service is described in this International Standard in terms of “data link connections.” The third type of operation (see clause 8) provides an acknowledged-connectionless-mode data unit exchange service, which permits a station to both send data and request the return of data at the same time. Although the exchange service is connectionless, in-sequence delivery is guaranteed for data sent by the initiating station.

This International Standard identifies four distinct “classes” of LLC operation. Class I provides data link connectionless-mode service only. Class II provides data-link-connection-mode service plus data-link-connectionless-mode service. Class III provides acknowledged-connectionless-mode service plus data-link-connectionless-mode service. Class IV provides acknowledged-connectionless-mode service plus data-link-connection-mode service plus data-link-connectionless-mode service. Any one of these classes of operation may be supported.

The basic protocols described herein are peer protocols for use in multistation, multiaccess environments. Because of the multistation, multiaccess environment, it shall be possible for a station to be involved in a multiplicity of peer protocol data exchanges with a multiplicity of different stations over a multiplicity of different logical data links and/or data link connections that are carried by a single physical layer (PHY) over a single physical medium. Each unique to-from pairing at the data link layer shall define a separate logical

1 Information about references can be found in 1.3.
data link or data link connection with separate logical parameters and variables. Except where noted, the
procedures described shall relate to each data link layer logical data link or data link connection separately
and independently from any other logical data link or data link connection that might exist at the stations
involved.

ISO/IEC 10038 : 1993, annex C, provides additional services to allow the MAC service user the ability to
determine and use multiple routes through a bridged LAN. This International Standard specifies the provi-
sion for an optional Route Determination Entity (RDE) within the LLC sublayer. This entity provides for the
discovery and selection of a path (bridged route) for each required data link through the bridged LAN. It
does not preclude the LLC service user from providing its own method of discovery and selection of routes.

To evaluate conformance of a particular implementation, it is necessary to have a statement of which capa-
bilities and options have been implemented. Such a statement is called a Protocol Implementation Conform-
ance Statement (PICS), as defined in ISO/IEC 9646-1 : 1994. This International Standard provides such a
PICS proforma (Annex A) in compliance with the relevant requirements, and in accordance with the relevant

1.2 Standards compatibility

The peer protocol procedures defined in clause 5 utilize some of the concepts and principles, as well as com-
mands and responses, of the balanced data link control procedures known as Asynchronous Balanced Mode
(ABM), as defined in ISO/IEC 14239 : 1997. (The ABM procedures provided the basis upon which the ITU-
T Recommendation X.25 Level 2 LAPB procedures were defined.) The frame structure defined for the data
link layers procedures as a whole is defined in part in clause 3 of this International Standard and in part in
those International Standards that define the various MAC procedures. The combination of a MAC sublayer
address and an LLC sublayer address is unique to each data link layer service access point in the LAN.

NOTE—This division of data link layer addressing space into separate MAC and LLC address fields is not presently a
part of any present ISO data link layer International Standard.

The RDE procedures defined in clause 9 utilize some of the concepts and principles as defined in ISO/IEC
10038 : 1993, annex C.

1.3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of
this part of ISO/IEC 8802. At the time of publication, the editions indicated were valid. All standards are
subject to revision, and parties to agreements based on this part of ISO/IEC 8802 are encouraged to investi-
gate the possibility of applying the most recent editions of the standards indicated below. Members of IEC
and ISO maintain registers of currently valid International Standards.

IEC 60955 : 1989, Process data highway, Type C (PROWAY C), for distributed process control systems.

Model—The Basic Model.

Model—Part 4: Management framework.

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ISO/IEC TR 10171:1994, Information technology—Telecommunications and information exchange between systems—List of standard data link layer protocols that utilize high-level data link control (HDLC) classes of procedures and list of standardized XID format identifiers and private parameter set identification values.


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.\(^5\)

ITU-T Recommendation X.200, Reference model on open systems interconnection for CCITT applications.

\(^5\)All ITU-T publications are available from the International Telecommunications Union, Sales Section, Place des Nations, CH-1211, Genève 20, Switzerland/Suisse. They are also available in the United States from the U.S. Department of Commerce, Technology Administration, National Technical Information Service (NTIS), Springfield, VA 22161, USA.