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American National Standard (ANSI)

IEEE Std 802.3u-1995
(Supplement to ISO/IEC 8802-3: 1993
[ANSI/IEEE Std 802.3, 1993 Edition])

IEEE Standards for Local and Metropolitan Area Networks:

Supplement to Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications

Media Access Control (MAC) Parameters, Physical Layer, Medium Attachment Units, and Repeater for 100 Mb/s Operation, Type 100BASE-T (Clauses 21–30)

Sponsor

LAN MAN Standards Committee
of the
IEEE Computer Society

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IEEE Standards Board

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American National Standards Institute

2nd Printing, Corrected Edition

Abstract: The ISO/IEC CSMA/CD Media Access Control (MAC) is given an additional set of parameters for 100 Mb/s operation. A repeater and added Physical Layers, known collectively as 100BASE-T, as well as significant additional supporting material for a Media Independent Interface (MII), management, and automatic configuration, are specified. This includes 100BASE-T4, which uses four pairs of Category 3, 4, or 5 generic twisted, balanced cable; 100BASE-TX, which uses two pairs of Category 5 balanced cable or 150 Ω shielded balanced cable; and 100BASE-FX, which uses two multi-mode fibers. Fibre Distributed Data Interface (FDDI) media interface specifications are referenced to provide the 100BASE-TX and 100BASE-FX physical signaling channels, defined under the subcategory 100BASE-X.
Keywords: 100BASE-FX, 100BASE-T, 100BASE-T4, 100BASE-TX, 100BASE-X, Auto-Negotiation, Fast Ethernet, management, Media Independent Interface (MII), repeater

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Corrected Edition, June 1996

The following corrections have been made to this edition:

Page 23: The designation of reference [A5] has been corrected to ANSI/EIA/TIA 526-14-1990. *[Note that further updates to annex A can be found in ISO/IEC 8802-3: 1996.]*

Page 32: In the last line of text on the page, the word "fourth" has been corrected to "sixth."

Page 174: In figure 24-11, the "BAD SSD" box text has been corrected. "RXD<3.0> ⇐ 1110" now reads "RXD<3:0> ⇐ 1110".

Page 234: The page, containing subclauses 27.7.4.11 and 27.7.4.12, was inadvertently omitted from the first printing. It is now included.

Page 286: Under list item a), notes 2 and 3 were misnumbered and have been corrected. Also, references in notes 2 and 3 to table 29-2 have been corrected to table 29-3.

Page 301: In table 30-1d, "aAutoNegAdvertisedTechnologyAbilit" has been corrected to "aAutoNegAdvertisedTechnologyAbility".

Page 312: In subclause 30.4.1.1.2, the reference to 20.2.2.3 for "other" has been corrected to 30.2.5.

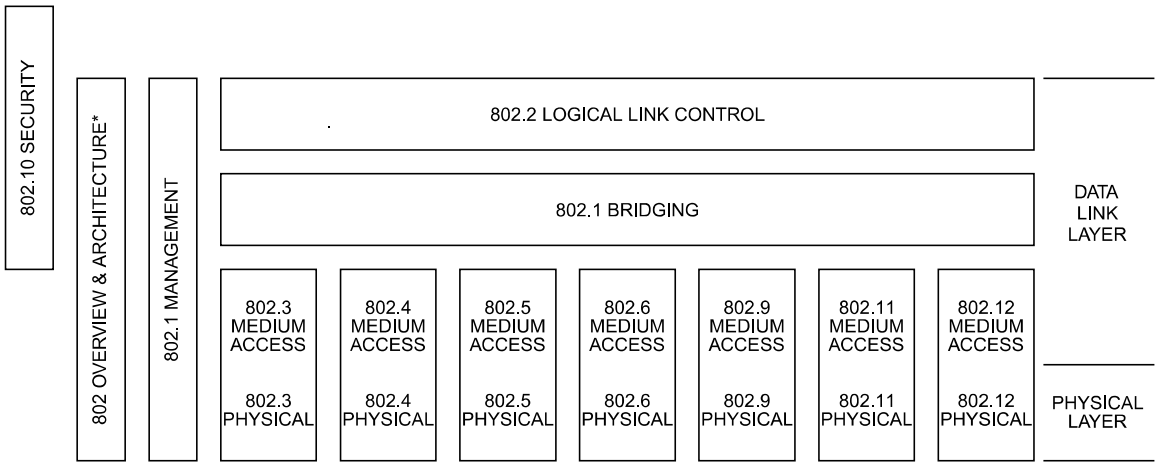
Page 323: In subclause 30.5.1.1.2, the reference to 20.2.2.3 for "other" has been corrected to 30.2.5.

Note that additional corrections are under consideration, and that some reference documents have been updated. These will be included in future maintenance documents.

Introduction

(This introduction is not part of IEEE Std 802.3u-1995.)

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.)



* Formerly IEEE Std 802.1A.

This family of standards deals with the Physical and Data Link layers as defined by the International Organization for Standardization (ISO) Open Systems Interconnection Basic Reference Model (ISO 7498 : 1984). The access standards define several 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[1]:	Overview and Architecture. This standard provides an overview to the family of IEEE 802 Standards. This document forms part of the 802.1 scope of work.
• ANSI/IEEE Std 802.1B [ISO/IEC 15802-2]:	LAN/MAN Management. Defines an Open Systems Interconnection (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 [ISO/IEC 10038]:	MAC Bridging. Specifies an architecture and protocol for the interconnection of IEEE 802 LANs below the MAC service boundary.
• ANSI/IEEE Std 802.1E [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.

[1]The 802 Architecture and Overview standard, originally known as IEEE Std 802.1A, has been renumbered as IEEE Std 802. This has been done to accommodate recognition of the base standard in a family of standards. References to IEEE Std 802.1A should be considered as references to IEEE Std 802.

- ANSI/IEEE Std 802.2 [ISO/IEC 8802-2]: Logical Link Control
- ANSI/IEEE Std 802.3 [ISO/IEC 8802-3]: CSMA/CD Access Method and Physical Layer Specifications
- ANSI/IEEE Std 802.4 [ISO/IEC 8802-4]: Token Bus Access Method and Physical Layer Specifications
- ANSI/IEEE Std 802.5 [ISO/IEC 8802-5]: Token Ring Access Method and Physical Layer Specifications
- ANSI/IEEE Std 802.6 [ISO/IEC 8802-6]: Distributed Queue Dual Bus Access Method and Physical Layer Specifications
- IEEE Std 802.9: Integrated Services (IS) LAN Interface at the Medium Access Control (MAC) and Physical (PHY) Layers
- IEEE Std 802.10: Interoperable LAN/MAN Security, *Currently approved:* Secure Data Exchange (SDE)
- IEEE 802.12: Demand Priority Access Method/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 groups have authorized standards projects under development:

- IEEE 802.11: Wireless LAN Medium Access Control (MAC) Sublayer and Physical Layer Specifications
- IEEE 802.14: Standard Protocol for Cable-TV Based Broadband Communication Network

The reader of this standard is urged to become familiar with the complete family of standards.

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, the conformance test documents for 802.5 will be 1802.5, and so on. Similarly, ISO will use 18802 to number conformance test standards for 8802 standards.

IEEE Std 802.3u-1995

At the time this standard (IEEE Std 802.3u-1995) was published, the IEEE 802.3 standard consisted of the following published documents:

- ISO/IEC 8802-3: 1993 [ANSI/IEEE Std 802.3, 1993 Edition]
- IEEE Std 802.3j-1993, Fiber Optic Active and Passive Star-Based Segments, Type 10BASE-F (Clauses 15–18)
- IEEE Std 802.3k-1992, Layer Management for 10 Mb/s Baseband Repeaters (Clause 19)
- IEEE Std 802.3l-1992, Type 10BASE-T Protocol Implementation Conformance Statement (PICS) Proforma (Subclause 14.10)
- IEEE Std 802.3p-1993 *and* IEEE Std 802.3q-1993, Guidelines for the Development of Managed Objects (GDMO) (ISO/IEC 10165-4) Format for Layer-Managed Objects (Clause 5) *and* Layer Management for 10 Mb/s Baseband Medium Attachment Units (MAUs) (Clause 20)
- IEEE Std 1802.3d-1993, Type 10BASE-T Medium Attachment Unit (MAU) (Conformance Test Methodology (Clause 6)

At the time this standard was published, there was revision and supplementary material that had been approved and scheduled for publication. Also, a new edition of ISO/IEC 8802-3 was in preparation to consolidate a significant amount of the above material. Information on the current state of this and other IEEE 802 standards may be obtained from

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IEEE 802 committee working documents are available from

IEEE Document Distribution Service
AlphaGraphics #35 Attn: P. Thrush
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Patent information

The IEEE Standards Board calls attention to the fact that it is claimed that portions of IEEE Std 802.3u-1995 are the subject of patents owned by a number of companies. The IEEE takes no position with respect to patent validity. Each of these companies has assured IEEE that it is willing to grant a license on these patents on reasonable and nondiscriminatory terms to anyone wishing to obtain such a license. The undertakings of these companies in this respect are on file with the IEEE Standards Department, and the license details may be obtained by contacting the Standards Department.

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CLAUSE PAGE

ANNEXES

IEEE Standards for Local and Metropolitan Area Networks:

Supplement to Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications

Revisions to ISO/IEC 8802-3 : 1993 [ANSI/IEEE Std 802.3, 1993 Edition]

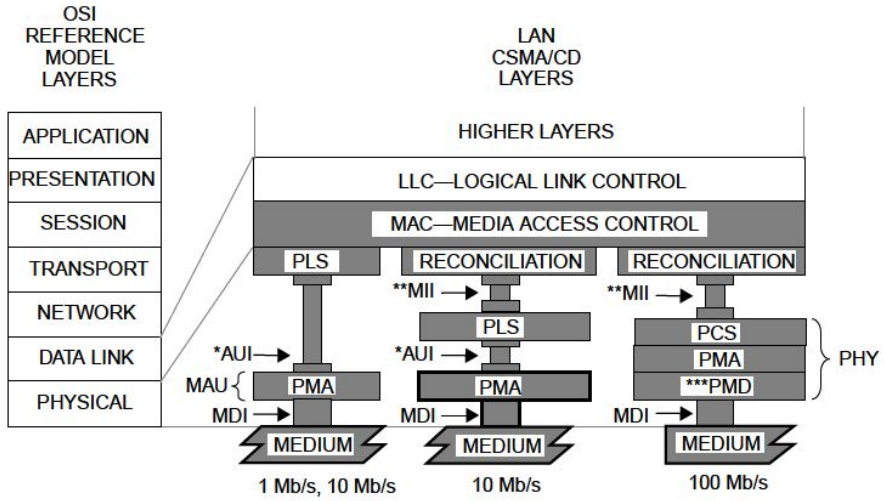
EDITORIAL NOTES

1—The following changes to ISO/IEC 8802-3 : 1993 [ANSI/IEEE Std 802.3, 1993 Edition] (and supplements 802.3j-1993, 802.3k-1992, 802.3l-1992, and 802.3p&q-1993) affect clauses 1, 2, 4, 5, 14, 19, 20, Annex A, and Annex D. These changes must also be applied to the 1995 edition of ISO/IEC 8802-3, which will incorporate all the supplements.

2—The text as shown includes editorial changes that accommodate recent changes to the IEEE style.

3—Editing instructions are shown in ***bold italic*** type. Where modifications are made to paragraphs of existing text, deletions are shown in ~~strikethrough type~~ and additions are underscored. Editorial notes will not be carried over into future editions.

Replace figure 1-1 with the following:



AUI = ATTACHMENT UNIT INTERFACE
MDI = MEDIUM DEPENDENT INTERFACE
MII = MEDIA INDEPENDENT INTERFACE
MAU = MEDIUM ATTACHMENT UNIT

PLS = PHYSICAL LAYER SIGNALING
PCS = PHYSICAL CODING SUBLAYER
PMA = PHYSICAL MEDIUM ATTACHMENT
PHY = PHYSICAL LAYER DEVICE
PMD = PHYSICAL MEDIUM DEPENDENT

NOTE—The three types of layers below the MAC sublayer are mutually independent.
* AUI is optional for 10 Mb/s systems and is not specified for 1 Mb/s and 100 Mb/s systems.
** MII is optional for 10 Mb/s DTEs and for 100 Mb/s systems and is not specified for 1 Mb/s systems.
*** PMD is specified for 100BASE-X only; 100BASE-T4 does not use this layer.
For an exposed AUI residing below an MII, see 22.5.

Figure 1-1—LAN standard relationship to the ISO Opens Systems Interconnection (OSI) reference model