

IEEE Standards for Local and Metropolitan Area Networks:

Common Definitions and Procedures for IEEE 802 Management Information

Sponsor

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Abstract: Management information and procedures applicable across the entire family of IEEE 802 LAN/MAN standards within the architectural framework for LAN/MAN Management specified in IEEE Std 802-1990 are identified. Common management information, such as attributes to represent MAC address and managed objects to represent configurable gauges, are specified. The need of developers of LAN/MAN management specifications for common procedures to develop, describe, and register management information is addressed.

Keywords: local area networks, management; metropolitan area networks, management

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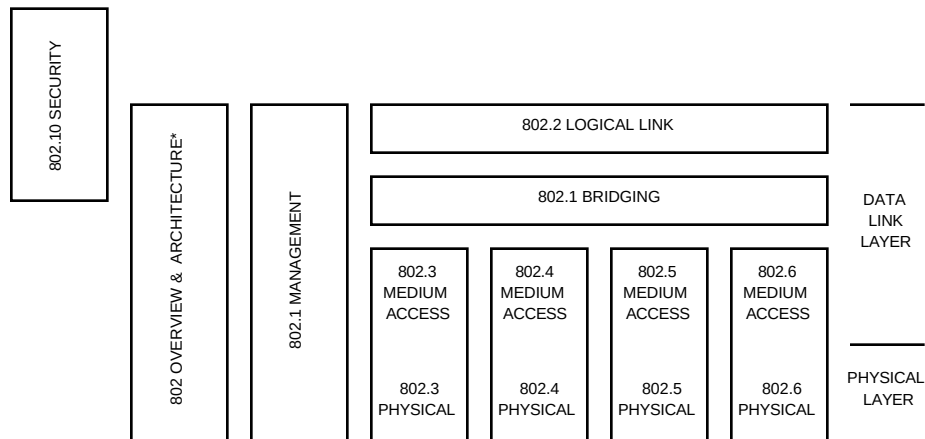
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Introduction

(This introduction is not a part of IEEE Std 802.1F-1993, IEEE Standards for Local and Metropolitan Area Networks: Common Definitions and Procedures for IEEE 802 Management Information.)

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 these technologies are as follows:

- IEEE Std 802[†]: Overview and Architecture. This standard provides an overview to the family of IEEE 802 Standards. This standard forms part of the 802.1 scope of work.
- IEEE Std 802.1B [ISO DIS 15802-2]: LAN/MAN Management. Defines an Open Systems Interconnection (OSI) management-compatible architecture, and service and protocol elements for use in a LAN/MAN environment for performing remote management.
- ISO/IEC 10038 [ANSI/IEEE Std 802.1D]: MAC Bridging. Specifies an architecture and protocol for the interconnection of IEEE 802 LANs below the MAC service boundary.
- IEEE Std 802.1E [ISO DIS 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.

[†]The 802 Architecture and Overview Specification, 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.

- ISO 8802-2 [ANSI/IEEE Std 802.2]: Logical Link Control
- ISO/IEC 8802-3 [ANSI/IEEE Std 802.3]: CSMA/CD Access Method and Physical Layer Specifications
- ISO/IEC 8802-4 [ANSI/IEEE Std 802.4]: Token Bus Access Method and Physical Layer Specifications
- ISO/IEC 8802-5 [ANSI/IEEE Std 802.5]: Token Ring Access Method and Physical Layer Specifications
- IEEE Std 802.6 [ISO/IEC DIS 8802-6]: Metropolitan Area Network Access Method and Physical Layer Specifications
- IEEE Std 802.10: Interoperable Local Area Network (LAN) Security, *Currently Contains* Secure Data Exchange (SDE)

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

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

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. This makes the correspondence between the various 802 standards and their applicable conformance test requirements readily apparent. 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.

802.1F-1993

This standard defines common management information types and procedures. It also provides guidance to developers of standards for management information related to IEEE 802 LAN/MAN technologies with respect to the appropriate techniques and notational conventions that should be applied when defining such information for use with ISO/IEC 15802-2 [ANSI/IEEE Std 802.1B-1992 and IEEE Std 802.1k-1993], LAN/MAN Management, or ISO/IEC 9596-1 : 1991, Common Management Information Protocol (CMIP).

This standard contains state-of-the-art material. The area covered by this standard is undergoing rapid evolution; revisions are anticipated to this standard within the next two years to clarify existing material and to incorporate new related material. Information on the current revision state of this standard may be obtained from

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IEEE Standards for Local and Metropolitan Area Networks: Common Definitions and Procedures for IEEE 802 Management Information

1. Overview

This standard identifies management information and procedures applicable across the entire family of IEEE 802 LAN/MAN standards within the architectural framework for LAN/MAN Management specified in IEEE Std 802-1990.¹ It specifies common management information, such as attributes to represent MAC addresses and managed objects to represent configurable gauges. It also addresses the need of developers of LAN/MAN management specifications for common procedures to develop, describe, and register management information.

Development of management specifications that permit remote management of resources in a communications environment involves coordinated activity of many independent developers, in international standards bodies, implementors' workshops, vendor organizations, etc. There is a danger that this will result in specifications that are inconsistent, incomplete, and inefficient. The goal of this document is therefore to provide both common definitions and common procedures to avoid inconsistency and duplication of effort in IEEE 802 LAN/MAN standards.

IEEE 802 LAN/MAN management information is based upon the following:

- a) The architectural framework for LAN/MAN management as described in IEEE Std 802-1990 (See Note below), and further refined in ISO/IEC DIS 15802-2;

NOTE—Current work is under way to refine the description of the management architecture for the IEEE 802 family of standards that is contained in IEEE Std 802-1990.

- b) Managed objects and management information as described in ISO/IEC 10165-1 : 1992;
- c) Notational techniques for defining managed objects as described in ISO/IEC 10165-4 : 1992; and
- d) The generic definitions contained in ISO/IEC 10165-2 : 1992.

To this base material, this standard adds common definitions and procedures that apply to development of managed object definitions in the LAN/MAN environment.

¹Information on references can be found in clause 3.

2. Scope

This standard provides the following two types of information to the developers of layer-, sublayer-, or resource-specific management specifications:

- a) Definition of common management information such as attributes, managed object classes, packages, behaviours, and encodings of information used by LAN/MAN Management.
- b) Common procedures required for specification of LAN/MAN Management, such as relationships to other common management information specifications and methods for registering management information within IEEE 802 standards.

This standard provides assistance and guidance to the developers of LAN/MAN management specifications that will

- Reduce duplication of effort by identifying commonly useful definitions and procedures.
- Encourage consistency between such specifications.
- Encourage the development of such specifications in a manner that will ensure compatibility with LAN/MAN Management specifications (ISO/IEC DIS 15802-2, ISO/IEC 8802-3 Amendment 11, and ISO 7498 : 1984) and with ISO/IEC 9595 : 1991 and 9596-1 : 1991.

To this end, this standard specifies the following:

- A set of definitions of commonly useful managed object and attribute types that build upon the generic definitions contained in DMI.
- The use of the Structure of Management Information (SMI) standards (ISO/IEC 10165-1 : 1992, 10165-2 : 1992, and 10165-4 : 1992) as the basis for the definition of management information and managed objects in a LAN/MAN environment.
- Procedures to be used in defining and registering management information within IEEE 802 LAN/MAN standards.

An informative annex is also included with guidelines toward recommended common approaches to be used for the documentation of LAN/MAN Management specifications.

This standard does not constrain the development of layer-specific management specifications.

This standard is applicable to the development of IEEE 802 management specifications that define the following:

- Management information that is to be transferred or manipulated by means of management protocol, in particular, that which is specified in ISO/IEC 15802-2 and ISO/IEC 9596-1 : 1991.
- The managed objects to which that information relates.

NOTE—Although the target audience for this standard is developers of managed object definitions relevant to LAN/MAN technologies, the information contained herein may also be of relevance to members of other communities.

3. References

The following standards contain provisions which, through references in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below.

ANSI ISSB990, Procedures for Registering Names for American National Standards Notation One (ASN.1).²

IEEE Std 802-1990, IEEE Standards for Local and Metropolitan Area Networks: Overview and Architecture (ANSI).³

ISO 7498 : 1984, Information processing systems—Open Systems Interconnection—Basic Reference Model.⁴

ISO/IEC 7498-4 : 1989, Information processing systems—Open Systems Interconnection—Basic Reference Model—Part 4: Management Framework.

ISO/IEC 8802-3 Amendment 11 [ANSI/IEEE Std 802.3k-1992], Information technology—Local and metropolitan area networks—Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications—Layer management for 10 Mbit/s baseband repeaters.

ISO/IEC DIS 8802-6...⁵ [ANSI/IEEE Std 802.6-1990], Information technology—Local and metropolitan area networks—Part 6: Distributed queue dual bus (DQDB) subnetwork of a metropolitan area network (MAN).

ISO/IEC 8824 : 1990, Information technology—Open Systems Interconnection—Specification of Abstract Syntax Notation One (ASN.1).

ISO/IEC 9595 : 1991, Information technology—Open Systems Interconnection—Common management information service definition.

ISO/IEC 9596-1 : 1991, Information technology—Open Systems Interconnection—Common management information protocol—Part 1: Specification.

ISO/IEC 10040 : 1992, Information technology—Open Systems Interconnection—Systems management overview.

ISO/IEC 10164-1 : 1992, Information technology—Open Systems Interconnection—Systems management—Part 1: Object Management Function.

ISO/IEC 10164-2 : 1992, Information technology—Open Systems Interconnection—Systems management—Part 2: State Management Function.

²ANSI publications are available from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036-8002, USA.

³IEEE publications are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA.

⁴ISO and ISO/IEC publications are available from the ISO Central Secretariat, 1 rue de Varembe, Case Postale 56, CH-1211, Genève 20, Switzerland/Suisse.

⁵Presently at state of draft International standard.

ISO/IEC 10164-3 : 1992, Information technology—Open Systems Interconnection—Systems management—Part 3: Attributes for Representing Relationships.

ISO/IEC 10164-4 : 1992, Information technology—Open Systems Interconnection—Systems management—Part 4: Alarm Reporting Function.

ISO/IEC 10164-5 : 1992, Information technology—Open Systems Interconnection—Systems management—Part 5: Event Report Management Function.

ISO/IEC 10164-6 : 1992, Information technology—Open Systems Interconnection—Systems management—Part 6: Log Control Function.

ISO/IEC 10164-7 : 1992, Information technology—Open Systems Interconnection—Systems management—Part 7: Security Alarm Reporting Function.

ISO/IEC 10164-8 : 1993, Information technology—Open Systems Interconnection—Systems management—Part 8: Security Audit Trail Function.

ISO/IEC DIS 10164-9..., Information technology—Open Systems Interconnection—Systems management—Part 9: Objects and Attributes for Access Control.

ISO/IEC DIS 10164-10..., Information technology—Open Systems Interconnection—Systems management—Part 10: Accounting Meter Function.

ISO/IEC DIS 10164-11..., Information technology—Open Systems Interconnection—Systems management—Part 11: Workload Monitoring Function.

ISO/IEC DIS 10164-13..., Information technology—Open Systems Interconnection—Systems management—Part 13: Summarization Function.

ISO/IEC 10165-1 : 1992, Information technology—Open Systems Interconnection—Management information services—Structure of management information—Part 1: Management Information Model.

ISO/IEC 10165-2 : 1992, Information technology—Open Systems Interconnection—Management information services—Structure of management information—Part 2: Definition of management information.

ISO/IEC 10165-4 : 1992, Information technology—Open Systems Interconnection—Management Information Services—Structure of management information—Part 4: Guidelines for the definition of managed objects.

ISO/IEC DIS 15802-2... [ANSI/IEEE Std 802.1B-1992 and IEEE Std 802.1k-1993], Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Common specifications—Part 2: LAN/MAN management, service and protocol.

4. Definitions

4.1 Basic Reference Model definitions

This standard makes use of the following terms defined in ISO 7498 : 1984:

- a) (N)-connection
- b) (N)-entity
- c) (N)-layer
- d) (N)-protocol
- e) (N)-sap
- f) open system
- g) systems management

4.2 Management Framework definition

This standard makes use of the following term defined in ISO/IEC 7498-4 : 1989:

- a) managed object

4.3 Systems Management Overview definitions

This standard makes use of the following terms defined in ISO/IEC 10040 : 1992:

- a) agent
- b) layer management protocol
- c) managed object class
- d) management information
- e) manager
- f) notification
- g) notification type
- h) (systems management) operation
- i) system managed object
- j) systems management protocol

4.4 Structure of Management Information (SMI) Information Model definitions

This standard makes use of the following terms defined in ISO/IEC 10165-1 : 1992:

- a) abstract datatype
- b) attribute type
- c) behaviour
- d) containment
- e) encapsulation
- f) inheritance
- g) inheritance hierarchy
- h) managed object boundary
- i) name binding
- j) (conditional) package
- k) subclass
- l) subordinate object

- m) superclass
- n) superior object

4.5 Common Management Information Service (CMIS) definitions

This standard makes use of the following terms defined in ISO/IEC 9595 : 1991:

- a) attribute
- b) Common Management Information Services

4.6 Abstract Syntax Notation One (ASN.1) definitions

This standard makes use of the following terms defined in ISO/IEC 8824 : 1990:

- a) object identifier
- b) type

4.7 Guidelines for the Definition of Managed Objects (GDMO) definitions

This standard makes use of the following terms defined in ISO/IEC 10165-4 : 1992:

- a) managed object class definition
- b) template

4.8 LAN/MAN Management definitions

This standard makes use of the following terms defined in ISO/IEC DIS 15802-2, ISO/IEC 8802-3 Amendment 11, and ISO 7498 : 1984:

- a) LAN/MAN Management

4.9 Exponentially Weighted Moving Average (EWMA) metric monitor definitions

This standard defines the following terms for use in the EWMA metric monitor managed object definition:

4.9.1 granularity period: As defined in ISO/IEC DIS 10164-11, the time between observations. For this standard, it is the time between two successive scans and is denoted by the symbol “GP.”

4.9.2 numeric attribute: An attribute whose value may be either integer or real.

4.9.3 observed attribute: An attribute of a managed object whose value is being observed by an EWMA metric managed object.

4.9.4 observed managed object: A managed object with one or more observed attributes.

NOTE—In this standard, only a single attribute is ever observed.

4.9.5 scan: A sampling process of observing attribute values at a specified point in time.

NOTE—In this standard, only a single attribute value is ever scanned.

4.9.6 metric: A value calculated from observed attribute values.

4.9.7 metric attribute: An attribute of a metric managed object whose value is either used as a parameter of one or more metric algorithms or whose value represents the output of such an algorithm.

4.9.8 metric algorithm: The behaviour of a metric managed object that models a formalized process to calculate specified results.

4.9.9 metric managed object: A managed object that contains at least one metric attribute whose value is calculated from values of attributes observed in managed objects.

4.9.10 monitoring: That aspect of performance management concerned with tracking the system activities in order to gather the appropriate data for determining performance.

4.9.11 rate: The change in a value over a specified period of time.

NOTE—Instantaneous rate is the derivative of the value with respect to time and cannot generally be measured. The measured rate approaches the instantaneous rate as the specified period of time approaches zero.

4.9.12 derived gauge: The computed difference between values of a counter type attribute sampled in successive scan intervals.

4.9.13 EWMA (exponentially weighted moving average) algorithm: A specific metric algorithm whose behaviour emphasizes recent observation values and that can also, depending upon initialization, transparently pass through the behaviour of the observed gauge or derived gauge type attribute.

NOTE—The EWMA algorithm specified by this standard is defined in annex A, A.7.

4.10 Abbreviations and acronyms

The following acronyms and abbreviations are used in this standard:

ASN.1	Abstract Syntax Notation One
CMIP	Common Management Information Protocol
CMIS	Common Management Information Service
CPDU	Convergence Protocol Data Unit
DIS	Draft International Standard
DMI	Definition of Management Information
EWMA	Exponentially Weighted Moving Average
GDMO	Guidelines for the Definition of Managed Objects
LAN	Local Area Network
LLC	Logical Link Control
MAC	Media Access Control
MAN	Metropolitan Area Network
OSI	Open Systems Interconnection
OUI	Organizationally Unique Identifier
PDU	Protocol Data Unit
QOS	Quality of Service
SMI	Structure of Management Information