

IEEE Standards for Local and Metropolitan Area Networks:

**Supplements to Standard for Interoperable LAN/MAN Security
(SILS)**

**Secure Data Exchange (SDE) Sublayer
Management (Subclause 2.8)
and Recommended Practice for SDE on
Ethernet V2.0 in IEEE 802 LANs (Annex 2H)**

Sponsor

**Technical Committee on Computer Communications
of the
IEEE Computer Society**

Approved December 2, 1993

IEEE Standards Board

Abstract for 802.10e-1993: A method to allow Ethernet V2.0 Media Access Control (MAC) Protocol Data Units (PDUs) to be protected with the Secure Data Exchange (SDE) protocol is provided.

Abstract for 802.10f-1993: A set of managed object classes to be used in the management of the Secure Data Exchange (SDE) sublayer and its protocol exchanges is specified.

Keywords: decipherment; encipherment; local area networks, security; metropolitan area networks, security; secure data exchange; security association

The Institute of Electrical and Electronics Engineers, Inc.
345 East 47th Street, New York, NY 10017-2394, USA

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ISBN 1-55937-393-8

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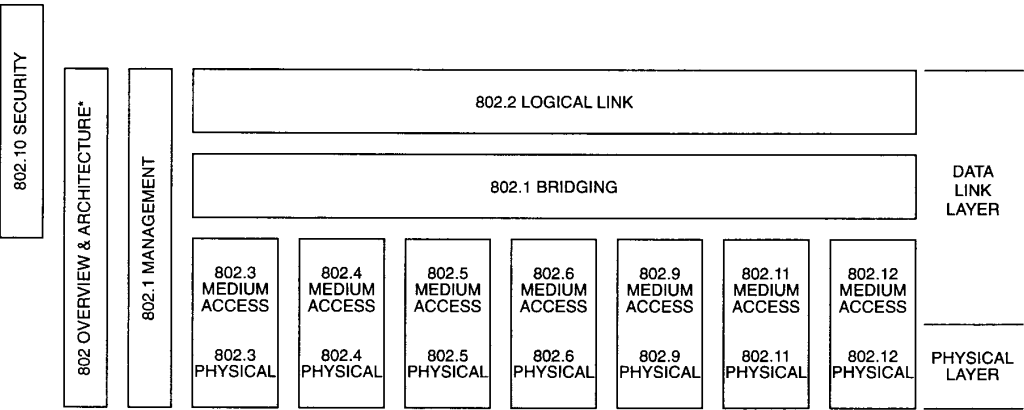
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Introduction

(This introduction is not part of IEEE Std 802.10e-1993 or of IEEE Std 802.10f-1993.)

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 document forms part of the 802.1 scope of work.
- ISO/IEC DIS 15802-2
[IEEE Stds 802.1B and 802.1k]: 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.
- 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.
- ISO/IEC 15802-4
[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.
- ISO 8802-2
[ANSI/IEEE Std 802.2]: Logical Link Control

[†]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/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
- ISO/IEC 8802-6
[ANSI/IEEE Std 802.6]: Distributed Queue Dual Bus Access Method and Physical Layer Specifications
- IEEE Std 802.10: Interoperable LAN/MAN Security, *Currently Contains* Secure Data Exchange

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 following additional working groups have authorized standards projects under development:

- IEEE 802.9 Integrated Services (IS) LAN Interface at the Medium Access Control (MAC) and Physical Layers
- IEEE 802.11 Wireless LAN Medium Access Control (MAC) and Physical Layer Specifications
- IEEE 802.12 Demand Priority Access Method and Physical Layer Specifications

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.

802.10e-1993 and 802.10f-1993

Recommended Practice IEEE Std 802.10e-1993 specifies the method for protecting Ethernet V2.0 Protocol Data Units (PDUs) with the Secure Data Exchange (SDE) protocol. ISO/IEC 8802-3 (IEEE 802.3) PDUs and Ethernet V2.0 PDUs often share the same media, but the Media Access Control (MAC) PDUs do not have the same structure. Specifically, Ethernet V2.0 defines the two octets following the addresses as a type, and ISO/IEC 8802-3 defines these same two octets as a length. Footnote 7 in 3.2.6 of ISO/IEC 8802-3 : 1993 (footnote 6 in earlier editions) alludes to this difference and points out a way that ISO/IEC 8802-3 and Ethernet V2.0 MAC PDUs may be distinguished. IEEE Std 802.10e-1993 is necessary to ensure that SDE-protected forms of both protocols can coexist on the same media without interfering with one another. In other words, IEEE Std 802.10e-1993 permits the encrypted forms of ISO/IEC 8802-3 and Ethernet V2.0 to enjoy the same peaceful coexistence as the unencrypted protocols.

IEEE Std 802.10f-1993 specifies a set of managed object classes to be used in the management of the SDE sublayer and its protocol exchanges. Managed object classes, attribute types, specific attributes, actions, and notifications are defined in accordance with ISO/IEC 10165-4 : 1992, Guidelines for the definition of managed objects (GDMO). This standard also uses the managed objects definitions and procedures defined in IEEE Std 802.1F-1993, Common Definitions and Procedures for IEEE 802 Management Information.

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. This standard contains state-of-the-art material. The area covered by this standard is undergoing evolution. Revisions are anticipated 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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Phoenix, AZ 85051, USA

Participants

The following is a list of participants in the IEEE Project 802.10 Working Group.

Kenneth G. Alonge, *Chair (1991 to present)*

Kimberly Kirkpatrick, *Chair (1988–1991)*

Russell Housley, *Vice Chair*

Brian J. Phillips, *Technical Editor, 802.10f*

Peter Yee, *Technical Editor, 802.10e and Recording Secretary*

L. Kirk Barker
Jacqueline Balfour
Robert Kolacki
Paul Lambert

Wen-Pai Lu
Massimo Mascoli
Ken McCoy
James Randall

Karen T. Randall
Brian P. Schanning
Jeffrey Vignes
Roberto Zamparo

The following persons were on the balloting committee:

William B. Adams
Kenneth G. Alonge
Alan Arndt
Kit Athul
Yong Myung Baeg
Tim Batten
Joe B. Brame
Paul W. Campbell
George Carson
Robert Crowder
Judith A. Edwards
John E. Emrich
Philip H. Enslow
Changxin Fan
John W. Fendrich
Harvey A. Freeman
Ingrid Fromm
Robert Gagliano
Isaac Ghansah
Julio Gonzalez-Sanz
Russell Housley
Thomas R. Hunwick
Richard J. Iliff

Youngbum Kim
Peter Kornerup[‡]
Randolph S. Little
Joseph Loo
Donald C. Loughry
Wen-Pai Lu
Marc Mandel
William C. McDonald
Robert J. Melford
Milan Merhar
Ann Miller
David S. Millman
C. B. Madhab Mishra
Ellis S. Nolley
Donal O'Mahony
Andreas Pfitzmann
Thomas E. Phillips
Art J Pina
Vikram Punj
Brian Ramelson
Robert Rosenthal
Daniel Rosich
Rainer A. Rueppel

Christoph Ruland
David J. Rypka
Brian P. Schanning
Gregory D. Schumacher
Donald A. Sheppard
Patrick Sheridan
William R. Smith
Alex Soceanu^{††}
Harry P. Solomon
Fred J. Strauss
Stuart G. Stubblebine
Efsthathios D. Sykas
Hao Tang
Geoffrey O. Thompson
Robert Tripi
Mark-Rene Uchida
J. Vandewalle
James T. Vorhies
Barry M. Vornbrock
Raymond Wenig
Paul A. Willis
Peter Yee
Oren Yuen

[‡]Balloted 802.10e-1993 only.

^{††}Balloted 802.10f-1993 only.

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James Beall
Richard B. Engelman
David E. Soffrin
Stanley I. Warshaw

Kristin M. Dittmann
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IEEE Standards for Local and Metropolitan Area Networks:

Supplements to Standard for Interoperable LAN/MAN Security (SILS)

Secure Data Exchange (SDE) Sublayer Management (Subclause 2.8) *and* Recommended Practice for SDE on Ethernet V2.0 in IEEE 802 LANs (Annex 2H)

The two standards included in this volume define a series of changes and additions to the existing text of IEEE Std 802.10-1992; the text therefore assumes all material, including references, acronyms, and definitions contained in the base text. The clause and subclause numbering in the following clauses corresponds to the clause and subclause numbering in the final document (i.e., when these additions are incorporated). Text shown in ***bold italics*** in the remainder of this document defines the editing instructions necessary to incorporate the changes and additions into IEEE Std 802.10-1992.

1.2.1 Acronyms

Add the following to 1.2.1 of IEEE Std 802.10-1992:

ANSI	American National Standards Institute
ASN.1	Abstract Syntax Notation One
CMIS	Common Management Information Service
DIS	Draft International Standard
DMI	Definition of Management Information
GDMO	Guidelines for the Definition of Managed Objects
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
LME	Layer Management Entity
LMI	Layer Management Interface
LMMP	LAN/MAN Management Protocol
LMMPE	LAN/MAN Management Protocol Entity
LMMS	LAN/MAN Management Service
LMMU	LAN/MAN Management User
MIS-User	Management Information Services User
MO	Managed Object
MOCS	Management Object Conformance Statement
NM	Network Management
NMI	Network Management Interface
OID	Object Identifier
OUI	Organizationally Unique Identifier
PDU	Protocol Data Unit
PE	Protocol Entity

PICS	Protocol Implementation Conformance Statement
RDN	Relative Distinguished Name
SMI	Structure of Management Information
SNAP	Subnetwork Service Access Point

1.3 References

Add the following references to IEEE Std 802.10-1992:

IEEE Std 802.1F-1993, IEEE Standards for Local and Metropolitan Area Networks: Common Definitions and Procedures for IEEE 802 Management Information.¹

ISO/IEC 7498-4 : 1989, Information processing systems—Open Systems Interconnection—Basic Reference Model—Part 4: Management Framework.²

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

ISO/IEC 8825 : 1990, Information technology—Open Systems Interconnection—Specification of basic encoding rules for Abstract Syntax Notation 1 (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 9596-2 : 1993, Information technology—Open Systems Interconnection—Common management information protocol—Part 2: Protocol Implementation Conformance Statement (PICS) proforma.

ISO/IEC 10164-1 : 1992, Information technology—Open Systems Interconnection—Systems management—Part 1: Object Management 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 10165-4 : 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 10165-6...³, Information technology—Open Systems Interconnection—Management Information Services—Structure of management information—Part 6: Requirements and guidelines for implementation conformance statement proforma associated with management information.

ISO/IEC DIS 15802-2...⁴ [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.

¹IEEE publications are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA.

²ISO and ISO/IEC publications are available from the ISO Central Secretariat, 1 rue de Varembé, Case Postale 56, CH-1211, Genève 20, Switzerland/Suisse.

³Currently at state of Draft International Standard.

⁴Currently at state of Draft International Standard.

2.8 SDE sublayer management

Replace 2.8 and add the following subclauses to IEEE Std 802.10-1992 as follows.

2.8.1 Overview

This clause specifies the managed objects that permit the operation of the SDE to be remotely operated, managed, and maintained. Both fully specified managed objects and partially specified managed objects together with their contained management information are documented.

2.8.2 Scope

This standard provides specifications for ISO/IEC 10165-style managed object classes that represent SDE sublayer resources that are subject to management. These specifications define managed object classes, attribute types, specific attributes, actions, and notification types in accordance with ISO/IEC 10165-4 : 1992 (GDMO) and the generic definitions contained in ISO/IEC 10165-2 : 1992 (DMI). This standard also follows the procedures and uses the managed objects defined in IEEE Std 802.1F-1993.

This document provides the following two types of management information to the developers of SDE sublayer management services:

- a) Definition of the managed object classes required for management of the SDE protocol; including their relationships with other managed objects within the Data Link layer and the bindings that are required in the naming of an instantiation of the management service, and;
- b) Definition of common management information such as ATTRIBUTES, PACKAGES, BEHAVIOURS, NOTIFICATIONS, and encodings of information that are used in managing the exchange of data in accordance with SDE specifications.

These managed object classes allow a manager (or management application processes) to monitor and control resources, represented as managed objects, through local agents in other (managed) systems. Event reports (notifications) may be returned from resources in other systems through their local agents to a designated manager or managers.

2.8.3 Definitions

2.8.3.1 LAN/MAN Management definitions

The SDE sublayer management subclause makes use of the following terms defined in ISO/IEC DIS 15802-2 [ANSI/IEEE Std 802.1B-1992 and IEEE Std 802.1k-1993] and ISO 7498 : 1984:

- a) LAN/MAN Management

2.8.3.2 Common Definitions and Procedures for IEEE 802 Management Information definitions

The SDE sublayer management subclause makes use of the following terms defined in the text of IEEE Std 802.1F-1993:

- a) MACAddress
- b) ResourceTypeID

2.8.3.3 Management Framework definitions

The SDE sublayer management subclause makes use of the following terms defined in ISO/IEC 7498-4 : 1989:

- a) managed object
- b) management information base
- c) systems management

2.8.3.4 Abstract Syntax Notation One (ASN.1) definitions

The SDE sublayer management subclause makes use of the following terms defined in ISO/IEC 8824 : 1990:

- a) object identifier
- b) type

2.8.3.5 Common Management Information Service (CMIS) definitions

The SDE sublayer management subclause makes use of the following terms defined in ISO/IEC 9595 : 1991:

- a) attribute (of managed object)
- b) Common Management Information Services

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

The SDE sublayer management subclause makes use of the following terms defined in ISO/IEC 10165-4 : 1992:

- a) managed object class definition
- b) template

2.8.3.7 Systems Management Overview definitions

The SDE sublayer management subclause makes use of the following terms defined in ISO/IEC 10040 : 1992:

- a) agent
- b) agent role
- c) generic definitions
- d) layer management protocol
- e) managed object class
- f) managed (open) system
- g) management information
- h) manager
- i) manager role
- j) notification
- k) notification type
- l) (systems management) operation
- m) systems management application protocol

2.8.3.8 Structure of Management Information (SMI) Information Model definitions

The SDE sublayer management subclause makes use of the following terms defined in ISO/IEC 10165-1 : 1992:

- a) abstract datatype
- b) unrestricted abstract datatype
- c) attribute type
- d) attribute value assertion
- e) behaviour
- f) containment
- g) containment hierarchy
- h) distinguished name
- i) inheritance
- j) inheritance hierarchy
- k) naming tree
- l) name binding
- m) mandatory package
- n) (conditional) package
- o) relative distinguished name
- p) subclass
- q) subordinate object
- r) superclass
- s) superior object

2.8.4 Management model

This standard describes the management of the SDE sublayer in terms of a general model of resource management within an open systems environment. Two major components of this management model are a *managing system* and a *managed system*.

Within the managing system (manager role), management processes invoke management operations that are translated into management messages, which are sent to the managed system. A managed system (agent role) provides an interface to those internal resources that are to be managed and processes the applicable management (operations) messages.

The internal resources of the managed system are represented at the interface by abstractions known as *managed objects*. Each managed object responds to a defined set of management operations with internal actions and notifications that the managed system translates into messages. These messages are sent to the management process that requested the management operation. Also, internal changes in the managed resources may trigger sending other notification messages to a management process.

2.8.4.1 SDE management requirements

In a dynamic system, where SDE must be set up, managed, enabled or disabled, both commands (operations) and information requests must be sent to the SDE protocol entity to perform these functions. These operations involve the creation and deletion of various SDE sublayer resources that manage that SDE sublayer and the setting of information values. The information requests involve the transfer of management information values. Other management information transfers include the reporting of events (notifications) within the SDE protocol entity.

Other methods for establishing and manipulating management knowledge may be used in addition to or in place of the ones described in this standard. However, the availability and the use of mechanisms identified in this standard will promote vendor interoperability.

2.8.4.2 SDE management services

Management services provide for the exchange of management operations and information.

Within the OSI environment, a set of management standards, that includes ISO 9595 : 1991 (CMIS) and ISO 9596-1 : 1991 (CMIP), defines these services and messages. Within the IEEE 802 environment, the LAN/MAN Management standard (ISO/IEC DIS 15802-2 [ANSI/IEEE Std 802.1B-1992 and IEEE Std 802.1k-1993]) specifies these management services. ISO/IEC DIS 15802-2 defines an OSI management-compatible architecture, services, and protocol elements for use in a LAN/MAN environment for the purpose of performing remote management of LAN/MAN-based devices. Local management on each LAN/MAN-based host is done by local agents that perform the management operations on locally managed objects and return the management responses and notifications. This local management is performed internally using methods that are not subject to standardization. The responses and notifications are sent to the remote manager via the standardized interface, services, and protocol.

Figure 2-13 illustrates ISO/IEC DIS 15802-2 LAN/MAN Management and OSI Management of the SDE sublayer.

The SDE management information is represented as data objects contained within managed objects that represent those resources that are being managed. These management variables are available to the SDE protocol entity as data input or as output values, such as counters or writable variables.

These management variables can be viewed externally as attributes to managed objects through the management interface. Thus the SDE sublayer resources can be remotely managed either by LAN/MAN Management user processes (LMMUs) using the LAN/MAN Management Services (LMMS) and Protocol (LMMP) or by Management Information Service user processes (MIS-User at ISO layer 7) using Common Management Information Services (CMIS) and Protocol (CMIP).

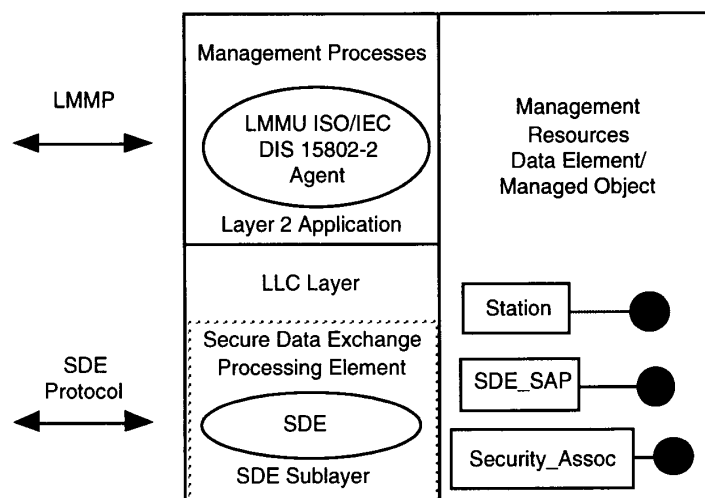
The interactions between an IEEE LAN/MAN (ISO/IEC DIS 15802-2) compliant manager and the managed objects associated with an ISO/IEC DIS 15802-2 LMMU Agent are illustrated in figure 2-14. A similar set of interactions occurs between an ISO Management Process and those managed objects either via a MIS-User Agent, via a hybrid agent that handles both CMIP and LMMP messages, or a via a LMMU Agent that transforms the CMIP messages to LMMP messages and vice versa.

2.8.4.3 SDE management operations

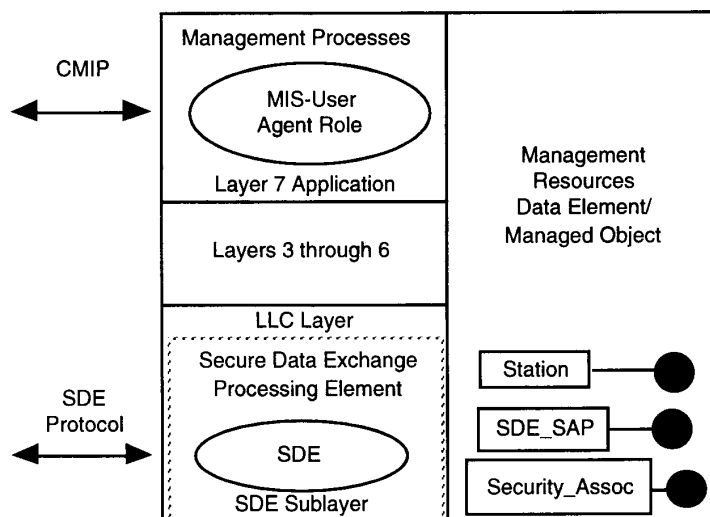
The manipulation of managed objects is carried out by a set of management operations, which are part of the management service at the management interface. The management operations that can be sent to a managed object to be applied to its attributes, or to the object as a whole, are specified in ISO/IEC 10165-1 : 1992. These operations are as follows:

Get attribute value	(GET);	--attribute related
Replace attribute value	(REPLACE);	
Replace-with-default	(REPLACE-WITH-DEFAULT);	
Add member	(ADD);	
Remove member	(REMOVE);	
Create	(CREATE);	--object related
Delete	(DELETE);	
Action	(ACTION), and;	
Notification.		

The ISO/IEC DIS 15802-2 LAN/MAN management services and the ISO CMIS/CMIP services that support these operations are as follows:



a) ISO/IEC DIS 15802-2 LAN/MAN Management



b) ISO Management

Figure 2-13—SDE management relationships

M_CREATE	Confirmed	
M_DELETE	Confirmed	
M_GET	Confirmed	
M_SET	Confirmed/nonconfirmed	
M_CANCEL_GET	Confirmed	
M_ACTION	Confirmed/nonconfirmed	
M_EVENT_REPORT	Confirmed/nonconfirmed	--notification event.

A managed system will complete one management operation before beginning the next operation. In addition to returning any data at the completion of the management operation, the agent will respond with an indication of the success or failure of that operation.