INTERNATIONAL STANDARDIZED PROFILE

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Information technology — International Standardized Profiles AOM3nn — OSI Management —

Part 2:
AOM312 — Lower Layer Systems and Network Management Ensemble for TB/TC/TD/TE/RB/RC profiles

Technologies de l'information — Profils normalisés internationaux AOM3nn — Gestion OSI —

Partie 2: AOM312 — Systèmes de couche inférieure et ensemble de gestion de réseau pour profils TB/TC/TD/TE/RB/RC

Reference number
ISO/IEC ISP 15122-2:1999(E)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. In addition to developing International Standards, ISO/IEC JTC 1 has created a Special Group on Functional Standardization for the elaboration of International Standardized Profiles.

An International Standardized Profile is an internationally agreed, harmonized document which identifies a standard or group of standards, together with options and parameters, necessary to accomplish a function or a set of functions.

Draft International Standardized Profiles are circulated to national bodies for voting. Publication as an International Standardized Profile requires approval by at least 75 % of the national bodies casting a vote.

International Standardized Profile ISO/IEC ISP 15122-2 was prepared with the collaboration of

— Asia-Oceania Workshop (AOW);

— European Workshop for Open Systems (EWOS);

— Open Systems Environment Implementors' Workshop (OIW).

ISO/IEC ISP 15122 consists of the following part, under the general title *Information technology — International Standardized Profiles AOM3nn — OSI Management*:

— *Part 2: AOM312 — Lower Layer Systems and Network Management Ensemble for TB/TC/TD/TE/RB/RC profiles*

Annexes A and B form an integral part of this part of ISO/IEC ISP 15122. Annex C is for information only.

Information technology — International Standardized Profiles AOM3nn — OSI Management —

Part 2:
AOM312 — Lower Layer Systems and Network Management Ensemble for TB/TC/TD/TE/RB/RC profiles

1 Scope

The Lower Layer System and Network Management Ensemble for **TB/TC/TD/TE/RB/RC** Profiles (LLSNME), AOM312, identifies how to manage connection oriented OSI environments using OSI Management. The scope of AOM312 is management of resources in the OSI transport layer, network layer, data link layer as specified by profiles for the OSI connection mode environment. The set of lower layer ISPs address interoperable stacks within the connection mode OSI environment. Certain connection mode ISPs interoperate with others. For example, a TB1111-compliant end system can communicate with TC1111-compliant end system through a RB51.1111-compliant system.

Transport and Relay International Standardized Profiles (ISPs) currently profile OSI Communication Stacks enabling End Systems and Intermediate Systems to interoperate. These Lower Layer profiles specify the management capability of OSI stacks. There also exists a set of System Management Function (SMF) ISPs (AOM2x) that specify how to use CMIP to perform remote management. The scope of AOM312 is to identify how to manage OSI resources by referencing and placing management requirements on Lower Layer Profiles and SMF Profiles. Conformance requirements for Managed Objects and SMF Profiles is addressed.

AOM312 addresses how to perform fault and configuration management of the OSI connection mode environment.

AOM312 specifically address how to accomplish the following systems management tasks:

- Configure Data Link , Network , or Transport Resources

- Determine current Date Link, Network , or Transport Configuration

- Determine Logical Date Link, Network, or Transport Connectivity

- Detect Data Link , Network , or Transport Errors and Changes

AOM312 is applicable in an environment in which end systems are able to take a manager role, an agent role or both.

AOM312 does not place any requirements on , or specify any conformance requirements for, the resources themselves (which is in the realm of the respective lower layer ISP).

AOM312 is based on OSI standard protocols, OSI Systems Management Information Standards, and ISPs.

AOM312 has been developed in accordance with the " Guidelines for the Scope and Content of Ensembles"(RWS-TR 005 Part 1).

2 Normative references

The following documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC ISP 15122. At the time of publication, the editions indicated were valid. All documents are subject to revision, and parties to agreements based on this part of ISO/IEC ISP 15122 are warned against automatically applying any more recent editions of the documents listed below, since the nature of references made by ISPs to such documents is that they may be specific to a particular edition. Members of IEC and ISO maintain registers of currently valid International Standards and ISPs, and ITU-T maintains published editions of its current Recommendations.

2.1 Identical CCITT/ITU-T Recommendations | International Standards

- CCITT Recommendation X.701 (1992) | ISO/IEC 10040:1992, *Information technology — Open Systems Interconnection — Systems management overview.*
- CCITT Recommendation X.720 (1992) | ISO/IEC 10165-1:1993, *Information technology — Open Systems Interconnection — Structure of management information: Management information model.*
- CCITT Recommendation X.721 (1992) | ISO/IEC 10165-2:1992, *Information technology — Open Systems Interconnection — Structure of management information: Definition of management information.*
- CCITT Recommendation X.722 (1992) | ISO/IEC 10165-4:1992, *Information technology — Open Systems Interconnection — Structure of management information: Guidelines for the definition of managed objects.*
- ITU-T Recommendation X.723 (1994) | ISO/IEC 10165-5:1994, *Information technology — Open Systems Interconnection — Structure of Management information: Generic management information.*
- ITU-T Recommendation X.724 (1994) | ISO/IEC 10165-6:1994, *Information technology — Open Systems Interconnection — Structure of Management information: Requirements and guidelines for implementation conformance statement proformas associated with OSI management.*

2.2 Paired CCITT/ITU-T Recommendations | International Standards equivalent in technical content

- CCITT Recommendation X.290 (1992), *OSI conformance testing methodology and framework for protocol Recommendations for CCITT applications — General concepts.*

  ISO/IEC 9646-1:1991, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 1: General concepts.*
- CCITT Recommendation X.291 (1992), *OSI conformance testing methodology and framework for protocol Recommendations for CCITT applications — Abstract test suite specification.*

  ISO/IEC 9646-2:1991, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 2: Abstract test suite specification.*
- ITU-T Recommendation X.296 (1995), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications — Implementation Conformance Statements.*

  ISO/IEC 9646-7:1995, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 7: Implementation Conformance Statements.*
- CCITT Recommendation X.700 (1992), *Management Framework Definition for Open Systems Interconnection (OSI).*

  ISO/IEC 7498-4:1989, *Information processing systems — Open Systems Interconnection — Basic Reference Model — Part 4: Management framework.*
- CCITT Recommendation X.710 (1991), *Common Management information Service Definition for CCITT Applications.*

  ISO/IEC 9595:1991, *Information technology — Open Systems Interconnection — Common management information service definition.*
- CCITT Recommendation X.711 (1991), *Common Management Information protocol specification for CCITT Applications.*

  ISO/IEC 9596-1:1991, *Information technology — Open Systems Interconnection — Common Management Information Protocol — Part 1: Protocol Specification.*
- ITU-T Recommendation X.284 (1993)**,** *Elements of Management Information Related to OSI Transport Layer Standards for ITU-T applications.*

  ISO/IEC 10737:1994, *Information technology — Telecommunications and information exchange between systems — Elements of Management Information Related to OSI Transport Layer Standards.*
- ITU-T Recommendation X.283 (1993), *Elements of Management Information Related to OSI Network Layer Standards for ITU-T applications.*

  ISO/IEC 10733:1993, *Information technology — Telecommunications and information exchange between systems — Elements of Management Information Related to OSI Network Layer standards.*
- ITU-T Recommendation X.282 (1993), *Elements of Management Information Related to OSI Data Link Layer Standards for ITU-T applications.*

  ISO/IEC 10742:1994, *Information technology — Telecommunications and information exchange between systems — Elements of management information related to OSI Data Link Layer standards.*

2.3 Additional references

- ISO/IEC 10589:1992, *Information technology — Telecommunications and information exchange between systems — Intermediate system to inter mediate system intra-domain routing information exchange protocol for use in conjunction with the protocol for providing the connection mode-mode Network Service (ISO 8473).*
- ISO/IEC 10747:1994, *Information technology — Telecommunications and Information Exchange between Systems — Protocol for Exchange of Inter-domain Routing Information among Systems to support Forwarding to ISO 8473 PDUs.*
- ISO/IEC TR 10000-1:1995, *Information technology — Framework and taxonomy of International Standardized profiles — Part 1: General principles and documentation framework.*
- ISO/IEC TR 10000-2:1995, *Information technology — Framework and taxonomy of International Standardized profiles — Part 2: Principles and Taxonomy for OSI profiles.*
- ISO/IEC ISP 12060-1:1995, *Information technology — International Standardized Profiles — OSI Management — Management functions — Part 1: AOM211 — General management capability.*
- ISO/IEC ISP 12060-4:1995, *Information technology — International Standardized Profiles — OSI Management — Management functions — Part 4: AOM221 — General event report management.*
- ISO/IEC ISP 12060-5:1995, *Information technology — International Standardized Profiles — OSI Management — Management functions — Part 5: AOM231 — General log control.*
- ISO/IEC ISP 12059-0:1995, *Information technology — International Standardized Profiles — OSI Management — Common Information for Management Functions — Part 0: Common definitions for management function profiles.*
- ISO/IEC ISP 10609-1:1992, *Information technology — International Standardized Profiles TB, TC, TD and TE — Connection Mode Transport Over Connection Mode Network Service — Part 1: Subnetwork-type independent requirements for Group TB.*
- ISO/IEC ISP 10609-2:1992, *Information technology — International Standardized Profiles TB, TC, TD and TE — Connection Mode Transport Over Connection Mode Network Service — Part 2: Subnetwork-type independent requirements for Group TC.*
- ISO/IEC ISP 10609-3:1992, *Information technology — International Standardized Profiles TB, TC, TD and TE — Connection Mode Transport Over Connection Mode Network Service — Part 3: Subnetwork-type independent requirements for Group TD.*
- ISO/IEC ISP 10609-4:1992, *Information technology — International Standardized Profiles TB, TC, TD and TE — Connection Mode Transport Over Connection Mode Network Service — Part 4: Subnetwork-type independent requirements for Group TE.*
- ISO/IEC ISP 10609-5:1992, *Information technology — International Standardized Profiles TB, TC, TD and TE — Connection Mode Transport Over Connection Mode Network Service — Part 5: Definition of profiles TB1111/TB1121.*
- ISO/IEC ISP 10609-6:1992, *Information technology — International Standardized Profiles TB, TC, TD and TE — Connection Mode Transport Over Connection Mode Network Service — Part 6: Definition of profiles TC1111/TC1121.*
- ISO/IEC ISP 10609-7:1992, *Information technology — International Standardized Profiles TB, TC, TD and TE — Connection Mode Transport Over Connection Mode Network Service — Part 7: Definition of profiles TD1111/TD1121.*
- ISO/IEC ISP 10609-8:1992, *Information technology — International Standardized Profiles TB, TC, TD and TE — Connection Mode Transport Over Connection Mode Network Service — Part 8: Definition of profiles TE1111/TE1121.*
- ISO/IEC ISP 10609-9:1992, *Information technology — International Standardized Profiles TB, TC, TD and TE — Connection Mode Transport Over Connection Mode Network Service — Part 9: Subnetwork-type dependent requirements for Network Layer, Data Link Layer and physical Layer concerning permanent access to a packet switched data network using virtual calls.*
- ISO/IEC ISP 12067-1:1996, *Information technology — International Standardized Profile RB — Relaying the connection-mode Network Service — Part 1: Subnetwork independent requirements.*

- ISO/IEC ISP 12067-2:1996, *Information technology — International Standardized Profile RB — Relaying the connection-mode Network Service — Part 2: LAN Subnetwork-dependent media-independent requirements.*
- ISO/IEC ISP 12067-3:1996, *Information technology — International Standardized Profile RB — Relaying the connection-mode Network Service — Part 3: PSDN subnetworks-dependent media-dependent requirements for virtual calls over a permanent access.*
- ISO/IEC ISP 12067-4:1996, *Information technology — International Standardized Profile RB — Relaying the connection-mode Network Service — Part 4: Definition of profile RB51.1111, relaying the connection-mode Network Service CSMA/CD LAN subnetworks and PSDNs using virtual calls over a PSTN leased line permanent access.*
- ISO/IEC ISP 12067-5:1996, *Information technology — International Standardized Profile RB — Relaying the connection-mode Network Service — Part 5: Definition of profile RB51.1121, relaying the connection-mode Network Service CSMA/CD LAN subnetworks and PSDNs using virtual calls over a digital data circuit / CSDN leased line permanent access.*
- ISO/IEC ISP 10614-1:1995, *Information technology — International Standardized Profile RC — X.25 protocol relaying — Part 1: Relaying functions, General overview and Subnetwork independent requirements.*
- ISO/IEC ISP 10614-2:1995, *Information technology — International Standardized Profile RC — X.25 protocol relaying — Part 2: LAN subnetwork-dependent, media-independent requirements.*
- ISO/IEC ISP 10614-3:1995, *Information technology — International Standardized Profile RC — X.25 protocol relaying — Part 3: CSMA/CD subnetwork-dependent, media-dependent requirements.*
- ISO/IEC ISP 10614-4:1995, *Information technology — International Standardized Profile RC — X.25 protocol relaying — Part 4: PSDN subnetwork-dependent, media-dependent requirements for virtual calls over a permanent access.*
- ISO/IEC ISP 10614-5:1995, *Information technology — International Standardized Profile RC — X.25 protocol relaying — Part 5: Definition of profile RC51.1111, X.25 protocol relaying between CSMA/CD LAN subnetworks and PSDNs using virtual calls over a digital data circuit/CSDN leased line permanent access.*
- ISO/IEC ISP 10614-6:1995, *Information technology — International Standardized Profile RC — X.25 protocol relaying — Part 6: Definition of profile RC51.1121, X.25 protocol relaying between CSMA/CD LAN subnetworks and PSDNs using virtual calls over a digital data circuit/CSDN leased line permanent access.*
- RWS-TR005, Part 1:1995, *Guidelines of Management Profiles — Part 1: Guidelines for the Scope and Content of Ensembles.*

3 Definitions

The terms used in this part of ISO/IEC ISP 15122 are defined in the base standards referenced in the referenced ISPs.

4 Abbreviations

CMIP	Common Management Information Protocol
CMIS	Common Management Information Service
CMISE	Common Management Information Service Element
CSMA/CD	Carrier Sense Multiple Access/Collision Detection
EFD	Event Forwarding Discriminator
FDDI	Fiber Distributed Data Interface
ICS	Implementation Conformance Statement
ISP	International Standardized Profile
IVMO	Initial Value Managed Object

LAN	Local Area Network
LLSNME	Lower Layer Systems and Network Management Ensemble
MAC	Media Access Control
MCS	Management Conformance Summary
MICS	Management Information Conformance Statement
MO	Managed Object
MOCS	Managed Object Conformance Statement
MRCS	Management Relationship Conformance Statement
OSI	Open Systems Interconnection
PDU	Protocol Data Unit
PICS	Protocol Implementation Conformance Statement
PSDN	Packet Switched Data Network
PT	Pass Through
QOS	Quality of Service
SMF	Systems Management Function

5 Conventions

The common conventions used in this part of ISO/IEC ISP 15122 are defined in ISO/IEC ISP 12059-0, ISO/IEC 9646-2, and ISO/IEC 9646-7.

6 Requirements

6.1 Resources

The resources to be managed that are within the scope of AOM312 are those that provide support for protocols and services within the OSI Transport , Network, and Data Link Layers. These resources, which are visible in the relevant standards for the service and protocol, include protocol machines, connections, entities, etc. A set of profiles (ISPs) has been specified that select the elements of the base standards that are necessary to provide a particular mode of transport service over a mode of network service over a physical media. These T (Transport) and R (Relay) profiles identify a set of resources needed to provide the particular service.

AOM312 requires support of the management option in the profile. AOM312 specifies how to complete remote management functionality supported by these ISPs across and OSI interface. If a system supports one or more of the following ISPs, AOM312 provides the associated management capability. Table 1 lists T and R profiles that can be managed by AOM312.

Table 1 — Transport and Relay ISPs addressed

Index	ISP	Profile	Profile Description
1	10609-5	TB11X1	Connection Oriented Transport class 4/2/0 over X.25
2	10609-6	TC11X1	Connection Oriented Transport class 2/0 over X.25
3	10609-7	TD11X1	Connection Oriented Transport class 0 over X.25
4	10609-8	TE11X1	Connection Oriented Transport class 2 over X.25
5	12067-4	RB51.1111	CSMA/CD-PSDN leased, CONS relay
6	12067-5	RB51.1121	CSMA/CD-PSDN relay, CSDN leased, CONS relay
7	10614-5	RC51.1111	CSMA/CD-PSDN leased, X.25 relay
8	10614-6	RC51.1121	CSMA/CD-PSDN relay, CSDN leased, X25 relay

6.2 Functional Requirements

AOM312 addresses how to perform fault and configuration management of the OSI connection mode OSI environment.

6.2.1 Fault Management

- Notifications of faults, protocol errors, quality of service degradation relating to OSI layer 2-4 protocol entities and configuration /routing information

- Administrative control and filtering (discrimination) of alarms and configuration change event reports relating to OSI layer 2-4 protocol entities and configuration/routing information.

- Administrator-controlled storage and filtering (discrimination) of alarms and configuration change reports relating to OSI layer 2-4 protocol entities and configuration/routing information.

6.2.2 Configuration Management

- Configuration monitoring, control, and attribute value change notification services for OSI layer 2-4 protocol entities and configuration/routing information.

- Status monitoring control, and state change notifications functions for layers 2-4 protocol entities and configuration/routing information.

6.3 Management View

AOM312 describes systems management of the connection mode OSI environment as described by the Lower Layer ISPs allowing configuration and fault management of the layer protocol entities.

One method of dealing with the complexity of today's network is to partition managed resources into groups Ensembles are a method of providing the grouping of sets of resources for the purposes of management. AOM312's management context includes the Data Link Layer, Network Layer, and Transport Layer ISP resources to be managed, and the management tasks that can be performed on these resources.

Manager role requirements of AOM312 is the support of management operations and notifications to/from the managed objects related to the Data Link Layer, Network Layer, and Transport Layer ISP resources.

Agent role requirements of AOM312 is the support of the managed objects related to the Data Link Layer, Network Layer, and Transport Layer ISP resources. This management requirements are specified in Lower Layer ISPs.

Figure 1 illustrates some examples of the possible OSI Connection mode environment that can be managed. Conformance can be directed to one or more of the ensemble reference points.

Each figure, by the reference points, indicates that one manager is managing one or more agents; however, the scope of AOM312 is the relationship between one manager and one agent.

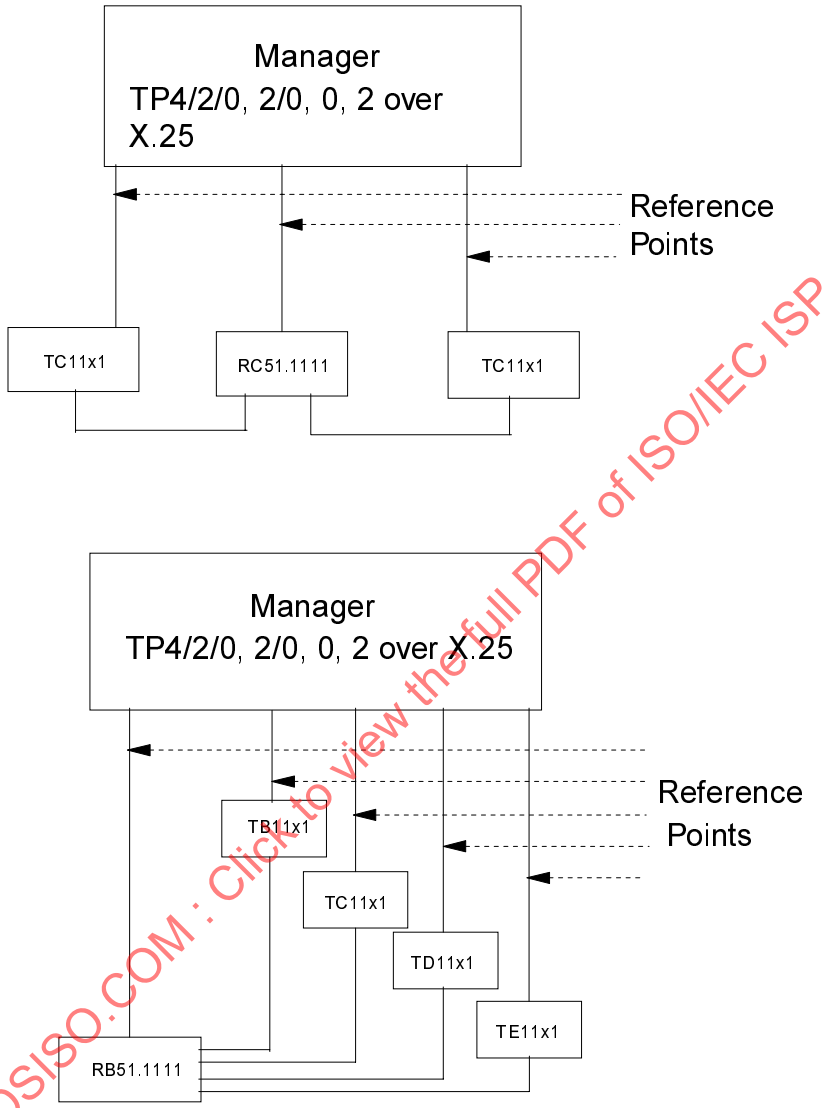

Figure 1 — Examples of Management for the OSI Connection mode Environments

7 Model

7.1 Resource Model

Figure 2 illustrates the functional relationship between the manager and agent for an TD11x1. This relationship holds true for all Transport and Relay Profiles. Note that the management information can, but does not have to be, sent over the resource profile. For example, the manager and agent stacks may comply to TD11x1 on a X.25 connection.

The shaded region highlights the parts of the diagram that are within the scope of AOM312.

The scope of AOM312 includes AOM211, AOM221, AOM231, and management capabilities related lower layer resource profiles.

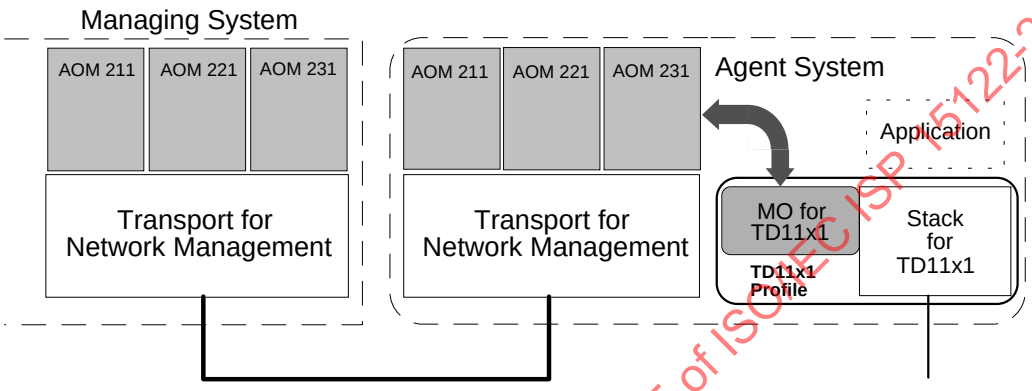

Figure 2 — Functional Relation between Manager and Agent for AOM312 and TD11x1 profiles

The managed object classes that represent the resources identified in 6.1 are shown in the following figures. Each figure illustrates a different managed object profile for a lower layer connection mode ISP. These figures also show the containment tree of these managed objects (i.e. the relationship between managed objects).

7.2 Systems Management Function

This clause specifies the system management functions used to complete the systems management functional areas described in 6.2.

7.2.1 Object Management Function

In the context of AOM312, object management provides configuration monitoring, control, and attribute value change notification services for OSI layer 2-4 protocol entities and configuration/routing information. This function might be used, for example, to acquire topological information to aid in depicting OSI end systems and intermediate systems, to information, or to configure packet segmentation and reassemble mechanisms.

7.2.2 State Management Function

In the context of AOM312, state management provides status monitoring, control, and state change notification services for OSI layer 2-4 protocol entities and configuration/routing information. This function might be used, for example, to provide current state information for routes which are currently in use, or to provide administrative control over the usage of specific protocol entities.

7.2.3 Alarm Reporting Function

In the context of AOM312, alarm reporting provides notification of faults, protocol errors, quality of service degradation, etc., relating to OSI layer 2-4 protocol entities and configuration/routing information. This function might be used, for example, to detect and signal crossing of established criteria for QOS, or errors relating to layer protocol or routing entities.

7.2.4 Event Report Management Function

In the context of AOM312, event report management provides administrative control and filtering (discrimination) of alarms and configuration change event reports relating to OSI layer 2-4 protocol entities and configuration/routing information. This function might be used, for example, to start or stop forwarding of selected alarms to a specific application responsible for fault management of a given OSI subnetwork.

7.2.5 Log Control Function

In the context of AOM312, log control provides administrator-controlled storage and subsequent retrieval of alarms and configuration change log records relating to OSI layer 2-4 protocol entities and configuration/routing information. This function might be used, for example, to retrieve previously stored configuration change information necessary to diagnose a routing fault.

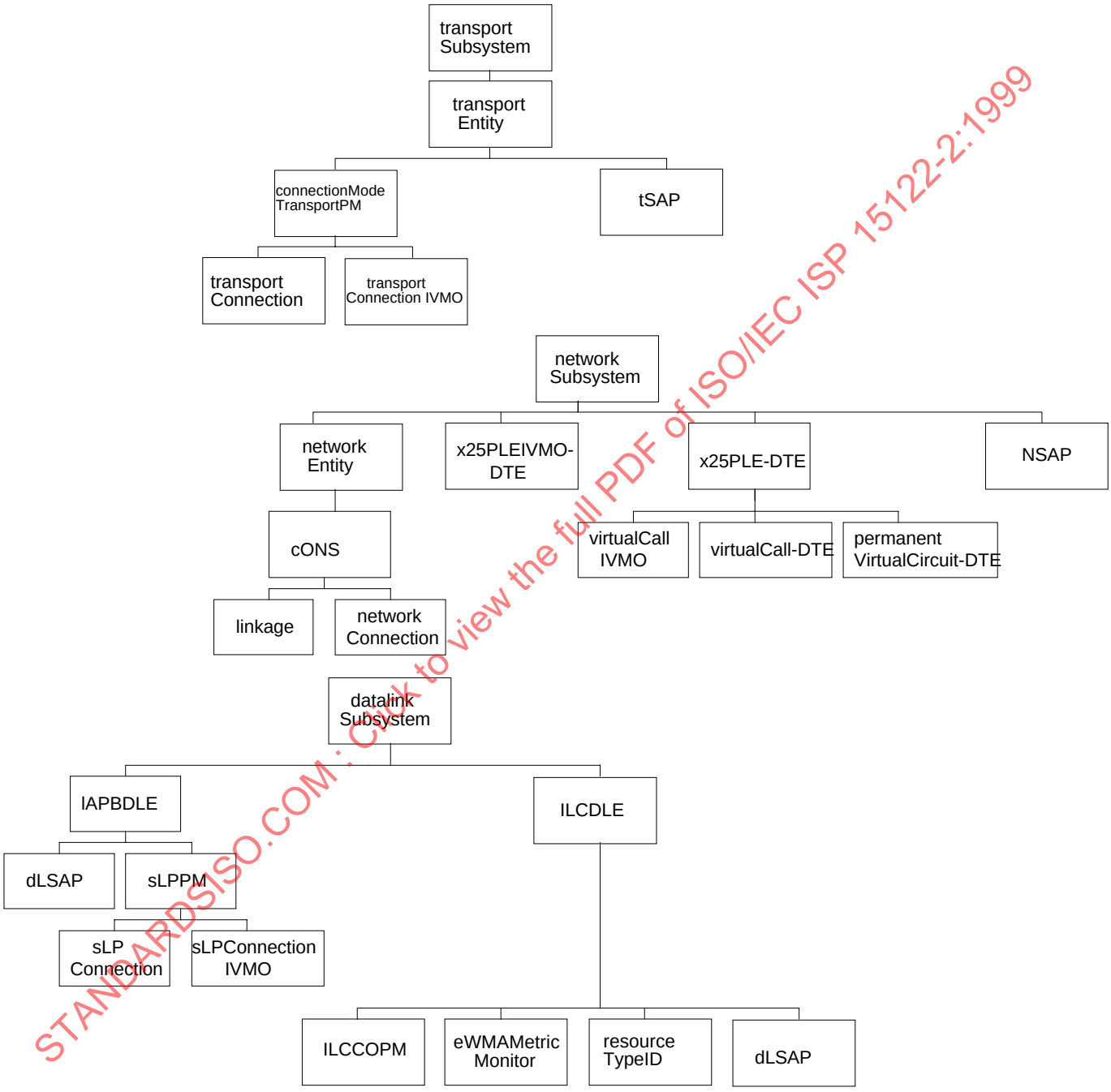

Figure 3 — Management Information Model for TB11x1/TC11x1:TD11x1/TE11x1

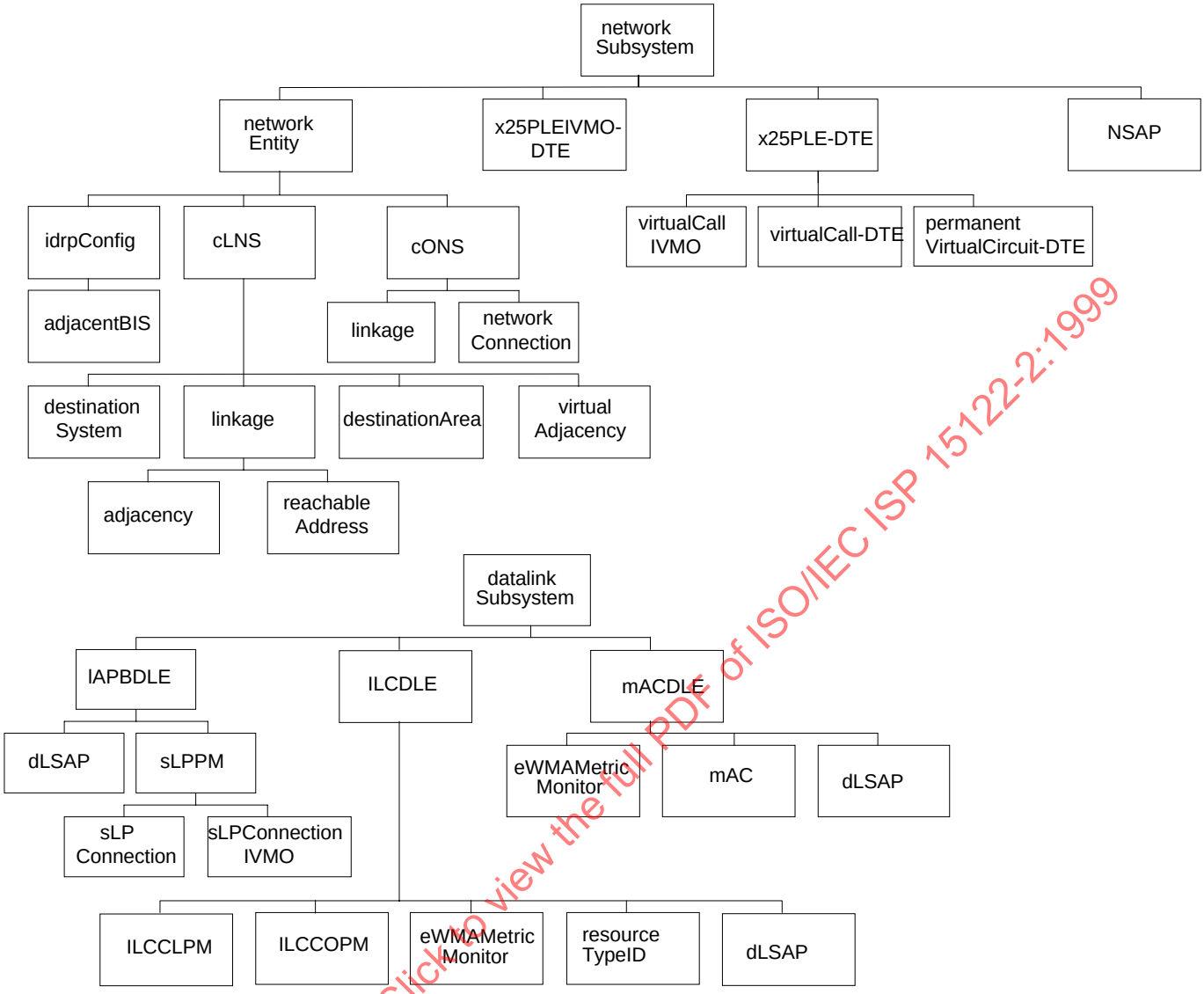

Figure 4 — Management Information Model for RB51.11x1 and RC51.11x1 Profiles

8 Conformance

The supplier of an implementation that conforms to AOM312 shall support the implementation in the manager role or agent role or both.

The supplier of an implementation that conforms to AOM312 shall support management information of at least one lower layer profile identified in Table A.2.

An implementation that conforms to AOM312 shall conform to all mandatory requirements in the systems management function profile AOM211, AOM221 and AOM231.

The supplier of an implementation that conforms to AOM312 in the agent role shall support set of managed objects relating to supported lower layer profile. Summary of management capabilities are identified in Table A.2 and detail list of managed objects is specified in each lower layer profile.

The supplier of an implementation that conforms to AOM312 in the manager role shall support management information relating to supported lower layer profile. Summary of management information are identified in C.1.1 and C.1.2.

The supplier of implementation that conforms to AOM312 shall support all the mandatory requirements of the systems management functions and management capability that are relevant according to the claims.

Annex A

(normative)

Profile Specific ICS Proforma for AOM312

A.1 Introduction

A profile specific ICS proforma is in the form of a questionnaire to be completed by the supplier of implementation conforming to this profile, to become a profile specific ICS.

A profile specific ICS proforma is essentially a set of items. An item is provided for each optional capability or for each conditional capability or for each mandatory capability. Each item includes an item number, an item description, a status value specifying the support requirement, and room for a support answer to be provided by the supplier of the implementation.

The notation used in this annex is identified in clause 5.

A.2 Profile Specific ICS Proforma

The supplier of the implementation shall specify the roles that are supported, in Table A.1.

Table A.1 — Roles

Index	Role supported	Status	Support	Additional Information
1	Does an implementation support the AOM312 in the manager role?	o.1		
2	Does an implementation support the AOM312 in the agent role?	o.1		

The supplier of the implementation shall specify management capabilities of lower layer profiles that are supported in AOM312, in Table A.2.

The supplier of the implementation shall complete the lower layer profile specific ICS proforma and conform to all mandatory requirements related to management capabilities that are supported in AOM312, identified in Table A.2.

Table A.2 — Management capabilities of lower layer profiles

Index	Identification of the document that specifies lower layer profile	Identification of lower layer profile	Status	Support	Additional Information
1	ISO/IEC ISP 10609-5	TB11X1	o.2		
2	ISO/IEC ISP 10609-6	TC11X1	o.2		
3	ISO/IEC ISP 10609-7	TD11X1	o.2		
4	ISO/IEC ISP 10609-8	TE11X1	o.2		
5	ISO/IEC ISP 12067-4	RB51.1111	o.2		
6	ISO/IEC ISP 12067-5	RB51.1121	o.2		
7	ISO/IEC ISP 10614-5	RC51.1111	o.2		
8	ISO/IEC ISP 10614-6	RC51.1121	o.2		

Annex B

(normative)

Profile Requirements List (profile RL) for AOM312

B.1 Introduction

The Profile RL is a statement that shall be supported by the supplier of the implementation conforming to this profile.

The notation used in this annex is identified in clause 5.

B.2 Profile Requirements List

B.2.1 Systems management function support

Table B.1 identifies the management conformance summary (MCS) and management capabilities to be supported as part of a claim of conformance to AOM312.

Table B.1 — Systems Management Function Profile support

Identification of Profile	Identification of MCS and Management Capabilities
AOM211	ISO/IEC ISP 12060-1, Table A.1 - A.17
AOM221	ISO/IEC ISP 12060-4, Table A.1 - A.9
AOM231	ISO/IEC ISP 12060-5, Table A.1 - A.9

B.2.2 Management capabilities support of lower layer profiles

B.2.2.1 Agent role support

An implementation that conforms to management capabilities of TB11x1 or TC11x1 or TD11x1 or TE11x1 profiles in the agent role shall support the following management capabilities, in Table B.2.

Table B.2 — Management Capabilities for TB11x1 or TC11x1 or TD11x1 or TE11x1 profiles

Index	Description	Lower layer profile	AOM312 profile	Additional Information
1	Management capability of Transport Layer	o	m	
2	Management capability of Network Layer	o	m	
3	Management capability of Data Link sublayer	o	m	
5	Management capability of Physical Layer	o	i	

An implementation that conforms to management capabilities of RB51.1111or RB51.1121 or RC51.1111 or RC51.1121 profile in the agent role shall support the following management capabilities, in Table B.3.

Table B.3 — Management Capabilities for RB51.1111or RB51.1121 or RC51.1111 or RC51.1121 profile

Index	Description	Lower layer profile	AOM312 profile	Additional Information
2	Management capability of Network Layer	o	m	
1	Management capability of MAC sublayer	o	m	
2	Management capability of Physical Layer	o	i	

B.2.2.2 Manager role support

An implementation that conforms to AOM312 in the manager role shall support management capabilities of at least one lower layer ISP, in Table B.9, Table B.10 and Table B.11.

The support of management capabilities of Physical layer is out of scope of AOM312.

Table B.9 — MICS support summary for transport layer

Index	Identification of the document that includes the MICS proforma	Table numbers of MICS proforma	Description	Constraints and values	Base Std.	Profile	Table numbers of MICS	Additional information
1	"ISO/IEC 10737 : 1994"	Table E.1 to E.15	management operations	—	c1	c4		
2	"ISO/IEC 10737 : 1994"	Table E.16	notifications	—	c2	c4		
3	"ISO/IEC 10737 : 1994"	Table E.17	actions	—	c3	c4		

c1: if D.3/1a [ISO/IEC 10737] then m else -

c2: if D.3/2a or D.3/3a or D.3/4a or D.3/5a or D.3/6a or D.3/7a or D.3/8a or D.3/11a or D.3/12a or D.3/13a or D.3/14a or D.3/16a or D.3/17a or D.3/18a or D.3/19a or D.3/20a or D.3/21a [ISO/IEC 10737] then m else -

c3: if D.3/9a or D.3/10a or D.3/15a or D.3/16a [ISO/IEC 10737] then m else -

c4: if A.2/1a or A.2/2a or A.2/3a or A.2/4a then o.3 else i

Table B.10 — MICS support summary for network layer

Index	Identification of the document that includes the MICS proforma	Table numbers of MICS proforma	Description	Constraints and values	Base Std.	Profile	Table numbers of MICS	Additional information
1	"ISO/IEC 10733 : 1993"	Table E.1 to E.42	management operations	—	c5	c14		
2	"ISO/IEC 10733 : 1993"	Table E.43	notifications	—	c6	c14		
3	"ISO/IEC 10733 : 1993"	Table E.44	actions	—	c7	c14		
4	"ISO/IEC 10747 : 1995"	Table M.1 to M.3	management operations	—	c8	o		
5	"ISO/IEC 10747 : 1995"	Table M.4	notifications	—	c9	o		
6	"ISO/IEC 10747 : 1995"	Table M.5	actions	—	c10	o		
7	"ISO/IEC 10589 : 1992"	Table H.1 to E.7	management operations	—	c11	o		
8	"ISO/IEC 10589 : 1992"	Table H.8	notifications	—	c12	o		
9	"ISO/IEC 10589 : 1992"	Table H.9	actions	—	c13	o		

c5: if D.3/1a [ISO/IEC 10733] then m else -

c6: if D.3/4a or D.3/5a or D.3/6a or D.3/7a or D.3/8a or D.3/12a or D.3/13a or D.3/14a or D.3/15a or D.3/16a or D.3/19a D.3/20a or D.3/21a or D.3/22a or D.3/23a or D.3/24a or D.3/25a or D.3/27a or D.3/28a or D.3/29a or D.3/30a or D.3/31a or D.3/32a or D.3/33a or D.3/34a or D.3/35a or D.3/36a or D.3/37a or D.3/38a or D.3/39a or D.3/41a or D.3/42a or

D.3/43a or D.3/44a or D.3/45a or D.3/48a or D.3/49a or D.3/50a or D.3/53a or D.3/54a or D.3/55a or D.3/56a or D.3/57a or D.3/58a or D.3/59a D.3/60a [ISO/IEC 10733] then m else -

c7: if D.3/2a or D.3/3a or D.3/9a or D.3/10a or D.3/11a or D.3/17a or D.3/18a or D.3/26a or D.3/40a D.3/46a or D.3/47a or D.3/51a or D.3/52a [ISO/IEC 10733] then m else -

c8: if L.2/1a [ISO/IEC 10747] then m else -

c9: if L.2/2a or L.2/3a [ISO/IEC 10747] then m else -

c10: if L.2/4a or L.2/5a or L.2/6a or L.2/7a [ISO/IEC 10747] then m else -

c11: if G.3/1a [ISO/IEC 10589] then m else -

c12: if G.3/5a or G.3/6a or G.3/7a or G.3/8a [ISO/IEC 10589] then m else -

c13: if G.3/3a or G.3/4a [ISO/IEC 10589] then m else -

c14: if A.2/1a or A.2/2a or A.2/3a or A.2/4a or A.2/11a or A.2/12a or A.2/13a or A.2/14a or A.2/15a or A.2/16a or A.2/17a or A.2/18a or A.2/19a or A.2/20a or A.2/21a or A.2/22a then o.4 else i

Table B.11 — MICS support summary for data link layer

Index	Identification of the document that includes the MICS proforma	Table numbers of MICS proforma	Description	Constraints and values	Base Std.	Profile	Table numbers of MICS	Additional information
1	"ISO/IEC 10742 : 1994"	Table F.1 to F.23	management operations	—	c15	m		
2	"ISO/IEC 10742 : 1994"	Table F.24	notifications	—	c16	m		
3	"ISO/IEC 10742 : 1994"	Table F.25	actions	—	c17	m		

c15: if E.3/1a [ISO/IEC 10742] then m else -

c16: if E.3/2a or E.3/3a or E.3/4a or E.3/5a or E.3/6a or E.3/7a or E.3/8a or E.3/9a or E.3/10a or E.3/11a or E.3/12a or E.3/13a or E.3/14a E.3/15 or E.3/17a or E.3/18a or E.3/19a or E.3/20a or E.3/21a or E.3/24a or E.3/25a or E.3/26a [ISO/IEC 10742] then m else -

c17: if E.3/16a or E.3/22a or E.3/23a [ISO/IEC 10742] then m else -

Annex C

(informative)

Ensemble Scenario

This Annex defines the Ensemble scenarios.

Each of these definitions consists of a brief textual description and message flow diagrams.

Scenarios are strictly informative. Each scenario is an example of one possible way to show how the managed objects in the information model can be used and to supply the reader additional information that facilitates understanding of how the Ensemble can be applied to real world situations.

In the scenarios that follow, CMIP flows between (and corresponding CMIS primitives within) manager and agent systems are indicated by arrows with a three-character abbreviation for request (Req), indicate (Ind), response (Rsp), and confirm (Cnf) primitives shown at the head and tail of the arrow. For example:

```
o-----Req-----------------------------------Ind----->
```

CMIS request

```
<-----Cnf-----------------------------------Rsp-----o
```

CMIS response

There are many possible scenarios that can be applied to the Systems Management for OSI Transport and Network Layers Ensemble. The following scenarios have been selected as examples.

Derive Current Data Link, Network, or Transport Layer Path Connectivity

The first step in performing almost any service provider view management task is likely to involve determining the current connectivity of the managed network. End-to-end transport connectivity and network path connectivity are included in AOM312.

Reconfigure Data Link, Network, or Transport Layer

Almost any proactive management of the OSI network will involve some sort of reconfiguration (for example, deactivation a malfunctioning protocol entity, or tuning performance-related parameters to improve QOS).

Monitor Data Link, Network, or Transport Layer Changes

It is expected that many management systems will simply monitor the managed network, displaying changes to connectivity, status, and resource configuration.

"Preconfigure" Data Link, Network, and/or Transport Layer Connections

Most OSI Data Link, Network, and Transport layer products provide configurable parameters that can be set to provide default values for connection characteristics, such as maxPDUSize or retryLimit. This capability can also be provided remotely in a distributed management environment.

These scenarios are further expanded in the following subclauses. Each provides a detailed step-by-step discussion of how these tasks can be performed using the management capability provided by AOM312. The specified calls are the pass through (PT) calls as the functions performed are users of the CMISE service. To enable the reader to focus on the salient points of the discussion, only relevant parameters or options are specified.

C.1 Relevant Information for Management Operations

This clause identifies the managed object and relevant packages and attributes of those managed objects that are to be used in one or more of the following scenarios. This information has been gathered in a separate subclause for the convenience of the reader in identifying the scope of all pertinent information.

C.1.1 Connectivity Information

C.1.1.1 Transport Layer

Managed Object	Attribute Names
transportSubsystem	subsystemId
transportEntity	actualNSAP, targetNSAP
comodeTPM	openConnections, localSuccessfulConnections, remoteSuccessfulConnections, coProtocolMachineId
transportConnection	localReference, remoteReference, callingTSelector, calledTSelector, callingNSAPAddress, calledNSAPAddress, respondingNSAPAddress, connectionDirection, networkConnectionIDs
tsap	sap1Addresses, sapId, userEntityNames

C.1.1.2 Network Layer

Managed Object	Attribute Names
cONS	coProtocolMachineId
linkage	l1CircuitId, l2CircuitId, linkageId, manualsISSNPAAddress, ptPtCircuitId, rejectedAdjacencies, sN-SAP, sN-ServiceProvider
nSAP	providerEntityNames, sap2Address, sapId, userEntityNames
networkConnection	connectionId, localNSAPMO, remoteNSAPMO, supportedConnectionNames
networkEntity	communicationEntityId, localSAPNames, networkEntityTitles
networkSubsystem	subsystemId
permanentVirtualCircuit-DTE	logicalChannel, virtualCircuitId
virtualCall-DTE	originallyCalledAddresses, remoteDTEAddresses, virtualCircuitId
X25-PLE	localDTEAddresses, logicalChannelAssignments, sN-SAP, sN-ServiceProvider, x25PLEMode
X25-DTE	callsconnected, localDTEAssignments, sN-SAP, sN-ServiceProvider, x25PLEId
destination System	networkEntityTitle
adjancency	adjancencyId
destinationArea	addressPrefix
reachableaddress	reachableAddressId, addressPrefix,mappingType, sNPAAddresses(explicitSNPA-P), sNPAMask(extractDSP-P), sNPAPrefix(extractDSP-P)
vertualAdjacency	networkEntityTitle
idrpConfig	externalBISNeightor, internaBIS, internalSystems, intraIS
adjacentBIS	bisNet, bisPeerSNPAs, bisRDC, bisRDI

C.1.1.3 Data Link Layer

Managed Object	Attribute Names
dLSAP	sap1Address, sapId, userEntityNames
datalinkEntity	communicationsId, localSAPNames, providerEntityNames
datalinkSubsystem	subsystemId
lAPBDLE	communicationsEntityId, localSapNames, providerEntityNames
lLCCLPM	clProtocolMachineId, totalRemoteSAPs
lLCCOPM	coProtocolMachineId
lLCDLE	communicationsEntityId, localSapNames, providerEntityNames
mACDLE	communicationEntityId, localSapNames, providerEntityNames
resourceType	resourceTypeId, resourceInfo, resourceTYPEIDName
sLPConnection	connectionId, underlyingConnectionNames, supportedConnectionNames
sLPPM	coProtocolMachineId

C.1.2 Configuration Information

C.1.2.1 Transport Layer

Managed Object	Attribute Names
transportSubsystem	subsystemId
transportEntity	actualNSAP, targetNSAP
comodeTPM	openConnections, localSuccessfulConnections, remoteSuccessfulConnections,
transportConnection	localReference, remoteReference, callingTSelector, calledTSelector, callingNSAPAddress, calledNSAPAddress, respondingNSAPAddress, connectionDirection, networkConnectionIDs
tsap	sap1Addresses, sapId, userEntityNames

C.1.2.2 Network Layer

Managed Object	Attribute Names
networkEntity	systemTypes
cONS	administrativeState, coProtocolMachineId, operationalState, operationalSystemType
dSeriesCounts	dSeriesId
linkage	linkageId, operationalProtocols, enableChecksum, iSO9542OperationalSubsets, holdingTimeMultiplier, defaultESConfigurationTimer, activeESConfigurationTimer, iSO9542OperationalSubsets, holdingTimeMultiplier, iSConfigurationTimer, suggestedESConfigurationTimer, redirectHoldingTime, administrativeState, callEstablishmentDefaultMetricIncrement, callEstablishmentDelayMetricIncrement, callEstablishmentErrorMetricIncrement, callEstablishmentExpenseMetricIncrement, circuitReceivePasswords, circuitTransmitPassword, eSReachabilityChanges, externalDomain, iSISHelloTimer, iSReachabilityChanges, idleTimer, initialMinimumTimer, initializaitionFailures, l1CircuitId, l1DefaultMetric, l1DelayMetric, l1DesignatedIntermediateSystem, l1ErrorMetric, l1ExpenseMetric, l1IntermediateSystemPriority, l2CircuitId, l2DefaultMetric, l2DelayMetric, l2DesignatedIntermediateSystem, l2ErrorMetric, l2ExpenseMetric, l2IntermediateSystemPriority, manualISSNPAAddress, manualL2OnlyMode, maximumAreaAddressesMismatches, operationalState, outgoingCallIVMO, ptPtCircuitId, rejectedAdjacencies, sN-SAP, sN-ServiceProvider
nSAP	providerEntityNames, sap2Address, sapId, userEntityNames
networkConnection	connectionId, localNSAPMO, remoteNSAPMO, supportedConnectionNames, underlyingConnectionNames
networkSubsystem	subsystemId

permanentVirtualCircuit-DTE	logicalChannel, operationalState, remoteDTEAddress, remoteLogicalChannel, throughputClasses, virtualCircuitId, windowSizes
virtualCall-DTE	calledAddressExtension, callingAddressExtension, direction, fastSelect, logicalChannel, remoteDTEAddresses, reverseCharging, throughputClasses, virtualCircuitId, windowSizes
virtualCallIVMO	fastSelect, packetSizes, reverseCharging, throughputClasses, virtualCallIVMOId, windowSizes
virtualCircuit-DTE	throughputClasses, virtualCallIVMOId, windowSizes
X25PLE	administrativeState, defaultPacketSizes, defaultThroughputClasses, defaultWindowSizes, flowControlParameterNegotiation, localDTEAddresses, logicalChannelAssignments, protocolVersionSupported, sN-SAP, sN-ServiceProvider, throughputClassNegotiation, x25PLEId, x25PLEMode
X25PLE-DTE	administrativeState, callDeflectionSubscription, callRequestResponseTimer, defaultPacketSizes, defaultThroughputClasses, defaultWindowSizes, extendedPacketSequenceNumbering flowControlParameterNegotiation, interruptResponseTimer, localDTEAddresses, logicalChannelAssignments, maxActiveCircuits, minimumRecallTimer, operationalState, protocolVersionSupported, registrationPermitted, registrationRequestResponseTimer, rejectResponseTimer, resetRequestResponseTimer, resetTimeouts, restartCountsExceeded, restartRequestResponseTimer, sN-SAP, sN-ServiceProvider, throughputClassNegotiation, windowRotationTimer, windowStatusTransmissionTimer, x25PLEId, x25PLEMode

X25PLEIVMO	defaultPacketSizes, defaultThroughputClasses, defaultWindowSizes, flowControlParameterNegotiation, localDTEAddresses, logicalChannelAssignments, objectClass, sN-ServiceProvider, throughputClassNegotiation, x25PLEIVMOId, x25PLEMode
X25PLEIVMO-DTE	callDeflectionSubscription, callRequestResponseTimer, defaultPacketSizes, defaultThroughputClasses, defaultWindowSizes, extendedPacketSequenceNumbering flowControlParameterNegotiation, interruptResonseTimer, localDTEAddresses, logicalChannelAssignments, maxActiveCircuits, minimumRecallTimer, operationalState, protocolVersionSupported, registrationPermitted, registrationRequestResponseTimer, rejectResponseTimer, resetRequestResponseTimer, resetTimeouts, restartCountsExceeded, restartRequestResponseTimer, sN-SAP, sN-ServiceProvider, throughputClassNegotiation, windowRotationTimer, windowStatusTransmissionTimer, x25PLEId, x25PLEMode
destination System	defaultMetricPathCost, defaultMetricOutputAdjancencies, delayMetricPathCost, delayMetricOutputAdjacencies, expenseMetricPathCost, expenseMetricOutputAdjancencies, errorMetricPathCost, errorMetricOutputAdjancies
adjancency	adjacencyState, neighbourSystemType, adjancencyUsage(isAdjacency-P), priorityOfNeighbour(broadcastISAdjancency-P)
reachableaddress	defaultMetric, delayMetric, expenseMetric, errorMetric, defaultMetricType, delayMetricType, expenseMetrictype, errorMetricType
vertualAdjacency	metric

idrpConfig	authenticationTypeCode, capacity, holdTime, locExpense, localRDI, localSNPA, maxCPUOverloadTimer, maxPDULocal, maxRIBintegrityCheck, maxRIBIntergrityTimer, minRDOriginationTimer, multiExit, priority, rdLRE, rdTransitDelay, rdcConfig, retransmissionTime, ribAddsSet, routeServer, version
adjacentBIS	bisNegotiatedVersion, closeWaitDelayTimer, holdTimer, keepAliveTimer, keepAlivesSinceLastUpdate, lastAckRecv, lastAckSent, lastPriorSeqNo, lastSeqNoRecv, lastSeqNoSent, listenForOPEN, maxPDUPeer, minRouteAdvertisementinterval, minRouteAdvertisementTimer, outstandingPDUs, state, totalBISPDUsIn, totalBISPDUsOut, updatesIn, updatesOut

C.1.2.3 Data Link Layer

Managed Object	Attribute Names
dLSAP	sap1Address, sapId, userEntityNames
datalinkSubsystem	subsystemId
eWMAMetricMonitor	administrativeState, counterModulus, counterTMinusGP, derivedGauge, estimateOfMean, granularityPeriod, movingTimePeriod, observedAttributeId, observedManagedObjectInstance, operationalState, scannerId, severityIndicatingThreshold
lAPBDLE	communicationsEntityId
lLCCLPM	clProtocolMachineId, operationalState, totalRemoteSAPs
lLCCOPM	coProtocolMachineId, operationalState
lLCDLE	communicationsEntityId, localSapNames, operationalState, providerEntityNames
mACDLE	communicationEntityId, localSapNames, operationalState, providerEntityNames
resourceType	resourceInfo, resourceTYPEIDName
sLPConnection	connectionId, k, n1, n2, sequenceModules, t1Timer, t2Timer, t3Timer, t4Timer, underlyingConnectionNames
sLPPM	coProtocolMachineId, operationalState

C.2 Determine Current Data Link, Network, or Transport Layer Connectivity

C.2.1 Obtain Layer Subsystem Configuration

Obtain layer subsystem configuration by having the manager send to each agent in its domain a request for relevant attributes.

To promote readability, the local relative distinguished name (RDN) has been used to identify the MO instance. In actual practice, the full distinguished name (DN) is expected to be used.

C.2.1.1 For Transport Connectivity Configuration Information

```
o-----Req-----------------------------------Ind----->
```

M-GET (MOClass: transportSubsystem,
MOInstance: subsysemId=“TransportSubsystem”,
Scope: Transport Entity, COTP, Transport Connection,
AttributeIdList: (See list for connectivity in C.1.1.1))

Agent receives PT-GET Indication, returns a PT-GET Response containing all or selected attributes for every MO instance contained in NW system (s).

```
<-----Cnf---------------------------------Rsp-----o
```

M-GET (MOClass: transportSubsystem,
MOInstance: subsystemId="TransportSubsystem",
Scope: subsystemId,
AttributeIdList: (See list for connectivity in C.1.1.1))

Manger receives PT-GET Confirm and accumulates managed object instance/attribute information.

C.2.1.2 For Network Connectivity Configuration Information

```
o-----Req---------------------------------Ind----->
```

M-GET (MOClass: networkSubsystem,
MOInstance: subsysemId="NetworkSubsystem",
Scope: subsystemId,
AttributeIdList: (See list for connectivity in C.1.1.2))

Agent receives PT-GET Indication, returns a PT-GET Response containing all or selected attributes for every MO instance contained in NW system (s).

```
<-----Cnf---------------------------------Rsp-----o
```

M-GET (MOClass: networkSubsystem,
MOInstance: subsystemId="NetworkSubsystem",
AttributeIdList: (See list for connectivity in C.1.1.2))

Manger receives PT-GET Confirm and accumulates managed object instance/attribute information.

C.2.1.3 For Data Link Connectivity Configuration Information

```
o-----Req---------------------------------Ind----->
```

M-GET (MOClass: datalinkSubsystem,
MOInstance: subsystemId="DatalinkSubsystem",
Scope: subsystemId,
AttributeIdList: (See list for connectivity in C.1.1.3))

Agent receives PT-GET Indication, returns a PT-GET Response containing all or selected attributes for every MO instance contained in NW system (s).

```
<-----Cnf---------------------------------Rsp-----o
```

M-GET (MOClass: datalinkSubsystem,
MOInstance: subsystemId="DatalinkSubsystem",
AttributeIdList: (See list for connectivity in C.1.1.3))

Manger receives PT-GET Confirm and accumulates managed object instance/attribute information.

C.2.2 Determine Current Connectivity

Use addressing information and relationship attributes to determine layer 2, 3, 4 connectivity.

For example:

dlSAP's userEntityNames identifies user of data link service
nSAP's userEntity attribute identifies transportEntity
transportEntity's actualNSAP attribute identifies nSAP
transportConnection's underlyingConnectionNames identifies nSAP of peer system

C.3 Configure Data Link, Network, or Transport Layer

To configure network and/or transport layer resources, the following CMIS sequence could occur.