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STANDARD

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10737

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1994-10-01

**Information technology —
Telecommunications and information
exchange between systems — Elements
of Management Information Related to OSI
Transport Layer Standards**
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*Technologies de l'information — Télécommunications et échange
d'information entre systèmes — Éléments d'information de gestion
concernant les normes de la couche Transport OSI*



Reference number
ISO/IEC 10737:1994(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. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 10737 was prepared by joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

Annex A forms an integral part of this International Standard. Annexes B and C are for information only.

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Introduction

This document is one of a set of International Standards produced to facilitate the interconnection of open systems. The set of International Standards covers the services, protocols and management information required to achieve such interconnection.

This International Standard is positioned with respect to other related International Standards by the layers defined in the *Reference Model for Open Systems Interconnection* (ISO 7498). In particular, it is concerned with the definition of Transport Layer management information.

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Information technology — Telecommunications and information exchange between systems — Elements of Management Information Related to OSI Transport Layer Standards

1 Scope

This International Standard provides the specification of management information within an Open System related to those operations of the OSI Transport Layer specified by CCITT Recommendations and International Standards. Specifics on how Transport layer management is accomplished is beyond the scope of this document. Transport Layer management information is defined by specifying:

- the managed object class definition of Transport Layer Managed Objects following guidelines put forth by the *Structure of Management Information* (ISO/IEC 10165 and CCITT Recommendations X.720 - X.723),
- the relationship of the Managed Objects and attributes to both the operation of the layer and to other objects and attributes of the layer, and
- the action type operations on the attributes of Transport Layer Managed Objects that are available to OSI Systems Management.

2 Normative references

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The following CCITT Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid international standards. The CCITT Secretariat maintains a list of the currently valid CCITT Recommendations.

2.1 Identical 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*.

CCITT Recommendation X.723 (1991) | ISO/IEC 10165-5:—¹⁾, *Information technology — Open Systems Interconnection — Structure of Management Information: Generic management information*.

1) To be published.

CCITT Recommendation X.730 (1992) | ISO/IEC 10164-1:1993, *Information technology — Open Systems Interconnection — Systems Management: Object Management Function.*

CCITT Recommendation X.731 (1992) | ISO/IEC 10164-2:1993, *Information technology — Open Systems Interconnection — Systems Management: State management function.*

CCITT Recommendation X.732 (1992) | ISO/IEC 10164-3:1993, *Information technology — Open Systems Interconnection — Systems Management: Attributes for representing relationships.*

CCITT Recommendation X.733 (1992) | ISO/IEC 10164-4:1992, *Information technology — Open Systems Interconnection — Systems Management: Alarm reporting function.*

CCITT Recommendation X.734 (1992) | ISO/IEC 10164-5:1993, *Information technology — Open Systems Interconnection — Systems Management: Event report management function.*

2.2 Paired Recommendations | International Standards equivalent in technical content

CCITT Recommendation X.200 (1988), *Reference Model of Open Systems Interconnection for CCITT Applications.*

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

CCITT Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1).*

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

CCITT Recommendation X.214 (1988), *Transport service definition for Open Systems Interconnection for CCITT applications.*

ISO 8072:1994, *Information technology — Open Systems Interconnection — Transport service definition.*

CCITT Recommendation X.224 (1988), *Transport protocol specification for Open Systems Interconnection for CCITT applications.*

ISO/IEC 8073:1992, *Information technology — Telecommunications and information exchange between systems — Open Systems Interconnection — Protocol for providing the connection-mode transport service.*

CCITT Recommendation X.700 (1992), *Management Framework for Open Systems Interconnection for CCITT applications.*

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

2.3 Additional reference

ISO 8602:1987, *Information processing systems — Open Systems Interconnection — Protocol for providing the connectionless-mode Transport Service.*

3 Definitions

3.1 Basic reference model

This International Standard makes use of the following terms defined in ISO 7498.

- a) Open System
- b) (N)-service-access-point
- c) Transport Layer
- d) Transport Protocol
- e) Layer Management
- f) Systems management

3.2 Information model

This International Standard makes use of the following terms defined in ISO/IEC 10165-1.

- a) Attributes
- b) Attribute type
- c) Containment
- d) Distinguished Name
- e) Inheritance
- f) Managed Object
- g) Management Operations
- h) Notifications
- i) Object Class
- j) Relative Distinguished Name
- k) Subclass
- l) Superclass

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3.3 GDMO

This International Standard makes use of the following terms defined in ISO/IEC 10165-4.

- a) Managed Object Class Definition
- b) Template
- c) Parameter

3.4 Management Framework

This International Standard makes use of the following term defined in ISO 7498-4.

Management Information

4 Symbols and Abbreviations

Within the Managed Object definitions and GDMO templates the following abbreviations are used in the standard-name element of a document-identifier when making references to other documents.

| | |
|-----|--|
| DMI | CCITT Rec X.721 (1992) ISO/IEC 10165-2: 1992 |
| GMI | CCITT Rec X.723 ISO/IEC 10165-5 |

This International Standard makes use of the following symbols and abbreviations.

| | |
|---------|--|
| AK TPDU | Data Acknowledge TPDU |
| CMIP | Common Management Information Protocol |
| CMIS | Common Management Information Service |
| DR TPDU | Disconnect Request TPDU |
| EA TPDU | Expedited Acknowledge TPDU |
| ED TPDU | Expedited Data TPDU |
| ER TPDU | Error TPDU |
| GDMO | Guidelines for Definition of MOs |
| IVMO | Initial Values Managed Object |
| MO | Managed Object |
| OSI | Open Systems Interconnection |
| PM | Protocol machine |
| RDN | Relative Distinguished Name |
| TC | Transport Connection |
| TPDU | Transport Protocol Data Unit |
| TSAP | Transport Service Access Point |

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5 Elements of Transport Layer Management Information

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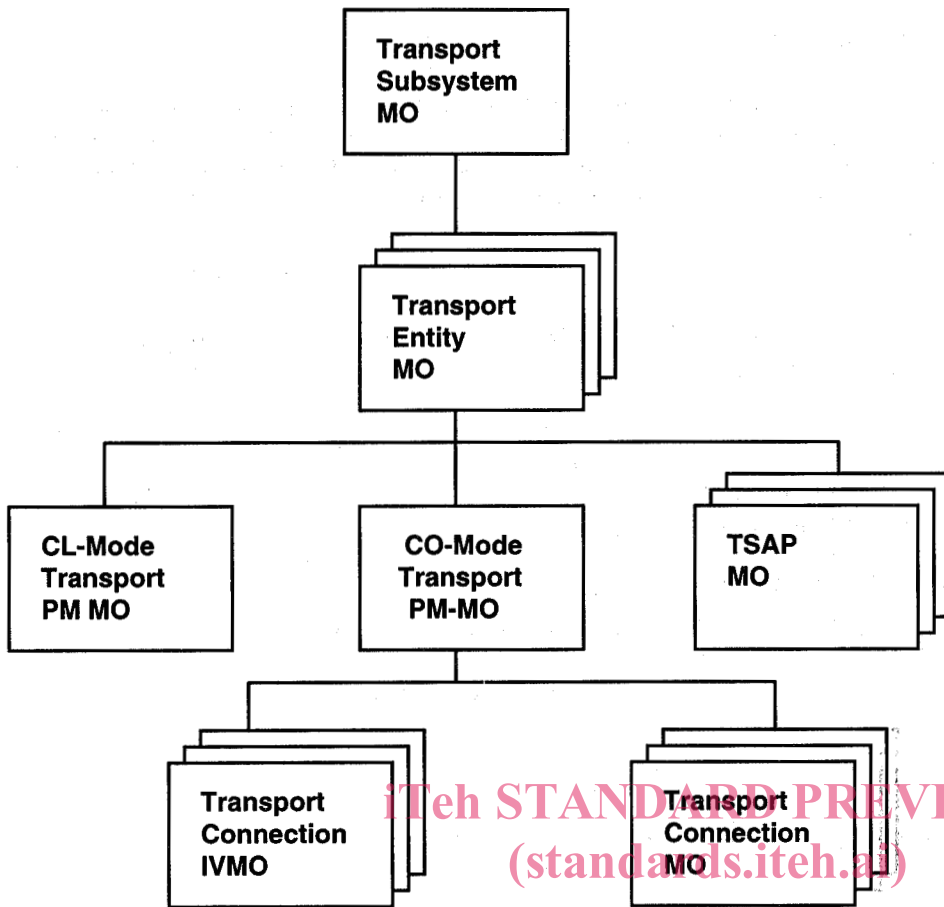
5.1 Managed Object Hierarchy

5.1.1 Summary of managed objects

The following set of managed objects are defined for the Transport Layer:

- a) Transport Subsystem managed object (transportSubsystem, see 5.3)
- b) Transport Entity managed object (transportEntity, see 5.4)
- c) Connectionless Transport Protocol Machine managed object (clmodeTPM, see 5.5)
- d) Connection-Oriented Transport Protocol Machine managed object (comodeTPM, see 5.6)
- e) Transport SAP managed object (tSAP, see 5.7)
- f) Transport Connection managed object (transportConnection, see 5.8.1)
- g) Transport Connection Initial Values managed object (transportConnectionIVMO, see 5.8.2)

These Managed Objects represent OSI Management's view of those elements of an Open System which support the OSI Transport Service subject to OSI management operations. The containment hierarchy is illustrated in figure 1. Managed objects which can have multiple instances are illustrated by multiple boxes. These objects are defined in detail in the following subclauses.



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Figure 1 - Transport Layer Containment Hierarchy
<https://standards.iteh.ai/catalog/standards/sist/8807/d773-78c5-4cc7-acb4-9a0196b104a5/iso-iec-10737-1994>

5.1.2 Relationships

5.1.2.1 General description

The use of Relationship attributes is illustrated by examples in Annex C of this International Standard. The following describes the individual relationships for Transport layer in more detail.

5.1.2.2 Layer n-1 Services

The Transport Layer Entity has a relation (actualNSAP) to the NSAP MO.

5.1.2.3 Connections

There is a relationship (underlyingConnectionNames) between a Transport Connection MO and its underlying Network LayerConnection MO (if one exists).

5.1.3 Minimum Event Filtering Capabilities

The transport layer management definitions embodied in this specification imply the frequent and possibly excessive generation of notifications of notifications during regular layer operation. These notifications are especially useful for effective fault management where they facilitate the tracing and pinpointing of error situations. To avoid the excessive dissemination of these event reports under normal operating conditions, it is advisable for a managed system to have as a minimum the capability to perform discrimination based on

- a) the source managed object class;
- b) the object Identifier values in the probable cause and specific problems field of Communication alarms, and the communication type field of Communication informations.

5.1.4 Use of Optional Fields

Where reference is made in this International Standard to ASN.1 syntax defined in Rec. X.723 | ISO/IEC 10165-5 or Rec.X.721 | ISO/IEC 10165-2, only the following fields shall be employed:

- a) those which are not OPTIONAL in the ASN.1 syntax;
- b) those which are OPTIONAL, but whose use is explicitly required by this International Standard;
- c) those which are OPTIONAL, but whose ASN.1 type is SET OF MngmntExtension.

The use of any other field is prohibited.

5.2 Common Transport Layer GDMO Definitions

commonCreationDeletion-B BEHAVIOUR
DEFINED AS

!Managed object class imports the 10165-2 objectCreation and objectDeletion notifications. Used as follows:

ObjectCreation - Generated whenever an instance of the managed object class is created. Implementations may optionally include the sourceIndicator parameter in the notification. If creation occurred as a result of internal operation of the resource, the value 'resourceOperation' is used. If creation occurred in response to a management operation, the value 'managementOperation' is used. A value of 'unknown' may be returned if it is not possible to determine the source of the operation. None of the other optional parameters are used.

ObjectDeletion - Generated whenever an instance of the managed object class is deleted. Implementations may optionally include the sourceIndicator parameter in the notification. If deletion occurred as a result of internal operation of the resource, the value 'resourceOperation' is used. If deletion occurred in response to a management operation, the value 'managementOperation' is used. A value of 'unknown' may be returned if it is not possible to determine the source of the operation. None of the other optional parameters are used.!!;

commonStateChange-B BEHAVIOUR
DEFINED AS

!Managed object class imports the 10165-2 stateChange notification. Used to report the changes to the operationalState attribute, and where present, the administrativeState attribute. A single parameter set is included in the State change definition field. Only the (mandatory) attributeId and (optional) newAttributeValue parameters are used.!!;

octetsSentReceivedCounter-B BEHAVIOUR
DEFINED AS

!The octetsSentCounter and octetsReceivedCounter shall count only user data octets in valid data TPDUs. They shall not count user data octets in data TPDUs which are rejected for any reason, nor user data octets in non-data TPDUs.!!;

successfulConnectionEstablishment-B BEHAVIOUR

DEFINED AS

!This Package imports the communicationsInformation notification from "GMI". It is used to report the following events :

successfulConnectionEstablishment: Generated when a connection is successfully established. However the precise synchronization between the notification and the corresponding protocol and service interface interactions is not defined by this Specification

The value TLM.successfulConnectionEstablishment shall be reported in the informationType field.!

deactivateConnection-B BEHAVIOUR

DEFINED AS

!The deactivate action causes the connection to be terminated. The termination should occur as rapidly as practical, but no particular time constraints are implied. Typically, this action simulates a disconnect request received across the service interface. If a more rapid means for terminating the connection exists, then this should be used. The termination shall occur in conformance to the protocol standard. The Managed Object remains in existence after completion of the Deactivate Action. It is subsequently deleted when the connection is terminated, in the same way as if the connection has been terminated by other means. A Deactivate action may fail (with the ProcessingError response) if it is temporarily not possible to terminate the connection.!

resettingTimer-B BEHAVIOUR

DEFINED AS

!This attribute specifies the interval between certain events in the operation of the protocol state machine. If the value of the attribute is changed to a new value while the protocol state machine is in operation, the implementation shall take the necessary steps to ensure that for any time interval which was in progress when the corresponding attribute was changed, the next expiration of that interval takes place no later than the expiration of the interval in progress or the specified interval whichever is the sooner. The precision with which this time shall be implemented shall be the same as that associated with the basic operation of the timer attribute.!

5.3 The transport subsystem managed object

-- Managed Object for Transport Layer Subsystem

-- There is exactly one of these MOs within
 -- a system. It exists to provide a container for the layer entity MOs.
 --
 -- The transportSubsystem managed object cannot be created or deleted
 -- explicitly by management operation. It exists inherently in a system;
 -- created and deleted as part of system operation.

transportSubsystem MANAGED OBJECT CLASS

DERIVED FROM "GMI":subsystem;

-- which is derived from "DMI":top

CHARACTERIZED BY transportSubsystem-P PACKAGE

ATTRIBUTES

"GMI":subsystemId

INITIAL VALUE TLM.transportSubsystemId-Value

GET;

;;

REGISTERED AS {TLM.moi transportSubsystem (1)};

-- Name Bindings

transportSubsystem-system NAME BINDING

SUBORDINATE OBJECT CLASS transportSubsystem AND SUBCLASSES;

NAMED BY

SUPERIOR OBJECT CLASS "DMI":system AND SUBCLASSES;

```
WITH ATTRIBUTE "GMI":subsystemId;
REGISTERED AS {TLM.nboi transportSubsystem-system (1)};
```

5.4 The transport entity managed object

- There may be multiple instances of these MOs within a system.
- Its definition permits it to be deleted and created explicitly by
- management operation, or to be created and deleted automatically
- as part of system operation.

```
transportEntity MANAGED OBJECT CLASS
DERIVED FROM "GMI":communicationsEntity;
-- which is derived from "DMI":top
CHARACTERIZED BY transportEntity-P PACKAGE
  BEHAVIOUR tEPackageImportedNotifications-B,
  commonCreationDeletion-B;
ATTRIBUTES
  actualNSAP GET,
  checksumErrorsDetected GET,
  protocolErrors GET,
  targetNSAP GET-REPLACE ADD-REMOVE,
  undecodedNSDUs GET;
```

ATTRIBUTE GROUPS

- The following attribute group is present in each of the transport
- MOs which define counters. It allows all of the
- counters to be retrieved in a single request.

```
"GMI":counters
  checksumErrorsDetected
  protocolErrors
  undecodedNSDUs;
```

NOTIFICATIONS

- protocolErrorNotification;
- The following notification is issued by the entity MO
- because in some cases it may be impossible to associate the
- protocol Error with any of the protocol Machines;

```
"DMI":communicationsAlarm
  tEProtocolErrorPDUHeader
  tEProtocolErrorSourceAddress
  tEProtocolErrorReasonCode,
```

```
"DMI":objectDeletion,
"DMI":objectCreation;;;
```

```
REGISTERED AS {TLM.moi transportEntity (2)};
```

-- Behaviours

- Definition of the tEPackageImportedNotifications and of the mapping
- of specific protocol error parameters into the fields of
- communicationsAlarm Notification.

```
tEPackageImportedNotifications-B BEHAVIOUR
```

DEFINED AS

!Notification issued when a Transport Entity receives a PDU which is invalid or contains a protocol error. The notification includes the header of the invalid PDU, the source N-Address, and the reason why the PDU is considered to be in error. The Reason code appears only if the protocol error relates to the connection-mode protocol, and if it has been possible to relate the PDU to a particular connection. The reason code is the value placed in the corresponding parameter of the ER TPDU, if sent. The tEPackage imports the communicationsAlarm Notification from DMI, in order to report the ProtocolError event. The probableCause shall be set to TLM.communicationsProtocolError. The tEProtocolErrorPDUheader, tEProtocolErrorSourceAddress and tEProtocolErrorReasonCode are reported as parameters in the additionalInformation field of the communicationsAlarm. The significance subparameter of each item of the problemData shall be set to the value 'False' (i.e. not significant) so that a managing system receiving the event will be less likely to reject it. The perceivedSeverity shall be set to Minor. A

subsequent communicationsAlarm with a perceivedSeverity value of 'Cleared' shall not be generated. No other fields or parameters shall be used, with the exception of further parameters in the additionalInformationfield.!!;

-- Name Bindings

transportEntity-transportSubsystem-Automatic NAME BINDING
 SUBORDINATE OBJECT CLASS transportEntity AND SUBCLASSES;
 NAMED BY
 SUPERIOR OBJECT CLASS transportSubsystem AND SUBCLASSES;
 WITH ATTRIBUTE "GMI":communicationsEntityId;
 BEHAVIOUR transportEntity-transportSubsystem-Automatic-B BEHAVIOUR
 DEFINED AS
 !This name binding shall be used when the transportEntity MO is created automatically by the operation of the system. The details of this operation are outside the scope of this Specification.!!;
 REGISTERED AS {TLM.nboi transportEntity-transportSubsystem-Automatic (11)};

transportEntity-transportSubsystem-Management NAME BINDING
 SUBORDINATE OBJECT CLASS transportEntity AND SUBCLASSES;
 NAMED BY
 SUPERIOR OBJECT CLASS transportSubsystem AND SUBCLASSES;
 WITH ATTRIBUTE "GMI":communicationsEntityId;
 BEHAVIOUR transportEntity-transportSubsystem-Management-B BEHAVIOUR
 DEFINED AS
 !This name binding shall be used when the transportEntity MO is created by management.!!;
 CREATE;
 DELETE;
 REGISTERED AS {TLM.nboi transportEntity-transportSubsystem-Management (12)};

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-- Attributes

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 actualNSAP ATTRIBUTE
 WITH ATTRIBUTE SYNTAX TLM.LocalDistinguishedNames;
 MATCHES FOR EQUALITY, SET-INTERSECTION;
 BEHAVIOUR actualNSAP-B BEHAVIOUR
 DEFINED AS
 The actual MO name(s) of the NSAP(s)
 in use by this Transport Entity;;
 REGISTERED AS {TLM.aoi actualNSAP (4)};

checksumErrorsDetected ATTRIBUTE
 DERIVED FROM "GMI":nonWrapping64BitCounter;
 BEHAVIOUR clChecksumErrorsDetected-B BEHAVIOUR
 DEFINED AS
 The number of PDUs received with an incorrect checksum;;
 REGISTERED AS {TLM.aoi checksumErrorsDetected (6)};

protocolErrors ATTRIBUTE
 DERIVED FROM "GMI":nonWrapping64BitCounter;
 BEHAVIOUR protocolErrors-B BEHAVIOUR
 DEFINED AS
 Counter associated to protocol errors;;
 REGISTERED AS {TLM.aoi protocolErrors(7)};

targetNSAP ATTRIBUTE
 WITH ATTRIBUTE SYNTAX TLM.LocalDistinguishedNames;
 MATCHES FOR EQUALITY, SET-INTERSECTION;
 BEHAVIOUR targetNSAP-B BEHAVIOUR
 DEFINED AS
 The MO name(s) of the NSAP(s) to be used
 by this Transport Entity. The value of this attribute cannot be changed
 unless the Operational State of the entity is Off. An implementation may