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INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**X.282**

(04/95)

**DATA NETWORKS AND  
OPEN SYSTEM COMMUNICATIONS  
OPEN SYSTEMS INTERCONNECTION –  
LAYER MANAGED OBJECTS**

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**ELEMENTS OF MANAGEMENT  
INFORMATION RELATED TO  
THE OSI DATA LINK LAYER**

**ITU-T Recommendation X.282**  
Superseded by a more recent version

(Previously "CCITT Recommendation")

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## FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (ITU). The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

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### NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS

(February 1994)

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## **SUMMARY**

This Recommendation specifies the specification of management information related to the Data Link Layer, including the managed objects class definition of Data Link Layer managed objects, 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 allowable actions on the attributes of Data Link Layer managed objects.

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Recommendation X.282

## ELEMENTS OF MANAGEMENT INFORMATION RELATED TO THE OSI DATA LINK LAYER

(Geneva, 1995)

### 1 Scope

This Recommendation provides the specification of management information within an Open System related to those operations of the OSI Data Link Layer specified by the specifications in this document. Specifics on how Data Link layer management is accomplished is beyond the scope of this Recommendation. Data Link Layer management is defined by specifying:

- the managed object class definition of Data Link Layer Managed Objects following guidelines put forth by the *Structure of Management Information*;
- 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 Data Link Layer Managed Objects that are available to OSI Systems Management.

### 2 References

The following Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision: all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of currently valid ITU-T Recommendations is regularly published.

#### 2.1 Identical Recommendations | International Standards

- ITU-T Recommendation X.200 (1994) | ISO/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model*
- 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 (1993) | ISO/IEC 10165-5:1993, *Information technology – Open Systems Interconnection – Structure of management information: Generic management information.*
- 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.*

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- 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.*
- CCITT Recommendation X.735 (1992) | ISO/IEC 10164-6:1993, *Information technology – Open Systems Interconnection – Systems management: Log control function.*

### 2.2 Paired Recommendations | International Standards equivalent in technical content

- CCITT Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1).*
- ISO/IEC 8824:1990, *Information technology – Open Systems Interconnection – Specification of Abstract Syntax Notation One (ASN.1).*
- CCITT Recommendation X.212 (1988), *Data link service definition for Open Systems Interconnection for CCITT applications.*
- ISO/IEC 8886:1992, *Information technology – Telecommunications and information exchange between systems – Data link service definition for Open Systems Interconnection.*
- ITU-T Recommendation X.222 (1995), *Use of X.25 to provide LAPB-compatible data link procedures to provide the OSI Connection-mode Data Link service.*
- ISO/IEC 11575 (1994), *Information technology – Telecommunications and Information Exchange between Systems – Protocol Mappings for the OSI Data Link service.*
- CCITT Recommendation X.700 (1992), *Management framework for Open Systems Interconnection (OSI) for CCITT applications.*
- ISO/IEC 7498-4:1989, *Information processing systems – Open Systems Interconnection – Basic Reference Model – 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: Specification.*

### 2.3 Additional references

- ITU-T Recommendation X.25 (1993), *Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit.*
- ISO/IEC 7776:1986, *Information processing systems – Data communications – High-level data link control procedures – Description of the X.25 LAPB-compatible DTE data link procedures.*
- ISO/IEC 8802-2:1994, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 2: Logical link control.*
- ISO/IEC 8802-3:1993, *Information technology – Local and metropolitan area networks – Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) access method and physical layer specifications.*

## 3 Definitions

For the purposes of this Recommendation, the following abbreviations apply.

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## 3.1 Basic reference model

This Recommendation makes use of the following terms defined in ITU-T Rec. X.200 | ISO/IEC 7498-1:

- a) Data Link Layer;
- b) open system;
- c) (N)-entity;
- d) (N)-protocol;
- e) (N)-service access point.

## 3.2 Management framework

This Recommendation makes use of the following term defined in CCITT Rec. X.700 | ISO/IEC 7498-4:

- Managed object.

## 3.3 Systems Management Overview

This Recommendation makes use of the following terms defined in CCITT Rec.X.701 | ISO/IEC 10040:

- a) Managed object class;
- b) Notification.

## 3.4 Common Management Information Service Definition

This Recommendation makes use of the following term defined in CCITT Rec. X.710 | ISO/IEC 9595:

- Attribute.

## 3.5 Information Model

This Recommendation makes use of the following terms defined in CCITT Rec. X.720 | ISO/IEC 10165-1:

- a) Attribute Type;
- b) Behaviour;
- c) Containment;
- d) Distinguished Name;
- e) Inheritance;
- f) Name Binding;
- g) Package;
- h) Parameter;
- i) Relative Distinguished Name;
- j) Sub-class;
- k) Superclass;

## 3.6 GDMO

This Recommendation makes use of the following terms defined in CCITT Rec. X.722 | ISO/IEC 10165-4:

- a) Managed Object Class Definition;
- b) Template.

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## 4 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	Definition of Management Information CCITT Rec. X.721   ISO/IEC 10165-2
GMI	Generic Management Information ITU-T Rec. X.723   ISO/IEC 10165-5

This Recommendation makes use of the following symbols and abbreviations:

DL	Data Link
DLL	Data Link Layer
DLE	Data Link Entity
DLSAP	Data Link Service Access Point
DMI	Definition of Management Information
GDMO	Guidelines for the Definition of Managed Objects
GMI	Generic Management Information
IVMO	Initial Value Managed Object
MLP	Multilink Procedure
MO	Managed Object
NSAP	Network Service Access Point
PLE	Packet Layer Entity
SAP	Service Access Point
SLP	Single Link Protocol

## 5 Elements of Data Link Layer Management Information

### 5.1 Managed Object Hierarchy

#### 5.1.1 Summary of managed objects

The following set of common managed objects are defined in this Recommendation for the OSI Data Link Layer:

- a) The Data Link Sub-system managed object (datalinkSubsystem) (see 5.3).
- b) The Data Link Entity managed object (datalinkEntity) (see 5.4). (This managed object is never instantiated.)
- c) The Data Link Service Access Point managed object (dLSAP) (see 5.5).
- d) The LAPB Data Link Entity managed object (LAPBDLE) (see 5.6).
- e) The LAPB Single Link Protocol Machine managed object (sLPPM) (see 5.7).
- f) The LAPB Single Link Protocol Connection managed object (sLPConnection) (see 5.8).
- g) The LAPB Single Link Protocol Connection Initial Values managed object (sLPConnectionIVMO) (see 5.9).

These Managed Objects represent OSI Management's view of those elements of an Open System which support the OSI Data Link Service subject to OSI management operations. Other MOs may be defined under Data Link Sub-system using these generic specifications.

#### 5.1.2 Containment hierarchy

The containment hierarchy is illustrated in Figure 1. Managed objects which can have multiple instances are illustrated by shadowed (multiple) boxes. These objects are defined in detail in the following subclauses.

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The datalink sub-system MO is subordinate to the system MO. The IAPBDLE MO represents protocol communication entity.

The sLPPM MO represents the operation of the protocol machine for the single-link procedures specified in ISO/IEC 7776. The sLPConnection MO represents the management view of connections established using the SLP.

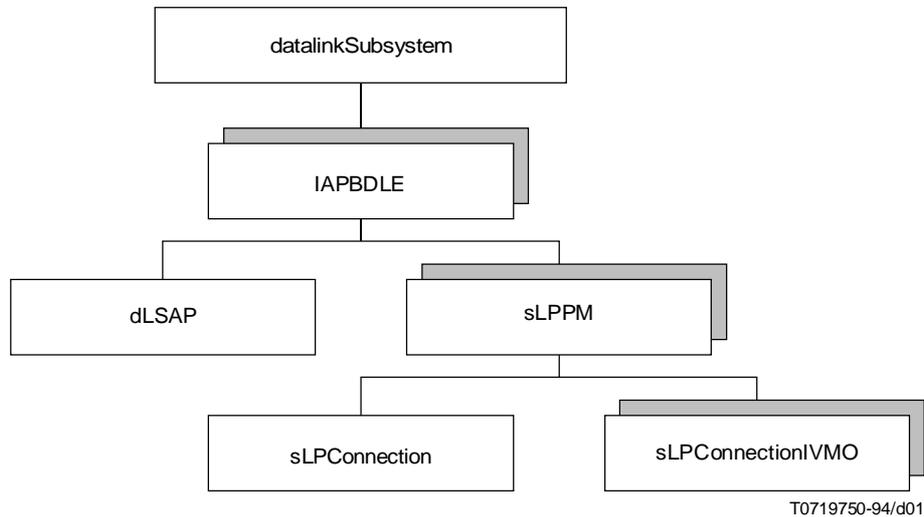


FIGURE 1/X.282

Data Link Layer Containment Hierarchy

## 5.1.3 Relationships

### 5.1.3.1 General

The use of relationship attributes is illustrated by examples in Annex B. The following describes the individual relationships in more detail.

### 5.1.3.2 DLE

There is a relationship between a 'DLE' MO (i.e. an IAPBDLE MO) and the MO representing the underlying service provider. This is represented by the attribute `providerEntityNames` inherited from the generic `datalinkEntity` MO. This is a read-write attribute which allows a manager to configure which entities are to be used to provide services to this entity. For example, a IAPBDLE MO might be configured with the local distinguished name of a Ph-Entity MO.

Additionally, a 'DLE' MO has a `localSapNames` attribute inherited from `GMI: communicationsEntity`. This is a read-only attribute which contains the local distinguished name(s) of SAP MO(s), representing the point at which services are provided to the entity. For example, in a IAPBDLE MO `localSapNames` might contain the name of a Ph-SAP MO.

The `sN-ServiceProvider` attribute of the Network layer Linkage, X25PLE-DTE MOs and X25PLE-DCE MOs contains the local distinguished name of a 'DLE' MO.

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## 5.1.3.3 dISAP

There is a relationship between a dISAP MO and the managed objects that represent the (Network layer) user entities that are using the SAP. This is represented by the userEntityNames attribute inherited from GMI: sap1. For example, in an dISAP MO contained in an IAPBDLE MO, userEntityNames might contain the distinguished name of an X25PLE-DTE MO.

The sN-SAP attribute of the Network layer Linkage and X25PLE-DTE MOs contains the distinguished name of a dISAP MO.

## 5.1.3.4 sLPConnection

There is a relationship between an sLPConnection MO and the MO representing the underlying Ph-Connection. This is represented by the attribute underlyingConnectionNames inherited from GMI: singlePeerConnection.

## 5.1.4 Minimum Event Filtering Capabilities

The Data Link Layer management definitions embodied in this Recommendation imply the frequent, and possibly excessive, generation 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 upon:

- a) The source managed object class.
- b) The object identifier values in the probable cause and specific problems field of communication alarms.

## 5.1.5 Use of Optional Fields

Where reference is made in this Recommendation to ASN.1 syntax defined in DMI or GMI, only the following fields shall be employed:

- 1) Those which are not OPTIONAL in the ASN.1 syntax.
- 2) Those which are OPTIONAL, but whose use is explicitly required by this Recommendation.
- 3) Those which are OPTIONAL, but whose ASN.1 type is SET OF ManagementExtension.

The use of any other fields is prohibited.

## 5.2 Common Data Link Layer GDMO definitions

-- *Behaviours*

**commonCreationDeletion-B BEHAVIOUR**

**DEFINED AS**

Managed object class imports the Rec. X.721 | ISO/IEC 10165-2

**objectCreation**

and/or **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.;

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**commonStateChange-B BEHAVIOUR**

**DEFINED AS**

Managed object class imports the Rec. X.721 | ISO/IEC 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.;

-- *Attribute Groups*

**timers ATTRIBUTE GROUP**

-- *Empty group definition. Timer attributes are added to the group in package definitions.*

**DESCRIPTION** The group of all timer attributes;

**REGISTERED AS** {DLM.agoi timers(1)};

## 5.3 The Data Link Sub-system managed object

-- *There shall be exactly one of these managed objects within a system.*

-- *It exists to provide a container for all managed objects in a system*

-- *that relate to the operation of the Datalink layer.*

--

-- *The datalinkSubsystem managed object can not be created or deleted*

-- *explicitly by management operation. It exists inherently in a system;*

-- *created and deleted as part of system operation.*

**datalinkSubsystem MANAGED OBJECT CLASS**

**DERIVED FROM** "GMI":subsystem;

**CHARACTERIZED BY** datalinkSubsystem-P PACKAGE

**ATTRIBUTES**

"GMI":subsystemId

INITIAL VALUE DLM.datalinkSubsystemId-Value

GET;;;

**REGISTERED AS** {DLM.moi datalinkSubsystem(1)};

-- *Name Bindings*

-- *IMPORT "GMI":subsystem-system NAME BINDING*

## 5.4 The Data Link Entity managed object

-- *The generic DLE MO from which protocol- and media-specific DLE MOs*

-- *may be derived.*

**datalinkEntity MANAGED OBJECT CLASS**

**DERIVED FROM** "GMI":communicationsEntity;

**CHARACTERIZED BY** datalinkEntity-P PACKAGE

**BEHAVIOUR**

commonCreationDeletion-B,

commonStateChange-B;

**ATTRIBUTES**

providerEntityNames REPLACE-WITH-DEFAULT

GET-REPLACE;

**ATTRIBUTE GROUPS**

"DMI":state

"DMI":operationalState;

**NOTIFICATIONS**

"DMI":objectCreation,

"DMI":objectDeletion,

"DMI":stateChange;;;

**REGISTERED AS** {DLM.moi datalinkEntity(2)};

-- *Name Bindings*

-- *IMPORT "GMI":communicationsEntity-subsystem NAME BINDING*

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**datalinkEntity-datalinkSubsystem-Management NAME BINDING**  
**SUBORDINATE OBJECT CLASS datalinkEntity AND SUB-CLASSES;**  
**NAMED BY**  
**SUPERIOR OBJECT CLASS datalinkSubsystem AND SUB-CLASSES;**  
**WITH ATTRIBUTE "GMI":communicationsEntityId;**  
**BEHAVIOUR datalinkEntity-datalinkSubsystem-Management-B BEHAVIOUR**  
**DEFINED AS**  
The name binding which applies when a datalinkEntity managed object (or an instance of a sub-class of the datalinkEntity MO class) can be created by management as a subordinate object of the datalinkSubsystem managed object (or sub-class), and deleted by management.;;  
**CREATE;**  
**DELETE ONLY-IF-NO-CONTAINED-OBJECTS;**  
**REGISTERED AS {DLM.nboi datalinkEntity-datalinkSubsystem-Management(1)};**

-- *Attributes*

**providerEntityNames ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX DLM.GroupObjects;**  
**MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;**  
**BEHAVIOUR providerEntityNames-B BEHAVIOUR**  
**DEFINED AS**  
The distinguished names of provider entity managed objects. The managed objects that represent the entities to be used to provide services to this entity.;;  
**REGISTERED AS {DLM.aoi providerEntityNames(11)};**

## 5.5 The Data Link Service Access Point managed object

-- *The dLSAP managed object class is used to represent a service access point at which services are provided by a DLE to the user entity.*  
-- *Instances of the dLSAP managed object class are contained within instances of sub-classes derived from the datalinkEntity managed object class. Constraints on the number of contained dLSAP MOs and any specific semantics of the attributes are given as part of the definition of the containing DLE managed object class.*  
--  
-- *A dLSAP managed object may be created and deleted explicitly by management operation or created and deleted automatically as part of system operation, e.g. when a user of the Data Link layer service requests and is granted use of the service. The mechanism by which this happens is a local matter and not subject to OSI standardization.*

**dLSAP MANAGED OBJECT CLASS**  
**DERIVED FROM "GMI":sap1;**  
**REGISTERED AS {DLM.moi dLSAP(13)};**

-- *Name Bindings*

-- **IMPORT "GMI":sap1-communicationsEntity NAME BINDING**

**dLSAP-datalinkEntity-Management NAME BINDING**  
**SUBORDINATE OBJECT CLASS dLSAP AND SUB-CLASSES;**  
**NAMED BY**  
**SUPERIOR OBJECT CLASS datalinkEntity AND SUB-CLASSES;**  
**WITH ATTRIBUTE "GMI":sapId;**  
**BEHAVIOUR dLSAP-datalinkEntity-Management-B BEHAVIOUR**  
**DEFINED AS**  
The name binding which applies when a dLSAP managed object (or an instance of a sub-class of the dLSAP MO class) can be created by management as a subordinate object of a datalinkEntity managed object (or sub-class), and deleted by management.;;  
**CREATE;**  
**DELETE ONLY-IF-NO-CONTAINED-OBJECTS;**  
**REGISTERED AS {DLM.nboi dLSAP-datalinkEntity-Management(2)};**

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## 5.6 The LAPB Data Link Entity managed object

- There may be multiple instances of the IAPBDLE managed object in a system. Systems not supporting the LAPB Data Link procedures defined in ISO/IEC 7776 are not required to support the IAPBDLE and contained managed objects.
- 
- The IAPBDLE managed object has a conditional mlp Package. There may be multiple instances of IAPBDLE MO in a system, both with and without the mlp Package. For those instances in which the package is absent, the mlp procedures do not apply and the IAPBDLE MO may contain at most one sLPPM MO. For those instances in which the package is present, the mlp procedures do apply and the IAPBDLE MO may contain multiple instances of sLPPM MO.
- 
- A IAPBDLE MO may contain at most one dLSAP MO. The value of the sapIAddress attribute is of no significance. The cardinality of the userEntityNames attribute is limited to one.
- 
- A IAPBDLE MO may be created and deleted explicitly by management operation or created and deleted automatically as part of system operation.
- 
- When the IAPBDLE MO is operable, the operationalState shall have the value 'enabled'; otherwise it shall have the value 'disabled'.
- Transitions of operationalState shall be reported using the stateChange notification.

### IAPBDLE MANAGED OBJECT CLASS

DERIVED FROM datalinkEntity;

#### CONDITIONAL PACKAGES

- mLP-P PRESENT IF IAPBDLE supports mlp procedures,
- mT2-P PRESENT IF IAPBDLE supports mlp procedures and mT2 timer.,
- mLP-Counters-P PRESENT IF ITU-T DCE mode operation is supported;

REGISTERED AS {DLM.moi IAPBDLE(3)};

-- Packages

#### mLP-P PACKAGE

BEHAVIOUR mLP-P-B BEHAVIOUR

DEFINED AS

Additional properties of an IAPBDLE MO, present when mlp procedures supported.;;

#### ATTRIBUTES

- mT1Timer REPLACE-WITH-DEFAULT  
GET-REPLACE,
- mT3Timer REPLACE-WITH-DEFAULT  
GET-REPLACE,
- mW REPLACE-WITH-DEFAULT  
GET-REPLACE,
- mX REPLACE-WITH-DEFAULT  
GET-REPLACE;

#### ATTRIBUTE GROUPS

timers

- mT1Timer
- mT3Timer;

REGISTERED AS {DLM.poi mLP-P(1)};

#### mT2-P PACKAGE

BEHAVIOUR mT2-P-B BEHAVIOUR

DEFINED AS

Additional properties present when mT2 timer is supported.;;

#### ATTRIBUTES

- mT2Timer REPLACE-WITH-DEFAULT  
GET-REPLACE,

#### ATTRIBUTE GROUPS

timers

- mT2Timer;

REGISTERED AS {DLM.poi mT2-P(5)};

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## mLP-Counters-P Package

### BEHAVIOUR mLP-Counters-P-B BEHAVIOUR

#### DEFINED AS

Additional properties present when ITU-T DCE mode operation is supported;;

#### ATTRIBUTES

receivedMlpResets REPLACE-WITH-DEFAULT GET-REPLACE,  
timesMT1Expired REPLACE-WITH-DEFAULT GET-REPLACE,  
iFramesReassignments REPLACE-WITH-DEFAULT GET-REPLACE,  
receivedMlpFramesInGuardRegion REPLACE-WITH-DEFAULT  
GET-REPLACE,

REGISTERED AS {DLM.poi mLP-Counters-P(6)};

-- *Attributes*

#### mT1Timer ATTRIBUTE

DERIVED FROM "GMI":timer;

#### BEHAVIOUR mT1Timer-B BEHAVIOUR

##### DEFINED AS

Value of the ISO/IEC 7776 parameter MT1 (lost frame timer). Unit is seconds.;;

REGISTERED AS {DLM.aoi mT1Timer(12)};

#### mT2Timer ATTRIBUTE

DERIVED FROM "GMI":timer;

#### BEHAVIOUR mT2Timer-B BEHAVIOUR

##### DEFINED AS

Value of the ISO/IEC 7776 parameter MT2 (group busy timer). Unit is seconds.;;

REGISTERED AS {DLM.aoi mT2Timer(13)};

#### mT3Timer ATTRIBUTE

DERIVED FROM "GMI":timer;

#### BEHAVIOUR mT3Timer-B BEHAVIOUR

##### DEFINED AS

Value of the ISO/IEC 7776 parameter MT3 (mlp reset confirmation timer). Unit is seconds.;;

REGISTERED AS {DLM.aoi mT3Timer(14)};

#### iFramesReassignments ATTRIBUTE

DERIVED FROM "GMI":nonWrapping64BitCounter;

#### BEHAVIOUR iFramesReassignments-B BEHAVIOUR

##### DEFINED AS

Counter. Number of reassignments of IFrames on another slp.;;

REGISTERED AS {DLM.aoi iFramesReassignments(46)};

#### mW ATTRIBUTE

WITH ATTRIBUTE SYNTAX DLM.WindowSize;

MATCHES FOR EQUALITY, ORDERING;

#### BEHAVIOUR mW-B BEHAVIOUR

##### DEFINED AS

MLP window size.;;

REGISTERED AS {DLM.aoi mW(47)};

#### mX ATTRIBUTE

WITH ATTRIBUTE SYNTAX DLM.MX;

MATCHES FOR EQUALITY, ORDERING;

#### BEHAVIOUR mX-B BEHAVIOUR

##### DEFINED AS

Receive MLP window in the Guard Region.;;

REGISTERED AS {DLM.aoi mX(48)};

#### receivedMlpFramesInGuardRegion ATTRIBUTE

DERIVED FROM "GMI":nonWrapping64BitCounter;

#### BEHAVIOUR receivedMlpFramesInGuardRegion-B BEHAVIOUR

##### DEFINED AS

Counter. Number of MLP Frames received in the Guard Region.;;

REGISTERED AS {DLM.aoi receivedMlpFramesInGuardRegion(49)};

# Superseded by a more recent version

```
receivedMlpResets ATTRIBUTE
DERIVED FROM "GMI":nonWrapping64BitCounter;
BEHAVIOUR receivedMlpResets-B BEHAVIOUR
DEFINED AS
    Counter. Number of received MLP Resets.;;
REGISTERED AS {DLM.aoi receivedMlpResets(50)};
```

```
timesMT1Expired ATTRIBUTE
DERIVED FROM "GMI":nonWrapping64BitCounter;
BEHAVIOUR timesMT1Expired-B BEHAVIOUR
DEFINED AS
    Counter. Lost multilink frames.;;
REGISTERED AS {DLM.aoi timesMT1Expired(51)};
```

## 5.7 The LAPB Single Link Protocol Machine managed object

```
-- The sLPPM managed object represents the operation of the LAPB Data
-- Link layer protocol machine described in ISO/IEC 7776 over a single physical
-- link. An sLPPM managed object may contain at most one sLPConnection
-- MO and one or more sLPConnectionIVMO.
--
-- An sLPPM MO may be created and deleted explicitly by
-- management operation or created and deleted automatically as
-- part of system operation.
--
-- When the sLPPM MO is operable, the operationalState shall
-- have the value 'enabled'; otherwise it shall have the value 'disabled'.
-- Transitions of operationalState shall be reported using the
-- stateChange notification.
```

```
sLPPM MANAGED OBJECT CLASS
DERIVED FROM "GMI":coProtocolMachine;
CHARACTERIZED BY sLPPM-P PACKAGE
BEHAVIOUR
    commonCreationDeletion-B,
    commonStateChange-B;
ATTRIBUTE GROUPS
    "DMI":state
    "DMI":operationalState;
ACTIONS
    "GMI":activate,
    "GMI":deactivate;
NOTIFICATIONS
    "DMI":objectCreation,
    "DMI":objectDeletion,
    "DMI":stateChange;;;
REGISTERED AS {DLM.moi sLPPM(4)};
```

```
-- Name Bindings
-- IMPORT "GMI":coProtocolMachine-entity NAME BINDING
```

```
sLPPM-IAPBDLE-Management NAME BINDING
SUBORDINATE OBJECT CLASS sLPPM AND SUB-CLASSES;
NAMED BY
SUPERIOR OBJECT CLASS IAPBDLE AND SUB-CLASSES;
WITH ATTRIBUTE "GMI":coProtocolMachineId;
BEHAVIOUR sLPPM-IAPBDLE-Management-B BEHAVIOUR
DEFINED AS
```

```
    The name binding which applies when a sLPPM managed object (or an instance of a sub-class of the sLPPM MO class)
    can be created by management as a subordinate object of a IAPBDLE managed object (or sub-class), and deleted by
    management.;;
```

```
CREATE;
DELETE ONLY-IF-NO-CONTAINED-OBJECTS;
REGISTERED AS {DLM.nboi sLPPM-IAPBDLE-Management(3)};
```

# Superseded by a more recent version

## 5.8 The LAPB Single Link Protocol Connection managed object

-- The *sLPConnection* managed object represents the local view of a  
-- connection between LAPB DLEs over a single physical link.

-- An *sLPConnection* MO is created automatically as part of system  
-- operation.  
-- An *sLPConnection* MO may be deleted automatically as part of system  
-- operation or may be deleted as a result of the deactivate or delete  
-- management operations.  
-- An *sLPConnectionIVMO* may be used as the source of  
-- initial values of attributes of an *slpConnection* MO.

**sLPConnection MANAGED OBJECT CLASS**

**DERIVED FROM "GMI":singlePeerConnection;**

**CHARACTERIZED BY**

**commonSLPConnection-P,  
sLPConnection-P;**

**CONDITIONAL PACKAGES**

**t3-P PRESENT IF Optional Timer T3 of ISO/IEC 7776 is supported. or ITU-T DCEmode  
operation is supported,**

**t4-P PRESENT IF Timer T4 of ISO 7776 or ITU-T DCE mode is supported,  
link-reset-disconnect-n2-P PRESENT IF supported;**

**REGISTERED AS {DLM.moi sLPConnection(5)};**

-- Packages

**0commonSLPConnection-P PACKAGE**

**BEHAVIOUR**

**commonCreationDeletion-B;**

**ATTRIBUTES**

**interfaceType REPLACE-WITH-DEFAULT  
DEFAULT VALUE DLM.interfaceTypeDefault -- dTE  
GET-REPLACE,**

**k REPLACE-WITH-DEFAULT  
GET-REPLACE,**

**n1 REPLACE-WITH-DEFAULT  
GET-REPLACE,**

**n2 REPLACE-WITH-DEFAULT  
GET-REPLACE,**

**sequenceModulus REPLACE-WITH-DEFAULT  
GET-REPLACE,**

**t1Timer REPLACE-WITH-DEFAULT  
GET-REPLACE,**

**t2Timer REPLACE-WITH-DEFAULT  
GET-REPLACE;**

**ATTRIBUTE GROUPS**

**timers**

**t1Timer**

**t2Timer;**

**NOTIFICATIONS**

**"DMI":objectCreation,**

**"DMI":objectDeletion;**

**; -- not registered**

**sLPConnection-P PACKAGE**

**BEHAVIOUR**

**commonDeactivateConnection-B,  
commonStateChange-B,  
fRMRReceivedCommunicationsAlarm-B;**

**ATTRIBUTES**

**fCSErrorsReceived GET,**

**fRMRsReceived GET,**

**fRMRsSent GET,**

**iFrameDataOctetsReceived GET,**

**iFrameDataOctetsSent GET,**

**iFramesReceived GET,**

# Superseded by a more recent version

iFramesSent GET,  
pollsReceived GET,  
rEJsReceived GET,  
rEJsSent GET,  
rNRsReceived GET,  
rNRsSent GET,  
sABMsReceived GET,  
sABMsSent GET,  
sLPPProtocolState GET,  
timesT1Expired GET;  
ATTRIBUTE GROUPS  
"GMI":counters  
    fCSErrorsReceived  
    fRMRsReceived  
    fRMRsSent  
    iFrameDataOctetsReceived  
    iFrameDataOctetsSent  
    iFramesReceived  
    iFramesSent  
    pollsReceived  
    rEJsReceived  
    rEJsSent  
    rNRsReceived  
    rNRsSent  
    sABMsReceived  
    sABMsSent  
    timesT1Expired,  
"DMI":state  
    sLPPProtocolState;  
ACTIONS  
"GMI":deactivate;  
NOTIFICATIONS  
"DMI":communicationsAlarm  
    fRMR;  
    -- NOTE – The fRMR parameter is carried  
    -- as additional information in the communicationsAlarm.  
; -- not registered  
  
t3-P PACKAGE  
BEHAVIOUR t3-P-B BEHAVIOUR  
DEFINED AS  
    Present if the optional Timer T3 is supported.;;  
ATTRIBUTES  
t3Timer REPLACE-WITH-DEFAULT  
    GET-REPLACE,  
timesT3Expired  
    GET;  
ATTRIBUTE GROUPS  
"GMI":counters  
    timesT3Expired,  
timers  
    t3Timer;  
REGISTERED AS {DLM.poi t3-P(2)};  
  
link-reset-disconnect-n2-P PACKAGE  
BEHAVIOUR link-reset-disconnect-n2-P-B BEHAVIOUR  
DEFINED AS  
    Present if supported.;;  
ATTRIBUTES  
abnormalLinkDisconnectsReceived GET,  
abnormalLinkDisconnectsSent GET,  
linkResetsReceived GET,  
linkResetsSent GET,  
timesN2Reached GET;

# Superseded by a more recent version

## ATTRIBUTE GROUPS

"GMI":counters

abnormalLinkDisconnectsReceived

abnormalLinkDisconnectsSent

linkResetsReceived

linkResetsSent

timesN2Reached;

REGISTERED AS {DLM.poi link-reset-disconnect-n2-P(4)};

## t4-P PACKAGE

### BEHAVIOUR t4-P-B BEHAVIOUR

DEFINED AS

Present if the Timer T4 is supported.;

### ATTRIBUTES

t4Timer REPLACE-WITH-DEFAULT GET REPLACE,

times T4Expired GET;

### ATTRIBUTES GROUPS

"GMI":counters

timesT4Expired,

timers

t4Timer;

REGISTERED AS {DLM.poi t4-P(7)};

-- *Behaviours*

### commonDeactivateConnection-B BEHAVIOUR

DEFINED AS

Managed object class imports the Recommendation X.723 deactivate action. 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 had been terminated by other means. A deactivate action may fail (with the ProcessingFailure response) if it is temporarily not possible to terminate the connection.;

### fRMRReceivedCommunicationsAlarm-B BEHAVIOUR

DEFINED AS

Managed object imports the Recommendation X.721 communicationsAlarm notification. Used to report the following conditions:

fRMRReceived – A fRMR frame is received. The received fRMR frame is reported as additionalInformation in the notification, using the fRMR parameter. The significance sub-parameter shall be set as described above.

The probableCause parameter is set to the value communicationsProtocolError.

The value DLM.fRMRReceived shall be reported in the specificProblems parameter. In addition, the reason why the frame was sent is also returned in specificProblems. Values are specified in the DLM ASN.1 module for controlFieldUndefinedOrUnimplemented, infoFieldLengthGreaterThanMaximum, invalidNR, formatError, and non-Specific.

The perceivedSeverity parameter is set to the value Minor. A subsequent communicationsAlarm with a perceivedSeverity value of Cleared is not generated. No other parameters are used.;

### sLPConnection-sLPPM-Automatic-B BEHAVIOUR

DEFINED AS

The name binding which applies when an sLPConnection managed object (or an instance of a sub-class of the sLPConnection MO class) is created automatically by the operation of the system as a subordinate object of an sLPPM managed object (or sub-class), and deleted automatically.

The creation of an instance of an sLPConnection MO (or sub-class) using this name binding may reference an instance of the sLPConnectionIVMO (or sub-class). The means by which an instance (if any) of the sLPConnectionIVMO are identified are a local matter. When this occurs, some of the initial values of the attributes of the instance of the sLPConnection MO may be supplied by the values of the attributes in the specified instance of sLPConnectionIVMO. However, any such value may be overridden by a value supplied by local means (for example across an internal interface). Where values are supplied by the IVMO, the initial value of an attribute of the sLPConnection MO shall be the value of the corresponding attribute in the sLPConnectionIVMO (that is, which has the same attribute template label). The naming attribute of the sLPConnection MO is assigned a value according to local mechanisms.;

# Superseded by a more recent version

sLPConnection-sLPPM-Management-B BEHAVIOUR

DEFINED AS

The name binding which applies when an sLPConnection managed object (or an instance of a sub-class of the sLPConnection MO class) which is a subordinate object of an sLPPM managed object (or sub-class), can be deleted by management.;

-- *Name Bindings*

sLPConnection-sLPPM-Automatic NAME BINDING

SUBORDINATE OBJECT CLASS sLPConnection AND SUB-CLASSES;

NAMED BY

SUPERIOR OBJECT CLASS sLPPM AND SUB-CLASSES;

WITH ATTRIBUTE "GMI":connectionId;

BEHAVIOUR sLPConnection-sLPPM-Automatic-B;

REGISTERED AS {DLM.nboi sLPConnection-sLPPM-Automatic(4)};

sLPConnection-sLPPM-Management NAME BINDING

SUBORDINATE OBJECT CLASS sLPConnection AND SUB-CLASSES;

NAMED BY

SUPERIOR OBJECT CLASS sLPPM AND SUB-CLASSES;

WITH ATTRIBUTE "GMI":connectionId;

BEHAVIOUR

sLPConnection-sLPPM-Automatic-B,

sLPConnection-sLPPM-Management-B;

DELETE ONLY-IF-NO-CONTAINED-OBJECTS;

REGISTERED AS {DLM.nboi sLPConnection-sLPPM-Management(5)};

-- *Attributes*

fCSErrorsReceived ATTRIBUTE

DERIVED FROM "GMI":nonWrapping64BitCounter;

BEHAVIOUR fCSErrorsReceived-B BEHAVIOUR

DEFINED AS

Counter. Total number of frames received with a bad frame

check.;;

REGISTERED AS {DLM.aoi fCSErrorsReceived(15)};

fRMRsReceived ATTRIBUTE

DERIVED FROM "GMI":nonWrapping64BitCounter;

BEHAVIOUR fRMRsReceived-B BEHAVIOUR

DEFINED AS

Counter. Total number of FRMR frames received.;;

REGISTERED AS {DLM.aoi fRMRsReceived(1)};

fRMRsSent ATTRIBUTE

DERIVED FROM "GMI":nonWrapping64BitCounter;

BEHAVIOUR fRMRsSent-B BEHAVIOUR

DEFINED AS

Counter. Total number of FRMR frames sent.;;

REGISTERED AS {DLM.aoi fRMRsSent(2)};

iFrameDataOctetsReceived ATTRIBUTE

DERIVED FROM "GMI":nonWrapping64BitCounter;

BEHAVIOUR iFrameDataOctetsReceived-B BEHAVIOUR

DEFINED AS

Counter. Total number of data octets received in I frames. Only data octets in new I frames are counted, i.e. retransmitted frames that are received do not cause the counter to be incremented.;;

REGISTERED AS {DLM.aoi iFrameDataOctetsReceived(16)};

iFrameDataOctetsSent ATTRIBUTE

DERIVED FROM "GMI":nonWrapping64BitCounter;

BEHAVIOUR iFrameDataOctetsSent-B BEHAVIOUR

DEFINED AS

Counter. Total number of data octets sent in I frames. Only data octets in new I frames are counted, i.e. retransmitted frames that are sent do not cause the counter to be incremented.;;

REGISTERED AS {DLM.aoi iFrameDataOctetsSent(17)};

# Superseded by a more recent version

## **iFramesReceived ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR iFramesReceived-B BEHAVIOUR**

**DEFINED AS**

Counter. Total number of I frames received. Only new I frames are counted, i.e. retransmitted frames that are received do not cause the counter to be incremented.;;

**REGISTERED AS {DLM.aoi iFramesReceived(3)};**

## **iFramesSent ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR iFramesSent-B BEHAVIOUR**

**DEFINED AS**

Counter. Total number of I frames sent. Only new I frames are counted, i.e. retransmitted frames that are sent do not cause the counter to be incremented.;;

**REGISTERED AS {DLM.aoi iFramesSent(4)};**

## **interfaceType ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX DLM.InterfaceType;**

**MATCHES FOR EQUALITY;**

**BEHAVIOUR interfaceType-B BEHAVIOUR**

**DEFINED AS**

Determines the address mode used by the local DTE.;;

**REGISTERED AS {DLM.aoi interfaceType(18)};**

## **k ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX DLM.WindowSize;**

**MATCHES FOR EQUALITY, ORDERING;**

**BEHAVIOUR k-B BEHAVIOUR**

**DEFINED AS**

Value of the ISO/IEC 7776 parameter k. The maximum number of sequentially numbered I frames that a DTE may have outstanding (i.e. unacknowledged) at any given time.;;

**REGISTERED AS {DLM.aoi k(19)};**

## **n1 ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX DLM.MaximumIFrameSize;**

**MATCHES FOR EQUALITY, ORDERING;**

**BEHAVIOUR n1-B BEHAVIOUR**

**DEFINED AS**

Value of the ISO/IEC 7776 parameter N1. The maximum number of bits in an I frame (excluding flags and "0" bits inserted for transparency).;;

**REGISTERED AS {DLM.aoi n1(20)};**

## **n2 ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX DLM.Integer;**

**MATCHES FOR EQUALITY, ORDERING;**

**BEHAVIOUR n2-B BEHAVIOUR**

**DEFINED AS**

Value of the ISO/IEC 7776 parameter N2. The maximum number of attempts that shall be made to complete the successful transmission of a frame.;;

**REGISTERED AS {DLM.aoi n2(21)};**

## **pollsReceived ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR pollsReceived-B BEHAVIOUR**

**DEFINED AS**

Counter. Total number of command frames received with P-bit set.;;

**REGISTERED AS {DLM.aoi pollsReceived(22)};**

## **rEJsReceived ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR rEJsReceived-B BEHAVIOUR**

**DEFINED AS**

Counter. Total number of REJ frames received.;;

**REGISTERED AS {DLM.aoi rEJsReceived(5)};**

# Superseded by a more recent version

## **rEJsSent ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR rEJsSent-B BEHAVIOUR**

**DEFINED AS**

**Counter. Total number of REJ frames sent.;;**

**REGISTERED AS {DLM.aoi rEJsSent(6)};**

## **rNRsReceived ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR rNRsReceived-B BEHAVIOUR**

**DEFINED AS**

**Counter. Total number of RNR frames received.;;**

**REGISTERED AS {DLM.aoi rNRsReceived(7)};**

## **rNRsSent ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR rNRsSent-B BEHAVIOUR**

**DEFINED AS**

**Counter. Total number of RNR frames sent.;;**

**REGISTERED AS {DLM.aoi rNRsSent(8)};**

## **sABMsReceived ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR sABMsReceived-B BEHAVIOUR**

**DEFINED AS**

**Counter. Total number of SABM frames received.;;**

**REGISTERED AS {DLM.aoi sABMsReceived(9)};**

## **sABMsSent ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR sABMsSent-B BEHAVIOUR**

**DEFINED AS**

**Counter. Total number of SABM frames sent.;;**

**REGISTERED AS {DLM.aoi sABMsSent(10)};**

## **sLPPProtocolState ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX DLM.SLPPProtocolState;**

**MATCHES FOR EQUALITY;**

**BEHAVIOUR sLPPProtocolState-B BEHAVIOUR**

**DEFINED AS**

**Local state of a LAPB (SLP) connection.;;**

**REGISTERED AS {DLM.aoi sLPPProtocolState(23)};**

## **sequenceModulus ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX DLM.SequenceModulus;**

**MATCHES FOR EQUALITY;**

**BEHAVIOUR sequenceModulus-B BEHAVIOUR**

**DEFINED AS**

**Determines basic (modulo 8) or extended (modulo 128) operation.;;**

**REGISTERED AS {DLM.aoi sequenceModulus(24)};**

## **t1Timer ATTRIBUTE**

**DERIVED FROM "GMI":timer;**

**BEHAVIOUR t1Timer-B BEHAVIOUR**

**DEFINED AS**

**Value of the ISO/IEC 7776 parameter Timer T1. Unit is hundreds of milliseconds.;;**

**REGISTERED AS {DLM.aoi t1Timer(25)};**

## **t2Timer ATTRIBUTE**

**DERIVED FROM "GMI":timer;**

**BEHAVIOUR t2Timer-B BEHAVIOUR**

**DEFINED AS**

**Value of the ISO/IEC 7776 parameter T2. Unit is hundreds of milliseconds.;;**

**REGISTERED AS {DLM.aoi t2Timer(26)};**

# Superseded by a more recent version

## **t3Timer ATTRIBUTE**

**DERIVED FROM "GMI":timer;**

**BEHAVIOUR t3Timer-B BEHAVIOUR**

**DEFINED AS**

Value of the ISO/IEC 7776 optional parameter or ITU-T X25 mandatory parameter T3. Unit is seconds.;;

**REGISTERED AS {DLM.aoi t3Timer(27)};**

## **t4Timer ATTRIBUTE**

**DERIVED FROM "GMI":timer;**

**BEHAVIOUR t4Timer-B BEHAVIOUR**

**DEFINED AS**

Value of the ISO/IEC 7776 parameter T4. The maximum time a DTE or a DCE will allow without frames being exchanged on the data link. Unit is seconds.;;

**REGISTERED AS {DLM.aoi t4Timer(28)};**

## **timesT1Expired ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR timesT1Expired-B BEHAVIOUR**

**DEFINED AS**

Counter. Total number of times the local Timer T1 expired.;;

**REGISTERED AS {DLM.aoi timesT1Expired(29)};**

## **timesT3Expired ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR timesT3Expired-B BEHAVIOUR**

**DEFINED AS**

Counter. Total number of times local Timer T3 expired.;;

**REGISTERED AS {DLM.aoi timesT3Expired(30)};**

## **abnormalLinkDisconnectsReceived ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR abnormalLinkDisconnectsReceived-B BEHAVIOUR**

**DEFINED AS**

Counter. Total number of received abnormal Link Disconnects.;;

**REGISTERED AS {DLM.aoi abnormalLinkDisconnectsReceived(41)};**

## **abnormalLinkDisconnectsSent ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR abnormalLinkDisconnectsSent-B BEHAVIOUR**

**DEFINED AS**

Counter. Total number of sent abnormal Link Disconnects.;;

**REGISTERED AS {DLM.aoi abnormalLinkDisconnectsSent(42)};**

## **linkResetsReceived ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR linkResetsReceived-B BEHAVIOUR**

**DEFINED AS**

Counter. Total number of received Link Resets.;;

**REGISTERED AS {DLM.aoi linkResetsReceived(43)};**

## **linkResetsSent ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR linkResetsSent-B BEHAVIOUR**

**DEFINED AS**

Counter. Total number of sent Link Resets.;;

**REGISTERED AS {DLM.aoi linkResetsSent(44)};**

## **timesN2Reached ATTRIBUTE**

**DERIVED FROM "GMI":nonWrapping64BitCounter;**

**BEHAVIOUR timesN2Reached-B BEHAVIOUR**

**DEFINED AS**

Counter. Total number of times N2 was Reached.;;

**REGISTERED AS {DLM.aoi timesN2Reached(45)};**

-- Parameters

# Superseded by a more recent version

FRMR PARAMETER

CONTEXT EVENT-INFO;

WITH SYNTAX DLM.FRMRSyntax;

BEHAVIOUR frMR-B BEHAVIOUR

DEFINED AS

FRMR frame. Returned as additionalInformation in a communicationsAlarm notification when specificProblems has the value DLM.frMRReceived.;;

REGISTERED AS {DLM.proi frMR(1)};

## 5.9 The LAPB Single Link Protocol Connection Initial Values managed object

-- An sLPConnectionIVMO may be used to supply initial values for the

-- attributes of sLPConnection MOs. Different instances of sLPConnectionIVMO may

-- contain different initial values.

--

-- An sLPConnectionIVMO may be created and deleted explicitly by management operation.

sLPConnectionIVMO MANAGED OBJECT CLASS

DERIVED FROM "DMI":top;

CHARACTERIZED BY

commonSLPConnection-P,

sLPConnectionIVMO-P;

CONDITIONAL PACKAGES

t3IVMO-P PRESENT IF optional Timer T3 of ISO/IEC 7776 is supported or ITU-T DCE mode operation is supported,

t4IVMO-P PRESENT IF Timer T4 of ISO 7776 or ITU-T DCE mode is supported.;

REGISTERED AS {DLM.moi sLPConnectionIVMO(6)};

-- Packages

sLPConnectionIVMO-P PACKAGE

ATTRIBUTES

sLPConnectionIVMOId GET;

; -- not registered

t3IVMO-P PACKAGE

BEHAVIOUR t3IVMO-P-B BEHAVIOUR

DEFINED AS

Present if the optional Timer T3 is supported.;;

ATTRIBUTES

t3Timer REPLACE-WITH-DEFAULT

GET-REPLACE;

ATTRIBUTE GROUPS

timers

t3Timer;

REGISTERED AS {DLM.poi t3IVMO-P(3)};

t4IVMO-P PACKAGE

BEHAVIOUR t4IVMO-P-B BEHAVIOUR

DEFINED AS

Present if the Timer T4 is supported.;;

ATTRIBUTES

t4Timer REPLACE-WITH-DEFAULT GET REPLACE,

times T4Expired GET;

ATTRIBUTES GROUPS

"GMI":counters

timesT4Expired,

timers

t4Timer;

REGISTERED AS {DLM.poi t4IVMO-P(8)};

-- Name Bindings

# Superseded by a more recent version

```
sLPConnectionIVMO-sLPPM-Management NAME BINDING
SUBORDINATE OBJECT CLASS sLPConnectionIVMO AND SUB-CLASSES;
NAMED BY
SUPERIOR OBJECT CLASS sLPPM AND SUB-CLASSES;
WITH ATTRIBUTE sLPConnectionIVMOId;
BEHAVIOUR sLPConnectionIVMO-sLPPM-B BEHAVIOUR
  DEFINED AS
    The name binding which applies when an sLPConnectionIVMO managed object (or an instance of a sub-class of the
    sLPConnectionIVMO MO class) can be created by management as a subordinate object of a sLPPM managed object
    (or sub-class), and deleted by management.;;
CREATE;
DELETE ONLY-IF-NO-CONTAINED-OBJECTS;
REGISTERED AS {DLM.nboi sLPConnectionIVMO-sLPPM-Management(6)};

-- Attributes

sLPConnectionIVMOId ATTRIBUTE
WITH ATTRIBUTE SYNTAX DLM.NamingString;
MATCHES FOR EQUALITY;
BEHAVIOUR sLPConnectionIMVOId-B BEHAVIOUR
  DEFINED AS
    Naming attribute for the sLPConnectionIVMO managed object.;;
REGISTERED AS {DLM.aoi sLPConnectionIVMOId(31)};
```

## 6 ASN.1 module

```
DLM {joint-iso-itu datalink-layer(15) management(0) asn1Module(2) 0}
DEFINITIONS IMPLICIT TAGS ::= BEGIN

IMPORTS
  GroupObjects, ObservedValue, PerceivedSeverity
    FROM Attribute-ASN1Module {joint-iso-itu ms(9) smi(3) part2(2) asn1Module(2) 1}
  SetInfoStatus, AttributeId, ObjectInstance
    FROM CMIP-1 {joint-iso-itu ms(9) cmip(1) modules(0) protocol(3)};

-- "infrastructure" object identifier definitions

datalink-layer OBJECT IDENTIFIER ::= {joint-iso-itu datalink-layer(15)}

dloi OBJECT IDENTIFIER ::= {datalink-layer management(0)}

sseoi OBJECT IDENTIFIER ::= {dloi standardSpecificExtension(0)}
moi OBJECT IDENTIFIER ::= {dloi objectClass (3)}
poi OBJECT IDENTIFIER ::= {dloi package (4)}
proi OBJECT IDENTIFIER ::= {dloi parameter (5)}
nboi OBJECT IDENTIFIER ::= {dloi nameBinding (6)}
aoi OBJECT IDENTIFIER ::= {dloi attribute (7)}
agoi OBJECT IDENTIFIER ::= {dloi attributeGroup (8)}
acoi OBJECT IDENTIFIER ::= {dloi action (9)}
noi OBJECT IDENTIFIER ::= {dloi notification (10)}

--
-- value assignments for Data Link layer specificProblems
--
fRMRRReceived OBJECT IDENTIFIER ::=
  {sseoi specificProblems(11) fRMRRReceived(5)}

fRMRRReasons OBJECT IDENTIFIER ::=
  {sseoi specificProblems(11) fRMRRReasons(6)}

fRMRRReasonsControlFieldUndefinedOrUnimplemented OBJECT IDENTIFIER ::=
  {sseoi specificProblems(11) fRMRRReasons(6)
  controlFieldUndefinedOrUnimplemented(1)}

fRMRRReasonsFormatError OBJECT IDENTIFIER ::=
  {sseoi specificProblems(11) fRMRRReasons(6) formatError(2)}
```

# Superseded by a more recent version

```
FRMRReasonsInfoFieldLengthGreaterThanMaximum OBJECT IDENTIFIER ::=
  {ssei specificProblems(11) fRMRReasons(6)
  infoFieldLengthGreaterThanMaximum(3)}

FRMRReasonsInvalidNR OBJECT IDENTIFIER ::=
  {ssei specificProblems(11) fRMRReasons(6) invalidNR(4)}

FRMRReasonsNonSpecific OBJECT IDENTIFIER ::=
  {ssei specificProblems(11) fRMRReasons(6) nonSpecific(5)}
--
-- value assignments for Data Link layer specific errorIds for activate action processingFailure
-- errors.
--
activateFailure OBJECT IDENTIFIER ::=
  {ssei action(9) activate(1) errors(1) processingFailure(1)}

activateFailureInsufficientResources OBJECT IDENTIFIER ::=
  {activateFailure insufficientResources(1)}

activateFailureProviderDoesNotExist OBJECT IDENTIFIER ::=
  {activateFailure providerDoesNotExist(2)}

activateFailureProviderNotAvailable OBJECT IDENTIFIER ::=
  {activateFailure providerNotAvailable(3)}

activateFailureRequiredServiceNotAvailable OBJECT IDENTIFIER ::=
  {activateFailure requiredServiceNotAvailable(4)}

activateFailureSystemSpecific OBJECT IDENTIFIER ::=
  {activateFailure systemSpecific(5)}

--
-- other definitions
--
datalinkSubsystemId-Value GraphicString ::= "datalinkSubsystem"

FRMRSyntax ::= OCTET STRING
NamingString ::= GraphicString
Integer ::= INTEGER

InterfaceType ::= ENUMERATED{
  dTE(0),
  dCE(1)}

interfaceTypeDefault InterfaceType ::= dTE

MaximumIFrameSize ::= INTEGER
-- in bits, 1080 (135 octets) minimum

MW ::= SEQUENCE{
  mWSend [0] IMPLICIT INTEGER (0 .. 4095),
  mWReceive [1] IMPLICIT INTEGER (0 .. 4095)}

MX ::= SEQUENCE{
  mXSend [0] IMPLICIT INTEGER (0 .. 4095)
  mX Receive [1] IMPLICIT INTEGER (0 .. 4095)}

Octet ::= OCTET STRING(SIZE(1))
OctetString ::= OCTET STRING

SequenceModulus ::= Integer

SLPPProtocolState ::= ENUMERATED{
  disconnectedPhase(0),
  linkdisconnection-phase(1),
  link-set-up-phase(2),
  information-Transfer-phase(3),
  frame-Reject-condition(4),
  busy-condition(5),
  sent-Reject-condition(6),
  system-Parameters-and-error-recovery(7)}
```

# Superseded by a more recent version

```
WindowSize ::= CHOICE{
  modulo8ws    [0] INTEGER(1..7), -- for modulo 8
  modulo128ws [1] INTEGER(1..127)} -- for modulo 128
```

END

## 7 Conformance

### 7.1 Conformance requirements to Recommendation X.282

An implementation for which conformance to this Recommendation as a managed implementation is claimed shall:

- a) support the datalinkSubsystem MO;
- b) for each supported MO, support at least one name binding defined in this Recommendation, for which the MO is the subordinate.

### 7.2 Protocol specific conformance requirements

**7.2.1** An implementation claiming conformance to the management operation of ISO/IEC 7776 as a managed implementation shall:

- a) conform to Recommendation X.282 as defined in 7.1;
- b) support the x25DLE MO, the dLSAP MO, the sLPPM MO and the sLPConnection MO.

NOTE – Behaviour clauses defined in this Recommendation may not always be testable. Care should be exercised when defining behaviour test suites in order not to impose additional constraints to those defined in this Recommendation for implementations.

## Annex A

### Allocation of Object Identifiers

(This annex forms an integral part of this Recommendation)

The following Object Identifiers have been allocated by the main body of this Recommendation.

joint-iso-itu

datalink-layer (15)

management (0)

standardSpecificExtension (0)

action (9)

activate (1)

errors (1)

processingFailure (1)

insufficientResources (1)

providerDoesNotExist (2)

providerNotAvailable (3)

requiredServiceNotAvailable (4)

systemSpecific (5)

specificProblems (11)

alignmentError (1)

frameTooLong (4)

fRMRReceived (5)

fRMRReasons (6)

controlFieldUndefinedOrUnimplemented (1)

formatError (2)

infoFieldLengthGreaterThanMaximum (3)

invalidNR (4)

nonSpecific (5)

asn1Module (2)

(0)

objectClass (3)

datalinkSubsystem (1)

datalinkEntity (2)

# Superseded by a more recent version

- x25DLE (3)
- sLPPM (4)
  - sLPConnection (5)
  - sLPConnectionIVMO (6)
- dLSAP (13)
- package (4)
  - mLP-P (1)
  - t3-P (2)
  - t3IVMO-P (3)
    - link-reset-disconnect-n2-P (4)
  - mT2-P (5)
  - mLP-Counters-P (6)
- parameter (5)
  - fRMR (1)
- nameBinding (6)
  - datalinkEntity-datalinkSubsystem-Management (1)
  - dLSAP-datalinkEntity-Management (2)
  - sLPPM-x25DLE-Management (3)
  - sLPConnection-sLPPM-Automatic (4)
  - sLPConnection-sLPPM-Management (5)
  - sLPConnectionIVMO-sLPPM-Management (6)
- attribute (7)
  - fRMRsReceived (1)
  - fRMRsSent (2)
  - iFramesReceived (3)
  - iFramesSent (4)
  - rEJsReceived (5)
  - rEJsSent (6)
  - rNRsReceived (7)
  - rNRsSent (8)
  - sABMsReceived (9)
  - sABMsSent (10)
  - providerEntityNames (11)
  - mT1Timer (12)
  - mT2Timer (13)
  - mT3Timer (14)
  - fCSErrorsReceived (15)
  - iFrameDataOctetsReceived (16)
  - iFrameDataOctetsSent (17)
  - interfaceType (18)
- k (19)
- n1 (20)
- n2 (21)
  - pollsReceived (22)
  - sLPProtocolState (23)
  - sequenceModulus (24)
- t1Timer (25)
- t2Timer (26)
- t3Timer (27)
- t4Timer (28)
  - timesT1Expired (29)
  - timesT3Expired (30)
- sLPConnectionIVMOId (31)
  - abnormalLinkDisconnectsReceived(41)
  - abnormalLinkDisconnectsSent(42)
  - linkResetsReceived(43)
  - linkResetsSent(44)
  - timesN2Reached(45)
  - iFramesReassignments(46)
  - mW(47)
  - mX(48)
  - receivedMlpFramesInGuardRegion(49)
  - receivedMlpResets(50)
  - timesMT1Expired(51)
- attributeGroup (8)
  - timers (1)
- action (9)
  - notification (10)

# Superseded by a more recent version

## Annex B

### An Example of the use of Relationship Attributes

(This annex does not form an integral part of this Recommendation)

This annex provides an example of the use of relationship attributes, both within the data link layer and also between the data link layer and its adjoining layers. This example is not intended to be exhaustive. Relationships for other protocol combinations may be constructed in a similar manner, and a particular implementation may be capable of supporting multiple protocols simultaneously. For example, network protocol operation over Recommendation X.25. Such a possibility has only been omitted for reasons of clarity.

Note that some relationships are implied by containment, and therefore no explicit relationship attributes are required.

The example is as follows (see Figure B.1).

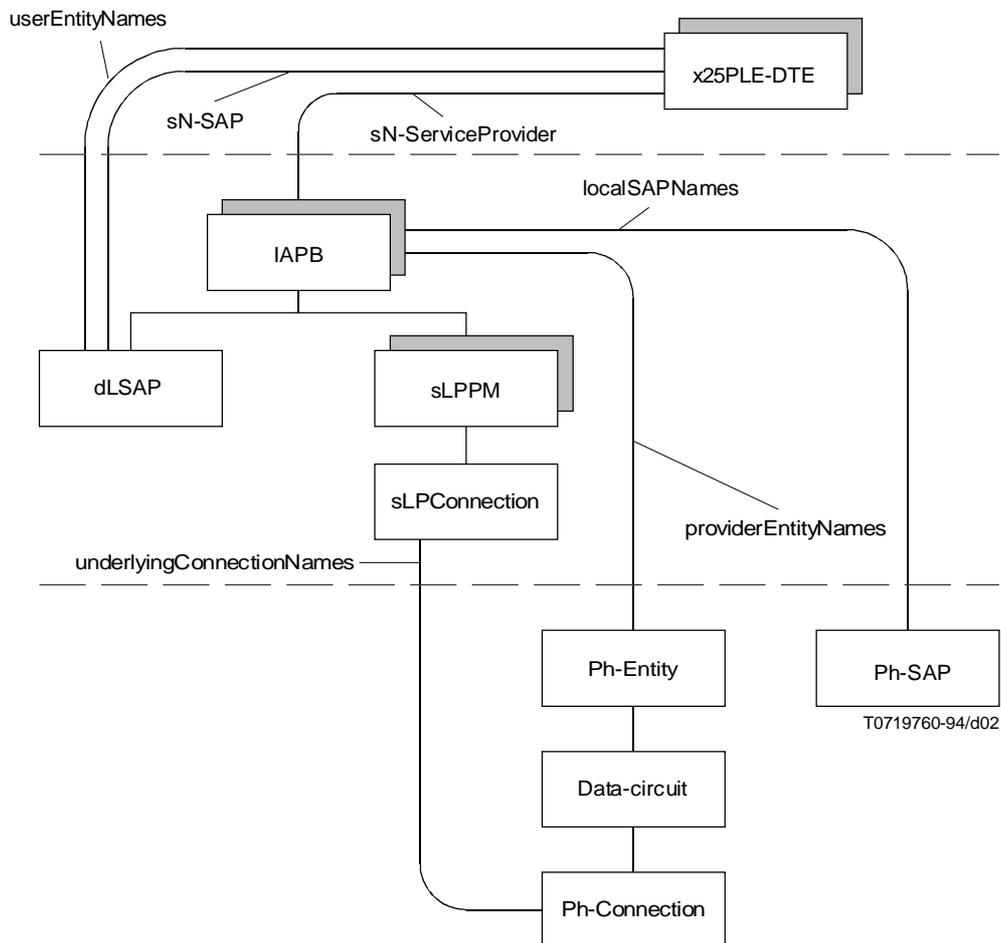


FIGURE B.1/X.282  
CONS over LAPB (SLP)

# Superseded by a more recent version

## Annex C

### Additional Attributes and Action required for Systems

(This annex does not form an integral part of this Recommendation)

#### C.1 Introduction

In complete intermediate systems, such as, e.g. a repeater, some attributes and actions are necessary to fill out the management of a complete system. These items are generic in the sense that they are required for managed systems in general. The following items are defined to aid in the completeness of this Recommendation, although it is recognized that they are outside the bounds of the definition area for a layer 2 standard.

#### C.2 Scope

This annex defines additional attributes and an action that are necessary to the management of a complete intermediate system, such as, e.g. a repeater. They are not specifically related to a Data Link Layer Management Standard.

When a generic systems management standard is available with these definitions (or similar), it is expected that this portion of this Recommendation will be removed.

#### C.3 Attributes and Action

-- *Attributes*

**aTimeSinceSystemReset ATTRIBUTE**

**DERIVED FROM** AttributeModule.ResettableCounter32;

**BEHAVIOUR** bTimeSinceSystemReset;

**DEFINED AS**

The time in tens of milliseconds since the last time that the system, including network management was reset. This may have been caused by ResetSystemAction or other means. This counter has a value of 0 when initialized.

Though the count is reported in tens of milliseconds, the required resolution is to the nearest 100 ms. The clocking source for the counter shall be accurate to within 1% throughout the full counting range.;

NOTE – The approximate minimum time for counter rollover is 497 days.

**REGISTERED AS** {iso(1)member-body(2) us(840) 802dot3(1006)

repeaterMgt(19)attribute(7)

sysResetTime(47)};

**aRepeaterResetTimeStamp ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** AttributeModule.Integer32;

**BEHAVIOUR** brepeaterResetTimeStamp;

**DEFINED AS**

Not a counter, this attribute provides the value of aTimeSinceSystemReset when the repeater enters the START state. This value may never be greater than aTimeSinceSystemReset.;

**REGISTERED AS** {iso(1)member-body(2) us(840)802dot3(10006)

repeaterMgt(19)attribute(7)

repeaterResetTimeStamp(48)};

-- *Action*

**acRestSystemAction ACTION**

**BEHAVIOUR** acResetSystem;

**DEFINED AS**

This action initializes the resettable management counters of the system and also of all contained objects. The value of non-resettable counters may change as a result of this action.;

NOTE – This action may result in the loss of packets.

**MODE CONFIRMED;**

**REGISTERED AS** {iso(1)member-body(2) us(840)802dot3(10006)

repeaterMgt(19)action(9)

resetSystem(49)}