# ETSI

# EUROPEAN TELECOMMUNICATION STANDARD

## ETS 300 273

**March 1994**

Source: ETSI TC-NA

Reference: DE/NA-053129

ICS: 33.080

**Key words:** MAN, management

# Network Aspects (NA);
# Metropolitan Area Network (MAN)
# Medium Access Control (MAC) layer management

## ETSI

European Telecommunications Standards Institute

**ETSI Secretariat**

New presentation - see History box

# Contents

## Foreword

This European Telecommunication Standard (ETS) describes the layer management for the Medium Access Control (MAC) layer of European Metropolitan Area Networks (MANs) to the ETSs on MANs.

This ETS has been produced by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI) taking into account the guide-lines given in CCITT Recommendation X.700 [11] and the protocol specification given in ETS 300 212 [2].

### Introduction

All the resources of a telecommunication network need to be managed in order to cost effectively provide the Quality Of Service (QOS) required by customers.

A subset of these resources is constituted by the protocol stack supporting communications between remote systems.

The structure and process of controlling and/or monitoring activities of different facilities in different communication layers is the layer management.

Blank page

# 1    Scope

This European Telecommunication Standard (ETS) describes the Medium Access Control (MAC) layer management which applies to the European standard Metropolitan Area Network (MAN).

To this end it:

a)    defines the reference architecture for MAC Layer Management (MLM);

b)    defines services and protocols for MLM;

c)    includes the specification of managed objects which permit the operation of the protocol elements to be remotely managed. The definition of the managed object classes for the Connection Oriented (CO) and Constant Bit Rate (CBR) services is not contained in this ETS.

Management information within the network is exchanged through systems management protocols and special purpose layer management protocols.

# 2    Normative references

This ETS incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed below. For dated references, subsequent amendments to or revisions of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1]                    ETS 300 211: "Network Aspects (NA); Metropolitan Area Network (MAN) Principles and architecture".

[2]                    ETS 300 212: "Network Aspects (NA); Metropolitan Area Network (MAN) Media access control layer and physical layer specification".

[3]                    ETS 300 213: "Network Aspects (NA); Metropolitan Area Network (MAN) Physical layer convergence procedure for 2,048 Mbit/s".

[4]                    ETS 300 214: "Network Aspects (NA); Metropolitan Area Network (MAN) Physical layer convergence procedure for 34,368 Mbit/s".

[5]                    ETS 300 215: "Network Aspects (NA); Metropolitan Area Network (MAN) Physical layer convergence procedure for 139,264 Mbit/s".

[6]                    ETS 300 216: "Network Aspects (NA); Metropolitan Area Network (MAN) Physical layer convergence procedure for 155,520 Mbit/s".

[7]                    IEEE Standard 802.1b, Draft D.19 (1991): "Local Area Networks and Metropolitan Area Networks - Management".

[8]                    IEEE Standard 802.1f, Draft D7 (1991): "Guide-lines for the Development of Layer Management Standard".

[9]                    IEEE Standard 802.6g, Draft D0 (1991): "Distributed Queue Dual Bus (DQDB) Subnetwork of a Metroplolitan Area Network (MAN) - Layer Management".

[10]                   CCITT Recommendation X.208 (1988): "Specification of Abstract syntax notation one (ASN.1)".

[11]                   CCITT Recommendation X.700: "OSI Management Framework".

[12]                   CCITT Recommendation X.701: "Information technology - Open systems interconnection - Systems management overview".

[13]     CCITT Recommendation X.711 (1991): "OSI Common management information protocol specification for CCITT applications".

[14]     CCITT Draft Recommendation X.720: "Information technology - Open systems interconnection - Structure of management informations: management information model".

[15]     CCITT Draft Recommendation X.721: "Information technology - Open systems interconnection - Structure of management informations: definition of management information".

[16]     CCITT Recommendation X.722: "Information technology - Open systems interconnection - Structure of management informations: Guide-lines for the Definition of Managed Objects".

[17]     CCITT Recommendation X.200 (1988): "Reference model of open system interconnection for CCITT applications".

[18]     IEEE Standard 802.6 (1991): "Distributed Queue Dual Bus (DQDB) Subnetwork of a Metropolitan Area Network (MAN)".

[19]     CCITT Recommendation M.3010 (1992): "Principles for a Telecommunication Management Network".

[20]     CCITT Recommendation G.773 (1988): "Protocol suites for Q-interfaces for management of transmission systems".

[21]     ETS 300 276: "Network Aspects (NA); Metropolitan Area Network (MAN) Physical layer convergence procedure for 622,080 Mbit/s CCITT Recommendations G.707, G.708, and G.709 SDH based systems".

[22]     ISO 8802-2 (1988): "Information processing systems - Local area networks - Part 2: Logical link control".

[23]     ISO 8802-2 addendum 2: "Information Processing Systems - Local Area Networks. Logical Link Control - Addendum 2: Acknowledged connectionless-mode services and protocol, Type 3 operation".

[24]     ISO 8348 addendum 1 (1987): "Information processing systems - Data communication - Network service definition Addendum 1: Connectionless-mode transmission".

[25]     ISO 8348 addendum 2 (1988): "Information processing systems - Data communication - Network service definition - Addendum 2: Network layer addressing".

[26]     ISO 8473 (1988): "Information processing systems - Data communications - Protocol for providing the connectionless-mode network service".

[27]     CCITT Recommendation M.3100 (1992): "Generic Network Information Model".

[28]     CCITT Draft Recommendation X.738 (1991): "Summarisation Function".

# 3 Definitions and abbreviations

## 3.1 Definitions

This ETS uses the MAN terminology defined in ETS 300 211 [1], specifically:

a)    Access Facility 1 (AF1);

b)    Access Facility 2 (AF2);

c)    Distributed Queue Dual Bus (DQDB);

d)    MAN Switching System (MSS);

e)    Metropolitan Area Network (MAN);

f)    User MAN Interface (UMI).

This ETS also uses the MAN terminology defined in ETS 300 212 [2], specifically:

a)    Bus Identification Field (BIF);

b)    Default Slot Generator Subfield (DSGS);

c)    External Timing Source Subfield (ETSS);

d)    Head Of Bus Subfield (HOBS);

e)    Medium Access Control (MAC);

f)    Message Identifier (MID);

g)    Physical Layer Convergence Procedure (PLCP);

h)    slot.

This ETS uses some of the terminology defined in the CCITT Draft Recommendation X.738 [28], specifically:

-    granularity period.

## 3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

| | |
|---|---|
| AF1 | Access Facility 1 |
| AF2 | Access Facility 2 |
| AFI | Authority and Format Identifier |
| ASN.1 | Abstract Syntax Notation 1 |
| BCD | Binary Coded Decimal |
| BIF | Bus Identification Field |
| BWB | Bandwidth Balancing |
| CBR | Constant Bit Rate |
| CC | Configuration Control |
| CL | Connectionless |
| CO | Connection Oriented |
| CRC | Cyclic Redundancy Check |
| DCN | Data Communication Network |
| DMPDU | Derived MAC Protocol Data Unit |
| DQDB | Distributed Queue Dual Bus |
| DSGS | Default Slot Generator Subfield |
| ETSI MAN | European MAN conforming to ETSI ETSs on MANs |
| ETSS | External Timing Source Subfield |

| | |
|---|---|
| HOB | Head Of Bus |
| HOBS | Head Of Bus Subfield |
| IDI | Initial Domain Identifier |
| IMPDU | Initial MAC Protocol Data Unit |
| LLC | Logical Link Control |
| LMPE | Layer Management Protocol Entity |
| LSAP | LLC Service Access Point |
| MAC | Medium Access Control |
| MAN | Metropolitan Area Network |
| MCF | MAC Convergence Functions |
| MID | Message Identifier |
| MLM | MAC Layer Management |
| MN | MAN Node |
| MSS | MAN Switching System |
| NE | Network Element |
| PDH | Plesiochronous Digital Hierarchy |
| PDU | Protocol Data Unit |
| PLCP | Physical Layer Convergence Procedure |
| PLCSM | Physical Layer Connection State Machine |
| PR | Page Request |
| QA | Queued Arbitrated |
| $Q_{MAN}$ | Q interface for specific MAN systems and service management |
| QOS | Quality Of Service |
| RDN | Relative Distinguished Name |
| RIT | Reassembly IMPDU Timer |
| RSM | Reassembly State Machine |
| SAP | Service Access Point |
| SDH | Synchronous Digital Hierarchy |
| TMN | Telecommunication Management Network |
| UMI | User MAN Interface |
| VCI | Virtual Channel Identifier |

# 4 MAC layer management

The MAC layer of the European MAN conforming to ETSI ETSs on MANs (ETSI MAN) uses IEEE Standard 802.6 [18] Distributed Queue Dual Bus (DQDB) functions. Management of these functions is performed in two specific categories: peer-to-peer management of DQDB entities is performed over a special purpose layer management protocol, and remote management is performed over a systems management interface. These are described below.

## 4.1 MAC layer management architecture

This subclause describes the general architecture for MLM.

There are two main aspects of the management function. One is the layer management related information and operations and the second is the communication services and protocols required to exchange management information between different open systems.

The information model used in this ETS is based on the definition given in CCITT Draft Recommendation X.720 [14]. Managed objects for MLM are defined according to guide-lines given in CCITT Recommendation X.722 [16].

Management communication is effected through the following mechanisms:

a)    the use of the special purpose management protocols within the layer;

b)    the use of systems management protocols.

### 4.2 MLM through special purpose layer management protocols within the MAC layer

The mechanism for the exchange of layer management information between two MAC layer entities is indicated in IEEE Standard 802.6 [18], sections 9 and 10, as indicated in ETS 300 212 [2]. Figure 1 shows a schematic representation of this mechanism.

The MAC layer entities communicate with one another via the MLM protocol to support management control of the layer.
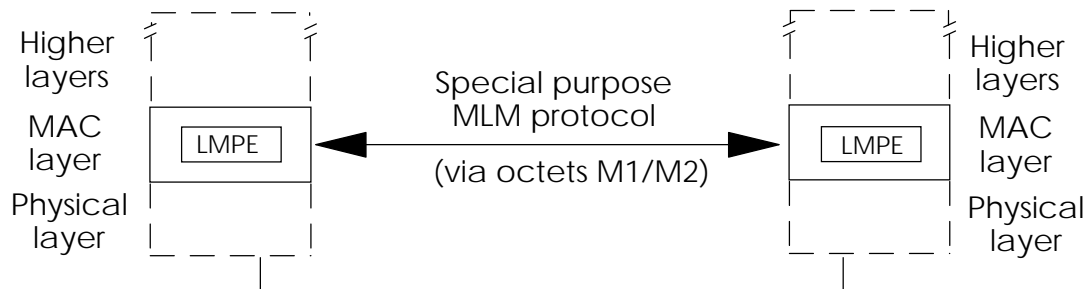


**Figure 1: Layer Management Protocol Entity (LMPE)**

### 4.2.1 MLM interface

This subclause is based on IEEE Standard 802.6 [18], section 9 (as indicated in ETS 300 212 [2]) and applies for Access Facility 1 (AF1) and Access Facility 2 (AF2). Section 9.2.4 of IEEE Standard 802.6 [18] describes functions required for the connection oriented convergence function and is, therefore, for further study within ETSI. Section 9.7 of IEEE Standard 802.6 [18] describes functions related to configuration control that are required only for a looped multipoint configuration.

### 4.2.2 MLM protocol

This subclause is based on IEEE Standard 802.6 [18], section 10 (as indicated in ETS 300 212 [2]) and applies for AF1 and AF2. Section 10.2 of IEEE Standard 802.6 [18] describes the configuration control protocol, which is required only for a looped multipoint configuration. In any other case the node on the MAN Switching System (MSS) side of the interface shall set the MAC layer information octet type 0 to 00111011 (TYPE=0, Bus Identification Field (BIF)=01, Default Slot Generator Subfield (DSGS)=11, Head of Bus Subfield (HOBS)=01, External Timing Source Subfield (ETSS)=1).

Section 10.3 of IEEE Standard 802.6 [18] describes the Message Identifier (MID) page allocation protocol. This section applies only where dynamic distributed MID page allocation is implemented.

## 4.3 MLM through systems management

The communication structure for the exchange of management information through systems management protocols is based on manager/agent relationships as indicated in CCITT Recommendation X.701 [12].

Figure 2 shows the communication between the manager and the agent entities, between agent and managed objects, as well as the protocols and services used for this purpose.

The MAC layer resources are part of the whole MAN resources. Therefore, they are subject to control and supervision by the MAN systems management.

The interface to the MAN management system is the systems management interface, and the definition of this interface implies the definition of the management information (the information model) as well as of the protocols that carry this information.

The DQDB MAC sublayer is implemented both in MSSs and MAN Nodes (MNs). Depending on the type of managed element, different interfaces can be used for the management of the sublayer resources through system management.

MSSs can use either DQDB based networks or other networks as access part to the public Telecommunication Management Network (TMN) Data Communication Network (DCN).

The protocol suite which shall be used is either the $Q_{MAN}$ (described in subclause 4.3.2), the Q (defined in CCITT Recommendation G.773 [20]) or the Q3 (defined in CCITT Recommendation Q.961 and CCITT Recommendation Q.962).

The $Q_{MAN}$ short stack (see subclause 4.3.2.2) management interface shall be provided in the MN.

Additional interfaces may be provided.

This ETS specifies only the short stack $Q_{MAN}$ protocol suite.
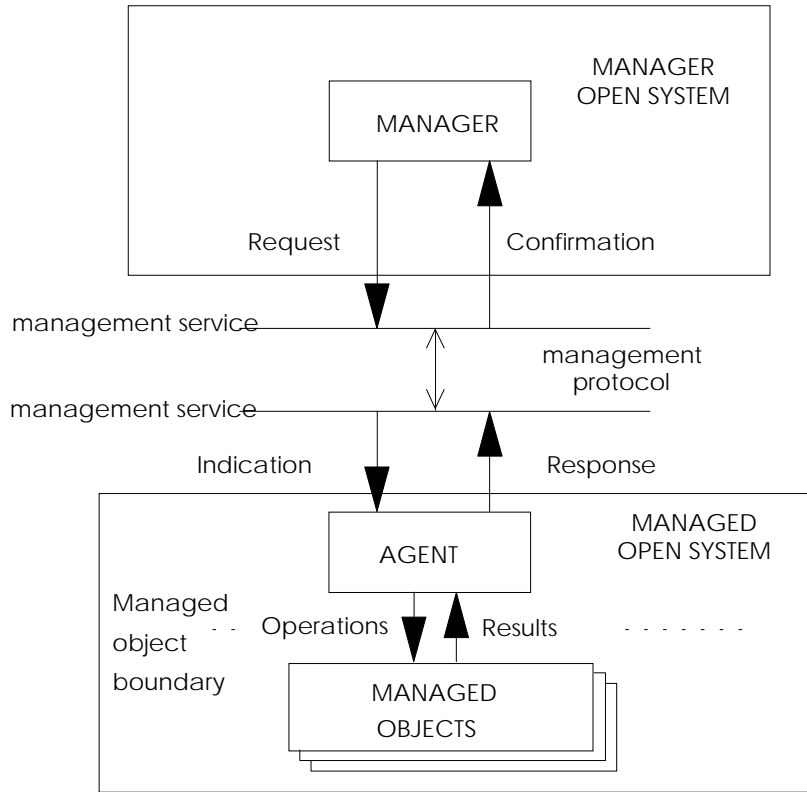
2a:   Operations
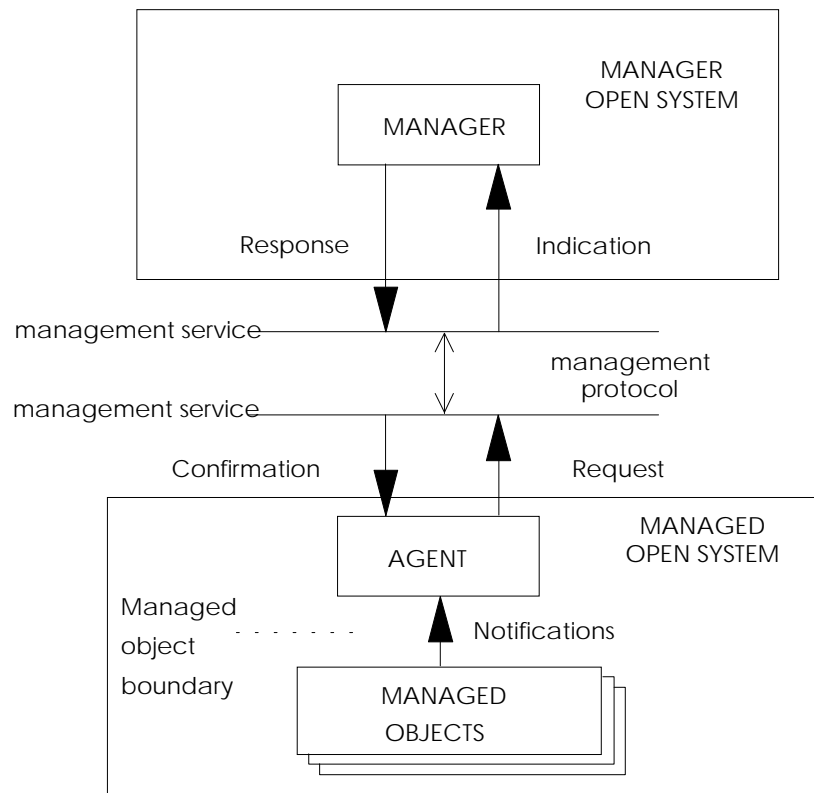


2b:   Notifications

**Figure 2: MAN management information exchanges**

### 4.3.1 Interface

The $Q_{MAN}$ interface is considered for specific MAN systems (and service) management. This interface shall be used for systems (and service) management communications among managers and agents (indicated in subclause 4.2) when they take place via a DQDB based MAN. The protocols for the $Q_{MAN}$ interface are specified in subclause 4.3.2. The exchanged information (as far as the MLM is concerned) is specified in Clause 5, where the MLM information model is defined.

> NOTE: The MAC layer information model as defined in this ETS can also be used with system management interfaces different from the $Q_{MAN}$.

### 4.3.2 Protocols

#### 4.3.2.1 Introduction

In the following, the protocol suites for the $Q_{MAN}$ interface are described.

The defined communication services and protocols are in accordance with the CCITT Recommendation X.200 [17]. The protocols for the non-MAC layers are based on CCITT Recommendations and/or ISO standards, while the MAC layer is defined in relevant IEEE Standard and ETSI standards, IEEE Standard 802.6 [18] and ETS 300 212 [2].

Two protocol suites are considered:

a)    short stack protocol suite;

b)    full 7 layers stack protocol suite.

A short stack protocol suite is mandatory when the $Q_{MAN}$ interface is placed on MAN Nodes (MNs) and shall be implemented as described in subclause 4.3.2.2.

The full 7 layers protocol suite for the $Q_{MAN}$ is not specified in this ETS. However, it should be aligned, for the layers above the MAC layer, to the CCITT Draft Recommendations Q.961 (§ 5.3.2.2 and § 5.3.3) and CCITT Recommendation Q.962 (§ 3.2, § 3.3, § 3.4, § 3.5, § 4.1 and § 4.2).

#### 4.3.2.2 Short stack protocol suite

#### 4.3.2.2.1 Physical layer

The short stack protocol suite employs MAN technology for the physical and data link layers. Therefore, the following alternatives are considered for the physical layer:

-    2,048 Mbit/s:    CCITT Recommendations G.702, G.703, and G.704 Plesiochronous
Digital Hierarchy (PDH);

-    34,368 Mbit/s:    CCITT Recommendations G.702, G.703, and G.751 PDH;

-    139,264 Mbit/s:    CCITT Recommendations G.702, G.703, and G.751 PDH;

-    155,520 Mbit/s:    CCITT Recommendations G.707, G.708, and G.709 Synchronous
Digital Hierarchy (SDH);

-    622,080 Mbit/s:    CCITT Recommendations G.707, G.708, and G.709 SDH.

The relevant Physical Layer Convergence Procedures (PLCPs) are indicated respectively in the following documents:    ETS 300 213 [3],    ETS 300 214 [4],    ETS 300 215 [5],    ETS 300 216 [6]    and    in ETS 300 276 [21].

#### 4.3.2.2.2 Data link layer

The data link layer provides the acknowledged connectionless-mode service. The access method employed is the DQDB in accordance with IEEE Standard 802.6 [18].

The services and protocol of the DQDB access method shall comply with those specified in ETS 300 211 [1]. The address length used at the MAC sublayer shall be 60 bits.

The definition of the acknowledged connectionless-mode Logical Link Control (LLC) service and protocol shall comply with that specified in ISO 8802-2 [22] and ISO 8802-2 addendum 2 [23].

#### 4.3.2.2.3 Network layer

The definition of the connectionless-mode network service shall comply with that specified in ISO 8348 addendum 1 [24]. Address formats supported shall conform to ISO 8348 addendum 2 [25].

The network layer requires the normal data transfer service from the data link layer. The network layer shall provide the N-UNITDATA service as listed in table 8 of CCITT Recommendation G.773 [20] (equivalent to table 15 of ISO 8348, addendum 1 [24]).

The network protocol is specified in ISO 8473 [26]. The Authority and Format Identifier (AFI) and the Initial Domain Identifier (IDI) shall be set according to ISO 8348 addendum 2 [25].

The full network layer protocol and its two subsets permit the use of known sub-network characteristics and are therefore not sub-network independent. Depending on the required usage and the sub-network architecture, the full network layer protocol, or one or both subsets, shall be supported by the short stack protocol suite:

- the inactive network layer protocol shall be in accordance with the inactive subset of the protocol as defined in ISO 8473 [26];

- the non-segmenting network layer protocol shall be in accordance with "Type 1" functions of the non-segmenting subset of the protocol as defined in ISO 8473 [26]. From the optional functions ("Type 3") defined in the non-segmenting subset only the "priority functions" shall be supported as defined in ISO 8473 [26];

- the full network layer protocol subset of category "Type 1" functions shall be in accordance with ISO 8473 [26]. An implementation of such a protocol shall not transmit PDUs encoded using the inactive subset. Received Protocol Data Units (PDUs) encoded using the inactive subset shall be discarded. An implementation shall not generate data PDUs without a segmentation part, i.e. the segmentation permitted flag (SP) shall be set to 1 and the segmentation part shall be included. However, an implementation shall be capable of receiving and correctly processing PDUs which do not contain the segmentation part.

#### 4.3.2.2.4 Mapping functions

No transport layer, session layer and presentation layer is specified for the short stack protocol suite. To provide the required service to the application layer and using the provided service of the network layer, a mapping function is defined. The mapping function for the short stack protocol suite is specified in the CCITT Recommendation G.773 [20], § 3.4.

#### 4.3.2.2.5 Application layer

The application layer services and protocol for the short stack protocol suite are specified in CCITT Recommendation G.773 [20], § 3.5.

#### 4.3.2.3 Addressing principles for MAN systems management

System management communications between local and remote managers require communication facilities (i.e. DCN). A specific protocol suite and interface (i.e. $Q_{MAN}$), to be used when the DCN is a DQDB-based MAN, have been specified. In the following subclauses a generic scheme for addressing of management communications is outlined.

#### 4.3.2.3.1 MAC layer addresses

Management communications shall make use of the Connectionless (CL) service functionalities provided by the MAN MAC layer. Numbers structured according to CCITT Recommendation E.164 shall be assigned to address management entities.

The management PDUs that run over the MAC shall be uniquely identified as containing management information by using the value '000010' binary (to be confirmed by the IEEE) of the protocol identifier field in the Initial MAC Protocol Data Unit (IMPDU), see ETS 300 212 [2].

#### 4.3.2.3.2 Logical link addresses

Management communications will use the LLC type 3 service. A single LLC (LLC Service Access Point (LSAP)) address shall be allocated for MAN management, similarly to what is expected for IEEE LAN/MAN management.

The value of the LLC address to be used is '01000000' binary.

#### 4.3.2.3.3 Addressing at higher layers

The addressing schemes and principles used for the higher layers of the protocol stack are outside the scope of this ETS.

# 5 Information model for systems management of the MAC layer

The definition of the information model is based on the guide-lines given in CCITT Draft Recommendations X.720 [14] and X.721 [15] and deals with managed objects. In this context managed objects are the management view of resources within the MAC Layer that are subject to management. Figures 3 and 4 show the MAC layer managed objects inheritance and naming trees respectively.

In the following the MAC layer managed objects for the MAC CL service are described.

> NOTE: The definition of the managed object classes for the Connection Oriented (CO) and Constant Bit Rate (CBR) services is not contained in this ETS and is for further study.

## 5.1 Object classes and packages definitions

### 5.1.1 Message identifier page allocation

midPageAllocation                    MANAGED OBJECT CLASS

  DERIVED FROM     "CCITT Recommendation X.721 [15]":top;
  CHARACTERIZED BY    midPageAllocationPackage;

REGISTERED AS {managedObjectClass 0};


midPageAllocationPackage             PACKAGE

BEHAVIOUR                            midPageAllocationPackageBehaviour;

  ATTRIBUTES
  midPageAllocationId    GET,
  reservedMIDPages     DEFAULT VALUE 0
             GET-REPLACE
             REPLACE-WITH-DEFAULT,
  midPagesInUse      GET
             ADD-REMOVE,
  maxMIDPages      DEFAULT VALUE 1
             GET-REPLACE
             REPLACE-WITH-DEFAULT;

REGISTERED AS {package 0};

midPageAllocationPackageBehaviour          BEHAVIOUR

DEFINED AS '

This is the managed object class which represents the MID allocation process. The reservedMIDPages attribute is equal to the DQDB single value RESERVED_MID_PAGES attribute defined in IEEE Standard 802.6 [18], section 7.3.4, as indicated in ETS 300 212 [2]. The midPagesInUse attribute specifies the MIDs used by the node. It contains a table with the following fields: MCF_ID; Message_ID; Time_Stamp. The maxMIDPages attribute is equal to the DQDB single value MAX_MID_PAGES attribute defined in IEEE Standard 802.6 [18], section 7.3.5, as indicated in ETS 300 212 [2].

> NOTE:        The implementation of this object class is conditional. It is mandatory if the dynamic centralised MID page allocation mechanism is implemented. This is reflected in ETS 300 274. The centralised MID page allocation is performed via the ADD-REMOVE operation on the midPagesInUse attribute.

';

## 5.1.2        DQDB configuration

dqdbConfiguration                          MANAGED OBJECT CLASS

        DERIVED FROM                       "CCITT Recommendation X.721 [15]":top;

        CHARACTERIZED BY                   dqdbConfigurationPackage;
        CONDITIONAL PACKAGES
        configurationControlPackage        PRESENT IF
                                           "an instance supports it";

REGISTERED AS {managedObjectClass 1};

dqdbConfigurationPackage                   PACKAGE

BEHAVIOUR                                   dqdbConfigurationPackageBehaviour;

        ATTRIBUTES
                dqdbConfigurationId          GET,
                hobOperationIndicators       GET,
                linkStatusIndicator          GET,
                externalTimingSourceStatus   GET,
                lmInfoOctetsType0            GET;

REGISTERED AS {package 1};

dqdbConfigurationPackageBehaviour          BEHAVIOUR

DEFINED AS '

The dqdbConfiguration managed object class represents the subnetwork (re)configuration functions in the DQDB layer. The hobOperationIndicators attribute is equal to the DQDB attribute HOB_OPERATION defined in IEEE Standard 802.6 [18], section 7.5.2, as indicated in ETS 300 212 [2]. The linkStatusIndicators attribute equals the DQDB single value attribute LINK_STATUS defined in IEEE Standard 802.6 [18], section 7.5.3, as indicated in ETS 300 212 [2]. The externalTimingSourceStatus attribute is equal to the DQDB single value attribute ETS_STATUS defined in IEEE Standard 802.6 [18], section 7.5.4, as indicated in ETS 300 212 [2]. The lmInfoOctetsType0 attribute represents the information carried in the two Type 0 octets, as defined in IEEE Standard 802.6 [18], received at the Ph-SAPs and supporting communication between different DQDB layer management entities.

> NOTE:        The information concerning the dqdb single value attribute CC_STATUS defined in IEEE 802.6 Standard [18], section 7.5.1, as indicated in ETS 300 212 [2], can be derived from the hobOperationIndicators attribute.

';

configurationControlPackage                PACKAGE

```
BEHAVIOUR                              configurationControlPackageBehaviour;

      ATTRIBUTES
            hobArbitrationTimerPeriod      DEFAULT VALUE 5000
                                           GET-REPLACE
                                           REPLACE-WITH-DEFAULT,
            nodeType                       GET-REPLACE,
            configurationControlFlag       DEFAULT VALUE disabled
                                           GET-REPLACE
                                           REPLACE-WITH-DEFAULT;

REGISTERED AS {package 2};

configurationControlPackageBehaviour      BEHAVIOUR

DEFINED AS '
```

The hobArbitrationTimerPeriod attribute is equal to the dqdb single value attribute Timer_H_PERIOD defined in IEEE Standard 802.6 [18], section 7.3.2, as indicated in ETS 300 212 [2] (its default value is 5 000 ms). The nodeType attribute identifies the distinction between a normal node and the default slot generator node. The configurationControlFlag attribute equals the DQDB single value attribute CC_12_CONTROL, defined in IEEE Standard 802.6 [18], section 7.4.1, as indicated in ETS 300 212 [2].

';

### 5.1.3        Distributed queue process

```
distributedQueueProcess                MANAGED OBJECT CLASS

      DERIVED FROM                     "CCITT Recommendation X.721 [15]":top;
      CHARACTERIZED BY                 distributedQueueProcessPackage;

REGISTERED AS {managedObjectClass 2};


distributedQueueProcessPackage         PACKAGE

BEHAVIOUR                              distributedQueueProcessPackageBehaviour;

      ATTRIBUTES
      distributedQueueProcessId        GET,
      priority                         GET;

REGISTERED AS {package 3};


distributedQueueProcessPackageBehaviour BEHAVIOUR

DEFINED AS '
```

The distributedQueueProcess managed object class represents the DQDB distributed queue resources.

';

### 5.1.4        Bandwidth balancing process

```
bandwidthBalancingProcess              MANAGED OBJECT CLASS

      DERIVED FROM                     "CCITT Recommendation X.721 [15]":top;
      CHARACTERIZED BY                 bandwidthBalancingProcessPackage;

REGISTERED AS {managedObjectClass 3};


bandwidthBalancingProcessPackage       PACKAGE
```

```
BEHAVIOUR                                    bwbProcessPackageBehaviour;

    ATTRIBUTES
    bandwidthBalancingId                     GET,
    bwbBusIdentifier                         GET,
    bwbModulus                               DEFAULT VALUE 8
                                             GET-REPLACE
                                             REPLACE-WITH-DEFAULT;

REGISTERED AS {package 4};


bwbProcessPackageBehaviour              BEHAVIOUR

DEFINED AS '
```

The bandwidthBalancingProcess managed object class represents the resources of the DQDB bandwidth balancing mechanism. The bwbBusIdentifier attribute specifies the bus on which the process is operating. The bwbModulus attribute is equal to the single value attribute BWB_MOD defined in IEEE Standard 802.6 [18], section 7.3.6, as indicated in ETS 300 212 [2].

> NOTE: This object class is optional if the multipoint configuration is implemented, and not applicable if the point-to-point configuration is implemented.

';

### 5.1.5 MAN DQDB service access point

```
manDQDBsap                          MANAGED OBJECT CLASS

    DERIVED FROM                    "CCITT Recommendation X.721 [15]":top;
    CHARACTERIZED BY                manDQDBsapPackage;

REGISTERED AS {managedObjectClass 4};


manDQDBsapPackage                   PACKAGE

BEHAVIOUR                           manDQDBsapPackageBehaviour;

    ATTRIBUTES
    manDQDBsapId                    GET,
    manDQDBsapNumber                GET-REPLACE,
    manDQDBsapStatus                GET-REPLACE;

REGISTERED AS {package 5};


manDQDBsapPackageBehaviour          BEHAVIOUR

DEFINED AS '
```

manDQDBsap is the managed object class representing the point at which the service is provided. The manDQDBsapId attribute can be used to build the relative distinguished name of the instances of the class. The manDQDBsapNumber attribute represents the CCITT Recommendation E.164 number associated with the point at which the DQDB layer services (CL, CO or CBR) are provided. The manDQDBsapStatus attribute represents the logical status of the service access point.

';

> NOTE: The manDQDBsapStatus attribute is under discussion. The need for representing the status of the sap is clear, but this might be done by deriving the object class from a superior class. While this would also be useful for other object classes, a suitable superior object class has not yet been identified and the manDQDBsapStatus attribute has been retained in the description.

### 5.1.6 MAN CL service access point

manCLsap                              MANAGED OBJECT CLASS

    DERIVED FROM            manDQDBsap;
    CHARACTERIZED BY        manCLsapPackage;

REGISTERED AS {managedObjectClass 5};


manCLsapPackage PACKAGE

BEHAVIOUR                              manCLsapPackageBehaviour;

    ATTRIBUTES
    manCLsapAddress                GET-REPLACE,
    discardedIMPDUsThreshold      DEFAULT VALUE
        ASN1AttributeModule.discardedIMPDUsThresholdDefVal
                        GET-REPLACE
                        REPLACE-WITH-DEFAULT;


    ACTIONS

    manCLsapAddressSet;
    NOTIFICATIONS
    discardedIMPDUsThresholdAlarm;

REGISTERED AS {package 6};


manCLsapPackageBehaviour              BEHAVIOUR

DEFINED AS '

manCLsap is the managed object class representing the point at which the connectionless service is provided. This object inherits the attributes from the manDQDBsap managed object class. The manCLsapAddress attribute represents the DQDB MAC address. The structure of the address includes a 4-bit field and a 60-bit field, as defined in IEEE Standard 802.6 [18]. The CCITT Recommendation E.164 numbers associated with the DQDB Service Access Point (SAP) and represented by the manDQDBsapNumber attribute are mapped into the coding defined for the CL service purposes, which is fully described in subclause 5.6. The mapping includes Binary Coded Decimal (BCD) coding of the 15 digits of the CCITT Recommendation E.164 number and their placing in the 60-bit field of the CL SAP address. An alarm is emitted when the threshold represented by the discardedIMPDUsThreshold attribute is reached.

';

    NOTE:        The discardedIMPDUsCounter attribute can be found in Annex A, Clause A.4.

### 5.1.7 Segment header processing

segmentHeaderProcessing               MANAGED OBJECT CLASS

    DERIVED FROM            "CCITT Recommendation X.721 [15]":top;
    CHARACTERIZED BY        segmentHeaderProcessingPackage;

REGISTERED AS {managedObjectClass 6};

segmentHeaderProcessingPackage        PACKAGE

BEHAVIOUR                              segmentHeaderProcessingPackageBehaviour;

    ATTRIBUTES
    segmentHeaderProcessingId      GET,
    clVCIList                      DEFAULT VALUE {1,'FFFFF' hex}
                        GET

```
                                                    ADD-REMOVE
                                                    REPLACE-WITH-DEFAULT;
        ACTIONS
        clVCIListSet;

REGISTERED AS {package 7};
```

segmentHeaderProcessingPackageBehaviour    BEHAVIOUR

DEFINED AS '

The segmentHeaderProcessing managed object class represents the resources related to virtual channel identifiers. The clVCIList attribute contains the list of connectionless VCIs associated with the MAC convergence function in a MAN node. The default list includes the number of Virtual Channel Identifiers (VCIs), i.e. 1 and the single value 'FFFFF' hex (or '11111111111111111111' binary), as specified in IEEE Standard 802.6 [18], section 6.3.1.1.1.1, as indicated in ETS 300 212 [2].

';

## 5.1.8 IMPDU reassembly process

impduReassemblyProcess               MANAGED OBJECT CLASS

```
        DERIVED FROM                            "CCITT Recommendation X.721 [15]":top;
        CHARACTERIZED BY                        impduReassemblyProcessPackage;
        CONDITIONAL PACKAGES
        reassemblyErrorCounterThresholdPackage  PRESENT IF
                                                "an instance supports it",
            crc32CheckControlPackage            PRESENT IF
                                                "an instance supports it";

REGISTERED AS {managedObjectClass 7};
```

impduReassemblyProcessPackage         PACKAGE

BEHAVIOUR                           impduReassemblyProcessPackageBehaviour;

```
        ATTRIBUTES
        impduReassemblyProcessId GET,
        ritPeriod                               DEFAULT VALUE 700
                                                GET-REPLACE
                                                REPLACE-WITH-DEFAULT;

REGISTERED AS {package 8};
```

impduReassemblyProcessPackageBehaviour    BEHAVIOUR

DEFINED AS '

The impduReassemblyProcess managed object class represents the resources of the DQDB reassembly procedure. The ritPeriod (its default value is 700 ms) attribute is equal to the single value attribute RIT_PERIOD defined in IEEE Standard 802.6 [18], section 7.3.1, as indicated in ETS 300 212 [2].

';

reassemblyErrorCounterThresholdPackage    PACKAGE

BEHAVIOUR             reassemblyErrorCounterThresholdPackageBehaviour;

```
        ATTRIBUTES
        reassemblyErrorCounterThreshold         DEFAULT VALUE
        ASN1AttributeModule.reassemblyErrorCounterThresholdDefVal
                                                GET-REPLACE
                                                REPLACE-WITH-DEFAULT;
        NOTIFICATIONS
```

reassemblyErrorCounterThresholdAlarm;

REGISTERED AS {package 9};


reassemblyErrorCounterThresholdPackageBehaviour        BEHAVIOUR

DEFINED AS '

This package supports the emission of an appropriate notification in case the number of errors occurring during the IMPDU reassembly process reach a specific threshold value within a certain granularity period. It also supports the control over this threshold value.

';

      NOTE:        The reassemblyErrorCounter attribute can be found in Annex A, Clause A.6.

crc32CheckControlPackage PACKAGE

BEHAVIOUR                crc32CheckControlPackageBehaviour;

    ATTRIBUTES
    crc32CheckControl                                DEFAULT VALUE off
                                        GET-REPLACE
                                        REPLACE-WITH-DEFAULT;

REGISTERED AS {package 10};


crc32CheckControlPackageBehaviour                        BEHAVIOUR

DEFINED AS '

The crc32CheckControlPackage package defines the information related to the operation of the CRC32 checking mechanism. It is an optional feature. The crc32CheckControl attribute is equal to the single value attribute CRC32_CHECK_CONTROL defined in IEEE Standard 802.6 [18], section 7.4.4, as indicated in ETS 300 212 [2]. The default value for this attribute is "off".

';

### 5.1.9        IMPDU transmission process

impduTransmissionProcess                                MANAGED OBJECT CLASS

    DERIVED FROM                                "CCITT Recommendation X.721 [15]":top;
    CHARACTERIZED BY                            impduTransmissionProcessPackage;
    CONDITIONAL PACKAGES
        crc32GenerationControlPackage        PRESENT IF
                                 "an instance supports it",
        headerExtensionPackage                PRESENT IF
                                 "an instance supports it";

REGISTERED AS {managedObjectClass 8};


impduTransmissionProcessPackage                        PACKAGE

BEHAVIOUR                                            impduTransmissionProcessBehaviour;

    ATTRIBUTES
    impduTransmissionProcessId                        GET,
    qosMap                                            DEFAULT VALUE {0,0,0,0,0,0,0,0}
                                         GET-REPLACE
                                      REPLACE-WITH-DEFAULT;

REGISTERED AS {package 11};

impduTransmissionProcessBehaviour                     BEHAVIOUR

DEFINED AS '

The impduTransmissionProcess is the managed object class which represents the resources of the IMPDU transmission procedure. The qosMap attribute is equal to the single value attribute QOS_MAP attribute defined in IEEE Standard 802.6 [18], section 7.3.3, as indicated in ETS 300 212 [2].

> NOTE:      The default value of the qosMap attribute is {0,0,0,0,0,0,0,0}, indicating that all the eight levels of QOS (from QOS level 0 to QOS level 7) for incoming PDUs correspond to the same priority value 0.

';

crc32GenerationControlPackage                         PACKAGE

BEHAVIOUR                                             crc32GenerationControlPackageBehaviour;

    ATTRIBUTES

    crc32GenerationControl
                                                     GET-REPLACE
                                                     REPLACE-WITH-DEFAULT;

REGISTERED AS {package 12};

crc32GenerationControlPackageBehaviour                BEHAVIOUR

DEFINED AS '

The crc32GenerationControlPackage package defines the information related to the operation of the CRC32 generation mechanism. It is an optional feature. The crc32GenerationControl attribute is equal to the single value attribute CRC32_GEN_CONTROL defined in IEEE Standard 802.6 [18], section 7.4.3, as indicated in ETS 300 212 [2].

';

headerExtensionPackage                                PACKAGE

BEHAVIOUR                                             headerExtensionPackageBehaviour;

    ATTRIBUTES
    headerExtensionList                                   GET
                                                     ADD-REMOVE;

REGISTERED AS {package 13};

headerExtensionPackageBehaviour                       BEHAVIOUR

DEFINED AS '

The headerExtensionPackage package defines information related to the use of the header extension field in the IMPDU. It is an optional feature. The headerExtensionList attribute specifies the list of header extension values that can be used by a MAC Convergence Functions (MCF) in order to provide the outgoing IMPDU with a header extension field.

';

### 5.1.10 Physical layer facilities

physicalLayerFacilities                        MANAGED OBJECT CLASS

    DERIVED FROM                        "CCITT Recommendation X.721 [15]":top;
    CHARACTERIZED BY                   physicalLayerFacilitiesPackage;
    CONDITIONAL PACKAGES
        physicalLayerFacilitiesStatusPackage       PRESENT IF
        "an instance supports it";

REGISTERED AS {managedObjectClass 9};

physicalLayerFacilitiesPackage                  PACKAGE

BEHAVIOUR                              physicalLayerFacilitiesPackageBehaviour;

    ATTRIBUTES
    physicalLayerFacilitiesId                 GET,
    hobCapableFlag                       GET;

REGISTERED AS {package 14};

physicalLayerFacilitiesPackageBehaviour       BEHAVIOUR

DEFINED AS '

The physicalLayerFacilities object class represents the resources of the physical layer. The hobCapableFlag attribute contains the status of the HOB_CAPABLE flag defined in IEEE Standard 802.6 [18], section 11.6.2, as indicated in ETS 300 212 [2].

';

physicalLayerFacilitiesStatusPackage          PACKAGE

BEHAVIOUR                              physicalLayerFacilitiesStatusPackageBehaviour;

    ATTRIBUTES
    physicalLayerFacilitiesStatus            DEFAULT VALUE normal
                                      GET-REPLACE
                                      REPLACE-WITH-DEFAULT;

REGISTERED AS {package 15};

physicalLayerFacilitiesStatusPackageBehaviour      BEHAVIOUR

DEFINED AS '

The physicalLayerFacilitiesStatus attribute contains information on the status of the physical layer connection state machine control flag defined in IEEE Standard 802.6 [18], section 11.6.1, as indicated in ETS 300 212 [2].

';

### 5.2 Name bindings for object classes

midPageAllocationBinding NAME BINDING

SUBORDINATE OBJECT CLASS              midPageAllocation;
NAMED BY SUPERIOR OBJECT CLASS
                          "CCITT Recommendation M.3100 [27]": managedElement;

WITH ATTRIBUTE                       midPageAllocationId;
CREATE with-automatic-instance-naming;
DELETE only-if-no-contained-objects;

REGISTERED AS {nameBinding 0};


dqdbConfigurationBinding                        NAME BINDING
SUBORDINATE OBJECT CLASS            dqdbConfiguration;
NAMED BY SUPERIOR OBJECT CLASS
                                   "CCITT Recommendation M.3100 [27]": managedElement;

WITH ATTRIBUTE                     dqdbConfigurationId;
CREATE with-automatic-instance-naming;
DELETE only-if-no-contained-objects;
REGISTERED AS {nameBinding 1};

distributedQueueProcessBinding                  NAME BINDING

SUBORDINATE OBJECT CLASS            distributedQueueProcess;
NAMED BY SUPERIOR OBJECT CLASS
                                   "CCITT Recommendation M.3100 [27]": managedElement;

WITH ATTRIBUTE                     distributedQueueProcessId;
CREATE with-automatic-instance-naming;
DELETE only-if-no-contained-objects;
REGISTERED AS {nameBinding 2};


bandwidthBalancingProcessBinding                NAME BINDING
SUBORDINATE OBJECT CLASS            bandwidthBalancingProcess;
NAMED BY SUPERIOR OBJECT CLASS
                                   "CCITT Recommendation M.3100 [27]": managedElement;

WITH ATTRIBUTE                     bandwidthBalancingId;
CREATE with-automatic-instance-naming;
DELETE only-if-no-contained-objects;
REGISTERED AS {nameBinding 3};


manCLsapBinding                                 NAME BINDING
SUBORDINATE OBJECT CLASS            manCLsap;
NAMED BY SUPERIOR OBJECT CLASS
                                   "CCITT Recommendation M.3100 [27]": managedElement;

WITH ATTRIBUTE                     manDQDBsapId;
CREATE with-automatic-instance-naming;
DELETE only-if-no-contained-objects;
REGISTERED AS {nameBinding 4};


segmentHeaderProcessingBinding                  NAME BINDING
SUBORDINATE OBJECT CLASS            segmentHeaderProcessing;
NAMED BY SUPERIOR OBJECT CLASS
                                   "CCITT Recommendation M.3100 [27]": managedElement;

WITH ATTRIBUTE                     segmentHeaderProcessingId;
CREATE with-automatic-instance-naming;
DELETE only-if-no-contained-objects;
REGISTERED AS {nameBinding 5};


impduReassemblyProcessBinding                   NAME BINDING
SUBORDINATE OBJECT CLASS            impduReassemblyProcess;
NAMED BY SUPERIOR OBJECT CLASS
                                   "CCITT Recommendation M.3100 [27]": managedElement;

WITH ATTRIBUTE                     impduReassemblyProcessId;
CREATE with-automatic-instance-naming;
DELETE only-if-no-contained-objects;
REGISTERED AS {nameBinding 6};

impduTransmissionProcessBinding                    NAME BINDING
SUBORDINATE OBJECT CLASS                    impduTransmissionProcess;
NAMED BY SUPERIOR OBJECT CLASS
                                   "CCITT Recommendation M.3100 [27]": managedElement;

WITH ATTRIBUTE                              impduTransmissionProcessId;
CREATE with-automatic-instance-naming;
DELETE only-if-no-contained-objects;
REGISTERED AS {nameBinding 7};


physicalLayerFacilitiesBinding NAME BINDING
SUBORDINATE OBJECT CLASS                    physicalLayerFacilities;
NAMED BY SUPERIOR OBJECT CLASS
                                   "CCITT Recommendation M.3100 [27]": managedElement;

WITH ATTRIBUTE                              physicalLayerFacilitiesId;
CREATE with-automatic-instance-naming;
DELETE only-if-no-contained-objects;
REGISTERED AS {nameBinding 8};
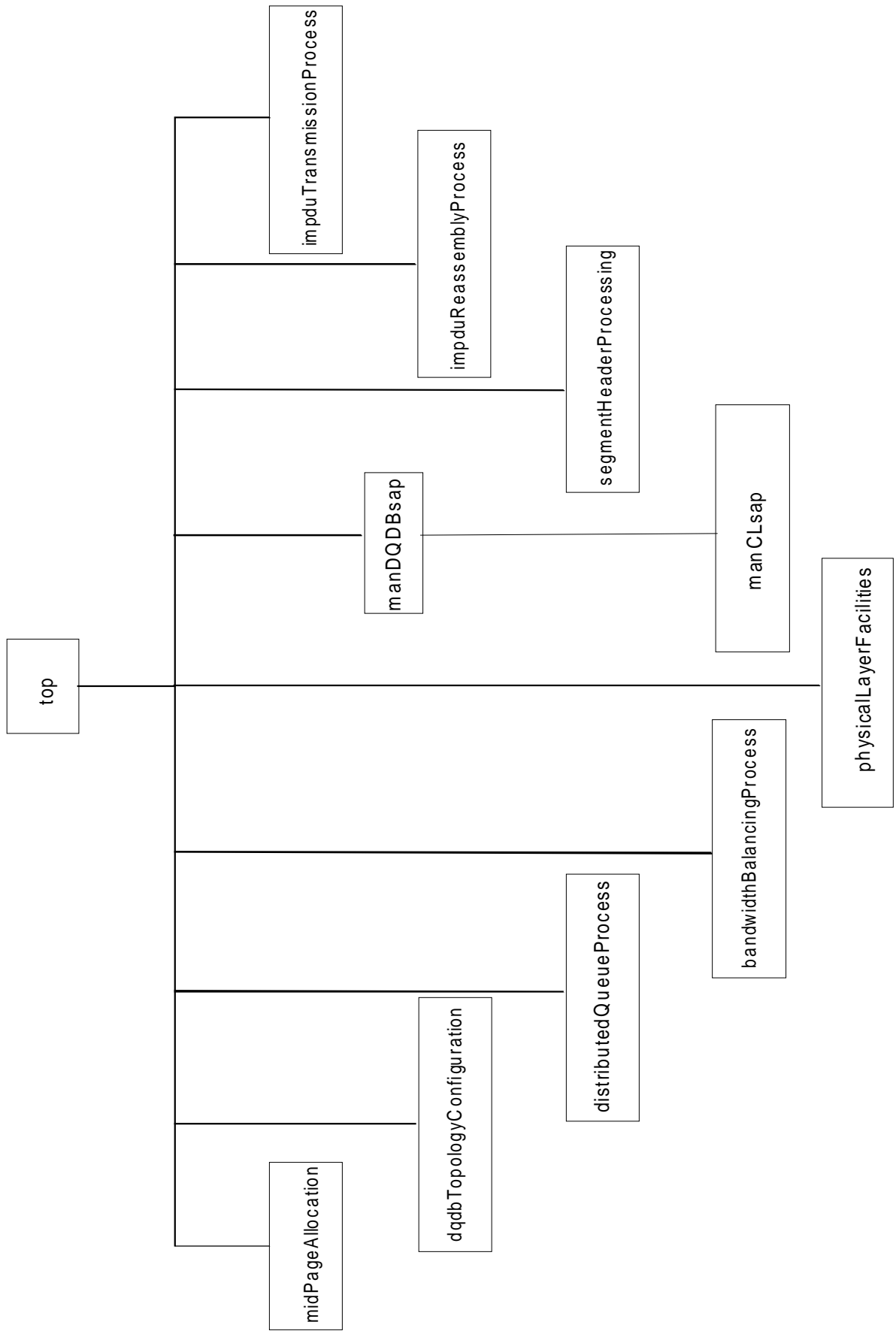
**Figure 3: MAC layer managed objects inheritance tree**
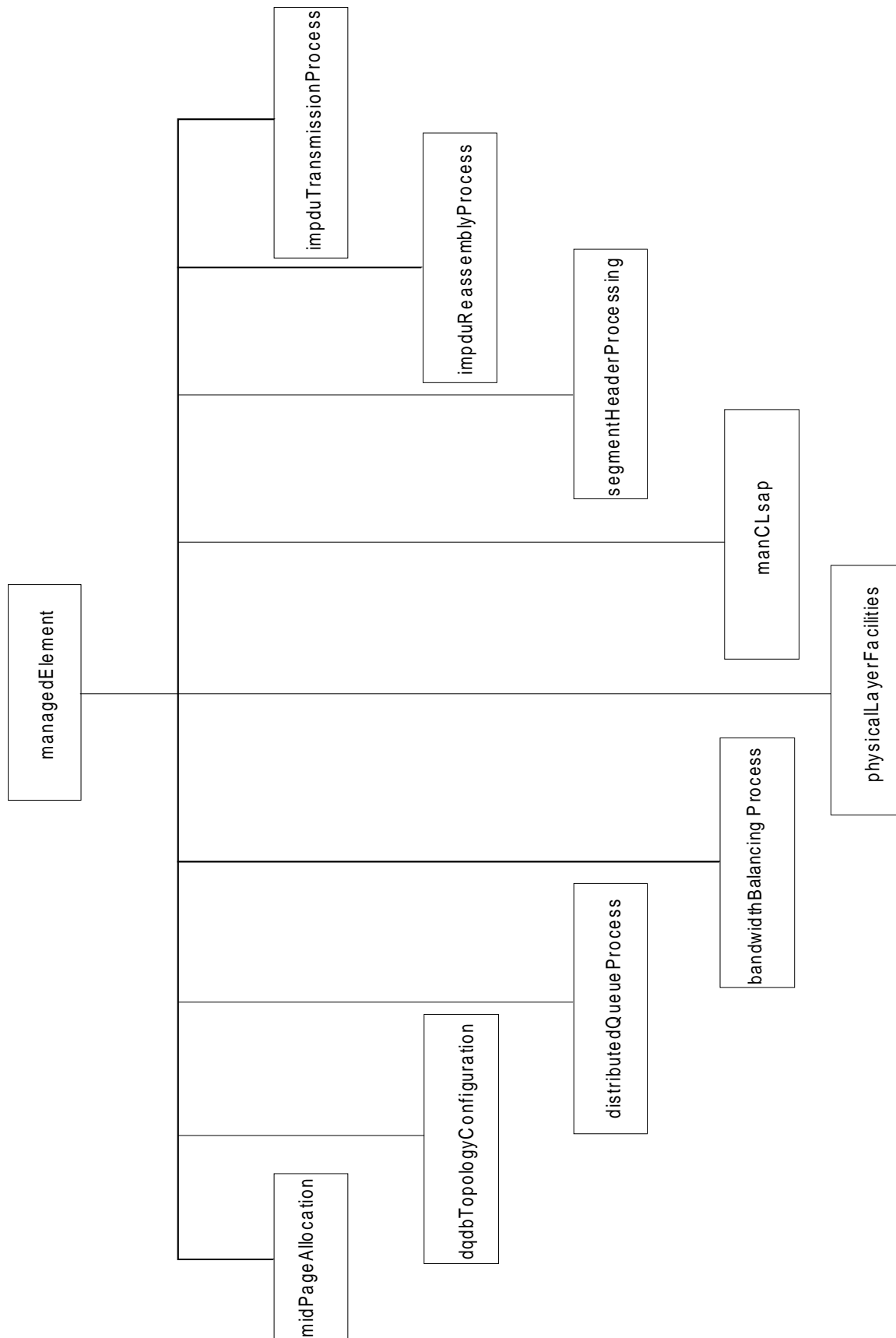
**Figure 4: MAC layer managed objects naming tree**

### 5.3    Attributes

bandwidthBalancingId                                 ATTRIBUTE

WITH ATTRIBUTE SYNTAX                     ASN1AttributeModule.Id;
MATCHES FOR                                       EQUALITY;
BEHAVIOUR                                             bandwidthBalancingIdBehaviour;
REGISTERED AS {attribute 0};


bandwidthBalancingIdBehaviour              BEHAVIOUR

DEFINED AS '

This attribute is used to construct the Relative Distinguished Name (RDN) of a bandwidthBalancingProcess managed object instance.

';

bwbBusIdentifier                                     ATTRIBUTE

WITH ATTRIBUTE SYNTAX

                                                             ASN1AttributeModule.BwbBusIdentifier;
MATCHES FOR                                       EQUALITY;
BEHAVIOUR                                             bwbBusIdentifierBehaviour;
REGISTERED AS {attribute 1};


bwbBusIdentifierBehaviour                      BEHAVIOUR

DEFINED AS '

The bwbBusIdentifier attribute specifies on which bus the bandwidth balancing process represented by the current instance is operating.

';

bwbModulus                                           ATTRIBUTE

WITH ATTRIBUTE SYNTAX                     ASN1AttributeModule.BwbModulus;
MATCHES FOR                                       EQUALITY;
BEHAVIOUR                                             bwbModulusBehaviour;
REGISTERED AS {attribute 2};


bwbModulusBehaviour                            BEHAVIOUR

DEFINED AS '

The bwbModulus attribute is equal to the single value attribute BWB_MOD defined in IEEE Standard 802.6 [18], section 7.3.6, as indicated in ETS 300 212 [2]. This attribute is associated with the control of access via the distributed queueing protocol. The value of this attribute is in the range 0 to 64 inclusive. The default value is 8.

';

clVCIList ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1AttributeModule.ClVCIList;
MATCHES FOR EQUALITY;
BEHAVIOUR clVCIListBehaviour;
REGISTERED AS {attribute 3};


clVCIListBehaviour BEHAVIOUR

DEFINED AS '

The clVCIList attribute contains the list of connectionless VCIs associated with the MAC convergence function in a MAN node. The default list includes the number of VCIs contained in the list (i.e.: 1), and the single value 'FFFFF' hex (or '11111111111111111111' binary), as specified in IEEE Standard 802.6 [18], section 6.3.1.1.1.1, as indicated in ETS 300 212 [2].

';

configurationControlFlag ATTRIBUTE

WITH ATTRIBUTE SYNTAX

ASN1AttributeModule.ConfigurationControlFlag;
MATCHES FOR EQUALITY;
BEHAVIOUR ConfigurationControlFlagBehaviour;
REGISTERED AS {attribute 4};


configurationControlFlagBehaviour BEHAVIOUR

DEFINED AS '

The configurationControlFlag attribute represents the CC_12_CONTROL flag defined in IEEE Standard 802.6 [18], section 7.4.1, as indicated in ETS 300 212 [2]. It is used to control the operation of the configuration control function of type 1 and 2 in the nodes which do not contain the default configuration control function. The allowed values are "normal", "disabled" and "forcedToDisabled". The default value is "disabled"; it indicates that the configuration control functions take no actions either on error or at power-up. The value "forcedToDisabled" forces the configuration control functions to take no action and is only changeable from the management system.

';

crc32CheckControl ATTRIBUTE

WITH ATTRIBUTE SYNTAX

ASN1AttributeModule.Crc32CheckControl;
MATCHES FOR EQUALITY;
BEHAVIOUR crc32CheckControlBehaviour;
REGISTERED AS {attribute 5};


crc32CheckControlBehaviour BEHAVIOUR

DEFINED AS '

The crc32CheckControl attribute is equal to the single value attribute CRC32_CHECK_CONTROL defined in IEEE Standard 802.6 [18], section 7.4.4, as indicated in ETS 300 212 [2]. It is used to control the operation of the CRC32 check control function at the MAN node. The allowed values are "on" and "off". The default value is "off".

';

| crc32GenerationControl | ATTRIBUTE |
|---|---|

WITH ATTRIBUTE SYNTAX
                         ASN1AttributeModule.Crc32GenerationControl;
MATCHES FOR                    EQUALITY;
BEHAVIOUR                      crc32GenerationControlBehaviour;
REGISTERED AS {attribute 6};

| crc32GenerationControlBehavior | BEHAVIOUR |
|---|---|

DEFINED AS '

The crc32GenerationControl attribute is equal to the single value attribute CRC32_GEN_CONTROL defined in IEEE Standard 802.6 [18], section 7.4.3, as indicated in ETS 300 212 [2]. It is used to control the operation on the CRC32 generation function at the MAN node. The allowed values are "on" and "off". The default value is "off".

';

| discardedIMPDUsThreshold | ATTRIBUTE |
|---|---|

WITH ATTRIBUTE SYNTAX
                         ASN1AttributeModule.DiscardedIMPDUsThreshold;
MATCHES FOR                    EQUALITY;
BEHAVIOUR                      discardedIMPDUsThresholdBehaviour;
REGISTERED AS {attribute 7};

| discardedIMPDUsThresholdBehaviour | BEHAVIOUR |
|---|---|

DEFINED AS '

The discardedIMPDUsThreshold attribute establishes the threshold value for the number of IMPDUs that were discarded resulting from the validation process of the IMPDUs received by the MAN node. When the threshold is reached, a proper action is taken by the MAN MAC layer management system.

';

| distributedQueueProcessId | ATTRIBUTE |
|---|---|

WITH ATTRIBUTE SYNTAX          ASN1AttributeModule.Id;
MATCHES FOR                    EQUALITY;
BEHAVIOUR                      distributedQueueProcessIdBehaviour;
REGISTERED AS {attribute 8};

| distributedQueueProcessIdBehaviour | BEHAVIOUR |
|---|---|

DEFINED AS '

This attribute is used to construct the RDN of a distributedQueueProcess managed object instance.

';

dqdbConfigurationId                              ATTRIBUTE

WITH ATTRIBUTE SYNTAX                     ASN1AttributeModule.Id;
MATCHES FOR                              EQUALITY;
BEHAVIOUR                                dqdbConfigurationIdBehaviour;
REGISTERED AS {attribute 9};


dqdbConfigurationIdBehaviour                     BEHAVIOUR

DEFINED AS '

This attribute is used to construct the RDN of the dqdbConfiguration managed object instances.

';

externalTimingSourceStatus                       ATTRIBUTE

WITH ATTRIBUTE SYNTAX
                                         ASN1AttributeModule.ExternalTimingSourceStatus;
MATCHES FOR                              EQUALITY;
BEHAVIOUR                                externalTimingSourceStatusBehaviour;
REGISTERED AS {attribute 10};


externalTimingSourceStatusBehaviour              BEHAVIOUR

DEFINED AS '

The externalTimingSourceStatus attribute specifies the external timing source status indicator defined as ETS_STATUS in IEEE Standard 802.6 [18], section 7.5.4, as indicated in ETS 300 212 [2]. It records the status of the external timing source function at the MAN nodes. The two allowed values are "up" and "down".

';

headerExtensionList                              ATTRIBUTE

WITH ATTRIBUTE SYNTAX
                                         ASN1AttributeModule.HeaderExtensionList;
MATCHES FOR                              EQUALITY;
BEHAVIOUR                                headerExtensionListBehaviour;
REGISTERED AS {attribute 11};


headerExtensionListBehaviour                     BEHAVIOUR

DEFINED AS '

The headerExtensionList attribute specifies the list of header extension values that can be used by a MCF in order to provide the outgoing IMPDU with a header extension field.

';

hobArbitrationTimerPeriod                        ATTRIBUTE
WITH ATTRIBUTE SYNTAX
                                         ASN1AttributeModule.HobArbitrationTimerPeriod;
MATCHES FOR                              EQUALITY;
BEHAVIOUR                                hobArbitrationTimerPeriodBehaviour;
REGISTERED AS {attribute 12};

hobArbitrationTimerPeriodBehaviour    BEHAVIOUR

DEFINED AS '

The hobArbitrationTimerPeriod attribute is equal to the dqdb single value attribute Timer_H_PERIOD defined in IEEE Standard 802.6 [18], section 7.3.2, as indicated in ETS 300 212 [2]. It sets the period of operation for each head of bus arbitration timer associated with a configuration control function of type 1 or 2. The value is an integer in milliseconds. The default value when the node is powered up shall be set to 5 000 ms, however, the value may be tuned once the subnetwork is fully operational.

';

hobCapableFlag    ATTRIBUTE

WITH ATTRIBUTE SYNTAX

    ASN1AttributeModule.HobCapableFlag;
MATCHES FOR    EQUALITY;
BEHAVIOUR    hobCapableFlagBehaviour;
REGISTERED AS {attribute 13};

hobCapableFlagBehavior    BEHAVIOUR

DEFINED AS '

The hobCapableFlag attribute is equal to the value of the HOB_CAPABLE flag defined in IEEE Standard 802.6 [18], Section 11.6.2, as indicated in ETS 300 212 [2]. It is used to indicate that the node is capable of performing head-of-bus functions. The allowed values are "yes" and "no".

';

hobOperationIndicators    ATTRIBUTE

WITH ATTRIBUTE SYNTAX

    ASN1AttributeModule.HobOperationIndicators;
MATCHES FOR    EQUALITY;
BEHAVIOUR    hobOperationIndicatorsBehaviour;
REGISTERED AS {attribute 14};

hobOperationIndicatorsBehaviour    BEHAVIOUR

DEFINED AS '

The hobOperationIndicators attribute contains two hobOperationIndicators values representing the operation indicators associated with the two configuration control functions in the node. It records which functions the head of bus function is performing, as set by the configuration control protocol. The values are "headOfBusA", "headOfBusB", "busA", "busB" and "undefined".

';

impduReassemblyProcessId    ATTRIBUTE

WITH ATTRIBUTE SYNTAX    ASN1AttributeModule.Id;
MATCHES FOR    EQUALITY;
BEHAVIOUR    impduReassemblyProcessIdBehaviour;
REGISTERED AS {attribute 15};

impduReassemblyProcessIdBehaviour    BEHAVIOUR

DEFINED AS '

The impduReassemblyProcessId attribute is used to construct the RDN of an impduReassemblyProcess object instance.

';

impduTransmissionProcessId                    ATTRIBUTE

WITH ATTRIBUTE SYNTAX                         ASN1AttributeModule.Id;
MATCHES FOR                                   EQUALITY;
BEHAVIOUR                                      impduTransmissionProcessIdBehaviour;
REGISTERED AS {attribute 16};


impduTransmissionProcessIdBehaviour           BEHAVIOUR

DEFINED AS '

This attribute is used to construct the RDN of an impduTransmissionProcess managed object instance.

';

linkStatusIndicators                          ATTRIBUTE

WITH ATTRIBUTE SYNTAX

                                              ASN1AttributeModule.LinkStatusIndicators;
MATCHES FOR                                   EQUALITY;
BEHAVIOUR                                      linkStatusIndicatorsBehaviour;
REGISTERED AS {attribute 17};


linkStatusIndicatorsBehaviour                 BEHAVIOUR

DEFINED AS '

The linkStatusIndicators attribute contains two values representing the status of the duplex transmission links for the Physical layer Service Access Point (Ph-SAP). It is composed of a SAP value "sapA", "sapB", or "undefined" and the associated status value of "up" or "down".

';

lmInfoOctetsType0                             ATTRIBUTE

WITH ATTRIBUTE SYNTAX                         ASN1AttributeModule.LmInfoOctetsType0;
MATCHES FOR                                   EQUALITY;
BEHAVIOUR                                      lmInfoOctetsType0Behaviour;
REGISTERED AS {attribute 18};


lmInfoOctetsType0Behaviour                    BEHAVIOUR

DEFINED AS '

The lmInfoOctetsType0 attribute supports the communication between different DQDB layer management entities. It contains two values representing the received Type 0 octets at the two Ph-SAPs. The Type 0 octet, defined in IEEE Standard 802.6 [18], section 10.1, as indicated in ETS 300 212 [2], is composed of Bus_Identification_Field, Default_Slot_Generator Subfield, Head_of_Bus Subfield and External_Timing_Source Subfield.

';

manCLsapAddress                               ATTRIBUTE

WITH ATTRIBUTE SYNTAX

                                              ASN1AttributeModule.ManCLsapAddress;
MATCHES FOR                                   EQUALITY;
BEHAVIOUR                                      manCLsapAddressBehaviour;

REGISTERED AS {attribute 19};


| manCLsapAddressBehaviour | BEHAVIOUR |
|---|---|

DEFINED AS '

The manCLsapAddress attribute represents the DQDB MAC address. The structure of the address includes a 4-bit field and a 60-bit field, as defined in IEEE Standard 802.6 [18]. The CCITT Recommendation E.164 numbers associated with the DQDB SAP and represented by the manDQDBsapNumber attribute are mapped into the coding defined for the CL service purposes, which is fully described in subclause 5.6. The mapping includes BCD coding of the 15 digits of the CCITT Recommendation E.164 number and their placing in the 60-bit field of the CL SAP address. The presence of group addresses is an option.

';

| manDQDBsapId | ATTRIBUTE |
|---|---|

WITH ATTRIBUTE SYNTAX            ASN1AttributeModule.Id;

MATCHES FOR            EQUALITY;
BEHAVIOUR            manDQDBsapIdBehaviour;
REGISTERED AS {attribute 20};


| manDQDBsapIdBehaviour | BEHAVIOUR |
|---|---|

DEFINED AS '

The manDQDBsapId attribute is used to construct the RDN of a manDQDBsap object instance.

';

| manDQDBsapNumber | ATTRIBUTE |
|---|---|

WITH ATTRIBUTE SYNTAX

                            ASN1AttributeModule.ManDQDBsapNumber;
MATCHES FOR            EQUALITY;
BEHAVIOUR            manDQDBsapNumberBehaviour;
REGISTERED AS {attribute 21};
manDQDBsapNumberBehaviour            BEHAVIOUR

DEFINED AS '

The manDQDBsapNumber attribute represents the CCITT Recommendation E.164 number associated with the point at which the DQDB layer services (CL, CO or CBR) are provided.

';

| manDQDBsapStatus | ATTRIBUTE |
|---|---|

WITH ATTRIBUTE SYNTAX

                            ASN1AttributeModule.ManDQDBsapStatus;
MATCHES FOR            EQUALITY;
BEHAVIOUR            manDQDBsapStatusBehaviour;
REGISTERED AS {attribute 22};


| manDQDBsapStatusBehaviour | BEHAVIOUR |
|---|---|

DEFINED AS '

The manDQDBsapStatus attribute specifies the DQDB SAP status. The allowed values are "on" and "off".

';

maxMIDPages                                         ATTRIBUTE

WITH ATTRIBUTE SYNTAX                 ASN1AttributeModule.MaxMIDPages;
MATCHES FOR                                   EQUALITY;
BEHAVIOUR                                       maxMIDPagesBehaviour;
REGISTERED AS {attribute 23};


maxMIDPagesBehaviour                          BEHAVIOUR

DEFINED AS '

The maxMIDPages attribute is equal to the DQDB single value MAX_MID_PAGES attribute defined in IEEE Standard 802.6 [18], section 7.3.5, as indicated in ETS 300 212 [2]. It contains the maximum number of MID pages that can be obtained by a MAN node using the MID page allocation function. The default value of this attribute is 1. The range value is 0 to 1023 ($2^{10}$ - 1).

';

midPageAllocationId                               ATTRIBUTE

WITH ATTRIBUTE SYNTAX                 ASN1AttributeModule.Id;
MATCHES FOR                                   EQUALITY;
BEHAVIOUR                                       midPageAllocationIdBehaviour;
REGISTERED AS {attribute 24};


midPageAllocationIdBehaviour                 BEHAVIOUR


DEFINED AS '

This attribute is used to construct the RDN of a midPageAllocation managed object instance.

';

midPagesInUse                                     ATTRIBUTE

WITH ATTRIBUTE SYNTAX                 ASN1AttributeModule.MidPagesInUse;
MATCHES FOR                                   EQUALITY;
BEHAVIOUR                                       midPagesInUseBehaviour;
REGISTERED AS {attribute 25};


midPagesinUseBehaviour                        BEHAVIOUR

DEFINED AS '

The midPagesInUse attribute specifies the MIDs being used by the node. It contains a table with the following fields: MCF_ID, Message_ID, Time_Stamp.

';

nodeType                                              ATTRIBUTE

WITH ATTRIBUTE SYNTAX                 ASN1AttributeModule.NodeType;
MATCHES FOR                                   EQUALITY;
BEHAVIOUR                                       nodeTypeBehaviour;
REGISTERED AS {attribute 26};


nodeTypeBehaviour                                 BEHAVIOUR

DEFINED AS '

The nodeType attribute identifies the distinction between a normal node and the default slot generator node. The value "DefaultSlotGenerator" indicates that the node supports the only default slot generator function in the subnetwork. The value "NormalNode" indicates that the node does not support the default slot generator function.

';

physicalLayerFacilitiesId                    ATTRIBUTE

WITH ATTRIBUTE SYNTAX                    ASN1AttributeModule.Id;

MATCHES FOR                    EQUALITY;

BEHAVIOUR                    physicalLayerFacilitiesIdBehaviour;

REGISTERED AS {attribute 27};


physicalLayerFacilitiesIdBehaviour                    BEHAVIOUR

DEFINED AS '

This attribute is used to construct the RDN of a physicalLayerFacilities managed object instance.

';

physicalLayerFacilitiesStatus                    ATTRIBUTE

WITH ATTRIBUTE SYNTAX

                    ASN1AttributeModule.PhysicalLayerFacilitiesStatus;

MATCHES FOR                    EQUALITY;

BEHAVIOUR                    physicalLayerFacilitiesStatusBehaviour;

REGISTERED AS {attribute 28};


physicalLayerFacilitiesStatusBehaviour                    BEHAVIOUR

DEFINED AS '

The physicalLayerFacilitiesStatus attribute represents information on the status of the Physical Layer Connection State Machine (PLCSM) control flag defined in IEEE 802.6 Standard [18], section 11.6.1, as indicated in ETS 300 212 [2]. There are two PLCSM flags in each node, one for each link. The allowed values are "normal" and "forceDown".

';

priority                    ATTRIBUTE

WITH ATTRIBUTE SYNTAX                    ASN1AttributeModule.Priority;

MATCHES FOR                    EQUALITY;

BEHAVIOUR                    priorityBehaviour;

REGISTERED AS {attribute 29};


priorityBehaviour                                    BEHAVIOUR

DEFINED AS '

The priority attribute specifies one of the three different priorities used to access the DQDB network by a MAN access unit.

';

qosMap                                               ATTRIBUTE

WITH ATTRIBUTE SYNTAX                                 ASN1AttributeModule.QosMap;

MATCHES FOR                                           EQUALITY;

BEHAVIOUR                                             qosMapBehaviour;

REGISTERED AS {attribute 30};


qosMapBehaviour                                      BEHAVIOUR

DEFINED AS '

The qosMap attribute is equal to the multivalued QOS_MAP attribute defined in IEEE Standard 802.6 [18], section 7.3.3, as indicated in ETS 300 212 [2], containing eight single-valued elements. It describes the mapping to be used between the priority parameter received in MA-UNITDATA request primitives (0 to 7) and the access queue priority level (0 to 2) to be used by the Queued Arbitrated (QA) functions block to access the medium at the requested priority. The default value is 0 for each of the eight elements.

';

reassemblyErrorCounterThreshold               ATTRIBUTE

WITH ATTRIBUTE SYNTAX

                                           ASN1AttributeModule.ReassemblyErrorCounterThreshold;

MATCHES FOR                                 EQUALITY;

BEHAVIOUR                                   reassemblyErrorCounterThresholdBehaviour;

REGISTERED AS {attribute 31};


reassemblyErrorCounterThresholdBehaviour       BEHAVIOUR

DEFINED AS '

The reassemblyErrorCounterThreshold attribute specifies the threshold for the number of errors due to a mismatch between the RX_SEQUENCE_NUM of the Reassembly State Machine (RSM) instance and the Sequence_Number of a Derived MAC Protocol Data Unit (DMPDU) belonging to a specified IMPDU or to the expiration of the reassembly timer. When the threshold value is reached, a proper action shall be taken by the MAN DQDB layer management system. The default value is the maximum value of the range. The range is 0 to at least 65535 (16 bits range).

';

NOTE: The default value has been chosen in order not to overload the management system with error messages.

| | |
|---|---|
| reservedMIDPages | ATTRIBUTE |
| WITH ATTRIBUTE SYNTAX | ASN1AttributeModule.ReservedMIDPages; |
| MATCHES FOR | EQUALITY; |
| BEHAVIOUR | reservedMIDPagesBehaviour; |
| REGISTERED AS {attribute 32}; | |

| | |
|---|---|
| reservedMIDPagesBehaviour | BEHAVIOUR |

DEFINED AS '

The reservedMIDPages attribute is equal to the DQDB single value RESERVED_MID_PAGES attribute defined in IEEE Standard 802.6 [18], section 7.3.4, as indicated in ETS 300 212 [2]. It contains the number of MID pages that are reserved by network management for centralised allocation. The minimum and default value of this attribute is 0. The maximum value is 1023 ($2^{10}$ - 1).

';

| | |
|---|---|
| ritPeriod | ATTRIBUTE |
| WITH ATTRIBUTE SYNTAX | ASN1AttributeModule.RitPeriod; |
| MATCHES FOR | EQUALITY; |
| BEHAVIOUR | ritPeriodBehaviour; |
| REGISTERED AS {attribute 33}; | |

| | |
|---|---|
| ritPeriodBehaviour | BEHAVIOUR |

DEFINED AS '

The ritPeriod attribute is equal to the single value attribute RIT_PERIOD defined in IEEE Standard 802.6 [18], section 7.3.1, as indicated in ETS 300 212 [2]. It sets the period of operation for each reassembly IMPDU timer associated with an active reassembly process under the control of a reassembly state machine. The maximum value is 65535 ($2^{16}$ - 1) ms. The default value of this attribute is 700 ms.

';

| | |
|---|---|
| segmentHeaderProcessingId | ATTRIBUTE |

WITH ATTRIBUTE SYNTAX          ASN1AttributeModule.Id;

MATCHES FOR          EQUALITY;

BEHAVIOUR          segmentHeaderProcessingIdBehaviour;

REGISTERED AS {attribute 34};

segmentHeaderProcessingIdBehaviour          BEHAVIOUR

DEFINED AS '

The segmentHeaderProcessingId attribute is used to construct the RDN of a segmentHeaderProcessing object instance.

';

## 5.4 Actions

clVCIListSet          ACTION

BEHAVIOUR clVCIListSetBehaviour;

PARAMETERS          subFieldId,value;

    WITH INFORMATION SYNTAX

                 ASN1ActionModule.clVCIListSet;

REGISTERED AS {action 0};

clVCIListSetBehaviour          BEHAVIOUR

DEFINED AS '

The clVCIListSet action is used to set one of the fields contained in the clVCIList attribute; the subfield parameter specifies which field is going to be set and the value parameter specifies the value used for setting the field.

';

manCLsapAddressSet          ACTION

BEHAVIOUR manCLsapAddressSetBehaviour;

PARAMETERS          subfield, value;

    WITH INFORMATION SYNTAX

                 ASN1ActionModule.manCLsapAddressSet;

REGISTERED AS {action 1};

manCLsapAddressSetBehaviour          BEHAVIOUR

DEFINED AS '

The manCLsapAddressSet action is used to set one of the fields contained in the manDQDBsapAddress attribute; the subfield parameter specifies which field is going to be set and the value parameter specifies the value used for setting the field.

';

## 5.5 Notifications

discardedIMPDUsThresholdAlarm                NOTIFICATION

BEHAVIOUR                                    discardedIMPDUsThresholdAlarmBehaviour;

WITH INFORMATION SYNTAX

ASN1NotificationModule.discardedIMPDUsThresholdAlarm;

REGISTERED AS {notification 0};


discardedIMPDUsThresholdAlarmBehaviour BEHAVIOUR

DEFINED AS '

The discardedIMPDUsThresholdAlarm notification is generated when the value of the discardedIMPDUsCounter becomes equal to the discardedIMPDUsThreshold.

';

reassemblyErrorCounterThresholdAlarm      NOTIFICATION

BEHAVIOUR       reassemblyErrorCounterThresholdAlarmBehaviour;

WITH INFORMATION SYNTAX

ASN1NotificationModule.reassemblyErrorCounterThresholdAlarm;

REGISTERED AS {notification 1};


reassemblyErrorCounterThresholdAlarm      BEHAVIOUR

DEFINED AS '

The reassemblyErrorCounterThresholdAlarm notification is generated when the reassemblyErrorCounter reaches the reassemblyErrorCounterThreshold value.

';

## 5.6 ASN.1 syntax

### 5.6.1 ASN.1 attributes definitions

ASN1AttributeModule  {ccitt(0)  identified-organization(4)  etsi(0)  mlm(XXX)  informationModel(0) asn1Module(2) asn1AttributeModule(7)}

DEFINITIONS IMPLICIT TAGS                    ::=

BEGIN
-- EXPORTS f.f.s.
-- IMPORTS f.f.s.

```
informationModel OBJECT IDENTIFIER       ::= {ccitt(0) identified-organization(4) etsi(0)
mlm(XXX)informationModel(0)}
standardSpecificExtension OBJECT IDENTIFIER ::= {informationModel
standardSpecificExtension(0)}
managedObjectClass OBJECT IDENTIFIER     ::= {informationModel managedObjectClass    (3)}
package OBJECT IDENTIFIER                 ::= {informationModel package                (4)}
parameter OBJECT IDENTIFIER              ::= {informationModel parameter              (5)}
nameBinding OBJECT IDENTIFIER            ::= {informationModel nameBinding            (6)}
attribute OBJECT IDENTIFIER              ::= {informationModel attribute              (7)}
attributeGroup OBJECT IDENTIFIER         ::= {informationModel attributeGroup         (8)}
action OBJECT IDENTIFIER                 ::= {informationModel action                 (9)}
notification OBJECT IDENTIFIER           ::= {informationModel notification          (10)}
AddressBody                              ::= BIT STRING
BusIdentificationField                   ::= ENUMERATED { unknownBusId             (0),
                                                          busA                     (1),
                                                          busB                     (2)}
BwbBusIdentifier                         ::= ENUMERATED { busA                     (0),
                                                          busB                     (1)}
BwbModulus                               ::= INTEGER   {0..64}
ConfigurationControlFlag                 ::= ENUMERATED { normal                   (0),
                                                          disabled                 (1),
                                                          forcedToDisabled         (2)}
Crc32CheckControl                        ::= ENUMERATED    { off                   (0),
                                                          on                       (1)}
Crc32GenerationControl                   ::= ENUMERATED    { off                   (0),
                                                          on                       (1)}
DefaultSlotGeneratorField                ::= ENUMERATED { notPresent               (0),
                                                          present                  (1)}
Digit                                    ::= INTEGER   {0..9}
DiscardedIMPDUsThreshold                 ::= INTEGER
-- discardedIMPDUsThresholdDefVal        ::=   f.f.s.
ExternalTimingSourceSubfield             ::= ENUMERATED { notPresent               (0),
                                                          present                  (1)}
ExternalTimingSourceStatus               ::= ENUMERATED { down                     (0),
                                                          up                       (1)}
GroupAddressType                         ::= ENUMERATED {
          60bitsPublicGroup  (4),        -- E.164 code '1110'B
          60bitsPrivateGroup (5)}        -- E.164 code '1111'B
HobArbitrationTimerPeriod                ::= INTEGER   {0..65535}
HobCapableFlag                           ::= ENUMERATED { no(0),
                                                          yes                      (1)}
HobOperationIndicator                    ::= ENUMERATED { headOfBusA               (0),
                                                          headOfBusB               (1),
                                                          busA                     (2),
                                                          busB                     (3),
                                                          undefined                (4)}
HeadOfBusSubfield                        ::= ENUMERATED { noActiveHOB              (0),
                                                          stable                   (1),
                                                          waiting                  (2)}
Id                                       ::= GRAPHICSTRING
```

```
IndividualAddressType                          ::= ENUMERATED {
            16bits                                   (0), -- E.164 code '0100'B
            48bits                                   (1), -- E.164 code '1000'B
            60bitsPublicIndiv  (2),                  -- E.164 code '1100'B
            60bitsPrivateIndiv  (3)}                 -- E.164 code '1101'B


ManDQDBsapStatus                               ::= ENUMERATED   { off              (0),
                                                              on               (1)}
MaxMIDPages                                    ::= INTEGER {0..1023}
NodeType                                       ::= ENUMERATED {
                                                  normalNode             (0),
                                                  defaultSlotGenerator   (1)}


Priority                                       ::= INTEGER   {0..2}
ReassemblyErrorCounterThreshold                ::= INTEGER
-- reassemblyErrorCounterThresholdDefVal       ::=   f.f.s.
ReservedMIDPages                               ::= INTEGER   {0..1023}
RitPeriod                                      ::= INTEGER
Sap                                            ::= ENUMERATED { sapA             (0),
                                                      sapB             (1),
                                                      undefined        (2)}
Status                                         ::= ENUMERATED { down             (0),
                                                      up               (1)}


VCINumber                                      ::= BITSTRING     { FIRST          (0),
                                                             LAST           (19)}


ClVCIList                                      ::= SEQUENCE {
                                                 activeCLVCINumber INTEGER,
                                                 SET OF {VCINumber}}
E164Number                                     ::= SEQUENCE {    [1]     digit,
                                                             [2]     digit,
                                                             [3]     digit,
                                                             [4]     digit,
                                                             [5]     digit,
                                                             [6]     digit,
                                                             [7]     digit,
                                                             [8]     digit,
                                                             [9]     digit,
                                                             [10]    digit,
                                                             [11]    digit,
                                                             [12]    digit,
                                                             [13]    digit,
                                                             [14]    digit,
                                                             [15]    digit}
GroupAddress                                   ::= SEQUENCE { GroupAddressType,
                                                       AddressBody}
GroupAddressList                               ::= SEQUENCE OF GroupAddress
HeaderExtensionList                            ::= SEQUENCE OF VisibleString
HobOperationIndicators                         ::= SEQUENCE {
                                                 [1] hobOperationIndicator
                                                 [2] hobOperationIndicator}
LinkStatusIndicator                            ::= SEQUENCE { Sap,
                                                       Status}
LinkStatusIndicators                           ::= SEQUENCE {
                                                 [1] linkStatusIndicator,
                                                 [2] linkStatusIndicator}
MidPagesinUse                                  ::= SEQUENCE OF {
                                                 mcfId      BIT STRING,
                                                 messageId  INTEGER,
                                                 timeStamp  BIT STRING}
Type0                                          ::= SEQUENCE {
                                                 BusIdentificationField,
```

```
                                                    DefaultSlotGeneratorSubfield,
                                                    ExternalTimingSourceSubfield,
                                                    HeadOfBusSubfield}
LmInfoOctetsType0                    ::= SEQUENCE {   [0] Type                    (0),
                                                      [1] Type                    (0)}
ManDQDBsapNumber                     ::= SEQUENCE OF E164Number
IndividualAddress                    ::= SEQUENCE { IndividualAddressType,
                                            AddressBody}
IndividualAddressList                ::= SEQUENCE OF IndividualAddress
ManCLSapAddress                      ::= SEQUENCE {
                                             IndividualAddressList,
                                             GroupAddressList OPTIONAL}
PhysicalLayerFacilitiesStatus        :: = SEQUENCE OF {
                [0]                   ENUMERATED { normal                          (0),
                                             forceDown                            (1)}
                [1]                   ENUMERATED { normal                          (0),
                                             forceDown                            (1)}}
QosMap                               ::= SEQUENCE OF {          [0] priority,
                                                               [1] priority,
                                                               [2] priority,
                                                               [3] priority,
                                                               [4] priority,
                                                               [5] priority,
                                                               [6] priority,
                                                               [7] priority}

END
```

## 5.6.2 Action module definitions

```
ASN1ActionModule {ccitt(0) identified-organization(4) etsi(0) mlm(XXX) informationModel(0)
asn1Module(2) asn1ActionModule(9)}
DEFINITIONS IMPLICIT TAGS                    ::=

BEGIN
-- EXPORTS f.f.s.
-- IMPORTS f.f.s.
informationModel OBJECT IDENTIFIER           ::= {ccitt(0) identified-organization(4) etsi(0) mlm(XXX)
informationModel(0)}
standardSpecificExtension OBJECT IDENTIFIER  ::= {informationModel standardSpecificExtension(0)}
managedObjectClass OBJECT IDENTIFIER         ::= {informationModel managedObjectClass(3)}
package OBJECT IDENTIFIER                     ::= {informationModel package(4)}
parameter OBJECT IDENTIFIER                   ::= {informationModel parameter(5)}
nameBinding OBJECT IDENTIFIER                 ::= {informationModel nameBinding(6)}
attribute OBJECT IDENTIFIER                   ::= {informationModel attribute(7)}
attributeGroup OBJECT IDENTIFIER              ::= {informationModel attributeGroup(8)}
action OBJECT IDENTIFIER                      ::= {informationModel action(9)}
notification OBJECT IDENTIFIER                ::= {informationModel notification(10)}
-- manCLsapAddressSet                         :: = f.f.s.
-- clVCIListSet                               :: = f.f.s.
END
        NOTE:        f.f.s. = for further study.
```

### 5.6.3        ASN.1 notification definitions

ASN1NotificationModule {ccitt(0) identified-organization(4) etsi(0) mlm(XXX) informationModel(0)
asn1Module(2) asn1NotificationModule(10)}

DEFINITIONS IMPLICIT TAGS                              ::=

BEGIN
-- EXPORTS f.f.s.
-- IMPORTS f.f.s.
informationModel OBJECT IDENTIFIER                ::= {ccitt(0) identified-organization(4) etsi(0) mlm(XXX)
informationModel(0)}
standardSpecificExtension OBJECT IDENTIFIER  ::= {informationModel standardSpecificExtension(0)}
managedObjectClass OBJECT IDENTIFIER         ::= {informationModel managedObjectClass(3)}
package OBJECT IDENTIFIER                          ::= {informationModel package(4)}
parameter OBJECT IDENTIFIER                        ::= {informationModel parameter(5)}
nameBinding OBJECT IDENTIFIER                    ::= {informationModel nameBinding(6)}
attribute OBJECT IDENTIFIER                         ::= {informationModel attribute(7)}
attributeGroup OBJECT IDENTIFIER                 ::= {informationModel attributeGroup(8)}
action OBJECT IDENTIFIER                            ::= {informationModel action(9)}
notification OBJECT IDENTIFIER                      ::= {informationModel notification(10)}
discardedIMPDUsThresholdAlarm                   :: = SET OF {
            discardedIMPDUsCounter                 DiscardedIMPDUsCounterType,
            sapAddress                             ManDQDBsapNumber}
-- reassemblyErrorCounterThresholdAlarm         :: =   f.f.s.
END

        NOTE:        f.f.s. = for further study.

## Annex A (informative):     Optional packages for the MAC layer information model

> NOTE:     Numbering starts from 50.

## A.1     MID page allocation

pageCountersPackage                                     PACKAGE

BEHAVIOUR                                               pageCountersPackageBehaviour;

     ATTRIBUTES

     pageCounters                                       GET;

REGISTERED AS {package 50};


pageCountersPackageBehaviour                            BEHAVIOUR

DEFINED AS '

The pageCounters attribute represents the page counters present in each node for the operation of the MID page allocation protocol.

';

pageCounters                                            ATTRIBUTE

WITH ATTRIBUTE SYNTAX   ASN1AttributeOptionModule.pageCounters;

MATCHES FOR                                             EQUALITY;

BEHAVIOUR                                               pageCountersBehaviour;

REGISTERED AS {attribute 50};


pageCountersBehaviour                                   BEHAVIOUR

DEFINED AS '

The pageCounters attribute is equal to the DQDB multi-value PAGE_CNTR attribute defined in IEEE Standard 802.6 [18], section 7.2.4, as indicated in ETS 300 212 [2]. It is used by the node containing the active head of bus function to generate the proper MID page allocation field values. Furthermore, the DQDB layer management protocol Entity for each node uses these counters to hold the page number of the page of MIDs that is associated with the next Page Request (PR) subfield to be received on the two MAN busses. These counters have a minimum value of 1 and a maximum value of $(2^{10} - 1)$.

';

lmInfoOctetType1Package                                 PACKAGE

BEHAVIOUR                                               lmInfoOctetType1PackageBehaviour;

     ATTRIBUTES

     lmInfoOctetType1                                   GET;

REGISTERED AS {package 51};

lmInfoOctetType1PackageBehaviour                    BEHAVIOUR

DEFINED AS '

The lmInfoOctetType1 package supports communication between different DQDB layer management entities for the purpose of dynamic MID page allocation.

';

lmInfoOctetType1                              ATTRIBUTE

WITH ATTRIBUTE SYNTAX

ASN1AttributeOptionModule.lmInfoOctetType1;

MATCHES FOR                           EQUALITY;

BEHAVIOUR                             lmInfoOctetType1Behaviour;

REGISTERED AS {attribute 51};

lmInfoOctetType1Behaviour                    BEHAVIOUR

DEFINED AS '

The lmInfoOctetType1 attribute is equal to the DQDB layer management information octet as defined in IEEE Standard 802.6 [18] , section 10.1, as indicated in ETS 300 212 [2], with the TYPE bit set to 1 and containing the MID page allocation field.

';

## A.2    Distributed queue process

localRequestQueueCounterPackage                    PACKAGE

BEHAVIOUR                             localRequestQueueCounterPackageBehaviour;

ATTRIBUTES

localRequestQueueCounter                GET;

REGISTERED AS {package 52};

localRequestQueueCounterPackageBehaviour    BEHAVIOUR

DEFINED AS '

The localRequestQueueCounterPackage supports the DQDB single value attribute REQ_I_Q defined in IEEE Standard 802.6 [18], section 7.2.3, as indicated in ETS 300 212 [2].

';

localRequestQueueCounter                       ATTRIBUTE

WITH ATTRIBUTE SYNTAX

ASN1AttributeOptionModule.localRequestQueueCounter;

MATCHES FOR                         EQUALITY;

BEHAVIOUR                           localReqQueueCounterBehaviour;

REGISTERED AS {attribute 52};


localReqQueueCounterBehaviour       BEHAVIOUR

DEFINED AS '

The localReqQueueCounter attribute is equal to the DQDB single value attribute REQ_I_Q defined in ETS 300 212 [2], subclause 7.2.3. This counter is used by the REQ queue machine which controls the writing of requests at an established priority level into the REQ_I subfield of the access control field of slots passing on the bus. It holds the number of local requests which the access unit has queued to send at an established priority level, but has not yet sent. It has a minimum value of 0 and a maximum value of $(2^8-1)$.

';

multiPointPackage                   PACKAGE

BEHAVIOUR                           multiPointPackageBehaviour;

    ATTRIBUTES

    busIdentifier                   GET,

    requestCounter                  GET,

    countDownCounter                GET;

REGISTERED AS {package 53};


multiPointPackageBehaviour          BEHAVIOUR

DEFINED AS '

The multiPointPackage represents the conditional distributed queue resources which are implemented in the multipoint configuration. It supports the DQDB single value attributes REQ_I_CNTR and CD_I_CNTR defined in IEEE Standard 802.6 [18], sections 7.2.1 and 7.2.2 respectively, as indicated in ETS 300 212 [2].

';

busIdentifier                       ATTRIBUTE

WITH ATTRIBUTE SYNTAX

ASN1AttributeOptionModule.busIdentifier;

MATCHES FOR                         EQUALITY;

BEHAVIOUR                           busIdentifierBehaviour;

REGISTERED AS {attribute 53};

busIdentifierBehaviour                    BEHAVIOUR

DEFINED AS '

The busIdentifier attribute specifies on which bus an IMPDU may be transmitted.

';

requestCounter                            ATTRIBUTE

WITH ATTRIBUTE SYNTAX

ASN1AttributeOptionModule.requestCounter;

MATCHES FOR                               EQUALITY;

BEHAVIOUR                                 requestCounterBehaviour;

REGISTERED AS {attribute 54};

requestCounterBehaviour                   BEHAVIOUR

DEFINED AS '

The RequestCounter attribute is equal to the DQDB single value attribute REQ_I_CNTR defined in IEEE Standard 802.6 [18], section 7.2.1, as indicated in ETS 300 212 [2]. This counter is used by the distributed queue state machine which performs the access control function for QA segments. If the MAN access unit does have a QA segment queued at an established priority level, the counter indicates the number of requests from downstream for access to the bus at the same priority level. It has a minimum value of 0 and a maximum value of $(2^{16}-1)$.

';

countDownCounter                          ATTRIBUTE

WITH ATTRIBUTE SYNTAX

ASN1AttributeOptionModule.countDownCounter;

MATCHES FOR                               EQUALITY;

BEHAVIOUR                                 countDownCounterBehaviour;

REGISTERED AS {attribute 55};

countDownCounterBehaviour                 BEHAVIOUR

DEFINED AS '

The countDownCounter attribute is equal to the DQDB single value attribute CD_I_CNTR defined in IEEE Standard 802.6 [18], section 7.2.2, as indicated in ETS 300 212 [2]. This counter is used by the distributed queue state machine which performs the access control function for QA segments. This counter indicates the number of outstanding requests made for access to the bus at an established priority level I or higher which have to be satisfied before the QA segment can be transmitted. It has a minimum value of 0 and a maximum value of $(2^{16}-1)$.

';

## A.3    Bandwidth balancing process

bwbActivePackage                    PACKAGE

BEHAVIOUR                           bwbActivePackageBehaviour;

                                    ATTRIBUTES

        bwbCounter                  GET;

REGISTERED AS {package 54};


bwbActivePackageBehaviour           BEHAVIOUR

DEFINED AS '

The bwbActivePackage package defines information concerning bandwidth balancing process operation in case of multipoint configuration.

';

bwbCounter                          ATTRIBUTE

WITH ATTRIBUTE SYNTAX               ASN1AttributeOptionModule.bwbCounter;

MATCHES FOR                         EQUALITY;

BEHAVIOUR                           bwbCounterBehaviour;

REGISTERED AS {attribute 56};


bwbCounterBehaviour                 BEHAVIOUR

DEFINED AS '

The bwbCounter attribute is equal to the BWB_CNTR attribute defined in IEEE Standard 802.6 [18], section 7.2.5, as indicated in ETS 300 212 [2].

';

## A.4 Connectionless service access points

discardedIMPDUsCounterPackage PACKAGE

BEHAVIOUR                                    discardedIMPDUsCounterPackageBehaviour;

    ATTRIBUTES

    discardedIMPDUsCounter                 GET

                                REPLACE-WITH-DEFAULT;

REGISTERED AS {package 55};

discardedIMPDUsCounterPackageBehaviour       BEHAVIOUR

DEFINED AS '

This package supports monitoring of the current number of IMPDUs received by the DQDB MAC layer from the network that have been discarded during a specific granularity period.

';

discardedIMPDUsCounter                       ATTRIBUTE

WITH ATTRIBUTE SYNTAX

                      ASN1AttributeOptionModule.discardedIMPDUsCounter;

MATCHES FOR                                  EQUALITY;

BEHAVIOUR                                    discardedIMPDUsCounterBehaviour;

REGISTERED AS {attribute 57};

discardedIMPDUsCounterBehaviour              BEHAVIOUR

DEFINED AS '

The discardedIMPDUsCounter attribute contains the number of errored IMPDUs received by the MAN node during a specific granularity period.

';

impduFlowPackage                             PACKAGE

BEHAVIOUR                                    impduFlowPackageBehaviour;

    ATTRIBUTES

        receivedIMPDUsCounter              GET

                                REPLACE-WITH-DEFAULT,

        sentIMPDUsCounter                 GET

                                REPLACE-WITH-DEFAULT;

REGISTERED AS {package 56};


impduFlowPackageBehaviour                    BEHAVIOUR

DEFINED AS '

The receivedIMPDUsCounter and sentIMPDUsCounter attributes keep track of the data flow at the CL SAP in terms of IMPDUs during a specific granularity period. The counters are incremented by 1 for each IMPDU respectively received and sent.

';

receivedIMPDUsCounter                        ATTRIBUTE

WITH ATTRIBUTE SYNTAX

                                ASN1AttributeOptionModule.receivedIMPDUsCounter;

MATCHES FOR                      EQUALITY;

BEHAVIOUR                        receivedIMPDUsCounterBehaviour;

REGISTERED AS {attribute 58};


receivedIMPDUsCounterBehaviour               BEHAVIOUR

DEFINED AS '

The receivedIMPDUsCounter attribute contains the number of IMPDUs received by the MAN node during a specific granularity period.

';

sentIMPDUsCounter                            ATTRIBUTE

WITH ATTRIBUTE SYNTAX

                                ASN1AttributeOptionModule.sentIMPDUsCounter;

MATCHES FOR                      EQUALITY;

BEHAVIOUR                        sentIMPDUsCounterBehaviour;

REGISTERED AS {attribute 59};


sentIMPDUsCounterBehaviour                   BEHAVIOUR

DEFINED AS '

The sentIMPDUsCounter attribute contains the number of IMPDUs outgoing from the MAN node during a specific granularity period.

';

## A.5 Segment header processing

segmentHeaderErrorPackage                    PACKAGE

BEHAVIOUR segmentHeaderErrorPackageBehaviour;

    ATTRIBUTES

    segmentHeaderErrorsCounter                    GET

        REPLACE-WITH-DEFAULT,

    segmentHeaderErrorsThreshold                    GET-REPLACE

        REPLACE-WITH-DEFAULT;

    NOTIFICATIONS

    segmentHeaderErrorsAlarm;

REGISTERED AS {package 57};


segmentHeaderErrorPackageBehaviour                    BEHAVIOUR

DEFINED AS '

The segmentHeaderErrorPackage package defines information related to the occurrence of errors in the headers of DQDB segments received during a specific granularity period. This is an optional feature.

';

segmentHeaderErrorsCounter                    ATTRIBUTE

WITH ATTRIBUTE SYNTAX

    ASN1AttributeOptionModule.segmentHeaderErrorsCounter;

MATCHES FOR                    EQUALITY;

BEHAVIOUR                    segmentHeaderErrorCountersBehaviour;

REGISTERED AS {attribute 60};


segmentHeaderErrorsCounterBehaviour                    BEHAVIOUR

DEFINED AS '

The segmentHeaderErrorsCounter attribute represents the number of corrupted segment headers received during a specific granularity period.

';

segmentHeaderErrorThreshold                    ATTRIBUTE

WITH ATTRIBUTE SYNTAX

    ASN1AttributeOptionModule.segmentHeaderErrorThreshold;

MATCHES FOR                                               EQUALITY;

BEHAVIOUR                                                 segmentHeaderErrorThresholdBehaviour;

REGISTERED AS {attribute 61};


segmentHeaderErrorThresholdBehaviour              BEHAVIOUR

DEFINED AS '

The segmentHeaderErrorsThreshold is the threshold for the number of corrupted received segment headers. When the threshold is reached within a specific granularity period an alarm notification is emitted.

';

segmentHeaderErrorAlarm                           NOTIFICATION

BEHAVIOUR                                         segmentHeaderErrorAlarmBehaviour;

WITH INFORMATION SYNTAX

                        ASN1NotificationOptionModule.segmentHeaderErrorAlarm;

REGISTERED AS {notification 50};


segmentHeaderErrorAlarmBehaviour                  BEHAVIOUR

DEFINED AS '

The segmentHeaderErrorAlarm notification is generated when the value of the segmentHeaderErrorCounter becomes equal to the segmentHeaderErrorThreshold within a specific granularity period.

';

## A.6    IMPDU reassembly process

| | |
|---|---|
| activeRSMPackage | PACKAGE |
| BEHAVIOUR | activeRSMPackageBehaviour; |
| ATTRIBUTES | |
| activeRSMCounter | GET, |
| maxActiveRSM | DEFAULT VALUE  1  -- f.f.s. |
| | GET-REPLACE |
| | REPLACE-WITH-DEFAULT; |
| REGISTERED AS {package 58}; | |

| | |
|---|---|
| activeRSMPackageBehaviour | BEHAVIOUR |

DEFINED AS '

The activeRSMCounter attribute specifies the number of active Reassembly State Machines (RSMs) inside the MCF block. The maxActiveRSM attribute specifies the maximum number of RSMs that can be active at the same time inside the MCF block.

';

| | |
|---|---|
| activeRSMCounter | ATTRIBUTE |
| WITH ATTRIBUTE SYNTAX | |
| | ASN1AttributeOptionModule.activeRSMCounter; |
| MATCHES FOR | EQUALITY; |
| BEHAVIOUR | activeRSMCounterBehaviour; |
| REGISTERED AS {attribute 62}; | |

| | |
|---|---|
| activeRSMCounterBehaviour | BEHAVIOUR |

DEFINED AS '

The activeRSMCounter attribute specifies the number of active RSMs inside the MCF block.

';

| | |
|---|---|
| maxActiveRSM | ATTRIBUTE |
| WITH ATTRIBUTE SYNTAX | |
| | ASN1AttributeOptionModule.maxActiveRSM; |
| MATCHES FOR | EQUALITY; |
| BEHAVIOUR | maxActiveRSMBehaviour; |

REGISTERED AS {attribute 63};


maxActiveRSMBehaviour                                          BEHAVIOUR

DEFINED AS '

The maxActiveRSM attribute specifies the maximum number of active RSMs at the same time inside the MCF block.

';

discardedDMPDUPackage                                         PACKAGE

BEHAVIOUR                                                     discardedDMPDUPackageBehaviour;

    ATTRIBUTES

    discardedDMPDUsCounter                        GET;

--    discardedDMPDUsCounterThreshold               DEFAULT VALUE   f.f.s.

                                       GET-REPLACE

                                       REPLACE-WITH-DEFAULT;

    NOTIFICATIONS

    discardedDMPDUsCounterThresholdAlarm;

REGISTERED AS {package 59};


discardedDMPDUPackageBehaviour                                BEHAVIOUR

DEFINED AS '

The discardedDMPDUPackage package defines information about the rate of discarded DMPDUs of the IMPDU reassembly procedure. It is an optional feature. The discardedDMPDUsCounter attribute represents the number of errored DMPDUs discarded by the RSM. The discardedDMPDUsThreshold attribute represents the threshold of errored DMPDUs received by the RSM at which an alarm notification is emitted.

';

discardedDMPDUsCounter                                        ATTRIBUTE

WITH ATTRIBUTE SYNTAX

                        ASN1AttributeOptionModule.discardedDMPDUsCounter;

MATCHES FOR                                                   EQUALITY;

BEHAVIOUR                                                     discardedDMPDUsCounterBehaviour;

REGISTERED AS {attribute 64};


discardedDMPDUsCounterBehaviour                               BEHAVIOUR

DEFINED AS '

The discardedDMPDUsCounter attribute contains the number of errored DMPDUs received by the MAN node in a fixed time interval.

';

discardedDMPDUsThreshold                ATTRIBUTE

WITH ATTRIBUTE SYNTAX

                      ASN1AttributeOptionModule.discardedDMPDUsThreshold;

MATCHES FOR                   EQUALITY;

BEHAVIOUR                     discardedDMPDUsThresholdBehaviour;

REGISTERED AS {attribute 65};

discardedDMPDUsThresholdBehaviour        BEHAVIOUR

DEFINED AS '

The discardedDMPDUsThreshold attribute establishes the threshold value for the number of errored DMPDUs received by the MAN node. When the threshold value is reached, a proper action shall be taken by the MAN MAC layer management system.

';

     NOTE:     The default value for the threshold is f.f.s.

discardedDMPDUsCounterThresholdAlarm      NOTIFICATION

BEHAVIOUR                     discardedDMPDUsCounterThresholdAlarmBehaviour;

WITH INFORMATION SYNTAX

            NotificationModule.discardedDMPDUsCounterThresholdAlarm;

REGISTERED AS {notification 51};

discardedDMPDUsCounterThresholdAlarmBehaviour    BEHAVIOUR

DEFINED AS '

The discardedDMPDUsCounterThresholdAlarm notification is generated when the value of the discardedDMPDUsCounter becomes equal to the discardedDMPDUsThreshold.

';

reassemblyErrorsCounterPackage          PACKAGE

BEHAVIOUR                     reassemblyErrorsCounterPackageBehaviour;

     ATTRIBUTES

      reassemblyErrorsCounter          DEFAULT VALUE 0

GET

REPLACE-WITH-DEFAULT;

REGISTERED AS {package 60};

reassemblyErrorsCounterPackageBehaviour        BEHAVIOUR

DEFINED AS '

The reassemblyErrorsCounterPackage package supports the counting of the number of errors occurring during the IMPDU reassembly process.

';

reassemblyErrorsCounter                        ATTRIBUTE

WITH ATTRIBUTE SYNTAX

ASN1AttributeOptionModule.ReassemblyErrorsCounter;

MATCHES FOR                        EQUALITY;

BEHAVIOUR                        reassemblyErrorsCounterBehaviour;

REGISTERED AS {attribute 66};

reassemblyErrorsCounterBehaviour        BEHAVIOUR

DEFINED AS '

The reassemblyErrorsCounter attribute specifies the number of errors due to a mismatch between the RX_SEQUENCE_NUM of the RSM instance and the Sequence_Number of a DMPDU belonging to a specified IMPDU or to the expiration of the reassembly timer.

';

## A.7    IMPDU transmission process

busSelectionTablePackage                          PACKAGE

BEHAVIOUR                                         busSelectionTablePackageBehaviour;

    ATTRIBUTES

    busSelectionTableEntries              GET-REPLACE;

REGISTERED AS {package 61};


busSelectionTablePackageBehaviour                 BEHAVIOUR

DEFINED AS '

The busSelectionTablePackage package defines the information related to the selection of the bus on which an IMPDU may be transmitted. It is an optional feature.

';

    NOTE:    The function needs to be specified in ETS 300 212 [2]. It is not applicable to an open bus User MAN Interface (UMI) and/or a point-to-point configuration.

busSelectionTableEntries                          ATTRIBUTE

WITH ATTRIBUTE SYNTAX

    ASN1AttributeOptionModule.busSelectionTableEntries;

MATCHES FOR                                       EQUALITY;

BEHAVIOUR                                         busSelectionTableEntriesBehaviour;

REGISTERED AS {attribute 67};


busSelectionTableEntriesBehaviour                 BEHAVIOUR

DEFINED AS '

The busSelectionTableEntries attribute specifies the entries in the bus selection table which is used to establish on which bus IMPDUs may be sent.

';

## A.8   ASN.1 syntax

### A.8.1   ASN.1 optional attributes definitions

ASN1AttributeOptionModule {ccitt(0) identified-organization(4) etsi(0) mlm(XXX)          informationModel(0)
asn1Module(2) asn1AttributeOptionModule(17)}

```
DEFINITIONS IMPLICIT TAGS                    ::=
BEGIN
-- EXPORTS  f.f.s.
-- IMPORTS  f.f.s.
informationModel OBJECT IDENTIFIER           ::= {ccitt(0) identified-organization(4) etsi(0) mlm(XXX)
informationModel(0)}
standardSpecificExtension OBJECT IDENTIFIER  ::= {informationModel standardSpecificExtension(0)}
managedObjectClass OBJECT IDENTIFIER         ::= {informationModel managedObjectClass(3)}
package OBJECT IDENTIFIER                     ::= {informationModel package(4)}
parameter OBJECT IDENTIFIER                   ::= {informationModel parameter(5)}
nameBinding OBJECT IDENTIFIER                 ::= {informationModel nameBinding(6)}
attribute OBJECT IDENTIFIER                   ::= {informationModel attribute(7)}
attributeGroup OBJECT IDENTIFIER             ::= {informationModel attributeGroup(8)}
action OBJECT IDENTIFIER                      ::= {informationModel action(9)}
notification OBJECT IDENTIFIER                ::= {informationModel notification(10)}

ActiveRSMCounter                             ::= INTEGER
BusIdentifier                                ::= ENUMERATED { A(0), B(1)}
BwbCounter                                   ::= INTEGER
CountDownCounter                             ::= INTEGER{0..65535}
DiscardedDMPDUsCounter                       ::= INTEGER

DiscardedIMPDUsCounter                       ::= INTEGER{0..255}
LmInfoOctetType1                             ::= OCTET STRING
```

> NOTE:     The structure of this octet could be better defined, like the Type 0 structure in
>                    subclause 5.6.1.

```
LocalReqQueueCounter                         ::= INTEGER {0..65535}
MaxActiveRSM                                 ::= INTEGER
OctetsReceivedCounter                        ::= INTEGER {0..65535}
OctetsSentCounter                            ::= INTEGER {0..65535}
PageCounters                                 ::= INTEGER {1..1023}
ReassemblyErrorsCounter                      ::= INTEGER

ReceivedIMPDUsCounter                        ::= INTEGER {0..65535}
RequestCounter                               ::= INTEGER {0..65535}
SegmentHeaderErrorCounter                    ::= INTEGER
SentIMPDUsCounter                            ::= INTEGER {0..65535}
```

> NOTE:     The threshold value is still to be defined.

```
Entry                                        ::= SEQUENCE {
                lowAddress  individualSapAddressType,
                highAddress individualSapAddressType,
                bus             busIdentifier }
BusSelectionTableEntries                     ::= SEQUENCE OF entry
-- ConfigurationControlStateMachineStatus    ::=      f.f.s.
DiscardedDMPDUsThreshold                     ::= INTEGER  -- f.f.s.
SegmentHeaderErrorThreshold                  ::= INTEGER  -- f.f.s.

END
```
> NOTE:     f.f.s. = for further study.

### A.8.2    ASN.1 optional notification definitions

ASN1NotificationOptionModule {ccitt(0) identified-organization(4) etsi(0) mlm(XXX) informationModel(0) asn1Module(2) asn1NotificationOptionModule(20)}

```
DEFINITIONS IMPLICIT TAGS                   ::=
BEGIN
-- EXPORTS f.f.s.
-- IMPORTS f.f.s.
informationModel OBJECT IDENTIFIER          ::= {ccitt(0) identified-organization(4) etsi(0) mlm(XXX)
informationModel(0)}
standardSpecificExtension OBJECT IDENTIFIER ::= {informationModel standardSpecificExtension(0)}
managedObjectClass OBJECT IDENTIFIER        ::= {informationModel managedObjectClass(3)}
package OBJECT IDENTIFIER                    ::= {informationModel package(4)}
parameter OBJECT IDENTIFIER                  ::= {informationModel parameter(5)}
nameBinding OBJECT IDENTIFIER                ::= {informationModel nameBinding(6)}
attribute OBJECT IDENTIFIER                  ::= {informationModel attribute(7)}
attributeGroup OBJECT IDENTIFIER             ::= {informationModel attributeGroup(8)}
action OBJECT IDENTIFIER                     ::= {informationModel action(9)}
notification OBJECT IDENTIFIER               ::= {informationModel notification(10)}

-- segmentHeaderErrorAlarm                   :: =  f.f.s.
-- discardedDMPDUsThresholdAlarm             :: =  f.f.s.

END
```

   NOTE:      f.f.s. = for further study.

## Annex B (informative): Bibliography

The following references are used for informative purposes within this ETS.

CCITT Recommendation Q.961 (1991):    "Lower layer protocol profiles for the Q3 interface".

CCITT Recommendation Q.962 (1991):    "Upper layer protocol profiles for the Q3 interface".

CCITT Recommendation E.164 (1991):    "Numbering plan for the international telephone service".

CCITT Recommendation G.702 (1988):    "Digital hierarchy bit rates".

CCITT Recommendation G.703 (1991):    "Physical/electrical characteristics of hierarchical digital interfaces".

CCITT Recommendation G.704 (1991):    "Synchronous frame structures used at primary and secondary hierarchical levels".

CCITT Recommendation G.707 (1991):    "Synchronous digital hierarchy bit rates".

CCITT Recommendation G.708 (1991):    "Network node interface for the synchronous digital hierarchy".

CCITT Recommendation G.709 (1991):    "Synchronous multiplexing structure".

CCITT Recommendation G.751 (1988):    "Digital multiplex equipments operating at the third order bit rate of 34 368 kbit/s and the fourth order bit rate of 139 264 kbit/s and using positive justification".

prETS 300 274:    "Network Aspects (NA); Metropolitan Area Network (MAN) Conformance specifications for the Medium Access Control (MAC) layer management".

**History**

| Document history | |
|---|---|
| March 1994 | First Edition |
| March 1996 | Converted into Adobe Acrobat Portable Document Format (PDF) |
| | |
| | |
| | |