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Omrežni vidiki (NA) – Velemestno omrežje (MAN) – Upravljanje plasti za krmiljenje dostopa do medijev (MAC)

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

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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.

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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 Metropolitan 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".
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- [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

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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.

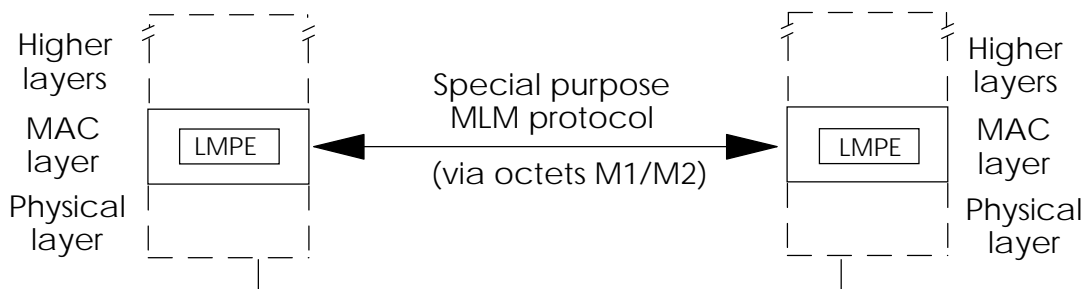


Figure 1: Layer Management Protocol Entity (LMPE)

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

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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.

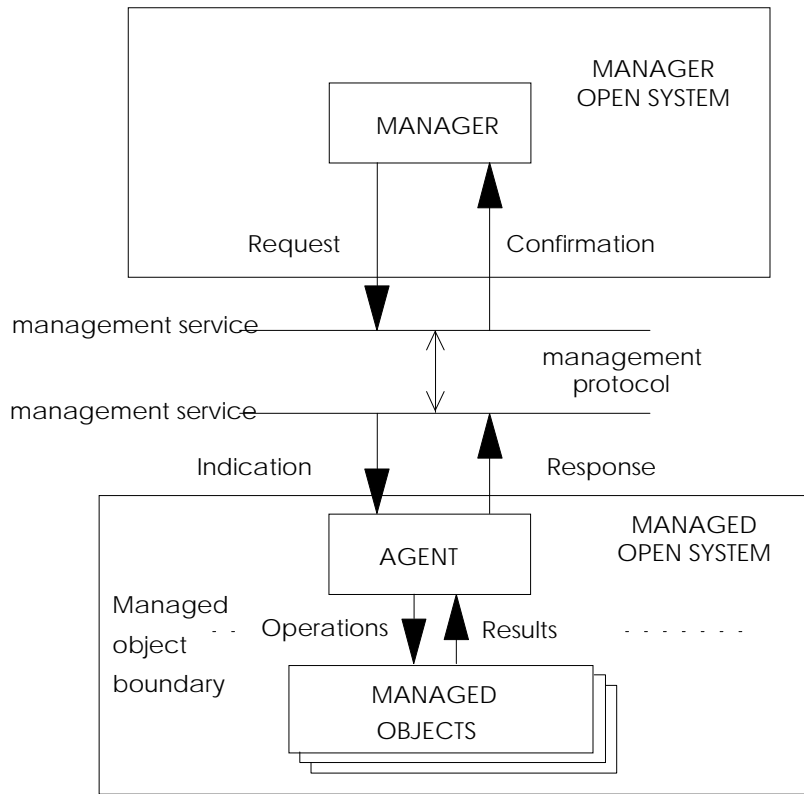
MSSs can use either DQDB based networks or other networks as access part to the public Telecommunication Management Network (TMN) Data Communication Network (DCN).

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).

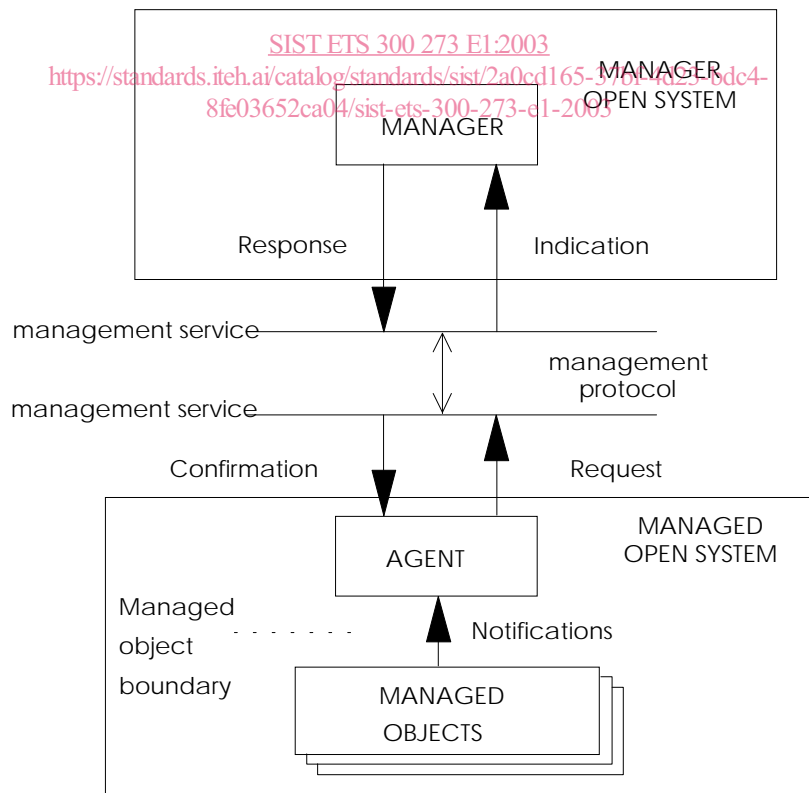
The Q_{MAN} short stack (see subclause 4.3.2.2) management interface shall be provided in the MN.

Additional interfaces may be provided.

This ETS specifies only the short stack Q_{MAN} protocol suite.



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2b: Notifications

Figure 2: MAN management information exchanges