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Foreword

This European Telecommunication Standard (ETS) has been prepared by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS describes the basic principles of the European Metropolitan Area Network (MAN) concept and is elaborated, taking into account the following:

- the emerging demand for multi-megabit communication services, especially for business users;

- the availability of new network technology based on distributed access over a shared broadband medium;

- the strategic need that the development and introduction of MAN products in Europe be driven by adequate ETSI standards;

- the requirement that MAN standardisation takes into account ongoing standardisation work on Broadband Integrated Services Digital Network (B-ISDN) and generate the necessary output so as to influence B-ISDN development.

MANs will promote B-ISDN by enabling network operators to timely offer a subset of B-ISDN services; in this way, user demand and provision of MANs should provide a graceful evolution towards B-ISDN by facilitating the access to this network.

The description of interworking aspects between the MAN and the transit network will be provided in the relevant ETSI documents.

General aspects of MAN management are defined in this ETS. More detailed information will be provided in the relevant ETSI documents.

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1 Scope

This European Telecommunication Standard (ETS) describes the basic principles and network architecture for an European Metropolitan Area Network (MAN).

This ETS defines and describes the MAN reference configuration and the functional blocks between the Customer Network (CN) and the MAN Switching System (MSS), which is described in Annex A (informative).

In addition, this ETS defines the protocol reference model for MANs, and is the basis for the development of companion ETSs related to MAN protocols (ETS 300 212 to ETS 300 216, [19] to [23], inclusive).

General aspects of MAN management are also defined in this ETS.

The MAN definition takes into account the final goal of providing an easy integration with Broadband Integrated Services Digital Network (B-ISDN).

The protocol chosen as the basis for this ETS is the IEEE Standard 802.6 [1].

The specification of performance figures is outside the scope of this ETS.

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 hereafter. For dated references, subsequent amendments to, or revisions of any 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] IEEE Standard 802.6 (1990): "Distributed Queue Dual Bus (DQDB) Subnetwork of a metropolitan area network (MAN)".

[2] CCITT Recommendation I.431 (1988): "Primary rate user-network interface - Layer 1 specification".

[3] CCITT Recommendation M.30 (1989): "Principles for a telecommunications management network".

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

[5] CCITT Recommendation I.113 (1991): "Vocabulary of terms for broadband aspects of ISDN".

[6] CCITT Recommendation I.121 (1991): "Broadband aspects of ISDN".

[7] CCITT Recommendation I.150 (1991): "B-ISDN asynchronous transfer mode functional characteristics".

[8] CCITT Recommendation I.211 (1991): "B-ISDN service aspects".

[9] CCITT Recommendation I.311 (1991): "B-ISDN general network aspects".

[10] CCITT Recommendation I.321 (1991): "B-ISDN protocol reference model and its application".

[11] CCITT Recommendation I.327 (1991): "B-ISDN functional architecture".

[12] CCITT Recommendation I.361 (1991): "B-ISDN ATM layer specification".

[13] CCITT Recommendation I.362 (1991): "B-ISDN ATM adaptation layer (AAL) functional description".

[14] CCITT Recommendation I.363 (1991): "B-ISDN ATM adaptation layer (AAL) specification".

[15] CCITT Recommendation I.413 (1991): "B-ISDN user network interface".

[16] CCITT Recommendation I.432 (1991): "B-ISDN user network interface Physical layer specification".

[17] CCITT Recommendation I.610 (1991): "OAM principles of the B-ISDN access".

[18] ISO/IEC 10038: "Information technology - Telecommunications and information exchange between systems - Local area network - Media access control (MAC) bridges".

[19] ETS 300 212 (1992): "Network Aspects (NA); Metropolitan Area Network (MAN) Media access control layer and physical layer specification".

[20] ETS 300 213 (1992): "Network Aspects (NA); Metropolitan Area Network (MAN) Physical layer convergence procedure for 2,048 Mbit/s".

[21] ETS 300 214 (1992): "Network Aspects (NA); Metropolitan Area Network (MAN) Physical layer convergence procedure for 34,368 Mbit/s".

[22] ETS 300 215 (1992): "Network Aspects (NA); Metropolitan Area Network (MAN) Physical layer convergence procedure for 139,264 Mbit/s".

[23] ETS 300 216 (1992): "Network Aspects (NA); Metropolitan Area Network (MAN) Physical layer convergence procedure for 155,520 Mbit/s".

[24] ETS 300 217, Parts 1 to 4 (1992): "Network Aspects (NA); Connectionless Broadband Data Service (CBDS)".

[25] ISO/IEC 8802-3 (1990): "Information processing systems - Local area networks - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications".

[26] ISO/IEC 8802-5 (1992): "Information processing systems - Local and metropolitan area networks - Part 5: Token ring access method and physical layer specifications".

[27] IEEE Standard 802.3b (1988): "Broadband Medium Attachment Unit and Broadband Medium Specifications, Type 10 BROAD36".

[28] IEEE Standard 802.3i (1990) (supplement to 802.3, (1990) edition): "System Considerations for Multi-Segment 10MB/S Baseband Networks (Section 13) and Medium Attachment Unit and Baseband Medium specification, Type 10 Base-T (Section 14)".

[29] IEEE Standard 802.1 (1990): "Local Area Network and Metropolitan Area Network - Overview and architecture".

[30] CCITT Recommendation E.164 (1991): "Numbering plan for the ISDN era".

[31] CCITT X.700 Recommendation Series (1988) on System management.

[32] CCITT Recommendation I.411 (1988): "ISDN user-network interfaces - Reference configurations".

[33] CCITT Recommendation I.320 (1988): "ISDN protocol reference model".

[34] ISO 9314 (1989): "Information processing systems - Fiber Distributed Data Interface (FDDI)".

[35] prETS 300 273: "Network Aspects (NA); Metropolitan Area Network (MAN) Medium Access Control (MAC) layer management".

[36] prETS 300 275: "Network Aspects (NA); Metropolitan Area Network (MAN) Interconnection of MANs".

[37] prETS 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 SHD based systems".

[38] prETS 300 268: "Network Aspects (NA); Metropolitan Area Network (MAN) Protocol Implementation Conformance Statement (PICS)".

[39] ISO/IEC TR 9575 (1990): "Information technology - Telecommunications and information exchange between systems - OSI Routing Framework".

[40] CCITT Recommendation G.773 (1990): "Protocol suites for Q-interfaces for management of transmission systems".

3 Definitions and abbreviations

This Clause consists primarily of those terms and definitions that are considered essential to the understanding and application of the principles of MANs.

3.1 Definitions

For the purposes of this ETS, the following definitions apply.

3.1.1 Interfaces

101 **Inter MAN Systems Interface (IMSI) :** IMSI is a generic term that correspond to a family of interfaces. These interfaces apply between two MSSs or between the MSS and the Transit Network. As far as the direct interconnection between MSSs is concern, corresponding interfaces are described in ETS 300 275 [36], the specification of the interconnection via Asynchronous Transfer Mode (ATM) links will be provided in another ETSI document.

102 **User MAN Interface (UMI):** interface between the CN and the Access Facility 1 (AF1).

103 **User Specific Interface (USI):** interface based on a user specific protocol.

3.1.2 Network elements

201 **Shared medium:** transmission facility whose capacity is shared among several users.

202 **Access Node (AN):** the network element located in the Customer EQuipment (CEQ) which performs the interfacing of various customer related protocols with the Distributed Queue Dual Bus (DQDB) protocol.

203 **Terminal Equipment (TE):** user terminals. The term "terminal" is used in a broad sense with different levels of complexity and functionality.

204 **Customer Network (CN):** the CN is defined between the T_M and S_M reference points.

205 **Customer EQuipment (CEQ):** the concatenation of equipment on the user side of the T_M reference point. In the case of multiple access, the CEQ includes all the equipment on the user side of all those accesses comprising the multiple access.

206 **Access Facility (AF):** the network segment that connects the CN to the MAN Switching System (MSS). The functionality of the AF may vary.

207 **Access Facility 1 (AF1):** an AF which only consists of a DQDB link between the CEQ and the MSS.

208 **Access Facility 2 (AF2):** an AF which consists of a gathering network.

209 **Gathering network:** a network which consists of several interconnected public MAN nodes.

210 **Metropolitan Area Network (MAN):** digital network based on a shared access broadband medium. A MAN covers an urban or metropolitan area (typically in the range of 50 km in diameter). A MAN is composed of one MSS and one or more AFs connected to the MSS. Remote MANs can be interconnected in order to cover a larger area by means of public Transit Network (TN) facilities. A MAN is a means to provide the support of narrowband and broadband services integrated in the same network.

211 **MAN Switching System (MSS):** a collection of functions that provides high-speed switching in the public network. It can be implemented through distributed or centralised switching.

212 **MAN Node (MN):** a network element, located in the public domain, performing the interfacing between the CEQ and the IEEE Standard 802.6 [1] DQDB protocol.

213 **Transit Network (TN) :** a network which provides transmission, switching and management functions to allow MSS interconnection. It can be implemented through point-to-point links, digital cross-connect, B-ISDN transit node, etc.

3.1.3 Functions

301 **DQDB Access Functions (DAF):** protocol functions required to receive and transmit information over the shared medium between different nodes. Functions for the management of the DQDB subnetwork are also contained in DAF.

302 **DQDB Access Termination (DAT):** functions within the MSS which consist of the DAF and Service Specific Function (SSF) functional blocks.

303 **Service Specific Functions (SSF):** those functions required for the provision of the connectionless, connection-oriented isochronous and connection-oriented non-isochronous services.

304 **User Access Functions (UAF):** the functionality to access a user specific network or a directly attached terminal.

3.1.4 Services

401 **Connectionless service:** a service, supporting the transfer of variable length data units that can tolerate variable delay but require error detection functions and without the establishment of an end to end connection. This service is described in ETS 300 217 [24] and is comparable to the "packet-oriented" Medium Access Control (MAC) service of ISO/IEC 8802 [25], Local Area Networks (LANs).

402 **Connection-oriented isochronous service:** a service which is oriented to the transport of isochronous data (e.g. conventional digitised voice); "isochronous" means that the time characteristic of an event or signal is recurring at known, periodic time intervals (as defined in IEEE Standard 802.6 [1]). The precise definition of this service is outside the scope of this ETS and is for further study.

403 **Connection-oriented non-isochronous service:** a service supporting the transfer, over a virtual channel, of information flows segmented into fixed-length cells having no specified inter-arrival time. The precise definition of this service is outside the scope of this document and is for further study.

3.2 Alphabetical list of terms

206 Access Facility (AF)

207 Access Facility 1 (AF1)

208 Access Facility 2 (AF2)

202 Access Node (AN)

402 Connection-oriented isochronous service

403 Connection-oriented non-isochronous service

401 Connectionless service

205 Customer EQuipment (CEQ)

204 Customer Network (CN)

301 DQDB Access Functions (DAF)

302 DQDB Access Termination (DAT)

209 Gathering network

101 Inter MAN systems Interface (IMSI)

210 Metropolitan Area Network (MAN)

212 MAN Node (MN)

211 MAN Switching System (MSS)

303 Service Specific Functions (SSF)

201 Shared medium

304 User Access Functions (UAF)

102 User MAN Interface (UMI)

103 User Specific Interface (USI)

203 Terminal Equipment (TE)

213 Transit Network (TN)

3.3 Abbreviations

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

ACF Access Control Field

AF Access Facility

AN Access Node

ATM Asynchronous Transfer Mode

AUI Attachment Unit Interface

B-ISDN	Broadband Integrated Services Digital Network
BT	BiT sublayer
C&S	Control & Switching functions
CEQ	Customer EQuipment
CN	Customer Network
CNMS	Customer Network Management Services
CSMA/CD	Carrier Sense Multiple Access with Collision Detection
DAF	DQDB Access Functions
DAT	DQDB Access Termination
DDI	Direct Dialling In
DLSAP	Data Link Service Access Point
DM	Derived MAC sublayer
DM-PDU	Derived MAC Protocol Data Unit
DQDB	Distributed Queue Dual Bus
DTE	Data Terminal Equipment
DXC	Digital Cross-Connect
E-LAN	Extended LAN
EOB	End Of Bus
FDDI	Fibre Distributed Data Interface
HL	Higher Layers
HOB	Head Of Bus
IM	Initial MAC sublayer
IM-PDU	Initial MAC-Protocol Data Unit
IMSI	Inter MAN Systems Interface
ISPBX	Integrated Services Private Branch eXchange
LAN	Local Area Network
LCRF	Local Connection Related Function
LLC	Logical Link Control
LT	Line Termination
M-LT	MAN-Line Termination
M-NT	MAN-Network Termination

MAC	Media Access Control
MAN	Metropolitan Area Network
MAU	Medium Attachment Unit
MDI	Medium Dependent Interface
MIC	Medium Interface Connector
MID	Message IDentifier
MMF	MSS Management Function
MN	MAN Node
MS	Management Services
MSAP	MAC Service Access Point
MSS	MAN Switching System
NMF	Node Management Function
NT	Network Termination
OSI	Open Systems Intercommunication
OUI	Organisationally Unique Identifier
PA	Pre-Arbitrated
PID	Protocol IDentifier
PHY	PHYsical layer
PLS	PhysicaL Signalling
PMA	Physical Medium Attachment
PRM	Protocol Reference Model
QA	Queued Arbitrated
QOS	Quality Of Service
SLT	SLoT sublayer
SLT-PDU	SLot Protocol Data Unit
SM	SegMent sublayer
SM-PDU	SegMent Protocol Data Unit
SNAP	Sub-Network Access Protocol
SSF	Service Specific Functions
SV	SerVice sublayer
TAT	Transit Access Termination