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Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 7-1: Equipment management and auxiliary layer functions

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European Standard (Telecommunications series)

**Transmission and Multiplexing (TM);
Generic requirements of
transport functionality of equipment;
Part 7-1: Equipment management
and auxiliary layer functions**

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Transmission and Multiplexing (TM).

The present document is one of a family of documents that has been produced in order to provide inter-vendor and inter-operator compatibility of Synchronous Digital Hierarchy (SDH) equipment.

The present document is Part 7-1 of a multi-part EN covering the generic requirements of transport functionality of equipment, as identified below:

- Part 1-1: "Generic processes and performance";
- Part 1-2: "General information about Implementation Conformance Statement (ICS) proforma";
- Part 2-1: "Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) physical section layer functions";
- Part 2-2: "Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) physical section layer functions; Implementation Conformance Statement (ICS) proforma specification";
- Part 3-1: "Synchronous Transport Module-N (STM-N) regenerator and multiplex section layer functions";
- Part 3-2: "Synchronous Transport Module-N (STM-N) regenerator and multiplex section layer functions; Implementation Conformance Statement (ICS) proforma specification";
- Part 4-1: "Synchronous Digital Hierarchy (SDH) path layer functions";
- Part 4-2: "Synchronous Digital Hierarchy (SDH) path layer functions; Implementation Conformance Statement (ICS) proforma specification";
- Part 5-1: "Plesiochronous Digital Hierarchy (PDH) path layer functions";
- Part 5-2: "Plesiochronous Digital Hierarchy (PDH) path layer functions; Implementation Conformance Statement (ICS) proforma specification";
- Part 6-1: "Synchronization layer functions";
- Part 6-2: "Synchronization layer functions; Implementation Conformance Statement (ICS) proforma specification";
- Part 7-1: "Equipment management and auxiliary layer functions";**
- Part 7-2: "Auxiliary layer functions; Implementation Conformance Statement (ICS) proforma specification".

Parts 2 to 7 specify the layers and their atomic functions.

NOTE: The SDH radio equipment functional blocks are addressed by ETSI WG TM4.

Various of the above parts have previously been published as parts of ETS 300 417.

They have been converted into parts of EN 300 417 without technical changes, but some editorial changes have been necessary (e.g. references). In particular:

- Parts 2-1, 2-2 and 3-2 have been modified to take account of editorial errors present in edition 1;
- Part 1-1 has had its title change to align with other parts published at a later date.

Also note that in the meantime Parts 8-1 and 8-2 together with all Parts x-3 (Abstract Test Suites) have been stopped.

National transposition dates	
Date of adoption of this EN:	13 October 2000
Date of latest announcement of this EN (doa):	31 January 2001
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 July 2001
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Introduction

The present document specifies for fault management, performance monitoring, and configuration management a library of basic equipment management function (EMF) building blocks and a set of rules by which they are combined in order to describe an equipment's EMF functionality. The library defined in the present document forms part of the set of libraries defined furthermore in the other parts of EN 300 417. In addition, a number of compound functions consisting of a number of EMF building blocks are defined.

NOTE: Not every function defined in the present document is required for every application. Different subsets of functions may be assembled in different ways to provide a variety of different capabilities. Network operators and equipment suppliers may choose which functions to implement for each application.

In addition, the present document specifies functions in the auxiliary layers: DCC layer and V11 section layer.

1 Scope

The present document specifies a library of basic building blocks and a set of rules by which they are combined in order to describe transport and equipment management function (EMF) functionality in equipment. The library comprises the functional building blocks needed to completely specify the generic functional structure of the European Digital Transmission Hierarchy. Equipment, which is compliant with the present document, will be describable as an interconnection of a subset of these functional blocks contained within the present document. The interconnections of these blocks will obey the combination rules given. The generic functionality is described in EN 300 417-1-1 [8].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- iTech STANDARD PREVIEW
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- [1] ETSI ETS 300 147 (1997): "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Multiplexing structure".
- [2] ETSI ETS 300 167: "Transmission and Multiplexing (TM); Functional characteristics of 2 048 kbit/s interfaces". [SIST EN 300 417-7-1 V1.1.1:2003](https://standards.itech.ai/catalog/standards/sist/91b04a7f-e1c0-4280-b5fa-cd34760c669/sist-en-300-417-7-1-v1-1-2003)
- [3] ETSI ETS 300 304: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); SDH information model for the Network Element (NE) view".
- [4] ETSI EN 300 371: "Transmission and Multiplexing (TM); Plesiochronous Digital Hierarchy (PDH) information model for the Network Element (NE) view".
- [5] ETSI ETS 300 411: "Transmission and Multiplexing (TM); Performance monitoring; Information model for the Network Element (NE) view".
- [6] ETSI ETS 300 412: "Transmission and Multiplexing (TM); Payload Configuration; Information model for the Network Element (NE) view".
- [7] ETSI ETS 300 413: "Transmission and Multiplexing (TM); Multiplex section protection; Information model for the Network Element (NE) view".
- [8] ETSI EN 300 417-1-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 1-1: Generic processes and performance".
- [9] ETSI EN 300 417-4-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 4-1: Synchronous Digital Hierarchy (SDH) path layer functions".
- [10] ETSI EN 300 417-6-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 6-1: Synchronization layer functions".
- [11] ETSI ETS 300 493: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH) information model of the Sub Network Connection Protection (SNCP) for the Network Element (NE) view".
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- [13] ETSI EN 301 155: "Synchronous Digital Hierarchy (SDH); Unidirectional performance monitoring for the network element view".
- [14] ETSI EN 301 268: "Telecommunications Management Network (TMN); Linear multiplex section protection configuration information model for the Network Element (NE) view".
- [15] ETSI ETS 300 337: "Transmission and Multiplexing (TM); Generic frame structures for the transport of various signals (including Asynchronous Transfer Mode (ATM) cells and Synchronous Digital Hierarchy (SDH) elements) at the ITU-T Recommendation G.702 hierarchical rates of 2 048 kbit/s, 34 368 kbit/s and 139 264 kbit/s".
- [16] ETSI EN 301 384: "Telecommunications Management Network (TMN); Performance monitoring for Plesynchronous Digital Hierarchy (PDH) interfaces; Information model for the Network Element (NE) view".
- [17] ETSI ES 202 098: "Telecommunications Management Network (TMN); Information model for a VC transport system using a 34 Mbit/s PDH transmission system in accordance with ITU-T Recommendation G.832".
- [18] ITU-T Recommendation G.774 (1992): "Synchronous digital hierarchy (SDH) management information model for the network element view".
- [19] ITU-T Recommendation G.826 (02/99): "Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate".
- [20] ITU-T Recommendation G.828 (02/00): "Error performance parameters and objectives for international, constant bit rate synchronous digital paths".
- [21] ITU-T Recommendation M.20 (1992): "Maintenance philosophy for telecommunications networks".
- [22] ITU-T Recommendation M.2100 (1995): "Performance limits for bringing-into-service and maintenance of international PDH paths, sections and transmission systems".
- [23] ITU-T Recommendation M.2101 (1997): "Performance limits for bringing-into-service and maintenance of international SDH paths and multiplex sections".
- [24] ITU-T Recommendation M.2101.1 (1997): "Performance limits for bringing-into-service and maintenance of international SDH paths and multiplex sections".
- [25] ITU-T Recommendation M.2120 (1997): "PDH path, section and transmission system and SDH path and multiplex section fault detection and localization procedures".
- [26] ITU-T Recommendation Q.822 (1994): "Stage 1, Stage 2 and Stage 3 description for the Q3 interface – Performance management".
- [27] ITU-T Recommendation Q.921 (1997): "ISDN user-network interface – Data link layer specification".
- [28] ITU-T Recommendation V.11 (1996): "Electrical characteristics for balanced double-current interchange circuits operating at data signalling rates up to 10 Mbit/s".

3 Definitions, abbreviations, symbols and diagrammatic conventions

3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 300 417-1-1 [8] apply.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

15m	15 minutes
24h	24 hours
AccPer	Accumulation Period
AcSL	Accepted Signal Label
AcTI	Accepted Trace Identifier
AF	Atomic Function
AvFb	Availability Function bi-directional
AvFu	Availability Function uni-directional
AI	Adapted Information
AIS	Alarm Indication Signal
AP	Access Point
API	Access Point Identifier
ARCH	ARCHitecture
ATM	Asynchronous Transfer Mode
AU	Administrative Unit
AUG	Administrative Unit Group
A/Z	from A to Z
BBE	Background Block Error
BUT	Begin of Unavailable Time
CI	Characteristic Information
CK	ClocK
CLR	CLeaR
ClrLON	Clear Lockout of Normal traffic signal from protection
CM	Configuration Management
CM	Connection Matrix
CP	Connection Point
CRC	Cyclic Redundancy Check
CS	Clock Source
CSES	Consecutive Severely Errored Seconds
Cur15m	Current 15 minutes
Cur24h	Current 24 hour
DCC	Data Communications Channel
DEC	DECrement
DEG	DEGraded
DEGM	DEGraded Monitor period
DEGTHR	DEGraded THreshold
DMA	Deferred Maintenance Alarm
DS	Defect Second
EBC	Errored Block Count
EDC	Error Detection Code
EFS	Equipment Functional Specification
EMF	Equipment Management Function
EQ	EQuipment
ES	Electrical Section
ES	Errored Second
EUT	End of Unavailable Time
EXER	Exercise

EXER-R	Exercise - Ring
EXER-S	Exercise - Span
EXTCMD	EXTERNAL CoMmanD
ExTI	Expected Trace Identifier
F_B	Far-end Block
FAS	Frame Alignment Signal
FBBE	Far-end Background Block Error
FES	Far-end Errored Second
FFS	For Further Study
FPME	Far-end Performance Monitoring Event
FOP	Failure Of Protocol
FS	Frame Start signal
FSES	Far-end Severely Errored Second
FS-R	Forced Switch to protection - ring
FS-S	Forced Switch to protection - span
FSw	Forced Switch
G826EN	G.826 [19] bi-directional package at the trail end node
G826IN	G.826 [19] bi-directional package at intermediate node
HO	Hold Off (used in HOTime)
ID	IDentifier
IM	In Multiframe state
INC	INCRement
IncAIS	Incoming AIS
LO	Lockout Of protection
LOF	Loss Of Frame
LOM	Loss Of Multiframe
LON	Lockout Of Normal traffic signal from protection
LOP	Loss Of Pointer
LOS	Loss Of Signal
LOW-R	Lockout Of Working channels - ring switch
LOW-S	Lockout Of Working channels - span switch
LP-A	Lockout of Protection - All spans
LP-S	Lockout of Protection - Span
LSS	Loss of Sequence Structure
LTC	Loss of Tandem Connection
MC	Matrix Connection
MCF	Message Communications Function
MEI	Maintenance Event Information
MFP	MultiFrame Present
MI	Management Information
MP	Management Point
MO	Managed Object
MON	MONitored
MP	Management Point
MS	Multiplex Section
MS1	STM-1 Multiplex Section
MS16	STM-16 Multiplex Section
MS4	STM-4 Multiplex Section
MS64	STM-64 Multiplex Section
MSP	Multiplex Section Protection
MS-R	Manual Switch to protection - ring
MS-S	Manual Switch to protection - span
MSw	Manual Switch
N/A	Not Applicable
NBBE	Near-end Background Block Error
NC	Network Connection
NE	Network Element
NES	Near-end Errored Second
NMON	Not MONitored
NPME	Near-end Performance Monitoring Event
NSES	Near-end Severely Errored Second
ODI	Outgoing Defect Indication

OEI	Outgoing Error Indication
OF	Outgoing Far-end
OH	OverHead
ON	Outgoing Near-end
OPER	OPERation
OS	Optical Section
OW	Order Wire
P	Protection
P12s	2 048 kbit/s PDH path layer with synchronous 125 µs frame structure according to ETS 300 167 [2]
P22e	8 448 kbit/s PDH path layer with 4 plesiochronous 2 048 kbit/s
P31e	34 368 kbit/s PDH path layer with 4 plesiochronous 8 448 kbit/s
P31s	34 368 kbit/s PDH path layer with synchronous 125 µs frame structure according to ETS 300 337 [15]
P4e	139 264 kbit/s PDH path layer with 4 plesiochronous 34 368 kbit/s
P4s	139 264 kbit/s PDH path layer with synchronous 125 µs frame structure according to ETS 300 337 [15]
PDH	Plesiochronous Digital Hierarchy
PJE	Pointer Justification Event
PJE-	Negative Pointer Justification Event
PJE+	Positive Pointer Justification Event
PLM	PayLoad Mismatch
PM	Performance Monitoring
PMA	Prompt Maintenance Alarm
PMCF	Performance Monitoring Clock Function
PMF	Performance Monitoring Function
PRC	Primary Reference Clock
PROT	PROTection
PS	Protection Switching
RDI	Remote Defect Indicator
REI	Remote Error Indicator
RI	Remote Information
RS	Regenerator Section
RS1	STM-1 Regenerator Section
RS16	STM-16 Regenerator Section
RS4	STM-4 Regenerator Section
RS64	STM-64 Regenerator Section
RTC	Real Time Clock
RTHR	Reset Threshold
RTR	Reset Threshold Report
SDH	Synchronous Digital Hierarchy
SES	Severely Errored Second
SF	Signal Fail
Sk	Sink
SNC	Sub-Network Connection
SNC/I	Inherently monitored Sub-Network Connection protection
SNC/N	Non-intrusively monitored Sub-Network Connection protection
SNC/S	Sublayer monitored Sub-Network Connection protection
So	Source
SOH	Section OverHead
SSF	Server Signal Fail
SSM	Synchronization Status Message
STM	Synchronous Transport Module
STM-N	Synchronous Transport Module, level N
TC	Tandem Connection
TCP	Termination Connection Point
THR	Threshold
ThrFd	Dual level Thresholding Function
ThrFs	Single level Thresholding Function
TI	Timing Information
TI	Trace Identifier

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TIM	Trace Identifier Mismatch
TIMdis	Trace Identifier Mismatch disable
TMN	Telecommunications Management Network
TP	Timing Point
TPmode	Termination Point mode
TR	Threshold Report
TS	Time Slot
TSE	Test Sequence Error
TSN	Tibutary Signal Number
TT	Trail Termination function
TTI	Trail Trace Identifier
TU	Tributary Unit
TUG	Tributary Unit Group
TxTI	Transmitted Trace Identifier
UAS	Unavailable Second
UAT	Unavailable Time
UNEQ	UNEQuipped
UTC	Universal Time Coordinated
VC	Virtual Container
VC-n	Virtual Container, level n
W	Working
WTR	Wait To Restore
Z/A	from Z to A

3.3 Symbols and diagrammatic conventions

For the purposes of the present document, the symbols and diagrammatic conventions described in EN 300 417-1-1 [8] apply.

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4 Equipment management function

The equipment management function (EMF) (figure 1) provides the means through which a network element level manager manages the network element function (NEF).

The EMF interacts with the transport and synchronization layer atomic functions by exchanging information (MI: management information) across the MP reference points. The EMF contains a number of functions that provide a data reduction mechanism on the information received across the MP reference points. These function outputs are available to the agent via the network element resources and management application functions (MAF) which represent this information as managed objects.

Network element resources provide event processing and storage. The MAF process the information provided to and by the NE resources. For example, the agent converts this information to CMISE (common management information service element) messages and responds to CMISE messages from the manager by performing the appropriate operations on the managed objects.

NOTE: The management application function specification is outside the scope of the present document.

Network elements may support several functions, which can be operated only in exclusivity of each other. Besides such configuration provisionings, provisionings are needed for parameters in individual functions and processes within a NE.

A number of functions/processes and reports have a notion of time. The network element Real Time Clock function provides this time information.