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Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 1-1: Generic processes and performance

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F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
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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 1, sub-part 1 of a multi-part deliverable 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 9-1: "Synchronous Digital Hierarchy (SDH) concatenated path layer functions; Requirements".

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

NOTE 1: The present document does not currently address configuration management.

NOTE 2: The SDH radio equipment functional blocks are addressed by ETSI WG TM4.

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

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

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

Also note that in the meantime parts 8-1, 8-2 and 8-3 have been stopped.

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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 functionality of equipment. The library comprises the functional building blocks needed to completely specify the generic functional structure of the European transmission hierarchies. Equipment which is compliant with the present document needs to be describable as an interconnection of a subset of these functional blocks contained within the present document. The interconnections of these blocks need to obey the combination rules given. The generic functionality is described in the present document.

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.

- [1] ETSI ETS 300 019: "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment".
- [2] ETSI EN 300 147: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Multiplexing structure".
- [3] ETSI EN 300 167: "Transmission and Multiplexing (TM); Functional characteristics of 2 048 kbit/s interfaces".
- [4] ETSI ETS 300 232 (1993): "Transmission and Multiplexing (TM); Optical interfaces for equipments and systems relating to the Synchronous Digital Hierarchy [ITU-T Recommendation G.957 (1993), modified]".
- [5] ETSI ETS 300 304: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); SDH information model for the Network Element (NE) view".
- [6] 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".
- [7] ETSI EN 300 417-2-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 2-1: Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) physical section layer functions".
- [8] ETSI EN 300 417-3-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 3-1: Synchronous Transport Module-N (STM-N) regenerator and multiplex section layer functions".
- [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 300 417-5-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 5-1: Plesiochronous Digital Hierarchy (PDH) path layer functions".
- [11] ETSI EN 300 417-6-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 6-1: Synchronization layer functions".

- [12] ETSI EN 300 417-7-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 7-1: Equipment management and auxiliary layer functions".
- [13] ETSI EN 300 462-2: "Synchronization network architecture".
- [14] ETSI EN 300 462-3: "The control of jitter and wander within synchronization networks".
- [15] ETSI EN 300 462-4: "Timing characteristics of slave clocks suitable for synchronization supply to Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) equipment".
- [16] ETSI EN 300 462-5: "Timing characteristics of slave clocks suitable for operation in Synchronous Digital Hierarchy (SDH) equipment".
- [17] ETSI EN 300 462-6: "Timing characteristics of primary reference clocks".
- [18] ETSI EN 300 746: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Network protection schemes; Automatic Protection Switch (APS) protocols and operation".
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- [20] ITU-T Recommendation E.862 (1992): "Dependability planning of telecommunication networks".
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- [22] ITU-T Recommendation G.704 (1998): "Synchronous frame structures used at 1 544, 6 312, 2 048, 8 448 and 44 736 kbit/s hierarchical levels".
- [23] ITU-T Recommendation G.707 (1996): "Network node interface for the synchronous digital hierarchy (SDH)".
- [24] ITU-T Recommendation G.742 (1988): "Second order digital multiplex equipment operating at 8 448 kbit/s and using positive justification".
- [25] ITU-T 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".
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- [31] ITU-T Recommendation G.826 (1999): "Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate".
- [32] ITU-T Recommendation G.831 (1996): "Management capabilities of transport networks based on the Synchronous Digital Hierarchy (SDH)".
- [33] ITU-T Recommendation G.841 (1998): "Types and characteristics of SDH network protection architectures".
- [34] ITU-T Recommendation G.911 (1997): "Parameters and calculation methodologies for reliability and availability of fibre optic systems".

- [35] ITU-T Recommendation G.957 (1999): "Optical interfaces for equipments and systems relating to the synchronous digital hierarchy".
- [36] ITU-T Recommendation X.721 (1992): "Information technology - Open Systems Interconnection - Structure of management information: Definition of management information".
- [37] ITU-T Recommendation M.20: "Maintenance philosophy for telecommunication networks".
- [38] ITU-T Recommendation M.3010: "Principles for a Telecommunications management network".
- [39] ITU-T Recommendation O.151: "Error performance measuring equipment operating at the primary rate and above".
- [40] ETSI TS 101 009: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Network protection schemes; Types and characteristics".
- [41] ITU-T Recommendation G.828: "Error performance parameters and objectives for international, constant bit rate synchronous digital paths".

3 Abbreviations, definitions and symbols

3.1 Abbreviations

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

A	Adaptation function
AcSL	Accepted Signal Label
AcTI	Accepted Trace identifier
ADM	Add-Drop Multiplexer
AI	Adapted Information
AIS	Alarm Indication Signal
ALS	Automatic Laser Shutdown
AP	Access Point
APId	Access Point Identifier
APS	Automatic Protection Switch
ATM	Asynchronous Transfer Mode
AU	Administrative Unit
AU-n	Administrative Unit, level n
AUG	Administrative Unit Group
BBE	Background Block Error
BER	Block Error Rate
BER	Bit Error Rate
BIP	Bit Interleaved Parity
BIP-N	Bit Interleaved Parity, width N
BNF	Backus-Naur Form
C	Connection function
Cs	supervisory-unequipped Connection function
CH	Channel
CI	Characteristic Information
CK	Clock
CM	Connection Matrix
CMI	Coded Mark Inversion
Co	Connection
CP	Connection Point
CRC	Cyclic Redundancy Check
D	Data
DCC	Data Communications Channel
DEC	Decrement
DEG	Degraded
DEGTHR	Degraded Threshold

DL	Data Link
DPRING	Dedicated Protection Ring
DXC	Digital Cross Connect
E0	Electrical interface signal 64 kbit/s
EBC	Errored Block Count
ECC	Embedded Communications Channel
EDC	Error Detection Code
EDCV	Error Detection Code Violation
EFS	Equipment Functional Specification
EMF	Equipment Management Function
EQ	Equipment
ERS	Elementary Regenerator Section
ES	Errored Second
ES	Electrical Section
ESR	Errored seconds Rate
Ex	ITU-T Recommendation G.703 [21] type electrical signal, bit rate order x
ExSL	Expected Signal Label
ExTI	Expected Trace Identifier
F_B	Far-end Block
F_DS	Far-end Defect Second
F_EBC	Far-end Errored Block Count
F_SES	Far-end Severely Errored Second
FAS	Frame Alignment Signal
FIT	Failure In Time
FO	Frame Offset information
FOP	Failure Of Protocol
FS	Frame Start signal
HO	Higher Order
HOVC	Higher Order Virtual Container
HP	Higher order Path
ID	Identifier
IF	In Frame state
INC	Increment
IncAIS	Incoming AIS
IS	Intermediate System
LC	Link Connection
LO	Lower Order
LOA	Loss Of Alignment; generic for LOF, LOM, LOP
LOF	Loss Of Frame
LOM	Loss Of Multiframe
LOP	Loss Of Pointer
LOS	Loss Of Signal
LOVC	Lower Order Virtual Container
LSS	Loss of Sequence Structure
LT	Line Termination
LTC	Loss of Tandem Connection
MC	Matrix Connection
MDT	Mean Down Time
mei	maintenance event information
MI	Management Information
MO	Managed Object
MON	Monitored
MP	Management Point
MS	Multiplex Section
MS1	STM-1 Multiplex Section
MS16	STM-16 Multiplex Section
MSB	Most Significant Bit
MSOH	Multiplex Section Overhead
MSP	Multiplex Section Protection
MTBF	Mean Time Between Failures
N_B	Near-end Block
N_DS	Near-end Defect Second

STANDARD PREVIEW
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[SIST EN 300 417-1-1 V1.2.1:2003](#)

<https://standards.iteh.ai/catalog/standards/sist/72d4a9af-66c2-483a-8e41->

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N_EBC	Near-end Errored Block Count
N_SES	Near-end Severely Errored Second
NC	Network Connection
NDF	New Data Flag
NE	Network Element
NNI	Network Node Interface
NMON	Not Monitored
NRZ	Non-Return to Zero
NU	National Use (bits, bytes)
OAM	Operation, Administration and Management
ODI	Outgoing Defect Indication
OEI	Outgoing Error Indication
OOF	Out Of Frame state
OS	Optical Section
OS	Operations System
OW	Order Wire
P	Protection
P_A	Protection Adaptation
P_C	Protection Connection
P_TT	Protection Trail Termination
P12s	2 048 kbit/s PDH path layer with synchronous 125 µs frame structure according to EN 300 167 [3]
P12x	2 048 kbit/s layer (transparent)
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 [6]
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 [6]
PDH	Plesiochronous Digital Hierarchy
PJE	Pointer Justification Event
PLM	Payload Mismatch
PM	Performance Monitoring
Pn	Plesiochronous signal, Level n
POH	Path Overhead
PRC	Primary Reference Clock
PS	Protection Switching
PTR	Pointer
PU	PDH Unit
RDI	Remote Defect Indication
REI	Remote Error Indication
RI	Remote Information
RLT	Regenerated Line Termination
RP	Remote Point
RS	Regenerator Section
RS1	STM-1 Regenerator Section
RS16	STM-16 Regenerator Section
RSOH	Regenerator Section Overhead
S11	VC-11 path layer
S12	VC-12 path layer
S2	VC-2 path layer
S3	VC-3 path layer
S4	VC-4 path layer
SD	Synchronization Distribution layer, Signal Degrade
SDH	Synchronous Digital Hierarchy
SEC	SDH Equipment Clock
SES	Severely Errored Second
SF	Signal Fail
SHR	Self Healing Ring
Sk	Sink