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Foreword

This European Telecommunication Standard (ETS) has been produced by the Transmission and Multiplexing (TM) Technical Committee of the European Telecommunications Standards Institute (ETSI).

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Date of adoption of this ETS:	20 February 1998
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1   Scope

This European Telecommunication Standard (ETS) defines functional blocks specific to the Digital Radio Relay System (DRRS) which use the Synchronous Digital Hierarchy (SDH) for transmitting sub-STM-1 (Synchronous Transport Module-1) rate (51,84 Mbit/s) signals.

Considering that:

- ITU-T Recommendations G.707 [5] describe the multiplexing structure for the 51,84 Mbit/s transport rate;

- ITU-R Recommendation F.750 [4] defines a synchronous Radio Relay Reference Point (RR-RP) to be used as transport capacity for sub-STM-1 SDH radio system and states that RR-RP shall not be considered a Network to Network Interface (NNI);

- ETS 300 147 [3] on SDH multiplexing structure recognizes the Administrative Unit-4 (AU-4) based STM-N multiplexing structure and does not allow direct mapping of AU-3s into an Administrative Unit Group (AUG) to form a STM-1 transport module which is on the contrary provided by ITU-T Recommendations G.707 [5] and ITU-R Recommendation F.750 [4];

- ITU-T Recommendation G.783 [6] describes the characteristics of SDH equipment functional blocks;

and also considering that:

- ETS 300 417 [1] defines a library of basic building blocks and a set of rules, by which they may be combined to describe SDH digital transmission equipment.

This ETS describes radio specific functional blocks using the methodology specified in ITU-T Recommendation G.783 [6], in order to give a generic description of a sub-STM-1 SDH DRRS to be used within the ETSI standardized, AU-4 based, synchronous network.

This ETS defines:

- the functional blocks specific to sub-STM-1 SDH DRRS.

This ETS does not define:

- the information model for radio relay network elements;

- the protocol stack to be used for message communication;

- the network level management processes;

- the functional block specific to other systems or equipment already defined by ITU-T Recommendation G.783 [6];

- the radio specific management of performance monitoring requirements.

The equipment functionality is consistent with SDH multiplexing structure given in ETS 300 147 [3].

Equipment developed prior to this ETS may not comply in all details with 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]   ETS 300 417: "Transmission and Multiplexing (TM); Generic functional requirements for Synchronous Digital Hierarchy (SDH) equipment".

[2]   ETS 300 635: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); SDH radio specific functional blocks for transmission of Mx STM-N".

[3]   ETS 300 147: "Transmission and Multiplexing (TM); Synchronous digital hierarchy multiplexing structure".

[4]   ITU-R Recommendation F.750: "Architectures and functional aspects of radio-relay systems for SDH-based networks".

[5]   ITU-T Recommendation G.707 (1996): "Synchronous digital hierarchy bit rates".

[6]   ITU-T Recommendation G.783: "Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks".

[7]   ITU-T Recommendation G.803: "Architectures of transport networks based on the synchronous digital hierarchy (SDH)".

[8]   ITU-T Recommendation G.782: "Types and general characteristics of synchronous digital hierarchy (SDH) equipment".

[9]   ITU-T Recommendation G.861: "Principles and guidelines for the integration of satellite and radio systems in SDH transport networks".

3   Definitions and abbreviations

3.1   Definitions

For the purposes of this ETS, the following definition applies:

sub-STM-1: Current terminology for medium capacity Synchronous Transport Module at 51,84 Mbit/s defined by ITU-T Recommendation G.707 [5] and ITU-R Recommendation F.750 [4]; it also coincide with RR-STM. Recently renominated as STM-0 by ITU-T Recommendation G.861 [9].

3.2   Abbreviations

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

AU	Administrative Unit
AUG	Administrative Unit Group
C	Container
DRRS	Digital Radio Relay System
HPA	Higher order Path Adaptation
HPC	Higher order Path Connection
HPT	Higher order Path Termination
HSUT	High order path Supervisory Unequipped Termination
LPA	Lower order Path Adaptation
LPC	Lower order Path Connection
LPT	Lower order Path Termination
LSUT	Low order path Supervisory Unequipped Termination
MCF	Message Communication Function

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MSA	Multiplex Section Adaptation
MSOH	Multiplex Section OverHead
MSP	Multiplex Section Protection
MST	Multiplex Section Termination
NNI	Network to Network Interface
OHA	OverHead Access
O&M	Operations and Maintenance
PDH	Plesiochronous Digital Hierarchy
POH	Path OverHead
PPI	Plesiochronous Physical Interface
RFCOH	Radio Frame Complementary OverHead
ROHA	Radio OverHead Access
RPS	Radio Protection Switching
RR-MSA	Radio Relay - Multiplex Section Adaptation for sub-STM-1 transmission
RR-MSOH	Radio Relay - Multiplex Section OverHead
RR-MST	Radio Relay - Multiplex Section Termination for sub-STM-1 transmission
RR-RP	Radio Relay - Reference Point
RR-RST	Radio Relay - Regenerator Section Termination for sub-STM-1 transmission
RR-STM	Radio Relay - Synchronous Transport Module for sub-STM-1 transmission (referred also as STM-0 in ITU-T Recommendation G.861 [9])
RR-RSOH	Radio Relay - Regenerator Section OverHead
RSOH	Regenerator Section OverHead
RSPI	Radio Synchronous Physical Interface
RsSPI	Radio Synchronous Physical Interface for sub-STM-1 transmission
RST	Regenerator Section Termination
SDH	Synchronous Digital Hierarchy
SEMF	Synchronous Equipment Management Function
SETPI	Synchronous Equipment Timing Physical Interface
SETS	Synchronous Equipment Timing Source
SOH	Section OverHead
SPI	SDH Physical Interface
STM-N	Synchronous Transport Module n
TU	Tributary Unit
TUG	Tributary Unit Group
VC-n	Virtual Container n

4 Generalized functional block diagram

Figure 1 is taken as a generalized block diagram for sub-STM-1 systems (in this figure U_x, K_x and S_x interface numbering for radio specific blocks has been taken starting from 50 onwards).

In figure 1 only the most common ITU-T Recommendation G.783 [6] defined functional blocks are reported, together with the radio specific functional blocks defined in ITU-R Recommendation F.750 [4]. Nevertheless other present or future ITU-T Recommendation G.783 [6] defined functional blocks may be implemented, if applicable, into SDH DRRS.

Additional description using ITU-T Recommendation G.803 [7] and ETS 300 417 [1] methodology is not in the scope of this ETS, however some basic related concept may be found in annex A.

Figure 2 shows the radio sub-STM-1 system multiplexing scheme on which figure 1 is based.
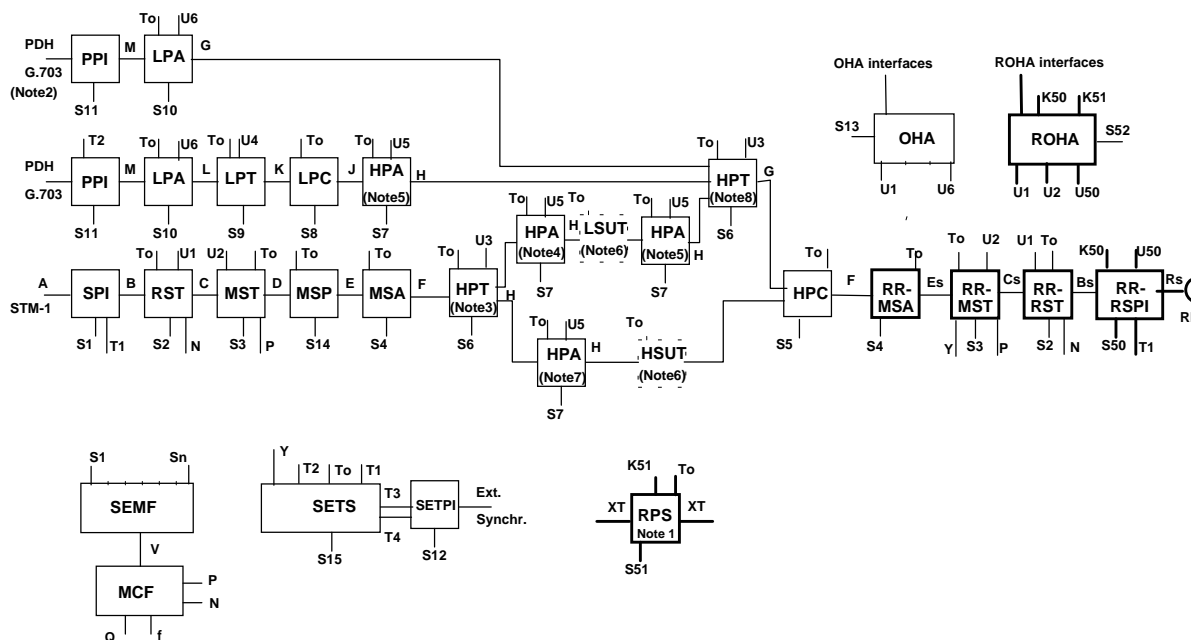
NOTE 1: The Radio Protection Switching (RPS) functional block is composed of a connection type function which, for implementation dependent purpose, can be inserted in between any other functional blocks to perform specific (n + m) line protection for the radio section. XL and XT are functionally the same interface and always fit to any interface where the RPS may be inserted (e.g. Bs, Cs, Es, F, E reference points).

NOTE 2: At this interface only G.703 based 34 Mbit/s or equivalent ETSI standardized wide band digital signal, may be presented.

NOTE 3: VC-4 termination.

NOTE 4: TUG-3/TUG-2 adaptation.

NOTE 5: TUG-2/VC-3 adaptation.

NOTE 6: Dashed HSUT and LSUT functional blocks are used for unequipped VC-3 or VC-2 or VC-11 or VC-12 generation (they have reduced functionality, being the subSTM-1 unused VCs permanently unequipped, their monitoring is not required).

NOTE 7: TUG-3/TU-3/VC-3 adaptation.

NOTE 8: VC-3 termination.

NOTE 9: The abbreviation used in this figure can be found in clause 3 of this ETS.

NOTE 10: The signal label (C2 byte) of the VC-4 Path OverHead (POH), inserted and terminated in the Higher order Path Termination (4) (HPT(4)) functional block, can not be provided with the value indicating the container C-4.

NOTE 11: ITU-T Recommendation G.707 [5] provide the multiplexing frame for 51,84 Mbit/s (subSTM-1) and refers to ITU-R Recommendation F.750 [4] for the description of the relevant functional blocks and interfaces (i.e. RR-MSA, RR-MST, RR-RST, Bs, Cs, Ds, Es, Rs) required for the multiplexing structure implementation.

Figure 1: Generalized SDH sub-STM-1 DRRS logical and functional block diagram

In figure 1, where other reference points are taken from ITU-T Recommendations G.782 [8] and G.783 [6], it may be noted that the following additional radio specific functional blocks, reference points and interfaces, with respect to those defined by ITU-T or already introduced in figure 1 of ETS 300 635 [2], are included:

- RsSPI: Radio sub-STM-1 Synchronous Physical Interface (functional block);
- RR-RST: Radio sub-STM-1 Regenerator Section Termination (functional block) (see note);
- RR-MST: Radio sub-STM-1 Multiplex Section Termination (functional block) (see note);
- RR-MSA: Radio sub-STM-1 Multiplex Section Adaptation (functional block) (see note);
- Rs: Reference point at R_sSPI radio frequency interface;
- Bs: Reference point between R_sSPI and RR-RST (see note);
- Cs: Reference point between RR-RST and RR-MST (see note);
- Ds ≡ Es: Reference point between RR-MST and RR-MSA (see note).

    NOTE: ITU-T Recommendation G.707 [5] has already foreseen the multiplexing structure for the sub-STM-1 rate, so that the required functional blocks, like RST, MST and MSA (together with their related interfaces B, C and D), may be considered as already defined by the ITU-T.
    Nevertheless ITU-T Recommendation G.783 [6] has not yet been updated in order to consider this case. ITU-R has addressed ITU-T on the argument and meanwhile described these blocks in ITU-R Recommendation F.750 [4].
    This ETS will follow the ITU-R Study Group 9 approach and will consider these blocks as equal to the STM-N case but will maintain, for the time being, a different terminology.
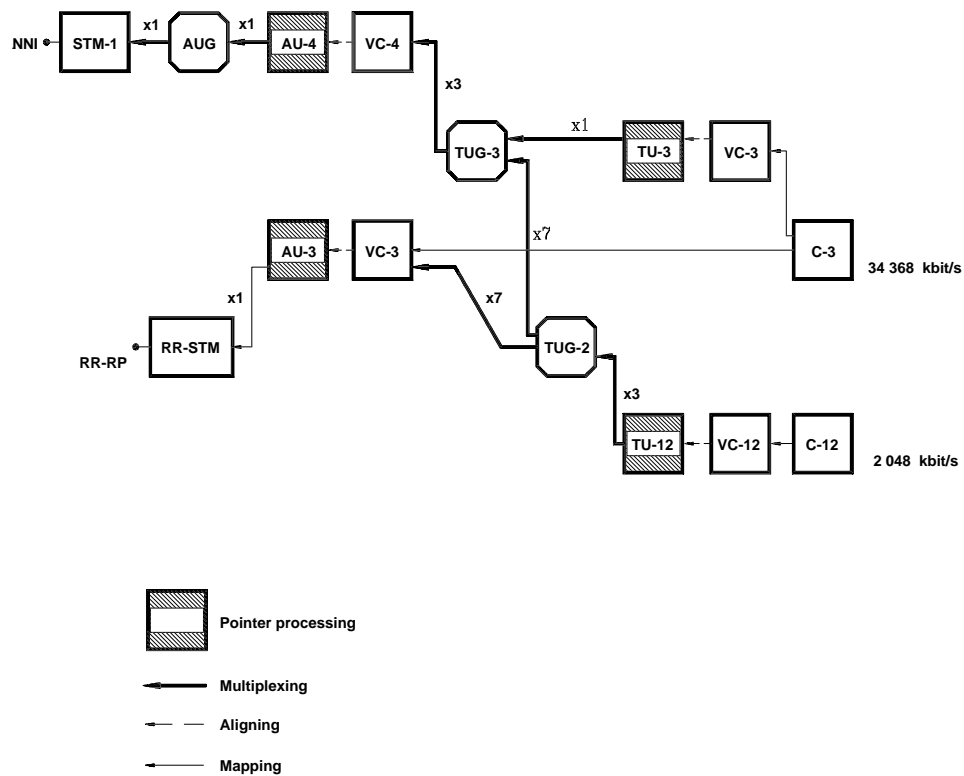
    NOTE: The abbreviations used in this figure can be found in subclause 3.2 of this ETS.

Figure 2: Sub-STM-1 radio-relay system multiplexing scheme

4.1 Radio sub-STM-1 Physical Interface function (R$_s$SPI)

The R$_s$SPI function provides the interface between the radio physical medium at reference point Rs and the Regenerator Section Termination (RST) function at reference point Bs.

Data at Rs is a radio frequency signal containing an Radio Relay - Synchronous Transport Module for sub-STM-1 transmission (RR-STM) signal with a non-standardized use of Section Overhead (SOH) media dependent bytes and (if used) an additional arbitrary RFCOH (Radio Frame Complementary Overhead). Therefore mid-air interconnectivity between transmitter and receiver of different vendors is not required.

The functional description of this block is identical to RSPI of ETS 300 635 [2], apart from the different input/output reference points.

Requirements for Operation and Maintenance (O&M) are described in the relevant clause of ETS 300 635 [2].

4.2 Radio Relay - sub-STM-1 Regenerator Section Termination (RR-RST)

The description of this block is identical to the RST described in ITU-T Recommendation G.783 [6] apart from the input/output reference points Bs and Cs which are analogous to reference points B and C of ITU-T Recommendation G.783 [6] but at a bit rate of 51,84 Mbit/s (RR-STM); Regenerator Section OverHead (RSOH) processed at the U1 reference point is limited only to the 51,84 Mbit/s Radio Relay - Regenerator Section OverHead (RR-RSOH) relevant columns.

4.3 Radio Relay - sub-STM-1 Multiplex Section Termination (RR-MST)

The description of this block is identical to the MST described in ITU-T Recommendation G.783 [6] apart from the input/output reference points Cs and Es which are analogous to reference points C and E of ITU-T Recommendation G.783 [6] but at a bit rate of 51,84 Mbit/s (RR-STM); Multiplex Section OverHead (MSOH) processed at the U2 reference point is limited only to the 51,84 Mbit/s Radio Relay - Multiplex Section OverHead (RR-MSOH) relevant columns.

4.4 Radio Relay - sub-STM-1 Multiplex Section Adaptation (RR-MSA)

The description of this block is identical to the Multiplex Section Adaptation (MSA) described in ITU-T Recommendation G.783 [6] apart from the input/output reference point Es which is analogous to reference point E of ITU-T Recommendation G.783 [6] but at a bit rate of 51,84 Mbit/s (RR-STM); moreover AU grouping functionality is not performed.

5 Requirements for Operation and Maintenance (O&M)

The requirement for O&M functionalities of the functional blocks are the same as the equivalent ones defined by ITU-T Recommendation G.783 [6] and ETS 300 635 [2] for the STM-N case.

Annex A (informative): **Description of the architecture of transport networks based on sub-STM-1 SDH DRRS**

A.1 Architecture description

For general concepts, see annex C of ETS 300 635 [2].

Annex B (informative): Bibliography

- ETS 300 304: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH) Information Model for the Network Element (NE) view".

- ITU-T Recommendation G.773: "Protocols suites for Q Interfaces for management of transmission systems".

- ITU-T Recommendation G.774: "Synchronous digital hierarchy (SDH) management information model for the network element view".

- ITU-T Recommendation G.781: "Structure of Recommendations on equipment for the synchronous digital hierarchy (SDH)".

- ITU-T Recommendation G.784: "Synchronous digital hierarchy (SDH) management".

- ITU-T Recommendation G.831: "Management capabilities of transport networks based on the synchronous digital hierarchy (SDH)".

- ITU-T Recommendation M.60: "Maintenance terminology and definitions".

- ITU-T Recommendation M.3010: "Principles for a telecommunications management network".

- ITU-T Recommendation M.3100: "Generic network information model".

- ITU-T Recommendation Q.811: "Lower layers protocol profiles for the Q3 interface".

- ITU-T Recommendation Q.812: "Higher layers protocols profiles for the Q3 interface".

- ITU-T Recommendation X.701: "Information technology - Open System Interconnection - Systems management overview".

- ITU-T Recommendation X.710: "Common management information service definition for CCITT applications".

- ITU-T Recommendation X.711: "Common management information protocol specification for CCITT applications".

- ITU-T Recommendation X.720: "Information technology - Open System Interconnection - Structure of management information: Management Information model".

- ITU-T Recommendation X.721: "Information technology - Open System Interconnection - Structure of management information: Definition of Management Information".

- ITU-T Recommendation X.722: "Information technology - Open System Interconnection - Structure of management information: Guidelines for the definition of managed objects".

- ITU-T Recommendation X.730: "Information technology - Open System Interconnection - Systems Management: Object management function".

- ITU-T Recommendation X.731: "Information technology - Open System Interconnection - Systems Management: State management function".

- ITU-T Recommendation X.733: "Information technology - Open System Interconnection - Systems Management: Alarm reporting function".

- ITU-T Recommendation X.734: "Information technology - Open System Interconnection - Systems Management: Event report management function".

- ITU-T Recommendation X.735: "Information technology - Open System Interconnection - Systems Management: Log control function".

History

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