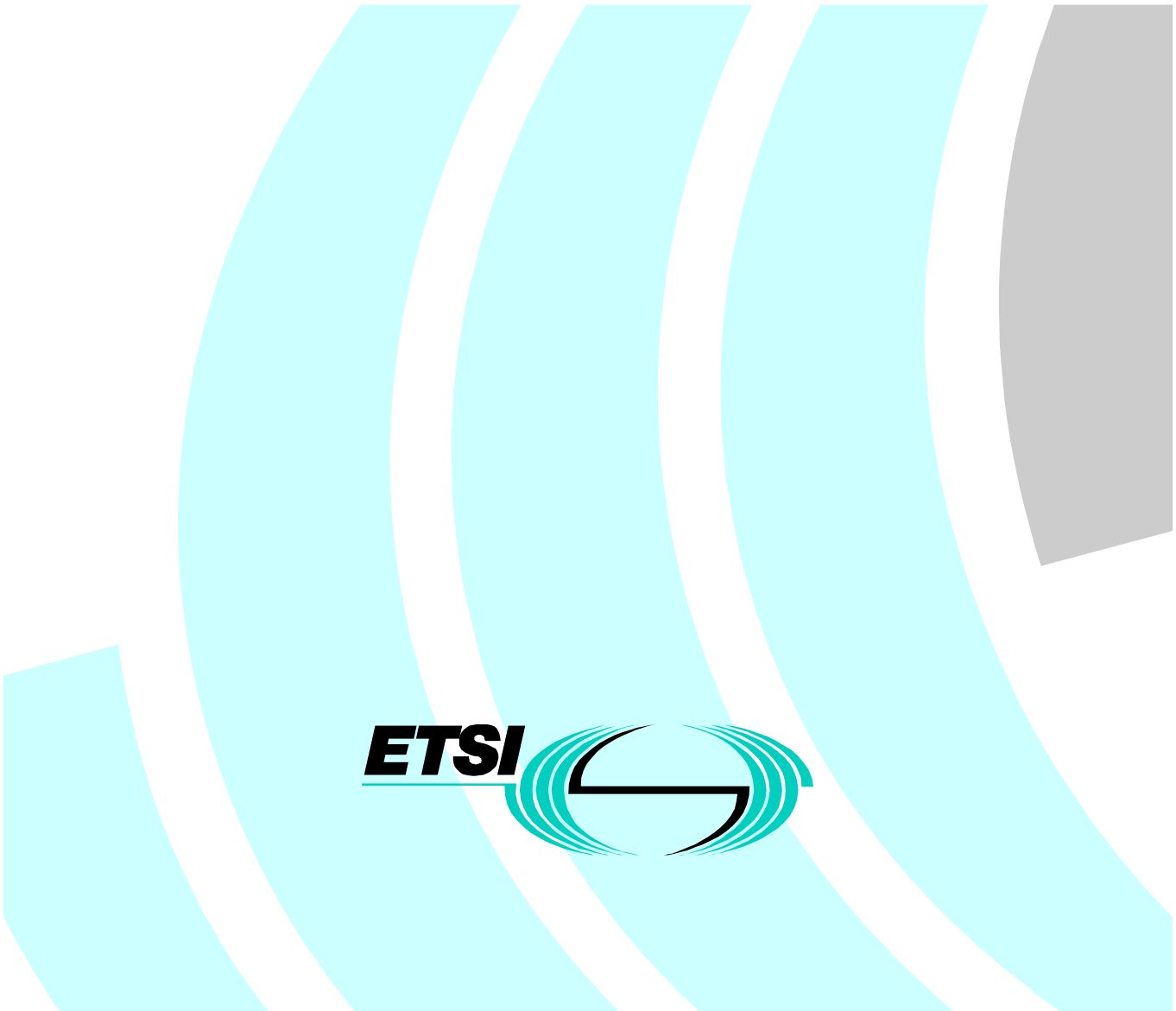
ETSI TS 101 974 V1.1.1 (2001-08)

Technical Specification

**Transmission and Multiplexing (TM);
Digital Radio Relay Systems (DRRS);
Radio specific SDH functionalities
for transmission of sub STM-0**



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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Transmission and Multiplexing (TM).

1 Scope

The present document defines radio specific functionality of SDH Digital Radio Relay Systems for transmission of Sub STM-0 signals referring to requirements defined by ITU-T Recommendation G.708 [5], while ETS 300 635 [1] and ETS 300 638 [2] define the radio specific functionality of STM-N respectively STM-0 radio relay systems. The typical application of systems here defined is for access networks including point-to-point and point-to-multipoint systems. For more information refer to annex A.

The present document defines:

- usage of media specific byte in the sSTM interface overhead;
- radio specific performance monitoring;
- radio protection switching requirements; and
- radio specific functionality and related atomic functions.

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 and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

[1] ETSI ETS 300 635: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Radio specific functional blocks for transmission of MxSTM-N".

[2] ETSI ETS 300 638: "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Fixed point-to-point radio link equipment for the transmission of digital signals and analogue video signal operating in the frequency bands 10 GHz and 14 GHz with 20 MHz alternate channel spacing".

[3] ETSI ETS 300 785: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Radio specific functional blocks for transmission of Mxsub-STM-1".

[4] ITU-T Recommendation G.707: "Network node interface for the synchronous digital hierarchy (SDH)".

[5] ITU-T Recommendation G.708: "Sub STM-0 network node interface for the synchronous digital hierarchy (SDH)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

SSTM-2N INTERFACE: SDH transmission interface which transports one or more TU Group(s)-2, as defined by ITU-T Recommendation G.707, with Section overhead (9 bytes per frame)

NOTE 1: sSTM-2n interfaces may be defined for optical, electrical or radio transport technologies. The number (n) of TUG in sSTM-2n interfaces provided by this recommendation is limited to n=1, 2 and 4.

sSTM-1k interface: SDH transmission interface which transports one or more TU-12, as defined by ITU-T Recommendation G.707, with Multiplex Section transport overhead (9 bytes per frame)

NOTE 2: sSTM-1k interfaces are defined for radio transport technologies only (sSTM-1k interfaces are defined in ETS 300 785).

The number (k) of TU-12 in sSTM-1k interfaces is limited to k=1, 2, 4, 8 and 16.

The interface sSTM-11 may also be used for reduced functionality, intra-station connections.

3.2 Abbreviations

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

AU	Administrative Unit
AUG	Administrative Unit Group
C	Container
CDN	Central Distribution Node
CS	Central Station
DRRS	Digital Radio Relay System
IP	Internet Protocol
ISDN	Integrated Services Digital Network
MS	Multiplex Section
RFCOH	Radio Frame Complementary OverHead
RP	Reference Point
RPS	Radio Protection Switching
RR	Radio Relay
RS	Regenerator Section or Repeater Station
sSTM	sub STM-0 Synchronous Transport Module
STM	Synchronous Transport Module
TE	Terminal Equipment
TMN	Telecommunication Management Network
TS	Terminal Side
TU	Tributary Unit
TUG	Tributary Unit Group
VC	Virtual container

4 Sub STM-0 signal structure

4.1 Multiplex structure

Figure 1 shows the proposed multiplexing structure for Sub STM-0 using the generic multiplex scheme of ITU-T Recommendation G.707 [4]. Following differences are pointed out:

Multiplexing routes of specific sSTM-1k, 2n for the modular ssTM-1k, 2n-RP (reference points of order k=1, 2, 4, 8 and 16 or n=1, 2 and 4) which are defined in ITU-T Recommendation G.708 [5].

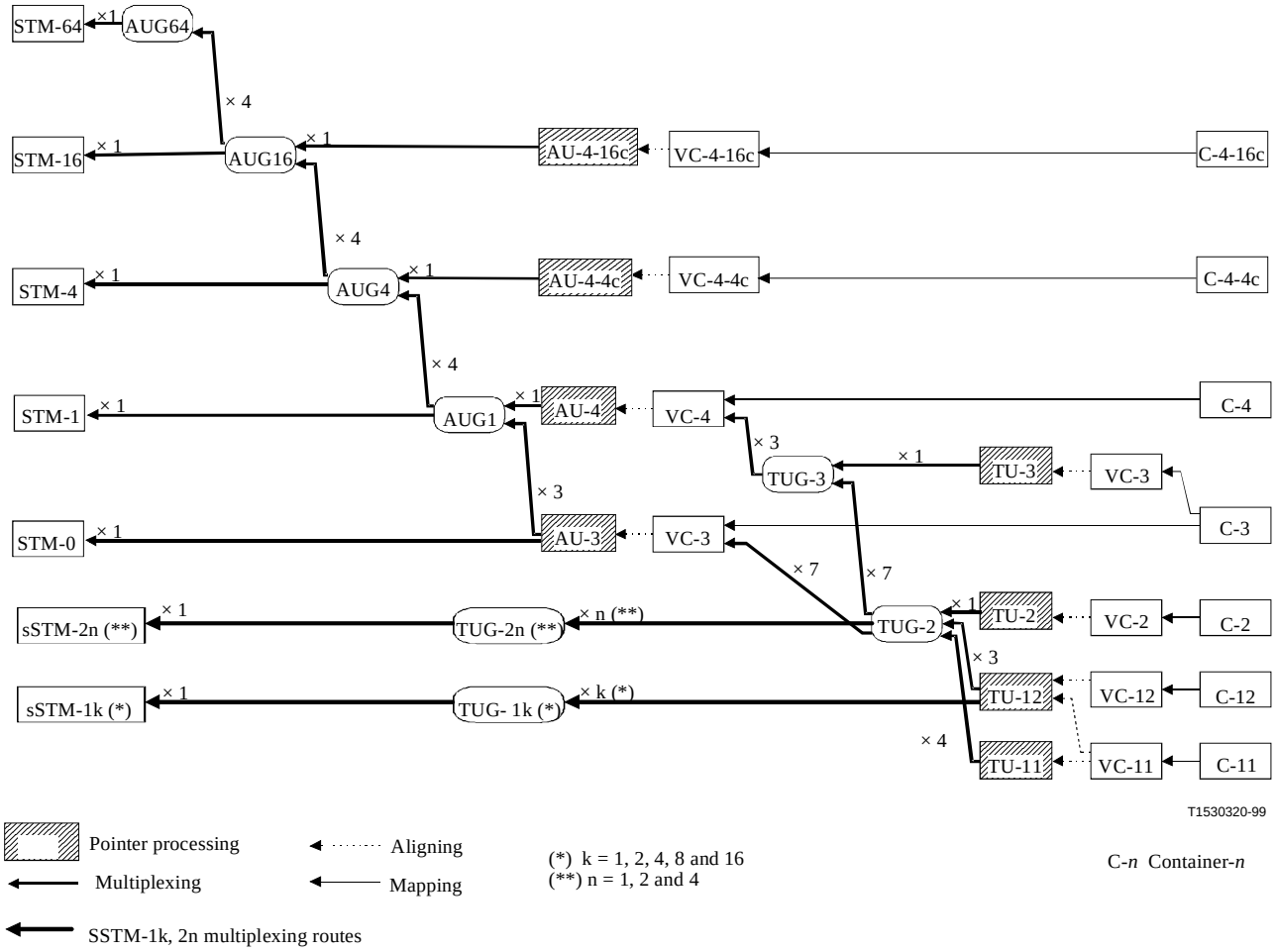


Figure 1: Integration of sSTM formats into ITU-T Recommendation G.707 Multiplexing structure

4.2 Transport formats

4.2.1 Section overhead

The sSTM interface has an associated Section overhead of 9 bytes. The location of the section overhead bytes within the sSTM Overhead is shown in figure 3.

Some of these bytes are further subdivided into separated 16 kbit/s transmission capacity, using the multiframe structure as shown in figure 2.

The detailed definitions and functions of these nine overhead bytes are described in ITU-T Recommendation G.708 [5].

	Frame	1	2	3	4
Byte					
1		A1	A2	A3	A4
2		(see note 1)	(see note 1)	(see note 1)	(see note 1)
3		(see note 1)	(see note 1)	(see note 1)	(see note 1)
4		D1	D1	D1	D1
5		(see note 1)	(see note 1)	(see note 1)	(see note 1)
6		(see note 2)	J0	Z1	Z2
7		S1	K1	Z3	Z4
8		B2	B2	B2	B2
9		M1	M1	M1	M1
	time	**125 µs**	**250 µs**	**375 µs**	**500 µs**

NOTE 1: media dependent byte
NOTE 2: media specific error indicator byte

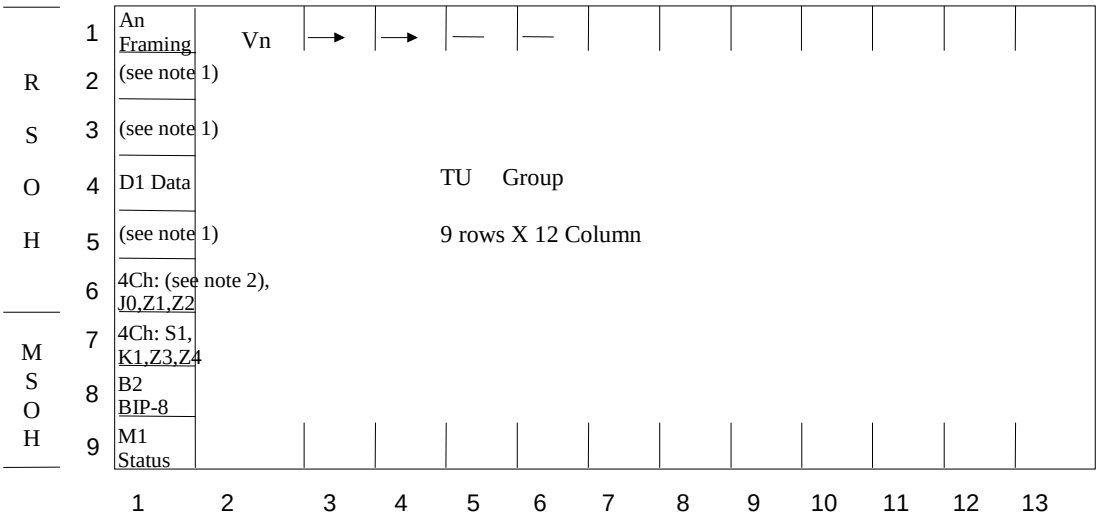
Figure 2: sSTM Interface Section Overhead multiframe

4.2.2 Scrambling

A frame synchronous scrambler equal to that recommended in ITU-T Recommendation G.707 [4] for STM-N frame shall be used to prevent long sequences of "1"s or "0"s. The frame alignment byte A(n) (n=1..4) shall be excluded from the scrambling.

4.2.3 Frame structure for the sSTM-2n interface

The sSTM-2n interface frame structure, for the n=1 case as illustrated in figure 2, consists of thirteen columns and nine rows of 8-bit bytes for a total of 117 bytes (936 bits). The frame duration is 125 µs (i.e. 8 000 frames per second), which results in a bit rate of 7,488 Mbit/s. As with the STM-1 signal, the order of transmission bytes is row by row, from left to right. In each byte, the most significant bit is transmitted first.



NOTE 1: media dependent byte
NOTE 2: media specific error indicator byte

Figure 3: sSTM-21 frame format

4.3 sSTM-Interface frame format

4.3.1 Media specific byte

Bytes 2, 3 and 5 of RSOH may be used for radio specific uses.

They can be used for system specific control signals (examples are ATPC Adaptive Transmit Power Control to reduce nodal interference) and Early-Warning Switch information (to activate in the terminals 1+1 a real-time "hitless" protection for propagation-induced degradation in the RS in between); other examples are reported in ETS 300 635 [1].

Alternatively they can be used for other optional SDH functionality such as E1 and F1 or as an additional D2 byte to be combined with D1 to create up to 128 kbit/s channel in case where subSTM-0 sub-network complexity require more capacity for management protocols transmission.

4.3.2 Media dependent error indicator

This byte is reserved for implementation dependent methods of error detection for Operation and Maintenance purposes.

5 Interface rates

Table 1: Interface rates for Sub STM-0 radio systems

TU Structure	#	Overhead	Payload Envelope	Bit Rate [Mbit/s]
TUG2	1	9 byte	108	7,488
	2		216	14,400
	4		432	28,224
TU12	1	9 byte	36	2,88
	2		72	5,184
	4		144	9,792
	8		288	19,008
	16		576	37,44

Radio spectral allocations vary in different region of the world requiring a wider range of bit rates in order to efficiently utilize the spectrum. Some areas of the world use frequency allocations based on increments of 5 MHz. For these areas the bit rates defined for TUG2 structure are usable. Some areas of the world use frequency allocations based on 7 MHz increments. For these regions TU12 bit rates are suitable.

6 Radio specific functions

6.1 Atomic functions

6.1.1 Point-to-Multipoint

Under further study.

6.1.2 Point-to-Point

Under further study.

6.2 Radio protection switching

6.2.1 Point-to-Multipoint

Under further study.

6.2.2 Point-to-Point

Due to the fact that sSTM radio relay systems are applicable for the access network the use of an n+m (n≠1, m≠1) radio protection switching is not practicable. On the consequence the RPS function of an sSTM DRRS provides one protection channel for one sSTM signal.

6.3 Performance Monitoring

Referring to clause 9 it is pointed out that sSTM Radio Relay Systems can be applicable for SDH-Regenerator use. On the consequence the Regenerator Section has to be monitored by an error performance algorithm. The RSOH structure of an sSTM signal foresees in clause 6.3.3 a media dependent error performance indicator.

The radio specific use is under further study.

6.4 Radio frame complementary overhead

6.4.1 Point-to-Multipoint

Under further study.

6.4.2 Point-to-Point

The use of an RFCOH is optional. It could be used for the transmission of additional data like EOW or Wayside channel. The radio specific functional blocks refer to ETS 300 635 [1].

Annex A (informative): Transmission of sub STM-0 in access networks

A.1 Applications

A.1.1 Multiplex Schemes

Two scenarios are considered. The methodology shown in clause 9.1.1 deals with the conversion of STM-N signals into sSTM signal structures at the Central Distribution Node (CDN). In clause 9.1.2 the multiplex structure of the terminal side is shown.

A.1.1.1 Multiplex scheme at Central Distribution Node

The CDN (see figures A.1 and A.2) multiplexes the sSTM signal to the STM-N level. The CDN could be subset of the radio system. The related processes are described in ITU-T Recommendation G.708 [5] respectively in ITU-T Recommendation G.707 [4].

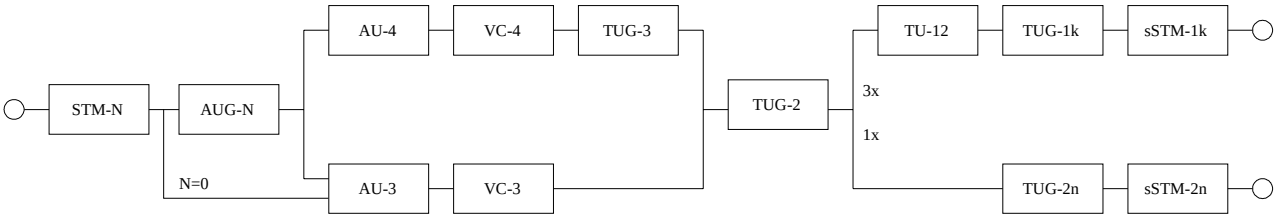


Figure A.1: Multiplex scheme at Central Distribution Node

A.1.1.2 Multiplex Scheme at Terminal Side

The Terminal Side (see figures A.1 and A.2) provides the functionality on an SDH terminal multiplexer. The related processes are described in ITU-T Recommendation G.708 [5] respectively in ITU-T Recommendation G.707 [4].

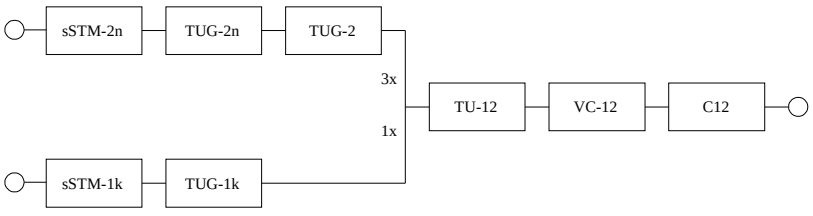
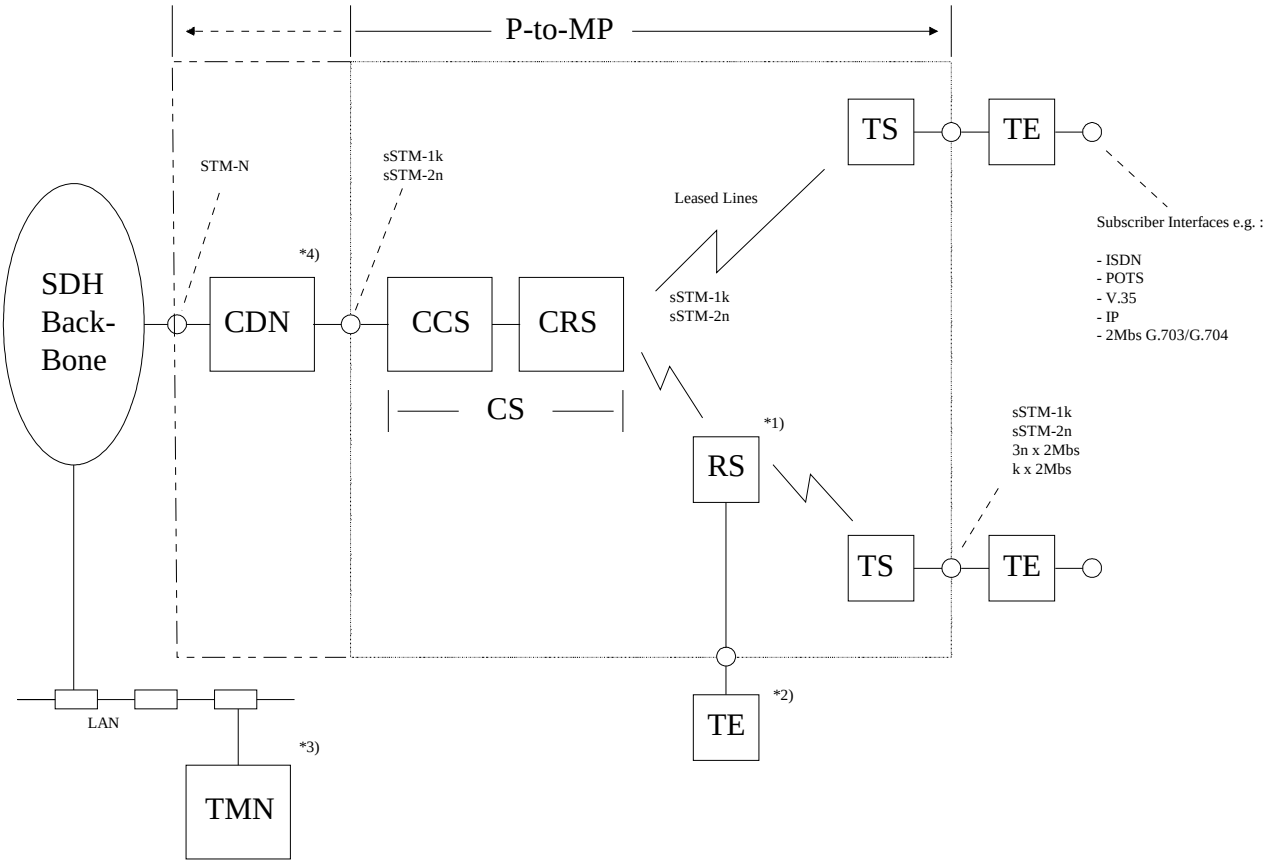


Figure A.2: Multiplex scheme at Terminal Side

A.1.1.3 Scenario Point-to-Multipoint

Figure A.3 describes a possible scenario for a Point-to-Multipoint sSTM application. It is pointed out that the CDN as an subset of the radio relay system could be a practicable solution. However it may also be useful to realize the CDN outside the radio relay system.



Remarks:

*1) Is an Repeater Station (RS) applicable the requirements of an SDH-Regenerator must be fulfilled. On this the Regenerator Section Overhead (RSOH) has to be processed according the rules defined in ITU-T Recommendation G.708 [5].

*2) under further study

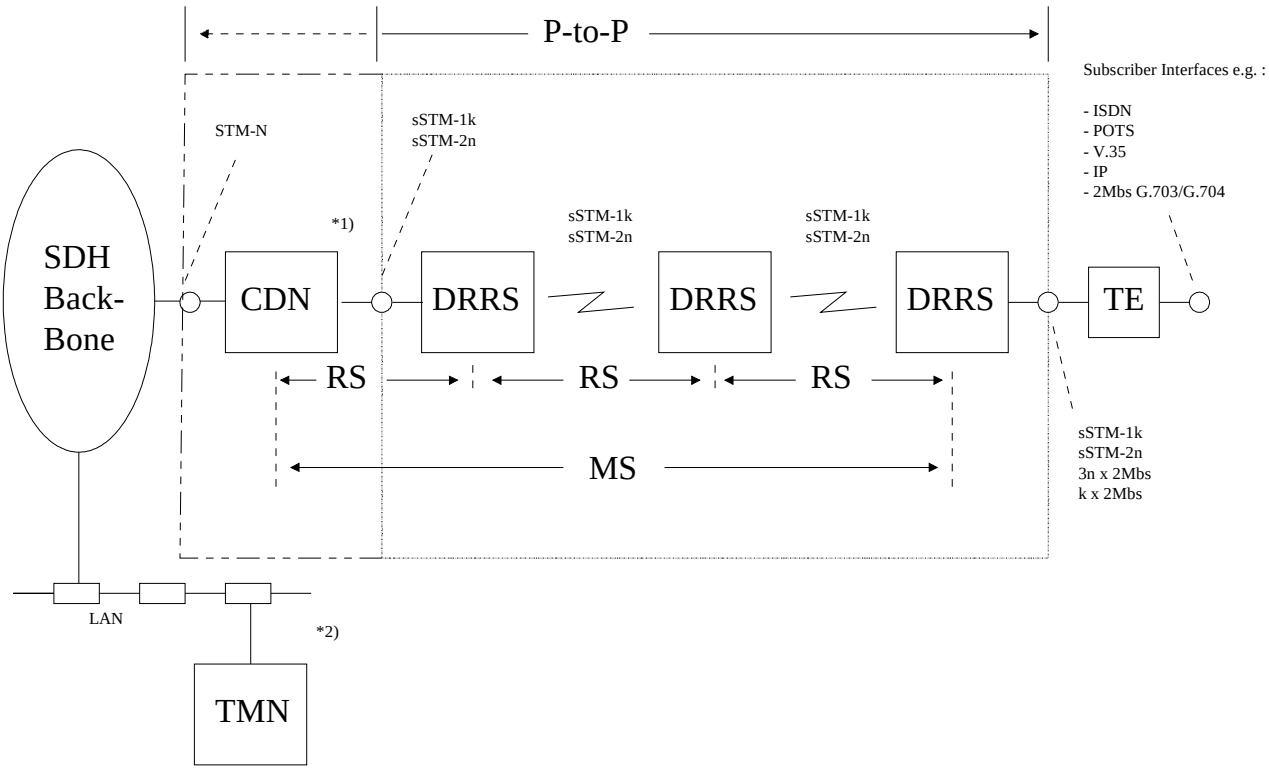
*3) The TMN scenario shows one possible solution. It points out the implementation of sSTM- Systems in SDH-Networks.

*4) The interface of the Point-to-Multipoint system depends on the network purposes. The Central Distribution Node could be subset of the Point-to Multipoint system.

Figure A.3: sSTM Scenario Point-to-Multipoint

A.1.1.4 Scenario Point-to-Point

Figure A.4 describes a possible scenario for a Point-to-Point sSTM application. It is pointed out that the CDN as an subset of the radio relay system could be a practicable solution. However it may also be useful to realize the CDN outside the radio relay system.



Remarks:

*1) The interface of the Point-to-Point system depends on the network purposes. The Central Distribution Node could be subset of the Point-to Point system.

*2)) The TMN scenario shows one possible solution. It points out the implementation of sSTM- Systems in SDH-Networks.

Figure A.4: sSTM Scenario Point-to-Point

Annex B(informative): Bibliography

- ETSI ETS 300 417: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment".
- ITU-T Recommendation G.702: "Digital hierarchy bit rates".
- ITU-T Recommendation G.861: "Principles and guidelines for the integration of satellite and radio systems in SDH transport networks".
- ITU-R Recommendation F.750: "Architectures and functional aspects of radio-relay systems for SDH-based networks".

History

Document history		
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