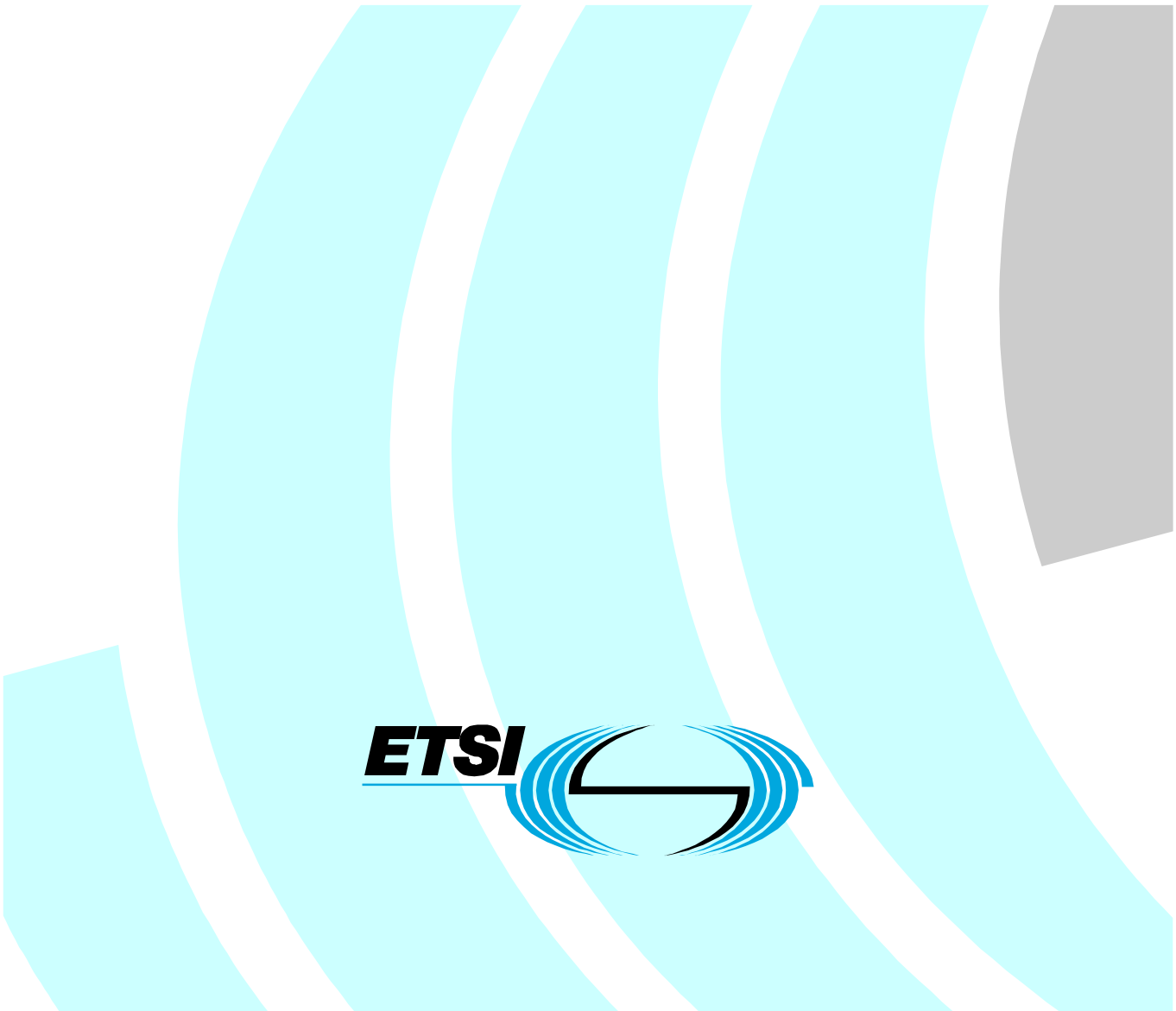
ETSI ES 201 803-5 V1.1.1 (2004-04)

ETSI Standard

Dynamic synchronous Transfer Mode (DTM); Part 5: Mapping of PDH over DTM



Reference
DES/TISPAN-02005-DTM

Keywords
DTM, PDH, protocol, switching, transmission

ETSI

650 Route des Lucioles
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
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

The present document is part 5 of a multi-part deliverable covering the Dynamic synchronous Transfer Mode (DTM), as identified below:

Part 1: System description;

Part 2: System characteristics;

Part 3: Physical protocol;

Part 4: Mapping of DTM frames into SDH containers;

Part 5: Mapping of PDH over DTM;

Part 6: Mapping of Synchronous Digital Hierarchy (SDH) over DTM;

Part 7: Ethernet over DTM Mapping;

Part 8: Mapping of Frame relay over DTM;

Part 9: Mapping of ATM over DTM;

Part 10: Routeing and switching of IP flows over DTM;

Part 11: Mapping of video streams over DTM;

Part 12: Mapping of MPLS over DTM;

Part 13: System description of sub-rate DTM;

Part 14: Network management.

Introduction

Dynamic synchronous Transfer Mode (DTM) is a time division multiplex and a circuit-switched network technique that combines switching and transport.

Part 1 describes the general properties of DTM and the DTM service over a unidirectional data channel. The overall system architecture is described and fundamental functions are identified.

Part 2 includes system aspects that are mandatory or optional for nodes from different vendors to interoperate. The interworking granularity should be at node level, such that nodes from different vendors can interoperate with regard to well-defined functions.

Part 3 specifies the physical layer for physical links based on 8B10B encoding.

Part 4 describes how DTM frames are mapped onto SDH containers.

The transport of various tributary signals is specified for PDH (Part 5), SDH (Part 6), Ethernet (Part 7), Frame Relay (Part 8), ATM (Part 9), IP (Part 10), MPLS (Part 11), video streaming (Part 12).

Subrate DTM is described in Part 13.

Finally, management aspects are standardized in Part 14.

1 Scope

The present document:

- specifies a method for mapping ETSI PDH 2 048 kb/s, 8 448 kb/s, 34 368 kb/s and 139 264 kb/s and ANSI PDH 1 544 kb/s, 6 312 kb/s, 44 736 kb/s and 139 264 kb/s signals over DTM channels;
- specifies the characteristics of critical parameters for mapping ETSI PDH signals 2 048 kb/s, 8 448 kb/s, 34 368 kb/s and 139 264 kb/s and ANSI PDH 1 544 kb/s, 6 312 kb/s, 44 736 kb/s and 139 264 kb/s over DTM channels;
- gives terms and definitions for mapping encoding.

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.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

[1] 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".

[2] ETSI ES 201 803-2-3: "Dynamic synchronous Transfer Mode (DTM); Part 2: System Characteristics; Sub-part 3: Transport network and channel adaptation aspects".

[3] ITU-T Recommendation G.805: "Generic functional architecture of transport networks".

[4] ITU-T Recommendation G.806: "Characteristics of transport equipment - Description methodology and generic functionality".

[5] ITU-T Recommendation G.823: "The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy".

[6] ITU-T Recommendation G.824: "The control of jitter and wander within digital networks which are based on the 1544 kbit/s hierarchy".

3 Definitions and abbreviations

3.1 Definitions

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

Access Point (AP): "reference point" that consists of the pair of co-located "unidirectional access" points, and therefore represents the binding between the trail termination and adaptation functions (adopted from ITU-T Recommendation G.805 [3])

Adapted Information (AI): information passing across an AP

NOTE: See also ITU-T Recommendation G.805 [3] (adopted from ITU-T Recommendation G.806 [4]).

Alarm Indication Signal (AIS): special marker sent in a data slot to mark the lack of transported data as a result of a defect in the transmission path

channel: set of slots allocated from one source access node to one or more destination access nodes in a network

Characteristic Information (CI): signal with a specific format, which is transferred on "network connections"

NOTE: The specific formats will be defined in the technology specific Recommendations. The information passing across a CP or TCP (adopted from ITU-T Recommendations G.805 [3] and G.806 [4]).

Connection Point (CP): reference point where the output of a trail termination source or a connection is bound to the input of another connection, or where the output of a connection is bound to the input of a trail termination sink or another connection (adopted from ITU-T Recommendation G.806 [4])

frame: set of slots forming an entity that is transmitted on a physical medium repeatedly every 125 µs (nominally), i.e. 8 000 frames/second

idle: special marker sent in a data slot to mark the lack of transported data in the slot

Performance Supervision (PS): special marker sent with the data containing per channel Performance Supervision information

Server Signal Fail (SSF): signal fail indication output at the CP of an adaptation function (adopted from ITU-T Recommendation G.806 [4])

Signal Fail (SF): signal indicating the associated data has failed in the sense that a near-end defect condition (not being the degraded defect) is active (adopted from ITU-T Recommendation G.806 [4])

slot: time slot within the frame being able to transport 64 bit of data or a number of special codes

Trail Signal Fail (TSF): signal fail indication output at the AP of a termination function (adopted from ITU-T Recommendation G.806 [4])

3.2 Abbreviations

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

A	Adapted function
AI	Adapted Information
AIS	Alarm Indication Signal
AP	Access Point
BPn	ByPass layer type n
BPnP	ByPass layer type n Protection
CI	Characteristic Information
CK	ClocK
D	Data
PDH	Plesiochronous Digital Hierarchy
PS	Performance Supervision
Sk	Sink
So	Source
SSF	Server Signal Fail
TS	Time Slot layer
TSF	Trail Signal Fail
TSP	Time Slot layer Protection
TST	Time Slot layer Tunnel

4 Overview

The ETSI PDH 2 048 kb/s, 8 448 kb/s, 34 368 kb/s and 139 264 kb/s and ANSI PDH 1 544 kb/s, 6 312 kb/s, 44 736 kb/s and 139 264 kb/s signals mapping over DTM (see figure 1) describes the mapping of the PDH bitstream into DTM channels. The functionality is part of the DTM Application layer and provides a transport service to the PDH path layer (EN 300 417-5-1 [1]).

The PDH traffic is a fixed rate isochronous/plesiochronous bitstream. The bitrate may deviate from the PDH transmission rate by up to ±50 ppm (depending on each stream) such that frequency justification is required. The SDH frequency justification mechanism of pointer justifications is replaced by DTM DCAP-2 bit justification upon justification opportunity.

The PDH supervision functionality is mapped over to the DTM functionality and PDH AIS is being encoded into DTM AIS.

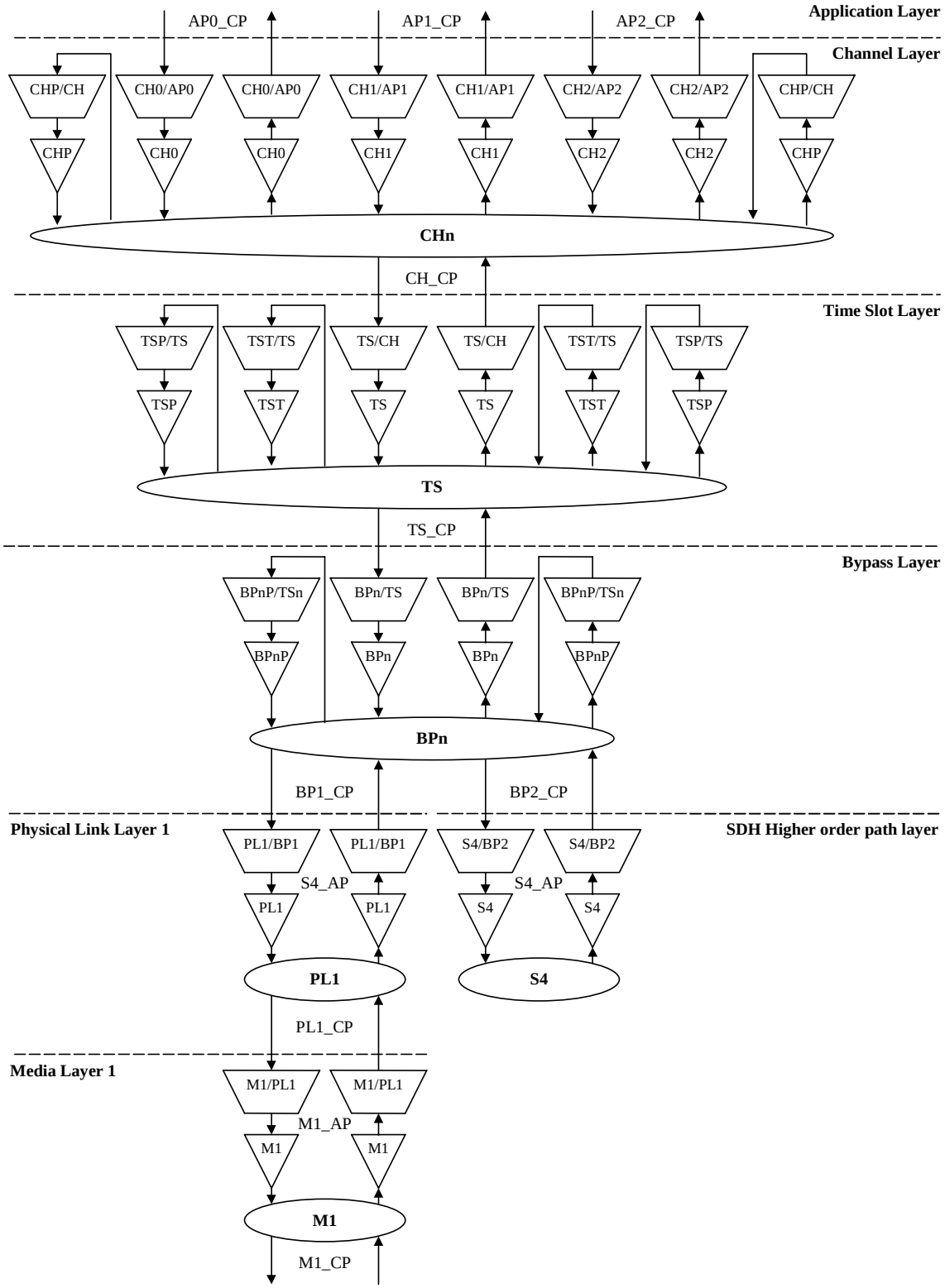


Figure 1: Transport network reference model for DTM

5 DTM PDH transport application layer

The ETSI PDH 2 048 kb/s, 8 448 kb/s, 34 368 kb/s and 139 264 kb/s and ANSI PDH 1 544 kb/s, 6 312 kb/s, 44 736 kb/s and 139 264 kb/s signals over DTM transport is specified as the adaptation functions on top of the DCAP-2 trail terminator functions, providing the Px trail over DTM.

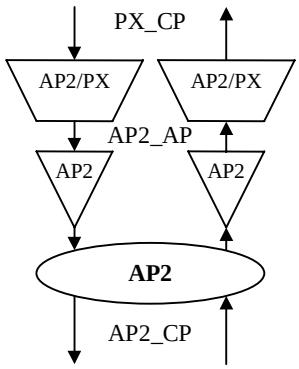


Figure 2: DTM application layer 2 for PDH PX (X=11x, 12x, 21, 22, 31, 32, 4x) mapping atomic functions

5.1 Access point information

5.1.1 Characteristic information

The Characteristic Information (CI) of the Connection Point (CP) is described in (EN 300 417-5-1 [1]).

5.1.2 Adapted information

The Adapted Information (AI) of the Adaption Point (AP) is described in (ES 201 803-2-3 [2]).

5.1.3 Management information

There is no management information for this application.

5.1.4 Timing information

There is no timing information for this application.

5.2 Connection function (Mn_C)

See ES 201 803-2-3 [2].

5.3 Trail termination functions

5.3.1 Application 2 trail termination function (AP2_TT)

The application 2 trail termination function maps data, clock and failure signals between CI and AI.

5.3.1.1 Application 2 trail termination source function (AP2_TT_So)

Symbol

Figure 3: Application 2 trail termination source (AP2_TT_So)

Interfaces

Table 1: AP2_TT_So input and output signals

Input(s)	Output(s)
AP2_AI_D	AP2_CI_D
AP2_AI_CK	AP2_CI_CK
AP2_AI_TSF	AP2_CI_SSF

Processes and anomalies

None.

Defects

None.

Consequent actions

None.

Defect correlation

None.

Performance monitoring

None.

Output mapping

AP2_CI_D ← AP2_AI_D

AP2_CI_CK ← AP2_AI_CK

AP2_CI_SSF ← AP2_AI_TSF

Fault management

None.

Long term performance monitoring

None.

5.3.1.2 Application 2 trail termination sink function (AP2_TT_Sk)

Symbol

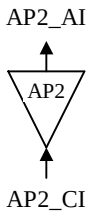


Figure 4: Application 2 trail termination sink (AP2_TT_Sk)

Interfaces

Table 2: AP2_TT_Sk input and output signals

Input(s)	Output(s)
AP2_CI_D	AP2_AI_D
AP2_CI_CK	AP2_AI_CK
AP2_CI_SSF	AP2_AI_TSF

Processes and anomalies

None.

Defects

None.

Consequent actions

None.

Defect correlation

None.

Performance monitoring

None.

Output mapping

AP2_AI_D ← AP2_CI_D

AP2_AI_CK ← AP2_CI_CK

AP2_AI_TSF ← AP2_CI_SSF

Fault management

None.

Long term performance monitoring

None.

5.4 Adaptation functions

5.4.1 DTM Application 2/PDH PX path adaptation function (AP2/PX_A)

This clause describes the generic PDH path layer adaptation using DCAP-2, where the PDH path layer may be any of P11x, P12x, P21, P22, P31, P32 and P4x.

5.4.1.1 Media adaptation source function (AP2/PX_A_So)

Symbol

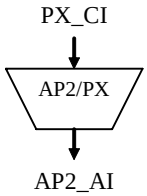


Figure 5: DTM Application 2/PDH PX path adaptation source (AP2/PX_A_So)

Interfaces

Table 3: AP2/PX_A_So input and output signals

Input(s)	Output(s)
PX_CI_D	AP2_AI_D
PX_CI_CK	AP2_AI_CK
PX_CI_SSF	AP2_AI_TSF

Processes and anomalies

None.

Defects

None.

Consequent actions

None.

Defect correlation

None.

Performance monitoring

None.

Output mapping

AP2_AI_D ← PX_CI_D

AP2_AI_CK ← PX_CI_CK

AP2_AI_TSF ← PX_CI_SSF

Fault management

None.

Long term performance monitoring

None.

5.4.1.2 Media adaptation sink function (AP2/PX_A_Sk)

Symbol

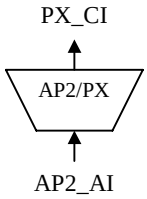


Figure 6: Media adaptation sink (AP0/S4_A_Sk)

Interfaces

Table 4: AP2/P12x_A_Sk input and output signals

Input(s)	Output(s)
AP2_AI_D	PX_CI_D
AP2_AI_CK	PX_CI_CK
AP2_AI_TSF	PX_CI_SSF

Processes and anomalies

The clock smoothing process in order to reduce phase deviations on the transmitted signal. The clock smoothing must comply with the jitter and wander requirements as defined in ITU-T Recommendations G.823 [5] and G.824 [6]. The resulting clock is delivered as CI_CK. See ES 201 803-2-3 [2], clause 6.1.11.3.

The elastic buffering of the transported signal such that the buffer output is being clocked by the smoothed clock. The resulting data stream is delivered as CI_D. See ES 201 803-2-3 [2], clause 6.1.11.3.

Defects

None.

Consequent actions

None.

Defect correlation

None.

Performance monitoring

None.

Output mapping

PX_CI_D ← CI_D

PX_CI_CK ← CI_CK

PX_CI_SSF ← AP2_AI_TSF

Fault management

None.

Long term performance monitoring

None.

6 Mapping of PDH path layer over DTM

The PDH path layer signals PX (X=11x, 12x, 21, 22, 31, 32, 4x) is mapped onto the DTM DCAP-2 format, providing means to transport the PX data, optionally PX frame alignment, SSF and providing performance monitoring. The PX can be of P11x, P12x, P21, P22, P31, P32 and P4x.

6.1 DCAP-2 slot elements

The DCAP-2 elements of 61 bit data slot and AIS-marker is described in ES 201 803-2-3 [2]. The DCAP-2 provides performance supervision by means of a per-block BIP transmitted on 2 dedicated bits in the preceeding block, so the Performance Supervision marker is not used. Frequency justification is performed by use of a bit justification mechanism and not by the 64 UI justifications of the Idle-marker. The justification opportunity occurs on the first slot in a block. A block may be any even multiple of DTM frames and a block has a minimum length of 16 slots (which may be divided over multiple frames, thus allowing channels down to 1 slot). The DCAP-2 allows for up to 61 slots to be transmitted per slot. Since the number of bits may not be an even multiple of 60 bits/slot times number of slots per frame, a base number of bits are transmitted per slot and a number of excess bits are dispersed evenly over the slots in a predefined pattern.

Table 5: PDH mapping characteristics

Path layer	P11x	P12x	P21	P22	P31	P32	P4x
Bitrate (kb/s)	1 544	2 048	6 312	8 448	34 368	44 736	139 264
Max bitrate deviation (ppm)	±32	±50	±30	±30	±20	±20	±15
bits/DTM frame	193	256	789	1 056	4 296	5 592	17 408
block rate	2 000	2 000	4 000	8 000	8 000	8 000	8 000
bits/block	1 544	2 048	789	1 056	4 296	5 592	17 408
slots/channel	4	5	13	18	71	92	286
slots/block	16	20	26	18	71	92	286
bits/slot	48,25	51,2	60,692	58,667	60,507	60,783	60,867
base bits/slot	48	51	60	58	60	60	60
excess bits	1	1	9	12	36	72	248

The PDH path layer is mapped into DCAP-2 according to the characteristics in table 5.

History

Document history		
V1.1.1	February 2004	Membership Approval Procedure MV 20040409: 2004-02-10 to 2004-04-09
V1.1.1	April 2004	Publication