

## **Dynamic synchronous Transfer Mode (DTM); Part 9: Mapping of ATM over DTM**

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Reference

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DES/TISPAN-02002-DTM

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Keywords

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DTM, ATM**ETSI**

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## 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 9 of a multi-part deliverable covering the Dynamic synchronous Transfer Mode (DTM), as identified below:

- ES 201 803-1: "System description";
- ES 201 803-2: "System characteristics";
- ES 201 803-3: "Physical protocol";
- ES 201 803-4: "Mapping of DTM frames into SDH containers";
- ES 201 803-5: "Mapping of PDH over DTM";
- ES 201 803-6: "Mapping of Synchronous Digital Hierarchy (SDH) over DTM";
- ES 201 803-7: "Ethernet over DTM Mapping";
- ES 201 803-9: "Mapping of ATM over DTM";**
- TR 101 803-10: "Routing and switching of IP traffic over DTM";
- ES 201 803-11: "Mapping of video streams over DTM";
- ES 201 803-12: "Mapping of MPLS over DTM";
- ES 201 803-13: "System description of sub-rate DTM".

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# 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), ATM (part 9), IP (part 10), video streaming (part 11) and MPLS (part 12).

Substrate DTM is described in part 13.

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# 1 Scope

The present document:

- specifies a method for mapping ATM virtual path over DTM channels;
- specifies the characteristics of critical parameters for mapping ATM virtual path over DTM channels;
- gives terms and definitions for mapping encoding and decoding.

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# 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 301 163-1-1: "Transmission and Multiplexing (TM); Generic requirements of Asynchronous Transfer Mode (ATM) transport functionality within equipment; Part 1-1: Functional characteristics and equipment performance".
- [2] ETSI EN 301 163-2-1: "Transmission and Multiplexing (TM); Generic requirements of Asynchronous Transfer Mode (ATM) transport functionality within equipment; Part 2-1: Functional model for the transfer and layer management plane".
- [3] ETSI EN 300 301-1: "Broadband Integrated Services Digital Network (B-ISDN); Traffic control and congestion control in B-ISDN; Conformance definitions for Available Bit Rate (ABR) and ATM Blocked Transfer (ABT) [ITU-T Recommendation I.371.1 (1997)]".
- [4] ETSI ES 201 803-1: "Dynamic synchronous Transfer Mode (DTM); Part 1: System description".
- [5] ETSI ES 201 803-2-3: "Dynamic synchronous Transfer Mode (DTM); Part 2: System characteristics; Sub-part 3: Transport network and channel adaptation aspects".
- [6] ETSI ETS 300 298-1: "Broadband Integrated Services Digital Network (B-ISDN); Asynchronous Transfer Mode (ATM); Part 1: B-ISDN ATM functional characteristics [ITU-T Recommendation I.150 (1995)]".
- [7] ETSI ETS 300 298-2: "Broadband Integrated Services Digital Network (B-ISDN); Asynchronous Transfer Mode (ATM); Part 2: B-ISDN ATM layer specification [ITU-T Recommendation I.361 (1995)]".
- [8] ETSI ETS 300 300: "Broadband Integrated Services Digital Network (B-ISDN); Synchronous Digital Hierarchy (SDH) based user network access; Physical layer User Network Interfaces (UNI) for 155 520 kbit/s and 622 080 kbit/s Asynchronous Transfer Mode (ATM) B-ISDN applications".
- [9] ETSI ETS 300 354: "Broadband Integrated Services Digital Network (B-ISDN); B-ISDN Protocol Reference Model (PRM)".
- [10] ETSI ETS 300 404: "Broadband Integrated Services Digital Network (B-ISDN); B-ISDN Operation And Maintenance (OAM) principles and functions".
- [11] ITU-T Recommendation I.150: "B-ISDN asynchronous transfer mode functional characteristics".

- [12] ITU-T Recommendation I.321: "B-ISDN protocol reference model and its application".
- [13] ITU-T Recommendation I.361: "B-ISDN ATM layer specification".
- [14] ITU-T Recommendation I.371: "Traffic control and congestion control in B-ISDN".
- [15] ITU-T Recommendation I.432.1: "B-ISDN user-network interface - Physical layer specification: General characteristics".
- [16] ITU-T Recommendation I.610: "B-ISDN operation and maintenance principles and functions".

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## 3 Abbreviations

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

A	Adapted function
aAIS	Alarm Indication Signal action
aCNGI	CoNGestion Indication action
ACS	ATM Cell Start
AI	Adapted Information
AIS	Alarm Indication Signal
AP	Access Point
AP0	Application layer channel adaptation type 0
ATM	Asynchronous Transfer Mode
aSSF	Server Signal Fail action
Avp	ATM virtual path
C	Connection function
CI	Characteristic Information
CK	ClocK
cLCD	Loss of Cell Delineation failure cause
CLP	Cell Loss Priority
CNGI	CoNGestion Indication
CP	Connection Point
D	Data
DCAP	DTM Channel Adaptation Protocol
DFLOC	Defect Field LOCation
dLCD	Loss of Cell Delineation defect
DTM	Dynamic synchronous Transfer Mode
EFCI	Explicit Forward Congestion Indicator
FS	Frame Start signal
GFC	Generic Flow Control
HEC	Header Error Check
II	Idle Insertion
LSB	Least Significant Bit
MI	Management Information
MP	Management Point
MSB	Most Significant Bit
NE	Network Element
NNI	Network Node Identifier
OAM	Operation, Administration and Maintenance
OCD	Out of Cell Delineation
PDH	Plesiochronous Digital Hierarchy
PRM	Protocol Reference Model
PS	Performance Supervision
PSI	Performance Supervision Indication
PTI	Payload Type Identifier
SDH	Synchronous Digital Hierarchy
sII	Idle Insertion signal
Sk	Sink
So	Source
SSF	Server Signal Fail

TI	Timing Information
TP	Timing Point
TSF	Trail Signal Fail
TT	Trail Termination
UNI	User Network Interface
VCI	Virtual Channel Identifier
VP	Virtual Path
VP-AIS	Virtual Path Alarm Indication Signal
VPI	Virtual Path Identifier

## 4 Overview

The ATM virtual path (Avp) over DTM mapping describes the mapping of ATM cells over DTM channels. The functionality is part of the DTM Application layer and provides a transport service to the ATM virtual path layer similar to the transport path definitions in EN 301 163-2-1 [2]. The mapping has been modelled to fit into the formal modelling of EN 301 163-1-1 [1] and EN 301 163-2-1 [2] and providing a service similar to the S4/Avp EN 301 163-2-1 [2] transport path, but with the arbitrary capacity of a DTM channel ES 201 803-1 [4].

The ATM over DTM mapping enables the service where an ATM network connection can be established over a DTM network either as a transported bit-pipe, overlay network or hybrid thereof. Such a connection can be either bi-directional or uni-directional. Uni-directional connections may take advantage of the DTM multicast capability.

## 5 DTM ATM Transport Application Layer (AP0)

The ATM virtual path (Avp) over DTM transport is specified as the Application 0 (AP0) adaptation functions on top of the DCAP-0 ES 201 803-2-3 [5] adaptation functions, providing the Avp trail over DTM.

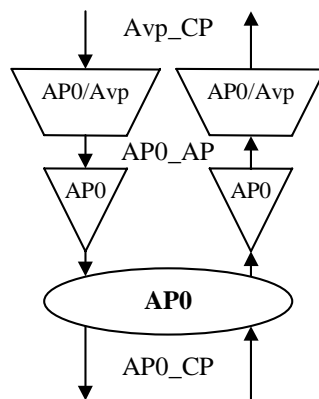


Figure 1: Application 0 atomic functions

### 5.1 Access point information

#### 5.1.1 Characteristic Information

The Characteristic Information (CI) of the Connection Point (CP) is described in EN 301 163-2-1 [2].

#### 5.1.2 Adapted Information

The Adapted Information (AI) of the Adaption Point (AP) is described in ES 201 803-2-3 [5] as the Application 0 Characteristic Information.



### 5.1.3 Management Information

The Management Information (MI) of the Management Point (MP) is described in EN 301 163-2-1 [2] as the S3/Avp management information.

### 5.1.4 Timing Information

The Timing Information (TI) of the Timing Point (TP) is:

- the Application 0 data clock timing indication AP0\_TI\_CK;
- and the Application 0 frame start timing indication AP0\_TI\_FS.

## 5.2 Connection function (AP0\_C)

Not applicable. There are no connection functions defined for this layer.

## 5.3 Trail Termination functions (AP0e\_TT)

The trail termination functions are empty mappings between AI and CI.

### 5.3.1 Application 0 empty Trail Termination (AP0e\_TT)

#### 5.3.1.1 Application 0 empty Termination Source function (AP0e\_TT\_So)

**Symbol:**



**Figure 2: Application 0 empty Trail Termination Source (AP0e\_TT\_So)**

**Interfaces:**

**Table 1: AP0e\_TT\_So Input and output signals**

Input(s)	Output(s)
AP0_AI_D	AP0_CI_D
AP0_AI_CK	AP0_CI_CK
AP0_AI_II	AP0_CI_II
AP0_AI_PSI	AP0_CI_PSI
AP0_AI_TSF	AP0_CI_SSF

**Processes and anomalies:**

None.

**Defects:**

None.

**Consequent actions:**

None.

**Defect correlation:**

None.

**Performance monitoring:**

None.

**Output mapping:**

$AP0\_CI\_D \leftarrow AP0\_AI\_D$ .

$AP0\_CI\_CK \leftarrow AP0\_AI\_CK$ .

$AP0\_CI\_II \leftarrow AP0\_AI\_II$ .

$AP0\_CI\_PSI \leftarrow AP0\_AI\_PSI$ .

$AP0\_CI\_SSF \leftarrow AP0\_AI\_TSF$ .

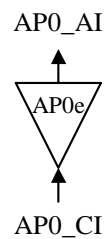
**Fault management:**

None.

**Long term performance monitoring:**

None.

### 5.3.1.2 Application 0 empty Trail Termination Sink function (AP0e\_TT\_Sk)

**Symbol:**

**Figure 3: Application 0 empty Trail Termination Sink (AP0e\_TT\_Sk)**

**Interfaces:**

**Table 2: AP0e\_TT\_Sk Input and output signals**

Input(s)	Output(s)
AP0_CI_D	AP0_AI_D
AP0_CI_CK	AP0_AI_CK
AP0_CI_II	AP0_AI_II
AP0_CI_PSI	AP0_AI_PSI
AP0_CI_SSF	AP0_AI_TSF

**Processes and anomalies:**

None.

**Defects:**

None.

**Consequent actions:**

None.

**Defect correlation:**

None.

**Performance monitoring:**

None.

**Output mapping:**

$AP0\_AI\_D \leftarrow AP0\_CI\_D$ .

$AP0\_AI\_CK \leftarrow AP0\_CI\_CK$ .

$AP0\_AI\_II \leftarrow AP0\_CI\_II$ .

$AP0\_AI\_PSI \leftarrow AP0\_CI\_PSI$ .

$AP0\_AI\_TSF \leftarrow AP0\_CI\_SSF$ .

**Fault management:**

None.

**Long term performance monitoring:**

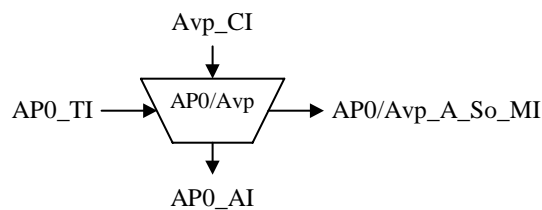
None.

## 5.4 Adaptation functions

### 5.4.1 Application 0 to ATM virtual path Adaptation function (AP0/Avp\_A)

This clause describes the ATM virtual path adaptation using Application 0 empty trail terminators.

#### 5.4.1.1 Application 0 to ATM virtual path Adaptation Source function (AP0/Avp\_A\_So)

**Symbol:**

**Figure 4: Application 0 to ATM virtual path Adaptation Source (AP0/Avp\_A\_So)**

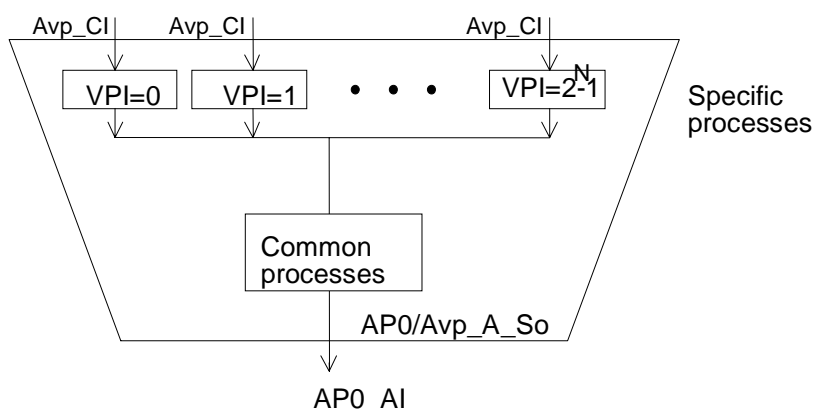
**Interfaces:****Table 3: AP0/Avp\_A\_So Input and output signals**

Input(s)	Output(s)
Per Avp_CI for each VP configured:	AP0_AI_D
Avp_CI_D	AP0_AI_CK
Avp_CI_ACS	AP0_AI_II
Avp_CI_SSF	AP0_AI_PSI
AP0_TI_CK	AP0_AI_TSF
AP0_TI_FS	
AP0/Avp_A_So_MI_Active	
AP0/Avp_A_So_MI_CellDiscardActive	
AP0/Avp_A_So_MI_TPusgActive	
AP0/Avp_A_So_MI_GFCActive	
AP0/Avp_A_So_MI_VPI-KActive	

**Processes and anomalies:**

The AP0/Avp\_A\_So function provides adaptation from the ATM Virtual Path layer to the DTM Application 0. This is performed by a grouping of Specific Processes and Common Processes as shown in figure 5.

Activation: The function shall access the access point when it is activated (MI\_Active is true). Otherwise, it shall not access the access point.

**Figure 5: AP0/Avp\_A\_So atomic function decomposed into Specific and Common processes parts**

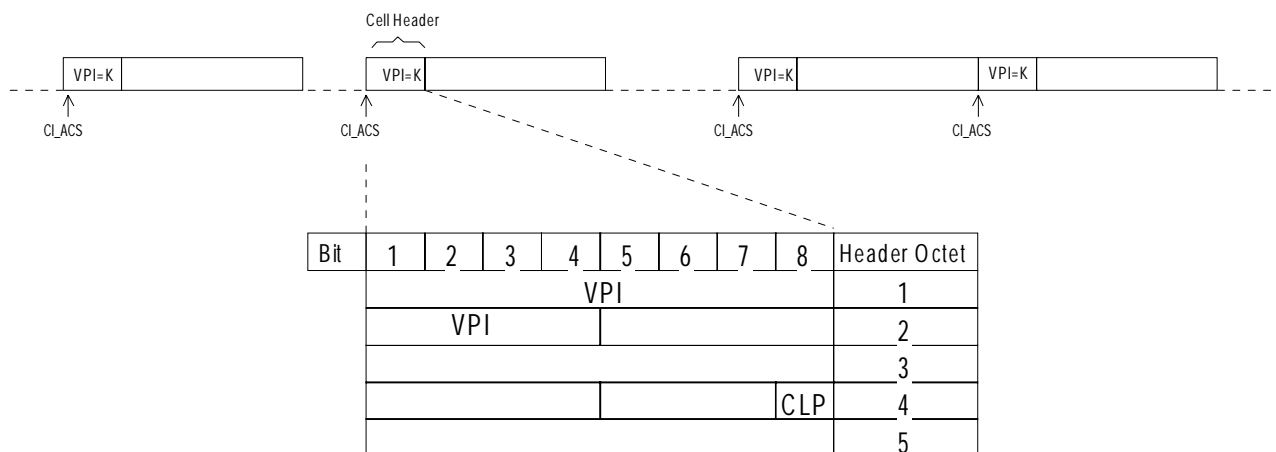
NOTE 1: The sequential order of the processes within the atomic functions is important. For the correct order, refer to the ordering of the processes given below.

**Specific Processes:**

These Processes include VPI setting as well as VP asynchronous multiplexing. Each of these Specific Processes is characterized by the Virtual Path Identifier number K, where  $0 \leq K \leq 2^N - 1$ .

VPI-K Activation: The Specific Processes perform the operation specified below when it is activated (MI\_VPI-KActive is true).

The format of the Characteristic Information (Avp\_CI) is given in figure 6.



**Figure 6: Avp\_CI (NNI format)**

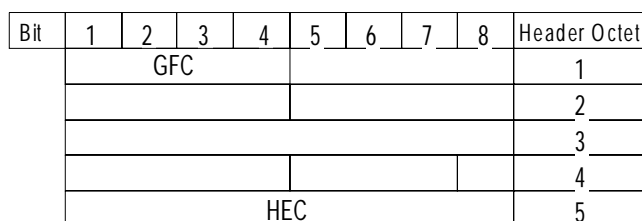
*VPI setting* is based on the activation of the Specific function by MI\_VPI-KActive and inserts the value of "K" as VPI.

NOTE 2: The value of N represents the number of bits in the VPI field and is an integer number. Its maximum value is equal to 12 for the ATM NNI. Its maximum value is equal to 8 for the ATM UNI.

*VP multiplexing*: Asynchronous multiplexing is performed for each active Specific function.

#### Common Processes:

The Common Processes include: Congestion control (selective cell discard (CLP based)), GFC processing, TP usage measurement, cell rate decoupling, HEC processing, cell information field scrambling and cell stream mapping into the Application 0 dataslots. The logical ordering of the processes from input to output shall be maintained.



**Figure 7: Cell header information processed in AP0/Avp\_A\_So**

*Congestion control*: If enabled by MI\_CellDiscardActive, this function shall perform selective cell discard according to CLP value. In the event of congestion, cells with CLP = 1 are subject to be discarded prior to cells with CLP = 0. See EN 300 301-1 [3] (ITU-T Recommendation I.371 [14]) for further details about the use of the CLP. In the event of congestion, the EFCI marking in the PTI field is set according to ETS 300 298-2 [7] (ITU-T Recommendation I.361 [13]).

*GFC processing*: The support of the GFC protocol applies to the UNI and in point-to-point configuration only and is an option. The GFC function uses assigned and unassigned cells. Two modes of operation are available: Uncontrolled Transmission (MI\_GFCActive = false) and Controlled Transmission (MI\_GFCActive = true). If enabled by MI\_GFCActive = true, this function shall insert the GFC protocol in the GFC field. The GFC field processing is defined in ETS 300 298-1 [6] (ITU-T Recommendation I.150 [11]) and ETS 300 298-2 [7] (ITU-T Recommendation I.361 [13]). If the GFC function is not supported or the GFC function disabled by MI\_GFCActive = false, the binary contents of the GFC field shall be set to "0000". In Uncontrolled Transmission mode, neither the controlling nor the controlled NE performs the GFC procedure.

NOTE 3: The application of the GFC function in the ETSI environment is for further study.

*TP usage measurement*: The function shall count the transmitted cells for cell measurement purposes. This cell counting shall be activated/deactivated by MI\_TPUsGActive.

*Cell rate decoupling:* This process takes the ATM cell stream present at its input and inserts it into the Application 0 data slot adding Idle special markers inbetween cells. The idle cells format is specified in ETS 300 298-2 [7]. The cell rate decoupling process makes use of the AP0 timing clock, frame position (AP0\_TI), and idle special marker indication signal (AP0\_AI\_II). After every 128 cells a Performance Supervision (PS) special marker is inserted directly after the last cell by activating the Application 0 Performance Supervision Indication (AP0\_AI\_PSI) signal. When an Idle special marker is to be sent, then the Idle Indication signals (sII) is asserted, else it is de-asserted. When a Performance Supervision special marker is to be sent, then the Performance Supervision Indication signal (sPSI) is asserted, else it is de-asserted.

*HEC Processing:* The HEC value for each cell is calculated and inserted into the HEC field. The method of HEC value calculation shall be according to ETS 300 300 [8] (ITU-T Recommendation I.432.1 [15]).

*Cell information field scrambling:* The self synchronizing scrambler polynomial  $x^{43} + 1$  has been identified for the SDH-based transmission paths and minimizes the error multiplication introduced by the self synchronizing scrambling process. It scrambles the information field bits only. The operation of the scrambler shall be according to ETS 300 300 [8], clause 10.5.3 (ITU-T Recommendation I.432.1 [15], clause 4.3.4).

NOTE 4: Technically the scrambling of ATM cell content has two uses, to protect the short SDH scrambler and for cell delineation algorithm support. For DTM mapping only the cell delineation is the only reason since DTM is datasafe otherwise.

*Cell stream mapping:* The octet structure of ATM cells shall be aligned with the octet structure of the Application 0 data slots and mapped into the AI\_D octet stream as detailed in clause 6.

The Trail Signal Fail (AI\_TSF) signal is de-asserted.

#### **Defects:**

None.

#### **Consequent actions:**

None.

#### **Defect correlation:**

None.

#### **Performance monitoring:**

The use of the Performance Monitoring parameters is for further study. The parameters for the following functions need to be defined:

- TP usage measurement;
- Count of discarded cells from congestion control.

#### **Output mapping:**

$AP0\_AI\_D \leftarrow AI\_D.$

$AP0\_AI\_CK \leftarrow TI\_CK.$

$AP0\_AI\_II \leftarrow sII.$

$AP0\_AI\_PSI \leftarrow sPSI.$

$AP0\_AI\_TSF \leftarrow AI\_TSF.$

#### **Fault management:**

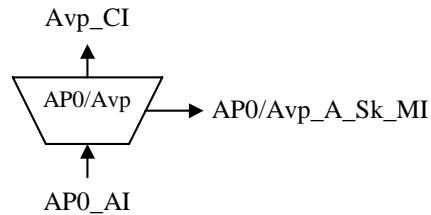
None.

#### **Long term performance monitoring:**

None.

### 5.4.1.2 Application 0 to ATM virtual path Adaptation Sink function (AP0/Avp\_A\_Sk)

Symbol:



**Figure 8: Application 0 to ATM virtual path Adaptation Sink (AP0/Avp\_A\_Sk)**

Interfaces:

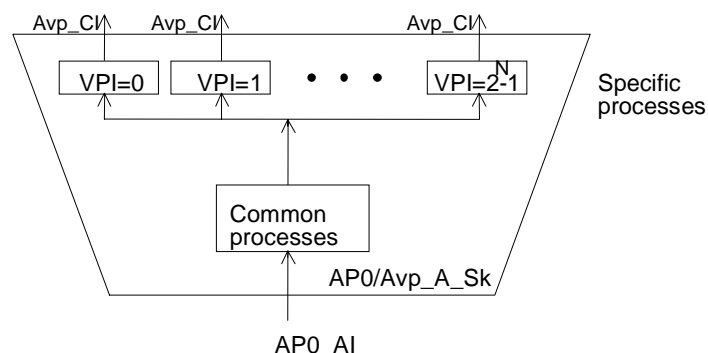
**Table 4: AP0/Avp\_A\_Sk Input and output signals**

Input(s)	Output(s)
AP0_AI_D	per Avp_CI, for each VP configured:
AP0_AI_CK	Avp_CI_D
AP0_AI_II	Avp_CI_ACS
AP0_AI_PSI	Avp_CI_SSF
AP0_AI_TSF	Avp_CI_CNGI
AP0/Avp_A_Sk_MI_Active	AP0/Avp_A_Sk_MI_cLCD
AP0/Avp_A_Sk_MI_CellDiscardActive	
AP0/Avp_A_Sk_MI_TPusgActive	
AP0/Avp_A_Sk_MI_VPIrange	
AP0/Avp_A_Sk_MI_HECActive	
AP0/Avp_A_Sk_MI_GFCActive	
AP0/Avp_A_Sk_MI_DFLOC	
AP0/Avp_A_Sk_MI_VPI-KActive	

#### Processes and anomalies:

The AP0/Avp\_A\_Sk function provides adaptation from the DTM Application 0 to the ATM Virtual Path. This is performed by a grouping of Specific Processes and Common Processes as shown in figure 9.

Activation: The AP0/Avp\_A\_Sk function shall perform the Common and Specific Processes operation specified below when it is activated (MI\_Active is true). Otherwise, it shall activate the SSF signals at its output (CI\_SSF) and not report its status via the management point.



**Figure 9: AP0/Avp\_A\_Sk atomic function decomposed into Specific and Common Processes parts**

NOTE 1: The sequential order of the processes within the atomic functions is important. For the correct order, refer to the ordering of the processes given below.

### Common Processes:

These Common Processes include: Demapping, cell delineation, cell information field descrambling, HEC processing, cell rate decoupling, TP usage measurement, header verification, GFC processing, VPI verification and congestion control (selective cell discard (CLP based)). The logical ordering of these processes from input to output shall be maintained.

*Demapping:* The cell stream shall be extracted from the Application 0 data slot stream in the AP0\_AI\_D in accordance with clause 6.

*Cell Delineation:* dLCD shall be declared if an incorrect HEC is obtained ALPHA times consecutively. dLCD shall be cleared if the cell delineation algorithm enters SYNC state. (According to clause 10.5.1.1, item 3 of ETS 300 300 [8], (clause 4.3.2.2 of ITU-T Recommendation I.432.1 [15])).

*Cell information field descrambling:* The self synchronizing descrambler polynomial  $x^{43} + 1$  has been identified for the SDH-based transmission paths and minimizes the error multiplication introduced by the self synchronizing scrambling process (factor 2). It descrambles the information field bits only. The operation of the descrambler in relation to the HEC cell delineation state diagram shall be according to ETS 300 300 [8], clause 10.5.3 (ITU-T Recommendation I.432.1 [15], clause 4.3.4).

*HEC Processing:* HEC verification and correction shall be according to ETS 300 300 [8] (ITU-T Recommendation I.432.1 [15]). Cells determined to have an invalid and inconvertible HEC pattern shall be discarded. A count of invalid HEC events and a count of invalid HEC cell discard events are maintained with threshold crossings checked. HEC correction mode may be activated/deactivated by MI\_HECActive. The HEC correction mode should be activated by default.

*Cell rate decoupling:* The function shall extract the Idle special markers used as fixed stuff in the far-end AP0/Avp adaptation source function.

*TP usage measurement:* The function shall count the received cells for cell measurement purposes. This cell counting shall be activated/deactivated by MI\_TPUsGActive.

*Header verification:* Invalid header patterns from paths based on SDH/PDH transmission systems are as follows (except idle cell)(x = any value):

	GFC	VPI	VCI	PTI	CLP
UNI	xxxx	all 0's	all 0's	xxx	1
	VPI	VCI	PTI	CLP	
NNI	all 0's	all 0's	xxx	1	

*GFC processing:* The support of the GFC protocol applies to the UNI and in point-to-point configuration only and is an option. The GFC function uses assigned and unassigned cells. Two modes of operation are available: Uncontrolled Transmission (MI\_GFCActive = false) and Controlled Transmission (MI\_GFCActive = true). In Uncontrolled Transmission mode, neither the controlling nor the controlled NE performs the GFC procedure. If enabled by MI\_GFCActive = true, this function shall extract the GFC protocol from the GFC field. The GFC field processing is defined in ETS 300 298-1 [6] (ITU-T Recommendation I.150 [11]) and ETS 300 298-2 [7] (ITU-T Recommendation I.361 [13]).

NOTE 2: The application of the GFC function in the ETSI environment is for further study.

NOTE 3: According to the PRM (ETS 300 354 [9] (ITU-T Recommendation I.321 [12])), the unassigned cells should be processed in the ATM layer. Some of the ATM layer processes are adaptation processes belonging to the adaptation function between the TP and the Avp layer network. The unassigned cells as well as idle cells are per physical connection (VPI = 0, VCI = 0). For this reason the idle and unassigned cells processing is allocated to the same atomic function.

*VPI verification:* The function shall verify that the received cell VPI is valid. If the VPI is determined to be invalid (i.e. out-of-range VPI or not assigned), the cell shall be discarded. The range of valid VPI is given by MI\_VPIrange.



*Congestion control:* If enabled by MI\_CellDiscardActive, this function shall perform selective cell discard according to CLP value. In the event of congestion, cells with CLP = 1 are subject to be discarded prior to cells with CLP = 0. See EN 300 301-1 [3] (ITU-T Recommendation I.371 [14]) for further details about the use of the CLP. In the event of congestion, the indication Avp\_CI\_CNGI is set for the traffic management function AvpT\_TT\_So to insert EFCI.

### Specific Processes:

The function performs VP-AIS insertion and demultiplexing on a per VP basis.

**VPI-K Activation:** The Specific Processes perform the operation specified below when it is activated (MI\_VPI-KActive is true). Otherwise, it shall send no cells and Server Signal Fail (SSF) = false.

**VP-AIS insertion:** If the Specific Processes are activated, the VP-AIS insertion shall be performed as in the Consequent Actions clause.

**VP demultiplexing:** The adaptation sink function has access to a specific Avp identified by the number K ( $0 \leq K \leq 2 - 1$ ). When the function is activated only the cells of that specific Avp-K are passed in client direction.

NOTE 4: The value of N represents the number of bits in the VPI field and is an integer number. Its maximum value is equal to 12 for the ATM NNI. Its maximum value is equal to 8 for the ATM UNI.

The demapped data of a particular VPI shall be mapped into the octet stream of CI\_D.

The demapped ATM cell frame start of a particular VPI shall be indicated by asserting the ATM Cell Start (CI\_ACS), else it is de-asserted.

### Defects:

The function shall detect the dLCD defect according to ETS 300 300 [8] (ITU-T Recommendation I.432.1 [15]).

### Consequent actions:

aCNGI  $\leftarrow$  "Event of Congestion" and CellDiscardActive.

aSSF  $\leftarrow$  dLCD or AI\_TSF.

aAIS  $\leftarrow$  dLCD or AI\_TSF.

On declaration of aAIS the function shall output VP-AIS OAM cells on all active VPCs according to ETS 300 404 [10] (ITU-T Recommendation I.610 [16], clause 9.2.1.1.1.1); on clearing of aAIS the generation of VP-AIS cells shall be stopped. If implemented, the defect type and defect location field (provided by MI\_DFLOC) of the VP-AIS cell shall be inserted in the information field. The contents of these fields are for further study.

### Defect correlation:

cLCD  $\leftarrow$  dLCD and (not AI\_TSF).

### Performance monitoring:

The use of the Performance Monitoring parameters is for further study. The parameters for the following functions need to be defined:

- TP usage measurement;
- Count of discarded cells from congestion control;
- Count of invalid HEC events;
- Count of invalid HEC discard events;
- Count of invalid header discard events (one common counter for invalid header/invalid VPI/invalid VCI is maintained);
- OCD event.

**Output mapping:**

$Avp\_CI\_D \leftarrow CI\_D.$

$Acp\_CI\_ACS \leftarrow CI\_ACS.$

$Avp\_CI\_SSF \leftarrow aSSF.$

$Avp\_CI\_CGNI \leftarrow aCGNI.$

$AP0/Avp\_A\_Sk\_MI\_cLCD \leftarrow cLCD.$

**Fault management:**

None.

**Long term performance monitoring:**

None.

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## 6 Mapping of ATM virtual paths over DTM

The mapping of ATM cells into a DTM Application 0 format requires the mapping into data slots (AP0\_AI\_D), idle special marker indication (AP0\_AI\_II) and performance supervision indication (AP0\_AI\_PSI).

The traditional stuffing with idle cells is replaced with the frequency justification mechanism of idle special markers. Idle special markers are only to be inserted inbetween cells, such that all data slots of a cell are in sequence without intermediate idle special markers. In order to provide for performance supervision a performance supervision special marker will be inserted directly after the last data slot word of every 128<sup>th</sup> cell.

The cell is mapped into 7 data slot words, where the header is mapped into the first and the cell payload is mapped into the following 6 data slot words. The cell header octets are mapped into the data slot word as given in table 5. Bit 23 to 0 of the data slot is reserved, always set to 0 and is never to be monitored for state.

**Table 5: Cell octet to data slot bit mapping**

Octet	MSB	LSB
1	63	56
2	55	48
3	47	40
4	39	32
5	31	24

The cell payload is mapped into the data slots such that the first octet is mapped into bit 63 to 56 with bit 63 as MSB, and the following octets in the same fashion for bit ranges 55 to 48, 47 to 40, 39 to 32, 31 to 24, 23 to 16, 15 to 8 and 7 to 0. When the first 8 octets of the cell payload have been mapped, the next 8 octets are mapped into the following data slot word according to the same mapping scheme. When all 48 octets of the payload have been mapped according to this scheme, they are to be transmitted in the mapped order after the data slot word containing the header. All 7 data slot words is to be transmitted in one consecutive sequence without inserted idle or performance supervision special markers.

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## History

Document history		
V1.1.1	October 2004	Membership Approval Procedure      MV 20041224: 2004-10-26 to 2004-12-24
V1.1.1	January 2005	Publication