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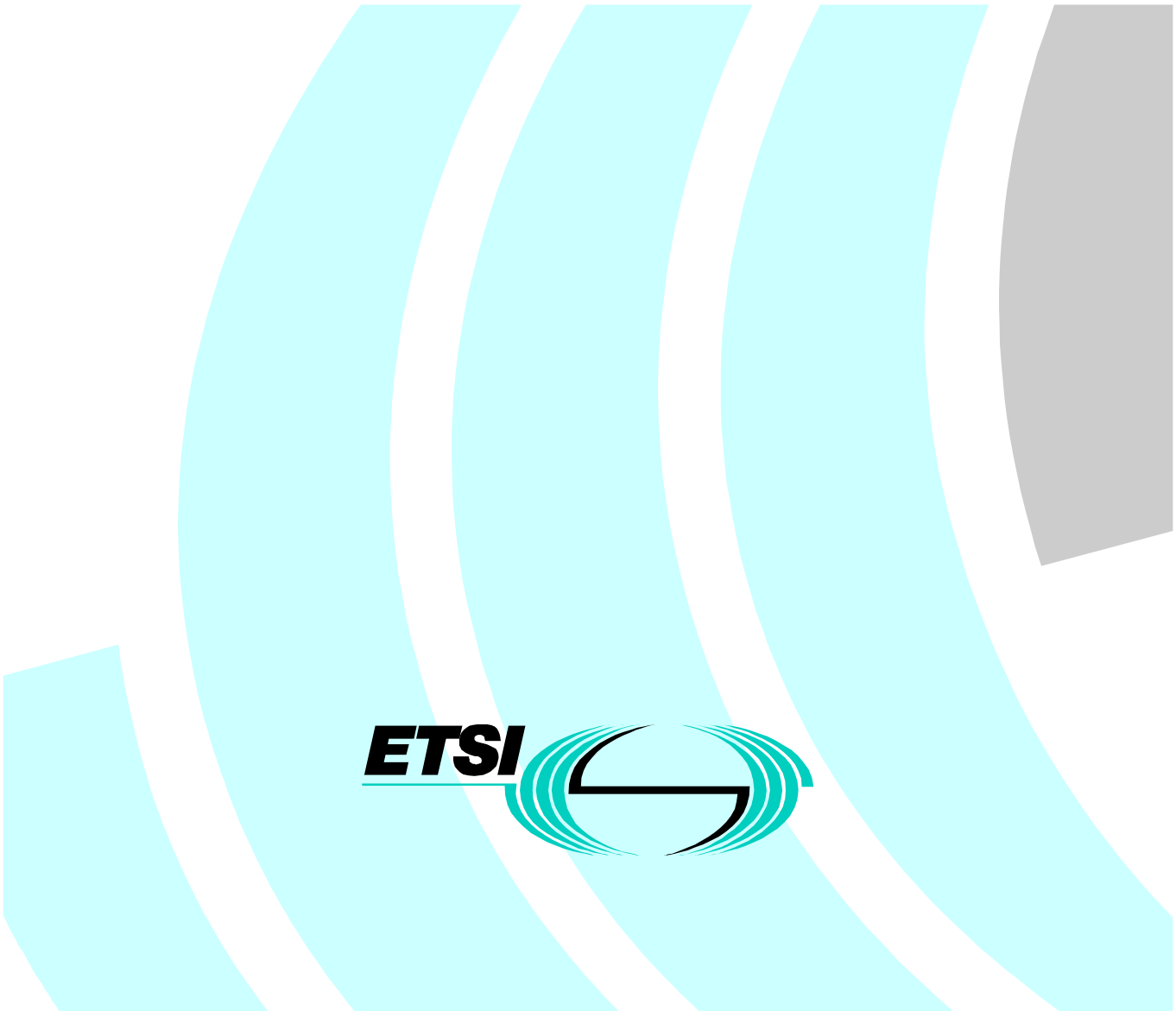
European Standard (Telecommunications series)

Telecommunications Management Network (TMN); Information models and protocols for the management and control of the Asynchronous Transfer Mode (ATM) switching network element; Part 1: Q3 interface specification



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Contents

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Telecommunications Management Network (TMN).

The present document is part 1 of a multi-part EN covering Telecommunications Management Network (TMN); Information models and protocols for the management and control of the Asynchronous Transfer Mode (ATM) switching network element, as identified below:

Part 1: "Q3 interface specification"

NOTE: Other parts will be defined later.

National transposition dates	
Date of adoption of this EN:	18 December 1998
Date of latest announcement of this EN (doa):	31 March 1999
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 September 1999
Date of withdrawal of any conflicting National Standard (dow):	30 September 1999

1 Scope

The present document specifies the Q3 interface between an Asynchronous Transfer Mode (ATM) switch and the Telecommunications Management Network (TMN) for the support of configuration, fault and performance management functions. The interface specified is that between TMN network elements or Q-adapters which interface to TMN Operations Systems (OSs) without mediation and between OSs and mediation devices, as defined in ITU-T Recommendation M.3010 [5]. Fault and performance management together include both passive monitoring of reports and active fault isolation.

The configuration by management of channels for signalling, including those for B-ISDN signalling, is within the scope of the present document. The management of broadband customer administration and the configuration for call routeing including that for interworking with narrowband switches for both incoming and outgoing interfaces is also within the scope of the present document.

An ATM switch may include ATM crossconnect functionality, but this is specified by reference to EN 300 820-1 [22] or the ITU-T Recommendation I.751 [4] and by importing the relevant classes of managed objects where appropriate.

Existing protocols are used where possible, and the focus of the work is on defining the object model. The definition of the functionality of TMN operations systems is outside the scope of the present document.

The management of ATM Adaptation Layers (AALs) which are only used in the user plane is outside the scope of the present document since the broadband switch management has no visibility of ATM adaptation for the user plane. Management of AAL5 and the Signalling ATM Adaptation Layer (SAAL) is within the scope since these are used in the control plane.

Security management is outside the scope of the present document.

2 References

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or

b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or

c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

2.1 Normative references

[1] ITU-T Recommendation I.311 (1993): "B-ISDN general network aspects".

[2] ITU-T Recommendation I.363.5 (1996): "B-ISDN ATM Adaptation Layer specification: Type 5 AAL".

[3] ITU-T Recommendation I.610 (1992): "B-ISDN operation and maintenance principles and functions".

[4] ITU-T Recommendation I.751 (1997): "Asynchronous transfer mode management of the network element view".

[5] ITU-T Recommendation M.3010 (1995): "Principles for a Telecommunications management network".

[6] ITU-T Recommendation M.3100 (1995): "Generic network information model".

[7] ITU-T Recommendation Q.2110 (1994): "B-ISDN ATM adaptation layer - service specific connection oriented protocol (SSCOP)".

[8] ITU-T Recommendation Q.2130 (1994): "B-ISDN signalling ATM adaptation layer - Service specific coordination function for support of signalling at the user network interface (SSFC at UNI)".

[9] ITU-T Recommendation Q.2140 (1995): "B-ISDN ATM adaptation layer - Service specific coordination function for signalling at the network node interface (SSFC at NNI)".

[10] ITU-T Recommendation Q.2761 (1995): "Functional description of the B-ISDN user part (B-ISUP) of signalling system No. 7".

[11] ITU-T Recommendation Q.2762 (1995): "General Functions of messages and signals of the B-ISDN user part (B-ISUP) of Signalling System No. 7".

[12] ITU-T Recommendation Q.2763 (1995): "Signaling System No. 7 B-ISDN User Part (B-ISUP) - Formats and codes".

[13] ITU-T Recommendation Q.2764 (1995): "Signalling system No. 7 B-ISDN User Part (B-ISUP) - Basic call procedures".

[14] ITU-T Recommendation Q.2931 (1995): "Digital Subscriber Signalling System No. 2 (DSS 2) - User-Network Interface (UNI) layer 3 specification for basic call/connection control".

[15] ITU-T Recommendation Q.824.6 (1998): "Broadband Switch Management".

NOTE: ITU-T Recommendation Q.824.6 will be published shortly.

[16] ITU-T Recommendation X.720 | ISO/IEC 10165-1 (1992): "Information technology - Open Systems Interconnection - Structure of management information: Management information model".

[17] ITU-T Recommendation X.721 | ISO/IEC 10165-2 (1992): "Information technology - Open Systems Interconnection - Structure of management information: Definition of management information".

[18] ITU-T Recommendation X.731 | ISO/IEC 10164-2 (1992): "Information technology - Open Systems Interconnection - Systems Management: State management function".

[19] ITU-T Recommendation X.732 | ISO/IEC 10164-3 (1992): "Information technology - Open Systems Interconnection - Systems Management: Attributes for representing relationships".

[20] ITU-T Recommendation Q.821 (1992): "Stage 2 and stage 3 description for the Q3 interface - Alarm surveillance".

[21] ETS 300 469: "Broadband Integrated Services Digital Network (B-ISDN); Asynchronous Transfer Mode (ATM); Management of the network element view [ITU-T Recommendation I.751 (1996)]".

[22] EN 300 820-1: "Network Aspects (NA); Management information model for the X-type interface between Operation Systems (OSs) of a Virtual Path (VP)/Virtual Channel (VC) cross connected network; Part 1: Configuration management aspects".

2.2 Informative references

[23] ITU-T Recommendation Q.811: "Lower layer protocol profiles for the Q3 X interfaces".

[24] ITU-T Recommendation Q.812: "Upper layer protocol profiles for the Q3 and X interfaces".

[25] ITU-T Recommendation G.773: "Protocol suites for Q-interfaces for management of transmission systems".

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

[27] ITU-T Recommendation Q.822 (1993): "Stage 1, stage 2 and stage 3 description for the Q3 interface - Performance Management".

[28] ITU-T Recommendation I.361: "B-ISDN ATM layer specification".

[29] ATM Forum Specification af-nm-0027.000 (1995): "CMIP Specification for the M4 interface".

3 Definitions and abbreviations

3.1 Definitions

See the identically numbered part of ITU-T Recommendation Q.824.6 [15] for the content here.

3.2 Abbreviations

See the identically numbered part of ITU-T Recommendation Q.824.6 [15] for the content here.

3.3 Conventions

See the identically numbered part of ITU-T Recommendation Q.824.6 [15] for the content here.

4 Information model diagrams

See the identically numbered part of ITU-T Recommendation Q.824.6 [15] for the content here.

4.1 Entity-relationship models

See the identically numbered part of ITU-T Recommendation Q.824.6 [15] for the content here.

4.1.1 ATM generic modelling

See the identically numbered part of ITU-T Recommendation Q.824.6 [15] for the content here.

4.1.2 ATM interworking and adaptation layer modelling

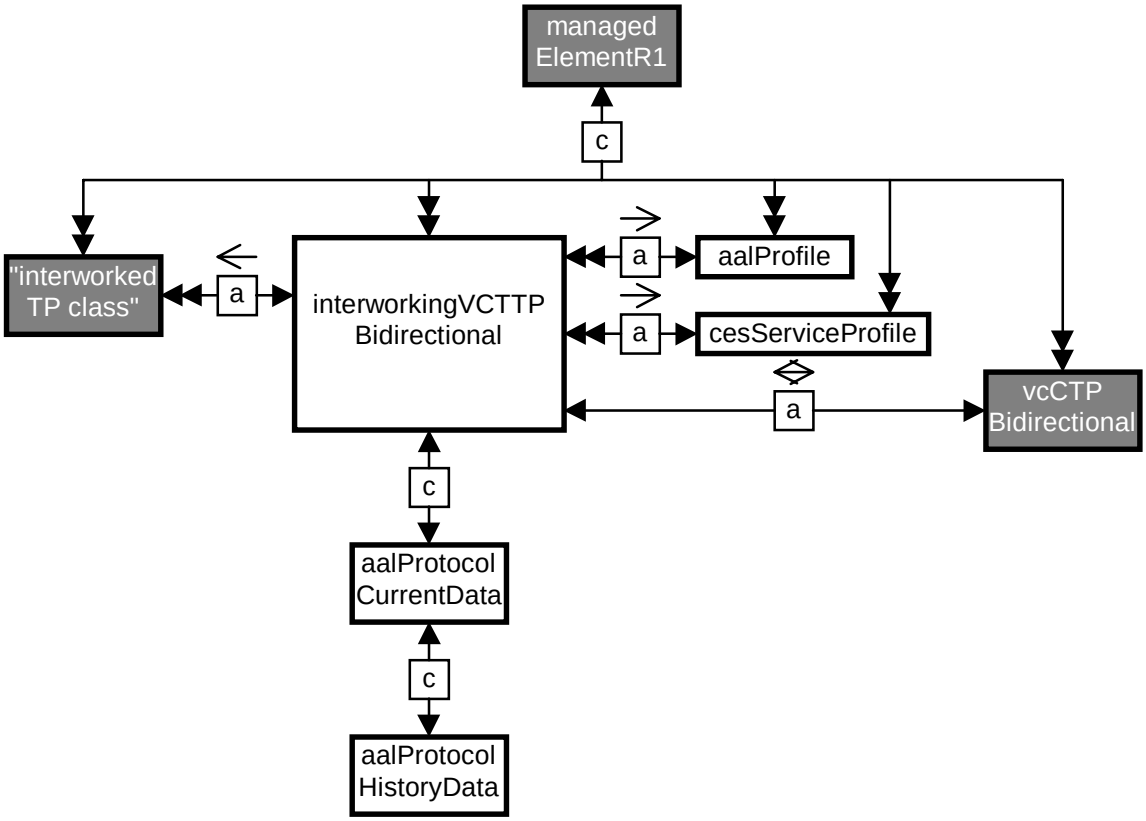


Figure 1: Entity relationship diagram - broadband customer administration

A interworkingVcTtpBidirectional objects represents a point in the managed system where the interworking of a service, for example frame relay, or the underlying physical infrastructure, for example DS1/E1, takes place. The "interworked TP class" is a generic managed object class that represents the service that is interworked.

4.1.3 Broadband customer administration modelling

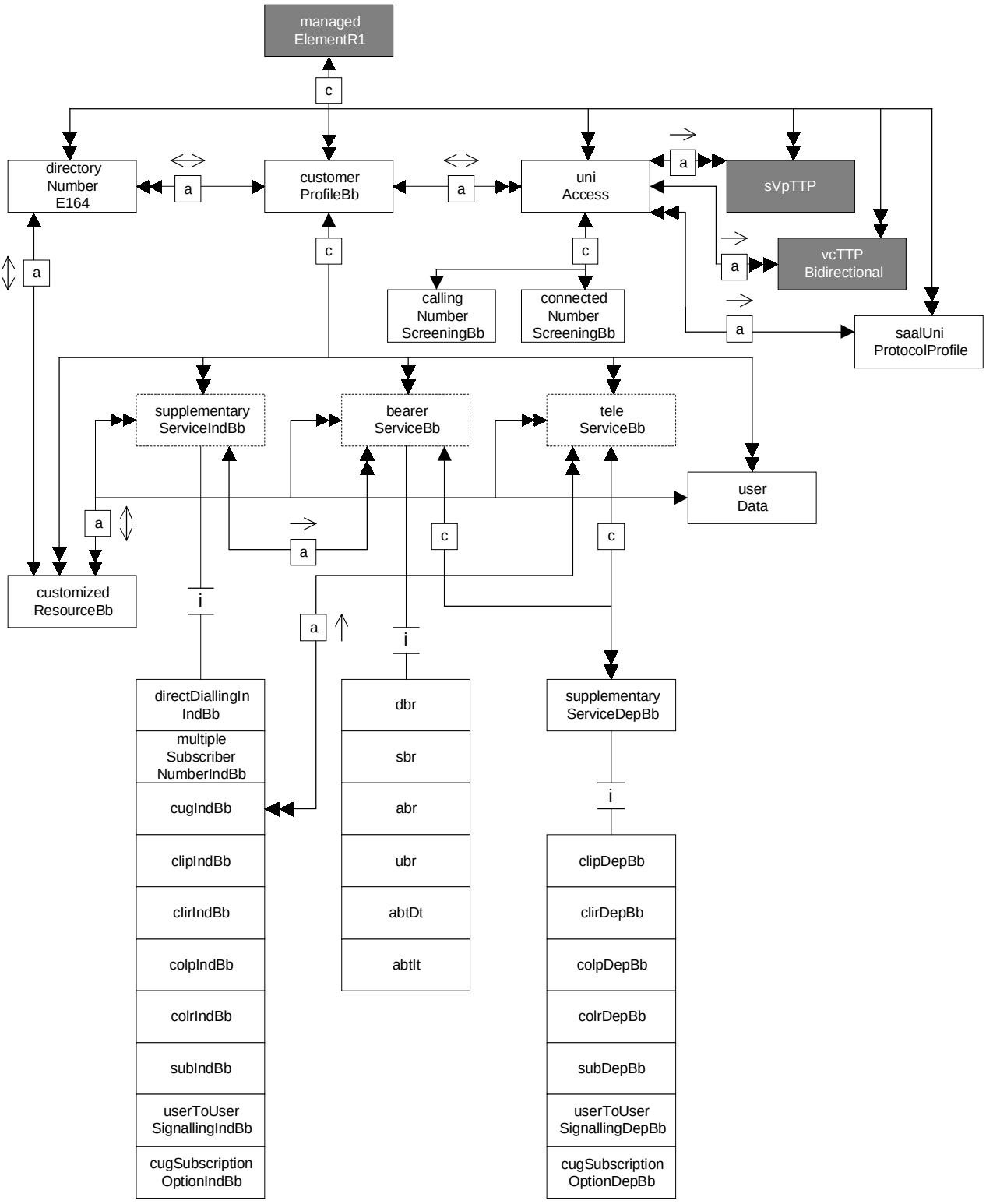


Figure 2: Entity relationship diagram - broadband customer administration

4.1.4 Broadband routeing modelling

all object classes except virtualPathGroup,
crCircuitEndPointSubgroupBb and crCircuitEndPointBb
are contained in managedElementR1

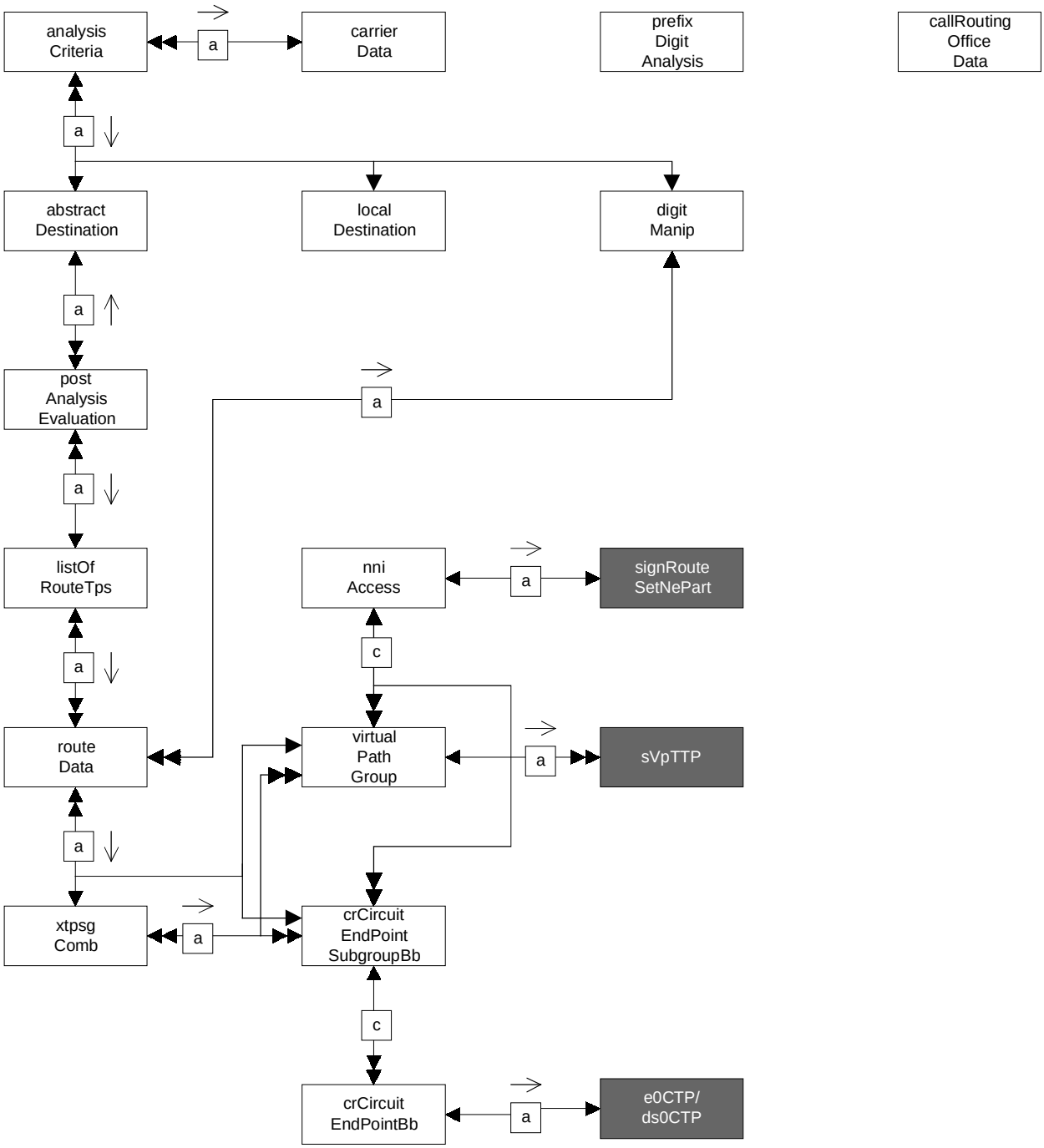


Figure 3: Entity relationship diagram - broadband call routeing management

4.2 Inheritance hierarchy

See the identically numbered part of ITU-T Recommendation Q.824.6 [15] for the content here.

5 Formal object class definitions

This clause gives the formal definitions of the managed object classes, name bindings, general packages, behaviours, attributes, actions and notifications.

5.1 Object classes

This subclause specifies the object classes for all of the managed objects used in the management information model. These object classes are either defined here or by reference to other specifications. Classes of managed objects which are defined elsewhere and which are only used for containment are not included, but are identified by the name bindings for the classes specified here.

Uni-directional trails are modelled by bi-directional objects with the traffic descriptor in the unused direction set to a null value.

The following class that is defined in ITU-T Recommendation M.3100 [6] may be instantiated:

- managedElementR1.

All instantiable classes that are defined in ITU-T Recommendation I.751 [4] may be instantiated.

All instantiable classes that are defined in ITU-T Recommendation Q.824.6 [15] may be instantiated.

The following class that is defined in ITU-T Recommendation X.721 [17] may be instantiated:

- log.

5.1.1 Broadband customer administration fragment

5.1.1.1 Calling line identification presentation independent for broadband (clipIndBb)

```
clipIndBb   MANAGED OBJECT CLASS
    DERIVED FROM "ITU-T Q.824.6 [15]":supplementaryServiceIndBb;
    CHARACTERIZED BY
        "ITU-T Q.824.6 [15]":clipBbPkg;
        CONDITIONAL PACKAGES
            "ITU-T Q.824.6 [15]":twoCallingPartyNumberDeliveryPkg
                PRESENT IF"supplied by the managing system";
REGISTERED AS {managedObjectClass 1};
```

5.1.1.2 Calling line identification restriction independent for broadband (clirIndBb)

```
clirIndBb   MANAGED OBJECT CLASS
    DERIVED FROM "ITU-T Q.824.6 [15]":supplementaryServiceIndBb;
    CHARACTERIZED BY
        "ITU-T Q.824.6 [15]":clirBbPkg;
REGISTERED AS {managedObjectClass 2};
```

5.1.1.3 Closed user group subscription option independent for broadband (cugSubscriptionOptionIndBb)

```
cugSubscriptionOptionIndBb  MANAGED OBJECT CLASS
    DERIVED FROM "ITU-T Q.824.6 [15]":supplementaryServiceIndBb;
    CHARACTERIZED BY
        "ITU-T Q.824.6 [15]":cugSubscriptionOptionBbPkg;
REGISTERED AS {managedObjectClass 3};
```

5.1.1.4 Connected line identification presentation independent for broadband (colpIndBb)

```
colpIndBb   MANAGED OBJECT CLASS
    DERIVED FROM "ITU-T Q.824.6 [15]":supplementaryServiceIndBb;
    CHARACTERIZED BY
        "ITU-T Q.824.6 [15]":colpBbPkg;
REGISTERED AS {managedObjectClass 4};
```

5.1.1.5 Connected line identification restriction independent for broadband (colrIndBb)

```
colrIndBb   MANAGED OBJECT CLASS
    DERIVED FROM "ITU-T Q.824.6 [15]":supplementaryServiceIndBb;
    CHARACTERIZED BY
        "ITU-T Q.824.6 [15]":colrBbPkg;
REGISTERED AS {managedObjectClass 5};
```

5.1.1.6 Sub-addressing independent for broadband (subIndBb)

```
subIndBb    MANAGED OBJECT CLASS
    DERIVED FROM "ITU-T Q.824.6 [15]":supplementaryServiceIndBb;
    CHARACTERIZED BY
        "ITU-T Q.824.6 [15]":subBbPkg;
REGISTERED AS {managedObjectClass 6};
```

5.1.1.7 User to user signalling independent for broadband (userToUserSignallingIndBb)

```
userToUserSignallingIndBb   MANAGED OBJECT CLASS
    DERIVED FROM "ITU-T Q.824.6 [15]":supplementaryServiceIndBb;
    CHARACTERIZED BY
        "ITU-T Q.824.6 [15]":userToUserSignallingBbPkg;
REGISTERED AS {managedObjectClass 7};
```

6 Type definitions

```
ASN1DefinedTypesModule {itu-t(0) identified-organization(4) etsi(0)
    en301064(1064) part1(1) informationModel(0) asn1Module(2) asn1TypeModule(0)}

DEFINITIONS IMPLICIT TAGS ::=

BEGIN
-- EXPORTS everything

informationModel  OBJECT IDENTIFIER ::= {itu-t(0) identified-organization(4) etsi(0)
    en301064(1064) part1(1) informationModel(0)}
managedObjectClass  OBJECT IDENTIFIER ::= {informationModel managedObjectClass(3)}

END -- of ASN1DefinedTypesModule
```

7 Protocol stacks

See the identically numbered part of ITU-T Recommendation Q.824.6 [15] for the content here.

Annex A (normative): ATM switch management requirements

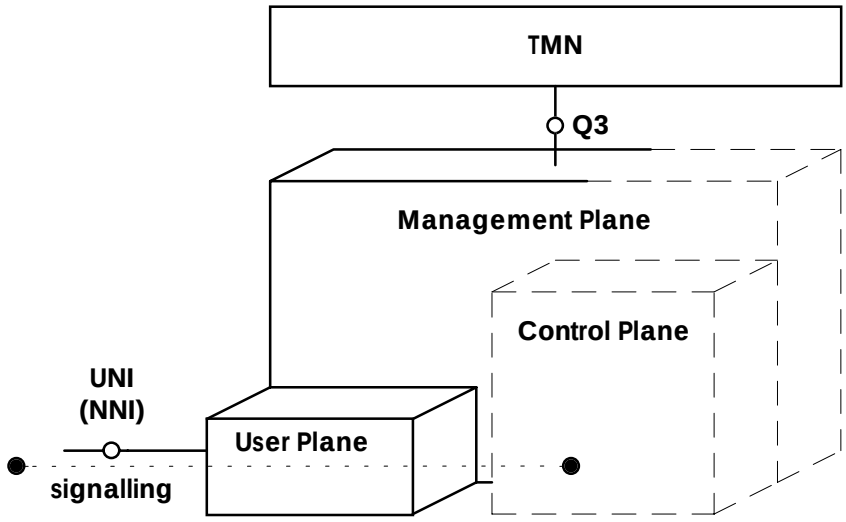
See Annex A of ITU-T Recommendation Q.824.6 [15] for the entire content of this annex.

Annex B (normative): Reference scenario for the management of the ATM switching network element

The definition of the reference configuration for B-ISDN management is based on ITU-T Recommendations I.311 [1], I.610 [3], I.751 [4] and ETS 300 469 [21].

ITU-T Recommendation I.311 [1] is mainly concerned with the communication scenario between user and network elements to provide control and management information exchange. ITU-T Recommendation I.610 [3] deals with the TMN architecture for the B-ISDN customer access. ITU-T Recommendation I.751 [4] and ETS 300 469 [21] propose a TMN architecture specialized for a VP cross-connect network, subdivided into an upper level (network OS) and a lower level (NE OS).

The reference scenario for the ATM switch management is shown in figure B.1.



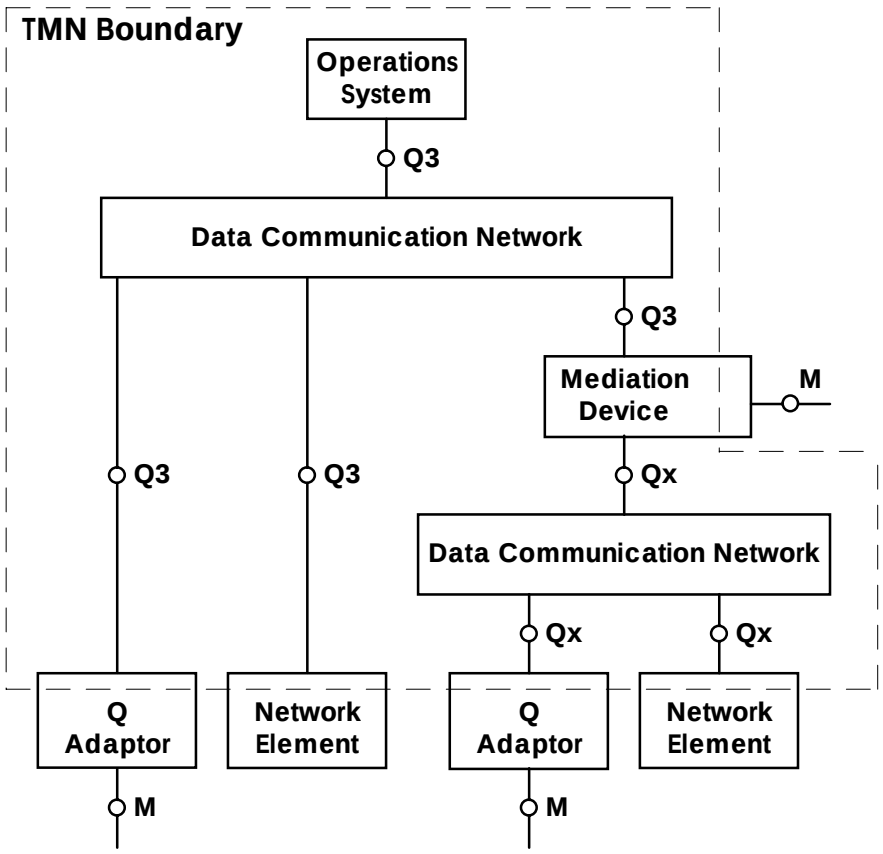
NOTE: Solid line - illustrates the application for ATM Cross Connect. Dashed line - illustrates the extensions for an ATM Switch

Figure B.1: ATM cross connect / ATM switch model

The present document focuses on the Q3 interface between the NE OS and the ATM switch, describing an object model for the management of control plane functions for the ATM switch. For example, it will address management of routeing, customer administration, and management of the virtual channels for signalling information transfer.

The location of the Q3 interface is illustrated in figure B.2 and the protocol stacks used at this point are specified in clause 7 of the present document.

The Q3 interface is the TMN interface between network elements or Q-adaptors which interface to operations systems without mediation and between operations systems and mediation devices. The use of standard at these points is mandatory. The specification of Q_x interfaces and proprietary interfaces is outside the scope of the present document.



NOTE 1: Q_X and M (proprietary) interfaces are outside the scope of the present document.
NOTE 2: A mediation device can only have a M interface if it contains Q-adapter functionality.

Figure B.2: Location of the Q3 interface

Protocols on the Q3 interface between the management plane and TMN will be considered at a later stage. Work will be concentrated on two items, namely mapping the information model onto CMIP and mapping CMIP onto the ATM protocol stack.

Annex C (informative): Functional architecture

C.1 Lower layers: SDH based interfaces

The functional architecture for SDH based interfaces is shown in figure C.1. The lowest layer of the functional architecture is the physical media layer. At the sink terminations of this layer, the incoming interface signal (which may be optical or electrical) is converted into an internal logic level and timing is recovered. A loss of incoming signal will typically result in a LOS (Loss Of Signal) alarm being raised. At the source terminations of this layer the internal logic level signals are converted into outgoing interface signals. An alarm may be raised if a transmit component such as a transmit laser fails. Alarms raised at the physical media layer may result in F1 OAM layer flows in the client layer.

The SDH regenerator section layer is the client layer which is served by the physical media layer. The sink terminations of this layer perform the descrambling of the incoming signal and the processing and removal of the regenerator section layer. A loss of framing will typically result in a Loss of Frame (LOF) alarm being raised and may result in an F1 OAM layer flow. The source terminations of this layer generate the regenerator section overhead and scramble the signal. The monitoring of the regenerator section layer error rate which is part of the regenerator section overhead may result in warnings or alarms being raised and may result in F2 OAM layer flows in the client layer.

The SDH multiplexer section layer is the client layer which is served by the regenerator section layer. The sink terminations of this layer perform the processing and the removal of the section overhead, whereas the source terminations generate and add this overhead. The loss of the pointer in the section overhead and the monitoring of the error rate for the multiplex section overhead may result in F3 OAM layer flows in the client layer.

The higher order SDH path layer is the client layer which is served by the SDH multiplexer layer. The sink terminations of this layer perform the processing and removal of the path overhead, whereas the source terminations generate and add this overhead. Monitoring of path error rate may result in alarms being raised and in F3 OAM flows, as may errors in the path ID label or the path signal label.

For ATM applications, the SDH transmission convergence layer replaces the lower order SDH path layer as the client layer which is served by the higher order SDH path layer. The sink terminations of this layer perform the adaptation to the higher ATM layers from the SDH path layer, whereas the source terminations perform the adaptation to the SDH path layer from the higher ATM layers. The loss of cell delineation, uncorrectable header errors, degraded header error performance and the detection of too many IDLE ATM cells can give rise to warnings, alarms, and F3 OAM flows. The terminations of this layer ensure that no IDLE cells are passed to its client layer.

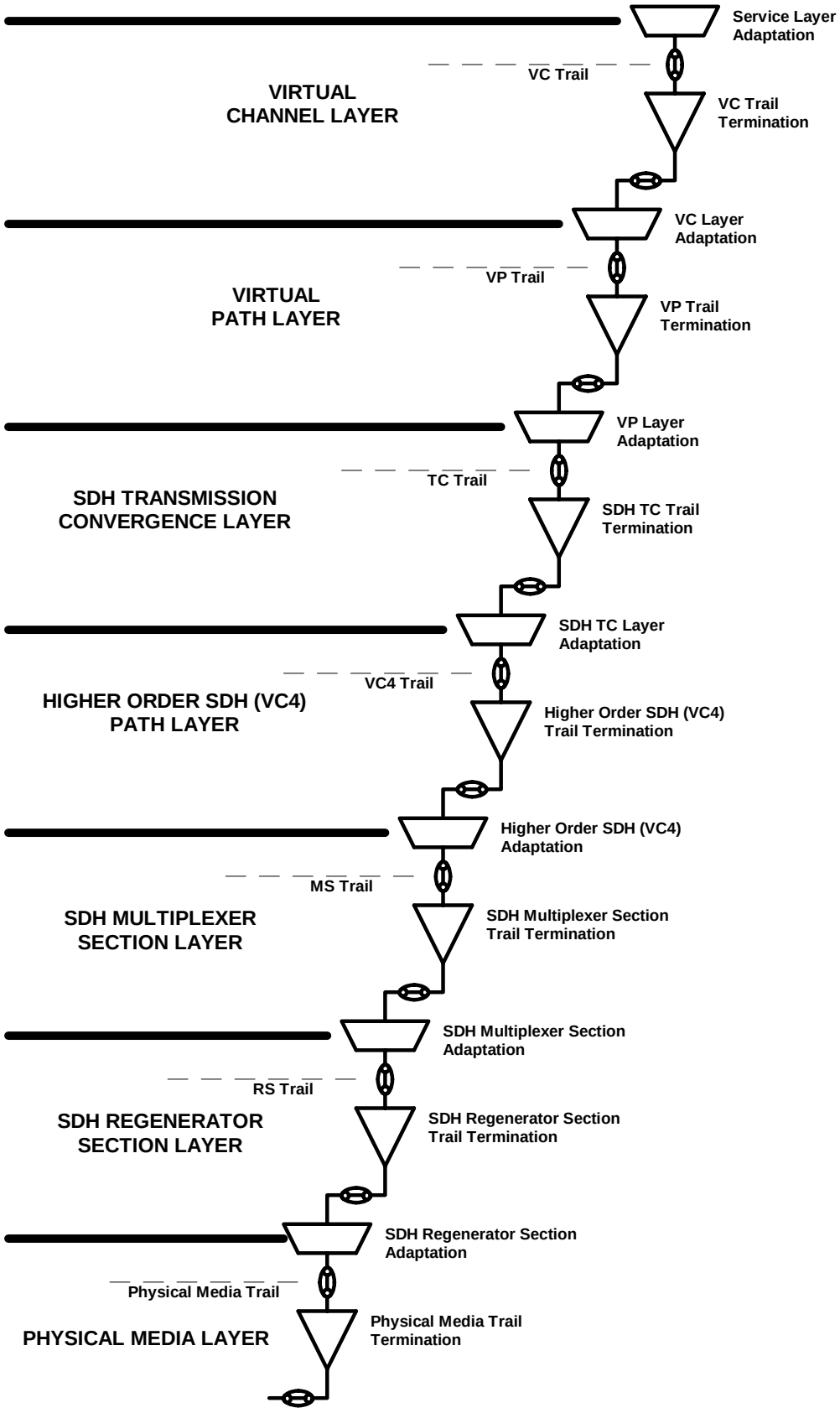


Figure C.1: Functional architecture for ATM on a SDH based Interface

C.2 Lower layers: cell based interfaces

The functional architecture for cell based interfaces is shown in figure C.2.

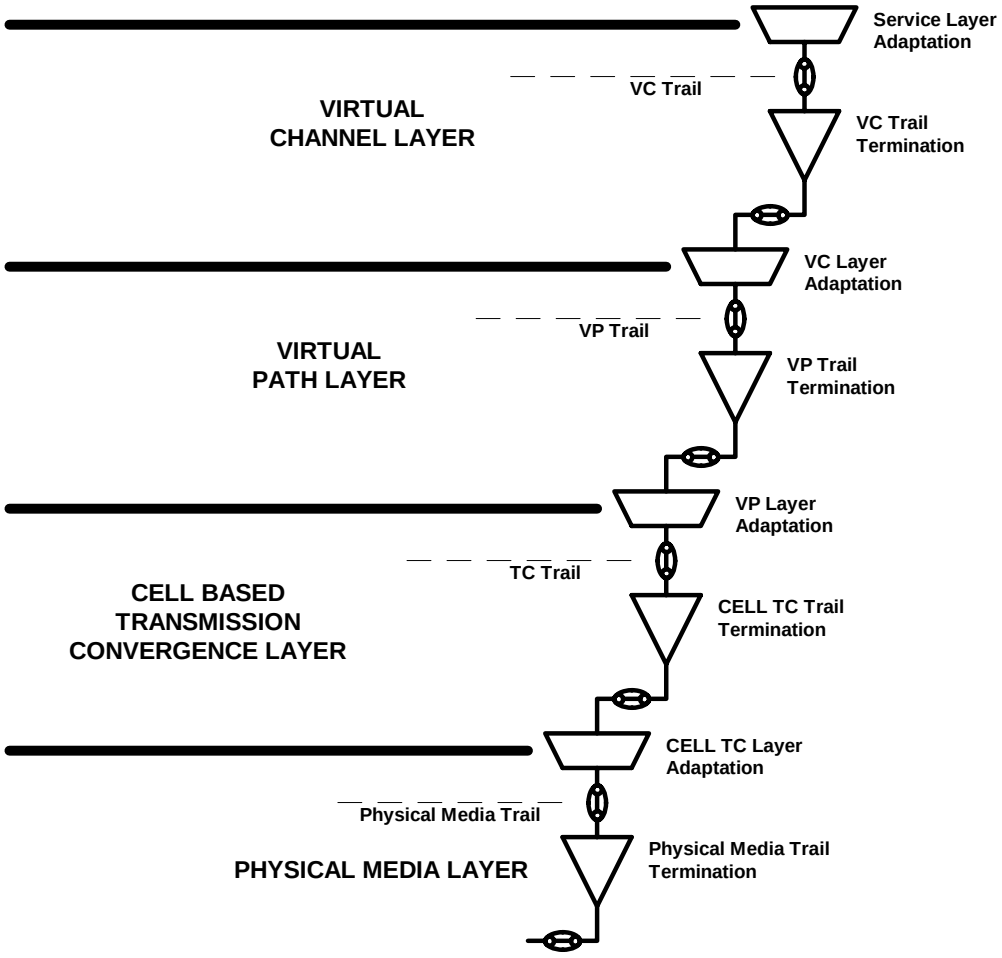


Figure C.2: Functional architecture for ATM on a cell based Interface

As for the SDH case, the lowest layer of the functional architecture is the physical media layer. At the sink terminations of this layer the incoming interface signal (which may be optical or electrical) is converted into an internal logic level and timing is recovered. A loss of incoming signal will typically result in a LOS alarm being raised. At the source terminations of this layer the internal logic level signals are converted into outgoing interface signals. An alarm may be raised if a transmit component such as a transmit laser fails. Alarms raised at the physical media layer may result in F1 OAM layer flows in the client layer.

The cell based transmission convergence layer is the client layer which is served by the physical media layer. The sink terminations of this layer perform the adaptation to the higher ATM layers from the media layer, whereas the source terminations perform the adaptation to the media layer from the higher ATM layers. Loss of F1 PL-OAM cells and degraded performance can give rise to alarms, warnings and F1 OAM flows. The loss of F3 PL-OAM cells, loss of cell delineation, uncorrectable header errors, degraded header error performance and the detection of too many IDLE ATM cells can give rise to warnings, alarms, and F3 OAM flows. The terminations of this layer ensure that no IDLE cells, F1 PL-OAM cells or F3 PL-OAM cells are passed to its client layer.

C.3 Higher ATM layers

The higher ATM layers are common to both SDH based interfaces and cell based interfaces. The virtual path layer is the client which is served by the appropriate transmission convergence layer. The sink terminations of this layer ensure that none of the VP overhead (VCI =3 and VCI=4) which supports the F4 layer OAM flows are passed onto its client layer. The terminations at this layer correspond to the endpoints of ATM VPCs.

The virtual channel layer is the client which is served by the virtual path layer. The sink terminations of this layer ensure that none of the VC overhead (PTI=4 and PTI=5) which supports the F5 layer OAM flows are passed onto its client layer. The terminations at this layer correspond to the endpoints of ATM VCCs.

Annex D (informative): Point-to-multipoint connections

See Appendix I of ITU-T Recommendation Q.824.6 [15] for the entire content of this annex.

Annex E (informative): Bibliography

See Appendix II of ITU-T Recommendation Q.824.6 [15] for the entire content of this annex.

History

Document history				
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