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Technical Specification

**Telecommunications Management Network (TMN);
Information models and protocols for the management and
control of the Asynchronous Transfer Mode (ATM)
switching network element;
Part 2: Enhanced broadband switch management**



Reference

DTS/TMN-ASM006

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Telecommunications Management Network (TMN).

The present document is part 2 of a multi-part deliverable covering the Information models and protocols for the management and control of the Asynchronous Transfer Mode (ATM) switching network element, as identified below:

EN 301 064-1: "Q3 interface specification";

TS 101 064-2: "Enhanced broadband switch management".

1 Scope

The present document specifies the Q3 interface between an ATM switch with enhanced functionality and the Telecommunications Management Network (TMN). 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].

The scope of the present document includes the management of switched VPs as defined in ITU-T Recommendations Q.2766.1 [10] and Q.2934 [12] and of soft PVCs as defined in ITU-T Recommendation Q.2767.1 [11]. The associated management for customer administration and for call routing is also within the scope of the present document. The object model in the present document is based on and extends the model in ITU-T Recommendation Q.824.6 [9].

The definition of the functionality of TMN Operations Systems is outside the scope of the present document. Security management is also outside the scope of the present document.

Existing protocols are used where possible, and the focus of the work is on defining the object model.

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] ITU-T Recommendation G.773 (1993): "Protocol suites for Q-interfaces for management of transmission systems".
- [2] ITU-T Recommendation G.784 (1999): "Synchronous digital hierarchy (SDH) management".
- [3] ITU-T Recommendation I.311 (1996): "B-ISDN general network aspects".
- [4] ITU-T Recommendation I.610 (1999): "B-ISDN operation and maintenance principles and functions".
- [5] ITU-T Recommendation M.3010 (2000): "Principles for a telecommunications management network".
- [6] ITU-T Recommendation M.3100 (1995): "Generic network information model".
- [7] ITU-T Recommendation Q.811 (1997): "Lower layer protocol profiles for the Q3 and X interfaces".
- [8] ITU-T Recommendation Q.812 (1997): "Upper layer protocol profiles for the Q3 and X interfaces".
- [9] ITU-T Recommendation Q.824.6 (1998): "Stage 2 and stage 3 description for the Q3 interface - Customer administration: Broadband switch management".
- [10] ITU-T Recommendations Q.2766.1 (1998): "Switched virtual path capability".
- [11] ITU-T Recommendations Q.2767.1 (2000): "Soft PVC capability".
- [12] ITU-T Recommendations Q.2934 (1998): "Digital subscriber signalling system No. 2 - Switched virtual path capability".

3 Definitions, abbreviations and conventions

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the referenced ITU-T Recommendations and the following apply:

permanent VCC: virtual circuit connection which is established by configuration management, not by on-demand call control

soft PVC: connection which is provisioned via management at the soft PVC Calling Endpoint (at the source interface) and established by signalling procedures across a network to the soft PVC Called Endpoint (at the destination interface)

virtual channel trail: VCC in standard ATM terminology

virtual channel trail termination point: end point of a VCC which marks the extremity of an end-to-end F5 OAM flow

virtual channel connection termination point: intermediate point of a VCC which may mark the extremity of a segment F5 OAM flow

virtual path trail: VPC in standard ATM terminology

virtual path trail termination point: end point of a VPC which marks the extremity of an end-to-end F4 OAM flow

virtual path connection termination point: intermediate point of a VPC which may mark the extremity of a segment F4 OAM flow

F4 OAM flow: See ITU-T Recommendation I.610 [4].

F5 OAM flow: See ITU-T Recommendation I.610 [4].

Soft PVC Called Endpoint: See ITU-T Recommendation Q.2767.1 [11].

Soft PVC Calling Endpoint: See ITU-T Recommendation Q.2767.1 [11].

Trail Termination Point: See ITU-T Recommendation M.3100 [6].

Virtual Channel: See ITU-T Recommendation I.311 [3].

Virtual Channel Connection: See ITU-T Recommendation I.311 [3].

Virtual Path: See ITU-T Recommendation I.311 [3].

Virtual Path Connection: See ITU-T Recommendation I.311 [3].

3.2 Abbreviations

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

ASN.1	Abstract Syntax Notation One
ATM	Asynchronous Transfer Mode
GDMO	Guidelines for the Definition of Managed Objects
MIB	Management Information Base
MOC	Managed Object Class
NNI	Network-Network Interface
OAM	Operations, Administration, and Maintenance
PVC	Permanent Virtual Connection
PVCC	Permanent Virtual Channel Connection
PVPC	Permanent Virtual Path Connection
SDH	Synchronous Digital Hierarchy
TMN	Telecommunications Management Network

TTP	Trail Termination Point
UNI	User-Network Interface
VC	Virtual Channel
VCC	Virtual Channel Connection
VCI	Virtual Channel Identifier
VP	Virtual Path
VPC	Virtual Path Connection
VPCI	Virtual Path Connection Identifier
VPI	Virtual Path Identifier

3.3 Conventions

Objects and their characteristics and associated ASN.1 defined here are given names with capitals used to indicate the start of the next word and acronyms are treated as if they were words.

Throughout the present document, all new attributes are named according to the following guidelines:

- The name of an attribute ends in the string "Ptr" if and only if the attribute value is intended to identify a single object.
- The name of an attribute ends in the string "PtrList" if and only if the attribute value is intended to identify one or more objects.
- The name of an attribute is composed of the name of an object class followed by the string "Ptr" if and only if the attribute value is intended to identify a specific object class.
- If an attribute is intended to identify different object classes, a descriptive name is given to that attribute and a description is provided in the attribute behaviour.
- The name of an attribute ends in the string "Id" if and only if the attribute value is intended to identify the name of an object, in which case this attribute should be the first one listed, should use ASN.1 NameType and should not be used to convey other information.
- The name of an attribute is composed of the name of an object class followed by the string "Id" if and only if the attribute value is intended to identify the name of the object class holding that attribute.

4 General overview

The following information model diagrams have been drawn for the purpose of clarifying the relations between the different object classes of the model.

- 1) Entity Relationship Models showing the relations of the different managed objects.
- 2) Inheritance Hierarchy showing how managed objects are derived from each other (i.e. the different paths of inherited characteristics of the different managed objects).

These diagrams are only for clarification. The formal specification in terms of GDMO templates and ASN.1 type definitions are the relevant information for implementations.

4.1 Entity-relationship models

The following conventions are used in the diagrams (see figure 1):

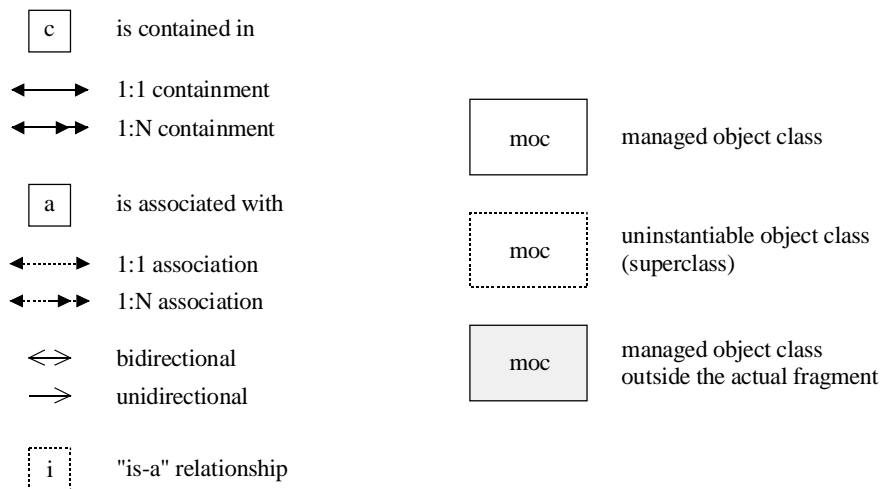


Figure 1: Conventions used in diagrams for Entity-relationship models

Where the directionality of containment is not clear it can be identified by implications since the root class is unique.

4.1.1 Entity relationship diagram for the switched virtual paths

See figure 2.

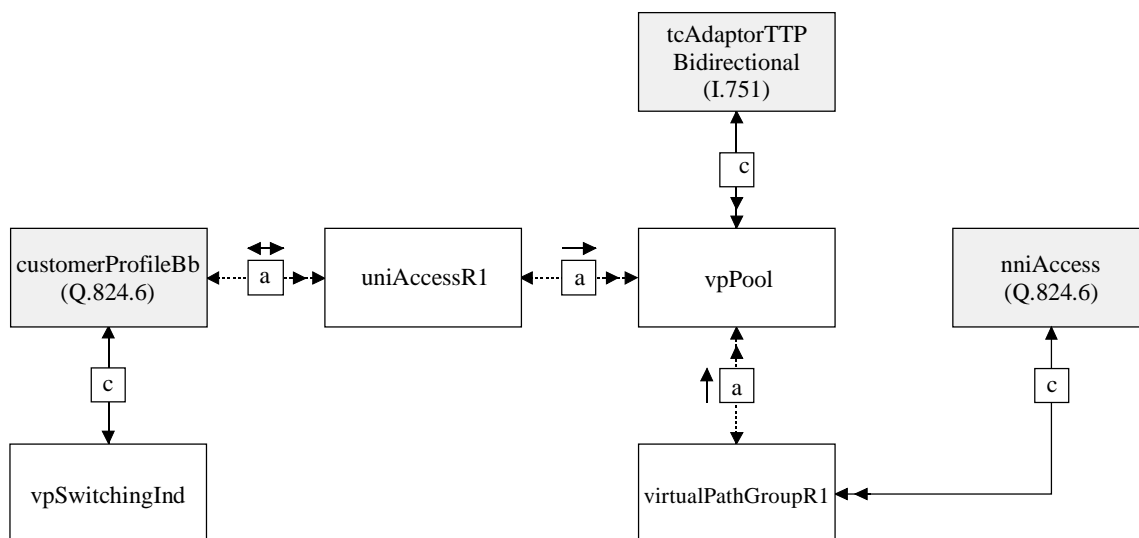


Figure 2: Entity relationship diagram for the switched virtual paths

4.1.2 Entity relationship diagram for the soft PVCs

See figure 3.

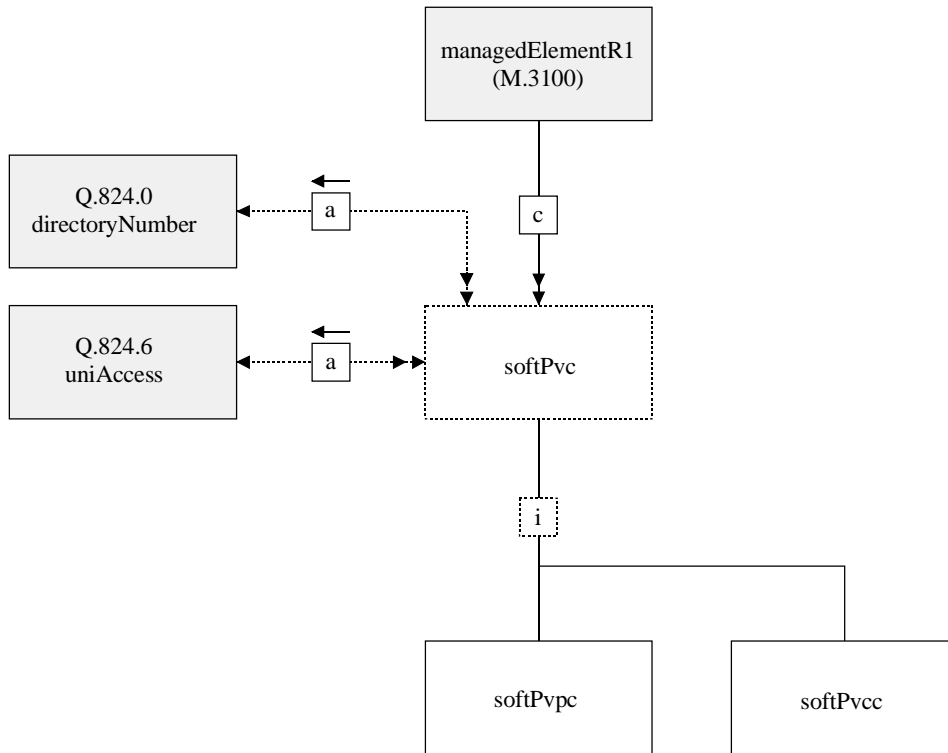


Figure 3: Entity relationship diagram for the soft PVCs

4.2 Inheritance hierarchy

See figure 4.

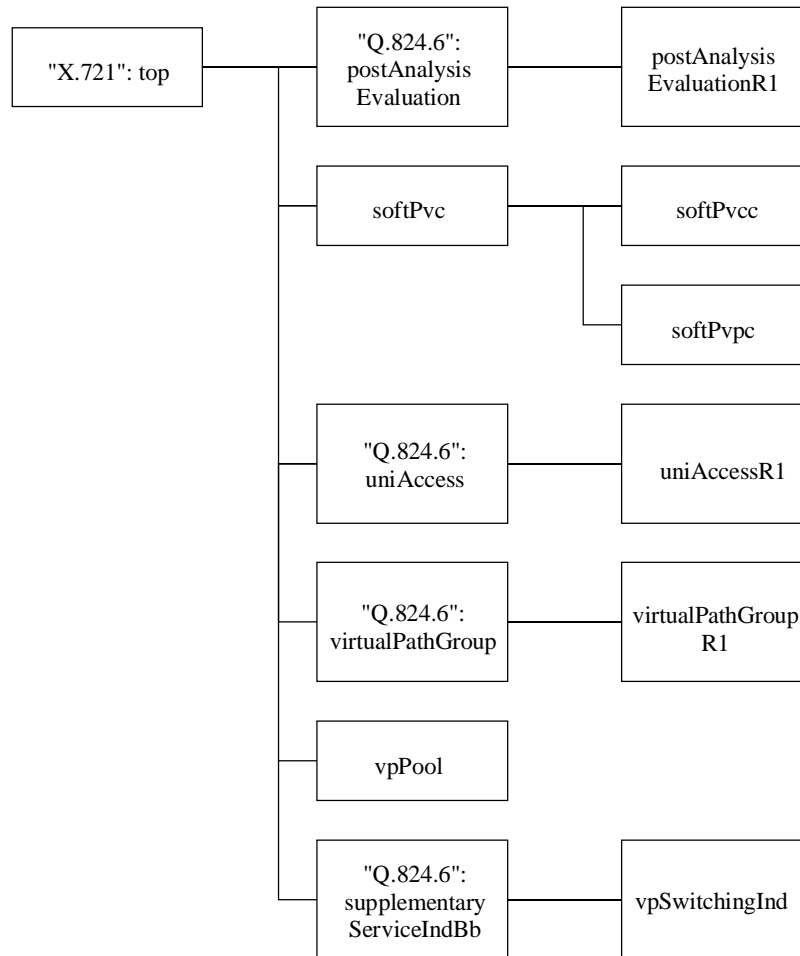


Figure 4: Inheritance hierarchy

5 Formal object class definitions

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

Formal definitions are shown in annex B.

6 Type definitions

Type definitions are shown in clause B.5.

7 Protocol stacks

The protocol stacks specified in ITU-T Recommendations Q.811 [7], Q.812 [8], G.773 [1] and the SDH digital cross-connect part of ITU-T Recommendation G.784 [2] can be used as part of the protocol stack for the present document.

Annex A (normative): Management requirements

A.1 Management requirements for switched virtual paths

VP Pools

To support VP switching at a physical interface, a part of the bandwidth of the interface and one or more VPI ranges need to be reserved for switched VPs. A range of VPIs together with a bandwidth reserved for switched VPs using these VPIs is called a VP pool.

VPC Pools

Before VP switching can take place, VP pools need to be associated with signalling interfaces and VPCIs need to be assigned to the VPI values. From a management perspective, a VPC Pool is a VP Pool which is associated with a signalling access and which has a VPCI range assigned to the VPI range. See ITU-T Recommendation Q.2766.1 [10] for VPC Pools.

Propagation Delay

The accumulation of propagation delay needs to be supported. The expected propagation delay should be provided for each VP Pool.

Blocking Procedures

The blocking procedures described in section 4.3 of ITU-T Recommendation Q.2766.1 [10] need to be supported at the management interface. It shall be possible to block and unblock VPC pools, to identify remotely blocked VPs and to identify whether maintenance signalling is running.

Subscription Option

According to ITU-T Recommendation Q.2934 [12] VP switching is a subscription option.

Routing Criterion

The support of switched VPs may be one of the criteria used to configure the selection of a route.

A.2 Management requirements for user-to-user soft PVCs

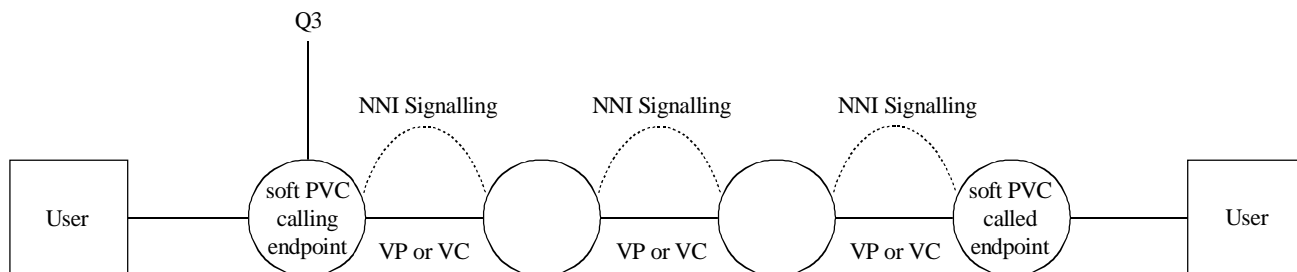


Figure A.1: Soft PVC Configuration

Two types of soft PVC are supported:

- soft permanent virtual path connection (PVPC); and
- soft permanent virtual channel connection (PVCC).

A user-to-user soft PVC is configured and established by management at the calling endpoint. There is no need for management action at the called endpoint.

For each soft PVC the following types of information need to be provided via the Q3 interface of the "calling endpoint" network element: information related to the calling party, information related to the called party, traffic descriptors, and information to support the re-establishment of soft PVCs.

Calling Party

The calling party is identified by the calling party number. In addition calling party VPCI and calling party VCI (for soft PVCCs only) need to be provided. As VPCIs are defined per signalling access, the signalling access needs to be identified.

Called party

The called party is identified by the called party number. Optionally called party VPCI and called party VCI (for soft PVCCs only) may be provided. The called party selection type determines the selection of VPCI (and VCI) at the soft PVC called endpoint, see ITU-T Recommendation Q.2767.1 [11].

Traffic descriptors

The traffic descriptors for the connection need to be provided via the Q3 interface.

Re-establishment of soft PVCs

To support the re-establishment of soft PVCs as described in section 6.5.1 and annex 1 of ITU-T Recommendation Q.2767.1 [11], configuration of retry limit and retry interval needs to be supported at the Q3 interface.

The decision whether or not the network element attempts to re-establish the soft PVCs depends on the cause value, i.e. on the reason of the failure. It is a fault management requirement that this information is available at the Q3 interface.

Annex B (informative): Referenced definitions

This annex contains the referenced GDMO and ASN.1 definitions from ITU-T Recommendation Q.824.7.

B.1 Object classes

This clause 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.

Unidirectional trails are modelled by bidirectional objects with the traffic descriptor in the unused direction set to a null value.

All of the instantiable classes that are defined in ITU-T Recommendation I.751 may be instantiated.

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

- managedElementR1.

All of the instantiable classes defined in ITU-T Recommendation Q.824.6 [9] may be instantiated.

The following defined in ITU-T Recommendation X.721 may be instantiated:

- log.

B.1.1 Profiling notes for imported classes

No profiling notes are required.

B.1.2 Definition of classes

B.1.2.1 postAnalysisEvaluationR1 (post analysis evaluation revision 1)

```
postAnalysisEvaluationR1 MANAGED OBJECT CLASS
  DERIVED FROM "ITU-T Q.824.6":postAnalysisEvaluation;
  CHARACTERIZED BY
    postAnalysisEvaluationR1Pkg PACKAGE
      BEHAVIOUR postAnalysisEvaluationR1Beh;
  ATTRIBUTES
    switchingModes
      DEFAULT VALUE Q824-7Asn1Module.switchingModesDefault
      GET-REPLACE;;;
REGISTERED AS {q824-7ManagedObjectClass 1};

postAnalysisEvaluationR1Beh BEHAVIOUR
  DEFINED AS
    "This subclass of postAnalysisEvaluation is enhanced to support VP switching.";
```

B.1.2.2 softPvc (soft PVC)

```
softPvc MANAGED OBJECT CLASS
  DERIVED FROM "Rec. X.721| ISO/IEC 10165-2": top;
  CHARACTERIZED BY
    "ITU-T M.3100": attributeValueChangeNotificationPackage,
    "ITU-T M.3100": stateChangeNotificationPackage,
    "ITU-T M.3100": createDeleteNotificationsPackage,
  softPvcPkg PACKAGE
    BEHAVIOUR softPvcBeh;
```

```

ATTRIBUTES
    softPvcId
        GET
        SET-BY-CREATE,
    "Rec. X.721|ISO/IEC-10165-2": administrativeState
        GET-REPLACE,
    "Rec. X.721|ISO/IEC-10165-2": operationalState
        GET
        SET-BY-CREATE,
    calledPartyNumber
        GET
        SET-BY-CREATE,
    calledPartySelectionType
        GET
        SET-BY-CREATE,
    softPvcCause
        GET;;;
CONDITIONAL PACKAGES
    atmTrafficDescriptorPtrPkg
        PRESENT IF "supplied by the managing system",
    uniAccessPtrPkg
        PRESENT IF "instance is associated with a 'uniAccess' object instance",
    callingPartyVpciPkg
        PRESENT IF "supplied by the managing system",
    callingPartyNumberPtrPkg
        PRESENT IF "supplied by the managing system",
    calledPartyVpciPkg
        PRESENT IF "supplied by the managing system",
    retryPkg
        PRESENT IF "supplied by the managing system";
REGISTERED AS {q824-7ManagedObjectClass 2};

softPvcBeh BEHAVIOUR
    DEFINED AS
        "The 'softPvc' object class (SPVC = Soft Permanent Virtual Connection) is a class of managed
objects that delimit virtual channel (VC) or virtual path (VP) connections.
        The softPvc class is not instantiated, but serves as a superclass from which specialized
subclasses are derived and instantiated. These represent either VC or VP connections.
        Management operations are limited to the network element where the originating side of
the SPVC is located.
        For the 'administrativeState' attribute only the values locked and unlocked shall be
used.
        If the attribute 'calledPartySelectionType' has the value requiredValue, then the
package 'calledPartyVpciPkg' must be present.
        The calling party number at the originating UNI shall be one of the directory numbers
assigned to this access, that is the object referenced by the callingPartyDirectoryNumberPtr must be
associated with the object referenced by the uniAccessPtr.
        The administrative state attribute may be used to establish ('unlocked') and release
('locked') the soft PVC.";

```

B.1.2.3 softPvcc (soft PVCC)

```

softPvcc MANAGED OBJECT CLASS
    DERIVED FROM softPvc;
    CHARACTERIZED BY
        softPvccPkg PACKAGE
            BEHAVIOUR softPvccBeh;;;
    CONDITIONAL PACKAGES
        callingPartyVciPkg
            PRESENT IF "supplied by the managing system",
        calledPartyVciPkg
            PRESENT IF "supplied by the managing system";
REGISTERED AS {q824-7ManagedObjectClass 3};

softPvccBeh BEHAVIOUR
    DEFINED AS
        "The 'softPvcc' object class is an instantiable subclass of the 'softPvc' managed object
class that delimits virtual channel (VC) connections.
        If the attribute 'calledPartySelectionType' has the value requiredValue, then the
package 'calledPartyVciPkg' must be present.
        The VPCI used by the soft PVCC at the originating UNI shall be one of the VPCIs assigned
to this access, that is the callingPartyVpci has to be one of the VPCIs assigned to the associated
uniAccess (referenced by the uniAccessPtr) in its tpAndVpciSigPtrList attribute.";

```

B.1.2.4 softPvpc (soft PVPC)

```
softPvpc MANAGED OBJECT CLASS
  DERIVED FROM softPvc;
  CHARACTERIZED BY
    softPvpcPkg PACKAGE
      BEHAVIOUR softPvpcBeh;;;
REGISTERED AS {q824-7ManagedObjectClass 4};
```

```
softPvpcBeh BEHAVIOUR
  DEFINED AS
    "The 'softPvpc' object class is an instantiable subclass of the 'softPvc' managed object
    class that delimits virtual path (VP) connections.
    The VPCI used by the soft PVPC at the originating UNI shall be one of the VPCIs assigned
    to this access, that is the callingPartyVpci has to be one of the VPCIs assigned to the associated
    uniAccessR1 (referenced by the uniAccessPtr) in its vpPoolAndVpciPtrList attribute.";
```

B.1.2.5 uniAccessR1 (UNI access revision 1)

```
uniAccessR1 MANAGED OBJECT CLASS
  DERIVED FROM "ITU-T Q.824.6":uniAccess;
  CHARACTERIZED BY
    uniAccessR1Pkg PACKAGE
      BEHAVIOUR uniAccessR1Beh;
      ATTRIBUTES
        vpPoolAndVpciPtrList
          GET-REPLACE ADD-REMOVE;;;
REGISTERED AS {q824-7ManagedObjectClass 5};
```

```
uniAccessR1Beh BEHAVIOUR
  DEFINED AS
    "This subclass of uniAccess represents a UNI access which supports VP switching.
    The vpPoolAndVpciPtrList attribute identifies the VPCI ranges that may be used at this
    uniAccessR1. A VPCI range is associated with each VPI range. Within a uniAccessR1, VPCIs and VPCI
    ranges assigned through the tpAndVpciSigPtrList and vpPoolAndVpciPtrList attributes must not
    overlap.
    Associated signalling does not apply when supporting switched virtual paths. Thus for
    instances of this class that support VP switching the signallingChannelPtrPkg (inherited from
    uniAccess) must be present and the sigChannel components of the tpAndVpciSigPtrList attribute
    (inherited from uniAccess) must be empty.";
```

B.1.2.6 virtualPathGroupR1 (virtual path group revision 1)

```
virtualPathGroupR1 MANAGED OBJECT CLASS
  DERIVED FROM "ITU-T Q.824.6":virtualPathGroup;
  CHARACTERIZED BY
    virtualPathGroupR1Pkg PACKAGE
      BEHAVIOUR virtualPathGroupR1Beh;
      ATTRIBUTES
        vpPoolAndVpciPtrList
          GET-REPLACE ADD-REMOVE;;;
REGISTERED AS {q824-7ManagedObjectClass 6};
```

```
virtualPathGroupR1Beh BEHAVIOUR
  DEFINED AS
    "This subclass of virtualPathGroup represents a virtual path group which supports VP
    switching.";
```

B.1.2.7 vpPool (VP pool)

```
vpPool MANAGED OBJECT CLASS
  DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":top;
  CHARACTERIZED BY
    "ITU-T M.3100": attributeValueChangeNotificationPackage,
    "ITU-T M.3100": stateChangeNotificationPackage,
    "ITU-T M.3100": createDeleteNotificationsPackage,
    "Rec. X.721|ISO/IEC 10165-2":administrativeStatePackage,
    vpPoolPkg PACKAGE
      BEHAVIOUR vpPoolBeh;
      ATTRIBUTES
        vpPoolId
          GET
          SET-BY-CREATE,
```



```

    vpiRange
        GET-REPLACE,
    egressBandwidth
        GET-REPLACE,
    ingressBandwidth
        GET-REPLACE;;;
CONDITIONAL PACKAGES
    "ITU-T Q.824.6": blockedForMaintenancePkg
        PRESENT IF "supplied by the managing system",
    "ITU-T Q.824.6": maintenanceSignallingRunningPkg
        PRESENT IF "supplied by the managing system",
    "ITU-T Q.824.6": propagationDelayPkg
        PRESENT IF "supplied by the managing system",
    "ITU-T Q.824.6": remoteBlockingPkg
        PRESENT IF "supplied by the managing system";
REGISTERED AS {q824-7ManagedObjectClass 7};

vpPoolBeh BEHAVIOUR
    DEFINED AS
        "This managed object represents a pool of bandwidth and VPI values available for VP
switching.

        The vpiRange attribute reserves a range of VPIs for switched VPs at an interface. This
range of VPIs must not overlap with ranges reserved for switched VPs by other vpPool instances
within the same tcAdaptorTTPBidirectional, and it must not contain a VPI used by a
vpCTPBidirectional for a VP established by management within the same tcAdaptorTTPBidirectional.

        The egress and ingress bandwidth attributes are used to reserve bandwidth that may be
used exclusively for switched VPs within the pool (i.e. using the VPIs within this pool).

        The attributeValueChangeNotification need not be sent for the
maintenanceSignallingRunning attribute.";

```

B.1.2.8 vpSwitchingInd (VP switching independent)

```

vpSwitchingInd MANAGED OBJECT CLASS
    DERIVED FROM "ITU-T Q.824.6":supplementaryServiceIndBb;
    CHARACTERIZED BY
        vpSwitchingIndPkg PACKAGE
            BEHAVIOUR vpSwitchingIndBeh;;;

REGISTERED AS {q824-7ManagedObjectClass 8};

vpSwitchingIndBeh BEHAVIOUR
    DEFINED AS
        "This subscription option enables VP switching for a user.
        Only one object of this class shall be contained within the superior managed object. ";

```

B.2 Name bindings

B.2.1 softPvc-managedElementR1

```

softPvc-managedElementR1 NAME BINDING
    SUBORDINATE OBJECT CLASS
        softPvc AND SUBCLASSES;
    NAMED BY SUPERIOR OBJECT CLASS
        "ITU-T M.3100": managedElementR1 AND SUBCLASSES;
    WITH ATTRIBUTE softPvcId;
    CREATE
        WITH-AUTOMATIC-INSTANCE-NAMING;
    DELETE
        ONLY-IF-NO-CONTAINED-OBJECTS;
REGISTERED AS {q824-7NameBinding 1};

```

B.2.2 vpPool-tcAdaptorTTPBidirectional

```

vpPool-tcAdaptorTTPBidirectional NAME BINDING
    SUBORDINATE OBJECT CLASS vpPool
        AND SUBCLASSES;
    NAMED BY SUPERIOR OBJECT CLASS "ITU-T Rec. I.751":tcAdaptorTTPBidirectional
        AND SUBCLASSES;
    WITH ATTRIBUTE vpPoolId;
    CREATE

```

```

WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE
ONLY-IF-NO-CONTAINED-OBJECTS;
REGISTERED AS {q824-7NameBinding 2};

```

B.3 Definition of packages

B.3.1 atmTrafficDescriptorPtrPkg (ATM traffic descriptor pointer package)

```

atmTrafficDescriptorPtrPkg PACKAGE
  ATTRIBUTES
    atmTrafficDescriptorPtr
      GET-REPLACE;
REGISTERED AS {q824-7Package 1};

```

B.3.2 calledPartyVciPkg (called party VCI package)

```

calledPartyVciPkg PACKAGE
  ATTRIBUTES
    calledPartyVci
      GET
      SET-BY-CREATE;
REGISTERED AS {q824-7Package 2};

```

B.3.3 calledPartyVpciPkg (called party VPCI package)

```

calledPartyVpciPkg PACKAGE
  ATTRIBUTES
    calledPartyVpci
      GET
      SET-BY-CREATE;
REGISTERED AS {q824-7Package 3};

```

B.3.4 callingPartyNumberPtrPkg (calling party number pointer package)

```

callingPartyNumberPtrPkg PACKAGE
  ATTRIBUTES
    callingPartyDirectoryNumberPtr
      GET
      SET-BY-CREATE;
REGISTERED AS {q824-7Package 4};

```

B.3.5 callingPartyVciPkg (calling party VCI package)

```

callingPartyVciPkg PACKAGE
  ATTRIBUTES
    callingPartyVci
      GET
      SET-BY-CREATE;
REGISTERED AS {q824-7Package 5};

```

B.3.6 callingPartyVpciPkg (calling party VPCI package)

```

callingPartyVpciPkg PACKAGE
  ATTRIBUTES
    callingPartyVpci
      GET
      SET-BY-CREATE;
REGISTERED AS {q824-7Package 6};

```

B.3.7 retryPkg (retry package)

```

retryPkg PACKAGE
  ATTRIBUTES
    retryLimit
      GET
      SET-BY-CREATE,
    retryInterval
      GET
      SET-BY-CREATE;
REGISTERED AS {q824-7Package 7};

```

B.3.8 uniAccessPtrPkg (uni access pointer package)

```

uniAccessPtrPkg PACKAGE
  ATTRIBUTES
    uniAccessPtr
      GET
      SET-BY-CREATE;
REGISTERED AS {q824-7Package 8};

```

B.4 Definition of attributes

B.4.1 atmTrafficDescriptorPtr (ATM traffic descriptor pointer)

```

atmTrafficDescriptorPtr ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7AsnlModule.PointerOrNull;
  MATCHES FOR EQUALITY;
  BEHAVIOUR atmTrafficDescriptorPtrBeh;
REGISTERED AS {q824-7Attribute 1};

atmTrafficDescriptorPtrBeh BEHAVIOUR
  DEFINED AS
    "This attribute is used as a pointer to an instance of the traffic descriptor managed object
class.";

```

B.4.2 calledPartyNumber (called party number)

```

calledPartyNumber ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7AsnlModule.DirectoryNumber;
  MATCHES FOR EQUALITY;
  BEHAVIOUR calledPartyNumberBeh;
REGISTERED AS {q824-7Attribute 2};

calledPartyNumberBeh BEHAVIOUR
  DEFINED AS
    "This attribute specifies the directory number of the called party.";

```

B.4.3 calledPartySelectionType (called party selection type)

```

calledPartySelectionType ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7AsnlModule.CalledPartySelectionType;
  MATCHES FOR EQUALITY;
  BEHAVIOUR calledPartySelectionTypeBeh;
REGISTERED AS {q824-7Attribute 3};

calledPartySelectionTypeBeh BEHAVIOUR
  DEFINED AS
    "This attribute indicates whether the VPCI (if applicable also the VCI) for the called party
have to be used at the destination. In case of 'anyValue' the destination switch will choose VPCI
(if applicable also VCI) values. In case of 'requiredValue', the VPCI (if applicable also VCI)
values supplied by the managing system will be used. ";

```

B.4.4 calledPartyVci (called party VCI)

```
calledPartyVci ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.VciValue;
  MATCHES FOR EQUALITY;
  BEHAVIOUR calledPartyVciBeh;
REGISTERED AS {q824-7Attribute 4};

calledPartyVciBeh BEHAVIOUR
  DEFINED AS
    "This attribute specifies the VCI for the called party.";
```

B.4.5 calledPartyVpci (called party VPCI)

```
calledPartyVpci ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.VpciValue;
  MATCHES FOR EQUALITY;
  BEHAVIOUR calledPartyVpciBeh;
REGISTERED AS {q824-7Attribute 5};

calledPartyVpciBeh BEHAVIOUR
  DEFINED AS
    "This attribute specifies the VPCI for the called party.";
```

B.4.6 callingPartyDirectoryNumberPtr (calling party directory number pointer)

```
callingPartyDirectoryNumberPtr ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.ObjectInstance;
  MATCHES FOR EQUALITY;
  BEHAVIOUR callingPartyDirectoryNumberPtrBeh;
REGISTERED AS {q824-7Attribute 6};

callingPartyDirectoryNumberPtrBeh BEHAVIOUR
  DEFINED AS
    "This attribute is used as a pointer to an instance of a subclass of the 'directoryNumber'
managed object class which pertains to the calling party.";
```

B.4.7 callingPartyVci (calling party VCI)

```
callingPartyVci ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.VciValue;
  MATCHES FOR EQUALITY;
  BEHAVIOUR callingPartyVciBeh;
REGISTERED AS {q824-7Attribute 7};

callingPartyVciBeh BEHAVIOUR
  DEFINED AS
    "This attribute specifies the VCI for the calling party.";
```

B.4.8 callingPartyVpci (calling party VPCI)

```
callingPartyVpci ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.VpciValue;
  MATCHES FOR EQUALITY;
  BEHAVIOUR callingPartyVpciBeh;
REGISTERED AS {q824-7Attribute 8};

callingPartyVpciBeh BEHAVIOUR
  DEFINED AS
    "This attribute specifies the VPCI for the calling party.";
```

B.4.9 egressBandwidth (egress bandwidth)

```
egressBandwidth ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7AsnlModule.EgressBandwidth ;
  BEHAVIOUR egressBandwidthBeh;
REGISTERED AS {q824-7Attribute 9};

egressBandwidthBeh BEHAVIOUR
  DEFINED AS
    "This attribute describes the egress bandwidth reserved for the VP pool.";
```

B.4.10 ingressBandwidth (ingress bandwidth)

```
ingressBandwidth ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7AsnlModule.IngressBandwidth ;
  BEHAVIOUR ingressBandwidthBeh;
REGISTERED AS {q824-7Attribute 10};

ingressBandwidthBeh BEHAVIOUR
  DEFINED AS
    "This attribute describes the ingress bandwidth reserved for the VP pool.";
```

B.4.11 retryInterval (retry interval)

```
retryInterval ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7AsnlModule.RetryInterval;
  MATCHES FOR EQUALITY;
  BEHAVIOUR retryIntervalBeh;
REGISTERED AS {q824-7Attribute 11};

retryIntervalBeh BEHAVIOUR
  DEFINED AS
    "This attribute specifies the time (in sec) between two attempts to re-establish an SPVC
automatically.";
```

B.4.12 retryLimit (retry limit)

```
retryLimit ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7AsnlModule.RetryLimit;
  MATCHES FOR EQUALITY;
  BEHAVIOUR retryLimitBeh;
REGISTERED AS {q824-7Attribute 12};

retryLimitBeh BEHAVIOUR
  DEFINED AS
    "This attribute specifies the maximal number of attempts to re-establish an SPVC
automatically. After this number is reached no more re-establishment efforts will be made. However
a value of zero indicates that an infinite number of call attempts will be made.";
```

B.4.13 softPvcCause (soft PVC cause)

```
softPvcCause ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7AsnlModule.SoftPvcCause;
  MATCHES FOR EQUALITY;
  BEHAVIOUR softPvcCauseBeh;
REGISTERED AS {q824-7Attribute 13};

softPvcCauseBeh BEHAVIOUR
  DEFINED AS
    "This attribute is used to inform the operator of problems with SPVC establishment after
receiving an 'attributeValueChange' notification that contains this attribute in the component
'attributeIdentifierList' of its information syntax. Possible cause values contained in this
attribute are identical to those specified in
ITU-T recommendations Q.850, Q.2610 and Q.2767.1.";
```

B.4.14 softPvcId (soft PVC identifier)

```
softPvcId ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7AsnlModule.NameType ;
  MATCHES FOR EQUALITY;
  BEHAVIOUR softPvcIdBeh;
REGISTERED AS {q824-7Attribute 14};

softPvcIdBeh BEHAVIOUR
  DEFINED AS
    "This is the naming attribute of the object class 'softPvc' and subclasses." ;
```

B.4.15 switchingModes (switching modes)

```
switchingModes ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7AsnlModule.SwitchingModes;
  MATCHES FOR EQUALITY;
  BEHAVIOUR switchingModesBeh;
REGISTERED AS {q824-7Attribute 15};

switchingModesBeh BEHAVIOUR
  DEFINED AS
    "This attribute specifies if the managed object may be used for channel switching and/or
    path switching. At least one of the two modes (channelSwitching, pathSwitching) must have value
    TRUE." ;
```

B.4.16 uniAccessPtr (uni access pointer)

```
uniAccessPtr ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7AsnlModule.ObjectInstance;
  MATCHES FOR EQUALITY;
  BEHAVIOUR uniAccessPtrBeh;
REGISTERED AS {q824-7Attribute 16};

uniAccessPtrBeh BEHAVIOUR
  DEFINED AS
    "This attribute is used as a pointer to an instance of the 'uniAccess' managed object class
    or a subclass." ;
```

B.4.17 vpiRange (VPI range)

```
vpiRange ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7AsnlModule.VpiRange ;
  BEHAVIOUR vpiRangeBeh;
REGISTERED AS {q824-7Attribute 17};

vpiRangeBeh BEHAVIOUR
  DEFINED AS
    "This attribute describes the range of VPI values belonging to the VP pool." ;
```

B.4.18 vpPoolAndVpciPtrList (VP pool and VPCI pointer list)

```
vpPoolAndVpciPtrList ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7AsnlModule.VpPoolAndVpciPtrList ;
  MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;
  BEHAVIOUR vpPoolAndVpciPtrListBeh;
REGISTERED AS {q824-7Attribute 18};

vpPoolAndVpciPtrListBeh BEHAVIOUR
  DEFINED AS
    "This is a set-valued attribute whose value(s) point to instances of the vpPool managed
    object class or its subclasses. The bandwidth and VPIs represented by the vpPool instances are
    available for VP switching at the concerned access. A VPCI value is related to every pointer. This
    VPCI value determines the lower limit of the VPCI range for the VP pool. The upper limit is
    calculated from the lower limit and the VPI range of the pool." ;
```

B.4.19 vpPoolId (VP pool identifier)

```
vpPoolId ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.NameType ;
  MATCHES FOR EQUALITY;
  BEHAVIOUR vpPoolIdBeh;
REGISTERED AS {q824-7Attribute 19};

vpPoolIdBeh BEHAVIOUR
  DEFINED AS
    "This entity describes the object identifier attribute of the object class 'vpPool'." ;
```

B.5 Type definitions

```
Q824-7Asn1Module {
  itu-t(0) recommendation (0) q(17) ca(824) dot(127) ebs(7)
  q824-7informationModel(0) asn1Modules(2) asn1DefinedTypesModule(0)}

DEFINITIONS IMPLICIT TAGS ::=

BEGIN
-- EXPORTS everything

IMPORTS
  ObjectInstance
    FROM CMIP-1 {joint-iso-ccitt ms(9) cmip(1) modules(0) protocol(3)}

  VciValue
    FROM AtmMIBMod {itu-t(0) recommendation(0) i(9) atmm(751)
    informationModel(0) asn1Module(2) atm(0)}

  NameType,
  PointerOrNull
    FROM ASN1DefinedTypesModule {ccitt recommendation m 3100
    informationModel(0) asn1Modules(2) asn1DefinedTypesModule(0)}

  DirectoryNumber,
  VpciValue
    FROM ASN1DefinedTypesModule {itu-t(0) recommendation(0)
    q(17) 824(824) dot(127) bsm(6)
    informationModel(0) asn1Module(2) asn1TypeModule(0)} -- Q.824.6

; -- end of imports

-- start of object identifier definitions

q824-7InformationModel
OBJECT IDENTIFIER ::= {itu-t(0) recommendation (0) q(17) ca(824) dot(127) ebs(7) q824-
7InformationModel(0)}
q824-7StandardSpecificExtension
OBJECT IDENTIFIER ::= {q824-7informationModel q824-7StandardSpecificExtension(0)}
q824-7ManagedObjectClass
OBJECT IDENTIFIER ::= {q824-7informationModel q824-7ManagedObjectClass(3)}
q824-7Package
OBJECT IDENTIFIER ::= {q824-7informationModel q824-7Package(4)}
q824-7NameBinding
OBJECT IDENTIFIER ::= {q824-7informationModel q824-7NameBinding(6)}
q824-7Attribute
OBJECT IDENTIFIER ::= {q824-7informationModel q824-7Attribute(7)}
q824-7Action
OBJECT IDENTIFIER ::= {q824-7informationModel q824-7Action(9)}
q824-7Notification
OBJECT IDENTIFIER ::= {q824-7informationModel q824-7Notification(10)}

-- end of object identifier definitions

-- other ASN1 definitions in alphabetical order

CalledPartySelectionType ::= ENUMERATED {
  anyValue (0),
  requiredValue (1) }
```

```
EgressBandwidth ::= INTEGER

IngressBandwidth ::= INTEGER

RetryInterval ::= INTEGER(0..3600)

RetryLimit ::= INTEGER

SoftPvcCause ::= SEQUENCE {
    softPvcCauseIndication [0] SoftPvcCauseIndication,
    softPvcCauseValue      [1] SoftPvcCauseValue }

SoftPvcCauseIndication ::= ENUMERATED {
    noCause (0),      -- no failure detected
    firstCause (1),  -- failure detected, trying to re-establish
    lastCause (2) -- not or no longer attempting to re-establish
}

SoftPvcCauseValue ::= INTEGER (0..127)

SwitchingModes ::= SEQUENCE {
    channelSwitching    BOOLEAN,
    pathSwitching       BOOLEAN }

switchingModesDefault SwitchingModes ::= {
    channelSwitching    TRUE,
    pathSwitching       FALSE }

VpiRange ::= SEQUENCE {
    lowerLimit INTEGER,
    upperLimit INTEGER }

VpPoolAndVpciPtrList ::= SET OF SEQUENCE {
    vpPool      ObjectInstance,
    lowerVpciLimit VpciValue }

END -- of Q824-7AsnlModule
```

Annex C (informative): Bibliography

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ITU-T Recommendation I.327: "B-ISDN functional architecture".

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

ITU-T Recommendation X.721: "Information technology - Open Systems Interconnection: Structure of management information: definition of management information".

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

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

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

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

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ITU-T Recommendation X.738: "Information technology - Open Systems Interconnection - Systems management: Summarization Function".

ITU-T Recommendation X.739: "Information technology - Open Systems Interconnection - Systems management: Metric objects and attributes".

ITU-T Recommendation X.745: "Information technology - Open Systems Interconnection - Systems management: Test management function".

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History

Document history		
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