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SERIES Q: SWITCHING AND SIGNALLING

Q3 interface

Stage 2 and stage 3 description for the Q3 interface – Customer administration: Enhanced broadband switch management

ITU-T Recommendation Q.824.7

(Formerly CCITT Recommendation)

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For further details, please refer to the list of ITU-T Recommendations.

ITU-T Recommendation Q.824.7

Stage 2 and stage 3 description for the Q3 interface – Customer administration: Enhanced broadband switch management

Summary

This Recommendation 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.

The scope of this Recommendation includes the management of switched VPs as defined in ITU-T Recommendations Q.2766.1 and Q.2934 and of soft PVCs as defined in ITU-T Recommendation Q.2767.1.

Source

ITU-T Recommendation Q.824.7 was prepared by ITU-T Study Group 4 (1997-2000) and approved under the WTSC Resolution 1 procedure on 4 February 2000.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSC Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

ITU-T Recommendation Q.824.7

Stage 2 and stage 3 description for the Q3 interface – Customer administration: Enhanced broadband switch management

1 Purpose and Scope

This Recommendation 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 this Recommendation includes the management of switched VPs as defined in ITU-T Recommendations Q.2766.1 [8] and Q.2934 [11] and of soft PVCs as defined in ITU-T Recommendation Q.2767.1 [9]. The associated management for customer administration and for call routing is also within the scope of this Recommendation. The object model in this Recommendation is based on and extends the model in ITU-T Recommendation Q.824.6 [12].

The definition of the functionality of TMN Operations Systems is outside the scope of this Recommendation. Security management is also outside the scope of this Recommendation.

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

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

[1] ITU-T Recommendation I.311 (1996), *B-ISDN general network aspects*.

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

[3] ITU-T Recommendation I.610 (1999), *B-ISDN operation and maintenance principles and functions*.

[4] ITU-T Recommendation I.751 (1996), *Asynchronous transfer mode management of the network element view*.

[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 Recommendations Q.2761 (1999), Q.2762 (1999), Q.2763 (1999), Q.2764 (1999), *B-ISDN User Part (B-ISUP) of Signalling System No. 7*.

[8] ITU-T Recommendation Q.2766.1 (1998), *Switched virtual path capability*.

[9] ITU-T Recommendation Q.2767.1 (2000), *Soft PVC capability*.

[10] ITU-T Recommendation Q.2931 (1995), *Digital Subscriber Signalling System No. 2 – User-Network Interface (UNI) layer 3 specification for basic call/connection control*.

[11] ITU-T Recommendation Q.2934 (1998), *Digital subscriber signalling system No. 2 – Switched virtual path capability*.

[12] ITU-T Recommendation Q.824.6 (1998), *Broadband Switch Management*.

[13] CCITT Recommendation X.720 (1992) | ISO/IEC 10165-1:1992, *Information technology – Open Systems Interconnection – Structure of management information: Management information model*.

[14] CCITT Recommendation X.721 (1992) | ISO/IEC 10165-2:1992, *Information technology – Open Systems Interconnection – Structure of management information: Definition of management information*.

[15] CCITT Recommendation X.731 (1992) | ISO/IEC 10164-2:1992, *Information technology – Open Systems Interconnection – Systems management: State management function*.

[16] CCITT Recommendation X.732 (1992) | ISO/IEC 10164-3:1992, *Information technology – Open Systems Interconnection – Systems management: Attributes for representing relationships*.

3 Definitions, abbreviations and conventions

3.1 Definitions

This Recommendation defines the following terms:

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

3.1.2 soft PVC: A 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).

3.1.3 virtual channel trail: This corresponds to a VCC in standard ATM terminology.

3.1.4 virtual channel trail termination point: This corresponds to the end point of a VCC and marks the extremity of an end-to-end F5 OAM flow.

3.1.5 virtual channel connection termination point: This corresponds to an intermediate point of a VCC and may mark the extremity of a segment F5 OAM flow.

3.1.6 virtual path trail: This corresponds to a VPC in standard ATM terminology.

3.1.7 virtual path trail termination point: This corresponds to the end point of a VPC and marks the extremity of an end-to-end F4 OAM flow.

3.1.8 virtual path connection termination point: This corresponds to an intermediate point of a VPC and may mark the extremity of a segment F4 OAM flow.

In addition, this Recommendation uses terms defined in ITU-T Recommendations:

3.1.9 F4 OAM flow: See ITU-T I.610 [3].

3.1.10 F5 OAM flow: See ITU-T I.610 [3].

3.1.11 soft PVC called endpoint: See ITU-T Q.2767.1 [9].

3.1.12 soft PVC calling endpoint: See ITU-T Q.2767.1 [9].

3.1.13 trail termination point: See ITU-T M.3100 [6].

3.1.14 virtual channel: See ITU-T I.311 [1].

3.1.15 virtual channel connection: See ITU-T I.311 [1].

3.1.16 virtual path: See ITU-T I.311 [1].

3.1.17 virtual path connection: See ITU-T I.311 [1].

3.2 Abbreviations

This Recommendation uses the following abbreviations:

AAL	ATM Adaptation Layer
AIS	Alarm Indication Signal
ASN.1	Abstract Syntax Notation One
ATM	Asynchronous Transfer Mode
ERD	Entity Relationship Diagram
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
OS	Operations System
PVC	Permanent Virtual Connection
PVCC	Permanent Virtual Channel Connection
PVPC	Permanent Virtual Path Connection
RDI	Remote Defect Indication
RDN	Relative Distinguished Name
SDH	Synchronous Digital Hierarchy
SVP	Switched Virtual Path
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 this Recommendation, 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):

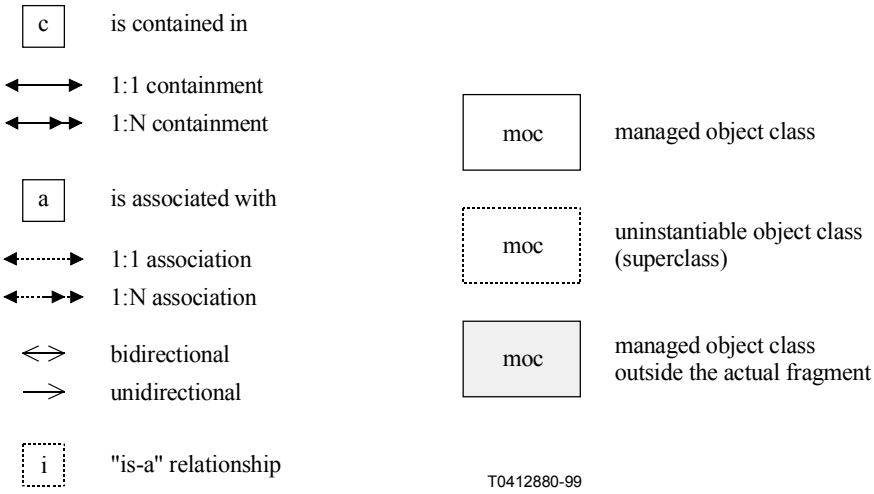

Figure 1/Q.824.7 – Conventions used in diagrams for Entity Relationship Models

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.

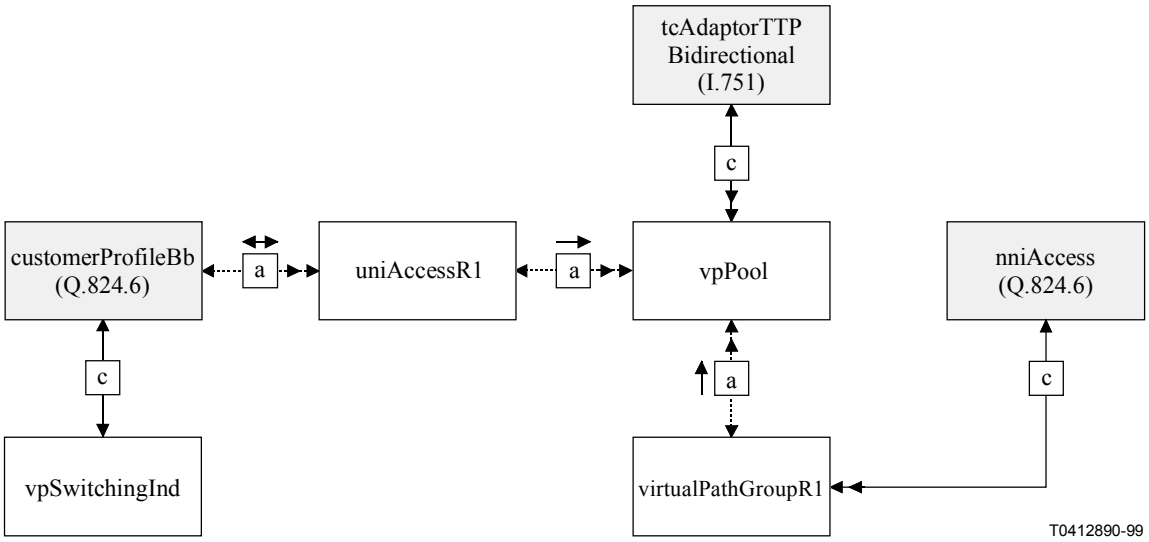

Figure 2/Q.824.7 – Entity relationship diagram – switched virtual paths

4.1.2 Entity relationship diagram for the soft PVCs

See Figure 3.

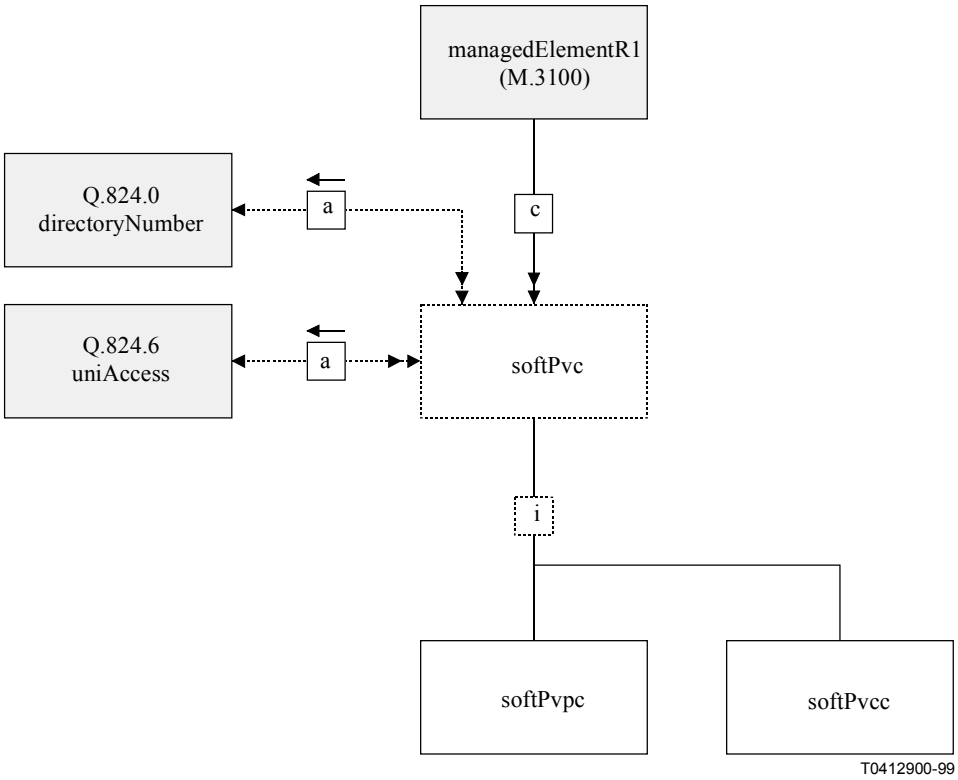

Figure 3/Q.824.7 – Entity relationship diagram – soft PVCs

4.2 Inheritance hierarchy

See Figure 4.

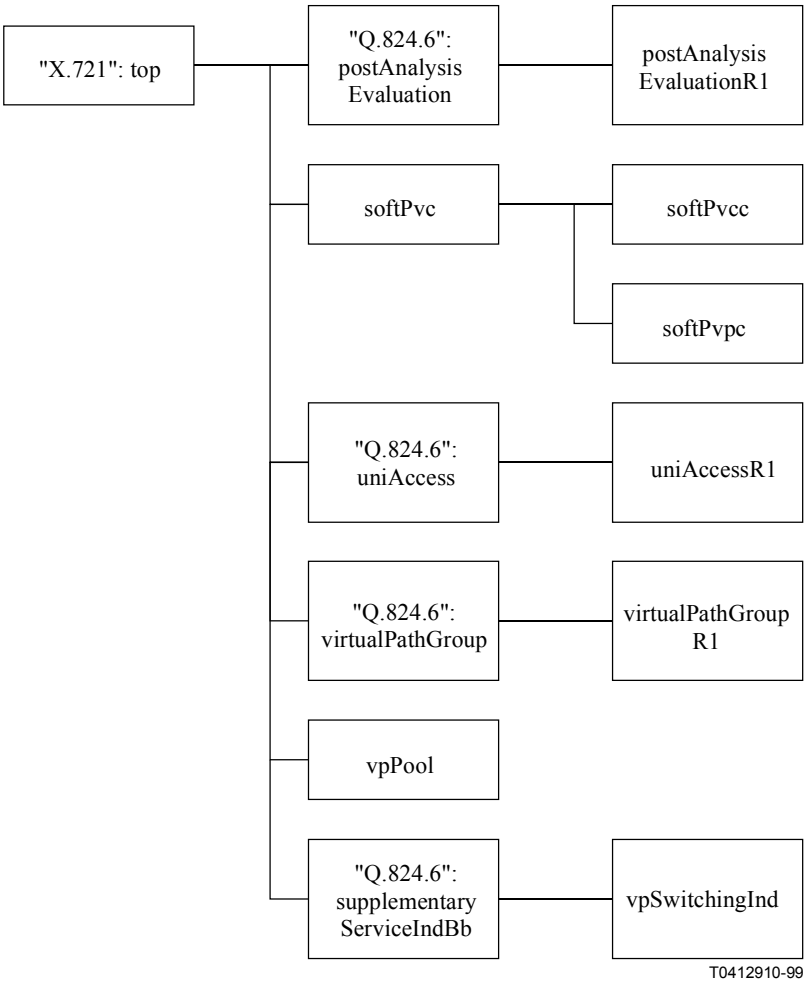

Figure 4/Q.824.7 – Inheritance hierarchy

5 Formal 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.

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 I.751 [4] may be instantiated.

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

- `managedElementR1.`

All of the instantiable classes that are defined in ITU-T Q.824.6 [12] may be instantiated.

The following class which is defined in ITU-T X.721 [14] may be instantiated:

– `log.`

5.1.1 Profiling notes for imported classes

No profiling notes are required.

5.1.2 Definition of classes

5.1.2.1 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.";
```

5.1.2.2 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.";

5.1.2.3 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.";

5.1.2.4 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.";
```

5.1.2.5 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.";
```

5.1.2.6 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.";
```

5.1.2.7 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.";
```

5.1.2.8 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. ";
```

5.2 Name bindings

5.2.1 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};
```

5.2.2 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};
```

5.3 Definition of packages

5.3.1 atmTrafficDescriptorPtrPkg (ATM traffic descriptor pointer package)

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

5.3.2 calledPartyVciPkg (called party VCI package)

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

5.3.3 calledPartyVpciPkg (called party VPCI package)

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

5.3.4 callingPartyNumberPtrPkg (calling party number pointer package)

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

5.3.5 callingPartyVciPkg (calling party VCI package)

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

5.3.6 callingPartyVpciPkg (calling party VPCI package)

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

5.3.7 retryPkg (retry package)

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

5.3.8 uniAccessPtrPkg (uni access pointer package)

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

5.4 Definition of attributes

5.4.1 atmTrafficDescriptorPtr (ATM traffic descriptor pointer)

```
atmTrafficDescriptorPtr ATTRIBUTE
    WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.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.";
```

5.4.2 calledPartyNumber (called party number)

```
calledPartyNumber ATTRIBUTE
    WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.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.";
```

5.4.3 calledPartySelectionType (called party selection type)

```
calledPartySelectionType ATTRIBUTE
    WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.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.
        ";
```

5.4.4 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.";
```

5.4.5 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.";
```

5.4.6 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.";
```

5.4.7 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.";
```

5.4.8 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.";
```

5.4.9 egressBandwidth (egress bandwidth)

```
egressBandwidth ATTRIBUTE
    WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.EgressBandwidth ;
    BEHAVIOUR egressBandwidthBeh;
REGISTERED AS {q824-7Attribute 9};

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

5.4.10 ingressBandwidth (ingress bandwidth)

```
ingressBandwidth ATTRIBUTE
    WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.IngressBandwidth ;
    BEHAVIOUR ingressBandwidthBeh;
REGISTERED AS {q824-7Attribute 10};

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

5.4.11 retryInterval (retry interval)

```
retryInterval ATTRIBUTE
    WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.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.";
```

5.4.12 retryLimit (retry limit)

```
retryLimit ATTRIBUTE
    WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.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.";
```

5.4.13 softPvcCause (soft PVC cause)

```
softPvcCause ATTRIBUTE
    WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.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.";
```

5.4.14 softPvcId (soft PVC identifier)

```
softPvcId ATTRIBUTE
    WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.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." ;
```

5.4.15 switchingModes (switching modes)

```
switchingModes ATTRIBUTE
    WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.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.";
```

5.4.16 uniAccessPtr (uni access pointer)

```
uniAccessPtr ATTRIBUTE
    WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.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.";
```

5.4.17 vpiRange (VPI range)

```
vpiRange ATTRIBUTE
    WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.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.";
```

5.4.18 vpPoolAndVpciPtrList (VP pool and VPCI pointer list)

```
vpPoolAndVpciPtrList ATTRIBUTE
    WITH ATTRIBUTE SYNTAX Q824-7Asn1Module.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.";
```

5.4.19 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'." ;
```

6 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 Q824-7Asn1Module
```

7 Protocol stacks

The protocol stacks specified in ITU-T Q.811, Q.812, G.773 and the SDH digital cross-connect part of ITU-T G.784 can be used as part of the protocol stack for this Recommendation. The following ITU-T Recommendations should be used to extend these stacks to include TM:

– Q.2811 Broadband Q3 and X interfaces – Lower Layer Protocols.

– Q.2812 Broadband Q3 and X interfaces – Upper Layer Protocols.

ANNEX A

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 Q.2766.1 [8] 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 4.3/Q.2766.1 [8] 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 Q.2934 [11] VP switching is a subscription option.

Routing criterium

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

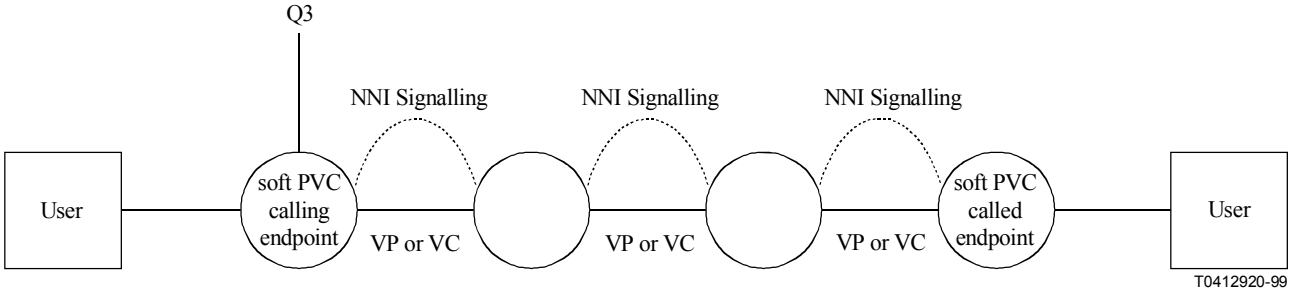

Figure A.1/Q.824.7 – Soft PVC Configuration

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 Q.2767.1 [9].

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 6.5.1 and Annex 1/Q.2767.1 [9], 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.

APPENDIX I

Bibliography

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APPENDIX II

Instantiation examples for switched VPs

Conventions

The following conventions are used in the example (see Figure II.1):

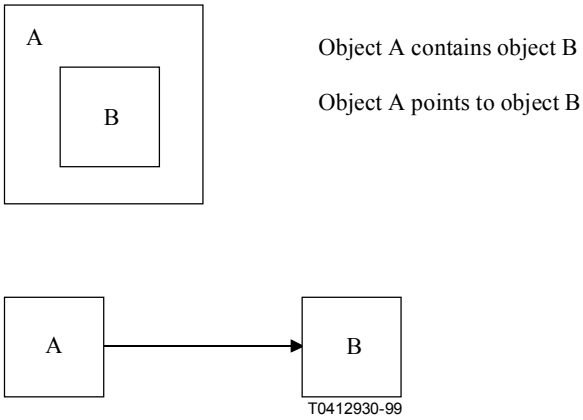
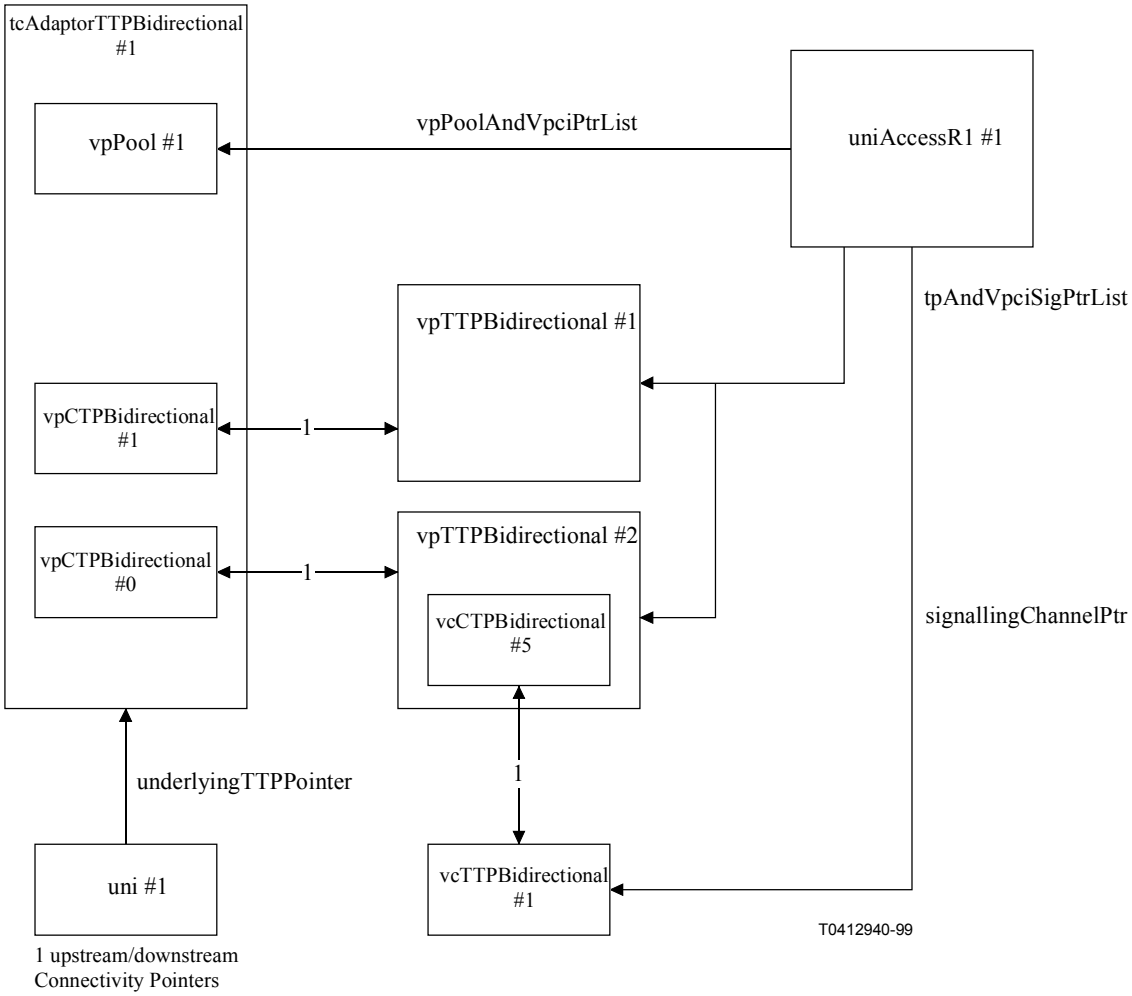


Figure II.1/Q.824.7 – Conventions

Object instances are labelled by their class name, followed by #, followed by their RDN. Pointers are labelled by their attribute names.

Instantiation Example of Managed Objects (Switched VPs at UNI)

In this example a user at a UNI has two permanent VPs (VPI = 0, VPI = 1) provided by management, while the vpPool object reserves bandwidth and a range of VPIs (not including 0 and 1) for VP switching. The vpPool is associated with the signalling access (uniAccess). See Figure II.2.



NOTE 1 – The use of #0 for the signalling VP and #5 for the signalling VC is deliberate so that the RDNs match the signalling VPI and VCI.

NOTE 2 – Not all (possible) managed objects are shown, e.g. the atmAccessProfile and the objet classes for customer administration are not shown.

Figure II.2/Q.824.7 – Instantiation example

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