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Specifications of Signalling System No. 7 – Q3 interface

Access management for V5

ITU-T Recommendation Q.831.1

(Formerly CCITT Recommendation)

ITU-T Q-SERIES RECOMMENDATIONS
SWITCHING AND SIGNALLING

SIGNALLING IN THE INTERNATIONAL MANUAL SERVICE	Q.1–Q.3
INTERNATIONAL AUTOMATIC AND SEMI-AUTOMATIC WORKING	Q.4–Q.59
FUNCTIONS AND INFORMATION FLOWS FOR SERVICES IN THE ISDN	Q.60–Q.99
CLAUSES APPLICABLE TO ITU-T STANDARD SYSTEMS	Q.100–Q.119
SPECIFICATIONS OF SIGNALLING SYSTEMS No. 4 AND No. 5	Q.120–Q.249
SPECIFICATIONS OF SIGNALLING SYSTEM No. 6	Q.250–Q.309
SPECIFICATIONS OF SIGNALLING SYSTEM R1	Q.310–Q.399
SPECIFICATIONS OF SIGNALLING SYSTEM R2	Q.400–Q.499
DIGITAL EXCHANGES	Q.500–Q.599
INTERWORKING OF SIGNALLING SYSTEMS	Q.600–Q.699
SPECIFICATIONS OF SIGNALLING SYSTEM No. 7	Q.700–Q.849
General	Q.700
Message transfer part (MTP)	Q.701–Q.709
Signalling connection control part (SCCP)	Q.711–Q.719
Telephone user part (TUP)	Q.720–Q.729
ISDN supplementary services	Q.730–Q.739
Data user part	Q.740–Q.749
Signalling System No. 7 management	Q.750–Q.759
ISDN user part	Q.760–Q.769
Transaction capabilities application part	Q.770–Q.779
Test specification	Q.780–Q.799
Q3 interface	Q.800–Q.849
DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1	Q.850–Q.999
PUBLIC LAND MOBILE NETWORK	Q.1000–Q.1099
INTERWORKING WITH SATELLITE MOBILE SYSTEMS	Q.1100–Q.1199
INTELLIGENT NETWORK	Q.1200–Q.1699
SIGNALLING REQUIREMENTS AND PROTOCOLS FOR IMT-2000	Q.1700–Q.1799
BROADBAND ISDN	Q.2000–Q.2999

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Access management for V5

Summary

This Recommendation specifies an ensemble for the access management of V5.

The management domain taken into account in this Recommendation is depicted in Figure 1 and covers:

- the provisioning of V5 based transport bearer services of an access network;
- the configuration of access network resources required for such services, and
- the coordination of element configuration between access network and service nodes.

This Recommendation covers management operations necessary for a transmission-technology independent management of narrowband transport bearer services (PSTN, ISDN and leased line) across V5 Service Port Functions. This includes the configuration and provisioning of both V5 based transport bearer services and their affected resources.

Source

ITU-T Recommendation Q.831.1 was prepared by ITU-T Study Group 4 (1997-2000) and approved under the WTSC Resolution 1 procedure on 4 February 2000.

FOREWORD

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CONTENTS

	Page
1 General information	1
1.1 Scope and purpose	1
1.2 References	1
1.3 Definitions and abbreviations	2
2 Management context	3
2.1 General introduction	3
2.2 Management view and level of abstraction	4
2.3 Resources	7
2.3.1 Major relationships	9
2.3.2 Service fragment	9
2.3.3 Topology fragment	10
2.3.4 Equipment and cabling fragment	11
2.3.5 Transport access network fragment	11
2.3.6 Digital section fragment	12
2.3.7 V5-based transport bearer service fragment	12
2.4 Functions	13
2.4.1 Functions over reference point a1	13
2.4.2 Functions over reference points a2 and a3	14
2.4.3 Functions over reference point a4	15
2.5 Other requirements	15
3 Management information model	15
3.1 Classes and relationships	15
3.1.1 Service fragment	16
3.1.2 Equipment fragment	17
3.1.3 Topology fragment	18
3.1.4 Transport access network fragment	19
3.1.5 Digital section fragment	20
3.1.6 V5 fragment	21
3.2 Scenarios	32
3.2.1 Scenarios over reference point a1	32
Annex A – Ensemble GDMO MOCS proformas	43
A.1 Managed objects	43
A.1.1 V5 transport bearer service fragment	43
A.1.2 equipment fragment	43
A.1.3 transmission fragment	43

	Page
A.1.4 topology fragment.....	43
A.1.5 digital section fragment	43
A.2 Selected managed object profiles.....	43
A.2.1 V5.1 interface	44
A.2.2 User ports.....	46

1 General information

1.1 Scope and purpose

This Recommendation specifies an ensemble for the access management of V5.

The management domain taken into account in this Recommendation is depicted in Figure 1 and covers:

- the provisioning of V5 based transport bearer services of an access network;
- the configuration of access network resources required for such a services; and
- the coordination of element configuration between access network and service nodes.

This Recommendation covers management operations necessary for a transmission-technology independent management of narrowband transport bearer services (PSTN, ISDN and leased line) across V5 Service Port Functions. This includes the configuration and provisioning of both V5 based transport bearer services and their affected resources.

The management of User Port Functions and Service Port Functions providing User Network Interface and Service Node Interface functionality, respectively, are considered in this Recommendation. Transmission specific resources lie outside its scope.

This Recommendation provides insights into the mapping of management services onto management operations across the specified reference points. Interactions with TMN support systems such as cable management are out of scope but are taken into account as data sources within the scenarios. The process flows illustrate the information required for service provisioning management and not a physical implementation. Information flows are designed as ONP-enabled, i.e. applicable both for management operations within a Telecom Operator and between Telecom Operators (e.g. between Access Network Operators and Service Providers).

As opposed to the standard ensemble, clauses 1 to 3 and Annex A have been written independently of any TMN-protocol. The methodology used is based on the recommendations given in ITU-T Recommendation M.3020 and Unified Modelling Language (UML). The GDMO application of the ensemble is given in Annex A. The GDMO models used in the annex derive from the existing ITU-T libraries. In cases where no satisfactory solution is available, the standard raises this as a work item and provides a temporary, non-normative proposal including solutions developed by industry forums.

1.2 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.

- ITU-T Recommendation G.805 (2000), *Generic functional architecture of transport networks*.

- ITU-T Recommendation G.964 (1994), *V-interfaces at the digital local exchange (LE) – V5.1-interface (based on 2 048 kbit/s) for the support of access network (AN)*.
- ITU-T Recommendation G.965 (1995), *V-interfaces at the digital local exchange (LE) – V5.2-interface (based on 2 048 kbit/s) for the support of access network (AN)*.
- ITU-T Recommendation M.1400 (2000), *Designations for inter-operator networks*.
- ITU-T Recommendation M.3010 (2000), *Principles for a telecommunications management network*.
- ITU-T Recommendation M.3020 (2000), *TMN interface specification methodology*.
- ITU-T Recommendation M.3100 (1995), *Generic network information model*.
- ITU-T Recommendation Q.824.5 (1997), *Configuration management of V5 interface environments and associated customer profiles*.
- CCITT Recommendation X.720 (1992) | ISO/IEC 10165-1:1993, *Information technology – Open Systems Interconnection – Structure of management information: Management information model*.
- CCITT Recommendation X.721 (1992) | ISO/IEC 10165-2:1992, *Information technology – Open Systems Interconnection – Structure of management information: Definition of management information*.
- CCITT Recommendation X.722 (1992) | ISO/IEC 10165-4:1992, *Information technology – Open Systems Interconnection – Structure of management information: Guidelines for the definition of managed objects*.
- ITU-T Recommendation X.725 (1995) | ISO/IEC 10165-7:1996, *Information technology – Open Systems Interconnection – Structure of management information: General relationship model*.

1.3 Definitions and abbreviations

For the purposes of this Recommendation, the following definitions apply, together with those given in recommendation references.

1.3.1 access network (AN): A system implemented between the Local Exchange (LE) and user, replacing part or the whole of the local line distribution network. The access network provides transport bearer services (TBS) to service providers and network.

1.3.2 ensemble: An ensemble provides a top down view of a particular solution to a certain management problem.

1.3.3 point of interconnection (POI): Connection between Access Network Operator and Service Providers require a common identifier of this connection point, called the Point of Interconnection (POI). By providing the POI to the Service Provider, the Access Network Operator makes available the location where the physical connection between the Access Network and a Service Node can be achieved.

1.3.4 service: A set of connections between network access points.

1.3.5 service node interface (SNI): The service node interface is an interface, which provides customer access to a service node.

1.3.6 service port function (SPF): This function adapts the specific SNI requirements into the core and system management functions.

1.3.7 transport bearer service (TBS): A transport bearer service provides the facilities for the information transfer across the access network.

1.3.8 user access point (UAP): The location to where a service is requested and is necessary for service invocation.

1.3.9 user network interface (UNI): The interface between the terminal equipment and a network termination at which interface the access protocols apply.

1.3.10 user port function (UPF): This function adapts the specific UNI requirements into the core and system management functions.

2 Management context

2.1 General introduction

Figure 1 provides an overview of the management domain in terms of functional blocks and reference points relevant for this ensemble. This Ensemble defines in a transmission-technology independent way how the provisioning of narrowband transport bearer services (PSTN, ISDN and leased line) is done in the management domain.

Access network and service node Network Element Functions (NEF) are connected by the v reference point. For the purpose of this discussion each NEF is subdivided into an "AN/SN-specific aspect" and a "common aspect". The previous covers functionalities specific either to AN or SN. The latter provides functionalities required for the coordination between the Service Provider's NEF and the Access Network's NEF.

E_{AN} -OSF/QAF, N_{AN} -OSF, S_{AN} -OSF and E_{SN} -OSF, N_{SN} -OSF and S_{SN} -OSF function blocks provide element, network and service management of the access network and the service node, respectively. Two reference points a2 and a4 provide for the information exchange between the TMN of the Access Network and the Service Node. The a4 reference point allows the management of bearer transport services in the AN. The a2 reference point enables the Service Provider to request (in a restricted manner) access network resources. Both a2 and a4 provide for a simple resource coordination information exchange. The Service Provider's OSFs act as managers. Figure 2 describes all reference points and possible management services in detail.

The management domain necessary for the interworking covers all OSFs listed above as well as those aspects of the Network Element Functions which are common to both the AN and the SN. AN-specific aspects (such as transmission management) lie outside the scope of the management domain. The same applies for SN-specific aspects such as customer administration or SN-fault management.

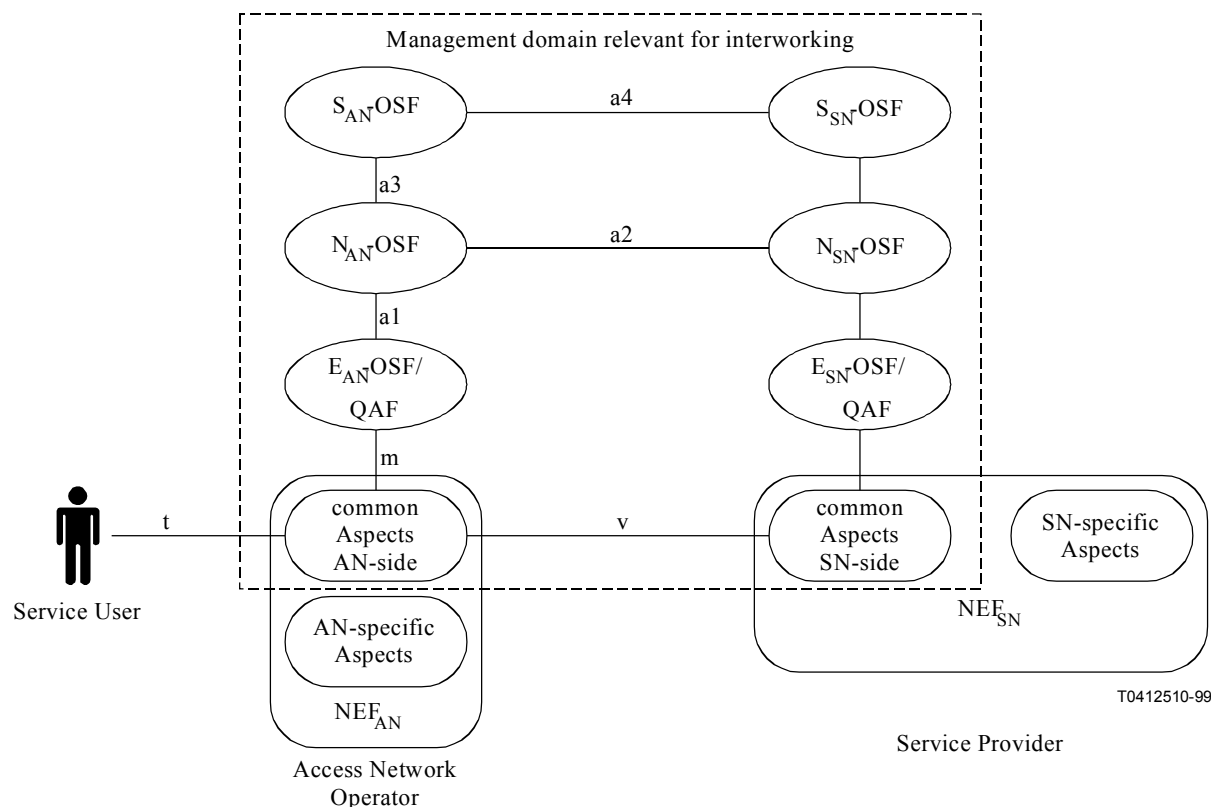


Figure 1/Q.831.1 – The management domain and reference points covered in this ensemble

2.2 Management view and level of abstraction

Figure 2 provides a detailed picture of the interactions between the Access Network Operator's TMN and the Service Provider's TMN. It describes the major "actors" involved in such an environment. On the AN-side the E_{AN}-OSF/QAF manages proprietary network element functions and provides standardized reference points where relevant (a1). The N_{AN}-OSF supports transmission-technology transparent network management functions and provides appropriate management services to the S_{AN}-OSF (a2, a4). The a2 reference point provides a restricted network level view of the access network to the Service Provider. The S_{AN}-OSF is responsible for service management of the Access Network and provides reference points to the Service Provider's S_{SN}-OSF (a3). The S_{SN}-OSF and its lower-layer OSFs manage all aspects relevant to the "service user access" part of its services.

Both the N_{AN}-OSF and S_{AN}-OSF of the Access Network will rely on non-TMN information systems such as legacy cable management, testing, topological databases, work flow management, etc. Access to these actors is provided through m₁ and m₂ reference points. Note that in a larger Telecom Operator Service Provider OSFs, too, will entertain access to the same support systems.

The lower part of Figure 2 describes the functional model for V5. The AN-specific part of the model is the management of the "Access Network" subnetwork. The second subnetwork visible in the diagram, the "digital section", is considered outside the scope of an Access Network Operator. The figure also shows the multiplexing structure of the communication paths as well as the allocation functions mentioned previously.

Three actors are involved in the Access Network, "the Service User", the Access Network Operator and the Service Provider. Figure 2 identifies two boundaries between these actors: a service boundary located vertically in the diagram and a management boundary, found horizontally. Two

functions are visible on the service boundary, the user port function and the service port function. On the management boundary the a2 and a3 define the management information flow between Access Network Operator and Service Provider, while the m_{user} provides for the interaction between Service User and Service Provider. The latter is out of the scope of this Recommendation.

Table 1 lists possible management services that can be made available through the reference points. This Ensemble covers the service provisioning functions at the reference points a1, a2, a3 and a4.

Coordination between the Service Provider and the Access Network Operator enables the interworking between the common parts of the Access Network with those of the Service Node. Coordination involves both network elements (e.g. configuration management) as well as service provisioning (e.g. common provisioning time). Coordination information may be exchanged either on a resource basis using the resource-id or on a service basis (using the service-id). In this Ensemble the latter method of operation is chosen as it provides for a sufficient method of abstraction and keeps the a4 reference point simple and efficient.

The relationships between the physical building blocks and the function blocks are outside the scope of this Recommendation.

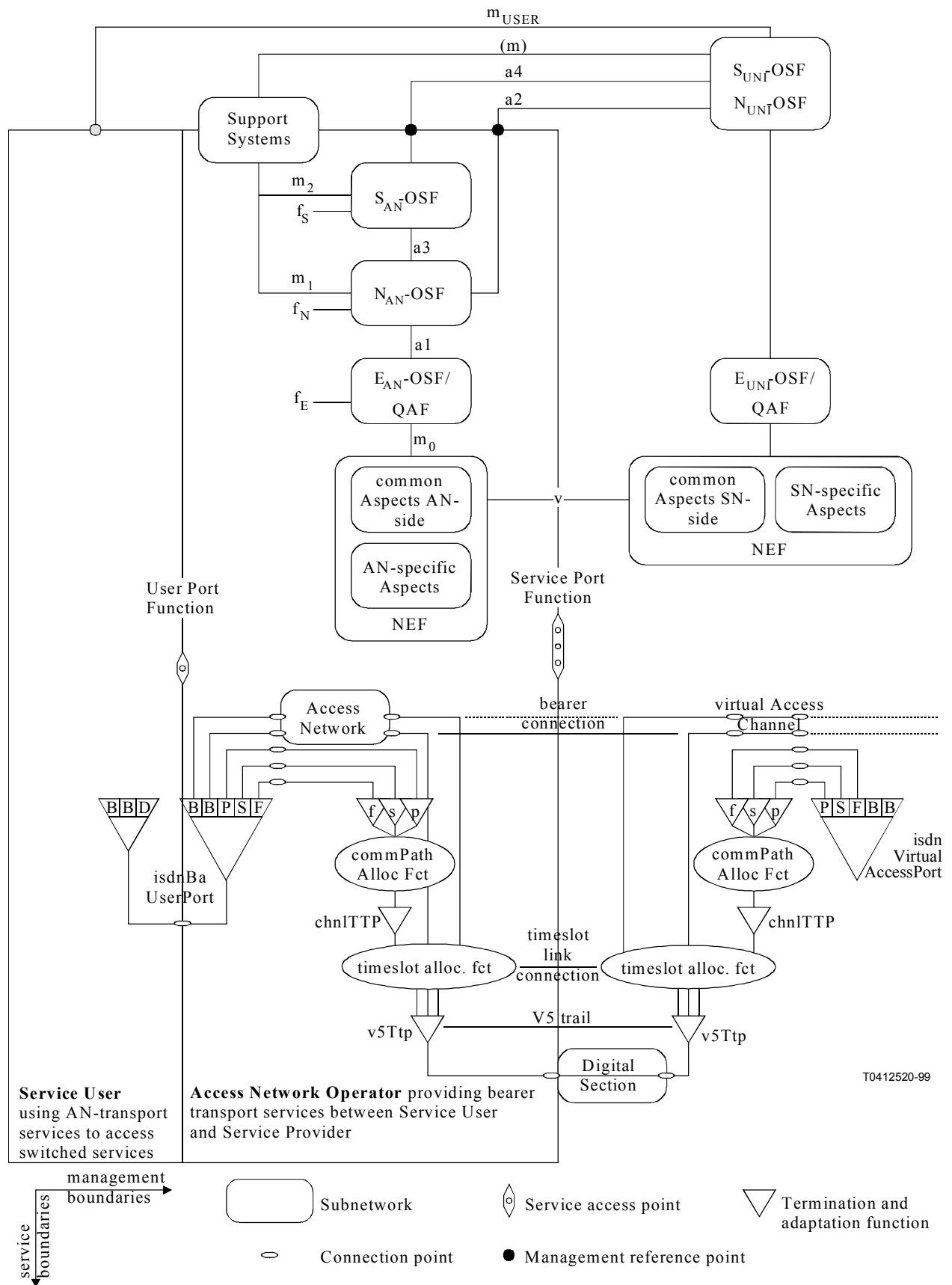


Figure 2/Q.831.1 – The management domain and functional architecture with the example of isdnBA

Table 1/Q.831.1 – Management reference points

Ref. Point	Management view available at the reference point
a1	Element level view of a V5 access network resources.
a2	Network level view of the V5 access network resources. The management functions over the reference point are restricted only to the TBS domains accessible to the Service Provider.
a3	Unrestricted network level view of the V5 access network resources. The management functions over the reference point are restricted only to the TBS domains accessible to the Service Provider.
a4	Reference point a4 provides the restricted information necessary for the coordination of services between AN and SN management domains. The management functions are restricted to the TBS domains accessible to the Service Provider.
M ₀	TMN or non-TMN reference point providing access to the NEF.
M ₁	Access to TMN or non-TMN management and database services like cable information, workflow information, resource information and planning.
M ₂	cf. m ₁
M _{user}	Reference point between service user and Service Provider: connectivity service provisioning, trouble administration, Quality of Service, billing and accounting.
f _S	Functions available for the transport bearer service management through AN personnel, possibly regional S/NMC.
f _N	Functions typically available at a regional NMC.
f _E	Functions available through the LCT (local craft terminal) or the element manager, typically product specific.

2.3 Resources

The information model covering V5 Access Network resources may be divided into the following fragments:

- Service fragment covers the service profiles describing the transport bearer services and the relationships to the other resources.
- Topology fragment covers the access network layout, the location of interfaces and user port and service port functions.
- Equipment and cabling fragment covers the equipment structures and their physical connectivity.
- Transmission network fragment covers the resources needed for mapping of logical resources to transmission resources.
- Digital section fragment covers the transmission network resources needed to connect the access network to the service node.
- Transport bearer service fragment covers resources providing V5 based transport bearer services like PSTN and Basic Rate ISDN services. This fragment forms the core of the information model.

The network level view of the access network is presented with a topological model. The topological model describes the Access Network as seen from the Service Provider. It identifies the minimal information that must be visible for the Service Provider. Based on the functional model described in ITU-T G.902, naming conventions must exist for the User Access Points (UAP), Service Node Interface and the Point Of Interconnect (POI).

In Figure 3 a simple FITL-based access network consisting of a single OLT and ONU is drawn. It shows the User Access Point, the Service Node Interface and the Point Of Interconnection. The figure displays that several "logical ports" (UPF or SPF) may be made available across the same Service Node Interface and User Access Point, respectively. The Point Of Interconnection is very similar to the Service Node Interface. While the SNI gives port location, the POI defines the location where the interconnection is possible.

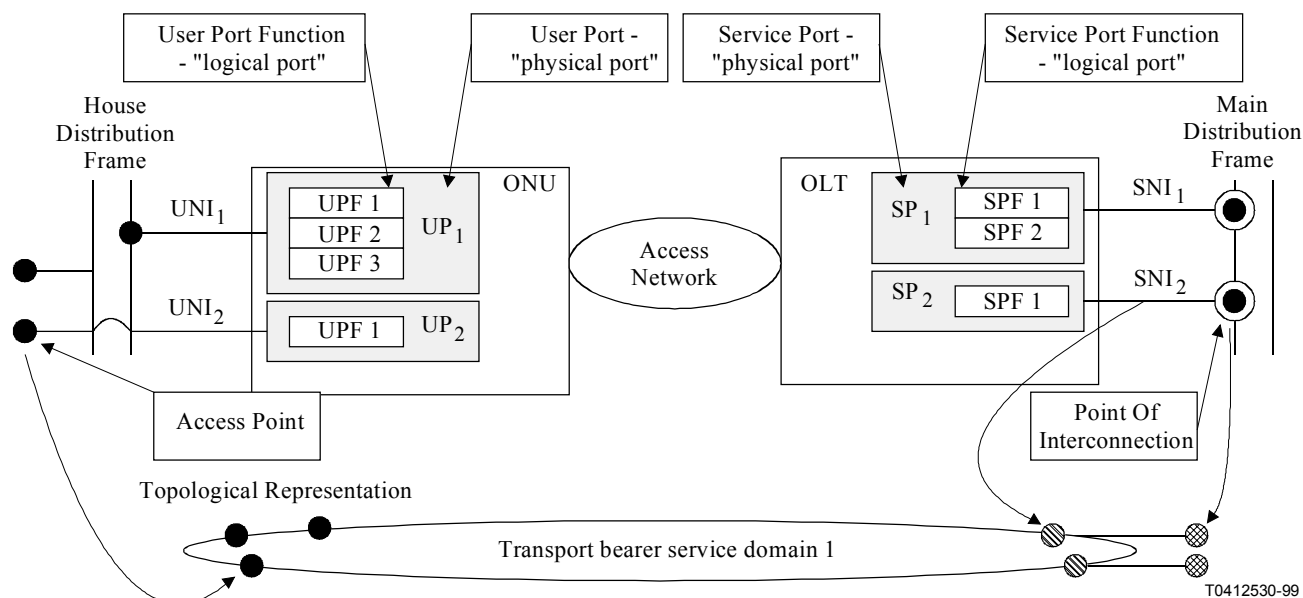


Figure 3/Q.831.1 – Sample mapping of the physical/logical representation of a FITL access network onto the topological model

In the scope of this Recommendation the G.902 terminology can be defined as follows:

- Service Port Function (SPF) is a pool of a 2 Mbit/s termination points controlled by the same V5 protocol.
- Service Port (SP) is a pool of physical ports carrying 2 Mbit/s signals controlled by the same V5 protocol.
- User Port Function (UPF) is a termination point of a PSTN/ISDN/leased trail carried over V5 SNI.
- User Port (UP) is a physical port carrying PSTN/ISDN/leased trail, for example PSTN, ISDN-BA or 2 Mbit/s physical interface.
- Service Node Interface (SNI) is the V-reference point between AN and SN. SNI can be identified with a V5 identifier.
- User Network Interface (UNI) is the T/Z-reference point between access network and customer premises and it can be identified with EF or L3 address.
- User Access Point (UAP) describes the location to where a service is requested and is necessary for service invocation. A unique naming scheme for the UAP is therefore necessary. The UAP is not identical with the UNI. An example would be a request for a bearer transport service to an UAP which is not yet accessible (i.e. has no UNI). UAPs are best identified by their geographical location, i.e. their addresses. Note too, that the UAP need not necessarily be the location where the Service User receives the service. A UAP may be a socket (typical example for a homeowner connection) or the connection point to a PABX or in-house network outside the responsibility of the Access Network Operator (situation of a small business connection).

- Point of Interconnection (POI) identifies the common connection point between the Access Network Operator and Service Providers. By providing the POI to the Service Provider, the Access Network Operator makes available the location where the physical connection between the Access Network and a Service Node can be achieved. A typical example of the POI is the physical connector on the Main Distribution Frame where the cable to the Service Port is attached. The POI is usually used in international networks to designate cross-border links. Consequently, both the Access Network Operator and the Service Provider must know the POI name. POIs are typically named using the ITU-T M.1400 naming scheme.

2.3.1 Major relationships

The following relationships connecting resources are identified:

"Owner" identifies which service provider has "ownership" for which access network resource (user ports and/or service ports). "Service resource" associates services with the resources. "Interface" provides the association between a digital section fragment (which provides the "Point Of Interconnection" into the access network) and the transport bearer service fragment. The "resource location" relationship aids the TMN in locating network functionalities in respect to the network topology and the underlying transport access network. Similarly, the "connectivity" associates a subnetwork with its topological representation. The "transmission" relationship associates the transport bearer service resources with resources in the transmission network(s). Equipment (port-#, racks, cards, cabling, etc.) is mapped to the functional models (transport bearer service fragments) through the "resource" relationship. The "equipment location" relationship locates equipment within the topology of the access network.

In the following E-R diagrams, a diamond represents a relationship and denoted lines their relationship roles. Boxes correspond to information objects and shaded boxes are groups of resources, e.g. fragments.

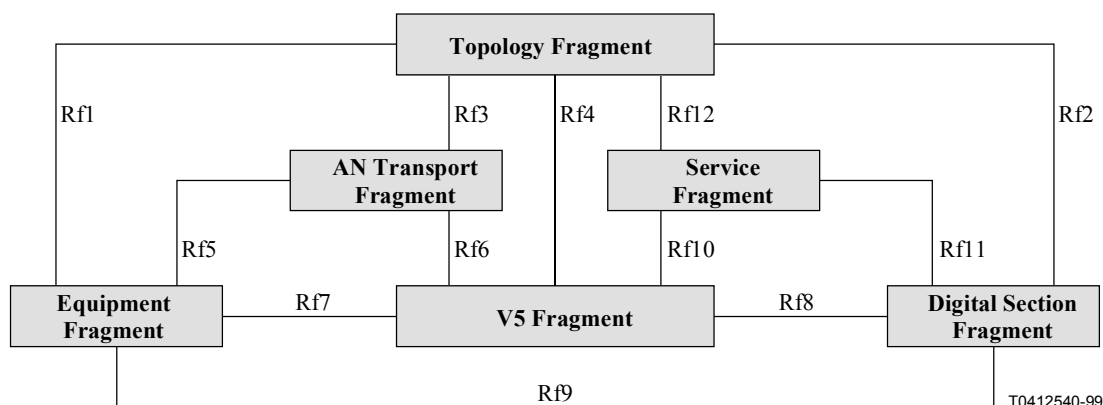


Figure 4/Q.831.1 – Major relationships between resources

2.3.2 Service fragment

The service fragment describes the resources and relationships needed to request and modify a V5 based transport bearer service across the access network. The transport bearer service information object itself identifies one service provided for the customer. Figure 5 gives the minimal structure for the service fragment.

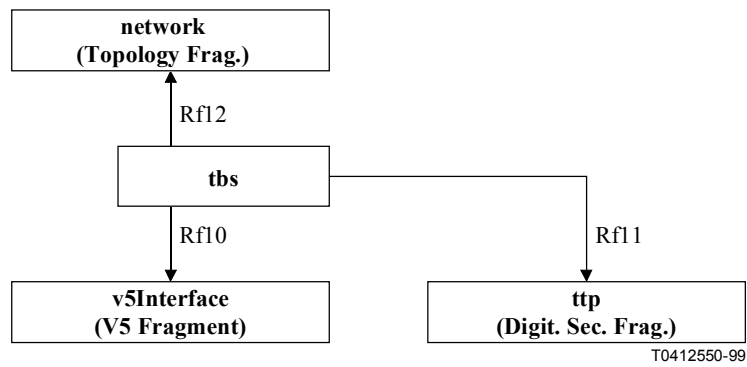


Figure 5/Q.831.1 – Service resources

2.3.3 Topology fragment

The topology fragment provides the framework in which the other fragments are located. In addition it provides the model for static blocking between ports within a bearer domain. Resources (both logical and physical) are associated to a managed element. A network consists of one or more managed elements (as may be the case in an Active Optical Network-AON). The network object provides the connectivity between the managed elements. The minimal structure for the topology management is depicted in Figure 6.

The most superior equipment object that is in the physical role of the "resource location" relationship provides the information on the actual node-location of the resources. Through a fine-grained modelling of the physical resources (see equipment fragment) additional details on the topology may be stored within the information model.

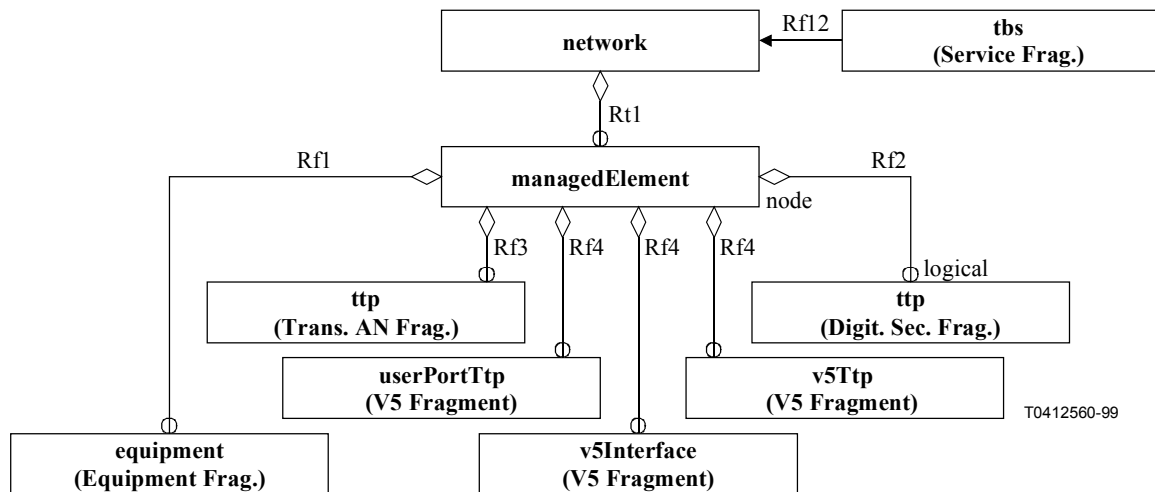


Figure 6/Q.831.1 – Topological resources

The topology shall reflect the topological connectivity (i.e. static blocking) between the UPF and SPF, independent of bandwidth details. The minimal instantiation of a network topology consists of one network and one managed element.

2.3.4 Equipment and cabling fragment

Equipment management itself lies outside the scope of this ensemble. A minimal equipment management model is necessary, however, to provide for the proper configuration and provisioning processes. The equipment model must also take the management of connection points into account should the manager wish to store such information (see topology fragment). Dependencies within the equipment model (e.g. between line cards and their power supply) are not considered here because they are irrelevant for configuration management purposes.

Figure 7 describes equipment resources and relationships required to cover the minimal requirements.

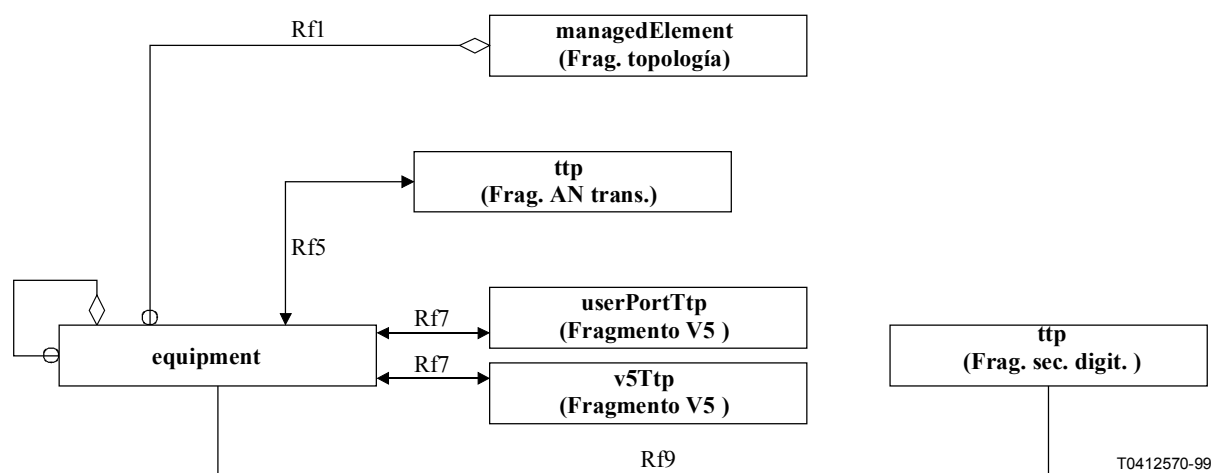


Figure 7/Q.831.1 – Equipment resources

The resource relationship connects logical resources and a physical resource. The minimal number of instantiations for the equipment resources is one, e.g. for the modelling of a multiplexer. In those cases, where the equipment structure is not modelled, the logical resources may take over this functionality (e.g. in the CMIP case by using the RDN as an identifier of the equipment port to which this logical resource is mapped).

2.3.5 Transport access network fragment

The transport access network fragment describes the transmission aspects of the one or more subnetworks comprising the access network. Its internal structure is outside the scope of this ensemble. Relationships between the transport bearer service fragment and the transport access network fragment describe the mapping of logical resources to transmission resources. The connectivity across the access network (e.g. the relationships R4/R5/R9/R10 in the V5 model) is not explicitly mapped. It is assumed that the implementation of the connection-setup between user port and service port handles the provisioning of transmission resources and the connection setup in the transmission network(s). See Figure 8.

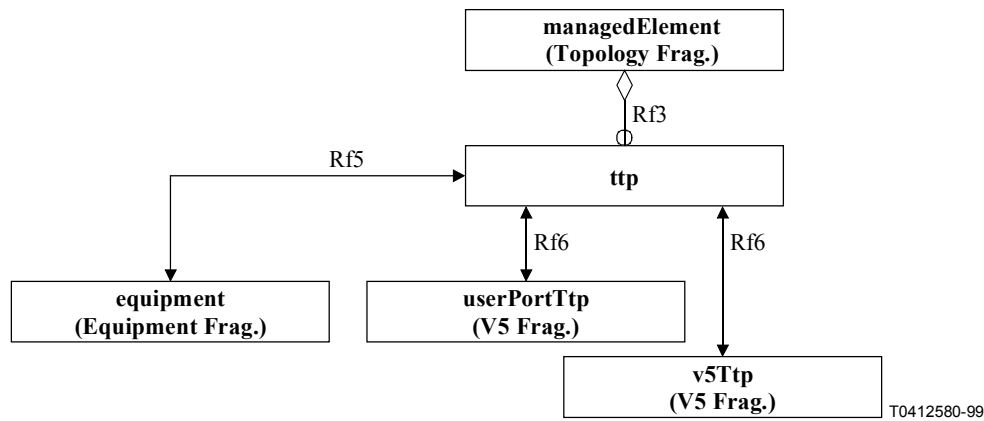


Figure 8/Q.831.1 – Transport access network resources

2.3.6 Digital section fragment

The interface relationship provides for this association between the objects in the "port function" role and those in the "network interface" role. The minimal number of object instantiations is one per interface. Note that the trail termination point is modelled in any event even if the digital section itself is managed in a different information model.

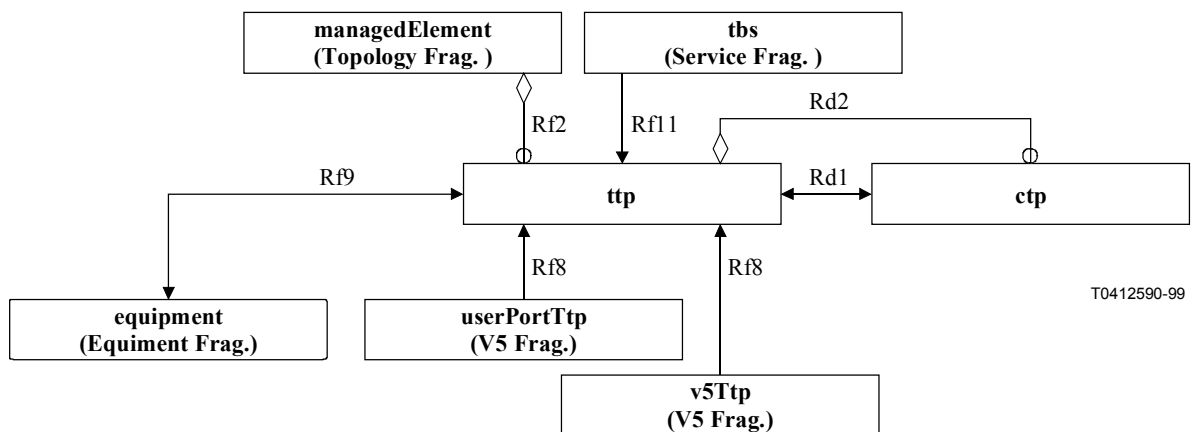


Figure 9/Q.831.1 – Digital section resources

2.3.7 V5-based transport bearer service fragment

The V5 based transport bearer service fragment covers the essential resources managed in V5 access network management. Figure 10 describes the resources and relationships required to cover the minimal requirements. V5 protection group and protection unit resources are not used in a V5.1 case. Relationships R1, R3, R7, R13 and R15 are containment relationships, other relationships are associations.

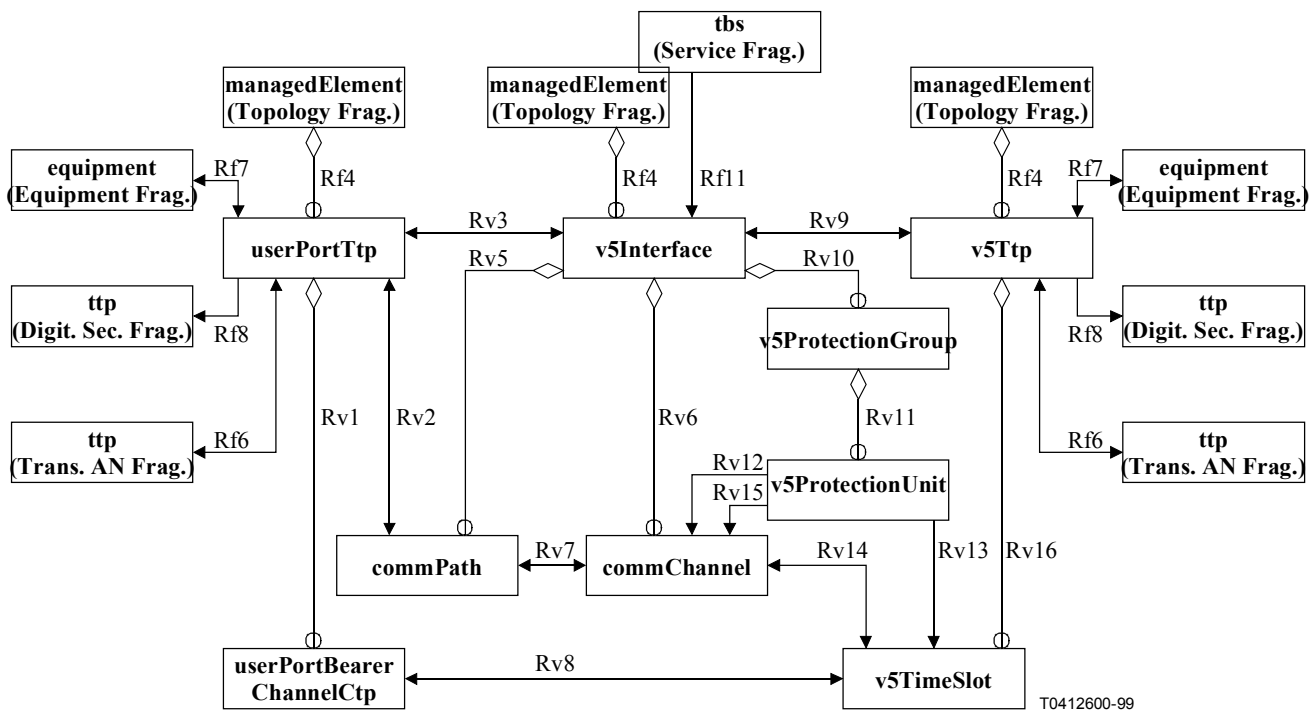


Figure 10/Q.831.1 – V5 based transport bearer service resources

2.4 Functions

2.4.1 Functions over reference point a1

Reference point a1 provides the element level view of a V5 access network resource.

Management Function	Description
Create a user port	N _{AN} -OSF creates a user port with the parameters and associations needed.
Delete a user port	N _{AN} -OSF deletes the given user port.
Modify a user port	N _{AN} -OSF modifies one or more user port parameters. This includes blocking/unblocking of the user port.
Read a user port	N _{AN} -OSF reads the current settings and states of the given user port. This includes the possibility for reading of subresources.
Create a V5 interface	N _{AN} -OSF creates a V5 interface with the parameters and associations needed. This includes the creation of subresources required for the full operation like c-channel termination points, 2 Mbit/s trail termination points, timeslots, etc.
Delete a V5 interface	N _{AN} -OSF deletes the given V5 interface with the necessary subresources.
Modify a V5 interface	N _{AN} -OSF modifies the parameters of the given V5 interface. This includes the possibility for modification/deletion of subresources and their associations, re-provisioning and possible state modifications.
Read a V5 interface	N _{AN} -OSF reads the current settings and states of the given user port. This includes the possibility for reading of subresources and provisioning data sets.
Create a V5 connection	N _{AN} -OSF makes all the necessary settings and associations for establishing a service connection from the given user port to a certain V5 interface.

Management Function	Description
Delete V5 connection	N _{AN} -OSF releases the settings and associations made for the given service connection.
Modify V5 connection	N _{AN} -OSF modifies one or more parameters or associations affecting the given service connection. N _{AN} -OSF is able to see the modifications.

2.4.2 Functions over reference points a2 and a3

The management functions over a2 and a3 are basically the same. The difference between the management functions over the reference point is that the management functions over the reference point a2 are restricted only to the TBS domains accessible to the Service Provider. Otherwise the reference points a2 and a3 provide the network level view of the V5 access network resources.

Management Function	Summary
Request a UPF resource	The N _{SN} -OSF/S _{AN} -OSF requests a UPF resource. The resource is identified by the transport bearer service domain it can cover and by its type.
Configure the UPF resource parameters	The management function enables the N _{SN} -OSF/S _{AN} -OSF to configure resources-specific parameters. It covers UPF and management resources.
View the UPF resource setup	Provides a view of the current UPF resource-configuration.
Release the UPF resource	The N _{SN} -OSF/S _{AN} -OSF requests the release of UPF resources and becomes re-allocable to other Service Providers.
Request a SPF resource	The N _{SN} -OSF/S _{AN} -OSF requests a SPF resource. The resource is identified by the transport bearer service domain it can cover and by its type.
Configure the SPF resource parameters	The management function enables the N _{SN} -OSF/S _{AN} -OSF to configure resources-specific parameters. It covers SPF and management resources.
View the SPF resource setup	Provides a view of the current SPF resource-configuration.
Release the SPF resource	The N _{SN} -OSF/S _{AN} -OSF requests the release of SPF resources and becomes re-allocable to other Service Providers.
Connect UPF to SPF	The N _{SN} -OSF/S _{AN} -OSF requests the connection between UPF and SPF. The result of this service gives the SPF the capability of transferring information from SPF to UPF and vice versa.
Disconnect UPF from SPF	The N _{SN} -OSF/S _{AN} -OSF requests the disconnection of a UPF from a SPF.
Connect UPF to UAP	The N _{SN} -OSF/S _{AN} -OSF requests the connection between UPF and UAP. The result of this service gives the UPF the capability of transferring information from UPF to UAP and vice versa.
Disconnect UPF from UAP	The N _{SN} -OSF/S _{AN} -OSF requests the disconnection of a UPF from a UAP, i.e. the service node.
Connect SPF to POI	The N _{SN} -OSF/S _{AN} -OSF requests the connection between SPF and POI. The result of this service gives the SPF the capability of transferring information from SPF to POI and vice versa.

Management Function	Summary
Disconnect SPF from POI	The N _{SN} -OSF/S _{AN} -OSF requests the disconnection of a SPF from a POI, i.e. the service node.
Request change of resource capabilities	The N _{SN} -OSF/S _{AN} -OSF requests the addition or removal of resource capabilities, e.g. upgrade/downgrade or migration, to conform to new requirements.

2.4.3 Functions over reference point a4

Reference point a4 provides the restricted information necessary for the coordination of services between AN and SN management domains. The management functions are restricted to the TBS domains accessible to the Service Provider.

Management Function	Summary
Create a TBS	The Service Provider requests that a service, specified through the service description, is made available across the TBS domain.
Delete a TBS	The Service Provider requests the termination of a service. The resources become re-allocable to other services but are still assigned to the Service Provider.
View TBS capabilities	S _{AN} -OSF returns the set of capabilities the TBS has.
Add a service capability to a TBS	The Service Provider requests the adding of a service capability to the TBS. For example, the basic rate ISDN service capability is added to the customer.
Remove the service capability from a TBS	The Service Provider requests the removing of the service capability from the TBS. For example, the basic rate ISDN service capability is removed from the customer.
Block/unblock a TBS	The Service Provider requests the blocking/unblocking of the TBS. The Access Network Operator may request permission to block/unblock from the Service Provider.

2.5 Other requirements

Requirements not covered in functions, resources or level of abstraction (if any) are described here.

3 Management information model

3.1 Classes and relationships

This clause declares the object classes used by this ensemble. The object classes are defined on a semantic level only and in protocol independent form. The mapping of the object classes to the GDMO managed objects classes is given in Annex A (Ensemble GDMO MOCS Proformas).

3.1.1 Service fragment

3.1.1.1 tbService

The tbService information entity represents a transport bearer service agreement. See Figure 11.

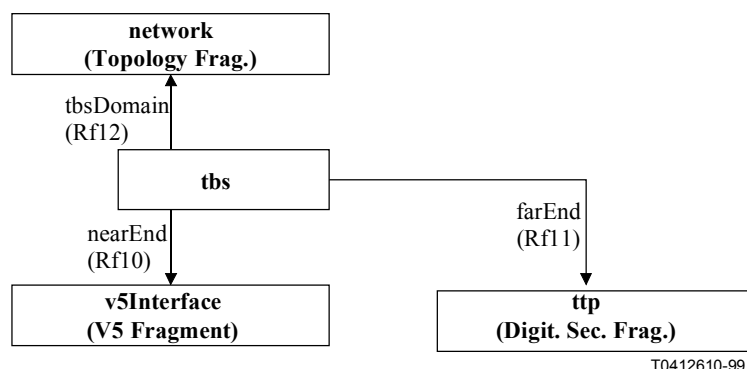


Figure 11/Q.831.1 – tbService information entity

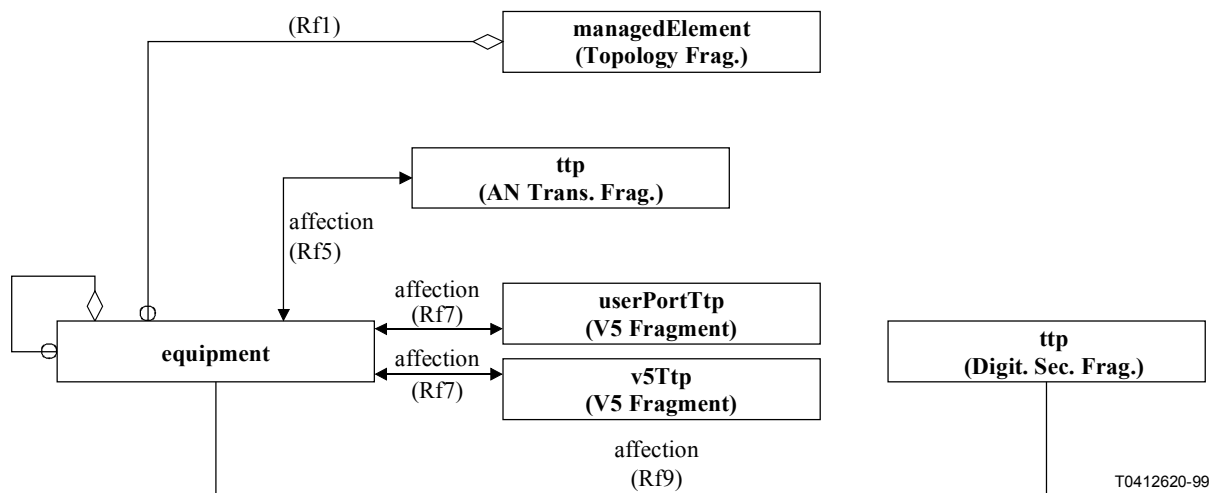
Attribute	Description
numberOfServices	The numberOfServices attribute identifies the number of multiple instantiations of the service at the access point.
schedule	This attribute is used to define the startup-time and -date of the service.
serviceId	The serviceId identifies the service.
serviceProviderId	This attribute identifies the provider providing the service (the service provider is not necessarily the same as AN operator).
serviceProfile	This attribute defines the parameters which may be used for the specific service type.
serviceReference	The serviceReference attribute permits the identification of the service using a service provider given reference.
serviceState	This attribute defines the state of the service.
serviceType	This attribute identifies the type of the service provided for the customer. Possible values are: <ul style="list-style-type: none"> – "pstn" (PSTN); – "isdn-ba" (basic rate ISDN); – "isdn-pra" (primary rate ISDN); and – "semi-ll" (semipermanent leased line).

Association	Description
farEnd	This association identifies the user access point (UAP).
nearEnd	This association identifies the service port function (SPF).
tbsDomain	This association identifies the related TBS domain network visible to the service provider.

3.1.2 Equipment fragment

3.1.2.1 equipment

The equipment information entity represents a physical component of a managed element, including replaceable components. See Figure 12.



T0412620-99

Figure 12/Q.831.1 – Equipment information entity

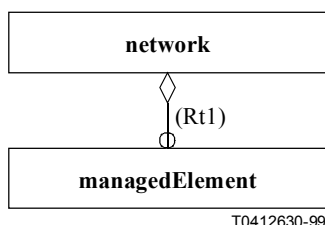
Attribute	Description
locationName	The locationName attribute identifies the location of the equipment.
equipmentId	The equipmentId attribute identifies the equipment within the managedElement or another equipment.
serialNumber	The locationName attribute identifies the serial number of the equipment.
userLabel	The userLabel attribute type assigns a user friendly name to the equipment.
vendorName	This attribute identifies the vendor of the equipment.
version	The version attribute identifies the version of the equipment.

Association	Description
affection	This association identifies the object instance which can be directly affected by a change in state or deletion of the equipment.
equipment-equipment	An equipment object instance is contained by another equipment object instance.
equipment-network	An equipment object instance is contained by a managedElement object instance.

3.1.3 Topology fragment

3.1.3.1 managedElement

The managedElement information entity represents a network element within the access network that performs managed element functions, i.e. provides support and/or service to the subscriber. See Figure 13.



T0412630-99

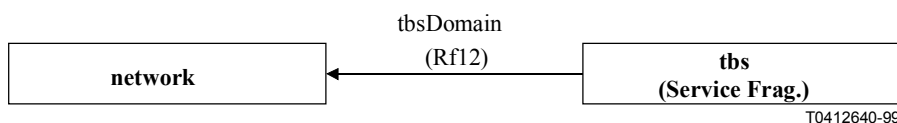
Figure 13/Q.831.1 – ManagedElement information entity

Attribute	Description
locationName	The locationName attribute identifies the location of the network element.
managedElementId	This attribute is a unique identifier for the network element.
userLabel	The userLabel attribute type assigns a user friendly name to the network element.
vendorName	This attribute identifies the vendor of the network element.
version	The version attribute identifies the version of the network element.

Association	Description
managedElement-network	A managedElement object instance is contained by a network object instance.

3.1.3.2 network

The network information entity represents an access network as defined in ITU-T G.902. See Figure 14.



T0412640-99

Figure 14/Q.831.1 – Network information entity

Attribute	Description
networkId	This attribute gives the identifier for the access network (as used by the AN operator).
systemTitle	This attribute gives the identifier for the transport bearer service (TBS) domain as used by the service provider.
userLabel	The userLabel attribute type assigns a user friendly name to the access network.

3.1.4 Transport access network fragment

3.1.4.1 ttp

The ttp information entity in this fragment represents a trail termination point which is acting as an access point in the transport access network. The internal structure of the transport access network is outside the scope of this Recommendation. See Figure 15.

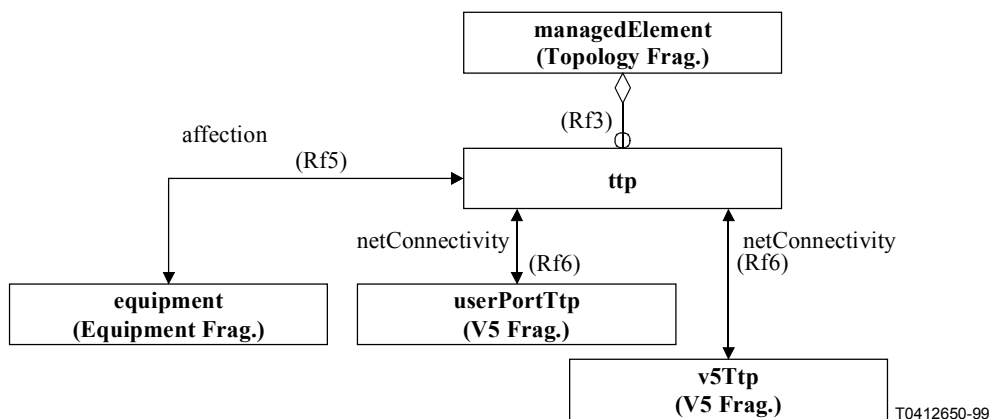


Figure 15/Q.831.1 – ttp information entity

Attribute	Description
administrativeState	The administrative state (following M.3100 semantics) of the TTP. Legal values are "locked", "unlocked" and "shuttingDown".
operationalState	The operational state (following M.3100 semantics) of the TTP. Legal values are "enabled" and "disabled".
tTpId	The tTpId identifies the TTP uniquely within the containing managedElement.
userLabel	This attribute is used to assign a user friendly name to a TTP which represents a physical interface. The attribute is not used for the non-physical TTPs.

Association	Description
affection	This association identifies the object instance which is capable of directly affecting the TTP.
netConnectivity	This association identifies the transport AN network termination point associated to this v5Ttp.
ttp-managedElement	A ttp object instance is always contained by a managedElement object instance.

3.1.5 Digital section fragment

3.1.5.1 ctp

The ctp information entity in this fragment represents a connection termination point inside the digital section between v5Ttp and LE, or between userPortTtp and physical UP (if separate). The detailed internal structure of the digital section is outside the scope of this Recommendation. See Figure 16.

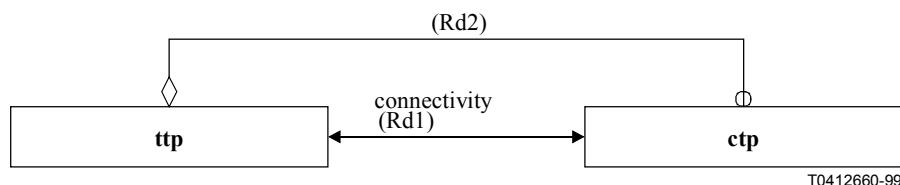


Figure 16/Q.831.1 – ctp information entity

Attribute	Description
operationalState	The operational state (following M.3100 semantics) of the CTP. Legal values are "enabled" and "disabled".
cTpId	The cTpId identifies the CTP uniquely within the containing managedElement.

Association	Description
connectivity	This association identifies the associated TTP sending and receiving traffic with this object instance.
ctp-ttp	A ttp object instance is always contained by a ttp object instance.

3.1.5.2 ttp

The ttp information entity in this fragment represents a trail termination point inside the digital section between v5Ttp and LE, or between userPortTtp and physical UP (if separate). The detailed internal structure of the digital section is outside the scope of this Recommendation. See Figure 17.

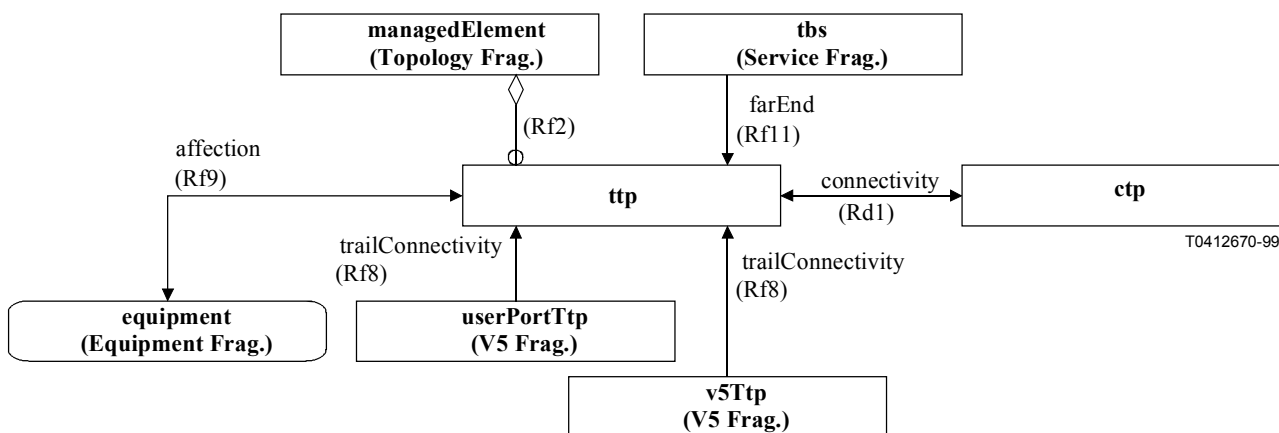


Figure 17/Q.831.1 – ttp information entity

Attribute	Description
administrativeState	The administrative state (following M.3100 semantics) of the TTP. Legal values are "locked", "unlocked" and "shuttingDown".
operationalState	The operational state (following M.3100 semantics) of the TTP. Legal values are "enabled" and "disabled".
tTpId	The tTpId identifies the TTP uniquely within the containing managedElement.
userLabel	This attribute is used to assign a user friendly name to a TTP which represents a physical interface. The attribute is not used for the non-physical TTPs.

Association	Description
affection	This association identifies the object instance which is capable of directly affecting the TTP.
connectivity	This association identifies the associated CTP sending and receiving traffic with this object instance.
ttp-managedElement	A ttp object instance is always contained by a managedElement object instance.

3.1.6 V5 fragment

3.1.6.1 commChannel

The commChannel information entity represents the termination point of a logical 64 kbit/s communication channel as defined in ITU-T G.964 and ITU-T G.965. See Figure 18.

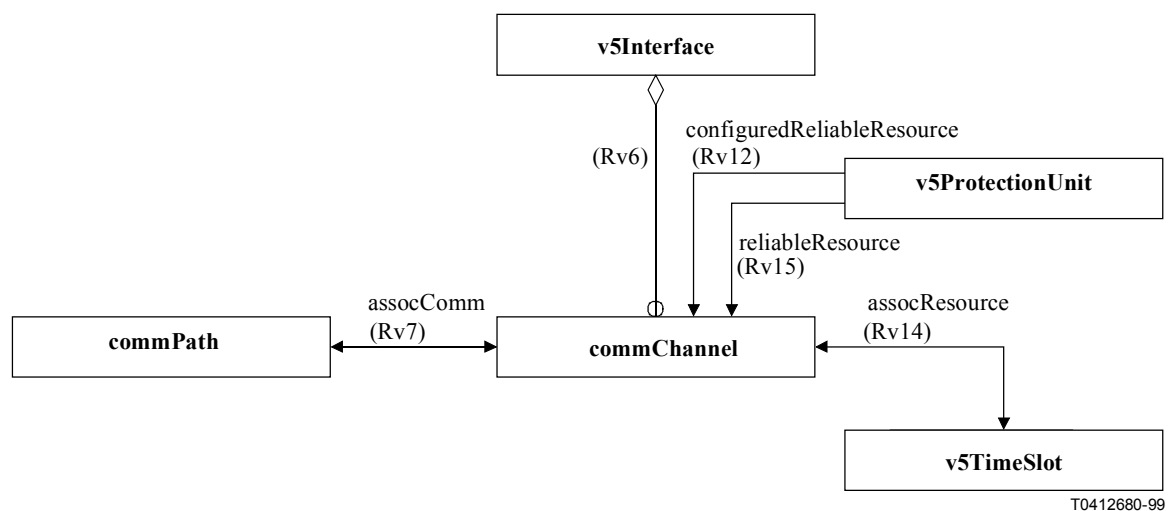


Figure 18/Q.831.1 – commChannel information entity

Attribute	Description
commChannelId	The commChannelId identifies the logical communication channel within the V5 protocol messages.
operationalState	The operational state (following M.3100 semantics) of the communication channel. Legal values are "enabled" and "disabled".

Association	Description
assocComm	A commChannel object instance is associated to the commPaths which it is carrying. A commPath carrying vital protocols, e.g. control, link control, protection and bcc protocol must always be carried at the commChannel associated to the timeslot 16 (8.4/G.964 and ITU-T G.965).
assocResource	A commChannel object instance is associated to the v5TimeSlot carrying it. A communication channel can only be associated to a v5TimeSlot number 16, 15 or 31 (8.4/G.964).
commChannel-v5Interface	A commChannel object instance is always contained by a single v5Interface object instance. The total number of commChannels related to a V5.1 interface may not exceed 3 (8.4/G.964) and the total number of commChannels related to a V5.2 interface may not exceed 44 (18.5.1/G.965).

3.1.6.2 commPath

The commPath information entity represents the termination point terminating a communication path resource as defined in ITU-T G.964 and ITU-T G.965.

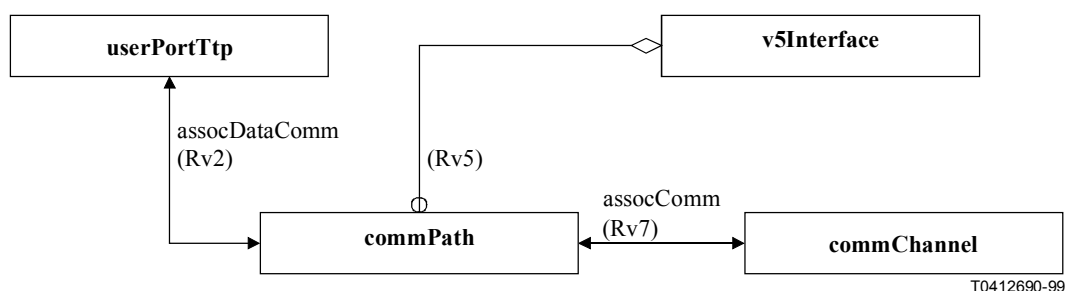


Figure 19/Q.831.1 – commPath information entity

Attribute	Description
commPathId	The commPathId identifies the logical communication channel within the V5 protocol messages.
commPathType	This attribute identifies the data type carried by the communication path. Possible values are: <ul style="list-style-type: none"> – "vital" (the communication path is carrying control protocol, bcc protocol, link control and/or protection protocol data); – "isdn-ds" (the communication path is carrying isdn Ds-type data); – "isdn-f" (the communication path is carrying isdn f-type data); – isdn-p (the communication path is carrying isdn p-type data); and – "pstn" (the communication path is carrying PSTN signalling data).

Association	Description
assocComm	A commPath object instance is associated to the commChannel carrying it. The commPath carrying vital protocols, e.g. control, link control, protection and bcc protocol must always be carried at the communication channel associated to the timeslot 16 (8.4/G.964 and ITU-T G.965).
assocDataComm	A userPortTtp of "isdn-ba" or "isdn-pra" type is associated from one to three different commPaths of ISDN path payload types ("isdn-ds", "isdn-f" and "isdn-"). All the associated communication paths must carry different ISDN data types (Ds-, p- or f-type). A userPortTtp of "pstn" type need not be associated to any commPath. A userPortTtp of "semi-ll" type cannot be associated to any commPath object instance.
commPath-v5Interface	A commPath object instance is always contained by a single v5Interface object instance. The total number of commPaths related to a V5.1 interface may not exceed 11 and the total number of commPaths related to a V5.2 interface may not exceed 146 (8.4/G.964 and ITU-T G.965).

3.1.6.3 userPortBearerChannelCtp

The userPortBearerChannelCtp information entity represents the CTP terminating a user port bearer channel as defined in ITU-T G.964 and ITU-T G.965. See Figure 20.

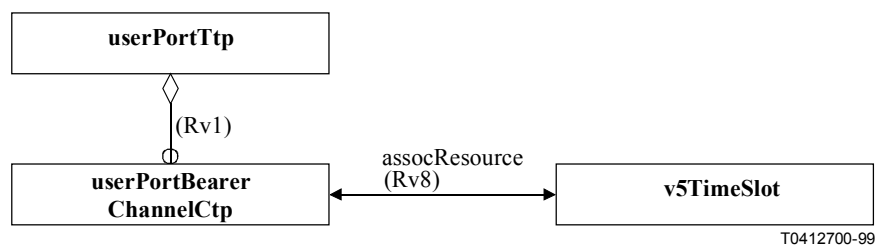


Figure 20/Q.831.1 – UserPortBearerChannelCtp information entity

Attribute	Description
bearerChannelId	The bearerChannelId identifies the terminated bearer channel CTP of a user port. Legal values are (1 byte) integer value from 1 to 31. If the containing userPortTtp is of ISDN primary rate access type then the id number may have any integer value from 1 to 31 (17.4.2.2/G.965). If the containing userPortTtp is of ISDN basic rate access type then the id number may have a value 1 or 2. If the containing userPortTtp is of PSTN type then the id number value is 1.
bearerChannelType	This attribute identifies whether or not this bearer channel is reserved for permanent line usage or not. Possible values are: <ul style="list-style-type: none"> – "non-pl" (the bearer channel is not in permanent line usage); – "pl" (the bearer-channel is in permanent line usage).

Association	Description
assocTimeSlot	In a V5.1 case a userPortBearerChannelCtp object instance of "non-pl" type is associated to a v5TimeSlot. A userPortBearerChannelCtp of "non-l" type is not instantiated in a V5.2 case as the timeslot association is performed dynamically by the bcc-protocol. A userPortBearerChannelCtp object instance of "pl" type does not use this association.
userPortBearerChannelCtp-userPortTtp	A userPortBearerChannelCtp object instance is always contained by a single userPortTtp object instance. The total number of userPortBearerChannelCtps contained by a userPortTtp of PSTN-type may not exceed 1. The total number of userPortBearerChannelCtps contained by a userPortTtp of "basic rate ISDN"-type may not exceed 2 and the total number of userPortBearerChannelCtps contained by a userPortTtp of "primary rate ISDN"-type may not exceed 31.

3.1.6.4 userPortTtp

The userPortTtp information entity represents the TTP in AN terminating the service trail at a user port resource as defined in ITU-T G.964 and ITU-T G.965. See Figure 21.

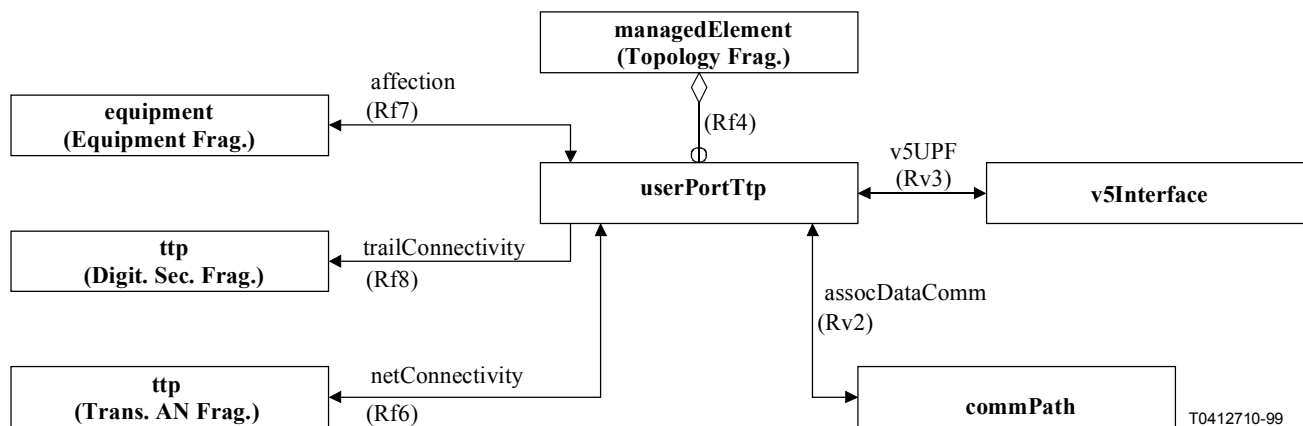


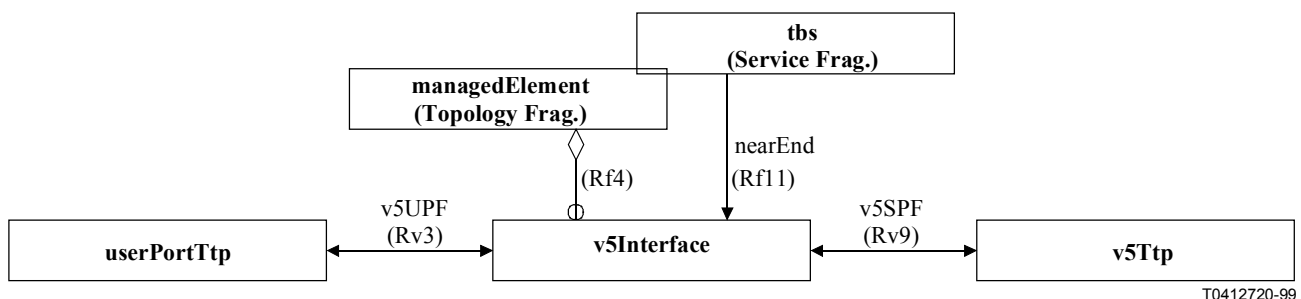
Figure 21/Q.831.1 – userPortTtp information entity

Attribute	Description
accessDigitalSection	<p>This attribute indicates whether or not there is an access digital section at an ISDN digital port. The possible values of the attribute are:</p> <ul style="list-style-type: none"> – "absent" (there is no access digital section at the port); and – "present" (access digital section is supported at the port). <p>The attribute is only used if the usageType is "isdn-ba" or "isdn-pra".</p>
administrativeState	<p>The administrative state (following M.3100 semantics) of the communication channel. Legal values are "locked", "unlocked" and "shuttingDown".</p>
blockingStatus	<p>This attribute indicates if the userPortTtp is blocked for local or remote reasons or both. Different values are "none" and "local", "remote" and "both".</p>
gradingMessages	<p>This attribute indicates whether or not the grading messages should be sent to LE. The possible values of the attribute are:</p> <ul style="list-style-type: none"> – "false" (grading messages are not used); and – "true" (grading messages are used). <p>The gradingMessages attribute has always value "false" if the type of the userPortTtp is non-ISDN ("pstn" or "semi-ll") or the ISDN user port is missing the access digital section.</p>
portAddress	<p>The portAddress attribute defines the identification of the user port within the V5 protocol messages. For a userPortTtp of "pstn" or "semi-ll" type, the attribute contains the layer 3 address of the user port. Allowed layer 3 address values are from 0 to 32767. For a userPortTtp of "isdn-ba" or "isdn-pra" the attribute contains the envelope function address of the user port. Allowed envelope function address values are from 0 to 8175.</p>
portId	<p>The portId identifies the terminated TTP at the user port resource.</p>
operationalState	<p>The operational state (following M.3100 semantics) of the communication channel. Legal values are "enabled" and "disabled".</p>
specialFeatures	<p>This attribute indicates whether or not there are any special features at the user port. The possible values of the attribute are:</p> <ul style="list-style-type: none"> – "direct" (direct dialling in); – "public" (public telephone); – "private-m" (private meter); – "special-l" (special loop resistance); – "security" (security line); and – "others" (anything else special). <p>The attribute is used only if the usageType of the user port is "pstn".</p>
usageType	<p>This attribute identifies the type of the payload data carried by the port. Different values are:</p> <ul style="list-style-type: none"> – "pstn" (PSTN); – "isdn-ba" (basic rate ISDN); – "isdn-pra" (primary rate ISDN); and – "semi-ll" (semipermanent leased line).

Association	Description
affection	This association identifies the object instance which is capable of directly affecting the userPortTtp.
assocDataComm	A userPortTtp of "isdn-ba" or "isdn-pra" type is associated from one to three different commPaths of ISDN path payload types ("isdn-ds", "isdn-f" and "isdn-"). All the associated communication paths must carry different ISDN data types (Ds-, p- or f-type). A userPortTtp of "pstn" type need not be associated to any commPath. A userPortTtp of "semi-ll" type cannot be associated to any commPath object instance.
trailConnectivity	This association identifies the associated trail termination point sending and receiving traffic with this object instance. This association is not used if the same userPortTtp object instance is also used to represent CTP functionality at the same layer.
netConnectivity	This association identifies the transport AN network trail termination point associated to this userPortTtp.
userPortTtp-managedElement	A userPortTtp object instance is always contained by a single managedElement object instance.
v5UPF	A userPortTtp instance is associated to one v5Interface controlling the userPortTtp. A userPortTtp of "isdn-pra" type cannot be associated to a V5.1 interface.

3.1.6.5 v5Interface

The v5Interface information entity represents either V5.1 interface as defined in ITU-T G.964 or V5.2 interface as defined in ITU-T G.965. See Figure 22.



T0412720-99

Figure 22/Q.831.1 – v5Interface information entity

Attribute	Description
locationName	This attribute gives the name of the containing access network.
operationalState	The operational state (following M.3100 semantics) of the V5 interface. Legal values are "enabled" and "disabled".
peerUserLabel	A user-friendly name for the peer element where this particular V5 interface is supposed to be terminated. This attribute is utilized in field service situations when the supposed peer element is not evident.
supportedProtocolVersion	The protocol version and interface role used. Legal values are "v5.1" or "v5.2".
v5Identification	The identification value of the V5 interface used within the V5 protocol. Legal values are from 0 to 4095 and the value must be unique in the containing AN.
v5InterfaceId	The identifier of the v5Interface.
v5ProvisioningVariant	The label identifying the provisioning data set valid in the V5 interface. Legal values are from 0 to 127.

Association	Description
v5UPF	A v5Interface object instance is associated to the userPortTtps, which are under its control. In a V5.1 case the total sum of userPortTtps associated to a v5Interface may not exceed 31. The userPortTtps of "isdn-pri" type cannot be associated to a V5.1 interface. In a V5.2 case the total sum of associated userPortTtps of "isdn-ba", "isdn-pra" and "semi-ll" (having multiple bearer channels) type may not exceed 8176. In a V5.2 case the total sum of associated userPortTtps of "pstn" and "semi-ll" (having single bearer channel) type may not exceed 32768.
v5SPF	A v5Interface object instance is associated to the v5Ttps, which are under its control. The total number of v5Ttps associated to a V5.1 interface may not exceed 1. The total number of v5Ttps associated to a V5.2 interface may not exceed 16.
v5Interface-managedElement	A v5Interface object instance is always contained by a single managedElement object instance.

Operation	Description
startV5Interface	This operation is used for initiating the v5Interface startup procedure as specified in Annex C/G.964.
restartPSTN	This operation is used for restarting the PSTN protocol controlled by the v5Interface. This operation is valid only if there is a commPath of "pstn"-type associated to the v5Interface.

3.1.6.6 v5ProtectionGroup

The v5ProtectionGroup information entity represents the group of protecting and protected units as defined in ITU-T G.965. See Figure 23.

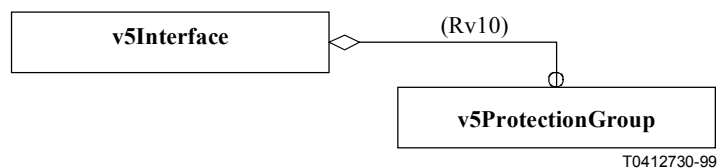


Figure 23/Q.831.1 – v5ProtectionGroup information entity

Attribute	Description
v5ProtectionGroupId	The v5ProtectionGroupId identifies the group protecting and protected units.
v5ProtectionGroupNumber	This attribute indicates whether the object instance represents the protection group number 1 or number 2 of a V5.2 interface. Possible values are "1" or "2". The v5ProtectionGroupNumber 1 is always used to protect the primary commChannel carrying the vital protocols (bcc, control, link control and protection protocols). The v5ProtectionGroupNumber 2 may protect only the commChannels carrying non-vital protocols (PSTN and ISDN protocols).
v5ProtectionGroupType	<p>This parameter indicates whether the protection relation is 1:1 or m:n. Possible values are:</p> <ul style="list-style-type: none"> – "plus" (1:1 protection); or – "colon" (m:n protection). <p>The v5ProtectionGroupType attribute of protection group number 1 shall always have the value "plus". The change of protection group type from "plus" to "colon" is allowed if only one protected v5ProtectionUnit and one protecting v5ProtectionUnit are contained by the v5ProtectionGroup, and if the underlying resources support m:n protection.</p>

Association	Description
v5ProtectionGroup-v5Interface	A v5ProtectionGroup object instance is always contained by a single v5Interface object instance. A v5ProtectionGroup can only be contained by a v5Interface of "v5.2" type. The total number of v5Protection groups related to a V5 interface cannot exceed 2.

3.1.6.7 v5ProtectionUnit

The v5ProtectionUnit information entity represents a protected (i.e. working, regular or preferred) unit or a protecting (i.e. backup or standby) unit as defined in ITU-T G.965. See Figure 24.

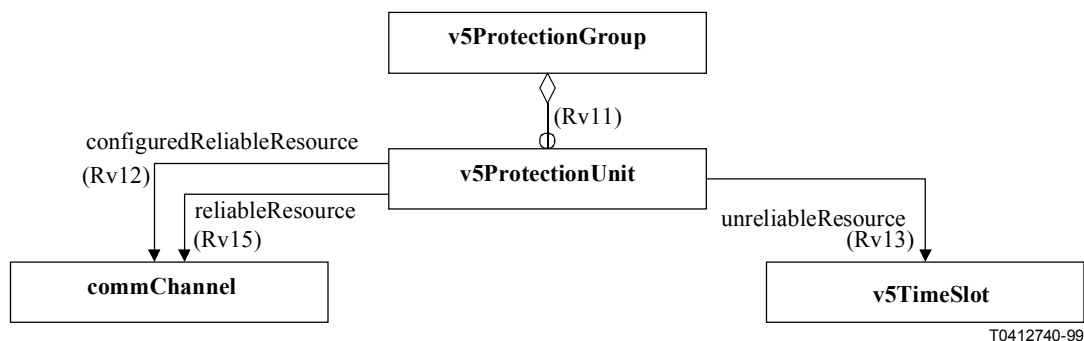


Figure 24/Q.831.1 – v5ProtectionUnit information entity

Attribute	Description
v5ProtectionUnitId	The v5ProtectionUnitId identifies the group protecting and protected units.
v5ProtectingStatus	This attribute indicates the active or standby mode of the protection unit. Possible values are: <ul style="list-style-type: none"> – "active" (the v5ProtectionUnit is protected); – "standby" (the v5ProtectingUnit is protecting).

Association	Description
configuredReliableResource	This association defines how the reliableResource association shall be set in the next V5 interface startup. In the case of "standby" v5ProtectingStatus the association shall not be used and in the case of "active" v5ProtectingStatus the v5ProtectionUnit shall be associated to the commChannel object instance to be protected.
reliableResource	In the case of "active" v5ProtectingStatus this association defines when the v5ProtectingStatus of the v5ProtectionUnit is "active" the association defines the commChannel object instance protected. In the "standby" v5ProtectingStatus case the association is not used.
unreliableResource	This association identifies the associated v5TimeSlot participating in the protection.
v5ProtectionGroup-v5Interface	A v5ProtectionGroup object instance is always contained by a single v5Interface object instance. A v5ProtectionGroup can only be contained by a v5Interface of "v5.2" type. The total number of v5Protection groups related to a V5 interface cannot exceed 2. The total number of commPaths related to a V5.1 interface may not exceed 11 and the total number of commPaths related to a V5.2 interface may not exceed 146 (8.4/G.964 and ITU-T G.965).

3.1.6.8 v5TimeSlot

The v5TimeSlot information entity represents a 64 kbit/s time slot within a 2048 kbit/s V5 link as defined in ITU-T G.964 and ITU-T G.965. See Figure 25.

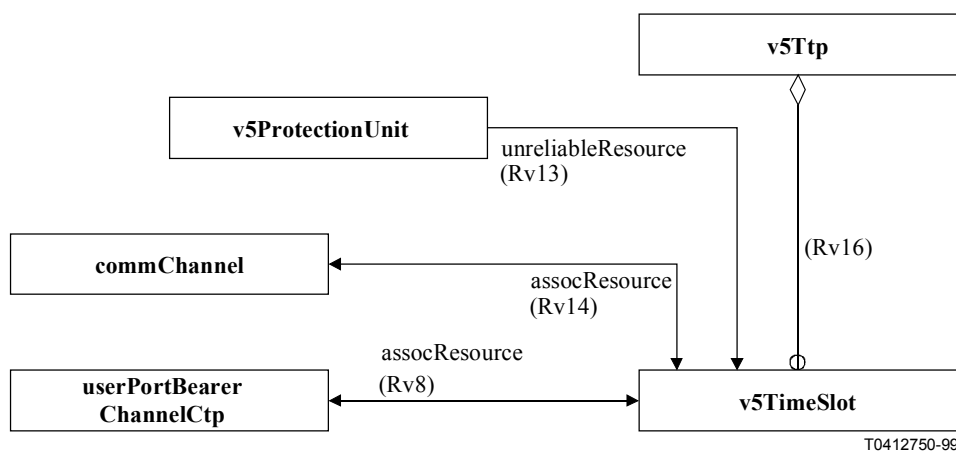


Figure 25/Q.831.1 – v5TimeSlot information entity

Attribute	Description
operationalState	The operational state (following M.3100 semantics) of the V5 interface. Legal values are "enabled" and "disabled".
timeSlotId	The timeSlotId identifies the time slot identifier of the 64 kbit/s time slot within the V5 protocol messages (17.4.2.3/G.965).
v5ChannelType	This attribute indicates whether the time slot is used as a bearer channel or a communication channel. Possible values are: <ul style="list-style-type: none"> – "bChannel" (the time slot is used as a bearer channel); – "cChannel" (the time slot is used as a communication channel).

Association	Description
assocResource	This association identifies the commChannel using the time slot if the v5ChannelType is "cChannel". If the v5ChannelType is "bChannel" and the related v5Interface is of "v5.1" type then this association identifies the userPortBearerChannelCtp using the timeslot. Otherwise, the association is not used.
v5TimeSlot-v5Ttp	A v5TimeSlot object instance is always contained by a single v5Ttp object instance. The total number of v5TimeSlots contained by a v5Ttp may not exceed 31.

3.1.6.9 v5Ttp

The v5Ttp information entity represents TTP terminating a 2048 kbit/s link that is used as a part of V5 interface as defined in ITU-T G.964 and ITU-T G.965. See Figure 26.

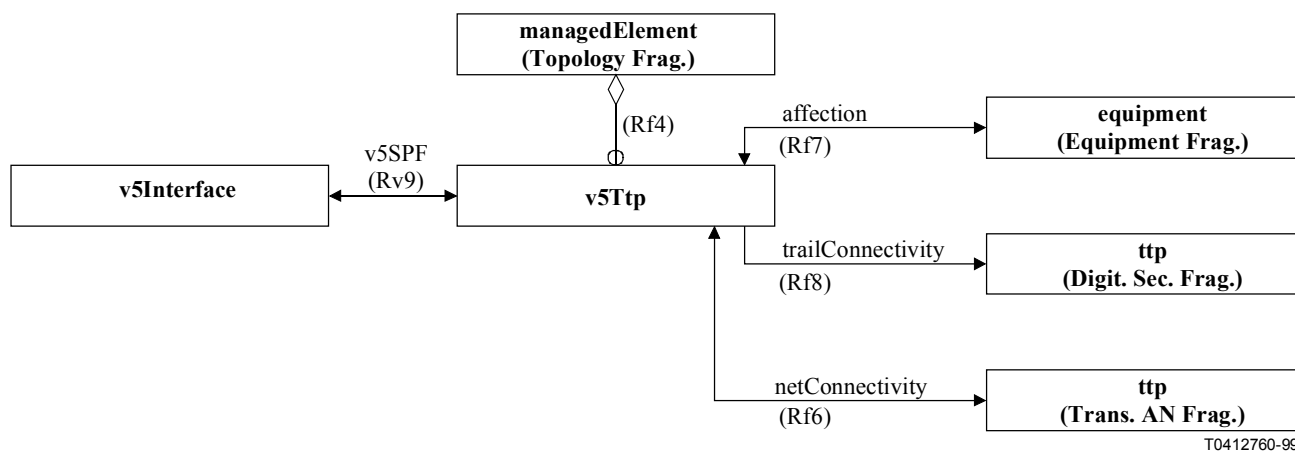


Figure 26/Q.831.1 – v5Ttp information entity

Attribute	Description
administrativeState	The administrative state (following M.3100 semantics) of the TTP. Legal values are "locked", "unlocked" and "shuttingDown".
blockingStatus	This attribute indicates if the entity is blocked for local (AN) or remote (LE) reasons or both. Possible values are: <ul style="list-style-type: none"> – "none " (the entity is not blocked); – "local" (the entity is blocked for a local reason); – "remote" (the entity is blocked for a remote reason); and – "both" (the entity is blocked both local and remote reasons). If the v5Ttp is associated with a V5.1 interface, the blockingStatus attribute shall always have the value "none" (16.2.4.3.2/G.965).
LinkId	This attribute identifies the v5 trail within the V5 protocol messages. Legal values are from 0 to 255.
operationalState	The operational state (following M.3100 semantics) of the TTP. Legal values are "enabled" and "disabled".
v5TtpId	The v5TtpId identifies the TTP of the 2048 kbit/s link.

Association	Description
Affection	This association identifies the object instance which is capable of directly affecting the v5Ttp.
assocV5Interface	This association identifies the v5Interface controlling the v5Ttp. The total number of v5Ttps associated to a V5.1 interface may not exceed 1 (clause 4/G.964). The total number of v5Ttps associated to a V5.2 interface may not exceed 16 (clause 4/G.965).
trailConnectivity	This association identifies the associated trail termination point sending and receiving traffic with this object instance. This association is not used if the same v5Ttp object instance is also used to represent CTP functionality at the same layer.
netConnectivity	This association identifies the transport AN network termination point associated to this v5Ttp.
v5Ttp-managedElement	A v5Ttp object instance is always contained by a single managedElement object instance.

Operation	Description
checkLinkId	This operation is used for triggering the V5 link identification check procedure on the 2048 kbit/s link the action is addressed to.

3.2 Scenarios

This subclause defines the dynamic model of the ensemble. The scenarios are used to show how the managed objects accomplish the functions listed in clause 2.

3.2.1 Scenarios over reference point a1

3.2.1.1 Create a user port

The operation creates the information structure of a userPortTtp. See Figure 27.

Precondition

There exists an instance *me* of class managedElement and an instance *e* of class equipment that supports the functionality provided by the userPortTtp.

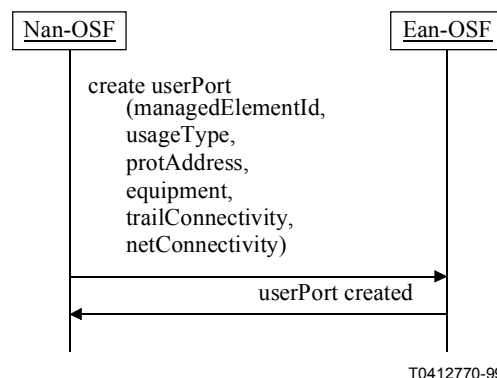


Figure 27/Q.831.1 – Creation of a user port

The equipment, trailConnectivity and netConnectivity parameters are given only when adequate. During the create operation the Ean-OSF creates the following associations: Rf4 (managedElement),

Rf6 (netConnectivity), Rf7 (affection) and Rf8 (trailConnectivity) according to the parameters given in the create call.

Postcondition

There exists an object instance *u* of class userPortTtp where (a Rf4-relationship exists between *u* and *me*) and (Rf7-relationship exists between *u* and *e*) and (*u*.operationalState = disabled).

Additional postconditions for a userPortTtp of "pstn" type

There exists an object instance *u* of class userPortTtp where (*u*.usageType = pstn) and (*u*.specialFeatures = {}).

Additional postconditions for a userPortTtp of "isdn-ba" or "isdn-pri" type

There exists an object instance *u* of class userPortTtp where ((*u*.usageType = isdn-ba) or (*u*.usageType = isdn-pri)) and (*u*.gradingMessages = disabled).

3.2.1.2 Delete a user port

The delete operation removes the information structure of a userPortTtp. See Figure 28.

Precondition

There exists an instance *u* of class userPortTtp to be deleted so that (*u* is not part of a Rv2 (assocDataComm) relationship) and (*u* is not part of a Rv3 (v5UPF) relationship).

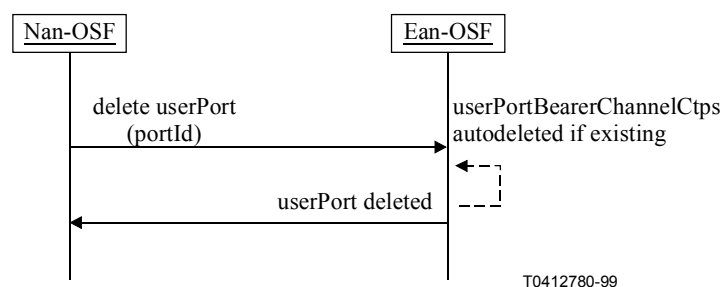


Figure 28/Q.831.1 – Deletion of a user port

During the delete operation the Ean-OSF autodeletes the associations: Rf4, Rf6, Rf7 and Rf8 if existing.

Postcondition

(There exists no *u*.)

3.2.1.3 Modify a user port

The modify operation modifies one or more userPortTtp parameters or changes the state of the userPortTtp. Modification of some parameters requires blocking of the userPortTtp. This is done by setting the administrativeState of the userPortTtp to "shuttingDown" or "locked".

Precondition

There exists an instance *u* of class userPortTtp to be modified.

It is possible to do any of the following modifications:

- a) Release and reassociate the following associations:
 - netConnectivity association (Rf6) if existing.

- b) Modify the following parameters of a v5Interface:
- administrativeState;
 - gradingMessages;
 - portAddress; and
 - specialFeatures.

The change of the portAddress attribute requires that the userPortTtp has been locked.

Postcondition

The administrativeState of the userPortTtp has to be changed to "unlocked" in order to become operable provided that the configuration is otherwise correct.

3.2.1.4 Read a user port

All the parameters and associations are always readable (if applicable to the user port type).

3.2.1.5 Create a V5 interface

Note, this operation is performed only in conjunction with the "Insert Equipment" scenario. See Figure 29.

Precondition

There exists an instance *me* of class managedElement and an instance *e* of class equipment that supports the functionality provided by the v5Interface, contained objects and associated v5Ttps.

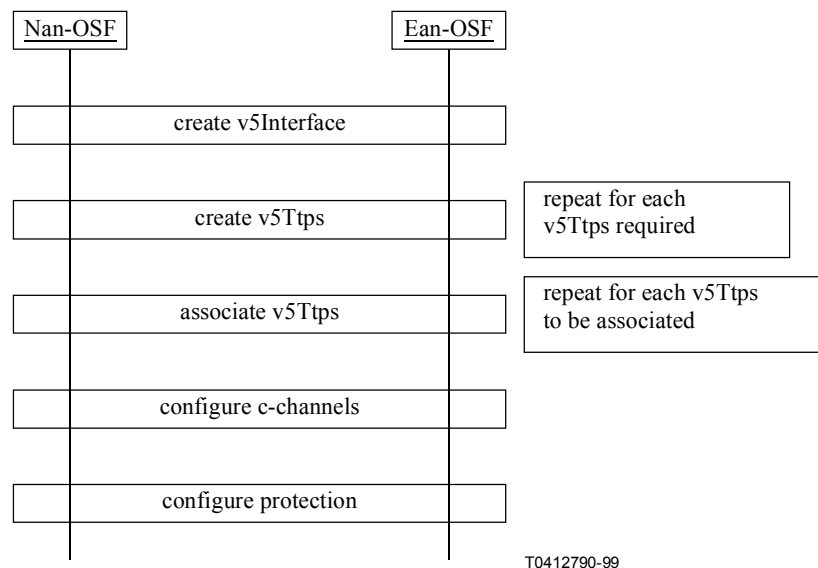


Figure 29/Q.831.1 – Creation of a fully configured V5 interface

The creation of a fully configured V5 interface can be divided into four or five subscenarios depending on the version of the v5Interface. The following diagrams show the details of these subscenarios:

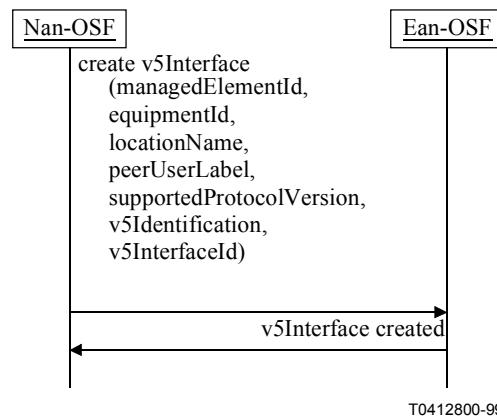


Figure 30/Q.831.1 – Creation of a V5 Interface

The equipment, locationName and peerUserLabel parameters are given only when adequate. During the create operation the Ean-OSF creates the Rf4 association according to the managedElement-parameter given in the create call.

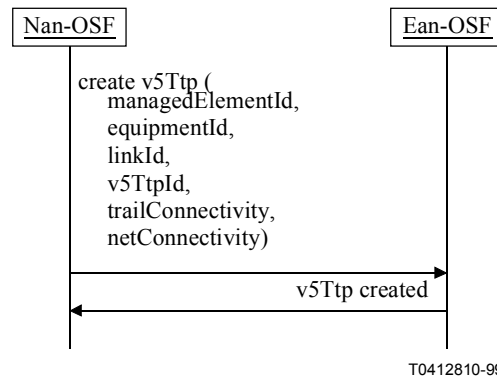


Figure 31/Q.831.1 – Creation of a v5Ttp

The equipment, trailConnectivity and netConnectivity parameters are given only when adequate. During the create operation the Ean-OSF creates the following associations: Rf4 (managedElement), Rf6 (netConnectivity), Rf7 (equipment) and Rf8 (trailConnectivity) according to the parameters given in the create call.

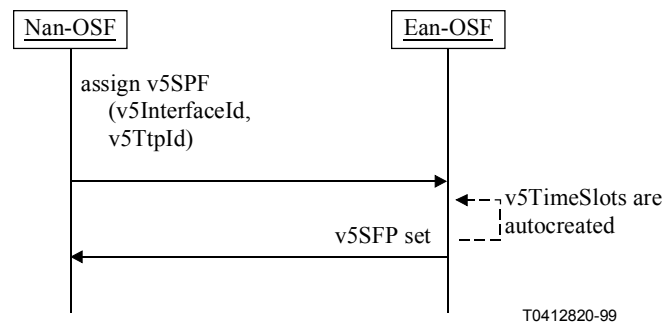
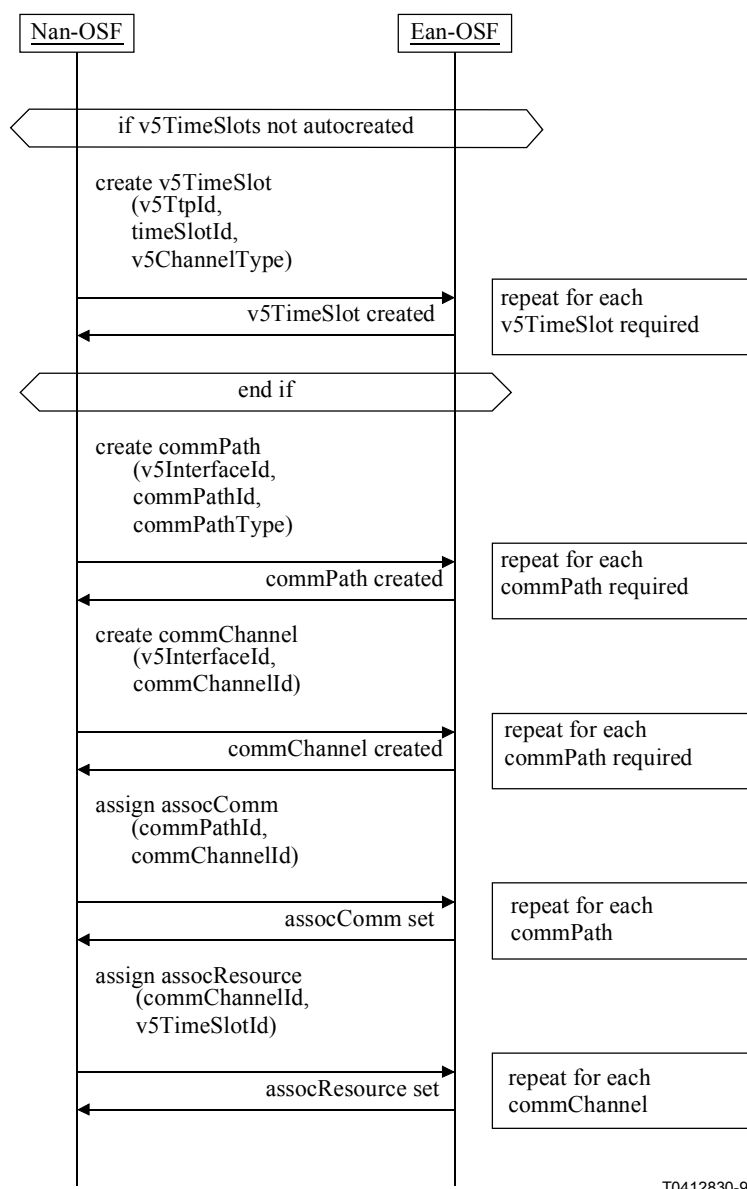


Figure 32/Q.831.1 – Association of a v5Ttp

With a v5Interface of V5.1 type, only one v5Ttp can be associated to the v5Interface. With a v5Interface of V5.2 type up to 16 can be associated with the v5Interface. The autocreation of v5TimeSlots is optional in this phase.



T0412830-99

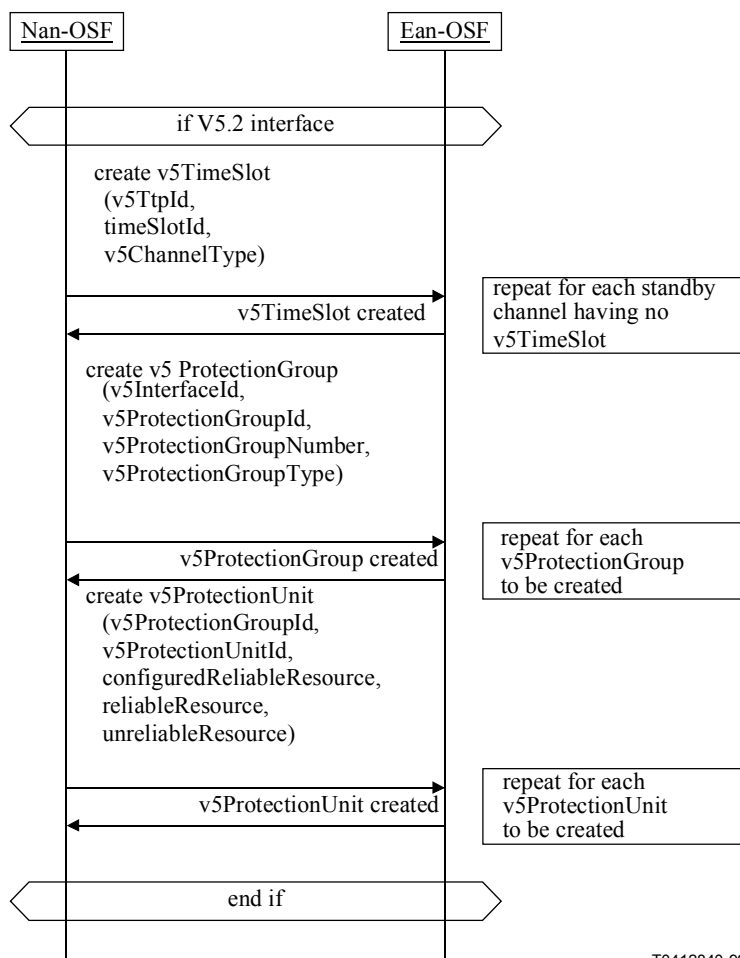
Figure 33/Q.831.1 – Configuration of c-channels

The required v5TimeSlots for physical c-channels has to be created if they do not already exist. During the create operation the Ean-OSF creates the Rv16 (v5Ttp) association according to the parameter given in the create call. The type of an existing v5TimeSlot may also be changed to cChannel according to the rules given in ITU-T G.964 and ITU-T G.965.

The commPath instances for isdn and pstn-signalling and commChannel object instances representing logical c-channels shall be created after the time slots for physical c-channels have been allocated. During the create operation the Ean-OSF creates the Rv5 and Rv6 associations (v5Interface) according to the parameters given in the create call.

The created commPaths are then associated to the commChannels following the allocation rules given in ITU-T G.964 and ITU-T G.965. Ean-OSF sets the assocResource association (Rv14) according to the parameters given in the call.

If the supportedProtocolVersion of v5Interface created is v5.2 and there are more than one v5Ttp associated to the v5Interface then the protection has to be created and configured.



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Figure 34/Q.831.1 – Configuration of protection

The required v5TimeSlots for standby channels have to be created if they are not already existing. During the create operation the Ean-OSF creates the Rv16 (v5Ttp) association according to the parameter given in the create call. The type of an existing v5TimeSlot may also be changed to cChannel according to the rules given in ITU-T G.964 and ITU-T G.965.

Up to two v5ProtectionGroups can be created under one v5Interface. The v5ProtectionGroup with the v5ProtectionGroupNumber = 1 must be used to protect primary commChannel carrying the vital protocols and the v5ProtectionGroupType must be equal to "plus". During the create operation the Ean-OSF creates the Rv10 associations (v5Interface) according to the parameters given in the create call.

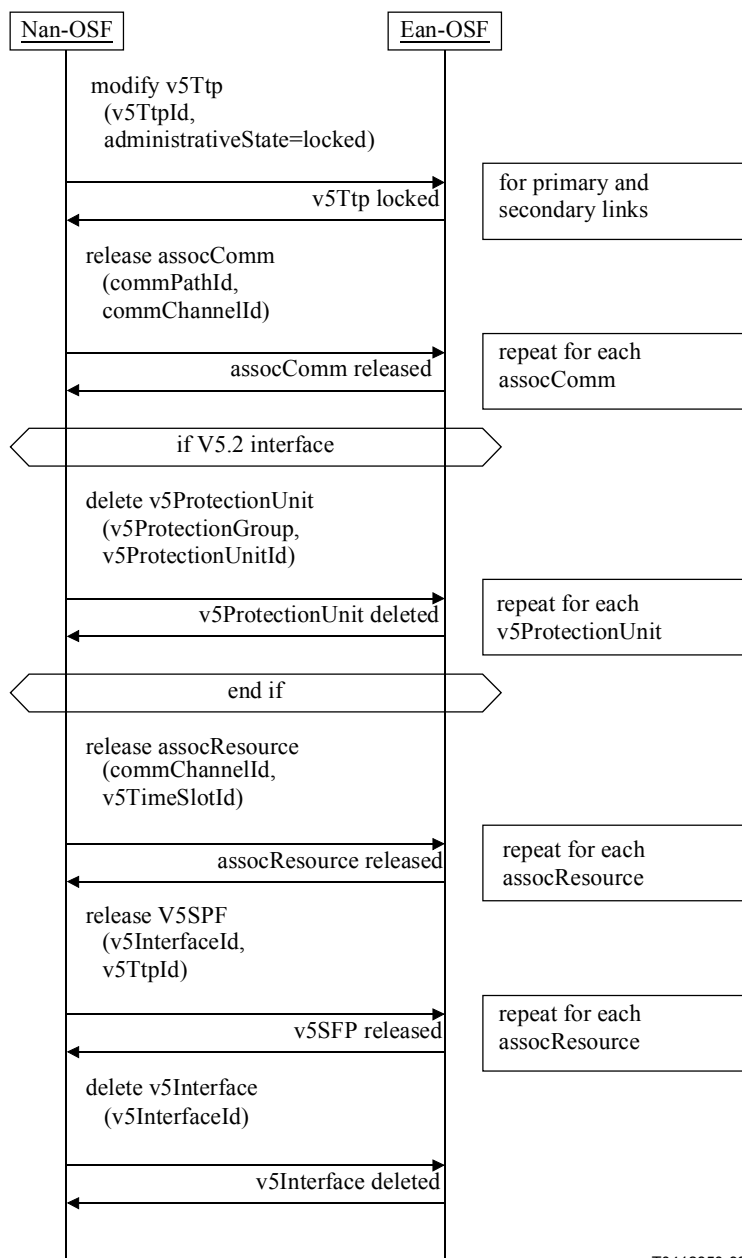
After that it is possible to create v5ProtectionUnits with the restriction that v5ProtectionGroups with v5ProtectionGroupType = "plus" may contain only two v5ProtectionUnits. For each v5ProtectionUnit Ean-OSF creates the Rv11 (v5ProtectionGroup), Rv12 (configuredReliableResource), Rv13 (unreliableResource) and Rv15 (reliableResource) associations according to the parameters given in the create call. The initial value of the v5ProtectingStatus attribute depends on the Rv15 (reliableResource) association.

3.2.1.6 Delete a V5 interface

This operation removes the V5.1 management interface structure.

Precondition

There exists an instance v of class v5Interface to be modified with associated v5Ttp instances t and so that there is no v5UPF association (see 3.2.1.10 "Delete V5 connection").



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Figure 35/Q.831.1 – Deletion of a v5Interface

Before deletion the v5Interface has to be shut down. This is done by blocking both the primary (carrying vital protocols) and the secondary (protecting vital protocols) v5Ttps.

Postcondition

There exists no v , t and subordinate object instances.

3.2.1.7 Modify a V5 interface

Some of the modifications described below require that the v5Interface has been shut down (operationalState = "disabled"). This is done by blocking both the primary (carrying vital protocols) and the secondary (protecting vital protocols) v5Ttps.

Precondition

There exists a v : v5Interface, t : v5Ttp, e : equipment where (v and e are related through the resource relationship) and (t and v are related through an Rv9 relationship).

It is possible to do any of the following modifications.

- a) Release and reassociate the following associations:
 - v5SPF association (Rv9);
 - assocComm association (Rv7);
 - assocResource association (Rv14); and
 - configuredReliableResource association (Rv12).

All the changes in the associations given above require the v5Interface has been shut down.

- b) Modify the following parameters of a v5Interface:
 - locationName;
 - peerUserLabel; and
 - v5Identification.

The change of the v5Identification requires that the v5Interface has been shut down.

- c) Modify the following parameters of a v5ProtectionGroup:
 - v5ProtectionGroupType.

The change of the v5Identification requires that the v5Interface has been shut down.

- d) Modify the following parameters of a v5Ttp:
 - administrativeState, and
 - linkId.

The change of linkId requires that the v5Interface has been shut down.

- e) Modify the parameters of a v5TimeSlot:
 - v5ChannelType.

The change of the v5ChannelType requires that the related v5Interface has been shut down.

- f) Add/remove commPath object instances. The adding or removing of the commPath instances requires that the related v5Interface has been shut down. The assocComm-association (Rv7) is automatically released by the Ean-OSF in the case of removing.
- g) Add/remove commChannel object instances. The adding or removing of the commChannel instances requires that the related v5Interface has been shut down. The removing of a commChannel instance requires that assocComm-association (Rv7) has been released and the possible v5ProtectionUnit associated to the commChannel has been removed. The assocResource-association (Rv14) is automatically released by the Ean-OSF in the case of removing.
- h) Add/remove v5ProtectionGroup object instances in V5.2 case. The adding or removing of the v5ProtectionGroup instances requires that the related v5Interface has been shut down. The removing of a v5ProtectionGroup requires that there is no v5ProtectionUnits in the v5ProtectionGroup.

- i) Add/remove v5ProtectionUnit object instances in V5.2 case. The adding or removing of the v5ProtectionUnit instances requires that the related v5Interface has been shut down. The configuredReliableResource (Rv12), unreliableResource (Rv13) and reliableResource (Rv15) associations are automatically released by the Ean-OSF in the case of removing.
- j) Add/remove v5TimeSlots object instances. Creating or removing the assocResource (Rv14) or unreliableResource (Rv13) associations requires that the related v5Interface has been shut down. In V5.1 case the assocResource (Rv8) relationship to a userPortBearerChannelCtp object instance may be created/removed without shutting down the v5Interface.
- k) Add/remove v5Ttp object instances. The adding or removing of the commPath instances requires that the related v5Interface has been shut down. The removing of a v5Ttp instance requires that v5SPF-association (Rv9) has been released. The contained v5TimeSlots with assocResource-associations (Rv8 or Rv14) are automatically deleted by the Ean-OSF in the case of removing.

Postcondition

The v5Interface requires startV5Interface operation if the operationalState of the v5Interface is "disabled" after the modifications in order to become fully operable provided that the configuration is otherwise correct.

3.2.1.8 Read a V5 interface

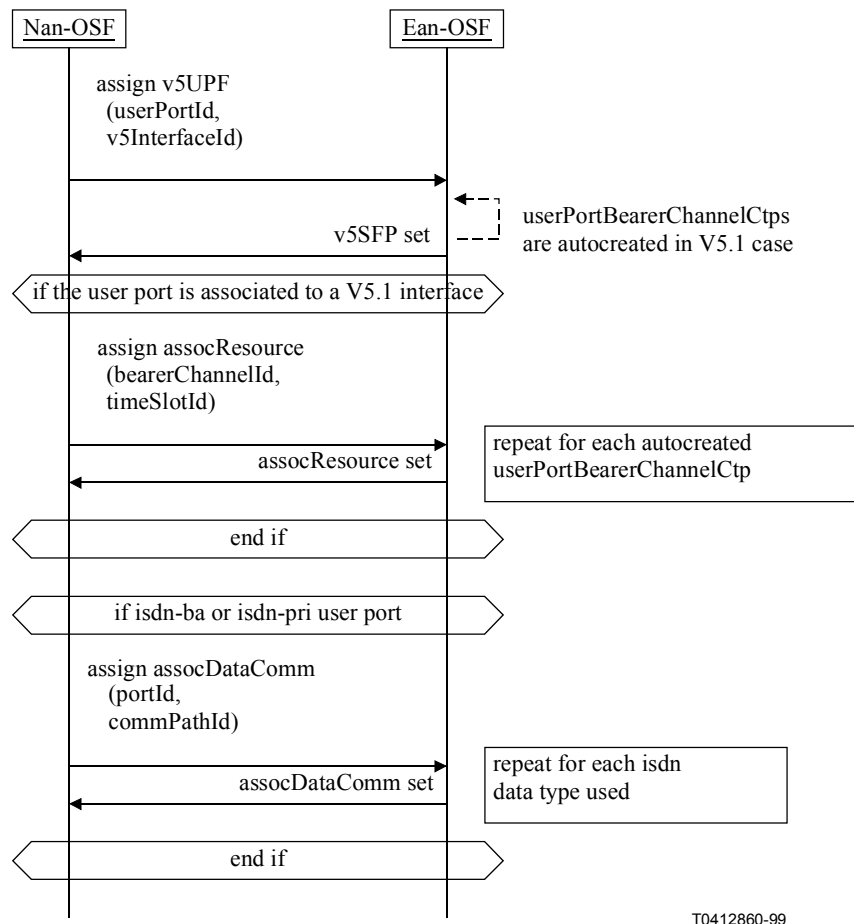
All the parameters and associations are always readable (if applicable to the V5 interface type).

3.2.1.9 Create a V5 connection

This scenario provides for the connection between a user port and a V5 interface. See Figure 36.

Precondition

There exists a (u : userPortTtp) and (v : v5Interface) and (u and v are within the same transport bearer service domain) and (u is not associated to any v).



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Figure 36/Q.831.1 – Creation of a V5 connection

The userPortBearerChannelCtp object instances are not autocreated if they already exist.

Postcondition

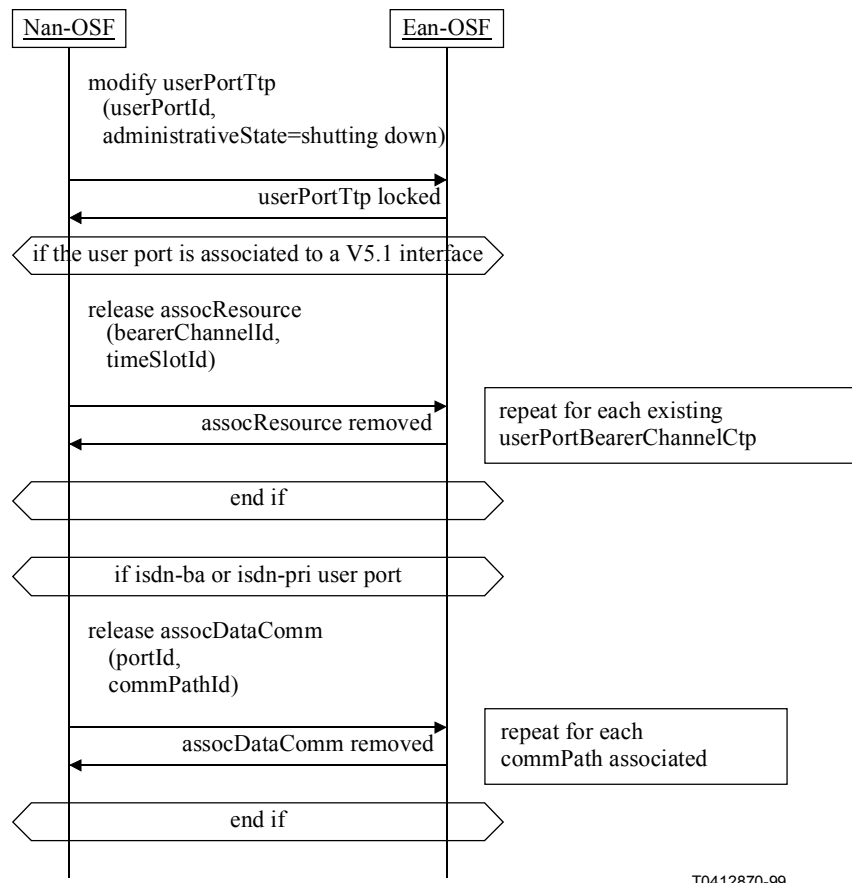
There exist the **Rv2** (assocDataComm) and **Rv3** (v5UPF) relationships and in the V5.1 case the **Rv8** (assocResource) relationship.

3.2.1.10 Delete V5 connection

This management operation deletes the connection between the user port and the V5 interface. See Figure 37.

Precondition

There exists the relationship **Rv3** (v5UPF).



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Figure 37/Q.831.1 – Deletion of V5 connection

Postcondition

There exists no relationships **Rv2** (assocDataComm) and **Rv3** (v5UPF) and in the V5.1 case the relationship **Rv8** (assocResource).

3.2.1.11 Modify V5 connection

The modifications of a V5 connection require that the userPortTtp is in a locked state. This is done by setting the administrativeState of the userPortTtp to "shuttingDown".

Precondition

There exists a (**u** : userPortTtp) and (**v** : v5Interface) and (there exist the **Rv2** (assocDataComm) and **Rv3** (v5UPF) relationships and in the V5.1 case the **Rv8** (assocResource) relationship).

It is possible to release and reassociate the following associations:

- v5UPF association (Rv3);
- assocCommData association (Rv2);
- assocResource association (Rv8) if V5.1 connection.

Ensemble GDMO MOCS proformas

This annex gives the mapping of the object classes to the GDMO managed objects classes and defines the MOCS proformas for the GDMO object classes.

A.1 Managed objects

The managed objects derive from following template libraries.

A.1.1 V5 transport bearer service fragment

[Q.824.5] pstnUserPort, isdnBAUserPort, bearerChannelCtp, leasedPort, sdnPRAUserPort

[Q.824.5] v5interface, v5Ttp, v5TimeSlot, commChannel, pstnCommPath, isdnCommPath, controlCommPath, bccCommPath, protectionCommPath

A.1.2 equipment fragment

[M.3100] equipmentR1

[G.774] SDHequipment

SDHequipment is to be used for network elements which support pre-installation facilities.

A.1.3 transmission fragment

[M.3100] trailTerminationPointBidirectional

A.1.4 topology fragment

[M.3100] networkR1, managedElement

A.1.5 digital section fragment

[G.774] vc12Ttp

A.2 Selected managed object profiles

These profiles describe the objects relevant for narrowband connectivity service provisioning. They describe the intended usage of the attributes of the selected managed objects with the goal to remove all conditionality in their specification. The "Base" column shows the conditionality of the attribute in the base library (e.g. M.3100). The values "M"andatory and "C"onditional are possible. In the "Model" column, the attribute is profiled to the use in this ensemble. An "X" denotes a mandatory attribute which is not used in this ensemble. "-" indicates that a conditional attribute is not provided for this ensemble.

¹ **Copyright release for MOCS proforma**

Users of this Recommendation may freely reproduce the MOCS proforma in this annex so that it can be used for its intended purpose, and may further publish the completed MOCS.

Name	Base	Model	Usage/Description
objectClass	M	M	Indicates the object class to which the MO belongs.
allomorphs		X	Only if allomorphism supported. Set of Obj classes.
nameBinding	M	M	Identifies the name binding with which the MO was instantiated.
packages		M	Appears in every MO in which any registered package other than package. Package has been instantiated.

Implementation notes:

To ensure easy reuse of existing objects in this specification, the behaviour of the networkLevelPointer in the M3100:terminationPoint object (and subclasses) is restricted as follows: "The networkLevelPointer identifies the network level objects of the access network transmission system or is NULL. The value shall only be set by the managed system." This restriction allows for easy implementation of the transmission relationship.

A.2.1 V5.1 interface

A.2.1.1 v5Interface

Name	Base	Model	Usage
v5InterfaceId	M	M	v5interface name (string[3]). RDN.
peerManagedElementId	O	M	identification of the v5If LE-counterpart defined by the manager. (GraphicString).
supportedProtocolVersion	M	M	"V51" or "V52" (GraphicString).
serverV5Ttps	M	M	pointer.
clientUserPorts	M	M	pointer.
operationalState	C	–	
availabilityStatus	C	–	
supportedByObjectList	C	–	
userLabel	O	M	string used for connection point and user specific names.
locationName	O	M	access network name the interface is associated to.

A.2.1.2 v5Ttp

Name	Base	Model	Usage
TtpId	M	M	v5Ttp number, defined by the agent upon creation. RDN.
supportedByObjectList	M	M	pointer to equipment fragment.
upstreamConnectivityPointer	M	M	pointer to digital section fragment.
downstreamConnectivityPointer	M	M	pointer to digital section fragment.
administrativeState	M	M	blockingState of the interface.
operationalState	M	M	system internal controlled status.
availabilityStatus	C	M	"notInstalled" – no V5Ttp equipment associated. "offLine" – no V5Ttp link associated.

Name	Base	Model	Usage
assocV5Interface	M	M	pointer.
linkId	M	M	V5 link ID assigned to the v5Ttp.
blockingStatus	M	M	indicates if the entity is blocked for local or remote reasons or both.
neSpecificPointer	C	–	
alarmSeverityAssignment ProfilePointer	C	X	
alarmStatus	C	X	
characteristicInformation	C	X	
crossConnectionObjectPointer	C	X	
currentProblemList	C	X	
downStreamConnectivity Pointer	M	M	points to the digital section.
networkLevelPointer	C	M	points to the network level object of a transport access network model.
supportableClientList	C	–	
supportedByObjectList	M	M	points to supporting equipment fragment objects.
upstreamConnectivityPointer	M	M	points to the digital section.

A.2.1.3 V5 timeSlot

Name	Base	Model	Usage
cTpid	M	M	timeslot number, given by agent upon creation. RDN.
supportedByObjectList	M	X	not used.
administrativeState	C	M	used for blocking a single timeslot, e.g. for testing purposes.
operationalState	M	M	
upstreamConnectivityPtr	M	X	
downstreamConnectivityPointer	M	X	
v5ChannelType	M	M	defines the usage of the timeslot.
assocResource	M	M	V5.1: NULL if the timeslot is unused otherwise pointing to the BearerChannel. V5.2: NULL if used as bearerChannel.

A.2.1.4 V5 Communication channel

Name	Base	Model	Usage
commChannelId	M	M	channel number, must be unique for a given V5tTp. (short integer). RDN.
assocV5CommPaths	M	M	points to the communication path objects.
assocV5TimeSlot	M	M	points to the associated timeslot.
operationalState	M	M	cf. 300 377-1.
supportedByObjectList	C	X	Not used.

A.2.1.5 Communication path (PSTN CommPath/BCC CommPath/Control CommPath)

Name	Base	Model	Usage
commPathId	M	M	path number, must be unique for a given V5tTp. (short integer). RDN.
assocCommChannel	M	M	points to the associated V5 C-channel.
supportedByObjectList	C	X	not used.

A.2.1.6 ISDN Communication path

Name	Base	Model	Usage
clientUserPorts	M	M	points to the related User Ports.
dataType	M	M	indicates the type (d, f, p).

A.2.2 User ports

A.2.2.1 PSTN user port

Name	Base	Model	Usage/Description
tTPId	M	M	tTP ID name. RDN.
administrativeState	M	M	Takes following values: locked, unlocked, shutting down. Default value: locked.
assocV5Interface	C	M	Pointer to the related V5 interface object.
blockingStatus	C	M	Indicate the reason of blocking (local or remote) if it is the case.
layer3PortAddress	M	M	It gives the layer 3 port address the analogue access is assigned to.
specialFeatures	M	M	The attribute indicates whether or not there are any special features at the PSTN user port and what the features are if they are present. Further to be cleared.
alarmSeverityAssignment ProfilePointer	C	X	Identifies an ASAP Object.

Name	Base	Model	Usage/Description
alarmStatus	C	X	Summary indicator of alarm condition (critical, warning,...).
characteristicInformation	C	X	Used to verify the connectivity of instances of the termination point subclasses.
crossConnectionObjectPointer	C	–	Points to a MO as a cross conn., a GTP or Fabric.
currentProblemList	C	X	Identifies the cause, alarmStatus list of a MO.
downStreamConnectivityPointer	M	X	
networkLevelPointer	C	M	
supportableClientList	C	–	List of supported obj classes as client.
supportedByObjectList	M	M	Identifies a set of object instances (both physical and logical) which are capable of directly affecting a given managed object.
upstreamConnectivityPointer	M	X	
operationalState	M	M	Meaning of the states: disabled = no access to service, enabled = port has access to any service.

A.2.2.2 isdnBAUserPort, isdnPRAUserPort

Name	Base	Model	Usage/Description
tTPId	M	M	tTP ID name. RDN.
administrativeState	M	M	Takes following values: locked, unlocked, shutting down. Default value: locked.
accessDigitalSection	M	M	Indicates whether the NT1 is implemented separately from the AN. Possible values: absent, present.
blockingStatus	C	M	Indicate if blocked for local or remote reason or both.
gradingEnabled	C	M	If the port has an access digital section, indicates whether the grading message should be sent to the LE. Values: {enabled, disabled}. Default value: disabled.
assocPacketCommPath	M	M	Pointer. Group rel. to the assoc. ISDN communication path carrying the D-Channel packet mode data of the assigned ISDN access if the customer has subscribed to this service. Path is owner.
assocFrameCommPath	M	M	Pointer. Group rel. to the assoc. path carrying the D-Channel frame mode data of the assigned ISDN access if the customer has subscribed to this service. Path is owner.
assocIsdnSignallingCommPath	M	M	Pointer. Group rel. Path carrying the signalling messages. Path is owner.
assocV5Interface	C	M	Pointer attribute. Group relationship with the V5 interface (owner).
envelopeFunctionAddress	M	M	It gives the envelope function address the ISDN access is assigned to.

Name	Base	Model	Usage/Description
alarmSeverityAssignment ProfilePointer	C	X	See pstnUserPort.
alarmStatus	C	X	
characteristicInformation	C	M	used to identify special uses of B-channels.
crossConnectionObjectPointer	C	–	
currentProblemList	C	X	
downStreamConnectivity Pointer	M	X	
networkLevelPointer	C	M	
supportableClientList	C	–	
supportedByObjectList	M	M	
upstreamConnectivityPointer	M	X	
operationalState	M	M	

A.2.2.3 leasedPort

Name	Base	Model	Usage/Description
tTPId	M	M	tTP ID name. RDN.
administrativeState	M	M	Takes following values: locked, unlocked, shutting down. Default value: locked.
envelopeFunctionAddress	M	M	It gives the envelope function address the ISDN access is assigned to.
alarmSeverityAssignment ProfilePointer	C	X	See pstnUserPort.
alarmStatus	C	X	
characteristicInformation	C	M	used to identify special uses of B-channels in this port.
crossConnectionObjectPointer	C	X	
currentProblemList	C	X	
downStreamConnectivity Pointer	M	X	
networkLevelPointer	C	M	
supportableClientList	C	X	
supportedByObjectList	M	M	
upstreamConnectivityPointer	M	X	
operationalState	M	M	

A.2.2.4 Bearer Channel Ctp

Name	Base	Model	Usage/Description
cTPId	M	M	cTP ID Name
administrativeState	C	M	Takes following values: locked, unlocked, shutting down. Default value: locked.
assocTimeSlot	C	M	Pointer to the associated object which represents a time slot at the service interface to the LE. Attribute used if the bearer channel has a call-independent association.
bearerChannelType	C	M	indicates whether or not the bearer channel is used for permanent line (PL) access.
alarmSeverityAssignmentProfilePointer	C	X	Identifies an ASAP Object.
alarmStatus	C	X	Summary indicator of alarm condition (critical, warning, ...).
channelNumber	C	X	
characteristicInformation	C	M	Used to verify the connectivity of instances of the termination point subclasses.
crossConnectionObjectPointer	C	–	
currentProblemList	C	X	Identifies the cause, alarmStatus list of a MO.
downStreamConnectivityPointer	M	X	
networkLevelPointer	C	–	
supportedByObjectList	M	X	
upstreamConnectivityPointer	M	X	

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