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SERIES Q: SWITCHING AND SIGNALLING

Specifications of Signalling System No. 7 – Q3 interface

Stage 2 and stage 3 description for the Q3 interface – Customer administration:

Configuration management of V5 interface environments and associated customer profiles

ITU-T Recommendation Q.824.5

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.824.5

STAGE 2 AND STAGE 3 DESCRIPTION FOR THE Q3 INTERFACE – CUSTOMER ADMINISTRATION: CONFIGURATION MANAGEMENT OF V5 INTERFACE ENVIRONMENTS AND ASSOCIATED CUSTOMER PROFILES

Summary

The purpose of this Recommendation is to define the Q3 interface between an Access Network (AN) and a Local Exchange (LE) and the Telecommunications Management Network (TMN) for the support of configuration management functions for V5 interfaces, as described in Recommendations G.964 and G.965, and their associated user ports. The management of transmission, media, and services which are not related to V5 interfaces is outside the scope of this Recommendation.

Generic modelling of leased line ports which are associated with a V5 interface is within the scope of this Recommendation, but the traffic from these ports can only be associated with 64 kbit/s bearer channels on the V5 interface.

This Recommendation does not constrain the logical or physical size of the AN or its geographical dispersion. The definition of the managed object class which represents an AN is outside the scope of this Recommendation.

Source

ITU-T Recommendation Q.824.5 was prepared by ITU-T Study Group 4 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 24th of October 1997.

Keywords

Access network, configuration management, customer administration, information model, local exchange, Q3 interface, TMN, V5 interface.

FOREWORD

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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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Introduction

Customer administration is a management activity that the network operator performs in order to exchange with the customer all the customer-related management data and functions required to offer a telecommunications service and to exchange with the network all the customer-related management data and functions necessary for the network to produce that telecommunications service.

It is considered that the customer's terminal equipment can be connected directly to the Local Exchange (LE) or via a V5 interface.

In a wide sense, this could include interactions for the purpose of service provision management, configuration administration, fault administration, charging (including detailed billing) administration, complaints administration, quality of service administration, traffic measurement administration, etc. In this Recommendation, however, only customer administration in the more traditional sense of service provision and service configuration has been included.

In particular, the tasks to be performed in the LE to provide service for customers which are connected via a V5 interface to the LE are considered.

Administration of V5 interface related data is a management activity that the network operator performs in order to configure initially or to reconfigure a V5 interface to enable and maintain the service offering for the customers connected.

Recommendation Q.824.5

STAGE 2 AND STAGE 3 DESCRIPTION FOR THE Q3 INTERFACE – CUSTOMER ADMINISTRATION: CONFIGURATION MANAGEMENT OF V5 INTERFACE ENVIRONMENTS AND ASSOCIATED CUSTOMER PROFILES

(Geneva, 1997)

1 Scope

This Recommendation specifies the Q3 interface between an Access Network (AN) and a Local Exchange (LE) and the Telecommunications Management Network (TMN) for the support of configuration management functions for V5 interfaces, as described in Recommendations G.964 [4] and G.965 [5], and their associated user ports. The management of transmission, media, and services which are not related to V5 interfaces is outside the scope of this Recommendation.

The Q3 interface is the TMN interface between network elements or Q-adapters which interface to Operations Systems (OSs) without mediation and between OSs and mediation devices. The location of the Q3 interface is illustrated in Annex D.

Generic modelling of leased line ports which are associated with a V5 interface is within the scope of this Recommendation, but the traffic from these ports can only be associated with 64 kbit/s bearer channels on the V5 interface.

The definition of Operations System (OS) functionality, and the specification of Qx interfaces and proprietary interfaces are outside the scope of this Recommendation.

This Recommendation does not constrain the logical or physical size of the AN or its geographical dispersion. The definition of the managed object class which represents an AN is outside the scope of this Recommendation.

Although security management is excluded from this Recommendation, any aspects of security relating to configuration management are included as an integral part of configuration management.

Existing protocols are used where possible, and the focus of this Recommendation is on defining the object models.

NOTE 1 – Configuration management includes provisioning and the provisioning activity may include testing, but this testing is not included in this Recommendation. It is specified in Recommendation Q.831 [12].

NOTE 2 – The current modelling may cause problems with long list attributes, in particular clientUserPort, since the encoded length of the values of these attributes could exceed the limit imposed by the size of CMIP PDUs. This issue is for further study.

2 References

2.1 Normative 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 G.773 (1993), *Protocol suites for Q-interfaces for management of transmission systems.*

[2] ITU-T Recommendation G.784 (1994), *Synchronous Digital Hierarchy (SDH) management.*

[3] ITU-T Recommendation G.960 (1993), *Access digital section for ISDN basic rate access.*

[4] ITU-T Recommendation G.964 (1994), *V-Interfaces at the digital Local Exchange (LE) – V5.1-interface (based on 2048 kbit/s) for the support of Access Network (AN).*

[5] ITU-T Recommendation G.965 (1995), *V-Interfaces at the digital Local Exchange (LE) – V5.2 Interface (based on 2048 kbit/s) for the support of Access Network (AN).*

[6] ITU-T Recommendation I.310 (1993), *ISDN – Network functional principles.*

[7] ITU-T Recommendation M.3010 (1996), *Principles for a telecommunications management network.*

[8] ITU-T Recommendation M.3100 (1995), *Generic network information model.*

[9] ITU-T Recommendation Q.811 (1997), *Lower layer protocol profiles for the Q3 and X interface.*

[10] ITU-T Recommendation Q.812 (1997), *Upper layer protocol profiles for the Q3 and X interface.*

[11] ITU-T Recommendation Q.824.0 (1995), *Stage 2 and stage 3 description for the Q3 interface – Customer administration: Common information.*

[12] ITU-T Recommendation Q.831 (1997), *Fault and performance management of V5 interface environments and associated customer profiles.*

[13] CCITT Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1).*

[14] ITU-T Recommendation X.680 (1994) | ISO/IEC 8824-1:1995, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation.*

[15] ITU-T Recommendation X.681 (1994) | ISO/IEC 8824-2:1995, *Information technology – Abstract Syntax Notation One (ASN.1): Information object specification.*

[16] ITU-T Recommendation X.682 (1994) | ISO/IEC 8824-3:1995, *Information technology – Abstract Syntax Notation One (ASN.1): Constraint specification.*

[17] ITU-T Recommendation X.683 (1994) | ISO/IEC 8824-4:1995, *Information technology – Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specification.*

[18] CCITT Recommendation X.711 (1991), *Common management information protocol specification for CCITT applications.*

[19] CCITT Recommendation X.720 (1992) | ISO/IEC 10165-1:1993, *Information technology – Open Systems Interconnection – Structure of management information: Management information model.*

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

[21] CCITT Recommendation X.730 (1992) | ISO/IEC 10164-3:1993, *Information technology – Open Systems Interconnection – Systems Management: Object management function.*

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

2.2 Informative references

– ITU-T Recommendation G.831 (1996), *Management capabilities of transport networks based on the synchronous digital hierarchy (SDH).*

– CCITT Recommendation I.601 (1988), *General maintenance principles of ISDN subscriber access und subscriber installation.*

– ITU-T Recommendation M.3020 (1995), *TMN interface specification methodology.*

– 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.*

3 Terms and definitions, abbreviations

3.1 Definitions

This Recommendation defines the following terms.

3.1.1 B-channel number: identifies a B-channel on the ISDN basic rate User-Network Interface (UNI) and ISDN primary rate UNI.

3.1.2 D-channel signalling type (Ds-type) data: ISDN D-channel signalling type data with Service Access Point Identifier (SAPI) not equal to 16, and not equal to 32 to 62 (see 8.4/G.964 [4]).

3.1.3 frame type (f-type) data: ISDN D-channel data with SAPI in the range from 32 to 62 (see 8.4/G.964 [4]).

3.1.4 packet type (p-type) data: ISDN D-channel data with SAPI equal to 16 (see 8.4/G.964 [4]).

3.1.5 V5 time slot: Is an object class representing a 64 kbit/s channel of a V5 interface that is used as bearer or communication channel. It is a subclass of "M.3100": Connection Termination Point Bidirectional.

3.1.6 V5 trail termination point (TTP): Is an object class representing a 2048 kbit/s interface that is used as V5.1 interface or as part of a V5.2 interface. It is a subclass of "M.3100":Trail Termination Point Bidirectional.

3.1.7 virtual access channel: Is an object class representing an individual ISDN B-/D-channel of an ISDN access port, or an individual channel of a digital access port, or the bearer channel for an analogue access port. It is a subclass of "Q.824.0": Access Channel.

3.1.8 virtual access port: Is an object class representing an image of the customer access port which is located in an AN and connected to the LE via V5 interface. It is a subclass of "Q.824.0": Access Port and used for provisioning services to the customer. This object class is subclassed for the different types of customer access ports.

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

– **G.964** [4]: Access Network (AN), Bearer channel, Communication channel (C-channel), Communication path (C-path), Control protocol, Envelope function address, Layer 3 address, Local Exchange (LE), Permanent Line (PL), Provisioning variant, Semi-permanent leased line, Time slot number, V5 interface.

– **G.965** [5]: Bearer Channel Connection (BCC), Protection protocol.
– **M.3010** [7]: Operations System (OS).

3.2 Abbreviations

This Recommendation uses the following abbreviations.

AN	Access Network
ASN.1	Abstract Syntax Notation one
BA	Basic rate Access
BCC	Bearer Channel Connection
C-channel	Communication channel
C-path	Communication path
CTP	Connection Termination Point
DCC	Data Communications Channel
DS	Digital Section
Ds-type	D-channel signalling type
ET	Exchange Termination
FSM	Finite State Machine
f-type	Frame type
ID	Identity, Identifier
ISDN	Integrated Services Digital Network
LE	Local Exchange
M/C	Mandatory/Conditional
MDU	Management Data Unit
MPH	Primitive between Physical layer and layer 2 Management
NE	Network Element
OS	Operations System
PH	Primitive between Physical layer and layer 2
PL	Permanent Line
PRA	Primary Rate Access
PSTN	Public Switched Telephone Network
p-type	Packet type
Q3AN	Q3 interface at the Access Network
Q3LE	Q3 interface at the Local Exchange
RDN	Relative Distinguished Name
SAPI	Service Access Point Identifier
TMN	Telecommunications Management Network
TTP	Trail Termination Point
UNI	User-Network Interface

4 Configuration management functions

4.1 Customer administration at the V5 interface and administration of V5 interface related data at the local exchange

4.1.1 Description of the service

Customer administration is a management activity that the network operator performs in order to exchange with the customer all the customer-related management data and functions required to offer a telecommunications service and to exchange with the network all the customer-related management data and functions necessary for the network to produce that telecommunications service.

It is considered that the customer installation can be accessed directly at the local exchange as well as via a V5 interface.

In a wide sense, this could include interactions for the purpose of service provision management, configuration administration, fault administration, charging (including detailed billing) administration, complaints administration, quality of service administration, traffic measurement administration, etc. Here, however, only customer administration in the more traditional sense of service provision and service configuration has been included.

In particular, the tasks to be performed in the local exchange to provide service for customers which are connected via a V5 interface to the local exchange are considered.

Administration of V5 interface related data is a management activity that the network operator performs in order to initially configure or to reconfigure a V5 interface to enable and maintain the service offering for the customers connected.

4.1.2 Components of service

1) Manage service provision:

   After receiving a customer order, find an available directory number and a suitable V5 interface with available time slot(s) in an appropriate exchange and connect these.

   The management of service provision to customer installations accessed directly at the local exchange is covered by Recommendation Q.824.0 [11].

   Here, the additional requirements for managing service provision to customer installations accessed via a V5 interface at the local exchange are considered.

2) Administer service facilities and supplementary services:

   Record user service requirements as data related to directory number. Some services can be both customer-controlled and operator-controlled. Examples are abbreviated dialling, priority, malicious call tracing, charging observation, traffic restriction, free of charge, etc. This item is covered by Recommendation Q.824.0 [11].

3) Administer customer line:

   Administer line characteristics which are relevant for the local exchange, considering lines accessing the local exchange via a V5 interface (e.g. line status, traffic direction). The administration of customer lines accessed directly at the local exchange is covered by Recommendation Q.824.0 [11].

4) Manage line test:

   Out of scope.

5) Configure and reconfigure V5 interface:

Record data related to a specific V5 interface to enable or maintain service offering and to yield data inconsistency detection between access network and local exchange.

4.1.3 Management function list

4.1.3.1 Insert, delete, modify, read single and multi-line customer access (ISDN and analogue access) accessed via a V5 interface

4.1.3.1.1 Customers accessed via a V5.1 interface (ISDN basic rate and analogue access)

4.1.3.1.1.1 Insert customer accesses

Set up relations between:

- directory number and its assigned customer service profile (see Recommendation Q.824.0 [11];
- V5.1 interface;
- time slot(s) in that interface;
- envelope function address (for ISDN access);
- layer 3 port address (for analogue access);
- in case of ISDN, B-channel number (B1, B2);
- in case of ISDN, time slot for D-channel packet and frame data;
- customer resources,

and provide the relevant data.

4.1.3.1.1.2 Delete customer accesses

Delete relations between the information elements mentioned in 4.1.3.1.1.1 and, if necessary, relevant data assigned to those elements.

4.1.3.1.1.3 Modify customer accesses

Modify one or more relation(s) and/or assigned data mentioned in 4.1.3.1.1.1.

4.1.3.1.1.4 Read customer accesses

Read information about one or more relations and/or assigned data mentioned in 4.1.3.1.1.1.

4.1.3.1.2 Customers accessed via a V5.2 interface (ISDN basic and primary rate and analogue access)

4.1.3.1.2.1 Insert customer accesses

Set up relations between:

- directory number and its assigned customer service profile (see Recommendation Q.824.0 [11];
- V5.2 interface;
- envelope function address (for ISDN access);
- layer 3 port address (for analogue access);
- in case of ISDN, time slot for D-channel packet and frame data;
- customer resources,

and provide the relevant data.

4.1.3.1.2.2 Delete customer accesses

Delete relations (ISDN basic and primary rate and analogue access) mentioned in 4.1.3.1.2.1.

4.1.3.1.2.3 Modify customer accesses

Modify (ISDN basic and primary rate and analogue access) mentioned in 4.1.3.1.2.1.

4.1.3.1.2.4 Read customer accesses

Read (ISDN basic and primary rate and analogue access) mentioned in 4.1.3.1.2.1.

4.1.3.2 Insert, delete, modify, read customer (supplementary) service

Out of scope.

4.1.3.3 Block/unblock single and multi-line customers

It is to be regarded, that dynamic blocking and unblocking can be initiated across the V5 interface. The impact between administrative and dynamic blocking/unblocking needs to be considered.

4.1.3.4 Block/unblock customer (supplementary) service

Out of scope.

4.1.3.5 Activate/de-activate malicious call tracing

Out of scope.

4.1.3.6 Activate/de-activate charging observation

Out of scope.

4.1.3.7 Activate/de-activate line test and measurement

Out of scope.

4.1.3.8 Insert, delete, modify, read a V5 interface

4.1.3.8.1 V5.1 interface

4.1.3.8.1.1 Insert a V5.1 interface

Add a V5.1 interface:

- V5.1 interface ID;
- time slots for communication and for bearer channels;
- protocol version;
- provisioning variant.

4.1.3.8.1.2 Delete a V5.1 interface

Remove a V5.1 interface and delete relevant data mentioned in 4.1.3.8.1.1.

4.1.3.8.1.3 Modify a V5.1 interface

Modify one or more information elements given in 4.1.3.8.1.1. Each modification should result in an appropriate mark in the provisioning variant information element.

4.1.3.8.1.4 Read a V5.1 interface

Read one or more information element given in 4.1.3.8.1.1. Read access network synchronization state and/or provisioning variant.

4.1.3.8.2 V5.2 interface

4.1.3.8.2.1 Insert a V5.2 interface

Add a V5.2 interface and provide relevant data:

- V5.2 interface ID;
- associated 2048 kbit/s link(s);
- time slot(s) for C-channels;
- protocol version;
- provisioning variant.

4.1.3.8.2.2 Augment a V5.2 interface

Add 2048 kbit/s link(s) to the existing V5.2 interface and provide relevant data:

- associated 2048 kbit/s link(s);
- time slot(s) for C-channels;
- provisioning variant.

4.1.3.8.2.3 Delete a V5.2 interface

Remove a V5.2 interface ID and delete the relevant data.

4.1.3.8.2.4 Reducing a V5.2 interface

Remove 2048 kbit/s link(s) from a V5.2 interface and delete the relevant data.

4.1.3.8.2.5 Modify a V5.2 interface

Modify one or more information elements given in 4.1.3.8.2.1 except of the associated access port number(s).

4.1.3.8.2.6 Read a V5.2 interface

Read access network synchronization state and/or provisioning variant in 4.1.3.8.2.1.

4.1.3.8.2.7 Upgrade a V5.1 to a V5.2 interface

The upgrade is performed by deleting the affected V5.1 interface and inserting a V5.2 interface using the relevant data having been assigned to the V5.1 interface.

4.2 V5-related configuration at the access network

4.2.1 Description of the service

The task requirements relate either to the V5 interfaces, or to the user ports, or arise from more general considerations.

4.2.2 Components of service

4.2.2.1 General requirements

These are the general requirements for the configuration management of V5 interfaces and related user ports via the Q3 interface of an Access Network (AN).

1) *Association of user ports with V5 interfaces*

   All relevant bearer channels and non-bearer communications of a user port shall go through one V5 interface. The association of user ports and their relevant bearer channels with V5 interfaces are controlled via the Q3 interface of the access network.

2) *Information flow across the Q3 interface*

   All data for provisioning, including modification and cessation, of V5 interfaces and related user ports shall be handled by the Q3 interface of the access network. This includes the relevant data for the user interface (for example line circuit parameters).

   The information flow for inventory and auditing functions in the access network shall be via the Q3 interface of the access network using a generic approach.

3) *Compatibility between access network and local exchange*

   The TMN function has the responsibility for ensuring that the configuration of the local exchange and of the access network are compatible.

4) *Configuration of bearer channels*

   Dynamic configuration of bearer channels (B-channels) via BCC for V5.2 is handled by the V5 interface and is not the concern of the Q3 interface of the access network. The configuration of bearer channels on the V5.1 interface is seldom changed and is handled over the Q3 interface of the access network.

4.2.2.2 V5 interface requirements

These are the requirements for the configuration management of V5 interfaces via the Q3 interface of an access network:

1) *V5 interface and link IDs*

   The Q3 interface on the access network shall define both the interface ID and the link IDs for each V5 interface. These should be consistent with the fields allocated in the V5 interface specification (Recommendations G.964 [4] and G.965 [5]).

2) *Provisioning variant*

   The Q3 interface on the access network may optionally define the provisioning variant label for each V5 interface. This should be consistent with the fields allocated in the V5 interface specification (Recommendations G.964 [4] and G.965 [5]).

3) *Channel configuration*

   The channel configuration related to the allocation of appropriate channels to p-type data, f-type data, operations and maintenance, BCC, and PSTN and ISDN signalling on the V5 interface shall be performed via the Q3 interface of the access network as part of provisioning.

4) *Association of interfaces with exchanges*

   The Q3 interface of the access network is responsible for bringing up and taking down V5 interfaces as part of associating them with local exchanges.

5) *Standby operation*

The Q3 interface of the access network should be able to support stand-by of a V5 interface.

The support of 2048 kbit/s standby for V5.1 does not create any additional requirements for the information model.

For V5.2 there are additional requirements due to the protection protocol, and these may impact the configuration model.

6) *Persistency checking*

The parameters for the persistence checking procedure for error detection should be set through the Q3 interface of the access network.

7) *Global PSTN parameters*

The Q3 interface of the access network shall support the provisioning of global parameters such as timers, cadencing, etc., which are related to PSTN services supported by the V5 interface and associated user ports.

4.2.2.3 User port requirements

These are the requirements for the configuration management of user ports via the Q3 interface of an access network.

1) *Operational threshold*

The Q3 interface of the access network is responsible for defining the threshold at which a user port is no longer operational for any service. If this does not involve a change during the lifetime of the equipment, then it should not be supported by the Q3 interface.

2) *Port blocking*

The Q3 interface of the access network can request that a port be blocked for non-urgent configuration or reconfiguration. If the port is routed through a V5 interface to a local exchange, then this request can only be granted by the local exchange via the V5 interface. This is intended to avoid interference with calls in progress, or calls being set up or cleared down.

The Q3 interface on the access network can request that a port be blocked for urgent configuration or reconfiguration. If the port is routed through a V5 interface to a local exchange, the other side of the interface shall be informed of this blocking via the V5 interface.

3) *User port addresses*

Addressing information which identifies user ports is assigned to the ports during provisioning via the Q3 interface of the access network.

4) *Split ISDN ports*

The Q3 interface of the access network can be used to configure an ISDN user port so that channels on that port can be split between the local exchange and leased lines which bypass the local exchange.

The TMN function has the responsibility of ensuring that the local exchange is informed about the availability of the B-channels on the user ports for services under the control of the local exchange.

5) *User requirements*

The Q3 interface has the responsibility of provisioning user port related to the V5 interface according to the requirements of the user.

6) *ISDN with access digital sections*

The Q3 interface shall be capable of supporting the communication associated with functional elements as specified in Recommendation G.960 [3] that are not communicated over the V5 interface.

7) *Port specific PSTN parameters*

The Q3 interface of the access network shall support the provisioning of port specific parameters such as timers, cadencing, etc. which are related to PSTN services supported by the V5 interface and associated user ports.

4.2.3 Management function list

The management functions relate mostly to the TMN management service for customer access. The functions are associated with the user ports, the V5 interface, or the cross-connection between the two.

There are create and read functions in each of the three groups. There are insert and delete functions for the user ports and for V5 interfaces, and these are matched by the establish and de-establish functions for cross-connection.

4.2.3.1 User port functions

The user port functions are "insert", "delete", "modify" and "read".

4.2.3.1.1 Insert a user port

The insert user port function performs the following actions:

- assign port address;
- assign port type;
- assign port specific parameters.

4.2.3.1.2 Delete a user port

The delete user port function deletes the user port, including the items listed for the insert user port function defined in 4.2.3.1.1.

4.2.3.1.3 Modify a user port

It may not be appropriate to modify certain items relating to user ports unless the port is blocked. The modify user port function can be used to block and unblock ports and to modify the items, other than port address, listed for the insert user port function defined in 4.2.3.1.1.

4.2.3.1.4 Read a user port

The read user port function reads any of the items listed for the insert user port function defined in 4.2.3.1.1.

4.2.3.2 V5 interface functions

The V5 interface functions are "insert", "delete", "modify" and "read".

4.2.3.2.1 Insert a V5 interface

The insert V5 interface function performs the following actions:

- assign interface ID;
- assign provisioning variant;
- assign grading thresholds;

- assign number of 2048 kbit/s links;
- define persistency checking;
- reserve time slots for communication channels;
- allocate communication channels.

4.2.3.2.2 Delete a V5 interface

The delete V5 interface function deletes the V5 interface, including the items listed for the insert V5 interface function defined in 4.2.3.2.1.

4.2.3.2.3 Modify a V5 interface

The modify V5 interface function modifies one of the items, other than interface ID, listed for the insert V5 interface function defined in 4.2.3.2.1. This function can be used to activate a change in provisioning on either side of a V5 interface.

4.2.3.2.4 Read a V5 interface

The read V5 interface function reads any of the items listed for the insert V5 interface function defined in 4.2.3.2.1. This function can be used to read interface ID and provisioning variant information from the other side of the V5 interface.

4.2.3.3 Cross-connection functions

The cross-connection functions are "establish", "de-establish", "modify" and "read".

4.2.3.3.1 Establish a connection

The establish connection function performs the following actions:

- assign access port to V5 interface, including V5 port address;
- assign port bearer channel to V5 bearer channel;
- assign PSTN signalling to V5 communications channel;
- assign ISDN Ds-type data to V5 communication channel;
- assign ISDN p-type data to V5 communication channel;
- assign ISDN f-type data to V5 communication channel.

4.2.3.3.2 De-establish a connection

The de-establish connection function removes a connection which has been established by the establish connection function defined in 4.2.3.3.1.

4.2.3.3.3 Modify a connection

The modify connection function modifies one of the items listed for the establish connection function defined in 4.2.3.3.1.

4.2.3.3.4 Read a connection

The read connection function reads any of the items listed for the establish connection function defined in 4.2.3.3.1.

5 Information model diagrams

The entity relationship diagrams are given in 5.1 and the inheritance hierarchy (is-a relationships) and naming hierarchy (containment relationships) are given in 5.2 and 5.3, respectively.

The conventions given in Figure 1 are used in the entity relationship diagrams.

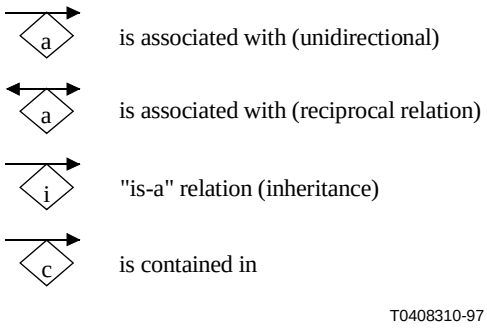


Figure 1/Q.824.5 – Conventions used in the entity relationship diagrams

5.1 Entity relationship diagrams

For V5.1 interfaces, access channels on access ports in the local exchange and bearer channels on user port in the access network are associated with bearer time slots on a V5.1 interface by configuration over the Q3 interface of the Local Exchange (LE) and Access Network (AN), respectively. For V5.2, access channels on access ports are associated with bearer time slots on a V5.2 interface by the V5.2 Bearer Channel Connection (BCC) protocol. For both V5.1 and V5.2, the association of user signalling with communication paths and the association between communication paths and logical communication channels on the V5 interface is by configuration over the Q3 interface of the LE and AN. The association of logical communication channels with physical communication time slots on the V5 interface is initially established over the Q3 interface, but can be changed for V5.2 interfaces by the V5.2 protection protocol.

The AN treats time slots on the V5.2 interface which are used for semi-permanent connections like any other bearer time slot on a V5.2 interface.

Signalling protocols and their associated communication are modelled using various objects which represent the communication paths and the communication time slots. There are six classes of communication path objects. There is a single class for all Integrated Services Digital Network (ISDN) signalling with an attribute to distinguish between Ds-type, p-type, and f-type data. There are classes for Public Switched Telephone Network (PSTN) signalling, the control protocol, the BCC protocol, the link control protocol, and the protection protocol. In addition to these six communication path object classes, there is also an object class which represents communication channels.

There is one instance of the appropriate object class per communication path and per communication channel. These are contained in instances of v5Interface.

V5 control messages relating to provisioning are managed by an optional object on the Q3 interface. These messages may not be required once a TMN X interface or an integrated OS is available.

If control messages relating to provisioning are not supported on the Q3 interface, then a default value for provisioning variant will be automatically used on the V5 interface. All V5 interfaces will use this default value unless actively changed via the Q3 interface. The value of this default is all 0s.

Protection group 1 and its contained protection unit(s) are to be instantiated for the V5.2 case even if there is only one 2048 kbit/s link.

A Trail Termination Point (TTP) contains the Connection Termination Points (CTPs) at the higher network layer which it serves. This relationship allows the entity relationship diagram to be mapped onto the functional architecture (see Appendix I).

5.1.1 Overview for the local exchange

The overall relationships between the various entities are illustrated in Figure 2 as an overview for the local exchange. These correspond to the managed objects which are manipulated at the Q3 interface.

A single managedElement can contain a number of virtualAccessPorts, a number of v5Interfaces, and a number of v5Ttps (which each represent a 2048 kbit/s link). There is a bi-directional association between each v5Interface and all of its related virtualAccessPorts. Likewise there is a bi-directional relationship between each v5Interface and all of its related v5Ttps (2048 kbit/s links).

Each virtualAccessPort can contain a number of virtualAccessChannels, each representing 64 kbit/s bearer channels. Each v5Ttp contains 31 v5TimeSlots which represent the CTPs corresponding to each of the 31 physical time slots. Each virtualAccessChannel can be associated with a unique v5TimeSlot for a V5.1 interface, but for the V5.2 case there is no corresponding association because the relationship is controlled by the V5.2 BCC protocol.

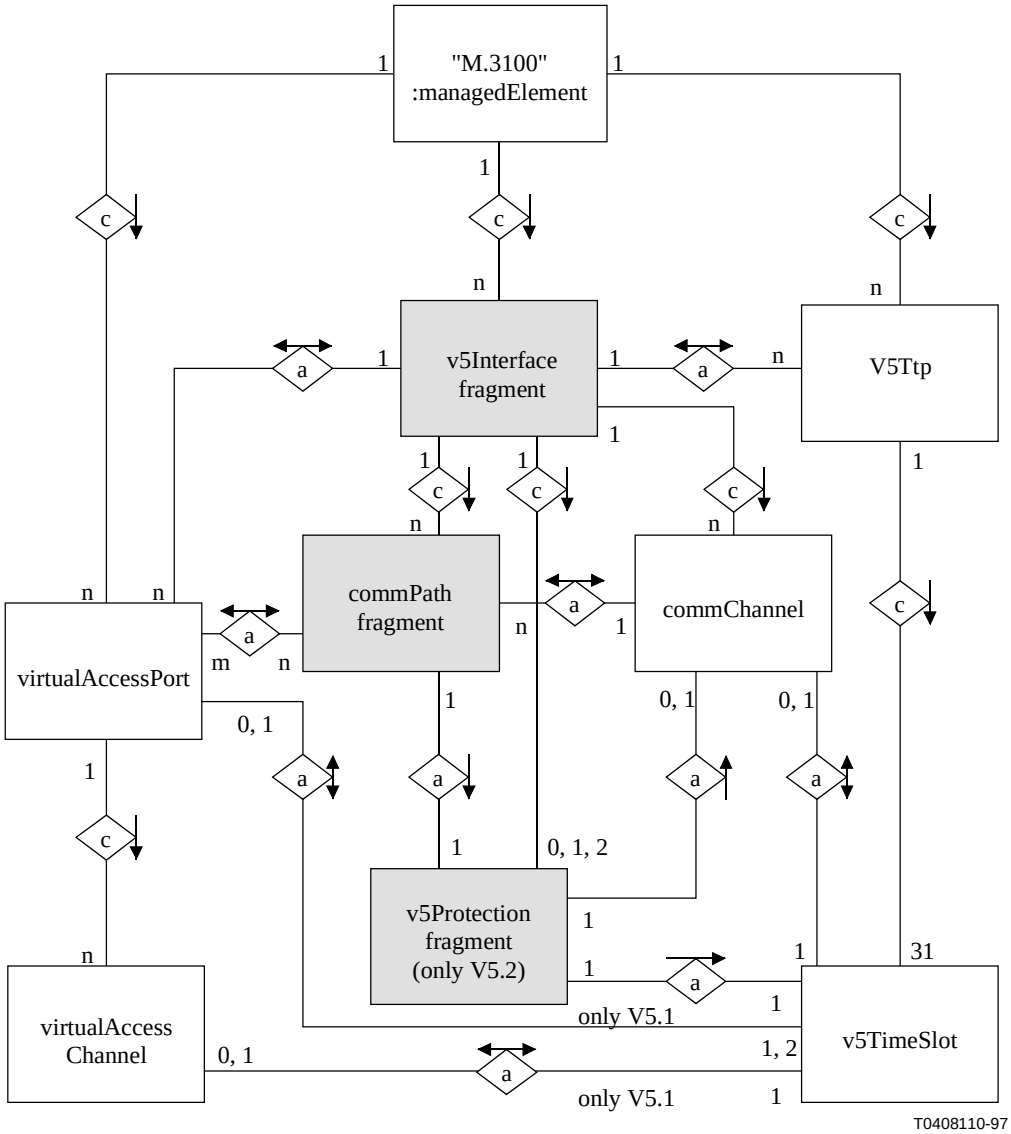


Figure 2/Q.824.5 – Entity relationship diagram – Local exchange overview

5.1.2 Overview for the access network

The overall relationships between the various entities are illustrated in Figure 3 as an overview for the access network. These correspond to the managed objects which are manipulated at the Q3 interface.

A single accessNetwork can contain a number of userPortTtps, a number of v5Interfaces, and a number of v5Ttps (which each represent a 2048 kbit/s link). There is a bi-directional association between each v5Interface and all of its related userPorts. Likewise there is a bi-directional relationship between each v5Interface and all of its related v5Ttps (2048 kbit/s links).

Each userPortTtp can contain a number of userPortBearerChannelCtps, one for each of its 64 kbit/s bearer channels. Each v5Ttp contains 31 v5TimeSlots which represent the CTPs corresponding to each of the 31 physical time slots which may be configured. Each userPortBearerChannelCtp can be associated with a unique v5TimeSlot for a V5.1 interface, but for the V5.2 case there is no corresponding association because the relationship is controlled by the V5.2 BCC protocol.

Link blocking requests on the link control protocol are generated by setting the administrative state attribute of the relevant instance of v5Ttp to shutting down. Only deferred blocking requests can be generated in this way. Deferred blocking requests on the link control protocol cannot be generated by manipulating the object model. Port blocking requests for the control protocol are generated by setting the administrative state attribute of the relevant instance of the subclass of userPortTtp to shutting down.

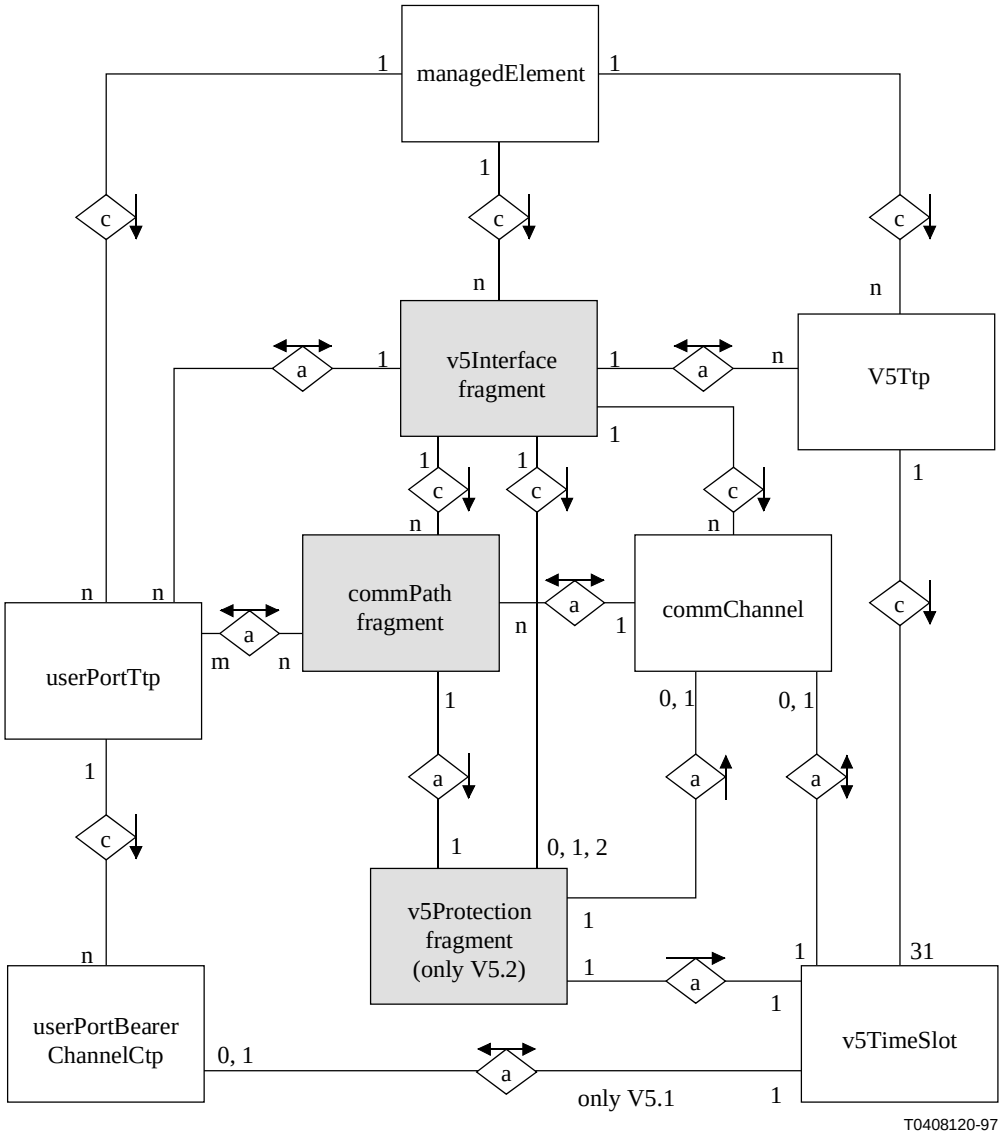


Figure 3/Q.824.5 – Entity relationship diagram – Access network overview

5.1.3 V5 interface fragment

The V5 interface fragment, which is common for local exchange and access network, is shown in Figure 4. Each v5Interface contains a number of communication path objects in its commPath fragment, a number of commChannels, and one or two v5ProtectionGroup objects if it represents a V5.2 interface. Each instance of v5Interface may contain an instance of v5Provision to support the V5 pre-provisioning messages.

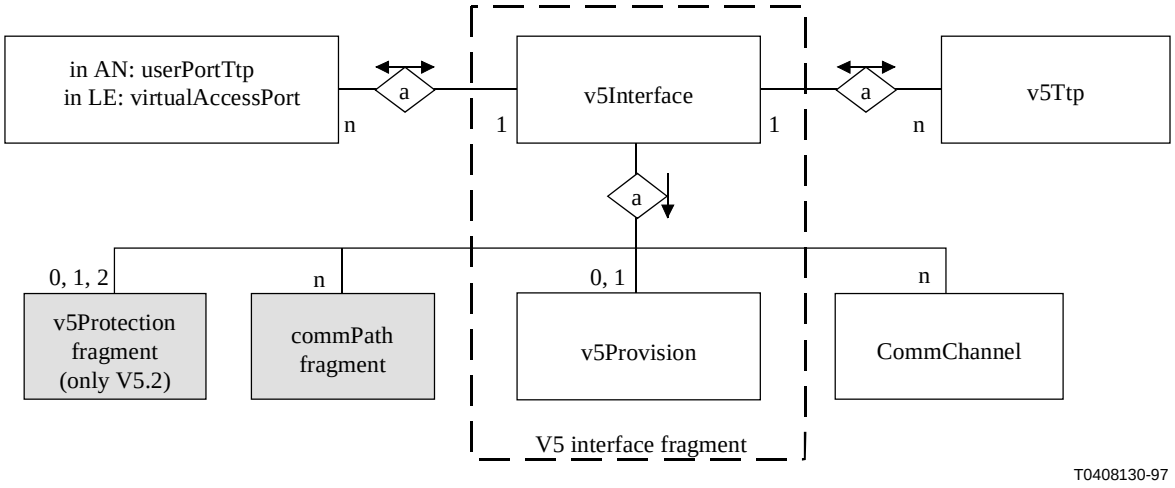


Figure 4/Q.824.5 – V5 interface fragment

5.1.4 Communication path fragment

The communication path fragment, which is common for local exchange and access network is shown in Figure 5. Each ISDN virtualAccessPortBasicRate resp. virtualAccessPortPrimaryRate in the local exchange or ISDN userPortTtp in the access network can be associated with up to three isdnCommPaths, one for each type of ISDN signalling. Each isdnCommPath handles a certain type of ISDN signalling for a number of virtualAccessPortBasicRate and/or virtualAccessPortPrimaryRate in the local exchange or userPortTtps in the access network, and is associated with these. There may be more than one isdnCommPath contained in the v5Interface for each type of ISDN signalling.

The v5Interface contains a single controlCommPath. It contains a single pstnCommPath, but only if there are any virtualAccessPortAnalogue in local exchange or PSTN userPortTtps in the access network associated with it. It also contains a single bccCommPath, a single protCommPath, and a single linkControlCommPath if it represents a V5.2 interface.

Each commChannel can be associated with up to 3 isdnCommPaths representing 3 different types of ISDN signalling. It can also be associated with the pstnCommPath. The commChannel which is associated with controlCommPath shall also be associated with the bccCommPath and with the linkControlCommPath if the v5Interface which contains it represents a V5.2 interface.

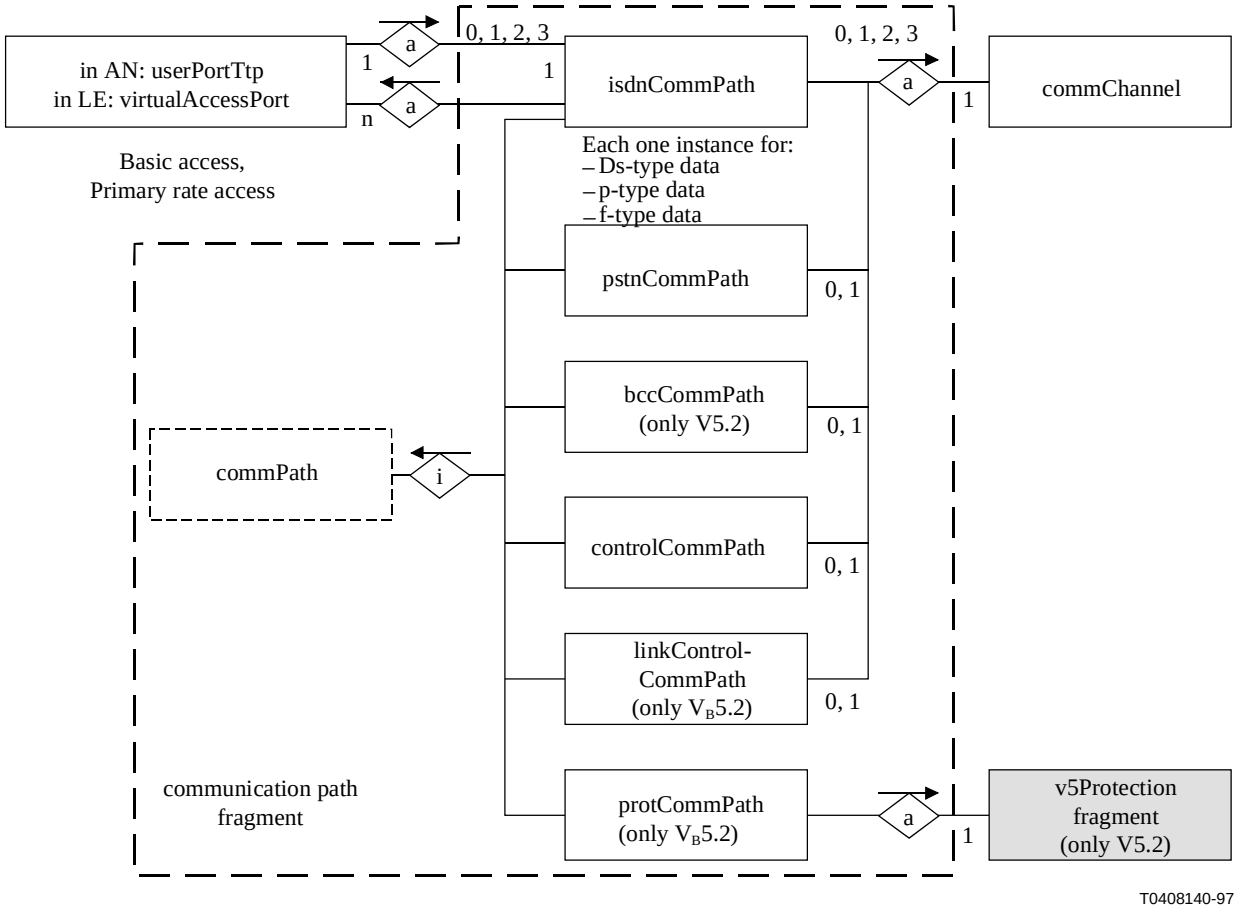


Figure 5/Q.824.5 – Communication path fragment

5.1.5 V5 protection fragment

The V5 protection fragment, which is common for local exchange and access network is shown in Figure 6. There is a bi-directional one-to-one association between commChannels and certain v5TimeSlots. Not every v5TimeSlot is associated with a commChannel. Some are used for bearer traffic and others are available for protection of commChannels on V5.2 interfaces. This protection adds onto the modelling for the V5.1 interfaces, and does not affect that modelling.

The time slots which may be associated with the commChannel, which is associated with the controlCommPath, are constrained by the V5 interface specifications of Recommendations G.964 [4] and G.965 [5]. A v5Interface which represents a V5.2 interface shall contain a v5ProtectionGroup of type 1 which contains two v5ProtectionUnits (see Figure 6). One of these v5ProtectionUnits points to the protected commChannel which is associated with the controlCommPath, the bccCommPath, and the linkControlCommPath. The corresponding pointer in the other v5ProtectionUnit is null. Both v5ProtectionUnits point to their associated v5TimeSlots. The containing v5ProtectionGroup of type 1 is pointed to by the protCommPath for the v5Interface, so there is an indirect mapping from the protCommPath through the v5ProtectionGroup of type 1, through its two contained v5ProtectionUnits onto its related v5TimeSlots.

A v5Interface which represents a V5.2 interface also contains a v5ProtectionGroup of type 2 if other commChannels are protected (see Figure 5). The v5ProtectionGroup of type 2 contains a number of v5ProtectionUnits, each of which points to its associated v5TimeSlot. The v5ProtectionUnits which point to active v5TimeSlots also point to the commChannels which are associated with the active v5TimeSlots. The corresponding pointers in the other v5ProtectionUnits are set to null.

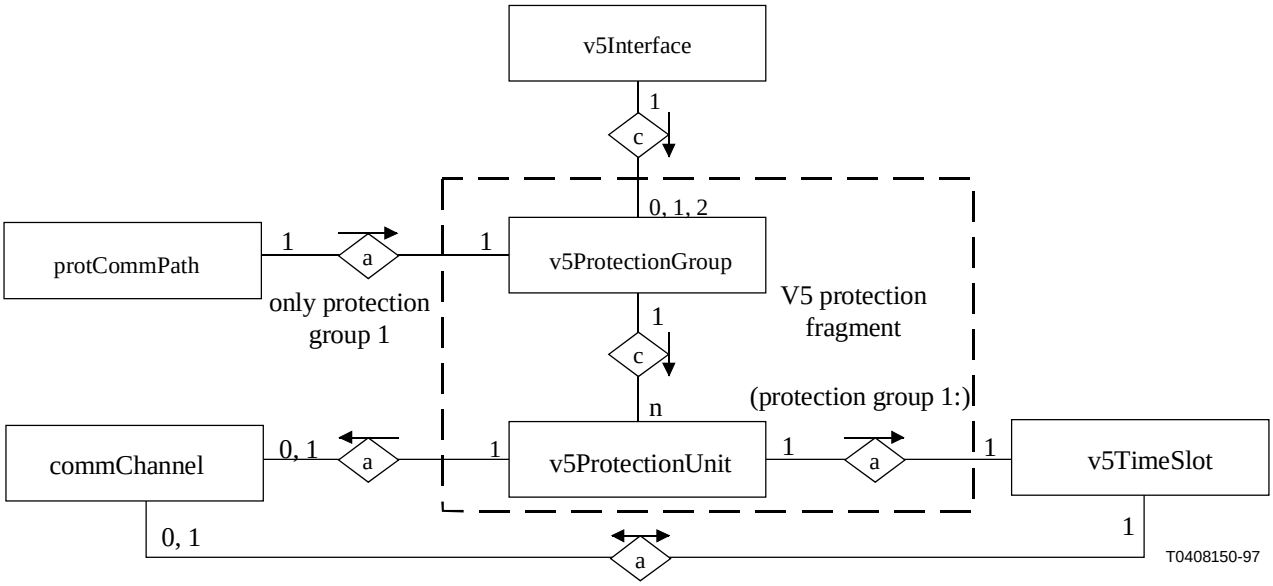


Figure 6/Q.824.5 – V5 protection fragment

5.1.6 Relation to customer administration within the local exchange

The provision of service to the customers follows the principles as defined in Recommendation Q.824.0 [11]. Therefore, the virtualAccessPort, the virtualAccessChannel, and the V5 specific services are derived from the appropriate object classes defined in Recommendation Q.824.0 [11], as illustrated in Figures 7 and 8.

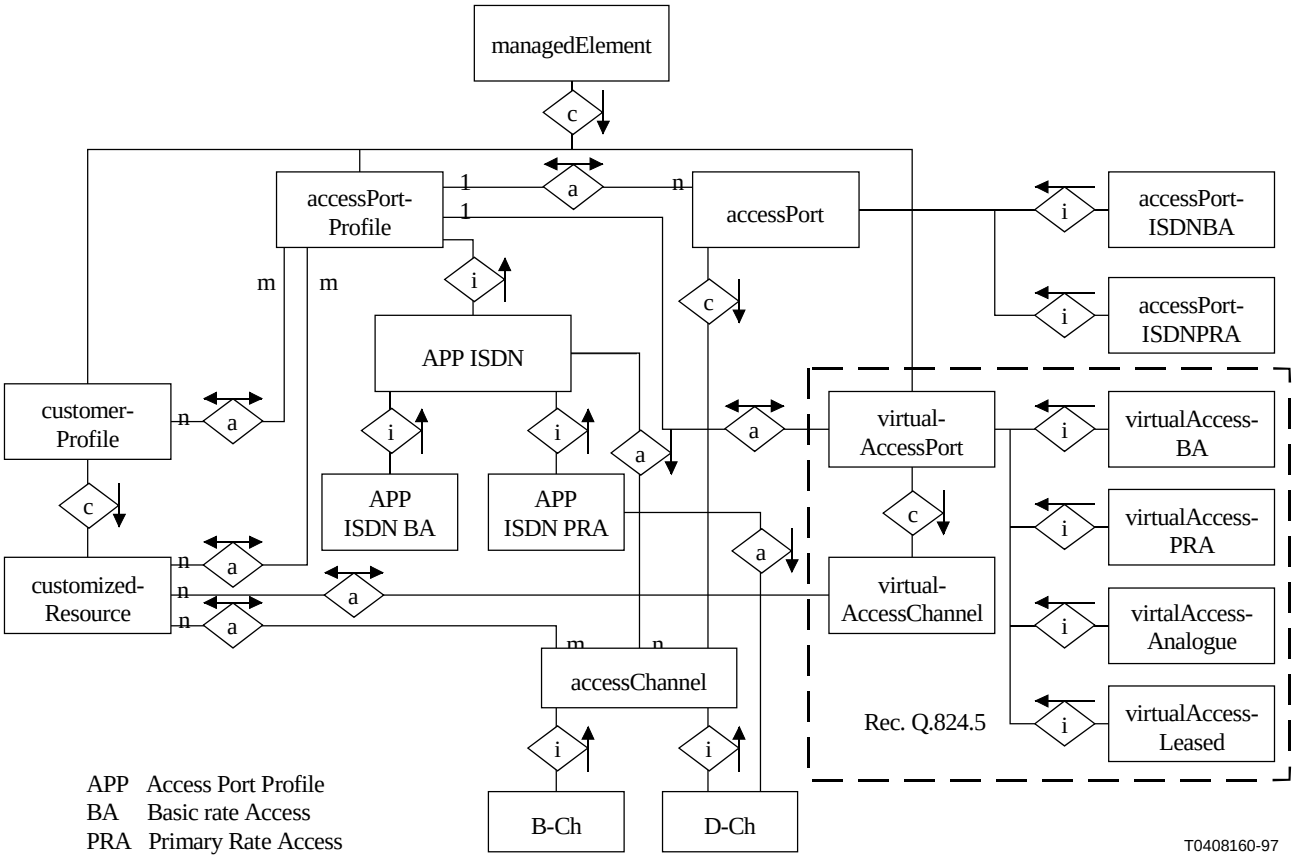


Figure 7/Q.824.5 – V5 interface connection to Q.824.0 for the virtual access ports and channels

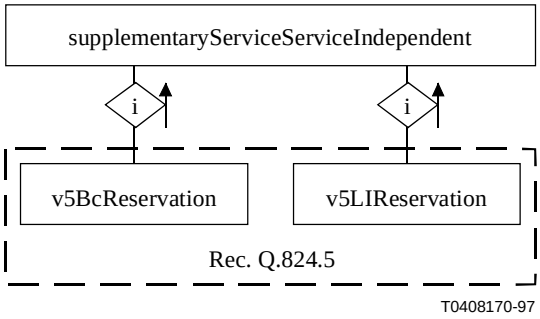
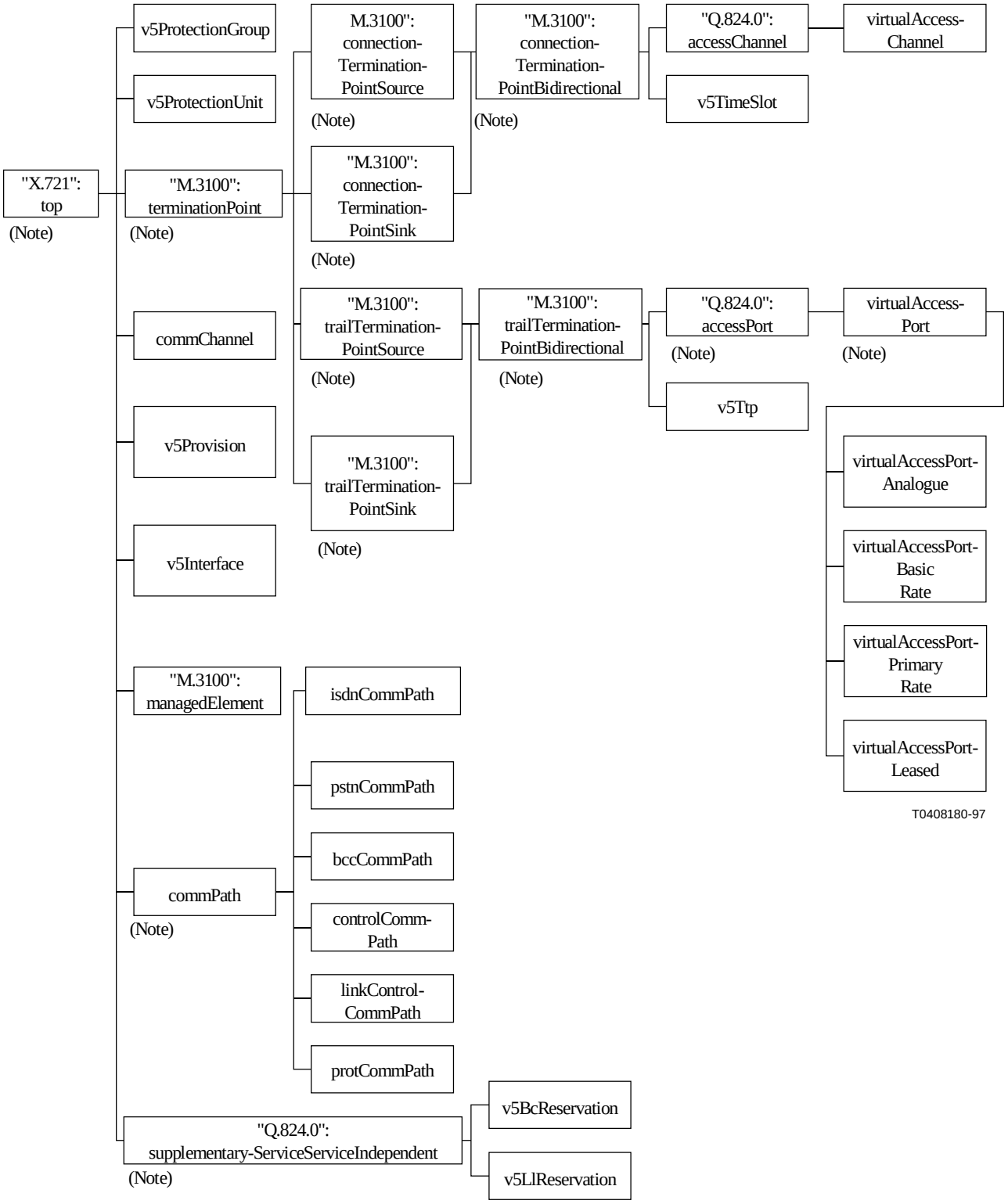


Figure 8/Q.824.5 – V5 interface connection to Q.824.0 for services

5.2 Inheritance hierarchy

5.2.1 Local exchange

Figure 9 traces the inheritance from the highest level object (CCITT Rec. X.721 | ISO/IEC 10165-2, "top") to the managed objects defined in this Recommendation.

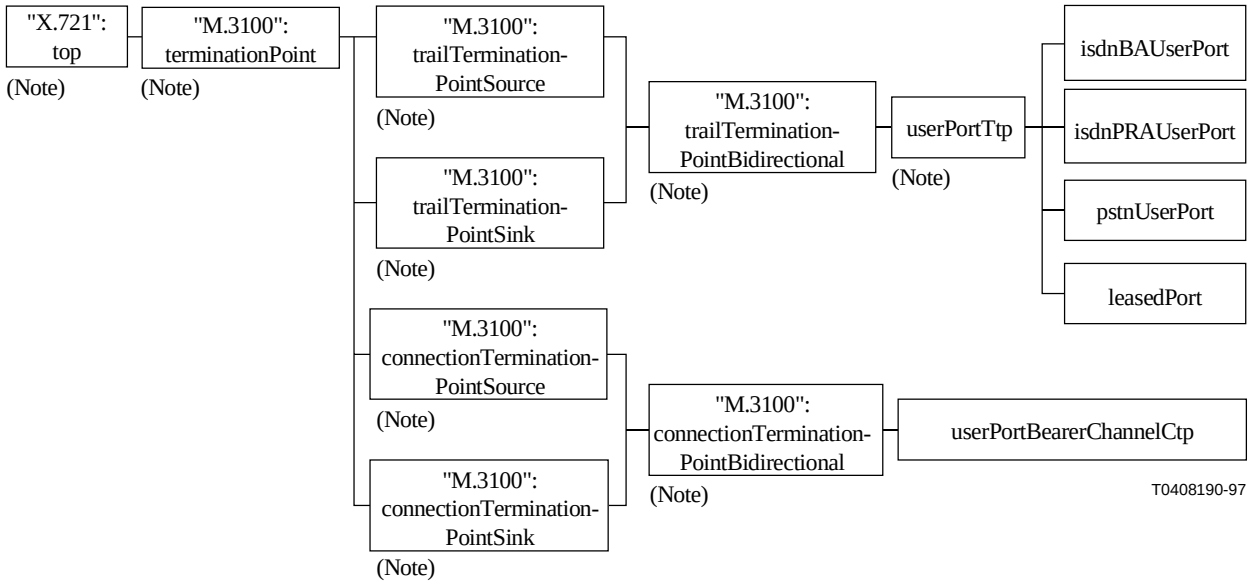


NOTE – Non-instantiable object class.

Figure 9/Q.824.5 – Inheritance hierarchy – Local exchange

5.2.2 Access network

Figure 10 traces the inheritance from the highest level object (CCITT Rec. X.721 | ISO/IEC 10165-2, "top") to the managed objects defined in this Recommendation.



NOTE – Non-instantiable object class.

Figure 10/Q.824.5 – Inheritance hierarchy – Access network

5.3 Naming hierarchy

5.3.1 Local exchange

Figure 11 shows the naming (i.e. containment) relationships for the LE's managed objects associated with configuration management.

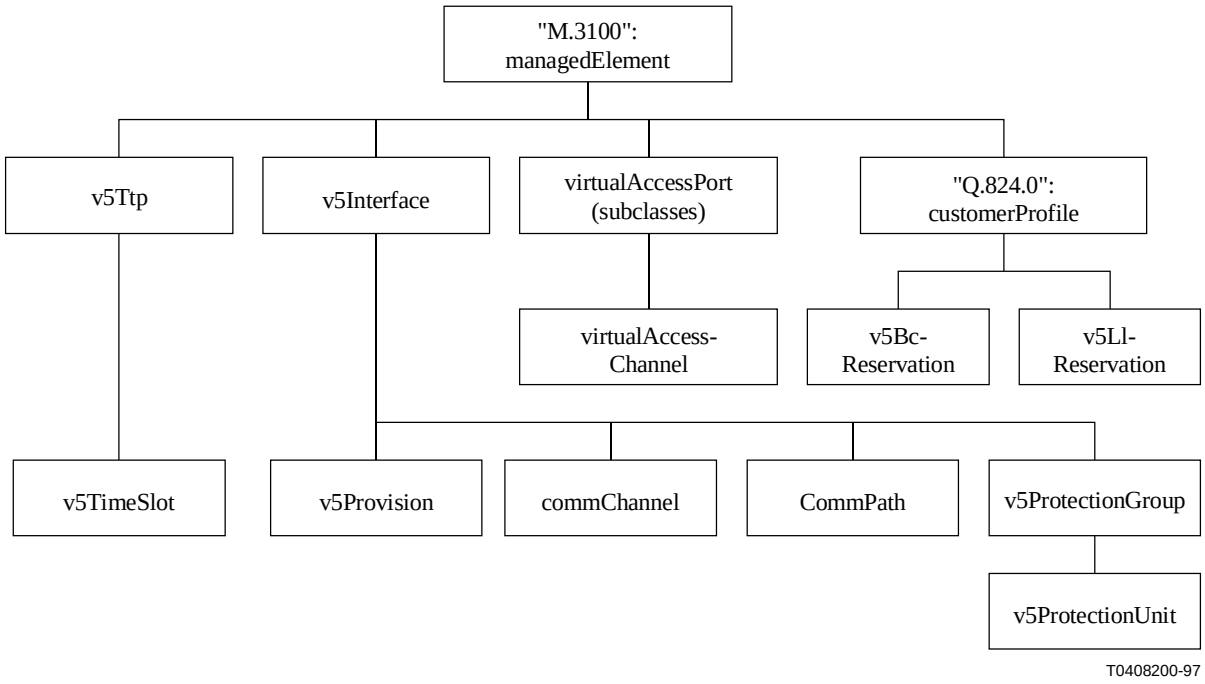


Figure 11/Q.824.5 – Naming hierarchy – Local exchange

5.3.2 Access network

Figure 12 shows the naming (i.e. containment) relationships for the AN's managed objects associated with configuration management.

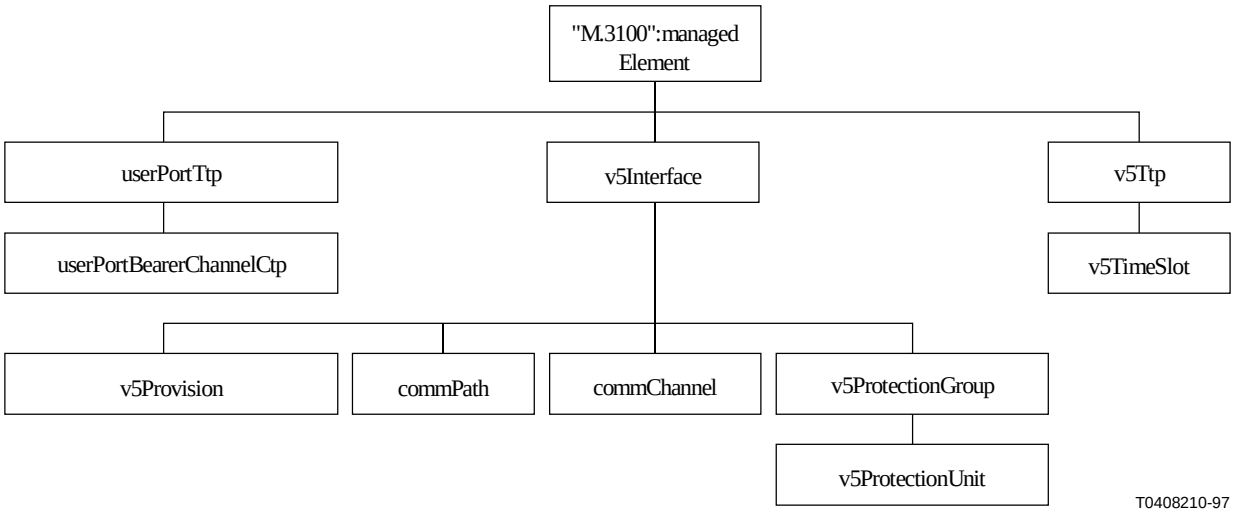


Figure 12/Q.824.5 – Naming hierarchy – Access network

6 Formal definitions

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

6.1 Definition of object classes

This subclause specifies the object classes for all of the managed objects used in the management information model. These objects are either defined here or by reference to other specifications.

6.1.1 Local exchange

This subclause specifies the object classes for all of the managed objects used in the management information model for the local exchange. These objects are either defined here or by reference to other specifications.

6.1.1.1 Managed element fragment

6.1.1.1.1 Managed element (managedElement)

The managed element object class is defined in Recommendation M.3100 [8].

6.1.1.2 V5 interface fragment

6.1.1.2.1 V5 interface

```
v5Interface MANAGED OBJECT CLASS
DERIVED FROM "CCITT Recommendation X.721:1992":top;
CHARACTERIZED BY
v5InterfacePackage PACKAGE
        BEHAVIOUR
        v5InterfaceBehaviour BEHAVIOUR
        DEFINED AS "A V5 interface is an object class representing either a V5.1 or a V5.2 interface as an
        abstract entity of its own right.
        A V5 interface may comprise in the case of a V5.1 interface of one, and in the case of a V5.2 interface of
        one to 16 2048 kbit/s links represented by V5 TTP object instances, which are listed in the serverV5Ttps
        attribute.
        The clientUserPorts attribute points to the instances of the virtualAccessPort subclasses in a LE, or
        userPort subclasses in an AN currently assigned to this particular V5 interface.
        The actions setReciprocalPointers and releaseReciprocalPointers shall be used to maintain these
        relationship attributes. They shall not be applied on the reciprocal relationship between a commChannel
        object instance and a v5TimeSlot object instance if one of the instances or both are pointed at by a
        v5ProtectionUnit object instance.
        The operational state shall be set to 'disabled' whenever one of the vital protocols (control, link control,
        BCC, protection) has a persistent failure which cannot be overcome by protection switching. All existing
        connections will be released. All associated access port objects will be set to 'disabled' except for the ports
        with permanent lines assigned.
        If all vital protocols are working, this attribute shall be set to 'enabled'. This shall result in all associated
        userPort/virtualAccessPort instances being set to 'enabled' if there are no other contradictory conditions.
        If an instance supports the use of 'degraded' then the availabilityStatus shall be set to 'degraded' if the
        PSTN or ISDN service is affected by any interface internal problems, e.g. persistent protocol errors.
        In case that both optional packages objectManagementNotificationPackages and
        relationshipChangeNotificationPackage are present any of the pointer changes in either serverV5Ttps or
        clientUserPorts only the attribute value change notification shall be generated if present in conditional
        package";;
        ATTRIBUTES
                v5InterfaceId                                                   GET SET-BY-CREATE,
                v5Identification                                                        GET-REPLACE;,
                supportedProtocolVersion                                        GET,
                serverV5Ttps INITIAL VALUE ASN1CMLETypeModule.initialPointerS   GET,
                clientUserPorts INITIAL VALUE ASN1CMLETypeModule.initialPointerS GET;
        ACTIONS
                setReciprocalPointers,
                releaseReciprocalPointers,
                restart,
                systemStartup;
        NOTIFICATIONS
                restartResult,
                systemStartupResult;;;
        CONDITIONAL PACKAGES
                peerUserLabelPackage     PRESENT IF "an instance supports it",
                "ITU-T Recommendation M.3100":operationalStatePackage
                                PRESENT IF "an instance supports it",
                v5AvailabilityStatusPackage      PRESENT IF "an instance supports it",
                supportedByObjectListPackage  PRESENT IF "the information model is not only used for
                provisioning",
                "ITU-T Recommendation M.3100":userLabelPackage
                                PRESENT IF "an instance supports it",
                "ITU-T Recommendation M.3100":locationNamePackage
                                PRESENT IF "an instance supports it",
                "ITU-T Recommendation M.3100":objectManagementNotificationsPackage
                                PRESENT IF "an instance supports it",
```

"ITU-T Recommendation M.3100":stateChangeNotificationPackage
PRESENT IF "an instance supports it",
relationshipChangeNotificationPackage PRESENT IF "an instance supports it",
v5TmnCommunicationsAlarmInformationPackage
PRESENT IF "an instance supports it",
"ITU-T Recommendation M.3100":alarmSeverityAssignmentPointerPackage
PRESENT IF "an instance supports it";
REGISTERED AS {managedObjectClass 1};

6.1.1.2.2 V5 TTP

v5Ttp MANAGED OBJECT CLASS
DERIVED FROM "ITT Recommendation M.3100":trailTerminationPointBidirectional;
CHARACTERIZED BY
"ITU-T Recommendation M.3100":ttpInstancePackage,
"CCITT Recommendation X.721":administrativeStatePackage,
"ITU-T Recommendation M.3100":createDeleteNotificationsPackage,
v5TtpPackage PACKAGE
BEHAVIOUR
v5TtpBehaviour BEHAVIOUR
DEFINED AS "A V5 TTP is an object class representing a 2048 kbit/s interface of the LE that is used as V5.1 interface or as part of a V5.2 interface.
A V5 TTP contains 31 V5 time slots. Time slot 0 is not instantiated, as it is an intrinsic part of the 2048 kbit/s link and is modelled as part of the V5 TTP.
The upstreamConnectivityPointer and the downstreamConnectivityPointer attributes have NULL value if this object class is instantiated in a LE. When instantiated in an AN, they will be set to NULL unless they point to TTPs within the transmission part of the AN.
The assocV5Interface attribute gives the relation to the v5Interface that v5Ttp is assigned to.
The relationship is maintained by use of the setReciprocalPointers and releaseReciprocalPointers actions of the v5Interface object class. An instance of this object class shall only be deleted if all reciprocal pointer relationships are released.
If the v5Ttp is associated with a V5.1 interface, the blockingStatus attribute shall always have the value 'none'.
The operational state of an object shall be set to 'disabled' whenever a link is in a non-operational state, e.g. because of a layer 1 failure or a remote link blocking request. Contained time slot objects will be set to 'disabled'.
If the link is in the 'operational' or 'normal' state, the attribute shall be set to 'enabled'. This shall result in contained time slot objects being set to 'enabled' if there are no other contradictory conditions.
The administrative state may be set to the values 'unlocked', 'shutting down' or 'locked'.
LE: If set to 'shutting down' all new call setup requests for time slots of this link will be rejected. Contained time slot objects will be set to 'disabled' if the time slot is idle. Existing connections including the semi-permanent will not be affected.
AN: If set to 'shutting down' deferred blocking for this link is requested in the LE via the V5 interface.
Shutting down can be rejected by the LE system management. The requester shall be informed by a shutdownRejected notification. The administrative state is to be set back to 'unlocked' by the requester.
If set to 'locked' the immediate (forced) link blocking procedure is initiated for this link, no traffic is possible any longer. All existing switched connections will be released. Semi-permanent and reserved connections will be re-established onto other links if possible. Contained time slot objects will be set to 'disabled'.
If set to 'unlocked' first a link unblock procedure followed by a link identification procedure will be initiated. The contained time slot objects shall be set to 'enabled' if there are no other contradictory conditions.
If an instance supports the use of 'degraded' then the availabilityStatus shall be set to 'degraded' if the V5 link is still 'enabled' but its ability to provide a transport service is reduced, e.g. if some but not all of the contained time slots are disabled.
If an instance supports the use of 'dependency' then the availabilityStatus shall be set to 'dependency' if objects on which the V5 link is functionally dependent are unavailable as described in CCITT Rec. X.731 | ISO/IEC 10164-2 [22], e.g. if the time slots 1 to 31 represented by the time slot objects are disabled by any internal reason.

In the Monitored Attributes parameter of the communicationsAlarm notification, the linkId attribute and the assocV5Interface attribute and their values shall be indicated.
If the 'ITU-T Recommendation M.3100:1995':tmnCommunicationsAlarmInformationPackage is instantiated, then the communicationsAlarm notification shall be used to report errors related to this object class. The errors to be reported and the usage of the alarm report parameters are specified in ITU-T Recommendation Q.831 [12].
The checkLinkId action can only be performed if the v5Ttp is associated with a V5.2 interface.";;
ATTRIBUTES
assocV5Interface INITIAL VALUE ASN1CMLETypeModule.initialPointer GET,
linkId GET-REPLACE,
blockingStatus GET;
ACTIONS
checkLinkId;
NOTIFICATIONS
shutdownRejected,
checkLinkIdResult;;;
CONDITIONAL PACKAGES
v5AvailabilityStatusPackage PRESENT IF "an instance supports it",
neSpecificPointerPackage PRESENT IF "an NE specific object instance is assigned",
"ITU-T Recommendation M.3100": tmnCommunicationsAlarmInformationPackage
PRESENT IF "an instance supports it",
"ITU-T Recommendation M.3100": alarmSeverityAssignmentPointerPackage
PRESENT IF "an instance supports it";
REGISTERED AS {managedObjectClass 2};

6.1.1.2.3 V5 time slot

v5TimeSlot MANAGED OBJECT CLASS
DERIVED FROM "ITU-T Recommendation M.3100": connectionTerminationPointBidirectional;
CHARACTERIZED BY
"ITU-T Recommendation M.3100": ctpInstancePackage,
"ITU-T Recommendation M.3100": operationalStatePackage,
"ITU-T Recommendation M.3100": createDeleteNotificationsPackage,
v5TimeSlotPackage PACKAGE
BEHAVIOUR
v5TimeSlotBehaviour BEHAVIOUR
DEFINED AS "A V5 time slot is an object class representing a 64 kbit/s channel of a V5 interface that is either used as bearer channel or as C-channel.
Each V5 time slot is either assigned as bearer channel or C-channel by setting the channel type attribute appropriately. In the case of a V5.1 interface, a V5 time slot assigned as a bearer channel points either to the associated virtual access port or to the associated virtual access channel object instance if instantiated in a LE, or to a user port bearer channel CTP if instantiated in an AN.
In the case of a V5.2 interface, V5 time slots foreseen as bearer channels need not be instantiated.
One V5 time slot assigned as C-channel points to the associated (active) communication channel object instance. In V5 time slots assigned as standby C-channels of a V5.2 interface, this pointer is set to NULL.
In a V5.1 interface, time slot 16 is always a communication channel (C-channel 1). A second communication channel (C-channel 2) may be installed in time slot 15. Time slot 31 may be assigned as a third communication channel (C-channel 3).
In a V5.2 interface, time slot 16 of all 2048 kbit/s links may be assigned as C-channel. Time slots 15 and 31 of all 2048 kbit/s links may be assigned as C-channels as well, if all time slots 16 are already used as C-channels.
The upstreamConnectivityPointer and the downstreamConnectivityPointer attributes have NULL value if this object class is instantiated in a LE. When instantiated in an AN, they will be set to NULL unless they point to connection termination points within the transmission part of the AN.
The assocResource attribute is maintained by using the setReciprocalPointers and releaseReciprocalPointers actions assigned to the V5 interface object class. An instance of this object class shall only be deleted if all reciprocal pointer relationships are released.
The v5ChannelType attribute of time slots 15, 16, and 31 can only be modified if the assocResource attribute has NULL value and in the case of being instantiated in an LE the administrativeState is locked.

The operational state shall be set to 'disabled' if one of the following conditions apply:

1) the containing v5Ttp object goes into the 'locked' state;

2) the containing v5Ttp object goes into the 'disabled' state;

3) the containing v5Ttp object goes into the 'shutting down' state and the time slot serves no connection;

4) any other internal reason.

In addition, this may also impact the operational state of user port/channel objects which are assigned to this time slot directly or via unprotected C-path.

V5.2 only: If the time slot carries a C-channel, then protection switching is initiated when the attribute is set to 'disabled'.

When the v5Ttp object goes to the state 'unlocked'/'enabled' the operational state shall be set to 'enabled'. This shall result in assigned user port/channel objects being set to 'enabled' if there are no other contradictory conditions.

The administrative state may be set to the values 'unlocked', 'shutting down' or 'locked'.

If set to 'shutting down' the time slot will be locked after an existing connection has been terminated. In addition, this may also impact the operational state of virtualAccessPort/Channel objects which are assigned to this time slot directly or via unprotected C-path. An existing semi-permanent connection will not be affected.

If set to 'locked' this time slot is no longer available for use. Any existing switched connection will be released. In addition, this may also impact the operational state of virtualAccessPort/Channel objects which are assigned to this time slot directly or via unprotected C-path.

V5.2 only: A semi-permanent or reserved connection will be re-established onto other links if possible. If the time slot carries a C-channel, then protection switching is initiated when the attribute is set to 'locked'.

If set to 'unlocked' this time slot is available for use. All virtualAccessPort/ Channel objects which are assigned to this time slot directly or via unprotected C-path shall be set to 'enabled' if there are no other contradictory conditions.

The 'ITU-T Recommendation M.3100': tmnCommunicationsAlarmInformation package shall only be instantiated if the time slot is used as communication channel.

If the 'ITU-T Recommendation M.3100': tmnCommunicationsAlarmInformationPackage is instantiated, then the communicationsAlarm notification shall be used to report errors related to this object class. The errors to be reported and the usage of the alarm report parameters are specified in ITU-T Recommendation Q.831 [12].

If the channelNumberPackage is not instantiated, the cTPId attribute should be used to number the channels consecutively from 1.";;

ATTRIBUTES

v5ChannelType GET-REPLACE,

assocResource INITIAL VALUE ASN1CMLETypeModule.initialPointer GET;;;

CONDITIONAL PACKAGES

v5TsAdministrativeStatePackage

PRESENT IF "this object class is instantiated in an LE or an instance in an AN supports it.",

"ITU-T Recommendation M.3100": tmnCommunicationsAlarmInformationPackage

PRESENT IF "an instance supports it",

"ITU-T Recommendation M.3100": alarmSeverityAssignmentPointerPackage

PRESENT IF "an instance supports it";

REGISTERED AS {managedObjectClass 3};

6.1.1.2.4 V5 provision

v5Provision MANAGED OBJECT CLASS
DERIVED FROM "CCITT Recommendation X.721":top;
CHARACTERIZED BY
v5ProvisionPackage PACKAGE

BEHAVIOUR

v5ProvisionBehaviour BEHAVIOUR

DEFINED AS "The V5 provision object class represents the messages of the V5 control protocol which communicate the provisioning variant. In this way it gives an OS the possibility to control a synchronized reconfiguration of the V5 interface via Q3LE or Q3AN. One instance of this object class is contained in one instance of the V5 interface object class.";;

```
        ATTRIBUTES
                provId                  GET SET-BY-CREATE,
                ownProvVariant          GET-REPLACE;
        ACTIONS
                requestRemoteProvVariant;
        NOTIFICATIONS
                requestRemoteProvVariantResult;;;
        CONDITIONAL PACKAGES
                leSwitchOverToNewVariantPackage
                        PRESENT IF "this object class is instantiated in an LE and if the re-provisioning
                        procedure is applied",
                anSwitchOverToNewVariantPackage
                        PRESENT IF "this object class is instantiated in an AN and if the re-provisioning
                        procedure is applied";
REGISTERED AS {managedObjectClass 4};
```

6.1.1.3 Virtual access port fragment

6.1.1.3.1 Virtual access port

This object class is subclassed for the different types of customer access ports and not instantiated within the scope of this application.

```
virtualAccessPort MANAGED OBJECT CLASS
DERIVED FROM "ITU-T Recommendation Q.824.0: 1995":accessPort;
CHARACTERIZED BY
virtualAccessPortPackage PACKAGE
        BEHAVIOUR
        virtualAccessPortBehaviour BEHAVIOUR
        DEFINED AS "A virtual access port is an object class representing an image of the customer access port
        which is located in an AN and connected to the LE via V5 interface.
        The upstreamConnectivityPointer and the downstreamConnectivityPointer attributes have NULL value.
        The operationalState attribute indicates whether or not the user port is able to provide its service to the
        customer's terminal equipment. It reflects the states of the user port FSM in the LE.
        A virtual access port may have assigned one or more bearer time slots and/or one or more C-paths
        providing transport for different data types (bearer, signalling, f-type, p-type). The operationalState
        attribute shall be set to 'enabled' as long as the port has access to any service, and if there are no other
        contradictory conditions.
        The operationalState attribute shall be set to 'disabled' if a virtual access port has no service at all because
        of a failure, i.e. the V5 interface itself or the related ISDN Ds or the PSTN C-path has failed.
        The assocV5Interface attribute gives the relation to the V5 interface, that virtual access port is assigned to.
        The relationships are maintained by use of the setReciprocalPointers and releaseReciprocalPointers actions
        of the v5Interface object class.
        If the 'ITU-T Recommendation M.3100: 1995': tmnCommunicationsAlarmInformationPackage is
        instantiated, then the communicationsAlarm notification shall be used to report errors related to this
        object class. The errors to be reported and the usage of the alarm report parameters is specified in ITU-T
        Recommendation Q.831 [12].";;
        ATTRIBUTES
                assocV5Interface    INITIAL VALUE ASN1CMLETypeModule.initialPointer   GET;;;
        CONDITIONAL PACKAGES
                anFaultReportedPackage
                        PRESENT IF "the associated V5 interface is a V5.2 interface and an instance supports
                        it";
REGISTERED AS {managedObjectClass 5};
```

6.1.1.3.2 Virtual analogue access

```
virtualAccessPortAnalogue MANAGED OBJECT CLASS
DERIVED FROM virtualAccessPort;
CHARACTERIZED BY
virtualAccessPortAnaloguePackage PACKAGE
```

BEHAVIOUR
virtualAccessPortAnalogueBehaviour BEHAVIOUR
DEFINED AS "A virtual analogue access is an information entity used for the association of a PSTN customer's layer 3 port address with a V5.1/V5.2 interface.
If no virtual access channel object instance is contained in the virtualAccessPortAnalogue object instance in the case of a V5.1 interface, the assocV5TimeSlot attribute points to the associated V5 time slot object instance. Otherwise it has NULL value.";;
ATTRIBUTES
lineSignalling GET-REPLACE,
layer3PortAddress GET-REPLACE,
assocV5TimeSlot INITIAL VALUE ASN1CMLETypeModule.initialPointer GET;;;
REGISTERED AS {managedObjectClass 6};

6.1.1.3.3 Virtual basic rate access

virtualAccessPortBasicRate MANAGED OBJECT CLASS
DERIVED FROM virtualAccessPort;
CHARACTERIZED BY
virtualAccessPortBasicRatePackage PACKAGE
BEHAVIOUR
virtualAccessPortBasicRateBehaviour BEHAVIOUR
DEFINED AS "A virtual basic rate access is an information entity used for the association of an envelope function address representing an ISDN basic access with a V5.1/V5.2 interface.
The assocIsdnSignallingCommPath attribute points to the associated ISDN communication path carrying the signalling messages of the assigned ISDN access.
The assocPacketCommPath attribute points to the associated ISDN communication path carrying the D-channel packet mode data of the assigned ISDN access if the customer has subscribed to this service. Else, it has NULL value.
The assocFrameCommPath attribute points to the associated ISDN communication path carrying the D-channel frame mode data of the assigned ISDN access if the customer has subscribed to this service. Else, it has NULL value.
The assocV5TimeSlotB1 and assocV5TimeSlotB2 attributes indicate for both B-channels the associated V5 time slot object instances, if no virtual access channel object instance is contained in the virtualAccessPortBasicRate object instance in the case of a V5.1 interface. Otherwise it has NULL value. These relationships are maintained by use of the setReciprocalPointers and releaseReciprocalPointers actions of the v5Interface object class.";;
ATTRIBUTES
dChannelActivation GET-REPLACE,
envelopeFunctionAddress GET-REPLACE,
assocIsdnSignallingCommPath
INITIAL VALUE ASN1CMLETypeModule.initialPointer GET,
assocPacketCommPath
INITIAL VALUE ASN1CMLETypeModule.initialPointer GET,
assocFrameCommPath
INITIAL VALUE ASN1CMLETypeModule.initialPointer GET,
assocV5TimeSlotB1
INITIAL VALUE ASN1CMLETypeModule.initialPointer GET,
assocV5TimeSlotB2
INITIAL VALUE ASN1CMLETypeModule.initialPointer GET;;;
CONDITIONAL PACKAGES
gradingAlarmPackage
PRESENT IF "there is a remote digital section or if performance parameters are to be monitored against a pre-defined threshold";
REGISTERED AS {managedObjectClass 7};

6.1.1.3.4 Virtual primary rate access

virtualAccessPortPrimaryRate MANAGED OBJECT CLASS
DERIVED FROM virtualAccessPort;
CHARACTERIZED BY

virtualAccessPortPrimaryRatePackage PACKAGE
BEHAVIOUR
virtualAccessPortPrimaryRateBehaviour BEHAVIOUR
DEFINED AS "A virtual primary rate access is an information entity used for the association of an envelope function address representing an ISDN primary rate access with a V5.2 interface.
The assocIsdnSignallingCommPath attribute points to the associated ISDN communication path carrying the signalling messages of the assigned ISDN access.
The assocPacketCommPath attribute points to the associated ISDN communication path carrying the D-channel packet mode data of the assigned ISDN access if the customer has subscribed to this service. Else, it has NULL value.
The assocFrameCommPath attribute points to the associated ISDN communication path carrying the D-channel frame mode data of the assigned ISDN access if the customer has subscribed to this service. Else, it has NULL value.
These relationships are maintained by use of the setReciprocalPointers and releaseReciprocalPointers actions of the v5Interface object class.
To the attribute dChannelActivation, the value '0', i.e. link deactivated, shall not be assigned, as layer 1 is permanently activated.";;
ATTRIBUTES
dChannelActivation GET-REPLACE,
envelopeFunctionAddress GET-REPLACE,
assocIsdnSignallingCommPath
INITIAL VALUE ASN1CMLETypeModule.initialPointer GET,
assocPacketCommPath
INITIAL VALUE ASN1CMLETypeModule.initialPointer GET,
assocFrameCommPath
INITIAL VALUE ASN1CMLETypeModule.initialPointer GET;;;
CONDITIONAL PACKAGES
actingRolePkg
PRESENT IF "this object class supports the primary and secondary role according to ITU-T Recommendation I.310 [6].",
gradingAlarmPackage
PRESENT IF "there is a remote digital section or if performance parameters are to be monitored against a pre-defined threshold";
REGISTERED AS {managedObjectClass 8};

6.1.1.3.5 Virtual leased access

virtualAccessPortLeased MANAGED OBJECT CLASS
DERIVED FROM virtualAccessPort;
CHARACTERIZED BY
virtualAccessPortLeasedPackage PACKAGE
BEHAVIOUR
virtualAccessPortLeasedBehaviour BEHAVIOUR
DEFINED AS "A virtual leased access is an information entity used for the association of a single analogue or digital semi-permanent leased line or a multiple digital semi-permanent leased line configuration with a V5.1/V5.2 interface.
If it is a single semi-permanent leased line, and if no virtual access channel object instance is contained in the virtualAccessPortLeased object instance, and if it is associated with a V5.1 interface, the assocV5TimeSlot attribute points to the associated V5 time slot object instance. Otherwise it has NULL value. The relationship shall be maintained by use of the setReciprocalPointers and releaseReciprocalPointers actions of the V5 interface object class.
A virtualAccessPortLeased object instance representing a single semi-permanent leased line shall contain either no or one virtual access channel object instance. In a multiple semi-permanent leased line configuration, the virtualAccessPortLeased object instance shall contain the appropriate number of virtual access channel object instances.
The v5UserPortAddress attribute gives for a single semi-permanent leased line the layer 3 port address the access is assigned to, otherwise it gives the envelope function address.";;

ATTRIBUTES
v5UserPortAddress GET-REPLACE,
assocV5TimeSlot
INITIAL VALUE ASN1CMLETypeModule.initialPointer GET;;;
REGISTERED AS {managedObjectClass 9};

6.1.1.3.6 Virtual access channel

virtualAccessChannel MANAGED OBJECT CLASS
DERIVED FROM "ITU-T Recommendation Q.824.0: 1995":accessChannel;
CHARACTERIZED BY
"ITU-T Recommendation M.3100: 1995": ctpInstancePackage,
virtualAccessChannelPackage PACKAGE
BEHAVIOUR
virtualAccessChannelBehaviour BEHAVIOUR
DEFINED AS "A virtual access channel is an object class representing an individual ISDN B-/D-channel of an ISDN access port, or the bearer channel for an analogue access port, or an individual channel of an access port for a semi-permanent leased line.
If the channel type is an ISDN B-channel or a channel of a non-ISDN access in the case of a V5.1 interface, the assocV5TimeSlot attribute points to the associated V5 time slot object instance. Otherwise it has NULL value.
The relationship is maintained by use of the setReciprocalPointers and releaseReciprocalPointers actions of the v5Interface object class. An instance of this object class shall only be deleted if all reciprocal pointer relationships are released.
The upstreamConnectivityPointer and the downstreamConnectivityPointer attributes have NULL value.
If the channelNumberPackage is not instantiated, the ctpId attribute should be used to number the channels consecutively from 1.";;
ATTRIBUTES
permanentLineReservation GET-REPLACE,
assocV5TimeSlot INITIAL VALUE ASN1CMLETypeModule.initialPointer GET;;;
REGISTERED AS {managedObjectClass 10};

6.1.1.4 Communication path fragment

6.1.1.4.1 V5 communication channel

commChannel MANAGED OBJECT CLASS
DERIVED FROM "CCITT Recommendation X.721":top;
CHARACTERIZED BY
"ITU-T Recommendation M.3100": operationalStatePackage,
commChannelPackage PACKAGE
BEHAVIOUR
commChannelBehaviour BEHAVIOUR
DEFINED AS "A V5 communication channel is an object class representing the image of a V5 C-channel that multiplexes one or more C-paths.
One V5 communication channel relates to one V5 time slot with the associated C-paths.
Instances of this object class have only to be created for active C-channels.
Restrictions and guidelines for the allocation of C-paths to C-channels are given in ITU-T Recommendations G.964 [4] and G.965 [5].
The assocV5TimeSlot attribute points to the associated V5 time slot object instance.
The assocV5CommPaths attribute points to the associated instances of communication path object classes.
The relationships are maintained by use of the setReciprocalPointers and releaseReciprocalPointers actions of the v5Interface object class. An instance of this object class shall only be deleted if all reciprocal pointer relationships are released.
The operationalState attribute shall be set to 'disabled' whenever one of the following conditions apply:
1) the assocV5TimeSlot is 'disabled';
2) no time slot assigned, neither directly nor via protection unit;
3) any other internal reason.
In addition, this may also impact the operational state of ISDN and PSTN virtualAccessPort objects representing user ports which are served by this C-channel.

```
        The operationalState attribute shall be set to 'enabled' when a time slot being in the 'enabled' state is
        assigned, either directly or via protection unit, or if the internal reason has been cleared.";;
        ATTRIBUTES
                commChannelId                                   GET SET-BY-CREATE,
                assocV5TimeSlot
                        INITIAL VALUE ASN1CMLETypeModule.initialPointer     GET,
                assocV5CommPaths
                        INITIAL VALUE ASN1CMLETypeModule.initialPointerS    GET,
                "ITU-T Recommendation M.3100":supportedByObjectList         GET;
        NOTIFICATIONS
                "CCITT Recommendation X.721": objectCreation,
                "CCITT Recommendation X.721": objectDeletion;;;
REGISTERED AS {managedObjectClass 11};
```

6.1.1.4.2 Communication path

This object class is subclassed for the different types of communication paths and not instantiated within the scope of this application.

```
commPath MANAGED OBJECT CLASS
DERIVED FROM "CCITT Recommendation X.721":top;
CHARACTERIZED BY
commPathPackage PACKAGE
        BEHAVIOUR
        commPathBehaviour BEHAVIOUR
        DEFINED AS "The communication path object class represents a V5 communication path.
        Restrictions and guidelines for the allocation of C-paths to C-channels are given in ITU-T
        Recommendations G.964 [4] and G.965 [5].
        The assocCommChannel attribute points to the associated V5 communication channel object instance.
        The relationship is maintained by use of the setReciprocalPointers and releaseReciprocalPointers actions of
        the v5Interface object class. An instance of this object class shall only be deleted if all reciprocal pointer
        relationships are released.";;
        ATTRIBUTES
                commPathId                                      GET SET-BY-CREATE,
                assocCommChannel
                INITIAL VALUE ASN1CMLETypeModule.initialPointer     GET,
                "ITU-T Recommendation M.3100":supportedByObjectList GET;
        NOTIFICATIONS
                "CCITT Recommendation X.721": objectCreation,
                "CCITT Recommendation X.721": objectDeletion;;;
REGISTERED AS {managedObjectClass 12};
```

6.1.1.4.3 ISDN communication path

```
isdnCommPath MANAGED OBJECT CLASS
DERIVED FROM commPath;
CHARACTERIZED BY
isdnCommPathPackage PACKAGE
        BEHAVIOUR
        isdnCommPathBehaviour BEHAVIOUR
        DEFINED AS "The ISDN communication path object class groups either the Ds-type, or the p-type, or the
        f-type data of ISDN accesses connected to an LE via a V5 interface.
        The clientUserPorts attribute points to the associated instances of virtual access port subclasses or user
        port subclasses.";;
        ATTRIBUTES
                clientUserPorts
                        INITIAL VALUE ASN1CMLETypeModule.initialPointerS        GET,
                dataType                                                        GET;;;
REGISTERED AS {managedObjectClass 13};
```

6.1.1.4.4 PSTN communication path

```
pstnCommPath MANAGED OBJECT CLASS
DERIVED FROM commPath;
CHARACTERIZED BY
pstnCommPathPackage PACKAGE
        BEHAVIOUR
        pstnCommPathBehaviour BEHAVIOUR
        DEFINED AS "The PSTN communication path object class carries the PSTN protocol information.";;;;
REGISTERED AS {managedObjectClass 14};
```

6.1.1.4.5 BCC communication path

```
bccCommPath MANAGED OBJECT CLASS
DERIVED FROM commPath;
CHARACTERIZED BY
bccCommPathPackage PACKAGE
        BEHAVIOUR
        bccCommPathBehaviour BEHAVIOUR
        DEFINED AS "The BCC communication path object class carries the BCC protocol information.";;;;
REGISTERED AS {managedObjectClass 15};
```

6.1.1.4.6 Control communication path

```
controlCommPath MANAGED OBJECT CLASS
DERIVED FROM commPath;
CHARACTERIZED BY
controlCommPathPackage PACKAGE
        BEHAVIOUR
        controlCommPathBehaviour BEHAVIOUR
        DEFINED AS "The control communication path object class carries the control protocol information.";;;;
REGISTERED AS {managedObjectClass 16};
```

6.1.1.4.7 Protection communication path

```
protCommPath MANAGED OBJECT CLASS
DERIVED FROM commPath;
CHARACTERIZED BY
protCommPathPackage PACKAGE
        BEHAVIOUR
        protCommPathBehaviour BEHAVIOUR
        DEFINED AS "The protection communication path object class carries the protection protocol
        information. The assocCommChannel attribute has NULL value.";;
        ATTRIBUTES
                assocProtectionGroup      GET-REPLACE;;;
REGISTERED AS {managedObjectClass 17};
```

6.1.1.4.8 Link control communication path

```
linkControlCommPath MANAGED OBJECT CLASS
DERIVED FROM commPath;
CHARACTERIZED BY
linkControlCommPathPackage PACKAGE
        BEHAVIOUR
        linkControlCommPathBehaviour BEHAVIOUR
        DEFINED AS "The link control communication path object class carries the link control protocol
        information.";;;;
REGISTERED AS {managedObjectClass 18};
```

6.1.1.5 V5 protection fragment

6.1.1.5.1 V5 protection group

v5ProtectionGroup MANAGED OBJECT CLASS
DERIVED FROM "CCITT Recommendation X.721":top;
CHARACTERIZED BY
v5ProtectionGroupPackage PACKAGE
BEHAVIOUR
v5ProtectionGroupBehaviour BEHAVIOUR
DEFINED AS "A v5ProtectionGroup object instance contains zero or more v5ProtectionUnit object instances for defining a protection switching relationship where one or more standby v5TimeSlot object instances provide protection for one or more active v5TimeSlot object instances.
The protectionSwitchReporting notification is emitted from the v5ProtectionGroup object to report any protection switch events, such as protection switching, protection release, lockout, or release of lockout.
The v5ProtectionGroupType attribute shall have the value 'colon' when more than one v5ProtectionUnit is protected. Changing the value of this attribute from 'plus' to 'colon' is allowed when only one protected v5ProtectionUnit and one protecting v5ProtectionUnit are contained by the v5ProtectionGroup, and if the underlying resources support m:n protection.
The v5ProtectionGroupType attribute of protection group #1 shall have the value 'plus'. For protection group #2, both values are possible, depending on the number of contained protecting and protected units. The value 'colon' for the v5ProtectionGroupType attribute of V5 protection group #1 shall be rejected.
The v5ProtectionGroupNumber attribute indicates whether this protection group instance is used for protection group #1 or #2 of V5 interface.
When an automatic, manual, or forced protection switch occurs, the reliableResourcePointer attribute of the protecting V5 protection unit shall be changed to the appropriate C-channel ID, whilst the reliableResourcePointer attribute of the protected V5 protection unit is changed to NULL. In parallel, the reciprocal relationship between the affected commChannel object instance and v5TimeSlot object instance shall be modified accordingly. The configuredReliableResourcePointer attribute of the contained V5 protection unit object instances is not affected by protection switching.";;
ATTRIBUTES
v5ProtectionGroupId GET SET-BY-CREATE,
v5ProtectionGroupType GET-REPLACE,
v5ProtectionGroupNumber GET;
NOTIFICATIONS
v5ProtectionSwitchReporting;;;
CONDITIONAL PACKAGES
v5ProtectionLeSwitchPackage PRESENT IF "an instance of this object class is instantiated in an LE.",
v5ProtectionAnSwitchPackage PRESENT IF "an instance of this object class is instantiated in an AN.";
REGISTERED AS {managedObjectClass 19};

6.1.1.5.2 V5 protection unit

v5ProtectionUnit MANAGED OBJECT CLASS
DERIVED FROM "CCITT Recommendation X.721":top;
CHARACTERIZED BY
v5ProtectionUnitPackage PACKAGE
BEHAVIOUR
v5ProtectionUnitBehaviour BEHAVIOUR
DEFINED AS "A v5ProtectionUnit object instance represents a protected (i.e. active) unit or a protecting (i.e. standby) unit. For a protecting v5ProtectionUnit, the attribute v5Protecting shall have the value TRUE. For a protected v5ProtectionUnit, the attribute v5Protecting shall have the value FALSE. The value of the unreliableResourcePointer points to a v5TimeSlot object instance. In the 'protected' case, the value of the reliableResourcePointer points to a commChannel object instance. In the 'protecting' case, the reliableResourcePointer has NULL value.

On creation of a v5ProtectionUnit object instance, the configuredReliableResourcePointer attribute shall be set to the same value as the reliableResourcePointer attribute. The relationship between the affected commChannel object instance and v5TimeSlot object instance shall be maintained accordingly.
On restart of the protection protocol the reliableResourcePointer attribute shall be set to the same value as the configuredReliableResourcePointer attribute. If this value is NULL then the attribute v5Protecting shall be set to TRUE. If the configuredReliableResourcePointer attribute contains a pointer to a commChannel object instance the attribute v5Protecting shall be set to FALSE. The relationship between the affected commChannel object instance and v5TimeSlot object instance shall be maintained accordingly.
The configuredReliableResourcePointer attribute of the contained V5 protection unit object instances is not affected by protection switching.";;
ATTRIBUTES
v5ProtectionUnitId GET SET-BY-CREATE,
v5Protecting GET,
reliableResourcePointer GET,
unreliableResourcePointer GET,
configuredReliableResourcePointer GET-REPLACE;;;
REGISTERED AS {managedObjectClass 20};

6.1.1.6 V5 service fragment

6.1.1.6.1 V5 bearer channel reservation

v5BcReservation MANAGED OBJECT CLASS
DERIVED FROM "ITU-T Recommendation Q.824.0: 1995":supplementaryServiceServiceIndependent;
CHARACTERIZED BY
v5BcReservationPackage PACKAGE
BEHAVIOUR
v5BcReservationBehaviour BEHAVIOUR
DEFINED AS "The assignment of a V5 bearer channel reservation object instance to a customized resource indicates that a fixed assignment of bearer channels of a V5.2 interface is made for a customer. Which V5 time slot is assigned is controlled by the resource manager but visible at the Q3 interface.
The servicePointerList attribute has NULL value.";;
ATTRIBUTES
noOfBcRequested GET-REPLACE,
bcReserved GET;;;
REGISTERED AS {managedObjectClass 21};

6.1.1.6.2 V5 leased line reservation

v5LlReservation MANAGED OBJECT CLASS
DERIVED FROM "ITU-T Recommendation Q.824.0: 1995":supplementaryServiceServiceIndependent;
CHARACTERIZED BY
v5LlReservationPackage PACKAGE
BEHAVIOUR
v5LlReservationBehaviour BEHAVIOUR
DEFINED AS "The assignment of a V5 leased line reservation object instance to a customized resource indicates that a fixed assignment of the bearer channel of a V5 interface is made for a customer. It is used either for analogue semi-permanent leased lines without signalling or for digital semi-permanent leased lines without signalling. Which V5 time slot in the case of a V5.2 interface is assigned is controlled by the resource manager but visible at the Q3 interface.
The servicePointerList attribute has NULL value.";;
ATTRIBUTES
bcReserved GET;;;
REGISTERED AS {managedObjectClass 22};

6.1.2 Access network

This subclause specifies the object classes for all of the managed objects used in the management information model for the access network. These objects are either defined here or by reference to other specifications.

6.1.2.1 Managed element fragment

6.1.2.1.1 Managed element (managedElement)

The managed element object class is defined in Recommendation M.3100 [8].

6.1.2.2 V5 interface fragment

In this subclause the definitions of the classes of the AN V5 interface fragment are specified.

Clarification of the use of the package "ITU-T Recommendation M.3100": tmnCommunicationsAlarmInformationPackage in these classes is given in Recommendation Q.831 [12]. The following classes which are specified in 6.1.1 are used:

- v5Interface;
- v5Ttp;
- v5TimeSlot;
- v5Provision;
- commChannel;
- isdnCommPath;
- pstnCommPath;
- bccCommPath;
- controlCommPath;
- protCommPath;
- linkControlCommPath;
- v5ProtectionGroup;
- v5ProtectionUnit.

6.1.2.3 Access fragment

In this subclause, the definitions of the new classes specific to the AN are specified.

6.1.2.3.1 User port TTP

userPortTtp MANAGED OBJECT CLASS
DERIVED FROM "ITU-T Recommendation M.3100": trailTerminationPointBidirectional;
CHARACTERIZED BY
"ITU-T Recommendation M.3100": ttpInstancePackage,
"CCITT Recommendation X.721": administrativeStatePackage,
"ITU-T Recommendation M.3100": createDeleteNotificationsPackage,
"ITU-T Recommendation M.3100": stateChangeNotificationPackage,
userPortTtpPackage PACKAGE
BEHAVIOUR
userPortTtpBehaviour BEHAVIOUR
DEFINED AS "This managed object class represents the generic user port which is subclassed to create the classes for specific types of user ports. Only subclasses of userPortTtp are instantiated for ports associated with a V5 interface.
An access port may have assigned one or more bearer time slots and/or one or more communication paths. The Operational state attribute shall be set to 'enabled' as long as the port has access to any service and there is no other condition to prevent this. The Operational state attribute shall be set to 'disabled' if an access port has no service at all.
An instance of this object class shall only be deleted if all reciprocal pointer relationships are released.";;
NOTIFICATIONS
shutdownRejected;;;

```
        CONDITIONAL PACKAGES
                blockingStatusPackage     PRESENT IF "blocking status is recorded at the port",
                assocV5InterfacePackage   PRESENT IF "user port is associated with a V5 interface",
                gradingAlarmPackage
                        PRESENT IF "there is an access digital section or if performance parameters are to be
                        monitored against a pre-defined threshold";
REGISTERED AS {managedObjectClass 23};
```

6.1.2.3.2 ISDN BA user port

```
isdnBAUserPort MANAGED OBJECT CLASS
DERIVED FROM userPortTtp;
CHARACTERIZED BY
assocCommPathsPackage,
isdnBAUserPortPackage PACKAGE
        BEHAVIOUR
        isdnBAUserPortBehaviour BEHAVIOUR
        DEFINED AS "This managed object class represents an ISDN basic user port which is associated with a V5
        interface on an AN. It can contain up to 2 instances of userPortBearerChannelCtp.";;
        ATTRIBUTES
                envelopeFunctionAddress         GET-REPLACE,
                accessDigitalSection            GET;;;
        CONDITIONAL PACKAGES
                gradingEnabledPackage           PRESENT IF "there is an access digital section for the port";
REGISTERED AS {managedObjectClass 24};
```

6.1.2.3.3 ISDN PRA user port

```
isdnPRAUserPort MANAGED OBJECT CLASS
DERIVED FROM userPortTtp;
CHARACTERIZED BY
assocCommPathsPackage,
isdnPRAUserPortPackage PACKAGE
        BEHAVIOUR
        isdnPRAUserPortBehaviour BEHAVIOUR
        DEFINED AS "This managed object class represents an ISDN primary rate user port which is associated
        with a V5 interface on an AN. It can contain up to 30 instances of userPortBearerChannelCtp.";;
        ATTRIBUTES
                envelopeFunctionAddress         GET-REPLACE,
                accessDigitalSection            GET;;;
        CONDITIONAL PACKAGES
                gradingEnabledPackage           PRESENT IF "there is an access digital section for the port";
REGISTERED AS {managedObjectClass 25};
```

6.1.2.3.4 PSTN user port

```
pstnUserPort MANAGED OBJECT CLASS
DERIVED FROM userPortTtp;
CHARACTERIZED BY
pstnUserPortPackage PACKAGE
        BEHAVIOUR
        pstnUserPortBehaviour BEHAVIOUR
        DEFINED AS "This managed object class represents a PSTN user port which is associated with a V5
        interface on an AN. In addition to the specialFeatures attribute, additional information about PSTN user
        ports may be modelled by objects contained in instances of pstnUserPort.";;
        ATTRIBUTES
                layer3PortAddress  GET-REPLACE,
                specialFeatures
                        DEFAULT VALUE ASN1CMLETypeModule.defaultSpecialFeatures
                                        GET-REPLACE ADD-REMOVE;;;
REGISTERED AS {managedObjectClass 26};
```

6.1.2.3.5 Leased port

This object class is used to model the generic characteristics of leased line ports which are associated with a V5 interface. Additional details of leased ports may be given in objects which are contained in instances of this class.

leasedPort MANAGED OBJECT CLASS
DERIVED FROM userPortTtp;
CHARACTERIZED BY
leasedPortPackage PACKAGE
BEHAVIOUR
leasedPortBehaviour BEHAVIOUR
DEFINED AS "Instances of leasedPort represents the generic form of leased line ports, which are defined as ports which do not have on demand signalling. Leased line ports which are related to V5 interfaces can only have their 64 kbit/s bearer channels connected to the host exchange via the V5 interface.
Instances of this class do not differentiate between analogue and digital leased line ports, but they do differentiate between ports which have a single bearer channel connected via the V5 interface and ports which have more than one channel connected via the V5 interface.
The v5UserPortAddress attribute has the value of the layer 3 port address on the V5 interface if a single bearer channel at the port is connected via the V5 interface. The attribute has the value of the layer 2 port address on the V5 interface if more than one bearer channel at the port is connected via the V5 interface. In either case the value should not be the same as that used for any PSTN or ISDN port.
Additional information concerning specific types of leased port may be added by containing an additional object within this object or by making use of connectivity pointers in contained channel objects.";;
ATTRIBUTES
v5UserPortAddress GET-REPLACE;;;
REGISTERED AS {managedObjectClass 27};

6.1.2.3.6 User port bearer channel CTP

userPortBearerChannelCtp MANAGED OBJECT CLASS
DERIVED FROM "ITU-T Recommendation M.3100": connectionTerminationPointBidirectional;
CHARACTERIZED BY
"ITU-T Recommendation M.3100":ctpInstancePackage,
"ITU-T Recommendation M.3100":createDeleteNotificationsPackage,
userPortBearerChannelCtpPackage PACKAGE
BEHAVIOUR
userPortBearerChannelCtpBehaviour BEHAVIOUR
DEFINED AS "This managed object class represents the point where a 64 kbit/s bearer channel is terminated. The connectivity pointers of instances of userPortBearerChannelCtp may be used to extend the modelling, but are otherwise null.
The cTPId attribute is used to number the channels consecutively from 1.
An instance of this object class shall only be deleted if all reciprocal pointer relationships are released.";;;;
CONDITIONAL PACKAGES
assocTimeSlotPackage PRESENT IF "the bearer channel has a call-independent association with a specific time slot at the interface to the local exchange or at the interface to some other service node such as a leased line network.",
bearerChannelTypePackage PRESENT IF "the bearer channel is contained in an ISDN port which can support PL service",
"CCITT Recommendation X.721":administrativeStatePackage
PRESENT IF "an instance supports it",
"ITU-T Recommendation M.3100": stateChangeNotificationPackage
PRESENT IF "administrativeStatePackage is present";
REGISTERED AS {managedObjectClass 28};

6.2 Name bindings

6.2.1 Local exchange

6.2.1.1 v5Interface-managedElement

v5Interface-managedElement NAME BINDING
SUBORDINATE OBJECT CLASS v5Interface AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS "ITU-T Recommendation M.3100":managedElement AND SUBCLASSES;
WITH ATTRIBUTE v5InterfaceId;
BEHAVIOUR commonDeleteBehaviour;
CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE DELETES-CONTAINED-OBJECTS;
REGISTERED AS {nameBinding 1};

6.2.1.2 v5Ttp-managedElement

v5Ttp-managedElement NAME BINDING
SUBORDINATE OBJECT CLASS v5Ttp AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS "ITU-T Recommendation M.3100":managedElement AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation M.3100":tTPId;
BEHAVIOUR commonDeleteBehaviour;
CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE ONLY-IF-NO-CONTAINED-OBJECTS;
REGISTERED AS {nameBinding 2};

6.2.1.3 v5TimeSlot-v5Ttp

v5TimeSlot-v5Ttp NAME BINDING
SUBORDINATE OBJECT CLASS v5TimeSlot AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS v5Ttp AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation M.3100":cTPId;
BEHAVIOUR commonDeleteBehaviour;
CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE;
REGISTERED AS {nameBinding 3};

6.2.1.4 v5Provision-v5Interface

v5Provision-v5Interface NAME BINDING
SUBORDINATE OBJECT CLASS v5Provision AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS v5Interface AND SUBCLASSES;
WITH ATTRIBUTE provId;
CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE;
REGISTERED AS {nameBinding 4};

6.2.1.5 commChannel-v5Interface

commChannel-v5Interface NAME BINDING
SUBORDINATE OBJECT CLASS commChannel AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS v5Interface AND SUBCLASSES;
WITH ATTRIBUTE commChannelId;

BEHAVIOUR commonDeleteBehaviour;
CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE;
REGISTERED AS {nameBinding 5};

6.2.1.6 commPath-v5Interface

commPath-v5Interface NAME BINDING
SUBORDINATE OBJECT CLASS commPath AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS v5Interface AND SUBCLASSES;
WITH ATTRIBUTE commPathId;
BEHAVIOUR commonDeleteBehaviour;
CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE;
REGISTERED AS {nameBinding 6};

6.2.1.7 v5ProtectionGroup-v5Interface

v5ProtectionGroup-v5Interface NAME BINDING
SUBORDINATE OBJECT CLASS v5ProtectionGroup AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS v5Interface AND SUBCLASSES;
WITH ATTRIBUTE v5ProtectionGroupId;
CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE ONLY-IF-NO-CONTAINED-OBJECTS;
REGISTERED AS {nameBinding 7};

6.2.1.8 v5ProtectionUnit-v5ProtectionGroup

v5ProtectionUnit-v5ProtectionGroup NAME BINDING
SUBORDINATE OBJECT CLASS v5ProtectionUnit AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS v5ProtectionGroup AND SUBCLASSES;
WITH ATTRIBUTE v5ProtectionUnitId;
CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE;
REGISTERED AS {nameBinding 8};

6.2.1.9 virtualAccessPort-managedElement

virtualAccessPort-managedElement NAME BINDING
SUBORDINATE OBJECT CLASS virtualAccessPort AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS "ITU-T Recommendation M.3100":managedElement AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation M.3100":tTPId;
BEHAVIOUR commonDeleteBehaviour;
CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE ONLY-IF-NO-CONTAINED-OBJECTS;
REGISTERED AS {nameBinding 9};

6.2.1.10 virtualAccessChannel-virtualAccessPort

virtualAccessChannel-virtualAccessPort NAME BINDING
SUBORDINATE OBJECT CLASS virtualAccessChannel AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS virtualAccessPort AND SUBCLASSES AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation M.3100":cTPId;
BEHAVIOUR commonDeleteBehaviour;
CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE;
REGISTERED AS {nameBinding 10};

6.2.2 Access network

6.2.2.1 v5Interface

As for Local Exchange.

6.2.2.2 v5Ttp

As for Local Exchange.

6.2.2.3 userPortTtp

userPortTtp-managedElement NAME BINDING
SUBORDINATE OBJECT CLASS userPortTtp AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS "ITU-T Recommendation M.3100":managedElement AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation M.3100":tTPId;
BEHAVIOUR commonDeleteBehaviour;
CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE ONLY-IF-NO-CONTAINED-OBJECTS;
REGISTERED AS {nameBinding 11};

6.2.2.4 userPortBearerChannelCtp-userPortTtp

userPortBearerChannelCtp-userPortTtp NAME BINDING
SUBORDINATE OBJECT CLASS userPortBearerChannelCtp AND SUBCLASSES AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS userPortTtp AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation M.3100":cTPId;
BEHAVIOUR commonDeleteBehaviour;
CREATE;
DELETE ONLY-IF-NO-CONTAINED-OBJECTS;
REGISTERED AS {nameBinding 12};

6.3 Definition of packages

6.3.1 Acting role

actingRolePkg PACKAGE
BEHAVIOUR
actingRolePkgBehaviour BEHAVIOUR
DEFINED AS "An ISDN primary rate access can have three different modes of operation:
1. Balanced mode: No priority is given to a certain communication partner
2. Master mode: the appropriate access port is the master in this communications
3. Slave mode: The appropriate access port is the slave in this communication.";;

```
        ATTRIBUTES
                actingRole    GET-REPLACE;
REGISTERED AS {package 1};
```

6.3.2 AN fault reported

```
anFaultReportedPackage PACKAGE
        NOTIFICATIONS
                anFaultReported;
REGISTERED AS {package 2};
```

6.3.3 AN switch over to new variant

```
anSwitchOverToNewVariantPackage PACKAGE
        ACTIONS
                switchOverToNewVariant,
                anReprovisioningStarted,
                verifyRemoteProvVariant,
                cannotReprovision,
                readyForReprovisioning,
                notReadyForReprovisioning;
        NOTIFICATIONS
                switchOverRequest,
                switchOverToNewVariantResult,
                verifyRequest,
                verifyRemoteProvVariantResult,
                anBlockingStarted;
REGISTERED AS {package 3};
```

6.3.4 Associated communication paths

```
assocCommPathsPackage PACKAGE
        BEHAVIOUR
        assocCommPathsPackageBehaviour BEHAVIOUR
        DEFINED AS "The assocIsdnSignallingCommPath attribute points to the associated ISDN
        Communication Path carrying the signalling messages of the assigned ISDN access.
        The assocPacketCommPath attribute points to the associated ISDN Communication Path carrying the D-
        channel packet mode data of the assigned ISDN access, if the customer has subscribed to this service. Else,
        it has NULL value.
        The assocFrameCommPath attribute points to the associated ISDN Communication Path carrying the D-
        channel frame mode data of the assigned ISDN access, if the customer has subscribed to this service. Else, it
        has NULL value.
        ";;
        ATTRIBUTES
                assocIsdnSignallingCommPath   GET,
                assocPacketCommPath           GET,
                assocFrameCommPath            GET;
REGISTERED AS {package 4};
```

6.3.5 Associated time slot

```
assocTimeSlotPackage PACKAGE
        BEHAVIOUR
        assocTimeSlotPackageBehaviour BEHAVIOUR
        DEFINED AS "The assocTimeSlot attribute points to the related time slot on a V5 interface or other
        service interface.";;
        ATTRIBUTES
                assocTimeSlot       GET;
REGISTERED AS {package 5};
```

6.3.6 Associated V5 interface

```
assocV5InterfacePackage PACKAGE
        BEHAVIOUR
        assocV5InterfacePackageBehaviour BEHAVIOUR
        DEFINED AS "The assocV5Interface attribute points to the related V5 interface.";;
        ATTRIBUTES
                assocV5Interface    GET;
REGISTERED AS {package 6};
```

6.3.7 Bearer channel type

```
bearerChannelTypePackage PACKAGE
        ATTRIBUTES
                bearerChannelType        GET-REPLACE;
REGISTERED AS {package 7};
```

6.3.8 Blocking status

```
blockingStatusPackage PACKAGE
        ATTRIBUTES
                blockingStatus      GET;
REGISTERED AS {package 8};
```

6.3.9 Grading enabled

```
gradingEnabledPackage PACKAGE
        ATTRIBUTES
                gradingEnabled     GET-REPLACE;
REGISTERED AS {package 10};
```

6.3.10 LE switch over to new variant

```
leSwitchOverToNewVariantPackage PACKAGE
        ACTIONS
                switchOverToNewVariant,
                leBlockingStarted,
                verifyRemoteProvVariant,
                cannotReprovision,
                readyForReprovisioning,
                notReadyForReprovisioning;
        NOTIFICATIONS
                switchOverRequest,
                switchOverToNewVariantResult,
                verifyRequest,
                verifyRemoteProvVariantResult;
REGISTERED AS {package 11};
```

6.3.11 NE specific pointer

```
neSpecificPointerPackage PACKAGE
        ATTRIBUTES
                neSpecificPointer    GET;
REGISTERED AS {package 12};
```

6.3.12 Peer user label

```
peerUserLabelPackage PACKAGE
        ATTRIBUTES
                peerUserLabel       GET-REPLACE;
REGISTERED AS {package 13};
```

6.3.13 Grading alarm

```
gradingAlarmPackage PACKAGE
        BEHAVIOUR
        gradingAlarmPackageBehaviour BEHAVIOUR
        DEFINED AS "This package is used to report threshold violations of performance parameters of an ISDN
        access, dependent on the value of the gradingEnabled attribute. The thresholds are assumed to be pre-
        defined in the NE. The parameter violating the threshold and the threshold itself shall be reported using
        the thresholdInfo field of the qualityOfServiceAlarm notification.";;
        NOTIFICATIONS
                "CCITT Recommendation X.721 | ISO/IEC 10165-2": qualityofServiceAlarm;
REGISTERED AS {package 14};
```

6.3.14 Relationship change notification

```
relationshipChangeNotificationPackage PACKAGE
        NOTIFICATIONS
                "CCITT Recommendation X.721 | ISO/IEC 10165-2": relationshipChange;
REGISTERED AS {package 15};
```

6.3.15 V5 availability status

```
v5AvailabilityStatusPackage PACKAGE
        ATTRIBUTES
                "CCITT Recommendation X.721":availabilityStatus   GET;
REGISTERED AS {package 16};
```

6.3.16 V5 protection AN switch

```
v5ProtectionAnSwitchPackage PACKAGE
        ACTIONS
                v5ProtectionAnSwitch;
REGISTERED AS {package 17};
```

6.3.17 V5 protection LE switch

```
v5ProtectionLeSwitchPackage PACKAGE
        ACTIONS
                v5ProtectionLeSwitch;
REGISTERED AS {package 18};
```

6.3.18 V5 time slot administrative state

```
v5TsAdministrativeStatePackage PACKAGE
        ATTRIBUTES
        "CCITT Recommendation X.721":administrativeState       GET-REPLACE;
REGISTERED AS {package 19};
```

6.3.19 V5 TMN communications alarm information

```
v5TmnCommunicationsAlarmInformationPackage PACKAGE
        BEHAVIOUR
                v5TmnCommunicationsAlarmInformationBehaviour;
        ATTRIBUTES
                "ITU-T Rec. M.3100":alarmStatus GET,
                "ITU-T Rec. M.3100":currentProblemList GET;
```

NOTIFICATIONS
"ITU-T Rec. X.721":communicationsAlarm
"ITU-T Rec. Q.831": envelopeFunctionAddress
"ITU-T Rec. Q.831": layer3PortAddress;
REGISTERED AS {package 20};

v5TmnCommunicationsAlarmInformationBehaviour BEHAVIOUR
DEFINED AS
"An alarm report which contains a Perceived Severity parameter with a value of 'cleared' and a Correlated Notifications parameter shall only indicate the clearing of those alarms whose Notification Identifiers are included in the set of Correlated Notifications. An alarm report which contains a Perceived Severity parameter with a value of 'cleared', but no Correlated Notifications parameter, shall indicate the clearing of alarms based on the value of the Alarm Type, Probable Cause, and Specific Problems parameters. The parameters that are associated with the communications alarm, if present, are placed in individual elements of the SET OF ManagementExtension in the additionalInformation field of the notification.
A V5 specific causeValue shall be carried in the identifier element of a ManagementExtension in the additionalInformation field. In that case the information element of the ManagementExtension is empty.";

6.4 Definition of behaviours

6.4.1 Common delete behaviour (commonDeleteBehaviour)

commonDeleteBehaviour BEHAVIOUR
DEFINED AS "An instance of this object class shall only be deleted if all reciprocal pointer relationships are released.";

6.5 Definition of attributes

This subclause contains the ASN.1 definitions for all attributes in the described object classes. These definitions identify the function of the attributes and their valid characteristics, such as their valid values, interdependencies, read/write constraints, etc. The attributes are identified by their ASN.1 descriptors.

6.5.1 Access digital section

accessDigitalSection ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMANTypeModule.AccessDigitalSection;
MATCHES FOR EQUALITY;
BEHAVIOUR
accessDigitalSectionBehaviour BEHAVIOUR
DEFINED AS "This attribute indicates whether or not there is an access digital section at an ISDN port.";;
REGISTERED AS {attribute 1};

6.5.2 Acting role

actingRole ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.ActingRole;
MATCHES FOR EQUALITY;
BEHAVIOUR
actingRole BEHAVIOUR
DEFINED AS "This attribute indicates whether the communication is balance or whether the port is a master or a slave.";;
REGISTERED AS {attribute 2};

6.5.3 Associated V5 communication channel

assocCommChannel ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Pointer;
MATCHES FOR EQUALITY;
BEHAVIOUR
assocCommChannelBehaviour BEHAVIOUR
DEFINED AS "It points to the associated V5 communication channel object instance. ";;
REGISTERED AS {attribute 3};

6.5.4 Associated ISDN D-channel frame mode communication path

assocFrameCommPath ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Pointer;
MATCHES FOR EQUALITY;
BEHAVIOUR
assocFrameCommPathBehaviour BEHAVIOUR
DEFINED AS "It points to the associated ISDN communication path carrying the D-channel frame mode data of the assigned ISDN access if the customer has subscribed to this service.";;
REGISTERED AS {attribute 4};

6.5.5 Associated ISDN signalling communication path

assocIsdnSignallingCommPath ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Pointer;
MATCHES FOR EQUALITY;
BEHAVIOUR
assocIsdnSignallingCommPathBehaviour BEHAVIOUR
DEFINED AS "It points to the associated ISDN communication path carrying the signalling messages of the assigned ISDN access.";;
REGISTERED AS {attribute 5};

6.5.6 Associated ISDN D-channel packet mode communication path

assocPacketCommPath ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Pointer;
MATCHES FOR EQUALITY;
BEHAVIOUR
assocPacketCommPathBehaviour BEHAVIOUR
DEFINED AS "It points to the associated ISDN communication path carrying the D-channel packet mode data of the assigned ISDN access if the customer has subscribed to this service.";;
REGISTERED AS {attribute 6};

6.5.7 Associated V5 protection group

assocProtectionGroup ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Pointer;
MATCHES FOR EQUALITY;
BEHAVIOUR
assocProtectionGroupBehaviour BEHAVIOUR
DEFINED AS "This attribute points to the associated V5 protection group.";;
REGISTERED AS {attribute 7};

6.5.8 Associated resource

assocResource ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Pointer;
MATCHES FOR EQUALITY;

BEHAVIOUR
assocResourceBehaviour BEHAVIOUR
DEFINED AS "It points to the associated communication channel object instance if the channel type is C-channel, or points to the associated virtual access port or virtual access channel or user port bearer channel CTP object instance in the case of a V5.1 interface.";;
REGISTERED AS {attribute 8};

6.5.9 Associated time slot

assocTimeSlot ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMANTypeModule.Pointer;
MATCHES FOR EQUALITY;
BEHAVIOUR
assocTimeSlotBehaviour BEHAVIOUR
DEFINED AS "This attribute points to an object representing the associated time slot.";;
REGISTERED AS {attribute 9};

6.5.10 Associated V5 communication paths

assocV5CommPaths ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.AssocInstances;
MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;
BEHAVIOUR
assocV5CommPathsBehaviour BEHAVIOUR
DEFINED AS "It points to the associated instances of communication path object classes.";;
REGISTERED AS {attribute 10};

6.5.11 Associated V5 interface

assocV5Interface ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Pointer;
MATCHES FOR EQUALITY;
BEHAVIOUR
assocV5InterfaceBehaviour BEHAVIOUR
DEFINED AS "It gives the relation to the V5 interface, that the virtual access port or that the user port or that the 2048 kbit/s interface is assigned to.";;
REGISTERED AS {attribute 11};

6.5.12 Associated V5 time slot

assocV5TimeSlot ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Pointer;
MATCHES FOR EQUALITY;
BEHAVIOUR
assocV5TimeSlotBehaviour BEHAVIOUR
DEFINED AS "It points to the associated V5 time slot object instance.";;
REGISTERED AS {attribute 12};

6.5.13 Associated V5 time slot for B-channel 1

assocV5TimeSlotB1 ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Pointer;
MATCHES FOR EQUALITY;
BEHAVIOUR
assocV5TimeSlotB1Behaviour BEHAVIOUR
DEFINED AS "It indicates for B-channel 1 the associated V5 time slot object instance.";;
REGISTERED AS {attribute 13};

6.5.14 Associated V5 time slot for B-channel 2

assocV5TimeSlotB2 ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Pointer;
MATCHES FOR EQUALITY;
BEHAVIOUR
assocV5TimeSlotB2Behaviour BEHAVIOUR
DEFINED AS "It indicates for B-channel 2 the associated V5 time slot object instance.";;
REGISTERED AS {attribute 14};

6.5.15 V5 bearer channel reservation

bcReserved ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.BcReserved;
MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;
BEHAVIOUR
bcReservedBehaviour BEHAVIOUR
DEFINED AS "This attribute indicates in a set of octets 3 and 4 of V5 time slot Identification information elements (17.4.2.3/G.964) which time slots are actually assigned by the BCC protocol.";;
REGISTERED AS {attribute 15};

6.5.16 Bearer channel type

bearerChannelType ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMANTypeModule.BearerChannelType;
MATCHES FOR EQUALITY;
BEHAVIOUR
bearerChannelTypeBehaviour BEHAVIOUR
DEFINED AS "This attribute indicates whether or not the bearer channel is used for PL access.";;
REGISTERED AS {attribute 16};

6.5.17 Blocking status

blockingStatus ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.BlockStatus;
MATCHES FOR EQUALITY;
BEHAVIOUR
blockingStatusBehaviour BEHAVIOUR
DEFINED AS "The blockingStatus attribute indicates if the entity is blocked for local or remote reasons or both.";;
REGISTERED AS {attribute 17};

6.5.18 Client user ports

clientUserPorts ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.AssocInstances;
MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;
BEHAVIOUR
clientUserPortsBehaviour BEHAVIOUR
DEFINED AS "This attribute lists the instances of user port or virtual access port subclasses currently using this particular object class as a transport and which are therefore associated to it.";;
REGISTERED AS {attribute 18};

6.5.19 Communication channel identifier

commChannelId ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.NameType;
MATCHES FOR EQUALITY;

BEHAVIOUR
commChannelIdBehaviour BEHAVIOUR
DEFINED AS "It is the RDN attribute to name an instance of the object class and its subclasses.";;
REGISTERED AS {attribute 19};

6.5.20 Communication path identifier

commPathId ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.NameType;
MATCHES FOR EQUALITY;
BEHAVIOUR
commPathIdBehaviour BEHAVIOUR
DEFINED AS "It is the RDN attribute to name an instance of the object class and its subclasses.";;
REGISTERED AS {attribute 20};

6.5.21 Configured reliable resource pointer

configuredReliableResourcePointer ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Pointer;
MATCHES FOR EQUALITY;
BEHAVIOUR
configuredReliableResourcePointerBehaviour BEHAVIOUR
DEFINED AS "This attribute points to a commChannel object instance to which the reliableResourcePointer attribute of this object instance shall be set automatically after a V5 interface restart.";;
REGISTERED AS {attribute 21};

6.5.22 Data type

dataType ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.DataType;
MATCHES FOR EQUALITY;
BEHAVIOUR
dataTypeBehaviour BEHAVIOUR
DEFINED AS "It indicates the type of data which is assigned to this ISDN communication path. This may be p-, f-, or Ds-type data.";;
REGISTERED AS {attribute 22};

6.5.23 D-channel activation

dChannelActivation ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.D-ChannelActivation;
MATCHES FOR EQUALITY;
BEHAVIOUR
dChannelActivationBehaviour BEHAVIOUR
DEFINED AS "This attribute indicates the level of activation.";;
REGISTERED AS {attribute 23};

6.5.24 Envelope function address

envelopeFunctionAddress ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.EnvelopeFunctionAddress;
MATCHES FOR EQUALITY;
BEHAVIOUR
envelopeFunctionAddressBehaviour BEHAVIOUR
DEFINED AS "It gives the envelope function address the ISDN access is assigned to.";;
REGISTERED AS {attribute 24};

6.5.25 Grading enabled

```
gradingEnabled              ATTRIBUTE
        WITH ATTRIBUTE SYNTAX ASN1CMANTypeModule.GradingEnabled;
        MATCHES FOR EQUALITY;
        BEHAVIOUR
        gradingEnabledBehaviour BEHAVIOUR
        DEFINED AS "This attribute allows grading messages to the LE to be enabled (TRUE) and disabled
        (FALSE) for ISDN ports with an access digital section.";;
REGISTERED AS {attribute 25};
```

6.5.26 Layer 3 port address

```
layer3PortAddress ATTRIBUTE
        WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Layer3PortAddress;
        MATCHES FOR EQUALITY;
        BEHAVIOUR
        layer3PortAddressBehaviour BEHAVIOUR
        DEFINED AS "It gives the layer 3 port address the analogue access is assigned to.";;
REGISTERED AS {attribute 26};
```

6.5.27 Line signalling

```
lineSignalling              ATTRIBUTE
        WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.LineSignalling;
        MATCHES FOR EQUALITY;
        BEHAVIOUR
        lineSignallingBehaviour BEHAVIOUR
        DEFINED AS "This attribute indicates whether the line signalling is DTMF, pulse, or both.";;
REGISTERED AS {attribute 27};
```

6.5.28 Link identifier

```
linkId ATTRIBUTE
        WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.LinkId;
        MATCHES FOR EQUALITY;
        BEHAVIOUR
        linkIdBehaviour BEHAVIOUR
        DEFINED AS "It is the RDN attribute to name an instance of the object class and its subclasses. It gives
        the link ID which is assigned to the v5Ttp.";;
REGISTERED AS {attribute 28};
```

6.5.29 Network element specific pointer

```
neSpecificPointer ATTRIBUTE
        WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.ObjectPointer;
        MATCHES FOR EQUALITY;
        BEHAVIOUR
        neSpecificPackagePointerBehaviour BEHAVIOUR
        DEFINED AS "This attribute points to an object instance specific for an individual NE.";;
REGISTERED AS {attribute 29};
```

6.5.30 Number of bearer channels requested

```
noOfBcRequested ATTRIBUTE
        WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.NoOf;
        MATCHES FOR EQUALITY;
```

BEHAVIOUR
noOfBcRequestedBehaviour BEHAVIOUR
DEFINED AS "It indicates the number of bearer channels requested for reservation.";;
REGISTERED AS {attribute 30};

6.5.31 Own provisioning variant

ownProvVariant ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.ProvVariant;
MATCHES FOR EQUALITY;
BEHAVIOUR
ownProvVariantBehaviour BEHAVIOUR
DEFINED AS "It indicates the provisioning variant which is currently valid in the local NE. This attribute will always be set by a management operation of the own OS. When a set operation has been performed on the attribute, the NE shall treat this as a 're-provisioning completed' and act according to 14.5.4.3/G.964.";;
REGISTERED AS {attribute 31};

6.5.32 Peer managed element

peerUserLabel ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.UserLabel;
MATCHES FOR EQUALITY;
BEHAVIOUR
peerUserLabelBehaviour BEHAVIOUR
DEFINED AS "It identifies the peer node where this particular V5 interface is terminated.";;
REGISTERED AS {attribute 32};

6.5.33 Permanent line reservation

permanentLineReservation ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.YesNo;
MATCHES FOR EQUALITY;
BEHAVIOUR
permanentLineReservationBehaviour BEHAVIOUR
DEFINED AS "It indicates whether this access channel is reserved as permanent line or not. Default value is no (FALSE).";;
REGISTERED AS {attribute 33};

6.5.34 Provisioning identifier

provId ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.NameType;
MATCHES FOR EQUALITY;
BEHAVIOUR
provIdBehaviour BEHAVIOUR
DEFINED AS "It is the RDN attribute to name an instance of the object class and its subclasses.";;
REGISTERED AS {attribute 34};

6.5.35 Reliable resource pointer

reliableResourcePointer ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Pointer;
MATCHES FOR EQUALITY;
BEHAVIOUR
reliableResourcePointerBehaviour BEHAVIOUR
DEFINED AS "This attribute points to a commChannel object instance. In the 'protecting' case (i.e. standby status), it has NULL value.";;
REGISTERED AS {attribute 35};

6.5.36 Server V5 TTP

serverV5Ttps ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.AssocInstances;
MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;
BEHAVIOUR
serverV5TtpsBehaviour BEHAVIOUR
DEFINED AS "It indicates the V5 TTP associated with the V5 interface.";;
REGISTERED AS {attribute 36};

6.5.37 Special feature

specialFeatures ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMANTypeModule.SpecialFeatures;
MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;
BEHAVIOUR
specialFeaturesBehaviour BEHAVIOUR
DEFINED AS "This attribute indicates whether or not there are special features and if so what they are. It has a default value of the empty set which indicates that there are no special features.";;
REGISTERED AS {attribute 37};

6.5.38 Supported protocol version

supportedProtocolVersion ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.ProtocolVersion;
MATCHES FOR EQUALITY;
BEHAVIOUR
supportedProtocolVersionBehaviour BEHAVIOUR
DEFINED AS "It indicates the version of the V5 interface protocol this particular V5 interface is supporting.";;
REGISTERED AS {attribute 38};

6.5.39 Unreliable resource pointer

unreliableResourcePointer ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.Pointer;
MATCHES FOR EQUALITY;
BEHAVIOUR
unreliableResourcePointerBehaviour BEHAVIOUR
DEFINED AS "This attribute points to a v5TimeSlot object instance.";;
REGISTERED AS {attribute 39};

6.5.40 V5 channel type

v5ChannelType ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.V5ChannelType;
MATCHES FOR EQUALITY;
BEHAVIOUR
v5ChannelTypeBehaviour BEHAVIOUR
DEFINED AS "It indicates whether the V5 time slot is used as bearer channel or C-channel.";;
REGISTERED AS {attribute 40};

6.5.41 V5 identification

v5Identification ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.V5Identification;
MATCHES FOR EQUALITY;

BEHAVIOUR
v5IdentificationBehaviour BEHAVIOUR
DEFINED AS "This is the identification of the V5 interface within the internal V5 protocol.";;
REGISTERED AS {attribute 41};

6.5.42 V5 interface identifier

v5InterfaceId ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.NameType;
MATCHES FOR EQUALITY;
BEHAVIOUR
v5InterfaceIdBehaviour BEHAVIOUR
DEFINED AS "It is the RDN attribute to name an instance of the object class and its subclasses.";;
REGISTERED AS {attribute 42};

6.5.43 V5 protecting

v5Protecting ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.YesNo;
MATCHES FOR EQUALITY;
BEHAVIOUR
v5ProtectingBehaviour BEHAVIOUR
DEFINED AS "This attribute indicates the active or standby status of the V5 protection unit.";;
REGISTERED AS {attribute 43};

6.5.44 V5 protection group identifier

v5ProtectionGroupId ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.NameType;
MATCHES FOR EQUALITY;
BEHAVIOUR
v5ProtectionGroupIdBehaviour BEHAVIOUR
DEFINED AS "It is the RDN attribute to name an instance of the object class and its subclasses.";;
REGISTERED AS {attribute 44};

6.5.45 V5 protection group number

v5ProtectionGroupNumber ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.NoOf;
MATCHES FOR EQUALITY;
BEHAVIOUR
v5ProtectionGroupNumberBehaviour BEHAVIOUR
DEFINED AS "This attribute indicates whether it is protection group number 1 or number 2 of a V5.2 interface. Permitted values are ’1’ and ’2’.";;
REGISTERED AS {attribute 45};

6.5.46 V5 protection group type

v5ProtectionGroupType ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.V5ProtectionGroupType;
MATCHES FOR EQUALITY;
BEHAVIOUR
v5ProtectionGroupTypeBehaviour BEHAVIOUR
DEFINED AS "It indicates whether the protection relation is 1:1 or m:n. The v5ProtectionGroupType attribute shall have the value ’colon’ when more than one v5ProtectionUnit is protected. Changing the value of this attribute from ’plus’ to ’colon’ is allowed when only one protected v5ProtectionUnit and one protecting v5ProtectionUnit are contained by the v5ProtectionGroup, and if the underlying resources support m:n protection.";;
REGISTERED AS {attribute 46};

6.5.47 V5 protection unit identifier

v5ProtectionUnitId ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.NameType;
MATCHES FOR EQUALITY;
BEHAVIOUR
v5ProtectionUnitIdBehaviour BEHAVIOUR
DEFINED AS "It is the RDN attribute to name an instance of the object class and its subclasses.";;
REGISTERED AS {attribute 47};

6.5.48 V5 user port address

v5UserPortAddress ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1CMLETypeModule.V5UserPortAddress;
MATCHES FOR EQUALITY;
BEHAVIOUR
v5UserPortAddressBehaviour BEHAVIOUR
DEFINED AS "It gives for a single semi-permanent leased line the layer 3 port address the access is assigned to, otherwise it gives the envelope function address.";;
REGISTERED AS {attribute 48};

6.6 Definition of actions

6.6.1 Set reciprocal pointers

setReciprocalPointers ACTION
BEHAVIOUR
setReciprocalPointersBehavior BEHAVIOUR
DEFINED AS "This action is used to set reciprocal pointers between instances of two different object classes. The applicable relationship types are peer relationship and group relationship.
The following parameters are provided:
– object class #1
– object instance #1
– pointer attribute #1
– object class #2
– object instance #2
– pointer attribute #2
If pointer attribute #1 or #2 are defined as single valued attributes, their original values shall be equal NULL. Otherwise the action shall be rejected by returning the failed parameter as defined in the reply syntax. If pointer attribute #1 or #2 are defined as set valued attributes, object instance #2 or #1, respectively, shall not be present in pointer attribute #1 or #2, respectively. Otherwise the action shall be rejected by returning the failed parameter as defined in the reply syntax.
Pointer attribute #1 in object instance #1 of object class #1 shall be set to or extended by object instance #2, as appropriate. Pointer attribute #2 in object instance #2 of object class #2 shall be set to or extended by object instance #1, as appropriate. Afterwards, the set parameter as defined in the reply syntax shall be returned in the action response.";;
MODE CONFIRMED;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.ReciprocalPointersInfo;
WITH REPLY SYNTAX ASN1CMLETypeModule.SetReciprocalPointersResult;
REGISTERED AS {action 1};

6.6.2 Release reciprocal pointers

releaseReciprocalPointers ACTION
BEHAVIOUR
releaseReciprocalPointersBehavior BEHAVIOUR
DEFINED AS "This action is used to release reciprocal pointers between instances of two different object classes. The applicable relationship types are peer relationship and group relationship.

The following parameters are provided:
- **object class #1**
- **object instance #1**
- **pointer attribute #1**
- **object class #2**
- **object instance #2**
- **pointer attribute #2**

If neither pointer attribute #1 points to object instance #2 nor pointer attribute #2 points to object instance #1, the action shall be rejected by returning the failed parameter as defined in the reply syntax. In all other cases, object instances #2 and #1 in pointer attributes #1 and #2 are replaced by NULL or removed as appropriate. The replaced or removed original pointer values from pointer attributes #1 and #2 are returned using the released parameter as defined in the reply syntax.
If pointer attribute #1 or #2 are defined as set valued attributes, and object instance #2 or #1, respectively, were not present so that no removal could be performed, the NULL value is returned using the released parameter as defined in the reply syntax.";;
MODE CONFIRMED;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.ReciprocalPointersInfo;
WITH REPLY SYNTAX ASN1CMLETypeModule.ReleaseReciprocalPointersResult;
REGISTERED AS {action 2};

6.6.3 Verify remote provisioning variant

verifyRemoteProvVariant ACTION
BEHAVIOUR
verifyRemoteProvVariantBehaviour BEHAVIOUR
DEFINED AS "This action initiates sending of the V5 control protocol message 'Verify re-provisioning'. The message will include the new variant as given in the information syntax of the action request. The verifyRemoteProvVariantResult notification will reflect the response of the remote NE which may be 'Ready for re-provisioning' or 'Not ready for re-provisioning'.";;
MODE CONFIRMED;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.VerifyRemoteProvVariantInfo;
REGISTERED AS {action 3};

6.6.4 Ready for re-provisioning

readyForReprovisioning ACTION
BEHAVIOUR
readyForReprovisioningBehaviour BEHAVIOUR
DEFINED AS "This action initiates sending of the V5 control protocol message 'Ready for re-provisioning' as a positive reply on a previously received 'Verify re-provisioning' message after the OS has compared its own new provisioning variant value with the value of the other side contained in the 'Verify re-provisioning' message.";;
MODE CONFIRMED;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.ProvVariant;
REGISTERED AS {action 4};

6.6.5 Not ready for re-provisioning

notReadyForReprovisioning ACTION
BEHAVIOUR
notReadyForReprovisioningBehaviour BEHAVIOUR
DEFINED AS "This action initiates sending of the V5 control protocol message 'Not ready for re-provisioning' as a negative reply on a previously received 'Verify re-provisioning' message after the OS has compared its own new provisioning variant value with the value of the other side contained in the 'Verify re-provisioning' message.";;
MODE CONFIRMED;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.RejectedProvVariant;
REGISTERED AS {action 5};

6.6.6 Request remote provisioning variant

```
requestRemoteProvVariant ACTION
        BEHAVIOUR
        requestRemoteProvVariantBehaviour BEHAVIOUR
        DEFINED AS "This action initiates sending of the V5 control protocol message 'Request variant and
        interface ID'. The requestRemoteProvVariantResult notification will contain the provisioning variant and
        the interface ID which will be sent from the remote NE as a response to this message.
        The V5 control protocol message 'Request variant and interface ID' may also be triggered by internal
        events in the NE (e.g. startup procedure).";;
        MODE CONFIRMED;
REGISTERED AS {action 6};
```

6.6.7 Switch over to new variant

```
switchOverToNewVariant ACTION
        BEHAVIOUR
        switchOverToNewVariantBehaviour BEHAVIOUR
        DEFINED AS "This action may be used to initiate the re-provisioning procedure from the AN or the LE
        side. It shall initiate sending of the V5 control protocol message 'switch-over to new variant' which will
        cause an appropriate notification to the OS at the remote side of the V5 interface.";;
        MODE CONFIRMED;
        WITH INFORMATION SYNTAX ASN1CMLETypeModule.ProvVariant;
REGISTERED AS {action 7};
```

6.6.8 AN re-provisioning started

```
anReprovisioningStarted ACTION
        BEHAVIOUR
        anReprovisioningStartedBehaviour BEHAVIOUR
        DEFINED AS "This action may be used to indicate to the AN that the OS has accepted a previous switch
        over request by the LE and that the management operations required for the re-provisioning will be
        performed afterwards. The action shall initiate sending of the V5 control protocol message 'Reprovisioning
        started' to the LE.";;
        MODE CONFIRMED;
        WITH INFORMATION SYNTAX ASN1CMLETypeModule.ProvVariant;
REGISTERED AS {action 8};
```

6.6.9 LE blocking started

```
leBlockingStarted ACTION
        BEHAVIOUR
        leBlockingStartedBehaviour BEHAVIOUR
        DEFINED AS "This action may be used to indicate to the LE that a previous switch over request by the
        AN will be accepted and that the OS will start to block all affected user ports. The action shall initiate
        sending of the V5 control protocol message 'Blocking started' to the AN.";;
        MODE CONFIRMED;
REGISTERED AS {action 9};
```

6.6.10 Cannot re-provision

```
cannotReprovision ACTION
        BEHAVIOUR
        cannotReprovisionBehaviour BEHAVIOUR
        DEFINED AS "This action may be used to indicate to the NE that the OS has rejected a previous switch
        over request by the other side and that the management operations required for the re-provisioning cannot
        be performed afterwards. The action shall initiate sending of the V5 control protocol message 'Cannot
        re-provision' across the V5 interface.";;
```

MODE CONFIRMED;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.RejectedProvVariant;
REGISTERED AS {action 10};

6.6.11 V5 protection AN switch

v5ProtectionAnSwitch ACTION
BEHAVIOUR
v5ProtectionAnSwitchBehaviour BEHAVIOUR
DEFINED AS "This action is used for manual protection switching of V5 time slot object instances being assigned as active or standby C-channel.
It may only be requested on v5protectionGroup number 2 and shall be rejected otherwise.
The following parameters are provided:
– switchType (permitted value: manual);
– switchFrom (indicates the active, i.e. protected V5 protection unit object instance);
– switchTo (indicates the standby, i.e. protecting V5 protection unit object instance).
This action shall change the v5Protecting attributes in the appropriate V5 protection unit object instances to TRUE or FALSE, respectively. The reliableResourcePointer attribute of the protecting V5 protection unit shall be changed to the appropriate C-channel ID, whilst the reliableResourcePointer attribute of the protected V5 protection unit shall be changed to NULL. In parallel, the reciprocal relationship between the affected commChannel object instance and v5TimeSlot object instance shall be modified accordingly.
The successful or failed protection switch will be reported to the OS by using v5ProtectionSwitchReporting Notification.";;
MODE CONFIRMED;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.V5ProtectionSwitchInfo;
REGISTERED AS {action 11};

6.6.12 V5 protection LE switch

v5ProtectionLeSwitch ACTION
BEHAVIOUR
v5ProtectionLeSwitchBehaviour BEHAVIOUR
DEFINED AS "This action is used for both manual and forced protection switching of V5 time slot object instances being assigned as active or standby C-channel. It may only be requested on v5protectionGroup number 2 and shall be rejected otherwise.
A forced switch request permits the allocation of a C-channel to an already active channel (v5Protecting attribute of related protection unit is FALSE). The preempted C-channel is switched to the time slot of the preempting C-channel.
A manual switch request permits the allocation of a C-channel only to a stand-by channel (v5Protecting attribute of related protection unit is TRUE).
The following parameters are provided:
– switchType (indicates whether it is a forced or manual switch request);
– switchFrom (indicates the active, i.e. protected V5 protection unit object instance);
– switchTo (indicates the standby, i.e. protecting V5 protection unit object instance or, in the case of a forced switch, request the dedicated active channel).
This action shall change the v5Protecting attributes in the appropriate V5 protection unit object instances to TRUE or FALSE, respectively. The reliableResourcePointer attribute of the protecting V5 protection unit shall be changed to the appropriate C-channel ID, whilst the reliableResourcePointer attribute of the protected V5 protection unit shall be changed to NULL. In parallel, the reciprocal relationship between the affected commChannel object instance and v5TimeSlot object instance shall be modified accordingly.
The successful or failed protection switch will be reported to the OS by using v5ProtectionSwitchReporting Notification.";;
MODE CONFIRMED;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.V5ProtectionSwitchInfo;
REGISTERED AS {action 12};

6.6.13 Check link ID

checkLinkId ACTION
BEHAVIOUR
checkLinkIdBehaviour BEHAVIOUR
DEFINED AS "This action is used for triggering the V5 link identification check procedure on the 2048 kbit/s link the action is addressed to. The checkLinkIdResult notification will indicate whether the result of the procedure was positive or negative or that the check was rejected from the other side of the V5 interface.";;
MODE CONFIRMED;
REGISTERED AS {action 13};

6.6.14 Restart

restart ACTION
BEHAVIOUR
restartBehaviour BEHAVIOUR
DEFINED AS "This action is used for initiating the restart procedure as specified in Annex C/G.964, which will be performed automatically by the NE. The result of the restart procedure will be reported to the OS in the restartResult notification.";;
MODE CONFIRMED;
REGISTERED AS {action 14};

6.6.15 System startup

systemStartup ACTION
BEHAVIOUR
systemStartupBehaviour BEHAVIOUR
DEFINED AS "This action is used for initiating the system startup procedure as specified in Annex C/G.964, which will be performed automatically by the NE. The successful or failed completion of the procedure will be reported to the OS in the systemStartupResult notification.";;
MODE CONFIRMED;
REGISTERED AS {action 15};

6.7 Definition of notifications

6.7.1 Switch over request

switchOverRequest NOTIFICATION
BEHAVIOUR
switchOverRequestBehaviour BEHAVIOUR
DEFINED AS "This notification indicates that a V5 control protocol message 'switch-over to new variant' has been received from the remote NE. The information syntax contains the new variant.";;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.ProvVariant;
REGISTERED AS {notification 1};

6.7.2 AN blocking started

anBlockingStarted NOTIFICATION
BEHAVIOUR
anBlockingStartedBehaviour BEHAVIOUR
DEFINED AS "This notification indicates that the V5 control protocol message 'Blocking Started' has been received in the AN as a first positive response to a previous switch over request.";;
REGISTERED AS {notification 2};

6.7.3 Verify request

verifyRequest NOTIFICATION
BEHAVIOUR
verifyRequestBehaviour BEHAVIOUR
DEFINED AS "This notification indicates that the V5 control protocol message ’Verify re-provisioning’ has been received in the NE to verify whether a switch over has been prepared at both sides of the V5 interface.";;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.ProvVariant;
REGISTERED AS {notification 3};

6.7.4 V5 protection switch reporting

v5ProtectionSwitchReporting NOTIFICATION
BEHAVIOUR
v5ProtectionSwitchReportingBehaviour BEHAVIOUR
DEFINED AS "This notification shall be emitted in case of any successful or failed protection switching attempt (automatic, manual or forced) at both the requesting and responding sides. It indicates the origin of the protection switch and which V5 protection units have changed or tried to be changed from standby to active and vice versa.";;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.V5ProtectionSwitchReportingInfo;
REGISTERED AS {notification 4};

6.7.5 Shutdown rejected

shutdownRejected NOTIFICATION
BEHAVIOUR
shutdownRejectedBehaviour BEHAVIOUR
DEFINED AS "This notification indicates that shutting down of a link was rejected.";;
REGISTERED AS {notification 5};

6.7.6 AN fault reported

anFaultReported NOTIFICATION
BEHAVIOUR
anFaultReportedBehaviour BEHAVIOUR
DEFINED AS "This notification indicates that the LE has received a V5 BCC protocol message ’AN Fault’ for the associated user port.";;
REGISTERED AS {notification 6};

6.7.7 Verify remote provisioning variant result

verifyRemoteProvVariantResult NOTIFICATION
BEHAVIOUR
verifyRemoteProvVariantResultBehaviour BEHAVIOUR
DEFINED AS "This notification indicates that the V5 control protocol message ’Ready for re-provisioning’ or ’Not ready for re-provisioning’ has been received from the remote NE as a response to a previous verify re-provisioning request.";;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.VerifyRemoteProvVariantResult;
REGISTERED AS {notification 7};

6.7.8 Switch over to new variant result

switchOverToNewVariantResult NOTIFICATION
BEHAVIOUR
switchOverToNewVariantResultBehaviour BEHAVIOUR
DEFINED AS "This notification indicates that the V5 control protocol message ’Re-provisioning started’ or ’Cannot re-provision’ has been received from the remote NE as a response to a previous switch over request.";;

WITH INFORMATION SYNTAX ASN1CMLETypeModule.SwitchOverToNewVariantResult;
REGISTERED AS {notification 8};

6.7.9 Request remote provisioning variant result

requestRemoteProvVariantResult NOTIFICATION
BEHAVIOUR
requestRemoteProvVariantResultBehaviour BEHAVIOUR
DEFINED AS "This notification indicates that the V5 control protocol message 'Provisioning variant and interface ID' has been received from the remote NE as a response to a previous remote provisioning variant request.";;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.RequestRemoteProvVariantResult;
REGISTERED AS {notification 9};

6.7.10 Check link ID result

checkLinkIdResult NOTIFICATION
BEHAVIOUR
checkLinkIdResultBehaviour BEHAVIOUR
DEFINED AS "This notification indicates that the V5 link identification procedure was performed by the NE as a consequence of a previous checkLinkId action. In case of a negative result, i.e. inconsistent link identities on the two sides of the V5 interface, this shall be regarded as a disabling reason according to Annex B and the operational state of the v5Ttp object instance affected shall be set to disabled.";;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.LinkIdCheckResult;
REGISTERED AS {notification 10};

6.7.11 Restart result

restartResult NOTIFICATION
BEHAVIOUR
restartResultBehaviour BEHAVIOUR
DEFINED AS "The successful or failed completion of the restart procedure shall be reported to the OS in the notification.";;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.Success;
REGISTERED AS {notification 11};

6.7.12 System startup result

systemStartupResult NOTIFICATION
BEHAVIOUR
systemStartupResultBehaviour BEHAVIOUR
DEFINED AS "The successful or failed completion of the system startup procedure shall be reported to the OS in the notification.";;
WITH INFORMATION SYNTAX ASN1CMLETypeModule.Success;
REGISTERED AS {notification 12};

6.8 ASN.1 defined types module

ASN1CMLETypeModule {itu-t(0) recommendation(0) q(17) ca(824) dot(127) v5interface(5) informationModel(0) asn1Module(2) cAV5LEModule(0)}

DEFINITIONS IMPLICIT TAGS ::= BEGIN
-- EXPORTS everything
IMPORTS
-- Recommendation M.3100
Failed,
NameType,
PointerOrNull,
UserLabel

```
        FROM ASN1DefinedTypesModule {ccitt recommendation m gnm(3100)
                informationModel(0) asn1Modules(2) asn1DefinedTypesModule(0)}
        -- Recommendation X.711
        AttributeId,
        ObjectClass,
        ObjectInstance
        FROM CMIP-1 {joint-iso-ccitt ms(9) cmip(1) modules(0) protocol(3)};
informationModel        OBJECT IDENTIFIER ::= {itu-t(0) recommendation(0) q(17) ca(824) dot(127)
v5interface(5) informationModel(0)}
standardSpecificExtension       OBJECT IDENTIFIER ::= {informationModel standardSpecificExtension(0)}
managedObjectClass              OBJECT IDENTIFIER ::= {informationModel managedObjectClass(3)}
package                         OBJECT IDENTIFIER ::= {informationModel package(4)}
nameBinding                     OBJECT IDENTIFIER ::= {informationModel nameBinding(6)}
attribute                       OBJECT IDENTIFIER ::= {informationModel attribute(7)}
action                          OBJECT IDENTIFIER ::= {informationModel action(9)}
notification                    OBJECT IDENTIFIER ::= {informationModel notification(10)}
initialPointer          Pointer  ::= null : NULL
initialPointerS         SET OF Pointer  ::= {}

ActingRole  ::= ENUMERATED {
        balanced        (0),
        master          (1),
        slave           (2),
        ...}
AssocInstances  ::= SET OF ObjectInstance

BcReserved  ::= SET OF OCTET STRING (SIZE(2))

BlockStatus  ::= ENUMERATED {
        none            (0),
        local           (1),
        remote          (2),
        both            (3),
        ...}

DataType  ::= ENUMERATED {
        dsType          (0),
        pType           (1),
        fType           (2),
        ...}

D-ChannelActivation  ::= ENUMERATED {
        deact           (0),    -- link deactivated
        act1            (1),    -- layer 1 maintained
        act2            (2),    -- layer 1 and 2 maintained
        ...}

EnvelopeFunctionAddress  ::= INTEGER (0 .. 8191)

Layer3PortAddress  ::= INTEGER (0 .. 65535)

LinkId  ::= OCTET STRING (SIZE(1))

LineSignalling  ::= INTEGER {
        dtmf   (0), -- push button
        pulse  (1), -- rotary
        both   (2)}
```

```
LinkIdCheckResult  ::= ENUMERATED {
        linkIdOk                (0),
        linkIdNotOk             (1),
        linkIdRejected          (2),
        ...}

NoOf  ::= INTEGER

ObjectPointer  ::= SEQUENCE {
        objectClass         [0] ObjectClass,
        objectInstance      [1] ObjectInstance}

Origin  ::= ENUMERATED {
        localResource           (0),
        remoteResource          (1),
        manual                  (2),
        ...}

OriginalPointer  ::= Pointer

OriginalPointerInfo  ::= SEQUENCE {
        originalPointer1    OriginalPointer,
        originalPointer2    OriginalPointer}

Pointer  ::= CHOICE {
        objectInstance          [0] ObjectInstance,
        null                    [1] NULL}

ProtocolVersion  ::= ENUMERATED {
        v5.1        (1),
        v5.2        (2),
        ...}

ProvVariant  ::= BIT STRING (SIZE(7))

ReciprocalPointersInfo  ::= SEQUENCE {
        objectClass1            ObjectClass,
        objectInstance1         ObjectInstance,
        attribute1              AttributeId,
        objectClass2            ObjectClass,
        objectInstance2         ObjectInstance,
        attribute2              AttributeId}

RejectedProvVariant  ::= SEQUENCE {
        provVariant             [0] ProvVariant,
        rejectionCause          [1] RejectionCause}

RejectionCause  ::= ENUMERATED {
        variantUnknown          (0),
        variantKnownNotReady    (1),
        reprovisioningInProgress (2),
        ...}

ReleaseReciprocalPointersResult  ::= SEQUENCE {
        originalPointerInfo     OriginalPointerInfo,
        CHOICE {
            failed      [0] Failed,
            released    [1] NULL}}
```

```
RequestRemoteProvVariantResult  ::= SEQUENCE {
        remoteProvVariant       [1] ProvVariant,
        remoteInterfaceId       [2] OCTET STRING (SIZE(3))}

SetReciprocalPointersResult  ::= SEQUENCE{
        originalPointerInfo     OriginalPointerInfo,
        CHOICE {
                failed          [0] Failed,
                set             [1] NULL}}

SwitchOverToNewVariantResult  ::= CHOICE {
        reprovisioningStarted   [0] ProvVariant,
        cannotReprovision       [1] RejectedProvVariant}

Success  ::= ENUMERATED {
        successful              (0),
        unsuccessful            (1),
        ...}

SwitchType  ::= ENUMERATED {
        manual          (0),
        forced          (1),
        automatic       (2),
        ...}

VerifyRemoteProvVariantInfo  ::= ProvVariant

VerifyRemoteProvVariantResult  ::= CHOICE {
        readyForReprovisioning          [0] ProvVariant,
        notReadyForReprovisioning       [1] RejectedProvVariant}

V5ChannelType  ::= ENUMERATED {
        bearerChannel   (0),
        commChannel     (1),
        ...}

V5Identification  ::= OCTET STRING (SIZE(3))

V5ProtectionFailedSwitchInfo  ::= ENUMERATED{
        noStandByCChannelsAvailable             (0),
        targetCChannelNotOperational            (1),
        targetCChannelNotProvisioned            (2),
        protectionSwitchImpossible              (3),
        protectionGroupMismatch                 (4),
        requestedAllocationExisting             (5),
        targetCChannelActive                    (6),
        ...}

V5ProtectionGroupNumber  ::= ENUMERATED {
        group1          (0),
        group2          (1),
        ...}

V5ProtectionGroupType  ::= ENUMERATED {
        plus            (0),
        colon           (1),
        ...}

V5ProtectionNoSwitchInfo  ::= SEQUENCE{
        failedSwitchInfo        [0] V5ProtectionFailedSwitchInfo,
        v5ProtectionSwitchInfo  [1] V5ProtectionSwitchInfo}
```

```
V5ProtectionSwitchInfo  ::= SEQUENCE {
        origin          Origin,
        switchType      SwitchType,
        switchFrom      ObjectInstance,
        switchTo                ObjectInstance}

V5ProtectionSwitchReportingInfo  ::= CHOICE{
        switched        [0] V5ProtectionSwitchInfo,
        failed          [1] V5ProtectionNoSwitchInfo}

V5UserPortAddress  ::= CHOICE {
        single          [0] Layer3PortAddress,
        multiple        [1] EnvelopeFunctionAddress}
YesNo  ::= BOOLEAN
END -- of ASN1CMLETypeModule


ASN1CMANTypeModule {itu-t(0) recommendation(0) q(17) ca(824) dot(127) v5interface(5) informationModel(0)
asn1Module(2) cAV5ANModule(1)}

DEFINITIONS IMPLICIT TAGS ::= BEGIN
        -- EXPORTS everything
        IMPORTS
        -- Recommendation X.711
        ObjectInstance
        FROM CMIP-1 {joint-iso-ccitt ms(9) cmip(1) modules(0) protocol(3)};
informationModel                OBJECT IDENTIFIER ::= {itu-t(0) recommendation(0) q(17) ca(824) dot(127)
v5interface(5) informationModel(0)}
standardSpecificExtension       OBJECT IDENTIFIER ::= {informationModel standardSpecificExtension(0)}
managedObjectClass              OBJECT IDENTIFIER ::= {informationModel managedObjectClass(3)}
package                         OBJECT IDENTIFIER ::= {informationModel package(4)}
nameBinding                     OBJECT IDENTIFIER ::= {informationModel nameBinding(6)}
attribute                       OBJECT IDENTIFIER ::= {informationModel attribute (7)}
action                          OBJECT IDENTIFIER ::= {informationModel action(9)}
notification                    OBJECT IDENTIFIER ::= {informationModel notification(10)}

defaultSpecialFeatures  SpecialFeatures ::= {}

AccessDigitalSection  ::= BOOLEAN

BearerChannelType  ::= ENUMERATED {
        non-PL-channel      (0),
        pL-channel          (1),
        ...}

GradingEnabled  ::= BOOLEAN

Pointer  ::= ObjectInstance

SpecialFeature  ::= ENUMERATED {
        directDiallingIn                (0),
        publicTelephone                 (1),
        privateMeter                    (2),
        specialLoopResistance           (3),
        securityLine                    (4),
        other                           (5),
        ...}

SpecialFeatures  ::= SET OF SpecialFeature
END -- of ASN1CMANTypeModule
```

7 Protocol requirements

Protocol suites are specified in Recommendations Q.811, Q.812, G.773 and the SDH DCC part of Recommendation G.784. No special requirements are identified.

In addition, it will be possible to use 64 kbit/s bearer channels and p-type and f-type data channels on a V5 interface. These will act as user ports (see Recommendation G.964) and the initial port addresses cannot be configurable over the Q3 interface of the AN. Layer 1 and the envelope part of layer 2 of the V5 interface will be used for the lower layers of the protocol stack, but the higher layers will be the same as the stacks already specified in this clause. The initial configuration of a V5 interface to enable the use of 64 kbit/s bearer channels and p-type and f-type data channels may be through predefinition of a default configuration or using a local craft interface.

ANNEX A

Mapping of link control states on X.731 states

Tables A.1 and A.2 specify detailed state machines for the link state mapping at the local exchange (see Table A.1) and access network (see Table A.2) side. They include substates of "disabled" to indicate the disabling reason.

V5 system management is responsible for sequencing of simultaneous Link Id requests. This is the case when AN or LE unblocks a link (see e.g. Table II.5), and when two links are to be checked at the same time. Figure A.1 indicates that by a separate system management procedure.

The primitives MDU-AI, MDU-IDReq, MDU-IDACK, MDU-IDRej, MDU-IDRel, MDU-EIg are related to this procedure. Reactions of the link control FSM on MDU-IDReq are also directed to it.

If the link id check is rejected (lid-rej), it can only be invoked again by the OS command sequence Lock, Unlock.

After link control FSM enters the operational state (AN2.0, LE2.0) from one of the blocked states, the link Id must be checked at both sides, before the link is fully operational, i.e. Enabled. For this purpose, system management is triggered by Link Id request (lid-req). System management is responsible for sequencing of simultaneous Link Id requests to avoid rejection whenever possible. Unblocking a link always leads to a simultaneous checking of a link by AN and LE, which requires sequencing to avoid the termination of the unblocking procedure at one side.

A shutdown request (sdReq) is handled by LE system management. It gracefully takes communications and switched services out of service. Shutdown from the OS of the AN uses deferred blocking (MDU-LBR). The request can either be rejected (sdRej) or successfully completed (sdComp). LE system management will reject a shutdown request if the required protection of the logical C-channels is not possible. It will generate an unblock request (FE301, resulting in MDU-LUBI at the AN) if the shutdown request came from the AN (MDU-LBR, FE305). The OS of the AN shall then be notified by ShutdownRej to change the administrative state from Shuttingdown back to Unlocked. If the shutdown request came from the OS at the LE, the ShutdownRej notification is sent to it. The OS which initiated the shutdown procedure can interrupt it by sending an Unlock command, resulting in sdCan (shutdown cancel) to the LE system management.

Non-deferred blocking (MDU-LBRN) immediately releasing switched connections is not used by the AN. Lock means immediate (forced) blocking of the link (MDU-LBI), with all its consequences to services provided by this link.

Disabling reasons

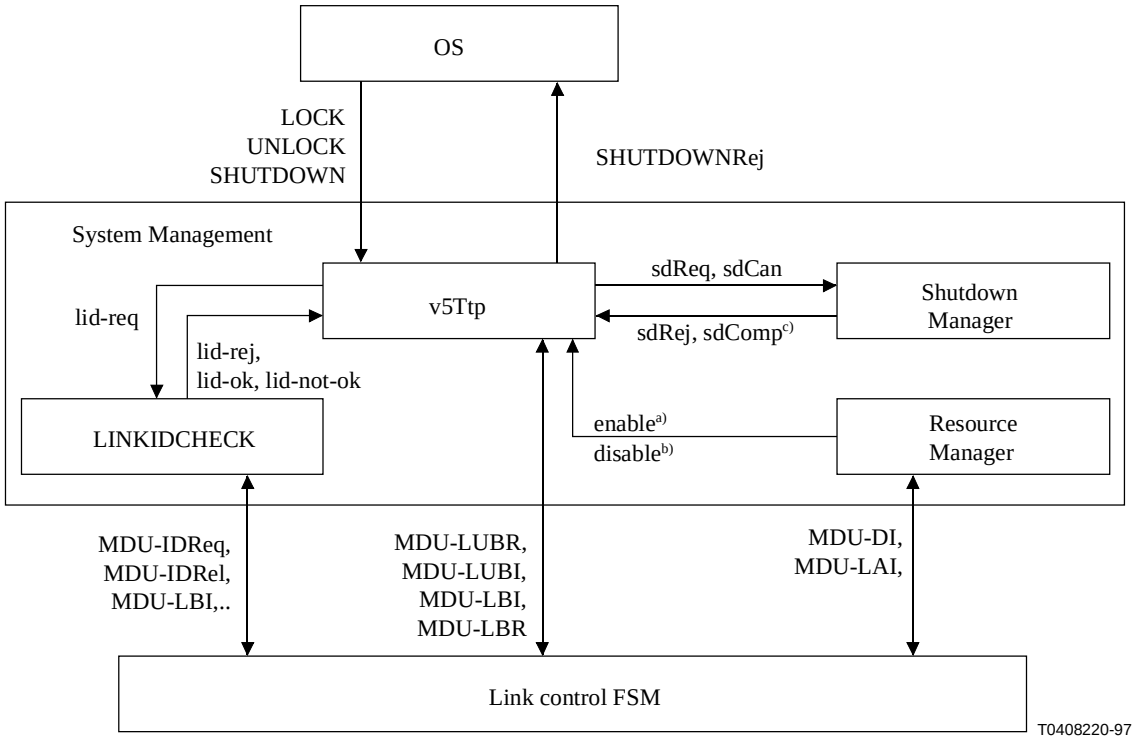
None: intermediate state with no fault or blocking reason. It is reached during the unblock procedure.

Local: occurrence of a layer 1 failure (MPH-DI) or any other local reason, as e.g. due to dependencies.

Remote: remote reason for blocking the link due to failure or management decision (MDU-LBI).

Sources of messages

- Lock, Unlock, Shutdown are generated by the OS.
- lid-req, lid-rej, lid-ok, lid-not-ok are generated by system management at AN and LE side.
- MDU-LUBR, MDU-LUBI, MDU-LBI, etc. are generated by the link control FSM.
- sdReq and sdCan are sent to system management, e.g. a shutdown manager.
- ShutdownRej is sent from the v5Ttp object to the OS.
- sdRej and sdComp are generated by LE system management, i.e. e.g. its shutdown manager.
- "Occurrence of internal disabling reasons", "Disappearance of internal disabling reasons" are generated by system management.



a) enable: disappearance of internal disabling reasons.
b) disable: occurrence of internal disabling reasons.
c) sdRej and sdComp only at LE side.

NOTE – This figure is for information only. The internal communication between Shutdown Manager, Resource Manager and Linkidcheck procedure is not shown.

Figure A.1/Q.824.5 – General relationship between the v5Ttp object class and system management

A.1 State mapping tables for the local exchange side

Table A.1/Q.824.5 – Link control state mapping for the local exchange side

State	state 1 locked disabled			state 2 locked enabled	state 3 shutting down
	1.1	1.2	1.3	2.0	3.0
Event	LBS: local	LBS: remote	LBS: both		
Lock	--	--	--	--	MDU-LBI;2.0
Unlock	MDU-LUBR;4.1	MDU-LUBR;4.2	MDU-LUBR;4.3	MDU-LUBR;4.0	sdCan;5.0
Shutdown	/	/	/	/	--
disable[a)]	--	--;1.3	--	--;1.1	--;1.1
enable[b)]	--;2.0	/	--;1.2	/	/
MDU-LUBR	--	--;2.0	--;1.1	--	/
MDU-LUBI	/	/	/	/	--
MDU-LBI	--	--	--	--	--;2.0
MDU-LBR	/	/	/	/	/
sdRej	/	/	/	/	ShutdownRej;--
sdComp	/	/	/	/	MDU-LBI;2.0
lid-rej	--	--	--	--	--
lid-ok	--	--	--	--	--
lid-not-ok	--	--	--	--	--

State	state 4 unlocked disabled				state 5 unlocked enabled
	4.0	4.1	4.2	4.3	5.0
Event	LBS: none	LBS: local	LBS: remote	LBS: both	
Lock	MDU-LBI;2.0	MDU-LBI;1.1	MDU-LBI;1.2	MDU-LBI;1.3	MDU-LBI;2.0
Unlock	--	--	--	--	--
Shutdown	MDU-LBI;2.0	MDU-LBI;1.1	MDU-LBI;1.2	MDU-LBI;1.3	sdReq;3.0
disable[a)]	--;4.1	--	--;4.3	--	--;4.1
enable[b)]	/	MDU-LUBR;4.0	/	MDU-LUBR;4.2	/
MDU-LUBR	MDU-LUBR;--	--	MDU-LUBR;4.0	/	/
MDU-LUBI	lid-req;--	/	lid-req;4.0	/	sdCan;--
MDU-LBI	--;4.2	--;4.3	--	--	--;4.2
MDU-LBR	/	/	/	/	sdReq;--
sdRej	/	/	/	/	MDU-LUBR;--
sdComp	/	/	/	/	MDU-LBI;4.2
lid-rej	--	--	--	--	--
lid-ok	--;5.0	--	--	--	--
lid-not-ok	--;4.1	--	--	--	--

/ Unexpected event

-- No action

LBS Link Block Status

a) disable: occurence of internal disabling reasons.

b) enable: disappearance of internal disabling reasons.

A.2 State mapping tables for the access network side

Table A.2/Q.824.5 – Link control state mapping for the access network side

State	state 1 locked disabled			state 2 locked enabled	state 3 shutting down
Event	1.1 LBS: local	1.2 LBS: remote	1.3 LBS: both	2.0	3.0
Lock	--	--	--	--	MDU-LBI;2.0
Unlock	MDU-LUBR;4.1	MDU-LUBR;4.2	MDU-LUBR;4.3	MDU-LUBR;4.0	MDU-LUBR;5.0
Shutdown	/	/	/	/	--
disable[a)]	--	--;1.3	--	--;1.1	--;1.1
enable[b)]	--;2.0	/	--;1.2	/	/
MDU-LUBR	--	--;2.0	--;1.1	--	/
MDU-LUBI	/	/	/	/	ShutdownRej;--
MDU-LBI	--	--	--	--	--;2.0
lid-rej	--	--	--	--	--
lid-ok	--	--	--	--	--
lid-not-ok	--	--	--	--	--

State	state 4 unlocked disabled				state 5 unlocked enabled
Event	4.0 LBS: none	4.1 LBS: local	4.2 LBS: remote	4.3 LBS: both	5.0
Lock	MDU-LBI; 2.0	MDU-LBI;1.1	MDU-LBI;1.2	MDU-LBI;1.3	MDU-LBI;2.0
Unlock	--	--	--	--	--
Shutdown	MDU-LBI;2.0	MDU-LBI;1.1	MDU-LBI;1.2	MDU-LBI;1.3	MDU-LBR;3.0
disable[a)]	--;4.1	--	--;4.3	--	--;4.1
enable[b)]	/	MDU-LUBR;4.0	/	MDU-LUBR;4.2	/
MDU-LUBR	MDU-LUBR;--	--	MDU-LUBR;4.0	/	/
MDU-LUBI	lid-req;--	/	lid-req;4.0	/	--
MDU-LBI	--;4.2	--;4.3	--	--	--;4.2
lid-rej	--	--	--	--	--
lid-ok	--;5.0	--	--	--	--
lid-not-ok	--;4.1	--	--	--	--

/ Unexpected event

-- No action

LBS Link Block status

a) disable: occurence of internal disabling reasons.

b) enable: disappearance of internal disabling reasons.

ANNEX B

Mapping of management primitives for user port FSM

The mapping of management primitives for user port FSM onto state transitions for virtualAccessPortAnalogue, virtualAccessPortBasicRate, and virtualAccessPortPrimaryRate is given in Table B.1.

Table B.1/Q.824.5 – Mapping of management primitives for user port FSM

Event	Operational state	
	enabled	**disabled**
MPH-BI	disabled	--
MPH-BR	Ask resource manager to change to disabled as soon as the access becomes idle	/
MPH-UBR	/	Ask resource manager whether change to enabled is allowed
MPH-UBI	--	enabled
Resource manager sets operational state to disabled	MPH-BI; disabled	MPH-BI
Resource manager sets operational state to enabled	--	MPH-UBR
Resource manager rejects to set operational state to enabled	/	MPH-BI
Resource manager confirms to set operational state to enabled	/	MPH-UBR
/ Unexpected event -- No action		

ANNEX C

Mapping of V5 user port states on X.731 states

This Annex defines the mapping of PSTN user ports, ISDN Basic access user ports and ISDN Primary rate user ports on X.731 states, including the case of permanent line capability.

C.1 Mapping of V5 PSTN user port states on X.731 state

The following state transition table (Table C.1) shows the mapping of the V5 PSTN user port states on X.731 operational and administrative state. The locked/enabled state means that the port has been locked by the Q3 interface of the AN and that there are no local fault conditions. In the "locked" state the operational state attribute only reflects AN internal failures, i.e. "enabled" means no AN fault and "disabled" means AN fault regardless of any knowledge about the LE side. However, in the "unlocked" state the operational state attribute is changed from "enabled" to "disabled" due to AN fault or blocking by the LE. There the information about the presence of a local or access disabling reason needs to be available. A "local reason" entry is made when a "port-not-ok" message is received and removed when a "port-ok" message arrives. A "remote reason" entry is made when a "MPH-BI" is received and removed when a "MPH-UBR" arrives.

State 4 is also entered as part of the unblocking procedure if the OS sent "UNLOCK" to the port object and an acknowledgment from the LE needs to be awaited.

Disabling reasons

Local: Port-not-ok: occurence/presence of internal disabling reasons.

Remote: MPH-BI: LE reason for blocking the port due to failure or management decision.

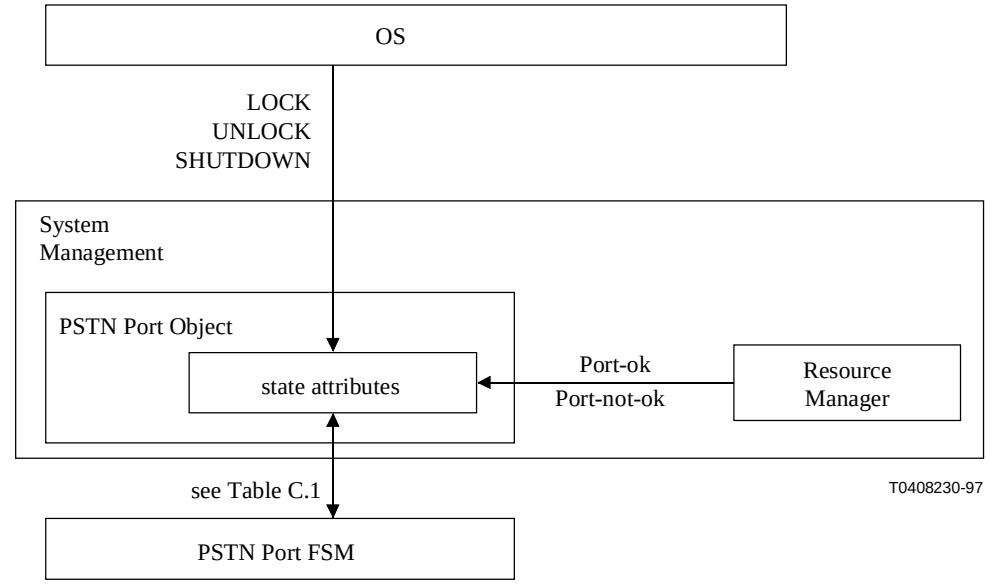
Enabling reasons

Local: Port-ok: disappearance/not existence of internal disabling reasons.

Remote: MPH-UBR: disappearance of an LE reason for blocking the port.

Sources of messages

Lock, Unlock, Shutdown are generated by the OS. MPH-BI, MPH-UBR, MPH-UBI are generated by the user port FSM. Port-ok, Port-not-ok are generated by an internal management entity, e.g. a resource manager, see Figure C.1.



NOTE – This figure is for information only.

Figure C.1/Q.824.5 – General relationship between the PSTN port object and system management

Table C.1/Q.824.5 – State table for PSTN port object state attributes

	state 1 locked disabled	**state 2 locked enabled**	**state 3 shutting down**	**state 4 unlocked disabled**	**state 5 unlocked enabled**
Lock	--	--	MPH-BI;2	no local reason: MPH-BI;2 else: MPH-BI;1	MPH-BI;2
Unlock	--;4	MPH-UBR;4	MPH-UBR;5	--	--
Shutdown	/	/	--	no local reason: MPH-BI;2 else: MPH-BI;1	MPH-BI;3
MPH-BI	--	--	--;2	--	--;4
MPH-UBR	--	--	MPH-BR;--	no local reason: MPH-UBR; -- else: --;1	/
MPH-UBI	/	/	--	--;5	--
Port-ok	--;2	/	/	MPH-UBR;--	/
Port-not-ok	/	--;1	MPH-BI;1	MPH-BI;	MPH-BI;4
/ Unexpected event -- No action					

C.2 Mapping of V5 ISDN Basic access user port states on X.731 state

The following state transition table (Table C.2) shows the mapping of the V5 ISDN basic access user port states on X.731 operational and administrative state.

It covers both the use of the port for on-demand service and (partial or full) permanent line service. In the state table two variables are used for determining the transition in case of Permanent Line (PL) service. PLp is TRUE if the port is used for PL service. PLa is TRUE if the port FSM is in one of the AN3.x PL activation states.

In the "locked" state the operational state attribute reflects only AN internal failures, i.e. "enabled" means no AN fault and "disabled" means AN fault regardless of any knowledge about the LE side.

However, in the "unlocked" state the operational state attribute is changed from "enabled" to "disabled" due to AN fault or blocking by the LE. There the information about the presence of a local or remote disabling reason needs to be available. A "local reason" entry is made when an internal disabling reason occurs and is removed when there is no internal reason for being disabled. A "remote reason" entry is made when MPH-BI is received and removed when MPH-UBR arrives. This information can be stored in the blockingStatus attribute of the port object. State 4 is also entered as part of the unblocking and activation procedure if the OS sends UNLOCK to the port object and an acknowledgment from the LE needs to be awaited.

Assumptions

1) PLa = TRUE means ISDN port FSM is in state AN3.x.

2) PLp = TRUE means at least one B-channel is provisioned as permanent line.

3) An unlocked enabled port provisioned for permanent line service rejects a SHUTDOWN from the OS. LOCK should be used to take this port out of service.

4) In case of a port without PL, the activation and deactivation status of layer 1 does not affect the enabled state. This status can be stored, e.g. in an activation variable, not visible to the OS.

5) If the port object is in state 1 or 2, the ISDN port FSM is in one of AN1.x, or AN4.x, respectively. If the port object is in state 3, the ISDN port FSM is in an AN2.x state. If the port object is in state 4, the ISDN port FSM is in an AN1.x state or in AN3.1. If the port object is in state 5, the ISDN port FSM is in an AN2.x state, or in AN3.2.

6) If a port is provisioned for PL services, it is assumed to be enabled if layer 1 is activated, independent of the blocking status, which is relevant for on-demand services.

7) The usual way to activate a port provisioned for PL is to send an unblock request (FE202) to the LE, which takes over responsibility for activating layer 1 after unblocking the port. This is reflected in MPH-AR being an unexpected event in state AN1.2 and AN2.0. A timer TPL1 is used to supervise this unblock procedure. If the LE does not respond within an appropriate time the AN becomes responsible for the activation of layer 1 and issues MPH-AR.

8) If a port provisioned for PL services is in the unlocked/enabled state and is blocked by the LE, the AN immediately starts re-activation of layer 1 by issuing MPH-AR and the port becomes enabled again after the successful activation. A short interruption of the PL service can be expected.

9) In case of semi-permanent connections the LE will reject a shutdown request (MPH-BR, FE205) from the AN by sending an unblock request (FE201, MPH-UBI). The OS of the AN shall then be notified to change the administrative state from SHUTTINGDOWN back to UNLOCKED.

10) Partial activation (states AN5.x) is not covered.

Disabling reasons

Local: occurence/presence of internal disabling reasons, e.g. bit error rate 10^{-3}.

Remote: MPH-BI: LE reason for blocking the port due to failure or management decision.

Enabling reasons

Local: disappearance/not existence of internal disabling reasons, e.g. bit error rate 10^{-3}.

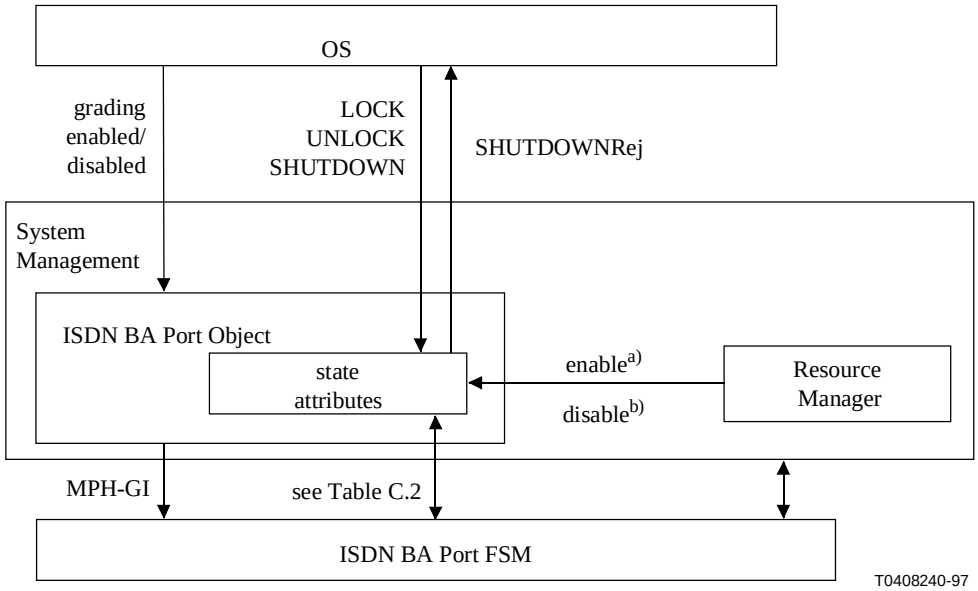
Remote: MPH-UBR: disappearance of an LE reason for blocking the port.

Sources of messages

Lock, Unlock, Shutdown are generated by the OS. MPH-BI, MPH-UBR, MPH-UBI are generated by the user port FSM. Port-ok, Port-not-ok are generated by an internal management entity, e.g. a resource manager, see Figure C.2.

Port maintenance

Loopback tests (states AN4.x) can only be applied while the port is locked by the OS. These tests are not covered by the state mapping table.



a) enable: disappearance of internal disabling reasons.

b) disable: occurrence of internal disabling reasons.

NOTE – This figure is for information only.

Figure C.2/Q.824.5 – Management entities controlling the ISDN basic access port FSM

Table C.2/Q.824.5 – State table for ISDN basic access port object state attributes

	state 1 locked disabled	**state 2 locked enabled**	**state 3 shutting down**	**state 4 unlocked disabled**	**state 5 unlocked enabled**
Lock	--	--	MPH-BI;2	[if PLa: MPH-DR; else MPH-BI, (if TLP1 running: stop TLP1)], if no local reason: --;2 else: --;1	if PLa: MPH-DR;2 else: MPH-BI;2
Unlock	--;4	MPH-UBR, (if PLp: start TLP1) ;4	MPH-UBR;5	--	--
Shutdown	/	/	--	if PLa: / else: (if TLP1 running: stop TLP1), (if no local reason: MPH-BI;2 else: MPH-BI;1)	if PLp: / else: MPH-BR;3
expiry of TLP1	/	/	/	if PLp: MPH-AR,; else: /	/
MPH-BI	--	--	--;2	--	if PLa: / else: (if PLp: MPH-AR);4
MPH-UBR	--	--	/	no local reason: MPH-UBR; else: --	/
MPH-UBI	/	/	ShutdownRej;	no local reason: MPH-UBR; else: --	/
MPH-T1	/	/	--	if PLa: -- else: /	if PLa: -- else: /

Table C.2/Q.824.5 – State table for ISDN basic access port object state attributes *(concluded)*

	state 1 locked disabled	**state 2 locked enabled**	**state 3 shutting down**	**state 4 unlocked disabled**	**state 5 unlocked enabled**
MPH-I1	/	/	--	/	if PLa: / else: --;
MPH-I2	MPH-DR;	MPH-DR;	--	if PLa: / else: MPH-DR;	if PLa: / else: --
MPH-DSAI	MPH-DR;	MPH-DR;	--	if PLa: / else: MPH-DR;	if PLa: / else: --
MPH-AI	MPH-DR;	MPH-DR;	--	if PLa: / else: MPH-DR;	--
MPH-I5	/	/	--	/	if PLa: / else: --
MPH-DI	--	--	--	--	--
MPH-EI7	MPH-DR;	MPH-DR;	--	if PLa: -- else: MPH-DR;	--
MPH-PAI	/	/	/	if PLa: --;5 else: MPH-DR;	if PLa: -- else: /
MPH-EI12	MPH-DR;	MPH-DR;	--	if PLa: / else: MPH-DR;	--
disappearance of internal disabling reasons	--;2	/	/	MPH-UBR (if PLp: start TLP1);	/
occurrence of internal disabling reasons	--	--;1	MPH-BI;1	if PLa: MPH-DR; else: (if TLP1 running: stop TLP1), MPH-BI;	if PLa: MPH-DR;4 else: MPH-BI;4
/ Unexpected event -- No action					

C.3 Mapping of V5 ISDN primary rate access user port states on X.731 state

Assumptions

1) PLa = TRUE means ISDN port FSM is in state AN3.0.

2) PLp = TRUE means at least one B-channel is provisioned as permanent line.

3) An unlocked enabled port provisioned for permanent line service rejects a SHUTDOWN from the OS. LOCK should be used to take this port out of service.

4) If the port object is in state 1 or 2 the ISDN port FSM is in one of AN1.0x, or AN4.x, respectively. If the port object is in state 3 the ISDN port FSM is in AN2.0. If the port object is in state 4 the ISDN port FSM is in one of the AN1.x states. If the port object is in state 5 the ISDN port FSM is in AN2.0, or in AN3.0.

5) If a port provisioned for PL services is in the unlocked/enabled state and is blocked by the LE, the AN immediately starts re-activation of layer 1 by issuing MPH-UBR and MPH-PRA, and the port becomes enabled again after the successful activation. A short interruption of the PL service can be expected.

6) In case of semi-permanent connections the LE will reject a shutdown request (MPH-BR, FE205) from the AN by sending an unblock request (FE201, MPH-UBI). The OS of the AN

shall then be notified to change the administrative state from SHUTTING DOWN back to UNLOCKED.

Disabling reasons

Local: occurence/presence of internal disabling reasons, e.g. bit error rate 10^{-3}.

Remote: MPH-BI: LE reason for blocking the port due to failure or management decision.

Enabling reasons

Local: disappearance/not existence of internal disabling reasons, e.g. bit error rate 10^{-3}.

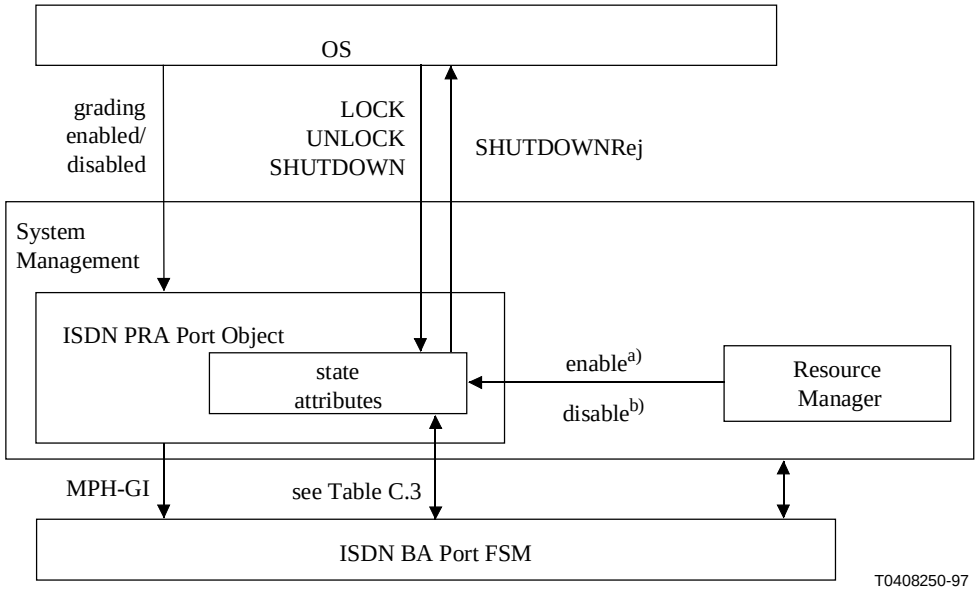
Remote: MPH-UBR: disappearance of an LE reason for blocking the port.

Sources of messages

Lock, Unlock, Shutdown are generated by the OS. MPH-BI, MPH-UBR, MPH-UBI are generated by the user port FSM. Port-ok, Port-not-ok are generated by an internal management entity, e.g. a resource manager, see Figure C.3.

Port maintenance

Loopback tests (states AN4.x) can only be applied while the port is locked by the OS. These tests are not covered by the state mapping table.



a) enable: disappearance of internal disabling reasons.

b) disable: occurrence of internal disabling reasons.

NOTE – This figure is for information only.

Figure C.3/Q.824.5 – Management entities controlling the ISDN PRA port FSM

Table C.3/Q.824.5 – State table for ISDN primary rate access port object state attributes

	state 1 locked disabled	**state 2 locked enabled**	**state 3 shutting down**	**state 4 unlocked disabled**	**state 5 unlocked enabled**
Lock	--	--	MPH-BI;2	MPH-BI, (if TLP1 running: stop TLP1), if no local reason: --;2 else: --;1	MPH-BI;2
Unlock	--;4	MPH-UBR, (if PLp: start TLP1) ;4	MPH-UBR;5	--	--
Shutdown	/	/	--	if PLp: / else: (if TLP1 running: stop TLP1), MPH-BI, (if no local reason: --;2 else: --;1	if PLp: / else: MPH-BR;3
expiry of TLP1	/	/	/	if PLp: MPH-PRA,; else: /	/
MPH-BI	--;	--;	--;2	if (no local reason AND PLp): MPH-UBR, start TLP1; else: --;a	if PLa: -- else: (if PLp: MPH-UBR, start TLP1) 4;a
MPH-UBR	--;	--;	/	no local reason: MPH-UBR, else: --	/
MPH-UBI	/	/	ShutdownRej;	(if TLP1 running: stop TLP1);5	if PLa: -- else: /
MPH-PAI	/	/	/	if PLp: --;5 else: /	if PLa: -- else: /
disappearance of internal disabling reasons	--;2	/	/	MPH-UBR (if PLp: start TLP1);	/
occurrence of internal disabling reasons	/	--;1	MPH-BI;1	(if TLP1 running: stop TLP1), MPH-BI;	MPH-BI;4

/ Unexpected event

-- No action

a MPH-UBR moves the Port into local unblock which is necessary to reach AN3.0 in case of Permanent Lines provisioned. Subsequently MPH-PRA is issued on expiry of timer TLP1.

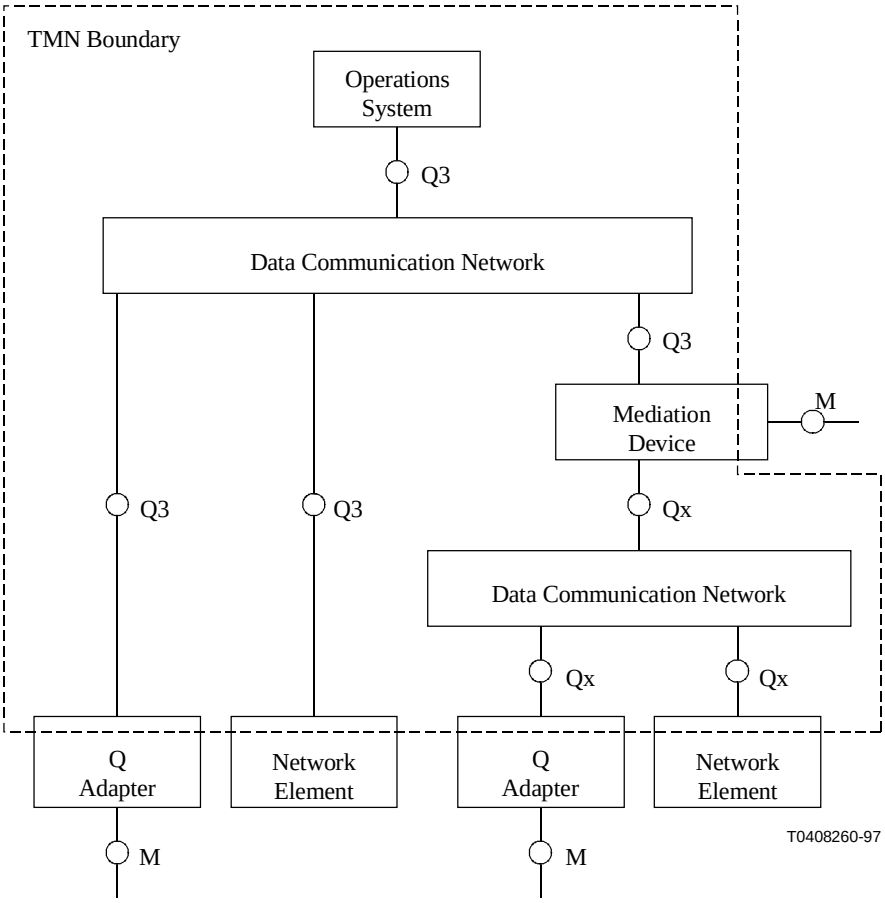
ANNEX D

Location of the Q3 interface

The Q3 interface is the TMN interface between network elements or Q-adapters which interface to operations systems without mediation and between operations systems and mediation devices (see Figure D.1). The use of this standard at these points is mandatory. The specification of Qx interfaces and proprietary interfaces is outside the scope of this Recommendation.

The Q3 interface places no constraint on the integration of the V5 configuration model for the access network with other object models relation to other aspects of the access network and the operation of these models over the same Q3 interface specified here.

The are also no constraints implied concerning the structure of the access network which supports the V5 interface. For example, at one extreme the access network might involve a simple direct connection between customers and exchanges, and at the other extreme it might involve a very large, highly complex transmission and switching network between them.



NOTE 1 – Qx and M (proprietary) interfaces are outside the scope of this Recommendation.

NOTE 2 – A mediation device can only have a M interface if it contains Q-adapter functionality.

Figure D.1/Q.824.5 – Location of the Q3 interface

ANNEX E

Summary of V5 requirement details

This Annex summarises the V5-related items which need to be provisioned over the Q3 interface.

1) Identification of V5 interfaces:
   - The interface ID field is three octets.
   - The link ID field is one octet.
2) Allocation of bearer channels to user ports.

3) Service allocation to bearer channels.

4) The allocation of addresses to ISDN and PSTN ports:

   – The PSTN address field is 15 bits.

   – The ISDN address field is 13 bits with certain addresses reserved for non-ISDN use.

5) The identification of new provisioning variants:

   – The provisioning variant field is one octet.

6) Communication path allocation:

   The V5.1 interface can have up to 3 communication time slots. Time slot 16 is always used. There are constraints on the other two time slots.

7) Activation of ISDN BA for PL service.

8) Activation of error performance monitoring for access digital sections:

   There are 2 grading levels.

9) PSTN line gain.

ANNEX F

Defaults and predefined items

A number of items are predefined, i.e. they need to be specified when equipment is procured, but they cannot be changed via the Q3 interface, and may not be visible over the Q3 interface. Items may also have default values which do not need to be specified via the Q3 interface. Predefined items and their defaults are specified here.

1) Specific PSTN parameters.

2) Autonomous-signalling-sequence.

3) The sequence-response information element.

4) The cadenced-ringing information element.

5) The recognition time of PSTN signals.

6) Signal information elements.

7) PSTN protocol state AN1.

8) Grading thresholds:

   The thresholds for the generation of grading messages related to error performance, including the nature of these thresholds, the algorithm used and any hysteresis included are predefined.

9) Persistency check for V5 layer 1.

10) CRC thresholds for V5 layer 1.

11) PSTN line current.

12) Provisioning variant:

   If the provisioning variant is not supported on the Q3 interface, for instance because of the existence of an integrated OS or of an TMN X interface, then a default value of all 0s will be automatically used on the V5 interface. All V5 interfaces will use this default value unless actively changed via the Q3 interface.

13) Initial configuration:

If the Q3 information is transported over a V5 interface, then an initial configuration needs to be specified to support this. It is possible to use 64 kbit/s bearer channels and p- and f-type data channels on virtual user ports (see Recommendation G.964) of a V5 interface to transport the Q3 information.

Predefinition of the virtual user port on the AN side at least is required.

APPENDIX I

Functional architecture

Figures I.1 to I.4 represent the functional architecture for PSTN and ISDN, respectively.

TTPs and CTPs are used as a basis for defining object classes for modelling. The V5 ports and the user ports are identified as TTPs, with the user ports at a higher level than the V5 ports, i.e. the V5 layer either directly or indirectly serves the user ports. The user port layer is related to the V5 layer by cross connections.

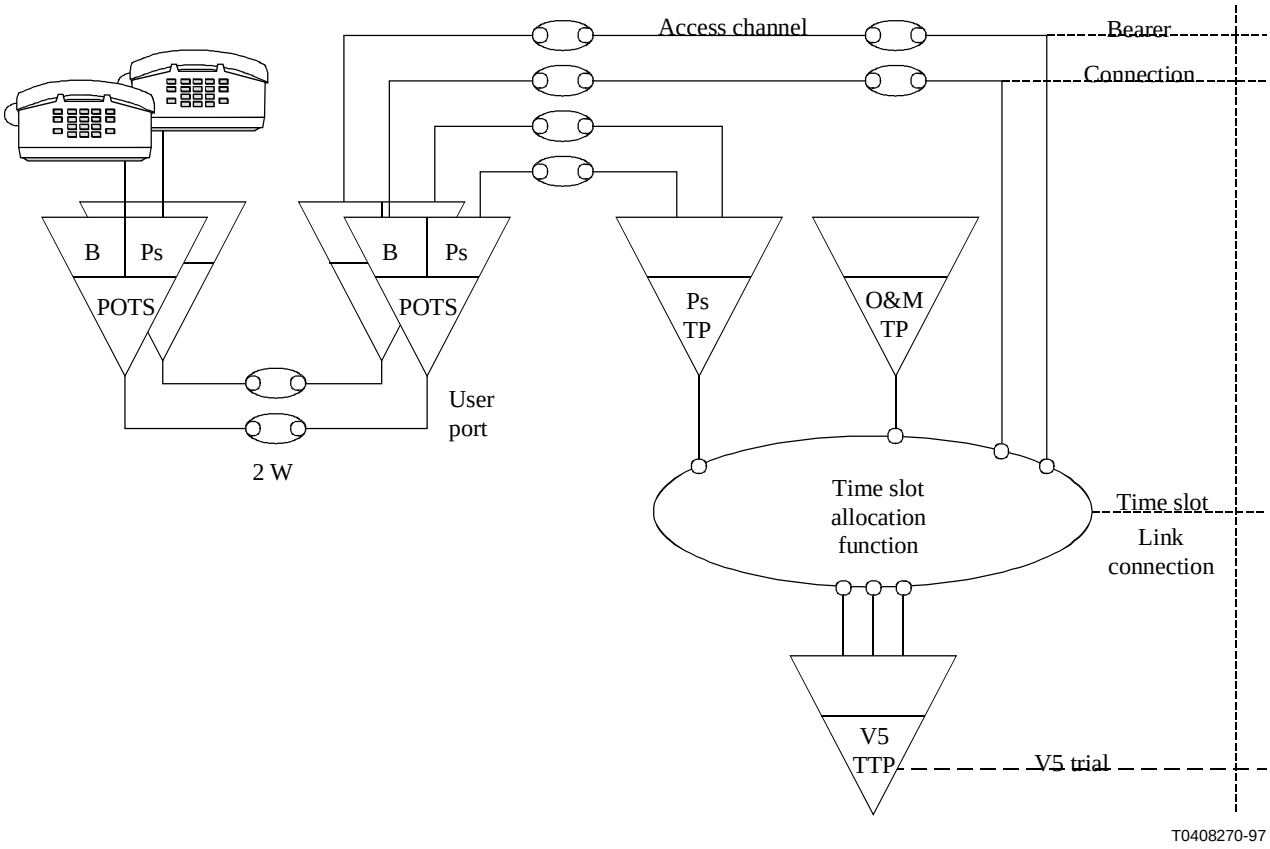


Figure I.1/Q.824.5 – Access network side V5 functional architecture for PSTN

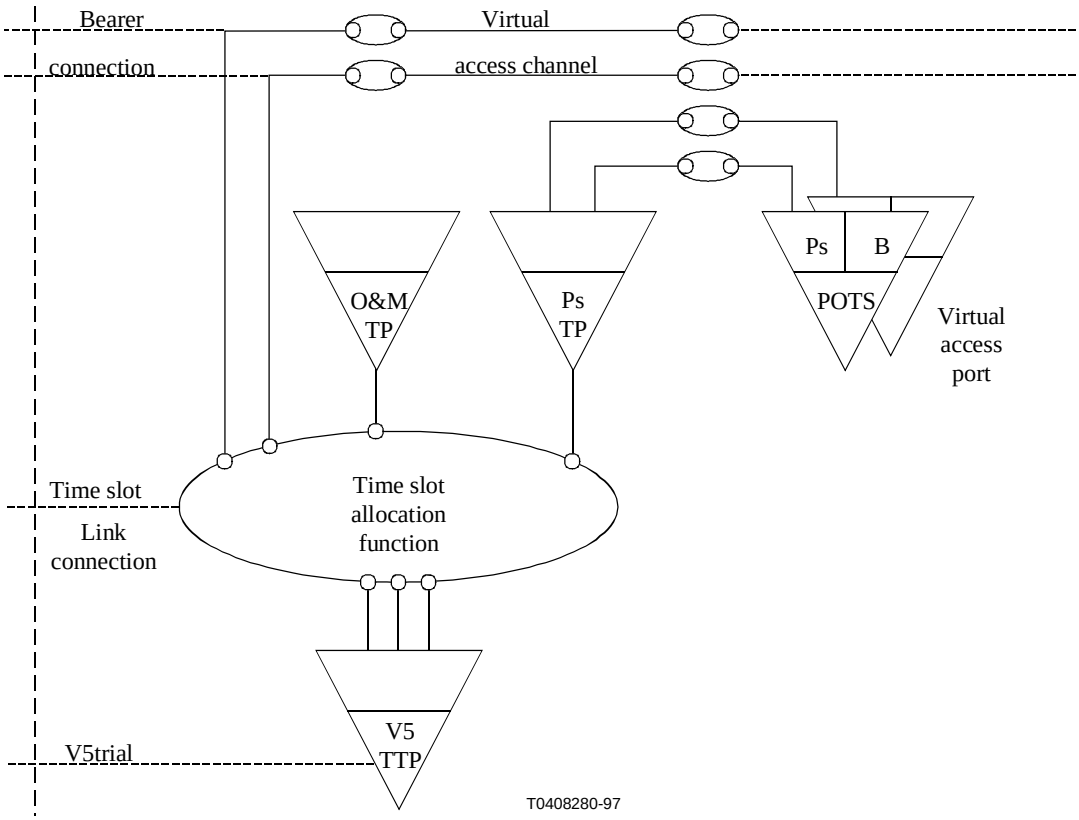


Figure I.2/Q.824.5 – Local exchange side V5 functional architecture for PSTN

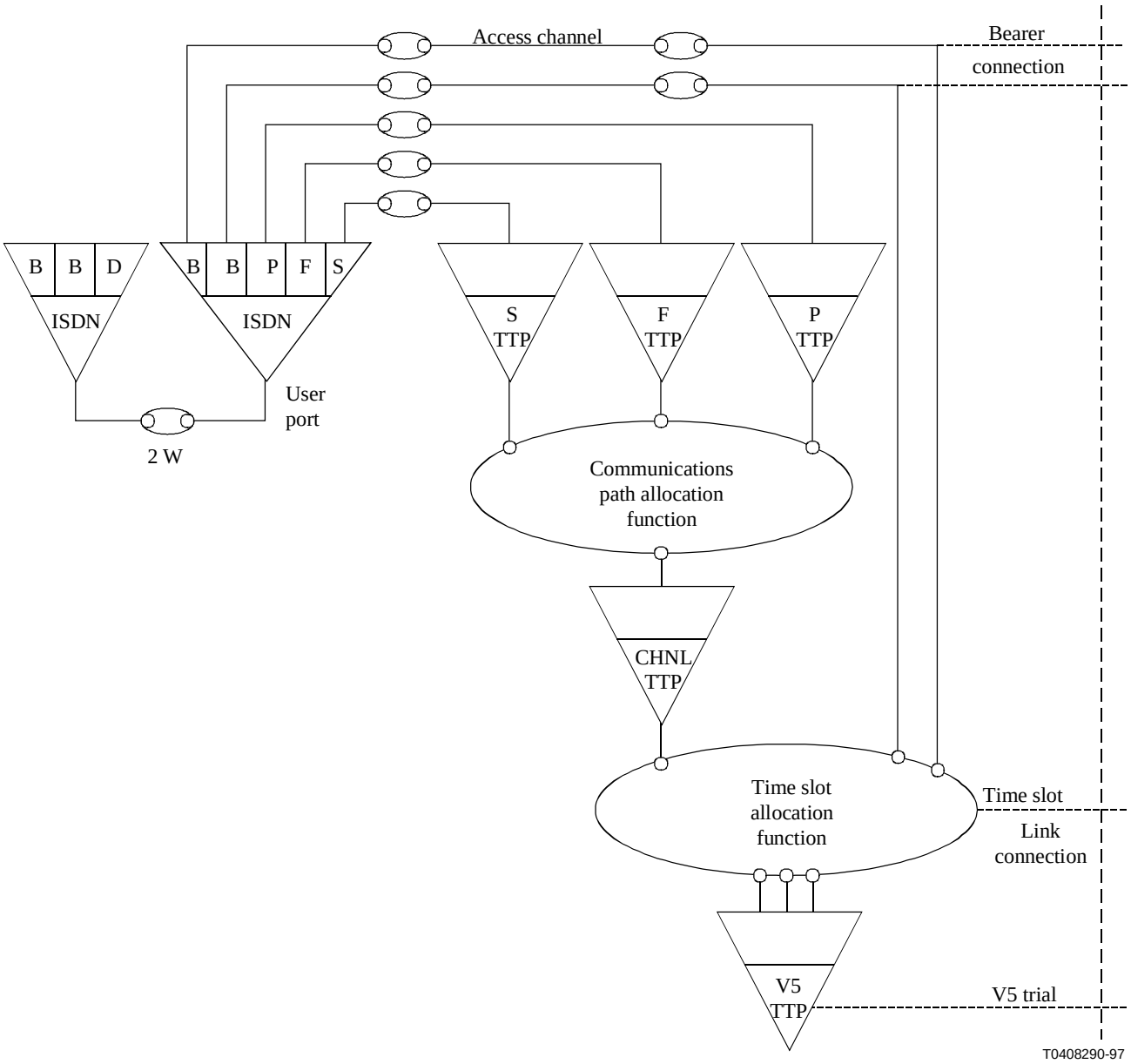


Figure I.3/Q.824.5 – Access network side V5 functional architecture for ISDN

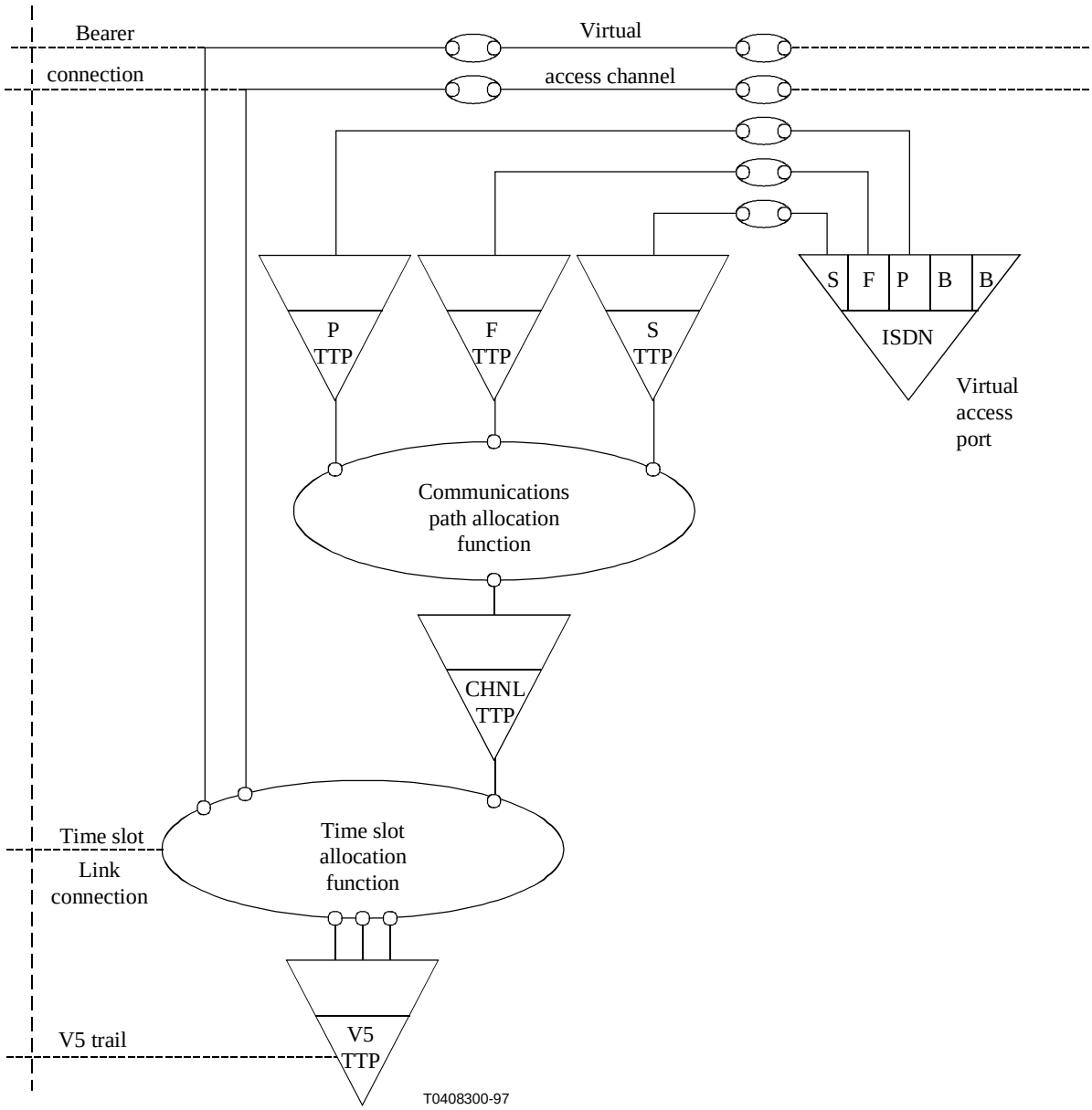


Figure I.4/Q.824.5 – Local exchange side V5 functional architecture for ISDN

APPENDIX II

Link control message flows

A state and a message written in the same line means that this state is entered and the message is sent as part of the transition into this state. There are transitions where more than one message is sent. As explained in Annex B, messages concerning the checking procedure of the link Id are sent to a special system management procedure. The v5 messages resulting from the link Id check procedure are not shown in Tables II.1 to II.8. MDU-DI and MDU-LAI issued by the link control FSM are sent to a resource manager, which transforms it into "occurrence of internal disabling reasons" and "disappearance of internal disabling reasons", shown in the tables as dis(MDU-DI) and en(MDU-LAI) Resp. The messages sdReq and sdComp are exchanged with a system management procedure handling the shutdown of a link.

Notifications to the OS due to state transitions are not shown. Where two messages are issued to system management within one state transition, the resulting new states and the messages sent are written in two lines within the same row of the table.

1) Urgent blocking by LE – see Table II.1.

2) Unblocking by LE (Both sides perform link Id checking.) – see Table II.2.

3) Urgent blocking by AN – see Table II.3.

4) Non-urgent blocking by AN – see Table II.4.

5) Unblocking by AN (Both sides perform link Id checking) – see Table II.5.

6) Link layer 1 failure and subsequent restoration – see Table II.6.

   Although a link failure or restoration happens at the AN and LE at the same time, there will be in general a different delay between the actual event and its observation. In the table, it is assumed that the AN side receives MPH-AI first and tries to unblock the link and to check the link Id. Both will fail since the LE side is still in a failure state.

7) Link layer 1 failure, link locked by LE, link restoration – see Table II.7.

   Although a link failure or restoration happens at the AN and LE at the same time, there will be in general a different delay between the actual event and its observation.

8) Link locked by AN, link layer 1 failure, link unlocked by AN, link layer 1 ok – see Table II.8.

   Although a link failure or restoration happens at the AN and LE at the same time, there will be in general a different delay between the actual event and its observation.

Table II.1/Q.824.5 – Urgent blocking by LE

AN					LE			
OS command	**X.731 state**	**MDU message**	**Link control state**	**V5 message/ MPH**	**Link control state**	**MDU message**	**X.731 state**	**OS command**
	5.0		2.0		2.0		5.0	
								←LOCK
						←MDU-LBI	2.0	
				←FE303	1.0			
		←MDU-LBI	1.0					
	4.2							

Table II.2/Q.824.5 – Unblocking by LE (Both sides perform link Id checking)

AN				V5 message/ MPH	LE			
OS command	**X.731 state**	**MDU message**	**Link control state**		**Link control state**	**MDU message**	**X.731 state**	**OS command**
	4.2		1.0		1.0		2.0	
								←UNLOCK
						←MDU-LUBR	4.0	
				←FE301	1.1			
		←MDU-LUBR	1.2					
	4.0	MDU-LUBR→						
		MDU-LUBI←	2.0	FE302→				
	4.0	(lid-req→)			2.0	MDU-LUBI→		
		(←lid-ok)				(←lid-req)	4.0	
	5.0					(lid-ok→)	5.0	

Table II.3/Q.824.5 – Urgent blocking by AN

AN				V5 message/ MPH	LE			
OS command	**X.731 state**	**MDU message**	**Link control state**		**Link control state**	**MDU message**	**X.731 state**	**OS command**
	5.0		2.0		2.0		5.0	
LOCK→								
	2.0	MDU-LBI→						
			1.0	FE304→				
					1.0	MDU-LBI→		
							4.2	

Table II.4/Q.824.5 – Non-urgent blocking by AN

AN					LE			
OS command	**X.731 state**	**MDU message**	**Link control state**	**V5 message/ MPH**	**Link control state**	**MDU message**	**X.731 state**	**OS command**
	5.0		2.0		2.0		5.0	
SHUTDOWN→								
	3.0	MDU-LBR→						
			2.0	FE305→				
					2.0	MDU-LBR→		
						(←sdReq)	5.0	
						(sdComp→)		
						←MDU-LBI	4.2	
				←FE303	1.0			
		←MDU-LBI	1.0					
	2.0							

Table II.5/Q.824.5 – Unblocking by AN (Both sides perform link Id checking)

AN					LE			
OS command	**X.731 state**	**MDU message**	**Link control state**	**V5 message/ MPH**	**Link control state**	**MDU message**	**X.731 state**	**OS command**
	2.0		1.0		1.0		4.2	
UNLOCK→								
	4.0	MDU-LUBR→						
			1.1	FE302→				
					1.2	MDU-LUBR→		
						←MDU-LUBR	4.0	
				←FE301	2.0	MDU-LUBI→		
		←MDU-LUBI	2.0			(←lid-req)	4.0	
	4.0	(lid-req→)				(lid-ok→)		
		(←lid-ok)					5.0	
	5.0							

Table II.6/Q.824.5 – Link layer 1 failure and subsequent restoration

AN				V5 message/ MPH	LE			
OS command	**X.731 state**	**MDU message**	**Link control state**		**Link control state**	**MDU message**	**X.731 state**	**OS command**
	5.0		2.0		2.0		5.0	
				←MPH-DI				
		←dis(MDU-DI)	0.1					
	4.1			MPH-DI→				
					0.1	dis(MDU-DI)→		
							4.1	
				←MPH-AI				
		←en(MDU-LAI)	2.0					
	4.0	MDU-LUBR→						
		←MDU-LUBI	2.0	FE302→				
	4.0	(lid-req→) (←lid-rej)		←FE303	0.2			
		←MDU-LBI	1.0					
	4.2							
				MPH-AI→				
					1.0	en(MDU-LAI)→ MDU-LBI→		
						←MDU-LUBR	4.0 4.2	
				←FE301	1.1			
		←MDU-LUBR	1.2					
	4.0	MDU-LUBR→						
		←MDU-LUBI	2.0	FE302→				
	4.0	(lid-req→)			2.0	MDU-LUBI→		
		(←lid-ok)				(←lid-req)	4.0	
	5.0					(lid-ok→)		
							5.0	

Table II.7/Q.824.5 – Link layer 1 failure, link locked by LE, link restoration

AN				V5 message/ MPH	LE			
OS command	**X.731 state**	**MDU message**	**Link control state**		**Link control state**	**MDU message**	**X.731 state**	**OS command**
	5.0		2.0		2.0		5.0	
				←MPH-DI				
		←dis(MDU-DI)	0.1					
	4.1			MPH-DI→				
					0.1	dis(MDU-DI)→		
							4.1	
								←LOCK
						←MDU-LBI	1.1	
				←FE303	0.2			
			0.2					
				←MPH-AI				
		←en(MDU-LAI) ←MDU-LBI	1.0		0.2			
	4.0 4.2	MDU-LUBR→						
			1.1	FE302→				
				←FE303	0.2			
			1.0					
		←MDU-LBI						
	4.2							
				MPH-AI→				
					1.0	en(MDU-LAI)→ MDU-LBI→		
							2.0 2.0	

Table II.8/Q.824.5 – Link locked by AN, link layer 1 failure, link unlocked by AN, link layer 1 ok

AN				V5 message/ MPH	LE			
OS command	**X.731 state**	**MDU message**	**Link control state**		**Link control state**	**MDU message**	**X.731 state**	**OS command**
	5.0		2.0		2.0		5.0	
LOCK								
	2.0	MDU-LBI						
			1.0	FE304				
					1.0	MDU-LBI		
							4.2	
				←MPH-DI				
		←dis(MDU-DI)	0.2					
	1.1			MPH-DI→				
					0.2	dis(MDU-DI)→		
							4.3	
UNLOCK→								
	4.1	MDU-LUBR→						
			0.2	FE304→				
					0.2			
				←MPH-AI				
		←en(MDU-LAI) ←MDU-LBI	1.0					
	4.0 4.2	MDU-LUBR→						
			1.1	FE302→				
				←FE303	0.2			
		←MDU-LBI	1.0					
	4.2							
				MPH-AI→				
					1.0	en(MDU-LAI)→ MDU-LBI→		
						←MDU-LUBR	4.2 4.2	
				←FE301	1.1			
		←MDU-LUBR	1.2					
	4.0	MDU-LUBR→						
		←MDU-LUBI	2.0	FE302→				
	4.0	(lid-req→)			2.0	MDU-LUBI→		
		(←lid-ok)				(←lid-req)	4.0	
	5.0					(lid-ok→)		
							5.0	

APPENDIX III

User port control message flows

This Appendix describes typical flows of control messages for PSTN user ports, ISDN basic access user ports and ISDN primary rate user ports for the mapping on X.731 states, including the case of permanent lines.

III.1 Message flows for the mapping of PSTN user port states on X.731 state

A state and a message written in the same line means that this state is entered and the message is sent as part of the transition into this state. There are transitions where two messages are sent. Since the resource manager is not shown in a separate column "port-ok" and "port-not-ok" messages appear in brackets in the MPH message column. Notifications to the OS due to state transitions are not shown.

See also Recommendation G.964 , "PSTN user ports status indication and control protocol".

1) Blocking initiated by LE – see Table III.1 and also Recommendation G.964 , "Blocking".

2) Blocking initiated by AN – see Table III.2 and also Recommendation G.964, "Blocking".

3) Blocking request initiated by AN – see Table III.3 and also Recommendation G.964 , "Blocking request".

4) Coordinated unblocking initiated by the LE.

   See also Recommendation G.964 , "Coordinated unblocking".

   AN administrative state is UNLOCKED (i.e. AN agrees to unblocking request from LE) – see Table III.4.

   AN administrative state is LOCKED in the meantime (i.e. AN rejects the unblocking request from LE) – see Table III.5.

5) Coordinated unblocking initiated by the AN.

   See also Recommendation G.964 "Coordinated unblocking".

   Administrative state = LOCKED, Operational state = ENABLED – see Table III.6.

   Administrative state = UNLOCKED, Operational state = DISABLED – see Table III.7.

   Administrative state = LOCKED, Operational state = ENABLED, LE local unblocked (LE1.1) – see Table III.8.

Table III.1/Q.824.5 – Blocking – initiated by LE

OS command	X.731 state	MPH message	Port state	V5 message	Port state	MPH message	X.731 state	OS command
	5		2.0		2.0		enabled	
								←LOCK
						←MPH-BI	disabled	
				←FE203	1.0			
		←MPH-BI	1.0					
	4							

Table III.2/Q.824.5 – Blocking – initiated by AN

OS command	X.731 state	MPH message	Port state	V5 message	Port state	MPH message	X.731 state	OS command
	5		2.0		2.0		enabled	
LOCK→								
	2	MPH-BI→						
			1.0	FE204→				
					1.0	MPH-BI→		
							disabled	

Table III.3/Q.824.5 – Blocking request – Initiated by AN

OS command	X.731 state	MPH message	Port state	V5 message	Port state	MPH message	X.731 state	OS command
	5		2.0		2.0		enabled	
SHUTDOWN→								
	3	MPH-BR→						
			2.0	FE205→				
					2.0	MPH-BR→		
							enabled	
						←MPH-BI	(access free) disabled	
				←FE203	1.0			
		←MPH-BI	1.0					
	2							

Table III.4/Q.824.5 – Coordinated unblocking from LE – AN = unlocked

OS command	X.731 state	MPH message	Port state	V5 message	Port state	MPH message	X.731 state	OS command
	4		1.0		1.0		disabled	
								←UNLOCK
						←MPH-UBR	disabled	
				←FE201	1.1			
			1.2					
		←MPH-UBR						
	4	MPH-UBR→						
		←MPH-UBI	2.0	FE202→				
	5				2.0	MPH-UBI→		
							enabled	

Table III.5/Q.824.5 – Coordinated unblocking from LE – AN = locked in the meantime

OS command	X.731 state	MPH message	Port state	V5 message	Port state	MPH message	X.731 state	OS command
	1		1.0		1.0		disabled	
								←UNLOCK
						←MPH-UBR	disabled	
				←FE201	1.1			
		←MPH-UBR	1.2					
	1							

Table III.6/Q.824.5 – Coordinated unblocking from AN – AN = locked/enabled

OS command	X.731 state	MPH message	Port state	V5 message	Port state	MPH message	X.731 state	OS command
	2		1.0		1.0		disabled	
UNLOCK→								
	4	MPH-UBR→						
			1.1	FE202→				
					1.2	MPH-UBR→		
						←MPH-UBR	disabled	
				←FE201	2.0	MPH-UBI→		
		←MPH-UBI	2.0				enabled	
	5							

Table III.7/Q.824.5 – Coordinated unblocking from AN – AN = unlocked/disabled

OS command	X.731 state	MPH message	Port state	V5 message	Port state	MPH message	X.731 state	OS command
	4		1.0		1.0		disabled	
		(←port-ok)						
	4	MPH-UBR→						
			1.1	FE202→				
					1.2	MPH-UBR→		
						←MPH-UBR	disabled	
				←FE201	2.0	MPH-UBI→		
		←MPH-UBI	2.0				enabled	
	5							

Table III.8/Q.824.5 – Coordinated unblocking from AN – AN = locked/enabled; LE = local unblocked

OS command	X.731 state	MPH message	Port state	V5 message	Port state	MPH message	X.731 state	OS command
	2		1.2		1.1		disabled	
UNLOCK→								
	4	MPH-UBR→						
		←MPH-UBI	2.0	FE202→				
	5				2.0	MPH-UBI→		
							enabled	

III.2 Message flows for the mapping of ISDN Basic access user port states on X.731 states

The following message flows show the behaviour of the isdnBAUserPort object class in the case that at least one bearer channel is provisioned for permanent line capability. A state and a message written in the same line means that this state is entered and the message is sent as a part of the transition into this state. There are transitions where more than one message is sent.

Notifications to the OS due to state transitions are not shown.

See also Recommendation G.964 , "ISDN user ports status indication and control protocol".

1) Blocking initiated by the LE, see also Recommendation G.964 , "Blocking".

   Port operational deactivated (AN2.0) – see Table III.15.

   Port operational activation initiated (AN2.1) – see Table III.16.

   Port operational and activated (AN2.2) – see Table III.17.

2) Blocking initiated by AN see also Recommendation G.964 , "Blocking".

   Port operational deactivated (AN2.0) – see Table III.9.

   Port operational activation initiated (AN2.1) – see Table III.10.

   Port operational and activated (AN2.2) – see Table III.11.

3) Blocking request initiated by the AN.

   Port operational deactivated (AN2.0) – see Table III.12.

   Port operational activation initiated (AN2.1) – see Table III.13.

   Port operational and activated (AN2.2) – see Table III.14.

4) Coordinated unblocking initiated by the LE.

   AN administrative state is UNLOCKED (i.e. AN agrees to unblocking request from LE) – see Table III.18.

   AN administrative state is LOCKED in the meantime (i.e. AN rejects the unblocking request from LE) – see Table III.19.

5) Coordinated unblocking initiated by the AN.

   Administrative state = LOCKED, Operational state = ENABLED – see Table III.20.

   Administrative state = UNLOCKED, Operational state = DISABLED – see Table III.21.

   Administrative state = LOCKED, Operational state = ENABLED (LE1.1) – see Table III.22.

Table III.9/Q.824.5 – Blocking from AN – Port operational deactivated (AN2.0)

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH message	X.731 state	OS command
	5			2.0		2.0		enabled	
LOCK→									
	2	MPH-BI→							
				1.0	FE204→				
						1.0	MPH-BI→		
								disabled	

Table III.10/Q.824.5 – Blocking from AN – Port operational activation initiated (AN2.1)

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	5			2.1		2.1		enabled	
LOCK→									
	2	MPH-BI→							
			←FE5	1.0	FE204→				
						1.0	MPH-BI→ MPH-DI→ PH-DI→		
								disabled	
			FE6→						
		←MPH-DI		1.0					
	2								

Table III.11/Q.824.5 – Blocking from AN – Port operational and activated (AN2.2)

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	5			2.2		2.2		enabled	
LOCK→									
	2	MPH-BI→							
			←FE5	1.0	FE204→				
						1.0	MPH-BI→ MPH-DI→ PH-DI→		
								disabled	
			FE6→						
		←MPH-DI		1.0					
	2								

Table III.12/Q.824.5 – Blocking request from AN – Port operational deactivated (AN2.0)

$Q3_{AN}$ AN management	AN primitive	V1 FE	AN state change	V5 FE	LE state change	LE primitive	$Q3_{LE}$ LE management
SET administrative state = SHUTTING DOWN							(operational state = ENABLED)
	MPH-BR→						
				→FE205			
						MPH-BR→	
							WAIT until access is free (idle), then change operational state = DISABLED
						←MPH-BI	
				←FE203	LE2.0→LE1.0 →blocked		
	←MPH-BI		AN2.0→AN1.0 →blocked				
operational state = ENABLED administrative state = LOCKED							

Table III.13/Q.824.5 – Blocking request from AN – Port operational activation initiated (AN2.1)

$Q3_{AN}$ AN management	AN primitive	V1 FE	AN state change	V5 FE	LE state change	LE primitive	$Q3_{LE}$ LE management
SET administrative state = SHUTTING DOWN							(operational state = ENABLED)
	MPH-BR→						
				→FE205			
						MPH-BR→	
							WAIT until access is free (idle), then change operational state = DISABLED
						←MPH-BI	
				←FE203	LE2.1→LE1.0 →blocked		
	←MPH-BI	DS←ET FE5	AN2.1→AN1.0 →blocked STOP T1				
operational state = ENABLED administrative state = LOCKED							

Table III.14/Q.824.5 – Blocking request from AN – Port operational and activated (AN2.2)

$Q3_{AN}$ AN management	**AN primitive**	**V1 FE**	**AN state change**	**V5 FE**	**LE state change**	**LE primitive**	**$Q3_{LE}$ LE management**
SET administrative state = SHUTTING DOWN							(operational state = ENABLED)
	MPH-BR→						
				→FE205			
						MPH-BR→	
							WAIT until access is free (idle), then change operational state = DISABLED
						←MPH-BI	
				←FE203	LE2.2→LE1.0 →blocked		
	←MPH-BI	DS←ET FE5	AN2.2→AN1.0→ blocked				
operational state = ENABLED administrative state = LOCKED							

Table III.15/Q.824.5 – Blocking initiated by the LE – Port operational deactivated (AN2.0)

OS command	**X.731 state**	**MPH message**	**V1 FE DS↔ET**	**Port state**	**V5 FE**	**Port state**	**MPH/PH message**	**X.731 state**	**OS command**
	5			2.0		2.0		enabled	
							←MPH-BI	disabled	
					←FE203	1.0			
		←MPH-BI		1.0					
	4	MPH-AR→							
			←FE1	3.1					
			FE2→						
				3.1					
			FE3→						
		←MPH-DSAI		3.1					
	4		FE4→						
		←MPH-PAI		3.2					
	5								

Table III.16/Q.824.5 – Blocking initiated by the LE – Port operational activation initiated (AN2.1)

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	5			2.1		2.1		enabled	
							←MPH-BI	disabled	
					←FE203	1.0			
		←MPH-BI	←FE5	1.0					
	4	MPH-AR→							
			←FE1	3.1					
			FE2→						
				3.1					
			FE3→						
		←MPH-DSAI		3.1					
	4		FE4→						
		←MPH-PAI		3.2					
	5								

Table III.17/Q.824.5 – Blocking initiated by the LE – Port operational and activated (AN2.2)

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	5			2.2		2.2		enabled	
							←MPH-BI	disabled	
					←FE203	1.0			
		←MPH-BI	←FE5	1.0					
	4	MPH-AR→							
			←FE1	3.1					
			FE2→						
				3.1					
			FE3→						
		←MPH-DSAI		3.1					
	4		FE4→						
		←MPH-PAI		3.2					
	5								

Table III.18/Q.824.5 – AN administrative state is UNLOCKED

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	4			1.0		1.0		disabled	
							←MPH-UBR	enabled req	
					←FE201	1.1			
		←MPH-UBR		1.2					
	4	MPH-UBR→							
		←MPH-UBI		2.0	FE202→				
	5					2.0	MPH-UBI→		
							←MPH-AR	enabled	
					←FE101	2.1			
		←MPH-I1	←FE1	2.1					
	5								
			FE2→						
				2.1					
			FE3→						
		←MPH-DSAI		2.1	FE103→				
	5					2.1	MPH-DSAI→		
			FE4→					enabled	
		←MPH-AI		2.2	FE104→				
	5					2.2	MPH-AI→ PH-AI→		
								enabled	

Table III.19/Q.824.5 – AN administrative state is LOCKED in the meantime

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	1			1.0		1.0		disabled	
							←MPH-UBR	enabled req	
					←FE201	1.1			
		←MPH-UBR		1.2					
	1								

Table III.20/Q.824.5 – Administrative state = LOCKED, Operational state = ENABLED

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	2			1.0		1.0		disabled	
UNLOCK→									
	(start TPL1) 4	MPH-UBR→							
				1.1	FE202→				
						1.2	MPH-UBR→		
							←MPH-UBR	disabled	
					←FE201	2.0	MPH-UBI→		
		←MPH-UBI		2.0				enabled	
	(stop TPL1) 5								
							←MPH-AR		
					←FE101	2.1			
		←MPH-I1	←FE1	2.1					
	5								
			FE2→						
				2.1					
			FE3→						
		←MPH-DSAI		2.1	FE103→				
	5					2.1	MPH-DSAI→		
			FE4→					enabled	
		←MPH-AI		2.2	FE104→				
	5					2.2	MPH-AI→ PH-AI→		
								enabled	

Table III.21/Q.824.5 – Administrative state = UNLOCKED, Operational state = DISABLED

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	4			1.0		1.0		disabled	
	(internal error) 4	MPH-BI→							
				1.0	FE204→				
						1.0			
	(no internal error, start TPL1) 4	MPH-UBR→							
				1.1	FE202→				
						1.2	MPH-UBR→		
							←MPH-UBR	disabled	
					←FE201	2.0	MPH-UBI→		
		←MPH-UBI		2.0				enabled	
	(stop TPL1) 5								
							←MPH-AR		
					←FE101	2.1			
		←MPH-I1	←FE1	2.1					
	5								
			FE2→						
				2.1					
			FE3→						
		←MPH-DSAI		2.1	FE103→				
	5					2.1	MPH-DSAI→		
			FE4→					enabled	
		←MPH-AI		2.2	FE104→				
	5					2.2	MPH-AI→ PH-AI→		
								enabled	

Table III.22/Q.824.5 – Administrative state = LOCKED, Operational state = ENABLED (LE1.1)

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	2			1.2		1.1		disabled	
UNLOCK→									
	(start TPL1) 4	MPH-UBR→							
		←MPH-UBI		2.0	FE202→				
	(stop TPL1) 5					2.0	MPH-UBI→		
								enabled	
							←MPH-AR		
					←FE101	2.1			
		←MPH-I1	←FE1	2.1					
	5								
			FE2→						
				2.1					
			FE3→						
		←MPH-DSAI		2.1	FE103→				
	5					2.1	MPH-DSAI→		
			FE4→					enabled	
		←MPH-AI		2.2	FE104→				
	5					2.2	MPH-AI→ PH-AI→		
								enabled	

III.3 Message flows for the mapping of ISDN primary rate access user port states on X.731 states

The following message flows show the behaviour of the isdnPRAUserPort object class in the case that at least one bearer channel is provisioned for permanent line capability. A state and a message written in the same line means that this state is entered and the message is sent as a part of the transition into this state. There are transitions where more than one message is sent. Notifications to the OS due to state transitions are not shown.

See also Recommendation G.964 , "ISDN primary rate user ports status indication and control".

1) Blocking initiated by the LE.

   Access operational (AN2.0) – see Table III.24.

2) Blocking initiated by the AN.

   Access operational (AN2.0) – see Table III.23.

3) Coordinated unblocking initiated by the LE.

   AN administrative state is UNLOCKED (i.e. AN agrees to unblocking request from LE) – see Table III.25.

   AN administrative state is LOCKED in the meantime (i.e. AN rejects the unblocking request from the LE) – see Table III.26.

4) Coordinated unblocking initiated by the AN.

Administrative state = LOCKED, Operational state = ENABLED – see Table III.27.

Administrative state = UNLOCKED, Operational state = DISABLED – see Table III.28.

Administrative state = LOCKED, Operational state = ENABLED (LE1.1) – see Table III.29.

Table III.23/Q.824.5 – Blocking initiated by the AN – Access operational (AN2.0)

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH message	X.731 state	OS command
	5			2.0		2.0		enabled	
LOCK→									
	2	MPH-BI→							
			←RAI	1.02	FE204→				
						1.0	MPH-BI→ PH-DI→ MPH-DI→		
								disabled	

Table III.24/Q.824.5 – Blocking initiated by the LE – Access operational (AN2.0)

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	5			2.0		2.0		enabled	
							←MPH-BI	disabled	
					←FE203	1.0			
		←MPH-BI	←RAI	1.02					
	(start TPL1) 4	MPH-UBR→							
				1.1	FE202→				
						1.2	MPH-UBR→		
								disabled	
	(expiry of TPL1) 4	MPH-PAR→							
		←MPH-PAI	←NOF	AN3.0					
	5								

Table III.25/Q.824.5 – Coordinated unblocking from LE – AN = UNLOCKED

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	4			1.02		1.0		disabled	
							←MPH-UBR	(enabled req)	
					←FE201	1.1			
		←MPH-UBR		1.22					
	4	MPH-UBR→							
		←MPH-UBI	←NOF	2.0	FE202→				
	5					2.0	MPH-AI→ PH-AI→		
								enabled	

Table III.26/Q.824.5 – Coordinated unblocking from LE – AN = LOCKED in the meantime

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	1			1.01		1.0		disabled	
							←MPH-UBR	(enabled req)	
					←FE201	1.1			
		←MPH-UBR		1.21					
	1								

Table III.27/Q.824.5 – Coordinated unblocking from AN – Administrative state = LOCKED, Operational state = ENABLED

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	2			1.02		1.0		disabled	
UNLOCK→									
	(start TPL1) 4	MPH-UBR→							
				1.1	FE202→				
						1.2	MPH-UBR→		
							←MPH-UBR	disabled	
					←FE201	2.0	MPH-AI→ PH-AI→		
		←MPH-UBI	←NOF	2.0				enabled	
	(stop TPL1) 5								

Table III.28/Q.824.5 – Coordinated unblocking from AN – Administrative state = UNLOCKED, Operational state = DISABLED

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	4			1.02		1.0		disabled	
	(internal error) 4	MPH-BI→							
				1.02	FE204→				
						1.0			
	(no internal error, start TPL1) 4	MPH-UBR→							
				1.1	FE202→				
						1.2	MPH-UBR→		
							←MPH-UBR	disabled	
					←FE201	2.0	MPH-AI→ PH-AI→		
		←MPH-UBI	←NOF	2.0				enabled	
	(stop TPL1) 5								

Table III.29/Q.824.5 – Coordinated unblocking from AN – Administrative state = LOCKED, Operational state = ENABLED (LE1.1)

OS command	X.731 state	MPH message	V1 FE DS↔ET	Port state	V5 FE	Port state	MPH/PH message	X.731 state	OS command
	2			1.22		1.1		disabled	
UNLOCK→									
	(start TPL1) 4	MPH-UBR→							
		←MPH-UBI	←NOF	2.0	FE202→				
	(stop TPL1) 5					2.0	MPH-AI→ PH-AI→		
								enabled	

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