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**Signalling Protocols and Switching (SPS);
Q3 interface at the Local Exchange (LE)
for fault and performance management of V5 interfaces
and associated customer profiles;
Part 1: Q3 interface specification**

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Signalling Protocols and Switching (SPS) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS is part 1 of a multi-part standard as described below:

Part 1: "Q3 interface specification at the Local Exchange (LE) for fault and performance management of V5 interfaces and associated customer profiles";

NOTE: A possible further part 2 may contain the Managed Object Conformance Statement (MOCS) proforma specification.

The following multi-part standards are directly related to this ETS:

ETS 300 376: "Q3 interface at the Access Network (AN) for configuration management of V5 interfaces and associated user ports";

ETS 300 377: "Q3 interface at the Local Exchange (LE) for configuration management of V5 interfaces and associated customer profiles";

ETS 300 378: "Q3 interface at the Local Exchange (AN) for fault and performance management of V5 interfaces and associated user ports".

Transposition dates	
Date of adoption of this ETS:	17 November 1995
Date of latest announcement of this ETS (doa):	28 February 1996
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	31 August 1996
Date of withdrawal of any conflicting National Standard (dow):	31 August 1996

Introduction

V5 interfaces, as described in ETS 300 324-1 and ETS 300 347-1, operate between a Local Exchange (LE) and an Access Network (AN) to support various narrowband Integrated Services Digital Network (ISDN) and Public Switched Telephone Network (PSTN) services. These interfaces and their associated user ports need to be managed by the Operations Systems (OSs) within the Telecommunications Management Network (TMN). This management is performed by means of Q3 interfaces.

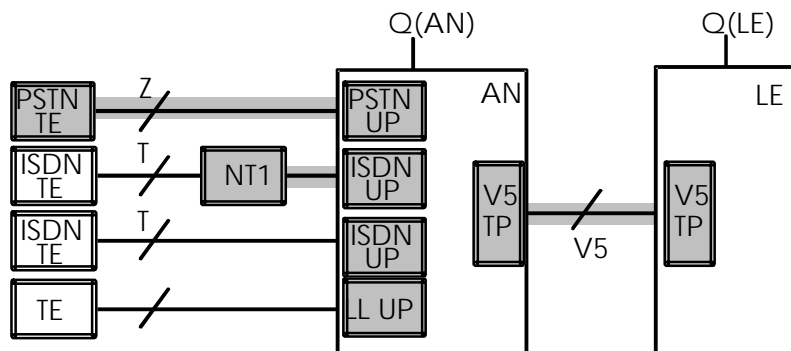
The companion standard on configuration management ETS 300 377-1 defines how the Q3 interface of a LE handles the configuration information for V5 interfaces and their associated customer profiles. This ETS describes the extension to include fault and performance management.

Fault management of V5 interfaces and associated user ports is part of a management activity which is performed by the operator in order to detect failure conditions and to bring the customer access back to its normal state of operation whenever a deviation occurs.

Performance management of V5 interfaces and associated user ports is part of a management activity which is employed in order to maintain the quality of service levels agreed with the customers. The activities undertaken in performance management are monitoring, analysis and problem alerting, diagnosis, optimization and control.

A customer access is considered as being that part of the local network which extends from the network termination equipment up to and including the exchange termination.

Here, only these parts of the activities are covered which are related directly to a V5 interface between a LE and an AN or to that part of the customer access which extends from the AN to the network termination equipment. An ISDN access extends to but does not include the T reference point. An analogue access extends to and may include the Customer Premise Equipment (CPE) (see figure 1).



NOTE: Shaded areas are subject to V5 fault and performance management. User ports represent the different configurations for Line Circuit (LC), Line Termination (LT), Exchange Termination (ET) and Network Termination (NT) as given in figure 2 of the V5 specifications ETS 300 324-1 and ETS 300 347-1.

Figure 1: Scope of V5 fault and performance management

This ETS details only those functions and management information model components for which V5 specific descriptions are required. However, the use of other components which may be applicable from other specifications is not precluded. In this case, combined application incorporating both V5-specific and more generic aspects would result. For example, if log control is to be provided in conjunction with the V5 specific alarm reporting function (see annex A) then other specifications (e.g. CCITT Recommendation X.735) are available to define this.

The management information model described in this ETS complements that for configuration; both information models will normally share the same physical interface.

1 Scope

This European Telecommunication Standard (ETS) specifies the Q3 interface between a Local Exchange (LE) and the Telecommunications Management Network (TMN) for the support of Fault and Performance Management functions for V5 interfaces, as described in ETS 300 324-1 [2] and ETS 300 347-1 [3], and their associated customer profiles. The management of transmission, media and services which are not related to V5 interfaces is outside the scope of this ETS, as is the management of equipment. This ETS includes the logging of faults and related functions.

For certain implementations, some test related functions like line monitoring, pattern injection for loopback tests and Dual Tone Multi-Frequency (DTMF) measurements may also be performed in the LE, e.g. due to economical reasons. A Q interface for these functions is required at the LE. As they are not V5 specific, this has to be handled within an overall LE test model which is outside the scope of this ETS.

The location of the Q3 interface to which this ETS refers is specified in ETS 300 377-1 [4].

Existing protocols are used where possible, and the focus of the work is on defining the object models. The definition of Operations System (OS) functionality is outside the scope of this ETS.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] I-ETS 300 292 (1995): "Network Aspects (NA); Functional specification of call routing information management on the Operations System/Network Element (OS/NE) interface".
- [2] ETS 300 324-1 (1994): "Signalling Protocols and Switching (SPS); V interfaces at the digital Local Exchange (LE); V5.1 interface for the support of Access Network (AN); Part 1: V5.1 interface specification".
- [3] ETS 300 347-1 (1994): "Signalling Protocols and Switching (SPS); V interfaces at the digital Local Exchange (LE); V5.2 interface for the support of Access Network (AN); Part 1: V5.2 interface specification".
- [4] ETS 300 377-1 (1994): "Signalling Protocols and Switching (SPS); Q3 interface at the Local Exchange (LE) for configuration management of V5 interfaces and associated customer profiles; Part 1: Q3 interface specification".
- [5] CEPT Recommendation T/S 54-08 E (1987): "ISDN subscriber access and installation maintenance".
- [6] CCITT Recommendation M.3010 (1992): "Principles for a telecommunications management network".
- [7] CCITT Recommendation M.3100 (1992): "Generic network information model".
- [8] ITU-T Recommendation Q.821 (1993): "Stage 2 and stage 3 description for the Q3 interface - Alarm surveillance".
- [9] ITU-T Recommendation Q.822: "Stage 1, stage 2 and stage 3 description for the Q3 interface - Performance management".
- [10] CCITT Recommendation X.208 (1988): "Specification of Abstract Syntax Notification One (ASN.1)".

- [11] CCITT Recommendation X.721 | ISO/IEC 10165-2 (1992): "Information technology - Open systems interconnection - Structure of management information: Definition of management information".
- [12] CCITT Recommendation X.730 | ISO/IEC 10164-1 (1992): "Information technology - Open systems interconnection - Systems management: Object management function".
- [13] CCITT Recommendation X.731 | ISO/IEC 10164-2 (1992): "Information technology - Open systems interconnection - Systems management: State management function".
- [14] CCITT Recommendation X.732 | ISO/IEC 10164-3 (1992): "Information technology - Open systems interconnection - Systems management: Attributes for representing relationships".
- [15] CCITT Recommendation X.733 | ISO/IEC 10164-4 (1992): "Information technology - Open systems interconnection - Systems management: Alarm reporting function".
- [16] CCITT Recommendation X.734 | ISO/IEC 10164-5 (1992): "Information technology - Open systems interconnection - Systems management: Event report management function".
- [17] CCITT Recommendation X.735 | ISO/IEC 10164-6 (1992): "Information technology - Open systems interconnection - Systems management: Log control functions".
- [18] ITU-T Recommendation X.738 | ISO/IEC 10164-13 (1993): "Information technology - Open systems interconnection - Systems management: Summarization function".
- [19] ITU-T Recommendation X.739 | ISO/IEC 10164-11 (1993): "Information technology - Open systems interconnection - Systems management: Metric objects and attributes".
- [20] ITU-T Recommendation X.745 | ISO/IEC 10164-12 (1993): "Information technology - Open systems interconnection - Systems management: Test management function".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of this ETS, the following definitions apply:

Access Network (AN): See ETS 300 324-1 [2].

bearer channel: See ETS 300 324-1 [2].

Bearer Channel Connection (BCC): See ETS 300 347-1 [3].

Communication channel (C-channel): See ETS 300 324-1 [2].

Communication path (C-path): See ETS 300 324-1 [2].

control protocol: See ETS 300 324-1 [2].

envelope function address: See ETS 300 324-1 [2].

layer 3 address: See ETS 300 324-1 [2].

leased lines: See ETS 300 324-1 [2].

Local Exchange (LE): See ETS 300 324-1 [2].

Operations System (OS): See CCITT Recommendation M.3010 [6].

protection protocol: See ETS 300 347-1 [3].

V5 interface: See ETS 300 324-1 [2].

V5 interface messages: This term refers to all Function Elements (FEs) and other V5 protocol messages as defined in ETS 300 324-1 [2] and ETS 300 347-1 [3] which are communicated via the V5 interface.

V5 time slot: See ETS 300 324-1 [2].

3.2 Symbols and abbreviations

For the purposes of this ETS, the following abbreviations apply:

AIS	Alarm Indication Signal
AN	Access Network
ASN.1	Abstract Syntax Notation One (see CCITT Recommendation X.208 [10])
BCC	Bearer Channel Connection
C-channel	Communication channel
C-path	Communication path
CPE	Customer Premise Equipment
CRC	Cyclic Redundancy Check
DTMF	Dual Tone Multi-Frequency
ET	Exchange Termination
ID	Identity, identifier
ISDN	Integrated Services Digital Network
LAPV5	Link Access Protocol for V5 interface
LC	Line Circuit
LE	Local Exchange
LFA	Loss of Frame Alignment
LT	Line Termination
M/C/O	Mandatory/Conditional/Optional
NE	Network Element
NT	Network Termination
OS	Operations System
PM	Performance Management
PSTN	Public Switched Telephone Network
RAI	Remote Alarm Indication
RDN	Relative Distinguished Name
TIB	Task Information Base
TMN	Telecommunication Management Network
TTP	Trail Termination Point

4 Information model diagrams

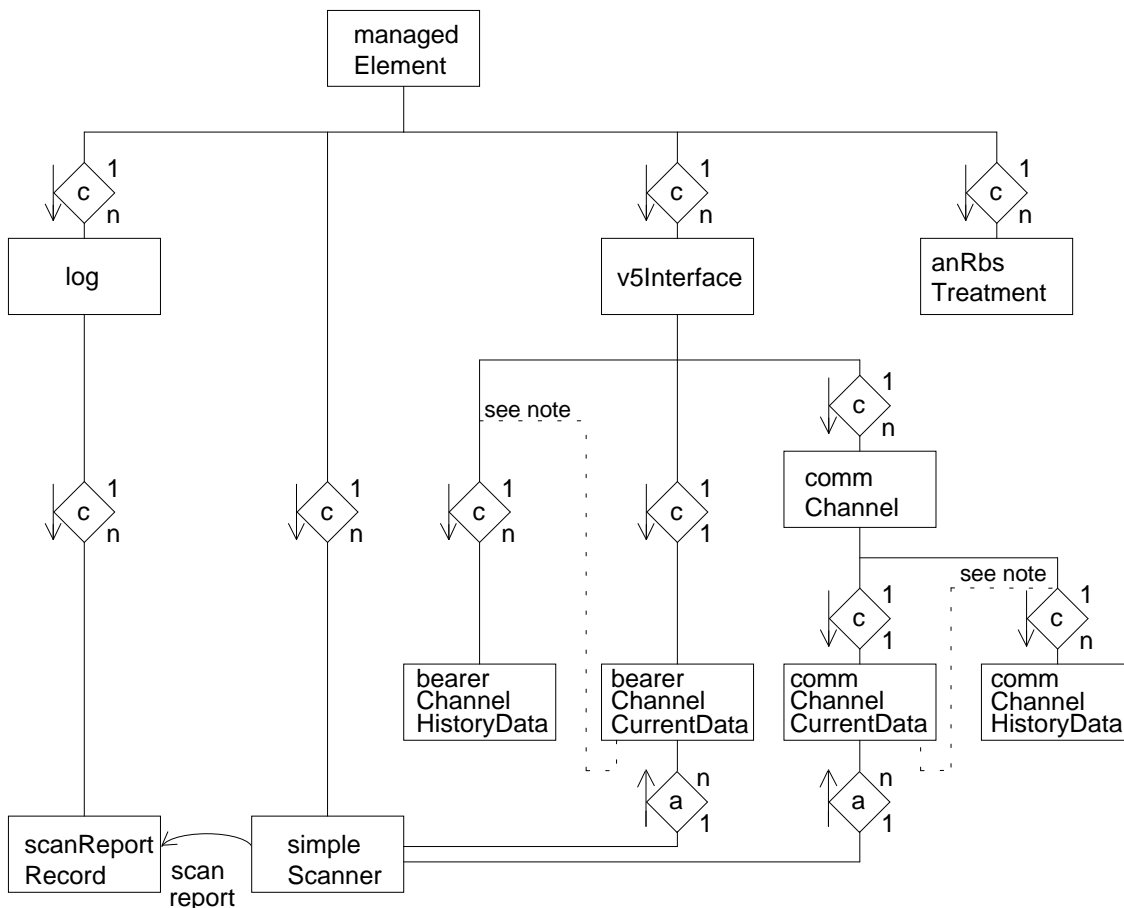
The entity relationship diagram is given in subclause 4.1 and the inheritance hierarchy (is-a relationships) and naming hierarchy (containment relationships) are given in subclauses 4.2 and 4.3, respectively.

4.1 Entity relationship diagram

Traffic measurements in the LE are concerned with bearer channel allocation and communication channel traffic characteristics. Subclasses of ITU-T Recommendation Q.822 [9] currentData object class are used to store traffic measurement data obtained from the object instance they are contained in. The current data is updated every 15 minutes.

The object class bearerChannelCurrentData has attributes for bearer channel oriented performance measurements of a V5.2 interface. The measurement results are obtained from the v5Interface object instance representing the V5.2 interface. The object class commChannelCurrentData is contained in an instance of commChannel. It has attributes for communication channel oriented measurements related to a V5 communication channel.

An instance of ITU-T Recommendation X.738 [18] simpleScanner object class may be used to collect the traffic measurement results stored in commChannelCurrentData and bearerChannelCurrentData object instances in a certain time interval. It generates a scanReport notification being sent to the managing system. In addition, results may be logged in a scanReportRecord object instance which is contained in a log object.



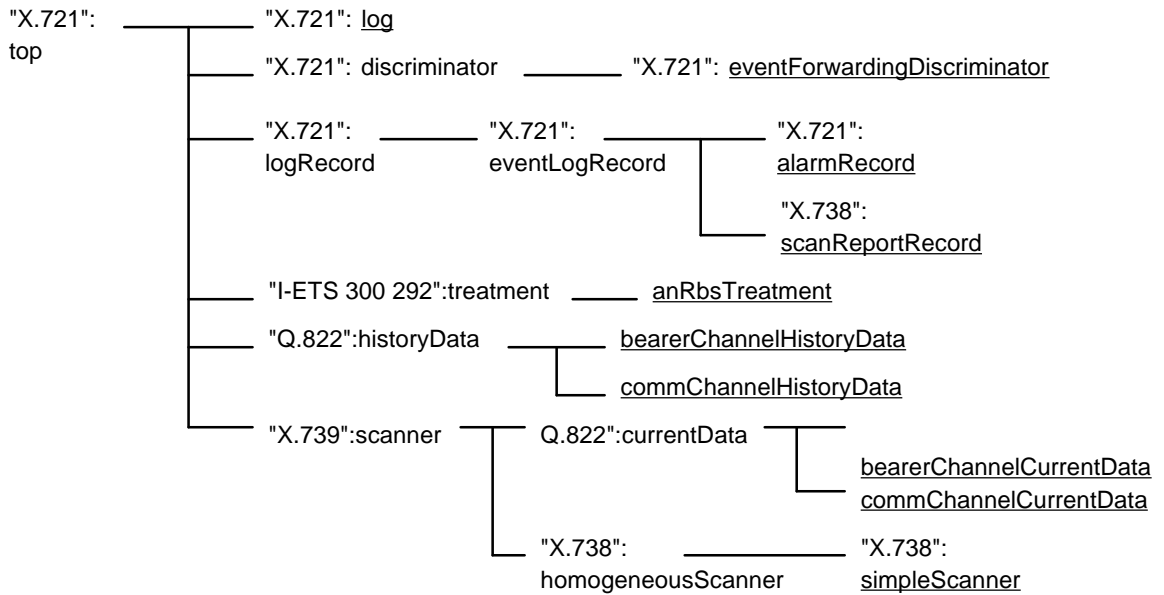
NOTE: History data objects may also be contained in the related current data objects.

Figure 2: Entity relationship diagram - V5 traffic measurement

Instead of generating scan reports, instances of the object classes bearerChannelHistoryData and commChannelHistoryData may be used to store the traffic measurement results. New instances of these object classes are created at the end of each interval.

4.2 Inheritance hierarchy

Figure 3 traces the inheritance from the highest level object "CCITT Recommendation X.721:1992":top to the managed objects defined in this ETS.

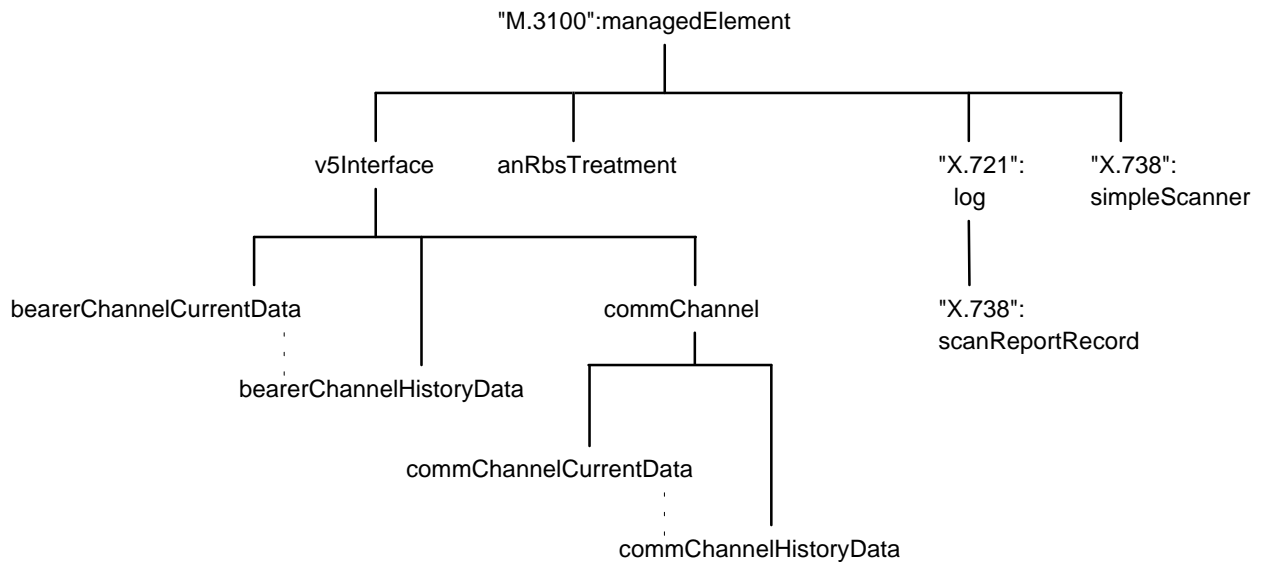


NOTE: Only classes which are underlined may be instantiated.

Figure 3: Inheritance hierarchy

4.3 Naming hierarchy

Figure 4 shows the naming (i.e. containment) relationships for the LE's managed objects associated with fault and performance management.



NOTE: History data objects may also be named from the related current data objects.

Figure 4: Naming hierarchy

5 Information model description

This clause provides a high-level informal description of the information model for fault and performance management of the LE.

Subclause 5.1 contains a brief description for each new object class or package used in the model as far as it is not described in the reference documents. The description covers:

- the purpose of the new object class or package;
- the attributes defined or inherited for the object class or package;
- the contents of the event reports defined in this ETS;
- the relationship of the object class to other object classes;
- the applicability of the packages.

Attributes which are common to several object classes are described in subclause 5.2. Subclause 5.3 describes actions which are influencing several object classes in the information model. Subclause 5.4 describes the common aspects of the notifications used in the information model.

5.1 Description of object classes

Subclause 5.1 is divided into subclauses which describe the fragments of the information model. In particular, the management information to be supported for V5 fault and performance management is specified. For object classes which are imported from other specifications, only the fault and performance related aspects considered relevant to this ETS are described. Other aspects of these object classes (e.g. particular packages) may be used in some fault and performance applications, and it is not intended that this is precluded.

5.1.1 V5 interface fragment

In this fragment, the following object classes are used. They are defined in ETS 300 377-1 [4]:

- "ETS 300 377-1":v5Interface;
- "ETS 300 377-1":v5Ttp;
- "ETS 300 377-1":v5TimeSlot.

5.1.1.1 V5 interface (v5Interface)

V5 interface is an object class representing a V5.x interface (x = 1, 2, ...) as an abstract entity of its own right. It is defined in ETS 300 377-1 [4].

For V5 fault management the following packages shall be instantiated with instances of this object class:

- "CCITT Recommendation M.3100:1992":operationalStatePackage;
- "CCITT Recommendation M.3100:1992":tmnCommunicationsAlarmInformationPackage.

The following events shall be reported by instances of this object class using the communicationsAlarm notification (for the specification of the alarm reports and for cross reference to the relevant V5 protocol specifications, see annex A):

- a) common control protocol time out errors;
- b) port control protocol layer 3 address errors;
- c) link control protocol layer 3 address errors;
- d) BCC protocol time out errors;
- e) protection protocol time out errors;
- f) PSTN protocol time out errors;
- g) PSTN protocol layer 3 address;
- h) V5 Interface identification failures;
- i) link control protocol data link failures;
- j) BCC protocol data link failures;
- k) protection protocol data link failures;
- l) PSTN protocol data link failures;
- m) V5 interface provisioning variant mismatch failure.

The following events may be reported optionally:

- n) common control protocol syntax errors;
- o) control protocol layer 3 address errors;
- p) BCC protocol syntax errors;
- q) protection protocol syntax errors.

5.1.1.2 V5 trail termination point (v5Ttp)

A V5 trail termination point is an object class representing a 2 Mbit/s interface of the LE that is used as V5.1 interface or as part of a V5.2 interface. It is defined in ETS 300 377-1 [4].

For V5 fault management the following packages shall be instantiated with instances of this object class:

- "CCITT Recommendation M.3100:1992":tmnCommunicationsAlarmInformationPackage.

The following events have to be reported by instances of this object class using the communicationsAlarm notification (for the specification of the alarm reports and for cross reference to the relevant V5 protocol specifications, see annex A):

- a) V5 interface layer 1 reception of Alarm Indication Signal (AIS);
- b) V5 interface layer 1 reception of Remote Alarm Indication (RAI);
- c) V5 interface layer 1 Loss of Frame Alignment (LFA);
- d) link identification failures;
- e) link control protocol time out errors;
- f) link control protocol errors while "Out of Service";
- g) link control protocol layer 3 address errors;
- h) CRC errors;
- i) internal failures.

The following events may be reported optionally:

- j) link control protocol syntax errors.

5.1.1.3 V5 time slot (v5TimeSlot)

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 communication channel. It is defined in ETS 300 377-1 [4].

For V5 fault management the following packages shall be instantiated with instances of this object class if the time slot is used as a communication channel:

- "CCITT Recommendation M.3100:1992":tmnCommunicationsAlarmInformationPackage.

The following events have to be reported by instances of this object class using the communicationsAlarm notification (for the specification of the alarm reports and for cross reference to the relevant V5 protocol specifications see annex A):

- a) cessation of flags on a C-channel.

5.1.2 Access port fragment

In this fragment the following object classes are used. They are defined in ETS 300 377-1 [4]:

- "ETS 300 377-1":virtualAnalogueAccess;
- "ETS 300 377-1":virtualBasicRateAccess;
- "ETS 300 377-1":virtualPrimaryRateAccess;
- "ETS 300 377-1":virtualLeasedAccess.

5.1.2.1 Virtual analogue access (virtualAnalogueAccess)

A virtual analogue access is an object class representing an image of an analogue (PSTN) customer access port which is located in an AN and connected to the LE via V5 interface.

For V5 fault management the following packages shall be instantiated with instances of this object class:

- "CCITT Recommendation M.3100:1992":tmnCommunicationsAlarmInformationPackage.

The following events shall be reported by instances of this object class using the communicationsAlarm notification (for the specification of the alarm reports and for cross reference to the relevant V5 protocol specifications, see annex A):

- a) port control protocol time out errors;
- b) port control protocol errors while "Out Of Service";
- c) port control protocol layer 3 address error;
- d) PSTN protocol time out errors;
- e) PSTN protocol layer 3 address error.

The following events may be reported optionally:

- f) port control protocol syntax errors;
- g) PSTN protocol syntax errors.

In addition, the following package may be instantiated with instances of this object class if the associated interface is a V5.2 interface and the instance supports it:

- "ETS 300 377-1":anFaultReportedPackage.

5.1.2.2 Virtual basic rate access (virtualBasicRateAccess)

A virtual basic rate access is an object class representing an image of an ISDN basic customer access port which is located in an AN and connected to the LE via V5 interface.

For V5 fault management the following packages shall be instantiated with instances of this object class:

- "CCITT Recommendation M.3100:1992":tmnCommunicationsAlarmInformationPackage.

The following events shall be reported by instances of the object class virtual basic rate access using the communicationsAlarm notification (for the specification of the alarm reports and for cross reference to the relevant V5 protocol specifications, see annex A):

- a) ISDN layer 1 activation faults (only for an access with permanent layer 1 requested in the dChannelActivation attribute);
- b) ISDN layer 2 faults (only for an access with permanent layer 2 requested in the dChannelActivation attribute);
- c) ISDN layer 3 faults;
- d) port control protocol time out errors;
- e) port control protocol errors while "Out of Service";
- f) port control protocol layer 3 address error.

The following events may be reported optionally:

- g) port control protocol syntax errors.

In addition, the following package may be instantiated with instances of this object class if the associated interface is a V5.2 interface and the instance supports it:

- "ETS 300 377-1":anFaultReportedPackage.

For V5 performance management, the following packages shall be instantiated with instances of the object class virtual basic rate access whenever a degraded quality of service of the access digital section has to be reported to the OS:

- "ETS 300 377-1":qualityOfServiceAlarmPackage.

5.1.2.3 Virtual primary rate access (virtualPrimaryRateAccess)

A virtual primary rate access is an object class representing an image of an ISDN primary rate customer access port which is located in an AN and connected to the LE via V5 interface.

For V5 fault management the following packages shall be instantiated with instances of this object class:

- "CCITT Recommendation M.3100:1992":tmnCommunicationsAlarmInformationPackage.

The following events shall be reported by instances of the object class virtual primary rate access using the communicationsAlarm notification (for the specification of the alarm reports and for cross reference to the relevant V5 protocol specifications see annex A):

- ISDN layer 1 activation faults;
- ISDN layer 2 faults;
- ISDN layer 3 faults;
- port control protocol time out errors;
- port control protocol errors while "Out of Service";
- port control protocol layer 3 address error;

The following events may be reported optionally:

- port control protocol syntax errors.

In addition, the following package may be instantiated with instances of this object class if the associated interface is a V5.2 interface and the instance supports it:

- "ETS 300 377-1":anFaultReportedPackage.

For V5 performance management the following packages shall be instantiated with instances of the object class virtual primary rate access whenever a degraded quality of service of the access digital section has to be reported to the OS:

- "ETS 300 377-1":qualityOfServiceAlarmPackage.

5.1.2.4 Virtual leased access (virtualLeasedAccess)

A virtual leased access is an object class representing an image of an access port serving a semipermanent leased line which is located in an AN and connected to the LE via a V5 interface.

For V5 fault management the "CCITT Recommendation M.3100:1992":tmnCommunicationsAlarmInformation package should be instantiated with instances of this object class. Events as applicable should be reported by instances of this object class using the communicationsAlarm notification (see also annex A).

NOTE: In the absence of clear standards for event reporting on leased lines it is not appropriate to state mandatory requirements.

5.1.3 Communications path fragment

In this fragment the following object classes are used. They are defined in ETS 300 377-1 [4]:

- "ETS 300 377-1":commChannel.

A V5 communication channel is an object class representing a V5 C-channel that multiplexes one or more C-paths.

Instances of this object class are used to contain commChannelCurrentData objects which represent V5 C-channel oriented traffic measurements.

5.1.4 Protection fragment

The following object classes shall be instantiated for fault and performance management in case of a V5.2 interface with more than one link. They are defined in ETS 300 377-1 [4]:

- "ETS 300 377-1":v5ProtectionGroup;
- "ETS 300 377-1":v5ProtectionUnit.

5.1.5 Performance fragment

For V5 specific traffic measurements a subclass of "ITU-T Recommendation Q.822:1993":currentData shall be used to represent the traffic measurement data related to the V5 interface. Bearer channel as well as C-channel oriented measurements are each grouped as a set of measurements. For each group a single object class derived from the currentData object class is defined.

In addition to the object classes defined in this fragment the following object classes are used. They are defined in ITU-T Recommendation X.738 [18]:

- "ITU-T Recommendation X.738:1993":simpleScanner;
- "ITU-T Recommendation X.738:1993":scanReportRecord.

Instances of the scanner object class shall be used to produce the scan reports. Instances of scanReportRecord can be used to store the traffic data in a log.

The results of a measurement may also be stored in separate history objects. In this case, for bearer channel measurements as well as for communication channel measurements a single object class derived from "ITU-T Recommendation Q.822:1993":historyData shall be used. Each object represents the results of a particular measurement interval.

5.1.5.1 Bearer channel current data

The bearer channel current data object class is a class of managed objects representing a set of V5.2 bearer channel oriented traffic measurements. It is a subclass of "ITU-T Recommendation Q.822:1993":currentData.

Only one instance of this object class is contained in each instance of the "ETS 300 377-1":v5Interface object class representing the V5.2 interface for which the measurements are to be activated. The measurements will then be performed on the basis of 15 minute intervals.

The following measurements are represented by attributes of this object class:

- a) number of bearer channel allocations;
- b) total sum of bearer channel holding times;
- c) total sum of bearer channel in-service times;
- d) unsuccessful bearer channel allocation attempts.

In addition to the inherited attributes, it has the attributes given in table 1.

Table 1

Name	M/C/O	Value set
"X.739":scannerId	M	RDN
bearerChannelAllocationsOriginating	M	single
bearerChannelAllocationsTerminating	M	single
bearerChannelHoldingTimesOriginating	M	single
bearerChannelHoldingTimesTerminating	M	single
bearerChannelInServiceTimes	M	single
unsuccessfulBearerChannelAllocationAttemptsIncoming	M	single
unsuccessfulBearerChannelAllocationAttemptsInternal	M	single
numberOfCommChannels	M	single
numberOfV5Links	M	single
bearerChannelAllocationsOriginating:		number of bearer channel allocations to originating calls.
bearerChannelAllocationsTerminating:		number of bearer channel allocations to terminating calls.
bearerChannelHoldingTimesOriginating:		total sum of bearer channel allocation duration for originating calls.
bearerChannelHoldingTimesTerminating:		total sum of bearer channel allocation duration for terminating calls.
bearerChannelInServiceTimes:		total sum of in-service times of the V5 time slots.
unsuccessfulBearerChannelAllocationAttemptsIncoming:		number of unsuccessful bearer channel allocation requests of incoming calls.
unsuccessfulBearerChannelAllocationAttemptsInternal:		number of unsuccessful bearer channel allocation requests of internal calls.
numberOfCommChannels:		number of V5 C-channels provisioned for the V5 interface.
numberOfV5Links:		number of V5 links which comprise the V5 interface.

5.1.5.2 Bearer channel history data

The bearer channel history data object class is a class of managed objects representing the results of V5.2 bearer channel oriented traffic measurements. It is a subclass of "ITU-T Recommendation Q.822:1993":historyData.

At the end of each current measurement interval an instance of this object class will be created. Instances of this object class may be contained in an instance of the object class bearerChannelCurrentData or in an instance of the object class "ETS 300 377-1":v5Interface.

In addition to the inherited attributes, it has the same attributes as the related bearer channel current data object class which are given in table 1.

5.1.5.3 Communication channel current data

The communication channel current data object class is a class of managed objects representing a set of V5 communication channel oriented traffic measurements. It is a subclass of "ITU-T Recommendation Q.822:1993":currentData.

Only one instance of this object class is contained in each instance of the "ETS 300 377-1":v5Interface object class representing the V5 interface for which the measurements are to be activated. The measurements will then be performed on the basis of 15 minute intervals.

The following measurements are represented by attributes of this object class:

- a) total sum of C-channel out-of-service times due to any reason;
- b) total sum of C-channel out-of-service times due to far end blocking;
- c) total sum of C-channel out-of-service times due to near end blocking;
- d) number of C-channel outages;
- e) number of transmitted or received octets in LAPV5 frames.

In addition to the inherited attributes, it has the attributes given in table 2.

Table 2

Name	M/C/O	Value set
"X.739":scannerId	M	RDN
commChannelOutOfServiceAnyReason	M	single
commChannelOutOfServiceFarEndBlocking	M	single
commChannelOutOfServiceNearEndBlocking	M	single
commChannelOutages	M	single
octetsV5Frame	M	single
activeStandby	M	single
commChannelOutOfServiceAnyReason:		total sum of C-channel out of service duration due to any reason.
commChannelOutOfServiceFarEndBlocking:		total sum of C-channel out of service duration due to far end blockings.
commChannelOutOfServiceNearEndBlocking:		total sum of C-channel out of service duration due to near end blockings.
commChannelOutages:		number of times a C-channel has been out of service.
octetsV5Frame:		number of octets transmitted or received within a LAPV5 frame.
activeStandby:		indicates if the C-channel is active or standby.

5.1.5.4 Communication channel history data

The communication channel history data object class is a class of managed objects representing the results of V5.2 communication channel oriented traffic measurements. It is a subclass of "ITU-T Recommendation Q.822:1993":historyData.

At the end of each current measurement interval an instance of this object class will be created. Instances of this object class may be contained in an instance of the object class commChannelCurrentData or in an instance of the object class "ETS 300 377-1":commChannel.

In addition to the inherited attributes, it has the same attributes as the related communication channel current data object class which are given in table 2.

5.1.6 Alarm surveillance fragment

Alarm surveillance functions are used to monitor or interrogate Network Elements (NEs) about events or conditions. The management information related to alarm surveillance is defined in ITU-T Recommendation Q.821 [8]. A summary is given in annex D.

5.1.7 Support fragment

5.1.7.1 Event report management

Event reporting management functions shall be used to establish and control the discrimination and the forwarding of event reports to other open systems. The management information related to event reporting is defined in CCITT Recommendation X.734 [16].

5.1.7.2 Log control function

Log control functions may be used to store event reports and local system notifications into logs and to control this log process. The management information related to log control is defined in CCITT Recommendation X.735 [17].

5.1.8 Test fragment

5.1.8.1 Access network ringback service treatment (anRbsTreatment)

The anRbsTreatment object class is a class of managed objects that represent the capability of an LE to support AN based tests initiated from the subscriber premises by dialling special service codes (ringback service). Instances of this object class will be pointed at by instances of object classes representing the special service codes. In addition, instances of anRbsTreatment may be pointed at by instances of other object classes representing tones or announcements which are related to particular steps and results of the test procedure identified by the service code.

In addition to the inherited attributes, it has the attributes given in table 3.

Table 3

Name	M/C/O	Value set
"I-ETS 300 292":treatmentId	M	RDN
applyTone	M	set
applyRingingCurrent	M	set
applyTone:	indicates the last test results to be used for applying tones or announcements to each subscriber line under test.	
applyRingingCurrent:	indicates subscriber lines where a ringing current is currently applied.	

5.2 Description of generic attributes

The description of generic attributes used within the information model is provided in ETS 300 377-1 [4]. The attributes specific to the information model are explained within the object class descriptions.

5.3 Description of generic actions

The description of generic actions used within the information model is provided in ETS 300 377-1 [4].

5.4 Description of generic notifications

The description of generic notifications used within the information model is provided in ETS 300 377-1 [4]. The notifications specific to the information model are explained within the object class descriptions.

6 Formal object class 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

In this subclause those object classes are specified whose instantiation is within the scope of this ETS. These object classes are either defined here or by reference to other specifications.

6.1.1 V5 interface fragment

The following classes which are defined in ETS 300 377-1 [4] may be instantiated:

- "ETS 300 377-1":v5Interface;
- "ETS 300 377-1":v5Ttp;
- "ETS 300 377-1":v5TimeSlot.

6.1.2 Access port fragment

The following classes which are defined in ETS 300 377-1 [4] may be instantiated:

- "ETS 300 377-1":virtualAnalogueAccess;
- "ETS 300 377-1":virtualBasicRateAccess;
- "ETS 300 377-1":virtualPrimaryRateAccess;
- "ETS 300 377-1":virtualLeasedAccess.

6.1.3 Communications path fragment

The following classes are which defined in ETS 300 377-1 [4] may be instantiated:

- "ETS 300 377-1":commChannel.

6.1.4 Protection fragment

The following classes which are defined in ETS 300 377-1 [4] may be instantiated:

- "ETS 300 377-1":v5ProtectionGroup;
- "ETS 300 377-1":v5ProtectionUnit.

6.1.5 Performance fragment

The following classes which are defined in ITU-T Recommendation X.738 [18] may be instantiated:

- "ITU-T Recommendation X.738:1993":simpleScanner;
- "ITU-T Recommendation X.738:1993":scanReportRecord.

In addition, the following definitions apply.

6.1.5.1 Bearer channel current data

bearerChannelCurrentData MANAGED OBJECT CLASS
DERIVED FROM "ITU-T Recommendation Q.822:1993":currentData;
CHARACTERIZED BY

bearerChannelCurrentDataPackage PACKAGE
BEHAVIOUR

bearerChannelCurrentDataBehaviour BEHAVIOUR

DEFINED AS "The bearerChannelCurrentData object class is a class of managed objects that contain the current bearer channel oriented traffic measurement data which is related to a V5.2 interface.

Instances of this object class are contained in instances of the v5Interface object class.";

```
ATTRIBUTES
    numberOfCommChannels    GET,
    numberOfV5Links        GET;
;;
CONDITIONAL PACKAGES
    eachWayBearerChannelMeasurementsPackage
        PRESENT IF "this object class is instantiated in a Local Exchange",
    bothWayBearerChannelMeasurementsPackage
        PRESENT IF "this object class is instantiated in an Access Network",
    unsuccessfulBearerChannelAllocationAttemptsPackage
        PRESENT IF "this object class is instantiated in a Local Exchange";
REGISTERED AS {managedObjectClass 1};
```

6.1.5.2 Bearer channel history data

```
bearerChannelHistoryData MANAGED OBJECT CLASS
DERIVED FROM "ITU-T Recommendation Q.822:1993":historyData;
CHARACTERIZED BY
    bearerChannelHistoryDataPackage PACKAGE
        BEHAVIOUR
            bearerChannelHistoryDataBehaviour BEHAVIOUR
                DEFINED AS "The bearerChannelHistoryData object class is a class of managed
                objects that contain a copy of the performance measurements present in a
                bearerChannelCurrentData object at the end of the current interval.
                Instances of this object class may be contained in an instance of the v5Interface object
                class or in an instance of the related bearerChannelCurrentData object class.";;
        ATTRIBUTES
            numberOfCommChannels    GET,
            numberOfV5Links        GET;
;;
CONDITIONAL PACKAGES
    eachWayBearerChannelMeasurementsPackage
        PRESENT IF "this object class is instantiated in a Local Exchange",
    bothWayBearerChannelMeasurementsPackage
        PRESENT IF "this object class is instantiated in an Access Network",
    unsuccessfulBearerChannelAllocationAttemptsPackage
        PRESENT IF "this object class is instantiated in a Local Exchange";
REGISTERED AS {managedObjectClass 2};
```

6.1.5.3 Communication channel current data

```
commChannelCurrentData MANAGED OBJECT CLASS
DERIVED FROM "ITU-T Recommendation Q.822:1993":currentData;
CHARACTERIZED BY
    commChannelCurrentDataPackage PACKAGE
        BEHAVIOUR
            commChannelCurrentDataBehaviour BEHAVIOUR
                DEFINED AS "The commChannelCurrentData object class is a class of managed
                objects that contain the current data of V5 C-channel related traffic measurement.
                Instances of this object class are contained in instances of the commChannel object
                class.";;
        ATTRIBUTES
            commChannelOutOfServiceAnyReason    GET,
            commChannelOutOfServiceFarEndBlock  GET,
            commChannelOutOfServiceNearEndBlock GET,
            commChannelOutages                  GET,
            octetsV5Frame                        GET,
            activeStandby                        GET;
;;
REGISTERED AS {managedObjectClass 3};
```

6.1.5.4 Communication channel history data

commChannelHistoryData MANAGED OBJECT CLASS

DERIVED FROM "ITU-T Recommendation Q.822:1993":historyData;

CHARACTERIZED BY

commChannelHistoryDataPackage PACKAGE

BEHAVIOUR

commChannelHistoryDataBehaviour BEHAVIOUR

DEFINED AS "The commChannelHistoryData object class is a class of managed objects that contain a copy of the performance measurements present in a commChannelCurrentData object at the end of the current interval.

Instances of this object class may be contained in an instance of the commChannel object class or in an instance of the related commChannelCurrentData object class.";

ATTRIBUTES

commChannelOutOfServiceAnyReason GET,

commChannelOutOfServiceFarEndBlock GET,

commChannelOutOfServiceNearEndBlock GET,

commChannelOutages GET,

octetsV5Frame GET,

activeStandby GET;

::

REGISTERED AS {managedObjectClass 4};

6.1.6 Alarm surveillance fragment

The following classes which are defined in ITU-T Recommendation Q.821 [8] may be instantiated:

- "ITU-T Recommendation Q.821:1993":currentAlarmSummaryControl;
- "ITU-T Recommendation Q.821:1993":managementOperationsSchedule.

6.1.7 Support fragment

In this subclause the classes of objects which are imported from other specifications for use in this ETS are defined. Only those classes are included whose instantiation is within the scope of this ETS. Uninstantiated superclasses are not included.

The following classes which are defined in CCITT Recommendation M.3100 [7] may be instantiated:

- "ITU-T Recommendation M.3100:1992":alarmSeverityAssignmentProfile;
- "ITU-T Recommendation M.3100:1992":managedElement.

The following classes which are defined in CCITT Recommendation X.721 [11] may be instantiated:

- "CCITT Recommendation X.721:1992":alarmRecord;
- "CCITT Recommendation X.721:1992":attributeValueChangeRecord;
- "CCITT Recommendation X.721:1992":eventForwardingDiscriminator;
- "CCITT Recommendation X.721:1992":log.

6.1.8 Test fragment

6.1.8.1 Access network ringback service treatment

anRbsTreatment MANAGED OBJECT CLASS
DERIVED FROM "I-ETS 300 292":treatment;
CHARACTERIZED BY

anRbsTreatmentPackage PACKAGE
BEHAVIOUR

anRbsTreatmentBehaviour BEHAVIOUR

DEFINED AS "The anRbsTreatment object class is a class of managed objects that represent the capability of an LE to support AN based tests initiated from the subscriber premises by dialling special service codes (ringback service). Instances of this object class will be pointed at by instances of object classes representing the special service codes. In addition, instances of anRbsTreatment may be pointed at by instances of other object classes representing tones or announcements which are related to particular steps and results of the test procedure identified by the service code.

Whenever one of those service codes is dialled the call routing function in the LE selects an appropriate instance of this object class. This instance shall then emit the offHook notification.

When a CPE under test goes on-hook this shall be reported by means of the onHook notification. Test results produced in the LE, e.g. by DTMF measurements, may optionally be contained in the information syntax of this notification.

When a user port address is added to the list contained in the applyRingingCurrent attribute the ringing current shall be applied to the associated subscriber line. The feeding shall stop when the CPE goes off-hook or when a pre-defined timer in the LE expires. The user port address shall then be removed from the attribute. A time out shall be reported by means of the timeOut notification.

When a user port address is added to the list contained in the applyTone attribute a tone or announcement related to the test result as specified in the information syntax of the attribute shall be applied to the associated subscriber line in order to indicate the test result. For associating tones or announcements to test results functions as specified in I-ETS 300 292 [1] may be used. The tone or announcement shall stop when the CPE goes on-hook or when a pre-defined timer in the LE expires or optionally when the next code is typed in at the CPE. The user port address and any related test result shall then be removed from the attribute. A time out shall be reported by means of the timeOut notification. The applyTone attribute may also be set by LE internal test procedures, e.g. DTMF measurements.";;

ATTRIBUTES

applyTone

DEFAULT VALUE ASN1FPLETypeModule.initialPointerS
GET-REPLACE ADD-REMOVE,

applyRingingCurrent

DEFAULT VALUE ASN1FPLETypeModule.initialPointerS
GET-REPLACE ADD-REMOVE;

NOTIFICATIONS

offHook,
onHook,
timeOut;

;;

REGISTERED AS {managedObjectClass 5};

6.2 Name bindings

This subclause specifies the new name bindings for the managed objects used in the management information model.

6.2.1 V5 interface fragment

The name bindings used for this fragment are specified in ETS 300 377-1 [4].

6.2.2 Access port fragment

The name bindings used for this fragment are specified in ETS 300 377-1 [4].

6.2.3 Communication path fragment

The name bindings used for this fragment are specified in ETS 300 377-1 [4].

6.2.4 Protection fragment

The name bindings used for this fragment are specified in ETS 300 377-1 [4].

6.2.5 Performance fragment

The name binding used for the object class scanReportRecord is specified in CCITT Recommendation X.721 [11].

For historyData objects another name binding to related currentData objects is defined in ITU-T Recommendation Q.822 [9]. In a given application, the naming of historyData objects shall be consistent for all instances of historyData subclasses (i.e., all shall be named from v5Interface and commChannel, respectively, or all shall be named from the currentData objects).

In addition, the following definitions apply.

6.2.5.1 Bearer channel current data

```
bearerChannelCurrentData-v5Interface NAME BINDING
  SUBORDINATE OBJECT CLASS bearerChannelCurrentData;
  NAMED BY SUPERIOR OBJECT CLASS "ETS 300 377-1":v5Interface;
  WITH ATTRIBUTE scannerId;
  CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
  DELETE;
REGISTERED AS {nameBinding 1};
```

6.2.5.2 Bearer channel history data

```
bearerChannelHistoryData-v5Interface NAME BINDING
  SUBORDINATE OBJECT CLASS bearerChannelHistoryData;
  NAMED BY SUPERIOR OBJECT CLASS "ETS 300 377-1":v5Interface;
  WITH ATTRIBUTE historyDataId;
  CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
  DELETE;
REGISTERED AS {nameBinding 2};
```

6.2.5.3 Communication channel current data

```
commChannelCurrentData-commChannel NAME BINDING
  SUBORDINATE OBJECT CLASS commChannelCurrentData;
  NAMED BY SUPERIOR OBJECT CLASS "ETS 300 377-1":commChannel;
  WITH ATTRIBUTE scannerId;
  CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
  DELETE;
REGISTERED AS {nameBinding 3};
```

6.2.5.4 Communication channel history data

```
commChannelHistoryData-v5Interface NAME BINDING
  SUBORDINATE OBJECT CLASS commChannelHistoryData;
  NAMED BY SUPERIOR OBJECT CLASS "ETS 300 377-1":commChannel;
  WITH ATTRIBUTE historyDataId;
  CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
  DELETE;
REGISTERED AS {nameBinding 4};
```

6.2.5.5 Simple scanner

```
simpleScanner-managedElement NAME BINDING
  SUBORDINATE OBJECT CLASS "ITU-T Recommendation X.738:1993":simpleScanner;
  NAMED BY
    SUPERIOR OBJECT CLASS "CCITT Recommendation M.3100:1992":managedElement;
  WITH ATTRIBUTE scannerId;
  CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
  DELETE;
REGISTERED AS {nameBinding 5};
```

6.2.6 Alarm surveillance fragment

The name bindings used for this fragment are specified in ITU-T Recommendation Q.821 [8].

6.2.7 Support fragment

The following name bindings used for this fragment are defined in CCITT Recommendation M.3100 [7]:

- a) alarmSeverityAssignmentProfile-managedElement;
- b) eventForwardingDiscriminator-managedElement;
- c) managedElement-network;
- d) log-managedElement.

The following name binding used for this fragment is defined in CCITT Recommendation X.721 [11]:

- alarmRecord-log.

6.2.8 Test fragment

6.2.8.1 Access network ringback service treatment

```
anRbsTreatment-managedElement NAME BINDING
  SUBORDINATE OBJECT CLASS anRbsTreatment;
  NAMED BY
    SUPERIOR OBJECT CLASS "CCITT Recommendation M.3100:1992":managedElement
    AND SUBCLASSES;
  WITH ATTRIBUTE treatmentId;
  CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
  DELETE;
REGISTERED AS {nameBinding 6};
```

6.3 Definition of packages

This subclause specifies the new packages for the managed objects used in the management information model.

6.3.1 Both-way bearer channel measurements package

```
bothWayBearerChannelMeasurementsPackage PACKAGE
  ATTRIBUTES
    bearerChannelAllocations      GET,
    bearerChannelHoldingTimes     GET,
    bearerChannelInServiceTimes  GET;
REGISTERED AS {package 1};
```

6.3.2 Each-way bearer channel measurements package

```
eachWayBearerChannelMeasurementsPackage PACKAGE
  ATTRIBUTES
    bearerChannelAllocationsOriginating      GET,
    bearerChannelAllocationsTerminating     GET,
    bearerChannelHoldingTimesOriginating    GET,
    bearerChannelHoldingTimesTerminating    GET,
    bearerChannelInServiceTimes             GET;
REGISTERED AS {package 2};
```

6.3.3 Unsuccessful bearer channel allocation attempts package

```
unsuccessfulBearerChannelAllocationAttemptsPackage PACKAGE
  ATTRIBUTES
    unsuccessfulBearerChannelAllocationAttemptsIncoming GET,
    unsuccessfulBearerChannelAllocationAttemptsInternal  GET;
REGISTERED AS {package 3};
```

6.4 Definition of attributes

This subclause specifies the new attributes for the managed objects used in the management information model.

6.4.1 Active standby

```
activeStandby ATTRIBUTE
  WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.ActiveStandby;
  MATCHES FOR EQUALITY;
  BEHAVIOUR
    activeStandbyBehaviour BEHAVIOUR
      DEFINED AS "This attribute indicates if the C-channel is an active or a standby channel or if
the configuration has changed during the measurement period.";;
REGISTERED AS {attribute 1};
```

6.4.2 Apply ringing current

```
applyRingingCurrent ATTRIBUTE
  WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.AnRingTest;
  MATCHES FOR EQUALITY;
  BEHAVIOUR
    applyRingingCurrentBehaviour BEHAVIOUR
      DEFINED AS "This attribute indicates all subscriber lines under test where a ringing current
is currently applied to the line.";;
REGISTERED AS {attribute 2};
```

6.4.3 Apply tone

applyTone ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.Results;
MATCHES FOR EQUALITY;
BEHAVIOUR
 applyToneBehaviour BEHAVIOUR
 DEFINED AS "This attribute indicates for each subscriber line under test the last test result
 which shall be used to apply the appropriate tones or announcements to the line.";;
REGISTERED AS {attribute 3};

6.4.4 Bearer channel allocations

bearerChannelAllocations ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.Count;
MATCHES FOR EQUALITY;
BEHAVIOUR
 bearerChannelAllocationsBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.1, item 1a --";;
REGISTERED AS {attribute 4};

6.4.5 Bearer channel allocations originating

bearerChannelAllocationsOriginating ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.Count;
MATCHES FOR EQUALITY;
BEHAVIOUR
 bearerChannelAllocationsOriginatingBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.1, item 1c --";;
REGISTERED AS {attribute 5};

6.4.6 Bearer channel allocations terminating

bearerChannelAllocationsTerminating ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.Count;
MATCHES FOR EQUALITY;
BEHAVIOUR
 bearerChannelAllocationsTerminatingBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.1, item 1b --";;
REGISTERED AS {attribute 6};

6.4.7 Bearer channel holding times

bearerChannelHoldingTimes ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.ObservedValue;
MATCHES FOR EQUALITY;
BEHAVIOUR
 bearerChannelHoldingTimesBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.1, item 2a --";;
REGISTERED AS {attribute 7};

6.4.8 Bearer channel holding times originating

bearerChannelHoldingTimesOriginating ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.ObservedValue;
MATCHES FOR EQUALITY;
BEHAVIOUR
 bearerChannelHoldingTimesOriginatingBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.1, item 2c --";;
REGISTERED AS {attribute 8};

6.4.9 Bearer channel holding times terminating

bearerChannelHoldingTimesTerminating ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.ObservedValue;
MATCHES FOR EQUALITY;
BEHAVIOUR
 bearerChannelHoldingTimesTerminatingBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.1, item 2b --";
REGISTERED AS {attribute 9};

6.4.10 Bearer channel in-service times

bearerChannelInServiceTimes ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.ObservedValue;
MATCHES FOR EQUALITY;
BEHAVIOUR
 bearerChannelInServiceTimesBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.1, item 4 --";
REGISTERED AS {attribute 10};

6.4.11 Communication channel outages

commChannelOutages ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.Count;
MATCHES FOR EQUALITY;
BEHAVIOUR
 commChannelOutagesBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.2, item 4 --";
REGISTERED AS {attribute 11};

6.4.12 Communication channel out of service any reason

commChannelOutOfServiceAnyReason ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.ObservedValue;
MATCHES FOR EQUALITY;
BEHAVIOUR
 channelOutOfServiceAnyReasonBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.2, item 1 --";
REGISTERED AS {attribute 12};

6.4.13 Communication channel out of service far end block

commChannelOutOfServiceFarEndBlock ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.ObservedValue;
MATCHES FOR EQUALITY;
BEHAVIOUR
 channelOutOfServiceFarEndBlockBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.2, item 3 --";
REGISTERED AS {attribute 13};

6.4.14 Communication channel out of service near end block

commChannelOutOfServiceNearEndBlock ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.ObservedValue;
MATCHES FOR EQUALITY;
BEHAVIOUR
 channelOutOfServiceNearEndBlockBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.2, item 2 --";
REGISTERED AS {attribute 14};

6.4.15 Number of channels

numberOfCommChannels ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.NumberOfChannels;
MATCHES FOR EQUALITY;
BEHAVIOUR
 numberOfCChannelsBehaviour BEHAVIOUR
 DEFINED AS "This attribute gives the number of time slots which are assigned as
 C-channels in the given V5 link.";;
REGISTERED AS {attribute 15};

6.4.16 Number of V5 links

numberOfV5Links ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.NumberOfV5Links;
MATCHES FOR EQUALITY;
BEHAVIOUR
 numberOfV5LinksBehaviour BEHAVIOUR
 DEFINED AS "This attribute gives the number of V5 links which comprise the V5 interface.";;
REGISTERED AS {attribute 16};

6.4.17 Octets V5 frame

octetsV5Frame ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.Count;
MATCHES FOR EQUALITY;
BEHAVIOUR
 octetsV5FrameBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.2, item 5 --";;
REGISTERED AS {attribute 17};

6.4.18 Unsuccessful bearer channel allocation attempts incoming

unsuccessfulBearerChannelAllocationAttemptsIncoming ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.Count;
MATCHES FOR EQUALITY;
BEHAVIOUR
 unsuccessfulBearerChannelAllocationAttemptsIncomingBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.1, item 3a --";;
REGISTERED AS {attribute 18};

6.4.19 Unsuccessful bearer channel allocation attempts internal

unsuccessfulBearerChannelAllocationAttemptsInternal ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1FPLETypeModule.Count;
MATCHES FOR EQUALITY;
BEHAVIOUR
 unsuccessfulBearerChannelAllocationAttemptsInternalBehaviour BEHAVIOUR
 DEFINED AS "-- see annex B, clause B.1, item 3b --";;
REGISTERED AS {attribute 19};

6.5 Definition of actions

No specific actions are specified for the managed objects used in the management information model.

6.6 Definition of notifications**6.6.1 Off hook**

offHook NOTIFICATION
BEHAVIOUR

offHookBehaviour BEHAVIOUR

DEFINED AS "This notification indicates that a CPE under test has changed to the off-hook condition. It contains the associated user port address and the dialled service code.";;

WITH INFORMATION SYNTAX ASN1FPLETypeModule.OffHook;

REGISTERED AS {notification 1};

6.6.2 On hook

onHook NOTIFICATION
BEHAVIOUR

onHookBehaviour BEHAVIOUR

DEFINED AS "This notification indicates that a CPE under test has changed to the on-hook condition. It contains the associated user port address and optionally test results produced in the LE for this user port.";;

WITH INFORMATION ASN1FPLETypeModule.OnHook;

REGISTERED AS {notification 2};

6.6.3 Time out

timeOut NOTIFICATION
BEHAVIOUR

timeOutBehaviour BEHAVIOUR

DEFINED AS "This notification indicates that a procedure applying a tone or ringing current to a subscriber line under test has been terminated. It contains the associated user port address.";;

WITH INFORMATION ASN1FPLETypeModule.UserPort;

REGISTERED AS {notification 3};

6.7 Definition of parameters**6.7.1 Layer 3 port address**

layer3PortAddress PARAMETER

CONTEXT EVENT-INFO;

WITH SYNTAX ASN1FPLETypeModule.Layer3PortAddress;

BEHAVIOUR

layer3PortAddressAddInf BEHAVIOUR

DEFINED AS "The layer3PortAddress shall be carried in the additionalInformation field of the communicationsAlarm notification for those cases specified in annex A.";;

REGISTERED AS {parameter 1};

6.7.2 Envelope function address

envelopeFunctionAddress PARAMETER

CONTEXT EVENT-INFO;

WITH SYNTAX ASN1FPLETypeModule.EnvelopeFunctionAddress;

BEHAVIOUR

envelopeFunctionAddressAddInf BEHAVIOUR

DEFINED AS "The envelopeFunctionAddress shall be carried in the additionalInformation field of the communicationsAlarm notification for those cases specified in annex A.";;

REGISTERED AS {parameter 2};

6.7.3 Cause value

```
causeValue PARAMETER
CONTEXT EVENT-INFO;
WITH SYNTAX ASN1FPLETypeModule.CauseValue;
BEHAVIOUR
    causeValueAddInf BEHAVIOUR
    DEFINED AS "The causeValue shall be carried in the additionalInformation field of the
communicationsAlarm notification for those cases specified in annex A.";;
REGISTERED AS {parameter 3};
```

6.8 ASN.1 defined types module

```
ASN1FPLETypeModule {ccitt(0) identified-organization(4) etsi(0) v5LeFPManagement(379)
informationModel(0) asnlModule(2) asnlTypeModule(0)}

DEFINITIONS IMPLICIT TAGS ::=

BEGIN -- EXPORTS everything

IMPORTS
-- I-ETS 300 292 [1]
    DigitComb
    FROM ASN1TypeModule
        {ccitt(0) identified-organization(4) etsi(0) callRoutingInformationManagement(292)
informationModel(0) asnlModule(2) asnlTypeModule(0)}
-- ETS 300 377-1 [4]
    EnvelopeFunctionAddress,
    Layer3PortAddress,
    initialPointerS
    FROM ASN1DefinedTypesModule
        {ccitt(0) identified-organization(4) etsi(0) v5LeConfigurationManagement(377)
informationModel(0) asnlModule(2) asnlDefinedTypesModule(0)}
-- CCITT Recommendation X.721 [11]
    AdditionalInformation,
    Count,
    ObservedValue,
    ProbableCause,
    SpecificProblems
    FROM Attribute-ASN1Module {joint-iso-ccitt ms(9) smi(3) part2(2) asnlModule(2) 1}
-- CCITT Recommendation X.745 [20]
    TestOutcome
    FROM Test-ASN1Module {joint-iso-ccitt ms(9) function(2) part12(12) asnlModule(2) 0}
;

informationModel OBJECT IDENTIFIER ::= {ccitt(0) identified-organization(4) etsi(0)
v5LeFPManagement(379) 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)}
notification OBJECT IDENTIFIER ::= {informationModel notification(10)}
parameter OBJECT IDENTIFIER ::= {informationModel parameter(11)}

v5SpecificProblems OBJECT IDENTIFIER ::= {standardSpecificExtension 0}
v5ProbableCause OBJECT IDENTIFIER ::= {standardSpecificExtension 1}
v5CauseValue OBJECT IDENTIFIER ::= {standardSpecificExtension 2}

-- The value assignments for the SpecificProblems parameter of the V5 specific communications
-- alarm notification are specified below

bccProtocolDataLinkError SpecificProblems ::= {{v5SpecificProblems 1}}
bccProtocolSyntaxError SpecificProblems ::= {{v5SpecificProblems 2}}
bccProtocolTimeOutError SpecificProblems ::= {{v5SpecificProblems 3}}
cessationOfFlagsError SpecificProblems ::= {{v5SpecificProblems 4}}
commonControlProtocolDataLinkError SpecificProblems ::= {{v5SpecificProblems 5}}
commonControlProtocolSyntaxError SpecificProblems ::= {{v5SpecificProblems 6}}
commonControlProtocolTimeOutError SpecificProblems ::= {{v5SpecificProblems 7}}
crcError SpecificProblems ::= {{v5SpecificProblems 8}}
internalFailure SpecificProblems ::= {{v5SpecificProblems 9}}
isdnLayer1ActivationFault SpecificProblems ::= {{v5SpecificProblems 10}}
isdnLayer2Fault SpecificProblems ::= {{v5SpecificProblems 11}}
isdnLayer3Fault SpecificProblems ::= {{v5SpecificProblems 12}}
linkControlProtocolDataLinkError SpecificProblems ::= {{v5SpecificProblems 13}}
linkControlProtocolLayer3AddressError SpecificProblems ::= {{v5SpecificProblems 14}}
linkControlProtocolOutOfService SpecificProblems ::= {{v5SpecificProblems 15}}
linkControlProtocolSyntaxError SpecificProblems ::= {{v5SpecificProblems 16}}
linkControlProtocolTimeOutError SpecificProblems ::= {{v5SpecificProblems 17}}
linkIdFailure SpecificProblems ::= {{v5SpecificProblems 18}}
```

```

portControlProtocolError                SpecificProblems ::= {{v5SpecificProblems 19}}
portControlProtocolLayer3AddressError   SpecificProblems ::= {{v5SpecificProblems 20}}
portControlProtocolSyntaxError          SpecificProblems ::= {{v5SpecificProblems 21}}
portControlProtocolTimeOutError         SpecificProblems ::= {{v5SpecificProblems 22}}
protectionProtocolDataLinkError         SpecificProblems ::= {{v5SpecificProblems 23}}
protectionProtocolSyntaxError           SpecificProblems ::= {{v5SpecificProblems 24}}
protectionProtocolTimeOutError          SpecificProblems ::= {{v5SpecificProblems 25}}
pstnProtocolDataLinkError               SpecificProblems ::= {{v5SpecificProblems 26}}
pstnProtocolLayer3AddressError          SpecificProblems ::= {{v5SpecificProblems 27}}
pstnProtocolSyntaxError                 SpecificProblems ::= {{v5SpecificProblems 28}}
pstnProtocolTimeOutError                SpecificProblems ::= {{v5SpecificProblems 29}}
v5InterfaceIdFailure                   SpecificProblems ::= {{v5SpecificProblems 30}}
v5InterfaceProvisioningMismatchFailure  SpecificProblems ::= {{v5SpecificProblems 31}}

-- Additional value assignments for the ProbableCause parameter of the V5 specific communications
-- alarm notification are specified below

lossOfFrameLossOfSignal                 ProbableCause   ::= globalValue {v5ProbableCause 1}
unintentionalLoopBack                   ProbableCause   ::= globalValue {v5ProbableCause 2}

-- The value assignments for the causeValue are specified below

protocolDiscriminatorError              CauseValue      ::= {v5CauseValue 0}
messageTypeUnrecognized                 CauseValue      ::= {v5CauseValue 1}
outOfSequenceElement                   CauseValue      ::= {v5CauseValue 2}
repeatedOptionalElement                 CauseValue      ::= {v5CauseValue 3}
mandatoryElementMissing                 CauseValue      ::= {v5CauseValue 4}
unrecognizedElement                     CauseValue      ::= {v5CauseValue 5}
mandatoryElementContentError            CauseValue      ::= {v5CauseValue 6}
optionalElementContentError             CauseValue      ::= {v5CauseValue 7}
messageNotCompatible                     CauseValue      ::= {v5CauseValue 8}
repeatedMandatoryElement                CauseValue      ::= {v5CauseValue 9}
tooManyElements                         CauseValue      ::= {v5CauseValue 10}

ActiveStandby                           ::= ENUMERATED {
                                active           (0),
                                standby          (1),
                                changed          (2)}

AnRingTest                               ::= SET OF UserPort

CauseValue                               ::= OBJECT IDENTIFIER

NumberOfChannels                          ::= INTEGER

NumberOfV5Links                          ::= INTEGER

OffHook                                   ::= SEQUENCE {
                                port              [0] UserPort,
                                serviceNumber    [1] DigitComb}

OnHook                                    ::= SEQUENCE {
                                port              [0] UserPort,
                                dtmfResult       [1] TestOutcome OPTIONAL}

Results                                   ::= SET OF SEQUENCE {
                                port              [0] UserPort,
                                result           [1] TestOutcome}

UserPort                                  ::= CHOICE {
                                pstn             [0] Layer3PortAddress,
                                isdn            [1] EnvelopeFunctionAddress}

END -- of ASN1FPLETypeModule

```

7 Protocol requirements

The protocol stack for use on this Q3 interface is the same as that specified in the companion standard on configuration management, ETS 300 377-1 [4], clause 8.

Annex A (normative): Specification of parameters for V5 specific alarm reports

Alarm reports shall be generated using the communicationsAlarm notification, as defined in CCITT Recommendation X.721 [11], whenever one of the following events occur. The reports shall use the alarm report parameters as specified below.

The parameters are defined in ITU-T Recommendation Q.821 [8], CCITT Recommendation X.721 [11] and in this ETS, respectively.

The values for the parameter perceived severity as given below are defaults. They may be modified by means of the alarm event criteria function as specified in ITU-T Recommendation Q.821 [8].

NOTE: All parameters and parameter values given in the following list are mandatory in the context of V5 alarm reporting if not marked as optional.

A.1 Alarm reports related to the V5 interface object class

A.1.1 Control protocol errors

Event: Persistent control protocol timer expiration error
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclause 14.4.4.6
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: communicationsSubsystemFailure (CCITT Recommendation X.721 [11])
Specific problems: commonControlProtocolTimeOutError
Perceived severity: critical

Event: Persistent control protocol syntax errors
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclause 14.4.4.2
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: commonControlProtocolSyntaxError
Perceived severity: major

NOTE 1: Reporting of this event is optional.

Event: Persistent port control protocol syntax errors
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclause 14.4.4.2.2
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: portControlProtocolLayer3AddressError
Perceived severity: warning
Additional information: layer3PortAddress or envelopeFunctionAddress

NOTE 2: This event report shall be used to indicate that an unknown layer 3 address has been received.

A.1.2 Link control protocol errors

Event: Persistent link control protocol layer 3 address error
Reference: V5.2: ETS 300 347-1 [3], subclause 16.3.5.2
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: linkControlProtocolLayer3AddressError
Perceived severity: major
Monitored attribute: assocV5Interface, linkId
Additional information: layer3PortAddress

NOTE: This event report shall be used to indicate that an unknown layer 3 address has been received.

A.1.3 BCC protocol errors

Event: Persistent BCC protocol timer expiration error
Reference: V5.2: ETS 300 347-1 [3], subclauses 17.5.2 to 17.5.4, 17.5.6 and 17.5.7
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: communicationsSubsystemFailure (CCITT Recommendation X.721 [11])
Specific problems: bccProtocolTimeOutError
Perceived severity: critical
Additional information: causeValue

NOTE 1: If a protocol error message has been received in the LE the cause value contained in this message shall be included in the additional information parameter.

Event: Persistent BCC protocol syntax errors
Reference: V5.2: ETS 300 347-1 [3], subclause 17.5.8
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: bccProtocolSyntaxErrors
Perceived severity: major

NOTE 2: Reporting of this event is optional.

A.1.4 Protection protocol errors

Event: Persistent protection protocol timer expiration error
Reference: V5.2: ETS 300 347-1 [3], subclauses 18.6.2.3.2, 18.6.3.3 and 18.6.5.4
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: protectionProtocolTimeOutError
Perceived severity: critical

NOTE 1: If a protocol error message has been received in the LE the cause value contained in this message shall be included in the additional information parameter.

Event: Persistent protection protocol syntax error
Reference: V5.2: ETS 300 347-1 [3], subclause 18.6.6
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: protectionProtocolSyntaxError
Perceived severity: major

NOTE 2: Reporting of this event is optional.

A.1.5 PSTN protocol errors

Event: Restart timer error
Reference: V5.1: ETS 300 324-1 [2], subclause 13.5.4.3 and annex C, item 14;
V5.2: ETS 300 347-1 [3], annex C, item 14
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: pstnProtocolTimeOutError
Perceived severity: major

Event: Persistent PSTN protocol layer 3 address errors
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclause 13.5.2.3
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: pstnProtocolLayer3AddressError
Perceived severity: warning
Additional information: layer3PortAddress

NOTE: This event report shall be used to indicate that an unknown layer 3 address has been received.

A.1.6 Interface control failures

Event: Interface identification failure
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclause 14.5.4 and annex C, item 13
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: configurationOrCustomizationError (CCITT Recommendation X.721 [11])
Specific problems: v5InterfaceIdFailure
Perceived severity: critical

Event: V5 Interface Provisioning Mismatch Failure
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclause 14.5.4 and annex C, item 13
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: configurationOrCustomizationError (CCITT Recommendation X.721 [11])
Specific problems: v5InterfaceProvisioningMismatchFailure
Perceived severity: major

NOTE: This alarm report shall be used to indicate a mismatch of the provisioning variants used in AN and LE during a startup or restart procedure.

A.1.7 V5 data link failures

Event: Persistent link control protocol data link failures
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclauses 10.4.1, 10.4.5.1.3 and annex C, item 17
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: communicationsSubsystemFailure (CCITT Recommendation X.721 [11])
Specific problems: linkControlProtocolDataLinkError
Perceived severity: critical

Event: Persistent BCC protocol data link failures
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclauses 10.4.1, 10.4.5.1.3 and annex C, item 17
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: communicationsSubsystemFailure (CCITT Recommendation X.721 [11])
Specific problems: bccProtocolDataLinkError
Perceived severity: critical

Event: Persistent protection protocol data link failures
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclauses 10.4.1, 10.4.5.1.3 and annex C, item 17
Managed object class: v5Interface
Event type: communicationsAlarm
Probable cause: communicationsSubsystemFailure (CCITT Recommendation X.721 [11])
Specific problems: protectionProtocolDataLinkError
Perceived severity: critical

Event: Persistent PSTN protocol data link failures
 Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclauses 10.4.1, 10.4.5.1.3 and annex C, item 17
 Managed object class: v5Interface
 Event type: communicationsAlarm
 Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
 Specific problems: pstnProtocolDataLinkError
 Perceived severity: major

A.2 Alarm reports related to the V5 trail termination point object class

A.2.1 Link control failures

Event: Link identification failure
 Reference: V5.2: ETS 300 347-1 [3], subclause 16.2.4.3.5
 Managed object class: v5Ttp
 Event type: communicationsAlarm
 Probable cause: configurationOrCustomizationError (CCITT Recommendation X.721 [11])
 Specific problems: linkIdFailure
 Perceived severity: critical
 Monitored attribute: assocV5Interface, linkId

Event: Persistent link control protocol timer expiration error
 Reference: V5.2: ETS 300 347-1 [3], subclause 16.3.4.4
 Managed object class: v5Ttp
 Event type: communicationsAlarm
 Probable cause: communicationsSubsystemFailure (CCITT Recommendation X.721 [11])
 Specific problems: linkControlProtocolTimeOutError
 Perceived severity: critical

Event: Persistent link control protocol syntax errors
 Reference: V5.2: ETS 300 347-1 [3], subclause 16.3.5 (excluding subclause 16.3.5.2)
 Managed object class: v5Ttp
 Event type: communicationsAlarm
 Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
 Specific problems: linkControlProtocolSyntaxError
 Perceived severity: major

NOTE: Reporting of this event is optional.

Event: Persistent link control protocol error while "Out of Service"
 Reference: V5.2: ETS 300 347-1 [3], subclause 16.3.4.2
 Managed object class: v5Ttp
 Event type: communicationsAlarm
 Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
 Specific problems: linkControlProtocolOutOfService
 Perceived severity: major
 Monitored attribute: assocV5Interface, linkId

Event: Persistent link control protocol layer 3 address error
 Reference: V5.2: ETS 300 347-1 [3], subclause 16.3.5.2
 Managed object class: v5Ttp
 Event type: communicationsAlarm
 Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
 Specific problems: linkControlProtocolLayer3AddressError
 Perceived severity: major
 Monitored attribute: assocV5Interface, linkId
 Additional information: layer3PortAddress

A.2.2 Link layer 1 failures

Event: Reception of AIS
Reference: V5.1: ETS 300 324-1 [2], subclause 14.3;
V5.2: ETS 300 347-1 [3], subclause 16.1
Managed object class: v5Ttp
Event type: communicationsAlarm
Probable causes: AIS (ITU-T Recommendation Q.821 [8])
Perceived severity: minor

Event: LFA
Reference: V5.1: ETS 300 324-1 [2], subclause 14.3;
V5.2: ETS 300 347-1 [3], subclause 16.1
Managed object class: v5Ttp
Event type: communicationsAlarm
Probable causes: lossOfFrame (ITU-T Recommendation Q.821 [8], CCITT Recommendation X.721 [11])
Perceived severity: minor

Event: Reception of RAI
Reference: V5.1: ETS 300 324-1 [2], subclause 14.3;
V5.2: ETS 300 347-1 [3], subclause 16.1
Managed object class: v5Ttp
Event type: communicationsAlarm
Probable causes: remoteAlarmInterface (CCITT Recommendation M.3100 [7])
Perceived severity: minor

Event: Persistent CRC error
Reference: V5.1: ETS 300 324-1 [2], subclause 14.3;
V5.2: ETS 300 347-1 [3], subclause 16.1.4
Managed object class: v5Ttp
Event type: communicationsAlarm
Probable causes: transmissionError (CCITT Recommendation M.3100 [7])
Specific Problem: crcError
Perceived severity: minor

NOTE: The exact specification of the meaning of "persistent" is outside the scope of this ETS.

Event: Internal failure
Reference: V5.1: ETS 300 324-1 [2], subclause 14.3;
V5.2: ETS 300 347-1 [3], subclause 16.1.4
Managed object class: v5Ttp
Event type: communicationsAlarm
Probable causes: localNodeTransmissionError (CCITT Recommendation X.721 [11])
Specific Problem: internalFailure
Perceived severity: minor

A.3 Alarm reports related to the V5 time slot object class

A.3.1 V5 communication channel failures

Event: Cessation of flags on a C-channel
Reference: V5.2: ETS 300 347-1 [3], subclause 18.1.5.2
Managed object class: v5TimeSlot
Event type: communicationsAlarm
Probable cause: localNodeTransmissionError (CCITT Recommendation X.721 [11])
Specific problems: cessationOfFlagsError
Perceived severity: minor

A.4 Alarm reports related to the virtual access port object class and subclasses

A.4.1 Control protocol errors

Event: Persistent port control protocol timer expiration errors
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclause 14.4.4.5
Managed object class: virtualAccessPort and subclasses
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: portControlProtocolTimeOutError
Perceived severity: minor

Event: Persistent port control protocol errors while "Out of Service"
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclause 14.4.4.3
Managed object class: virtualAccessPort and subclasses
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: portControlProtocolError
Perceived severity: warning

Event: Persistent port control protocol syntax errors
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclause 14.4.4.2 (excluding subclause 14.4.4.2.2)
Managed object class: virtualAccessPort and subclasses
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: portControlProtocolSyntaxError
Perceived severity: warning

NOTE: Reporting of this event is optional.

Event: Persistent port control protocol syntax errors
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclause 14.4.4.2.2
Managed object class: virtualAccessPort and subclasses
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: portControlProtocolLayer3AddressError
Perceived severity: warning
Additional information: layer3PortAddress or envelopeFunctionAddress

A.4.2 PSTN protocol errors

Event: PSTN protocol syntax errors
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclause 13.5.2 (excluding subclause 13.5.2.3)
Managed object class: virtualAnalogueAccess
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: pstnProtocolSyntaxError
Perceived severity: warning

NOTE: Reporting of this event is optional.

Event: Persistent PSTN protocol layer 3 address errors
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclause 13.5.2.3
Managed object class: virtualAnalogueAccess
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: pstnProtocolLayer3AddressError
Perceived severity: warning

Event: Persistent PSTN protocol timer expiration errors
Reference: V5.1 and V5.2: ETS 300 324-1 [2], subclauses 13.5.5.2.11 and 13.5.7
Managed object class: virtualAnalogueAccess
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: pstnProtocolTimeOutError
Perceived severity: minor

A.4.3 ISDN layer faults

Event: ISDN layer 1 activation fault
Reference: -
Managed object class: virtualBasicRateAccess, virtualPrimaryRateAccess
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: isdnLayer1ActivationFault
Perceived severity: warning

NOTE 1: This event indicates a layer 1 activation fault. It is only relevant for ISDN access with permanent layer 1 requested in the dChannelActivation attribute.

Event: ISDN layer 2 fault
Reference: CEPT Recommendation T/S 54-08 E [5], subclause 3.2
Managed object class: virtualBasicRateAccess, virtualPrimaryRateAccess
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: isdnLayer2Fault
Perceived severity: warning

NOTE 2: This event is only relevant for ISDN access with permanent layer 2 requested in the dChannelActivation attribute.

Event: ISDN layer 3 fault
Reference: CEPT Recommendation T/S 54-08 E [5], subclause 3.2
Managed object class: virtualBasicRateAccess, virtualPrimaryRateAccess
Event type: communicationsAlarm
Probable cause: communicationsProtocolError (CCITT Recommendation X.721 [11])
Specific problems: isdnLayer3Fault
Perceived severity: warning

Annex B (normative): V5 specific traffic measurement

B.1 Bearer channel oriented measurements at the V5 interface

The following bearer channel oriented traffic measurements may be performed whenever a V5.2 interface is used to connect subscriber accesses to the LE. The measurements shall be performed per V5 interface on the basis of 15 minute intervals.

1a) Total number of bearer channel allocations bothway

This measurement gives the number of bearer channel allocations to user ports in the AN per V5 interface for calls terminating or originating at subscriber terminals which are connected to these ports.

In the AN bearer channel allocations are identified by a MDU-BCC (Allocation indication) sent from the BCC protocol entity to the resource manager and answered by a MDU-BCC (Allocation response complete) primitive.

Units: number of events.

NOTE 1: Measurement 1a is to performed in the AN only.

1b) Measurement of the total number of bearer channel allocations for terminating traffic

This measurement gives the number of bearer channel allocations to user ports in the AN per V5 interface for calls terminating at subscriber terminals which are connected to these ports.

In the LE bearer channel allocations are identified by a MDU-BCC (Allocation request) sent from the resource manager to the BCC protocol entity and answered by a MDU-BCC (Allocation confirmation) primitive.

Units: number of events.

NOTE 2: Measurement 1b is to performed in the LE only.

1c) Total number of bearer channel allocations for originating traffic

This measurement gives the number of bearer channel allocations to user ports in the AN per V5 interface for calls originating at subscriber terminals which are connected to these ports.

In the LE bearer channel allocations are identified by a MDU-BCC (Allocation request) sent from the resource manager to the BCC protocol entity and answered by a MDU-BCC (Allocation confirmation) primitive.

Units: number of events.

NOTE 3: Measurement 1c is to performed in the LE only.

2a) Total sum of bearer channel holding times bothway

This measurement gives the total sum of bearer channel allocation duration for calls terminating or originating at subscriber terminals which are connected to user ports in the AN and can be reached via this V5 interface.

In the AN, the bearer channel allocation duration may start with the MDU-BCC (Allocation response complete) primitive and stop with the MDU-BCC (Deallocation response complete) primitive sent from the resource manager to the BCC protocol entity.

Units: seconds.

NOTE 4: Measurement 2a is to performed in the AN only.

2b) Total sum of bearer channel holding times for terminating traffic

This measurement gives the total sum of bearer channel allocation duration for calls terminating at subscriber terminals which are connected to user ports in the AN and can be reached via this V5 interface.

In the LE, the bearer channel allocation duration starts with the MDU-BCC (Allocation confirmation) primitive and stops with the MDU-BCC (Deallocation confirmation) primitive received in the resource manager.

Units: seconds.

NOTE 5: Measurement 2b is to performed in the LE only.

2c) Total sum of bearer channel holding times for originating traffic

This measurement gives the total sum of bearer channel allocation duration for calls originating at subscriber terminals which are connected to user ports in the AN and can be reached via this V5 interface.

In the LE, the bearer channel allocation duration starts with the MDU-BCC (Allocation confirmation) primitive and stops with the MDU-BCC (Deallocation confirmation) primitive received in the resource manager.

Units: seconds.

NOTE 6: Measurement 2c is to performed in the LE only.

3a) Number of unsuccessful bearer channel allocation attempts for incoming traffic

This measurement gives the number of bearer channel allocation requests for calls from the transit network to the BCC protocol entity which do not receive a bearer channel.

These unsuccessful attempts are identified by a MDU-BCC (Allocation request) primitive sent from the resource manager to the BCC protocol entity which is not answered by a MDU-BCC (Allocation confirmation) primitive.

Units: number of events.

NOTE 7: Measurement 3a is to performed in the LE only.

3b) Number of unsuccessful bearer channel allocation attempts for LE internal traffic

This measurement gives the number of bearer channel allocation requests for LE internal calls to the BCC protocol entity which do not receive a bearer channel.

These unsuccessful attempts are identified by a MDU-BCC (Allocation request) primitive sent from the resource manager to the BCC protocol entity which is not answered by a MDU-BCC (Allocation confirmation) primitive.

Units: number of events.

NOTE 8: Measurement 3b is to performed in the LE only.

4) Total sum of bearer channel in-service times

This measurement gives the total sum of in-service times of all V5 time slots which can be used for bearer channels during the measurement interval.

Units: seconds.

B.2 Communication channel oriented measurements at the V5 interface

The following C-channel oriented traffic measurements may be performed whenever a V5.1 or V5.2 interface is used to connect subscriber accesses to the LE. The measurements shall be performed per V5 C-channel on the basis of 15 minute intervals.

1) Duration of C-channel out-of-service due to any reason

This measurement gives the total sum of duration a C-channel has been out of service due to any reason.

Units: seconds/C-channel.

2) Duration of C-channel out-of-service due to near end blocking

This measurement gives the total sum of duration a C-channel has been out of service due to blockings initiated locally.

Units: seconds/C-channel.

3) Duration of C-channel out of service by far end blocking

This measurement gives the total sum of duration a C-channel has been out of service due to blockings initiated by the remote side.

Units: seconds/C-channel.

4) Number of C-channel outages

This measurement gives the total number of times a C-channel has been out of service due to any reason.

Units: number of events.

5) Number of LAPV5-EF frame octets on a C-channel

This measurement gives the total number of frame octets which have been transmitted or received within a LAPV5 frame in this C-channel including the overhead octets (see also ETS 300 324-1 [2], subclause 11.3). It includes the start flag of the LAPV5 frame and all octets between this and the stop flag. The stop flag and any idle flags are excluded from this measurement.

Units: number of events.

Annex C (informative): Task Information Base (TIB)

C.1 TMN management service "Fault management of V5 interfaces and associated user ports"

C.1.1 Description

Fault management of V5 interfaces and associated user ports is part of a management activity which is performed by the operator in order to detect failure conditions and to bring the customer access back to its normal state of operation whenever a deviation occurs. A customer access is considered as being that part of the local network which extends from the network termination equipment up to and including the exchange termination.

In this clause, only the parts of the activities are covered which are directly related to a V5 interface between a LE and an AN or to that part of the customer access which extends from the AN to the network termination equipment. An ISDN access extends to but does not include the T reference point. An analogue access extends to and may include the CPE.

C.1.2 Components of service (TIB A)

a) Failure detection

Observe or supervise the V5 interface and the customer line and collect relevant data in order to detect failures or degradations. Perform continuous or periodic checks of the system functions.

b) System protection

Initiate blocking of V5 interface or parts of it and user access ports. Initiate protection switching for the V5 interface (V5.2 only).

c) Failure information

Send alarms and event reports from the NE to TMN with failure information related to V5 interfaces and customer lines.

d) Failure localization

Receive failure information from NEs which may be generated by performing tests and measurements on V5 interfaces or customer lines. Initiate additional fault localization procedures and receive information from these procedures.

e) Fault correction

Replace faulty V5 interface equipment or user access port equipment with working replacements. Restart the V5 interface in order to eliminate NE internal problems.

f) Verification

Apply the appropriate tests and measurements to the replaced component before bringing it back to service.

g) Restoration

Restore the component to service. Unblock the blocked V5 interfaces or user access ports.

C.1.3 Management function list (TIB B)

a) Request status

TMN requests NE to send the current status information related to the V5 interface or to the user access port.

b) Initiate switch-over

TMN directs NE to switch a specified V5 communication channel:

- to a standby C-channel which then becomes the active C-channel; or
- to an active C-channel which will be pre-empted (this is valid for Q(LE) only).

c) Report automatic switch-over

NE notifies TMN that an automatic switch-over to a standby V5 communication channel has occurred.

d) Set service state

TMN directs NE to place a user access port, a V5 interface or parts of it in a specified service state, e.g. in service (available for use), standby (not for normal use), out of service (unavailable for use).

e) Alarm report

NE notifies TMN of alarm information concerning user access ports or V5 interfaces or parts of it.

f) Set alarm conditions

TMN directs NE to assign specific alarm parameters, modes and thresholds to alarms concerning user access ports or V5 interfaces or parts of it.

g) Apply test signals

TMN directs NE to send test signals to the terminating equipment or to the line circuit, e.g. ringing signals, dial pulses, meter pulses.

h) Remove test signals

TMN directs NE to remove the test signal sent by the apply function.

i) Request test results

TMN requests NE to report intermediate or final results from a test or measurement applied to a customer line or a line circuit.

j) Test result report

NE sends the results of a test or measurement applied to a customer line or a line circuit to TMN.

C.2 TMN management service "Performance management of V5 interfaces and associated user ports"

C.2.1 Description

Performance Management (PM) of V5 interfaces and associated user ports is part of a management activity which is employed in order to maintain the quality of service levels agreed with the customers. The activities undertaken in performance management are monitoring, analysis and problem alerting, diagnosis, optimization and control.

In this clause, only the parts of the activities are covered which are directly related to a V5 interface between a LE and an AN or to that part of the customer access which extends from the AN to the network termination equipment. An ISDN access extends to but does not include the T reference point. An analogue access extends to and may include the CPE.

C.2.2 Components of service (TIB A)

a) Performance monitoring

Initiate the collection of PM data concerning the load of a C-channel.

b) Performance information

Notify the TMN when PM thresholds have been crossed in the monitored ISDN digital section. Send PM data reports related to C-channel load to the TMN.

C.2.3 Management function list (TIB B)

a) Start/stop PM data

Start or stop the collection of C-channel load data in order to monitor the current load of a particular C-channel.

b) PM data report

The NE sends a report containing the new transmission quality level to the TMN. It will be generated whenever a predefined threshold has been crossed in an ISDN digital section being monitored. The NE sends reports containing the current load of the C-channels to the TMN periodically or on demand.

Annex D (informative): Description of management functions

D.1 Alarm surveillance

D.1.1 Alarm surveillance functions

Alarm surveillance functions are a set of functions used to monitor or interrogate NEs about events or conditions (see figure D.1).

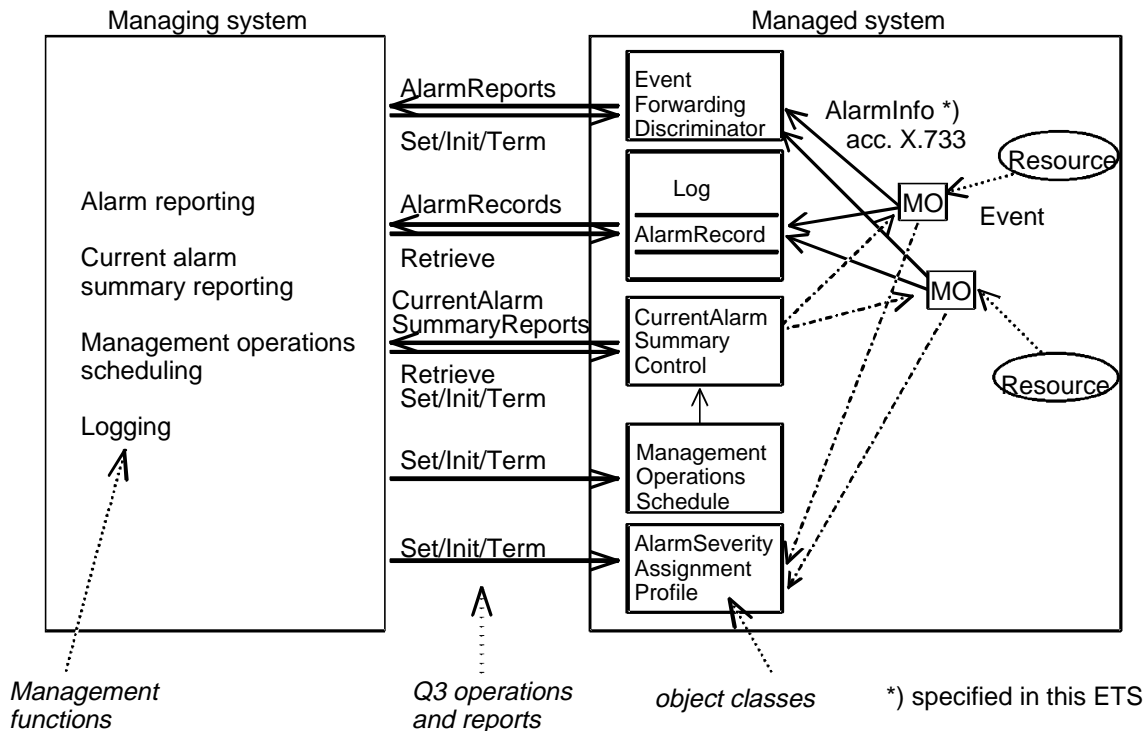


Figure D.1: ITU-T Recommendation Q.821 [8] alarm surveillance scenario

Managed systems concerned with V5 fault management need to provide alarm reporting functions. Other alarm surveillance functions may be provided optionally. Event data is generated by a NE upon detection of an abnormal condition. Examples of such events are detection of transmission data errors (layer 1 failures) and V5 protocol entity errors. Alarm surveillance comprises the following functions specified in ITU-T Recommendation Q.821 [8].

a) Alarm reporting functions

Event data may be reported at the time of occurrence by means of alarm notifications, as specified in CCITT Recommendation X.733 [15]. Control of the alarm reporting service is provided by mechanisms specified in CCITT Recommendation X.734 [16].

b) Alarm summary functions

The NE may generate summary reports of alarm conditions and provide these reports to TMN on demand or on a scheduled basis.

c) Alarm event criteria functions

Particular alarm severity assignments may be specified which are to be used with alarm reports generated in the NE.

d) Alarm indication management functions

This function provides services to control alarm indicating devices in the NE via the Q interface.

e) Log control functions

Event data may be logged for further access in alarm log objects, as specified in CCITT Recommendation X.735 [17].

D.1.2 Alarm reporting function

Alarms are specific types of notifications concerning detected faults or abnormal conditions. By use of the event report management function specified in CCITT Recommendation X.734 [16] these notifications may result in alarm reports being sent to the TMN. In CCITT Recommendation X.733 [15] five basic categories of alarms are specified. For V5 related alarms the communications alarm notification is used. Alarm notifications consist of a standardized set of parameters which provide information about the event to be reported, e.g. source, event type, probable cause, severity. Some of these parameters allow for application specific values to be added, for some even a specific type can be defined. These possibilities are used within this standard to provide V5 specific alarm information.

Description of alarm report parameters relevant for V5 related alarm reports:

a) Event type

Five basic categories of alarm are specified. These are:

- communications alarm type, associated with procedures required to convey information from one point to another;
- quality of service alarm type, associated with degradation in the quality of a service;
- processing error alarm type, associated with software or processing faults;
- equipment alarm type, associated with an equipment fault;
- environmental alarm type, associated with conditions relating to an enclosure in which the equipment resides.

b) Probable cause

This parameter further qualifies the probable cause of an alarm. The probable cause values for notifications is indicated in the behaviour clause of the object class definition. The syntax of the probable causes is an ASN.1 type object identifier. Standard probable cause values that have wide applicability across managed object classes are defined in CCITT Recommendation X.733 [15]. Other probable causes may be defined in other specifications and registered using the procedures defined for ASN.1 object identifier values in CCITT Recommendation X.208 [10].

c) Specific problems

This parameter identifies further refinements to the probable cause of an alarm. The syntax of the specific problems is an ASN.1 type object identifier.

d) Perceived severity

This parameter defines six severity levels, which provide an indication of how it is perceived that the capability of the managed object has been affected. These are:

- critical, indicates a service affecting condition which needs immediate corrective action;
- major, indicates a service affecting condition which needs urgent corrective action;
- minor, indicates a non-service affecting condition and that corrective action is advisable to prevent more serious faults;
- warning, indicates a potential or impending service affecting fault before any significant effects have been felt. Further diagnostic actions should be taken to prevent more serious effects;
- indeterminate, indicates that the severity level cannot be determined;
- cleared, indicates the clearing of one or more previously reported alarms.

e) Monitored attributes

This parameter defines one or more attributes of the managed object and their corresponding values at the time of the alarm.

f) Additional information

Managed systems may provide additional information like alarm status, related log IDs and a list of suspected objects. In ITU-T Recommendation Q.821 [8] according to the basic alarm categories five alarm information packages are introduced which specify this additional information. In the context of V5 alarm reporting it is used for example to report a suspect layer 3 address whenever an address error has been detected.

For the description of other optional parameters of the alarm report see CCITT Recommendation X.733 [15].

Object classes which are specified in this ETS to be used for V5 fault management need to contain the `tmnCommunicationsAlarmInformationPackage`. This package constitutes the `communicationsAlarm` notification with the parameters `logRecordId`, `correlatedRecordName`, `suspectObjectList` and the attributes `alarmStatus` and `currentProblemList`.

D.2 Performance management

D.2.1 Performance management functions

Performance management as defined in ITU-T Recommendation Q.822 [9] comprises the following functions:

- performance management data collection functions
PM data collection refers to the ability for the NE to collect the various PM data relating to a single monitored entity in that NE. The following specific functions are associated with the collection activity:
 - a) assign PM data collection interval;
 - b) suspend/Resume PM data collection;
 - c) reset PM data;
 - d) schedule PM data collection.
- performance management data storage functions
PM data storage refers to the optional capability for the NE to store historical PM data on each monitored entity for a prescribed time duration. The NE can also store summarized or statistical data derived from various monitored entities. When this capability is available, the following specific functions are associated with the storage activity:
 - a) assign PM history duration;
 - b) screen PM data storage;
 - c) remove PM history data.
- performance management thresholding functions
PM thresholding refers to the ability for the NE to inform the TMN manager of any threshold crossing. It also provides the TMN manager with the means for establishing thresholding criteria. When this capability is available, the following specific functions are associated with the thresholding activity:
 - a) assign PM threshold;
 - b) report PM threshold violation.

- performance management data reporting functions
 PM data reporting refers to the optional capability for the NE to report PM data on a scheduled basis, or as a result of a spontaneous request from the TMN manager. A report may contain data from a given monitored entity, or it can contain summarized data or data derived statistically from a set of monitored entities. The following specific functions are associated with the reporting activity:
 - a) request PM data;
 - b) report PM data;
 - c) allow/inhibit PM data reports;
 - d) screen PM data reports.

D.2.2 Performance management model

The object model for performance management is shown in figure D.2. Current PM data is collected for a monitored object by a currentData object class or its subclasses. Instances of the currentData object class or its subclasses are contained by the monitored object. At the end of each performance interval, the duration of which is determined by the granularityPeriod attribute, a summary report (scanReport) may be issued and a historyData object may be created to record the performance measurements for that interval. Thresholds may be established by use of the thresholdData object. When a threshold is violated by a performance measurement an alarm is emitted by the currentData object and logged as required. Performance measurements can be aggregated or statistically summarized by use of Scanner objects as defined in ITU-T Recommendation X.738 [18].

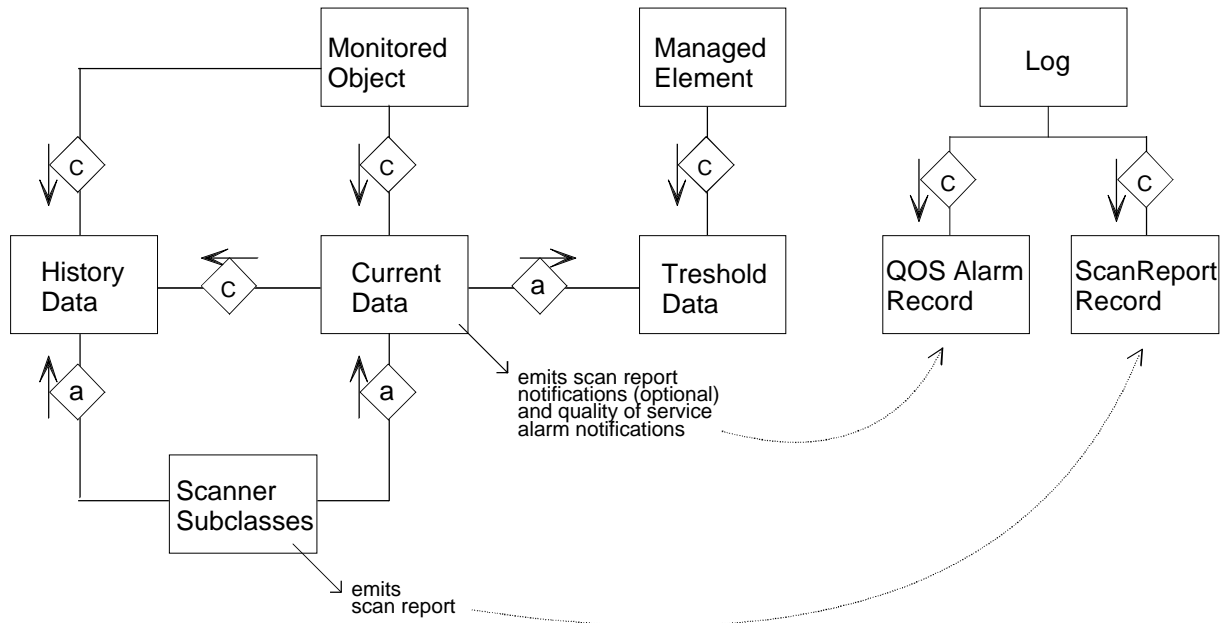


Figure D.2: Q.822 Object model for performance management

The specific objects in the model are:

- monitored object
 This object is the managed object for which the performance measurements are being collected. It represents the resource being measured (e.g. V5 communication channel).

- **currentData object**

This object contains the measurements for the resource being monitored for a specified time interval (e.g. 15 min.). In most cases the instantiated managed object will be an instance of a subclass of currentData. This subclass will have performance measurement attributes appropriate to the resource represented by the class of the monitored object (e.g., V5 performance measurements). At the end of each interval the currentData object may emit a scanReport notification which may result in a corresponding event report being sent to a managing system (it is not mandatory that the discriminator construct in the Log object be configured such that this notification is logged). Also, at the end of each interval a historyData object may be created containing the same attributes as the currentData object with values of the performance measurements at the end of the interval.

The currentData object may contain a pointer to a thresholdData object. If any of the thresholds (defined in the referenced thresholdData object) are violated, a quality of service alarm notification is emitted by the currentData object. The resulting alarm record may be logged.

The generic currentData object class should not be used for technology specific interfaces where standardized technology specific subclasses of currentData exist.
- **historyData object**

This object will contain a copy of the performance management and other selected attributes that are present in the currentData object at the end of the current interval (e.g. 15 min.). A new instance of this object class is created at the end of each interval.
- **thresholdData object**

This object contains a set of threshold values which correspond to a set of measurements defined for one or more classes of currentData. The thresholdData object is referenced from the currentData object by a pointer. If any of the thresholds specified in the thresholdData object are violated by the measurements in the referencing currentData object the currentData object immediately issues a quality of service alarm notification.
- **scanners**

Any of the scanner objects which are defined in CCITT Recommendation X.738 [18] may be used to scan the contents of either the currentData or historyData objects. These scanners may be used to aggregate sets of measurements from a number of currentData objects representing a number of different monitored objects and/or a number of historyData objects for one or more monitored entities. These scanner objects may simply aggregate the measurements into a scanReport notification for bulk transfer to a managing system, or they may be used to perform statistics on the measurements (e.g. mean, variance, etc.) for inclusion in a scanReport which can be sent to the managing system or stored in the log.

Scanners used to aggregate measurements include: simpleScanner and dynamicSimpleScanner. Those used to perform statistics include: meanScanner, meanVarianceScanner and minMaxScanner.

NOTE: The historyData object provides more flexible access to performance measurements than the scanReport, since the measurements are held in individual attributes, rather than a single complex attribute. The use of historyData also provides a closer association of the contained information with the monitored object that does the scanReport. In the generic log there is no mechanism to restrict log records in a similar way to historyData (which may be implicitly deleted after a number of intervals).

Annex E (informative): Bibliography

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History

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