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MANAGEMENT INFORMATION MODEL FOR THE MANAGEMENT OF THE DATA LINK AND NETWORK LAYER OF THE ISDN D-CHANNEL

ITU-T Recommendation M.3641

(Previously "CCITT Recommendation")

FOREWORD

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ITU-T Recommendation M.3641 was prepared by ITU-T Study Group 4 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 15th of October 1994.

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NOTE

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

CONTENTS

ABSTRACT

This Recommendation provides the management information model of the Q3-interface in a TMN [8] for the management of the D-channels in an ISDN switch. In particular, it focuses on the fault and performance management of the data link and network layer of ISDN D-channels. Managed objects are specified by using the OSI-management templates of Recommendation X.722 [5]. These specifications are based on the prosaic description of the D-channel management aspects as provided by Recommendation M.3640.

KEYWORDS

Fault Management, Management of ISDN D-channel, Performance Management.

MANAGEMENT INFORMATION MODEL FOR THE MANAGEMENT OF THE DATA LINK AND NETWORK LAYER OF THE ISDN D-CHANNEL

(Geneva, 1994)

1   Overview of the Model

This clause provides a conceptual framework for understanding how the various managed object classes are used to provide the performance monitoring services described in this Recommendation. The managed objects defined in this Recommendation are derived from the managed object class definitions in Recommendations Q.822 [2] and M.3100 [6]. They are based on the prosaic description of the D-channel management aspects as provided by Recommendation M.3640 [1] and supersedes the definitions as contained in the appendix of M.3640 [1].

The naming schema for the management of the ISDN D-channel data link and network layer is shown in Figure 1.

T0405350-95/d01
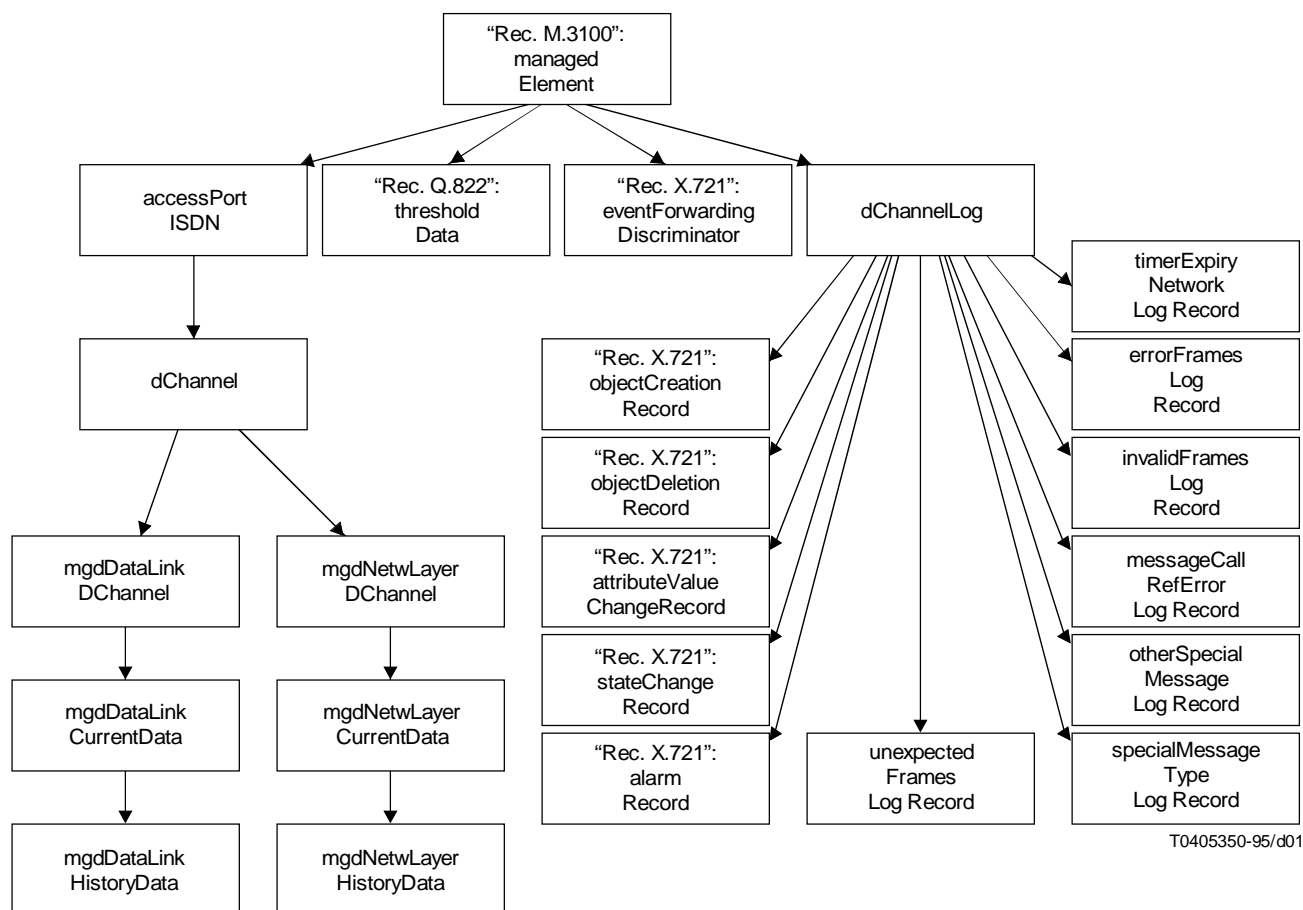
FIGURE 1/M.3641

Illustration of the naming schema

(Arrows point from superior to subordinate object classes)

The monitored entities are the protocol machine objects mgdDataLinkDChannel for layer 2 and mgdNetwLayerDChannel for layer 3 contained in the D-channel objects.

The inheritance hierarchy for the management of the ISDN D-channel data link and network layer is shown in Figure 2.
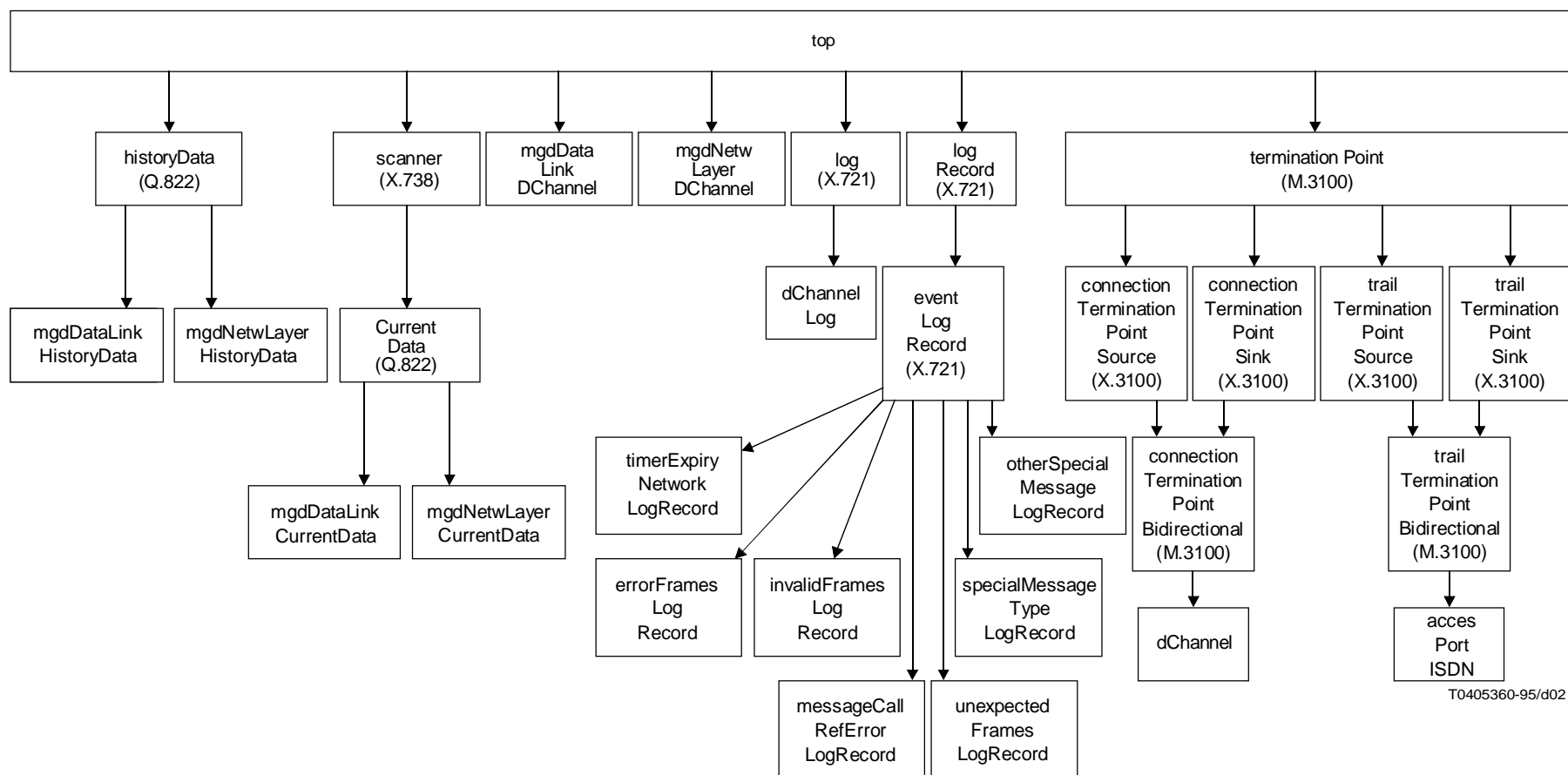
FIGURE 2/M.3641

Illustration of the inheritance hierarchy
(Arrows point from superclasses to their subclasses)

The Current PM data is collected for the Monitored Objects by instances of mgdDataLinkCurrentData and mgdNetwLayerCurrentData object classes. Instances of the current data object classes are contained by the monitored object. The details on the behaviour of the current data objects regarding the collection and emission of reports are defined in Recommendation Q.822 [2]. mgdDataLink and mgdNetwLayer history data objects, defined as subclasses of historyData in Q.822 [2] are contained in the respective current data objects. The history objects store the information collected during the performance interval.

The specific objects in the model are:

– accessPortISDN Object – This object **reflects the management view of an ISDN access port in a switch and** is used for naming the D-channel objects[1] .

– dChannel Object – This object reflects the management view of an ISDN D channel in a switch and is used for naming the mgdDataLinkDChannel and mgdNetwLayerDChannel objects[1].

– dChannelLog Object – This object is the managed object for logging in case the protocol machine has detected one of the following events which are defined in clause 7: an operational state change, the receipt of an invalid, error or unexpected frame, the receipt of a special message or other special message, a message call reference error or a timer expiry.

– errorFramesLogRecord Object – This object represents the logged information in the dChannelLog object in case of detection of the receipt of error frames.

– invalidFramesLogRecord Object – This object represents the logged information in the dChannelLog object in case an invalid frame other than a frame with an FCS error was received.

– messageCallReferenceErrorLogRecord Object – This object represents the logged information in the dChannelLog object in case a message with a call reference error was detected.

– mgdDataLinkDChannel Object – This object is the managed object for which the performance measurements are being collected. It represents the resource Layer 2 protocol machine.

– mgdNetwLayerDChannel Object – This object is the managed object for which the performance measurements are being collected. It represents the resource Layer 3 protocol machine.

– mgdDataLinkCurrentData Object – This object contains the measurements for the layer 2 protocol machine being monitored for a specified time interval (e.g. 15 minutes).

– mgdNetwLayerCurrentData Object – This object contains the measurements for the layer 3 protocol machine being monitored for a specified time interval (e.g. 15 minutes).

– mgdDataLinkHistoryData Object – This object will contain a copy of the performance attributes that are present in the mgdDataLinkCurrentData object at the end of the current interval (e.g. 15 minutes). A new instance of this object class is created at the end of each interval.

– mgdNetwLayerHistoryData Object – This object will contain a copy of the performance attributes that are present in the mgdnetwlayerCurrentData object at the end of the current interval (e.g. 15 minutes). A new instance of this object class is created at the end of each interval.

– other Special MessageTypeLogRecord Object – This object represents the logged information in the dChannelLog object in case a STATUS or RESTART message was received or transmitted.

– specialMessageTypeLogRecord Object – This object represents the logged information in the dChannelLog object in case of the receipt or transmission of a DISCONNECT, RELEASE or RELEASE COMPLETE message.

– timerExpiryNetworkLogRecord Object – This object represents the logged information in the dChannelLog object in case of the expiry of timers T308, T309, T316 or T317.

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[1] The accessPort ISDN and D-channel objects are currently for further study and will be further specified in Q-Series Recommendations.

– unexpectedFramesLogRecord Object – This object represents the logged information in the dChannelLog object in case of the receipt of unexpected frames.

In addition, the generic thresholdData and scanner [X.738] support objects as defined in Recommendation Q.822 [2] and log and eventLogRecord support objects as defined in Recommendation X.721 [4] are included in the model.

2   Managed object classes

2.1   Access port ISDN[2]

accessPortISDN   MANAGED OBJECT CLASS
        DERIVED FROM   "Recommendation M.3100 : 1992": trailTerminationPointBidirectional;
        CHARACTERIZED BY   accessPortISDN-package;

REGISTERED AS   { m3641ManagedObjectClass 1 };

2.2   D Channel[2]

dChannel MANAGED OBJECT CLASS
        DERIVED FROM   "Recommendation M.3100 : 1992": connectionTerminationPointBidirectional;
        CHARACTERIZED BY   dChannel-package;

REGISTERED AS   { m3641ManagedObjectClass 2 };

2.3   D-channel log

dChannelLog   MANAGED OBJECT CLASS
        DERIVED FROM   "Recommendation X.721 : 1992":log;
        CHARACTERIZED BY   dChannelLog-package;

REGISTERED AS   { m3641ManagedObjectClass 3 };

2.4   Error frames log record

errorFramesLogRecord   MANAGED OBJECT CLASS
        DERIVED FROM   "Recommendation X.721 : 1992":eventLogRecord;
        CHARACTERIZED BY   errorFramesLogRecord-package;

REGISTERED AS   { m3641ManagedObjectClass 4 };

2.5   Invalid frames log record

invalidFramesLogRecord   MANAGED OBJECT CLASS
        DERIVED FROM   "Recommendation X.721 : 1992":eventLogRecord;
        CHARACTERIZED BY   invalidFramesLogRecord-package;

REGISTERED AS   { m3641ManagedObjectClass 5 };

2.6   Managed data link D-channel

mgdDataLinkDChannel   MANAGED OBJECT CLASS
        DERIVED FROM   "Recommendation X.721 : 1992":top;
        CHARACTERIZED BY   mgdDataLinkDChannel-package;
        CONDITIONAL PACKAGES
        invalidFramesNotification-package PRESENT IF
        "the events of *invalid frame received* are to be logged[3].";

REGISTERED AS   { m3641ManagedObjectClass 6 };

---

[2] The accessPort ISDN and D-channel objects are currently for further study and will be further specified in Q-Series Recommendations.

[3] This case is one of two alternatives (see Recommendation M.3640): the events of *invalid frame received* may be counted or logged.

2.7 Managed data link current data

mgdDataLinkCurrentData MANAGED OBJECT CLASS
      DERIVED FROM   **"Recommendation Q.822 : 1993":currentData;**
      CHARACTERIZED BY "Recommendation Q.822 : 1993":thresholdPkg,
                    mgdDataLinkCurrentData-package;

      CONDITIONAL PACKAGES
      invalidFramesCurrentData-package PRESENT IF
      "the events of *invalid frame received* are to be counted[4].";

REGISTERED AS   { m3641ManagedObjectClass 7 };

2.8 Managed data link history data

mgdDataLinkHistoryData MANAGED OBJECT CLASS
      DERIVED FROM   **"Recommendation Q.822 : 1993":historyData;**
      CHARACTERIZED BY   mgdDataLinkHistoryData-package;
      CONDITIONAL PACKAGES
      invalidFramesHistoryData-package PRESENT IF
      "the events of *invalid frame received* are to be counted[4]" ;

REGISTERED AS   { m3641ManagedObjectClass 8};

2.9 Managed network layer D-channel

mgdNetwLayerDChannel   MANAGED OBJECT CLASS
      DERIVED FROM   **"Recommendation X.721 : 1992":top;**
      CHARACTERIZED BY   mgdNetwLayerDChannel-package;
      CONDITIONAL PACKAGES
      otherSpecialMessageNotification-package PRESENT IF
      "the events of *other special message received* are to be logged[5].",
      messageCallRefErrorNotification-package PRESENT IF
      "the events of *message Call Reference Error detected* are to be logged[6].";

REGISTERED AS   { m3641ManagedObjectClass 9 };

2.10 Managed network layer current data

mgdNetwLayerCurrentData   **MANAGED OBJECT CLASS**
      DERIVED FROM   **"Recommendation Q.822 : 1993":currentData;**
      CHARACTERIZED BY   **"Recommendation Q.822 : 1993":thresholdPkg,**
      mgdNetwLayerCurrentData-package;
      CONDITIONAL PACKAGES
      otherSpecialMessageCurrentData-package PRESENT IF
      "the events of *other special message received* are to be counted[5].",
      messageCallRefErrorCurrentData-package PRESENT IF
      "the events of *message Call Reference Error detected* are to be counted[6].";

REGISTERED AS   { m3641ManagedObjectClass 10 };

2.11 Managed network layer history data

mgdNetwLayerHistoryDataMANAGED OBJECT CLASS
      DERIVED FROM   **"Recommendation Q.822 : 1993":historyData;**
      CHARACTERIZED BY   mgdNetwLayerHistoryData-package;
      CONDITIONAL PACKAGES
      otherSpecialMessageHistoryData-package PRESENT IF
      "the events of *other special message received* are to be counted[5].",

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[4] This case is one of two alternatives (see Recommendation M.3640): the events of *invalid frame received* may be counted or logged.

[5] This case is one of two alternatives (see Recommendation M.3640): the events of *other special message received* may be counted or logged.

[6] This case is one of two alternatives (see Recommendation M.3640): the events of *message Call Reference Error detected* may be counted or logged.

        messageCallRefErrorHistoryData-package PRESENT IF
        "the events of *message Call Reference Error detected* are to be counted[7].";

REGISTERED AS { m3641ManagedObjectClass 11 };

2.12   Message call reference error log record

messageCallRefErrorLogRecord   MANAGED OBJECT CLASS
       DERIVED FROM   "Recommendation X.721 : 1992":eventLogRecord;
       CHARACTERIZED BY   messageCallRefErrorLogRecord-package;

REGISTERED AS { m3641ManagedObjectClass 12 };

2.13   Other special message log record

otherSpecialMessageLogRecord   MANAGED OBJECT CLASS
       DERIVED FROM   "Recommendation X.721 : 1992":eventLogRecord;
       CHARACTERIZED BY   otherSpecialMessageLogRecord-package;

REGISTERED AS { m3641ManagedObjectClass 13 };

2.14   Special message type log record

specialMessageTypeLogRecord   MANAGED OBJECT CLASS
       DERIVED FROM   "Recommendation X.721 : 1992":eventLogRecord;
       CHARACTERIZED BY   specialMessageTypeLogRecord-package;

REGISTERED AS { m3641ManagedObjectClass 14 };

2.15   Timer expiry network log record

timerExpiryNetworkLogRecord   MANAGED OBJECT CLASS
       DERIVED FROM   "Recommendation X.721 : 1992":eventLogRecord;
       CHARACTERIZED BY   timerExpiryNetworkLogRecord-package;

REGISTERED AS { m3641ManagedObjectClass 15 };

2.16   Unexpected frames log record

unexpectedFramesLogRecord   MANAGED OBJECT CLASS
       DERIVED FROM   "Recommendation X.721 : 1992":eventLogRecord;
       CHARACTERIZED BY   unexpectedFramesLogRecord-package;

REGISTERED AS { m3641ManagedObjectClass 16 };

3   Packages

3.1   Access port ISDN

accessPortISDN-package   PACKAGE
       BEHAVIOUR
          accessPortISDNBehaviour BEHAVIOUR
          DEFINED AS
          "This package is contained by the access port ISDN object which reflects the management view of the
          termination of an ISDN D-channel on a switch."
       ;;

REGISTERED AS { m3641Package 1 };

---

[7] This case is one of two alternatives (see Recommendation M.3640): the events of *message Call reference Error detected* may be counted or logged.

3.2 D-channel

dChannel-package   PACKAGE
    BEHAVIOUR
        dChannelBehaviour BEHAVIOUR
        DEFINED AS
        "This package is contained by the D-channel object which reflects the management view of an ISDN D-channel
        on a switch."
    ;;

REGISTERED AS   { m3641Package 2 };

3.3 D-channel log

dChannelLog-package   PACKAGE
    BEHAVIOUR
        dChannelLogBehaviour BEHAVIOUR
        DEFINED AS
        "This package contains the notification which will be sent by the dChannelLog object instance in case the
        D-channel Log is full and the oldest record in this log is younger than the value indicated by attribute
        oldestRecordAge."
    ;;
    ATTRIBUTES
        oldestRecordAge   GET-REPLACE;
    NOTIFICATIONS
        oldestRecordLessThanLimit;

REGISTERED AS   { m3641Package 3 };

3.4 Error frames log record

errorFramesLogRecord-package   PACKAGE
    BEHAVIOUR
        errorFramesLogRecordBehaviour BEHAVIOUR
        DEFINED AS
        "This managed object is used to represent logged information from notifications received from the
        mgdDataLinkDChannel managed object in case of detection of the receipt of error frames.";;
    ATTRIBUTES
        errorFrames   GET;

REGISTERED AS   { m3641Package 4 };

3.5 Invalid frames log record

invalidFramesLogRecord-package   PACKAGE
    BEHAVIOUR
        invalidFramesLogRecordBehaviour BEHAVIOUR
        DEFINED AS
        "This managed object is used to represent logged information from notifications received from the
        mgdDataLinkDChannel managed object in case an invalid frame other than a frame with an FCS error is
        received.";;
    ATTRIBUTES
        invalidFrames   GET;

REGISTERED AS   { m3641Package 5 };

3.6 Invalid frames current data

invalidFramesCurrentData-package PACKAGE
    BEHAVIOUR
        invalidFramesCurrentDataBehaviour BEHAVIOUR
        DEFINED AS
        "This package contains the noOfInvalidFrames attribute. When this attribute exceeds a threshold, a
        qualityofServiceAlarm notification is issued. The threshold corresponding to this attribute is contained in a
        thresholdData managed object. The mgdDataLinkHistoryData object corresponds to the
        mgdDataLinkCurrentData object according to the performance management model of
        Recommendation Q.822 [2].";;

```
        ATTRIBUTES
            noOfInvalidFrames   REPLACE-WITH-DEFAULT
            DEFAULT VALUE ASN1TypeModule.defaultZero
                                GET;

REGISTERED AS   { m3641Package 6 };
```

3.7   Invalid frames history data

```
invalidFramesHistoryData-package   PACKAGE
        BEHAVIOUR
            invalidFramesHistoryDataBehaviour BEHAVIOUR
            DEFINED AS
            "This package contains the history data of the noOfInvalidFrames attribute.";;
        ATTRIBUTES
            noOfInvalidFrames                 GET;

REGISTERED AS   { m3641Package 7 };
```

3.8   Invalid frames notification

```
invalidFramesNotification-package   PACKAGE
        BEHAVIOUR
            invalidFramesNotificationBehaviour BEHAVIOUR
            DEFINED AS
            "This package contains the notification which will be sent in case an invalid frame other than a frame with an
            FCS error is received.";;
        NOTIFICATIONS
            invalidFrames;

REGISTERED AS   { m3641Package 8 };
```

3.9   Message call reference error current data

```
messageCallRefErrorCurrentData-package    PACKAGE
        BEHAVIOUR
            messageCallRefErrorCurrentDataBehaviour BEHAVIOUR
            DEFINED AS
            "This package contains an attribute that counts the number of messages with a call reference error. When this
            attribute exceeds a threshold, a qualityofServiceAlarm notification is issued. The threshold corresponding to
            this attribute is contained in a thresholdData managed object. The mgdNetwLayerHistoryData object
            corresponds to the mgdNetwLayerCurrentData object according to the performance management model
            of Recommendation Q.822 [2].";;
        ATTRIBUTES
            messageCallReferenceErrors   REPLACE-WITH-DEFAULT
                                        DEFAULT VALUE ASN1TypeModule.defaultZero
                                        GET;

REGISTERED AS   { m3641Package 9 };
```

3.10   Message call reference error history data

```
messageCallRefErrorHistoryData-package      PACKAGE
        BEHAVIOUR
            messageCallRefErrorHistoryDataBehaviour BEHAVIOUR
            DEFINED AS
            "This package contains the history data of the messageCallReferenceErrors attribute.";;
        ATTRIBUTES
            messageCallReferenceErrors            GET;

REGISTERED AS   { m3641Package 10 };
```

3.11 Message call reference error log record

messageCallRefErrorLogRecord-package   PACKAGE
        BEHAVIOUR
                messageCallRefErrorLogRecordBehaviour BEHAVIOUR
                DEFINED AS
                "This managed object is used to represent logged information from notifications received from the
                mgdNetwLayerDChannel managed object in case a message with a call reference error was detected.";;
        ATTRIBUTES
                messageCallRefError   GET;

REGISTERED AS   { m3641Package 11 };

3.12 Message call reference error notification

messageCallRefErrorNotification-package   PACKAGE
        BEHAVIOUR
                messageCallRefErrorNotificationBehaviour BEHAVIOUR
                DEFINED AS
                "This package contains the notification which will be sent by the mgdNetwLayerDChannel object instance in
                case a message with a call reference error was detected."
        ;;
        NOTIFICATIONS
                messageCallRefError;

REGISTERED AS   { m3641Package 12 };

3.13 Managed data link D-channel

mgdDataLinkDChannel-package   PACKAGE
        BEHAVIOUR
                mgdDataLinkDChannelBehaviour BEHAVIOUR
                DEFINED AS
                "This managed object class reflects the management information for the data link layer protocol. The major
                part of this information is for fault and performance management.";;
        ATTRIBUTES
                mgdDataLinkDChannelId   GET,
                "Recommendation X.721 : 1992":operationalState   GET;
        NOTIFICATIONS
                errorFrames,
                unexpectedFrames,
                "Recommendation X.721 : 1992":stateChange;

REGISTERED AS   { m3641Package 13 };

3.14 Managed data link current data

mgdDataLinkCurrentData-package PACKAGE
        BEHAVIOUR
                mgdDataLinkCurrentDataBehaviour BEHAVIOUR
                DEFINED AS
                "When one of the attributes in this package exceeds a threshold, a qualityofServiceAlarm notification is issued.
                The thresholds corresponding to the attributes are contained in a thresholdData managed object.
                The mgdDataLinkHistoryData object is corresponding to the mgdDataLinkCurrentData object according to
                the performance management model of Recommendation Q.822 [2].";;
        ATTRIBUTES
                noOfFramesWithFCSERROR   REPLACE-WITH-DEFAULT
                    DEFAULT VALUE ASN1TypeModule.defaultZero
                                                GET,
                noOfFramesReceived   REPLACE-WITH-DEFAULT
                    DEFAULT VALUE ASN1TypeModule.defaultZero
                                                GET,

```
                noOfFramesTransmitted              REPLACE-WITH-DEFAULT
                    DEFAULT VALUE ASN1TypeModule.defaultZero
                                                  GET,
                noOfFramesRetransmitted            REPLACE-WITH-DEFAULT
                    DEFAULT VALUE ASN1TypeModule.defaultZero
                                                  GET;
```

REGISTERED AS   { m3641Package 14 };

3.15   Managed data link history data

mgdDataLinkHistoryData-package   PACKAGE
       BEHAVIOUR
          mgdDataLinkHistoryDataBehaviour BEHAVIOUR
          DEFINED AS
          "The managed object, characterized by this package contains the history data of the performance attributes for layer two of an ISDN D-channel.";;
       ATTRIBUTES
          noOfFramesWithFCSERROR   GET,
          noOfFramesReceived   GET,
          noOfFramesTransmitted   GET,
          noOfFramesRetransmitted   GET;

REGISTERED AS   { m3641Package15 };

3.16   Managed network layer D-channel

mgdNetwLayerDChannel-package   PACKAGE
       BEHAVIOUR
          mgdNetwLayerDChannelBehaviour BEHAVIOUR
          DEFINED AS
          "This managed object class represents the management view of the basic call control function in the network layer of the D-channel.";;
       ATTRIBUTES
          mgdNetwLayerDChannelId   GET,
          "Recommendation X.721 : 1992":operationalState   GET;
       NOTIFICATIONS
          timerExpiryNetwork,
          specialMessageType,
          "Recommendation X.721 : 1992":stateChange;

REGISTERED AS   { m3641Package 16 };

3.17   Managed network layer current data

mgdNetwLayerCurrentData-package   PACKAGE
       BEHAVIOUR
          mgdNetwLayerCurrentDataBehaviour BEHAVIOUR
          DEFINED AS
          "When one of the attributes in this package exceeds a threshold, a qualityofServiceAlarm notification is issued. The thresholds corresponding to the attributes are contained in a thresholdData managed object. The mgdNetwLayerHistoryData object is corresponding to the mgdNetwLayerCurrentData object according to the performance management model of Recommendation Q.822 [2].";;
       ATTRIBUTES

```
                messageWithWrongPdi         REPLACE-WITH-DEFAULT
                    DEFAULT VALUE ASN1TypeModule.defaultZero
                                                  GET,
                messagesTooShort            REPLACE-WITH-DEFAULT
                    DEFAULT VALUE ASN1TypeModule.defaultZero
                                                  GET,
                messagesWithGenInfoElemMissing     REPLACE-WITH-DEFAULT
                    DEFAULT VALUE ASN1TypeModule.defaultZero
                                                  GET,
                messagesWithMandInfoElemMissing   REPLACE-WITH-DEFAULT
                    DEFAULT VALUE ASN1TypeModule.defaultZero
                                                  GET,
```

```
        noOfT303Expiries                          REPLACE-WITH-DEFAULT
            DEFAULT VALUE ASN1TypeModule.defaultZero
                                                  GET,
        noOfT310Expiries                          REPLACE-WITH-DEFAULT
            DEFAULT VALUE ASN1TypeModule.defaultZero
                                                  GET;
```

REGISTERED AS   { m3641Package 17 };

3.18   Managed network layer history data

mgdNetwLayerHistoryData-package   PACKAGE
> **BEHAVIOUR**
>> **mgdNetwLayerHistoryDataBehaviour BEHAVIOUR**
>> **DEFINED AS**
>> **"The managed object, characterized by this package contains the history data of the attributes it has.";;**
> **ATTRIBUTES**
>> **messageWithWrongPdi   GET,**
>> **messagesTooShort   GET,**
>> **messagesWithGenInfoElemMissing   GET,**
>> **messagesWithMandInfoElemMissing   GET,**
>> **noOfT303Expiries   GET,**
>> **noOfT310Expiries   GET;**

REGISTERED AS   { m3641Package 18 };

3.19   Other special message current data

otherSpecialMessageCurrentData-package   PACKAGE
> **BEHAVIOUR**
>> **otherSpecialMessageCurrentDataBehaviour BEHAVIOUR**
>> **DEFINED AS**
>> **"This package contains attributes that count the receipt or transmission of STATUS and RESTART messages. When one of these attributes exceeds a threshold, a qualityofServiceAlarm notification is issued. The thresholds corresponding to these attributes are contained in a thresholdData managed objet. The mgdNetwLayerHistoryData object is corresponding to the mgdNetwLayerCurrentData object according to the performance management model of Recommendation Q.822 [2].";;**
> **ATTRIBUTES**
>> **sTATUSMessagesReceived   REPLACE-WITH-DEFAULT**
>>> **DEFAULT VALUE ASN1TypeModule.defaultZero**
>>>   **GET,**
>> **sTATUS MessagesTransmitted   REPLACE-WITH-DEFAULT**
>>> **DEFAULT VALUE ASN1TypeModule.defaultZero**
>>>   **GET,**
>> **rESTARTMessagesReceived   REPLACE-WITH-DEFAULT**
>>> **DEFAULT VALUE ASN1TypeModule.defaultZero**
>>>   **GET,**
>> **rESTARTMessagesTransmitted   REPLACE-WITH-DEFAULT**
>>>> **DEFAULT VALUE ASN1TypeModule.defaultZero**
>>>   **GET;**

REGISTERED AS   { m3641Package 19 };

3.20   Other special message log record

otherSpecialMessageLogRecord-package   PACKAGE
> **BEHAVIOUR**
>> **otherSpecialMessageLogRecordBehaviour BEHAVIOUR**
>> **DEFINED AS**
>> **"This managed object is used to represent logged information from notifications received from the mgdNetwLayerDChannel managed object in case a STATUS or RESTART message is received or transmitted.";;**
> **ATTRIBUTES**
>> **otherSpecialMessage   GET;**

REGISTERED AS   { m3641Package 20 };

3.21 Other special message notification

otherSpecialMessageNotification-package   PACKAGE
    BEHAVIOUR
        otherSpecialMessageNotificationBehaviour BEHAVIOUR
        DEFINED AS
        "This package contains the notification which will be sent by the mgdNetwLayerDChannel object instance in case a status or restart message is received or transmitted."
    ;;
    NOTIFICATIONS
        otherSpecialMessage;

REGISTERED AS   { m3641Package 21 };

3.22 Other special message history data

otherSpecialMessageHistoryData-package   PACKAGE
    BEHAVIOUR
        otherSpecialMessageHistoryDataBehaviour BEHAVIOUR
        DEFINED AS
        "This package contains the history data of the attributes it has.";;
    ATTRIBUTES
        sTATUSMessagesReceived   GET,
        sTATUSMessagesTransmitted   GET,
        rESTARTMessagesReceived   GET,
        rESTARTMessagesTransmitted   GET;

REGISTERED AS   { m3641Package 22};

3.23 Special message type log record

specialMessageTypeLogRecord-package   PACKAGE
    BEHAVIOUR
        specialMessageTypeLogRecordBehaviour BEHAVIOUR
        DEFINED AS
        "This managed object is used to represent logged information from notifications received from the mgdNetwLayerDChannel managed object in case of the receipt or transmission of a DISCONNECT, RELEASE or RELEASE COMPLETE message.";;
    ATTRIBUTES
    specialMessageType   GET;

REGISTERED AS   { m3641Package 23 };

3.24 Timer expiry network log record

timerExpiryNetworkLogRecord-package   PACKAGE
    BEHAVIOUR
        timerExpiryNetworkLogRecordBehaviour BEHAVIOUR
        DEFINED AS
        "This managed object is used to represent logged information from notifications received from the mgdNetwLayerDChannel managed object in case of detection of the expiry of timers T308, T309, T316 or T317.";;
    ATTRIBUTES
    timerExpiryNetwork   GET;
REGISTERED AS   { m3641Package 24 };

3.25 Unexpected frames log record

unexpectedFramesLogRecord-package   PACKAGE
    BEHAVIOUR
        unexpectedFramesLogRecordBehaviour BEHAVIOUR

DEFINED AS
"This managed object is used to represent logged information from notifications received from the mgdDataLinkDChannel managed object in case of receipt of unexpected frames.";;
ATTRIBUTES
unexpectedFrames   GET;

REGISTERED AS   { m3641Package 25 };

4   Name bindings

4.1   Access port ISDN – Managed element

accessPortISDN-managedElement   NAME BINDING
    SUBORDINATE OBJECT CLASS accessPortISDN AND SUBCLASSES;
    NAMED BY
        SUPERIOR OBJECT CLASS   "Recommendation M.3100 : 1992":managedElement
                                     AND SUBCLASSES;
        WITH ATTRIBUTE   "Recommendation M.3100 : 1992":tTPId;
    CREATE
        WITH-REFERENCE-OBJECT,
        WITH-AUTOMATIC-INSTANCE-NAMING;
    DELETE
        DELETES-CONTAINED-OBJECTS;

REGISTERED AS   { m3641NameBinding 1 };

4.2   D-channel log – Managed element

dChannelLog-managedElement   NAME BINDING
    SUBORDINATE OBJECT CLASS dChannelLog AND SUBCLASSES;
    NAMED BY
        SUPERIOR OBJECT CLASS "Recommendation M.3100 : 1992":managedElement
                                      AND SUBCLASSES;
        WITH ATTRIBUTE   "Recommendation X.721 : 1992":logId;
    CREATE
        WITH-REFERENCE-OBJECT,
        WITH-AUTOMATIC-INSTANCE-NAMING;
    DELETE
        DELETES-CONTAINED-OBJECTS;

REGISTERED AS   { m3641NameBinding 2 };

4.3   D-channel – Access port ISDN

dChannel-accessPortISDN NAME BINDING
    SUBORDINATE OBJECT CLASS dChannel AND SUBCLASSES;
    NAMED BY
    SUPERIOR OBJECT CLASS   accessPortISDN AND SUBCLASSES;
    WITH ATTRIBUTE   cTPId;
    CREATE
        WITH-REFERENCE-OBJECT,
        WITH-AUTOMATIC-INSTANCE-NAMING;
    DELETE
        DELETES-CONTAINED-OBJECTS;

REGISTERED AS   { m3641NameBinding 3 };

4.4   Managed data link D-channel – D-channel

mgdDataLinkDChannel-dChannel   NAME BINDING
    SUBORDINATE OBJECT CLASS   mgdDataLinkDChannel AND SUBCLASSES;
    NAMED BY

```
                SUPERIOR OBJECT CLASS              dChannel AND SUBCLASSES;
                WITH ATTRIBUTE                     mgdDataLinkDChannelId;
        CREATE
            WITH-REFERENCE-OBJECT,
            WITH-AUTOMATIC-INSTANCE-NAMING;
        DELETE
            DELETES-CONTAINED-OBJECTS;
```

REGISTERED AS   { m3641NameBinding 4};

4.5   Managed network layer D-channel – D-channel

mgdNetwLayerDChannel-dChannel NAME BINDING
```
        SUBORDINATE OBJECT CLASS           mgdNetwLayerDChannel AND SUBCLASSES;
        NAMED BY
            SUPERIOR OBJECT CLASS         dChannel AND SUBCLASSES;
            WITH ATTRIBUTE                mgdNetwLayerDChannelId;
        CREATE
            WITH-REFERENCE-OBJECT,
            WITH-AUTOMATIC-INSTANCE-NAMING;
        DELETE
            DELETES-CONTAINED-OBJECTS;
```

REGISTERED AS   { m3641NameBinding 5 };

4.6   Managed data link current data – Managed data link D-channel

mgdDataLinkCurrentData-mgdDataLinkDChannel   NAME BINDING
```
        SUBORDINATE OBJECT CLASS           mgdDataLinkCurrentData AND SUBCLASSES;
        NAMED BY
            SUPERIOR OBJECT CLASS         mgdDataLinkDChannel AND SUBCLASSES;
            WITH ATTRIBUTE                "Recommendation X.738 : 1992":scannerId;
        CREATE
            WITH-REFERENCE-OBJECT,
            WITH-AUTOMATIC-INSTANCE-NAMING;
        DELETE
            DELETES-CONTAINED-OBJECTS;
```

REGISTERED AS   { m3641NameBinding 6 };

4.7   Managed network layer current data – Managed network layer D-channel

mgdNetwLayerCurrentData-mgdNetwLayerDChannel   NAME BINDING
```
        SUBORDINATE OBJECT CLASS   mgdNetwLayerCurrentData AND SUBCLASSES;
        NAMED BY
            SUPERIOR OBJECT CLASS         mgdNetwLayerDChannel AND SUBCLASSES;
            WITH ATTRIBUTE                "Recommendation X.738 : 1992":scannerId";
        CREATE
            WITH-REFERENCE-OBJECT,
            WITH-AUTOMATIC-INSTANCE-NAMING;
        DELETE
            DELETES-CONTAINED-OBJECTS;
```

REGISTERED AS   { m3641NameBinding 7 };

The naming of mgdDataLinkHistoryData instances by mgdDataLinkCurrentData instances is specified in Recommendation Q.822 [2] by means of the name binding between currentData and historyData instances. This is also true for naming of mgdNetwLayerHistoryData instances by mgdNetwLayerCurrentData instances. The naming of thresholdData instances by managedElement instances is also specified in Recommendation Q.822 [2].

The naming of eventForwardingDiscriminator instances by managedElement instances is specified in Recommendation M.3100 [6].

The naming of the following generic and the following D-channel specific object instances by dChannelLog instances is specified in Recommendation X.721 [4] by means of the name binding between log and logRecord instances:

    – objectCreationRecord;

    – objectDeletionRecord;

    – attributeValueChangeRecord;

    – stateChangeRecord;

    – alarmRecord;

    – errorFramesLogRecord;

    – invalidFramesLogRecord;

    – messageCallRefErrorLogRecord;

    – otherSpecialMessageLogRecord;

    – specialMessageTypeLogRecord;

    – timerExpiryNetworkLogRecord;

    – unexpectedFramesLogRecord.

5 Attributes

5.1 Call Reference Flag

callReferenceFlag ATTRIBUTE
    WITH ATTRIBUTE SYNTAX   **ASN1TypeModule.CallReferenceFlag;**
        MATCHES FOR   **EQUALITY;**

BEHAVIOUR
    callReferenceFlagBehaviour   **BEHAVIOUR**
        DEFINED AS
           "This attribute represents the value of the call reference flag.";;

REGISTERED AS   { m3641Attribute 1 };

5.2 Call Reference Value

callReferenceValue ATTRIBUTE
    WITH ATTRIBUTE SYNTAX   **ASN1TypeModule.CallReferenceValue;**
    MATCHES FOR   **EQUALITY;**

BEHAVIOUR
    callReferenceValueBehaviour   **BEHAVIOUR**
    DEFINED AS
        "This attribute represents the incorrect call reference value.";;

REGISTERED AS   { m3641Attribute 2 };

5.3 Cause Value

causeValue ATTRIBUTE
    WITH ATTRIBUTE SYNTAX   **ASN1TypeModule.CauseType;**
    MATCHES FOR   **EQUALITY;**
BEHAVIOUR
    causeValueBehaviour   **BEHAVIOUR**
    DEFINED AS
        "This attribute represents the octets three to five as defined in Recommendation Q.931, which includes the cause value, location and diagnostic field.";;

REGISTERED AS   { m3641Attribute 3 };

5.4 Data Link State

dataLinkState ATTRIBUTE
      WITH ATTRIBUTE SYNTAX   ASN1TypeModule.DataLinkState;
      MATCHES FOR   EQUALITY;

BEHAVIOUR
      dataLinkStateBehaviour   BEHAVIOUR
      DEFINED AS
        "This attribute represents the state of the data link.";;

REGISTERED AS   { m3641Attribute 4 };

5.5 Error Frames

errorFrames ATTRIBUTE
      WITH ATTRIBUTE SYNTAX   ASN1TypeModule.ErrorFrames;
      MATCHES FOR   EQUALITY;
      BEHAVIOUR
        errorFramesAttrBehaviour BEHAVIOUR
        DEFINED AS "This attribute represents the specific error information that is stored in the
        errorFramesLogRecord.";;

REGISTERED AS   { m3641Attribute 5 };

5.6 Frame Type

frameType   ATTRIBUTE
      WITH ATTRIBUTE SYNTAX   ASN1TypeModule.FrameType;
      MATCHES FOR   EQUALITY;

BEHAVIOUR
      frameTypeBehaviour   BEHAVIOUR
      DEFINED AS
        "This attribute represents the type of the unexpected frame.";;

REGISTERED AS   { m3641Attribute 6 };

5.7 Invalid Frames

invalidFrames ATTRIBUTE
      WITH ATTRIBUTE SYNTAX   ASN1TypeModule.InvalidFrames;
      MATCHES FOR   EQUALITY;
      BEHAVIOUR
        invalidFramesAttrBehaviour   BEHAVIOUR
        DEFINED AS "This attribute represents the specific error information that is stored in the
        invalidFramesLogRecord.";;

REGISTERED AS   { m3641Attribute 7 };

5.8 Managed data link D-channel identification

mgdDataLinkDChannelId ATTRIBUTE
      WITH ATTRIBUTE SYNTAX   ASN1TypeModule.NameType;
      MATCHES FOR   EQUALITY, ORDERING;
      BEHAVIOUR
        mgdDataLinkDChannelIdBehaviour   BEHAVIOUR
        DEFINED AS "This attribute represents the identification of the mgdDataLinkDChannel managed object
        class.";;

REGISTERED AS   { m3641Attribute 8 };

5.9 Managed network layer D-channel identification

mgdNetwLayerDChannelId ATTRIBUTE
      WITH ATTRIBUTE SYNTAX   ASN1TypeModule.NameType;
      MATCHES FOR   EQUALITY, ORDERING;
      BEHAVIOUR
        mgdNetwLayerDChannelIdBehaviour   BEHAVIOUR

DEFINED AS "This attribute represents the identification of the mgdNetwLayerDChannel managed object class.";;

REGISTERED AS   { m3641Attribute 9 };

5.10   Message call reference error

messageCallRefError   ATTRIBUTE
        WITH ATTRIBUTE SYNTAX   ASN1TypeModule.MessageCallRefError;
        MATCHES FOR   EQUALITY;
        BEHAVIOUR
            messageCallRefErrorAttrBehaviour   BEHAVIOUR
            DEFINED AS "This attribute represents the specific error information that is stored in the messageCallRefErrorLogRecord.";;

REGISTERED AS   { m3641Attribute 10 };

5.11   Message call reference errors

messageCallReferenceErrors   ATTRIBUTE
        DERIVED FROM "Recommendation X.721 : 1992":counter;
        BEHAVIOUR
            messageCallReferenceErrorsBehaviour BEHAVIOUR
            DEFINED AS "A call reference is used to specify a call. This attribute represents the number of messages with call reference errors. In the following situations, the call reference error is not correct:

Messages	Call reference value
All messages except: SETUP, STATUS, RESUME	Which is not relating to an active call or a call in progress
SETUP, RESUME	Which is not relating to an active call or a call in progress and with a call reference flag set to "1"
SETUP	Which is relating to an active call or a call in progress
All messages except: RESTART, RESTART ACK, STATUS	Which is the global call reference

";;

REGISTERED AS   { m3641Attribute 11 };

5.12   Messages too short

messagesTooShort   ATTRIBUTE
        DERIVED FROM "Recommendation X.721 : 1992":counter;
        BEHAVIOUR
            messagesTooShortBehaviour   BEHAVIOUR
            DEFINED AS "This attribute represents a counter for the number of messages that are too short to contain a complete message type.";;

REGISTERED AS   { m3641Attribute 12 };

5.13   Messages with general information element missing

messagesWithGenInfoElemMissing   ATTRIBUTE
        DERIVED FROM "Recommendation X.721 : 1992":counter;
        BEHAVIOUR
            messagesWithGenInfoElemMissingBehaviour   BEHAVIOUR
            DEFINED AS "This attribute represents a counter for counting the number of general information element errors. The counter is raised when an information element is out of sequence or when a duplicated information element was detected, see 5.8.5/Q.931.";;

REGISTERED AS   { m3641Attribute 13 };

5.14 Messages with mandatory information element missing

messagesWithMandInfoElemMissing   ATTRIBUTE
        DERIVED FROM "Recommendation X.721 : 1992":counter;
        BEHAVIOUR
            messagesWithMandInfoElemMissingBehaviour   BEHAVIOUR
            DEFINED AS "This attribute represents a counter for counting the number of messages with mandatory
            information element errors. The counter is raised when a mandatory information element is missing or when a
            mandatory information element content error was detected, see 5.8.5 and 5.8.6/Q.931.";;

REGISTERED AS   { m3641Attribute 14 };

5.15 Message type

messageType   ATTRIBUTE
        WITH ATTRIBUTE SYNTAX   ASN1TypeModule.MessageType;
        MATCHES FOR   EQUALITY;
BEHAVIOUR
        messageTypeBehaviour   BEHAVIOUR
        DEFINED AS
                "This attribute represents the type of layer 3 message.";;

REGISTERED AS   { m3641Attribute 15 };

5.16 Message with wrong protocol discriminator

messageWithWrongPdi   ATTRIBUTE
        DERIVED FROM "Recommendation X.721 : 1992":counter;
            BEHAVIOUR
            messageWithWrongPdiBehaviour   BEHAVIOUR
            DEFINED AS "This attribute represents a counter. This counter holds the number of messages receved with a
            protocol discriminator that is not valid, i.e. a protocol discriminator other than "Q.931 user-network call
            control message". The counter has an associated threshold.";;

REGISTERED AS   { m3641Attribute 16 };

5.17 Number of frames received

noOfFramesReceived   ATTRIBUTE
        DERIVED FROM "Recommendation X.721 : 1992":counter;
        BEHAVIOUR
            noOfFramesReceivedBehaviour   BEHAVIOUR
            DEFINED AS "This attribute represents the total number of frames received for a D-channel.";;

REGISTERED AS   { m3641Attribute 17 };

5.18 Number of frames retransmitted

noOfFramesRetransmitted   ATTRIBUTE
        DERIVED FROM "Recommendation X.721 : 1992":counter;
        BEHAVIOUR
            noOfFramesRetransmittedBehaviour   BEHAVIOUR
            DEFINED AS "This attribute represents the total number of frames retransmitted for a D-channel.";;

REGISTERED AS   { m3641Attribute 18 };

5.19 Number of frames transmitted

noOfFramesTransmitted   ATTRIBUTE
        DERIVED FROM "Recommendation X.721 : 1992":counter;
        BEHAVIOUR
            noOfFramesTransmitted   BEHAVIOUR
            DEFINED AS "This attribute represents the total number of frames transmitted for a D-channel.";;

REGISTERED AS   { m3641Attribute 19 };

5.20 Number of frames with frame check sequence error

noOfFramesWithFCSERROR   ATTRIBUTE

DERIVED FROM "Recommendation X.721 : 1992":counter;

    BEHAVIOUR

        noOfFramesWithFCSERRORBehaviour   BEHAVIOUR

        DEFINED AS "This attribute represents a counter for the total number of frames received with FCS-error for a D-channel.";;

REGISTERED AS   { m3641Attribute 20 };

5.21   Number of invalid frames

noOfInvalidFrames   **ATTRIBUTE**

    DERIVED FROM "Recommendation X.721 : 1992":counter;

    BEHAVIOUR

        noOfInvalidFramesBehaviour BEHAVIOUR

        DEFINED AS "This attribute represents the number of invalid frames received.";;

REGISTERED AS   { m3641Attribute 21 };

5.22   Number of timer 303 expiries

noOfT303Expiries   **ATTRIBUTE**

    DERIVED FROM "Recommendation X.721 : 1992":counter;

    BEHAVIOUR

        noOfT303ExpiriesBehaviour   BEHAVIOUR

        DEFINED AS "This attribute represents the number of expiries of T303. The counter is raised after the second expiry. This implies that the user did not respond after a SETUP was sent to the user on a point-to-point link.";;

REGISTERED AS   { m3641Attribute 22 };

5.23   Number of timer 310 expiries

noOfT310Expiries   **ATTRIBUTE**

    DERIVED FROM "Recommendation X.721 : 1992":counter;

    BEHAVIOUR

        noOfT310ExpiriesBehaviour   BEHAVIOUR

        DEFINED AS "This attribute represents the number of expiries of T310. T310 expires after receipt of a CALL PROCEEDING, no response has reached the network.";;

REGISTERED AS   { m3641Attribute 23 };

5.24   Oldest record age

oldestRecordAge   **ATTRIBUTE**

    WITH ATTRIBUTE SYNTAX   ASN1TypeModule.OldestRecordAge

    MATCHES FOR   EQUALITY, ORDERING;

BEHAVIOUR

    oldestRecordAgeBehaviour   BEHAVIOUR

DEFINED AS "This attribute represents the time when the notification oldestRecordLessThanLimit will be emitted by object dChannelLog.";;

REGISTERED AS   { m3641Attribute 24 };

5.25 Other special message

otherSpecialMessage   ATTRIBUTE
        WITH ATTRIBUTE SYNTAX   ASN1TypeModule.OtherSpecialMessage;
        MATCHES FOR   EQUALITY;
        BEHAVIOUR
            otherSpecialMessageAttrBehaviour   BEHAVIOUR
            DEFINED AS "This attribute represents the specific error information that is stored in the
            otherSpecialMessageLogRecord.";;

REGISTERED AS   { m3641Attribute 25 };

5.26 Received

received   ATTRIBUTE
        WITH ATTRIBUTE SYNTAX   ASN1TypeModule.Received;
        MATCHES FOR   EQUALITY;

BEHAVIOUR
        receivedBehaviour   BEHAVIOUR
        DEFINED AS
                "This attribute indicates whether a message was received or not, i.e. sent.";;

REGISTERED AS   { m3641Attribute 26 };

5.27 Relating To Active Call

relatingToActiveCall   ATTRIBUTE
        WITH ATTRIBUTE SYNTAX   ASN1TypeModule.RelatingToActiveCall;
        MATCHES FOR   EQUALITY;

BEHAVIOUR
        relatingToActiveCallBehaviour   BEHAVIOUR
        DEFINED AS
                "This attribute indicates whether a call reference relates to an active call.";;

REGISTERED AS   { m3641Attribute 27 };

5.28 Restart messages received

rESTARTMessagesReceived   ATTRIBUTE
        DERIVED FROM "Recommendation X.721 : 1992":counter;
        BEHAVIOUR
            rESTARTMessagesReceivedBehaviour   BEHAVIOUR
            DEFINED AS "This attribute represents the number of RESTART messages received.";;

REGISTERED AS   { m3641Attribute 28 };

5.29 Restart messages transmitted

rESTARTMessagesTransmitted   ATTRIBUTE
        DERIVED FROM "Recommendation X.721 : 1992":counter;
        BEHAVIOUR
        rESTARTMessagesTransmittedBehaviour   BEHAVIOUR
        DEFINED AS "This attribute represents the number of RESTART messages transmitted.";;

REGISTERED AS   { m3641Attribute 29 };

5.30 Special message type

specialMessageType   ATTRIBUTE
        WITH ATTRIBUTE SYNTAX   ASN1TypeModule.SpecialMessageType;
        MATCHES FOR   EQUALITY;
        BEHAVIOUR
            specialMessageTypeAttrBehaviour   BEHAVIOUR
            DEFINED AS "This attribute represents the specific error information that is stored in the
            specialMessageTypeLogRecord";;

REGISTERED AS   { m3641Attribute 30 };

5.31 Status messages received

sTATUSMessagesReceived   ATTRIBUTE
        DERIVED FROM "Recommendation X.721 : 1992":counter;
        BEHAVIOUR
            sTATUSMessagesReceivedBehaviour   BEHAVIOUR
            DEFINED AS "This attribute represents the number of STATUS messages received.";;

REGISTERED AS   { m3641Attribute 31 };

5.32 Status messages transmitted

sTATUSMessagesTransmitted   ATTRIBUTE
        DERIVED FROM "Recommendation X.721 : 1992":counter;

BEHAVIOUR
        sTATUSMessagesTransmittedBehaviour   BEHAVIOUR

DEFINED AS "This attribute represents the number of STATUS messages transmitted.";;

REGISTERED AS   { m3641Attribute 32 };

5.33 TEI value

tEIValue ATTRIBUTE
        WITH ATTRIBUTE SYNTAX   ASN1TypeModule.TEIValue;
        MATCHES FOR   EQUALITY;

BEHAVIOUR
        tEIValueBehaviour   BEHAVIOUR
        DEFINED AS
                "This attribute represents the TEI Value of the terminal involved.";;

REGISTERED AS   { m3641Attribute 33 };

5.34 Timer expiry network

timerExpiryNetwork   ATTRIBUTE
        WITH ATTRIBUTE SYNTAX   ASN1TypeModule.TimerExpiryNetwork;
        MATCHES FOR   EQUALITY;
        BEHAVIOUR
            timerExpiryNetworkAttrBehaviour   BEHAVIOUR
            DEFINED AS "This attribute represents the specific error information that is stored in the
            timerExpiryNetworkLogRecord.";;

REGISTERED AS   { m3641Attribute 34 };

5.35 Type Of Error Frame

typeOfErrorFrame ATTRIBUTE
        WITH ATTRIBUTE SYNTAX   ASN1TypeModule.TypeOfErrorFrame;
        MATCHES FOR   EQUALITY;

BEHAVIOUR
        typeOfErrorFrameBehaviour   BEHAVIOUR
        DEFINED AS
                "This attribute represents the type of error when a frame error was detected.";;

REGISTERED AS   { m3641Attribute 35 };

5.36 Type Of Timer

typeOfTimer   ATTRIBUTE
        WITH ATTRIBUTE SYNTAX   ASN1TypeModule.TypeOfTimer;
        MATCHES FOR   EQUALITY;

BEHAVIOUR
        typeOfTimerBehaviour   BEHAVIOUR

DEFINED AS
    "This attribute represents the type of the timer expired.";;

REGISTERED AS   { m3641Attribute 36 };

5.37   Unexpected frames

unexpectedFrames ATTRIBUTE
        WITH ATTRIBUTE SYNTAX   ASN1TypeModule.UnexpectedFrames;
        MATCHES FOR   EQUALITY;
        BEHAVIOUR
            unexpectedFramesAttrBehaviour   BEHAVIOUR
            DEFINED AS "This attribute represents the specific error information that is stored in the
            unexpectedFramesLogRecord.";;

REGISTERED AS   { m3641Attribute 37 };

6   Notifications

6.1   Error frames

errorFrames   NOTIFICATION
        BEHAVIOUR
            errorFramesBehaviour BEHAVIOUR
            DEFINED AS
                "This notification is issued when a protocol error is detected. It will contain one of the following
                    messages:
                •   The frames received with a control field that is undefined or not implemented:
                        framesWithBadControlfield.
                •   The frames received with an information field that is not permitted: framesWithBadInfoField.
                •   The supervisory frames with incorrect length: supervisoryFramesWithBadLength.
                •   The unnumbered frames with incorrect length: unnumberedFramesBadLength.
                •   The frames received with an invalid receive sequence number (i.e. invalid N(R))
                        framesWithInvalidReceiveSeqNumber.
                •   The frames received with an information field that exceeds the maximum established length. A
                        parameter is defined for the maximum established length. The default value is 260 octets:
                        framesWithInfoFieldTooLong.
                •   The Frame Reject (FRMR) frames received: fRMRReceived.
                •   The Disconnect Mode (DM) frames received in response to a Set Asynchronous Balanced Mode
                        Extended (SABME) frame: dMFramesSentInResponseToSABME.
                •   The proper responses (i.e. unnumbered acknowledgement or disconnect mode frames not received
                        to establish or restore the link after N200 SABME frames were sent:
                        notProperResponseAfterN200SABMEs.
                •   The Disconnect Mode (DM) frames received in response to a Set Asynchronous Balanced Mode
                        Extended (SABME) frame: dMFramesReceivedInResponseToSABME.
                It also contains the TEI value to identify the terminal involved.";;
        WITH INFORMATION SYNTAX   ASN1TypeModule.ErrorFrames
            AND ATTRIBUTE IDS
            tEIValue   tEIValue,
            typeOfErrorFrame   typeOfErrorFrame;

REGISTERED AS { m3641Notification 1 };

6.2   Invalid frames

invalidFrames NOTIFICATION
        BEHAVIOUR
            invalidFramesBehaviour BEHAVIOUR
            DEFINED AS
                "This notification is emitted on receipt of an invalid frame. The notification contains the invalid frame.
                An invalid frame is a frame with any of the following:
                •   is not properly bounded by two flags;
                •   has fewer than six octets between flags of frames that contain sequence numbers and fewer than
                        five octets between flags of frames that do not contain sequence numbers;
                •   does not consist of an integral number of octets prior to zero bit insertion or following zero bit
                        extraction;

- contains a single address field;
- contains a service access point identifier, which is not supported by the receiver.
";;
WITH INFORMATION SYNTAX   ASN1TypeModule.InvalidFrames;

REGISTERED AS   { m3641Notification 2 };

6.3   Message call reference error

messageCallRefError   NOTIFICATION
    BEHAVIOUR
      messageCallRefErrorBehaviour BEHAVIOUR
      DEFINED AS
      "This notification is issued when a message with a call reference error was detected. A call reference is used to specify a call. In the following situations, the call reference error is not correct:

Messages	Call reference value
All messages except: SETUP, STATUS, RESUME	Which is not relating to an active call or a call in progress
SETUP, RESUME	Which is not relating to an active call or a call in progress and with a call reference flag set to "1"
SETUP	Which is relating to an active call or a call in progress
All messages except: RESTART, RESTART ACK, STATUS	Which is the global call reference

      It also contains the TEI value to identify the terminal involved.";;
    WITH INFORMATION SYNTAX   ASN1TypeModule.MessageCallRefError
      AND ATTRIBUTE IDS
      messageType   messageType,
      relatingToActiveCall   relatingToActiveCall,
      callReferenceFlag   callReferenceFlag,
      callReferenceValue   callReferenceValue,
      tEIValue   tEIValue;

REGISTERED AS   { m3641Notification 3 };

6.4   Oldest record less than limit

oldestRecordLessThanLimit   NOTIFICATION
    BEHAVIOUR
      oldestRecordLessThanLimitBehaviour BEHAVIOUR
      DEFINED AS
      "This notification is emitted when the oldest record in the full D-Channel Log is less old than the value indicated by attribute oldestRecordAge of object dChannelLog.";;
    WITH INFORMATION SYNTAX   ASN1TypeModule.OldestRecordLessThanLimit;

REGISTERED AS   { m3641Notification 4 };

6.5   Other special message

otherSpecialMessage   NOTIFICATION
    BEHAVIOUR
      otherSpecialMessageBehaviour BEHAVIOUR
      DEFINED AS
      "This notification is issued upon the receipt or transmission of a STATUS or RESTART message. The notification contains the information whether the message was received or transmitted and the message concerned. It also contains the TEI value to identify the terminal involved. In case of a STATUS message, it also contains the contents of the cause field. The cause field contains the octets three to five as defined in Recommendation Q.931. This includes the cause value, location and the diagnostic field.";;
    WITH INFORMATION SYNTAX   ASN1TypeModule.OtherSpecialMessage
      AND ATTRIBUTE IDS

    messageType   **messageType,**
    received   **received,**
    tEIValue   **tEIValue,**
    causeValue   **causeValue;**

REGISTERED AS { m3641Notification 5 };

6.6   Special message type

specialMessageType NOTIFICATION
   BEHAVIOUR
     specialMessageTypeBehaviour BEHAVIOUR
     DEFINED AS
     "This notification is issued upon the receipt or transmission of a DISCONNECT, RELEASE and RELEASE COMPLETE message. This notification is only issued when the cause value indicates an other than normal event. The notification contains the information whether the message was received or transmitted and the message concerned. It also contains the TEI value to identify the terminal involved. It also contains the contents of the cause field. The cause field contains the octets three to five as defined in Recommendation Q.931. This includes the cause value, location and the diagnostic field.";;
   WITH INFORMATION SYNTAX ASN1TypeModule.SpecialMessageType
    AND ATTRIBUTE IDS
    messageType   **messageType,**
    received   **received,**
    tEIValue   **tEIValue,**
    causeValue   **causeValue;**

REGISTERED AS { m3641Notification 6 };

6.7   Timer expiry network

timerExpiryNetwork NOTIFICATION
   BEHAVIOUR
     timerExpiryNetworkBehaviour BEHAVIOUR
     DEFINED AS
     "This notification is issued upon expiry of timers:
     T308:   **A DISCONNECT was received from the user. The network answers with a RELEASE. T308 expires when no answer was received from the user after that. After the second expiry the B-channel will be placed in a maintenance condition.**
     T309:   **The data link failure has not been recovered from a data link layer malfunction.**
     T316:   **No RESTART ACKNOWLEDGE was received after a RESTART was transmitted. After "n" expiries the Operations System shall be notified.**
     T317:   **After a RESTART was received, the restart procedure did not work. It also contains the TEI value to identify the terminal involved.";;**
   WITH INFORMATION SYNTAX ASN1TypeModule.TimerExpiryNetwork
    AND ATTRIBUTE IDS
    tEIValue   **tEIValue,**
    typeOfTimer   **typeOfTimer;**

REGISTERED AS { m3641Notification 7 };

6.8   Unexpected frames

unexpectedFrames NOTIFICATION
   BEHAVIOUR
   unexpectedFramesBehaviour BEHAVIOUR
   DEFINED AS
   "This notification is emitted on receipt of an unexpected frame. The notification contains the unexpected frame. In Table 9/Q.921, an overview of unexpected frames is given. It also contains the TEI value to identify the terminal involved.";;
   WITH INFORMATION SYNTAX ASN1TypeModule.UnexpectedFrames
   AND ATTRIBUTE IDS
    frameType   **frameType,**
    dataLinkState   **dataLinkState,**
    tEIValue   **tEIValue;**

REGISTERED AS { m3641Notification 8 };

7   ASN.1 Type definitions module

This clause contains the abstract syntax in ASN.1 [10] for the management information defined in this Recommendation.

ASN1TypeModule { itu(0) recommendation(0) m(13) m3641(3641) informationModel(0) asn1Module(2) asn1TypeModule(0) }

DEFINITIONS IMPLICIT TAGS ::=
BEGIN
-- *EXPORTS everything*

IMPORTS
NameType FROM ASN1DefinedTypeModule { itu(0) recommendation(0) m(13) gnm(3100) informationModel(0)
asn1Module(2) asn1DefinedTypesModule(0)};
m3641InformationModel OBJECT IDENTIFIER ::= { itu(0) recommendation(0) m(13) m3641(3641) informationModel(0) }
m3641StandardSpecificExtension OBJECT IDENTIFIER ::= { m3641InformationModel standardSpecificExtension (0) }
m3641ManagedObjectClass OBJECT IDENTIFIER ::= { m3641InformationModel managedObjectClass (3) }
m3641Package OBJECT IDENTIFIER ::= { m3641InformationModel package(4) }
m3641NameBinding OBJECT IDENTIFIER ::= { m3641InformationModel nameBinding (6) }
m3641Attribute OBJECT IDENTIFIER ::= { m3641InformationModel attribute (7) }
m3641Notification OBJECT IDENTIFIER ::= { m3641InformationModel notification (10) }

defaultZero DefaultZero ::= 0

CallReferenceFlag ::= INTEGER

CallReferenceValue ::= INTEGER

CauseType ::= OCTETSTRING
-- *The causeType contains the octets three to five as defined in Recommendation Q.931.*
-- *This includes the cause value, location and the diagnostic field.*

DataLinkState ::= ENUMERATED {
awaitingEstablishment   (1),
awaitingRelease   (2),
multipleFrameEstablishedMode   (3),
multipleFrameTimeRecoveryMode   (4),
tEIAssigned   (5),
tEIUnassigned   (6) }
DefaultZero ::= INTEGER
ErrorFrames ::= SEQUENCE {
tEIValue   TEIValue,
typeOfErrorFrame   TypeOfErrorFrame}
FrameType ::=   ENUMERATED {
dISC   (1),
dM   (2),
fRMR   (3),
i   (4),
rEJ   (5),
rNR   (6),
rR   (7),
sABME   (8),
uA   (9),
uI   (10),
xID   (11) }

InvalidFrames ::= BITSTRING

MessageCallRefError ::= SEQUENCE {
messageType   MessageType,
relatingToActiveCall   RelatingToActiveCall,
callReferenceFlag   CallReferenceFlag,
callReferenceValue   CallReferenceValue,
tEIValue   TEIValue }

MessageType ::= ENUMERATED {
aLERTING   (1),
cALLpROCEEDING   (2),
cONGESTIONcONTROL   (3),
cONNECT   (4),
cONNECTaCKNOWLEDGE   (5),
dISCONNECT   (6),

```
fACILITY                          (7),
iNFORMATION                       (8),
nOTIFY                            (9),
pROGRESS                         (10),
rELEASE                          (11),
rELEASEcOMPLETE                  (12),
rESTART                          (13),
rESUME                           (14),
rESUMEaCKNOWLEDGE                (15),
rESUMErEJECT                     (16),
sETUP                            (17),
sETUPaCKNOWLEDGE                 (18),
sTATUS                           (19),
sTATUSeNQUIRY                    (20),
sUSPEND                          (21),
sUSPENDaCKNOWLEDGE               (22),
sUSPENDrEJECT                    (23),
uSERiNFORMATION                  (24) }


OtherSpecialMessage ::= SEQUENCE {
messageType         MessageType,
received            Received,
tEIValue            TEIValue,
causeValue          CauseType      OPTIONAL }

OldestRecordAge ::= GeneralizedTime

OldestRecordLessThanLimit ::= BOOLEAN

Received ::= BOOLEAN

RelatingToActiveCall ::= BOOLEAN

SpecialMessageType ::= SEQUENCE {
messageType         MessageType,
received            Received,
tEIValue            TEIValue,
causeValue          CauseType }

TEIValue ::= INTEGER

TimerExpiryNetwork ::= SEQUENCE {
tEIValue            TEIValue,
typeOfTimer         TypeOfTimer }

TypeOfErrorFrame ::= ENUMERATED {
framesWithBadInfoField                   (1),
framesWithBadControlField                (2),
supervisoryFramesWithBadLength           (3),
unnumberedFramesBadLength                (4),
framesWithInvalidReceiveSeqNumber        (5),
framesWithInfoFieldTooLong               (6),
fRMRReceived                             (7),
dMFramesSentInResponseToSABME            (8),
notProperResponseAfterN200SABMEs         (9),
dMFramesReceivedInResponseToSABME       (10)}

TypeOfTimer ::= ENUMERATED {
t308          (0),
t309          (1),
t316          (2),
t317          (3) }

UnexpectedFrames ::= SEQUENCE {
frameType           FrameType,
dataLinkState       DataLinkState,
tEIValue            TEIValue }

END
```

8 Support objects from other ITU-T Recommendations

The following support object classes (or their subclasses) should be used to support the ISDN D-channel performance and fault management functions specified in this Recommendation:

- eventForwardingDiscriminator (defined in Recommendation X.721 [4];

- eventLogRecord (defined in Recommendation X.721 [4]);

- thresholdData (defined in Recommendation Q.822 [2]);

- log (defined in Recommendation X.721 [4]).

The following system management functions define management capabilities which are used in the management information model of the data link and network layer:

- Object management function [11];

- State management function [12];

- Alarm reporting function [13];

- Event report management function [14];

- Log control function [15];

- Summarization function [7];

- Metric Objects and Attributes [16].

9 Functional unit

9.1 Definition of the fpmMonitorDchannel functional unit

One functional unit is defined in this Recommendation for the management of fault and performance monitor object classes:

- fpmMonitorDchannel functional unit - This functional unit supports the following seven specific Event Reporting Services:

  – Error Frames Reporting Service;

  – Invalid Frames Reporting Service;

  – Message with call reference error Reporting Service;

  – Special Message Reporting Service;

  – Other Special Message Reporting Service;

  – Timer Expiry Reporting Service;

  – Unexpected Frames Reporting Service.

It requires support of the pmMonitor and pmControl functional units defined in Recommendation Q.822 [2].

To provide the mapping between the parameters for the event report (result of the notification) and CMIS M-EVENT-REPORT [3], [9], the seven specific Event Reporting Services are defined as follows.

The Error, Invalid, Unexpected Frames Reporting Service, Timer Expiry, Message with call reference error, Special Message or Other Special Message Reporting Service allow a managed system to report that a protocol error, timer expiry or special message is detected.

Table 1 contains the parameters for these specific Event Reporting Services. The Event Information parameter will indicate which Event Reporting Service is invoked (in this example the Error Frames Reporting Service).

TABLE 1/M.3641

**D-channel specific Event Reporting Service Parameters
in case of errorFrames Event Type**

Parameter Name	REQ/IND	RSP/CNF
Invoke Identifier	P	P
Mode	P	–
Managed Object Class	P	P
Managed Object Instance	P	P
Event Type	M	C(=)
Event Time	P	–
Event Information		
ErrorFrames	M	–
Current Time	–	P
Event reply	–	C
Errors	–	P
NOTE – The meaning of the symbols "M", "C" and "(=)" used in this table are the same as used in the tables for the CMISE description [3]. The symbol "P" means "subject to the constraints imposed on the parameter by Rec. X.710 | ISO/IEC 9595".		

The following parameters are defined for use in the specific Event Reporting Services:

- Invoke Identifier: see Invoke Identifier [3].

- Mode: see Mode [3]. The values for this parameter are either confirmed or unconfirmed.

- Managed Object Class: see Managed Object Class [3]. This parameter shall indicate the mgdDataLinkDChannel or mgdNetwLayerDChannel object class.

- Managed Object Instance: see Managed Object Instance [3].

- Event Type: This parameter specifies the type of event being reported and the value shall be as indicated by Table 2.

TABLE 2/M.3641

Event Type values for the D-channel specific Event Reporting Services

Event reporting service	Event type value
Error Frames	errorFrames
Invalid Frames	invalidFrames
Unexpected Frames	unexpectedFrames
Timer Expiry	timerExpiryNetwork
Message with call reference error	messageCallRefError
Special Message	specialMessageType
Other Special Message	otherSpecialMessage

The Event Type parameter may be included in the response if the Event Reply parameter is present in the response.

- Event Time: see Event Time [3].

- Event Information: see Event Information [3]. This parameter contains a sub-parameter which depends on the Event Type parameter. The sub-parameter specifies the following information as indicated by Table 3.

- Current Time: see Current Time [3].

- Event Reply: see Event Reply [3]. The inclusion of this parameter in the response is conditional upon the successful receipt of the event report in the confirmed mode.

- Errors: see Errors [3]. This parameter shall be included in a failure confirmation.

TABLE 3/M.3641

Information included in Event Information Subparameters

Sub-parameter Name	Information
ErrorFrames	TEI value, type of error frame received
InvalidFrames	Incorrectness of frame received
UnexpectedFrames	Type of frame, datalink state, TEI value
TimerExpiryNetwork	TEI value, type of timer
MessageCallRefError	Message type, indication whether call was active or not, call reference flag and value, TEI value
SpecialMessageType	Message type, special message was sent or received, TEI value, cause value
OtherSpecialMessage	Message type, special message was sent or received, TEI value, cause value

9.2   Negotiation of the fpmMonitorDchannel functional unit

This Recommendation assigns the following object identifier value

{ itu(0) recommendation (0) m(13) m3641(3641) functionalUnitPackage(1) } as a value for the ASN.1 type FunctionalUnitPackageID defined in Rec. X.701 | ISO/IEC 10040 [17] to use for negotiation the following functional unit:

0 fpmMonitorDchannel

where the number (0) identifies the bit position in the BITSTRING assigned to the functional unit.

In addition, the functional units identified in Recommendation Q.822 [2] are to be used in order to monitor and control the objects defined in this Recommendation.

The mechanism for negotiating the functional units is described in X.701 | ISO/IEC 10040 [17].

10   Conformance

A system claiming conformance to this Recommendation shall comply to the general static and dynamic conformance statements as included in Recommendation Q.822 [2]. In addition, the system shall comply to the conformance statements of Recommendation Q.822 [2] which address conformance to support managed object definitions. Finally, the system shall comply to the following ISDN D-channel specific conformance statement:

The system shall:

– support the role of manager or agent or both, with respect to the fpmMonitorDchannel functional unit defined in this Recommendation;

– For each dChannel managed object it should be possible to instantiate exactly one instance of the mgdDataLinkDChannel and mgdNetwLayerDChannel object.

– For each mgdDataLinkDChannel and mgdNetwLayerDChannel managed object it should be possible to instantiate at least one instance of the mgdDataLinkCurrentData or mgdNetwLayerCurrentData object.

11   References

[1]   CCITT Recommendation M.3640, *Management of the D-channel – Data link and network layer.*

[2]   ITU-T Recommendation Q.822: COM11\R\R002EV2, *Stage 1, stage 2 and stage 3 description for the Q3 interface – Performance management.*

[3]   CCITT Recommendation X.710, *Common management information service definition for CCITT applications.*

[4]   CCITT Recommendation X.721, *Definition of management information.*

[5]   CCITT Recommendation X.722, *Guidelines for the definition of managed objects.*

[6]   CCITT Recommendation M.3100, *Generic network information model.*

[7]   ITU-T Recommendation X.738, *Summarization function.*

[8]   CCITT Recommendation M.3010, *Principles for a telecommunication management network.*

[9]   CCITT Recommendation X.711, *Common management information protocol specification for CCITT applications.*

[10]   CCITT Recommendation X.208, *Specification of abstract syntax notation one (ASN.1).*

[11]   CCITT Recommendation X.730, *Object management function.*

[12]   CCITT Recommendation X.731, *State management function.*

[13]   CCITT Recommendation X.733, *Alarm reporting function.*

[14]   CCITT Recommendation X.734, *Event report management function.*

[15]   CCITT Recommendation X.735, *Log control function.*

[16]   ITU-T Recommendation X.739, *Metric objects and attributes.*

[17]   CCITT Rec. X.701 | ISO/IEC 10040:1992, *Information technology – Open Systems Interconnection – Systems management overview.*