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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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The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

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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.

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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.

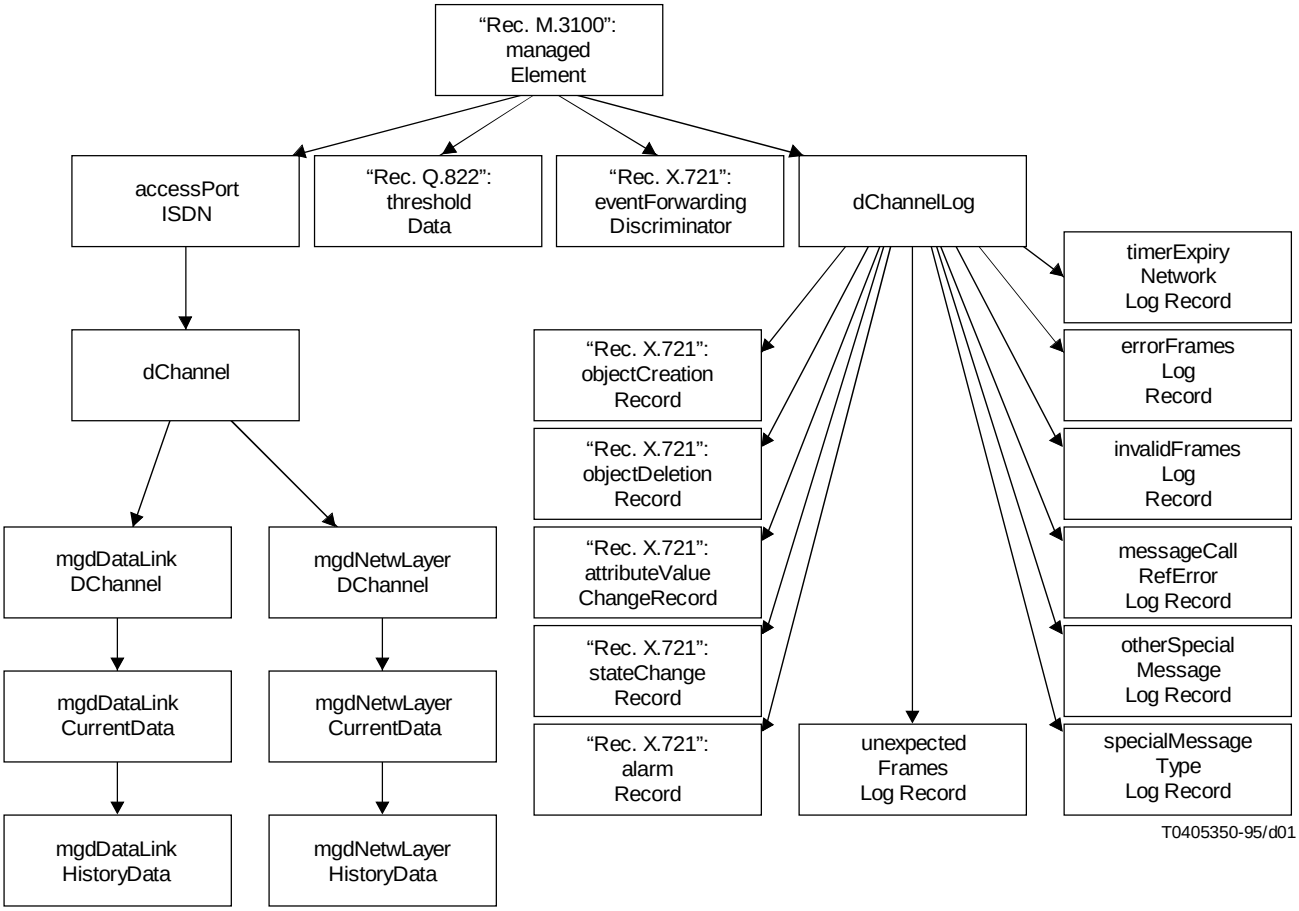

FIGURE 1/M.3641

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.

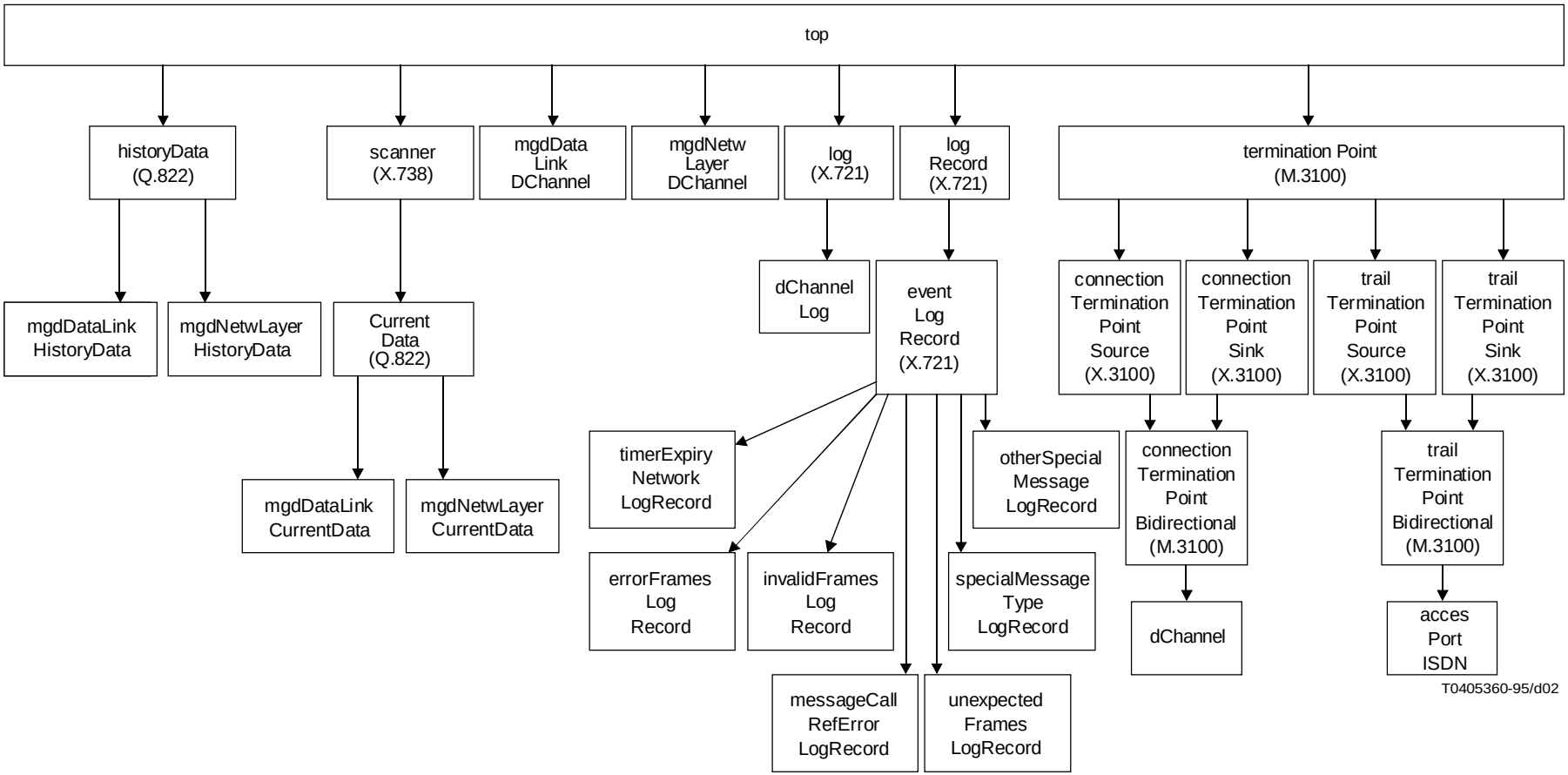

FIGURE 2/M.3641

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.

---

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].",

---

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*.