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**Telecommunications Management Network (TMN);
Performance monitoring for
Plesiochronous Digital Hierarchy (PDH) interfaces;
Information model for the Network Element (NE) view**

ETSI

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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00   Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Telecommunications Management Network (TMN), and is now submitted for the ETSI standards One-step Approval Procedure.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
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1   Scope

The present document provides an information model for the performance monitoring of Synchronous Digital Hierarchy (SDH) network. This model describes the managed object classes and their properties for the performance monitoring function, as defined in ITU-T Recommendation G.784 [1] and EN 301 167 [2] and as related to SDH Network Elements (NEs). These objects are useful to describe information exchanged across interfaces defined in ITU-T Recommendation M.3010 [3] Telecommunications Management Network (TMN) architecture for the management of the performance monitoring function.

PDH performance monitoring functions are used to monitor specified performance events of specified termination points managed objects as defined in EN 300 371 [4] and to report these performance data, as well as quality of service alarms to its managing system according to a given schedule.

ITU-T Recommendation M.2120 [5] defines maintenance of transport network,
ITU-T Recommendation G.784 [1] defines the management of SDH based NE. The present document defines the object model based on ITU-T Recommendation Q.822 [6] according to the requirements described in
ITU-T Recommendation G.784 [1], EN 301 167 [2] and ITU-T Recommendation M.2120 [5]. This model uses generic mechanism defined in ITU-T Recommendation Q.822 [6].

The present document defines:

-    an information model, as related to the performance monitoring function for the Plesiochronous Digital Hierarchy (PDH).

The present document does not define:

-    the protocol stack to be used for message communication;

-    the network level management processes;

-    the application contexts;

-    the conformance requirements to be met by an implementation of this information model;

-    information models for other systems or equipment.

The information model defined here (and the corresponding message set) is concerned with the management of NEs, the equipment by which they are implemented and the functions contained within them. More precisely, it applies to an equipment domain visible at the element manager to element interface and is only concerned with information available within that domain. Information proper to the domain of a network level management process is not included within this model.

2   References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, subsequent revisions do apply.

[1]   ITU-T Recommendation G.784 (1994): "Synchronous Digital Hierarchy (SDH) management".

[2]   ETSI EN 301 167: "Transmission and Multiplexing (TM); Management of Synchronous Digital Hierarchy (SDH) transmission equipment; Fault management and performance monitoring; Functional description".

[3]   ITU-T Recommendation M.3010 (1996): "Principles for a Telecommunications management network".

[4]   ETSI EN 300 371: "Telecommunications Management Network (TMN); Plesiochronous Digital Hierarchy (PDH) information model for the Network Element (NE) view".

[5]   ITU-T Recommendation M.2120 (1997): "PDH path, section and transmission system and SDH path and multiplex section fault detection and localization procedures".

[6]   ITU-T Recommendation Q.822 (1994): "Stage 1, stage 2 and stage 3 description for the Q3 interface - Performance management".

[7]   ITU-T Recommendation G.774-01 (1996): "Synchronous Digital Hierarchy (SDH) performance monitoring for the network element view".

[8]   ITU-T Recommendation G.774-06 (1997): "Synchronous Digital Hierarchy (SDH) unidirectional performance monitoring for the network element view".

[9]   ETSI EN 300 417-1-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 1-1: Generic processes and performance".

[10]   ETSI EN 300 417-5-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 5-1: Plesiochronous Digital Hierarchy (PDH) path layer functions".

[11]   ITU-T Recommendation G.826 (1996): "Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate".

[12]   ITU-T Recommendation X.739 (1993): "Information technology - Open Systems Interconnection - Systems management: Metric objects and attributes".

[13]   ITU-T Recommendation M.3100 (1995): "Generic network information model".

3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

BBE	Background Block Error
CSES	Consecutive Severely Errored Seconds
CTP	Connection Termination Point
ES	Errored Second
FEBBE	Far End Background Block Error
FEES	Far End Errored Second
FESES	Far End Severely Errored Seconds
NE	Network Element
PDH	Plesiochronous Digital Hierarchy
SDH	Synchronous Digital Hierarchy
SEMF	Synchronous Equipment Management Function
SES	Severely Errored Second
TMN	Telecommunications Management Network
TR	Threshold Reset
TTP	Trail Termination Point
UAS	Unavailable Seconds

4 Performance Monitoring Management Model

The performance monitoring requirements to be met by the SDH Equipment Management Function (SEMF) are described in ITU-T Recommendation G.784 [1], clause 5.3 and in EN 301 167 [2], clauses 5.1 to 5.2.
The functional model given in the SEMF for performance monitoring of SDH signals is basically applicable for PDH signals as well.

5 Managed object class definitions

In the context of the present document, the IMPORTS clause specifies the object classes which can be instantiated in the Scope of the present document. The IMPORTS clause does not include uninstantiated superclasses.

```
BEGIN
IMPORTS
currentData,
historyData
FROM Q822-PM-ASN1Module {itu(0) recommendation(0) q(17) q822(822) informationModel(0)
managedObjectClass(3)}
;
END
```

PDH Current Data Unidirectional

```
pdhCurrentDataUnidirectional    MANAGED OBJECT CLASS
DERIVED FROM                    "Recommendation Q.822 [6] : 1993": currentData;
CHARACTERIZED  BY
 "Recommendation Q.822 [6] : 1993": zeroSuppressionPkg,
 "Recommendation Q.822 [6] : 1993": thresholdPkg,
 pdhCurrentDataUnidirectionalPackage  PACKAGE
    BEHAVIOUR pdhCurrentDataUnidirectionalBehaviour;
    ATTRIBUTES
 "Recommendation M.3100 [13] : 1995": currentProblemList    GET,
 "Recommendation X.739 [12] : 1993": granularityPeriod       PERMITTED VALUES
                                                   PDHPMASN1.UniDGranularityPeriod;;;
CONDITIONAL  PACKAGES
 "Recommendation G.774-01 [7] : 1994":  historyPackage  PRESENT IF
         "an instance does not support flexible assignment of the history length",
 "Recommendation G.774-01 [7] : 1994":  unavailableTimeAlarmPackage PRESENT IF
         "starting and ending of unavailable period has to be reported and the granularity period
is 24 hours";
REGISTERED AS {en1384ObjectClass 1};

pdhCurrentDataUnidirectionalBehaviour BEHAVIOUR
```

DEFINED AS
"The pdhCurrentDataUnidirectional class is used to define generic characteristic for unidirectional
PDH performance monitoring from which subclasses are defined in order to hold performance event
counts for a specific monitoring point. Subclasses of this class are used in order to support
performance monitoring of PDH trails at various layers as described in EN 300 417-5-1 [10] . The
performance monitoring events ES, SES and BBE which are monitored by some of the subclasses of this
subclass are defined in annex B/G.826 [11] and are based on the performance event primitives
specified in EN 300 417-1-1 [9] and EN 300 417-5-1 [10] . The granularityPeriod attribute can only
be assigned a value at creation time.
This class can only contain one reference to an instance of the thresholdData object class in the
thresholdDataInstance attribute.
If a threshold is reached or crossed then the currentProblemList attribute shall indicate it with
the probable cause thresholdCrossed. Subclass of this class is used to monitor the near-end or far-
end performance data of the trail.
A period of unavailable time begins at the onset of 10 consecutive SES events. These ten seconds are
considered to be part of unavailable time. A new period of available time begins at the onset of ten
consecutive non-SES events. These ten seconds are considered to be part of available time.
The unavailability conditions are kept separate for near end and far end monitoring. This means that
near end unavailability is deduced from near end conditions only (e.g. 10 consecutive SES at the
near end) and far end unavailability is deduced from far end conditions only (e.g. 10 consecutive
SES at the far end).
For threshold reset subclasses of this object class the following rules apply:
No more than one QOS alarm shall be generated until there has been a 15 minutes rectangular fixed
window with less error count than the low error count threshold and no unavailable period exists.
To provision the high and low threshold value, the counterThresholdAttributList attribute of the
ITU-T Recommendation Q.822 [6] thresholdDataInstance is used. In this attribute all the thresholds
(high and low) for each necessary counter are stored in a list. This means for example, that the
high threshold for ES and the low threshold for ES are individually stored in the same list. It is
up to the network element to recognize which is the high and which is the low one.
If the unavailableTimeAlarmPackage is present and if an unavailable period starts then a
communication alarm shall be sent with a probable cause of Unavailable and the presence of this
unavailable condition is indicated by the currentProblemList attribute. If an unavailable period is
ending then a communication alarm shall be sent with a probable cause of Unavailable and a severity
of Cleared. An available condition is indicated by the absence of the unavailable condition in the
current problem list. The unavailable condition has no effect on the operationalState.
Each subclass of this class shall define the performance attributes required to hold the mandatory
or optional performance events. These performance event counts (except UAS) are inhibited during
unavailable time of its own direction (at the near end or at the far end).
Attributes which are defined in a subclass of this class shall be included in history information
using the historyData, or one of its subclass, unless it is explicitly specified in the subclass of
this class that a particular attribute be not included. Each subclass of this class shall indicate
which subclass of the history data is used for history retention. The following conditional packages
are not used in this class:
filterSuppressionPkg, observedManagedObjectPkg.
Concerning the subclasses of this class the following rule applies:
If a subclass of this class has a granularity period of 15 minutes, it should be either an instance
with the threshold reset functionality or an instance without this functionality instantiated (per
termination point), but not both.";

PDH Current Data Near End

```
pdhCurrentDataNearEnd          MANAGED OBJECT CLASS
DERIVED FROM                   pdhCurrentDataUnidirectional;
CHARACTERIZED  BY
pdhCurrentDataNearEndPackage    PACKAGE
               BEHAVIOUR   pdhCurrentDataNearEndBehaviour;
               ATTRIBUTES
               "Recommendation G.774-01 [7] : 1994":  bBE  REPLACE-WITH-DEFAULT  GET,
               "Recommendation G.774-01 [7] : 1994":  eS   REPLACE-WITH-DEFAULT GET,
               "Recommendation G.774-01 [7] : 1994":  sES  REPLACE-WITH-DEFAULT  GET;;;
CONDITIONAL  PACKAGES
  "Recommendation G.774-06 [8] : 1997":nearEndUASCurrentDataPackage     PRESENT IF
"an instance supports it",
  "Recommendation G.774-01 [7] : 1994":cSESCurrentDataPackage          PRESENT IF
"the granularity period is 15 minutes and an instance supports it";
REGISTERED AS {en1384ObjectClass 2} ;


pdhCurrentDataNearEndBehaviour BEHAVIOUR
DEFINED AS
"Instances of the pdhCurrentDataNearEnd managed object class are used to hold the current near end
register counts for a PDH path during a collection period.
The following performance primitives are observed:
Defect Seconds (pN_DS) and Errored Blocks (nN_B).
These primitives are provided by monitoring functions represented in superior PDH  termination
points and are defined in PDH path layers according EN 300 417-5-1 [10] . For these performance
primitives the following performance events are defined:
```

```
BBE Background Block Error.
ES  Errored Second.
SES Severely Errored Second.
UAS Unavailable Second: This counter is used to store one second intervals pertaining to an
unavailable time period at the near end.
In addition, the optional performance event CSES (Consecutive SES) is defined.
This managed object class uses the pdhPathHistoryDataNearEnd managed object class for history
retention.
A QOS alarm shall be sent as soon as a threshold is reached or crossed. At the end of the
granularity period the QOS alarm is implicitly cleared and, providing there are no other outstanding
threshold crossing QOS alarms, thresholdCrossing is removed from the currentProblemList (i.e. no
notification is sent). A new QOS alarm shall be sent if the threshold is reached or crossed again
during the next granularity period. Only one threshold value per performance counter will be
supported.";
```

PDH Current Data Near End Threshold Reset

```
pdhCurrentDataNearEndTR        MANAGED OBJECT CLASS
DERIVED FROM                   pdhCurrentDataNearEnd;
CHARACTERIZED  BY
"Recommendation G.774-01 [7] : 1994": thresholdResetPackage,
pdhCurrentDataNearEndTRPackage  PACKAGE
   ATTRIBUTES
"Recommendation X.739 [12] : 1993": granularityPeriod
                               PERMITTED VALUES PDHPMASN1.TRGranularityPeriod;;;
REGISTERED AS {en1384ObjectClass 3} ;
```

PDH Current Data Far End

```
pdhCurrentDataFarEnd           MANAGED OBJECT CLASS
DERIVED FROM                   pdhCurrentDataUnidirectional;
CHARACTERIZED  BY
pdhFarEndCurrentDataPkg,
pdhCurrentDataFarEndPackage    PACKAGE
  BEHAVIOUR  pdhCurrentDataFarEndBehaviour;;;
CONDITIONAL PACKAGES
  "Recommendation G.774-06 [8] : 1997": farEndUASCurrentDataPackage    PRESENT IF
"an instance supports it",
  "Recommendation G.774-01 [7] : 1994": farEndCSESCurrentDataPackage    PRESENT IF
"the granularity period is 15 minutes and an instance supports it",
  farEndBBEPackage                                              PRESENT IF
"an instance of this class is subordinate of a PDH-termination point monitoring a frame and block
structured path according Recommendation G.826 [11] (e.g. framed 2MBit/s signal with CRC4-
submultiframe) and pdhFarEndCurrentDataPkg is instantiated";
REGISTERED AS {en1384ObjectClass 4} ;

pdhCurrentDataFarEndBehaviour    BEHAVIOUR
DEFINED AS
"Instances of the pdhCurrentDataFarEnd managed object class are used to hold the current far end
register counts for a PDH path during a collection period.
The following performance primitives are observed:
Defect Seconds (pF_DS)  and conditionally Errored Blocks (nF_B).
The Errored Blocks are  count in the attribute fEBBE if an instance of this class is subordinate of
a PDH-termination point monitoring a frame and block structured paths. These primitives are
provided by monitoring functions represented in superior PDH termination points and are defined in
PDH path layers according to EN 300 417-5-1 [10] .
For these performance primitives the following performance events are defined:
FEES    Far End Errored Second.
FESES   Far End Severely Errored Second.
In addition, the following optional performance events are defined:
FEUAS   Far End Unavailable Second: This counter is used to store one second intervals pertaining to
an unavailable time period at the far end.
FEBBE   Far End Errored Blocks for frame and block structured paths.
FECSES  Far End Consecutive SES.
This managed object class uses the pdhPathHistoryDataFarEnd managed object class for history
retention.
A QOS alarm shall be sent as soon as a threshold is reached or crossed. At the end of the
granularity period the QOS alarm is implicitly cleared and, providing there are no other outstanding
threshold crossing QOS alarms, thresholdCrossing removed from the currentProblemList (i.e. No
Notification is Sent). A new QOS alarm shall be sent if the threshold is reached or crossed again
during the next granularity period. Only one threshold value per performance counter will be
supported.";
```

PDH Current Data Far End Threshold Reset

```
pdhCurrentDataFarEndTR          MANAGED OBJECT CLASS
DERIVED FROM                    pdhCurrentDataFarEnd;
CHARACTERIZED  BY
"Recommendation G.774-01 [7] : 1994": thresholdResetPackage,
pdhCurrentDataFarEndTRPackage   PACKAGE
  ATTRIBUTES
  "Recommendation X.739 [12] : 1993": granularityPeriod
                                        PERMITTED VALUES PDHPMASN1.TRGranularityPeriod;;;
REGISTERED AS {en1384ObjectClass 5} ;
```

PDH Current Data Bidirectional

```
pdhCurrentDataBidirectional    MANAGED OBJECT CLASS
DERIVED FROM                   "Recommendation Q.822 [6] : 1993": currentData;
CHARACTERIZED  BY
  "Recommendation Q.822 [6] : 1993": zeroSuppressionPkg,
  pdhCurrentDataBidirectionalPkg PACKAGE
     BEHAVIOUR pdhCurrentDataBidirectionalBehaviour;
     ATTRIBUTES
     "Recommendation X.739 [12] : 1993": granularityPeriod
                                        PERMITTED VALUES PDHPMASN1.BiDGranularityPeriod,
     "Recommendation M.3100 [13] : 1992": currentProblemList
                                        GET;;;
CONDITIONAL  PACKAGES
     "Recommendation G.774-01 [7] : 1994": historyPackage                   PRESENT IF
     "an instance does not support flexible assignment of the history length",
     "Recommendation G.774-01 [7] : 1994": unavailableTimeAlarmPackage      PRESENT IF
     "starting and ending of unavailable period has to be reported";
REGISTERED AS {en1384ObjectClass 6};

pdhCurrentDataBidirectionalBehaviour BEHAVIOUR
DEFINED AS
*The pdhCurrentDataBidirectional class is used to define generic characteristic for PDH performance
monitoring from which subclasses are defined in order to hold performance event counts for a
specific monitoring point. Subclasses of this class are used in order to support performance
monitoring of PDH trails at various layers as described in the Standard EN 300 417-5-1. The
performance monitoring events ES, SES and BBE which are monitored by some of the subclasses of this
subclass are defined in annex B/G.826 [11] and are based on the performance event primitives
specified in EN 300 417-1-1 [9] and EN 300 417-5-1 [10] . The granularityPeriod attribute can only
be assigned a value at creation time.
Subclass of this class is used to monitor the near end of the trail, and in case of bi-directional
trail the far end of the trail shall be supported additionally. In case of monitoring of a bi-
directional trail an unavailable period starts if either the near end or the far end is in a
unavailable condition. In case of monitoring of a unidirectional trail only the near end is
considered.
An unavailable condition starts when 10 consecutive severely errored seconds have been detected;
these 10 seconds belong to the unavailable time. An unavailable condition ends when 10 consecutive
seconds with no severely errored second are detected. These 10 seconds belong to the available time.
The unavailable period entry / exit criteria are described in ITU-T Recommendation G.826/annex 1.
If the unavailableTimeAlarmPackage is present and if an unavailable period starts then a
communication alarm shall be sent with a probable cause of "Unavailable" and the presence of this
unavailable condition is indicated by the currentProblemList attribute. If an unavailable period is
ending then a communication alarm shall be sent with a probable cause of "Unavailable" and a
severity of "Cleared". An available condition is indicated by the absence of the unavailable
condition in the current problem list. The unavailable condition has no effect on the
operationalState.
Each subclass of this class shall define the performance attributes required to hold the mandatory
or optional performance events. These performance event counts (except UAS) are inhibited during
unavailable time. Attributes which are defined in a subclass of this class shall be included in
history information using the historyData, or one of its subclass, unless it is
explicitly specified in the subclass of this class that a particular attribute be not included. Each
subclass of this class shall indicate which subclass of the history data is used for
history retention.
The following conditional packages are not used in this class:
filterSuppressionPkg, observedManagedObjectPkg and thresholdPkg.*;
```

PDH Error Performance Current Data

```
pdhErrorPerformanceCurrentData  MANAGED OBJECT CLASS
  DERIVED FROM               pdhCurrentDataBidirectional;
  CHARACTERIZED  BY
  pdhErrorPerformanceCurrentDataPackage  PACKAGE
    BEHAVIOUR  pdhErrorPerformanceCurrentDataBehaviour;
    ATTRIBUTES
    "Recommendation G.774-01 [7] : 1994":  bBE  REPLACE-WITH-DEFAULT GET,
    "Recommendation G.774-01 [7] : 1994":  eS   REPLACE-WITH-DEFAULT GET,
    "Recommendation G.774-01 [7] : 1994":  sES  REPLACE-WITH-DEFAULT GET;;;
  CONDITIONAL PACKAGES
    "Recommendation G.774-01 [7] : 1994": cSESCurrentDataPackage       PRESENT IF
 "an instance supports it",
    "Recommendation G.774-01 [7] : 1994": farEndCSESCurrentDataPackage    PRESENT IF
 "an instance supports it" ,
    "Recommendation G.774-01 [7] : 1994": uASCurrentDataPackage        PRESENT IF
 "an instance supports it",
    pdhFarEndCurrentDataPkg                                     PRESENT IF
 "the monitored point is Bi-directional",
    farEndBBEPackage                                           PRESENT IF
 "an instance of this class is subordinate of a PDH-termination point monitoring a frame and block
structured path according Recommendation G.826 [11] (e.g. framed 2MBit/s signal with CRC4-
submultiframe) and pdhFarEndCurrentDataPkg is instantiated";
REGISTERED AS {en1384ObjectClass 7} ;

pdhErrorPerformanceCurrentDataBehaviour  BEHAVIOUR
DEFINED AS
*Instances of the pdhErrorPerformanceCurrentData managed object Class are used to hold the current
register counts for a PDH Path during a collection period. An instance of this object class, for a
monitored managed object instance, holds the current register counts of each performance events
(BBE, ES, SES, FEES, FESES, and optionally UAS, FEBBE, CSES, FECSES).

Near End Monitoring
The following performance primitives are observed: Defect Seconds (pN_DS)  and Errored Blocks
(nN_B). These primitives are provided by monitoring functions represented in superior PDH
termination points and are defined in PDH path layers according to EN 300 417-5-1 [10] .
For these performance primitives the following performance events are defined:
BBE Background Block Error.
ES  Errored Second.
SES Severely Errored Second.

Far End Monitoring.
The following performance primitives are observed: Defect Seconds (pF_DS)  and Errored Blocks (nF_B)
in case of frame and block structured paths. These primitives are provided by  monitoring functions
represented in superior PDH termination points and are defined in PDH path layers according to
EN 300 417-5-1 [10] .
For these performance primitives the following performance events are defined:
FEBBE   Far End Background Block Error (in case of frame and block structured paths only).
FEES    Far End Errored Second.
FESES   Far End Severely Errored Second.

This managed object class uses the pdhPathHistoryData managed object class for history retention.*;
```

PDH Path History Data

For the sake of backward compatibility with its corresponding class pathTerminationHistoryData the attribute
elapsedTime is optional (contained in a conditional package).

```
pdhPathHistoryData              MANAGED OBJECT CLASS
  DERIVED FROM               "Recommendation Q.822 [6] : 1993":historyData;
  CHARACTERIZED BY
  pdhPathHistoryDataPackage     PACKAGE
    BEHAVIOUR       pdhPathHistoryDataBehaviour;
    ATTRIBUTES
    "Recommendation G.774-01 [7] : 1994": bBE   GET,
    "Recommendation G.774-01 [7] : 1994": eS    GET,
    "Recommendation G.774-01 [7] : 1994": sES   GET ;;;
CONDITIONAL PACKAGES
    elapsedTimePkg                                            PRESENT IF
"an instance supports it",
    "Recommendation G.774-01 [7] : 1994": uASHistoryDataPackage    PRESENT IF
"the superior object contains the uASCurrentDataPackage ",
    pdhFarEndHistoryDataPkg                                   PRESENT IF
"the superior object contains the pdhFarEndCurrentDataPkg ",
    farEndBBEHistoryPkg                                       PRESENT IF
```

```
"an instance of this class is subordinate of a PDH-termination point monitoring a frame and block
structured path according Recommendation G.826 [11] (e.g. framed 2MBit/s  signal with CRC4-
submultiframe) and pdhFarEndHistoryDataPkg is instantiated";
REGISTERED AS {en1384ObjectClass 8} ;

pdhPathHistoryDataBehaviour BEHAVIOUR
DEFINED AS
"Instances of this class are used to store the observed events of a pdhErrorPerformanceCurrentData
object at the end of an observation interval. An instance of this managed object is contained by any
of the managed object instances specified above";
```

pdhPathHistoryDataFarEnd

```
pdhPathHistoryDataFarEnd        MANAGED OBJECT CLASS
DERIVED FROM        "Recommendation Q.822 [6] : 1993":historyData;
CHARACTERIZED BY
pdhFarEndHistoryDataPkg,
pdhPathHistoryDataFarEndPackage PACKAGE
     BEHAVIOUR        pdhPathHistoryDataFarEndBehaviour;;;
CONDITIONAL PACKAGES
     elapsedTimePkg                                                    PRESENT IF
"an instance supports it",
     "Recommendation G.774-06 [8] : 1997": farEndUASHistoryDataPackage        PRESENT IF
"the superior object contains the farEndUASCurrentDataPackage ",
     farEndBBEHistoryPkg                                              PRESENT IF
"an instance of this class is subordinate of a PDH-terminationpoint monitoring a frame and block
structured path according Recommendation G.826 [11] (e.g. framed 2MBit/s signal with CRC4-
submultiframe)";
REGISTERED AS {en1384ObjectClass 9} ;

pdhPathHistoryDataFarEndBehaviour BEHAVIOUR
DEFINED AS
"Instances of this class are used to store the observed events of a pdhCurrentDataFarEnd(TR) object
at the end of an observation interval. An instance of this managed object is contained by any of the
managed object instances specified above";
```

PDH Path History DataNearEnd

```
pdhPathHistoryDataNearEnd               MANAGED OBJECT CLASS
  DERIVED FROM                          "Recommendation Q.822 [6] : 1993":historyData;
  CHARACTERIZED  BY
  pdhPathHistoryDataNearEndPackage  PACKAGE
     BEHAVIOUR  pdhPathHistoryDataNearEndBehaviour;
     ATTRIBUTES
                    "Recommendation G.774-01 [7] : 1994": bBE     GET,
                    "Recommendation G.774-01 [7] : 1994": eS      GET,
                    "Recommendation G.774-01 [7] : 1994": sES     GET ;;;
  CONDITIONAL  PACKAGES
     elapsedTimePkg                                                    PRESENT IF
"an instance supports it",
     "Recommendation G.774-06 [8] : 1996": nearEndUASHistoryDataPackage        PRESENT IF
"the superior object contains the nearEndUASCurrentDataPackage ";
REGISTERED AS {en1384ObjectClass 10};

pdhPathHistoryDataNearEndBehaviour BEHAVIOUR
DEFINED AS
"Instances of this class are used to store the observed events of a pdhCurrentDataNearEnd(TR) object
at the end of an observation interval. An instance of this managed object is contained by any of the
managed object instances specified above".
```

6 Packages

All packages are imported from relevant Recommendations. The following special packages are defined for the PDH-PM fragment:

```
elapsedTimePkg                  PACKAGE
  ATTRIBUTES
  "Recommendation Q.822 [6] :1993": elapsedTime   GET;
REGISTERED AS {en1384Package 1};

pdhFarEndCurrentDataPkg         PACKAGE
  ATTRIBUTES
  "Recommendation G.774-01 [7] : 1994":  fEES   REPLACE-WITH-DEFAULT GET,
  "Recommendation G.774-01 [7] : 1994":  fESES  REPLACE-WITH-DEFAULT GET;
REGISTERED AS {en1384Package 2};

farEndBBEPackage                PACKAGE
  ATTRIBUTES
  "Recommendation G.774-01 [7] : 1994":  fBBE  REPLACE-WITH-DEFAULT GET;
REGISTERED AS {en1384Package 3};

pdhFarEndHistoryDataPkg         PACKAGE
  ATTRIBUTES
  "Recommendation G.774-01 [7] : 1994": fEES     GET,
  "Recommendation G.774-01 [7] : 1994": fESES    GET;
REGISTERED AS {en1384Package 4};

farEndBBEHistoryPkg             PACKAGE
  ATTRIBUTES
  "Recommendation G.774-01 [7] : 1994": fBBE     GET;
REGISTERED AS {en1384Package 5};
```

7 Attributes

All attributes are imported from relevant Recommendations.

8 Actions

None.

9 Notifications

None.

10 Name bindings

In this context, the IMPORTS clause specifies the object classes which can be instantiated in the scope of the present document. The IMPORT clause does not include uninstantiated super classes.

```
BEGIN
IMPORTS
eMonitoringCTPSink,
ePDHTTPSinkR1
FROM ASN1TypeModule {itu(0) identified-organization(4) etsi(0) ets371(371) informationModel(0))
                             managedObjectClass (3)};
;
END

pdhCurrentDataBidirectional-eMonitoringCTPSink      NAME BINDING
  SUBORDINATE OBJECT CLASS  pdhCurrentDataBidirectional AND SUBCLASSES;
  NAMED BY SUPERIOR OBJECT CLASS    "EN 300 371 [4] (2000)":eMonitoringCTPSink
  AND SUBCLASSES;
  WITH ATTRIBUTE    "Recommendation X.739 [12] : 1993": scannerId;
```

```
  CREATE     WITH-REFERENCE-OBJECT,
        WITH-AUTOMATIC-INSTANCE-NAMING;
  DELETE     DELETES-CONTAINED-OBJECTS;
REGISTERED AS {en1384NameBinding 1};


pdhCurrentDataUnidirectional-eMonitoringCTPSink     NAME BINDING
  SUBORDINATE OBJECT CLASS  pdhCurrentDataUnidirectional AND SUBCLASSES;
  NAMED BY SUPERIOR OBJECT CLASS     "EN 300 371 [4] (2000)":eMonitoringCTPSink
  AND SUBCLASSES;
  WITH ATTRIBUTE     "Recommendation X.739 [12] : 1993": scannerId;
  CREATE     WITH-REFERENCE-OBJECT,
        WITH-AUTOMATIC-INSTANCE-NAMING;
  DELETE     DELETES-CONTAINED-OBJECTS;
REGISTERED AS {en1384NameBinding 2};


pdhCurrentDataBidirectional-ePDHTTPSinkR1          NAME BINDING
  SUBORDINATE OBJECT CLASS  pdhCurrentDataBidirectional AND SUBCLASSES;
  NAMED BY SUPERIOR OBJECT CLASS     "EN 300 371 [4] (2000)": ePDHTTPSinkR1
  AND SUBCLASSES;
  WITH ATTRIBUTE     "Recommendation X.739 [12] : 1993": scannerId;
  CREATE     WITH-REFERENCE-OBJECT,
        WITH-AUTOMATIC-INSTANCE-NAMING;
  DELETE     DELETES-CONTAINED-OBJECTS;
REGISTERED AS {en1384NameBinding 3};


pdhCurrentDataUnidirectional-ePDHTTPSinkR1         NAME BINDING
  SUBORDINATE OBJECT CLASS  pdhCurrentDataUnidirectional AND SUBCLASSES;
  NAMED BY SUPERIOR OBJECT CLASS     "EN 300 371 [4] (2000)": ePDHTTPSinkR1
  AND SUBCLASSES;
  WITH ATTRIBUTE     "Recommendation X.739 [12] : 1993": scannerId;
  CREATE     WITH-REFERENCE-OBJECT,
        WITH-AUTOMATIC-INSTANCE-NAMING;
  DELETE     DELETES-CONTAINED-OBJECTS;
REGISTERED AS {en1384NameBinding 4};


pdhPathHistoryDataFarEnd-pdhCurrentDataFarEnd      NAME BINDING
  SUBORDINATE OBJECT CLASS  pdhPathHistoryDataFarEnd AND SUBCLASSES;
  NAMED BY SUPERIOR OBJECT CLASS     pdhCurrentDataFarEnd AND SUBCLASSES;
  WITH ATTRIBUTE     "Recommendation Q.822 [6] :1993": historyDataId;
  BEHAVIOUR       pdhPathHistoryDataFarEnd-pdhCurrentDataFarEndBeh
BEHAVIOUR DEFINED AS
*Instance of the pdhPathHistoryDataFarEnd object class or one of its subclasses is created at the
end of the granularity period of an instance of the pdhCurrentDataFarEnd object or one of its
subclass and is directly contained by that instance*;;
  DELETE     DELETES-CONTAINED-OBJECTS;
REGISTERED AS {en1384NameBinding 5};


pdhPathHistoryDataNearEnd-pdhCurrentDataNearEnd    NAME BINDING
  SUBORDINATE OBJECT CLASS  pdhPathHistoryDataNearEnd AND SUBCLASSES;
  NAMED BY SUPERIOR OBJECT CLASS     pdhCurrentDataNearEnd AND SUBCLASSES;
  WITH ATTRIBUTE     "Recommendation Q.822 [6] :1993": historyDataId;
  BEHAVIOUR  pdhPathHistoryDataNearEnd-pdhCurrentDataNearEndBeh
BEHAVIOUR DEFINED AS
*Instance of the pdhPathHistoryDataNearEnd object class or one of its subclasses is created at the
end of the granularity period of an instance of the pdhCurrentDataNearEnd object or one of its
subclass and is directly contained by that instance*;;
  DELETE     DELETES-CONTAINED-OBJECTS;
REGISTERED AS {en1384NameBinding 6};


pdhPathHistoryData-pdhCurrentDataBidirectional     NAME BINDING
  SUBORDINATE OBJECT CLASS  pdhPathHistoryData AND SUBCLASSES;
  NAMED BY SUPERIOR OBJECT CLASS     pdhCurrentDataBidirectional AND SUBCLASSES;
  WITH ATTRIBUTE     "Recommendation Q.822 [6] :1993": historyDataId;
  BEHAVIOUR pdhPathHistoryData-pdhCurrentDataBidirectionalBeh
BEHAVIOUR DEFINED AS
*Instance of the pdhPathHistoryData object class or one of its subclasses is created at the end of
the granularity period of an instance of the pdhCurrentDataBidirectional object or one of its
subclass and is directly contained by that instance*;;
  DELETE     DELETES-CONTAINED-OBJECTS;
REGISTERED AS {en1384NameBinding 7};
```

11   ASN.1 definitions

```
PDHPMASN1 {ccitt(0) identified-organization(4) etsi(0) en301384(1384)
informationModel(0) asn1Module(2) pdhPM(0) }

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

TimePeriod
FROM MetricModule {joint-iso-itu(2) ms(9) function(2) part11(11) asn1Module(2) 0};

UniDGranularityPeriod::=  TimePeriod (WITH COMPONENTS {minutes(15), days(1)})
BiDGranularityPeriod::=   TimePeriod (WITH COMPONENTS {days(1)})
TRGranularityPeriod::=    TimePeriod (WITH COMPONENTS {minutes(15)})

enPM OBJECT IDENTIFIER ::= {ccitt(0) identified-organization(4) etsi(0) en301384(1384)
informationModel(0)}
en1384ObjectClass OBJECT IDENTIFIER ::= {enPM managedObjectClass(3)}
en1384Package OBJECT IDENTIFIER ::= {enPM package(4)}
en1384NameBinding OBJECT IDENTIFIER ::= {enPM nameBinding(6)}
en1384Attribute OBJECT IDENTIFIER ::= {enPM attribute(7)}
en1384Action OBJECT IDENTIFIER ::= {enPM action(9)}
en1384Notification OBJECT IDENTIFIER ::= {enPM notification(10)}

END -- end of PDHPMASN1
```
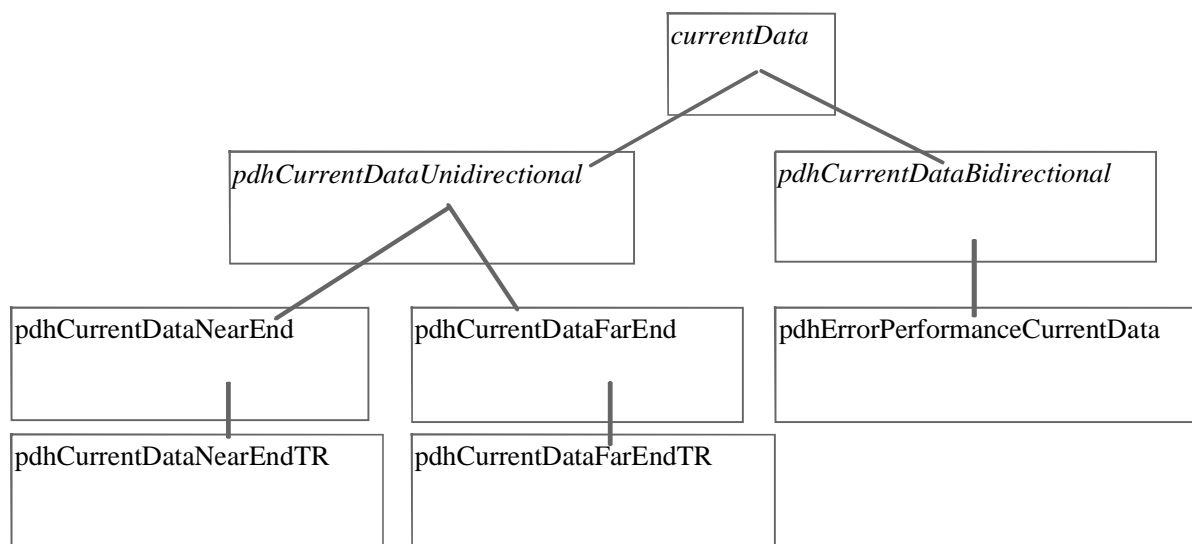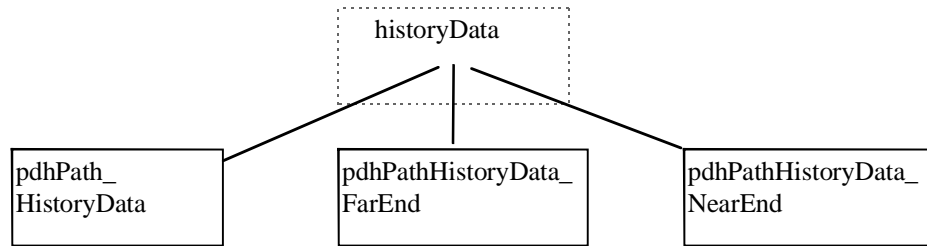
Figure 1: Inheritance of current data classes
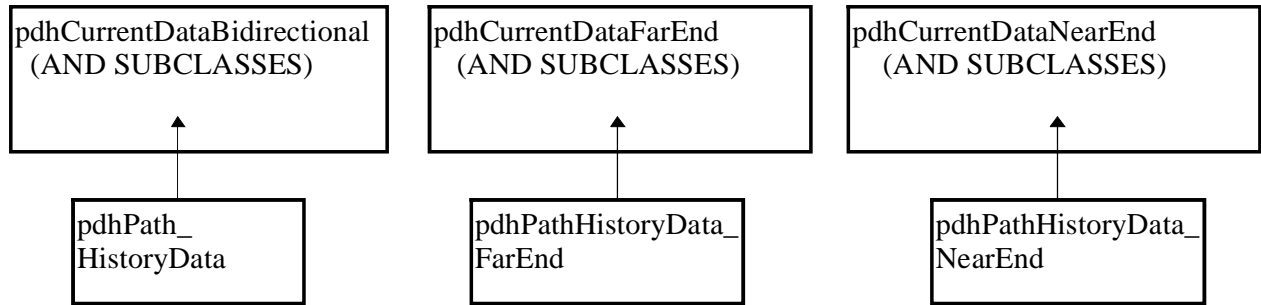
Figure 2: Inheritance of history data classes

Figure 3: Naming tree of classes relevant for PDH Performance Management

History

Document history		
V1.1.1	May 1999	Publication
V1.1.2	October 2000	One-step Approval Procedure OAP 20010223: 2000-10-25 to 2001-02-23