Abstract

This memo defines an experimental portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects for modeling Native Service Processing of SONET/SDH circuits over a Packet Switch Network (PSN).
1   Introduction

This document describes a model for managing encapsulated SONET Time Division Multiplexed (TDM) digital signals for transmission over a Packet Switched Network (PSN).

This document is closely related to [CEP], which describes the technology to encapsulate TDM signals and provide the Circuit Emulation Service over a Packet Switched Network (PSN).

The model for CEP management is a MIB module. The CEP MIB module described in this document works closely with the MIB modules described in [PWMIB] and the textual conventions defined in [PWTC].

In the spirit of the [RFC2863], a CEP connection will be a pseudo-wire (PW), and will therefore not be represented in the ifTable.

CEP is currently specified to carry "structured" SONET paths, meaning that each SONET PATH/VT within the section/line/path can be processed separately. The SONET section/line/path interface stack is modeled within [RFC3592].

Comments should be made directly to PWE3 group at pwe3@ietf.org.

This memo does not, in its draft form, specify a standard for the Internet community.

Conventions used in this document

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The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC-2119 [BCP14].

2   Terminology
CEP terminology comes from the CEP draft that describes a mechanism for transporting SONET Time Division Multiplexed (TDM) digital signals over a packet-oriented network. The mechanism for structured (as outlined in the CEP draft) terminates the SONET section and line overhead and then breaks the SONET path’s Synchronous Payload Envelope (SPE) into fragments for transmission over a PSN. Mechanism for terminating of the SONET path overhead and extracting SONET VTs are also described in \[CEP\]. Mechanisms for Fractional SONET SPE emulation are described in \[CEP\]. A CEP header is appended at the beginning of each fragment to provide information regarding where the SPE begins within the packet stream, a sequence number, and pointer adjustment information (see \[CEP\]).

"Outbound" references the traffic direction where a SONET path’s payload (SPE) is received, adapted to packet, assigned a PW label, and sent into the PSN.

Conversely, "inbound" is the direction where packets are received from the PSN, packet payloads are reassembled back into an SPE, and inserted as a SONET path into the SONET section and line.

Since A SONET path is bi-directional and symmetrical, CEP uses the same SONET time-slot, SONET width and packet size. Inbound and outbound PW labels may differ.

3 The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

4 CEP MIB module architecture

The CEP MIB module is part of the PW MIB modules architecture, as described in [PWMIB], and serves as one of the PW type-specific MIB module.

For clarity of the description below, in most cases we refer to the PATH SONET signal configuration only. When configuring VT mode as described in [CEP], the same apply for the VT level.
1.1 Summary of CEP MIB

- The CEP PW Table (pwCepTable) contains the SONET Path/VT ifIndex, SONET Path Time slot, the pwCepCfgTable index, config error indications, and various status indications.

- The CEP PW Configuration Parameter Table (pwCepCfgTable) has objects for CEP PW configuration. In situations where sets of config objects are common amongst more than 1 CEP PW, a single entry here may be referenced by many pwCepTable entries.

- The CEP Performance Current Table (pwCemPerfCurrentTable) contains CEP stats for the current 15-minute period.

- The CEP Performance 15 Minutes Interval Table (pwCemPerfIntervalTable) is similar to the pwCemPerfCurrentTable. It contains historical intervals (usually 96 15-minute entries to cover a 24 hour period).

Note: the performance interval statistics are supported by CEP due to the very function of CEP - that is, processing SONET. See [RFC3592].

- The CEP Performance 1 day Table (pwCepPerf1DayTable) contains statistics accumulated during the current day and contains previous days historical statistics.

- The CEP Fractional Table (pwCepFracTable) adds configuration and monitoring parameters for fractional SPE PWs.

- The Conformance Config Table (pwCepConformanceCfgTable) allows the vendor to specify the extent to which certain objects are supported (or not).

1.2 CEP configuration Step by Step

Configuring a CEP PW involves the following steps.

First create an entry in the pwTable and configure the PSN tunnels:

- Follow steps as defined in [PWMIB].

Configure the SONET Path parameters:

- Set the SONET path width in the sonetPathCurrentTable [RFC3592].

- Set the SONET path index and the SONET path starting time slot in the pwCepTable.

NOTE: The agent will have created an entry in the pwCepTable based on the entry created in the pwTable.

Configure the CEP PW:

- If necessary, create an entry in the pwCepCfgTable (a suitable entry may already exist). Set packet length, etc.
- Set the index of this pwCepCfgTable entry in the pwCepTable.

Observe the CEP PW:

- Once a CEP PW is operational, the pwCepPerfCurrentTable, pwCepPerfIntervalTable, and pwCepPerf1DayTable are used to monitor the various counts, indicators, and conditions of the PW.

Conforming to the CEP MIB objects:

- The pwCepConformanceCfgTable is used to state True/False whether certain objects are supported. An ASCII string object is available with every True/False object as a means to explain the extent of ‘true’ support, or perhaps explain why the ‘false’ was set.

5 Example of CEP PW Setup

In this section we provide an example of using the MIB objects described in section 8 to set up a CEP PW (width of 3 STSs, starting at time slot 1). While this example is not meant to illustrate every permutation of the MIB, it is intended as an aid to understanding some of the key concepts. It is meant to be read after going through the MIB itself. See [PWMIB] for an example of setting up PSN Tunnels.

First configure the SONET path width, starting time-slot, and associated CEP PW. In this case, an STS-3c starts at SONET time slot 1 (and is distributed normally within the SONET frame). In the following example, the ifIndex for the sonetPathCurrentEntry is 23, while the pwCepCfgTable index is 9.

In [RFC3592] sonetPathCurrentEntry (ifIndex = 23) :

```plaintext
sonetPathCurrentWidth           = 3,
sonetPathCurrentStatus ...
```

Create an entry in the pwCepCfgTable (index = 9) :

```plaintext
{
  pwCepCfgSonetPayloadLength    = 783 -- payload bytes
  pwCepCfgMinPktLength          = 0   -- no minimum
  pwCepCfgPktReorder            = true
  pwCepCfgEnableDBA             = unequipped
  pwCepCfgRtpHdrSuppress        = false
  pwCepCfgJtrBfrDepth           = 500 -- micro-seconds
  pwCepCfgConsecPktsInsync      = 2   -- Exit LOPS state
  pwCepCfgConsecMissingOutSync  = 10  -- Enter LOPS state
  pwCepCfgPktErrorPlayOutValue  = 0xFF -- All ones
  pwCepCfgMissingPktsToSes      = 3   -- packets,
```
\begin{verbatim}
pwCepCfgSesToUas = 2 -- seconds,
pwCepCfgSecsToExitUas = 10 -- seconds,
pwCepCfgRowStatus = createAndGo
\}

Check that there is no error bit set in pwCepConfigError.

In the PW MIB module: Get a new index and create a new pwTable entry using pwIndexNext (here, the PW index = 83) and pwRowStatus. In this new entry, set pwType to ‘cep’. This should create a new entry in the pwCepTable. Set up and the SONET path ifIndex, SONET path time slot, and Cfg Table indexes within this new pwCep table entry:

\begin{verbatim}
\{
pwCepSonetIfIndex = 23 -- Index of associated entry
  -- in sonetPathCurrent table.
pwCepCfgIndex = 9 -- Index of associated entry
  -- in pwCepCfg table (above).
\}
\end{verbatim}

Verify that none of the error bits are set in pwCepSonetConfigError.
\end{verbatim}
6  Object definition

PW-CEP-STD-MIB DEFINITIONS ::= BEGIN

IMPORTS
  MODULE-IDENTITY, OBJECT-TYPE,
  Integer32, Counter32, Unsigned32, Counter64, transmission
  FROM SNMPv2-SMI -- [RFC2578]

  MODULE-COMPLIANCE, OBJECT-GROUP
  FROM SNMPv2-CONF -- [RFC2580]

  TEXTUAL-CONVENTION, TruthValue, RowStatus, StorageType, TimeStamp
  FROM SNMPv2-TC -- [RFC2579]

  SnmpAdminString
  FROM SNMP-FRAMEWORK-MIB -- [RFC3411]

  InterfaceIndexOrZero, InterfaceIndex
  FROM IF-MIB -- [RFC2863]

  PerfCurrentCount, PerfIntervalCount
  FROM PerfHist-TC-MIB -- [RFC3593]

  HCPerfCurrentCount, HCPerfIntervalCount, HCPerfTimeElapsed,
  HCPerfValidIntervals
  FROM HC-PerfHist-TC-MIB -- [RFC3705]

  pwIndex
  -- RFC Ed.: replace yyyy with actual RFC number & remove this note
  FROM PW-STD-MIB -- [RFCyyyy]

;

-- The PW CEP MIB

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pwCepStdMIB MODULE-IDENTITY
LAST-UPDATED "200602011200Z" -- 1 February 2006 12:00:00 GMT
ORGANIZATION "Pseudo-Wire Emulation Edge-to-Edge (PWE3)
Working Group"

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  "
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The PWE3 Working Group (email distribution pwe3@ietf.org,
http://www.ietf.org/html.charters/pwe3-charter.html)
"
DESCRIPTION
"This MIB module contains managed object definitions for Circuit Emulation over Packet (CEP) as in: Malis, A.,
Prayson, P., Cohen, R. and Zelig, D. 'SONET/SDH Circuit Emulation Over Packet (CEP)', RFC yyyy
-- RFC Ed.: replace yyyy with actual RFC number & remove this note
Copyright (C) The Internet Society (2006). This version of this MIB module is part of RFC yyyy; see the RFC itself for full legal notices.
-- RFC Ed.: replace yyyy with actual RFC number & remove this note"

::= { transmission 5 } -- To be assigned by IANA
  -- RFC Editor: please replace the XXXX with the
  -- IANA assigned value and remove this note

-- Local Textual conventions
PwCepCfgIndex ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION "Index into the pwCepCfgTable."
  SYNTAX Unsigned32

PwCepSonetEbm ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION "Equipped Bit Mask (EBM) used for fractional STS-1/VC-3. The EBM bits are the 28 least significant bits out of the 32 bit value"
  SYNTAX Unsigned32

PwCepSdhVc4Ebm ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION

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  "Equipped Bit Mask (EBM) used for each TUG-3 in fractional VC-4 circuits. The EBM bits are the 30 least significant bits out of the 32 bit value"
  SYNTAX Unsigned32

PwCepSonetVtgMap ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION "The VT/VC types carried in the 7 VTG/TUG-2s. The format is 28 bits in the form of an Equipped Bit Mask (EBM) for fractional STS-1/VC-3. The mapping specifies the maximal occupancies of VT/VC within each VTG/TUG-2. For example, all four bits are set to 1 in this objects it represents a VTG carrying VT1.5/VC11s, while only three are set when VT2/VC12 are carried within this VTG. The relevant bits are the 28 least significant bits out of the 32 bit value."
  SYNTAX Unsigned32

PwCepFracAsyncMap ::= TEXTUAL-CONVENTION
The type of Asynchronous mapping carried inside STS-1, VC-3 or TUG-3 containing TU-3 circuit. The value of 'other' MUST be used if the Use of this object is not applicable.

SYNTAX INTEGER {
    other (1),
    ds3 (2),
    e3 (3)
}

-- Top level components of this MIB module.

-- Tables, Scalars

pwCepObjects OBJECT IDENTIFIER
    ::= { pwCepStdMIB 1 }

-- Conformance

pwCepConformance OBJECT IDENTIFIER
    ::= { pwCepStdMIB 2 }

-- CEP PW table

pwCepTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF PwCepEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION  
        "This table contains objects and parameters for managing and monitoring the CEP PW."
    ::= { pwCepObjects 1 }

PwCepEntry OBJECT-TYPE
    SYNTAX       PwCepEntry

    pwCepType                       INTEGER,
    pwCepSonetIfIndex               InterfaceIndexOrZero,
    pwCepSonetConfigErrorOrStatus   BITS,
    pwCepCfgIndex                   PwCepCfgIndex,
    pwCepTimeElapsed                HCPerfTimeElapsed,
    pwCepValidIntervals             HCPerfValidIntervals,
pwCepIndications  BITS,
pwCepLastEsTimeStamp  TimeStamp,
pwCepPeerCepOption  Unsigned32
}

pwCepType OBJECT-TYPE
SYNTAX  INTEGER {
  spe  (1),
  vt   (2),
  fracSpe  (3)
}
MAX-ACCESS  read-write
STATUS  current
DESCRIPTION
"Specifies the sub-type of CEP PW. Currently only structured types are supported:

'spe'(1) : SONET STS-Nc signals.
'vt' (2) : SONET VT-x (x=1.5,2,3,6) signals.
'fracSpe' (3) : SONET fractional STS-1 or SDH fractional VC-3 or VC-4 carrying tributaries or Asynchronous signals.

Support of 'vt' mode or 'fracSpe' mode is optional."
DEFVAL
{ spe }
::= { pwCepEntry 1 }

pwCepSonetIfIndex OBJECT-TYPE
SYNTAX  InterfaceIndexOrZero
MAX-ACCESS  read-write
STATUS  current
DESCRIPTION
"This is a unique index within the ifTable. It represents the interface index for the SONET path for SPE emulation (RFC3593 section 3.3), an interface index for the SONET VT (RFC3593 section 3.4) if the VT to be emulated is extracted a SONET signal or locally mapped from a physical interface.

A value of zero indicates an interface index that has yet to be determined. Once set, if the SONET ifIndex is (for some reason) later removed, the agent MAY delete the associated PW rows (e.g., this pwCepTableEntry). If the agent does not delete the rows, it is recommended that the agent set this object to zero."
::= { pwCepEntry 2 }

pwCepSonetConfigErrorOrStatus OBJECT-TYPE
SYNTAX  BITS {
  other   ( 0),
  timeslotInUse   ( 1),
  timeslotMisuse   ( 2),
  peerDbaIncompatible   ( 3), -- Status Only
peerEbmIncompatible ( 4),
peerRtpIncompatible ( 5),
peerPidIncompatible ( 6),
peerAsyncIncompatible ( 7)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object report a configuration mismatch inside
the local node or between the local node and the peer node.
Some bits indicate an error and some are simply a status
report that does not affect the forwarding process.

'timeslotInUse'(1) is set when another CEP PW has already
reserved a timeslot(s) that this CEP PW is attempting to
reserved.

'timeslotMisuse'(2) is set when the stated timeslot this
PW is trying to use is not legal. For example, if
specifying a starting timeslot of 45 for a SONET path of
an STS-12c width.

The peerIncompatible bits are set if the local configuration
is not compatible with the peer configuration as available
from the CEP option received through the signaling process
from the peer."

REFERENCE
(CEP), RFC yyyy, section 11. "

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-- RFC Editor: Please replace yyyy with the RFC number and remove
-- this remark
::= { pwCepEntry 3 }

pwCepCfgIndex OBJECT-TYPE
SYNTAX PwCepCfgIndex
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"Index to CEP configuration table below. Multiple CEP PWs
MAY share a single pwCepCfgEntry."

::= { pwCepEntry 4 }

pwCepTimeElapsed OBJECT-TYPE
SYNTAX HCPerfTimeElapsed
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of seconds, including partial seconds,
that have elapsed since the beginning of the current
measurement period. If, for some reason, such as an
adjustment in the system’s time-of-day clock, the
current interval exceeds the maximum value, the
agent will return the maximum value."
::= { pwCepEntry 5 }

pwCepValidIntervals OBJECT-TYPE
SYNTAX HCPerpValidIntervals
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The number of previous 15-minute intervals for which data was collected. An agent with CEP capability must be capable of supporting at least \( n \) intervals. The minimum value of \( n \) is 4, The default of \( n \) is 32 and the maximum value of \( n \) is 96."

::= { pwCepEntry 6 }

pwCepIndications OBJECT-TYPE
SYNTAX BITS {
  missingPkt (0),
  ooRngDropped(1),
  jtrBfrUnder (2),
  pktMalformed(3),
  lops (4),
  cepRdi (5),
  cepAis (6),
  badHdrStack (7),
  cepNeFailure(8),
  cepFeFailure(9)
}

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MAX-ACCESS read-write
STATUS current
DESCRIPTION "Definitions:

'missingPkt'(0) - While playing out a sequence of packets, a packet(s) was determined to be missing based on a gap in the CEP sequence number. Note: If the implementation supports packet re-ordering, detecting gaps should not take place as packets arrive, only as they are played out - this gives time for mis-ordered packets to arrive late.

'ooRngDropped'(1) - Packet(s) arrives that is outside the range of the jitter buffer. This may be because the jitter buffer is full, or the sequence number addresses a buffer outside the current jitter buffer range, or addresses an already occupied buffer within range. Whether or not packet re-ordering is supported by the implementation, this indication MUST be supported.

'jtrBfrUnder'(2) - The jitter buffer underflowed due to not enough packets arriving as packets were being played out.

'pktMalformed'(3) - Any error related to unexpected packet format (except bad header stack) or unexpected length.
'lops'(4) - Loss Of Packet Synchronization.

'cepRdi'(5) - Circuit Emulation over Packet Remote Defect Indication. Generated by the remote CEP de-packetizer when detecting LOPS. Note: not generated by the remote SONET function. See draft-ietf-pwe3-sonet.

'cepAis'(6) - Remote CEP packetizer has detected AIS on its incoming SONET stream. Note: cepAis MUST NOT (in itself) cause a CEP down notification.

'badHdrStack'(7) - This indication is set when the number of CEP header extensions detected in incoming packets does not match the expected number.

'cepNeFailure'(8) - Set when CEP-NE failure is currently declared.

'cepFeFailure'(8) - Set when CEP-FE failure is currently declared.

This object MUST hold the accumulated indications, until the next SNMP write that clear the indication(s).

Writing a non zero value MUST fail.

Currently there is no hierarchy of CEP defects.

The algorithm used to capture these indications is implementation specific.

::= { pwCepEntry 7 }

pwCepLastEsTimeStamp OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The value of sysUpTime on the most recent occasion at which the CEP PW entered the ES or SES state."

::= { pwCepEntry 8 }

pwCepPeerCepOption OBJECT-TYPE
SYNTAX      Unsigned32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The value of CEP option parameter as received from the peer by the PW signaling protocol."

::= { pwCepEntry 9 }

-- End of CEP PW table

-- Obtain index for PW CEP Configuration table entries
pwCepCfgIndexNext OBJECT-TYPE
SYNTAX        PwCepCfgIndex
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION   "This object contains an appropriate value to be used for pwCepCfgIndex when creating entries in the pwCepCfgTable. The value 0 indicates that no unassigned entries are available. To obtain the value of pwCepCfgIndex for a new entry in the pwCepCfgTable, the manager issues a management protocol retrieval operation to obtain the current value of pwCepCfgIndex. After each retrieval operation, the agent should modify the value to reflect the next unassigned index. After a manager retrieves a value the agent will determine through its local policy when this index value will be made available for reuse."

::= { pwCepObjects 2 }

-- PW CEP PW Configuration Table

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pwCepCfgTable OBJECT-TYPE
SYNTAX                  SEQUENCE OF PwCepCfgEntry
MAX-ACCESS              not-accessible
STATUS                  current
DESCRIPTION             "This table contains a set of parameters that may be referenced by one or more CEP PWs by pwCepTable."

::= { pwCepObjects 3 }

pwCepCfgEntry OBJECT-TYPE
SYNTAX                  PwCepCfgEntry
MAX-ACCESS              not-accessible
STATUS                  current
DESCRIPTION             "These parameters define the characteristics of a CEP PW. They are grouped here to ease NMS burden. Once an entry is created here it may be re-used by many PWs."

INDEX  { pwCepCfgTableIndex }

::= { pwCepCfgTable 1 }

PwCepCfgEntry ::= SEQUENCE {
  pwCepCfgTableIndex            PwCepCfgIndex,
  pwCepConfigError              BITS,
  pwCepSonetPayloadLength       Unsigned32,
  pwCepCfgMinPktLength          Unsigned32,
  pwCepCfgPktReorder            TruthValue,
  pwCepCfgEnableDBA             BITS,
pwCepCfgRtpHdrSuppress TruthValue,
pwCepCfgJtrBfrDepth Unsigned32,
pwCepCfgConsecPktsInsync Unsigned32,
pwCepCfgConsecMissingOutSync Unsigned32,
pwCepCfgPktErrorPlayOutValue Unsigned32,
pwCepCfgMissingPktsToSes Unsigned32,
pwCepCfgSesToUas Unsigned32,
pwCepCfgSecsToExitUas Unsigned32,
pwCepCfgName SnmpAdminString,
pwCepCfgRowStatus RowStatus,
pwCepCfgStorageType StorageType
}

pwCepCfgTableIndex OBJECT-TYPE
SYNTAX PwCepCfgIndex
MAX-ACCESS not-accessible

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STATUS current
DESCRIPTION "Primary index to this table"
::= { pwCepCfgEntry 1 }

pwCepConfigError OBJECT-TYPE
SYNTAX BITS {
  other     ( 0),
  dba       ( 1),
  lopsPktCount ( 2),
  pktLength ( 3),
  jtrBfrDepth ( 4)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION "Various configurations errors, detected when a configured value within the pwCepCfg or pwCepSonetExt tables cannot be supported by the local agent."
::= { pwCepCfgEntry 2 }

pwCepSonetPayloadLength OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The number of SONET bytes of the Path or VT carried as payload within one packet. For example, for STS-1/VC-3 SPE circuits, value of 783 bytes indicates that each packet carries payload equivalent to one frame. For VT1.5/VC11 circuits, a payload length of 104 bytes indicates that each packet carries payload equivalent to one VT1.5 super-frame."
The actual payload size may be different, due to bandwidth reduction modes, e.g. DBA mode or dynamically assigned fractional SPE. This length applies to inbound and outbound packets carrying user payload. Although there is no control over inbound packets, those of illegal length are discarded and accounted for (see pwCepPerf...Malformed.) The default values are determined by the pwCepType: 783 for pwCepType equal spe(2) or fracSpe(3). For vt(3) modes, the applicable super-frame payload size is the default value.

REFERENCE
"Malis, A., et al, ‘SONET/SDH Circuit Emulation over Packet (CEP), RFC yyyy, sections 4.1 and 10.2"
-- RFC Editor: Please replace yyyy with the RFC number and remove this remark
::= { pwCepCfgEntry 3 }

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pwCepCfgMinPktLength OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-create
STATUS current
DESCRIPTION "This is the minimum CEP packet length in number of bytes (including CEP header and payload). It applies to CEP’s bandwidth-savings packets. Currently DBA is the only bandwidth-savings packet type (in the future, CEP may support compression). Minimum packet length is necessary in some systems or networks.

Setting Zero here indicates that there is no minimum packet restriction."
DEFVAL { 0 }
::= { pwCepCfgEntry 4 }

pwCepCfgPktReorder OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION "If set ‘true’: as inbound packets are queued in the jitter buffer, out of order packets are re-ordered. The maximum sequence number differential (i.e., the range in which re-sequencing can occur) is dependant on the depth of the jitter buffer.

If the local agent support packet re-ordering, the default value SHOULD be set to ‘true’, Otherwise, this value SHOULD be set to ‘false’."
::= { pwCepCfgEntry 5 }
pwCepCfgEnableDBA OBJECT-TYPE
SYNTAX BITS {
  ais    
  unequipped
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"Bits set here MUST enable the DBA (dynamic bandwidth allocation) feature for the specified condition. Setting 'ais' MUST cause CEP packet payload suppression when AIS is detected on the associated SONET path. Similarly, 'unequipped' MUST cause payload suppression when an un-equipped condition is detected on the SONET/SDH PATH/VT. During these conditions, CEP packets will continue to be sent, but with indicators set in the CEP header instructing the remote to play all ones (for AIS) or all zeros (for un-equipped) onto its SONET path.

NOTE: Some implementations may not support this feature. In these cases, this object should be read-only."

REFERENCE
-- RFC Editor: Please replace yyyy with the RFC number and remove this remark
::= { pwCepCfgEntry 6 }

pwCepCfgRtpHdrSuppress OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"If set True: an RTP header is not pre-pended to the CEP packet."
REFERENCE
"Malis, A., et al, 'SONET/SDH Circuit Emulation over Packet (CEP), RFC yyyy, section 4.3."
-- RFC Editor: Please replace yyyy with the RFC number and remove this remark
DEFVAL 
{ false }
::= { pwCepCfgEntry 7 }

pwCepCfgJtrBfrDepth OBJECT-TYPE
SYNTAX Unsigned32
UNITS "micro-seconds"
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This setting configures the number of microseconds of expected packet delay variation for this CEP PW"
over the PSN.

The actual jitter buffer MUST be at least twice this value for proper operation, and is implementation specific.

If configured to a value not supported by the implementation, the agent MUST return an error code 'jtrBfrDepth' in 'pwCepConfigError'.

::= { pwCepCfgEntry 8 }

-- The following counters work together to integrate (filter)
-- errors and the lack of errors on the CEP PW. An error is
-- caused by a missing packet. Missing packet can be a result
-- of: packet loss in the network, (uncorrectable) packet out
-- of sequence, packet length error, jitter buffer overflow,
-- and jitter buffer underflow. The result is declaring whether
-- or not the CEP PW is in Loss of Packet Sync (LOPS) state.

pwCepCfgConsecPktsInsync OBJECT-TYPE
SYNTAX        Unsigned32
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION   "Consecutive pkts with sequential sequence
numbers required to exit the LOPS state."
REFERENCE
(CEP), RFC yyyy, section 5.2.2. "
-- RFC Editor: Please replace yyyy with the RFC number and remove
-- this remark
DEFVAL
  { 2 }

::= { pwCepCfgEntry 9 }

pwCepCfgConsecMissingOutSync OBJECT-TYPE
SYNTAX        Unsigned32
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION   "Consecutive missing pkts required to enter
the LOPS state."
REFERENCE
(CEP), RFC yyyy, section 5.2.2. "
-- RFC Editor: Please replace yyyy with the RFC number and remove
-- this remark
DEFVAL
  { 10 }

::= { pwCepCfgEntry 10 }

pwCepCfgPktErrorPlayOutValue OBJECT-TYPE
SYNTAX        Unsigned32 (0..255)
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This is the value played when inbound packets have
over/underflowed the jitter buffer, or are missing
for any reason. This byte pattern is sent (played) on
the SONET path."
DEFVAL
{ 255 } -- Play all ones, equal to AIS indications.
::= { pwCepCfgEntry 11 }

pwCepCfgMissingPktsToSes OBJECT-TYPE
SYNTAX Unsigned32
UNITs "seconds"
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"Number of missing packets detected (consecutive or not)
within a 1 second window to cause a Severely Errored
Second (SES) to be counted."
REFERENCE
(CEP), RFC yyyy, section 9.1."
-- RFC Editor: Please replace yyyy with the RFC number and remove
-- this remark
DEFVAL
{ 3 }
::= { pwCepCfgEntry 12 }

pwCepCfgSesToUas OBJECT-TYPE
SYNTAX Unsigned32
UNITs "seconds"
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"Number of consecutive SESs before declaring PW in UAS
state (and at which point pwCepPerfUASs starts counting).
The SesToUas default value is 10 seconds.

NOTE: Similar to RFC 3592, If the agent chooses to update
the various performance statistics in real time then it must
be prepared to retroactively reduce the ES, SES, counts by
this value and increase the UAS count by this value when it
determines that UAS state has been entered.

NOTE: See pwCepPerfSESs and pwCepPerfUASs."
REFERENCE
(CEP), RFC yyyy, section 9.1."
-- RFC Editor: Please replace yyyy with the RFC number and remove
-- this remark
DEFVAL
{ 10 }
::= { pwCepCfgEntry 13 }

pwCepCfgSecsToExitUas OBJECT-TYPE
SYNTAX       Unsigned32
UNITS        "seconds"
MAX-ACCESS   read-create
STATUS       current
DESCRIPTION  "Number of consecutive nonSESs before declaring PW is NOT in UAS state (and at which point pwCepPerfUASs stops counting)."

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-- RFC Editor: Please replace yyyy with the RFC number and remove
-- this remark
DEFVAL { 10 }
::= { pwCepCfgEntry 14 }

pwCepCfgName OBJECT-TYPE
SYNTAX       SnmpAdminString
MAX-ACCESS   read-create
STATUS       current
DESCRIPTION  "This variable contains the name of the Configuration entry. This name may be used to help the NMS to display the purpose of the entry."
::= { pwCepCfgEntry 15 }

pwCepCfgRowStatus OBJECT-TYPE
SYNTAX       RowStatus
MAX-ACCESS   read-create
STATUS       current
DESCRIPTION  "For creating, modifying, and deleting this row.

None of the read-create objects values can be changed when pwCepCfgRowStatus is in the active(1) state. Changes are allowed when the pwRowStatus is in notInService(2) or notReady(3) states only.

If the operator need to change one of the values for an active row (for example in order to fix a mismatch in configuration between the local node and the peer), the pwCepCfgRowStatus should be first changed to notInService(2), the objects may be changed now, and later to active(1) in order to re-initiate the signaling process with the new values in effect.

Change of status from the active(1) state or deleting a row SHOULD be blocked by the local agent if the row is referenced by any pwCepEntry whose pwRowStatus is in the active(1) state."
::= { pwCepCfgEntry 16 }

pwCepCfgStorageType OBJECT-TYPE
SYNTAX       StorageType
MAX-ACCESS   read-create
This variable indicates the storage type for this row.

 ::= { pwCepCfgEntry 17 }

-- End of CEP PW Configuration Parameter Table

This table contains a set of parameters for CEP PWs with pwCepType FRAC type.

 ::= { pwCepObjects 4 }

An entry of this table can be created in two options:
- By the EMS in advance for creating the PW.
- By the agent automatically when the PW is set up.

The first option is typically used when there is an NSP cross-connect option between the physical ports and the emulated (virtual ports), while the second MAY be used when there is a one-to-one mapping between the emulated signal and the physical signal.

INDEX { pwCepFracIndex }

 ::= { pwCepFracTable 1 }

PwCepFracEntry ::= SEQUENCE {
    pwCepFracIndex InterfaceIndex,
    pwCepFracMode INTEGER,
    pwCepFracConfigError BITS,
    pwCepFracAsync PwCepFracAsyncMap,
    pwCepFracVtgMap PwCepSonetVtgMap,
    pwCepFracEbm PwCepSonetEbm,
    pwCepFracPeerEbm PwCepSonetEbm,
    pwCepFracSdhVc4Mode INTEGER,
    pwCepFracSdhVc4Tu3Map1 PwCepFracAsyncMap,
    pwCepFracSdhVc4Tu3Map2 PwCepFracAsyncMap,
    pwCepFracSdhVc4Tu3Map3 PwCepFracAsyncMap,
    pwCepFracSdhVc4Tug2Map1 PwCepSonetVtgMap,
    pwCepFracSdhVc4Tug2Map2 PwCepSonetVtgMap,
    pwCepFracSdhVc4Tug2Map3 PwCepSonetVtgMap,
    pwCepFracSdhVc4Ebm1 PwCepSdhVc4Ebm,
pwCepFracIndex OBJECT-TYPE
SYNTAX InterfaceIndex
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This is the primary index of this table. It is a unique
index within the ifTable. It represents the interface index
for the SONET path (RFC 3592 section 3.3) for fractional SPE
emulation.
It may represent an internal (virtual) interface if an NSP
function exists between the physical interface and the
emulation process."
::= { pwCepFracEntry 1 }

pwCepFracMode OBJECT-TYPE
SYNTAX INTEGER {
   notApplicable ( 1),
   dynamic   ( 2),
   static    ( 3),
   staticWithEbm ( 4),
   staticAsync ( 5)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"Fractional mode for STS-1/VC-3 or VC-4 circuits:
notApplicable - When this object is not applicable.
dynamic  - EBM carried within the CEP header. Unequipped
VTs are removed from the payload on the fly.
static   - EBM not carried within the CEP header. Only VTs
defined in the EBM are carried within the payload.
staticWithEbm - EBM carried within the CEP header. Only
VTs defined in the EBM are carried within the
payload.
staticAsync - Asynchronous E3/T3 fixed byte removal only."
DEFVAL
{ dynamic }
::= { pwCepFracEntry 2 }

pwCepFracConfigError OBJECT-TYPE
SYNTAX BITS {
   other            ( 0),
   vtgMapEbmConflict ( 1),
   vtgMapAsyncConflict ( 2)
}
vtgMapEbmConflict is set when the configured static EBM does not match the configured vtgMap for fractional STS-1/VC-3 circuits, or when the TUG2Map is in conflict with the static EBM for VC-4 circuits. For example, if the vtgMap specifies that VTG#1 carries VT2 VTs while the EBM indicate that four VTs are equipped within VTG#1.

vtgMapAsyncConflict is set when there is a conflict between the mode, the async indication and the vtgMap fields. For example, fractional mode is set to Static Async while the VtgMap indicate that the STS-1/VC-3 carries VTs. Or in fractional VC-4 circuits both async1 and Tug2Map are set.

::= { pwCepFracEntry 3 }

pwCepFracAsync OBJECT-TYPE
SYNTAX PwCepFracAsyncMap
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The Asynchronous payload carried within the STS-1/VC-3. This variable should be set when 'staticAsync' Fractional STS-1/VC-3 pwCepFracMode is selected, and hold the value of 'other' otherwise."

DEFVAL { other }

::= { pwCepFracEntry 4 }

pwCepFracVtgMap OBJECT-TYPE
SYNTAX PwCepSonetVtgMap
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The VT/VC types of the seven VTG/TUG-2 within the STS-1/VC-3. This variable should be set when 'dynamic', 'static' or 'staticWithEbm' Fractional STS-1/VC-3 pwCepFracMode is selected."

::= { pwCepFracEntry 5 }

pwCepFracEbm OBJECT-TYPE
SYNTAX PwCepSonetEbm
MAX-ACCESS read-create
STATUS current
DESCRIPTION "Static Equipped Bit Mask (EBM) for STS-1/VC-3 channel. This variable MAY be set when 'static' or 'staticWithEbm' Fractional STS-1/VC-3 pwCepFracMode is selected.

It is possible that the EBM that would be used is available based on configuration of other MIB modules."
In these cases this object is read-only and reflects the actual EBM that would be used.

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::= { pwCepFracEntry 6 }

pwCepFracPeerEbm OBJECT-TYPE
SYNTAX PwCepSonetEbm
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Equipped Bit Mask (EBM) for STS-1/VC-3 channel received from the peer within the CEP extension header."

::= { pwCepFracEntry 7 }

pwCepFracSdhVc4Mode OBJECT-TYPE
SYNTAX INTEGER {
   notApplicable ( 1),
   dynamic       ( 2),
   static        ( 3),
   staticWithEbm ( 4)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"Fractional mode for VC-4 circuits:
notApplicable - When this is not VC-4 circuit.
dynamic - EBM carried within the CEP header. Unequipped VTs are removed from the payload on the fly.
static - EBM not carried within the CEP header. Only VTs defined in the EBM are carried within the payload.
staticWithEbm - EBM carried within the CEP header. Only VTs defined in the EBM are carried within the payload."

DEFVAL { notApplicable }

::= { pwCepFracEntry 8 }

pwCepFracSdhVc4Tu3Map1 OBJECT-TYPE
SYNTAX PwCepFracAsyncMap
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"If the first TUG-3 within the VC-4 contains a TU-3, this variable must be set to the required mode."

DEFVAL { other }

::= { pwCepFracEntry 9 }
MAX-ACCESS read-create
STATUS current
DESCRIPTION "If the third TUG-3 within the VC-4 contains a TU-3, this variable must be set."

DEFVAL { other }
::= { pwCepFracEntry 11 }

pwCepFracSdhVc4Tug2Map1 OBJECT-TYPE
SYNTAX PwCepSonetVtgMap
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The VC types of the seven TUG-2 within the first TUG-3 of the VC-4."

::= { pwCepFracEntry 12 }

pwCepFracSdhVc4Tug2Map2 OBJECT-TYPE
SYNTAX PwCepSonetVtgMap
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The VC types of the seven TUG-2 within the second TUG-3 of the VC-4."

::= { pwCepFracEntry 13 }

pwCepFracSdhVc4Tug2Map3 OBJECT-TYPE
SYNTAX PwCepSonetVtgMap
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The VC types of the seven TUG-2 within the third TUG-3 of the VC-4."

::= { pwCepFracEntry 14 }

pwCepFracSdhVc4Ebm1 OBJECT-TYPE
SYNTAX PwCepSdhVc4Ebm
::= { pwCepFracEntry 15 }

pwCepFracSdhVc4Ebm2 OBJECT-TYPE
SYNTAX PwCepSdhVc4Ebm
MAX-ACCESS read-create
STATUS current
DESCRIPTION "Static Equipped Bit Mask (EBM) for second TUG-3 within the VC-4.
This variable should be set when 'static' or 'staticWithEbm' Fractional VC-4 pwCepFracMode is selected.
It is possible that the EBM that would be used is available based on configuration of other MIB modules. In these cases this object is read-only and reflects the actual EBM that would be used."

::= { pwCepFracEntry 16 }

pwCepFracSdhVc4Ebm3 OBJECT-TYPE
SYNTAX PwCepSdhVc4Ebm
MAX-ACCESS read-create
STATUS current
DESCRIPTION "Static Equipped Bit Mask (EBM) for third TUG-3 within the VC-4.
This variable should be set when 'Static' or 'staticWithEbm' Fractional VC-4 pwCepFracMode is selected.
It is possible that the EBM that would be used is available based on configuration of other MIB modules. In these cases this object is read-only and reflects the actual EBM that would be used."

::= { pwCepFracEntry 17 }

pwCepFracSdhVc4PeerEbm1 OBJECT-TYPE
SYNTAX PwCepSdhVc4Ebm
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Equipped Bit Mask (EBM) for the first TUG-3 within the fractional VC-4 channel received from peer within the CEP extension header."

::= { pwCepFracEntry 18 }

pwCepFracSdhVc4PeerEbm2 OBJECT-TYPE
SYNTAX        PwCepSdhVc4Ebm
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
"Equipped Bit Mask (EBM) for the second TUG-3 within the fractional VC-4 channel received from peer within the CEP extension header."

::= { pwCepFracEntry 19 }

pwCepFracSdhVc4PeerEbm3 OBJECT-TYPE
SYNTAX        PwCepSdhVc4Ebm
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
"Equipped Bit Mask (EBM) for the third TUG-3 within the fractional VC-4 channel received from peer within the CEP extension header."

::= { pwCepFracEntry 20 }

pwCepFracRowStatus OBJECT-TYPE
SYNTAX        RowStatus
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION
"For creating, modifying, and deleting this row. It is allowed to make changes to read-create entries in this table, but the operator should be aware that such changes for an active row may cause temporary mis-configurations between the peers in terms of the carried signal, leading to traffic disruption."

::= { pwCepFracEntry 21 }

pwCepFracStorageType OBJECT-TYPE
SYNTAX        StorageType
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION
"This variable indicates the storage type for this object."

::= { pwCepFracEntry 22 }
CEP bridges the SONET and packet worlds. In the packet world, counts typically start from the time of service creation – and don’t stop. In the SONET world, counts are kept in 15 minute intervals. The PW CEP MIB supports both methods. The current 15 minute interval counts are in this table. The interval and total stats are in tables following this.

This table provides per CEP PW performance information. HC (high capacity) counters are required for some counts due to the high speeds expected with CEP services. A SONET path of width 48 (STS-48c) can rollover non- HC counters in a few minutes."

::= { pwCepObjects 5 }

pwCepPerfCurrentEntry OBJECT-TYPE
SYNTAX PwCepPerfCurrentEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "An entry in this table is created by the agent for every pwCep entry. After 15 minutes, the contents of this table entry are copied to a new entry in the pwCepPerfInterval table and the counts in this entry are reset to zero."

INDEX { pwIndex }

::= { pwCepPerfCurrentTable 1 }

PwCepPerfCurrentEntry ::= SEQUENCE {
    pwCepPerfCurrentDbaInPacketsHC     HCPerfCurrentCount,
    pwCepPerfCurrentDbaOutPacketsHC    HCPerfCurrentCount,
    pwCepPerfCurrentInNegPtrAdjust     PerfCurrentCount,
    pwCepPerfCurrentInPosPtrAdjust     PerfCurrentCount,
    pwCepPerfCurrentInPtrAdjustSecs    PerfCurrentCount,
    pwCepPerfCurrentOutNegPtrAdjust    PerfCurrentCount,
    pwCepPerfCurrentOutPosPtrAdjust    PerfCurrentCount,
    pwCepPerfCurrentOutPtrAdjustSecs   PerfCurrentCount,
    pwCepPerfCurrentAbsPtrAdjust       Integer32,
    pwCepPerfCurrentMissingPkts        PerfCurrentCount,
    pwCepPerfCurrentPktsOoseq          PerfCurrentCount,
    pwCepPerfCurrentPktsOoRngDropped   PerfCurrentCount,
    pwCepPerfCurrentJtrBfrUnderruns    PerfCurrentCount,
    pwCepPerfCurrentPktsMalformed      PerfCurrentCount,
}
pwCepPerfCurrentSummaryErrors  PerfCurrentCount,
pwCepPerfCurrentESs  PerfCurrentCount,
pwCepPerfCurrentSESs  PerfCurrentCount,
pwCepPerfCurrentUASs  PerfCurrentCount,
pwCepPerfCurrentFC  PerfCurrentCount
}

pwCepPerfCurrentDbaInPacketsHC OBJECT-TYPE
SYNTAX        HCPerfCurrentCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION      "Number of DBA packets received."
 ::= { pwCepPerfCurrentEntry 1 }

pwCepPerfCurrentDbaOutPacketsHC OBJECT-TYPE
SYNTAX        HCPerfCurrentCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION      "Number of DBA packets sent."
 ::= { pwCepPerfCurrentEntry 2 }

-- Pointer adjustment stats

pwCepPerfCurrentInNegPtrAdjust OBJECT-TYPE
SYNTAX        PerfCurrentCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION      "Number of negative pointer adjustments sent on the
SONET path based on CEP pointer adjustments received."
 ::= { pwCepPerfCurrentEntry 3 }

pwCepPerfCurrentInPosPtrAdjust OBJECT-TYPE
SYNTAX        PerfCurrentCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION      "Number of positive pointer adjustments sent on the
SONET path based on CEP pointer adjustments received."
 ::= { pwCepPerfCurrentEntry 4 }

pwCepPerfCurrentInPtrAdjustSecs OBJECT-TYPE
SYNTAX        PerfCurrentCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION      "Number of seconds in which a positive or negative pointer
adjustment was sent on the SONET path."

::= { pwCepPerfCurrentEntry 5 }

pwCepPerfCurrentOutNegPtrAdjust OBJECT-TYPE
SYNTAX        PerfCurrentCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION      "Number of negative pointer adjustments sent on the
SONET path based on CEP pointer adjustments received."

::= { pwCepPerfCurrentEntry 6 }

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MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of negative pointer adjustments seen on the SONET path and encoded onto sent CEP packets."
::= { pwCepPerfCurrentEntry 6 }

pwCepPerfCurrentOutPosPtrAdjust OBJECT-TYPE
SYNTAX PerfCurrentCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of positive pointer adjustments seen on the SONET path and encoded onto sent CEP packets."
::= { pwCepPerfCurrentEntry 7 }

pwCepPerfCurrentOutPtrAdjustSecs OBJECT-TYPE
SYNTAX PerfCurrentCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of seconds in which a positive or negative pointer adjustment was seen on the SONET path."
::= { pwCepPerfCurrentEntry 8 }

pwCepPerfCurrentAbsPtrAdjust OBJECT-TYPE
SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Absolute Pointer adjustments is relative adjustment drifts between inbound and outbound streams. It is calculated as absolute value of:
( InPosPtrAdjust - InNegPtrAdjust ) -
(OutPosPtrAdjust - OutNegPtrAdjust)"
::= { pwCepPerfCurrentEntry 9 }

pwCepPerfCurrentMissingPkts OBJECT-TYPE
SYNTAX PerfCurrentCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of missing packets (as detected via CEP header sequence number gaps)."
::= { pwCepPerfCurrentEntry 10 }

pwCepPerfCurrentPktsOoseq OBJECT-TYPE
SYNTAX PerfCurrentCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of packets detected out of sequence (via CEP header sequence numbers), but successfully re-ordered. Note: some implementations may not support this feature (see pwCepCfgPktReorder)."
::= { pwCepPerfCurrentEntry 11 }
pwCepPerfCurrentPktsOoRngDropped OBJECT-TYPE
SYNTAX PerfCurrentCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION "Number of packets detected out of range (via CEP header sequence numbers), and could not be re-ordered, or could not fit in the jitter buffer."
 ::= { pwCepPerfCurrentEntry 12 }

pwCepPerfCurrentJtrBfrUnderruns OBJECT-TYPE
SYNTAX PerfCurrentCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION "Number of times a packet needed to be played out and the jitter buffer was empty."
 ::= { pwCepPerfCurrentEntry 13 }

pwCepPerfCurrentPktsMalformed OBJECT-TYPE
SYNTAX PerfCurrentCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION "Number of packets detected with unexpected size, or bad headers stack."
 ::= { pwCepPerfCurrentEntry 14 }

pwCepPerfCurrentSummaryErrors OBJECT-TYPE
SYNTAX PerfCurrentCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A summary of all the packet error types above (from missing packets to bad length packets)."
 ::= { pwCepPerfCurrentEntry 15 }

pwCepPerfCurrentESs OBJECT-TYPE
SYNTAX PerfCurrentCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The counter associated with the number of Errored Seconds encountered."
 ::= { pwCepPerfCurrentEntry 16 }

pwCepPerfCurrentSESs OBJECT-TYPE

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SYNTAX PerfCurrentCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The counter associated with the number of Severely Errored Seconds encountered."
 ::= { pwCepPerfCurrentEntry 17 }
pwCepPerfCurrentUASs OBJECT-TYPE
SYNTAX        PerfCurrentCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
"The counter associated with the number of
Unavailable Seconds encountered."
::= { pwCepPerfCurrentEntry 18 }

pwCepPerfCurrentFC OBJECT-TYPE
SYNTAX        PerfCurrentCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
"CEP Failure Counts (FC-CEP). The number of CEP failure
events. A failure event begins when the LOPS failure
is declared, and ends when the failure is cleared. A
failure event that begins in one period and ends in
another period is counted only in the period in which
it begins."
::= { pwCepPerfCurrentEntry 19 }

-- End CEP PW Performance Current Interval Table

-- CEP PW Performance 15 Minutes Interval Table.

pwCepPerfIntervalTable OBJECT-TYPE
SYNTAX        SEQUENCE OF PwCepPerfIntervalEntry
MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
"This table provides per CEP PW performance information
much like the pwCepPerfCurrentTable above. However,
these counts represent historical 15 minute intervals.
Typically, this table will have a maximum of 96 entries
for a 24 hour period, but is not limited to this.
NOTE: Counter64 objects are used here, Counter32 is
too small for OC-768 CEP PWs."
::= { pwCepObjects 6 }

pwCepPerfIntervalEntry OBJECT-TYPE
SYNTAX        PwCepPerfIntervalEntry
MAX-ACCESS    not-accessible
STATUS        current

DESCRIPTION
"An entry in this table is created by the agent for
every pwCepPerfCurrentEntry that is 15 minutes old.
The contents of the Current entry are copied to the new
entry here. The Current entry, then resets its counts
to zero for the next current 15 minute interval.
pwCepIndex is found in the pwCepCfg table."

INDEX  { pwIndex, pwCepPerfIntervalNumber }
::= { pwCepPerfIntervalTable 1 }

PwCepPerfIntervalEntry ::= SEQUENCE {
  pwCepPerfIntervalNumber             Integer32,
  pwCepPerfIntervalValidData          TruthValue,
  pwCepPerfIntervalReset              INTEGER,
  pwCepPerfIntervalTimeElapsed        HCPerfTimeElapsed,
  pwCepPerfIntervalDbaInPacketsHC     HCPerfIntervalCount,
  pwCepPerfIntervalDbaOutPacketsHC    HCPerfIntervalCount,
  pwCepPerfIntervalInNegPtrAdjust     PerfIntervalCount,
  pwCepPerfIntervalInPosPtrAdjust     PerfIntervalCount,
  pwCepPerfIntervalInPtrAdjustSecs    PerfIntervalCount,
  pwCepPerfIntervalOutNegPtrAdjust    PerfIntervalCount,
  pwCepPerfIntervalOutPosPtrAdjust    PerfIntervalCount,
  pwCepPerfIntervalOutPtrAdjustSecs   PerfIntervalCount,
  pwCepPerfIntervalAbsPtrAdjust       Integer32,
  pwCepPerfIntervalMissingPktss       PerfIntervalCount,
  pwCepPerfIntervalPktsooseq          PerfIntervalCount,
  pwCepPerfIntervalPktsoorngDropped   PerfIntervalCount,
  pwCepPerfIntervalJtrBfrUnderruns    PerfIntervalCount,
  pwCepPerfIntervalPktsMalformed      PerfIntervalCount,
  pwCepPerfIntervalSummaryErrors      PerfIntervalCount,
  pwCepPerfIntervalESs                PerfIntervalCount,
  pwCepPerfIntervalSESs               PerfIntervalCount,
  pwCepPerfIntervalUASs               PerfIntervalCount,
  pwCepPerfIntervalFC                 PerfIntervalCount
}

pwCepPerfIntervalNumber OBJECT-TYPE
SYNTAX     Integer32 (1..96)
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
    "A number (normally between 1 and 96 to cover a 24 hour
period) which identifies the interval for which the set
of statistics is available. The interval identified by 1
is the most recently completed 15 minute interval, and
the interval identified by N is the interval immediately
preceding the one identified by N-1. The minimum range of
N is 1 through 4. The default range is 1 through 32. The
maximum value of N is 1 through 96."
::= { pwCepPerfIntervalEntry 1 }

pwCepPerfIntervalValidData OBJECT-TYPE
SYNTAX     TruthValue
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
    "This variable indicates if the data for this interval
is valid."
::= { pwCepPerfIntervalEntry 2 }
pwCepPerfIntervalReset OBJECT-TYPE
SYNTAX        INTEGER {
    reset (1),
    normal(2)
}
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION
"Used in cases where the user knows that the errors
within this interval should not be counted. Writing
'reset' sets all error counts to zero."
::= { pwCepPerfIntervalEntry 3 }

pwCepPerfIntervalTimeElapsed OBJECT-TYPE
SYNTAX      HCPerfTimeElapsed
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The duration of a particular interval in seconds,
Adjustments in the system’s time-of-day clock may
cause the interval to be greater or less than, the
normal value. Therefore this actual interval value
is provided."
::= { pwCepPerfIntervalEntry 4 }

pwCepPerfIntervalDbaInPacketsHC OBJECT-TYPE
SYNTAX        HCPerfIntervalCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
"Number of DBA packets received."
::= { pwCepPerfIntervalEntry 5 }

pwCepPerfIntervalDbaOutPacketsHC OBJECT-TYPE
SYNTAX        HCPerfIntervalCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
"Number of DBA packets sent."
::= { pwCepPerfIntervalEntry 6 }
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of positive pointer adjustments sent on the
SONET path based on CEP pointer adjustments received."
::= { pwCepPerfIntervalEntry 8 }

pwCepPerfIntervalInPtrAdjustSecs OBJECT-TYPE
SYNTAX       PerfIntervalCount
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
"Number of seconds in which a pos or neg pointer
adjustment was sent on the SONET path."
::= { pwCepPerfIntervalEntry 9 }

pwCepPerfIntervalOutNegPtrAdjust OBJECT-TYPE
SYNTAX       PerfIntervalCount
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
"Number of negative pointer adjustments seen on the
SONET path and encoded onto sent CEP packets."
::= { pwCepPerfIntervalEntry 10 }

pwCepPerfIntervalOutPosPtrAdjust OBJECT-TYPE
SYNTAX       PerfIntervalCount
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
"Number of positive pointer adjustments seen on the
SONET path and encoded onto sent CEP packets."
::= { pwCepPerfIntervalEntry 11 }

pwCepPerfIntervalOutPtrAdjustSecs OBJECT-TYPE
SYNTAX       PerfIntervalCount
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
"Number of seconds in which a pos or neg pointer
adjustment was seen on the SONET path."
::= { pwCepPerfIntervalEntry 12 }

pwCepPerfIntervalAbsPtrAdjust OBJECT-TYPE
SYNTAX       Integer32
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
"Absolute Pointer adjustments is relative adjustment
drifts between inbound and outbound streams. It is
calculated as absolute value of :
( InPosPtrAdjust - InNegPtrAdjust) -
(OutPosPtrAdjust - OutNegPtrAdjust)
"::= { pwCepPerfIntervalEntry 13 }

pwCepPerfIntervalMissingPkts OBJECT-TYPE
SYNTAX        PerfIntervalCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
  "Number of missing packets (as detected via CEP header
  sequence number gaps)."
::= { pwCepPerfIntervalEntry 14 }

pwCepPerfIntervalPktsOoseq OBJECT-TYPE
SYNTAX        PerfIntervalCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
  "Number of packets detected out of sequence (via CEP
  header sequence numbers), but successfully re-ordered.
  Note: some implementations may not support this
  feature (see pwCepCfgPktReorder)."
::= { pwCepPerfIntervalEntry 15 }

pwCepPerfIntervalPktsOoRngDropped OBJECT-TYPE
SYNTAX        PerfIntervalCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
  "Number of packets detected out of range (via CEP
  header sequence numbers), and could not be re-
  ordered, or could not fit in the jitter buffer."
::= { pwCepPerfIntervalEntry 16 }

pwCepPerfIntervalJtrBfrUnderruns OBJECT-TYPE
SYNTAX        PerfIntervalCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
  "Number of times a packet needed to be played
  out and the jitter buffer was empty."
::= { pwCepPerfIntervalEntry 17 }

pwCepPerfIntervalPktsMalformed OBJECT-TYPE
SYNTAX        PerfIntervalCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
  "Number of packets detected with unexpected size, or bad
  headers stack."
::= { pwCepPerfIntervalEntry 18 }

pwCepPerfIntervalSummaryErrors OBJECT-TYPE
SYNTAX        PerfIntervalCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
  "A summary of all the packet error types above (from
  missing packets to bad length packets)."
::= { pwCepPerfIntervalEntry 19 }
pwCepPerfIntervalESs OBJECT-TYPE
SYNTAX       PerfIntervalCount
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
"The counter associated with the number of Errored
Seconds encountered."
::= { pwCepPerfIntervalEntry 20 }

pwCepPerfIntervalSESs OBJECT-TYPE
SYNTAX        PerfIntervalCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
"The counter associated with the number of
Severely Errored Seconds encountered."
::= { pwCepPerfIntervalEntry 21 }

pwCepPerfIntervalUASs OBJECT-TYPE
SYNTAX        PerfIntervalCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
"The counter associated with the number of
Unavailable Seconds encountered."
::= { pwCepPerfIntervalEntry 22 }

pwCepPerfIntervalFC OBJECT-TYPE
SYNTAX        PerfIntervalCount
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
"CEP Failure Counts (FC-CEP). The number of CEP failure
events. A failure event begins when the LOPS failure
is declared, and ends when the failure is cleared. A
failure event that begins in one period and ends in
another period is counted only in the period in which it begins."
::= { pwCepPerfIntervalEntry 23 }

-- End CEP PW Performance 15 Minutes Interval Table

-- CEP PW Day Performance Table

pwCepPerf1DayIntervalTable OBJECT-TYPE
SYNTAX       SEQUENCE OF PwCepPerf1DayIntervalEntry
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION
"This table provides per CEP PW performance information
the current day measurement and the previous days interval.
On the extreme cases where one of the error counters has
overflowed during the one day interval, the error counter
MUTS NOT wrap around and MUST return the maximum value."
::= { pwCepObjects 7 }
pwCepPerf1DayIntervalEntry OBJECT-TYPE
SYNTAX PwCepPerf1DayIntervalEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"An entry is created in this table by the agent for every entry in the pwCepTable and for each day interval up to the number of supported historical intervals."

INDEX { pwIndex, pwCepPerf1DayIntervalNumber }
 ::= { pwCepPerf1DayIntervalTable 1 }

PwCepPerf1DayIntervalEntry ::= SEQUENCE {
  pwCepPerf1DayIntervalNumber                 Unsigned32,
pwCepPerf1DayIntervalValidData              TruthValue,
pwCepPerf1DayIntervalMoniSecs               HCPerfTimeElapsed,
pwCepPerf1DayIntervalDbaInPacketsHC         Counter64,
pwCepPerf1DayIntervalDbaOutPacketsHC        Counter64,
pwCepPerf1DayIntervalInNegPtrAdjust         Counter32,
pwCepPerf1DayIntervalInPosPtrAdjust         Counter32,
pwCepPerf1DayIntervalInPtrAdjustSecs        Counter32,
pwCepPerf1DayIntervalOutNegPtrAdjust        Counter32,
pwCepPerf1DayIntervalOutPosPtrAdjust        Counter32,
pwCepPerf1DayIntervalOutPtrAdjustSecs       Counter32,
pwCepPerf1DayIntervalAbsPtrAdjust           Integer32,
pwCepPerf1DayIntervalMissingPkts            Counter32,
pwCepPerf1DayIntervalPktsOoseq              Counter32,
pwCepPerf1DayIntervalPktsOoRngDropped       Counter32,
pwCepPerf1DayIntervalJtrBfrUnderruns        Counter32,
pwCepPerf1DayIntervalPktsMalformed          Counter32,
pwCepPerf1DayIntervalSummaryErrors          Counter32,
pwCepPerf1DayIntervalESs                    Counter32,
pwCepPerf1DayIntervalSESs                   Counter32,
pwCepPerf1DayIntervalUASs                   Counter32,
pwCepPerf1DayIntervalFC                     Counter32
}

pwCepPerf1DayIntervalNumber OBJECT-TYPE
SYNTAX Unsigned32(1..31)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"History Data Interval number. Interval 1 is the current day measurement period, Interval 2 is the most recent previous day; interval 30 is 31 days ago. Intervals 3..31 are optional."
 ::= { pwCepPerf1DayIntervalEntry 1 }
pwCepPerf1DayIntervalValidData OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This variable indicates if the data for this interval is valid."
::= { pwCepPerf1DayIntervalEntry 2 }

pwCepPerf1DayIntervalMoniSecs OBJECT-TYPE
SYNTAX HCPerfTimeElapsed
UNITS "seconds"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The amount of time in the 1-day interval over which the performance monitoring information is actually counted. This value will be the same as the interval duration except in a situation where performance monitoring data could not be collected for any reason or agent clock adjustments."
::= { pwCepPerf1DayIntervalEntry 3 }

pwCepPerf1DayIntervalDbaInPacketsHC OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of DBA packets received."
::= { pwCepPerf1DayIntervalEntry 4 }

pwCepPerf1DayIntervalDbaOutPacketsHC OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of DBA packets sent."
::= { pwCepPerf1DayIntervalEntry 5 }

-- Pointer adjustment stats
pwCepPerf1DayIntervalInNegPtrAdjust OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of negative pointer adjustments sent on the SONET path based on CEP pointer adjustments received."
::= { pwCepPerf1DayIntervalEntry 6 }

pwCepPerf1DayIntervalInPosPtrAdjust OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of positive pointer adjustments sent on the SONET path based on CEP pointer adjustments received."
::= { pwCepPerf1DayIntervalEntry 7 }

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pwCepPerf1DayIntervalInPtrAdjustSecs OBJECT-TYPE
SYNTAX    Counter32
MAX-ACCESS read-only
STATUS    current
DESCRIPTION
"Number of seconds in which a positive or negative pointer
adjustment was sent on the SONET path."
 ::= { pwCepPerf1DayIntervalEntry 8 }

pwCepPerf1DayIntervalOutNegPtrAdjust OBJECT-TYPE
SYNTAX    Counter32
MAX-ACCESS read-only
STATUS    current
DESCRIPTION
"Number of negative pointer adjustments seen on the
SONET path and encoded onto sent CEP packets."
 ::= { pwCepPerf1DayIntervalEntry 9 }

pwCepPerf1DayIntervalOutPosPtrAdjust OBJECT-TYPE
SYNTAX    Counter32
MAX-ACCESS read-only
STATUS    current
DESCRIPTION
"Number of positive pointer adjustments seen on the
SONET path and encoded onto sent CEP packets."
 ::= { pwCepPerf1DayIntervalEntry 10 }

pwCepPerf1DayIntervalOutPtrAdjustSecs OBJECT-TYPE
SYNTAX    Counter32
MAX-ACCESS read-only
STATUS    current
DESCRIPTION
"Number of seconds in which a positive or negative pointer
adjustment was seen on the SONET path."
 ::= { pwCepPerf1DayIntervalEntry 11 }

pwCepPerf1DayIntervalAbsPtrAdjust OBJECT-TYPE
SYNTAX    Integer32
MAX-ACCESS read-only
STATUS    current
DESCRIPTION
"Absolute Pointer adjustments is relative adjustment
drifts between inbound and outbound streams. It is
calculated as absolute value of :

( InPosPtrAdjust - InNegPtrAdjust) -
(OutPosPtrAdjust - OutNegPtrAdjust) "
 ::= { pwCepPerf1DayIntervalEntry 12 }

pwCepPerf1DayIntervalMissingPkts OBJECT-TYPE
SYNTAX    Counter32
MAX-ACCESS read-only
STATUS    current
DESCRIPTION
"Number of missing packets (as detected via CEP header
sequence number gaps)."
::= { pwCepPerf1DayIntervalEntry 13 }

pwCepPerf1DayIntervalPktsOoseq OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of packets detected out of sequence (via CEP
header sequence numbers), but successfully re-ordered.
Note: some implementations may not support this feature
(see pwCepCfgPktReorder)."
::= { pwCepPerf1DayIntervalEntry 14 }

pwCepPerf1DayIntervalPktsOoRngDropped OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of packets detected out of range (via CEP header
sequence numbers), and could not be re-ordered, or could not
fit in the jitter buffer."
::= { pwCepPerf1DayIntervalEntry 15 }

pwCepPerf1DayIntervalJtrBfrUnderruns OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of times a packet needed to be played out and the
jitter buffer was empty."
::= { pwCepPerf1DayIntervalEntry 16 }

pwCepPerf1DayIntervalPktsMalformed OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of packets detected with unexpected size, or bad
headers stack."
::= { pwCepPerf1DayIntervalEntry 17 }

pwCepPerf1DayIntervalSummaryErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A summary of all the packet error types above (from
missing packets to bad length packets)."
::= { pwCepPerf1DayIntervalEntry 18 }

pwCepPerf1DayIntervalESs OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The counter associated with the number of Errored
Seconds encountered.
::= { pwCepPerf1DayIntervalEntry 19 }

pwCepPerf1DayIntervalSESs OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
  "The counter associated with the number of Severely
 Errored Seconds. See pwCepCfgMissingPktsToSes."
::= { pwCepPerf1DayIntervalEntry 20 }

pwCepPerf1DayIntervalUASs OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
  "The counter associated with the number of
UnAvailable Seconds. See pwCepCfgSesToUAS.

NOTE: When first entering the UAS state, the number
of SesToUas is added to this object, then as each
additional UAS occurs, this object increments by one.

NOTE: Similar to RFC 3592, If the agent chooses to update
the various performance statistics in real time then it must

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be prepared to retroactively reduce the ES, SES, counts (by
the value of pwCepCfgSesToUas) and increase the UAS
count (by that same value) when it determines that UAS
state has been entered."
::= { pwCepPerf1DayIntervalEntry 21 }

pwCepPerf1DayIntervalFC OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
  "CEP Failure Counts (FC-CEP). The number of CEP failure
events. A failure event begins when the LOPS failure
is declared, and ends when the failure is cleared."
::= { pwCepPerf1DayIntervalEntry 22 }

-- End of PW CEP 1 Day Interval Performance table

-- Conformance Configuration table

pwCepConformanceCfgTable OBJECT-TYPE
SYNTAX        SEQUENCE OF PwCepConformanceCfgEntry
MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
  "This table provides the means for the agent to
declare whether certain CEP PW statistics objects
are supported (conformed to) or not."
::= { pwCepObjects 9 }
The agent MUST create a single entry in this table.

::= { pwCepConformanceCfgTable 1 }

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pwCepConformanceCfgIndex OBJECT-TYPE
SYNTAX        INTEGER  (0..128)
MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION    "Any arbitrary number."
 ::= { pwCepConformanceCfgEntry 1 }

pwCepPerfDbaInPacketsHCTruth OBJECT-TYPE
SYNTAX        TruthValue
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION    "Tells whether the pwCepPerf...DbaInPacketsHC
in the pwCepPerf...Table is supported."
 ::= { pwCepConformanceCfgEntry 2 }

pwCepPerfDbaInPacketsHCDesc OBJECT-TYPE
SYNTAX        SnmpAdminString
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION    "Explanation for pwCepPerf...DbaInPacketsHC
support in the pwCepPerf...Table."
::= { pwCepConformanceCfgEntry 3 }

pwCepPerfDbaOutPacketsHCTruth OBJECT-TYPE
SYNTAX        TruthValue
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
 "Tells whether the pwCepPerf...DbaOutPacketsHC
in the pwCepPerf...Table is supported."
::= { pwCepConformanceCfgEntry 4 }

pwCepPerfDbaOutPacketsHCDesc  OBJECT-TYPE
SYNTAX        SnmpAdminString
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
 "Explanation for pwCepPerf...DbaOutPacketsHC
support in the pwCepPerf...Table."
::= { pwCepConformanceCfgEntry 5 }

pwCepPerfPktsOoseqTruth OBJECT-TYPE
SYNTAX        TruthValue
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
 "Tells whether the pwCepPerf...PktsOoseq
in the pwCepPerf...Table is supported."
::= { pwCepConformanceCfgEntry 6 }

pwCepPerfPktsOoseqDesc  OBJECT-TYPE
SYNTAX        SnmpAdminString
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
 "Explanation for pwCepPerf...PktsOoseq
support in the pwCepPerf...Table."
::= { pwCepConformanceCfgEntry 7 }

pwCepPerfPktsOoRngDroppedTruth OBJECT-TYPE
SYNTAX        TruthValue
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
 "Tells whether the pwCepPerf...PktsOoRngDropped
in the pwCepPerf...Table is supported."
::= { pwCepConformanceCfgEntry 8 }

pwCepPerfPktsOoRngDroppedDesc  OBJECT-TYPE
SYNTAX        SnmpAdminString
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
 "Explanation for pwCepPerf...PktsOoRngDropped
support in the pwCepPerf...Table."
::= { pwCepConformanceCfgEntry 9 }

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pwCepPerfSummaryErrorsTruth OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"Tells whether the pwCepPerf...SummaryError
in the pwCepPerf...Table is supported."
::= { pwCepConformanceCfgEntry 10 }

pwCepPerfSummaryErrorsDesc OBJECT-TYPE
SYNTAX      SnmpAdminString
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"Explanation for pwCepPerf...SummaryError
support in the pwCepPerf...Table."
::= { pwCepConformanceCfgEntry 11 }

-- End of CEP PW Conformance report table

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-- Conformance Information

pwCepGroups      OBJECT IDENTIFIER ::= { pwCepConformance 1 }
pwCepCompliances OBJECT IDENTIFIER ::= { pwCepConformance 2 }

-- Compliance statement for full compliant implementations

pwCepModuleFullCompliance MODULE-COMPLIANCE
STATUS  current
DESCRIPTION
"The compliance statement for agent that support full
CEP PW configuration through this MIB module."

MODULE -- this module
MANDATORY-GROUPS { pwCepGroup,
pwCepCfgGroup,
pwCepPerfCurrentGroup,
pwCepPerfIntervalGroup,
pwCepPerf1DayIntervalGroup,
pwCepConformanceCfgGroup
 }

GROUP        pwPwCepFractionalGroup
DESCRIPTION "This group is only mandatory for implementations
that support fractional SPE.
"

GROUP        pwPwCepFractionalSts1Vc3Group
DESCRIPTION "This group is only mandatory for implementations
that support the fractional STS-1/VC-3.
"

GROUP        pwPwCepFractionalVc4Group
DESCRIPTION "This group is only mandatory for implementations
that support the Fractional VC-4.

GROUP pwPwCepSignalingGroup
DESCRIPTION "This group is only mandatory for implementations that support the CEP PW signaling."

OBJECT pwCepType
SYNTAX INTEGER { spe(1) }
MIN-ACCESS read-only
DESCRIPTION "The support of the value vt(2) or fracSpe(3) is optional. If either of these options are supported, read-write access is not required."

OBJECT pwCepSonetPayloadLength
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations that support only the default values (which are based on the pwCepType)."

OBJECT pwCepCfgMinPktLength
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations that support only a single pre-defined value."

OBJECT pwCepCfgEnableDBA
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations that support only a single pre-defined value."

OBJECT pwCepCfgRtpHdrSuppress
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations that do not support RTP header for CEP connections."

OBJECT pwCepCfgConsecPktsInsync
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations that support only a single pre-defined value."

OBJECT pwCepCfgConsecMissingOutSync
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations that support only a single pre-defined value."

OBJECT pwCepCfgPktErrorPlayOutValue
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations that support only a single pre-defined value."

OBJECT pwCepCfgMissingPktsToSes
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations that support only a single pre-defined value."
OBJECT  pwCepCfgSesToUas
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations
that support only a single pre-defined value."

OBJECT  pwCepCfgSecsToExitUas
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations
that support only a single pre-defined value."

OBJECT  pwCepCfgName
MIN-ACCESS read-only
DESCRIPTION "Write access is not required."

OBJECT  pwCepCfgRowStatus
SYNTAX  RowStatus { active(1), notInService(2),
notReady(3) }
WRITE-SYNTAX  RowStatus { active(1), notInService(2),
createAndGo(4), destroy(6) }
DESCRIPTION "Support for createAndWait is not required."

OBJECT  pwCepFracMode
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations
that support only a single pre-defined value."

OBJECT  pwCepFracAsync
SYNTAX  PwCepFracAsyncMap { other(0) }
MIN-ACCESS read-only
DESCRIPTION "Support for ds3(1) or e3(2) and read-write access
is not required if the implementation do not support
these options."

OBJECT  pwCepFracVtgMap
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations
that support only a single pre-defined value."

OBJECT  pwCepFracEbm
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations
where the EBM is derived from configuration in
other MIB modules."

OBJECT  pwCepFracSdhVc4Mode
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations
that support only a single pre-defined value."

OBJECT  pwCepFracSdhVc4Tu3Map1
MIN-ACCESS read-only
DESCRIPTION "Write access is not required for implementations
that support only a single pre-defined value."

OBJECT  pwCepFracSdhVc4Tu3Map2
MIN-ACCESS   read-only
DESCRIPTION "Write access is not required for implementations that support only a single pre-defined value."

OBJECT       pwCepFracSdhVc4Tu3Map3
MIN-ACCESS   read-only
DESCRIPTION "Write access is not required for implementations that support only a single pre-defined value."

OBJECT       pwCepFracSdhVc4Tu2Map1
MIN-ACCESS   read-only
DESCRIPTION "Write access is not required for implementations that support only a single pre-defined value."

OBJECT       pwCepFracSdhVc4Tu2Map2
MIN-ACCESS   read-only
DESCRIPTION "Write access is not required for implementations that support only a single pre-defined value."

OBJECT       pwCepFracSdhVc4Tu2Map3
MIN-ACCESS   read-only
DESCRIPTION "Write access is not required for implementations that support only a single pre-defined value."

OBJECT       pwCepFracSdhVc4Ebm1
MIN-ACCESS   read-only
DESCRIPTION "Write access is not required for implementations where the EBM is derived from configuration in other MIB modules."

OBJECT       pwCepFracSdhVc4Ebm2
MIN-ACCESS   read-only
DESCRIPTION "Write access is not required for implementations where the EBM is derived from configuration in other MIB modules."

OBJECT       pwCepFracSdhVc4Ebm3
MIN-ACCESS   read-only
DESCRIPTION "Write access is not required for implementations where the EBM is derived from configuration in other MIB modules."

OBJECT       pwCepFracRowStatus
SYNTAX       RowStatus { active(1), notInService(2), notReady(3) }
WRITE-SYNTAX RowStatus { active(1), notInService(2), createAndGo(4), destroy(6) }
DESCRIPTION "Support for createAndWait is not required."
::= { pwCepCompliances 1 }
The compliance statement for agents that provide read only support for PW CEP MIB Module. Such devices can then be monitored but cannot be configured using this MIB module.

-- this module
MANDATORY-GROUPS { pwCepGroup,
pwCepCfgGroup,
pwCepPerfCurrentGroup,
pwCepPerfIntervalGroup,
pwCepPerf1DayIntervalGroup,
pwCepConformanceCfgGroup }

GROUP pwPwCepFractionalGroup
DESCRIPTION "This group is only mandatory for implementations that support fractional SPE."

GROUP pwPwCepFractionalSts1Vc3Group
DESCRIPTION "This group is only mandatory for implementations that support the fractional STS-1/VC-3."

GROUP pwPwCepFractionalVc4Group
DESCRIPTION "This group is only mandatory for implementations that support the Fractional VC-4."

GROUP pwPwCepSignalingGroup
DESCRIPTION "This group is only mandatory for implementations that support the CEP PW signaling."

OBJECT pwCepType
MIN-ACCESS read-only
DESCRIPTION "Write access is not required."

OBJECT pwCepSonetIfIndex
MIN-ACCESS read-only
DESCRIPTION "Write access is not required."

OBJECT pwCepCfgIndex
MIN-ACCESS read-only
DESCRIPTION "Write access is not required."

OBJECT pwCepSonetPayloadLength
MIN-ACCESS read-only
DESCRIPTION "Write access is not required."

OBJECT pwCepCfgMinPktLength
MIN-ACCESS read-only
DESCRIPTION "Write access is not required."
OBJECT  pwCepCfgEnableDBA
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

OBJECT  pwCepCfgRtpHdrSuppress
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

OBJECT  pwCepCfgJtrBfrDepth
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

OBJECT  pwCepCfgConsecPktsInsync
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

OBJECT  pwCepCfgConsecMissingOutSync
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

OBJECT  pwCepCfgPktErrorPlayOutValue
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

OBJECT  pwCepCfgMissingPktsToSes
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

OBJECT  pwCepCfgSesToUas
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

OBJECT  pwCepCfgSecsToExitUas
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

OBJECT  pwCepCfgRowStatus
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required.."

OBJECT  pwCepCfgStorageType
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required.."

OBJECT  pwCepFracMode
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

OBJECT  pwCepFracAsync
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

OBJECT  pwCepFracVtgMap
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."
OBJECT        pwCepFracEbm
MIN-ACCESS    read-only
DESCRIPTION  "Write access is not required."

OBJECT        pwCepFracSdhVc4Mode
MIN-ACCESS    read-only
DESCRIPTION  "Write access is not required."

OBJECT        pwCepFracSdhVc4Tu3Map1
MIN-ACCESS    read-only
DESCRIPTION  "Write access is not required."

OBJECT        pwCepFracSdhVc4Tu3Map2
MIN-ACCESS    read-only
DESCRIPTION  "Write access is not required."

OBJECT        pwCepFracSdhVc4Tu3Map3
MIN-ACCESS    read-only
DESCRIPTION  "Write access is not required."

OBJECT        pwCepFracSdhVc4Tug2Map1
MIN-ACCESS    read-only
DESCRIPTION  "Write access is not required."

OBJECT        pwCepFracSdhVc4Tug2Map2
MIN-ACCESS    read-only
DESCRIPTION  "Write access is not required."

OBJECT        pwCepFracSdhVc4Tug2Map3
MIN-ACCESS    read-only
DESCRIPTION  "Write access is not required."

OBJECT        pwCepFracSdhVc4Ebm1
MIN-ACCESS    read-only
DESCRIPTION  "Write access is not required."

OBJECT        pwCepFracSdhVc4Ebm2
MIN-ACCESS    read-only
DESCRIPTION  "Write access is not required."

OBJECT        pwCepFracSdhVc4Ebm3
MIN-ACCESS    read-only
DESCRIPTION  "Write access is not required."

OBJECT        pwCepFracRowStatus
MIN-ACCESS    read-only
DESCRIPTION  "Write access is not required."

OBJECT        pwCepFracStorageType
MIN-ACCESS    read-only
DESCRIPTION  "Write access is not required."

::= { pwCepCompliances 2 }

-- Units of conformance.
pwCepGroup OBJECT-GROUP
  OBJECTS {
    pwCepType,
    pwCepSonetIfIndex,
    pwCepSonetConfigErrorOrStatus,
    pwCepCfgIndex,
    pwCepTimeElapsed,
    pwCepValidIntervals,
    pwCepIndications,
    pwCepLastEsTimeStamp
  }
  STATUS  current
  DESCRIPTION
    "Collection of objects for basic CEP PW config and
    status."
  ::= { pwCepGroups 1 }

pwPwCepSignalingGroup OBJECT-GROUP
  OBJECTS {
    pwCepPeerCepOption
  }
  STATUS  current
  DESCRIPTION
    "Collection of objects required if the network element
    support CEP connections signaling."
  ::= { pwCepGroups 2 }

pwCepCfgGroup OBJECT-GROUP
  OBJECTS {
    pwCepCfgIndexNext,
    pwCepConfigError,
    pwCepSonetPayloadLength,
    pwCepCfgMinPktLength,
    pwCepCfgPktReorder,
    pwCepCfgEnableDBA,
    pwCepCfgRtpHdrSuppress,
    pwCepCfgJtrBfrDepth,
    pwCepCfgConsecPktsInsync,
    pwCepCfgConsecMissingOutSync,
    pwCepCfgPktErrorPlayOutValue,
    pwCepCfgMissingPktsToSes,
    pwCepCfgSesToUas,
    pwCepCfgSecsToExitUas,
    pwCepCfgName,
    pwCepCfgRowStatus,
    pwCepCfgStorageType
  }
 STATUS  current  
DESCRIPTION  
"Collection of detailed objects needed to configure CEP PWs."

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::= { pwCepGroups 3 }

pwCepPerfCurrentGroup OBJECT-GROUP
OBJECTS {
  pwCepPerfCurrentDbaInPacketsHC,
  pwCepPerfCurrentDbaOutPacketsHC,
  pwCepPerfCurrentInNegPtrAdjust,
  pwCepPerfCurrentInPosPtrAdjust,
  pwCepPerfCurrentInPtrAdjustSecs,
  pwCepPerfCurrentOutNegPtrAdjust,
  pwCepPerfCurrentOutPosPtrAdjust,
  pwCepPerfCurrentOutPtrAdjustSecs,
  pwCepPerfCurrentAbsPtrAdjust,
  pwCepPerfCurrentMissingPkts,
  pwCepPerfCurrentPktsOoseq,
  pwCepPerfCurrentPktsOocRngDropped,
  pwCepPerfCurrentJtrBfrUnderruns,
  pwCepPerfCurrentPktsMalformed,
  pwCepPerfCurrentSummaryErrors,
  pwCepPerfCurrentESs,
  pwCepPerfCurrentSESs,
  pwCepPerfCurrentUASs,
  pwCepPerfCurrentFC
}

 STATUS  current  
DESCRIPTION  
"Collection of statistics objects for CEP PWs."

::= { pwCepGroups 4 }

pwCepPerfIntervalGroup OBJECT-GROUP
OBJECTS {
  pwCepPerfIntervalValidData,
  pwCepPerfIntervalReset,
  pwCepPerfIntervalTimeElapsed,
  pwCepPerfIntervalDbaInPacketsHC,
  pwCepPerfIntervalDbaOutPacketsHC,
  pwCepPerfIntervalInNegPtrAdjust,
  pwCepPerfIntervalInPosPtrAdjust,
  pwCepPerfIntervalInPtrAdjustSecs,
  pwCepPerfIntervalOutNegPtrAdjust,
  pwCepPerfIntervalOutPosPtrAdjust,
  pwCepPerfIntervalOutPtrAdjustSecs,
  pwCepPerfIntervalAbsPtrAdjust,
  pwCepPerfIntervalMissingPkts,
  pwCepPerfIntervalPktsOoseq,
pwCepPerfIntervalPktsOoRngDropped,
pwCepPerfIntervalJtrBfrUnderruns,

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pwCepPerfIntervalPktsMalformed,
pwCepPerfIntervalSummaryErrors,
pwCepPerfIntervalESs,
pwCepPerfIntervalSESs,
pwCepPerfIntervalUASs,
pwCepPerfIntervalFC

} STATUS current
DESCRIPTION
"Collection of statistics objects for CEP PWs."
::= { pwCepGroups 5 }

pwCepPerf1DayIntervalGroup OBJECT-GROUP
OBJECTS {
pwCepPerf1DayIntervalValidData,
pwCepPerf1DayIntervalMoniSecs,
pwCepPerf1DayIntervalDbaInPacketsHC,
pwCepPerf1DayIntervalDbaOutPacketsHC,
pwCepPerf1DayIntervalInNegPtrAdjust,
pwCepPerf1DayIntervalInPosPtrAdjust,
pwCepPerf1DayIntervalInPtrAdjustSecs,
pwCepPerf1DayIntervalOutNegPtrAdjust,
pwCepPerf1DayIntervalOutPosPtrAdjust,
pwCepPerf1DayIntervalOutPtrAdjustSecs,
pwCepPerf1DayIntervalAbsPtrAdjust,
pwCepPerf1DayIntervalMissingPkts,
pwCepPerf1DayIntervalPktsOoseq,
pwCepPerf1DayIntervalPktsOoRngDropped,
pwCepPerf1DayIntervalJtrBfrUnderruns,
pwCepPerf1DayIntervalPktsMalformed,
pwCepPerf1DayIntervalSummaryErrors,
pwCepPerf1DayIntervalESs,
pwCepPerf1DayIntervalSESs,
pwCepPerf1DayIntervalUASs,
pwCepPerf1DayIntervalFC
}

pwPwCepFractionalGroup OBJECT-GROUP
OBJECTS {
pwCepFracRowStatus,
pwCepFracStorageType
}

STATUS current
DESCRIPTION
"Collection of fractional SPE objects. These objects are optional and should be supported only if fractional SPE is supported within the network element."

::= { pwCepGroups 7 }

pwPwCepFractionalSts1Vc3Group OBJECT-GROUP
OBJECTS {
  pwCepFracMode,
  pwCepFracConfigError,
  pwCepFracAsync,
  pwCepFracVtgMap,
  pwCepFracEbm,
  pwCepFracPeerEbm
}

STATUS  current
DESCRIPTION
"Collection of fractional STS-1/VC3 objects. These objects are optional and should be supported only if fractional STS-1/VC3 is supported within the network element."

::= { pwCepGroups 8 }

pwPwCepFractionalVc4Group OBJECT-GROUP
OBJECTS {
  pwCepFracSdhVc4Mode,
  pwCepFracSdhVc4Tu3Map1,
  pwCepFracSdhVc4Tu3Map2,
  pwCepFracSdhVc4Tu3Map3,
  pwCepFracSdhVc4Tug2Map1,
  pwCepFracSdhVc4Tug2Map2,
  pwCepFracSdhVc4Tug2Map3,
  pwCepFracSdhVc4Ebm1,
  pwCepFracSdhVc4Ebm2,
  pwCepFracSdhVc4Ebm3,
  pwCepFracSdhVc4PeerEbm1,
  pwCepFracSdhVc4PeerEbm2,
  pwCepFracSdhVc4PeerEbm3
}

STATUS  current
DESCRIPTION
"Collection of fractional VC4 objects. These objects are optional and should be supported only if fractional VC4 is supported within the network element."

::= { pwCepGroups 9 }

pwCepConformanceCfgGroup OBJECT-GROUP
OBJECTS {
  pwCepPerfDbaInPacketsHCTruth,
  pwCepPerfDbaInPacketsHCDesc,
  pwCepPerfDbaOutPacketsHCTruth,
  pwCepPerfDbaOutPacketsHCDesc,
  pwCepPerfDbaOutPacketsHCTest,
  pwCepPerfDbaOutPacketsHCDesc,
7 Security considerations

It is clear that this MIB module is potentially useful for monitoring of CEP PWs. This MIB can also be used for configuration of certain objects, and anything that can be configured can be incorrectly configured, with potentially disastrous results.

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations. These are the tables and objects and their sensitivity/vulnerability:

- the pwCepTable, pwCepCfgTable and pwCepFracTable contains objects to CEP PW parameters on a Provider Edge (PE) device. Unauthorized access to objects in these tables could result in disruption of traffic on the network.
  The use of stronger mechanisms such as SNMPv3 security should be considered where possible. Specifically, SNMPv3 VACM and USM MUST be used with any v3 agent which implements this MIB module. Administrators should consider whether read access to these objects should be allowed, since read access may be undesirable under certain circumstances.

Some of the readable objects in this MIB module "i.e., objects with a MAX-ACCESS other than not-accessible" may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. These are the tables and objects and their sensitivity/vulnerability:
the pwCepTable, pwCepPerfCurrentTable, pwCepPerfIntervalTable and pwCepPerf1DayTable collectively show the CEP pseudo wire connectivity topology and its performance characteristics. If an Administrator does not want to reveal this information, then these tables should be considered sensitive/vulnerable.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure "for example by using IPSec", even then, there is no control as to who on the secure network is allowed to access and GET/SET "read/change/create/delete" the objects in this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework "see [RFC3410], section 8", including full support for the SNMPv3 cryptographic mechanisms "for authentication and privacy".

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module, is properly configured to give access to the objects only to those principals "users" that have legitimate rights to indeed GET or SET "change/create/delete" them.

8 References

8.3 Normative references


8.4 Informative references

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13 IANA considerations

The MIB module in this document uses the following IANA-assigned OBJECT IDENTIFIER values recorded in the SMI Numbers registry:

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>OBJECT IDENTIFIER value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pwCepStdMIB</td>
<td>{ transmission XXXX }</td>
</tr>
</tbody>
</table>

Editor’s Note (to be removed prior to publication): the IANA is requested to assign a value for "XXXX" under the ’transmission’ subtree and to record the assignment in the SMI Numbers registry. When the assignment has been made, the RFC Editor is asked to replace "XXXX" (here and in the MIB module) with the assigned value and to remove this note.

14 Acknowledgement

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