

Pseudowire (PW) Management Information Base (MIB)

Abstract

This memo defines a Standards Track portion of the Management Information Base for use with network management protocols in the Internet community. In particular, it describes managed objects for modeling of Pseudowire Edge-to-Edge services carried over a general Packet Switched Network.

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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1. Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it defines a MIB module that can be used to manage pseudowire (PW) services for transmission over a Packet Switched Network (PSN) [RFC3931] [RFC4447]. This MIB module provides generic management of PWs that is common to all types of PSN and PW services defined by the IETF PWE3 Working Group.

2. 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].

3. Conventions

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].

This document adopts the definitions, acronyms, and mechanisms described in [RFC3985] and [RFC3916]. Unless otherwise stated, the mechanisms of [RFC3985] apply and will not be re-described here.

4. Overview

The PWE3 MIB modules architecture provides a layered modular model into which any supported emulated service can be connected to any supported PSN type. This specific MIB module provides the glue for mapping between the emulated service onto the native PSN service. As such, the defining of a PW emulated service requires the use of at least three types of MIB modules.

Starting from the emulated service, the first type is a service-specific module, which is dependent on the emulated signal type. These modules are defined in other documents.

The second type is this module, the PW-STD-MIB module, which configures general parameters of the PW that are common to all types of emulated services and PSN types.

The third type of module is a PSN-specific module. There is a different module for each type of PSN. These modules associate the PW with one or more "tunnels" that carry the service over the PSN. These modules are defined in other documents.

5. Structure of the MIB Module

The MIB module consists of six tables:

- The generic configuration and status monitoring objects that are common to all service types and PSN types (pwTable).
- The PW Performance Current Table (pwPerfCurrentTable) contains PW statistics for the current 15-minute period.

- The PW Performance Interval Table (pwPerfIntervalTable) contains PW statistics for historical intervals (usually 96 15-minute entries to cover a 24-hour period).
- The PW Performance 1-day Interval Table (pwPerf1DayIntervalTable) contains PW statistics for historical intervals accumulated per day. Usually 30 1-day entries to cover a monthly period.
- The mapping table (pwIndexMappingTable) enables the reverse mapping of the unique PWid parameters [peer IP, PW type, and PW ID] and the pwIndex.
- The mapping table (pwGenFecIndexMappingTable) enables the reverse mapping of unique PWid parameters used in genFecSignaling [pwGroupAttachmentID, pwLocalAttachmentID, and pwPeerAttachmentID] and the pwIndex.

This MIB module uses Textual Conventions from [RFC2578], [RFC2579], [RFC2580], [RFC2863], [RFC3411], [RFC3593], [RFC3705], [RFC4001], and [RFC5542], and references [RFC3413], [RFC4623], and [RFC4720].

6. PW-STD-MIB Module Usage

An entry in the PW table (pwTable) MUST exist for all PW types (ATM, FR, Ethernet, SONET, etc.). This table holds generic parameters related to the PW creation and monitoring.

A conceptual row can be created in the pwTable in one of the following ways:

- 1) The operator creates a row in the pwTable when configuring the node for a new service. This mode MUST be supported by the agent, and MUST be used when creating a non-signaled (manually assigned) PW.
 - 2) The agent MAY create a row in the pwTable if a signaling message has been received from a peer node with signaling identification parameters that are not already known to the local node (i.e., there is no related entry created by the operator with matching parameters). This mode is OPTIONAL.
 - 3) The agent MAY create a row in the pwTable automatically due to some auto-discovery application, or based on configuration that is done through non-SNMP applications. This mode is OPTIONAL.
- The agent then creates the rows in the (locally supported) performance tables and reverse-mapping tables in PW-STD-MIB module.

7. Relations to Other PWE3 MIB Modules

- Based on the PSN type defined for the PW, a row is created in the PSN-specific module (for example, [RFC5602]) and associated to the PW table by the common pwIndex.
- Based on the PW type defined for the PW, a row is created in the service-specific module (for example, [CEPMIB]) and associated to the PW table by the common pwIndex.
- Unless all the necessary entries in the applicable tables have been created and all the parameters have been consistently configured in those tables, signaling cannot be performed from the local node, and the pwVcOperStatus should report 'notPresent'.

8. Relations to the IF-MIB

The PW in general is not an ifIndex [RFC2863] on its own, for agent scalability reasons. The PW is typically associated via the PWE3 MIB modules to an ifIndex the PW is emulating. This ifIndex may represent a physical entity -- for example, a PW emulating a SONET path as in Circuit Emulation Service over Packet (CEP). In that case, the PW itself is not an ifIndex; however, the PW-STD-CEP-MIB module associates the PW to the ifIndex of the path to be emulated. In some cases, the PW will be associated to an ifIndex representing a virtual interface. An example is Virtual Private LAN Service (VPLS) where the PW emulates a logical interface of a (logical) bridge. The physical ports' association to the VPLS instance is defined in the non-PW MIB modules in this case.

Exception to the above MAY exist in some implementations where it is convenient to manage the PW as an ifIndex in the ifTable. A special ifType to represent a PW virtual interface (246) will be used in the ifTable in this case.

When the PW is managed as an ifIndex, by default it SHOULD NOT be stacked, i.e., this ifIndex SHOULD NOT be layered above the respective PSN tunnel ifIndex or the attachment circuit ifIndex or the interface carrying the attachment circuit.

Note that the ifIndex that carries the PW toward/from the PSN is not explicitly configured via PWE3 MIB modules except in rare cases. In most cases, the PW is carried inside a PSN tunnel, and the interfaces carrying the tunnel are specified in the related MIB modules that control the PSN tunnels.

9. PW Notifications

This MIB module includes notifications for PW entering the up or down state, in accordance with the guidelines for interface notifications as described in [RFC2863]. Implementers should be aware that in many systems, it is desired to correlate notifications, such that notifications will not be emitted if notifications from a higher level (such as ports or tunnels) are already in effect. Specifically for PWs, it is anticipated that most network's equipment failures turn into lowerLayerDown state at the PW level, where a notification has already been emitted from a higher level.

When a PW is represented as an ifIndex, it is RECOMMENDED that PW notifications be turned off, to avoid duplication with the ifIndex status change notifications.

10. Example of the PW MIB Modules Usage

In this section, we provide an example of using the MIB objects described in [section 7](#) to set up a CEP PW over Multiprotocol Label Switching (MPLS) PSN. 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.

In this example, a PW service for CEP is configured over an MPLS PSN (MPLS-TE tunnel). It uses LDP as in [RFC4447] for service setup.

For the operation in the service-specific MIB modules and the PSN-specific MIB modules, see the specific MIB module memo. This example is continued in the memo describing the PW-CEP-STD-MIB module (for example, [CEPMIB]) and the PW-MPLS-STD-MIB module [RFC5602].

In the PW-STD-MIB module:

In pwTable:

```
{
    pwIndex                5,

    pwType                 cep,
    pwOwner                pwIdFecSignaling,
    pwPsnType              mpls,
    pwSetUpPriority        0, -- Highest
    pwHoldingPriority      0, -- Highest
    pwInboundMode          loose,

    pwPeerAddrType         ipv4,
    pwPeerAddr             192.0.2.5, -- In this case, equal to the
                                -- peer LDP entity IP addr

    pwID                   10,
    pwLocalGroupID         12,
    ..

    pwCwPreference         true,    -- Actually ignored for CEP
    pwLocalIfMtu           0,       -- Do not send ifMtu parameter
    pwLocalIfString        false,   -- Do not send interface string
    pwCapabAdvert          0,       -- Does not support status
                                -- report to the peer.
    pwRemoteGroupID        0xFFFF, -- Will be received by
                                -- signaling protocol

    pwRemoteCwStatus       notKnownYet,
    pwRemoteIfMtu          0,
    pwRemoteIfString       "",
    pwRemoteCapabilities    notYetKnown,
    ..
    pwOutboundVcLabel      0xFFFF, -- Will be received by
                                -- signaling protocol
    pwInboundVcLabel       0xFFFF, -- Will be set by signaling
                                -- protocol
    pwName                 "Example of CEP PW",
    pwDescr                 "",
    ..

    pwAdminStatus          up,
    ..
}
```

11. IANA PWE3 MIB Module

This section contains the initial version of the IANA-PWE3-MIB. IANA has updated this MIB module based on expert review as defined in [RFC5226]. Each new assignment of PW type or PW PSN type made by IANA based on the procedures described in [RFC4446] should be documented in the online version of IANA-PWE3-MIB. The current IANA-PWE3-MIB contains PW types as requested in [RFC4446] and [RFC4863].

IANA-PWE3-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, mib-2
FROM SNMPv2-SMI -- [RFC2578]

TEXTUAL-CONVENTION
FROM SNMPv2-TC; -- [RFC2579]

ianaPwe3MIB MODULE-IDENTITY

LAST-UPDATED "200906110000Z" -- 11 June 2009 00:00:00 GMT

ORGANIZATION "IANA"

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DESCRIPTION

"This MIB module defines the IANAPwTypeTC and
IANAPwPsnTypeTC textual conventions for use in PWE3
MIB modules.

Any additions or changes to the contents of this MIB module require either publication of an RFC, Designated Expert Review as defined in RFC 5226, Guidelines for Writing an IANA Considerations Section in RFCs, and should be based on the procedures defined in [RFC4446]. The Designated Expert will be selected by the IESG Area Director(s) of the internet Area.

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REVISION "200906110000Z" -- 11 June 2009 00:00:00 GMT
DESCRIPTION "Original version, published as part of RFC 5601."
 ::= { mib-2 174 }

IANAPwTypeTC ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"Indicates the PW type (i.e., the carried service). "

SYNTAX INTEGER {
 other(0),
 frameRelayDlciMartiniMode(1),
 atmAal5SduVcc(2),
 atmTransparent(3),
 ethernetTagged(4),
 ethernet(5),
 hdlc(6),
 ppp(7),

```
cem(8), -- Historic type
atmCellNtolVcc(9),
atmCellNtolVpc(10),
ipLayer2Transport(11),
atmCell11tolVcc(12),
atmCell11tolVpc(13),
atmAal5PduVcc(14),
frameRelayPortMode(15),
cep(16),
elSatop(17),
tlSatop(18),
e3Satop(19),
t3Satop(20),
basicCesPsn(21),
basicTdmIp(22),
tdmCasCesPsn(23),
tdmCasTdmIp(24),
frDlci(25),
wildcard (32767)
}
```

IANAPwPsnTypeTC ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"Identifies the PSN type that the PW will use over the network."

```
SYNTAX INTEGER {
    mpls          (1),
    l2tp          (2),
    udpOverIp     (3),
    mplsOverIp    (4),
    mplsOverGre   (5),
    other         (6)
}
```

IANAPwCapabilities ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"This TC describes a collection of capabilities related to a specific PW.
Values may be added in the future based on new capabilities introduced in IETF documents.
"

```
SYNTAX BITS {
    pwStatusIndication (0), -- Applicable only if maintenance
                           -- protocol is in use.
    pwVCCV              (1)
}
```

END

12. Object Definitions

PW-STD-MIB DEFINITIONS ::= BEGIN

IMPORTS

NOTIFICATION-TYPE, MODULE-IDENTITY, OBJECT-TYPE,
Integer32, Unsigned32, Counter32, Counter64, TimeTicks,
transmission

FROM SNMPv2-SMI -- [RFC2578]

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

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

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

InterfaceIndexOrZero
FROM IF-MIB -- [RFC2863]

InetAddressType, InetAddress
FROM INET-ADDRESS-MIB -- [RFC4001]

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

HCPperfCurrentCount, HCPperfIntervalCount, HCPperfTimeElapsed,
HCPperfValidIntervals
FROM HC-PerfHist-TC-MIB -- [RFC3705]

PwIndexType, PwIndexOrZeroType, PwGroupID, PwIDType,
PwOperStatusTC, PwAttachmentIdentifierType, PwCwStatusTC,
PwStatus, PwFragSize, PwFragStatus, PwGenIdType
FROM PW-TC-STD-MIB -- [RFC5542]
IANAPwTypeTC, IANAPwPsnTypeTC, IANAPwCapabilities
FROM IANA-PWE3-MIB -- [RFC5601]

;

pwStdMIB MODULE-IDENTITY

LAST-UPDATED "200906110000Z" -- 11 June 2009 00:00:00 GMT

ORGANIZATION "Pseudowire Edge-to-Edge Emulation (PWE3) Working
Group"

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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 pseudowire operation as in Bryant, S. and P. Pate, 'Pseudo Wire Emulation Edge-to-Edge (PWE3) Architecture' [RFC3985], Martini, L., et al, 'Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)' [RFC4447], and Townsley, M., et al, 'Layer Two Tunneling Protocol (Version 3)' [RFC3931].

This MIB module enables the use of any underlying packet switched network (PSN). MIB nodules that will support PW operations over specific PSN types are defined in separate memos.

The indexes for this MIB module are also used to index the PSN-specific tables and the PW-specific tables. The PW Type dictates which PW-specific MIB module to use.

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This version of this MIB module is part of RFC 5601;
see the RFC itself for full legal notices.

"

```
-- Revision history.
REVISION
    "200906110000Z" -- 11 June 2009 00:00:00 GMT
DESCRIPTION "Initial version published as part of RFC 5601."
 ::= { transmission 246 }

-- Top-level components of this MIB.

-- Notifications
pwNotifications OBJECT IDENTIFIER
                ::= { pwStdMIB 0 }

-- Tables, Scalars
pwObjects      OBJECT IDENTIFIER
                ::= { pwStdMIB 1 }

-- Conformance
pwConformance  OBJECT IDENTIFIER
                ::= { pwStdMIB 2 }

-- PW Virtual Connection Table

pwIndexNext OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "This object contains an appropriate value to be used for
        pwIndex when creating entries in the pwTable. The value 0
        indicates that no unassigned entries are available. To
        obtain the value of pwIndex for a new entry in the pwTable,
```

the manager issues a management protocol retrieval operation. The agent will determine through its local policy when this index value will be made available for reuse."

::= { pwObjects 1 }

pwTable OBJECT-TYPE

SYNTAX SEQUENCE OF PwEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table specifies information for configuring and status monitoring that is common to all service types and PSN types."

::= { pwObjects 2 }

pwEntry OBJECT-TYPE

SYNTAX PwEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A row in this table represents a pseudowire (PW) virtual connection across a packet network. It is indexed by pwIndex, which uniquely identifies a singular connection.

A row can be created by an operator command from a management plan of a PE, by signaling, or due to auto-discovery process. An operator's command can be issued via a non-SNMP application; in such case, a row will be created implicitly by the agent.

The read-create objects in this table are divided into three categories:

- 1) Objects that MUST NOT be changed after row activation. These are objects that define basic properties of the PW (for example type, destination, etc.).
- 2) Objects that MAY be changed when the PW is defined as not active. A change of these objects involves re-signaling of the PW or it might be traffic affecting. PW not active is defined as one of the following conditions:
 - a) The pwRowStatus is notInService(2).
 - b) The pwRowStatus is notReady(3).
 - c) The pwAdminStatus is down(2).

If the operator needs to change one of the values for an active row, the operator can either set the pwRowStatus to notInService(2) or set pwAdminStatus to down(2).

Signaling (or traffic) is initiated again upon setting the pwRowStatus to active(1) or setting the pwAdminStatus to up(1) or testing(3), respectively.

3) Objects that MAY be changed at any time.

A PW MAY have an entry in the ifTable in addition to the entry in this table. In this case, a special ifType for PW will be set in the ifTable, and the ifIndex in the ifTable of the PW will be set in the pwIfIndex object in this table.

By default, all the read-create objects MUST NOT be changed after row activation, unless specifically indicated in the individual object description.

Manual entries in this table SHOULD be preserved after a reboot; the agent MUST ensure the integrity of those entries. If the set of entries of a specific row are found to be inconsistent after reboot, the PW pwOperStatus MUST be declared as notPresent(5).

"

INDEX { pwIndex }

::= { pwTable 1 }

PwEntry ::= SEQUENCE {

pwIndex	PwIndexType,
pwType	IANA PWTypeTC,
pwOwner	INTEGER,
pwPsnType	IANA PWPsnTypeTC,
pwSetUpPriority	Integer32,
pwHoldingPriority	Integer32,
pwPeerAddrType	InetAddressType,
pwPeerAddr	InetAddress,
pwAttachedPwIndex	PwIndexOrZeroType,
pwIfIndex	InterfaceIndexOrZero,
pwID	PwIDType,
pwLocalGroupID	PwGroupID,
pwGroupAttachmentID	PwAttachmentIdentifierType,
pwLocalAttachmentID	PwAttachmentIdentifierType,
pwRemoteAttachmentID	PwAttachmentIdentifierType,
pwCwPreference	TruthValue,
pwLocalIfMtu	Unsigned32,
pwLocalIfString	TruthValue,
pwLocalCapabAdvert	IANA PWCapabilities,
pwRemoteGroupID	PwGroupID,
pwCwStatus	PwCwStatusTC,
pwRemoteIfMtu	Unsigned32,

```

pwRemoteIfString      SnmpAdminString,
pwRemoteCapabilities  IANAPwCapabilities,

pwFragmentCfgSize     PwFragSize,
pwRmtFragCapability    PwFragStatus,
pwFcsRetentionCfg     INTEGER,
pwFcsRetentionStatus  BITS,

pwOutboundLabel       Unsigned32,
pwInboundLabel        Unsigned32,

pwName                SnmpAdminString,
pwDescr               SnmpAdminString,
pwCreateTime          TimeStamp,
pwUpTime              TimeTicks,
pwLastChange          TimeTicks,
pwAdminStatus         INTEGER,
pwOperStatus          PwOperStatusTC,
pwLocalStatus         PwStatus,
pwRemoteStatusCapable INTEGER,
pwRemoteStatus        PwStatus,
pwTimeElapsed         HCPperfTimeElapsed,
pwValidIntervals      HCPperfValidIntervals,
pwRowStatus           RowStatus,
pwStorageType         StorageType,
pwOamEnable           TruthValue,
pwGenAGIType          PwGenIdType,
pwGenLocalAIIType     PwGenIdType,
pwGenRemoteAIIType    PwGenIdType
}

```

pwIndex OBJECT-TYPE

```

SYNTAX      PwIndexType
MAX-ACCESS  not-accessible
STATUS      current

```

DESCRIPTION

```

    "A unique index for the conceptual row identifying a PW within
    this table."
 ::= { pwEntry 1 }

```

pwType OBJECT-TYPE

```

SYNTAX      IANAPwTypeTC
MAX-ACCESS  read-create
STATUS      current

```

DESCRIPTION

```

    "This value indicates the emulated service to be carried over
    this PW.
    "

```



```
::= { pwEntry 2 }
```

pwOwner OBJECT-TYPE

```
SYNTAX      INTEGER {
    manual                (1),
    pwIdFecSignaling      (2), -- PW signaling with PW ID FEC
    genFecSignaling       (3), -- Generalized attachment FEC
    l2tpControlProtocol    (4),
    other                  (5)
}
```

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object is set by the operator to indicate the protocol responsible for establishing this PW.

'manual' is used in all cases where no maintenance protocol (PW signaling) is used to set up the PW, i.e., configuration of entries in the PW tables including PW labels, etc., is done by setting the MIB fields manually.

'pwIdFecSignaling' is used in case of signaling with the PwId FEC element with LDP signaling.

'genFecSignaling' is used in case of LDP signaling with the generalized FEC.

'l2tpControlProtocol' indicates the use of the L2TP control protocol.

'other' is used for other types of signaling."

```
::= { pwEntry 3 }
```

pwPsnType OBJECT-TYPE

```
SYNTAX      IANAPwPsnTypeTC
```

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object is set by the operator to indicate the PSN type. Based on this object, the relevant PSN table's entry is created in the PSN-specific MIB modules.

"

```
::= { pwEntry 4 }
```

pwSetUpPriority OBJECT-TYPE

```
SYNTAX      Integer32 (0..7)
```

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object defines the relative priority of the PW during set-up in a lowest-to-highest fashion, where 0 is the highest priority. PWs with the same priority are treated with equal priority. PWs that have not yet

completed setup will report 'dormant' in the pwOperStatus.

This value is significant if there are competing resources among PWs and the implementation supports this feature. Equal priority handling with competing resources is implementation specific.

This object MAY be changed at any time."

DEFVAL { 0 }

::= { pwEntry 5 }

pwHoldingPriority OBJECT-TYPE

SYNTAX Integer32 (0..7)

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object defines the relative holding priority of the PW in a lowest-to-highest fashion, where 0 is the highest priority. PWs with the same priority are treated equally. This value is significant if there are competing resources among PWs and the implementation supports this feature. Equal priority handling with competing resources is implementation specific.

This object MAY be changed only if the PW is not active."

DEFVAL { 0 }

::= { pwEntry 6 }

pwPeerAddrType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Denotes the address type of the peer node. It should be set to 'unknown' if PE/PW maintenance protocol is not used and the address is unknown."

DEFVAL { ipv4 }

::= { pwEntry 8 }

pwPeerAddr OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object contains the value of the peer node address of the PW/PE maintenance protocol entity. This object SHOULD contain a value of all zeroes if not applicable (pwPeerAddrType is 'unknown')."

::= { pwEntry 9 }

pwAttachedPwIndex OBJECT-TYPE

SYNTAX PwIndexOrZeroType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"If the PW is attached to another PW instead of a local native service, this item indicates the pwIndex of the attached PW. Otherwise, this object MUST be set to zero. Attachment to another PW will have no PW specific entry in any of the service MIB modules."

DEFVAL { 0 }

::= { pwEntry 10 }

pwIfIndex OBJECT-TYPE

SYNTAX InterfaceIndexOrZero

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object indicates the ifIndex of the PW if the PW is represented in the ifTable. Otherwise, it MUST be set to zero."

DEFVAL { 0 }

::= { pwEntry 11 }

pwID OBJECT-TYPE

SYNTAX PwIDType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Pseudowire identifier.

If the pwOwner object is 'pwIdFecSignaling' or 'l2tpControlProtocol', then this object is signaled in the outgoing PW ID field within the 'Virtual Circuit FEC Element'. For other values of pwOwner, this object is not signaled and it MAY be set to zero.

For implementations that support the pwIndexMappingTable, a non-zero value is RECOMMENDED, even if this identifier is not signaled. This is so that reverse mappings can be provided by pwIndexMappingTable and pwPeerMappingTable. It is therefore RECOMMENDED that the value of this pwID be unique (or if pwPeerAddrType is not 'unknown', at least [pwType, pwID, pwPeerAddrType, pwPeerAddr] is unique.)"

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol', [RFC 4447](#)."

::= { pwEntry 12 }

pwLocalGroupID OBJECT-TYPE

SYNTAX PwGroupID
MAX-ACCESS read-create
STATUS current
DESCRIPTION

"Used in the Group ID field sent to the peer PW End Service within the maintenance protocol used for PW setup. It SHOULD be set to zero if a maintenance protocol is not used."

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol', [RFC 4447](#)."

::= { pwEntry 13 }

pwGroupAttachmentID OBJECT-TYPE

SYNTAX PwAttachmentIdentifierType
MAX-ACCESS read-create
STATUS current
DESCRIPTION

"This object is an octet string representing the attachment group identifier (AGI) that this PW belongs to, which typically identifies the VPN ID. Applicable if pwOwner equals 'genFecSignaling'."

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol', [RFC 4447](#)."

::= { pwEntry 14 }

pwLocalAttachmentID OBJECT-TYPE

SYNTAX PwAttachmentIdentifierType
MAX-ACCESS read-create
STATUS current
DESCRIPTION

"This object is an octet string representing the local forwarder attachment individual identifier (AII) to be used by this PW. It is used as the Source AII (SAII) for outgoing signaling messages and the Target AII (TAII) in the incoming messages from the peer. Applicable if pwOwner equal 'genFecSignaling'."

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol', [RFC 4447](#)."

::= { pwEntry 15 }

pwRemoteAttachmentID OBJECT-TYPE

SYNTAX PwAttachmentIdentifierType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object is an octet string representing the remote forwarder attachment individual identifier (AII) to be used by this PW. It is used as the TAI for outgoing signaling messages and the SAI in the incoming messages from the peer.

Applicable if pwOwner equals 'genFecSignaling'."

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol', [RFC 4447](#)."

::= { pwEntry 16 }

pwCwPreference OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Defines if the control word will be sent with each packet by the local node. Some PW types mandate the use of a control word, and in such cases, the value configured for this object has no effect on the existence of the control word.

This object MAY be changed only if the PW is not active."

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol.', [RFC 4447](#)."

DEFVAL { false }

::= { pwEntry 17 }

pwLocalIfMtu OBJECT-TYPE

SYNTAX Unsigned32 (0..65535)

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"If not equal to zero, the optional IfMtu object in the signaling protocol will be sent with this value, which represents the locally supported MTU size over the interface (or the virtual interface) associated with the PW.

This object MAY be changed only if the PW is not active."

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol', [RFC 4447](#)."

DEFVAL { 0 }

::= { pwEntry 18 }

pwLocalIfString OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-create
STATUS current
DESCRIPTION

"A PW MAY be associated to an interface (or a virtual interface) in the ifTable of the node as part of the service configuration. This object defines if the maintenance protocol will send the interface's name (ifAlias) as it appears in the ifTable. If set to false, the optional element will not be sent.
This object MAY be changed only if the PW is not active."

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol', [RFC 4447, section 5.5](#)."

DEFVAL { false }

::= { pwEntry 19 }

pwLocalCapabAdvert OBJECT-TYPE

SYNTAX IANAPwCapabilities
MAX-ACCESS read-create
STATUS current
DESCRIPTION

"If a maintenance protocol is used, it indicates the capabilities the local node will advertise to the peer. The operator MAY selectively assign a partial set of capabilities. In case of manual configuration of the PW, the operator SHOULD set non-conflicting options (for example, only a single type of Operations, Administration, and Management (OAM)) out of the available options in the implementation. It is possible to change the value of this object when the PW is not active. The agent MUST reject any attempt to set a capability that is not supported.

The default value MUST be the full set of local node capabilities."

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol', [RFC 4447](#)."

::= { pwEntry 20 }

pwRemoteGroupID OBJECT-TYPE

SYNTAX PwGroupID
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"This object is obtained from the Group ID field as received via the maintenance protocol used for PW setup. Value of zero will be reported if not used. Value of 0xFFFFFFFF shall be used if the object is yet to be defined by the PW maintenance protocol."

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol', [RFC 4447](#)."

::= { pwEntry 21 }

pwCwStatus OBJECT-TYPE

SYNTAX PwCwStatusTC
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"If signaling is used for PW establishment, this object indicates the status of the control word negotiation. For either signaling or manual configuration, it indicates if the control word (CW) is to be present for this PW."

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol', [RFC 4447](#)."

::= { pwEntry 22 }

pwRemoteIfMtu OBJECT-TYPE

SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The remote interface MTU as (optionally) received from the remote node via the maintenance protocol. The object SHOULD report zero if the MTU is not available."

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol', [RFC 4447](#)."

::= { pwEntry 23 }

pwRemoteIfString OBJECT-TYPE

SYNTAX SnmpAdminString (SIZE (0..80))
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"Indicates the interface description string as received by the maintenance protocol. It MUST be a NULL string if a maintenance protocol is not used or the value is not known yet."

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol', [RFC 4447, section 5.5.](#)"
::= { pwEntry 24 }

pwRemoteCapabilities OBJECT-TYPE

SYNTAX IANAPwCapabilities
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"Indicates the capabilities as received from the peer."

REFERENCE

"Martini, et al, 'Pseudowire Setup and Maintenance using the Label Distribution Protocol', [RFC 4447.](#)"
::= { pwEntry 25 }

pwFragmentCfgSize OBJECT-TYPE

SYNTAX PwFragSize
UNITS "bytes"
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"If set to a value other than zero, indicates that fragmentation is desired for this PW.
This object MAY be changed only if the PW is not active."

REFERENCE

"Malis A., Townsley M., 'PWE3 Fragmentation and Reassembly', [RFC 4623.](#)"
DEFVAL { 0 } -- i.e., fragmentation not desired
::= { pwEntry 26 }

pwRmtFragCapability OBJECT-TYPE

SYNTAX PwFragStatus
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The status of the fragmentation based on the local configuration and the peer capabilities as received from the peer when a control protocol is used."

REFERENCE

"Malis A., Townsley M., 'PWE3 Fragmentation and Reassembly', [RFC 4623.](#)"
::= { pwEntry 27 }

pwFcsRetentionCfg OBJECT-TYPE

SYNTAX INTEGER {
fcsRetentionDisable (1),
fcsRetentionEnable (2)


```

    }
    MAX-ACCESS      read-create
    STATUS          current
    DESCRIPTION
        "The local configuration of Frame Check Sequence (FCS)
        retention for this PW.  FCS retention can be configured for
        PW types High-Level Data Link Control (HDLC), Point-to-Point
        Protocol (PPP), and Ethernet only.  If the implementation
        does not support FCS retention, an error MUST be reported in
        pwFcsRetentionStatus.  This object MAY be changed only if
        the PW is not active."
    REFERENCE
        "Malis A., et al., 'PWE3 Frame Check Sequence Retention',
        RFC 4720."
    DEFVAL { fcsRetentionDisable }
    ::= { pwEntry 28 }

pwFcsRetentionStatus OBJECT-TYPE
    SYNTAX  BITS {
        remoteIndicationUnknown      (0),
        remoteRequestFcsRetention    (1),
        fcsRetentionEnabled           (2),
        fcsRetentionDisabled          (3),
        localFcsRetentionCfgErr       (4),
        fcsRetentionFcsSizeMismatch  (5)
    }
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The status of the FCS retention negotiation process based on
        local configuration and the remote advertisement.

        remoteIndicationUnknown - set if a FEC has not been received
        from the remote.

        remoteRequestFcsRetention - indicates that the peer has
        requested FCS retention.  FCS retention will be used if
        the local node is capable and configured to use it for
        this PW.

        fcsRetentionEnabled - FCS retention is enabled (both peers
        were configured for FCS retention for signaled PW, or the
        local node is configured and capable of FCS retention for
        manually assigned PWs).

        fcsRetentionDisabled - FCS retention is disabled (not
        configured locally or not advertised by the peer).

```

localFcsRetentionCfgErr - set if the local node has been configured for FCS retention but is not capable to support it.

fcsRetentionFcsSizeMismatch - set if there is an FCS size mismatch between the local and the peer node.

"

REFERENCE

"Malis A., et al., 'PWE3 Frame Check Sequence Retention',
[RFC 4720](#)"

::= { pwEntry 29 }

pwOutboundLabel OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The PW label used in the outbound direction (i.e., toward the PSN). It might be set manually if pwOwner is 'manual'; otherwise, it is set automatically.

For MPLS, MPLS over IP, or MPLS over Generic Routing Encapsulation (GRE) PSN, it represents the 20-bit PW tag; for L2TP, it represents the 32-bit Session ID; and for IP PSN, it represents the destination UDP port number.

If the label is not yet known (signaling in process), the object SHOULD return a value of 0xFFFFFFFF.

For manual configuration, this object MAY be changed only if the PW is not active."

::= { pwEntry 30 }

pwInboundLabel OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The PW label used in the inbound direction (i.e., packets received from the PSN). It may be set manually if pwOwner is 'manual'; otherwise, it is set automatically.

For MPLS, MPLS over IP, or MPLS over GRE PSN, it represents the 20-bit PW tag; for L2TP, it represents the 32-bit Session ID; and for IP PSN, it represents the source UDP port number.

If the label is not yet known (signaling in process), the object SHOULD return a value of 0xFFFFFFFF.

For manual configuration, this object MAY be changed only if the PW is not active."

::= { pwEntry 31 }

pwName OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The canonical name assigned to the PW. This object MAY be changed at any time."

::= { pwEntry 32 }

pwDescr OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"A textual string containing information about the PW.

If there is no description, this object contains a zero-length string. This object MAY be changed at any time."

::= { pwEntry 33 }

pwCreateTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime at the time this PW was created."

::= { pwEntry 34 }

pwUpTime OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Specifies the time since last change of pwOperStatus to Up(1)."

::= { pwEntry 35 }

pwLastChange OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime at the time the PW entered its current operational state. If the current state was entered prior to the last re-initialization of the local network management subsystem, then this object contains a zero value."

::= { pwEntry 36 }

pwAdminStatus OBJECT-TYPE

```

SYNTAX      INTEGER {
                up(1),      -- ready to pass packets
                down(2),
                testing(3) -- in a test mode
            }

```

```

MAX-ACCESS      read-create

```

```

STATUS          current

```

DESCRIPTION

"The desired operational status of this PW. This object MAY be set at any time."

```
 ::= { pwEntry 37 }
```

pwOperStatus OBJECT-TYPE

```

SYNTAX          PwOperStatusTC

```

```

MAX-ACCESS      read-only

```

```

STATUS          current

```

DESCRIPTION

"This object indicates the operational status of the PW; it does not reflect the status of the Customer Edge (CE) bound interface. It is set to down only if pwNotForwarding, psnFacingPwRxFault, or psnFacingPwTxFault indications are set in pwLocalStatus or pwRemoteStatus.

It indicates 'lowerLayerDown' if the only reason for not being in the 'up' state is that either the outer tunnel or physical layer of the network side is in the 'down' state.

All other states are declared based on the description of the PwOperStatusTC.

"

```
 ::= { pwEntry 38 }
```

pwLocalStatus OBJECT-TYPE

```

SYNTAX          PwStatus

```

```

MAX-ACCESS      read-only

```

```

STATUS          current

```

DESCRIPTION

"Indicates the status of the PW in the local node.

The various indications in this object SHOULD be available independent of the ability of the local node to advertise them or the remote node to accept these status indications through the control protocol.

"

```
 ::= { pwEntry 39 }
```

pwRemoteStatusCapable OBJECT-TYPE

```

SYNTAX          INTEGER {
                notApplicable    (1),

```

```
        notYetKnown      (2),
        remoteCapable     (3),
        remoteNotCapable (4)
    }
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "Indicates the remote node capability to advertise the
        PW status notification.
        notApplicable SHOULD be reported for a manually set PW, or
        if the local node is not capable of accepting the status
        notification object.
        notYetKnown SHOULD be reported if the signaling protocol
        has not yet finished the process of capability
        determination.
        remoteCapable and remoteNotcapable SHOULD be reported
        based on the initial signaling exchange that has
        determined the remote node capability.
        "
    ::= { pwEntry 40 }

pwRemoteStatus OBJECT-TYPE
    SYNTAX      PwStatus
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Indicates the status of the PW as was advertised by the
        remote.  If the remote is not capable of advertising the
        status object, or the local node is not able to accept
        the status object through signaling, then the applicable
        bit is 'pwNotForwarding', which is set if the remote has
        sent label release or label withdraw for this PW.
        "
    ::= { pwEntry 41 }

pwTimeElapsed 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
        interval measurement period."
    ::= { pwEntry 42 }

pwValidIntervals OBJECT-TYPE
    SYNTAX      HCPerfValidIntervals
    MAX-ACCESS  read-only
```

```
STATUS    current
DESCRIPTION
    "The number of previous 15-minute intervals
    for which data was collected."
::= { pwEntry 43 }

pwRowStatus OBJECT-TYPE
SYNTAX      RowStatus
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "For creating, modifying, and deleting this row.
    This object MAY be changed at any time."
::= { pwEntry 44 }

pwStorageType OBJECT-TYPE
SYNTAX      StorageType
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "This variable indicates the storage type for this
    object."
DEFVAL { nonVolatile }
::= { pwEntry 45 }

pwOamEnable OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "This variable indicates if OAM is enabled for this
    PW. It MAY be changed at any time."
DEFVAL { true }
::= { pwEntry 46 }

pwGenAGIType OBJECT-TYPE
SYNTAX      PwGenIdType
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "This variable indicates the AGI type if generalized FEC
    (129) is used for PW signaling or configuration. It SHOULD
    return the value of zero otherwise."
DEFVAL { 0 }
::= { pwEntry 47 }

pwGenLocalAllIType OBJECT-TYPE
SYNTAX      PwGenIdType
```

```

MAX-ACCESS      read-create
STATUS          current
DESCRIPTION
    "This object is the type of the local forwarder
    attachment individual identifier (AII) to be used
    by this PW if generalized FEC (129) is used for PW
    signaling or configuration."
DEFVAL { 0 }
 ::= { pwEntry 48 }

```

```

pwGenRemoteAIIType OBJECT-TYPE
    SYNTAX      PwGenIdType
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
        "This object is the type of the remote forwarder
        attachment individual identifier (AII) to be used
        by this PW if generalized FEC (129) is used for PW
        signaling or configuration."
    DEFVAL { 0 }
    ::= { pwEntry 49 }

```

```
-- End of the PW Virtual Connection Table
```

```
-- PW Performance Table
```

```

pwPerfCurrentTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF PwPerfCurrentEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "This table provides per-PW performance information for
        the current interval."
    ::= { pwObjects 3 }

```

```

pwPerfCurrentEntry OBJECT-TYPE
    SYNTAX      PwPerfCurrentEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "An entry in this table is created by the agent for
        every PW."
    INDEX { pwIndex }
    ::= { pwPerfCurrentTable 1 }

```

```

PwPerfCurrentEntry ::= SEQUENCE {
    pwPerfCurrentInHCPackets      HCPperfCurrentCount,
    pwPerfCurrentInHCBytes        HCPperfCurrentCount,

```

pwPerfCurrentOutHCPackets	HCPperfCurrentCount,
pwPerfCurrentOutHCBytes	HCPperfCurrentCount,
pwPerfCurrentInPackets	PerfCurrentCount,
pwPerfCurrentInBytes	PerfCurrentCount,
pwPerfCurrentOutPackets	PerfCurrentCount,
pwPerfCurrentOutBytes	PerfCurrentCount
}	

pwPerfCurrentInHCPackets OBJECT-TYPE

SYNTAX HCPperfCurrentCount
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"High-capacity counter for number of packets received by the PW (from the PSN) in the current 15-minute interval. This is the 64-bit version of pwPerfCurrentInPackets, if pwPerfCurrentInHCPackets is supported according to the rules spelled out in [RFC 2863](#)."

::= { pwPerfCurrentEntry 1 }

pwPerfCurrentInHCBytes OBJECT-TYPE

SYNTAX HCPperfCurrentCount
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"High-capacity counter for number of bytes received by the PW (from the PSN) in the current 15-minute interval. This is the 64-bit version of pwPerfCurrentInBytes, if pwPerfCurrentInHCBytes is supported according to the rules spelled out in [RFC 2863](#)."

::= { pwPerfCurrentEntry 2 }

pwPerfCurrentOutHCPackets OBJECT-TYPE

SYNTAX HCPperfCurrentCount
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"High-capacity counter for number of packets forwarded by the PW (to the PSN) in the current 15-minute interval. This is the 64-bit version of pwPerfCurrentOutPackets, if pwPerfCurrentOutHCPackets is supported according to the rules spelled out in [RFC 2863](#)."

::= { pwPerfCurrentEntry 3 }

pwPerfCurrentOutHCBytes OBJECT-TYPE

SYNTAX HCPperfCurrentCount
MAX-ACCESS read-only

STATUS current
DESCRIPTION
"High-capacity counter for number of bytes forwarded by the PW (to the PSN) in the current 15-minute interval. This is the 64-bit version of pwPerfCurrentOutBytes, if pwPerfCurrentOutHCBytes is supported according to the rules spelled out in [RFC 2863](#)."
 ::= { pwPerfCurrentEntry 4 }

pwPerfCurrentInPackets OBJECT-TYPE
SYNTAX PerfCurrentCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The counter for number of packets received by the PW (from the PSN) in the current 15-minute interval. This is the 32-bit version of pwPerfCurrentInHCPackets, if pwPerfCurrentInHCPackets is supported according to the rules spelled out in [RFC 2863](#)."
 ::= { pwPerfCurrentEntry 5 }

pwPerfCurrentInBytes OBJECT-TYPE
SYNTAX PerfCurrentCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The counter for number of bytes received by the PW (from the PSN) in the current 15-minute interval. It MUST be equal to the least significant 32 bits of pwPerfCurrentInHCBytes, if pwPerfCurrentInHCBytes is supported according to the rules spelled out in [RFC 2863](#)."
 ::= { pwPerfCurrentEntry 6 }

pwPerfCurrentOutPackets OBJECT-TYPE
SYNTAX PerfCurrentCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The counter for number of packets forwarded by the PW (to the PSN) in the current 15-minute interval. It MUST be equal to the least significant 32 bits of pwPerfCurrentOutHCPackets, if pwPerfCurrentOutHCPackets is supported according to the rules spelled out in [RFC 2863](#)."
 ::= { pwPerfCurrentEntry 7 }

pwPerfCurrentOutBytes OBJECT-TYPE
SYNTAX PerfCurrentCount

```

MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "The counter for number of bytes forwarded by
    the PW (to the PSN) in the current 15-minute interval.
    It MUST be equal to the least significant 32 bits of
    pwPerfCurrentOutHCBytes, if pwPerfCurrentOutHCBytes is
    supported according to the rules spelled out in RFC 2863."
 ::= { pwPerfCurrentEntry 8 }

-- End of the PW Performance Current Table

-- PW Performance Interval Table

pwPerfIntervalTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF PwPerfIntervalEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "This table provides per-PW performance information for
        each interval."
    ::= { pwObjects 4 }

pwPerfIntervalEntry OBJECT-TYPE
    SYNTAX      PwPerfIntervalEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "An entry in this table is created by the agent for every
        PW."
    INDEX { pwIndex, pwPerfIntervalNumber }
    ::= { pwPerfIntervalTable 1 }

PwPerfIntervalEntry ::= SEQUENCE {
    pwPerfIntervalNumber      Integer32,
    pwPerfIntervalValidData   TruthValue,
    pwPerfIntervalTimeElapsed HCPerfTimeElapsed,
    pwPerfIntervalInHCPackets HCPerfIntervalCount,
    pwPerfIntervalInHCBytes   HCPerfIntervalCount,
    pwPerfIntervalOutHCPackets HCPerfIntervalCount,
    pwPerfIntervalOutHCBytes  HCPerfIntervalCount,
    pwPerfIntervalInPackets   PerfIntervalCount,
    pwPerfIntervalInBytes     PerfIntervalCount,
    pwPerfIntervalOutPackets  PerfIntervalCount,
    pwPerfIntervalOutBytes    PerfIntervalCount
    }

pwPerfIntervalNumber OBJECT-TYPE

```

SYNTAX Integer32 (1..96)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
 "A number N, between 1 and 96, 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 to 32. The maximum range of N is 1 through 96."
REFERENCE
 "Tesink, K. 'Definitions of Managed Objects for the
 SONET/SDH Interface Type', [RFC 2558](#)"
::= { pwPerfIntervalEntry 1 }

pwPerfIntervalValidData OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This variable indicates if the data for this interval
 is valid."
::= { pwPerfIntervalEntry 2 }

pwPerfIntervalTimeElapsed OBJECT-TYPE

SYNTAX HCPperfTimeElapsed
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The duration of this interval in seconds."
::= { pwPerfIntervalEntry 3 }

pwPerfIntervalInHCPackets OBJECT-TYPE

SYNTAX HCPperfIntervalCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "High-capacity counter for number of packets received by
 the PW (from the PSN) during the interval. This is the
 64-bit version of pwPerfIntervalInPackets, if
 pwPerfIntervalInHCPackets is supported according to the
 rules spelled out in [RFC 2863](#)."
::= { pwPerfIntervalEntry 4 }

pwPerfIntervalInHCBytes OBJECT-TYPE

SYNTAX HCPperfIntervalCount

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"High-capacity counter for number of bytes received by the PW (from the PSN) during the interval.

This is the 64-bit version of pwPerfIntervalInBytes, if pwPerfIntervalInHCBytes is supported according to the rules spelled out in [RFC 2863](#)."

::= { pwPerfIntervalEntry 5 }

pwPerfIntervalOutHCPackets OBJECT-TYPE

SYNTAX HCPerfIntervalCount

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"High-capacity counter for number of packets forwarded by the PW (to the PSN) during the interval.

This is the 64-bit version of pwPerfIntervalOutPackets, if pwPerfIntervalOutHCPackets is supported according to the rules spelled out in [RFC 2863](#)."

::= { pwPerfIntervalEntry 6 }

pwPerfIntervalOutHCBytes OBJECT-TYPE

SYNTAX HCPerfIntervalCount

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"High-capacity counter for number of bytes forwarded by the PW (to the PSN) during the interval.

This is the 64-bit version of pwPerfIntervalOutBytes, if pwPerfIntervalOutHCBytes is supported according to the rules spelled out in [RFC 2863](#)."

::= { pwPerfIntervalEntry 7 }

pwPerfIntervalInPackets OBJECT-TYPE

SYNTAX PerfIntervalCount

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This value represents the number of packets received by this PW during the interval.

It MUST be equal to the least significant 32 bits of pwPerfIntervalInHCPackets, if pwPerfIntervalInHCPackets is supported according to the rules spelled out in [RFC 2863](#)."

::= { pwPerfIntervalEntry 8 }

pwPerfIntervalInBytes OBJECT-TYPE

SYNTAX PerfIntervalCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This value represents the number of bytes received by
 this PW during the interval. It MUST be equal to the
 least significant 32 bits of pwPerfIntervalInHCBytes, if
 pwPerfIntervalInHCBytes is supported according to the
 rules spelled out in [RFC 2863](#)."
 ::= { pwPerfIntervalEntry 9 }

pwPerfIntervalOutPackets OBJECT-TYPE
SYNTAX PerfIntervalCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This value represents the number of packets sent by this
 PW during the interval.
 It MUST be equal to the least significant 32 bits of
 pwPerfIntervalOutHCPackets, if
 pwPerfIntervalOutHCPackets is supported according to the
 rules spelled out in [RFC 2863](#)."
 ::= { pwPerfIntervalEntry 10 }

pwPerfIntervalOutBytes OBJECT-TYPE
SYNTAX PerfIntervalCount
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This value represents the number of bytes sent by this
 PW during the interval.
 It MUST be equal to the least significant 32
 bits of pwPerfIntervalOutHCBytes,
 if pwPerfIntervalOutHCBytes is supported according to
 the rules spelled out in [RFC 2863](#)."
 ::= { pwPerfIntervalEntry 11 }

-- End of the PW Performance Interval Table

-- PW Performance 1-day Interval Table

pwPerf1DayIntervalTable OBJECT-TYPE
SYNTAX SEQUENCE OF PwPerf1DayIntervalEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
 "This table provides per-PW performance information for
 the current day's measurement and the previous day's

```

        interval."
 ::= { pwObjects 5 }

pwPerf1DayIntervalEntry OBJECT-TYPE
    SYNTAX      PwPerf1DayIntervalEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "An entry in this table is created by the agent for every
        PW."
    INDEX   { pwIndex, pwPerf1DayIntervalNumber }

 ::= { pwPerf1DayIntervalTable 1 }

PwPerf1DayIntervalEntry ::= SEQUENCE {
    pwPerf1DayIntervalNumber      Unsigned32,
    pwPerf1DayIntervalValidData   TruthValue,
    pwPerf1DayIntervalTimeElapsed HCPerfTimeElapsed,
    pwPerf1DayIntervalInHCPackets Counter64,
    pwPerf1DayIntervalInHCBytes   Counter64,
    pwPerf1DayIntervalOutHCPackets Counter64,
    pwPerf1DayIntervalOutHCBytes  Counter64
}

pwPerf1DayIntervalNumber OBJECT-TYPE
    SYNTAX      Unsigned32(1..31)
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "History Data Interval number. Interval 1 is the current day's
        measurement period, interval 2 is the most recent previous
        day, and interval 30 is 31 days ago. Intervals 3..31 are
        optional."
    ::= { pwPerf1DayIntervalEntry 1 }

pwPerf1DayIntervalValidData OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "This variable indicates if the data for this interval
        is valid."
    ::= { pwPerf1DayIntervalEntry 2 }

pwPerf1DayIntervalTimeElapsed OBJECT-TYPE
    SYNTAX      HCPerfTimeElapsed
    UNITS       "seconds"
    MAX-ACCESS   read-only

```

```
STATUS          current
DESCRIPTION
    "The number of seconds 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 where agent clock adjustments
    have been made."
 ::= { pwPerf1DayIntervalEntry 3 }

pwPerf1DayIntervalInHCPackets OBJECT-TYPE
    SYNTAX      Counter64
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "High-capacity counter for the total number of packets
        received by the PW (from the PSN)."
```

```
 ::= { pwPerf1DayIntervalEntry 4 }

pwPerf1DayIntervalInHCBytes OBJECT-TYPE
    SYNTAX      Counter64
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "High-capacity counter for the total number of bytes
        received by the PW (from the PSN)."
```

```
 ::= { pwPerf1DayIntervalEntry 5 }

pwPerf1DayIntervalOutHCPackets OBJECT-TYPE
    SYNTAX      Counter64
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "High-capacity counter for the total number of packets
        forwarded by the PW (to the PSN)."
```

```
 ::= { pwPerf1DayIntervalEntry 6 }

pwPerf1DayIntervalOutHCBytes OBJECT-TYPE
    SYNTAX      Counter64
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "High-capacity counter for the total number of bytes
        forwarded by the PW (to the PSN)."
```

```
 ::= { pwPerf1DayIntervalEntry 7 }

-- End of the PW Performance 1-day Interval Table
```

-- Error counter scalar

pwPerfTotalErrorPackets OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Counter for number of errors at the PW processing level,
for example, packets received with unknown PW label."

::= { pwObjects 6 }

-- Reverse mapping tables

-- The PW ID mapping table

pwIndexMappingTable OBJECT-TYPE

SYNTAX SEQUENCE OF PwIndexMappingEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table enables the reverse mapping of the unique
PwId parameters [peer IP, PW type, and PW ID] and the
pwIndex. The table is not applicable for PWs created
manually or by using the generalized FEC."

::= { pwObjects 7 }

pwIndexMappingEntry OBJECT-TYPE

SYNTAX PwIndexMappingEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in this table MUST be created by the agent for
every PW created by the pwTable for which pwOwner
equals pwIdFecSignaling and pwID is not zero."

Implementers need to be aware that if the value of
the pwIndexMappingPeerAddr (an OID) has more than
113 sub-identifiers, then OIDs of column instances
in this table will have more than 128 sub-identifiers
and cannot be accessed using SNMPv1, SNMPv2c, or SNMPv3."

INDEX { pwIndexMappingPwType, pwIndexMappingPwID,
pwIndexMappingPeerAddrType, pwIndexMappingPeerAddr
}

::= { pwIndexMappingTable 1 }

PwIndexMappingEntry ::= SEQUENCE {

pwIndexMappingPwType IANAPwTypeTC,

pwIndexMappingPwID PwIDType,

pwIndexMappingPeerAddrType InetAddressType,


```
        pwIndexMappingPeerAddr      InetAddress,
        pwIndexMappingPwIndex       PwIndexType
        }

pwIndexMappingPwType OBJECT-TYPE
    SYNTAX      IANAPwTypeTC
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "The PW type (indicates the service) of this PW."
    ::= { pwIndexMappingEntry 1 }

pwIndexMappingPwID OBJECT-TYPE
    SYNTAX      PwIDType
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "The PW ID of this PW.  Zero if the PW is configured
        manually."
    ::= { pwIndexMappingEntry 2 }

pwIndexMappingPeerAddrType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "IP address type of the peer node."
    ::= { pwIndexMappingEntry 3 }

pwIndexMappingPeerAddr OBJECT-TYPE
    SYNTAX      InetAddress
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "IP address of the peer node."
    ::= { pwIndexMappingEntry 4 }

pwIndexMappingPwIndex OBJECT-TYPE
    SYNTAX      PwIndexType
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The value that represents the PW in the pwTable."
    ::= { pwIndexMappingEntry 5 }

-- End of the PW ID mapping table

-- The peer mapping table
```

pwPeerMappingTable OBJECT-TYPE

SYNTAX SEQUENCE OF PwPeerMappingEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table provides reverse mapping of the existing PW based on PW type and PW ID ordering. This table is typically useful for the element management system (EMS) ordered query of existing PWs."

::= { pwObjects 8 }

pwPeerMappingEntry OBJECT-TYPE

SYNTAX PwPeerMappingEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in this table is created by the agent for every PW entry in the pwTable."

Implementers need to be aware that if the value of the pwPeerMappingPeerAddr (an OID) has more than 113 sub-identifiers, then OIDs of column instances in this table will have more than 128 sub-identifiers and cannot be accessed using SNMPv1, SNMPv2c, or SNMPv3."

INDEX { pwPeerMappingPeerAddrType, pwPeerMappingPeerAddr, pwPeerMappingPwType, pwPeerMappingPwID }

::= { pwPeerMappingTable 1 }

PwPeerMappingEntry ::= SEQUENCE {

pwPeerMappingPeerAddrType	InetAddressType,
pwPeerMappingPeerAddr	InetAddress,
pwPeerMappingPwType	IANA-PwTypeTC,
pwPeerMappingPwID	PwIDType,
pwPeerMappingPwIndex	PwIndexType

}

pwPeerMappingPeerAddrType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"IP address type of the peer node."

::= { pwPeerMappingEntry 1 }

pwPeerMappingPeerAddr OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS not-accessible

```
STATUS          current
DESCRIPTION
    "IP address of the peer node."
 ::= { pwPeerMappingEntry 2 }

pwPeerMappingPwType OBJECT-TYPE
    SYNTAX      IANAPwTypeTC
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "The PW type (indicates the emulated service) of this PW."
    ::= { pwPeerMappingEntry 3 }

pwPeerMappingPwID OBJECT-TYPE
    SYNTAX      PwIDType
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "The PW ID of this PW.  Zero if the PW is configured
        manually."
    ::= { pwPeerMappingEntry 4 }

pwPeerMappingPwIndex OBJECT-TYPE
    SYNTAX      PwIndexType
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The value that represents the PW in the pwTable."
    ::= { pwPeerMappingEntry 5 }

-- End of the peer mapping table

-- End of the reverse mapping tables

pwUpDownNotifEnable OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS   read-write
    STATUS      current
    DESCRIPTION
        "If this object is set to true(1), then it enables
        the emission of pwUp and pwDown
        notifications; otherwise, these notifications are not
        emitted."
    REFERENCE
        "See also [RFC3413] for explanation that
        notifications are under the ultimate control of the
        MIB module in this document."
    DEFVAL { false }
```

```
::= { pwObjects 9 }
```

pwDeletedNotifEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"If this object is set to true(1), then it enables the emission of pwDeleted notification; otherwise, this notification is not emitted."

REFERENCE

"See also [\[RFC3413\]](#) for explanation that notifications are under the ultimate control of the MIB module in this document."

DEFVAL { false }

```
::= { pwObjects 10 }
```

pwNotifRate OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object defines the maximum number of PW notifications that can be emitted from the device per second."

```
::= { pwObjects 11 }
```

-- The Gen Fec PW ID mapping table

pwGenFecIndexMappingTable OBJECT-TYPE

SYNTAX SEQUENCE OF PwGenFecIndexMappingEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table enables the reverse mapping of the unique PwId parameters [GroupAttachmentID, LocalAttachmentID, and PeerAttachmentID] and the pwIndex. The table is only applicable for PW using the generalized FEC."

```
::= { pwObjects 12 }
```

pwGenFecIndexMappingEntry OBJECT-TYPE

SYNTAX PwGenFecIndexMappingEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in this table MUST be created by the agent for every PW created by the pwTable for which pwOwner equals genFecSignaling."

Implementers need to be aware that if the combined value of pwGenFecIndexMappingAGI, pwGenFecIndexMappingLocalAII, and pwGenFecIndexMappingRemoteAII (OIDs) has more than 113 sub-identifiers, then OIDs of column instances in this table will have more than 128 sub-identifiers and cannot be accessed using SNMPv1, SNMPv2c, or SNMPv3."

```
INDEX { pwGenFecIndexMappingAGIType,
        pwGenFecIndexMappingAGI,
        pwGenFecIndexMappingLocalAIIType,
        pwGenFecIndexMappingLocalAII,
        pwGenFecIndexMappingRemoteAIIType,
        pwGenFecIndexMappingRemoteAII
      }
 ::= { pwGenFecIndexMappingTable 1 }
```

```
PwGenFecIndexMappingEntry ::= SEQUENCE {
    pwGenFecIndexMappingAGIType      PwGenIdType,
    pwGenFecIndexMappingAGI          PwAttachmentIdentifierType,
    pwGenFecIndexMappingLocalAIIType PwGenIdType,
    pwGenFecIndexMappingLocalAII     PwAttachmentIdentifierType,
    pwGenFecIndexMappingRemoteAIIType PwGenIdType,
    pwGenFecIndexMappingRemoteAII    PwAttachmentIdentifierType,
    pwGenFecIndexMappingPwIndex      PwIndexType
  }
```

pwGenFecIndexMappingAGIType OBJECT-TYPE

```
SYNTAX      PwGenIdType
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "This object is the type of the attachment
    group identifier (AGI) that this PW belongs to."
 ::= { pwGenFecIndexMappingEntry 1 }
```

pwGenFecIndexMappingAGI OBJECT-TYPE

```
SYNTAX      PwAttachmentIdentifierType
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "This object is an octet string representing the attachment
    group identifier (AGI) that this PW belongs to,
    which typically identifies the VPN ID."
 ::= { pwGenFecIndexMappingEntry 2 }
```

pwGenFecIndexMappingLocalAIIType OBJECT-TYPE

```
SYNTAX      PwGenIdType
MAX-ACCESS  not-accessible
STATUS      current
```

DESCRIPTION

"This object is the type of the local forwarder attachment individual identifier (AII) to be used by this PW."

::= { pwGenFecIndexMappingEntry 3 }

pwGenFecIndexMappingLocalAII OBJECT-TYPE

SYNTAX PwAttachmentIdentifierType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object is an octet string representing the local forwarder attachment individual identifier (AII) to be used by this PW. It is used as the SAII for outgoing signaling messages and the TAIID in the incoming messages from the peer."

::= { pwGenFecIndexMappingEntry 4 }

pwGenFecIndexMappingRemoteAIIType OBJECT-TYPE

SYNTAX PwGenIdType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object is the type of the remote forwarder attachment individual identifier (AII) to be used by this PW."

::= { pwGenFecIndexMappingEntry 5 }

pwGenFecIndexMappingRemoteAII OBJECT-TYPE

SYNTAX PwAttachmentIdentifierType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object is an octet string representing the peer forwarder attachment individual identifier (AII) to be used by this PW. It is used as the TAIID for outgoing signaling messages and the SAII in the incoming messages from the peer."

::= { pwGenFecIndexMappingEntry 6 }

pwGenFecIndexMappingPwIndex OBJECT-TYPE

SYNTAX PwIndexType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value that represents the PW in the pwTable."

::= { pwGenFecIndexMappingEntry 7 }

-- End of the Gen Fec PW ID mapping table

-- Notifications - PW

pwDown NOTIFICATION-TYPE

OBJECTS { pwOperStatus, --start of range
 pwOperStatus --end of range
}

STATUS current

DESCRIPTION

"This notification is generated when the pwOperStatus object for one or more contiguous entries in the pwTable are about to enter the down(2) or lowerLayerDown(6) state from any other state, except for transition from the notPresent(5) state. For the purpose of deciding when these notifications occur, the lowerLayerDown(6) state and the down(2) state are considered to be equivalent; i.e., there is no notification on transition from lowerLayerDown(6) into down(2), and there is a trap on transition from any other state except down(2) (and notPresent) into lowerLayerDown(6).

The included values of pwOperStatus MUST each be equal to down(2) or lowerLayerDown(6). The two instances of pwOperStatus in this notification indicate the range of indexes that are affected. Note that all the indexes of the two ends of the range can be derived from the instance identifiers of these two objects. For cases where a contiguous range of cross-connects have transitioned into the down(2) and lowerLayerDown(6) states at roughly the same time, the device SHOULD issue a single notification for each range of contiguous indexes in an effort to minimize the emission of a large number of notifications. If a notification has to be issued for just a single cross-connect entry, then the instance identifier (and values) of the two pwOperStatus objects MUST be identical."

::= { pwNotifications 1 }

pwUp NOTIFICATION-TYPE

OBJECTS { pwOperStatus, --start of range
 pwOperStatus --end of range
}

STATUS current

DESCRIPTION

"This notification is generated when the pwOperStatus object for one or more contiguous entries in the pwTable are about to enter the up(1) state from some other state

except the notPresent(5) state and given that the pwDown notification been issued for these entries. The included values of pwOperStatus MUST both be set equal to this new state (i.e., up(1)). The two instances of pwOperStatus in this notification indicate the range of indexes that are affected. Note that all the indexes of the two ends of the range can be derived from the instance identifiers of these two objects. For cases where a contiguous range of cross-connects have transitioned into the up(1) state at roughly the same time, the device SHOULD issue a single notification for each range of contiguous indexes in an effort to minimize the emission of a large number of notifications. If a notification has to be issued for just a single cross-connect entry, then the instance identifier (and values) of the two pwOperStatus objects MUST be identical."

```
 ::= { pwNotifications 2 }
```

pwDeleted NOTIFICATION-TYPE

```
  OBJECTS { pwType,
             pwID,
             pwPeerAddrType,
             pwPeerAddr
           }
  STATUS   current
  DESCRIPTION
    "This notification is generated when the PW has been
    deleted, i.e., when the pwRowStatus has been set to
    destroy(6) or the PW has been deleted by a non-MIB
    application or due to an auto-discovery process.
    "
```

```
 ::= { pwNotifications 3 }
```

-- End of notifications.

-- Conformance information

```
pwGroups          OBJECT IDENTIFIER ::= { pwConformance 1 }
pwCompliances OBJECT IDENTIFIER ::= { pwConformance 2 }
```

-- Compliance requirement for fully compliant implementations

pwModuleFullCompliance MODULE-COMPLIANCE

```
  STATUS   current
  DESCRIPTION
    "The compliance statement for agents that provide full
    support for the PW MIB module. Such devices can
    then be monitored and configured using
```


this MIB module."

```
MODULE -- this module
    MANDATORY-GROUPS { pwBasicGroup,
                        pwPerformanceGeneralGroup
    }

GROUP pwNotificationGroup
DESCRIPTION "This group is only mandatory for implementations
            that can efficiently implement the notifications
            contained in this group.
            "

GROUP pwPwIdGroup
DESCRIPTION "This group is only mandatory for implementations
            that support the PW ID FEC.
            "

GROUP pwGeneralizedFecGroup
DESCRIPTION "This group is only mandatory for implementations
            that support the generalized PW FEC.
            "

GROUP pwFcsGroup
DESCRIPTION "This group is only mandatory for implementations
            that support FCS retention."

GROUP pwFragGroup
DESCRIPTION "This group is only mandatory for implementations
            that support PW fragmentation.
            "

GROUP pwPwStatusGroup
DESCRIPTION "This group is only mandatory for implementations
            that support PW status notification.
            "

GROUP pwGetNextGroup
DESCRIPTION "This group is only mandatory for implementations
            where the pwIndex may be any arbitrary value
            and the EMS would require retrieval of the next
            free index."

GROUP pwPriorityGroup
DESCRIPTION "This group is only mandatory for implementations
            that support the controlling the PW setup and
            holding priority."
```

GROUP pwAttachmentGroup
DESCRIPTION "This group is only mandatory for implementations that support attachment of two PWs (PW stitching)."

GROUP pwPerformance1DayIntervalGroup
DESCRIPTION "This group is only mandatory for implementations that support PW performance gathering in 1-day intervals."

GROUP pwPerformanceIntervalGeneralGroup
DESCRIPTION "This group is only mandatory for implementations that support PW performance gathering in 15-minute intervals."

GROUP pwPerformanceIntervalGroup
DESCRIPTION "This group is only mandatory for implementations that support PW performance gathering in 15-minute intervals."

GROUP pwHCPeformanceIntervalGroup
DESCRIPTION "This group is only mandatory for implementations where at least one of the interval performance counters wraps around too quickly based on the criteria specified in [RFC 2863](#) for high-capacity counters."

GROUP pwMappingTablesGroup
DESCRIPTION "This group is only mandatory for implementations that support reverse mapping of PW indexes to the pwIndex and the peer mapping table."

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

GROUP pwNotificationControlGroup
DESCRIPTION "This group is only mandatory for implementations that support the PW notifications."

OBJECT pwAdminStatus
SYNTAX INTEGER { up(1), down(2) }
DESCRIPTION "Support of the value testing(3) is not required."

OBJECT pwOperStatus
SYNTAX INTEGER { up(1), down(2), notPresent(5), lowerLayerDown(6) }
DESCRIPTION "Support of the values testing(3) and dormant(4)

is not required."

OBJECT pwRowStatus
 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. Support
 of notReady is not required for implementations
 that do not support signaling, or if it is
 guaranteed that the conceptual row has all the
 required information to create the PW when the
 row has been created by the agent or written by
 the operator."

OBJECT pwPeerAddrType
 SYNTAX InetAddressType { unknown(0), ipv4(1) }
 MIN-ACCESS read-only
 DESCRIPTION "Only unknown(0) and ipv4(1) are required.
 Implementations that support only IPv4 MAY support
 read-only access."

OBJECT pwPeerAddr
 SYNTAX InetAddress (SIZE(0|4))
 DESCRIPTION "An implementation is only required to support
 0, 4 address sizes."

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

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

::= { pwCompliances 1 }

-- Compliance requirement for read-only compliant implementations

pwModuleReadOnlyCompliance MODULE-COMPLIANCE
 STATUS current
 DESCRIPTION
 "The compliance statement for agents that provide read-
 only support for the PW MIB module. Such devices can
 then be monitored but cannot be configured using this
 MIB module."

```
MODULE -- this module
    MANDATORY-GROUPS { pwBasicGroup
    }

GROUP      pwNotificationGroup
DESCRIPTION "This group is only mandatory for implementations
            that can efficiently implement the notifications
            contained in this group."

GROUP      pwPwIdGroup
DESCRIPTION "This group is only mandatory for implementations
            that support the PW ID FEC.
            "

GROUP      pwGeneralizedFecGroup
DESCRIPTION "This group is only mandatory for implementations
            that support the generalized PW FEC.
            "

GROUP      pwFcsGroup
DESCRIPTION "This group is only mandatory for implementations
            that support FCS retention."

GROUP      pwFragGroup
DESCRIPTION "This group is only mandatory for implementations
            that support PW fragmentation.
            "

GROUP      pwPwStatusGroup
DESCRIPTION "This group is only mandatory for implementations
            that support PW status notification.
            "

GROUP      pwGetNextGroup
DESCRIPTION "This group is only mandatory for implementations
            where the pwIndex may be any arbitrary value
            and the EMS would require retrieval of the next
            free index."

GROUP      pwPriorityGroup
DESCRIPTION "This group is only mandatory for implementations
            that support the controlling the PW setup and
            holding priority."

GROUP      pwAttachmentGroup
DESCRIPTION "This group is only mandatory for implementations
            that support attachment of two PWs (PW stitching)."
```

GROUP pwPerformance1DayIntervalGroup
DESCRIPTION "This group is only mandatory for implementations that support PW performance gathering in 1-day intervals."

GROUP pwPerformanceIntervalGeneralGroup
DESCRIPTION "This group is only mandatory for implementations that support PW performance gathering in 15-minute intervals."

GROUP pwPerformanceIntervalGroup
DESCRIPTION "This group is only mandatory for implementations that support PW performance gathering in 15-minute intervals."

GROUP pwHCPeformanceIntervalGroup
DESCRIPTION "This group is only mandatory for implementations where at least one of the interval performance counters wraps around too quickly based on the criteria specified in [RFC 2863](#) for high-capacity counters."

GROUP pwMappingTablesGroup
DESCRIPTION "This group is only mandatory for implementations that support reverse mapping of PW indexes to the pwIndex and the peer mapping table."

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

GROUP pwNotificationControlGroup
DESCRIPTION "This group is only mandatory for implementations that support the PW notifications."

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

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

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

OBJECT pwSetUpPriority

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

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

OBJECT pwPeerAddrType
SYNTAX InetAddressType { unknown(0), ipv4(1) }
MIN-ACCESS read-only
DESCRIPTION "Write access is not required. Only unknown(0) and ipv4(1) are required."

OBJECT pwPeerAddr
SYNTAX InetAddress (SIZE(0|4))
MIN-ACCESS read-only
DESCRIPTION "Write access is not required. An implementation is only required to support 0, 4 address sizes."

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

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

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

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

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

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

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

OBJECT pwCwPreference

MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	pwLocalIfMtu
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	pwLocalIfString
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	pwLocalCapabAdvert
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	pwFragmentCfgSize
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	pwFcsRetentionCfg
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	pwOutboundLabel
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	pwInboundLabel
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	pwName
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	pwDescr
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	pwAdminStatus
SYNTAX	INTEGER { up(1), down(2) }
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required. The support of value testing(3) is not required."
OBJECT	pwOperStatus
SYNTAX	INTEGER { up(1), down(2), notPresent(5), lowerLayerDown(6) }

DESCRIPTION "The support of the values testing(3) and dormant(4)
is not required."

OBJECT pwRowStatus
SYNTAX RowStatus { active(1) }
MIN-ACCESS read-only
DESCRIPTION "Write access is not required."

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

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

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

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

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

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

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

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

::= { pwCompliances 2 }

-- Units of conformance.

pwBasicGroup OBJECT-GROUP
OBJECTS {
 pwType,
 pwOwner,


```
    pwPsnType,  
    pwIfIndex,  
    pwCwPreference,  
    pwLocalIfMtu,  
    pwOutboundLabel,  
    pwInboundLabel,  
    pwName,  
    pwDescr,  
    pwCreateTime,  
    pwUpTime,  
    pwLastChange,  
    pwAdminStatus,  
    pwOperStatus,  
    pwLocalStatus,  
    pwRowStatus,  
    pwStorageType,  
    pwOamEnable  
}
```

STATUS current

DESCRIPTION

"Collection of objects that are required in all
implementations that support the PW MIB module."

::= { pwGroups 1 }

pwPwIdGroup OBJECT-GROUP

```
OBJECTS {  
    pwID  
}
```

STATUS current

DESCRIPTION

"Collection of objects required for PW ID configuration
and signaling."

::= { pwGroups 2 }

pwGeneralizedFecGroup OBJECT-GROUP

```
OBJECTS {  
    pwGroupAttachmentID,  
    pwLocalAttachmentID,  
    pwRemoteAttachmentID,  
    pwGenAGIType,  
    pwGenLocalAIIType,  
    pwGenRemoteAIIType  
}
```

STATUS current

DESCRIPTION

"Collection of objects required for generalized FEC

```
        configuration and signaling."
 ::= { pwGroups 3 }

pwFcsGroup      OBJECT-GROUP
  OBJECTS {
    pwFcsRetentionCfg,
    pwFcsRetentionStatus
  }

  STATUS current
  DESCRIPTION
    "Collection of objects required for FCS retention
    configuration and signaling."
 ::= { pwGroups 4 }

pwFragGroup      OBJECT-GROUP
  OBJECTS {
    pwFragmentCfgSize,
    pwRmtFragCapability
  }

  STATUS current
  DESCRIPTION
    "Collection of objects required for fragmentation
    configuration and signaling."
 ::= { pwGroups 5 }

pwPwStatusGroup  OBJECT-GROUP
  OBJECTS {
    pwRemoteCapabilities,
    pwRemoteStatusCapable,
    pwRemoteStatus
  }

  STATUS current
  DESCRIPTION
    "Collection of objects required for PW status configuration
    and signaling."
 ::= { pwGroups 6 }

pwGetNextGroup  OBJECT-GROUP
  OBJECTS {
    pwIndexNext
  }

  STATUS current
  DESCRIPTION
    "Collection of objects for getting the next available
```

```
        index."
 ::= { pwGroups 7 }

pwPriorityGroup OBJECT-GROUP
  OBJECTS {
    pwSetUpPriority,
    pwHoldingPriority
  }

  STATUS current
  DESCRIPTION
    "Collection of objects for controlling the PW setup and
    holding priority."
 ::= { pwGroups 8 }

pwAttachmentGroup OBJECT-GROUP
  OBJECTS {
    pwAttachedPwIndex
  }

  STATUS current
  DESCRIPTION
    "Collection of objects for PW configuration as ifIndex."
 ::= { pwGroups 9 }

pwPerformanceGeneralGroup OBJECT-GROUP
  OBJECTS {
    pwPerfTotalErrorPackets
  }

  STATUS current
  DESCRIPTION
    "Collection of general objects needed for managing the
    total running performance parameters."
 ::= { pwGroups 10 }

pwPerformance1DayIntervalGroup OBJECT-GROUP
  OBJECTS {
    pwPerf1DayIntervalValidData,
    pwPerf1DayIntervalTimeElapsed,
    pwPerf1DayIntervalInHCPackets,
    pwPerf1DayIntervalInHCBytes,
    pwPerf1DayIntervalOutHCPackets,
    pwPerf1DayIntervalOutHCBytes
  }

  STATUS current
  DESCRIPTION
    "Collection of objects needed for a PW running 1-day
```

```
        interval performance collection."
 ::= { pwGroups 11 }

pwPerformanceIntervalGeneralGroup OBJECT-GROUP
    OBJECTS {
        pwTimeElapsed,
        pwValidIntervals,
        pwPerfIntervalValidData,
        pwPerfIntervalTimeElapsed
    }

    STATUS current
    DESCRIPTION
        "Collection of general objects needed for managing the
        interval performance parameters."
    ::= { pwGroups 12 }

pwPerformanceIntervalGroup OBJECT-GROUP
    OBJECTS {
        pwPerfCurrentInPackets,
        pwPerfCurrentInBytes,
        pwPerfCurrentOutPackets,
        pwPerfCurrentOutBytes,

        pwPerfIntervalInPackets,
        pwPerfIntervalInBytes,
        pwPerfIntervalOutPackets,
        pwPerfIntervalOutBytes
    }

    STATUS current
    DESCRIPTION
        "Collection of 32-bit objects needed for PW performance
        collection in 15-minute intervals."
    ::= { pwGroups 13 }

pwHCPeformanceIntervalGroup OBJECT-GROUP
    OBJECTS {
        pwPerfCurrentInHCPackets,
        pwPerfCurrentInHCBytes,
        pwPerfCurrentOutHCPackets,
        pwPerfCurrentOutHCBytes,

        pwPerfIntervalInHCPackets,
        pwPerfIntervalInHCBytes,
        pwPerfIntervalOutHCPackets,
        pwPerfIntervalOutHCBytes
    }
}
```

```
STATUS current
DESCRIPTION
    "Collection of HC objects needed for PW performance
    collection in 15-minute intervals."
 ::= { pwGroups 14 }

pwMappingTablesGroup OBJECT-GROUP
OBJECTS {
    pwIndexMappingPwIndex,
    pwPeerMappingPwIndex,
    pwGenFecIndexMappingPwIndex
}

STATUS current
DESCRIPTION
    "Collection of objects contained in the reverse
    mapping tables."
 ::= { pwGroups 15 }

pwNotificationControlGroup OBJECT-GROUP
OBJECTS {
    pwUpDownNotifEnable,
    pwDeletedNotifEnable,
    pwNotifRate
}

STATUS current
DESCRIPTION
    "Collection of objects for controlling the PW
    notifications."
 ::= { pwGroups 16 }

pwNotificationGroup NOTIFICATION-GROUP
NOTIFICATIONS {
    pwUp,
    pwDown,
    pwDeleted
}

STATUS current
DESCRIPTION
    "Collection of PW notifications objects."
 ::= { pwGroups 17 }

pwSignalingGroup OBJECT-GROUP
OBJECTS {
    pwPeerAddrType,
    pwPeerAddr,
```

```
        pwLocalGroupID,  
        pwLocalIfString,  
        pwLocalCapabAdvert,  
        pwRemoteGroupID,  
        pwCwStatus,  
        pwRemoteIfMtu,  
        pwRemoteIfString  
    }  
  
    STATUS    current  
    DESCRIPTION  
        "Collection of objects for use in implementations that  
        support the PW signaling."  
    ::= { pwGroups 18 }  
  
END
```

13. Security Considerations

It is clear that this MIB module is potentially useful for monitoring PW-capable PEs. This MIB module 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:

- o the pwTable contains objects to configure PW parameters on a Provider Edge (PE) device. Unauthorized access to objects in this table could result in disruption of traffic on the network. The objects pwUpDownNotifEnable and pwNotifRate control the reports from the network element to the EMS. Unauthorized access to these objects could result in disruption of configuration and status change reporting, resulting mis-view of the network conditions. 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 that 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:

- o the pwTable, pwPerfCurrentTable, pwPerfIntervalTable, pwPerf1DayIntervalTable, pwIndexMappingTable, pwPeerMappingTable, and pwGenFecIndexMappingTable collectively show the pseudowire 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.

14. IANA Considerations

14.1. ifType for PW

IANA has assigned a value (246) for PW in the IANAifType-MIB called ifPwType.

14.2. PW MIB Modules OBJECT IDENTIFIER Values

A PW may appear as ifIndex in the ifTable, and therefore the pwStdMIB OBJECT IDENTIFIER has been assigned under the 'transmission' subtree, as the common practice in assigning OBJECT IDENTIFIERS for MIB modules representing entities in the ifTable.

All other MIB modules related to PW management SHOULD be assigned under the 'mib-2' subtree; individual requests will appear in the MIB module memo's IANA Considerations section.

14.3. IANA Considerations for PW-STD-MIB

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

Descriptor -----	OBJECT IDENTIFIER value -----
pwStdMIB	{ transmission 246 }

14.4. IANA Considerations for IANA-PWE3-MIB

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

Descriptor -----	OBJECT IDENTIFIER value -----
ianaPwe3MIB	{ mib-2 174 }

15. Acknowledgments

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Sharon Mantin - Corrigent Systems

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