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Pseudo Wire (PW) Management Information Base

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1 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 of Pseudo Wire (PW) services on a general Packet Switched Net (PSN).

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2 Introduction

This document describes a model for managing pseudo wire services for transmission over a packet Switched Network (PSN). This MIB module is generic and common to all types of PSN.

This document is closely related to [[FRMWK](#)], describing the transport and encapsulation of L1 and L2 services over any type of PSN and MPLS respectively, creating a Pseudo Wire (PW) service. This document describes the MIB objects that define the generic pseudo wire association to the PSN and pseudo wire configurations that are not specific to the carried service. A PW type field will be used to point to the relevant service MIB tables, described in other documents. Such document is available currently for CEP services [[CEPMIB](#)]. A similar PSN type field will point to PSN specific modules, for example [[PwMPLSMIB](#)].

Conventions used in this document

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](#)].

3 Terminology

This document uses terminology from the document describing the PW framework [[FRMWK](#)].

"Adaptation" refers to the method of adapting a "foreign" communications protocol such that it can be carried by a packet switched net (the PSN). For example, in a CEP service the foreign protocol is SONET/SDH and the PSN is MPLS.

"PSN Tunnel" is a general term indicating a virtual connection between the two PW edge devices. In practice, it is not limited to path oriented types of PSNs like MPLS; an example is IP PSN. Since a PW service is bi-directional, a PW service requires two uni-directional tunnels from a uni-directional oriented PSN (MPLS for example).

4 The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- o An overall architecture, described in [RFC 2571](#) [[RFC2571](#)].
- o Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIV1 and described in STD 16, [RFC 1155](#) [[RFC1155](#)], STD 16, [RFC 1212](#) [[RFC1212](#)] and [RFC 1215](#) [[RFC1215](#)]. The second version, called SMIV2, is described in STD 58, [RFC 2578](#) [[RFC2578](#)], STD 58, [RFC 2579](#) [[RFC2579](#)] and STD 58, [RFC 2580](#) [[RFC2580](#)].
- o Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, [RFC 1157](#) [[RFC1157](#)]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in [RFC 1901](#) [[RFC1901](#)] and [RFC 1906](#) [[RFC1906](#)]. The third version of the message protocol is called SNMPv3 and described in [RFC 1906](#) [[RFC1906](#)], [RFC 2572](#) [[RFC2572](#)] and [RFC 2574](#) [[RFC2574](#)].
- o Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, [RFC 1157](#) [[RFC1157](#)]. A second set of protocol operations and associated PDU formats is described in [RFC 1905](#) [[RFC1905](#)].
- o A set of fundamental applications described in [RFC 2573](#) [[RFC2573](#)] and the view-based access control mechanism described in [RFC 2575](#)

[\[RFC2575\]](#) .

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A more detailed introduction to the current SNMP Management Framework can be found in [RFC 2570](#) [[RFC2570](#)].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIV2. A MIB conforming to the SMIV1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIV2 will be converted into textual descriptions in SMIV1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

4.1 Object Definitions

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the subset of Abstract Syntax Notation One (ASN.1) defined in the SMI. In particular, an OBJECT IDENTIFIER, an administratively assigned name, names each object type. The object type together with an object instance serves to uniquely identify a specific instantiation of the object. For human convenience, we often use a textual string, termed the descriptor, to also refer to the object type.

5 Feature Checklist

The PW MIB (PW-MIB) is designed to satisfy the following requirements and constraints:

- The MIB is designed to be extensible to all types of PSNs. PSNs specific MIBs will be defined in additional documents.
- The MIB supports manually configured VCs.
- The MIB supports the VC ID and Group ID.
- The MIB supports point-to-point PW connections. Point-to-multipoint connections are for future study.
- The MIB enables the use of any emulated service. Emulated service specific MIBs will be defined in additional documents.
- The MIB enables both strict and loose incoming VC lookup. In strict mode, only VC carried inside explicitly configured or signaled tunnels are accepted in path oriented PSNs. In no path

oriented PSNs, the source address of the received packet must be checked in strict mode.

6 PW-MIB usage

The MIB structure for defining a PW service is composed from three types of modules.

The first type is the PW-MIB module, which configures general parameters of the VC that are common to all types of emulated services and PSNs.

The second type of modules is per PSN module. There is a different module for each type of PSN. These modules associate the VC with one or more "tunnels" that carry the service over the PSN. These modules are defined in other documents; see for example [\[PWPPLSMIB\]](#).

The third type of modules is service-specific module, which is emulated signal type dependent. These modules are defined in other documents; see for example [\[CEPMIB\]](#).

[PWTC] defines some of the object types used in these modules.

6.1 PW-MIB usage

- The VC table (pwVcTable) is used for all VC types (ATM, FR, Ethernet, SONET, etc.). This table contains high level generic parameters related to the VC creation. A row is created by the operator for each PW service.
- Based on the PSN type defined for the VC, rows are created in PSN specific module(for example [\[PWPPLSMIB\]](#)) and associated to the VC table by the common VC index.
- Based on the VC type defined for the VC, rows are created in service-specific module (for example [\[CEPMIB\]](#)) and associated to the VC table by the common VC index.
- The MIB includes performance parameters collection common to all types of PW.

6.2 Relations to the ifTable

The PW VC itself is not an ifIndex as it's own, however in many cases the VC is associated via the MIB tables to an ifIndex the VC is emulating. This ifIndex may represent a physical entity - for example a PW emulating a SONET path as in CEP. The VC itself is not an ifIndex, however the MIB associate the VC to the ifIndex of the path to be emulated. In some cases, the VC will be associated to an ifIndex representing a virtual interface. An examples is VPLS

service where the PW emulates a logical interface of a (logical) bridge. The physical ports association to the VPLS service instance is defined in non-PW MIBs in this case.

pwVcInboundVcLabel 0xFFFF, -- Will be set by signaling

pwVcName "Example of CEP VC",

```
pwVcDescr          "",
..
pwVcAdminStatus    up,
..
..
}
```

The agent now create a row in pwVcMplsTable [PVMPLS] based on the VcIndex, that is configured with MPLS specific values:

In pwVcMplsTable:

```
{
    pwVcMplsMplsType      mplsTe,
    pwVcMplsExpBitsMode   outerTunnel,
    pwVcMplsExpBits       0,
    pwVcMplsTtl           2,
    ...
}
```

The operator now associates the VC with an outgoing TE tunnel:

In pwVcMplsOutboundTable:

```
{
    pwVcMplsOutboundIndex          0, -- The first row
                                   -- for this VcIndex
    pwVcMplsOutBoundLsrXcIndex     0, -- MPLS-TE
    pwVcMplsOutboundTunnelIndex    500,
    pwVcMplsOutboundTunnelInstance 0,
    pwVcMplsOutboundTunnelLc1LSR   1.2.3.4, -- Always
                                   -- the LSR ID of the current node.
    pwVcMplsOutboundTunnelPeerLSR  1.4.3.2
    pwVcMplsOutboundIfIndex        0, -- MPLS-TE
    ..
}
```

pwVcMplsInboundTable is not used because loose LDP set-up is used.

pwVcMplsMappingTable entry will be created by the agent once the LDP control session will be finished and will enable easy lookup for the VcIndex from knowledge of VC label or tunnel.

7 Object definitions

```
PW-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE,  
    experimental, Integer32, Counter32, Unsigned32,  
    Counter64, TimeTicks  
    FROM SNMPv2-SMI
```

```
    MODULE-COMPLIANCE, OBJECT-GROUP  
    FROM SNMPv2-CONF
```

```
    TruthValue, RowStatus, StorageType,  
    TimeStamp  
    FROM SNMPv2-TC
```

```
    SnmpAdminString  
    FROM SNMP-FRAMEWORK-MIB
```

```
    PwVcIndexType, PwGroupID, PwVcIDType, PwOperStatus  
    FROM PW-TC-MIB
```

```
    InetAddressType, InetAddress  
    FROM INET-ADDRESS-MIB
```

```
;
```

```
pwVcMIB MODULE-IDENTITY
```

```
    LAST-UPDATED "200201301200Z" -- 30 January 2002 12:00:00 EST  
    ORGANIZATION "Pseudo Wire Edge to Edge Emulation (PWE3) Working  
    Group"
```

```
    CONTACT-INFO
```

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The PWE3 Working Group (email distribution pwe3@ietf.org)
"

DESCRIPTION

"This MIB contains managed object definitions for Pseudo Wire operation as in: Pate, P., et al, <[draft-ietf-pwe3-framework](#)>, Xiao, X., et al, <[draft-ietf-pwe3-requirements](#)>, Martini, L., et al, <[draft-martini-l2circuit-trans-mpls](#)>, and Martini, L., et al, <[draft-martini-l2circuit-encap-mpls](#)>.

The indexes for this MIB are also used to index the PSN-specific tables and the VC-specific tables. The VC Type dictates which VC-specific MIB to use. For example, a 'cep' VC Type requires the use the configuration and status tables within the CEP-MIB.

This MIB enable the use of any underlying packet switched network (PSN). Specific tables for the MPLS PSN is currently defined in a separate PW-MPLS-MIB. Tables to support other PSNs (IP, L2TP for example) will be added to this MIB in future revisions."

-- Revision history.

REVISION

"200201301200Z" -- 30 January 2002 12:00:00 EST

DESCRIPTION

" Changes from -01 draft:

- 1) Inbound and outbound clarification and name changes.

- 2) Removing pwVcPeerIpv4Addr and pwVcPeerIpv6Addr, replacing them with pwVcPeerAddr and adding type for address type selection.
- 3) Adding type for VC OperStatus.

4) Adding pwVcTimeElapsed and pwVcValidIntervals.

```
"  
REVISION  
  "200111071200Z" -- 7 November 2001 12:00:00 EST  
DESCRIPTION  
  "Changes from -00 draft:  
  1) Remove VcInstance from tables indexes in order to simplify  
    the MIB.  
  2) Removing APS 1+1 table.  
  3) Changing hdlcCisco to hdlc in pwVcType.  
  4) Add description of VC label at pending PW signaling stage.  
  5) Add interval valid object in interval performance tables.  
  6) Remove VC APS notification.  
  7) Change 'conservative'/'liberal' to 'strict'/'loose'.  
  8) Add objects for interface MTU, use of control word,  
    interface string.  
  9) Ordering of objects based on functionality.  
  10) Update operation of pwVcOperStatus.  
"
```

```
REVISION  
  "200107111200Z" -- 11 July 2001 12:00:00 EST  
DESCRIPTION  
  "draft-00 version"
```

```
::= { experimental xxx } -- To be assigned by IANA
```

```
-- Top-level components of this MIB.
```

```
-- Notifications
```

```
-- Tables, Scalars
```

```
pwVcObjects      OBJECT IDENTIFIER  
                  ::= { pwVcMIB 1 }
```

```
-- Conformance
```

```
pwVcConformance OBJECT IDENTIFIER  
                  ::= { pwVcMIB 2 }
```

```
-- PW Virtual Connection (VC) Table
```

```
pwVcIndexNext OBJECT-TYPE
```

```
  SYNTAX          Unsigned32
```

```
  MAX-ACCESS      read-only
```

```
  STATUS          current
```

```
  DESCRIPTION
```

```
    "This object contains an appropriate value to be used
```

for pwVcIndex when creating entries in the
pwVcTable. The value 0 indicates that no
unassigned entries are available. To obtain the

value of pwVcIndex for a new entry in the pwVcTable, the manager issues a management protocol retrieval operation to obtain the current value of pwVcIndex. 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."

::= { pwVcObjects 1 }

pwVcTable OBJECT-TYPE

SYNTAX SEQUENCE OF PwVcEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table specifies information for connecting various emulated services to various tunnel type."

::= { pwVcObjects 2 }

pwVcEntry OBJECT-TYPE

SYNTAX PwVcEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A row in this table represents an emulated virtual connection (VC) across a packet network. It is indexed by pwVcIndex, which Uniquely identifying a singular connection.

"

INDEX { pwVcIndex }

::= { pwVcTable 1 }

PwVcEntry ::= SEQUENCE {

pwVcIndex	PwVcIndexType,
pwVcType	INTEGER,
pwVcOwner	INTEGER,
pwVcPsnType	INTEGER,
pwVcPriority	Unsigned32,
pwVcInboundMode	INTEGER,
pwVcPeerAddrType	InetAddressType,
pwVcPeerAddr	InetAddress,
pwVcID	PwVcIDType,
pwVcLocalGroupID	PwGroupID,
pwVcControlWord	TruthValue,

pwVcLocalIfMtu	Unsigned32,
pwVcLocalIfString	TruthValue,
pwVcRemoteGroupID	PwGroupID,
pwVcRemoteControlWord	INTEGER,

```
pwVcRemoteIfMtu      Unsigned32,  
pwVcRemoteIfString  SnmpAdminString,  
pwVcOutboundVcLabel Unsigned32,  
pwVcInboundVcLabel  Unsigned32,  
pwVcName             SnmpAdminString,  
pwVcDescr            SnmpAdminString,  
pwVcCreateTime       Timestamp,  
pwVcUpTime           TimeTicks,  
pwVcAdminStatus      INTEGER,  
pwVcOperStatus       PwOperStatus,  
pwVcInboundOperStatus PwOperStatus,  
pwVcOutboundOperStatus PwOperStatus,  
pwVcTimeElapsed      Integer32,  
pwVcValidIntervals   Integer32,  
pwVcRowStatus         RowStatus,  
pwVcStorageType       StorageType  
}
```

pwVcIndex OBJECT-TYPE

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

DESCRIPTION

"Index for the conceptual row identifying a VC within
this PW Emulation VC table."

```
::= { pwVcEntry 1 }
```

pwVcType OBJECT-TYPE

```
SYNTAX      INTEGER {  
    other(0),  
    frameRelay(1),  
    atmAal5Vcc(2),  
    atmTransparent(3),  
    ethernetVLAN(4),  
    ethernet(5),  
    hdlc(6),  
    ppp(7),  
    cep(8),  
    atmVccCell(9),  
    atmVpcCell(10),  
    ethernetVPLS (11)  
}
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

DESCRIPTION

"This value dictates what service-specific tables are
indexed by pwVcIndex. For example, if set for 'cep'

pwVcIndex indexes the pwVcCepTable in [[CEPMIB](#)].

"

REFERENCE

"Martini, et al, <[draft-martini-l2circuit-trans-mpls](#)>.

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Note: as specified in l2circuit-trans: It is REQUIRED to assign the same VC ID, and VC type for a given circuit in both directions."

::= { pwVcEntry 2 }

pwVcOwner OBJECT-TYPE

SYNTAX INTEGER {
 manual (1),
 maintenanceProtocol (2), -- PW signaling
 other (3)
}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Set by the operator to indicate the protocol responsible for establishing this VC. Value 'manual' is used in all cases where no maintenance protocol (PW signaling) is used to set-up the VC, i.e. require configuration of entries in the VC tables including VC labels, etc. The value 'maintenanceProtocol' is used in case of standard signaling of the VC for the specific PSN, for example LDP for MPLS PSN as specified in <draft- [draft-martini-l2circuit-trans-mpls](#)> or L2TP control protocol.

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

::= { pwVcEntry 3 }

pwVcPsnType OBJECT-TYPE

SYNTAX INTEGER {
 mpls (1),
 l2tp (2),
 ip (3),
 mplsOverIp (4), -- May be combined with 'mpls' in the future
 gre (5),
 other (6)
}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Set by the operator to indicate the PSN type on which this VC will be carried. Based on this object, the relevant PSN table entries are created in the in the PSN specific MIB modules. For example, if mpls(1) is defined, the agent create an entry in pwVcMplsTable, which further define the MPLS PSN configuration."

::= { pwVcEntry 4 }

pwVcPriority	OBJECT-TYPE
SYNTAX	Unsigned32
MAX-ACCESS	read-create
STATUS	current

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DESCRIPTION

"This object define the relative priority of the VC in a lowest-to-highest fashion, where 0 is the lowest priority. VCs with the same priority are treated with equal priority. Dropped VC will be set 'dormant' (as indicated in pwVcOperStatus)."

::= { pwVcEntry 5 }

pwVcInboundMode OBJECT-TYPE

SYNTAX INTEGER {
loose (1),
strict (2)
}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object is used to enable greater security for implementation that use global VC label space. In strict mode, inbound packets (coming from the PSN) are accepted only from tunnels that are associated to the same VC via the inbound tunnel table in the case of MPLS, or as identified by the source IP address in case of L2TP or IP PSN. The entries in the inbound tunnel table are either explicitly configured or implicitly known by the maintenance protocol used for VC set-up.

If such association is not known, not configured or not desired, loose mode should be configured, and the node should accept the packet based on the VC label only regardless of the outer tunnel used to carry the VC."

::= { pwVcEntry 6 }

pwVcPeerAddrType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Denotes the address type of the peer node maintenance protocol (signaling) address if PW maintenance protocol is used for the VC creation. It should be set to 'unknown' if PE/PW maintenance protocol is not used, i.e. pwVcOwner is set to 'manual'. "

DEFVAL { ipv4 }

::= { pwVcEntry 7 }

pwVcPeerAddr OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object conatin the value of of the peer node address

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of the PW/PE maintenance protocol entity. This object should contain a value of 0 if not relevant (manual configuration of the VC)."

::= { pwVcEntry 8 }

pwVcID OBJECT-TYPE

SYNTAX PwVcIDType
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"Used in the outgoing VC ID field within the 'Virtual Circuit FEC Element' when LDP signaling is used or PW ID AVP for L2TP."

REFERENCE

"Martini, et al, <[draft-martini-l2circuit-trans-mpls](#)>. and So, et al, <[draft-so-pwe3-ethernet](#)>."

Note: as specified in l2circuit-trans: It is REQUIRED to assign the same VC ID, and VC type for a given circuit in both directions."

::= { pwVcEntry 9 }

pwVcLocalGroupID OBJECT-TYPE

SYNTAX PwGroupID
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"Used in the Group ID field sent to the peer PWES within the maintenance protocol used for VC setup, zero if not used."

REFERENCE

"Martini, et al, <[draft-martini-l2circuit-trans-mpls](#)> and So, et al, <[draft-so-pwe3-ethernet.txt](#)>."

::= { pwVcEntry 10 }

pwVcControlWord OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"Define if the control word will be sent with each packet by the local node."

REFERENCE

"Martini, et al, <[draft-martini-l2circuit-trans-mpls](#)>"

DEFVAL

{ false }

::= { pwVcEntry 11 }

pwVcLocalIfMtu OBJECT-TYPE
SYNTAX Unsigned32 (0..65535)
MAX-ACCESS read-create
STATUS current

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DESCRIPTION

"If not equal zero, the optional IfMtu object in the maintenance protocol will be sent with this value, representing the locally supported MTU size over the interface (or the virtual interface) associated with the VC."

REFERENCE

"Martini, et al, <[draft-martini-l2circuit-trans-mpls](#)> and So, et al, <[draft-so-pwe3-ethernet](#)>."

DEFVAL

{ 0 }
::= { pwVcEntry 12 }

pwVcLocalIfString OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"Each VC is 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 as appears on the ifTable in the name object as part of the maintenance protocol. If set to false, the optional element will not be sent."

REFERENCE

"Martini, et al, <[draft-martini-l2circuit-trans-mpls](#)> and So, et al, <[draft-so-pwe3-ethernet.txt](#)>."

DEFVAL

{ false }
::= { pwVcEntry 13 }

pwVcRemoteGroupID OBJECT-TYPE

SYNTAX PwGroupID
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"Obtained from the Group ID field as received via the maintenance protocol used for VC setup, zero if not used. Value of 0xFFFF shall be used if the object is yet to be defined by the VC maintenance protocol."

REFERENCE

"Martini, et al, <[draft-martini-l2circuit-trans-mpls](#)> and So, et al, <[draft-so-pwe3-ethernet.txt](#)>."

::= { pwVcEntry 14 }

pwVcRemoteControlWord OBJECT-TYPE

SYNTAX INTEGER {
noControlWord (1),
withControlWord (2),

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```
        notYetKnown(3)
    }
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION
    "If maintenance protocol is used for VC establishment, this
    parameter indicates the received status of the control word
    usage, i.e. if packets will be received with control word
    or not. The value of 'notYetKnown' is used while the
    maintenance protocol has not yet received the indication
    from the remote node.
    In manual configuration of the VC this parameters indicate
    to the local node what is the expected encapsulation for
    the received packets.
    "
```

REFERENCE

```
    "Martini, et al, <draft-martini-l2circuit-trans-mps>
    and So, et al, <draft-so-pwe3-ethernet.txt>."
 ::= { pwVcEntry 15 }
```

pwVcRemoteIfMtu 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. Should be zero if
    this parameter is not available or not used."
```

REFERENCE

```
    "Martini, et al, <draft-martini-l2circuit-trans-mps>
    and So, et al, <draft-so-pwe3-ethernet.txt>."
 ::= { pwVcEntry 16 }
```

pwVcRemoteIfString OBJECT-TYPE

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

DESCRIPTION

```
    "Indicate the interface description string as received by
    the maintenance protocol, MUST be NULL string if not
    applicable or not known yet."
```

REFERENCE

```
    "Martini, et al, <draft-martini-l2circuit-trans-mps>
    and So, et al, <draft-so-pwe3-ethernet>."
 ::= { pwVcEntry 17 }
```

pwVcOutboundVcLabel OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-create

STATUS current

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DESCRIPTION

"The VC label used in the outbound direction (i.e. toward the PSN. It may be set up manually if owner is 'manual' or automatically otherwise. Examples: For MPLS PSN, it represents the 20 bits of VC tag, for L2TP it represent the 32 bits Session ID.

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

REFERENCE

"Martini, et al, <[draft-martini-l2circuit-trans-mpls](#)>"
 ::= { pwVcEntry 18 }

pwVcInboundVcLabel OBJECT-TYPE

SYNTAX Unsigned32
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"The VC label used in the inbound direction (i.e. packets recieved from the PSN. It may be set up manually if owner is 'manual' or automatically otherwise.

Examples: For MPLS PSN, it represents the 20 bits of VC tag, for L2TP it represent the 16 bits Session ID.

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

REFERENCE

"Martini, et al, <[draft-martini-l2circuit-trans-mpls](#)>"
 ::= { pwVcEntry 19 }

pwVcName OBJECT-TYPE

SYNTAX SnmpAdminString
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"The canonical name assigned to the VC."

::= { pwVcEntry 20 }

pwVcDescr OBJECT-TYPE

SYNTAX SnmpAdminString
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"A textual string containing information about the VC. If there is no description this object contains a zero length string."

::= { pwVcEntry 21 }

pwVcCreateTime OBJECT-TYPE

SYNTAX	TimeStamp
MAX-ACCESS	read-only
STATUS	current
DESCRIPTION	

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"System time when this VC was created."
 ::= { pwVcEntry 22 }

pwVcUpTime OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Number of consecutive ticks this VC has been 'up' in both directions together (i.e. 'up' is observed in pwVcOperStatus.)"

::= { pwVcEntry 23 }

pwVcAdminStatus OBJECT-TYPE

SYNTAX INTEGER {

up(1), -- ready to pass packets

down(2),

testing(3) -- in some test mode

}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The desired operational status of this VC."

::= { pwVcEntry 24 }

pwVcOperStatus OBJECT-TYPE

SYNTAX PwOperStatus

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Indicates the actual combined operational status of this VC. It is 'up' if both pwVcInboundOperStatus and pwVcOutboundOperStatus are in 'up' state. For all other values, if the VCs in both directions are of the same value it reflects that value, otherwise it is set to the most severe status out of the two statuses. The order of severance from most severe to less severe is: unknown, notPresent, down, lowerLayerDown, dormant, testing, up. The operator may consult the per direction OperStatus for fault isolation per direction."

::= { pwVcEntry 25 }

pwVcInboundOperStatus OBJECT-TYPE

SYNTAX PwOperStatus

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Indicates the actual operational status of this VC in the inbound direction.

- down: if PW signaling has not yet finished, or

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```
indications available at the service
level indicate that the VC is not
passing packets.
- testing:      if AdminStatus at the VC level is set to
                 test.
- dormant:      The VC is not available because of the
                 required resources are occupied VC with
                 higher priority VCs .
- notPresent:   Some component is missing to accomplish
                 the set up of the VC.
- lowerLayerDown: The underlying PSN is not in OperStatus
                 'up'.
"
 ::= { pwVcEntry 26 }
```

pwVcOutboundOperStatus OBJECT-TYPE

SYNTAX PwOperStatus

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Indicates the actual operational status of this VC in the
outbound direction

- down: if PW signaling has not yet finished, or
indications available at the service
level indicate that the VC is not
passing packets.
- testing: if AdminStatus at the VC level is set to
test.
- dormant: The VC is not available because of the
required resources are occupied VC with
higher priority VCs .
- notPresent: Some component is missing to accomplish
the set up of the VC.
- lowerLayerDown: The underlying PSN is not in OperStatus
'up'.

```
"
 ::= { pwVcEntry 27 }
```

pwVcTimeElapsed OBJECT-TYPE

SYNTAX Integer32 (1..900)

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."
::= { pwVcEntry 28 }
```


pwVcValidIntervals OBJECT-TYPE

SYNTAX Integer32 (0..96)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of previous 15-minute intervals
for which data was collected.

An agent with PW 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.

The value will be <n> unless the measurement was
(re-)started within the last (<n>*15) minutes, in which
case the value will be the number of complete 15
minute intervals for which the agent has at least
some data. In certain cases (e.g., in the case
where the agent is a proxy) it is possible that some
intervals are unavailable. In this case, this
interval is the maximum interval number for
which data is available. "

::= { pwVcEntry 29 }

pwVcRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"For creating, modifying, and deleting this row."

::= { pwVcEntry 30 }

pwVcStorageType OBJECT-TYPE

SYNTAX StorageType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This variable indicates the storage type for this
object."

::= { pwVcEntry 31 }

-- End of PW Virtual Connection (VC) Table

-- Vc Performance Table.

pwVcPerfCurrentTable OBJECT-TYPE

SYNTAX SEQUENCE OF PwVcPerfCurrentEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table provides per-VC performance information."
::= { pwVcObjects 3 }

pwVcPerfCurrentEntry OBJECT-TYPE

SYNTAX PwVcPerfCurrentEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

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

INDEX { pwVcIndex }

::= { pwVcPerfCurrentTable 1 }

PwVcPerfCurrentEntry ::= SEQUENCE {

pwVcPerfCurrentInPackets	Counter32,
pwVcPerfCurrentInHCPackets	Counter64,
pwVcPerfCurrentInBytes	Counter32,
pwVcPerfCurrentInHCBytes	Counter64,
pwVcPerfCurrentOutPackets	Counter32,
pwVcPerfCurrentOutHCPackets	Counter64,
pwVcPerfCurrentOutBytes	Counter32,
pwVcPerfCurrentOutHCBytes	Counter64

}

pwVcPerfCurrentInPackets OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Number of packets received by the VC in the current 15 minute interval"

::= { pwVcPerfCurrentEntry 1 }

pwVcPerfCurrentInHCPackets OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"High capacity counter for number of packets received by the VC in the current 15 minute interval."

::= { pwVcPerfCurrentEntry 2 }

pwVcPerfCurrentInBytes OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Number of bytes received by the VC in the current 15 minute interval."

::= { pwVcPerfCurrentEntry 3 }

pwVcPerfCurrentInHCBytes OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

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STATUS current
DESCRIPTION
"High capacity counter for number of bytes received
by the VC in the current 15 minute interval."
::= { pwVcPerfCurrentEntry 4 }

pwVcPerfCurrentOutPackets OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of packets forwarded by the VC. in the current 15
minute interval"
::= { pwVcPerfCurrentEntry 5 }

pwVcPerfCurrentOutHCPackets OBJECT-TYPE

SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"High capacity counter for number of packets forwarded
by the VC in the current 15 minute interval."
::= { pwVcPerfCurrentEntry 6 }

pwVcPerfCurrentOutBytes OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of bytes forwarded by the VC in the current 15
minute interval."
::= { pwVcPerfCurrentEntry 7 }

pwVcPerfCurrentOutHCBytes OBJECT-TYPE

SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"High capacity counter for number of bytes forwarded
by the VC in the current 15 minute interval."
::= { pwVcPerfCurrentEntry 8 }

-- End of Vc Perf current Table

-- Vc Performance Interval Table.

pwVcPerfIntervalTable OBJECT-TYPE

SYNTAX	SEQUENCE OF PwVcPerfIntervalEntry
MAX-ACCESS	not-accessible
STATUS	current
DESCRIPTION	

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[page 23]

"This table provides per-VC performance information."
 ::= { pwVcObjects 4 }

pwVcPerfIntervalEntry OBJECT-TYPE

SYNTAX PwVcPerfIntervalEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in this table is created by the LSR for every VC. "

INDEX { pwVcIndex, pwVcPerfIntervalNumber }

::= { pwVcPerfIntervalTable 1 }

PwVcPerfIntervalEntry ::= SEQUENCE {

pwVcPerfIntervalNumber Integer32,
pwVcPerfIntervalValidData TruthValue,

pwVcPerfIntervalInPackets Counter32,
pwVcPerfIntervalInHCPackets Counter64,
pwVcPerfIntervalInBytes Counter32,
pwVcPerfIntervalInHCBytes Counter64,
pwVcPerfIntervalOutPackets Counter32,
pwVcPerfIntervalOutHCPackets Counter64,
pwVcPerfIntervalOutBytes Counter32,
pwVcPerfIntervalOutHCBytes Counter64

}

pwVcPerfIntervalNumber 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](#)"

::= { pwVcPerfIntervalEntry 1 }

pwVcPerfIntervalValidData OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This variable indicates if the data for this interval
is valid."

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::= { pwVcPerfIntervalEntry 2 }

pwVcPerfIntervalInPackets OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Number of packets received by the VC in a particular 15-minute interval in the past 24 hours."

::= { pwVcPerfIntervalEntry 3 }

pwVcPerfIntervalInHCPackets OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"High capacity counter for number of packets received by the VC in a particular 15-minute interval in the past 24 hours."

::= { pwVcPerfIntervalEntry 4 }

pwVcPerfIntervalInBytes OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Number of bytes received by the VC in a particular 15-minute interval in the past 24 hours."

::= { pwVcPerfIntervalEntry 5 }

pwVcPerfIntervalInHCBytes OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"High capacity counter for number of bytes received by the VC in a particular 15-minute interval in the past 24 hours."

::= { pwVcPerfIntervalEntry 6 }

pwVcPerfIntervalOutPackets OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Number of packets forwarded by the VC in a particular 15-

```
minute interval in the past 24 hours."  
 ::= { pwVcPerfIntervalEntry 7 }
```

pwVcPerfIntervalOutHCPackets OBJECT-TYPE

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SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"High capacity counter for number of packets forwarded by
the VC in a particular 15-minute interval in the past 24
hours."
 ::= { pwVcPerfIntervalEntry 8 }

pwVcPerfIntervalOutBytes OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Number of bytes forwarded by the VC in a particular 15-
minute interval in the past 24 hours."
 ::= { pwVcPerfIntervalEntry 9 }

pwVcPerfIntervalOutHCBytes OBJECT-TYPE

SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"High capacity counter for number of bytes forwarded by the
VC in a particular 15-minute interval in the past 24
hours."

 ::= { pwVcPerfIntervalEntry 10 }

-- End of VC Performance Interval Table

-- VC Performance Total Table.

pwVcPerfTotalTable OBJECT-TYPE

SYNTAX SEQUENCE OF PwVcPerfTotalEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This table provides per-VC Performance information."
 ::= { pwVcObjects 5 }

pwVcPerfTotalEntry OBJECT-TYPE

SYNTAX PwVcPerfTotalEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"An entry in this table is created by the LSR for every

VC."

```
INDEX { pwVcIndex }  
::= { pwVcPerfTotalTable 1 }
```

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```
PwVcPerfTotalEntry ::= SEQUENCE {  
    pwVcPerfTotalInPackets      Counter32,  
    pwVcPerfTotalInHCPackets   Counter64,  
    pwVcPerfTotalInBytes       Counter32,  
    pwVcPerfTotalInHCBytes     Counter64,  
    pwVcPerfTotalOutPackets    Counter32,  
    pwVcPerfTotalOutHCPackets  Counter64,  
    pwVcPerfTotalOutBytes      Counter32,  
    pwVcPerfTotalOutHCBytes    Counter64  
}
```

```
pwVcPerfTotalInPackets OBJECT-TYPE  
    SYNTAX      Counter32  
    MAX-ACCESS  read-only  
    STATUS      current  
    DESCRIPTION  
        "Number of packets received by the VC."  
    ::= { pwVcPerfTotalEntry 1 }
```

```
pwVcPerfTotalInHCPackets OBJECT-TYPE  
    SYNTAX      Counter64  
    MAX-ACCESS  read-only  
    STATUS      current  
    DESCRIPTION  
        "High capacity counter for number of packets received by the  
        VC ."  
    ::= { pwVcPerfTotalEntry 2 }
```

```
pwVcPerfTotalInBytes OBJECT-TYPE  
    SYNTAX      Counter32  
    MAX-ACCESS  read-only  
    STATUS      current  
    DESCRIPTION  
        "Number of bytes received by the VC."  
    ::= { pwVcPerfTotalEntry 3 }
```

```
pwVcPerfTotalInHCBytes OBJECT-TYPE  
    SYNTAX      Counter64  
    MAX-ACCESS  read-only  
    STATUS      current  
    DESCRIPTION  
        "High capacity counter for number of bytes received by the  
        VC."  
    ::= { pwVcPerfTotalEntry 4 }
```

```
pwVcPerfTotalOutPackets OBJECT-TYPE
```

SYNTAX	Counter32
MAX-ACCESS	read-only
STATUS	current
DESCRIPTION	

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"Number of packets forwarded by the VC."
 ::= { pwVcPerfTotalEntry 5 }

pwVcPerfTotalOutHCPackets OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"High capacity counter for number of packets forwarded by
the VC ."

::= { pwVcPerfTotalEntry 6 }

pwVcPerfTotalOutBytes OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Number of bytes forwarded by the VC."

::= { pwVcPerfTotalEntry 7 }

pwVcPerfTotalOutHCBytes OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"High capacity counter for number of bytes forwarded by the
VC."

::= { pwVcPerfTotalEntry 8 }

-- End of VC Perf Total Table

-- Error counter scalar

pwVcPerfTotalErrorPackets OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Counter for number of error at VC level processing, for
example packets received with unknown VC label."

::= { pwVcObjects 6 }

-- Notifications - PW VCs

-- No notifications are defined. Notifications are generated in
-- the per service MIB modules and/or PSN specific modules.
-- Notification related to the maintenance protocol are FFS.

-- End of notifications.

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-- conformance information

-- Note: Conformance at the object access and values level is
-- still FFS, therefore current conformance is defined at the
-- object existence level only.

pwVcGroups OBJECT IDENTIFIER ::= { pwVcConformance 1 }
pwVcCompliances OBJECT IDENTIFIER ::= { pwVcConformance 2 }

pwModuleCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The compliance statement for agent that support PW
operation."

MODULE -- this module

MANDATORY-GROUPS { pwVcGroup,
pwVcPerformanceGroup }

::= { pwVcCompliances 1 }

-- Units of conformance.

pwVcGroup OBJECT-GROUP

OBJECTS {

pwVcIndexNext,
pwVcType,
pwVcOwner,
pwVcPsnType,
pwVcPriority,
pwVcInboundMode,
pwVcPeerAddrType,
pwVcPeerAddr,
pwVcID,
pwVcLocalGroupID,
pwVcControlWord,
pwVcLocalIfMtu,
pwVcLocalIfString,
pwVcRemoteGroupID,
pwVcRemoteControlWord,
pwVcRemoteIfMtu,
pwVcRemoteIfString,
pwVcOutboundVcLabel,
pwVcInboundVcLabel,
pwVcName,
pwVcDescr,

pwVcCreateTime,
pwVcUpTime,
pwVcAdminStatus,

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```
    pwVcOperStatus,  
    pwVcOutboundOperStatus,  
    pwVcInboundOperStatus,  
    pwVcTimeElapsed,  
    pwVcValidIntervals,  
    pwVcRowStatus,  
    pwVcStorageType  
}
```

STATUS current

DESCRIPTION

"Collection of objects needed for PW VC
configuration."

::= { pwVcGroups 1 }

pwVcPerformanceGroup OBJECT-GROUP

OBJECTS {

```
    pwVcPerfTotalInPackets,  
    pwVcPerfTotalInHCPackets,  
    pwVcPerfTotalInBytes,  
    pwVcPerfTotalInHCBytes,  
    pwVcPerfTotalOutPackets,  
    pwVcPerfTotalOutHCPackets,  
    pwVcPerfTotalOutBytes,  
    pwVcPerfTotalOutHCBytes,  
    pwVcPerfCurrentInPackets,  
    pwVcPerfCurrentInHCPackets,  
    pwVcPerfCurrentInBytes,  
    pwVcPerfCurrentInHCBytes,  
    pwVcPerfCurrentOutPackets,  
    pwVcPerfCurrentOutHCPackets,  
    pwVcPerfCurrentOutBytes,  
    pwVcPerfCurrentOutHCBytes,  
    pwVcPerfIntervalValidData,  
    pwVcPerfIntervalInPackets,  
    pwVcPerfIntervalInHCPackets,  
    pwVcPerfIntervalInBytes,  
    pwVcPerfIntervalInHCBytes,  
    pwVcPerfIntervalOutPackets,  
    pwVcPerfIntervalOutHCPackets,  
    pwVcPerfIntervalOutBytes,  
    pwVcPerfIntervalOutHCBytes,  
    pwVcPerfTotalErrorPackets
```

}

STATUS current

DESCRIPTION

"Collection of objects needed for PW VC
performance."

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```
::= { pwVcGroups 2 }
```

```
-- END of PW-MIB
```

```
END
```

8 Security Considerations

There are a number of management objects defined in this MIB that have 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.

No managed objects in this MIB contain sensitive information.

SNMPv1 by itself is not a secure environment. 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.

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model [RFC 2574](#) [[RFC2574](#)] and the View-based Access Control Model [RFC 2575](#) [[RFC2575](#)] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to an instance of this MIB, 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.

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