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Ethernet Pseudowire (PW) Management Information Base (MIB)

Abstract

This memo defines a 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 Ethernet pseudowire (PW) services.

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 document describes a model for managing Ethernet pseudowire services for transmission over a Packet Switched Network (PSN). This MIB module is generic and common to all types of PSNs supported in the Pseudowire Emulation Edge-to-Edge (PWE3) architecture [RFC3985], which describes the transport and encapsulation of L1 and L2 services over supported PSN types.

In particular, the MIB module associates a port or specific VLANs on top of a physical Ethernet port or a virtual Ethernet interface (for Virtual Private LAN Service (VPLS)) to a point-to-point PW. It is complementary to the PW-STD-MIB [RFC5601], which manages the generic PW parameters common to all services, including all supported PSN types.

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 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 MIB module structure for defining a PW service is composed of three layers of MIB modules functioning together. This general model is defined in the PWE3 architecture [RFC3985]. The layering model is intended to sufficiently isolate PW services from the underlying PSN layer that carries the emulated service. This is done at the same time as providing a standard means for connecting any supported services to any supported PSNs.

The first layer, known as the service layer, contains service-specific modules. These modules define service-specific management objects that interface or collaborate with existing MIB modules for the native version of the service. The service-specific module "glues" the standard modules to the PWE3 MIB modules.

The next layer of the PWE3 MIB framework is the PW MIB module [RFC5601]. This module is used to configure general parameters of PWs that are common to all types of emulated services and PSNs. This layer is connected to the service-specific layer above and the PSN layer below.

The PSN layer provides PSN-specific modules 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 used to "glue" the PW service to the underlying PSN-specific MIB modules. This document defines the MIB module for Ethernet PW over any PSN type.

This module uses Textual Conventions (TCs) and objects as defined in [RFC2578], [RFC2579], [RFC2580], [RFC2863], [RFC4363], [RFC4502], and [RFC5601].

The Etherlike-MIB [RFC3635] does not support virtual Ethernet ports; however, it is sometimes desired to manage the PW as an Ethernet port via the Etherlike-MIB. This MIB module supports an option to recognize the PW as an ifIndex, enabling standard use of the Etherlike-MIB to manage the PW.

5. Feature Checklist

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

- The MIB module is designed to work with the PW-STD-MIB [RFC5601].
- The MIB module is agnostic to the PSN type.
- The MIB module supports various options for selecting Ethernet packets into the PW, as defined in [RFC4448]. These include port-based PW, VLAN-based PW, and VLAN-manipulated based (change, add, or remove) between the port to be emulated and the PW.
- In the case of an MPLS PSN, the MIB module supports the use of multiple PWs to carry the same Ethernet service. These PWs can be used to support Label-Only-Inferred-PSC LSPs (L-LSPs) or EXP-Inferred-PSC LSPs (E-LSPs) that are from a single Class of Service (CoS), when mapping of the Ethernet user priority (PRI) bits to the PSN CoS is required.
- The MIB module enables both point-to-point Ethernet services and VPLS services as discussed in the L2VPN working group [RFC4664].
- The MIB module allows modeling of the PW as an Ethernet virtual port to be managed via existing Ethernet MIBs like Etherlike-MIB [RFC3635].

6. PW ENET MIB Module Usage

- The PW table (pwTable) is used for all PW types (ATM, FR, Ethernet, SONET, etc.). This table contains high-level generic parameters related to the PW creation. A row is typically created by the operator (see [RFC5542] for other options) for each PW service.
- Based on the PSN type defined for the PW, rows are created in the PSN-specific module (for example, [RFC5602]) and associated to the pwTable by the common pwIndex.
- If the PW type is Ethernet or EthernetTagged a row is created by the agent in the pwEnetTable.

8. Example of the PW-ENET MIB Module Usage

Assume we would like to create a PW of type VLAN between two PEs, for VLAN value 5.

- Follows the example in [RFC5601], with pwType equals 'ethernetTagged'.
- The agent creates a row in the pwEnetTable and a row in the pwEnetStatsTable for the specified pwIndex. The pwEnetPwInstance is automatically set by the agent to the value of 1.
- The operator fills the following entries in the pwEnetTable:

```
pwEnetPwVlan          5,  
pwEnetVlanMode        noChange,  
pwEnetPortVlan        5,  
  
pwEnetPortIfIndex     1001,  
pwEnetPwIfIndex       0, -- Not managed in the  
                       -- Etherlike MIB module  
...
```
- The PW is ready for forwarding when signaling has been accomplished successfully between the two peers.

9. Service-Delimiting Modes

This section describes how the MIB module supports point-to-point applications with various VLAN service-delimiting options on the original Ethernet port and the corresponding PW mode and VLAN values. If the PW is attached to VPLS service, the PW is associated to a virtual interface that is attached to a bridge or VPLS forwarder. The bridging function between local physical ports and virtual interfaces that are later associated to PWs is not handled via this MIB module.

There are three main service types that are supported by this MIB module:

- (1) Port mode: In this mode, the whole traffic from the port is mapped to the PW.
 - A. In the typical application, the packet is sent to the PW as is:


```

pwEnetPwVlan      4095,
pwEnetVlanMode    portMode,
pwEnetPortVlan   4095,

pwType            Ethernet,
```
 - B. It is possible to add a provider tag (value 10, for example) to the packet when it is sent over the PW:


```

pwEnetPwVlan      10,
pwEnetVlanMode    addVlan,
pwEnetPortVlan   4095,

pwType SHOULD be set to 'EthernetTagged'.
```
- (2) Single VLAN: In this mode, only the first VLAN field on the packet from the physical port is the service-delimiting tag, as an example VLAN=5. The following options of processing are possible:
 - A. One-to-one mapping: The service-delimiting tag is kept as is on the PW.


```

pwEnetPwVlan      5,
pwEnetVlanMode    noChange,
pwEnetPortVlan   5,

pwType SHOULD be set to 'EthernetTagged'.
```
 - B. VLAN change mapping: The service-delimiting tag changes its value (to the value of 6) on the PW.


```

pwEnetPwVlan      6,
pwEnetVlanMode    changeVlan,
pwEnetPortVlan   5,

pwType SHOULD be set to 'EthernetTagged'.
```

- C. The service-delimiting tag is removed when the packet is sent to the PW.

```
pwEnetPwVlan      4095,
pwEnetVlanMode    removeVlan,
pwEnetPortVlan    5,
```

pwType SHOULD be set to 'EthernetTagged'.

It should be noted that this mode is also applicable when the service-delimiting tag is a service provider tag (VLAN=5 in this case), and the node removes this VLAN and maps the traffic to a single PW independent of the packet format on top of this VLAN.

- D. Untagged packets mapped to a PW as is (packets with a VLAN field from the same port MAY be mapped to other PWs).

```
pwEnetPwVlan      0,
pwEnetVlanMode    noChange,
pwEnetPortVlan    0,
```

pwType MAY equal 'Ethernet' or 'EthernetTagged'.

- E. Untagged packets mapped to a PW, and a VLAN field is added to the packet.

```
pwEnetPwVlan      6,
pwEnetVlanMode    addVlan,
pwEnetPortVlan    0,
```

pwType SHOULD be set to 'EthernetTagged'.

- F. A provider VLAN (value 10) is added to packets arriving with VLAN value 5 before they are sent to the PW.

```
pwEnetPwVlan      10,
pwEnetVlanMode    addVlan,
pwEnetPortVlan    5,
```

pwType SHOULD be set to 'EthernetTagged'.

- (3) Nested VLAN (QinQ): When only the first VLAN is the service-delimiting tag, one of the modes as described in 2) SHOULD be used. If the service-delimiting tag is both the first VLAN and the second VLAN, the following option is supported by this MIB module:

Assuming the provider VLAN tag equals 5 and the user VLAN tag equal 100, this traffic can be mapped to the PW without the provider tag by using the following configuration:

```
pwEnetPwVlan      100,
pwEnetVlanMode    removeVLAN,
pwEnetPortVlan    5,
```

It is RECOMMENDED that the pwType would equal 'EthernetTagged', but pwType equal to 'Ethernet' MAY be used as well.

Packets with the same provider tag MAY be mapped to other PWs.

- (4) Other scenarios are considered out of scope and should be handled by other MIB modules that manage the forwarder and the Native Service Processing (NSP) sections.

10. Object Definitions

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

IMPORTS

OBJECT-TYPE, MODULE-IDENTITY, Unsigned32, mib-2
FROM SNMPv2-SMI -- [RFC2578]

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

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

InterfaceIndexOrZero
FROM IF-MIB -- [RFC2863]

ZeroBasedCounter32
FROM RMON2-MIB -- [RFC4502]

pwIndex
FROM PW-STD-MIB -- [RFC5601]

VlanIdOrAnyOrNone
FROM Q-BRIDGE-MIB; -- [RFC4363]

pwEnetStdMIB MODULE-IDENTITY

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DESCRIPTION

"This MIB module describes a model for managing Ethernet point-to-point pseudowire services over a Packet Switched Network (PSN).

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This version of this MIB module is part of RFC 5603;

see the RFC itself for full legal notices."

```
-- Revision history
REVISION "200906150000Z" -- 15 June 2009 00:00:00 GMT
DESCRIPTION "Initial version published as part of RFC 5603."

 ::= { mib-2 180 }

pwEnetObjects          OBJECT IDENTIFIER ::= { pwEnetStdMIB 1 }
pwEnetConformance     OBJECT IDENTIFIER ::= { pwEnetStdMIB 2 }

--
-- Ethernet PW table
--

pwEnetTable OBJECT-TYPE
    SYNTAX SEQUENCE OF PwEnetEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "This table contains the index to the Ethernet tables
        associated with this Ethernet PW, the VLAN configuration,
        and the VLAN mode."
    ::= { pwEnetObjects 1 }

pwEnetEntry OBJECT-TYPE
    SYNTAX PwEnetEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "This table is indexed by the same index that was created
        for the associated entry in the PW generic table in the

        PW-STD-MIB module.
        The pwIndex and the pwEnetPwInstance are used as indexes
        to allow multiple VLANs to exist on the same PW.

        An entry is created in this table by the agent for every
        entry in the pwTable with a pwType of 'ethernetTagged'
        or 'ethernet'. Additional rows may be created by the
        operator or the agent if multiple entries are required for
        the same PW.

        The value of pwEnetPwInstance can be arbitrarily selected
        to make the row unique; however, implementations that know
        the VLAN field value when the row is created MAY use the
        value of the VLAN itself for better readability and
        backward compatibility with older versions of this MIB
```

module.

This table provides Ethernet port mapping and VLAN configuration for each Ethernet PW.

All read-create objects in this table MAY be changed at any time; however, change of some objects (for example, pwEnetVlanMode) during the PW forwarding state MAY cause traffic disruption.

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

"

```
INDEX { pwIndex, pwEnetPwInstance }
 ::= { pwEnetTable 1 }
```

```
PwEnetEntry ::= SEQUENCE {
    pwEnetPwInstance      Unsigned32,
    pwEnetPwVlan          VlanIdOrAnyOrNone,
    pwEnetVlanMode        INTEGER,
    pwEnetPortVlan        VlanIdOrAnyOrNone,

    pwEnetPortIfIndex     InterfaceIndexOrZero,
    pwEnetPwIfIndex       InterfaceIndexOrZero,

    pwEnetRowStatus       RowStatus,
    pwEnetStorageType     StorageType
}
```

```
pwEnetPwInstance OBJECT-TYPE
SYNTAX      Unsigned32
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
```

```
"If multiple rows are mapped to the same PW, this index is
used to uniquely identify the individual row.
If the value of the VLAN field is known at the time of
row creation, the value of pwEnetPwVlan MAY be used
for better readability and backward compatibility with
older versions of this MIB module. Otherwise, the value
1 SHOULD be set to the first row for each pwIndex
for better readability and in order that the management
application will know in advance how to access the
first row when it was created by the agent.
```

```

"
 ::= { pwEnetEntry 1 }

pwEnetPwVlan OBJECT-TYPE
    SYNTAX      VlanIdOrAnyOrNone
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "This object defines the (service-delimiting) VLAN field
        value on the PW.  The value 4095 MUST be used if the
        object is not applicable, for example, when mapping all
        packets from an Ethernet port to this PW (raw mode).
        The value 0 MUST be set to indicate untagged frames
        (from the PW point of view), i.e., when pwEnetVlanMode
        equals 'noChange' and pwEnetPortVlan equals 0."
    ::= { pwEnetEntry 2 }

pwEnetVlanMode OBJECT-TYPE
    SYNTAX      INTEGER {
        other(0),
        portBased(1),
        noChange(2),
        changeVlan(3),
        addVlan(4),
        removeVlan(5)
    }
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "This object indicates the mode of VLAN handling between the
        port or the virtual port associated with the PW and the
        PW encapsulation.

        - 'other' indicates an operation that is not defined by
          this MIB module.

        - 'portBased' indicates that the forwarder will forward
          packets between the port and the PW independent of their
          structure (i.e., there are no service-delimiting VLAN tags
          from the PE standpoint).

        - 'noChange' indicates that the PW contains the original
          user VLAN, as specified in pwEnetPortVlan; i.e., the
          VLAN on the PE-CE link is the service-delimiting tag
          and is kept 'as is' on the PW.

        - 'changeVlan' indicates that the VLAN field on the PW
          may be different than the VLAN field on the user's

```

port. The VLAN on the PE-CE link is the service-delimiting tag but has a different value on the PW.

- 'addVlan' indicates that a VLAN field will be added on the PSN-bound direction (i.e., on the PW). pwEnetPwVlan indicates the value that will be added.
- 'removeVlan' indicates that the encapsulation on the PW does not include the service-delimiting VLAN field. Note that PRI bits transparency is lost in this case.
- Implementation of 'portsbased', 'removeVlan', 'addVlan', 'other', and 'changeVlan' is OPTIONAL.

```
"
DEFVAL { noChange }
::= { pwEnetEntry 3 }
```

```
pwEnetPortVlan OBJECT-TYPE
SYNTAX      VlanIdOrAnyOrNone
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
```

"This object defines if the mapping between the original port (physical port or VPLS virtual port) to the PW is VLAN based or not. In case of VLAN mapping, this object indicates the VLAN value on the original port.

The value of '4095' MUST be used if the whole original port traffic is mapped to the same PW. Note that a pwType of 'ethernetTagged' can still be used if service-delimiting tag is added on the PW (pwEnetVlanMode equals 'addVlan').

This object MUST be equal to pwEnetPwVlan if pwEnetVlanMode equals 'noChange'.

The value 0 indicates that packets without a VLAN field (i.e., untagged frames) on the port are associated to this PW. This allows the same behavior as assigning 'Default VLAN' to untagged frames.

```
"
DEFVAL { 4095 }
::= { pwEnetEntry 4 }
```

```
pwEnetPortIfIndex OBJECT-TYPE
SYNTAX      InterfaceIndexOrZero
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
```

"This object is used to specify the ifIndex of the Ethernet port associated with this PW for point-to-point Ethernet service, or the ifIndex of the virtual interface of the VPLS instance associated with the PW if the service is VPLS. Two rows in this table can point to the same ifIndex only if there is no overlap of VLAN values specified in pwEnetPortVlan that are associated with this port.

A value of zero indicates that association to an ifIndex is not yet known."

```
::= { pwEnetEntry 5 }
```

```
pwEnetPwIfIndex OBJECT-TYPE
```

```
SYNTAX      InterfaceIndexOrZero
```

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

```
STATUS      current
```

```
DESCRIPTION
```

"If the PW is modeled as an ifIndex in the ifTable, this object indicates the value of the ifIndex representing the Ethernet PW on the PSN side in the Etherlike-MIB. Note that this value may be different from the value of pwIfIndex that represents the ifIndex of the PW for ifType 'pw'."

```
DEFVAL { 0 }
```

```
::= { pwEnetEntry 6 }
```

```
pwEnetRowStatus OBJECT-TYPE
```

```
SYNTAX      RowStatus
```

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

```
STATUS      current
```

```
DESCRIPTION
```

"This object enables creating, deleting, and modifying this row."

```
::= { pwEnetEntry 7 }
```

```
pwEnetStorageType OBJECT-TYPE
```

```
SYNTAX      StorageType
```

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

```
STATUS      current
```

```
DESCRIPTION
```

"This object indicates the storage type of this row."

```
DEFVAL { nonVolatile }
```

```
::= { pwEnetEntry 8 }
```

```
--
```

```
-- Ethernet PW Statistics Table
```

```
--
```

```
pwEnetStatsTable OBJECT-TYPE
    SYNTAX SEQUENCE OF PwEnetStatsEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "This table contains statistical counters specific for
        Ethernet PW."
    ::= { pwEnetObjects 2 }

pwEnetStatsEntry OBJECT-TYPE
    SYNTAX PwEnetStatsEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "Each entry represents the statistics gathered for the
        PW carrying the Ethernet."
    INDEX { pwIndex }
    ::= { pwEnetStatsTable 1 }

PwEnetStatsEntry ::= SEQUENCE {
    pwEnetStatsIllegalVlan ZeroBasedCounter32,
    pwEnetStatsIllegalLength ZeroBasedCounter32
}

pwEnetStatsIllegalVlan OBJECT-TYPE
    SYNTAX ZeroBasedCounter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The number of packets received (from the PSN) on this PW
        with either an illegal VLAN field, a missing VLAN field
        when one was expected, or an excessive VLAN field when
        it was not expected. This counter may not be applicable
        in some cases, and MUST return the value of zero in
        such a case."
    ::= { pwEnetStatsEntry 1 }

pwEnetStatsIllegalLength OBJECT-TYPE
    SYNTAX ZeroBasedCounter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The number of packets that were received with an illegal
        Ethernet packet length on this PW. An illegal length is
        defined as being greater than the value in the advertised
        MTU supported, or shorter than the allowed Ethernet packet
        size."
```



```

 ::= { pwEnetStatsEntry 2 }

---
--- Conformance description
---

pwEnetGroups      OBJECT IDENTIFIER ::= { pwEnetConformance 1 }
pwEnetCompliances OBJECT IDENTIFIER ::= { pwEnetConformance 2 }

-- Compliance requirement for fully compliant implementations

pwEnetModuleFullCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for agents that provides full
        support for the PW-ENET-STD-MIB module.  Such devices
        can then be monitored and also be configured using
        this MIB module."
    MODULE -- this module
        MANDATORY-GROUPS {
            pwEnetGroup,
            pwEnetStatsGroup
        }

    OBJECT pwEnetVlanMode
    DESCRIPTION "An implementation MUST support at least the value
        noChange(2)."
```

```

    OBJECT pwEnetPwIfIndex
    MIN-ACCESS read-only
    DESCRIPTION "Write access and values other than zero are
        required only for implementations that support
        modeling the Ethernet PW in the Etherlike-MIB."

    OBJECT pwEnetRowStatus
    SYNTAX RowStatus { active(1), notInService(2),
        notReady(3) }
    WRITE-SYNTAX RowStatus { active(1), notInService(2),
        createAndGo(4), destroy(6)
        }

    MIN-ACCESS read-only
    DESCRIPTION "Support for createAndWait is not required.  Support
        of notReady is not required for implementations that
        do not support signaling.
        Support of read-write is not required for
        implementations that do not support more than one
        VLAN mapping to the same PW."
 ::= { pwEnetCompliances 1 }
```

-- Compliance requirement for read-only compliant implementations

pwEnetModuleReadOnlyCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The compliance statement for agents that provide read-only support for the PW-ENET-STD-MIB module. Such devices can then be monitored but cannot be configured using this MIB module."

MODULE -- this module

MANDATORY-GROUPS { pwEnetGroup,
pwEnetStatsGroup
}

OBJECT pwEnetPwVlan

MIN-ACCESS read-only

DESCRIPTION "Write access is not required."

OBJECT pwEnetVlanMode

MIN-ACCESS read-only

DESCRIPTION "Write access is not required. An implementation MUST support at least the value noChange(2)."

OBJECT pwEnetPortVlan

MIN-ACCESS read-only

DESCRIPTION "Write access is not required."

OBJECT pwEnetPortIfIndex

MIN-ACCESS read-only

DESCRIPTION "Write access is not required."

OBJECT pwEnetPwIfIndex

MIN-ACCESS read-only

DESCRIPTION "Write access is not required. Values other than zero are required only for implementations that support modeling the Ethernet PW in the Etherlike-MIB."

OBJECT pwEnetRowStatus

SYNTAX RowStatus { active(1), notInService(2),
notReady(3) }

MIN-ACCESS read-only

DESCRIPTION "Write access is not required. Support of notReady is not required for implementations that do not support signaling."

OBJECT pwEnetStorageType

```

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

 ::= { pwEnetCompliances 2 }

-- Units of conformance

pwEnetGroup OBJECT-GROUP
  OBJECTS {
    pwEnetPwVlan,
    pwEnetVlanMode,
    pwEnetPortVlan,
    pwEnetPortIfIndex,
    pwEnetPwIfIndex,
    pwEnetRowStatus,
    pwEnetStorageType
  }
  STATUS      current
  DESCRIPTION
    "Collection of objects for basic Ethernet PW configuration."
  ::= { pwEnetGroups 1 }

pwEnetStatsGroup OBJECT-GROUP
  OBJECTS {
    pwEnetStatsIllegalVlan,
    pwEnetStatsIllegalLength
  }
  STATUS      current
  DESCRIPTION
    "Collection of objects counting various PW level errors."
  ::= { pwEnetGroups 2 }

END

```

11. Security Considerations

It is clear that this MIB module is potentially useful for monitoring of 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 pwEnetTable contains objects to provision Ethernet PWs. Unauthorized access to objects in these tables could result in disruption of traffic on the network. The use of stronger mechanisms such as SNMPv3 security should be considered where possible. Specifically, SNMPv3 VACM and USM MUST be used with any v3 agent 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 pwEnetTable shows the Ethernet PW service configuration. 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.

12. IANA Considerations

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

Descriptor -----	OBJECT IDENTIFIER value -----
pwEnetStdMIB	{ mib-2 180 }

13. References

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