

Power Ethernet MIB

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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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. This document proposes an extension to the Ethernet-like Interfaces MIB with a set of objects for managing Power Sourcing Equipment (PSE).

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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 set of MIB objects to manage Power Ethernet [IEEE-802.3af] Power Sourcing Equipment (PSE).

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 [RFC2119].

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. Overview

The emergence of IP telephony as an application that allows voice applications to be run over the same infrastructure as data applications has led to the emergence of Ethernet IP phones, which have similar functions and characteristics as traditional phones. Powering the phone with the same cable used for signal transfer is one of the functions that are being taken as granted. The IEEE 802.3 Working Group has initiated standardization on this subject, currently known as the IEEE 802.3af work [IEEE-802.3af].

The IEEE 802.3af WG did not define a full management interface, but only the hardware registers that will allow for management interfaces to be built for a powered Ethernet device. The MIB module defined in this document extends the Ethernet-like Interfaces MIB [RFC3635] with the management objects required for the management of the powered Ethernet devices and ports.

The following abbreviations are defined in [IEEE-802.3af] and will be used with the same significance in this document:

PSE - Power Sourcing Equipment;

PD - Powered Device

4. MIB Structure

These MIB objects are categorized into three MIB groups.

The pethPsePortTable defines the objects used for configuring and describing the status of ports on a PSE device. Examples of PSE devices are Ethernet switches that support power Ethernet and mid-span boxes.

The pethMainPseObjects MIB group defines the management objects for a managed main power source in a PSE device. Ethernet switches are one example of boxes that would support these objects.

The pethNotificationControlTable includes objects that control the transmission of notifications from the agent to a management application.

5. Definitions

POWER-ETHERNET-MIB DEFINITIONS ::= BEGIN

IMPORTS

```
MODULE-IDENTITY, mib-2, OBJECT-TYPE, Integer32,
Gauge32, Counter32, NOTIFICATION-TYPE
    FROM SNMPv2-SMI
TruthValue
    FROM SNMPv2-TC
MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
    FROM SNMPv2-CONF

SnmAdminString
    FROM SNMP-FRAMEWORK-MIB;
```

powerEthernetMIB MODULE-IDENTITY

```
LAST-UPDATED      "200311240000Z"  -- November 24, 2003
ORGANIZATION      "IETF Ethernet Interfaces and Hub MIB
Working Group"
```

CONTACT-INFO

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DESCRIPTION

"The MIB module for managing Power Source Equipment (PSE) working according to the IEEE 802.af Powered Ethernet (DTE Power via MDI) standard.

The following terms are used throughout this MIB module. For complete formal definitions, the IEEE 802.3 standards should be consulted wherever possible:

Group - A recommended, but optional, entity defined by the IEEE 802.3 management standard, in order to support a modular numbering scheme. The classical example allows an implementor to represent field-replaceable units as groups of ports, with the port numbering matching the modular hardware implementation.

Port - This entity identifies the port within the group for which this entry contains information. The numbering scheme for ports is implementation specific.

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REVISION "200311240000Z" -- November 24, 2003
 DESCRIPTION "Initial version, published as RFC 3621."
 ::= { mib-2 105 }

pethNotifications OBJECT IDENTIFIER ::= { powerEthernetMIB 0 }
 pethObjects OBJECT IDENTIFIER ::= { powerEthernetMIB 1 }
 pethConformance OBJECT IDENTIFIER ::= { powerEthernetMIB 2 }

-- PSE Objects

pethPsePortTable OBJECT-TYPE
 SYNTAX SEQUENCE OF PethPsePortEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "A table of objects that display and control the power characteristics of power Ethernet ports on a Power Source Entity (PSE) device. This group will be implemented in managed power Ethernet switches and mid-span devices. Values of all read-write objects in this table are persistent at restart/reboot."
 ::= { pethObjects 1 }

pethPsePortEntry OBJECT-TYPE
 SYNTAX PethPsePortEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "A set of objects that display and control the power characteristics of a power Ethernet PSE port."
 INDEX { pethPsePortGroupIndex , pethPsePortIndex }
 ::= { pethPsePortTable 1 }

PethPsePortEntry ::= SEQUENCE {
 pethPsePortGroupIndex
 Integer32,
 pethPsePortIndex
 Integer32,
 pethPsePortAdminEnable
 TruthValue,
 pethPsePortPowerPairsControlAbility
 TruthValue,
 pethPsePortPowerPairs
 INTEGER,
 pethPsePortDetectionStatus
 INTEGER,
 pethPsePortPowerPriority
 INTEGER,

```
pethPsePortMPSAbsentCounter
    Counter32,
pethPsePortType
    SnmpAdminString,
pethPsePortPowerClassifications
    INTEGER,
pethPsePortInvalidSignatureCounter
    Counter32,
pethPsePortPowerDeniedCounter
    Counter32,
pethPsePortOverLoadCounter
    Counter32,
pethPsePortShortCounter
    Counter32
}
```

pethPsePortGroupIndex OBJECT-TYPE

SYNTAX Integer32 (1..2147483647)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This variable uniquely identifies the group containing the port to which a power Ethernet PSE is connected. Group means box in the stack, module in a rack and the value 1 MUST be used for non-modular devices. Furthermore, the same value MUST be used in this variable, pethMainPseGroupIndex, and pethNotificationControlGroupIndex to refer to a given box in a stack or module in the rack."

::= { pethPsePortEntry 1 }

pethPsePortIndex OBJECT-TYPE

SYNTAX Integer32 (1..2147483647)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This variable uniquely identifies the power Ethernet PSE port within group pethPsePortGroupIndex to which the power Ethernet PSE entry is connected."

::= { pethPsePortEntry 2 }

pethPsePortAdminEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"true (1) An interface which can provide the PSE functions.
false(2) The interface will act as it would if it had no PSE function."

REFERENCE

"IEEE Std 802.3af Section 30.9.1.1.2 aPSEAdminState"
 ::= { pethPsePortEntry 3 }

pethPsePortPowerPairsControlAbility OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Describes the capability of controlling the power pairs functionality to switch pins for sourcing power. The value true indicate that the device has the capability to control the power pairs. When false the PSE Pinout Alternative used cannot be controlled through the PethPsePortAdminEnable attribute."

REFERENCE

"IEEE Std 802.3af Section 30.9.1.1.3
 aPSEPowerPairsControlAbility"
 ::= { pethPsePortEntry 4 }

pethPsePortPowerPairs OBJECT-TYPE

SYNTAX INTEGER {
 signal(1),
 spare(2)
 }

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Describes or controls the pairs in use. If the value of pethPsePortPowerPairsControl is true, this object is writable. A value of signal(1) means that the signal pairs only are in use. A value of spare(2) means that the spare pairs only are in use."

REFERENCE

"IEEE Std 802.3af Section 30.9.1.1.4 aPSEPowerPairs"
 ::= { pethPsePortEntry 5 }

pethPsePortDetectionStatus OBJECT-TYPE

SYNTAX INTEGER {
 disabled(1),
 searching(2),
 deliveringPower(3),
 fault(4),
 test(5),
 otherFault(6)
 }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Describes the operational status of the port PD detection.

A value of disabled(1)- indicates that the PSE State diagram is in the state DISABLED.

A value of deliveringPower(3) - indicates that the PSE State diagram is in the state POWER_ON for a duration greater than tlim max (see IEEE Std 802.3af Table 33-5 tlim).

A value of fault(4) - indicates that the PSE State diagram is in the state TEST_ERROR.

A value of test(5) - indicates that the PSE State diagram is in the state TEST_MODE.

A value of otherFault(6) - indicates that the PSE State diagram is in the state IDLE due to the variable error_conditions.

A value of searching(2)- indicates the PSE State diagram is in a state other than those listed above."

REFERENCE

"IEEE Std 802.3af Section 30.9.1.1.5

aPSEPowerDetectionStatus"

::= { pethPsePortEntry 6 }

pethPsePortPowerPriority OBJECT-TYPE

```
SYNTAX INTEGER {
    critical(1),
    high(2),
    low(3)
}
```

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object controls the priority of the port from the point of view of a power management algorithm. The priority that is set by this variable could be used by a control mechanism that prevents over current situations by disconnecting first ports with lower power priority. Ports that connect devices critical to the operation of the network - like the E911 telephones ports - should be set to higher priority."

::= { pethPsePortEntry 7 }

pethPsePortMPSAbsentCounter OBJECT-TYPE

```
SYNTAX Counter32
```

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented when the PSE state diagram transitions directly from the state POWER_ON to the

state IDLE due to tmpdo_timer_done being asserted."

REFERENCE

"IEEE Std 802.3af Section 30.9.1.1.11

aPSEMPSAbsentCounter"

::= { pethPsePortEntry 8 }

pethPsePortType OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"A manager will set the value of this variable to indicate the type of powered device that is connected to the port. The default value supplied by the agent if no value has ever been set should be a zero-length octet string."

::= { pethPsePortEntry 9 }

pethPsePortPowerClassifications OBJECT-TYPE

SYNTAX INTEGER {
 class0(1),
 class1(2),
 class2(3),
 class3(4),
 class4(5)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Classification is a way to tag different terminals on the Power over LAN network according to their power consumption. Devices such as IP telephones, WLAN access points and others, will be classified according to their power requirements.

The meaning of the classification labels is defined in the IEEE specification.

This variable is valid only while a PD is being powered, that is, while the attribute pethPsePortDetectionStatus is reporting the enumeration deliveringPower."

REFERENCE

"IEEE Std 802.3af Section 30.9.1.1.6

aPSEPowerClassification"

::= { pethPsePortEntry 10 }

pethPsePortInvalidSignatureCounter OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented when the PSE state diagram enters the state SIGNATURE_INVALID."

REFERENCE

"IEEE Std 802.3af Section 30.9.1.1.7

aPSEInvalidSignatureCounter"

::= { pethPsePortEntry 11 }

pethPsePortPowerDeniedCounter OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented when the PSE state diagram enters the state POWER_DENIED."

REFERENCE

"IEEE Std 802.3af Section 30.9.1.1.8

aPSEPowerDeniedCounter"

::= { pethPsePortEntry 12 }

pethPsePortOverLoadCounter OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented when the PSE state diagram enters the state ERROR_DELAY_OVER."

REFERENCE

"IEEE Std 802.3af Section 30.9.1.1.9

aPSEOverLoadCounter"

::= { pethPsePortEntry 13 }

pethPsePortShortCounter OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented when the PSE state diagram enters the state ERROR_DELAY_SHORT."

REFERENCE

"IEEE Std 802.3af Section 30.9.1.1.10

aPSEShortCounter"

::= { pethPsePortEntry 14 }

-- Main PSE Objects

pethMainPseObjects OBJECT IDENTIFIER ::= { pethObjects 3 }

pethMainPseTable OBJECT-TYPE**SYNTAX** SEQUENCE OF PethMainPseEntry**MAX-ACCESS** not-accessible**STATUS** current**DESCRIPTION**

"A table of objects that display and control attributes of the main power source in a PSE device. Ethernet switches are one example of boxes that would support these objects.

Values of all read-write objects in this table are persistent at restart/reboot."

::= { pethMainPseObjects 1 }**pethMainPseEntry OBJECT-TYPE****SYNTAX** PethMainPseEntry**MAX-ACCESS** not-accessible**STATUS** current**DESCRIPTION**

"A set of objects that display and control the Main power of a PSE. "

INDEX { pethMainPseGroupIndex }**::=** { pethMainPseTable 1 }**PethMainPseEntry ::= SEQUENCE {**

pethMainPseGroupIndex

Integer32,

pethMainPsePower

Gauge32 ,

pethMainPseOperStatus

INTEGER,

pethMainPseConsumptionPower

Gauge32,

pethMainPseUsageThreshold

Integer32

}**pethMainPseGroupIndex OBJECT-TYPE****SYNTAX** Integer32 (1..2147483647)**MAX-ACCESS** not-accessible**STATUS** current**DESCRIPTION**

"This variable uniquely identifies the group to which power Ethernet PSE is connected. Group means (box in the stack, module in a rack) and the value 1 MUST be used for non-modular devices. Furthermore, the same value MUST be used in this variable, pethPsePortGroupIndex, and pethNotificationControlGroupIndex to refer to a given box in a stack or module in a rack."

::= { pethMainPseEntry 1 }

```
pethMainPsePower OBJECT-TYPE
    SYNTAX      Gauge32  (1..65535)
    UNITS        "Watts"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The nominal power of the PSE expressed in Watts."
    ::= { pethMainPseEntry 2 }
```

```
pethMainPseOperStatus OBJECT-TYPE
    SYNTAX INTEGER {
        on(1),
        off(2),
        faulty(3)
    }
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The operational status of the main PSE."
    ::= { pethMainPseEntry 3 }
```

```
pethMainPseConsumptionPower OBJECT-TYPE
    SYNTAX      Gauge32
    UNITS        "Watts"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "Measured usage power expressed in Watts."
    ::= { pethMainPseEntry 4 }
```

```
pethMainPseUsageThreshold OBJECT-TYPE
    SYNTAX      Integer32 (1..99)
    UNITS        "%"
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
        "The usage threshold expressed in percents for
         comparing the measured power and initiating
         an alarm if the threshold is exceeded."
    ::= { pethMainPseEntry 5 }
```

-- Notification Control Objects

```
pethNotificationControl          OBJECT IDENTIFIER ::= { pethObjects 4 }
```

```
pethNotificationControlTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF PethNotificationControlEntry
    MAX-ACCESS   not-accessible
```

STATUS current

DESCRIPTION

"A table of objects that display and control the Notification on a PSE device. Values of all read-write objects in this table are persistent at restart/reboot."

::= { pethNotificationControl 1 }

pethNotificationControlEntry OBJECT-TYPE

SYNTAX PethNotificationControlEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A set of objects that control the Notification events."

INDEX { pethNotificationControlGroupIndex }

::= { pethNotificationControlTable 1 }

PethNotificationControlEntry ::= SEQUENCE {

pethNotificationControlGroupIndex

Integer32,

pethNotificationControlEnable

TruthValue

}

pethNotificationControlGroupIndex OBJECT-TYPE

SYNTAX Integer32 (1..2147483647)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This variable uniquely identifies the group. Group means box in the stack, module in a rack and the value 1 MUST be used for non-modular devices. Furthermore, the same value MUST be used in this variable, pethPsePortGroupIndex, and pethMainPseGroupIndex to refer to a given box in a stack or module in a rack. "

::= { pethNotificationControlEntry 1 }

pethNotificationControlEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object controls, on a per-group basis, whether or not notifications from the agent are enabled. The value true(1) means that notifications are enabled; the value false(2) means that they are not."

::= { pethNotificationControlEntry 2 }

```
--
-- Notifications Section
--
--
```

```
pethPsePortOnOffNotification NOTIFICATION-TYPE
    OBJECTS      { pethPsePortDetectionStatus }
    STATUS        current
    DESCRIPTION
        " This Notification indicates if Pse Port is delivering or
          not power to the PD. This Notification SHOULD be sent on
          every status change except in the searching mode.
          At least 500 msec must elapse between notifications
          being emitted by the same object instance."
    ::= { pethNotifications 1 }
```

```
pethMainPowerUsageOnNotification NOTIFICATION-TYPE
    OBJECTS      { pethMainPseConsumptionPower }
    STATUS        current
    DESCRIPTION
        " This Notification indicate PSE Threshold usage
          indication is on, the usage power is above the
          threshold. At least 500 msec must elapse between
          notifications being emitted by the same object
          instance."
    ::= { pethNotifications 2 }
```

```
pethMainPowerUsageOffNotification NOTIFICATION-TYPE
    OBJECTS      { pethMainPseConsumptionPower }
    STATUS        current
    DESCRIPTION
        " This Notification indicates PSE Threshold usage indication
          off, the usage power is below the threshold.
          At least 500 msec must elapse between notifications being
          emitted by the same object instance."
    ::= { pethNotifications 3 }
```

```
--
-- Conformance Section
--
```

```
pethCompliances OBJECT IDENTIFIER ::= { pethConformance 1 }
pethGroups      OBJECT IDENTIFIER ::= { pethConformance 2 }
```

```
pethCompliance MODULE-COMPLIANCE
    STATUS        current
    DESCRIPTION
        "Describes the requirements for conformance to the
        Power Ethernet MIB."
```

```
MODULE -- this module
    MANDATORY-GROUPS { pethPsePortGroup,
                        pethPsePortNotificationGroup,
                        pethNotificationControlGroup
                      }
    GROUP    pethMainPseGroup
    DESCRIPTION
        "The pethMainPseGroup is mandatory for PSE systems
         that implement a main power supply."
    GROUP    pethMainPowerNotificationGroup
    DESCRIPTION
        "The pethMainPowerNotificationGroup is mandatory for
         PSE systems that implement a main power supply."
    ::= { pethCompliances 1 }
```

```
pethPsePortGroup OBJECT-GROUP
    OBJECTS {
        pethPsePortAdminEnable,
        pethPsePortPowerPairsControlAbility,
        pethPsePortPowerPairs,
        pethPsePortDetectionStatus,
        pethPsePortPowerPriority,
        pethPsePortMPSAbsentCounter,
        pethPsePortInvalidSignatureCounter,
        pethPsePortPowerDeniedCounter,
        pethPsePortOverLoadCounter,
        pethPsePortShortCounter,
        pethPsePortType,
        pethPsePortPowerClassifications
    }
    STATUS    current
    DESCRIPTION
        "PSE Port objects."
    ::= { pethGroups 1 }
```

```
pethMainPseGroup OBJECT-GROUP
    OBJECTS {
        pethMainPsePower,
        pethMainPseOperStatus,
        pethMainPseConsumptionPower,
        pethMainPseUsageThreshold
    }
    STATUS    current
    DESCRIPTION
        "Main PSE Objects. "
    ::= { pethGroups 2 }
```

```
pethNotificationControlGroup OBJECT-GROUP
```

```
OBJECTS {
    pethNotificationControlEnable
}
STATUS current
DESCRIPTION
    "Notification Control Objects. "
 ::= { pethGroups 3 }

pethPsePortNotificationGroup NOTIFICATION-GROUP
NOTIFICATIONS { pethPsePortOnOffNotification}
STATUS current
DESCRIPTION "Pse Port Notifications."
 ::= { pethGroups 4 }

pethMainPowerNotificationGroup NOTIFICATION-GROUP
NOTIFICATIONS { pethMainPowerUsageOnNotification,
                pethMainPowerUsageOffNotification}
STATUS current
DESCRIPTION "Main PSE Notifications."
 ::= { pethGroups 5 }

END
```

6. Acknowledgements

This document is the product of the Ethernet Interfaces and Hub MIB WG. The authors would like to recognize the special contributions of C.M. Heard and David Law.

7. References

7.1. Normative References

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- [RFC2578] McCloghrie, K., Perkins, D. and J. Schoenwaelder, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.
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- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
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- [IEEE-802.3af] IEEE 802.3 Working Group, "IEEE Std 802.3af-2003 - Data Terminal Equipment (DTE) Power via Media Dependent Interface (MDI)", July 2003.

7.2. Informative References

- [RFC3410] Case, J., Mundy, R., Partain, D. and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", RFC 3410, December 2002.

8. Intellectual Property Statement

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9. Security Considerations

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write. 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.

Setting the following object to incorrect values can result in improper operation of the PSE, including the possibility that the PD does not receive power from the PSE port:

- pethPsePortAdminEnable
- pethPsePortPowerPairs
- pethPsePortPowerPriority
- pethPsePortType

Setting the following objects to incorrect values can result in an excessive number of traps being sent to network management stations:

- pethMainPseUsageThreshold
- pethNotificationControlEnable

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. These are:

- pethPsePortPowerPairsControlAbility
- pethPsePortPowerPriority
- pethPsePortPowerClassifications

It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt their values when sending them over the network via SNMP.

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.

10. Authors' Addresses

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