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.

Berger & Romascanu          Standards Track                     [Page 2]
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

SnmpAdminString
FROM SNMP-FRAMEWORK-MIB;

powerEthernetMIB MODULE-IDENTITY

LAST-UPDATED   "200311240000Z" -- November 24, 2003
ORGANIZATION "IETF Ethernet Interfaces and Hub MIB
Working Group"
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
aPSEPoweDeniedCounter"
::= { 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
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 }
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,
  pethMainPseUsagePower,
  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


7.2. Informative References


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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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