Entity Sensor Management Information Base

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. In particular, it describes managed objects for extending the Entity MIB (RFC 2737) to provide generalized access to information related to physical sensors, which are often found in networking equipment (such as chassis temperature, fan RPM, power supply voltage).

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1. 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].

2. Overview

There is a need for a standardized way of obtaining information 
related to the physical sensors which are commonly found in 
networking equipment. Information such as the current value of the 
sensor, the current operational status, and the data units precision 
associated with the sensor, should be represented in a consistent 
manner for any type of sensor.

Physical sensors are represented in the Entity MIB with 
entPhysicalEntry and an entPhysicalClass value of ‘sensor(8)’. The 
information provided in the ENTITY-SENSOR-MIB module (defined in this 
document) defines a sparse augmentation of the entPhysicalTable, for 
entries which represent physical sensors.

2.1. Terms

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 BCP 14, RFC 2119. 
[RFC2119]

2.2. Relationship to the Entity MIB

The MIB objects defined in this document provide a sparse 
augmentation to the entPhysicalTable in the Entity MIB, for entries 
in which the associated entPhysicalClass object is equal to 
‘sensor(8)’. An agent is expected to maintain an entPhySensorEntry 
with the same entPhysicalIndex value for each entPhysicalEntry 
representing a physical sensor. Therefore, implementation of the 
entityPhysicalGroup is required for agents that implement the Entity 
Sensor MIB.
2.3. Relationship to General Thresholding Mechanisms

There are no specialized sensor value thresholding mechanisms defined in this MIB module. Instead, it is recommended that a generalized thresholding MIB, such as the mechanisms defined by the Alarm and Events groups of the Remote Network Monitoring MIB [RFC2819], be used for this purpose.

3. MIB Structure

The Entity Sensor MIB contains a single group called the entitySensorValueGroup, which allows objects to convey the current value and status of a physical sensor.

The entitySensorValueGroup contains a single table, called the entPhySensorTable, which provides a small number of read-only objects:

- **entPhySensorType**
  
  This object identifies the type of data units associated with the sensor value.

- **entPhySensorScale**
  
  This object identifies the (power of 10) scaling factor associated with the sensor value.

- **entPhySensorPrecision**
  
  This object identifies the number of decimal places of precision associated with the sensor value.

- **entPhySensorValue**
  
  This object identifies the current value of the sensor.

- **entPhySensorOperStatus**
  
  This object identifies the current operational status of the sensor (as it’s known to the agent).

- **entPhySensorUnitsDisplay**
  
  This object provides a textual description of the data units represented by the entPhySensorType and entPhySensorScale objects.

- **entPhySensorValueTimeStamp**
  
  The object identifies the value of sysUpTime at the time the agent last updated the information in the entry. This object is only relevant if the agent uses a polling implementation strategy, (i.e., the associated entPhySensorValueUpdateRate object is greater than zero).
entPhySensorValueUpdateRate

This object indicates the nature of the agent implementation of the entPhySensorEntry, and contains the (possibly estimated) number of milliseconds that elapse between polling updates of the information in the associated entry. The value zero indicates that the agent always return current data for the entry (as opposed to the data as it was at the last polling interval).

4. Definitions

ENTITY-SENSOR-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE,
   Integer32, Unsigned32, mib-2
   FROM SNMPv2-SMI

MODULE-COMPLIANCE, OBJECT-GROUP
   FROM SNMPv2-CONF

TEXTUAL-CONVENTION, TimeStamp
   FROM SNMPv2-TC

entPhysicalIndex, entityPhysicalGroup
   FROM ENTITY-MIB

SnmpAdminString
   FROM SNMP-FRAMEWORK-MIB;

entitySensorMIB MODULE-IDENTITY

LAST-UPDATED    "200212160000Z"

ORGANIZATION    "IETF Entity MIB Working Group"

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DESCRIPTION

"This module defines Entity MIB extensions for physical sensors.

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REVISION        "200212160000Z"
DESCRIPTION

"Initial version of the Entity Sensor MIB module, published as RFC 3433."

::= { mib-2 99 }

entitySensorObjects              OBJECT IDENTIFIER
 ::= { entitySensorMIB 1 }

-- entitySensorNotifications        OBJECT IDENTIFIER
--     ::= { entitySensorMIB 2 }

entitySensorConformance          OBJECT IDENTIFIER
 ::= { entitySensorMIB 3 }

--

-- Textual Conventions
--

EntitySensorDataType ::= TEXTUAL-CONVENTION

STATUS       current

DESCRIPTION

"An object using this data type represents the Entity Sensor measurement data type associated with a physical sensor value. The actual data units are determined by examining an object of this type together with the associated EntitySensorDataScale object.

An object of this type SHOULD be defined together with objects of type EntitySensorDataScale and EntitySensorPrecision. Together, associated objects of these three types are used to identify the semantics of an object of type EntitySensorValue."
Valid values are:

other(1): a measure other than those listed below
unknown(2): unknown measurement, or arbitrary, relative numbers
voltsAC(3): electric potential
voltsDC(4): electric potential
amperes(5): electric current
watts(6): power
hertz(7): frequency
celsius(8): temperature
percentRH(9): percent relative humidity
rpm(10): shaft revolutions per minute
cmm(11): cubic meters per minute (airflow)
truthvalue(12): value takes { true(1), false(2) }

"SYNTAX INTEGER {
other(1),
unknown(2),
voltsAC(3),
voltsDC(4),
amperes(5),
watts(6),
hertz(7),
celsius(8),
percentRH(9),
rpm(10),
cmm(11),
truthvalue(12)
}

EntitySensorDataScale ::= TEXTUAL-CONVENTION

STATUS       current
DESCRIPTION
"An object using this data type represents a data scaling factor, represented with an International System of Units (SI) prefix. The actual data units are determined by examining an object of this type together with the associated EntitySensorDataType object.

An object of this type SHOULD be defined together with objects of type EntitySensorDataType and EntitySensorPrecision. Together, associated objects of these three types are used to identify the semantics of an object of type EntitySensorValue."

REFERENCE
"The International System of Units (SI),
SYNTAX INTEGER {
  yocto(1),  -- 10^-24
  zepto(2),  -- 10^-21
  atto(3),   -- 10^-18
  femto(4),  -- 10^-15
  pico(5),   -- 10^-12
  nano(6),   -- 10^-9
  micro(7),  -- 10^-6
  milli(8),  -- 10^-3
  units(9),  -- 10^0
  kilo(10),  -- 10^3
  mega(11),  -- 10^6
  giga(12),  -- 10^9
  tera(13),  -- 10^12
  exa(14),   -- 10^15
  peta(15),  -- 10^18
  zetta(16), -- 10^21
  yotta(17)  -- 10^24
}

EntitySensorPrecision ::= TEXTUAL-CONVENTION
STATUS       current
DESCRIPTION  "An object using this data type represents a sensor precision range.

An object of this type SHOULD be defined together with objects of type EntitySensorDataType and EntitySensorDataScale. Together, associated objects of these three types are used to identify the semantics of an object of type EntitySensorValue.

If an object of this type contains a value in the range 1 to 9, it represents the number of decimal places in the fractional part of an associated EntitySensorValue fixed-point number.

If an object of this type contains a value in the range -8 to -1, it represents the number of accurate digits in the associated EntitySensorValue fixed-point number.

The value zero indicates the associated EntitySensorValue object is not a fixed-point number.

Agent implementors must choose a value for the associated EntitySensorPrecision object so that the precision and
accuracy of the associated EntitySensorValue object is correctly indicated.

For example, a physical entity representing a temperature sensor that can measure 0 degrees to 100 degrees C in 0.1 degree increments, +/- 0.05 degrees, would have an EntitySensorPrecision value of ’1’, an EntitySensorDataScale value of ’units(9)’, and an EntitySensorValue ranging from ’0’ to ’1000’. The EntitySensorValue would be interpreted as ’degrees C * 10’.

SYNTAX Integer32 (-8..9)

EntitySensorValue ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION "An object using this data type represents an Entity Sensor value. An object of this type SHOULD be defined together with objects of type EntitySensorDataType, EntitySensorDataScale and EntitySensorPrecision. Together, associated objects of those three types are used to identify the semantics of an object of this data type.

The semantics of an object using this data type are determined by the value of the associated EntitySensorDataType object.

If the associated EntitySensorDataType object is equal to ’voltsAC(3)’, ’voltsDC(4)’, ’amperes(5)’, ’watts(6)’, ’hertz(7)’, ’celsius(8)’, or ’cmm(11)’, then an object of this type MUST contain a fixed point number ranging from -999,999,999 to +999,999,999. The value -1000000000 indicates an underflow error. The value +1000000000 indicates an overflow error. The EntitySensorPrecision indicates how many fractional digits are represented in the associated EntitySensorValue object.

If the associated EntitySensorDataType object is equal to ’percentRH(9)’, then an object of this type MUST contain a number ranging from 0 to 100.

If the associated EntitySensorDataType object is equal to ’rpm(10)’, then an object of this type MUST contain a number ranging from -999,999,999 to +999,999,999.

If the associated EntitySensorDataType object is equal to ’truthvalue(12)’, then an object of this type MUST contain either the value ’true(1)’ or the value ’false(2)’. 
If the associated EntitySensorDataType object is equal to 'other(1)' or unknown(2)', then an object of this type MUST contain a number ranging from -1000000000 to 1000000000."

SYNTAX Integer32 (-1000000000..1000000000)

EntitySensorStatus ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION
"An object using this data type represents the operational status of a physical sensor.

The value 'ok(1)' indicates that the agent can obtain the sensor value.

The value 'unavailable(2)' indicates that the agent presently cannot obtain the sensor value.

The value 'nonoperational(3)' indicates that the agent believes the sensor is broken. The sensor could have a hard failure (disconnected wire), or a soft failure such as out-of-range, jittery, or wildly fluctuating readings."

SYNTAX INTEGER {
    ok(1),
    unavailable(2),
    nonoperational(3)
}

--

-- Entity Sensor Table
--

entPhySensorTable OBJECT-TYPE
SYNTAX        SEQUENCE OF EntPhySensorEntry
MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
"This table contains one row per physical sensor represented by an associated row in the entPhysicalTable."
::= { entitySensorObjects 1 }

entPhySensorEntry OBJECT-TYPE
SYNTAX        EntPhySensorEntry
MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
"Information about a particular physical sensor."
An entry in this table describes the present reading of a sensor, the measurement units and scale, and sensor operational status.

Entries are created in this table by the agent. An entry for each physical sensor SHOULD be created at the same time as the associated entPhysicalEntry. An entry SHOULD be destroyed if the associated entPhysicalEntry is destroyed.

INDEX { entPhysicalIndex } -- SPARSE-AUGMENTS
 ::= { entPhySensorTable 1 }

EntPhySensorEntry ::= SEQUENCE {
  entPhySensorType            EntitySensorDataType,
  entPhySensorScale           EntitySensorDataScale,
  entPhySensorPrecision       EntitySensorPrecision,
  entPhySensorValue           EntitySensorValue,
  entPhySensorOperStatus      EntitySensorStatus,
  entPhySensorUnitsDisplay    SnmpAdminString,
  entPhySensorValueTimeStamp  TimeStamp,
  entPhySensorValueUpdateRate Unsigned32
}

entPhySensorType OBJECT-TYPE
SYNTAX        EntitySensorDataType
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
  "The type of data returned by the associated entPhySensorValue object.

  This object SHOULD be set by the agent during entry creation, and the value SHOULD NOT change during operation."
 ::= { entPhySensorEntry 1 }

entPhySensorScale OBJECT-TYPE
SYNTAX        EntitySensorDataScale
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
  "The exponent to apply to values returned by the associated entPhySensorValue object.

  This object SHOULD be set by the agent during entry creation, and the value SHOULD NOT change during operation."
 ::= { entPhySensorEntry 2 }
entPhySensorPrecision OBJECT-TYPE
SYNTAX EntitySensorPrecision
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The number of decimal places of precision in fixed-point sensor values returned by the associated entPhySensorValue object.

This object SHOULD be set to '0' when the associated entPhySensorType value is not a fixed-point type: e.g., 'percentRH(9)', 'rpm(10)', 'cmm(11)', or 'truthvalue(12)'.

This object SHOULD be set by the agent during entry creation, and the value SHOULD NOT change during operation."
 ::= { entPhySensorEntry 3 }

entPhySensorValue OBJECT-TYPE
SYNTAX EntitySensorValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The most recent measurement obtained by the agent for this sensor.

To correctly interpret the value of this object, the associated entPhySensorType, entPhySensorScale, and entPhySensorPrecision objects must also be examined."
 ::= { entPhySensorEntry 4 }

entPhySensorOperStatus OBJECT-TYPE
SYNTAX EntitySensorStatus
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The operational status of the sensor."
 ::= { entPhySensorEntry 5 }

entPhySensorUnitsDisplay OBJECT-TYPE
SYNTAX SnmpAdminString
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A textual description of the data units that should be used in the display of entPhySensorValue."
 ::= { entPhySensorEntry 6 }
entPhySensorValueTimeStamp OBJECT-TYPE
SYNTAX        TimeStamp
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION    "The value of sysUpTime at the time the status and/or value of this sensor was last obtained by the agent."
::= { entPhySensorEntry 7 }

entPhySensorValueUpdateRate  OBJECT-TYPE
SYNTAX        Unsigned32
UNITS         "milliseconds"
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION    "An indication of the frequency that the agent updates the associated entPhySensorValue object, representing in milliseconds.

The value zero indicates:

- the sensor value is updated on demand (e.g., when polled by the agent for a get-request),
- the sensor value is updated when the sensor value changes (event-driven),
- the agent does not know the update rate.

"
::= { entPhySensorEntry 8 }

--
-- Conformance Section
--

entitySensorCompliances OBJECT IDENTIFIER
 ::= { entitySensorConformance 1 }
entitySensorGroups         OBJECT IDENTIFIER
 ::= { entitySensorConformance 2 }

entitySensorCompliance MODULE-COMPLIANCE
STATUS        current
DESCRIPTION    "Describes the requirements for conformance to the Entity Sensor MIB module."
MODULE        -- this module
MANDATORY-GROUPS { entitySensorValueGroup }
MODULE ENTITY-MIB
    MANDATORY-GROUPS { entityPhysicalGroup }

::= { entitySensorCompliances 1 }

-- Object Groups

entitySensorValueGroup OBJECT-GROUP
    OBJECTS {
        entPhySensorType,
        entPhySensorScale,
        entPhySensorPrecision,
        entPhySensorValue,
        entPhySensorOperStatus,
        entPhySensorUnitsDisplay,
        entPhySensorValueTimeStamp,
        entPhySensorValueUpdateRate
    }

STATUS  current
DESCRIPTION
    "A collection of objects representing physical entity sensor information."

::= { entitySensorGroups 1 }

END

5. Intellectual Property

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6. Acknowledgements

This memo is a product of the Entity MIB working group. It is based on an existing proprietary MIB module written by Cliff Sojourner.

7. Normative References


8. Informative References


9. Security Considerations

There is one managed object in this MIB that may contain sensitive information. This is:

   entPhySensorValue

This object may expose the values of particular physical sensors for a device.

SNMPv1 by itself is not a secure environment. Even if the network itself is secure (for example by using IPSec), 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 implementors consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model STD 62, RFC 3414 [RFC3414] and the View-based Access Control Model STD 62, RFC 3415 [RFC3415] 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 only the objects, and those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.
10. Authors’ Addresses

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