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Power Consumption MIB for IP forwarding devices
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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols. In particular it defines objects for monitoring power consumption with IP network element that has a function of dynamic performance control.

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Table of Contents

1.	Introduction	3
2.	The Internet-Standard Management Framework	3
3.	Conventions	3
4.	Overview	3
4.1.	The module constitution of the network device	4
4.2.	The peak and minimum power consumption	4
5.	Structure of the MIB Module	4
5.1.	Textual Conventions	5
5.2.	The pconPowerCon Group	5
6.	Relationship to Other MIB Modules	6
6.1.	Relationship to the SNMPv2-MIB	6
6.2.	MIB modules required for IMPORTS	6
7.	Definitions	6
8.	Security Considerations	12
9.	IANA Considerations	13
10.	Acknowledgements	13
11.	References	13
11.1.	Normative References	13
11.2.	Informative References	14
Appendix A.	Change Log	14

1. Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols. In particular it defines objects for monitoring power consumption with IP network element that has a function of dynamic performance control.

The goal of this MIB is the realization of effective reducing power consumption for the network element. Currently, routers and switches are able to manage dynamic performance.

Modern network devices can reduce power consumption by the performance control. This MIB is used to optimize performance. Some routers with a dynamic performance control lowers the operation clock frequency when the amount of traffic decreases and suppresses a surplus performance. The performance control is carried out in each entity of the device, and it becomes necessary to measure the electricity information every entity.

This MIB is used to know the situation of power consumption and peak power. This makes it possible to know the effect of the power saving of the performance control.

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. 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](#) [[RFC2119](#)].

4. Overview

The purpose of this MIB is to provide monitoring power consumption information.

The Power Consumption MIB module (POWER-CONSUMPTION-MIB) is designed to:

- o Support monitoring of modules' measured power consumption information.

4.1. The module constitution of the network device

In order to understand the current power consumption of the entire router, you can accomplish with a simple configuration of MIB objects. But if you try to reduce the power consumption of the router, you need to get more detailed information.

This MIB assumes that the router is composed of control plane, forwarding plane and network interface. It thinks about these three pieces as an element to control the electric power. Individual information is collected from these modules, and the operational condition of each module is understood.

The judgment whether an appropriate setting can be achieved becomes possible by knowing operation information, and it is possible to reflect it in the policy decision in the future. As a result, the engine control of three modules achieves reduction of the consumption electricity.

4.2. The peak and minimum power consumption

The range of power consumption based on the performance setting of entity can be understood by acquiring the maximum and minimum amount of power consumption, and the effect of the performance setting can be confirmed.

5. Structure of the MIB Module

This section presents the structure of the POWER CONSUMPTION MIB module. The objects are arranged into the following groups:

- o pconObjects - defines the objects forming the basis for the POWER CONSUMPTION MIB. These objects are divided up by function into the following groups:
 - * Power Consumption Group - This group contains the objects which describe power consumption to network device.
- o pconConformance - defines minimal and full conformance of implementations to this POWER CONSUMPTION MIB.

5.1. Textual Conventions

- o PowerConUnit:

Attributes with this syntax are configuration parameters that reference the power consumption measurement data unit.

other(1) - a measure other than those listed below
wattSec(2) - Watt Second[Wsec]
wattMin(3) - Watt minute[Wmin]
wattHour(4) - Watt hour[Wh]

5.2. The pconPowerCon Group

The pconPowerCon Subtree reports power consumption information.

```
--pconObjects(1)
|
+--pconPowerCon(1) [entPhysicalIndex]
|
+-- EntitySensorDataScale pconPowerConScale(1)
+-- PowerConsUnit        pconPowerConUnit(2)
+-- ZeroBasedCounter64   pconPowerConValue(3)
+-- Gauge32              pconPowerConPeakValue(4)
+-- TimeStamp            pconPowerConPeakTime(5)
+-- TruthValue           pconPowerConPeakReset(6)
+-- Gauge32              pconPowerConMinimumValue(7)
+-- TimeStamp            pconPowerConMinimumTime(8)
+-- TruthValue           pconPowerConMinimumReset(9)
```

- o pconPowerConScale - This object identifies the scaling factor associated with the power consumption value.
- o pconPowerConUnit - This object identifies the unit associated with the power consumption value.
- o pconPowerConValue - This object identifies the number of power consumption.
- o pconPowerConPeakValue - This object identifies the maximum value of power consumption."
- o pconPowerConPeakTime - This object identifies the time that the power consumption at the peak was updated.
- o pconPowerConPeakReset - This object is used to reset the peak value and peak time of power consumption.

- o pconPowerConMinimumValue - This object identifies the minimum value of power consumption."
- o pconPowerConMinimumTime - This object identifies the time that the power consumption at the minimum was updated.
- o pconPowerConMinimumReset - This object is used to reset the minimum value and minimum time of power consumption.

6. Relationship to Other MIB Modules

6.1. Relationship to the SNMPv2-MIB

The 'system' group in the SNMPv2-MIB [[RFC3418](#)] is defined as being mandatory for all systems, and the objects apply to the entity as a whole. The 'system' group provides identification of the management entity and certain other system-wide data. The POWER CONSUMPTION MIB does not duplicate those objects.

6.2. MIB modules required for IMPORTS

The POWER CONSUMPTION MIB module requires following MIB modules for IMPORTS:

- o SNMPv2-SMI defined in [[RFC2578](#)]
- o SNMPv2-TC defined in [[RFC2579](#)]
- o SNMPv2-CONF defined in [[RFC2580](#)]
- o HCNUM-TC defined in [[RFC2856](#)]
- o ENTITY-MIB defined in [[RFC4133](#)]
- o ENTITY-SENSOR-MIB defined in [[RFC3433](#)]

7. Definitions

POWER-CONSUMPTION-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, mib-2, Gauge32
FROM SNMPv2-SMI
TEXTUAL-CONVENTION, TimeStamp, TruthValue
FROM SNMPv2-TC
MODULE-COMPLIANCE, OBJECT-GROUP
FROM SNMPv2-CONF
ZeroBasedCounter64

FROM HCNM-TC
entPhysicalIndex
FROM ENTITY-MIB
EntitySensorDataScale
FROM ENTITY-SENSOR-MIB;

pconMIB MODULE-IDENTITY

LAST-UPDATED "201001180000Z" -- 18 Jan 2010
ORGANIZATION "Operations and Management Area Working Group"
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DESCRIPTION "

The MIB module for management of reducing the power consumption for network device which can be useful for dynamic power management."

REVISION "201001180000Z" -- 18 Jan 2010

DESCRIPTION "Initial version."

::= { mib-2 xxx }

-- Top level components of this MIB

pconObjects OBJECT IDENTIFIER

::= { pconMIB 1 }

pconConformance OBJECT IDENTIFIER

::= { pconMIB 2 }

-- Textual Conventions

PowerConUnit ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"Represents the power consumption measurement data unit.

Valid values are:

other(1): a measure other than those listed below

wattSec(2): Watt Second[Wsec]

wattMin(3): Watt minute[Wmin]

wattHour(4): Watt hour[Wh]

-- joule(5): joule[J]

-- electronVolt(6): electron volt[eV]

"

SYNTAX INTEGER {

other (1),

wattSec (2),

wattMin (3),

wattHour (4)

-- joule (5),

-- electronVolt(6)

}

-- pconPowerConTable

pconPowerConTable OBJECT-TYPE

SYNTAX SEQUENCE OF PconPowerConEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The power consumption information table."


```
::= { pconObjects 1 }
```

pconPowerConEntry OBJECT-TYPE

SYNTAX PconPowerConEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The power consumption information entry."

```
INDEX {  
    entPhysicalIndex  
}
```

```
::= { pconPowerConTable 1 }
```

PconPowerConEntry ::= SEQUENCE {

pconPowerConScale EntitySensorDataScale,

pconPowerConUnit PowerConUnit,

pconPowerConValue ZeroBasedCounter64,

pconPowerConPeakValue Gauge32,

pconPowerConPeakTime TimeStamp,

pconPowerConPeakReset TruthValue,

pconPowerConMinimumValue Gauge32,

pconPowerConMinimumTime TimeStamp,

pconPowerConMinimumReset TruthValue

}

pconPowerConScale OBJECT-TYPE

SYNTAX EntitySensorDataScale

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This variable indicates the exponent to apply to the value of
pconPowerConValue object.

This object SHOULD be set by the agent during entry creation,
and the value SHOULD NOT change during operation."

```
::= { pconPowerConEntry 1 }
```

pconPowerConUnit OBJECT-TYPE

SYNTAX PowerConUnit

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This variable indicates the unit to apply to the value of
pconPowerConValue object.

This object SHOULD be set by the agent during entry creation,
and the value SHOULD NOT change during operation."

```
::= { pconPowerConEntry 2 }
```


pconPowerConValue OBJECT-TYPE

SYNTAX ZeroBasedCounter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This variable indicates the number of power consumption."

::= { pconPowerConEntry 3 }

pconPowerConPeakValue OBJECT-TYPE

SYNTAX Gauge32

UNITS "watts"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This variable indicates the peak value of power consumption."

::= { pconPowerConEntry 4 }

pconPowerConPeakTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime when pconPowerConPeakValue was last updated."

::= { pconPowerConEntry 5 }

pconPowerConPeakReset OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object always returns false on read. If this object is set to true, pconPowerConPeakValue and pconPowerConPeakTime are initialized."

::= { pconPowerConEntry 6 }

pconPowerConMinimumValue OBJECT-TYPE

SYNTAX Gauge32

UNITS "watts"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This variable indicates the minimum value of power consumption."

::= { pconPowerConEntry 7 }

pconPowerConMinimumTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime when pconPowerConMinimumValue was last updated."

::= { pconPowerConEntry 8 }

pconPowerConMinimumReset OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object always returns false on read. If this object is set to true, pconPowerConMinimumValue and pconPowerConMinimumTime are initialized."

::= { pconPowerConEntry 9 }

-- Conformance Information

pconCompliances OBJECT IDENTIFIER

::= { pconConformance 1 }

pconGroups OBJECT IDENTIFIER

::= { pconConformance 2 }

-- Compliance statements

pconCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION "The compliance statement for network device supporting POWER-CONSUMPTION-MIB."

MODULE -- this module

MANDATORY-GROUPS {
pconPowerConGroup
}

MODULE ENTITY-MIB

MANDATORY-GROUPS { entityPhysicalGroup }

::= { pconCompliances 1 }

pconPowerConGroup OBJECT-GROUP

OBJECTS {
pconPowerConScale,
pconPowerConUnit,
pconPowerConValue,
pconPowerConPeakValue,
pconPowerConPeakTime,
pconPowerConPeakReset,
pconPowerConMinimumValue,


```
        pconPowerConMinimumTime,  
        pconPowerConMinimumReset  
    }  
    STATUS      current  
    DESCRIPTION "A collection of objects providing information of the  
                power consumption in the network device."  
    ::= { pconGroups 1 }
```

END

8. Security Considerations

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 value of pconPowerConPeakValue and pconPowerConPeakTime may be reset by setting pconPowerConPeakReset = true(1).

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.

9. IANA Considerations

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

Descriptor	OBJECT IDENTIFIER value
-----	-----
pconMIB	{ mib-2 XXX }

10. Acknowledgements

The authors wish to thank Tomoyuki Iijima, Yoshifumi Atarashi.

11. References

11.1. Normative References

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[Appendix A.](#) Change Log

The following changes have been made from
[draft-teraoka-powerconsumption-mib-00](#) .

1. Completely reworked the entire pconPowerCon Group in order to be
compliant with ENTITY-MIB.

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