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<Green Usage Monitoring Information Base>
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Abstract

This memo defines a portion of the Management Information Base (MIB), the GreenUsage MIB, for use with network management protocols in the Internet community. In particular, the GreenUsage MIB can be used to monitor the power-on/power-off status of electrical devices.

Table of Contents

1. The Internet-Standard Management Framework	3
2. Overview	3
2.1. The GreenUsage monitoring concept	3
2.2. Terminology	3
3. GreenUsage Monitoring Requirements	4
4. MIB Design	4
5. MIB Definitions	5
5.1. The GreenUsage MIB	5
6. Security Considerations	13
7. IANA Considerations	13
8. References	14
8.1. Normative References	14
8.2. Informative References	14
9. Acknowledgements	15
10. Authors' Addresses	15

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

2.1. The GreenUsage monitoring concept

Monitor the power-on/power-off status of electrical devices. If a device is in power-on state beyond business hours, it is wasteful usage of electricity. The GreenUsage concept aims to monitor and reduce this wastage.

The feature of the GreenUsage-MIB is simple and easy to use and develop. The GreenUsage-MIB has essential functions to monitoring the power status of the devices. The GreenUsage-MIB is a simple structure and has only 6 Managed Objects (MOs). The file size of the GreenUsage-MIB is small, therefore the MIB can be developed on the limited computational resource such as a mobile device.

This document defines a set of managed objects (MOs) that can be used to monitor the power-on/power-off status of electrical devices.

2.2. Terminology

Electrical device: a device that consumes electricity. Power-on/power-off status indicates whether the device is powered on or not. Often it is not possible to get a direct indication of whether a device is powered on or not. But indirect means may be used to infer the power-on/power-off status of a device. For example, if a device shows some network activity, it can be inferred that the device is powered on. Note that it is difficult to infer that a device is powered off. Also, there may be several states between power-on and power-off e.g. sleep state, power-saving state etc.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14, RFC 2119 [RFC2119].

3. GreenUsage Monitoring Requirements

Multiple mechanisms may be used to determine whether a device is powered on or not. The mechanisms will depend on the nature of the device. Since the number of devices may be very large, the identification, usage type, and location of devices needs to be addressed with care.

4. MIB Design

The basic principle has been to keep the MIB as simple as possible and at the same time to make it effective enough so that the essential needs of monitoring are met.

The GreenUsage-MIB is composed of the following

- device Table: a list of the devices that will be monitored
- deviceStatus Table: the power-on/power-off status of the devices

5. MIB Definitions

5.1. The GreenUsage MIB

```
GREENUSAGE-MIB DEFINITIONS ::= BEGIN
    IMPORTS
        MODULE-IDENTITY, mib-2, Unsigned32, OBJECT-TYPE
            FROM SNMPv2-SMI -- RFC 2578
        TimeStamp, MacAddress, TEXTUAL-CONVENTION
            FROM SNMPv2-TC -- RFC 2579
        MODULE-COMPLIANCE, OBJECT-GROUP
            FROM SNMPv2-CONF -- RFC 2580
        SnmpAdminString
            FROM SNMP-FRAMEWORK-MIB
    ;

greenUsageMIB MODULE-IDENTITY
    LAST-UPDATED "201301080000Z" -- 8th January, 2013
    ORGANIZATION "PREDICT Working Group"
    CONTACT-INFO
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"

DESCRIPTION

"This MIB module is for monitoring the power-on/power-off
status of electrical devices.

Copyright (C) The IETF Trust (2012). This version of
this MIB module is part of RFC XXXX; see the RFC itself for
full legal notices.

"

-- RFC Ed.: replace XXXX with the actual RFC number & remove this
-- note

REVISION "201301080000Z" -- 8th January, 2013

DESCRIPTION

"added gumDevUsageCreatedTimeStamp to usage table"

REVISION "201207070000Z" -- 7th July, 2012

DESCRIPTION

"The initial version, published as draft-suganuma-greenmib-00.txt"

-- RFC Ed.: replace XXXX with the actual RFC number & remove this
-- note

::= { mib-2 YYY1 } -- Will be assigned by IANA

-- IANA Reg.: Please assign a value for "YYY1" under the
-- 'mib-2' subtree and record the assignment in the SMI
-- Numbers registry.

-- RFC Ed.: When the above assignment has been made, please
-- remove the above note
-- replace "YYY1" here with the assigned value and
-- remove this note.

-- Textual Conventions

GumStatusDetectionMethod ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The object specifies the technology which is used
to detect the power-on/power-off status of a device.
The enumerated values and the corresponding
technology are as follows:

reserved	(0): reserved (Not used)
arpSensing	(1): arp packets from the device
neighborDiscoverySensing	(2): neighbor discovery packets from the device
icmpEchoProbing	(3): ICMP echo packets
switchMonitoring	(4): switch monitoring

"

SYNTAX INTEGER

{
 reserved (0),
 arpSensing (1),
 neighborDiscoverySensing (2),

```

        icmpEchoProbing          (3),
        switchMonitoring         (4)
    }

GumDeviceStatus ::= TEXTUAL-CONVENTION
    STATUS current
    DESCRIPTION
        "The object represents the power-on/power-off
        status of a monitored device.
        unknown          (0)
        powerOn          (1): device is powered on
        powerOff         (2): device is powered off
        sleepMode        (3): device is in sleep mode
        powerSavingMode  (4): device is in
                           powersaving mode
    "
    SYNTAX INTEGER
    {
        unknown          (0),
        powerOn          (1),
        powerOff         (2),
        sleepMode        (3),
        powerSavingMode  (4)
    }

-- The GREENUSAGE MIB has the following 3 primary groups

gumNotifications OBJECT IDENTIFIER ::= { greenUsageMIB 0 }
gumObjects        OBJECT IDENTIFIER ::= { greenUsageMIB 1 }
gumConformance    OBJECT IDENTIFIER ::= { greenUsageMIB 2 }

gumDeviceTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF GumDeviceEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table models the device list

        Entries in this table are required to survive
        a reboot of the managed entity.
    "
    ::= { gumObjects 1 }

gumDeviceEntry OBJECT-TYPE
    SYNTAX      GumDeviceEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION

```



```

        "This entry represents a conceptual row in the
        gumDevice table. It represents a device that
        will be monitored for power-on/power-off status.
        "
INDEX { gumDeviceID }
 ::= { gumDeviceTable 1 }

GumDeviceEntry ::=
SEQUENCE {
    gumDeviceID             Unsigned32,
    gumDeviceName           SnmpAdminString,
    gumDeviceMacAddress     MacAddress,
    gumDeviceType           SnmpAdminString,
    gumDeviceLocation       SnmpAdminString
}

gumDeviceID OBJECT-TYPE
SYNTAX      Unsigned32
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "A unique arbitrary identifier for this device."
 ::= { gumDeviceEntry 1 }

gumDeviceName OBJECT-TYPE
SYNTAX      SnmpAdminString (SIZE(1..64))
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "Administratively assigned textual name of this
    device."
 ::= { gumDeviceEntry 2 }

gumDeviceMacAddress OBJECT-TYPE
SYNTAX      MacAddress
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "MAC Address of this device.
    If there is no MAC address, this object will be
    inaccessible."
 ::= { gumDeviceEntry 3 }

gumDeviceType OBJECT-TYPE
SYNTAX      SnmpAdminString (SIZE(1..64))
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
```

```

        "Administratively assigned textual description about
        usage type of this device."
 ::= { gumDeviceEntry 4 }

gumDeviceLocation OBJECT-TYPE
    SYNTAX      SnmpAdminString (SIZE(1..64))
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "Administratively assigned textual location
        name of this device."
 ::= { gumDeviceEntry 5 }

gumDevUsageTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF GumDevUsageEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table models the device usage status

        Entries in this table are required to survive
        a reboot of the managed entity.
        "
 ::= { gumObjects 2 }

gumDevUsageEntry OBJECT-TYPE
    SYNTAX      GumDevUsageEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This entry represents a conceptual row in the
        gumDevUsage table. It represents a power-on/power-off
        status of a monitored device.
        "
    INDEX { gumDeviceID, gumDevUsageDetID }
 ::= { gumDevUsageTable 1 }

GumDevUsageEntry ::=
    SEQUENCE {
        gumDevUsageDetID      GumStatusDetectionMethod,
        gumDevUsageDetStatus  GumDeviceStatus,
        gumDevUsageDetTimeStamp TimeStamp,
        gumDevUsageCreatedTimeStamp TimeStamp
    }

gumDevUsageDetID OBJECT-TYPE
    SYNTAX      GumStatusDetectionMethod
    MAX-ACCESS  not-accessible
```

```
STATUS      current
DESCRIPTION
    "The detection method by which the usage status is
    computed."
 ::= { gumDevUsageEntry 1 }

gumDevUsageDetStatus OBJECT-TYPE
SYNTAX      GumDeviceStatus
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "the usage status of the device."
 ::= { gumDevUsageEntry 2 }

gumDevUsageDetTimeStamp OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "the time at which the usage status of the
    device was computed."
 ::= { gumDevUsageEntry 3 }

gumDevUsageCreatedTimeStamp OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "the time at which the entry of usage table created."
 ::= { gumDevUsageEntry 4 }

-- Units of conformance
gumGroups      OBJECT IDENTIFIER ::= { gumConformance 1}
gumCompliances OBJECT IDENTIFIER ::= { gumConformance 2}

gumObjectsGroup OBJECT-GROUP
OBJECTS {
    gumDeviceName,
    gumDeviceMacAddress,
    gumDeviceType,
    gumDeviceLocation,
    gumDevUsageDetStatus,
    gumDevUsageDetTimeStamp,
    gumDevUsageCreatedTimeStamp
}
STATUS      current
DESCRIPTION
    " A collection of objects for basic GreenUsage
```

```
        monitoring."
    ::= { gumGroups 1 }

-- Compliance statements
gumCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for SNMP entities
        which implement the GREENUSAGE-MIB
        "
    MODULE -- this module
        MANDATORY-GROUPS { gumObjectsGroup
        }
    ::= { gumCompliances 1 }

END
```

6. Security Considerations

There are no management objects defined in this MIB module with a MAX-ACCESS clause of read-write.

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:

- gumDeviceName,
- gumDeviceMacAddress,
- gumDeviceType,
- gumDeviceLocation,
- gumDevUsageDetStatus,
- gumDevUsageDetTimeStamp

The above objects may be used to identify users and their activities. Thus these objects may be considered to be particularly sensitive and/or private.

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.

7. IANA Considerations

IANA should assign

1. a base arc in the 'mib-2' (standards track) OID tree for the 'greenUsageMIB' MODULE-IDENTITY defined in the

GREENUSAGE-MIB.

8. References

8.1 Normative References

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8.2 Informative References

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9. Acknowledgements

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