Network Working Group
Request for Comments: 3434
Category:Standards Track

A. Bierman
K. McCloghrie
Cisco Systems, Inc.

December 2002

Remote Monitoring MIB Extensions for High Capacity Alarms

Status of this Memo

Copyright Notice

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 alarm thresholding capabilities found in the Remote Monitoring (RMON) MIB (RFC 2819), to provide similar threshold monitoring of objects based on the Counter64 data type.

Table of Contents

1 The Internet-Standard Management Framework 2
2 Terms 2
3 Overview 2
3.1 Relationship to the Remote Monitoring MIBs 3
4 MIB Structure 4
4.1 MIB Group Overview 4
4.1.1 High Capacity Alarm Control Group 5
4.1.2 High Capacity Alarm Capabilities 6
4.1.3 High Capacity Alarm Notifications 6
5 Definitions 6
6 Intellectual Property 21
7 Acknowledgements 21
8 Normative References 21
9 Informative References 22

10 Security Considerations 22
11 Authors' Addresses 23
12 Full Copyright Statement 24

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. 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]

3. Overview

There is a need for a standardized way of providing the same type of alarm thresholding capabilities for Counter64 objects, as already exists for Counter32 objects. The RMON-1 alarmTable objects and RMON-1 notification types are specific to 32-bit objects, and cannot be used to properly monitor Counter64-based objects. Extensions to these existing constructs which explicitly support Counter64-based objects are needed. These extensions are completely independent of the existing RMON-1 alarm mechanisms.

The usage of Counter64 objects is increasing. One of the causes for this increase is the increasing speeds of network interfaces; RFC 2863 [RFC2863] says:

> As the speed of network media increase, the minimum time in which a 32 bit counter will wrap decreases. For example, a 10Mbs stream of back-to-back, full-size packets causes ifInOctets to wrap in just over 57 minutes; at 100Mbs, the minimum wrap time is 5.7 minutes, and at 1Gbs, the minimum is 34 seconds. Requiring that interfaces be polled frequently enough not to miss a counter wrap is increasingly problematic.

and therefore requires:

> For interfaces that operate at 20,000,000 (20 million) bits per second or less, 32-bit byte and packet counters MUST be supported. For interfaces that operate faster than 20,000,000 bits/second, and slower than 650,000,000 bits/second, 32-bit packet counters MUST be supported and 64-bit octet counters MUST be supported. For interfaces that operate at 650,000,000 bits/second or faster, 64-bit packet counters AND 64-bit octet counters MUST be supported.

Of the variables on which thresholds are set using RMON-1's alarmTable, two of the most popular are: ifInOctets and ifOutOctets. Thus, the increasing usage of the 64-bit versions: ifHCInOctets and ifHCOutOctets means that there is an increasing requirement to use RMON-1's thresholding capability for ifHCInOctets and ifHCOutOctets.

The RMON-1 Alarm Group is implemented not only by all RMON probes, but also by the SNMP agents in many other types of devices for the purpose of monitoring any of their (non-RMON) integer-valued MIB objects. The fact that it has been so widely implemented indicates its obvious value. Without this extension, that obvious value is becoming incomplete because of its lack of support for 64-bit integers. This extension is the easiest, simplest, and most compatible way for an implementation to overcome that lack of support.

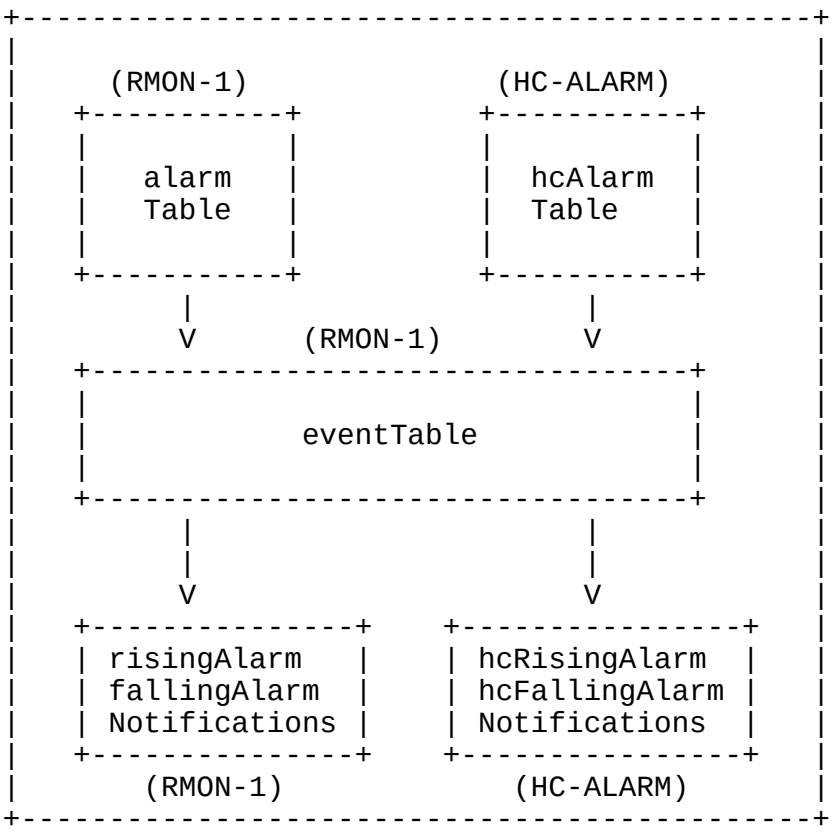
3.1. Relationship to the Remote Monitoring MIBs

This MIB is intended to be implemented in Remote Monitoring (RMON) probes, which may also support the RMON-1 MIB [RFC2819]. Such probes may be stand-alone devices, or may be co-located with other networking devices (e.g., ethernet switches and repeaters).

The functionality of the High Capacity Alarm Group is a superset of RMON-1's Alarm Group. Thus, one day in the distant future, it is a possibility that RMON-1's Alarm Group will be deprecated in favor of this MIB's High Capacity Alarm Group. However, that day will not come before this document, or one of its successors, reaches the same standardization state as RMON-1.

4. MIB Structure

Figure 1: HC-ALARM MIB Functional Structure



4.1. MIB Group Overview

The HC-ALARM MIB contains three MIB groups:

- hcAlarmControlObjects group
  Controls the configuration of alarms for high capacity MIB object instances.

- hcAlarmCapabilities group
  Describes the high capacity alarm capabilities provided by the agent.

- hcAlarmNotifications group
  Provide new rising and falling threshold notifications for high capacity objects.

4.1.1. High Capacity Alarm Control Group

This group contains one table, which is used by a management station to configure high capacity alarm entries. To configure alarm thresholding for Counter64 or CounterBasedGauge64 objects, a management application must configure the hcAlarmTable in a manner similar to how RMON-1's alarmTable is configured.

Because the language in some of the DESCRIPTION clauses of objects in the alarmTable is specific to the alarmTable itself, their defined semantics do not allow them to be used for this MIB also. Therefore, the following objects are essentially cloned from the alarmTable to the hcAlarmTable:

alarmTable	hcAlarmTable
alarmIndex	hcAlarmIndex
alarmInterval	hcAlarmInterval
alarmVariable	hcAlarmVariable
alarmSampleType	hcAlarmSampleType
alarmStartupAlarm	hcAlarmStartupAlarm
alarmRisingEventIndex	hcAlarmRisingEventIndex
alarmFallingEventIndex	hcAlarmFallingEventIndex
alarmOwner	hcAlarmOwner
alarmStatus	hcAlarmStatus

In addition, the following hcAlarmTable objects are used as high capacity values instead of the corresponding 32-bit version in the alarmTable.

alarmTable	hcAlarmTable
alarmValue	hcAlarmAbsValue
	hcAlarmValueStatus
alarmRisingThreshold	hcAlarmRisingThreshAbsValueLo
	hcAlarmRisingThreshAbsValueHi
	hcAlarmRisingThresholdValStatus
alarmFallingThreshold	hcAlarmFallingThreshAbsValueLo
	hcAlarmFallingThreshAbsValueHi
	hcAlarmFallingThresholdValStatus

Nevertheless, the hcAlarmTable does have a few differences from the alarmTable:

- Counter64 based objects are thresholded properly
- an entry is not destroyed if the instance identified by the hcAlarmVariable is not available during a polling interval.

- the RowStatus textual convention is used instead of EntryStatus for the hcAlarmStatus object.
- the non-volatile storage of an HC alarm entry is explicitly controlled with a StorageType parameter.
- a counter is provided to indicate the number of times the hcAlarmVariable object value could not be retrieved by the agent.

4.1.2. High Capacity Alarm Capabilities

This group contains a single scalar object, called hcAlarmCapabilities. It describes the basic high capacity alarm features supported by the agent.

4.1.3. High Capacity Alarm Notifications

This group contains two notifications, hcRisingAlarm and hcFallingAlarm. These are generated for high capacity alarms in the same manner and used to convey essentially the same information as RMON-1's risingAlarm and fallingAlarm notifications do for alarmTable-specified alarms.

5. Definitions

```
HC-ALARM-MIB DEFINITIONS ::= BEGIN

IMPORTS
        MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
        Integer32, Counter32, Unsigned32
                FROM SNMPv2-SMI
        MODULE-COMPLIANCE, OBJECT-GROUP,
        NOTIFICATION-GROUP
                FROM SNMPv2-CONF
        RowStatus, VariablePointer, StorageType,
        TEXTUAL-CONVENTION
                FROM SNMPv2-TC
        CounterBasedGauge64
                FROM HCNUM-TC
        rmon, OwnerString, rmonEventGroup
                FROM RMON-MIB;

hcAlarmMIB MODULE-IDENTITY
    LAST-UPDATED    "200212160000Z"
    ORGANIZATION    "IETF RMONMIB Working Group"
    CONTACT-INFO
            "        Andy Bierman
                     Cisco Systems, Inc.
                Tel: +1 408 527-3711
```

```
              E-mail: abierman@cisco.com
              Postal: 170 West Tasman Drive
                      San Jose, CA USA 95134

                      Keith McCloghrie
                      Cisco Systems, Inc.
                 Tel: +1 408 526-5260
              E-mail: kzm@cisco.com
              Postal: 170 West Tasman Drive
                      San Jose, CA USA 95134

              Send comments to <rmonmib@ietf.org>
              Mailing list subscription info:
                  http://www.ietf.org/mailman/listinfo/rmonmib "
    DESCRIPTION
            "This module defines Remote Monitoring MIB extensions for
             High Capacity Alarms.

             Copyright (C) The Internet Society (2002). This version
             of this MIB module is part of RFC 3434; see the RFC
             itself for full legal notices."

    REVISION        "200212160000Z"
    DESCRIPTION
            "Initial version of the High Capacity Alarm MIB module.
             This version published as RFC 3434."
    ::= { rmon 29 }

hcAlarmObjects       OBJECT IDENTIFIER ::= { hcAlarmMIB 1 }
hcAlarmNotifications OBJECT IDENTIFIER ::= { hcAlarmMIB 2 }
hcAlarmConformance   OBJECT IDENTIFIER ::= { hcAlarmMIB 3 }

hcAlarmControlObjects OBJECT IDENTIFIER ::= { hcAlarmObjects 1 }
hcAlarmCapabilitiesObjects OBJECT IDENTIFIER
                                        ::= { hcAlarmObjects 2 }

--
-- Textual Conventions
--

HcValueStatus ::= TEXTUAL-CONVENTION
    STATUS current
    DESCRIPTION
            "This data type indicates the validity and sign of the data
            in associated object instances which represent the absolute
            value of a high capacity numeric quantity.  Such an object
            may be represented with one or more object instances. An
            object of type HcValueStatus MUST be defined within the same
```

```
            structure as the object(s) representing the high capacity
            absolute value.

            If the associated object instance(s) representing the high
            capacity absolute value could not be accessed during the
            sampling interval, and is therefore invalid, then the
            associated HcValueStatus object will contain the value
            'valueNotAvailable(1)'.

            If the associated object instance(s) representing the high
            capacity absolute value are valid and actual value of the
            sample is greater than or equal to zero, then the associated
            HcValueStatus object will contain the value
            'valuePositive(2)'.

            If the associated object instance(s) representing the high
            capacity absolute value are valid and the actual value of
            the sample is less than zero, then the associated
            HcValueStatus object will contain the value
            'valueNegative(3)'.  The associated absolute value should be
            multiplied by -1 to obtain the true sample value."
        SYNTAX INTEGER {
            valueNotAvailable(1),
            valuePositive(2),
            valueNegative(3)
        }

--
-- High Capacity Alarm Table
--

hcAlarmTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF HcAlarmEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A list of entries for the configuration of high capacity
            alarms."
    ::= { hcAlarmControlObjects 1 }

hcAlarmEntry OBJECT-TYPE
    SYNTAX      HcAlarmEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A conceptual row in the hcAlarmTable. Entries are usually
            created in this table by management application action, but
            may also be created by agent action as well."
```

```
    INDEX { hcAlarmIndex }
    ::= { hcAlarmTable 1 }

HcAlarmEntry ::= SEQUENCE {
    hcAlarmIndex                    Integer32,
    hcAlarmInterval                 Integer32,
    hcAlarmVariable                 VariablePointer,
    hcAlarmSampleType               INTEGER,
    hcAlarmAbsValue                 CounterBasedGauge64,
    hcAlarmValueStatus              HcValueStatus,
    hcAlarmStartupAlarm             INTEGER,
    hcAlarmRisingThreshAbsValueLo   Unsigned32,
    hcAlarmRisingThreshAbsValueHi   Unsigned32,
    hcAlarmRisingThresholdValStatus HcValueStatus,
    hcAlarmFallingThreshAbsValueLo  Unsigned32,
    hcAlarmFallingThreshAbsValueHi  Unsigned32,
    hcAlarmFallingThresholdValStatus HcValueStatus,
    hcAlarmRisingEventIndex         Integer32,
    hcAlarmFallingEventIndex        Integer32,
    hcAlarmValueFailedAttempts      Counter32,
    hcAlarmOwner                    OwnerString,
    hcAlarmStorageType              StorageType,
    hcAlarmStatus                   RowStatus }

hcAlarmIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..65535)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "An arbitrary integer index value used to uniquely identify
            this high capacity alarm entry."
    ::= { hcAlarmEntry 1 }

hcAlarmInterval OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    UNITS      "seconds"
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The interval in seconds over which the data is sampled and
            compared with the rising and falling thresholds.  When
            setting this variable, care should be taken in the case of
            deltaValue sampling - the interval should be set short
            enough that the sampled variable is very unlikely to
            increase or decrease by more than 2^63 - 1 during a single
            sampling interval.
```

```
            This object may not be modified if the associated
            hcAlarmStatus object is equal to active(1)."
    ::= { hcAlarmEntry 2 }

hcAlarmVariable OBJECT-TYPE
    SYNTAX      VariablePointer
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The object identifier of the particular variable to be
            sampled.  Only variables that resolve to an ASN.1 primitive
            type of INTEGER (INTEGER, Integer32, Counter32, Counter64,
            Gauge, or TimeTicks) may be sampled.

            Because SNMP access control is articulated entirely in terms
            of the contents of MIB views, no access control mechanism
            exists that can restrict the value of this object to
            identify only those objects that exist in a particular MIB
            view.  Because there is thus no acceptable means of
            restricting the read access that could be obtained through
            the alarm mechanism, the probe must only grant write access
            to this object in those views that have read access to all
            objects on the probe.

            This object may not be modified if the associated
            hcAlarmStatus object is equal to active(1)."
    ::= { hcAlarmEntry 3 }

hcAlarmSampleType OBJECT-TYPE
    SYNTAX INTEGER {
               absoluteValue(1),
               deltaValue(2)
           }
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The method of sampling the selected variable and
            calculating the value to be compared against the thresholds.
            If the value of this object is absoluteValue(1), the value
            of the selected variable will be compared directly with the
            thresholds at the end of the sampling interval.  If the
            value of this object is deltaValue(2), the value of the
            selected variable at the last sample will be subtracted from
            the current value, and the difference compared with the
            thresholds.

            If the associated hcAlarmVariable instance could not be
            obtained at the previous sample interval, then a delta
```

```
            sample is not possible, and the value of the associated
            hcAlarmValueStatus object for this interval will be
            valueNotAvailable(1).

            This object may not be modified if the associated
            hcAlarmStatus object is equal to active(1)."
    ::= { hcAlarmEntry 4 }

hcAlarmAbsValue OBJECT-TYPE
    SYNTAX      CounterBasedGauge64
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The absolute value (i.e., unsigned value) of the
            hcAlarmVariable statistic during the last sampling period.
            The value during the current sampling period is not made
            available until the period is completed.

            To obtain the true value for this sampling interval, the
            associated instance of hcAlarmValueStatus must be checked,
            and the value of this object adjusted as necessary.

            If the MIB instance could not be accessed during the
            sampling interval, then this object will have a value of
            zero and the associated instance of hcAlarmValueStatus will
            be set to 'valueNotAvailable(1)'."
    ::= { hcAlarmEntry 5 }

hcAlarmValueStatus OBJECT-TYPE
    SYNTAX      HcValueStatus
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "This object indicates the validity and sign of the data for
            the hcAlarmAbsValue object, as described in the
            HcValueStatus textual convention."
    ::= { hcAlarmEntry 6 }

hcAlarmStartupAlarm OBJECT-TYPE
    SYNTAX     INTEGER {
                  risingAlarm(1),
                  fallingAlarm(2),
                  risingOrFallingAlarm(3)
               }
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The alarm that may be sent when this entry is first set to
```

```
            active.  If the first sample after this entry becomes active
            is greater than or equal to the rising threshold and this
            object is equal to risingAlarm(1) or
            risingOrFallingAlarm(3), then a single rising alarm will be
            generated.  If the first sample after this entry becomes
            valid is less than or equal to the falling threshold and
            this object is equal to fallingAlarm(2) or
            risingOrFallingAlarm(3), then a single falling alarm will be
            generated.

            This object may not be modified if the associated
            hcAlarmStatus object is equal to active(1)."
    ::= { hcAlarmEntry 7 }

hcAlarmRisingThreshAbsValueLo OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The lower 32 bits of the absolute value for threshold for
            the sampled statistic.  The actual threshold value is
            determined by the associated instances of the
            hcAlarmRisingThreshAbsValueHi and
            hcAlarmRisingThresholdValStatus objects, as follows:

               ABS(threshold) = hcAlarmRisingThreshAbsValueLo +
                     (hcAlarmRisingThreshAbsValueHi * 2^^32)

            The absolute value of the threshold is adjusted as required,
            as described in the HcValueStatus textual convention.  These
            three object instances are conceptually combined to
            represent the rising threshold for this entry.

            When the current sampled value is greater than or equal to
            this threshold, and the value at the last sampling interval
            was less than this threshold, a single event will be
            generated.  A single event will also be generated if the
            first sample after this entry becomes valid is greater than
            or equal to this threshold and the associated
            hcAlarmStartupAlarm is equal to risingAlarm(1) or
            risingOrFallingAlarm(3).

            After a rising event is generated, another such event will
            not be generated until the sampled value falls below this
            threshold and reaches the threshold identified by the
            hcAlarmFallingThreshAbsValueLo,
            hcAlarmFallingThreshAbsValueHi, and
            hcAlarmFallingThresholdValStatus objects.
```

```
            This object may not be modified if the associated
            hcAlarmStatus object is equal to active(1)."

    ::= { hcAlarmEntry 8 }

hcAlarmRisingThreshAbsValueHi OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The upper 32 bits of the absolute value for threshold for
            the sampled statistic.  The actual threshold value is
            determined by the associated instances of the
            hcAlarmRisingThreshAbsValueLo and
            hcAlarmRisingThresholdValStatus objects, as follows:

               ABS(threshold) = hcAlarmRisingThreshAbsValueLo +
                     (hcAlarmRisingThreshAbsValueHi * 2^^32)

            The absolute value of the threshold is adjusted as required,
            as described in the HcValueStatus textual convention.  These
            three object instances are conceptually combined to
            represent the rising threshold for this entry.

            When the current sampled value is greater than or equal to
            this threshold, and the value at the last sampling interval
            was less than this threshold, a single event will be
            generated.  A single event will also be generated if the
            first sample after this entry becomes valid is greater than
            or equal to this threshold and the associated
            hcAlarmStartupAlarm is equal to risingAlarm(1) or
            risingOrFallingAlarm(3).

            After a rising event is generated, another such event will
            not be generated until the sampled value falls below this
            threshold and reaches the threshold identified by the
            hcAlarmFallingThreshAbsValueLo,
            hcAlarmFallingThreshAbsValueHi, and
            hcAlarmFallingThresholdValStatus objects.

            This object may not be modified if the associated
            hcAlarmStatus object is equal to active(1)."
    ::= { hcAlarmEntry 9 }

hcAlarmRisingThresholdValStatus OBJECT-TYPE
    SYNTAX      HcValueStatus
    MAX-ACCESS  read-create
    STATUS      current
```

```
    DESCRIPTION
            "This object indicates the sign of the data for the rising
            threshold, as defined by the hcAlarmRisingThresAbsValueLo
            and hcAlarmRisingThresAbsValueHi objects, as described in
            the HcValueStatus textual convention.

            The enumeration 'valueNotAvailable(1)' is not allowed, and
            the associated hcAlarmStatus object cannot be equal to
            'active(1)' if this object is set to this value.

            This object may not be modified if the associated
            hcAlarmStatus object is equal to active(1)."
    ::= { hcAlarmEntry 10 }

hcAlarmFallingThreshAbsValueLo OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The lower 32 bits of the absolute value for threshold for
            the sampled statistic.  The actual threshold value is
            determined by the associated instances of the
            hcAlarmFallingThreshAbsValueHi and
            hcAlarmFallingThresholdValStatus objects, as follows:

               ABS(threshold) = hcAlarmFallingThreshAbsValueLo +
                     (hcAlarmFallingThreshAbsValueHi * 2^^32)

            The absolute value of the threshold is adjusted as required,
            as described in the HcValueStatus textual convention.  These
            three object instances are conceptually combined to
            represent the falling threshold for this entry.

            When the current sampled value is less than or equal to this
            threshold, and the value at the last sampling interval was
            greater than this threshold, a single event will be
            generated.  A single event will also be generated if the
            first sample after this entry becomes valid is less than or
            equal to this threshold and the associated
            hcAlarmStartupAlarm is equal to fallingAlarm(2) or
            risingOrFallingAlarm(3).

            After a falling event is generated, another such event will
            not be generated until the sampled value rises above this
            threshold and reaches the threshold identified by the
            hcAlarmRisingThreshAbsValueLo,
            hcAlarmRisingThreshAbsValueHi, and
            hcAlarmRisingThresholdValStatus objects.
```

```
            This object may not be modified if the associated
            hcAlarmStatus object is equal to active(1)."
    ::= { hcAlarmEntry 11 }

hcAlarmFallingThreshAbsValueHi OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The upper 32 bits of the absolute value for threshold for
            the sampled statistic.  The actual threshold value is
            determined by the associated instances of the
            hcAlarmFallingThreshAbsValueLo and
            hcAlarmFallingThresholdValStatus objects, as follows:

               ABS(threshold) = hcAlarmFallingThreshAbsValueLo +
                     (hcAlarmFallingThreshAbsValueHi * 2^^32)

            The absolute value of the threshold is adjusted as required,
            as described in the HcValueStatus textual convention.  These
            three object instances are conceptually combined to
            represent the falling threshold for this entry.

            When the current sampled value is less than or equal to this
            threshold, and the value at the last sampling interval was
            greater than this threshold, a single event will be
            generated.  A single event will also be generated if the
            first sample after this entry becomes valid is less than or
            equal to this threshold and the associated
            hcAlarmStartupAlarm is equal to fallingAlarm(2) or
            risingOrFallingAlarm(3).

            After a falling event is generated, another such event will
            not be generated until the sampled value rises above this
            threshold and reaches the threshold identified by the
            hcAlarmRisingThreshAbsValueLo,
            hcAlarmRisingThreshAbsValueHi, and
            hcAlarmRisingThresholdValStatus objects.

            This object may not be modified if the associated
            hcAlarmStatus object is equal to active(1)."
    ::= { hcAlarmEntry 12 }

hcAlarmFallingThresholdValStatus OBJECT-TYPE
    SYNTAX      HcValueStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
```

```
            "This object indicates the sign of the data for the falling
            threshold, as defined by the hcAlarmFallingThreshAbsValueLo
            and hcAlarmFallingThreshAbsValueHi objects, as described in
            the HcValueStatus textual convention.

            The enumeration 'valueNotAvailable(1)' is not allowed, and
            the associated hcAlarmStatus object cannot be equal to
            'active(1)' if this object is set to this value.

            This object may not be modified if the associated
            hcAlarmStatus object is equal to active(1)."
    ::= { hcAlarmEntry 13 }

hcAlarmRisingEventIndex OBJECT-TYPE
    SYNTAX      Integer32 (0..65535)
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The index of the eventEntry that is used when a rising
            threshold is crossed.  The eventEntry identified by a
            particular value of this index is the same as identified by
            the same value of the eventIndex object.  If there is no
            corresponding entry in the eventTable, then no association
            exists.  In particular, if this value is zero, no associated
            event will be generated, as zero is not a valid event index.

            This object may not be modified if the associated
            hcAlarmStatus object is equal to active(1)."
    ::= { hcAlarmEntry 14 }

hcAlarmFallingEventIndex OBJECT-TYPE
    SYNTAX      Integer32 (0..65535)
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The index of the eventEntry that is used when a falling
            threshold is crossed.  The eventEntry identified by a
            particular value of this index is the same as identified by
            the same value of the eventIndex object.  If there is no
            corresponding entry in the eventTable, then no association
            exists.  In particular, if this value is zero, no associated
            event will be generated, as zero is not a valid event index.

            This object may not be modified if the associated
            hcAlarmStatus object is equal to active(1)."
    ::= { hcAlarmEntry 15 }

hcAlarmValueFailedAttempts OBJECT-TYPE
```

```
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The number of times the associated hcAlarmVariable instance
            was polled on behalf of this hcAlarmEntry, (while in the
            active state) and the value was not available.  This counter
            may experience a discontinuity if the agent restarts,
            indicated by the value of sysUpTime."
    ::= { hcAlarmEntry 16 }

hcAlarmOwner OBJECT-TYPE
    SYNTAX     OwnerString
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The entity that configured this entry and is therefore
            using the resources assigned to it."
    ::= { hcAlarmEntry 17 }

hcAlarmStorageType OBJECT-TYPE
    SYNTAX     StorageType
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The type of non-volatile storage configured for this entry.
            If this object is equal to 'permanent(4)', then the
            associated hcAlarmRisingEventIndex and
            hcAlarmFallingEventIndex objects must be writable."
    ::= { hcAlarmEntry 18 }

hcAlarmStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The status of this row.

            An entry MUST NOT exist in the active state unless all
            objects in the entry have an appropriate value, as described
            in the description clause for each writable object.

            The hcAlarmStatus object may be modified if the associated
            instance of this object is equal to active(1),
            notInService(2), or notReady(3).  All other writable objects
            may be modified if the associated instance of this object is
            equal to notInService(2) or notReady(3)."
    ::= { hcAlarmEntry 19 }
```

```
--
-- Capabilities
--

hcAlarmCapabilities OBJECT-TYPE
    SYNTAX      BITS {
       hcAlarmCreation(0),
       hcAlarmNvStorage(1)
    }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "An indication of the high capacity alarm capabilities
            supported by this agent.

            If the 'hcAlarmCreation' BIT is set, then this agent allows
            NMS applications to create entries in the hcAlarmTable.

            If the 'hcAlarmNvStorage' BIT is set, then this agent allows
            entries in the hcAlarmTable which will be recreated after a
            system restart, as controlled by the hcAlarmStorageType
            object."
    ::= { hcAlarmCapabilitiesObjects 1 }

--
-- Notifications
--

hcAlarmNotifPrefix OBJECT IDENTIFIER
      ::= { hcAlarmNotifications 0 }

hcRisingAlarm NOTIFICATION-TYPE
    OBJECTS  { hcAlarmVariable,
               hcAlarmSampleType,
               hcAlarmAbsValue,
               hcAlarmValueStatus,
               hcAlarmRisingThreshAbsValueLo,
               hcAlarmRisingThreshAbsValueHi,
               hcAlarmRisingThresholdValStatus,
               hcAlarmRisingEventIndex }
    STATUS   current
    DESCRIPTION
            "The SNMP notification that is generated when a high
            capacity alarm entry crosses its rising threshold and
            generates an event that is configured for sending SNMP
            traps.

            The hcAlarmEntry object instances identified in the OBJECTS
```

```
            clause are from the entry that causes this notification to
            be generated."
     ::= { hcAlarmNotifPrefix 1 }

hcFallingAlarm NOTIFICATION-TYPE
    OBJECTS { hcAlarmVariable,
              hcAlarmSampleType,
              hcAlarmAbsValue,
              hcAlarmValueStatus,
              hcAlarmFallingThreshAbsValueLo,
              hcAlarmFallingThreshAbsValueHi,
              hcAlarmFallingThresholdValStatus,
              hcAlarmFallingEventIndex }
    STATUS    current
    DESCRIPTION
            "The SNMP notification that is generated when a high
            capacity alarm entry crosses its falling threshold and
            generates an event that is configured for sending SNMP
            traps.

            The hcAlarmEntry object instances identified in the OBJECTS
            clause are from the entry that causes this notification to
            be generated."
     ::= { hcAlarmNotifPrefix 2 }

--
-- Conformance Section
--

hcAlarmCompliances OBJECT IDENTIFIER ::= { hcAlarmConformance 1 }
hcAlarmGroups      OBJECT IDENTIFIER ::= { hcAlarmConformance 2 }

hcAlarmCompliance MODULE-COMPLIANCE
    STATUS  current
    DESCRIPTION
            "Describes the requirements for conformance to the High
            Capacity Alarm MIB."
    MODULE  -- this module
        MANDATORY-GROUPS {
                            hcAlarmControlGroup,
                            hcAlarmCapabilitiesGroup,
                            hcAlarmNotificationsGroup
                          }

    MODULE RMON-MIB
        MANDATORY-GROUPS { rmonEventGroup }

    ::= { hcAlarmCompliances 1 }
```

```
-- Object Groups

hcAlarmControlGroup OBJECT-GROUP
    OBJECTS {
             hcAlarmInterval,
             hcAlarmVariable,
             hcAlarmSampleType,
             hcAlarmAbsValue,
             hcAlarmValueStatus,
             hcAlarmStartupAlarm,
             hcAlarmRisingThreshAbsValueLo,
             hcAlarmRisingThreshAbsValueHi,
             hcAlarmRisingThresholdValStatus,
             hcAlarmFallingThreshAbsValueLo,
             hcAlarmFallingThreshAbsValueHi,
             hcAlarmFallingThresholdValStatus,
             hcAlarmRisingEventIndex,
             hcAlarmFallingEventIndex,
             hcAlarmValueFailedAttempts,
             hcAlarmOwner,
             hcAlarmStorageType,
             hcAlarmStatus
    }
    STATUS  current
    DESCRIPTION
            "A collection of objects used to configure entries for high
            capacity alarm threshold monitoring purposes."
    ::= { hcAlarmGroups 1 }

hcAlarmCapabilitiesGroup OBJECT-GROUP
    OBJECTS {
             hcAlarmCapabilities
    }
    STATUS  current
    DESCRIPTION
            "A collection of objects used to indicate an agent's high
            capacity alarm threshold monitoring capabilities."
    ::= { hcAlarmGroups 2 }

hcAlarmNotificationsGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
            hcRisingAlarm,
            hcFallingAlarm
    }
    STATUS  current
    DESCRIPTION
            "A collection of notifications to deliver information
            related to a high capacity rising or falling threshold event
```

```
            to a management application."
    ::= { hcAlarmGroups 3 }

END
```

6. Intellectual Property

The IETF takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on the IETF's procedures with respect to rights in standards-track and standards-related documentation can be found in BCP-11. Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementors or users of this specification can be obtained from the IETF Secretariat.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights which may cover technology that may be required to practice this standard. Please address the information to the IETF Executive Director.

7. Acknowledgements

This memo is a product of the RMONMIB working group, and is based on existing alarmTable objects in the RMON-1 MIB module [RFC2819]. In order to maintain the RMON 'look-and-feel' and semantic consistency, some of Steve Waldbusser's text from [RFC2819] has been adapted for use in this MIB.

8. Normative References

[RFC2026] Bradner, S., "The Internet Standards Process -- Revision 3", BCP 9, RFC 2026, October 1996.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC2578] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.

[RFC2579] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.

[RFC2580] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Conformance Statements for SMIv2", RFC 2580, STD 58, April 1999.

[RFC2819] Waldbusser, S., "Remote Network Monitoring Management Information Base", STD 59, RFC 2819, May 2000.

[RFC3414] Blumenthal, U. and B. Wijnen, "User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)", STD 62, RFC 3414, December 2002.

[RFC3415] Wijnen, B., Presuhn, R. and K. McCloghrie, "View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)", STD 62, RFC 3415, December 2002.

9. 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.

[RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB", RFC 2863, June, 2000.

10. Security Considerations

There are a number of management objects defined in this MIB that have 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.

There are a number of managed objects in this MIB that may contain sensitive information. These are:

```
hcAlarmAbsValue
hcAlarmValueStatus
```

These objects are used together, and may expose the values of particular MIB instances, as identified by associated instances of the hcAlarmVariable object.

hcAlarmVariable

This object identifies the object instance that the associated hcAlarmEntry will periodically sample. Because SNMP access control is articulated entirely in terms of the contents of MIB views, no access control mechanism exists that can restrict the value of this object to identify only those objects that exist in a particular MIB view. Thus, because there is no acceptable means of restricting the read access that could be obtained through the alarm mechanism, the probe must only grant write access to this object in those views that have read access to all objects on the probe.

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 to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

11. Authors' Addresses

Andy Bierman
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA USA 95134
Phone: +1 408-527-3711
EMail: abierman@cisco.com

Keith McCloghrie
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA USA 95134
Phone: +1 408-526-5260
EMail: kzm@cisco.com

12. Full Copyright Statement

Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.