                     Remote Monitoring MIB Extensions for
                          High Capacity Alarms

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 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.

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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. 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

```
+--------------------------------------------+
|                                            |
|      (RMON-1)              (HC-ALARM)       |
|    +-----------+         +-----------+      |
|    |           |         |           |      |
|    |  alarm    |         |  hcAlarm  |      |
|    |  Table    |         |  Table    |      |
|    |           |         |           |      |
|    +-----------+         +-----------+      |
|          |                     |            |
|          V     (RMON-1)        V            |
|    +----------------------------------+     |
|    |                                  |     |
|    |            eventTable            |     |
|    |                                  |     |
|    +----------------------------------+     |
|          |                     |            |
|          |                     |            |
|          V                     V            |
|    +---------------+   +----------------+   |
|    | risingAlarm   |   | hcRisingAlarm  |   |
|    | fallingAlarm  |   | hcFallingAlarm |   |
|    | Notifications |   | Notifications  |   |
|    +---------------+   +----------------+   |
|       (RMON-1)            (HC-ALARM)        |
+--------------------------------------------+
```
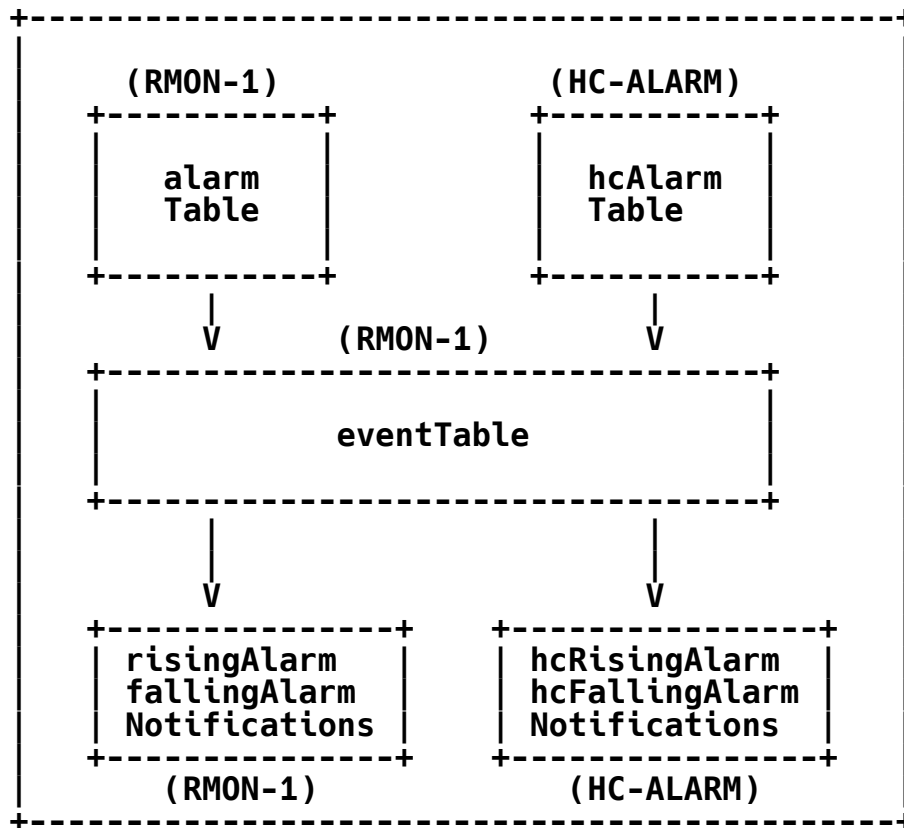
4.1. MIB Group Overview

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.
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                        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

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intellectual property or other rights that might be claimed to
pertain to the implementation or use of the technology described in
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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

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9. Informative References

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   [RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group
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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.

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12. Full Copyright Statement

Acknowledgement