Abstract

This document defines the model for alarms in the SNMP framework and defines a Management Information Base (MIB) module that defines a list of outstanding alarms and log of alarms that have occurred and have been cleared.

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1. The SNMP Management Framework


A more detailed introduction to the current SNMP Management Framework can be found in [RFC 2570](https://tools.ietf.org/html/rfc2570).

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIv2. A MIB conforming to the SMIv1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIv2 will be converted into textual descriptions in SMIv1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.
2. Introduction

There are two main approaches to management. One is based on polling by a management application to determine node status, and the other is based on a node sending notifications to manager when status changes to and from fault conditions. The SNMP approach to date has been the first. Little has been done to support the second in the SNMP framework. This document provides the mechanisms for management to be based on exception reporting.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC-2119 [1].

3. Exception Reporting Framework

3.1 Terminology

Error
A deviation of a system from intended operation.

Fault
A lasting error or warning condition.

Alarm
Persistent indication of a fault. An alarm is said to be ‘set’ (or raised) when a fault is first detected and administratively enabled. An alarm is said to be ‘cleared’ when a fault is first noticed to have ceased or administratively disabled.

Event
Something that happened. Examples include a change in status, crossing a threshold, an external input to the system. Additionally, setting or clearing an alarm is also an event.

Notification
An unsolicited transmission of management information due to an event or condition.

3.2 Alarm Definitions

Each type of an alarm needs to be well specified. Ideally, a new construct (or template) would be added to the MIB module language, which is specified by SNMP’s SMI. Unfortunately, this is not possible. Since alarms are identified with an OID value, the best choice of construct to use is OBJECT-IDENTITY. This construct allows a descriptor to be defined, a status and description specified, and an OID value assigned. The contents of the DESCRIPTION text must be
structured to specify the attributes of an alarm type. The attributes include:

Raise Conditions
What set of conditions or events cause the alarm to be raised?

Clear Conditions
What must occur to cause the alarm to be cleared?

Source Identification
How are the sources of the alarm identified (a source can be physical (such as port), or logical, such as a session)?

Perceived Severity
How is the perceived severity of the alarm determined (it may be statically specified or dynamically determined)?

Service Affecting
How is it determined if the condition is service affecting (it may be statically specified or dynamically determined)?

Associated Information
What additional information is associated, if any, with the alarm? For example, if the alarm is due to a threshold being crossed, the additional information could be the threshold value and the current value.

Class (Category)
What is the class (category) of the alarm using the ITU-T terminology?

Probable Cause
How is the probable cause of the alarm determined (it may be statically specified or dynamically determined)?

Dependencies
What are the dependencies, if any, between this alarm and other alarms. For example, a loss of signal alarm on a network interface would probably also result in a network interface down alarm.

In summary, instead of adding a new construct like the following:

TemperatureAlarm  ALARM-TYPE
STATUS         current
DESCRIPTION    "The current temperature outside of the acceptable operating range"
RAISED-BY      "The measured temperature has been outside of the acceptable operating range for the last 5 seconds."
CLEARED-BY     "The measure temperature has been within the acceptable range for the last 15 seconds."
::= { myAlarms 1 }

the existing OBJECT-IDENTITY construct must be used and the
DESCRIPTION field structured like in the following:

TemperatureAlarm OBJECT-IDENTITY
STATUS current
DESCRIPTION "An Alarm

Description:
The current temperature outside of the
acceptable operating range

RAISED-BY:
The measured temperature has been outside of the
acceptable operating range for the last 5
seconds.

CLEARED-BY:
The measure temperature has been within the
acceptable range for the last 15 seconds.
..."
::= { myAlarms 1 }

4. MIB Module Overview

The MIB module defines a list of current alarms and a log of alarms
that have been raised and/or cleared. The current alarm list is
specified as two tables. Table snmpAlarmCurrTable contains generic
information about alarms and table snmpItuAlarmCurrTable contains
ITU-T (from X.733 and X.736) information about alarms. The current
varBind table provides additional information about each current
alarm.

The alarm log table is specified as two tables. An entry is made in
table snmpAlarmLogTable each time an entry is added or removed from
the current alarm table. Likewise an entry is made in table
snmpItuAlarmLogTable each time an entry is added or removed from the
ITU-T augmentation of the current alarm table.

Scalar objects snmpAlarmLastChange, snmpAlarmLogFirstIndex, and
snmpAlarmLogLastIndex provide the information so that a management
application can efficiently track the current alarms and retrieve
entries in the alarm log. Additionally, a manager may choose to use
notifications to assist in tracking the current alarms and/or alarm
log entries. The notification snmpAlarmStatusChange or
snmpItuAlarmStatusChange can be used.
5. Definitions

SNMP-ALARM-MIB DEFINITIONS ::= BEGIN

IMPORTS
   MODULE-IDENTITY,
   OBJECT-TYPE,
   NOTIFICATION-TYPE,
   snmpModules,
   Gauge32,
   Unsigned32
   FROM SNMPv2-SMI

   TEXTUAL-CONVENTION,
   TruthValue,
   AutonomousType,
   VariablePointer,
   TimeStamp
   FROM SNMPv2-TC

   SnmpAdminString
   FROM SNMP-FRAMEWORK-MIB

MODULE-COMPLIANCE,
   OBJECT-GROUP,
   NOTIFICATION-GROUP
   FROM SNMPv2-CONF;

snmpAlarmMIB MODULE-IDENTITY
   LAST-UPDATED "200102220000Z"  -- feb 22, 2001
   ORGANIZATION "IETF Distributed Management Working Group"
   CONTACT-INFO
      "WG-email:   disman@dorothy.bmc.com
       Subscribe:   disman-request@dorothy.bmc.com
       In message body:
          subscribe disman your_email_address
       Archive:     ftp://amethyst.bmc.com/pub/disman/archives"
   Chair:      Randy Presuhn
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Perkins Standards Track [Page 7]
This MIB module defines MIB objects and notifications that provide mechanisms to monitor alarms currently active and the history of alarms being set and cleared on a managed system.

Terminology used in this MIB module:

Error - A deviation from intended operation.

Fault - A lasting error or warning condition.

Alarm - A persistent indication of a fault. An alarm is said to be ‘set’ when a fault is first detected and administratively enabled. An alarm is said to be ‘cleared’ when a fault is first noticed to have ceased or administratively disabled.

Event - Something that happened. Examples include a change in status, crossing a threshold, an external input to the system. Additionally, setting or clearing an alarm is also an event.

SnmpAlarmCond ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION "The alarm condition. The values are: set(1)....the alarm condition detected clear(2)....the alarm condition ceased"
  SYNTAX INTEGER {
    set(1),
    clear(2)
  }

SnmpAlarmType ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION "The identity of the type of an SNMP alarm. The SNMP SMI does not have a construct to define SNMP alarms. Thus, the OBJECT-IDENTITY construct must be
used with the text of the DESCRIPTION clause
describing the conditions that cause the alarm
to be set and to be clear, and a description of
each varBind to be associated with the alarm.

SYNTAX

OPTDateAndTime ::= TEXTUAL-CONVENTION
DISPLAY-HINT "2d-1d-1d,1d:1d.1d,1ald:1d"
STATUS current
DESCRIPTION
"An date-time specification, or a zero length string.

field octets contents                  range
----- ------ --------                  -----  
1  1-2   year                      0..65536
2  3    month                     1..12
3  4    day                       1..31
4  5    hour                      0..23
5  6    minutes                   0..59
6  7    seconds                   0..60
   (use 60 for leap-second)
7  8    deci-seconds              0..9
8  9    direction from UTC        ‘+’ / ‘-’
9 10    hours from UTC            0..11
10 11    minutes from UTC          0..59

For example, Tuesday May 26, 1992 at 1:30:15 PM EDT would be
displayed as:

1992-5-26,13:30:15.0,-4:0

Note that if only local time is known, then time zone
information (fields 8-10) is not present."

SYNTAX

SnmpValUnion ::= TEXTUAL-CONVENTION
STATUS      current
DESCRIPTION "A descriminated union, which is the
following ASN.1 sequence BER encoded
and wrapped as the value of an OCTET
STRING.
        <details later>
     "

SYNTAX

SnmpAlarmGlobals OBJECT IDENTIFIER ::= { snmpAlarmObjects 1 }

SnmpAlarmCurrEntries OBJECT-TYPE
SYNTAX      Gauge32
MAX-ACCESS  read-only
snmpAlarmGlobalStatus OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The number of entries in the current alarm table."
::= { snmpAlarmGlobals 1 }

snmpAlarmLastChange OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The value of object sysUpTime when an entry was added or removed from the current alarm table and added to the alarm log table."
::= { snmpAlarmGlobals 2 }

snmpAlarmLogFirstIndex OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The index of the oldest entry in the alarm log table, or zero. The value of zero is used to indicate that no entry exists in the alarm log."
::= { snmpAlarmGlobals 3 }

snmpAlarmLogLastIndex OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The index of the youngest entry in the alarm log table, or zero. The value of zero is used to indicate that no entry exists in the alarm log."
::= { snmpAlarmGlobals 4 }

snmpAlarmGenNotify OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-write
STATUS current
DESCRIPTION "The controls whether or not notification snmpAlarmStatusChange may be generated. The values are:
true(1)...notifications may be generated
false(2)...notifications may not be generated"
::= { snmpAlarmGlobals 5 }

-- ITU extension
snmpItuAlarmGenNotify OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-write
STATUS current
DESCRIPTION "The controls whether or not notification snmpItuAlarmStatusChange may be generated. The values are:
true(1)...notifications may be generated
false(2)...notifications may not be generated"
false(2) notifications may not be generated.

Note: if this is enabled, then most likely generation of notification snmpAlarmStatusChange should be disabled.

::= { snmpAlarmGlobals 6 }

snmpAlarmCurrTable OBJECT-TYPE
SYNTAX SEQUENCE OF SnmpAlarmCurrEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "A table listing all the current 'alarms'. An alarm indicates a persistent fault condition in a software or hardware component or sub-system that is intended to be operating. An alarm is cleared by 'fixing' the fault condition or administratively disabling the alarm."
::= { snmpAlarmObjects 2 }

snmpAlarmCurrEntry OBJECT-TYPE
SYNTAX SnmpAlarmCurrEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "A row in the table of current alarms. Rows cannot be created or deleted via SNMP operations."
INDEX { snmpAlarmCurrIndex }
::= { snmpAlarmCurrTable 1 }

SnmpAlarmCurrEntry ::= SEQUENCE {
  snmpAlarmCurrIndex             Unsigned32,
  snmpAlarmCurrOccurDateAndTime  OptDateAndTime,
  snmpAlarmCurrOccurUpTime       TimeStamp,
  snmpAlarmCurrType              SnmpAlarmType,
  snmpAlarmCurrId                Unsigned32,
  snmpAlarmCurrContextName       SnmpAdminString,
  snmpAlarmCurrVarBinds          Gauge32
}

snmpAlarmCurrIndex OBJECT-TYPE
SYNTAX Unsigned32(1..4294967295)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "An arbitrary index of the alarm in the current alarm table. The index for an existing entry is not affected when a entry is added or removed from the table. Index values may be cycled to the max before reuse or follow any implementation specific reuse strategy."
::= { snmpAlarmCurrEntry 1 }
snmpAlarmCurrOccurDateAndTime OBJECT-TYPE
SYNTAX      OptDateAndTime
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "The local date and time when the alarm was set, or a zero length string. The value is a zero length string when the local time cannot be determined."
 ::= { snmpAlarmCurrEntry 2 }

snmpAlarmCurrOccurUpTime OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "The value of sysUpTime when the alarm was set or zero. The value is zero when the alarm occurred before the most recent reset of the management system."
 ::= { snmpAlarmCurrEntry 3 }

snmpAlarmCurrType OBJECT-TYPE
SYNTAX      SnmpAlarmType
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "The type of the alarm."
 ::= { snmpAlarmCurrEntry 4 }

snmpAlarmCurrId OBJECT-TYPE
SYNTAX      Unsigned32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "The ID of the alarm. No two active alarms may have the same value. This value is used in matching the set and clear entries in the alarm log."
 ::= { snmpAlarmCurrEntry 5 }

snmpAlarmCurrContextName OBJECT-TYPE
SYNTAX      SnmpAdminString (SIZE(0..32))
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "The context in which the alarm occurred."
 ::= { snmpAlarmCurrEntry 6 }

snmpAlarmCurrVarBinds OBJECT-TYPE
SYNTAX      Gauge32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "The number of varBinds associated with the alarm. The count is usually at least one, with at least one varBind identifying..."
the source of the alarm.
::= { snmpAlarmCurrEntry 7 }

snmpAlarmCurrVarBindTable OBJECT-TYPE
SYNTAX      SEQUENCE OF SnmpAlarmCurrVarBindEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION "A table of varBinds (pairs of variable and value) that sparse extends the rows in table snmpAlarmCurrTable. That is, for each row in table snmpAlarmCurrTable, there is zero, one, or more associated rows in this table. The value of object snmpAlarmCurrVarBinds specifies the number of rows in this table."
 ::= { snmpAlarmObjects 3 }

SnmpAlarmCurrVarBindEntry OBJECT-TYPE
SYNTAX      SnmpAlarmCurrVarBindEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION "A row in the table of varBinds for current alarms. Rows cannot be created or deleted via SNMP operations."
INDEX       { snmpAlarmCurrIndex, snmpAlarmCurrVarBindIndex }
 ::= { snmpAlarmCurrVarBindTable 1 }

SnmpAlarmCurrVarBindEntry ::= SEQUENCE {
  snmpAlarmCurrVarBindIndex   Unsigned32,
  snmpAlarmCurrVarBindId      VariablePointer,
  snmpAlarmCurrVarBindVal     SnmpValUnion
}

snmpAlarmCurrVarBindIndex OBJECT-TYPE
SYNTAX       Unsigned32 (1..4294967295)
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION "The index of the varBind. The value is between one and the value of the associated object snmpAlarmCurrVarBinds."
 ::= { snmpAlarmCurrVarBindEntry 1 }

snmpAlarmCurrVarBindId OBJECT-TYPE
SYNTAX       VariablePointer
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION "The ID of the object instance."
 ::= { snmpAlarmCurrVarBindEntry 2 }

snmpAlarmCurrVarBindVal OBJECT-TYPE
SYNTAX SnmpValUnion
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The value of the object instance."
::= { snmpAlarmCurrVarBindEntry 3 }

snmpAlarmLogTable OBJECT-TYPE
SYNTAX SEQUENCE OF SnmpAlarmLogEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "A table containing a log of when each 'alarm'
has been 'set' or 'cleared'. An alarm indicates
a persistent fault condition in a software or
hardware component or sub-system that is intended
to be operating. An alarm is cleared by 'fixing'
the fault condition or administratively disabling
the alarm.

The alarm log operates like a circular buffer.
The index of the oldest entry is specified by
object snmpAlarmLogFirstIndex and the index
of the youngest entry is specified by object
tbtSystemAlarmLogLastIndex.

The alarm log may be preserved in part or in
total across restarts of a management system.
The last few entries SHOULD be saved to assist
in determining the cause of an unplanned
restart."
::= { snmpAlarmObjects 4 }

SnmpAlarmLogEntry OBJECT-TYPE
SYNTAX SnmpAlarmLogEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "A row in the alarm log table. Rows cannot
be created or deleted via SNMP operations."
INDEX { snmpAlarmLogIndex }
::= { snmpAlarmLogTable 1 }

SnmpAlarmLogEntry ::= SEQUENCE {
  snmpAlarmLogIndex Unsigned32,
  snmpAlarmLogCond SnmpAlarmCond,
  snmpAlarmLogOccurDateAndTime OptDateAndTime,
  snmpAlarmLogOccurUpTime TimeStamp,
  snmpAlarmLogType SnmpAlarmType,
  snmpAlarmLogId Unsigned32,
  snmpAlarmLogContextName SnmpAdminString,
  snmpAlarmLogVarBinds Gauge32
}
snmpAlarmLogIndex OBJECT-TYPE
   SYNTAX       Unsigned32(1..4294967295)
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION "An index of the alarm in the alarm log table. The
index is increased by one for each new entry in the
table until the maximum value is reach and then the
index restarts at 1. The index of the oldest entry
is specified by object snmpAlarmLogFirstIndex and
index of the youngest entry is specified by object
snmpAlarmLogLastIndex."
   ::= { snmpAlarmLogEntry 1 }

snmpAlarmLogCond OBJECT-TYPE
   SYNTAX      SnmpAlarmCond
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION "Indicates if the log entry is due to the alarm
   Being set (raised) or being cleared."
   ::= { snmpAlarmLogEntry 2 }

snmpAlarmLogOccurDateAndTime OBJECT-TYPE
   SYNTAX      OptDateAndTime
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION "The local date and time when the alarm was set
or clear, or a zero length string. The value is a
zero length string when the local time cannot be
determined."
   ::= { snmpAlarmLogEntry 3 }

snmpAlarmLogOccurUpTime OBJECT-TYPE
   SYNTAX      TimeStamp
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION "The value of sysUpTime when the alarm was set or
cleared, or zero. The value is zero when the alarm
was set or cleared before the most recent reset of
the management system."
   ::= { snmpAlarmLogEntry 4 }

snmpAlarmLogType OBJECT-TYPE
   SYNTAX      SnmpAlarmType
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION "The type of the alarm."
   ::= { snmpAlarmLogEntry 5 }

snmpAlarmLogId OBJECT-TYPE
   SYNTAX      Unsigned32
The ID of the alarm. Each alarm that is set is assigned a unique ID among active alarms. That is, no two active alarms may have the same value. This value is used in matching the set and clear entries in this log. Note: alarms may be cleared and not recorded across restarts of the management system. Thus, additional checks must be performed to match set and clear entries in the log that occur on opposite sides of a restart.

::= { snmpAlarmLogEntry 6 }

snmpAlarmLogContextName OBJECT-TYPE
SYNTAX SnmpAdminString (SIZE (0..32))
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The context in which the alarm occurred."
::= { snmpAlarmLogEntry 7 }

snmpAlarmLogVarBinds OBJECT-TYPE
SYNTAX Gauge32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The number of varBinds associated with the alarm. The count is usually at least one, with at least one varBind identifying the source of the alarm."
::= { snmpAlarmLogEntry 8 }

snmpAlarmLogVarBindTable OBJECT-TYPE
SYNTAX SEQUENCE OF SnmpAlarmLogVarBindEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "A table of varBinds (pairs of variable and value) that sparse extends the rows in table snmpAlarmLogTable. That is, for each row in table snmpAlarmLogTable, there is zero, one, or more associated rows in this table. The value of object snmpAlarmLogVarBinds specifies the number of rows in this table."
::= { snmpAlarmObjects 5 }

snmpAlarmLogVarBindEntry OBJECT-TYPE
SYNTAX SnmpAlarmLogVarBindEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "A row in the table of varBinds for the alarm
log. Rows cannot be created or deleted via SNMP operations."

INDEX
{ snmpAlarmLogIndex,
  snmpAlarmLogVarBindIndex }
::= { snmpAlarmLogVarBindTable 1 }

SnmpAlarmLogVarBindEntry ::= SEQUENCE {
  snmpAlarmLogVarBindIndex   Unsigned32,
  snmpAlarmLogVarBindId      VariablePointer,
  snmpAlarmLogVarBindVal     SnmpValUnion
}

snmpAlarmLogVarBindIndex OBJECT-TYPE
SYNTAX      Unsigned32 (1..4294967295)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION "The index of the varBind. The value is between
one and the value of the associated object
snmpAlarmLogVarBinds."
::= { snmpAlarmLogVarBindEntry 1 }

snmpAlarmLogVarBindId OBJECT-TYPE
SYNTAX      VariablePointer
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "The ID of the object instance."
::= { snmpAlarmLogVarBindEntry 2 }

snmpAlarmLogVarBindVal OBJECT-TYPE
SYNTAX      SnmpValUnion
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "The value of the object instance."
::= { snmpAlarmLogVarBindEntry 3 }

-- ITU-T extensions
SnmpItuAlarmClass ::= TEXTUAL-CONVENTION
SYNTAX   INTEGER {
  other (1),
  communicationsAlarm (2),
  qualityOfServiceAlarm (3),
  processingErrorAlarm (4),
  equipmentAlarm (5),
  environmentalAlarm (6),
  integrityViolation (7),
  operationalViolation (8),
  [X.733] and [X.736].
  <expand this>"
physicalViolation (9),
securityServiceOrMechanismViolation (10),
timeDomainViolation (11)
)

SnmpItuAlarmProbCause ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION "The probable cause of the alarm as
specified in [X.733] and [X.736].
<expand this>"
SYNTAX INTEGER {
  other (1),
  adapterError (2),
  applicationSubsystemFailure (3),
  bandwidthReduced (4),
  callEstablishmentError (5),
  communicationsProtocolError (6),
  communicationsSubsystemFailure (7),
  configurationOrCustomizationError (8),
  congestion (9),
  corruptData (10),
  cpuCyclesLimitExceeded (11),
  dataSetOrModemError (12),
  degradedSignal (13),
  dteDceInterfaceError (14),
  enclosureDoorOpen (15),
  equipmentMalfunction (16),
  excessiveVibration (17),
  fileError (18),
  fireDetected (19),
  floodDetected (20),
  framingError (21),
  heatingVentCoolingSystemProblem (22),
  humidityUnacceptable (23),
  inputOutputDeviceError (24),
  inputDeviceError (25),
  lanError (26),
  leakDetected (27),
  localNodeTransmissionError (28),
  lossOfFrame (29),
  lossOfSignal (30),
  materialSupplyExhausted (31),
  multiplexerProblem (32),
  outOfMemory (33),
  outputDeviceError (34),
  performanceDegraded (35),
  powerProblem (36),
  pressureUnacceptable (37),
  processorProblem (38),
  pumpFailure (39),
  queueSizeExceeded (40),
  }
receiveFailure (41),
receiverFailure (42),
remoteNodeTransmissionError (43),
resourceAtOrNearingCapacity (44),
responseTimeExcessive (45),
retransmissionRateExcessive (46),
softwareError (47),
softwareProgramAbnormallyTerminated (48),
softwareProgramError (49),
storageCapacityProblem (50),
temperatureUnacceptable (51),
thresholdCrossed (52),
timingProblem (53),
toxicLeakDetected (54),
transmitFailure (55),
transmitterFailure (56),
underlyingResourceUnavailable (57),
versionMismatch (58),
authenticationFailure (59),
breachOfConfidentiality (60),
cableTamper (61),
delayedInformation (62),
denialOfService (63),
duplicateInformation (64),
informationMissing (65),
informationModificationDetected (66),
informationOutOfSequence (67),
intrusionDetection (68),
keyExpired (69),
onRepudiationFailure (70),
outOfHoursActivity (71),
outOfService (72),
proceduralError (73),
unauthorizedAccessAttempt (74),
unexpectedInformation (75)
}

SnmpItuAlarmPercSeverity ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION "The perceived severity of the alarm as specified in [X.733] and [X.736]. <expand this>"
  SYNTAX INTEGER {
    indeterminate (2),
    critical (3),
    major (4),
    minor (5),
    warning (6)
  }
STATUS  current
DESCRIPTION "The trend indication of the alarm as specified in [X.733].
<expand this>"
SYNTAX  INTEGER {
    moreSevere (1),
    noChange  (2),
    lessSevere (3)
}

snmpItuAlarmCurrTable OBJECT-TYPE
SYNTAX  SEQUENCE OF SnmpItuAlarmCurrEntry
MAX-ACCESS not-accessible
STATUS  current
DESCRIPTION "A table augmenting the current alarm table (snmpAlarmCurrTable) with additional information from the ITU-T alarm model."
::= { snmpAlarmObjects 6 }

SnmpItuAlarmCurrEntry OBJECT-TYPE
SYNTAX  SnmpItuAlarmCurrEntry
MAX-ACCESS not-accessible
STATUS  current
DESCRIPTION "A row in the table of ITU-T current alarms. Rows cannot be created or deleted via SNMP operations."
AUGMENTS  { snmpAlarmCurrEntry }
::= { snmpItuAlarmCurrTable 1 }

SnmpItuAlarmCurrEntry ::= SEQUENCE {
    snmpItuAlarmCurrClass SnmpItuAlarmClass,
    snmpItuAlarmCurrProbCause SnmpItuAlarmProbCause,
    snmpItuAlarmCurrPercSeverity SnmpItuAlarmPercSeverity,
    snmpItuAlarmCurrAdditText SnmpAdminString,
    snmpItuAlarmCurrTrendInd SnmpItuAlarmTrendInd,
    snmpItuAlarmCurrDetector AutonomousType,
    snmpItuAlarmCurrServiceProvider AutonomousType,
    snmpItuAlarmCurrServiceUser AutonomousType
}

snmpItuAlarmCurrClass OBJECT-TYPE
SYNTAX  SnmpItuAlarmClass
MAX-ACCESS read-only
STATUS  current
DESCRIPTION "The class of the alarm as specified in [X.733] and [X.736].
<expand this>"
::= { snmpItuAlarmCurrEntry 1 }

snmpItuAlarmCurrProbCause OBJECT-TYPE
SYNTAX  SnmpItuAlarmProbCause
DESCRIPTION "The probable cause of the alarm as specified in [X.733] and [X.736].
<expand this>"
 ::= { snmpItuAlarmCurrEntry 2 }

snmpItuAlarmCurrPercSeverity OBJECT-TYPE
SYNTAX SnmpItuAlarmPercSeverity
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The perceived severity of the alarm as specified in [X.733] and [X.736].
<expand this>"
 ::= { snmpItuAlarmCurrEntry 3 }

snmpItuAlarmCurrAdditText OBJECT-TYPE
SYNTAX SnmpAdminString
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The additional text field of the alarm as specified in [X.733].
<expand this>"
 ::= { snmpItuAlarmCurrEntry 4 }

snmpItuAlarmCurrTrendInd OBJECT-TYPE
SYNTAX SnmpItuAlarmTrendInd
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The trend indication of the alarm as specified in [X.733].
<expand this>"
 ::= { snmpItuAlarmCurrEntry 5 }

-- more investigation is needed for the following objects
snmpItuAlarmCurrDetector OBJECT-TYPE
SYNTAX AutonomousType
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The SecurityAlarmDetector object from [X.736].
<expand this>"
 ::= { snmpItuAlarmCurrEntry 6 }

snmpItuAlarmCurrServiceProvider OBJECT-TYPE
SYNTAX AutonomousType
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The ServiceProvider object from [X.736].
<expand this>"
 ::= { snmpItuAlarmCurrEntry 7 }

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snmpItuAlarmCurrServiceUser OBJECT-TYPE
   SYNTAX      AutonomousType
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION "The ServiceUser object from [X.736]."
   ::= { snmpItuAlarmCurrEntry 8 }

snmpItuAlarmLogTable OBJECT-TYPE
   SYNTAX      SEQUENCE OF SnmpItuAlarmLogEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION "A table augmenting the alarm log table
                (snmpAlarmLogTable) with additional information
                from the ITU-T alarm model."
   ::= { snmpAlarmObjects 7 }

SnmpItuAlarmLogEntry ::= SEQUENCE {
   snmpItuAlarmLogClass         SnmpItuAlarmClass,  
   snmpItuAlarmLogProbCause     SnmpItuAlarmProbCause, 
   snmpItuAlarmLogPercSeverity  SnmpItuAlarmPercSeverity, 
   snmpItuAlarmLogAdditText     SnmpAdminString, 
   snmpItuAlarmLogTrendInd      SnmpItuAlarmTrendInd, 
   snmpItuAlarmLogDetector      AutonomousType,  
   snmpItuAlarmLogServiceProvider AutonomousType, 
   snmpItuAlarmLogServiceUser   AutonomousType 
}

snmpItuAlarmLogClass OBJECT-TYPE
   SYNTAX      SnmpItuAlarmClass
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION "The class of the alarm as specified in
                [X.733] and [X.736]."
   ::= { snmpItuAlarmLogEntry 1 }

snmpItuAlarmLogProbCause OBJECT-TYPE
   SYNTAX      SnmpItuAlarmProbCause
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION "The probable cause of the alarm as
specified in [X.733] and [X.736].
<expand this>"
::= { snmpItuAlarmLogEntry 2 }

snmpItuAlarmLogPercSeverity OBJECT-TYPE
SYNTAX SnmpItuAlarmPercSeverity
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The perceived severity of the alarm as
specified in [X.733] and [X.736].
<expand this>"
::= { snmpItuAlarmLogEntry 3 }

snmpItuAlarmLogAdditText OBJECT-TYPE
SYNTAX SnmpAdminString
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The additional text field of the alarm as
specified in [X.733].
<expand this>"
::= { snmpItuAlarmLogEntry 4 }

snmpItuAlarmLogTrendInd OBJECT-TYPE
SYNTAX SnmpItuAlarmTrendInd
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The trend indication of the alarm as
specified in [X.733].
<expand this>"
::= { snmpItuAlarmLogEntry 5 }

-- more investigation is needed for the following objects

snmpItuAlarmLogDetector OBJECT-TYPE
SYNTAX AutonomousType
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The SecurityAlarmDetector object from [X.736].
<expand this>"
::= { snmpItuAlarmLogEntry 6 }

snmpItuAlarmLogServiceProvider OBJECT-TYPE
SYNTAX AutonomousType
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The ServiceProvider object from [X.736].
<expand this>"
::= { snmpItuAlarmLogEntry 7 }

snmpItuAlarmLogServiceUser OBJECT-TYPE
SYNTAX AutonomousType
MAX-ACCESS read-only
--- notifications

snmpAlarmStatusChange NOTIFICATION-TYPE
OBJECTS     { snmpAlarmLogCond,
               snmpAlarmLogOccurDateAndTime,
               snmpAlarmLogOccurUpTime,
               snmpAlarmLogId,
               snmpAlarmLogVarBinds }

status      current
DESCRIPTION "An entry has been added to the alarm log table. That is, an alarm has been set or cleared. The objects all have the same instance, which is the row in the alarm log, and the objects are:

snmpAlarmLogCond....alarm condition, either set or clear
snmpAlarmLogOccurDateAndTime...date/time the alarm log entry created
snmpAlarmLogOccurUpTime...timestamp the alarm log entry created
snmpAlarmLogId....the ID of the alarm
snmpAlarmLogVarBinds....the number of varBinds associated with the alarm

Note 1: after these varBinds, the associated varBinds, if any, from table snmpAlarmLogVarBindTable must be specified in the varBind list for the notification.

Note 2: object snmpAlarmGenNotify controls if or if not this notification may be generated."
::= { snmpAlarmNotifications 0 1 }

snmpItuAlarmStatusChange NOTIFICATION-TYPE
OBJECTS     { snmpAlarmLogCond,
               snmpAlarmLogOccurDateAndTime,
               snmpAlarmLogOccurUpTime,
               snmpAlarmLogId,
               snmpAlarmLogVarBinds,
               snmpItuAlarmLogClass,
               snmpItuAlarmLogProbCause,
               snmpItuAlarmLogPercSeverity,
               snmpItuAlarmLogAdditText,
               snmpItuAlarmLogTrendInd,
               snmpItuAlarmLogDetector,
               snmpItuAlarmLogServiceProvider,
snmpItuAlarmLogServiceUser }
STATUS current
DESCRIPTION "An entry has been added to the alarm log
table and the ITU extensions are supported.
That is, an alarm has been set or cleared.
The objects all have the same instance, which is
the row in the alarm log, and the objects are:
  snmpAlarmLogCond....alarm condition, either
      set or clear
  snmpAlarmLogOccurDateAndTime...date/time the
      alarm log entry created
  snmpAlarmLogOccurUpTime...timestamp the alarm
      log entry created
  snmpAlarmLogId....the ID of the alarm
  snmpAlarmLogVarBinds....the number of varBinds
      associated with the alarm
  <finish this>
  snmpItuAlarmLogClass...
  snmpItuAlarmLogProbCause...
  snmpItuAlarmLogPercSeverity...
  snmpItuAlarmLogAdditText...
  snmpItuAlarmLogTrendInd...
  snmpItuAlarmLogDetector...
  snmpItuAlarmLogServiceProvider...
  snmpItuAlarmLogServiceUser...

Note 1: after these varBinds, the associated
varBinds, if any, from table
snmpAlarmLogVarBindTable must be specified in the
varBind list for the notification.

Note 2: object snmpItuAlarmGenNotify controls
if or if not this notification may be generated."
::= { snmpAlarmNotifications 0 2 }

-- Conformance

snmpAlarmCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION "The compliance statement for systems supporting
the SNMP alarms."
MODULE -- this module
  MANDATORY-GROUPS { snmpAlarmGblGroup,
    snmpAlarmCurrGroup,
    snmpAlarmLogGroup,
    snmpAlarmNotifyGroup }
 ::= { snmpAlarmCompliances 1 }

snmpItuAlarmCompliance MODULE-COMPLIANCE

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STATUS  current
DESCRIPTION
"The compliance statement for systems supporting
the ITU-T extension to SNMP alarms."
MODULE -- this module
  MANDATORY-GROUPS { snmpAlarmGblGroup,
                      snmpAlarmCurrGroup,
                      snmpAlarmLogGroup,
                      snmpAlarmNotifyGroup,
                      snmpItuAlarmGblGroup,
                      snmpItuAlarmCurrGroup,
                      snmpItuAlarmLogGroup,
                      snmpItuAlarmNotifyGroup }
::= { snmpAlarmCompliances 2 }

snmpAlarmGblGroup OBJECT-GROUP
  OBJECTS     { snmpAlarmCurrEntries,
                 snmpAlarmLastChange,
                 snmpAlarmLogFirstIndex,
                 snmpAlarmLogLastIndex,
                 snmpAlarmGenNotify }
  STATUS      current
DESCRIPTION "Global objects for managing SNMP alarms."
::= { snmpAlarmGroups 1 }

snmpAlarmCurrGroup OBJECT-GROUP
  OBJECTS     { snmpAlarmCurrOccurDateAndTime,
                 snmpAlarmCurrOccurUpTime,
                 snmpAlarmCurrType,
                 snmpAlarmCurrId,
                 snmpAlarmCurrContextName,
                 snmpAlarmCurrVarBinds,
                 snmpAlarmCurrVarBindId,
                 snmpAlarmCurrVarBindVal }
  STATUS      current
DESCRIPTION "Objects in the SNMP current alarm and
current varBind tables."
::= { snmpAlarmGroups 2 }

snmpAlarmLogGroup OBJECT-GROUP
  OBJECTS     { snmpAlarmLogCond,
                 snmpAlarmLogOccurDateAndTime,
                 snmpAlarmLogOccurUpTime,
                 snmpAlarmLogType,
                 snmpAlarmLogId,
                 snmpAlarmLogContextName,
                 snmpAlarmLogVarBinds,
                 snmpAlarmLogVarBindId,
                 snmpAlarmLogVarBindVal }

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DESCRIPTION "Objects in the SNMP alarm log and log varBind tables."
::= { snmpAlarmGroups 3 }

snmpAlarmNotifyGroup NOTIFICATION-GROUP
NOTIFICATIONS { snmpAlarmStatusChange }
STATUS current
DESCRIPTION "Notifications for SNMP alarms."
::= { snmpAlarmGroups 4 }

snmpItuAlarmGblGroup OBJECT-GROUP
OBJECTS { snmpItuAlarmGenNotify }
STATUS current
DESCRIPTION "Global objects for managing ITU-T extensions to SNMP alarms."
::= { snmpAlarmGroups 5 }

snmpItuAlarmCurrGroup OBJECT-GROUP
OBJECTS { snmpItuAlarmCurrClass,
            snmpItuAlarmCurrProbCause,
            snmpItuAlarmCurrPercSeverity,
            snmpItuAlarmCurrAdditText,
            snmpItuAlarmCurrTrendInd,
            snmpItuAlarmCurrDetector,
            snmpItuAlarmCurrServiceProvider,
            snmpItuAlarmCurrServiceUser }
STATUS current
DESCRIPTION "Objects in the ITU-T extension to the SNMP current alarm and current varBind tables."
::= { snmpAlarmGroups 6 }

snmpItuAlarmLogGroup OBJECT-GROUP
OBJECTS { snmpItuAlarmLogClass,
            snmpItuAlarmLogProbCause,
            snmpItuAlarmLogPercSeverity,
            snmpItuAlarmLogAdditText,
            snmpItuAlarmLogTrendInd,
            snmpItuAlarmLogDetector,
            snmpItuAlarmLogServiceProvider,
            snmpItuAlarmLogServiceUser }
STATUS current
DESCRIPTION "Objects in the ITU-T extension to the SNMP alarm log and log varBind tables."
::= { snmpAlarmGroups 7 }

snmpItuAlarmNotifyGroup NOTIFICATION-GROUP
NOTIFICATIONS { snmpItuAlarmStatusChange }
STATUS current
DESCRIPTION "Notifications for ITU-T extension to SNMP alarms."

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6. Examples

<later>

7. 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.

SNMPv1 by itself is not a secure environment. 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.

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2574 [RFC2574] and the View-based Access Control Model RFC 2575 [RFC2575] 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 the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

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9. Acknowledgements
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10. References


[X.733] <finish this>

[X.736] <finish this>

11. Full Copyright Statement

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