

Network Working Group
Request for Comments: 3877
Category: Standards Track

S. Chisholm
Nortel Networks
D. Romascanu
Avaya
September 2004

Alarm Management Information Base (MIB)

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.

Copyright Notice

Copyright (C) The Internet Society (2004).

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 management objects used for modelling and storing alarms.

Table of Contents

1.	The Internet-Standard Management Framework	3
2.	Introduction	3
3.	Alarm Management Framework	4
3.1.	Terminology.	4
3.2.	Alarm Management Architecture.	5
3.3.	Features of this Architecture.	5
3.4.	Security	8
3.5.	Relationship between Alarm and Notifications	9
3.6.	Notification Varbind Storage and Reference	9
3.7.	Relation to Notification Log MIB	10
3.8.	Relation to Event MIB.	10
4.	Generic Alarm MIB.	10
4.1.	Overview	10
4.2.	Definitions.	15
5.	ITU Alarm.	38
5.1.	Overview	38
5.2.	IANA Considerations.	39
5.3.	Textual Conventions.	47
5.4.	Definitions.	49
6.	Examples	59
6.1.	Alarms Based on linkUp/linkDown Notifications.	59
6.2.	Temperature Alarm using generic Notifications.	62
6.3.	Temperature Alarm without Notifications.	63
6.4.	Printer MIB Alarm Example.	65
6.5.	Rmon Alarm Example	66
6.6.	The Lifetime of an Alarm	67
7.	Security Considerations.	70
8.	Acknowledgements	72
9.	References	72
9.1.	Normative References	72
9.2.	Informative References	73
10.	Authors' Addresses	74
11.	Full Copyright Statement	75

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. Introduction

In traditional SNMP management, problems are detected on an entity either through polling interesting MIB variables, waiting for the entity to send a Notification for a problem, or some combination of the two. This method is somewhat successful, but experience has shown some problems with this approach. Managers monitoring large numbers of entities cannot afford to be polling large numbers of objects on each device. Managers trying to ensure high reliability are unable to accurately determine whether any problems had occurred when they were not monitoring an entity. Finally, it can be time consuming for managers to try to understand the relationships between the various objects they poll, the Notifications they receive and the problems occurring on the entity. Even after detailed analysis they may still be left with an incomplete picture of what problems are occurring. But, it is important for an operator to be able to determine current problems on a system, so they can be fixed.

This memo describes a method of using alarm management in SNMP to address these problems. It also provides the necessary MIB objects to support this method.

Alarms and other terms related to alarm management are defined in the following sections.

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. Alarm Management Framework

3.1. Terminology

Error

A deviation of a system from normal operation.

Fault

Lasting error or warning condition.

Event

Something that happens which may be of interest. A fault, a change in status, crossing a threshold, or an external input to the system, for example.

Notification

Unsolicited transmission of management information.

Alarm

Persistent indication of a fault.

Alarm State

A condition or stage in the existence of an alarm. As a minimum, alarms states are raise and clear. They could also include severity information such as defined by perceived severity in the International Telecommunications Union (ITU) model [M.3100] - cleared, indeterminate, critical, major, minor and warning.

Alarm Raise

The initial detection of the fault indicated by an alarm or any number of alarm states later entered, except clear.

Alarm Clear

The detection that the fault indicated by an alarm no longer exists.

Active Alarm

An alarm which has an alarm state that has been raised, but not cleared.

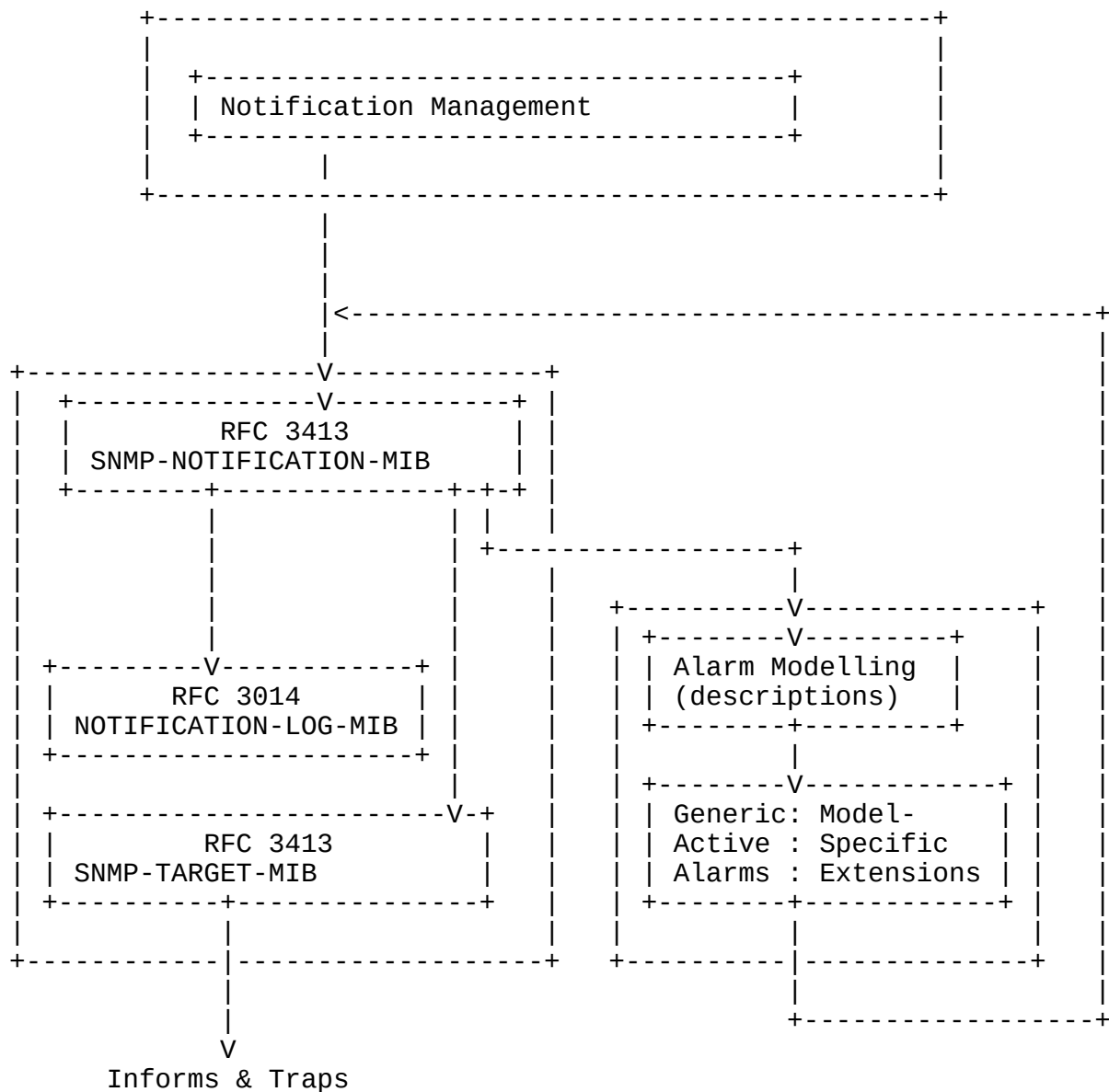
Alarm Detection Point

The entity that detected the alarm.

Perceived Severity

The severity of the alarm as determined by the alarm detection point using the information it has available.

3.2. Alarm Management Architecture



3.3. Features of this Architecture

3.3.1. Modular Alarm Architecture

The subject of alarm management can potentially cover a large number of topics including real-time alarms, historical alarms, alarm correlation, and alarm suppression, to name a few. Within each of these topics, there are a number of established models that could be

supported. This memo focuses on a subset of this problem space, but describes a modular SNMP alarm management framework. Alarms SHOULD be modelled so Notifications are sent on alarm Clear.

The framework defines a generic Alarm MIB that can be supported on its own, or with additional alarm modelling information such as the provided ITU Alarm MIB. In addition, the active alarm tables could also be extended to support additional information about active alarm instances. This framework can also be expanded in the future to support such features as alarm correlation and alarm suppression. This modular architecture means that the cost of supporting alarm management features is proportional to the number of features an implementation supports.

3.3.2. Flexible Alarm Modelling

Alarm models document an understanding between a manager and an agent as to what problems will be reported on a system, how these problems will be reported, and what might possibly happen over the lifetime of this problem.

The alarm modelling method provided in this memo provides flexibility to support implementations with different modelling requirements. All alarms are modelled as a series of states that are related together using an alarm ID. Alarm states can be modelled using traditional Notifications, generic alarm Notifications, or without the use of Notifications.

Alarm states modelled using traditional Notifications would specify a Notification Object Identifier, and optionally an (offset, value) pair of one of the Notification varbinds to identify the state. This alarm state would be entered when the entity generated a Notification that matched this information and the alarm would be added to the active alarm table. This Notification would also get sent on the wire to any destinations, as indicated in the SNMP-TARGET-MIB and SNMP-NOTIFICATION-MIB [RFC3413].

Alarm states modelled using generic Notifications use the alarmActiveState or alarmClearState Notifications defined in this memo. These alarm states would be entered after being triggered by a stimulus outside the scope of this memo, the alarm would be added to the active alarm table and these generic Notifications would then be sent on the wire to any destinations, as indicated in the SNMP-TARGET-MIB and SNMP-NOTIFICATION-MIB [RFC3413].

Alarm states modelled without any Notifications would be triggered by some stimulus outside the scope of this memo, the alarm would be added to the active alarm table, but no Notifications would be sent to interested managers.

3.3.3. Problem Indication

The Alarm MIB provides a means to determine whether a given notification is of interest to managers for purposes of alarm management by permitting inspection of the alarm models. If no entries in the alarmModelTable could match a particular notification, then that notification is not relevant to the alarm models defined. In addition, information in the alarm model, such as the Notification ID and the description tell exactly what error or warning condition this alarm is indicating. If the ITU-ALARM-MIB is also supported, additional information is provided via the probable cause.

3.3.5. Identifying Resource under Alarm

An important goal of alarm management is to ensure that any detected problems get fixed, so it is necessary to know exactly where this problem is occurring. In addition, it is necessary to be able to tell when alarm instances are raised against the same component, as well as to be able to tell what instance of an alarm is cleared by an instance of an alarm clear.

The Alarm MIB provides a generic method for identifying the resource by extracting and building a resource ID from the Notification varbinds. It records the relevant information needed to locate the source of the alarm.

3.3.6. Means of obtaining ITU alarm information

Alarm Information, as defined in ITU alarm models [M.3100], is optionally available to implementations through the optional support of the ITU-ALARM-MIB.

3.3.7. Configuration of Alarm Models

An alarm model can be added and removed during runtime. It can be modified assuming it is not being referenced by any active alarm instance.

3.3.8. Active Alarm Management

A list of currently active alarms and supporting statistics on the SNMP entity can be obtained.

This allows the network management station to find out about any problems that may have occurred before it started managing a particular network element, or while it was out of contact with it.

3.3.9. Distributed Alarm Management

All aspects of the Alarm MIB can be supported both on the device experiencing the alarms and on any mid-level managers that might be monitoring such devices.

3.3.10. Historical Alarm Management

Some systems may have a requirement that information on alarms that are no longer active is available. This memo provides a clear table to support this requirement.

This can also be achieved through the support of the Notification Log MIB [RFC3014] to store alarm state transitions.

3.4. Security

Given the nature of VACM, security for alarms is awkward since access control for the objects in the underlying Notifications can be checked only where the Notification is created. Thus such checking is possible only for locally generated Notifications, and even then only when security credentials are available.

For the purpose of this discussion, "security credentials" means the input values for the abstract service interface function `isAccessAllowed` [RFC3411] and using those credentials means conceptually using that function to see that those credentials allow access to the MIB objects in question, operating as for a Notification Originator in [RFC3413].

The Alarm MIB has the notion of a named alarm list. By using alarm list names and view-based access control [RFC3415] a network administrator can provide different access for different users. When an application creates an alarm model (indexed in part by the alarm list name) the security credentials of the creator remain associated with that alarm model and constrain what information is allowed to be placed in the active alarm table, the active alarm variable table, the cleared alarm table, and the ITU alarm table.

When processing locally-generated Notifications, the managed system MUST use the security credentials associated with each alarm model respectively, and MUST apply the same access control rules as described for a Notification Originator in [RFC3413].

The managed system SHOULD NOT apply access control when processing remotely-generated Notifications using the alarm models. In those cases the security of the information in the alarm tables SHOULD be left to the normal, overall access control for those tables.

3.5. Relationship between Alarm and Notifications

It is important to understand the relationship between alarms and Notifications, as both are traditional fault management methods. This relationship is modelled using the alarmModelTable to define the alarmModelNotificationId for each alarm state.

Not all Notifications signal an alarm state transition. Some Notifications are simply informational in nature, such as those that indicate that a configuration operation has been performed on an entity. These sorts of Notifications would not be represented in the Alarm MIB.

The Alarm MIB allows the use of the Notification space as defined in [RFC2578] in order to identify the Notifications that are related with the specific alarm state transitions. However there is no assumption that the respective Notifications must be sent for all or any of the alarm state transitions. It is also possible to model alarms using no Notifications at all. This architecture allows for both the efficient exploitation of the body of defined Notification and for the use of non-Notification based systems.

3.6. Notification Varbind Storage and Reference

In SNMPv1 [RFC1157], the varbinds in the Trap-PDU sent over the wire map one to one into those varbinds listed in the SMI of the trap in the MIB in which it was defined [RFC1215]. In the case of linkDown trap, the first varbind can unambiguously be identified as ifIndex. With the introduction of the InformRequest-PDU and SNMPv2-Trap-PDU types, which send sysUptime and snmpTrapOID as the first two varbinds, while the SMI in the MIB where the Notification is defined only lists additional varbinds, the meaning of "first varbind" becomes less clear. In the case of the linkDown Notification, referring to the first varbind could potentially be interpreted as either the sysUptime or ifIndex.

The varbind storage approach taken in the Alarm MIB is that sysUptime and snmpTrapOID SHALL always be stored in the active alarm variable table as entry 1 and 2 respectively, regardless of whether the transport was the Trap-PDU, the InformRequest-PDU or the SNMPv2-Trap-PDU. If the incoming Notification is an SNMPv1 Trap-PDU then an appropriate value for sysUpTime.0 or snmpTrapOID.0 shall be determined by using the rules in section 3.1 of [RFC3584].

The varbind reference approach taken in the Alarm MIB is that, for variables such as the `alarmModelVarbindIndex`, the first two obligatory varbinds of the `InformRequest-PDU` and `SNMPv2-Trap-PDU` need to be considered so the index values of the `Trap-PDU` and the `SMI` need be adjusted by two. In the case of `linkDown`, the third varbind would always be `ifIndex`.

3.7. Relation to Notification Log MIB

The Alarm MIB is intended to complement the Notification Log MIB [RFC3014], but can be used independently. The `alarmActiveTable` is defined in manner similar to that of the `nlmLogTable`. This format allows for the storage of any Trap or Notification type that can be defined using the SMI, or can be carried by SNMP. Using the same format as the Notification Log MIB also simplifies operations for systems choosing to implement both MIBs.

The object `alarmActiveLogPointer` points, for each entry in the `alarmActiveLogTable`, to the log index in the Notification Log MIB, if used.

If the Notification Log MIB is supported, it can be monitored by a management system as a hedge against lost alarms. The Notification Log can also be used to support historical alarm management.

3.8. Relationship with the Event MIB

During the work and discussions in the Working Group, the issue of the relationship between the MIB modules and the Event MIB [RFC2981] was raised. There is no direct relation or dependency between the Alarm MIB and the Event MIB. Some common terms (like 'event') are being used in both MIB modules, and the user is directed to the sections that define terminology in the two documents for clarification.

4. Generic Alarm MIB

4.1. Overview

The ALARM-MIB consists of alarm models and lists of active and cleared alarms.

The `alarmModelTable` contains information that is applicable to all instances of an alarm. It can be populated at start-up with all alarms that could happen on a system or later configured by a management application. It contains all the alarms for a given system. If a Notification is not represented in the `alarmModelTable`, it is not an alarm state transition. The `alarmModelTable` provides a

means of defining the raise/clear and other state transition relationships between alarm states. The alarmModelIndex acts as a unique identifier for an alarm. An alarm model consists of definitions of the possible states an alarm can assume as well as the Object Identifier (OID) of the Notification associated with this alarm state. The object alarmModelState defines the states of an alarm.

The alarmActiveTable contains a list of alarms that are currently occurring on a system. It is intended that this table be queried upon device discovery and rediscovery to determine which alarms are currently active on the device.

The alarmActiveVariableTable contains the Notification variable bindings associated with the alarms in the alarmActiveTable.

The alarmActiveStatsTable contains current and total raised alarm counts as well as the time of the last alarm raise and alarm clears per named alarm list.

The alarmClearTable contains recently cleared alarms. It contains up to alarmClearMaximum cleared alarms.

The MIB also defines generic alarm Notifications that can be used when there is not an existing applicable Notification to signal the alarm state transition - alarmActiveState and alarmClearState.

4.1.1. Extensibility

The relationship between the Alarm MIB and the other alarm model MIB modules is expressed by the following: The alarmModelTable has a corresponding table in the specific MIB. For each row in the specific MIB alarm model table there is one row in the alarmModelTable. The alarmActiveTable has a corresponding table in the specific MIBs. For each row in the specific MIB active alarm table, there is one row in the alarmActiveTable. The alarmModelSpecificPointer object in the alarmModelTable points to the specific model entry in an extended alarm model table corresponding to this particular alarm. The alarmActiveSpecificPointer object in the alarmActiveTable points to the specific active alarm entry in an extended active alarm table corresponding to this particular alarm instance.

Additional extensions can be defined by defining an AUGMENTATION of either the Alarm or ITU Alarm tables. As the alarm model table only provides a mechanism to point at one specific alarm model, additional specific models SHOULD define another mechanism to map from the generic alarm model to the additional model.

4.1.2. Problem Indication

The problem that each alarm indicates is identified through the Object Identifier of the NotificationId of the state transition, and, optionally, the ITU parameters. alarmModelDescription provides a description of the alarm state suitable for displaying to an operator.

4.1.3. Alarm State Transition Notification

The SNMP-TARGET-MIB [RFC3413] provides the ability to specify which managers, if any, receive Notifications of problems. Solutions can therefore use the features of this MIB to change the Notification behaviour of their implementations. Specifying target hosts in this MIB along with specifying notifications in the alarmModelNotificationId would allow Notifications to be logged and sent out to management stations in an architecture as described in section 3.2. Specifying no target hosts in this MIB along with specifying notifications in the alarmModelNotificationId would allow Notifications to be logged but not sent out to management stations in an architecture as described in section 3.2. Regardless of what is defined in the SNMP-TARGET-MIB, specifying { 0 0 } in the alarmModelNotificationId would result in no notifications being logged or sent to management stations as a consequence of this particular alarm state transition.

Alarms are modelled by defining all possible states in the alarmModelTable, as well as defining alarmModelNotificationId, alarmModelVarbindIndex, and alarmModelVarbindValue for each of the possible alarm states. Optionally, ituAlarmPerceivedSeverity models the states in terms of ITU perceived severity.

4.1.4. Active Alarm Resource Identifier

Resources under alarm can be identified using the alarmActiveResourceId. This OBJECT IDENTIFIER points to an appropriate object to identify the given resource, depending on the type of the resource.

The consumer of the alarmActiveResourceId does not necessarily need to know the type of the resource in the resource ID, but if they want to know this, examining the content of the resource ID can derive it - 1.3.6.1.2.1.2.2.1.1.something is an interface, for example. It is therefore good practice to use resource IDs that can be consistently used across technologies, such as ifIndex, entPhysicalIndex or sysApplRunIndex, to minimize the number of resource prefixes a manager interested in a resource type needs to learn.

Resource ID can be calculated using the `alarmModelResourcePrefix`, `alarmModelVarbindSubtree` and the Notification varbinds. This allows for both the managed element to be able to compute and populate the `alarmActiveResourceId` object and for the manager to be able to determine when two separate alarm instances are referring to the same resource.

If `alarmModelResourcePrefix` has a value of 0.0, then `alarmActiveResourceId` is simply the variable identifier of the first Notification varbind that matches the prefix defined in `alarmModelVarbindSubtree`. Otherwise, `alarmActiveResourceId` is calculated by appending the instance information from the first Notification varbind that matches `alarmModelVarbindSubtree` to the prefix defined in `alarmModelResourcePrefix`. The instance information is the portion of the variable identifier following the part that matched `alarmModelVarbindSubtree`. If no match is found, then `alarmActiveResourceId` is simply the value of `alarmModelResourcePrefix`.

In addition to this, the variable bindings from the Notifications that signal the alarm state transitions are stored in the active alarm variable table. This allows for implementations familiar with the particular Notifications to implement other forms of resource identification.

For Example:

A) Consider an alarm modelled using the authenticationFailure [RFC3418] Notification.

authenticationFailure NOTIFICATION-TYPE

STATUS current

DESCRIPTION

"An authenticationFailure trap signifies that the SNMPv2 entity, acting in an agent role, has received a protocol message that is not properly authenticated. While all implementations of the SNMPv2 must be capable of generating this trap, the `snmpEnableAuthenTraps` object indicates whether this trap will be generated."

::= { snmpTraps 5 }

To set the resource ID to be `usmStats`, 1.3.6.1.6.3.15.1.1, configure as follows:

`alarmModelVarbindSubtree` = 0.0

`alarmModelResourcePrefix` = `usmStats` (1.3.6.1.6.3.15.1.1)

B) Consider an alarm modelled using linkDown [RFC2863]

```
linkDown NOTIFICATION-TYPE
    OBJECTS { ifIndex, ifAdminStatus, ifOperStatus }
    STATUS   current
    DESCRIPTION
        ""
    ::= { snmpTraps 3 }
```

To set the resource Id to be the ifIndex, configure as follows:
 alarmModelVarbindSubtree = ifIndex (1.3.6.1.2.1.2.2.1.1)
 alarmModelResourcePrefix = 0.0

Alternatively, since ifIndex is the first varbind, the following would also work, but might be less meaningful to a human reader of the MIB table:

```
alarmModelVarbindSubtree = 0.0
alarmModelResourcePrefix = 0.0
```

C) Consider an alarm modelled using the bgpBackwardTransition [RFC1657] Notification.

```
bgpBackwardTransition NOTIFICATION-TYPE
    OBJECTS { bgpPeerLastError,
              bgpPeerState      }
    STATUS   current
    DESCRIPTION
        "The BGPBackwardTransition Event is generated
        when the BGP FSM moves from a higher numbered
        state to a lower numbered state."
    ::= { bgpTraps 2 }
```

To set the resource Id to be the bgpPeerRemoteAddr, the index to the bgpTable, where bgpPeerState resides, configure as follows:
 alarmModelVarbindSubtree = bgpPeerState
(1.3.6.1.2.1.15.3.1.2)
 alarmModelResourcePrefix = bgpPeerRemoteAddr
 (1.3.6.1.2.1.15.3.1.7)

4.1.5. Configurable Alarm Models

The alarm model table SHOULD be initially populated by the system. The objects in alarmModelTable and ituAlarmTable have a MAX-ACCESS of read-create, which allows managers to modify the alarm models to suit their requirements.

4.1.6. Active Alarm Management

Lists of alarms currently active on an SNMP entity are stored in the alarmActiveTable and, optionally, a model specific alarmTable, e.g., the ituAlarmActiveTable.

4.1.7. Distributed Alarm Management

Distributed alarm management can be achieved by support of the Alarm MIB on both the alarm detection point and on the mid-level manager. This is facilitated by the ability to be able to store different named alarm lists. A mid-level manager could create an alarmListName for each of the devices it manages and therefore store separate lists for each device. In addition, the context and IP addresses of the alarm detection point are stored in the alarmActiveTable.

4.2. Definitions

ALARM-MIB DEFINITIONS ::= BEGIN

IMPORTS

```

MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
Integer32, Unsigned32, Gauge32,
TimeTicks, Counter32, Counter64,
IpAddress, Opaque, mib-2,
zeroDotZero
    FROM SNMPv2-SMI                -- [RFC2578]
DateAndTime,
RowStatus, RowPointer,
TEXTUAL-CONVENTION
    FROM SNMPv2-TC                -- [RFC2579]
SnmAdminString
    FROM SNMP-FRAMEWORK-MIB       -- [RFC3411]
InetAddressType, InetAddress
    FROM INET-ADDRESS-MIB        -- [RFC3291]
MODULE-COMPLIANCE, OBJECT-GROUP,
NOTIFICATION-GROUP
    FROM SNMPv2-CONF             -- [RFC2580]
ZeroBasedCounter32
    FROM RMON2-MIB;              -- [RFC2021]

```

alarmMIB MODULE-IDENTITY

```

LAST-UPDATED "200409090000Z" -- September 09, 2004
ORGANIZATION "IETF Distributed Management Working Group"
CONTACT-INFO
    "WG EMail: disman@ietf.org
    Subscribe: disman-request@ietf.org
    http://www.ietf.org/html.charters/disman-charter.html"

```

Chair: Randy Presuhn
randy_presuhn@mindspring.com

Editors: Sharon Chisholm
Nortel Networks
PO Box 3511 Station C
Ottawa, Ont. K1Y 4H7
Canada
schishol@nortelnetworks.com

Dan Romascanu
Avaya
Atidim Technology Park, Bldg. #3
Tel Aviv, 61131
Israel
Tel: +972-3-645-8414
Email: dromasca@avaya.com"

DESCRIPTION

"The MIB module describes a generic solution to model alarms and to store the current list of active alarms.

Copyright (C) The Internet Society (2004). The initial version of this MIB module was published in RFC 3877. For full legal notices see the RFC itself. Supplementary information may be available on: <http://www.ietf.org/copyrights/ianamib.html>"

REVISION "200409090000Z" -- September 09, 2004

DESCRIPTION

"Initial version, published as RFC 3877."

::= { mib-2 118 }

alarmObjects OBJECT IDENTIFIER ::= { alarmMIB 1 }

alarmNotifications OBJECT IDENTIFIER ::= { alarmMIB 0 }

alarmModel OBJECT IDENTIFIER ::= { alarmObjects 1 }

alarmActive OBJECT IDENTIFIER ::= { alarmObjects 2 }

alarmClear OBJECT IDENTIFIER ::= { alarmObjects 3 }

-- Textual Conventions

-- ResourceId is intended to be a general textual convention
-- that can be used outside of the set of MIBs related to
-- Alarm Management.

ResourceId ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"A unique identifier for this resource.

The type of the resource can be determined by looking at the OID that describes the resource.

Resources must be identified in a consistent manner. For example, if this resource is an interface, this object MUST point to an ifIndex and if this resource is a physical entity [RFC2737], then this MUST point to an entPhysicalDescr, given that entPhysicalIndex is not accessible. In general, the value is the name of the instance of the first accessible columnar object in the conceptual row of a table that is meaningful for this resource type, which SHOULD be defined in an IETF standard MIB."

SYNTAX OBJECT IDENTIFIER

-- LocalSnmpEngineOrZeroLenStr is intended to be a general
-- textual convention that can be used outside of the set of
-- MIBs related to Alarm Management.

LocalSnmpEngineOrZeroLenStr ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"An SNMP Engine ID or a zero-length string. The instantiation of this textual convention will provide guidance on when this will be an SNMP Engine ID and when it will be a zero lengths string"

SYNTAX OCTET STRING (SIZE(0 | 5..32))

-- Alarm Model

alarmModelLastChanged OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime at the time of the last creation, deletion or modification of an entry in the alarmModelTable.

If the number and content of entries has been unchanged since the last re-initialization of the local network management subsystem, then the value of this object MUST be zero."

```
::= { alarmModel 1 }
```

```
alarmModelTable OBJECT-TYPE
```

```
SYNTAX      SEQUENCE OF AlarmModelEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "A table of information about possible alarms on the system,  
    and how they have been modelled."
```

```
::= { alarmModel 2 }
```

```
alarmModelEntry OBJECT-TYPE
```

```
SYNTAX      AlarmModelEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Entries appear in this table for each possible alarm state.  
    This table MUST be persistent across system reboots."
```

```
INDEX       { alarmListName, alarmModelIndex, alarmModelState }
```

```
::= { alarmModelTable 1 }
```

```
AlarmModelEntry ::= SEQUENCE {
```

alarmModelIndex	Unsigned32,
alarmModelState	Unsigned32,
alarmModelNotificationId	OBJECT IDENTIFIER,
alarmModelVarbindIndex	Unsigned32,
alarmModelVarbindValue	Integer32,
alarmModelDescription	SnmpAdminString,
alarmModelSpecificPointer	RowPointer,
alarmModelVarbindSubtree	OBJECT IDENTIFIER,
alarmModelResourcePrefix	OBJECT IDENTIFIER,
alarmModelRowStatus	RowStatus

```
}
```

```
alarmModelIndex OBJECT-TYPE
```

```
SYNTAX      Unsigned32 (1..4294967295)
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "An integer that acts as an alarm Id  
    to uniquely identify each alarm  
    within the named alarm list. "
```

```
::= { alarmModelEntry 1 }
```

```
alarmModelState OBJECT-TYPE
```

```
SYNTAX      Unsigned32 (1..4294967295)
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

DESCRIPTION

"A value of 1 MUST indicate a clear alarm state. The value of this object MUST be less than the alarmModelState of more severe alarm states for this alarm. The value of this object MUST be more than the alarmModelState of less severe alarm states for this alarm."

::= { alarmModelEntry 2 }

alarmModelNotificationId OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The NOTIFICATION-TYPE object identifier of this alarm state transition. If there is no notification associated with this alarm state, the value of this object MUST be '0.0'."

DEFVAL { zeroDotZero }

::= { alarmModelEntry 3 }

alarmModelVarbindIndex OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The index into the varbind listing of the notification indicated by alarmModelNotificationId which helps signal that the given alarm has changed state. If there is no applicable varbind, the value of this object MUST be zero.

Note that the value of alarmModelVarbindIndex acknowledges the existence of the first two obligatory varbinds in the InformRequest-PDU and SNMPv2-Trap-PDU (sysUpTime.0 and snmpTrapOID.0). That is, a value of 2 refers to the snmpTrapOID.0.

If the incoming notification is instead an SNMPv1 Trap-PDU, then an appropriate value for sysUpTime.0 or snmpTrapOID.0 shall be determined by using the rules in section 3.1 of [RFC3584]"

DEFVAL { 0 }

::= { alarmModelEntry 4 }

alarmModelVarbindValue OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value that the varbind indicated by alarmModelVarbindIndex takes to indicate that the alarm has entered this state.

If alarmModelVarbindIndex has a value of 0, so MUST alarmModelVarbindValue.

"

DEFVAL { 0 }

::= { alarmModelEntry 5 }

alarmModelDescription OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"A brief description of this alarm and state suitable to display to operators."

DEFVAL { "" }

::= { alarmModelEntry 6 }

alarmModelSpecificPointer OBJECT-TYPE

SYNTAX RowPointer

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"If no additional, model-specific Alarm MIB is supported by the system the value of this object is '0.0' and attempts to set it to any other value MUST be rejected appropriately.

When a model-specific Alarm MIB is supported, this object MUST refer to the first accessible object in a corresponding row of the model definition in one of these model-specific MIB and attempts to set this object to { 0 0 } or any other value MUST be rejected appropriately."

DEFVAL { zeroDotZero }

::= { alarmModelEntry 7 }

alarmModelVarbindSubtree OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The name portion of each VarBind in the notification, in order, is compared to the value of this object. If the name is equal to or a subtree of the value of this object, for purposes of computing the value

of AlarmActiveResourceId the 'prefix' will be the matching portion, and the 'indexes' will be any remainder. The examination of varbinds ends with the first match. If the value of this object is 0.0, then the first varbind, or in the case of v2, the first varbind after the timestamp and the trap OID, will always be matched.

"

```
DEFVAL { zeroDotZero }
::= { alarmModelEntry 8 }
```

alarmModelResourcePrefix OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value of AlarmActiveResourceId is computed by appending any indexes extracted in accordance with the description of alarmModelVarbindSubtree onto the value of this object. If this object's value is 0.0, then the 'prefix' extracted is used instead.

"

```
DEFVAL { zeroDotZero }
::= { alarmModelEntry 9 }
```

alarmModelRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Control for creating and deleting entries. Entries may be modified while active. Alarms whose alarmModelRowStatus is not active will not appear in either the alarmActiveTable or the alarmClearTable. Setting this object to notInService cannot be used as an alarm suppression mechanism. Entries that are notInService will disappear as described in RFC2579.

This row can not be modified while it is being referenced by a value of alarmActiveModelPointer. In these cases, an error of 'inconsistentValue' will be returned to the manager.

This entry may be deleted while it is being referenced by a value of alarmActiveModelPointer. This results in the deletion of this entry and entries in the active alarms referencing this entry via an alarmActiveModelPointer.

As all read-create objects in this table have a DEFVAL clause, there is no requirement that any object be explicitly set before this row can become active. Note that a row consisting only of default values is not very meaningful."

```
::= { alarmModelEntry 10 }
```

-- Active Alarm Table --

alarmActiveLastChanged OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime at the time of the last creation or deletion of an entry in the alarmActiveTable. If the number of entries has been unchanged since the last re-initialization of the local network management subsystem, then this object contains a zero value."

```
::= { alarmActive 1 }
```

alarmActiveOverflow OBJECT-TYPE

SYNTAX Counter32

UNITS "active alarms"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of active alarms that have not been put into the alarmActiveTable since system restart as a result of extreme resource constraints."

```
::= { alarmActive 5 }
```

alarmActiveTable OBJECT-TYPE

SYNTAX SEQUENCE OF AlarmActiveEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table of Active Alarms entries."

```
::= { alarmActive 2 }
```

alarmActiveEntry OBJECT-TYPE

SYNTAX AlarmActiveEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Entries appear in this table when alarms are raised. They are removed when the alarm is cleared."

If under extreme resource constraint the system is unable to

add any more entries into this table, then the alarmActiveOverflow statistic will be increased by one."

```

INDEX      { alarmListName, alarmActiveDateAndTime,
              alarmActiveIndex }
 ::= { alarmActiveTable 1 }

```

```

AlarmActiveEntry ::= SEQUENCE {
    alarmListName          SnmpAdminString,
    alarmActiveDateAndTime DateAndTime,
    alarmActiveIndex       Unsigned32,
    alarmActiveEngineID    LocalSnmpEngineOrZeroLenStr,
    alarmActiveEngineAddressType InetAddressType,
    alarmActiveEngineAddress InetAddress,
    alarmActiveContextName SnmpAdminString,
    alarmActiveVariables    Unsigned32,
    alarmActiveNotificationID OBJECT IDENTIFIER,
    alarmActiveResourceId   ResourceId,
    alarmActiveDescription  SnmpAdminString,
    alarmActiveLogPointer   RowPointer,
    alarmActiveModelPointer RowPointer,
    alarmActiveSpecificPointer RowPointer }

```

```

alarmListName OBJECT-TYPE
SYNTAX      SnmpAdminString (SIZE(0..32))
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The name of the list of alarms. This SHOULD be the same as
    nlmLogName if the Notification Log MIB [RFC3014] is supported.
    This SHOULD be the same as, or contain as a prefix, the
    applicable snmpNotifyFilterProfileName if the
    SNMP-NOTIFICATION-MIB DEFINITIONS [RFC3413] is supported.

```

An implementation may allow multiple named alarm lists, up to some implementation-specific limit (which may be none). A zero-length list name is reserved for creation and deletion by the managed system, and MUST be used as the default log name by systems that do not support named alarm lists."

```

 ::= { alarmActiveEntry 1 }

```

```

alarmActiveDateAndTime OBJECT-TYPE
SYNTAX      DateAndTime
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The local date and time when the error occurred.

```

This object facilitates retrieving all instances of

alarms that have been raised or have changed state since a given point in time.

Implementations MUST include the offset from UTC, if available. Implementation in environments in which the UTC offset is not available is NOT RECOMMENDED."

::= { alarmActiveEntry 2 }

alarmActiveIndex OBJECT-TYPE

SYNTAX Unsigned32 (1..4294967295)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A strictly monotonically increasing integer which acts as the index of entries within the named alarm list. It wraps back to 1 after it reaches its maximum value."

::= { alarmActiveEntry 3 }

alarmActiveEngineID OBJECT-TYPE

SYNTAX LocalSnmpEngineOrZeroLenStr

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The identification of the SNMP engine at which the alarm originated. If the alarm is from an SNMPv1 system this object is a zero length string."

::= { alarmActiveEntry 4 }

alarmActiveEngineAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object indicates what type of address is stored in the alarmActiveEngineAddress object - IPv4, IPv6, DNS, etc."

::= { alarmActiveEntry 5 }

alarmActiveEngineAddress OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The address of the SNMP engine on which the alarm is occurring.

This object MUST always be instantiated, even if the list can contain alarms from only one engine."


```
::= { alarmActiveEntry 6 }
```

alarmActiveContextName OBJECT-TYPE

SYNTAX SnmpAdminString (SIZE(0..32))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The name of the SNMP MIB context from which the alarm came. For SNMPv1 alarms this is the community string from the Trap. Note that care MUST be taken when selecting community strings to ensure that these can be represented as a well-formed SnmpAdminString. Community or Context names that are not well-formed SnmpAdminStrings will be mapped to zero length strings.

If the alarm's source SNMP engine is known not to support multiple contexts, this object is a zero length string."

```
::= { alarmActiveEntry 7 }
```

alarmActiveVariables OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of variables in alarmActiveVariableTable for this alarm."

```
::= { alarmActiveEntry 8 }
```

alarmActiveNotificationID OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The NOTIFICATION-TYPE object identifier of the alarm state transition that is occurring."

```
::= { alarmActiveEntry 9 }
```

alarmActiveResourceId OBJECT-TYPE

SYNTAX ResourceId

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object identifies the resource under alarm.

If there is no corresponding resource, then the value of this object MUST be 0.0."

```
::= { alarmActiveEntry 10 }
```

alarmActiveDescription OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object provides a textual description of the active alarm. This text is generated dynamically by the notification generator to provide useful information to the human operator. This information SHOULD provide information allowing the operator to locate the resource for which this alarm is being generated. This information is not intended for consumption by automated tools."

::= { alarmActiveEntry 11 }

alarmActiveLogPointer OBJECT-TYPE

SYNTAX RowPointer

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A pointer to the corresponding row in a notification logging MIB where the state change notification for this active alarm is logged. If no log entry applies to this active alarm, then this object MUST have the value of 0.0"

::= { alarmActiveEntry 12 }

alarmActiveModelPointer OBJECT-TYPE

SYNTAX RowPointer

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A pointer to the corresponding row in the alarmModelTable for this active alarm. This points not only to the alarm model being instantiated, but also to the specific alarm state that is active."

::= { alarmActiveEntry 13 }

alarmActiveSpecificPointer OBJECT-TYPE

SYNTAX RowPointer

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If no additional, model-specific, Alarm MIB is supported by the system this object is '0.0'. When a model-specific Alarm MIB is supported, this object is the instance pointer to the specific model-specific active alarm list."

```
::= { alarmActiveEntry 14 }
```

```
-- Active Alarm Variable Table --
```

```
alarmActiveVariableTable OBJECT-TYPE
```

```
SYNTAX      SEQUENCE OF AlarmActiveVariableEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"A table of variables to go with active alarm entries."
```

```
::= { alarmActive 3 }
```

```
alarmActiveVariableEntry OBJECT-TYPE
```

```
SYNTAX      AlarmActiveVariableEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"Entries appear in this table when there are variables in
the varbind list of a corresponding alarm in
alarmActiveTable.
```

```
Entries appear in this table as though
the trap/notification had been transported using a
SNMPv2-Trap-PDU, as defined in [RFC3416] - i.e., the
alarmActiveVariableIndex 1 will always be sysUpTime
and alarmActiveVariableIndex 2 will always be
snmpTrapOID.
```

```
If the incoming notification is instead an SNMPv1 Trap-PDU and
the value of alarmModelVarbindIndex is 1 or 2, an appropriate
value for sysUpTime.0 or snmpTrapOID.0 shall be determined
by using the rules in section 3.1 of [RFC3584]."
```

```
INDEX      { alarmListName, alarmActiveIndex,
              alarmActiveVariableIndex }
```

```
::= { alarmActiveVariableTable 1 }
```

```
AlarmActiveVariableEntry ::= SEQUENCE {
```

alarmActiveVariableIndex	Unsigned32,
alarmActiveVariableID	OBJECT IDENTIFIER,
alarmActiveVariableValueType	INTEGER,
alarmActiveVariableCounter32Val	Counter32,
alarmActiveVariableUnsigned32Val	Unsigned32,
alarmActiveVariableTimeTicksVal	TimeTicks,
alarmActiveVariableInteger32Val	Integer32,
alarmActiveVariableOctetStringVal	OCTET STRING,
alarmActiveVariableIpAddressVal	IpAddress,
alarmActiveVariableOidVal	OBJECT IDENTIFIER,
alarmActiveVariableCounter64Val	Counter64,

alarmActiveVariableOpaqueVal Opaque }

alarmActiveVariableIndex OBJECT-TYPE

SYNTAX Unsigned32 (1..4294967295)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A strictly monotonically increasing integer, starting at 1 for a given alarmActiveIndex, for indexing variables within the active alarm variable list. "

::= { alarmActiveVariableEntry 1 }

alarmActiveVariableID OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The alarm variable's object identifier."

::= { alarmActiveVariableEntry 2 }

alarmActiveVariableValueType OBJECT-TYPE

SYNTAX INTEGER {
 counter32(1),
 unsigned32(2),
 timeTicks(3),
 integer32(4),
 ipAddress(5),
 octetString(6),
 objectId(7),
 counter64(8),
 opaque(9)
 }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The type of the value. One and only one of the value objects that follow is used for a given row in this table, based on this type."

::= { alarmActiveVariableEntry 3 }

alarmActiveVariableCounter32Val OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value when alarmActiveVariableType is 'counter32'."

::= { alarmActiveVariableEntry 4 }

alarmActiveVariableUnsigned32Val OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value when alarmActiveVariableType is 'unsigned32'."
::= { alarmActiveVariableEntry 5 }

alarmActiveVariableTimeTicksVal OBJECT-TYPE
SYNTAX TimeTicks
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value when alarmActiveVariableType is 'timeTicks'."
::= { alarmActiveVariableEntry 6 }

alarmActiveVariableInteger32Val OBJECT-TYPE
SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value when alarmActiveVariableType is 'integer32'."
::= { alarmActiveVariableEntry 7 }

alarmActiveVariableOctetStringVal OBJECT-TYPE
SYNTAX OCTET STRING (SIZE(0..65535))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value when alarmActiveVariableType is 'octetString'."
::= { alarmActiveVariableEntry 8 }

alarmActiveVariableIpAddressVal OBJECT-TYPE
SYNTAX IpAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value when alarmActiveVariableType is 'ipAddress'."
::= { alarmActiveVariableEntry 9 }

alarmActiveVariableOidVal OBJECT-TYPE
SYNTAX OBJECT IDENTIFIER
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value when alarmActiveVariableType is 'objectId'."
::= { alarmActiveVariableEntry 10 }

alarmActiveVariableCounter64Val OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value when alarmActiveVariableType is 'counter64'."

::= { alarmActiveVariableEntry 11 }

alarmActiveVariableOpaqueVal OBJECT-TYPE

SYNTAX Opaque (SIZE(0..65535))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value when alarmActiveVariableType is 'opaque'."

Note that although RFC2578 [RFC2578] forbids the use of Opaque in 'standard' MIB modules, this particular usage is driven by the need to be able to accurately represent any well-formed notification, and justified by the need for backward compatibility."

::= { alarmActiveVariableEntry 12 }

-- Statistics --

alarmActiveStatsTable OBJECT-TYPE

SYNTAX SEQUENCE OF AlarmActiveStatsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table represents the alarm statistics information."

::= { alarmActive 4 }

alarmActiveStatsEntry OBJECT-TYPE

SYNTAX AlarmActiveStatsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Statistics on the current active alarms."

INDEX { alarmListName }

::= { alarmActiveStatsTable 1 }

AlarmActiveStatsEntry ::=

SEQUENCE {

alarmActiveStatsActiveCurrent	Gauge32,
alarmActiveStatsActives	ZeroBasedCounter32,
alarmActiveStatsLastRaise	TimeTicks,

```

        alarmActiveStatsLastClear      TimeTicks
    }

```

alarmActiveStatsActiveCurrent OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of currently active alarms on the system."

::= { alarmActiveStatsEntry 1 }

alarmActiveStatsActives OBJECT-TYPE

SYNTAX ZeroBasedCounter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of active alarms since system restarted."

::= { alarmActiveStatsEntry 2 }

alarmActiveStatsLastRaise OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime at the time of the last alarm raise for this alarm list.

If no alarm raises have occurred since the last re-initialization of the local network management subsystem, then this object contains a zero value."

::= { alarmActiveStatsEntry 3 }

alarmActiveStatsLastClear OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime at the time of the last alarm clear for this alarm list.

If no alarm clears have occurred since the last re-initialization of the local network management subsystem, then this object contains a zero value."

::= { alarmActiveStatsEntry 4 }

-- Alarm Clear

alarmClearMaximum OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object specifies the maximum number of cleared alarms to store in the alarmClearTable. When this number is reached, the cleared alarms with the earliest clear time will be removed from the table."

::= { alarmClear 1 }

alarmClearTable OBJECT-TYPE

SYNTAX SEQUENCE OF AlarmClearEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table contains information on cleared alarms."

::= { alarmClear 2 }

alarmClearEntry OBJECT-TYPE

SYNTAX AlarmClearEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Information on a cleared alarm."

INDEX { alarmListName, alarmClearDateAndTime, alarmClearIndex }

::= { alarmClearTable 1 }

AlarmClearEntry ::=

SEQUENCE {	
alarmClearIndex	Unsigned32,
alarmClearDateAndTime	DateAndTime,
alarmClearEngineID	LocalSnmpEngineOrZeroLenStr,
alarmClearEngineAddressType	InetAddressType,
alarmClearEngineAddress	InetAddress,
alarmClearContextName	SnmpAdminString,
alarmClearNotificationID	OBJECT IDENTIFIER,
alarmClearResourceId	ResourceId,
alarmClearLogIndex	Unsigned32,
alarmClearModelPointer	RowPointer
}	

alarmClearIndex OBJECT-TYPE

SYNTAX Unsigned32 (1..4294967295)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An integer which acts as the index of entries within

the named alarm list. It wraps back to 1 after it reaches its maximum value.

This object has the same value as the alarmActiveIndex that this alarm instance had when it was active."

::= { alarmClearEntry 1 }

alarmClearDateAndTime OBJECT-TYPE

SYNTAX DateAndTime
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION

"The local date and time when the alarm cleared.

This object facilitates retrieving all instances of alarms that have been cleared since a given point in time.

Implementations MUST include the offset from UTC, if available. Implementation in environments in which the UTC offset is not available is NOT RECOMMENDED."

::= { alarmClearEntry 2 }

alarmClearEngineID OBJECT-TYPE

SYNTAX LocalSnmpEngineOrZeroLenStr
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"The identification of the SNMP engine at which the alarm originated. If the alarm is from an SNMPv1 system this object is a zero length string."

::= { alarmClearEntry 3 }

alarmClearEngineAddressType OBJECT-TYPE

SYNTAX InetAddressType
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"This object indicates what type of address is stored in the alarmActiveEngineAddress object - IPv4, IPv6, DNS, etc."

::= { alarmClearEntry 4 }

alarmClearEngineAddress OBJECT-TYPE

SYNTAX InetAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"The Address of the SNMP engine on which the alarm was occurring. This is used to identify the source of an SNMPv1

trap, since an alarmActiveEngineId cannot be extracted from the SNMPv1 trap PDU.

This object MUST always be instantiated, even if the list can contain alarms from only one engine."

::= { alarmClearEntry 5 }

alarmClearContextName OBJECT-TYPE

SYNTAX SnmpAdminString (SIZE(0..32))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The name of the SNMP MIB context from which the alarm came. For SNMPv1 traps this is the community string from the Trap. Note that care needs to be taken when selecting community strings to ensure that these can be represented as a well-formed SnmpAdminString. Community or Context names that are not well-formed SnmpAdminStrings will be mapped to zero length strings.

If the alarm's source SNMP engine is known not to support multiple contexts, this object is a zero length string."

::= { alarmClearEntry 6 }

alarmClearNotificationID OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The NOTIFICATION-TYPE object identifier of the alarm clear."

::= { alarmClearEntry 7 }

alarmClearResourceId OBJECT-TYPE

SYNTAX ResourceId

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object identifies the resource that was under alarm.

If there is no corresponding resource, then the value of this object MUST be 0.0."

::= { alarmClearEntry 8 }

alarmClearLogIndex OBJECT-TYPE

SYNTAX Unsigned32 (0..4294967295)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This number MUST be the same as the log index of the applicable row in the notification log MIB, if it exists. If no log index applies to the trap, then this object MUST have the value of 0."

::= { alarmClearEntry 9 }

alarmClearModelPointer OBJECT-TYPE

SYNTAX RowPointer

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A pointer to the corresponding row in the alarmModelTable for this cleared alarm."

::= { alarmClearEntry 10 }

-- Notifications

alarmActiveState NOTIFICATION-TYPE

OBJECTS { alarmActiveModelPointer,
alarmActiveResourceId }

STATUS current

DESCRIPTION

"An instance of the alarm indicated by alarmActiveModelPointer has been raised against the entity indicated by alarmActiveResourceId."

The agent must throttle the generation of consecutive alarmActiveState traps so that there is at least a two-second gap between traps of this type against the same alarmActiveModelPointer and alarmActiveResourceId. When traps are throttled, they are dropped, not queued for sending at a future time.

A management application should periodically check the value of alarmActiveLastChanged to detect any missed alarmActiveState notification-events, e.g., due to throttling or transmission loss."

::= { alarmNotifications 2 }

alarmClearState NOTIFICATION-TYPE

OBJECTS { alarmActiveModelPointer,
alarmActiveResourceId }

STATUS current

DESCRIPTION

"An instance of the alarm indicated by alarmActiveModelPointer has been cleared against

the entity indicated by alarmActiveResourceId.

The agent must throttle the generation of consecutive alarmActiveClear traps so that there is at least a two-second gap between traps of this type against the same alarmActiveModelPointer and alarmActiveResourceId. When traps are throttled, they are dropped, not queued for sending at a future time.

A management application should periodically check the value of alarmActiveLastChanged to detect any missed alarmClearState notification-events, e.g., due to throttling or transmission loss."

```
::= { alarmNotifications 3 }
```

```
-- Conformance
```

```
alarmConformance OBJECT IDENTIFIER ::= { alarmMIB 2 }
```

```
alarmCompliances OBJECT IDENTIFIER ::= { alarmConformance 1 }
```

```
alarmCompliance MODULE-COMPLIANCE
```

```
    STATUS current
```

```
    DESCRIPTION
```

```
        "The compliance statement for systems supporting  
        the Alarm MIB."
```

```
    MODULE -- this module
```

```
        MANDATORY-GROUPS {
```

```
            alarmActiveGroup,
```

```
            alarmModelGroup
```

```
        }
```

```
    GROUP alarmActiveStatsGroup
```

```
    DESCRIPTION
```

```
        "This group is optional."
```

```
    GROUP alarmClearGroup
```

```
    DESCRIPTION
```

```
        "This group is optional."
```

```
    GROUP alarmNotificationsGroup
```

```
    DESCRIPTION
```

```
        "This group is optional."
```

```
::= { alarmCompliances 1 }
```

```
alarmGroups OBJECT IDENTIFIER ::= { alarmConformance 2 }
```

```
alarmModelGroup OBJECT-GROUP
```

```
    OBJECTS {
```

```
        alarmModelLastChanged,
```

```
        alarmModelNotificationId,
```

```

    alarmModelVarbindIndex,
    alarmModelVarbindValue,
    alarmModelDescription,
    alarmModelSpecificPointer,
    alarmModelVarbindSubtree,
    alarmModelResourcePrefix,
    alarmModelRowStatus
}
STATUS    current
DESCRIPTION
    "Alarm model group."
 ::= { alarmGroups 1}

```

```

alarmActiveGroup OBJECT-GROUP
    OBJECTS {
        alarmActiveLastChanged,
        alarmActiveOverflow,
        alarmActiveEngineID,
        alarmActiveEngineAddressType,
        alarmActiveEngineAddress,
        alarmActiveContextName,
        alarmActiveVariables,
        alarmActiveNotificationID,
        alarmActiveResourceId,
        alarmActiveDescription,
        alarmActiveLogPointer,
        alarmActiveModelPointer,
        alarmActiveSpecificPointer,
        alarmActiveVariableID,
        alarmActiveVariableValueType,
        alarmActiveVariableCounter32Val,
        alarmActiveVariableUnsigned32Val,
        alarmActiveVariableTimeTicksVal,
        alarmActiveVariableInteger32Val,
        alarmActiveVariableOctetStringVal,
        alarmActiveVariableIpAddressVal,
        alarmActiveVariableOidVal,
        alarmActiveVariableCounter64Val,
        alarmActiveVariableOpaqueVal
    }
    STATUS    current
    DESCRIPTION
        "Active Alarm list group."
    ::= { alarmGroups 2}

alarmActiveStatsGroup OBJECT-GROUP
    OBJECTS {
        alarmActiveStatsActives,

```

```

        alarmActiveStatsActiveCurrent,
        alarmActiveStatsLastRaise,
        alarmActiveStatsLastClear
    }
    STATUS    current
    DESCRIPTION
        "Active alarm summary group."
    ::= { alarmGroups 3}

alarmClearGroup OBJECT-GROUP
    OBJECTS {
        alarmClearMaximum,
        alarmClearEngineID,
        alarmClearEngineAddressType,
        alarmClearEngineAddress,
        alarmClearContextName,
        alarmClearNotificationID,
        alarmClearResourceId,
        alarmClearLogIndex,
        alarmClearModelPointer
    }
    STATUS    current
    DESCRIPTION
        "Cleared alarm group."
    ::= { alarmGroups 4}

alarmNotificationsGroup NOTIFICATION-GROUP
    NOTIFICATIONS { alarmActiveState, alarmClearState }
    STATUS    current
    DESCRIPTION
        "The collection of notifications that can be used to
        model alarms for faults lacking pre-existing
        notification definitions."
    ::= { alarmGroups 6 }

END

```

5. ITU Alarm

5.1. Overview

This MIB module defines alarm information specific to the alarm model defined in ITU M.3100 [M.3100], X.733 [X.733], and X.736 [X.736]. This MIB module follows the modular architecture defined by the Alarm MIB, in which the generic Alarm MIB can be augmented by other alarm information defined according to more specific models that define additional behaviour and characteristics.

The `ituAlarmTable` contains information from the ITU Alarm Model about possible alarms in the system.

The `ituAlarmActiveTable` contains information from the ITU Alarm Model about alarms modelled using the `ituAlarmTable` that are currently occurring on the system.

The `ituAlarmActiveStatsTable` provides statistics on current and total alarms.

5.2. IANA Considerations

Over time, there will be a need to add new `IANAITUEventType` and `IANAItuProbableCause` enumerated values. The Internet Assigned Number Authority (IANA) is responsible for the assignment of the enumerations in these TCs.

`IANAItuProbableCause` value of 0 is reserved for special purposes and MUST NOT be assigned. Values of `IANAItuProbableCause` in the range 1 to 1023 are reserved for causes that correspond to ITU-T probable cause. All other requests for new causes will be handled on a first-come basis, with 1025.

Request should come in the form of well-formed SMI [RFC2578] for enumeration names that are unique and sufficiently descriptive.

While some effort will be taken to ensure that new enumerations do not conceptually duplicate existing enumerations it is acknowledged that the existence of conceptual duplicates in the starting probable cause list is an known industry reality.

To aid IANA in the administration of probable cause names and values, the OPS Area Director will appoint one or more experts to help review requests.

See <http://www.iana.org>

The following shall be used as the initial values, but the latest values for these textual conventions should be obtained from IANA:

IANA-ITU-ALARM-TC-MIB DEFINITIONS ::= BEGIN

IMPORTS

```

MODULE-IDENTITY, mib-2
    FROM SNMPv2-SMI                -- [RFC2578]
TEXTUAL-CONVENTION
    FROM SNMPv2-TC;                -- [RFC2579]
```

ianaItuAlarmNumbers MODULE-IDENTITY

LAST-UPDATED "200409090000Z" -- September 09, 2004

ORGANIZATION "IANA"

CONTACT-INFO

"Postal: Internet Assigned Numbers Authority
 Internet Corporation for Assigned Names
 and Numbers
 4676 Admiralty Way, Suite 330
 Marina del Rey, CA 90292-6601
 USA

Tel: +1 310-823-9358

E-Mail: iana@iana.org"

DESCRIPTION

"The MIB module defines the ITU Alarm
 textual convention for objects expected to require
 regular extension.

Copyright (C) The Internet Society (2004). The
 initial version of this MIB module was published
 in RFC 3877. For full legal notices see the RFC
 itself. Supplementary information may be available on:
<http://www.ietf.org/copyrights/ianamib.html>"

REVISION "200409090000Z" -- September 09, 2004

DESCRIPTION

"Initial version, published as RFC 3877."

::= { mib-2 119 }

IANAItuProbableCause ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"ITU-T probable cause values. Duplicate values defined in
 X.733 are appended with X733 to ensure syntactic uniqueness.
 Probable cause value 0 is reserved for special purposes.

The Internet Assigned Number Authority (IANA) is responsible
 for the assignment of the enumerations in this TC.
 IANAItuProbableCause value of 0 is reserved for special
 purposes and MUST NOT be assigned.

Values of IANAItuProbableCause in the range 1 to 1023 are
 reserved for causes that correspond to ITU-T probable cause.

All other requests for new causes will be handled on a
 first-come, first served basis and will be assigned
 enumeration values starting with 1025.

Request should come in the form of well-formed

SMI [RFC2578] for enumeration names that are unique and sufficiently descriptive.

While some effort will be taken to ensure that new probable causes do not conceptually duplicate existing probable causes it is acknowledged that the existence of conceptual duplicates in the starting probable cause list is an known industry reality.

To aid IANA in the administration of probable cause names and values, the OPS Area Director will appoint one or more experts to help review requests.

See <http://www.iana.org>"

REFERENCE

- "ITU Recommendation M.3100, 'Generic Network Information Model', 1995
- ITU Recommendation X.733, 'Information Technology - Open Systems Interconnection - System Management: Alarm Reporting Function', 1992
- ITU Recommendation X.736, 'Information Technology - Open Systems Interconnection - System Management: Security Alarm Reporting Function', 1992"

SYNTAX

INTEGER

```
{
-- The following probable causes were defined in M.3100
aIS (1),
callSetUpFailure (2),
degradedSignal (3),
farEndReceiverFailure (4),
framingError (5),
lossOfFrame (6),
lossOfPointer (7),
lossOfSignal (8),
payloadTypeMismatch (9),
transmissionError (10),
remoteAlarmInterface (11),
excessiveBER (12),
pathTraceMismatch (13),
unavailable (14),
signalLabelMismatch (15),
lossOfMultiFrame (16),
receiveFailure (17),
transmitFailure (18),
modulationFailure (19),
demodulationFailure (20),
broadcastChannelFailure (21),
```

```
connectionEstablishmentError (22),
invalidMessageReceived (23),
localNodeTransmissionError (24),
remoteNodeTransmissionError (25),
routingFailure (26),

--Values 27-50 are reserved for communications alarm related
--probable causes
-- The following are used with equipment alarm.

    backplaneFailure (51),
    dataSetProblem (52),
    equipmentIdentifierDuplication (53),
    externalIFDeviceProblem (54),
    lineCardProblem (55),
    multiplexerProblem (56),
    nEIdentifierDuplication (57),
    powerProblem (58),
    processorProblem (59),
    protectionPathFailure (60),
    receiverFailure (61),
    replaceableUnitMissing (62),
    replaceableUnitTypeMismatch (63),
    synchronizationSourceMismatch (64),
    terminalProblem (65),
    timingProblem (66),
    transmitterFailure (67),
    trunkCardProblem (68),
    replaceableUnitProblem (69),
    realTimeClockFailure (70),
--An equipment alarm to be issued if the system detects that the
--real time clock has failed
    antennaFailure (71),
    batteryChargingFailure (72),
    diskFailure (73),
    frequencyHoppingFailure (74),
    iODeviceError (75),
    lossOfSynchronisation (76),
    lossOfRedundancy (77),
    powerSupplyFailure (78),
    signalQualityEvaluationFailure (79),
    tranceiverFailure (80),
    protectionMechanismFailure (81),
    protectingResourceFailure (82),
-- Values 83-100 are reserved for equipment alarm related probable
-- causes
-- The following are used with environmental alarm.
    airCompressorFailure (101),
```

```
airConditioningFailure (102),
airDryerFailure (103),
batteryDischarging (104),
batteryFailure (105),
commercialPowerFailure (106),
coolingFanFailure (107),
engineFailure (108),
fireDetectorFailure (109),
fuseFailure (110),
generatorFailure (111),
lowBatteryThreshold (112),
pumpFailure (113),
rectifierFailure (114),
rectifierHighVoltage (115),
rectifierLowFVoltage (116),
ventilationsSystemFailure (117),
enclosureDoorOpen (118),
explosiveGas (119),
fire (120),
flood (121),
highHumidity (122),
highTemperature (123),
highWind (124),
iceBuildUp (125),
intrusionDetection (126),
lowFuel (127),
lowHumidity (128),
lowCablePressure (129),
lowTemperatue (130),
lowWater (131),
smoke (132),
toxicGas (133),
coolingSystemFailure (134),
externalEquipmentFailure (135),
externalPointFailure (136),
-- Values 137-150 are reserved for environmental alarm related
-- probable causes
-- The following are used with Processing error alarm.
    storageCapacityProblem (151),
    memoryMismatch (152),
    corruptData (153),
    outOfCPUCycles (154),
    sfwrEnvironmentProblem (155),
    sfwrDownloadFailure (156),
    lossOfRealTime1 (157),
--A processing error alarm to be issued after the system has
--reinitialised. This will indicate
--to the management systems that the view they have of the managed
```

```
--system may no longer
--be valid. Usage example: The managed
--system issues this alarm after a reinitialization with severity
--warning to inform the
--management system about the event. No clearing notification will
--be sent.
```

```
    applicationSubsystemFailure (158),
    configurationOrCustomisationError (159),
    databaseInconsistency (160),
    fileError (161),
    outOfMemory (162),
    softwareError (163),
    timeoutExpired (164),
    underlayingResourceUnavailable (165),
    versionMismatch (166),
```

```
--Values 168-200 are reserved for processing error alarm related
-- probable causes.
```

```
    bandwidthReduced (201),
    congestion (202),
    excessiveErrorRate (203),
    excessiveResponseTime (204),
    excessiveRetransmissionRate (205),
    reducedLoggingCapability (206),
    systemResourcesOverload (207 ),
    -- The following were defined X.733
    adapterError (500),
    applicationSubsystemFailure (501),
    bandwidthReducedX733 (502),
    callEstablishmentError (503),
    communicationsProtocolError (504),
    communicationsSubsystemFailure (505),
    configurationOrCustomizationError (506),
    congestionX733 (507),
    corruptData (508),
    cpuCyclesLimitExceeded (509),
    dataSetOrModemError (510),
    degradedSignalX733 (511),
    dteDceInterfaceError (512),
    enclosureDoorOpenX733 (513),
    equipmentMalfunction (514),
    excessiveVibration (515),
    fileErrorX733 (516),
    fireDetected (517),
    framingErrorX733 (518),
    heatingVentCoolingSystemProblem (519),
    humidityUnacceptable (520),
    inputOutputDeviceError (521),
    inputDeviceError (522),
```

lanError (523),
leakDetected (524),
localNodeTransmissionErrorX733 (525),
lossOfFrameX733 (526),
lossOfSignalX733 (527),
materialSupplyExhausted (528),
multiplexerProblemX733 (529),
outOfMemoryX733 (530),
ouputDeviceError (531),
performanceDegraded (532),
powerProblems (533),
pressureUnacceptable (534),
processorProblems (535),
pumpFailureX733 (536),
queueSizeExceeded (537),
receiveFailureX733 (538),
receiverFailureX733 (539),
remoteNodeTransmissionErrorX733 (540),
resourceAtOrNearingCapacity (541),
responseTimeExcessive (542),
retransmissionRateExcessive (543),
softwareErrorX733 (544),
softwareProgramAbnormallyTerminated (545),
softwareProgramError (546),
storageCapacityProblemX733 (547),
temperatureUnacceptable (548),
thresholdCrossed (549),
timingProblemX733 (550),
toxicLeakDetected (551),
transmitFailureX733 (552),
transmitterFailure (553),
underlyingResourceUnavailable (554),
versionMismatchX733 (555),
-- The following are defined in X.736
authenticationFailure (600),
breachOfConfidentiality (601),
cableTamper (602),
delayedInformation (603),
denialOfService (604),
duplicateInformation (605),
informationMissing (606),
informationModificationDetected (607),
informationOutOfSequence (608),
keyExpired (609),
nonRepudiationFailure (610),
outOfHoursActivity (611),
outOfService (612),
proceduralError (613),

```
    unauthorizedAccessAttempt (614),
    unexpectedInformation (615),

    other (1024)
}
```

IANAItuEventType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The ITU event Type values.

The Internet Assigned Number Authority (IANA) is responsible for the assignment of the enumerations in this TC.

Request should come in the form of well-formed SMI [RFC2578] for enumeration names that are unique and sufficiently descriptive.

See <http://www.iana.org> "

REFERENCE

"ITU Recommendation X.736, 'Information Technology - Open Systems Interconnection - System Management: Security Alarm Reporting Function', 1992"

SYNTAX

INTEGER

```
{
    other (1),
    communicationsAlarm (2),
    qualityOfServiceAlarm (3),
    processingErrorAlarm (4),
    equipmentAlarm (5),
    environmentalAlarm (6),
    integrityViolation (7),
    operationalViolation (8),
    physicalViolation (9),
    securityServiceOrMechanismViolation (10),
    timeDomainViolation (11)
}
```

END

5.3. Textual Conventions

ITU-ALARM-TC-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, mib-2
 FROM SNMPv2-SMI -- [RFC2578]
 TEXTUAL-CONVENTION
 FROM SNMPv2-TC; -- [RFC2579]

ituAlarmTc MODULE-IDENTITY

LAST-UPDATED "200409090000Z" -- September 09, 2004
 ORGANIZATION "IETF Distributed Management Working Group"
 CONTACT-INFO
 " WG Email: disman@ietf.org
 Subscribe: disman-request@ietf.org
<http://www.ietf.org/html.charters/disman-charter.html>

Chair: Randy Presuhn
randy_presuhn@mindspring.com

Editors: Sharon Chisholm
 Nortel Networks
 PO Box 3511 Station C
 Ottawa, Ont. K1Y 4H7
 Canada
schishol@nortelnetworks.com

Dan Romascanu
 Avaya
 Atidim Technology Park, Bldg. #3
 Tel Aviv, 61131
 Israel
 Tel: +972-3-645-8414
 Email: dromasca@avaya.com

DESCRIPTION

"This MIB module defines the ITU Alarm textual convention for objects not expected to require regular extension.

Copyright (C) The Internet Society (2004). The initial version of this MIB module was published in RFC 3877. For full legal notices see the RFC itself. Supplementary information may be available on: <http://www.ietf.org/copyrights/ianamib.html>"

REVISION "200409090000Z" -- September 09, 2004

DESCRIPTION

"Initial version, published as RFC 3877."

```
::= { mib-2 120 }
```

```
ItuPerceivedSeverity ::= TEXTUAL-CONVENTION
```

```
    STATUS current
```

```
    DESCRIPTION
```

```
        "ITU perceived severity values"
```

```
    REFERENCE
```

```
        "ITU Recommendation M.3100, 'Generic Network Information  
        Model', 1995
```

```
        ITU Recommendation X.733, 'Information Technology - Open  
        Systems Interconnection - System Management: Alarm  
        Reporting Function', 1992"
```

```
    SYNTAX          INTEGER
```

```
        {  
        cleared (1),  
        indeterminate (2),  
        critical (3),  
        major (4),  
        minor (5),  
        warning (6)  
        }
```

```
ItuTrendIndication ::= TEXTUAL-CONVENTION
```

```
    STATUS current
```

```
    DESCRIPTION
```

```
        "ITU trend indication values for alarms."
```

```
    REFERENCE
```

```
        "ITU Recommendation M.3100, 'Generic Network Information  
        Model', 1995
```

```
        ITU Recommendation X.733, 'Information Technology - Open  
        Systems Interconnection - System Management: Alarm  
        Reporting Function', 1992"
```

```
    SYNTAX          INTEGER
```

```
        {  
        moreSevere (1),  
        noChange (2),  
        lessSevere (3)  
        }
```

```
END
```


5.4. Definitions

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

IMPORTS

```
MODULE-IDENTITY, OBJECT-TYPE,
Gauge32, mib-2
    FROM SNMPv2-SMI                -- [RFC2578]
AutonomousType, RowPointer
    FROM SNMPv2-TC                -- [RFC2579]
SnmpAdminString
    FROM SNMP-FRAMEWORK-MIB        -- [RFC3411]
alarmListName, alarmModelIndex,
alarmActiveDateAndTime, alarmActiveIndex
    FROM ALARM-MIB                -- [RFC3877]
ItuPerceivedSeverity,
ItuTrendIndication
    FROM ITU-ALARM-TC-MIB          -- [RFC3877]
IANAItuProbableCause,
IANAItuEventType
    FROM IANA-ITU-ALARM-TC-MIB     -- [RFC3877]
MODULE-COMPLIANCE, OBJECT-GROUP
    FROM SNMPv2-CONF              -- [RFC2580]
ZeroBasedCounter32
    FROM RMON2-MIB;               -- [RFC2021]
```

ituAlarmMIB MODULE-IDENTITY

```
LAST-UPDATED "200409090000Z" -- September 09, 2004
ORGANIZATION "IETF Distributed Management Working Group"
CONTACT-INFO
    "WG EMail: disman@ietf.org
    Subscribe: disman-request@ietf.org
    http://www.ietf.org/html.charters/disman-charter.html"
```

```
Chair:      Randy Presuhn
            randy_presuhn@mindspring.com
```

```
Editors:    Sharon Chisholm
            Nortel Networks
            PO Box 3511 Station C
            Ottawa, Ont. K1Y 4H7
            Canada
            schishol@nortelnetworks.com
```

```
Dan Romascanu
Avaya
Atidim Technology Park, Bldg. #3
Tel Aviv, 61131
```

Israel
 Tel: +972-3-645-8414
 Email: dromasca@avaya.com"

DESCRIPTION

"The MIB module describes ITU Alarm information as defined in ITU Recommendation M.3100 [M.3100], X.733 [X.733] and X.736 [X.736].

Copyright (C) The Internet Society (2004). The initial version of this MIB module was published in RFC 3877. For full legal notices see the RFC itself. Supplementary information may be available on: <http://www.ietf.org/copyrights/ianamib.html>"

REVISION "200409090000Z" -- September 09, 2004

DESCRIPTION

"Initial version, published as RFC 3877."

::= { mib-2 121 }

ituAlarmObjects OBJECT IDENTIFIER ::= { ituAlarmMIB 1 }

ituAlarmModel OBJECT IDENTIFIER ::= { ituAlarmObjects 1 }

ituAlarmActive OBJECT IDENTIFIER ::= { ituAlarmObjects 2 }

ituAlarmTable OBJECT-TYPE

SYNTAX SEQUENCE OF ItuAlarmEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table of ITU Alarm information for possible alarms on the system."

::= { ituAlarmModel 1 }

ituAlarmEntry OBJECT-TYPE

SYNTAX ItuAlarmEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Entries appear in this table whenever an entry is created in the alarmModelTable with a value of alarmModelState in the range from 1 to 6. Entries disappear from this table whenever the corresponding entries are deleted from the alarmModelTable, including in cases where those entries have been deleted due to local system action. The value of alarmModelSpecificPointer has no effect on the creation or deletion of entries in this table. Values of alarmModelState map to values of ituAlarmPerceivedSeverity as follows:

alarmModelState	->	ituAlarmPerceivedSeverity
1	->	clear (1)
2	->	indeterminate (2)
3	->	warning (6)
4	->	minor (5)
5	->	major (4)
6	->	critical (3)

All other values of alarmModelState MUST NOT appear in this table.

This table MUST be persistent across system reboots."

```

INDEX      { alarmListName, alarmModelIndex,
              ituAlarmPerceivedSeverity }
 ::= { ituAlarmTable 1 }

```

```

ItuAlarmEntry ::= SEQUENCE {
    ituAlarmPerceivedSeverity      ItuPerceivedSeverity,
    ituAlarmEventType             IANAItuEventType,
    ituAlarmProbableCause         IANAItuProbableCause,
    ituAlarmAdditionalText        SnmpAdminString,
    ituAlarmGenericModel          RowPointer }

```

ituAlarmPerceivedSeverity OBJECT-TYPE

SYNTAX ItuPerceivedSeverity

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"ITU perceived severity values."

REFERENCE

"ITU Recommendation M.3100, 'Generic Network Information Model', 1995

ITU Recommendation X.733, 'Information Technology - Open Systems Interconnection - System Management: Alarm Reporting Function', 1992"

```
 ::= { ituAlarmEntry 1 }
```

ituAlarmEventType OBJECT-TYPE

SYNTAX IANAItuEventType

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Represents the event type values for the alarms"

REFERENCE

"ITU Recommendation M.3100, 'Generic Network Information Model', 1995

ITU Recommendation X.733, 'Information Technology - Open Systems Interconnection - System Management: Alarm

```

        Reporting Function', 1992
    ITU Recommendation X.736, 'Information Technology - Open
        Systems Interconnection - System Management: Security
        Alarm Reporting Function', 1992"
    ::= { ituAlarmEntry 2 }

ituAlarmProbableCause OBJECT-TYPE
    SYNTAX      IANAItuProbableCause
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "ITU probable cause values."
    REFERENCE
        "ITU Recommendation M.3100, 'Generic Network Information
            Model', 1995
        ITU Recommendation X.733, 'Information Technology - Open
            Systems Interconnection - System Management: Alarm
            Reporting Function', 1992
        ITU Recommendation X.736, 'Information Technology - Open
            Systems Interconnection - System Management: Security
            Alarm Reporting Function', 1992"
    ::= { ituAlarmEntry 3 }

ituAlarmAdditionalText OBJECT-TYPE
    SYNTAX      SnmpAdminString
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "Represents the additional text field for the alarm."
    REFERENCE
        "ITU Recommendation M.3100, 'Generic Network Information
            Model', 1995
        ITU Recommendation X.733, 'Information Technology - Open
            Systems Interconnection - System Management: Alarm
            Reporting Function', 1992"
    ::= { ituAlarmEntry 4}

ituAlarmGenericModel OBJECT-TYPE
    SYNTAX      RowPointer
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "This object points to the corresponding
        row in the alarmModelTable for this alarm severity.

        This corresponding entry to alarmModelTable could also
        be derived by performing the reverse of the mapping
        from alarmModelState to ituAlarmPerceivedSeverity defined

```

```

    in the description of ituAlarmEntry to determine the
    appropriate { alarmListName, alarmModelIndex, alarmModelState }
    for this { alarmListName, alarmModelIndex,
    ituAlarmPerceivedSeverity }."
 ::= { ituAlarmEntry 5 }

```

```
-- ITU Active Alarm Table --
```

```
ituAlarmActiveTable OBJECT-TYPE
```

```
SYNTAX      SEQUENCE OF ItuAlarmActiveEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "A table of ITU information for active alarms entries."
```

```
::= { ituAlarmActive 1 }
```

```
ituAlarmActiveEntry OBJECT-TYPE
```

```
SYNTAX      ItuAlarmActiveEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Entries appear in this table when alarms are active.  They
    are removed when the alarm is no longer occurring."
```

```
INDEX       { alarmListName, alarmActiveDateAndTime,
              alarmActiveIndex }
```

```
::= { ituAlarmActiveTable 1 }
```

```
ItuAlarmActiveEntry ::= SEQUENCE {
```

```
    ituAlarmActiveTrendIndication      ItuTrendIndication,
```

```
    ituAlarmActiveDetector             AutonomousType,
```

```
    ituAlarmActiveServiceProvider      AutonomousType,
```

```
    ituAlarmActiveServiceUser          AutonomousType
```

```
}
```

```
ituAlarmActiveTrendIndication OBJECT-TYPE
```

```
SYNTAX      ItuTrendIndication
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Represents the trend indication values for the alarms."
```

```
REFERENCE
```

```
    "ITU Recommendation M.3100, 'Generic Network Information
    Model', 1995
```

```
    ITU Recommendation X.733, 'Information Technology - Open
    Systems Interconnection - System Management: Alarm
    Reporting Function', 1992"
```

```
::= { ituAlarmActiveEntry 1 }
```

```
ituAlarmActiveDetector OBJECT-TYPE
    SYNTAX AutonomousType
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Represents the SecurityAlarmDetector object."
    REFERENCE
        "ITU Recommendation X.736, 'Information Technology - Open
        Systems Interconnection - System Management: Security
        Alarm Reporting Function', 1992"
    ::= { ituAlarmActiveEntry 2 }

ituAlarmActiveServiceProvider OBJECT-TYPE
    SYNTAX AutonomousType
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Represents the ServiceProvider object."
    REFERENCE
        "ITU Recommendation X.736, 'Information Technology - Open
        Systems Interconnection - System Management: Security
        Alarm Reporting Function', 1992"
    ::= { ituAlarmActiveEntry 3 }

ituAlarmActiveServiceUser OBJECT-TYPE
    SYNTAX AutonomousType
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Represents the ServiceUser object."
    REFERENCE
        "ITU Recommendation X.736, 'Information Technology - Open
        Systems Interconnection - System Management: Security
        Alarm Reporting Function', 1992"
    ::= { ituAlarmActiveEntry 4 }

-- Statistics and Counters

ituAlarmActiveStatsTable OBJECT-TYPE
    SYNTAX SEQUENCE OF ItuAlarmActiveStatsEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "This table represents the ITU alarm statistics
        information."
    ::= { ituAlarmActive 2 }
```

```

ituAlarmActiveStatsEntry OBJECT-TYPE
    SYNTAX  ItuAlarmActiveStatsEntry
    MAX-ACCESS  not-accessible
    STATUS  current
    DESCRIPTION
        "Statistics on the current active ITU alarms."
    INDEX    { alarmListName }

 ::= { ituAlarmActiveStatsTable 1 }

ItuAlarmActiveStatsEntry ::=
SEQUENCE {
    ituAlarmActiveStatsIndeterminateCurrent Gauge32,
    ituAlarmActiveStatsCriticalCurrent      Gauge32,
    ituAlarmActiveStatsMajorCurrent         Gauge32,
    ituAlarmActiveStatsMinorCurrent         Gauge32,
    ituAlarmActiveStatsWarningCurrent       Gauge32,
    ituAlarmActiveStatsIndeterminates       ZeroBasedCounter32,
    ituAlarmActiveStatsCriticals            ZeroBasedCounter32,
    ituAlarmActiveStatsMajors               ZeroBasedCounter32,
    ituAlarmActiveStatsMinors               ZeroBasedCounter32,
    ituAlarmActiveStatsWarnings             ZeroBasedCounter32
}

ituAlarmActiveStatsIndeterminateCurrent OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A count of the current number of active alarms with a
         ituAlarmPerceivedSeverity of indeterminate."
    ::= { ituAlarmActiveStatsEntry 1 }

ituAlarmActiveStatsCriticalCurrent OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A count of the current number of active alarms with a
         ituAlarmPerceivedSeverity of critical."
    ::= { ituAlarmActiveStatsEntry 2 }

ituAlarmActiveStatsMajorCurrent OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A count of the current number of active alarms with a

```

```
        ituAlarmPerceivedSeverity of major."
 ::= { ituAlarmActiveStatsEntry 3 }

ituAlarmActiveStatsMinorCurrent OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A count of the current number of active alarms with a
         ituAlarmPerceivedSeverity of minor."
    ::= { ituAlarmActiveStatsEntry 4 }

ituAlarmActiveStatsWarningCurrent OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A count of the current number of active alarms with a
         ituAlarmPerceivedSeverity of warning."
    ::= { ituAlarmActiveStatsEntry 5 }

ituAlarmActiveStatsIndeterminates OBJECT-TYPE
    SYNTAX      ZeroBasedCounter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A count of the total number of active alarms with a
         ituAlarmPerceivedSeverity of indeterminate since system
         restart."
    ::= { ituAlarmActiveStatsEntry 6 }

ituAlarmActiveStatsCriticals OBJECT-TYPE
    SYNTAX      ZeroBasedCounter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A count of the total number of active alarms with a
         ituAlarmPerceivedSeverity of critical since system restart."
    ::= { ituAlarmActiveStatsEntry 7 }

ituAlarmActiveStatsMajors OBJECT-TYPE
    SYNTAX      ZeroBasedCounter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A count of the total number of active alarms with a
         ituAlarmPerceivedSeverity of major since system restart."
    ::= { ituAlarmActiveStatsEntry 8 }
```



```

ituAlarmActiveStatsMinors OBJECT-TYPE
    SYNTAX      ZeroBasedCounter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A count of the total number of active alarms with a
         ituAlarmPerceivedSeverity of minor since system restart."
    ::= { ituAlarmActiveStatsEntry 9 }

ituAlarmActiveStatsWarnings OBJECT-TYPE
    SYNTAX      ZeroBasedCounter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A count of the total number of active alarms with a
         ituAlarmPerceivedSeverity of warning since system restart."
    ::= { ituAlarmActiveStatsEntry 10 }

-- Conformance

ituAlarmConformance OBJECT IDENTIFIER ::= { ituAlarmMIB 2 }
ituAlarmCompliances  OBJECT IDENTIFIER ::= { ituAlarmConformance 1 }

ituAlarmCompliance MODULE-COMPLIANCE
    STATUS      current
    DESCRIPTION
        "The compliance statement for systems supporting
         the ITU Alarm MIB."
    MODULE -- this module
        MANDATORY-GROUPS {
            ituAlarmGroup
        }
    GROUP      ituAlarmServiceUserGroup
        DESCRIPTION
            "This group is optional."
    GROUP      ituAlarmSecurityGroup
        DESCRIPTION
            "This group is optional."
    GROUP      ituAlarmStatisticsGroup
        DESCRIPTION
            "This group is optional."
    ::= { ituAlarmCompliances 1 }

ituAlarmGroups OBJECT IDENTIFIER ::= { ituAlarmConformance 2 }

ituAlarmGroup OBJECT-GROUP
    OBJECTS {
        ituAlarmEventType,

```

```

        ituAlarmProbableCause,
        ituAlarmGenericModel
    }
STATUS    current
DESCRIPTION
    "ITU alarm details list group."
 ::= { ituAlarmGroups 1}

ituAlarmServiceUserGroup OBJECT-GROUP
OBJECTS {
    ituAlarmAdditionalText,
    ituAlarmActiveTrendIndication
}
STATUS    current
DESCRIPTION
    "The use of these parameters is a service-user option."
 ::= { ituAlarmGroups 2 }

ituAlarmSecurityGroup OBJECT-GROUP
OBJECTS {
    ituAlarmActiveDetector,
    ituAlarmActiveServiceProvider,
    ituAlarmActiveServiceUser
}
STATUS    current
DESCRIPTION
    "Security Alarm Reporting Function"
REFERENCE
    "ITU Recommendation X.736, 'Information Technology - Open
    Systems Interconnection - System Management: Security
    Alarm Reporting Function', 1992"
 ::= { ituAlarmGroups 3 }

ituAlarmStatisticsGroup OBJECT-GROUP
OBJECTS {
    ituAlarmActiveStatsIndeterminateCurrent,
    ituAlarmActiveStatsCriticalCurrent,
    ituAlarmActiveStatsMajorCurrent,
    ituAlarmActiveStatsMinorCurrent,
    ituAlarmActiveStatsWarningCurrent,
    ituAlarmActiveStatsIndeterminates,
    ituAlarmActiveStatsCriticals,
    ituAlarmActiveStatsMajors,
    ituAlarmActiveStatsMinors,
    ituAlarmActiveStatsWarnings
}
STATUS    current
DESCRIPTION

```

```
"ITU Active Alarm Statistics."
 ::= { ituAlarmGroups 4 }
```

```
END
```

6. Examples

6.1. Alarms Based on linkUp/linkDown Notifications

This example demonstrates an interface-based alarm that goes into a state of "warning" when a linkDown Notification [RFC2863] occurs but the ifAdminStatus indicates the interface was taken down administratively. If IfAdminStatus is "up" when the linkDown Notification occurs, then there is a problem, so the state of the alarm is critical. A linkUp alarm clears the alarm.

```
linkDown NOTIFICATION-TYPE
    OBJECTS { ifIndex, ifAdminStatus, ifOperStatus }
    STATUS current
    DESCRIPTION
        ""
    ::= { snmpTraps 3 }
```

```
linkUp NOTIFICATION-TYPE
    OBJECTS { ifIndex, ifAdminStatus, ifOperStatus }
    STATUS current
    DESCRIPTION
        ""
    ::= { snmpTraps 4 }
```

alarmModelIndex	3
alarmModelState	1
alarmModelNotificationId	linkUp
alarmModelVarbindIndex	0
alarmModelVarbindValue	0
alarmModelDescription	"linkUp"
alarmModelSpecificPointer	ituAlarmEntry.3.1
alarmModelVarbindSubtree	ifIndex (1.3.6.1.2.1.2.2.1.1)
alarmModelResourcePrefix	0.0
alarmModelRowStatus	active (1)
ituAlarmEventType	communicationsAlarm (2)
ituAlarmPerceivedSeverity	cleared (1)
ituAlarmGenericModel	alarmModelEntry.3.1
alarmModelIndex	3
alarmModelState	2
alarmModelNotificationId	linkDown
alarmModelVarbindIndex	2

alarmModelVarbindValue	down (2)
alarmModelDescription	"linkDown administratively"
alarmModelSpecificPointer	ituAlarmEntry.3.6
alarmModelVarbindSubtree	ifIndex (1.3.6.1.2.1.2.2.1.1)
alarmModelResourcePrefix	0.0
alarmModelRowStatus	active (1)
ituAlarmEventType	communicationsAlarm (2)
ituAlarmPerceivedSeverity	warning (6)
ituAlarmGenericModel	alarmModelEntry.3.2
alarmModelIndex	3
alarmModelState	3
alarmModelNotificationId	linkDown
alarmModelVarbindIndex	2
alarmModelVarbindValue	up (1)
alarmModelDescription	"linkDown - confirmed problem"
alarmModelSpecificPointer	ituAlarmEntry.3.3
alarmModelVarbindSubtree	ifIndex (1.3.6.1.2.1.2.2.1.1)
alarmModelResourcePrefix	0.0
alarmModelRowStatus	active (1)
ituAlarmEventType	communicationsAlarm (2)
ituAlarmPerceivedSeverity	critical (3)
ituAlarmGenericModel	alarmModelEntry.3.3
alarmActiveIndex	1
alarmActiveDateAndTime	2342464573
alarmActiveDateAndTime	DateAndTime,
alarmActiveEngineID	SnmpEngineID,
alarmActiveEngineAddressType	ipV4
alarmActiveEngineAddress	10.10.10.10
alarmActiveContextName	SnmpAdminString,
alarmActiveVariables	3
alarmActiveNotificationID	1.3.6.1.6.3.1.1.5.3
alarmActiveResourceId	1.3.6.1.2.1.2.2.1.1.346
alarmActiveLogPointer	0.0
alarmActiveModelPointer	alarmModelEntry.3.3
alarmActiveSpecificPointer	ituAlarmActiveEntry.1.3
ituAlarmActiveTrendIndication	moreSevere (1)
ituAlarmDetector	0.0
ituAlarmServiceProvider	0.0
ituAlarmServiceUser	0.0
alarmActiveVariableIndex	1
alarmActiveVariableID	sysUpTime.0
alarmActiveVariableValueType	timeTicks(3)
alarmActiveVariableCounter32Val	0
alarmActiveVariableUnsigned32Val	0
alarmActiveVariableTimeTicksVal	46754

alarmActiveVariableInteger32Val	0
alarmActiveVariableOctetStringVal	""
alarmActiveVariableIpAddressVal	0
alarmActiveVariableOidVal	0.0
alarmActiveVariableCounter64Val	0
alarmActiveVariableIndex	2
alarmActiveVariableID	snmpTrapOID.0
alarmActiveVariableValueType	objectId(7)
alarmActiveVariableCounter32Val	0
alarmActiveVariableUnsigned32Val	0
alarmActiveVariableTimeTicksVal	0
alarmActiveVariableInteger32Val	0
alarmActiveVariableOctetStringVal	""
alarmActiveVariableIpAddressVal	0
alarmActiveVariableOidVal	1.3.6.1.6.3.1.1.5.3
alarmActiveVariableCounter64Val	0
alarmActiveVariableIndex	3
alarmActiveVariableID	ifIndex
alarmActiveVariableValueType	integer32(4)
alarmActiveVariableCounter32Val	0
alarmActiveVariableUnsigned32Val	0
alarmActiveVariableTimeTicksVal	0
alarmActiveVariableInteger32Val	346
alarmActiveVariableOctetStringVal	""
alarmActiveVariableIpAddressVal	0
alarmActiveVariableOidVal	0.0
alarmActiveVariableCounter64Val	0
alarmActiveVariableIndex	4
alarmActiveVariableID	ifAdminStatus
alarmActiveVariableValueType	integer32(4)
alarmActiveVariableCounter32Val	0
alarmActiveVariableUnsigned32Val	0
alarmActiveVariableTimeTicksVal	0
alarmActiveVariableInteger32Val	up (1)
alarmActiveVariableOctetStringVal	""
alarmActiveVariableIpAddressVal	0
alarmActiveVariableOidVal	0.0
alarmActiveVariableCounter64Val	0
alarmActiveVariableIndex	5
alarmActiveVariableID	ifOperStatus
alarmActiveVariableValueType	integer32(4)
alarmActiveVariableCounter32Val	0
alarmActiveVariableUnsigned32Val	0
alarmActiveVariableTimeTicksVal	0
alarmActiveVariableInteger32Val	down(2)
alarmActiveVariableOctetStringVal	""
alarmActiveVariableIpAddressVal	0
alarmActiveVariableOidVal	0.0

```
alarmActiveVariableCounter64Val      0
alarmActiveVariableOpaqueVal
```

6.2. Temperature Alarms Using Generic Notifications

Consider a system able to detect four different temperature states for a widget - normal, minor, major, critical. The system does not have any Notification definitions for these alarm states. A temperature alarm can be modelled using the generic alarm Notifications of alarmClearState and alarmActive.

```
alarmModelIndex      5
alarmModelState      1
alarmModelNotificationId  alarmClearState
alarmModelVarbindIndex  2
alarmModelVarbindValue cleared (1)
alarmModelDescription "Acme Widget Temperature Normal"
alarmModelSpecificPointer ituAlarmEntry.5.1
alarmModelVarbindSubtree alarmActiveResourceId
alarmModelResourcePrefix 0.0
alarmModelRowStatus   active (1)
ituAlarmEventType     environmentalAlarm (6)
ituPerceivedSeverity   cleared (1)
ituAlarmGenericModel   alarmModelEntry.5.1
```

```
alarmModelIndex      5
alarmModelState      2
alarmModelNotificationId  alarmActiveState
alarmModelVarbindIndex  2
alarmModelVarbindValue   minor (5)
alarmModelDescription    "Acme Widget Temperature Minor"
alarmModelSpecificPointer ituAlarmEntry.5.5
alarmModelVarbindSubtree alarmActiveResourceId
alarmModelResourcePrefix 0.0
alarmModelRowStatus     active (1)
ituAlarmEventState      environmentalAlarm (6)
ituPerceivedSeverity     minor (5)
ituAlarmGenericModel    alarmModelEntry.5.2
```

```
alarmModelIndex      5
alarmModelState      3
alarmModelNotificationId  alarmActiveState
alarmModelVarbindIndex  2
alarmModelVarbindValue   major (4)
alarmModelDescription    "Acme Widget Temperature Major"
alarmModelSpecificPointer ituAlarmEntry.5.4
alarmModelVarbindSubtree alarmActiveResourceId
alarmModelResourcePrefix 0.0
```

alarmModelRowStatus	active (1)
ituAlarmEventType	environmentalAlarm (6)
ituPerceivedSeverity	major (4)
ituAlarmGenericModel	alarmModelEntry.5.3
alarmModelIndex	5
alarmModelState	4
alarmModelNotificationId	alarmActiveState
alarmModelVarbindIndex	2
alarmModelVarbindValue	critical (3)
alarmModelDescription	"Acme Widget Temperature Critical"
alarmModelSpecificPointer	ituAlarmEntry.5.3
alarmModelVarbindSubtree	alarmActiveResourceId
alarmModelResourcePrefix	0.0
alarmModelRowStatus	active (1)
ituAlarmEventType	environmentalAlarm (6)
ituPerceivedSeverity	critical (3)
ituAlarmGenericModel	alarmModelEntry.5.4

6.3. Temperature Alarms Without Notifications

Consider a system able to detect four different temperature states for a widget - normal, minor, major, critical. The system does not have any Notification definitions for these alarm states. A temperature alarm can be modelled without specifying any Notifications in the alarm model. When a temperature state other than normal is detected, an instance of this alarm would be added to the active alarm table, but no Notifications would be sent out.

This could alternatively be accomplished using the models from example 6.2 and by not specifying any target managers in the SNMP-TARGET-MIB, which would allow the alarm state Notifications to be logged in the Notification Log while still preventing Notifications from being transmitted on the wire.

alarmModelIndex	6
alarmModelState	1
alarmModelNotificationId	0.0
alarmModelVarbindIndex	0
alarmModelVarbindValue	0
alarmModelDescription	"Widget Temperature"
alarmModelSpecificPointer	ituAlarmEntry.6.1
alarmModelVarbindSubtree	0.0
alarmModelResourcePrefix	0.0
alarmModelRowStatus	active (1)
ituAlarmEventType	environmentalAlarm (6)
ituPerceivedSeverity	cleared (1)
ituAlarmGenericModel	alarmModelEntry.6.1

alarmModelIndex	6
alarmModelState	2
alarmModelNotificationId	0.0
alarmModelVarbindIndex	0
alarmModelVarbindValue	0
alarmModelDescription	"Widget Temperature"
alarmModelSpecificPointer	ituAlarmEntry.6.5
alarmModelVarbindSubtree	0.0
alarmModelResourcePrefix	0.0
alarmModelRowStatus	active (1)
ituAlarmEventState	environmentalAlarm (6)
ituAlarmPerceivedSeverity	minor (5)
ituAlarmGenericModel	alarmModelEntry.6.2
alarmModelIndex	6
alarmModelState	3
alarmModelNotificationId	0.0
alarmModelVarbindIndex	0
alarmModelVarbindValue	0
alarmModelDescription	"Widget Temperature"
alarmModelSpecificPointer	ituAlarmEntry.6.4
alarmModelVarbindSubtree	0.0
alarmModelResourcePrefix	0.0
alarmModelRowStatus	active (1)
ituAlarmEventType	environmentalAlarm (6)
ituPerceivedSeverity	major (4)
ituAlarmGenericModel	alarmModelEntry.6.3
alarmModelIndex	6
alarmModelState	4
alarmModelNotificationId	0.0
alarmModelVarbindIndex	0
alarmModelVarbindValue	0
alarmModelDescription	"Widget Temperature Severe"
alarmModelSpecificPointer	ituAlarmEntry.6.3
alarmModelVarbindSubtree	0.0
alarmModelResourcePrefix	0.0
alarmModelRowStatus	active (1)
ituAlarmEventType	environmentalAlarm (6)
ituPerceivedSeverity	critical (3)
ituAlarmGenericModel	alarmModelEntry.6.4

6.4. Printer MIB Alarm Example

Consider the following Notifications defined in the printer MIB [RFC3805]:

```
prtAlertSeverityLevel OBJECT-TYPE
-- This value is a type 1 enumeration
SYNTAX      INTEGER {
                other(1),
                critical(3),
                warning(4)
            }
MAX-ACCESS read-only
STATUS      current
DESCRIPTION
    "The level of severity of this alert table entry. The printer
    determines the severity level assigned to each entry into the
    table."
 ::= { prtAlertEntry 2 }

printerV2Alert NOTIFICATION-TYPE
OBJECTS { prtAlertIndex, prtAlertSeverityLevel, prtAlertGroup,
          prtAlertGroupIndex, prtAlertLocation, prtAlertCode }
STATUS current
DESCRIPTION
    "This trap is sent whenever a critical event is added to the
    prtAlertTable."
 ::= { printerV2AlertPrefix 1 }
```

These Notifications can be used to model a printer alarm as follows:

alarmModelIndex	9 alarmModelState	1
alarmModelNotificationId	alarmClearState	
alarmModelVarbindIndex	0 alarmModelVarbindValue	0
alarmModelDescription	"Printer Alarm"	
alarmModelSpecificPointer	0.0 alarmModelVarbindSubtree	
prtAlertGroup alarmModelResourcePrefix	0.0	
alarmModelRowStatus	active (1)	
alarmModelIndex	9 alarmModelState	2
alarmModelNotificationId	printerV2Alert	
alarmModelVarbindIndex	2 alarmModelVarbindValue	
warning (4) alarmModelDescription	"Printer Alarm"	
alarmModelSpecificPointer	0.0 alarmModelVarbindSubtree	
prtAlertGroup alarmModelResourcePrefix	0.0	
alarmModelRowStatus	active (1)	
alarmModelIndex	9 alarmModelState	3

```

alarmModelNotificationId      printerV2Alert
alarmModelVarbindIndex        2 alarmModelVarbindValue
other (1) alarmModelDescription      "Printer Alarm - unknown
severity" alarmModelSpecificPointer  0.0
alarmModelVarbindSubtree      prtAlertGroup
alarmModelResourcePrefix      0.0 alarmModelRowStatus
active (1)

```

```

alarmModelIndex              9 alarmModelState              4
alarmModelNotificationId      printerV2Alert
alarmModelVarbindIndex        2 alarmModelVarbindValue
critical (3) alarmModelDescription      "Printer Alarm"
alarmModelSpecificPointer      0.0 alarmModelVarbindSubtree
prtAlertGroup alarmModelResourcePrefix  0.0
alarmModelRowStatus          active (1)

```

6.5. RMON Alarm Example

The RMON MIB [RFC2819] defines a mechanism for generating threshold alarms. When the thresholds are crossed, RisingAlarm and FallingAlarm Notifications are generated as appropriate. These Notifications can be used to model an upper threshold alarm as follows:

```

alarmModelIndex              6
alarmModelState              1
alarmModelNotificationId      FallingAlarm
alarmModelVarbindIndex        0
alarmModelVarbindValue        0
alarmModelDescription          "RMON Rising Clear Alarm"
alarmModelSpecificPointer      0.0
alarmModelVarbindSubtree      alarmIndex
alarmModelResourcePrefix      0.0
alarmModelRowStatus          active (1)

```

```

alarmModelIndex              6
alarmModelState              2
alarmModelNotificationId      RisingAlarm
alarmModelVarbindIndex        0
alarmModelVarbindValue        0
alarmModelDescription          "RMON Rising Alarm"
alarmModelSpecificPointer      0.0
alarmModelVarbindSubtree      alarmIndex
alarmModelResourcePrefix      0.0
alarmModelRowStatus          active (1)

```

6.6. The Lifetime of an Alarm

The following example demonstrates the relationship between the active alarm table, the clear alarm table and the Notification Log MIB.

Consider a system with alarms modelled as in example 1 and which also supports the informational Notification `dsx3LineStatusChange`.

`dsx3LineStatusChange` NOTIFICATION-TYPE

OBJECTS { `dsx3LineStatus`,
 `dsx3LineStatusLastChange` }

STATUS current

DESCRIPTION

"A `dsx3LineStatusChange` trap is sent when the value of an instance of `dsx3LineStatus` changes. It can be utilized by an NMS to trigger polls. When the line status change results in a lower level line status change (i.e., `ds1`), then no traps for the lower level are sent."

::= { `ds3Traps` 0 1 }

0. At system start, the active alarm table, alarm clear table and the Notification Log are all empty.

alarmActiveTable	nlmLogTable
-----	-----
alarmActiveIndex alarm	nlmLogPointer notif.
-----	-----

alarmClearTable

alarmClear Index alarm

1. Some time later, a link goes down generating a linkDown Notification, which is sent out and logged in the Notification Log. As this Notification is modelled as an alarm state, an entry is added to the active alarm table.

alarmActiveTable	
alarmActiveIndex	alarm
1	link down - problem confirmed

nlmLogTable	
nlmLogPointer	Notification
1	linkdown

alarmClearTable	
alarmClear Index	alarm

2. Some time later, the value of an instance of `dsx3LineStatus` changes. This Notification is sent out and logged. As this is not modelled into an alarm state, the active alarm table remains unchanged.

alarmActiveTable	
alarmActiveIndex	alarm
1	linkDown - problem confirmed

nlmLogTable	
nlmLogPointer	Notification
1	linkDown
2	dsx3LineStatusChange

alarmClearTable	
alarmClear Index	alarm

3. Some time later, the link goes back up. A linkUp Notification is sent out and logged. As this Notification models the clear alarm for this alarm, the alarm entry is removed from the active alarm table. An entry is added to the clear alarm table.

alarmActiveTable	
alarmActiveIndex	alarm

nlmLogTable	
nlmLogPointer	Notification
1	linkDown
2	dsx3LineStatusChange
3	linkUp

alarmClearTable	
alarmClear Index	alarm
1	linkDown - confirmed problem

7. Security Considerations

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

The following objects are defined with a MAX-ACCESS clause of read-write or read-create: alarmModelNotificationId, alarmModelVarbindIndex, alarmModelVarbindValue, alarmModelDescription, alarmModelSpecificPointer, alarmModelVarbindSubtree, alarmModelResourcePrefix, alarmModelRowStatus, alarmClearMaximum, ituAlarmEventType, ituAlarmProbableCause, ituAlarmAdditionalText, and ituAlarmGenericModel.

Note that setting the value of `alarmClearMaximum` too low may result in security related alarms history being prematurely lost.

Changing values of `alarmModelRowStatus` as part of creating and deleting rows in the `alarmModelTable` result in adding new alarm models to the system or taking them out respectively. These operations need to be carefully planned. Adding a new model should be made in a consistent manner to avoid the system overflow with alarms. Taking out a model should result in the deletion of all this model's related alarms in the system.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPsec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [RFC3410], section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

Note that the alarm throttling mechanism associated with the `alarmActiveState` and `alarmActiveClear` notifications only applies to a given alarm. Defining multiple alarms from the same internal stimulus may then still result in a flood of alarms into the network.

Although the use of community strings in SNMPv1 is not considered an effective means of providing security, security administrators SHOULD consider whether the fact that `alarmActiveContextName` can reveal community string values would make this object sensitive in their environment.

This MIB module can provide access to information that may also be accessed through manipulation of the SNMP-NOTIFICATION-MIB and the NOTIFICATION-LOG-MIB. This is expressed in part through the common indexing structure of `nlmLogName` [RFC3014], `snmpNotifyFilterProfileName` [RFC3413], and `alarmListName`. Consequently, it is RECOMMENDED that security administrators take care to configure a coherent VACM security policy. The objects

alarmActiveLogPointer, alarmActiveModelPointer, alarmActiveSpecificPointer, and alarmClearModelPointer are object identifiers that reference information to which a particular user might not be given direct access. The structure of these object identifiers does not permit the extraction of any sensitive information. Two other objects, alarmClearResourceId, and alarmActiveResourceId, are also syntactically object identifiers, but their structure could provide a user with potentially useful information to which he or she might not otherwise be granted access, such as the existence of a particular resource.

For further discussion of security, see section 3.4.

8. Acknowledgements

This document is a product of the DISMAN Working Group.

9. References

9.1. Normative References

- [M.3100] ITU Recommendation M.3100, "Generic Network Information Model", 1995
- [RFC1157] Case, J., Fedor, M., Schoffstall, M. and J. Davin, "Simple Network Management Protocol (SNMP)", STD 15, RFC 1157, May 1990.
- [RFC1215] Rose, M., "A Convention for defining traps for use with the SNMP", RFC 1215, March 1991.
- [RFC2021] Waldbusser, S., "Remote Network Monitoring Management Information Base Version 2 using SMIV2", January 1997.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
- [RFC2578] McCloghrie, K., Perkins, D. and J. Schoenwaelder, "Structure of Management Information Version 2 (SMIV2)", STD 58, RFC 2578, April 1999.
- [RFC2579] McCloghrie, K., Perkins, D. and J. Schoenwaelder, "Textual Conventions for SMIV2", STD 58, RFC 2579, April 1999.
- [RFC2580] McCloghrie, K., Perkins, D. and J. Schoenwaelder, "Conformance Statements for SMIV2", STD 58, RFC 2580, April 1999.

- [RFC3291] Daniele, M., Haberman, B., Routhier, S. and J. Schoenwaelder, "Textual Conventions for Internet Network Addresses", RFC 3291, May 2002.
- [RFC3411] Harrington, D., Presuhn, R. and B. Wijnen, "An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks", STD 62, RFC 3411, December 2002.
- [RFC3413] Levi, D., Meyer, P. and B. Stewart, "Simple Network Management Protocol (SNMP) Applications", 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.
- [RFC3416] Presuhn, R., Ed., "Version 2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)", STD 62, RFC 3416, December 2002.
- [RFC3584] Frye, R., Levi, D., Routhier, S. and B. Wijnen, "Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework", BCP 74, RFC 3584, August 2003.
- [X.733] ITU Recommendation X.733, "Information Technology - Open Systems Interconnection - System Management: Alarm Reporting Function", 1992.
- [X.736] ITU Recommendation X.736, "Information Technology - Open Systems Interconnection - System Management: Security Alarm Reporting Function", 1992.

9.2 Informative References

- [RFC1657] Willis, S., Burruss, J. and J. Chu, Ed., "Definitions of Managed Objects for the Fourth Version of the Border Gateway Protocol (BGP-4) using SMIV2", RFC 1657, July 1994.
- [RFC2737] McCloghrie, K. and A. Bierman, "Entity MIB (version 2)", RFC 2737, December 1999.
- [RFC2819] Waldbusser, S. "Remote Network Monitoring Management Information Base", STD 59, RFC 2819, May 2000.

- [RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB using SMIV2", RFC 2863, June 2000.
- [RFC2981] Kavasseri, R., Ed., "Event MIB", RFC 2981, October 2000.
- [RFC3014] Kavasseri, R., "Notification Log MIB", RFC 3014, November 2000.
- [RFC3410] Case, J., Mundy, R., Partain, D. and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", RFC 3410, December 2002.
- [RFC3418] Presuhn, R., Ed., "Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)", STD 62, RFC 3418, December 2002.
- [RFC3805] Bergman, R., Lewis, H. and I. McDonald, "Printer MIB v2", RFC 3805, June 2004.

10. Authors' Addresses

Sharon Chisholm
Nortel Networks
PO Box 3511, Station C
Ottawa, Ontario, K1Y 4H7
Canada

Email: schishol@nortelnetworks.com

Dan Romascanu
Avaya
Atidim Technology Park, Bldg. #3
Tel Aviv, 61131
Israel

Phone: +972-3-645-8414
Email: dromasca@avaya.com

11. Full Copyright Statement

Copyright (C) The Internet Society (2004). This document is subject to the rights, licenses and restrictions contained in BCP 78, and except as set forth therein, the authors retain all their rights.

This document and the information contained herein are provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Intellectual Property

The IETF takes no position regarding the validity or scope of any Intellectual Property Rights 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; nor does it represent that it has made any independent effort to identify any such rights. Information on the procedures with respect to rights in RFC documents can be found in BCP 78 and BCP 79.

Copies of IPR disclosures made to the IETF Secretariat 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 implementers or users of this specification can be obtained from the IETF on-line IPR repository at <http://www.ietf.org/ipr>.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this standard. Please address the information to the IETF at ietf-ipr@ietf.org.

Acknowledgement

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

