

Network Working Group
Request for Comments: 1757
Obsoletes: 1271
Category: Standards Track

S. Waldbusser
Carnegie Mellon University
February 1995

Remote Network Monitoring Management Information Base

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.

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets. In particular, it defines objects for managing remote network monitoring devices.

Table of Contents

1. The Network Management Framework	2
2. Overview	3
2.1 Remote Network Management Goals	3
2.2 Textual Conventions	5
2.3 Structure of MIB	5
2.3.1 The Ethernet Statistics Group	6
2.3.2 The History Control Group	6
2.3.3 The Ethernet History Group	6
2.3.4 The Alarm Group	6
2.3.5 The Host Group	6
2.3.6 The HostTopN Group	7
2.3.7 The Matrix Group	7
2.3.8 The Filter Group	7
2.3.9 The Packet Capture Group	7
2.3.10 The Event Group	7
3. Control of Remote Network Monitoring Devices	7
3.1 Resource Sharing Among Multiple Management Stations ..	8
3.2 Row Addition Among Multiple Management Stations	10
4. Conventions	11
5. Definitions	11
6. Acknowledgments	89
7. References	89
8. Security Considerations	90

9. Author's Address	90
10. Appendix: Changes from RFC 1271	91

1. The Network Management Framework

The Internet-standard Network Management Framework consists of three components. They are:

STD 16, RFC 1155 [1] which defines the SMI, the mechanisms used for describing and naming objects for the purpose of management.

STD 16, RFC 1212 [2] defines a more concise description mechanism, which is wholly consistent with the SMI.

STD 17, RFC 1213 [3] which defines MIB-II, the core set of managed objects for the Internet suite of protocols.

STD 15, RFC 1157 [4] which defines the SNMP, the protocol used for network access to managed objects.

The Framework permits new objects to be defined for the purpose of experimentation and evaluation.

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Within a given MIB module, objects are defined using RFC 1212's OBJECT-TYPE macro. At a minimum, each object has a name, a syntax, an access-level, and an implementation-status.

The name is an object identifier, an administratively assigned name, which specifies an object type. The object type together with an object instance serves to uniquely identify a specific instantiation of the object. For human convenience, we often use a textual string, termed the object descriptor, to also refer to the object type.

The syntax of an object type defines the abstract data structure corresponding to that object type. The ASN.1[5] language is used for this purpose. However, RFC 1155 purposely restricts the ASN.1 constructs which may be used. These restrictions are explicitly made for simplicity.

The access-level of an object type defines whether it makes "protocol sense" to read and/or write the value of an instance of the object type. (This access-level is independent of any administrative authorization policy.)

The implementation-status of an object type indicates whether the object is mandatory, optional, obsolete, or deprecated.

2. Overview

Remote network monitoring devices, often called monitors or probes, are instruments that exist for the purpose of managing a network. Often these remote probes are stand-alone devices and devote significant internal resources for the sole purpose of managing a network. An organization may employ many of these devices, one per network segment, to manage its internet. In addition, these devices may be used for a network management service provider to access a client network, often geographically remote.

The objects defined in this document are intended as an interface between an RMON agent and an RMON management application and are not intended for direct manipulation by humans. While some users may tolerate the direct display of some of these objects, few will tolerate the complexity of manually manipulating objects to accomplish row creation. These functions should be handled by the management application.

While most of the objects in this document are suitable for the management of any type of network, there are some which are specific to managing Ethernet networks. These are the objects in the etherStatsTable, the etherHistoryTable, and some attributes of the filterPktStatus and capturBufferPacketStatus objects. The design of this MIB allows similar objects to be defined for other network types. It is intended that future versions of this document and additional documents will define extensions for other network types such as Token Ring and FDDI.

2.1. Remote Network Management Goals

o Offline Operation

There are sometimes conditions when a management station will not be in constant contact with its remote monitoring devices. This is sometimes by design in an attempt to lower communications costs (especially when communicating over a WAN or dialup link), or by accident as network failures affect the communications between the management station and the probe.

For this reason, this MIB allows a probe to be configured to perform diagnostics and to collect statistics continuously, even when communication with the management station may not be possible or efficient. The probe may then attempt to notify the management station when an exceptional condition occurs. Thus, even in circumstances where

communication between management station and probe is not continuous, fault, performance, and configuration information may be continuously accumulated and communicated to the management station conveniently and efficiently.

- o Proactive Monitoring

Given the resources available on the monitor, it is potentially helpful for it continuously to run diagnostics and to log network performance. The monitor is always available at the onset of any failure. It can notify the management station of the failure and can store historical statistical information about the failure. This historical information can be played back by the management station in an attempt to perform further diagnosis into the cause of the problem.

- o Problem Detection and Reporting

The monitor can be configured to recognize conditions, most notably error conditions, and continuously to check for them. When one of these conditions occurs, the event may be logged, and management stations may be notified in a number of ways.

- o Value Added Data

Because a remote monitoring device represents a network resource dedicated exclusively to network management functions, and because it is located directly on the monitored portion of the network, the remote network monitoring device has the opportunity to add significant value to the data it collects. For instance, by highlighting those hosts on the network that generate the most traffic or errors, the probe can give the management station precisely the information it needs to solve a class of problems.

- o Multiple Managers

An organization may have multiple management stations for different units of the organization, for different functions (e.g. engineering and operations), and in an attempt to provide disaster recovery. Because environments with multiple management stations are common, the remote network monitoring device has to deal with more than own management station, potentially using its resources concurrently.

2.2. Textual Conventions

Two new data types are introduced as a textual convention in this MIB document. These textual conventions enhance the readability of the specification and can ease comparison with other specifications if appropriate. It should be noted that the introduction of these textual conventions has no effect on either the syntax nor the semantics of any managed objects. The use of these is merely an artifact of the explanatory method used. Objects defined in terms of one of these methods are always encoded by means of the rules that define the primitive type. Hence, no changes to the SMI or the SNMP are necessary to accommodate these textual conventions which are adopted merely for the convenience of readers and writers in pursuit of the elusive goal of clear, concise, and unambiguous MIB documents.

The new data types are: OwnerString and EntryStatus.

2.3. Structure of MIB

The objects are arranged into the following groups:

- ethernet statistics
- history control
- ethernet history
- alarm
- host
- hostTopN
- matrix
- filter
- packet capture
- event

These groups are the basic unit of conformance. If a remote monitoring device implements a group, then it must implement all objects in that group. For example, a managed agent that implements the host group must implement the hostControlTable, the hostTable and the hostTimeTable.

All groups in this MIB are optional. Implementations of this MIB must also implement the system and interfaces group of MIB-II [6]. MIB-II may also mandate the implementation of additional groups.

These groups are defined to provide a means of assigning object identifiers, and to provide a method for managed agents to know which objects they must implement.

2.3.1. The Ethernet Statistics Group

The ethernet statistics group contains statistics measured by the probe for each monitored Ethernet interface on this device. This group consists of the etherStatsTable. In the future other groups will be defined for other media types including Token Ring and FDDI. These groups should follow the same model as the ethernet statistics group.

2.3.2. The History Control Group

The history control group controls the periodic statistical sampling of data from various types of networks. This group consists of the historyControlTable.

2.3.3. The Ethernet History Group

The ethernet history group records periodic statistical samples from an ethernet network and stores them for later retrieval. This group consists of the etherHistoryTable. In the future, other groups will be defined for other media types including Token Ring and FDDI.

2.3.4. The Alarm Group

The alarm group periodically takes statistical samples from variables in the probe and compares them to previously configured thresholds. If the monitored variable crosses a threshold, an event is generated. A hysteresis mechanism is implemented to limit the generation of alarms. This group consists of the alarmTable and requires the implementation of the event group.

2.3.5. The Host Group

The host group contains statistics associated with each host discovered on the network. This group discovers hosts on the network by keeping a list of source and destination MAC Addresses seen in good packets promiscuously received from the network. This group consists of the hostControlTable, the hostTable, and the hostTimeTable.

2.3.6. The HostTopN Group

The hostTopN group is used to prepare reports that describe the hosts that top a list ordered by one of their statistics. The available statistics are samples of one of their base statistics over an interval specified by the management station. Thus, these statistics are rate based. The management station also selects how many such hosts are reported. This group consists of the hostTopNControlTable and the hostTopNTable, and requires the implementation of the host group.

2.3.7. The Matrix Group

The matrix group stores statistics for conversations between sets of two addresses. As the device detects a new conversation, it creates a new entry in its tables. This group consists of the matrixControlTable, the matrixSDTable and the matrixDSTable.

2.3.8. The Filter Group

The filter group allows packets to be matched by a filter equation. These matched packets form a data stream that may be captured or may generate events. This group consists of the filterTable and the channelTable.

2.3.9. The Packet Capture Group

The Packet Capture group allows packets to be captured after they flow through a channel. This group consists of the bufferControlTable and the captureBufferTable, and requires the implementation of the filter group.

2.3.10. The Event Group

The event group controls the generation and notification of events from this device. This group consists of the eventTable and the logTable.

3. Control of Remote Network Monitoring Devices

Due to the complex nature of the available functions in these devices, the functions often need user configuration. In many cases, the function requires parameters to be set up for a data collection operation. The operation can proceed only after these parameters are fully set up.

Many functional groups in this MIB have one or more tables in which to set up control parameters, and one or more data tables in which to place the results of the operation. The control tables are typically read-write in nature, while the data tables are typically read-only. Because the parameters in the control table often describe resulting data in the data table, many of the parameters can be modified only when the control entry is invalid. Thus, the method for modifying these parameters is to invalidate the control entry, causing its deletion and the deletion of any associated data entries, and then create a new control entry with the proper parameters. Deleting the control entry also gives a convenient method for reclaiming the resources used by the associated data.

Some objects in this MIB provide a mechanism to execute an action on the remote monitoring device. These objects may execute an action as a result of a change in the state of the object. For those objects in this MIB, a request to set an object to the same value as it currently holds would thus cause no action to occur.

To facilitate control by multiple managers, resources have to be shared among the managers. These resources are typically the memory and computation resources that a function requires.

3.1. Resource Sharing Among Multiple Management Stations

When multiple management stations wish to use functions that compete for a finite amount of resources on a device, a method to facilitate this sharing of resources is required. Potential conflicts include:

- o Two management stations wish to simultaneously use resources that together would exceed the capability of the device.
- o A management station uses a significant amount of resources for a long period of time.
- o A management station uses resources and then crashes, forgetting to free the resources so others may use them.

A mechanism is provided for each management station initiated function in this MIB to avoid these conflicts and to help resolve them when they occur. Each function has a label identifying the initiator (owner) of the function. This label is set by the initiator to provide for the following possibilities:

- o A management station may recognize resources it owns and no longer needs.
- o A network operator can find the management station that owns the resource and negotiate for it to be freed.

- o A network operator may decide to unilaterally free resources another network operator has reserved.
- o Upon initialization, a management station may recognize resources it had reserved in the past. With this information it may free the resources if it no longer needs them.

Management stations and probes should support any format of the owner string dictated by the local policy of the organization. It is suggested that this name contain one or more of the following: IP address, management station name, network manager's name, location, or phone number. This information will help users to share the resources more effectively.

There is often default functionality that the device or the administrator of the probe (often the network administrator) wishes to set up. The resources associated with this functionality are then owned by the device itself or by the network administrator, and are intended to be long-lived. In this case, the device or the administrator will set the relevant owner object to a string starting with 'monitor'. Indiscriminate modification of the monitor-owned configuration by network management stations is discouraged. In fact, a network management station should only modify these objects under the direction of the administrator of the probe.

Resources on a probe are scarce and are typically allocated when control rows are created by an application. Since many applications may be using a probe simultaneously, indiscriminate allocation of resources to particular applications is very likely to cause resource shortages in the probe.

When a network management station wishes to utilize a function in a monitor, it is encouraged to first scan the control table of that function to find an instance with similar parameters to share. This is especially true for those instances owned by the monitor, which can be assumed to change infrequently. If a management station decides to share an instance owned by another management station, it should understand that the management station that owns the instance may indiscriminately modify or delete it.

It should be noted that a management application should have the most trust in a monitor-owned row because it should be changed very infrequently. A row owned by the management application is less long-lived because a network administrator is more likely to re-assign resources from a row that is in use by one user than from a monitor-owned row that is potentially in use by many users. A row owned by another application would be even less long-lived because the other application may delete or modify that row completely at its

discretion.

3.2. Row Addition Among Multiple Management Stations

The addition of new rows is achieved using the method described in RFC 1212 [9]. In this MIB, rows are often added to a table in order to configure a function. This configuration usually involves parameters that control the operation of the function. The agent must check these parameters to make sure they are appropriate given restrictions defined in this MIB as well as any implementation specific restrictions such as lack of resources. The agent implementor may be confused as to when to check these parameters and when to signal to the management station that the parameters are invalid. There are two opportunities:

- o When the management station sets each parameter object.
- o When the management station sets the entry status object to valid.

If the latter is chosen, it would be unclear to the management station which of the several parameters was invalid and caused the badValue error to be emitted. Thus, wherever possible, the implementor should choose the former as it will provide more information to the management station.

A problem can arise when multiple management stations attempt to set configuration information simultaneously using SNMP. When this involves the addition of a new conceptual row in the same control table, the managers may collide, attempting to create the same entry. To guard against these collisions, each such control entry contains a status object with special semantics that help to arbitrate among the managers. If an attempt is made with the row addition mechanism to create such a status object and that object already exists, an error is returned. When more than one manager simultaneously attempts to create the same conceptual row, only the first will succeed. The others will receive an error.

When a manager wishes to create a new control entry, it needs to choose an index for that row. It may choose this index in a variety of ways, hopefully minimizing the chances that the index is in use by another manager. If the index is in use, the mechanism mentioned previously will guard against collisions. Examples of schemes to choose index values include random selection or scanning the control table looking for the first unused index. Because index values may be any valid value in the range and they are chosen by the manager, the agent must allow a row to be created with any unused index value if it has the resources to create a new row.

Some tables in this MIB reference other tables within this MIB. When creating or deleting entries in these tables, it is generally allowable for dangling references to exist. There is no defined order for creating or deleting entries in these tables.

4. Conventions

The following conventions are used throughout the RMON MIB and its companion documents.

Good Packets

Good packets are error-free packets that have a valid frame length. For example, on Ethernet, good packets are error-free packets that are between 64 octets long and 1518 octets long. They follow the form defined in IEEE 802.3 section 3.2.all.

Bad Packets

Bad packets are packets that have proper framing and are therefore recognized as packets, but contain errors within the packet or have an invalid length. For example, on Ethernet, bad packets have a valid preamble and SFD, but have a bad CRC, or are either shorter than 64 octets or longer than 1518 octets.

5. Definitions

```
RMON-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    Counter                FROM RFC1155-SMI
    DisplayString           FROM RFC1158-MIB
    mib-2                   FROM RFC1213-MIB
    OBJECT-TYPE             FROM RFC-1212
    TRAP-TYPE               FROM RFC-1215;
```

```
-- Remote Network Monitoring MIB
```

```
rmon    OBJECT IDENTIFIER ::= { mib-2 16 }
```

```
-- textual conventions
```

```
OwnerString ::= DisplayString
```

```
-- This data type is used to model an administratively
-- assigned name of the owner of a resource. This
-- information is taken from the NVT ASCII character
-- set. It is suggested that this name contain one or
```

```
-- more of the following: IP address, management station
-- name, network manager's name, location, or phone
-- number.
-- In some cases the agent itself will be the owner of
-- an entry. In these cases, this string shall be set
-- to a string starting with 'monitor'.
--
-- SNMP access control is articulated entirely in terms
-- of the contents of MIB views; access to a particular
-- SNMP object instance depends only upon its presence
-- or absence in a particular MIB view and never upon
-- its value or the value of related object instances.
-- Thus, objects of this type afford resolution of
-- resource contention only among cooperating managers;
-- they realize no access control function with respect
-- to uncooperative parties.
--
-- By convention, objects with this syntax are declared as
-- having
--
--     SIZE (0..127)

EntryStatus ::= INTEGER
    { valid(1),
      createRequest(2),
      underCreation(3),
      invalid(4)
    }
-- The status of a table entry.
--
-- Setting this object to the value invalid(4) has the
-- effect of invalidating the corresponding entry.
-- That is, it effectively disassociates the mapping
-- identified with said entry.
-- It is an implementation-specific matter as to whether
-- the agent removes an invalidated entry from the table.
-- Accordingly, management stations must be prepared to
-- receive tabular information from agents that
-- corresponds to entries currently not in use. Proper
-- interpretation of such entries requires examination
-- of the relevant EntryStatus object.
--
-- An existing instance of this object cannot be set to
-- createRequest(2). This object may only be set to
-- createRequest(2) when this instance is created. When
-- this object is created, the agent may wish to create
-- supplemental object instances with default values
-- to complete a conceptual row in this table. Because
```

-- the creation of these default objects is entirely at
 -- the option of the agent, the manager must not assume
 -- that any will be created, but may make use of any that
 -- are created. Immediately after completing the create
 -- operation, the agent must set this object to
 -- underCreation(3).

--
 -- When in the underCreation(3) state, an entry is
 -- allowed to exist in a possibly incomplete, possibly
 -- inconsistent state, usually to allow it to be
 -- modified in mutiple PDUs. When in this state, an
 -- entry is not fully active. Entries shall exist in
 -- the underCreation(3) state until the management
 -- station is finished configuring the entry and sets
 -- this object to valid(1) or aborts, setting this
 -- object to invalid(4). If the agent determines that
 -- an entry has been in the underCreation(3) state for
 -- an abnormally long time, it may decide that the
 -- management station has crashed. If the agent makes
 -- this decision, it may set this object to invalid(4)
 -- to reclaim the entry. A prudent agent will
 -- understand that the management station may need to
 -- wait for human input and will allow for that
 -- possibility in its determination of this abnormally
 -- long period.

--
 -- An entry in the valid(1) state is fully configured and
 -- consistent and fully represents the configuration or
 -- operation such a row is intended to represent. For
 -- example, it could be a statistical function that is
 -- configured and active, or a filter that is available
 -- in the list of filters processed by the packet capture
 -- process.

-- A manager is restricted to changing the state of an
 -- entry in the following ways:

		create	under	
To:	valid	Request	Creation	invalid
From:				
valid	OK	NO	OK	OK
createRequest	N/A	N/A	N/A	N/A
underCreation	OK	NO	OK	OK
invalid	NO	NO	NO	OK
nonExistent	NO	OK	NO	OK

--
 -- In the table above, it is not applicable to move the
 -- state from the createRequest state to any other

```

-- state because the manager will never find the
-- variable in that state.  The nonExistent state is
-- not a value of the enumeration, rather it means that
-- the entryStatus variable does not exist at all.
--
-- An agent may allow an entryStatus variable to change
-- state in additional ways, so long as the semantics
-- of the states are followed.  This allowance is made
-- to ease the implementation of the agent and is made
-- despite the fact that managers should never
-- exercise these additional state transitions.

statistics      OBJECT IDENTIFIER ::= { rmon 1 }
history         OBJECT IDENTIFIER ::= { rmon 2 }
alarm          OBJECT IDENTIFIER ::= { rmon 3 }
hosts          OBJECT IDENTIFIER ::= { rmon 4 }
hostTopN       OBJECT IDENTIFIER ::= { rmon 5 }
matrix         OBJECT IDENTIFIER ::= { rmon 6 }
filter         OBJECT IDENTIFIER ::= { rmon 7 }
capture        OBJECT IDENTIFIER ::= { rmon 8 }
event          OBJECT IDENTIFIER ::= { rmon 9 }

-- The Ethernet Statistics Group
--
-- Implementation of the Ethernet Statistics group is
-- optional.
--
-- The ethernet statistics group contains statistics
-- measured by the probe for each monitored interface on
-- this device.  These statistics take the form of free
-- running counters that start from zero when a valid entry
-- is created.
--
-- This group currently has statistics defined only for
-- Ethernet interfaces.  Each etherStatsEntry contains
-- statistics for one Ethernet interface.  The probe must
-- create one etherStats entry for each monitored Ethernet
-- interface on the device.

etherStatsTable OBJECT-TYPE
    SYNTAX SEQUENCE OF EtherStatsEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of Ethernet statistics entries."
    ::= { statistics 1 }

```

```

etherStatsEntry OBJECT-TYPE
    SYNTAX EtherStatsEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A collection of statistics kept for a particular
        Ethernet interface.  As an example, an instance of the
        etherStatsPkts object might be named etherStatsPkts.1"
    INDEX { etherStatsIndex }
    ::= { etherStatsTable 1 }

```

```

EtherStatsEntry ::= SEQUENCE {
    etherStatsIndex                INTEGER (1..65535),
    etherStatsDataSource           OBJECT IDENTIFIER,
    etherStatsDropEvents           Counter,
    etherStatsOctets               Counter,
    etherStatsPkts                 Counter,
    etherStatsBroadcastPkts       Counter,
    etherStatsMulticastPkts       Counter,
    etherStatsCRCAlignErrors      Counter,
    etherStatsUndersizePkts       Counter,
    etherStatsOversizePkts        Counter,
    etherStatsFragments           Counter,
    etherStatsJabbers              Counter,
    etherStatsCollisions           Counter,
    etherStatsPkts64Octets        Counter,
    etherStatsPkts65to127Octets   Counter,
    etherStatsPkts128to255Octets  Counter,
    etherStatsPkts256to511Octets  Counter,
    etherStatsPkts512to1023Octets Counter,
    etherStatsPkts1024to1518Octets Counter,
    etherStatsOwner                OwnerString,
    etherStatsStatus               EntryStatus
}

```

```

etherStatsIndex OBJECT-TYPE
    SYNTAX INTEGER (1..65535)
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The value of this object uniquely identifies this
        etherStats entry."
    ::= { etherStatsEntry 1 }

```

```

etherStatsDataSource OBJECT-TYPE
    SYNTAX OBJECT IDENTIFIER
    ACCESS read-write
    STATUS mandatory

```

DESCRIPTION

"This object identifies the source of the data that this etherStats entry is configured to analyze. This source can be any ethernet interface on this device. In order to identify a particular interface, this object shall identify the instance of the ifIndex object, defined in RFC 1213 and RFC 1573 [4,6], for the desired interface. For example, if an entry were to receive data from interface #1, this object would be set to ifIndex.1.

The statistics in this group reflect all packets on the local network segment attached to the identified interface.

An agent may or may not be able to tell if fundamental changes to the media of the interface have occurred and necessitate an invalidation of this entry. For example, a hot-pluggable ethernet card could be pulled out and replaced by a token-ring card. In such a case, if the agent has such knowledge of the change, it is recommended that it invalidate this entry.

This object may not be modified if the associated etherStatsStatus object is equal to valid(1)."

```
::= { etherStatsEntry 2 }
```

etherStatsDropEvents OBJECT-TYPE

SYNTAX Counter

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The total number of events in which packets were dropped by the probe due to lack of resources. Note that this number is not necessarily the number of packets dropped; it is just the number of times this condition has been detected."

```
::= { etherStatsEntry 3 }
```

etherStatsOctets OBJECT-TYPE

SYNTAX Counter

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including

FCS octets).

This object can be used as a reasonable estimate of ethernet utilization. If greater precision is desired, the etherStatsPkts and etherStatsOctets objects should be sampled before and after a common interval. The differences in the sampled values are Pkts and Octets, respectively, and the number of seconds in the interval is Interval. These values are used to calculate the Utilization as follows:

$$\text{Utilization} = \frac{\text{Pkts} * (9.6 + 6.4) + (\text{Octets} * .8)}{\text{Interval} * 10,000}$$

The result of this equation is the value Utilization which is the percent utilization of the ethernet segment on a scale of 0 to 100 percent."

```
::= { etherStatsEntry 4 }
```

```
etherStatsPkts OBJECT-TYPE
```

```
SYNTAX Counter
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

```
"The total number of packets (including bad packets, broadcast packets, and multicast packets) received."
```

```
::= { etherStatsEntry 5 }
```

```
etherStatsBroadcastPkts OBJECT-TYPE
```

```
SYNTAX Counter
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

```
"The total number of good packets received that were directed to the broadcast address. Note that this does not include multicast packets."
```

```
::= { etherStatsEntry 6 }
```

```
etherStatsMulticastPkts OBJECT-TYPE
```

```
SYNTAX Counter
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

```
"The total number of good packets received that were directed to a multicast address. Note that this number does not include packets directed to the broadcast address."
```

```
::= { etherStatsEntry 7 }
```

```
etherStatsCRCAAlignErrors OBJECT-TYPE
```

```
SYNTAX Counter
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

```
"The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but but had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)."
```

```
::= { etherStatsEntry 8 }
```

```
etherStatsUndersizePkts OBJECT-TYPE
```

```
SYNTAX Counter
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

```
"The total number of packets received that were less than 64 octets long (excluding framing bits, but including FCS octets) and were otherwise well formed."
```

```
::= { etherStatsEntry 9 }
```

```
etherStatsOversizePkts OBJECT-TYPE
```

```
SYNTAX Counter
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

```
"The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well formed."
```

```
::= { etherStatsEntry 10 }
```

```
etherStatsFragments OBJECT-TYPE
```

```
SYNTAX Counter
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

```
"The total number of packets received that were less than 64 octets in length (excluding framing bits but including FCS octets) and had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral
```

number of octets (Alignment Error).

Note that it is entirely normal for etherStatsFragments to increment. This is because it counts both runts (which are normal occurrences due to collisions) and noise hits."

```
::= { etherStatsEntry 11 }
```

etherStatsJabbers OBJECT-TYPE

SYNTAX Counter

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).

Note that this definition of jabber is different than the definition in IEEE-802.3 section 8.2.1.5 (10BASE5) and section 10.3.1.4 (10BASE2). These documents define jabber as the condition where any packet exceeds 20 ms. The allowed range to detect jabber is between 20 ms and 150 ms."

```
::= { etherStatsEntry 12 }
```

etherStatsCollisions OBJECT-TYPE

SYNTAX Counter

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The best estimate of the total number of collisions on this Ethernet segment.

The value returned will depend on the location of the RMON probe. Section 8.2.1.3 (10BASE-5) and section 10.3.1.3 (10BASE-2) of IEEE standard 802.3 states that a station must detect a collision, in the receive mode, if three or more stations are transmitting simultaneously. A repeater port must detect a collision when two or more stations are transmitting simultaneously. Thus a probe placed on a repeater port could record more collisions than a probe connected to a station on the same segment would.

Probe location plays a much smaller role when considering 10BASE-T. 14.2.1.4 (10BASE-T) of IEEE standard 802.3 defines a collision as the simultaneous presence of signals on the DO and RD circuits (transmitting and receiving at the same time). A 10BASE-T station can only detect collisions when it is transmitting. Thus probes placed on a station and a repeater, should report the same number of collisions.

Note also that an RMON probe inside a repeater should ideally report collisions between the repeater and one or more other hosts (transmit collisions as defined by IEEE 802.3k) plus receiver collisions observed on any coax segments to which the repeater is connected."

```
::= { etherStatsEntry 13 }
```

```
etherStatsPkts64Octets OBJECT-TYPE
```

```
SYNTAX Counter
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

```
"The total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets)."
```

```
::= { etherStatsEntry 14 }
```

```
etherStatsPkts65to127Octets OBJECT-TYPE
```

```
SYNTAX Counter
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

```
"The total number of packets (including bad packets) received that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets)."
```

```
::= { etherStatsEntry 15 }
```

```
etherStatsPkts128to255Octets OBJECT-TYPE
```

```
SYNTAX Counter
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

```
"The total number of packets (including bad packets) received that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets)."
```

```
::= { etherStatsEntry 16 }
```

```
etherStatsPkts256to511Octets OBJECT-TYPE
```

```
SYNTAX Counter  
ACCESS read-only  
STATUS mandatory  
DESCRIPTION
```

```
"The total number of packets (including bad  
packets) received that were between  
256 and 511 octets in length inclusive  
(excluding framing bits but including FCS octets)."
```

```
::= { etherStatsEntry 17 }
```

```
etherStatsPkts512to1023Octets OBJECT-TYPE
```

```
SYNTAX Counter  
ACCESS read-only  
STATUS mandatory  
DESCRIPTION
```

```
"The total number of packets (including bad  
packets) received that were between  
512 and 1023 octets in length inclusive  
(excluding framing bits but including FCS octets)."
```

```
::= { etherStatsEntry 18 }
```

```
etherStatsPkts1024to1518Octets OBJECT-TYPE
```

```
SYNTAX Counter  
ACCESS read-only  
STATUS mandatory  
DESCRIPTION
```

```
"The total number of packets (including bad  
packets) received that were between  
1024 and 1518 octets in length inclusive  
(excluding framing bits but including FCS octets)."
```

```
::= { etherStatsEntry 19 }
```

```
etherStatsOwner OBJECT-TYPE
```

```
SYNTAX OwnerString  
ACCESS read-write  
STATUS mandatory  
DESCRIPTION
```

```
"The entity that configured this entry and is  
therefore using the resources assigned to it."
```

```
::= { etherStatsEntry 20 }
```

```
etherStatsStatus OBJECT-TYPE
```

```
SYNTAX EntryStatus  
ACCESS read-write  
STATUS mandatory
```

DESCRIPTION

"The status of this etherStats entry."

::= { etherStatsEntry 21 }

-- The History Control Group

-- Implementation of the History Control group is optional.

--

-- The history control group controls the periodic statistical
-- sampling of data from various types of networks. The
-- historyControlTable stores configuration entries that each
-- define an interface, polling period, and other parameters.
-- Once samples are taken, their data is stored in an entry
-- in a media-specific table. Each such entry defines one
-- sample, and is associated with the historyControlEntry that
-- caused the sample to be taken. Each counter in the
-- etherHistoryEntry counts the same event as its
-- similarly-named counterpart in the etherStatsEntry,
-- except that each value here is a cumulative sum during a
-- sampling period.

--

-- If the probe keeps track of the time of day, it should
-- start the first sample of the history at a time such that
-- when the next hour of the day begins, a sample is
-- started at that instant. This tends to make more
-- user-friendly reports, and enables comparison of reports
-- from different probes that have relatively accurate time
-- of day.

--

-- The probe is encouraged to add two history control entries
-- per monitored interface upon initialization that describe
-- a short term and a long term polling period. Suggested
-- parameters are 30 seconds for the short term polling period
-- and 30 minutes for the long term period.

historyControlTable OBJECT-TYPE

SYNTAX SEQUENCE OF HistoryControlEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"A list of history control entries."

::= { history 1 }

historyControlEntry OBJECT-TYPE

SYNTAX HistoryControlEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"A list of parameters that set up a periodic sampling of statistics. As an example, an instance of the historyControlInterval object might be named historyControlInterval.2"

```
INDEX { historyControlIndex }
 ::= { historyControlTable 1 }
```

```
HistoryControlEntry ::= SEQUENCE {
  historyControlIndex          INTEGER (1..65535),
  historyControlDataSource     OBJECT IDENTIFIER,
  historyControlBucketsRequested  INTEGER (1..65535),
  historyControlBucketsGranted   INTEGER (1..65535),
  historyControlInterval       INTEGER (1..3600),
  historyControlOwner          OwnerString,
  historyControlStatus         EntryStatus
}
```

historyControlIndex OBJECT-TYPE

SYNTAX INTEGER (1..65535)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"An index that uniquely identifies an entry in the historyControl table. Each such entry defines a set of samples at a particular interval for an interface on the device."

```
::= { historyControlEntry 1 }
```

historyControlDataSource OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

ACCESS read-write

STATUS mandatory

DESCRIPTION

"This object identifies the source of the data for which historical data was collected and placed in a media-specific table on behalf of this historyControlEntry. This source can be any interface on this device. In order to identify a particular interface, this object shall identify the instance of the ifIndex object, defined in RFC 1213 and RFC 1573 [4,6], for the desired interface. For example, if an entry were to receive data from interface #1, this object would be set to ifIndex.1.

The statistics in this group reflect all packets on the local network segment attached to the

identified interface.

An agent may or may not be able to tell if fundamental changes to the media of the interface have occurred and necessitate an invalidation of this entry. For example, a hot-pluggable ethernet card could be pulled out and replaced by a token-ring card. In such a case, if the agent has such knowledge of the change, it is recommended that it invalidate this entry.

This object may not be modified if the associated historyControlStatus object is equal to valid(1)."
 ::= { historyControlEntry 2 }

historyControlBucketsRequested OBJECT-TYPE

SYNTAX INTEGER (1..65535)

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The requested number of discrete time intervals over which data is to be saved in the part of the media-specific table associated with this historyControlEntry.

When this object is created or modified, the probe should set historyControlBucketsGranted as closely to this object as is possible for the particular probe implementation and available resources."

DEFVAL { 50 }

::= { historyControlEntry 3 }

historyControlBucketsGranted OBJECT-TYPE

SYNTAX INTEGER (1..65535)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The number of discrete sampling intervals over which data shall be saved in the part of the media-specific table associated with this historyControlEntry.

When the associated historyControlBucketsRequested object is created or modified, the probe should set this object as closely to the requested value as is possible for the particular probe implementation and available resources. The probe must not lower this value except as a result

of a modification to the associated historyControlBucketsRequested object.

There will be times when the actual number of buckets associated with this entry is less than the value of this object. In this case, at the end of each sampling interval, a new bucket will be added to the media-specific table.

When the number of buckets reaches the value of this object and a new bucket is to be added to the media-specific table, the oldest bucket associated with this historyControlEntry shall be deleted by the agent so that the new bucket can be added.

When the value of this object changes to a value less than the current value, entries are deleted from the media-specific table associated with this historyControlEntry. Enough of the oldest of these entries shall be deleted by the agent so that their number remains less than or equal to the new value of this object.

When the value of this object changes to a value greater than the current value, the number of associated media-specific entries may be allowed to grow."

```
::= { historyControlEntry 4 }
```

historyControlInterval OBJECT-TYPE

SYNTAX INTEGER (1..3600)

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The interval in seconds over which the data is sampled for each bucket in the part of the media-specific table associated with this historyControlEntry. This interval can be set to any number of seconds between 1 and 3600 (1 hour).

Because the counters in a bucket may overflow at their maximum value with no indication, a prudent manager will take into account the possibility of overflow in any of the associated counters. It is important to consider the minimum time in which any counter could overflow on a particular media type and set the historyControlInterval object to a value less

than this interval. This is typically most important for the 'octets' counter in any media-specific table. For example, on an Ethernet network, the etherHistoryOctets counter could overflow in about one hour at the Ethernet's maximum utilization.

This object may not be modified if the associated historyControlStatus object is equal to valid(1)."

```
DEFVAL { 1800 }
 ::= { historyControlEntry 5 }
```

historyControlOwner OBJECT-TYPE

SYNTAX OwnerString

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The entity that configured this entry and is therefore using the resources assigned to it."

```
 ::= { historyControlEntry 6 }
```

historyControlStatus OBJECT-TYPE

SYNTAX EntryStatus

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The status of this historyControl entry.

Each instance of the media-specific table associated with this historyControlEntry will be deleted by the agent if this historyControlEntry is not equal to valid(1)."

```
 ::= { historyControlEntry 7 }
```

-- The Ethernet History Group

-- Implementation of the Ethernet History group is optional.

--

-- The Ethernet History group records periodic
 -- statistical samples from a network and stores them
 -- for later retrieval. Once samples are taken, their
 -- data is stored in an entry in a media-specific
 -- table. Each such entry defines one sample, and is
 -- associated with the historyControlEntry that caused
 -- the sample to be taken. This group defines the
 -- etherHistoryTable, for Ethernet networks.

--

```

etherHistoryTable OBJECT-TYPE
    SYNTAX SEQUENCE OF EtherHistoryEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of Ethernet history entries."
    ::= { history 2 }

etherHistoryEntry OBJECT-TYPE
    SYNTAX EtherHistoryEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "An historical sample of Ethernet statistics on a
        particular Ethernet interface. This sample is
        associated with the historyControlEntry which set up
        the parameters for a regular collection of these
        samples. As an example, an instance of the
        etherHistoryPkts object might be named
        etherHistoryPkts.2.89"
    INDEX { etherHistoryIndex , etherHistorySampleIndex }
    ::= { etherHistoryTable 1 }

EtherHistoryEntry ::= SEQUENCE {
    etherHistoryIndex                INTEGER (1..65535),
    etherHistorySampleIndex          INTEGER (1..2147483647),
    etherHistoryIntervalStart        TimeTicks,
    etherHistoryDropEvents           Counter,
    etherHistoryOctets               Counter,
    etherHistoryPkts                 Counter,
    etherHistoryBroadcastPkts        Counter,
    etherHistoryMulticastPkts        Counter,
    etherHistoryCRCAlignErrors        Counter,
    etherHistoryUndersizePkts        Counter,
    etherHistoryOversizePkts         Counter,
    etherHistoryFragments            Counter,
    etherHistoryJabbers              Counter,
    etherHistoryCollisions           Counter,
    etherHistoryUtilization          INTEGER (0..10000)
}

etherHistoryIndex OBJECT-TYPE
    SYNTAX INTEGER (1..65535)
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The history of which this entry is a part. The
        history identified by a particular value of this

```

index is the same history as identified
by the same value of historyControlIndex."
 ::= { etherHistoryEntry 1 }

etherHistorySampleIndex OBJECT-TYPE

SYNTAX INTEGER (1..2147483647)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"An index that uniquely identifies the particular
sample this entry represents among all samples
associated with the same historyControlEntry.
This index starts at 1 and increases by one
as each new sample is taken."

::= { etherHistoryEntry 2 }

etherHistoryIntervalStart OBJECT-TYPE

SYNTAX TimeTicks

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The value of sysUpTime at the start of the interval
over which this sample was measured. If the probe
keeps track of the time of day, it should start
the first sample of the history at a time such that
when the next hour of the day begins, a sample is
started at that instant. Note that following this
rule may require the probe to delay collecting the
first sample of the history, as each sample must be
of the same interval. Also note that the sample which
is currently being collected is not accessible in this
table until the end of its interval."

::= { etherHistoryEntry 3 }

etherHistoryDropEvents OBJECT-TYPE

SYNTAX Counter

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The total number of events in which packets
were dropped by the probe due to lack of resources
during this sampling interval. Note that this number
is not necessarily the number of packets dropped, it
is just the number of times this condition has been
detected."

::= { etherHistoryEntry 4 }

etherHistoryOctets OBJECT-TYPE

SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets)."
 ::= { etherHistoryEntry 5 }

etherHistoryPkts OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The number of packets (including bad packets) received during this sampling interval."
 ::= { etherHistoryEntry 6 }

etherHistoryBroadcastPkts OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The number of good packets received during this sampling interval that were directed to the broadcast address."
 ::= { etherHistoryEntry 7 }

etherHistoryMulticastPkts OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The number of good packets received during this sampling interval that were directed to a multicast address. Note that this number does not include packets addressed to the broadcast address."
 ::= { etherHistoryEntry 8 }

etherHistoryCRCAlignErrors OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The number of packets received during this sampling interval that had a length (excluding framing bits but including FCS octets) between 64 and 1518

octets, inclusive, but had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)."
 ::= { etherHistoryEntry 9 }

etherHistoryUndersizePkts OBJECT-TYPE

SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION

"The number of packets received during this sampling interval that were less than 64 octets long (excluding framing bits but including FCS octets) and were otherwise well formed."

::= { etherHistoryEntry 10 }

etherHistoryOversizePkts OBJECT-TYPE

SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION

"The number of packets received during this sampling interval that were longer than 1518 octets (excluding framing bits but including FCS octets) but were otherwise well formed."

::= { etherHistoryEntry 11 }

etherHistoryFragments OBJECT-TYPE

SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION

"The total number of packets received during this sampling interval that were less than 64 octets in length (excluding framing bits but including FCS octets) had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).

Note that it is entirely normal for etherHistoryFragments to increment. This is because it counts both runts (which are normal occurrences due to collisions) and noise hits."

::= { etherHistoryEntry 12 }

etherHistoryJabbers OBJECT-TYPE

SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION

"The number of packets received during this sampling interval that were longer than 1518 octets (excluding framing bits but including FCS octets), and had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).

Note that this definition of jabber is different than the definition in IEEE-802.3 section 8.2.1.5 (10BASE5) and section 10.3.1.4 (10BASE2). These documents define jabber as the condition where any packet exceeds 20 ms. The allowed range to detect jabber is between 20 ms and 150 ms."

::= { etherHistoryEntry 13 }

etherHistoryCollisions OBJECT-TYPE

SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION

"The best estimate of the total number of collisions on this Ethernet segment during this sampling interval.

The value returned will depend on the location of the RMON probe. Section 8.2.1.3 (10BASE-5) and section 10.3.1.3 (10BASE-2) of IEEE standard 802.3 states that a station must detect a collision, in the receive mode, if three or more stations are transmitting simultaneously. A repeater port must detect a collision when two or more stations are transmitting simultaneously. Thus a probe placed on a repeater port could record more collisions than a probe connected to a station on the same segment would.

Probe location plays a much smaller role when considering 10BASE-T. 14.2.1.4 (10BASE-T) of IEEE standard 802.3 defines a collision as the simultaneous presence of signals on the DO and RD circuits (transmitting and receiving at the same time). A 10BASE-T station can only detect collisions when it is transmitting. Thus probes

placed on a station and a repeater, should report the same number of collisions.

Note also that an RMON probe inside a repeater should ideally report collisions between the repeater and one or more other hosts (transmit collisions as defined by IEEE 802.3k) plus receiver collisions observed on any coax segments to which the repeater is connected."

```
::= { etherHistoryEntry 14 }
```

etherHistoryUtilization OBJECT-TYPE

SYNTAX INTEGER (0..10000)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The best estimate of the mean physical layer network utilization on this interface during this sampling interval, in hundredths of a percent."

```
::= { etherHistoryEntry 15 }
```

-- The Alarm Group

-- Implementation of the Alarm group is optional.

--

-- The Alarm Group requires the implementation of the Event group.

--

-- The Alarm group periodically takes statistical samples from variables in the probe and compares them to thresholds that have been configured. The alarm table stores configuration entries that each define a variable, polling period, and threshold parameters. If a sample is found to cross the threshold values, an event is generated. Only variables that resolve to an ASN.1 primitive type of INTEGER (INTEGER, Counter, Gauge, or TimeTicks) may be monitored in this way.

--

-- This function has a hysteresis mechanism to limit the generation of events. This mechanism generates one event as a threshold is crossed in the appropriate direction. No more events are generated for that threshold until the opposite threshold is crossed.

--

-- In the case of a sampling a deltaValue, a probe may

```
-- implement this mechanism with more precision if it
-- takes a delta sample twice per period, each time
-- comparing the sum of the latest two samples to the
-- threshold. This allows the detection of threshold
-- crossings that span the sampling boundary. Note
-- that this does not require any special configuration
-- of the threshold value. It is suggested that probes
-- implement this more precise algorithm.
```

```
alarmTable OBJECT-TYPE
    SYNTAX SEQUENCE OF AlarmEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of alarm entries."
    ::= { alarm 1 }
```

```
alarmEntry OBJECT-TYPE
    SYNTAX AlarmEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of parameters that set up a periodic checking
        for alarm conditions. For example, an instance of the
        alarmValue object might be named alarmValue.8"
    INDEX { alarmIndex }
    ::= { alarmTable 1 }
```

```
AlarmEntry ::= SEQUENCE {
    alarmIndex                INTEGER (1..65535),
    alarmInterval             INTEGER,
    alarmVariable             OBJECT IDENTIFIER,
    alarmSampleType          INTEGER,
    alarmValue                INTEGER,
    alarmStartupAlarm        INTEGER,
    alarmRisingThreshold     INTEGER,
    alarmFallingThreshold    INTEGER,
    alarmRisingEventIndex    INTEGER (0..65535),
    alarmFallingEventIndex   INTEGER (0..65535),
    alarmOwner                OwnerString,
    alarmStatus               EntryStatus
}
```

```
alarmIndex OBJECT-TYPE
    SYNTAX INTEGER (1..65535)
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
```

"An index that uniquely identifies an entry in the alarm table. Each such entry defines a diagnostic sample at a particular interval for an object on the device."

::= { alarmEntry 1 }

alarmInterval OBJECT-TYPE

SYNTAX INTEGER

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The interval in seconds over which the data is sampled and compared with the rising and falling thresholds. When setting this variable, care should be taken in the case of deltaValue sampling - the interval should be set short enough that the sampled variable is very unlikely to increase or decrease by more than $2^{31} - 1$ during a single sampling interval.

This object may not be modified if the associated alarmStatus object is equal to valid(1)."

::= { alarmEntry 2 }

alarmVariable OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The object identifier of the particular variable to be sampled. Only variables that resolve to an ASN.1 primitive type of INTEGER (INTEGER, Counter, Gauge, or TimeTicks) may be sampled.

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

During a set operation, if the supplied variable name is not available in the selected MIB view, a badValue error must be returned. If at any time the

variable name of an established alarmEntry is no longer available in the selected MIB view, the probe must change the status of this alarmEntry to invalid(4).

This object may not be modified if the associated alarmStatus object is equal to valid(1)."

```
::= { alarmEntry 3 }
```

alarmSampleType OBJECT-TYPE

```
SYNTAX INTEGER {  
    absoluteValue(1),  
    deltaValue(2)  
}
```

```
ACCESS read-write  
STATUS mandatory
```

DESCRIPTION

"The method of sampling the selected variable and calculating the value to be compared against the thresholds. If the value of this object is absoluteValue(1), the value of the selected variable will be compared directly with the thresholds at the end of the sampling interval. If the value of this object is deltaValue(2), the value of the selected variable at the last sample will be subtracted from the current value, and the difference compared with the thresholds.

This object may not be modified if the associated alarmStatus object is equal to valid(1)."

```
::= { alarmEntry 4 }
```

alarmValue OBJECT-TYPE

```
SYNTAX INTEGER  
ACCESS read-only  
STATUS mandatory
```

DESCRIPTION

"The value of the statistic during the last sampling period. For example, if the sample type is deltaValue, this value will be the difference between the samples at the beginning and end of the period. If the sample type is absoluteValue, this value will be the sampled value at the end of the period.

This is the value that is compared with the rising and falling thresholds.

The value during the current sampling period is not made available until the period is completed and will remain available until the next period completes."
 ::= { alarmEntry 5 }

alarmStartupAlarm OBJECT-TYPE

SYNTAX INTEGER {
 risingAlarm(1),
 fallingAlarm(2),
 risingOrFallingAlarm(3)
 }

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The alarm that may be sent when this entry is first set to valid. If the first sample after this entry becomes valid is greater than or equal to the risingThreshold and alarmStartupAlarm is equal to risingAlarm(1) or risingOrFallingAlarm(3), then a single rising alarm will be generated. If the first sample after this entry becomes valid is less than or equal to the fallingThreshold and alarmStartupAlarm is equal to fallingAlarm(2) or risingOrFallingAlarm(3), then a single falling alarm will be generated.

This object may not be modified if the associated alarmStatus object is equal to valid(1)."

::= { alarmEntry 6 }

alarmRisingThreshold OBJECT-TYPE

SYNTAX INTEGER

ACCESS read-write

STATUS mandatory

DESCRIPTION

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

After a rising event is generated, another such event will not be generated until the sampled value falls below this threshold and reaches the

alarmFallingThreshold.

This object may not be modified if the associated alarmStatus object is equal to valid(1)."

::= { alarmEntry 7 }

alarmFallingThreshold OBJECT-TYPE

SYNTAX INTEGER

ACCESS read-write

STATUS mandatory

DESCRIPTION

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

After a falling event is generated, another such event will not be generated until the sampled value rises above this threshold and reaches the alarmRisingThreshold.

This object may not be modified if the associated alarmStatus object is equal to valid(1)."

::= { alarmEntry 8 }

alarmRisingEventIndex OBJECT-TYPE

SYNTAX INTEGER (0..65535)

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The index of the eventEntry that is used when a rising threshold is crossed. The eventEntry identified by a particular value of this index is the same as identified by the same value of the eventIndex object. If there is no corresponding entry in the eventTable, then no association exists. In particular, if this value is zero, no associated event will be generated, as zero is not a valid event index.

This object may not be modified if the associated alarmStatus object is equal to valid(1)."

::= { alarmEntry 9 }

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

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

```
 ::= { alarmEntry 10 }
```

```
alarmOwner OBJECT-TYPE
    SYNTAX OwnerString
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "The entity that configured this entry and is
        therefore using the resources assigned to it."
```

```
 ::= { alarmEntry 11 }
```

```
alarmStatus OBJECT-TYPE
    SYNTAX EntryStatus
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "The status of this alarm entry."
```

```
 ::= { alarmEntry 12 }
```

```
-- The Host Group

-- Implementation of the Host group is optional.
--
-- The host group discovers new hosts on the network by
-- keeping a list of source and destination MAC Addresses seen
-- in good packets.  For each of these addresses, the host
-- group keeps a set of statistics.  The hostControlTable
-- controls which interfaces this function is performed on,
-- and contains some information about the process.  On
-- behalf of each hostControlEntry, data is collected on an
```

-- interface and placed in both the hostTable and the
-- hostTimeTable. If the monitoring device finds itself
-- short of resources, it may delete entries as needed. It
-- is suggested that the device delete the least recently
-- used entries first.

-- The hostTable contains entries for each address
-- discovered on a particular interface. Each entry
-- contains statistical data about that host. This table is
-- indexed by the MAC address of the host, through which a
-- random access may be achieved.

-- The hostTimeTable contains data in the same format as the
-- hostTable, and must contain the same set of hosts, but is
-- indexed using hostTimeCreationOrder rather than
-- hostAddress.

-- The hostTimeCreationOrder is an integer which reflects
-- the relative order in which a particular entry was
-- discovered and thus inserted into the table. As this
-- order, and thus the index, is among those entries
-- currently in the table, the index for a particular entry
-- may change if an (earlier) entry is deleted. Thus the
-- association between hostTimeCreationOrder and
-- hostTimeEntry may be broken at any time.

-- The hostTimeTable has two important uses. The first is the
-- fast download of this potentially large table. Because the
-- index of this table runs from 1 to the size of the table,
-- inclusive, its values are predictable. This allows very
-- efficient packing of variables into SNMP PDU's and allows
-- a table transfer to have multiple packets outstanding.
-- These benefits increase transfer rates tremendously.

-- The second use of the hostTimeTable is the efficient
-- discovery by the management station of new entries added
-- to the table. After the management station has downloaded
-- the entire table, it knows that new entries will be added
-- immediately after the end of the current table. It can
-- thus detect new entries there and retrieve them easily.

-- Because the association between hostTimeCreationOrder and
-- hostTimeEntry may be broken at any time, the management
-- station must monitor the related hostControlLastDeleteTime
-- object. When the management station thus detects a
-- deletion, it must assume that any such associations have
-- been broken, and invalidate any it has stored locally.
-- This includes restarting any download of the
-- hostTimeTable that may have been in progress, as well as

```
-- rediscovering the end of the hostTimeTable so that it may
-- detect new entries.  If the management station does not
-- detect the broken association, it may continue to refer
-- to a particular host by its creationOrder while
-- unwittingly retrieving the data associated with another
-- host entirely.  If this happens while downloading the
-- host table, the management station may fail to download
-- all of the entries in the table.
```

```
hostControlTable OBJECT-TYPE
    SYNTAX SEQUENCE OF HostControlEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of host table control entries."
    ::= { hosts 1 }
```

```
hostControlEntry OBJECT-TYPE
    SYNTAX HostControlEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of parameters that set up the discovery of
        hosts on a particular interface and the collection
        of statistics about these hosts.  For example, an
        instance of the hostControlTableSize object might be
        named hostControlTableSize.1"
    INDEX { hostControlIndex }
    ::= { hostControlTable 1 }
```

```
HostControlEntry ::= SEQUENCE {
    hostControlIndex          INTEGER (1..65535),
    hostControlDataSource     OBJECT IDENTIFIER,
    hostControlTableSize     INTEGER,
    hostControlLastDeleteTime TimeTicks,
    hostControlOwner         OwnerString,
    hostControlStatus        EntryStatus
}
```

```
hostControlIndex OBJECT-TYPE
    SYNTAX INTEGER (1..65535)
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "An index that uniquely identifies an entry in the
        hostControl table.  Each such entry defines
        a function that discovers hosts on a particular
        interface and places statistics about them in the
```

```
hostTable and the hostTimeTable on behalf of this
hostControlEntry."
 ::= { hostControlEntry 1 }
```

hostControlDataSource OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

ACCESS read-write

STATUS mandatory

DESCRIPTION

"This object identifies the source of the data for this instance of the host function. This source can be any interface on this device. In order to identify a particular interface, this object shall identify the instance of the ifIndex object, defined in RFC 1213 and RFC 1573 [4,6], for the desired interface. For example, if an entry were to receive data from interface #1, this object would be set to ifIndex.1.

The statistics in this group reflect all packets on the local network segment attached to the identified interface.

An agent may or may not be able to tell if fundamental changes to the media of the interface have occurred and necessitate an invalidation of this entry. For example, a hot-pluggable ethernet card could be pulled out and replaced by a token-ring card. In such a case, if the agent has such knowledge of the change, it is recommended that it invalidate this entry.

This object may not be modified if the associated hostControlStatus object is equal to valid(1)."

```
 ::= { hostControlEntry 2 }
```

hostControlTableSize OBJECT-TYPE

SYNTAX INTEGER

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The number of hostEntries in the hostTable and the hostTimeTable associated with this hostControlEntry."

```
 ::= { hostControlEntry 3 }
```

hostControlLastDeleteTime OBJECT-TYPE

SYNTAX TimeTicks

ACCESS read-only

STATUS mandatory
DESCRIPTION
 "The value of sysUpTime when the last entry was deleted from the portion of the hostTable associated with this hostControlEntry. If no deletions have occurred, this value shall be zero."
 ::= { hostControlEntry 4 }

hostControlOwner OBJECT-TYPE
SYNTAX OwnerString
ACCESS read-write
STATUS mandatory
DESCRIPTION
 "The entity that configured this entry and is therefore using the resources assigned to it."
 ::= { hostControlEntry 5 }

hostControlStatus OBJECT-TYPE
SYNTAX EntryStatus
ACCESS read-write
STATUS mandatory
DESCRIPTION
 "The status of this hostControl entry.

 If this object is not equal to valid(1), all associated entries in the hostTable, hostTimeTable, and the hostTopNTable shall be deleted by the agent."
 ::= { hostControlEntry 6 }

hostTable OBJECT-TYPE
SYNTAX SEQUENCE OF HostEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION
 "A list of host entries."
 ::= { hosts 2 }

hostEntry OBJECT-TYPE
SYNTAX HostEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION
 "A collection of statistics for a particular host that has been discovered on an interface of this device. For example, an instance of the hostOutBroadcastPkts object might be named hostOutBroadcastPkts.1.6.8.0.32.27.3.176"

```

INDEX { hostIndex, hostAddress }
 ::= { hostTable 1 }

HostEntry ::= SEQUENCE {
    hostAddress          OCTET STRING,
    hostCreationOrder   INTEGER (1..65535),
    hostIndex           INTEGER (1..65535),
    hostInPkts         Counter,
    hostOutPkts        Counter,
    hostInOctets       Counter,
    hostOutOctets      Counter,
    hostOutErrors      Counter,
    hostOutBroadcastPkts Counter,
    hostOutMulticastPkts Counter
}

hostAddress OBJECT-TYPE
    SYNTAX OCTET STRING
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The physical address of this host."
    ::= { hostEntry 1 }

hostCreationOrder OBJECT-TYPE
    SYNTAX INTEGER (1..65535)
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "An index that defines the relative ordering of
        the creation time of hosts captured for a
        particular hostControlEntry.  This index shall
        be between 1 and N, where N is the value of
        the associated hostControlTableSize.  The ordering
        of the indexes is based on the order of each entry's
        insertion into the table, in which entries added
        earlier have a lower index value than entries added
        later.

        It is important to note that the order for a
        particular entry may change as an (earlier) entry
        is deleted from the table.  Because this order may
        change, management stations should make use of the
        hostControlLastDeleteTime variable in the
        hostControlEntry associated with the relevant
        portion of the hostTable.  By observing
        this variable, the management station may detect
        the circumstances where a previous association

```

between a value of hostCreationOrder
and a hostEntry may no longer hold."
 ::= { hostEntry 2 }

hostIndex OBJECT-TYPE
SYNTAX INTEGER (1..65535)
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The set of collected host statistics of which
 this entry is a part. The set of hosts
 identified by a particular value of this
 index is associated with the hostControlEntry
 as identified by the same value of hostControlIndex."
 ::= { hostEntry 3 }

hostInPkts OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The number of good packets transmitted to this
 address since it was added to the hostTable."
 ::= { hostEntry 4 }

hostOutPkts OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The number of packets, including bad packets,
 transmitted by this address since it was added
 to the hostTable."
 ::= { hostEntry 5 }

hostInOctets OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The number of octets transmitted to this address
 since it was added to the hostTable (excluding
 framing bits but including FCS octets), except for
 those octets in bad packets."
 ::= { hostEntry 6 }

hostOutOctets OBJECT-TYPE
SYNTAX Counter

ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The number of octets transmitted by this address
 since it was added to the hostTable (excluding
 framing bits but including FCS octets), including
 those octets in bad packets."
 ::= { hostEntry 7 }

hostOutErrors OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The number of bad packets transmitted by this address
 since this host was added to the hostTable."
 ::= { hostEntry 8 }

hostOutBroadcastPkts OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The number of good packets transmitted by this
 address that were directed to the broadcast address
 since this host was added to the hostTable."
 ::= { hostEntry 9 }

hostOutMulticastPkts OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The number of good packets transmitted by this
 address that were directed to a multicast address
 since this host was added to the hostTable.
 Note that this number does not include packets
 directed to the broadcast address."
 ::= { hostEntry 10 }

-- host Time Table

hostTimeTable OBJECT-TYPE
SYNTAX SEQUENCE OF HostTimeEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION
 "A list of time-ordered host table entries."

```
::= { hosts 3 }
```

```
hostTimeEntry OBJECT-TYPE
```

```
SYNTAX HostTimeEntry
```

```
ACCESS not-accessible
```

```
STATUS mandatory
```

```
DESCRIPTION
```

```
"A collection of statistics for a particular host
that has been discovered on an interface of this
device. This collection includes the relative
ordering of the creation time of this object. For
example, an instance of the hostTimeOutBroadcastPkts
object might be named
```

```
hostTimeOutBroadcastPkts.1.687"
```

```
INDEX { hostTimeIndex, hostTimeCreationOrder }
```

```
::= { hostTimeTable 1 }
```

```
HostTimeEntry ::= SEQUENCE {
```

```
hostTimeAddress OCTET STRING,
```

```
hostTimeCreationOrder INTEGER (1..65535),
```

```
hostTimeIndex INTEGER (1..65535),
```

```
hostTimeInPkts Counter,
```

```
hostTimeOutPkts Counter,
```

```
hostTimeInOctets Counter,
```

```
hostTimeOutOctets Counter,
```

```
hostTimeOutErrors Counter,
```

```
hostTimeOutBroadcastPkts Counter,
```

```
hostTimeOutMulticastPkts Counter
```

```
}
```

```
hostTimeAddress OBJECT-TYPE
```

```
SYNTAX OCTET STRING
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

```
"The physical address of this host."
```

```
::= { hostTimeEntry 1 }
```

```
hostTimeCreationOrder OBJECT-TYPE
```

```
SYNTAX INTEGER (1..65535)
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

```
"An index that uniquely identifies an entry in
the hostTime table among those entries associated
with the same hostControlEntry. This index shall
be between 1 and N, where N is the value of
the associated hostControlTableSize. The ordering
```

of the indexes is based on the order of each entry's insertion into the table, in which entries added earlier have a lower index value than entries added later. Thus the management station has the ability to learn of new entries added to this table without downloading the entire table.

It is important to note that the index for a particular entry may change as an (earlier) entry is deleted from the table. Because this order may change, management stations should make use of the `hostControlLastDeleteTime` variable in the `hostControlEntry` associated with the relevant portion of the `hostTimeTable`. By observing this variable, the management station may detect the circumstances where a download of the table may have missed entries, and where a previous association between a value of `hostTimeCreationOrder` and a `hostTimeEntry` may no longer hold."

```
::= { hostTimeEntry 2 }
```

```
hostTimeIndex OBJECT-TYPE
```

```
SYNTAX INTEGER (1..65535)
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

"The set of collected host statistics of which this entry is a part. The set of hosts identified by a particular value of this index is associated with the `hostControlEntry` as identified by the same value of `hostControlIndex`."

```
::= { hostTimeEntry 3 }
```

```
hostTimeInPkts OBJECT-TYPE
```

```
SYNTAX Counter
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

"The number of good packets transmitted to this address since it was added to the `hostTimeTable`."

```
::= { hostTimeEntry 4 }
```

```
hostTimeOutPkts OBJECT-TYPE
```

```
SYNTAX Counter
```

```
ACCESS read-only
```

```
STATUS mandatory
```

```
DESCRIPTION
```

"The number of god packets transmitted by this

```
        address since it was added to the hostTimeTable."  
 ::= { hostTimeEntry 5 }
```

hostTimeInOctets OBJECT-TYPE

```
SYNTAX Counter  
ACCESS read-only  
STATUS mandatory  
DESCRIPTION  
    "The number of octets transmitted to this address  
    since it was added to the hostTimeTable (excluding  
    framing bits but including FCS octets), except for  
    those octets in bad packets."  
 ::= { hostTimeEntry 6 }
```

hostTimeOutOctets OBJECT-TYPE

```
SYNTAX Counter  
ACCESS read-only  
STATUS mandatory  
DESCRIPTION  
    "The number of octets transmitted by this address  
    since it was added to the hostTimeTable (excluding  
    framing bits but including FCS octets), including  
    those octets in bad packets."  
 ::= { hostTimeEntry 7 }
```

hostTimeOutErrors OBJECT-TYPE

```
SYNTAX Counter  
ACCESS read-only  
STATUS mandatory  
DESCRIPTION  
    "The number of bad packets transmitted by this address  
    since this host was added to the hostTimeTable."  
 ::= { hostTimeEntry 8 }
```

hostTimeOutBroadcastPkts OBJECT-TYPE

```
SYNTAX Counter  
ACCESS read-only  
STATUS mandatory  
DESCRIPTION  
    "The number of good packets transmitted by this  
    address that were directed to the broadcast address  
    since this host was added to the hostTimeTable."  
 ::= { hostTimeEntry 9 }
```

hostTimeOutMulticastPkts OBJECT-TYPE

```
SYNTAX Counter  
ACCESS read-only  
STATUS mandatory
```

DESCRIPTION

"The number of good packets transmitted by this address that were directed to a multicast address since this host was added to the hostTimeTable. Note that this number does not include packets directed to the broadcast address."

::= { hostTimeEntry 10 }

-- The Host Top "N" Group

-- Implementation of the Host Top N group is optional.

--

-- The Host Top N group requires the implementation of the host group.

--

-- The Host Top N group is used to prepare reports that describe the hosts that top a list ordered by one of their statistics.

-- The available statistics are samples of one of their base statistics, over an interval specified by the management station. Thus, these statistics are rate based. The management station also selects how many such hosts are reported.

-- The hostTopNControlTable is used to initiate the generation of such a report. The management station may select the parameters of such a report, such as which interface, which statistic, how many hosts, and the start and stop times of the sampling. When the report is prepared, entries are created in the hostTopNTable associated with the relevant hostTopNControlEntry. These entries are static for each report after it has been prepared.

hostTopNControlTable OBJECT-TYPE

SYNTAX SEQUENCE OF HostTopNControlEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"A list of top N host control entries."

::= { hostTopN 1 }

hostTopNControlEntry OBJECT-TYPE

SYNTAX HostTopNControlEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"A set of parameters that control the creation of a report of the top N hosts according to several metrics. For example, an instance of the hostTopNDuration object might be named hostTopNDuration.3"

```
INDEX { hostTopNControlIndex }
 ::= { hostTopNControlTable 1 }
```

```
HostTopNControlEntry ::= SEQUENCE {
  hostTopNControlIndex    INTEGER (1..65535),
  hostTopNHostIndex       INTEGER (1..65535),
  hostTopNRateBase        INTEGER,
  hostTopNTimeRemaining   INTEGER,
  hostTopNDuration        INTEGER,
  hostTopNRequestedSize   INTEGER,
  hostTopNGrantedSize     INTEGER,
  hostTopNStartTime       TimeTicks,
  hostTopNOwner           OwnerString,
  hostTopNStatus          EntryStatus
}
```

```
hostTopNControlIndex OBJECT-TYPE
  SYNTAX INTEGER (1..65535)
  ACCESS read-only
  STATUS mandatory
  DESCRIPTION
    "An index that uniquely identifies an entry
    in the hostTopNControl table. Each such
    entry defines one top N report prepared for
    one interface."
  ::= { hostTopNControlEntry 1 }
```

```
hostTopNHostIndex OBJECT-TYPE
  SYNTAX INTEGER (1..65535)
  ACCESS read-write
  STATUS mandatory
  DESCRIPTION
    "The host table for which a top N report will be
    prepared on behalf of this entry. The host table
    identified by a particular value of this index is
    associated with the same host table as identified by
    the same value of hostIndex.

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

```
 ::= { hostTopNControlEntry 2 }
```

```
hostTopNRateBase OBJECT-TYPE
```

```

SYNTAX INTEGER {
    hostTopNInPkts(1),
    hostTopNOutPkts(2),
    hostTopNInOctets(3),
    hostTopNOutOctets(4),
    hostTopNOutErrors(5),
    hostTopNOutBroadcastPkts(6),
    hostTopNOutMulticastPkts(7)
}
ACCESS read-write
STATUS mandatory
DESCRIPTION
    "The variable for each host that the hostTopNRate
    variable is based upon.

    This object may not be modified if the associated
    hostTopNStatus object is equal to valid(1)."
 ::= { hostTopNControlEntry 3 }

hostTopNTimeRemaining OBJECT-TYPE
SYNTAX INTEGER
ACCESS read-write
STATUS mandatory
DESCRIPTION
    "The number of seconds left in the report currently
    being collected.  When this object is modified by
    the management station, a new collection is started,
    possibly aborting a currently running report.  The
    new value is used as the requested duration of this
    report, which is loaded into the associated
    hostTopNDuration object.

    When this object is set to a non-zero value, any
    associated hostTopNEntries shall be made
    inaccessible by the monitor.  While the value of
    this object is non-zero, it decrements by one per
    second until it reaches zero.  During this time, all
    associated hostTopNEntries shall remain
    inaccessible.  At the time that this object
    decrements to zero, the report is made accessible in
    the hostTopNTable.  Thus, the hostTopN table needs
    to be created only at the end of the collection
    interval."
DEFVAL { 0 }
 ::= { hostTopNControlEntry 4 }

hostTopNDuration OBJECT-TYPE
SYNTAX INTEGER

```

ACCESS read-only
 STATUS mandatory
 DESCRIPTION

"The number of seconds that this report has collected during the last sampling interval, or if this report is currently being collected, the number of seconds that this report is being collected during this sampling interval.

When the associated hostTopNTimeRemaining object is set, this object shall be set by the probe to the same value and shall not be modified until the next time the hostTopNTimeRemaining is set.

This value shall be zero if no reports have been requested for this hostTopNControlEntry."

DEFVAL { 0 }
 ::= { hostTopNControlEntry 5 }

hostTopNRequestedSize OBJECT-TYPE

SYNTAX INTEGER
 ACCESS read-write
 STATUS mandatory
 DESCRIPTION

"The maximum number of hosts requested for the top N table.

When this object is created or modified, the probe should set hostTopNGrantedSize as closely to this object as is possible for the particular probe implementation and available resources."

DEFVAL { 10 }
 ::= { hostTopNControlEntry 6 }

hostTopNGrantedSize OBJECT-TYPE

SYNTAX INTEGER
 ACCESS read-only
 STATUS mandatory
 DESCRIPTION

"The maximum number of hosts in the top N table.

When the associated hostTopNRequestedSize object is created or modified, the probe should set this object as closely to the requested value as is possible for the particular implementation and available resources. The probe must not lower this value except as a result of a set to the associated hostTopNRequestedSize object.

Hosts with the highest value of hostTopNRate shall be placed in this table in decreasing order of this rate until there is no more room or until there are no more hosts."

::= { hostTopNControlEntry 7 }

hostTopNStartTime OBJECT-TYPE

SYNTAX TimeTicks

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The value of sysUpTime when this top N report was last started. In other words, this is the time that the associated hostTopNTimeRemaining object was modified to start the requested report."

::= { hostTopNControlEntry 8 }

hostTopNOwner OBJECT-TYPE

SYNTAX OwnerString

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The entity that configured this entry and is therefore using the resources assigned to it."

::= { hostTopNControlEntry 9 }

hostTopNStatus OBJECT-TYPE

SYNTAX EntryStatus

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The status of this hostTopNControl entry.

If this object is not equal to valid(1), all associated hostTopNEntries shall be deleted by the agent."

::= { hostTopNControlEntry 10 }

hostTopNTable OBJECT-TYPE

SYNTAX SEQUENCE OF HostTopNEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"A list of top N host entries."

::= { hostTopN 2 }

hostTopNEntry OBJECT-TYPE

SYNTAX HostTopNEntry

```

ACCESS not-accessible
STATUS mandatory
DESCRIPTION
    "A set of statistics for a host that is part of a
    top N report.  For example, an instance of the
    hostTopNRate object might be named
    hostTopNRate.3.10"
INDEX { hostTopNReport, hostTopNIndex }
 ::= { hostTopNTable 1 }

HostTopNEntry ::= SEQUENCE {
    hostTopNReport          INTEGER (1..65535),
    hostTopNIndex          INTEGER (1..65535),
    hostTopNAddress        OCTET STRING,
    hostTopNRate           INTEGER
}

hostTopNReport OBJECT-TYPE
    SYNTAX INTEGER (1..65535)
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "This object identifies the top N report of which
        this entry is a part.  The set of hosts
        identified by a particular value of this
        object is part of the same report as identified
        by the same value of the hostTopNControlIndex object."
    ::= { hostTopNEntry 1 }

hostTopNIndex OBJECT-TYPE
    SYNTAX INTEGER (1..65535)
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "An index that uniquely identifies an entry in
        the hostTopN table among those in the same report.
        This index is between 1 and N, where N is the
        number of entries in this table.  Increasing values
        of hostTopNIndex shall be assigned to entries with
        decreasing values of hostTopNRate until index N
        is assigned to the entry with the lowest value of
        hostTopNRate or there are no more hostTopNEntries."
    ::= { hostTopNEntry 2 }

hostTopNAddress OBJECT-TYPE
    SYNTAX OCTET STRING
    ACCESS read-only
    STATUS mandatory

```

```
DESCRIPTION
    "The physical address of this host."
 ::= { hostTopNEntry 3 }

hostTopNRate OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The amount of change in the selected variable
         during this sampling interval. The selected
         variable is this host's instance of the object
         selected by hostTopNRateBase."
 ::= { hostTopNEntry 4 }

-- The Matrix Group

-- Implementation of the Matrix group is optional.
--
-- The Matrix group consists of the matrixControlTable,
-- matrixSDTable and the matrixDSTable. These tables
-- store statistics for a particular conversation
-- between two addresses. As the device detects a new
-- conversation, including those to a non-unicast
-- address, it creates a new entry in both of the
-- matrix tables. It must only create new entries
-- based on information received in good packets. If
-- the monitoring device finds itself short of
-- resources, it may delete entries as needed. It is
-- suggested that the device delete the least recently
-- used entries first.

matrixControlTable OBJECT-TYPE
    SYNTAX SEQUENCE OF MatrixControlEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of information entries for the
         traffic matrix on each interface."
 ::= { matrix 1 }

matrixControlEntry OBJECT-TYPE
    SYNTAX MatrixControlEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "Information about a traffic matrix on a particular
```

interface. For example, an instance of the matrixControlLastDeleteTime object might be named matrixControlLastDeleteTime.1"

```
INDEX { matrixControlIndex }
 ::= { matrixControlTable 1 }
```

```
MatrixControlEntry ::= SEQUENCE {
  matrixControlIndex          INTEGER (1..65535),
  matrixControlDataSource     OBJECT IDENTIFIER,
  matrixControlTableSize     INTEGER,
  matrixControlLastDeleteTime TimeTicks,
  matrixControlOwner         OwnerString,
  matrixControlStatus        EntryStatus
}
```

matrixControlIndex OBJECT-TYPE

SYNTAX INTEGER (1..65535)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"An index that uniquely identifies an entry in the matrixControl table. Each such entry defines a function that discovers conversations on a particular interface and places statistics about them in the matrixSDTable and the matrixDSTable on behalf of this matrixControlEntry."

```
 ::= { matrixControlEntry 1 }
```

matrixControlDataSource OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

ACCESS read-write

STATUS mandatory

DESCRIPTION

"This object identifies the source of the data from which this entry creates a traffic matrix. This source can be any interface on this device. In order to identify a particular interface, this object shall identify the instance of the ifIndex object, defined in RFC 1213 and RFC 1573 [4,6], for the desired interface. For example, if an entry were to receive data from interface #1, this object would be set to ifIndex.1.

The statistics in this group reflect all packets on the local network segment attached to the identified interface.

An agent may or may not be able to tell if

fundamental changes to the media of the interface have occurred and necessitate an invalidation of this entry. For example, a hot-pluggable ethernet card could be pulled out and replaced by a token-ring card. In such a case, if the agent has such knowledge of the change, it is recommended that it invalidate this entry.

This object may not be modified if the associated matrixControlStatus object is equal to valid(1)."

::= { matrixControlEntry 2 }

matrixControlTableSize OBJECT-TYPE

SYNTAX INTEGER

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The number of matrixSDEntries in the matrixSDTable for this interface. This must also be the value of the number of entries in the matrixDSTable for this interface."

::= { matrixControlEntry 3 }

matrixControlLastDeleteTime OBJECT-TYPE

SYNTAX TimeTicks

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The value of sysUpTime when the last entry was deleted from the portion of the matrixSDTable or matrixDSTable associated with this matrixControlEntry. If no deletions have occurred, this value shall be zero."

::= { matrixControlEntry 4 }

matrixControlOwner OBJECT-TYPE

SYNTAX OwnerString

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The entity that configured this entry and is therefore using the resources assigned to it."

::= { matrixControlEntry 5 }

matrixControlStatus OBJECT-TYPE

SYNTAX EntryStatus

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The status of this matrixControl entry.

If this object is not equal to valid(1), all associated entries in the matrixSDTable and the matrixDSTable shall be deleted by the agent."

::= { matrixControlEntry 6 }

matrixSDTable OBJECT-TYPE

SYNTAX SEQUENCE OF MatrixSDEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"A list of traffic matrix entries indexed by source and destination MAC address."

::= { matrix 2 }

matrixSDEntry OBJECT-TYPE

SYNTAX MatrixSDEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"A collection of statistics for communications between two addresses on a particular interface. For example, an instance of the matrixSDPkts object might be named matrixSDPkts.1.6.8.0.32.27.3.176.6.8.0.32.10.8.113"

INDEX { matrixSDIndex,
matrixSDSourceAddress, matrixSDDestAddress }

::= { matrixSDTable 1 }

MatrixSDEntry ::= SEQUENCE {

matrixSDSourceAddress	OCTET STRING,
matrixSDDestAddress	OCTET STRING,
matrixSDIndex	INTEGER (1..65535),
matrixSDPkts	Counter,
matrixSDOctets	Counter,
matrixSDErrors	Counter

}

matrixSDSourceAddress OBJECT-TYPE

SYNTAX OCTET STRING

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The source physical address."

::= { matrixSDEntry 1 }

matrixSDDestAddress OBJECT-TYPE

```
SYNTAX OCTET STRING
ACCESS read-only
STATUS mandatory
DESCRIPTION
    "The destination physical address."
 ::= { matrixSDEntry 2 }

matrixSDIndex OBJECT-TYPE
SYNTAX INTEGER (1..65535)
ACCESS read-only
STATUS mandatory
DESCRIPTION
    "The set of collected matrix statistics of which
    this entry is a part.  The set of matrix statistics
    identified by a particular value of this index
    is associated with the same matrixControlEntry
    as identified by the same value of
    matrixControlIndex."
 ::= { matrixSDEntry 3 }

matrixSDPkts OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
    "The number of packets transmitted from the source
    address to the destination address (this number
    includes bad packets)."
```

```
 ::= { matrixSDEntry 4 }

matrixSDOctets OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
    "The number of octets (excluding framing bits but
    including FCS octets) contained in all packets
    transmitted from the source address to the
    destination address."
```

```
 ::= { matrixSDEntry 5 }

matrixSDErrors OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
    "The number of bad packets transmitted from
    the source address to the destination address."
```

```

 ::= { matrixSDEntry 6 }

-- Traffic matrix tables from destination to source

matrixDSTable OBJECT-TYPE
    SYNTAX SEQUENCE OF MatrixDSEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of traffic matrix entries indexed by
         destination and source MAC address."
    ::= { matrix 3 }

matrixDSEntry OBJECT-TYPE
    SYNTAX MatrixDSEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A collection of statistics for communications between
         two addresses on a particular interface. For example,
         an instance of the matrixSDPkts object might be named
         matrixSDPkts.1.6.8.0.32.10.8.113.6.8.0.32.27.3.176"
    INDEX { matrixDSIndex,
            matrixDSDestAddress, matrixDSSourceAddress }
    ::= { matrixDSTable 1 }

MatrixDSEntry ::= SEQUENCE {
    matrixDSSourceAddress      OCTET STRING,
    matrixDSDestAddress        OCTET STRING,
    matrixDSIndex              INTEGER (1..65535),
    matrixDSPkts               Counter,
    matrixDSOctets             Counter,
    matrixDSErrors             Counter
}

matrixDSSourceAddress OBJECT-TYPE
    SYNTAX OCTET STRING
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The source physical address."
    ::= { matrixDSEntry 1 }

matrixDSDestAddress OBJECT-TYPE
    SYNTAX OCTET STRING
    ACCESS read-only
    STATUS mandatory

```

DESCRIPTION
"The destination physical address."
 ::= { matrixDSEntry 2 }

matrixDSIndex OBJECT-TYPE
SYNTAX INTEGER (1..65535)
ACCESS read-only
STATUS mandatory
DESCRIPTION
"The set of collected matrix statistics of which
this entry is a part. The set of matrix statistics
identified by a particular value of this index
is associated with the same matrixControlEntry
as identified by the same value of
matrixControlIndex."
 ::= { matrixDSEntry 3 }

matrixDSPkts OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
"The number of packets transmitted from the source
address to the destination address (this number
includes bad packets)."
 ::= { matrixDSEntry 4 }

matrixDSOctets OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
"The number of octets (excluding framing bits
but including FCS octets) contained in all packets
transmitted from the source address to the
destination address."
 ::= { matrixDSEntry 5 }

matrixDSErrors OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
"The number of bad packets transmitted from
the source address to the destination address."
 ::= { matrixDSEntry 6 }

```

-- The Filter Group

-- Implementation of the Filter group is optional.
--
-- The Filter group allows packets to be captured with an
-- arbitrary filter expression. A logical data and
-- event stream or "channel" is formed by the packets
-- that match the filter expression.
--
-- This filter mechanism allows the creation of an arbitrary
-- logical expression with which to filter packets. Each
-- filter associated with a channel is OR'ed with the others.
-- Within a filter, any bits checked in the data and status
-- are AND'ed with respect to other bits in the same filter.
-- The NotMask also allows for checking for inequality.
-- Finally, the channelAcceptType object allows for
-- inversion of the whole equation.
--
-- If a management station wishes to receive a trap to alert
-- it that new packets have been captured and are available
-- for download, it is recommended that it set up an alarm
-- entry that monitors the value of the relevant
-- channelMatches instance.
--
-- The channel can be turned on or off, and can also
-- generate events when packets pass through it.

filterTable OBJECT-TYPE
    SYNTAX SEQUENCE OF FilterEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of packet filter entries."
    ::= { filter 1 }

filterEntry OBJECT-TYPE
    SYNTAX FilterEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A set of parameters for a packet filter applied on a
        particular interface. As an example, an instance of
        the filterPktData object might be named
        filterPktData.12"
    INDEX { filterIndex }
    ::= { filterTable 1 }

```

```

FilterEntry ::= SEQUENCE {
    filterIndex          INTEGER (1..65535),
    filterChannelIndex  INTEGER (1..65535),
    filterPktDataOffset INTEGER,
    filterPktData       OCTET STRING,
    filterPktDataMask   OCTET STRING,
    filterPktDataNotMask OCTET STRING,
    filterPktStatus     INTEGER,
    filterPktStatusMask INTEGER,
    filterPktStatusNotMask INTEGER,
    filterOwner         OwnerString,
    filterStatus       EntryStatus
}

filterIndex OBJECT-TYPE
    SYNTAX INTEGER (1..65535)
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "An index that uniquely identifies an entry
        in the filter table.  Each such entry defines
        one filter that is to be applied to every packet
        received on an interface."
    ::= { filterEntry 1 }

filterChannelIndex OBJECT-TYPE
    SYNTAX INTEGER (1..65535)
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "This object identifies the channel of which this
        filter is a part.  The filters identified by a
        particular value of this object are associated with
        the same channel as identified by the same value of
        the channelIndex object."
    ::= { filterEntry 2 }

filterPktDataOffset OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "The offset from the beginning of each packet where
        a match of packet data will be attempted.  This offset
        is measured from the point in the physical layer
        packet after the framing bits, if any.  For example,
        in an Ethernet frame, this point is at the beginning
        of the destination MAC address."

```

This object may not be modified if the associated filterStatus object is equal to valid(1)."
 DEFVAL { 0 }
 ::= { filterEntry 3 }

filterPktData OBJECT-TYPE
 SYNTAX OCTET STRING
 ACCESS read-write
 STATUS mandatory
 DESCRIPTION

"The data that is to be matched with the input packet. For each packet received, this filter and the accompanying filterPktDataMask and filterPktDataNotMask will be adjusted for the offset. The only bits relevant to this match algorithm are those that have the corresponding filterPktDataMask bit equal to one. The following three rules are then applied to every packet:

- (1) If the packet is too short and does not have data corresponding to part of the filterPktData, the packet will fail this data match.
- (2) For each relevant bit from the packet with the corresponding filterPktDataNotMask bit set to zero, if the bit from the packet is not equal to the corresponding bit from the filterPktData, then the packet will fail this data match.
- (3) If for every relevant bit from the packet with the corresponding filterPktDataNotMask bit set to one, the bit from the packet is equal to the corresponding bit from the filterPktData, then the packet will fail this data match.

Any packets that have not failed any of the three matches above have passed this data match. In particular, a zero length filter will match any packet.

This object may not be modified if the associated filterStatus object is equal to valid(1)."
 ::= { filterEntry 4 }

filterPktDataMask OBJECT-TYPE
 SYNTAX OCTET STRING
 ACCESS read-write
 STATUS mandatory

DESCRIPTION

"The mask that is applied to the match process. After adjusting this mask for the offset, only those bits in the received packet that correspond to bits set in this mask are relevant for further processing by the match algorithm. The offset is applied to filterPktDataMask in the same way it is applied to the filter. For the purposes of the matching algorithm, if the associated filterPktData object is longer than this mask, this mask is conceptually extended with '1' bits until it reaches the length of the filterPktData object.

This object may not be modified if the associated filterStatus object is equal to valid(1)."

::= { filterEntry 5 }

filterPktDataNotMask OBJECT-TYPE

SYNTAX OCTET STRING

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The inversion mask that is applied to the match process. After adjusting this mask for the offset, those relevant bits in the received packet that correspond to bits cleared in this mask must all be equal to their corresponding bits in the filterPktData object for the packet to be accepted. In addition, at least one of those relevant bits in the received packet that correspond to bits set in this mask must be different to its corresponding bit in the filterPktData object.

For the purposes of the matching algorithm, if the associated filterPktData object is longer than this mask, this mask is conceptually extended with '0' bits until it reaches the length of the filterPktData object.

This object may not be modified if the associated filterStatus object is equal to valid(1)."

::= { filterEntry 6 }

filterPktStatus OBJECT-TYPE

SYNTAX INTEGER

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The status that is to be matched with the input packet. The only bits relevant to this match algorithm are those that have the corresponding filterPktStatusMask bit equal to one. The following two rules are then applied to every packet:

- (1) For each relevant bit from the packet status with the corresponding filterPktStatusNotMask bit set to zero, if the bit from the packet status is not equal to the corresponding bit from the filterPktStatus, then the packet will fail this status match.
- (2) If for every relevant bit from the packet status with the corresponding filterPktStatusNotMask bit set to one, the bit from the packet status is equal to the corresponding bit from the filterPktStatus, then the packet will fail this status match.

Any packets that have not failed either of the two matches above have passed this status match. In particular, a zero length status filter will match any packet's status.

The value of the packet status is a sum. This sum initially takes the value zero. Then, for each error, E, that has been discovered in this packet, 2^E raised to a value representing E is added to the sum. The errors and the bits that represent them are dependent on the media type of the interface that this channel is receiving packets from.

The errors defined for a packet captured off of an Ethernet interface are as follows:

bit #	Error
0	Packet is longer than 1518 octets
1	Packet is shorter than 64 octets
2	Packet experienced a CRC or Alignment error

For example, an Ethernet fragment would have a value of 6 ($2^1 + 2^2$).

As this MIB is expanded to new media types, this object will have other media-specific errors defined.

For the purposes of this status matching algorithm, if the packet status is longer than this filterPktStatus object, this object is conceptually extended with '0' bits until it reaches the size of the packet status.

This object may not be modified if the associated filterStatus object is equal to valid(1)."
 ::= { filterEntry 7 }

filterPktStatusMask OBJECT-TYPE

SYNTAX INTEGER

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The mask that is applied to the status match process. Only those bits in the received packet that correspond to bits set in this mask are relevant for further processing by the status match algorithm. For the purposes of the matching algorithm, if the associated filterPktStatus object is longer than this mask, this mask is conceptually extended with '1' bits until it reaches the size of the filterPktStatus. In addition, if a packet status is longer than this mask, this mask is conceptually extended with '0' bits until it reaches the size of the packet status.

This object may not be modified if the associated filterStatus object is equal to valid(1)."
 ::= { filterEntry 8 }

filterPktStatusNotMask OBJECT-TYPE

SYNTAX INTEGER

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The inversion mask that is applied to the status match process. Those relevant bits in the received packet status that correspond to bits cleared in this mask must all be equal to their corresponding bits in the filterPktStatus object for the packet to be accepted. In addition, at least one of those relevant bits in the received packet status that correspond to bits set in this mask must be different to its corresponding bit in the filterPktStatus object for the packet to be accepted.

For the purposes of the matching algorithm, if the associated filterPktStatus object or a packet status is longer than this mask, this mask is conceptually extended with '0' bits until it reaches the longer of the lengths of the filterPktStatus object and the packet status.

This object may not be modified if the associated filterStatus object is equal to valid(1)."
 ::= { filterEntry 9 }

filterOwner OBJECT-TYPE
SYNTAX OwnerString
ACCESS read-write
STATUS mandatory
DESCRIPTION
"The entity that configured this entry and is therefore using the resources assigned to it."
 ::= { filterEntry 10 }

filterStatus OBJECT-TYPE
SYNTAX EntryStatus
ACCESS read-write
STATUS mandatory
DESCRIPTION
"The status of this filter entry."
 ::= { filterEntry 11 }

channelTable OBJECT-TYPE
SYNTAX SEQUENCE OF ChannelEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION
"A list of packet channel entries."
 ::= { filter 2 }

channelEntry OBJECT-TYPE
SYNTAX ChannelEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION
"A set of parameters for a packet channel applied on a particular interface. As an example, an instance of the channelMatches object might be named channelMatches.3"
INDEX { channelIndex }
 ::= { channelTable 1 }

```

ChannelEntry ::= SEQUENCE {
    channelIndex          INTEGER (1..65535),
    channelIfIndex       INTEGER (1..65535),
    channelAcceptType    INTEGER,
    channelDataControl   INTEGER,
    channelTurnOnEventIndex  INTEGER (0..65535),
    channelTurnOffEventIndex INTEGER (0..65535),
    channelEventIndex    INTEGER (0..65535),
    channelEventStatus   INTEGER,
    channelMatches       Counter,
    channelDescription   DisplayString (SIZE (0..127)),
    channelOwner         OwnerString,
    channelStatus        EntryStatus
}

```

channelIndex OBJECT-TYPE

SYNTAX INTEGER (1..65535)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"An index that uniquely identifies an entry in the channel table. Each such entry defines one channel, a logical data and event stream.

It is suggested that before creating a channel, an application should scan all instances of the filterChannelIndex object to make sure that there are no pre-existing filters that would be inadvertently be linked to the channel."

::= { channelEntry 1 }

channelIfIndex OBJECT-TYPE

SYNTAX INTEGER (1..65535)

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The value of this object uniquely identifies the interface on this remote network monitoring device to which the associated filters are applied to allow data into this channel. The interface identified by a particular value of this object is the same interface as identified by the same value of the ifIndex object, defined in RFC 1213 and RFC 1573 [4,6].

The filters in this group are applied to all packets on the local network segment attached to the identified interface.

An agent may or may not be able to tell if fundamental changes to the media of the interface have occurred and necessitate an invalidation of this entry. For example, a hot-pluggable ethernet card could be pulled out and replaced by a token-ring card. In such a case, if the agent has such knowledge of the change, it is recommended that it invalidate this entry.

This object may not be modified if the associated channelStatus object is equal to valid(1)."

```
::= { channelEntry 2 }
```

channelAcceptType OBJECT-TYPE

```
SYNTAX INTEGER {
    acceptMatched(1),
    acceptFailed(2)
}
```

ACCESS read-write

STATUS mandatory

DESCRIPTION

"This object controls the action of the filters associated with this channel. If this object is equal to acceptMatched(1), packets will be accepted to this channel if they are accepted by both the packet data and packet status matches of an associated filter. If this object is equal to acceptFailed(2), packets will be accepted to this channel only if they fail either the packet data match or the packet status match of each of the associated filters.

In particular, a channel with no associated filters will match no packets if set to acceptMatched(1) case and will match all packets in the acceptFailed(2) case.

This object may not be modified if the associated channelStatus object is equal to valid(1)."

```
::= { channelEntry 3 }
```

channelDataControl OBJECT-TYPE

```
SYNTAX INTEGER {
    on(1),
    off(2)
}
```

ACCESS read-write

STATUS mandatory

DESCRIPTION

"This object controls the flow of data through this channel. If this object is on(1), data, status and events flow through this channel. If this object is off(2), data, status and events will not flow through this channel."

DEFVAL { off }
 ::= { channelEntry 4 }

channelTurnOnEventIndex OBJECT-TYPE

SYNTAX INTEGER (0..65535)

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The value of this object identifies the event that is configured to turn the associated channelDataControl from off to on when the event is generated. The event identified by a particular value of this object is the same event as identified by the same value of the eventIndex object. If there is no corresponding entry in the eventTable, then no association exists. In fact, if no event is intended for this channel, channelTurnOnEventIndex must be set to zero, a non-existent event index.

This object may not be modified if the associated channelStatus object is equal to valid(1)."

::= { channelEntry 5 }

channelTurnOffEventIndex OBJECT-TYPE

SYNTAX INTEGER (0..65535)

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The value of this object identifies the event that is configured to turn the associated channelDataControl from on to off when the event is generated. The event identified by a particular value of this object is the same event as identified by the same value of the eventIndex object. If there is no corresponding entry in the eventTable, then no association exists. In fact, if no event is intended for this channel, channelTurnOffEventIndex must be set to zero, a non-existent event index.

This object may not be modified if the associated channelStatus object is equal to valid(1)."

::= { channelEntry 6 }

channelEventIndex OBJECT-TYPE

SYNTAX INTEGER (0..65535)

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The value of this object identifies the event that is configured to be generated when the associated channelDataControl is on and a packet is matched. The event identified by a particular value of this object is the same event as identified by the same value of the eventIndex object. If there is no corresponding entry in the eventTable, then no association exists. In fact, if no event is intended for this channel, channelEventIndex must be set to zero, a non-existent event index.

This object may not be modified if the associated channelStatus object is equal to valid(1)."

```
::= { channelEntry 7 }
```

channelEventStatus OBJECT-TYPE

```
SYNTAX INTEGER {
    eventReady(1),
    eventFired(2),
    eventAlwaysReady(3)
}
```

ACCESS read-write

STATUS mandatory

DESCRIPTION

"The event status of this channel.

If this channel is configured to generate events when packets are matched, a means of controlling the flow of those events is often needed. When this object is equal to eventReady(1), a single event may be generated, after which this object will be set by the probe to eventFired(2). While in the eventFired(2) state, no events will be generated until the object is modified to eventReady(1) (or eventAlwaysReady(3)). The management station can thus easily respond to a notification of an event by re-enabling this object.

If the management station wishes to disable this flow control and allow events to be generated at will, this object may be set to eventAlwaysReady(3). Disabling the flow control is discouraged as it can result in high network

```
        traffic or other performance problems."
DEFVAL { eventReady }
 ::= { channelEntry 8 }

channelMatches OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The number of times this channel has matched a
        packet. Note that this object is updated even when
        channelDataControl is set to off."
    ::= { channelEntry 9 }

channelDescription OBJECT-TYPE
    SYNTAX DisplayString (SIZE (0..127))
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "A comment describing this channel."
    ::= { channelEntry 10 }

channelOwner OBJECT-TYPE
    SYNTAX OwnerString
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "The entity that configured this entry and is
        therefore using the resources assigned to it."
    ::= { channelEntry 11 }

channelStatus OBJECT-TYPE
    SYNTAX EntryStatus
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "The status of this channel entry."
    ::= { channelEntry 12 }

-- The Packet Capture Group
--
-- Implementation of the Packet Capture group is optional.
--
-- The Packet Capture Group requires implementation of the
-- Filter Group.
--
-- The Packet Capture group allows packets to be captured
```

```
-- upon a filter match.  The bufferControlTable controls
-- the captured packets output from a channel that is
-- associated with it.  The captured packets are placed
-- in entries in the captureBufferTable.  These entries are
-- associated with the bufferControlEntry on whose behalf they
-- were stored.
```

```
bufferControlTable OBJECT-TYPE
    SYNTAX SEQUENCE OF BufferControlEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of buffers control entries."
    ::= { capture 1 }
```

```
bufferControlEntry OBJECT-TYPE
    SYNTAX BufferControlEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A set of parameters that control the collection of
        a stream of packets that have matched filters.  As
        an example, an instance of the
        bufferControlCaptureSliceSize object might be named
        bufferControlCaptureSliceSize.3"
    INDEX { bufferControlIndex }
    ::= { bufferControlTable 1 }
```

```
BufferControlEntry ::= SEQUENCE {
    bufferControlIndex                INTEGER (1..65535),
    bufferControlChannelIndex         INTEGER (1..65535),
    bufferControlFullStatus           INTEGER,
    bufferControlFullAction           INTEGER,
    bufferControlCaptureSliceSize    INTEGER,
    bufferControlDownloadSliceSize   INTEGER,
    bufferControlDownloadOffset      INTEGER,
    bufferControlMaxOctetsRequested   INTEGER,
    bufferControlMaxOctetsGranted    INTEGER,
    bufferControlCapturedPackets    INTEGER,
    bufferControlTurnOnTime           TimeTicks,
    bufferControlOwner                OwnerString,
    bufferControlStatus               EntryStatus
}
```

```
bufferControlIndex OBJECT-TYPE
    SYNTAX INTEGER (1..65535)
    ACCESS read-only
    STATUS mandatory
```

DESCRIPTION

"An index that uniquely identifies an entry in the bufferControl table. The value of this index shall never be zero. Each such entry defines one set of packets that is captured and controlled by one or more filters."

::= { bufferControlEntry 1 }

bufferControlChannelIndex OBJECT-TYPE

SYNTAX INTEGER (1..65535)

ACCESS read-write

STATUS mandatory

DESCRIPTION

"An index that identifies the channel that is the source of packets for this bufferControl table. The channel identified by a particular value of this index is the same as identified by the same value of the channelIndex object.

This object may not be modified if the associated bufferControlStatus object is equal to valid(1)."

::= { bufferControlEntry 2 }

bufferControlFullStatus OBJECT-TYPE

SYNTAX INTEGER {
 spaceAvailable(1),
 full(2)
}

ACCESS read-only

STATUS mandatory

DESCRIPTION

"This object shows whether the buffer has room to accept new packets or if it is full.

If the status is spaceAvailable(1), the buffer is accepting new packets normally. If the status is full(2) and the associated bufferControlFullAction object is wrapWhenFull, the buffer is accepting new packets by deleting enough of the oldest packets to make room for new ones as they arrive. Otherwise, if the status is full(2) and the bufferControlFullAction object is lockWhenFull, then the buffer has stopped collecting packets.

When this object is set to full(2) the probe must not later set it to spaceAvailable(1) except in the case of a significant gain in resources such as an increase of bufferControlOctetsGranted. In

particular, the wrap-mode action of deleting old packets to make room for newly arrived packets must not affect the value of this object."
 ::= { bufferControlEntry 3 }

bufferControlFullAction OBJECT-TYPE
SYNTAX INTEGER {
 lockWhenFull(1),
 wrapWhenFull(2) -- FIFO
}
ACCESS read-write
STATUS mandatory
DESCRIPTION
 "Controls the action of the buffer when it reaches the full status. When in the lockWhenFull(1) state and a packet is added to the buffer that fills the buffer, the bufferControlFullStatus will be set to full(2) and this buffer will stop capturing packets."
 ::= { bufferControlEntry 4 }

bufferControlCaptureSliceSize OBJECT-TYPE
SYNTAX INTEGER
ACCESS read-write
STATUS mandatory
DESCRIPTION
 "The maximum number of octets of each packet that will be saved in this capture buffer. For example, if a 1500 octet packet is received by the probe and this object is set to 500, then only 500 octets of the packet will be stored in the associated capture buffer. If this variable is set to 0, the capture buffer will save as many octets as is possible.

 This object may not be modified if the associated bufferControlStatus object is equal to valid(1)."
DEFVAL { 100 }
 ::= { bufferControlEntry 5 }

bufferControlDownloadSliceSize OBJECT-TYPE
SYNTAX INTEGER
ACCESS read-write
STATUS mandatory
DESCRIPTION
 "The maximum number of octets of each packet in this capture buffer that will be returned in an SNMP retrieval of that packet. For example,

if 500 octets of a packet have been stored in the associated capture buffer, the associated `bufferControlDownloadOffset` is 0, and this object is set to 100, then the `captureBufferPacket` object that contains the packet will contain only the first 100 octets of the packet.

A prudent manager will take into account possible interoperability or fragmentation problems that may occur if the download slice size is set too large. In particular, conformant SNMP implementations are not required to accept messages whose length exceeds 484 octets, although they are encouraged to support larger datagrams whenever feasible."

```
DEFVAL { 100 }
 ::= { bufferControlEntry 6 }
```

`bufferControlDownloadOffset` OBJECT-TYPE

```
SYNTAX INTEGER
ACCESS read-write
STATUS mandatory
DESCRIPTION
```

"The offset of the first octet of each packet in this capture buffer that will be returned in an SNMP retrieval of that packet. For example, if 500 octets of a packet have been stored in the associated capture buffer and this object is set to 100, then the `captureBufferPacket` object that contains the packet will contain bytes starting 100 octets into the packet."

```
DEFVAL { 0 }
 ::= { bufferControlEntry 7 }
```

`bufferControlMaxOctetsRequested` OBJECT-TYPE

```
SYNTAX INTEGER
ACCESS read-write
STATUS mandatory
DESCRIPTION
```

"The requested maximum number of octets to be saved in this capture buffer, including any implementation-specific overhead. If this variable is set to -1, the capture buffer will save as many octets as is possible.

When this object is created or modified, the probe should set `bufferControlMaxOctetsGranted` as closely to this object as is possible for the particular probe implementation and available resources. However, if

the object has the special value of -1, the probe must set bufferControlMaxOctetsGranted to -1."

```
DEFVAL { -1 }
 ::= { bufferControlEntry 8 }
```

bufferControlMaxOctetsGranted OBJECT-TYPE

SYNTAX INTEGER

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The maximum number of octets that can be saved in this captureBuffer, including overhead. If this variable is -1, the capture buffer will save as many octets as possible.

When the bufferControlMaxOctetsRequested object is created or modified, the probe should set this object as closely to the requested value as is possible for the particular probe implementation and available resources.

However, if the request object has the special value of -1, the probe must set this object to -1.

The probe must not lower this value except as a result of a modification to the associated bufferControlMaxOctetsRequested object.

When this maximum number of octets is reached and a new packet is to be added to this capture buffer and the corresponding bufferControlFullAction is set to wrapWhenFull(2), enough of the oldest packets associated with this capture buffer shall be deleted by the agent so that the new packet can be added. If the corresponding bufferControlFullAction is set to lockWhenFull(1), the new packet shall be discarded. In either case, the probe must set bufferControlFullStatus to full(2).

When the value of this object changes to a value less than the current value, entries are deleted from the captureBufferTable associated with this bufferControlEntry. Enough of the oldest of these captureBufferEntries shall be deleted by the agent so that the number of octets used remains less than or equal to the new value of this object.

When the value of this object changes to a value

```
        greater than the current value, the number of
        associated captureBufferEntries may be allowed to
        grow."
 ::= { bufferControlEntry 9 }

bufferControlCapturedPackets OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The number of packets currently in this
        captureBuffer."
 ::= { bufferControlEntry 10 }

bufferControlTurnOnTime OBJECT-TYPE
    SYNTAX TimeTicks
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The value of sysUpTime when this capture buffer was
        first turned on."
 ::= { bufferControlEntry 11 }

bufferControlOwner OBJECT-TYPE
    SYNTAX OwnerString
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "The entity that configured this entry and is
        therefore using the resources assigned to it."
 ::= { bufferControlEntry 12 }

bufferControlStatus OBJECT-TYPE
    SYNTAX EntryStatus
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "The status of this buffer Control Entry."
 ::= { bufferControlEntry 13 }

captureBufferTable OBJECT-TYPE
    SYNTAX SEQUENCE OF CaptureBufferEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of packets captured off of a channel."
 ::= { capture 2 }
```

```
captureBufferEntry OBJECT-TYPE
    SYNTAX CaptureBufferEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A packet captured off of an attached network.  As an
        example, an instance of the captureBufferPacketData
        object might be named captureBufferPacketData.3.1783"
    INDEX { captureBufferControlIndex, captureBufferIndex }
    ::= { captureBufferTable 1 }
```

```
CaptureBufferEntry ::= SEQUENCE {
    captureBufferControlIndex    INTEGER (1..65535),
    captureBufferIndex          INTEGER (1..2147483647),
    captureBufferPacketID       INTEGER,
    captureBufferPacketData     OCTET STRING,
    captureBufferPacketLength   INTEGER,
    captureBufferPacketTime     INTEGER,
    captureBufferPacketStatus   INTEGER
}
```

```
captureBufferControlIndex OBJECT-TYPE
    SYNTAX INTEGER (1..65535)
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The index of the bufferControlEntry with which
        this packet is associated."
    ::= { captureBufferEntry 1 }
```

```
captureBufferIndex OBJECT-TYPE
    SYNTAX INTEGER (1..2147483647)
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "An index that uniquely identifies an entry
        in the captureBuffer table associated with a
        particular bufferControlEntry.  This index will
        start at 1 and increase by one for each new packet
        added with the same captureBufferControlIndex.

        Should this value reach 2147483647, the next packet
        added with the same captureBufferControlIndex shall
        cause this value to wrap around to 1."
    ::= { captureBufferEntry 2 }
```

```
captureBufferPacketID OBJECT-TYPE
    SYNTAX INTEGER
```

ACCESS read-only
STATUS mandatory
DESCRIPTION

"An index that describes the order of packets that are received on a particular interface. The packetID of a packet captured on an interface is defined to be greater than the packetID's of all packets captured previously on the same interface. As the captureBufferPacketID object has a maximum positive value of $2^{31} - 1$, any captureBufferPacketID object shall have the value of the associated packet's packetID mod 2^{31} ."

::= { captureBufferEntry 3 }

captureBufferPacketData OBJECT-TYPE

SYNTAX OCTET STRING
ACCESS read-only
STATUS mandatory
DESCRIPTION

"The data inside the packet, starting at the beginning of the packet plus any offset specified in the associated bufferControlDownloadOffset, including any link level headers. The length of the data in this object is the minimum of the length of the captured packet minus the offset, the length of the associated bufferControlCaptureSliceSize minus the offset, and the associated bufferControlDownloadSliceSize. If this minimum is less than zero, this object shall have a length of zero."

::= { captureBufferEntry 4 }

captureBufferPacketLength OBJECT-TYPE

SYNTAX INTEGER
ACCESS read-only
STATUS mandatory
DESCRIPTION

"The actual length (off the wire) of the packet stored in this entry, including FCS octets."

::= { captureBufferEntry 5 }

captureBufferPacketTime OBJECT-TYPE

SYNTAX INTEGER
ACCESS read-only
STATUS mandatory
DESCRIPTION

"The number of milliseconds that had passed since this capture buffer was first turned on when this

```

        packet was captured."
 ::= { captureBufferEntry 6 }

```

captureBufferPacketStatus OBJECT-TYPE

```

SYNTAX INTEGER
ACCESS read-only
STATUS mandatory
DESCRIPTION

```

"A value which indicates the error status of this packet.

The value of this object is defined in the same way as filterPktStatus. The value is a sum. This sum initially takes the value zero. Then, for each error, E, that has been discovered in this packet, 2 raised to a value representing E is added to the sum.

The errors defined for a packet captured off of an Ethernet interface are as follows:

bit #	Error
0	Packet is longer than 1518 octets
1	Packet is shorter than 64 octets
2	Packet experienced a CRC or Alignment error
3	First packet in this capture buffer after it was detected that some packets were not processed correctly.
4	Packet's order in buffer is only approximate (May only be set for packets sent from the probe)

For example, an Ethernet fragment would have a value of 6 ($2^1 + 2^2$).

```

As this MIB is expanded to new media types, this
object will have other media-specific errors defined."
 ::= { captureBufferEntry 7 }

```

-- The Event Group

-- Implementation of the Event group is optional.

--

-- The Event group controls the generation and notification
 -- of events from this device. Each entry in the eventTable
 -- describes the parameters of the event that can be

```
-- triggered. Each event entry is fired by an associated
-- condition located elsewhere in the MIB. An event entry
-- may also be associated- with a function elsewhere in the
-- MIB that will be executed when the event is generated. For
-- example, a channel may be turned on or off by the firing
-- of an event.
--
```

```
-- Each eventEntry may optionally specify that a log entry
-- be created on its behalf whenever the event occurs.
-- Each entry may also specify that notification should
-- occur by way of SNMP trap messages. In this case, the
-- community for the trap message is given in the associated
-- eventCommunity object. The enterprise and specific trap
-- fields of the trap are determined by the condition that
-- triggered the event. Two traps are defined: risingAlarm
-- and fallingAlarm. If the eventTable is triggered by a
-- condition specified elsewhere, the enterprise and
-- specific trap fields must be specified for traps
-- generated for that condition.
```

```
eventTable OBJECT-TYPE
    SYNTAX SEQUENCE OF EventEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of events to be generated."
    ::= { event 1 }
```

```
eventEntry OBJECT-TYPE
    SYNTAX EventEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A set of parameters that describe an event to be
        generated when certain conditions are met. As an
        example, an instance of the eventLastTimeSent object
        might be named eventLastTimeSent.6"
    INDEX { eventIndex }
    ::= { eventTable 1 }
```

```
EventEntry ::= SEQUENCE {
    eventIndex          INTEGER (1..65535),
    eventDescription    DisplayString (SIZE (0..127)),
    eventType           INTEGER,
    eventCommunity      OCTET STRING (SIZE (0..127)),
    eventLastTimeSent   TimeTicks,
    eventOwner          OwnerString,
    eventStatus         EntryStatus
```

```
}  
  
eventIndex OBJECT-TYPE  
    SYNTAX INTEGER (1..65535)  
    ACCESS read-only  
    STATUS mandatory  
    DESCRIPTION  
        "An index that uniquely identifies an entry in the  
        event table.  Each such entry defines one event that  
        is to be generated when the appropriate conditions  
        occur."  
    ::= { eventEntry 1 }  
  
eventDescription OBJECT-TYPE  
    SYNTAX DisplayString (SIZE (0..127))  
    ACCESS read-write  
    STATUS mandatory  
    DESCRIPTION  
        "A comment describing this event entry."  
    ::= { eventEntry 2 }  
  
eventType OBJECT-TYPE  
    SYNTAX INTEGER {  
        none(1),  
        log(2),  
        snmp-trap(3),    -- send an SNMP trap  
        log-and-trap(4)  
    }  
    ACCESS read-write  
    STATUS mandatory  
    DESCRIPTION  
        "The type of notification that the probe will make  
        about this event.  In the case of log, an entry is  
        made in the log table for each event.  In the case of  
        snmp-trap, an SNMP trap is sent to one or more  
        management stations."  
    ::= { eventEntry 3 }  
  
eventCommunity OBJECT-TYPE  
    SYNTAX OCTET STRING (SIZE (0..127))  
    ACCESS read-write  
    STATUS mandatory  
    DESCRIPTION  
        "If an SNMP trap is to be sent, it will be sent to  
        the SNMP community specified by this octet string.  
        In the future this table will be extended to include  
        the party security mechanism.  This object shall be  
        set to a string of length zero if it is intended that
```

```
        that mechanism be used to specify the destination of
        the trap."
 ::= { eventEntry 4 }

eventLastTimeSent OBJECT-TYPE
    SYNTAX TimeTicks
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The value of sysUpTime at the time this event
        entry last generated an event.  If this entry has
        not generated any events, this value will be
        zero."
 ::= { eventEntry 5 }

eventOwner OBJECT-TYPE
    SYNTAX OwnerString
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "The entity that configured this entry and is
        therefore using the resources assigned to it.

        If this object contains a string starting with
        'monitor' and has associated entries in the log
        table, all connected management stations should
        retrieve those log entries, as they may have
        significance to all management stations connected to
        this device"
 ::= { eventEntry 6 }

eventStatus OBJECT-TYPE
    SYNTAX EntryStatus
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "The status of this event entry.

        If this object is not equal to valid(1), all
        associated log entries shall be deleted by the
        agent."
 ::= { eventEntry 7 }

--
logTable OBJECT-TYPE
    SYNTAX SEQUENCE OF LogEntry
    ACCESS not-accessible
    STATUS mandatory
```

DESCRIPTION

"A list of events that have been logged."

::= { event 2 }

logEntry OBJECT-TYPE

SYNTAX LogEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"A set of data describing an event that has been logged. For example, an instance of the logDescription object might be named logDescription.6.47"

INDEX { logEventIndex, logIndex }

::= { logTable 1 }

LogEntry ::= SEQUENCE {

logEventIndex

INTEGER (1..65535),

logIndex

INTEGER (1..2147483647),

logTime

TimeTicks,

logDescription

DisplayString (SIZE (0..255))

}

logEventIndex OBJECT-TYPE

SYNTAX INTEGER (1..65535)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The event entry that generated this log entry. The log identified by a particular value of this index is associated with the same eventEntry as identified by the same value of eventIndex."

::= { logEntry 1 }

logIndex OBJECT-TYPE

SYNTAX INTEGER (1..2147483647)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"An index that uniquely identifies an entry in the log table amongst those generated by the same eventEntries. These indexes are assigned beginning with 1 and increase by one with each new log entry. The association between values of logIndex and logEntries is fixed for the lifetime of each logEntry. The agent may choose to delete the oldest

```
instances of logEntry as required because of
lack of memory. It is an implementation-specific
matter as to when this deletion may occur."
 ::= { logEntry 2 }

logTime OBJECT-TYPE
    SYNTAX TimeTicks
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The value of sysUpTime when this log entry was
        created."
    ::= { logEntry 3 }

logDescription OBJECT-TYPE
    SYNTAX DisplayString (SIZE (0..255))
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "An implementation dependent description of the
        event that activated this log entry."
    ::= { logEntry 4 }

-- These definitions use the TRAP-TYPE macro as
-- defined in RFC 1215 [10]

-- Remote Network Monitoring Traps

risingAlarm TRAP-TYPE
    ENTERPRISE rmon
    VARIABLES { alarmIndex, alarmVariable, alarmSampleType,
                alarmValue, alarmRisingThreshold }
    DESCRIPTION
        "The SNMP trap that is generated when an alarm
        entry crosses its rising threshold and generates
        an event that is configured for sending SNMP
        traps."
    ::= 1

fallingAlarm TRAP-TYPE
    ENTERPRISE rmon
    VARIABLES { alarmIndex, alarmVariable, alarmSampleType,
                alarmValue, alarmFallingThreshold }
    DESCRIPTION
        "The SNMP trap that is generated when an alarm
        entry crosses its falling threshold and generates
        an event that is configured for sending SNMP
        traps."
```

::= 2

END

6. Acknowledgments

This document was produced by the IETF Remote Network Monitoring Working Group.

7. References

- [1] Cerf, V., "IAB Recommendations for the Development of Internet Network Management Standards", RFC 1052, NRI, April 1988.
- [2] Cerf, V., "Report of the Second Ad Hoc Network Management Review Group", RFC 1109, NRI, August 1989.
- [3] Rose M., and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based internets", STD 16, RFC 1155, Performance Systems International, Hughes LAN Systems, May 1990.
- [4] McCloghrie K., and M. Rose, Editors, "Management Information Base for Network Management of TCP/IP-based internets", STD 17, RFC 1213, Performance Systems International, March 1991.
- [5] Case, J., Fedor, M., Schoffstall, M., and J. Davin, "Simple Network Management Protocol", STD 15, RFC 1157, SNMP Research, Performance Systems International, Performance Systems International, MIT Laboratory for Computer Science, May 1990.
- [6] McCloghrie, K., and F. Kastenholz, "Evolution of the Interfaces Group of MIB-II", RFC 1573, Hughes LAN Systems, FTP Software, January 1994.
- [7] Information processing systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1), International Organization for Standardization. International Standard 8824, (December, 1987).
- [8] Information processing systems - Open Systems Interconnection - Specification of Basic Encoding Rules for Abstract Notation One (ASN.1), International Organization for Standardization. International Standard 8825, (December, 1987).
- [9] Rose, M., and K. McCloghrie, Editors, "Concise MIB Definitions", RFC 1212, Performance Systems International, Hughes LAN Systems, March 1991.
- [10] Rose, M., Editor, "A Convention for Defining Traps for use with the SNMP", RFC 1215, Performance Systems International, March 1991.

8. Security Considerations

Security issues are not discussed in this memo.

9. Author's Address

Steven Waldbusser
Carnegie Mellon University
5000 Forbes Ave.
Pittsburgh, PA 15213

EMail: waldbusser@cmu.edu

10. Appendix: Changes from RFC 1271

The RMON MIB has not been significantly changed since RFC 1271 was issued.

Two changes were made to object definitions:

- 1) A new status bit has been defined for the captureBufferPacketStatus object, indicating that the packet order within the capture buffer may not be identical to the packet order as received off the wire. This bit may only be used for packets transmitted by the probe. Older NMS applications can safely ignore this status bit, which might be used by newer agents.
- 2) The packetMatch trap has been removed. This trap was never actually 'approved' and was not added to this document along with the risingAlarm and fallingAlarm traps. The packetMatch trap could not be throttled, which could cause disruption of normal network traffic under some circumstances. An NMS should configure a risingAlarm threshold on the appropriate channelMatches instance if a trap is desired for a packetMatch event. Note that logging of packetMatch events is still supported--only trap generation for such events has been removed.

In addition, several clarifications to individual object definitions have been added to assist agent and NMS implementors:

- global definition of "good packets" and "bad packets"
- more detailed text governing conceptual row creation and modification
- instructions for probes relating to interface changes and disruptions
- clarification of some ethernet counter definitions
- recommended formula for calculating network utilization
- clarification of channel and captureBuffer behavior for some unusual conditions
- examples of proper instance naming for each table

