Network Working Group
Request for Comments: 2819
STD: 59
Obsoletes: 1757
Category: Standards Track

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May 2000

Remote Network Monitoring Management Information Base

Status of this Memo

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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.

This memo obsoletes RFC 1757. This memo extends that specification by documenting the RMON MIB in SMIv2 format while remaining semantically identical to the existing SMIv1-based MIB.

Table of Contents

1. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2571 [1].
- Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIv1 and described in STD 16, RFC 1155 [2], STD 16, RFC 1212 [3] and RFC 1215 [4]. The second version, called SMIv2, is described in STD 58, RFC 2578 [5], RFC 2579 [6] and RFC 2580 [7].
- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, RFC 1157 [8]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [9] and RFC

1906 [10]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [10], RFC 2572 [11] and RFC 2574 [12].

- o Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [8]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [13].

- o A set of fundamental applications described in RFC 2573 [14] and the view-based access control mechanism described in RFC 2575 [15].

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [22].

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

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

2. 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.

There are a number of companion documents to the RMON MIB. The Token Ring RMON MIB [19] provides objects specific to managing Token Ring networks. The RMON-2 MIB [20] extends RMON by providing RMON analysis up to the application layer. The SMON MIB [21] extends RMON by providing RMON analysis for switched networks.

2.1. Remote Network Management Goals

- 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.

- 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, 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. While this section provides an overview of grouping and conformance information for this MIB, the authoritative reference for such information is contained in the MODULE-COMPLIANCE and OBJECT-GROUP macros later in this MIB.

All groups in this MIB are optional. Implementations of this MIB must also implement the system group of MIB-II [16] and the IF-MIB [17]. 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 implementors of 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.

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.

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:

- Two management stations wish to simultaneously use resources that together would exceed the capability of the device.
- A management station uses a significant amount of resources for a long period of time.
- 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:

- A management station may recognize resources it owns and no longer needs.
- A network operator can find the management station that owns the resource and negotiate for it to be freed.
- A network operator may decide to unilaterally free resources another network operator has reserved.
- 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 1905 [13]. 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:

- When the management station sets each parameter object.
- 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 can 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
         MODULE-IDENTITY, OBJECT-TYPE, OBJECT-IDENTITY,
         NOTIFICATION-TYPE, mib-2, Counter32,
         Integer32, TimeTicks                    FROM SNMPv2-SMI

         TEXTUAL-CONVENTION, DisplayString       FROM SNMPv2-TC

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


 --  Remote Network Monitoring MIB

 rmonMibModule MODULE-IDENTITY
     LAST-UPDATED "200005110000Z"  -- 11 May, 2000
     ORGANIZATION "IETF RMON MIB Working Group"
     CONTACT-INFO
         "Steve Waldbusser
         Phone: +1-650-948-6500
         Fax:   +1-650-745-0671
         Email: waldbusser@nextbeacon.com"
     DESCRIPTION
         "Remote network monitoring devices, often called
         monitors or probes, are instruments that exist for
         the purpose of managing a network. This MIB defines
         objects for managing remote network monitoring devices."

     REVISION "200005110000Z"    -- 11 May, 2000
     DESCRIPTION
         "Reformatted into SMIv2 format.

         This version published as RFC 2819."

     REVISION "199502010000Z" -- 1 Feb, 1995
     DESCRIPTION
         "Bug fixes, clarifications and minor changes based on
         implementation experience, published as RFC1757 [18].

         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"

    REVISION "199111010000Z"    -- 1 Nov, 1991
    DESCRIPTION
        "The original version of this MIB, published as RFC1271."
    ::= { rmonConformance 8 }

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


    -- textual conventions

 OwnerString ::= TEXTUAL-CONVENTION
    STATUS current
```

```
    DESCRIPTION
        "This data type is used to model an administratively
        assigned name of the owner of a resource. Implementations
        must accept values composed of well-formed NVT ASCII
        sequences. In addition, implementations should accept
        values composed of well-formed UTF-8 sequences.

        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."
    SYNTAX OCTET STRING (SIZE (0..127))

EntryStatus ::= TEXTUAL-CONVENTION
    STATUS current
    DESCRIPTION
        "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 multiple 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:

To: / From:	valid	createRequest	underCreation	invalid
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."
    SYNTAX INTEGER {
               valid(1),
               createRequest(2),
               underCreation(3),
               invalid(4)
           }

    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 }
    rmonConformance   OBJECT IDENTIFIER ::= { rmon 20 }

-- The Ethernet Statistics Group
--
-- Implementation of the Ethernet Statistics group is optional.
-- Consult the MODULE-COMPLIANCE macro for the authoritative
-- conformance information for this MIB.
--
-- 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
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
        "A list of Ethernet statistics entries."
    ::= { statistics 1 }
```

```
 etherStatsEntry OBJECT-TYPE
     SYNTAX     EtherStatsEntry
     MAX-ACCESS not-accessible
     STATUS     current
     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                   Integer32,
     etherStatsDataSource              OBJECT IDENTIFIER,
     etherStatsDropEvents              Counter32,
     etherStatsOctets                  Counter32,
     etherStatsPkts                    Counter32,
     etherStatsBroadcastPkts           Counter32,
     etherStatsMulticastPkts           Counter32,
     etherStatsCRCAlignErrors          Counter32,
     etherStatsUndersizePkts           Counter32,
     etherStatsOversizePkts            Counter32,
     etherStatsFragments               Counter32,
     etherStatsJabbers                 Counter32,
     etherStatsCollisions              Counter32,
     etherStatsPkts64Octets            Counter32,
     etherStatsPkts65to127Octets       Counter32,
     etherStatsPkts128to255Octets      Counter32,
     etherStatsPkts256to511Octets      Counter32,
     etherStatsPkts512to1023Octets     Counter32,
     etherStatsPkts1024to1518Octets    Counter32,
     etherStatsOwner                   OwnerString,
     etherStatsStatus                  EntryStatus
 }

 etherStatsIndex OBJECT-TYPE
     SYNTAX     Integer32 (1..65535)
     MAX-ACCESS read-only
     STATUS     current
     DESCRIPTION
         "The value of this object uniquely identifies this
         etherStats entry."
     ::= { etherStatsEntry 1 }

 etherStatsDataSource OBJECT-TYPE
     SYNTAX     OBJECT IDENTIFIER
     MAX-ACCESS read-create
     STATUS     current
```

```
        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 2233 [17], 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     Counter32
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Octets"
        MAX-ACCESS read-only
        STATUS     current
        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
        10-Megabit 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:

                              Pkts * (9.6 + 6.4) + (Octets * .8)
         Utilization = ---------------------------------------
                                    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     Counter32
    UNITS      "Packets"
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The total number of packets (including bad packets,
        broadcast packets, and multicast packets) received."
    ::= { etherStatsEntry 5 }

etherStatsBroadcastPkts OBJECT-TYPE
    SYNTAX     Counter32
    UNITS      "Packets"
    MAX-ACCESS read-only
    STATUS     current
    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     Counter32
    UNITS      "Packets"
    MAX-ACCESS read-only
    STATUS     current
    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 }

etherStatsCRCAlignErrors OBJECT-TYPE
    SYNTAX     Counter32
    UNITS      "Packets"
    MAX-ACCESS read-only
    STATUS     current
    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 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     Counter32
    UNITS      "Packets"
    MAX-ACCESS read-only
    STATUS     current
    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     Counter32
    UNITS      "Packets"
    MAX-ACCESS read-only
    STATUS     current
    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     Counter32
    UNITS      "Packets"
    MAX-ACCESS read-only
    STATUS     current
    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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Collisions"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
```

```
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        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
        MAX-ACCESS read-create
        STATUS     current
```

```
        DESCRIPTION
            "The entity that configured this entry and is therefore
            using the resources assigned to it."
        ::= { etherStatsEntry 20 }

    etherStatsStatus OBJECT-TYPE
        SYNTAX     EntryStatus
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The status of this etherStats entry."
        ::= { etherStatsEntry 21 }

    -- The History Control Group

    -- Implementation of the History Control group is optional.
    -- Consult the MODULE-COMPLIANCE macro for the authoritative
    -- conformance information for this MIB.
    --
    -- 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
        MAX-ACCESS not-accessible
```

```
        STATUS     current
        DESCRIPTION
            "A list of history control entries."
        ::= { history 1 }

    historyControlEntry OBJECT-TYPE
        SYNTAX     HistoryControlEntry
        MAX-ACCESS not-accessible
        STATUS     current
        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             Integer32,
        historyControlDataSource        OBJECT IDENTIFIER,
        historyControlBucketsRequested  Integer32,
        historyControlBucketsGranted    Integer32,
        historyControlInterval          Integer32,
        historyControlOwner             OwnerString,
        historyControlStatus            EntryStatus
    }

    historyControlIndex OBJECT-TYPE
        SYNTAX     Integer32 (1..65535)
        MAX-ACCESS read-only
        STATUS     current
        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
        MAX-ACCESS read-create
        STATUS     current
        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 2233 [17], 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     Integer32 (1..65535)
    MAX-ACCESS read-create
    STATUS     current
    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     Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS     current
    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     Integer32 (1..3600)
        UNITS      "Seconds"
        MAX-ACCESS read-create
        STATUS     current
        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
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The entity that configured this entry and is therefore
            using the resources assigned to it."
        ::= { historyControlEntry 6 }

    historyControlStatus OBJECT-TYPE
        SYNTAX     EntryStatus
        MAX-ACCESS read-create
        STATUS     current
        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.
    -- Consult the MODULE-COMPLIANCE macro for the authoritative
    -- conformance information for this MIB.
    --
    -- 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
     MAX-ACCESS not-accessible
     STATUS     current
     DESCRIPTION
         "A list of Ethernet history entries."
     ::= { history 2 }

 etherHistoryEntry OBJECT-TYPE
     SYNTAX     EtherHistoryEntry
     MAX-ACCESS not-accessible
     STATUS     current
     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                   Integer32,
     etherHistorySampleIndex             Integer32,
     etherHistoryIntervalStart           TimeTicks,
     etherHistoryDropEvents              Counter32,
     etherHistoryOctets                  Counter32,
     etherHistoryPkts                    Counter32,
     etherHistoryBroadcastPkts           Counter32,
     etherHistoryMulticastPkts           Counter32,
     etherHistoryCRCAlignErrors          Counter32,
     etherHistoryUndersizePkts           Counter32,
     etherHistoryOversizePkts            Counter32,
     etherHistoryFragments               Counter32,
     etherHistoryJabbers                 Counter32,
     etherHistoryCollisions              Counter32,
     etherHistoryUtilization             Integer32
 }

 etherHistoryIndex OBJECT-TYPE
     SYNTAX     Integer32 (1..65535)
     MAX-ACCESS read-only
```

```
        STATUS     current
        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     Integer32 (1..2147483647)
        MAX-ACCESS read-only
        STATUS     current
        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
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Octets"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The number of packets (including bad packets)
            received during this sampling interval."
        ::= { etherHistoryEntry 6 }

    etherHistoryBroadcastPkts OBJECT-TYPE
        SYNTAX     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The number of good packets received during this
            sampling interval that were directed to the
            broadcast address."
        ::= { etherHistoryEntry 7 }

    etherHistoryMulticastPkts OBJECT-TYPE
        SYNTAX     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
     UNITS      "Packets"
     MAX-ACCESS read-only
     STATUS     current
     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     Counter32
     UNITS      "Packets"
     MAX-ACCESS read-only
     STATUS     current
     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     Counter32
     UNITS      "Packets"
     MAX-ACCESS read-only
     STATUS     current
     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     Counter32
     UNITS      "Packets"
     MAX-ACCESS read-only
     STATUS     current
     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     Counter32
    UNITS      "Packets"
    MAX-ACCESS read-only
    STATUS     current
    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     Counter32
    UNITS      "Collisions"
    MAX-ACCESS read-only
    STATUS     current
    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     Integer32 (0..10000)
        MAX-ACCESS read-only
        STATUS     current
        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.
    -- Consult the MODULE-COMPLIANCE macro for the authoritative
    -- conformance information for this MIB.
    --
    -- 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, Integer32,
    -- Counter32, Counter64, Gauge32, 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
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
        "A list of alarm entries."
    ::= { alarm 1 }

alarmEntry OBJECT-TYPE
    SYNTAX     AlarmEntry
    MAX-ACCESS not-accessible
    STATUS     current
    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                   Integer32,
    alarmInterval                Integer32,
    alarmVariable                OBJECT IDENTIFIER,
    alarmSampleType              INTEGER,
    alarmValue                   Integer32,
    alarmStartupAlarm            INTEGER,
    alarmRisingThreshold         Integer32,
    alarmFallingThreshold        Integer32,
    alarmRisingEventIndex        Integer32,
    alarmFallingEventIndex       Integer32,
    alarmOwner                   OwnerString,
    alarmStatus                  EntryStatus
}
```

```
alarmIndex OBJECT-TYPE
    SYNTAX     Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS     current
    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     Integer32
    UNITS      "Seconds"
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
        "The interval in seconds over which the data is
        sampled and compared with the rising and falling
        thresholds.  When setting this variable, care
        should be taken in the case of deltaValue
        sampling - the interval should be set short enough
        that the sampled variable is very unlikely to
        increase or decrease by more than 2^31 - 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
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
        "The object identifier of the particular variable to be
        sampled.  Only variables that resolve to an ASN.1 primitive
        type of INTEGER (INTEGER, Integer32, Counter32, Counter64,
        Gauge, or TimeTicks) may be sampled.

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

```
        those views that have read access to all objects on
        the probe.

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

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

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

            This object may not be modified if the associated
```

```
        alarmStatus object is equal to valid(1)."
    ::= { alarmEntry 9 }

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

        This object may not be modified if the associated
        alarmStatus object is equal to valid(1)."
    ::= { alarmEntry 10 }

alarmOwner OBJECT-TYPE
    SYNTAX     OwnerString
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
        "The entity that configured this entry and is therefore
        using the resources assigned to it."
    ::= { alarmEntry 11 }

alarmStatus OBJECT-TYPE
    SYNTAX     EntryStatus
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
        "The status of this alarm entry."
    ::= { alarmEntry 12 }

-- The Host Group

-- Implementation of the Host group is optional.
-- Consult the MODULE-COMPLIANCE macro for the authoritative
-- conformance information for this MIB.
--
-- 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
     MAX-ACCESS not-accessible
     STATUS     current
     DESCRIPTION
         "A list of host table control entries."
     ::= { hosts 1 }

 hostControlEntry OBJECT-TYPE
     SYNTAX     HostControlEntry
     MAX-ACCESS not-accessible
     STATUS     current
     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            Integer32,
     hostControlDataSource       OBJECT IDENTIFIER,
     hostControlTableSize        Integer32,
     hostControlLastDeleteTime   TimeTicks,
     hostControlOwner            OwnerString,
     hostControlStatus           EntryStatus
 }

 hostControlIndex OBJECT-TYPE
     SYNTAX     Integer32 (1..65535)
     MAX-ACCESS read-only
     STATUS     current
     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
    MAX-ACCESS read-create
    STATUS     current
    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 2233 [17], 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     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The number of hostEntries in the hostTable and the
        hostTimeTable associated with this hostControlEntry."
    ::= { hostControlEntry 3 }

 hostControlLastDeleteTime OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
```

```
        STATUS     current
        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
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The entity that configured this entry and is therefore
            using the resources assigned to it."
        ::= { hostControlEntry 5 }

    hostControlStatus OBJECT-TYPE
        SYNTAX     EntryStatus
        MAX-ACCESS read-create
        STATUS     current
        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
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "A list of host entries."
        ::= { hosts 2 }

    hostEntry OBJECT-TYPE
        SYNTAX     HostEntry
        MAX-ACCESS not-accessible
        STATUS     current
        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        Integer32,
     hostIndex                Integer32,
     hostInPkts               Counter32,
     hostOutPkts              Counter32,
     hostInOctets             Counter32,
     hostOutOctets            Counter32,
     hostOutErrors            Counter32,
     hostOutBroadcastPkts     Counter32,
     hostOutMulticastPkts     Counter32
 }

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

 hostCreationOrder OBJECT-TYPE
     SYNTAX     Integer32 (1..65535)
     MAX-ACCESS read-only
     STATUS     current
     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     Integer32 (1..65535)
     MAX-ACCESS read-only
     STATUS     current
     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     Counter32
     UNITS      "Packets"
     MAX-ACCESS read-only
     STATUS     current
     DESCRIPTION
         "The number of good packets transmitted to this
         address since it was added to the hostTable."
     ::= { hostEntry 4 }

 hostOutPkts OBJECT-TYPE
     SYNTAX     Counter32
     UNITS      "Packets"
     MAX-ACCESS read-only
     STATUS     current
     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     Counter32
     UNITS      "Octets"
     MAX-ACCESS read-only
     STATUS     current
     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     Counter32
     UNITS      "Octets"
     MAX-ACCESS read-only
```

```
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The number of bad packets transmitted by this address
            since this host was added to the hostTable."
        ::= { hostEntry 8 }

    hostOutBroadcastPkts OBJECT-TYPE
        SYNTAX     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        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
        MAX-ACCESS not-accessible
        STATUS     current
```

```
        DESCRIPTION
            "A list of time-ordered host table entries."
        ::= { hosts 3 }

    hostTimeEntry OBJECT-TYPE
        SYNTAX     HostTimeEntry
        MAX-ACCESS not-accessible
        STATUS     current
        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        Integer32,
        hostTimeIndex                Integer32,
        hostTimeInPkts               Counter32,
        hostTimeOutPkts              Counter32,
        hostTimeInOctets             Counter32,
        hostTimeOutOctets            Counter32,
        hostTimeOutErrors            Counter32,
        hostTimeOutBroadcastPkts     Counter32,
        hostTimeOutMulticastPkts     Counter32
    }

    hostTimeAddress OBJECT-TYPE
        SYNTAX     OCTET STRING
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The physical address of this host."
        ::= { hostTimeEntry 1 }

    hostTimeCreationOrder OBJECT-TYPE
        SYNTAX     Integer32 (1..65535)
        MAX-ACCESS read-only
        STATUS     current
        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     Integer32 (1..65535)
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The number of good packets transmitted to this
            address since it was added to the hostTimeTable."
        ::= { hostTimeEntry 4 }

    hostTimeOutPkts OBJECT-TYPE
        SYNTAX     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
```

```
        STATUS     current
        DESCRIPTION
            "The number of packets, including bad packets, transmitted
            by this address since it was added to the hostTimeTable."
        ::= { hostTimeEntry 5 }

    hostTimeInOctets OBJECT-TYPE
        SYNTAX     Counter32
        UNITS      "Octets"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Octets"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The number of bad packets transmitted by this address
            since this host was added to the hostTimeTable."
        ::= { hostTimeEntry 8 }

    hostTimeOutBroadcastPkts OBJECT-TYPE
        SYNTAX     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        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.
    -- Consult the MODULE-COMPLIANCE macro for the authoritative
    -- conformance information for this MIB.
    --
    -- 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
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "A list of top N host control entries."
        ::= { hostTopN 1 }

    hostTopNControlEntry OBJECT-TYPE
```

```
    SYNTAX     HostTopNControlEntry
    MAX-ACCESS not-accessible
    STATUS     current
    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    Integer32,
    hostTopNHostIndex       Integer32,
    hostTopNRateBase        INTEGER,
    hostTopNTimeRemaining   Integer32,
    hostTopNDuration        Integer32,
    hostTopNRequestedSize   Integer32,
    hostTopNGrantedSize     Integer32,
    hostTopNStartTime       TimeTicks,
    hostTopNOwner           OwnerString,
    hostTopNStatus          EntryStatus
}

hostTopNControlIndex OBJECT-TYPE
    SYNTAX     Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS     current
    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     Integer32 (1..65535)
    MAX-ACCESS read-create
    STATUS     current
    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)
               }
    MAX-ACCESS read-create
    STATUS     current
    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     Integer32
    UNITS      "Seconds"
    MAX-ACCESS read-create
    STATUS     current
    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     Integer32
     UNITS      "Seconds"
     MAX-ACCESS read-only
     STATUS     current
     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     Integer32
     MAX-ACCESS read-create
     STATUS     current
     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     Integer32
     MAX-ACCESS read-only
     STATUS     current
     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
        MAX-ACCESS read-only
        STATUS     current
        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
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The entity that configured this entry and is therefore
            using the resources assigned to it."
        ::= { hostTopNControlEntry 9 }

    hostTopNStatus OBJECT-TYPE
        SYNTAX     EntryStatus
        MAX-ACCESS read-create
        STATUS     current
        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
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "A list of top N host entries."
        ::= { hostTopN 2 }
```

```
hostTopNEntry OBJECT-TYPE
    SYNTAX     HostTopNEntry
    MAX-ACCESS not-accessible
    STATUS     current
    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                Integer32,
    hostTopNIndex                 Integer32,
    hostTopNAddress               OCTET STRING,
    hostTopNRate                  Integer32
}

hostTopNReport OBJECT-TYPE
    SYNTAX     Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS     current
    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     Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS     current
    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
    MAX-ACCESS read-only
```

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

    hostTopNRate OBJECT-TYPE
        SYNTAX     Integer32
        MAX-ACCESS read-only
        STATUS     current
        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.
    -- Consult the MODULE-COMPLIANCE macro for the authoritative
    -- conformance information for this MIB.
    --
    -- 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
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "A list of information entries for the
            traffic matrix on each interface."
        ::= { matrix 1 }

    matrixControlEntry OBJECT-TYPE
        SYNTAX     MatrixControlEntry
        MAX-ACCESS not-accessible
        STATUS     current
        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           Integer32,
    matrixControlDataSource      OBJECT IDENTIFIER,
    matrixControlTableSize       Integer32,
    matrixControlLastDeleteTime  TimeTicks,
    matrixControlOwner           OwnerString,
    matrixControlStatus          EntryStatus
}

matrixControlIndex OBJECT-TYPE
    SYNTAX     Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS     current
    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
    MAX-ACCESS read-create
    STATUS     current
    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 2233 [17], 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     Integer32
        MAX-ACCESS read-only
        STATUS     current
        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
        MAX-ACCESS read-only
        STATUS     current
        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
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The entity that configured this entry and is therefore
            using the resources assigned to it."
        ::= { matrixControlEntry 5 }

    matrixControlStatus OBJECT-TYPE
        SYNTAX     EntryStatus
        MAX-ACCESS read-create
        STATUS     current
        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
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "A list of traffic matrix entries indexed by
            source and destination MAC address."
        ::= { matrix 2 }

    matrixSDEntry OBJECT-TYPE
        SYNTAX     MatrixSDEntry
        MAX-ACCESS not-accessible
        STATUS     current
        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               Integer32,
        matrixSDPkts                Counter32,
        matrixSDOctets              Counter32,
        matrixSDErrors              Counter32
    }

    matrixSDSourceAddress OBJECT-TYPE
        SYNTAX     OCTET STRING
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The source physical address."
        ::= { matrixSDEntry 1 }

    matrixSDDestAddress OBJECT-TYPE
        SYNTAX     OCTET STRING
        MAX-ACCESS read-only
        STATUS     current
```

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

    matrixSDIndex OBJECT-TYPE
        SYNTAX     Integer32 (1..65535)
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Octets"
        MAX-ACCESS read-only
        STATUS     current
        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     Counter32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        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
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
        "A list of traffic matrix entries indexed by
        destination and source MAC address."
    ::= { matrix 3 }

matrixDSEntry OBJECT-TYPE
    SYNTAX     MatrixDSEntry
    MAX-ACCESS not-accessible
    STATUS     current
    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               Integer32,
    matrixDSPkts                Counter32,
    matrixDSOctets              Counter32,
    matrixDSErrors              Counter32
}

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

matrixDSDestAddress OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The destination physical address."
    ::= { matrixDSEntry 2 }
```

```
 matrixDSIndex OBJECT-TYPE
     SYNTAX     Integer32 (1..65535)
     MAX-ACCESS read-only
     STATUS     current
     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     Counter32
     UNITS      "Packets"
     MAX-ACCESS read-only
     STATUS     current
     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     Counter32
     UNITS      "Octets"
     MAX-ACCESS read-only
     STATUS     current
     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     Counter32
     UNITS      "Packets"
     MAX-ACCESS read-only
     STATUS     current
     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.
```

```
 -- Consult the MODULE-COMPLIANCE macro for the authoritative
 -- conformance information for this MIB.
 --
 -- 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
     MAX-ACCESS not-accessible
     STATUS     current
     DESCRIPTION
         "A list of packet filter entries."
     ::= { filter 1 }

 filterEntry OBJECT-TYPE
     SYNTAX     FilterEntry
     MAX-ACCESS not-accessible
     STATUS     current
     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                 Integer32,
     filterChannelIndex          Integer32,
     filterPktDataOffset         Integer32,
```

```
    filterPktData               OCTET STRING,
    filterPktDataMask           OCTET STRING,
    filterPktDataNotMask        OCTET STRING,
    filterPktStatus             Integer32,
    filterPktStatusMask         Integer32,
    filterPktStatusNotMask      Integer32,
    filterOwner                 OwnerString,
    filterStatus                EntryStatus
}

filterIndex OBJECT-TYPE
    SYNTAX     Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS     current
    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     Integer32 (1..65535)
    MAX-ACCESS read-create
    STATUS     current
    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     Integer32
    UNITS      "Octets"
    MAX-ACCESS read-create
    STATUS     current
    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
     MAX-ACCESS read-create
     STATUS     current
     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
     MAX-ACCESS read-create
     STATUS     current
     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
        MAX-ACCESS read-create
        STATUS     current
        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     Integer32
        MAX-ACCESS read-create
        STATUS     current
        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 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     Integer32
    MAX-ACCESS read-create
    STATUS     current
```

```
    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     Integer32
    MAX-ACCESS read-create
    STATUS     current
    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
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
        "The entity that configured this entry and is therefore
        using the resources assigned to it."
```

```
    ::= { filterEntry 10 }

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

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

channelEntry OBJECT-TYPE
    SYNTAX     ChannelEntry
    MAX-ACCESS not-accessible
    STATUS     current
    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                Integer32,
    channelIfIndex              Integer32,
    channelAcceptType           INTEGER,
    channelDataControl          INTEGER,
    channelTurnOnEventIndex     Integer32,
    channelTurnOffEventIndex    Integer32,
    channelEventIndex           Integer32,
    channelEventStatus          INTEGER,
    channelMatches              Counter32,
    channelDescription          DisplayString,
    channelOwner                OwnerString,
    channelStatus               EntryStatus
}

channelIndex OBJECT-TYPE
    SYNTAX     Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS     current
```

```
    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     Integer32 (1..65535)
    MAX-ACCESS read-create
    STATUS     current
    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 2233 [17].

        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)
               }
    MAX-ACCESS read-create
    STATUS     current
    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)
               }
    MAX-ACCESS read-create
    STATUS     current
    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     Integer32 (0..65535)
    MAX-ACCESS read-create
    STATUS     current
    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     Integer32 (0..65535)
    MAX-ACCESS read-create
    STATUS     current
    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     Integer32 (0..65535)
    MAX-ACCESS read-create
    STATUS     current
    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)
                }
    MAX-ACCESS read-create
    STATUS     current
    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     Counter32
    UNITS      "Packets"
    MAX-ACCESS read-only
    STATUS     current
    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))
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
        "A comment describing this channel."
    ::= { channelEntry 10 }

channelOwner OBJECT-TYPE
```

```
        SYNTAX     OwnerString
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The entity that configured this entry and is therefore
            using the resources assigned to it."
        ::= { channelEntry 11 }

    channelStatus OBJECT-TYPE
        SYNTAX     EntryStatus
        MAX-ACCESS read-create
        STATUS     current
        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.
    -- Consult the MODULE-COMPLIANCE macro for the authoritative
    -- conformance information for this MIB.
    --
    -- 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
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "A list of buffers control entries."
        ::= { capture 1 }

    bufferControlEntry OBJECT-TYPE
        SYNTAX     BufferControlEntry
        MAX-ACCESS not-accessible
        STATUS     current
        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               Integer32,
    bufferControlChannelIndex        Integer32,
    bufferControlFullStatus          INTEGER,
    bufferControlFullAction          INTEGER,
    bufferControlCaptureSliceSize    Integer32,
    bufferControlDownloadSliceSize   Integer32,
    bufferControlDownloadOffset      Integer32,
    bufferControlMaxOctetsRequested  Integer32,
    bufferControlMaxOctetsGranted    Integer32,
    bufferControlCapturedPackets     Integer32,
    bufferControlTurnOnTime          TimeTicks,
    bufferControlOwner               OwnerString,
    bufferControlStatus              EntryStatus
}

bufferControlIndex OBJECT-TYPE
    SYNTAX     Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS     current
    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     Integer32 (1..65535)
    MAX-ACCESS read-create
    STATUS     current
    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)
              }
    MAX-ACCESS read-only
    STATUS     current
    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
              }
    MAX-ACCESS read-create
    STATUS     current
    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     Integer32
    UNITS      "Octets"
    MAX-ACCESS read-create
```

```
    STATUS     current
    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     Integer32
    UNITS      "Octets"
    MAX-ACCESS read-create
    STATUS     current
    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     Integer32
    UNITS      "Octets"
    MAX-ACCESS read-create
    STATUS     current
    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     Integer32
        UNITS      "Octets"
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The requested maximum number of octets to be
            saved in this captureBuffer, 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     Integer32
        UNITS      "Octets"
        MAX-ACCESS read-only
        STATUS     current
        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     Integer32
        UNITS      "Packets"
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The number of packets currently in this captureBuffer."
        ::= { bufferControlEntry 10 }

    bufferControlTurnOnTime OBJECT-TYPE
        SYNTAX     TimeTicks
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The value of sysUpTime when this capture buffer was
            first turned on."
```

```
    ::= { bufferControlEntry 11 }

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

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

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

 captureBufferEntry OBJECT-TYPE
    SYNTAX     CaptureBufferEntry
    MAX-ACCESS not-accessible
    STATUS     current
    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   Integer32,
    captureBufferIndex          Integer32,
    captureBufferPacketID       Integer32,
    captureBufferPacketData     OCTET STRING,
    captureBufferPacketLength   Integer32,
    captureBufferPacketTime     Integer32,
    captureBufferPacketStatus   Integer32
 }
```

```
captureBufferControlIndex OBJECT-TYPE
    SYNTAX     Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The index of the bufferControlEntry with which
        this packet is associated."
    ::= { captureBufferEntry 1 }

captureBufferIndex OBJECT-TYPE
    SYNTAX     Integer32 (1..2147483647)
    MAX-ACCESS read-only
    STATUS     current
    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     Integer32
    MAX-ACCESS read-only
    STATUS     current
    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
    MAX-ACCESS read-only
    STATUS     current
    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     Integer32
        UNITS      "Octets"
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The actual length (off the wire) of the packet stored
            in this entry, including FCS octets."
        ::= { captureBufferEntry 5 }

    captureBufferPacketTime OBJECT-TYPE
        SYNTAX     Integer32
        UNITS      "Milliseconds"
        MAX-ACCESS read-only
        STATUS     current
        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     Integer32
        MAX-ACCESS read-only
        STATUS     current
        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.
    -- Consult the MODULE-COMPLIANCE macro for the authoritative
    -- conformance information for this MIB.
    --
    -- 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
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
```

```
        "A list of events to be generated."
    ::= { event 1 }

eventEntry OBJECT-TYPE
    SYNTAX     EventEntry
    MAX-ACCESS not-accessible
    STATUS     current
    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          Integer32,
    eventDescription    DisplayString,
    eventType           INTEGER,
    eventCommunity      OCTET STRING,
    eventLastTimeSent   TimeTicks,
    eventOwner          OwnerString,
    eventStatus         EntryStatus
}

eventIndex OBJECT-TYPE
    SYNTAX     Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS     current
    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))
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
        "A comment describing this event entry."
    ::= { eventEntry 2 }

eventType OBJECT-TYPE
    SYNTAX     INTEGER {
                 none(1),
                 log(2),
```

```
                snmptrap(3),    -- send an SNMP trap
                logandtrap(4)
              }
    MAX-ACCESS read-create
    STATUS     current
    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))
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
        "If an SNMP trap is to be sent, it will be sent to
        the SNMP community specified by this octet string."
    ::= { eventEntry 4 }

eventLastTimeSent OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     current
    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
    MAX-ACCESS read-create
    STATUS     current
    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
    MAX-ACCESS read-create
    STATUS     current
    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
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
        "A list of events that have been logged."
    ::= { event 2 }

logEntry OBJECT-TYPE
    SYNTAX     LogEntry
    MAX-ACCESS not-accessible
    STATUS     current
    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           Integer32,
    logIndex                Integer32,
    logTime                 TimeTicks,
    logDescription          DisplayString
}

logEventIndex OBJECT-TYPE
    SYNTAX     Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS     current
    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     Integer32 (1..2147483647)
    MAX-ACCESS read-only
    STATUS     current
    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
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The value of sysUpTime when this log entry was created."
    ::= { logEntry 3 }

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

--  Remote Network Monitoring Traps

rmonEventsV2 OBJECT-IDENTITY
    STATUS      current
    DESCRIPTION "Definition point for RMON notifications."
    ::= { rmon 0 }

risingAlarm NOTIFICATION-TYPE
    OBJECTS  { alarmIndex, alarmVariable, alarmSampleType,
               alarmValue, alarmRisingThreshold }
    STATUS   current
```

```
    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."
    ::= { rmonEventsV2 1 }

fallingAlarm NOTIFICATION-TYPE
    OBJECTS { alarmIndex, alarmVariable, alarmSampleType,
              alarmValue, alarmFallingThreshold }
    STATUS    current
    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."
    ::= { rmonEventsV2 2 }

-- Conformance information

rmonCompliances OBJECT IDENTIFIER ::= { rmonConformance 9 }
rmonGroups      OBJECT IDENTIFIER ::= { rmonConformance 10 }

-- Compliance Statements
rmonCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The requirements for conformance to the RMON MIB. At least
        one of the groups in this module must be implemented to
        conform to the RMON MIB. Implementations of this MIB
        must also implement the system group of MIB-II [16] and the
        IF-MIB [17]."
    MODULE -- this module

      GROUP rmonEtherStatsGroup
          DESCRIPTION
              "The RMON Ethernet Statistics Group is optional."

      GROUP rmonHistoryControlGroup
          DESCRIPTION
              "The RMON History Control Group is optional."

      GROUP rmonEthernetHistoryGroup
          DESCRIPTION
              "The RMON Ethernet History Group is optional."

      GROUP rmonAlarmGroup
          DESCRIPTION
```

```
            "The RMON Alarm Group is optional."

      GROUP rmonHostGroup
          DESCRIPTION
              "The RMON Host Group is mandatory when the
              rmonHostTopNGroup is implemented."

      GROUP rmonHostTopNGroup
          DESCRIPTION
              "The RMON Host Top N Group is optional."

      GROUP rmonMatrixGroup
          DESCRIPTION
              "The RMON Matrix Group is optional."

      GROUP rmonFilterGroup
          DESCRIPTION
              "The RMON Filter Group is mandatory when the
              rmonPacketCaptureGroup is implemented."

      GROUP rmonPacketCaptureGroup
          DESCRIPTION
              "The RMON Packet Capture Group is optional."

      GROUP rmonEventGroup
          DESCRIPTION
              "The RMON Event Group is mandatory when the
              rmonAlarmGroup is implemented."
  ::= { rmonCompliances 1 }

  rmonEtherStatsGroup OBJECT-GROUP
      OBJECTS {
          etherStatsIndex, etherStatsDataSource,
          etherStatsDropEvents, etherStatsOctets, etherStatsPkts,
          etherStatsBroadcastPkts, etherStatsMulticastPkts,
          etherStatsCRCAlignErrors, etherStatsUndersizePkts,
          etherStatsOversizePkts, etherStatsFragments,
          etherStatsJabbers, etherStatsCollisions,
          etherStatsPkts64Octets, etherStatsPkts65to127Octets,
          etherStatsPkts128to255Octets,
          etherStatsPkts256to511Octets,
          etherStatsPkts512to1023Octets,
          etherStatsPkts1024to1518Octets,
          etherStatsOwner, etherStatsStatus
      }
      STATUS current
      DESCRIPTION
          "The RMON Ethernet Statistics Group."
```

```
        ::= { rmonGroups 1 }

    rmonHistoryControlGroup OBJECT-GROUP
        OBJECTS {
            historyControlIndex, historyControlDataSource,
            historyControlBucketsRequested,
            historyControlBucketsGranted, historyControlInterval,
            historyControlOwner, historyControlStatus
        }
        STATUS current
        DESCRIPTION
            "The RMON History Control Group."
        ::= { rmonGroups 2 }

    rmonEthernetHistoryGroup OBJECT-GROUP
        OBJECTS {
            etherHistoryIndex, etherHistorySampleIndex,
            etherHistoryIntervalStart, etherHistoryDropEvents,
            etherHistoryOctets, etherHistoryPkts,
            etherHistoryBroadcastPkts, etherHistoryMulticastPkts,
            etherHistoryCRCAlignErrors, etherHistoryUndersizePkts,
            etherHistoryOversizePkts, etherHistoryFragments,
            etherHistoryJabbers, etherHistoryCollisions,
            etherHistoryUtilization
        }
        STATUS current
        DESCRIPTION
            "The RMON Ethernet History Group."
        ::= { rmonGroups 3 }

    rmonAlarmGroup OBJECT-GROUP
        OBJECTS {
            alarmIndex, alarmInterval, alarmVariable,
            alarmSampleType, alarmValue, alarmStartupAlarm,
            alarmRisingThreshold, alarmFallingThreshold,
            alarmRisingEventIndex, alarmFallingEventIndex,
            alarmOwner, alarmStatus
        }
        STATUS current
        DESCRIPTION
            "The RMON Alarm Group."
        ::= { rmonGroups 4 }

    rmonHostGroup OBJECT-GROUP
        OBJECTS {
            hostControlIndex, hostControlDataSource,
            hostControlTableSize, hostControlLastDeleteTime,
            hostControlOwner, hostControlStatus,
```

```
            hostAddress, hostCreationOrder, hostIndex,
            hostInPkts, hostOutPkts, hostInOctets,
            hostOutOctets, hostOutErrors, hostOutBroadcastPkts,
            hostOutMulticastPkts, hostTimeAddress,
            hostTimeCreationOrder, hostTimeIndex,
            hostTimeInPkts, hostTimeOutPkts, hostTimeInOctets,
            hostTimeOutOctets, hostTimeOutErrors,
            hostTimeOutBroadcastPkts, hostTimeOutMulticastPkts
        }
        STATUS current
        DESCRIPTION
            "The RMON Host Group."
        ::= { rmonGroups 5 }

    rmonHostTopNGroup OBJECT-GROUP
        OBJECTS {
            hostTopNControlIndex, hostTopNHostIndex,
            hostTopNRateBase, hostTopNTimeRemaining,
            hostTopNDuration, hostTopNRequestedSize,
            hostTopNGrantedSize, hostTopNStartTime,
            hostTopNOwner, hostTopNStatus,
            hostTopNReport, hostTopNIndex,
            hostTopNAddress, hostTopNRate
        }
        STATUS current
        DESCRIPTION
            "The RMON Host Top 'N' Group."
        ::= { rmonGroups 6 }

    rmonMatrixGroup OBJECT-GROUP
        OBJECTS {
            matrixControlIndex, matrixControlDataSource,
            matrixControlTableSize, matrixControlLastDeleteTime,
            matrixControlOwner, matrixControlStatus,
            matrixSDSourceAddress, matrixSDDestAddress,
            matrixSDIndex, matrixSDPkts,
            matrixSDOctets, matrixSDErrors,
            matrixDSSourceAddress, matrixDSDestAddress,
            matrixDSIndex, matrixDSPkts,
            matrixDSOctets, matrixDSErrors
        }
        STATUS current
        DESCRIPTION
            "The RMON Matrix Group."
        ::= { rmonGroups 7 }

    rmonFilterGroup OBJECT-GROUP
        OBJECTS {
```

```
            filterIndex, filterChannelIndex, filterPktDataOffset,
            filterPktData, filterPktDataMask,
            filterPktDataNotMask, filterPktStatus,
            filterPktStatusMask, filterPktStatusNotMask,
            filterOwner, filterStatus,
            channelIndex, channelIfIndex, channelAcceptType,
            channelDataControl, channelTurnOnEventIndex,
            channelTurnOffEventIndex, channelEventIndex,
            channelEventStatus, channelMatches,
            channelDescription, channelOwner, channelStatus
        }
        STATUS current
        DESCRIPTION
            "The RMON Filter Group."
        ::= { rmonGroups 8 }

    rmonPacketCaptureGroup OBJECT-GROUP
        OBJECTS {
            bufferControlIndex, bufferControlChannelIndex,
            bufferControlFullStatus, bufferControlFullAction,
            bufferControlCaptureSliceSize,
            bufferControlDownloadSliceSize,
            bufferControlDownloadOffset,
            bufferControlMaxOctetsRequested,
            bufferControlMaxOctetsGranted,
            bufferControlCapturedPackets,
            bufferControlTurnOnTime,
            bufferControlOwner, bufferControlStatus,
            captureBufferControlIndex, captureBufferIndex,
            captureBufferPacketID, captureBufferPacketData,
            captureBufferPacketLength, captureBufferPacketTime,
            captureBufferPacketStatus
        }
        STATUS current
        DESCRIPTION
            "The RMON Packet Capture Group."
        ::= { rmonGroups 9 }

    rmonEventGroup OBJECT-GROUP
        OBJECTS {
            eventIndex, eventDescription, eventType,
            eventCommunity, eventLastTimeSent,
            eventOwner, eventStatus,
            logEventIndex, logIndex, logTime,
            logDescription
        }
        STATUS current
        DESCRIPTION
```

```
            "The RMON Event Group."
        ::= { rmonGroups 10 }

    rmonNotificationGroup NOTIFICATION-GROUP
        NOTIFICATIONS { risingAlarm, fallingAlarm }
        STATUS        current
        DESCRIPTION
            "The RMON Notification Group."
        ::= { rmonGroups 11 }
END
```

6. Security Considerations

In order to implement this MIB, a probe must capture all packets on the locally-attached network, including packets between third parties. These packets are analyzed to collect network addresses, protocol usage information, and conversation statistics. Data of this nature may be considered sensitive in some environments. In such environments the administrator may wish to restrict SNMP access to the probe.

This MIB also includes functions for returning the contents of captured packets, potentially including sensitive user data or passwords. It is recommended that SNMP access to these functions be restricted.

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

SNMPv1 by itself is not a secure environment. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB.

It is recommended that the implementors consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2574 [12] and the View-based Access Control Model RFC 2575 [15] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to an instance of this MIB, is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

7. Acknowledgments

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

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Acknowledgement

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