                   Definitions of Managed Objects
                  for IEEE 802.3 Repeater Devices
                           using SMIv2

Status of this Memo

   This document specifies an Internet standards track protocol for the
   Internet community, and requests discussion and suggestions for
   improvements. Please refer to the current edition of the "Internet
   Official Protocol Standards" (STD 1) for the standardization state
   and status of this protocol. Distribution of this memo is unlimited.

Abstract

   This memo defines a portion of the Management Information Base (MIB)
   for use with network management protocols in the Internet community.
   In particular, it defines objects for managing IEEE 802.3 10 and 100
   Mb/second baseband repeaters based on IEEE Std 802.3 Section 30, "10
   & 100 Mb/s Management," October 26, 1995.

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1. The SNMP Network Management Framework

    The SNMP Network Management Framework presently consists of three
    major components. They are:

    o   the SMI, described in RFC 1902 [6] - the mechanisms used
         for describing and naming objects for the purpose of
         management.

    o   the MIB-II, STD 17, RFC 1213 [5] - the core set of
         managed objects for the Internet suite of protocols.

    o   the protocol, STD 15, RFC 1157 [10] and/or RFC 1905
         [9] - the protocol used for accessing managed information.

    Textual conventions are defined in RFC 1903 [7], and conformance
    statements are defined in RFC 1904 [8].

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

1.1. Object Definitions

    Managed objects are accessed via a virtual information store, termed
    the Management Information Base or MIB. Objects in the MIB are
    defined using the subset of Abstract Syntax Notation one (ASN.1)
    defined in the SMI. In particular, each object type is named by an
    OBJECT IDENTIFIER, an administratively assigned name. The object
    type together with an object instance serves to uniquely identify a
    specific instantiation of the object. For human convenience, we
    often use a textual string, termed the descriptor, to refer to the
    object type.

2. Overview

2.1. Relationship to RFC 1516

    This MIB is intended as a superset of that defined by RFC 1516 [11],
    which will go to historic status. This MIB includes all of the
    objects contained in that MIB, plus several new ones which provide

for significant additional capabilities. Implementors are encouraged
to support all applicable conformance groups in order to make the
best use of the new functionality provided by this MIB. The new
objects provide support for:

o   multiple repeaters

o   100BASE-T management

o   port TopN capability

o   address search and topology mapping

Certain objects have been deprecated; in particular, those scalar
objects used for managing a single repeater are now of minimal use
since they are duplicated in the new multiple- repeater definitions.
Additional objects have been deprecated based on implementation
experience with RFC 1516.

2.2. Repeater Management

Instances of the object types defined in this memo represent
attributes of an IEEE 802.3 (Ethernet-like) repeater, as defined by
Section 9, "Repeater Unit for 10 Mb/s Baseband Networks" in the IEEE
802.3/ISO 8802-3 CSMA/CD standard [1], and Section 27, "Repeater for
100 Mb/s Baseband Networks" in the IEEE Standard 802.3u-1995 [2].

These Repeater MIB objects may be used to manage non-standard
repeater-like devices, but defining objects to describe
implementation-specific properties of non-standard repeater- like
devices is outside the scope of this memo.

The definitions presented here are based on Section 30.4, "Layer
Management for 10 and 100 Mb/s Baseband Repeaters" and Annex 30A,
"GDMO Specificataions for 802.3 managed objects" of [3].

Implementors of these MIB objects should note that [3] explicitly
describes when, where, and how various repeater attributes are
measured. The IEEE document also describes the effects of repeater
actions that may be invoked by manipulating instances of the MIB
objects defined here.

The counters in this document are defined to be the same as those
counters in [3], with the intention that the same instrumentation can
be used to implement both the IEEE and IETF management standards.

2.3. Structure of the MIB

   Objects in this MIB are arranged into packages, each of which
   contains a set of related objects within a broad functional category.
   Objects within a package are generally defined under the same OID
   subtree. These packages are intended for organizational convenience
   ONLY, and have no relation to the conformance groups defined later in
   the document.

2.3.1. Basic Definitions

   The basic definitions include objects which are applicable to all
   repeaters: status, parameter and control objects for each repeater
   within the managed system, for the port groups within the system, and
   for the individual ports themselves.

2.3.2. Monitor Definitions

   The monitor definitions include monitoring statistics for each
   repeater within the system and for individual ports.

2.3.3. Address Tracking Definitions

   This collection includes objects for tracking the MAC addresses of
   the DTEs attached to the ports within the system and for mapping the
   topology of a network.

   Note: These definitions are based on a technology which has been
   patented by Hewlett-Packard Company. HP has granted rights to this
   technology to implementors of this MIB. See [12] and [13] for
   details.

2.3.4. Top N Definitions

   These objects may be used for tracking the ports with the most
   activity within the system or within particular repeaters.

2.4. Relationship to Other MIBs

2.4.1. Relationship to MIB-II

   It is assumed that a repeater implementing this MIB will also
   implement (at least) the 'system' group defined in MIB-II [5].

2.4.1.1. Relationship to the 'system' group

   In MIB-II, the 'system' group is defined as being mandatory for all
   systems such that each managed entity contains one instance of each
   object in the 'system' group. Thus, those objects apply to the
   entity even if the entity's sole functionality is management of
   repeaters.

2.4.1.2. Relationship to the 'interfaces' group

   In MIB-II, the 'interfaces' group is defined as being mandatory for
   all systems and contains information on an entity's interfaces, where
   each interface is thought of as being attached to a 'subnetwork'.
   (Note that this term is not to be confused with 'subnet' which refers
   to an addressing partitioning scheme used in the Internet suite of
   protocols.)

   This Repeater MIB uses the notion of ports on a repeater. The
   concept of a MIB-II interface has NO specific relationship to a
   repeater's port. Therefore, the 'interfaces' group applies only to
   the one (or more) network interfaces on which the entity managing the
   repeater sends and receives management protocol operations, and does
   not apply to the repeater's ports.

   This is consistent with the physical-layer nature of a repeater. A
   repeater is a bitwise store-and-forward device. It recognizes
   activity and bits, but does not process incoming data based on any
   packet-related information (such as checksum or addresses). A
   repeater has no MAC address, no MAC implementation, and does not pass
   packets up to higher-level protocol entities for processing.

   (When a network management entity is observing a repeater, it may
   appear as though the repeater is passing packets to a higher-level
   protocol entity. However, this is only a means of implementing
   management, and this passing of management information is not part of
   the repeater functionality.)

3. Definitions

```
SNMP-REPEATER-MIB DEFINITIONS ::= BEGIN

IMPORTS
    Counter32, Counter64, Integer32, Gauge32, TimeTicks,
    OBJECT-TYPE, MODULE-IDENTITY, NOTIFICATION-TYPE, mib-2
        FROM SNMPv2-SMI
    TimeStamp, DisplayString, MacAddress, TEXTUAL-CONVENTION,
    RowStatus, TestAndIncr
        FROM SNMPv2-TC
    OBJECT-GROUP, MODULE-COMPLIANCE
        FROM SNMPv2-CONF
    OwnerString
        FROM IF-MIB;


snmpRptrMod MODULE-IDENTITY
    LAST-UPDATED    "9609140000Z"
    ORGANIZATION    "IETF HUB MIB Working Group"
    CONTACT-INFO
        "WG E-mail: hubmib@hprnd.rose.hp.com

          Chair: Dan Romascanu
         Postal: Madge Networks (Israel) Ltd.
                 Atidim Technology Park, Bldg. 3
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                 118 Turnpike Rd.
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         E-mail: kdegraaf@isd.3com.com"
    DESCRIPTION
        "Management information for 802.3 repeaters.

        The following references are used throughout
        this MIB module:

        [IEEE 802.3 Std]
            refers to IEEE 802.3/ISO 8802-3 Information
            processing systems - Local area networks -
            Part 3: Carrier sense multiple access with
```

collision detection (CSMA/CD) access method
and physical layer specifications (1993).

[IEEE 802.3 Mgt]
    refers to IEEE 802.3u-1995, '10 Mb/s &
    100 Mb/s Management, Section 30,'
    Supplement to ANSI/IEEE 802.3.

The following terms are used throughout this
MIB module. For complete formal definitions,
the IEEE 802.3 standards should be consulted
wherever possible:

System - A managed entity compliant with this
MIB, and incorporating at least one managed
802.3 repeater.

Chassis - An enclosure for one managed repeater,
part of a managed repeater, or several managed
repeaters. It typically contains an integral
power supply and a variable number of available
module slots.

Repeater-unit - The portion of the repeater set
that is inboard of the physical media interfaces.
The physical media interfaces (MAUs, AUIs) may be
physically separated from the repeater-unit, or
they may be integrated into the same physical
package.

Trivial repeater-unit - An isolated port that can
gather statistics.

Group - A recommended, but optional, entity
defined by the IEEE 802.3 management standard,
in order to support a modular numbering scheme.
The classical example allows an implementor to
represent field-replaceable units as groups of
ports, with the port numbering matching the
modular hardware implementation.

System interconnect segment - An internal
segment allowing interconnection of ports
belonging to different physical entities
into the same logical manageable repeater.
Examples of implementation might be
backplane busses in modular hubs, or
chaining cables in stacks of hubs.

```
        Stack - A scalable system that may include
        managed repeaters, in which modularity is
        achieved by interconnecting a number of
        different chassis.

        Module - A building block in a modular
        chassis.  It typically maps into one 'slot';
        however, the range of configurations may be
        very large, with several modules entering
        one slot, or one module covering several
        slots.
        "
    REVISION "9309010000Z"
    DESCRIPTION
        "Published as RFC 1516"
    REVISION "9210010000Z"
    DESCRIPTION
        "Published as RFC 1368"
    ::= { snmpDot3RptrMgt 5 }



snmpDot3RptrMgt OBJECT IDENTIFIER ::= { mib-2 22 }


OptMacAddr ::= TEXTUAL-CONVENTION
    DISPLAY-HINT    "1x:"
    STATUS          current
    DESCRIPTION
        "Either a 6 octet address in the 'canonical'
        order defined by IEEE 802.1a, i.e., as if it
        were transmitted least significant bit first
        if a value is available or a zero length string."
    REFERENCE
        "See MacAddress in SNMPv2-TC. The only difference
        is that a zero length string is allowed as a value
        for OptMacAddr and not for MacAddress."
    SYNTAX OCTET STRING (SIZE (0 | 6))



-- Basic information at the repeater, group, and port level.

rptrBasicPackage
    OBJECT IDENTIFIER ::= { snmpDot3RptrMgt 1 }
  rptrRptrInfo
        OBJECT IDENTIFIER ::= { rptrBasicPackage 1 }
  rptrGroupInfo
```

```
           OBJECT IDENTIFIER ::= { rptrBasicPackage 2 }
     rptrPortInfo
           OBJECT IDENTIFIER ::= { rptrBasicPackage 3 }
     rptrAllRptrInfo
           OBJECT IDENTIFIER ::= { rptrBasicPackage 4 }

  -- Monitoring information at the repeater, group, and port level.
  rptrMonitorPackage
      OBJECT IDENTIFIER ::= { snmpDot3RptrMgt 2 }
     rptrMonitorRptrInfo
           OBJECT IDENTIFIER ::= { rptrMonitorPackage 1 }
     rptrMonitorGroupInfo
           OBJECT IDENTIFIER ::= { rptrMonitorPackage 2 }
     rptrMonitorPortInfo
           OBJECT IDENTIFIER ::= { rptrMonitorPackage 3 }
     rptrMonitorAllRptrInfo
           OBJECT IDENTIFIER ::= { rptrMonitorPackage 4 }

  -- Address tracking information at the repeater, group,
  -- and port level.
  rptrAddrTrackPackage
      OBJECT IDENTIFIER ::= { snmpDot3RptrMgt 3 }
     rptrAddrTrackRptrInfo
           OBJECT IDENTIFIER ::= { rptrAddrTrackPackage 1 }
     rptrAddrTrackGroupInfo
           -- this subtree is currently unused
           OBJECT IDENTIFIER ::= { rptrAddrTrackPackage 2 }
     rptrAddrTrackPortInfo
           OBJECT IDENTIFIER ::= { rptrAddrTrackPackage 3 }

  -- TopN information.
  rptrTopNPackage
           OBJECT IDENTIFIER ::= { snmpDot3RptrMgt 4 }
     rptrTopNRptrInfo
           -- this subtree is currently unused
           OBJECT IDENTIFIER ::= { rptrTopNPackage 1 }
     rptrTopNGroupInfo
           -- this subtree is currently unused
           OBJECT IDENTIFIER ::= { rptrTopNPackage 2 }
     rptrTopNPortInfo
           OBJECT IDENTIFIER ::= { rptrTopNPackage 3 }


  -- Old version of basic information at the repeater level.
  --
  -- In a system containing a single managed repeater,
  -- configuration, status, and control objects for the overall
  -- repeater.
```

```
     --
     -- The objects contained under the rptrRptrInfo subtree are
     -- intended for backwards compatibility with implementations of
     -- RFC 1516 [11].  In newer implementations (both single- and
     -- multiple-repeater implementations) the rptrInfoTable should
     -- be implemented.  It is the preferred source of this information,
     -- as it contains the values for all repeaters managed by the
     -- agent.  In all cases, the objects in the rptrRptrInfo subtree
     -- are duplicates of the corresponding objects in the first entry
     -- of the rptrInfoTable.

     rptrGroupCapacity OBJECT-TYPE
         SYNTAX      Integer32 (1..2147483647)
         MAX-ACCESS  read-only
         STATUS      deprecated
         DESCRIPTION
                 "********** THIS OBJECT IS DEPRECATED **********

                 The rptrGroupCapacity is the number of groups
                 that can be contained within the repeater.  Within
                 each managed repeater, the groups are uniquely
                 numbered in the range from 1 to rptrGroupCapacity.

                 Some groups may not be present in the repeater, in
                 which case the actual number of groups present
                 will be less than rptrGroupCapacity.  The number
                 of groups present will never be greater than
                 rptrGroupCapacity.

                 Note:  In practice, this will generally be the
                 number of field-replaceable units (i.e., modules,
                 cards, or boards) that can fit in the physical
                 repeater enclosure, and the group numbers will
                 correspond to numbers marked on the physical
                 enclosure."
         REFERENCE
                 "[IEEE 802.3 Mgt], 30.4.1.1.3,
                 aRepeaterGroupCapacity."
         ::= { rptrRptrInfo 1 }

   rptrOperStatus OBJECT-TYPE
         SYNTAX          INTEGER {
                     other(1),           -- undefined or unknown
                     ok(2),              -- no known failures
                     rptrFailure(3),     -- repeater-related failure
                     groupFailure(4),    -- group-related failure
                     portFailure(5),     -- port-related failure
                     generalFailure(6)   -- failure, unspecified type
```

```
                }
    MAX-ACCESS  read-only
    STATUS      deprecated
    DESCRIPTION
            "********* THIS OBJECT IS DEPRECATED **********

            The rptrOperStatus object indicates the
            operational state of the repeater.  The
            rptrHealthText object may be consulted for more
            specific information about the state of the
            repeater's health.

            In the case of multiple kinds of failures (e.g.,
            repeater failure and port failure), the value of
            this attribute shall reflect the highest priority
            failure in the following order, listed highest
            priority first:

                rptrFailure(3)
                groupFailure(4)
                portFailure(5)
                generalFailure(6)."
    REFERENCE
            "[IEEE 802.3 Mgt], 30.4.1.1.5, aRepeaterHealthState."
    ::= { rptrRptrInfo 2 }

rptrHealthText OBJECT-TYPE
    SYNTAX      DisplayString (SIZE (0..255))
    MAX-ACCESS  read-only
    STATUS      deprecated
    DESCRIPTION
            "********* THIS OBJECT IS DEPRECATED **********

            The health text object is a text string that
            provides information relevant to the operational
            state of the repeater.  Agents may use this string
            to provide detailed information on current
            failures, including how they were detected, and/or
            instructions for problem resolution.  The contents
            are agent-specific."
    REFERENCE
            "[IEEE 802.3 Mgt], 30.4.1.1.6, aRepeaterHealthText."
    ::= { rptrRptrInfo 3 }

rptrReset OBJECT-TYPE
    SYNTAX      INTEGER {
                 noReset(1),
                 reset(2)
```

```
                }
        MAX-ACCESS   read-write
        STATUS       deprecated
        DESCRIPTION
                "********* THIS OBJECT IS DEPRECATED **********

                Setting this object to reset(2) causes a
                transition to the START state of Fig 9-2 in
                section 9 [IEEE 802.3 Std] for a 10Mb/s repeater,
                and the START state of Fig 27-2 in section 27
                of that standard for a 100Mb/s repeater.

                Setting this object to noReset(1) has no effect.
                The agent will always return the value noReset(1)
                when this object is read.

                After receiving a request to set this variable to
                reset(2), the agent is allowed to delay the reset
                for a short period.  For example, the implementor
                may choose to delay the reset long enough to allow
                the SNMP response to be transmitted.  In any
                event, the SNMP response must be transmitted.

                This action does not reset the management counters
                defined in this document nor does it affect the
                portAdminStatus parameters.  Included in this
                action is the execution of a disruptive Self-Test
                with the following characteristics:  a) The nature
                of the tests is not specified.  b) The test resets
                the repeater but without affecting management
                information about the repeater.  c) The test does
                not inject packets onto any segment.  d) Packets
                received during the test may or may not be
                transferred.  e) The test does not interfere with
                management functions.

                After performing this self-test, the agent will
                update the repeater health information (including
                rptrOperStatus and rptrHealthText), and send a
                rptrHealth trap."
        REFERENCE
                "[IEEE 802.3 Mgt], 30.4.1.2.1, acResetRepeater."
        ::= { rptrRptrInfo 4 }

   rptrNonDisruptTest OBJECT-TYPE
        SYNTAX       INTEGER {
                     noSelfTest(1),
                     selfTest(2)
```

```
                }
        MAX-ACCESS  read-write
        STATUS      deprecated
        DESCRIPTION
                "********* THIS OBJECT IS DEPRECATED **********

                Setting this object to selfTest(2) causes the
                repeater to perform a agent-specific, non-
                disruptive self-test that has the following
                characteristics:  a) The nature of the tests is
                not specified.  b) The test does not change the
                state of the repeater or management information
                about the repeater.  c) The test does not inject
                packets onto any segment.  d) The test does not
                prevent the relay of any packets.  e) The test
                does not interfere with management functions.

                After performing this test, the agent will update
                the repeater health information (including
                rptrOperStatus and rptrHealthText) and send a
                rptrHealth trap.

                Note that this definition allows returning an
                'okay' result after doing a trivial test.

                Setting this object to noSelfTest(1) has no
                effect.  The agent will always return the value
                noSelfTest(1) when this object is read."
        REFERENCE
                "[IEEE 802.3 Mgt], 30.4.1.2.2,
                acExecuteNonDisruptiveSelfTest."
        ::= { rptrRptrInfo 5 }

    rptrTotalPartitionedPorts OBJECT-TYPE
        SYNTAX      Gauge32
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "********* THIS OBJECT IS DEPRECATED **********

                This object returns the total number of ports in
                the repeater whose current state meets all three
                of the following criteria:  rptrPortOperStatus
                does not have the value notPresent(3),
                rptrPortAdminStatus is enabled(1), and
                rptrPortAutoPartitionState is autoPartitioned(2)."
        ::= { rptrRptrInfo 6 }
```

    -- Basic information at the group level.
    --
    -- Configuration and status objects for each
    -- managed group in the system, independent
    -- of whether there is one or more managed
    -- repeater-units in the system.

    rptrGroupTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF RptrGroupEntry
        MAX-ACCESS not-accessible
        STATUS   current
        DESCRIPTION
                "Table of descriptive and status information about
                the groups of ports."
        ::= { rptrGroupInfo 1 }

    rptrGroupEntry OBJECT-TYPE
        SYNTAX   RptrGroupEntry
        MAX-ACCESS not-accessible
        STATUS   current
        DESCRIPTION
                "An entry in the table, containing information
                about a single group of ports."
        INDEX   { rptrGroupIndex }
        ::= { rptrGroupTable 1 }

    RptrGroupEntry ::=
        SEQUENCE {
            rptrGroupIndex
                Integer32,
            rptrGroupDescr
                DisplayString,
            rptrGroupObjectID
                OBJECT IDENTIFIER,
            rptrGroupOperStatus
                INTEGER,
            rptrGroupLastOperStatusChange
                TimeTicks,
            rptrGroupPortCapacity
                Integer32
        }

    rptrGroupIndex OBJECT-TYPE
        SYNTAX   Integer32 (1..2147483647)
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "This object identifies the group within the

```
                     system for which this entry contains
                     information."
          REFERENCE
                     "[IEEE 802.3 Mgt], 30.4.2.1.1, aGroupID."
          ::= { rptrGroupEntry 1 }

     rptrGroupDescr OBJECT-TYPE
          SYNTAX      DisplayString (SIZE (0..255))
          MAX-ACCESS  read-only
          STATUS      deprecated
          DESCRIPTION
                     "********* THIS OBJECT IS DEPRECATED **********

                     A textual description of the group.  This value
                     should include the full name and version
                     identification of the group's hardware type and
                     indicate how the group is differentiated from
                     other types of groups in the repeater.  Plug-in
                     Module, Rev A' or 'Barney Rubble 10BASE-T 4-port
                     SIMM socket Version 2.1' are examples of valid
                     group descriptions.

                     It is mandatory that this only contain printable
                     ASCII characters."
          ::= { rptrGroupEntry 2 }

     rptrGroupObjectID OBJECT-TYPE
          SYNTAX      OBJECT IDENTIFIER
          MAX-ACCESS  read-only
          STATUS      current
          DESCRIPTION
                     "The vendor's authoritative identification of the
                     group.  This value may be allocated within the SMI
                     enterprises subtree (1.3.6.1.4.1) and provides a
                     straight-forward and unambiguous means for
                     determining what kind of group is being managed.

                     For example, this object could take the value
                     1.3.6.1.4.1.4242.1.2.14 if vendor 'Flintstones,
                     Inc.' was assigned the subtree 1.3.6.1.4.1.4242,
                     and had assigned the identifier
                     1.3.6.1.4.1.4242.1.2.14 to its 'Wilma Flintstone
                     6-Port FOIRL Plug-in Module.'"
          ::= { rptrGroupEntry 3 }

     rptrGroupOperStatus OBJECT-TYPE
          SYNTAX      INTEGER {
                     other(1),
```

```
                            operational(2),
                            malfunctioning(3),
                            notPresent(4),
                            underTest(5),
                            resetInProgress(6)
                         }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "An object that indicates the operational status
                of the group.

                A status of notPresent(4) indicates that the group
                is temporarily or permanently physically and/or
                logically not a part of the repeater.  It is an
                implementation-specific matter as to whether the
                agent effectively removes notPresent entries from
                the table.

                A status of operational(2) indicates that the
                group is functioning, and a status of
                malfunctioning(3) indicates that the group is
                malfunctioning in some way."
        ::= { rptrGroupEntry 4 }

    rptrGroupLastOperStatusChange OBJECT-TYPE
        SYNTAX      TimeTicks
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "********* THIS OBJECT IS DEPRECATED **********

                An object that contains the value of sysUpTime at
                the time when the last of the following occurred:
                  1) the agent cold- or warm-started;
                  2) the row for the group was created (such
                     as when the group was added to the system); or
                  3) the value of rptrGroupOperStatus for the
                     group changed.

                A value of zero indicates that the group's
                operational status has not changed since the agent
                last restarted."
        ::= { rptrGroupEntry 5 }

    rptrGroupPortCapacity OBJECT-TYPE
        SYNTAX      Integer32 (1..2147483647)
        MAX-ACCESS  read-only
```

        STATUS   current
        DESCRIPTION
                "The rptrGroupPortCapacity is the number of ports
                that can be contained within the group. Valid
                range is 1-2147483647. Within each group, the
                ports are uniquely numbered in the range from 1 to
                rptrGroupPortCapacity.

                Some ports may not be present in the system, in
                which case the actual number of ports present
                will be less than the value of rptrGroupPortCapacity.
                The number of ports present in the group will never
                be greater than the value of rptrGroupPortCapacity.

                Note: In practice, this will generally be the
                number of ports on a module, card, or board, and
                the port numbers will correspond to numbers marked
                on the physical embodiment."
        REFERENCE
                "IEEE 802.3 Mgt, 30.4.2.1.2, aGroupPortCapacity."
        ::= { rptrGroupEntry 6 }

    -- Basic information at the port level.
    --
    -- Configuration and status objects for
    -- each managed repeater port in the system,
    -- independent of whether there is one or more
    -- managed repeater-units in the system.

    rptrPortTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF RptrPortEntry
        MAX-ACCESS not-accessible
        STATUS   current
        DESCRIPTION
                "Table of descriptive and status information about
                the repeater ports in the system. The number of
                entries is independent of the number of repeaters
                in the managed system."
        ::= { rptrPortInfo 1 }

    rptrPortEntry OBJECT-TYPE
        SYNTAX   RptrPortEntry
        MAX-ACCESS not-accessible
        STATUS   current
        DESCRIPTION
                "An entry in the table, containing information
                about a single port."

```
         INDEX     { rptrPortGroupIndex, rptrPortIndex }
         ::= { rptrPortTable 1 }

   RptrPortEntry ::=
       SEQUENCE {
           rptrPortGroupIndex
               Integer32,
           rptrPortIndex
               Integer32,
           rptrPortAdminStatus
               INTEGER,
           rptrPortAutoPartitionState
               INTEGER,
           rptrPortOperStatus
               INTEGER,
           rptrPortRptrId
               Integer32
       }

   rptrPortGroupIndex OBJECT-TYPE
       SYNTAX      Integer32 (1..2147483647)
       MAX-ACCESS  read-only
       STATUS      current
       DESCRIPTION
               "This object identifies the group containing the
               port for which this entry contains information."
       ::= { rptrPortEntry 1 }

   rptrPortIndex OBJECT-TYPE
       SYNTAX      Integer32 (1..2147483647)
       MAX-ACCESS  read-only
       STATUS      current
       DESCRIPTION
               "This object identifies the port within the group
               for which this entry contains information.  This
               identifies the port independently from the repeater
               it may be attached to.  The numbering scheme for
               ports is implementation specific; however, this
               value can never be greater than
               rptrGroupPortCapacity for the associated group."
       REFERENCE
               "[IEEE 802.3 Mgt], 30.4.3.1.1, aPortID."
       ::= { rptrPortEntry 2 }

   rptrPortAdminStatus OBJECT-TYPE
       SYNTAX      INTEGER {
                   enabled(1),
                   disabled(2)
```

```
                   }
       MAX-ACCESS   read-write
       STATUS       current
       DESCRIPTION
               "Setting this object to disabled(2) disables the
               port.  A disabled port neither transmits nor
               receives.  Once disabled, a port must be
               explicitly enabled to restore operation.  A port
               which is disabled when power is lost or when a
               reset is exerted shall remain disabled when normal
               operation resumes.

               The admin status takes precedence over auto-
               partition and functionally operates between the
               auto-partition mechanism and the AUI/PMA.

               Setting this object to enabled(1) enables the port
               and exerts a BEGIN on the port's auto-partition
               state machine.

               (In effect, when a port is disabled, the value of
               rptrPortAutoPartitionState for that port is frozen
               until the port is next enabled.  When the port
               becomes enabled, the rptrPortAutoPartitionState
               becomes notAutoPartitioned(1), regardless of its
               pre-disabling state.)"
       REFERENCE
               "[IEEE 802.3 Mgt], 30.4.3.1.2, aPortAdminState
               and 30.4.3.2.1, acPortAdminControl."
       ::= { rptrPortEntry 3 }

   rptrPortAutoPartitionState OBJECT-TYPE
       SYNTAX       INTEGER {
                      notAutoPartitioned(1),
                      autoPartitioned(2)
                    }
       MAX-ACCESS   read-only
       STATUS       current
       DESCRIPTION
               "The autoPartitionState flag indicates whether the
               port is currently partitioned by the repeater's
               auto-partition protection.

               The conditions that cause port partitioning are
               specified in partition state machine in Sections
               9 and 27 of [IEEE 802.3 Std].  They are not
               differentiated here."
       REFERENCE
```

```
                   "[IEEE 802.3 Mgt], 30.4.3.1.3, aAutoPartitionState."
          ::= { rptrPortEntry 4 }

   rptrPortOperStatus  OBJECT-TYPE
       SYNTAX       INTEGER {
                       operational(1),
                       notOperational(2),
                       notPresent(3)
                    }
       MAX-ACCESS  read-only
       STATUS      current
       DESCRIPTION
               "This object indicates the port's operational
               status.  The notPresent(3) status indicates the
               port is physically removed (note this may or may
               not be possible depending on the type of port.)
               The operational(1) status indicates that the port
               is enabled (see rptrPortAdminStatus) and working,
               even though it might be auto-partitioned (see
               rptrPortAutoPartitionState).

               If this object has the value operational(1) and
               rptrPortAdminStatus is set to disabled(2), it is
               expected that this object's value will soon change
               to notOperational(2)."
          ::= { rptrPortEntry 5 }

   rptrPortRptrId OBJECT-TYPE
       SYNTAX       Integer32 (0..2147483647)
       MAX-ACCESS  read-only
       STATUS      current
       DESCRIPTION
               "This object identifies the repeater to
               which this port belongs.  The repeater
               identified by a particular value of this object
               is the same as that identified by the same
               value of rptrInfoId.  A value of zero
               indicates that this port currently is not
               a member of any repeater."
          ::= { rptrPortEntry 6 }


   -- New version of basic information at the repeater level.
   --
   -- Configuration, status, and control objects for
   -- each managed repeater in the system.

   rptrInfoTable OBJECT-TYPE
```

```
        SYNTAX       SEQUENCE OF RptrInfoEntry
        MAX-ACCESS   not-accessible
        STATUS       current
        DESCRIPTION
                "A table of information about each
                non-trivial repeater. The number of entries
                depends on the physical configuration of the
                managed system."
        ::= { rptrAllRptrInfo 1 }

    rptrInfoEntry OBJECT-TYPE
        SYNTAX       RptrInfoEntry
        MAX-ACCESS   not-accessible
        STATUS       current
        DESCRIPTION
                "An entry in the table, containing information
                about a single non-trivial repeater."
        INDEX    { rptrInfoId }
        ::= { rptrInfoTable 1 }

    RptrInfoEntry ::=
        SEQUENCE {
            rptrInfoId
                Integer32,
            rptrInfoRptrType
                INTEGER,
            rptrInfoOperStatus
                INTEGER,
            rptrInfoReset
                INTEGER,
            rptrInfoPartitionedPorts
                Gauge32,
            rptrInfoLastChange
                TimeStamp
        }

    rptrInfoId OBJECT-TYPE
        SYNTAX       Integer32 (1..2147483647)
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
                "This object identifies the repeater for which
                this entry contains information."
        ::= { rptrInfoEntry 1 }

    rptrInfoRptrType OBJECT-TYPE
        SYNTAX       INTEGER {
                    other(1),                 -- undefined or unknown
```

```
                    tenMb(2),
                    onehundredMbClassI(3),
                    onehundredMbClassII(4)
                 }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The rptrInfoRptrType returns a value that identifies
            the CSMA/CD repeater type."
    REFERENCE
            "[IEEE 802.3 Mgt], 30.4.1.1.2, aRepeaterType."
    ::= { rptrInfoEntry 2 }

rptrInfoOperStatus OBJECT-TYPE
    SYNTAX      INTEGER {
                    other(1),
                    ok(2),
                    failure(3)
                 }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The rptrInfoOperStatus object indicates the
            operational state of the repeater."
    REFERENCE
            "[IEEE 802.3 Mgt], 30.4.1.1.5, aRepeaterHealthState."
    ::= { rptrInfoEntry 3 }

rptrInfoReset OBJECT-TYPE
    SYNTAX      INTEGER {
                    noReset(1),
                    reset(2)
                 }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
            "Setting this object to reset(2) causes a
            transition to the START state of Fig 9-2 in
            section 9 [IEEE 802.3 Std] for a 10Mb/s repeater,
            and to the START state of Fig 27-2 in section 27
            of that standard for a 100Mb/s repeater.

            Setting this object to noReset(1) has no effect.
            The agent will always return the value noReset(1)
            when this object is read.

            After receiving a request to set this variable to
            reset(2), the agent is allowed to delay the reset
```

                    for a short period. For example, the implementor
                    may choose to delay the reset long enough to allow
                    the SNMP response to be transmitted. In any
                    event, the SNMP response must be transmitted.

                    This action does not reset the management counters
                    defined in this document nor does it affect the
                    portAdminStatus parameters. Included in this
                    action is the execution of a disruptive Self-Test
                    with the following characteristics: a) The nature
                    of the tests is not specified. b) The test resets
                    the repeater but without affecting management
                    information about the repeater. c) The test does
                    not inject packets onto any segment. d) Packets
                    received during the test may or may not be
                    transferred. e) The test does not interfere with
                    management functions.

                    After performing this self-test, the agent will
                    update the repeater health information (including
                    rptrInfoOperStatus), and send a rptrInfoResetEvent
                    notification."
            REFERENCE
                    "[IEEE 802.3 Mgt], 30.4.1.2.1, acResetRepeater."
            ::= { rptrInfoEntry 4 }

    rptrInfoPartitionedPorts OBJECT-TYPE
            SYNTAX   Gauge32
            MAX-ACCESS read-only
            STATUS   current
            DESCRIPTION
                    "This object returns the total number of ports in
                    the repeater whose current state meets all three
                    of the following criteria: rptrPortOperStatus
                    does not have the value notPresent(3),
                    rptrPortAdminStatus is enabled(1), and
                    rptrPortAutoPartitionState is autoPartitioned(2)."
            ::= { rptrInfoEntry 5 }

    rptrInfoLastChange OBJECT-TYPE
            SYNTAX   TimeStamp
            MAX-ACCESS read-only
            STATUS   current
            DESCRIPTION
                    "The value of sysUpTime when any of the following
                    conditions occurred:
                      1) agent cold- or warm-started;
                      2) this instance of repeater was created

```
                        (such as when a device or module was
                        added to the system);
                   3) a change in the value of rptrInfoOperStatus;
                   4) ports were added or removed as members of
                        the repeater; or
                   5) any of the counters associated with this
                        repeater had a discontinuity."
          ::= { rptrInfoEntry 6 }




        --
        -- Old version of statistics at the repeater level.
        --
        -- Performance monitoring statistics for the repeater
        --
        -- In a system containing a single managed repeater-unit,
        -- the statistics object for the repeater-unit.

        -- The objects contained under the rptrMonitorRptrInfo subtree are
        -- intended for backwards compatibility with implementations of
        -- RFC 1516 [11].  In newer implementations (both single- and
        -- multiple-repeater implementations), the rptrMonitorTable will
        -- be implemented.  It is the preferred source of this information,
        -- as it contains the values for all repeaters managed by the
        -- agent.  In all cases, the objects in the rptrMonitorRptrInfo
        -- subtree are duplicates of the corresponding objects in the
        -- first entry of the rptrMonitorTable.


        rptrMonitorTransmitCollisions OBJECT-TYPE
            SYNTAX        Counter32
            MAX-ACCESS    read-only
            STATUS        deprecated
            DESCRIPTION
                    "********** THIS OBJECT IS DEPRECATED **********

                    For a clause 9 (10Mb/s) repeater, this counter
                    is incremented every time the repeater state
                    machine enters the TRANSMIT COLLISION state
                    from any state other than ONE PORT LEFT
                    (Ref: Fig 9-2 [IEEE 802.3 Std]).

                    For a clause 27 repeater, this counter is
                    incremented every time the repeater core state
                    diagram enters the Jam state as a result of
                    Activity(ALL) > 1 (fig 27-2 [IEEE 802.3 Std]).
```

                  The approximate minimum time for rollover of this
                  counter is 16 hours in a 10Mb/s repeater and 1.6
                  hours in a 100Mb/s repeater."
         REFERENCE
                  "[IEEE 802.3 Mgt], 30.4.1.1.8, aTransmitCollisions."
         ::= { rptrMonitorRptrInfo 1 }

   -- Statistics at the group level.
   --
   -- In a system containing a single managed repeater-unit,
   -- the statistics objects for each group.

   rptrMonitorGroupTable OBJECT-TYPE
       SYNTAX   SEQUENCE OF RptrMonitorGroupEntry
       MAX-ACCESS not-accessible
       STATUS   deprecated
       DESCRIPTION
                  "********** THIS OBJECT IS DEPRECATED **********

                  Table of performance and error statistics for the
                  groups within the repeater. The number of entries
                  is the same as that in the rptrGroupTable."
       ::= { rptrMonitorGroupInfo 1 }

   rptrMonitorGroupEntry OBJECT-TYPE
       SYNTAX   RptrMonitorGroupEntry
       MAX-ACCESS not-accessible
       STATUS   deprecated
       DESCRIPTION
                  "********** THIS OBJECT IS DEPRECATED **********

                  An entry in the table, containing total
                  performance and error statistics for a single
                  group. Regular retrieval of the information in
                  this table provides a means of tracking the
                  performance and health of the networked devices
                  attached to this group's ports.

                  The counters in this table are redundant in the
                  sense that they are the summations of information
                  already available through other objects. However,
                  these sums provide a considerable optimization of
                  network management traffic over the otherwise
                  necessary retrieval of the individual counters
                  included in each sum.

                  Note: Group-level counters are

```
                    deprecated in this MIB.  It is recommended
                    that management applications instead use
                    the repeater-level counters contained in
                    the rptrMonTable."
        INDEX     { rptrMonitorGroupIndex }
        ::= { rptrMonitorGroupTable 1 }

    RptrMonitorGroupEntry ::=
        SEQUENCE {
            rptrMonitorGroupIndex
                Integer32,
            rptrMonitorGroupTotalFrames
                Counter32,
            rptrMonitorGroupTotalOctets
                Counter32,
            rptrMonitorGroupTotalErrors
                Counter32
        }

    rptrMonitorGroupIndex OBJECT-TYPE
        SYNTAX      Integer32 (1..2147483647)
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "********* THIS OBJECT IS DEPRECATED **********

                This object identifies the group within the
                repeater for which this entry contains
                information."
        ::= { rptrMonitorGroupEntry 1 }

    rptrMonitorGroupTotalFrames OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "********* THIS OBJECT IS DEPRECATED **********

                The total number of frames of valid frame length
                that have been received on the ports in this group
                and for which the FCSError and CollisionEvent
                signals were not asserted.  This counter is the
                summation of the values of the
                rptrMonitorPortReadableFrames counters for all of
                the ports in the group.

                This statistic provides one of the parameters
                necessary for obtaining the packet error rate.
```

```
              The approximate minimum time for rollover of this
              counter is 80 hours in a 10Mb/s repeater."
       ::= { rptrMonitorGroupEntry 2 }

   rptrMonitorGroupTotalOctets OBJECT-TYPE
       SYNTAX      Counter32
       MAX-ACCESS  read-only
       STATUS      deprecated
       DESCRIPTION
              "********** THIS OBJECT IS DEPRECATED **********

              The total number of octets contained in the valid
              frames that have been received on the ports in
              this group.  This counter is the summation of the
              values of the rptrMonitorPortReadableOctets
              counters for all of the ports in the group.

              This statistic provides an indicator of the total
              data transferred.  The approximate minimum time
              for rollover of this counter is 58 minutes in a
              10Mb/s repeater."
       ::= { rptrMonitorGroupEntry 3 }

   rptrMonitorGroupTotalErrors OBJECT-TYPE
       SYNTAX      Counter32
       MAX-ACCESS  read-only
       STATUS      deprecated
       DESCRIPTION
              "********** THIS OBJECT IS DEPRECATED **********

              The total number of errors which have occurred on
              all of the ports in this group.  This counter is
              the summation of the values of the
              rptrMonitorPortTotalErrors counters for all of the
              ports in the group."
       ::= { rptrMonitorGroupEntry 4 }


   -- Statistics at the port level.
   --

   rptrMonitorPortTable OBJECT-TYPE
       SYNTAX      SEQUENCE OF RptrMonitorPortEntry
       MAX-ACCESS  not-accessible
       STATUS      current
       DESCRIPTION
              "Table of performance and error statistics for the
              ports.  The number of entries is the same as that
```

                in the rptrPortTable.

                The columnar object rptrMonitorPortLastChange
                is used to indicate possible discontinuities
                of counter type columnar objects in the table."
        ::= { rptrMonitorPortInfo 1 }

    rptrMonitorPortEntry OBJECT-TYPE
        SYNTAX   RptrMonitorPortEntry
        MAX-ACCESS not-accessible
        STATUS   current
        DESCRIPTION
                "An entry in the table, containing performance and
                error statistics for a single port."
        INDEX   { rptrMonitorPortGroupIndex, rptrMonitorPortIndex }
        ::= { rptrMonitorPortTable 1 }

    RptrMonitorPortEntry ::=
        SEQUENCE {
            rptrMonitorPortGroupIndex
                Integer32,
            rptrMonitorPortIndex
                Integer32,
            rptrMonitorPortReadableFrames
                Counter32,
            rptrMonitorPortReadableOctets
                Counter32,
            rptrMonitorPortFCSErrors
                Counter32,
            rptrMonitorPortAlignmentErrors
                Counter32,
            rptrMonitorPortFrameTooLongs
                Counter32,
            rptrMonitorPortShortEvents
                Counter32,
            rptrMonitorPortRunts
                Counter32,
            rptrMonitorPortCollisions
                Counter32,
            rptrMonitorPortLateEvents
                Counter32,
            rptrMonitorPortVeryLongEvents
                Counter32,
            rptrMonitorPortDataRateMismatches
                Counter32,
            rptrMonitorPortAutoPartitions
                Counter32,
            rptrMonitorPortTotalErrors

```
                      Counter32,
               rptrMonitorPortLastChange
                      TimeStamp
          }

   rptrMonitorPortGroupIndex OBJECT-TYPE
       SYNTAX       Integer32 (1..2147483647)
       MAX-ACCESS   read-only
       STATUS       current
       DESCRIPTION
               "This object identifies the group containing the
               port for which this entry contains information."
       ::= { rptrMonitorPortEntry 1 }

   rptrMonitorPortIndex OBJECT-TYPE
       SYNTAX       Integer32 (1..2147483647)
       MAX-ACCESS   read-only
       STATUS       current
       DESCRIPTION
               "This object identifies the port within the group
               for which this entry contains information."
       REFERENCE
               "[IEEE 802.3 Mgt], 30.4.3.1.1, aPortID."
       ::= { rptrMonitorPortEntry 2 }

   rptrMonitorPortReadableFrames OBJECT-TYPE
       SYNTAX       Counter32
       MAX-ACCESS   read-only
       STATUS       current
       DESCRIPTION
               "This object is the number of frames of valid
               frame length that have been received on this port.
               This counter is incremented by one for each frame
               received on this port whose OctetCount is greater
               than or equal to minFrameSize and less than or
               equal to maxFrameSize (Ref: IEEE 802.3 Std,
               4.4.2.1) and for which the FCSError and
               CollisionEvent signals are not asserted.

               A discontinuity may occur in the value
               when the value of object
               rptrMonitorPortLastChange changes.

               This statistic provides one of the parameters
               necessary for obtaining the packet error rate.
               The approximate minimum time for rollover of this
               counter is 80 hours at 10Mb/s."
       REFERENCE
```

```
                   "[IEEE 802.3 Mgt], 30.4.3.1.4, aReadableFrames."
          ::= { rptrMonitorPortEntry 3 }

    rptrMonitorPortReadableOctets OBJECT-TYPE
          SYNTAX       Counter32
          MAX-ACCESS   read-only
          STATUS       current
          DESCRIPTION
                   "This object is the number of octets contained in
                   valid frames that have been received on this port.
                   This counter is incremented by OctetCount for each
                   frame received on this port which has been
                   determined to be a readable frame (i.e., including
                   FCS octets but excluding framing bits and dribble
                   bits).

                   A discontinuity may occur in the value
                   when the value of object
                   rptrMonitorPortLastChange changes.

                   This statistic provides an indicator of the total
                   data transferred.  The approximate minimum time
                   for rollover of this counter in a 10Mb/s repeater
                   is 58 minutes.

                   For ports receiving traffic at a maximum rate in
                   a 100Mb/s repeater, this counter can roll over
                   in less than 6 minutes.  Since that amount of time
                   could be less than a management station's poll cycle
                   time, in order to avoid a loss of information a
                   management station is advised to also poll the
                   rptrMonitorPortUpper32Octets object, or to use the
                   64-bit counter defined by
                   rptrMonitorPortHCReadableOctets instead of the
                   two 32-bit counters."
          REFERENCE
                   "[IEEE 802.3 Mgt], 30.4.3.1.5, aReadableOctets."
          ::= { rptrMonitorPortEntry 4 }

    rptrMonitorPortFCSErrors OBJECT-TYPE
          SYNTAX       Counter32
          MAX-ACCESS   read-only
          STATUS       current
          DESCRIPTION
                   "This counter is incremented by one for each frame
                   received on this port with the FCSError signal
                   asserted and the FramingError and CollisionEvent
                   signals deasserted and whose OctetCount is greater
```

                    than or equal to minFrameSize and less than or
                    equal to maxFrameSize (Ref: 4.4.2.1, IEEE 802.3
                    Std).

                    A discontinuity may occur in the value
                    when the value of object
                    rptrMonitorPortLastChange changes.

                    The approximate minimum time for rollover of this
                    counter is 80 hours at 10Mb/s."
          REFERENCE
                    "[IEEE 802.3 Mgt], 30.4.3.1.6,
                    aFrameCheckSequenceErrors."
          ::= { rptrMonitorPortEntry 5 }

     rptrMonitorPortAlignmentErrors OBJECT-TYPE
          SYNTAX   Counter32
          MAX-ACCESS   read-only
          STATUS   current
          DESCRIPTION
                    "This counter is incremented by one for each frame
                    received on this port with the FCSError and
                    FramingError signals asserted and CollisionEvent
                    signal deasserted and whose OctetCount is greater
                    than or equal to minFrameSize and less than or
                    equal to maxFrameSize (Ref: IEEE 802.3 Std,
                    4.4.2.1). If rptrMonitorPortAlignmentErrors is
                    incremented then the rptrMonitorPortFCSErrors
                    Counter shall not be incremented for the same
                    frame.

                    A discontinuity may occur in the value
                    when the value of object
                    rptrMonitorPortLastChange changes.

                    The approximate minimum time for rollover of this
                    counter is 80 hours at 10Mb/s."
          REFERENCE
                    "[IEEE 802.3 Mgt], 30.4.3.1.7, aAlignmentErrors."
          ::= { rptrMonitorPortEntry 6 }

     rptrMonitorPortFrameTooLongs OBJECT-TYPE
          SYNTAX   Counter32
          MAX-ACCESS   read-only
          STATUS   current
          DESCRIPTION
                    "This counter is incremented by one for each frame
                    received on this port whose OctetCount is greater

than maxFrameSize (Ref: 4.4.2.1, IEEE 802.3 Std).
If rptrMonitorPortFrameTooLongs is incremented
then neither the rptrMonitorPortAlignmentErrors
nor the rptrMonitorPortFCSErrors counter shall be
incremented for the frame.

A discontinuity may occur in the value
when the value of object
rptrMonitorPortLastChange changes.

The approximate minimum time for rollover of this
counter is 61 days in a 10Mb/s repeater."
        REFERENCE
                "[IEEE 802.3 Mgt], 30.4.3.1.8, aFramesTooLong."
        ::= { rptrMonitorPortEntry 7 }

    rptrMonitorPortShortEvents OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
                "This counter is incremented by one for each
                CarrierEvent on this port with ActivityDuration
                less than ShortEventMaxTime. ShortEventMaxTime is
                greater than 74 bit times and less than 82 bit
                times. ShortEventMaxTime has tolerances included
                to provide for circuit losses between a
                conformance test point at the AUI and the
                measurement point within the state machine.

                Notes:

                ShortEvents may indicate externally
                generated noise hits which will cause the repeater
                to transmit Runts to its other ports, or propagate
                a collision (which may be late) back to the
                transmitting DTE and damaged frames to the rest of
                the network.

                Implementors may wish to consider selecting the
                ShortEventMaxTime towards the lower end of the
                allowed tolerance range to accommodate bit losses
                suffered through physical channel devices not
                budgeted for within this standard.

                The significance of this attribute is different
                in 10 and 100 Mb/s collision domains. Clause 9
                repeaters perform fragment extension of short

                events which would be counted as runts on the
                interconnect ports of other repeaters. Clause
                27 repeaters do not perform fragment extension.

                A discontinuity may occur in the value
                when the value of object
                rptrMonitorPortLastChange changes.

                The approximate minimum time for rollover of this
                counter is 16 hours in a 10Mb/s repeater."
        REFERENCE
                "[IEEE 802.3 Mgt], 30.4.3.1.9, aShortEvents."
        ::= { rptrMonitorPortEntry 8 }

    rptrMonitorPortRunts OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "This counter is incremented by one for each
                CarrierEvent on this port that meets one of the
                following two conditions. Only one test need be
                made. a) The ActivityDuration is greater than
                ShortEventMaxTime and less than ValidPacketMinTime
                and the CollisionEvent signal is deasserted. b)
                The OctetCount is less than 64, the
                ActivityDuration is greater than ShortEventMaxTime
                and the CollisionEvent signal is deasserted.
                ValidPacketMinTime is greater than or equal to 552
                bit times and less than 565 bit times.

                An event whose length is greater than 74 bit times
                but less than 82 bit times shall increment either
                the shortEvents counter or the runts counter but
                not both. A CarrierEvent greater than or equal to
                552 bit times but less than 565 bit times may or
                may not be counted as a runt.

                ValidPacketMinTime has tolerances included to
                provide for circuit losses between a conformance
                test point at the AUI and the measurement point
                within the state machine.

                Runts usually indicate collision fragments, a
                normal network event. In certain situations
                associated with large diameter networks a
                percentage of collision fragments may exceed
                ValidPacketMinTime.

                A discontinuity may occur in the value
                when the value of object
                rptrMonitorPortLastChange changes.

                The approximate minimum time for rollover of this
                counter is 16 hours in a 10Mb/s repeater."
        REFERENCE
                "[IEEE 802.3 Mgt], 30.4.3.1.10, aRunts."
        ::= { rptrMonitorPortEntry 9 }

    rptrMonitorPortCollisions OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "For a clause 9 repeater, this counter is
                incremented by one for any CarrierEvent signal
                on any port for which the CollisionEvent signal
                on this port is asserted. For a clause 27
                repeater port the counter increments on entering
                the Collision Count Increment state of the
                partition state diagram (fig 27-8 of
                [IEEE 802.3 Std]).

                A discontinuity may occur in the value
                when the value of object
                rptrMonitorPortLastChange changes.

                The approximate minimum time for rollover of this
                counter is 16 hours in a 10Mb/s repeater."
        REFERENCE
                "[IEEE 802.3 Mgt], 30.4.3.1.11, aCollisions."
        ::= { rptrMonitorPortEntry 10 }

    rptrMonitorPortLateEvents OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "For a clause 9 repeater port, this counter is
                incremented by one for each CarrierEvent
                on this port in which the CollIn(X)
                variable transitions to the value SQE (Ref:
                9.6.6.2, IEEE 802.3 Std) while the
                ActivityDuration is greater than the
                LateEventThreshold. For a clause 27 repeater
                port, this counter is incremented by one on
                entering the Collision Count Increment state

                    of the partition state diagram (fig 27-8)
                    while the ActivityDuration is greater than
                    the LateEvent- Threshold. Such a CarrierEvent
                    is counted twice, as both a collision and as a
                    lateEvent.

                    The LateEventThreshold is greater than 480 bit
                    times and less than 565 bit times.
                    LateEventThreshold has tolerances included to
                    permit an implementation to build a single
                    threshold to serve as both the LateEventThreshold
                    and ValidPacketMinTime threshold.

                    A discontinuity may occur in the value
                    when the value of object
                    rptrMonitorPortLastChange changes.

                    The approximate minimum time for rollover of this
                    counter is 81 hours in a 10Mb/s repeater."
            REFERENCE
                    "[IEEE 802.3 Mgt], 30.4.3.1.12, aLateEvents."
            ::= { rptrMonitorPortEntry 11 }

    rptrMonitorPortVeryLongEvents OBJECT-TYPE
            SYNTAX   Counter32
            MAX-ACCESS read-only
            STATUS   current
            DESCRIPTION
                    "For a clause 9 repeater port, this counter
                    is incremented by one for each CarrierEvent
                    whose ActivityDuration is greater than the
                    MAU Jabber Lockup Protection timer TW3
                    (Ref: 9.6.1 & 9.6.5, IEEE 802.3 Std).

                    For a clause 27 repeater port, this counter
                    is incremented by one on entry to the
                    Rx Jabber state of the receiver timer state
                    diagram (fig 27-7). Other counters may
                    be incremented as appropriate.

                    A discontinuity may occur in the value
                    when the value of object
                    rptrMonitorPortLastChange changes."
            REFERENCE
                    "[IEEE 802.3 Mgt], 30.4.3.1.13, aVeryLongEvents."
            ::= { rptrMonitorPortEntry 12 }

    rptrMonitorPortDataRateMismatches OBJECT-TYPE

```
        SYNTAX       Counter32
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
                "This counter is incremented by one for each
                frame received by this port that meets all
                of the conditions required by only one of the
                following two measurement methods:

                Measurement method A:  1) The CollisionEvent
                signal is not asserted (10Mb/s operation) or
                the Collision Count Increment state of the
                partition state diagram (fig 27-8 of
                [IEEE 802.3 Std]) has not been entered
                (100Mb/s operation).  2) The ActivityDuration
                is greater than ValidPacketMinTime.  3) The
                frequency (data rate) is detectably mismatched
                from the local transmit frequency.

                Measurement method B:  1) The CollisionEvent
                signal is not asserted (10Mb/s operation)
                or the Collision Count Increment state of the
                partition state diagram (fig 27-8 of
                [IEEE 802.3 Std]) has not been entered
                (100Mb/s operation).  2) The OctetCount is
                greater than 63.  3) The frequency (data
                rate) is detectably mismatched from the local
                transmit frequency.  The exact degree of
                mismatch is vendor specific and is to be
                defined by the vendor for conformance testing.

                When this event occurs, other counters whose
                increment conditions were satisfied may or may not
                also be incremented, at the implementor's
                discretion.  Whether or not the repeater was able
                to maintain data integrity is beyond the scope of
                this standard.

                A discontinuity may occur in the value
                when the value of object
                rptrMonitorPortLastChange changes."
        REFERENCE
                "[IEEE 802.3 Mgt], 30.4.3.1.14, aDataRateMismatches."
        ::= { rptrMonitorPortEntry 13 }

    rptrMonitorPortAutoPartitions OBJECT-TYPE
        SYNTAX       Counter32
        MAX-ACCESS   read-only
```

```
        STATUS       current
        DESCRIPTION
                "This counter is incremented by one for
                each time the repeater has automatically
                partitioned this port.

                The conditions that cause a clause 9
                repeater port to partition are specified in
                the partition state diagram in clause 9 of
                [IEEE 802.3 Std].  They are not differentiated
                here.  A clause 27 repeater port partitions
                on entry to the Partition Wait state of the
                partition state diagram (fig 27-8 in
                [IEEE 802.3 Std]).

                A discontinuity may occur in the value
                when the value of object
                rptrMonitorPortLastChange changes."
        REFERENCE
                "[IEEE 802.3 Mgt], 30.4.3.1.15, aAutoPartitions."
        ::= { rptrMonitorPortEntry 14 }

   rptrMonitorPortTotalErrors OBJECT-TYPE
        SYNTAX       Counter32
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
                "The total number of errors which have occurred on
                this port.  This counter is the summation of the
                values of other error counters (for the same
                port), namely:

                    rptrMonitorPortFCSErrors,
                    rptrMonitorPortAlignmentErrors,
                    rptrMonitorPortFrameTooLongs,
                    rptrMonitorPortShortEvents,
                    rptrMonitorPortLateEvents,
                    rptrMonitorPortVeryLongEvents,
                    rptrMonitorPortDataRateMismatches, and
                    rptrMonitorPortSymbolErrors.

                This counter is redundant in the sense that it is
                the summation of information already available
                through other objects.  However, it is included
                specifically because the regular retrieval of this
                object as a means of tracking the health of a port
                provides a considerable optimization of network
                management traffic over the otherwise necessary
```

                    retrieval of the summed counters.

                    Note that rptrMonitorPortRunts is not included
                    in this total; this is because runts usually
                    indicate collision fragments, a normal network
                    event.

                    A discontinuity may occur in the value
                    when the value of object
                    rptrMonitorPortLastChange changes."
            ::= { rptrMonitorPortEntry 15 }

    rptrMonitorPortLastChange OBJECT-TYPE
        SYNTAX   TimeStamp
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The value of sysUpTime when the last of
                the following occurred:
                  1) the agent cold- or warm-started;
                  2) the row for the port was created
                     (such as when a device or module was added
                      to the system); or
                  3) any condition that would cause one of
                     the counters for the row to experience
                     a discontinuity."
            ::= { rptrMonitorPortEntry 16 }

    rptrMonitor100PortTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF RptrMonitor100PortEntry
        MAX-ACCESS not-accessible
        STATUS   current
        DESCRIPTION
                "Table of additional performance and error
                statistics for 100Mb/s ports, above and
                beyond those parameters that apply to both
                10 and 100Mbps ports. Entries exist only for
                ports attached to 100Mbps repeaters.

                The columnar object rptrMonitorPortLastChange
                is used to indicate possible discontinuities
                of counter type columnar objects in this table."
            ::= { rptrMonitorPortInfo 2 }

    rptrMonitor100PortEntry OBJECT-TYPE
        SYNTAX   RptrMonitor100PortEntry
        MAX-ACCESS not-accessible
        STATUS   current

```
          DESCRIPTION
                  "An entry in the table, containing performance
                  and error statistics for a single 100Mb/s port."
          INDEX     { rptrMonitorPortGroupIndex, rptrMonitorPortIndex }
          ::= { rptrMonitor100PortTable 1 }

      RptrMonitor100PortEntry ::=
          SEQUENCE {
              rptrMonitorPortIsolates
                  Counter32,
              rptrMonitorPortSymbolErrors
                  Counter32,
              rptrMonitorPortUpper32Octets
                  Counter32,
              rptrMonitorPortHCReadableOctets
                  Counter64
          }

      rptrMonitorPortIsolates OBJECT-TYPE
          SYNTAX       Counter32
          MAX-ACCESS   read-only
          STATUS       current
          DESCRIPTION
                  "This counter is incremented by one each time that
                  the repeater port automatically isolates as a
                  consequence of false carrier events.  The conditions
                  which cause a port to automatically isolate are
                  defined by the transition from the False Carrier
                  state to the Link Unstable state of the carrier
                  integrity state diagram (figure 27-9)
                  [IEEE 802.3 Standard].

                  Note:  Isolates do not affect the value of
                  the PortOperStatus object.

                  A discontinuity may occur in the value
                  when the value of object
                  rptrMonitorPortLastChange changes."
          REFERENCE
                  "[IEEE 802.3 Mgt], 30.4.3.1.16, aIsolates."
          ::= { rptrMonitor100PortEntry 1 }

      rptrMonitorPortSymbolErrors OBJECT-TYPE
          SYNTAX       Counter32
          MAX-ACCESS   read-only
          STATUS       current
          DESCRIPTION
                  "This counter is incremented by one each time when
```

```
                    valid length packet was received at the port and
                    there was at least one occurrence of an invalid
                    data symbol. This can increment only once per valid
                    carrier event. A collision presence at any port of
                    the repeater containing port N, will not cause this
                    attribute to increment.

                    A discontinuity may occur in the value
                    when the value of object
                    rptrMonitorPortLastChange changes.

                    The approximate minimum time for rollover of this
                    counter is 7.4 hours at 100Mb/s."
            REFERENCE
                    "[IEEE 802.3 Mgt], 30.4.3.1.17,
                    aSymbolErrorDuringPacket."
            ::= { rptrMonitor100PortEntry 2 }

        rptrMonitorPortUpper32Octets OBJECT-TYPE
            SYNTAX      Counter32
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "This object is the number of octets contained in
                    valid frames that have been received on this port,
                    modulo 2**32.  That is, it contains the upper 32
                    bits of a 64-bit octets counter, of which the
                    lower 32 bits are contained in the
                    rptrMonitorPortReadableOctets object.

                    This two-counter mechanism is provided for those
                    network management protocols that do not support
                    64-bit counters (e.g. SNMP V1) and are used to
                    manage a repeater type of 100Mb/s.

                    Conformance clauses for this MIB are defined such
                    that implementation of this object is not required
                    in a system which does not support 100Mb/s.
                    However, systems with mixed 10 and 100Mb/s ports
                    may implement this object across all ports,
                    including 10Mb/s.  If this object is implemented,
                    it must be according to the definition in the first
                    paragraph of this description; that is, the value
                    of this object MUST be a valid count.

                    A discontinuity may occur in the value
                    when the value of object
                    rptrMonitorPortLastChange changes."
```

```
        ::= { rptrMonitor100PortEntry 3 }

rptrMonitorPortHCReadableOctets OBJECT-TYPE
    SYNTAX       Counter64
    MAX-ACCESS  read-only
    STATUS       current
    DESCRIPTION
            "This object is the number of octets contained in
            valid frames that have been received on this port.
            This counter is incremented by OctetCount for each
            frame received on this port which has been
            determined to be a readable frame (i.e., including
            FCS octets but excluding framing bits and dribble
            bits).

            This statistic provides an indicator of the total
            data transferred.

            This counter is a 64-bit version of rptrMonitor-
            PortReadableOctets. It should be used by network
            management protocols which suppport 64-bit counters
            (e.g. SNMPv2).

            Conformance clauses for this MIB are defined such
            that implementation of this object is not required
            in a system which does not support 100Mb/s.
            However, systems with mixed 10 and 100Mb/s ports
            may implement this object across all ports,
            including 10Mb/s.  If this object is implemented,
            it must be according to the definition in the first
            paragraph of this description; that is, the value
            of this object MUST be a valid count.

            A discontinuity may occur in the value
            when the value of object
            rptrMonitorPortLastChange changes."
    REFERENCE
            "[IEEE 802.3 Mgt], 30.4.3.1.5, aReadableOctets."
    ::= { rptrMonitor100PortEntry 4 }


-- New version of statistics at the repeater level.
--
-- Statistics objects for each managed repeater
-- in the system.

rptrMonTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF RptrMonEntry
```

```
     MAX-ACCESS  not-accessible
     STATUS      current
     DESCRIPTION
             "A table of information about each
             non-trivial repeater.  The number of entries
             in this table is the same as the number of
             entries in the rptrInfoTable.

             The columnar object rptrInfoLastChange is
             used to indicate possible discontinuities of
             counter type columnar objects in this table."
     ::= { rptrMonitorAllRptrInfo 1 }

rptrMonEntry OBJECT-TYPE
     SYNTAX      RptrMonEntry
     MAX-ACCESS  not-accessible
     STATUS      current
     DESCRIPTION
             "An entry in the table, containing information
             about a single non-trivial repeater."
     INDEX    { rptrInfoId }
     ::= { rptrMonTable 1 }

RptrMonEntry ::=
     SEQUENCE {
         rptrMonTxCollisions
             Counter32,
         rptrMonTotalFrames
             Counter32,
         rptrMonTotalErrors
             Counter32,
         rptrMonTotalOctets
             Counter32
     }

rptrMonTxCollisions OBJECT-TYPE
     SYNTAX      Counter32
     MAX-ACCESS  read-only
     STATUS      current
     DESCRIPTION
             "For a clause 9 (10Mb/s) repeater, this counter
             is incremented every time the repeater state
             machine enters the TRANSMIT COLLISION state
             from any state other than ONE PORT LEFT
             (Ref: Fig 9-2 [IEEE 802.3 Std]).

             For a clause 27 repeater, this counter is
             incremented every time the repeater core state
```

                    diagram enters the Jam state as a result of
                    Activity(ALL) > 1 (fig 27-2 [IEEE 802.3 Std]).

                    The approximate minimum time for rollover of this
                    counter is 16 hours in a 10Mb/s repeater and 1.6
                    hours in a 100Mb/s repeater."
           REFERENCE
                    "[IEEE 802.3 Mgt], 30.4.1.1.8, aTransmitCollisions"
           ::= { rptrMonEntry 1 }

     rptrMonTotalFrames OBJECT-TYPE
           SYNTAX   Counter32
           MAX-ACCESS   read-only
           STATUS   current
           DESCRIPTION
                    "The number of frames of valid frame length
                    that have been received on the ports in this repeater
                    and for which the FCSError and CollisionEvent
                    signals were not asserted. If an implementation
                    can not obtain a count of frames as seen by
                    the repeater itself, this counter may be
                    implemented as the summation of the values of the
                    rptrMonitorPortReadableFrames counters for all of
                    the ports in the repeater.

                    This statistic provides one of the parameters
                    necessary for obtaining the packet error rate.
                    The approximate minimum time for rollover of this
                    counter is 80 hours in a 10Mb/s repeater."
           ::= { rptrMonEntry 3 }

     rptrMonTotalErrors OBJECT-TYPE
           SYNTAX   Counter32
           MAX-ACCESS   read-only
           STATUS   current
           DESCRIPTION
                    "The total number of errors which have occurred on
                    all of the ports in this repeater. The errors
                    included in this count are the same as those listed
                    for the rptrMonitorPortTotalErrors counter. If an
                    implementation can not obtain a count of these
                    errors as seen by the repeater itself, this counter
                    may be implemented as the summation of the values of
                    the rptrMonitorPortTotalErrors counters for all of
                    the ports in the repeater."
           ::= { rptrMonEntry 4 }

     rptrMonTotalOctets OBJECT-TYPE

```
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The total number of octets contained in the valid
                frames that have been received on the ports in
                this group.  If an implementation can not obtain
                a count of octets as seen by the repeater itself,
                this counter may be the summation of the
                values of the rptrMonitorPortReadableOctets
                counters for all of the ports in the group.

                This statistic provides an indicator of the total
                data transferred.  The approximate minimum time
                for rollover of this counter in a 10Mb/s repeater
                is 58 minutes divided by the number of ports in
                the repeater.

                For 100Mb/s repeaters processing traffic at a
                maximum rate, this counter can roll over in less
                than 6 minutes divided by the number of ports in
                the repeater.  Since that amount of time could
                be less than a management station's poll cycle
                time, in order to avoid a loss of information a
                management station is advised to also poll the
                rptrMonUpper32TotalOctets object, or to use the
                64-bit counter defined by rptrMonHCTotalOctets
                instead of the two 32-bit counters."
        ::= { rptrMonEntry 5 }

    rptrMon100Table OBJECT-TYPE
        SYNTAX      SEQUENCE OF RptrMon100Entry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "A table of additional information about each
                100Mb/s repeater, augmenting the entries in
                the rptrMonTable.  Entries exist in this table
                only for 100Mb/s repeaters.

                The columnar object rptrInfoLastChange is
                used to indicate possible discontinuities of
                counter type columnar objects in this table."
        ::= { rptrMonitorAllRptrInfo 2 }

    rptrMon100Entry OBJECT-TYPE
        SYNTAX      RptrMon100Entry
        MAX-ACCESS  not-accessible
```

```
        STATUS      current
        DESCRIPTION
                "An entry in the table, containing information
                about a single 100Mbps repeater."
        INDEX    { rptrInfoId }
        ::= { rptrMon100Table 1 }

    RptrMon100Entry ::=
        SEQUENCE {
            rptrMonUpper32TotalOctets
                Counter32,
            rptrMonHCTotalOctets
                Counter64
        }


    rptrMonUpper32TotalOctets OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The total number of octets contained in the valid
                frames that have been received on the ports in
                this repeater, modulo 2**32.  That is, it contains
                the upper 32 bits of a 64-bit counter, of which
                the lower 32 bits are contained in the
                rptrMonTotalOctets object.  If an implementation
                can not obtain a count of octets as seen
                by the repeater itself, the 64-bit value
                may be the summation of the values of the
                rptrMonitorPortReadableOctets counters combined
                with the corresponding rptrMonitorPortUpper32Octets
                counters for all of the ports in the repeater.

                This statistic provides an indicator of the total
                data transferred within the repeater.

                This two-counter mechanism is provided for those
                network management protocols that do not support
                64-bit counters (e.g. SNMP V1) and are used to
                manage a repeater type of 100Mb/s.

                Conformance clauses for this MIB are defined such
                that implementation of this object is not required
                in a system which does not support 100Mb/s.
                However, systems with mixed 10 and 100Mb/s ports
                may implement this object across all ports,
                including 10Mb/s.  If this object is implemented,
                it must be according to the definition in the first
```

```
              paragraph of this description; that is, the value
              of this object MUST be a valid count."
      ::= { rptrMon100Entry 1 }

  rptrMonHCTotalOctets OBJECT-TYPE
      SYNTAX       Counter64
      MAX-ACCESS   read-only
      STATUS       current
      DESCRIPTION
              "The total number of octets contained in the valid
              frames that have been received on the ports in
              this group.  If a implementation can not obtain
              a count of octets as seen by the repeater itself,
              this counter may be the summation of the
              values of the rptrMonitorPortReadableOctets
              counters for all of the ports in the group.

              This statistic provides an indicator of the total
              data transferred.

              This counter is a 64-bit (high-capacity) version
              of rptrMonUpper32TotalOctets and rptrMonTotalOctets.
              It should be used by network management protocols
              which support 64-bit counters (e.g. SNMPv2).

              Conformance clauses for this MIB are defined such
              that implementation of this object is not required
              in a system which does not support 100Mb/s.
              However, systems with mixed 10 and 100Mb/s ports
              may implement this object across all ports,
              including 10Mb/s.  If this object is implemented,
              it must be according to the definition in the first
              paragraph of this description; that is, the value
              of this object MUST be a valid count."
       ::= { rptrMon100Entry 2 }


  --
  -- The Repeater Address Search Table
  --
  -- This table provides an active address tracking
  -- capability which can be also used to collect the
  -- necessary information for mapping the topology
  -- of a network.  Note that an NMS is required to have
  -- read-write access to the table in order to access
  -- this function.  Section 4, "Topology Mapping",
  -- contains a description of an algorithm which can
  -- make use of this table, in combination with the
```

     -- forwarding databases of managed bridges/switches
     -- in the network, to map network topology.
     --

     rptrAddrSearchTable OBJECT-TYPE
         SYNTAX   SEQUENCE OF RptrAddrSearchEntry
         MAX-ACCESS not-accessible
         STATUS   current
         DESCRIPTION
                 "This table contains one entry per repeater in the
                 system. It defines objects which allow a network
                 management application to instruct an agent to watch
                 for a given MAC address and report which port it
                 was seen on. Only one address search can be in
                 progress on each repeater at any one time. Before
                 starting an address search, a management application
                 should obtain 'ownership' of the entry in
                 rptrAddrSearchTable for the repeater that is to
                 perform the search. This is accomplished with the
                 rptrAddrSearchLock and rptrAddrSearchStatus as
                 follows:

                 try_again:
                     get(rptrAddrSearchLock, rptrAddrSearchStatus)
                     while (rptrAddrSearchStatus != notInUse)
                     {
                         /* Loop waiting for objects to be available*/
                         short delay
                         get(rptrAddrSearchLock, rptrAddrSearchStatus)
                     }

                     /* Try to claim map objects */
                     lock_value = rptrAddrSearchLock
                     if (set(rptrAddrSearchLock = lock_value,
                             rptrAddrSearchStatus = inUse,
                             rptrAddrSearchOwner = 'my-IP-address)
                           == FAILURE)
                         /* Another manager got the lock */
                         goto try_again

                     /* I have the lock */
                     set (rptrAddrSearchAddress = <search target>)

                     wait for rptrAddrSearchState to change from none

                     if (rptrAddrSearchState == single)
                         get (rptrAddrSearchGroup, rptrAddrSearchPort)

```
                    /* release the lock, making sure not to overwrite
                       anyone else's lock */
                    set (rptrAddrSearchLock = lock_value+1,
                         rptrAddrSearchStatus = notInUse,
                         rptrAddrSearchOwner = '')
```

A management station first retrieves the values of
the appropriate instances of the rptrAddrSearchLock
and rptrAddrSearchStatus objects, periodically
repeating the retrieval if necessary, until the value
of rptrAddrSearchStatus is 'notInUse'. The
management station then tries to set the same
instance of the rptrAddrSearchLock object to the
value it just retrieved, the same instance of the
rptrAddrSearchStatus object to 'inUse', and the
corresponding instance of rptrAddrSearchOwner to a
value indicating itself. If the set operation
succeeds, then the management station has obtained
ownership of the rptrAddrSearchEntry, and the value
of rptrAddrSearchLock is incremented by the agent (as
per the semantics of TestAndIncr). Failure of the
set operation indicates that some other manager has
obtained ownership of the rptrAddrSearchEntry.

Once ownership is obtained, the management station
can proceed with the search operation. Note that the
agent will reset rptrAddrSearchStatus to 'notInUse'
if it has been in the 'inUse' state for an abnormally
long period of time, to prevent a misbehaving manager
from permanently locking the entry. It is suggested
that this timeout period be between one and five
minutes.

When the management station has completed its search
operation, it should free the entry by setting
the instance of the rptrAddrSearchLock object to the
previous value + 1, the instance of the
rptrAddrSearchStatus to 'notInUse', and the instance
of rptrAddrSearchOwner to a zero length string. This
is done to prevent overwriting another station's
lock."
```
        ::= { rptrAddrTrackRptrInfo 1 }

   rptrAddrSearchEntry OBJECT-TYPE
        SYNTAX      RptrAddrSearchEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
```

```
                 "An entry containing objects for invoking an address
                 search on a repeater."
        INDEX      { rptrInfoId }
        ::= { rptrAddrSearchTable 1 }

    RptrAddrSearchEntry ::=
        SEQUENCE {
            rptrAddrSearchLock      TestAndIncr,
            rptrAddrSearchStatus    INTEGER,
            rptrAddrSearchAddress   MacAddress,
            rptrAddrSearchState     INTEGER,
            rptrAddrSearchGroup     Integer32,
            rptrAddrSearchPort      Integer32,
            rptrAddrSearchOwner     OwnerString
        }


    rptrAddrSearchLock OBJECT-TYPE
        SYNTAX     TestAndIncr
        MAX-ACCESS read-write
        STATUS     current
        DESCRIPTION
                "This object is used by a management station as an
                advisory lock for this rptrAddrSearchEntry."
        ::= { rptrAddrSearchEntry 1 }

    rptrAddrSearchStatus  OBJECT-TYPE
        SYNTAX     INTEGER {
                    notInUse(1),
                    inUse(2)
                }
        MAX-ACCESS read-write
        STATUS     current
        DESCRIPTION
                "This object is used to indicate that some management
                station is currently using this rptrAddrSearchEntry.
                Cooperating managers should set this object to
                'notInUse' when they are finished using this entry.
                The agent will automatically set the value of this
                object to 'notInUse' if it has been set to 'inUse'
                for an unusually long period of time."
        ::= { rptrAddrSearchEntry 2 }

    rptrAddrSearchAddress OBJECT-TYPE
        SYNTAX     MacAddress
        MAX-ACCESS read-write
        STATUS     current
        DESCRIPTION
```

                    "This object is used to search for a specified MAC
                    address. When this object is set, an address search
                    begins. This automatically sets the corresponding
                    instance of the rptrAddrSearchState object to 'none'
                    and the corresponding instances of the
                    rptrAddrSearchGroup and rptrAddrSearchPort objects to
                    0.

                    When a valid frame is received by this repeater with
                    a source MAC address which matches the current value
                    of rptrAddrSearchAddress, the agent will update the
                    corresponding instances of rptrAddrSearchState,
                    rptrAddrSearchGroup and rptrAddrSearchPort to reflect
                    the current status of the search, and the group and
                    port on which the frame was seen."
            ::= { rptrAddrSearchEntry 3 }

    rptrAddrSearchState OBJECT-TYPE
        SYNTAX   INTEGER {
                        none(1),
                        single(2),
                        multiple(3)
                    }
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                    "The current state of the MAC address search on this
                    repeater. This object is initialized to 'none' when
                    the corresponding instance of rptrAddrSearchAddress
                    is set. If the agent detects the address on exactly
                    one port, it will set this object to 'single', and
                    set the corresponding instances of
                    rptrAddrSearchGroup and rptrAddrSearchPort to reflect
                    the group and port on which the address was heard.
                    If the agent detects the address on more than one
                    port, it will set this object to 'multiple'."
            ::= { rptrAddrSearchEntry 4 }

    rptrAddrSearchGroup OBJECT-TYPE
        SYNTAX   Integer32 (0..2147483647)
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                    "The group from which an error-free frame whose
                    source address is equal to the corresponding instance
                    of rptrAddrSearchAddress has been received. The
                    value of this object is undefined when the
                    corresponding instance of rptrAddrSearchState is

```
                    equal to 'none' or 'multiple'."
        ::= { rptrAddrSearchEntry 5 }

    rptrAddrSearchPort OBJECT-TYPE
        SYNTAX      Integer32 (0..2147483647)
        MAX-ACCESS read-only
        STATUS      current
        DESCRIPTION
                "The port rom which an error-free frame whose
                source address is equal to the corresponding instance
                of rptrAddrSearchAddress has been received.  The
                value of this object is undefined when the
                corresponding instance of rptrAddrSearchState is
                equal to 'none' or 'multiple'."
        ::= { rptrAddrSearchEntry 6 }

    rptrAddrSearchOwner OBJECT-TYPE
        SYNTAX      OwnerString
        MAX-ACCESS read-write
        STATUS      current
        DESCRIPTION
                "The entity which currently has 'ownership' of this
                rptrAddrSearchEntry."
        ::= { rptrAddrSearchEntry 7 }


    --
    -- The Port Address Tracking Table
    --
    -- This table provides a way for a network management
    -- application to passively gather information (using
    -- read-only privileges) about which network addresses
    -- are connected to which ports of a repeater.
    --

    rptrAddrTrackTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF RptrAddrTrackEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "Table of address mapping information about the
                ports."
        ::= { rptrAddrTrackPortInfo 1 }

    rptrAddrTrackEntry OBJECT-TYPE
        SYNTAX      RptrAddrTrackEntry
        MAX-ACCESS  not-accessible
        STATUS      current
```

```
        DESCRIPTION
                "An entry in the table, containing address mapping
                information about a single port."
        INDEX    { rptrAddrTrackGroupIndex, rptrAddrTrackPortIndex }
        ::= { rptrAddrTrackTable 1 }

    RptrAddrTrackEntry ::=
        SEQUENCE {
            rptrAddrTrackGroupIndex
                INTEGER,
            rptrAddrTrackPortIndex
                INTEGER,
            rptrAddrTrackLastSourceAddress      -- DEPRECATED OBJECT
                MacAddress,
            rptrAddrTrackSourceAddrChanges
                Counter32,
            rptrAddrTrackNewLastSrcAddress
                OptMacAddr,
            rptrAddrTrackCapacity
                Integer32
        }

    rptrAddrTrackGroupIndex OBJECT-TYPE
        SYNTAX      INTEGER (1..2147483647)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "This object identifies the group containing the
                port for which this entry contains information."
        ::= { rptrAddrTrackEntry 1 }

    rptrAddrTrackPortIndex OBJECT-TYPE
        SYNTAX      INTEGER (1..2147483647)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "This object identifies the port within the group
                for which this entry contains information."
        REFERENCE
                "[IEEE 802.3 Mgt], 30.4.3.1.1, aPortID."
        ::= { rptrAddrTrackEntry 2 }

    rptrAddrTrackLastSourceAddress OBJECT-TYPE
        SYNTAX      MacAddress
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "********* THIS OBJECT IS DEPRECATED **********
```

                 This object is the SourceAddress of the last
                 readable frame (i.e., counted by
                 rptrMonitorPortReadableFrames) received by this
                 port.

                 This object has been deprecated because its value
                 is undefined when no frames have been observed on
                 this port. The replacement object is
                 rptrAddrTrackNewLastSrcAddress."
        REFERENCE
                 "[IEEE 802.3 Mgt], 30.4.3.1.18, aLastSourceAddress."
        ::= { rptrAddrTrackEntry 3 }

    rptrAddrTrackSourceAddrChanges OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
                 "This counter is incremented by one for each time
                 that the rptrAddrTrackLastSourceAddress attribute
                 for this port has changed.

                 This may indicate whether a link is connected to a
                 single DTE or another multi-user segment.

                 A discontinuity may occur in the value when the
                 value of object rptrMonitorPortLastChange changes.

                 The approximate minimum time for rollover of this
                 counter is 81 hours in a 10Mb/s repeater."
        REFERENCE
                 "[IEEE 802.3 Mgt], 30.4.3.1.19, aSourceAddressChanges."
        ::= { rptrAddrTrackEntry 4 }

    rptrAddrTrackNewLastSrcAddress OBJECT-TYPE
        SYNTAX   OptMacAddr
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
                 "This object is the SourceAddress of the last
                 readable frame (i.e., counted by
                 rptrMonitorPortReadableFrames) received by this
                 port. If no frames have been received by this
                 port since the agent began monitoring the port
                 activity, the agent shall return a string of
                 length zero."
        REFERENCE
                 "[IEEE 802.3 Mgt], 30.4.3.1.18, aLastSourceAddress."

        ::= { rptrAddrTrackEntry 5 }

    rptrAddrTrackCapacity OBJECT-TYPE
        SYNTAX   Integer32
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The maximum number of addresses that can be
                detected on this port. This value indicates
                to the maximum number of entries in the
                rptrExtAddrTrackTable relative to this port.

                If this object has the value of 1, the agent
                implements only the LastSourceAddress mechanism
                described by RFC 1368 or RFC 1516."
        ::= { rptrAddrTrackEntry 6 }

    -- Table for multiple addresses per port

    rptrExtAddrTrackTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF RptrExtAddrTrackEntry
        MAX-ACCESS not-accessible
        STATUS   current
        DESCRIPTION
                "A table to extend the address tracking table (i.e.,
                rptrAddrTrackTable) with a list of source MAC
                addresses that were recently received on each port.
                The number of ports is the same as the number
                of entries in table rptrPortTable. The number of
                entries in this table depends on the agent/repeater
                implementation and the number of different
                addresses received on each port.

                The first entry for each port contains
                the same MAC address that is given by the
                rptrAddrTrackNewLastSrcAddress for that port.

                Entries in this table for a particular port are
                retained when that port is switched from one
                repeater to another.

                The ordering of MAC addresses listed for a
                particular port is implementation dependent."
        ::= { rptrAddrTrackPortInfo 2 }

    rptrExtAddrTrackEntry OBJECT-TYPE
        SYNTAX   RptrExtAddrTrackEntry

```
     MAX-ACCESS  not-accessible
     STATUS      current
     DESCRIPTION
             "A row in the table of extended address tracking
             information for ports. Entries can not be directly
             created or deleted via SNMP operations."
     INDEX       { rptrAddrTrackGroupIndex,
                   rptrAddrTrackPortIndex,
                   rptrExtAddrTrackMacIndex }
     ::= { rptrExtAddrTrackTable 1 }

 RptrExtAddrTrackEntry ::= SEQUENCE {
     rptrExtAddrTrackMacIndex Integer32,
     rptrExtAddrTrackSourceAddress MacAddress
     }

 rptrExtAddrTrackMacIndex OBJECT-TYPE
     SYNTAX      Integer32 (1..2147483647)
     MAX-ACCESS  read-only
     STATUS      current
     DESCRIPTION
             "The index of a source MAC address seen on
             the port.

             The ordering of MAC addresses listed for a
             particular port is implementation dependent.

             There is no implied relationship between a
             particular index and a particular MAC
             address.  The index for a particular MAC
             address may change without notice."
     ::= { rptrExtAddrTrackEntry 1 }

 rptrExtAddrTrackSourceAddress OBJECT-TYPE
     SYNTAX      MacAddress
     MAX-ACCESS  read-only
     STATUS      current
     DESCRIPTION
             "The source MAC address from a readable frame
             (i.e., counted by rptrMonitorPortReadableFrames)
             recently received by the port."
     REFERENCE
             "[IEEE 802.3 Mgt], 30.4.3.1.18, aLastSourceAddress."
     ::= { rptrExtAddrTrackEntry 2 }


 -- The Repeater Top "N" Port Group
```

```
    -- The Repeater Top N Port group is used to prepare reports that
    -- describe a list of ports ordered by one of the statistics in the
    -- Repeater Monitor Port Table.  The statistic chosen by the
    -- management station is sampled over a management
    -- station-specified time interval, making the report rate based.
    -- The management station also specifies the number of ports that
    -- are reported.
    --
    -- The rptrTopNPortControlTable is used to initiate the generation
    -- of a report.  The management station may select the parameters
    -- of such a report, such as which repeater, which statistic, how
    -- many ports, and the start & stop times of the sampling.  When
    -- the report is prepared, entries are created in the
    -- rptrTopNPortTable associated with the relevent
    -- rptrTopNControlEntry.  These entries are static for
    -- each report after it has been prepared.

    -- Note that counter discontinuities may appear in some
    -- implementations if ports' assignment to repeaters changes
    -- during the collection of data for a Top "N" report.
    -- A management application could read the corresponding
    -- rptrMonitorPortLastChange timestamp in order to check
    -- whether a discontinuity occurred.


    rptrTopNPortControlTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF RptrTopNPortControlEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "A table of control records for reports on the top 'N'
            ports for the rate of a selected counter. The number
            of entries depends on the configuration of the agent.
            The maximum number of entries is implementation
            dependent."
        ::= { rptrTopNPortInfo 1 }

    rptrTopNPortControlEntry OBJECT-TYPE
        SYNTAX      RptrTopNPortControlEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "A set of parameters that control the creation of a
                report of the top N ports according to several metrics."
        INDEX    { rptrTopNPortControlIndex }
        ::= { rptrTopNPortControlTable 1 }

    RptrTopNPortControlEntry ::= SEQUENCE {
```

```
        rptrTopNPortControlIndex
            Integer32,
        rptrTopNPortRepeaterId
            Integer32,
        rptrTopNPortRateBase
            INTEGER,
        rptrTopNPortTimeRemaining
            Integer32,
        rptrTopNPortDuration
            Integer32,
        rptrTopNPortRequestedSize
            Integer32,
        rptrTopNPortGrantedSize
            Integer32,
        rptrTopNPortStartTime
            TimeStamp,
        rptrTopNPortOwner
            OwnerString,
        rptrTopNPortRowStatus
            RowStatus
    }

    rptrTopNPortControlIndex OBJECT-TYPE
        SYNTAX      Integer32 (1 .. 65535)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "An index that uniquely identifies an entry in the
                rptrTopNPortControl table.  Each such entry defines
                one top N report prepared for a repeater or system."
        ::= { rptrTopNPortControlEntry 1 }

    rptrTopNPortRepeaterId OBJECT-TYPE
        SYNTAX      Integer32 (0..2147483647)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "Identifies the repeater for which a top N report will
                be prepared (see rptrInfoId).  If the value of this
                object is positive, only ports assigned to this repeater
                will be used to form the list in which to order the
                Top N table.  If this value is zero, all ports will be
                eligible for inclusion on the list.

                The value of this object may not be modified if the
                associated rptrTopNPortRowStatus object is equal to
                active(1).
```

                   If, for a particular row in this table, the repeater
                   specified by the value of this object goes away (is
                   removed from the rptrInfoTable) while the associated
                   rptrTopNPortRowStatus object is equal to active(1),
                   the row in this table is preserved by the agent but
                   the value of rptrTopNPortRowStatus is changed to
                   notInService(2), and the agent may time out the row
                   if appropriate. If the specified repeater comes
                   back (reappears in the rptrInfoTable) before the row
                   has been timed out, the management station must set
                   the value of the rptrTopNPortRowStatus object back
                   to active(1) if desired (the agent doesn't do this
                   automatically)."
            ::= { rptrTopNPortControlEntry 2 }

      rptrTopNPortRateBase OBJECT-TYPE
          SYNTAX   INTEGER {
                       readableFrames(1),
                       readableOctets(2),
                       fcsErrors(3),
                       alignmentErrors(4),
                       frameTooLongs(5),
                       shortEvents(6),
                       runts(7),
                       collisions(8),
                       lateEvents(9),
                       veryLongEvents(10),
                       dataRateMismatches(11),
                       autoPartitions(12),
                       totalErrors(13),
                       isolates(14),
                       symbolErrors(15)
                   }
          MAX-ACCESS read-create
          STATUS   current
          DESCRIPTION
                   "The monitored variable, which the rptrTopNPortRate
                   variable is based upon.

                   The value of this object may not be modified if
                   the associated rptrTopNPortRowStatus object has
                   a value of active(1)."
            ::= { rptrTopNPortControlEntry 3 }

   rptrTopNPortTimeRemaining OBJECT-TYPE
          SYNTAX   Integer32 (0..2147483647)
          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
                rptrTopNPortDuration object.

                When this object is set to a non-zero value,
                any associated rptrTopNPortEntries shall be
                made inaccessible by the agent. While the value
                of this object is non-zero, it decrements by one
                per second until it reaches zero. During this
                time, all associated rptrTopNPortEntries shall
                remain inaccessible. At the time that this object
                decrements to zero, the report is made accessible
                in the rptrTopNPortTable. Thus, the rptrTopNPort
                table needs to be created only at the end of the
                collection interval.

                If the value of this object is set to zero
                while the associated report is running, the
                running report is aborted and no associated
                rptrTopNPortEntries are created."
        DEFVAL { 0 }
        ::= { rptrTopNPortControlEntry 4 }

    rptrTopNPortDuration OBJECT-TYPE
        SYNTAX   Integer32 (0..2147483647)
        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 rptrTopNPortTimeRemaining
                object is set, this object shall be set by the
                agent to the same value and shall not be modified
                until the next time the rptrTopNPortTimeRemaining
                is set.

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

```
        ::= { rptrTopNPortControlEntry 5 }

rptrTopNPortRequestedSize OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The maximum number of repeater ports requested
            for the Top N Table.

            When this object is created or modified, the
            agent should set rptrTopNPortGrantedSize as close
            to this object as is possible for the particular
            implementation and available resources."
    DEFVAL { 10 }
    ::= { rptrTopNPortControlEntry 6 }

rptrTopNPortGrantedSize OBJECT-TYPE
    SYNTAX      Integer32 (0..65535)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The maximum number of repeater ports in the
            top N table.

            When the associated rptrTopNPortRequestedSize object is
            created or modified, the agent should set this object as
            closely to the requested value as is possible for the
            particular implementation and available resources.  The
            agent must not lower this value except as a result of a
            set to the associated rptrTopNPortRequestedSize object."
    ::= { rptrTopNPortControlEntry 7 }

rptrTopNPortStartTime OBJECT-TYPE
    SYNTAX      TimeStamp
    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 rptrTopNPortTimeRemaining object was
            modified to start the requested report.

            If the report has not yet been started, the value
            of this object is zero."
    ::= { rptrTopNPortControlEntry 8 }

rptrTopNPortOwner OBJECT-TYPE
```

```
        SYNTAX      OwnerString
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The entity that configured this entry and is
                using the resources assigned to it."
        ::= { rptrTopNPortControlEntry 9 }

    rptrTopNPortRowStatus OBJECT-TYPE
        SYNTAX      RowStatus
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The status of this row.

                If the value of this object is not equal to
                active(1), all associated entries in the
                rptrTopNPortTable shall be deleted by the
                agent."
        ::= { rptrTopNPortControlEntry 10 }


    -- Top "N" reports

    rptrTopNPortTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF RptrTopNPortEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "A table of reports for the top 'N' ports based on
                setting of associated control table entries. The
                maximum number of entries depends on the number
                of entries in table rptrTopNPortControlTable and
                the value of object rptrTopNPortGrantedSize for
                each entry.

                For each entry in the rptrTopNPortControlTable,
                repeater ports with the highest value of
                rptrTopNPortRate shall be placed in this table
                in decreasing order of that rate until there is
                no more room or until there are no more ports."
        ::= { rptrTopNPortInfo 2 }

    rptrTopNPortEntry OBJECT-TYPE
        SYNTAX      RptrTopNPortEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
```

```
                  "A set of statistics for a repeater port that is
                  part of a top N report."
          INDEX     { rptrTopNPortControlIndex,
                      rptrTopNPortIndex }
          ::= { rptrTopNPortTable 1 }

    RptrTopNPortEntry ::= SEQUENCE {
        rptrTopNPortIndex
            Integer32,
        rptrTopNPortGroupIndex
            Integer32,
        rptrTopNPortPortIndex
            Integer32,
        rptrTopNPortRate
            Gauge32
    }

    rptrTopNPortIndex OBJECT-TYPE
        SYNTAX      Integer32 (1..65535)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "An index that uniquely identifies an entry in
                the rptrTopNPort table among those in the same
                report.  This index is between 1 and N, where N
                is the number of entries in this report.  Increasing
                values of rptrTopNPortIndex shall be assigned to
                entries with decreasing values of rptrTopNPortRate
                until index N is assigned to the entry with the
                lowest value of rptrTopNPortRate or there are no
                more rptrTopNPortEntries.

                No ports are included in a report where their
                value of rptrTopNPortRate would be zero."
        ::= { rptrTopNPortEntry 1 }

    rptrTopNPortGroupIndex OBJECT-TYPE
        SYNTAX      Integer32  (1..2147483647)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "This object identifes the group containing
                the port for this entry. (See also object
                type rptrGroupIndex.)"
        ::= { rptrTopNPortEntry 2 }

    rptrTopNPortPortIndex OBJECT-TYPE
        SYNTAX      Integer32 (1..2147483647)
```

```
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The index of the repeater port.
            (See object type rptrPortIndex.)"
        ::= { rptrTopNPortEntry 3 }

    rptrTopNPortRate OBJECT-TYPE
        SYNTAX      Gauge32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The amount of change in the selected variable
                during this sampling interval for the identified
                port.  The selected variable is that port's
                instance of the object selected by
                rptrTopNPortRateBase."
        ::= { rptrTopNPortEntry 4 }



    -- Notifications for use by Repeaters

    rptrHealth NOTIFICATION-TYPE
        OBJECTS     { rptrOperStatus }
        STATUS      deprecated
        DESCRIPTION
                "********* THIS OBJECT IS DEPRECATED **********

                In a system containing a single managed repeater,
                the rptrHealth notification conveys information
                related to the operational status of the repeater.
                It is sent either when the value of
                rptrOperStatus changes, or upon completion of a
                non-disruptive test.

                The rptrHealth notification must contain the
                rptrOperStatus object.  The agent may optionally
                include the rptrHealthText object in the varBind
                list.  See the rptrOperStatus and rptrHealthText
                objects for descriptions of the information that
                is sent.

                The agent must throttle the generation of
                consecutive rptrHealth traps so that there is at
                least a five-second gap between traps of this
                type.  When traps are throttled, they are dropped,
                not queued for sending at a future time.  (Note
```

```
                     that 'generating' a trap means sending to all
                     configured recipients.)"
          REFERENCE
                     "[IEEE 802.3 Mgt], 30.4.1.3.1, nRepeaterHealth
                     notification."
          ::= { snmpDot3RptrMgt 0 1 }

     rptrGroupChange NOTIFICATION-TYPE
          OBJECTS     { rptrGroupIndex }
          STATUS      deprecated
          DESCRIPTION
                     "********** THIS OBJECT IS DEPRECATED **********

                     In a system containing a single managed repeater,
                     this notification is sent when a change occurs in the
                     group structure of the repeater.  This occurs only
                     when a group is logically or physically removed
                     from or added to a repeater.  The varBind list
                     contains the identifier of the group that was
                     removed or added.

                     The agent must throttle the generation of
                     consecutive rptrGroupChange traps for the same
                     group so that there is at least a five-second gap
                     between traps of this type.  When traps are
                     throttled, they are dropped, not queued for
                     sending at a future time.  (Note that 'generating'
                     a trap means sending to all configured
                     recipients.)"
          REFERENCE
                     "[IEEE 802.3 Mgt], 30.4.1.3.3, nGroupMapChange
                     notification."
          ::= { snmpDot3RptrMgt 0 2 }

     rptrResetEvent NOTIFICATION-TYPE
          OBJECTS     { rptrOperStatus }
          STATUS      deprecated
          DESCRIPTION
                     "********** THIS OBJECT IS DEPRECATED **********

                     In a system containing a single managed repeater-unit,
                     the rptrResetEvent notification conveys information
                     related to the operational status of the repeater.
                     This trap is sent on completion of a repeater
                     reset action.  A repeater reset action is defined
                     as an a transition to the START state of Fig 9-2
                     in section 9 [IEEE 802.3 Std], when triggered by a
                     management command (e.g., an SNMP Set on the
```

                rptrReset object).

                The agent must throttle the generation of
                consecutive rptrResetEvent traps so that there is
                at least a five-second gap between traps of this
                type. When traps are throttled, they are dropped,
                not queued for sending at a future time. (Note
                that 'generating' a trap means sending to all
                configured recipients.)

                The rptrResetEvent trap is not sent when the agent
                restarts and sends an SNMP coldStart or warmStart
                trap. However, it is recommended that a repeater
                agent send the rptrOperStatus object as an
                optional object with its coldStart and warmStart
                trap PDUs.

                The rptrOperStatus object must be included in the
                varbind list sent with this trap. The agent may
                optionally include the rptrHealthText object as
                well."
          REFERENCE
                "[IEEE 802.3 Mgt], 30.4.1.3.2, nRepeaterReset
                notification."
           ::= { snmpDot3RptrMgt 0 3 }

   -- Notifications for repeaters in a multiple-repeater implementation.
   -- An implementation may send either the single-repeater OR
   -- multiple-repeater version of these notifications (1 or 4; 2 or 5)
   -- but not both.

   rptrInfoHealth NOTIFICATION-TYPE
       OBJECTS   { rptrInfoOperStatus }
       STATUS   current
       DESCRIPTION
                "In a system containing multiple managed repeaters,
                the rptrInfoHealth notification conveys information
                related to the operational status of a repeater.
                It is sent either when the value of rptrInfoOperStatus
                changes, or upon completion of a non-disruptive test.

                The agent must throttle the generation of
                consecutive rptrInfoHealth notifications for
                the same repeater so that there is at least
                a five-second gap between notifications of this type.
                When notifications are throttled, they are dropped,
                not queued for sending at a future time. (Note

                    that 'generating' a notification means sending
                    to all configured recipients.)"
            REFERENCE
                    "[IEEE 802.3 Mgt], 30.4.1.3.1, nRepeaterHealth
                    notification."
            ::= { snmpDot3RptrMgt 0 4 }

    rptrInfoResetEvent NOTIFICATION-TYPE
        OBJECTS   { rptrInfoOperStatus }
        STATUS   current
        DESCRIPTION
                "In a system containing multiple managed
                repeaters, the rptrInfoResetEvent notification
                conveys information related to the operational
                status of a repeater. This notification is sent
                on completion of a repeater reset action. A
                repeater reset action is defined as a transition
                to the START state of Fig 9-2 in section 9 of
                [IEEE 802.3 Std], when triggered by a management
                command (e.g., an SNMP Set on the rptrInfoReset
                object).

                The agent must throttle the generation of
                consecutive rptrInfoResetEvent notifications for
                a single repeater so that there is at least
                a five-second gap between notifications of
                this type. When notifications are throttled,
                they are dropped, not queued for sending at
                a future time. (Note that 'generating' a
                notification means sending to all configured
                recipients.)

                The rptrInfoResetEvent is not sent when the
                agent restarts and sends an SNMP coldStart or
                warmStart trap. However, it is recommended that
                a repeater agent send the rptrInfoOperStatus
                object as an optional object with its coldStart
                and warmStart trap PDUs."
        REFERENCE
                "[IEEE 802.3 Mgt], 30.4.1.3.2, nRepeaterReset
                notification."
            ::= { snmpDot3RptrMgt 0 5 }

    -- Conformance information

    snmpRptrModConf
            OBJECT IDENTIFIER ::= { snmpRptrMod 1 }

        snmpRptrModCompls
              OBJECT IDENTIFIER ::= { snmpRptrModConf 1 }
        snmpRptrModObjGrps
              OBJECT IDENTIFIER ::= { snmpRptrModConf 2 }
        snmpRptrModNotGrps
              OBJECT IDENTIFIER ::= { snmpRptrModConf 3 }

    -- Object groups

    snmpRptrGrpBasic1516 OBJECT-GROUP
        OBJECTS   { rptrGroupCapacity,
                        rptrOperStatus,
                        rptrHealthText,
                        rptrReset,
                        rptrNonDisruptTest,
                        rptrTotalPartitionedPorts,

                        rptrGroupIndex,
                        rptrGroupDescr,
                        rptrGroupObjectID,
                        rptrGroupOperStatus,
                        rptrGroupLastOperStatusChange,
                        rptrGroupPortCapacity,

                        rptrPortGroupIndex,
                        rptrPortIndex,
                        rptrPortAdminStatus,
                        rptrPortAutoPartitionState,
                        rptrPortOperStatus }
        STATUS   deprecated
        DESCRIPTION
            "********* THIS GROUP IS DEPRECATED **********

            Basic group from RFCs 1368 and 1516.

            NOTE: this object group is DEPRECATED and replaced
                  with snmpRptrGrpBasic."
        ::= { snmpRptrModObjGrps 1 }

    snmpRptrGrpMonitor1516 OBJECT-GROUP
        OBJECTS   { rptrMonitorTransmitCollisions,

                        rptrMonitorGroupIndex,
                        rptrMonitorGroupTotalFrames,
                        rptrMonitorGroupTotalOctets,
                        rptrMonitorGroupTotalErrors,

```
                       rptrMonitorPortGroupIndex,
                       rptrMonitorPortIndex,
                       rptrMonitorPortReadableFrames,
                       rptrMonitorPortReadableOctets,
                       rptrMonitorPortFCSErrors,
                       rptrMonitorPortAlignmentErrors,
                       rptrMonitorPortFrameTooLongs,
                       rptrMonitorPortShortEvents,
                       rptrMonitorPortRuns,
                       rptrMonitorPortCollisions,
                       rptrMonitorPortLateEvents,
                       rptrMonitorPortVeryLongEvents,
                       rptrMonitorPortDataRateMismatches,
                       rptrMonitorPortAutoPartitions,
                       rptrMonitorPortTotalErrors }
         STATUS      deprecated
         DESCRIPTION
             "********** THIS GROUP IS DEPRECATED **********

             Monitor group from RFCs 1368 and 1516.

             NOTE: this object group is DEPRECATED and replaced
                   with snmpRptrGrpMonitor."
         ::= { snmpRptrModObjGrps 2 }

     snmpRptrGrpAddrTrack1368 OBJECT-GROUP
         OBJECTS     { rptrAddrTrackGroupIndex,
                       rptrAddrTrackPortIndex,
                       rptrAddrTrackLastSourceAddress,
                       rptrAddrTrackSourceAddrChanges }
         STATUS      obsolete
         DESCRIPTION
             "Address tracking group from RFC 1368.

             NOTE: this object group is OBSOLETE and replaced
                   with snmpRptrGrpAddrTrack1516."
         ::= { snmpRptrModObjGrps 3 }

     snmpRptrGrpAddrTrack1516 OBJECT-GROUP
         OBJECTS     { rptrAddrTrackGroupIndex,
                       rptrAddrTrackPortIndex,
                       rptrAddrTrackLastSourceAddress,
                       rptrAddrTrackSourceAddrChanges,
                       rptrAddrTrackNewLastSrcAddress }
         STATUS      deprecated
         DESCRIPTION
             "********** THIS GROUP IS DEPRECATED **********
```

          Address tracking group from RFC 1516.

          NOTE: this object group is DEPRECATED and
                replaced with snmpRptrGrpAddrTrack."
      ::= { snmpRptrModObjGrps 4 }

   snmpRptrGrpBasic OBJECT-GROUP
       OBJECTS   { rptrGroupIndex,
                       rptrGroupObjectID,
                       rptrGroupOperStatus,
                       rptrGroupPortCapacity,

                       rptrPortGroupIndex,
                       rptrPortIndex,
                       rptrPortAdminStatus,
                       rptrPortAutoPartitionState,
                       rptrPortOperStatus,
                       rptrPortRptrId,

                       rptrInfoId,
                       rptrInfoRptrType,
                       rptrInfoOperStatus,
                       rptrInfoReset,
                       rptrInfoPartitionedPorts,
                       rptrInfoLastChange }
       STATUS   current
       DESCRIPTION
           "Basic group for a system with one or more
           repeater-units in multi-segment (post-RFC 1516)
           version of the MIB module."
       ::= { snmpRptrModObjGrps 5 }

   snmpRptrGrpMonitor OBJECT-GROUP
       OBJECTS   { rptrMonitorPortGroupIndex,
                       rptrMonitorPortIndex,
                       rptrMonitorPortReadableFrames,
                       rptrMonitorPortReadableOctets,
                       rptrMonitorPortFCSErrors,
                       rptrMonitorPortAlignmentErrors,
                       rptrMonitorPortFrameTooLongs,
                       rptrMonitorPortShortEvents,
                       rptrMonitorPortRunts,
                       rptrMonitorPortCollisions,
                       rptrMonitorPortLateEvents,
                       rptrMonitorPortVeryLongEvents,
                       rptrMonitorPortDataRateMismatches,
                       rptrMonitorPortAutoPartitions,
                       rptrMonitorPortTotalErrors,

```
                        rptrMonitorPortLastChange,

                        rptrMonTxCollisions,
                        rptrMonTotalFrames,
                        rptrMonTotalErrors,
                        rptrMonTotalOctets }
        STATUS      current
        DESCRIPTION
            "Monitor group for a system with one or more
            repeater-units in multi-segment (post-RFC 1516)
            version of the MIB module."
        ::= { snmpRptrModObjGrps 6 }

    snmpRptrGrpMonitor100 OBJECT-GROUP
        OBJECTS     { rptrMonitorPortIsolates,
                        rptrMonitorPortSymbolErrors,
                        rptrMonitorPortUpper32Octets,

                        rptrMonUpper32TotalOctets }
        STATUS      current
        DESCRIPTION
            "Monitor group for 100Mb/s ports and repeaters
            in a system with one or more repeater-units in
            multi-segment (post-RFC 1516) version of the MIB
            module.  Systems which support Counter64 should
            also implement snmpRptrGrpMonitor100w64."
        ::= { snmpRptrModObjGrps 7 }

    snmpRptrGrpMonitor100w64 OBJECT-GROUP
        OBJECTS     { rptrMonitorPortHCReadableOctets,
                        rptrMonHCTotalOctets }
        STATUS      current
        DESCRIPTION
            "Monitor group for 100Mb/s ports and repeaters in a
            system with one or more repeater-units and support
            for Counter64."
        ::= { snmpRptrModObjGrps 8 }

    snmpRptrGrpAddrTrack OBJECT-GROUP
        OBJECTS     { rptrAddrTrackGroupIndex,
                        rptrAddrTrackPortIndex,
                        rptrAddrTrackSourceAddrChanges,
                        rptrAddrTrackNewLastSrcAddress,
                        rptrAddrTrackCapacity }
        STATUS      current
        DESCRIPTION
            "Passive address tracking group for post-RFC 1516
            version of the MIB module."
```

```
        ::= { snmpRptrModObjGrps 9 }

    snmpRptrGrpExtAddrTrack OBJECT-GROUP
        OBJECTS     { rptrExtAddrTrackMacIndex,
                      rptrExtAddrTrackSourceAddress }
        STATUS      current
        DESCRIPTION
            "Extended passive address tracking group for
            a system with one or more repeater-units in
            post-RFC 1516 version of the MIB module."
        ::= { snmpRptrModObjGrps 10 }

    snmpRptrGrpRptrAddrSearch OBJECT-GROUP
        OBJECTS     { rptrAddrSearchLock,
                      rptrAddrSearchStatus,
                      rptrAddrSearchAddress,
                      rptrAddrSearchState,
                      rptrAddrSearchGroup,
                      rptrAddrSearchPort,
                      rptrAddrSearchOwner }
        STATUS      current
        DESCRIPTION
            "Active MAC address search group and topology
            mapping support for repeaters."
        ::= { snmpRptrModObjGrps 11 }

    snmpRptrGrpTopNPort OBJECT-GROUP
        OBJECTS     { rptrTopNPortControlIndex,
                      rptrTopNPortRepeaterId,
                      rptrTopNPortRateBase,
                      rptrTopNPortTimeRemaining,
                      rptrTopNPortDuration,
                      rptrTopNPortRequestedSize,
                      rptrTopNPortGrantedSize,
                      rptrTopNPortStartTime,
                      rptrTopNPortOwner,
                      rptrTopNPortRowStatus,
                      rptrTopNPortIndex,
                      rptrTopNPortGroupIndex,
                      rptrTopNPortPortIndex,
                      rptrTopNPortRate }
        STATUS      current
        DESCRIPTION
            "Top 'N' group for repeater ports."
        ::= { snmpRptrModObjGrps 12 }


    -- Compliances
```

    snmpRptrModComplRFC1368 MODULE-COMPLIANCE
        STATUS   obsolete
        DESCRIPTION
            "Compliance for RFC 1368.

            NOTE: this module compliance is OBSOLETE and
                  replaced by snmpRptrModComplRFC1516."

        MODULE -- this module
            MANDATORY-GROUPS { snmpRptrGrpBasic1516 }

            GROUP snmpRptrGrpMonitor1516
            DESCRIPTION
                "Implementation of this optional group is
                recommended for systems which have the
                instrumentation to do performance monitoring."

            GROUP snmpRptrGrpAddrTrack1368
            DESCRIPTION
                "Implementation of this group is
                recommended for systems which have
                the necessary instrumentation."

        ::= { snmpRptrModCompls 1 }

    snmpRptrModComplRFC1516 MODULE-COMPLIANCE
        STATUS   deprecated
        DESCRIPTION
            "********* THIS COMPLIANCE IS DEPRECATED **********

            Compliance for RFC 1516 and for backwards
            compatibility with single-repeater,
            10Mb/s-only implementations."

        MODULE -- this module
            MANDATORY-GROUPS { snmpRptrGrpBasic1516 }

            GROUP snmpRptrGrpMonitor1516
            DESCRIPTION
                "Implementation of this optional group is
                recommended for systems which have the
                instrumentation to do performance monitoring."

            GROUP snmpRptrGrpAddrTrack1516
            DESCRIPTION
                "Implementation of this group is
                recommended for systems which have
                the necessary instrumentation."

```
        ::= { snmpRptrModCompls 2 }

snmpRptrModCompl MODULE-COMPLIANCE
    STATUS      current
    DESCRIPTION
        "Compliance for the multi-segment version of the
        MIB module for a system with one or more
        repeater-units."

    MODULE -- this module
        MANDATORY-GROUPS { snmpRptrGrpBasic,
                           snmpRptrGrpMonitor,
                           snmpRptrGrpAddrTrack }

        GROUP snmpRptrGrpMonitor100
        DESCRIPTION
            "Implementation of this group is
            mandatory for managed systems which
            contain 100Mb/s repeaters."

        GROUP snmpRptrGrpMonitor100w64
        DESCRIPTION
            "Implementation of this group is
            mandatory for managed systems which
            contain 100Mb/s repeaters and which
            can support Counter64."

        GROUP snmpRptrGrpExtAddrTrack
        DESCRIPTION
            "Implementation of this group is
            recommended for systems which have
            the necessary instrumentation to track
            MAC addresses of multiple DTEs attached
            to a single repeater port."

        GROUP snmpRptrGrpRptrAddrSearch
        DESCRIPTION
            "Implementation of this group is
            recommended for systems which allow
            read-write access and which have
            the necessary instrumentation to
            search all incoming data streams
            for a particular MAC address."

        GROUP snmpRptrGrpTopNPort
        DESCRIPTION
            "Implementation of this group is
            recommended for systems which have
```

```
                 the necessary resources to support
                 TopN statistics reporting."

        ::= { snmpRptrModCompls 3 }


   END
```
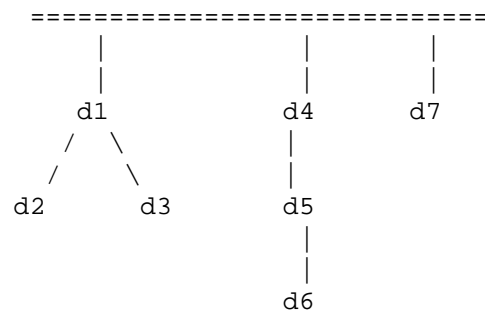
4. Topology Mapping

   The network mapping algorithm presented below takes information
   available from network devices such as repeaters, bridges, and
   switches, and creates a representation of the physical topology of
   the network.

   Networking devices connect to the network via one or more ports.
   Through these ports, the device is capable of hearing network packets
   sent by other devices. By looking the source address in the packet,
   and identifying which port the packet was heard on, the device can
   provide information to a Network Management System about the location
   of an address in the network, relative to that device. For devices
   such as bridges and switches, the association of address to port can
   be retrieved via the forwarding data base part of the Bridge MIB.
   For repeaters, the rptrAddrSearchTable may be used to perform the
   association.

   Given this information, it would be possible for the NMS to create a
   topology of the network which represents the physical relationships
   of the devices in the networks. The following is an example of how
   this might be done:

   Assume the network:

```
              ===============================
                 |             |        |
                 |             |        |
                d1            d4       d7
               /  \            |
              /    \           |
            d2      d3        d5
                               |
                               |
                              d6
```

   The discovery process would first determine the existence of the
   network devices and nodes in the network. In the above example, the
   network devices discovered would be:

                       d1,d2,d3,d4,d5,d6,d7

   From this list of discovered devices, select (arbitrarily or via some
   heuristic) a device as the starting point. From that device,
   determine where all other devices are located in the network with
   respect to the selected device.

For example, if d1 is the selected device, the network in relation to
d1 would look like:

```
         d1
        / | \
       /  |  \
     d2   d3   d4,d5,d6,d7
```
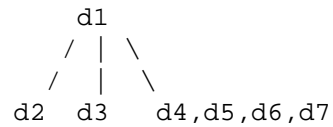
So d1 sees d2 on one port, d3 on another port, and d4, d5, and d6 on
the third port. In other words, using the rptrAddrSearchTable (if d1
is a repeater) or the Forwarding Database (if it is a bridge or a
switch), d1 has located d2 on one port, d1 has located d3 on another
port, and finally, d1 has located d4, d5, d6, and d7 on yet another
port.

After the first step of the algorithm is accomplished, the next and
final step is a recursive one. Go to each of these temporary
'segments' (e.g., the segment connecting d1 and d2, or the segment
connecting d1 and d3, or the segment connecting d1, d4, d5, d6, and
d7) and determine which of these devices really belongs in that
segment.

As new segments are created due to this process, the recursive
algorithm visits them, and performs the exact same process.

In the example, the segments connecting d1 and d2, and connecting d1
and d3, require no further scrutiny, since there are only two nodes
in those segments. However, the segment connecting d1, d4, d5, d6,
and d7 may prove to be one or more segments, so we will investigate
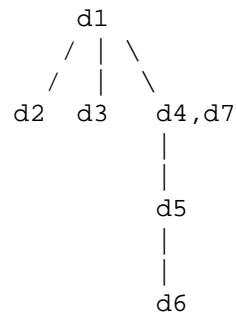it.

The purpose of this step is to determine which devices are really
connected to this segment, and which are actually connected
downstream. This is done by giving each of the child devices in the
segment (d4, d5, d6, and d7) a chance to eliminate each of the others
from the segment.

A device eliminates another device by showing that it hears the
parent device (in this case, d1) on one port, and the other device on
another port (different from the port on which it heard the parent).
If this is true, then it must mean that that device is _between_ the
parent device and the device which is being eliminated.

In the example, we can see that device d4 can eliminate both d5 and
d6, , but nobody can eliminate d4 and d7, because everybody hears
them on the same port that they hear the parent device (d1). So the
resulting topology looks like:

```
              d1
            / | \
           /  |  \
         d2  d3   d4,d7
                    |
                    |
                  d5,d6
```
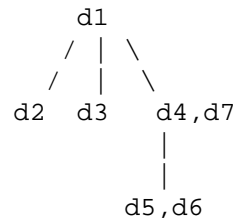
Next the algorithm visits the next segment, which is the one
connecting d4, d5, and d6. Using the process stated above, d5 can
eliminate d6, since it hears d4 on a different port from where it
hears d6. Finally, the topology looks like:

```
              d1
            / | \
           /  |  \
         d2  d3   d4,d7
                    |
                    |
                   d5
                    |
                    |
                   d6
```
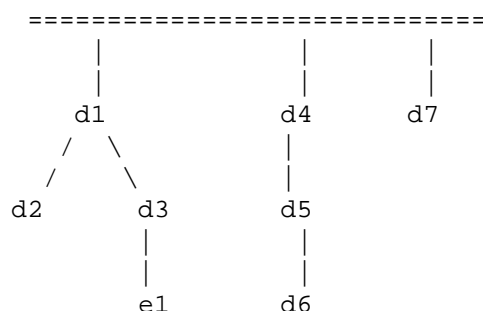
This is actually the topology shown at the beginning of the
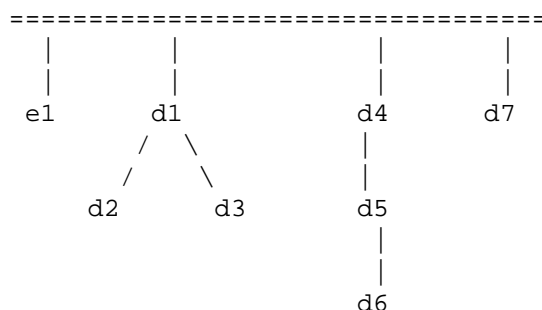description.

With this information about how the network devices are connected, it
is a relatively simple extension to then place nodes such as
workstations and PCs in the network. This can be done by placing the
node into a segment, then allowing the network devices to show that
the node is really not part of that segment.

This elimination can be done because the devices know what port
connects them to the segment on which the node is temporarily placed.
If they actually hear the node on a different port than that which
connects the device to the segment, then the node must be downstream,
and so it is moved onto the downstream segment. Then that segment is
evaluated, and so forth. Eventually, no device can show that the
node is connected downstream, and so it must be attached to that
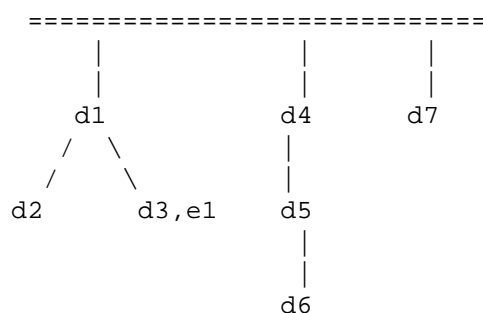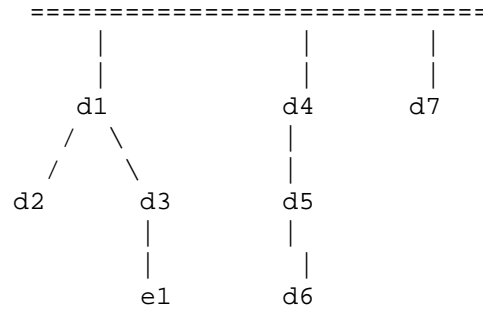segment.

For example, assume the network:

```
                =============================
                    |            |        |
                    |            |        |
                   d1           d4       d7
                  /  \           |
                 /    \          |
               d2      d3       d5
                       |         |
                       |         |
                       e1       d6
```

In this network, we are trying to place e1 where it belongs. We
begin by placing it arbitrarily into a segment:

```
                =================================
                 |        |          |        |
                 |        |          |        |
                e1       d1         d4       d7
                        /  \         |
                       /    \        |
                     d2      d3     d5
                                     |
                                     |
                                    d6
```

In the above case, we would give d1, d4, and d7 a chance to show that
e1 is not really on that segment. d4 and d7 hear e1 on the same port
which connects them to that segment, so they cannot eliminate e1 from
the segment. However, d1 will hear e1 on a different port, so we
move e1 down onto the segment which is connected by that port. This
yields the following:

```
                =============================
                    |            |        |
                    |            |        |
                   d1           d4       d7
                  /  \           |
                 /    \          |
               d2      d3,e1    d5
                                 |
                                 |
                                d6
```

Now we give everyone in that segment (besides that parent device, d1)
a chance to eliminate e1. Only d3 can try, and it succeeds, so we
place e1 on segment which is connected by the port on which d3 heard
e1. There is no segment there (yet), so we create one, and end up
with the following:

```
          ==============================
            |             |        |
            |             |        |
           d1            d4       d7
         /  \             |
        /    \            |
      d2      d3         d5
              |          |
              |          |
             e1         d6
```

which is the correct position.

5. Acknowledgements

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efforts were greatly advanced by the contributions of the following
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            Chuck Black
            John Flick
            Jeff Johnson
            Leon Leong
            Mike Lui
            Dave Perkins
            Geoff Thompson
            Maurice Turcotte
            Paul Woodruff

6. References

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        Conjunction With the Internet Engineering Task Force's
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        Interfaces Group of MIB-II", RFC 1573, January 1994.

7. Security Considerations

   Security issues are not discussed in this memo.

8. Authors' Addresses

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