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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"
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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.

rpPtrBasicPackage

OBJECT IDENTIFIER ::= { snmpDot3RptrMgt 1 }

rpPtrRptrInfo

OBJECT IDENTIFIER ::= { rpPtrBasicPackage 1 }

rpPtrGroupInfo


```
    OBJECT IDENTIFIER ::= { rptrBasicPackage 2 }
rpPtrPortInfo
    OBJECT IDENTIFIER ::= { rptrBasicPackage 3 }
rpPtrAllRptrInfo
    OBJECT IDENTIFIER ::= { rptrBasicPackage 4 }

-- Monitoring information at the repeater, group, and port level.
rpPtrMonitorPackage
    OBJECT IDENTIFIER ::= { snmpDot3RptrMgt 2 }
rpPtrMonitorRptrInfo
    OBJECT IDENTIFIER ::= { rpPtrMonitorPackage 1 }
rpPtrMonitorGroupInfo
    OBJECT IDENTIFIER ::= { rpPtrMonitorPackage 2 }
rpPtrMonitorPortInfo
    OBJECT IDENTIFIER ::= { rpPtrMonitorPackage 3 }
rpPtrMonitorAllRptrInfo
    OBJECT IDENTIFIER ::= { rpPtrMonitorPackage 4 }

-- Address tracking information at the repeater, group,
-- and port level.
rpPtrAddrTrackPackage
    OBJECT IDENTIFIER ::= { snmpDot3RptrMgt 3 }
rpPtrAddrTrackRptrInfo
    OBJECT IDENTIFIER ::= { rpPtrAddrTrackPackage 1 }
rpPtrAddrTrackGroupInfo
    -- this subtree is currently unused
    OBJECT IDENTIFIER ::= { rpPtrAddrTrackPackage 2 }
rpPtrAddrTrackPortInfo
    OBJECT IDENTIFIER ::= { rpPtrAddrTrackPackage 3 }

-- TopN information.
rpPtrTopNPackage
    OBJECT IDENTIFIER ::= { snmpDot3RptrMgt 4 }
rpPtrTopNRptrInfo
    -- this subtree is currently unused
    OBJECT IDENTIFIER ::= { rpPtrTopNPackage 1 }
rpPtrTopNGroupInfo
    -- this subtree is currently unused
    OBJECT IDENTIFIER ::= { rpPtrTopNPackage 2 }
rpPtrTopNPortInfo
    OBJECT IDENTIFIER ::= { rpPtrTopNPackage 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 rpPtrOperStatus and rpPtrHealthText), and send a rpPtrHealth trap."

REFERENCE

```

    "[IEEE 802.3 Mgt], 30.4.1.2.1, acResetRepeater."
    ::= { rpPtrRptrInfo 4 }

```

```

rpPtrNonDisruptTest 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 rpPtrOperStatus and rpPtrHealthText) and send a rpPtrHealth 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."

```

```

 ::= { rpPtrRptrInfo 5 }

```

rpPtrTotalPartitionedPorts 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: rpPtrPortOperStatus does not have the value notPresent(3), rpPtrPortAdminStatus is enabled(1), and rpPtrPortAutoPartitionState is autoPartitioned(2)."

```

 ::= { rpPtrRptrInfo 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.

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

rpPtrGroupEntry 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       { rpPtrGroupIndex }
    ::= { rpPtrGroupTable 1 }

RptrGroupEntry ::=
    SEQUENCE {
        rpPtrGroupIndex
            Integer32,
        rpPtrGroupDescr
            DisplayString,
        rpPtrGroupObjectID
            OBJECT IDENTIFIER,
        rpPtrGroupOperStatus
            INTEGER,
        rpPtrGroupLastOperStatusChange
            TimeTicks,
        rpPtrGroupPortCapacity
            Integer32
    }

rpPtrGroupIndex 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 }

```

rpPtrGroupLastOperStatusChange 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 rpPtrGroupOperStatus for the
                  group changed.

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

```

rpPtrGroupPortCapacity 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.

rpPtrPortTable 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."

::= { rpPtrPortInfo 1 }

rpPtrPortEntry 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 rpPtrPortAutoPartitionState for that port is frozen until the port is next enabled. When the port becomes enabled, the rpPtrPortAutoPartitionState 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."
 ::= { rpPtrPortEntry 3 }

```

rpPtrPortAutoPartitionState 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 rpPtrInfoOperStatus), and send a rpPtrInfoResetEvent notification."

REFERENCE

"[IEEE 802.3 Mgt], 30.4.1.2.1, acResetRepeater."
::= { rpPtrInfoEntry 4 }

rpPtrInfoPartitionedPorts 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: rpPtrPortOperStatus does not have the value notPresent(3), rpPtrPortAdminStatus is enabled(1), and rpPtrPortAutoPartitionState is autoPartitioned(2)."

::= { rpPtrInfoEntry 5 }

rpPtrInfoLastChange 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 rpPtrInfoOperStatus;
    4) ports were added or removed as members of
        the repeater; or
    5) any of the counters associated with this
        repeater had a discontinuity."
 ::= { rpPtrInfoEntry 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 rpPtrMonitorRpPtrInfo subtree are
-- intended for backwards compatibility with implementations of
-- RFC 1516 [11]. In newer implementations (both single- and
-- multiple-repeater implementations), the rpPtrMonitorTable 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 rpPtrMonitorRpPtrInfo
-- subtree are duplicates of the corresponding objects in the
-- first entry of the rpPtrMonitorTable.

```

rpPtrMonitorTransmitCollisions 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."
 ::= { rpPtrMonitorRpPtrInfo 1 }

-- Statistics at the group level.

--

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

rpPtrMonitorGroupTable OBJECT-TYPE

SYNTAX SEQUENCE OF RpPtrMonitorGroupEntry

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 rpPtrGroupTable."

::= { rpPtrMonitorGroupInfo 1 }

rpPtrMonitorGroupEntry OBJECT-TYPE

SYNTAX RpPtrMonitorGroupEntry

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 rpPtrMonTable."

```
INDEX      { rpPtrMonitorGroupIndex }
::= { rpPtrMonitorGroupTable 1 }
```

```
RpPtrMonitorGroupEntry ::=
SEQUENCE {
    rpPtrMonitorGroupIndex
        Integer32,
    rpPtrMonitorGroupTotalFrames
        Counter32,
    rpPtrMonitorGroupTotalOctets
        Counter32,
    rpPtrMonitorGroupTotalErrors
        Counter32
}
```

```
rpPtrMonitorGroupIndex 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."
::= { rpPtrMonitorGroupEntry 1 }
```

```
rpPtrMonitorGroupTotalFrames 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
    rpPtrMonitorPortReadableFrames 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."
 ::= { rpPtrMonitorGroupEntry 2 }

rpPtrMonitorGroupTotalOctets 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 rpPtrMonitorPortReadableOctets 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."

::= { rpPtrMonitorGroupEntry 3 }

rpPtrMonitorGroupTotalErrors 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 rpPtrMonitorPortTotalErrors counters for all of the ports in the group."

::= { rpPtrMonitorGroupEntry 4 }

-- Statistics at the port level.

--

rpPtrMonitorPortTable OBJECT-TYPE

SYNTAX SEQUENCE OF RpPtrMonitorPortEntry

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 rpPtrPortTable.

The columnar object rpPtrMonitorPortLastChange is used to indicate possible discontinuities of counter type columnar objects in the table."

```
::= { rpPtrMonitorPortInfo 1 }
```

rpPtrMonitorPortEntry 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 { rpPtrMonitorPortGroupIndex, rpPtrMonitorPortIndex }

```
::= { rpPtrMonitorPortTable 1 }
```

RptrMonitorPortEntry ::=

SEQUENCE {

rpPtrMonitorPortGroupIndex

Integer32,

rpPtrMonitorPortIndex

Integer32,

rpPtrMonitorPortReadableFrames

Counter32,

rpPtrMonitorPortReadableOctets

Counter32,

rpPtrMonitorPortFCSErrors

Counter32,

rpPtrMonitorPortAlignmentErrors

Counter32,

rpPtrMonitorPortFrameTooLongs

Counter32,

rpPtrMonitorPortShortEvents

Counter32,

rpPtrMonitorPortRunts

Counter32,

rpPtrMonitorPortCollisions

Counter32,

rpPtrMonitorPortLateEvents

Counter32,

rpPtrMonitorPortVeryLongEvents

Counter32,

rpPtrMonitorPortDataRateMismatches

Counter32,

rpPtrMonitorPortAutoPartitions

Counter32,

rpPtrMonitorPortTotalErrors

```
        Counter32,
rpPtrMonitorPortLastChange
        TimeStamp
    }

rpPtrMonitorPortGroupIndex 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."
    ::= { rpPtrMonitorPortEntry 1 }

rpPtrMonitorPortIndex 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."
    ::= { rpPtrMonitorPortEntry 2 }

rpPtrMonitorPortReadableFrames 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
        rpPtrMonitorPortLastChange 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 }
```

rpPtrMonitorPortReadableOctets 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 rpPtrMonitorPortLastChange 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 rpPtrMonitorPortUpper32Octets object, or to use the 64-bit counter defined by rpPtrMonitorPortHCReadableOctets instead of the two 32-bit counters."

REFERENCE

```
        "[IEEE 802.3 Mgt], 30.4.3.1.5, aReadableOctets."
 ::= { rptrMonitorPortEntry 4 }
```

rpPtrMonitorPortFCSErrors 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 rpPtrMonitorPortLastChange 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."

::= { rpPtrMonitorPortEntry 5 }

rpPtrMonitorPortAlignmentErrors 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 rpPtrMonitorPortAlignmentErrors is incremented then the rpPtrMonitorPortFCSErrors Counter shall not be incremented for the same frame.

A discontinuity may occur in the value when the value of object rpPtrMonitorPortLastChange 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."

::= { rpPtrMonitorPortEntry 6 }

rpPtrMonitorPortFrameTooLongs 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 rpPtrMonitorPortFrameTooLongs is incremented
then neither the rpPtrMonitorPortAlignmentErrors
nor the rpPtrMonitorPortFCSErrors counter shall be
incremented for the frame.

A discontinuity may occur in the value
when the value of object
rpPtrMonitorPortLastChange 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."
::= { rpPtrMonitorPortEntry 7 }

rpPtrMonitorPortShortEvents 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 Runt 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 runs 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 `rpPtrMonitorPortLastChange` 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`."
::= { `rpPtrMonitorPortEntry` 8 }

`rpPtrMonitorPortRuns` 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 runs 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.

Runs 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
rpPtrMonitorPortLastChange 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."
::= { rpPtrMonitorPortEntry 9 }

rpPtrMonitorPortCollisions 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
rpPtrMonitorPortLastChange 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."
::= { rpPtrMonitorPortEntry 10 }

rpPtrMonitorPortLateEvents 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 rpPtrMonitorPortLastChange 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."
::= { rpPtrMonitorPortEntry 11 }

rpPtrMonitorPortVeryLongEvents 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 rpPtrMonitorPortLastChange changes."

REFERENCE

"[IEEE 802.3 Mgt], 30.4.3.1.13, aVeryLongEvents."
::= { rpPtrMonitorPortEntry 12 }

rpPtrMonitorPortDataRateMismatches 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
rpPtrMonitorPortLastChange changes."

REFERENCE

"[IEEE 802.3 Mgt], 30.4.3.1.14, aDataRateMismatches."
::= { rpPtrMonitorPortEntry 13 }

rpPtrMonitorPortAutoPartitions 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
rpPtrMonitorPortLastChange changes."

REFERENCE

"[IEEE 802.3 Mgt], 30.4.3.1.15, aAutoPartitions."
::= { rpPtrMonitorPortEntry 14 }

rpPtrMonitorPortTotalErrors 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:

rpPtrMonitorPortFCSErrors,
rpPtrMonitorPortAlignmentErrors,
rpPtrMonitorPortFrameTooLongs,
rpPtrMonitorPortShortEvents,
rpPtrMonitorPortLateEvents,
rpPtrMonitorPortVeryLongEvents,
rpPtrMonitorPortDataRateMismatches, and
rpPtrMonitorPortSymbolErrors.

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 `rpPtrMonitorPortRunts` 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 `rpPtrMonitorPortLastChange` changes."

::= { `rpPtrMonitorPortEntry` 15 }

`rpPtrMonitorPortLastChange` 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."

::= { `rpPtrMonitorPortEntry` 16 }

`rpPtrMonitor100PortTable` OBJECT-TYPE

SYNTAX SEQUENCE OF `RpPtrMonitor100PortEntry`

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 `rpPtrMonitorPortLastChange` is used to indicate possible discontinuities of counter type columnar objects in this table."

::= { `rpPtrMonitorPortInfo` 2 }

`rpPtrMonitor100PortEntry` OBJECT-TYPE

SYNTAX `RpPtrMonitor100PortEntry`

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the table, containing performance and error statistics for a single 100Mb/s port."

INDEX { rpPtrMonitorPortGroupIndex, rpPtrMonitorPortIndex }
 ::= { rpPtrMonitor100PortTable 1 }

RpPtrMonitor100PortEntry ::=

```
SEQUENCE {
    rpPtrMonitorPortIsolates
        Counter32,
    rpPtrMonitorPortSymbolErrors
        Counter32,
    rpPtrMonitorPortUpper32Octets
        Counter32,
    rpPtrMonitorPortHCReadableOctets
        Counter64
}
```

rpPtrMonitorPortIsolates 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
 rpPtrMonitorPortLastChange changes."

REFERENCE

"[IEEE 802.3 Mgt], 30.4.3.1.16, aIsolates."

::= { rpPtrMonitor100PortEntry 1 }

rpPtrMonitorPortSymbolErrors 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 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.

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 }

```

```

rpPtrMonEntry 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       { rpPtrInfoId }
    ::= { rpPtrMonTable 1 }

```

```

RptrMonEntry ::=
    SEQUENCE {
        rpPtrMonTxCollisions
            Counter32,
        rpPtrMonTotalFrames
            Counter32,
        rpPtrMonTotalErrors
            Counter32,
        rpPtrMonTotalOctets
            Counter32
    }

```

```

rpPtrMonTxCollisions 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 }

rpPtrMonTotalFrames 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 rpPtrMonitorPortReadableFrames 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."

::= { rpPtrMonEntry 3 }

rpPtrMonTotalErrors 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 rpPtrMonitorPortTotalErrors 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 rpPtrMonitorPortTotalErrors counters for all of the ports in the repeater."

::= { rpPtrMonEntry 4 }

rpPtrMonTotalOctets 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 rpPtrMonitorPortReadableOctets 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 rpPtrMonUpper32TotalOctets object, or to use the 64-bit counter defined by rpPtrMonHCTotalOctets instead of the two 32-bit counters."

::= { rpPtrMonEntry 5 }

rpPtrMon100Table OBJECT-TYPE

SYNTAX SEQUENCE OF RpPtrMon100Entry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"A table of additional information about each 100Mb/s repeater, augmenting the entries in the rpPtrMonTable. Entries exist in this table only for 100Mb/s repeaters.

The columnar object rpPtrInfoLastChange is used to indicate possible discontinuities of counter type columnar objects in this table."

::= { rpPtrMonitorAllRpPtrInfo 2 }

rpPtrMon100Entry OBJECT-TYPE

SYNTAX RpPtrMon100Entry
 MAX-ACCESS not-accessible

```
STATUS      current
DESCRIPTION
    "An entry in the table, containing information
    about a single 100Mbps repeater."
INDEX       { rpPtrInfoId }
 ::= { rpPtrMon100Table 1 }

RpPtrMon100Entry ::=
    SEQUENCE {
        rpPtrMonUpper32TotalOctets
            Counter32,
        rpPtrMonHCTotalOctets
            Counter64
    }

rpPtrMonUpper32TotalOctets 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
        rpPtrMonTotalOctets 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
        rpPtrMonitorPortReadableOctets counters combined
        with the corresponding rpPtrMonitorPortUpper32Octets
        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 }
```

rpPtrMonHCTotalOctets 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 rpPtrMonitorPortReadableOctets 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 rpPtrMonUpper32TotalOctets and rpPtrMonTotalOctets. 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 (rpPtrAddrSearchLock = lock_value+1,
     rpPtrAddrSearchStatus = notInUse,
     rpPtrAddrSearchOwner = '')

```

A management station first retrieves the values of the appropriate instances of the rpPtrAddrSearchLock and rpPtrAddrSearchStatus objects, periodically repeating the retrieval if necessary, until the value of rpPtrAddrSearchStatus is 'notInUse'. The management station then tries to set the same instance of the rpPtrAddrSearchLock object to the value it just retrieved, the same instance of the rpPtrAddrSearchStatus object to 'inUse', and the corresponding instance of rpPtrAddrSearchOwner to a value indicating itself. If the set operation succeeds, then the management station has obtained ownership of the rpPtrAddrSearchEntry, and the value of rpPtrAddrSearchLock 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 rpPtrAddrSearchEntry.

Once ownership is obtained, the management station can proceed with the search operation. Note that the agent will reset rpPtrAddrSearchStatus 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 rpPtrAddrSearchLock object to the previous value + 1, the instance of the rpPtrAddrSearchStatus to 'notInUse', and the instance of rpPtrAddrSearchOwner to a zero length string. This is done to prevent overwriting another station's lock."

```
 ::= { rpPtrAddrTrackRpPtrInfo 1 }
```

```

rpPtrAddrSearchEntry OBJECT-TYPE
    SYNTAX      RpPtrAddrSearchEntry
    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 rpPtrTopNPortControlTable 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
-- rpPtrTopNPortTable associated with the relevant
-- rpPtrTopNPortControlEntry. 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
-- rpPtrMonitorPortLastChange timestamp in order to check
-- whether a discontinuity occurred.
```

rpPtrTopNPortControlTable OBJECT-TYPE

SYNTAX SEQUENCE OF RpPtrTopNPortControlEntry

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."

::= { rpPtrTopNPortInfo 1 }

rpPtrTopNPortControlEntry OBJECT-TYPE

SYNTAX RpPtrTopNPortControlEntry

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 { rpPtrTopNPortControlIndex }

::= { rpPtrTopNPortControlTable 1 }

RpPtrTopNPortControlEntry ::= SEQUENCE {


```

rpPtrTopNPortControlIndex
    Integer32,
rpPtrTopNPortRepeaterId
    Integer32,
rpPtrTopNPortRateBase
    INTEGER,
rpPtrTopNPortTimeRemaining
    Integer32,
rpPtrTopNPortDuration
    Integer32,
rpPtrTopNPortRequestedSize
    Integer32,
rpPtrTopNPortGrantedSize
    Integer32,
rpPtrTopNPortStartTime
    TimeStamp,
rpPtrTopNPortOwner
    OwnerString,
rpPtrTopNPortRowStatus
    RowStatus
}

```

rpPtrTopNPortControlIndex OBJECT-TYPE

SYNTAX Integer32 (1 .. 65535)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"An index that uniquely identifies an entry in the rpPtrTopNPortControl table. Each such entry defines one top N report prepared for a repeater or system."

::= { rpPtrTopNPortControlEntry 1 }

rpPtrTopNPortRepeaterId 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 rpPtrInfoId). 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 rpPtrTopNPortRowStatus 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 rpPtrInfoTable) while the associated rpPtrTopNPortRowStatus object is equal to active(1), the row in this table is preserved by the agent but the value of rpPtrTopNPortRowStatus is changed to notInService(2), and the agent may time out the row if appropriate. If the specified repeater comes back (reappears in the rpPtrInfoTable) before the row has been timed out, the management station must set the value of the rpPtrTopNPortRowStatus object back to active(1) if desired (the agent doesn't do this automatically)."

```
::= { rpPtrTopNPortControlEntry 2 }
```

rpPtrTopNPortRateBase 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 rpPtrTopNPortRate variable is based upon.

The value of this object may not be modified if the associated rpPtrTopNPortRowStatus object has a value of active(1)."

```
::= { rpPtrTopNPortControlEntry 3 }
```

rpPtrTopNPortTimeRemaining 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 rpPtrTopNPortDuration object.

When this object is set to a non-zero value, any associated rpPtrTopNPortEntries 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 rpPtrTopNPortEntries shall remain inaccessible. At the time that this object decrements to zero, the report is made accessible in the rpPtrTopNPortTable. Thus, the rpPtrTopNPort 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 rpPtrTopNPortEntries are created."

DEFVAL { 0 }

::= { rpPtrTopNPortControlEntry 4 }

rpPtrTopNPortDuration 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 rpPtrTopNPortTimeRemaining 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 rpPtrTopNPortTimeRemaining is set.

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

```

 ::= { rpPtrTopNPortControlEntry 5 }

rpPtrTopNPortRequestedSize 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 rpPtrTopNPortGrantedSize as close
        to this object as is possible for the particular
        implementation and available resources."
    DEFVAL { 10 }
 ::= { rpPtrTopNPortControlEntry 6 }

rpPtrTopNPortGrantedSize 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 rpPtrTopNPortRequestedSize 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 rpPtrTopNPortRequestedSize object."
 ::= { rpPtrTopNPortControlEntry 7 }

rpPtrTopNPortStartTime 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 rpPtrTopNPortTimeRemaining object was
        modified to start the requested report.

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

rpPtrTopNPortOwner 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."
::= { rpPtrTopNPortControlEntry 9 }
```

rpPtrTopNPortRowStatus 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 rpPtrTopNPortTable shall be deleted by the agent."

```
::= { rpPtrTopNPortControlEntry 10 }
```

-- Top "N" reports

rpPtrTopNPortTable 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 rpPtrTopNPortControlTable and the value of object rpPtrTopNPortGrantedSize for each entry.

For each entry in the rpPtrTopNPortControlTable, repeater ports with the highest value of rpPtrTopNPortRate 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."

```
::= { rpPtrTopNPortInfo 2 }
```

rpPtrTopNPortEntry 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      { rpPtrTopNPortControlIndex,
              rpPtrTopNPortIndex }
 ::= { rpPtrTopNPortTable 1 }

RpPtrTopNPortEntry ::= SEQUENCE {
    rpPtrTopNPortIndex
        Integer32,
    rpPtrTopNPortGroupIndex
        Integer32,
    rpPtrTopNPortPortIndex
        Integer32,
    rpPtrTopNPortRate
        Gauge32
}

rpPtrTopNPortIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..65535)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "An index that uniquely identifies an entry in
        the rpPtrTopNPort 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 rpPtrTopNPortIndex shall be assigned to
        entries with decreasing values of rpPtrTopNPortRate
        until index N is assigned to the entry with the
        lowest value of rpPtrTopNPortRate or there are no
        more rpPtrTopNPortEntries.

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

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

rpPtrTopNPortPortIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)

```

```

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

```

```

rpPtrTopNPortRate 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
        rpPtrTopNPortRateBase."
    ::= { rpPtrTopNPortEntry 4 }

```

-- Notifications for use by Repeaters

```

rpPtrHealth NOTIFICATION-TYPE
    OBJECTS      { rpPtrOperStatus }
    STATUS        deprecated
    DESCRIPTION
        "***** THIS OBJECT IS DEPRECATED *****

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

```

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

The agent must throttle the generation of consecutive rpPtrHealth 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 }

rpPtrGroupChange NOTIFICATION-TYPE

OBJECTS { rpPtrGroupIndex }

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 rpPtrGroupChange 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 }

rpPtrResetEvent NOTIFICATION-TYPE

OBJECTS { rpPtrOperStatus }

STATUS deprecated

DESCRIPTION

***** THIS OBJECT IS DEPRECATED *****

In a system containing a single managed repeater-unit, the rpPtrResetEvent 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

rpPtrReset object).

The agent must throttle the generation of consecutive rpPtrResetEvent 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 rpPtrResetEvent 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 rpPtrOperStatus object as an optional object with its coldStart and warmStart trap PDUs.

The rpPtrOperStatus object must be included in the varbind list sent with this trap. The agent may optionally include the rpPtrHealthText object as well."

REFERENCE

"[IEEE 802.3 Mgt], 30.4.1.3.2, nRepeaterReset notification."

::= { snmpDot3RpPtrMgt 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.

rpPtrInfoHealth NOTIFICATION-TYPE

OBJECTS { rpPtrInfoOperStatus }

STATUS current

DESCRIPTION

"In a system containing multiple managed repeaters, the rpPtrInfoHealth notification conveys information related to the operational status of a repeater. It is sent either when the value of rpPtrInfoOperStatus changes, or upon completion of a non-disruptive test.

The agent must throttle the generation of consecutive rpPtrInfoHealth 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 }

rpPtrInfoResetEvent NOTIFICATION-TYPE

OBJECTS { rpPtrInfoOperStatus }

STATUS current

DESCRIPTION

"In a system containing multiple managed repeaters, the rpPtrInfoResetEvent 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 rpPtrInfoReset object).

The agent must throttle the generation of consecutive rpPtrInfoResetEvent 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 rpPtrInfoResetEvent 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 rpPtrInfoOperStatus 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,

```

```

        rpPtrMonitorPortGroupIndex,
        rpPtrMonitorPortIndex,
        rpPtrMonitorPortReadableFrames,
        rpPtrMonitorPortReadableOctets,
        rpPtrMonitorPortFCSErrors,
        rpPtrMonitorPortAlignmentErrors,
        rpPtrMonitorPortFrameTooLongs,
        rpPtrMonitorPortShortEvents,
        rpPtrMonitorPortRunts,
        rpPtrMonitorPortCollisions,
        rpPtrMonitorPortLateEvents,
        rpPtrMonitorPortVeryLongEvents,
        rpPtrMonitorPortDataRateMismatches,
        rpPtrMonitorPortAutoPartitions,
        rpPtrMonitorPortTotalErrors }
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      { rpPtrAddrTrackGroupIndex,
                    rpPtrAddrTrackPortIndex,
                    rpPtrAddrTrackLastSourceAddress,
                    rpPtrAddrTrackSourceAddrChanges }
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      { rpPtrAddrTrackGroupIndex,
                    rpPtrAddrTrackPortIndex,
                    rpPtrAddrTrackLastSourceAddress,
                    rpPtrAddrTrackSourceAddrChanges,
                    rpPtrAddrTrackNewLastSrcAddress }
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 { rpPtrGroupIndex,
rpPtrGroupObjectID,
rpPtrGroupOperStatus,
rpPtrGroupPortCapacity,

rpPtrPortGroupIndex,
rpPtrPortIndex,
rpPtrPortAdminStatus,
rpPtrPortAutoPartitionState,
rpPtrPortOperStatus,
rpPtrPortRptrId,

rpPtrInfoId,
rpPtrInfoRptrType,
rpPtrInfoOperStatus,
rpPtrInfoReset,
rpPtrInfoPartitionedPorts,
rpPtrInfoLastChange }

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 { rpPtrMonitorPortGroupIndex,
rpPtrMonitorPortIndex,
rpPtrMonitorPortReadableFrames,
rpPtrMonitorPortReadableOctets,
rpPtrMonitorPortFCSErrors,
rpPtrMonitorPortAlignmentErrors,
rpPtrMonitorPortFrameTooLongs,
rpPtrMonitorPortShortEvents,
rpPtrMonitorPortRunts,
rpPtrMonitorPortCollisions,
rpPtrMonitorPortLateEvents,
rpPtrMonitorPortVeryLongEvents,
rpPtrMonitorPortDataRateMismatches,
rpPtrMonitorPortAutoPartitions,
rpPtrMonitorPortTotalErrors,

```

        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

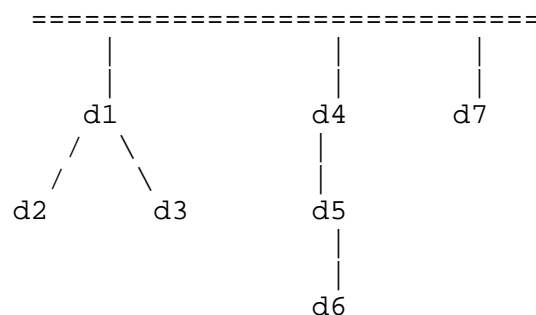
4. Topology Mapping

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:

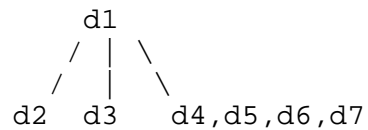


The discovery process would first determine the existence of the network devices and nodes in the network. In the above example, the network devices discovered would be:

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:



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.

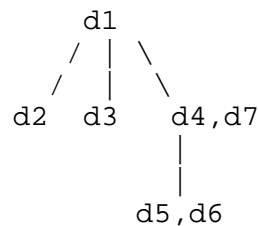
As new segments are created due to this process, the recursive algorithm visits them, and performs the exact same process.

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.

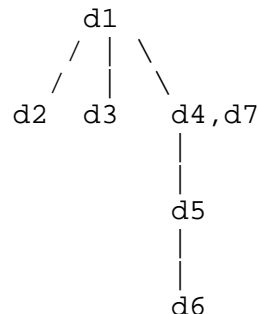
The purpose of this step is to determine which devices are really connected to this segment, and which are actually connected downstream. This is done by giving each of the child devices in the segment (d4, d5, d6, and d7) a chance to eliminate each of the others from the segment.

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:



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:

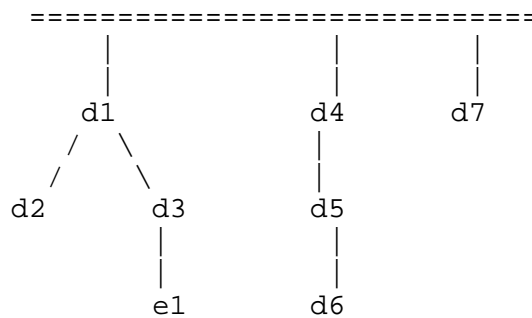


This is actually the topology shown at the beginning of the description.

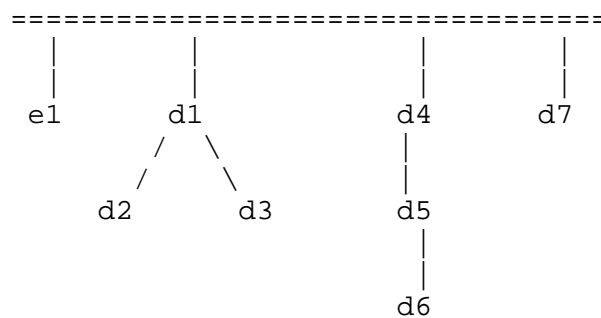
With this information about how the network devices are connected, it is a relatively simple extension to then place nodes such as workstations and PCs in the network. This can be done by placing the node into a segment, then allowing the network devices to show that the node is really not part of that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

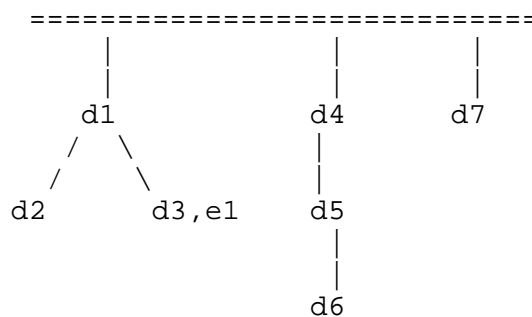
For example, assume the network:



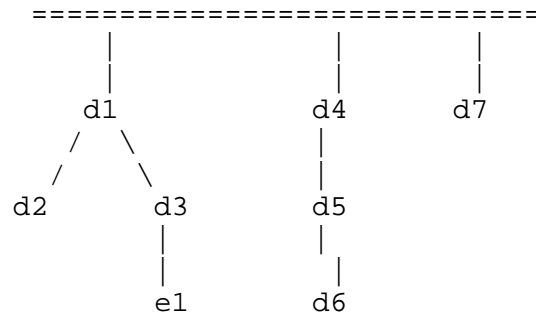
In this network, we are trying to place e_1 where it belongs. We begin by placing it arbitrarily into a segment:



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:



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:



which is the correct position.

5. Acknowledgements

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6. References

- [1] 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.
- [2] IEEE 802.3u-1995, "MAC Parameters, Physical Layer, Medium Attachment Units and Repeater for 100 Mb/s Operation, Type 100BASE-T," Sections 21 through 29, Supplement to IEEE Std 802.3, October 26, 1995.
- [3] IEEE 802.3u-1995, "10 & 100 Mb/s Management," Section 30, Supplement to IEEE Std 802.3, October 26, 1995.
- [4] de Graaf, K., D. Romascanu, D. McMaster, K. McCloghrie, and S. Roberts, "Definitions of Managed Objects for IEEE 802.3 Medium Attachment Units (MAUs)", Work in Progress.
- [5] McCloghrie, K., and M. Rose, Editors, "Management Information Base for Network Management of TCP/IP-based internets: MIB-II", STD 17, RFC 1213, Hughes LAN Systems, Performance Systems International, March 1991.
- [6] SNMPv2 Working Group, J. Case, K. McCloghrie, M. Rose, and S. Waldbusser, "Structure of Management Information for version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1902, January 1996.
- [7] SNMPv2 Working Group, J. Case, K. McCloghrie, M. Rose, and S. Waldbusser, "Textual Conventions for version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1903, January 1996.
- [8] SNMPv2 Working Group, J. Case, K. McCloghrie, M. Rose, and S. Waldbusser, "Conformance Statements for version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1904, January 1996.
- [9] SNMPv2 Working Group, J. Case, K. McCloghrie, M. Rose, and S. Waldbusser, "Protocol Operations for version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1905, January 1996.

- [10] Case, J., M. Fedor, M. Schoffstall, and J. Davin, "Simple Network Management Protocol", STD 15, RFC 1157, SNMP Research, Performance Systems International, MIT Laboratory for Computer Science, May 1990.
- [11] McMaster, D., and K. McCloghrie, "Definitions of Managed Objects for IEEE 802.3 Repeater Devices", RFC 1516, September 1993.
- [12] McAnally, G., D. Gilbert, and J. Flick, "Conditional Grant of Rights to Specific Hewlett-Packard Patents In Conjunction With the Internet Engineering Task Force's Internet-Standard Network Management Framework", RFC 1988, August 1996.
- [13] Hewlett-Packard Company, US Patents 5,293,635 and 5,421,024.
- [14] McCloghrie, K., and F. Kastenholz, "Evolution of the Interfaces Group of MIB-II", RFC 1573, January 1994.

7. Security Considerations

Security issues are not discussed in this memo.

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