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Definitions of Managed Objects for Bridges

Status of this Memo

This memo is an extension to the SNMP MIB. This RFC specifies an IAB standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "IAB Official Protocol Standards" for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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1. Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP based internets. In particular it defines objects for managing bridges based on the IEEE 802.1d draft standard between Local Area Network (LAN) segments. Provisions are made for support of transparent and source route bridging. Provisions are also made so that these objects apply to bridges connected by subnetworks other than LAN segments.

2. The Network Management Framework

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

RFC 1155 which defines the SMI, the mechanisms used for describing and naming objects for the purpose of management. RFC 1212 defines a more concise description mechanism, which is wholly consistent with the SMI.

RFC 1156 which defines MIB-I, the core set of managed objects for the Internet suite of protocols. RFC 1213, defines MIB-II, an evolution of MIB-I based on implementation experience and new operational requirements.

RFC 1157 which defines the SNMP, the protocol used for network access to managed objects.

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

3. Objects

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) [7] defined in the SMI. In particular, each object has a name, a syntax, and an encoding. The name is an object identifier, an administratively assigned name, which specifies an object type. The object type together with an object instance serves to uniquely identify a specific instantiation of the object. For human convenience, we often use a textual string, termed the OBJECT DESCRIPTOR, to also refer to the object type.

The syntax of an object type defines the abstract data structure corresponding to that object type. The ASN.1 language is used for this purpose. However, the SMI [3] purposely restricts the ASN.1 constructs which may be used. These restrictions are explicitly made for simplicity.

The encoding of an object type is simply how that object type is represented using the object type's syntax. Implicitly tied to the notion of an object type's syntax and encoding is how the object type is represented when being transmitted on the network.

The SMI specifies the use of the basic encoding rules of ASN.1 [8], subject to the additional requirements imposed by the SNMP.

3.1. Format of Definitions

Section 5 contains the specification of all object types contained in this MIB module. The object types are defined using the conventions defined in the SMI, as amended by the extensions specified in [9,10].

4. Overview

A common device present in many networks is the Bridge. This device is used to connect Local Area Network segments below the network layer. There are two major modes defined for this bridging; transparent and source route. The transparent method of bridging is defined in the draft IEEE 802.1d specification [11]. Source route bridging has been defined by I.B.M. and is described in the Token Ring Architecture Reference [12]. IEEE 802.1d is currently working on combining the source route and transparent techniques in a compatible fashion. This memo defines those objects needed for the management of a bridging entity operating in one of these modes.

To be consistent with IAB directives and good engineering practice, an explicit attempt was made to keep this MIB as simple as possible. This was accomplished by applying the following criteria to objects proposed for inclusion:

(1) Start with a small set of essential objects and add only as further objects are needed.

(2) Require objects be essential for either fault or configuration management.

(3) Consider evidence of current use and/or utility.

(4) Limit the total of objects.

(5) Exclude objects which are simply derivable from others in this or other MIBs.

(6) Avoid causing critical sections to be heavily instrumented. The guideline that was followed is one counter per critical section per layer.

4.1. Structure of MIB

Objects in this MIB are arranged into groups. Each group is organized as a set of related objects. The overall structure and assignment of objects to their groups is shown below. Where appropriate the corresponding IEEE 802.1d [11] management object name is also included.

```
Bridge MIB Name                 IEEE 802.1d Name

dot1dBridge
  dot1dBase
    BridgeAddress               Bridge.BridgeAddress
    NumPorts                    Bridge.NumberOfPorts
    Type
    PortTable
      Port                      BridgePort.PortNumber
      IfIndex
      Circuit
      DelayExceededDiscards       .DiscardTransitDelay
      MtuExceededDiscards         .DiscardOnError
  dot1dStp
    ProtocolSpecification
    Priority                    SpanningTreeProtocol
                                  .BridgePriority
    TimeSinceTopologyChange       .TimeSinceTopologyChange
    TopChanges                    .TopologyChangeCount
    DesignatedRoot                .DesignatedRoot
    RootCost                      .RootCost
    RootPort                      .RootPort
    MaxAge                        .MaxAge
    HelloTime                     .HelloTime
    HoldTime                      .HoldTime
    ForwardDelay                  .ForwardDelay
    BridgeMaxAge                  .BridgeMaxAge
    BridgeHelloTime               .BridgeHelloTime
    BridgeForwardDelay            .BridgeForwardDelay
    PortTable
      Port                       SpanningTreeProtocolPort
                                   .PortNumber
      Priority                     .PortPriority
```

```
      State                          .SpanningTreeState
      Enable
      PathCost                       .PortPathCost
      DesignatedRoot                 .DesignatedRoot
      DesignatedCost                 .DesignatedCost
      DesignatedBridge               .DesignatedBridge
      DesignatedPort                 .DesignatedPort
      ForwardTransitions

  dot1dSr
    PortTable
      Port
      HopCount                     SourceRoutingPort
                                     .PortHopCount
      LocalSegment                   .SegmentNumber
      BridgeNum                      .BridgeNumber
      TargetSegment
      LargestFrame                   .LargestFrameSize
      STESpanMode                    .LimitedBroadcastMode
      SpecInFrames                 BridgePort
                                     .ValidSRFramesReceived
      SpecOutFrames                  .ValidSRForwardedOutbound
      ApeInFrames
      ApeOutFrames                   .BroadcastFramesForwarded
      SteInFrames
      SteOutFrames                   .BroadcastFramesForwarded
      SegmentMismatchDiscards        .DiscardInvalidRI
      DuplicateSegmentDiscards       .LanIdMismatch
      HopCountExceededDiscards       .FramesDiscardedHopCountExceeded
  dot1dTp
    LearnedEntryDiscards           BridgeFilter.DatabaseSize
                                     .NumDynamic,NumStatic
    AgingTime                      BridgeFilter.AgingTime
    FdbTable
      Address
      Status
      Port
    PortTable
      Port
      MaxInfo
      InFrames                     BridgePort.FramesReceived
      OutFrames                      .ForwardOutbound
      InDiscards                     .DiscardInbound
  dot1dStatic
    StaticTable
      Address
      ReceivePort
      AllowedToGoTo
```

Status

The following IEEE 802.1d management objects have not been included in the Bridge MIB for the indicated reasons.

IEEE 802.1d Object	Disposition
Bridge.BridgeName	Same as sysDescr (MIB II)
Bridge.BridgeUpTime	Same as sysUpTime (MIB II)
Bridge.PortAddresses	Same as ifPhysAddress (MIB II)
BridgePort.PortName	Same as ifDescr (MIB II)
BridgePort.PortType	Same as ifType (MIB II)
BridgePort.RoutingType	Derivable from the implemented groups
SpanningTreeProtocol	
.BridgeIdentifier	Combination of dot1dStpPriority and dot1dBaseBridgeAddress
.TopologyChange	Since this is transitory, it is not considered useful.
SpanningTreeProtocolPort	
.Uptime	Same as ifLastChange (MIB II)
.PortIdentifier	Combination of dot1dStpPortNum and dot1dStpPortPriority
.TopologyChangeAcknowledged	Since this is transitory, it is not considered useful.
.DiscardLackOfBuffers	Redundant
Transmission Priority	These objects are not required as per the Pics Proforma and not considered useful.
.TransmissionPriorityName	
.OutboundUserPriority	
.OutboundAccessPriority	
SourceRoutingPort	The Source Routing Supplement, at the time of this writing, is not stable. The following objects were NOT included in this MIB because they are redundant or not considered useful.
.LimitedBroadcastEnable	
BridgePort.DupLanIdOrTreeError	
.DiscardLackOfBuffers	
.DiscardErrorDetails	
.DiscardTargetLANInoperable	

.ValidSRDiscardedInbound
.BroadcastBytesForwarded
.NonBroadcastBytesForwarded
.FramesNotReceivedDueToCongestion
.FramesDiscardedDueToInternalError

4.1.1. The dot1dBase Group

This mandatory group contains the objects which are applicable to all types of bridges.

4.1.2. The dot1dStp Group

This group contains the objects that denote the bridge's state with respect to the Spanning Tree Protocol. If a node does not implemented the Spanning Tree Protocol, this group will not be implemented. This group is applicable to any transparent only, source route, or SRT bridge which implements the Spanning Tree Protocol.

4.1.3. The dot1dSr Group

This group contains the objects that describe the entity's state with respect to source route bridging. If source routing is not supported this group will not be implemented. This group is applicable to source route only, and SRT bridges.

4.1.4. The dot1dTp Group

This group contains objects that describe the entity's state with respect to transparent bridging. If transparent bridging is not supported this group will not be implemented. This group is applicable to transparent only and SRT bridges.

4.1.5. The dot1dStatic Group

This group contains objects that describe the entity's state with respect to destination-address filtering. If destination-address filtering is not supported this group will not be implemented. This group is applicable to any type of bridge which performs destination-address filtering.

4.2. Relationship to Other MIBs

As described above, some IEEE 802.1d management objects have not been included in this MIB because they overlap with objects in other MIBs applicable to a bridge implementing this MIB. In particular, it is assumed that a bridge implementing this MIB will also implement (at

least) the 'system' group and the 'interfaces' group defined in MIB-II [6].

4.2.1. 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 as a whole irrespective of whether the entity's sole functionality is bridging, or whether bridging is only a subset of the entity's functionality.

4.2.2. 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.) The term 'segment' is used in this memo to refer to such a subnetwork, whether it be an Ethernet segment, a 'ring', a WAN link, or even an X.25 virtual circuit.

Implicit in this Bridge MIB is the notion of ports on a bridge. Each of these ports is associated with one interface of the 'interfaces' group, and in most situations, each port is associated with a different interface. However, there are situations in which multiple ports are associated with the same interface. An example of such a situation would be several ports each corresponding one-to-one with several X.25 virtual circuits but all on the same interface.

Each port is uniquely identified by a port number. A port number has no mandatory relationship to an interface number, but in the simple case a port number will have the same value as the corresponding interface's interface number. Port numbers are in the range (1..dot1dBaseNumPorts).

Some entities perform other functionality as well as bridging through the sending and receiving of data on their interfaces. In such situations, only a subset of the data sent/received on an interface is within the domain of the entity's bridging functionality. This subset is considered to be delineated according to a set of protocols, with some protocols being bridged, and other protocols not being bridged. For example, in an entity which exclusively performed bridging, all protocols would be considered as being bridged, whereas in an entity which performed IP routing on IP datagrams and only bridged other protocols, only the non-IP data would be considered as being bridged.

Thus, this Bridge MIB (and in particular, its counters) are applicable only to that subset of the data on an entity's interfaces which is sent/received for a protocol being bridged. All such data is sent/received via the ports of the bridge.

4.3. Textual Conventions

The datatypes, MacAddress, BridgeId and Timeout, are used as textual conventions in this document. These textual conventions have NO effect on either the syntax nor the semantics of any managed object. Objects defined using these conventions are always encoded by means of the rules that define their primitive type. Hence, no changes to the SMI or the SNMP are necessary to accommodate these textual conventions which are adopted merely for the convenience of readers.

5. Definitions

```
RFC1286-MIB DEFINITIONS ::= BEGIN

IMPORTS
        Counter, Gauge, TimeTicks
                FROM RFC1155-SMI
        mib-2
                FROM RFC1213-MIB
        OBJECT-TYPE
                FROM RFC-1212
        TRAP-TYPE
                FROM RFC-1215;

-- All representations of MAC addresses in this MIB Module use,
-- as a textual convention (i.e. this convention does not affect
-- their encoding), the data type:

MacAddress ::= OCTET STRING (SIZE (6))    -- a 6 octet address in
                                          -- the "canonical" order
-- defined by IEEE 802.1a, i.e., as if it were transmitted least
-- significant bit first, even though 802.5 (in contrast to other
-- 802.x protocols) requires MAC addresses to be transmitted most
-- significant bit first.
--
-- 16-bit addresses, if needed, are represented by setting their
-- upper 4 octets to all 0's, i.e., AAFF would be represented
-- as 00000000AAFF.


-- Similarly, all representations of Bridge-Id in this MIB Module
-- use, as a textual convention (i.e. this convention does not affect
-- their encoding), the data type:
```

```
   BridgeId ::= OCTET STRING (SIZE (8))   -- the Bridge-Identifier as
                                          -- used in the Spanning Tree
   -- Protocol to uniquely identify a bridge.  Its first two octets
   -- (in network byte order) contain a priority value and its last
   -- 6 octets contain the MAC address used to refer to a bridge in a
   -- unique fashion (typically, the numerically smallest MAC address
   -- of all ports on the bridge).
   -- Several objects in this MIB module represent values of timers
   -- used by the Spanning Tree Protocol.  In this MIB, these timers
   -- have values in units of hundreths of a second (i.e. 1/100 secs).
   -- These timers, when stored in a Spanning Tree Protocol's BPDU,
   -- are in units of 1/256 seconds.  Note, however, that 802.1d/D9
   -- specifies a settable granularity of no more than 1 second for
   -- these timers.  To avoid ambiguity, a data type is defined here
   -- as a textual convention and all representation of these timers
   -- in this MIB module are defined using this data type.  An algorithm
   -- is also defined for converting between the different units, to
   -- ensure a timer's value is not distorted by multiple conversions.
   -- The data type is:

   Timeout ::= INTEGER      -- a STP timer in units of 1/100 seconds

   -- To convert a Timeout value into a value in units of
   -- 1/256 seconds, the following algorithm should be used:
   --
   --      b  = floor( (n * 256) / 100)
   --
   -- where:
   --      floor   =  quotient [ignore remainder]
   --      n is the value in 1/100 second units
   --      b is the value in 1/256 second units
   --
   -- To convert the value from 1/256 second units back to
   -- 1/100 seconds, the following algorithm should be used:
   --
   --      n = ceiling( (b * 100) / 256)
   --
   -- where:
   --      ceiling =  quotient [if remainder is 0], or
   --                 quotient + 1 [if remainder is non-zero]
   --      n is the value in 1/100 second units
   --      b is the value in 1/256 second units
   --
   -- Note: it is important that the arithmetic operations are done
   -- in the order specified (i.e., multiply first, divide second).

   dot1dBridge   OBJECT IDENTIFIER ::= { mib-2 17 }
```

```
   -- groups in the Bridge MIB

   dot1dBase     OBJECT IDENTIFIER ::= { dot1dBridge 1 }

   dot1dStp      OBJECT IDENTIFIER ::= { dot1dBridge 2 }

   dot1dSr       OBJECT IDENTIFIER ::= { dot1dBridge 3 }

   dot1dTp       OBJECT IDENTIFIER ::= { dot1dBridge 4 }

   dot1dStatic   OBJECT IDENTIFIER ::= { dot1dBridge 5 }


   -- the dot1dBase group

   -- Implementation of the dot1dBase group is mandatory for all
   -- bridges.

   dot1dBaseBridgeAddress OBJECT-TYPE
       SYNTAX  MacAddress
       ACCESS  read-only
       STATUS  mandatory
       DESCRIPTION
               "The MAC address used by this bridge when it must
               be referred to in a unique fashion.   It is
               recommended that this be the numerically smallest
               MAC address of all ports that belong to this
               bridge.  However it is only required to be unique.
               When concatenated with dot1dStpPriority a unique
               BridgeIdentifier is formed which is used in the
               Spanning Tree Protocol."
       REFERENCE
               "P802.1d/D9, July 14, 1989: Sections 6.4.1.1.3 and 3.12.5"
       ::= { dot1dBase 1 }

   dot1dBaseNumPorts OBJECT-TYPE
       SYNTAX  INTEGER
       ACCESS  read-only
       STATUS  mandatory
       DESCRIPTION
               "The number of ports controlled by this bridging
               entity."
       REFERENCE
               "P802.1d/D9, July 14, 1989: Section 6.4.1.1.3"
       ::= { dot1dBase 2 }

   dot1dBaseType OBJECT-TYPE
       SYNTAX  INTEGER {
```

```
                    unknown(1),
                    transparent-only(2),
                    sourceroute-only(3),
                    srt(4)
                }
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "Indicates what type of bridging this bridge can
                perform.  If a bridge is actually performing a
                certain type of bridging this will be indicated by
                entries in the port table for the given type."
        ::= { dot1dBase 3 }

    -- The Generic Bridge Port Table

    dot1dBasePortTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF Dot1dBasePortEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION
                "A table that contains generic information about
                every port that is associated with this bridge.
                Transparent, source-route, and srt ports are
                included."
        ::= { dot1dBase 4 }

    dot1dBasePortEntry OBJECT-TYPE
        SYNTAX  Dot1dBasePortEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION
                "A list of information for each port of the
                bridge."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 6.4.2, 6.6.1"
        INDEX  { dot1dBasePort }
        ::= { dot1dBasePortTable 1 }

    Dot1dBasePortEntry ::=
        SEQUENCE {
            dot1dBasePort
                INTEGER,
            dot1dBasePortIfIndex
                INTEGER,
            dot1dBasePortCircuit
                OBJECT IDENTIFIER,
            dot1dBasePortDelayExceededDiscards
```

```
            Counter,
        dot1dBasePortMtuExceededDiscards
            Counter
    }

dot1dBasePort OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
            "The port number of the port for which this entry
            contains bridge management information."
    ::= { dot1dBasePortEntry 1 }

dot1dBasePortIfIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
            "The value of the instance of the ifIndex object,
            defined in [4,6], for the interface corresponding
            to this port."
    ::= { dot1dBasePortEntry 2 }

dot1dBasePortCircuit OBJECT-TYPE
    SYNTAX  OBJECT IDENTIFIER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
            "For a port which (potentially) has the same value
            of dot1dBasePortIfIndex as another port on the
            same bridge, this object contains the name of an
            object instance unique to this port.  For example,
            in the case where multiple ports correspond one-
            to-one with multiple X.25 virtual circuits, this
            value might identify an (e.g., the first) object
            instance associated with the X.25 virtual circuit
            corresponding to this port.

            For a port which has a unique value of
            dot1dBasePortIfIndex, this object can have the
            value { 0 0 }."
    ::= { dot1dBasePortEntry 3 }

dot1dBasePortDelayExceededDiscards OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
```

```
        DESCRIPTION
                "The number of frames discarded by this port due
                to excessive transit delay through the bridge.  It
                is incremented by both transparent and source
                route bridges."
        REFERENCE
                 "P802.1d/D9, July 14, 1989: Section 6.6.1.1.3"
        ::= { dot1dBasePortEntry 4 }

    dot1dBasePortMtuExceededDiscards OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The number of frames discarded by this port due
                to an excessive size.  It is incremented by both
                transparent and source route bridges."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 6.6.1.1.3"
        ::= { dot1dBasePortEntry 5 }


    -- the dot1dStp group

    -- Implementation of the dot1dStp group is optional.  It is
    -- implemented by those bridges that support the Spanning Tree
    -- Protocol.  Transparent, Source Route, and SRT bridges will
    -- implement this group only if they support the Spanning Tree
    -- Protocol.


    dot1dStpProtocolSpecification OBJECT-TYPE
        SYNTAX  INTEGER {
                    unknown(1),
                    decLb100(2),
                    ieee8021d(3)
                }
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "An indication of what version of the Spanning
                Tree Protocol is being run.  The value
                'decLb100(2)' indicates the DEC LANbridge 100
                Spanning Tree protocol.  IEEE 802.1d
                implementations will return 'ieee8021d(3)'.  If
                future versions of the IEEE Spanning Tree Protocol
                are released that are incompatible with the
                current version a new value will be defined."
```

```
        ::= { dot1dStp 1 }

    dot1dStpPriority OBJECT-TYPE
        SYNTAX  INTEGER (0..65535)
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION
                "The value of the write-able portion of the Bridge
                ID, i.e., the first two octets of the (8 octet
                long) Bridge ID.  The other (last) 6 octets of the
                Bridge ID are given by the value of
                dot1dBaseBridgeAddress."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.3.7"
        ::= { dot1dStp 2 }

    dot1dStpTimeSinceTopologyChange OBJECT-TYPE
        SYNTAX  TimeTicks
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The time (in hundredths of a second) since the
                last time a topology change was detected by the
                bridge entity."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 6.8.1.1.3"
        ::= { dot1dStp 3 }

    dot1dStpTopChanges OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The total number of topology changes detected by
                this bridge since the management entity was last
                reset or initialized."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 6.8.1.1.3"
        ::= { dot1dStp 4 }

    dot1dStpDesignatedRoot OBJECT-TYPE
        SYNTAX  BridgeId
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The bridge identifier of the root of the spanning
                tree as determined by the Spanning Tree Protocol
                as executed by this node.  This value is used as
```

```
                the Root Identifier parameter in all Configuration
                Bridge PDUs originated by this node."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.3.1"
        ::= { dot1dStp 5 }

    dot1dStpRootCost OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The cost of the path to the root as seen from
                this bridge."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.3.2"
        ::= { dot1dStp 6 }

    dot1dStpRootPort OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The port number of the port which offers the
                lowest cost path from this bridge to the root
                bridge."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.3.3"
        ::= { dot1dStp 7 }

    dot1dStpMaxAge OBJECT-TYPE
        SYNTAX  Timeout
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The maximum age of Spanning Tree Protocol
                information learned from the network on any port
                before it is discarded, in units of hundredths of
                a second.  This is the actual value that this
                bridge is currently using."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.3.4"
        ::= { dot1dStp 8 }

    dot1dStpHelloTime OBJECT-TYPE
        SYNTAX  Timeout
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
```

```
                "The amount of time between the transmission of
                Configuration bridge PDUs by this node on any port
                when it is the root of the spanning tree or trying
                to become so, in units of hundredths of a second.
                This is the actual value that this bridge is
                currently using."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.3.5"
        ::= { dot1dStp 9 }

    dot1dStpHoldTime OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "This time value determines the interval length
                during which no more than two Configuration bridge
                PDUs shall be transmitted by this node, in units
                of hundredths of a second."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.3.14"
        ::= { dot1dStp 10 }

    dot1dStpForwardDelay OBJECT-TYPE
        SYNTAX  Timeout
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "This time value, measured in units of hundredths
                of a second, controls how fast a port changes its
                spanning state when moving towards the Forwarding
                state.  The value determines how long the port
                stays in a particular state before moving to the
                next state.  For example, how long a port stays in
                the Listening state when moving from Blocking to
                Learning.  This value is also used, when a
                topology change has been detected and is underway,
                to age all dynamic entries in the Forwarding
                Database.  [Note that this value is the one that
                this bridge is currently using, in contrast to
                dot1dStpBridgeForwardDelay which is the value that
                this bridge and all others would start using
                if/when this bridge were to become the root.]"
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.3.6"
        ::= { dot1dStp 11 }
```

```
   dot1dStpBridgeMaxAge OBJECT-TYPE
       SYNTAX  Timeout (600..4000)
       ACCESS  read-write
       STATUS  mandatory
       DESCRIPTION
               "The value that all bridges use for MaxAge when
               this bridge is acting as the root.  Note that
               802.1d/D9 specifies that the range for this
               parameter is related to the value of
               dot1dStpBridgeHelloTime. The granularity of this
               timer is specified by 802.1d/D9 to be 1 second.
               An agent may return a badValue error if a set is
               attempted to a value which is not a whole number
               of seconds."
       REFERENCE
               "P802.1d/D9, July 14, 1989: Section 4.5.3.8"
       ::= { dot1dStp 12 }

   dot1dStpBridgeHelloTime OBJECT-TYPE
       SYNTAX  Timeout (100..1000)
       ACCESS  read-write
       STATUS  mandatory
       DESCRIPTION
               "The value that all bridges use for HelloTime when
               this bridge is acting as the root.  The
               granularity of this timer is specified by
               802.1d/D9 to be 1 second.  An agent may return a
               badValue error if a set is attempted to a value
               which is not a whole number of seconds."
       REFERENCE
               "P802.1d/D9, July 14, 1989: Section 4.5.3.9"
       ::= { dot1dStp 13 }

   dot1dStpBridgeForwardDelay OBJECT-TYPE
       SYNTAX  Timeout (400..3000)
       ACCESS  read-write
       STATUS  mandatory
       DESCRIPTION
               "The value that all bridges use for ForwardDelay
               when this bridge is acting as the root.  Note that
               802.1d/D9 specifies that the range for this
               parameter is related to the value of
               dot1dStpBridgeMaxAge.  The granularity of this
               timer is specified by 802.1d/D9 to be 1 second.
               An agent may return a badValue error if a set is
               attempted to a value which is not a whole number
               of seconds."
       REFERENCE
```

```
                "P802.1d/D9, July 14, 1989: Section 4.5.3.10"
        ::= { dot1dStp 14 }


    -- The Spanning Tree Port Table

    dot1dStpPortTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF Dot1dStpPortEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION
                "A table that contains port-specific information
                for the Spanning Tree Protocol."
        ::= { dot1dStp 15 }

    dot1dStpPortEntry OBJECT-TYPE
        SYNTAX  Dot1dStpPortEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION
                "A list of information maintained by every port
                about the Spanning Tree Protocol state for that
                port."
        INDEX   { dot1dStpPort }
        ::= { dot1dStpPortTable 1 }

    Dot1dStpPortEntry ::=
        SEQUENCE {
            dot1dStpPort
                INTEGER,
            dot1dStpPortPriority
                INTEGER,
            dot1dStpPortState
                INTEGER,
            dot1dStpPortEnable
                INTEGER,
            dot1dStpPortPathCost
                INTEGER,
            dot1dStpPortDesignatedRoot
                BridgeId,
            dot1dStpPortDesignatedCost
                INTEGER,
            dot1dStpPortDesignatedBridge
                BridgeId,
            dot1dStpPortDesignatedPort
                OCTET STRING,
            dot1dStpPortForwardTransitions
                Counter
```

```
        }

    dot1dStpPort OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The port number of the port for which this entry
                contains Spanning Tree Protocol management
                information."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 6.8.2.1.2"
        ::= { dot1dStpPortEntry 1 }

    dot1dStpPortPriority OBJECT-TYPE
        SYNTAX  INTEGER (0..255)
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION
                "The value of the priority field which is
                contained in the first (in network byte order)
                octet of the (2 octet long) Port ID.  The other
                octet of the Port ID is given by the value of
                dot1dStpPort."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.5.1"
        ::= { dot1dStpPortEntry 2 }

    dot1dStpPortState OBJECT-TYPE
        SYNTAX  INTEGER {
                    disabled(1),
                    blocking(2),
                    listening(3),
                    learning(4),
                    forwarding(5),
                    broken(6)
                }
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The port's current state as defined by
                application of the Spanning Tree Protocol.  This
                state controls what action a port takes on
                reception of a frame.  If the bridge has detected
                a port that is malfunctioning it will place that
                port into the broken(6) state.  For ports which
                are disabled (see dot1dStpPortEnable), this object
                will have a value of disabled(1)."
```

```
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.5.2"
        ::= { dot1dStpPortEntry 3 }

    dot1dStpPortEnable OBJECT-TYPE
        SYNTAX  INTEGER {
                    enabled(1),
                    disabled(2)
                }
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION
                "The enabled/disabled status of the port."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.5.2"
        ::= { dot1dStpPortEntry 4 }

    dot1dStpPortPathCost OBJECT-TYPE
        SYNTAX  INTEGER (1..65535)
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION
                "The contribution of this port to the path cost of
                paths towards the spanning tree root which include
                this port."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.5.3"
        ::= { dot1dStpPortEntry 5 }

    dot1dStpPortDesignatedRoot OBJECT-TYPE
        SYNTAX  BridgeId
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The unique Bridge Identifier of the Bridge
                recorded as the Root in the Configuration BPDUs
                transmitted by the Designated Bridge for the
                segment to which the port is attached."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.5.4"
        ::= { dot1dStpPortEntry 6 }

    dot1dStpPortDesignatedCost OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The path cost of the Designated Port of the
```

```
                segment connected to this port.  This value is
                compared to the Root Path Cost field in received
                bridge PDUs."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.5.5"
        ::= { dot1dStpPortEntry 7 }

    dot1dStpPortDesignatedBridge OBJECT-TYPE
        SYNTAX  BridgeId
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The Bridge Identifier of the bridge which this
                port considers to be the Designated Bridge for
                this port's segment."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.5.6"
        ::= { dot1dStpPortEntry 8 }

    dot1dStpPortDesignatedPort OBJECT-TYPE
        SYNTAX  OCTET STRING (SIZE (2))
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The Port Identifier of the port on the Designated
                Bridge for this port's segment."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 4.5.5.7"
        ::= { dot1dStpPortEntry 9 }

    dot1dStpPortForwardTransitions OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The number of times this port has transitioned
                from the Learning state to the Forwarding state."
        ::= { dot1dStpPortEntry 10 }


    -- the dot1dSr group

    -- Implementation of the dot1dSr group is optional.  It is
    -- implemented by those bridges that support the source route
    -- bridging mode, including Source Route and SRT bridges.
```

```
   dot1dSrPortTable OBJECT-TYPE
       SYNTAX  SEQUENCE OF Dot1dSrPortEntry
       ACCESS  not-accessible
       STATUS  mandatory
       DESCRIPTION
               "A table that contains information about every
               port that is associated with this source route
               bridge."
       ::= { dot1dSr 1 }

   dot1dSrPortEntry OBJECT-TYPE
       SYNTAX  Dot1dSrPortEntry
       ACCESS  not-accessible
       STATUS  mandatory
       DESCRIPTION
               "A list of information for each port of a source
               route bridge."
       INDEX   { dot1dSrPort }
       ::= { dot1dSrPortTable 1 }

   Dot1dSrPortEntry ::=
       SEQUENCE {
           dot1dSrPort
               INTEGER,
           dot1dSrPortHopCount
               INTEGER,
           dot1dSrPortLocalSegment
               INTEGER,
           dot1dSrPortBridgeNum
               INTEGER,
           dot1dSrPortTargetSegment
               INTEGER,
           dot1dSrPortLargestFrame
               INTEGER,
           dot1dSrPortSTESpanMode
               INTEGER,
           dot1dSrPortSpecInFrames
               Counter,
           dot1dSrPortSpecOutFrames
               Counter,
           dot1dSrPortApeInFrames
               Counter,
           dot1dSrPortApeOutFrames
               Counter,
           dot1dSrPortSteInFrames
               Counter,
           dot1dSrPortSteOutFrames
               Counter,
```

```
            dot1dSrPortSegmentMismatchDiscards
                Counter,
            dot1dSrPortDuplicateSegmentDiscards
                Counter,
            dot1dSrPortHopCountExceededDiscards
                Counter
        }

    dot1dSrPort OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The port number of the port for which this entry
                contains Source Route management information."
        ::= { dot1dSrPortEntry 1 }

    dot1dSrPortHopCount OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION
                "The maximum number of routing descriptors allowed
                in an All Paths or Spanning Tree Explorer frames."
        ::= { dot1dSrPortEntry 2 }

    dot1dSrPortLocalSegment OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION
                "The segment number that uniquely identifies the
                segment to which this port is connected. Current
                source routing protocols limit this value to the
                range: 0 through 4095. A value of 65535 signifies
                that no segment number is assigned to this port."
        ::= { dot1dSrPortEntry 3 }

    dot1dSrPortBridgeNum OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION
                "A bridge number uniquely identifies a bridge when
                more than one bridge is used to span the same two
                segments.  Current source routing protocols limit
                this value to the range: 0 through 15. A value of
                65535 signifies that no bridge number is assigned
```

```
                to this bridge."
        ::= { dot1dSrPortEntry 4 }

    dot1dSrPortTargetSegment OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION
                "The segment number that corresponds to the target
                segment this port is considered to be connected to
                by the bridge.  Current source routing protocols
                limit this value to the range: 0 through 4095. A
                value of 65535 signifies that no target segment is
                assigned to this port."
        ::= { dot1dSrPortEntry 5 }

    -- It would be nice if we could use ifMtu as the size of the
    -- largest frame, but we can't because ifMtu is defined to be
    -- the size that the (inter-)network layer can use which can
    -- differ from the MAC layer (especially if several layers of
    -- encapsulation are used).

    dot1dSrPortLargestFrame OBJECT-TYPE
        SYNTAX  INTEGER {
                    dot1dSrMtu516   (516),
                    dot1dSrMtu1500  (1500),
                    dot1dSrMtu2052  (2052),
                    dot1dSrMtu4472  (4472),
                    dot1dSrMtu8144  (8144),
                    dot1dSrMtu11407 (11407), -- yes this is correct don't
                    dot1dSrMtu17800 (17800), -- ask me where it came from.
                    dot1dSrMtu65535 (65535)
                }

        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION
                "The maximum size of the INFO field (LLC and
                above) that this port can send/receive.  It does
                not include any MAC level (framing) octets.  The
                value of this object is used by this bridge to
                determine whether a modification of the
                LargestFrame (LF, see [14]) field of the Routing
                Control field of the Routing Information Field is
                necessary.  Valid values as defined by the 802.5
                source routing bridging specification[14] are 516,
                1500, 2052, 4472, 8144, 11407, 17800, and 65535
                octets.  Behavior of the port when an illegal
```

```
                value is written is implementation specific.  It
                is recommended that a reasonable legal value be
                chosen."
        ::= { dot1dSrPortEntry 6 }

    dot1dSrPortSTESpanMode OBJECT-TYPE
        SYNTAX  INTEGER {
                    auto-span(1),
                    disabled(2),
                    forced(3)
                }
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION
                "Determines how this port behaves when presented
                with a Spanning Tree Explorer frame.  The value
                'disabled(2)' indicates that the port will not
                accept or send Spanning Tree Explorer packets; any
                STE packets received will be silently discarded.
                The value 'forced(3)' indicates the port will
                always accept and propagate Spanning Tree Explorer
                frames.  This allows a manually configured
                Spanning Tree for this class of packet to be
                configured.  Note that unlike transparent bridging
                this is not catastrophic to the network if there
                are loops.  The value 'auto-span(1)' can only be
                returned by a bridge that both implements the
                Spanning Tree Protocol and has use of the protocol
                enabled on this port. The behavior of the port for
                Spanning Tree Explorer frames is determined by the
                state of dot1dStpPortState.  If the port is in the
                'forwarding' state, the frame will be accepted or
                propagated.  Otherwise it will be silently
                discarded."
        ::= { dot1dSrPortEntry 7 }

    dot1dSrPortSpecInFrames OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The number of specifically routed frames that
                have been received from this port's segment."
        ::= { dot1dSrPortEntry 8 }

    dot1dSrPortSpecOutFrames OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
```

```
        STATUS  mandatory
        DESCRIPTION
                "The number of specifically routed frames that
                this port has transmitted on its segment."
        ::= { dot1dSrPortEntry 9 }

    dot1dSrPortApeInFrames OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The number of all paths explorer frames that have
                been received by this port from its segment."
        ::= { dot1dSrPortEntry 10 }

    dot1dSrPortApeOutFrames OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The number of all paths explorer frames that have
                been transmitted by this port on its segment."
        ::= { dot1dSrPortEntry 11 }

    dot1dSrPortSteInFrames OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The number of spanning tree explorer frames that
                have been received by this port from its segment."
        ::= { dot1dSrPortEntry 12 }

    dot1dSrPortSteOutFrames OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The number of spanning tree explorer frames that
                have been transmitted by this port on its
                segment."
        ::= { dot1dSrPortEntry 13 }

    dot1dSrPortSegmentMismatchDiscards OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
```

```
                "The number of explorer frames that have been
                discarded by this port because the routing
                descriptor field contained an invalid adjacent
                segment value."
        ::= { dot1dSrPortEntry 14 }

    dot1dSrPortDuplicateSegmentDiscards OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The number of frames that have been discarded by
                this port because the routing descriptor field
                contained a duplicate segment identifier."
        ::= { dot1dSrPortEntry 15 }

    dot1dSrPortHopCountExceededDiscards OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The number of explorer frames that have been
                discarded by this port because the Routing
                Information Field has exceeded the maximum route
                descriptor length."
        ::= { dot1dSrPortEntry 16 }


    -- the dot1dTp group

    -- Implementation of the dot1dTp group is optional.  It is
    -- implemented by those bridges that support the transparent
    -- bridging mode.  A transparent or SRT bridge will implement
    -- this group.


    dot1dTpLearnedEntryDiscards OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The total number of Forwarding Database entries,
                which have been or would have been learnt, but
                have been discarded due to a lack of space to
                store them in the Forwarding Database.  If this
                counter is increasing, it indicates that the
                Forwarding Database is regularly becoming full (a
                condition which has unpleasant performance effects
```

```
                on the subnetwork).  If this counter has a
                significant value but is not presently increasing,
                it indicates that the problem has been occurring
                but is not persistent."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 6.7.1.1.3"
        ::= { dot1dTp 1 }

    dot1dTpAgingTime OBJECT-TYPE
        SYNTAX   INTEGER
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
                "The timeout period in seconds for aging out
                dynamically learned forwarding information."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 6.7.1.1.3"
        ::= { dot1dTp 2 }


    --  The Forwarding Database for Transparent Bridges

    dot1dTpFdbTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF Dot1dTpFdbEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION
                "A table that contains information about unicast
                entries for which the bridge has forwarding and/or
                filtering information.  This information is used
                by the transparent bridging function in
                determining how to propagate a received frame."
        ::= { dot1dTp 3 }

    dot1dTpFdbEntry OBJECT-TYPE
        SYNTAX  Dot1dTpFdbEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION
                "Information about a specific unicast MAC address
                for which the bridge has some forwarding and/or
                filtering information."
        INDEX   { dot1dTpFdbAddress }
        ::= { dot1dTpFdbTable 1 }

    Dot1dTpFdbEntry ::=
        SEQUENCE {
            dot1dTpFdbAddress
```

```
            MacAddress,
        dot1dTpFdbPort
            INTEGER,
        dot1dTpFdbStatus
            INTEGER
    }

dot1dTpFdbAddress OBJECT-TYPE
    SYNTAX  MacAddress
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
            "A unicast MAC address for which the bridge has
            forwarding and/or filtering information."
    REFERENCE
            "P802.1d/D9, July 14, 1989: Section 3.9.1, 3.9.2"
    ::= { dot1dTpFdbEntry 1 }

dot1dTpFdbPort OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
            "Either the value '0', or the port number of the
            port on which a frame having a source address
            equal to the value of the corresponding instance
            of dot1dTpFdbAddress has been seen.  A value of
            '0' indicates that the port number has not been
            learned but that the bridge does have some
            forwarding/filtering information about this
            address (e.g. in the dot1dStaticTable).
            Implementors are encouraged to assign the port
            value to this object whenever it is learned even
            for addresses for which the corresponding value of
            dot1dTpFdbStatus is not learned(3)."

    ::= { dot1dTpFdbEntry 2 }

dot1dTpFdbStatus OBJECT-TYPE
    SYNTAX  INTEGER {
                other(1),
                invalid(2),
                learned(3),
                self(4),
                mgmt(5)
            }
    ACCESS  read-only
    STATUS  mandatory
```

```
        DESCRIPTION
                "The status of this entry.  The meanings of the
                values are:

                  other(1)   : none of the following.  This would
                               include the case where some other
                               MIB object (not the corresponding
                               instance of dot1dTpFdbPort, nor an
                               entry in the dot1dStaticTable) is
                               being used to determine if and how
                               frames addressed to the value of
                               the corresponding instance of
                               dot1dTpFdbAddress are being
                               forwarded.

                  invalid(2) : this entry is not longer valid
                               (e.g., it was learned but has since
                               aged-out), but has not yet been
                               flushed from the table.

                  learned(3) : the value of the corresponding
                               instance of dot1dTpFdbPort was
                               learned, and is being used.

                  self(4)    : the value of the corresponding
                               instance of dot1dTpFdbAddress
                               represents one of the bridge's
                               addresses.  The corresponding
                               instance of dot1dTpFdbPort
                               indicates which of the bridge's
                               ports has this address.

                  mgmt(5)    : the value of the corresponding
                               instance of dot1dTpFdbAddress is
                               also the value of an existing
                               instance of dot1dStaticAddress."
        ::= { dot1dTpFdbEntry 3 }


    --  Port Table for Transparent Bridges

    dot1dTpPortTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF Dot1dTpPortEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION
                "A table that contains information about every
                port that is associated with this transparent
```

```
                bridge."
        ::= { dot1dTp 4 }

    dot1dTpPortEntry OBJECT-TYPE
        SYNTAX  Dot1dTpPortEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION
                "A list of information for each port of a
                transparent bridge."
        INDEX   { dot1dTpPort }
        ::= { dot1dTpPortTable 1 }

    Dot1dTpPortEntry ::=
        SEQUENCE {
            dot1dTpPort
                INTEGER,
            dot1dTpPortMaxInfo
                INTEGER,
            dot1dTpPortInFrames
                Counter,
            dot1dTpPortOutFrames
                Counter,
            dot1dTpPortInDiscards
                Counter
        }

    dot1dTpPort OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The port number of the port for which this entry
                contains Transparent bridging management
                information."
        ::= { dot1dTpPortEntry 1 }

    -- It would be nice if we could use ifMtu as the size of the
    -- largest INFO field, but we can't because ifMtu is defined
    -- to be the size that the (inter-)network layer can use which
    -- can differ from the MAC layer (especially if several layers
    -- of encapsulation are used).

    dot1dTpPortMaxInfo OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
```

```
                "The maximum size of the INFO (non-MAC) field that
                this port will receive or transmit."
        ::= { dot1dTpPortEntry 2 }

    dot1dTpPortInFrames OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The number of frames that have been received by
                this port from its segment. Note that a frame
                received on the interface corresponding to this
                port is only counted by this object if and only if
                it is for a protocol being processed by the local
                bridging function."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 6.6.1.1.3"
        ::= { dot1dTpPortEntry 3 }

    dot1dTpPortOutFrames OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The number of frames that have been transmitted
                by this port to its segment.  Note that a frame
                transmitted on the interface corresponding to this
                port is only counted by this object if and only if
                it is for a protocol being processed by the local
                bridging function."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 6.6.1.1.3"
        ::= { dot1dTpPortEntry 4 }

    dot1dTpPortInDiscards OBJECT-TYPE
        SYNTAX   Counter
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
                "Count of valid frames received which were
                discarded (i.e., filtered) by the Forwarding
                Process."
        REFERENCE
                "P802.1d/D9, July 14, 1989: Section 6.6.1.1.3"
        ::= { dot1dTpPortEntry 5 }
```

```
   -- The Static (Destination-Address Filtering) Database

   -- Implementation of this group is optional.


   dot1dStaticTable OBJECT-TYPE
       SYNTAX  SEQUENCE OF Dot1dStaticEntry
       ACCESS  not-accessible
       STATUS  mandatory
       DESCRIPTION
               "A table containing filtering information
               configured into the bridge by (local or network)
               management specifying the set of ports to which
               frames received from specific ports and containing
               specific destination addresses are allowed to be
               forwarded.  The value of zero in this table as the
               port number from which frames with a specific
               destination address are received, is used to
               specify all ports for which there is no specific
               entry in this table for that particular
               destination address.  Entries are valid for
               unicast and for group/broadcast addresses."
       REFERENCE
               "P802.1d/D9, July 14, 1989: Section 6.7.2"
       ::= { dot1dStatic 1 }

   dot1dStaticEntry OBJECT-TYPE
       SYNTAX  Dot1dStaticEntry
       ACCESS  not-accessible
       STATUS  mandatory
       DESCRIPTION
               "Filtering information configured into the bridge
               by (local or network) management specifying the
               set of ports to which frames received from a
               specific port and containing a specific
               destination address are allowed to be forwarded."
       REFERENCE
               "P802.1d/D9, July 14,1989: Section 6.7.2"
       INDEX   { dot1dStaticAddress, dot1dStaticReceivePort }
       ::= { dot1dStaticTable 1 }

   Dot1dStaticEntry ::=
       SEQUENCE {
           dot1dStaticAddress
               MacAddress,
           dot1dStaticReceivePort
               INTEGER,
           dot1dStaticAllowedToGoTo
```

```
            OCTET STRING,
        dot1dStaticStatus
            INTEGER
    }

dot1dStaticAddress OBJECT-TYPE
    SYNTAX  MacAddress
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION
            "The destination MAC address in a frame to which
            this entry's filtering information applies.  This
            object can take the value of a unicast address, a
            group address or the broadcast address."
    REFERENCE
            "P802.1d/D9, July 14, 1989: Section 3.9.1, 3.9.2"
    ::= { dot1dStaticEntry 1 }

dot1dStaticReceivePort OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION
            "Either the value '0', or the port number of the
            port from which a frame must be received in order
            for this entry's filtering information to apply.
            A value of zero indicates that this entry applies
            on all ports of the bridge for which there is no
            other applicable entry."
    ::= { dot1dStaticEntry 2 }

dot1dStaticAllowedToGoTo OBJECT-TYPE
    SYNTAX  OCTET STRING
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION
            "The set of ports to which frames received from a
            specific port and destined for a specific MAC
            address, are allowed to be forwarded.  Each octet
            within the value of this object specifies a set of
            eight ports, with the first octet specifying ports
            1 through 8, the second octet specifying ports 9
            through 16, etc.  Within each octet, the most
            significant bit represents the lowest numbered
            port, and the least significant bit represents the
            highest numbered port.  Thus, each port of the
            bridge is represented by a single bit within the
            value of this object.  If that bit has a value of
```

```
                '1' then that port is included in the set of
                ports; the port is not included if its bit has a
                value of '0'.  (Note that the setting of the bit
                corresponding to the port from which a frame is
                received is irrelevant.)"
        ::= { dot1dStaticEntry 3 }

    dot1dStaticStatus OBJECT-TYPE
        SYNTAX  INTEGER {
                    other(1),
                    invalid(2),
                    permanent(3),
                    deleteOnReset(4),
                    deleteOnTimeout(5)
                }
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION
                "This object indicates the status of this entry.
                     other(1) - this entry is currently in use but
                          the conditions under which it will
                          remain so are different from each of the
                          following values.
                     invalid(2) - writing this value to the object
                          removes the corresponding entry.
                     permanent(3) - this entry is currently in use
                          and will remain so after the next reset
                          of the bridge.
                     deleteOnReset(4) - this entry is currently in
                          use and will remain so until the next
                          reset of the bridge.
                     deleteOnTimeout(5) - this entry is currently
                          in use and will remain so until it is
                          aged out."
        ::= { dot1dStaticEntry 4 }

    -- Traps for use by Bridges

    -- Traps for the Spanning Tree Protocol

    newRoot TRAP-TYPE
        ENTERPRISE  dot1dBridge
        DESCRIPTION
                "The newRoot trap indicates that the sending agent
                has become the new root of the Spanning Tree; the
                trap is sent by a bridge soon after its election
                as the new root, e.g., upon expiration of the
                Topology Change Timer immediately subsequent to
```

```
                its election."
        ::= 1

    topologyChange TRAP-TYPE
        ENTERPRISE  dot1dBridge
        DESCRIPTION
                "A topologyChange trap is sent by a bridge when
                any of its configured ports transitions from the
                Learning state to the Forwarding state, or from
                the Forwarding state to the Blocking state.  The
                trap is not sent if a newRoot trap is sent for the
                same transition."
        ::= 2

    END
```

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7. References

[1] Cerf, V., "IAB Recommendations for the Development of Internet Network Management Standards", RFC 1052, NRI, April 1988.

[2] Cerf, V., "Report of the Second Ad Hoc Network Management Review Group", RFC 1109, NRI, August 1989.

[3] Rose M., and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based internets", RFC 1155, Performance Systems International, Hughes LAN Systems, May 1990.

[4] McCloghrie K., and M. Rose, "Management Information Base for Network Management of TCP/IP-based internets", RFC 1156, Hughes LAN Systems, Performance Systems International, May 1990.

[5] Case, J., Fedor, M., Schoffstall, M., and J. Davin, "Simple Network Management Protocol", RFC 1157, SNMP Research, Performance Systems International, Performance Systems International, MIT Laboratory for Computer Science, May 1990.

[6] McCloghrie K., and M. Rose, Editors, "Management Information Base for Network Management of TCP/IP-based internets", RFC 1213, Performance Systems International, March 1991.

[7] Information processing systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1), International Organization for Standardization, International Standard 8824, December 1987.

[8] Information processing systems - Open Systems Interconnection - Specification of Basic Encoding Rules for Abstract Notation One (ASN.1), International Organization for Standardization, International Standard 8825, December 1987.

[9] Rose, M., and K. McCloghrie, Editors, "Concise MIB Definitions", RFC 1212, Performance Systems International, Hughes LAN Systems, March 1991.

[10] Rose, M., Editor, "A Convention for Defining Traps for use with the SNMP", RFC 1215, Performance Systems International, March 1991.

[11] ANSI/IEEE Draft P802.1d/D9 MAC Bridges, "IEEE Project 802 Local and Metropolitan Area Networks", July 14, 1989.

[12] I.B.M. Token Ring Architecture Reference.

[13] ISO DIS 10038 MAC Bridges.

[14] ANSI/IEEE P802.1x/P802.5x, "Proposed Draft Local Area Network Standard -- MAC Bridges, Source Routing Supplement", IEEE Project 802, September 1990.

[15] ANSI/IEEE 802.1y, "Source Routing Tutorial for End System Operation", September 1990.

8. Security Considerations

Security issues are not discussed in this memo.

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