                Definitions of Managed Objects for Bridges
                    with Rapid Spanning Tree Protocol

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.

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Abstract

   This memo defines an SMIv2 MIB module for managing the Rapid Spanning
   Tree capability defined by the IEEE P802.1t and P802.1w amendments to
   IEEE Std 802.1D-1998 for bridging between Local Area Network (LAN)
   segments. The objects in this MIB are defined to apply both to
   transparent bridging and to bridges connected by subnetworks other
   than LAN segments.

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1. The Internet-Standard Management Framework

   For a detailed overview of the documents that describe the current
   Internet-Standard Management Framework, please refer to section 7 of
   RFC 3410 [RFC3410].

   Managed objects are accessed via a virtual information store, termed
   the Management Information Base or MIB. MIB objects are generally
   accessed through the Simple Network Management Protocol (SNMP).
   Objects in the MIB are defined using the mechanisms defined in the
   Structure of Management Information (SMI). This memo specifies a MIB
   module that is compliant to the SMIv2, which is described in STD 58,
   RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580
   [RFC2580].

2. Overview

   This memo defines an SMIv2 MIB module for managing the Rapid Spanning
   Tree (RSTP) capability defined by the IEEE P802.1t [802.1t] and
   P802.1w [802.1w] amendments to IEEE Std 802.1D-1998 [802.1D-1998] for
   bridging between Local Area Network (LAN) segments. The objects in
   this MIB are defined to apply both to transparent bridging and to
   bridges connected by subnetworks other than LAN segments.

3. Relationship to IEEE 802.1t and 802.1w Amendments

   This document defines managed objects for the Rapid Spanning Tree
   Protocol defined by the IEEE P802.1t and IEEE P802.1w amendments to
   802.1D-1998.

   RSTP-MIB Name   IEEE 802.1 Reference

   dot1dStp
     dot1dStpVersion   (w) 17.16.1 ForceVersion
     dot1dStpTxHoldCount   (w) 17.16.6 TxHoldCount
     dot1dStpExtPortTable
       dot1dStpPortProtocolMigration   (w) 17.18.10 mcheck
       dot1dStpPortAdminEdgePort   (t) 18.3.3   adminEdgePort
       dot1dStpPortOperEdgePort   (t) 18.3.4   operEdgePort
       dot1dStpPortAdminPointToPoint   (w) 6.4.3   adminPointToPointMAC
       dot1dStpPortOperPointToPoint   (w) 6.4.3   operPointToPointMAC
       dot1dStpPortAdminPathCost   (D) 8.5.5.3 Path Cost

   There are concerns that there may be changes made in the 802.1D-2004
   edition that would lead to non-backward-compatible SMI changes for
   802.1t and 802.1w managed objects in the MIB modules. The Bridge MIB
   working group decided to 'freeze' the technical content of the MIB
   modules at a level that is compatible with the 802.1t and 802.1w

versions, and leave to the IEEE 802.1 working group any updates
beyond this.

For informational purposes only, these are the references for the
above objects in 802.1D-2004 [802.1D-2004].

```
RSTP-MIB Name                         IEEE 802.1D-2004 Reference

dot1dStp
  dot1dStpVersion                     17.13.4  ForceVersion
  dot1dStpTxHoldCount                 17.13.12 TxHoldCount
  dot1dStpExtPortTable
    dot1dStpPortProtocolMigration     17.19.13 mcheck
    dot1dStpPortAdminEdgePort         17.13.1  adminEdgePort
    dot1dStpPortOperEdgePort          17.19.17 operEdgePort
    dot1dStpPortAdminPointToPoint     6.4.3    adminPointToPointMAC
    dot1dStpPortOperPointToPoint      6.4.3    operPointToPointMAC
    dot1dStpPortAdminPathCost         17.13.11 Path Cost
```

4. Relation to the BRIDGE-MIB

The objects in the RSTP-MIB supplement those defined in the Bridge
MIB [RFC4188].

The Original BRIDGE-MIB [RFC1493] has been updated in an SMIv2-
compliant version [RFC4188]. Conformance statements have been added
and some description and reference clauses have been updated. The
interpretations of some objects were changed to accommodate IEEE
802.1t and 802.1w amendments.

The object dot1dStpPortPathCost32 was added to support IEEE 802.1t,
and the permissible values of dot1dStpPriority and
dot1dStpPortPriority have been clarified for bridges supporting IEEE
802.1t or IEEE 802.1w. The interpretation of
dot1dStpTimeSinceTopologyChange has been clarified for bridges
supporting the RSTP.

See the updated BRIDGE-MIB [RFC4188] for details.

5. Definitions for RSTP-MIB

RSTP-MIB DEFINITIONS ::= BEGIN

```
-- ---------------------------------------------------------------
-- MIB for IEEE 802.1w Rapid Spanning Tree Protocol
-- ---------------------------------------------------------------

IMPORTS
```

```
        MODULE-IDENTITY, OBJECT-TYPE, Integer32, mib-2
            FROM SNMPv2-SMI
        TruthValue
            FROM SNMPv2-TC
        MODULE-COMPLIANCE, OBJECT-GROUP
            FROM SNMPv2-CONF
        dot1dStp, dot1dStpPortEntry
            FROM BRIDGE-MIB;

    rstpMIB MODULE-IDENTITY
        LAST-UPDATED "200512070000Z"
        ORGANIZATION "IETF Bridge MIB Working Group"
        CONTACT-INFO
            "Email: Bridge-mib@ietf.org"
        DESCRIPTION
            "The Bridge MIB Extension module for managing devices
             that support the Rapid Spanning Tree Protocol defined
             by IEEE 802.1w.

             Copyright (C) The Internet Society (2005).  This version of
             this MIB module is part of RFC 4318; See the RFC itself for
             full legal notices."

        REVISION     "200512070000Z"
        DESCRIPTION
            "The initial version of this MIB module as published in
             RFC 4318."
        ::= { mib-2 134 }

    -- ------------------------------------------------------------- --
    -- subtrees in the RSTP-MIB
    -- ------------------------------------------------------------- --

    rstpNotifications OBJECT IDENTIFIER ::= { rstpMIB 0 }
    rstpObjects       OBJECT IDENTIFIER ::= { rstpMIB 1 }
    rstpConformance   OBJECT IDENTIFIER ::= { rstpMIB 2 }


    -- -------------------------------------------------------------
    -- Addition to the dot1dStp group
    -- -------------------------------------------------------------

    dot1dStpVersion OBJECT-TYPE
        SYNTAX        INTEGER {
                    stpCompatible(0),
                    rstp(2)
                }
        MAX-ACCESS  read-write
        STATUS      current
```

```
        DESCRIPTION
            "The version of Spanning Tree Protocol the bridge is
             currently running.  The value 'stpCompatible(0)'
             indicates the Spanning Tree Protocol specified in
             IEEE 802.1D-1998 and 'rstp(2)' indicates the Rapid
             Spanning Tree Protocol specified in IEEE 802.1w and
             clause 17 of 802.1D-2004.  The values are directly from
             the IEEE standard.  New values may be defined as future
             versions of the protocol become available.

             The value of this object MUST be retained across
             reinitializations of the management system."
        REFERENCE
            "IEEE 802.1w clause 14.8.1, 17.12, 17.16.1"
        DEFVAL      { rstp }
        ::= { dot1dStp 16 }

    dot1dStpTxHoldCount OBJECT-TYPE
        SYNTAX      Integer32 (1..10)
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The value used by the Port Transmit state machine to limit
             the maximum transmission rate.

             The value of this object MUST be retained across
             reinitializations of the management system."

        REFERENCE
            "IEEE 802.1w clause 17.16.6"
        DEFVAL      { 3 }
        ::= { dot1dStp 17 }

    --
    -- { dot1dStp 18 } was used to represent dot1dStpPathCostDefault
    -- in an earlier version of this MIB.  It has since been
    -- obsoleted, and should not be used.
    --

    dot1dStpExtPortTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF Dot1dStpExtPortEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "A table that contains port-specific Rapid Spanning Tree
             information."
        ::= { dot1dStp 19 }
```

```
    dot1dStpExtPortEntry OBJECT-TYPE
        SYNTAX        Dot1dStpExtPortEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "A list of Rapid Spanning Tree information maintained by
             each port."
        AUGMENTS      { dot1dStpPortEntry }
        ::= { dot1dStpExtPortTable 1 }

    Dot1dStpExtPortEntry ::=
        SEQUENCE {
            dot1dStpPortProtocolMigration
                TruthValue,
            dot1dStpPortAdminEdgePort
                TruthValue,
            dot1dStpPortOperEdgePort
                TruthValue,
            dot1dStpPortAdminPointToPoint
                INTEGER,
            dot1dStpPortOperPointToPoint
                TruthValue,
            dot1dStpPortAdminPathCost
                Integer32
        }

    dot1dStpPortProtocolMigration OBJECT-TYPE
        SYNTAX        TruthValue
        MAX-ACCESS    read-write
        STATUS        current
        DESCRIPTION
            "When operating in RSTP (version 2) mode, writing true(1)
             to this object forces this port to transmit RSTP BPDUs.
             Any other operation on this object has no effect and
             it always returns false(2) when read."
        REFERENCE
            "IEEE 802.1w clause 14.8.2.4, 17.18.10, 17.26"
        ::= { dot1dStpExtPortEntry 1 }

    dot1dStpPortAdminEdgePort OBJECT-TYPE
        SYNTAX        TruthValue
        MAX-ACCESS    read-write
        STATUS        current
        DESCRIPTION
            "The administrative value of the Edge Port parameter.  A
             value of true(1) indicates that this port should be
             assumed as an edge-port, and a value of false(2) indicates
             that this port should be assumed as a non-edge-port.
```

         Setting this object will also cause the corresponding
         instance of dot1dStpPortOperEdgePort to change to the
         same value. Note that even when this object's value
         is true, the value of the corresponding instance of
         dot1dStpPortOperEdgePort can be false if a BPDU has
         been received.

         The value of this object MUST be retained across
         reinitializations of the management system."

    REFERENCE
        "IEEE 802.1t clause 14.8.2, 18.3.3"
    ::= { dot1dStpExtPortEntry 2 }

dot1dStpPortOperEdgePort OBJECT-TYPE
    SYNTAX   TruthValue
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "The operational value of the Edge Port parameter. The
         object is initialized to the value of the corresponding
         instance of dot1dStpPortAdminEdgePort. When the
         corresponding instance of dot1dStpPortAdminEdgePort is
         set, this object will be changed as well. This object
         will also be changed to false on reception of a BPDU."

    REFERENCE
        "IEEE 802.1t clause 14.8.2, 18.3.4"
    ::= { dot1dStpExtPortEntry 3 }

dot1dStpPortAdminPointToPoint OBJECT-TYPE
    SYNTAX   INTEGER {
                    forceTrue(0),
                    forceFalse(1),
                    auto(2)
                 }
    MAX-ACCESS   read-write
    STATUS   current
    DESCRIPTION
        "The administrative point-to-point status of the LAN segment
         attached to this port, using the enumeration values of the
         IEEE 802.1w clause. A value of forceTrue(0) indicates
         that this port should always be treated as if it is
         connected to a point-to-point link. A value of
         forceFalse(1) indicates that this port should be treated as
         having a shared media connection. A value of auto(2)
         indicates that this port is considered to have a
         point-to-point link if it is an Aggregator and all of its

            members are aggregatable, or if the MAC entity
            is configured for full duplex operation, either through
            auto-negotiation or by management means. Manipulating this
            object changes the underlying adminPortToPortMAC.

            The value of this object MUST be retained across
            reinitializations of the management system."

        REFERENCE
            "IEEE 802.1w clause 6.4.3, 6.5, 14.8.2"
        ::= { dot1dStpExtPortEntry 4 }

    dot1dStpPortOperPointToPoint OBJECT-TYPE
        SYNTAX   TruthValue
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
            "The operational point-to-point status of the LAN segment
            attached to this port. It indicates whether a port is
            considered to have a point-to-point connection.
            If adminPointToPointMAC is set to auto(2), then the value
            of operPointToPointMAC is determined in accordance with the
            specific procedures defined for the MAC entity concerned,
            as defined in IEEE 802.1w, clause 6.5. The value is
            determined dynamically; that is, it is re-evaluated whenever
            the value of adminPointToPointMAC changes, and whenever
            the specific procedures defined for the MAC entity evaluate
            a change in its point-to-point status."
        REFERENCE
            "IEEE 802.1w clause 6.4.3, 6.5, 14.8.2"
        ::= { dot1dStpExtPortEntry 5 }

    dot1dStpPortAdminPathCost OBJECT-TYPE
        SYNTAX   Integer32 (0..200000000)
        MAX-ACCESS   read-write
        STATUS   current
        DESCRIPTION
            "The administratively assigned value for the contribution
            of this port to the path cost of paths toward the spanning
            tree root.

            Writing a value of '0' assigns the automatically calculated
            default Path Cost value to the port. If the default Path
            Cost is being used, this object returns '0' when read.

            This complements the object dot1dStpPortPathCost or
            dot1dStpPortPathCost32, which returns the operational value
            of the path cost.

```
          The value of this object MUST be retained across
          reinitializations of the management system."
     REFERENCE
          "IEEE 802.1D-1998: Section 8.5.5.3"
     ::= { dot1dStpExtPortEntry 6 }

-- -----------------------------------------------------------------
-- rstpMIB - Conformance Information
-- -----------------------------------------------------------------

rstpGroups OBJECT IDENTIFIER ::= { rstpConformance 1 }

rstpCompliances OBJECT IDENTIFIER ::= { rstpConformance 2 }

-- -----------------------------------------------------------------
-- Units of conformance
-- -----------------------------------------------------------------

rstpBridgeGroup OBJECT-GROUP
     OBJECTS {
          dot1dStpVersion,
          dot1dStpTxHoldCount
     }
     STATUS        current
     DESCRIPTION
          "Rapid Spanning Tree information for the bridge."
     ::= { rstpGroups 1 }

rstpPortGroup OBJECT-GROUP
     OBJECTS {
          dot1dStpPortProtocolMigration,
          dot1dStpPortAdminEdgePort,
          dot1dStpPortOperEdgePort,
          dot1dStpPortAdminPointToPoint,
          dot1dStpPortOperPointToPoint,
          dot1dStpPortAdminPathCost
     }
     STATUS        current
     DESCRIPTION
          "Rapid Spanning Tree information for individual ports."
     ::= { rstpGroups 2 }

-- -----------------------------------------------------------------
-- Compliance statements
-- -----------------------------------------------------------------

rstpCompliance MODULE-COMPLIANCE
     STATUS        current
```

```
    DESCRIPTION
        "The compliance statement for device support of Rapid
         Spanning Tree Protocol (RSTP) bridging services."
    MODULE
        MANDATORY-GROUPS {
            rstpBridgeGroup,
            rstpPortGroup
        }
    ::= { rstpCompliances 1 }

END
```

6. Acknowledgements

   This document was produced on behalf of the Bridge MIB Working Group
   in the Operations and Management area of the Internet Engineering
   Task Force.

   The authors wish to thank the members of the Bridge MIB Working
   Group, especially Alex Ruzin, for their comments and suggestions that
   improved this effort.

   Vivian Ngai and Les Bell were the initial authors of this document,
   and did the bulk of the development work for this document.

7. IANA Considerations

   The IANA has assigned the following OID:

```
        Descriptor          OBJECT IDENTIFIER value
        ----------          ----------------------
        rstpMIB             { mib-2 134 }
```

8. Security Considerations

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

   Writable objects that could be misused to cause network delays and
   spanning tree instabilities include dot1dStpVersion,
   dot1dStpTxHoldCount, dot1dStpPortProtocolMigration,
   dot1dStpPortAdminEdgePort, and dot1dStpPortAdminPathCost.

Some of the readable objects in this MIB module (i.e., objects with a
MAX-ACCESS other than not-accessible) may be considered sensitive or
vulnerable in some network environments. It is thus important to
control even GET and/or NOTIFY access to these objects and possibly
to even encrypt the values of these objects when sending them over
the network via SNMP. These are the tables and objects and their
sensitivity/vulnerability:

dot1dStpVersion could be read by an attacker to identify environments
containing applications or protocols that are potentially sensitive
to RSTP mode.

dot1dStpPortAdminPointToPoint could be used to mislead an access
control protocol, such as 802.1x, to believe that only one other
system is attached to a LAN segment and to enable network access
based on that assumption. This situation could permit potential
man-in-the-middle attacks.

SNMP versions prior to SNMPv3 did not include adequate security.
Even if the network itself is secure (for example by using IPsec),
even then, there is no control as to who on the secure network is
allowed to access and GET/SET (read/change/create/delete) the objects
in this MIB module.

It is RECOMMENDED that implementers consider the security features as
provided by the SNMPv3 framework (see [RFC3410], section 8),
including full support for the SNMPv3 cryptographic mechanisms (for
authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT
RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to
enable cryptographic security. It is then a customer/operator
responsibility to ensure that the SNMP entity giving access to an
instance of this MIB module is properly configured to give access to
the objects only to those principals (users) that have legitimate
rights to indeed GET or SET (change/create/delete) them.

9. Normative References

   [RFC2578]   McCloghrie, K., Perkins, D., and J. Schoenwaelder,
                  "Structure of Management Information Version 2
                  (SMIv2)", STD 58, RFC 2578, April 1999.

   [RFC2579]   McCloghrie, K., Perkins, D., and J. Schoenwaelder,
                  "Textual Conventions for SMIv2", STD 58, RFC 2579,
                  April 1999.

   [RFC2580]   McCloghrie, K., Perkins, D., and J. Schoenwaelder,
                  "Conformance Statements for SMIv2", STD 58, RFC 2580,
                  April 1999.

   [802.1D-1998] "Information technology - Telecommunications and
                  information exchange between systems - Local and
                  metropolitan area networks - Common specifications -
                  Part 3: Media Access Control (MAC) Bridges: Revision.
                  This is a revision of ISO/IEC 10038: 1993, 802.1j-1992
                  and 802.6k-1992. It incorporates P802.11c, P802.1p and
                  P802.12e." ISO/IEC 15802-3: 1998.

   [RFC4188]   Norseth, K. and E. Bell, "Definitions of Managed
                  Objects for Bridges", RFC 4188, September 2005.

   [802.1t]   IEEE 802.1t-2001, "(Amendment to IEEE Standard 802.1D)
                  IEEE Standard for Information technology -
                  Telecommunications and information exchange between
                  systems - Local and metropolitan area networks - Common
                  specifications - Part 3: Media Access Control (MAC)
                  Bridges: Technical and Editorial Corrections".

   [802.1w]   IEEE 802.1w-2001, "(Amendment to IEEE Standard 802.1D)
                  IEEE Standard for Information technology--
                  Telecommunications and information exchange between
                  systems--Local and metropolitan area networks--Common
                  Specifications--Part 3: Media Access Control (MAC)
                  Bridges: Rapid Reconfiguation".

10. Informative References

   [RFC3410]   Case, J., Mundy, R., Partain, D., and B. Stewart,
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                  December 2002.

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                  "IEEE Standard 802.1D-2004 MAC Bridges", 2004.

   [RFC1493]   Decker, E., Langille, P., Rijsinghani, A., and K.
                  McCloghrie, "Definitions of Managed Objects for
                  Bridges", RFC 1493, July 1993.

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