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Definitions of Managed Objects for Bridges with Rapid Spanning Tree Protocol

Status of This Memo

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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, "Introduction and Applicability Statements for Internet-Standard Management Framework", RFC 3410, December 2002.

[802.1D-2004] IEEE Project 802 Local and Metropolitan Area Networks, "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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