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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 a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP based internets. In particular, it defines a MIB module for managing the Rapid Spanning Tree capability defined by the IEEE P802.1t [802.1t] and P802.1w [802.1w] amendments to IEEE Std 802.1D-1998 for bridging between Local Area Network (LAN) segments.

Provisions are made for support of transparent bridging. Provisions are also made so that these objects apply to bridges connected by subnetworks other than LAN segments. This memo also includes a MIB module in a manner that is compliant to SMIv2 [RFC2578].

This memo supplements RFC 1493 [BRIDGEMIB] and RFC 2674 [Q-BRIDGE-MIB].

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1. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2571 [RFC2571].
- Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIv1 and described in STD 16, RFC 1155 [RFC1155], STD 16, RFC 1212 [RFC1212] and RFC 1215 [RFC1215]. The second version, called SMIv2, is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].
- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, RFC 1157 [RFC1157]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [RFC1901] and RFC 1906 [RFC1906]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [RFC1906], RFC 2572 [RFC2572] and RFC 2574 [RFC2574].
- Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [RFC1157]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [RFC1905].
- A set of fundamental applications described in RFC 2573 [RFC2573] and the view-based access control mechanism described in RFC 2575 [RFC2575].

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [RFC2570].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIv2. A MIB conforming to the SMIv1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIv2 will be converted into textual descriptions in SMIv1 during the translation process. However, this loss of machine

readable information is not considered to change the semantics of the MIB.

2. 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. These devices are often known as 'layer 2 switches'.

There are two major modes defined for this bridging: Source-Route and transparent. Source-Route bridging is described by IEEE 802.5 [802.5] and is not discussed further in this document.

The transparent method of bridging is defined by IEEE 802.1D-1998 [802.1D] Managed objects for that original specification of transparent bridging were defined in RFC 1493 [BRIDGEMIB].

2.1. Scope

This MIB includes a comprehensive set of managed objects which attempts to match the set defined in IEEE P802.1t [802.1t] and P802.1w [802.1w].

3. Structure of MIBs

This document defines additional managed objects for Rapid Spanning Tree Protocol defined by IEEE P802.1t and IEEE P802.1w, on top of those existing in the original BRIDGE-MIB module defined in [BRIDGEMIB]: that MIB module is to be maintained unchanged for backwards compatibility. Section 3.4.1 of the present document contains some recommendations regarding usage of objects in the original bridge MIB by devices implementing the enhancements defined here.

3.1. Structure of RSTP-MIB

Objects in this MIB are defined as an addition to the dot1dStp group in the original bridge MIB [BRIDGE-MIB]. The overall structure is shown below:

Bridge MIB Name	IEEE 802.1 Reference	
dot1dStp		
dot1dStpVersion	(w) 17.16.1	ForceVersion
dot1dStpTxHoldCount	(w) 17.16.6	TxHoldCount
dot1dStpPathCostDefault		
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

3.4. 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 implement the original bridge MIB [BRIDGEMIB].

3.4.1. Relation to Original Bridge MIB

This section defines how objects in the original bridge MIB module [BRIDGEMIB] should be represented for devices which implement all the MIB modules described in this memo. Some of the old objects are less useful in such devices but must still be implemented for reasons of backwards compatibility.

3.4.1.1. The dot1dBase Group

This mandatory group contains the objects which are applicable to all types of bridges. Interpretation of this group is unchanged.

3.4.1.2. 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 implement the Spanning Tree Protocol, this group will not be implemented.

In a device supporting the Spanning Tree Algorithm and Protocol defined in IEEE 802.1D-1998 Clause 8, interpretation of this group is unchanged.

In a device supporting the Rapid Spanning Tree Algorithm and Protocol defined in IEEE 802.1w Clause 17, the interpretation of objects in this group is unchanged except for those listed below:

dot1dStpPriority
Definition remains unchanged, but the permissible values are changed to 0-61440, in steps of 4096.

dot1dStpPortPriority
Definition remains unchanged, but the permissible values are changed to 0-240, in steps of 16.

dot1dStpTimeSinceTopologyChange
The time since the tcWhile timer for any port on this Bridge was non-zero.

dot1dStpTopChanges
The number of times that there have been at least one non-zero tcWhile timer on this Bridge.

In a device supporting the 32-bit default Path Costs defined in IEEE 802.1t Table 8-5, the interpretation of objects in this group is unchanged except for the following:

dot1dStpPortPathCost
Definition remains unchanged, but the permissible values are extended to 1-200,000,000.

3.4.1.3. The dot1dTp Group

This group contains objects that describe the entity's state with respect to transparent bridging. Interpretation for this group is unchanged.

3.4.1.4. The dot1dStatic Group

This group contains objects that describe the entity's state with respect to destination-address filtering. Interpretation for this group is unchanged.

4. Definitions for RSTP-MIB

```
RSTP-MIB DEFINITIONS ::= BEGIN

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

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE
        FROM SNMPv2-SMI
    TruthValue
        FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP
        FROM SNMPv2-CONF
    dot1dBridge, dot1dStp, dot1dStpPortEntry
        FROM BRIDGE-MIB;

rstpMIB MODULE-IDENTITY
    LAST-UPDATED "200206170000Z"
    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."
    REVISION     "200206170000Z"
    DESCRIPTION
         "Draft 1"
    ::= { dot1dBridge 11 }

-- ------------------------------------------------------------
-- 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 and 'rstp(2)' indicates the Rapid Spanning
```

```
          Tree Protocol specified in IEEE 802.1w.  New value may
          be defined as future versions of the protocol become
          available."
    REFERENCE
        "IEEE 802.1w clause 14.8.1, 17.12, 17.16.1"
    DEFVAL      { rstp }
    ::= { dot1dStp 16 }

dot1dStpTxHoldCount OBJECT-TYPE
    SYNTAX      INTEGER (1..10)
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The value used by the Port Transmit state machine to limit
         the maximum transmission rate."
    REFERENCE
        "IEEE 802.1w clause 17.16.6"
    DEFVAL      { 3 }
    ::= { dot1dStp 17 }

dot1dStpPathCostDefault OBJECT-TYPE
    SYNTAX      INTEGER {
                    stp8021d1998(1),
                    stp8021t2001(2)
                }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The version of the Spanning Tree default Path Costs that
         are to be used by this Bridge.  A value of 8021d1998(1)
         uses the 16-bit default Path Costs from IEEE Std. 802.1D-1998.
         A value of stp8021t2001(2) uses the 32-bit default Path
         Costs from IEEE Std. 802.1t."
    REFERENCE
        "IEEE 802.1D & 802.1t Table 8-5"
    ::= { dot1dStp 18 }

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
            INTEGER
    }

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."
    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
         dot1dStpPortAdminEdgePort and is set 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.  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."
   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 or not.
         The value is determined by management or by auto-detection,
         as described in the dot1dStpPortAdminPointToPoint object."
```

```
    REFERENCE
        "IEEE 802.1w clause 6.4.3, 6.5, 14.8.2"
    ::= { dot1dStpExtPortEntry 5 }

dot1dStpPortAdminPathCost OBJECT-TYPE
    SYNTAX      INTEGER (0..65535)
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The administratively assigned value for the contribution
         of this port to the path cost of paths towards 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, which
         returns the operational value of the path cost."
    REFERENCE
        "IEEE 802.1D-1998: Section 8.5.5.3"
    ::= { dot1dStpExtPortEntry 6 }

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

rstpConformance OBJECT IDENTIFIER ::= { rstpMIB 1 }

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 }

rstpDefaultPathCostGroup OBJECT-GROUP
```

```
    OBJECTS {
        dot1dStpPathCostDefault
    }
    STATUS      current
    DESCRIPTION
        "Default Spanning Tree path cost information."
    ::= { rstpGroups 2 }

rstpPortGroup OBJECT-GROUP
    OBJECTS {
        dot1dStpPortProtocolMigration,
        dot1dStpPortAdminEdgePort,
        dot1dStpPortOperEdgePort,
        dot1dStpPortAdminPointToPoint,
        dot1dStpPortOperPointToPoint,
        dot1dStpPortAdminPathCost
    }
    STATUS      current
    DESCRIPTION
        "Rapid Spanning Tree information for individual ports."
    ::= { rstpGroups 3 }

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

rstpCompliance MODULE-COMPLIANCE
    STATUS      current
    DESCRIPTION
        "The compliance statement for device support of bridging
         services."

    MODULE
        MANDATORY-GROUPS {
            rstpBridgeGroup,
            rstpPortGroup
        }

        GROUP rstpDefaultPathCostGroup
            DESCRIPTION
                "Support for this group is mandatory only if
                 both 16-bit and 32-bit Path Costs are supported."
    ::= { rstpCompliances 1 }

END
```

5. Acknowledgments

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 which improved this effort.

6. Security Considerations

There are a number of management objects defined in this MIB that have 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.

SNMPv1 by itself is not a secure environment. 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.

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model [USM] and the View-based Access Control Model [VACM] is recommended.

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