

Internet Draft

Expires March 2005

[draft-ietf-bridge-rstpmib-05.txt](#)

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September 2004

## **Definitions of Managed Objects for Bridges with Rapid Spanning Tree Protocol**

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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](#) [[RFC1493](#)] and [RFC 2674](#) [[RFC2674](#)].

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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**

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](#) [[RFC1493](#)].

### **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 [[RFC1493](#)]: 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 [[RFC1493](#)]. 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          |

### **3.2. 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 implement the original bridge MIB [[RFC1493](#)].

#### **3.2.1. Relation to Original Bridge MIB**

This section defines how objects in the original bridge MIB module [[RFC1493](#)] 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.





#### **3.2.1.1. The dot1dBase Group**

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

#### **3.2.1.2. 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 object dot1dStpPortPathCost32 [[RFC1493](#)] should be used rather than the older object dot1dStpPortPathCost. The newer object supports the expanded range of 1-200,000,000.



#### **3.2.1.3. The dot1dTp Group**

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

#### **3.2.1.4. 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, Integer32  
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 "200403210000Z"  
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 "200403210000Z"  
DESCRIPTION  
"Draft 4"  
::= { 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 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."

## 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 stp8021d1998(1) means the bridge is using the 16-bit default Path Costs from IEEE Std. 802.1D-1998. A value of stp8021t2001(2) means the bridge is using 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

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."

## 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. 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 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 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 or dot1dStpPortPathCost32, 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.



## **7. Normative References**

- [RFC2578] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, [RFC 2578](#), April 1999.
- [RFC2579] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, [RFC 2579](#), April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Conformance Statements for SMIv2", STD 58, [RFC 2580](#), April 1999.
- [RFC2674] Bell, E., Smith, A., Langille, P., Rijhsinghani, A. and McCloghrie, "Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and Virtual LAN Extensions", [RFC 2674](#), August 1999.
- [802.1D] "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.
- [RFC1493] Decker, E., Langille, P., Rijhsinghani, A. and K. McCloghrie, "Definitions of Managed Objects for Bridges", [RFC 1493](#), July 1993.
- [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 Reconfiguration".



## **8. 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.

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