P802.1Qdy/D2.2
November 24, 2024
(Amendment to IEEE Std 802.1Q™-2022 as amended by IEEE Std 802.1Qcz™-2023, IEEE Std 802.1Qcw™-2023, IEEE Std 802.1Qcj™-2023, IEEE Std 802.1Qdj™-2024, and IEEE Std 802.1Qdx™-2024)

Draft Standard for Local and Metropolitan Area Networks—

Bridges and Bridged Networks

Amendment 40: YANG for the Multiple Spanning Tree Protocol

Prepared by the
Time-Sensitive Networking (TSN) Task Group of IEEE 802.1

Sponsor
LAN/MAN Standards Committee
of the
IEEE Computer Society

This and the following cover pages are not part of the draft. They provide revision and other information for IEEE 802.1 Working Group members and participants in the IEEE Standards Association ballot process, and will be updated as convenient. The text proper of this draft begins with the Title page.

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Current draft

This draft, P802.1Qdy/D2.2, has been prepared for a second Standards Association (SA) Recirculation Ballot following the sucessful Initial SA Ballot of P802.1Qdy/D2.0 and the first recirculation ballot of P802.1Qdy/D2.1. The comments received on those ballots, and their disposition by the CRG (Comment Resolution Group), are available in myProject.

The changes in this draft as a result of comment disposition are solely to the ieee802-dot1q-rstp.yang (48.6.26) and ieee802-dot1q-mstp.yang (48.6.28) YANG modules, their resulting bridge schema (48.5.27, 48.5.29), and their depiction in Figures 48-24 and 48-25 as follows:

- The revision date of both modules has been updated, as required when any change has been made to a module, and the anticipated year of publication of the amendment updated to 2025 to avoid the need to further revise the modules solely to make that change.
- The typedef rstp:id-priority now specifies the default of ‘8’.
- The leaves port-path-cost in the rstp module and internal-port-path-cost for the ist and each msti in the mstp module have been made config false (read-only). Leaves fix-port-path-cost (in the rstp module) and fix-internal-port-path-cost (for the ist, and for each msti, in the mstp module) allow those Port Path Costs to be managed, but if zero (the default, and not a permissible Port Path Cost) allow the bridge component to set those values dependent on the interface speed (as described in detail in the base standard).
- The updated rstp and mstp model schema, and Figures 48-24 and 48-25, include the added fix-port-path-cost and fix-internal-port-path-cost leaves.

These changes are not change barred in the updated draft because the YANG schema and modules incorporated in Clause 48 are imported as complete UTF-8 files without the possibility of inadvertent change, which rules out selective change bar marking. Selective change bar marking of the figures is likewise impractical.

YANG modules

The YANG modules specified by this standard are attached to the draft pdf as plain text (UTF-8) .yang files.

This page intentionally left blank, to allow for the addition of information (e.g. pointers to changed text) during the SA Ballot process without the need to renumber the following pages in the draft.

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(Amendment to IEEE Std 802.1Q™-2022 as amended by IEEE Std 802.1Qcz™-2023, IEEE Std 802.1Qcw™-2023, IEEE Std 802.1Qcj™-2023, IEEE Std 802.1Qdj™-2024, and IEEE Std 802.1Qdx™-2024)

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Abstract: This amendment to IEEE Std 802.1Q-2022 as amended by IEEE Std 802.1Qcz-2023, IEEE Std 802.1Qcw-2023, IEEE Std 802.1Qcj-2023, IEEE Std 802.1Qdj-2024, and IEEE Std 802.1Qdx-2024 addresses Multiple Spanning Tree Protocol (MSTP) requirements arising from industrial automation networks. It specifies YANG for Bridge and Bridge component RSTP and MSTP configuration and status reporting.

Keywords: Bridged Network, IEEE 802.1Q™, IEEE 802.1Qdy™, LAN, local area network, MAC Bridge, metropolitan area network, MSTP, Multiple Spanning Tree Protocol, MIB, Rapid Spanning Tree Protocol, RSTP, Virtual Bridged Network, virtual LAN, VLAN Bridge,YANG.

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Jessy V. Rouyer, *Vice Chair*
János Farkas, *Chair, Time-Sensitive Networking Task Group*
David McCall, *Vice Chair, Time-Sensitive Networking Task Group*
Martin Mittelberger, *Editor*

<<TBA>>

The following members of the individual balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

<<TBA>>

When the IEEE-SA Standards Board approved this standard on XX Month 20xx, it had the following membership:

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*Member Emeritus

Introduction

This introduction is not part of IEEE Std 802.1Qdy™-2024, IEEE Standard for Local and metropolitan area networks— Bridges and Bridged Networks—Amendment 40: YANG for Multiple Spanning Trees.

IEEE Std 802.1Qdy™-202X: YANG for Multiple Spanning Trees addresses requirements arising from industrial automation networks, specifying YANG for bridge and bridge component MSTP configuration and status reporting.

This standard contains state-of-the-art material. The area covered by this standard is undergoing evolution. Revisions are anticipated within the next few years to clarify existing material, to correct possible errors, and to incorporate new related material. Information on the current revision state of this and other IEEE 802 standards may be obtained from

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Amendment 40: YANG for the Multiple Spanning Tree Protocol

[This amendment is based on IEEE Std 802.1Q™-2022 as amended by IEEE Std 802.1Qcz™-2023, IEEE Std 802.1Qcw™-2023, IEEE Std 802.1Qcj™-2023, IEEE Std 802.1Qdj™-2024, and IEEE Std 802.1Qdx™-2024.]

NOTE—The editing instructions contained in this amendment define how to merge the material contained therein into the existing base standard and its amendments to form the comprehensive standard.

The editing instructions are shown in ***bold italics***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~strikethrough~~ (to remove old material) and underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Deletions and insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make changes in figures or equations by removing the existing figure or equation and replacing it with a new one. Editing instructions, change markings, and this note will not be carried over into future editions because the changes will be incorporated into the base standard.

5. Conformance

5.4.1.1 Multiple Spanning Tree (MST) operation (optional)

Insert new list item q) after item p) in 5.4.1.1 as follows:

q) Support YANG modules for the management of MSTP (48.6.24).

13. Spanning tree protocols

13.25 State machine timers

Change Table 13-5 and the following NOTE as follows:

Table 13-5—Timer and related parameter values

Parameter	Default	Permitted range	Interoperability recommendations
Migrate Time	3.0	—[a]	—[a]
(Bridge) Hello Time	2.0	—[a]	—[a]
Bridge Max Age	20.0	6.0–40.0	20.0
Bridge Forward Delay	15.0	4.0–30.0	15.0
Transmit Hold Count	6	1–10	6
Max Hops	20	6–~~40~~100	—

All times are in seconds. —[a] Not applicable, value is fixed.

NOTE—Changes to Bridge Forward Delay do not affect reconfiguration times, unless the network includes Bridges that do not conform to this revision of this standard. Changes to Bridge Max Age can have an effect, as it is possible for old information to persist in loops in the physical topology for a number of "hops" equal to the value of Max Age in seconds, and thus exhaust the Transmit Hold Count in small loops. The IEEE Std 802.1Qdy amendment to this standard increased the permitted range of Max Hops to allow a spanning tree to provide initial and remedial connectivity in extended ring topologies whenever physical connectivity is possible. Once configured such networks are not expected to depend on spanning tree for failure protection.

48. YANG Data Models

48.2 IEEE 802.1Q YANG models

Insert 48.2.14 and 48.2.15 at the end of 48.2 as follows:

48.2.14 Rapid Spanning Tree Protocol (RSTP) model

The RSTP model augments the VLAN Bridge component model (48.2.1, Figure 48-4) and the Interface management model for Bridge Ports (48.2.1, Figure 48-5) with nodes common to both RSTP and MSTP. These nodes control the configuration of the CST (and the CIST, when augmented by the Multiple Spanning Trees model, 48.2.15) and report on protocol operation. The RSTP model is illustrated in Figure 48-24.

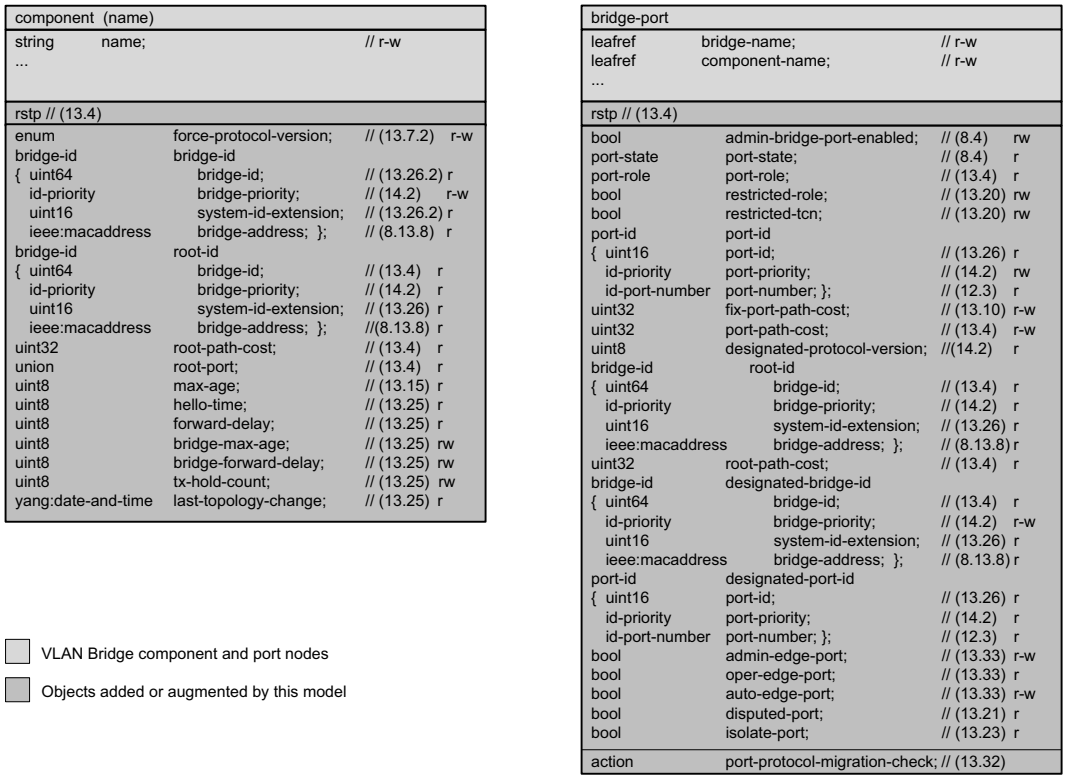

Figure 48-24—RSTP model

48.2.15 Multiple Spanning Tree Protocol (MSTP) model

The Multiple Spanning Tree Protocol model augments the bridge-mst container of the VLAN Bridge components model (48.2.1) and the RSTP model (48.2.14) with nodes for MSTP. These nodes control the configuration of the CIST and MSTIs and the assignment of VLANs and VIDs to MSTIs (8.9) within MST Regions. They also report on MSTP protocol operation. The Multiple Spanning Tree Protocol model is illustrated in Figure 48-25.

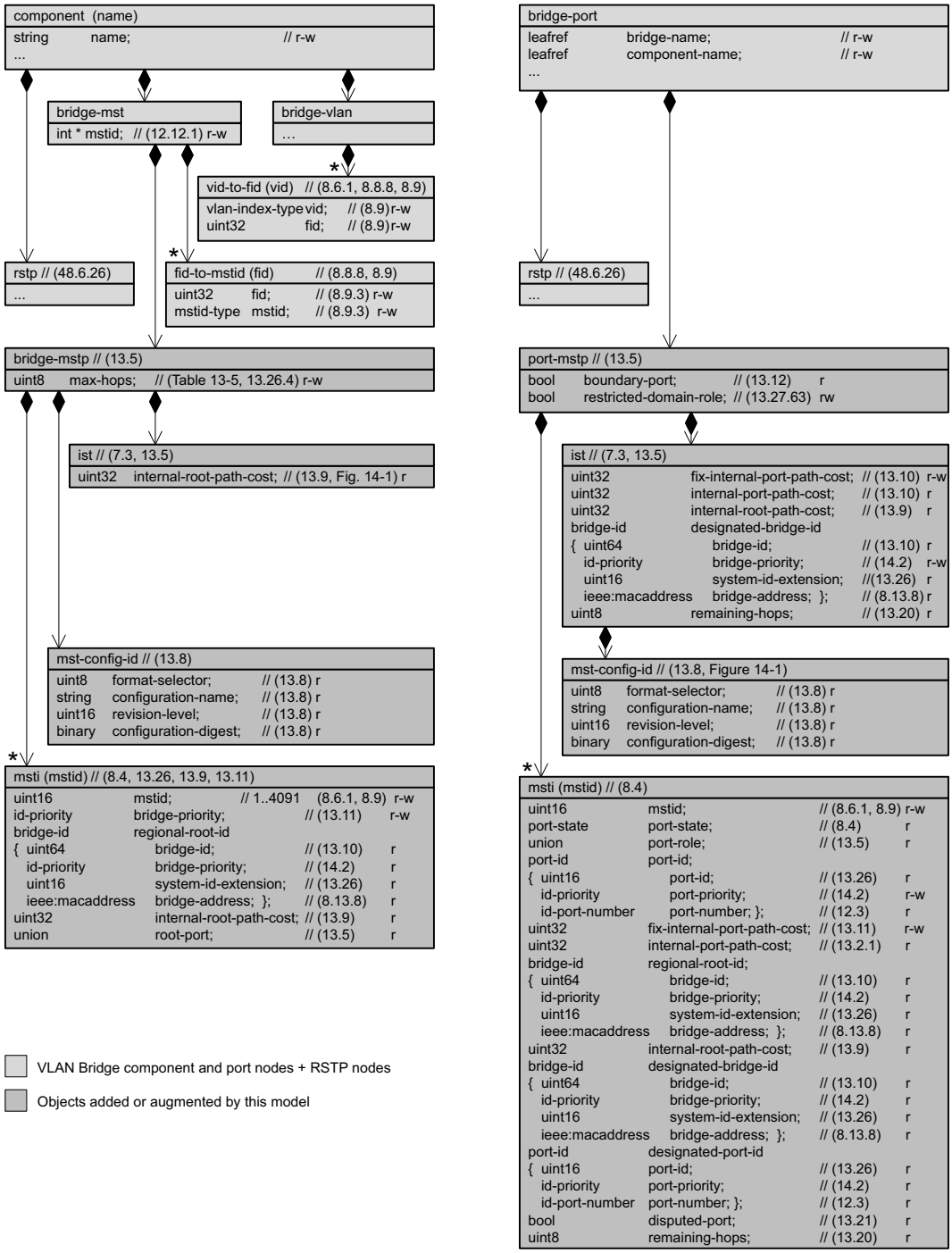

Figure 48-25—MSTP model

48.3 Structure of the YANG models

Insert four new rows at the end of Table 48-1 as follows (unchanged rows not shown):

Table 48-1—Summary of the YANG modules

Module	References	Managed functionality	Initial YANG specification Notes
ieee802-dot1q-rstp	48.5.26, 48.6.26	8.4, 8.7, 8.8, 8.10, Clause 13	IEEE Std 802.1Qdy Bridge and Bridge Port RSTP parameters.
ieee802-dot1q-rstp-bridge	48.5.27, 48.6.27		IEEE Std 802.1Qdy Augments Bridge components and Bridge Ports with RSTP parameters.
ieee802-dot1q-mstp	48.5.28, 48.6.28	8.4, 8.7, 8.8, 8.8, 8.9, 8.10, Clause 13	IEEE Std 802.1Qdy Bridge and Bridge Port MSTP parameters.
ieee802-dot1q-mstp-bridge	48.5.29, 48.6.29		IEEE Std 802.1Qdy Augments RSTP-capable Bridge components and Bridge Ports with MSTP parameters.

Insert 48.3.14 and 48.3.15 after 48.3.13 (inserted by IEEE Std 802.1Qdx-2024) as follows:

48.3.14 RSTP model

A bridge implementing the RSTP model (48.2.14) implements the YANG modules in Table 48-15.

Table 48-15—RSTP model YANG modules

YANG module
ieee802-types
ieee802-dot1q-types
ieee802-dot1q-bridge
ieee802-dot1q-rstp
ieee802-dot1q-rstp-bridge

48.3.15 MSTP model

A bridge implementing the MSTP model (48.2.15) implements the YANG modules in Table 48-16.

Table 48-16—MSTP model YANG modules

YANG module
ieee802-types
ieee802-dot1q-types
ieee802-dot1q-bridge
ieee802-dot1q-rstp
ieee802-dot1q-rstp-bridge
ieee802-dot1q-mstp
ieee802-dot1q-mstp-bridge

48.4 Security considerations

Insert 48.4.14 and 48.4.15 after 48.4.13 (inserted by IEEE Std 802.1Qdx-2024) as follows:

48.4.14 Security considerations of the RSTP model

All writeable nodes in the ieee802-dot1q-rstp YANG module could be manipulated to interfere with basic networking connectivity.

See 48.4.1 for related ieee802-dot1q-bridge YANG model security considerations.

48.4.15 Security considerations of the Multiple Spanning Trees model

All writeable nodes in the ieee802-dot1q-mstp YANG module could be manipulated to interfere with basic networking connectivity.

See 48.4.1 for related ieee802-dot1q-bridge YANG model security considerations.

48.5 YANG schema tree definitions

A simplified graphical representation of the data model is used in this document. The meaning of the symbols in these diagrams is as follows:

- Brackets "[" and "]" enclose list keys.
- Abbreviations before data node names: "rw" means configuration (read-write), and "ro" means state data (read-only).
- Symbols after data node names: "?" means an optional node, "!" means a presence container, and "*" denotes a list and leaf-list.
- Parentheses enclose choice and case nodes, and case nodes are also marked with a colon (":").
- Ellipsis ("...") stands for contents of subtrees that are not shown.

Insert 48.5.26, 48.5.27, 48.5.28, and 48.5.29 at the end of 48.5 as follows:

48.5.26 Schema for the ieee802-dot1q-rstp YANG module

This YANG module does not have a YANG schema tree.

48.5.27 Schema for the ieee802-dot1q-rstp-bridge YANG module

```
module: ieee802-dot1q-rstp-bridge

  augment /dot1q:bridges/dot1q:bridge/dot1q:component:
    +--rw rstp!
       +--rw force-protocol-version?   enumeration
       +--rw bridge-id
       |  +--ro bridge-id?             uint64
       |  +--rw bridge-priority?       id-priority
       |  +--ro system-id-extension?   uint16
       |  +--ro bridge-address?        ieee:mac-address
       +--ro root-id
       |  +--ro bridge-id?             uint64
       |  +--ro bridge-priority?       id-priority
       |  +--ro system-id-extension?   uint16
       |  +--ro bridge-address?        ieee:mac-address
       +--ro root-path-cost?           uint32
       +--ro root-port?                union
       +--ro max-age?                  uint8
       +--ro hello-time?               uint8
       +--ro forward-delay?            uint8
       +--rw bridge-max-age?           uint8
       +--rw bridge-forward-delay?     uint8
       +--rw tx-hold-count?            uint8
       +--ro last-topology-change?     yang:date-and-time
  augment /if:interfaces/if:interface/dot1q:bridge-port:
    +--rw rstp!
       +--rw admin-bridge-port-enabled?       boolean
       +--ro port-state?                      port-state
       +--ro port-role?                       port-role
       +--rw restricted-role?                 boolean
       +--rw restricted-tcn?                  boolean
       +--rw port-id
       |  +--ro port-id?         uint16
       |  +--rw port-priority?   id-priority
       |  +--ro port-number?     id-port-number
       +--rw fix-port-path-cost?              uint32
       +--ro port-path-cost?                  uint32
       +--ro designated-protocol-version?     uint8
       +---x port-protocol-migration-check
       +--ro root-id
       |  +--ro bridge-id?             uint64
       |  +--ro bridge-priority?       id-priority
       |  +--ro system-id-extension?   uint16
       |  +--ro bridge-address?        ieee:mac-address
       +--ro root-path-cost?                  uint32
```

```
      +--ro designated-bridge-id
      |  +--ro bridge-id?             uint64
      |  +--ro bridge-priority?       id-priority
      |  +--ro system-id-extension?   uint16
      |  +--ro bridge-address?        ieee:mac-address
      +--ro designated-port-id
      |  +--ro port-id?         uint16
      |  +--ro port-priority?   id-priority
      |  +--ro port-number?     id-port-number
      +--rw admin-edge-port?                boolean
      +--ro oper-edge-port?                 boolean
      +--rw auto-edge-port?                 boolean
      +--ro disputed-port?                  boolean
      +--ro isolate-port?                   boolean
```

48.5.28 Schema for the ieee802-dot1q-mstp YANG module

This YANG module does not have a YANG schema tree.

48.5.29 Schema for the ieee802-dot1q-mstp-bridge YANG module

```
module: ieee802-dot1q-mstp-bridge

  augment /dot1q:bridges/dot1q:bridge/dot1q:component/dot1q:bridge-mst:
    +--rw bridge-mstp!
       +--rw mst-config-id
       |  +--ro format-selector?        uint8
       |  +--rw configuration-name?     string
       |  +--ro revision-level?         uint16
       |  +--ro configuration-digest?   binary
       +--rw max-hops?        uint8
       +--rw ist
       |  +--ro internal-root-path-cost?   uint32
       +--rw msti* [mstid]
          +--rw mstid                      uint16
          +--rw bridge-priority?           rstp:id-priority
          +--ro regional-root-id
          |  +--ro bridge-id?             uint64
          |  +--ro bridge-priority?       id-priority
          |  +--ro system-id-extension?   uint16
          |  +--ro bridge-address?        ieee:mac-address
          +--ro internal-root-path-cost?   uint32
          +--ro root-port?                 union
  augment /if:interfaces/if:interface/dot1q:bridge-port:
    +--rw port-mstp!
       +--ro boundary-port?            boolean
       +--rw restricted-domain-role?   boolean
       +--rw ist
       |  +--ro mst-config-id
       |  |  +--ro format-selector?        uint8
       |  |  +--ro configuration-name?     string
       |  |  +--ro revision-level?         uint16
       |  |  +--ro configuration-digest?   binary
       |  +--rw fix-internal-port-path-cost?   uint32
       |  +--ro internal-port-path-cost?       uint32
       |  +--ro internal-root-path-cost?       uint32
       |  +--ro designated-bridge
       |  |  +--ro bridge-id?             uint64
       |  |  +--ro bridge-priority?       id-priority
       |  |  +--ro system-id-extension?   uint16
       |  |  +--ro bridge-address?        ieee:mac-address
       |  +--ro remaining-hops?                uint8
       +--rw msti* [mstid]
          +--rw mstid                         uint16
          +--ro port-state?                   rstp:port-state
          +--ro port-role?                    union
          +--rw port-id
          |  +--ro port-id?         uint16
          |  +--rw port-priority?   id-priority
```

```
|  +--ro port-number?     id-port-number
+--rw fix-internal-port-path-cost?   uint32
+--ro internal-port-path-cost?       uint32
+--ro regional-root-id
|  +--ro bridge-id?             uint64
|  +--ro bridge-priority?       id-priority
|  +--ro system-id-extension?   uint16
|  +--ro bridge-address?        ieee:mac-address
+--ro internal-root-path-cost?       uint32
+--ro designated-bridge-id
|  +--ro bridge-id?             uint64
|  +--ro bridge-priority?       id-priority
|  +--ro system-id-extension?   uint16
|  +--ro bridge-address?        ieee:mac-address
+--ro designated-port-id
|  +--ro port-id?         uint16
|  +--ro port-priority?   id-priority
|  +--ro port-number?     id-port-number
+--ro disputed-port?                 boolean
+--ro remaining-hops?                uint8
```

48.6 YANG modules[6] [7] [8]

Insert 48.6.26 at the end of 48.6 as follows::

48.6.26 The ieee802-dot1q-rstp YANG module

```
module ieee802-dot1q-rstp {
  yang-version 1.1;
  namespace "urn:ieee:std:802.1Q:yang:ieee802-dot1q-rstp";
  prefix rstp;

  import ietf-yang-types {
    prefix yang;
  }
  import ietf-interfaces {
    prefix if;
  }
  import ieee802-types {
    prefix ieee;
  }

  organization
    "IEEE 802.1 Working Group";
  contact
    "WG-URL: http://www.ieee802.org/1/
    WG-EMail: stds-802-1-l@ieee.org

    Contact: IEEE 802.1 Working Group Chair
    Postal: C/O IEEE 802.1 Working Group
            IEEE Standards Association
            445 Hoes Lane
            Piscataway, NJ 08854
            USA

    E-mail: stds-802-1-chairs@ieee.org";
  description
    "This module provides management of IEEE Std 802.1Q Bridge components
    that support the Rapid Spanning Tree Algorithm and Protocol (RSTP).
    The managed objects specified also support those aspects of Multiple
    Spanning Tree Algorithm and Protocol (MSTP) and Shortest Path Bridging
    (SPB) operation that provide plug-and-play interoperability with RSTP.

    References specify constraints on, and consequences of, settings of
    leaf values and the creation and deletion of list entries. The values
    of all configured objects are retained across system reinitialization.

    Copyright (C) IEEE (2024).

    This version of this YANG module is part of IEEE Std 802.1Q; see the
    standard itself for full legal notices.";

  revision 2024-11-17 {
    description
      "Published as part of IEEE Std 802.1Qdy-2025.

      The following reference statement identifies each referenced IEEE
      Standard as updated by applicable amendments.";
    reference
      "IEEE Std 802.1Q Bridges and Bridged Networks:
      IEEE Std 802.1Q-2022, IEEE Std 802.1Qcz-2023,
      IEEE Std 802.1Qcw-2023, IEEE Std 802.1Qcj-2023,
      IEEE Std 802.1Qdj-2024, IEEE Std 802.1Qdx-2024,
```

[6] Copyright release for YANG: Users of this standard may freely reproduce the YANG modules contained in this standard so that they can be used for their intended purpose.

[7] An ASCII version of each YANG module is attached to the PDF of this standard and can also be obtained from the IEEE 802.1 Website at https://1.ieee802.org/yang-modules/.

[8] References in this standard's YANG module definitions are not clickable, as each module has been incorporated unchanged after development and verification using YANG tools.

```
    IEEE Std 802.1Qdy-2024.";
}

typedef id-priority {
  type uint8 {
    range "0..15";
  }
  default "8";
  description
    "Priority for Bridge and Bridge Port identifiers. Lower numeric
    values indicate the better identifier.";
}

typedef id-port-number{
  type uint16 {
    range "0..4095";
  }
  description
    "A system assigned Bridge Port number, unique in the context of
    a Bridge component, used in a Port Identifier.";
}

grouping bridge-id {
  description
    "A 64-bit Bridge Identifier and its components: a manageable
    priority in the four most-significant bits, a system ID extension in
    the next 12 bits, and the Bridge Address in the remaining 48 bits.";
  reference
    "13.26.2, 14.1.2, 14.2.5, and item e) in 13.26 of IEEE Std 802.1Q.";
  leaf bridge-id {
    type uint64;
    config false;
    description
      "The Bridge Identifier as used in protocol and tree computation.";
  }
  leaf bridge-priority {
    type id-priority;
    description
    "The manageable bridge priority.";
  }
  leaf system-id-extension {
    type uint16 {
      range  "0..4095";
    }
    config false;
    description
      "The system ID extension.";
    reference
      "13.26.2, 13.41.5, 13.42, 14.2.5, and 14.4 of IEEE Std 802.1Q.";
  }
  leaf bridge-address {
    type ieee:mac-address;
    config false;
    description
      "A Bridge Address.";
  }
}

grouping port-id {
  description
    "A 16-bit Port Identifier and its components: a priority in the four
    most-significant bits, and a twelve-bit Bridge Port number.";
  reference
    "13.26.2, 14.1.2, 14.2.5, and item e) in 13.26 of IEEE Std 802.1Q.";
  leaf port-id {
    type uint16;
    config false;
    description
      "The Port Identifier as used in protocol and tree computation.";
  }
  leaf port-priority {
    type id-priority;
```

```
      description
        "The manageable port priority, encoded in the four most-significant
        bits of octet 26 of Configuration BPDUs for the CIST and in the
        four most-significant bits of octet 15 of the MSTI Configuration
        Message for an MSTI.";
      reference
        "13.2, 13.18, Table 13-3, 14.27, and item e) in 14.4.1
        of IEEE Std 802.1Q.";
      }
    leaf port-number {
      type id-port-number;
      config false;
      description
        "The system assigned Port Number, encoded in the twelve
        least-significant bits of octets 26 and 27 of Configuration BPDUs.";
        reference
          "12.3, 12.4.2, 13.2, and 14.2.7 of IEEE Std 802.1Q.";
    }
  }

  typedef port-state {
    type enumeration {
      enum discarding {
        value 1;
        description
          "Received frames are not submitted to the Learning Process or
          to the Forwarding Process. The Forwarding Process does not relay
          frames to the port for transmission. The Discarding state
          includes an inability to receive or transmit frames or BPDUs
          because MAC_Operational is false (if:oper-status not up).";
      }
      enum learning {
        value 2;
        description
          "Received frames are submitted to the Learning Process, but not
          to the Forwarding Process. The Forwarding Process does not
          relay frames to the port for transmission.";
      }
      enum forwarding {
        value 3;
        description
          "Received frames are submitted to the Learning Process and the
          Forwarding Process. The Forwarding Process can relay frames to
          the port for transmission.";
      }
    }
    description
      "The Port State for frames assigned to a given spanning tree,
      governing submission of frames received by the port to the Learning
      and Forwarding Processes and relay of frames to the port by the
      Forwarding Process.";
    reference
      "8.4, 8.6, 8.7, 13.4, and items aw) and item ba) in 13.27
      of IEEE Std 802.1Q.";
  }

  typedef port-role {
    type enumeration {
      enum disabled-port {
        value 1;
        description
          "The port's MAC_Operational status is false (if:oper-status not
          up), or admin-bridge-port-enabled is false.";
      }
      enum root-port {
        value 2;
        description
          "The Root Port.";
      }
      enum designated-port {
        value 3;
        description
```

```
          "A Designated Port.";
      }
      enum alternate-port {
        value 4;
        description
          "An Alternate Port.";
      }
      enum backup-port {
        value 5;
        description
          "A Backup Port.";
      }
    }
    description
      "The Port Role assigned by the Bridge's spanning tree protocol entity
      for a given spanning tree.";
    reference
      "13.4, 13.5, 13.12, 13.24, 13.27.66, and item bn) in 13.27
      of IEEE Std 802.1Q.";
  }

  grouping bridge-component-parameters {
    description
      "This grouping comprises per-Bridge component parameters.";
    container rstp {
      presence "The presence of this container indicates that RSTP is
      supported.";
      description
        "Per-Bridge component parameters common to RSTP, MST, and SPB.";
      leaf force-protocol-version {
        type enumeration {
          enum emulate-stp {
            value 0;
            description
              "Forces transmission of STP BPDUs. Slows reconfiguration and
              ageing of FDB entries.";
          }
          enum rstp {
            value 2;
            description
              "RST BPDUs are transmitted. MCID, MSTI, and SPT information
              is not transmitted and is ignored on receipt, treating a
              neighboring Bridge as in a separate MST or SPT region even
              if MSTP and/or SPB are implemented.";
          }
          enum rstp-mstp {
            value 3;
            description
              "If MSTP is implemented, full MSTP behavior is enabled and
              transmitted BPDUs include RSTP and MSTP information.";
          }
          enum rstp-mstp-spb{
            value 4;
            description
              "Shortest Path Bridging (SPB) and MSTP (if implemented) are
              both enabled. Transmitted BPDUs can include RSTP, MSTP,
              and SPB information.";
          }
        }
        description
          "Each Bridge implementing RSTP, MSTP, or SPT is plug-and-play
          interoperable with neighboring Bridges using a different subset
          of those protocols. Force Protocol Version applies to all ports,
          and can restrict protocol use. Each Bridge Port also detects a
          neighbor(s) using STP (IEEE Std 802.1D-1998, now withdrawn)
          and uses STP BPDUs and slow reconfiguration to interwork with
          those neighbors independently of Force Protocol Version.
          Force Protocol Version value 1 was previously assigned to
          IEEE Std 802.1G-1996 (now withdrawn) and is not to be used.";
        reference
          "5.4, 5.4.1.1, 5.4.5, 13.7.2, 13.26, 13.28.21, 13.29.13, and
          13.29.28 of IEEE Std 802.1Q.";
```

```
    }
    container bridge-id {
      uses bridge-id;
      description
        "The Bridge Identifier used by this Bridge for the single spanning
        tree (the Common Spanning Tree, CST) supported by RSTP, and for
        that tree and its extension (the CIST) through MST and SPT Regions
        supported by MSTP and SPB.";
      reference
        "13.26.2, 14.1.2, 14.2.5, and item e) in 13.26 of IEEE Std 802.1Q.";
    }
    container root-id {
      uses bridge-id;
      config false;
      description
        "The Root Bridge of the single spanning tree (the CST) supported
        by RSTP, and its extension  (the CIST) through MST and SPT Regions
        supported by MSTP and SPB, as currently determined by this node.";
      reference
        "13.9, 14.1.2, and item f) in 13.26 of IEEE Std 802.1Q.";
    }
    leaf root-path-cost {
      type uint32;
      config false;
      description
        "The Root Path Cost for the single spanning tree (the CST)
        supported by RSTP and the External Root Path Cost for its
        extension (the CIST) through MST and SPT Regions supported by
        MSTP and SPB. Includes the Port Path Cost of the Bridge's Root
        Port unless the Bridge is the Root Bridge or its Root Port is not
        a Boundary Port of its MST or SPT Region.";
      reference
        "13.9, 13.10, 13.5.3, and item i) in 13.26 of IEEE Std 802.1Q.";
    }
    leaf root-port {
      type union {
      type if:interface-ref;
      type empty;
      }
      config false;
      description
        "A reference to the Root Port for the single spanning tree
        (the CST) supported by RSTP or its extension (the CIST) through
        MST and SPT Regions supported by MSTP and SPB, empty if this
        Bridge is the Root Bridge.";
      reference
        "13.5 and 13.26.9 of IEEE Std 802.1Q.";
    }
    leaf max-age {
      type uint8;
      units "seconds";
      config false;
      description
        "The maximum age of the spanning tree information (Max Age)
        currently used by this Bridge for the common spanning tree
        supported by RSTP, MSTP, and SPB. Set to the bridge-max-age if
        the Bridge is the Root Bridge, and to the whole seconds part of
        the value received on the Root Port otherwise.";
      reference
        "13.15, 13.20, 13.25, item l) in 13.28, and item g) in 13.26 of
         IEEE Std 802.1Q.";
    }
    leaf hello-time {
      type uint8;
      units "seconds";
      config false;
      description
        "The interval (Hello Time) between the periodic transmission
        of Configuration Bridge PDUs on Designated Ports. Set to
        2 seconds if the Bridge is currently acting as the Root
        Bridge, and to the whole seconds part of the value received on
        the Root Port for the common spanning tree supported by RSTP,
```

```
          MSTP, and SPB otherwise.";
        reference
          "Table 13-5, 13.25.3, and 13.28.11 of IEEE Std 802.1Q.";
      }
      leaf forward-delay {
        type uint8;
        units "seconds";
        config false;
        description
          "If a Port is using STP because STP BPDUs are being received or
          force-protocol-version is set to emulate-stp (0), Forward Delay
          determines the time to transition from Discarding to Learning
          and from Learning to Forwarding, and to age FDB entries after a
          topology change. Set to bridge-forward-delay if the Bridge is the
          CIST Root, and to the whole seconds part of the value received on
          the CIST Root Port otherwise. Does not affect RSTP, MSTP, and SPB
          rapid Port State transitions and FDB flushing.";
        reference
          "Table 13-5, 13.25.2, 13.28.10, and item g) in 13.26.4 of
           IEEE Std 802.1Q.";
      }
      leaf bridge-max-age {
        type uint8 {
          range "6..40";
        }
        units "seconds";
        default "20";
        description
          "The value of Max Age when this Bridge is the Root Bridge for the
          common spanning tree supported by RSTP, MSTP, and SPB.";
        reference
          "Table 13-5, 13.26.4, and item g) in 13.26 of IEEE Std 802.1Q.";
      }
      leaf bridge-forward-delay {
        type uint8 {
          range "4..30";
        }
        units "seconds";
        default "15";
        description
          "The value of Forward Delay when this Bridge is the Root Bridge
          for the common spanning tree supported by RSTP, MSTP, and SPB.";
        reference
          "Table 13-5, 13.26.4, and item a) in 13.26.4 of IEEE Std 802.1Q.";
      }
      leaf tx-hold-count {
        type uint8 {
          range "1..10";
        }
        default "6";
        description
          "Limits the rate of BPDU transmission. If the variable txCount
          (which is incremented on each transmission and decremented once a
          second) reaches TxHoldCount, transmission is delayed.";
        reference
          "Table 13-5, 13.27.75, 13.26.12, and item b) in 13.26 of
          IEEE Std 802.1Q.";
      }
      leaf last-topology-change {
        type yang:date-and-time;
        config false;
        description
          "The time at which the Topology Change timer, tcWhile, for any
          Bridge Port was last running: when Topology Change Notification
          (TCN) Messages were last transmitted.";
        reference
          "13.25.9 of IEEE Std 802.1Q.";
      }
    }
  }

  grouping bridge-port-parameters {
```

```
    description
      "This grouping comprises per-interface parameters.";
    container rstp {
      presence "The presence of this container indicates that RSTP is
      supported";
      description
      "Per-Bridge Port interface parameters common to RSTP, MSTP, and SPB.";
      leaf admin-bridge-port-enabled {
        type boolean;
        default "true";
        description
        "The Administrative Bridge Port State for the port. If false, the
        port is excluded from the active topology for all spanning trees
        and Ethernet Switched Paths (ESPs), and BPDUs are not transmitted
        or received.";
        reference
        "8.4, 8.6.1, 8.13.9, 13.12, and 13.27.45 of IEEE Std 802.1Q.";
      }
      leaf port-state {
        type port-state;
        config false;
        description
          "The Port State for RSTP, and for the CIST for MSTP and SPB.";
        reference
          "8.4, 8.6, 8.7, 13.4, item aw) and item ba) in 13.27
          of IEEE Std 802.1Q.";
      }
      leaf port-role {
        type port-role;
        config false;
        description
          "The Port Role for the single spanning tree (the CST) supported
          by RSTP, and for its extension (the CIST) through MST and SPT
          Regions supported by MSTP and SPB.";
        reference
          "13.4, 13.5, 13.12, 13.24, 13.27.66, and item bn) in 13.27
           of IEEE Std 802.1Q.";
      }
      leaf restricted-role {
        type boolean;
        default "false";
        description
          "Set to prevent selection of the port as Root Port for the CIST
          or any MSTI, even if it has the best spanning tree priority
          vector, at the risk of causing a lack of spanning tree
          connectivity, thus preventing Bridges external to a core region
          of the network influencing the spanning tree active topology.
          The port will be selected as an Alternate Port rather than a
          Root Port.";
        reference
          "13.20, 13.27.64, 13.29.34, 16.2, 16.3, 26.5, 27.6, 27.20,
           item s) in 13.27 of IEEE Std 802.1Q.";
      }
      leaf restricted-tcn {
        type boolean;
        default "false";
        description
        "Set to prevent propagation of topology changes and topology change
        notifications to other ports. Set to prevent a Bridge external to
        a core region of the network causing address flushing. If set can
        cause temporary loss of connectivity after a topology change.";
        reference
          "13.20, 13.27.65, 13.29.25, 16.2, 16.3, item t) in 13.27
          of IEEE Std 802.1Q.";
      }
      container port-id {
        uses port-id;
        description
          "The Port Identifier used by this Bridge Port by RSTP for the
          CST and by MSTP and SPB for the CIST.";
        reference
          "13.27.46, 14.1.2, items bd) and be) in 13.27
```

```
        of IEEE Std 802.1Q.";
    }
    leaf fix-port-path-cost {
      type uint32 {
        range "0..200000000";
      }
      default "0";
      description
        "Zero if the port-path-cost is to be determined by the Bridge,
        and the value to be used otherwise.";
      reference
        "13.10, 13.18, and Table 13-4 of IEEE Std 802.1Q.";
    }
    leaf port-path-cost {
      type uint32 {
        range "1..200000000";
      }
      config false;
      description
        "The port's contribution to the Bridge's External Root Path Cost,
        when the port is the CST Root Port (for RSTP and MSTP) or the
        CIST Master Port (for MSTP and ISIS-SPB).";
      reference
        "13.5.3, 13.27.25, Table 13-4, and item g) of 13.27
        of IEEE Std 802.1Q.";
    }
    leaf designated-protocol-version {
      type uint8;
      config false;
      description
        "The Protocol Version Identifier in BPDUs transmitted by the
        Designated Bridge for the attached LAN.";
      reference
        "14.2.2, 14.3, and Figure 14-1 of IEEE Std 802.1Q.";
    }
    action port-protocol-migration-check {
      description
        "Executing port-protocol-migration-check (mcheck) forces
        transmission of RST (or MST or SPT) BPDUs for migrate-time to
        check that all STP Bridges have been removed from the port's
        attached LAN, so RST/MST/SPT BPDU transmission can persist.
        Has no effect if force-protocol-version is emulate-stp(0).";
      reference
        "13.27.38, 13.32, and item j) in 13.27 of IEEE Std 802.1Q.";
    }
    container root-id {
      uses bridge-id;
      config false;
      description
        "The CIST Root Identifier in Configuration BPDUs transmitted by
        the Designated Bridge for the attached LAN.";
      reference
        "14.1.2, 13.27.20, 13.10, and item ar) in 13.27
        of IEEE Std 802.1Q.";
    }
    leaf root-path-cost {
      type uint32;
      config false;
      description
        "The CIST External Path Cost advertised in BPDUS by the
        Designated Bridge for the CIST for the attached LAN.";
      reference
        "14.1.2, 13.27.20, item ar) in 13.27, and 27.6
        of IEEE Std 802.1Q.";
    }
    container designated-bridge-id {
      uses bridge-id;
      config false;
      description
        "The Bridge Identifier of the Bridge that this port considers to
        be the Designated Bridge for the attached LAN for RSTP, and the
        CIST Regional Root for MSTP and SPB.";
```

```
        reference
          "14.1.2, 13.27.20, 13.10, item ar) in 13.27, and Figure 14-1
          of IEEE Std 802.1Q.";
      }
      container designated-port-id {
        uses port-id;
        config false;
        description
          "The Port Identifier of the Bridge Port that this port considers
          to be the Designated Port for the CIST for the attached LAN.";
        reference
          "13.27.20, 13.10, item ar) in 13.27, and octets 26 and 27 of
          Figure 14-1 of IEEE Std 802.1Q.";
      }
      leaf admin-edge-port {
        type boolean;
        default "false";
        description
          "Set if the port is to be identified as an Edge Port on
          initialization without a delay to detect other Bridges attached
          to the LAN. Recommended default false(2). The operational value,
          oper-edge-port, becomes false(2) if a BPDU has been received.";
        reference
          "13.33, and item a) in 13.27 of IEEE Std 802.1Q.";
      }
      leaf oper-edge-port {
        type boolean;
        config false;
        description
          "Set if the port is currently identified as an Edge Port.
          Initialized to the value of admin-edge-port, and controlled
          by the Bridge Detection state machine.";
        reference
          "13.33, and item l) in 13.27 of IEEE Std 802.1Q.";
      }
      leaf auto-edge-port {
        type boolean;
        default "true";
        description
          "Administratively set true(1) to allow oper-edge-port
          is to be maintained automatically, with continuous monitoring of
          the presence or absence of other Bridges attached to the LAN.
          If admin-edge-port and auto-edge-port are both false and the port
          is attached to a point-to-point LAN, the port is presumed to
          provide connectivity to another bridge, and a failure to receive
          BPDUs when the port is attempting to become Forwarding is taken
          to be an indication of the failure of that other bridge's Spanning
          Tree Protocol Entity (or its transmission and/or reception),
          isolate-port will be set and the port will remain Discarding.";
        reference
          "13.33, 13.27.18, and item c) in 13.27 of IEEE Std 802.1Q.";
      }
      leaf disputed-port {
        type boolean;
        config false;
        description
          "Set when more than one Bridge Port apparently believes itself to
          be the CIST Designated Port for the LAN and has incorrectly
          transitioned to a Learning or Forwarding port state.";
        reference
          "13.21, 13.29.16, Figure 13-20 of IEEE Std 802.1Q.";
      }
      leaf isolate-port {
        type boolean;
        config false;
        description
          "Set by the Bridge Detection state machine when the Spanning Tree
          Protocol Entity of a neighboring Bridge has apparently failed.";
        reference
          "13.23, 13.27.27, 13.33, and item i) in 13.27
          of IEEE Std 802.1Q.";
      }
```

```
        }
    }
}
```

Insert 48.6.27 after 48.6.26 (inserted above) as follows:

48.6.27 The ieee802-dot1q-rstp-bridge YANG module

```
module ieee802-dot1q-rstp-bridge {
  yang-version 1.1;
  namespace "urn:ieee:std:802.1Q:yang:ieee802-dot1q-rstp-bridge";
  prefix rstp-bridge;

  import ietf-interfaces {
    prefix if;
  }
  import ieee802-dot1q-bridge {
    prefix dot1q;
  }
  import ieee802-dot1q-rstp {
    prefix rstp;
  }

  organization
    "IEEE 802.1 Working Group";
  contact
    "WG-URL: http://www.ieee802.org/1/
    WG-EMail: stds-802-1-l@ieee.org

    Contact: IEEE 802.1 Working Group Chair
    Postal: C/O IEEE 802.1 Working Group
            IEEE Standards Association
            445 Hoes Lane
            Piscataway, NJ 08854
            USA

    E-mail: stds-802-1-chairs@ieee.org";
  description
    "This module provides management of IEEE Std 802.1Q Bridge components
    that support the Rapid Spanning Tree Algorithm and Protocol (RSTP).

    Copyright (C) IEEE (2024).

    This version of this YANG module is part of IEEE Std 802.1Q; see the
    standard itself for full legal notices.";

  revision 2024-08-13 {
    description
      "Published as part of IEEE Std 802.1Qdy-2024.

      The following reference statement identifies each referenced IEEE
      Standard as updated by applicable amendments.";
    reference
      "IEEE Std 802.1Q Bridges and Bridged Networks:
      IEEE Std 802.1Q-2022, IEEE Std 802.1Qcz-2023,
      IEEE Std 802.1Qcw-2023, IEEE Std 802.1Qcj-2023,
      IEEE Std 802.1Qdj-2024, IEEE Std 802.1Qdx-2024,
      IEEE Std 802.1Qdy-2024.";
  }

  augment "/dot1q:bridges/dot1q:bridge/dot1q:component" {
    description
      "Augment Bridge component with RSTP parameters.";
    reference
      "13.24, 13.25, and 13.26 of IEEE Std 802.1Q.";
    uses rstp:bridge-component-parameters;
  }

  augment "/if:interfaces/if:interface/dot1q:bridge-port" {
    description
      "Augment Bridge Port with RSTP configuration.";
    reference
      "13.24, 13.25, and 13.27 of IEEE Std 802.1Q.";
    uses rstp:bridge-port-parameters;
  }
```

```
}
```

Insert 48.6.28 after 48.6.27 (inserted above) as follows:

48.6.28 The ieee802-dot1q-mstp YANG module

```
module ieee802-dot1q-mstp {
  yang-version 1.1;
  namespace "urn:ieee:std:802.1Q:yang:ieee802-dot1q-mstp";
  prefix mstp;

  import ietf-interfaces {
    prefix if;
  }
  import ieee802-dot1q-rstp {
    prefix rstp;
  }

  organization
    "IEEE 802.1 Working Group";
  contact
    "WG-URL: http://www.ieee802.org/1/
     WG-EMail: stds-802-1-l@ieee.org

     Contact: IEEE 802.1 Working Group Chair
     Postal: C/O IEEE 802.1 Working Group
             IEEE Standards Association
             445 Hoes Lane
             Piscataway, NJ 08854
             USA

     E-mail: stds-802-1-chairs@ieee.org";
  description
    "This module augments ieee802-dot1q-rstp to provide management of
    IEEE Std 802.1Q Bridge components that support the
    Multiple Spanning Tree Algorithm and Protocol (MSTP).

    References specify constraints on, and consequences of, settings of
    leaf values and the creation and deletion of list entries. The values
    of all configured objects are retained across system reinitialization.

    Copyright (C) IEEE (2024).

    This version of this YANG module is part of IEEE Std 802.1Q; see the
    standard itself for full legal notices.";

  revision 2024-11-17 {
    description
      "Published as part of IEEE Std 802.1Qdy-2025.

      The following reference statement identifies each referenced IEEE
      Standard as updated by applicable amendments.";
    reference
      "IEEE Std 802.1Q Bridges and Bridged Networks:
      IEEE Std 802.1Q-2022, IEEE Std 802.1Qcz-2023,
      IEEE Std 802.1Qcw-2023, IEEE Std 802.1Qcj-2023,
      IEEE Std 802.1Qdj-2024, IEEE Std 802.1Qdx-2024,
      IEEE Std 802.1Qdy-2024.";
  }

  grouping mst-config-id {
    description
      "A system calculated MST Configuration Identifier (MCID), reflecting
      the assignment of VIDs to the CIST, MSTIs, SPTs, or ESPs.";
      reference
        "13.8, 13.9, and item d) in 13.26 of IEEE Std 802.1Q.";
    leaf format-selector {
      type uint8;
      config false;
      description
        "The Configuration Identifier Format Selector. A value of 0
        indicates the format specified in IEEE Std 802.1Q.";
      reference
```

```
        "Item a) in 13.8 of IEEE Std 802.1Q.";
    }
    leaf configuration-name {
      type string {
        length "1..32";
      }
      description
        "The Configuration Name.";
      reference
        "Item b) in 13.8 of IEEE Std 802.1Q.";
    }
    leaf revision-level {
      type uint16;
      config false;
      description
        "The Revision Level.";
      reference
        "Item c) in 13.8 of IEEE Std 802.1Q.";
      }
    leaf configuration-digest {
      type binary {
        length "16";
      }
      config false;
      description
        "The Configuration Digest (16 octets).";
      reference
        "Item d) in 13.8 of IEEE Std 802.1Q.";
    }
  }

  grouping bridge-component-parameters {
    description
      "This grouping comprises MSTP per-Bridge component parameters.";
      container bridge-mstp {
      presence "The presence of this container indicates that MSTP is
      supported.";
      description
        "Per-Bridge configuration and management parameters for the IST
        and each MSTI in an MST Region.";
      reference
        "Clause 13 and 13.26 of IEEE Std 802.1Q.";
      container mst-config-id {
        uses mst-config-id;
        description
        "This Bridge's MST Configuration Identifier.";
      }
      leaf max-hops {
        type uint8 {
          range "6..100";
        }
        default "20";
        description
          "In an MSTP Bridge, the MaxHops parameter for the IST, and each
          of the MSTIs.";
        reference
          "Clause 13, Table 13-5, 13.26.4, item g) in 13.26
          of IEEE Std 802.1Q.";
      }
      container ist {
        description
          "CIST parameter(s) additional to those for RSTP.";
        leaf internal-root-path-cost {
          type uint32;
          config false;
          description
            "The Internal Root Path Cost for the CIST including the
            Internal Port Path Cost for the Root Port.";
          reference
            "13.9, 13.10, 13.5.3, 13.26.10, and octets 90-93 in Figure 14-1
            of IEEE Std 802.1Q.";
        }
```

```
      }
      list msti {
        key "mstid";
        description
          "Per-Bridge configuration and management parameters for each MST,
          with an MSTID in the range allocated for MSTP configuration.";
        reference
          "13.26, 13.9, and 13.11 of IEEE Std 802.1Q.";
        leaf mstid {
          type uint16 {
            range "1..4091";
          }
          description
            "MSTIDs allocated for use by MSTP (1..4091) to identify MSTIs.
             Other MSTIDs in the 12-bit range are reserved [for use in
             the MST Configuration Table, whose configuration is identified
             by the Configuration Digest in the MST Configuration Identifier
             (mst-config-id/configuration-digest)] for the CIST-MSTID,
             SPBM-MSTID, SPBV-MSTID, TE-MSTID, and SPVID-Poll-MSTID.";
          reference
            "8.4, 8.6.1, 8.9.3, 13.2.1 of IEEE Std 802.1Q.";
        }
        leaf bridge-priority {
          type rstp:id-priority;
          description
            "The priority component of this Bridge's Bridge Identifier for
            the MSTI, encoded in the four most-significant bits of octet 14
            of the MST Configuration Message.";
          reference
            "13.26.3, 13.11, 14.4.1, and item f) in 13.26
            of IEEE Std 802.1Q.";
        }
        container regional-root-id {
          uses rstp:bridge-id;
          config false;
          description
            "The MSTI Regional Root Identifier for this MSTI.";
          reference
            "13.27.20, 13.10, and item ar) in 13.27 of IEEE Std 802.1Q.";
        }
        leaf internal-root-path-cost {
          type uint32;
          config false;
          description
            "The Internal Root Path Cost for the MSTI including the
            Internal Port Path Cost for the Root Port for this MSTI.";
          reference
            "13.9, 13.10, 13.5.3, 13.26.10 and item i) in 13.26
            of IEEE Std 802.1Q.";
        }
        leaf root-port {
          type union {
          type if:interface-ref;
          type empty;
          }
          config false;
          description
            "A reference to the Root Port for the MSTI, empty if this
            Bridge is the MSTI Regional Root.";
          reference
            "13.5 and 13.26.9 of IEEE Std 802.1Q.";
        }
      }
    }
  }

  grouping bridge-port-parameters {
    description
      "This grouping comprises MSTP Bridge Port parameters.";
    reference
      "13.24, 13.25, and 13.27 of IEEE Std 802.1Q.";
    container port-mstp {
```

```
      presence "The presence of this container indicates that MSTP is
      supported.";
      description
        "Per-Bridge Port interface parameters for MST Configuration,
        for the IST, and for each MSTI.";
      leaf boundary-port {
        type boolean;
        config false;
        description
          "True if the port is a Boundary Port of the Region.";
        reference
          "13.12 of IEEE Std 802.1Q.";
      }
      leaf restricted-domain-role {
        type boolean;
        description
          "If TRUE, causes a port that is a Boundary Port of an SPT Region
          not to be selected as Root Port for the CIST, any MSTI, or any
          SPT, even it has the best spanning tree priority vector.";
        reference
          "13.27.63 of IEEE Std 802.1Q.";
      }
      container ist {
        description
          "CIST parameters additional to those for RSTP.";
        container mst-config-id {
          uses mst-config-id;
          config false;
          description
            "The MST Configuration Identifier transmitted by the CIST's
            Designated Bridge for the attached LAN.";
          reference
            "Figure 14-1 of IEEE Std 802.1Q.";
        }
        leaf fix-internal-port-path-cost {
          type uint32 {
            range "0..200000000";
          }
          default "0";
          description
            "Zero if the internal-port-path-cost is to be determined by
            the Bridge, and the value to be used otherwise.";
          reference
            "13.10, 13.18, and Table 13-4 of IEEE Std 802.1Q.";
        }
        leaf internal-port-path-cost {
          type uint32 {
            range "1..200000000";
          }
          config false;
          description
            "The CIST's Internal Port Path Cost for this Bridge Port.";
          reference
            "13.10, 13.18, and Table 13-4 of IEEE Std 802.1Q.";
        }
        leaf internal-root-path-cost {
          type uint32;
          config false;
          description
            "The CIST Internal Root Path Cost advertised in BPDUs by the
            Designated Bridge for the CIST. Zero if the field was not
            present in the last BPDU received from that Bridge.";
          reference
            "13.5.3, 13.9, 13.27.20, 14.4.1, and 27.6 of IEEE Std 802.1Q.";
        }
        container designated-bridge {
          uses rstp:bridge-id;
          config false;
          description
            "The CIST Bridge Identifier advertised in BPDUs by the CIST's
            Designated Bridge. Zero if the field was not present in the
            last BPDU received from that Bridge.";
```

```
        reference
          "Octets 94-101 of Figure 14-1 of IEEE Std 802.1Q.";
      }
      leaf remaining-hops {
        type uint8;
        config false;
        description
          "The remainingHops for the CIST, received from or to be
          transmitted by this port's CIST Designated Bridge.";
        reference
          "13.20, 13.26.4, 13.26.11, 13.27.40, 14.2.11, and octet 102 in
          Figure 14-1 of IEEE Std 802.1Q.";
      }
    }
    list msti {
      key "mstid";
      description
        "Per-Bridge Port parameters for each MSTI with an MSTID in the
        range allocated for MSTP configuration.";
      reference
        " ";
      leaf mstid {
        type uint16 {
          range "1..4091";
        }
        description
          "MSTIDs allocated for use by MSTP (1..4091) to identify MSTIs.";
        reference
          "8.4, 8.6.1, 8.9.3, 13.2.1 of IEEE Std 802.1Q.";
      }
      leaf port-state {
        type rstp:port-state;
        config false;
        description
          "The Port State for this MSTI.";
        reference
          "8.4, 8.6, 8.7, 13.4, item aw) and item ba) in 13.27
          of IEEE Std 802.1Q.";
      }
      leaf port-role {
        type union {
          type rstp:port-role;
          type enumeration {
            enum master-port {
              value 6;
              description "A Master Port.";
            }
          }
        }
        config false;
        description
          "The Port Role for the MSTI.";
        reference
          "13.4, 13.5, 13.12, 13.24, 13.27.66, and item bn) in 13.27
          of IEEE Std 802.1Q.";
      }
      container port-id {
        uses rstp:port-id;
        description
          "This Bridge Port's Port Identifier for the MSTI, including the
          manageable port-priority encoded in the four most-significant
          bits of octet 15 of the MSTI Configuration Message.";
        reference
          "13.18, 13.27.64, and item e) in 14.4.1, of IEEE Std 802.1Q.";
      }
      leaf fix-internal-port-path-cost {
        type uint32 {
          range "0..200000000";
        }
        default "0";
        description
          "Zero if the internal-port-path-cost for this Bridge Port and
```

```
        MSTI is to be determined by the Bridge, and the value to be
        used otherwise.";
      reference
        "13.11, 13.18, and Table 13-4 of IEEE Std 802.1Q.";
    }
    leaf internal-port-path-cost {
      type uint32 {
        range "1..200000000";
      }
      config false;
      description
        "The Internal Port Path Cost for this Bridge Port and MSTI.";
      reference
        "Item b) of 13.2.1, and item ay) in 13.27 of IEEE Std 802.1Q.";
    }
    container regional-root-id {
      uses rstp:bridge-id;
      config false;
      description
        "The MSTI Regional Root Identifier in Configuration BPDUs
        transmitted by the  Designated Bridge for the attached LAN
        and this MSTI.";
      reference
        "13.27.20, 13.10, and item ar) in 13.27 of IEEE Std 802.1Q.";
    }
    leaf internal-root-path-cost {
      type uint32;
      config false;
      description
        "The MSTI Internal Path Cost advertised in BPDUS by the
        Designated Bridge for the attached LAN and this MSTI.";
      reference
        "13.5.3, 13.9, 13.27.20, 14.4.1, and 27.6 of IEEE Std 802.1Q.";
    }
    container designated-bridge-id {
      uses rstp:bridge-id;
      config false;
      description
        "The Bridge Identifier of the Bridge believed to be the
        Designated Bridge for the attached LAN and this MSTI. The
        bridge-priority component is encoded in the MSTI Configuration
        Message, the system-id-extension component is the MSTID, and
        the bridge-address is that of the ist/designated-bridge.";
      reference
        "13.27.20, 13.10, and item ar) in 13.27 of IEEE Std 802.1Q.";
    }
    container designated-port-id {
      uses rstp:port-id;
      config false;
      description
        "The Port Identifier of the Designated Port for this MSTI for
        the attached LAN, transmitting the port-priority in the
        MSTI Configuration  Message and the port-number in the CIST
        Port Identifier field.";
      reference
        "13.27.20, 13.10, item ar) in 13.27, octet 15 in Figure 14-3,
        and octets 26 and 27 of Figure 14-1 of IEEE Std 802.1Q.";
    }
    leaf disputed-port {
      type boolean;
      config false;
      description
        "Set when more than one Bridge Port apparently believes itself
        to be the MSTI Designated Port for the LAN and has incorrectly
        transitioned to a Learning or Forwarding port state.";
      reference
        "13.21, 13.29.16, Figure 13-20 of IEEE Std 802.1Q.";
    }
    leaf remaining-hops {
      type uint8;
      config false;
      description
```

```
            "The remainingHops for the MSTI, received from or transmitted
            by the MSTI's Designated Bridge for this port.";
          reference
            "13.20, 13.26.4, 13.26.11, 13.27.40, 14.2.11, and octet 16 in
            Figure 14-3 of IEEE Std 802.1Q.";
        }
      }
    }
  }
}
```

Insert 48.6.29 after 48.6.28 (inserted above) as follows:

48.6.29 The ieee802-dot1q-mstp-bridge YANG module

```
module ieee802-dot1q-mstp-bridge {
  yang-version 1.1;
  namespace "urn:ieee:std:802.1Q:yang:ieee802-dot1q-mstp-bridge";
  prefix mstp-bridge;

  import ietf-interfaces {
    prefix if;
  }
  import ieee802-dot1q-bridge {
    prefix dot1q;
  }
  import ieee802-dot1q-rstp-bridge {
    prefix rstp-bridge;
  }
  import ieee802-dot1q-mstp {
    prefix mstp;
  }

  organization
    "IEEE 802.1 Working Group";
  contact
    "WG-URL: http://www.ieee802.org/1/
    WG-EMail: stds-802-1-l@ieee.org

    Contact: IEEE 802.1 Working Group Chair
    Postal: C/O IEEE 802.1 Working Group
            IEEE Standards Association
            445 Hoes Lane
            Piscataway, NJ 08854
            USA

    E-mail: stds-802-1-chairs@ieee.org";
  description
    "This module provides management of IEEE Std 802.1Q Bridge components
    that support the Multiple Spanning Tree Algorithm and Protocol (MSTP).

    Copyright (C) IEEE (2024).

    This version of this YANG module is part of IEEE Std 802.1Q; see the
    standard itself for full legal notices.";

  revision 2024-08-13 {
    description
      "Published as part of IEEE Std 802.1Qdy-2024.

      The following reference statement identifies each referenced IEEE
      Standard as updated by applicable amendments.";
    reference
      "IEEE Std 802.1Q Bridges and Bridged Networks:
      IEEE Std 802.1Q-2022, IEEE Std 802.1Qcz-2023,
      IEEE Std 802.1Qcw-2023, IEEE Std 802.1Qcj-2023,
      IEEE Std 802.1Qdj-2024, IEEE Std 802.1Qdx-2024,
      IEEE Std 802.1Qdy-2024.";
  }

  augment "/dot1q:bridges/dot1q:bridge/dot1q:component/dot1q:bridge-mst" {
    when '../rstp-bridge:rstp';
    description
      "Augment RSTP-capable Bridge component with MSTP configuration and
       management.";
    reference
      "13.24, 13.25, and 13.26 of IEEE Std 802.1Q.";
    uses mstp:bridge-component-parameters;
  }

  augment "/if:interfaces/if:interface/dot1q:bridge-port" {
    when 'rstp-bridge:rstp';
```

```
    description
      "Augment RSTP Bridge Port with MSTP configuration.";
    reference
      "13.24, 13.25, and 13.27 of IEEE Std 802.1Q.";
    uses mstp:bridge-port-parameters;
  }
}
```

Annex A

(normative)

PICS proforma—Bridge implementations[9]

A.47 YANG

Insert the following rows at the end of the table in A.47 (unchanged rows not shown):

Item	Feature	Status	References	Support
YANG-RSTP	Is the *ieee802-dot1q-rstp* module supported?	RSTP:O	48.6.26	Yes [ ] No [ ] N/A [ ]
YANG-MSTP	Is the *ieee802-dot1q-mstp* module supported?	MSTP:O	48.6.28	Yes [ ] No [ ] N/A [ ]

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