Proposed RSTP and MSTP YANG module updates

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This note introduces proposed revisions of the RSTP and MSTP YANG modules. These are based on the Qdy-YANG-2024-07-25 ieee802-dot1q-rstp, ieee802-dot1q-rstp, ieee802-dot1-rstp-bridge, and ieee802-dot1-mstp-bridge modules recently distributed by Martin, which incorporated the restructuring/split into "rstp" and an "rstp-bridge"modules as agreed by the CRG in the July 2024 Plenary.

1. Files

The proposed changes are incorporated in updated yang module files. To mitigate the chance of errors (and of going crazy trying to identify in-progress updates) through using module-name.yang names without a revision or version component, the revised module files are named according to the convention of Section 3.2 of RFC 5407 and Section 5.2 of RFC 7950:

module-or-submodule-name@revision-date.yang

Schema and validation results are similarly named.

2. Validation

This module has been validated using the online https://www.yangcatalog.org/yangvalidator. Validation results are provided in a separate pdf.[1]

Schema trees were produced using pyang.

3. Changes

Annotated trees for the YANG model augmentations (module: ieee802-dot1q-rstp-bridge, module: ieee802-dot1q-mstp-bridge) are included and are probably the easiest way to review the most significant changes (addition of previously missing leaves, change to leaf types, use of containers and groupings). The schema trees included in P802.1Qdy/D2.0 (module: ieee802-dot1q-rstp, module: ieee802-dot1q-mstp) are also included in the same format for anyone who wishes to duplicate the document for a side-by-side review.

The annotations for the updated model trees include labels **I-<n>**, e.g., **I-85**, referencing the Initial SA Ballot Comments documented in the 802-1Qdy-d2-0-pdis-v05.pdf [2] posted by Martin. Proposed changes arising from CRG discussion (or my recollection of the discussion and its likely consequences) are labelled CRG with an indication of the time frame of the relevant CRG meeting.

Where there is no obvious initial SA ballot comment whose disposition could include the proposed change, I have included a label **R-** to indicate the probable need for a Rogue Comment (for eventual numbering).

To review changes to leaf descriptions and other detail not apparent, please refer to the updated modules. I have tried a variety of compare/diff utilities, but these typically do not ignore unimportant changes such as spacing, are not smart about deletions, insertions, and moves, and in consequence are virtually useless.

A table of SA Ballot comments, that I have used to check that comments have been considered and applied, is included.

The more significant changes are described, numbered **P-n**. Ballot comment references are to 802-1Qdy-d2-0-pdis-v05.pdf. Proposed changes arising from CRG discussion (or my recollection of the discussion and its likely consequences) are labelled CRG with an indication of the time frame of the relevant CRG meeting.

Where no related **I–** numbered comment is shown, the comment needs to be treated as a Rogue Comment for formal pdis/dis purposes.

4. SA Ballot Responses

Writing a Response for each ballot comment that could, theoretically, be mechanically applied to generate revised modules would be a mammoth task. We have to include clear reasoning for each REJECT. On AIPs we should be clear on the intent of the change, but detailed resolution should be something like "as detailed in the module revision reviewed by the CRG and prepared for recirculation ballot".

[1] No errors or warnings were reported with the exception of (a) complaints about the initial characters of the module names and urns; (b) Confdc complaint about using an intref in a union, which is a confdc failure to properly update to yang 1.1. Module name and urn warnings are also given for imported modules, including those from the IETF, so I expect that the validator is not up to date on those issues.

[2] https://www.ieee802.org/1/files/private/dy-drafts/d2/802-1Qdy-d2-0-pdis-v05.pdf

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

  augment /dot1q:bridges/dot1q:bridge/dot1q:component:
    +--rw rstp!
       +--rw force-protocol-version?          enumeration
       +---x port-protocol-migration-check
       +--rw bridge-id
       |  +--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
       |     +--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?                       if:interface-ref
       +--ro max-age?                         uint8
       +--ro hello-time?                      uint8
       +--ro forward-delay?                   uint8
       +--rw bridge-max-age?                  uint8
       +--ro bridge-hello-time?               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
       |  +--rw port-id
       |     +--ro port-id?         uint16
       |     +--rw port-priority?   id-priority
       |     +--ro port-number?     id-port-number
       +--rw port-path-cost?              uint32
       +--ro root-id
       |  +--ro bridge-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
       |     +--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
       |     +--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
```

1–2: Modules split into rstp-bridge and rstp. An alternate bridg-like component could be augmented (I-31, I-32, I-100).

5: Migration check now an action (I-52).
6-54: rstp module objects now have ‘rstp friendly’ names, descriptions map to protocol fields and mstp/spb use (I-85, I-7, I-93, I-95).
8: id-priority is four bits (I-1).
6–11: bridge-id a grouping, uint64 for protocol computation, separate components also shown, component identified by bridge address and optionally system-id-extension (CRG 7/2024, RC-).

14: A bridge-id, including root-id is 8 octets/64 bits (I-51, I-53).

20: Root Port identified by interface-ref (I-2).

25: hello-time is uint8 (I-3).
27: tx-hold-count is unsigned, and a small integer (I-4).
–: migrate-time removed (I-5).
–: topology-change-count removed (I-67).
28: Last topology change now wall clock, not time since (I-66).

31. Administrative Bridge Port State was missing.
32–33: Port State and Port Role now by typedef, for reusability.

34–35: restricted-role, restricted-tcn are read-write (I-6, I-49, I-50).

36–40: port-id a reusable grouping, uint16 for protocol computation, separate components for configuration (I-8).

38: id-priority is 4 bits, not 3 as per dot1qtypes:priority-type (I-1).
39: id-port-number typedef uint16, 12 bit range.

42–47, 49–54: root-id and designated-bridge-id use bridge-id grouping, but are received or derived information, so all components are read-only (CRG 7/2024, RC-) .

55–59: port-id uses port-id grouping.

–: auto-isolate-port removed (I-9).
63: disputed-port added (I-10, I-83).

ieee802-dot1q-mstp@2024-08-20.tree

```
1   module: ieee802-dot1q-mstp-bridge
2
3     augment
      /dot1q:bridges/dot1q:bridge/dot1q:component/dot1q:bridge-mst:
4       +--rw bridge-mstp!
5          +--rw mst-config-id
6          |  +--ro format-selector?        uint8
7          |  +--ro configuration-name?     string
8          |  +--ro revision-level?         uint16
9          |  +--ro configuration-digest?   binary
10         +--rw max-hops?        uint8
11         +--rw ist
12         |  +--ro internal-root-path-cost?   uint32
13         +--rw msti* [mstid]
14            +--rw mstid                     uint16
15            +--rw bridge-priority?          rstp:id-priority
16            +--ro regional-root-id
17            |  +--ro bridge-id
18            |     +--ro bridge-id?             uint64
19            |     +--ro bridge-priority?       id-priority
20            |     +--ro system-id-extension?   uint16
21            |     +--ro bridge-address?        ieee:mac-address
22            +--ro internal-root-path-cost?   uint32
23            +--ro root-port?                 union
24    augment /if:interfaces/if:interface/dot1q:bridge-port:
25      +--rw port-mstp!
26         +--rw boundary-port?            boolean
27         +--rw restricted-domain-role?   boolean
28         +--rw ist
29         |  +--ro mst-config-id
30         |  |  +--ro format-selector?        uint8
31         |  |  +--ro configuration-name?     string
32         |  |  +--ro revision-level?         uint16
33         |  |  +--ro configuration-digest?   binary
34         |  +--rw internal-port-path-cost?   uint32
35         |  +--ro internal-root-path-cost?   uint32
36         |  +--ro designated-bridge
37         |  |  +--ro bridge-id
38         |  |     +--ro bridge-id?             uint64
39         |  |     +--ro bridge-priority?       id-priority
40         |  |     +--ro system-id-extension?   uint16
41         |  |     +--ro bridge-address?        ieee:mac-address
42         |  +--ro remaining-hops?            uint8
43         +--rw msti* [mstid]
44            +--rw mstid                     uint16
45            +--ro port-state?               rstp:port-state
46            +--ro port-role?                union
47            +--rw port-id
48            |  +--rw port-id
49            |     +--ro port-id?         uint16
50            |     +--rw port-priority?   id-priority
51            |     +--ro port-number?     id-port-number
52            +--rw internal-port-path-cost?   uint32
53            +--ro regional-root-id
54            |  +--ro bridge-id
55            |     +--ro bridge-id?             uint64
56            |     +--ro bridge-priority?       id-priority
57            |     +--ro system-id-extension?   uint16
58            |     +--ro bridge-address?        ieee:mac-address
59            +--ro internal-root-path-cost?   uint32
60            +--ro designated-bridge-id
61            |  +--ro bridge-id
62            |     +--ro bridge-id?             uint64
63            |     +--ro bridge-priority?       id-priority
64            |     +--ro system-id-extension?   uint16
65            |     +--ro bridge-address?        ieee:mac-address
66            +--ro designated-port-id
67            |  +--ro port-id
68            |     +--ro port-id?         uint16
69            |     +--ro port-priority?   id-priority
70            |     +--ro port-number?     id-port-number
71            +--ro disputed-port?             boolean
72            +--ro remaining-hops?            uint8
73
```

1–2: Modules split into mstp-bridge and mstp. An alternate bridge-like component could be augmented (I-33, I-34, I-100).

5: mst-config-id changed to a grouping, used by bridge-mstp and port-mstp (R-).
6. format-selector uint8, not int32, and computed by the system, not direct manageable, so ro not rw (I-13, I-58).
8. revision-level is 16-bit, not 32-bit, computed by the system, not direct manageable, so ro not rw (I-15, I-59).
10: max-hops is uint8 not int32 (I-17, I-60).
11: ist container to mirror per msti structure, with internal-root-path-cost (R-).

15. bridge-priority, not port-id-priority, here (I-21, I-65).
16. msti regional-root-id added (I-69).

17: Root Port identified by union of interface-ref and empty (if Bridge is Regional Root), not port number (I-2, I-24).

26. Boundary Port, information previously missing (R-).
27: restricted-domain-role, previously missing (I-44).
28: ist container to mirror per-msti structure (I-25).
29: received MST Configuration Identifier information was missing, need to know when (and if it is the reason for being) a Boundary Port. Possible remedial action wanted. Uses grouping. All read-only as is derived or received.

34: IST internal-port-path-cost was missing (I-25).
35: Want to know IST internal-root-path-cost (received or derived information) to assess reconfiguration if Root Port fails (I-25+).
36-41: IST designated bridge information previously missing, in MST Region, the RSTP Designated Bridge information is the CIST Regional Root (I-25+).

42: IST remaining-hops was missing, need to know per port for possible failure/reconfiguration planning (I-25+)
43: named list ‘msti’, removed ‘msti’ prefix from elements (R-).
45: Port State now by typedef, for reusability.
46: Port Role uses rstp typedef with union to add Master Port.
47: port-id grouping includes all info for computation, with manageable port-priority, previously incorrectly msti-bridge-id-priority (I-21, I-65).

53: regional-root-id uses bridge-id grouping,

54–58, 60-65: root-id and designated-bridge-id use bridge-id grouping, but are received or derived information, so all components are read-only (CRG 7/2024, RC-) .

66: disputed-port added (I-10, I-27, I-83).
67:MSTI remaining-hops was missing, need to know per port for possible failure/reconfiguration planning (I-26).

Initial SA Ballot Comment check table

Comment numbers I-1 etc. are from the Initial SA Ballot.

Current Proposed Disposition of Comments (pdis05):
A – Accept, AIP – Accept In Principle (Revise, make a chance to the draft, not necessarily that proposed),
PAIP – Proposed Accept In Principle, R – Reject (no change to the draft), "—" no current proposed disposition.

Revised: Updated modules/proposals suggest change/update to current proposed disposition. T – see schema (tree) annotations, P-1 etc. refer to further detail in this document. "—" no further module change, revision is per pdis.

Further action: Changes not yet made in the modules, or other supporting changes.

Comment #	pdis05	Revised	Further action
I-1	A	P–3.	
I-2	AIP	T, P–13.	
I-3	A	[P–14.]	
I-4	A	—	—
I-5	PA	P–16.	—
I-6	PA	—	—
I-7	A	—	—
I-8	A	—	—
I-9	PAIP	P–23.	
I-10	A	—	
I-11	A	P–3.	
I-12	A	!!!	
I-13	A	—	
I-14	A	—	
I-15	A	—	
I-16	A	—	
I-17	A		
I-18	PA	—	
I-19	AIP	—	
I-20	A	—	
I-21	PAIP	updated as per pdis05	
I-22	A	—	
I-23	A	—	
I-24	AIP	P–13.	
I-25	A	—	

Comment #	pdis05	Revised	Further action
I-26	A	—	
I-27	A	—	—
I-28	PAIP	—	Update figure
I-29	AIP	—	Update Figures
I-30	AIP	—	Renumber Tables
I-31	AIP	P–4. P–7.	Other modules
I-32			
I-33			
I-34			
I-35	AIP	—	—
I-36	R	—	—
I-37	R	—	—
I-38	R	—	—
I-39	A	—	—
I-40	PAIP	P–10.	—
I-41	AIP	P–10.	—
I-42	AIP	—	—
I-43	R	—	—
I-44	AIP	—	
I-45	PAIP	P–21.	
I-46	PAIP	P–21.	
I-47	PAIP	desc. line 392	also I-101
I-48	PAIP	desc. line 403	
I-49	AIP	—	

Comment #	pdis05	Revised	Further action
I-50	AIP	—	
I-51	AIP	—	
I-52	AIP	desc. line 119	
I-53	AIP	—	
I-54	AIP	—	
I-55	A	—	
I-56	R	—	
I-57	PAIP	???	
I-58	AIP	—	
I-59	AIP	—	
I-60	AIP	updated as per dis05	
I-61	AIP	—	
I-62	AIP	—	
I-63	R	—	
I-64	PR	???	
I-65	PA	—	
I-66	—	P–17.	
I-67	R	—	
I-68	R	—	
I-69	PAIP	—	
I-70	R	—	
I-71	PA	—	
I-72	AIP	—	
I-73	AIP	—	
I-74	PAIP	—	

Comment #	pdis05	Revised	Further action
I-75	PA	—	
I-76	AIP	—	
I-77	PA	—	
I-78	AIP	—	
I-79	R	—	
I-80	AIP	—	
I-81	A	P–24.	
I-82	PAIP	P–24.	Clause 12
I-83	AIP	—	
I-84	PAIP	P–24.	
I-85	PAIP	P–4. P–22.	
I-86	R	—	
I-87	AIP	—	
I-88	PR	—	
I-89	A	—	
I-90	A	—	
I-91	R	—	
I-92	—		
I-93	PAIP	?	
I-94	PR	—	
I-95	PAIP	!!!	
I-96			
I-97	A	—	
I-98	PAIP	P–24.	
I-99	—	P–24.	
I-100	A	P–1.	
I-101	PAIP	P–9. P–10.	

Additional change detail

The description of some of the following is a bit rough (time), and there is some duplication.

P–1. Top-level naming

Related Comment(s) # I-31, I-32, I-33, I-34

The CRG agreed (July 2024) to restructure the modules to allow rstp and mstp parameter modules to be used in conjunction with 'bridge-like' modules specified by another SDO. This restructuring might also be directly useful to 802.1 as it frees us from a need to add any future bridge variant (e.g. a simple MAC Bridge, with 802.1D like capabilities) to the ieee802-dot1q-bridge module, rather than creating a simpler module for the purpose.

However the restructuring should not be allowed obscure fact that rstp and mstp were specifically designed to be used in conjunction with bridges and bridge ports as 802.1 understands them, and not with arbitrary components and interfaces. The latter could lead to unexpected interoperability issues, allowing (for example) RSTP/MSTP to run over the individual interfaces of a LAG on one system while its peer bridge runs them over the Bridge Port aggregate.

Explicitly using bridge-component and bridge-port in grouping names will not prevent the suggested use by other SDOs, but will retain clarity as to how the parameter structure relate to IEEE Std 802.1Q. While the module could be used in other ways by other groups such use should be at their risk, not ours, and any resulting maintenance their risk not ours.

Changed top-level grouping names to
bridge-component-parameters
and
bridge-port-parameters
as applicable in the rstp and in the mstp modules.

Note that the parameters in the rstp module also apply to MSTP use, including aspects of the IST which are not applicable to RSTP, so a name such as rstp..parameters is not really appropriate for these groupings, and the same commment applies to mstp module parameters in relation to SPB.

P–2. Bridge and port identifier structure

Rogue Comment

Almost at the end of the July 2024 CRG meeting Murugan made an interesting comment re Bridge Identifiers. While these are 64 bit quantities in protocol, and tree computation simply compares those 64 bit unsigned integers, a human looking directly at the data is interested in the information that makes up that 64 bits—which is the Designated Bridge, what is is its priority, is it using the system extension (potentially in a non-standard way, this is relevant to interoperating with early implementations if any remain, including STP). As Scott observed the simple identity of a Bridge (stripped of manageable priority) is the Bridge Address, and that should be presented to a human user in MAC Address format (as in ieee802-types).

Introducing the necessary expansion of bridge-id into every instance of its use would bloat the modules.

Added an rstp:bridge-id grouping with the simple uint64 simple (aka bridge-id) (that would be used in computation), and the bridge-priority, the system-id-extension, and bridge-address components, and used that in the rstp and mstp modules.

Note that the utility of these expansions does depend somewhat on how the YANG is used. If retrieved objects are presented directly to a human user, the breakdown should be very useful. If the YANG is being used by a bridge specific application, then the uint64 is sufficient and arguably more useful, if the application writers can be trusted to use the appropriate presentation syntax.

Changes at rstp:lines 64-103, and where used (uses) at rstp:lines 288, 298, 521, and 541, and at .

The bridge-address component should always be provided by the managed system, and is therefore config false in the grouping bridge-id. The system-id-extension is fixed, as defined in the base standard, but arbitary values might be received, and is therefore also config false. In some cases the bridge-priority can be managed as in the bridge-component-parameters/bridge-id, and is therefore not marked as config false in the grouping, in other case (e.g. in received values) it is not configured. In those latter cases config false is applied to the use of the grouping.

Similarly added an rstp:port-id grouping for port-id, with the simple uint16 simple component (aka port-id) (that would be used in computation), the port-priority, and the port-number, and used that in the rstp and mstp modules.

Note that the typedef id-port-number is previously defined in the rstp module, as the dot1q-bridge module, does not include the required range (which it should have done, because bridge port numbers are specified as being only 12 bits, independent of their use in spanning tree protocol.

P–3. Identifier priorities

STP priorities were 8 bits, not 4 bits (as for RSTP, MSTP).

Related Comment(s) # I-1

To avoid confusion **changed** stp-priority to id-priority and changed description to be explicit about the use of this priority.

P–4. RSTP module is also a base for MSTP (and possibly SPB) YANG.

Related Comment(s) # I-85

The RSTP module is also a base for MSTP (and possibly SPB) YANG, including aspects of the IST which are not applicable to RSTP.

Changed beginning The managed objects specified also support those aspects of Multiple.

Since parameters are not specific to RSTP, removed the "rstp-" prefix from component and interface parameter groupings.

NOTE—The BPDU field and variable descriptions used in IEEE Std 802.1Q for RSTP are also used for MSTP and SPB. There is some risk of ambiguity with using RSTP names in this module. The Bridge Identifier for a LAN's Designated Bridge is transmitted, by an RSTP -only Bridge and by an MST/SPB capable Bridge that is the Regional Root in the field named (in Clause 14) 'CIST Regional Root Identifier', while an MST/SPB Designated Bridge that is not the Regional Root transmits its Bridge Identifier in the CIST Bridge Identifier field (not present in RSTP-only BPDUs).

P–5. Constraints in base specification

Rogue Comment

The base specification, IEEE Std 802.1Q, can constrain the relationships between leaves and specifies consequences for changing some leaf values. For example, changing the value of Force Protocol Version reinitializes the spanning tree protocol state machines (see 13.26). YANG does not, of itself, provide controls that can be used to address all the specified constraints and consequences. A complete duplication of the base standard's constraints in YANG modules would require much text, and attempts would be prone to over-simplification. A general statement about such constraints should be provided at the beginning of the module, rather than cherry picking individual items.

[This comment follows my reading of the 2024-07-02 Yangsters minutes, which I take as supporting the sense of the comment.]

Additions in the rstp and mstp modules beginning References specify constraints on, and consequences of, settings

P–6. Retaining configuration

Related Comment(s) # I-90, I-42

The CRG agreed (July 2024) to delete the sentences containing "MUST" and that object value persistence across reinitialization was stated as a whole in 802.1Q and not particular to YANG. However since object persistence has historically been mentionned in management modules, and applies to all the objects in this module, it seems prudent to provide an overall statement for the module.

Addition to the module descriptions after the proposed text re: constraints: The values of all configured objects are retained across system reinitialization.

P–7. Component vs component

Initial capitalization (other than at the beginning of sentences) is used in 802.1Q to identify 'Reserved Terms', i.e. names of things that are to be read as a whole with a particular meaning in the standard, rather than a word or term precede by a general adjective (or two). 'Bridge Port' is such a term, 'component' by itself is not. The capitalization of Bridge component and Bridge Component currently varies in the base standard.

Change at line rstp:67, replace per-Component with per-Bridge component. Similarly elsewhere.

P–8. Withdrawn enum value(s)

Related Comment(s) # I-101

As per CRG discussion (July 2024), "holes" in the set of enum values are appropriate for values that are not to be used. The value withdrawn (1) should be removed from force-protocol-version and its withdrawn status documented in the leaf description.

Changed.

P–9. description missing from per-component and per-interface containers

Related Comment(s) # I-101

Changed.

P–10. force-protocol-version descriptions

Related Comment(s) # I-101, I-40

Supply descriptions for enum values of force-protocol-version.

Changed.

Changed `enum rstp-spb` to `enum rstp-mstp-spb` to make it clear that this value includes the possibility of MSTP parameters.

Changed description to include the imporrtant point that receipt of an STP BPDU effectively overrides the setting on a specific port, i.e. force-protocol-version communicates maximum capability.

Changed to remove `default "rstp"`, as the default for any bridge should be the maximum implemented (which is capable of plug-and-play interoperation with all subsets).

P–11. port-protocol-migration-check is action

Related Comment(s) # I-52

Changed leaf to action as per comment and move to follow the definition of force-protocol-version (as the action relates to that functionality) at line rstp:line 117 and following. Minor change to associated description.

P–12. Simplify leaf names to be RSTP (simple case) friendly

Related Comment(s) # I-85

Changed cist-bridge-id, cist-bridge-id-priority, cist-root-id, external-root-path-cost, cist-root-port to bridge-id, bridge-id-priority, root-id, root-path-cost, root-port. Changed descriptions of each of these to be clear as to RSTP (CST) and MSTP/SPB (CIST) use. .

Changed leaf names `cist-port-id`, `cist-port-priority`, `external-port-path-cost`, `cist-root-id`, and `cist-external-path-cost` to `port-id`, `port-priority`, `port-path-cost`, `root-id`, and `root-path-cost` and updated descriptions to reflect applicability to RSTP and to MSTP and SPB.

Added 13.5.3 to the references for `leaf port-path-cost`.

P–13. Simplified description of root-port interface-ref

Related Comment(s) # I-24

Changed at line 179 `A reference to the name of the Root Port` to `A reference to the Root Port`. While the former may also be correct, it doesn't (without further study on the part of the reader) directly address the issue raised by I-24. The short form "a reference to <interface>" is used in RFC 8343 YANG Interface Management, see for example the descriptions of leaf-list higher-layer-if and leaf list lower-layer-if in module ietf-interfaces.

P–14. Simplify timer descriptions to be RSTP friendly

Related Comment(s) # I-85

Changed descriptions in lines 185 through 264.

NOTE—The used values of the local timers for max-age are whole seconds, and the encoding of timer values specified in Clause 14 handles their encoding in the most significant octet of the relevant BPDU field, so does not require repeating in each description.

P–15. Canonical order

Related Comment(s) # I-101

Corrected order of `units` statements throughout.

P–16. migrate-time not required

Related Comment(s) # I-5

Following up on pdis-05, the `leaf migrate-time` should be removed. It is a fixed value, and that value is not updated by received BPDUs. If it were to be changed in the future then it could be added at that time.

Removed `leaf migrate-time`.

P–17. Use date-and-time not 'time since' for last-topology-change

Related Comment(s) # I-66

Changed.

P–18. Administrative Bridge Port State was missing from module

Rogue Comment

Added `admin-bridge-port-enabled`.

P–19. port-state, port-role enum descriptions

Related Comment(s) # I-85, I-101

Changed to add descriptions. Includes updating leaf descriptions so as to not duplicate information now in individual enum descriptions, and to give prominence to RSTP use of the parameters as per I-85.

P–20. descriptions missing from restricted-role and restricted-tcn

Related Comment(s) # I-101

Changed to add descriptions.

P–21. Reference check

Related Comment(s) # I-45, I-46

Changes to references including 13.27.64, 13.27.65 were misssed.

Changed at line 396, 408

P–22. Descriptions should include SPB as well as MSTP where appropriated

Rogue Comment

In most cases where MSTP is referenced SPB is also applicable.

Changed throughout.

P–23. Update auto-edge-port description for isolate functionality

Related Comment(s) # 9

As per comment, with minor change to proposed addition to auto-edge-port description.

Removed `leaf auto-isolate`.

Changed `auto-edge-port description`.

P–24. L2GP

Related Comment(s) # I-84, I-98

As per the CRG (July 2024) the YANG should be restructured using feature for L2GP related nodes. My personal technical opinion is that this feature should be contained in a separate module that could be used to augment he rstp module. Tjhat would be the easiest way forward to support an improvement to L2GP which would make it much more useable for support of in-service upgardes. However independent of this opinion, the location of L2GP within the module is bound to change even it is retained as a feature.

Removed (pending relocation in a feature, or in a separate module) `leaf cist-port-pseudo-root-id`.

P–25. Boundary Port and received MST Config ID missing

The MSTP topology, and its management, depend on the identification of MST Regions with Root Ports and Alternate Ports identified as Boundary Ports if MST Config IDs do not match.

Changed to add both.

ieee802-dot1q-rstp@2024-03-26.tree

```
module: ieee802-dot1q-rstp

  augment /dot1q:bridges/dot1q:bridge/dot1q:component:
    +--rw rstp!
       +--rw force-protocol-version?       enumeration
       +--ro cist-bridge-id?               uint64
       +--rw cist-bridge-id-priority?
                                     dot1qtypes:priority-type
       +--ro cist-root-id?                 uint64
       +--ro external-root-path-cost?      uint32
       +--ro cist-root-port-number?
                                     dot1qtypes:port-number-type
       +--ro max-age?                      uint8
       +--ro hello-time?
                         rt-types:timer-value-seconds16
       +--ro forward-delay?                uint8
       +--rw bridge-max-age?               uint8
       +--ro bridge-hello-time?            uint8
       +--rw bridge-forward-delay?         uint8
       +--rw tx-hold-count?                int32
       +--ro migrate-time?                 int32
       +--ro time-since-topology-change?   uint32
       +--ro topology-change-count?        yang:counter64
  augment /if:interfaces/if:interface/dot1q:bridge-port:
    +--rw rstp!
       +--ro cist-port-state?                 enumeration
       +--ro cist-port-role?                  enumeration
       +--ro restricted-role?                 boolean
       +--ro restricted-tcn?                  boolean
       +--ro cist-port-id?                    uint16
       +--rw cist-port-priority?
                                       dot1qtypes:priority-type
       +--rw external-port-path-cost?         uint32
       +--ro cist-root-id?                    uint32
       +--ro cist-external-path-cost?         uint32
       +--ro designated-bridge-id?            uint32
       +--ro designated-port-id?              binary
       +--rw port-protocol-migration-check?   boolean
       +--rw admin-edge-port?                 boolean
       +--ro oper-edge-port?                  boolean
       +--rw auto-edge-port?                  boolean
       +--rw auto-isolate-port?               boolean
       +--ro isolate-port?                    boolean
```

ieee802-dot1q-mstp@2024-03-26.tree

```
module: ieee802-dot1q-mstp

  augment
  /dot1q:bridges/dot1q:bridge/dot1q:component/dot1q:bridge-mst:
    +--rw mst-config-id!
    |  +--rw format-selector?        int32
    |  +--rw configuration-name?     string
    |  +--rw revision-level?         uint32
    |  +--ro configuration-digest?   binary
    +--rw bridge-mstp!
       +--rw max-hops?                       int32
       +--ro ist-internal-root-path-cost?   uint32
       +--rw mst* [mstid]
          +--rw mstid                      uint16
          +--rw port-id-priority?
                                    dot1qtypes:priority-type
          +--ro internal-root-path-cost?   uint32
          +--ro root-port-number?
                                   dot1qtypes:port-number-type
  augment /if:interfaces/if:interface/dot1q:bridge-port:
    +--rw port-mstp!
       +--rw mst* [mstid]
       |  +--rw mstid                            uint16
       |  +--ro msti-port-state?                 enumeration
       |  +--ro msti-port-role?                  enumeration
       |  +--rw msti-bridge-id-priority?
                                     dot1qtypes:priority-type
       |  +--rw msti-internal-port-path-cost?   uint32
       |  +--ro msti-regional-root-id?          uint32
       +--ro msti-internal-root-path-cost?   uint32
       +--ro msti-designated-bridge-id?      uint32
       +--ro msti-designated-port-id?        uint32

```