Single-Instance Spanning Tree Protocol

A Manual Supplement
for the HP ProCurve Routing Switch 9304M, 9308M, and 6308M-SX, and the HP ProCurve Switch 6208M-SX

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Software Version Requirement

The features described in this supplement require software release 05.2.16 (or later). If this supplement was shipped from the factory with your HP ProCurve device, then release 05.2.16 (or later) should already be installed in the device. If your HP ProCurve device has an earlier version of the software, you can download the latest version free as follows:

2. Click on Free Software Updates.
3. Click on Switches download page
4. Begin the download process by clicking on the description of the product for which you want to download the latest software.

For information on how to update your HP device software, refer to the "Upgrading Software Images and Configuration Files" chapter in the installation guide you received with the device.
Applicable Products
HP J4138A, HP J4139A, HP J4840A, HP J4841A

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Single-Instance Spanning Tree

In software releases earlier than 05.2.16, each port-based VLAN runs a separate spanning tree, which you can enable or disable on an individual VLAN basis. This is still the default behavior in software release 05.2.16 and later. However, this software release enhances HP's STP support by enabling you to configure a single instance of the Spanning Tree Protocol (STP) to run on all the port-based VLANs on a device.

The single STP feature is especially useful for connecting an HP 9304M, 9308M, 6308M-SX, or 6208M-SX to devices that run a single spanning tree in accordance with the 802.1p specification.

Single-instance STP uses the same parameters, with the same value ranges and defaults, as the default multiple-instance STP.

NOTE: This feature applies only to the 9304M, 9308M, and 6308M-SX routing switches and the 6208M-SX switch.

STP Defaults

STP is disabled by default. When enabled, each port-based VLAN runs a separate instance of STP by default. Thus, on devices that have multiple port-based VLANs, each VLAN has its own spanning tree domain. In addition, the STP state of each port-based VLAN is independent of the STP states of other VLANs. You can have STP enabled on port-based VLAN 10, but disabled on port-based VLANs 20 and 30, and so on.

When you configure a port-based VLAN, that VLAN inherits the STP state of the default port-based VLAN. Thus, if STP is enabled on the default VLAN, STP is also enabled on the new port-based VLAN. You can change the STP state of the VLAN afterwards. Changes to the STP state of the default VLAN do not affect existing VLANs. A change to the STP state affects only the VLANs you create after the change.

Single STP and Existing Port-Based VLANs

When you enable single STP, all the ports that are in port-based VLANs with STP enabled become members of a single spanning tree domain. Thus, the ports share a single BPDU broadcast domain. The HP device places all the ports in a non-configurable VLAN, 4094, to implement the single STP domain. However, this VLAN does not affect port membership in the port-based VLANs you have configured. Other broadcast traffic is still contained within the individual port-based VLANs. Therefore, you can use single STP while still using your existing VLAN configurations without changing your network. In addition, single STP does not affect 802.1Q tagging. Tagged and untagged ports alike can be members of the single spanning tree domain.

NOTE: When single STP is enabled, the BPDUs on tagged ports go out untagged.

If STP is disabled on a VLAN when you enable single STP, STP remains disabled on the ports in that VLAN and that VLAN does not become a member of the single STP domain. To enable STP on the VLAN, you must first disable single STP, enable STP on the VLAN, then re-enable single STP.

Spanning Tree Parameters

The STP parameters behave the same and have the same defaults and possible values whether you use single STP or you use the default configuration of a separate spanning tree for each port-based VLAN (multiple-instance STP).

You can configure the following parameters on the global level. The parameters apply to all ports.

• Forward Delay – The period of time a bridge will wait (the listen and learn period) before forwarding data packets. Possible values: 4 – 30 seconds. Default is 15.
• Maximum Age – The interval a bridge will wait for receipt of a hello packet before initiating a topology change. Possible values: 6 – 40 seconds. Default is 20.
• Hello Time – The interval of time between each configuration BPDU sent by the root bridge. Possible values: 1 – 10 seconds. Default is 2.
• Priority – A parameter used to identify the root bridge in a network. The bridge with the lowest value has the
highest priority and is the root. Possible values: 0 – 65,535. Default is 32,678.

You can apply the following parameters on an individual port level.

- **Port Priority** – This parameter can be used to assign a higher (or lower) priority to a port. In the event that traffic is re-routed, this parameter gives the port forwarding preference over lower priority ports within a VLAN or on the device (when no VLANs are configured for the system). Ports are re-routed based on their priority. The highest value is routed first. Possible values: 0 – 255. Default is 128. This value overrides the system-wide STP priority.

- **Path Cost** – This parameter can be used to assign a higher or lower path cost to a port. This value can be used to bias traffic toward or away from a certain path during periods of rerouting. For example, if you wish to bias traffic away from a certain port, assign it a higher value than other ports within the VLAN or all other ports (when VLANs are not active on the switch or routing switch). Possible values are 0 – 65,535 and the default values are 1000/port speed for half-duplex ports and (1000/port speed)/2 for full-duplex ports.

### Enabling Single STP

To enable single STP, use one of the following methods.

**NOTE:** If the device has only one port-based VLAN (the default VLAN) and STP is enabled, then the device is already running a single instance of STP. In this case, you do not need to enable single STP. You need to enable single STP only if the device contains more than one port-based VLAN and you want all the ports to be in the same STP broadcast domain.

**USING THE CLI**

To configure the HP device to run a single spanning tree, enter the following command at the global CONFIG level.

```bash
HP9300(config) spanning-tree single
```

**Syntax for global parameters:** `[no] spanning-tree single [forward-delay <value>] [hello-time <value>] [maximum-age <time>] [priority <value>]`

**Syntax for port parameters:** `[no] spanning-tree single [ethernet <portnum> path-cost <value> | priority <value>]`

**NOTE:** Both commands listed above are entered at the global CONFIG level.

**NOTE:** If the device has only one port-based VLAN, the CLI command for enabling single-instance STP is not listed in the CLI. The command is listed only if you have configured a port-based VLAN.

To change a global STP parameter, enter a command such as the following at the global CONFIG level:

```bash
HP9300(config) spanning-tree single priority 2
```

This command changes the STP priority for all ports to 2.

To change an STP parameter for a specific port, enter commands such as the following:

```bash
HP9300(config) spanning-tree single ethernet 1/1 priority 10
```

The commands shown above override the global setting for STP priority and set the priority to 10 for port 1/1.

To verify that single STP is in effect, enter the following command at any level of the CLI:

```bash
HP9300(config) show span
```

**Syntax:** `show span [vlan <vlanID>]`

Here is an example of the information displayed by this command. Notice that the top of the display contains a message stating that VLAN 2 is not in the single STP domain. STP was disabled on this port-based VLAN when single STP was enabled. As a result, the ports in VLAN 2 were omitted from the single STP domain. To enable STP on the VLAN, you must first disable single STP, enable STP on the VLAN, then re-enable single STP.
Also notice that no VLAN IDs are listed in the VLAN ID column. For STP, all ports are members of VLAN 4094, the single STP VLAN. When you enable single STP, all the ports in the single spanning tree, regardless of other VLAN membership, are configured as members of port-based VLAN 4094. This VLAN is used to implement the single spanning tree. VLAN 4094 is used only by single spanning tree. A port can be a member of VLAN 4094 and another port-based VLAN at the same time without being tagged. All ports in VLAN 4094 share a common STP domain, but for all other traffic, the ports remain within the separate Layer 2 broadcast domains established by the port-based VLANs.

```
HP9300(config)#show span
port-vlan 2 is not in single spanning tree domain.
Global STP Parameters:

<table>
<thead>
<tr>
<th>VLAN Root</th>
<th>Root Root Prio</th>
<th>Max He-</th>
<th>Ho-</th>
<th>Fwd</th>
<th>Last</th>
<th>Chg</th>
<th>Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Cost</td>
<td>Port rity</td>
<td>Age</td>
<td>llo</td>
<td>dly</td>
<td>Chang</td>
<td>cnt</td>
</tr>
<tr>
<td>Hex</td>
<td>sec</td>
<td>sec</td>
<td>sec</td>
<td>sec</td>
<td>sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800000e052f04f00</td>
<td>0</td>
<td>Root</td>
<td>8000</td>
<td>20</td>
<td>2</td>
<td>15</td>
<td>0</td>
</tr>
</tbody>
</table>

Port STP Parameters:

<table>
<thead>
<tr>
<th>VLAN Port Prio Path State</th>
<th>Fwd</th>
<th>Design Design</th>
<th>Design Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Num</td>
<td>rity</td>
<td>Cost</td>
</tr>
<tr>
<td>Hex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/1</td>
<td>80</td>
<td>0</td>
<td>DISABLED</td>
</tr>
<tr>
<td>1/2</td>
<td>80</td>
<td>0</td>
<td>DISABLED</td>
</tr>
<tr>
<td>1/3</td>
<td>80</td>
<td>0</td>
<td>DISABLED</td>
</tr>
<tr>
<td>1/4</td>
<td>80</td>
<td>0</td>
<td>DISABLED</td>
</tr>
</tbody>
</table>

To display VLAN information, including the STP state of each VLAN, enter the following command at any CLI level:

```
HP9300(config)# show vlan
```

**Syntax:** show vlan [<vlanID>|ethernet <portnum>]

```
HP9300(config)# show vlan
```

Total PORT-VLAN entries: 3
Maximum PORT-VLAN entries: 8
legend: [S=Slot]

PORT-VLAN 1, Name DEFAULT-VLAN, Priority level0, in single spanning tree domain
Untagged Ports: (S1) 5 6 7 8
Untagged Ports: (S2) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Untagged Ports: (S4) 17 18 19 20 21 22 23 24
Untagged Ports: (S4) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Untagged Ports: (S4) 17 18 19 20 21 22 23 24
Untagged Ports: (S6) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Untagged Ports: (S6) 17 18 19 20 21 22 23 24
Tagged Ports: None

PORT-VLAN 2, Name Noi, Priority level0, not in single spanning tree domain
Untagged Ports: (S1) 1 2 3 4
Tagged Ports: None

SINGLE-SPANNING-TREE-VLAN, Name Single-spanning-tree-vlan, Priority level0, in single spanning tree domain
Untagged Ports: (S1) 1 2 3 4 5 6 7 8
This example shows information for port-based VLANs 1 and 2. VLAN 1 is the default VLAN and VLAN 2 is a user-configured VLAN. The display also shows information for the SINGLE-SPANNING-TREE-VLAN (4094). Notice that for port-based VLAN 1, a message indicates that the VLAN is in the single STP domain. For VLAN 2, a message indicates the VLAN is not a member of the single STP domain. When single STP was enabled, (multiple-instance) STP was already enabled on VLAN 1 but was disabled on VLAN 2. The VLANs still provide separate Layer 2 broadcast domains. Only the STP domain is shared across all the ports.

Also notice that the SINGLE-SPANNING-TREE-VLAN contains all the ports in the device except those in VLAN 2, because STP is disabled on those ports.

**USING THE WEB MANAGEMENT INTERFACE**

1. Log on to the device using a valid user name and password for read-write access. The System configuration dialog is displayed.

2. Click on the Single checkbox next to Spanning Tree to place a checkmark in the box, as shown in the following example.

3. Click Apply to apply the change to the device's running-config file.

4. Select the Save link at the bottom of the panel. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.
NOTE: You also can access the dialog for saving configuration changes by clicking on Command in the tree view, then clicking on Save to Flash.