ProCurve Networking

ProCurve & Cisco Spanning Tree Interoperability

Configuration Example
Important!

1. These configurations have been tested and verified by HP ProCurve support engineers. However, HP does not guarantee that these exact configurations will work in your environment.

2. You will need to modify these configurations depending on your model of Routing Switch or Router, software version, VLAN port assignment, and your network's IP, IPX, and AppleTalk addresses.

3. Information on how to troubleshoot configuration problems, including configurations based upon these examples, is not provided here. Please refer to the Troubleshooting chapter of your product manual for this type of information. If you need assistance from HP, please refer to the ProCurve Networking by HP Service & Support Guide or the services section of this Web site.
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Introduction

This article explains and provides step-by-step configuration instructions for implementing multiple instance spanning-tree protocol (MSTP) and virtual router redundancy protocol (VRRP) on specific ProCurve and Cisco Catalyst switches. By combining both MSTP and VRRP you create a highly available network with layer 2 and layer 3 redundancies and the ability to load balance network traffic, optimizing network performance. In this example, all ProCurve and Cisco switches are configured for MSTP. VRRP is configured on the ProCurve 8200zl switches in the core.

Spanning-Tree Protocol (STP) is a link management protocol that provides path redundancy while preventing undesirable loops in the network. For an Ethernet network to function properly, only one active path can exist between two devices. Multiple Spanning Tree Protocol (MSTP) extends STP and the Rapid Spanning Tree Protocol (RSTP) and is backwards compatible with both versions.

With MSTP, each spanning tree instance can include one or more VLANs. It applies a separate, per-instance forwarding topology which uses RSTP for rapid convergence. When a port belongs to multiple VLANs, it may be blocked in one spanning tree instance, but forwarding in another instance. This provides multiple forwarding paths for data traffic and achieves load-balancing across the network. In contrast to PVST, MSTP reduces the switch's CPU load to a moderate level by aggregating multiple VLANs in a single spanning tree instance. MSTP provides fast convergence in the case of a switch, port or link failure.

The Virtual Router Redundancy Protocol (VRRP) is designed to eliminate the single point of failure inherent in an environment that uses statically configured default routes. VRRP specifies an election protocol that dynamically assigns responsibility for a virtual router to one of the VRRP routers on a LAN. The VRRP router controlling the IP address(es) associated with a virtual router is called the Master, and forwards packets sent to these IP addresses. The election process provides dynamic fail-over in the forwarding responsibility should the Master become unavailable. Any of the virtual router's IP addresses on a LAN can then be used as the default first hop router by end-hosts. The advantage gained from using VRRP is a higher availability default path without requiring configuration of dynamic routing or router discovery protocols on every end-host.

When configured properly, this solution ensures that all redundant links are used and that the VRRP routers can share default gateway duties. Combining MSTP and VRRP protocols into your network design achieves a balanced, redundant, and highly available network solution.

Terminology Differences

<table>
<thead>
<tr>
<th>Description</th>
<th>Cisco Switches</th>
<th>ProCurve Switches</th>
</tr>
</thead>
<tbody>
<tr>
<td>A port that belongs to a unique VLAN and is untagged</td>
<td>Access mode</td>
<td>Untagged</td>
</tr>
<tr>
<td>A port that carries multiple VLANs using 802.1q tags</td>
<td>Trunk mode</td>
<td>Tagged</td>
</tr>
<tr>
<td>Aggregated links to support additional bandwidth and link redundancy</td>
<td>Ether channel or Channel-group</td>
<td>Trunk Group</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Configuration item</th>
<th>Cisco Switches</th>
<th>ProCurve Switches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untagged VLAN traffic</td>
<td>Switchport mode access</td>
<td>untagged</td>
</tr>
<tr>
<td></td>
<td>Switchport Access VLAN</td>
<td></td>
</tr>
<tr>
<td>Tagged VLAN traffic</td>
<td>Switchport trunk encapsulation</td>
<td>tagged</td>
</tr>
<tr>
<td></td>
<td>Switchport mode trunk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Switchport allowed vlan</td>
<td></td>
</tr>
<tr>
<td>Aggregated links</td>
<td>Channel-group</td>
<td>trunk trk</td>
</tr>
</tbody>
</table>
### Path Cost Parameter Values

<table>
<thead>
<tr>
<th>Port Type</th>
<th>RSTP and MSTP Path Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>10Mbps</td>
<td>2,000,000</td>
</tr>
<tr>
<td>100 Mbps</td>
<td>200,000</td>
</tr>
<tr>
<td>1Gbps</td>
<td>20,000</td>
</tr>
<tr>
<td>10Gbps</td>
<td>2,000</td>
</tr>
</tbody>
</table>

Cisco switches reduce the path costs on aggregated links. For example on the 3750s in this paper the path cost on an ether-channel group with two gigabit links is 10,000. One gigabit link is 20,000. ProCurve switches do not reduce path cost on aggregated links.

### Equipment and Software Versions

The following table lists the equipment and software for each switch in this scenario. It’s a good practice to download the latest software for each switch that will participate in MSTP.

<table>
<thead>
<tr>
<th>ProCurve Equipment</th>
<th>S/W Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>ProCurve Switch 8200zl</td>
<td>K.12.30</td>
</tr>
<tr>
<td>ProCurve Switch 5400zl</td>
<td>K.12.02</td>
</tr>
<tr>
<td>ProCurve Switch 4202vl-48G</td>
<td>L.10.24</td>
</tr>
<tr>
<td>ProCurve Switch 2900-48G</td>
<td>T.12.03</td>
</tr>
<tr>
<td>ProCurve Switch 2810-48G</td>
<td>N.10.09</td>
</tr>
<tr>
<td>ProCurve Switch 3400cl-48G</td>
<td>M.10.30</td>
</tr>
<tr>
<td>Cisco Equipment</td>
<td></td>
</tr>
<tr>
<td>3550</td>
<td>IOS 12.2(25)SED</td>
</tr>
<tr>
<td>3750</td>
<td>IOS 12.2(25)SEC2</td>
</tr>
</tbody>
</table>

### Configuration Checklist

- Upgrade all switches to the latest software version.
- Ensure that all switches MST configurations match exactly. The name, revision, and instance VLAN mappings must be identical on all switches participating in MSTP.
- Configure all trunks on Cisco switches as 802.1Q (dot1q) trunks.
- Be sure to configure all edge ports. If you don’t, you will see a lot of topology changes. In this configuration no edge ports are configured.
- All backbone ports (switch to switch links) must be members of all VLANs to insure your network supports all of the forwarding paths necessary for the desired connectivity. All ports connecting one switch to another within a region and one switch to another between regions should be configured as members of all VLANs configured in the region.
- Never connect LAGs before they’re configured. This will create loops in your network and cause an unstable environment.

### Network Scenario with Spanning Tree Configurations

The following 3 diagrams depict what ports will be forwarding and blocked for CST and IST, MSTP instance 1 and 2. All edge switches forward VLANs 3, 4, 5, 23, 24, 25, 33, 34, 35, 43, 44 and 45 traffic over uplinks to 8200A. For VLANs 7, 8, 9, 27, 28, 29, 37, 38, 39, 47, 48 and 49 their traffic is sent over uplinks to 8200B.

<table>
<thead>
<tr>
<th>Location</th>
<th>8200A Instance 1</th>
<th>8200B Instance 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDF 1</td>
<td>3,4,5</td>
<td>7,8,9</td>
</tr>
<tr>
<td>IDF 2</td>
<td>23,24,25</td>
<td>27,28,29</td>
</tr>
<tr>
<td>IDF 3</td>
<td>33,34,35</td>
<td>37,38,39</td>
</tr>
<tr>
<td>IDF 4</td>
<td>43,44,45</td>
<td>47,48,49</td>
</tr>
</tbody>
</table>
The 8200A is VRRP owner for VLANs 3, 4, 5, 23, 24, 25, 33, 34, 35, 43, 44 and 45 and is VRRP backup for VLANs 7, 8, 9, 27, 28, 29, 37, 38, 39, 47, 48 and 49. The 8200B is VRRP owner for VLANs 7, 8, 9, 27, 28, 29, 37, 38, 39, 47, 48 and 49 and backup for VLANs 3, 4, 5, 23, 24, 25, 33, 34, 35, 43, 44 and 45.

<table>
<thead>
<tr>
<th>VLANs</th>
<th>8200A VRRP Configuration</th>
<th>8200B VRRP Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>3, 4, 5, 23, 24, 25, 33, 34, 35, 43, 44, 45</td>
<td>Master</td>
<td>Backup</td>
</tr>
<tr>
<td>7, 8, 9, 27, 28, 29, 37, 38, 39, 47, 48, 49</td>
<td>Backup</td>
<td>Master</td>
</tr>
</tbody>
</table>

The network design strategy is to configure VLANs based on location. This will help isolate problems quickly on the network. All hosts from Building 1 will be configured on one of the following VLANs 3, 4, 5, 7, 8 and 9. Building 2 hosts use VLANs 23, 24, 25, 27, 28 and 29. Building 3 hosts use VLANs 33, 34, 35, 37, 38 and 39. Building 4 hosts use VLANs 43, 44, 45, 47, 48 and 49.

Refer to Appendix for additional information on configuring Spanning tree.
VLANs that end with 3, 4, and 5 are blocked between 8200B and EAST IDFs. The ports connecting the 8200A and WEST IDFs are forwarding. Only if the active Trunk between the 8200A and WEST IDFs fail will the links between the 8200B and EAST IDFs become active.
Figure 2 MST Instance 2

VLANs that end with 7, 8, and 9 are blocked between 8200A and WEST IDFs. The ports connecting the 8200B and EAST IDFs are forwarding. Only if the active Trunk between the 8200B and EAST IDFs fail will the links between the 8200A and WEST IDFs become active.
Figure 3 IST/CST

For consistency purposes configure the IST/CST to Block on the same ports as Instance 1. This way you only have to remember two configurations.
Step by Step Configurations

The following sections take you through the step by step configuration of each switch in this network, including examples of the resulting show command outputs.

**ProCurve 5406zl (IDF1WEST) ProCurve step by step explanation**

**Configure Switch**
ProCurve Switch 5400zl> enable
ProCurve Switch 5400zl# config

**Configure Trunks and VLANs on Switch.** This switch is configured for VLANs 1,3,4,5,7,8,9,23,24,25,27,28,29,33,34,35,37,38,39,43,44,45,47,48,and 49. Because when configuring MSTP instances, if a VLAN is not configured you can not add it to instances. The Trunks are only configured for VLANs 1,23,24,25,27,28, and 29. Set up a management IP on VLAN 1 and a default-gateway. Tag VLANs supported on trunks. If your network requires more than 8 VLANs you will need to use max-VLANs command to increase the number of VLANs the switch supports.

ProCurve Switch 5400zl(config)# max-vlans 50
Command will take effect after saving configuration and reboot.
ProCurve Switch 5400zl(config)# write memory
ProCurve Switch 5400zl(config)# reload
Device will be rebooted, do you want to continue [y/n]? Y

**Device reboots . . .**
ProCurve Switch 5400zl# configure
ProCurve Switch 5400zl(config)# hostname IDF1WEST
IDF1WEST(config)# trunk b23-b24 Trk1 Trunk
IDF1WEST(config)# trunk b21-b22 Trk2 Trunk
IDF1WEST(config)# vlan 1
IDF1WEST(vlan-1)# ip address 10.1.1.21 255.255.255.0
IDF1WEST(vlan-1)# vlan 3
IDF1WEST(vlan-3)# tagged trk1-trk2
IDF1WEST(vlan-3)# vlan 4
IDF1WEST(vlan-4)# tagged trk1-trk2
IDF1WEST(vlan-4)# vlan 5
IDF1WEST(vlan-5)# tagged trk1-trk2
IDF1WEST(vlan-5)# vlan 7
IDF1WEST(vlan-7)# tagged trk1-trk2
IDF1WEST(vlan-7)# vlan 8
IDF1WEST(vlan-8)# tagged trk1-trk2
IDF1WEST(vlan-8)# vlan 9
IDF1WEST(vlan-9)# tagged trk1-trk2
IDF1WEST(vlan-9)# vlan 23
IDF1WEST(vlan-23)# vlan 24
IDF1WEST(vlan-24)# vlan 25
IDF1WEST(vlan-25)# vlan 27
IDF1WEST(vlan-27)# vlan 28
IDF1WEST(vlan-28)# vlan 29
IDF1WEST(vlan-29)# vlan 33
IDF1WEST(vlan-33)# vlan 34
IDF1WEST(vlan-34)# vlan 35
IDF1WEST(vlan-35)# vlan 37
Configure MST and enable MSTP globally. It is very important that all switch MST configurations match exactly. The name, revision, and instances VLAN mappings must be identical on all switches participating in MSTP configuration.

Edge Port Configuration
For this configuration no edge ports were configured. Be aware if edge ports are not configured it will increase convergence times. Below is an example of the commands required to configure a range of ports for untagged VLAN 23. Be sure to edit command for correct ports and VLANS.

Show Running Configuration

hostname "IDF1WEST"
max-vlans 50
module 2 type J8702A
trunk B23-B24 Trk1 Trunk
trunk B21-B22 Trk2 Trunk
ip default-gateway 10.1.1.1
snmp-server community "public" Unrestricted
vlan 1
  name "DEFAULT_VLAN"
  untagged B1-B20,Trk1-Trk2
  ip address 10.1.1.21 255.255.255.0
  exit
vlan 3
  name "VLAN3"
  tagged Trk1-Trk2
  no ip address
exit
vlan 4
  name "VLAN4"
  tagged Trk1-Trk2
  no ip address
  exit
vlan 5
  name "VLAN5"
  tagged Trk1-Trk2
  no ip address
  exit
vlan 7
  name "VLAN7"
  tagged Trk1-Trk2
  no ip address
  exit
vlan 8
  name "VLAN8"
  tagged Trk1-Trk2
  no ip address
  exit
vlan 9
  name "VLAN9"
  tagged Trk1-Trk2
  no ip address
  exit
vlan 23
  name "VLAN23"
  no ip address
  exit
vlan 24
  name "VLAN24"
  no ip address
  exit
vlan 25
  name "VLAN25"
  no ip address
  exit
vlan 27
  name "VLAN27"
  no ip address
  exit
vlan 28
  name "VLAN28"
  no ip address
  exit
vlan 29
  name "VLAN29"
  no ip address
  exit
vlan 33
name "VLAN33"
no ip address
exit
vlan 34
name "VLAN34"
no ip address
exit
vlan 35
name "VLAN35"
no ip address
exit
vlan 37
name "VLAN37"
no ip address
exit
vlan 38
name "VLAN38"
no ip address
exit
vlan 39
name "VLAN39"
no ip address
exit
vlan 43
name "VLAN43"
no ip address
exit
vlan 44
name "VLAN44"
no ip address
exit
vlan 45
name "VLAN45"
no ip address
exit
vlan 47
name "VLAN47"
no ip address
exit
vlan 48
name "VLAN48"
no ip address
exit
vlan 49
name "VLAN49"
no ip address
exit
spanning-tree
spanning-tree Trk1 priority 4
spanning-tree Trk2 priority 4
spanning-tree config-name "mstp-vrrp"
spanning-tree config-revision 1
spanning-tree instance 1 vlan 3-5 23-25 33-35 43-45
spanning-tree instance 2 vlan 7-9 27-29 37-39 47-49

**Show Spanning-Tree Instance IST**

In order to save space for this document all show spanning-tree statistics will be specific to trunks only. If interested in edge ports the command is "show span ins IST".

IDF1WEST(config)# show span trk1-trk2 ins ist

IST Instance Information

<table>
<thead>
<tr>
<th>Instance ID</th>
<th>Mapped VLANs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Switch Priority : 32768

Topology Change Count : 47
Time Since Last Change : 4 mins

Regional Root MAC Address : 001871-b80a00
Regional Root Priority : 0
Regional Root Path Cost : 20000
Regional Root Port : Trk1
Remaining Hops : 19

Designated

<table>
<thead>
<tr>
<th>Port</th>
<th>Type</th>
<th>Cost</th>
<th>Priority</th>
<th>Role</th>
<th>State</th>
<th>Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trk1</td>
<td></td>
<td>20000</td>
<td>64</td>
<td>Root</td>
<td>Forwarding</td>
<td>001871-b80a00</td>
</tr>
<tr>
<td>Trk2</td>
<td></td>
<td>20000</td>
<td>64</td>
<td>Designated</td>
<td>Forwarding</td>
<td>0017a4-b2e100</td>
</tr>
</tbody>
</table>

**Show Spanning-Tree Instance 1**

IDF1WEST(config)# show spanning-tree trk1-trk2 instance 1

MST Instance Information

<table>
<thead>
<tr>
<th>Instance ID</th>
<th>Mapped VLANs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3-5,23-25,33-35,43-45</td>
</tr>
</tbody>
</table>

Switch Priority : 32768

Topology Change Count : 3
Time Since Last Change : 10 mins

Regional Root MAC Address : 001871-b80a00
Regional Root Priority : 0
Regional Root Path Cost : 20000
Regional Root Port : Trk1
Remaining Hops : 19

Designated

<table>
<thead>
<tr>
<th>Port</th>
<th>Type</th>
<th>Cost</th>
<th>Priority</th>
<th>Role</th>
<th>State</th>
<th>Bridge</th>
</tr>
</thead>
</table>

---
Trk1            20000     128      Root       Forwarding 001871-b80a00
Trk2            20000     128      Designated Forwarding 0017a4-b2e100

Show Spanning-Tree Instance 2

IDF1WEST(config)# show span trk1-trk2 in 2

MST Instance Information

Instance ID : 2
Mapped VLANs : 7-9,27-29,37-39,47-49

Switch Priority         : 32768

Topology Change Count   : 1
Time Since Last Change  : 12 mins

Regional Root MAC Address : 001871-b9e400
Regional Root Priority    : 0
Regional Root Path Cost   : 40000
Regional Root Port       : Trk2
Remaining Hops            : 18

Designated
Port  Type      Cost      Priority Role       State      Bridge
----- --------- --------- -------- ---------- ---------- -------------
Trk1            20000     128      Alternate  Blocking   001871-b80a00
Trk2            20000     128      Root       Forwarding 001635-f0f800

Show Spanning-Tree MST Configuration

IDF1WEST(config)# show spanning-tree mst-config

MST Configuration Identifier Information

MST Configuration Name : mstp-vrrp
MST Configuration Revision : 1
MST Configuration Digest : 0x1936FB656D900E359ED1D09A34AC0AAC

IST Mapped VLANs : 1

Instance ID Mapped VLANs
---------------------- ----------------------------------------
1           3-5,23-25,33-35,43-45
2           7-9,27-29,37-39,47-49

ProCurve 4200 (IDF1EAST)

Configure Switch
> enable
ProCurve Switch 4202vl-48G# config
ProCurve Switch 4202vl-48G(config)# max-vlans 50
Command will take effect after saving configuration and reboot.
ProCurve Switch 4202vl-48G(config)# write memory
ProCurve Switch 4202vl-48G(config)# reload
Device will be rebooted, do you want to continue [y/n]? Y

Device reboots . . .
ProCurve Switch 4202vl-48G# configure
ProCurve Switch 4202vl-48G(config)# hostname IDF1EAST
IDF1EAST(config)# trunk 47-48 Trk1 Trunk
IDF1EAST(config)# trunk 45-46 Trk2 Trunk
IDF1EAST(config)# vlan 1
IDF1EAST(vlan-1)# ip address 10.1.1.22 255.255.255.0
IDF1EAST(vlan-1)# vlan 3
IDF1EAST(vlan-3)# tagged trk1-trk2
IDF1EAST(vlan-3)# vlan 4
IDF1EAST(vlan-4)# tagged trk1-trk2
IDF1EAST(vlan-4)# vlan 5
IDF1EAST(vlan-5)# tagged trk1-trk2
IDF1EAST(vlan-5)# vlan 7
IDF1EAST(vlan-7)# tagged trk1-trk2
IDF1EAST(vlan-7)# vlan 8
IDF1EAST(vlan-8)# tagged trk1-trk2
IDF1EAST(vlan-8)# vlan 9
IDF1EAST(vlan-9)# tagged trk1-trk2
IDF1EAST(vlan-9)# vlan 23
IDF1EAST(vlan-23)# vlan 24
IDF1EAST(vlan-24)# vlan 25
IDF1EAST(vlan-25)# vlan 27
IDF1EAST(vlan-27)# vlan 28
IDF1EAST(vlan-28)# vlan 29
IDF1EAST(vlan-29)# vlan 33
IDF1EAST(vlan-33)# vlan 34
IDF1EAST(vlan-34)# vlan 35
IDF1EAST(vlan-35)# vlan 37
IDF1EAST(vlan-37)# vlan 38
IDF1EAST(vlan-38)# vlan 39
IDF1EAST(vlan-39)# vlan 43
IDF1EAST(vlan-43)# vlan 44
IDF1EAST(vlan-44)# vlan 45
IDF1EAST(vlan-45)# vlan 47
IDF1EAST(vlan-47)# vlan 48
IDF1EAST(vlan-48)# vlan 49
IDF1EAST(vlan-49)# exit
IDF1EAST(config)# ip default-gateway 10.1.1.1
IDF1EAST(config)# spanning-tree config-name mstp-vrrp
IDF1EAST(config)# spanning-tree config-revision 1
IDF1EAST(config)# spanning-tree instance 1 vlan 3-5 23-25 33-35 43-45
IDF1EAST(config)# spanning-tree instance 2 vlan 7-9 27-29 37-39 47-49
IDF1EAST(config)# spanning-tree

Show Running Configuration

IDF1EAST(config)# show run
hostname "IDF1EAST"
max-vlans 50
trunk 47-48 Trk1 Trunk
default-gateway 10.1.1.1
snmp-server community "public" Unrestricted

vlan 1
  name "DEFAULT_VLAN"
  untagged 1-44,Trk1-Trk2
  ip address 10.1.1.22 255.255.255.0
  exit

vlan 3
  name "VLAN3"
  no ip address
  tagged Trk1-Trk2
  exit

vlan 4
  name "VLAN4"
  no ip address
  tagged Trk1-Trk2
  exit

vlan 5
  name "VLAN5"
  no ip address
  tagged Trk1-Trk2
  exit

vlan 7
  name "VLAN7"
  no ip address
  tagged Trk1-Trk2
  exit

vlan 8
  name "VLAN8"
  no ip address
  tagged Trk1-Trk2
  exit

vlan 9
  name "VLAN9"
  no ip address
  tagged Trk1-Trk2
  exit

vlan 23
  name "VLAN23"
  no ip address
  exit

vlan 24
  name "VLAN24"
  no ip address
  exit
vlan 25
  name "VLAN25"
  no ip address
  exit
vlan 27
  name "VLAN27"
  no ip address
  exit
vlan 28
  name "VLAN28"
  no ip address
  exit
vlan 29
  name "VLAN29"
  no ip address
  exit
vlan 33
  name "VLAN33"
  no ip address
  exit
vlan 34
  name "VLAN34"
  no ip address
  exit
vlan 35
  name "VLAN35"
  no ip address
  exit
vlan 37
  name "VLAN37"
  no ip address
  exit
vlan 38
  name "VLAN38"
  no ip address
  exit
vlan 39
  name "VLAN39"
  no ip address
  exit
vlan 43
  name "VLAN43"
  no ip address
  exit
vlan 44
  name "VLAN44"
  no ip address
  exit
vlan 45
  name "VLAN45"
  no ip address
exit
vlan 47
  name "VLAN47"
  no ip address
  exit
vlan 48
  name "VLAN48"
  no ip address
  exit
vlan 49
  name "VLAN49"
  no ip address
  exit
spanning-tree
spanning-tree Trk1 priority 4
spanning-tree Trk2 priority 4
spanning-tree config-name "mstp-vrrp"
spanning-tree config-revision 1
spanning-tree instance 1 vlan 3-5 23-25 33-35 43-45
spanning-tree instance 2 vlan 7-9 27-29 37-39 47-49

Show Spanning-Tree Instance IST

IDF1EAST(config)# show span trk1-trk2 inst ist

IST Instance Information

  Instance ID : 0
  Mapped VLANs : 1
  Switch Priority : 32768
  Topology Change Count : 1
  Time Since Last Change : 18 hours
  Regional Root MAC Address : 001871-b80a00
  Regional Root Priority : 0
  Regional Root Path Cost : 40000
  Regional Root Port : Trk2
  Remaining Hops : 18

  Designated
  Port Type Cost Priority Role State Bridge
  Trk1 20000 64 Alternate Blocking 001871-b9e400
  Trk2 20000 64 Root Forwarding 0017a4-b2e100

Show Spanning-Tree Instance 1

IDF1EAST(config)# show span trk1-trk2 inst 1

MST Instance Information

  Instance ID : 1
Mapped VLANs : 3-5,23-25,33-35,43-45

Switch Priority : 32768

Topology Change Count : 2
Time Since Last Change : 18 hours

Regional Root MAC Address : 001871-b80a00
Regional Root Priority : 0
Regional Root Path Cost : 40000
Regional Root Port : Trk2
Remaining Hops : 18

<table>
<thead>
<tr>
<th>Port</th>
<th>Type</th>
<th>Cost</th>
<th>Priority</th>
<th>Role</th>
<th>State</th>
<th>Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trk1</td>
<td></td>
<td>20000</td>
<td>128</td>
<td>Alternate</td>
<td>Blocking</td>
<td>001871-b9e400</td>
</tr>
<tr>
<td>Trk2</td>
<td></td>
<td>20000</td>
<td>128</td>
<td>Root</td>
<td>Forwarding</td>
<td>0017a4-b2e100</td>
</tr>
</tbody>
</table>

Show Spanning-Tree Instance 2

IDF1EAST(config)# show span trk1-trk2 inst 2

MST Instance Information

Instance ID : 2
Mapped VLANs : 7-9,27-29,37-39,47-49

Switch Priority : 32768

Topology Change Count : 2
Time Since Last Change : 18 hours

Regional Root MAC Address : 001871-b9e400
Regional Root Priority : 0
Regional Root Path Cost : 20000
Regional Root Port : Trk1
Remaining Hops : 19

<table>
<thead>
<tr>
<th>Port</th>
<th>Type</th>
<th>Cost</th>
<th>Priority</th>
<th>Role</th>
<th>State</th>
<th>Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trk1</td>
<td></td>
<td>20000</td>
<td>128</td>
<td>Root</td>
<td>Forwarding</td>
<td>001871-b9e400</td>
</tr>
<tr>
<td>Trk2</td>
<td></td>
<td>20000</td>
<td>128</td>
<td>Designated</td>
<td>Forwarding</td>
<td>001635-f0f800</td>
</tr>
</tbody>
</table>

Show Spanning-Tree MST Configuration

IDF1EAST(config)# show spanning-tree mst-config

MST Configuration Identifier Information

MST Configuration Name : mstp-vrrp
MST Configuration Revision : 1
MST Configuration Digest : 0x1936FB656D900E359ED1D09A34AC0AAC
IST Mapped VLANs : 1

Instance ID Mapped VLANs

<table>
<thead>
<tr>
<th>Instance ID</th>
<th>Mapped VLANs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3-5,23-25,33-35,43-45</td>
</tr>
<tr>
<td>2</td>
<td>7-9,27-29,37-39,47-49</td>
</tr>
</tbody>
</table>

**Cisco 3550 (IDF2WEST) Cisco step by step explanation**

**Configure Switch**

**Configure Switch Name**

>`enable`  
#configure terminal  
(config)# hostname IDF2WEST *(configures system name)*

**Configure VLANs on the Switch**. This switch will be configured with VLANs 1, 23, 24, 25, 27, 28, and 29. VLAN 1 will be untagged on trunks and used only as a management VLAN. Set up a management IP on VLAN 1 and a default gateway.

IDF2WEST(config)# vlan 1  
IDF2WEST(config-vlan)# vlan 23-25,27-29  
IDF2WEST(config-vlan)# exit  
IDF2WEST(config)# interface vlan 1  
IDF2WEST(config-if)# ip address 10.1.1.29 255.255.255.0  
IDF2WEST(config-if)# exit  
IDF2WEST(config)# ip default-gateway 10.1.1.1

**Configure dot1q Trunking on Switch**. To keep it simple in this design all edge switches are similarly configured. Most edge switches connect to the 8200 on ports 47 and 48, and connect to the second switch in their IDF on ports 45 & 46. All links are configured as a "LAG" or "Trunk Group", meaning 2 links aggregated together to provide link redundancy and improve bandwidth. Configure VLANs allowed on each LAG and configure spanning tree cost. The 3550s are 10/100 switches so the default path cost is 200000 for one 100M link. In order to block the correct port the cost needs to be configured as 20000 on interface port-channel 1 which leads to the 8200A, and 20000 on interface port-channel 2 which leads to IDF2EAST.

IDF2WEST(config)# interface range fastethernet 0/47-48  
IDF2WEST(config-if-range)# channel-group 1 mode on  
IDF2WEST(config-if-range)# interface po 1  
IDF2WEST(config-if-range)# switchport trunk encapsulation dot1q  
IDF2WEST(config-if-range)# switchport mode trunk  
IDF2WEST(config-if-range)# switchport trunk allowed vlan 1,23-25,27-29  
IDF2WEST(config-if-range)# spanning-tree cost 20000  
IDF2WEST(config-if-range)# exit  
IDF2WEST(config)# interface range fastethernet 0/45-46  
IDF2WEST(config-if-range)# channel-group 2 mode on  
IDF2WEST(config-if-range)# interface po 2  
IDF2WEST(config-if-range)# switchport trunk encapsulation dot1q  
IDF2WEST(config-if-range)# switchport mode trunk  
IDF2WEST(config-if-range)# switchport trunk allowed vlan 1,23-25,27-29  
IDF2WEST(config-if-range)# spanning-tree cost 20000  
IDF2WEST(config-if-range)# exit

**Configure MST and Enable MSTP Globally**. It is very important that all switch MST configurations match exactly. The name, revision, and instance VLAN mappings must be identical on all switches participating in MSTP configuration.

IDF2WEST(config)# spanning-tree mst configuration  
IDF2WEST(config-mst)# name mstp-vrrp  
IDF2WEST(config-mst)# revision 1
IDF2WEST(config-mst)# instance 1 vlan 3-5,23-25,33-35,43-45
IDF2WEST(config-mst)# instance 2 vlan 7-9,27-29,37-39,47-49
IDF2WEST(config-mst)# exit
IDF2WEST(config)# spanning-tree mode mst

**Edge Port Configuration**
For this configuration no edge ports were configured. Be aware that if edge ports are not configured, it will slow convergence times down drastically. Below is an example of the commands required to configure a range or individual ports for untagged VLAN 9. Be sure to edit command for correct ports and VLANs.

IDF2WEST(config)# interface range fastethernet 0/1-44
IDF2WEST(config-if-range)# switchport mode access
IDF2WEST(config-if-range)# switchport access vlan 9
IDF2WEST(config-if-range)# exit

IDF2WEST(config)# interface fastethernet 0/1
IDF2WEST(config-if-range)# switchport mode access
IDF2WEST(config-if-range)# switchport access vlan 9
IDF2WEST(config-if-range)# exit

**Configure Port Fast and BPDU Guard on Edge Ports.** When configuring an interface with port fast, the edge port immediately transitions to the forwarding state. Port Fast should be enabled only on ports that connect to a single end station. When you globally enable BPDU guard on ports that are Port Fast-enabled (the ports are in a Port Fast-operational state), spanning tree shuts down Port Fast-enabled ports that receive BPDUs. In a valid configuration, Port Fast-enabled ports do not receive BPDUs. Receiving a BPDU on a Port Fast-enabled port signals an invalid configuration, such as the connection of an unauthorized device, and the BPDU guard feature puts the port in the error-disabled state. The BPDU guard feature provides a secure response to invalid configurations because you must manually put the port back in service.

IDF2WEST(config)# spanning-tree portfast bpduguard default
IDF2WEST(config)# interface range fastethernet 0/1-44
IDF2WEST(config-if-range)# spanning-tree portfast
IDF2WEST(config-if-range)# end

Never connect LAGs before they’re configured. This will create loops in your network and cause an unstable environment.

**Show Running Configuration**

IDF2WEST# show run
Building configuration...
Current configuration : 4683 bytes
!
version 12.2
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname IDF2WEST
!
no aaa new-model
ip subnet-zero
!
vtp domain INFO
vtp mode transparent
!
no file verify auto
!
spanning-tree mode mst
spanning-tree extend system-id
!
spanning-tree mst configuration
name mstp-vrrp
revision 1
instance 1 vlan 3-5, 23-25, 33-35, 43-45
instance 2 vlan 7-9, 27-29, 37-39, 47-49
!
vlan internal allocation policy ascending
!
vlan 3-5,7-9,23-25,27-29,33-35,37-39,43-45,47-49
!
interface Port-channel1
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,23-25,27-29
  switchport mode trunk
  spanning-tree cost 20000
!
interface Port-channel2
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,23-25,27-29
  switchport mode trunk
  spanning-tree cost 20000
!
interface FastEthernet0/1
  switchport mode dynamic desirable
!
interface FastEthernet0/2
  switchport mode dynamic desirable
!
... 
!
interface FastEthernet0/43
  switchport mode dynamic desirable
!
interface FastEthernet0/44
  switchport mode dynamic desirable
!
interface FastEthernet0/45
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,23-25,27-29
  switchport mode trunk
  channel-group 2 mode on
!
interface FastEthernet0/46
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,23-25,27-29
  switchport mode trunk
channel-group 2 mode on
!
interface FastEthernet0/47
switchport trunk encapsulation dot1q
switchport trunk allowed vlan 1,23-25,27-29
switchport mode trunk
channel-group 1 mode on
!
interface FastEthernet0/48
switchport trunk encapsulation dot1q
switchport trunk allowed vlan 1,23-25,27-29
switchport mode trunk
channel-group 1 mode on
!
interface GigabitEthernet0/1
switchport mode dynamic desirable
!
interface GigabitEthernet0/2
switchport mode dynamic desirable
!
interface Vlan1
  ip address 10.1.1.29 255.255.255.0
!
ip default-gateway 10.1.1.1
ip classless
ip http server
ip http secure-server
!
control-plane
!
line con 0
line vty 0 4
  no login
line vty 5 15
  no login
!
end

Show Spanning-Tree

IDF2WEST#show span

MST0
  Spanning tree enabled protocol mstp
  Root ID  Priority  0
  Address  0018.71b8.0a00
  Cost  0
  Port  65 (Port-channel1)
  Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority  32768 (priority 32768 sys-id-ext 0)
  Address  000d.bd43.1580
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

<table>
<thead>
<tr>
<th>Interface</th>
<th>Role</th>
<th>Sts</th>
<th>Cost</th>
<th>Prio.Nbr</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Po1</td>
<td>Root</td>
<td>FWD</td>
<td>20000</td>
<td>128.65</td>
<td>P2p</td>
</tr>
<tr>
<td>Po2</td>
<td>Desg</td>
<td>FWD</td>
<td>20000</td>
<td>128.66</td>
<td>P2p</td>
</tr>
</tbody>
</table>

MST1
Spanning tree enabled protocol mstp
Root ID Priority 1
Address 0018.71b8.0a00
Cost 20000
Port 65 (Port-channel1)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 000d.bd43.1580
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

<table>
<thead>
<tr>
<th>Interface</th>
<th>Role</th>
<th>Sts</th>
<th>Cost</th>
<th>Prio.Nbr</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Po1</td>
<td>Root</td>
<td>FWD</td>
<td>20000</td>
<td>128.65</td>
<td>P2p</td>
</tr>
<tr>
<td>Po2</td>
<td>Desg</td>
<td>FWD</td>
<td>20000</td>
<td>128.66</td>
<td>P2p</td>
</tr>
</tbody>
</table>

MST2
Spanning tree enabled protocol mstp
Root ID Priority 2
Address 0018.71b9.e400
Cost 40000
Port 66 (Port-channel2)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32770 (priority 32768 sys-id-ext 2)
Address 000d.bd43.1580
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

<table>
<thead>
<tr>
<th>Interface</th>
<th>Role</th>
<th>Sts</th>
<th>Cost</th>
<th>Prio.Nbr</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Po1</td>
<td>Altn</td>
<td>BLK</td>
<td>20000</td>
<td>128.65</td>
<td>P2p</td>
</tr>
<tr>
<td>Po2</td>
<td>Root</td>
<td>FWD</td>
<td>20000</td>
<td>128.66</td>
<td>P2p</td>
</tr>
</tbody>
</table>

Show Spanning-Tree MST Configuration

IDF2WEST#show spanning-tree mst configuration
Name [mstp-vrrp]
Revision 1 Instances configured 3

Instance Vlans mapped
-------- ---------------------------------------------------------------------
0 1-2,6,10-22,26,30-32,36,40-42,46,50-4094
1 3-5,23-25,33,35,43-45
2 7-9,27-29,37-39,47-49
Cisco 3550 (IDF2EAST)

Configure Switch

>enable  
#configure terminal  
(IDF2EAST(config)# hostname IDF2EAST (configures system name)  
IDF2EAST(config)# vlan 1  
IDF2EAST(config-vlan)# vlan 23-25,27-29  
IDF2EAST(config-vlan)# exit  
IDF2EAST(config)# interface vlan 1  
IDF2EAST(config-if)# ip address 10.1.1.30 255.255.255.0  
IDF2EAST(config-if)# exit  
IDF2EAST(config)# ip default-gateway 10.1.1.1  
IDF2EAST(config)#interface range fastethernet 0/47-48  
IDF2EAST(config-if-range)# channel-group 1 mode on  
IDF2EAST(config-if-range)# interface po 1  
IDF2EAST(config-if-range)# switchport trunk encapsulation dot1q  
IDF2EAST(config-if-range)# switchport mode trunk  
IDF2EAST(config-if-range)# switchport trunk allowed vlan 1,23-25,27-29  
IDF2EAST(config-if-range)# spanning-tree cost 20000  
IDF2EAST(config-if-range)# exit  
IDF2EAST(config)#interface range fastethernet 0/45-46  
IDF2EAST(config-if-range)# channel-group 2 mode on  
IDF2EAST(config-if-range)# interface po 2  
IDF2EAST(config-if-range)# switchport trunk encapsulation dot1q  
IDF2EAST(config-if-range)# switchport mode trunk  
IDF2EAST(config-if-range)# switchport trunk allowed vlan 1,23-25,27-29  
IDF2EAST(config-if-range)# spanning-tree cost 20000  
IDF2EAST(config-if-range)# exit  
IDF2EAST(config)# spanning-tree mst configuration  
IDF2EAST(config-mst)# name mstp-vrrp  
IDF2EAST(config-mst)# revision 1  
IDF2EAST(config-mst)# instance 1 vlan 3-5,23-25,33-35,43-45  
IDF2EAST(config-mst)# instance 2 vlan 7-9,27-29,37-39,47-49  
IDF2EAST(config-mst)# exit  
IDF2EAST(config)# spanning-tree mode mst

Show Running Configuration

IDF2EAST#show run  
Building configuration...  
Current configuration : 4581 bytes  
!  
version 12.2  
no service pad  
service timestamps debug uptime  
service timestamps log uptime  
no service password-encryption  
!  
hostname IDF2EAST  
!  
no aaa new-model  
ip subnet-zero  
!  
no file verify auto  
!  
spanning-tree mode mst  
spanning-tree extend system-id
! spanning-tree mst configuration
  name mstp-vrrp
  revision 1
instance 1 vlan 3-5, 23-25, 33-35, 43-45
instance 2 vlan 7-9, 27-29, 37-39, 47-49
!
vlan internal allocation policy ascending
!
interface Port-channel1
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,23-25,27-29
  switchport mode trunk
  spanning-tree cost 20000
!
interface Port-channel2
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,23-25,27-29
  switchport mode trunk
  spanning-tree cost 20000
!
interface FastEthernet0/1
  switchport mode dynamic desirable
!
interface FastEthernet0/2
  switchport mode dynamic desirable
!

interface FastEthernet0/43
  switchport mode dynamic desirable
!
interface FastEthernet0/44
  switchport mode dynamic desirable
!
interface FastEthernet0/45
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,23-25,27-29
  switchport mode trunk
  channel-group 2 mode on
!
interface FastEthernet0/46
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,23-25,27-29
  switchport mode trunk
  channel-group 2 mode on
!
interface FastEthernet0/47
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,23-25,27-29
  switchport mode trunk
channel-group 1 mode on
!
interface FastEthernet0/48
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,23-25,27-29
  switchport mode trunk
  channel-group 1 mode on
!
interface GigabitEthernet0/1
  switchport mode dynamic desirable
!
interface GigabitEthernet0/2
  switchport mode dynamic desirable
!
interface Vlan1
  ip address 10.1.1.30 255.255.255.0
!
ip default-gateway 10.1.1.1
ip classless
ip http server
ip http secure-server
!
control-plane
!
line con 0
line vty 0 4
  no login
line vty 5 15
  no login
!
end

Show Spanning-Tree

IDF2EAST#show span

MST0
  Spanning tree enabled protocol mstp
  Root ID  Priority  0
  Address  0018.71b8.0a00
  Cost  0
  Port  66 (Port-channel2)
  Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority  32768  (priority 32768 sys-id-ext 0)
  Address  000d.65ae.9080
  Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Interface    Role  Sts  Cost    Prio.Nbr  Type
  ------------------------  --------
  Po1       Altn  BLK 20000  128.65   P2p
  Po2       Root FWD 20000  128.66   P2p
MST1
Spanning tree enabled protocol mstp
Root ID  Priority  1
  Address  0018.71b8.0a00
  Cost  40000
  Port  66 (Port-channel2)
  Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
  Bridge ID  Priority  32769  (priority 32768 sys-id-ext 1)
    Address  000d.65ae.9080
    Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Interface  Role Sts  Cost  Prio.Nbr  Type
---  ----  ---  ---------  --------  --------------------------------
Po1       Altn BLK  20000  128.65  P2p
Po2       Root FWD  20000  128.66  P2p

MST2
Spanning tree enabled protocol mstp
Root ID  Priority  2
  Address  0018.71b9.e400
  Cost  20000
  Port  65 (Port-channel1)
  Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
  Bridge ID  Priority  32770  (priority 32768 sys-id-ext 2)
    Address  000d.65ae.9080
    Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Interface  Role Sts  Cost  Prio.Nbr  Type
---  ----  ---  ---------  --------  --------------------------------
Po1       Root FWD  20000  128.65  P2p
Po2       Desg FWD  20000  128.66  P2p

Show Spanning-Tree MST Configuration

IDF2EAST#show spanning-tree mst configuration
Name  [mstp-vrrp]
Revision  1  Instances configured 3

Instance  Vlans mapped
--------  ---------------------------------------------------------------------
0         1-2,6,10-22,26,30-32,36,40-42,46,50-4094
1         3-5,23-25,33-35,43-45
2         7-9,27-29,37-39,47-49

ProCurve 2810 (IDF3WEST)
Configure Switch
> enable
ProCurve Switch 2810-48G# config
ProCurve Switch 2810-48G(config)# max-vlans 50
Command will take effect after saving configuration and reboot.
ProCurve Switch 2810-48G(config)# write memory
ProCurve Switch 2810-48G(config)# reload
Device will be rebooted, do you want to continue [y/n]? Y

Device Reboots . . .
ProCurve Switch 2810-48G# configure
ProCurve Switch 2810-48G(config)# hostname IDF3WEST
IDF3WEST(config)# trunk 47-48 Trk1 Trunk
IDF3WEST(config)# trunk 45-46 Trk2 Trunk
IDF3WEST(config)# vlan 1
IDF3WEST(vlan-1)# ip address 10.1.1.27 255.255.255.0
IDF3WEST(vlan-1)# vlan 3
IDF3WEST(vlan-3)# vlan 4
IDF3WEST(vlan-4)# vlan 5
IDF3WEST(vlan-5)# vlan 7
IDF3WEST(vlan-7)# vlan 8
IDF3WEST(vlan-8)# vlan 9
IDF3WEST(vlan-9)# vlan 23
IDF3WEST(vlan-23)# vlan 24
IDF3WEST(vlan-24)# vlan 25
IDF3WEST(vlan-25)# vlan 27
IDF3WEST(vlan-27)# vlan 28
IDF3WEST(vlan-28)# vlan 29
IDF3WEST(vlan-29)# vlan 33
IDF3WEST(vlan-33)# tagged trk1-trk2
IDF3WEST(vlan-33)# vlan 34
IDF3WEST(vlan-34)# tagged trk1-trk2
IDF3WEST(vlan-34)# vlan 35
IDF3WEST(vlan-35)# tagged trk1-trk2
IDF3WEST(vlan-35)# vlan 37
IDF3WEST(vlan-37)# tagged trk1-trk2
IDF3WEST(vlan-37)# vlan 38
IDF3WEST(vlan-38)# tagged trk1-trk2
IDF3WEST(vlan-38)# vlan 39
IDF3WEST(vlan-39)# tagged trk1-trk2
IDF3WEST(vlan-39)# vlan 43
IDF3WEST(vlan-43)# vlan 44
IDF3WEST(vlan-44)# vlan 45
IDF3WEST(vlan-45)# vlan 47
IDF3WEST(vlan-47)# vlan 48
IDF3WEST(vlan-48)# vlan 49
IDF3WEST(vlan-49)# exit
IDF3WEST(config)# ip default-gateway 10.1.1.1
IDF3WEST(config)# spanning-tree config-name mstp-vrrp
IDF3WEST(config)# spanning-tree config-revision 1
IDF3WEST(config)# spanning-tree instance 1 vlan 3-5 23-25 33-35 43-45
IDF3WEST(config)# spanning-tree instance 2 vlan 7-9 27-29 37-39 47-49
IDF3WEST(config)# spanning-tree

Show Running Configuration
IDF3WEST# show run

Running configuration:

; J9022A Configuration Editor; Created on release #N.10.09

hostname "IDF3WEST"
max-vlans 50
trunk 47-48 Trk1 Trunk
trunk 45-46 Trk2 Trunk
ip default-gateway 10.1.1.1
snmp-server community "public" Unrestricted
vlan 1
    name "DEFAULT_VLAN"
    untagged 1-44,Trk1-Trk2
    ip address 10.1.1.27 255.255.255.255.0
    exit
vlan 3
    name "VLAN3"
    no ip address
    exit
vlan 4
    name "VLAN4"
    no ip address
    exit
vlan 5
    name "VLAN5"
    no ip address
    exit
vlan 7
    name "VLAN7"
    no ip address
    exit
vlan 8
    name "VLAN8"
    no ip address
    exit
vlan 9
    name "VLAN9"
    no ip address
    exit
vlan 23
    name "VLAN23"
    no ip address
    exit
vlan 24
    name "VLAN24"
    no ip address
    exit
vlan 25
    name "VLAN25"
no ip address
exit
vlan 27
name "VLAN27"
no ip address
exit
vlan 28
name "VLAN28"
no ip address
exit
vlan 29
name "VLAN29"
no ip address
exit
vlan 33
name "VLAN33"
no ip address
tagged Trk1-Trk2
exit
vlan 34
name "VLAN34"
no ip address
tagged Trk1-Trk2
exit
vlan 35
name "VLAN35"
no ip address
tagged Trk1-Trk2
exit
vlan 37
name "VLAN37"
no ip address
tagged Trk1-Trk2
exit
vlan 38
name "VLAN38"
no ip address
tagged Trk1-Trk2
exit
vlan 39
name "VLAN39"
no ip address
tagged Trk1-Trk2
exit
vlan 43
name "VLAN43"
no ip address
exit
vlan 44
name "VLAN44"
no ip address
exit
vlan 45
  name "VLAN45"
  no ip address
exit
vlan 47
  name "VLAN47"
  no ip address
exit
vlan 48
  name "VLAN48"
  no ip address
exit
vlan 49
  name "VLAN49"
  no ip address
exit
spanning-tree
  spanning-tree Trk1 priority 4
  spanning-tree Trk2 priority 4
  spanning-tree config-name "mstp-vrrp"
  spanning-tree config-revision 1
  spanning-tree instance 1 vlan 3-5 23-25 33-35 43-45
  spanning-tree instance 2 vlan 7-9 27-29 37-39 47-49

Show Spanning-Tree Instance IST

IDF3WEST# show span trk1-trk2 in ist

IST Instance Information

  Instance ID : 0
  Mapped VLANS : 1

  Switch Priority         : 32768
  Topology Change Count   : 3
  Time Since Last Change  : 99 mins

  Regional Root MAC Address : 001871-b80a00
  Regional Root Priority    : 0
  Regional Root Path Cost   : 20000
  Regional Root Port        : Trk1
  Remaining Hops            : 19

  Designated
  Port  Type     Cost  Priority Role       State            Bridge
  ----- -------- --------- ---- ------------- ----------- ------------
  Trk1  20000 64       Root  Forwarding 001871-b80a00
  Trk2  20000 64 Designated Forwarding 001708-2361c0

Show Spanning-Tree Instance 1

IDF3WEST# show span trk1-trk2 in 1
MST Instance Information

Instance ID : 1
Mapped VLANs : 3-5,23-25,33-35,43-45
Switch Priority : 32768
Topology Change Count : 3
Time Since Last Change : 103 mins

Regional Root MAC Address : 001871-b80a00
Regional Root Priority : 0
Regional Root Path Cost : 20000
Regional Root Port : Trk1
Remaining Hops : 19

Designated
Port Type  Cost  Priority Role  State      Bridge
----- ------- ------- ---------- ---------- ---------------
Trk1      20000   128      Root       Forwarding 001871-b80a00
Trk2      20000   128      Designated Forwarding 001708-2361c0

Show Spanning-Tree Instance 2

IDF3WEST# show span trk1-trk2 in 2

MST Instance Information

Instance ID : 2
Mapped VLANs : 7-9,27-29,37-39,47-49
Switch Priority : 32768
Topology Change Count : 7
Time Since Last Change : 10 mins

Regional Root MAC Address : 001871-b9e400
Regional Root Priority : 0
Regional Root Path Cost : 40000
Regional Root Port : Trk2
Remaining Hops : 18

Designated
Port Type  Cost  Priority Role  State      Bridge
----- ------- ------- ---------- ---------- ---------------
Trk1      20000   128      Alternate Blocking 001871-b80a00
Trk2      20000   128      Root       Forwarding 0019bb-ad6fc0

Show Spanning-Tree MST Configuration

IDF3WEST# show spanning-tree mst-config

MST Configuration Identifier Information

MST Configuration Name : mstp-vrrp
MST Configuration Revision : 1
MST Configuration Digest : 0x1936FB656D900E359ED1D09A34AC0AAC

IST Mapped VLANs : 1

Instance ID Mapped VLANs

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3-5,23-25,33-35,43-45</td>
</tr>
<tr>
<td>2</td>
<td>7-9,27-29,37-39,47-49</td>
</tr>
</tbody>
</table>

**ProCurve 2900 (IDF3EAST)**

**Configure Switch**

> enable

ProCurve Switch 2900# config

ProCurve Switch 2900(config)# max-vlans 50

Command will take effect after saving configuration and reboot.

ProCurve Switch 2900(config)# write memory

ProCurve Switch 2900(config)# reload

Device will be rebooted, do you want to continue [y/n]? Y

**Device Reboots . . . .**

ProCurve Switch 2900# configure

ProCurve Switch 2900(config)# hostname IDF3EAST

IDF3EAST(config)# trunk 47-48 Trk1 Trunk

IDF3EAST(config)# trunk 45-46 Trk2 Trunk

IDF3EAST(config)# vlan 1

IDF3EAST(vlan-1)# ip address 10.1.1.28 255.255.255.0

IDF3EAST(vlan-1)# vlan 3

IDF3EAST(vlan-3)# vlan 4

IDF3EAST(vlan-4)# vlan 5

IDF3EAST(vlan-5)# vlan 7

IDF3EAST(vlan-7)# vlan 8

IDF3EAST(vlan-8)# vlan 9

IDF3EAST(vlan-9)# vlan 23

IDF3EAST(vlan-23)# vlan 24

IDF3EAST(vlan-24)# vlan 25

IDF3EAST(vlan-25)# vlan 27

IDF3EAST(vlan-27)# vlan 28

IDF3EAST(vlan-28)# vlan 29

IDF3EAST(vlan-29)# vlan 33

IDF3EAST(vlan-33)# tagged trk1-trk2

IDF3EAST(vlan-33)# vlan 34

IDF3EAST(vlan-34)# tagged trk1-trk2

IDF3EAST(vlan-34)# vlan 35

IDF3EAST(vlan-35)# tagged trk1-trk2

IDF3EAST(vlan-35)# vlan 37

IDF3EAST(vlan-37)# tagged trk1-trk2

IDF3EAST(vlan-37)# vlan 38

IDF3EAST(vlan-38)# tagged trk1-trk2

IDF3EAST(vlan-38)# vlan 39

IDF3EAST(vlan-39)# tagged trk1-trk2

IDF3EAST(vlan-39)# vlan 43
IDF3EAST(vlan-43)# vlan 44
IDF3EAST(vlan-44)# vlan 45
IDF3EAST(vlan-45)# vlan 47
IDF3EAST(vlan-47)# vlan 48
IDF3EAST(vlan-48)# vlan 49
IDF3EAST(vlan-49)# exit
IDF3EAST(config)# ip default-gateway 10.1.1.1
IDF3EAST(config)# spanning-tree config-name mstp-vrrp
IDF3EAST(config)# spanning-tree config-revision 1
IDF3EAST(config)# spanning-tree instance 1 vlan 3-5 23-25 33-35 43-45
IDF3EAST(config)# spanning-tree instance 2 vlan 7-9 27-29 37-39 47-49
IDF3EAST(config)# spanning-tree

**Show Running Configuration**

IDF3EAST# show run
Running configuration:
; J9050A Configuration Editor; Created on release #T.12.03
hostname "IDF3EAST"
max-vlans 50
module 3 type J90XXA
trunk 47-48 Trk1 Trunk
trunk 45-46 Trk2 Trunk
snmp-server community "public" Unrestricted
vlan 1
  name "DEFAULT_VLAN"
  untagged 1-44,A1-A4,Trk1-Trk2
  ip address 10.1.1.28 255.255.255.0
  exit
vlan 3
  name "VLAN3"
  no ip address
  exit
vlan 4
  name "VLAN4"
  no ip address
  exit
vlan 5
  name "VLAN5"
  no ip address
  exit
vlan 7
  name "VLAN7"
  no ip address
  exit
vlan 8
  name "VLAN8"
  no ip address
  exit
vlan 9
  name "VLAN9"
no ip address
exit
vlan 23
  name "VLAN23"
  no ip address
  exit
vlan 24
  name "VLAN24"
  no ip address
  exit
vlan 25
  name "VLAN25"
  no ip address
  exit
vlan 27
  name "VLAN27"
  no ip address
  exit
vlan 28
  name "VLAN28"
  no ip address
  exit
vlan 29
  name "VLAN29"
  no ip address
  exit
vlan 33
  name "VLAN33"
  tagged Trk1-Trk2
  no ip address
  exit
vlan 34
  name "VLAN34"
  tagged Trk1-Trk2
  no ip address
  exit
vlan 35
  name "VLAN35"
  tagged Trk1-Trk2
  no ip address
  exit
vlan 37
  name "VLAN37"
  tagged Trk1-Trk2
  no ip address
  exit
vlan 38
  name "VLAN38"
  tagged Trk1-Trk2
  no ip address
  exit
vlan 39
    name "VLAN39"
tagged Trk1-Trk2
    no ip address
    exit
vlan 43
    name "VLAN43"
    no ip address
    exit
vlan 44
    name "VLAN44"
    no ip address
    exit
vlan 45
    name "VLAN45"
    no ip address
    exit
vlan 47
    name "VLAN47"
    no ip address
    exit
vlan 48
    name "VLAN48"
    no ip address
    exit
vlan 49
    name "VLAN49"
    no ip address
    exit
spanning-tree
    spanning-tree Trk1 priority 4
    spanning-tree Trk2 priority 4
    spanning-tree config-name "mstp-rrp"
    spanning-tree config-revision 1
    spanning-tree instance 1 vlan 3-5 23-25 33-35 43-45
    spanning-tree instance 2 vlan 7-9 27-29 37-39 47-49

**Show Spanning-Tree Instance IST**

IDF3EAST# show span trk1-trk2 in ist

IST Instance Information

Instance ID : 0
Mapped VLANs : 1

    Switch Priority : 32768

    Topology Change Count : 10
    Time Since Last Change : 11 mins

    Regional Root MAC Address : 001871-b80a00
Regional Root Priority : 0
Regional Root Path Cost : 40000
Regional Root Port : Trk2
Remaining Hops : 18

Designated
Port Type Cost Priority Role State Bridge
----- -------- -------- --------- ----------- ---------- --------------
Trk1 20000 64 Alternate Blocking 001871-b9e400
Trk2 20000 64 Root Forwarding 001708-2361c0

**Show Spanning-Tree Instance 1**

IDF3EAST# show span trk1-trk2 in 1

MST Instance Information

Instance ID : 1
Mapped VLANs : 3-5,23-25,33-35,43-45

Switch Priority : 16384

Topology Change Count : 7
Time Since Last Change : 2 hours

Regional Root MAC Address : 001871-b80a00
Regional Root Priority : 0
Regional Root Path Cost : 40000
Regional Root Port : Trk2
Remaining Hops : 18

Designated
Port Type Cost Priority Role State Bridge
----- -------- -------- --------- ----------- ---------- --------------
Trk1 20000 128 Alternate Blocking 001871-b9e400
Trk2 20000 128 Root Forwarding 001708-2361c0

**Show Spanning-Tree Instance 2**

IDF3EAST# show span trk1-trk2 in 2

MST Instance Information

Instance ID : 2
Mapped VLANs : 7-9,27-29,37-39,47-49

Switch Priority : 32768

Topology Change Count : 8
Time Since Last Change : 13 mins

Regional Root MAC Address : 001871-b9e400
Regional Root Priority : 0
Regional Root Path Cost : 20000
Regional Root Port : Trk1
Remaining Hops : 19
<table>
<thead>
<tr>
<th>Port</th>
<th>Type</th>
<th>Cost</th>
<th>Priority</th>
<th>Role</th>
<th>State</th>
<th>Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trk1</td>
<td></td>
<td>20000</td>
<td>128</td>
<td>Root</td>
<td>Forwarding</td>
<td>001871-b9e400</td>
</tr>
<tr>
<td>Trk2</td>
<td></td>
<td>20000</td>
<td>128</td>
<td>Designated</td>
<td>Forwarding</td>
<td>0019bb-ad6fc0</td>
</tr>
</tbody>
</table>

Show Spanning-Tree MST Configuration

IDF3EAST# show spanning-tree mst

MST Configuration Identifier Information

MST Configuration Name : mstp-vrrp
MST Configuration Revision : 1
MST Configuration Digest : 0x1936FB656D900E359ED1D09A34AC0AAC

IST Mapped VLANs : 1

Instance ID Mapped VLANs

<table>
<thead>
<tr>
<th>Instance</th>
<th>VLANs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3,5,23-25,33-35,43-45</td>
</tr>
<tr>
<td>2</td>
<td>7-9,27-29,37-39,47-49</td>
</tr>
</tbody>
</table>

Cisco 3750 (IDF4WEST)

Configure Switch

>enable
#configure terminal
(config)# hostname IDF4WEST (configures system name)
IDF4WEST(config)# vlan 1
IDF4WEST(config-vlan)# vlan 43-45,47-49
IDF4WEST(config-vlan)# exit
IDF4WEST(config)# interface vlan 1
IDF4WEST(config-if)# ip address 10.1.1.25 255.255.255.0
IDF4WEST(config-if)# exit
IDF4WEST(config)# interface range gigabitEthernet 1/0/23-24
IDF4WEST(config-if-range)# channel-group 1 mode on
IDF4WEST(config-if-range)# interface po 1
IDF4WEST(config-if)# switchport trunk encapsulation dot1q
IDF4WEST(config-if)# switchport mode trunk
IDF4WEST(config-if)# switchport trunk allowed vlan 1,43-45,47-49
IDF4WEST(config-if)# exit
IDF4WEST(config)# interface range gigabitEthernet 1/0/21-22
IDF4WEST(config-if-range)# channel-group 2 mode on
IDF4WEST(config-if-range)# interface po 2
IDF4WEST(config-if)# switchport trunk encapsulation dot1q
IDF4WEST(config-if)# switchport mode trunk
IDF4WEST(config-if)# switchport trunk allowed vlan 1,43-45,47-49
IDF4WEST(config-if)# exit
IDF4WEST(config)# spanning-tree mst configuration
IDF4WEST(config-mst)# name mstp-vrrp
IDF4WEST(config-mst)# revision 1
IDF4WEST(config-mst)# instance 1 vlan 3-5,23-25,33-35,43-45
IDF4WEST(config-mst)# instance 2 vlan 7-9,27-29,37-39,47-49
IDF4WEST(config-mst)# exit
IDF4WEST(config)# spanning-tree mode mst
**Show Running Configuration**

IDF4WEST#show run
Building configuration...
Current configuration : 2491 bytes
!
version 12.2
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname IDF4WEST
!
no aaa new-model
switch 1 provision ws-c3750g-24ps
vtp mode transparent
ip subnet-zero
!
no file verify auto
!
spanning-tree mode mst
spanning-tree extend system-id
!
spanning-tree mst configuration
  name mstp-vrrp
  revision 1
  instance 1 vlan 3-5, 23-25, 33-35, 43-45
  instance 2 vlan 7-9, 27-29, 37-39, 47-49
!
vlan internal allocation policy ascending
!
  vlan 3-5,7-9,23-25,27-29,33-35,37-39,43-45,47-49
!
interface Port-channel1
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,43-45,47-49
  switchport mode trunk
!
interface Port-channel2
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,43-45,47-49
  switchport mode trunk
!
interface GigabitEthernet1/0/1
!
interface GigabitEthernet1/0/2
!

...
! interface GigabitEthernet1/0/20
! interface GigabitEthernet1/0/21
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,43-45,47-49
  switchport mode trunk
  channel-group 2 mode on
! interface GigabitEthernet1/0/22
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,43-45,47-49
  switchport mode trunk
  channel-group 2 mode on
! interface GigabitEthernet1/0/23
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,43-45,47-49
  switchport mode trunk
  channel-group 1 mode on
! interface GigabitEthernet1/0/24
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,43-45,47-49
  switchport mode trunk
  channel-group 1 mode on
! interface GigabitEthernet1/0/25
! interface GigabitEthernet1/0/26
! interface GigabitEthernet1/0/27
! interface GigabitEthernet1/0/28
! interface Vlan1
  ip address 10.1.1.25 255.255.255.0
! ip default-gateway 10.1.1.1
ip classless
ip http server
ip http secure-server
! control-plane
! line con 0
line vty 5 15
! end

IDF4WEST#
Show Spanning-Tree

IDF4WEST#show span

MST0
Spanning tree enabled protocol mstp
Root ID  Priority  0
  Address  0018.71b8.0a00
  Cost  0
  Port  616 (Port-channel1)
  Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority  32768 (priority 32768 sys-id-ext 0)
  Address  0018.1928.f080
  Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

<table>
<thead>
<tr>
<th>Interface</th>
<th>Role</th>
<th>Sts</th>
<th>Cost</th>
<th>Prio.Nbr</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Po1</td>
<td>Root</td>
<td>FWD</td>
<td>10000</td>
<td>128.616</td>
<td>P2p</td>
</tr>
<tr>
<td>Po2</td>
<td>Desg</td>
<td>FWD</td>
<td>10000</td>
<td>128.624</td>
<td>P2p</td>
</tr>
</tbody>
</table>

MST1
Spanning tree enabled protocol mstp
Root ID  Priority  1
  Address  0018.71b8.0a00
  Cost  10000
  Port  616 (Port-channel1)
  Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority  32769 (priority 32768 sys-id-ext 1)
  Address  0018.1928.f080
  Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

<table>
<thead>
<tr>
<th>Interface</th>
<th>Role</th>
<th>Sts</th>
<th>Cost</th>
<th>Prio.Nbr</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Po1</td>
<td>Root</td>
<td>FWD</td>
<td>10000</td>
<td>128.616</td>
<td>P2p</td>
</tr>
<tr>
<td>Po2</td>
<td>Desg</td>
<td>FWD</td>
<td>10000</td>
<td>128.624</td>
<td>P2p</td>
</tr>
</tbody>
</table>

MST2
Spanning tree enabled protocol mstp
Root ID  Priority  2
  Address  0018.71b9.e400
  Cost  30000
  Port  624 (Port-channel2)
  Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority  32770 (priority 32768 sys-id-ext 2)
  Address  0018.1928.f080
  Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

<table>
<thead>
<tr>
<th>Interface</th>
<th>Role</th>
<th>Sts</th>
<th>Cost</th>
<th>Prio.Nbr</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Po1</td>
<td>Root</td>
<td>FWD</td>
<td>10000</td>
<td>128.616</td>
<td>P2p</td>
</tr>
<tr>
<td>Po2</td>
<td>Desg</td>
<td>FWD</td>
<td>10000</td>
<td>128.624</td>
<td>P2p</td>
</tr>
</tbody>
</table>
Show Spanning-Tree MST Configuration

IDF4WEST#show spanning-tree mst configuration
Name     [mstp-vrrp]
Revision  1     Instances configured 3

Instance  Vlans mapped
---------- ---------------------------------------------------------------------
0         1-2,6,10-22,26,30-32,36,40-42,46,50-4094
1         3-5,23-25,33-35,43-45
2         7-9,27-29,37-39,47-49
-------------------------------------------------------------------------------

ProCurve 3400cl (IDF4EAST)

Configure Switch
ProCurve Switch 3400cl-48G(config)#
ProCurve Switch 3400cl-48G(config)# max-vlans 50
Command will take effect after saving configuration and reboot.
ProCurve Switch 3400cl-48G(config)# spanning-tree protocol-version mstp
STP version was changed. To activate the change you must save the configuration to flash and reboot the device.
ProCurve Switch 3400cl-48G(config)# wr mem
ProCurve Switch 3400cl-48G(config)# reload
Device will be rebooted, do you want to continue [y/n]?  y

Device Reboots . . .
ProCurve Switch 3400cl-48G> enable
ProCurve Switch 3400cl-48G# configure
ProCurve Switch 3400cl-48G(config)# hostname IDF4EAST
IDF4EAST(config)# trunk 47-48 Trk1 Trunk
IDF4EAST(config)# trunk 45-46 Trk2 Trunk
IDF4EAST(config)# vlan 1
IDF4EAST(vlan-1)# ip address 10.1.1.26 255.255.255.0
IDF4EAST(vlan-1)# vlan 3
IDF4EAST(vlan-3)# vlan 4
IDF4EAST(vlan-4)# vlan 5
IDF4EAST(vlan-5)# vlan 7
IDF4EAST(vlan-7)# vlan 8
IDF4EAST(vlan-8)# vlan 9
IDF4EAST(vlan-9)# vlan 23
IDF4EAST(vlan-23)# vlan 24
IDF4EAST(vlan-24)# vlan 25
IDF4EAST(vlan-25)# vlan 27
IDF4EAST(vlan-27)# vlan 28
IDF4EAST(vlan-28)# vlan 29
IDF4EAST(vlan-29)# vlan 33
IDF4EAST(vlan-33)# vlan 34
IDF4EAST(vlan-34)# vlan 35
IDF4EAST(vlan-35)# vlan 37
IDF4EAST(vlan-37)# vlan 38
IDF4EAST(vlan-38)# vlan 39
IDF4EAST(vlan-39)# vlan 43
IDF4EAST(vlan-43)# tagged trk1-trk2
IDF4EAST(vlan-43)# vlan 44
IDF4EAST(vlan-44)# tagged trk1-trk2
IDF4EAST(vlan-44)# vlan 45
IDF4EAST(vlan-45)# tagged trk1-trk2
IDF4EAST(vlan-45)# vlan 47
IDF4EAST(vlan-47)# tagged trk1-trk2
IDF4EAST(vlan-47)# vlan 48
IDF4EAST(vlan-48)# tagged trk1-trk2
IDF4EAST(vlan-48)# vlan 49
IDF4EAST(vlan-49)# tagged trk1-trk2
IDF4EAST(vlan-49)# exit
IDF4EAST(config)# ip default-gateway 10.1.1.1
IDF4EAST(config)# spanning-tree config-name mstp-vrrp
IDF4EAST(config)# spanning-tree config-revision 1
IDF4EAST(config)# spanning-tree instance 1 vlan 3-5 23-25 33-35 43-45
IDF4EAST(config)# spanning-tree instance 2 vlan 7-9 27-29 37-39 47-49
IDF4EAST(config)# spanning-tree
IDF4EAST(config)# wr mem
IDF4EAST(config)#

Show Running Configuration

IDF4EAST(config)# show run
Running configuration:
; J4906A Configuration Editor; Created on release #M.10.30
hostname "IDF4EAST"
max-vlans 50
interface 45
   no lacp
exit
interface 46
   no lacp
exit
interface 47
   no lacp
exit
interface 48
   no lacp
exit
trunk 47-48 Trk1 Trunk
trunk 45-46 Trk2 Trunk
ip default-gateway 10.1.1.1
snmp-server community "public" Unrestricted
vlan 1
   name "DEFAULT_VLAN"
untagged 1-44,Trk1-Trk2
ip address 10.1.1.26 255.255.255.0
exit
vlan 3
  name "VLAN3"
  no ip address
  exit
vlan 4
  name "VLAN4"
  no ip address
  exit
vlan 5
  name "VLAN5"
  no ip address
  exit
vlan 7
  name "VLAN7"
  no ip address
  exit
vlan 8
  name "VLAN8"
  no ip address
  exit
vlan 9
  name "VLAN9"
  no ip address
  exit
vlan 23
  name "VLAN23"
  no ip address
  exit
vlan 24
  name "VLAN24"
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  exit
vlan 25
  name "VLAN25"
  no ip address
  exit
vlan 27
  name "VLAN27"
  no ip address
  exit
vlan 28
  name "VLAN28"
  no ip address
  exit
vlan 29
  name "VLAN29"
  no ip address
  exit
vlan 33
  name "VLAN33"
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  exit
vlan 34
  name "VLAN34"
  no ip address
  exit
vlan 35
  name "VLAN35"
  no ip address
  exit
vlan 37
  name "VLAN37"
  no ip address
  exit
vlan 38
  name "VLAN38"
  no ip address
  exit
vlan 39
  name "VLAN39"
  no ip address
  exit
vlan 43
  name "VLAN43"
  no ip address
  tagged Trk1-Trk2
  exit
vlan 44
  name "VLAN44"
  no ip address
  tagged Trk1-Trk2
  exit
vlan 45
  name "VLAN45"
  no ip address
  tagged Trk1-Trk2
  exit
vlan 47
  name "VLAN47"
  no ip address
  tagged Trk1-Trk2
  exit
vlan 48
  name "VLAN48"
  no ip address
  tagged Trk1-Trk2
  exit
vlan 49
  name "VLAN49"
no ip address
tagged Trk1-Trk2
exit
spanning-tree
spanning-tree protocol-version MSTP
spanning-tree Trk1 priority 4
spanning-tree Trk2 priority 4
spanning-tree config-name "mstp-vrrp"
spanning-tree config-revision 1
spanning-tree instance 1 vlan 3-5 23-25 33-35 43-45
spanning-tree instance 2 vlan 7-9 27-29 37-39 47-49

Show Spanning-Tree Instance IST

IDF4EAST(config)# show span trk1-trk2 in ist

IST Instance Information

  Instance ID : 0
  Mapped VLANs : 1
  Switch Priority : 32768
  Topology Change Count : 2
  Time Since Last Change : 2 mins
  Regional Root MAC Address : 001871-b80a00
  Regional Root Priority : 0
  Regional Root Path Cost : 30000
  Regional Root Port : Trk2
  Remaining Hops : 18

Designated
Port Type Cost Priority Role State Bridge
----- -------- -------- ---------- ---------- --------------
Trk1 20000 64 Alternate Blocking 001871-b9e400
Trk2 20000 64 Root Forwarding 001819-28f080

Show Spanning-Tree Instance 1

IDF4EAST(config)# show span trk1-trk2 in 1

MST Instance Information

  Instance ID : 1
  Mapped VLANs : 3-5,23-25,33-35,43-45
  Switch Priority : 32768
  Topology Change Count : 2
  Time Since Last Change : 4 mins
  Regional Root MAC Address : 001871-b80a00
  Regional Root Priority : 0
Regional Root Path Cost : 30000
Regional Root Port : Trk2
Remaining Hops : 18

<table>
<thead>
<tr>
<th>Port Type</th>
<th>Cost</th>
<th>Priority</th>
<th>Role</th>
<th>State</th>
<th>Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trk1</td>
<td>20000</td>
<td>128</td>
<td>Alternate</td>
<td>Blocking</td>
<td>001871-b9e400</td>
</tr>
<tr>
<td>Trk2</td>
<td>20000</td>
<td>128</td>
<td>Root</td>
<td>Forwarding</td>
<td>001819-28f080</td>
</tr>
</tbody>
</table>

Show Spanning-Tree Instance 2

IDF4EAST(config)# show span trk1-trk2 in 2

MST Instance Information

Instance ID : 2
Mapped VLANs : 7-9,27-29,37-39,47-49

Switch Priority : 32768

Topology Change Count : 3
Time Since Last Change : 61 mins

Regional Root MAC Address : 001871-b9e400
Regional Root Priority : 0
Regional Root Path Cost : 20000
Regional Root Port : Trk1
Remaining Hops : 19

<table>
<thead>
<tr>
<th>Port Type</th>
<th>Cost</th>
<th>Priority</th>
<th>Role</th>
<th>State</th>
<th>Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trk1</td>
<td>20000</td>
<td>128</td>
<td>Root</td>
<td>Forwarding</td>
<td>001871-b9e400</td>
</tr>
<tr>
<td>Trk2</td>
<td>20000</td>
<td>128</td>
<td>Designated</td>
<td>Forwarding</td>
<td>001185-6e97c0</td>
</tr>
</tbody>
</table>

Show Spanning-Tree MST Configuration

IDF4EAST(config)# show spanning-tree mst-config

MST Configuration Identifier Information

MST Configuration Name : mstp-vrrp
MST Configuration Revision : 1
MST Configuration Digest : 0x1936FB656D900E359ED1D09A34AC0AAC

IST Mapped VLANs : 1

Instance ID Mapped VLANs

<table>
<thead>
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<tbody>
<tr>
<td>1</td>
<td>3-5,23-25,33-35,43-45</td>
</tr>
<tr>
<td>2</td>
<td>7-9,27-29,37-39,47-49</td>
</tr>
</tbody>
</table>
**8200A Configuration**

**Configure Switch**

**Configure the Device Name**
ProCurve Switch 8200zl# configure
ProCurve Switch 8200zl(config)# hostname 8200A

**Configure Trunks**
This is a manual trunk configuration, no link aggregation protocol is used.

8200A(config)# trunk A14,C14 Trk1 Trunk
8200A(config)# trunk A16,C16 Trk2 Trunk
8200A(config)# trunk A18,C18 Trk3 Trunk
8200A(config)# trunk A20,C20 Trk4 Trunk
8200A(config)# trunk A23,C23 Trk6 Trunk

**Configure Vlans, Addresses, and Trunks**

The MDF switches have a vlan gateway address assigned to each vlan. These addresses are assigned at the vlan configuration level, not per interface. For a trunk to carry tagged vlan traffic for a given vlan, that trunk must be named at the vlan configuration level. In this configuration, Trk6 represents the MDF-MDF trunk, and carries all vlans. Other trunks carry the vlans corresponding to the appropriate IDF. For example, IDF2 uses TRK2, and is added to all of the vlans configured for IDF2.

Vlan 1 is assigned to all ports as an untagged vlan by default. This can be verified with “show config” and “show vlan 1”.

All other vlans require port assignments.

8200A(config)# vlan 1
8200A(vlan-1)# ip address 10.1.1.1 255.255.255.0
8200A(vlan-1)# vlan 3
8200A(vlan-3)# ip address 10.1.3.1 255.255.255.0
8200A(vlan-3)# tagged Trk1,Trk6
8200A(config)# vlan 4
8200A(vlan-4)# ip address 10.1.4.1 255.255.255.0
8200A(vlan-4)# tagged Trk1,Trk6
8200A(config)# vlan 5
8200A(vlan-5)# ip address 10.1.5.1 255.255.255.0
8200A(vlan-5)# tagged Trk1,Trk6
8200A(config)# vlan 7
8200A(vlan-7)# ip address 10.1.7.2 255.255.255.0
8200A(vlan-7)# tagged Trk1,Trk6
8200A(config)# vlan 8
8200A(vlan-8)# ip address 10.1.8.2 255.255.255.0
8200A(vlan-8)# tagged Trk1,Trk6
8200A(config)# vlan 9
8200A(vlan-9)# ip address 10.1.9.2 255.255.255.0
8200A(vlan-9)# tagged Trk1,Trk6
8200A(config)# vlan 23
8200A(vlan-23)# ip address 10.1.23.1 255.255.255.0
8200A(vlan-23)# tagged Trk2,Trk6
8200A(config)# vlan 24
8200A(vlan-24)# ip address 10.1.24.1 255.255.255.0
8200A(vlan-24)# tagged Trk2,Trk6
8200A(config)# vlan 25
8200A(vlan-25)# ip address 10.1.25.1 255.255.255.0
8200A(vlan-25)# tagged Trk2,Trk6
8200A(config)# vlan 27
8200A(vlan-27)# ip address 10.1.27.2 255.255.255.0
8200A(vlan-27)# tagged Trk2,Trk6
8200A(config)# vlan 28
8200A(vlan-28)# ip address 10.1.28.2 255.255.255.0
8200A(vlan-28)# tagged Trk2,Trk6
8200A(config)# vlan 29
8200A(vlan-29)# ip address 10.1.29.2 255.255.255.0
8200A(vlan-29)# tagged Trk2,Trk6
8200A(config)# vlan 33
8200A(vlan-33)# ip address 10.1.33.1 255.255.255.0
8200A(vlan-33)# tagged Trk3,Trk6
8200A(config)# vlan 34
8200A(vlan-34)# ip address 10.1.34.1 255.255.255.0
8200A(vlan-34)# tagged Trk3,Trk6
8200A(config)# vlan 35
8200A(vlan-35)# ip address 10.1.35.1 255.255.255.0
8200A(vlan-35)# tagged Trk3,Trk6
8200A(config)# vlan 37
8200A(vlan-37)# ip address 10.1.37.2 255.255.255.0
8200A(vlan-37)# tagged Trk3,Trk6
8200A(config)# vlan 38
8200A(vlan-38)# ip address 10.1.38.2 255.255.255.0
8200A(vlan-38)# tagged Trk3,Trk6
8200A(config)# vlan 39
8200A(vlan-39)# ip address 10.1.39.2 255.255.255.0
8200A(vlan-39)# tagged Trk3,Trk6
8200A(config)# vlan 43
8200A(vlan-43)# ip address 10.1.43.1 255.255.255.0
8200A(vlan-43)# tagged Trk4,Trk6
8200A(config)# vlan 44
8200A(vlan-44)# ip address 10.1.44.1 255.255.255.0
8200A(vlan-44)# tagged Trk4,Trk6
8200A(config)# vlan 45
8200A(vlan-45)# ip address 10.1.45.1 255.255.255.0
8200A(vlan-45)# tagged Trk4,Trk6
8200A(config)# vlan 47
8200A(vlan-47)# ip address 10.1.47.2 255.255.255.0
8200A(vlan-47)# tagged Trk4,Trk6
8200A(config)# vlan 48
8200A(vlan-48)# ip address 10.1.48.2 255.255.255.0
8200A(vlan-48)# tagged Trk4,Trk6
8200A(config)# vlan 49
8200A(vlan-49)# ip address 10.1.49.2 255.255.255.0
8200A(vlan-49)# tagged Trk4,Trk6
Configure MSTP

Be sure that the MSTP regional name and VLAN set match EXACTLY for each device. 8200A is the root for the CST and Span Instance 1, so it has its priority set to 0. Path costs on Trk6 are manually set to force blocking on specific IDF switch ports.

8200A(config)# spanning-tree config-name "mstp-vrrp"
8200A(config)# spanning-tree config-revision 1
8200A(config)# spanning-tree instance 1 vlan 3-5 23-25 33-35 43-45
8200A(config)# spanning-tree instance 1 priority 0
8200A(config)# spanning-tree instance 2 vlan 7-9 27-29 37-39 47-49
8200A(config)# spanning-tree instance 2 priority 1
8200A(config)# spanning-tree priority 0
8200A(config)# spanning-tree Trk6 path-cost 30000
8200A(config)# spanning-tree instance 1 Trk6 path-cost 30000
8200A(config)# spanning-tree instance 2 Trk6 path-cost 30000
8200A(config)# spanning-tree

Configure VRRP Instances

First, IP routing and VRRP must be enabled globally:

8200A(config)# ip routing
8200A(config)# router vrrp

A VRRP instance must be declared for each VLAN. 1 VRID is used in this configuration. The VRRP owner has a default priority of 255, and the backup has a default priority of 100. The virtual ip of the owner is configured in each VLAN instance, and then each VRID instance must be set with the "enable" command. 8200A is the owner of the VLANs ending in 3, 4, 5; and the backup for VLANs ending in 7, 8, 9.

8200A(config)# vlan 1
8200A(vlan-1)# vrrp vrid 1
8200A(vlan-1-vrid-1)# owner
8200A(vlan-1-vrid-1)# virtual-ip-address 10.1.1.1 255.255.255.0
8200A(vlan-1-vrid-1)# enable
8200A(vlan-1-vrid-1)# vlan 3
8200A(vlan-3)# vrrp vrid 1
8200A(vlan-3-vrid-1)# owner
8200A(vlan-3-vrid-1)# virtual-ip-address 10.1.3.1 255.255.255.0
8200A(vlan-3-vrid-1)# enable
8200A(vlan-3-vrid-1)# vlan 4
8200A(vlan-4)# vrrp vrid 1
8200A(vlan-4-vrid-1)# owner
8200A(vlan-4-vrid-1)# virtual-ip-address 10.1.4.1 255.255.255.0
8200A(vlan-4-vrid-1)# enable
8200A(vlan-4-vrid-1)# vlan 5
8200A(vlan-5)# vrrp vrid 1
8200A(vlan-5-vrid-1)# owner
8200A(vlan-5-vrid-1)# virtual-ip-address 10.1.5.1 255.255.255.0
8200A(vlan-5-vrid-1)# enable
8200A(vlan-5-vrid-1)# vlan 7
8200A(vlan-7)# vrrp vrid 1
8200A(vlan-7-vrid-1)# backup
8200A(vlan-7-vrid-1)# virtual-ip-address 10.1.7.1 255.255.255.0
8200A(vlan-7-vrid-1)# enable
8200A(vlan-7-vrid-1)# vlan 8
8200A(vlan-8)# vrrp vrid 1
8200A(vlan-8-vrid-1)# backup
8200A(vlan-8-vrid-1)# virtual-ip-address 10.1.8.1 255.255.255.0
8200A(vlan-8-vrid-1)# enable
8200A(vlan-8-vrid-1)# vlan 9
8200A(vlan-9)# vrrp vrid 1
8200A(vlan-9-vrid-1)# backup
8200A(vlan-9-vrid-1)# virtual-ip-address 10.1.9.1 255.255.255.0
8200A(vlan-9-vrid-1)# enable
8200A(vlan-9-vrid-1)# vlan 23
8200A(vlan-23)# vrrp vrid 1
8200A(vlan-23-vrid-1)# owner
8200A(vlan-23-vrid-1)# virtual-ip-address 10.1.23.1 255.255.255.0
8200A(vlan-23-vrid-1)# enable
8200A(vlan-23-vrid-1)# vlan 24
8200A(vlan-24)# vrrp vrid 1
8200A(vlan-24-vrid-1)# owner
8200A(vlan-24-vrid-1)# virtual-ip-address 10.1.24.1 255.255.255.0
8200A(vlan-24-vrid-1)# enable
8200A(vlan-24-vrid-1)# vlan 25
8200A(vlan-25)# vrrp vrid 1
8200A(vlan-25-vrid-1)# owner
8200A(vlan-25-vrid-1)# virtual-ip-address 10.1.25.1 255.255.255.0
8200A(vlan-25-vrid-1)# enable
8200A(vlan-25-vrid-1)# vlan 27
8200A(vlan-27)# vrrp vrid 1
8200A(vlan-27-vrid-1)# backup
8200A(vlan-27-vrid-1)# virtual-ip-address 10.1.27.1 255.255.255.0
8200A(vlan-27-vrid-1)# enable
8200A(vlan-27-vrid-1)# vlan 28
8200A(vlan-28)# vrrp vrid 1
8200A(vlan-28-vrid-1)# backup
8200A(vlan-28-vrid-1)# virtual-ip-address 10.1.28.1 255.255.255.0
8200A(vlan-28-vrid-1)# enable
8200A(vlan-28-vrid-1)# vlan 29
8200A(vlan-29)# vrrp vrid 1
8200A(vlan-29-vrid-1)# backup
8200A(vlan-29-vrid-1)# virtual-ip-address 10.1.29.1 255.255.255.0
8200A(vlan-29-vrid-1)# enable
8200A(vlan-29-vrid-1)# vlan 33
8200A(vlan-33)# vrrp vrid 1
8200A(vlan-33-vrid-1)# owner
8200A(vlan-33-vrid-1)# virtual-ip-address 10.1.33.1 255.255.255.0
8200A(vlan-33-vrid-1)# enable
8200A(vlan-33-vrid-1)# vlan 34
8200A(vlan-34)# vrrp vrid 1
8200A(vlan-34-vrid-1)# owner
8200A(vlan-34-vrid-1)# virtual-ip-address 10.1.34.1 255.255.255.0
8200A(vlan-34-vrid-1)# enable
8200A(vlan-34-vrid-1)# vlan 35
8200A(vlan-35)# vrrp vrid 1
8200A(vlan-35-vrid-1)# owner
8200A(vlan-35-vrid-1)# virtual-ip-address 10.1.35.1 255.255.255.0
8200A(vlan-35-vrid-1)# enable
8200A(vlan-35-vrid-1)# vlan 37
8200A(vlan-37)# vrrp vrid 1
8200A(vlan-37-vrid-1)# backup
8200A(vlan-37-vrid-1)# virtual-ip-address 10.1.37.1 255.255.255.0
8200A(vlan-37-vrid-1)# enable
8200A(vlan-37-vrid-1)# vlan 38
8200A(vlan-38)# vrrp vrid 1
8200A(vlan-38-vrid-1)# backup
8200A(vlan-38-vrid-1)# virtual-ip-address 10.1.38.1 255.255.255.0
8200A(vlan-38-vrid-1)# enable
8200A(vlan-38-vrid-1)# vlan 39
8200A(vlan-39)# vrrp vrid 1
8200A(vlan-39-vrid-1)# backup
8200A(vlan-39-vrid-1)# virtual-ip-address 10.1.39.1 255.255.255.0
8200A(vlan-39-vrid-1)# enable
8200A(vlan-39-vrid-1)# vlan 43
8200A(vlan-43)# vrrp vrid 1
8200A(vlan-43-vrid-1)# owner
8200A(vlan-43-vrid-1)# virtual-ip-address 10.1.43.1 255.255.255.0
8200A(vlan-43-vrid-1)# enable
8200A(vlan-43-vrid-1)# vlan 44
8200A(vlan-44)# vrrp vrid 1
8200A(vlan-44-vrid-1)# owner
8200A(vlan-44-vrid-1)# virtual-ip-address 10.1.44.1 255.255.255.0
8200A(vlan-44-vrid-1)# enable
8200A(vlan-44-vrid-1)# vlan 45
8200A(vlan-45)# vrrp vrid 1
8200A(vlan-45-vrid-1)# owner
8200A(vlan-45-vrid-1)# virtual-ip-address 10.1.45.1 255.255.255.0
8200A(vlan-45-vrid-1)# enable
8200A(vlan-45-vrid-1)# vlan 47
8200A(vlan-47)# vrrp vrid 1
8200A(vlan-47-vrid-1)# backup
8200A(vlan-47-vrid-1)# virtual-ip-address 10.1.47.1 255.255.255.0
8200A(vlan-47-vrid-1)# enable
8200A(vlan-47-vrid-1)# vlan 48
8200A(vlan-48)# vrrp vrid 1
8200A(vlan-48-vrid-1)# backup
8200A(vlan-48-vrid-1)# virtual-ip-address 10.1.48.1 255.255.255.0
8200A(vlan-48-vrid-1)# enable
8200A(vlan-48-vrid-1)# vlan 49
8200A(vlan-49)# vrrp vrid 1
8200A(vlan-49-vrid-1)# backup
8200A(vlan-49-vrid-1)# virtual-ip-address 10.1.49.1 255.255.255.0
8200A(vlan-49-vrid-1)# enable
8200A(vlan-49-vrid-1)# exit
8200A(vlan-49)# exit
8200A(config)# write memory

Show Running Configuration

8200A(config)# show run
Running configuration:
; J9091A Configuration Editor; Created on release #K.12.30
hostname "8200A"
module 1 type J8702A
module 3 type J8702A
trunk A14,C14 Trk1 Trunk
trunk A16,C16 Trk2 Trunk
trunk A18,C18 Trk3 Trunk
trunk A20,C20 Trk4 Trunk
trunk A23,C23 Trk6 Trunk
ip routing
snmp-server community "public" Unrestricted
vlan 1
  name "DEFAULT_VLAN"
   ip address 10.1.1.1 255.255.255.0
   exit
vlan 3
  name "VLAN3"
   ip address 10.1.3.1 255.255.255.0
   tagged Trk1,Trk6
   exit
vlan 4
  name "VLAN4"
   ip address 10.1.4.1 255.255.255.0
   tagged Trk1,Trk6
   exit
vlan 5
  name "VLAN5"
   ip address 10.1.5.1 255.255.255.0
   tagged Trk1,Trk6
   exit
vlan 7
  name "VLAN7"
   ip address 10.1.7.2 255.255.255.0
   tagged Trk1,Trk6
   exit
vlan 8
  name "VLAN8"
   ip address 10.1.8.2 255.255.255.0
   tagged Trk1,Trk6
   exit
vlan 9
  name "VLAN9"
  ip address 10.1.9.2 255.255.255.0
  tagged Trk1,Trk6
  exit
vlan 23
  name "VLAN23"
  ip address 10.1.23.1 255.255.255.0
  tagged Trk2,Trk6
  exit
vlan 24
  name "VLAN24"
  ip address 10.1.24.1 255.255.255.0
  tagged Trk2,Trk6
  exit
vlan 25
  name "VLAN25"
  ip address 10.1.25.1 255.255.255.0
  tagged Trk2,Trk6
  exit
vlan 27
  name "VLAN27"
  ip address 10.1.27.2 255.255.255.0
  tagged Trk2,Trk6
  exit
vlan 28
  name "VLAN28"
  ip address 10.1.28.2 255.255.255.0
  tagged Trk2,Trk6
  exit
vlan 29
  name "VLAN29"
  ip address 10.1.29.2 255.255.255.0
  tagged Trk2,Trk6
  exit
vlan 33
  name "VLAN33"
  ip address 10.1.33.1 255.255.255.0
  tagged Trk3,Trk6
  exit
vlan 34
  name "VLAN34"
  ip address 10.1.34.1 255.255.255.0
  tagged Trk3,Trk6
  exit
vlan 35
  name "VLAN35"
  ip address 10.1.35.1 255.255.255.0
  tagged Trk3,Trk6
  exit
vlan 37
name "VLAN37"
ip address 10.1.37.2 255.255.255.0
tagged Trk3,Trk6
exit
vlan 38
name "VLAN38"
ip address 10.1.38.2 255.255.255.0
tagged Trk3,Trk6
exit
vlan 39
name "VLAN39"
ip address 10.1.39.2 255.255.255.0
tagged Trk3,Trk6
exit
vlan 43
name "VLAN43"
ip address 10.1.43.1 255.255.255.0
tagged Trk4,Trk6
exit
vlan 44
name "VLAN44"
ip address 10.1.44.1 255.255.255.0
tagged Trk4,Trk6
exit
vlan 45
name "VLAN45"
ip address 10.1.45.1 255.255.255.0
tagged Trk4,Trk6
exit
vlan 47
name "VLAN47"
ip address 10.1.47.2 255.255.255.0
tagged Trk4,Trk6
exit
vlan 48
name "VLAN48"
ip address 10.1.48.2 255.255.255.0
tagged Trk4,Trk6
exit
vlan 49
name "VLAN49"
ip address 10.1.49.2 255.255.255.0
tagged Trk4,Trk6
exit
router vrrp
spanning-tree
spanning-tree Trk1 priority 4
spanning-tree Trk2 priority 4
spanning-tree Trk3 priority 4
spanning-tree Trk4 priority 4
spanning-tree Trk6 path-cost 30000
spanning-tree Trk6 priority 4
spanning-tree config-name "mstp-vrrp"
spanning-tree config-revision 1
spanning-tree instance 1 vlan 3-5 23-25 33-35 43-45
spanning-tree instance 1 priority 0
spanning-tree instance 2 vlan 7-9 27-29 37-39 47-49
spanning-tree instance 2 priority 1
spanning-tree instance 1 Trk6 path-cost 30000
spanning-tree instance 2 Trk6 path-cost 30000
spanning-tree priority 0
vlan 1
    vrrp vrid 1
    owner
    virtual-ip-address 10.1.1.1 255.255.255.0
    priority 255
    enable
    exit
exit
exit
vlan 3
    vrrp vrid 1
    owner
    virtual-ip-address 10.1.3.1 255.255.255.0
    priority 255
    enable
    exit
exit
exit
vlan 4
    vrrp vrid 1
    owner
    virtual-ip-address 10.1.4.1 255.255.255.0
    priority 255
    enable
    exit
exit
exit
vlan 5
    vrrp vrid 1
    owner
    virtual-ip-address 10.1.5.1 255.255.255.0
    priority 255
    enable
    exit
exit
exit
vlan 7
    vrrp vrid 1
    backup
    virtual-ip-address 10.1.7.1 255.255.255.0
    enable
    exit
exit
exit
vlan 8
    vrrp vrid 1
backup
virtual-ip-address 10.1.8.1 255.255.255.0
enable
exit
exit

vlan 9
vrrp vrid 1
  backup
  virtual-ip-address 10.1.9.1 255.255.255.0
  enable
  exit
  exit

vlan 23
vrrp vrid 1
  owner
  virtual-ip-address 10.1.23.1 255.255.255.0
  priority 255
  enable
  exit
  exit

vlan 24
vrrp vrid 1
  owner
  virtual-ip-address 10.1.24.1 255.255.255.0
  priority 255
  enable
  exit
  exit

vlan 25
vrrp vrid 1
  owner
  virtual-ip-address 10.1.25.1 255.255.255.0
  priority 255
  enable
  exit
  exit

vlan 27
vrrp vrid 1
  backup
  virtual-ip-address 10.1.27.1 255.255.255.0
  enable
  exit
  exit

vlan 28
vrrp vrid 1
  backup
  virtual-ip-address 10.1.28.1 255.255.255.0
  enable
  exit
  exit

vlan 29
vrrp vrid 1
  backup
  virtual-ip-address 10.1.29.1 255.255.255.0
  enable
  exit
exit
vlan 33
vrrp vrid 1
  owner
  virtual-ip-address 10.1.33.1 255.255.255.0
  priority 255
  enable
  exit
exit
vlan 34
vrrp vrid 1
  owner
  virtual-ip-address 10.1.34.1 255.255.255.0
  priority 255
  enable
  exit
exit
vlan 35
vrrp vrid 1
  owner
  virtual-ip-address 10.1.35.1 255.255.255.0
  priority 255
  enable
  exit
exit
vlan 37
vrrp vrid 1
  backup
  virtual-ip-address 10.1.37.1 255.255.255.0
  enable
  exit
exit
vlan 38
vrrp vrid 1
  backup
  virtual-ip-address 10.1.38.1 255.255.255.0
  enable
  exit
exit
vlan 39
vrrp vrid 1
  backup
  virtual-ip-address 10.1.39.1 255.255.255.0
  enable
  exit
exit
vlan 43
  vrrp vrid 1
  owner
  virtual-ip-address 10.1.43.1 255.255.255.0
  priority 255
  enable
  exit
exit
vlan 44
  vrrp vrid 1
  owner
  virtual-ip-address 10.1.44.1 255.255.255.0
  priority 255
  enable
  exit
exit
vlan 45
  vrrp vrid 1
  owner
  virtual-ip-address 10.1.45.1 255.255.255.0
  priority 255
  enable
  exit
exit
vlan 47
  vrrp vrid 1
  backup
  virtual-ip-address 10.1.47.1 255.255.255.0
  enable
  exit
exit
vlan 48
  vrrp vrid 1
  backup
  virtual-ip-address 10.1.48.1 255.255.255.0
  enable
  exit
exit
vlan 49
  vrrp vrid 1
  backup
  virtual-ip-address 10.1.49.1 255.255.255.0
  enable
  exit
exit

Note: Vlans show up in the running config in the order in which they are configured. If any edits are made to a vlan, that VLAN will show up last in the running config. Also the spanning-tree trk1 prio 4 command shows up by default.
Show Spanning-Tree Instance IST (Trunks only)
8200A(config)# show span trk1-trk6 instance ist

IST Instance Information

Instance ID : 0
Mapped VLANs : 1

Switch Priority : 0

Topology Change Count : 204
Time Since Last Change : 21 hours

Regional Root MAC Address : 001871-b80a00
Regional Root Priority : 0
Regional Root Path Cost : 0
Regional Root Port : This switch is root
Remaining Hops : 20

Designated
Port Type Cost Priority Role State Bridge
----- --------- -------- ---------- ---------- ------------- 
Trk1 20000 64 Designated Forwarding 001871-b80a00
Trk2 200000 64 Designated Forwarding 001871-b80a00
Trk3 20000 64 Designated Forwarding 001871-b80a00
Trk4 20000 64 Designated Forwarding 001871-b80a00
Trk6 30000 64 Designated Forwarding 001871-b80a00

Show Spanning-Tree Instance 1
8200A(config)# show span trk1-trk6 instance 1

MST Instance Information

Instance ID : 1
Mapped VLANs : 3-5,23-25,33-35,43-45

Switch Priority : 0

Topology Change Count : 204
Time Since Last Change : 21 hours

Regional Root MAC Address : 001871-b80a00
Regional Root Priority : 0
Regional Root Path Cost : 0
Regional Root Port : This switch is root
Remaining Hops : 20

Designated
Port Type Cost Priority Role State Bridge
----- --------- -------- ---------- ---------- ------------- 
Trk1 20000 128 Designated Forwarding 001871-b80a00
Trk2 200000 128 Designated Forwarding 001871-b80a00
Trk3 20000 128 Designated Forwarding 001871-b80a00
Trk4 20000 128 Designated Forwarding 001871-b80a00
Trk6 30000 128 Designated Forwarding 001871-b80a00
Show Spanning-Tree Instance 2
8200A(config)# show span trk1-trk6 instance 2

MST Instance Information

Instance ID : 2  
Mapped VLANs : 7-9,27-29,37-39,47-49

Switch Priority : 4096

Topology Change Count : 288  
Time Since Last Change : 21 hours

Regional Root MAC Address : 001871-b9e400  
Regional Root Priority : 0
Regional Root Path Cost : 30000
Regional Root Port : Trk6
Remaining Hops : 19

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<tr>
<th>Port</th>
<th>Type</th>
<th>Cost</th>
<th>Priority</th>
<th>Role</th>
<th>State</th>
<th>Bridge</th>
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<td>Trk1</td>
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<td>20000</td>
<td>128</td>
<td>Designated Forwarding</td>
<td>001871-b80a00</td>
<td></td>
</tr>
<tr>
<td>Trk2</td>
<td></td>
<td>200000</td>
<td>128</td>
<td>Designated Forwarding</td>
<td>001871-b80a00</td>
<td></td>
</tr>
<tr>
<td>Trk3</td>
<td></td>
<td>20000</td>
<td>128</td>
<td>Designated Forwarding</td>
<td>001871-b80a00</td>
<td></td>
</tr>
<tr>
<td>Trk4</td>
<td></td>
<td>20000</td>
<td>128</td>
<td>Designated Forwarding</td>
<td>001871-b80a00</td>
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</tr>
<tr>
<td>Trk6</td>
<td></td>
<td>30000</td>
<td>128</td>
<td>Root</td>
<td>Forwarding</td>
<td>001871-b9e400</td>
</tr>
</tbody>
</table>

Show Spanning-Tree MST Configuration
8200A(config)# show spanning-tree mst-config

MST Configuration Identifier Information

MST Configuration Name : mstp-rrrp
MST Configuration Revision : 1
MST Configuration Digest : 0x1936FB656D900E359ED1D09A34AC0AAC

IST Mapped VLANs : 1

Instance ID Mapped VLANs

<p>| | | |</p>
<table>
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</tr>
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<tr>
<td>1</td>
<td>3-5,23-25,33-35,43-45</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7-9,27-29,37-39,47-49</td>
<td></td>
</tr>
</tbody>
</table>

8200B Configuration

Configure Switch
ProCurve Switch 8200zl# configure
ProCurve Switch 8200zl(config)# hostname 8200B
8200B(config)# trunk A14,C14 Trk1 Trunk
8200B(config)# trunk A16,C16 Trk2 Trunk
8200B(config)# trunk A18,C18 Trk3 Trunk
8200B(config)# trunk A20,C20 Trk4 Trunk
8200B(config)# trunk A23,C23 Trk6 Trunk
8200B(config)# vlan 1
8200B(vlan-1)# ip address 10.1.1.2 255.255.255.0
8200B(config)# vlan 3
8200B(vlan-3)# ip address 10.1.3.2 255.255.255.0
8200B(vlan-3)# tagged Trk1,Trk6
8200B(config)# vlan 4
8200B(vlan-4)# ip address 10.1.4.2 255.255.255.0
8200B(vlan-4)# tagged Trk1,Trk6
8200B(config)# vlan 5
8200B(vlan-5)# ip address 10.1.5.2 255.255.255.0
8200B(vlan-5)# tagged Trk1,Trk6
8200B(config)# vlan 7
8200B(vlan-7)# ip address 10.1.7.1 255.255.255.0
8200B(vlan-7)# tagged Trk1,Trk6
8200B(config)# vlan 8
8200B(vlan-8)# ip address 10.1.8.1 255.255.255.0
8200B(vlan-8)# tagged Trk1,Trk6
8200B(config)# vlan 9
8200B(vlan-9)# ip address 10.1.9.1 255.255.255.0
8200B(vlan-9)# tagged Trk1,Trk6
8200B(config)# vlan 23
8200B(vlan-23)# ip address 10.1.23.2 255.255.255.0
8200B(vlan-23)# tagged Trk2,Trk6
8200B(config)# vlan 24
8200B(vlan-24)# ip address 10.1.24.2 255.255.255.0
8200B(vlan-24)# tagged Trk2,Trk6
8200B(config)# vlan 25
8200B(vlan-25)# ip address 10.1.25.2 255.255.255.0
8200B(vlan-25)# tagged Trk2,Trk6
8200B(config)# vlan 27
8200B(vlan-27)# ip address 10.1.27.1 255.255.255.0
8200B(vlan-27)# tagged Trk2,Trk6
8200B(config)# vlan 28
8200B(vlan-28)# ip address 10.1.28.1 255.255.255.0
8200B(vlan-28)# tagged Trk2,Trk6
8200B(config)# vlan 29
8200B(vlan-29)# ip address 10.1.29.1 255.255.255.0
8200B(vlan-29)# tagged Trk2,Trk6
8200B(config)# vlan 33
8200B(vlan-33)# ip address 10.1.33.2 255.255.255.0
8200B(vlan-33)# tagged Trk3,Trk6
8200B(config)# vlan 34
8200B(vlan-34)# ip address 10.1.34.2 255.255.255.0
8200B(vlan-34)# tagged Trk3,Trk6
8200B(config)# vlan 35
8200B(vlan-35)# ip address 10.1.35.2 255.255.255.0
8200B(vlan-35)# tagged Trk3,Trk6
8200B(config)# vlan 37
8200B(vlan-37)# ip address 10.1.37.1 255.255.255.0
8200B(vlan-37)# tagged Trk3,Trk6
8200B(config)# vlan 38
8200B(vlan-38)# ip address 10.1.38.1 255.255.255.0
8200B(vlan-38)# tagged Trk3,Trk6
8200B(config)# vlan 39
8200B(vlan-39)# ip address 10.1.39.1 255.255.255.0
8200B(vlan-39)# tagged Trk3,Trk6
8200B(config)# vlan 43
8200B(vlan-43)# ip address 10.1.43.2 255.255.255.0
8200B(vlan-43)# tagged Trk4,Trk6
8200B(config)# vlan 44
8200B(vlan-44)# ip address 10.1.44.2 255.255.255.0
8200B(vlan-44)# tagged Trk4,Trk6
8200B(config)# vlan 45
8200B(vlan-45)# ip address 10.1.45.2 255.255.255.0
8200B(vlan-45)# tagged Trk4,Trk6
8200B(config)# vlan 47
8200B(vlan-47)# ip address 10.1.47.1 255.255.255.0
8200B(vlan-47)# tagged Trk4,Trk6
8200B(config)# vlan 48
8200B(vlan-48)# ip address 10.1.48.1 255.255.255.0
8200B(vlan-48)# tagged Trk4,Trk6
8200B(config)# vlan 49
8200B(vlan-49)# ip address 10.1.49.1 255.255.255.0
8200B(vlan-49)# tagged Trk4,Trk6
8200B(vlan-49)# exit
8200B(config)# spanning-tree config-name "mstp-vrrp"
8200B(config)# spanning-tree config-revision 1
8200B(config)# spanning-tree instance 1 vlan 3-5 23-25 33-35 43-45
8200B(config)# spanning-tree instance 1 priority 1
8200B(config)# spanning-tree instance 2 vlan 7-9 27-29 37-39 47-49
8200B(config)# spanning-tree instance 2 priority 0
8200B(config)# spanning-tree priority 1
8200B(config)# spanning-tree Trk6 path-cost 30000
8200B(config)# spanning-tree instance 1 Trk6 path-cost 30000
8200B(config)# spanning-tree instance 2 Trk6 path-cost 30000
8200B(config)# spanning-tree
8200B(config)# ip routing
8200B(config)# router vrrp
8200B(config)# vlan 1
8200B(vlan-1)# vrrp vrid 1
8200B(vlan-1-vrid-1)# backup
8200B(vlan-1-vrid-1)# virtual-ip-address 10.1.1.1 255.255.255.0
8200B(vlan-1-vrid-1)# enable
8200B(vlan-1-vrid-1)# vlan 3
8200B(vlan-3)# vrrp vrid 1
8200B(vlan-3-vrid-1)# backup
8200B(vlan-3-vrid-1)# virtual-ip-address 10.1.3.1 255.255.255.0
8200B(vlan-3-vrid-1)# enable
8200B(vlan-3-vrid-1)# vlan 4
8200B(vlan-4)# vrrp vrid 1
8200B(vlan-4-vrid-1)# backup
8200B(vlan-4-vrid-1)# virtual-ip-address 10.1.4.1 255.255.255.0
8200B(vlan-4-vrid-1)# enable
8200B(vlan-4-vrid-1)# vlan 5
8200B(vlan-5)# vrrp vrid 1
8200B(vlan-5-vrid-1)# backup
8200B(vlan-5-vrid-1)# virtual-ip-address 10.1.5.1 255.255.255.0
8200B(vlan-5-vrid-1)# enable
8200B(vlan-5-vrid-1)# vlan 7
8200B(vlan-7)# vrrp vrid 1
8200B(vlan-7-vrid-1)# owner
8200B(vlan-7-vrid-1)# virtual-ip-address 10.1.7.1 255.255.255.0
8200B(vlan-7-vrid-1)# enable
8200B(vlan-7-vrid-1)# vlan 8
8200B(vlan-8)# vrrp vrid 1
8200B(vlan-8-vrid-1)# owner
8200B(vlan-8-vrid-1)# virtual-ip-address 10.1.8.1 255.255.255.0
8200B(vlan-8-vrid-1)# enable
8200B(vlan-8-vrid-1)# vlan 9
8200B(vlan-9)# vrrp vrid 1
8200B(vlan-9-vrid-1)# owner
8200B(vlan-9-vrid-1)# virtual-ip-address 10.1.9.1 255.255.255.0
8200B(vlan-9-vrid-1)# enable
8200B(vlan-9-vrid-1)# vlan 23
8200B(vlan-23)# vrrp vrid 1
8200B(vlan-23-vrid-1)# backup
8200B(vlan-23-vrid-1)# virtual-ip-address 10.1.23.1 255.255.255.0
8200B(vlan-23-vrid-1)# enable
8200B(vlan-23-vrid-1)# vlan 24
8200B(vlan-24)# vrrp vrid 1
8200B(vlan-24-vrid-1)# backup
8200B(vlan-24-vrid-1)# virtual-ip-address 10.1.24.1 255.255.255.0
8200B(vlan-24-vrid-1)# enable
8200B(vlan-24-vrid-1)# vlan 25
8200B(vlan-25)# vrrp vrid 1
8200B(vlan-25-vrid-1)# backup
8200B(vlan-25-vrid-1)# virtual-ip-address 10.1.25.1 255.255.255.0
8200B(vlan-25-vrid-1)# enable
8200B(vlan-25-vrid-1)# vlan 27
8200B(vlan-27)# vrrp vrid 1
8200B(vlan-27-vrid-1)# owner
8200B(vlan-27-vrid-1)# virtual-ip-address 10.1.27.1 255.255.255.0
8200B(vlan-27-vrid-1)# enable
8200B(vlan-27-vrid-1)# vlan 28
8200B(vlan-28)# vrrp vrid 1
8200B(vlan-28-vrid-1)# owner
8200B(vlan-28-vrid-1)# virtual-ip-address 10.1.28.1 255.255.255.0
8200B(vlan-28-vrid-1)# enable
8200B(vlan-28-vrid-1)# vlan 29
8200B(vlan-29)# vrrp vrid 1
8200B(vlan-29-vrid-1)# owner
8200B(vlan-29-vrid-1)# virtual-ip-address 10.1.29.1 255.255.255.0
8200B(vlan-29-vrid-1)# enable
8200B(vlan-29-vrid-1)# vlan 33
8200B(vlan-33)# vrrp vrid 1
8200B(vlan-33-vrid-1)# backup
8200B(vlan-33-vrid-1)# virtual-ip-address 10.1.33.1 255.255.255.0
8200B(vlan-33-vrid-1)# enable
8200B(vlan-33-vrid-1)# vlan 34
8200B(vlan-34)# vrrp vrid 1
8200B(vlan-34-vrid-1)# backup
8200B(vlan-34-vrid-1)# virtual-ip-address 10.1.34.1 255.255.255.0
8200B(vlan-34-vrid-1)# enable
8200B(vlan-34-vrid-1)# vlan 35
8200B(vlan-35)# vrrp vrid 1
8200B(vlan-35-vrid-1)# backup
8200B(vlan-35-vrid-1)# virtual-ip-address 10.1.35.1 255.255.255.0
8200B(vlan-35-vrid-1)# enable
8200B(vlan-35-vrid-1)# vlan 37
8200B(vlan-37)# vrrp vrid 1
8200B(vlan-37-vrid-1)# owner
8200B(vlan-37-vrid-1)# virtual-ip-address 10.1.37.1 255.255.255.0
8200B(vlan-37-vrid-1)# enable
8200B(vlan-37-vrid-1)# vlan 38
8200B(vlan-38)# vrrp vrid 1
8200B(vlan-38-vrid-1)# owner
8200B(vlan-38-vrid-1)# virtual-ip-address 10.1.38.1 255.255.255.0
8200B(vlan-38-vrid-1)# enable
8200B(vlan-38-vrid-1)# vlan 39
8200B(vlan-39)# vrrp vrid 1
8200B(vlan-39-vrid-1)# owner
8200B(vlan-39-vrid-1)# virtual-ip-address 10.1.39.1 255.255.255.0
8200B(vlan-39-vrid-1)# enable
8200B(vlan-39-vrid-1)# vlan 43
8200B(vlan-43)# vrrp vrid 1
8200B(vlan-43-vrid-1)# backup
8200B(vlan-43-vrid-1)# virtual-ip-address 10.1.43.1 255.255.255.0
8200B(vlan-43-vrid-1)# enable
8200B(vlan-43-vrid-1)# vlan 44
8200B(vlan-44)# vrrp vrid 1
8200B(vlan-44-vrid-1)# backup
8200B(vlan-44-vrid-1)# virtual-ip-address 10.1.44.1 255.255.255.0
8200B(vlan-44-vrid-1)# enable
8200B(vlan-44-vrid-1)# vlan 45
8200B(vlan-45)# vrrp vrid 1
8200B(vlan-45-vrid-1)# backup
8200B(vlan-45-vrid-1)# virtual-ip-address 10.1.45.1 255.255.255.0
8200B(vlan-45-vrid-1)# enable
8200B(vlan-45-vrid-1)# vlan 47
8200B(vlan-47)# vrrp vrid 1
8200B(vlan-47-vrid-1)# owner
8200B(vlan-47-vrid-1)# virtual-ip-address 10.1.47.1 255.255.255.0
8200B(vlan-47-vrid-1)# enable
Show Running Configuration

8200B(config)# show run
Running configuration:
; J9091A Configuration Editor; Created on release #K.12.30
hostname "8200B"
module 1 type J8702A
module 3 type J8702A
trunk A14,C14 Trk1 Trunk
trunk A16,C16 Trk2 Trunk
trunk A18,C18 Trk3 Trunk
trunk A20,C20 Trk4 Trunk
trunk A23,C23 Trk6 Trunk
ip routing
snmp-server community "public" Unrestricted
vlan 1
  name "DEFAULT_VLAN"
  ip address 10.1.1.2 255.255.255.0
  exit
vlan 3
  name "VLAN3"
  ip address 10.1.3.2 255.255.255.0
  tagged Trk1,Trk6
  exit
vlan 4
  name "VLAN4"
  ip address 10.1.4.2 255.255.255.0
  tagged Trk1,Trk6
  exit
vlan 5
  name "VLAN5"
  ip address 10.1.5.2 255.255.255.0
  tagged Trk1,Trk6
  exit
vlan 7
  name "VLAN7"
ip address 10.1.7.1 255.255.255.0
tagged Trk1,Trk6
exit
vlan 8
  name "VLAN8"
ip address 10.1.8.1 255.255.255.0
tagged Trk1,Trk6
exit
vlan 9
  name "VLAN9"
ip address 10.1.9.1 255.255.255.0
tagged Trk1,Trk6
exit
vlan 23
  name "VLAN23"
ip address 10.1.23.2 255.255.255.0
tagged Trk2,Trk6
exit
vlan 24
  name "VLAN24"
ip address 10.1.24.2 255.255.255.0
tagged Trk2,Trk6
exit
vlan 25
  name "VLAN25"
ip address 10.1.25.2 255.255.255.0
tagged Trk2,Trk6
exit
vlan 27
  name "VLAN27"
ip address 10.1.27.1 255.255.255.0
tagged Trk2,Trk6
exit
vlan 28
  name "VLAN28"
ip address 10.1.28.1 255.255.255.0
tagged Trk2,Trk6
exit
vlan 29
  name "VLAN29"
ip address 10.1.29.1 255.255.255.0
tagged Trk2,Trk6
exit
vlan 33
  name "VLAN33"
ip address 10.1.33.2 255.255.255.0
tagged Trk3,Trk6
exit
vlan 34
  name "VLAN34"
ip address 10.1.34.2 255.255.255.0
tagged Trk3,Trk6
exit
vlan 35
  name "VLAN35"
  ip address 10.1.35.2 255.255.255.0
  tagged Trk3,Trk6
  exit
vlan 37
  name "VLAN37"
  ip address 10.1.37.1 255.255.255.0
  tagged Trk3,Trk6
  exit
vlan 38
  name "VLAN38"
  ip address 10.1.38.1 255.255.255.0
  tagged Trk3,Trk6
  exit
vlan 39
  name "VLAN39"
  ip address 10.1.39.1 255.255.255.0
  tagged Trk3,Trk6
  exit
vlan 43
  name "VLAN43"
  ip address 10.1.43.2 255.255.255.0
  tagged Trk4,Trk6
  exit
vlan 44
  name "VLAN44"
  ip address 10.1.44.2 255.255.255.0
  tagged Trk4,Trk6
  exit
vlan 45
  name "VLAN45"
  ip address 10.1.45.2 255.255.255.0
  tagged Trk4,Trk6
  exit
vlan 47
  name "VLAN47"
  ip address 10.1.47.1 255.255.255.0
  tagged Trk4,Trk6
  exit
vlan 48
  name "VLAN48"
  ip address 10.1.48.1 255.255.255.0
  tagged Trk4,Trk6
  exit
vlan 49
  name "VLAN49"
  ip address 10.1.49.1 255.255.255.0
  tagged Trk4,Trk6
exit
router vrrp
spanning-tree
spanning-tree Trk1 priority 4
spanning-tree Trk2 priority 4
spanning-tree Trk3 priority 4
spanning-tree Trk4 priority 4
spanning-tree Trk6 path-cost 30000
spanning-tree Trk6 priority 4
spanning-tree config-name "mstp-vrrp"
spanning-tree config-revision 1
spanning-tree instance 1 vlan 3-5 23-25 33-35 43-45
spanning-tree instance 1 priority 1
spanning-tree instance 1 Trk6 path-cost 30000
spanning-tree instance 2 vlan 7-9 27-29 37-39 47-49
spanning-tree instance 2 priority 0
spanning-tree instance 2 Trk6 path-cost 30000
spanning-tree priority 1
vlan 1
  vrrp vrid 1
    backup
    virtual-ip-address 10.1.1.1 255.255.255.0
    enable
    exit
  exit
vlan 3
  vrrp vrid 1
    backup
    virtual-ip-address 10.1.3.1 255.255.255.0
    enable
    exit
  exit
vlan 4
  vrrp vrid 1
    backup
    virtual-ip-address 10.1.4.1 255.255.255.0
    enable
    exit
  exit
vlan 5
  vrrp vrid 1
    backup
    virtual-ip-address 10.1.5.1 255.255.255.0
    enable
    exit
  exit
vlan 7
  vrrp vrid 1
    owner
    virtual-ip-address 10.1.7.1 255.255.255.0
    priority 255
enable
exit
exit

vlan 8
vrpp vrid 1
  owner
  virtual-ip-address 10.1.8.1 255.255.255.0
  priority 255
  enable
  exit
exit

vlan 9
vrpp vrid 1
  owner
  virtual-ip-address 10.1.9.1 255.255.255.0
  priority 255
  enable
  exit
exit

vlan 23
vrpp vrid 1
  backup
  virtual-ip-address 10.1.23.1 255.255.255.0
  enable
  exit
exit

vlan 24
vrpp vrid 1
  backup
  virtual-ip-address 10.1.24.1 255.255.255.0
  enable
  exit
exit

vlan 25
vrpp vrid 1
  backup
  virtual-ip-address 10.1.25.1 255.255.255.0
  enable
  exit
exit

vlan 27
vrpp vrid 1
  owner
  virtual-ip-address 10.1.27.1 255.255.255.0
  priority 255
  enable
  exit
exit

vlan 28
vrpp vrid 1
  owner
virtual-ip-address 10.1.28.1 255.255.255.0
priority 255
enable
exit
exit
vlan 29
vrrp vrid 1
  owner
  virtual-ip-address 10.1.29.1 255.255.255.0
  priority 255
  enable
  exit
  exit
vlan 33
vrrp vrid 1
  backup
  virtual-ip-address 10.1.33.1 255.255.255.0
  enable
  exit
  exit
vlan 34
vrrp vrid 1
  backup
  virtual-ip-address 10.1.34.1 255.255.255.0
  enable
  exit
  exit
vlan 35
vrrp vrid 1
  backup
  virtual-ip-address 10.1.35.1 255.255.255.0
  enable
  exit
  exit
vlan 37
vrrp vrid 1
  owner
  virtual-ip-address 10.1.37.1 255.255.255.0
  priority 255
  enable
  exit
  exit
vlan 38
vrrp vrid 1
  owner
  virtual-ip-address 10.1.38.1 255.255.255.0
  priority 255
  enable
  exit
  exit
vlan 39
vrrp vrid 1
  owner
  virtual-ip-address 10.1.39.1 255.255.255.0
  priority 255
  enable
  exit
exit

vlan 43
  vrrp vrid 1
    backup
    virtual-ip-address 10.1.43.1 255.255.255.0
    enable
    exit
exit

vlan 44
  vrrp vrid 1
    backup
    virtual-ip-address 10.1.44.1 255.255.255.0
    enable
    exit
exit

vlan 45
  vrrp vrid 1
    backup
    virtual-ip-address 10.1.45.1 255.255.255.0
    enable
    exit
exit

vlan 47
  vrrp vrid 1
    owner
    virtual-ip-address 10.1.47.1 255.255.255.0
    priority 255
    enable
    exit
exit

vlan 48
  vrrp vrid 1
    owner
    virtual-ip-address 10.1.48.1 255.255.255.0
    priority 255
    enable
    exit
exit

vlan 49
  vrrp vrid 1
    owner
    virtual-ip-address 10.1.49.1 255.255.255.0
    priority 255
    enable
    exit
Show Spanning-Tree Instance IST

8200B(config)# show span trk1-trk6 instance ist

IST Instance Information

Instance ID : 0
Mapped VLANs : 1

Switch Priority : 4096

Topology Change Count : 144
Time Since Last Change : 41 secs

Regional Root MAC Address : 001871-b80a00
Regional Root Priority : 0
Regional Root Path Cost : 30000
Regional Root Port : Trk6
Remaining Hops : 19

Designated
Port  Type      Cost      Priority Role       State      Bridge
----- --------- --------- -------- ---------- ---------- -------------
Trk1            20000     64       Designated Forwarding 001871-b9e400
Trk2            200000    64       Designated Forwarding 001871-b9e400
Trk3            20000     64       Designated Forwarding 001871-b9e400
Trk4            20000     64       Designated Forwarding 001871-b9e400
Trk6            30000     64       Root       Forwarding 001871-b80a00

Show Spanning-Tree Instance 1

8200B(config)# show span trk1-trk6 instance 1

MST Instance Information

Instance ID : 1
Mapped VLANs : 3-5,23-25,33-35,43-45

Switch Priority : 4096

Topology Change Count : 141
Time Since Last Change : 87 secs

Regional Root MAC Address : 001871-b80a00
Regional Root Priority : 0
Regional Root Path Cost : 30000
Regional Root Port : Trk6
Remaining Hops : 19

Designated
Port  Type      Cost      Priority Role       State      Bridge
----- --------- --------- -------- ---------- ---------- -------------
Trk1            20000     128      Designated Forwarding 001871-b9e400
Trk2            200000    128      Designated Forwarding 001871-b9e400
Trk3            20000     128      Designated Forwarding 001871-b9e400
Trk4            20000     128      Designated Forwarding 001871-b9e400
Show Spanning-Tree Instance 2
8200B(config)# show span trk1-trk6 instance 2

MST Instance Information

Instance ID : 2
Mapped VLANs : 7-9,27-29,37-39,47-49

Switch Priority : 0

Topology Change Count : 240
Time Since Last Change : 110 secs

Regional Root MAC Address : 001871-b9e400
Regional Root Priority : 0
Regional Root Path Cost : 0
Regional Root Port : This switch is root
Remaining Hops : 20

Designated
Port Type Cost Priority Role State Bridge
----- --------- --------- -------- ---------- ---------- -------------
Trk1 20000 128 Designated Forwarding 001871-b9e400
Trk2 200000 128 Designated Forwarding 001871-b9e400
Trk3 20000 128 Designated Forwarding 001871-b9e400
Trk4 20000 128 Designated Forwarding 001871-b9e400
Trk6 30000 128 Designated Forwarding 001871-b9e400

Show Spanning-Tree MST Configuration
8200B(config)# show span mst

MST Configuration Identifier Information

MST Configuration Name : mstp-vrrp
MST Configuration Revision : 1
MST Configuration Digest : 0x1936FB656D900E359ED1D09A34AC0AAC

IST Mapped VLANs : 1,

Instance ID Mapped VLANs

1  3-5,23-25,33-35,43-45
2  7-9,27-29,37-39,47-49
Test and Verification

Below are the test and verification methods used to verify convergence results. Refer to Figure 4 network layout for test and verification. Three tests were performed:

1. Break active link while downloading a file using FTP protocol.
2. Break active link during continuous ping of gateway; record convergence time.
3. Simulate Core box failure (8200); time how fast VRRP and spanning tree converge.

FTP Download Test

This test verifies when an active link fails during an FTP download, the network converges quickly enough that the FTP transfer succeeds. Below outlines the test procedure followed.

1. Setup FTP server on 8200A on port A1, on VLAN 1 with IP address 10.1.1.100.
2. Configure a port on one of the switches in IDF 1 for a VLAN (VLAN 3) on Instance 1.
3. Connect client to port with IP address 10.1.3.100 and gateway 10.1.3.1.
4. Start an FTP download on a large file (e.g. 800 Megabytes).
5. Break active link for Instance 1 immediately after initiating FTP transfer (Looks like a link failure). For VLAN 3 on switch IDF1EAST the LAG between IDF1WEST and the 8200A was broken.
6. Log the time from when the transfer rate starts to decrease until transfer rate starts to increase.
7. Repeat on VLAN for Instance 2.
8. For Instance 2 VLAN 7 was used. The client was configured with IP 10.1.7.100 and gateway 10.1.7.1. Break active link between IDF1EAST and 8200B.

Results
The active LAG was disconnected. The transfer rate began to decrease quickly. After approximately 4 seconds the transfer rate started to increase again and the FTP transfer was successful for both instances.

Gateway Ping Test

This test verifies that when an active link fails the redundant link becomes active. Capture how much time it takes to converge. Below outlines the test procedure followed.

1. Configure a port on one of the switches in IDF for a VLAN in Instance 1.
2. Start a continuous ping to the default gateway. For VLAN 3 the command used was Ping 10.1.3.1 –t.
3. Break active link for Instance 1. For VLAN 3 on switch IDF1EAST the LAG between IDF1WEST and the 8200A was broken.
4. Time how many pings fail until successful again.
5. Repeat on VLAN for Instance 2.

Results
It took approximately 3 seconds for the convergence to complete for both Instances. One ping was lost. Below is a screen capture of the test.

C:\Documents and Settings\Owner>ping 10.1.3.1 -t

Pinging 10.1.3.1 with 32 bytes of data:

Reply from 10.1.3.1: bytes=32 time=2ms TTL=255
Reply from 10.1.3.1: bytes=32 time=6ms TTL=255
Request timed out.
Reply from 10.1.3.1: bytes=32 time=988ms TTL=255
Reply from 10.1.3.1: bytes=32 time=10ms TTL=255
Reply from 10.1.3.1: bytes=32 time=10ms TTL=255
Reply from 10.1.3.1: bytes=32 time=10ms TTL=255

Ping statistics for 10.1.3.1:
  Packets: Sent = 17, Received = 16, Lost = 1 (5% loss),
Approximate round trip times in milli-seconds:
  Minimum = 0ms, Maximum = 988ms, Average = 68ms
Control-C
^C
Simulate 8200 (Core) failure Test

This test simulates an 8200 chassis failure and validates network convergence recovery time.

2. Configure a port on one of the switches in IDF 1 for a VLAN (VLAN 3) on Instance 1.
3. Connect client to port with IP address 10.1.3.100 and gateway 10.1.3.1.
4. Start an FTP download on a large file (e.g. 800 Megabytes)
5. Shut down 8200A.
6. Log how much time between when the FTP transfer rate starts to decrease until transfer rate starts to increase.
7. Repeat on VLAN for Instance 2.
8. Be sure to move FTP server to 8200A.
9. For Instance 2 VLAN 7 was used. The client was configured with IP 10.1.7.100 and gateway 10.1.7.1. Shut down 8200B.

Results

The transfer rate began to decrease quickly once 8200A lost power. After approximately 3 seconds the transfer rate started to increase again and the FTP transfer was successful for both core failure tests.

Conclusion

MSTP and VRRP provide an excellent, highly available network solution with layer 2 and layer 3 redundancies combined with the ability to load balance network traffic, optimizing network performance. When configuring MSTP and VRRP be sure to follow the configuration checklist in the introduction of this paper. Careful attention is required to configure MSTP and VRRP correctly from scratch, but the benefits are certainly worth the effort. Fast convergence times are achieved if a link or switch failure occurs, ensuring maximum network uptime.

Appendix

802.1s MSTP on ProCurve Switches

The 802.1D STP and 802.1w RSTP spanning tree protocols operate without regard to a network’s VLAN configuration, and maintain one common spanning tree throughout a bridged network. Thus, these protocols map one loop-free, logical topology on a given physical topology. 802.1s MSTP uses VLANs to create multiple spanning trees in a network, which significantly improves network resource utilization while maintaining a loop-free environment.

While the per-VLAN spanning tree approach adopted by some vendors overcomes the network utilization problems inherent in using STP or RSTP, using a per-VLAN technology with multiple VLANs can overload the switch’s CPU. MSTP on the ProCurve 8200zl switch complies with the IEEE 802.1s standard, and extends STP and RSTP functionality to map multiple independent spanning tree instances onto a physical topology. With MSTP, each spanning tree instance can include one or more VLANs and applies a separate, per-instance forwarding topology. Thus, where a port belongs to multiple VLANs, it may be dynamically blocking in one spanning tree instance, but forwarding in another instance. This achieves load-balancing across the network while keeping the switch’s CPU load at a moderate level (by aggregating multiple VLANs in a single spanning tree instance).

MSTP provides fault tolerance through rapid, automatic reconfiguration if there is a failure in a network’s physical topology. With MSTP-capable switches, you can create a number of MST regions containing multiple spanning tree instances. This requires the configuration of a number of MSTP-capable switches. However, it is
NOT necessary to do this. You can just enable MSTP on an MSTP-capable switch and a spanning tree instance is created automatically. This instance always exists by default when spanning tree is enabled, and is the spanning tree instance that communicates with STP and RSTP environments.

802.1s MSTP on Cisco Switches
You must run the latest versions of IOS to support MSTP on Cisco switches (check the Cisco web site for details). Be advised, however, that it is not an easy task tracking down the appropriate IOS version for MSTP on individual switch models. The correct version of IOS for the Cisco 3750 switch configurations used in this example was (IOS 12.2(25) SEC2).

What Spanning-Tree mode should you choose between Cisco and ProCurve Switches?

MSTP is obviously the ideal choice because it is standards based and supported by both vendors, it converges quickly and allows load balancing of traffic on uplinks with appropriate configuration.

Terminology

Common and Internal Spanning Tree (CIST): Comprises all LANs, STP, and RSTP bridges and MSTP regions in a network. The CIST automatically determines the MST regions in a network and defines the root bridge (switch) and designated port for each region. The CIST includes the Common Spanning Tree (CST), the Internal Spanning Tree (IST) within each region, and any multiple spanning-tree instances (MSTIs) in a region.

Common Spanning Tree (CST): Administers the connectivity among the MST regions, STP LANs, and RSTP LANs in a bridged network. CST refers to the single forwarding path the switch calculates for STP (802.1D) and RSTP (802.1w) topologies, and for inter-regional paths in MSTP (802.1s) topologies. Note that all three versions of spanning tree can interoperate in the same network. Also, the MSTP switch interprets a device running 802.1D STP or 802.1w RSTP as a separate region.

Internal Spanning Tree (IST): When you configure a switch for MSTP operation, the switch automatically includes all of the static VLANs configured on the switch in a single, active spanning tree topology (instance) within the IST. This is termed the “IST instance”. Any VLANs you subsequently configure on the switch are added to this IST instance. To create separate forwarding paths within a region, group specific VLANs into different Multiple Spanning Tree Instances (MSTIs).

Multiple Spanning Tree Instances: A multiple spanning tree network comprises separate spanning-tree instances existing in an MST region. (There can be multiple regions in a network.) Each instance defines a single forwarding topology for an exclusive set of VLANs. By contrast, an STP or RSTP network has only one spanning tree instance for the entire network, and includes all VLANs in the network. (An STP or RSTP network operates as a single-instance network.) A region can include two types of STP instances:

1. **Internal Spanning-Tree Instance (IST Instance):** This is the default spanning tree instance in any MST region. It provides the root switch for the region and comprises all VLANs configured on the switches in the region that are not specifically assigned to Multiple Spanning Tree Instances (MSTIs, described below). All VLANs in the IST instance of a region are part of the same, single spanning tree topology, which allows only one forwarding path between any two nodes belonging to any of the VLANs included in the IST instance. All switches in the region must belong to the set of VLANs that comprise the IST instance.

2. **MSTI (Multiple Spanning Tree Instance):** This type of configurable spanning tree instance comprises all static VLANs you specifically assign to it, and must include at least one VLAN. The VLAN(s) you assign to an MSTI must initially exist in the IST instance of the same MST region. When you assign a static VLAN to an MSTI, the switch removes the VLAN from the IST instance. (Thus, you can assign a VLAN to only one MSTI in a given region.) All VLANs in an MSTI operate as part of the same single spanning tree topology. (The switch does not allow dynamic VLANs in an MSTI.)

MSTP (Multiple Spanning Tree Protocol): A network supporting MSTP allows multiple spanning tree instances within configured regions, and a single spanning tree among regions, STP bridges, and RSTP bridges.
**MSTP BPDU (MSTP Bridge Protocol Data Unit):** These BPDUs carry region-specific information, such as the region identifier (region name and revision number). If a switch receives an MSTP BPDU with a region identifier that differs from its own, then the port on which that BPDU was received is on the boundary of the region in which the switch resides.

**MSTP Bridge:** In this paper, an MSTP bridge is an 8200zl switch (or another 802.1s-compatible device) configured for MSTP operation.

**MST Region:** An MST region comprises the VLANs configured on physically connected MSTP switches. All switches in a given region must be configured with the same VLANs and Multiple Spanning Tree Instances (MSTIs). The MST region forms a multiple spanning tree domain and is a component of a single spanning-tree domain within a network. For switches internal to the MST Region:
1. All switches have identical MST configuration identifiers (region name and revision number).
2. All switches have identical VLAN assignments to the region’s IST and (optional) MST instances.
3. One switch functions as the designated bridge (IST root) for the region.
4. No switch has a point-to-point connection to a bridging device that cannot process RSTP BPDUs.

**Caution -** When you enable MSTP on the switch, the default MSTP spanning tree configuration settings comply with the values recommended in the IEEE 802.1s MSTP standard. Note that inappropriate changes to these settings can result in severely degraded network performance. For this reason, ProCurve strongly recommends that changing these default settings be reserved only for experienced network administrators who have a strong understanding of the IEEE 802.1D/w/s 2004 standards and operation.

**Operating Rules**

- All switches in a region must be configured with the same set of VLANs, as well as the same MST configuration name and MST configuration number.
- Within a region, a VLAN can be allocated to either a single MSTI or to the region’s IST instance.
- All switches in a region must have the same VID-to-MST instance and VID-to-IST instance assignments.
- There is one root MST switch per configured MST instance.
- Within any region, the root switch for the IST instance is also the root switch for the region. Because boundary ports provide the VLAN connectivity between regions, all boundary ports on a region’s root switch should be configured as members of all static VLANs defined in the region.
- There is one root switch for the Common and Internal Spanning Tree (CIST). Note that the per-port hello-time parameter assignments on the CIST root switch propagate to the ports on downstream switches in the network and override the hello-time configured on the downstream switch ports.
- Where multiple MST regions exist in a network, there is only one active, physical communication path between any two regions, or between an MST region and an STP or RSTP switch. MSTP blocks any other physical paths as long as the currently active path remains in service.
- Within a network, an MST region appears as a virtual RSTP bridge to other spanning tree entities (other MST regions, and any switches running 802.1D or 802.1w spanning-tree protocols).
- Within an MSTI, there is one spanning tree (one physical, communication path) between any two nodes. That is, within an MSTI, there is one instance of spanning tree, regardless of how many VLANs belong to the MSTI. Within an IST instance, there is also one spanning tree across all VLANs belonging to the IST instance.
- An MSTI comprises a unique set of VLANs and forms a single spanning tree instance within the region to which it belongs.
- Communication between MST regions uses a single spanning tree.
- If a port on a switch configured for MSTP receives a legacy (STP/802.1D or RSTP/802.1w) BPDU, it automatically operates as a legacy port. In this case, the MSTP switch interoperates with the connected STP or RSTP switch as a separate MST region.
- Within an MST region, there is one logical forwarding topology per instance, and each instance comprises a unique set of VLANs. Where multiple paths exist between a pair of nodes using VLANs belonging to the same instance, all but one of those paths will be blocked for that instance. However, if there are different paths in different instances, all such paths are available for traffic. Separate forwarding paths exist through separate spanning tree instances.
- A port can have different states (forwarding or blocking) for different instances (which represent different forwarding paths).

**Tips for Planning an MSTP Application**
• Ensure that the VLAN configuration in your network supports all of the forwarding paths necessary for the desired connectivity. All ports connecting one switch to another within a region and one switch to another between regions should be configured as members of all VLANs configured in the region.
• Plan individual regions based on VLAN groupings. That is, plan on all MSTP switches in a given region supporting the same set of VLANs. Within each region, determine the VLAN membership for each spanning-tree instance. (Each instance represents a single forwarding path for all VLANs in that instance.)
• There is one logical spanning-tree path through the following:
  o Any inter-regional links
  o Any IST or MST instance within a region
  o Any legacy (802.1D or 802.1w) switch or group of switches. (Where multiple paths exist between an MST region and a legacy switch, expect the CST to block all but one such path.)
• Determine the root bridge and root port for each instance.
• Determine the designated bridge and designated port for each LAN segment.
• Determine which VLANs to assign to each instance, and use port trunks with 802.1Q VLAN tagging where separate links for separate VLANs would result in a blocked link preventing communication between nodes on the same VLAN. (Refer to “MSTP Operation with 802.1Q VLANs” on page 9-10.)
• Identify the edge ports connected to end nodes and enable the edge-port setting for these ports. Leave the edge-port setting disabled for ports connected to another switch, a bridge, or a hub.