25-2 Spanning Tree Configuration - Answer Key

You discovered that switch Acc3 is the Root Bridge in the previous Spanning Tree Troubleshooting lab and traffic is not taking the most direct path across the network. You will correct the configuration in this lab.

Spanning Tree Version

1) Verify which version of Spanning Tree is currently in use.

All switches are using the default PVST+ Spanning Tree version.

On all switches:

```
CD1#show spanning-tree summary
Switch is in pvst mode
Root bridge for:
Extended system ID is enabled
Portfast Default is disabled
PortFast BPDU Guard Default is disabled
Portfast BPDU Filter Default is disabled
Loopguard Default is disabled
EtherChannel misconfig guard is disabled
UplinkFast is disabled
BackboneFast is disabled
Configured Pathcost method used is short
```

Name	Blocking	Listening	Learning	Forwarding	STP Active
VLAN0001	1	0	0	2	3
VLAN0010	1	0	0	3	4
VLAN0020	1	0	0	2	3
VLAN0199	1	0	0	2	3
4 vlans	4	0	0	9	13

2) Configure the campus to use RPVST+ to reduce convergence time in the case of switch or link failure.

The default PVST+ Spanning Tree version can take up to 50 seconds to converge. RPVST+ typically converges within a few seconds.

On all switches:

```
CD1(config)#spanning-tree mode rapid-pvst
```

Verify the Spanning Tree version has changed on every switch:

```
CD1#show spanning-tree summary
Switch is in rapid-pvst mode
Root bridge for:
Extended system ID is enabled
Portfast Default is disabled
PortFast BPDU Guard Default is disabled
Portfast BPDU Filter Default is disabled
Loopguard Default is disabled
EtherChannel misconfig guard is disabled
UplinkFast is disabled
BackboneFast is disabled
Configured Pathcost method used is short
```

Name	Blocking	Listening	Learning	Forwarding	STP Active
VLAN0001	2	0	0	2	4
VLAN0010	1	0	0	3	4
VLAN0020	2	0	0	2	4
VLAN0199	2	0	0	2	4
4 vlans	7	0	0	9	16

(Note there is a bug in Packet Tracer where it may incorrectly report the number of Blocking ports.)

Spanning Tree Root Bridge Configuration

3) Configure the network so that traffic between the PCs and the Internet travels along the shortest available path. If a core/distribution switch fails traffic should failover to the next shortest available path. Do not change any Layer 3 configuration such as HSRP settings.

We need to configure the Spanning Tree so it aligns with the HSRP configuration. R1 is the HSRP active gateway. R1 is directly connected to the core/distribution switch CD1 (but not CD2) so we should make this the Spanning Tree Root Bridge.

You can use either the 'spanning-tree vlan 10 root primary' or 'spanning-tree vlan 10 priority *value*' commands.

```
CD1(config)#spanning-tree vlan 10 root primary
```

If CD1 fails we need to ensure that the Spanning Tree Root Bridge will failover to CD2 rather than an access layer switch.

```
CD2(config)#spanning-tree vlan 10 root secondary
```

Verify CD1 has the best Bridge Priority and becomes the Root Bridge.

```
CD1#show spanning-tree vlan 10
VLAN0010
  Spanning tree enabled protocol rstp
  Root ID    Priority    24586
             Address     0090.0CA0.3902
             This bridge is the root
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    24586  (priority 24576 sys-id-ext 10)
             Address     0090.0CA0.3902
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  20

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- ----------------------
Fa0/21           Desg FWD 19        128.21   P2p
Fa0/24           Desg FWD 19        128.24   P2p
Gi0/1            Desg FWD 4         128.25   P2p
Gi0/2            Desg FWD 4         128.26   P2p
```

Check the other switches to verify CD2 has the next best Bridge Priority.

```
CD2#show spanning-tree vlan 10
VLAN0010
  Spanning tree enabled protocol rstp
  Root ID    Priority    24586
             Address     0090.0CA0.3902
             Cost        4
             Port        26(GigabitEthernet0/2)
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    28682  (priority 28672 sys-id-ext 10)
             Address     0090.0C16.7A9B
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  20

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- ----------------------
Fa0/21           Desg FWD 19        128.21   P2p
Fa0/24           Altn BLK 19        128.24   P2p
Gi0/2            Root FWD 4         128.26   P2p
Gi0/1            Desg FWD 4         128.25   P2p


Acc3#show spanning-tree vlan 10
VLAN0010
  Spanning tree enabled protocol rstp
  Root ID    Priority    24586
             Address     0090.0CA0.3902
             Cost        19
             Port        24(FastEthernet0/24)
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32778  (priority 32768 sys-id-ext 10)
             Address     0001.C962.D43D
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  20

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- ----------------------
Fa0/24           Root FWD 19        128.24   P2p
Fa0/21           Altn BLK 19        128.21   P2p
Fa0/1            Desg FWD 19        128.1    P2p
```

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```
Acc4#show spanning-tree vlan 10
VLAN0010
  Spanning tree enabled protocol rstp
  Root ID    Priority    24586
             Address     0090.0CA0.3902
             Cost        19
             Port        21(FastEthernet0/21)
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32778  (priority 32768 sys-id-ext 10)
             Address     0060.708A.D564
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  20

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- -----------------------
Fa0/1            Desg FWD 19        128.1    P2p
Fa0/21           Root FWD 19        128.21   P2p
Fa0/24           Desg FWD 19        128.24   P2p
```

Verify the end to end traffic path between the PCs and the Internet by using the 'show spanning-tree vlan 10' and 'show mac address-table' commands as shown in the last lab exercise.

Port Configuration for End Hosts

4) A Layer 2 loop cannot be formed on a port where a single end host is connected. Ensure these ports transition to a forwarding state immediately when they become active.

You are concerned that a user may introduce a loop into the network by adding additional switches or changing the cabling. Also ensure these ports will be automatically shut down if a switch is detected on the other side of the link.

Enable PortFast and BPDU Guard on the ports connected to PCs and routers.

```
Acc3(config)#interface f0/1
Acc3(config-if)#spanning-tree portfast
Acc3(config-if)#spanning-tree bpduguard enable

Acc4(config)#interface f0/1
Acc4(config-if)#spanning-tree portfast
Acc4(config-if)#spanning-tree bpduguard enable
```

```
CD1(config)#interface g0/1
CD1(config-if)#spanning-tree portfast
CD1(config-if)#spanning-tree bpduguard enable

CD2(config)#interface g0/1
CD2(config-if)#spanning-tree portfast
CD2(config-if)#spanning-tree bpduguard enable
```

Root Bridge Protection

5) Ensure the switches will not allow an unintended switch to become the Root Bridge for the campus.

On the Root Bridge CD1 and backup Root Bridge CD2, configure Root Guard on the interfaces facing other switches to ensure those ports will transition to 'root-inconsistent' if they receive superior BPDU's.

```
CD1(config)#interface f0/21
CD1(config-if)#spanning-tree guard root
CD1(config)#interface f0/24
CD1(config-if)#spanning-tree guard root

CD2(config)#interface f0/21
CD2(config-if)#spanning-tree guard root
CD2(config)#interface f0/24
CD2(config-if)#spanning-tree guard root
```