**Lab 4.2Title: Observe STP and RSTP Port States in a Redundant Topology**

**🧠 Objective:**

* Understand how STP and RSTP manage Layer 2 loops.
* Observe port roles and states (Root, Designated, Blocked, etc.).
* Verify convergence when links fail or recover.

**🖥️ Topology:**

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[SW1]

/ \

/ \

[SW2]--------[SW3]

* Three switches connected in a triangle.
* VLAN 1 is used for simplicity.
* PCs connected to each switch for testing connectivity.

**🔧 Initial Configuration:**

**On All Switches:**

bash

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conf t

spanning-tree mode pvst # Use 'rapid-pvst' for RSTP

exit

**On SW1:**

bash

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hostname SW1

int range fa0/1 - 2

switchport mode access

no shutdown

**On SW2 and SW3: (similarly configure ports and hostnames)**

**🛠️ Scenario 1 – Observe STP Port States (Default PVST):**

**Steps:**

1. Connect the topology with all links forming a triangle.
2. Let switches elect the root bridge automatically (lowest Bridge ID).
3. Use the command:

bash

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show spanning-tree

on all switches to observe:

* + Root Bridge
  + Port Roles: Root Port, Designated Port, Blocked Port

1. Check interface states:

bash

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show spanning-tree interface fa0/x

**Expected Output:**

* One switch becomes **Root Bridge**.
* One link is in **Blocking** state to prevent a loop.
* You’ll see port roles: **Root Port**, **Designated Port**, **Blocked Port**.

**🛠️ Scenario 2 – Change Root Bridge Manually:**

bash

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SW1(config)# spanning-tree vlan 1 priority 4096

* This will force SW1 to become the root.
* Observe port role changes again on all switches.
* Use show spanning-tree to confirm.

**🛠️ Scenario 3 – Simulate Link Failure:**

* Shut down the active root port on one non-root switch:

bash

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interface fa0/x

shutdown

* Observe how STP reconverges.
* Previously blocked port should now transition to forwarding (may take ~30-50 seconds in STP).

**🛠️ Scenario 4 – Enable RSTP for Faster Convergence:**

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spanning-tree mode rapid-pvst

* Repeat the same tests and observe much faster convergence (1-2 seconds).
* Port roles: **Alternate**, **Discarding**, **Forwarding**, **Designated**.
* Use:

bash

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show spanning-tree detail

**✅ Verification Commands:**

* show spanning-tree
* show spanning-tree vlan 1
* show spanning-tree interface fa0/x
* ping between PCs connected to each switch

**📌 Conclusion:**

You will observe how STP prevents loops by placing redundant links in a blocked state and how RSTP quickly recovers from failures, making it ideal for modern networks.

Out put

**Switch0#sh spanning-tree**

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 32769

Address 000A.4194.AE9D

This bridge is the root

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)

Address 000A.4194.AE9D

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Aging Time 20

Interface Role Sts Cost Prio.Nbr Type

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Fa0/2 Desg FWD 19 128.2 P2p

Fa0/1 Desg FWD 19 128.1 P2p

Switch#sh sp

Switch#sh spanning-tree int f0/1

Vlan Role Sts Cost Prio.Nbr Type

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VLAN0001 Desg FWD 19 128.1 P2p

Switch#sh spanning-tree int f0/2

Vlan Role Sts Cost Prio.Nbr Type

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VLAN0001 Desg FWD 19 128.2 P2p

Switch#

**Switch1#sh spanning-tree**

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 32769

Address 000A.4194.AE9D

Cost 19

Port 1(FastEthernet0/1)

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)

Address 000C.85EC.C505

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Aging Time 20

Interface Role Sts Cost Prio.Nbr Type

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Fa0/2 Desg FWD 19 128.2 P2p

Fa0/1 Root FWD 19 128.1 P2p

Switch#sh sp

Switch#sh spanning-tree int f0/1

Vlan Role Sts Cost Prio.Nbr Type

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VLAN0001 Root FWD 19 128.1 P2p

Switch#sh spanning-tree int f0/2

Vlan Role Sts Cost Prio.Nbr Type

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VLAN0001 Desg FWD 19 128.2 P2p

Switch#

**Switch2#sh spanning-tree**

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 32769

Address 000A.4194.AE9D

Cost 19

Port 2(FastEthernet0/2)

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)

Address 000C.CFEA.9761

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Aging Time 20

Interface Role Sts Cost Prio.Nbr Type

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Fa0/1 Altn BLK 19 128.1 P2p

Fa0/2 Root FWD 19 128.2 P2p

Switch#sh sp

Switch#sh spanning-tree int f0/1

Vlan Role Sts Cost Prio.Nbr Type

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VLAN0001 Altn BLK 19 128.1 P2p

Switch#sh spanning-tree int f0/2

Vlan Role Sts Cost Prio.Nbr Type

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VLAN0001 Root FWD 19 128.2 P2p

Switch#