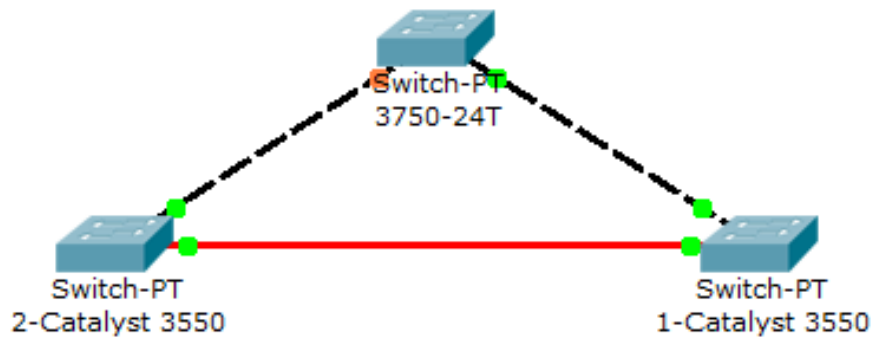


Packet Tracer Hands-On Lab: Spanning Tree Protocol (STP)

Objective:

- Understand what happens **in a Layer 2 switching network without STP**
- Observe issues such as loops, broadcast storms, and MAC flapping
- Enable **STP (PVST+)** and verify stable Layer 2 paths



Devices Needed:

- 3 × Cisco 2960 Switches (S1, S2, S3)
- 2 × PCs (PC0, PC1)

Connections:

PC0 → S1
PC1 → S2
S1 → S2
S2 → S3
S3 → S1

This forms a **Layer 2 loop (triangle topology)**.

◆ PART 2 — Verify Behaviour WITHOUT STP

STEP 1: Disable STP on All Switches

PVST+ runs automatically in Packet Tracer, so we must turn it off manually.

Run the following on **S1, S2, S3**:

```
S1(config)# no spanning-tree vlan 1
S2(config)# no spanning-tree vlan 1
S3(config)# no spanning-tree vlan 1
```

STEP 2: Generate Traffic

1. Ping from **PC0** → **PC1**
2. Try again after a few seconds

EXPECTED BEHAVIOUR WITHOUT STP

- **Broadcast Storm starts**
- **MAC addresses keep flapping**
- PC0 and PC1 may not ping
- Switch CPU usage increases

STEP 3: Observe MAC Table Instability

On any switch (example S1):

```
S1# show mac address-table
```

You will notice:

- Same MAC address appearing on **different ports repeatedly**
- The table rapidly updating — **MAC flapping**

This shows why STP is needed.

◆ PART 3 — Enable STP & Observe Recovery

STEP 1: Re-enable STP on All Switches

```
S1(config)# spanning-tree vlan 1
S2(config)# spanning-tree vlan 1
S3(config)# spanning-tree vlan 1
```

Packet Tracer defaults to **PVST+**.

STEP 2: Verify STP is Running

```
show spanning-tree
```

Check for:

- **Root Bridge**
- **Root Port**
- **Designated Ports**
- **Blocking/Alternate Ports**

The switch with the **lowest MAC address** becomes the **Root Bridge**.

PART 4 — Observe Loop Prevention

After 30–50 seconds (STP convergence):

- One of the redundant links will move to **blocking** state
- Broadcast storm will stop
- MAC table will stabilize
- Pings succeed normally

Verify Blocked Ports

Use:

```
show spanning-tree interface
```

Or:

```
show spanning-tree vlan 1
```

Look for:

- **Forwarding ports**
 - **Blocking ports**
-

◆ PART 5 — Optional Enhancement: Manipulate Root Bridge

You can make **S1 the Root Bridge**:

```
S1(config)# spanning-tree vlan 1 priority 4096
```

Verify:

```
show spanning-tree
```

Expected:

- S1 becomes the root
 - Other switches choose their Root Ports correctly
-

◆ PART 6 — Optional: Fast-STP (RSTP)

Enable Rapid Spanning Tree:

```
S1(config)# spanning-tree mode rapid-pvst  
S2(config)# spanning-tree mode rapid-pvst  
S3(config)# spanning-tree mode rapid-pvst
```

Observe **faster convergence** (< 5 seconds).

✓ END RESULTS

Scenario	Expected Outcome
Without STP	Broadcast storm, MAC flapping, pings fail
With STP (PVST+)	One port blocks, network becomes stable
With RSTP	Even faster convergence