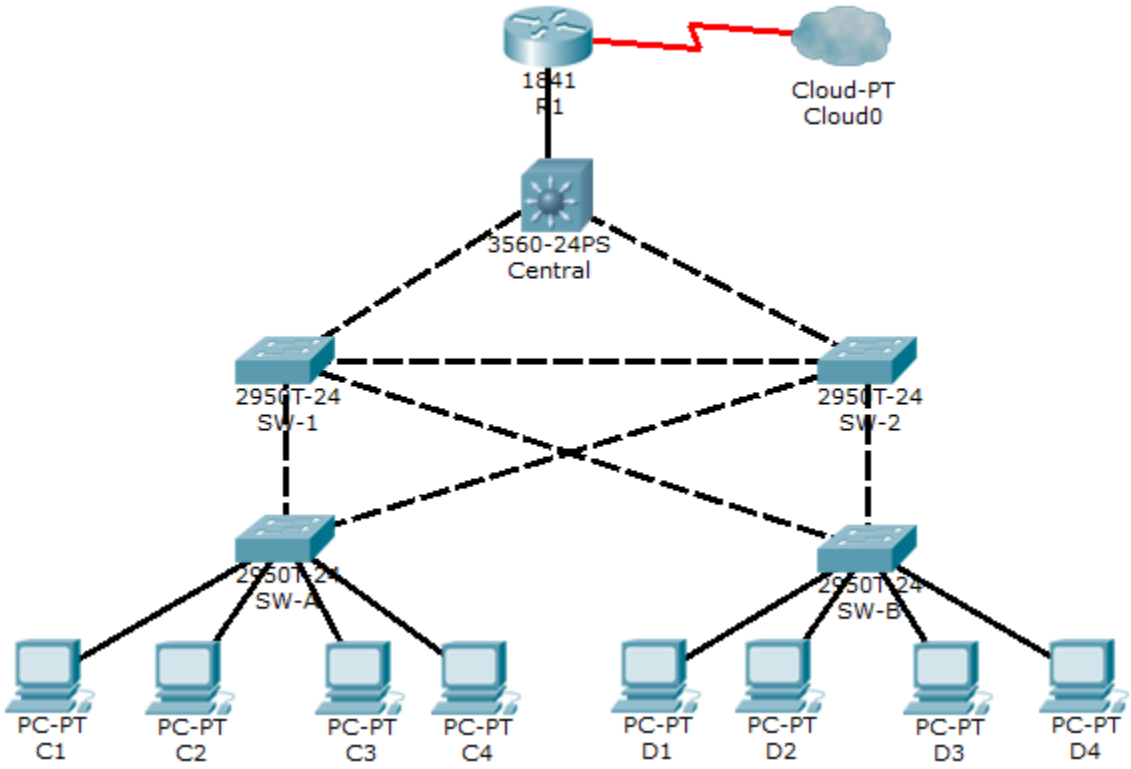
Packet Tracer - Layer 2 Security (Instructor Version)

Instructor Note: Red font color or Gray highlights indicate text that appears in the instructor copy only.

Topology



Objectives

- Assign the Central switch as the root bridge.
- Secure spanning-tree parameters to prevent STP manipulation attacks.
- Enable storm control to prevent broadcast storms.
- Enable port security to prevent MAC address table overflow attacks.

Background / Scenario

There have been a number of attacks on the network recently. For this reason, the network administrator has assigned you the task of configuring Layer 2 security.

For optimum performance and security, the administrator would like to ensure that the root bridge is the 3560 Central switch. To prevent against spanning-tree manipulation attacks, the administrator wants to ensure that the STP parameters are secure. In addition, the network administrator would like to enable storm control to prevent broadcast storms. Finally, to prevent against MAC address table overflow attacks, the network administrator has decided to configure port security to limit the number of MAC addresses that can be learned per switch port. If the number of MAC addresses exceeds the set limit, the administrator would like the port to be shutdown.

All switch devices have been preconfigured with the following:

- Enable password: **ciscoenpa55**

- Console password: **ciscoconpa55**
- VTY line password: **ciscovtypa55**

Part 1: Configure Root Bridge

Step 1: Determine the current root bridge.

From **Central**, issue the **show spanning-tree** command to determine the current root bridge and to see the ports in use and their status.

Which switch is the current root bridge?

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Current root is SW-1

Based on the current root bridge, what is the resulting spanning tree? (Draw the spanning-tree topology.)

Step 2: Assign Central as the primary root bridge.

Using the **spanning-tree vlan 1 root primary** command, assign **Central** as the root bridge.

```
Central(config)# spanning-tree vlan 1 root primary
```

Step 3: Assign SW-1 as a secondary root bridge.

Assign **SW-1** as the secondary root bridge using the **spanning-tree vlan 1 root secondary** command.

```
SW-1(config)# spanning-tree vlan 1 root secondary
```

Step 4: Verify the spanning-tree configuration.

Issue the **show spanning-tree** command to verify that **Central** is the root bridge.

Which switch is the current root bridge?

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Current root is Central

Based on the new root-bridge, what is the resulting spanning tree? (Draw the spanning-tree topology.)

Part 2: Protect Against STP Attacks

Secure the STP parameters to prevent STP manipulation attacks.

Step 1: Enable PortFast on all access ports.

PortFast is configured on access ports that connect to a single workstation or server to enable them to become active more quickly. On the connected access ports of the **SW-A** and **SW-B**, use the **spanning-tree portfast** command.

```
SW-A(config)# interface range fastethernet 0/1 - 4
SW-A(config-if-range)# spanning-tree portfast

SW-B(config)# interface range fastethernet 0/1 - 4
SW-B(config-if-range)# spanning-tree portfast
```

Step 2: Enable BPDU guard on all access ports.

BPDU guard is a feature that can help prevent rogue switches and spoofing on access ports. Enable BPDU guard on **SW-A** and **SW-B** access ports.

```
SW-A(config)# interface range fastethernet 0/1 - 4
SW-A(config-if-range)# spanning-tree bpduguard enable

SW-B(config)# interface range fastethernet 0/1 - 4
SW-B(config-if-range)# spanning-tree bpduguard enable
```

Note: Spanning-tree BPDU guard can be enabled on each individual port using the **spanning-tree bpduguard enable** command in the interface configuration mode or the **spanning-tree portfast bpduguard default** command in the global configuration mode. For grading purposes in this activity, please use the **spanning-tree bpduguard enable** command.

Step 3: Enable root guard.

Root guard can be enabled on all ports on a switch that are not root ports. It is best deployed on ports that connect to other non-root switches. Use the **show spanning-tree** command to determine the location of the root port on each switch.

On **SW-1**, enable root guard on ports Fa0/23 and Fa0/24. On **SW-2**, enable root guard on ports Fa0/23 and Fa0/24.

```
SW-1(config)# interface range fa0/23 - 24
SW-1(config-if-range)# spanning-tree guard root

SW-2(config)# interface range fa0/23 - 24
SW-2(config-if-range)# spanning-tree guard root
```

Part 3: Enable Storm Control

Step 1: Enable storm control for broadcasts.

a. Enable storm control for broadcasts on all ports connecting switches (trunk ports).

b. Enable storm control on interfaces connecting **Central**, **SW-1**, and **SW-2**. Set a **50** percent rising suppression level using the **storm-control broadcast** command.

```
SW-1(config)# interface range gi1/1 , fa0/1 , fa0/23 - 24
SW-1(config-if)# storm-control broadcast level 50

SW-2(config)# interface range gi1/1 , fa0/1 , fa0/23 - 24
SW-2(config-if)# storm-control broadcast level 50

Central(config-if)# interface range gi0/1 , gi0/2 , fa0/1
Central(config-if)# storm-control broadcast level 50
```

Step 2: Verify storm control configuration.

Verify your configuration with the **show storm-control broadcast** and the **show run** commands.

Part 4: Configure Port Security and Disable Unused Ports

Step 1: Configure basic port security on all ports connected to host devices.

This procedure should be performed on all access ports on **SW-A** and **SW-B**. Set the maximum number of learned MAC address to **2**, allow the MAC address to be learned dynamically, and set the violation to **shutdown**.

Note: A switch port must be configured as an access port to enable port security.

```
SW-A(config)# interface range fa0/1 - 22
SW-A(config-if-range)# switchport mode access
SW-A(config-if-range)# switchport port-security
SW-A(config-if-range)# switchport port-security maximum 2
SW-A(config-if-range)# switchport port-security violation shutdown
SW-A(config-if-range)# switchport port-security mac-address sticky

SW-B(config)# interface range fa0/1 - 22
SW-B(config-if-range)# switchport mode access
SW-B(config-if-range)# switchport port-security
SW-B(config-if-range)# switchport port-security maximum 2
SW-B(config-if-range)# switchport port-security violation shutdown
SW-B(config-if-range)# switchport port-security mac-address sticky
```

Why would you not want to enable port security on ports connected to other switches or routers?

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Ports connected to other switch devices and routers can, and should, have a multitude of MAC addresses learned for that single port. Limiting the number of MAC addresses that can be learned on these ports can significantly impact network functionality.

Step 2: Verify port security.

On **SW-A**, issue the **show port-security interface fa0/1** command to verify that port security has been configured.

Step 3: Disable unused ports.

Disable all ports that are currently unused.

```
SW-A(config)# interface range fa0/5 - 22
SW-A(config-if-range)# shutdown

SW-B(config)# interface range fa0/5 - 22
SW-B(config-if-range)# shutdown
```

Step 4: Check results.

Your completion percentage should be 100%. Click **Check Results** to see feedback and verification of which required components have been completed.

!!!Script for Central

```
conf t
spanning-tree vlan 1 root primary
interface range gi0/1 , gi0/2 , fa0/1
 storm-control broadcast level 50
end
```

!!!Script for SW-1

```
conf t
spanning-tree vlan 1 root secondary
interface range fa0/23 - 24
 spanning-tree guard root
interface range gi1/1 , fa0/1 , fa0/23 - 24
 storm-control broadcast level 50
end
```

!!!Script for SW-2

```
conf t
interface range fa0/23 - 24
 spanning-tree guard root
interface range gi1/1 , fa0/1 , fa0/23 - 24
 storm-control broadcast level 50
end
```

!!!Script for SW-A

```
conf t
interface range fastethernet 0/1 - 4
 spanning-tree portfast
 spanning-tree bpduguard enable
interface range fa0/1 - 22
 switchport mode access
 switchport port-security
 switchport port-security maximum 2
 switchport port-security violation shutdown
 switchport port-security mac-address sticky
interface range fa0/5 - 22
 shutdown
end
```

!!!Script for SW-B

```
conf t
interface range fastethernet 0/1 - 4
 spanning-tree portfast
```

```
 spanning-tree bpduguard enable
interface range fa0/1 - 22
 switchport mode access
 switchport port-security
 switchport port-security maximum 2
 switchport port-security violation shutdown
 switchport port-security mac-address sticky
interface range fa0/5 - 22
 shutdown
end
```