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Subject: Security in Computing Practical Subject Code: USIT6P2

PRACTICAL - 8

Aim: Packet Tracer - Layer 2 Security

Objectives:

- Assign the Central switch as the root bridge.
- Secure spanning-tree parameters to prevent STP manipulation attacks.
- Enable port security to prevent CAM 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 spanning-tree manipulation attacks, the administrator wants to ensure that the STP parameters are secure. To prevent against CAM table overflow attacks, the network administrator has decided to configure port security to limit the number of MAC addresses each switch port can learn. 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
- SSH username and password: SSHadmin / ciscosshpa55

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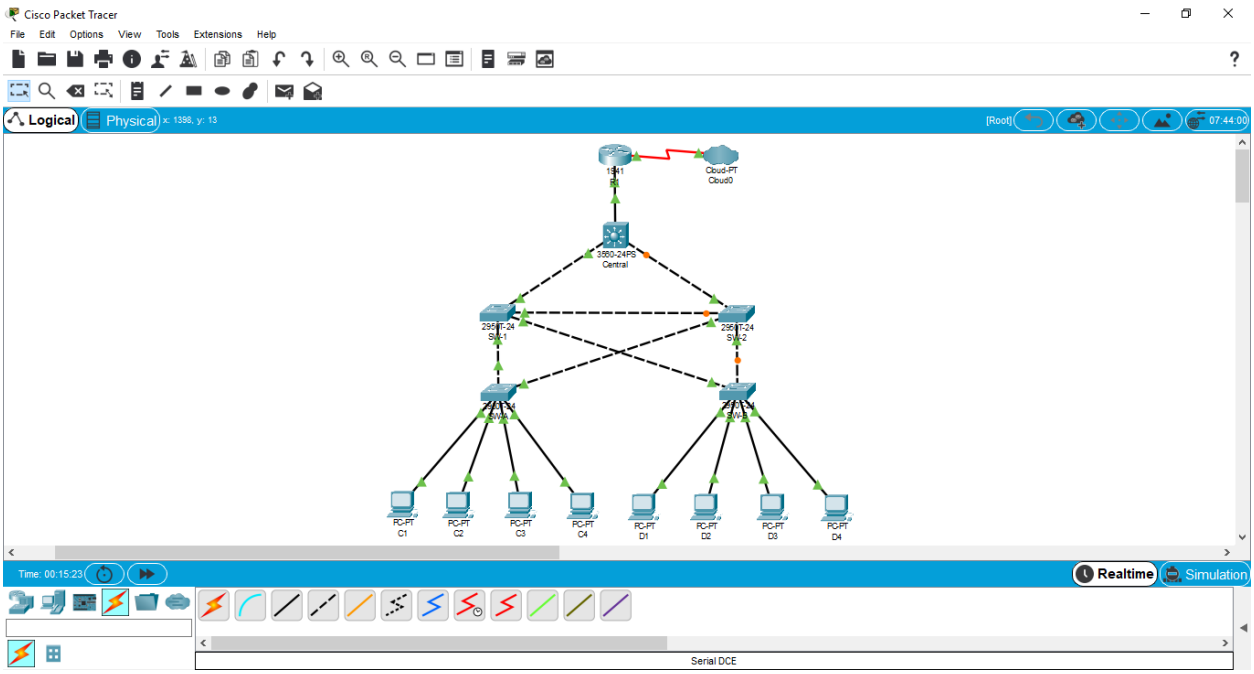
Topology Diagram :



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, to see the ports in use, and to see their status.

Step 2: Assign Central as the primary root bridge. Using the spanning-tree vlan 1 root primary command, and 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.

```
Central#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    24577
             Address     0030.A3A6.CA1C
             This bridge is the root
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
```

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 f0/1 - 4
SW-A(config-if-range)#spanning-tree portfast
```

```
SW-B(config)#interface range f0/1 - 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 f0/1 - 4
SW-A(config-if-range)#spanning-tree bpduguard enable
```

```
SW-B(config)#interface range f0/1 - 4
SW-B(config-if-range)#spanning-tree bpduguard enable
```

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 F0/23 and F0/24. On SW-2, enable root guard on ports F0/23 and F0/24.

```
SW-1(config)#interface range f0/23 - 24
SW-1(config-if-range)#spanning-tree guard root
```

```
SW-2(config)#interface range f0/23 - 24
SW-2(config-if-range)#spanning-tree guard root
```

Part 3: 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 addresses to 2, allow the MAC address to be learned dynamically, and set the violation to shutdown.

```
SW-A(config)#interface range f0/1 - 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 f0/1 - 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
```

Step 2: Verify port security.

a. On SW-A, issue the command show port-security interface f0/1 to verify that port security has been configured.

```
SW-A#show port-security interface f0/1
Port Security              : Enabled
Port Status                : Secure-up
Violation Mode             : Shutdown
Aging Time                 : 0 mins
Aging Type                 : Absolute
SecureStatic Address Aging : Disabled
Maximum MAC Addresses      : 2
Total MAC Addresses        : 0
Configured MAC Addresses   : 0
Sticky MAC Addresses       : 0
Last Source Address:Vlan   : 0000.0000.0000:0
Security Violation Count   : 0
```

b. Ping from C1 to C2 and issue the command show port-security interface f0/1 again to verify that the switch has learned the MAC address for C1.

Step 3: Disable unused ports.

Disable all ports that are currently unused.

```
SW-A(config)#interface range f0/5 - 22
SW-A(config-if-range)#shutdown
```

```
SW-B(config)#interface range f0/5 - 22
SW-B(config-if-range)#shutdown
```

Step 4: Check results.

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

Script for Central

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

Script for SW-1

```
SW-1(config)#spanning-tree vlan 1 root secondary
SW-1(config)#interface range f0/23 - 24
SW-1(config-if-range)#spanning-tree guard root
SW-1(config-if-range)#end
```

Script for SW-2

```
SW-2(config)#interface range f0/23 - 24
SW-2(config-if-range)#spanning-tree guard root
SW-2(config-if-range)#end
```

Script for SW-A

```
SW-A(config)#interface range f0/1 - 4
SW-A(config-if-range)#spanning-tree portfast
```

```
SW-A(config-if-range)#spanning-tree bpduguard enable
SW-A(config-if-range)#interface range f0/1 - 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-A(config-if-range)#interface range f0/5 - 22
SW-A(config-if-range)#shutdown
SW-A(config-if-range)#end
SW-A#
%SYS-5-CONFIG_I: Configured from console by console
exit
```

Script for SW-B

```
SW-B(config)#interface range f0/1 - 4
SW-B(config-if-range)#spanning-tree portfast
```

```
SW-B(config-if-range)#spanning-tree bpduguard enable
SW-B(config-if-range)#interface range f0/1 - 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
SW-B(config-if-range)#interface range f0/5 - 22
SW-B(config-if-range)#shutdown
SW-B(config-if-range)#end
SW-B#
%SYS-5-CONFIG_I: Configured from console by console
exit
```