

Switch Security Configuration

Implement Port Security

- Secure switch ports ➡ **Disable all unused ports!!!** `interface range` and `no shutdown`
- Prevent MAC address table overflow ➡ **Enable port security** (limits the number of valid MAC addresses allowed on a port).
 - Can only be configured on manually access or trunk ports.

```
S1(config)# interface f0/1
S1(config-if)# switchport mode access
S1(config-if)# switchport port-security
S1# show port-security interface f0/1
```

- Set the maximum number of MAC addresses allowed on a port:

```
S1(config-if)# switchport port-security maximum 2
```

Learn MAC Addresses modes

1. Manually Configured

```
S1(config-if)# switchport port-security mac-address cafe.caca.baba
```

2. Dynamically Learned

`switchport port-security` command ➡ current source MAC secured but NOT added to `running-config` (config lost!)

3. Dynamically Learned - Sticky

```
S1(config-if)# switchport port-security mac-address sticky
```

Learn MAC address and stick them to `running-config` (`wr` to commit changes).

Switch Port Security Configuration Example

- Maximum of 4 MAC addresses
- Manually configure one secure MAC address
- Configure the port to dynamically learn additional secure MAC addresses up to the 4 secure MAC address maximum.

```
S1(config)# interface f0/1
S1(config-if)# switchport mode access
S1(config-if)# switchport port-security
S1(config-if)# switchport port-security maximum 4
S1(config-if)# switchport port-security mac-address aaaa.bbbb.1234
S1(config-if)# switchport port-security mac-address sticky
S1(config-if)# end
S1# show port-security interface f0/1
S1# show port-security
```

Port security aging

Set the aging time for static and dynamic secure addresses on a port:

- **Absolute:** Secured addresses deleted after specified aging time (minutes).

```
S1(config-if)# switchport port-security aging time 10  
S1(config-if)# switchport port-security aging type absolute
```

- **Inactivity:** Secured addresses deleted if they are inactive for a specified time.

```
S1(config-if)# switchport port-security aging time 10  
S1(config-if)# switchport port-security aging type inactivity
```

Enable / disable static aging for the secured port:

```
S1(config-if)# switchport port-security aging static
```

Port Security Violation Modes

MAC address differs from list of secured addresses ➡ Port violation (error-disabled)

- **shutdown** (default): ✗ err-disabled immediately + LED off + ✉ sends syslog + 🔌 increments violation counter. Re-enable: `shutdown` and `no shutdown`

```
S1(config-if)# switchport port-security violation shutdown
```

- **restrict**: port drops packets with unknown source address until removed below the maximum allowed. 🔌 increments violation counter + ✉ sends syslog

```
S1(config-if)# switchport port-security violation restrict
```

- **protect**: port drops packets with unknown source address until removed below the maximum allowed.

```
S1(config-if)# switchport port-security violation protect
```

Mitigate VLAN attacks

1. Disable DTP on non-trunking ports

```
S1(config)# interface f0/1 - 16  
S1(config-if-range)# switchport mode access
```

2. Disable unused ports and put them in an unused VLAN

```
S1(config)# interface f0/17 - 20  
S1(config-if-range)# switchport mode access  
S1(config-if-range)# switchport access vlan 1000
```

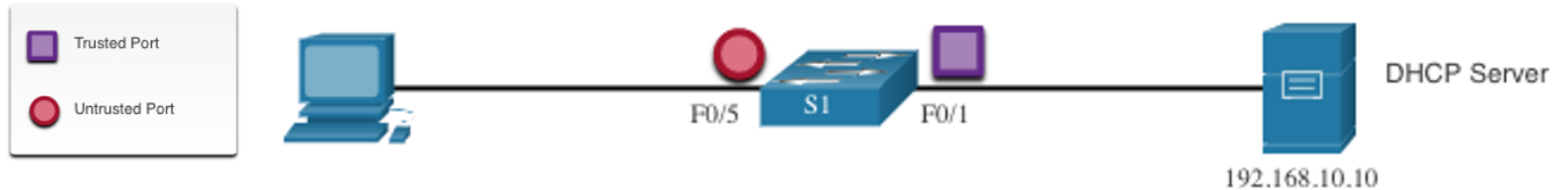
3. Manually enable trunks + 4. Disable DTP on trunking ports +5. Set the native VLAN to a VLAN other than VLAN 1

```
S1(config)# interface f0/21 - 24  
S1(config-if-range)# switchport mode trunk  
S1(config-if-range)# switchport nonegotiate  
S1(config-if-range)# switchport trunk native vlan 999
```

Mitigate DHCP attacks ➡ DHCP Snooping

- Enable DHCP snooping on trusted ports ● ➡ rate-limit DHCP traffic on untrusted ports ●
 - ● Switches, routers and servers
 - ● Trunk links, server ports ➡ explicitly configured as trusted
 - ● Devices outside the network and all access ports
- **DHCP Snooping Binding Table** built that includes:
 - **Source MAC address** of a device on an untrusted port
 - **IP assigned** by the DHCP server to that device

Implement DHCP Snooping



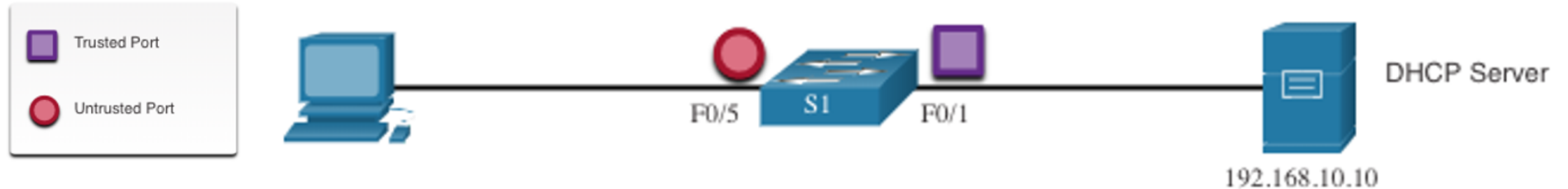
1. Enable DHCP snooping:

```
S1(config)# ip dhcp snooping
```

2. On trusted ports:

```
S1(config)# interface f0/1  
S1(config-if)# ip dhcp snooping trust
```

Implement DHCP Snooping




3. On untrusted interfaces, limit the number of DHCP discovery messages received (packets/second):

```
S1(config)# interface range f0/5 - 24
S1(config-if)# ip dhcp snooping limit rate 6
```

4. Enable DHCP snooping by VLAN

```
S1(config)# ip dhcp snooping vlan 5,10,50-52
S1# show ip dhcp snooping
S1# show ip dhcp snooping binding
```

Mitigate ARP Attacks Dynamic ARP Inspection

- To prevent ARP spoofing and poisoning, switch must ensure that only valid ARP Requests and Replies are relayed  Enable Dynamic ARP Inspection (DAI)
- DAI requires DHCP snooping:
 - **Don't relay invalid ARP Replies** out to other ports in same VLAN.
 - **Intercept all ARP Requests and Replies on untrusted ports.**
 - Verify each intercepted packet for **valid IP-to-MAC binding**.
 - **Drop and log ARP Replies coming from invalid** to prevent ARP poisoning.
 - **err-disabled the interface** if the configured DAI number of ARP packets is exceeded.

All access switch ports:  untrusted

All uplink ports that are connected to other switches:  trusted

DAI Implementation

1. Enable DHCP snooping globally

```
S1(config)# ip dhcp snooping
```

2. Enable DHCP snooping on selected VLANs

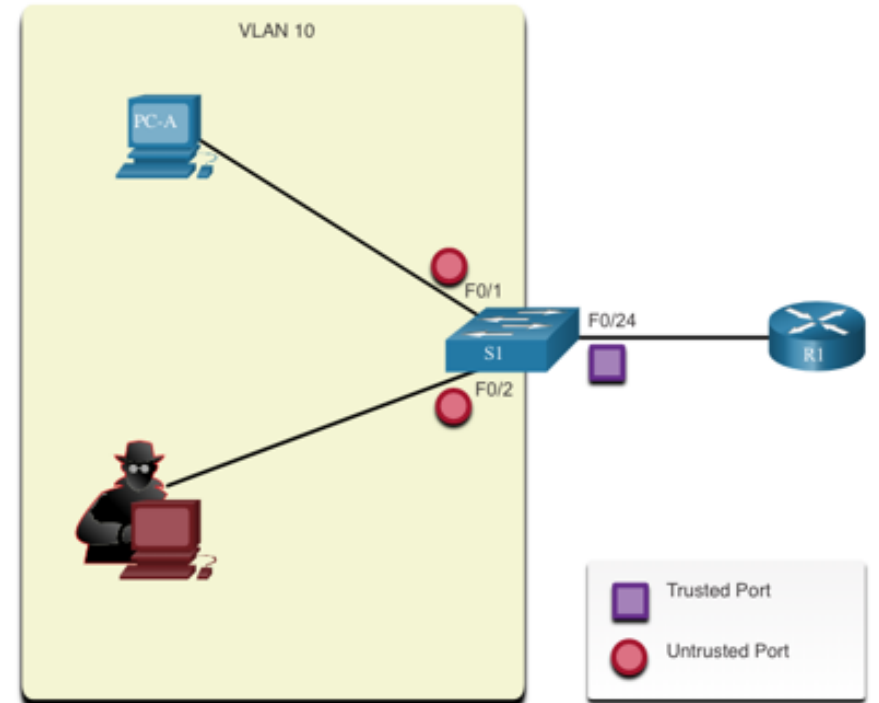
```
S1(config)# ip dhcp snooping vlan 10
```

3. Enable DAI on selected VLANs.


```
S1(config)# ip arp inspectgion vlan 10
```

4. Configure trusted interfaces

```
S1(config)# interface f0/24  
S1(config-if)# ip dhcp snooping trust  
S1(config-if)# ip arp inspection trust
```



Mitigate STP Attacks PortFast and BPDU Guard

- **PortFast:** brings a port to the FWD state from a BLK state (bypassing listening and learning states).
 -  Apply to all end-user access ports

- On a **interface**

```
S1(config)# interface f0/1
S1(config-if)# switchport mode access
S1(config-if)# spanning-tree portfast
```

- **Globally**

```
S1(config)# spanning-tree portfast default
```

Mitigate STP Attacks ➡ PortFast and BPDU Guard

- **BPDU Guard:** err-disabled a port that receives a BPDU
 - ⚠ Apply to all end-user access ports
 - Automatically re-enable port:

```
S1(config)# errdisable recovery cause psecure_violation
```

- **On a interface**

```
S1(config)# interface f0/1  
S1(config-if)# spanning-tree bpduguard enable
```

- **Globally**

```
S1(config)# spanning-tree portfast bpduguard default  
S1(config)# end  
S1# show spanning-tree summary
```