Switch Security Configuration

📕 CCNA2v7 Module 11 Switch Security Configuration
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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

1️⃣ Manually Configured

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

2️⃣ Dynamically Learned

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

3️⃣ 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 (`err-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
```

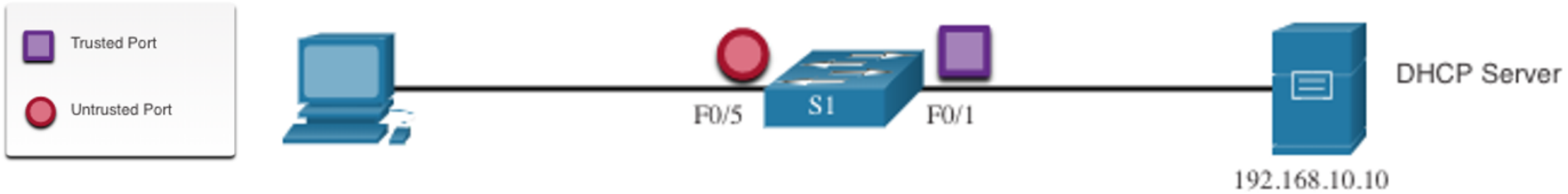
3 Manually enable trunks + 4 Disable DTP on trunking ports + 5 Set the native VLAN to a VLAN other than VLAN 1

```
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 ➡️ explicity 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



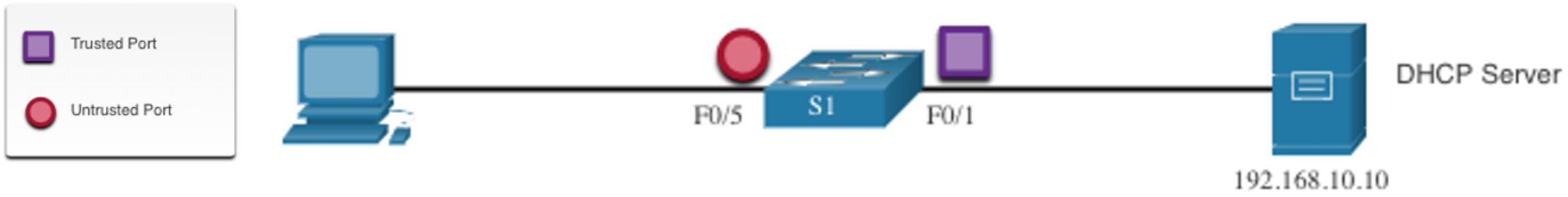
1 Enable DHCP snooping

```
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

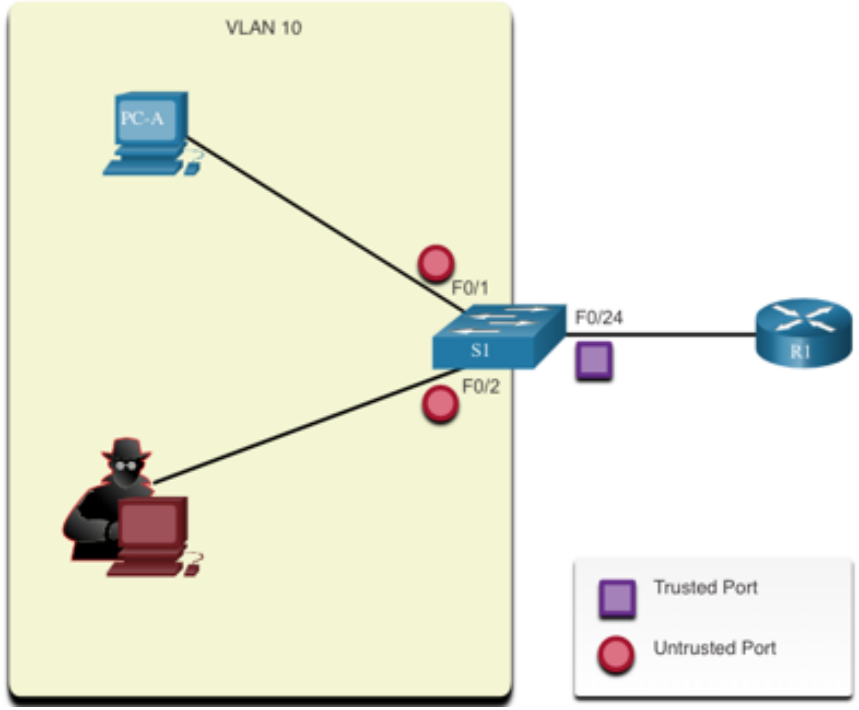
```
S1(config)# ip dhcp snooping vlan 10
```

3 Enable DAI on selected VLANs

```
S1(config)# ip arp inspection 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
```