

Inter-VLAN Routing

Cisco Packet Tracer Configuration Command Reference

Covers three inter-VLAN routing methods:

Legacy Routing • Router-on-a-Stick (ROAS) • Multilayer Switch (SVI) Routing

1. Legacy Inter-VLAN Routing

Each VLAN is connected to the router through a separate physical interface. The switch trunks nothing; the router routes between the two directly-connected subnets.

1.1 Configure VLANs on Switch (Switch0)

```
Switch0>enable
Switch0#configure terminal
Switch0(config)#vlan 10
Switch0(config-vlan)#name VLAN10
Switch0(config-vlan)#exit
Switch0(config)#vlan 20
Switch0(config-vlan)#name VLAN20
Switch0(config-vlan)#exit
Switch0(config)#end
```

1.2 Assign Ports to VLANs (Switch0)

```
Switch0#configure terminal
Switch0(config)#interface fa0/3
Switch0(config-if)#switchport mode access
Switch0(config-if)#switchport access vlan 10
Switch0(config-if)#exit

Switch0(config)#interface fa0/4
Switch0(config-if)#switchport mode access
Switch0(config-if)#switchport access vlan 20
Switch0(config-if)#exit
Switch0(config)#end
```

1.3 Configure Router Interfaces (Router0)

```
Router0>enable
Router0#configure terminal
Router0(config)#interface g0/0
Router0(config-if)#ip address 172.16.10.1 255.255.255.0
Router0(config-if)#no shutdown
Router0(config-if)#exit

Router0(config)#interface g0/1
Router0(config-if)#ip address 172.16.20.1 255.255.255.0
Router0(config-if)#no shutdown
Router0(config-if)#end
```

1.4 Verify Legacy Inter-VLAN Routing

On Switch0 — confirm VLANs exist and ports are assigned correctly:

```
Switch0#show vlan brief
Switch0#show interfaces status
```

On Router0 — confirm both interfaces are up and in the routing table:

```
Router0#show ip interface brief
Router0#show ip route
```

From Router0 — test reachability to both VLAN gateways/hosts:

```
Router0#ping 172.16.10.1
Router0#ping 172.16.20.1
```

From PC1 (VLAN 10, 172.16.10.10) — ping PC2 (VLAN 20, 172.16.20.10) to confirm end-to-end inter-VLAN connectivity:

```
PC1>ping 172.16.20.10
```

2. Router-on-a-Stick (ROAS)

A single trunk link connects the switch to the router. The router uses sub-interfaces, each tagged with 802.1Q encapsulation, to route between VLANs over that one physical link.

2.1 Configure VLANs on Switch (Switch1)

```
Switch1>enable
Switch1#configure terminal
Switch1(config)#vlan 10
Switch1(config-vlan)#name VLAN10
Switch1(config-vlan)#exit
Switch1(config)#vlan 20
Switch1(config-vlan)#name VLAN20
Switch1(config-vlan)#exit
```

2.2 Assign Ports to VLANs (Switch1)

```
Switch1(config)#interface fa0/2
Switch1(config-if)#switchport mode access
Switch1(config-if)#switchport access vlan 10
Switch1(config-if)#exit

Switch1(config)#interface fa0/3
Switch1(config-if)#switchport mode access
Switch1(config-if)#switchport access vlan 20
Switch1(config-if)#exit
```

2.3 Configure Trunk Port (Switch1)

```
Switch1(config)#interface fa0/1
Switch1(config-if)#switchport mode trunk
Switch1(config-if)#switchport trunk allowed vlan 10,20
Switch1(config-if)#exit
Switch1(config)#end
```

2.4 Configure Sub-interfaces on Router (Router1)

```
Router1>enable
Router1#configure terminal
Router1(config)#interface g0/0
Router1(config-if)#no shutdown
Router1(config-if)#exit

Router1(config)#interface g0/0.10
```

```
Router1(config-subif)#encapsulation dot1q 10
Router1(config-subif)#ip address 172.16.10.1 255.255.255.0
Router1(config-subif)#exit

Router1(config)#interface g0/0.20
Router1(config-subif)#encapsulation dot1q 20
Router1(config-subif)#ip address 172.16.20.1 255.255.255.0
Router1(config-subif)#exit
```

2.5 Verify Router-on-a-Stick (ROAS)

On Switch1 — confirm VLANs, access ports, and the trunk link:

```
Switch1#show vlan brief
Switch1#show interfaces trunk
```

On Router1 — confirm both sub-interfaces are up and appear in the routing table:

```
Router1#show ip interface brief
Router1#show interfaces g0/0.10
Router1#show interfaces g0/0.20
Router1#show ip route
```

From Router1 — test reachability to both VLAN gateways:

```
Router1#ping 172.16.10.1
Router1#ping 172.16.20.1
```

From PC1 (VLAN 10, 172.16.10.10) — ping PC2 (VLAN 20, 172.16.20.10) to confirm the trunk and sub-interfaces are correctly tagging/routing traffic end to end:

```
PC1>ping 172.16.20.10
```

3. Multilayer Switch Inter-VLAN Routing

A Layer 3 multilayer switch (3650) performs the routing itself using Switched Virtual Interfaces (SVIs), with IP routing enabled globally. It connects to two Layer 2 access switches (2960) via trunk links.

3.1 Multilayer Switch (3650) — Switch0

```
Switch0>enable
Switch0#configure terminal
Switch0(config)#ip routing

Switch0(config)#vlan 10
Switch0(config-vlan)#name VLAN10
Switch0(config-vlan)#exit
Switch0(config)#vlan 20
Switch0(config-vlan)#name VLAN20
Switch0(config-vlan)#exit

Switch0(config)#interface vlan 10
Switch0(config-if)#ip address 172.16.10.1 255.255.255.0
Switch0(config-if)#no shutdown
Switch0(config-if)#exit

Switch0(config)#interface vlan 20
Switch0(config-if)#ip address 172.16.20.1 255.255.255.0
Switch0(config-if)#no shutdown
Switch0(config-if)#exit

Switch0(config)#interface gigabitEthernet1/0/1
Switch0(config-if)#switchport mode trunk
Switch0(config-if)#switchport trunk allowed vlan 10,20
Switch0(config-if)#no shutdown
Switch0(config-if)#exit

Switch0(config)#interface gigabitEthernet1/0/2
Switch0(config-if)#switchport mode trunk
Switch0(config-if)#switchport trunk allowed vlan 10,20
Switch0(config-if)#no shutdown
Switch0(config-if)#exit
```

3.2 Access Switch Left (2960) — Switch2

```
Switch2>enable
Switch2#configure terminal

Switch2(config)#vlan 10
Switch2(config-vlan)#name VLAN10
Switch2(config-vlan)#exit
```

```
Switch2(config)#interface fa0/1
Switch2(config-if)#switchport mode trunk
Switch2(config-if)#switchport trunk allowed vlan 10,20
Switch2(config-if)#no shutdown
Switch2(config-if)#exit

Switch2(config)#interface fa0/2
Switch2(config-if)#switchport mode access
Switch2(config-if)#switchport access vlan 10
Switch2(config-if)#spanning-tree portfast
Switch2(config-if)#no shutdown
Switch2(config-if)#exit
```

3.3 Access Switch Right (2960) — Switch3

```
Switch3>enable
Switch3#configure terminal

Switch3(config)#vlan 20
Switch3(config-vlan)#name VLAN20
Switch3(config-vlan)#exit

Switch3(config)#interface fa0/1
Switch3(config-if)#switchport mode trunk
Switch3(config-if)#switchport trunk allowed vlan 10,20
Switch3(config-if)#no shutdown
Switch3(config-if)#exit

Switch3(config)#interface fa0/2
Switch3(config-if)#switchport mode access
Switch3(config-if)#switchport access vlan 20
Switch3(config-if)#spanning-tree portfast
Switch3(config-if)#no shutdown
Switch3(config-if)#exit
```

3.4 Verify Multilayer Switch Inter-VLAN Routing

On Switch0 (3650) — confirm IP routing is enabled, VLANs/SVIs are up, and the routing table has both VLAN subnets:

```
Switch0#show ip route
Switch0#show ip interface brief
Switch0#show vlan brief
Switch0#show interfaces trunk
```

On Switch2 and Switch3 — confirm the trunk to the 3650 and the correct access VLAN on the host port:

```
Switch2#show vlan brief
Switch2#show interfaces trunk
```

```
Switch3#show vlan brief
Switch3#show interfaces trunk
```

From Switch0 — test reachability to both SVI gateways:

```
Switch0#ping 172.16.10.1
Switch0#ping 172.16.20.1
```

From PC1 (behind Switch2, VLAN 10, 172.16.10.10) — ping PC2 (behind Switch3, VLAN 20, 172.16.20.10) to confirm the multilayer switch is routing between VLANs correctly:

```
PC1>ping 172.16.20.10
```