

Network Configuration Guide

DHCP, Inter-VLAN Routing, Trunking & EtherChannel (PAgP) — Cisco IOS CLI Reference

Device	Role	Key Feature
Router0	Router-on-a-stick	Sub-interfaces + DHCP (VLAN 10/20/30)
MultilayerSwitch1	Distribution switch	Trunking + PAgP EtherChannel (desirable)
Switch0	Access switch (left)	VLAN 10 trunk + access port
Switch1	Access switch (right)	PAgP EtherChannel (auto) + VLAN 30 access

1. Router0 Configuration

DHCP & Inter-VLAN Routing

Router0 performs router-on-a-stick inter-VLAN routing using sub-interfaces on GigabitEthernet0/0, and provides DHCP services for VLANs 10, 20, and 30.

```
Router>enable
Router#configure terminal
Router(config)#hostname Router0

Router0(config)#interface GigabitEthernet0/0
Router0(config-if)#no shutdown
Router0(config-if)#exit

Router0(config)#interface GigabitEthernet0/0.10
Router0(config-subif)#encapsulation dot1Q 10
Router0(config-subif)#ip address 10.10.10.1 255.255.255.0
Router0(config-subif)#exit

Router0(config)#interface GigabitEthernet0/0.20
Router0(config-subif)#encapsulation dot1Q 20
Router0(config-subif)#ip address 20.20.20.1 255.255.255.0
Router0(config-subif)#exit

Router0(config)#interface GigabitEthernet0/0.30
Router0(config-subif)#encapsulation dot1Q 30
Router0(config-subif)#ip address 30.30.30.1 255.255.255.0
Router0(config-subif)#exit

Router0(config)#ip dhcp pool VLAN10
Router0(dhcp-config)#network 10.10.10.0 255.255.255.0
Router0(dhcp-config)#default-router 10.10.10.1
Router0(dhcp-config)#exit

Router0(config)#ip dhcp pool VLAN20
Router0(dhcp-config)#network 20.20.20.0 255.255.255.0
Router0(dhcp-config)#default-router 20.20.20.1
Router0(dhcp-config)#exit

Router0(config)#ip dhcp pool VLAN30
Router0(dhcp-config)#network 30.30.30.0 255.255.255.0
```

```
Router0(dhcp-config)#default-router 30.30.30.1
Router0(dhcp-config)#exit
```

2. Multilayer Switch1 Configuration

Trunking, Access & EtherChannel (PAgP)

MultilayerSwitch1 creates VLANs 10/20/30, trunks to Router0, provides an access port for VLAN 20, and forms a PAgP EtherChannel (desirable mode) toward Switch1.

```
Switch>enable
Switch#configure terminal
Switch(config)#hostname MultilayerSwitch1

MultilayerSwitch1(config)#vlan 10
MultilayerSwitch1(config-vlan)#vlan 20
MultilayerSwitch1(config-vlan)#vlan 30
MultilayerSwitch1(config-vlan)#exit

MultilayerSwitch1(config)#interface GigabitEthernet0/1
MultilayerSwitch1(config-if)#switchport trunk encapsulation dot1q
MultilayerSwitch1(config-if)#switchport mode trunk
MultilayerSwitch1(config-if)#exit

MultilayerSwitch1(config)#interface FastEthernet0/7
MultilayerSwitch1(config-if)#switchport mode access
MultilayerSwitch1(config-if)#switchport access vlan 20
MultilayerSwitch1(config-if)#exit

MultilayerSwitch1(config)#interface range FastEthernet0/1 - 2
MultilayerSwitch1(config-if-range)#switchport trunk encapsulation dot1q
MultilayerSwitch1(config-if-range)#switchport mode trunk
MultilayerSwitch1(config-if-range)#exit

MultilayerSwitch1(config)#interface range FastEthernet0/3 - 6
MultilayerSwitch1(config-if-range)#switchport trunk encapsulation dot1q
MultilayerSwitch1(config-if-range)#switchport mode trunk
MultilayerSwitch1(config-if-range)#channel-group 1 mode desirable
MultilayerSwitch1(config-if-range)#exit

MultilayerSwitch1(config)#interface Port-channel 1
MultilayerSwitch1(config-if)#switchport trunk encapsulation dot1q
MultilayerSwitch1(config-if)#switchport mode trunk
MultilayerSwitch1(config-if)#exit
```

3. Switch0 Configuration

Left Access Switch

Switch0 hosts VLAN 10, trunks uplinks toward the multilayer switch, and provides an access port for VLAN 10 end devices.

```
Switch>enable
Switch#configure terminal
Switch(config)#hostname Switch0

Switch0(config)#vlan 10
Switch0(config-vlan)#exit
Switch0(config)#interface range FastEthernet0/1 - 2
```

```
Switch0(config-if-range)#switchport mode trunk
Switch0(config-if-range)#exit

Switch0(config)#interface FastEthernet0/3
Switch0(config-if)#switchport mode access
Switch0(config-if)#switchport access vlan 10
Switch0(config-if)#exit
```

4. Switch1 Configuration

Right Access Switch with PAgP

Switch1 hosts VLAN 30, forms the PAgP EtherChannel (auto mode) toward MultilayerSwitch1, and provides an access port for VLAN 30 end devices.

```
Switch>enable
Switch#configure terminal
Switch(config)#hostname Switch1

Switch1(config)#vlan 30
Switch1(config-vlan)#exit

Switch1(config)#interface range FastEthernet0/1 - 4
Switch1(config-if-range)#channel-group 1 mode auto
Switch1(config-if-range)#exit

Switch1(config)#interface Port-channel 1
Switch1(config-if)#switchport mode trunk
Switch1(config-if)#exit

Switch1(config)#interface FastEthernet0/5
Switch1(config-if)#switchport mode access
Switch1(config-if)#switchport access vlan 30
Switch1(config-if)#exit
```

Verification Commands

Use the following commands after applying the configuration to confirm DHCP, VLAN, trunk, and EtherChannel status. On the PC side, verify that each PC receives an IP address from its VLAN's DHCP pool, then test end-to-end connectivity between PC1 and PC2 (in Packet Tracer: click the PC → Desktop tab → Command Prompt).

Device	Command
Router0	Router0#show ip interface brief
Router0	Router0#show ip dhcp binding
Switches	Switch#show vlan brief
Switches	Switch#show etherchannel summary
Switches	Switch#show interfaces trunk
PC1 / PC2	C:\>ipconfig /release
PC1 / PC2	C:\>ipconfig /renew
PC1 / PC2	C:\>ipconfig (confirm IP, mask, gateway from DHCP)
PC1	C:\>ping <PC2 IP address>

Note: VLAN/IP addressing follows the pattern VLANx → x.x.x.0/24 (e.g., VLAN 10 → 10.10.10.0/24, VLAN 20 → 20.20.20.0/24, VLAN 30 → 30.30.30.0/24). A successful ping from PC1 to PC2 across different VLANs confirms that DHCP addressing, trunking, EtherChannel, and inter-VLAN routing on Router0 are all working correctly.