Configuration of Encapsulation dot1Q using Cisco Packet Tracer
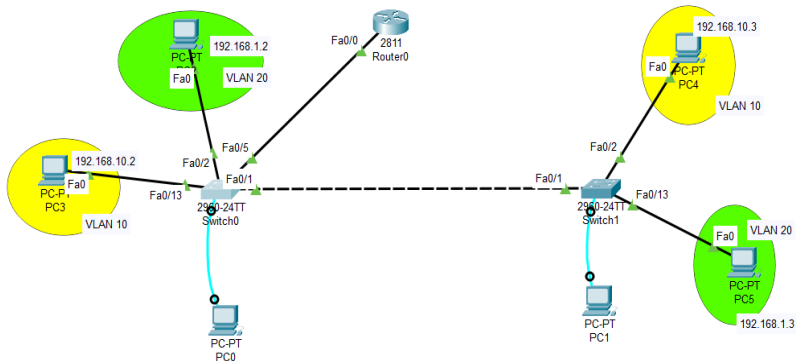
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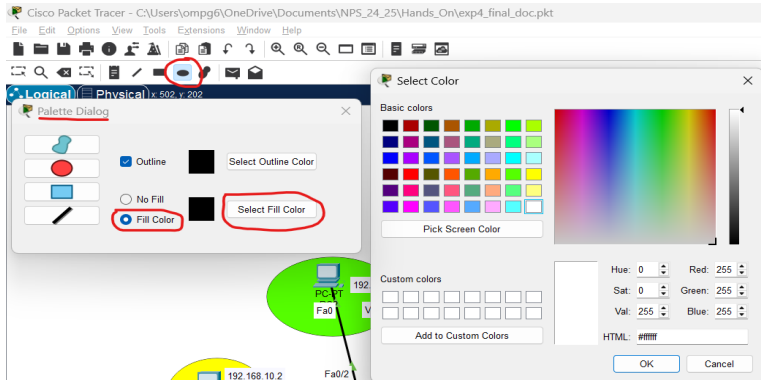# Inter-VLAN connection using Router

Console connection to setup a switch

- Console Connection: PC0 to Switch0 (left side switch)
    - Select console cable and connect to
        - **RS232** of PC0 ↔ **console** of Switch0
- Console Connection: PC1 to Switch1 (right side switch)
    - Select console cable and connect to
        - **RS232** of PC1 ↔ **console** of Switch1
- Connect FastEthernet port of PCs to FastEthernet ports Switch0 and Switch1 as shown in the figure 3
- **To display port labels**
    - Goto Options → Preferences → select **Always Show Port Labels in Logical Workspace**

Colour Display

Goto **Draw Ellipse** → Check the option **Fill Color** → **Select Fill Color**

Switch0 Configuration

Open terminal of PC0

Click on PC0→ Desktop Tab → Terminal → Ok (Terminal Configuration)

- **Enter Global configuration mode**
  - Switch>en
  - Switch#config t
- **Create VLANs**
  - Switch(config)#vlan 20
  - Switch(config-vlan)#name green
  - Switch(config-vlan)#exit
  - Switch(config)#vlan 10
  - Switch(config-vlan)#name yellow
  - Switch(config-vlan)#exit

Switch0 Configuration

- **Assign Ports to VLANs**
  - Switch(config)#int f0/2
  - Switch(config-if)#switchport mode access
  - Switch(config-if)#switchport access vlan 20
  - Switch(config-if)#exit
  - Switch(config)#int f0/13
  - Switch(config-if)#switchport mode access
  - Switch(config-if)#switchport access vlan 10
  - Switch(config-if)#exit
- **Configure Trunk on the Interface**
  - Switch(config)#int f0/1
  - Switch(config-if)#switchport mode trunk
  - Switch(config-if)#switchport trunk allowed vlan 10,20
  - Switch(config-if)#exit
  - Switch(config)#int f0/5
  - Switch(config-if)#switchport mode trunk
  - Switch(config-if)#exit
  - Switch(config)#exit

Check Switch0 VLAN status

```
Switch#sh vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/3, Fa0/4, Fa0/5, Fa0/6
                                                Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                                Fa0/11, Fa0/12, Fa0/14, Fa0/15
                                                Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                                Fa0/20, Fa0/21, Fa0/22, Fa0/23
                                                Fa0/24, Gig0/1, Gig0/2
10   yellow                           active    Fa0/13
20   green                            active    Fa0/2
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
```

Check Switch0 Interface Status

```
Switch#sh int status
Port          Name            Status          Vlan      Duplex  Speed Type
Fa0/1                         connected       trunk     auto    auto  10/100BaseTX
Fa0/2                         connected       20        auto    auto  10/100BaseTX
Fa0/3                         notconnect      1         auto    auto  10/100BaseTX
Fa0/4                         notconnect      1         auto    auto  10/100BaseTX
Fa0/5                         notconnect      trunk     auto    auto  10/100BaseTX
Fa0/6                         notconnect      1         auto    auto  10/100BaseTX
Fa0/7                         notconnect      1         auto    auto  10/100BaseTX
Fa0/8                         notconnect      1         auto    auto  10/100BaseTX
Fa0/9                         notconnect      1         auto    auto  10/100BaseTX
Fa0/10                        notconnect      1         auto    auto  10/100BaseTX
Fa0/11                        notconnect      1         auto    auto  10/100BaseTX
Fa0/12                        notconnect      1         auto    auto  10/100BaseTX
Fa0/13                        connected       10        auto    auto  10/100BaseTX
Fa0/14                        notconnect      1         auto    auto  10/100BaseTX
Fa0/15                        notconnect      1         auto    auto  10/100BaseTX
Fa0/16                        notconnect      1         auto    auto  10/100BaseTX
Fa0/17                        notconnect      1         auto    auto  10/100BaseTX
Fa0/18                        notconnect      1         auto    auto  10/100BaseTX
Fa0/19                        notconnect      1         auto    auto  10/100BaseTX
Fa0/20                        notconnect      1         auto    auto  10/100BaseTX
```

Check Switch0 Trunk Status

Check this status after Router configuration

```
Switch#sh int trunk
Port        Mode            Encapsulation   Status          Native vlan
Fa0/1       on              802.1q          trunking        1
Fa0/5       on              802.1q          trunking        1

Port        Vlans allowed on trunk
Fa0/1       10,20
Fa0/5       1-1005

Port        Vlans allowed and active in management domain
Fa0/1       10,20
Fa0/5       1,10,20

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/1       10,20
Fa0/5       1,10,20
```

Switch1 Configuration

Open terminal of PC1
Click on PC1→ Desktop Tab → Terminal → Ok (Terminal Configuration)

- **Enter Global configuration mode**
  - Switch>en
  - Switch#config t
- **Create VLANs**
  - Switch(config)#vlan 20
  - Switch(config-vlan)#name green
  - Switch(config-vlan)#exit
  - Switch(config)#vlan 10
  - Switch(config-vlan)#name yellow
  - Switch(config-vlan)#exit

Switch1 Configuration

- **Assign Ports to VLANs**
  - Switch(config)#int f0/2
  - Switch(config-if)#switchport mode access
  - Switch(config-if)#switchport access vlan 10
  - Switch(config-if)#exit
  - Switch(config)#int f0/13
  - Switch(config-if)#switchport mode access
  - Switch(config-if)#switchport access vlan 20
  - Switch(config-if)#exit
- **Configure Trunk on the Interface**
  - Switch(config)#int f0/1
  - Switch(config-if)#switchport mode trunk
  - Switch(config-if)#switchport trunk allowed vlan 10,20
  - Switch(config-if)#exit
  - Switch(config)#exit

Check Switch1 VLAN status

```
Switch#sh vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/3, Fa0/4, Fa0/5, Fa0/6
                                                Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                                Fa0/11, Fa0/12, Fa0/14, Fa0/15
                                                Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                                Fa0/20, Fa0/21, Fa0/22, Fa0/23
                                                Fa0/24, Gig0/1, Gig0/2
10   yellow                           active    Fa0/2
20   green                            active    Fa0/13
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
```

Check Switch1 Interface Status

```
Switch#sh int status
Port       Name                   Status       Vlan     Duplex  Speed Type
Fa0/1                             connected    trunk    auto    auto  10/100BaseTX
Fa0/2                             connected    10       auto    auto  10/100BaseTX
Fa0/3                             notconnect   1        auto    auto  10/100BaseTX
Fa0/4                             notconnect   1        auto    auto  10/100BaseTX
Fa0/5                             notconnect   1        auto    auto  10/100BaseTX
Fa0/6                             notconnect   1        auto    auto  10/100BaseTX
Fa0/7                             notconnect   1        auto    auto  10/100BaseTX
Fa0/8                             notconnect   1        auto    auto  10/100BaseTX
Fa0/9                             notconnect   1        auto    auto  10/100BaseTX
Fa0/10                            notconnect   1        auto    auto  10/100BaseTX
Fa0/11                            notconnect   1        auto    auto  10/100BaseTX
Fa0/12                            notconnect   1        auto    auto  10/100BaseTX
Fa0/13                            connected    20       auto    auto  10/100BaseTX
Fa0/14                            notconnect   1        auto    auto  10/100BaseTX
Fa0/15                            notconnect   1        auto    auto  10/100BaseTX
```

Check Switch1 Trunk Status

```
Switch#sh int trunk
Port            Mode            Encapsulation   Status          Native vlan
Fa0/1           on              802.1q          trunking        1

Port            Vlans allowed on trunk
Fa0/1           10,20

Port            Vlans allowed and active in management domain
Fa0/1           10,20

Port            Vlans in spanning tree forwarding state and not pruned
Fa0/1           10,20
```

Assign IP Address

Click on PC → Desktop Tab → IP Configuration

- PC2 (Green-Left)
  - IPv4: 192.168.1.2; Subnet Mask:255.255.255.0; Gateway: 192.168.1.1
- PC5 (Green-Right)
  - IPv4: 192.168.1.3; Subnet Mask:255.255.255.0; Gateway: 192.168.1.1
- PC3 (Yellow-Left)
  - IPv4: 192.168.10.2; Sub Mask:255.255.255.0; Gateway: 192.168.10.1
- PC4 (Yellow-Right)
  - IPv4: 192.168.10.3; Sub Mask:255.255.255.0; Gateway: 192.168.10.1

Router Configuration

Enable communication between the two vlans via a single physical interface Divide the single physical interface on the router into logical interfaces (sub interfaces). Each sub-interface will then serve as a default gateway for each of the VLANs. This scenario is called router on a stick (R.O.A.S) and will allow the VLANs to communicate through the single physical interface.

Note: We can't assign an IP address to the router's physical interface that we have subdivided into logical sub-interfaces. We'll instead assign IP addresses to the sub interfaces.

Router Configuration

Would you like to enter the initial configuration dialog? [yes/no]: no

- Router>en
- Router#config t
- Router(config)#int fa0/0
- Router(config-if)#no shutdown
- Router(config-if)#int fa0/0.10
- Router(config-subif)#encapsulation dot1q 10
- Router(config-subif)#ip add 192.168.10.1 255.255.255.0
- Router(config-subif)#int fa0/0.20
- Router(config-subif)#encapsulation dot1q 20
- Router(config-subif)#ip add 192.168.1.1 255.255.255.0
- Router(config-subif)#exit
- Router(config)#

Check Connection

Ping the PCs to check connection. There is an inter-VLAN connection.
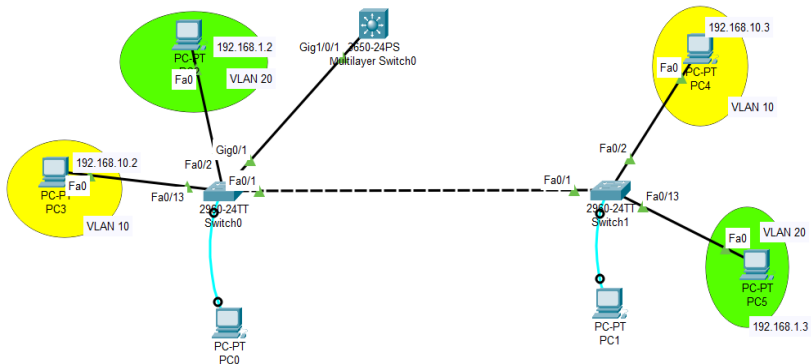Every PC is connected to every other PC

Conclusion

This configuration sets up 802.1Q encapsulation on trunk ports, allowing VLAN traffic to be carried across a single link between switches. By following these steps, you can manage multiple VLANs efficiently within your network using Cisco Packet Tracer.

Inter-VLAN connection using Layer-3 Switch

- If you have Completed the previous setup using Router, do the following changes
    - Delete the Router
    - Connect Gig0/1 of Switch0 to Gig1/0/1 port of L3-Switch
    - **Assign Gig0/1 as trunk port in Switch0 (left)**
        - Switch(config)#int g0/1
        - Switch(config-if)#switchport mode trunk
        - Switch(config-if)#exit
        - Switch(config)#exit
    - Configure the L3-switch (3650) → slide (37).
- If you are starting fresh, continue from next slide and follow the steps

Console connection to setup a switch

- Console Connection: PC0 to Switch0 (left side switch)
  - Select console cable and connect to
    - **RS232** of PC0 ↔ **console** of Switch0
- Console Connection: PC1 to Switch1 (right side switch)
  - Select console cable and connect to
    - **RS232** of PC1 ↔ **console** of Switch1
- Connect FastEthernet port of PCs to FastEthernet ports Switch0 and Switch1 as shown in the figure 22
- **To display port labels**
  - Goto Options → Preferences → select **Always Show Port Labels in Logical Workspace**

Colour Display

Goto **Draw Ellipse** → Check the option **Fill Color** → **Select Fill Color**

Switch0 Configuration

Open terminal of PC0
Click on PC0→ Desktop Tab → Terminal → Ok (Terminal Configuration)

- **Enter Global configuration mode**
  - Switch>en
  - Switch#config t
- **Create VLANs**
  - Switch(config)#vlan 20
  - Switch(config-vlan)#name green
  - Switch(config-vlan)#exit
  - Switch(config)#vlan 10
  - Switch(config-vlan)#name yellow
  - Switch(config-vlan)#exit

Switch0 Configuration

- **Assign Ports to VLANs**
  - Switch(config)#int f0/2
  - Switch(config-if)#switchport mode access
  - Switch(config-if)#switchport access vlan 20
  - Switch(config-if)#exit
  - Switch(config)#int f0/13
  - Switch(config-if)#switchport mode access
  - Switch(config-if)#switchport access vlan 10
  - Switch(config-if)#exit
- **Configure Trunk on the Interface**
  - Switch(config)#int f0/1
  - Switch(config-if)#switchport mode trunk
  - Switch(config-if)#switchport trunk allowed vlan 10,20
  - Switch(config-if)#exit
  - Switch(config)#int g0/1
  - Switch(config-if)#switchport mode trunk
  - Switch(config-if)#exit
  - Switch(config)#exit

Check Switch0 VLAN status

```
Switch#sh vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/3, Fa0/4, Fa0/5, Fa0/6
                                                Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                                Fa0/11, Fa0/12, Fa0/14, Fa0/15
                                                Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                                Fa0/20, Fa0/21, Fa0/22, Fa0/23
                                                Fa0/24, Gig0/2
10   yellow                           active    Fa0/13
20   green                            active    Fa0/2
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
```

Check Switch0 Interface Status

```
Switch#sh int status
Port            Name            Status        Vlan      Duplex  Speed Type
Fa0/1                           connected     trunk     auto    auto  10/100BaseTX
Fa0/2                           connected     20        auto    auto  10/100BaseTX
Fa0/3                           notconnect    1         auto    auto  10/100BaseTX
Fa0/4                           notconnect    1         auto    auto  10/100BaseTX
Fa0/5                           notconnect    1         auto    auto  10/100BaseTX
Fa0/6                           notconnect    1         auto    auto  10/100BaseTX
Fa0/7                           notconnect    1         auto    auto  10/100BaseTX
Fa0/8                           notconnect    1         auto    auto  10/100BaseTX
Fa0/9                           notconnect    1         auto    auto  10/100BaseTX
Fa0/10                          notconnect    1         auto    auto  10/100BaseTX
Fa0/11                          notconnect    1         auto    auto  10/100BaseTX
Fa0/12                          notconnect    1         auto    auto  10/100BaseTX
Fa0/13                          connected     10        auto    auto  10/100BaseTX
Fa0/14                          notconnect    1         auto    auto  10/100BaseTX
Fa0/15                          notconnect    1         auto    auto  10/100BaseTX
Fa0/16                          notconnect    1         auto    auto  10/100BaseTX
Fa0/17                          notconnect    1         auto    auto  10/100BaseTX
Fa0/18                          notconnect    1         auto    auto  10/100BaseTX
Fa0/19                          notconnect    1         auto    auto  10/100BaseTX
Fa0/20                          notconnect    1         auto    auto  10/100BaseTX
Fa0/21                          notconnect    1         auto    auto  10/100BaseTX
Fa0/22                          notconnect    1         auto    auto  10/100BaseTX
Fa0/23                          notconnect    1         auto    auto  10/100BaseTX
Fa0/24                          notconnect    1         auto    auto  10/100BaseTX
Gig0/1                          connected     trunk     auto    auto  10/100BaseTX
Gig0/2                          notconnect    1         auto    auto  10/100BaseTX
```

Check Switch0 Trunk Status

Check this status after Router configuration

```
Switch#sh int trunk
Port            Mode            Encapsulation   Status          Native vlan
Fa0/1           on              802.1q          trunking        1
Gig0/1          on              802.1q          trunking        1

Port            Vlans allowed on trunk
Fa0/1           10,20
Gig0/1          1-1005

Port            Vlans allowed and active in management domain
Fa0/1           10,20
Gig0/1          1,10,20

Port            Vlans in spanning tree forwarding state and not pruned
Fa0/1           10,20
Gig0/1          1,10,20
```

Switch1 Configuration

Open terminal of PC1

Click on PC1→ Desktop Tab → Terminal → Ok (Terminal Configuration)

- **Enter Global configuration mode**
  - Switch>en
  - Switch#config t
- **Create VLANs**
  - Switch(config)#vlan 20
  - Switch(config-vlan)#name green
  - Switch(config-vlan)#exit
  - Switch(config)#vlan 10
  - Switch(config-vlan)#name yellow
  - Switch(config-vlan)#exit

Switch1 Configuration

- **Assign Ports to VLANs**
    - Switch(config)#int f0/2
    - Switch(config-if)#switchport mode access
    - Switch(config-if)#switchport access vlan 10
    - Switch(config-if)#exit
    - Switch(config)#int f0/13
    - Switch(config-if)#switchport mode access
    - Switch(config-if)#switchport access vlan 20
    - Switch(config-if)#exit
- **Configure Trunk on the Interface**
    - Switch(config)#int f0/1
    - Switch(config-if)#switchport mode trunk
    - Switch(config-if)#switchport trunk allowed vlan 10,20
    - Switch(config-if)#exit
    - Switch(config)#exit

Check Switch1 VLAN status

```
Switch#sh vlan brief

VLAN Name                             Status     Ports
---- -------------------------------- --------- -------------------------------
1    default                          active     Fa0/3, Fa0/4, Fa0/5, Fa0/6
                                                 Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                                 Fa0/11, Fa0/12, Fa0/14, Fa0/15
                                                 Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                                 Fa0/20, Fa0/21, Fa0/22, Fa0/23
                                                 Fa0/24, Gig0/1, Gig0/2
10   yellow                           active     Fa0/2
20   green                            active     Fa0/13
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
```

Check Switch1 Interface Status

```
Switch#sh int status
Port      Name              Status       Vlan    Duplex  Speed Type
Fa0/1                       connected    trunk   auto    auto  10/100BaseTX
Fa0/2                       connected    10      auto    auto  10/100BaseTX
Fa0/3                       notconnect   1       auto    auto  10/100BaseTX
Fa0/4                       notconnect   1       auto    auto  10/100BaseTX
Fa0/5                       notconnect   1       auto    auto  10/100BaseTX
Fa0/6                       notconnect   1       auto    auto  10/100BaseTX
Fa0/7                       notconnect   1       auto    auto  10/100BaseTX
Fa0/8                       notconnect   1       auto    auto  10/100BaseTX
Fa0/9                       notconnect   1       auto    auto  10/100BaseTX
Fa0/10                      notconnect   1       auto    auto  10/100BaseTX
Fa0/11                      notconnect   1       auto    auto  10/100BaseTX
Fa0/12                      notconnect   1       auto    auto  10/100BaseTX
Fa0/13                      connected    20      auto    auto  10/100BaseTX
Fa0/14                      notconnect   1       auto    auto  10/100BaseTX
Fa0/15                      notconnect   1       auto    auto  10/100BaseTX
```

Check Switch1 Trunk Status

```
Switch#sh int trunk
Port          Mode            Encapsulation  Status        Native vlan
Fa0/1         on              802.1q         trunking      1

Port          Vlans allowed on trunk
Fa0/1         10,20

Port          Vlans allowed and active in management domain
Fa0/1         10,20

Port          Vlans in spanning tree forwarding state and not pruned
Fa0/1         10,20
```

Assign IP Address

Click on PC $\rightarrow$ Desktop Tab $\rightarrow$ IP Configuration

- PC2 (Green-Left)
  - IPv4: 192.168.1.2; Subnet Mask:255.255.255.0; Gateway: 192.168.1.1
- PC5 (Green-Right)
  - IPv4: 192.168.1.3; Subnet Mask:255.255.255.0; Gateway: 192.168.1.1
- PC3 (Yellow-Left)
  - IPv4: 192.168.10.2; Sub Mask:255.255.255.0; Gateway: 192.168.10.1
- PC4 (Yellow-Right)
  - IPv4: 192.168.10.3; Sub Mask:255.255.255.0; Gateway: 192.168.10.1

Power supply to 3650 Switch

Drag and drop the **AC Power Supply** onto the rack
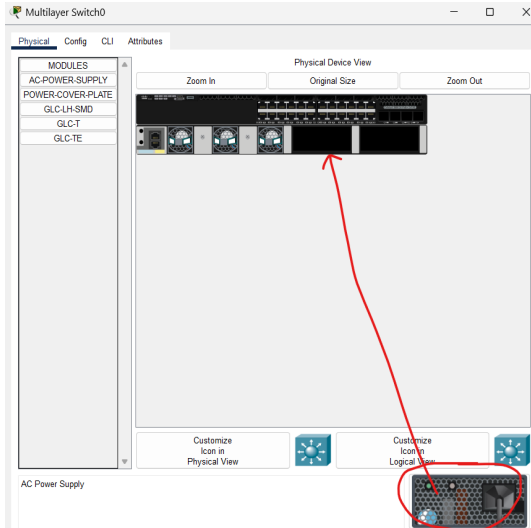
Layer-3 Switch Configuration

Click on the Switch → Goto CLI tab

Would you like to enter the initial configuration dialog? [yes/no]: no

- Switch>en
- Switch#config t
- Switch(config)#vlan 10
- Switch(config-vlan)#name yellow
- Switch(config-vlan)#exit
- Switch(config)#vlan 20
- Switch(config-vlan)#name green
- Switch(config-vlan)#exit
- Switch(config)#int vlan 10
- Switch(config-if)#ip add 192.168.10.1 255.255.255.0
- Switch(config-if)#exit
- Switch(config)#int vlan 20

Layer-3 Switch Configuration

- Switch(config-if)#ip add 192.168.1.1 255.255.255.0
- Switch(config-if)#exit
- Switch(config)#int g1/0/1
- Switch(config-if)#switchport mode trunk
- Switch(config-if)#exit
- Switch(config)#ip routing
- Switch(config)#exit

Check Connection

Ping the PCs to check connection. There is an inter-VLAN connection.
Every PC is connected to every other PC

Conclusion

This configuration sets up 802.1Q encapsulation on trunk ports, allowing VLAN traffic to be carried across a single link between switches. By following these steps, you can manage multiple VLANs efficiently within your network using Cisco Packet Tracer.