Router on a Stick(ROAS)

Router on a Stick is a method for handling inter-VLAN routing using a combination of a layer two switch and a router configured with subinterfaces. This setup allows communication between different VLANs, which is not possible with just a layer two switch since it can't assign IP addresses or handle routing due to its function being confined to data link layer (Layer 2) operations.

Here's a summary of the Router on a Stick configuration and its benefits:

Configuration:
A layer two switch is connected to a router.

- The router is configured with multiple subinterfaces, with each subinterface corresponding to a VLAN on the switch.
- Each subinterface on the router is set up with a gateway IP address that devices in the corresponding VLAN use to send traffic to other VLANs.

Functionality:

- Devices in different VLANs (e.g., VLAN 20 and VLAN 30) send traffic to the layer two switch.
- The switch forwards this traffic to the router.
- The router routes the traffic between its subinterfaces corresponding to the VLANs, thus allowing communication between the VLANs.

Benefits:

- Cost-effectiveness: Using a router with subinterfaces is generally cheaper than deploying a layer three switch.
- Enhanced capabilities: This setup allows for routing (Layer 3) and can also include filtering of Layer 3 and Layer 4 traffic, providing some advanced network management features that a layer two switch alone cannot offer.

This configuration is particularly useful in smaller or budget-conscious network environments where full Layer 3 switching capability is not feasible but inter-VLAN routing is needed.

Packet Tracer equipment setup:

- Router

- Layer 2 switch
- Two PCs

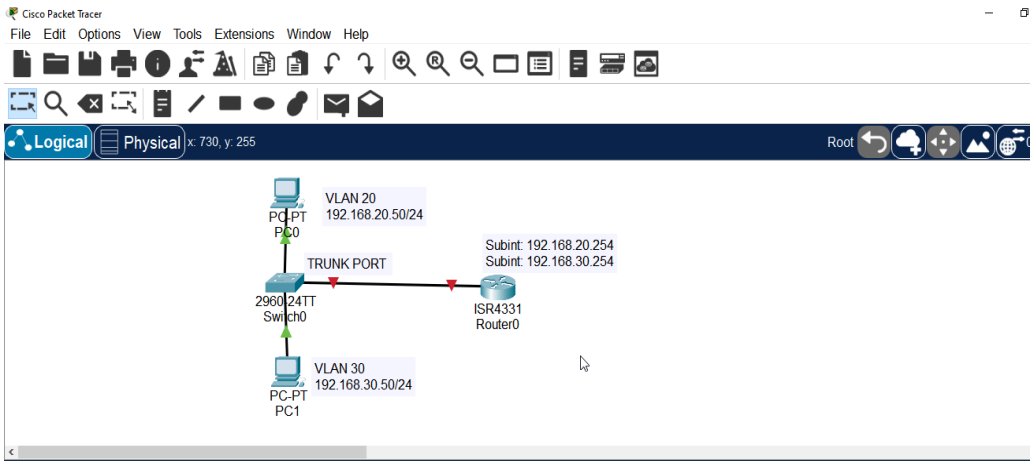
Step 1: Setup Physical Connections

Connect the PCs to the Switch:

- Connect PC0 to the first interface on the switch.
- Connect PC1 to the second interface on the switch.

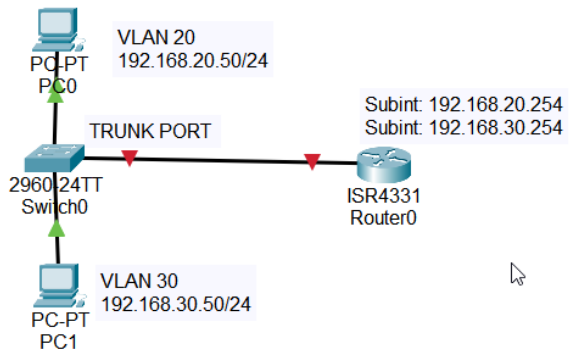
Connect the Switch to the Router:

Use a Gigabit interface on the router to connect to a designated trunk port on the switch.



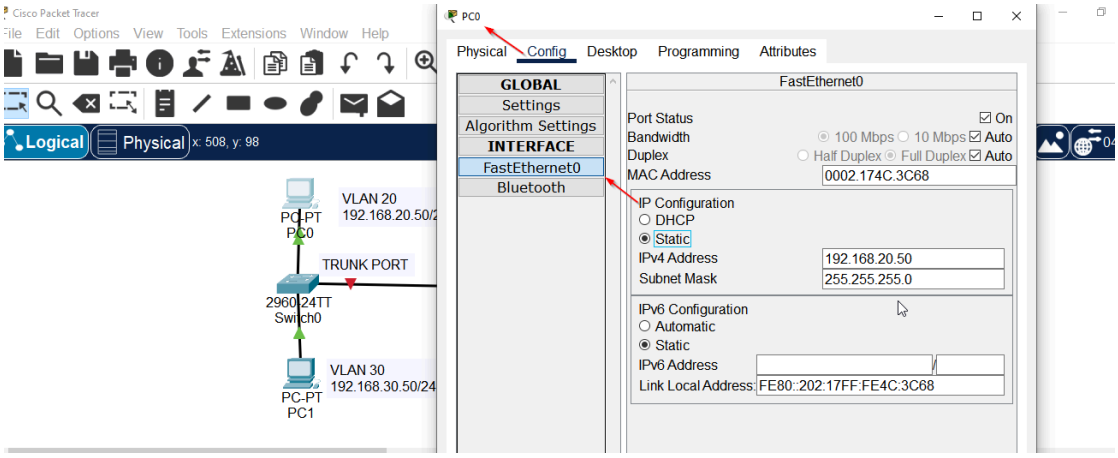
Step 2: Assign VLANs and IPs

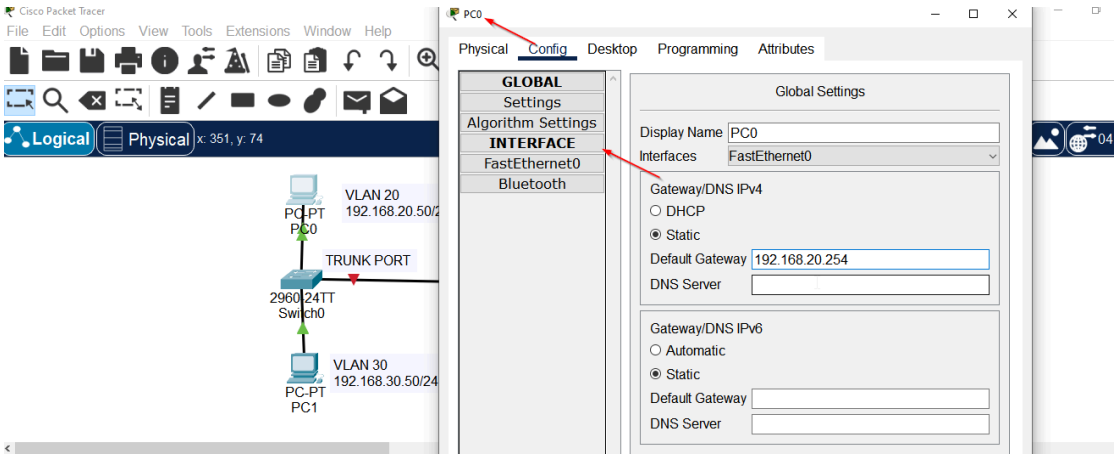
1. Assign VLANs to the PCs:
    - Assign PC0 to VLAN 20 with a subnet of 192.168.20.0.
    - Assign PC1 to VLAN 30 with a subnet of 192.168.30.0.

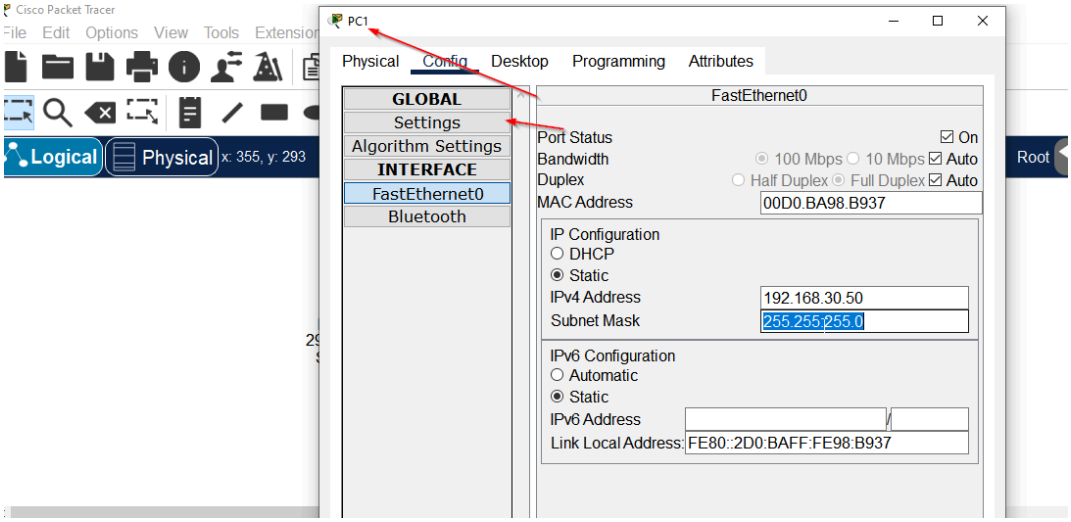


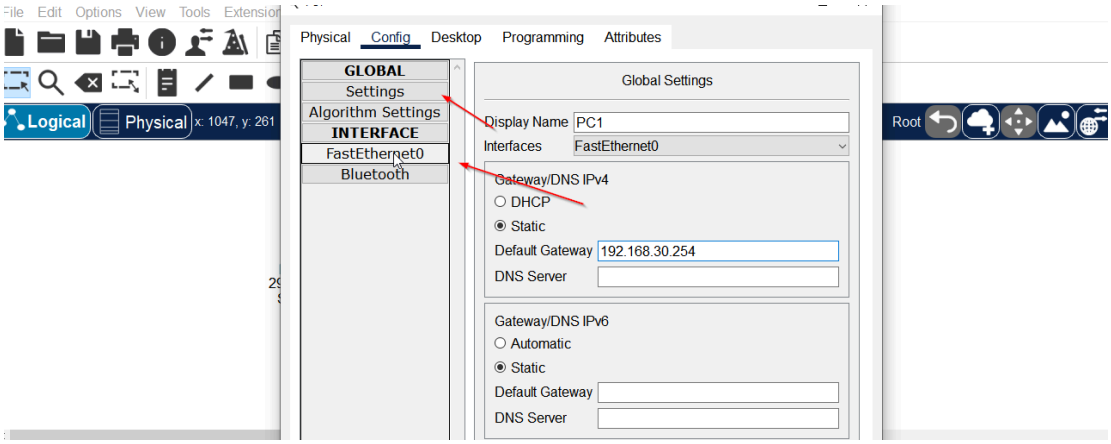
Step 3: Configure PCs

1. Set Static IP Addresses and Default Gateways on the PCs:
    - On PC0, set the IP as 192.168.20.50 and default gateway as 192.168.20.254.
    - On PC1, set the IP as 192.168.30.50 and default gateway as 192.168.30.254.



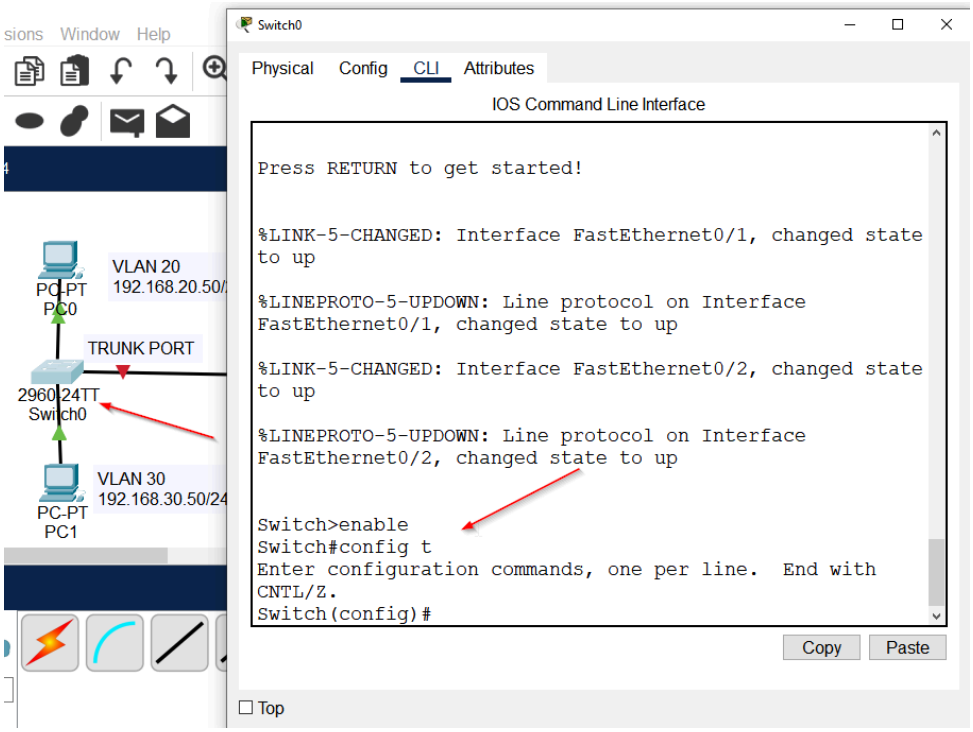






Step 4: Configure the Switch

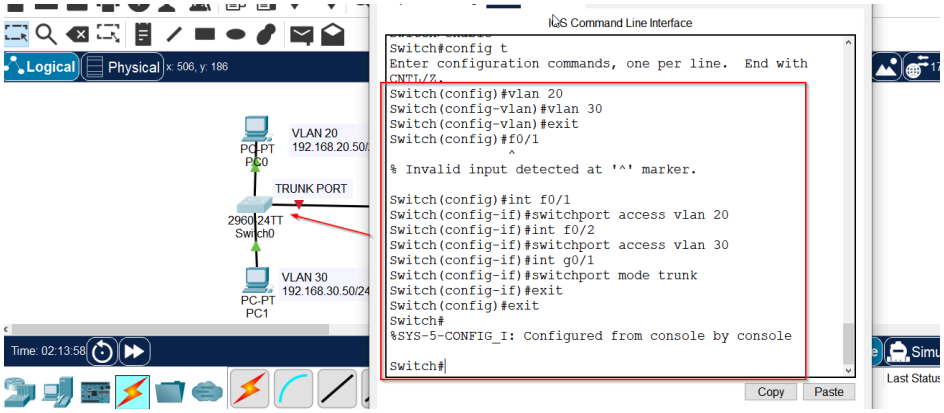
1. Access the Switch CLI and Enter Configuration Mode:

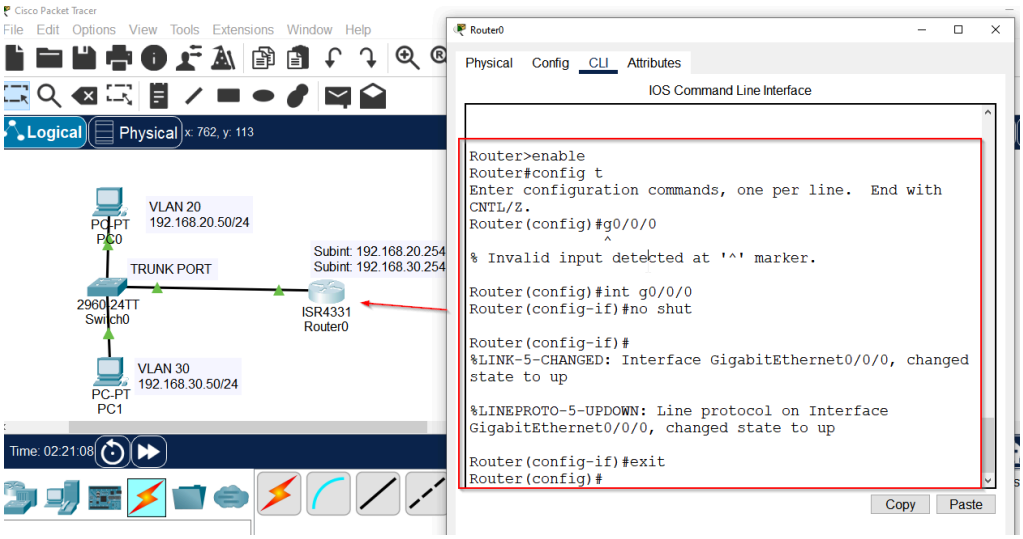


- 2. Create and Assign VLANs:
- vlan 20
- exit
- vlan 30
- exit
- interface FastEthernet0/1
- switchport mode access
- switchport access vlan 20
- exit
- interface FastEthernet0/2
- switchport mode access
- switchport access vlan 30

3. Configure the Trunk Port:

- interface GigabitEthernet0/1
- switchport mode trunk
- exit





Step 5: Configure the Router

Access the Router CLI and Enter Configuration Mode:

- enable
- configure terminal

Enable the Interface Connected to the Switch:

- interface GigabitEthernet0/0
- no shutdown
- exit

Create Subinterfaces for Each VLAN:

For VLAN 20:

- interface GigabitEthernet0/0.20
- encapsulation dot1Q 20
- ip address 192.168.20.254 255.255.255.0
- no shutdown
- exit

For VLAN 30:

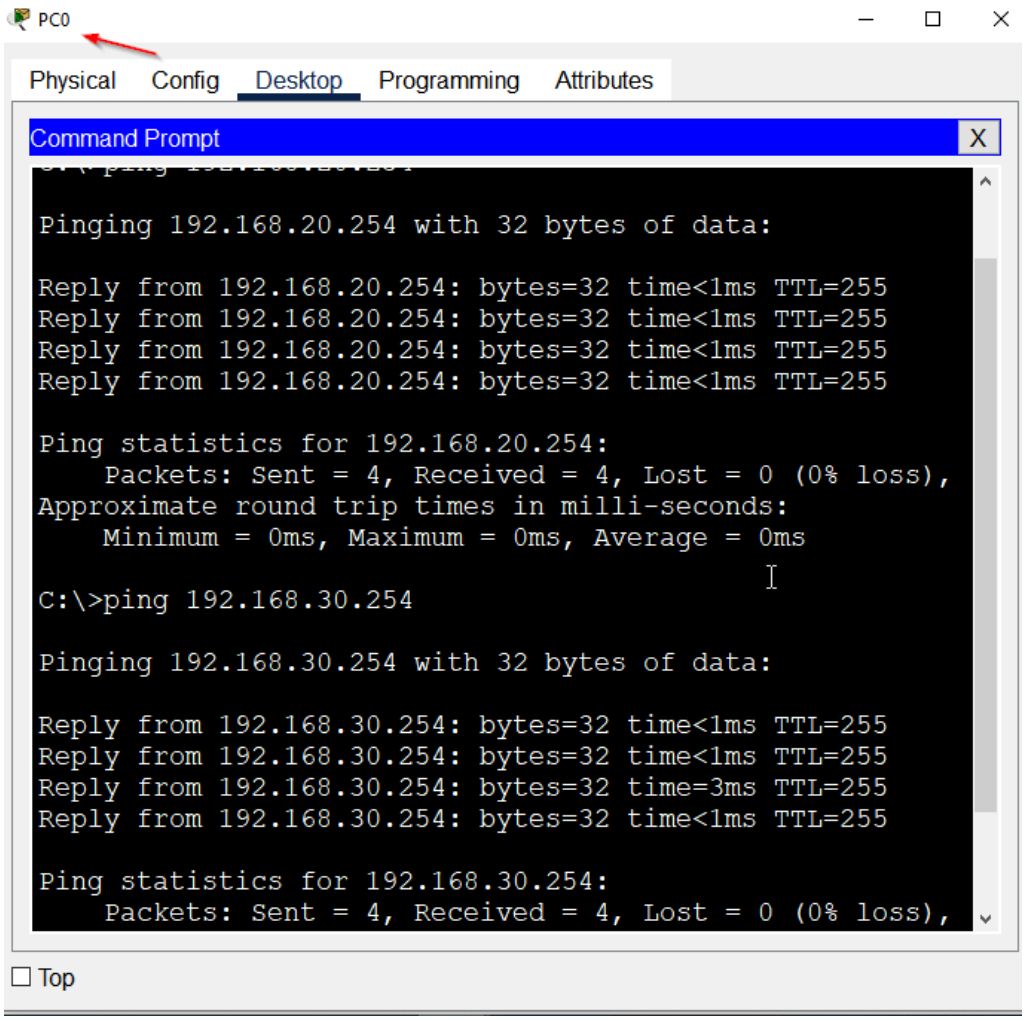
- interface GigabitEthernet0/0.30
- encapsulation dot1Q 30
- ip address 192.168.30.254 255.255.255.0
- no shutdown
- exit

```
Router>
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int g0/0/0
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#int g0/0/0.20
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0.20, changed state to u

Router(config-subif)#enca
Router(config-subif)#encapsulation dot1q 20
Router(config-subif)#ip address 192.168.20.254 255.255.255.0
Router(config-subif)#no shut
Router(config-subif)#exit
```

```
Router(config)#int g0/0/0.30
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0.30, changed st

Router(config-subif)#enc
Router(config-subif)#encapsulation
% Incomplete command.
Router(config-subif)#encapsulation
% Incomplete command.
Router(config-subif)#encapsulation dot1Q 30
Router(config-subif)#ip address 192.168.30.254 255.255.255.0
Router(config-subif)#no shut
Router(config-subif)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
```

Step 6: Test Connectivity

1. Verify Connectivity to Subinterfaces:
    - From PC0, ping its respective default gateway to ensure the subinterfaces are reachable.



2. Test Inter-VLAN Routing:Attempt to ping from PC0 (VLAN 20) to PC1 (VLAN 30) to confirm inter-VLAN communication is successful.

```
C:\>ping 192.168.30.50

Pinging 192.168.30.50 with 32 bytes of data:

Request timed out.
Reply from 192.168.30.50: bytes=32 time<1ms TTL=127
Reply from 192.168.30.50: bytes=32 time<1ms TTL=127
Reply from 192.168.30.50: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.30.50:
    Packets: Sent = 4, Received = 3, Lost = 1 (25%
loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Conclusion

This setup enables each VLAN to operate within its own subnet while allowing controlled routing between them using a single physical interface on the router. This configuration is ideal for small to medium network environments where cost and complexity must be minimized while maintaining the flexibility to control traffic between VLANs.