

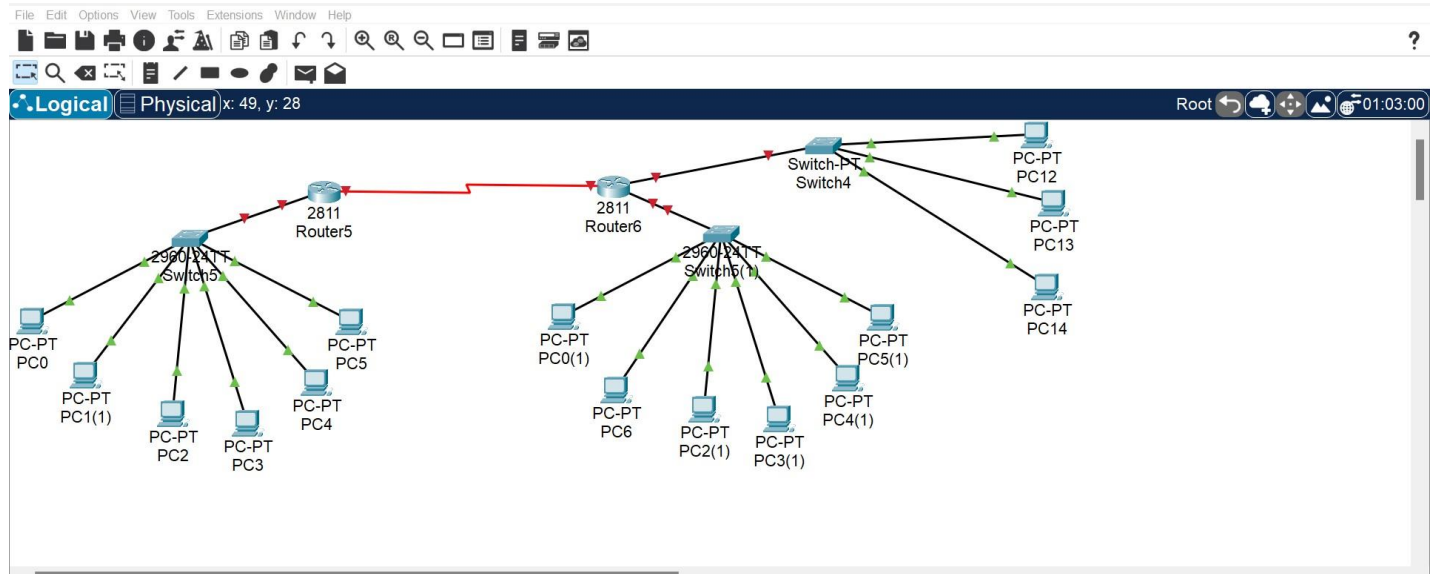
# TASK 6: IP Subnetting in CISCO Packet Tracker

Submitted by: YOUAIL JOHN (EL-19038)

## Designing the Topology and Wiring Devices:

First we layout all the network devices which include PCs, Switches, Routers.

Then we connect PCs to switches via Copper Pass through cable. Similarly Switches are connected to Routers via Copper Pass through cables. And the connection between routers is done with Serial DCE.



To connect routers via Serial DCE connection we have to modify the router with WIC-1T module.

Physical Config CLI Attributes

NM-1E2W  
NM-1FE-FX  
NM-1FE-TX  
NM-1FE2W  
NM-2E2W  
NM-2FE2W  
NM-2W  
NM-4A/S  
NM-4E  
NM-8A/S  
NM-8AM  
NM-Cover  
NM-ESW-161  
HWIC-1GE-SFP  
HWIC-2T  
HWIC-4ESW  
HWIC-8A  
HWIC-AP-AG-B  
WIC-1AM  
WIC-1ENET  
WIC-1T  
WIC-2AM  
WIC-2T  
WIC-Cover  
GLC-LH-SMD

Physical Device View

Zoom In Original Size Zoom Out

Customize Icon in Physical View Customize Icon in Logical View

The WIC-1T provides a single port serial connection to remote sites or legacy serial network devices such as Synchronous Data Link Control (SDLC) concentrators, alarm systems, and packet over SONET (POS) devices.

# Configuring The PCs:

After completing connections. PCs will be configured

PC0

Physical

Config

Desktop

Programming

Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address192.168.1.2

Subnet Mask255.255.255.240

Default Gateway192.168.1.1

DNS Server0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address/

Link Local AddressFE80::207:ECFF:FEC7:2D69

Default Gateway

DNS Server

802.1X

Top

PC1(1)

Physical

Config

Desktop

Programming

Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address192.168.1.3

Subnet Mask255.255.255.192

Default Gateway192.168.1.1

DNS Server0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address/

Link Local AddressFE80::2E0:8FFF:FE67:D745

Default Gateway

DNS Server

802.1X

Top

PC2

Physical

Config

Desktop

Programming

Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address192.168.1.4

Subnet Mask255.255.255.192

Default Gateway192.168.1.1

DNS Server0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address/

Link Local AddressFE80::2D0:BAFF:FE64:1ECE

Default Gateway

DNS Server

802.1X

Top

PC3

Physical

Config

Desktop

Programming

Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address192.168.1.5

Subnet Mask255.255.255.192

Default Gateway192.168.1.1

DNS Server0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address/

Link Local AddressFE80::203:E4FF:FE35:72BE

Default Gateway

DNS Server

802.1X

Top

PC4

Physical

Config

Desktop

Programming

Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address192.168.1.6

Subnet Mask255.255.255.192

Default Gateway192.168.1.1

DNS Server0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address/

Link Local AddressFE80::203:E4FF:FECE:7D97

Default Gateway

DNS Server

802.1X

Top

PC5

Physical

Config

Desktop

Programming

Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address192.168.1.7

Subnet Mask255.255.255.192

Default Gateway192.168.1.1

DNS Server0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address/

Link Local AddressFE80::201:63FF:FE71:EE17

Default Gateway

DNS Server

802.1X

Top

PC6

Physical

Config

Desktop

Programming

Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address192.168.1.18

Subnet Mask255.255.255.240

Default Gateway192.168.1.17

DNS Server0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address/

Link Local AddressFE80::205:5EFF:FEE3:3255

Default Gateway

DNS Server

802.1X

Top

PC7

Physical

Config

Desktop

Programming

Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address192.168.1.19

Subnet Mask255.255.255.240

Default Gateway192.168.1.17

DNS Server0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address/

Link Local AddressFE80::201:C7FF:FEA7:1991

Default Gateway

DNS Server

802.1X

Top

PC8

Physical

Config

Desktop

Programming

Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address192.168.1.20

Subnet Mask255.255.255.240

Default Gateway192.168.1.17

DNS Server0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address/

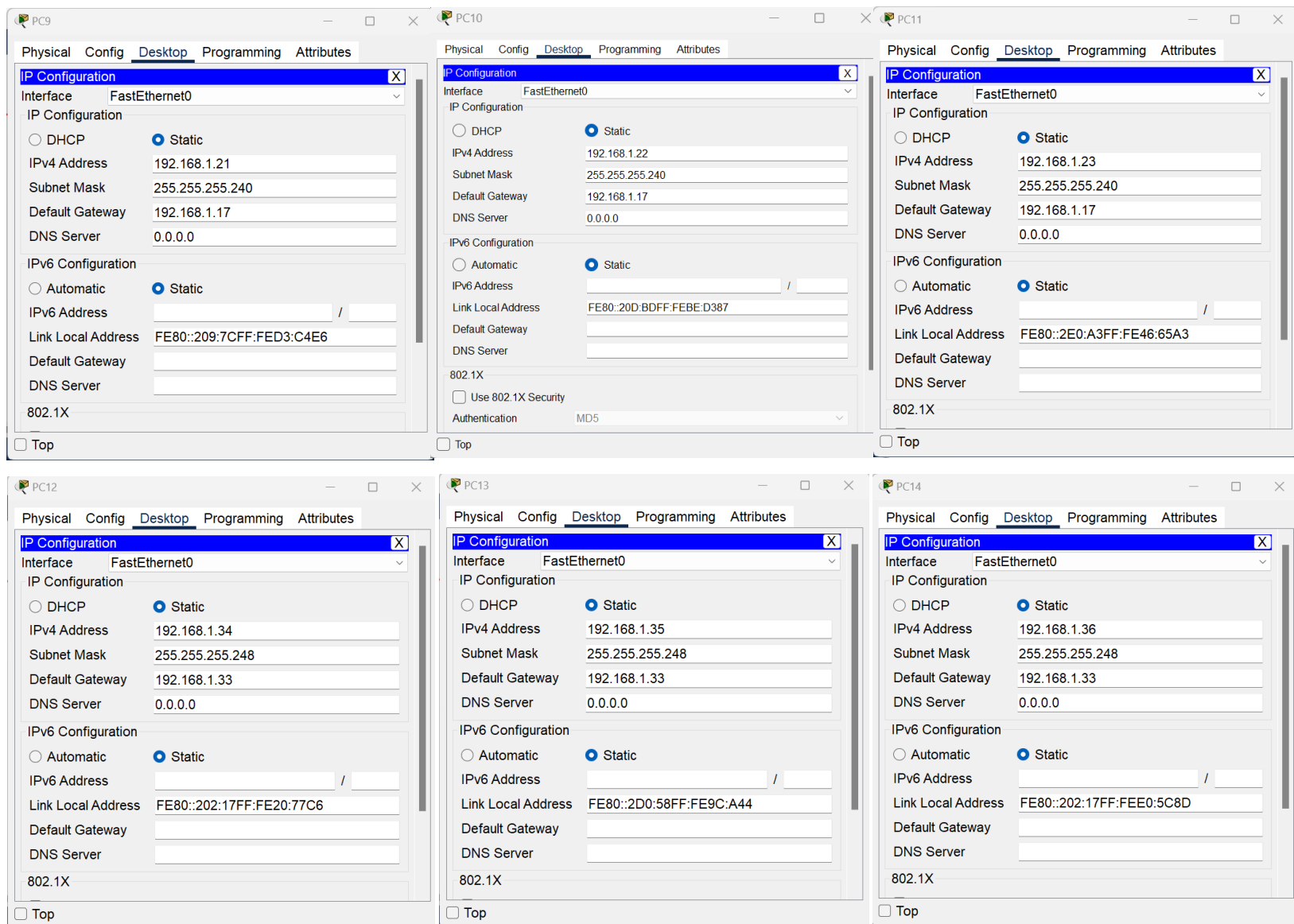
Link Local AddressFE80::2E0:8FFF:FE99:C2C

Default Gateway

DNS Server

802.1X

Top



We have created 3 Networks

In Network 1 assigned IPv4 between 192.168.1.2 upto 192.168.1.7 with subnet mask 255.255.240 with default gateway 192.168.1.1.

In Network 2 assigned IPv4 between 192.168.1.18 upto 192.168.1.23 with subnet mask 255.255.240 with default gateway 192.168.1.17.

In Network 3 assigned IPv4 between 192.168.1.33 upto 192.168.1.36 with subnet mask 255.255.248 with default gateway 192.168.1.33.

Subnet masks are assigned by following calculations

- **For Network1 and Network2**

I need 7 IP address

$$7 = 2^x - 2 \Rightarrow x = 4 \text{ host bits}$$

Octet - 4 = 4 bits borrowed

Subnet mask = 255.255.255.11110000

**255.255.255.240 = /28**

- **For Network3**

I need 4 IP address

$$4 = 2^x - 2 \Rightarrow x = 3 \text{ host bits}$$

Octet - 3 = 5 bits borrowed

Subnet mask = 255.255.255.11111000

**255.255.255.248 = /29**

- **For Network4**

I need 2 IP address

$$2 = 2^x - 2 \Rightarrow x = 2 \text{ host bits}$$

Octet - 2 = 6 bits borrowed

Subnet mask = 255.255.255.11111100

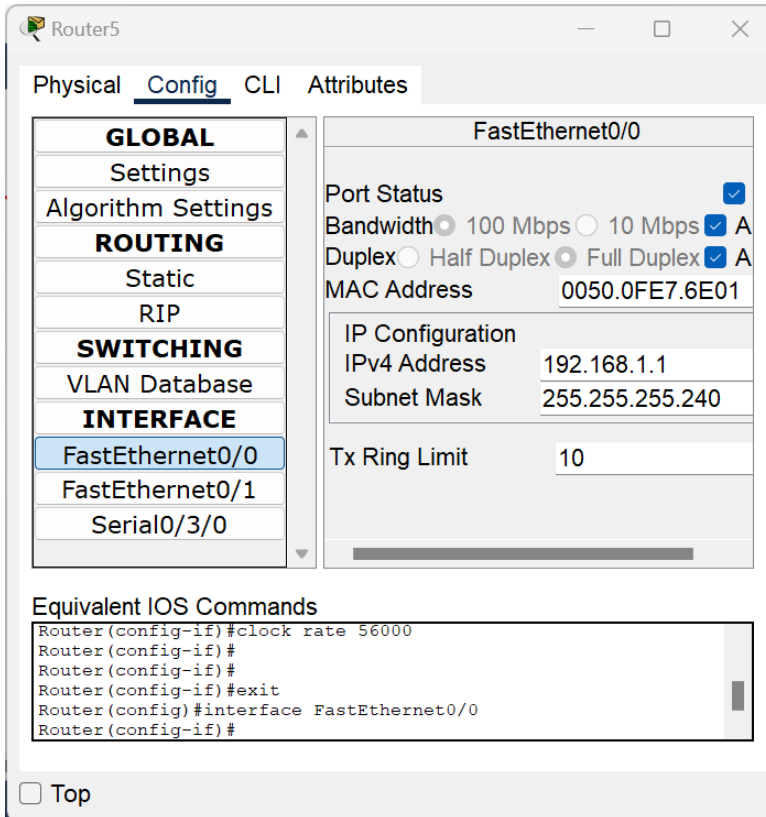
**255.255.255.252 = /30**

## Configuring Routers:

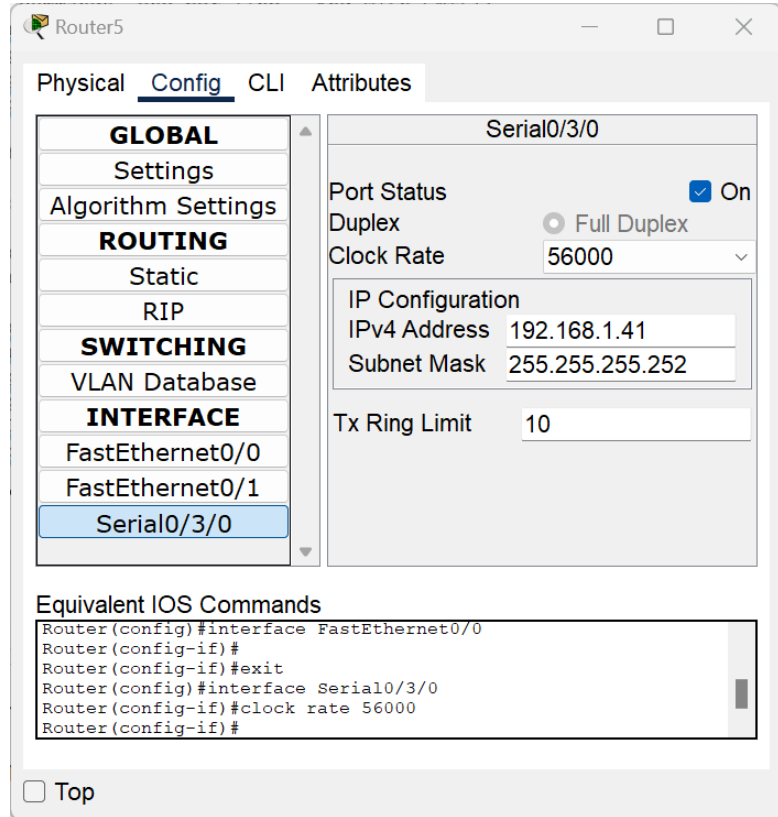
Now we will configure the routers.

In Router 1, first we configure the FastEthernet port which is connected to the switch 1. IPv4 address is 192.168.1.1 which is also the default gate way for Network 1.

Serial0/3/0 port is connected to Router 2 clock rate is set at 56000 IPv4 address assigned is 192.168.41. The 2 routers will also constitute their own network called Network 4 so the subnet mask for which is 255.255.255.252.



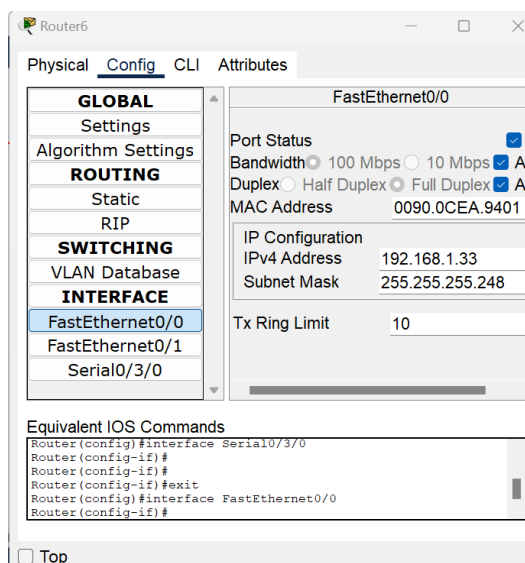
Router5 Config window for FastEthernet0/0. The window shows the configuration for the FastEthernet0/0 interface. The left sidebar has tabs for Physical, Config, CLI, and Attributes. The Config tab is active, showing a tree view with GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under INTERFACE, FastEthernet0/0 is selected. The main area shows the configuration for FastEthernet0/0: Port Status is checked, Bandwidth is 100 Mbps, Duplex is Full Duplex, MAC Address is 0050.0FE7.6E01, IP Configuration shows IPv4 Address 192.168.1.1 and Subnet Mask 255.255.255.240, and Tx Ring Limit is 10. Below the configuration is a section for Equivalent IOS Commands with the following text: Router(config-if)#clock rate 56000, Router(config-if)#, Router(config-if)#, Router(config-if)#exit, Router(config)#interface FastEthernet0/0, Router(config-if)#. There is a Top button at the bottom left.



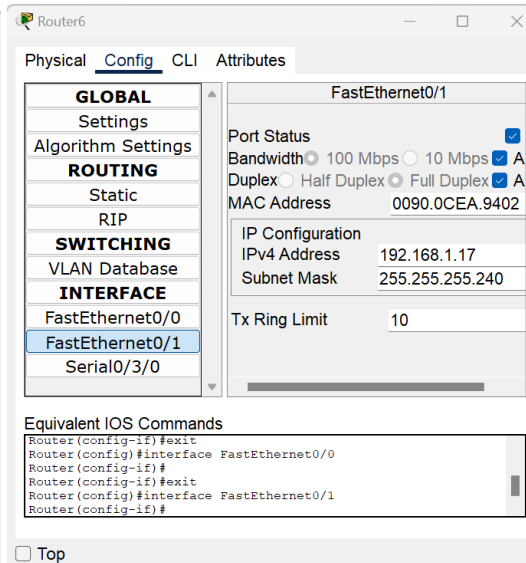
Router5 Config window for Serial0/3/0. The window shows the configuration for the Serial0/3/0 interface. The left sidebar has tabs for Physical, Config, CLI, and Attributes. The Config tab is active, showing a tree view with GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under INTERFACE, Serial0/3/0 is selected. The main area shows the configuration for Serial0/3/0: Port Status is checked, Duplex is Full Duplex, Clock Rate is 56000, IP Configuration shows IPv4 Address 192.168.1.41 and Subnet Mask 255.255.255.252, and Tx Ring Limit is 10. Below the configuration is a section for Equivalent IOS Commands with the following text: Router(config)#interface FastEthernet0/0, Router(config-if)#, Router(config-if)#exit, Router(config)#interface Serial0/3/0, Router(config-if)#clock rate 56000, Router(config-if)#. There is a Top button at the bottom left.

As Router 2 is connected to 2 switches so there are 2 ports connected FastEthernet0/0 for Network 3 and FastEthernet0/1 for Network 2. The default gateway of Network 3 is 192.168.1.33 which is IPv4 address for Router 2 at FastEthernet 0/0 port. Similarly, the default gateway of Network 2 is 192.168.1.17 which is IPv4 address for Router 2 at FastEthernet 0/1 port and we will turn on all the connected ports.

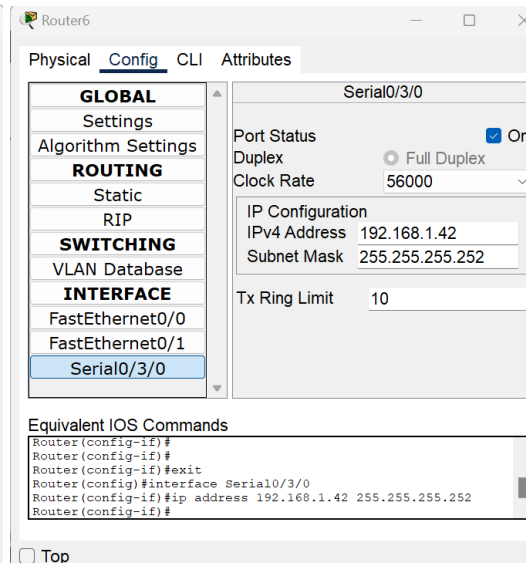
Now for serial port the Subnet mask is same as Router 1 and IPv4 is 192.168.1.42.



Router6 Config window for FastEthernet0/0. The window shows the configuration for the FastEthernet0/0 interface. The left sidebar has tabs for Physical, Config, CLI, and Attributes. The Config tab is active, showing a tree view with GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under INTERFACE, FastEthernet0/0 is selected. The main area shows the configuration for FastEthernet0/0: Port Status is checked, Bandwidth is 100 Mbps, Duplex is Full Duplex, MAC Address is 0090.0CEA.9401, IP Configuration shows IPv4 Address 192.168.1.33 and Subnet Mask 255.255.255.248, and Tx Ring Limit is 10. Below the configuration is a section for Equivalent IOS Commands with the following text: Router(config)#interface Serial0/3/0, Router(config-if)#, Router(config-if)#, Router(config-if)#exit, Router(config)#interface FastEthernet0/0, Router(config-if)#. There is a Top button at the bottom left.



Router6 Config window for FastEthernet0/1. The window shows the configuration for the FastEthernet0/1 interface. The left sidebar has tabs for Physical, Config, CLI, and Attributes. The Config tab is active, showing a tree view with GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under INTERFACE, FastEthernet0/1 is selected. The main area shows the configuration for FastEthernet0/1: Port Status is checked, Bandwidth is 100 Mbps, Duplex is Full Duplex, MAC Address is 0090.0CEA.9402, IP Configuration shows IPv4 Address 192.168.1.17 and Subnet Mask 255.255.255.240, and Tx Ring Limit is 10. Below the configuration is a section for Equivalent IOS Commands with the following text: Router(config-if)#exit, Router(config)#interface FastEthernet0/0, Router(config-if)#, Router(config-if)#exit, Router(config-if)#exit, Router(config)#interface FastEthernet0/1, Router(config-if)#. There is a Top button at the bottom left.



Router6 Config window for Serial0/3/0. The window shows the configuration for the Serial0/3/0 interface. The left sidebar has tabs for Physical, Config, CLI, and Attributes. The Config tab is active, showing a tree view with GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under INTERFACE, Serial0/3/0 is selected. The main area shows the configuration for Serial0/3/0: Port Status is checked, Duplex is Full Duplex, Clock Rate is 56000, IP Configuration shows IPv4 Address 192.168.1.42 and Subnet Mask 255.255.255.252, and Tx Ring Limit is 10. Below the configuration is a section for Equivalent IOS Commands with the following text: Router(config-if)#, Router(config-if)#, Router(config-if)#exit, Router(config)#interface Serial0/3/0, Router(config-if)#ip address 192.168.1.42 255.255.255.252, Router(config-if)#. There is a Top button at the bottom left.

Now we establish Static Routing so the data between the routers can be sent and received as well. For Router 1 as it is receiving data from 2 networks i.e. Network 2 and Network 3. So we defined both separately.

The screenshot shows the configuration window for Router5. The 'Config' tab is active, and the 'Static' option under the 'ROUTING' section is selected. The 'Static Routes' section contains the following fields: Network (192.168.1.32), Mask (255.255.255.248), and Next Hop (192.168.1.42). Below these fields is an 'Add' button. A list of 'Network Address' entries shows two configured routes: '192.168.1.16/28 via 192.168.1.42' and '192.168.1.32/29 via 192.168.1.42'. A 'Remove' button is located at the bottom right of this list. The 'Equivalent IOS Commands' section at the bottom displays the following commands: 

```
Router(config)#interface Serial0/3/0
Router(config-if)#ip address 192.168.1.41 255.255.255.252
Router(config-if)#
Router(config-if)#
Router(config-if)#exit
Router(config)#
Router(config)#ip route 192.168.1.16 255.255.255.248
```

In Router 1 similar thing is done but for Network 1 only.

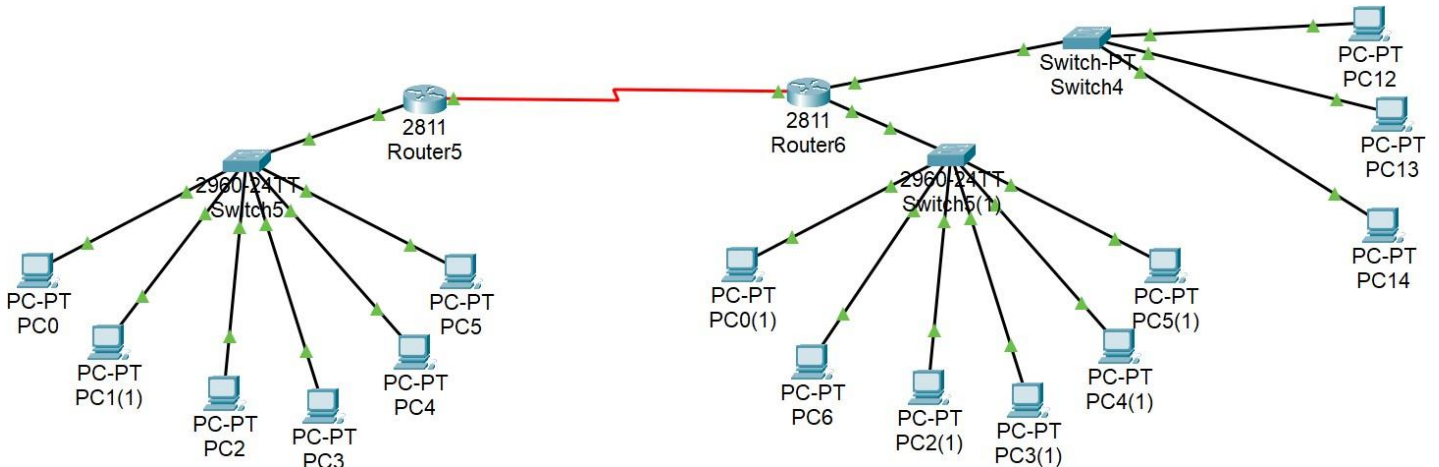
The screenshot shows the configuration window for Router6. The 'Config' tab is active, and the 'Static' option under the 'ROUTING' section is selected. The 'Static Routes' section contains the following fields: Network (empty), Mask (empty), and Next Hop (empty). Below these fields is an 'Add' button. A list of 'Network Address' entries shows one configured route: '192.168.1.0/28 via 192.168.1.42'. A 'Remove' button is located at the bottom right of this list. The 'Equivalent IOS Commands' section at the bottom displays the following commands: 

```
Router(config)#router rip
Router(config-router)#
Router(config-router)#end
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
```



## Verification

All the connections are green proving that connections are established.



PC1 pings to PC5 (IPv4 address: 192.168.1.7) successfully which is within the Network 1, which proves communication within network is successful.

```
PC1
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.7

Pinging 192.168.1.7 with 32 bytes of data:

Reply from 192.168.1.7: bytes=32 time<1ms TTL=128
Reply from 192.168.1.7: bytes=32 time<1ms TTL=128
Reply from 192.168.1.7: bytes=32 time<1ms TTL=128
Reply from 192.168.1.7: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.1.7:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

PC1 pings to PC12 (IPv4 address: 192.168.1.33) successfully which is in Network 3, which proves communication with other networks is also successful.

```
PC1
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.33

Pinging 192.168.1.33 with 32 bytes of data:

Reply from 192.168.1.33: bytes=32 time=1ms TTL=254
Reply from 192.168.1.33: bytes=32 time=1ms TTL=254
Reply from 192.168.1.33: bytes=32 time=1ms TTL=254
Reply from 192.168.1.33: bytes=32 time=16ms TTL=254

Ping statistics for 192.168.1.33:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 16ms, Average = 4ms

C:\>
```