Name : Jawad Ahmed

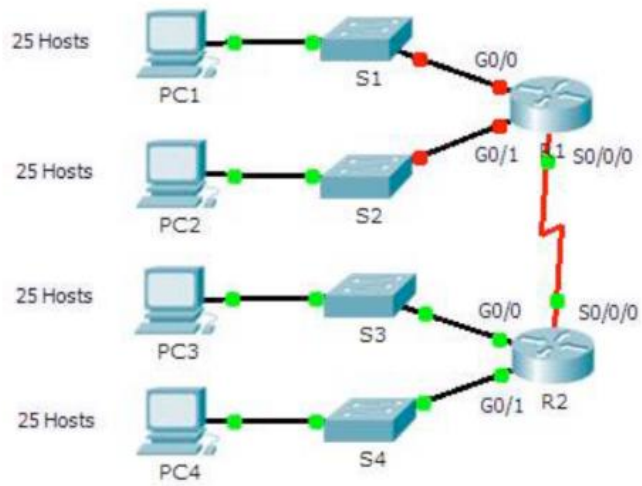
Roll No : 20P-0165

Section : BCS-5A

LAB 11 Task

Lab Tasks:

Topology A:



Questions:

1. Based on the topology, how many subnets are needed?

Ans: Based on the topology five subnets are needed.

Reason:

- One Network for Router one (R1) G0/0.
- One Network for Router one (R1) G0/1.
- One Network for Router two (R2) G0/0.
- One Network for Router two (R2) G0/1.
- One Network for Router one (R1) S0/0/0 and same network for Router two (R2) S0/0/0.

2. How many bits must be borrowed to support the number of subnets in the topology?

Ans: Three bits must be borrowed to supports five subnets in the topology.

Reason:

Three bits will be reserved from host bits so total possible subnets will be **2^3 = 8**. That mean 8 subnets can be made by borrowing three bits. If we borrow two bits then possible subnets will be **2^2 = 4**. That is why three bits need to be borrowed to create five subnets.

3. How many subnets does this create?

Ans: This will create eight subnets.

Reason:

We have borrowed three bits so possible subnets will be 2^3 = 8 subnets.

4. How many usable hosts does this create per subnet?

Ans: This will create 30 usable hosts per subnet.

Reason:

Initially there are eight bits in the host. We have reserved three bits for network. Five bits are left for host. So Possible host can create with five bits will be 2^5 = 32 host. First and last host cannot be used so 32 – 2 = 30 Usable Hosts.

5. Calculate the binary value for the first five subnets. The first two subnets have been done for you.

Ans:

Subnet	Network Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	**192.168.100.**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1	**192.168.100.**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
2	**192.168.100.**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
3	**192.168.100.**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**
4	**192.168.100.**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

6. Calculate the binary and decimal value of the new subnet mask.

Binary Value of the new subnet Mask will be:

11111111 . 11111111 . 11111111 . 11100000

First Octet Second Octet Third Octet Fourth Octet

Decimal Value of the New subnet Mask:

255 . 255 . 255 . 244

Frist Decimal Octet Second Decimal Octet Third Decimal Octet Fourth Decimal Octet

7. Fill in the Subnet Table, listing the decimal value of all available subnets, the first and last usable host address, and the broadcast address. Repeat until all addresses are listed.

Note: You may not need to use all rows.

Subnet Table

Subnet Number	Subnet Address	First Usable Host Address	Last Usable Host Address	Broadcast Address
1	192.168.100.0	192.168.100.1	192.168.100.30	192.168.100.31
2	192.168.100.32	192.168.100.33	192.168.100.62	192.168.100.63
3	192.168.100.64	192.168.100.65	192.168.100.94	192.168.100.95
4	192.168.100.96	192.168.100.97	192.168.100.126	192.168.100.127
5	192.168.100.128	192.168.100.129	192.168.100.158	192.168.100.159
6	192.168.100.160	192.168.100.161	192.168.100.190	192.168.100.191
7	192.168.100.192	192.168.100.193	192.168.100.222	192.168.100.223
8	192.168.100.224	192.168.100.225	192.168.100.254	192.168.100.255

Step 2: Assign the subnets to the network shown in the topology.

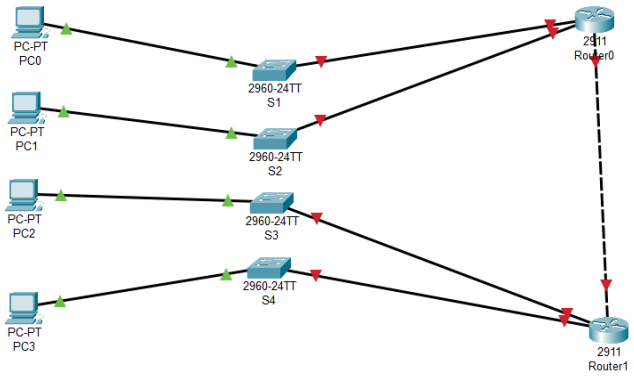
a) Assign Subnet 0 to the LAN connected to the GigabitEthernet 0/0 interface of R1:

b) Assign Subnet 1 to the LAN connected to the GigabitEthernet 0/1 interface of R1:

c) Assign Subnet 2 to the LAN connected to the GigabitEthernet 0/0 interface of R2:

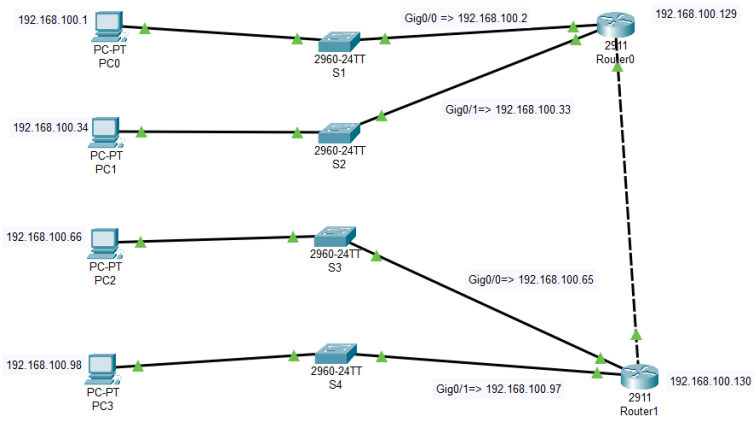
d) Assign Subnet 3 to the LAN connected to the GigabitEthernet 0/1 interface of R2:

e) Assign Subnet 4 to the WAN link between R1 to R2:

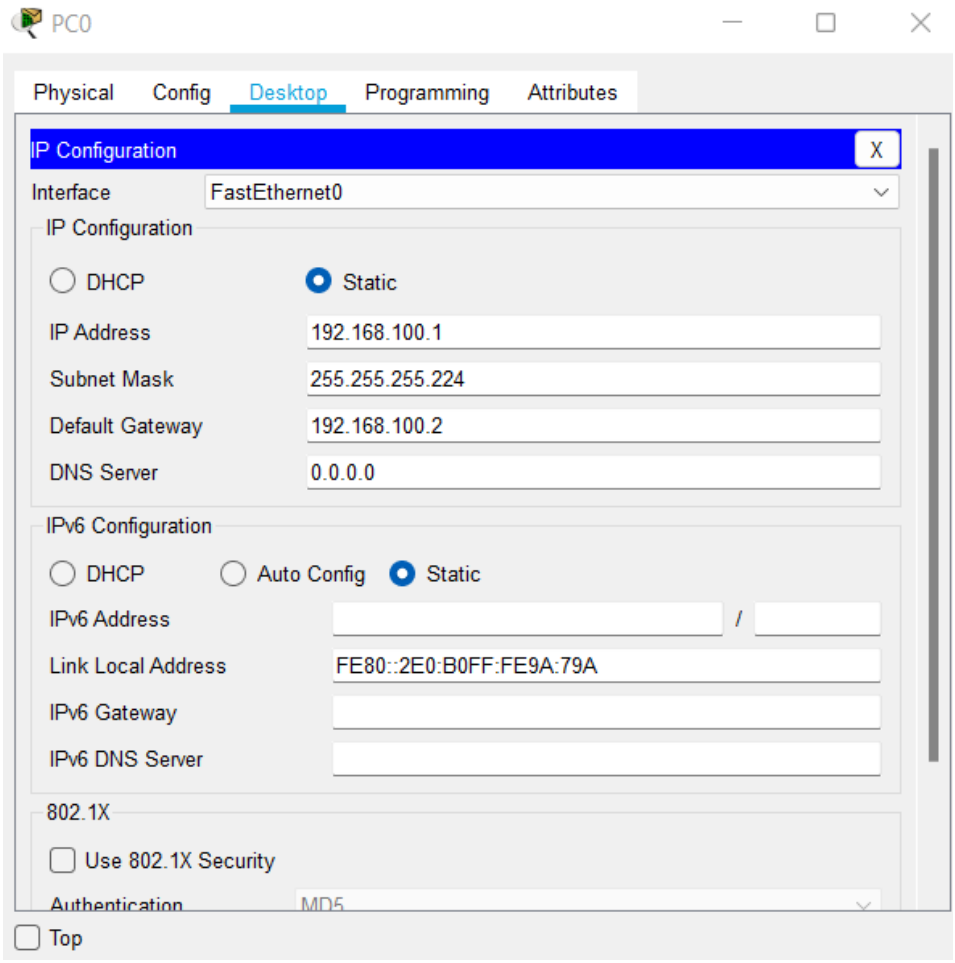


Step 3: Document the addressing scheme.

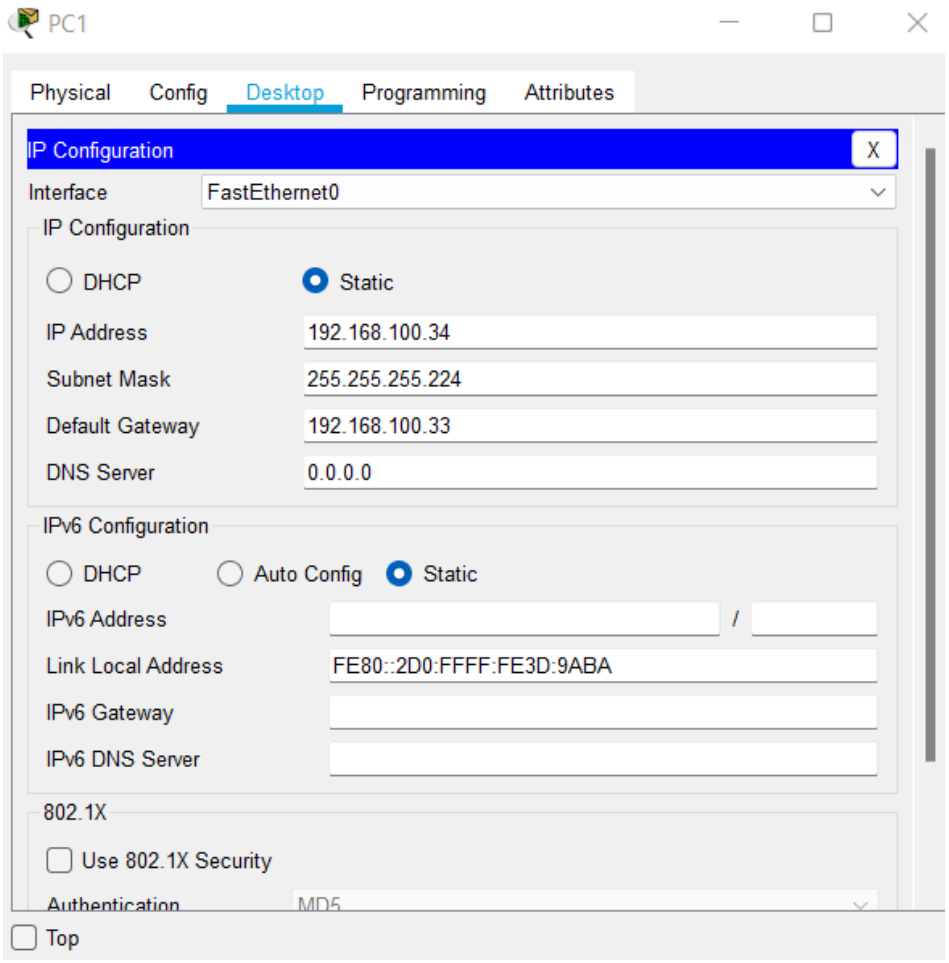
Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	GigabitEthernet0/0	192.168.100.1	255.255.255.224	#
//	GigabitEthernet0/1	192.168.100.33	255.255.255.224	#
//	GigabitEthernet0/2	192.168.100.129	255.255.255.224	#
R2	GigabitEthernet0/0	192.168.100.65	255.255.255.224	#
//	GigabitEthernet0/1	192.168.100.97	255.255.255.224	#
//	GigabitEthernet0/2	192.168.100.130	255.255.255.224	#
PC1	NIC	192.168.100.2	255.255.255.224	192.168.100.1
PC2	NIC	192.168.100.34	255.255.255.224	192.168.100.33
PC3	NIC	192.168.100.66	255.255.255.224	192.168.100.65
PC4	NIC	192.168.100.98	255.255.255.224	192.168.100.97



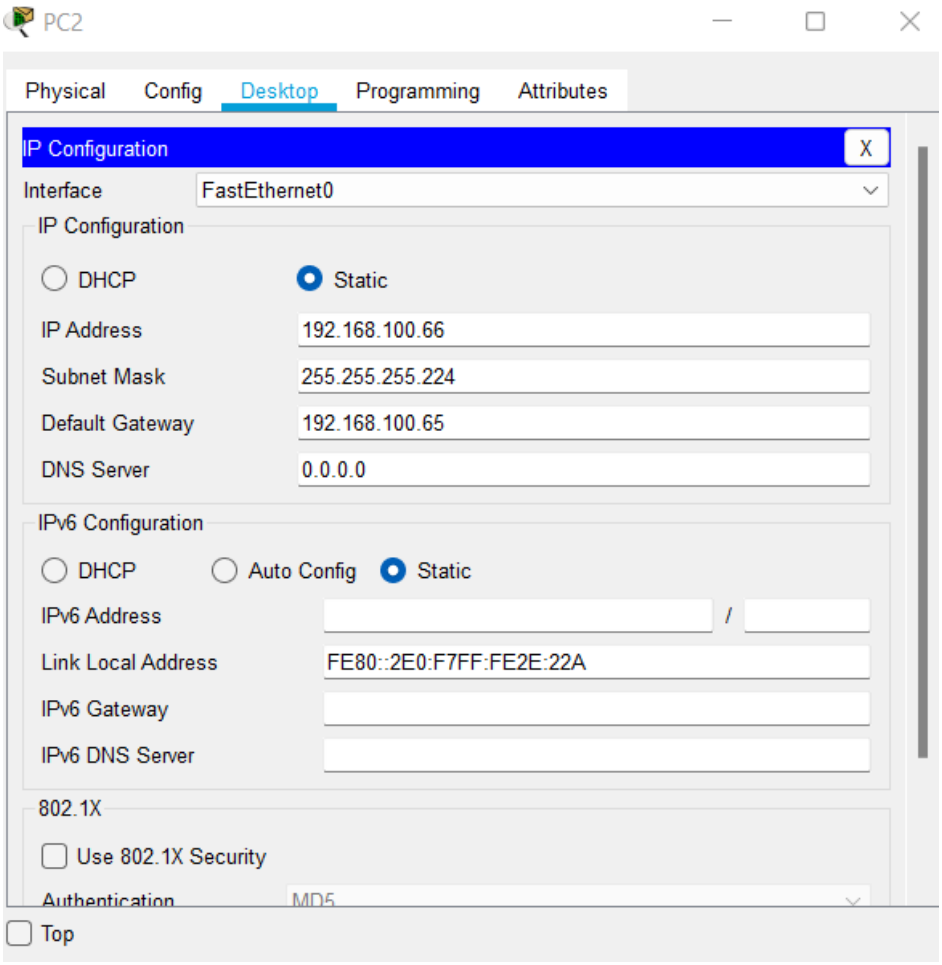
PC0 IP Configuration:



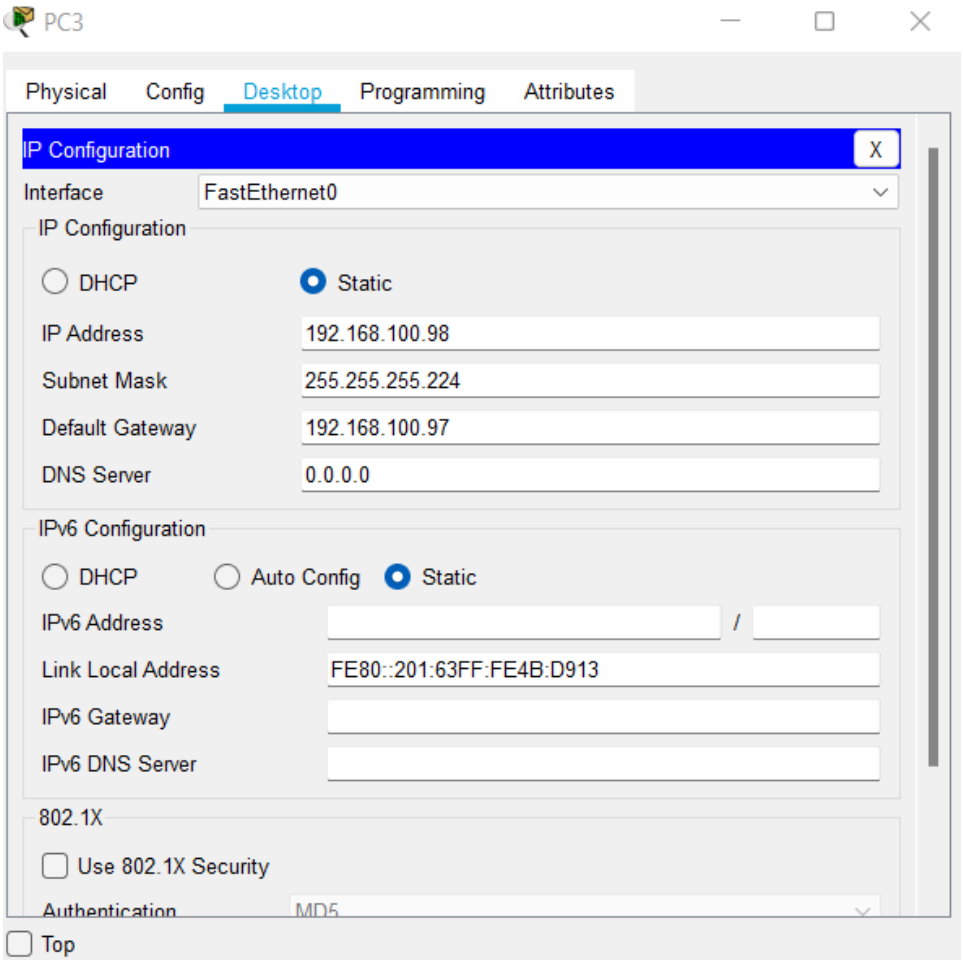
PC1 IP Configuration:



PC2 IP Configuration:



PC3 IP Configuration:



Router R1 Configuration:

```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip address 192.168.100.1 255.255.255.244
Bad mask 0xFFFFFFF4 for address 192.168.100.1
Router(config-if)#ip address 192.168.100.2 255.255.255.244
Bad mask 0xFFFFFFF4 for address 192.168.100.2
Router(config-if)#ip address 192.168.100.2 255.255.255.224
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to
up

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

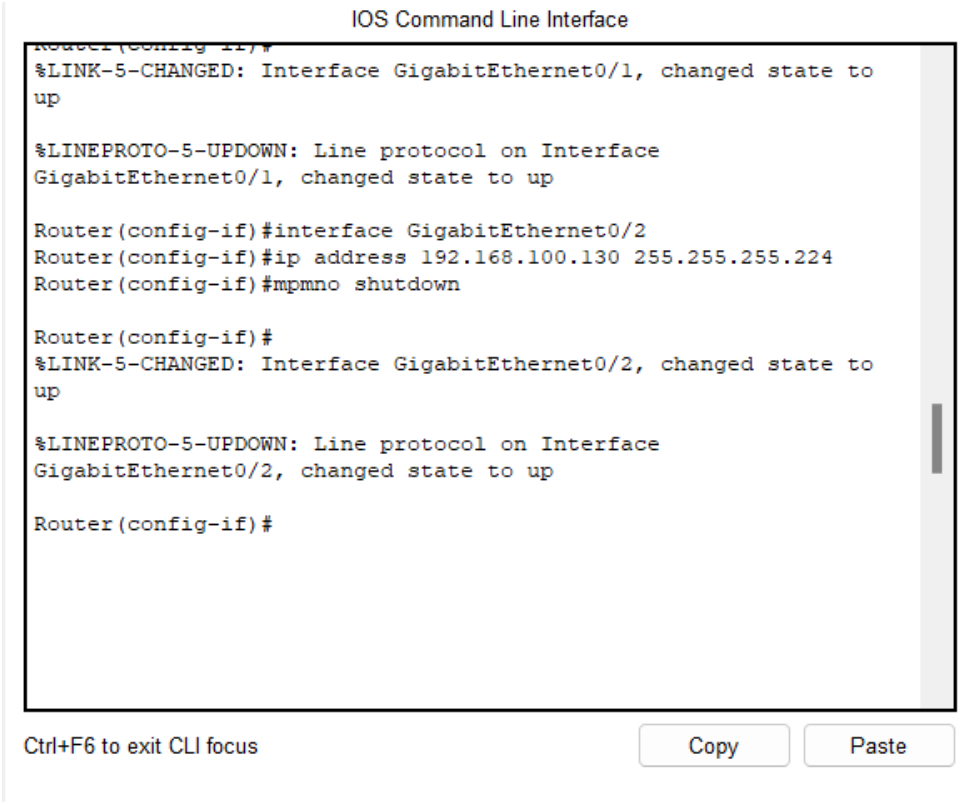
```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface GigabitEthernet0/1
Router(config-if)#ip address 192.168.100.33 255.255.255.224
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to
up

%LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/1, changed state to up

Router(config-if)#interface GigabitEthernet0/2
Router(config-if)#ip address 192.168.100.129 255.255.255.224
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to
up
```

Ctrl+F6 to exit CLI focus Copy Paste

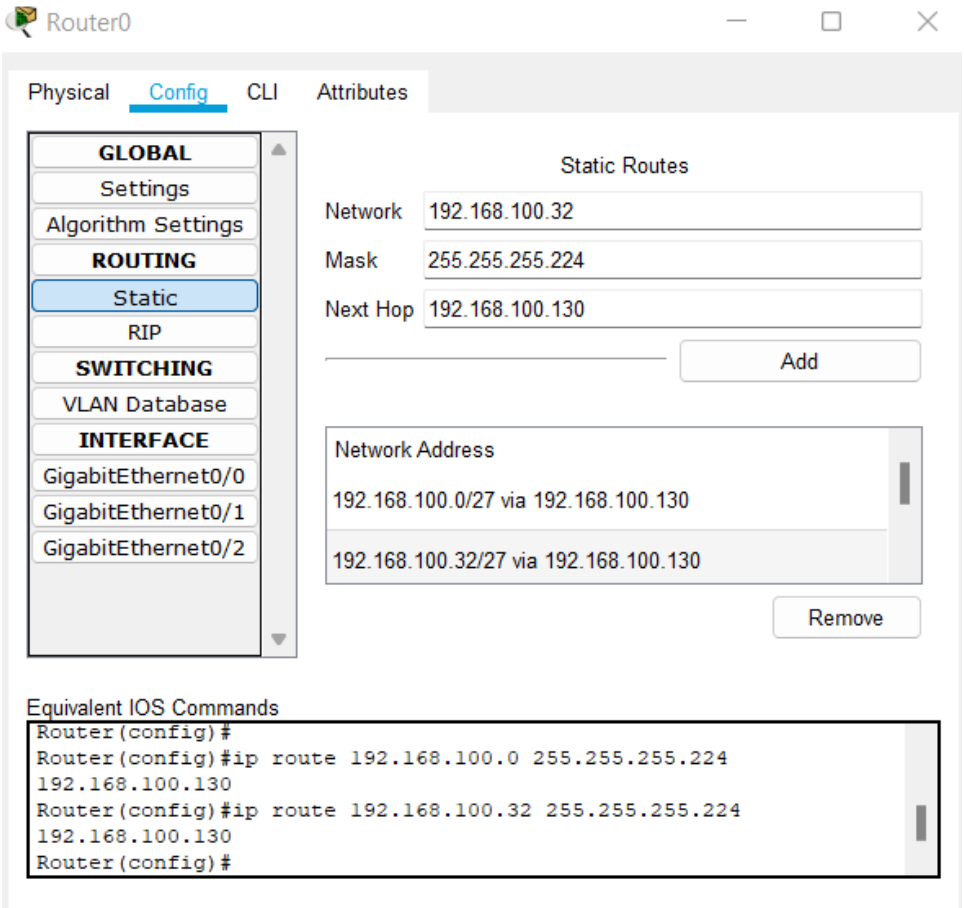
Router R2 Configuration:

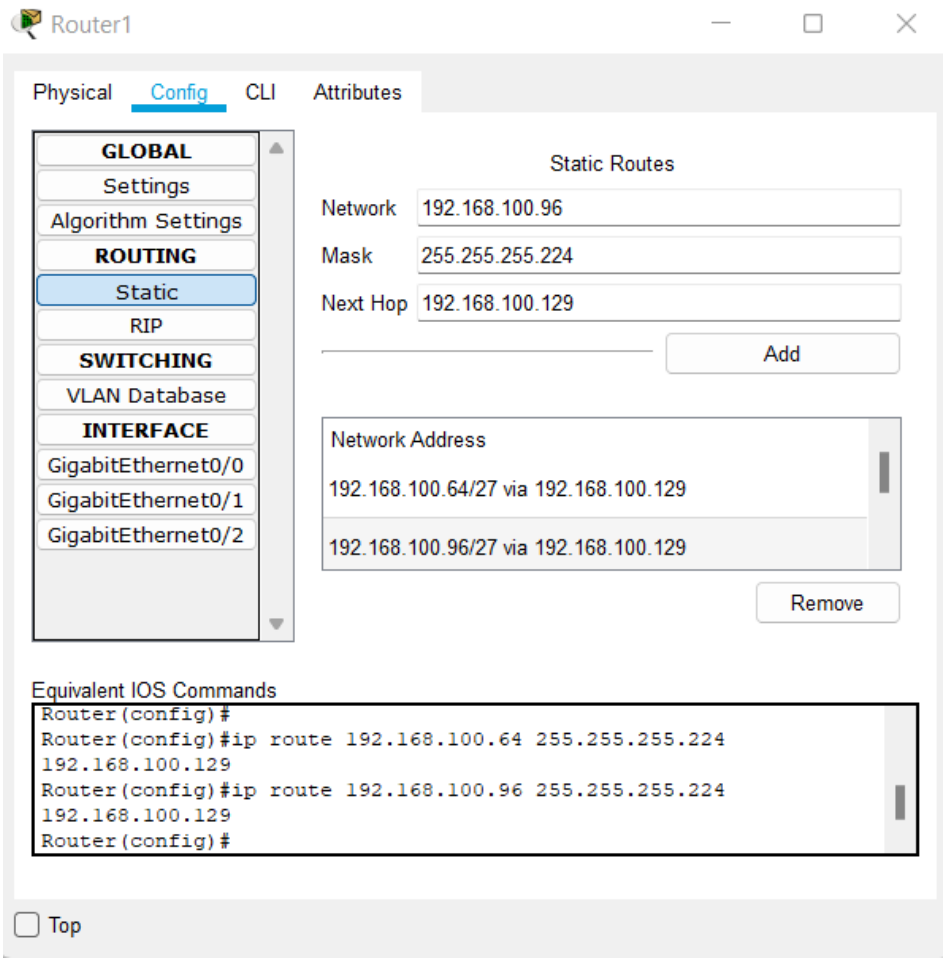
```
Press RETURN to get started!



Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip address 192.168.100.65
% Incomplete command.
Router(config-if)#ip address 192.168.100.65 255.255.255.224
Router(config-if)#mpmno shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to
up

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

Router(config-if)#ipiinterface GigabitEthernet0/1
Router(config-if)#ip address 192.168.100.97 255.255.255.224
Router(config-if)#no shutdown
```

Ctrl+F6 to exit CLI focus Copy Paste

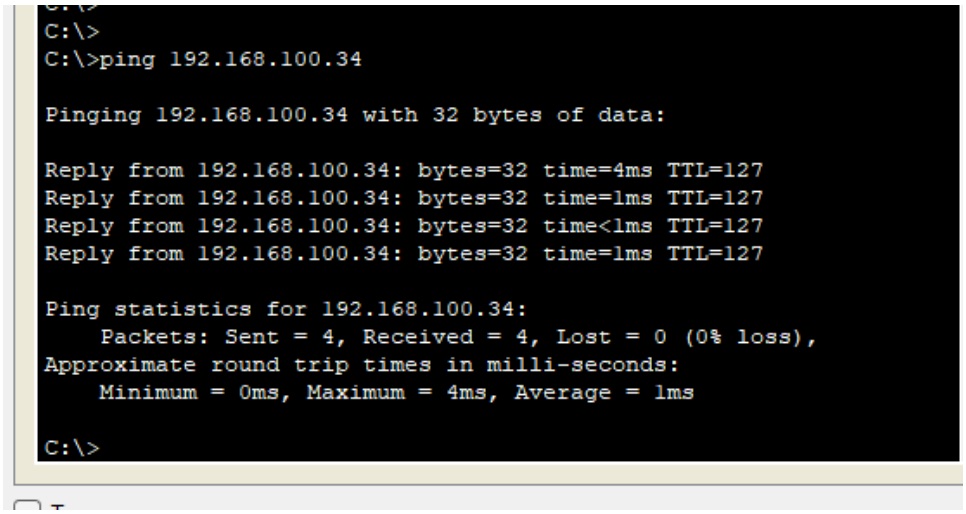


Static Routing:


Router0
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0
GigabitEthernet0/1
GigabitEthernet0/2
Static Routes
Network 192.168.100.32
Mask 255.255.255.224
Next Hop 192.168.100.130
Add
Network Address
192.168.100.0/27 via 192.168.100.130
192.168.100.32/27 via 192.168.100.130
Remove
Equivalent IOS Commands
Router(config)#
Router(config)#ip route 192.168.100.0 255.255.255.224
192.168.100.130
Router(config)#ip route 192.168.100.32 255.255.255.224
192.168.100.130
Router(config)#



Communication Between PC0 and PC1:



Topology B:

Step 1: Determine the number of subnets in Network Topology B.

a. How many subnets are there?

Ans: There are **six** subnets in the given Network Topology.

b. How many bits should you borrow to create the required number of subnets?

Ans: Three bits to borrow to create the required number of subnets.

c. How many usable host addresses per subnet are in this addressing scheme?

Ans: 2 ^ 5 = 32 => 32 – 2 => 30 usable host addresses per subnet in this addressing scheme.

Reason:

Subtracting 2 from it as first and last address cannot be used.

d. What is the new subnet mask in dotted decimal format?

Ans: 255.255.255.224

Reason:

Binary representation of the subnet mask => **11111111.11111111.11111111.11100000.**

(11111111)2 = 255

(11100000)2 = 224

e. How many subnets are available for future use?

Ans: Two subnets are available for future use.

Reason:

Possible subnets = 2 ^ 3 = 8

Six are used in the given network topology. So (8 – 6) => 2 available for future use.

Step 2: Record the subnet information.

Fill in the following table with the subnet information:

Calculation:

First Usable Host for 192.168.10.0.

- First address cannot be used because it is used to identify the network so 192.168.10.1 will be going to be the first usable host address.

Last Usable Host for 192.168.10.0.

- To calculate the last usable host address that will be first three bits of the last octets will be zero. The next five bits will be one.
- 192.168.10.00011111 => 192.168.10.31
- Last address is used for broadcasting so the last usable host will be **192.168.10.30**.

Broadcast Address for 192.168.10.0:

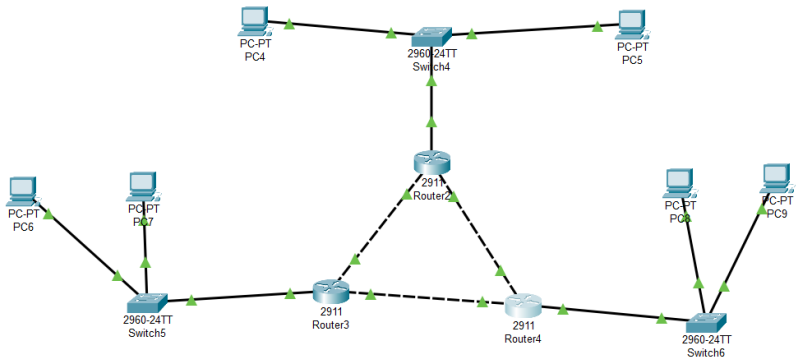
- Network Address = IP Address AND Subnet Mask => 192.168.10.0
- **Bits to make 1 of network addres**s = (IPV4 total bits) - (Network Bits)
- = 32 – 27
- **Bits to make 1 of network address = 5**
- **Network Address = 192.168.10.00000000**
- **Broadcast Address = 192.168.10.00011111**
- **Result => Broadcast Address = 192.168.10.31**

Step 3: Assign addresses to network devices in the subnets.

a. Fill in the following table with IP addresses and subnet masks for the router interfaces:

Device	Interface	IP Address	Subnet Mask
R1	**GigabitEthernet 0/1**	**192.168.10.1**	**255.255.255.224**
	Serial 0/0/0	**192.168.10.33**	**255.255.255.224**
	Serial 0/0/1	**192.168.10.65**	**255.255.255.224**
R2	**GigabitEthernet 0/1**	**192.168.10.97**	**255.255.255.224**
	Serial 0/0/0	**192.168.10.34**	**255.255.255.224**
	Serial 0/0/1	**192.168.10.129**	**255.255.255.224**
R3	**GigabitEthernet 0/1**	**192.168.10.161**	**255.255.255.224**
	Serial 0/0/0	**192.168.10.66**	**255.255.255.224**
	Serial 0/0/1	**192.168.10.130**	**255.255.255.224**

Topology in Cisco Packet Tracer



Verifying PC's Communication:

```
C:\>ping 192.168.10.163

Pinging 192.168.10.163 with 32 bytes of data:

Reply from 192.168.10.163: bytes=32 time<1ms TTL=128
Reply from 192.168.10.163: bytes=32 time<1ms TTL=128
Reply from 192.168.10.163: bytes=32 time<1ms TTL=128
Reply from 192.168.10.163: bytes=32 time=1ms TTL=128

Ping statistics for 192.168.10.163:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

///