NST21022 - Practical for Network Switching and Routing

Department of Information and Communication Technology

Faculty of Technology

Lab sheet :06
Reg. Number: SEU/IS/20/ICT/084
Academic Year :2020/2021
Practical No :06

Title: Internet Protocol version 4 (IPv4) Subnet

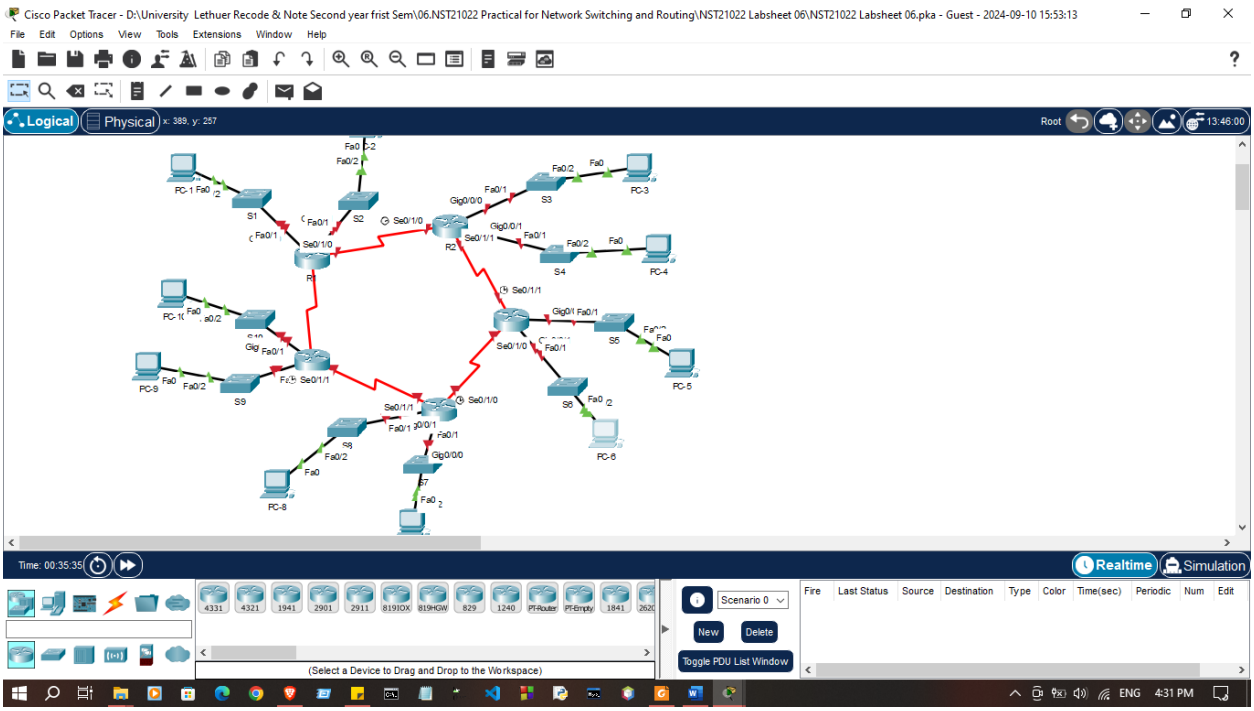
Aim:

- IP addressing scheme.
- Getting familiar with IPv4 subnets
- Configure devices with IPv4 after subnetting.

Task:

- Design an IP scheme.
- Subnet the IPv4 address
- Assign IP address to Network devices and verify connectivity

Use "NST21022 Labsheet 06.pka" file Activities



Exercise 01: Subnet the 172.16.1.0/24 network into the appropriate number of subnets.

1. Based on the topology, how many subnets were needed?
    - 15
2. How many bits must be borrowed to support the number of subnets in the topology table?
    - 4
3. How many subnets does this create?
    - 16

Exercise 02: Fill the subnet table

Subnet Number	Network Address	First Usable Host Address	Last Usable Host Address	Broadcast Address
1	172.16.1.0	172.16.1.1	172.16.1.15	172.16.1.15
2	172.16.1.16	172.16.1.17	172.16.1.30	172.16.1.31
3	172.16.1.32	172.16.1.33	172.16.1.46	172.16.1.47
4	172.16.1.48	172.16.1.49	172.16.1.62	172.16.1.63
5	172.16.1.64	172.16.1.65	172.16.1.78	172.16.1.79
6	172.16.1.80	172.16.1.81	172.16.1.94	172.16.1.95
7	172.16.1.96	172.16.1.97	172.16.1.110	172.16.1.111
8	172.16.1.112	172.16.1.113	172.16.1.126	172.16.1.127
9	172.16.1.128	172.16.1.129	172.16.1.142	172.16.1.143
10	172.16.1.144	172.16.1.145	172.16.1.158	172.16.1.159
11	172.16.1.160	172.16.1.161	172.16.1.174	172.16.1.175
12	172.16.1.176	172.16.1.177	172.16.1.190	172.16.1.191
13	172.16.1.192	172.16.1.193	172.16.1.206	172.16.1.207
14	172.16.1.208	172.16.1.209	172.16.1.222	172.16.1.223
15	172.16.1.224	172.16.1.225	172.16.1.238	172.16.1.239
16	172.16.1.240	172.16.1.241	172.16.1.254	172.16.1.255

Exercise 03: Configure IP address according to following criteria.

1. Assign the subnets to the network shown in the topology.

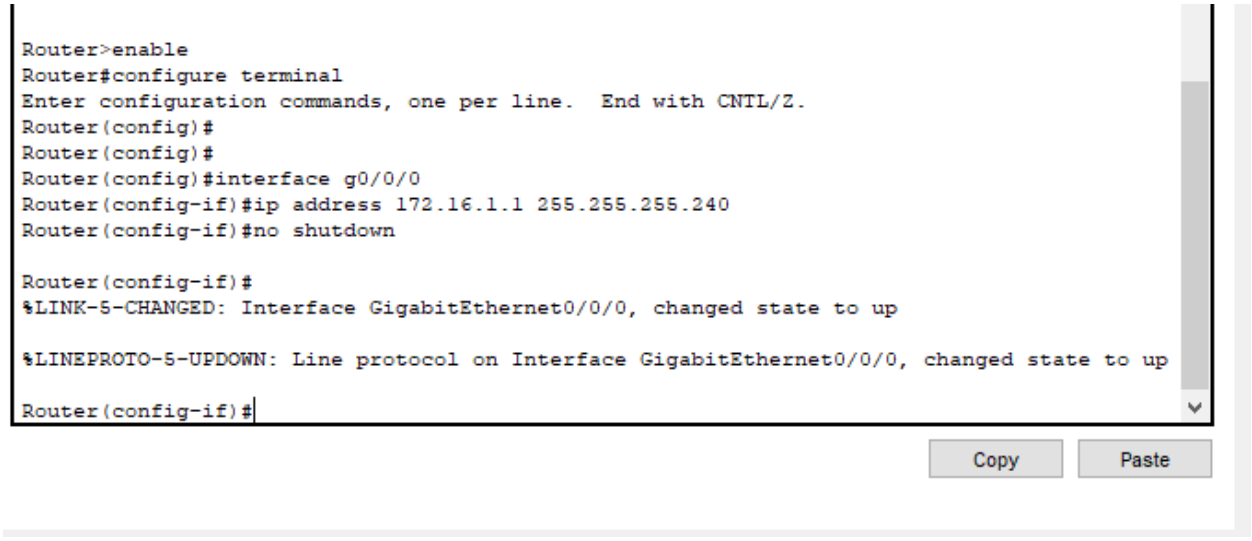
   a. Assign Subnet 1 to the LAN connected to the GigabitEthernet 0/0/0 interface of R1:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.1 255.255.255.240
Router(config-if)#no shutdown

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

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

Router(config-if)#
```

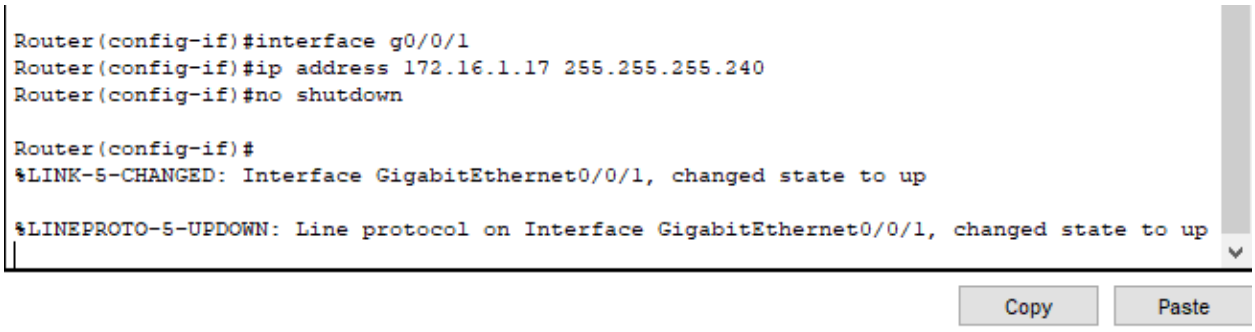


b. Assign Subnet 2 to the LAN connected to the GigabitEthernet 0/0/1 interface of R1:

Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.17 255.255.255.240
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up



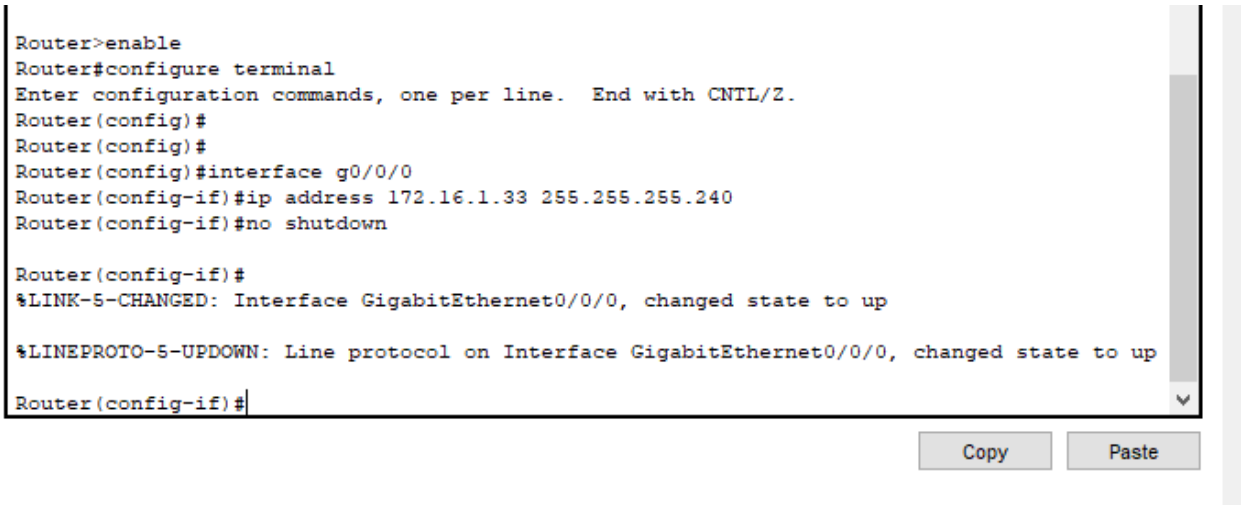
c. Assign Subnet 3 to the LAN connected to the GigabitEthernet 0/0/0 interface of R2:

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.33 255.255.255.240
Router(config-if)#no shutdown

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

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

Router(config-if)#



d. Assign Subnet 4 to the LAN connected to the GigabitEthernet 0/0/1 interface of R2:

Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.49 255.255.255.240
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up

Router(config-if)#

```
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.49 255.255.255.240
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up

Router(config-if)#
```

Copy Paste

d. Assign Subnet 5 to the LAN connected to the GigabitEthernet 0/0/0 interface of R3:

Router>
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.65 255.255.255.240
Router(config-if)#no shutdown

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

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

```
Router>
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.65 255.255.255.240
Router(config-if)#no shutdown

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

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

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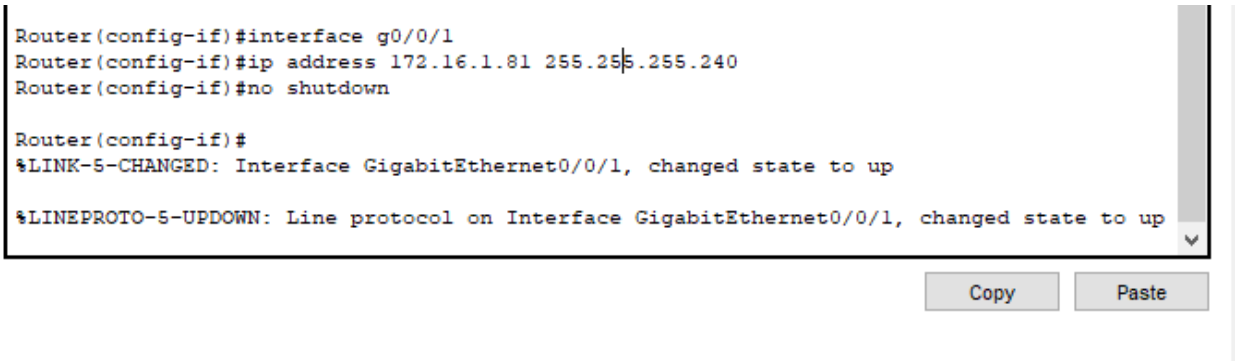
e. Assign Subnet 6 to the LAN connected to the GigabitEthernet 0/0/1 interface of R3:

```
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.81 255.255.255.240
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1,
changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/0/1, changed state to up
```



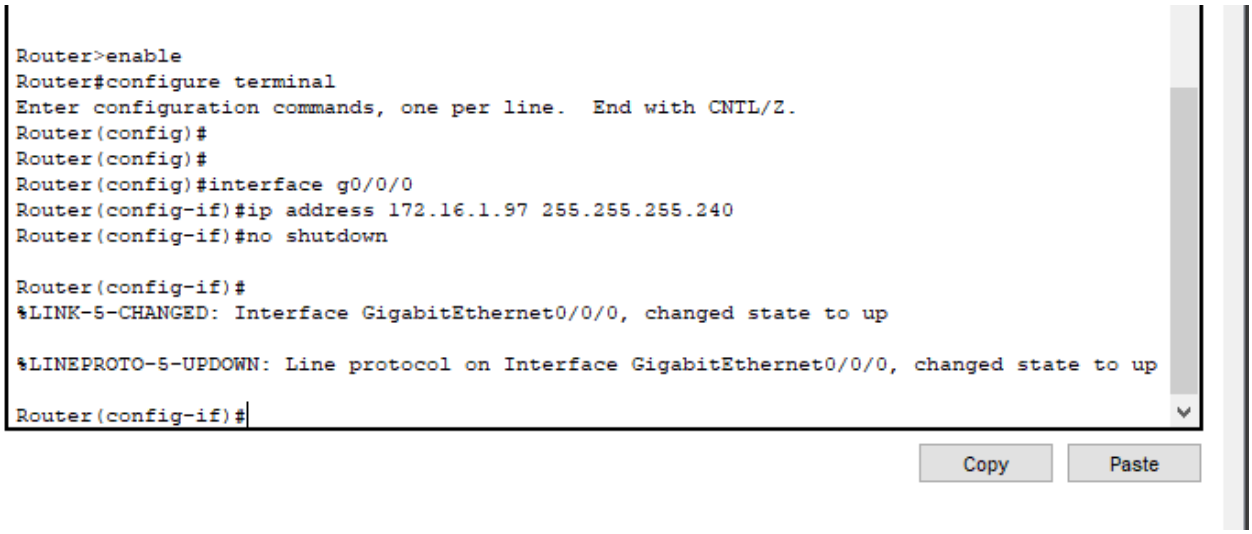
f. Assign Subnet 7 to the LAN connected to the GigabitEthernet 0/0/0 interface of R4:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with
CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.97 255.255.255.240
Router(config-if)#no shutdown

Router(config-if)#
```

%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up

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



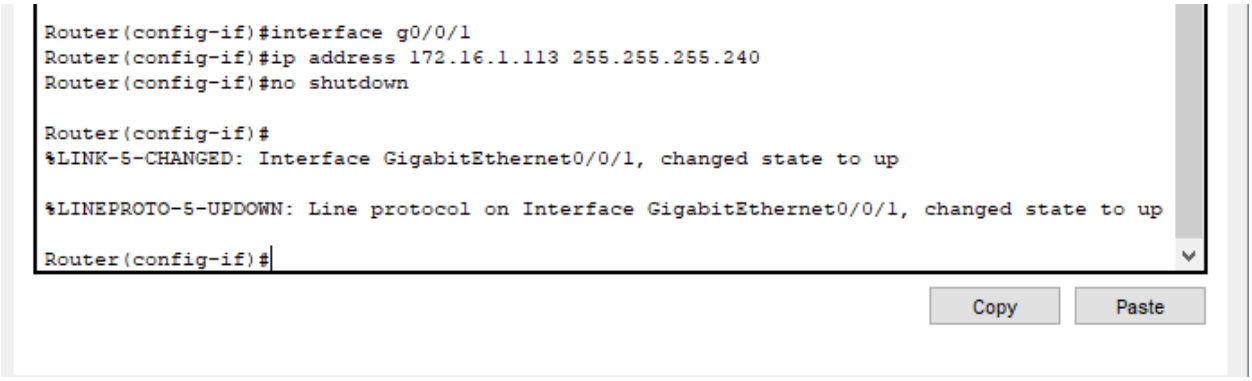
g. Assign Subnet 8 to the LAN connected to the GigabitEthernet 0/0/1 interface of R4:

Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.113 255.255.255.240
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up

Router(config-if)#



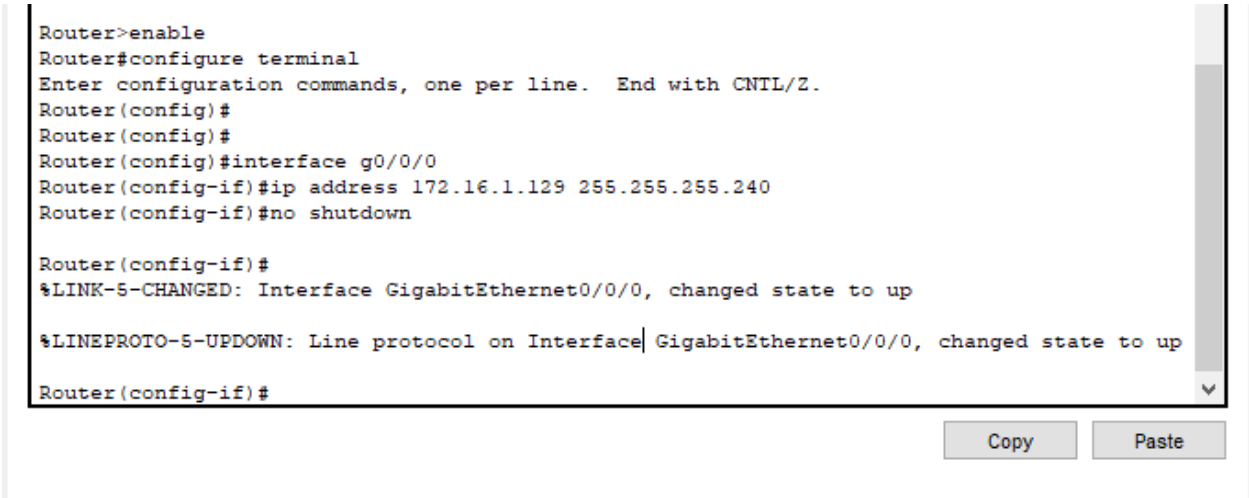
h. Assign Subnet 9 to the LAN connected to the GigabitEthernet 0/0/0 interface of R5:

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.129 255.255.255.240
Router(config-if)#no shutdown

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

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

Router(config-if)#



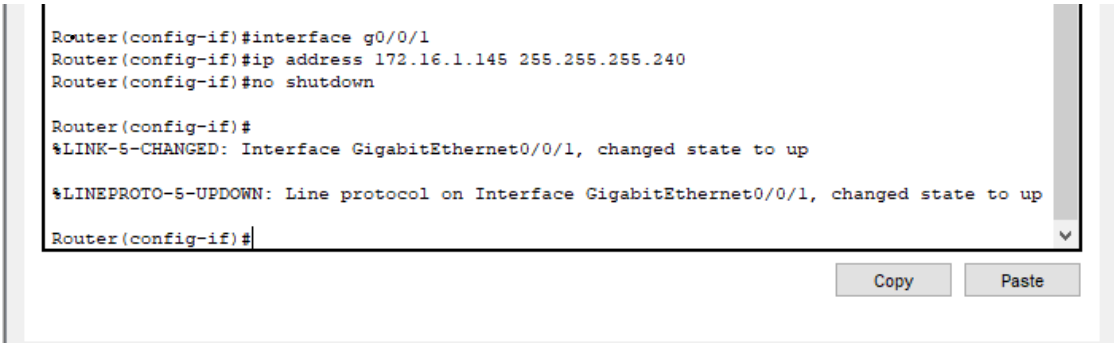
i. Assign Subnet 10 to the LAN connected to the GigabitEthernet 0/0/1 interface of R5:

Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.145 255.255.255.240
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up

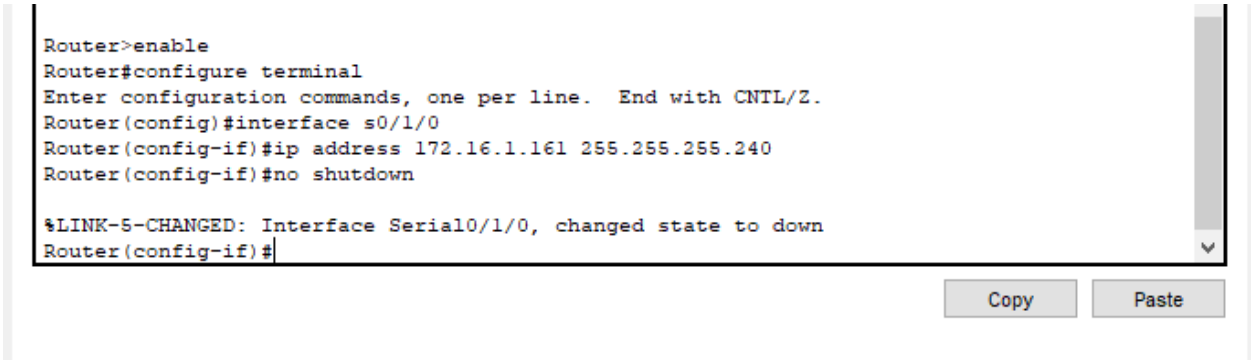
Router(config-if)#



j. Assign Subnet 11 to the WAN ling between R1 to R2:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface s0/1/0
Router(config-if)#ip address 172.16.1.161 255.255.255.240
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
Router(config-if)#
```




```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
Router(config)#interface s0/1/0
Router(config-if)#ip address 172.16.1.174 255.255.255.240
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up

Router(config-if)#
```

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
Router(config)#interface s0/1/0
Router(config-if)#ip address 172.16.1.174 255.255.255.240
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up

Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up

05:14:09: %OSPF-5-ADJCHG: Process 1, Nbr 172.16.1.1 on Serial0/1/0 from LOADING to FULL,
Loading Done
```

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k. Assign Subnet 12 to the WAN ling between R2 to R3:

Router(config-if)#interface s0/1/1
Router(config-if)#ip address 172.16.1.177 255.255.255.240
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
Router(config-if)#

```
Router(config-if)#interface s0/1/1
Router(config-if)#ip address 172.16.1.177 255.255.255.240
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
Router(config-if)#
```

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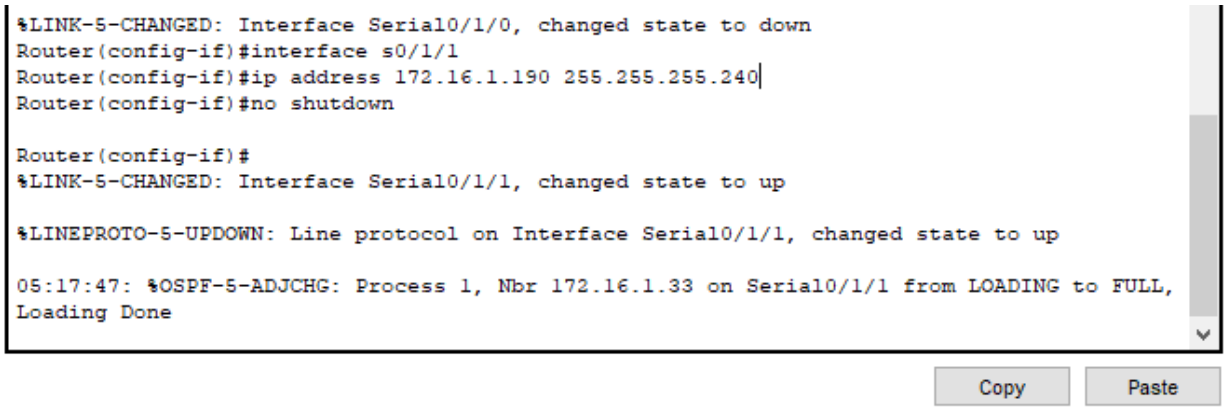
Top

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
Router(config-if)#interface s0/1/1
Router(config-if)#ip address 172.16.1.190 255.255.255.240
Router(config-if)#no shutdown

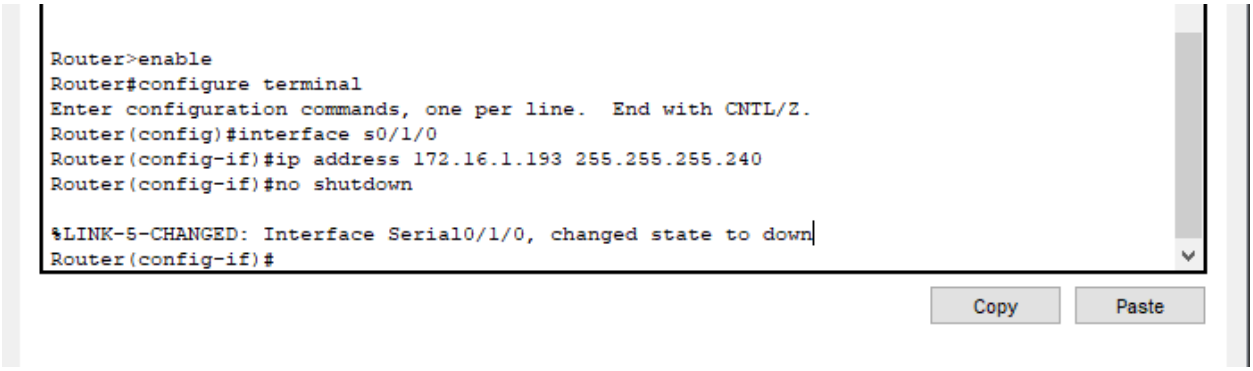
Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up



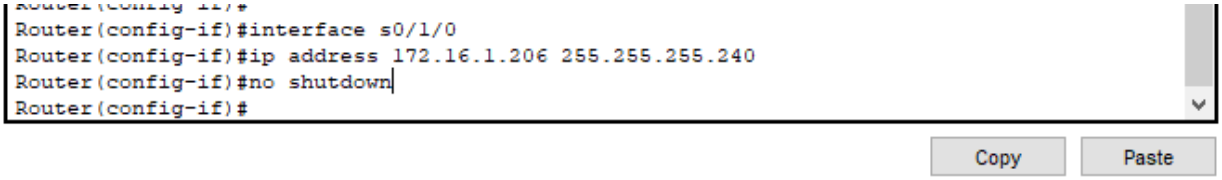
l. Assign Subnet 13 to the WAN ling between R3 to R4:

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface s0/1/0
Router(config-if)#ip address 172.16.1.193 255.255.255.240
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
Router(config-if)#



Router(config-if)#interface s0/1/0
Router(config-if)#ip address 172.16.1.206 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#



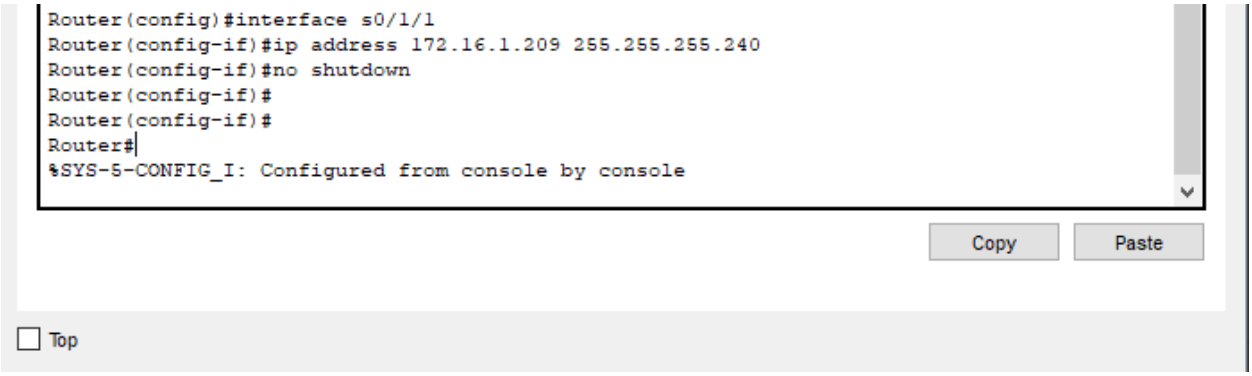
m. Assign Subnet 14 to the WAN ling between R4 to R5:

Router(config)#interface s0/1/1

Router(config-if)#ip address 172.16.1.209 255.255.255.240

Router(config-if)#no shutdown

Router(config-if)#



Router(config)#interface s0/1/1

Router(config-if)#ip address 172.16.1.222 255.255.255.240

Router(config-if)#no shutdown

```
Router(config)#interface s0/1/1
Router(config-if)#ip address 172.16.1.222 255.255.255.240
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up

Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to up

05:51:58: %OSPF-5-ADJCHG: Process 1, Nbr 172.16.1.97 on Serial0/1/1 from LOADING to FULL,
Loading Done
```

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Top

n. Assign Subnet 15 to the WAN ling between R5 to R1:

Router(config)#

Router(config)#interface s0/1/1

Router(config-if)#ip address 172.16.1.222 255.255.255.240

Router(config-if)#no shutdown

Router(config-if)#

```
Router#enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
Router(config)#interface s0/1/1
Router(config-if)#ip address 172.16.1.222 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

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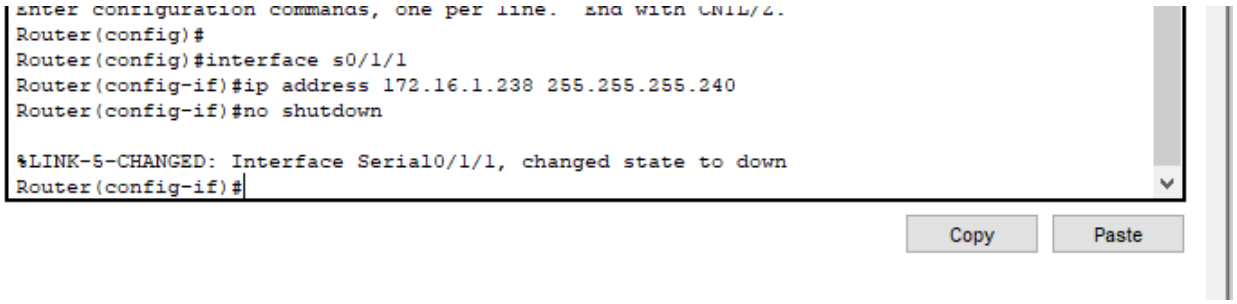
Top

Router(config)#

Router(config)#interface s0/1/1

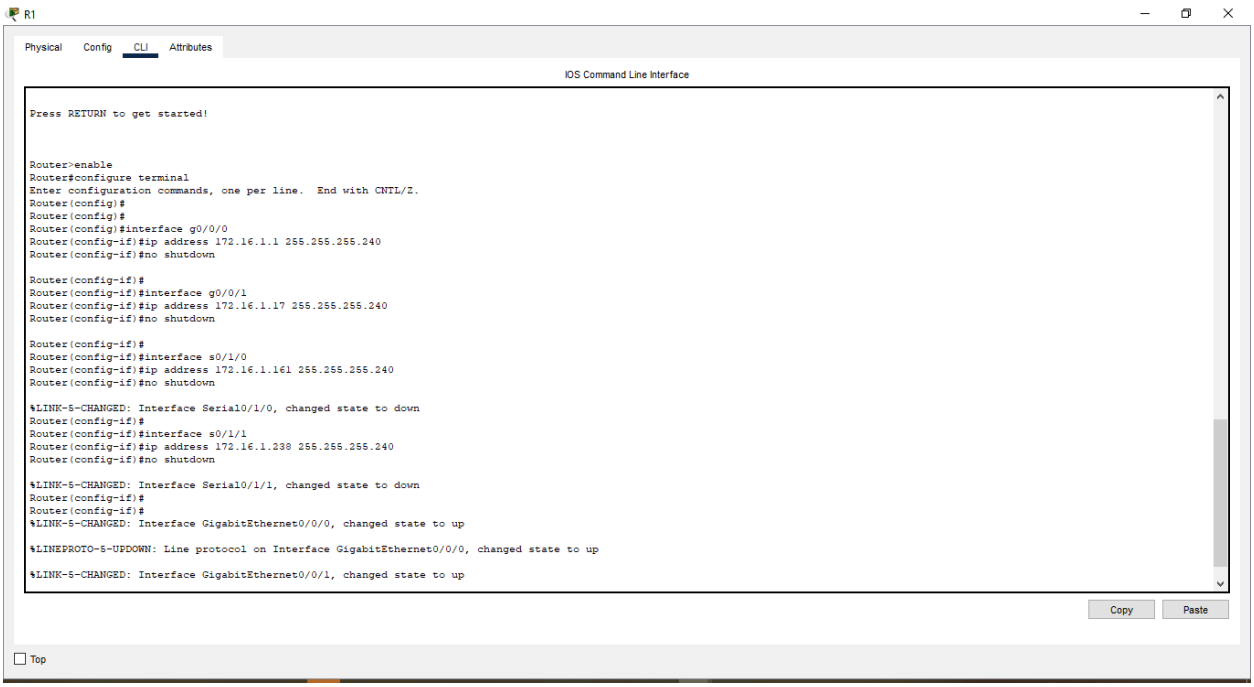
Router(config-if)#ip address 172.16.1.238 255.255.255.240

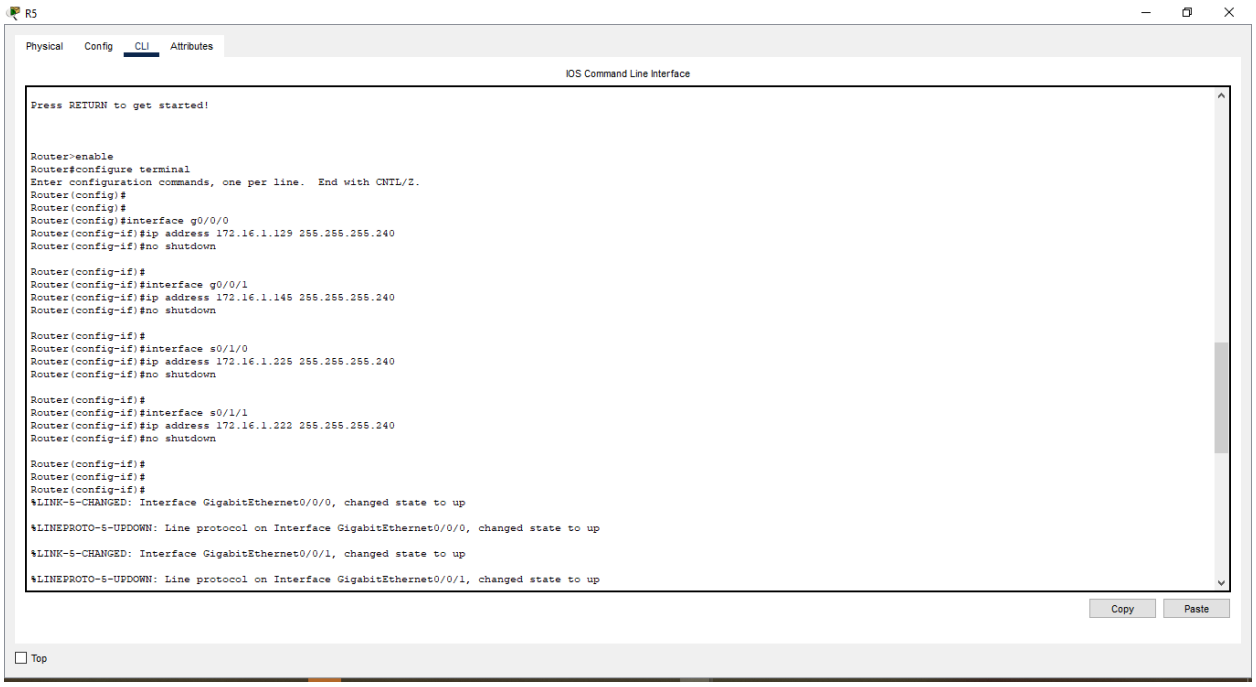
Router(config-if)#no shutdown



2. Fill the addressing table using following guidelines:

a. Assign the first usable IP addresses in each subnet to all LAN link in all routers.




R5
Physical
Config
CLI
Attributes
IOS Command Line Interface
Press RETURN to get started!
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.129 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.145 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/0
Router(config-if)#ip address 172.16.1.225 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/1
Router(config-if)#ip address 172.16.1.222 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
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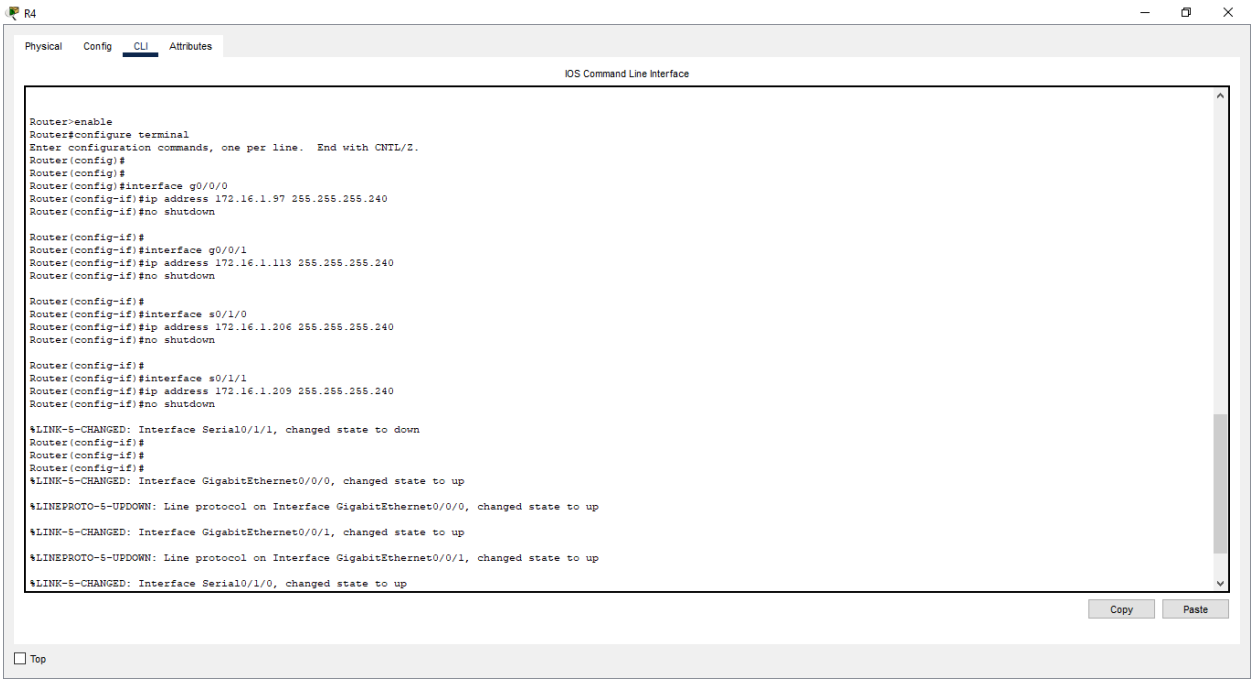
Top


R4
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.97 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.113 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/0
Router(config-if)#ip address 172.16.1.206 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/1
Router(config-if)#ip address 172.16.1.209 255.255.255.240
Router(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
Router(config-if)#
Router(config-if)#
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
Copy
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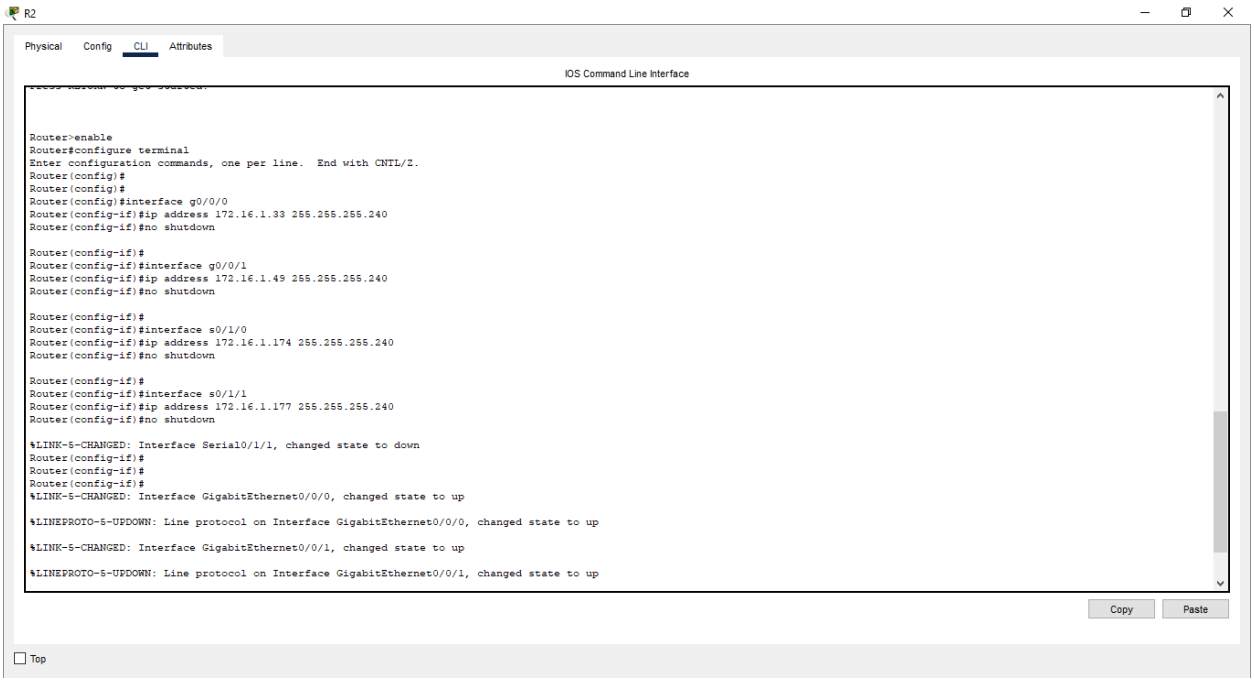
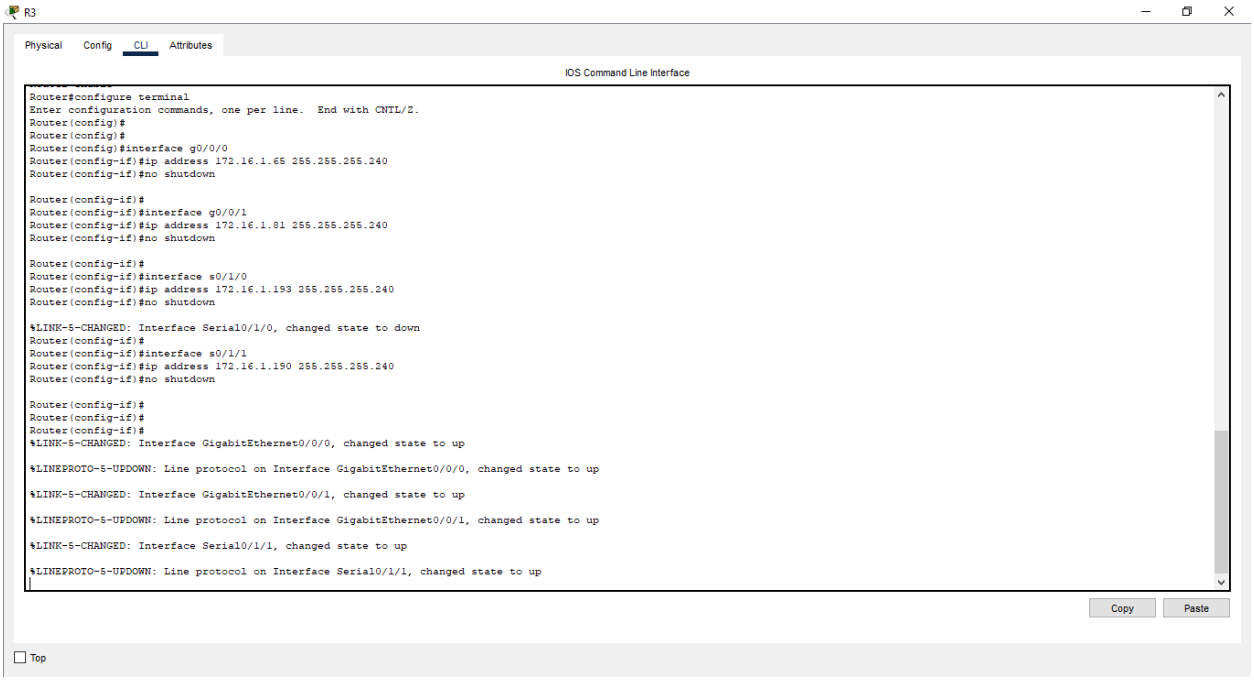
Top


R2
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.33 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.49 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/0
Router(config-if)#ip address 172.16.1.174 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/1
Router(config-if)#ip address 172.16.1.177 255.255.255.240
Router(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
Router(config-if)#
Router(config-if)#
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
Copy
Paste
Top


R3
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.65 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.81 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/0
Router(config-if)#ip address 172.16.1.193 255.255.255.240
Router(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
Router(config-if)#
Router(config-if)#interface s0/1/1
Router(config-if)#ip address 172.16.1.190 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to up
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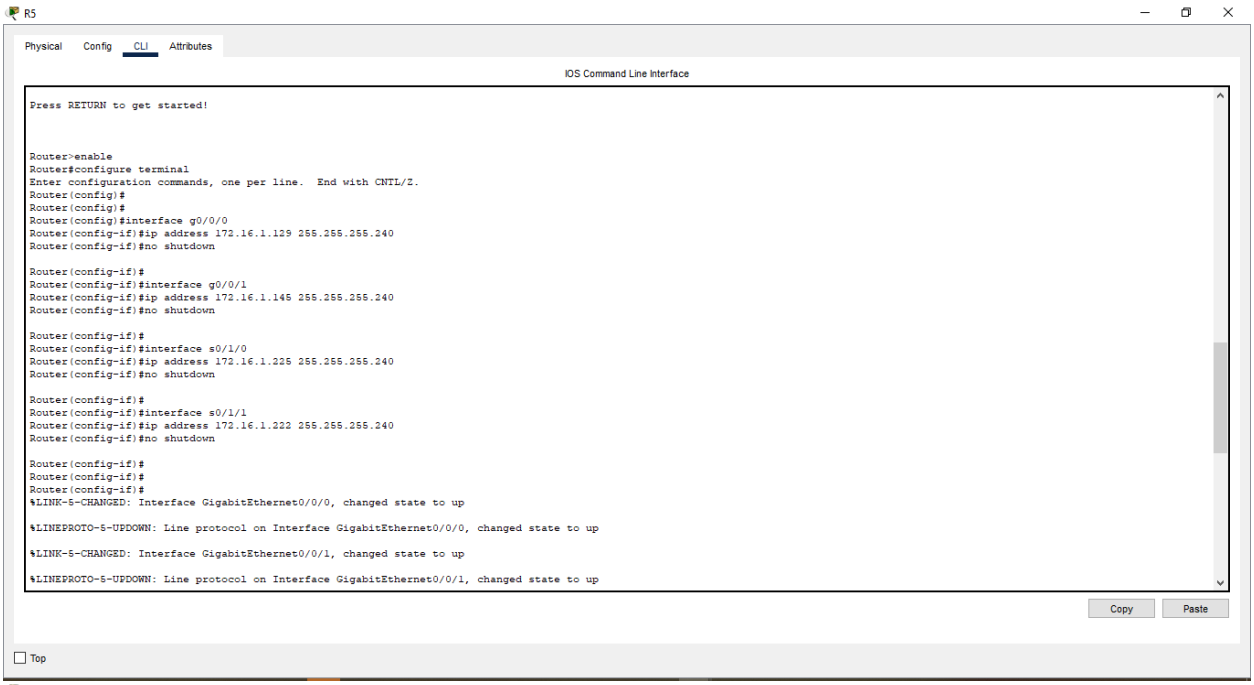
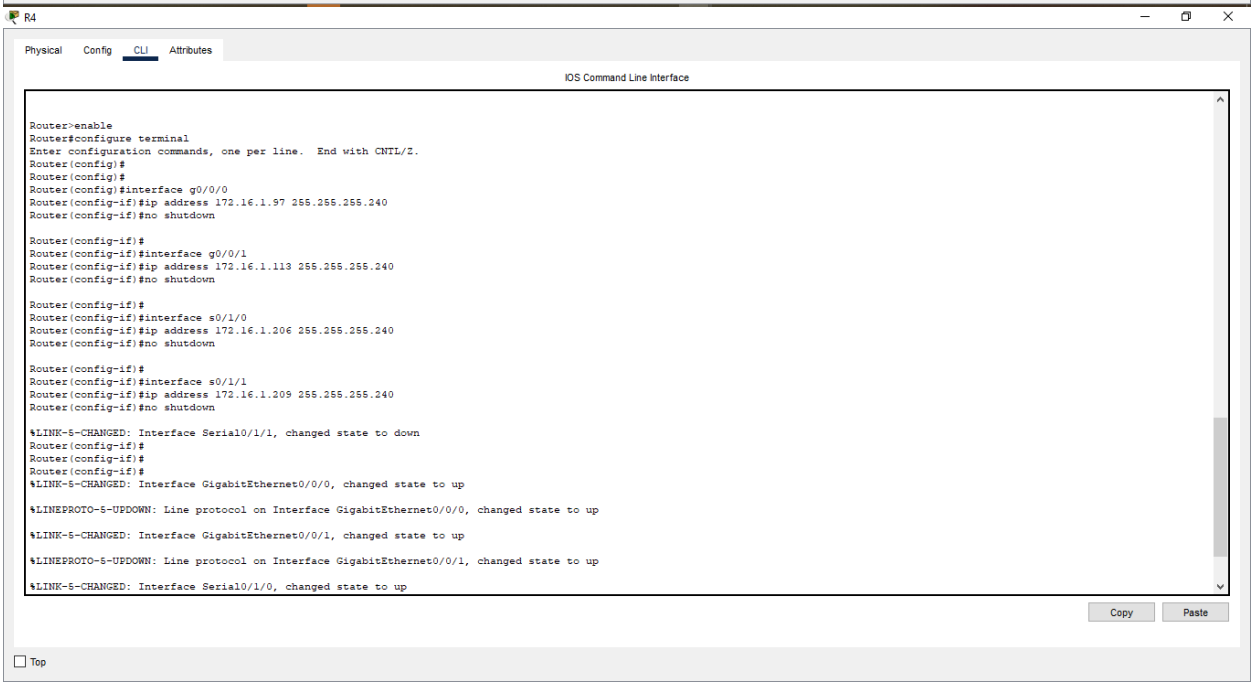
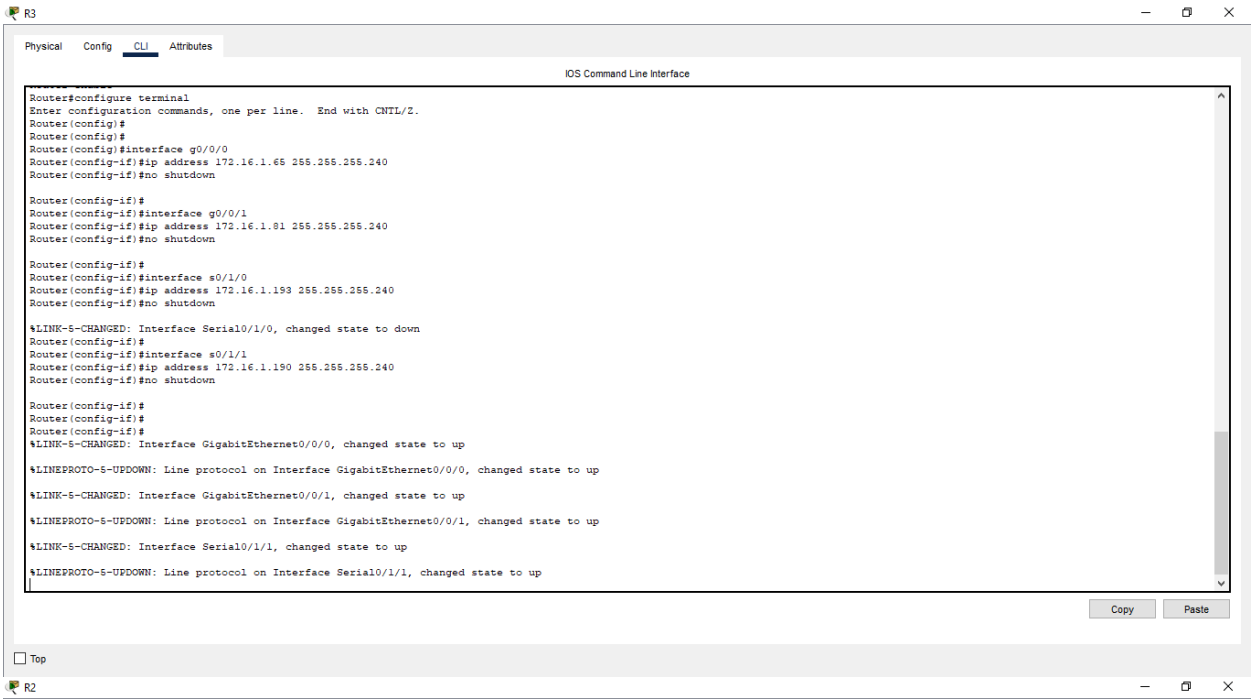
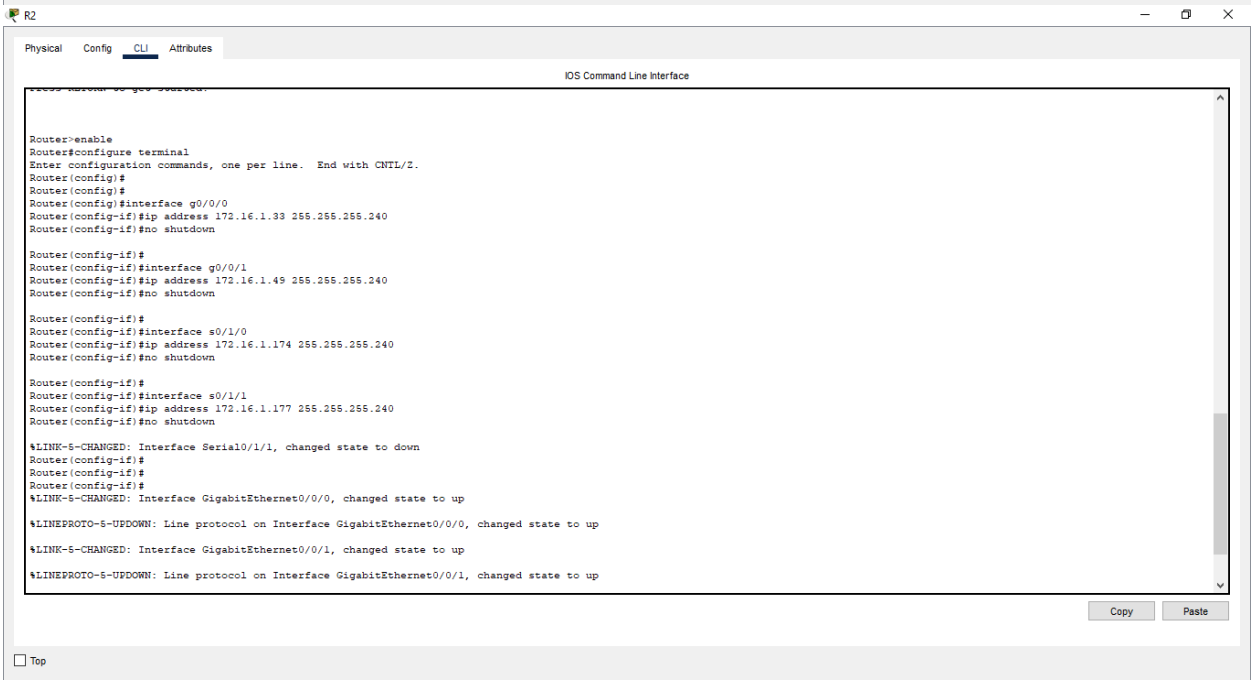
Top

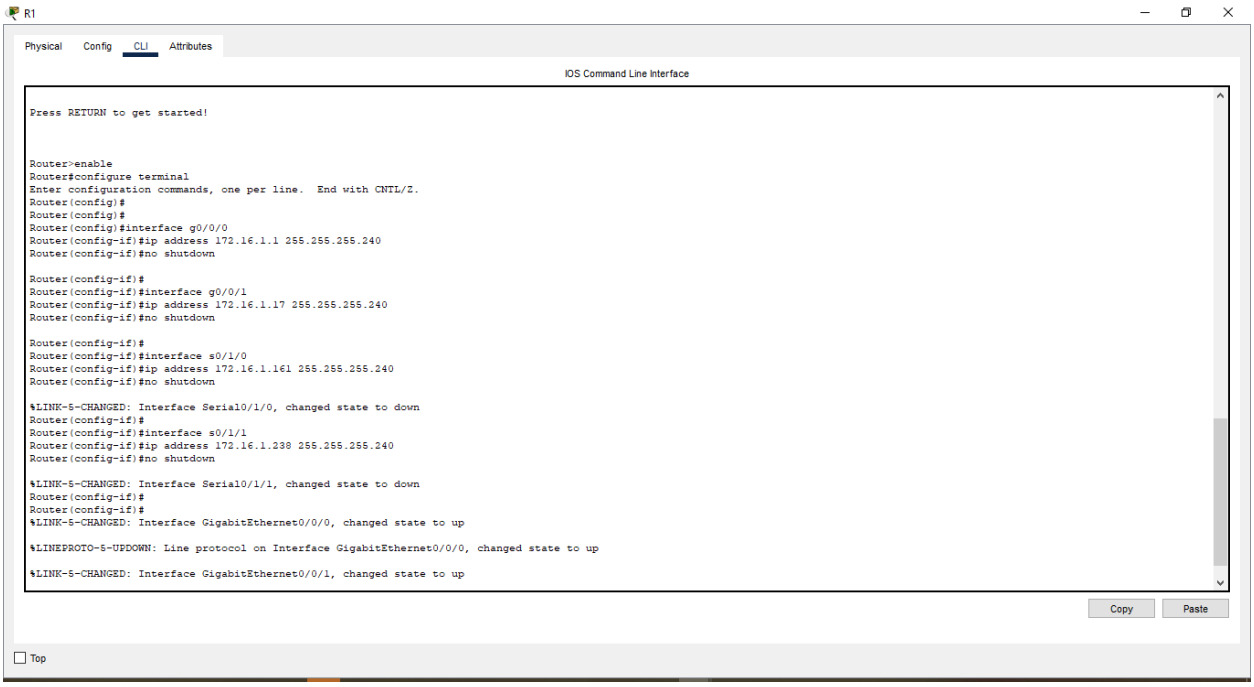
b. Assign the first usable IP addresses in each subnet for the WAN links as follows. R1 - S0/1/0 R2 - S0/1/1 R3 - S0/1/0 R4 - S0/1/1 R5 - S0/1/0



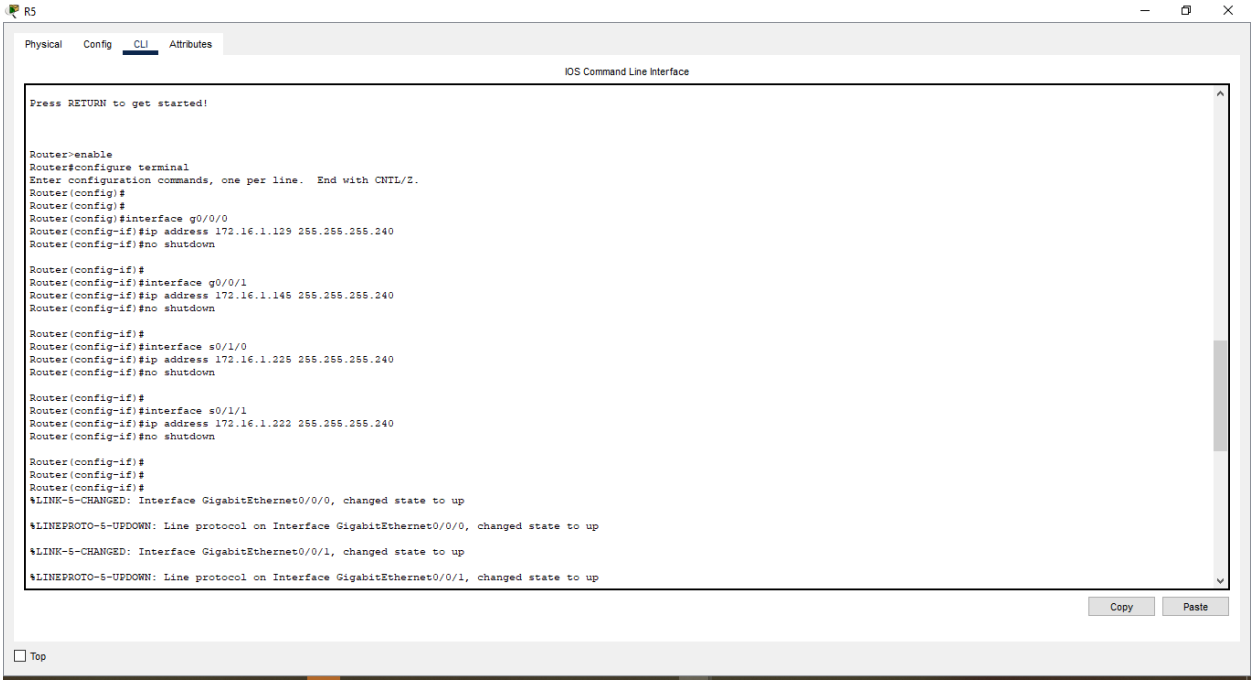


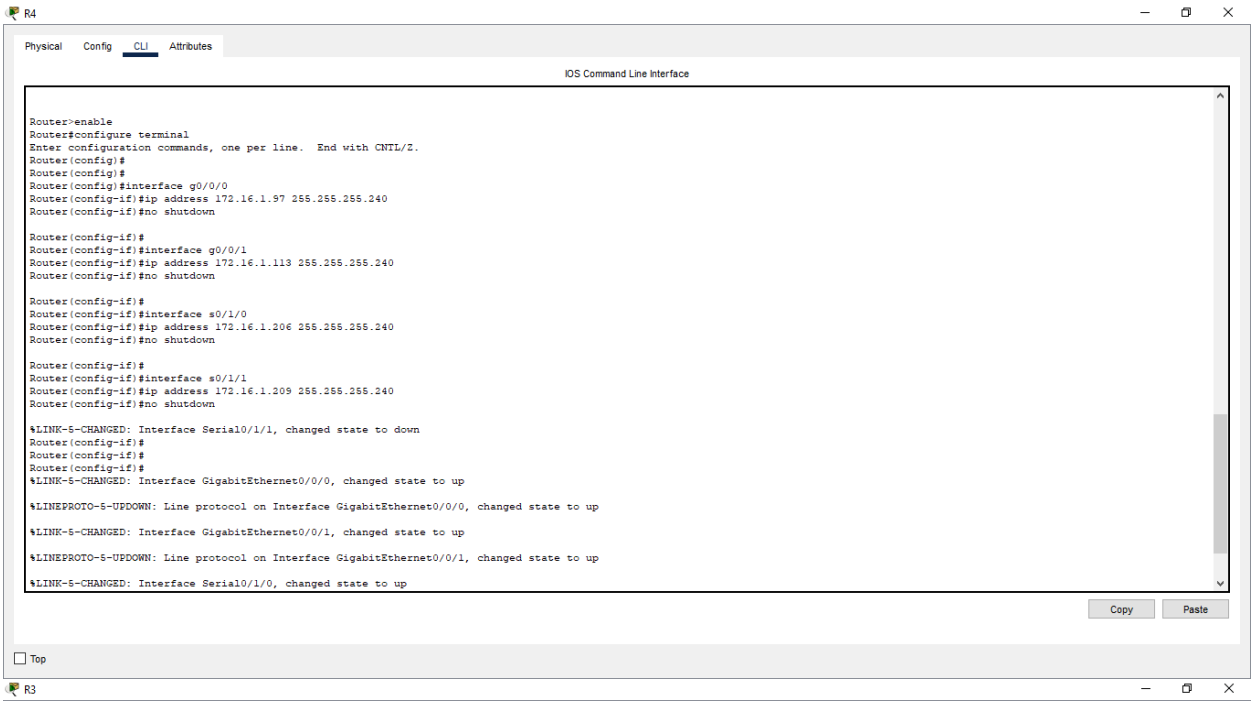

R3
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.65 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.81 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/0
Router(config-if)#ip address 172.16.1.193 255.255.255.240
Router(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
Router(config-if)#
Router(config-if)#interface s0/1/1
Router(config-if)#ip address 172.16.1.190 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to up
Copy
Paste
Top


R2
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.33 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.49 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/0
Router(config-if)#ip address 172.16.1.174 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/1
Router(config-if)#ip address 172.16.1.177 255.255.255.240
Router(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
Router(config-if)#
Router(config-if)#
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
Copy
Paste
Top



c. Assign the last usable IP addresses in each subnet for the WAN links as follows. R1 - S0/1/1 R2 - S0/1/0 R3 - S0/1/1 R4 - S0/1/0 R5 - S0/1/1




R4
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.97 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.113 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/0
Router(config-if)#ip address 172.16.1.206 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/1
Router(config-if)#ip address 172.16.1.209 255.255.255.240
Router(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
Router(config-if)#
Router(config-if)#
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
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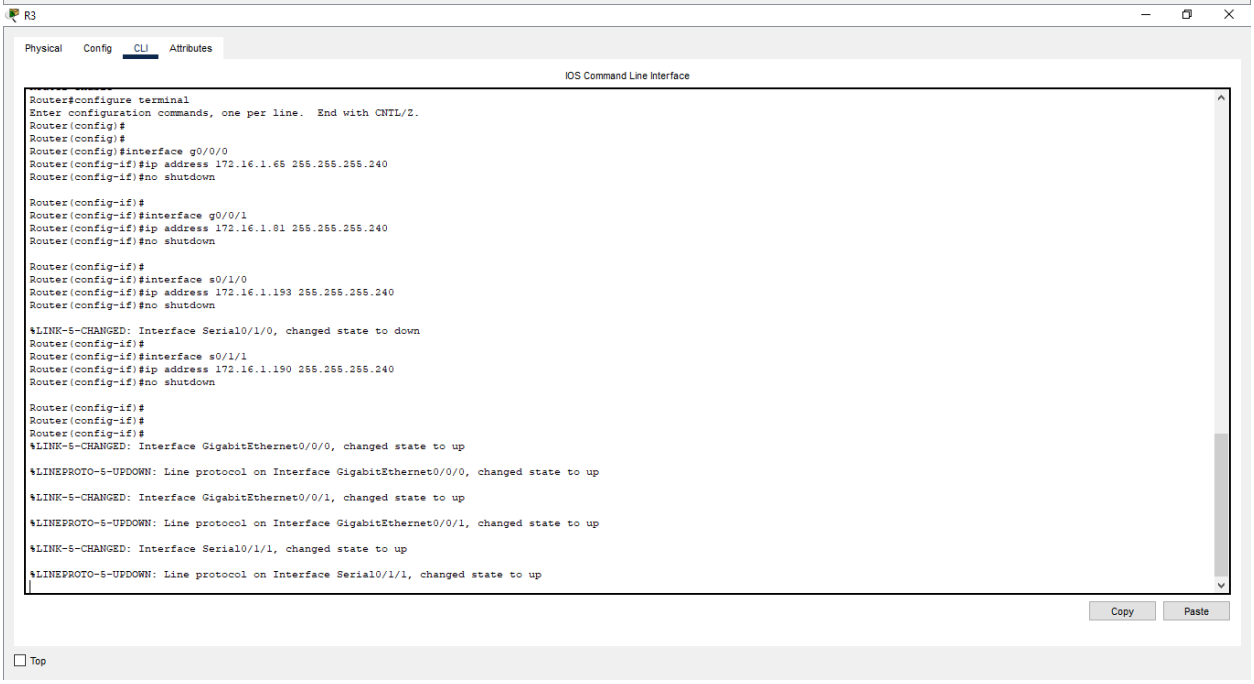
R3
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.65 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.81 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/0
Router(config-if)#ip address 172.16.1.193 255.255.255.240
Router(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
Router(config-if)#
Router(config-if)#interface s0/1/1
Router(config-if)#ip address 172.16.1.190 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to up
Copy
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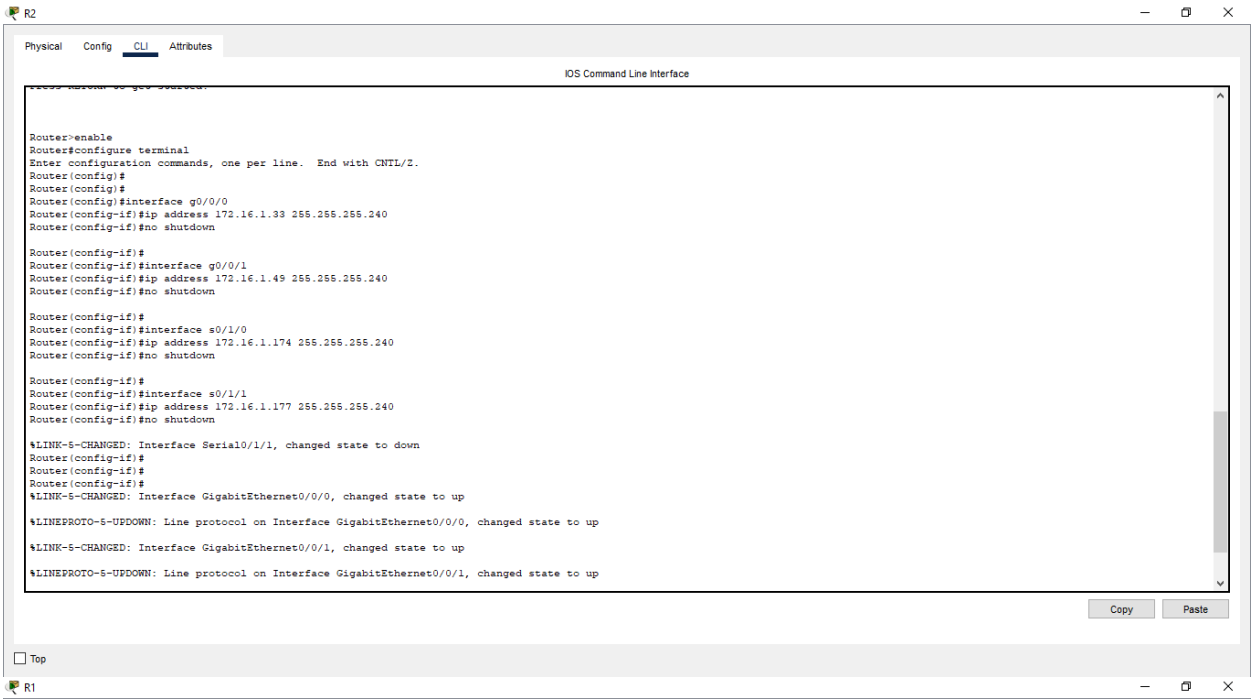
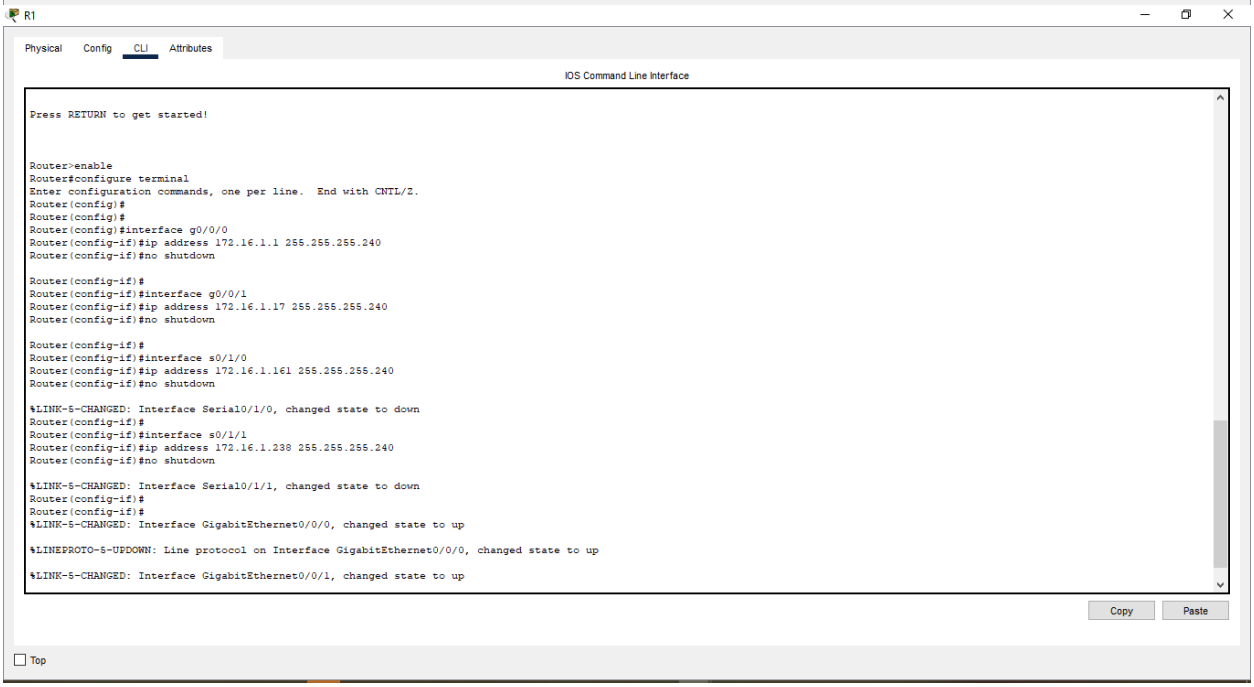
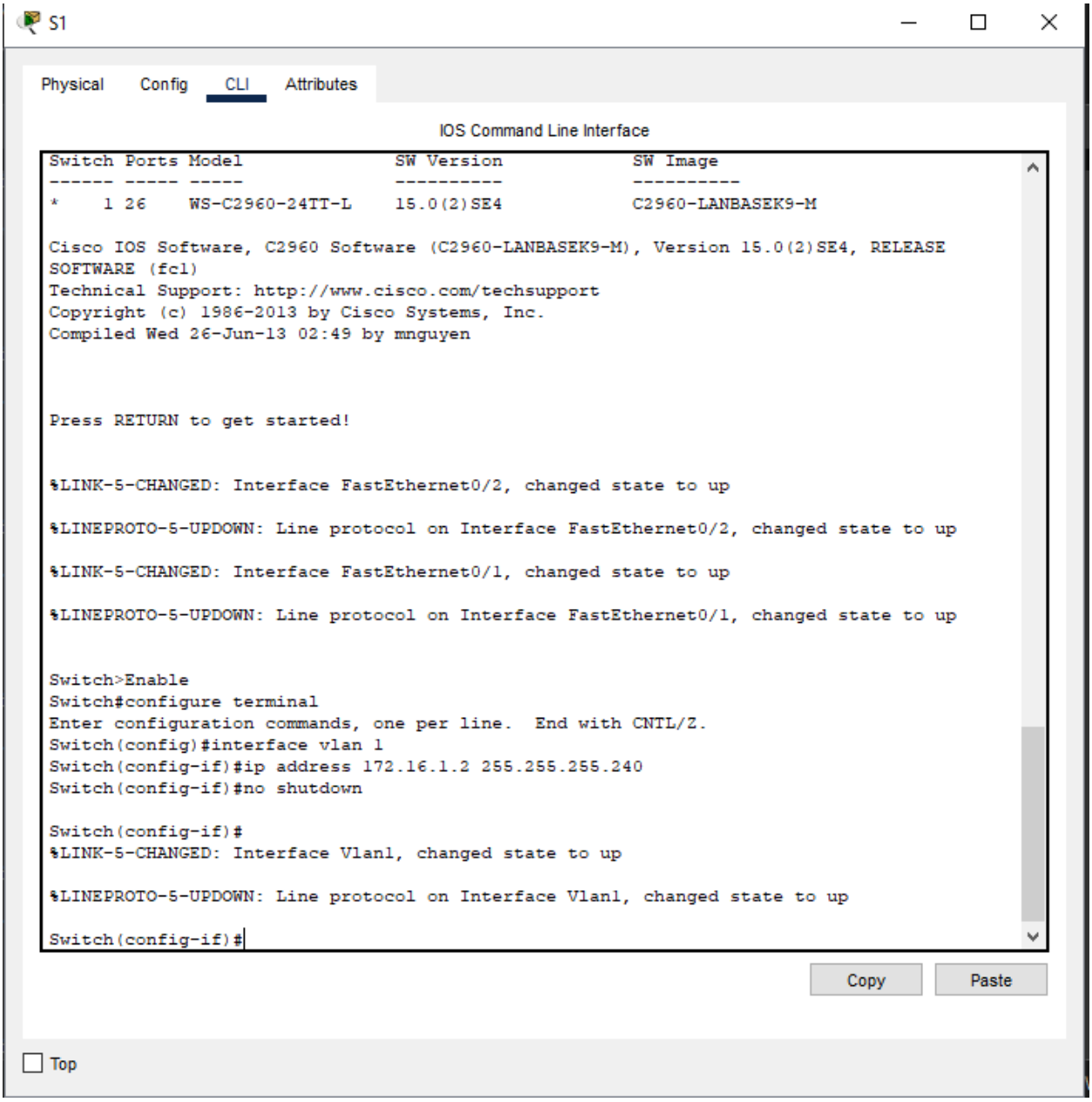
Top





d. Assign the second usable IP address in the attached subnets to the switches.


S1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Switch Ports Model SW Version SW Image
------ ----- ----- ---------- ----------
* 1 26 WS-C2960-24TT-L 15.0(2)SE4 C2960-LANBASEK9-M
Cisco IOS Software, C2960 Software (C2960-LANBASEK9-M), Version 15.0(2)SE4, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2013 by Cisco Systems, Inc.
Compiled Wed 26-Jun-13 02:49 by mnguyen
Press RETURN to get started!
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Switch>Enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface vlan 1
Switch(config-if)#ip address 172.16.1.2 255.255.255.240
Switch(config-if)#no shutdown
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
Switch(config-if)#
Copy
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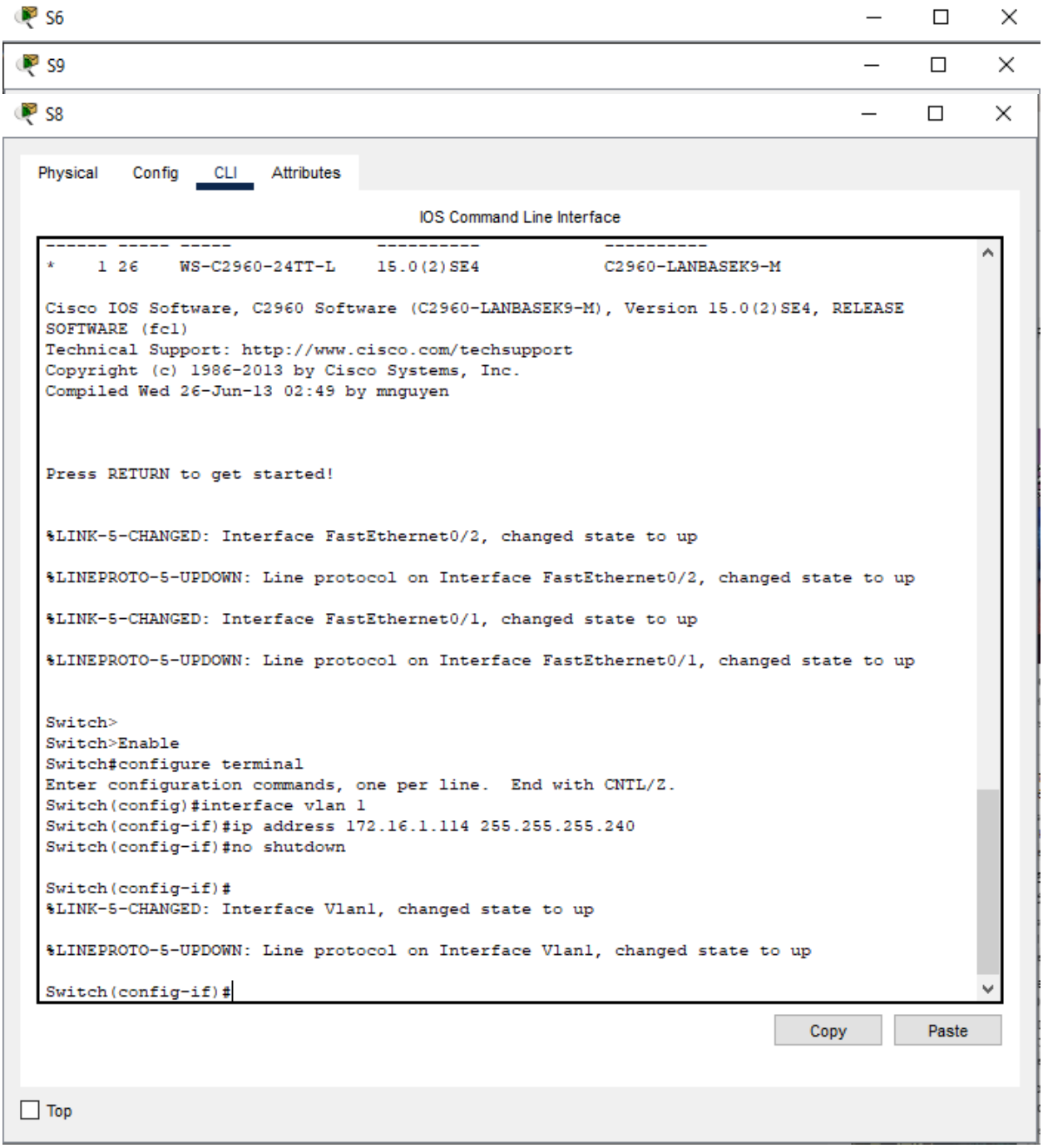
S6
S9
S8
Physical
Config
CLI
Attributes
IOS Command Line Interface
------ ----- ----- ---------- ----------
*   1 26   WS-C2960-24TT-L   15.0(2)SE4 C2960-LANBASEK9-M
Cisco IOS Software, C2960 Software (C2960-LANBASEK9-M), Version 15.0(2)SE4, RELEASE
SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2013 by Cisco Systems, Inc.
Compiled Wed 26-Jun-13 02:49 by mnguyen
Press RETURN to get started!
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Switch>
Switch>Enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface vlan 1
Switch(config-if)#ip address 172.16.1.114 255.255.255.240
Switch(config-if)#no shutdown
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
Switch(config-if)#
Copy
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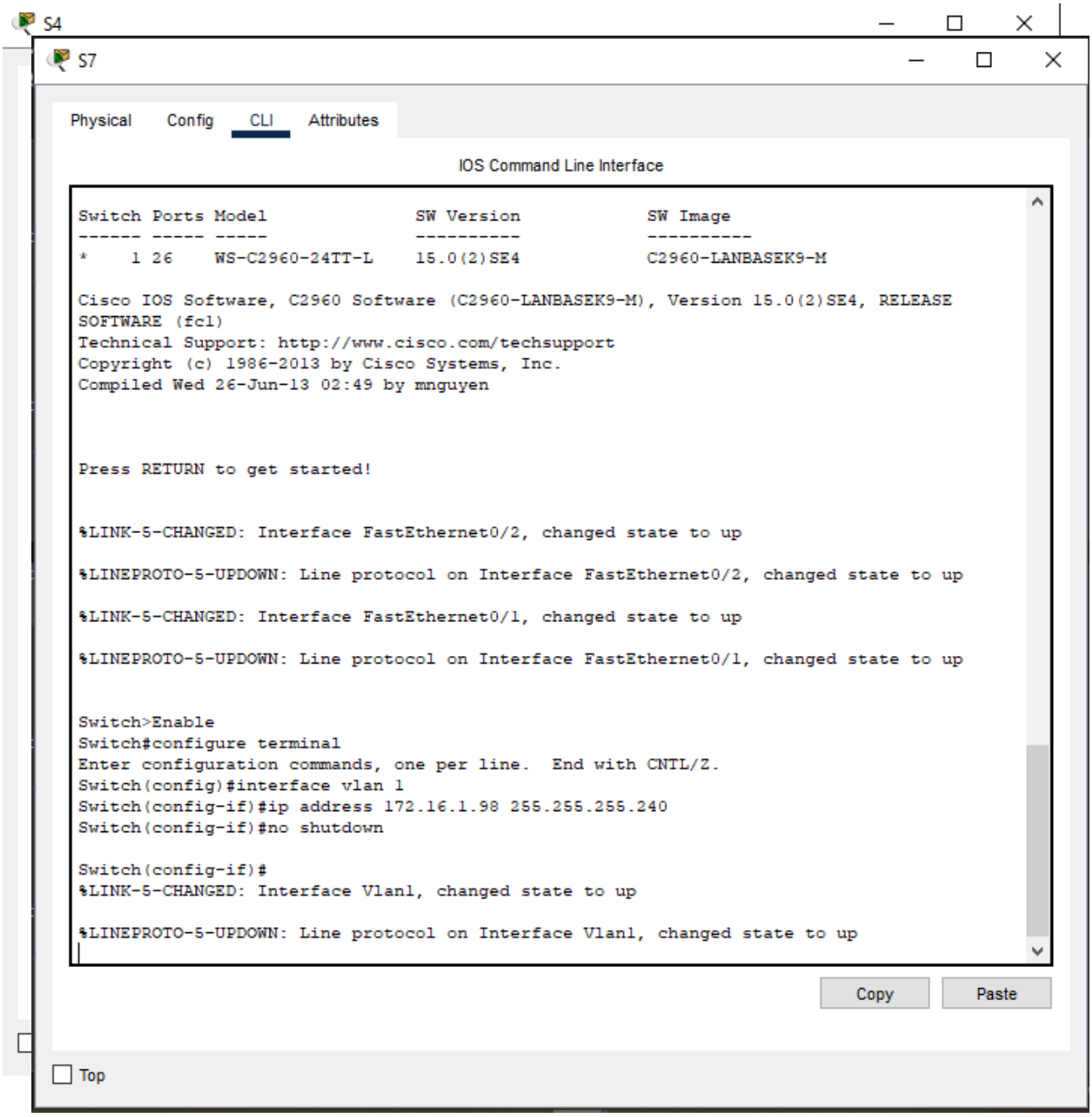
S4
S7
Physical
Config
CLI
Attributes
IOS Command Line Interface
Switch Ports Model SW Version SW Image
------ ----- ----- ---------- ----------
* 1 26 WS-C2960-24TT-L 15.0(2)SE4 C2960-LANBASEK9-M
Cisco IOS Software, C2960 Software (C2960-LANBASEK9-M), Version 15.0(2)SE4, RELEASE SOFTWARE (fc1)
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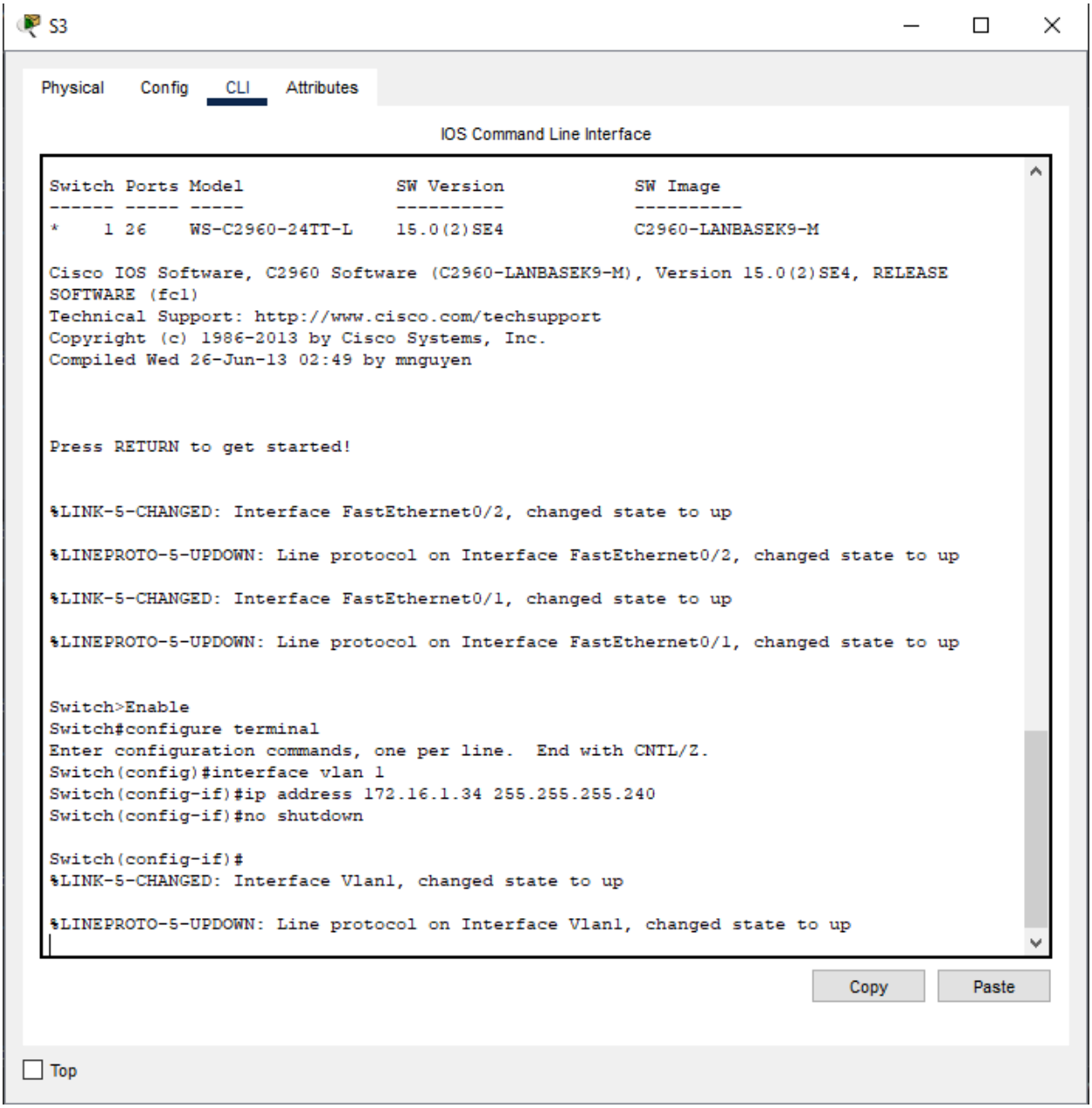
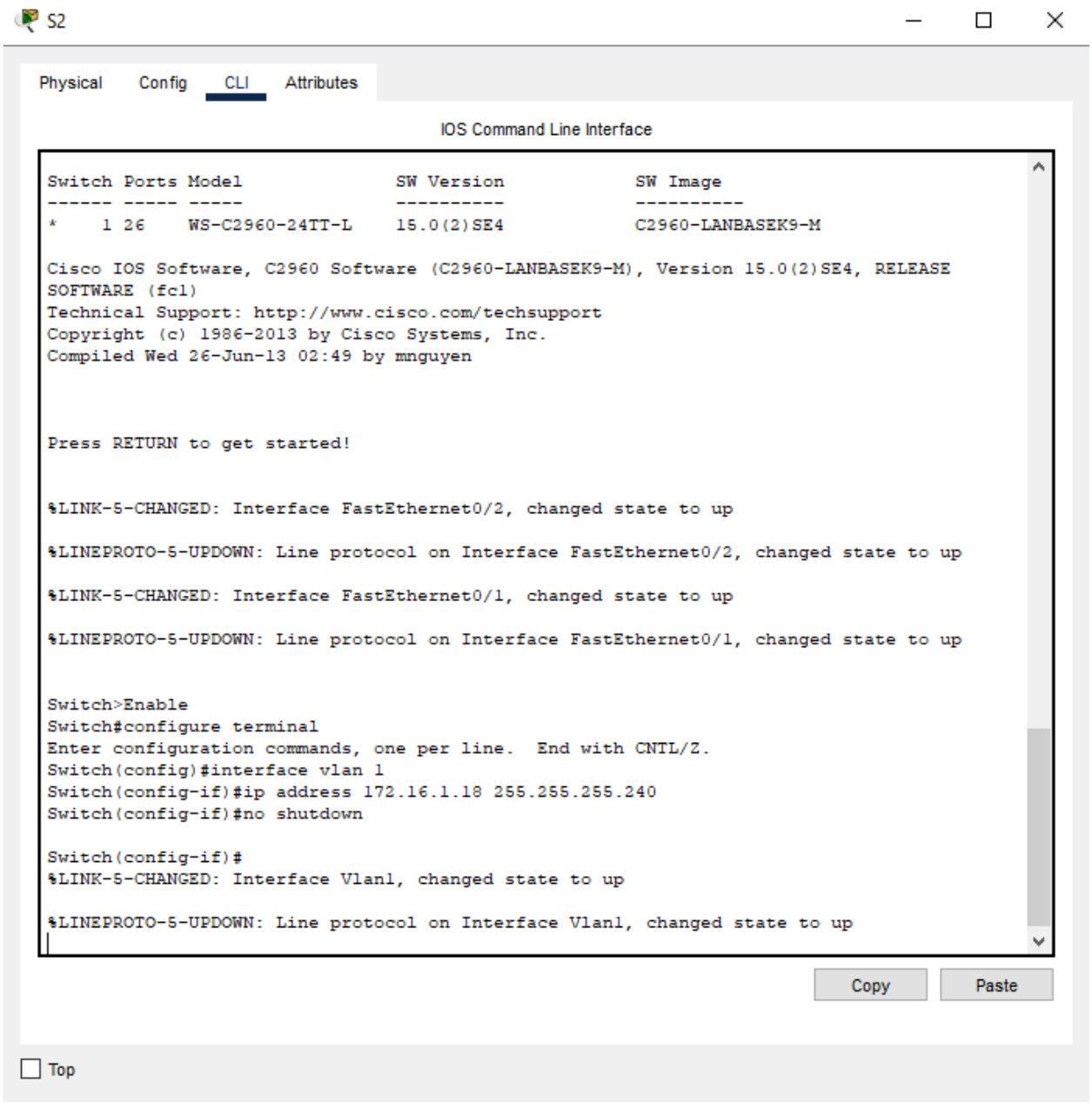
Copyright (c) 1986-2013 by Cisco Systems, Inc.
Compiled Wed 26-Jun-13 02:49 by mnguyen
Press RETURN to get started!
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Switch>Enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface vlan 1
Switch(config-if)#ip address 172.16.1.98 255.255.255.240
Switch(config-if)#no shutdown
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
Copy
Paste
Top


S3
Physical
Config
CLI
Attributes
IOS Command Line Interface
Switch Ports Model SW Version SW Image
------ ----- ----- ---------- ----------
* 1 26 WS-C2960-24TT-L 15.0(2)SE4 C2960-LANBASEK9-M
Cisco IOS Software, C2960 Software (C2960-LANBASEK9-M), Version 15.0(2)SE4, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2013 by Cisco Systems, Inc.
Compiled Wed 26-Jun-13 02:49 by mnguyen
Press RETURN to get started!
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Switch>Enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface vlan 1
Switch(config-if)#ip address 172.16.1.34 255.255.255.240
Switch(config-if)#no shutdown
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
Copy
Paste
Top


S2
Physical
Config
CLI
Attributes
IOS Command Line Interface
Switch Ports Model SW Version SW Image
------ ----- ----- ---------- ----------
* 1 26 WS-C2960-24TT-L 15.0(2)SE4 C2960-LANBASEK9-M
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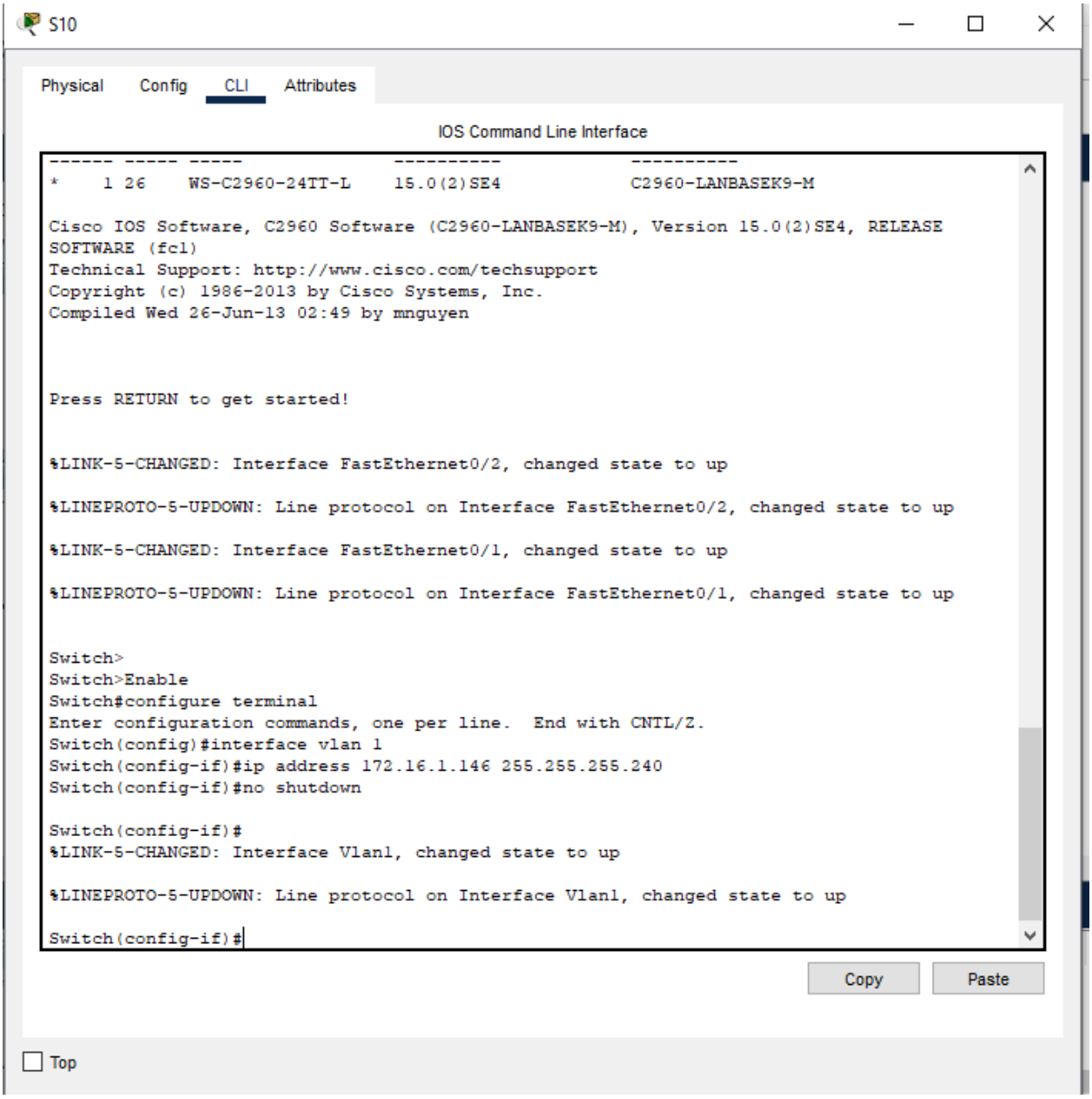
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2013 by Cisco Systems, Inc.
Compiled Wed 26-Jun-13 02:49 by mnguyen
Press RETURN to get started!
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Switch>Enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface vlan 1
Switch(config-if)#ip address 172.16.1.18 255.255.255.240
Switch(config-if)#no shutdown
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
Copy
Paste
Top


S10
Physical
Config
CLI
Attributes
IOS Command Line Interface
------ ----- ----- ---------- ----------
* 1 26 WS-C2960-24TT-L 15.0(2)SE4 C2960-LANBASEK9-M
Cisco IOS Software, C2960 Software (C2960-LANBASEK9-M), Version 15.0(2)SE4, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
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Compiled Wed 26-Jun-13 02:49 by mnguyen
Press RETURN to get started!
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Switch>
Switch>Enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface vlan 1
Switch(config-if)#ip address 172.16.1.146 255.255.255.240
Switch(config-if)#no shutdown
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
Switch(config-if)#
Copy
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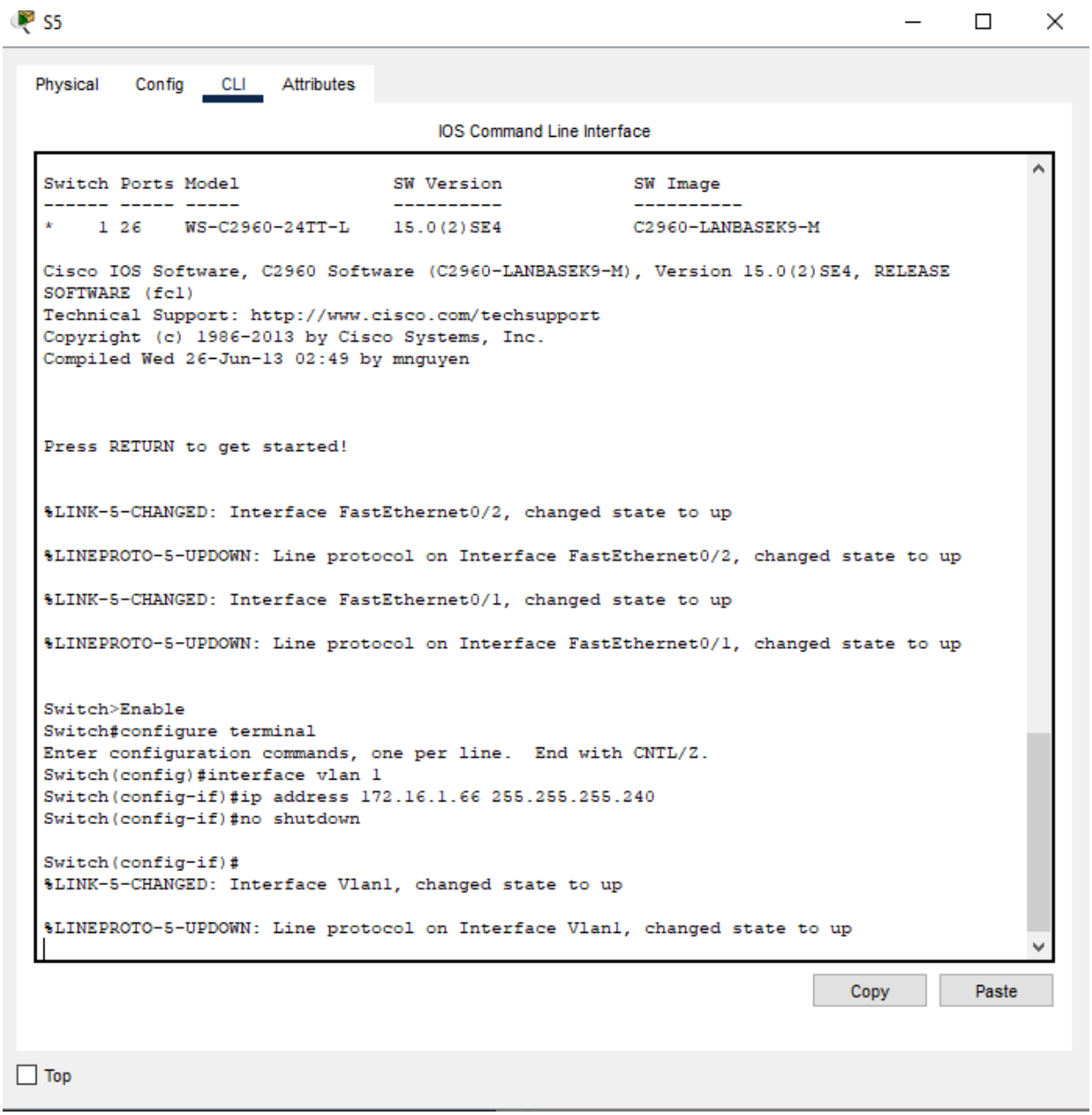
Top


S5
Physical
Config
CLI
Attributes
IOS Command Line Interface
Switch Ports Model SW Version SW Image
------ ----- ----- ---------- ----------
* 1 26 WS-C2960-24TT-L 15.0(2)SE4 C2960-LANBASEK9-M
Cisco IOS Software, C2960 Software (C2960-LANBASEK9-M), Version 15.0(2)SE4, RELEASE SOFTWARE (fc1)
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%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Switch>Enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface vlan 1
Switch(config-if)#ip address 172.16.1.66 255.255.255.240
Switch(config-if)#no shutdown
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
Copy
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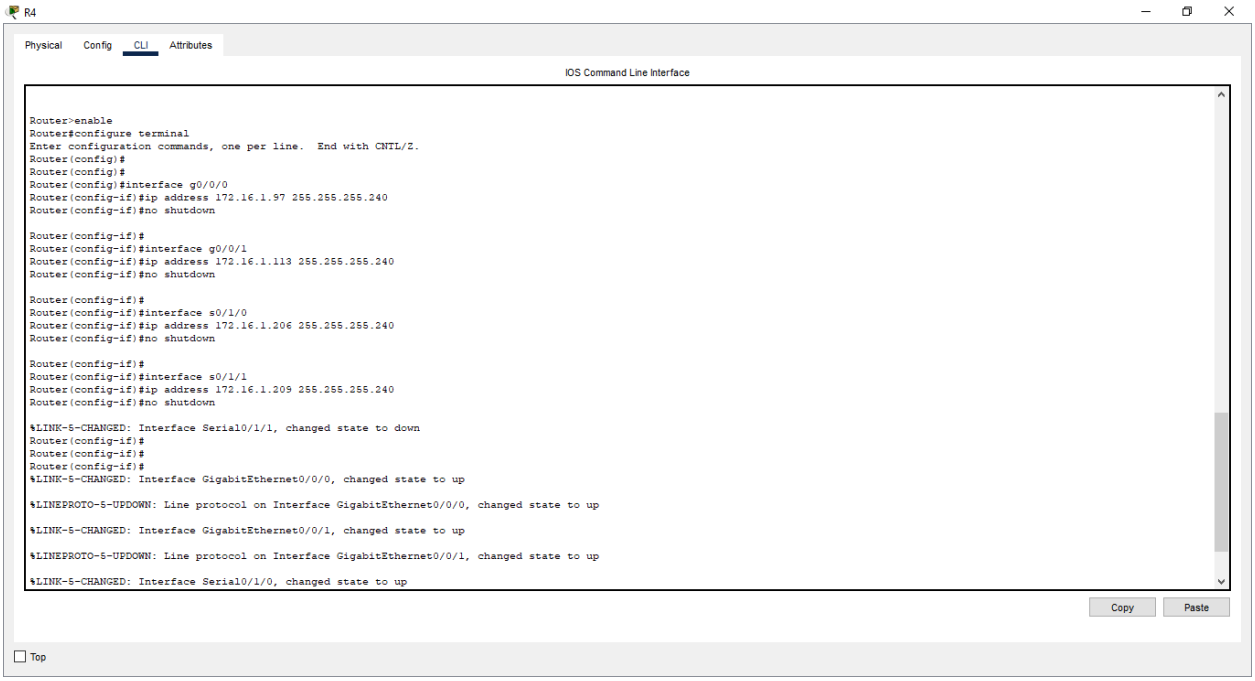
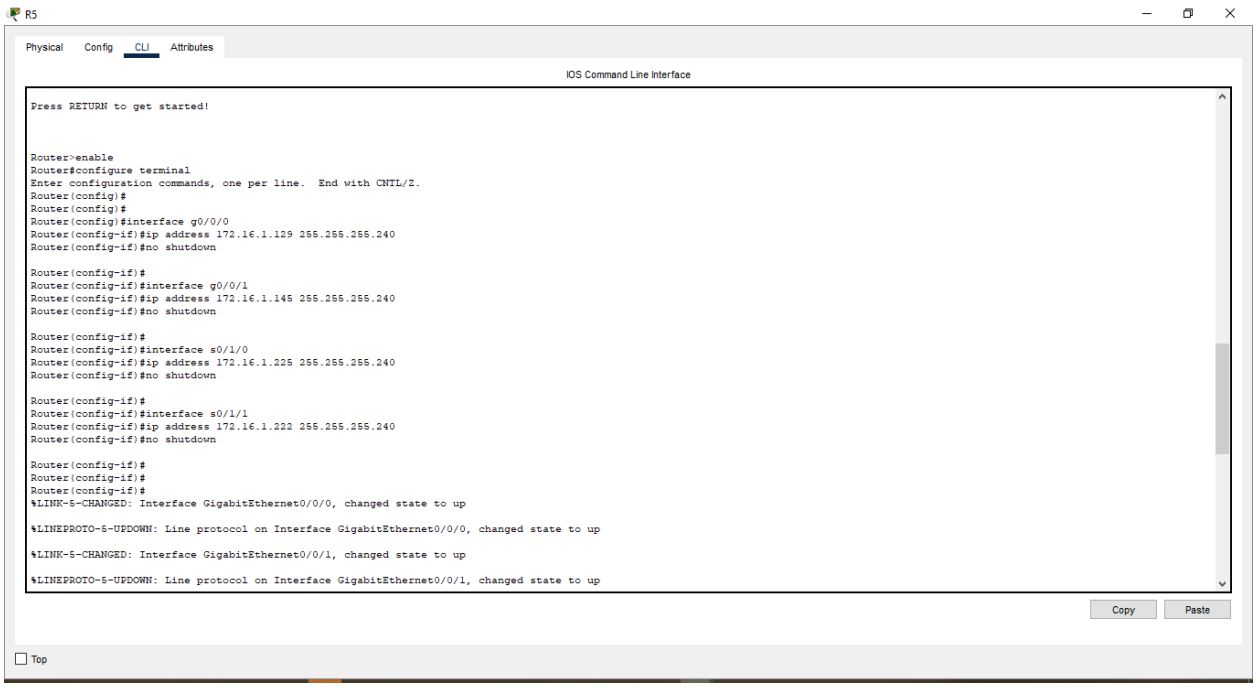
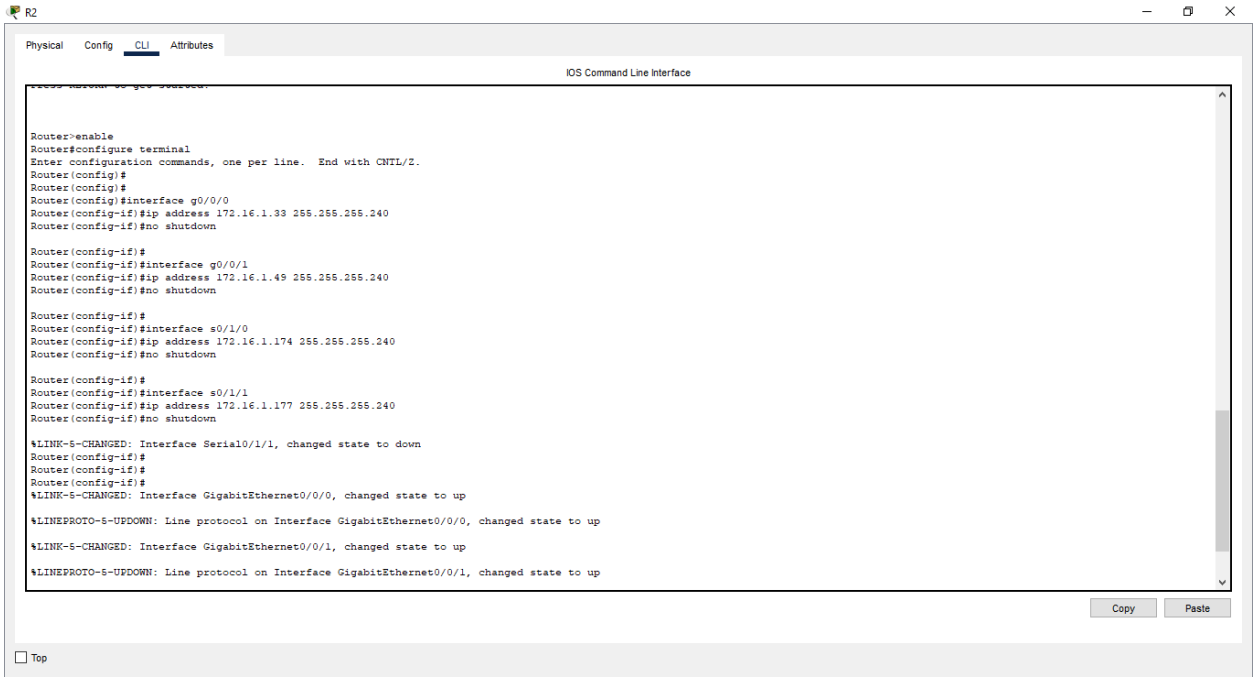
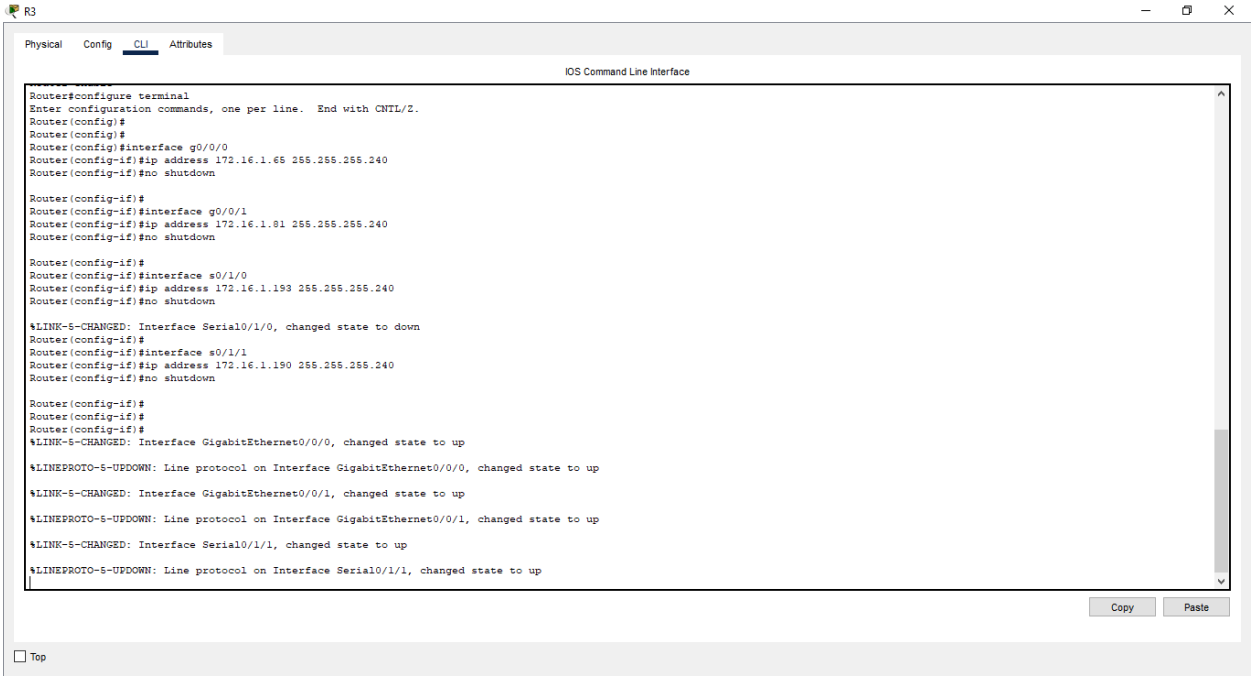
Top

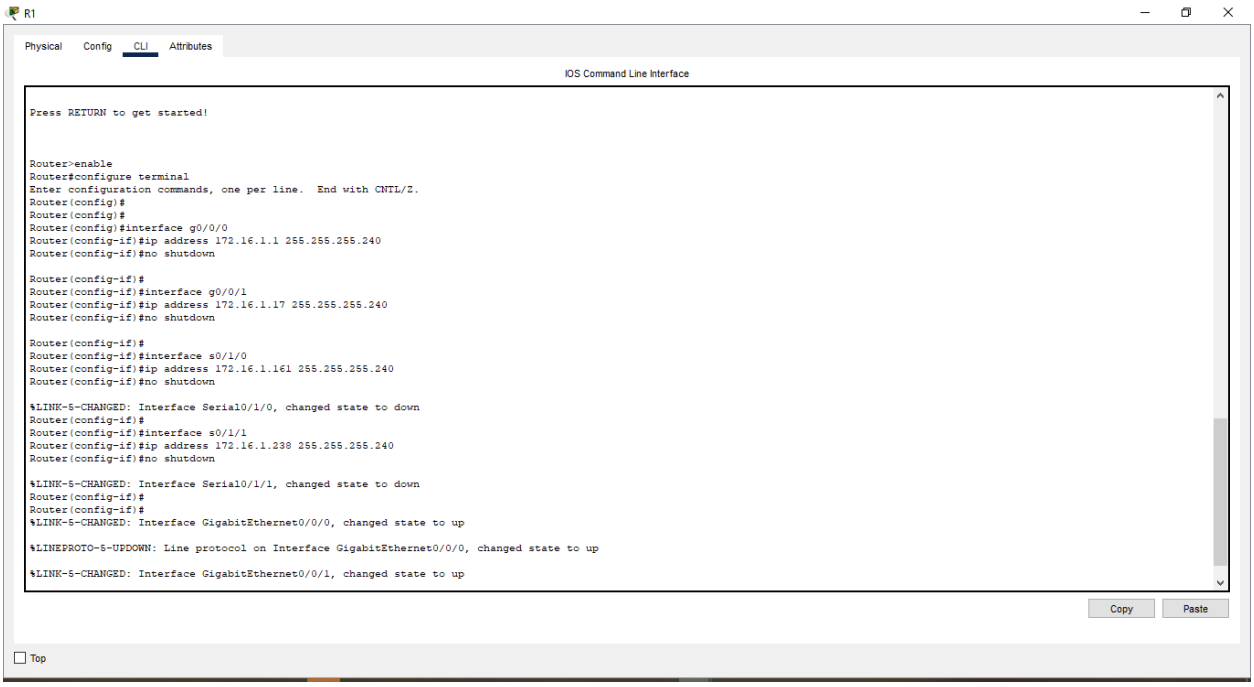
e. Assign the third usable IP address to the PCs in each subnet






R2
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.33 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.49 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/0
Router(config-if)#ip address 172.16.1.174 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/1
Router(config-if)#ip address 172.16.1.177 255.255.255.240
Router(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
Router(config-if)#
Router(config-if)#
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
Copy
Paste
Top


R3
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 172.16.1.65 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 172.16.1.81 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface s0/1/0
Router(config-if)#ip address 172.16.1.193 255.255.255.240
Router(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
Router(config-if)#
Router(config-if)#interface s0/1/1
Router(config-if)#ip address 172.16.1.190 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to up
Copy
Paste
Top

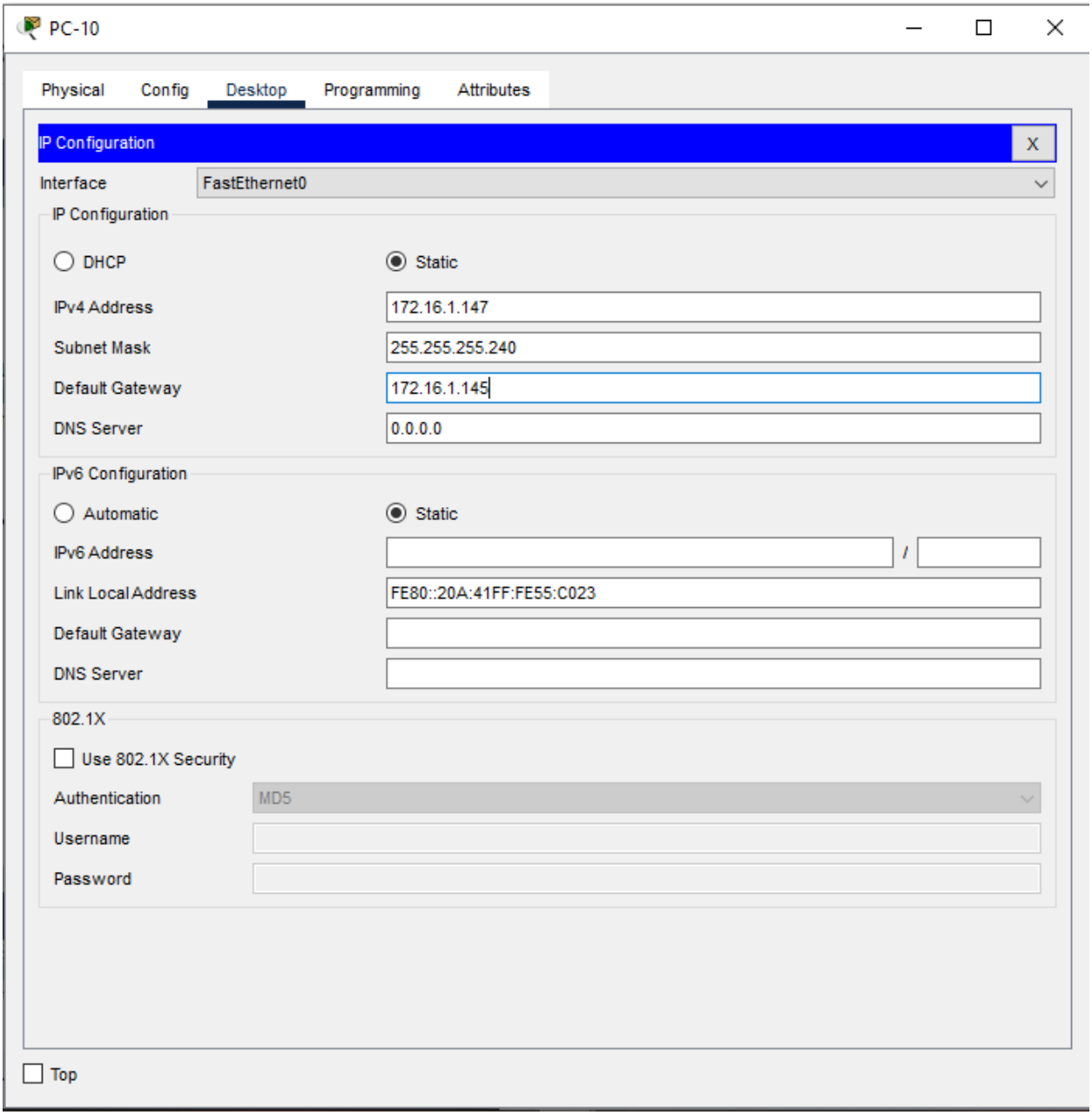


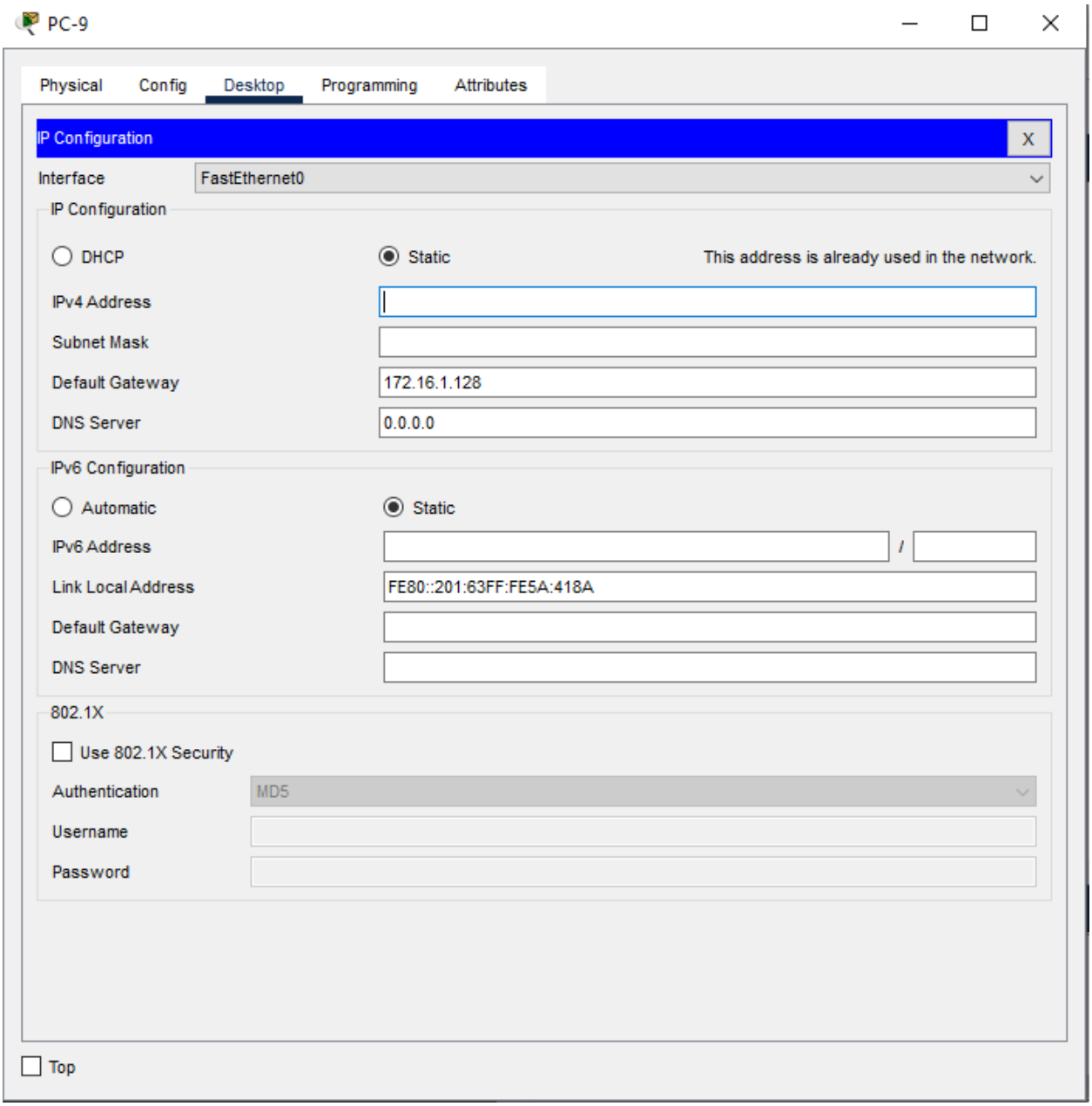
Addressing Table

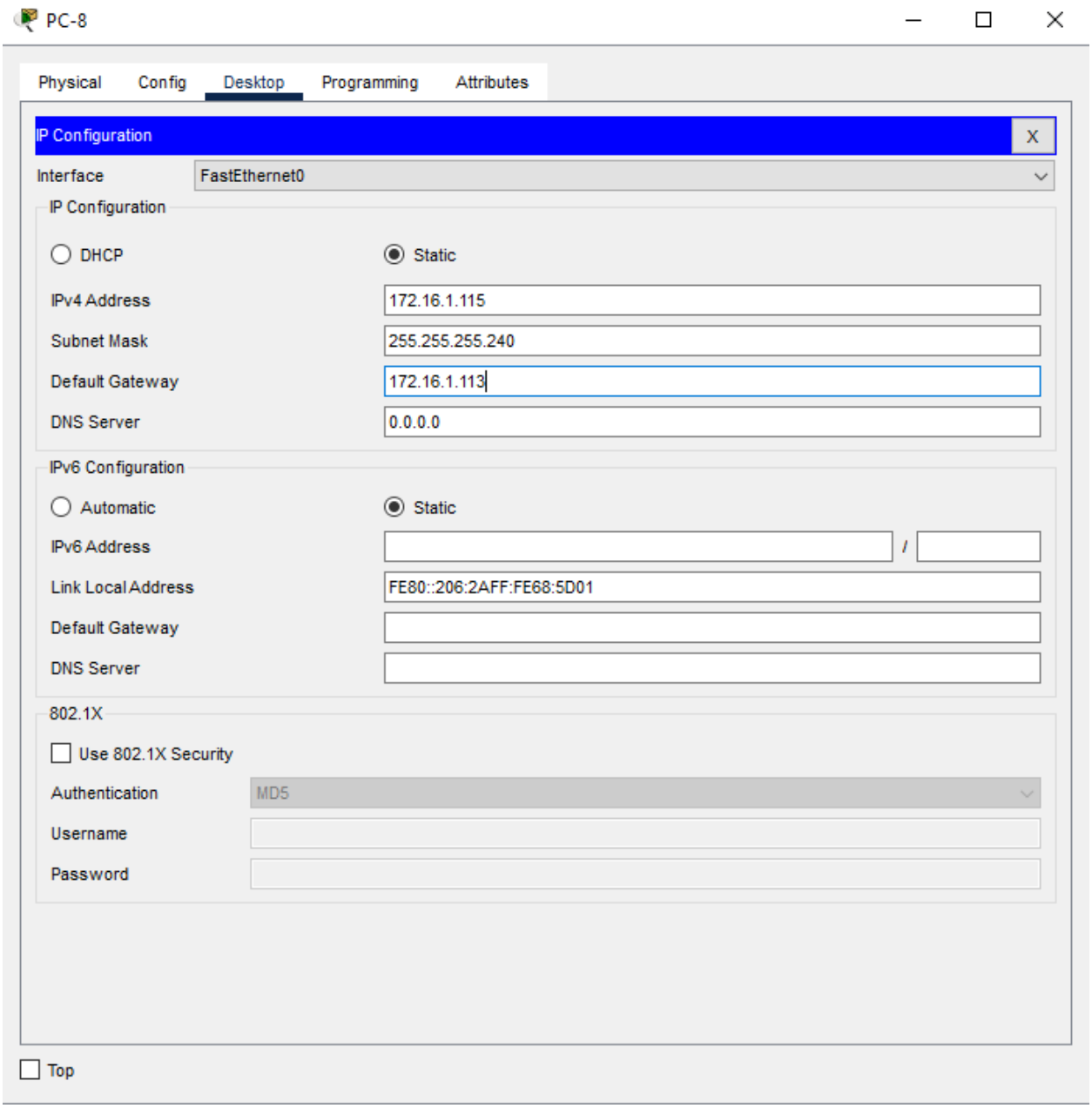
Devices	Interfaces	IP Addresses	Subnet Mask	Default Gateway
R1	G0/0/0	172.16.1.1	255.255.255.240	
	G0/0/1	172.16.1.17	255.255.255.240	
	S0/1/0	172.16.1.161	255.255.255.240	
	S0/1/1	172.16.1.238	255.255.255.240	
R2	G0/0/0	172.16.1.33	255.255.255.240	
	G0/0/1	172.16.1.49	255.255.255.240	
	S0/1/0	172.16.1.174	255.255.255.240	
	S0/1/1	172.16.1.177	255.255.255.240	
R3	G0/0/0	172.16.1.65	255.255.255.240	
	G0/0/1	172.16.1.81	255.255.255.240	
	S0/1/0	172.16.1.193	255.255.255.240	
	S0/1/1	172.16.1.190	255.255.255.240	
R4	G0/0/0	172.16.1.97	255.255.255.240	
	G0/0/1	172.16.1.113	255.255.255.240	
	S0/1/0	172.16.1.206	255.255.255.240	
	S0/1/1	172.16.1.209	255.255.255.240	
R5	G0/0/0	172.16.1.129	255.255.255.240	

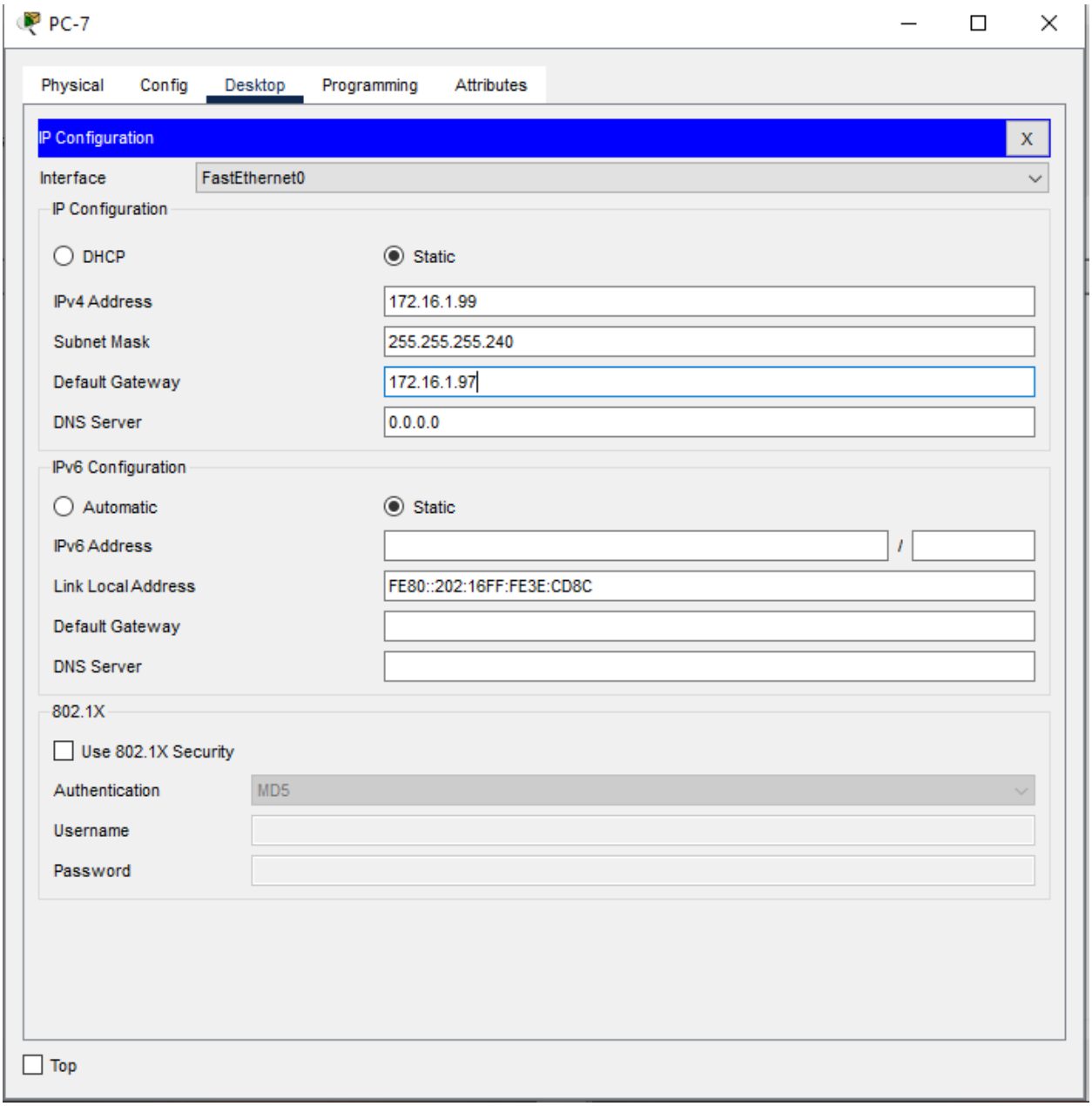
	G0/0/1	**172.16.1.145**	**255.255.255.240**	
	S0/1/0	**172.16.1.255**	**255.255.255.240**	
	S0/1/1	**172.16.1.222**	**255.255.255.240**	
S1	**VLAN1**	**172.16.1.2**	**255.255.255.240**	
S2	**VLAN1**	**172.16.1.18**	**255.255.255.240**	
S3	**VLAN1**	**172.16.1.34**	**255.255.255.240**	
S4	**VLAN1**	**172.16.1.50**	**255.255.255.240**	
S5	**VLAN1**	**172.16.1.66**	**255.255.255.240**	
S6	**VLAN1**	**172.16.1.82**	**255.255.255.240**	
S7	**VLA**	**172.16.1.98**	**255.255.255.240**	
S8	**VLAN1**	**172.16.1.114**	**255.255.255.240**	
S9	**VLAN1**	**172.16.1.130**	**255.255.255.240**	
S10	**VLAN1**	**172.16.1.146**	**255.255.255.240**	
PC-1	**NIC**	**172.16.1.2**	**255.255.255.240**	**172.16.1.1**
PC-2	**NIC**	**172.16.1.19**	**255.255.255.240**	**172.16.1.17**
PC-3	**NIC**	**172.16.1.35**	**255.255.255.240**	**172.16.1.33**
PC-4	**NIC**	**172.16.1.51**	**255.255.255.240**	**172.16.1.49**
PC-5	**NIC**	**172.16.1.66**	**255.255.255.240**	**172.16.1.65**
PC-6	**NIC**	**172.16.1.83**	**255.255.255.240**	**172.16.1.81**
PC-7	**NIC**	**172.16.1.89**	**255.255.255.240**	**172.16.1.87**
PC-8	**NIC**	**172.16.1.115**	**255.255.255.240**	**172.16.1.113**
PC-9	**NIC**	**172.16.1.131**	**255.255.255.240**	**172.16.1.129**
PC-10	**NIC**	**172.16.1.147**	**255.255.255.240**	**172.16.1.145**

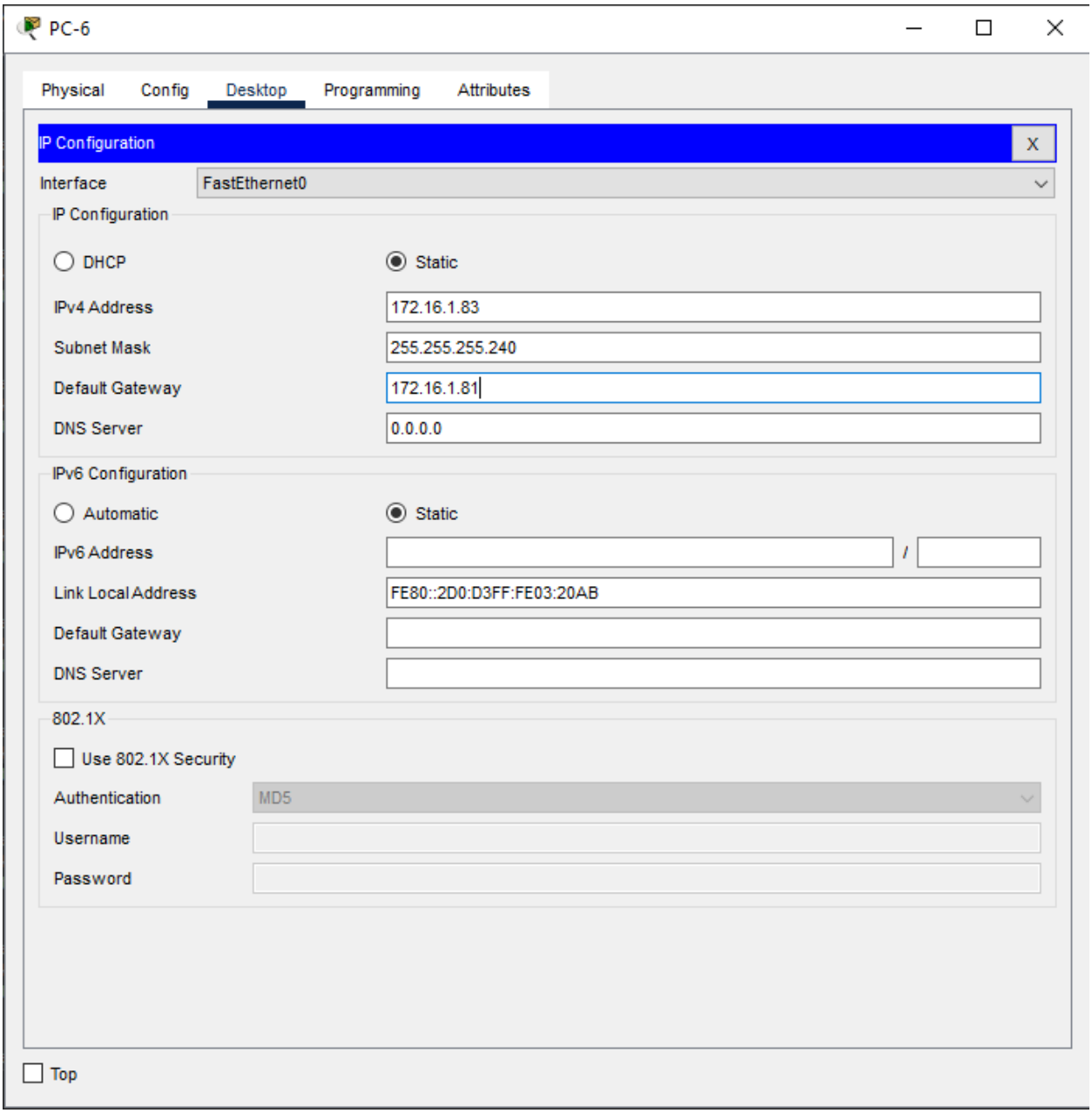
4. Assign IP addresses to network devices and verify connectivity.

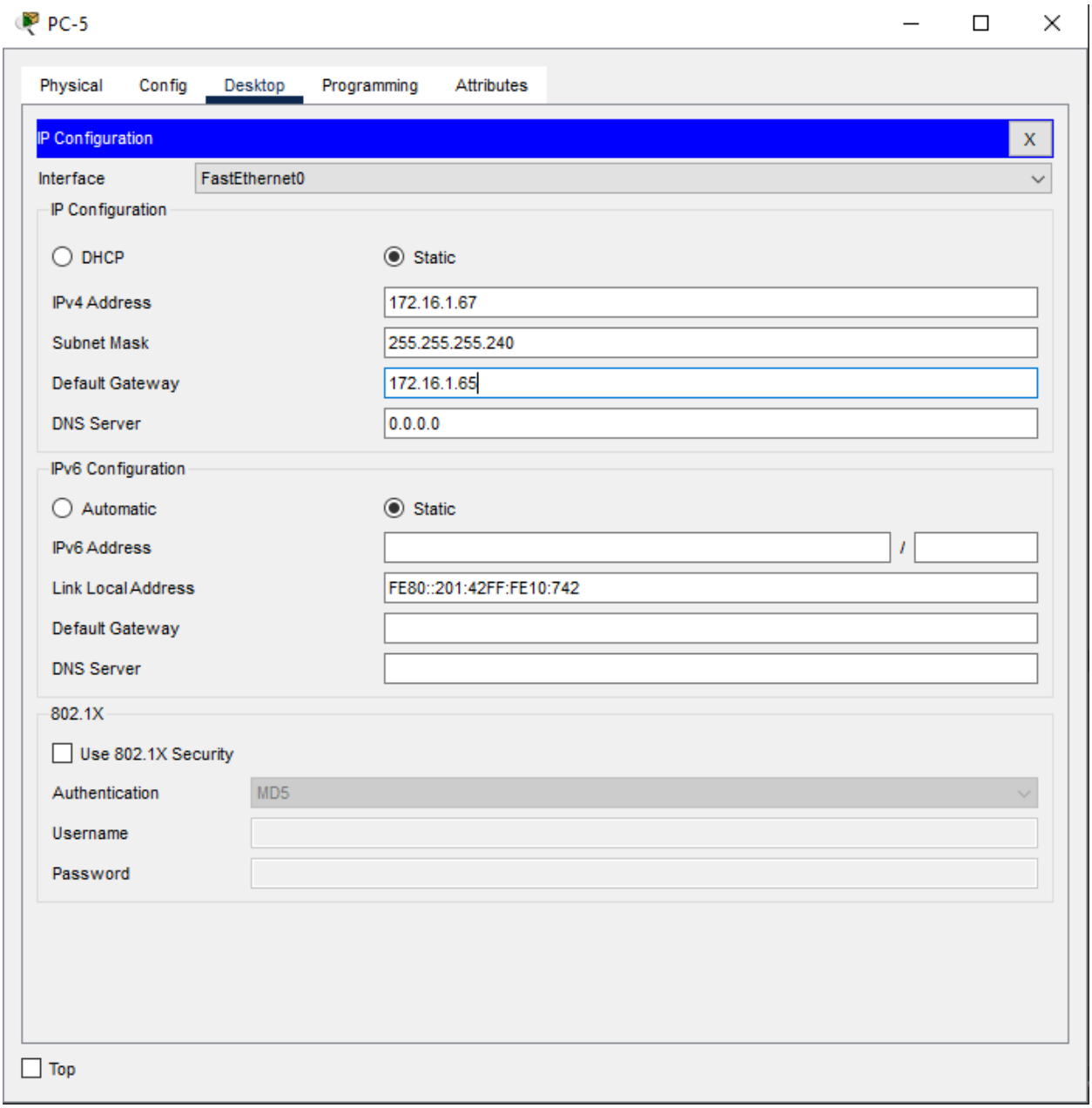

PC-10
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.16.1.147
Subnet Mask
255.255.255.240
Default Gateway
172.16.1.145
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::20A:41FF:FE55:C023
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

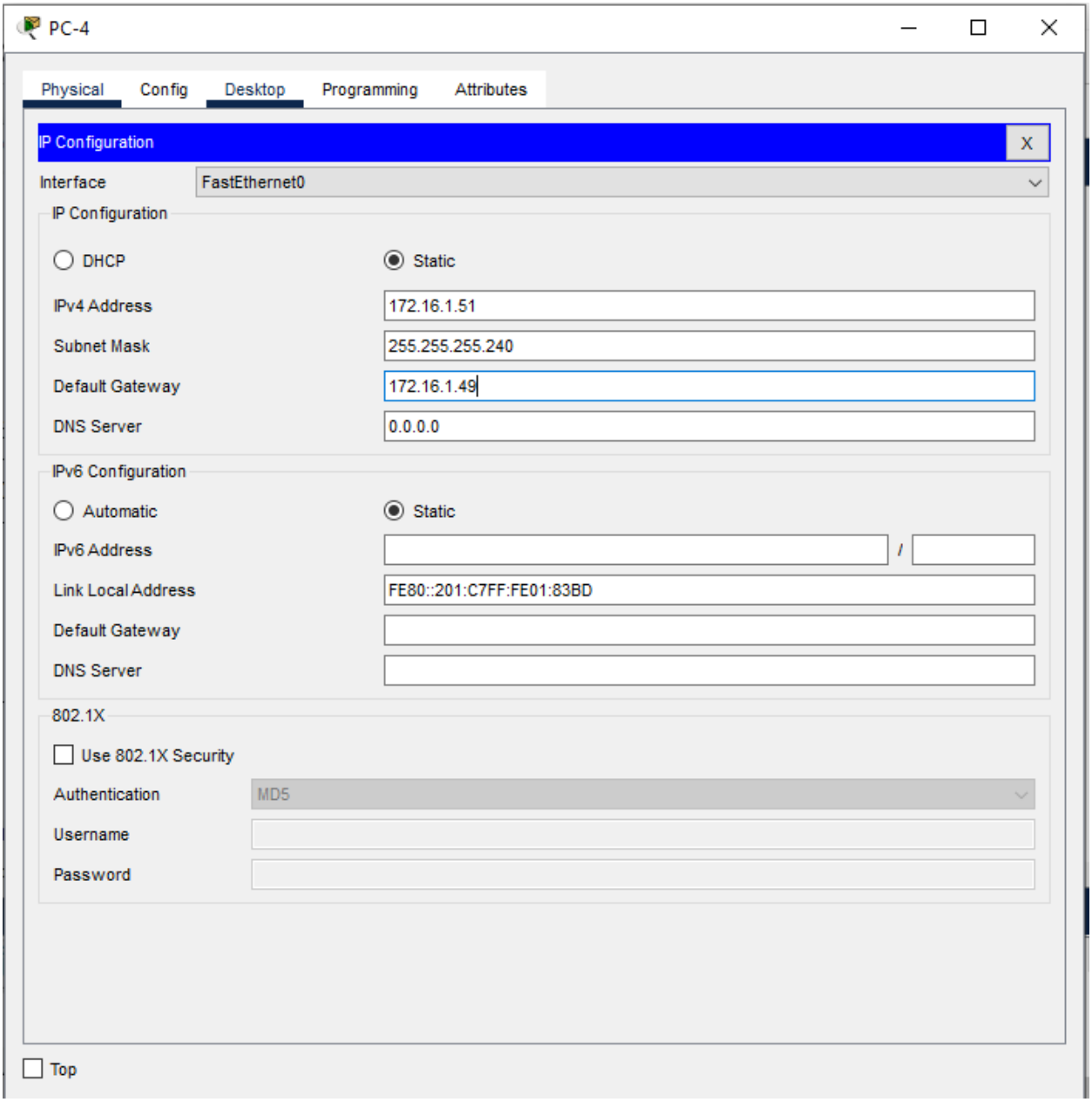

PC-9
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
This address is already used in the network.
IPv4 Address
Subnet Mask
Default Gateway
172.16.1.128
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::201:63FF:FE5A:418A
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

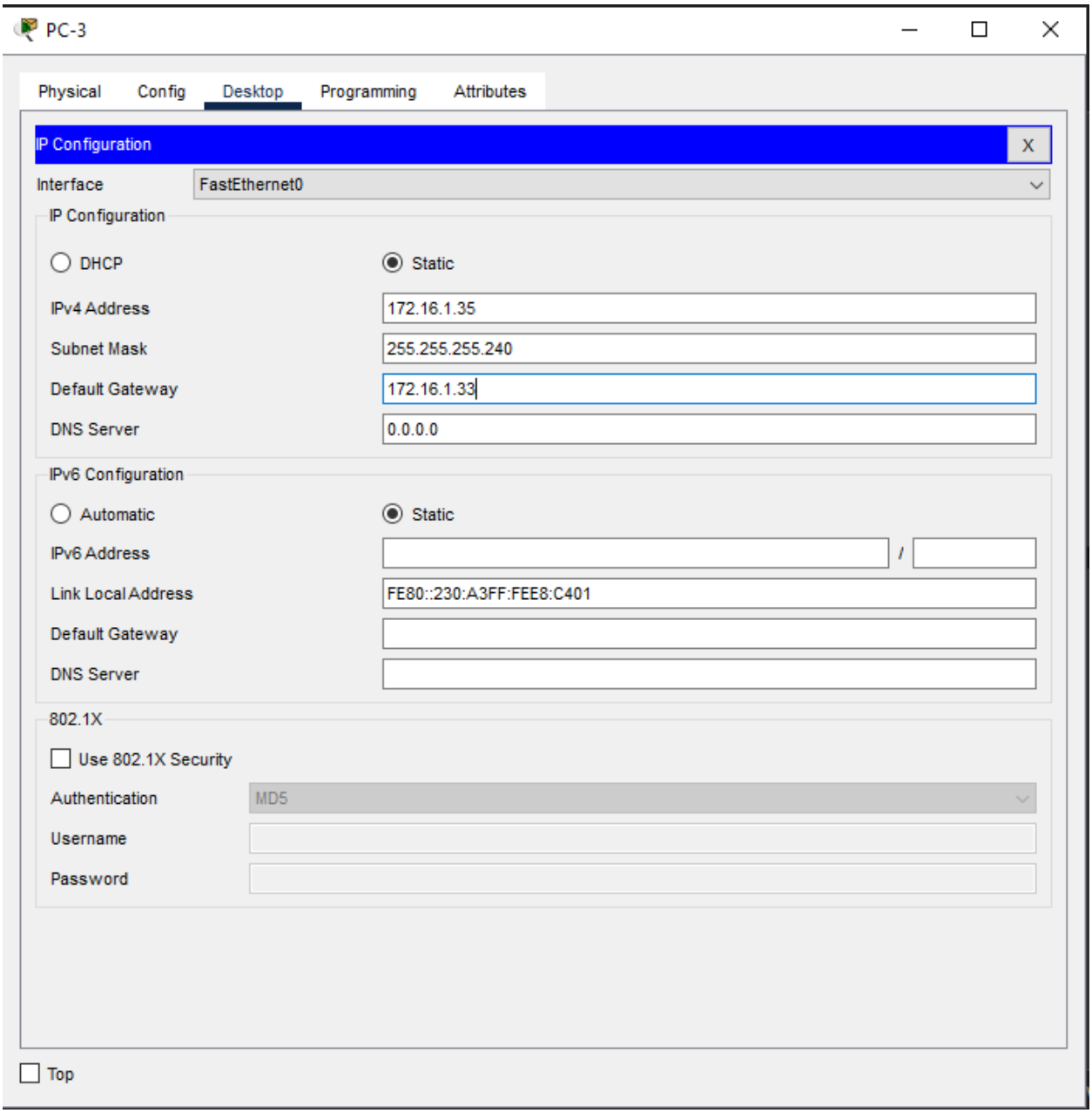

PC-8
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.16.1.115
Subnet Mask
255.255.255.240
Default Gateway
172.16.1.113
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::206:2AFF:FE68:5D01
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

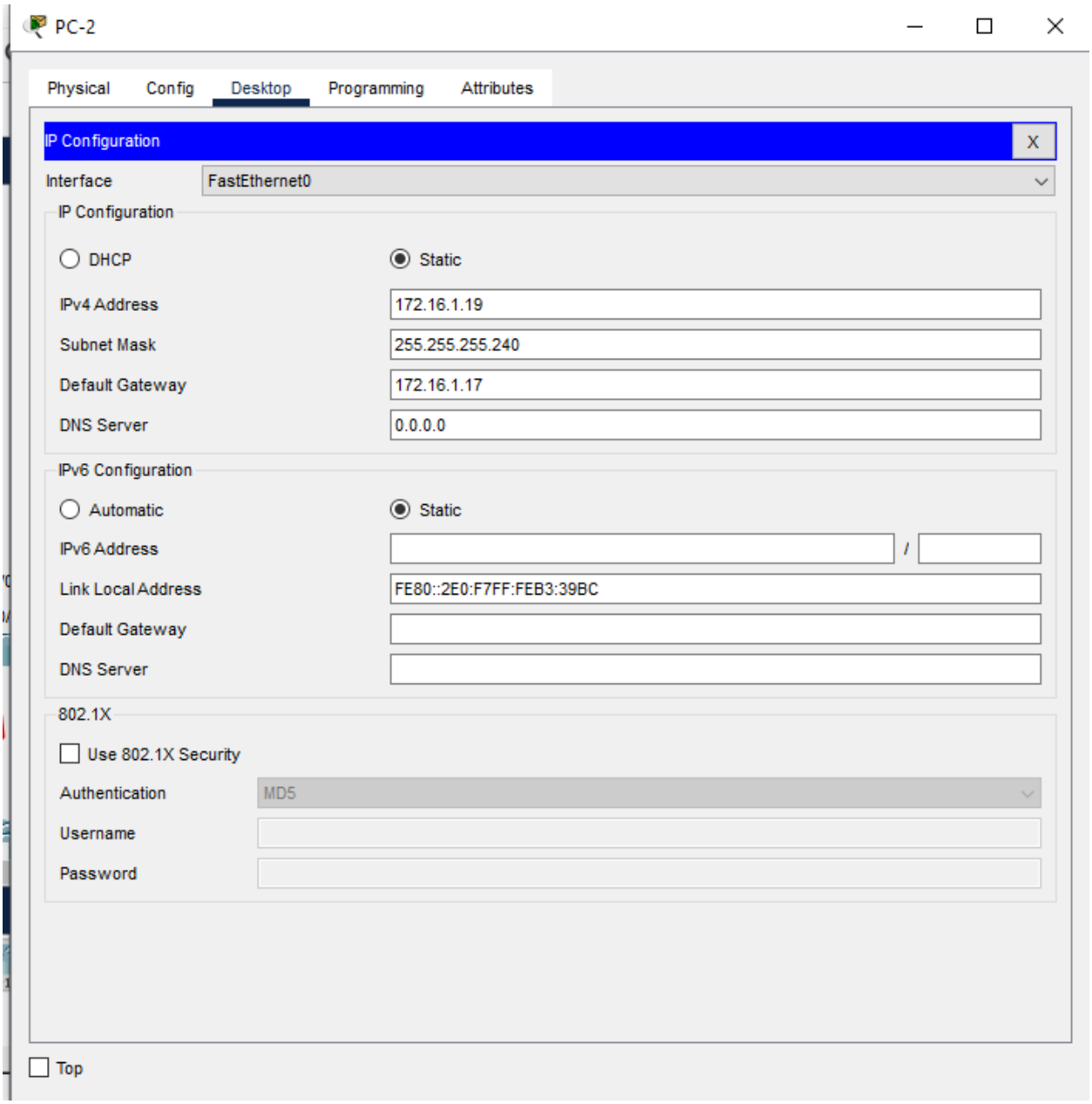

PC-7
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.16.1.99
Subnet Mask
255.255.255.240
Default Gateway
172.16.1.97
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::202:16FF:FE3E:CD8C
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

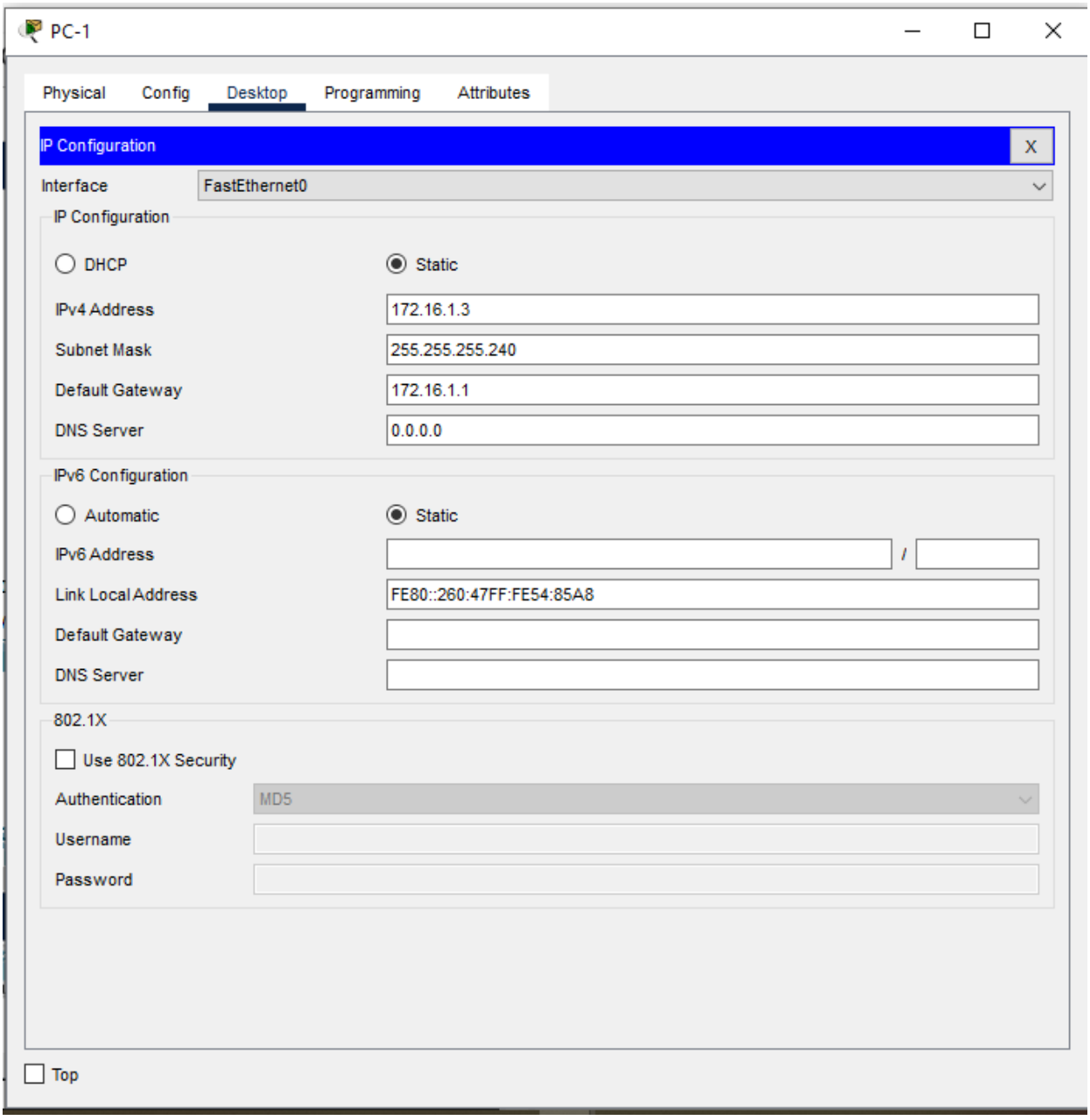

PC-6
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.16.1.83
Subnet Mask
255.255.255.240
Default Gateway
172.16.1.81
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::2D0:D3FF:FE03:20AB
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top


PC-5
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.16.1.67
Subnet Mask
255.255.255.240
Default Gateway
172.16.1.65
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::201:42FF:FE10:742
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top


PC-4
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.16.1.51
Subnet Mask
255.255.255.240
Default Gateway
172.16.1.49
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::201:C7FF:FE01:83BD
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top


PC-3
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.16.1.35
Subnet Mask
255.255.255.240
Default Gateway
172.16.1.33
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::230:A3FF:FEE8:C401
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top


PC-2
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.16.1.19
Subnet Mask
255.255.255.240
Default Gateway
172.16.1.17
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::2E0:F7FF:FEB3:39BC
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top


PC-1
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.16.1.3
Subnet Mask
255.255.255.240
Default Gateway
172.16.1.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::260:47FF:FE54:85A8
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

Discussion

- In this lab session, we focused on learning and implementing IPv4 subnetting and IP addressing schemes. The primary goal was to design an effective IP scheme for a network. First, we identified the main network address and, based on the requirements for the number of subnets and hosts, proceeded to divide the network using IPv4 subnetting. After creating the subnets, we assigned appropriate IP addresses to each network device, including routers, switches, and PCs. Finally, we verified the connectivity between the devices, ensuring that communication was successful both within the same subnet and across different subnets. This exercise emphasized the importance of proper subnetting for efficient IP management and network organization.