NST21022 - Practical for Network Switching and Routing

Department of Information and Communication Technology

Faculty of Technology

Labsheet :07
Reg. Number: SEU/IS/20/ICT/084
Academic Year :2020/2021
Practical No :07

Title: IPv4 VLSM (Variable Length Subnet Mask)
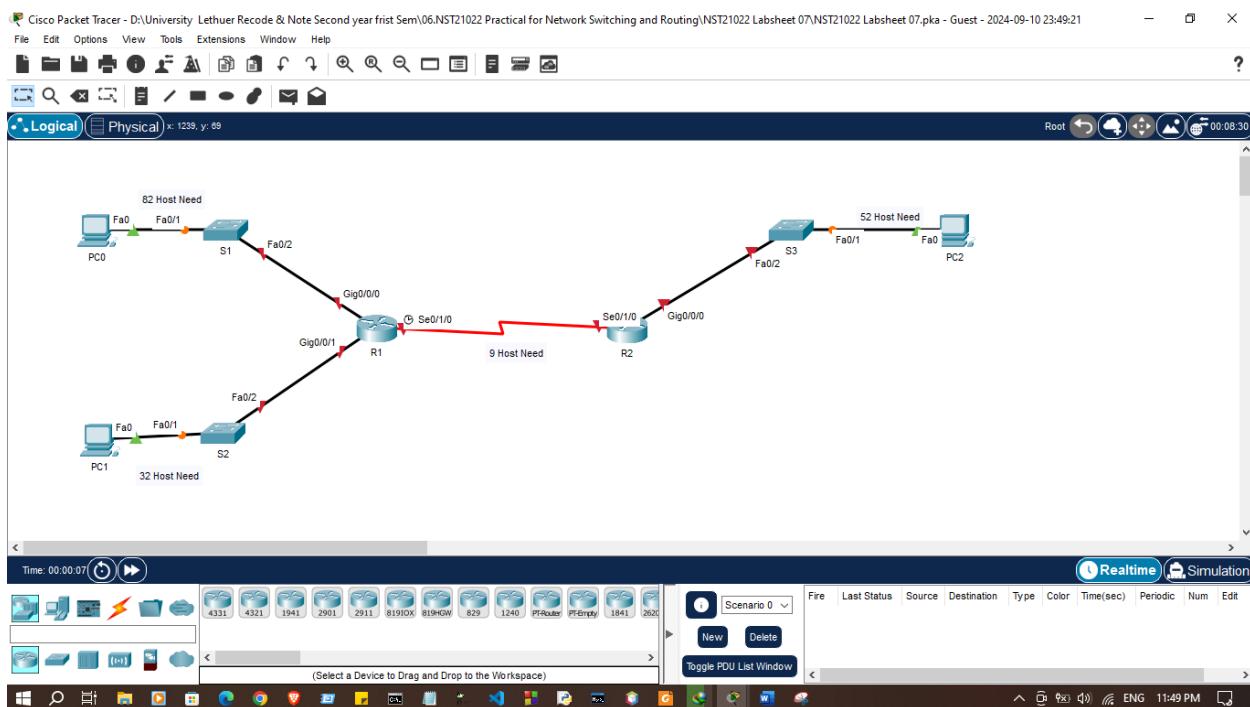
Aim:

- VLSM IP addressing scheme
- 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 07.pka" file Activities

Exercise 01: Subnet the 192.168.1.0/24 network into the appropriate subnets.

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

   - 4

2. How many hosts need for each subnet?

   - Subnet 01 –82
   - Subnet 02 -32
   - Subnet 03 -52
   - Subnet 04 -2

3. How many hosts provide by each subnet?
   - Subnet 01 –128
   - Subnet 02 -32
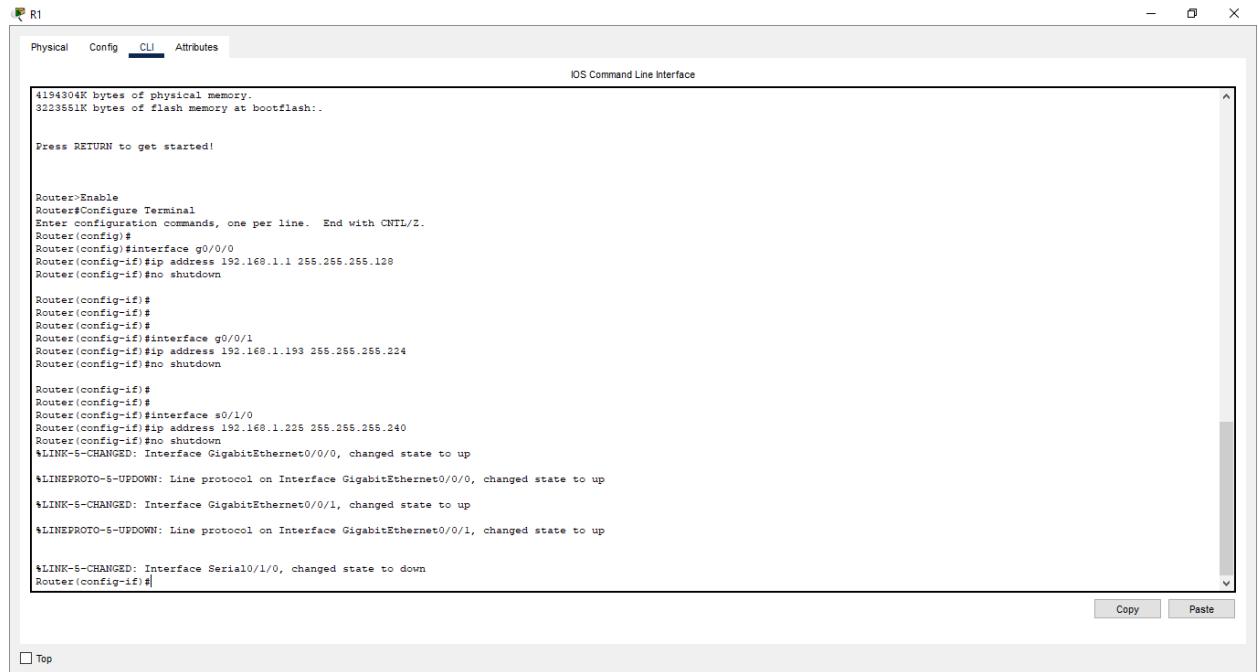   - Subnet 03 -64
   - Subnet 04 -4

Exercise 02: Fill the subnet table

Subnet Numbe	Network Address	First Usable Host Address	Last Usable Host Address	Broadcast Address
1	192.168.1.0	192.168.1.1	192.168.1.126	192.168.1.127
2	192.168.1.128	192.168.1.127	192.168.1.190	192.168.1.191
3	192.168.1.192	192.168.1.193	192.168.1.222	192.168.1.223
4	192.168.1.224	192.168.1.225	192.168.1.253	192.168.1.254

Exercise 03: Configure IP address according to following criteria.

1. Fill the addressing table using following guidelines:

a. Assign the first usable IP addresses in each subnet to R1 for the two LAN link and WAN link

b. Assign the first usable IP addresses of the subnet to R2 for the LAN links, assign the last usable IP address for the WAN link

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

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*    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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Press RETURN to get started!


%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up


Switch>Enable
Switch#Configure Terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#
Switch(config)#interface vlan1
Switch(config-if)#ip address 192.168.1.2 255.255.255.128
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)#
```

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*    1 26    WS-C2960-24TT-L    15.0(2)SE4              C2960-LANBASEK9-M

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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


Switch>Enable
Switch#Configure Terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#
Switch(config)#interface vlan1
Switch(config-if)#ip address 192.168.1.194 255.255.255.224
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)#
```

```
------ ----- -----                    ----------          ----------
*   1 26   WS-C2960-24TT-L    15.0(2)SE4               C2960-LANBASEK9-M

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Press RETURN to get started!


%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up


Switch>Enable
Switch#Configure Terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#
Switch(config)#interface vlan1
Switch(config-if)#ip address 192.168.1.130 255.255.255.192
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)#
```
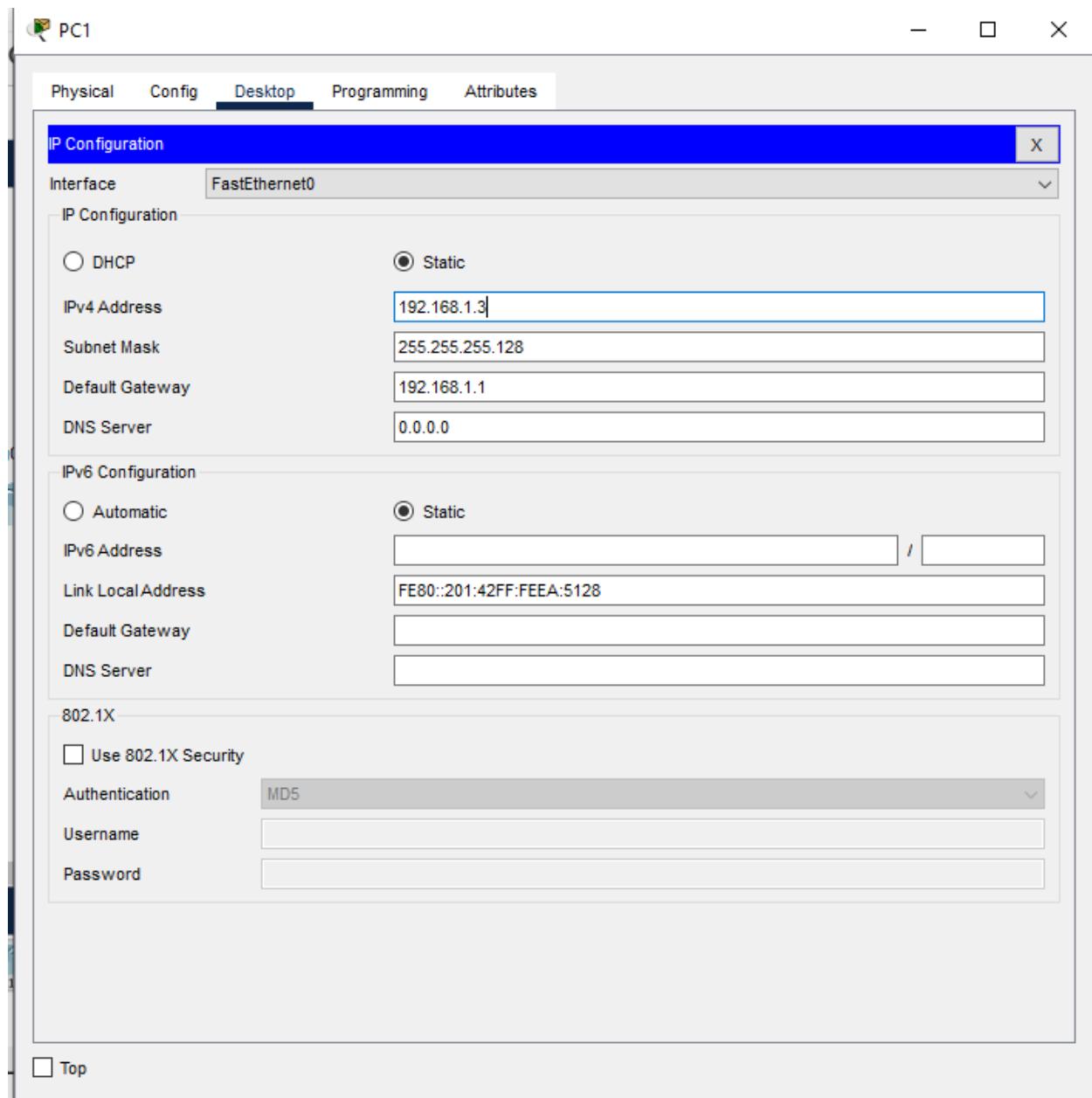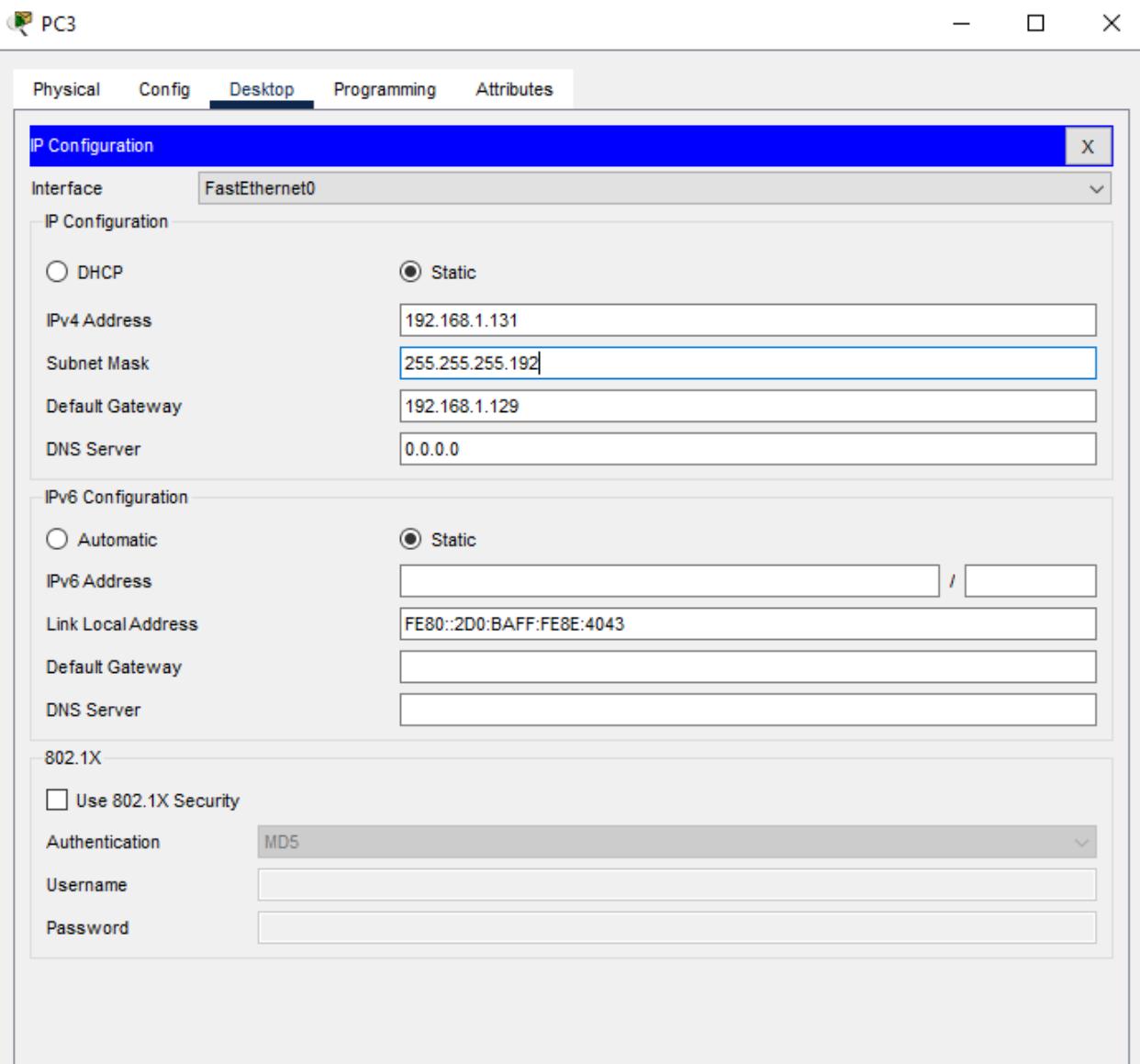
d. Assign the third usable IP address to the PCs in each subnet

PC1 — □ X

Physical | Config | Desktop | Programming | Attributes

IP Configuration   X

Interface   FastEthernet0

IP Configuration

○ DHCP   ● Static

IPv4 Address   192.168.1.3

Subnet Mask   255.255.255.128

Default Gateway   192.168.1.1

DNS Server   0.0.0.0

IPv6 Configuration

○ Automatic   ● Static

IPv6 Address   /

Link Local Address   FE80::201:42FF:FEEA:5128

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication   MD5

Username

Password

☐ Top

PC3

Physical | Config | Desktop | Programming | Attributes

IP Configuration [X]

Interface: FastEthernet0

IP Configuration

○ DHCP   ● Static

IPv4 Address: 192.168.1.131

Subnet Mask: 255.255.255.192

Default Gateway: 192.168.1.129

DNS Server: 0.0.0.0

IPv6 Configuration

○ Automatic   ● Static

IPv6 Address: _____ / ___

Link Local Address: FE80::2D0:BAFF:FE8E:4043

Default Gateway: _____

DNS Server: _____

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username: _____

Password: _____

PC2   — ☐ ✕

Physical   Config   Desktop   Programming   Attributes

IP Configuration   X

Interface   FastEthernet0   ⌄

IP Configuration

○ DHCP   ◉ Static

IPv4 Address   192.168.1.195

Subnet Mask   255.255.255.224

Default Gateway   192.168.1.193

DNS Server   0.0.0.0

IPv6 Configuration

○ Automatic   ◉ Static

IPv6 Address   [ ] / [ ]

Link Local Address   FE80::2D0:58FF:FE4D:5CB8

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication   MD5   ⌄

Username

Password
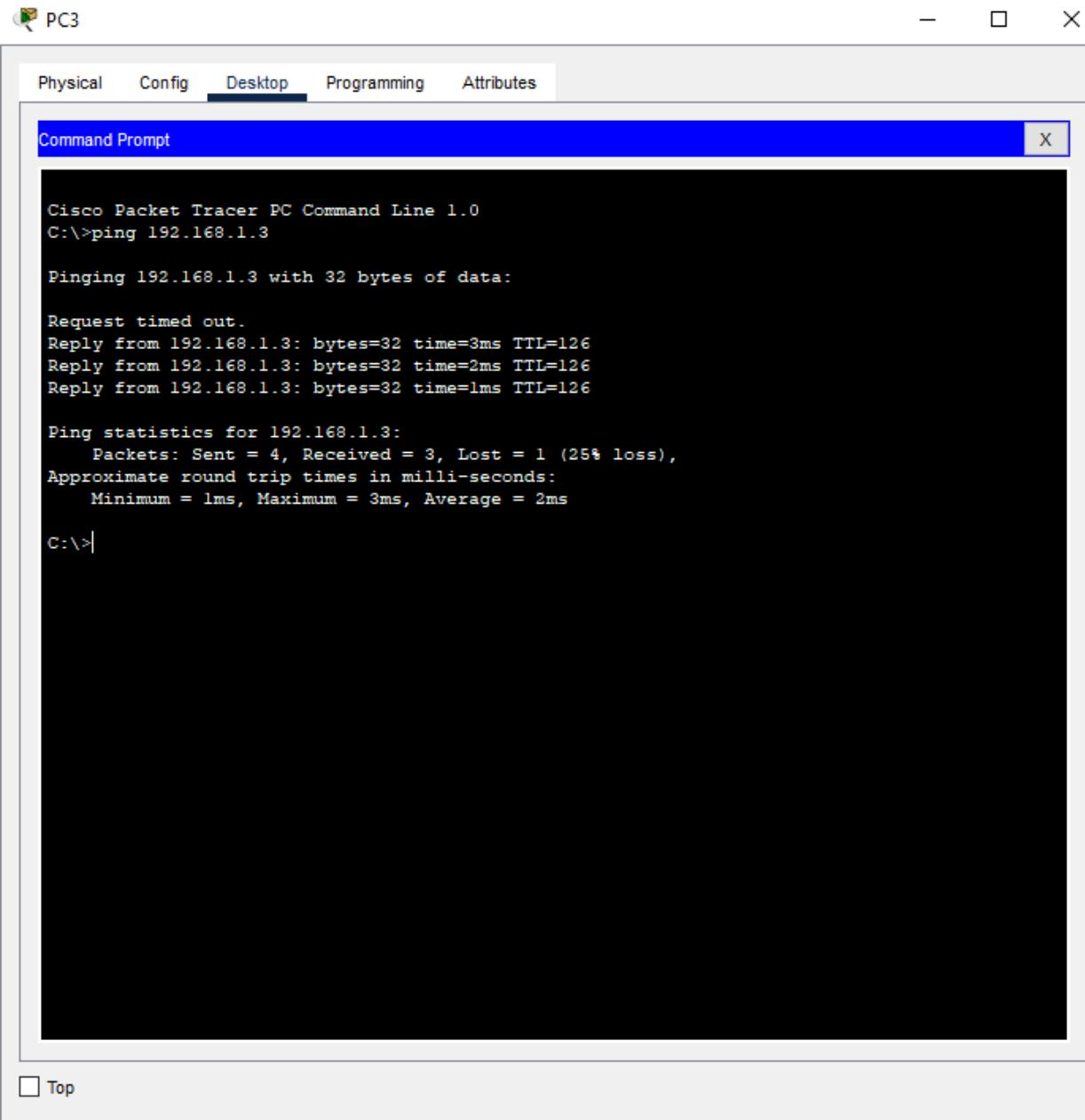
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Addressing Table

Devices	Interfaces	IP Addresses	Subnet Mask	Default Gateway
R1	G0/0/0	192.168.1.1	255.255.255.128	
	G0/0/1	192.168.1.193	255.255.255.224	
	S0/1/0	192.168.1.225	255.255.255.240	
R2	G0/0/0	192.168.1.129	255.255.255.192	
	S0/1/0	192.168.1.138	255.255.255.240	
S1	VLAN1	192.168.1.2	255.255.255.128	
S2	VLAN1	192.168.1.194	255.255.255.224	
S2	VLAN1	192.168.1.130	255.255.255.192	
PC-1	NIC	192.168.1.3	255.255.255.128	192.168.1.1
PC-2	NIC	192.168.1.195	255.255.255.224	192.168.1.193
PC-3	NIC	192.168.1.131	255.255.255.192	192.168.1.129

2. Assign IP addresses to network devices and verify connectivity
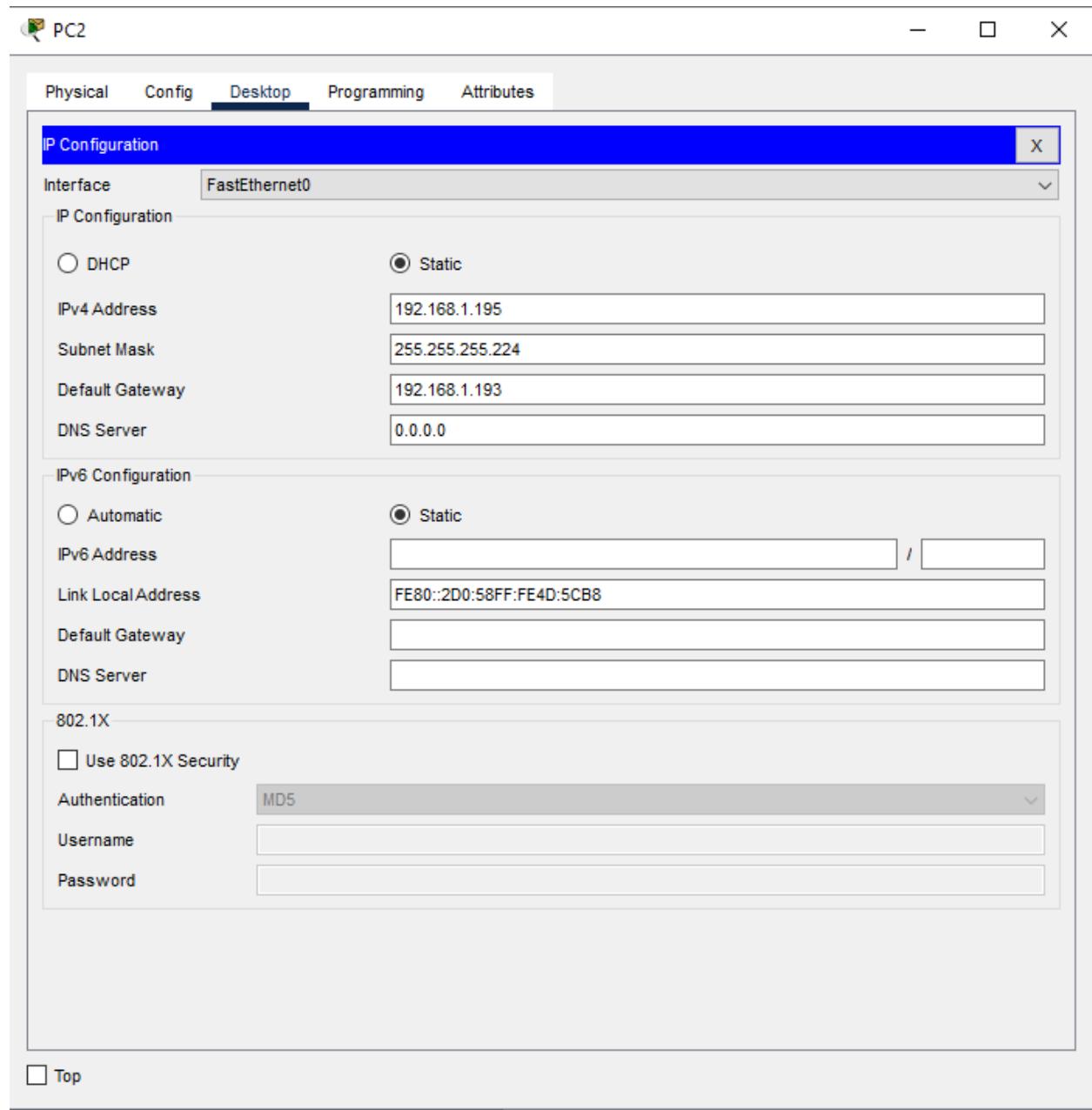
PC3   —   □   ✕

Physical   Config   Desktop   Programming   Attributes

Command Prompt   X

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.3

Pinging 192.168.1.3 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.3: bytes=32 time=3ms TTL=126
Reply from 192.168.1.3: bytes=32 time=2ms TTL=126
Reply from 192.168.1.3: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.1.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 3ms, Average = 2ms

C:\>
```

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Discussion

- In this lab session, we explored the concept of Variable Length Subnet Mask (VLSM) and its application in designing efficient IP addressing schemes. The goal was to create a flexible IP addressing plan that maximizes the use of available IP addresses. We started by designing an IP scheme based on the specific requirements for different subnets, using VLSM to allocate varying subnet sizes based on the number of hosts in each network segment. After subnetting the IPv4 address using VLSM, we assigned the appropriate IP addresses to network devices, ensuring each subnet had the correct size. Finally, we verified connectivity between devices, confirming that communication within and between subnets was successful. This session provided hands-on experience in optimizing IP address allocation using VLSM.