King Abdul-Aziz University
Faculty of Computing and Information Technology
Department of Information Technology

Networks Administration
CPIT470

Lab Project: Configuration of Network Devices for a Company
Semester II – Winter 2023

Phase 1

Student name: Elaf Yousef Aloufi

Student ID: 1911265

Section: B10

Task 1: IP addressing

The subnetwork addresses based on KAU ID:

- KAU ID: 1911265
- Reverse KAU ID: 5621191
- Add number 2 in front of the reversed KAU ID: 25621191
- Now, split this number into an IP address with every two digits forming a part: 25.62.11.91
- Consider the network address as: 25.62.11.91/22
- Network ID:

Binary IP address: 00011001001111100000101101011011

Binary Subnet mask: 11111111111111111111110000000000

AND operation: 00011001001111100000100000000000

Network address: 25.62.8.0

Subnet Name	Needed Size	Allocated Size	Address	Mask	Dec Mask	Assignable Range	Broadcast
VLAN 30	500	510	25.62.8.0	/23	255.255.254.0	25.62.8.1 - 25.62.9.254	25.62.9.255
VLAN 40	60	62	25.62.10.0	/26	255.255.255.192	25.62.10.1 - 25.62.10.62	25.62.10.63
VLAN 10	30	30	25.62.10.64	/27	255.255.255.224	25.62.10.65 - 25.62.10.94	25.62.10.95
Multiaccess	4	6	25.62.10.96	/29	255.255.255.248	25.62.10.97 - 25.62.10.102	25.62.10.103
VLAN 88	4	6	25.62.10.104	/29	255.255.255.248	25.62.10.105 - 25.62.10.110	25.62.10.111
VLAN 99	4	6	25.62.10.112	/29	255.255.255.248	25.62.10.113 - 25.62.10.118	25.62.10.119

- VLAN 30 (500 Hosts)
    - Number of hosts: 2^n – 2 >= 500, n= 9
    - Block size: 2^9 = 512
    - Network bits: 32 – 9 = 23
    - Subnet mask: 255.255.254.0
    - Network address: 25.62.8.0
    - Broadcast address: 25.62.9.255
    - First address: 25.62.8.1
    - Last address: 25.62.9.254
    - Range: 25.62.8.1 - 25.62.9.254

- VLAN 40 (60 Hosts)
    - Number of hosts: 2^n – 2 >= 60, n= 6
    - Block size: 2^6 = 64
    - Network bits: 32 – 6 = 26
    - Subnet mask: 255.255.255.192
    - Network address: 25.62.10.0
    - Broadcast address: 25.62.10.63
    - First address: 25.62.10.1
    - Last address: 25.62.10.62
    - Range: 25.62.10.1 - 25.62.10.62

- VLAN 10 (30 Hosts)
    - Number of hosts: 5
    - Block size: 32
    - Network bits: 27
    - Subnet mask: 255.255.255.224
    - Network address: 25.62.10.64
    - Broadcast address: 25.62.10.95
    - First address: 25.62.10.65
    - Last address: 25.62.10.94
    - Range: 25.62.10.65 - 25.62.10.94

- Multiaccess (4 Hosts)
    - Number of hosts: 3
    - Block size: 8
    - Network bits: 29
    - Subnet mask: 255.255.255.248
    - Network address: 25.62.10.96
    - Broadcast address: 25.62.10.103
    - First address: 25.62.10.97
    - Last address: 25.62.10.102
    - Range: 25.62.10.97 - 25.62.10.102

- VLAN 88 (4 Hosts)
    - Number of hosts: 3
    - Block size: 8
    - Network bits: 29
    - Subnet mask: 255.255.255.248
    - Network address: 25.62.10.104
    - Broadcast address: 25.62.10.111
    - First address: 25.62.10.105
    - Last address: 25.62.10.110
    - Range: 25.62.10.105 - 25.62.10.110

- VLAN 99 (4 Hosts)
    - Number of hosts: 3
    - Block size: 8
    - Network bits: 29
    - Subnet mask: 255.255.255.248
    - Network address: 25.62.10.112
    - Broadcast address: 25.62.10.119
    - First address: 25.62.10.113
    - Last address: 25.62.10.118
    - Range: 25.62.10.113 - 25.62.10.118

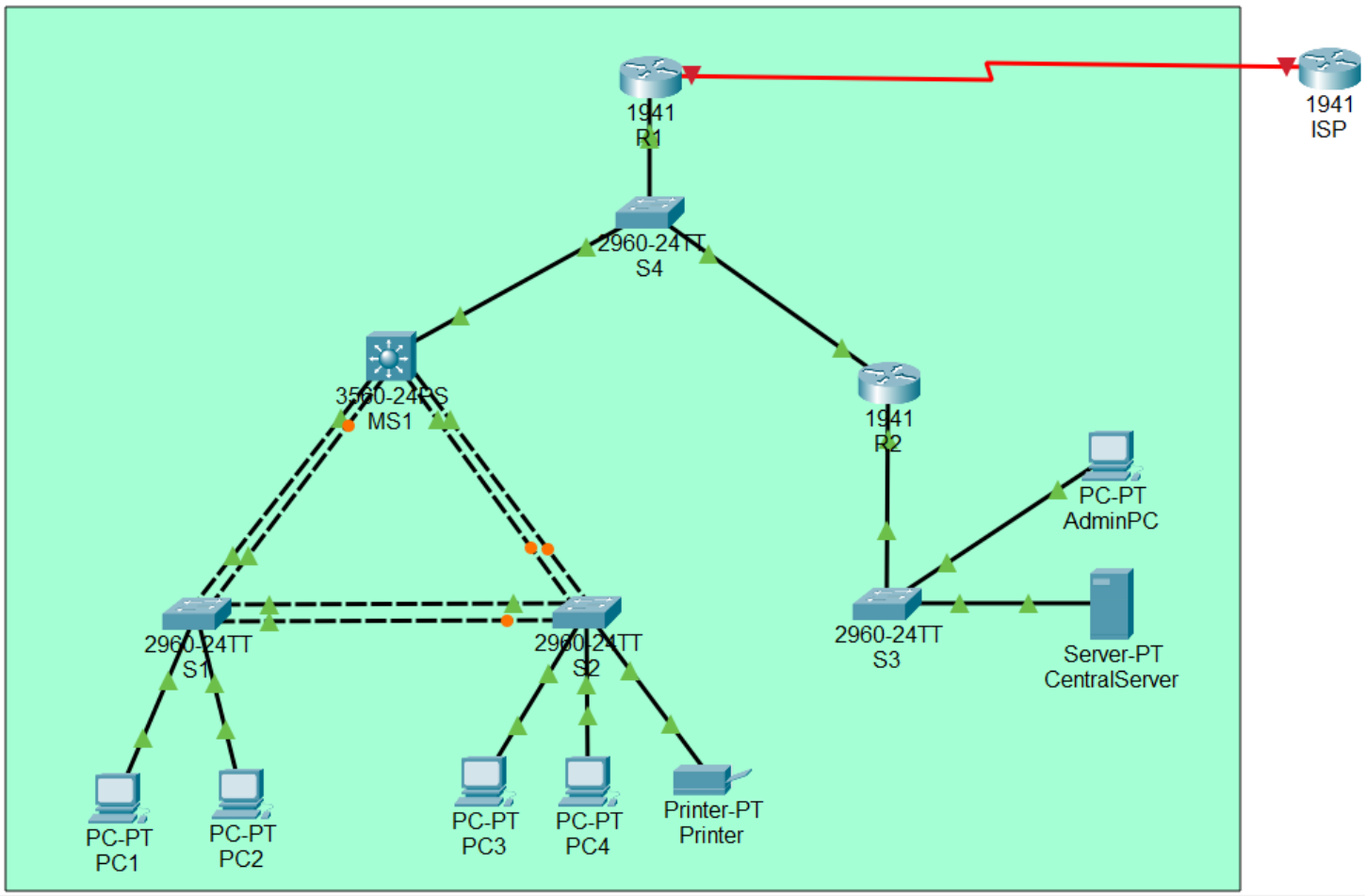
Device Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
S1	**VLAN 99**	25.62.10.114	255.255.255.248	25.62.10.113
S2	**VLAN 99**	25.62.10.115	255.255.255.248	25.62.10.113
S3	**VLAN 88**	25.62.10.106	255.255.255.248	25.62.10.105
S4	**Multiaccess**	25.62.10.100	255.255.255.248	25.62.10.98
MS1	**G0/1**	25.62.10.97	255.255.255.248	N/A
	VLAN 10	25.62.10.65	255.255.255.224	N/A
	VLAN 30	25.62.8.1	255.255.254.0	N/A
	VLAN 40	25.62.10.1	255.255.255.192	N/A
	VLAN 99	25.62.10.113	255.255.255.248	N/A
R1	**S0/0/0**	209.165.200.241	255.255.255.252	N/A
	G0/0	25.62.10.98	255.255.255.248	N/A
R2	**G0/0**	25.62.10.99	255.255.255.248	N/A
	G0/1	25.62.10.105	255.255.255.248	N/A
Admin PC	**NIC**	25.62.10.107	255.255.255.248	25.62.10.105
CentralServer	**NIC**	25.62.10.108	255.255.255.248	25.62.10.105
PC1	**NIC**	25.62.8.2	255.255.254.0	25.62.8.1
PC2	**NIC**	25.62.10.2	255.255.255.192	25.62.10.1
PC3	**NIC**	25.62.8.3	255.255.254.0	25.62.8.1
PC4	**NIC**	25.62.10.3	255.255.255.192	25.62.10.1
Printer	**NIC**	25.62.10.66	255.255.255.224	25.62.10.65

Port Assignments Table

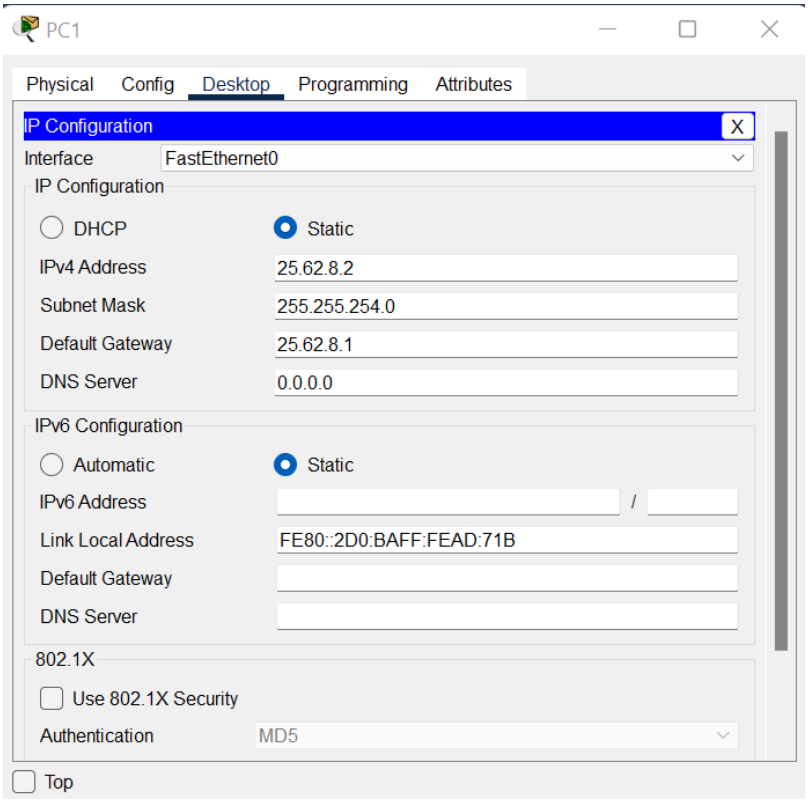
Ports	VLAN
F0/1- 0/10 for S1, S2 and MS1	Vlan99
All ports for S3	Vlan88
F0/11- 0/15 for S1, S2 and MS1	Vlan10
F0/16- 0/20 for S1, S2 and MS1	Vlan30
F0/21- 0/24 for S1, S2 and MS1	Vlan40

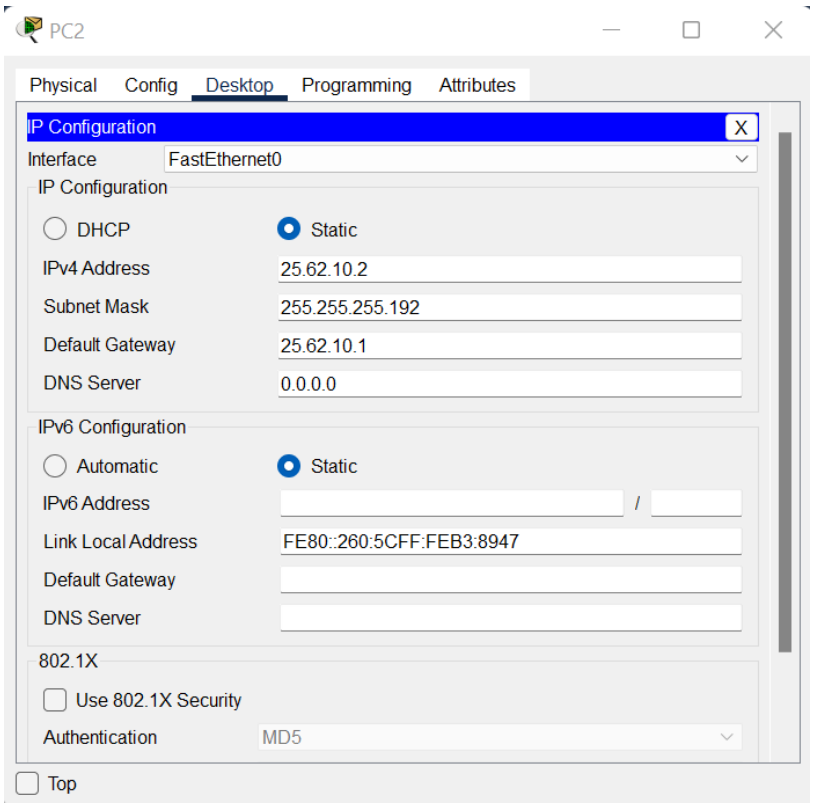
Task 2: Cable the network

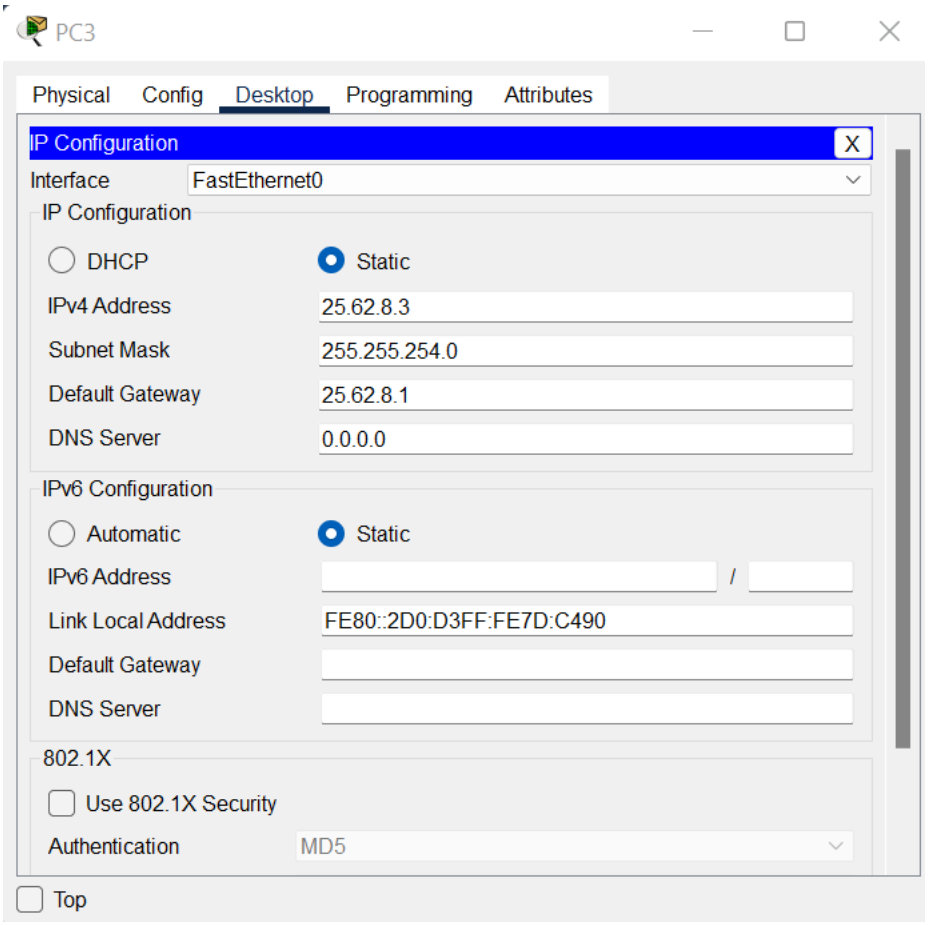


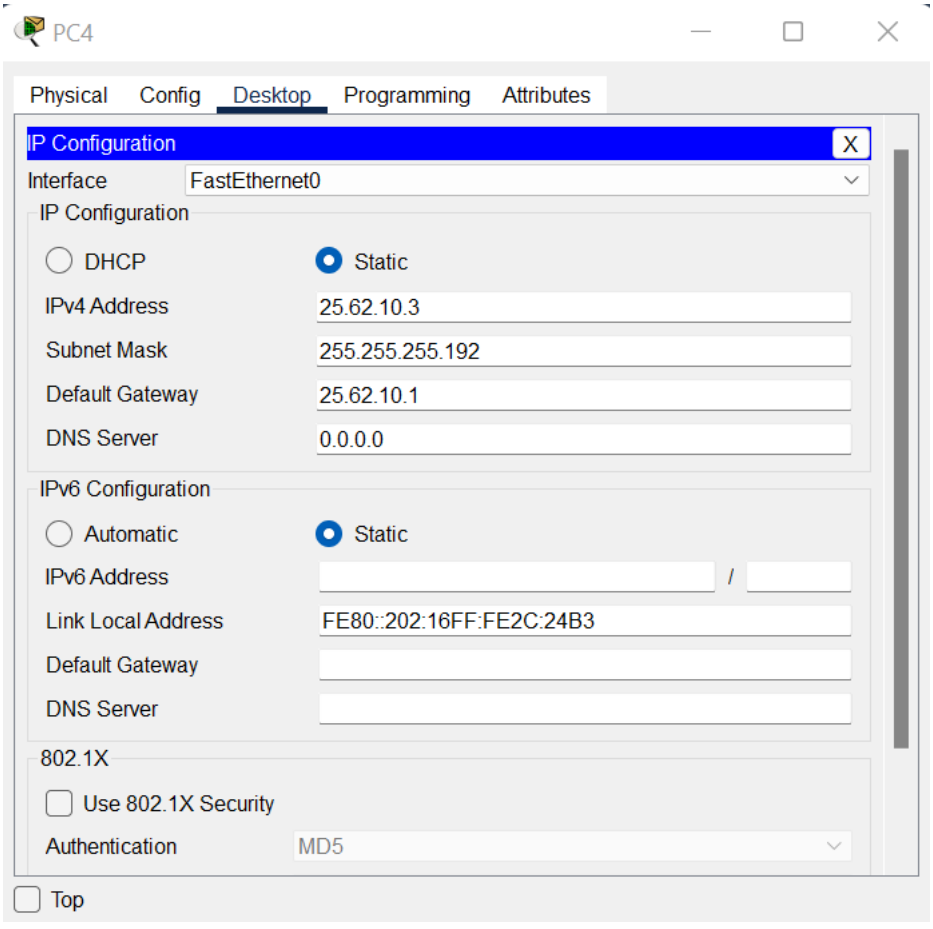
Task 3: Configure host PCs

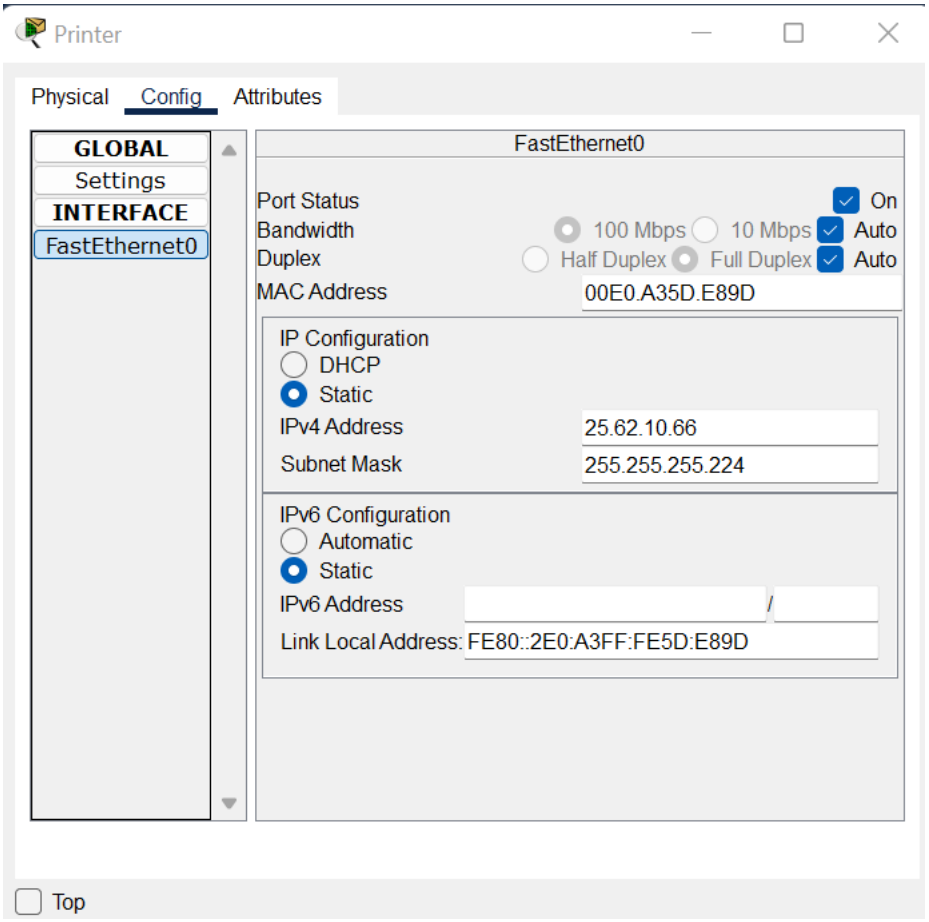
Configure all PCs with IP addresses and default gateways according to your addressing table.

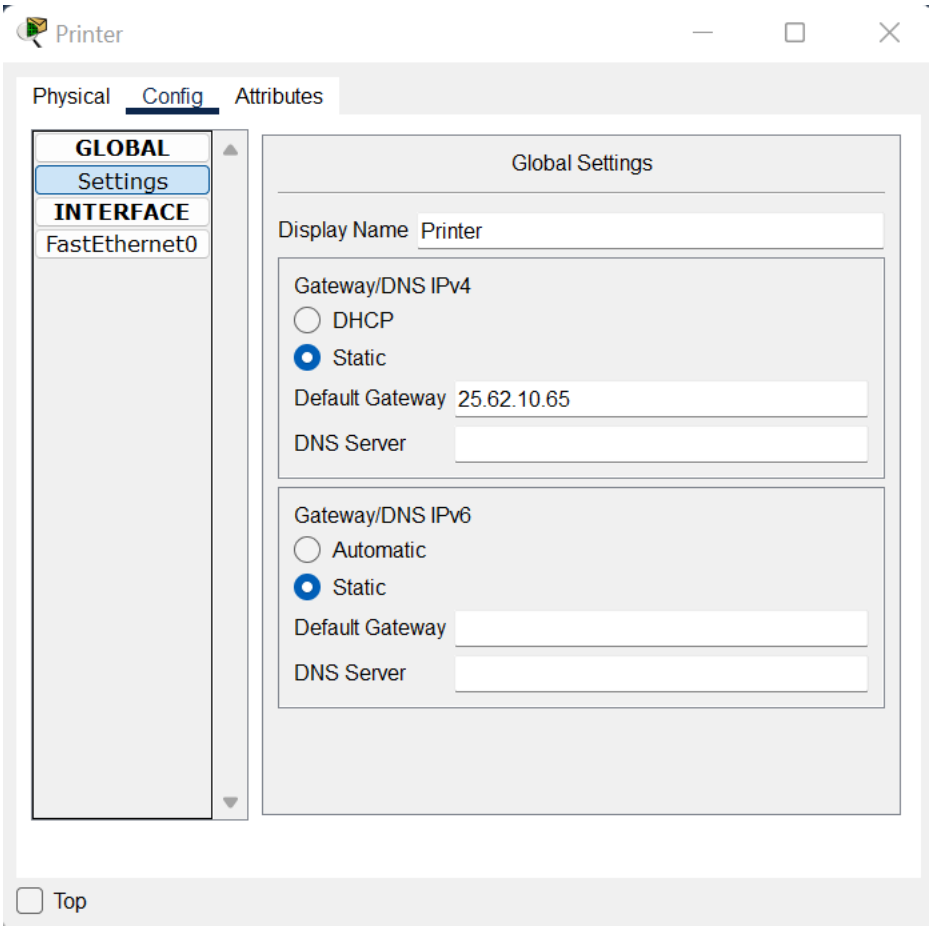


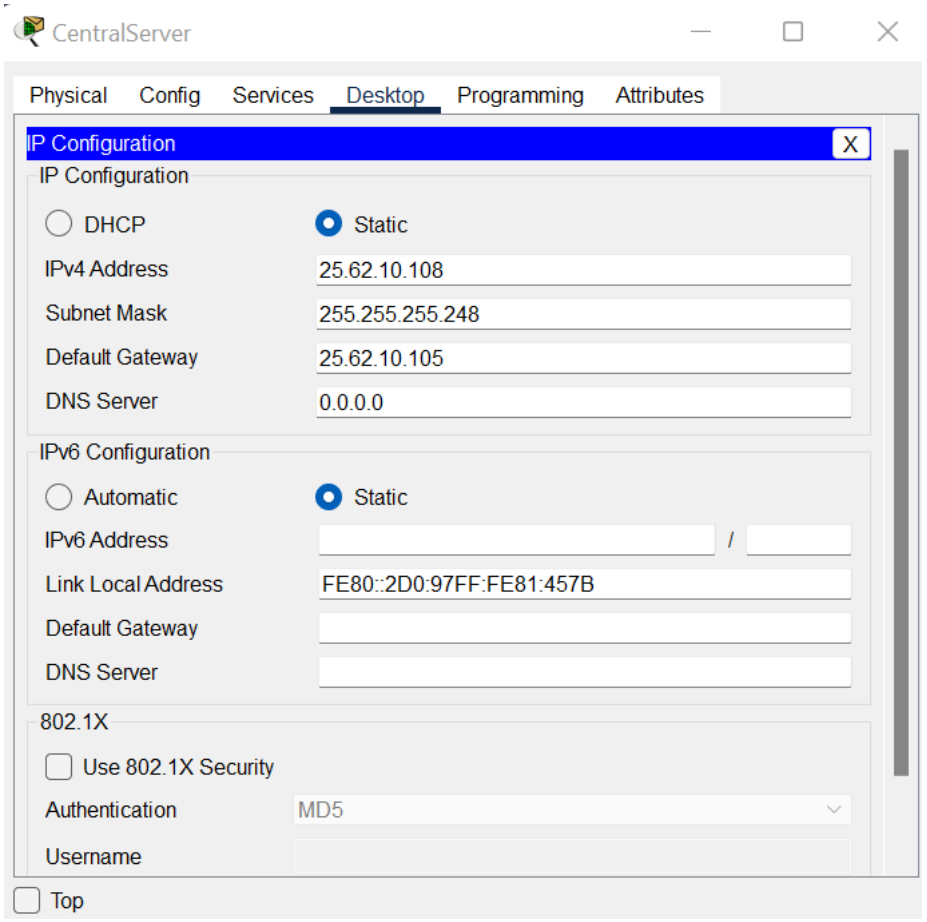


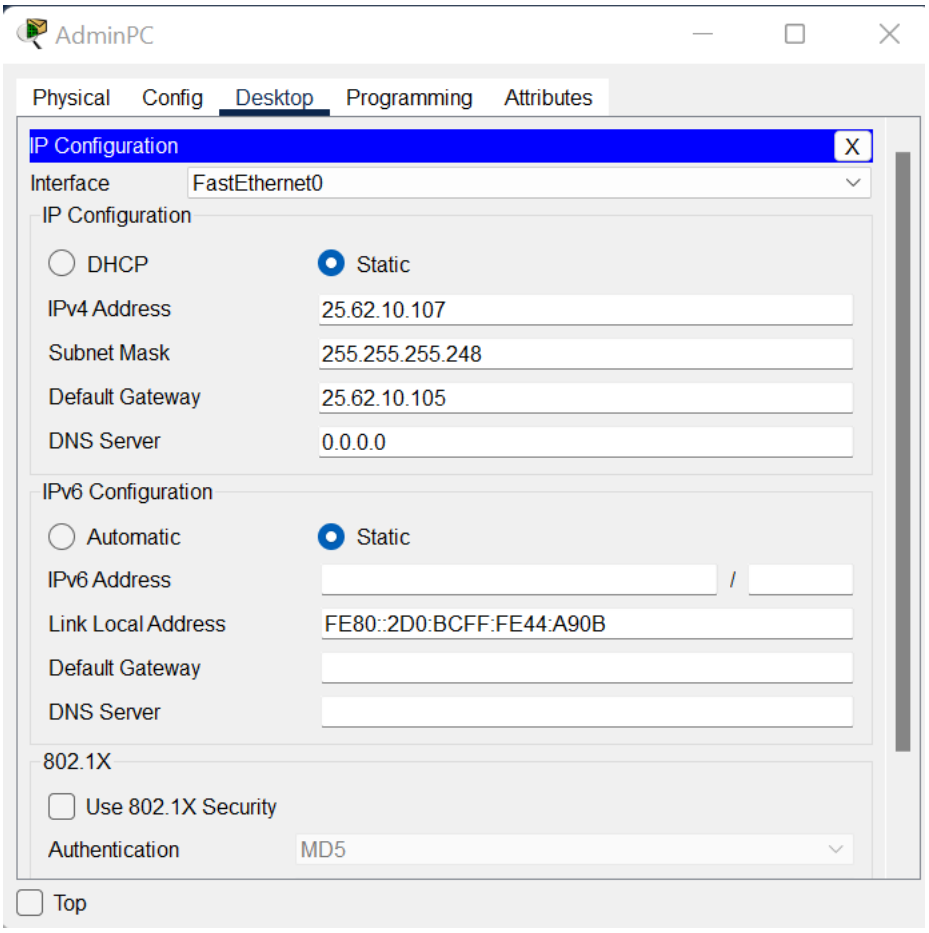

PC3
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
25.62.8.3
Subnet Mask
255.255.254.0
Default Gateway
25.62.8.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::2D0:D3FF:FE7D:C490
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Top


PC4
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
25.62.10.3
Subnet Mask
255.255.255.192
Default Gateway
25.62.10.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::202:16FF:FE2C:24B3
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Top


Printer
Physical
Config
Attributes
GLOBAL
Settings
INTERFACE
FastEthernet0
FastEthernet0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
00E0.A35D.E89D
IP Configuration
DHCP
Static
IPv4 Address
25.62.10.66
Subnet Mask
255.255.255.224
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address:
FE80::2E0:A3FF:FE5D:E89D
Top


Printer
Physical
Config
Attributes
GLOBAL
Settings
INTERFACE
FastEthernet0
Global Settings
Display Name
Printer
Gateway/DNS IPv4
DHCP
Static
Default Gateway
25.62.10.65
DNS Server
Gateway/DNS IPv6
Automatic
Static
Default Gateway
DNS Server
Top


CentralServer
Physical
Config
Services
Desktop
Programming
Attributes
IP Configuration
X
IP Configuration
DHCP
Static
IPv4 Address
25.62.10.108
Subnet Mask
255.255.255.248
Default Gateway
25.62.10.105
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::2D0:97FF:FE81:457B
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Top

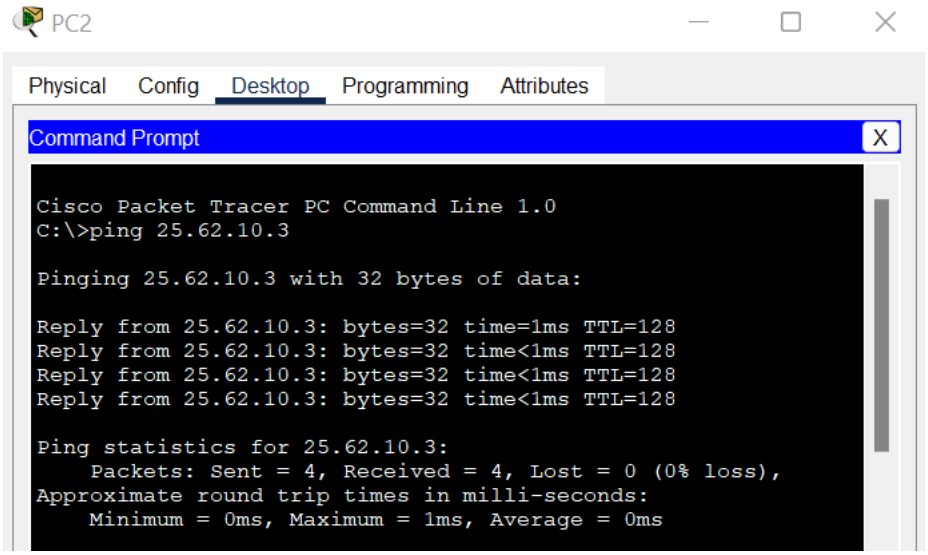

AdminPC
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
25.62.10.107
Subnet Mask
255.255.255.248
Default Gateway
25.62.10.105
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::2D0:BCFF:FE44:A90B
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Top

Phase 2

Task 4: Explain how Layer 2 switches forward data

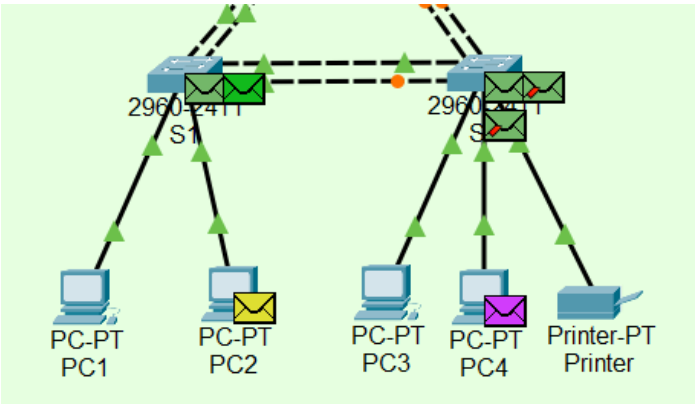
a. Can PC2 ping PC4? Why?

Yes, because they belong to the same VLAN (same network).



b. When PC2 pings PC4 and PC2 frame arrive to S2, where will S2 forward this frame?

The frame will be flooded out to all connected interfaces (ports) except the one where it was received, until it reaches PC4.



c. What is the content of S2 MAC table after?

The Port and MAC address of PC2 and S1 will be added to the MAC table of S2.

```
S2>enable
S2#show MAC-address
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----

S2#show MAC-address
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----

   1    0002.162c.24b3    DYNAMIC     Fa0/21
   1    0060.5cb3.8947    DYNAMIC     Fa0/3
   1    0090.2b58.9803    DYNAMIC     Fa0/3
S2#
```

Task 5: Configure device basic settings (Switches, Routers)

a. Configure device names as shown in the topology.

Router(config)#hostname ISP

```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname ISP
ISP(config)#
ISP#
```

b. Assign **Letmein** as the privileged EXEC password.

ISP(config)#enable secret Letmein

```
ISP#config t
Enter configuration commands, one per line.  End with CNTL/Z.
ISP(config)#enable secret Letmein
ISP(config)#
```

c. Assign **Connectme** as the console and vty passwords.

ISP(config)#line console 0

ISP(config-line)#password Connectme

ISP(config-line)#login

ISP(config)#line vty 0 15

ISP(config-line)#password Connectme

ISP(config-line)#login

```
ISP>enable
Password:
ISP#config t
Enter configuration commands, one per line.  End with CNTL/Z.
ISP(config)#line console 0
ISP(config-line)#password Connectme
ISP(config-line)#login
ISP(config-line)#exit
ISP(config)#
```

```
ISP(config)#line vty 0 15
ISP(config-line)#password Connectme
ISP(config-line)#login
ISP(config-line)#exit
```

d. Configure routers interfaces.

R1(config)#interface g0/0

R1(config-if)#ip address 25.62.10.98 255.255.255.248

R1(config-if)#no shutdown

```
R1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface g0/0
R1(config-if)#ip address 25.62.10.98 255.255.255.248
R1(config-if)#no shutdown
```

Task 6: Configure VLANs on Switches

a. Configure the IP address and default gateway listed in your addressing table for VLANs on switches.

```
S1(config)#interface vlan 99
S1(config-if)#ip address 25.62.10.114 255.255.255.248
S1(config-if)#no shutdown
S1(config)#ip default-gateway 25.62.10.113
```

b. Create the VLANs on switches.

```
S1(config)#vlan 99
S1(config-vlan)#name vlan99
```

Task 7: Configure VLAN ports and trunk ports on the switches

a. Configure the access ports on switches.

```
S1(config)#interface F0/16
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 30
S1(config)#interface F0/21
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 40

S2(config)#interface F0/11
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 10
S2(config)#interface F0/16
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 30
S2(config)#interface F0/21
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 40

S3(config)#interface F0/1
S3(config-if)#switchport mode access
S3(config-if)#switchport access vlan 88
S3(config)#interface F0/2
S3(config-if)#switchport mode access
S3(config-if)#switchport access vlan 88
```

b. Configure the trunk ports on switches.

```
S1(config)#int range F0/1-2
S1(config-if-range)#channel-group 1 mode desirable
S1(config-if-range)#no shut
S1(config)#int port-channel 1
S1(config-if)#switchport mode trunk
S1(config)#int range F0/3-4
S1(config-if-range)#channel-group 3 mode desirable
S1(config-if-range)#no shut
S1(config)#int port-channel 3
S1(config-if)#switchport mode trunk

S2(config)#int range F0/1-2
S2(config-if-range)#channel-group 2 mode desirable
S2(config-if-range)#no shut
S2(config)#int port-channel 2
S2(config-if)#switchport mode trunk
S2(config)#int range F0/3-4
S2(config-if-range)#channel-group 3 mode desirable
S2(config-if-range)#no shut
S2(config)#int port-channel 3
S2(config-if)#switchport mode trunk

S3(config)#int g0/1
S3(config-if)#switchport mode trunk

S4(config)#int range F0/1-F0/3
S4(config-if-range)#switchport mode trunk

MS1(config)#int range F0/1-2
MS1(config-if-range)#channel-group 1 mode desirable
MS1(config-if-range)#no shut
MS1(config)#int port-channel 1
MS1(config-if)#switchport mode trunk
```

MS1(config)#int range F0/3-4

MS1(config-if-range)#channel-group 2 mode desirable

MS1(config-if-range)#no shut

MS1(config)#int port-channel 2

MS1(config-if)#switchport mode trunk

Task 8: Configure Inter-VLAN Routing on MS1

a. Configure the IP address listed in your addressing table

MS1(config)#int vlan 10

MS1(config-if)#ip address 25.62.10.65 255.255.255.224

MS1(config-if)#no shutdown

b. Use a proper command to enable inter-VLAN routing.

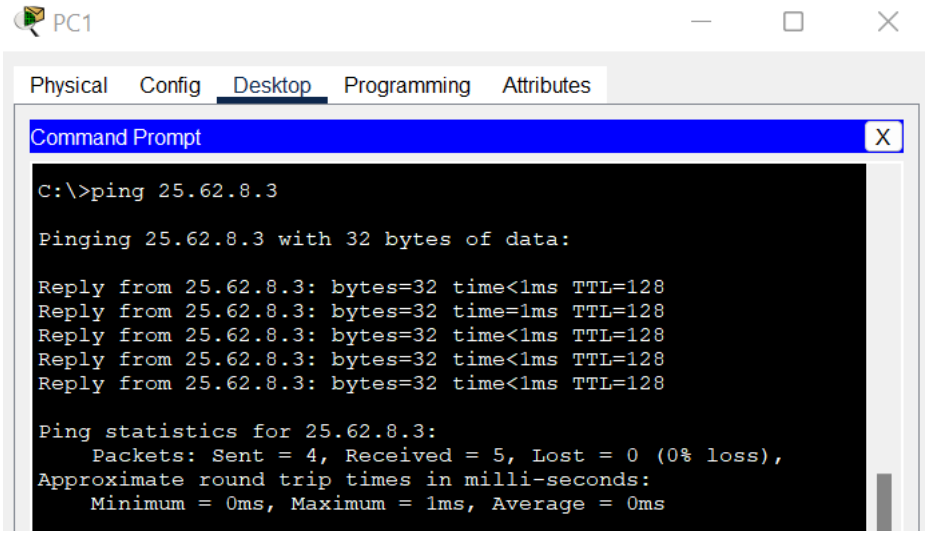
MS1(config)#ip routing

```
MS1(config)#ip routing
MS1(config)#
```

Task 9: Verify connectivity

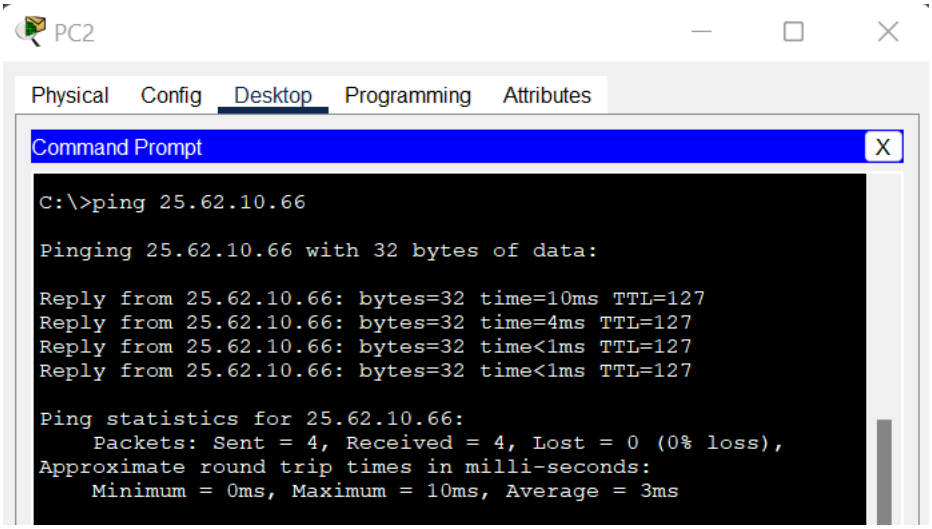
a. Verify connectivity between same VLANs

From PC1 (VLAN 30) > PC3 (VLAN 30)



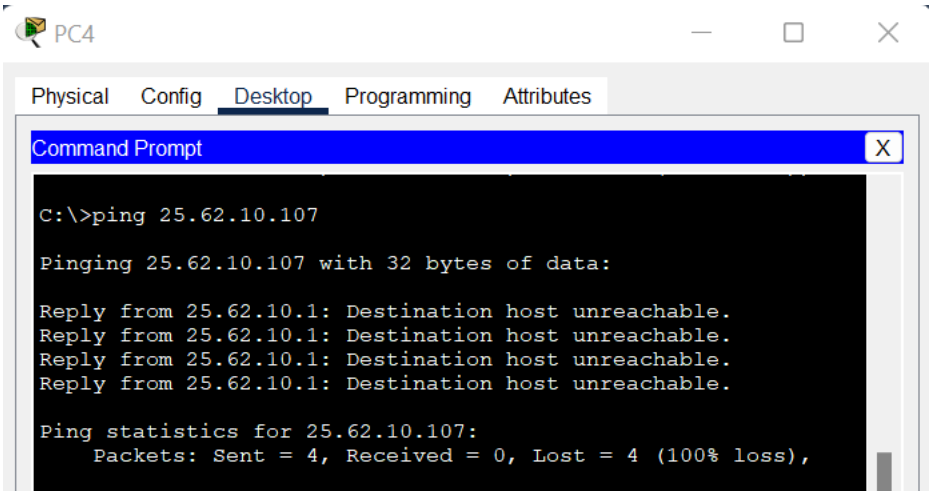
b. Verify connectivity between different VLANs

From PC2 (VLAN 40) > Printer (VLAN 10)



c. Can PC4 ping AdminPC? Why?

No, PC4 cannot reach AdminPC because AdminPC belongs to VLAN 88 which is not connected to the multi-layer switch, and there are no routing protocols configured to reach VLAN 88.



Task 10: Configure default route between R1 and ISP

a. Change IP address for interface s0/0/0 on R1 to 209.165.200.241/30 and 209.165.200.242/30 for interface s0/0/0 on ISP.

R1(config)#int s0/0/0

R1(config-if)#ip address 209.165.200.241 255.255.255.252

R1(config-if)#no shutdown

```
R1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int s0/0/0
R1(config-if)#ip address 209.165.200.241 255.255.255.252
R1(config-if)#no shutdown
```

ISP(config)#int s0/0/0

ISP(config-if)#ip address 209.165.200.242 255.255.255.252

ISP(config-if)#no shut

```
ISP#config t
Enter configuration commands, one per line.  End with CNTL/Z.
ISP(config)#int s0/0/0
ISP(config-if)#ip address 209.165.200.242 255.255.255.252
ISP(config-if)#no shut
```

b. Configure default route in R1.

R1(config)# ip route 0.0.0.0 0.0.0.0 209.165.200.242

```
R1(config)#ip route 0.0.0.0 0.0.0.0 209.165.200.242
R1(config)#ex
```

Task 11: Configure Single-Area OSPFv2

a. Configure OSPFv2 for the networks directly connected.

R1(config)#interface S0/0/0

R1(config-if)#ip ospf 10 area 0

R1(config)#interface G0/0

R1(config-if)#ip ospf 10 area 0

```
R1(config)#interface S0/0/0
R1(config-if)#ip ospf 10 area 0
R1(config-if)#exit
R1(config)#interface G0/0
R1(config-if)#ip ospf 10 area 0
R1(config-if)#exit
```

OR

MS1(config)#router ospf 10

MS1(config-router)#network 25.62.8.0 0.0.1.255 area 0

MS1(config-router)#network 25.62.10.0 0.0.0.63 area 0

MS1(config-router)#network 25.62.10.64 0.0.0.31 area 0

MS1(config-router)#network 25.62.10.96 0.0.0.7 area 0

MS1(config-router)#network 25.62.10.112 0.0.0.7 area 0

```
MS1(config)#router ospf 10
MS1(config-router)#network 25.62.8.0 0.0.1.255 area 0
MS1(config-router)#network 25.62.10.0 0.0.0.63 area 0
MS1(config-router)#network 25.62.10.64 0.0.0.31 area 0
MS1(config-router)#network 25.62.10.96 0.0.0.7 area 0
MS1(config-router)#network 25.62.10.112 0.0.0.7 area 0
MS1(config-router)#exit
```

b. Configure the passive interface.

R2(config)#router ospf 10

R2(config)#passive-interface G0/1

```
R2(config)#router ospf 10
R2(config-router)#passive-int g0/1
R2(config-router)#exit
```

c. **On R1**, redistribute static route into OSPF.

R1(config)#router ospf 10

R1(config-router)#redistribute static subnets

```
R1(config)#router ospf 10
R1(config-router)#redistribute static subnets
R1(config-router)#exit
```

d. **On R1**, automatically distribute the default route to all routers in the network**.**

R1(config)#router ospf 10

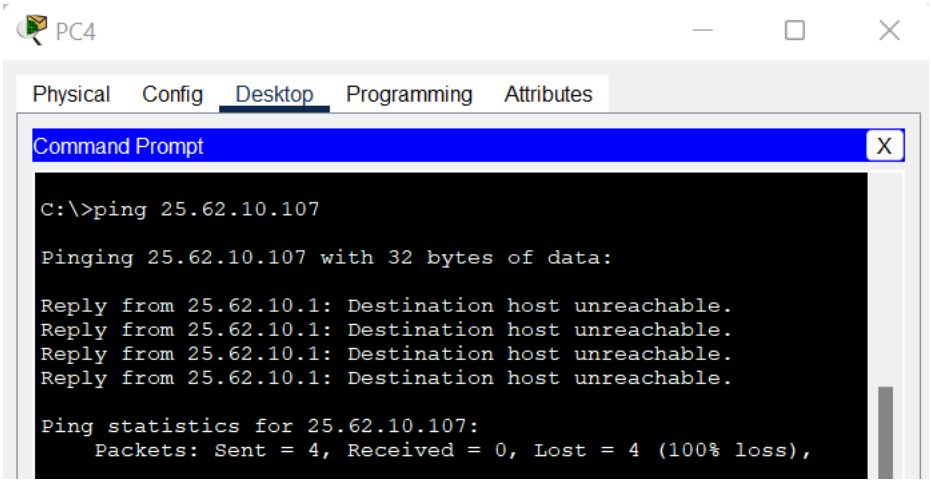
R1(config-router)#default-information originate

```
R1(config)#router ospf 10
R1(config-router)#default-information originate
R1(config-router)#exit
```

Task 12: Verify connectivity

a. Can PC4 ping AdminPC? Why?

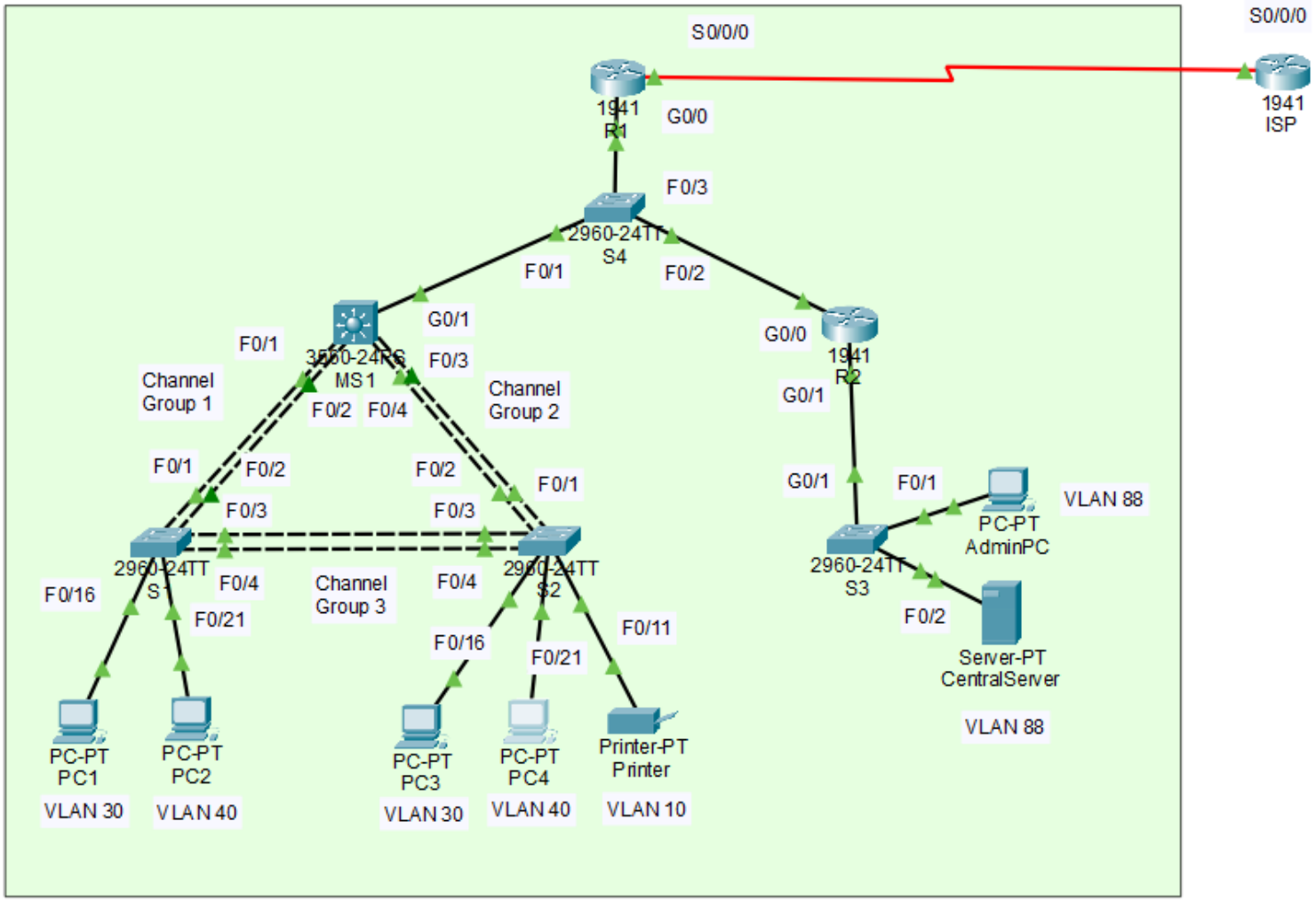
Yes, because we configured Single-Area OSPFv2 as a link-state routing protocol that is used to find the distance between two endpoints of a network, the best path between them, and the routers in the network.




```
R1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#router ospf 10
R1(config-router)#network 25.62.10.96 0.0.0.7 area 0
R1(config-router)#network 209.165.200.240 0.0.0.3 area 0
R1(config-router)#exit
R1(config)#router ospf 10
R1(config-router)#redistribute static subnets
R1(config-router)#exit
R1(config)#router ospf 10
R1(config-router)#default-information originate
R1(config-router)#exit
R1(config)#
```

```
R2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router ospf 10
R2(config-router)#network 25.62.10.96 0.0.0.7 area 0
R2(config-router)#network 25.62.10.104 0.0.0.7 area 0
R2(config-router)#exit
R2(config)#router ospf 10
R2(config-router)#passive-int g0/1
R2(config-router)#exit
R2(config)#
```

```
MS1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
MS1(config)#router ospf 10
MS1(config-router)#network 25.62.8.0 0.0.1.255 area 0
MS1(config-router)#network 25.62.10.0 0.0.0.63 area 0
MS1(config-router)#network 25.62.10.64 0.0.0.31 area 0
MS1(config-router)#network 25.62.10.96 0.0.0.7 area 0
MS1(config-router)#network 25.62.10.112 0.0.0.7 area 0
MS1(config-router)#exit
MS1(config)#router ospf 10
MS1(config-router)#passive-int vlan 10
MS1(config-router)#passive-int vlan 30
MS1(config-router)#passive-int vlan 40
MS1(config-router)#passive-int vlan 99
MS1(config-router)#exit
MS1(config)#
```


S0/0/0
S0/0/0
1941
R1
G0/0
1941
ISP
F0/3
2960-24TT
S4
F0/1
F0/2
G0/1
F0/1
3560-24PS
MS1
F0/3
G0/0
1941
R2
Channel
Group 1
F0/2
F0/4
Channel
Group 2
G0/1
F0/1
F0/2
F0/2
F0/1
G0/1
F0/1
VLAN 88
F0/3
F0/3
PC-PT
AdminPC
2960-24TT
S1
2960-24TT
S2
2960-24TT
S3
F0/16
F0/4
Channel
Group 3
F0/4
F0/2
F0/21
F0/11
F0/16
F0/21
Server-PT
CentralServer
VLAN 88
PC-PT
PC1
PC-PT
PC2
PC-PT
PC3
PC-PT
PC4
Printer-PT
Printer
VLAN 30
VLAN 40
VLAN 30
VLAN 40
VLAN 10

Submission guidelines:
The project must be done by every student alone. No groupwork. The network address to be used by each student is different as it is based on her own KAU ID.

Deliverables:

1. A report which contains the device addressing table as shown above. Also, answer the questions raised before with **providing the screenshots** for both phases in the same order.
2. A Packet tracer File (named as NAME_KAUID_ PHASE1.pkt).
3. A Packet tracer File (named as NAME_KAUID_ PHASE2.pkt).

Note:
Submit the deliverables on Blackboard regarding the provided due dates and instructions there. Late Submissions Policy will be conducted for any late submission during the available time.

Marking Criteria:

Phase 1	
Task 1	10
Task 2	5
Task 3	5
Subtotal	**20**

Phase 2	
Task 4	9
Task 5	8
Task 6	10
Task 7	10
Task 8	10
Task 9	9
Task 10	10
Task 11	10
Task 12	4
Subtotal	**80**

Total	**100**