INSTITUTE OF ENGINEERING
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COMPUTER NETWORK

LAB #7

Configuration of Dynamic Routing using RIP and OSPF

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1 Title

Configuration of Dynamic Routing using RIP and OSPF

2 Objective

- To be familiar with dynamic routing
- To configure dynamic routing using RIP and OSPF
- To observe how the dynamic routing can address changing network topology automatically

3 Requirement

- Network simulation tool: Packet Tracer

4 Procedure

With the help of Cisco Packet Tracer we simulated Subnetting of different IP ranges also explored Configuration of Dynamic Routing using RIP and OSPF. We performed ping and trace route between different PCs and compare result before and after performing RIP and OSPF dynamic routing.

5 Exercises:

5.1 Question -1

What is a dynamic routing? How it differs with static routing? Explain briefly.

Answer:

Dynamic Routing is an Adaptive type routing which adjust its Routing Table according to change in Network Topology.It is less secure and uses Protocols like BGP , RIP, OSPF.

Static Routing is manually defined for every router and every network whereas Dynamic routing adapts the change and propagate the changes to neighboring router. Static routing use simple algorithm whereas Dynamic has complex algorithm. Static Routing is suitable for small network and doesnot required additional resources But Dyanamic Routing is suitable for bigger network and additional resources is required.

5.2 Question -2

List out the dynamic routing configuration commands (that you have used in lab) of router with their syntax and examples.

Answer:

RIP

router rip
network network-number

Router(config)# **router rip**
Router(config-router)# **network 192.5.5.0**
Router(config-router)# **network 205.7.5.0**

OSPF

router ospf PROCESS-ID
network IP_ADDRESS WILDCARD_MASK AREA_ID

R1# **configure terminal**
R1(config)# **router ospf 1**
R1(config-router)# **network 102.108.109.16 0.0.0.3 area 0**
R1(config-router)# **end**

5.3 Question -3

Note down the observation of each steps with necessary commands specified in activities A, B and C mentioned above and comment on the result by explaining the reason in detail.

5.3.1 Activities A

A. Create the following network topology using Packet Tracer and perform the followings:

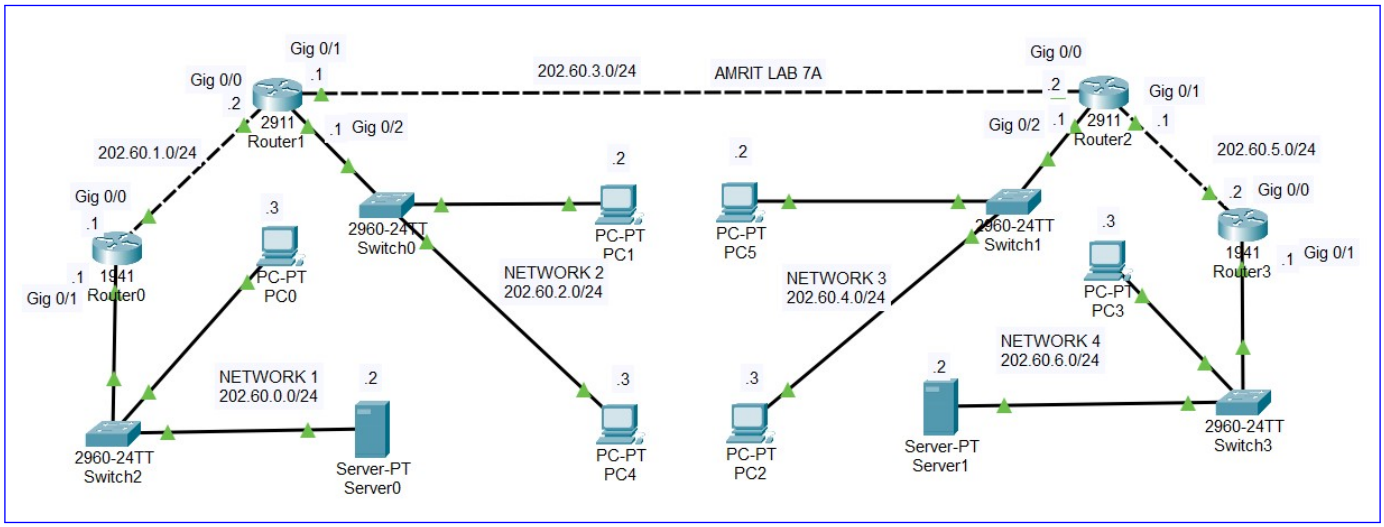

Figure 1: Network topology Lab 7A

1. **Configure the hostname, console password and enable password in each Router.**

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname AMRIT_0

AMRIT_0(config)#line console 0
AMRIT_0(config-line)#password amrit
AMRIT_0(config-line)#login
AMRIT_0(config-line)#exit

AMRIT_0(config)#enable password 403

AMRIT_0(config)#line vty 0 4
AMRIT_0(config-line)#password phuyal
AMRIT_0(config-line)#login
AMRIT_0(config-line)#exit
AMRIT_0(config)#
```

Output 1: Config Hostname, Console ,enable,vty password for Router 0

S.N	Hostname	Console Password	Enable Password	vty Password
Router 0	AMRIT_0	amrit	403	phuyal
Router 1	AMRIT_1	amrit	403	phuyal
Router 2	AMRIT_2	amrit	403	phuyal
Router 3	AMRIT_3	amrit	403	phuyal

Table 1: Table for hostname, console password , enable password,vty password

2. **Configure each interfaces of Router with given IP address and appropriate interface description.**

```
AMRIT_0>enable
Password:
AMRIT_0#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.

AMRIT_0(config)#interface GigabitEthernet0/1
AMRIT_0(config-if)#ip address 202.60.0.1  255.255.255.0
AMRIT_0(config-if)#description connected to network 1
AMRIT_0(config-if)#no shutdown

AMRIT_0(config-if)#exit
AMRIT_0(config)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

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

----------------------------------------------------

AMRIT_0(config)#interface GigabitEthernet0/1
AMRIT_0(config-if)#ip address 202.60.0.1  255.255.255.0
AMRIT_0(config-if)#description connected to Network 1
AMRIT_0(config-if)#no shutdown

AMRIT_0(config-if)#exit
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

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

Output 2: Configuring each interface of Router0

```
AMRIT_3#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
AMRIT_3(config)#
AMRIT_3(config)#interface GigabitEthernet0/0
AMRIT_3(config-if)#ip address 202.60.5.2  255.255.255.0
AMRIT_3(config-if)#description connected to Router 2
AMRIT_3(config-if)#no shutdown

AMRIT_3(config-if)#exit
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

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

-----------------------------------------------------------------------
AMRIT_3(config)#interface GigabitEthernet0/1
AMRIT_3(config-if)#ip address 202.60.6.1  255.255.255.0
AMRIT_3(config-if)#description connected to network 4
AMRIT_3(config-if)#no shutdown

AMRIT_3(config-if)#exit
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

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

Output 3: Configuring each interface of Router3

Router no.	GigabitEthernet	Assigned Ip	Description
Router 0	0/0	202.60.1.1	Connected to Router 1
	0/1	202.60.0.1	Connected to Network 1
Router 1	0/0	202.60.1.2	Connected to Router 0
	0/1	202.60.3.1	Connected to Router 2
	0/2	202.60.2.1	Connected to Network 2
Router 2	0/0	202.60.3.2	Connected to Router 1
	0/1	202.60.5.1	Connected to Router 3
	0/2	202.60.4.1	Connected to Network 3
Router 3	0/0	202.60.5.2	Connected to Router 2
	0/1	202.60.6.1	Connected to Network 4

Table 2: Assigned IPs and description for all interfaces

3. **Configure the IP address and default gateway on each computer as specified in figure above.**

Network no.	Default gateway	Device name	Assigned IP
Network 1	202.60.0.1	Server 0	202.60.0.2
		PC0	202.60.0.3
Network 2	202.60.2.1	PC1	202.60.2.2
		PC4	202.60.2.3
Network 3	202.60.4.1	PC5	202.60.4.2
		PC2	202.60.4.3
Network 4	202.60.6.1	Server 1	202.60.6.2
		PC3	202.60.6.3

Table 3: Table for Name, assigned ip, Default gateway

4. **Enable telnet on each Router.**

   Already enabled in Activity A.1

5. **Observe the output of the command *show ip route* in each Router and note it down.**

```
AMRIT_0#show ip route

Gateway of last resort is not set

     202.60.0.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.0.0/24 is directly connected, GigabitEthernet0/1
L       202.60.0.1/32 is directly connected, GigabitEthernet0/1
     202.60.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.1.0/24 is directly connected, GigabitEthernet0/0
L       202.60.1.1/32 is directly connected, GigabitEthernet0/0
```

Output 4: *show ip route* Router 0

```
AMRIT_1#show ip route

Gateway of last resort is not set

     202.60.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.1.0/24 is directly connected, GigabitEthernet0/0
L       202.60.1.2/32 is directly connected, GigabitEthernet0/0
     202.60.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.2.0/24 is directly connected, GigabitEthernet0/2
L       202.60.2.1/32 is directly connected, GigabitEthernet0/2
     202.60.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.3.0/24 is directly connected, GigabitEthernet0/1
```

```
L       202.60.3.1/32 is directly connected, GigabitEthernet0/1
```

Output 5: *show ip route* Router 1

```
AMRIT_2#show ip route

Gateway of last resort is not set

     202.60.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.3.0/24 is directly connected, GigabitEthernet0/0
L       202.60.3.2/32 is directly connected, GigabitEthernet0/0
     202.60.4.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.4.0/24 is directly connected, GigabitEthernet0/2
L       202.60.4.1/32 is directly connected, GigabitEthernet0/2
     202.60.5.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.5.0/24 is directly connected, GigabitEthernet0/1
L       202.60.5.1/32 is directly connected, GigabitEthernet0/1
```

Output 6: *show ip route* Router 2

```
AMRIT_3#show ip route

Gateway of last resort is not set

     202.60.5.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.5.0/24 is directly connected, GigabitEthernet0/0
L       202.60.5.2/32 is directly connected, GigabitEthernet0/0
     202.60.6.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.6.0/24 is directly connected, GigabitEthernet0/1
L       202.60.6.1/32 is directly connected, GigabitEthernet0/1
```

Output 7: *show ip route* Router 3

6. **Observe the output while using ping command from PC0 to PC0, PC1, PC2, PC3, Server0, Server1, Router0, Router1, Router2 and Router3.**

```
C:\>ping 202.60.0.1

Pinging 202.60.0.1 with 32 bytes of data:

Reply from 202.60.0.1: bytes=32 time=1ms TTL=255
Reply from 202.60.0.1: bytes=32 time=3ms TTL=255
Reply from 202.60.0.1: bytes=32 time<1ms TTL=255
Reply from 202.60.0.1: bytes=32 time=1ms TTL=255

Ping statistics for 202.60.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 3ms, Average = 1ms
```

Output 8: Ping from PC0 to Router 0 : 0/1

```
C:\>ping 202.60.4.1

Pinging 202.60.4.1 with 32 bytes of data:

Reply from 202.60.0.1: Destination host unreachable.
Reply from 202.60.0.1: Destination host unreachable.
Reply from 202.60.0.1: Destination host unreachable.
Reply from 202.60.0.1: Destination host unreachable.

Ping statistics for 202.60.4.1:
```

```
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss)
```

Output 9: Ping from PC0 to Router 2 : 0/2

```
C:\>ping 202.60.6.3

Pinging 202.60.6.3 with 32 bytes of data:

Reply from 202.60.0.1: Destination host unreachable.
Reply from 202.60.0.1: Destination host unreachable.
Reply from 202.60.0.1: Destination host unreachable.
Reply from 202.60.0.1: Destination host unreachable.

Ping statistics for 202.60.6.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 10: Ping from PC0 to PC3

Sending Host	**Destination**	**Ping status**
PC0	PC0	**Successful**
	Server 0	
	Router 0 : 0/1	
	Router 0 : 0/0	
	Router 1 : 0/0	**Failed**
	Router 1 : 0/1	
	Router 1 : 0/2	
	PC1	
	Router 2 : 0/0	
	Router 2 : 0/2	
	PC2	
	Router 2 : 0/1	
	Router 3 : 0/0	
	Router 3 : 0/1	
	PC3	
	Server 1	

Table 4: Ping from PC0 to all Routers,PCs and Servers

7. **Similarly, observe the output while using ping command from PC1 to all other computers, servers and routers.**

```
C:\>ping 202.60.0.1

Pinging 202.60.0.1 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 202.60.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 11: Ping from PC1 to Router 0 : 0/1

```
C:\>ping 202.60.4.1

Pinging 202.60.4.1 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 202.60.4.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 12: Ping from PC1 to Router 2 : 0/2

```
C:\>ping 202.60.6.3

Pinging 202.60.6.3 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 202.60.6.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 13: Ping from PC1 to PC3

Sending Host	Destination	Ping status
PC1	PC0	Failed
	Server 0	
	Router 0 : 0/1	
	Router 0 : 0/0	
	Router 1 : 0/0	Successful
	Router 1 : 0/1	
	Router 1 : 0/2	
	PC1	
	Router 2 : 0/0	Failed
	Router 2 : 0/2	
	PC2	
	Router 2 : 0/1	
	Router 3 : 0/0	
	Router 3 : 0/1	
	PC3	
	Server 1	

Table 5: Ping from PC1 to all Routers,PCs and Servers

8. **Repeat the process from all other computers and routers.**

   (a) **Ping from PC2**

```
C:\>ping 202.60.0.1

Pinging 202.60.0.1 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
```

```
Request timed out.

Ping statistics for 202.60.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 14: Ping from PC2 to Router 0 : 0/1

```
C:\>ping 202.60.2.2

Pinging 202.60.2.2 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 202.60.2.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 15: Ping from PC2 to PC1

```
C:\>ping 202.60.6.3

Pinging 202.60.6.3 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 202.60.6.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 16: Ping from PC2 to PC3

Sending Host	**Destination**	**Ping status**
PC2	PC0	**Failed**
	Server 0	
	Router 0 : 0/1	
	Router 0 : 0/0	
	Router 1 : 0/0	
	Router 1 : 0/1	
	Router 1 : 0/2	
	PC1	
	Router 2 : 0/0	**Successful**
	Router 2 : 0/2	
	PC2	
	Router 2 : 0/1	
	Router 3 : 0/0	**Failed**
	Router 3 : 0/1	
	PC3	
	Server 1	

Table 6: Ping from PC2 to all Routers,PCs and Servers

(b) **Ping from PC3**

```
C:\>ping 202.60.0.1

Pinging 202.60.0.1 with 32 bytes of data:

Reply from 202.60.6.1: Destination host unreachable.
Request timed out.
Reply from 202.60.6.1: Destination host unreachable.
Request timed out.

Ping statistics for 202.60.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 17: Ping from PC3 to Router 0 : 0/1

```
C:\>ping 202.60.2.2

Pinging 202.60.2.2 with 32 bytes of data:

Reply from 202.60.6.1: Destination host unreachable.
Reply from 202.60.6.1: Destination host unreachable.
Reply from 202.60.6.1: Destination host unreachable.
Reply from 202.60.6.1: Destination host unreachable.

Ping statistics for 202.60.2.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 18: Ping from PC3 to PC1

```
C:\>ping 202.60.4.3

Pinging 202.60.4.3 with 32 bytes of data:

Reply from 202.60.6.1: Destination host unreachable.
Request timed out.
Reply from 202.60.6.1: Destination host unreachable.
Reply from 202.60.6.1: Destination host unreachable.

Ping statistics for 202.60.4.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 19: Ping from PC3 to PC2

```
C:\>ping 202.60.6.2

Pinging 202.60.6.2 with 32 bytes of data:

Reply from 202.60.6.2: bytes=32 time<1ms TTL=128
Reply from 202.60.6.2: bytes=32 time=1ms TTL=128
Reply from 202.60.6.2: bytes=32 time<1ms TTL=128
Reply from 202.60.6.2: bytes=32 time<1ms TTL=128

Ping statistics for 202.60.6.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Output 20: Ping from PC3 to Server 1

Sending Host	Destination	Ping status
PC3	PC0	**Failed**
	Server 0	
	Router 0 : 0/1	
	Router 0 : 0/0	
	Router 1 : 0/0	
	Router 1 : 0/1	
	Router 1 : 0/2	
	PC1	
	Router 2 : 0/0	
	Router 2 : 0/2	
	PC2	
	Router 2 : 0/1	
	Router 3 : 0/0	**Successful**
	Router 3 : 0/1	
	PC3	
	Server 1	

Table 7: Ping from PC3 to all Routers,PCs and Servers

(c) **Ping from Router 0**

```
AMRIT_0>ping 202.60.0.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.0.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/2 ms
```

Output 21: Ping from Router 0 to PC0

```
AMRIT_0>ping 202.60.2.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.2.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Output 22: Ping from Router 0 to PC1

```
AMRIT_0>ping 202.60.4.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.4.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Output 23: Ping from Router 0 to PC2

```
AMRIT_0>ping 202.60.6.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.6.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Output 24: Ping from Router 0 to Server 1

Sending Host	Destination	Ping status
Router 0	PC0	**Successful**
	Server 0	
	Router 0 : 0/1	
	Router 0 : 0/0	
	Router 1 : 0/0	
	Router 1 : 0/1	**Failed**
	Router 1 : 0/2	
	PC1	
	Router 2 : 0/0	
	Router 2 : 0/2	
	PC2	
	Router 2 : 0/1	
	Router 3 : 0/0	
	Router 3 : 0/1	
	PC3	
	Server 1	

Table 8: Ping from Router 0 to all Routers,PCs and Servers

(d) **Ping from Router 1**

```
AMRIT_1>ping 202.60.0.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.0.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Output 25: Ping from Router 1 to PC0

```
AMRIT_1>ping 202.60.2.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms
```

Output 26: Ping from Router 1 to PC1

```
AMRIT_1>ping 202.60.5.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.5.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Output 27: Ping from Router 1 to Router 2: 0/1

```
AMRIT_1>ping 202.60.6.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.6.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Output 28: Ping from Router 1 to Server 1

Sending Host	Destination	Ping status
Router 1	PC0	**Failed**
	Server 0	
	Router 0 : 0/1	
	Router 0 : 0/0	**Successful**
	Router 1 : 0/0	
	Router 1 : 0/1	
	Router 1 : 0/2	
	PC1	
	Router 2 : 0/0	
	Router 2 : 0/2	**Failed**
	PC2	
	Router 2 : 0/1	
	Router 3 : 0/0	
	Router 3 : 0/1	
	PC3	
	Server 1	

Table 9: Ping from Router 1 to all Routers,PCs and Servers

(e) **Ping from Router 2**

```
AMRIT_2>ping 202.60.0.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.0.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Output 29: Ping from Router 2 to PC0

```
AMRIT_2>ping 202.60.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.1.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Output 30: Ping from Router 2 to Router 1 : 0/0

```
AMRIT_2>ping 202.60.4.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.4.3, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/3 ms
```

Output 31: Ping from Router 2 to PC2

```
AMRIT_2>ping 202.60.6.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.6.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Output 32: Ping from Router 2 to PC3

Sending Host	Destination	Ping status
Router 2	PC0	**Failed**
	Server 0	
	Router 0 : 0/1	
	Router 0 : 0/0	
	Router 1 : 0/0	
	Router 1 : 0/1	**Successful**
	Router 1 : 0/2	**Failed**
	PC1	
	Router 2 : 0/0	**Successful**
	Router 2 : 0/2	
	PC2	
	Router 2 : 0/1	
	Router 3 : 0/0	
	Router 3 : 0/1	**Failed**
	PC3	
	Server 1	

Table 10: Ping from Router 2 to all Routers,PCs and Servers

(f) **Ping from Router 3**

```
AMRIT_3>ping 202.60.0.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.0.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Output 33: Ping from Router 3 to PC0

```
AMRIT_3>ping 202.60.2.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.2.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Output 34: Ping from Router 3 to PC1

```
AMRIT_3>ping 202.60.4.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.4.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Output 35: Ping from Router 3 to PC2

```
AMRIT_3>ping 202.60.6.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.6.2, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/2/4 ms
```

Output 36: Ping from Router 3 to Server 1

Sending Host	Destination	Ping status
Router 3	PC0	Failed
	Server 0	
	Router 0 : 0/1	
	Router 0 : 0/0	
	Router 1 : 0/0	
	Router 1 : 0/1	
	Router 1 : 0/2	
	PC1	
	Router 2 : 0/0	
	Router 2 : 0/2	
	PC2	
	Router 2 : 0/1	Successful
	Router 3 : 0/0	
	Router 3 : 0/1	
	PC3	
	Server 1	

Table 11: Ping from Router 3 to all Routers,PCs and Servers

9. **From PC0 enter into Router0 using telnet and configure RIP.**

```
C:\>telnet 202.60.0.1
Trying 202.60.0.1 ...Open

User Access Verification

Password:
AMRIT_0>enable
Password:
AMRIT_0# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.

AMRIT_0(config)#router rip
AMRIT_0(config-router)#network 202.60.0.0
AMRIT_0(config-router)#network 202.60.1.0

AMRIT_0(config-router)#passive-interface GigabitEthernet 0/1
```

Output 37: Telnet to Router 0 and configure RIP

10. **From there enter into Router1 using telnet and configure RIP.**

```
AMRIT_0(config-router)#exit
AMRIT_0(config)#exit
AMRIT_0#telnet 202.60.1.2
Trying 202.60.1.2 ...Open

User Access Verification

Password:
AMRIT_1>enable
Password:
AMRIT_1#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.

AMRIT_1(config)#router rip
AMRIT_1(config-router)#network 202.60.3.0
AMRIT_1(config-router)#network 202.60.1.0
```

```
AMRIT_1(config-router)#network 202.60.2.0

AMRIT_1(config-router)#passive-interface GigabitEthernet 0/2
```

Output 38: Telnet to Router 1 and configure RIP

11. **Repeat the process for Router2 and Router3.**

    From Router 1 we further Telent to Router 2 and Router 3 to configure RIP in them.

```
AMRIT_1(config-router)#exit
AMRIT_1(config)#exit
AMRIT_1#telnet 202.60.3.2
Trying 202.60.3.2 ...Open


User Access Verification

Password:
AMRIT_2>enable
Password:
AMRIT_2#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.

AMRIT_2(config)#router rip
AMRIT_2(config-router)#network 202.60.3.0
AMRIT_2(config-router)#network 202.60.5.0
AMRIT_2(config-router)#network 202.60.4.0

AMRIT_2(config-router)#passive-interface GigabitEthernet 0/2
```

Output 39: Telnet to Router 2 and configure RIP

```
AMRIT_2(config-router)#exit
AMRIT_2(config)#exit
AMRIT_2#telnet 202.60.5.2
Trying 202.60.5.2 ...Open

User Access Verification

Password:
AMRIT_3>enable
Password:
AMRIT_3#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.

AMRIT_3(config)#router rip
AMRIT_3(config-router)#network 202.60.5.0
AMRIT_3(config-router)#network 202.60.6.0

AMRIT_3(config-router)#passive-interface GigabitEthernet 0/1

AMRIT_3(config-router)#exit
AMRIT_3(config)#exit
AMRIT_3#exit

[Connection to 202.60.5.2 closed by foreign host]
AMRIT_2#exit

[Connection to 202.60.3.2 closed by foreign host]
AMRIT_1#exit

[Connection to 202.60.1.2 closed by foreign host]
AMRIT_0#exit
```

```
[Connection to 202.60.0.1 closed by foreign host]
C:\>
```

Output 40: Telnet to Router 3 and configure RIP

12. **Repeat the step from 5 to 8 and note down the output by observing it.**

```
User Access Verification

Password:

AMRIT_0>show ip route

Gateway of last resort is not set

     202.60.0.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.0.0/24 is directly connected, GigabitEthernet0/1
L       202.60.0.1/32 is directly connected, GigabitEthernet0/1
     202.60.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.1.0/24 is directly connected, GigabitEthernet0/0
L       202.60.1.1/32 is directly connected, GigabitEthernet0/0
R    202.60.2.0/24 [120/1] via 202.60.1.2, 00:00:07, GigabitEthernet0/0
R    202.60.3.0/24 [120/1] via 202.60.1.2, 00:00:07, GigabitEthernet0/0
R    202.60.4.0/24 [120/2] via 202.60.1.2, 00:00:07, GigabitEthernet0/0
R    202.60.5.0/24 [120/2] via 202.60.1.2, 00:00:07, GigabitEthernet0/0
R    202.60.6.0/24 [120/3] via 202.60.1.2, 00:00:07, GigabitEthernet0/0
```

Output 41: *show ip route* Router 0

```
User Access Verification

Password:

AMRIT_1>show ip route

Gateway of last resort is not set

R    202.60.0.0/24 [120/1] via 202.60.1.1, 00:00:07, GigabitEthernet0/0
     202.60.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.1.0/24 is directly connected, GigabitEthernet0/0
L       202.60.1.2/32 is directly connected, GigabitEthernet0/0
     202.60.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.2.0/24 is directly connected, GigabitEthernet0/2
L       202.60.2.1/32 is directly connected, GigabitEthernet0/2
     202.60.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.3.0/24 is directly connected, GigabitEthernet0/1
L       202.60.3.1/32 is directly connected, GigabitEthernet0/1
R    202.60.4.0/24 [120/1] via 202.60.3.2, 00:00:08, GigabitEthernet0/1
R    202.60.5.0/24 [120/1] via 202.60.3.2, 00:00:08, GigabitEthernet0/1
R    202.60.6.0/24 [120/2] via 202.60.3.2, 00:00:08, GigabitEthernet0/1
```

Output 42: *show ip route* Router 1

```
User Access Verification

Password:

AMRIT_2>show ip route

Gateway of last resort is not set

R    202.60.0.0/24 [120/2] via 202.60.3.1, 00:00:14, GigabitEthernet0/0
R    202.60.1.0/24 [120/1] via 202.60.3.1, 00:00:14, GigabitEthernet0/0
R    202.60.2.0/24 [120/1] via 202.60.3.1, 00:00:14, GigabitEthernet0/0
     202.60.3.0/24 is variably subnetted, 2 subnets, 2 masks
```

```
C        202.60.3.0/24 is directly connected, GigabitEthernet0/0
L        202.60.3.2/32 is directly connected, GigabitEthernet0/0
     202.60.4.0/24 is variably subnetted, 2 subnets, 2 masks
C        202.60.4.0/24 is directly connected, GigabitEthernet0/2
L        202.60.4.1/32 is directly connected, GigabitEthernet0/2
     202.60.5.0/24 is variably subnetted, 2 subnets, 2 masks
C        202.60.5.0/24 is directly connected, GigabitEthernet0/1
L        202.60.5.1/32 is directly connected, GigabitEthernet0/1
R    202.60.6.0/24 [120/1] via 202.60.5.2, 00:00:28, GigabitEthernet0/1
```

Output 43: *show ip route* Router 2

```
User Access Verification

Password:

AMRIT_3>show ip route

Gateway of last resort is not set

R    202.60.0.0/24 [120/3] via 202.60.5.1, 00:00:07, GigabitEthernet0/0
R    202.60.1.0/24 [120/2] via 202.60.5.1, 00:00:07, GigabitEthernet0/0
R    202.60.2.0/24 [120/2] via 202.60.5.1, 00:00:07, GigabitEthernet0/0
R    202.60.3.0/24 [120/1] via 202.60.5.1, 00:00:07, GigabitEthernet0/0
R    202.60.4.0/24 [120/1] via 202.60.5.1, 00:00:07, GigabitEthernet0/0
     202.60.5.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.5.0/24 is directly connected, GigabitEthernet0/0
L       202.60.5.2/32 is directly connected, GigabitEthernet0/0
     202.60.6.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.6.0/24 is directly connected, GigabitEthernet0/1
L       202.60.6.1/32 is directly connected, GigabitEthernet0/1
```

Output 44: *show ip route* Router 3

We can clearly see that there is additional entries in Routing Table in all routers with initial **R** than available in Activities A.5. Although we have only configured RIP for connected interface the routing table includes all others routes through communication between the router. In Router 0 we have only entered the neighboring details in Rip but its Routing Table has Routing Path to Network 4.

```
C:\>ping 202.60.4.1

Pinging 202.60.4.1 with 32 bytes of data:

Reply from 202.60.4.1: bytes=32 time<1ms TTL=253
Reply from 202.60.4.1: bytes=32 time=10ms TTL=253
Reply from 202.60.4.1: bytes=32 time<1ms TTL=253
Reply from 202.60.4.1: bytes=32 time<1ms TTL=253

Ping statistics for 202.60.4.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 10ms, Average = 2ms
```

Output 45: Ping from PC0 to Router 2 : 0/2

Sending Host	Destination	Ping Status
PC0	PC1	**Successful**
	Router 0 : 0/0	
	Router 0 : 0/1	
	Router 0 : 0/2	
	PC3	
	PC4	
	Router 1 : 0/0	
	Router 1 : 0/1	
	PC5	
	PC6	

Table 12: Ping Status PC0 to all others after RIP

```
C:\>ping 202.60.6.3

Pinging 202.60.6.3 with 32 bytes of data:

Request timed out.
Reply from 202.60.6.3: bytes=32 time=1ms TTL=125
Reply from 202.60.6.3: bytes=32 time<1ms TTL=125
Reply from 202.60.6.3: bytes=32 time<1ms TTL=125

Ping statistics for 202.60.6.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Output 46: Ping from PC1 to PC3

Sending Host	Destination	Ping Status
PC1	PC1	**Successful**
	Router 0 : 0/0	
	Router 0 : 0/1	
	Router 0 : 0/2	
	PC3	
	PC4	
	Router 1 : 0/0	
	Router 1 : 0/1	
	PC5	
	PC6	

Table 13: Ping Status PC1 to all others after RIP

```
C:\>ping 202.60.2.2

Pinging 202.60.2.2 with 32 bytes of data:

Reply from 202.60.2.2: bytes=32 time<1ms TTL=126
Reply from 202.60.2.2: bytes=32 time=1ms TTL=126
Reply from 202.60.2.2: bytes=32 time=1ms TTL=126
Reply from 202.60.2.2: bytes=32 time=11ms TTL=126

Ping statistics for 202.60.2.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
```

```
    Minimum = 0ms, Maximum = 11ms, Average = 3ms
```

Output 47: Ping from PC2 to PC1

Sending Host	Destination	Ping Status
PC2	PC1	**Successful**
	Router 0 : 0/0	
	Router 0 : 0/1	
	Router 0 : 0/2	
	PC3	
	PC4	
	Router 1 : 0/0	
	Router 1 : 0/1	
	PC5	
	PC6	

Table 14: Ping Status PC2 to all others after RIP

```
C:\>ping 202.60.6.2

Pinging 202.60.6.2 with 32 bytes of data:

Reply from 202.60.6.2: bytes=32 time<1ms TTL=128
Reply from 202.60.6.2: bytes=32 time<1ms TTL=128
Reply from 202.60.6.2: bytes=32 time<1ms TTL=128
Reply from 202.60.6.2: bytes=32 time<1ms TTL=128

Ping statistics for 202.60.6.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Output 48: Ping from PC3 to Server 1

Sending Host	Destination	Ping Status
PC3	PC1	**Successful**
	Router 0 : 0/0	
	Router 0 : 0/1	
	Router 0 : 0/2	
	PC3	
	PC4	
	Router 1 : 0/0	
	Router 1 : 0/1	
	PC5	
	PC6	

Table 15: Ping Status PC3 to all others after RIP

```
AMRIT_0>ping 202.60.2.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
```

Output 49: Ping from Router 0 to PC1

Sending Host	Destination	Ping Status
Router 0	PC1	**Successful**
	PC2	
	Router 0 : 0/0	
	Router 0 : 0/1	
	Router 0 : 0/2	
	PC3	
	Router 1 : 0/0	
	Router 1 : 0/1	
	PC5	
	PC6	

Table 16: Ping Status Router 0 to all others after RIP

```
AMRIT_1>ping 202.60.0.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.0.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms
```

Output 50: Ping from Router 1 to PC0

Sending Host	Destination	Ping Status
Router 1	PC1	**Successful**
	PC2	
	Router 0 : 0/0	
	Router 0 : 0/1	
	Router 0 : 0/2	
	PC3	
	Router 1 : 0/0	
	Router 1 : 0/1	
	PC5	
	PC6	

Table 17: Ping Status Router 1 to all others after RIP

```
AMRIT_2>ping 202.60.2.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms
```

Output 51: Ping from Router 2 to PC2

Sending Host	Destination	Ping Status
Router 2	PC1	**Successful**
	PC2	
	Router 0 : 0/0	
	Router 0 : 0/1	
	Router 0 : 0/2	
	PC3	
	Router 1 : 0/0	
	Router 1 : 0/1	
	PC5	
	PC6	

Table 18: Ping Status Router 2 to all others after RIP

```
AMRIT_3>ping 202.60.0.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 202.60.0.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/4/11 ms
```

Output 52: Ping from Router 3 to PC0

Sending Host	Destination	Ping Status
Router 3	PC1	**Successful**
	PC2	
	Router 0 : 0/0	
	Router 0 : 0/1	
	Router 0 : 0/2	
	PC3	
	Router 1 : 0/0	
	Router 1 : 0/1	
	PC5	
	PC6	

Table 19: Ping Status Router 3 to all others after RIP

After Successfully Configuring RIP in every Router. Routers stat to exchange its information available in its Routing Table to its Neighbors which make it possible to reach each PCs to other PCs.

13. **Use tracert command to observe the output from each PC to all other PCs.**

```
C:\>tracert 202.60.2.2

Tracing route to 202.60.2.2 over a maximum of 30 hops:

  1    0 ms      1 ms      1 ms      202.60.0.1
  2    0 ms      0 ms      0 ms      202.60.1.2
  3    0 ms      12 ms     0 ms      202.60.2.2

Trace complete.
```

Output 53: Trace Route from PC0 to PC1

```
C:\>tracert 202.60.4.3

Tracing route to 202.60.4.3 over a maximum of 30 hops:

  1    0 ms       0 ms       0 ms       202.60.0.1
  2    0 ms       0 ms       0 ms       202.60.1.2
  3    3 ms       0 ms       0 ms       202.60.3.2
  4    0 ms       0 ms       12 ms      202.60.4.3

Trace complete.
```

Output 54: Trace Route from PC0 to PC2

```
C:\>tracert 202.60.6.3

Tracing route to 202.60.6.3 over a maximum of 30 hops:

  1    0 ms       0 ms       0 ms       202.60.0.1
  2    3 ms       0 ms       0 ms       202.60.1.2
  3    0 ms       0 ms       3 ms       202.60.3.2
  4    0 ms       11 ms      0 ms       202.60.5.2
  5    11 ms      0 ms       13 ms      202.60.6.3

Trace complete.
```

Output 55: Trace Route from PC0 to PC3

```
C:\>tracert 202.60.4.3

Tracing route to 202.60.4.3 over a maximum of 30 hops:

  1    0 ms       10 ms      0 ms       202.60.2.1
  2    3 ms       0 ms       0 ms       202.60.3.2
  3    0 ms       11 ms      11 ms      202.60.4.3

Trace complete.
```

Output 56: Trace Route from PC1 to PC2

```
C:\>tracert 202.60.6.3

Tracing route to 202.60.6.3 over a maximum of 30 hops:

  1    0 ms       0 ms       0 ms       202.60.2.1
  2    0 ms       0 ms       0 ms       202.60.3.2
  3    3 ms       0 ms       11 ms      202.60.5.2
  4    0 ms       12 ms      3 ms       202.60.6.3

Trace complete.
```

Output 57: Trace Route from PC1 to PC3

```
C:\>tracert 202.60.6.3

Tracing route to 202.60.6.3 over a maximum of 30 hops:

  1    0 ms       1 ms       1 ms       202.60.4.1
  2    0 ms       3 ms       0 ms       202.60.5.2
  3    3 ms       11 ms      0 ms       202.60.6.3

Trace complete.
```

Output 58: Trace Route from PC2 to PC3

```
C:\>tracert 202.60.2.3

Tracing route to 202.60.2.3 over a maximum of 30 hops:

  1    0 ms       1 ms       1 ms       202.60.6.1
  2    0 ms       0 ms       2 ms       202.60.5.1
  3    1 ms       0 ms       0 ms       202.60.3.1
  4    *          11 ms      1 ms       202.60.2.3

Trace complete.
```

Output 59: Trace Route from PC3 to PC4

We can observe that Packets followed Optimal path to its destination.

5.3.2 Activities B

B. To increase the reliability, add a new router to connect Switch0 with Switch1 as shown in figure below. Assign IP address to both interfaces of router as specified. Configure RIP in this router (for each of the network connected to it) and observe the followings

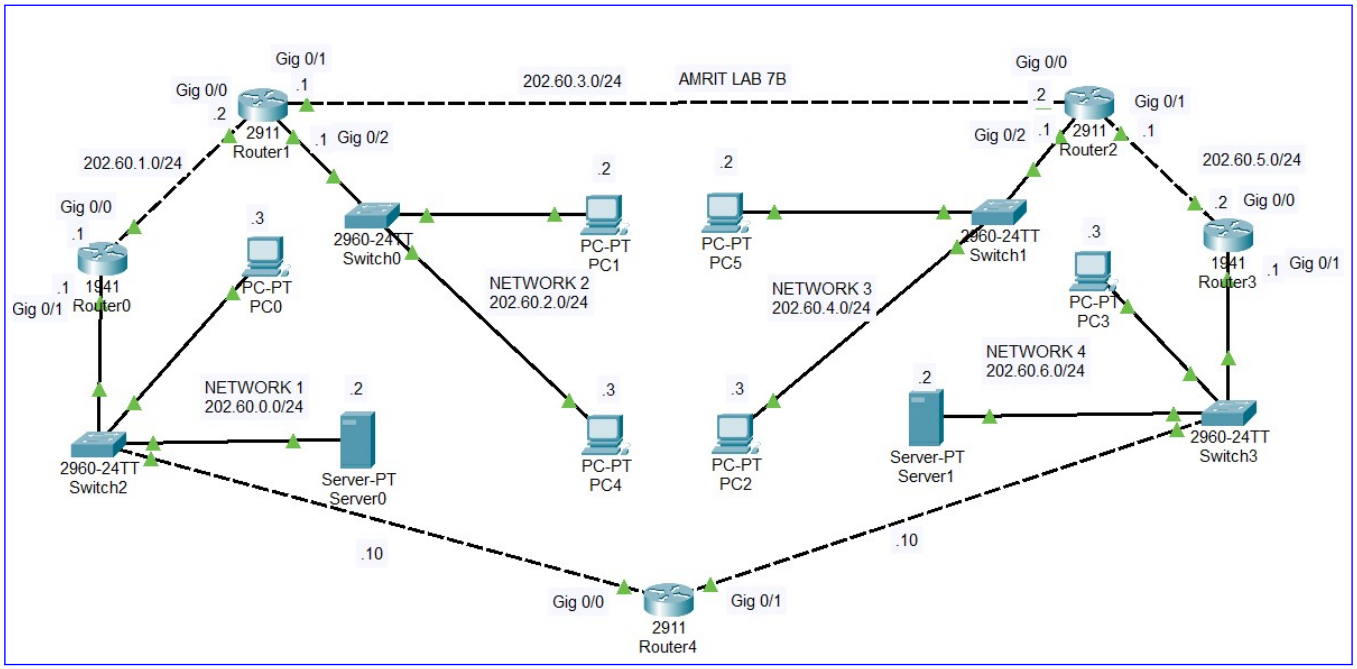

Figure 2: Network topology Lab 7B

First Disable Passive interface for Network 1 and Network 4 in order to receive updates in Router 4.

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.

Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip address 202.60.0.10 255.255.255.0
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(config-if)#exit
Router(config)#interface GigabitEthernet0/1
Router(config-if)#no ip address
Router(config-if)#ip address 202.60.6.10 255.255.255.0
Router(config-if)#ip address 202.60.6.10 255.255.255.0
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)#exit
Router(config)#router rip
Router(config-router)#network 202.60.6.0
```

```
Router(config-router)#network 202.60.0.0
```

Output 60: Assigning Ip and Configuring RIP Router 4

1. **Observe the output of show ip route command in each router, and compare with that of previous case that is specified in Activity A.**

```
AMRIT_0>show ip route

Gateway of last resort is not set

     202.60.0.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.0.0/24 is directly connected, GigabitEthernet0/1
L       202.60.0.1/32 is directly connected, GigabitEthernet0/1
     202.60.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.1.0/24 is directly connected, GigabitEthernet0/0
L       202.60.1.1/32 is directly connected, GigabitEthernet0/0
R    202.60.2.0/24 [120/1] via 202.60.1.2, 00:00:20, GigabitEthernet0/0
R    202.60.3.0/24 [120/1] via 202.60.1.2, 00:00:20, GigabitEthernet0/0
R    202.60.4.0/24 [120/2] via 202.60.1.2, 00:00:20, GigabitEthernet0/0
R    202.60.5.0/24 [120/2] via 202.60.0.10, 00:00:04, GigabitEthernet0/1
                   [120/2] via 202.60.1.2, 00:00:20, GigabitEthernet0/0
R    202.60.6.0/24 [120/1] via 202.60.0.10, 00:00:04, GigabitEthernet0/1
```

Output 61: *show ip route* Router 0

```
AMRIT_1>show ip route

Gateway of last resort is not set

R    202.60.0.0/24 [120/1] via 202.60.1.1, 00:00:15, GigabitEthernet0/0
     202.60.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.1.0/24 is directly connected, GigabitEthernet0/0
L       202.60.1.2/32 is directly connected, GigabitEthernet0/0
     202.60.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.2.0/24 is directly connected, GigabitEthernet0/2
L       202.60.2.1/32 is directly connected, GigabitEthernet0/2
     202.60.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.3.0/24 is directly connected, GigabitEthernet0/1
L       202.60.3.1/32 is directly connected, GigabitEthernet0/1
R    202.60.4.0/24 [120/1] via 202.60.3.2, 00:00:21, GigabitEthernet0/1
R    202.60.5.0/24 [120/1] via 202.60.3.2, 00:00:21, GigabitEthernet0/1
R    202.60.6.0/24 [120/2] via 202.60.3.2, 00:00:21, GigabitEthernet0/1
                   [120/2] via 202.60.1.1, 00:00:15, GigabitEthernet0/0
```

Output 62: *show ip route* Router 1

```
AMRIT_2>show ip route

Gateway of last resort is not set

R    202.60.0.0/24 [120/2] via 202.60.5.2, 00:00:26, GigabitEthernet0/1
                   [120/2] via 202.60.3.1, 00:00:24, GigabitEthernet0/0
R    202.60.1.0/24 [120/1] via 202.60.3.1, 00:00:24, GigabitEthernet0/0
R    202.60.2.0/24 [120/1] via 202.60.3.1, 00:00:24, GigabitEthernet0/0
     202.60.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.3.0/24 is directly connected, GigabitEthernet0/0
L       202.60.3.2/32 is directly connected, GigabitEthernet0/0
     202.60.4.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.4.0/24 is directly connected, GigabitEthernet0/2
L       202.60.4.1/32 is directly connected, GigabitEthernet0/2
     202.60.5.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.5.0/24 is directly connected, GigabitEthernet0/1
L       202.60.5.1/32 is directly connected, GigabitEthernet0/1
```

```
R    202.60.6.0/24 [120/1] via 202.60.5.2, 00:00:26, GigabitEthernet0/1
```

Output 63: *show ip route* Router 2

```
AMRIT_3>show ip route

Gateway of last resort is not set

R    202.60.0.0/24 [120/1] via 202.60.6.10, 00:00:02, GigabitEthernet0/1
R    202.60.1.0/24 [120/2] via 202.60.6.10, 00:00:02, GigabitEthernet0/1
                   [120/2] via 202.60.5.1, 00:00:12, GigabitEthernet0/0
R    202.60.2.0/24 [120/2] via 202.60.5.1, 00:00:12, GigabitEthernet0/0
R    202.60.3.0/24 [120/1] via 202.60.5.1, 00:00:12, GigabitEthernet0/0
R    202.60.4.0/24 [120/1] via 202.60.5.1, 00:00:12, GigabitEthernet0/0
     202.60.5.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.5.0/24 is directly connected, GigabitEthernet0/0
L       202.60.5.2/32 is directly connected, GigabitEthernet0/0
     202.60.6.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.6.0/24 is directly connected, GigabitEthernet0/1
L       202.60.6.1/32 is directly connected, GigabitEthernet0/1
```

Output 64: *show ip route* Router 3

```
Router>show ip route

Gateway of last resort is not set

     202.60.0.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.0.0/24 is directly connected, GigabitEthernet0/0
L       202.60.0.10/32 is directly connected, GigabitEthernet0/0
R    202.60.1.0/24 [120/1] via 202.60.0.1, 00:00:08, GigabitEthernet0/0
R    202.60.2.0/24 [120/2] via 202.60.0.1, 00:00:08, GigabitEthernet0/0
R    202.60.3.0/24 [120/2] via 202.60.6.1, 00:00:01, GigabitEthernet0/1
                   [120/2] via 202.60.0.1, 00:00:08, GigabitEthernet0/0
R    202.60.4.0/24 [120/2] via 202.60.6.1, 00:00:01, GigabitEthernet0/1
R    202.60.5.0/24 [120/1] via 202.60.6.1, 00:00:01, GigabitEthernet0/1
     202.60.6.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.6.0/24 is directly connected, GigabitEthernet0/1
L       202.60.6.10/32 is directly connected, GigabitEthernet0/1
```

Output 65: *show ip route* Router 4

After enabling RIP on additional Router (Router 4) the Routing table in each router has been updated to reach its destination with minimum hops or through shortest path. For example in Router 0, previously there was entry to reach Network 4 through 202.60.1.0 network taking 3 hops but now it has been updated through 200.60.0.10 in 1 hop.

2. **Use tracert command from each PC to each another PC and note down the result. Note how the changing network topology is addressed by dynamic routing automatically.**

```
C:\>tracert 202.60.2.2

Tracing route to 202.60.2.2 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      202.60.0.1
  2    0 ms      0 ms      0 ms      202.60.1.2
  3    0 ms      0 ms      0 ms      202.60.2.2

Trace complete.
```

Output 66: Trace Route from PC0 to PC1

```
C:\>tracert 202.60.4.3

Tracing route to 202.60.4.3 over a maximum of 30 hops:

  1    0 ms       1 ms       0 ms       202.60.0.1
  2    0 ms       0 ms       1 ms       202.60.1.2
  3    0 ms       0 ms       0 ms       202.60.3.2
  4    0 ms       12 ms      0 ms       202.60.4.3

Trace complete.
```

Output 67: Trace Route from PC0 to PC2

```
C:\>tracert 202.60.6.3

Tracing route to 202.60.6.3 over a maximum of 30 hops:

  1    0 ms       5 ms       1 ms       202.60.0.1
  2    0 ms       0 ms       0 ms       202.60.0.10
  3    13 ms      11 ms      0 ms       202.60.6.3

Trace complete.
```

Output 68: Trace Route from PC0 to PC3

```
C:\>tracert 202.60.4.3

Tracing route to 202.60.4.2 over a maximum of 30 hops:

  1    0 ms       0 ms       0 ms       202.60.2.1
  2    0 ms       0 ms       1 ms       202.60.3.2
  3    0 ms       0 ms       3 ms       202.60.4.3

Trace complete.
```

Output 69: Trace Route from PC1 to PC2

```
C:\>tracert 202.60.6.3

Tracing route to 202.60.6.3 over a maximum of 30 hops:

  1    1 ms       0 ms       0 ms       202.60.2.1
  2    0 ms       3 ms       0 ms       202.60.1.1
  3    0 ms       *          0 ms       202.60.5.2
  4    10 ms      11 ms      2 ms       202.60.6.3

Trace complete.
```

Output 70: Trace Route from PC1 to PC3

```
C:\>tracert 202.60.6.3

Tracing route to 202.60.6.3 over a maximum of 30 hops:

  1    0 ms       0 ms       0 ms       202.60.4.1
  2    1 ms       0 ms       0 ms       202.60.5.2
  3    11 ms      0 ms       1 ms       202.60.6.3

Trace complete.
```

Output 71: Trace Route from PC2 to PC3

```
C:\>tracert 202.60.2.3

Tracing route to 202.60.2.3 over a maximum of 30 hops:

  1    0 ms       0 ms       0 ms       202.60.6.1
  2    1 ms       0 ms       0 ms       202.60.5.1
  3    1 ms       1 ms       1 ms       202.60.1.2
  4    1 ms       0 ms       0 ms       202.60.2.3

Trace complete.
```

Output 72: Trace Route from PC3 to PC4

```
C:\>tracert 202.60.4.2

Tracing route to 202.60.4.2 over a maximum of 30 hops:

  1    1 ms       0 ms       0 ms       202.60.6.1
  2    0 ms       0 ms       3 ms       202.60.5.1
  3    *          3 ms       1 ms       202.60.4.2

Trace complete.
```

Output 73: Trace Route from PC3 to PC5

```
C:\>tracert 202.60.0.3

Tracing route to 202.60.0.3 over a maximum of 30 hops:

  1    1 ms       0 ms       0 ms       202.60.6.1
  2    *          *          0 ms       202.60.6.10
  3    *          *          0 ms       202.60.0.3

Trace complete.
```

Output 74: Trace Route from PC3 to PC0

With RIP and Shortest path algorithm Router now has data or routes to reach destination through shortest routes. Taking PC0 and PC3 as example, Before introducing Router 4 between Network 1 and 4 , Packets from PC0 has to travel through Router 1 then Router 2 then Router 3 and finally to PC3 But now Packets can reach to PC3 in 1 hops through Router 4.

3. **Now disconnect the link between Router0 and Router1 and observe the output while using tracert command from each PC to each another PC. Note how changing network topology is addressed in dynamic routing. Also observe the routing table of each router using show ip route.**

```
C:\>tracert 202.60.2.2

Tracing route to 202.60.2.2 over a maximum of 30 hops:

  1    0 ms       0 ms       0 ms       202.60.0.1
  2    0 ms       0 ms       0 ms       202.60.0.10
  3    11 ms      0 ms       0 ms       202.60.6.1
  4    0 ms       0 ms       1 ms       202.60.5.1
  5    0 ms       0 ms       12 ms      202.60.3.1
  6    1 ms       11 ms      0 ms       202.60.2.2

Trace complete.
```

Output 75: Trace Route from PC0 to PC1

```
C:\>tracert 202.60.0.3

Tracing route to 202.60.0.3 over a maximum of 30 hops:

  1    1 ms       0 ms       0 ms       202.60.4.1
  2    0 ms       3 ms       0 ms       202.60.5.2
  3    1 ms       0 ms      11 ms       202.60.6.10
  4    0 ms       0 ms       0 ms       202.60.0.3

Trace complete.
```

Output 76: Trace Route from PC5 to PC0

```
C:\>tracert 202.60.0.3

Tracing route to 202.60.0.3 over a maximum of 30 hops:

  1    0 ms       0 ms       0 ms       202.60.2.1
  2    0 ms       3 ms       0 ms       202.60.3.2
  3    1 ms       0 ms       0 ms       202.60.5.2
  4    0 ms       3 ms       0 ms       202.60.6.10
  5    1 ms       0 ms       0 ms       202.60.0.3

Trace complete.
```

Output 77: Trace Route from PC4 to PC0

```
AMRIT_0>show ip route

Gateway of last resort is not set

     202.60.0.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.0.0/24 is directly connected, GigabitEthernet0/1
L       202.60.0.1/32 is directly connected, GigabitEthernet0/1
R    202.60.2.0/24 [120/4] via 202.60.0.10, 00:00:04, GigabitEthernet0/1
R    202.60.3.0/24 [120/3] via 202.60.0.10, 00:00:04, GigabitEthernet0/1
R    202.60.4.0/24 [120/3] via 202.60.0.10, 00:00:04, GigabitEthernet0/1
R    202.60.5.0/24 [120/2] via 202.60.0.10, 00:00:04, GigabitEthernet0/1
R    202.60.6.0/24 [120/1] via 202.60.0.10, 00:00:04, GigabitEthernet0/1
```

Output 78: *show ip route* Router 0

```
AMRIT_1>show ip route

Gateway of last resort is not set

R    202.60.0.0/24 [120/3] via 202.60.3.2, 00:00:02, GigabitEthernet0/1
     202.60.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.2.0/24 is directly connected, GigabitEthernet0/2
L       202.60.2.1/32 is directly connected, GigabitEthernet0/2
     202.60.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.3.0/24 is directly connected, GigabitEthernet0/1
L       202.60.3.1/32 is directly connected, GigabitEthernet0/1
R    202.60.4.0/24 [120/1] via 202.60.3.2, 00:00:02, GigabitEthernet0/1
R    202.60.5.0/24 [120/1] via 202.60.3.2, 00:00:02, GigabitEthernet0/1
R    202.60.6.0/24 [120/2] via 202.60.3.2, 00:00:02, GigabitEthernet0/1
```

Output 79: *show ip route* Router 1

```
AMRIT_2>show ip route

Gateway of last resort is not set

R    202.60.0.0/24 [120/2] via 202.60.5.2, 00:00:05, GigabitEthernet0/1
```

```
R    202.60.2.0/24 [120/1] via 202.60.3.1, 00:00:13, GigabitEthernet0/0
     202.60.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.3.0/24 is directly connected, GigabitEthernet0/0
L       202.60.3.2/32 is directly connected, GigabitEthernet0/0
     202.60.4.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.4.0/24 is directly connected, GigabitEthernet0/2
L       202.60.4.1/32 is directly connected, GigabitEthernet0/2
     202.60.5.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.5.0/24 is directly connected, GigabitEthernet0/1
L       202.60.5.1/32 is directly connected, GigabitEthernet0/1
R    202.60.6.0/24 [120/1] via 202.60.5.2, 00:00:05, GigabitEthernet0/1
```

Output 80: *show ip route* Router 2

```
AMRIT_3>show ip route

Gateway of last resort is not set

R    202.60.0.0/24 [120/1] via 202.60.6.10, 00:00:03, GigabitEthernet0/1
R    202.60.2.0/24 [120/2] via 202.60.5.1, 00:00:08, GigabitEthernet0/0
R    202.60.3.0/24 [120/1] via 202.60.5.1, 00:00:08, GigabitEthernet0/0
R    202.60.4.0/24 [120/1] via 202.60.5.1, 00:00:08, GigabitEthernet0/0
     202.60.5.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.5.0/24 is directly connected, GigabitEthernet0/0
L       202.60.5.2/32 is directly connected, GigabitEthernet0/0
     202.60.6.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.6.0/24 is directly connected, GigabitEthernet0/1
L       202.60.6.1/32 is directly connected, GigabitEthernet0/1
```

Output 81: *show ip route* Router 3

```
Router>show ip route

Gateway of last resort is not set

     202.60.0.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.0.0/24 is directly connected, GigabitEthernet0/0
L       202.60.0.10/32 is directly connected, GigabitEthernet0/0
R    202.60.2.0/24 [120/3] via 202.60.6.1, 00:00:06, GigabitEthernet0/1
R    202.60.3.0/24 [120/2] via 202.60.6.1, 00:00:06, GigabitEthernet0/1
R    202.60.4.0/24 [120/2] via 202.60.6.1, 00:00:06, GigabitEthernet0/1
R    202.60.5.0/24 [120/1] via 202.60.6.1, 00:00:06, GigabitEthernet0/1
     202.60.6.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.6.0/24 is directly connected, GigabitEthernet0/1
L       202.60.6.10/32 is directly connected, GigabitEthernet0/1
```

Output 82: *show ip route* Router 4

Through *tracert* output of PCs and Routing Table of routers , it is clear that Router has Successfully adapted to change in topology hence determine shortest and alternative Router to destination. For example, Previously Packets from PC4 used to travel through 202.60.1.0 to Router 0 and then to PC0 but as that link is down Router has determined the alternative path theough Router 2 then Router 3 then Router 4 and finally to PC0.

4. **Similarly observe the routing table of each router and output of traceroute/tracert command by removing different links between routers as well as by connecting the links.**

   Trace Route and Routing Table after diconnecting **202.60.3.0/24** line:

```
Tracing route to 202.60.4.3 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      202.60.0.1
  2    *         *         0 ms      202.60.0.10
```

```
  3    *         0 ms      1 ms      202.60.6.1
  4    1 ms      1 ms      0 ms      202.60.5.1
  5    *         0 ms      0 ms      202.60.4.3

Trace complete.
```

Output 83: Trace Route from PC0 to PC2

```
C:\>tracert 202.60.4.2

Tracing route to 202.60.4.2 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      202.60.2.1
  2    0 ms      0 ms      0 ms      202.60.1.1
  3    0 ms      0 ms      0 ms      202.60.0.10
  4    0 ms      0 ms      0 ms      202.60.6.1
  5    0 ms      0 ms      1 ms      202.60.5.1
  6    *         1 ms      0 ms      202.60.4.2

Trace complete.
```

Output 84: Trace Route from PC1 to PC5

```
C:\>tracert 202.60.2.3

Tracing route to 202.60.2.3 over a maximum of 30 hops:

  1    0 ms      0 ms      1 ms      202.60.6.1
  2    *         0 ms      0 ms      202.60.6.10
  3    2 ms      0 ms      3 ms      202.60.0.1
  4    3 ms      0 ms      1 ms      202.60.1.2
  5    *         0 ms      0 ms      202.60.2.3

Trace complete.
```

Output 85: Trace Route from PC3 to PC4

```
AMRIT_0>show ip route

Gateway of last resort is not set

     202.60.0.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.0.0/24 is directly connected, GigabitEthernet0/1
L       202.60.0.1/32 is directly connected, GigabitEthernet0/1
     202.60.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.1.0/24 is directly connected, GigabitEthernet0/0
L       202.60.1.1/32 is directly connected, GigabitEthernet0/0
R    202.60.2.0/24 [120/1] via 202.60.1.2, 00:00:05, GigabitEthernet0/0
R    202.60.4.0/24 [120/3] via 202.60.0.10, 00:00:03, GigabitEthernet0/1
R    202.60.5.0/24 [120/2] via 202.60.0.10, 00:00:03, GigabitEthernet0/1
R    202.60.6.0/24 [120/1] via 202.60.0.10, 00:00:03, GigabitEthernet0/1
```

Output 86: *show ip route* Router 0

```
AMRIT_1>show ip route

Gateway of last resort is not set

R    202.60.0.0/24 [120/1] via 202.60.1.1, 00:00:24, GigabitEthernet0/0
     202.60.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.1.0/24 is directly connected, GigabitEthernet0/0
L       202.60.1.2/32 is directly connected, GigabitEthernet0/0
     202.60.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.2.0/24 is directly connected, GigabitEthernet0/2
```

```
L       202.60.2.1/32 is directly connected, GigabitEthernet0/2
R    202.60.4.0/24 [120/4] via 202.60.1.1, 00:00:24, GigabitEthernet0/0
R    202.60.5.0/24 [120/3] via 202.60.1.1, 00:00:24, GigabitEthernet0/0
R    202.60.6.0/24 [120/2] via 202.60.1.1, 00:00:24, GigabitEthernet0/0
```

Output 87: *show ip route* Router 1

```
AMRIT_2>show ip route

Gateway of last resort is not set

R    202.60.0.0/24 [120/2] via 202.60.5.2, 00:00:08, GigabitEthernet0/1
R    202.60.1.0/24 [120/3] via 202.60.5.2, 00:00:08, GigabitEthernet0/1
R    202.60.2.0/24 [120/4] via 202.60.5.2, 00:00:08, GigabitEthernet0/1
     202.60.4.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.4.0/24 is directly connected, GigabitEthernet0/2
L       202.60.4.1/32 is directly connected, GigabitEthernet0/2
     202.60.5.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.5.0/24 is directly connected, GigabitEthernet0/1
L       202.60.5.1/32 is directly connected, GigabitEthernet0/1
R    202.60.6.0/24 [120/1] via 202.60.5.2, 00:00:08, GigabitEthernet0/1
```

Output 88: *show ip route* Router 2

```
AMRIT_3>show ip route

Gateway of last resort is not set

R    202.60.0.0/24 [120/1] via 202.60.6.10, 00:00:28, GigabitEthernet0/1
R    202.60.1.0/24 [120/2] via 202.60.6.10, 00:00:28, GigabitEthernet0/1
R    202.60.2.0/24 [120/3] via 202.60.6.10, 00:00:28, GigabitEthernet0/1
R    202.60.4.0/24 [120/1] via 202.60.5.1, 00:00:17, GigabitEthernet0/0
     202.60.5.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.5.0/24 is directly connected, GigabitEthernet0/0
L       202.60.5.2/32 is directly connected, GigabitEthernet0/0
     202.60.6.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.6.0/24 is directly connected, GigabitEthernet0/1
L       202.60.6.1/32 is directly connected, GigabitEthernet0/1
```

Output 89: *show ip route* Router 3

```
Router>show ip route

Gateway of last resort is not set

     202.60.0.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.0.0/24 is directly connected, GigabitEthernet0/0
L       202.60.0.10/32 is directly connected, GigabitEthernet0/0
R    202.60.1.0/24 [120/1] via 202.60.0.1, 00:00:03, GigabitEthernet0/0
R    202.60.2.0/24 [120/2] via 202.60.0.1, 00:00:03, GigabitEthernet0/0
R    202.60.4.0/24 [120/2] via 202.60.6.1, 00:00:11, GigabitEthernet0/1
R    202.60.5.0/24 [120/1] via 202.60.6.1, 00:00:11, GigabitEthernet0/1
     202.60.6.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.6.0/24 is directly connected, GigabitEthernet0/1
L       202.60.6.10/32 is directly connected, GigabitEthernet0/1
```

Output 90: *show ip route* Router 4

Here PC1 uses the Routes through PC4 to reach PC2 after link to connect these Network is disconnected.

5. **Note down how the changing network topology is addressed by dynamic routing protocol automatically to determine the optimal path to reach each of the destination network.**

Through RIP protocol, Routing information is periodically shared between the routers so, when any changes is detected, it first update its routing table then send updates to neighbors about changes and its available neighbors.

5.3.3 Activities C

C. Create the network topology as shown in figure below and perform the following activities:

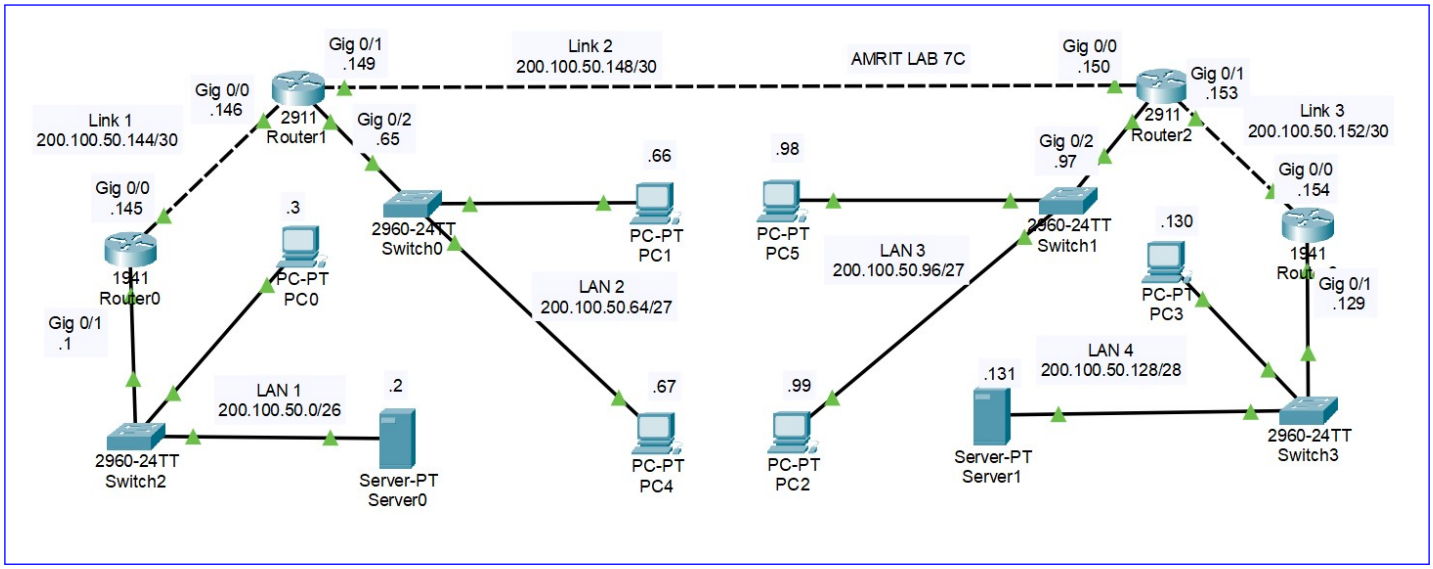

Figure 3: Network topology Lab 7C

1. **You have given an IP addresses of 200.100.50.0/24. You have to divide this address range for different LANs i.e. LAN1, LAN2, LAN3 and LAN4 interconnected as shown in figure above, each LAN having 60, 27, 25 and 12 number of hosts. In addition to this there are few networks having only two host in each (i.e. connection between two routers). Allocate the IP address range for each of the sub-networks with their network address, broadcast address and subnet mask. Also list out the unused range of IP addresses (if any)**

Subnet Name	Needed Size	Allocated Size	Network Address	Mask	Dec Mask	Assignable Range	Broadcast Address
LAN 1	60	62	200.100.50.0	/26	255.255.255.192	200.100.50.1 - 200.100.50.62	200.100.50.63
LAN 2	27	30	200.100.50.64	/27	255.255.255.224	200.100.50.65 - 200.100.50.94	200.100.50.95
LAN 3	25	30	200.100.50.96	/27	255.255.255.224	200.100.50.97 - 200.100.50.126	200.100.50.127
LAN 4	12	14	200.100.50.128	/28	255.255.255.240	200.100.50.129 - 200.100.50.142	200.100.50.143
Link 1	2	2	200.100.50.144	/30	255.255.255.252	200.100.50.145 - 200.100.50.146	200.100.50.147
Link 2	2	2	200.100.50.148	/30	255.255.255.252	200.100.50.149 - 200.100.50.150	200.100.50.151
Link 2	2	2	200.100.50.152	/30	255.255.255.252	200.100.50.153 - 200.100.50.154	200.100.50.155

Table 20: Assignning IP thropugh VLSM

The unused IP range is **200.100.50.156 - 200.100.50.255**

2. **On the basis of your division configure IP address for each interface of routers. Also configure the IP address and default gateway of each PC and server.**

```
AMRIT_0>enable
Password:
AMRIT_0#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.

AMRIT_0(config)#interface GigabitEthernet0/0
AMRIT_0(config-if)#ip address 200.100.50.145 255.255.255.252
AMRIT_0(config-if)#no shutdown

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

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

AMRIT_0(config-if)#exit
AMRIT_0(config)#interface GigabitEthernet0/1
AMRIT_0(config-if)#ip address 200.100.50.1 255.255.255.192
AMRIT_0(config-if)#no shutdown

%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

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

Output 91: Configure Router 0

```
AMRIT_1>enable
Password:
AMRIT_1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.

AMRIT_1(config)#interface GigabitEthernet0/0
AMRIT_1(config-if)#ip address 200.100.50.146 255.255.255.252
AMRIT_1(config-if)#no shutdown

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

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


AMRIT_1(config-if)#exit
AMRIT_1(config)#interface GigabitEthernet0/1
AMRIT_1(config-if)#ip address 200.100.50.149 255.255.255.252
AMRIT_1(config-if)#no shutdown

%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

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

AMRIT_1(config-if)#exit
AMRIT_1(config)#interface GigabitEthernet0/2
AMRIT_1(config-if)#ip address 200.100.50.65 255.255.255.224
AMRIT_1(config-if)#no shutdown

%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed
    state to up
```

Output 92: Configure Router 1

```
AMRIT_2>enable
Password:
AMRIT_2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.

AMRIT_2(config)#interface GigabitEthernet0/0
AMRIT_2(config-if)#ip address 200.100.50.150 255.255.255.252
AMRIT_2(config-if)#no shutdown

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

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

AMRIT_2(config-if)#exit
AMRIT_2(config)#interface GigabitEthernet0/1
AMRIT_2(config-if)#ip address 200.100.50.153 255.255.255.252
AMRIT_2(config-if)#no shutdown

%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

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

AMRIT_2(config-if)#exit
AMRIT_2(config)#interface GigabitEthernet0/2
AMRIT_2(config-if)#ip address 200.100.50.97 255.255.255.224
AMRIT_2(config-if)#no shutdown

%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed
    state to up
```

Output 93: Configure Router 2

```
AMRIT_3>enable
Password:
AMRIT_3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.

AMRIT_3(config)#interface GigabitEthernet0/0
AMRIT_3(config-if)#ip address 200.100.50.154 255.255.255.252
AMRIT_3(config-if)#no shutdown

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

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

AMRIT_3(config-if)#exit

AMRIT_3(config)#interface GigabitEthernet0/1
AMRIT_3(config-if)#ip address 200.100.50.129 255.255.255.240
AMRIT_3(config-if)#no shutdown

%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

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

Output 94: Configure Router 3

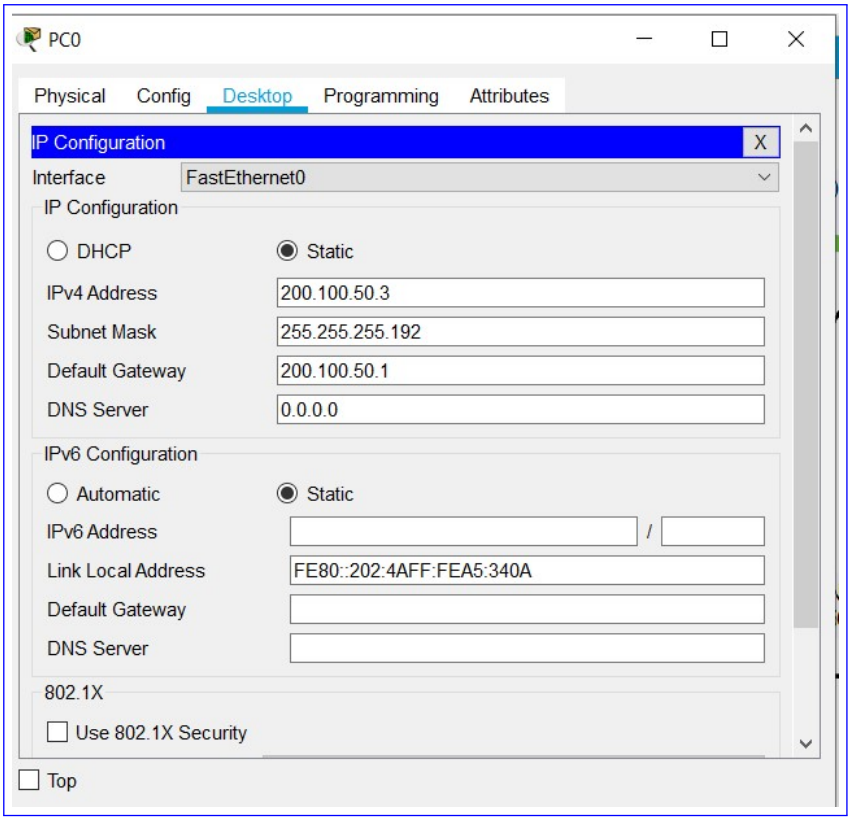

Figure 4: Config IP and Default gateway in PC 0

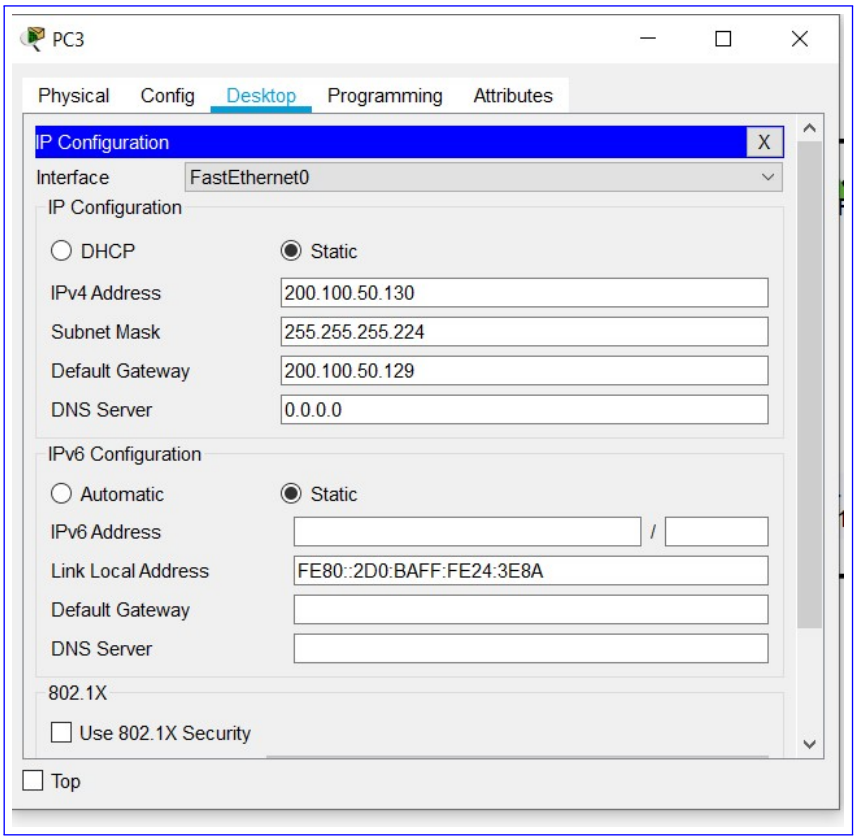

Figure 5: Config IP and Default gateway in PC 3

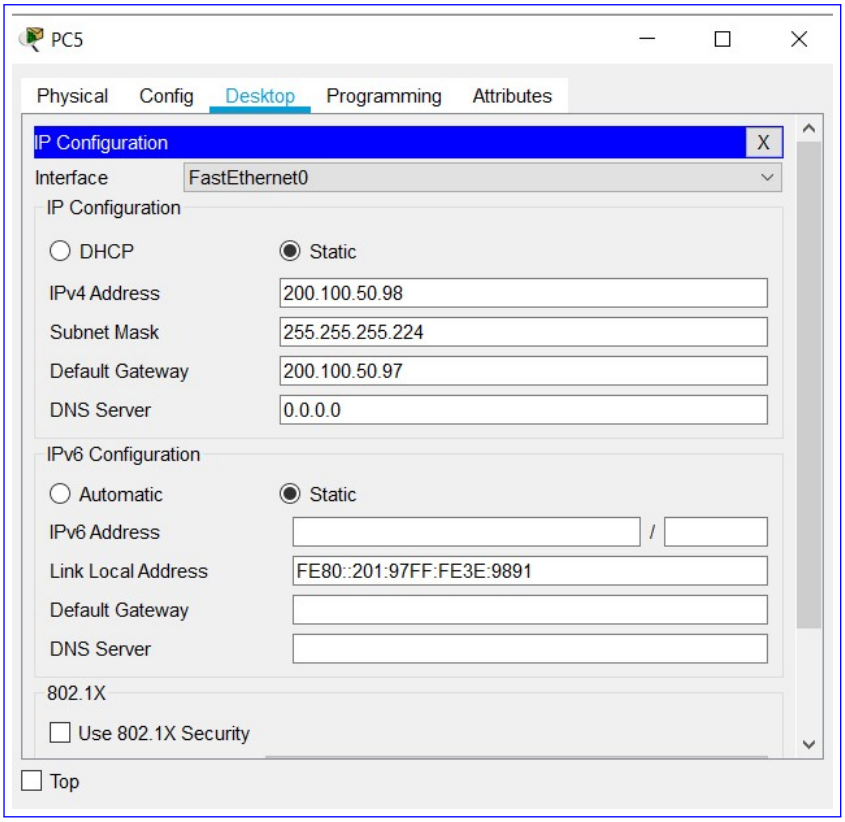

Figure 6: Config IP and Default gateway in PC 5

3. **Enable routing in between LANs using OSPF. Test the connectivity from a pc of any LAN to pc of any another LAN by using ping.**

```
AMRIT_0>enable
Password:

AMRIT_0#
AMRIT_0#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.

AMRIT_0(config)#router ospf 1
AMRIT_0(config-router)#network 200.100.50.0   0.0.0.63    area 0
AMRIT_0(config-router)#network 200.100.50.144   0.0.0.3    area 0
AMRIT_0(config-router)#end
AMRIT_0#
%SYS-5-CONFIG_I: Configured from console by console
```

Output 95: Routing using OSPF Router 0

```
AMRIT_1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.

AMRIT_1(config)#router ospf 1
AMRIT_1(config-router)#network 200.100.50.64  0.0.0.31   area 0
AMRIT_1(config-router)#network 200.100.50.144   0.0.0.3    area 0
AMRIT_1(config-router)#network 200.100.50.148   0.0.0.3    area 0
AMRIT_1(config-router)#end

AMRIT_1#
%SYS-5-CONFIG_I: Configured from console by console
```

Output 96: Routing using OSPF Router 1

```
AMRIT_2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
AMRIT_2(config)#router ospf 1
AMRIT_2(config-router)#network 200.100.50.96  0.0.0.31   area 0
AMRIT_2(config-router)#network 200.100.50.152   0.0.0.3    area 0
AMRIT_2(config-router)#network 200.100.50.148   0.0.0.3    area 0
AMRIT_2(config-router)#end
AMRIT_2#
%SYS-5-CONFIG_I: Configured from console by console
```

Output 97: Routing using OSPF Router 2

```
AMRIT_3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
AMRIT_3(config)#router ospf 1
AMRIT_3(config-router)#network 200.100.50.128   0.0.0.15   area 0
AMRIT_3(config-router)#network 200.100.50.152   0.0.0.3    area 0
AMRIT_3(config-router)#end
AMRIT_3#
%SYS-5-CONFIG_I: Configured from console by console
```

Output 98: Routing using OSPF Router 3

```
C:\>ping 200.100.50.66

Pinging 200.100.50.66 with 32 bytes of data:

Reply from 200.100.50.66: bytes=32 time<1ms TTL=126
Reply from 200.100.50.66: bytes=32 time=22ms TTL=126
Reply from 200.100.50.66: bytes=32 time=2ms TTL=126
Reply from 200.100.50.66: bytes=32 time=15ms TTL=126

Ping statistics for 200.100.50.66:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 22ms, Average = 9ms
```

Output 99: Ping from PC0 to PC1

```
C:\>ping 200.100.50.99

Pinging 200.100.50.99 with 32 bytes of data:

Reply from 200.100.50.99: bytes=32 time<1ms TTL=126
Reply from 200.100.50.99: bytes=32 time<1ms TTL=126
Reply from 200.100.50.99: bytes=32 time=1ms TTL=126
Reply from 200.100.50.99: bytes=32 time=1ms TTL=126

Ping statistics for 200.100.50.99:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Output 100: Ping from PC1 to PC2

```
C:\>ping 200.100.50.130

Pinging 200.100.50.130 with 32 bytes of data:

Reply from 200.100.50.130: bytes=32 time=1ms TTL=126
Reply from 200.100.50.130: bytes=32 time=12ms TTL=126
Reply from 200.100.50.130: bytes=32 time=10ms TTL=126
Reply from 200.100.50.130: bytes=32 time=13ms TTL=126
```

```
Ping statistics for 200.100.50.130:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 13ms, Average = 9ms
```

Output 101: Ping from PC2 to PC3

```
C:\>ping 200.100.50.99

Pinging 200.100.50.99 with 32 bytes of data:

Request timed out.
Reply from 200.100.50.99: bytes=32 time=14ms TTL=125
Reply from 200.100.50.99: bytes=32 time=12ms TTL=125
Reply from 200.100.50.99: bytes=32 time=2ms TTL=125

Ping statistics for 200.100.50.99:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 14ms, Average = 9ms
```

Output 102: Ping from PC0 to PC2

```
C:\>ping 200.100.50.66

Pinging 200.100.50.66 with 32 bytes of data:

Request timed out.
Reply from 200.100.50.66: bytes=32 time<1ms TTL=125
Reply from 200.100.50.66: bytes=32 time=10ms TTL=125
Reply from 200.100.50.66: bytes=32 time<1ms TTL=125

Ping statistics for 200.100.50.66:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 10ms, Average = 3ms
```

Output 103: Ping from PC3 to PC1

```
C:\>ping 200.100.50.3

Pinging 200.100.50.3 with 32 bytes of data:

Request timed out.
Reply from 200.100.50.3: bytes=32 time<1ms TTL=124
Reply from 200.100.50.3: bytes=32 time<1ms TTL=124
Reply from 200.100.50.3: bytes=32 time<1ms TTL=124

Ping statistics for 200.100.50.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Output 104: Ping from PC3 to PC0

All Ping are Successful after using OSPF routing Protocols. Similar to RIP , OSPF also adapts the Routing table as per the changes im its Topology and has initials as **O** in its Routing Table.

4. **Note down the result of traceroute using traceroute command from PC0 to PC3**

```
C:\>tracert 200.100.50.130

Tracing route to 200.100.50.130 over a maximum of 30 hops:

  1    1 ms      3 ms      3 ms      200.100.50.1
  2    0 ms      0 ms      0 ms      200.100.50.146
  3    10 ms     0 ms      1 ms      200.100.50.150
  4    13 ms     14 ms     26 ms     200.100.50.154
  5    11 ms     15 ms     15 ms     200.100.50.130

Trace complete.
```

Output 105: Trace Route from PC0 to PC3

5. **Observe the routing table in each router by using show ip route command.**

```
AMRIT_0>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 9 subnets, 5 masks
C       200.100.50.0/26 is directly connected, GigabitEthernet0/1
L       200.100.50.1/32 is directly connected, GigabitEthernet0/1
O       200.100.50.64/27 [110/2] via 200.100.50.146, 01:09:03,
    GigabitEthernet0/0
O       200.100.50.96/27 [110/3] via 200.100.50.146, 01:02:32,
    GigabitEthernet0/0
O       200.100.50.128/28 [110/4] via 200.100.50.146, 00:47:01,
    GigabitEthernet0/0
C       200.100.50.144/30 is directly connected, GigabitEthernet0/0
L       200.100.50.145/32 is directly connected, GigabitEthernet0/0
O       200.100.50.148/30 [110/2] via 200.100.50.146, 01:09:03,
    GigabitEthernet0/0
O       200.100.50.152/30 [110/3] via 200.100.50.146, 01:02:32,
    GigabitEthernet0/0
```

Output 106: *show ip route* Router 0

```
AMRIT_1>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 10 subnets, 5 masks
O       200.100.50.0/26 [110/2] via 200.100.50.145, 01:08:34,
    GigabitEthernet0/0
C       200.100.50.64/27 is directly connected, GigabitEthernet0/2
L       200.100.50.65/32 is directly connected, GigabitEthernet0/2
O       200.100.50.96/27 [110/2] via 200.100.50.150, 01:02:09,
    GigabitEthernet0/1
O       200.100.50.128/28 [110/3] via 200.100.50.150, 00:46:33,
    GigabitEthernet0/1
C       200.100.50.144/30 is directly connected, GigabitEthernet0/0
L       200.100.50.146/32 is directly connected, GigabitEthernet0/0
C       200.100.50.148/30 is directly connected, GigabitEthernet0/1
L       200.100.50.149/32 is directly connected, GigabitEthernet0/1
O       200.100.50.152/30 [110/2] via 200.100.50.150, 01:02:09,
    GigabitEthernet0/1
```

Output 107: *show ip route* Router 1

```
AMRIT_2>show ip route

Gateway of last resort is not set
```

```
      200.100.50.0/24 is variably subnetted, 10 subnets, 5 masks
O        200.100.50.0/26 [110/3] via 200.100.50.149, 01:01:28,
    GigabitEthernet0/0
O        200.100.50.64/27 [110/2] via 200.100.50.149, 01:01:28,
    GigabitEthernet0/0
C        200.100.50.96/27 is directly connected, GigabitEthernet0/2
L        200.100.50.97/32 is directly connected, GigabitEthernet0/2
O        200.100.50.128/28 [110/2] via 200.100.50.154, 00:45:57,
    GigabitEthernet0/1
O        200.100.50.144/30 [110/2] via 200.100.50.149, 01:01:28,
    GigabitEthernet0/0
C        200.100.50.148/30 is directly connected, GigabitEthernet0/0
L        200.100.50.150/32 is directly connected, GigabitEthernet0/0
C        200.100.50.152/30 is directly connected, GigabitEthernet0/1
L        200.100.50.153/32 is directly connected, GigabitEthernet0/1
```

Output 108: *show ip route* Router 2

```
AMRIT_3>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 9 subnets, 5 masks
O        200.100.50.0/26 [110/4] via 200.100.50.153, 00:45:08,
    GigabitEthernet0/0
O        200.100.50.64/27 [110/3] via 200.100.50.153, 00:45:08,
    GigabitEthernet0/0
O        200.100.50.96/27 [110/2] via 200.100.50.153, 00:45:08,
    GigabitEthernet0/0
C        200.100.50.128/28 is directly connected, GigabitEthernet0/1
L        200.100.50.129/32 is directly connected, GigabitEthernet0/1
O        200.100.50.144/30 [110/3] via 200.100.50.153, 00:45:08,
    GigabitEthernet0/0
O        200.100.50.148/30 [110/2] via 200.100.50.153, 00:45:08,
    GigabitEthernet0/0
C        200.100.50.152/30 is directly connected, GigabitEthernet0/0
L        200.100.50.154/32 is directly connected, GigabitEthernet0/0
```

Output 109: *show ip route* Router 3

5.3.4 Activities D

D.Now Connect additional router as shown in figure below:

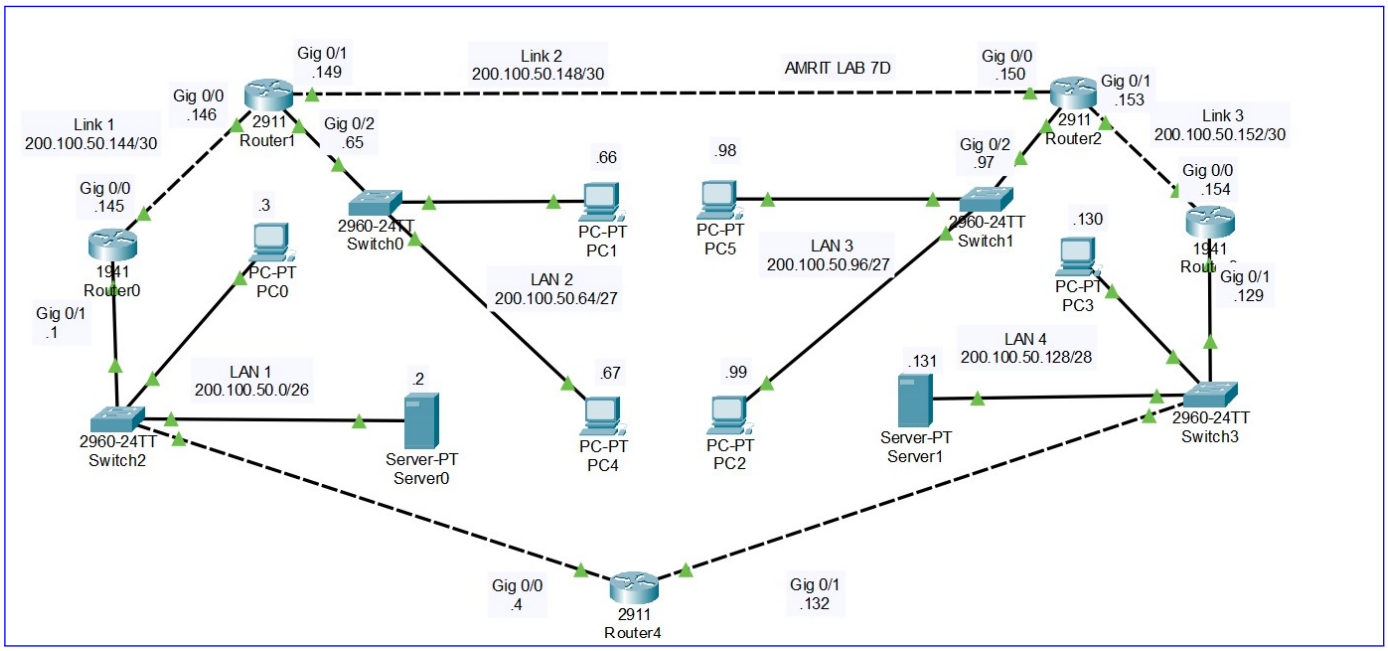

Figure 7: Network topology Lab 7D

1. **Configure the interfaces of Router4 with appropriate IP addresses and enable OSPF in it. Now note down the result of traceroute command from PC3 to PC0 and routing table in each router. Compare the result of previous.**

```
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.

Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip address 200.100.50.4 255.255.255.192
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(config-if)#exit
Router(config)#interface GigabitEthernet0/1
Router(config-if)#ip address 200.100.50.132 255.255.255.240
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
```

Output 110: Configure Router 4

```
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 200.100.50.0  0.0.0.63    area 0
```

```
Router(config-router)#network 200.100.50.128   0.0.0.15   area 0
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

Output 111: Routing using OSPF Router 4

```
C:\>tracert 200.100.50.3

Tracing route to 200.100.50.3 over a maximum of 30 hops:

  1    3 ms      0 ms      3 ms      200.100.50.129
  2    *         0 ms      0 ms      200.100.50.132
  3    *         11 ms     0 ms      200.100.50.3

Trace complete.
```

Output 112: Trace Route from PC3 to PC0

```
AMRIT_0>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 9 subnets, 5 masks
C       200.100.50.0/26 is directly connected, GigabitEthernet0/1
L       200.100.50.1/32 is directly connected, GigabitEthernet0/1
O       200.100.50.64/27 [110/2] via 200.100.50.146, 00:37:39,
    GigabitEthernet0/0
O       200.100.50.96/27 [110/3] via 200.100.50.146, 00:37:39,
    GigabitEthernet0/0
O       200.100.50.128/28 [110/2] via 200.100.50.4, 00:23:01,
    GigabitEthernet0/1
C       200.100.50.144/30 is directly connected, GigabitEthernet0/0
L       200.100.50.145/32 is directly connected, GigabitEthernet0/0
O       200.100.50.148/30 [110/2] via 200.100.50.146, 00:37:39,
    GigabitEthernet0/0
O       200.100.50.152/30 [110/3] via 200.100.50.4, 00:23:01,
    GigabitEthernet0/1
                          [110/3] via 200.100.50.146, 00:23:01,
    GigabitEthernet0/0
```

Output 113: *show ip route* Router 0

```
AMRIT_1>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 10 subnets, 5 masks
O       200.100.50.0/26 [110/2] via 200.100.50.145, 00:21:42,
    GigabitEthernet0/0
C       200.100.50.64/27 is directly connected, GigabitEthernet0/2
L       200.100.50.65/32 is directly connected, GigabitEthernet0/2
O       200.100.50.96/27 [110/2] via 200.100.50.150, 02:50:57,
    GigabitEthernet0/1
O       200.100.50.128/28 [110/3] via 200.100.50.145, 00:21:32,
    GigabitEthernet0/0
                          [110/3] via 200.100.50.150, 00:21:32,
    GigabitEthernet0/1
C       200.100.50.144/30 is directly connected, GigabitEthernet0/0
L       200.100.50.146/32 is directly connected, GigabitEthernet0/0
C       200.100.50.148/30 is directly connected, GigabitEthernet0/1
L       200.100.50.149/32 is directly connected, GigabitEthernet0/1
O       200.100.50.152/30 [110/2] via 200.100.50.150, 00:36:03,
```

```
    GigabitEthernet0/1
```

Output 114: *show ip route* Router 1

```
AMRIT_2>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 10 subnets, 5 masks
O       200.100.50.0/26 [110/3] via 200.100.50.154, 00:20:02,
    GigabitEthernet0/1
                        [110/3] via 200.100.50.149, 00:20:02,
    GigabitEthernet0/0
O       200.100.50.64/27 [110/2] via 200.100.50.149, 00:34:40,
    GigabitEthernet0/0
C       200.100.50.96/27 is directly connected, GigabitEthernet0/2
L       200.100.50.97/32 is directly connected, GigabitEthernet0/2
O       200.100.50.128/28 [110/2] via 200.100.50.154, 00:20:12,
    GigabitEthernet0/1
O       200.100.50.144/30 [110/2] via 200.100.50.149, 00:34:40,
    GigabitEthernet0/0
C       200.100.50.148/30 is directly connected, GigabitEthernet0/0
L       200.100.50.150/32 is directly connected, GigabitEthernet0/0
C       200.100.50.152/30 is directly connected, GigabitEthernet0/1
L       200.100.50.153/32 is directly connected, GigabitEthernet0/1
```

Output 115: *show ip route* Router 2

```
AMRIT_3>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 9 subnets, 5 masks
O       200.100.50.0/26 [110/2] via 200.100.50.132, 00:19:19,
    GigabitEthernet0/1
O       200.100.50.64/27 [110/3] via 200.100.50.153, 00:33:52,
    GigabitEthernet0/0
O       200.100.50.96/27 [110/2] via 200.100.50.153, 00:33:52,
    GigabitEthernet0/0
C       200.100.50.128/28 is directly connected, GigabitEthernet0/1
L       200.100.50.129/32 is directly connected, GigabitEthernet0/1
O       200.100.50.144/30 [110/3] via 200.100.50.132, 00:19:19,
    GigabitEthernet0/1
                          [110/3] via 200.100.50.153, 00:19:19,
    GigabitEthernet0/0
O       200.100.50.148/30 [110/2] via 200.100.50.153, 00:33:52,
    GigabitEthernet0/0
C       200.100.50.152/30 is directly connected, GigabitEthernet0/0
L       200.100.50.154/32 is directly connected, GigabitEthernet0/0
```

Output 116: *show ip route* Router 3

```
Router>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 9 subnets, 5 masks
C       200.100.50.0/26 is directly connected, GigabitEthernet0/0
L       200.100.50.4/32 is directly connected, GigabitEthernet0/0
O       200.100.50.64/27 [110/3] via 200.100.50.1, 00:17:48,
    GigabitEthernet0/0
O       200.100.50.96/27 [110/3] via 200.100.50.129, 00:17:48,
    GigabitEthernet0/1
C       200.100.50.128/28 is directly connected, GigabitEthernet0/1
```

```
L       200.100.50.132/32 is directly connected, GigabitEthernet0/1
O       200.100.50.144/30 [110/2] via 200.100.50.1, 00:17:48,
    GigabitEthernet0/0
O       200.100.50.148/30 [110/3] via 200.100.50.1, 00:17:48,
    GigabitEthernet0/0
                          [110/3] via 200.100.50.129, 00:17:48,
    GigabitEthernet0/1
O       200.100.50.152/30 [110/2] via 200.100.50.129, 00:17:48,
    GigabitEthernet0/1
```

Output 117: *show ip route* Router 4

With addition of Router 4 there is noticeable changes in Routing Tables in all Routers. From above Trace route and Routing table of Router 3 one can explain how OSPF adapts to changes and determine the shortest path to destination.

2. **Remove a link i.e. the link between router 4 and switch 0 and then observe the result of traceroute command from PC3 to PC0 and routing table in each router. Compare the result of previous. Note down how the routing is updated to address the changing topology.**

   The link between Router 4 and switch 2 of LAN 1(200.100.50.0/26) is removed.

```
C:\>tracert 200.100.50.3

Tracing route to 200.100.50.3 over a maximum of 30 hops:

  1    0 ms      0 ms      2 ms      200.100.50.129
  2    0 ms      1 ms      0 ms      200.100.50.153
  3    1 ms      0 ms      0 ms      200.100.50.149
  4    0 ms      1 ms      0 ms      200.100.50.145
  5    0 ms      0 ms      0 ms      200.100.50.3

Trace complete.
```

Output 118: Trace Route from PC3 to PC0

```
AMRIT_0>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 9 subnets, 5 masks
C       200.100.50.0/26 is directly connected, GigabitEthernet0/1
L       200.100.50.1/32 is directly connected, GigabitEthernet0/1
O       200.100.50.64/27 [110/2] via 200.100.50.146, 01:38:08,
    GigabitEthernet0/0
O       200.100.50.96/27 [110/3] via 200.100.50.146, 01:38:08,
    GigabitEthernet0/0
O       200.100.50.128/28 [110/4] via 200.100.50.146, 00:22:33,
    GigabitEthernet0/0
C       200.100.50.144/30 is directly connected, GigabitEthernet0/0
L       200.100.50.145/32 is directly connected, GigabitEthernet0/0
O       200.100.50.148/30 [110/2] via 200.100.50.146, 01:38:08,
    GigabitEthernet0/0
O       200.100.50.152/30 [110/3] via 200.100.50.146, 00:22:33,
    GigabitEthernet0/0
```

Output 119: *show ip route* Router 0

```
AMRIT_1>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 10 subnets, 5 masks
O       200.100.50.0/26 [110/2] via 200.100.50.145, 00:21:24,
```

```
    GigabitEthernet0/0
C       200.100.50.64/27 is directly connected, GigabitEthernet0/2
L       200.100.50.65/32 is directly connected, GigabitEthernet0/2
O       200.100.50.96/27 [110/2] via 200.100.50.150, 03:52:21,
    GigabitEthernet0/1
O       200.100.50.128/28 [110/3] via 200.100.50.150, 00:21:59,
    GigabitEthernet0/1
C       200.100.50.144/30 is directly connected, GigabitEthernet0/0
L       200.100.50.146/32 is directly connected, GigabitEthernet0/0
C       200.100.50.148/30 is directly connected, GigabitEthernet0/1
L       200.100.50.149/32 is directly connected, GigabitEthernet0/1
O       200.100.50.152/30 [110/2] via 200.100.50.150, 01:37:27,
    GigabitEthernet0/1
```

Output 120: *show ip route* Router 1

```
AMRIT_2>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 10 subnets, 5 masks
O       200.100.50.0/26 [110/3] via 200.100.50.149, 00:20:52,
    GigabitEthernet0/0
O       200.100.50.64/27 [110/2] via 200.100.50.149, 01:37:02,
    GigabitEthernet0/0
C       200.100.50.96/27 is directly connected, GigabitEthernet0/2
L       200.100.50.97/32 is directly connected, GigabitEthernet0/2
O       200.100.50.128/28 [110/2] via 200.100.50.154, 01:22:34,
    GigabitEthernet0/1
O       200.100.50.144/30 [110/2] via 200.100.50.149, 01:37:02,
    GigabitEthernet0/0
C       200.100.50.148/30 is directly connected, GigabitEthernet0/0
L       200.100.50.150/32 is directly connected, GigabitEthernet0/0
C       200.100.50.152/30 is directly connected, GigabitEthernet0/1
L       200.100.50.153/32 is directly connected, GigabitEthernet0/1
```

Output 121: *show ip route* Router 2

```
AMRIT_3>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 9 subnets, 5 masks
O       200.100.50.0/26 [110/4] via 200.100.50.153, 00:19:50,
    GigabitEthernet0/0
O       200.100.50.64/27 [110/3] via 200.100.50.153, 01:36:00,
    GigabitEthernet0/0
O       200.100.50.96/27 [110/2] via 200.100.50.153, 01:36:00,
    GigabitEthernet0/0
C       200.100.50.128/28 is directly connected, GigabitEthernet0/1
L       200.100.50.129/32 is directly connected, GigabitEthernet0/1
O       200.100.50.144/30 [110/3] via 200.100.50.153, 00:20:25,
    GigabitEthernet0/0
O       200.100.50.148/30 [110/2] via 200.100.50.153, 01:36:00,
    GigabitEthernet0/0
C       200.100.50.152/30 is directly connected, GigabitEthernet0/0
L       200.100.50.154/32 is directly connected, GigabitEthernet0/0
```

Output 122: *show ip route* Router 3

```
Router>show ip route

Gateway of last resort is not set
```

```
      200.100.50.0/24 is variably subnetted, 8 subnets, 5 masks
O        200.100.50.0/26 [110/5] via 200.100.50.129, 00:19:11,
    GigabitEthernet0/1
O        200.100.50.64/27 [110/4] via 200.100.50.129, 00:19:45,
    GigabitEthernet0/1
O        200.100.50.96/27 [110/3] via 200.100.50.129, 01:20:52,
    GigabitEthernet0/1
C        200.100.50.128/28 is directly connected, GigabitEthernet0/1
L        200.100.50.132/32 is directly connected, GigabitEthernet0/1
O        200.100.50.144/30 [110/4] via 200.100.50.129, 00:19:45,
    GigabitEthernet0/1
O        200.100.50.148/30 [110/3] via 200.100.50.129, 00:19:45,
    GigabitEthernet0/1
O        200.100.50.152/30 [110/2] via 200.100.50.129, 01:20:52,
    GigabitEthernet0/1
```

Output 123: *show ip route* Router 4

3. **Again connect the link and repeat the observations.**
   Observation is Similar to Activity D.1 that is before disconnection.

4. **You can observe by removing another link between Router0 and Router1 also.**
   After removing Link 1 (200.100.50.144/30) following Observation is done.

```
C:\>tracert 200.100.50.3

Tracing route to 200.100.50.3 over a maximum of 30 hops:

  1    0 ms      0 ms      1 ms      200.100.50.65
  2    0 ms      1 ms      1 ms      200.100.50.150
  3    0 ms      1 ms      0 ms      200.100.50.154
  4    13 ms     17 ms     14 ms     200.100.50.132
  5    0 ms      11 ms     3 ms      200.100.50.3

Trace complete.
```

Output 124: Trace Route from PC1 to PC0

```
AMRIT_0>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 7 subnets, 5 masks
C       200.100.50.0/26 is directly connected, GigabitEthernet0/1
L       200.100.50.1/32 is directly connected, GigabitEthernet0/1
O       200.100.50.64/27 [110/5] via 200.100.50.4, 00:15:50,
    GigabitEthernet0/1
O       200.100.50.96/27 [110/4] via 200.100.50.4, 00:15:50,
    GigabitEthernet0/1
O       200.100.50.128/28 [110/2] via 200.100.50.4, 00:29:47,
    GigabitEthernet0/1
O       200.100.50.148/30 [110/4] via 200.100.50.4, 00:15:50,
    GigabitEthernet0/1
O       200.100.50.152/30 [110/3] via 200.100.50.4, 00:15:50,
    GigabitEthernet0/1
```

Output 125: *show ip route* Router 0

```
AMRIT_1>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 8 subnets, 5 masks
```

```
O        200.100.50.0/26 [110/4] via 200.100.50.150, 00:15:21,
    GigabitEthernet0/1
C        200.100.50.64/27 is directly connected, GigabitEthernet0/2
L        200.100.50.65/32 is directly connected, GigabitEthernet0/2
O        200.100.50.96/27 [110/2] via 200.100.50.150, 07:10:30,
    GigabitEthernet0/1
O        200.100.50.128/28 [110/3] via 200.100.50.150, 00:15:21,
    GigabitEthernet0/1
C        200.100.50.148/30 is directly connected, GigabitEthernet0/1
L        200.100.50.149/32 is directly connected, GigabitEthernet0/1
O        200.100.50.152/30 [110/2] via 200.100.50.150, 04:55:36,
    GigabitEthernet0/1
```

Output 126: *show ip route* Router 1

```
AMRIT_2>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 9 subnets, 5 masks
O        200.100.50.0/26 [110/3] via 200.100.50.154, 00:14:49,
    GigabitEthernet0/1
O        200.100.50.64/27 [110/2] via 200.100.50.149, 04:55:11,
    GigabitEthernet0/0
C        200.100.50.96/27 is directly connected, GigabitEthernet0/2
L        200.100.50.97/32 is directly connected, GigabitEthernet0/2
O        200.100.50.128/28 [110/2] via 200.100.50.154, 04:40:43,
    GigabitEthernet0/1
C        200.100.50.148/30 is directly connected, GigabitEthernet0/0
L        200.100.50.150/32 is directly connected, GigabitEthernet0/0
C        200.100.50.152/30 is directly connected, GigabitEthernet0/1
L        200.100.50.153/32 is directly connected, GigabitEthernet0/1
```

Output 127: *show ip route* Router 2

```
AMRIT_3>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 8 subnets, 5 masks
O        200.100.50.0/26 [110/2] via 200.100.50.132, 00:28:16,
    GigabitEthernet0/1
O        200.100.50.64/27 [110/3] via 200.100.50.153, 04:54:41,
    GigabitEthernet0/0
O        200.100.50.96/27 [110/2] via 200.100.50.153, 04:54:41,
    GigabitEthernet0/0
C        200.100.50.128/28 is directly connected, GigabitEthernet0/1
L        200.100.50.129/32 is directly connected, GigabitEthernet0/1
O        200.100.50.148/30 [110/2] via 200.100.50.153, 04:54:41,
    GigabitEthernet0/0
C        200.100.50.152/30 is directly connected, GigabitEthernet0/0
L        200.100.50.154/32 is directly connected, GigabitEthernet0/0
```

Output 128: *show ip route* Router 3

```
Router>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 8 subnets, 5 masks
C        200.100.50.0/26 is directly connected, GigabitEthernet0/0
L        200.100.50.4/32 is directly connected, GigabitEthernet0/0
O        200.100.50.64/27 [110/4] via 200.100.50.129, 00:13:40,
    GigabitEthernet0/1
```

```
O        200.100.50.96/27 [110/3] via 200.100.50.129, 01:31:16,
    GigabitEthernet0/1
C        200.100.50.128/28 is directly connected, GigabitEthernet0/1
L        200.100.50.132/32 is directly connected, GigabitEthernet0/1
O        200.100.50.148/30 [110/3] via 200.100.50.129, 00:13:40,
    GigabitEthernet0/1
O        200.100.50.152/30 [110/2] via 200.100.50.129, 01:42:10,
    GigabitEthernet0/1
```

Output 129: *show ip route* Router 4

5. **Similarly you can observe by removing other links.**

   After removing Link 1 (200.100.50.148/30) following Observation is done.

```
C:\>tracert 200.100.50.99

Tracing route to 200.100.50.99 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      200.100.50.65
  2    0 ms      1 ms      0 ms      200.100.50.145
  3    0 ms      0 ms      7 ms      200.100.50.4
  4    0 ms      12 ms     0 ms      200.100.50.129
  5    1 ms      10 ms     2 ms      200.100.50.153
  6    *         0 ms      1 ms      200.100.50.99

Trace complete.
```

Output 130: Trace Route from PC1 to PC2

```
AMRIT_0>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 8 subnets, 5 masks
C       200.100.50.0/26 is directly connected, GigabitEthernet0/1
L       200.100.50.1/32 is directly connected, GigabitEthernet0/1
O       200.100.50.64/27 [110/2] via 200.100.50.146, 00:16:29,
    GigabitEthernet0/0
O       200.100.50.96/27 [110/4] via 200.100.50.4, 00:13:04,
    GigabitEthernet0/1
O       200.100.50.128/28 [110/2] via 200.100.50.4, 00:49:00,
    GigabitEthernet0/1
C       200.100.50.144/30 is directly connected, GigabitEthernet0/0
L       200.100.50.145/32 is directly connected, GigabitEthernet0/0
O       200.100.50.152/30 [110/3] via 200.100.50.4, 00:13:04,
    GigabitEthernet0/1
```

Output 131: *show ip route* Router 0

```
AMRIT_1>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 8 subnets, 5 masks
O       200.100.50.0/26 [110/2] via 200.100.50.145, 00:16:02,
    GigabitEthernet0/0
C       200.100.50.64/27 is directly connected, GigabitEthernet0/2
L       200.100.50.65/32 is directly connected, GigabitEthernet0/2
O       200.100.50.96/27 [110/5] via 200.100.50.145, 00:12:37,
    GigabitEthernet0/0
O       200.100.50.128/28 [110/3] via 200.100.50.145, 00:12:37,
    GigabitEthernet0/0
C       200.100.50.144/30 is directly connected, GigabitEthernet0/0
L       200.100.50.146/32 is directly connected, GigabitEthernet0/0
```

```
O       200.100.50.152/30 [110/4] via 200.100.50.145, 00:12:37,
    GigabitEthernet0/0
```

Output 132: *show ip route* Router 1

```
AMRIT_2>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 8 subnets, 5 masks
O       200.100.50.0/26 [110/3] via 200.100.50.154, 00:12:03,
    GigabitEthernet0/1
O       200.100.50.64/27 [110/5] via 200.100.50.154, 00:12:03,
    GigabitEthernet0/1
C       200.100.50.96/27 is directly connected, GigabitEthernet0/2
L       200.100.50.97/32 is directly connected, GigabitEthernet0/2
O       200.100.50.128/28 [110/2] via 200.100.50.154, 04:59:56,
    GigabitEthernet0/1
O       200.100.50.144/30 [110/4] via 200.100.50.154, 00:12:03,
    GigabitEthernet0/1
C       200.100.50.152/30 is directly connected, GigabitEthernet0/1
L       200.100.50.153/32 is directly connected, GigabitEthernet0/1
```

Output 133: *show ip route* Router 2

```
AMRIT_3>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 8 subnets, 5 masks
O       200.100.50.0/26 [110/2] via 200.100.50.132, 00:47:15,
    GigabitEthernet0/1
O       200.100.50.64/27 [110/4] via 200.100.50.132, 00:11:19,
    GigabitEthernet0/1
O       200.100.50.96/27 [110/2] via 200.100.50.153, 05:13:40,
    GigabitEthernet0/0
C       200.100.50.128/28 is directly connected, GigabitEthernet0/1
L       200.100.50.129/32 is directly connected, GigabitEthernet0/1
O       200.100.50.144/30 [110/3] via 200.100.50.132, 00:11:19,
    GigabitEthernet0/1
C       200.100.50.152/30 is directly connected, GigabitEthernet0/0
L       200.100.50.154/32 is directly connected, GigabitEthernet0/0
```

Output 134: *show ip route* Router 3

```
Router>show ip route

Gateway of last resort is not set

     200.100.50.0/24 is variably subnetted, 8 subnets, 5 masks
C       200.100.50.0/26 is directly connected, GigabitEthernet0/0
L       200.100.50.4/32 is directly connected, GigabitEthernet0/0
O       200.100.50.64/27 [110/3] via 200.100.50.1, 00:14:04,
    GigabitEthernet0/0
O       200.100.50.96/27 [110/3] via 200.100.50.129, 01:50:14,
    GigabitEthernet0/1
C       200.100.50.128/28 is directly connected, GigabitEthernet0/1
L       200.100.50.132/32 is directly connected, GigabitEthernet0/1
O       200.100.50.144/30 [110/2] via 200.100.50.1, 00:14:04,
    GigabitEthernet0/0
O       200.100.50.152/30 [110/2] via 200.100.50.129, 02:01:08,
    GigabitEthernet0/1
```

Output 135: *show ip route* Router 4

5.4 Question -4

How dynamic routing can address the changing topology of a network automatically? Explain with reference to the observation of your lab exercise.

Answer:

Dynamic Routing is Adaptive routing technique. Here in this LAb we explore RIp and OSPF . In dynamic Routing, Routers shares the routing Information to its Neighbors and neighbor updates its routing table if any shortest path to any network is found.

RIP uses distance vector algorithm where as OSPF Dijkstra's algorithm to determine the shortest path to destination.

6 Conclusion

In this Lab we familiarize ourselves with dynamic Routing and its protocols like RIP and OSPF. In Activity A we created the setup and Configured RIP and tested with the help of Ping and Tracert command. In Activity B we connected additional router and studied the changes it makes to the routing tables. We also observe the output after disconnecting different links and how Network reacts and stay connected during that time. Activity C and D are based on OSPF with additional touch of VLSM .