INSTITUTE OF ENGINEERING
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COMPUTER NETWORK

LAB #5

Default Route and its Configurations

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December 5, 2020

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Default Route and its Configurations

2 Objective

- To be familiar with default route and its configuration

3 Requirement

- Network simulation tool: Packet Tracer

4 Procedure

With the help of Cisco Packet Tracer we simulated three different setup and learned about default gateway, Static route and configuration and Default route and its configuration. We compared the result of Ping operation and routing table before and after the route configuration.

5 Exercises:

5.1 Question -1

What is a default route? Explain its significance.

Answer:

Routing Table consist of Network id , Subnet mask and next hop address to reach that network. When a packet reaches to router it look into its Routing table and forward the packets accordingly if there is entries of destination network. In case of no entries found error message is sent back to host to prevent this Default Route is configured then all packets is forwarded to Default route specified.It is generally used for traffic having their destination address somewhere in internet.

The importance of default route are:

- Reduces entries in routing table as we dont have to specify the routes for every network in every routers.
- Reduces Load and latency in router as all unaccounted destination can be forwarded to next hop address and they will handle the rest.

5.2 Question -2

Explain the default route configuration command of Router with its syntax.

Answer:

The basic syntax for Default routing Configuration is similar to Static Routing :

ip route	**Destination-Network**	**Subnet-Mask**	**[next-hop-address or outgoing interface]**
ip route	**0.0.0.0**	**0.0.0.0**	**[next-hop-address or outgoing interface]**

Here both Destinatin Network id and Subnet mask is **0.0.0.0**.

- Destination Network: Destination Network address
- Subnet-mask: only needed if subnetting is implemented and used to reveal the destination network address.
- Next-hop-address or outgoing interface: Its an Ip of nearest Router in Routing Path or alternatively we can also specify the interface.

  There are other parameters like administrative distance and Permanent.

The Routing Table of router can be observed using command ***show ip route***

5.3 Question -3

Note down the observations of each step with necessary commands specified in activities A, B and C mentioned above and comment on it.

5.3.1 Activities A

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

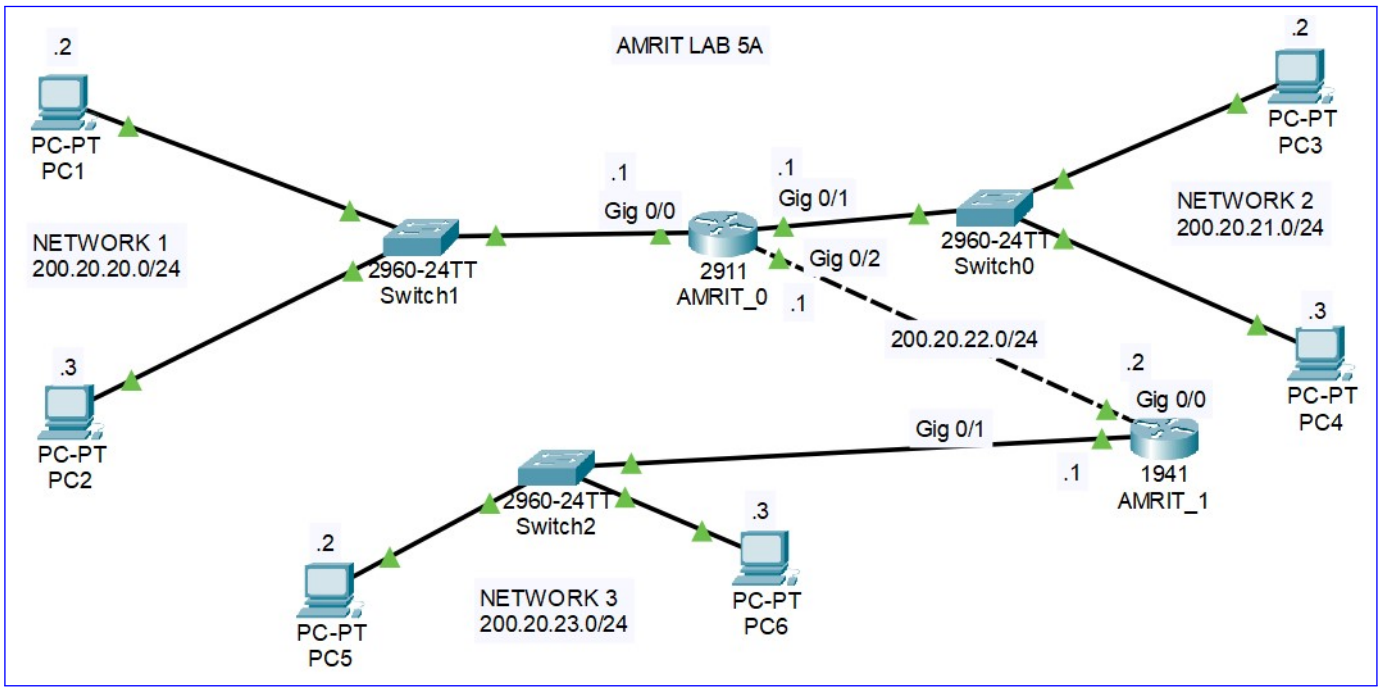

Figure 1: Network topology Lab 5A

1. **Set the IP address of different computers as following:**
   - PC1: 200.20.20.2 255.255.255.0

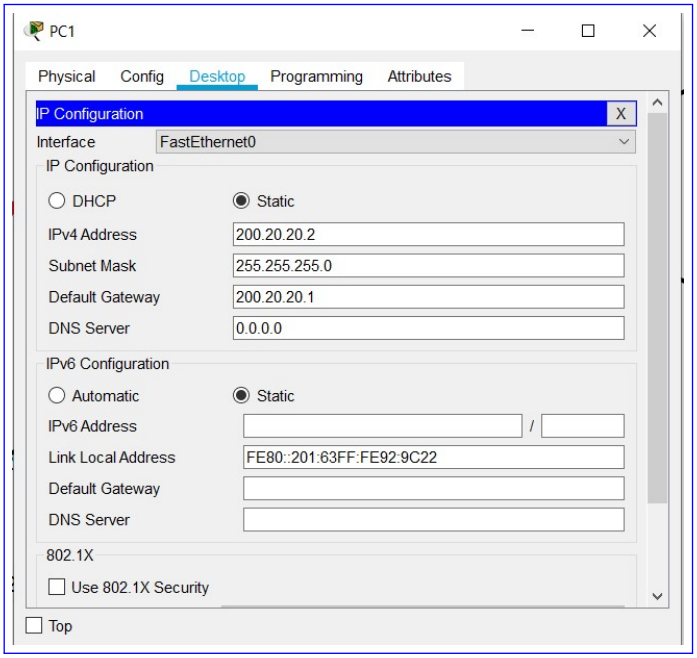

Figure 2: PC1 IP configuration

- PC2: 200.20.20.3 255.255.255.0
- PC3: 200.20.21.2 255.255.255.0
- PC4: 200.20.21.3 255.255.255.0
- PC5: 200.20.23.2 255.255.255.0
- PC6: 200.20.23.3 255.255.255.0

Also set each of PCs with appropriate default gateway.
Set the IP address of Router interfaces as:

- **Router 0:**
  - GigabitEthernet 0/0: 200.20.20.1 255.255.255.0

```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip address 200.20.20.1 255.255.255.0
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
```

Output 1: Assign the IP address of GigabitEthernet 0/0 for Router 0

  - GigabitEthernet 0/1: 200.20.21.1 255.255.255.0
  - GigabitEthernet 0/2: 200.20.22.1 255.255.255.0

- **Router 1:**
  - GigabitEthernet 0/0: 200.20.22.2 255.255.255.0

```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip address 200.20.22.2 255.255.255.0
Router(config-if)#no shutdown

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

Output 2: Assign the IP address of GigabitEthernet 0/0 for Router 1

  - GigabitEthernet 0/1: 200.20.23.1 255.255.255.0

Name	Assigned IP
PC1	200.20.20.2
PC2	200.20.20.3
Router 0 : 0/0	200.20.20.1
Router 0 : 0/1	200.20.21.1
Router 0 : 0/2	200.20.22.1
PC3	200.20.21.2
PC4	200.20.21.3
Router 1 : 0/0	200.20.22.2
Router 1 : 0/1	200.20.23.1
PC5	200.20.23.2
PC6	200.20.23.3

Table 1: Name and assigned IP Activity A

2. **Test the connectivity from PC2 to all other computers and all interfaces of Routers using ping and note down the result.**

```
C:\>ping 200.20.21.2

Pinging 200.20.21.2 with 32 bytes of data:

Request timed out.
Reply from 200.20.21.2: bytes=32 time=3ms TTL=127
Reply from 200.20.21.2: bytes=32 time=1ms TTL=127
Reply from 200.20.21.2: bytes=32 time=1ms TTL=127

Ping statistics for 200.20.21.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 3ms, Average = 1ms
```

Output 3: Ping from PC2 to PC3

```
C:\>ping 200.20.23.1

Pinging 200.20.23.1 with 32 bytes of data:

Reply from 200.20.20.1: Destination host unreachable.
Reply from 200.20.20.1: Destination host unreachable.
Reply from 200.20.20.1: Destination host unreachable.
Request timed out.

Ping statistics for 200.20.23.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 4: Ping from PC2 to Router 1 : 0/1

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	**Failed**
	Router 1 : 0/1	
	PC5	
	PC6	

Table 2: Ping Status PC2 to all others

3. **Similarly test the connectivity from PC4 to all other computers and all interfaces of Routers using ping and note down the result.**

```
C:\>ping 200.20.20.3

Pinging 200.20.20.3 with 32 bytes of data:

Reply from 200.20.20.3: bytes=32 time<1ms TTL=127
Reply from 200.20.20.3: bytes=32 time<1ms TTL=127
Reply from 200.20.20.3: bytes=32 time<1ms TTL=127
Reply from 200.20.20.3: bytes=32 time<1ms TTL=127

Ping statistics for 200.20.20.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Output 5: Ping from PC4 to PC2

```
C:\>ping 200.20.23.1

Pinging 200.20.23.1 with 32 bytes of data:

Reply from 200.20.21.1: Destination host unreachable.
Reply from 200.20.21.1: Destination host unreachable.
Reply from 200.20.21.1: Destination host unreachable.
Request timed out.

Ping statistics for 200.20.23.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 6: Ping from PC4 to Router 1 : 0/1

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

Table 3: Ping Status PC4 to all others

4. **Similarly test the connectivity from PC6 to all other computers and all interfaces of Routers using ping and note down the result.**

```
C:\>ping 200.20.20.3

Pinging 200.20.20.3 with 32 bytes of data:

Reply from 200.20.23.1: Destination host unreachable.
Reply from 200.20.23.1: Destination host unreachable.
Reply from 200.20.23.1: Destination host unreachable.
Reply from 200.20.23.1: Destination host unreachable.

Ping statistics for 200.20.20.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 7: Ping from PC6 to PC2

```
C:\>ping 200.20.21.1

Pinging 200.20.21.1 with 32 bytes of data:

Reply from 200.20.23.1: Destination host unreachable.
Reply from 200.20.23.1: Destination host unreachable.
Reply from 200.20.23.1: Destination host unreachable.
Reply from 200.20.23.1: Destination host unreachable.

Ping statistics for 200.20.21.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Output 8: Ping from PC6 to Router 0 : 0/1

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

Table 4: Ping Status PC6 to all others

5. **Use default route configuration in each Router to forward the network traffic to another Router and observe the output of *show ip route* command in both Routers**

```
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 200.20.22.2
```

Output 9: Default Route configuration in Router 0

```
Router#show ip route

Gateway of last resort is 200.20.22.2 to network 0.0.0.0

     200.20.20.0/24 is variably subnetted, 2 subnets, 2 masks
C       200.20.20.0/24 is directly connected, GigabitEthernet0/0
L       200.20.20.1/32 is directly connected, GigabitEthernet0/0
     200.20.21.0/24 is variably subnetted, 2 subnets, 2 masks
C       200.20.21.0/24 is directly connected, GigabitEthernet0/1
L       200.20.21.1/32 is directly connected, GigabitEthernet0/1
     200.20.22.0/24 is variably subnetted, 2 subnets, 2 masks
C       200.20.22.0/24 is directly connected, GigabitEthernet0/2
L       200.20.22.1/32 is directly connected, GigabitEthernet0/2
S*   0.0.0.0/0 [1/0] via 200.20.22.2
```

Output 10: *show ip route* Router 0

```
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 200.20.22.1
```

Output 11: Default Route configuration in Router 1

```
Router#show ip route

Gateway of last resort is 200.20.22.1 to network 0.0.0.0

     200.20.22.0/24 is variably subnetted, 2 subnets, 2 masks
C       200.20.22.0/24 is directly connected, GigabitEthernet0/0
L       200.20.22.2/32 is directly connected, GigabitEthernet0/0
     200.20.23.0/24 is variably subnetted, 2 subnets, 2 masks
C       200.20.23.0/24 is directly connected, GigabitEthernet0/1
L       200.20.23.1/32 is directly connected, GigabitEthernet0/1
S*   0.0.0.0/0 [1/0] via 200.20.22.1
```

Output 12: *show ip route* Router 1

Here default route is configured in such a way that all unknown destination request and packets are forwarded to next Router available. For example in Router 0 all packets meant for Network 3 is forwarded to Router 1's GigabitEthernet 0/0.

6. **Again test connectivity by repeating step 2 to 4 and note down the result. Compare this observation with previous and comment on the result.**

   - **Test the connectivity from PC2 to all other computers and all interfaces of Routers using ping and note down the result.**

```
C:\>ping 200.20.23.3

Pinging 200.20.23.3 with 32 bytes of data:

Reply from 200.20.23.3: bytes=32 time<1ms TTL=126
Reply from 200.20.23.3: bytes=32 time=11ms TTL=126
Reply from 200.20.23.3: bytes=32 time=1ms TTL=126
```

```
Reply from 200.20.23.3: bytes=32 time<1ms TTL=126

Ping statistics for 200.20.23.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 11ms, Average = 3ms
```

Output 13: Ping from PC2 to PC6 after Default Configuration

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 5: Ping Status PC2 to all others after Default route Configuration

Previously Ping operation was Successful to its network or only to Network connected to Router 0 and Ping failed when PC2 tries to ping Router and PCs of Network 3 and all packet forwarded to Network 3 is dropped and error message is sent back to host. But after default route is set in both Routers, Router 0 forward all the packets to Router 1 if there is no entries of destination network in its routing Table. So, the packets reached its destination network i.e Network 3 and ping is successful.

- **Similarly test the connectivity from PC4 to all other computers and all interfaces of Routers using ping and note down the result.**

```
C:\>ping 200.20.23.3

Pinging 200.20.23.3 with 32 bytes of data:

Reply from 200.20.23.3: bytes=32 time<1ms TTL=126
Reply from 200.20.23.3: bytes=32 time<1ms TTL=126
Reply from 200.20.23.3: bytes=32 time<1ms TTL=126
Reply from 200.20.23.3: bytes=32 time=11ms TTL=126

Ping statistics for 200.20.23.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 11ms, Average = 2ms
```

Output 14: Ping from PC4 to PC6 after Default Configuration

Sending Host	Destination	Ping Status
PC4	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 6: Ping Status PC4 to all others after Default route Configuration

Previously Ping operation was Successful to its network or only to Network connected to Router 0 and Ping failed when PC4 tries to ping Router and PCs of Network 3 and all packet forwarded to Network 3 is dropped and error message is sent back to host. But after default route is set in both Routers, Router 0 forward all the packets to Router 1 if there is no entries of destination network in its routing Table. So, the packets reached its destination network i.e Network 3 and ping is successful.

- **Similarly test the connectivity from PC6 to all other computers and all interfaces of Routers using ping and note down the result.**

```
C:\>ping 200.20.20.3

Pinging 200.20.20.3 with 32 bytes of data:

Reply from 200.20.20.3: bytes=32 time<1ms TTL=126
Reply from 200.20.20.3: bytes=32 time=3ms TTL=126
Reply from 200.20.20.3: bytes=32 time<1ms TTL=126
Reply from 200.20.20.3: bytes=32 time<1ms TTL=126

Ping statistics for 200.20.20.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 3ms, Average = 0ms
```

Output 15: Ping from PC6 to PC2 after Default Configuration

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

Table 7: Ping Status PC6 to all others after Default route Configuration

Previously Ping operation was Successful to its network or only to Network connected to Router 1 and Ping failed when PC6 tries to ping Router and PCs of Network 1 or Network

2 and all packet forwarded to these Network are dropped and error message is sent back to host. But after default route is set in both Routers, Router 1 forward all the packets to Router 0 if there is no entries of destination network in its routing Table. So, the packets reached its destination network i.e Network 1 or Network 2 and ping is successful.

7. **Here the hostname of Router0 should be your FirstName_0 and hostname of Router1 should be your FirstName_1.**

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

Output 16: Setting Hostname for Router 0 to Amrit_0

```
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname AMRIT_1
AMRIT_1(config)#
```

Output 17: Setting Hostname for Router 1 to Amrit_1

5.3.2 Activities B

B. Create the following network topology and perform the followings:

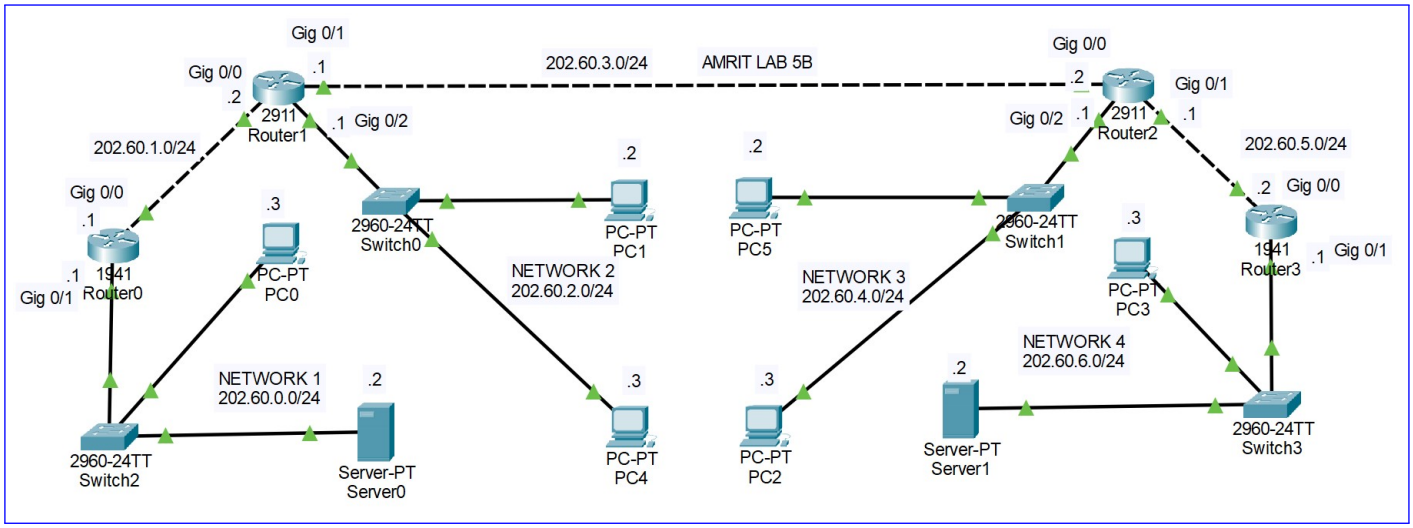

Figure 3: Network topology Lab 5B

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 18: 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 8: 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 19: 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 20: 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 9: 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 10: Table for Name, assigned ip, Default gateway

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

   Already enabled in Activity B.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 21: *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 22: *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 23: *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 24: *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 25: 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 26: 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 27: 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 11: Ping from PC0 to all Routers,PCs and Servers

7. **Observe the output while using ping command from PC1 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:

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 28: 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 29: 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 30: 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 12: Ping from PC1 to all Routers,PCs and Servers

8. **Observe the output while using ping command from PC2 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:

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 31: 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 32: 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 33: 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 13: Ping from PC2 to all Routers,PCs and Servers

9. **Observe the output while using ping command from PC3 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 202.60.6.1: 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 34: 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 35: 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 36: 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 37: 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 14: Ping from PC3 to all Routers,PCs and Servers

10. **From Router0 use ping command to Router1, Router2, Router3, PC0, PC1, PC2, PC3 and observe the output**

```
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 38: 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 39: 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 40: 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 41: 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 15: Ping from Router 0 to all Routers,PCs and Servers

11. **From Router1 use ping command to Router0, Router2, Router3, PC0, PC1, PC2, PC3 and observe the output**

```
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 42: 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 43: 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 44: 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 45: 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 16: Ping from Router 1 to all Routers,PCs and Servers

12. **From Router2 use ping command to Router0, Router1, Router3, PC0, PC1, PC2, PC3 and observe the output**

```
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 46: 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 47: 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 48: 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 49: 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 17: Ping from Router 2 to all Routers,PCs and Servers

13. **From Router3 use ping command to Router0, Router1, Router2, PC0, PC1, PC2, PC3 and observe the output**

```
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 50: 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 51: 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 52: 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 53: 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 18: Ping from Router 3 to all Routers,PCs and Servers

14. **From PC0 enter into Router0 using telnet and configure the static route for each destination network.**

```
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)#ip route 202.60.2.0 255.255.255.0 202.60.1.2
AMRIT_0(config)#ip route 202.60.3.0 255.255.255.0 202.60.1.2
AMRIT_0(config)#ip route 202.60.4.0 255.255.255.0 202.60.1.2
AMRIT_0(config)#ip route 202.60.5.0 255.255.255.0 202.60.1.2
AMRIT_0(config)#ip route 202.60.6.0 255.255.255.0 202.60.1.2
AMRIT_0(config)#^Z
```

Output 54: Telnet from PC0 to Router 0 and set Static Configuration

15. **From there enter into Router1 using telnet and configure the static route for each destination network.**

```
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)#ip route 202.60.0.0 255.255.255.0 202.60.1.1
AMRIT_1(config)#ip route 202.60.4.0 255.255.255.0 202.60.3.2
AMRIT_1(config)#ip route 202.60.5.0 255.255.255.0 202.60.3.2
AMRIT_1(config)#ip route 202.60.6.0 255.255.255.0 202.60.3.2
AMRIT_1(config)#^Z
```

```
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 55: Telnet from Router 0 to Router 1 and set Static Configuration

16. **Similarly configure the static route in Router2 and Router3 for each destination network.**

```
AMRIT_2>enable
Password:
AMRIT_2#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
AMRIT_2(config)#ip route 202.60.0.0 255.255.255.0 202.60.3.1
AMRIT_2(config)#ip route 202.60.1.0 255.255.255.0 202.60.3.1
AMRIT_2(config)#ip route 202.60.2.0 255.255.255.0 202.60.3.1
AMRIT_2(config)#ip route 202.60.6.0 255.255.255.0 202.60.5.2
AMRIT_2(config)#^Z
AMRIT_2#
%SYS-5-CONFIG_I: Configured from console by console
```

Output 56: Set Static Configuration for Router 2

```
AMRIT_3>enable
Password:
AMRIT_3#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
AMRIT_3(config)#ip route 202.60.0.0 255.255.255.0 202.60.5.1
AMRIT_3(config)#ip route 202.60.1.0 255.255.255.0 202.60.5.1
AMRIT_3(config)#ip route 202.60.2.0 255.255.255.0 202.60.5.1
AMRIT_3(config)#ip route 202.60.3.0 255.255.255.0 202.60.5.1
AMRIT_3(config)#ip route 202.60.4.0 255.255.255.0 202.60.5.1
AMRIT_3(config)#^Z
AMRIT_3#
%SYS-5-CONFIG_I: Configured from console by console
```

Output 57: Set Static Configuration for Router 3

17. **Repeat the step from 6 to 13 and observe the output.**

Previously we encountered error while performing ping operation on unknown Destination Network.Now we have manually configured routes for each and every Network by including their network address , subnet mask and Next hop address from Host Router. Performing Ping operation now, we get Successful result among any network.

(a) **Ping from PC0 to all after static configuration**

```
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=124
Reply from 202.60.6.3: bytes=32 time=12ms TTL=124
Reply from 202.60.6.3: bytes=32 time=11ms TTL=124

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 = 12ms, Average = 7ms
```

Output 58: 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	
	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 19: Ping from PC0 to all Routers,PCs and Servers

(b) **Ping from PC1 to all after static configuration**

```
C:\>ping 202.60.6.3

Pinging 202.60.6.3 with 32 bytes of data:

Reply from 202.60.6.3: bytes=32 time=2ms 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
Reply from 202.60.6.3: bytes=32 time=1ms TTL=125

Ping statistics for 202.60.6.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 2ms, Average = 1ms
```

Output 59: Ping from PC1 to PC3

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

Table 20: Ping from PC1 to all Routers,PCs and Servers

(c) **Ping from PC2 to all after static configuration**

```
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=253
Reply from 202.60.0.1: bytes=32 time=11ms TTL=253
Reply from 202.60.0.1: bytes=32 time=10ms TTL=253
Reply from 202.60.0.1: bytes=32 time=10ms TTL=253

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 = 11ms, Average = 7ms
```

Output 60: Ping from PC2 to Router 0 : 0/1

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

Table 21: Ping from PC2 to all Routers,PCs and Servers

(d) **Ping from PC3 to all after static configuration**

```
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=125
Reply from 202.60.2.2: bytes=32 time=12ms TTL=125
Reply from 202.60.2.2: bytes=32 time=11ms TTL=125
Reply from 202.60.2.2: bytes=32 time<1ms TTL=125

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 = 12ms, Average = 5ms
```

Output 61: Ping from PC3 to PC1

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

Table 22: Ping from PC3 to all Routers,PCs and Servers

(e) **Ping from Router 0 to all after static configuration**

```
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 = 0/0/1 ms
```

Output 62: Ping from Router 0 to PC2

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

(f) **Ping from Router 1 to all after static configuration**

```
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 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
```

Output 63: Ping from Router 1 to Server 1

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

Table 24: Ping from Router 1 to all Routers,PCs and Servers

(g) **Ping from Router 2 to all after static configuration**

```
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 100 percent (5/5), round-trip min/avg/max = 0/2/10 ms
```

Output 64: Ping from Router 2 to PC0

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

Table 25: Ping from Router 2 to all Routers,PCs and Servers

(h) **Ping from Router 3 to all after static configuration**

```
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 100 percent (5/5), round-trip min/avg/max = 0/0/3 ms
```

Output 65: Ping from Router 3 to PC2

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

Table 26: Ping from Router 3 to all Routers,PCs and Servers

18. **Observe the output of *show ip route* in each Router and note down the result.**

```
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
S    202.60.2.0/24 [1/0] via 202.60.1.2
S    202.60.3.0/24 [1/0] via 202.60.1.2
S    202.60.4.0/24 [1/0] via 202.60.1.2
S    202.60.5.0/24 [1/0] via 202.60.1.2
S    202.60.6.0/24 [1/0] via 202.60.1.2
```

Output 66: *show ip route* Router 0 after Static route Configuration

```
AMRIT_1>show ip route

Gateway of last resort is not set

S    202.60.0.0/24 [1/0] via 202.60.1.1
     202.60.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.1.0/24 is directly connected, GigabitEthernet0/0
L       202.60.1.2/32 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
S    202.60.4.0/24 [1/0] via 202.60.3.2
S    202.60.5.0/24 [1/0] via 202.60.3.2
S    202.60.6.0/24 [1/0] via 202.60.3.2
```

Output 67: *show ip route* Router 1 after Static route Configuration

```
AMRIT_2>show ip route

Gateway of last resort is not set

S    202.60.0.0/24 [1/0] via 202.60.3.1
S    202.60.1.0/24 [1/0] via 202.60.3.1
S    202.60.2.0/24 [1/0] via 202.60.3.1
     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
S    202.60.6.0/24 [1/0] via 202.60.5.2
```

Output 68: *show ip route* Router 2 after Static route Configuration

```
AMRIT_3>show ip route

Gateway of last resort is not set

S    202.60.0.0/24 [1/0] via 202.60.5.1
S    202.60.1.0/24 [1/0] via 202.60.5.1
```

```
S     202.60.2.0/24 [1/0] via 202.60.5.1
S     202.60.3.0/24 [1/0] via 202.60.5.1
S     202.60.4.0/24 [1/0] via 202.60.5.1
      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 69: *show ip route* Router 3 after Static route Configuration

Comparing to Output of Activity B.5 we can clearly see that 4 additional entries(Static routes) are added in Routing Table with **S** as initial in all records.

19. **The hostname of each Router should be as your LastName_0, LastName_1 and so on.**

Router Name	Previous Hostname	Current Hostname
Router 0	AMRIT_0	PHUYAL_0
Router 1	AMRIT_1	PHUYAL_1
Router 2	AMRIT_2	PHUYAL_2
Router 3	AMRIT_3	PHUYAL_3

Table 27: Changing Hostname to pattern *Lastname_*

5.3.3 Activities C

C. Use the network topology given above in B and perform the followings:

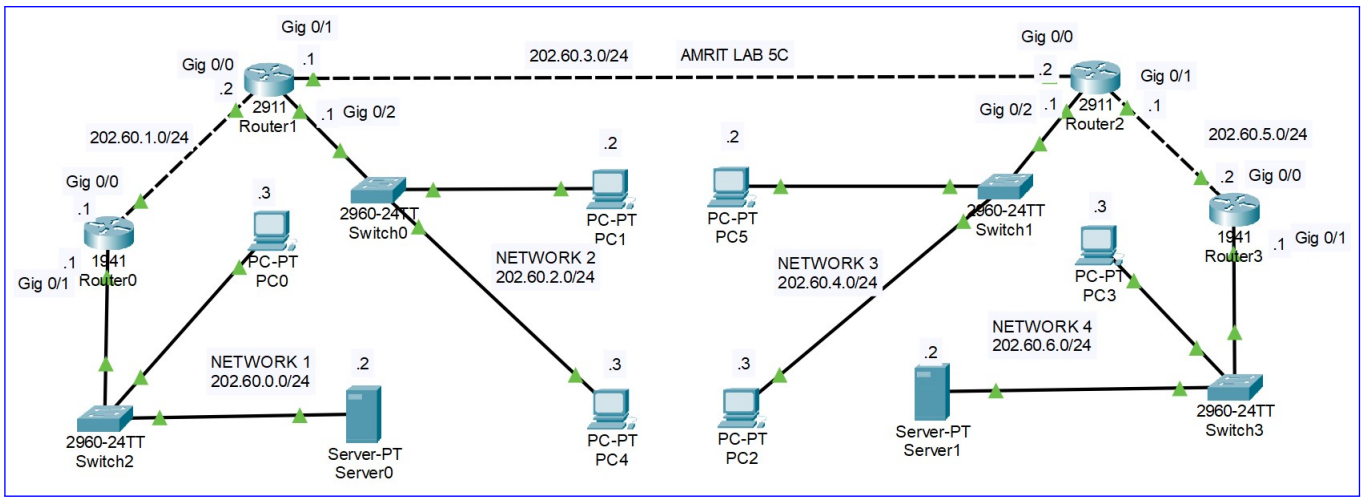

Figure 4: Network topology Lab 5C

1. **Minimize the static route entries by configuring the default route in each Router.**

```
PHUYAL_0>enable
Password:
PHUYAL_0#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
PHUYAL_0(config)#
PHUYAL_0(config)#no ip route 202.60.2.0 255.255.255.0 202.60.1.2
PHUYAL_0(config)#no ip route 202.60.3.0 255.255.255.0 202.60.1.2
PHUYAL_0(config)#no ip route 202.60.4.0 255.255.255.0 202.60.1.2
PHUYAL_0(config)#no ip route 202.60.5.0 255.255.255.0 202.60.1.2
PHUYAL_0(config)#no ip route 202.60.6.0 255.255.255.0 202.60.1.2
PHUYAL_0(config)#ip route 0.0.0.0 0.0.0.0 202.60.1.2
PHUYAL_0(config)#^Z
PHUYAL_0#
%SYS-5-CONFIG_I: Configured from console by console
```

Output 70: Minimize static route entries in Router 0

```
PHUYAL_1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
PHUYAL_1(config)#
PHUYAL_1(config)#no ip route 202.60.5.0 255.255.255.0 202.60.3.2
PHUYAL_1(config)#no ip route 202.60.6.0 255.255.255.0 202.60.3.2
PHUYAL_1(config)#no ip route 202.60.4.0 255.255.255.0 202.60.3.2
PHUYAL_1(config)#ip route 0.0.0.0 0.0.0.0 202.60.3.2
PHUYAL_1(config)#^Z
PHUYAL_1#
%SYS-5-CONFIG_I: Configured from console by console
```

Output 71: Minimize static route entries in Router 1

```
PHUYAL_2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
PHUYAL_2(config)#
PHUYAL_2(config)#no ip route 202.60.1.0 255.255.255.0 202.60.3.1
PHUYAL_2(config)#no ip route 202.60.2.0 255.255.255.0 202.60.3.1
PHUYAL_2(config)#no ip route 202.60.0.0 255.255.255.0 202.60.3.1
PHUYAL_2(config)#ip route 0.0.0.0 0.0.0.0 202.60.3.1
```

```
PHUYAL_2(config)#^Z
PHUYAL_2#
%SYS-5-CONFIG_I: Configured from console by console
```

Output 72: Minimize static route entries in Router 2

```
PHUYAL_3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
PHUYAL_3(config)#
PHUYAL_3(config)#no ip route 202.60.0.0 255.255.255.0 202.60.5.1
PHUYAL_3(config)#no ip route 202.60.1.0 255.255.255.0 202.60.5.1
PHUYAL_3(config)#no ip route 202.60.2.0 255.255.255.0 202.60.5.1
PHUYAL_3(config)#no ip route 202.60.3.0 255.255.255.0 202.60.5.1
PHUYAL_3(config)#no ip route 202.60.4.0 255.255.255.0 202.60.5.1
PHUYAL_3(config)#ip route 0.0.0.0 0.0.0.0 202.60.5.1
PHUYAL_3(config)#^Z
PHUYAL_3#
%SYS-5-CONFIG_I: Configured from console by console
```

Output 73: Minimize static route entries in Router 3

2. **Test the connectivity from PC0, PC1, PC2 and PC3 to each of the given PC and Router using ping command and note down the result.**

   All ping will be Successful among the networks as routers are now able to forward package intended to Unknown destination to the next Router in its routing path.

   (a) **Ping from PC0 to all after static configuration**

```
C:\>ping 202.60.6.3

Pinging 202.60.6.3 with 32 bytes of data:

Reply from 202.60.6.3: bytes=32 time=1ms TTL=124
Reply from 202.60.6.3: bytes=32 time=11ms TTL=124
Reply from 202.60.6.3: bytes=32 time<1ms TTL=124
Reply from 202.60.6.3: bytes=32 time=13ms TTL=124

Ping statistics for 202.60.6.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 13ms, Average = 6ms
```

Output 74: 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	
	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 28: Ping from PC0 to all Routers,PCs and Servers

(b) **Ping from PC1 to all after static configuration**

```
C:\>ping 202.60.6.3

Pinging 202.60.6.3 with 32 bytes of data:

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
Reply from 202.60.6.3: bytes=32 time<1ms TTL=125

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

Output 75: Ping from PC1 to PC3

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

Table 29: Ping from PC1 to all Routers,PCs and Servers

(c) **Ping from PC2 to all after static configuration**

```
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=253
Reply from 202.60.0.1: bytes=32 time<1ms TTL=253
Reply from 202.60.0.1: bytes=32 time<1ms TTL=253
Reply from 202.60.0.1: bytes=32 time<1ms TTL=253

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 = 0ms, Average = 0ms
```

Output 76: Ping from PC2 to Router 0 : 0/1

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

Table 30: Ping from PC2 to all Routers,PCs and Servers

(d) **Ping from PC3 to all after static configuration**

```
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=125
Reply from 202.60.2.2: bytes=32 time<1ms TTL=125
Reply from 202.60.2.2: bytes=32 time=3ms TTL=125
Reply from 202.60.2.2: bytes=32 time=11ms TTL=125

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 77: Ping from PC3 to PC1

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

Table 31: Ping from PC3 to all Routers,PCs and Servers

3. **Observe the output of *show ip route* in each Router and note down the result.**

```
PHUYAL_0>show ip route

Gateway of last resort is 202.60.1.2 to network 0.0.0.0

     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
S*   0.0.0.0/0 [1/0] via 202.60.1.2
```

Output 78: *show ip route* Router 0

```
PHUYAL_1>show ip route

Gateway of last resort is 202.60.3.2 to network 0.0.0.0

S    202.60.0.0/24 [1/0] via 202.60.1.1
     202.60.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.60.1.0/24 is directly connected, GigabitEthernet0/0
L       202.60.1.2/32 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
S*   0.0.0.0/0 [1/0] via 202.60.3.2
```

Output 79: *show ip route* Router 1

```
PHUYAL_2>show ip route

Gateway of last resort is 202.60.3.1 to network 0.0.0.0

     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
S    202.60.6.0/24 [1/0] via 202.60.5.2
S*   0.0.0.0/0 [1/0] via 202.60.3.1
```

Output 80: *show ip route* Router 2

```
PHUYAL_3>show ip route

Gateway of last resort is 202.60.5.1 to network 0.0.0.0

     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
S*   0.0.0.0/0 [1/0] via 202.60.5.1
```

Output 81: *show ip route* Router 3

4. **Compare the output of *show ip route* command used in question 18 of activity B and question 3 of activity C.**

   Here we used our understanding and knowledge of default route to our advantage to reduce entries in Routing Table. To be clear in Router 0 all the outgoing traffic is forwarded to Router 1 and default route is configured accordingly thus reducing the entries from 4 to 1 comparing to Activity B.18.Similarly in Router 2 Static route is configured for Network 4 (Router 3) and all other outgoing package if forwarded to Router 1 using Default Route Configuration hence reducing entries from 4 to 2.

5. **The hostname of each Router should be as your LastName_0, LastName_1 and so on.**

   Already Edited to required format.

6 Conclusion:

In this Lab we familiarize ourselves with Static and Default Route . In activity A we performed default route configuration to have insight of topic and compared the ping performed before and after setting Default Route. In Activity B we used Static Route and configure each Router for each available network and also compared the result of Ping Operation Before and after configuring Static Route. in the same Activity we also compared the Routing Table and found that in each routers 4 additional entries are added as Static Route. Similarly in Activity C we try to minimize those entries in Routing Table using Knowledge of Default Route and we were successful . In the same Activity we performed the ping operation after setting the default routes and deleting unwanted entries from Routing Tables of all Routers. We also performed Telnet ,configured hostname and password for various purposes.