Lab Manual for Computer Communication and Networking

Lab No. 7

Static Routing

BAHRIA UNIVERSITY KARACHI CAMPUS
Department of Software Engineering

COMPUTER COMMUNICATION & NETWORKING

LAB EXPERIMENT # 7

Static Routing

OBJECTIVE: -

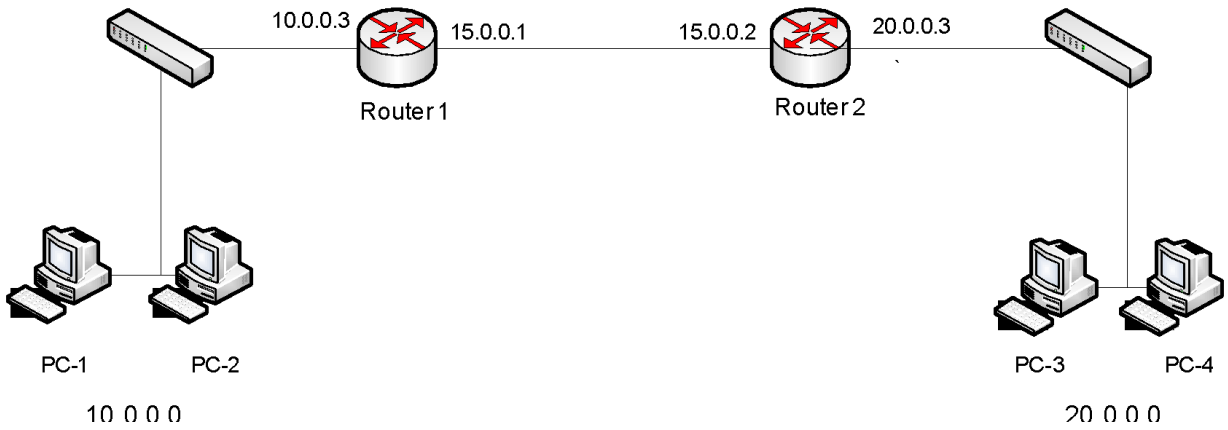
- This lab assignment helps in understanding how static routing can be configured on a router.

THEORY: -

Static routing occurs when you manually add routes in each router's routing table. There are pros and cons to static routing, but that's true for all routing processes. Static routing has the following benefits:

- There is no overhead on the router CPU, which means you, could possibly buy a cheaper router than you would use if you were using dynamic routing.
- It adds security because the administrator can choose to allow routing access to certain networks only.
- Static routing has the following disadvantages:
- The administrator must really understand the internetwork and how each router is connected to configure routes correctly.
- If a network is added to the internetwork, the administrator must add a route to it on all routers—by hand.
- It's not feasible in large networks because maintaining it would be a full-time job.

NETWORK TOPOLOGY: -



PROCEDURE AND OBSERVATION: -

Step01: Configuring static routing on router 1

```
Router1(config)#interface GigabitEthernet0/0
Router1(config-if)#ip address 15.0.0.1 255.0.0.0
Router1(config-if)#no shut
Router1(config-if)#exit

Router1(config)#interface fa 0/0
Router1(config-if)#ip address 10.0.0.3 255.0.0.0
Router1(config-if)#no shut
Router1(config-if)#exit

Router1(config)#ip route 20.0.0.0 255.0.0.0 15.0.0.2          (IP route)
Router1# show ip route
```

The above given command inserts a static route into the routing table of router saying, if a packet having destination address of network 20.0.0.0/8 is received on any of the router interfaces then it should be routed to 15.0.0.2

Step 02: Configuring static routing on router 2

```
Router2(config)#interface GigabitEthernet0/0
Router2(config-if)#ip address 15.0.0.5 255.0.0.0
Router2(config-if)#no shut
Router2(config-if)#exit

Router2(config)#interface fa 0/0
Router2(config-if)#ip address 20.0.0.3 255.0.0.0
Router2(config-if)#no shut
Router2(config-if)#exit

Router2(config)#ip route 10.0.0.0 255.0.0.0 15.0.0.1          (IP route)
```

Router2# show ip route

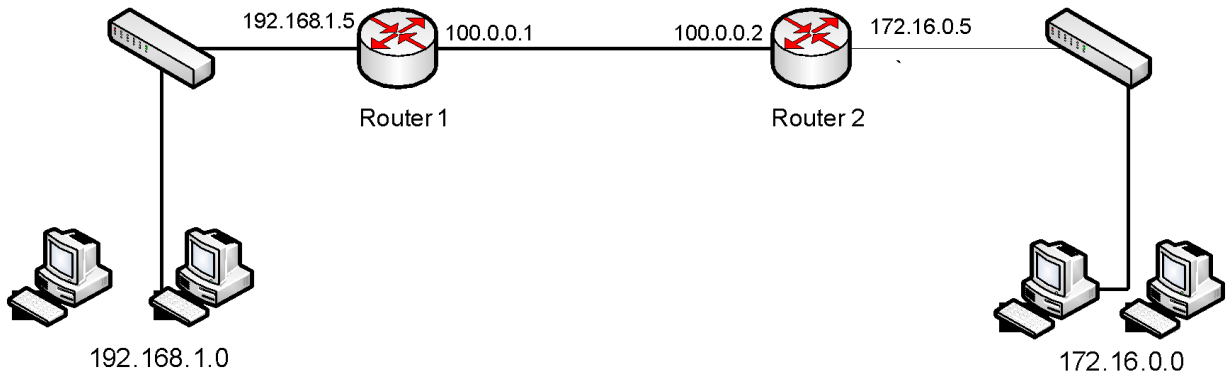
The above given command inserts a static route into the routing table of router saying, if a packet having destination address of network 10.0.0.0/8 is received on any of the router interfaces then it should be routed to 15.0.0.1

Step03: Verify the route by pinging from Router 1 to Router 2
Router2# ping 20.0.0.2
Router1# ping 10.0.0.2

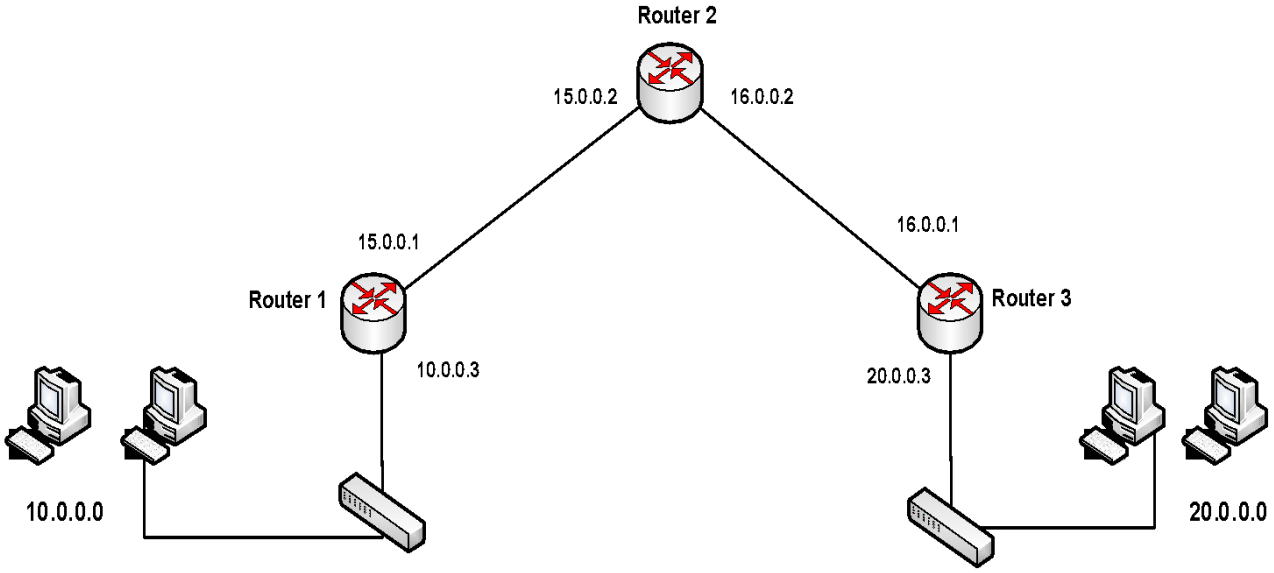
Step04: Verify the route by pinging from PC 1 to PC3
C:\> ping 10.0.0.1 (from PC 1)
C:\> ping 20.0.0.2 (from PC 3)

QUESTIONS: -

1. **Configure static route on the following network and show all necessary configuration steps for each router.**



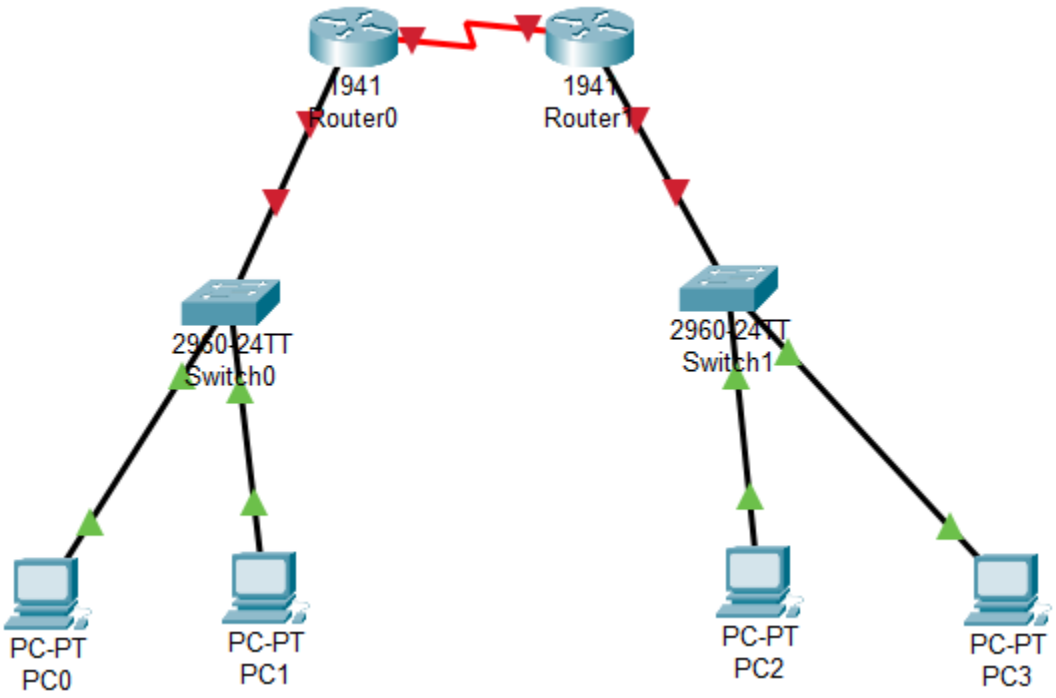
2. **Configure static route on the following network and show all necessary configuration steps for each router.**



Solution: -

Task 1: -

Initial Topology: -



IP Addresses Assigment: -

PC0: -

IPv4 Address	192.168.1.1
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.5

PC1: -

IPv4 Address	192.168.1.2
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.5

PC2: -

IPv4 Address	172.16.0.1
Subnet Mask	255.255.0.0
Default Gateway	172.16.0.5

PC3 :-

IPv4 Address	172.16.0.2
Subnet Mask	255.255.0.0
Default Gateway	172.16.0.5

Ip address assigment to routers: -

Router0: -

```
Router(config)#int gig0/0
Router(config-if)#ip address 192.168.1.5 255.255.255.0
Router(config-if)#no shut

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
```

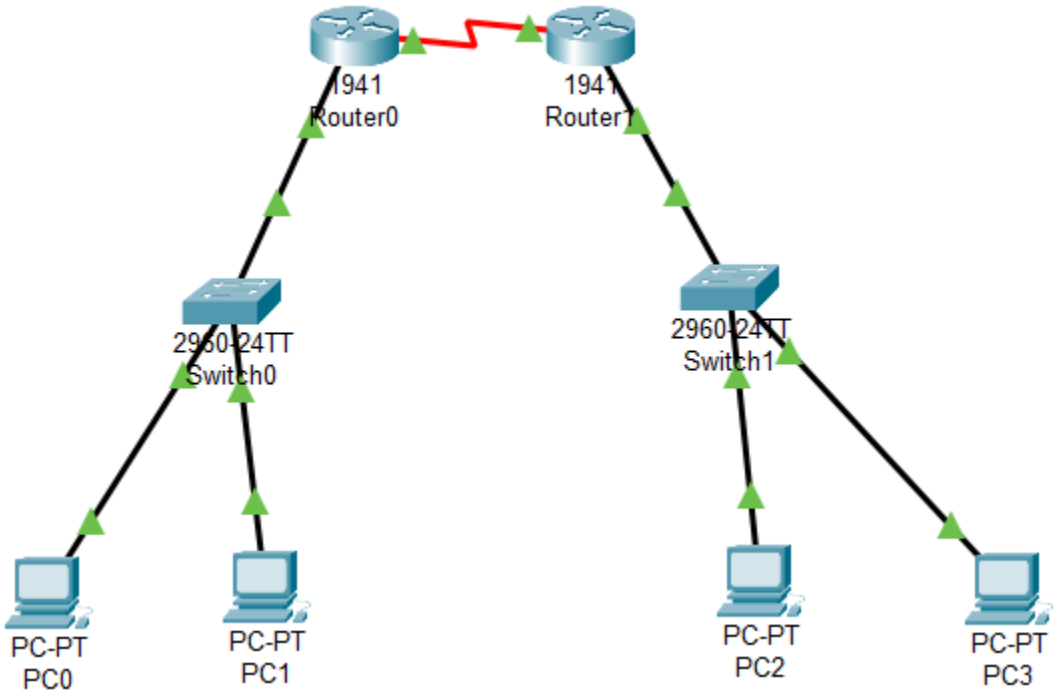
```
Router(config)#int se0/1/0
Router(config-if)#ip address 100.0.0.1 255.255.255.0
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
```

Router1: -

```
Router(config)#int gig0/0
Router(config-if)#ip address 172.16.0.5 255.255.0.0
Router(config-if)#no shut

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)#int se0/1/0
Router(config-if)#ip address 100.0.0.1 255.255.255.0
Router(config-if)#no shut

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

Final Connection: -



Setting Static Routes: -

Router 0: -

```
Router(config)#ip route 172.16.0.0 255.255.0.0 100.0.0.2
```

```
Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter
area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     100.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       100.0.0.0/24 is directly connected, Serial0/1/0
L       100.0.0.1/32 is directly connected, Serial0/1/0
S    172.16.0.0/16 [1/0] via 100.0.0.2
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, GigabitEthernet0/0
L       192.168.1.5/32 is directly connected, GigabitEthernet0/0
```

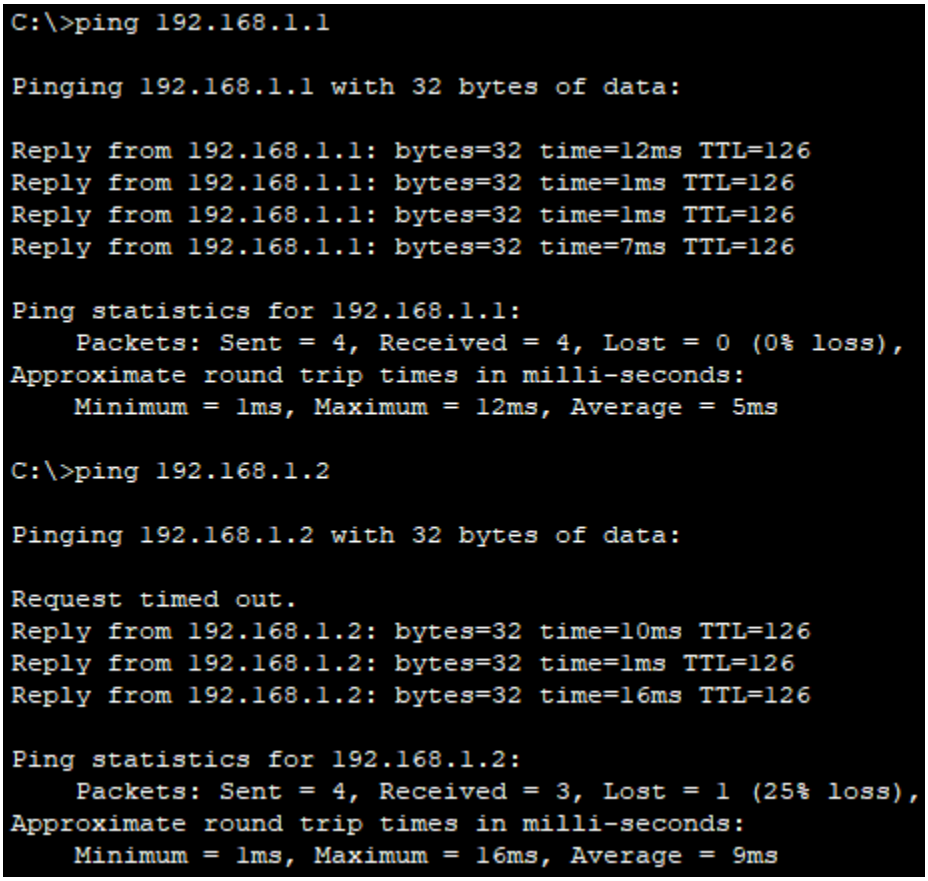
Router 1: -

```
Router(config)#ip route 192.168.1.0 255.255.255.0 100.0.0.1
Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter
area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     100.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       100.0.0.0/24 is directly connected, Serial0/1/0
L       100.0.0.2/32 is directly connected, Serial0/1/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.0.0/16 is directly connected, GigabitEthernet0/0
L       172.16.0.5/32 is directly connected, GigabitEthernet0/0
S    192.168.1.0/24 [1/0] via 100.0.0.1
```

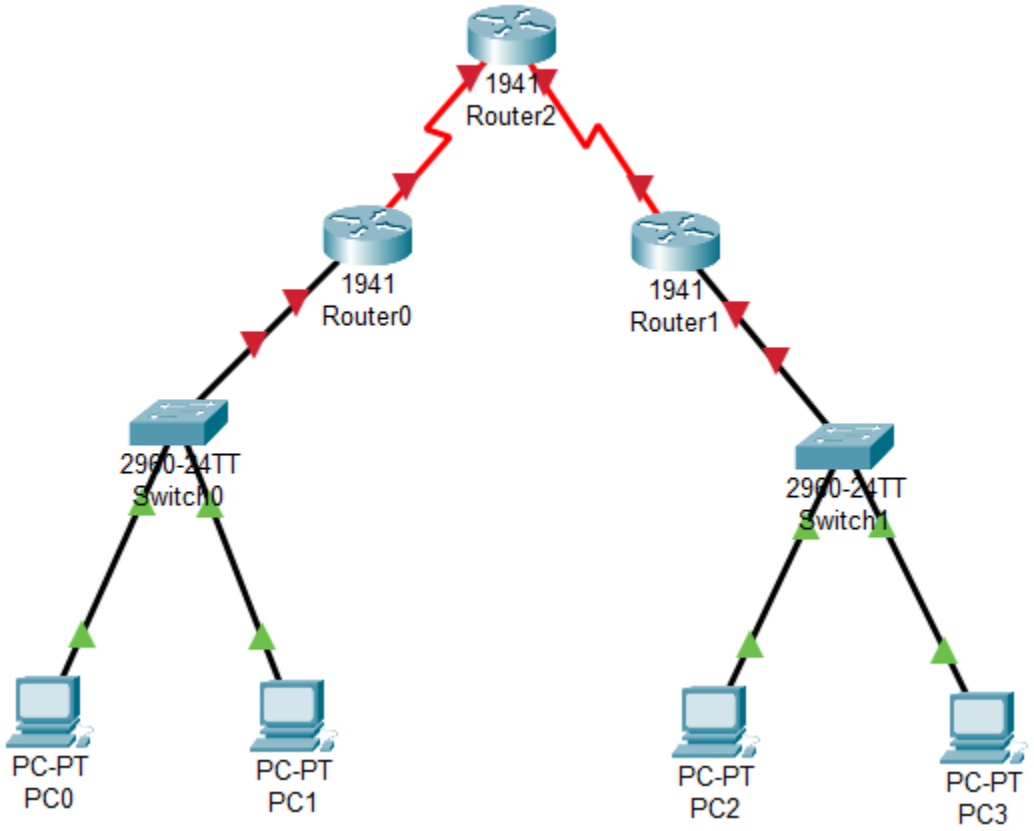
Pinging Results: -
192 network to 172 network: -

```
C:\>ping 172.16.0.1

Pinging 172.16.0.1 with 32 bytes of data:

Request timed out.
Reply from 172.16.0.1: bytes=32 time=1ms TTL=126
Reply from 172.16.0.1: bytes=32 time=1ms TTL=126
Reply from 172.16.0.1: bytes=32 time=7ms TTL=126

Ping statistics for 172.16.0.1:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 7ms, Average = 3ms

C:\>ping 172.16.0.2

Pinging 172.16.0.2 with 32 bytes of data:

Request timed out.
Reply from 172.16.0.2: bytes=32 time=10ms TTL=126
Reply from 172.16.0.2: bytes=32 time=1ms TTL=126
Reply from 172.16.0.2: bytes=32 time=15ms TTL=126

Ping statistics for 172.16.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 15ms, Average = 8ms
```

172 network to 192 network: -



Task 2: -
Initial Topology: -



IP Addresses Assigment: -
PC0: -

IPv4 Address	10.0.0.1
Subnet Mask	255.0.0.0
Default Gateway	10.0.0.3

PC1: -

IPv4 Address	10.0.0.2
Subnet Mask	255.0.0.0
Default Gateway	10.0.0.3

PC2: -

IPv4 Address	20.0.0.1
Subnet Mask	255.0.0.0
Default Gateway	20.0.0.3

PC3 :-

IPv4 Address	20.0.0.2
Subnet Mask	255.0.0.0
Default Gateway	20.0.0.3

Ip address assigment to routers: -

Router0: -

```
                          Router(config)#int gig0/0
Router(config-if)#ip address 10.0.0.3 255.0.0.0
Router(config-if)#no shut

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)#int se0/1/0
       Router(config-if)#ip address 15.0.0.1 255.0.0.0
       Router(config-if)#no shut

       %LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
```

Router1: -

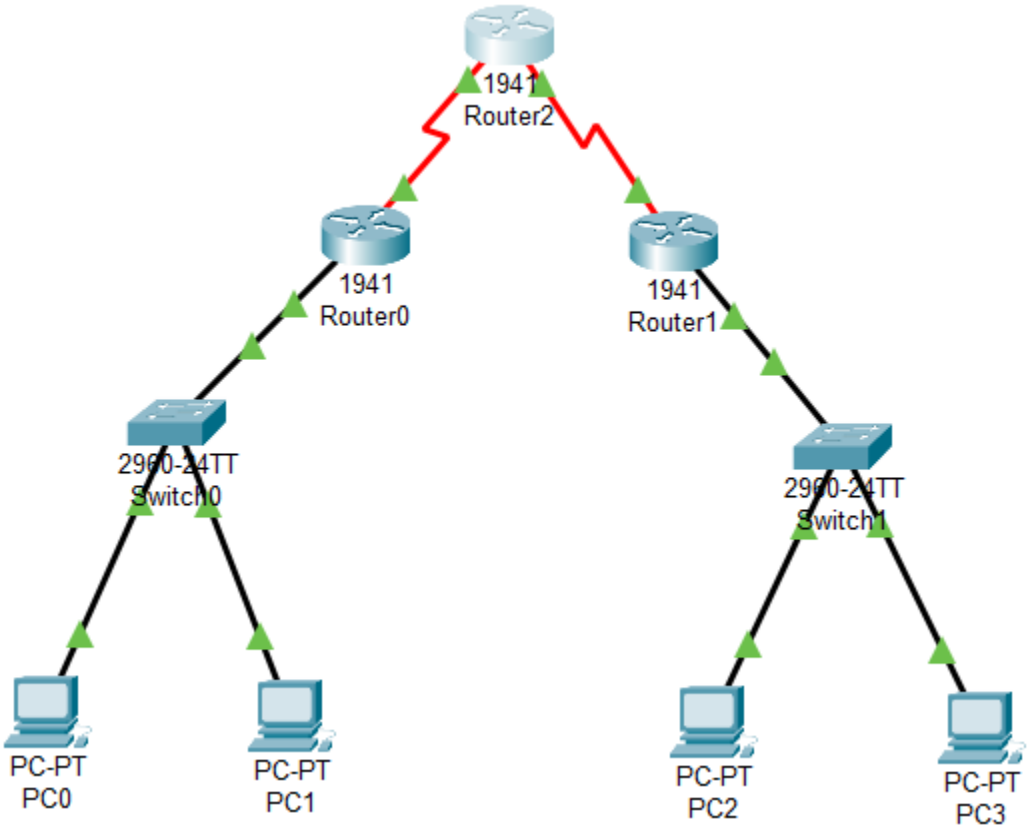
```
Router(config)#int gig0/0
Router(config-if)#ip address 20.0.0.3 255.0.0.0
Router(config-if)#no shut

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)#int se0/1/0
       Router(config-if)#ip address 16.0.0.1 255.0.0.0
       Router(config-if)#no shut

       %LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
```

Router 2: -

```
        Router(config)#int se0/1/0
        Router(config-if)#ip address 15.0.0.2 255.0.0.0
        Router(config-if)#no shut

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

```
Router(config)#int se0/1/0
Router(config-if)#exit
Router(config)#int se0/1/1
Router(config-if)#ip address 16.0.0.2 255.0.0.0
Router(config-if)#no shut

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

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

Final Connection: -



Setting Static Routes: -
Router 0: -

```
Router(config)#ip route 20.0.0.0 255.0.0.0 15.0.0.2
```

```
Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter
area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.0.0.0/8 is directly connected, GigabitEthernet0/0
L       10.0.0.3/32 is directly connected, GigabitEthernet0/0
     15.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       15.0.0.0/8 is directly connected, Serial0/1/0
L       15.0.0.1/32 is directly connected, Serial0/1/0
S    20.0.0.0/8 [1/0] via 15.0.0.2
```

Router 1: -

```
Router(config)#ip route 10.0.0.0 255.0.0.0 16.0.0.2
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter
area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

S    10.0.0.0/8 [1/0] via 16.0.0.2
     16.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       16.0.0.0/8 is directly connected, Serial0/1/0
L       16.0.0.1/32 is directly connected, Serial0/1/0
     20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       20.0.0.0/8 is directly connected, GigabitEthernet0/0
L       20.0.0.3/32 is directly connected, GigabitEthernet0/0
```

Router 2: -

```
Router(config)#ip route 20.0.0.0 255.0.0.0 16.0.0.1
Router(config)#ip route 10.0.0.0 255.0.0.0 15.0.0.1
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter
area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

S    10.0.0.0/8 [1/0] via 15.0.0.1
     15.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       15.0.0.0/8 is directly connected, Serial0/1/0
L       15.0.0.2/32 is directly connected, Serial0/1/0
     16.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       16.0.0.0/8 is directly connected, Serial0/1/1
L       16.0.0.2/32 is directly connected, Serial0/1/1
S    20.0.0.0/8 [1/0] via 16.0.0.1
```

Pinging Results: -
10 network to 20 network: -

```
C:\>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 20.0.0.2: bytes=32 time=2ms TTL=125
Reply from 20.0.0.2: bytes=32 time=2ms TTL=125
Reply from 20.0.0.2: bytes=32 time=2ms TTL=125

Ping statistics for 20.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 2ms, Average = 2ms

C:\>ping 20.0.0.1

Pinging 20.0.0.1 with 32 bytes of data:

Request timed out.
Reply from 20.0.0.1: bytes=32 time=2ms TTL=125
Reply from 20.0.0.1: bytes=32 time=2ms TTL=125
Reply from 20.0.0.1: bytes=32 time=24ms TTL=125

Ping statistics for 20.0.0.1:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 24ms, Average = 9ms
```

20 network to 10 network: -

```
C:\>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time=22ms TTL=125
Reply from 10.0.0.1: bytes=32 time=2ms TTL=125
Reply from 10.0.0.1: bytes=32 time=2ms TTL=125
Reply from 10.0.0.1: bytes=32 time=2ms TTL=125

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 22ms, Average = 7ms

C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 10.0.0.2: bytes=32 time=2ms TTL=125
Reply from 10.0.0.2: bytes=32 time=2ms TTL=125
Reply from 10.0.0.2: bytes=32 time=17ms TTL=125

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 17ms, Average = 7ms
```

TIME BOXING:

Activity Name	**Activity Time**	**Total Time**
Instruments Allocation + Setting up Lab	10 mints	10 mints
Walk through Theory & Tasks (Lecture)	60 mints	60 mints
Implementation & Practice time	90 mints	80 mints
Evaluation Time	20 mints	20 mints
	Total Duration	180 mints

Teacher Signature: _____

Student Registration No: 69966_____