

SRM Institute of Science and Technology
NCR Campus, Modinagar, Ghaziabad
21CSC302J/ Computer Networks

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VALUE ADDED PROGRAMS				
1	To analyse the performance of various configurations and protocols in LAN			
2	To understand the concept and operation of Routing Information Protocol (RIP)			

Experiment: 6

NAT Configuration

Aim:

To understand and configure Static NAT, Dynamic NAT, and PAT (Port Address Translation) on Cisco routers using Packet Tracer.

Materials: Cisco Packet Tracer (latest version)

Procedure:

1. Set Up the Network Topology

- i. Launch Cisco Packet Tracer.
- ii. Add the devices to the workspace:
 - a. 1 Router
 - b. 2 Switches
 - c. 2 PCs (PC1 and PC2)
 - d. 1 Server
- iii. Connect the devices:
 - a. Connect Router G0/0 to Switch 1.
 - b. Connect Router G0/1 to Switch 2.
 - c. Connect PC1 and PC2 to Switch 1.
 - d. Connect the Server to Switch 2.

2. Configure IP Addresses

i) Configure Router Interfaces:

- Click on the router, then go to the CLI.
- Assign IP addresses to the interfaces:

```
Router> enable
```

```
Router# configure terminal
```

```
Router(config)# interface gigabitEthernet 0/0
```

```
Router(config-if)# ip address 192.168.1.1 255.255.255.0
```

```
Router(config-if)# no shutdown
```

```
Router(config-if)# exit
```

```
Router(config)# interface gigabitEthernet 0/1
```

```
Router(config-if)# ip address 200.200.200.1 255.255.255.0
```

```
Router(config-if)# no shutdown
```

Router(config-if)# exit

ii) Configure PCs:

- On PC1:
 - IP Address: 192.168.1.2
 - Subnet Mask: 255.255.255.0
 - Default Gateway: 192.168.1.1
- On PC2:
 - IP Address: 192.168.1.3
 - Subnet Mask: 255.255.255.0
 - Default Gateway: 192.168.1.1

iii) Configure Server:

- IP Address: 200.200.200.2
- Subnet Mask: 255.255.255.0
- Default Gateway: 200.200.200.1

3. Configure Static NAT

i. Create Static NAT Mapping:

- a. Map the internal IP of PC1 (192.168.1.2) to an external IP (200.200.200.3):
- b. Router(config)# ip nat inside source static 192.168.1.2 200.200.200.3

ii. Specify the Inside and Outside Interfaces:

- Inside (LAN interface):

```
Router(config)# interface gigabitEthernet 0/0
```

```
Router(config-if)# ip nat inside
```

```
Router(config-if)# exit
```

- Outside (WAN interface):

```
Router(config)# interface gigabitEthernet 0/1
```

```
Router(config-if)# ip nat outside
```

```
Router(config-if)# exit
```

Verify these NAT translations:

```
R1#show ip nat translations
```

Experiment: 7

Implementation of RIP version 1

Aim:

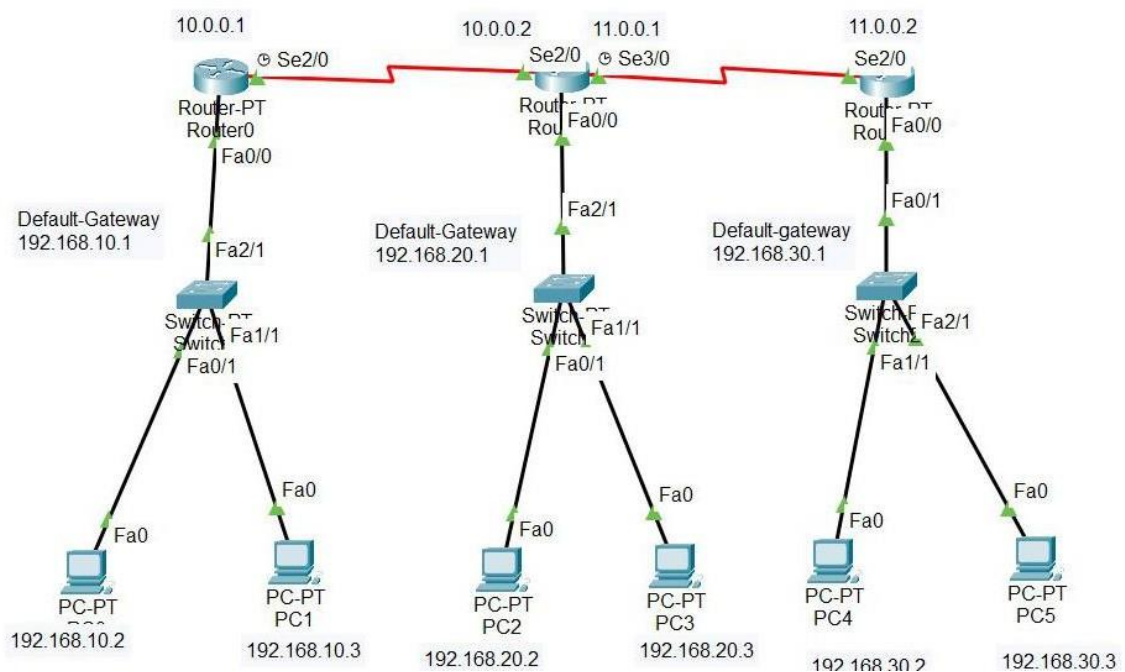
To understand and configure the Routing Information Protocol Version 1 (RIPv1) on Cisco routers using Packet Tracer.

Materials: Cisco Packet Tracer (latest version)

Procedure:

1. Set Up the Network Topology

- i. Launch Cisco Packet Tracer.
- ii. Add the devices to the workspace:
 - a. 3 Routers
 - b. 3 Switches
 - c. 6 PCs
- iii. Connect the devices



1. Configure IP Addresses

i) Configure Router 1:

- Click on Router 1 and access the CLI.
- Assign IP addresses to the interfaces:

```
Router1> enable
```

```
Router1# configure terminal
```

```
Router1(config)# interface gigabitEthernet 0/0
Router1(config-if)# ip address 192.168.1.1 255.255.255.0
Router1(config-if)# no shutdown

Router1(config-if)# exit
Router1(config)# interface gigabitEthernet 0/1
Router1(config-if)# ip address 10.1.1.1 255.255.255.252
Router1(config-if)# no shutdown
Router1(config-if)# exit
```

ii) Configure Router 2:

- Click on Router 2 and access the CLI.
- Assign IP addresses to the interfaces:

```
Router2> enable
Router2# configure terminal
Router2(config)# interface gigabitEthernet 0/0
Router2(config-if)# ip address 10.1.1.2 255.255.255.252
Router2(config-if)# no shutdown

Router2(config-if)# exit
Router2(config)# interface gigabitEthernet 0/1
Router2(config-if)# ip address 10.1.2.1 255.255.255.252
Router2(config-if)# no shutdown

Router2(config-if)# exit
Router2(config)# interface gigabitEthernet 0/2
Router2(config-if)# ip address 192.168.2.1 255.255.255.0
Router2(config-if)# no shutdown

Router2(config-if)# exit
```

Repeat the same procedure with other routers to configure them thoroughly.

- iii) Configure PCs:** Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table.

3: Configure RIP Version 1 on the Routers

To assign RIP routes to the particular router:

- First, click on router0 then Go to CLI.
- Then type the commands and IP information given below.

CLI command : router rip

CLI command : network <network id>

RIP Routes for Router0 are given below:

```
Router(config)#router rip
```

```
Router(config-router)#network 192.168.10.0
```

```
Router(config-router)#network 10.0.0.0
```

RIP Routes for Router1 are given below:

```
Router(config)#router rip
```

```
Router(config-router)#network 192.168.20.0
```

```
Router(config-router)#network 10.0.0.0
```

```
Router(config-router)#network 11.0.0.0
```

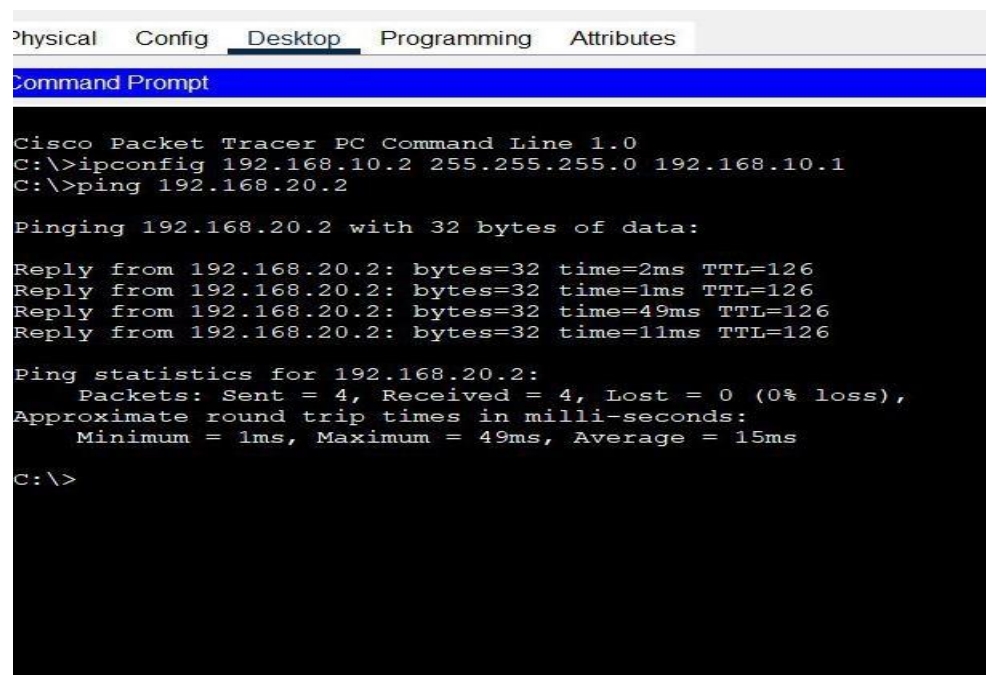
RIP Routes for Router2 are given below:

```
Router(config)#router rip
```

```
Router(config-router)#network 192.168.30.0
```

```
Router(config-router)#network 11.0.0.0
```

4. Verification of RIP Configuration



```
Physical  Config  Desktop  Programming  Attributes
Command Prompt

Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig 192.168.10.2 255.255.255.0 192.168.10.1
C:\>ping 192.168.20.2

Pinging 192.168.20.2 with 32 bytes of data:

Reply from 192.168.20.2: bytes=32 time=2ms TTL=126
Reply from 192.168.20.2: bytes=32 time=1ms TTL=126
Reply from 192.168.20.2: bytes=32 time=49ms TTL=126
Reply from 192.168.20.2: bytes=32 time=11ms TTL=126

Ping statistics for 192.168.20.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 49ms, Average = 15ms

C:\>
```

We have successfully configured RIP Version 1 on Cisco Routers using Packet Tracer.

Experiment: 8

Implementation of RIP version 2

Aim:

To configure and verify Routing Information Protocol Version 2 (RIPv2) on Cisco routers using Packet Tracer.

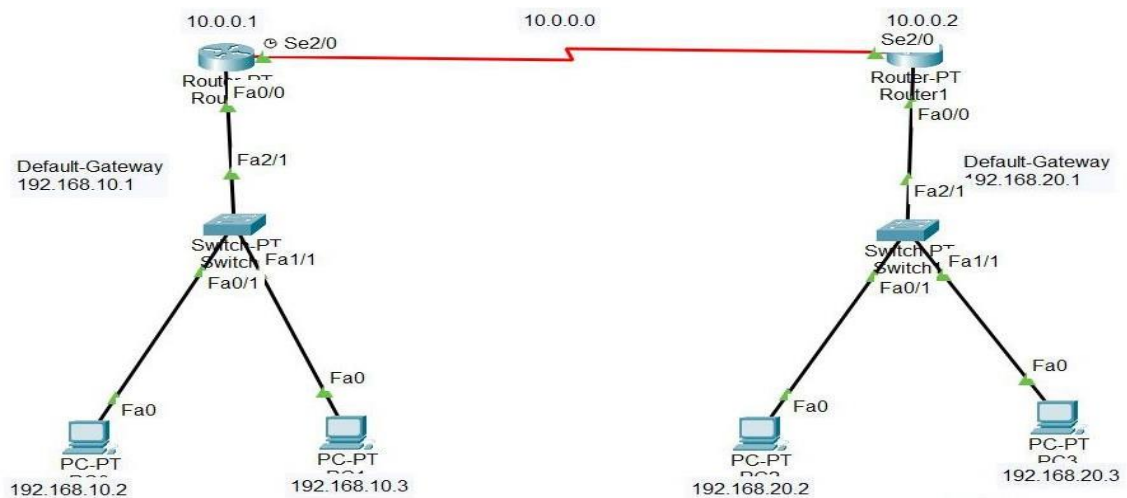
Materials: Cisco Packet Tracer (latest version)

Procedure:

1: Set Up the Network Topology

Add the devices to the workspace:

- 2 Routers
- 2 Switches
- 4 PCs (PC1, PC2, PC3, PC4)



2: Configure IP Addresses

Configure Router 1:

- Click on Router 1 and access the CLI.
- Assign IP addresses to the interfaces:

```
Router1> enable
```

```
Router1# configure terminal
```

```
Router1(config)# interface gigabitEthernet 0/0
```

```
Router1(config-if)# ip address 192.168.1.1 255.255.255.0
```

```
Router1(config-if)# no shutdown
Router1(config-if)# exit
Router1(config)# interface gigabitEthernet 0/1
Router1(config-if)# ip address 10.1.1.1 255.255.255.252
Router1(config-if)# no shutdown
Router1(config-if)# exit
```

Repeat the same procedure with other routers to configure them thoroughly.

Configure PCs: Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table.

3. Configure RIPv2 on the Routers

Configure RIPv2 on Router 1:

- Access the CLI of Router 1.
- Configure RIPv2

```
Router1> enable
Router1# configure terminal
Router1(config)# router rip
Router1(config-router)# version 2
Router1(config-router)# no auto-summary
Router1(config-router)# network 192.168.1.0
Router1(config-router)# network 10.0.0.0
Router1(config-router)# exit
Router1(config)# exit
```

Configure RIPv2 on Router 2:

- Access the CLI of Router 2.
- Configure RIPv2:

```
Router2> enable
Router2# configure terminal
Router2(config)# router rip
Router2(config-router)# version 2
Router2(config-router)# no auto-summary
```



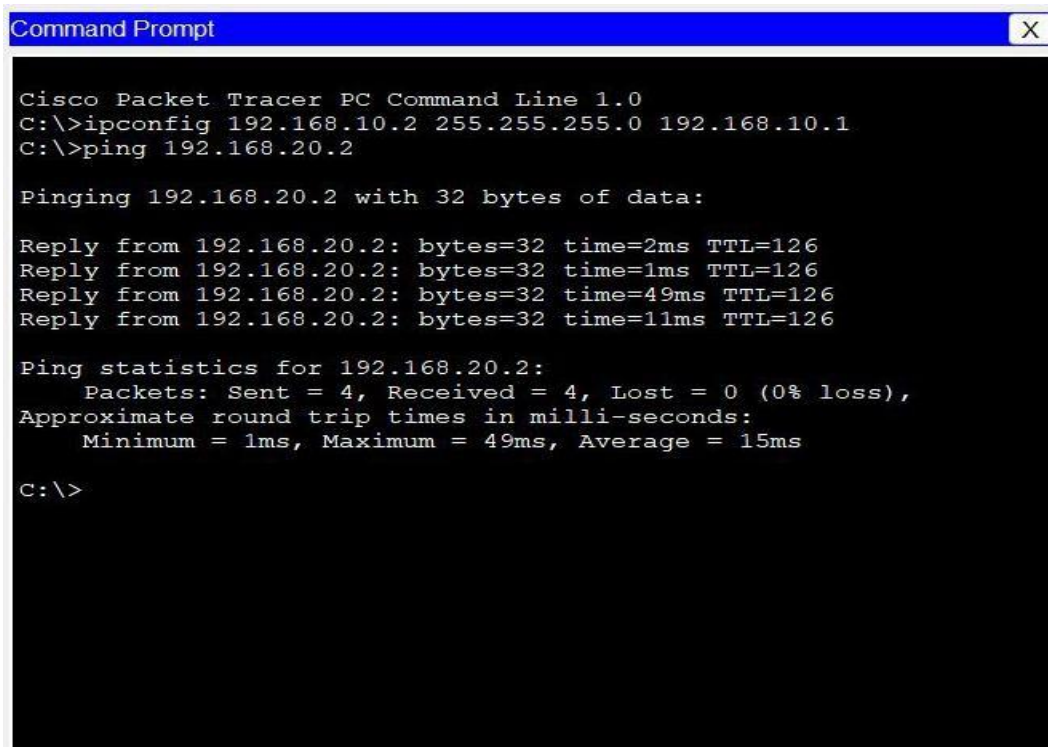
```
Router2(config-router)# network 192.168.2.0
```

```
Router2(config-router)# network 10.0.0.0
```

```
Router2(config-router)# exit
```

```
Router2(config)# exit
```

4. Verification of RIP Configuration



```
Command Prompt X
Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig 192.168.10.2 255.255.255.0 192.168.10.1
C:\>ping 192.168.20.2

Pinging 192.168.20.2 with 32 bytes of data:

Reply from 192.168.20.2: bytes=32 time=2ms TTL=126
Reply from 192.168.20.2: bytes=32 time=1ms TTL=126
Reply from 192.168.20.2: bytes=32 time=49ms TTL=126
Reply from 192.168.20.2: bytes=32 time=11ms TTL=126

Ping statistics for 192.168.20.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 49ms, Average = 15ms

C:\>
```

We have successfully configured RIP Version 2 on Cisco Routers using Packet Tracer.

Experiment: 9

Implementation of Single Area OSPF

Aim:

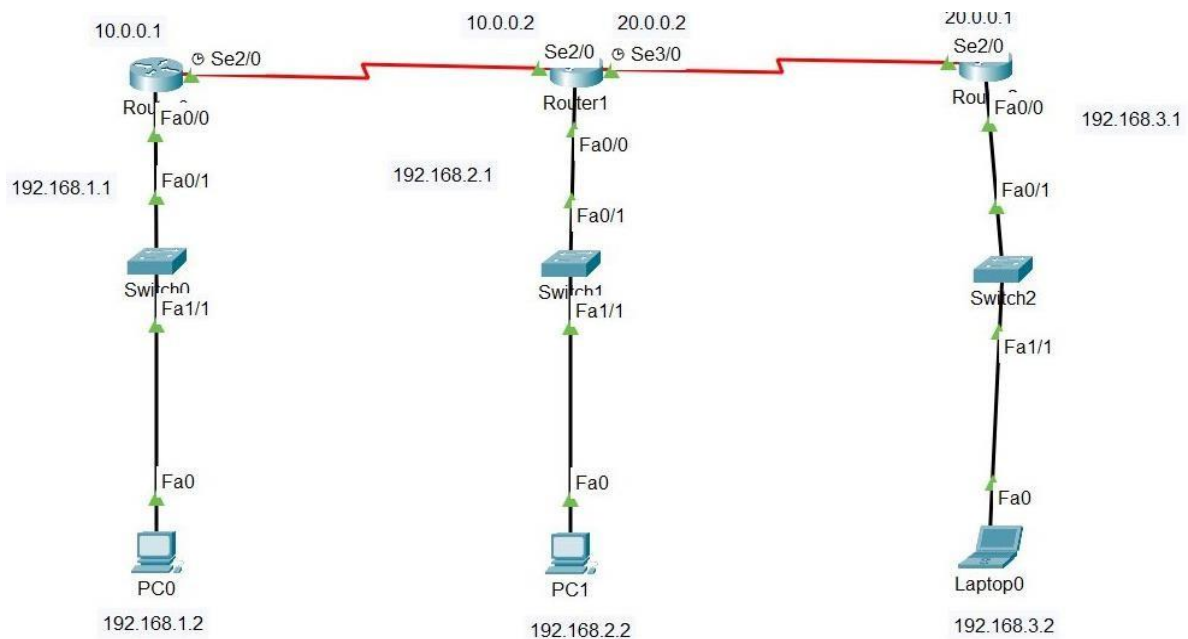
To configure and verify a Single Area OSPF (OSPFv2) routing protocol on Cisco routers using Packet Tracer.

Materials: Cisco Packet Tracer (latest version)

Procedure:

1. Set Up the Network Topology

- i. Launch Cisco Packet Tracer.
- ii. Add the devices to the workspace:
 - a. 3 Routers
 - b. 3 Switches
 - c. 3 PCs (PC1, PC2, PC3)
- iii. Connect the devices



2. Configure IP Addresses

Configure Router 1:

- Click on Router 1 and access the CLI.
- Assign IP addresses to the interfaces:

Router1> enable

```
Router1# configure terminal
Router1(config)# interface gigabitEthernet 0/0
Router1(config-if)# ip address 192.168.1.1 255.255.255.0
Router1(config-if)# no shutdown

Router1(config-if)# exit
Router1(config)# interface gigabitEthernet 0/1
Router1(config-if)# ip address 10.1.1.1 255.255.255.252
Router1(config-if)# no shutdown

Router1(config-if)# exit
```

Repeat the same procedure with other routers to configure them thoroughly.

Configure PCs: Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table.

3: Configure Single Area OSPF on the Routers

Configure OSPF on Router 1:

- Access the CLI of Router 1.
- Configure OSPF with Area 0:

```
Router1> enable
Router1# configure terminal
Router1(config)# router ospf 1

Router1(config-router)# network 192.168.1.0 0.0.0.255 area 0
Router1(config-router)# network 10.1.1.0 0.0.0.3 area 0
Router1(config-router)# exit

Router1(config)# exit
```

Configure OSPF on Router 2:

- Access the CLI of Router 2.
- Configure OSPF with Area 0:

```
Router2> enable
Router2# configure terminalRouter2(config)# router ospf 1
Router2(config-router)# network 192.168.2.0 0.0.0.255 area 0
Router2(config-router)# network 10.1.1.0 0.0.0.3 area 0
```

```
Router2(config-router)# network 10.1.2.0 0.0.0.3 area 0
```

```
Router2(config-router)# exit
```

```
Router2(config)# exit
```

Configure OSPF on Router 3:

- Access the CLI of Router 3.
- Configure OSPF with Area 0:

```
Router3> enable
```

```
Router3# configure terminal
```

```
Router3(config)# router ospf 1
```

```
Router3(config-router)# network 192.168.3.0 0.0.0.255 area 0
```

```
Router3(config-router)# network 10.1.2.0 0.0.0.3 area 0
```

```
Router3(config-router)# exit
```

```
Router3(config)# exit
```

4. Verification of OSPF Configuration

Check OSPF Neighbors: On each router, verify OSPF neighbor relationships:

```
Router# show ip ospf neighbor
```

Check OSPF Routing Table:

```
Router# show ip route ospf
```

Ping Test:

- From **PC1**, ping **PC2** and **PC3**. The pings should be successful.
- From **PC2**, ping **PC1** and **PC3**. The pings should be successful.
- From **PC3**, ping **PC1** and **PC2**. The pings should be successful.

Verify OSPF Database:

- On each router, check the OSPF database to ensure OSPF has learned all routes:

```
Router# show ip ospf database
```

```

O   192.168.10.0/24 [110/65] via 172.16.10.2, 00:06:10, Serial0/0/0
O   192.168.20.0/24 [110/65] via 172.16.10.6, 00:06:10, Serial0/0/1
Corp#
Corp#show ip ospf
Corp#show ip ospf da
Corp#show ip ospf database
      OSPF Router with ID (223.255.255.254) (Process ID 1)

      Router Link States (Area 0)

Link ID        ADV Router    Age         Seq#          Checksum Link count
172.31.1.3     172.31.1.3    384         0x8000000d   0x00e92f 3
172.31.1.2     172.31.1.2    384         0x8000000d   0x00ae7e 3
11.11.11.11    11.11.11.11   349         0x8000000a   0x004f5f 1
223.255.255.254 223.255.255.254 349         0x80000009   0x002dd4 6
10.10.10.10    10.10.10.10   349         0x80000012   0x004f65 1

      Net Link States (Area 0)

Link ID        ADV Router    Age         Seq#          Checksum
11.11.11.1     223.255.255.254 349         0x80000001   0x003f2e
10.10.10.1     223.255.255.254 349         0x80000002   0x004f24
Corp#

```

We have successfully configured Single Area OSPF on Cisco Routers using Packet Tracer.

Experiment: 10

Implementation of Multi Area OSPF

Aim:

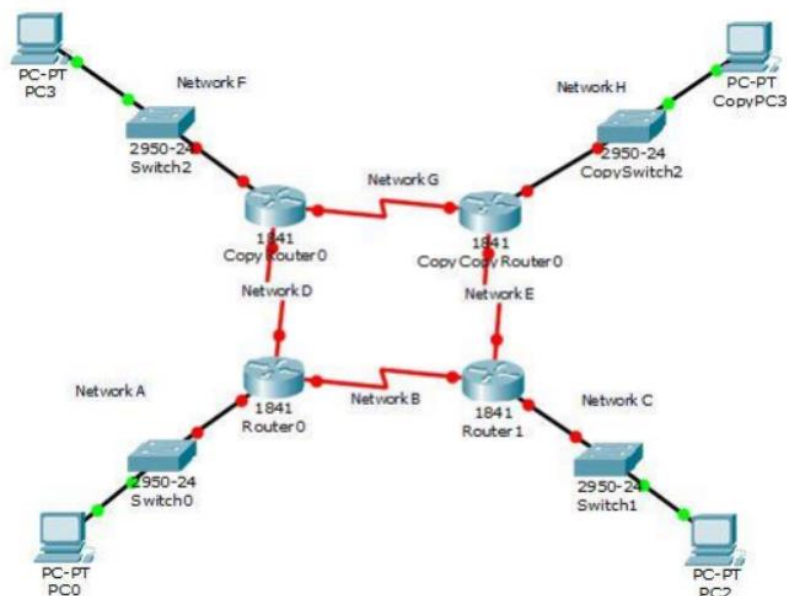
To configure and verify Multi-Area OSPF (OSPFv2) routing protocol on Cisco routers using Packet Tracer.

Materials: Cisco Packet Tracer (latest version)

Procedure:

1. Set Up the Network Topology

- i. Launch Cisco Packet Tracer.
- ii. Add the devices to the workspace:
 - a. 4 Routers
 - b. 4 Switches
 - c. 4 PCs (PC1, PC2, PC3, PC4)
- iii. Connect the devices



2. Configure IP Addresses

Configure Router 1:

- Click on Router 1 and access the CLI.
- Assign IP addresses to the interfaces:

```
Router1> enable
Router1# configure terminal
Router1(config)# interface gigabitEthernet 0/0
Router1(config-if)# ip address 192.168.1.1 255.255.255.0
Router1(config-if)# no shutdown
Router1(config-if)# exit
Router1(config)# interface gigabitEthernet 0/1
Router1(config-if)# ip address 10.1.1.1 255.255.255.252
Router1(config-if)# no shutdown
Router1(config-if)# exit
```

Repeat the same procedure with other routers to configure them thoroughly.

Configure PCs: Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table.

3. Configure Multi-Area OSPF on the Routers

Configure OSPF on Router 1:

- Access the CLI of Router 1.
- Configure OSPF with Area 0 (backbone):

```
Router1> enable
Router1# configure terminal
Router1(config)# router ospf 1
Router1(config-router)# network 192.168.1.0 0.0.0.255 area 0
Router1(config-router)# network 10.1.1.0 0.0.0.3 area 0
Router1(config-router)# exit
Router1(config)# exit
```

Configure OSPF on Router 2:

- Access the CLI of Router 2.
- Configure OSPF with Areas 0 and 1

```
Router2> enable
Router2# configure terminal
Router2(config)# router ospf 1
Router2(config-router)# network 192.168.2.0 0.0.0.255 area 1
Router2(config-router)# network 10.1.1.0 0.0.0.3 area 0
Router2(config-router)#
```

Configure OSPF on Router 3:

- Access the CLI of Router 3.
- Configure OSPF with Area 0:

```
Router3> enable
Router3# configure terminal
Router3(config)# router ospf 1
Router3(config-router)# network 192.168.3.0 0.0.0.255 area 0
Router3(config-router)# network 10.1.2.0 0.0.0.3 area 0
Router3(config-router)# exit
Router3(config)# exit
```

4. Verification of OSPF Configuration

1. Check OSPF Neighbors:

- On each router, verify OSPF neighbor relationships:
- Router# show ip ospf neighbor

2. Check OSPF Routing Table:

- On each router, verify the OSPF routing table:

```
Router# show ip route ospf
```

Ping Test:

- From **PC1**, ping **PC2** and **PC3**. The pings should be successful.
- From **PC2**, ping **PC1** and **PC3**. The pings should be successful.
- From **PC3**, ping **PC1** and **PC2**. The pings should be successful.

Verify OSPF Database:

- On each router, check the OSPF database to ensure OSPF has learned all routes:

```
Router# show ip ospf database
```



```
Router_A#
Router_A#show ip ospf database

        OSPF Router with ID (192.168.3.1) (Process ID 100)

        Router Link States (Area 0)

Link ID      ADV Router    Age      Seq#        Checksum Link count
192.168.1.25 192.168.1.25  458      0x80000004  0x00430E  1
192.168.2.2  192.168.2.2  41       0x80000005  0x00FA83  2
192.168.3.1  192.168.3.1  461      0x80000008  0x00B4F1  5
192.168.3.2  192.168.3.2  277      0x80000003  0x000F6D  2

        Net Link States (Area 0)

Link ID      ADV Router    Age      Seq#        Checksum
192.168.1.1  192.168.3.1  461      0x80000001  0x00FD72

        Summary Net Link States (Area 0)

Link ID      ADV Router    Age      Seq#        Checksum
10.17.43.0   192.168.2.2  34       0x80000001  0x009DE1
172.16.15.0  192.168.3.2  268      0x80000001  0x009563
Router_A#
```

We have successfully configured Multi Area OSPF on Cisco Routers using Packet Tracer.

Experiment: 11

PPP Configuration

Aim:

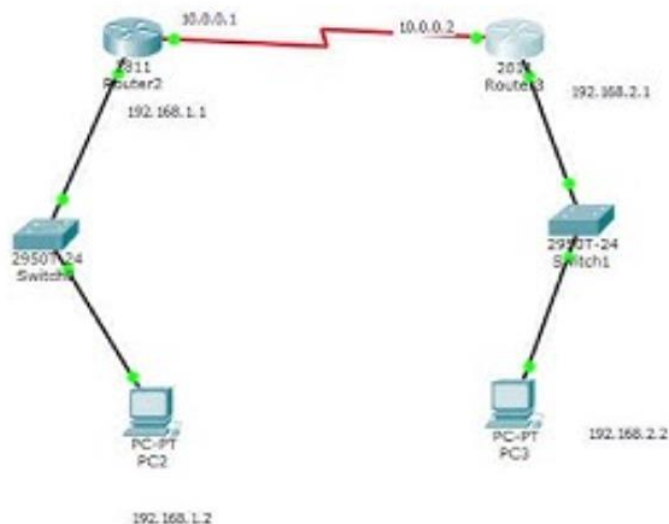
To configure and verify the Point-to-Point Protocol (PPP) with authentication (PAP or CHAP) on Cisco routers using Packet Tracer.

Materials: Cisco Packet Tracer (latest version)

Procedure:

1. Set Up the Network Topology

- i. Launch Cisco Packet Tracer.
- ii. Add the devices to the workspace:
 - a. 2 Routers
 - b. 2 Switches
 - c. 2 PCs (PC1, PC2)
- iii. Connect the devices



2. Configure IP Addresses

Configure Router 1:

- Click on Router 1 and access the CLI.
- Assign IP addresses to the interfaces:

Router1> enable

Router1# configure terminal

```
Router1(config)# interface gigabitEthernet 0/0
Router1(config-if)# ip address 192.168.1.1 255.255.255.0
Router1(config-if)# no shutdown
Router1(config-if)# exit
Router1(config)#interface serial 0/0/0
Router1(config-if)# ip address 10.1.1.1 255.255.255.252
Router1(config-if)# clock rate 64000
Router1(config-if)# encapsulation ppp
Router1(config-if)# no shutdown
Router1(config-if)# exit
```

Configure Router 2:

- Click on Router 2 and access the CLI.
- Assign IP addresses to the interfaces:

```
Router2> enable
Router2# configure terminal
Router2(config)# interface gigabitEthernet 0/0
Router2(config-if)# ip address 192.168.2.1 255.255.255.0
Router2(config-if)# no shutdown
Router2(config-if)# exit

Router2(config)# interface serial 0/0/0
Router2(config-if)# ip address 10.1.1.2 255.255.255.252
Router2(config-if)# encapsulation ppp
Router2(config-if)# no shutdown
Router2(config-if)# exit
```

Configure PCs: Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table.

3. Configure PPP Authentication: PPP can be configured with either PAP (Password Authentication Protocol) or CHAP (Challenge Handshake Authentication Protocol). Here is a configuration for PAP.

On Router 1:

```
Router1>  
enable  
  
Router1# configure terminal  
Router1(config)# username Router2 password cisco  
Router1(config)# interface serial 0/0/0  
Router1(config-if)# ppp authentication  
pap  
Router1(config-if)# ppp pap sent-username Router1 password  
cisco Router1(config-if)# exit
```

On Router 2:

```
Router2> enable  
  
Router2# configure terminal  
Router2(config)# username Router1 password cisco  
Router2(config)# interface serial 0/0/0  
Router2(config-if)# ppp authentication pap  
Router2(config-if)# ppp pap sent-username Router2 password cisco  
Router2(config-if)# exit
```

4. Verification of PPP Configuration**1. Check the Serial Interface Status:**

- On both routers, verify the status of the serial interface:

```
Router# show interfaces serial 0/0/0
```

2. Check PPP Encapsulation:

- On both routers, verify PPP encapsulation is active:

```
Router# show interfaces serial 0/0/0
```

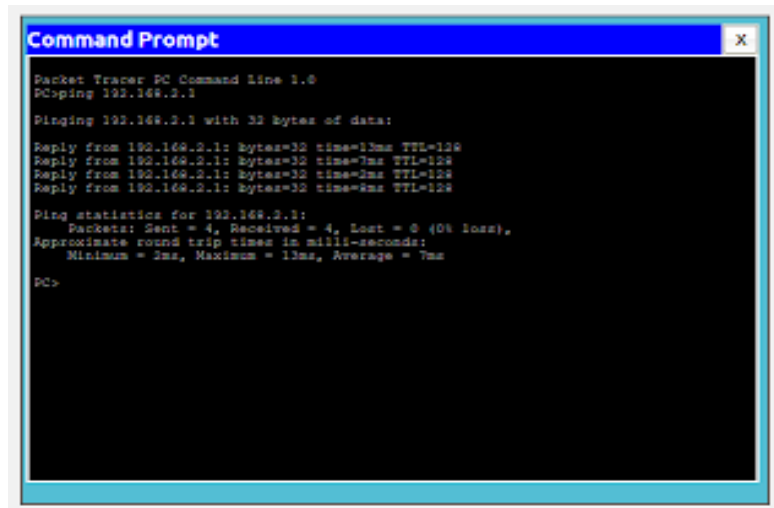
3. Check PPP Authentication:

- 4. If PAP authentication is configured, verify authentication:

```
Router# show ppp all
```

Ping Test:

From PC1, ping PC2. The ping should be successful, indicating that PPP is correctly configured and operational.



```
Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 192.168.2.1
Pinging 192.168.2.1 with 32 bytes of data:
Reply from 192.168.2.1: bytes=32 time=13ms TTL=128
Reply from 192.168.2.1: bytes=32 time=7ms TTL=128
Reply from 192.168.2.1: bytes=32 time=2ms TTL=128
Reply from 192.168.2.1: bytes=32 time=2ms TTL=128

Ping statistics for 192.168.2.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 13ms, Average = 7ms

PC>
```

We have successfully configured PPP on Cisco routers using Packet Tracer.

Experiment: 12

HDLC Configuration

Aim:

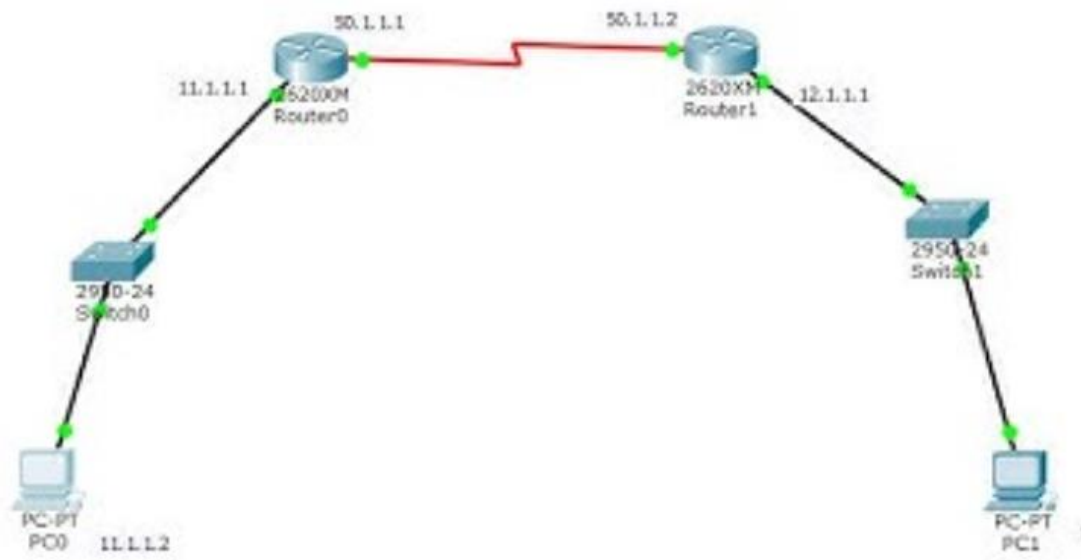
To configure and verify the High-Level Data Link Control (HDLC) protocol on a point-to-point serial connection between two Cisco routers using Packet Tracer.

Materials: Cisco Packet Tracer (latest version)

Procedure:

1. Set Up the Network Topology

- i. Launch Cisco Packet Tracer.
- ii. Add the devices to the workspace:
 - a. 2 Routers
 - b. 2 Switches
 - c. 2 PCs (PC1, PC2)
- iii. Connect the devices



2. Configure IP Addresses

Configure Router 1:

- Click on Router 1 and access the CLI.
- Assign IP addresses to the interfaces:

```
Router1> enable
```

```
Router1# configure terminal
```

```
Router1(config)# interface gigabitEthernet 0/0
Router1(config-if)# ip address 192.168.1.1 255.255.255.0
Router1(config-if)# no shutdown
Router1(config-if)# exit
Router1(config)# interface serial 0/0/0
Router1(config-if)# ip address 10.1.1.1 255.255.255.252
Router1(config-if)# clock rate 64000
Router1(config-if)# encapsulation hdlc
Router1(config-if)# no shutdown
Router1(config-if)# exit
```

Configure Router 2:

- Click on Router 2 and access the CLI.
- Assign IP addresses to the interfaces:

```
Router2> enable
Router2# configure terminal
Router2(config)# interface gigabitEthernet 0/0
Router2(config-if)# ip address 192.168.2.1 255.255.255.0
Router2(config-if)# no shutdown
Router2(config-if)# exit

Router2(config)# interface serial 0/0/0
Router2(config-if)# ip address 10.1.1.2 255.255.255.252
Router2(config-if)# encapsulation hdlc
Router2(config-if)# no shutdown
Router2(config-if)# exit
```

Configure PCs: Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table.

3. Verify the HDLC Configuration

1. Check the Serial Interface Status:

- On both routers, verify the status of the serial interface:

Router# show interfaces serial 0/0/0

You should see the interface is up, and HDLC is listed as the encapsulation method.

2. Check the Routing Table:

On both routers, verify that the routes are correctly populated:

Router# show ip route

Ping Test:

- From **PC1**, ping **PC2**. The ping should be successful, indicating that HDLC is correctly configured and operational.
- From **PC2**, ping **PC1** to verify bidirectional communication.

OUTPUT:

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 11.1.1.2

Pinging 11.1.1.2 with 32 bytes of data:

Reply from 11.1.1.2: bytes=32 time<1ms TTL=128
Reply from 11.1.1.2: bytes=32 time<1ms TTL=128
Reply from 11.1.1.2: bytes=32 time<1ms TTL=128
Reply from 11.1.1.2: bytes=32 time<1ms TTL=128

Ping statistics for 11.1.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```


Experiment: 13

Implementation of BGP

Aim:

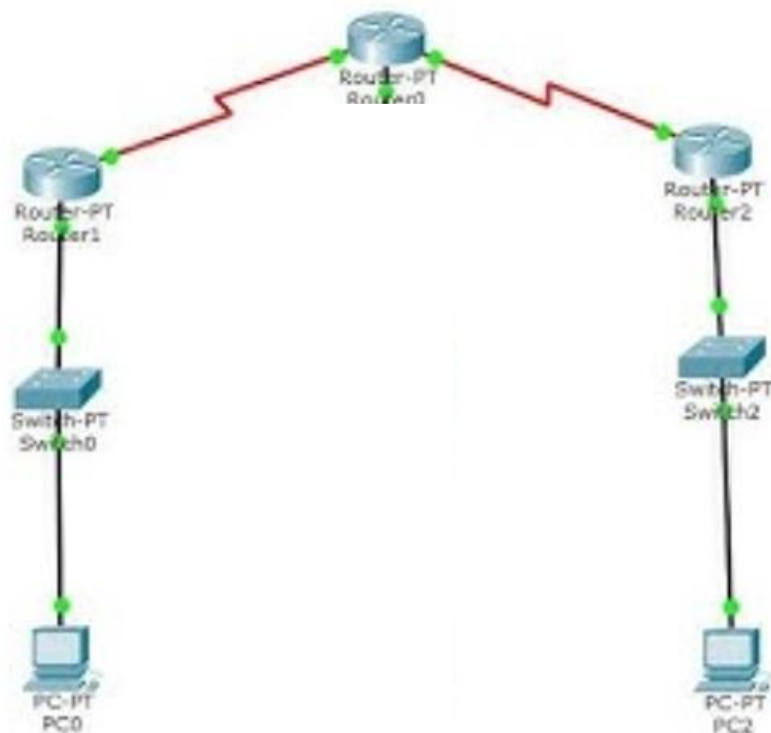
To configure and verify Border Gateway Protocol (BGP) on Cisco routers in a simulated network environment using Packet Tracer. This lab focuses on basic BGP configuration between two Autonomous Systems (AS)

Materials: Cisco Packet Tracer (latest version)

Procedure:

1. Set Up the Network Topology

- i. Launch Cisco Packet Tracer.
- ii. Add the devices to the workspace:
 - a. 3 Routers
 - b. 2 Switches
 - c. 2 PCs (PC1, PC2)
- iii. Connect the devices



2. Configure IP Addresses

Configure Router 1:

- Click on Router 1 and access the CLI.
- Assign IP addresses to the interfaces:

Router1> enable

Router1# configure terminal

Router1(config)# interface gigabitEthernet 0/0

Router1(config-if)# ip address 192.168.1.1 255.255.255.0

Router1(config-if)# no shutdown

Router1(config-if)# exit

Router1(config)# interface serial 0/0/0

Router1(config-if)# ip address 10.1.1.1 255.255.255.252

Router1(config-if)# clock rate 64000

Router1(config-if)# no shutdown

Router1(config-if)# exit

Router1(config)# interface serial 0/0/1

Router1(config-if)# ip address 10.1.2.1 255.255.255.252

Router1(config-if)# clock rate 64000

Router1(config-if)# no shutdown

Router1(config-if)# exit

Configure Router 2:

- Click on Router 2 and access the CLI.
- Assign IP addresses to the interfaces:

Router2> enable

Router2# configure terminal

Router2(config)# interface serial 0/0/0

```
Router2(config-if)# ip address 10.1.1.2 255.255.255.252
```

```
Router2(config-if)# no shutdown
```

```
Router2(config-if)# exit
```

Configure Router 3:

- Click on Router 3 and access the CLI.
- Assign IP addresses to the interfaces:

```
Router3> enable
```

```
Router3# configure terminal
```

```
Router3(config)# interface gigabitEthernet 0/0
```

```
Router3(config-if)# ip address 192.168.3.1 255.255.255.0
```

```
Router3(config-if)# no shutdown
```

```
Router3(config-if)# exit
```

```
Router3(config)# interface serial 0/0/0
```

```
Router3(config-if)# ip address 10.1.2.2 255.255.255.252
```

```
Router3(config-if)# no shutdown
```

```
Router3(config-if)# exit
```

Configure PCs: Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table.

3. Configure BGP on the Routers

Configure BGP on Router 1 (AS 100):

```
Router1> enable
```

```
Router1# configure terminal
```

```
Router1(config)# router bgp 100
```

```
Router1(config-router)# network 192.168.1.0 mask 255.255.255.0
```

```
Router1(config-router)# neighbor 10.1.1.2 remote-as 100
```

```
Router1(config-router)# neighbor 10.1.2.2 remote-as 200
```

```
Router1(config-router)# exit
```

Configure BGP on Router 2 (AS 100):

Router2> enable

Router2# configure terminal

Router2(config)# router bgp 100

Router2(config-router)# neighbor 10.1.1.1 remote-as 100

Router2(config-router)# exit

Configure BGP on Router 3 (AS 200):

Router3> enable

Router3# configure terminal

Router3(config)# router bgp 200

Router3(config-router)# network 192.168.3.0 mask 255.255.255.0

Router3(config-router)# neighbor 10.1.2.1 remote-as 100

Router3(config-router)# exit

4. Verification of BGP Configuration

Check BGP Neighbors:

On Router 1, check BGP neighbors:

Router1# show ip bgp summary

We should see Router 2 and Router 3 as neighbors.

Check BGP Routing Table:

Router# show ip bgp

Ping Test:

- From **PC1**, ping **PC2**. The ping should be successful, indicating that BGP is correctly configured and operational.
- From **PC2**, ping **PC1** to verify bidirectional communication.

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time<1ms TTL=128
Reply from 192.168.1.1: bytes=32 time<1ms TTL=128
Reply from 192.168.1.1: bytes=32 time<1ms TTL=128
Reply from 192.168.1.1: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>|
```

We have successfully configured BGP on Cisco routers using Packet Tracer.

Experiment: 14

Implementation of EIGRP

Aim:

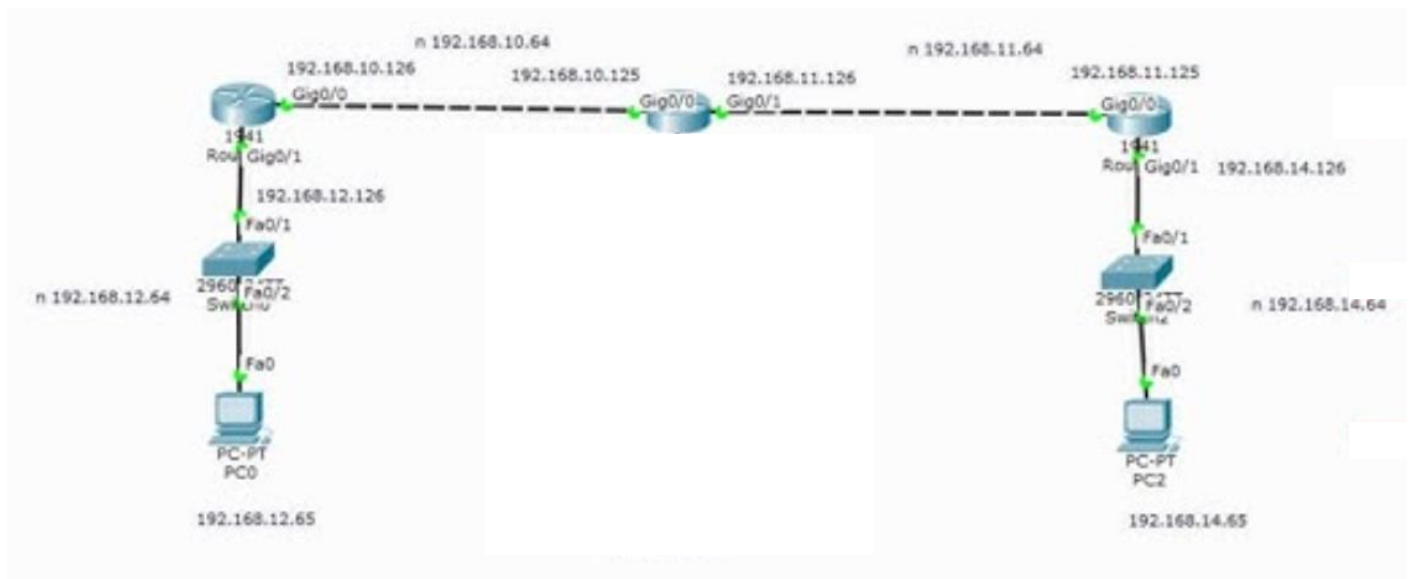
To configure and verify Enhanced Interior Gateway Routing Protocol (EIGRP) on Cisco routers in a simulated network environment using Packet Tracer. This lab will demonstrate the basic configuration of EIGRP for dynamic routing..

Materials: Cisco Packet Tracer (latest version)

Procedure:

1. Set Up the Network Topology

- i. Launch Cisco Packet Tracer.
- ii. Add the devices to the workspace:
 - a. 3 Routers
 - b. 2 Switches
 - c. 2 PCs (PC1, PC2,)
- iii. Connect the devices



2. Configure IP Addresses

Configure Router 1:

- Click on Router 1 and access the CLI.
- Assign IP addresses to the interfaces:

```
Router1> enable
```

```
Router1# configure terminal
```

```
Router1(config)# interface gigabitEthernet 0/0
```

```
Router1(config-if)# ip address 192.168.1.1 255.255.255.0
```

```
Router1(config-if)# no shutdown
```

```
Router1(config-if)# exit
```

```
Router1(config)# interface serial 0/0/0
```

```
Router1(config-if)# ip address 10.1.1.1 255.255.255.252
```

```
Router1(config-if)# clock rate 64000
```

```
Router1(config-if)# no shutdown
```

```
Router1(config-if)# exit
```

Repeat the same procedure with other routers to configure them thoroughly.

Configure PCs: Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table.

3. Configure EIGRP on the Routers

Configure EIGRP on Router 1:

```
Router1> enable
```

```
Router1# configure terminal
```

```
Router1(config)# router eigrp 100
```

```
Router1(config-router)# network 192.168.1.0 0.0.0.255
```

```
Router1(config-router)# network 10.1.1.0 0.0.0.3
```

```
Router1(config-router)# no auto-summary
```

```
Router1(config-router)# exit
```

Configure EIGRP on Router 2:

```
Router2> enable
```

```
Router2# configure terminal
```

```
Router2(config)# router eigrp 100

Router2(config-router)# network 10.1.1.0 0.0.0.3
Router2(config-router)# network 10.1.2.0 0.0.0.3

Router2(config-router)# no auto-summary

Router2(config-router)# exit
```

Configure EIGRP on Router 3:

```
Router3> enable

Router3# configure terminal

Router3(config)# router eigrp 100

Router3(config-router)# network 192.168.3.0 0.0.0.255
Router3(config-router)# network 10.1.2.0 0.0.0.3

Router3(config-router)# no auto-summary


Router3(config-router)# exit
```

4. Verification of EIGRP Configuration

Check EIGRP Neighbors:

On each router, check EIGRP neighbors:

```
Router# show ip eigrp neighbors
```

We should see the other routers as neighbors.

Check EIGRP Routing Table:

On each router, verify that the EIGRP routes are correctly populated:

```
Router# show ip route eigrp
```

Ping Test:

- From **PC1**, ping **PC2**. The ping should be successful, indicating that EIGRP is correctly configured and operational.
- From **PC2**, ping **PC1** to verify bidirectional communication.

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.12.65

Pinging 192.168.12.65 with 32 bytes of data:

Reply from 192.168.12.65: bytes=32 time<1ms TTL=128
Reply from 192.168.12.65: bytes=32 time<1ms TTL=128
Reply from 192.168.12.65: bytes=32 time<1ms TTL=128
Reply from 192.168.12.65: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.12.65:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>|
```

We have successfully configured EIGRP on Cisco routers using Packet Tracer.

Experiment: 15

Telnet Configuration

Aim:

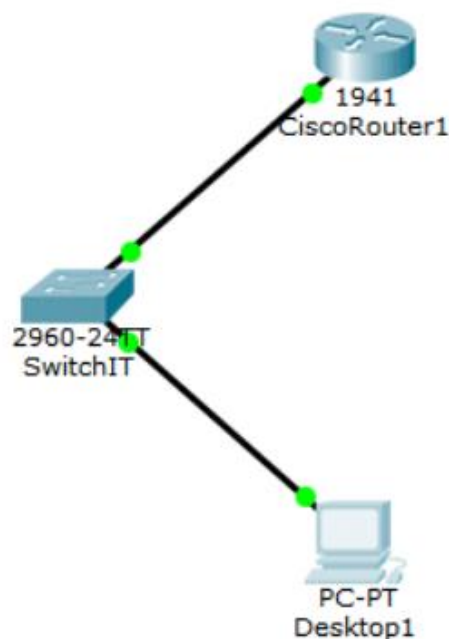
To configure and verify Telnet access on a Cisco router in a simulated network environment using Packet Tracer. This lab will demonstrate the steps required to set up Telnet access for remote management.

Materials: Cisco Packet Tracer (latest version)

Procedure:

1. Set Up the Network Topology

- i. Launch Cisco Packet Tracer.
- ii. Add the devices to the workspace:
 - a. 1 Routers
 - b. 1 Switch
 - c. 1 PCs (PC1)
- iii. Connect the devices



2: Configure IP Address on Router and PC

Configure Router 1:

- Click on Router 1 and access the CLI.
- Assign an IP address to the G0/0 interface:

Router1> enable

Router1# configure terminal

Router1(config)# interface gigabitEthernet 0/0

Router1(config-if)# ip address 192.168.1.1 255.255.255.0

Router1(config-if)# no shutdown

Router1(config-if)# exit

Configure PC1:

- On PC1:
 - IP Address: 192.168.1.2
 - Subnet Mask: 255.255.255.0
 - Default Gateway: 192.168.1.1

3: Configure Telnet on Router

Set the Router Hostname:

Router1(config)# hostname R1

Set a Password for Telnet Access: Configure the VTY (Virtual Teletype) lines to allow Telnet access and set a password:

R1(config)# line vty 0 4

R1(config-line)# password cisco123

R1(config-line)# login

R1(config-line)# exit

Configure a Local User Account for Authentication:

R1(config)# username admin privilege 15 secret adminpass

Set VTY Lines to Use Local User Authentication:

R1(config)# line vty 0 4

R1(config-line)# login local

R1(config-line)# transport input telnet

R1(config-line)# exit

Enable Password Encryption:

- Encrypt all plaintext passwords:

R1(config)# service password-encryption

4: Verification of Telnet Configuration

Test Telnet Access from PC1:

On PC1, open the Command Prompt.

Telnet to the router using the following command:

```
telnet 192.168.1.1
```

When prompted, enter the username and password configured earlier (admin and adminpass).

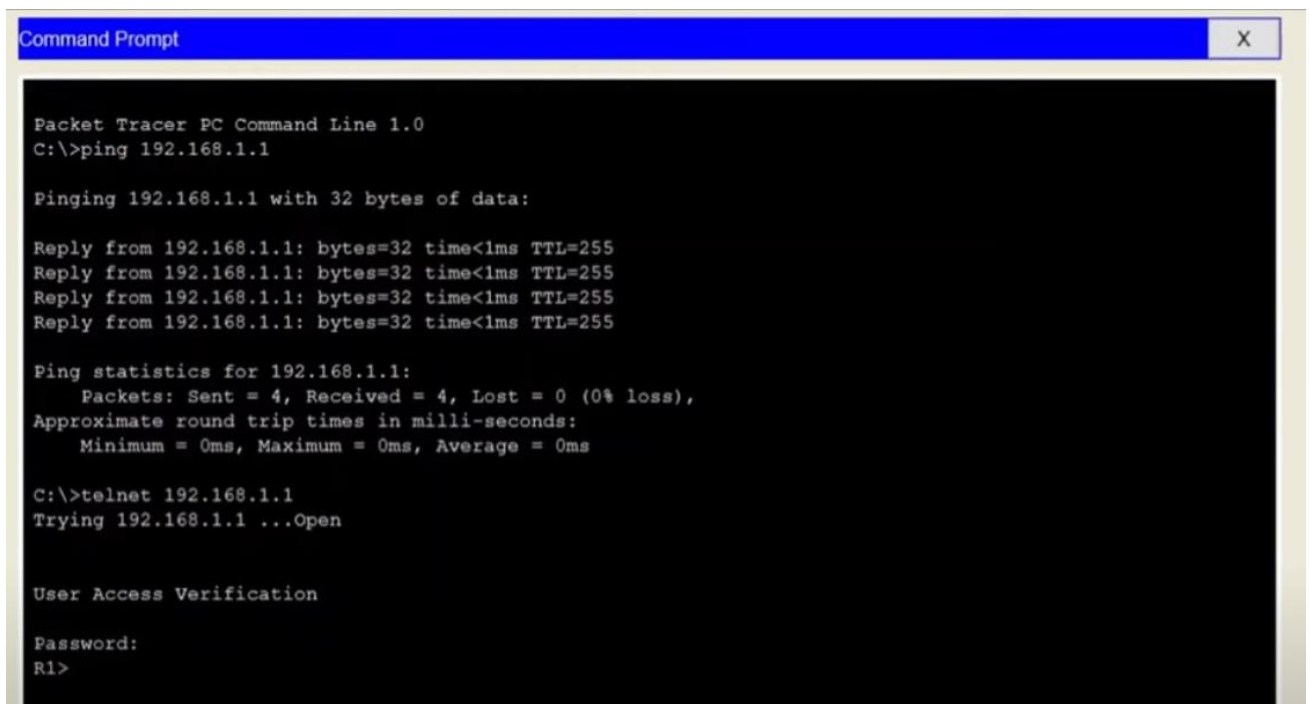
Verify Telnet Connection:

Once logged in, you should have command-line access to the router via Telnet.

Test basic commands, such as show ip interface brief to verify you can execute commands remotely.

Exit the Telnet Session:

To exit the Telnet session, type exit in the command line.



```
Command Prompt
X

Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>telnet 192.168.1.1
Trying 192.168.1.1 ...Open

User Access Verification

Password:
R1>
```

We have successfully configured Telnet on a Cisco router using Packet Tracer.

Experiment: 1

To analyze the performance of various configurations and protocols in LAN

Requirements:

- Windows pc – 3Nos
- CISCO Packet Tracer Software (Student Version)
- 8 port switch – 1 No
- Cat-5 LAN cable

Procedure:

- Open the CISCO Packet tracer software
- Drag and drop 3 pcs using End Device Icons on the left corner
- Select 8 port switch from switch icon list in the left bottom corner
- Make the connections using Straight through Ethernet cables
- Give IP address of the PC1, PC2 and PC3 as 192.168.1.1, 192.168.1.2 and 192.168.1.3 respectively, ping between PCs and observe the transfer of data packets in real and simulation mode.

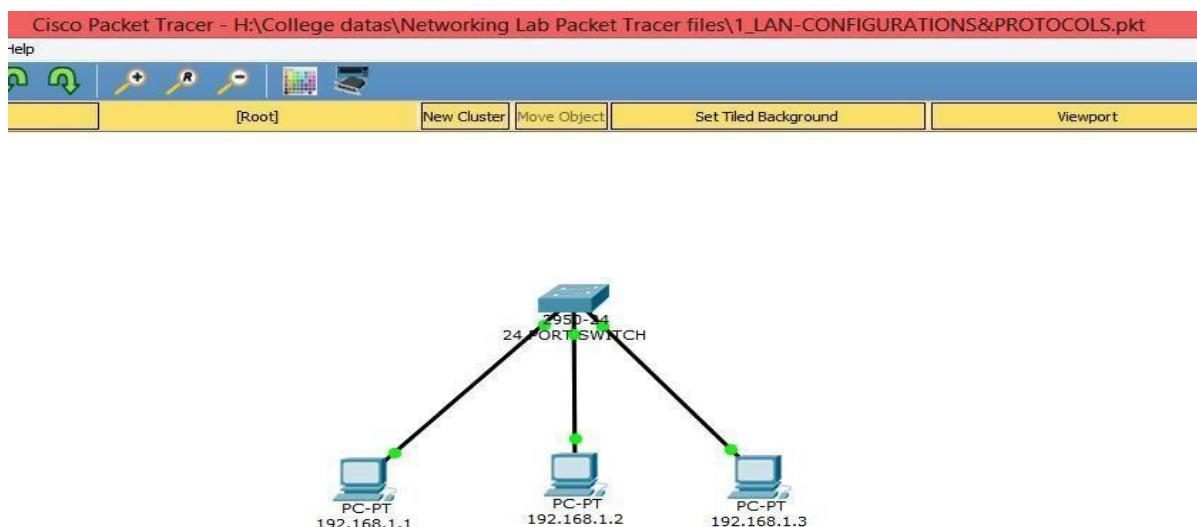
Theory:

A local area network (LAN) is a collection of devices connected together in one physical location, such as a building, office, or home. A LAN can be small or large, ranging from a home network with one user to an enterprise network with thousands of users and devices in an office or school.

A LAN comprises cables, access points, switches, routers, and other components that enable devices to connect to internal servers, web servers, and other LANs via wide area networks.

The advantages of a LAN are the same as those for any group of devices networked together. The devices can use a single Internet connection, share files with one another, print to shared printers, and be accessed and even controlled by one another.

Network Topology Diagram for LAN:



Input Details for LAN:

PC0	PC1	PC2
IP Address : 10.0.0.1 Gate way : 10.0.0.50	IP Address : 10.0.0.2 Gate way : 10.0.0.50	IP Address : 10.0.0.3 Gate way : 10.0.0.50

LAN OUTPUT WINDOW: (PINGING FROM PC0-PC1)

Packet Tracer PC Command Line 1.0

C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time=8ms TTL=128 Reply from 10.0.0.2: bytes=32 time=4ms
TTL=128 Reply from 10.0.0.2: bytes=32 time=4ms TTL=128 Reply from 10.0.0.2: bytes=32
time=4ms TTL=128

Ping statistics for 10.0.0.2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-
seconds: Minimum = 4ms, Maximum = 8ms, Average = 5ms

Result: Hence, the various configurations and protocols in LAN are analysed and the
experiment is performed successfully.

Experiment: 2

To understand the concept and operation of Routing Information Protocol (RIP)

Requirements

- Windows pc – 2 Nos
- CISCO Packet Tracer Software (Student Version)
- 8 port switch – 2 No
- Router – 2 Nos
- Cat-5 LAN cable

Procedure

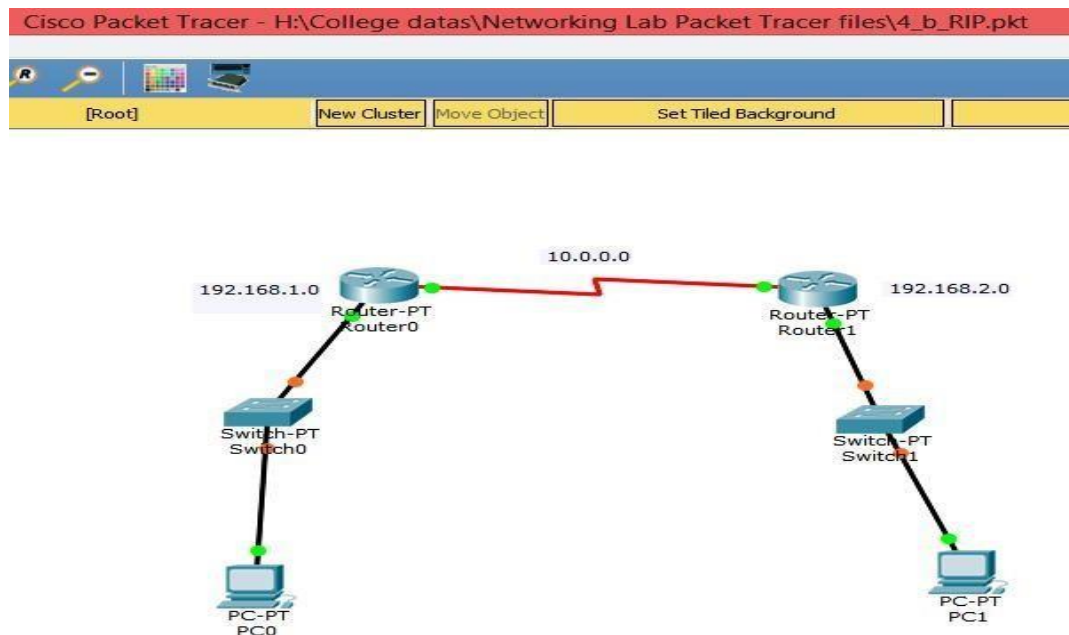
- Open the CISCO Packet tracer software
- Drag and drop 5 pcs using End Device Icons on the left corner
- Select 8 port switch from switch icon list in the left bottom corner
- Select Routers and Give the IP address for serial ports of router and apply clock rate as per the table.
- Make the connections using Straight through Ethernet cables
- Ping between PCs and observe the transfer of data packets in real and simulation mode.

Theory

RIP (Routing Information Protocol) is one of the oldest distance vector routing protocols. It is usually used on small networks because it is very simple to configure and maintain, but lacks some advanced features of routing protocols like OSPF or EIGRP. Two versions of the protocol exists: version 1 and version 2. Both versions use hop count as a metric and have the administrative distance of 120. RIP version 2 is capable of advertising subnet masks and uses multicast to send routing updates, while version 1 doesn't advertise subnet masks and uses broadcast for updates. Version 2 is backwards compatible with version 1.

RIPv2 sends the entire routing table every 30 seconds, which can consume a lot of bandwidth. RIPv2 uses multicast address of 224.0.0.9 to send routing updates, supports authentication and triggered updates (updates that are sent when a change in the network occurs).

Network Topology Diagram for RIP



Input Details for LAN:

PC0	PC1	Router 0	Router 1
IP Address : 192.168.1.2 Gate way : 192.168.1.1	IP Address: 192.168.2.2 Gate way : 192.168.2.1	<u>Fast Ethernet 0/0</u> IP Address: 192.168.1.1 <u>Serial 2/0</u> : 10.0.0.1 at 6400 clock rate	<u>Fast Ethernet 0/0</u> IP Address : 192.168.2.1 <u>Serial 2/0</u> : 10.0.0.2 no clock rate

OUTPUT:

RIP (PINGING FROM PC0 TO PC1): C:\>ping 192.168.2.2

Pinging 192.168.2.2 with 32 bytes of data:

Reply from 192.168.2.2: bytes=32 time=11ms TTL=126 Reply from 192.168.2.2: bytes=32
time=12ms TTL=126 Reply from 192.168.2.2: bytes=32 time=13ms TTL=126

Reply from 192.168.2.2: bytes=32 time=11ms TTL=126 Ping statistics for 192.168.2.2:

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

Minimum = 11ms, Maximum = 13ms, Average = 11ms

Result:

Thus, understand the concept and operation of RIP and pinged from PC in are networks to PC to another network.

COMPUTER NETWORKS
(Subject Code: 21CSC302J)
B.TECH III YEAR / V Semester

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ODD SEMESTER (2024-2025)

BONAFIDE CERTIFICATE

Registration no.....

Certified to be the bonafide record of work done by

*Of 5th semester 3rd year B.TECH degree course in SRM INSTITUTE OF SCIENCE & TECHNOLOGY, DELHI-NCR Campus for the Department of **Computer Science & Engineering**, in COMPUTER NETWORK LAB (21CSC302J) during the academic year **2024-25**.*

Lab In charges

Head of the department

Submitted for end semester examination held on __/__/__ at SRM INSTITUTE OF SCIENCE & TECHNOLOGY, DELHI-NCR Campus.

Internal Examiner-I

Internal Examiner-II

Experiment: 1

Introduction to Packet Tracer, Peer to Peer communication, study of cables and its colour codes

Aim:

- To introduce the Packet Tracer simulation tool and familiarize with its interface.
- To understand and configure a peer-to-peer (P2P) network.
- To learn about different types of networking cables and their color codes.

Materials:

- Computer with Packet Tracer installed.
- Two PCs or laptops connected via a crossover cable.

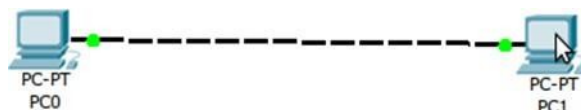
Procedure:

1. Setting Up the Network:

- o Open Packet Tracer on your computer.
- o Explore the various components of the interface:
 - **Workspace:** Where you will create and view your network topology.
 - **Device-Type Selection Box:** Where you can select different types of devices.
 - **Toolbar:** Contains tools for adding devices, connecting them, and managing the simulation.
- o Add two PCs to the workspace.
- o Connect the PCs using a crossover cable.

2. Configuring IP Addresses:

- o Assign IP addresses to both PCs.
 - **PC1 IP Address:** 192.168.1.10
 - **PC2 IP Address:** 192.168.1.11
 - **Subnet Mask:** 255.255.255.0



3. Enabling File Sharing:

- o On each PC, go to the "Desktop" tab, then click on "PC Wireless."

- o Turn on file sharing and create a shared folder on both PCs.

4. Testing the P2P Communication:

- o On PC1, go to the "Command Prompt" and ping PC2's IP address.
- o On PC2, do the same for PC1.
- o Check if both PCs can access the shared folders by using the command \\192.168.1.10 from PC2 and \\192.168.1.11 from PC1.

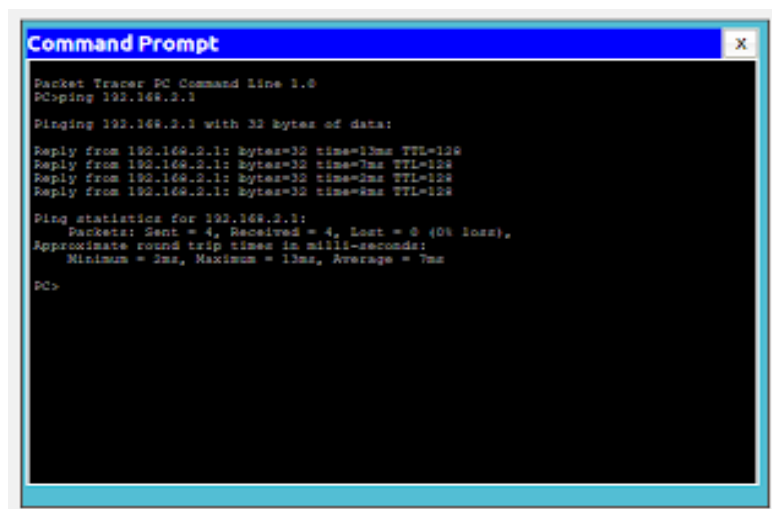
5. Understanding Cable Types:

- o **Copper Straight-Through Cable:** Used to connect different types of devices (e.g., PC to switch).
- o **Crossover Cable:** Used to connect similar devices (e.g., PC to PC).
- o **Fiber Optic Cable:** Used for high-speed data transmission over long distances.

6. Cable Color Codes:

- o **TIA/EIA-568A and TIA/EIA-568B Standards:**
 - **TIA/EIA-568A:** White/Green, Green, White/Orange, Blue, White/Blue, Orange, White/Brown, Brown.
 - **TIA/EIA-568B:** White/Orange, Orange, White/Green, Blue, White/Blue, Green, White/Brown, Brown.

OUTPUT:



```
Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 192.168.2.1

Pinging 192.168.2.1 with 32 bytes of data:

Reply from 192.168.2.1: Bytes=32 time=13ms TTL=128
Reply from 192.168.2.1: Bytes=32 time=7ms TTL=128
Reply from 192.168.2.1: Bytes=32 time=2ms TTL=128
Reply from 192.168.2.1: Bytes=32 time=4ms TTL=128

Ping statistics for 192.168.2.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 13ms, Average = 7ms

PC>
```

Experiment: 2

Implementation of Network Topologies

Aim:

To understand and implement various network topologies (Star, Bus, Ring, and Mesh) using Cisco Packet Tracer. This lab aims to provide hands-on experience in designing and analysing different network topologies and understanding their advantages and disadvantages.

Materials: Cisco Packet Tracer (latest version)

Procedure:

1. Implementing the Star Topology

- i. **Setup the Network:**
 - a. Open Cisco Packet Tracer and create a new project.
 - b. Drag and drop one **Switch** and multiple **PCs** onto the workspace.
- ii. **Connect the Devices:**
 - a. Connect each PC to the switch using **copper straight-through cables**.
- iii. **Assign IP Addresses:**
 - a. Click on each PC, go to the "Desktop" tab, and open "IP Configuration."
 - b. Assign the following IP addresses:
 - c. Subnet Mask for all PCs: 255.255.255.0
- iv. **Test Connectivity:**
 - a. Use the "Ping" command from one PC to ping the other PCs to verify connectivity.
- v. **Observation:**
 - a. Record the ping results and observe the central role of the switch in this topology.

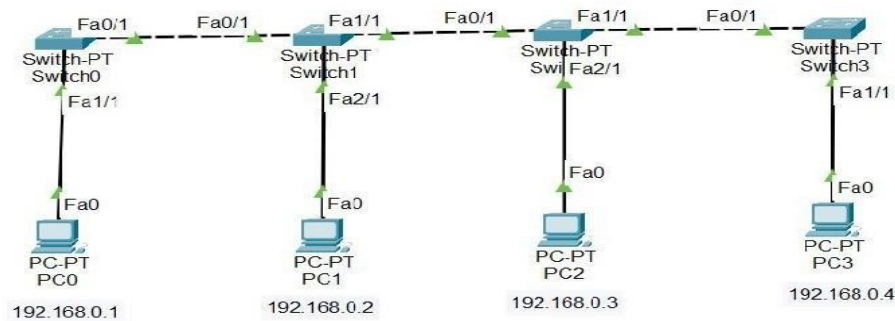


2. Implementing the Bus Topology

- i. **Setup the Network:**
 - a. In the same or new project, drag and drop a **Hub** and multiple **PCs** (e.g., 4 PCs) onto the workspace.
- ii. **Connect the Devices:**
 - a. Connect each PC to the hub using **copper straight-through cables**.
- iii. **Assign IP Addresses:**
 - a. Assign IP addresses to each PC, similar to the Star topology setup.
- iv. **Test Connectivity:**
 - a. Use the "Ping" command to test connectivity between the PCs.

v. **Observation:**

- a. Note the communication pattern in a Bus topology and the role of the hub.



3. Implementing the Ring Topology

i. **Setup the Network:**

- a. Create a new topology by dragging and dropping **PCs** and **Routers** onto the workspace. You may also use **Switches** if routers are not preferred.

ii. **Connect the Devices:**

- a. Connect the PCs in a closed-loop (ring) formation. Use **copper crossover cables** to connect each PC to another or connect each PC to a router/switch in sequence, forming a ring.

iii. **Assign IP Addresses:**

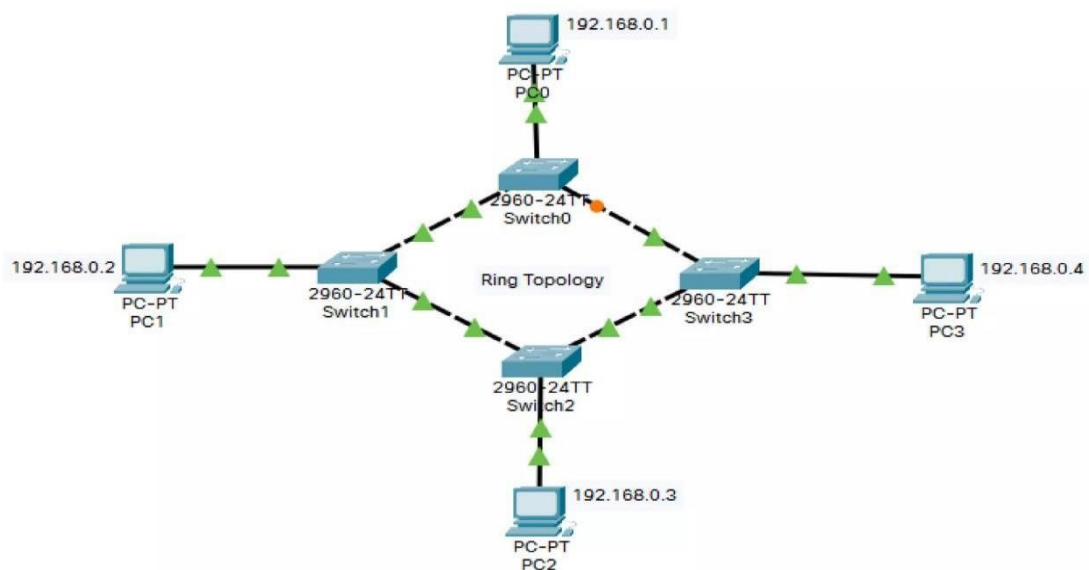
- a. Assign IP addresses to each PC as done previously.

iv. **Test Connectivity:**

- a. Ping between the PCs to ensure they are connected in a ring configuration.

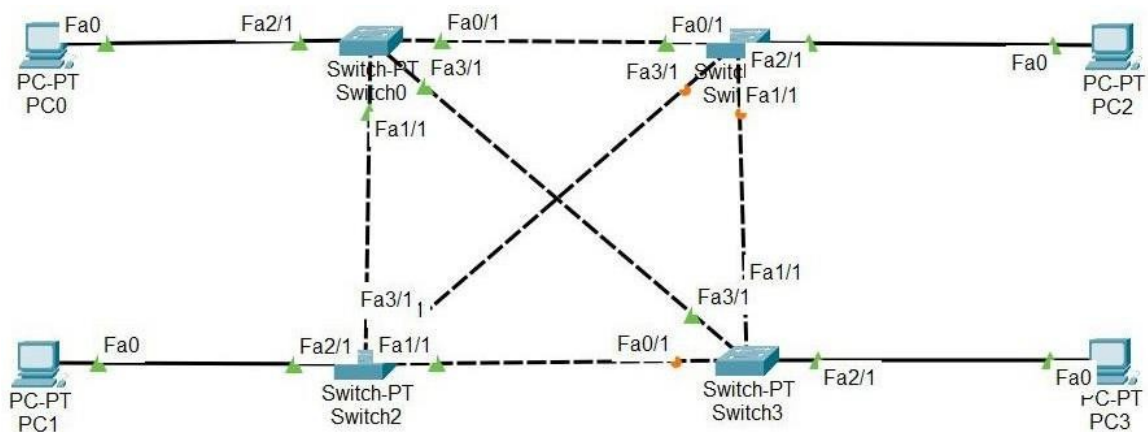
v. **Observation:**

- a. Record the behaviour of data transmission in the Ring topology.



4: Implementing the Mesh Topology

- i. **Setup the Network:**
 - a. Create a new project and drag and drop multiple **PCs** onto the workspace.
- ii. **Connect the Devices:**
 - a. In a Mesh topology, each device is connected to every other device.
 - b. Use **copper crossover cables** to connect each PC to every other PC.
- iii. **Assign IP Addresses:**
 - a. Assign IP addresses to each PC, similar to previous setups.
- iv. **Test Connectivity:**
 - a. Ping from each PC to all other PCs to verify full connectivity.
- v. **Observation:**
 - a. Observe the redundancy and fault tolerance offered by the Mesh topology.



OUTPUT:

```
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.4

Pinging 192.168.1.4 with 32 bytes of data:

Reply from 192.168.1.4: bytes=32 time=1ms TTL=128
Reply from 192.168.1.4: bytes=32 time=2ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.1.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>|
```

Experiment: 3

Router Configuration (Creating Passwords, Configuring Interfaces)

Aim:

To configure a Cisco router by setting up passwords for different access modes and configuring the router's interfaces with IP addresses to enable network communication.

Materials: Cisco Packet Tracer (latest version)

Procedure:

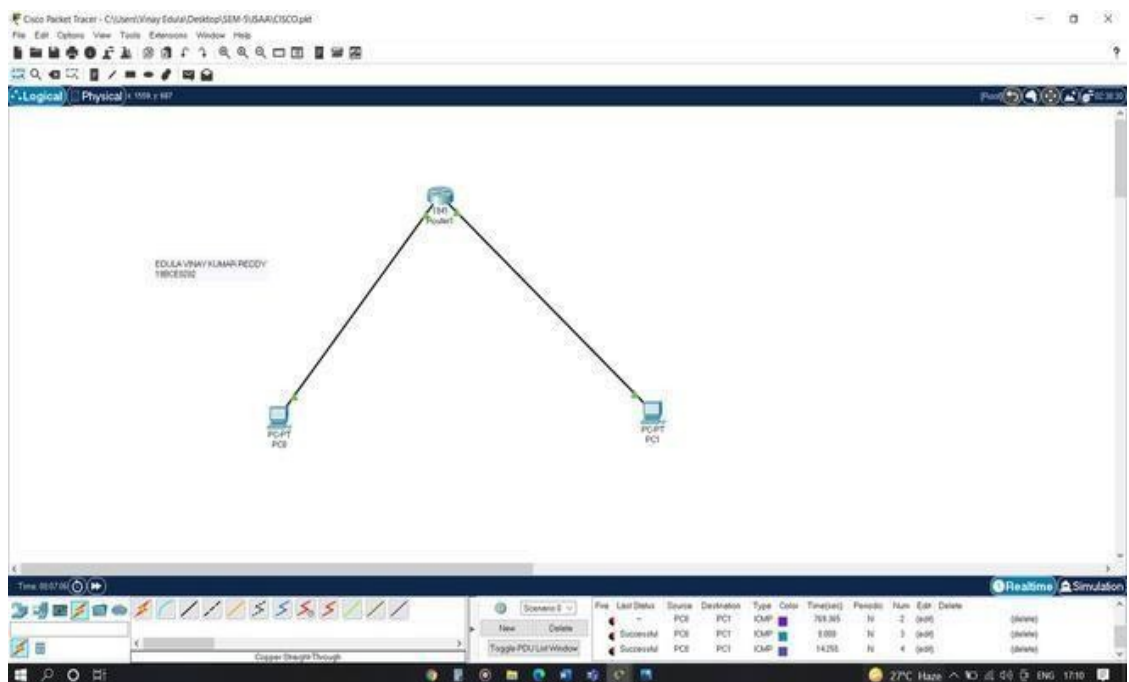
1: Setting Up the Network

i. Setup the Network:

- Open Cisco Packet Tracer and create a new project.
- Drag and drop a **Router** (e.g., Cisco 2811), a **Switch**, and two **PCs** onto the workspace.

ii. Connect the Devices:

- Connect the router to the switch using a **copper straight-through cable** (connect the router's GigabitEthernet0/0 interface to any port on the switch).
- Connect each PC to the switch using **copper straight-through cables**.



2: Accessing the Router and Creating Passwords

i. Access the Router:

- Click on the router to open its configuration window.
- Go to the "CLI" tab to access the Command Line Interface (CLI).

ii. Enter Global Configuration Mode:

- a. Type enable to enter privileged EXEC mode.
 - b. Type configure terminal to enter global configuration mode.
- iii. **Set the Enable Password:**
 - a. Type enable secret yourpassword to set an encrypted enable password (replace yourpassword with your desired password).
- iv. **Set Console Password:**
 - a. Type line console 0 to configure the console line.
 - b. Type password yourpassword to set the console password.
 - c. Type login to enable password checking at login.
- v. **Exit to Global Configuration Mode:**
 - a. Type exit to return to the global configuration mode.

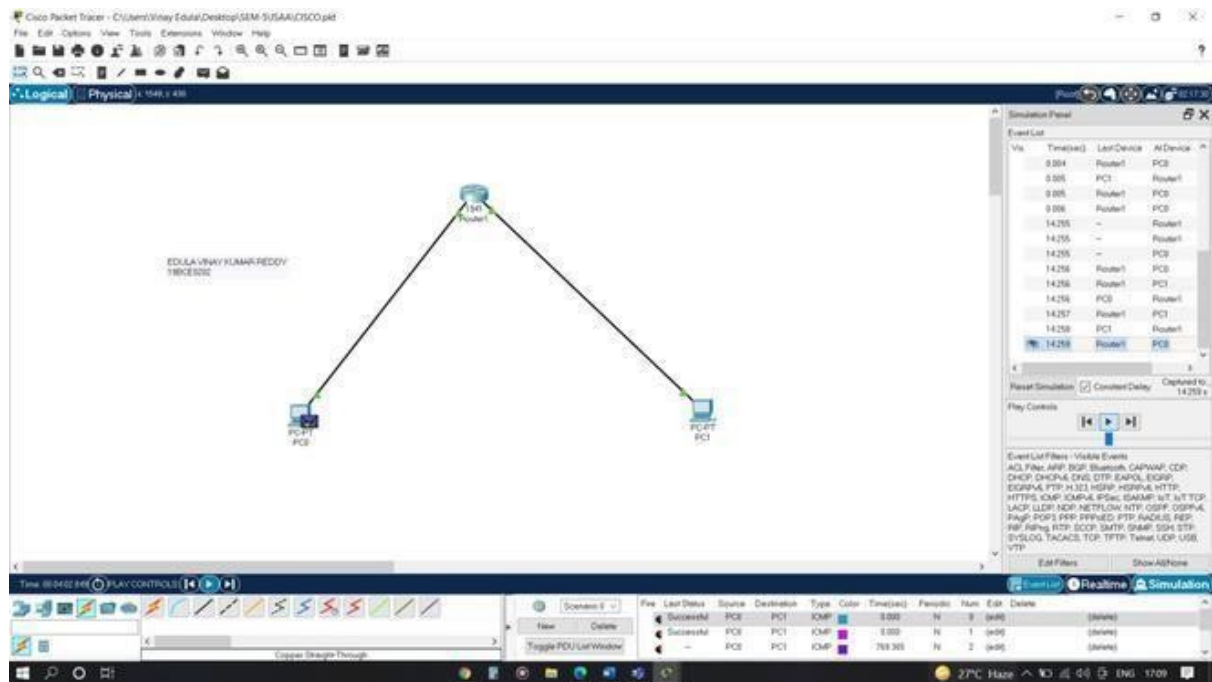
3: Configuring Router Interfaces

- i. **Configure GigabitEthernet0/0 Interface:**
 - a. In global configuration mode, type interface GigabitEthernet0/0.
 - b. Type ip address 192.168.1.1 255.255.255.0 to assign an IP address to the interface.
 - c. Type no shutdown to enable the interface.
 - d. Type exit to return to global configuration mode.
- ii. **Configure GigabitEthernet0/1 Interface (Optional):**
 - a. If you have a second network to connect, repeat the steps for the GigabitEthernet0/1 interface:
 - b. Type interface GigabitEthernet0/1.
 - c. Type ip address 192.168.2.1 255.255.255.0 to assign an IP address to this interface.
 - d. Type no shutdown to enable the interface.
 - e. Type exit to return to global configuration mode.
- iii. **Save the Configuration:**
 - a. Type exit to return to privileged EXEC mode.
 - b. Type write memory or copy running-config startup-config to save the configuration.

4: Testing the Configuration

- i. **Assign IP Addresses to PCs:**
 - a. Click on each PC, go to the "Desktop" tab, and select "IP Configuration."
 - b. Assign the following IP addresses:
 - i. **PC1:** IP Address: 192.168.1.2, Subnet Mask: 255.255.255.0, Default Gateway: 192.168.1.1
 - ii. **PC2:** IP Address: 192.168.1.3, Subnet Mask: 255.255.255.0, Default Gateway: 192.168.1.1
- ii. **Test Connectivity:**
 - a. On **PC1**, open the "Command Prompt" from the "Desktop" tab.
 - b. Type ping 192.168.1.1 to check connectivity to the router.
 - c. Type ping 192.168.1.3 to check connectivity between the PCs.
- iii. **Telnet to the Router (Optional):**
 - a. On **PC1**, open the "Command Prompt" and type telnet 192.168.1.1 to remotely access the router.
 - b. Enter the VTY password when prompted.

OUTPUT :



Experiment: 4

IP addressing and Sub netting (VLSM)

Aim:

To understand and implement Variable Length Subnet Masking (VLSM) in IP addressing by dividing a network into multiple subnets with varying subnet sizes. This lab will involve designing a network topology, assigning IP addresses using VLSM, and verifying network connectivity using Cisco Packet Tracer.

Materials: Cisco Packet Tracer (latest version)

Procedure:

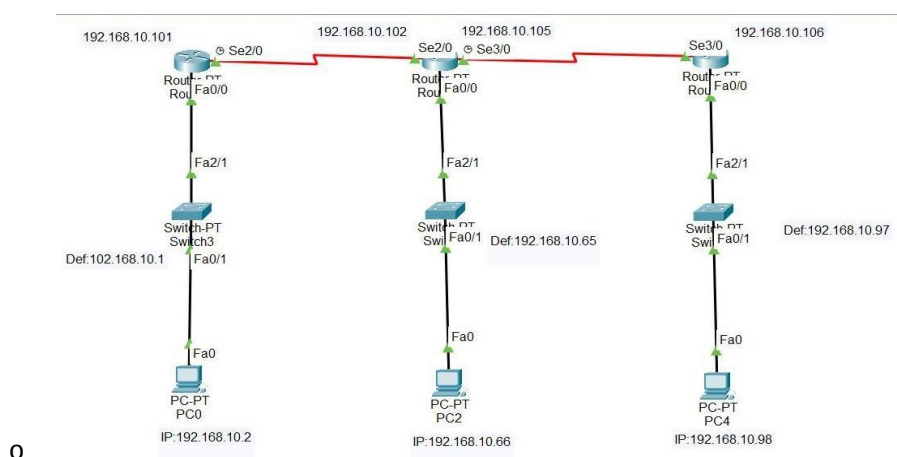
1. Designing the Network Topology

1. Create a New Project:

- o Open Cisco Packet Tracer and create a new project.

2. Set Up the Network Topology:

- o Drag and drop the following devices onto the workspace:
 - **3 Routers** (e.g., R1, R2, R3)
 - **3 Switches** (e.g., S1, S2, S3)
 - **3 PCs** (e.g., PC0, PC1, PC2)
- o Connect the routers to each other using **serial cables** (e.g., R1 to R2, R2 to R3).
- o Connect each router to its corresponding switch using **copper straight-through cables**.
- o Connect the PCs to their respective switches using **copper straight-through cables**.



2. Configuring the Network in Packet Tracer

Configure Router R1: Access R1's CLI and enter the following commands:

enable

configure terminal

interface GigabitEthernet0/0

ip address 192.168.1.1 255.255.255.192

no shutdown

exit

interface Serial0/0/0

ip address 192.168.1.113 255.255.255.252

clock rate 64000

no shutdown

exit

Configure Router R2: Access R2's CLI and enter the following commands:

enable

configure terminal

interface GigabitEthernet0/0

ip address 192.168.1.65 255.255.255.224

no shutdown

exit

interface Serial0/0/0

ip address 192.168.1.114 255.255.255.252

no shutdown

exit

interface Serial0/0/1

ip address 192.168.1.117 255.255.255.252

clock rate 64000

no shutdown

exit

Configure Router R3: Access R3's CLI and enter the following commands:

enable

configure terminal

interface GigabitEthernet0/0

ip address 192.168.1.97 255.255.255.240

no shutdown

exit

interface Serial0/0/0

ip address 192.168.1.118 255.255.255.252

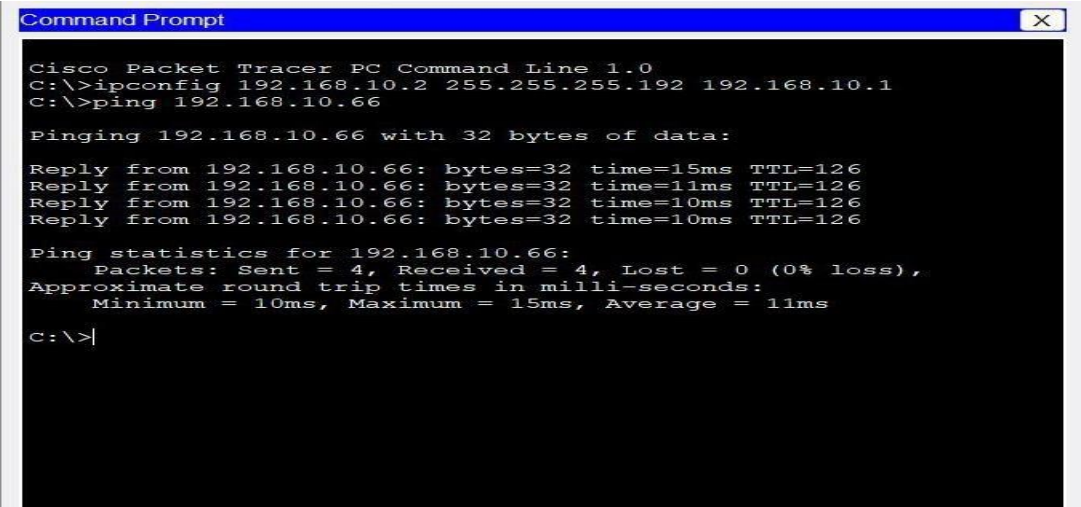
no shutdown

exit

Configure the PCs with IP Addresses:

- On each PC connected to R1's LAN, assign IP addresses from the range 192.168.1.2 - 192.168.1.62.
- On each PC connected to R2's LAN, assign IP addresses from the range 192.168.1.66 - 192.168.1.94.
- On each PC connected to R3's LAN, assign IP addresses from the range 192.168.1.98 - 192.168.1.110.

OUTPUT :



```
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig 192.168.10.2 255.255.255.192 192.168.10.1
C:\>ping 192.168.10.66

Pinging 192.168.10.66 with 32 bytes of data:

Reply from 192.168.10.66: bytes=32 time=15ms TTL=126
Reply from 192.168.10.66: bytes=32 time=11ms TTL=126
Reply from 192.168.10.66: bytes=32 time=10ms TTL=126
Reply from 192.168.10.66: bytes=32 time=10ms TTL=126

Ping statistics for 192.168.10.66:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 15ms, Average = 11ms

C:\>|
```

Experiment: 5

Static and Default Routing

Aim:

To understand and implement static and default routing in a network using Cisco Packet Tracer. This lab will involve configuring static routes and default routes to ensure proper network connectivity between different subnets.

Materials : Cisco Packet Tracer (latest version)

Procedure:

1. Designing the Network Topology

i. Create a New Project:

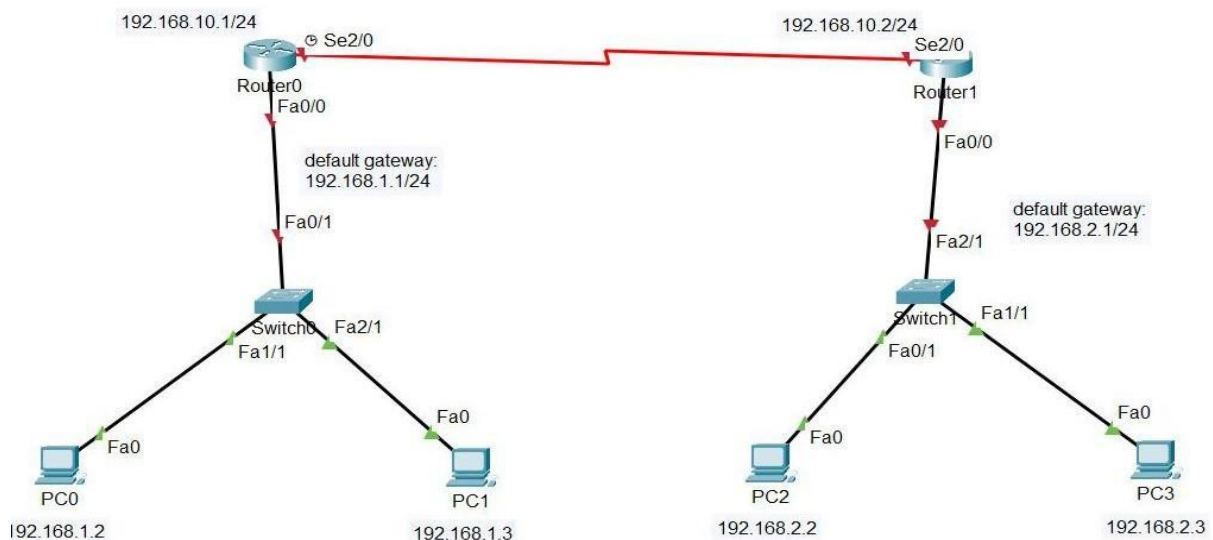
- a. Open Cisco Packet Tracer and create a new project.

ii. Set Up the Network Topology:

- a. Drag and drop the following devices onto the workspace:
 - i. **2 Routers** (e.g., R1, R2)
 - ii. **2 Switches** (e.g., S1, S2)
 - iii. **4 PCs** (2 PCs connected to each switch)
- b. Connect each router to its corresponding switch using **copper straight-through cables**.
- c. Connect the routers to each other using **serial cables**.
- d. Connect the PCs to their respective switches using **copper straight-through cables**.

2: Configuring IP Addressing

- i. Assign IP Addresses to Each Network:
- ii. Configure Serial Connections Between Routers



3. Configuring Static Routing

i. Configure Static Routes on R1:

- a. Access R1's CLI and enter the following commands:
 - i. enable
 - ii. configure terminal
 - iii. ip route 192.168.2.0 255.255.255.0 10.0.0.2
 - iv. ip route 192.168.3.0 255.255.255.0 10.0.0.2
 - v. exit

ii. Configure Static Routes on R2:

- a. Access R2's CLI and enter the following commands:
 - i. enable
 - ii. configure terminal
 - iii. ip route 192.168.1.0 255.255.255.0 10.0.0.1
 - iv. ip route 192.168.3.0 255.255.255.0 10.0.0.6
 - v. exit

4. Configuring Default Routing

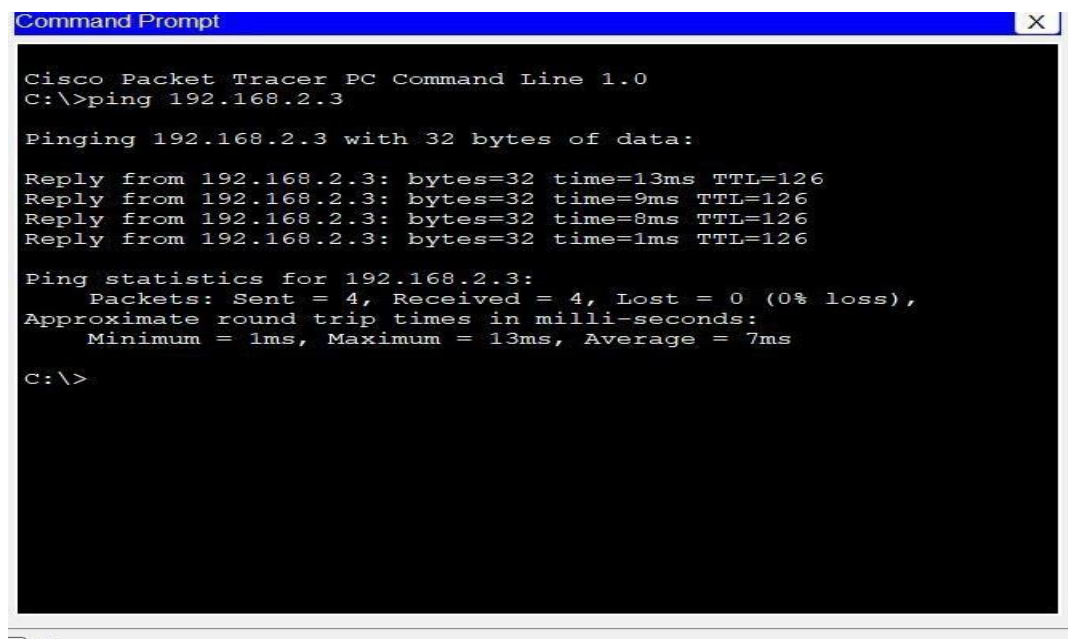
i. Configure a Default Route on R1:

- a. Access R1's CLI and enter the following command:
 - i. enable
 - ii. configure terminal
 - iii. ip route 0.0.0.0 0.0.0.0 10.0.0.2
 - iv. exit

ii. Configure a Default Route on R2:

- a. Access R3's CLI and enter the following command:
 - i. enable
 - ii. configure terminal
 - iii. ip route 0.0.0.0 0.0.0.0 10.0.0.

OUTPUT:



```
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.2.3

Pinging 192.168.2.3 with 32 bytes of data:

Reply from 192.168.2.3: bytes=32 time=13ms TTL=126
Reply from 192.168.2.3: bytes=32 time=9ms TTL=126
Reply from 192.168.2.3: bytes=32 time=8ms TTL=126
Reply from 192.168.2.3: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.2.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 13ms, Average = 7ms

C:\>
```