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

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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:

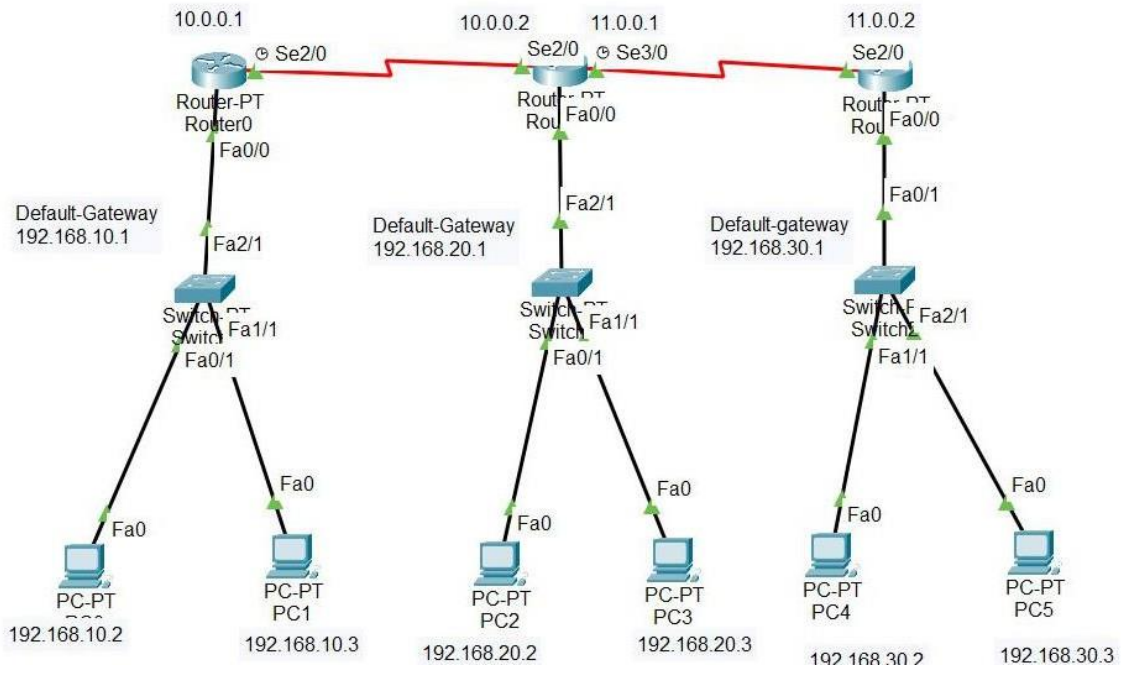
To understand and configure the Routing Information Protocol Version 1 (RIPv1) on Cisco routers using Packet Tracer.

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
```

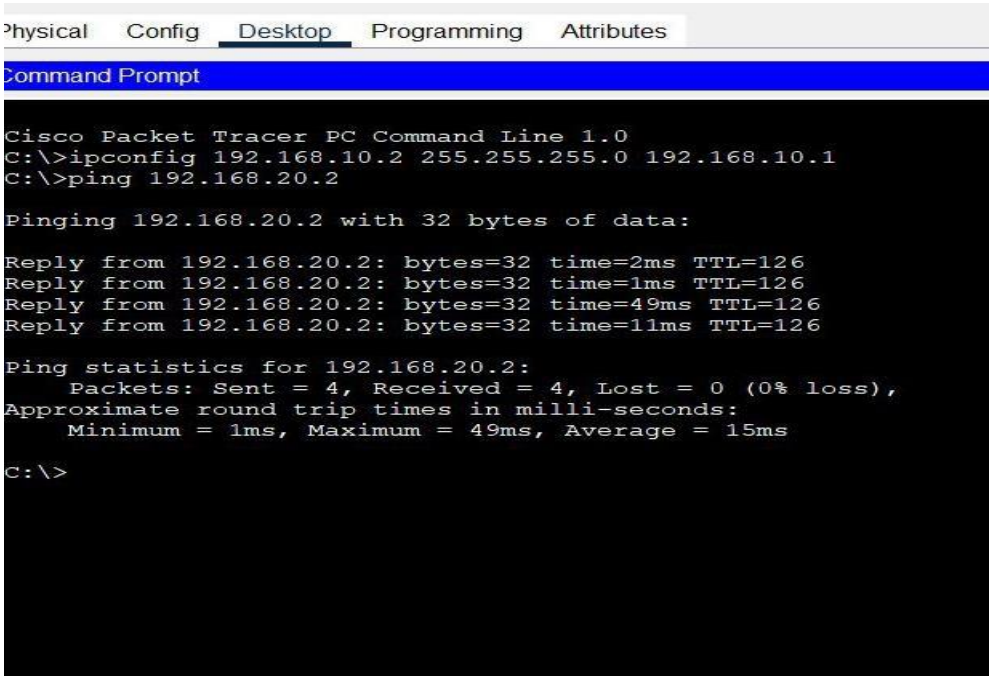
RIP Routes for Router1 are given below:

```
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



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.

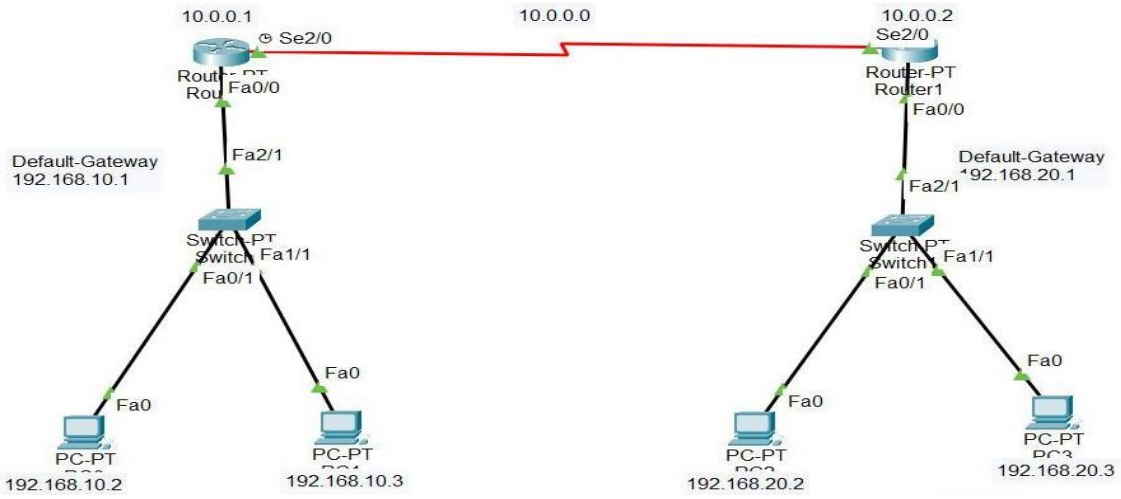
Materials: Cisco Packet Tracer (latest version)

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
```

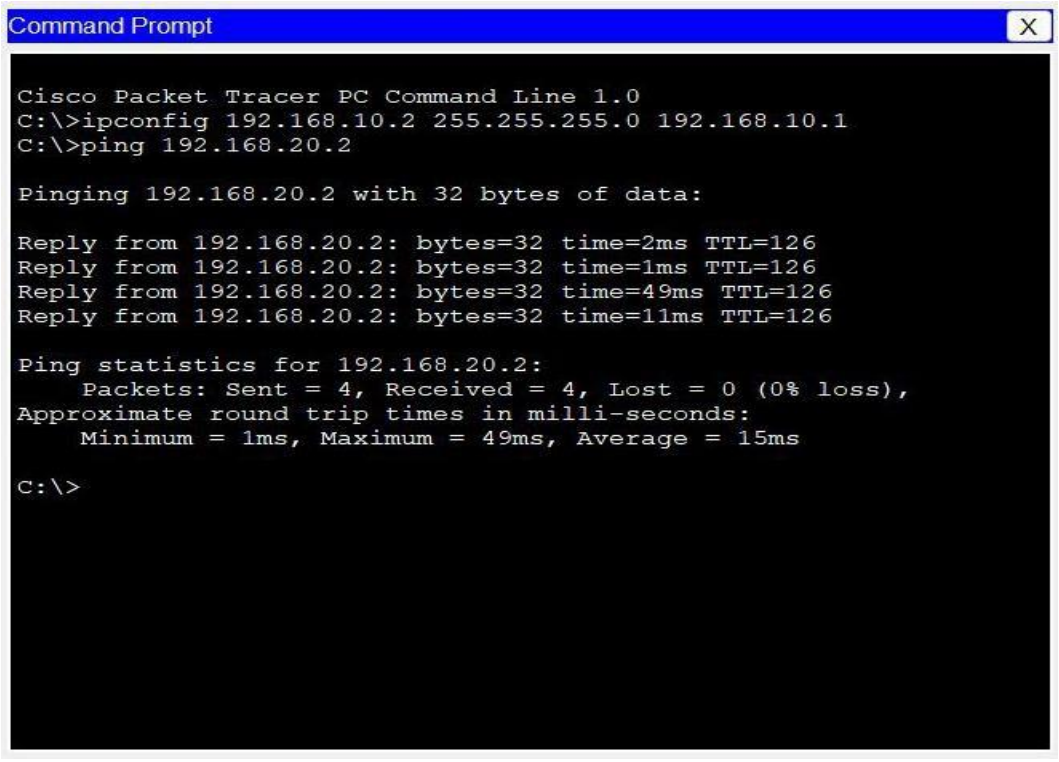
Router2(config-router)# network 192.168.2.0

Router2(config-router)# network 10.0.0.0

Router2(config-router)# exit

Router2(config)# exit

4. Verification of RIP Configuration



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

Experiment: 9

Implementation of Single Area OSPF

Aim:

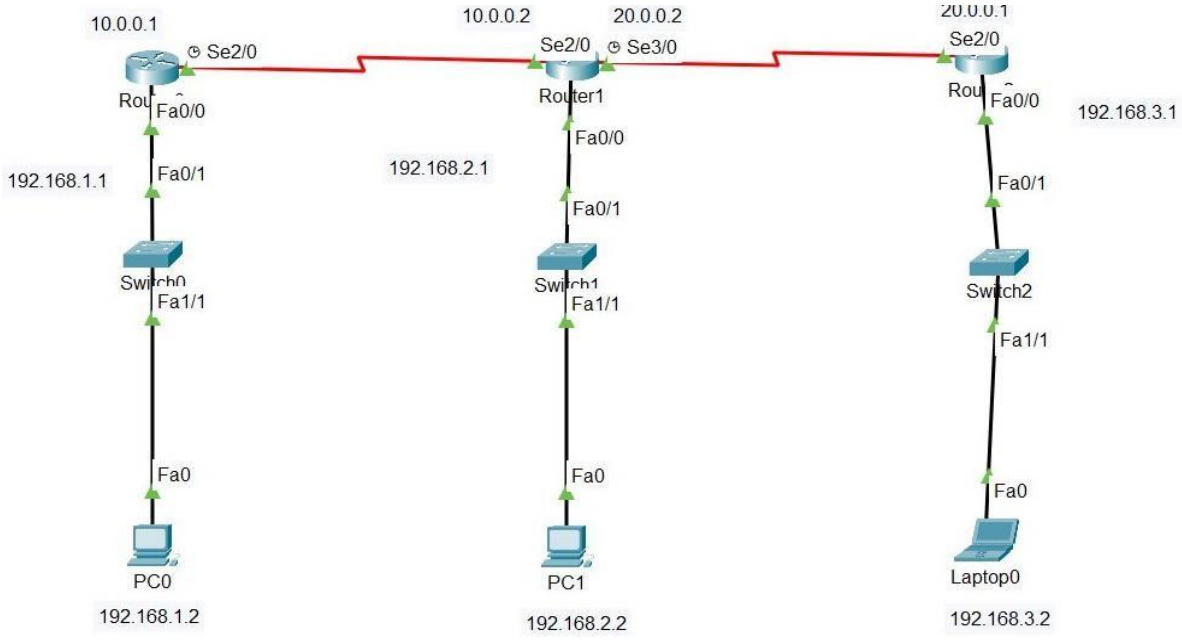
To configure and verify a Single Area OSPF (OSPFv2) routing protocol on Cisco routers using Packet Tracer.

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.

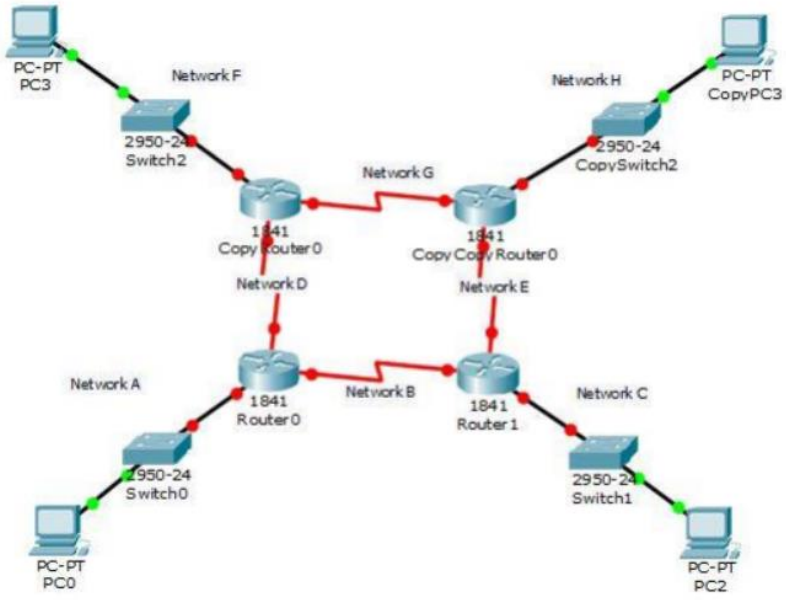
ii. Add the devices to the workspace:

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)# routerospf1

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

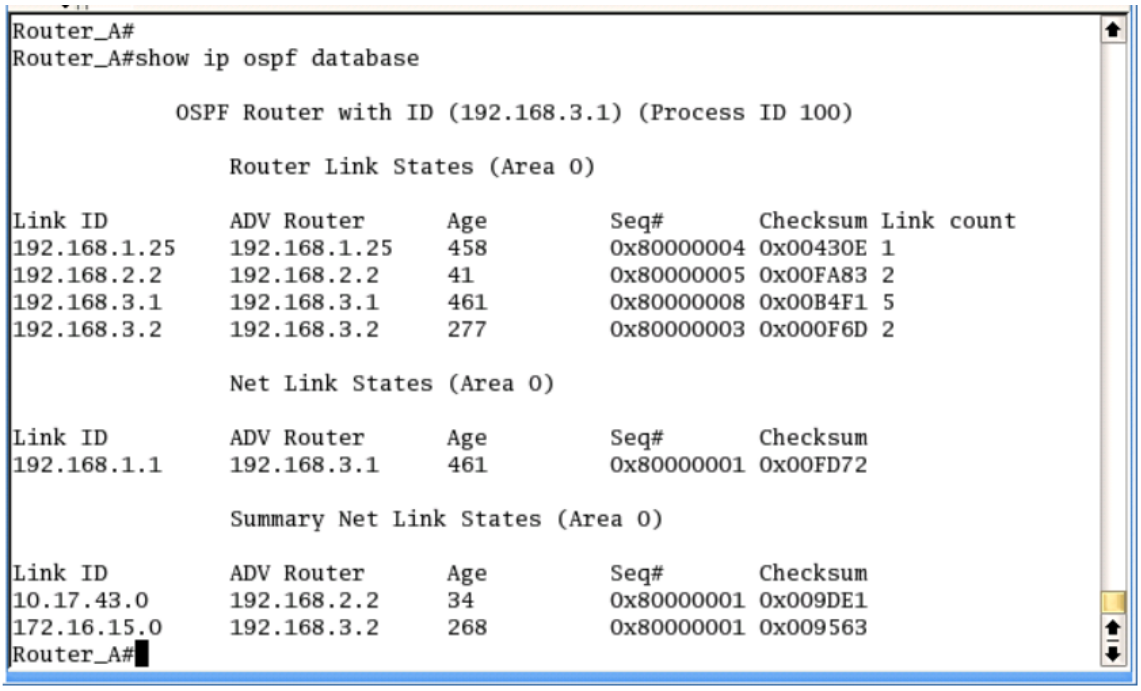
Ping Test:

- 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:

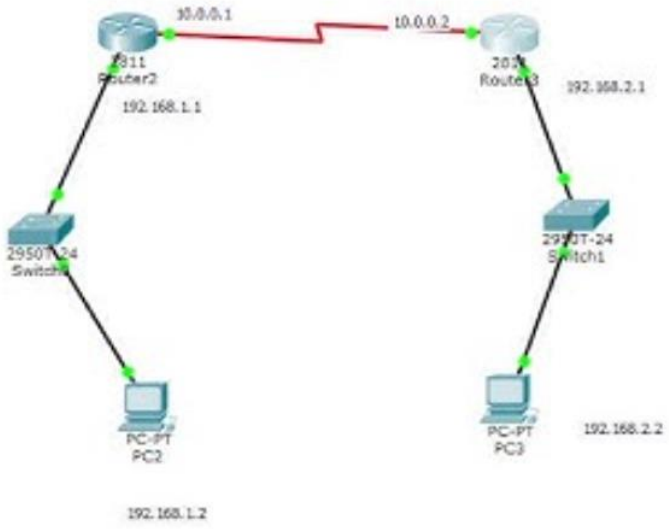
To configure and verify the Point-to-Point Protocol (PPP) with authentication (PAP or CHAP) on Cisco routers using Packet Tracer.

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:

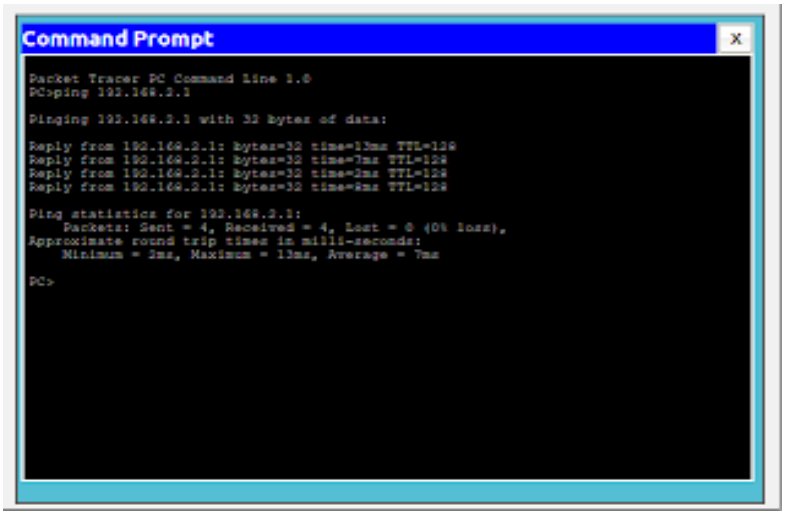
Router# show interfaces serial 0/0/0

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.



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

Experiment: 12

HDLC Configuration

Aim:

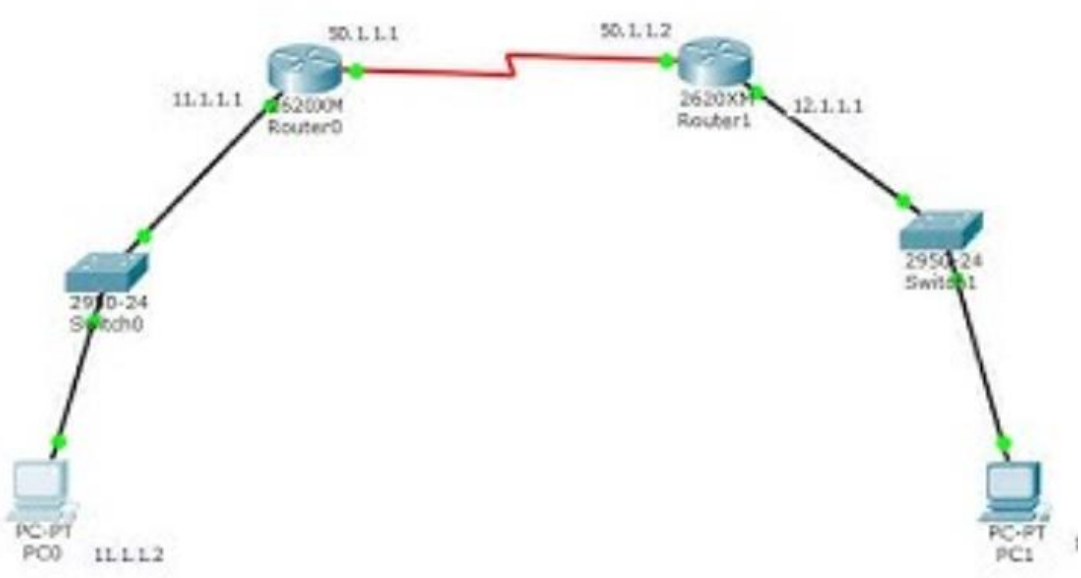
To configure and verify the High-Level Data Link Control (HDLC) protocol on a point-to-point serial connection between two Cisco routers using Packet Tracer.

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:**

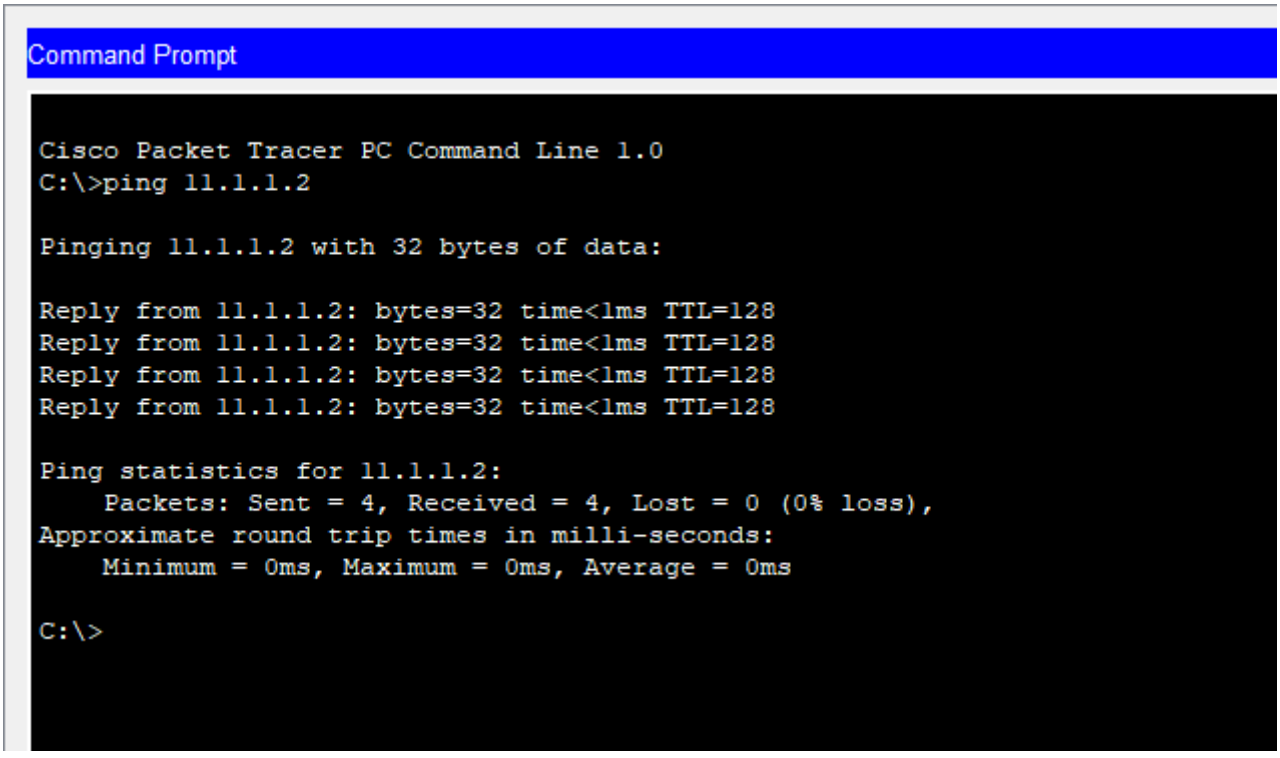
On both routers, verify that the routes are correctly populated:

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:



Experiment: 13

Implementation of BGP

Aim:

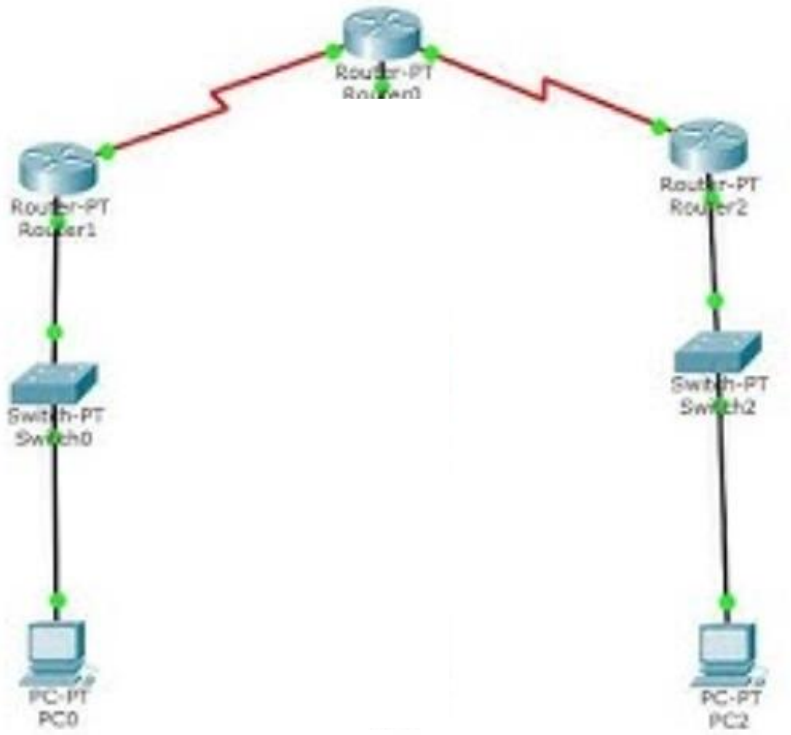
To configure and verify Border Gateway Protocol (BGP) on Cisco routers in a simulated network environment using Packet Tracer. This lab focuses on basic BGP configuration between two Autonomous Systems (AS)

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

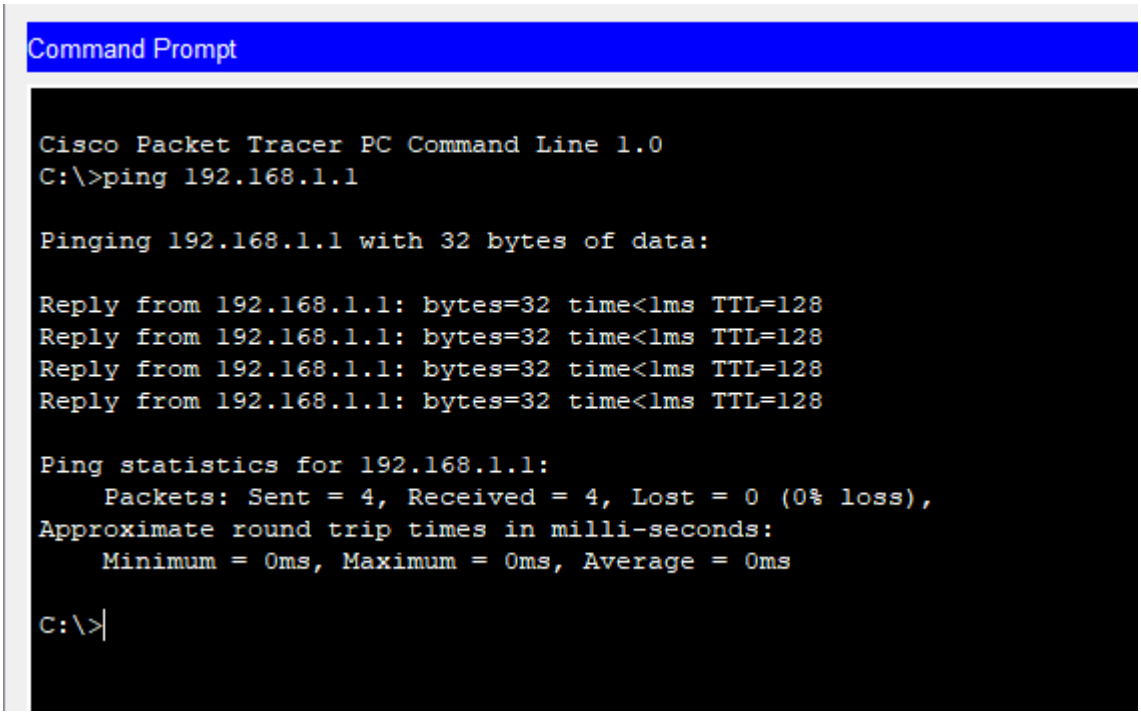
We should see Router 2 and Router 3 as neighbors.

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.



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

Experiment: 14

Implementation of EIGRP

Aim:

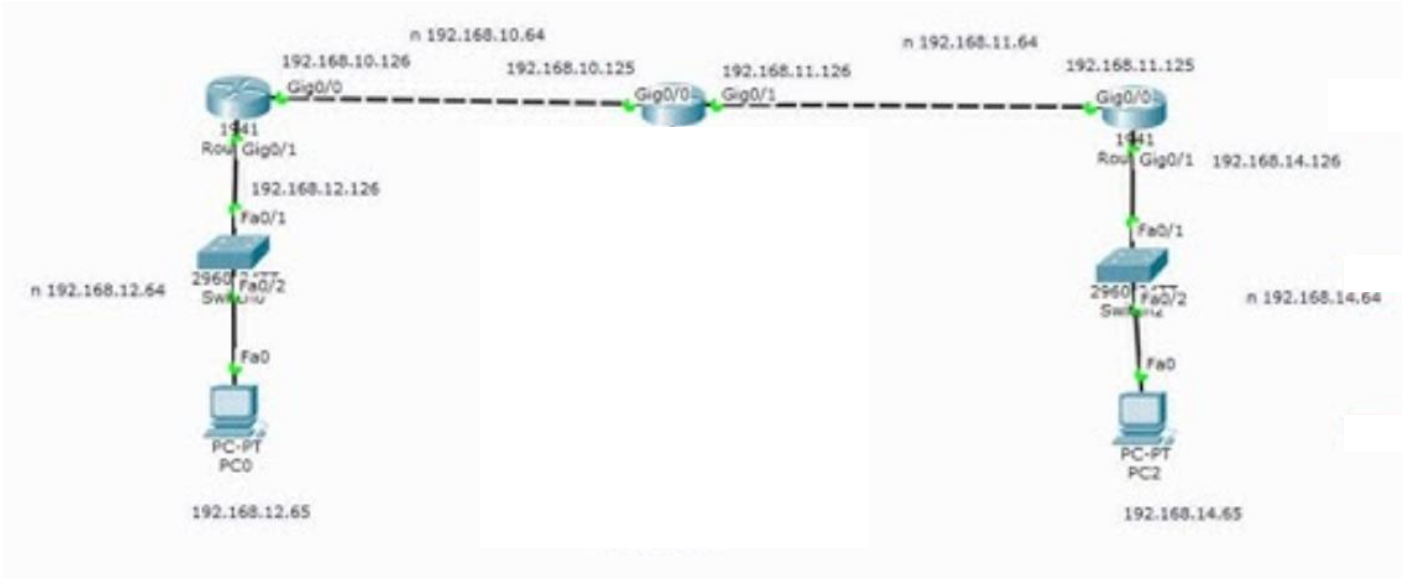
To configure and verify Enhanced Interior Gateway Routing Protocol (EIGRP) on Cisco routers in a simulated network environment using Packet Tracer. This lab will demonstrate the basic configuration of EIGRP for dynamic routing..

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.

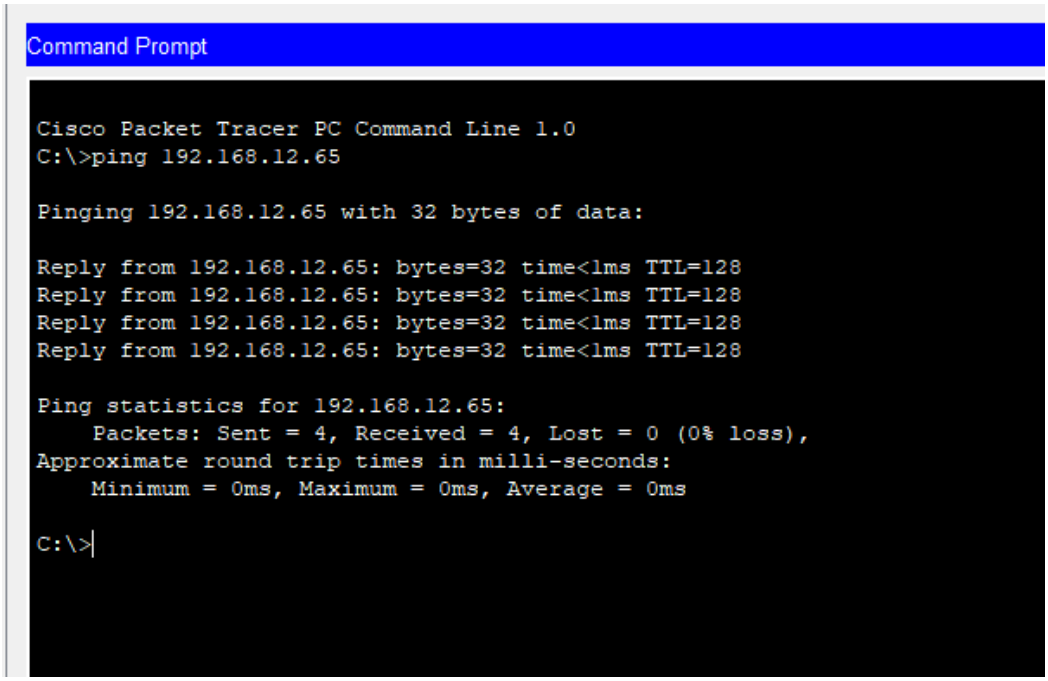
Check EIGRP Routing Table:

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.



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

Experiment: 15

Telnet Configuration

Aim:

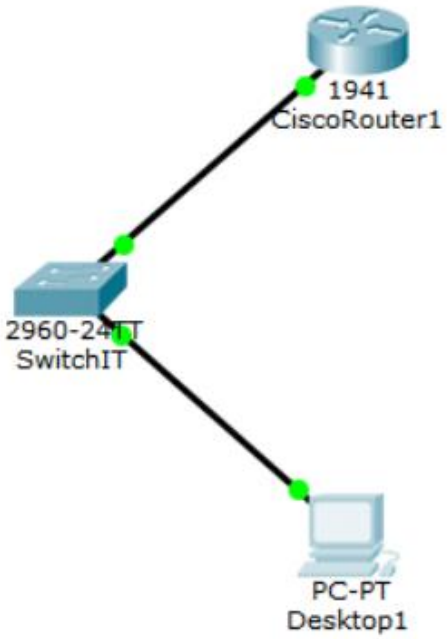
To configure and verify Telnet access on a Cisco router in a simulated network environment using Packet Tracer. This lab will demonstrate the steps required to set up Telnet access for remote management.

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).

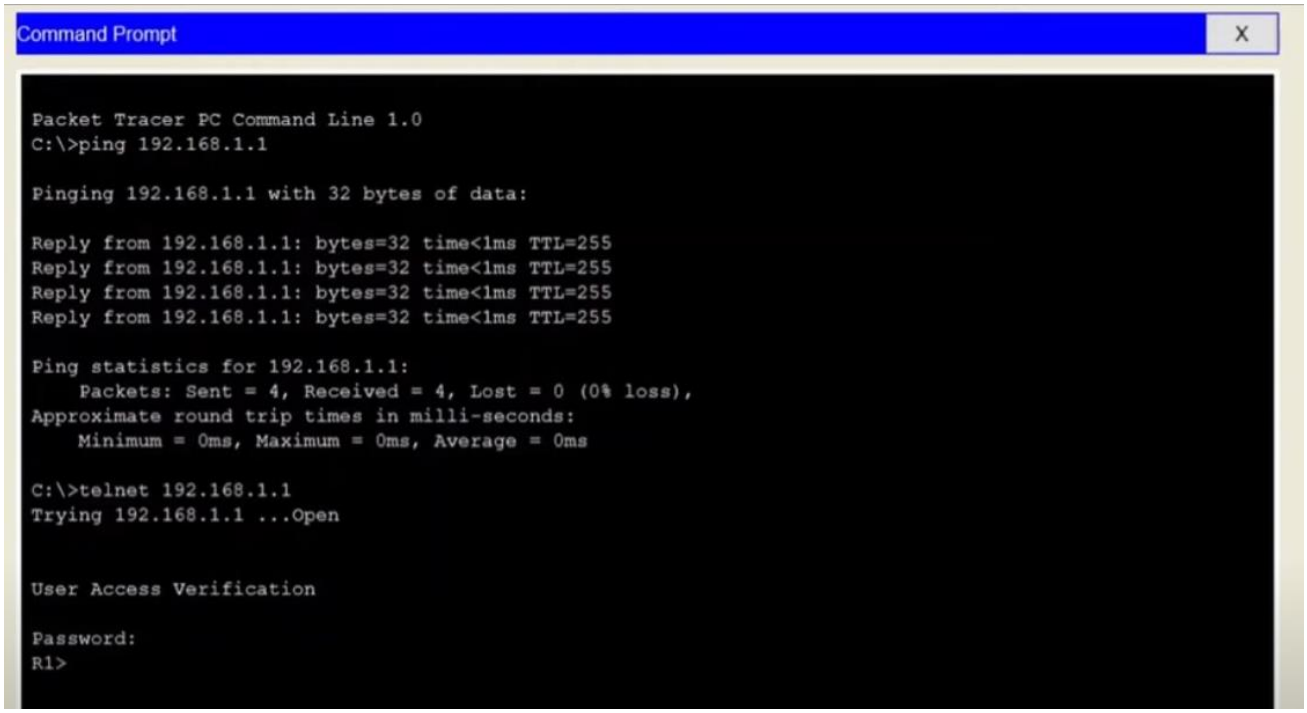
Verify Telnet Connection:

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.



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.

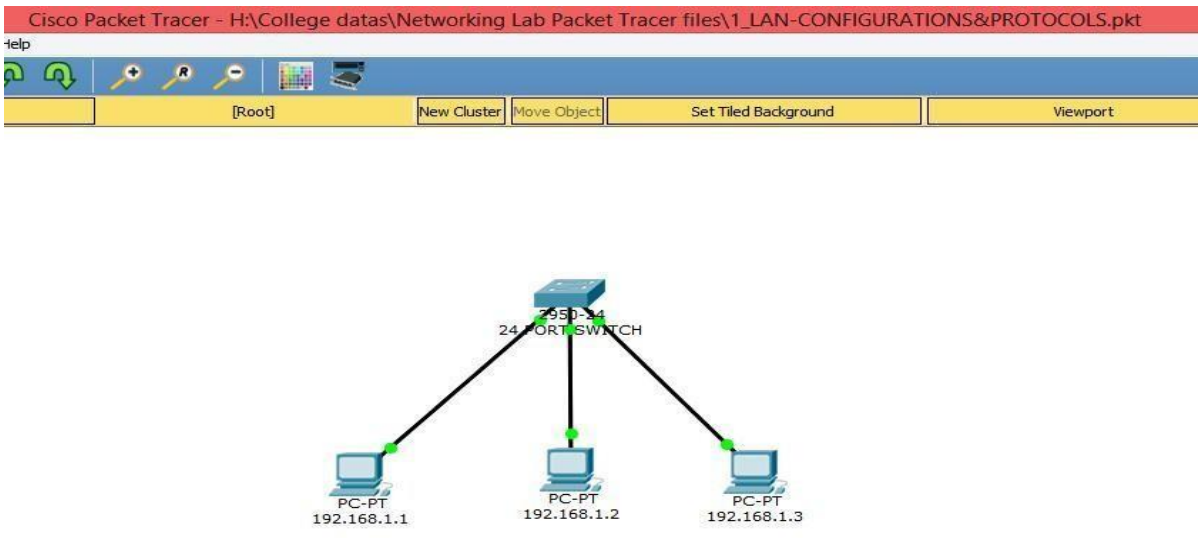
Theory:

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

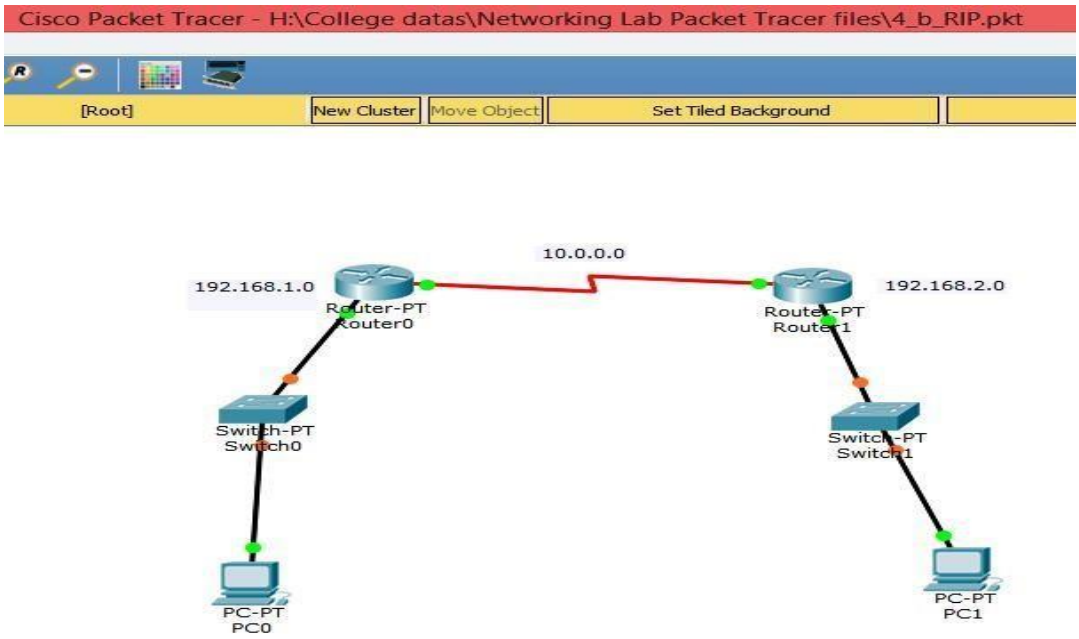
- Open the CISCO Packet tracer software
- Drag and drop 5 pcs using End Device Icons on the left corner
- Select 8 port switch from switch icon list in the left bottom corner
- Select Routers and Give the IP address for serial ports of router and apply clock rate asper the table.
- Make the connections 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 metricand 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	Fast Ethernet 0/0 IP Address: 192.168.1.1 Serial 2/0 : 10.0.0.1 at 6400 clock rate	Fast Ethernet 0/0 IP Address : 192.168.2.1 Serial 2/0 : 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.