Ex No: 8

Date:

PERFORMANCE ANALYSIS OF ROUTING PROTOCOLS USING SIMULATION TOOL.

A) Routing Information Protocol (RIP)

B) Open shortest Path First Protocol (OSPF)

Aim:

To configure and study the implementation of dynamic routing protocols, RIP (Routing Information Protocol) and OSPF (Open Shortest Path First), in a simulated network environment using Cisco Packet Tracer.

Theory:

Dynamic Routing is a method where routers automatically adjust the paths to network destinations based on current network conditions. Unlike static routing, where routes are manually configured, dynamic routing allows routers to share routing information and adapt to network changes such as link failures or topology changes.

A) RIP (Routing Information Protocol) is a distance-vector routing protocol that uses hop count as a routing metric. It periodically broadcasts its entire routing table to its neighbours every 30 seconds. RIP is simple but limited to smaller networks due to its maximum hop count of 15.

b) OSPF (Open Shortest Path First) is a link-state routing protocol that uses the Dijkstra algorithm to compute the shortest path to each network. Unlike RIP, OSPF sends routing updates only when there are changes in the network, making it more efficient for larger and more complex networks. OSPF supports hierarchical routing using areas, improving scalability and network management.

In this experiment, RIP and OSPF will be configured on routers within a simulated network environment using Cisco Packet Tracer. The performance and behavior of these protocols will be observed by examining how they populate the routing tables and handle network changes.

Procedure :

Routing Information Protocol (RIP) is an active routing protocol that operates hop count as a routing metric to find the most suitable route between the source and the destination network. It is a distance-vector routing protocol that has an AD value of 120 and works on the Network layer of the OSI model.

Steps to Configure and Verify Three Router Connections in Cisco Packet Tracer using RIP Routing:

Step 1: First, open the Cisco packet tracer desktop and select the devices given below:

S.NO	Device	Model Name	Qty.
1.	PC	PC	6
2.	Switch	PT-Switch	3
3.	Router	PT-router	3

IP Addressing Table:

S.NO	Device	IPv4 Address	Subnet mask	Default Gateway
1.	PC0	192.168.10.2	255.255.255.0	192.168.10.1
2.	PC1	192.168.10.3	255.255.255.0	192.168.10.1

S.NO	Device	IPv4 Address	Subnet mask	Default Gateway
3.	PC2	192.168.20.2	255.255.255.0	192.168.20.1
4.	PC3	192.168.20.3	255.255.255.0	192.168.20.1
5.	PC4	192.168.30.2	255.255.255.0	192.168.30.1
6.	PC5	192.168.30.3	255.255.255.0	192.168.30.1

- Then, create a network topology as shown below the image.
- Use an Automatic connecting cable to connect the devices with others.

Step 2: Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table given above.

- To assign an IP address in PC0, click on PC0.
- Then, go to desktop and then IP configuration and there you will IPv4 configuration.
- Fill IPv4 address and subnet mask.
- Assigning an IP address using the ipconfig command, or we can also assign an IP address with the help of a command.
- Go to the command terminal of the PC.
- Then, type iPConfig <IPv4 address><subnet mask><default gateway>(if needed)

Example: iPConfig 192.168.10.2 255.255.255.0 192.168.10.1

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

Step 3: Configure router with IP address and Subnet mask.

IP Addressing Table Router:

S.NO	Device	Interface	IPv4 Address	Subnet mask
1.	router0	FastEthernet0/0	192.168.10.1	255.255.255.0
		Serial2/0	10.0.0.1	255.0.0.0
2.	router1	FastEthernet0/0	192.168.20.1	255.255.255.0
		Serial2/0	10.0.0.2	255.0.0.0
		Serial3/0	11.0.0.1	255.0.0.0
3.	router2	FastEthernet0/0	192.168.30.1	255.255.255.0
		Serial2/0	11.0.0.2	255.0.0.0

- To assign an IP address in router0, click on router0.
- Then, go to config and then Interfaces.
- Make sure to turn on the ports.
- Then, configure the IP address in FastEthernet and serial ports according to IP addressing Table.
- Fill IPv4 address and subnet mask.

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

Step 4: After configuring all of the devices we need to assign the routes to 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

Step 5: Verifying the network by pinging the IP address of any PC.

- We will use the ping command to do so.
- First, click on PC0 then Go to the command prompt.
- Then type ping <IP address of targeted node>.
- As we can see in the below image we are getting replies which means the connection is working properly.

Example : ping 192.168.20.2

A simulation of the experiment is given below we are sending PDU from PC0 to PC2 and PC3 to PC5

Steps to Execute – Input /Output Sections

(i) Set Up Network Topology:

- Open Cisco Packet Tracer and create a new project.
- Add three routers, three switches, and six PCs to the workspace.
- Connect the routers to each other and to the switches using serial or Ethernet cables, and connect the PCs to the switches.

(ii) Assign IP Addresses:

- Configure IP addresses on each router's interfaces to ensure proper communication.
- Example: Router 1 with 192.168.1.1/24 for LAN and 10.0.0.1/30 for WAN; similar configurations for Router 2 and Router 3.

(iii) Configure RIP on Routers:

- Access the CLI of each router and enable RIP.
- Use network commands to add the directly connected networks to the RIP process.

(iv) Configure OSPF on Routers:

- Access the CLI of each router and enable OSPF with router ospf 1.
- Use network commands to add networks to OSPF in area 0.

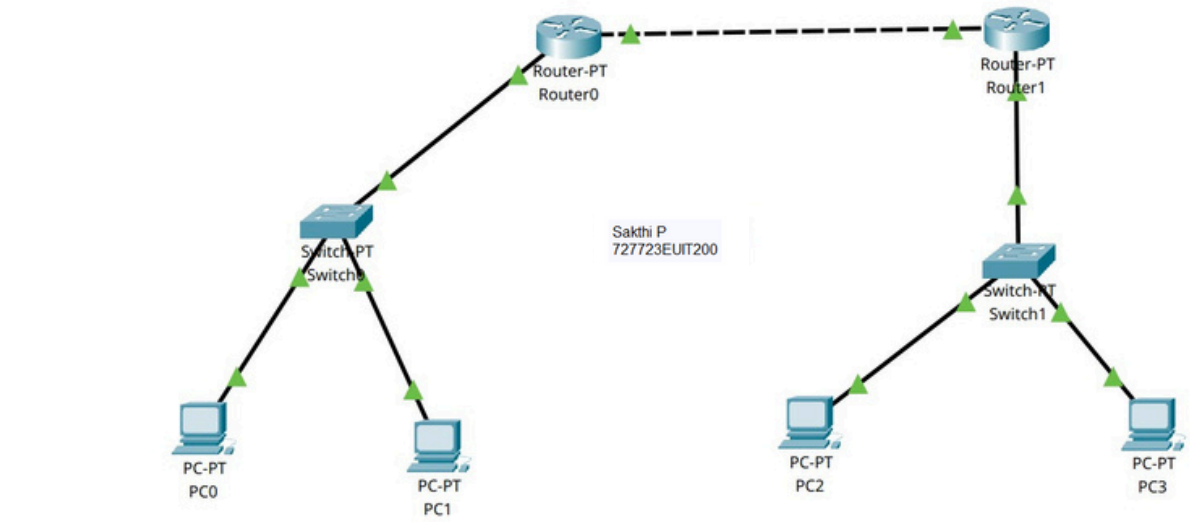
(v) Verify and Test Configurations:

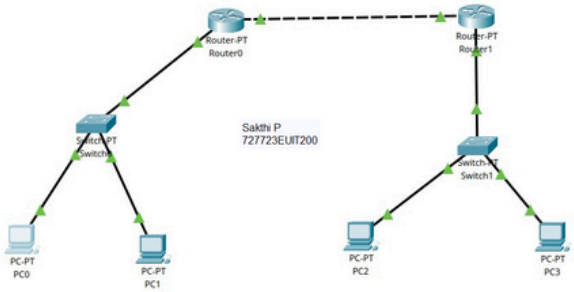
- Use the show ip route command on each router to verify that RIP and OSPF have correctly populated the routing tables.
- Test connectivity by pinging between PCs across different networks.

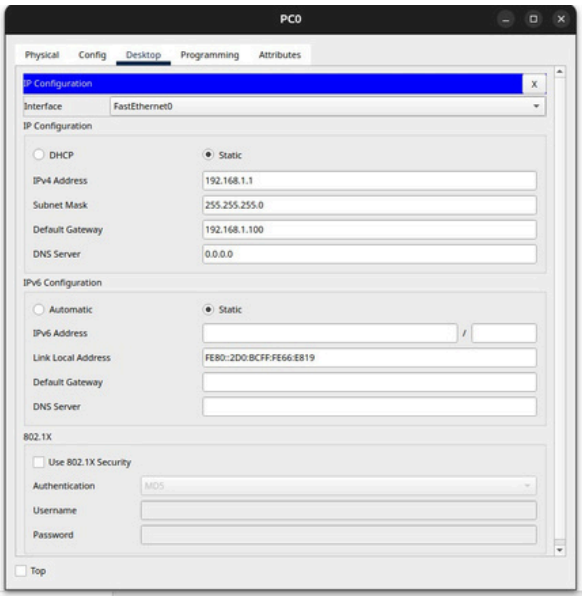
(vi) Observe Dynamic Routing Behaviour:

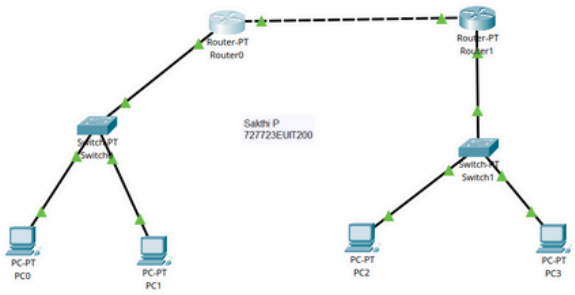
- Simulate network changes (e.g., disconnect a link) and observe how RIP and OSPF update the routing tables automatically.
- Reconnect the link and verify that the network recovers and reestablishes the routes

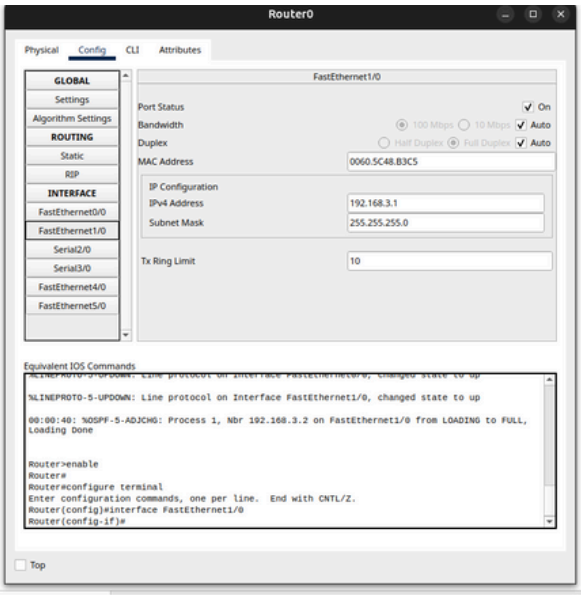
Output / Screenshot

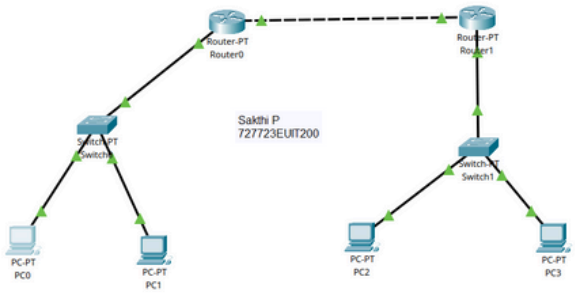


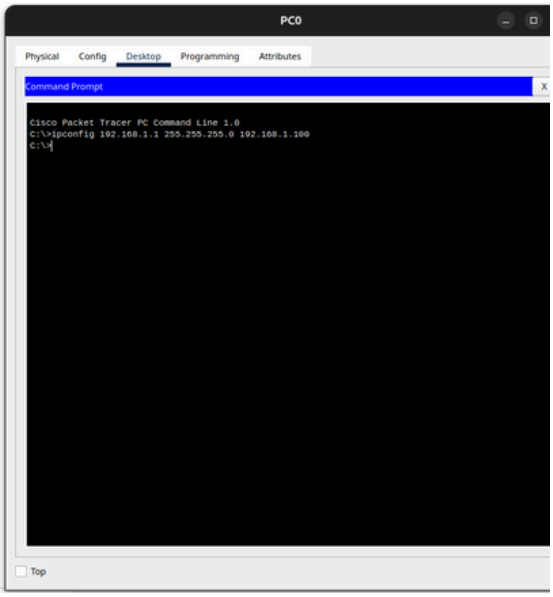


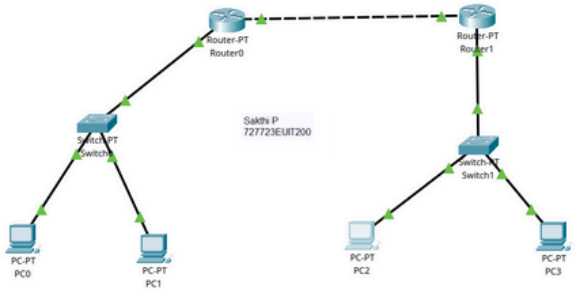


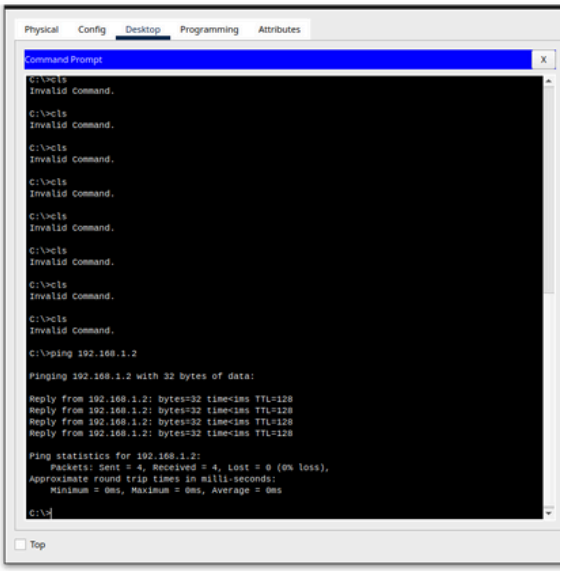

Router-PT
Router0
Router-PT
Router1
Sakthi P
727723EUIT200
Switch-PT
Switch0
Switch-PT
Switch1
PC-PT
PC0
PC-PT
PC1
PC-PT
PC2
PC-PT
PC3


Router0
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
FastEthernet1/0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0060.5C48.B3C5
IP Configuration
IPv4 Address
192.168.3.1
Subnet Mask
255.255.255.0
Tx Ring Limit
10
Equivalent IOS Commands
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
00:00:40: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.3.2 on FastEthernet1/0 from LOADING to FULL, Loading Done
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet1/0
Router(config-if)#
Top


Router-PT
Router0
Router-PT
Router1
Sakthi P
727723EUIT200
Switch-PT
Switch0
Switch-PT
Switch1
PC-PT
PC0
PC-PT
PC1
PC-PT
PC2
PC-PT
PC3


PC0
Physical
Config
Desktop
Programming
Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig 192.168.1.1 255.255.255.0 192.168.1.100
C:\>
Top


Router-PT
Router0
Router-PT
Router1
Sakthi P
727723EUIT200
Switch-PT
Switch0
Switch-PT
Switch1
PC-PT
PC0
PC-PT
PC1
PC-PT
PC2
PC-PT
PC3


Physical
Config
Desktop
Programming
Attributes
Command Prompt
C:\>cls
Invalid Command.
C:\>ping 192.168.1.2
Pinging 192.168.1.2 with 32 bytes of data:
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Ping statistics for 192.168.1.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>
Top

Result:

Thus, the RIP (Routing Information Protocol) and OSPF (Open Shortest Path First) is studied and the dynamic routing protocols implemented in a simulated environment using Cisco Packet Tracer.