Experiment 07- Implementing Dynamic routing

SE COMP C 34 YASH SINHA

Learning Objective: Build a simple network topology and configure it for dynamic routing protocol using packet tracer

Tools: Cisco Packet Tracer

Theory:

- Dynamic routing is the process of using protocols to find and update routing tables on routers and to maintain a loop-free, single path to each network. This is easier than static or default routing, but we use it at the expense of router CPU processes and bandwidth usage on the network links.
- A routing protocol defines the set of rules used by a router when it communicates between neighbor routers.
- There are two broad classifications:

Distance Vector Routing

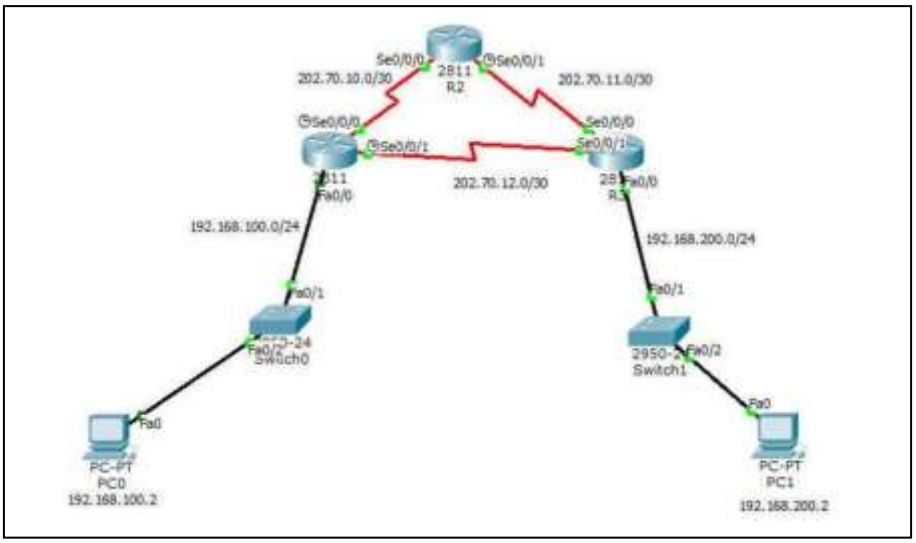
- Distance Vector Routing: Distance vector protocols (a vector contains both distance and direction), such as RIP, determine the path to remote networks using hop count as the metric.
- A hop count is defined as the number of times a packet needs to pass through a router to reach a remote destination. For IP RIP, the maximum hop is 15. A hopcount of 16 indicates an unreachable network.
- Two versions of RIP exist: version 1 and version 2. IGRP is another example of a distance vector protocol with a higher hop count of 255 hops. A higher hop counts allows your network to scale larger.
- One of the drawbacks of protocols, such as RIP and IGRP, is convergence time, which is the time it takes for routing information changes to propagate through all your topology.

Link-State Routing

- Link-state routing protocols, such as OSPF and IS-IS, create a topology of the network and place themselves at the root of the tree.
- Link-state protocols implement an algorithm called the shortest path first (SPF, also known as Dijkstra's Algorithm) to determine the path to a remote destination. There is no hop count limit.

Procedure:

We will be implementing RIP (Distance Vector Protocol) and OSPF (Link-State Protocol) for the given network:



STEP 1- CONFIGURATION ON ROUTER R1:

interface FastEthernet0/0 ip address 192.168.100.1 255.255.255.0 no shutdown
exit

interface Serial0/0/0
ip address 202.70.10.1 255.255.255.252 encapsulation ppp
clock rate 64000 no shutdown
exit

interface Serial0/0/1
ip address 202.70.12.1 255.255.255.252 encapsulation ppp
clock rate 64000
no shutdown
exit

router rip network 192.168.100.0
network 202.70.10.0 network 202.70.12.0 ctrl+z write exit

STEP:2- CONFIGURATION ON ROUTER R2:

interface Serial0/0/0 ip address
202.70.10.2 255.255.255.252
encapsulation ppp no shut exit
interface Serial0/0/1 ip address
202.70.11.1 255.255.255.252
encapsulation ppp clock rate 64000 no
shut exit router rip
network 202.70.10.0 network
202.70.11.0 ctrl+z write

STEP:3-CONFIGURATION ON ROUTER R3:

interface FastEthernet0/0 ip address
192.168.200.1 255.255.255.0 no shut
exit interface Serial0/0/0 ip address
202.70.11.2 255.255.255.252

encapsulation ppp no shut exit
interface Serial0/0/1 ip address
202.70.12.2 255.255.255.252
encapsulation ppp no shut exit router
rip network 192.168.200.0 network
202.70.11.0 network 202.70.12.0
exit ctrl+z write

Once configuration is completed, on each router see the below result

#sh ip rip database
#sh ip route rip

The IP configuration is SAME as before. Using the OSPF Configuration on the same topology, first we will remove RIP routing and enable OSPF routing. For OSPF configuration, follow the steps below:

Step 1: CONFIGURATION ON ROUTER R1: no router rip router
ospf 10 router-id 1.1.1.1
network 192.168.100.0 0.0.0.255
area 0 network 202.70.10.0 0.0.0.3
area 0 network 202.70.12.0 0.0.0.3 area
0 ctrl + z
Write
Exit

Step 2: CONFIGURATION ON ROUTER R2:

no ip rip router ospf 10 router-id 2.2.2.2

network 202.70.10.0 0.0.0.3 area 0

network 202.70.11.0 0.0.0.3 area 0 ctrl

+ z

Write

Exit

Step 3: CONFIGURATION ON ROUTER R3:

no ip rip router ospf 10 router-id 3.3.3.3

network 202.70.11.0 0.0.0.3 area 0

network 202.70.12.0 0.0.0.3 area 0

network 192.168.200.0 0.0.0.255 area 0

ctrl + z

Write

Exit

Once configuration is completed, on each router see the below result

#sh ip ospf

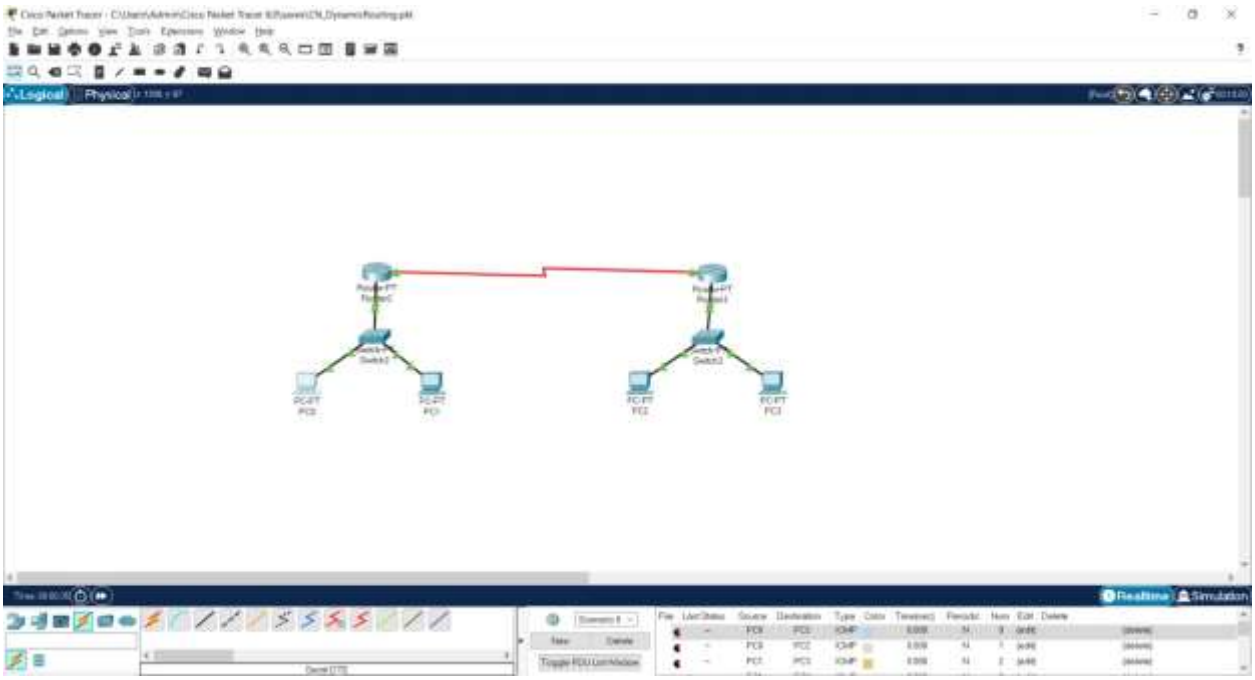
#sh ip ospf neighbor

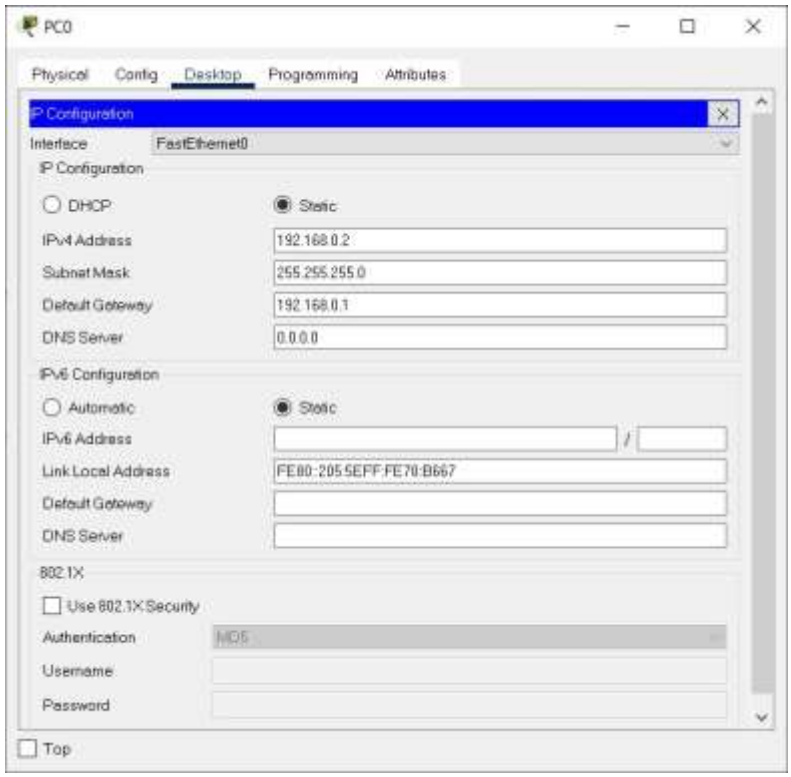
#sh ip ospf route

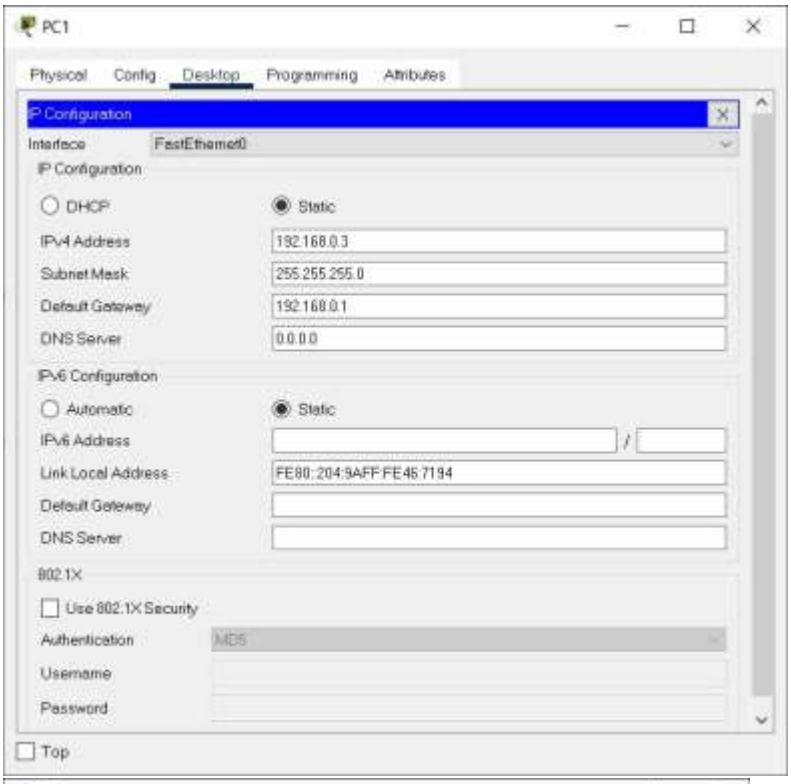
#sh ip ospf interface

#sh ip ospf database

Design and Discussion:




PC0
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.0.2
Subnet Mask
255.255.255.0
Default Gateway
192.168.0.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::205:5EFF:FE70:B667
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top


PC1
Physical
Config
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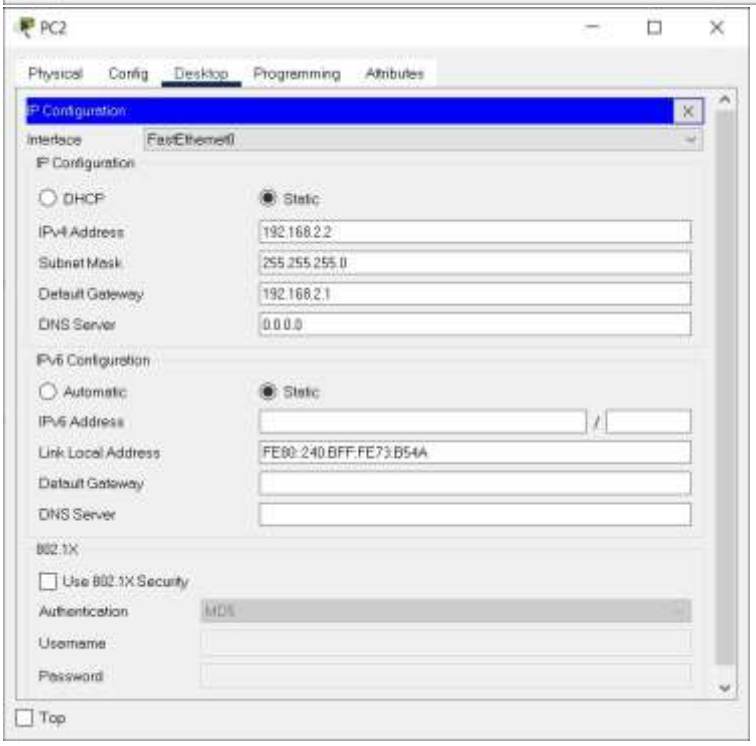
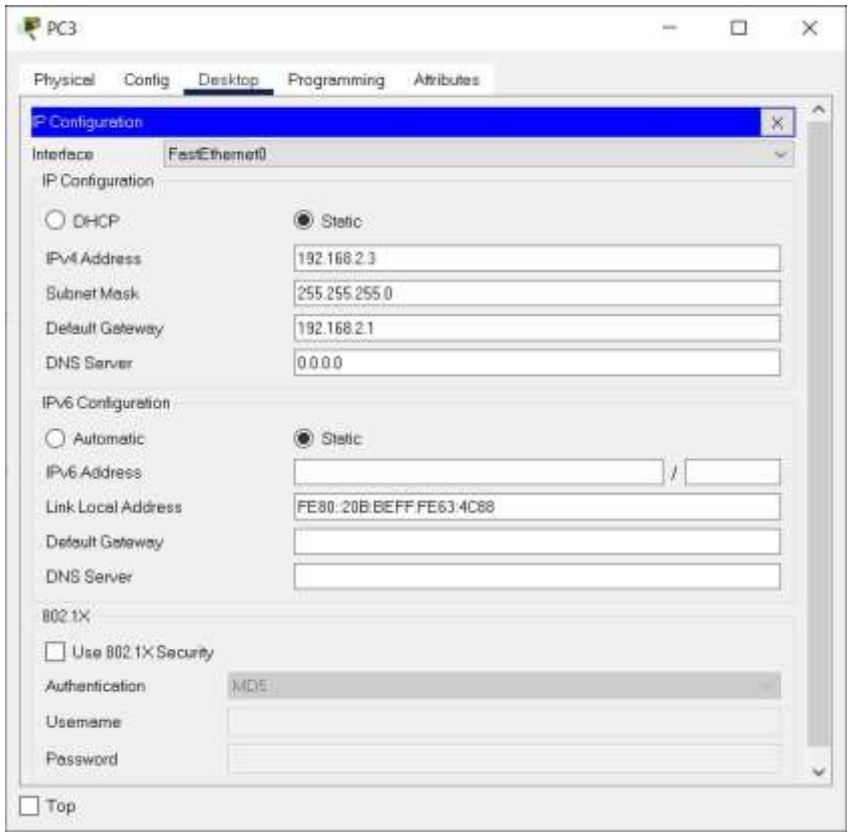
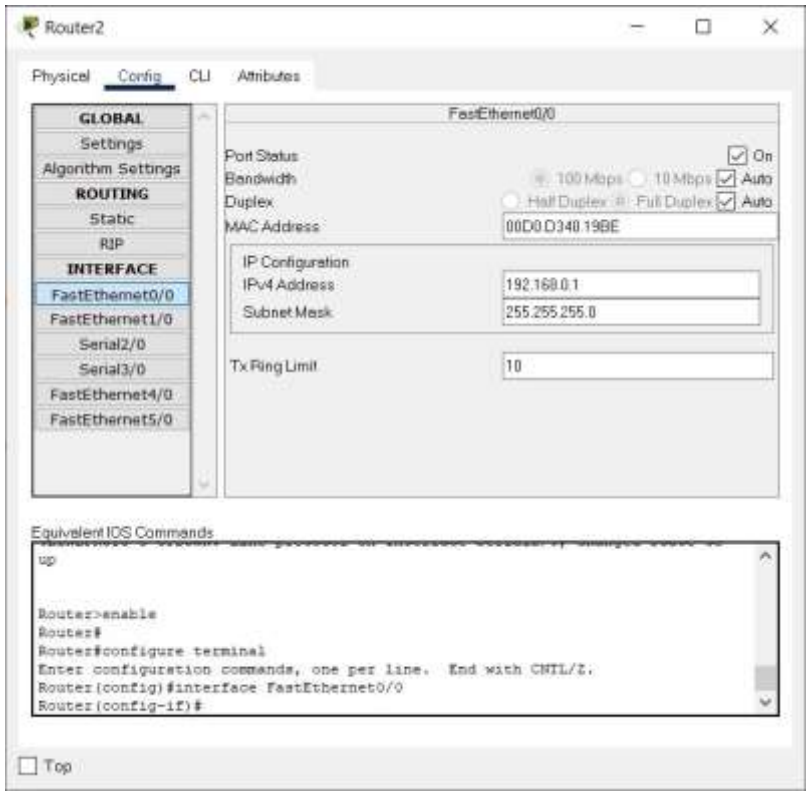
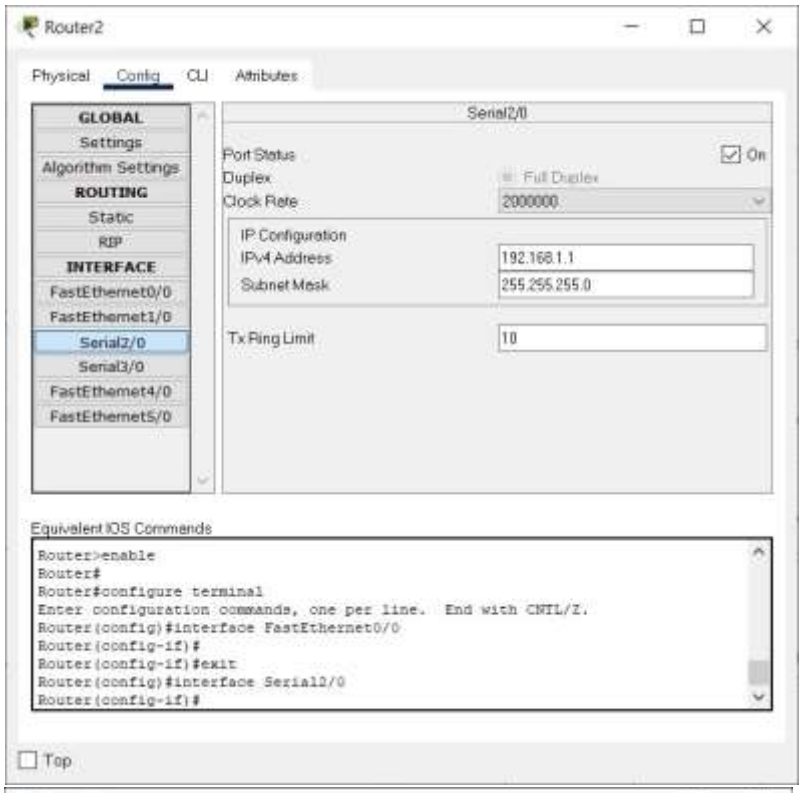
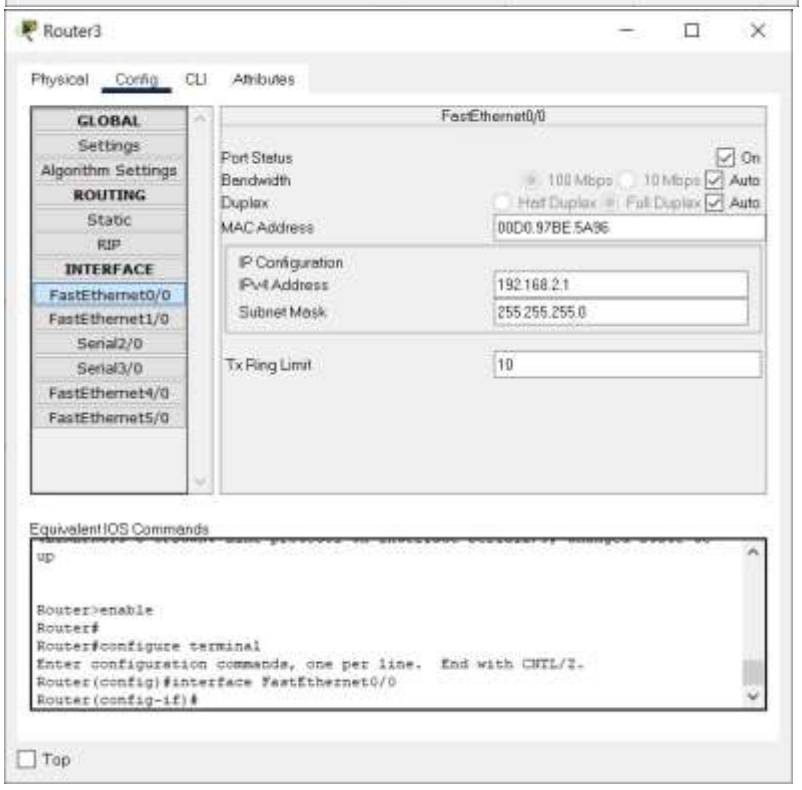
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.0.3
Subnet Mask
255.255.255.0
Default Gateway
192.168.0.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::204:9AFF:FE46:7194
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

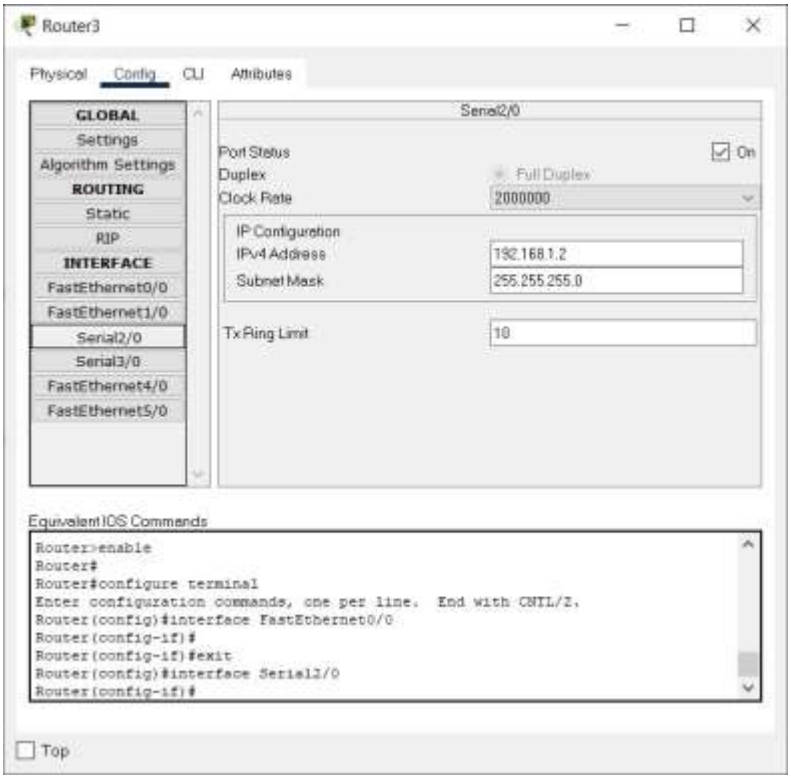

PC2
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.2.2
Subnet Mask
255.255.255.0
Default Gateway
192.168.2.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::240:BFF:FE73:B54A
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top


PC3
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.2.3
Subnet Mask
255.255.255.0
Default Gateway
192.168.2.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::20B:BEFF:FE63:4C88
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top


Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
FastEthernet0/0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
00D0.D340.19BE
IP Configuration
IPv4 Address
192.168.0.1
Subnet Mask
255.255.255.0
Tx Ring Limit
10
Equivalent IOS Commands
up
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
Top


Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
Serial2/0
Port Status
On
Duplex
Full Duplex
Clock Rate
2000000
IP Configuration
IPv4 Address
192.168.1.1
Subnet Mask
255.255.255.0
Tx Ring Limit
10
Equivalent IOS Commands
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#
Top


Router3
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
FastEthernet0/0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
00D0.97BE.5A86
IP Configuration
IPv4 Address
192.168.2.1
Subnet Mask
255.255.255.0
Tx Ring Limit
10
Equivalent IOS Commands
up
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
Top


Router3
Physical
Config
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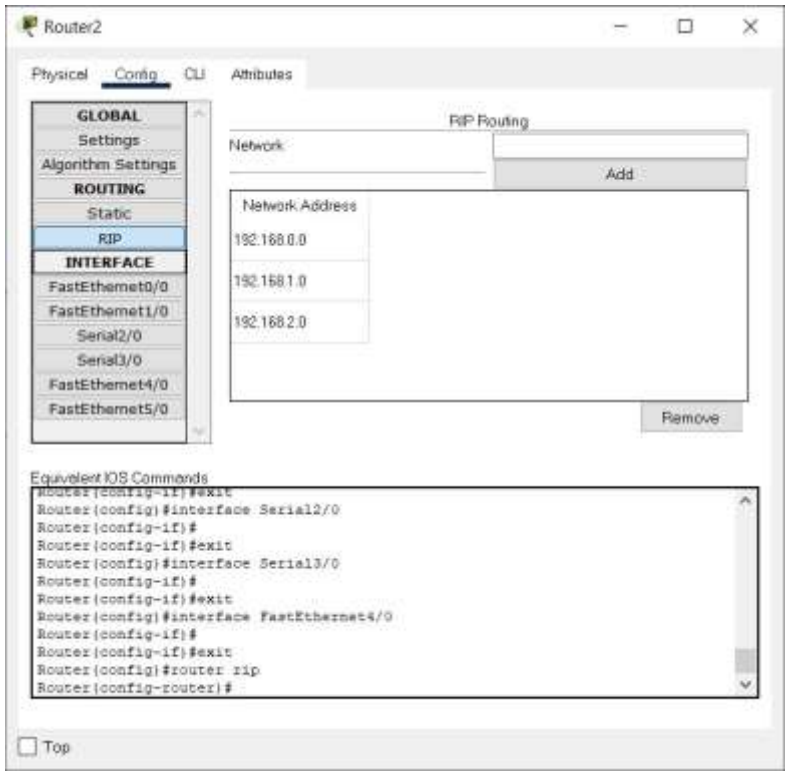
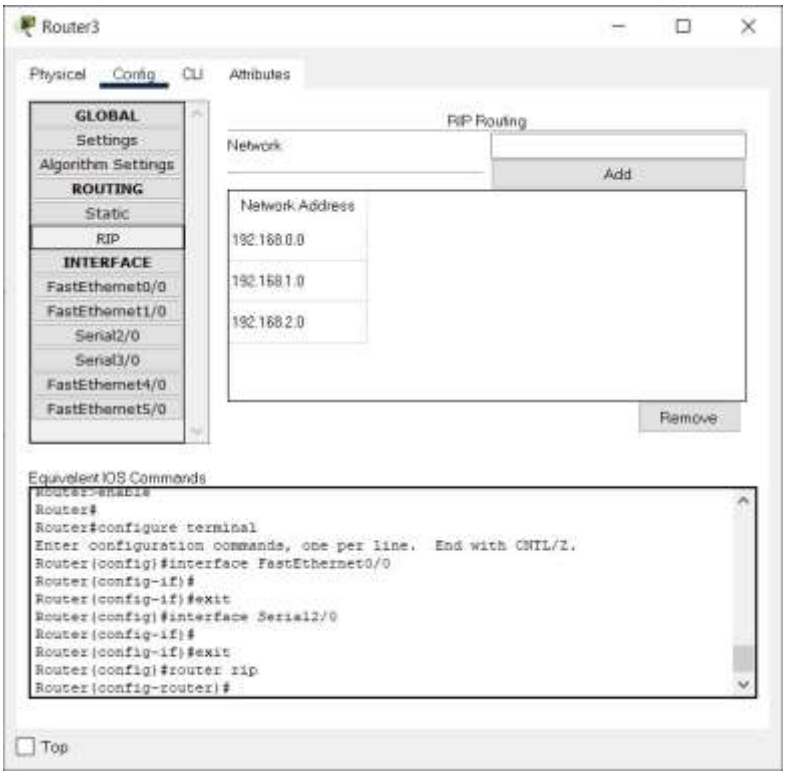
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
Serial2/0
Port Status
On
Duplex
Full Duplex
Clock Rate
2000000
IP Configuration
IPv4 Address
192.168.1.2
Subnet Mask
255.255.255.0
Tx Ring Limit
10
Equivalent IOS Commands
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#
Top


Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
RIP Routing
Network
Add
Network Address
192.168.0.0
192.168.1.0
192.168.2.0
Remove
Equivalent IOS Commands
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial3/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet4/0
Router(config-if)#
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#
Top



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC1	PC2	ICMP		0.000	N	19	(edit)	(delete)
	Successful	PC0	PC2	ICMP		0.000	N	20	(edit)	(delete)
	Successful	PC0	PC3	ICMP		0.000	N	21	(edit)	(delete)

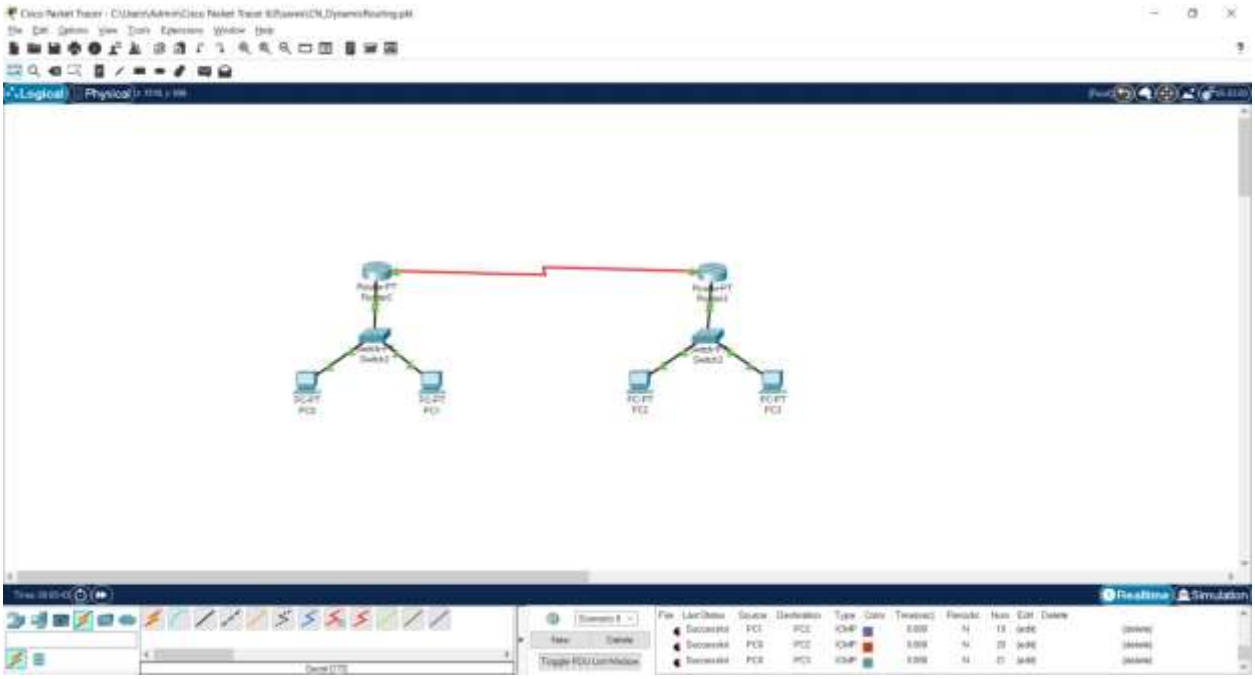
Result and Discussion:

Q.1) Analyze the result for RIP and OSPF implementation in terms of commands executed on each router.
Answer:

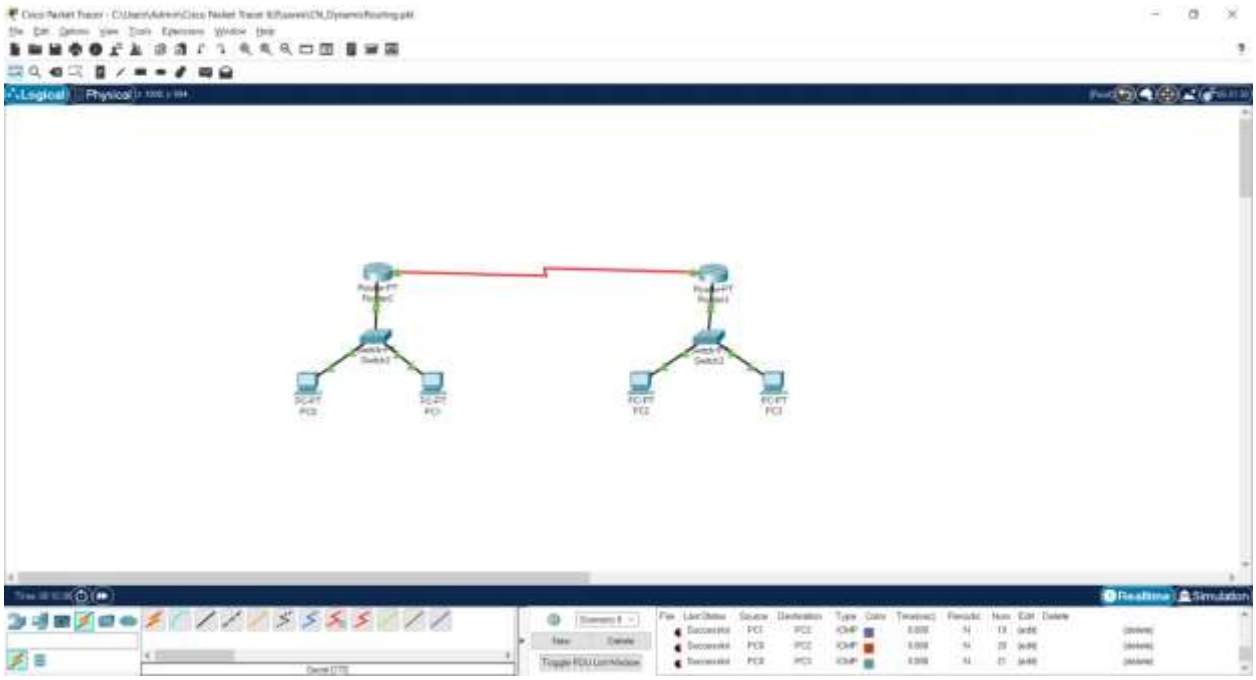
RIP Routing:

1. Ping command for end devices:

```
Pinging 192.168.2.2 with 32 bytes of data:

Reply from 192.168.2.2: bytes=32 time<1ms TTL=253
Reply from 192.168.2.2: bytes=32 time<1ms TTL=253
Reply from 192.168.2.2: bytes=32 time<1ms TTL=253
Reply from 192.168.2.2: bytes=32 time<1ms TTL=253

Ping statistics for 192.168.2.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.3.2
```



2. OSPF Routing:



Q.2) Discuss a scenario where static routing can be useful.
Answer: Static routes are useful for smaller networks with only one path to an outside network. They also provide security in a larger network for certain types of traffic or links to other networks that need more control.

Learning Outcomes: The student should have the ability to:

LO7.1 Describe the dynamic routing.

LO7.2 Illustrate the networking devices in CISCO packet tracer.

LO7.3 Use CISCO packet tracer to demonstrate dynamic routing.

Course Outcomes: Upon completion of the course students will be able to understand and demonstrate how dynamic routing works.

Conclusion: Thus, students have understood and successfully implemented dynamic routing.

Viva Questions:

1. What is dynamic routing?
2. What are the drawbacks of distance vector routing protocols?
3. What is the difference between terms “routing” and “forwarding”?
4. Which protocol at network layer is involved in the process of routing?

For Faculty Use:

Correction Parameters	**Formative Assessment [40%]**	**Timely completion of Practical [40%]**	**Attendance / Learning Attitude [20%]**	
Marks Obtained				