Project Name :-

OSPF Dynamic Routing Configuration Lab – CCNA

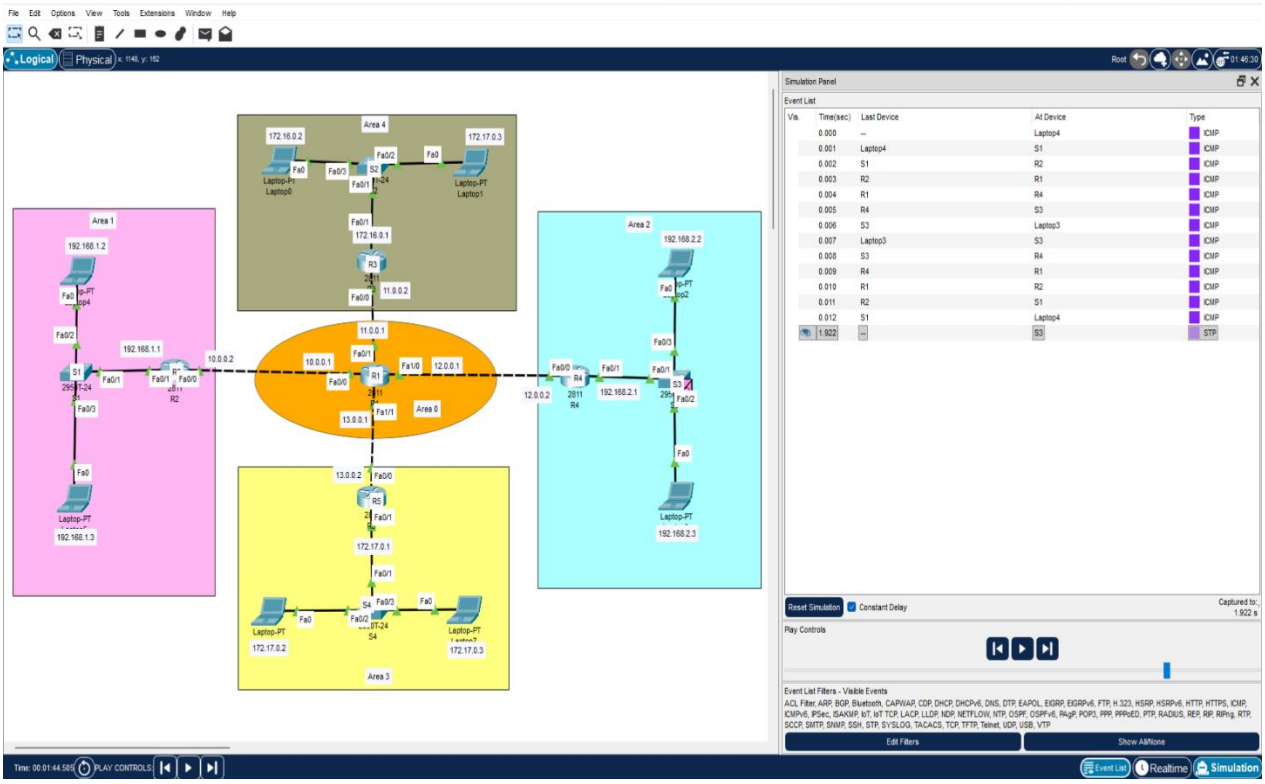
- **Student Name :-**

  Harshad Jalindar Nikam.

- **Objective / Purpose :-**

  To understand and implement OSPF (Open Shortest Path First) dynamic routing protocol in a multi-area network.

- **Network Topology Diagram :-**



- **Lab Setup :-**

Router	Interfaces	IP Address	Wild Card Mask	Description
R1	Fa 0/0	10.0.0.1	0.255.255.255	Connected to R2
	Fa 0/1	11.0.0.1	0.255.255.255	Connected to R3
	Fa 1/0	12.0.0.1	0.255.255.255	Connected to R4
	Fa 1/1	13.0.0.1	0.255.255.255	Connected to R5
R2	Fa 0/0	10.0.0.2	0.255.255.255	Connected to R1
	Fa 0/1	192.168.1.1	0.0.0.255	Connected to S1
R3	Fa 0/0	11.0.0.2	0.255.255.255	Connected to R1
	Fa 0/1	172.16.0.1	0.0.255.255	Connected to S2
R4	Fa 0/0	12.0.0.2	0.255.255.255	Connected to R1
	Fa 0/1	192.168.2.1	0.0.0.255	Connected to S3
R5	Fa 0/0	13.0.0.2	0.255.255.255	Connected to R1
	Fa 0/1	172.17.0.1	0.0.255.255	Connected to S4

- **Configuration Steps :-**

  -Configured IP addresses directly on router interfaces for each connected network.

  -Implemented OSPF Dynamic routes using the –
  "router OSPF [AS No.]
  network [ip address] [Wild Card Mask] area" Commands.

Router 1 :-

```
Router>enable
Router#configure terminal
Router(config)#hostname R1
R1(config)#router ospf 1
R1(config-router)#network 10.0.0.0 0.255.255.255 area 0
R1(config-router)#network 11.0.0.0 0.255.255.255 area 0
R1(config-router)#network 12.0.0.0 0.255.255.255 area 0
R1(config-router)#network 13.0.0.0 0.255.255.255 area 0
R1(config-router)#ex
R1(config)#do write
```

Router 2 :-

```
Router>enable
Router#configure terminal
Router(config)#hostname R2
R2(config)#router ospf 2
R2(config-router)#network 10.0.0.0 0.255.255.255 area 0
R2(config-router)#network 192.168.1.0 0.0.0.255 area 1
R2(config-router)#exit
R2(config)#do write
```

Router 3 :-

```
Router>enable
Router#configure terminal
Router(config)#hostname R3
R3(config)#router ospf 3
R3(config-router)#network 11.0.0.0 0.255.255.255 area 0
R3(config-router)#network 172.16.0.0 0.0.255.255 area 4
R3(config-router)#ex
R3(config)#do write
```

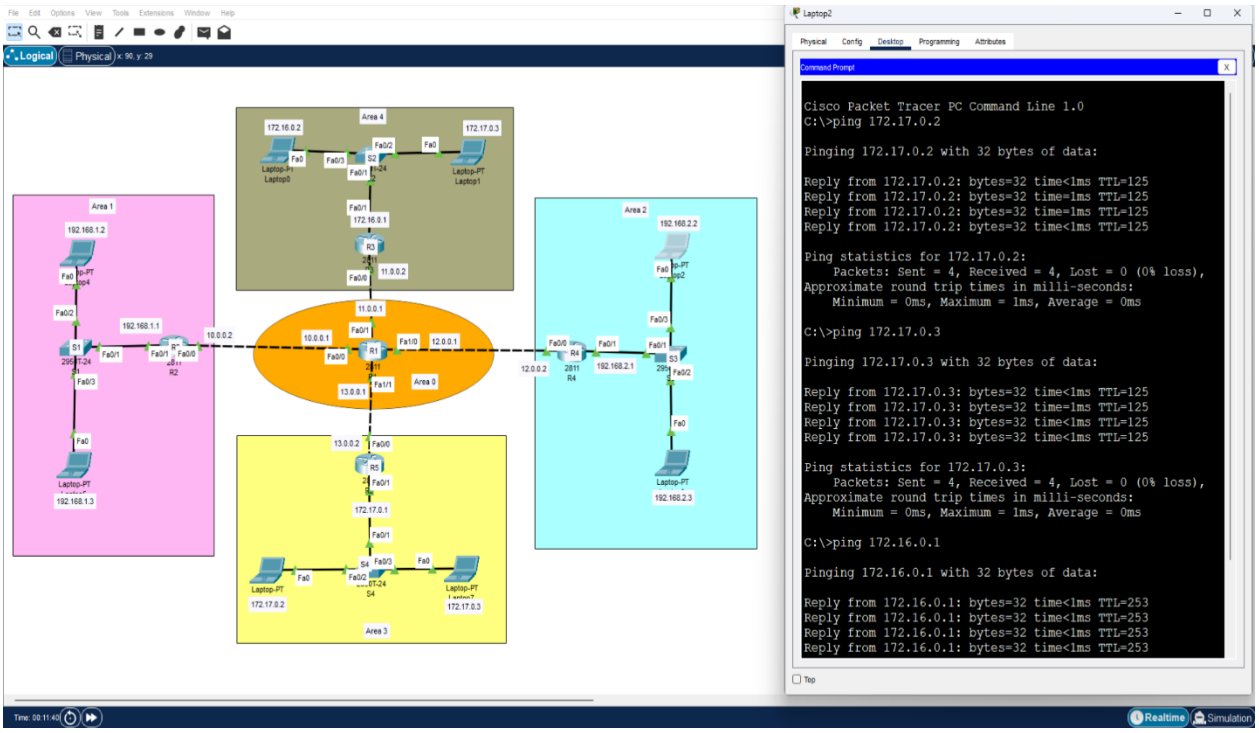
Router 4 :-

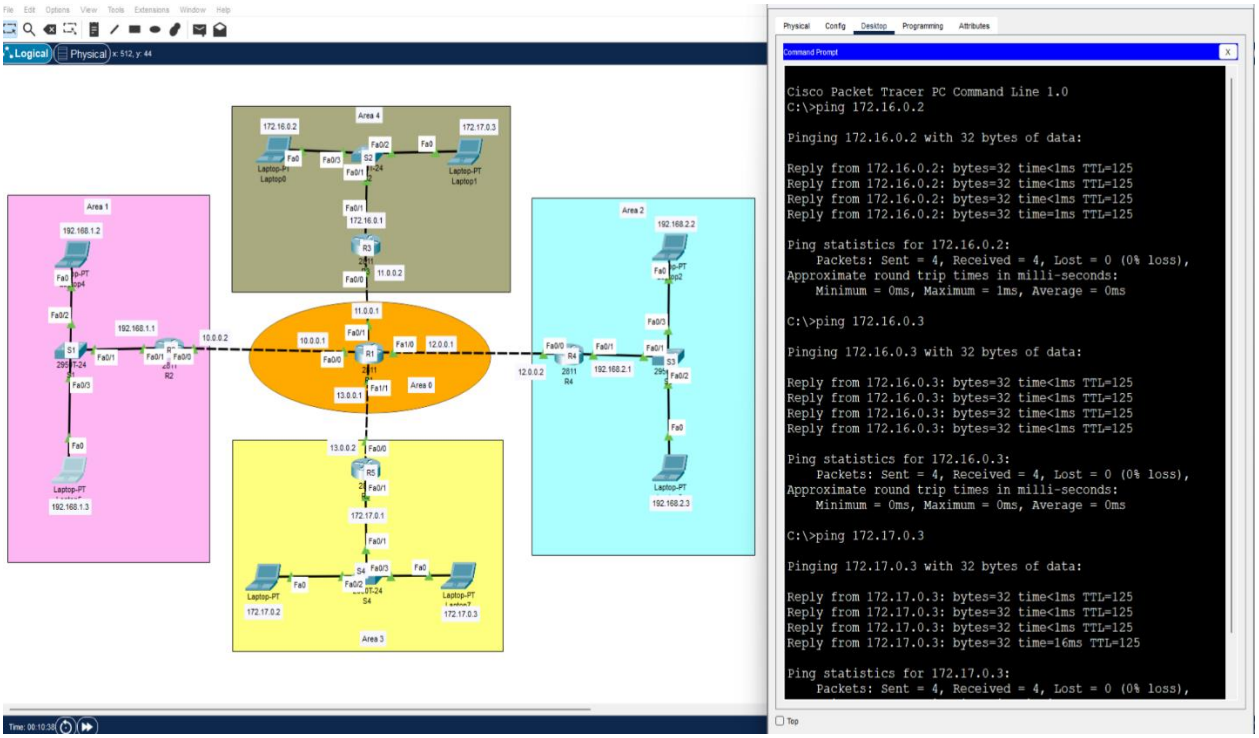
```
Router>enable
Router#configure terminal
Router(config)#hostname R4
R4(config)#router ospf 4
R4(config-router)#network 12.0.0.0 0.255.255.255 area 0
R4(config-router)#network 192.168.2.0 0.0.0.255 area 2
R4(config-router)#exit
R4(config)#do write
```

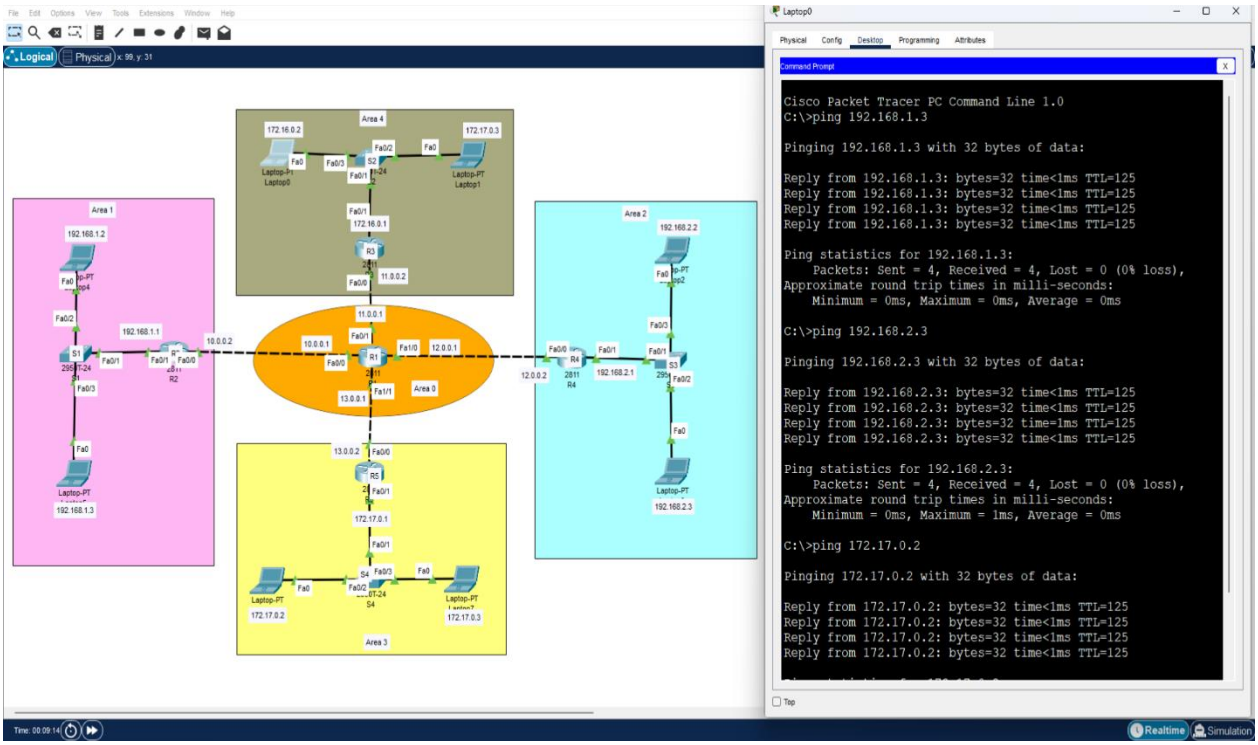
Router 5 :-

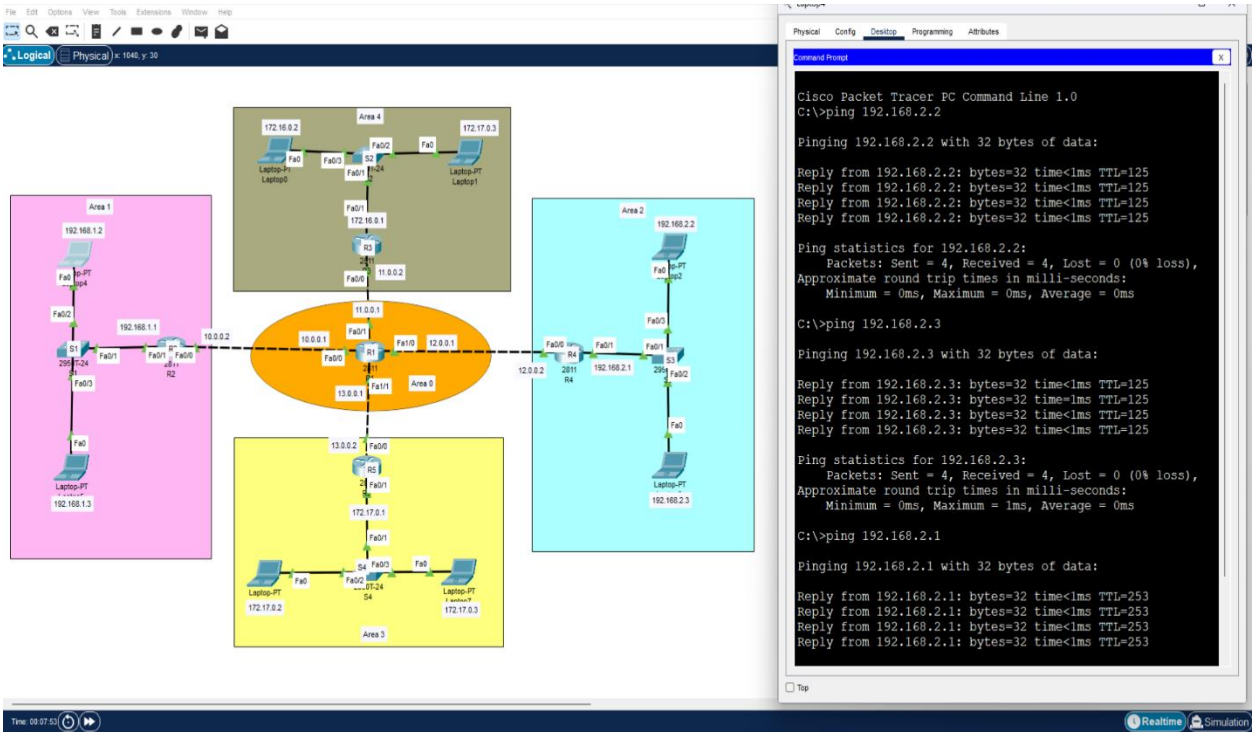
```
R1>enable
R1#configure terminal
R1(config)#hostname R5
R5(config)#router ospf 5
R5(config-router)#network 13.0.0.0 0.255.255.255 area 0
R5(config-router)#network 172.17.0.0 0.0.255.255 area 3
R5(config-router)#exit
R5(config)#do write
```

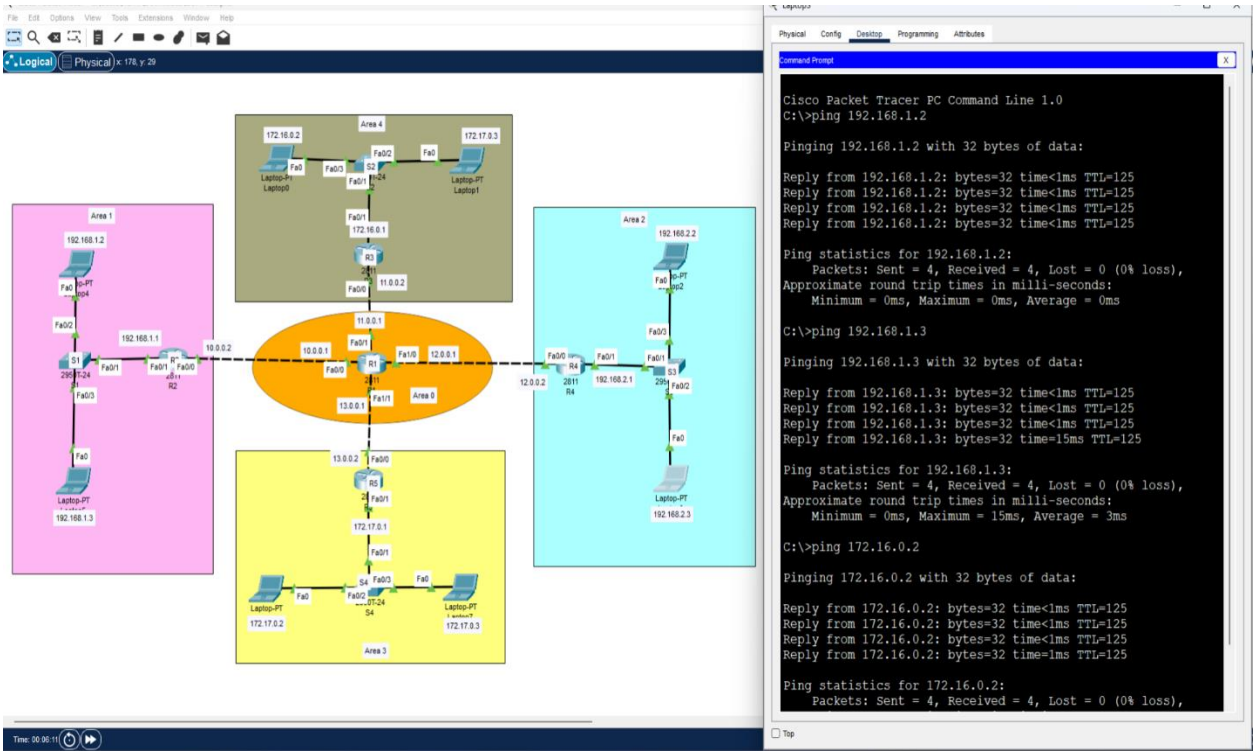
- **Ping Test Section :-**






Laptop0
Physical
Config
Desktop
Programming
Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.3
Pinging 192.168.1.3 with 32 bytes of data:
Reply from 192.168.1.3: bytes=32 time<1ms TTL=125
Reply from 192.168.1.3: bytes=32 time<1ms TTL=125
Reply from 192.168.1.3: bytes=32 time<1ms TTL=125
Reply from 192.168.1.3: bytes=32 time<1ms TTL=125
Ping statistics for 192.168.1.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 192.168.2.3
Pinging 192.168.2.3 with 32 bytes of data:
Reply from 192.168.2.3: bytes=32 time<1ms TTL=125
Reply from 192.168.2.3: bytes=32 time<1ms TTL=125
Reply from 192.168.2.3: bytes=32 time=1ms TTL=125
Reply from 192.168.2.3: bytes=32 time<1ms TTL=125
Ping statistics for 192.168.2.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
C:\>ping 172.17.0.2
Pinging 172.17.0.2 with 32 bytes of data:
Reply from 172.17.0.2: bytes=32 time<1ms TTL=125
Reply from 172.17.0.2: bytes=32 time<1ms TTL=125
Reply from 172.17.0.2: bytes=32 time<1ms TTL=125
Reply from 172.17.0.2: bytes=32 time<1ms TTL=125
Top
Realtime
Simulation


Physical
Config
Desktop
Programming
Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
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<1ms TTL=125
Reply from 192.168.2.2: bytes=32 time<1ms TTL=125
Reply from 192.168.2.2: bytes=32 time<1ms TTL=125
Reply from 192.168.2.2: bytes=32 time<1ms TTL=125
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 192.168.2.3
Pinging 192.168.2.3 with 32 bytes of data:
Reply from 192.168.2.3: bytes=32 time<1ms TTL=125
Reply from 192.168.2.3: bytes=32 time=1ms TTL=125
Reply from 192.168.2.3: bytes=32 time<1ms TTL=125
Reply from 192.168.2.3: bytes=32 time<1ms TTL=125
Ping statistics for 192.168.2.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
C:\>ping 192.168.2.1
Pinging 192.168.2.1 with 32 bytes of data:
Reply from 192.168.2.1: bytes=32 time<1ms TTL=253
Reply from 192.168.2.1: bytes=32 time<1ms TTL=253
Reply from 192.168.2.1: bytes=32 time<1ms TTL=253
Reply from 192.168.2.1: bytes=32 time<1ms TTL=253
Top
Realtime
Simulation


Area 1
Area 2
Area 3
Area 4
Area 0
Physical
Config
Desktop
Programming
Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
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=125
Reply from 192.168.1.2: bytes=32 time<1ms TTL=125
Reply from 192.168.1.2: bytes=32 time<1ms TTL=125
Reply from 192.168.1.2: bytes=32 time<1ms TTL=125
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:\>ping 192.168.1.3
Pinging 192.168.1.3 with 32 bytes of data:
Reply from 192.168.1.3: bytes=32 time<1ms TTL=125
Reply from 192.168.1.3: bytes=32 time<1ms TTL=125
Reply from 192.168.1.3: bytes=32 time<1ms TTL=125
Reply from 192.168.1.3: bytes=32 time=15ms TTL=125
Ping statistics for 192.168.1.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 15ms, Average = 3ms
C:\>ping 172.16.0.2
Pinging 172.16.0.2 with 32 bytes of data:
Reply from 172.16.0.2: bytes=32 time<1ms TTL=125
Reply from 172.16.0.2: bytes=32 time<1ms TTL=125
Reply from 172.16.0.2: bytes=32 time<1ms TTL=125
Reply from 172.16.0.2: bytes=32 time=1ms TTL=125
Ping statistics for 172.16.0.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

- **Obeservations :-**

1. All OSPF neighbors were successfully established in each area.
2. Area 0 backbone effectively connected all other areas.
3. Routes propagated correctly between different OSPF areas.
4. Ping tests confirmed full connectivity across the network.
5. No packet loss observed during connectivity verification.

- **Troubleshooting :-**

1. Verified IP addresses and subnet masks on all interfaces.
2. Checked and corrected OSPF network statements and area assignments.
3. Matched hello and dead intervals on all neighbor interfaces.
4. Used ping and traceroute to test connectivity between routers.

- **Conclusion :-**

The OSPF lab project successfully demonstrated the implementation of a multi-area OSPF network using areas 0, 1, 2, 3, and 4. All routers formed correct neighbor relationships, routes propagated properly between areas, and connectivity was verified using ping tests. The lab highlighted the importance of area-based hierarchical design for scalability and reduced routing overhead. Troubleshooting steps helped in resolving configuration errors and understanding OSPF behavior in real scenarios. Overall, the project enhanced practical knowledge of OSPF routing, inter-area communication, and network troubleshooting.