DATE : 27-NOVEMBER-2024

LAB- 7

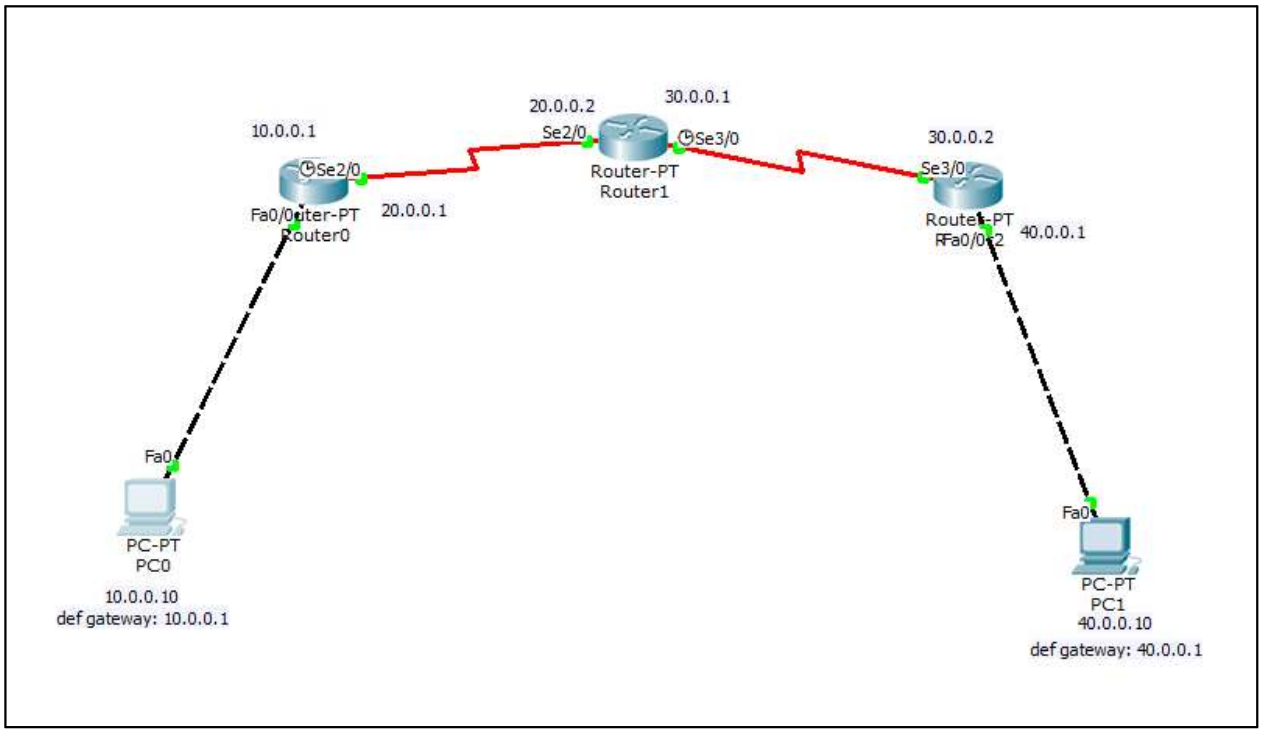
Question:

Configure OSPF routing protocol

Aim:

To Configure OSPF routing protocol

Topology:



Topology Description:

The topology consists of three routers (R1, R2, R3), two PCs (PC0 and PC1), and connections established as follows:

Devices and Configuration

1. R1 (Router 1):
    - Connected to PC0 via FastEthernet 0/0.
    - Connected to R2 via Serial 1/0.
    - Belongs to Area 3 for its connection with PC0 and Area 1 for its connection with R2.
2. R2 (Router 2):
    - Connected to R1 via Serial 1/0.
    - Connected to R3 via Serial 1/1.
    - Acts as a bridge between Area 1 and Area 0.
    - Plays a crucial role in forming the OSPF backbone (Area 0).
3. R3 (Router 3):
    - Connected to PC1 via FastEthernet 0/0.
    - Connected to R2 via Serial 1/0.
    - Belongs to Area 0 for its connection with R2 and Area 2 for its connection with PC1.
4. PC0 (Host 1):
    - IP Address: 10.0.0.10/24
    - Default Gateway: 10.0.0.1
    - Connected to R1 via FastEthernet.
5. PC1 (Host 2):
    - IP Address: 40.0.0.10/24
    - Default Gateway: 40.0.0.1
    - Connected to R3 via FastEthernet.

Area Assignments

- Area 0 (Backbone Area):
    - Connects R2 and R3.
    - All OSPF areas must connect to Area 0 for full connectivity.
- Area 1:
    - Connects R1 and R2.
- Area 3:
    - Connects R1 and PC0.
- Area 2:
    - Connects R3 and PC1

Router 0 (R1) Configuration:

IOS Command Line Interface

```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up

Router(config-if)#exit
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

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Router 1 (R2) Configuration:

```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#encasulation ppp
                  ^
% Invalid input detected at '^' marker.

Router(config-if)#encapsulation ppp
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state
to up
exit
Router(config)#interface serial 3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shutdown
```

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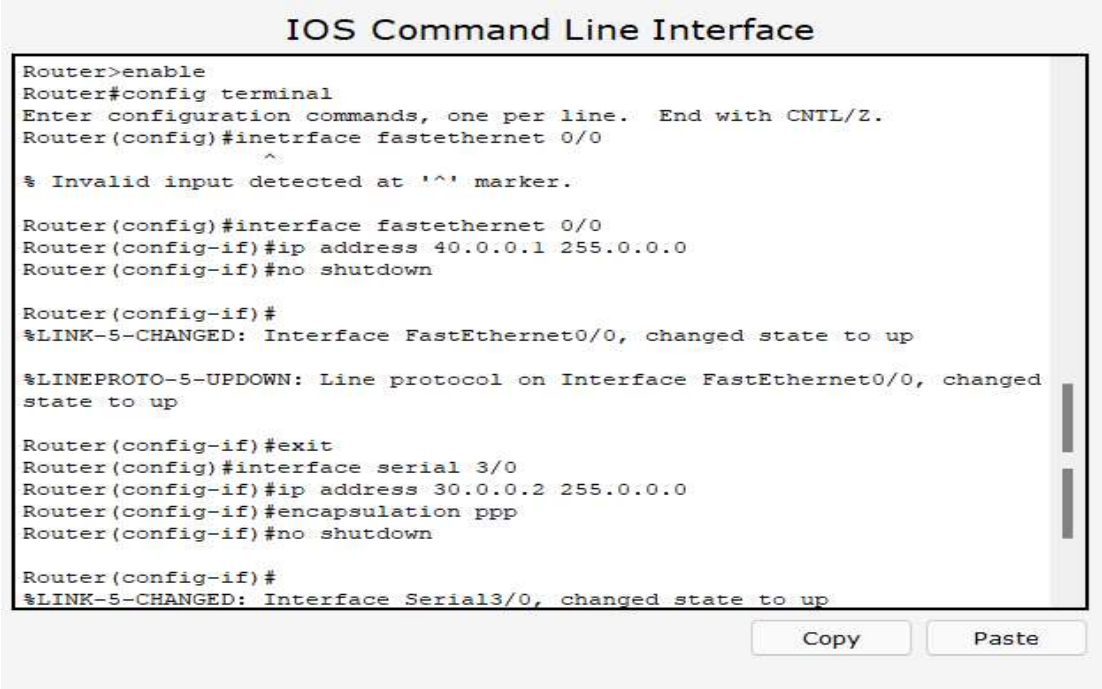
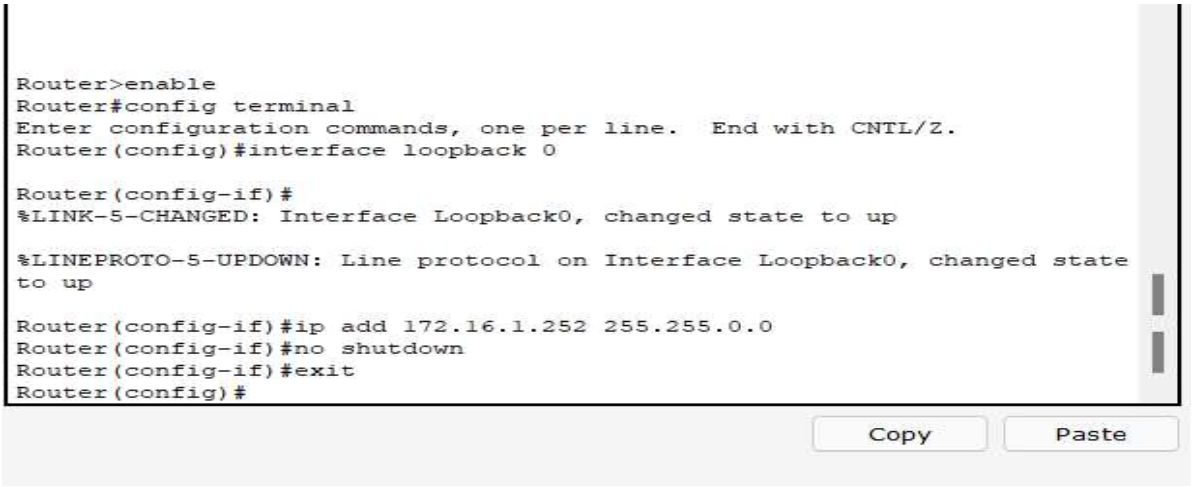
Router 2 (R3) Configuration:



Step 2: Configure Loopback interfaces:

Router 0 (R1):



Router 1 (R2):

```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface loopback 0
Router(config-if)#ip add 172.16.1.253 255.255.0.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
```

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Router 2 (R3):

```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface loopback 0
Router(config-if)#ip add 172.16.1.254 255.255.0.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
```

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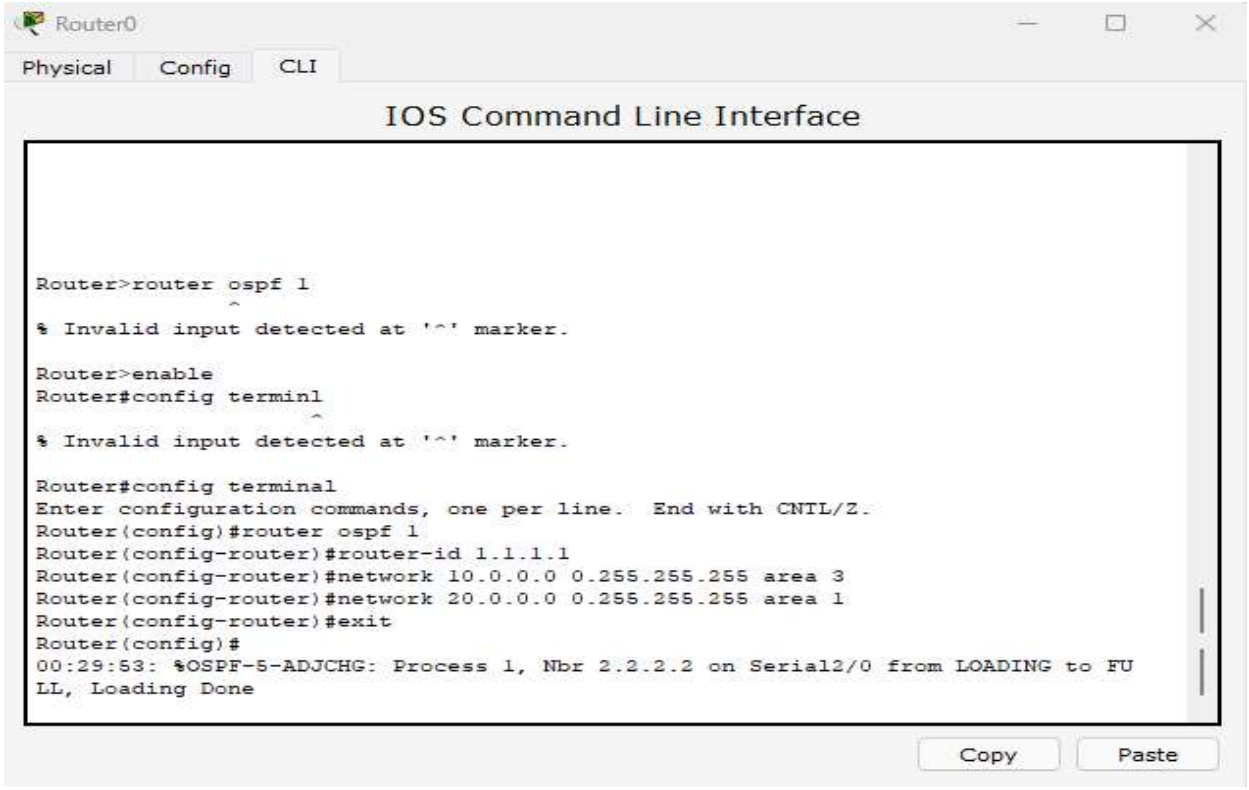
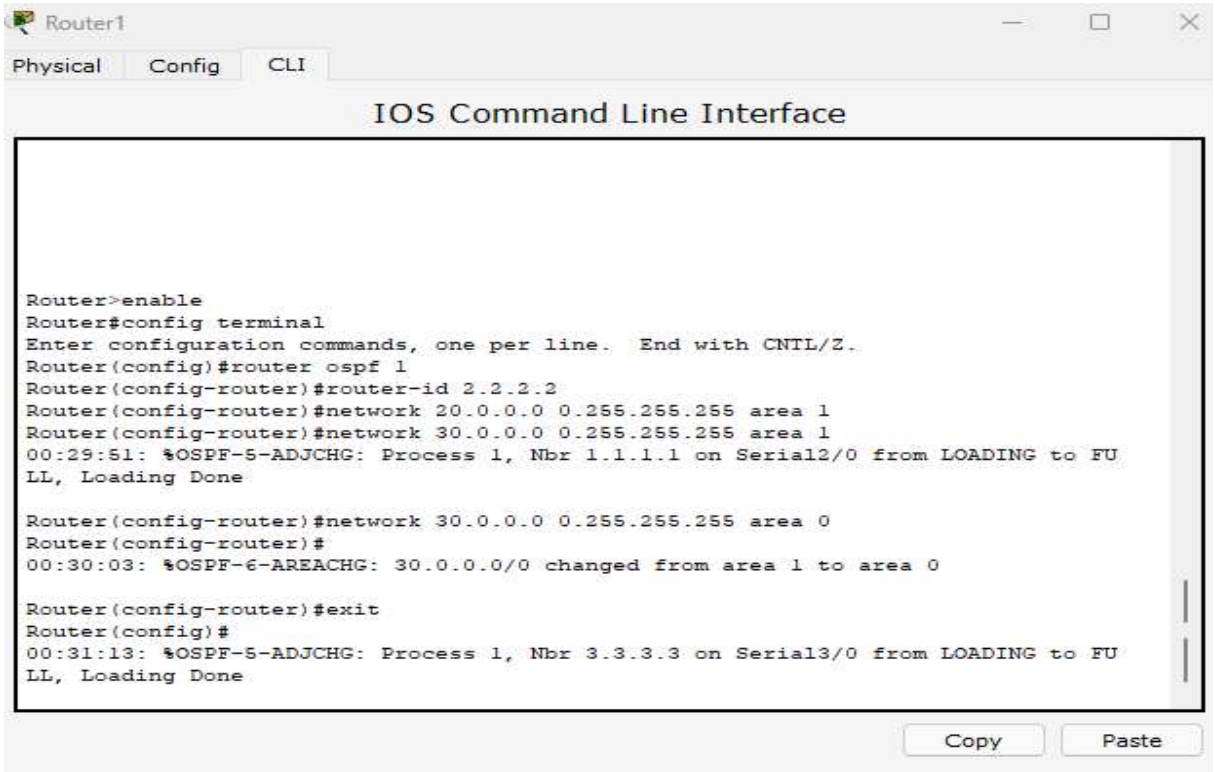
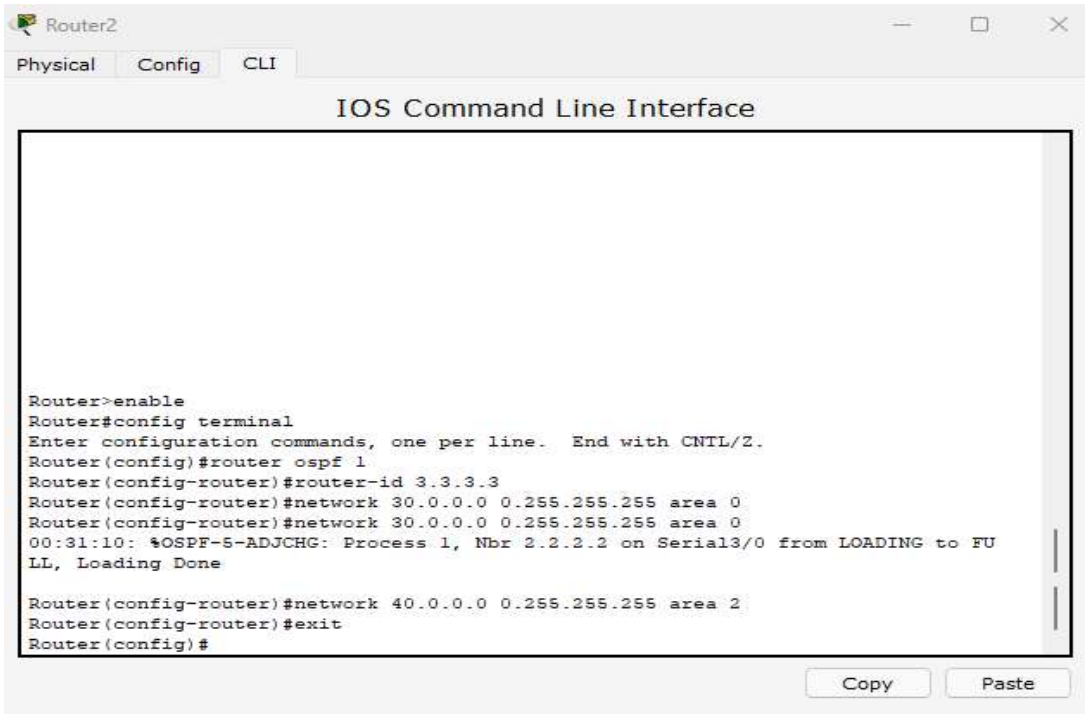
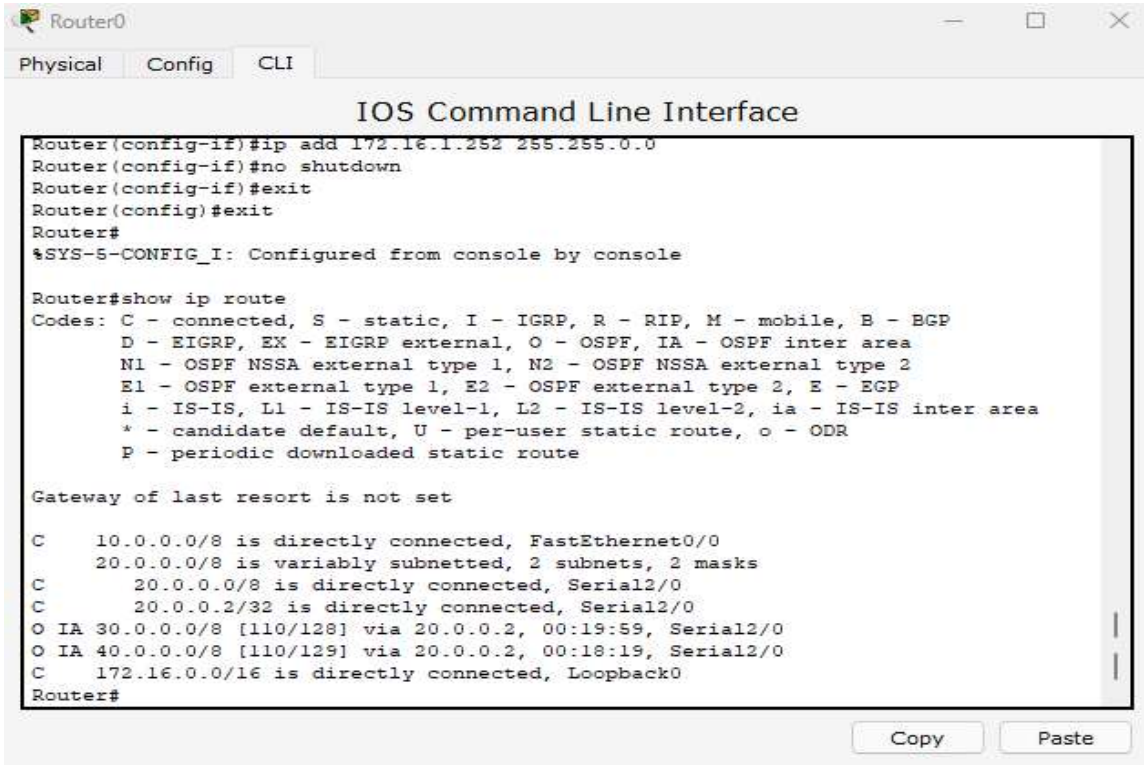
Step 2: Enable OSPF on the routers:





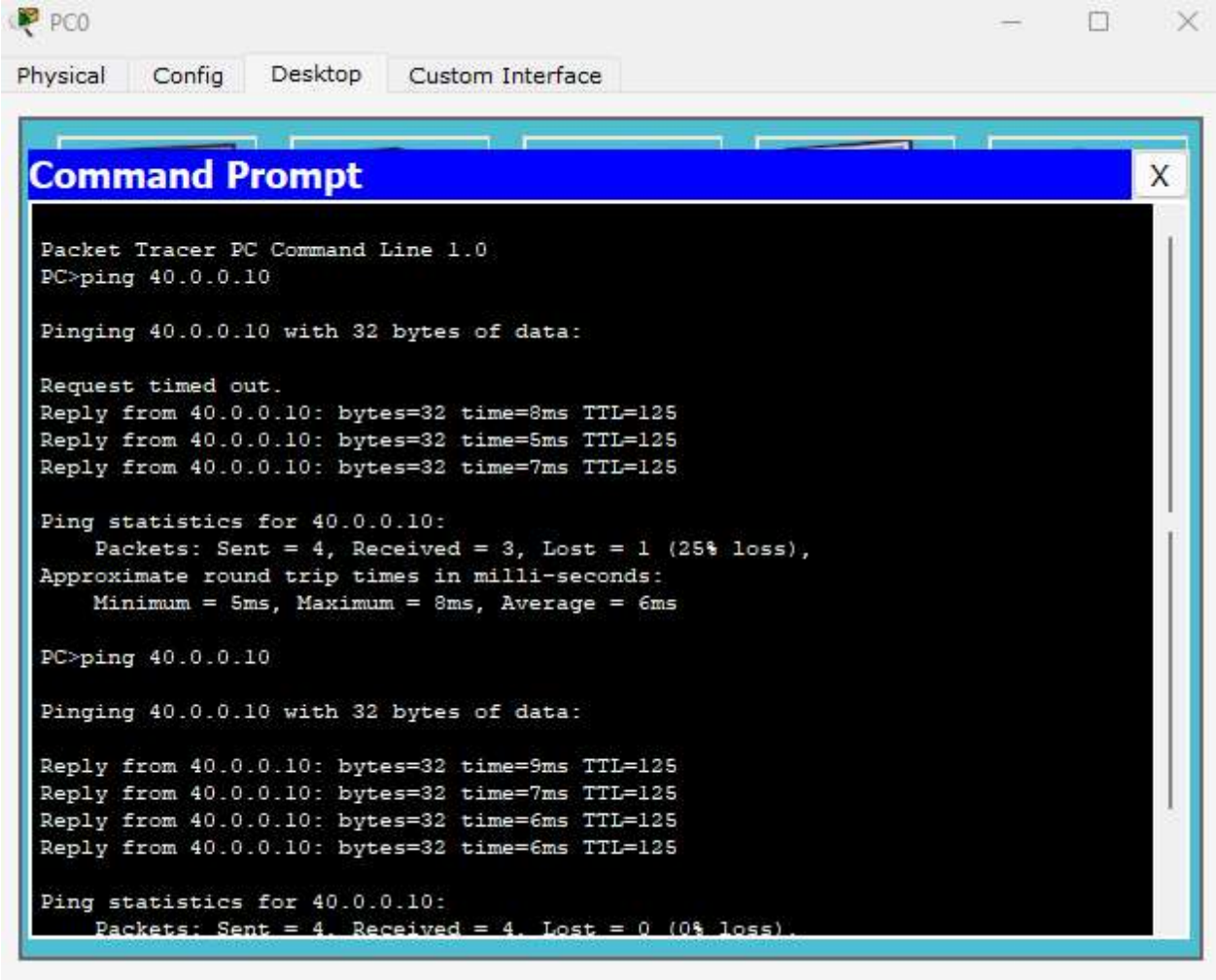


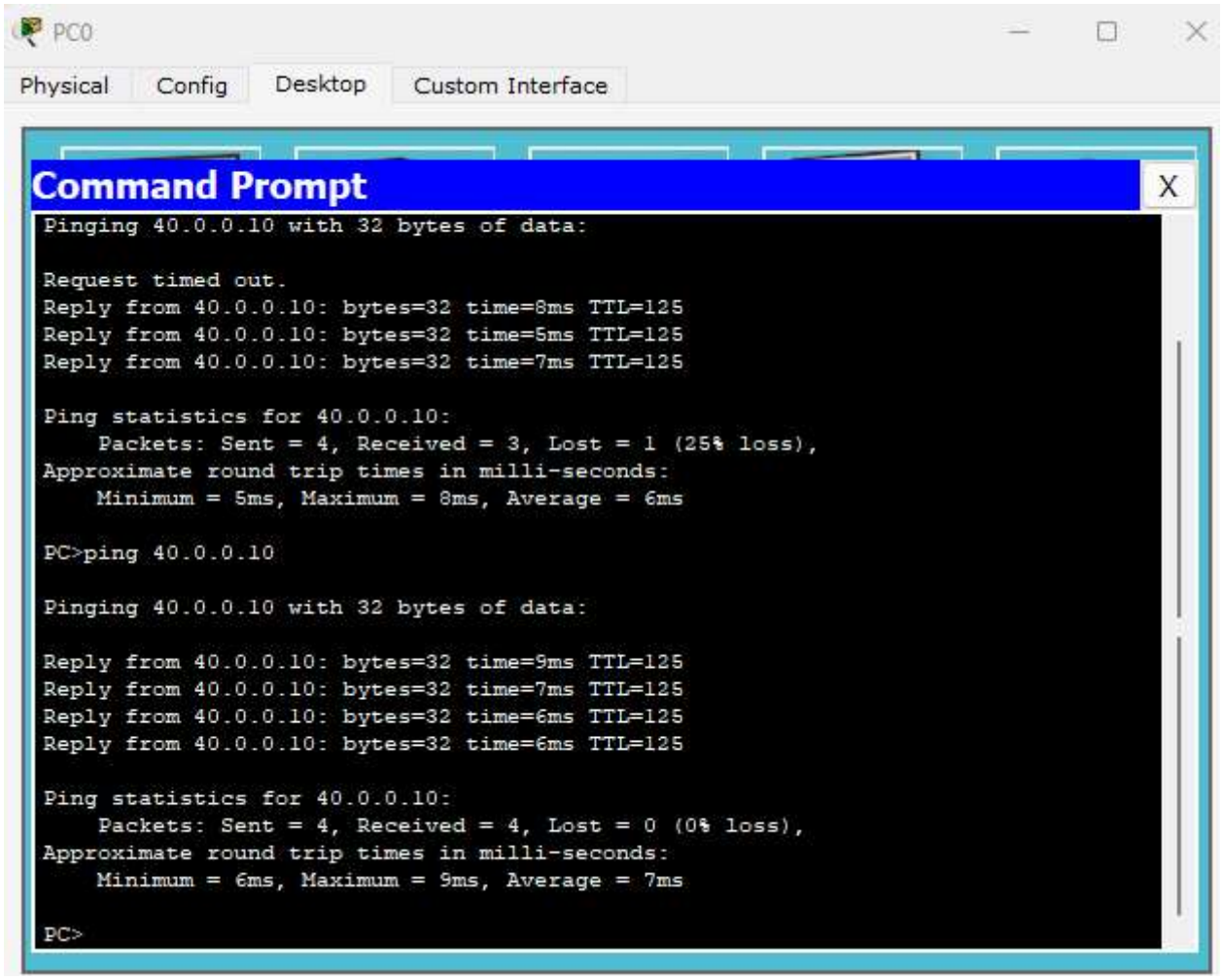
R1#show ip route:



Step 6: Test connectivity

1. Ping from PC0 to PC1:
   Copy code
   ```
   ping 40.0.0.10
   ```





Observation:

The experiment demonstrates how OSPF dynamically learns and advertises routes, enabling efficient and scalable routing across multiple areas.

OSPF neighbors should establish adjacency.

Routing tables on all routers must display networks from all areas with `OIA` indicating inter-area routes.

Connectivity between PC0 (10.0.0.10) and PC1 (40.0.0.10) should be successful.