8) configure OSPF routing Protocol
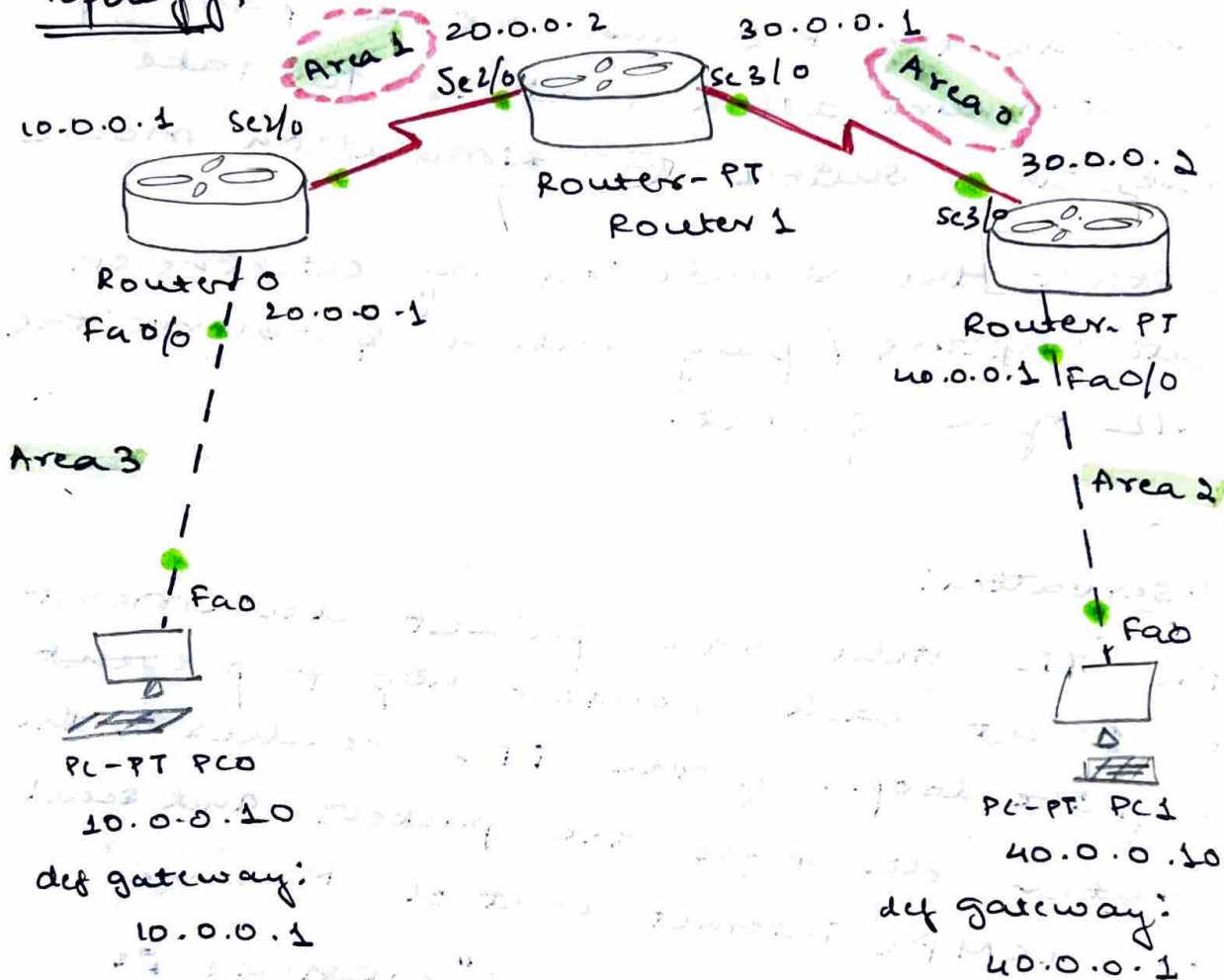
Aim: To configure OSPF routing Protocol.

Topology:

Topology Description:

The topology consists of 2 PC's and 3 routers.

PCO: (10.0.0.10)

- connected to Router 0 via the fastethernet 0/0 interface

- Default gateway 10.0.0.1

PC1 (40.0.0.10):

- connected to router 2 via the Fastethernet 0/0 interface
- Default gateway 40.0.0.1

ROUTER 0:

- Interfaces:
  - Fastethernet 0 (10.0.0.1): connected to PC0
  - serial 2/0 (20.0.0.1): connected to router 1.

gateway for PC0, forwarding traffic to Router 1.

ROUTER 1:

- Interfaces:
  - serial 2/0 (20.0.0.2): connected to Router 0
  - serial 3/0 (30.0.0.1): connected to Router 2

central router, relaying traffic between Router 0 and Router 2.

Router 2:

- Interfaces:
  - serial 3/0 (30.0.0.2): connected to Router 1
  - Fastethernet 0 (40.0.0.1): connected to PC1.

gateway for PC1, forwarding traffic to Router 1.

Procedure:

configure ip address to all interfaces.

In Router 0:

```
Router > enable , Router # config terminal
Router (config)# interface fastethernet 2/0
Router (config-if) # ip address 10.0.0.1
                              255.0.0.0
Router (config-if) # no shutdown
Router # exit.

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

In Router 1:

```
Router (config) # interface serial 2/0
Router (config-if) # ip address 20.0.0.2
                               255.0.0.0
Router (config-if) # encapsulation PPP
Router (config-if) # no shutdown
Router (config-if) # 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
Router (config-if) # exit
```

Router 2:

Router (config) # interface serial 3/0
Router (config-if) ip address 30.0.0.2
                255.0.0.0
Router (config-if) # encapsulation ppp
Router (config-if) # no shutdown
Router (config-if) # exit

Router (config) # interface fastethernet 2/0
Router (config-if) # ip address 40.0.0.1
                255.0.0.0
Router (config-if) # no shutdown
Router (config) # exit

Step 3: Now, Enable ip routing by configuring ospf routing protocol in all routers.

Router 0:

Router (config) # router ospf 1
Router (config-router) # router-id 1.1.1.1
Router (config-router) # network
     10.0.0.0   0.255.255.255 area 3
Router (config-router) # network
     20.0.0.0   0.255.255.255 area 1
Router (config-router) # exit

Router 1:

Router (config) # router ospf 1
Router (config-router) # router-id 12.2.2.2
Router (config-router) # network
    20.0.0.0 0.255.255.255 area 1

Router (config-router) # network
      30.0.0.0.0.255.255.255 area 0
Router (config-router) # exit.

Router 2:

Router (config) # router ospf 1
Router (config) # router -id: 3.3.3.3
Router (config) # network 30.0.0.0
      0.255.255.255 area 0
Router (config) # network 40.0.0.0
      0.255.255.255 area 2
Router (config) # exit

step4: Now check routing table of R1.

Router # show ip route

C   10.0.0.0/8 is directly connected, Fa2/0
C   20.0.0.0/8 is directly connected, Serial2/0
OIA 40.0.0.0/8 [110/129] via 20.0.0.2,
      00:04:23, Serial 2/0
OIA 30.0.0.0/8 [110/129] via 20.0.0.2,
      00:07:29, Serial 3/0

configure loopback:

Router 0:

Router (config-if) # interface loopback 0
Router (config-if) # ip add 172.16.1.1
                     255 255.255.0.0

Router 1:

Router (config-if) # interface loopback 0
Router (config-if) # ip add 172.16.1.253 255.255.0.0
Router (config-if) # no shutdown

Router 2:

Router (config-if) # interface loopback 0
Router (config-if) # ip add 172.16.1.254 255.255.0
Router (config-if) # no shutdown.

step 5: Now, check Routing table of R3.

→ Show ip route
O I A 30.0.0:0/8 [110/128] via 30.1.0.0.1, 00:18,
                 Serial 3/0
C 40.0.0.8/8 is directly connected, Fa2/0
C 30.0.0.8/8 is directly connected, serial 3/0

step 6: create virtual link between R1, R2,
by this we create a virtual link to
connect area 3 to area 0.

Router 0:

Router (Router-config) # router ospf 1
Router (config-router) # area 1 virtual-link
                2.2.2.2
Router (router-config) # *Feb 10 ......,
   from LOADING to FULL, loading Done,

Router 1:

Router (router-config) # router ospf1

Router(config- router) # area 1 virtual-
    -link   1.1.1.1

Router (config - router) # exit

Step 7: R2 and R3 get updates about
Area 3:

Router2: show ip route

OIA 20.0.0.0/8 [110/128] via 30.0.0.1,
    00:00:01:56, serial 2/0

C 40.0.0.0/8 is directly connected,
    fastethernet 2/0

O1A 10.0.0.0/8 [110/128] via 30.0.0.1,
    00:01:56, serial 1/0

C 30.0.0.0/8 is directly connected,
    Serial 3/0.

Step 8: Check connectivity between
Host 10.0.0.10 to 40.0.0.10

PCo command prompt.

PC> ping 40.0.0.10

Pinging 40.0.0.10 with 32 bytes of Data:

Reply from 40.0.0.10: bytes=32 time= 9ms
    TTL=125

Reply from 40.0.0.10: bytes=32 time=7ms
    TTL=125

Reply from 40.0.0.10: bytes=32 time= 6ms
    TTL=125

Reply from 40.0.0.10: bytes=32 time=6ms
    TTL=125

Ping statistics for 40.0.0.10:
Packets: Sent = 4, Received = 4, Los = 0
(0% Loss)

Observation:

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

→ Routing tables on all routers must display networks from all areas with O IA indicating inter-area routes.