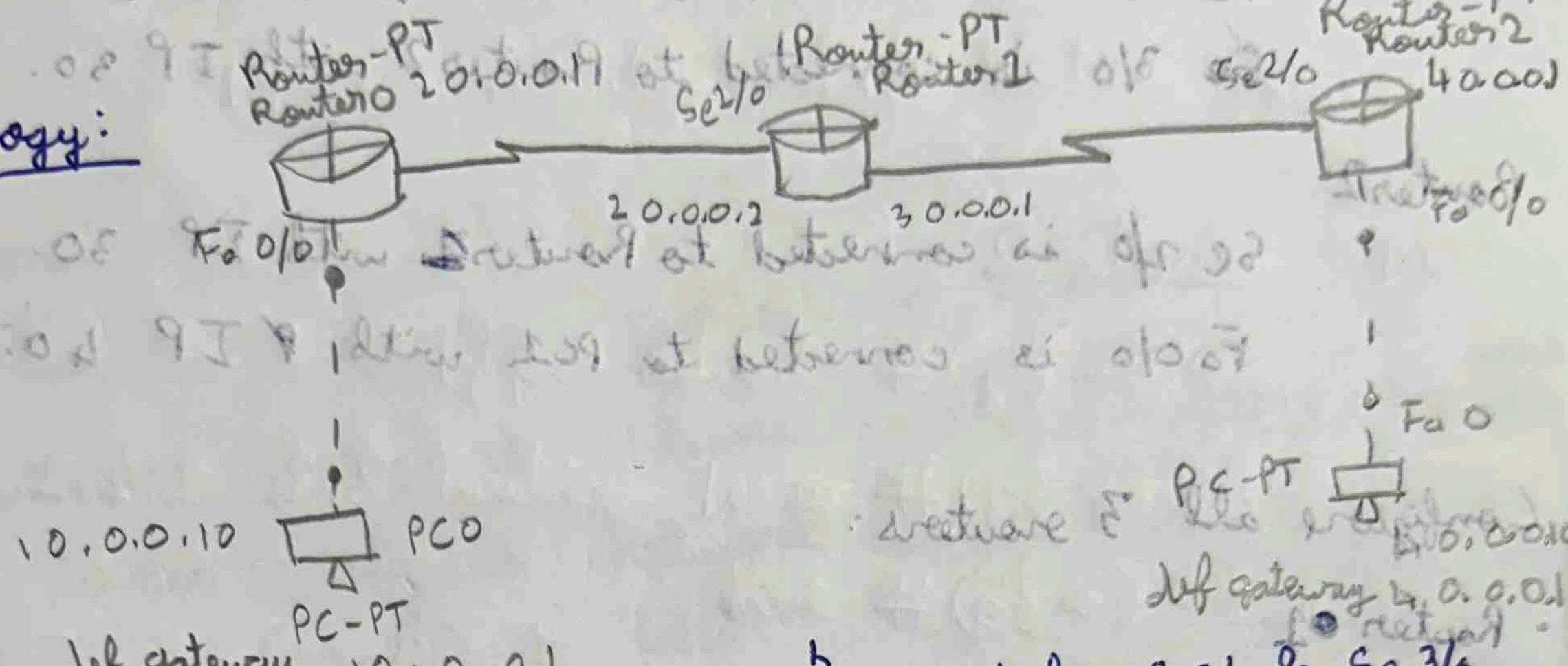
Experiment -7

27/11/2024

a) Configure OSPF routing Protocol

Aim: to configure OSPF routing protocol

Topology:



1. Router1 connected to Router0 & Router2 through interface Se2/0 & Se 3/0
2. PC0 connected to Router0 via copper cross cable through Fa 0/0 interface with IP address 10.0.0.10
3. PC1 connected to Router2 via cross cable through Fa 0/0 interface, with IP address 40.0.0.10

Procedure:

Open cisco Packet tracer and arrange as given in the topology and configure the devices as given below

PC0:

IP address: 10.0.0.10
Subnet mask: 255.0.0.0
Gateway: 10.0.0.1

PC1:

IP address: 40.0.0.10
Subnet mask: 255.0.0.0
Gateway: 40.0.0.1

Router 0:

Se2/0 is connected to Router1 with IP 20.0.0.1

Fa0/0 is connected to PC0 with IP 10.0.0.1

Router 1

Se 2/0 is connected to Router0 with IP 20.0.0.2

Se 3/0 is connected to Router2 with IP 30.00.1

Router 2

Se 2/0 is connected to Router1 with IP 30.0.02

Fa0/0 is connected to PC1 with IP 40.0.0.1

Configure all 3 routers:

- Router 01

Router> enable

Router # config terminal

Router (config)> interface fastethernet 0/0

Router (config-if)> ip address 20.0.0.1 255.0.0.0

> encapsulation PPP

> clock rate 64000

> no shut

Router 0:

Router > enable

Router # config terminal

Router (config)> interface fastethernet 0/0

Router (config-if)

→ Enable IP routing for configuring OSPF routing Protocol in all routers

Router 0:-

Router (config)# router ospf 1

```
Router(config) # router-id 1.1.1.1
Router(config) # network 10.0.0.0 0.255.255.255 area3
Router(config) # network 20.0.0.0 0.255.255.255 area1
Router(config) # exit
```

Router 1:

```
Router (config)# router OSPF 1
Router (config) # router-id 2.2.2.2
Router (config) # network 20.0.0.0 0.255.255.255 area1
Router (config) # network 30.0.0.0 0.255.255.255 area0
Router (config) # 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 area0
Router (config) # network 40.0.0.0 0.255.255.255 area2
Router (config) # exit
```

→ Configure loopback address to routers

```
RO (config) # loop interface loopback 0
RO (config) # ip address 172.16.1.252 255.255.0
RO (config) # no shut

R1 (config) # interface loopback 0
R1 (config) # ip address 172.16.1.253 255.255.0
R1 (config) # no shut
```

```
R2 (config)# interface loopback 0
R2 (config)# ip address 172.16.1.254 255.255.0
R2 (config)# no shut
```

→ Create virtual link between R0, R1

Router0

```
R0 (config)# router ospf 1
R0 (config)# area1 virtual-link 2.2.2.2
R0 (config)# exit
```

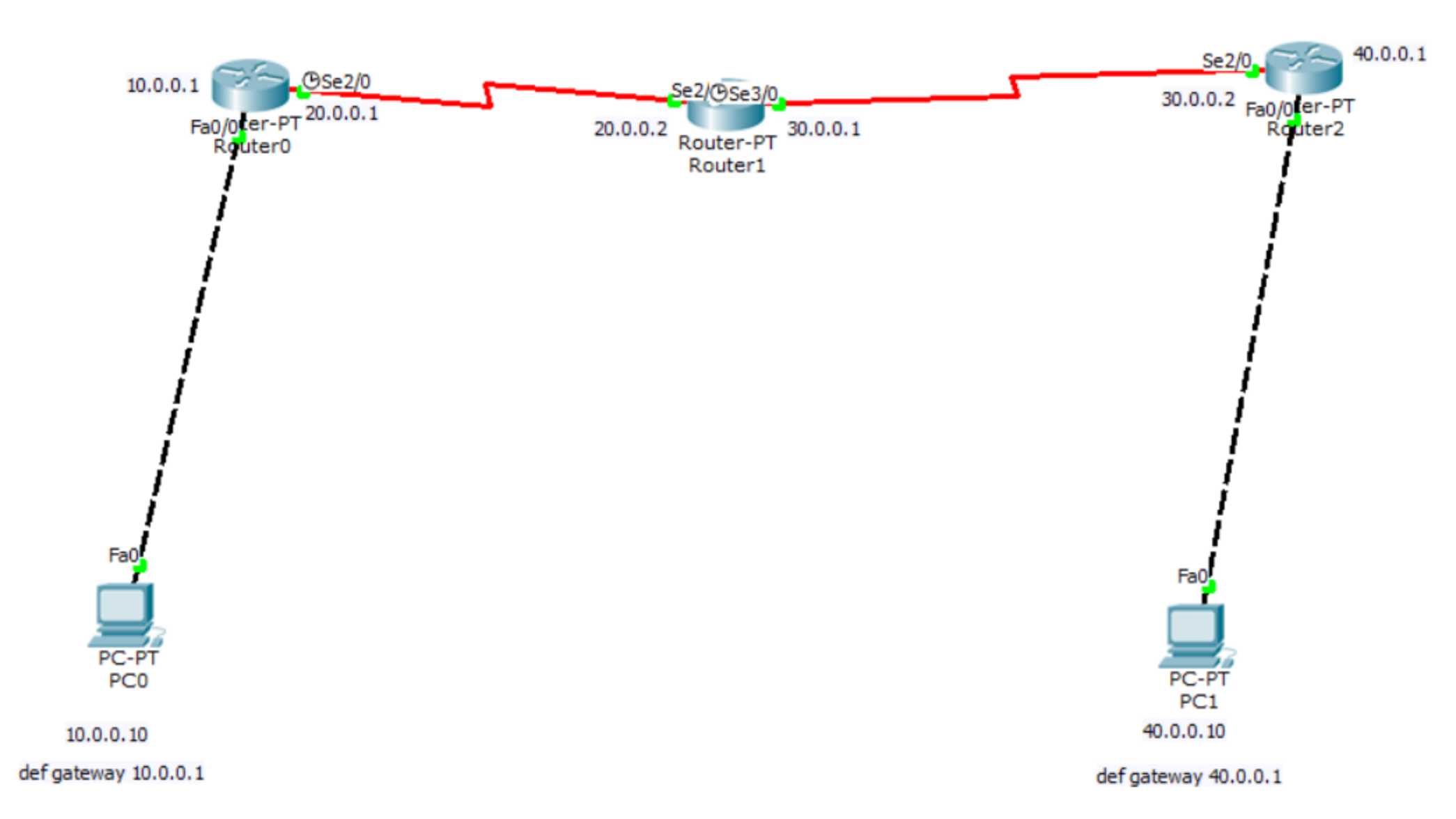
Router1

```
R1 (config)# router ospf 1
R1 (config)# area1 virtual-link 1.1.1.1
R1 (config)# exit
```

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.


10.0.0.1
Se2/0
20.0.0.1
Fa0/0
Router-PT
Router0
Se2/0
Se3/0
20.0.0.2
Router-PT
Router1
30.0.0.1
Se2/0
30.0.0.2
40.0.0.1
Fa0/0
Router-PT
Router2
Fa0
PC-PT
PC0
10.0.0.10
def gateway 10.0.0.1
Fa0
PC-PT
PC1
40.0.0.10
def gateway 40.0.0.1

PC0

Physical | Config | Desktop | Custom Interface

Command Prompt

```
Reply from 10.0.0.1: Destination host unreachable.
Reply from 40.0.0.10: bytes=32 time=6ms TTL=125
Reply from 40.0.0.10: bytes=32 time=8ms TTL=125
Reply from 40.0.0.10: bytes=32 time=7ms TTL=125

Ping statistics for 40.0.0.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 8ms, Average = 7ms

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=6ms TTL=125
Reply from 40.0.0.10: bytes=32 time=5ms 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

Ping statistics for 40.0.0.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 5ms, Maximum = 7ms, Average = 6ms

PC>
PC>
```

Router2

Physical | Config | CLI

IOS Command Line Interface

```
Router>
Router>show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

O IA 10.0.0.0/8 [110/129] via 30.0.0.1, 00:00:11, Serial2/0
O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:21:19, Serial2/0
     30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       30.0.0.0/8 is directly connected, Serial2/0
C       30.0.0.1/32 is directly connected, Serial2/0
C    40.0.0.0/8 is directly connected, FastEthernet0/0
C    172.16.0.0/16 is directly connected, Loopback0
Router>
00:51:41: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial2/0 from LOADING to FU
LL, Loading Done
```

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Router1

Physical | Config | CLI

IOS Command Line Interface

```
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       20.0.0.0/8 is directly connected, Serial2/0
C       20.0.0.1/32 is directly connected, Serial2/0
     30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       30.0.0.0/8 is directly connected, Serial3/0
C       30.0.0.2/32 is directly connected, Serial3/0
O IA 40.0.0.0/8 [110/65] via 30.0.0.2, 00:02:33, Serial3/0
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface loopback 0

Router(config-if)#
```

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Router0

Physical | Config | CLI

IOS Command Line Interface

```
Router>show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
     20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       20.0.0.0/8 is directly connected, Serial2/0
C       20.0.0.2/32 is directly connected, Serial2/0
O    30.0.0.0/8 [110/128] via 20.0.0.2, 00:18:38, Serial2/0
O IA 40.0.0.0/8 [110/129] via 20.0.0.2, 00:18:13, Serial2/0
C    172.16.0.0/16 is directly connected, Loopback0
Router>
```

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