CLab3

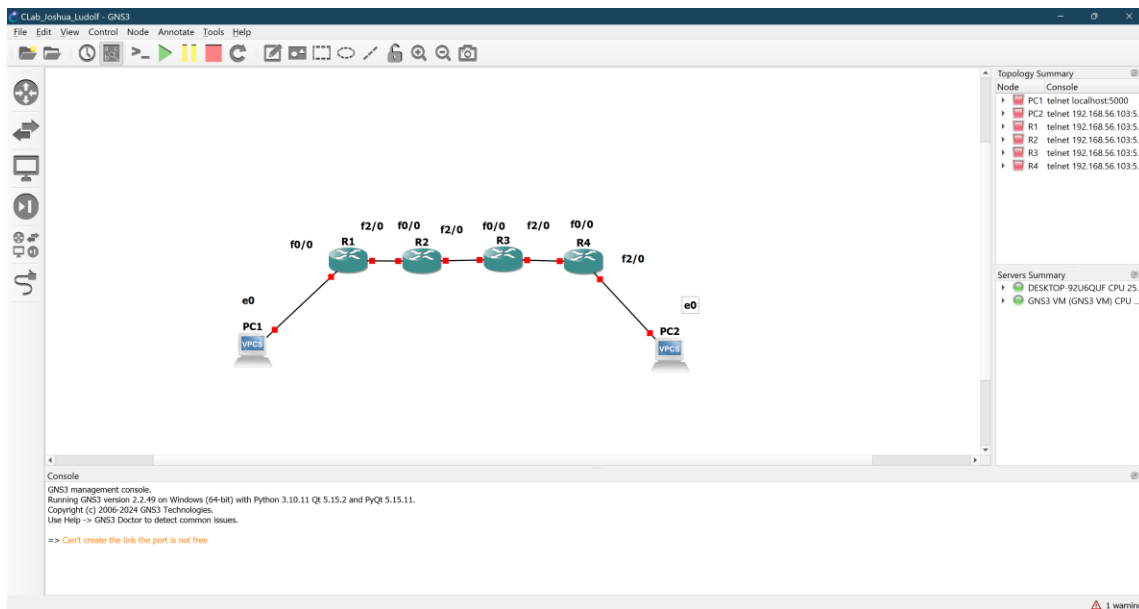## OSFP Routing

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❖ I created the following topology that shows PC1 connected to Router 1 (R1) and Router 1 (R1) is connected to 3 other Routers (R2, R3, & R4) then Router 4 connected to PC2.

❖ Then I started configuring the Ip address on PC1

❖ PC2 configuring Ip address

❖ Configuration of Router 1 to connect it to PC1 & Router 2

```
R1#
R1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface f0/0
R1(config-if)#ip address 10.10.10.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#
*Sep 10 23:53:49.891: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Sep 10 23:53:50.891: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#exit
R1(config)#interface f2/0
R1(config-if)#ip address 20.20.20.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
*Sep 10 23:54:30.947: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
*Sep 10 23:54:31.947: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R1(config)#
```

❖ Configuring Open Shortest Path First (OSPF) in Router 1 (R1)

```
R1(config)#router ospf 1
R1(config-router)#network 10.10.10.0 0.0.0.255 area 0
R1(config-router)#network 20.20.20.0 0.0.0.255 area 0
R1(config-router)#exit
R1(config)#exit
R1#
*Sep 10 23:58:58.627: %SYS-5-CONFIG_I: Configured from console by console
R1#
```

❖ Configuration of Router 2 (R2) to connect it to Router 1 (R1) & Router 3 (R3)

```
R2#
R2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#interface f0/0
R2(config-if)#ip address 20.20.20.2 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#
*Sep 11 00:01:49.107: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Sep 11 00:01:50.107: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config)#interface f2/0
R2(config-if)#ip address 30.30.30.1 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#exi
*Sep 11 00:02:21.231: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
*Sep 11 00:02:22.231: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R2(config)#
```

❖ Configuring Open Shortest Path First (OSPF) in Router 2 (R2)

```
*Sep 11 00:02:22.231: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R2(config)#router ospf 1
R2(config-router)#network 20.20.20.0 0.0.0.255 area 0
R2(config-router)#
*Sep 11 00:03:50.039: %OSPF-5-ADJCHG: Process 1, Nbr 20.20.20.1 on FastEthernet0/0 from LOADING to FULL, Loading Done
R2(config-router)#network 30.30.30.0 0.0.0.255 area 0
R2(config-router)#exit
R2(config)#end
R2#
*Sep 11 00:04:17.283: %SYS-5-CONFIG_I: Configured from console by console
R2#
```

❖ Configuration of Router 3 (R3) to connect it to Router 2 (R2) & Router 4 (R4)

```
R3#
R3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#interface f0/0
R3(config-if)#ip address 30.30.30.2 255.255.255.0
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#
*Sep 11 00:06:44.667: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Sep 11 00:06:45.667: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R3(config)#interface f2/0
R3(config-if)#ip address 40.40.40.1 255.255.255.0
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#
*Sep 11 00:07:19.059: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
*Sep 11 00:07:20.059: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R3(config)#end
R3#
*Sep 11 00:07:23.483: %SYS-5-CONFIG_I: Configured from console by console
R3#
```

❖ Configuring Open Shortest Path First (OSPF) in Router 3 (R3)

```
R3(config)#router ospf 1
R3(config-router)#network 30.30.30.0 0.0.0.255 area 0
R3(config-router)#
*Sep 11 00:08:38.491: %OSPF-5-ADJCHG: Process 1, Nbr 30.30.30.1 on FastEthernet0/0 from LOADING to FULL, Loading Done
R3(config-router)#network 40.40.40.0 0.0.0.255 area 0
R3(config-router)#exit
R3(config)#end
R3#
*Sep 11 00:09:04.111: %SYS-5-CONFIG_I: Configured from console by console
R3#
```

❖ Configuration of Router 4 (R4) to connect it to Router 3 (R3) & PC 2

```
*Sep 10 23:52:00.435: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet3/0, changed state to down
R4#
R4#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#interface f0/0
R4(config-if)#ip address 40.40.40.2 255.255.255.0
R4(config-if)#no shutdown
R4(config-if)#exit
R4(config)#
*Sep 11 00:10:44.503: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Sep 11 00:10:45.503: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R4(config)#interface f2/0
R4(config-if)#ip address 50.50.50.1 255.255.255.0
R4(config-if)#no shutdown
R4(config-if)#exit
*Sep 11 00:11:21.315: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
*Sep 11 00:11:22.315: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R4(config-if)#exit
R4(config)#
```

❖ Configuring Open Shortest Path First (OSPF) in Router 4 (R4)

```
R4(config)#router ospf 1
R4(config-router)#network 40.40.40.0 0.0.0.255 area 0
R4(config-router)#
*Sep 11 00:14:34.199: %OSPF-5-ADJCHG: Process 1, Nbr 40.40.40.1 on FastEthernet0/0 from LOADING to FULL, Loading Done
R4(config-router)#network 50.50.50.0 0.0.0.255 area 0
R4(config-router)#exit
R4(config)#end
R4#
*Sep 11 00:15:11.767: %SYS-5-CONFIG_I: Configured from console by console
R4#
```

❖ Showing IP Route for Router 1 (R1)

```
R1#show ip route
Codes: L - local, C - connected, S - static, 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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        10.10.10.0/24 is directly connected, FastEthernet0/0
L        10.10.10.1/32 is directly connected, FastEthernet0/0
      20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        20.20.20.0/24 is directly connected, FastEthernet2/0
L        20.20.20.1/32 is directly connected, FastEthernet2/0
      30.0.0.0/24 is subnetted, 1 subnets
O        30.30.30.0 [110/2] via 20.20.20.2, 00:04:54, FastEthernet2/0
      40.0.0.0/24 is subnetted, 1 subnets
O        40.40.40.0 [110/3] via 20.20.20.2, 00:02:38, FastEthernet2/0
      50.0.0.0/24 is subnetted, 1 subnets
O        50.50.50.0 [110/4] via 20.20.20.2, 00:00:04, FastEthernet2/0
R1#
```

❖ Showing IP Route for Router 2 (R2)

```
R2#show ip route
Codes: L - local, C - connected, S - static, 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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

      10.0.0.0/24 is subnetted, 1 subnets
O        10.10.10.0 [110/2] via 20.20.20.1, 00:07:45, FastEthernet0/0
      20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        20.20.20.0/24 is directly connected, FastEthernet0/0
L        20.20.20.2/32 is directly connected, FastEthernet0/0
      30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        30.30.30.0/24 is directly connected, FastEthernet2/0
L        30.30.30.1/32 is directly connected, FastEthernet2/0
      40.0.0.0/24 is subnetted, 1 subnets
O        40.40.40.0 [110/2] via 30.30.30.2, 00:05:13, FastEthernet2/0
      50.0.0.0/24 is subnetted, 1 subnets
O        50.50.50.0 [110/3] via 30.30.30.2, 00:02:39, FastEthernet2/0
R2#
```

❖ Showing IP Route for Router 3 (R3)

```
R3#show ip route
Codes: L - local, C - connected, S - static, 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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

      10.0.0.0/24 is subnetted, 1 subnets
O        10.10.10.0 [110/3] via 30.30.30.1, 00:57:46, FastEthernet0/0
      20.0.0.0/24 is subnetted, 1 subnets
O        20.20.20.0 [110/2] via 30.30.30.1, 00:57:46, FastEthernet0/0
      30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        30.30.30.0/24 is directly connected, FastEthernet0/0
L        30.30.30.2/32 is directly connected, FastEthernet0/0
      40.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        40.40.40.0/24 is directly connected, FastEthernet2/0
L        40.40.40.1/32 is directly connected, FastEthernet2/0
      50.0.0.0/24 is subnetted, 1 subnets
O        50.50.50.0 [110/2] via 40.40.40.2, 00:54:44, FastEthernet2/0
R3#
```

❖ **Showing IP Route for Router 4 (R4)**

```
R4#show ip route
Codes: L - local, C - connected, S - static, 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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

      10.0.0.0/24 is subnetted, 1 subnets
O        10.10.10.0 [110/4] via 40.40.40.1, 00:55:29, FastEthernet0/0
      20.0.0.0/24 is subnetted, 1 subnets
O        20.20.20.0 [110/3] via 40.40.40.1, 00:55:29, FastEthernet0/0
      30.0.0.0/24 is subnetted, 1 subnets
O        30.30.30.0 [110/2] via 40.40.40.1, 00:55:29, FastEthernet0/0
      40.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        40.40.40.0/24 is directly connected, FastEthernet0/0
L        40.40.40.2/32 is directly connected, FastEthernet0/0
      50.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        50.50.50.0/24 is directly connected, FastEthernet2/0
L        50.50.50.1/32 is directly connected, FastEthernet2/0
R4#
```

❖ **Showing IP OSPF Neighbor for Router 1 (R1)**

```
R1#show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
30.30.30.1        1   FULL/BDR        00:00:38    20.20.20.2      FastEthernet2/0
R1#
```

❖ **Showing IP OSPF Neighbor for Router 2 (R2)**

```
R2#show ip ospf neighbor

Neighbor ID     Pri    State         Dead Time   Address         Interface
40.40.40.1        1    FULL/BDR      00:00:31    30.30.30.2      FastEthernet2/0
20.20.20.1        1    FULL/DR       00:00:33    20.20.20.1      FastEthernet0/0
R2#
```

❖ Showing IP OSPF Neighbor for Router 3 (R3)

```
R3#show ip ospf neighbor

Neighbor ID     Pri   State        Dead Time   Address        Interface
50.50.50.1       1    FULL/BDR     00:00:37    40.40.40.2     FastEthernet2/0
30.30.30.1       1    FULL/DR      00:00:31    30.30.30.1     FastEthernet0/0
R3#
```

❖ Showing IP OSPF Neighbor for Router 4 (R4)

```
R4#show ip ospf neighbor

Neighbor ID     Pri   State        Dead Time   Address        Interface
40.40.40.1       1    FULL/DR      00:00:35    40.40.40.1     FastEthernet0/0
R4#
```

❖ PC 1 ping PC 2 & PC 2 Ping PC 1

```
PC1> ping PC2
Cannot resolve PC2

PC1> ping 50.50.50.50

84 bytes from 50.50.50.50 icmp_seq=1 ttl=60 time=467.538 ms
84 bytes from 50.50.50.50 icmp_seq=2 ttl=60 time=303.796 ms
84 bytes from 50.50.50.50 icmp_seq=3 ttl=60 time=365.484 ms
84 bytes from 50.50.50.50 icmp_seq=4 ttl=60 time=270.185 ms
84 bytes from 50.50.50.50 icmp_seq=5 ttl=60 time=325.503 ms

PC1>
```

```
PC2> ping 10.10.10.10

84 bytes from 10.10.10.10 icmp_seq=1 ttl=60 time=323.908 ms
84 bytes from 10.10.10.10 icmp_seq=2 ttl=60 time=315.741 ms
84 bytes from 10.10.10.10 icmp_seq=3 ttl=60 time=174.539 ms
84 bytes from 10.10.10.10 icmp_seq=4 ttl=60 time=319.752 ms
84 bytes from 10.10.10.10 icmp_seq=5 ttl=60 time=269.005 ms

PC2>
```

❖ PC 1 & PC 2 ping Router 1 (R1)

```
PC1> ping 10.10.10.1

84 bytes from 10.10.10.1 icmp_seq=1 ttl=255 time=62.646 ms
84 bytes from 10.10.10.1 icmp_seq=2 ttl=255 time=34.650 ms
84 bytes from 10.10.10.1 icmp_seq=3 ttl=255 time=5.074 ms
84 bytes from 10.10.10.1 icmp_seq=4 ttl=255 time=53.631 ms
84 bytes from 10.10.10.1 icmp_seq=5 ttl=255 time=20.115 ms

PC1>
```

```
PC2> ping 10.10.10.1

84 bytes from 10.10.10.1 icmp_seq=1 ttl=252 time=196.423 ms
84 bytes from 10.10.10.1 icmp_seq=2 ttl=252 time=290.427 ms
84 bytes from 10.10.10.1 icmp_seq=3 ttl=252 time=359.360 ms
84 bytes from 10.10.10.1 icmp_seq=4 ttl=252 time=269.519 ms
84 bytes from 10.10.10.1 icmp_seq=5 ttl=252 time=248.940 ms

PC2>
```

❖ PC 1 & PC 2 ping Router 2 (R2)
  o Testing through both OSPF neighbors (Router 1 & Router 3)

```
PC1> ping 20.20.20.2

84 bytes from 20.20.20.2 icmp_seq=1 ttl=254 time=93.945 ms
84 bytes from 20.20.20.2 icmp_seq=2 ttl=254 time=152.779 ms
84 bytes from 20.20.20.2 icmp_seq=3 ttl=254 time=110.976 ms
84 bytes from 20.20.20.2 icmp_seq=4 ttl=254 time=86.312 ms
84 bytes from 20.20.20.2 icmp_seq=5 ttl=254 time=106.146 ms

PC1> ping 30.30.30.1

84 bytes from 30.30.30.1 icmp_seq=1 ttl=254 time=120.304 ms
84 bytes from 30.30.30.1 icmp_seq=2 ttl=254 time=75.664 ms
84 bytes from 30.30.30.1 icmp_seq=3 ttl=254 time=94.669 ms
84 bytes from 30.30.30.1 icmp_seq=4 ttl=254 time=117.922 ms
84 bytes from 30.30.30.1 icmp_seq=5 ttl=254 time=143.245 ms
```

```
PC2> ping 30.30.30.1

84 bytes from 30.30.30.1 icmp_seq=1 ttl=253 time=219.845 ms
84 bytes from 30.30.30.1 icmp_seq=2 ttl=253 time=171.236 ms
84 bytes from 30.30.30.1 icmp_seq=3 ttl=253 time=183.054 ms
84 bytes from 30.30.30.1 icmp_seq=4 ttl=253 time=172.576 ms
84 bytes from 30.30.30.1 icmp_seq=5 ttl=253 time=325.080 ms

PC2> ping 20.20.20.2

84 bytes from 20.20.20.2 icmp_seq=1 ttl=253 time=230.606 ms
84 bytes from 20.20.20.2 icmp_seq=2 ttl=253 time=320.717 ms
84 bytes from 20.20.20.2 icmp_seq=3 ttl=253 time=148.300 ms
84 bytes from 20.20.20.2 icmp_seq=4 ttl=253 time=156.186 ms
84 bytes from 20.20.20.2 icmp_seq=5 ttl=253 time=147.756 ms
```

❖ PC 1 & PC 2 ping Router 3 (R3)
  o Testing through both OSPF neighbors (Router 2 & Router 4)

```
PC1> ping 30.30.30.2

84 bytes from 30.30.30.2 icmp_seq=1 ttl=253 time=310.248 ms
84 bytes from 30.30.30.2 icmp_seq=2 ttl=253 time=140.394 ms
84 bytes from 30.30.30.2 icmp_seq=3 ttl=253 time=211.949 ms
84 bytes from 30.30.30.2 icmp_seq=4 ttl=253 time=209.059 ms
84 bytes from 30.30.30.2 icmp_seq=5 ttl=253 time=151.913 ms

PC1> ping 40.40.40.1

84 bytes from 40.40.40.1 icmp_seq=1 ttl=253 time=168.156 ms
84 bytes from 40.40.40.1 icmp_seq=2 ttl=253 time=329.977 ms
84 bytes from 40.40.40.1 icmp_seq=3 ttl=253 time=166.120 ms
84 bytes from 40.40.40.1 icmp_seq=4 ttl=253 time=156.246 ms
84 bytes from 40.40.40.1 icmp_seq=5 ttl=253 time=155.517 ms
```

```
PC2> ping 30.30.30.2

84 bytes from 30.30.30.2 icmp_seq=1 ttl=254 time=107.249 ms
84 bytes from 30.30.30.2 icmp_seq=2 ttl=254 time=71.348 ms
84 bytes from 30.30.30.2 icmp_seq=3 ttl=254 time=103.844 ms
84 bytes from 30.30.30.2 icmp_seq=4 ttl=254 time=99.483 ms
84 bytes from 30.30.30.2 icmp_seq=5 ttl=254 time=138.862 ms

PC2> ping 40.40.40.1

84 bytes from 40.40.40.1 icmp_seq=1 ttl=254 time=185.875 ms
84 bytes from 40.40.40.1 icmp_seq=2 ttl=254 time=155.238 ms
84 bytes from 40.40.40.1 icmp_seq=3 ttl=254 time=91.176 ms
84 bytes from 40.40.40.1 icmp_seq=4 ttl=254 time=96.033 ms
84 bytes from 40.40.40.1 icmp_seq=5 ttl=254 time=55.276 ms
```

❖ PC 1 & PC 2 ping Router 4 (R4)

```
PC1> ping 40.40.40.2

84 bytes from 40.40.40.2 icmp_seq=1 ttl=252 time=469.293 ms
84 bytes from 40.40.40.2 icmp_seq=2 ttl=252 time=319.449 ms
84 bytes from 40.40.40.2 icmp_seq=3 ttl=252 time=188.022 ms
84 bytes from 40.40.40.2 icmp_seq=4 ttl=252 time=259.876 ms
84 bytes from 40.40.40.2 icmp_seq=5 ttl=252 time=200.858 ms

PC1> ping 50.50.50.1

84 bytes from 50.50.50.1 icmp_seq=1 ttl=252 time=285.501 ms
84 bytes from 50.50.50.1 icmp_seq=2 ttl=252 time=275.786 ms
84 bytes from 50.50.50.1 icmp_seq=3 ttl=252 time=258.325 ms
84 bytes from 50.50.50.1 icmp_seq=4 ttl=252 time=347.412 ms
84 bytes from 50.50.50.1 icmp_seq=5 ttl=252 time=265.175 ms
```

```
PC2> ping 40.40.40.2

84 bytes from 40.40.40.2 icmp_seq=1 ttl=255 time=54.541 ms
84 bytes from 40.40.40.2 icmp_seq=2 ttl=255 time=19.466 ms
84 bytes from 40.40.40.2 icmp_seq=3 ttl=255 time=55.386 ms
84 bytes from 40.40.40.2 icmp_seq=4 ttl=255 time=22.670 ms
84 bytes from 40.40.40.2 icmp_seq=5 ttl=255 time=22.799 ms

PC2> ping 50.50.50.1

84 bytes from 50.50.50.1 icmp_seq=1 ttl=255 time=38.721 ms
84 bytes from 50.50.50.1 icmp_seq=2 ttl=255 time=39.898 ms
84 bytes from 50.50.50.1 icmp_seq=3 ttl=255 time=14.135 ms
84 bytes from 50.50.50.1 icmp_seq=4 ttl=255 time=11.894 ms
84 bytes from 50.50.50.1 icmp_seq=5 ttl=255 time=15.126 ms
```

From this lab I learned:

Routing Information Protocol (RIP) is a distance-vector protocol that uses hop count to determine the best path for data packets. It's one of the oldest routing protocols still in use. **Open Shortest Path First (OSPF)** is a link-state protocol that uses the shortest path first algorithm to calculate the best route for data packets. It's widely adopted in large enterprise networks. One of the useful commands in OSPF is show ip ospf neighbor, which provides detailed information about the OSPF neighbors of a router. This command helps network administrators monitor and troubleshoot OSPF adjacency relationships, ensuring that routers maintain accurate and up-to-date routing information. By using OSPF, organizations can achieve more efficient and reliable routing, making it a preferred choice for complex and large-scale network environments.