NWK780 – TRADITIONAL NETWORKS

Seneca | SCHOOL OF INFORMATION TECHNOLOGY ADMINISTRATION & SECURITY

Lab4 OSPFv2 Group size =4

[redacted]

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Lab Theory

OSPFv2 requires only a few configuration commands if you rely on default settings. To use OSPF, all you need to do is enable OSPF on each interface you intend to use in the network, and OSPF uses messages to discover neighbors and learn routes through those neighbors.

However, the complexity of OSPFv2 results in a large number of show commands, many of which reveal those default settings.

Therefore, while you can make OSPFv2 work in a lab with all default settings, to become comfortable working with it, you need to know the most common optional features as well.

Lab Objectives

1. To understand how to configure OSPFv2 on routers
2. To understand how to configure DR and BDR and change them
3. To understand how to use default routes with OSPF

Lab Instructions

1. **Mode of Operation:** This lab must be done **in person** with groups of **four** students.
2. **Handle Equipment Carefully:** Cisco devices are delicate and expensive. Handle all equipment with care.
3. **Power Safety:** Ensure all devices are powered off before connecting or disconnecting cables to avoid electrical hazards.
4. **Avoid Physical Hazards:** Be mindful of cables to prevent tripping and ensure proper cable management to avoid entanglements.

5. Each group must **present** the results to the instructor to gain the mark of this lab.
6. **After finishing your lab:** Disconnect cables, return them to their proper place and power down all devices.

Network Topology

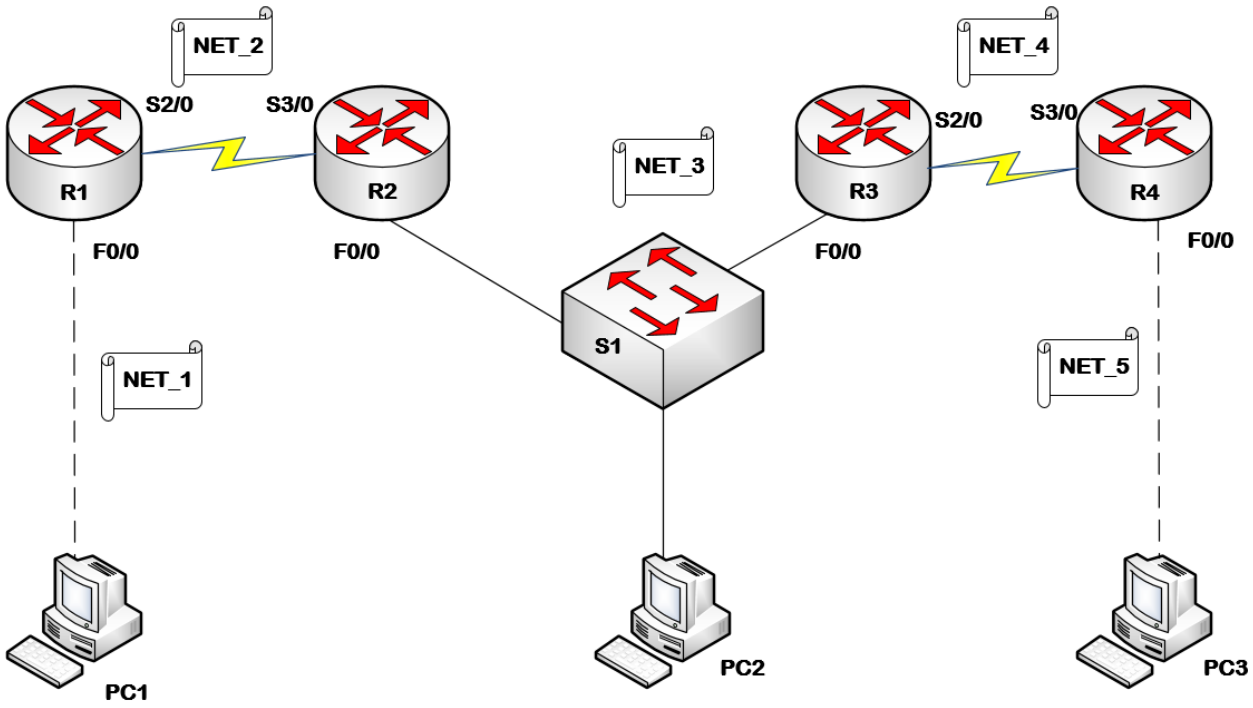

Fig1

Procedure

1. The major IP address for this lab is **192.168.ab.0/24** where **ab** represents the last two digits of the student ID of the group member with the smallest ID number.
2. The networks in the diagram above have the following number of addresses

Network	Number of hosts
NET_1	75
NET_2	2
NET_3	55
NET_4	4
NET_5	12

3. At the beginning assume that NET_5 **does not exist**
4. Use VLSM to assign addresses to routers and PCs (**PC1 and PC2 only**)

5. Assign first IP address of the range to the router and last address to the host
6. For **NET_3**; assign R2 the first address, R3 the second address and PC2 the last address of the range.
7. For serial interfaces; the lowest serial number should have the lowest IP address
8. **Check point 1:** Show your professor the VLSM calculations, once approved, you can move on to the next step.
9. **Add NET_5** after the last address of previous calculations. Fill the full IP addresses in the below table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	FastEthernet0/0	192.168.46.1	255.255.255.128	N.A.
	Serial 2/0	192.168.46.201	255.255.255.252	N.A.
R2	FastEthernet0/0	192.168.46.129	255.255.255.192	N.A.
	Serial 3/0	192.168.46.202	255.255.255.252	N.A.
R3	FastEthernet0/0	192.168.46.130	255.255.255.192	N.A.
	Serial 2/0	192.168.46.193	255.255.255.248	N.A.
R4	GigaEthernet0/0	192.168.46.209	255.255.255.240	N.A.
	Serial 1	192.168.46.194	255.255.255.248	N.A.
PC1	NIC	192.168.46.126	255.255.255.128	192.168.46.1
PC2	NIC	192.168.46.190	255.255.255.192	192.168.46.129
PC3	NIC	192.168.46.218	255.255.255.240	192.168.46.209

Table 1

10. **Check point 2:** Show table 1 to your professor, then draw a full labled diagram of the whole network with complete network and IP addresses. Once everything is approved, you can start connecting physical devices.
11. Connect the full diagram of Fig. 1 using routers and switches on your rack.
12. Install OSPF only on **R1, R2 and R3**

R1

```
R1(config-if)#router ospf 1
R1(config-router)#network 192.168.46.0 0.0.0.127 area 0
R1(config-router)#network 192.168.46.200 0.0.0.3 area 0
```

R2

```
R2(config)#router ospf 1
R2(config-router)#network 192.168.46.128 0.0.0.63 area 0
R2(config-router)#network 192.168.46.200 0.0.0.3 area 0
R2(config-router)#ip route
*Jan  1 00:17:43.959: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.46.201 on Serial0/0
```

R3

```
R3(config)#router ospf 1
R3(config-router)#network 192.168.46.128 0.0.0.63 area 0
```

13. For **R3-R4** connection; use **static and default routes** to ensure connectivity (do not install OSPF on R4).

    R3 (static and default routes)

    R4 (static and default routes)

14. Now R4 is connected to R3 through static routes, we need to notify R1 and R2 about these routes.
15. The command which is used is ***Router(config-router)#redistribute static subnets***
16. The Cisco command ***redistribute static subnets*** is used in dynamic routing protocols to redistribute static routes into a dynamic routing protocol's process, such as OSPF.
17. Apply this command to both R2 and R3.

    R2

```
R2(config)#router ospf 1
R2(config-router)#redistribute static subnets
R2(config-router)#
```

R3

```
R3(config-router)#redistribute static subnets
R3(config-router)#router ospf 1
R3(config-router)#redistribute static subnets
R3(config-router)#
```

18. At this point; all your PCs should be able to ping each other (you should have full connectivity, verify that by manually issuing many pings between different PCs).

    PC1 Pinging PC2

```
C:\Users\fmnoor>ping 192.168.46.126

Pinging 192.168.46.126 with 32 bytes of data:
Reply from 192.168.46.126: bytes=32 time<1ms TTL=128
Reply from 192.168.46.126: bytes=32 time<1ms TTL=128
Reply from 192.168.46.126: bytes=32 time<1ms TTL=128
Reply from 192.168.46.126: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.46.126:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\fmnoor>
```

PC1 → ping PC3

```
C:\Users\zmmohamed>ping 192.168.46.218

Pinging 192.168.46.218 with 32 bytes of data:
Reply from 192.168.46.218: bytes=32 time=20ms TTL=124
Reply from 192.168.46.218: bytes=32 time=20ms TTL=124
Reply from 192.168.46.218: bytes=32 time=20ms TTL=124
Reply from 192.168.46.218: bytes=32 time=20ms TTL=124

Ping statistics for 192.168.46.218:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 20ms, Maximum = 20ms, Average = 20ms

C:\Users\zmmohamed>
```

PC2 → ping PC3

```
C:\Users\zmmohamed>ping 192.168.46.218

Pinging 192.168.46.218 with 32 bytes of data:
Reply from 192.168.46.218: bytes=32 time=11ms TTL=126
Reply from 192.168.46.218: bytes=32 time=11ms TTL=126
Reply from 192.168.46.218: bytes=32 time=11ms TTL=126
Reply from 192.168.46.218: bytes=32 time=10ms TTL=126

Ping statistics for 192.168.46.218:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
```

R1 → R4

```
R1#ping 192.168.46.209

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.46.209, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/29/32 ms
R1#
```

Do show ip ospf neighbor (R3)

```
R3(config)#do SHOW IP OSPF NEIGHBOR

Neighbor ID     Pri   State           Dead Time   Address         Interface
192.168.46.202    1   FULL/DR         00:00:34    192.168.46.129  FastEthernet0/0
R3(config)#
```

Do show ip ospf neighbor (R2)

```
R2(config)#do show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
192.168.46.201    0   FULL/  -        00:00:33    192.168.46.201  Serial0/0/1
192.168.46.193    1   FULL/BDR        00:00:33    192.168.46.130  FastEthernet0/0
R2(config)#
```

Show IP Protocols (R3)

```
R3(config)#do show ip protocols
Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 192.168.46.193
  It is an autonomous system boundary router
  Redistributing External Routes from,
    static, includes subnets in redistribution
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    192.168.46.128 0.0.0.63 area 0
    192.168.46.192 0.0.0.7 area 0
 Reference bandwidth unit is 100 mbps
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.46.202        110      00:08:50
    192.168.46.201        110      00:04:19
  Distance: (default is 110)

R3(config)#
```

Show IP protocols (R2)

```
R3(config)#do show ip protocols
Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 192.168.46.193
  It is an autonomous system boundary router
  Redistributing External Routes from,
    static, includes subnets in redistribution
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    192.168.46.128 0.0.0.63 area 0
    192.168.46.192 0.0.0.7 area 0
 Reference bandwidth unit is 100 mbps
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.46.202       110      00:08:50
    192.168.46.201       110      00:04:19
  Distance: (default is 110)

R3(config)#
```

DEFAULT AND STATIC ROUTES ON 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
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is 192.168.46.193 to network 0.0.0.0

S*    0.0.0.0/0 [1/0] via 192.168.46.193
      192.168.46.0/24 is variably subnetted, 4 subnets, 3 masks
C        192.168.46.192/29 is directly connected, Serial0/0/1
L        192.168.46.194/32 is directly connected, Serial0/0/1
C        192.168.46.208/28 is directly connected, GigabitEthernet0/0
L        192.168.46.209/32 is directly connected, GigabitEthernet0/0
```

19. **Check point 3:** Call your Instructor to show all your results.