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Lab 3 Writeup

1.

**Router-2**

```
Interface FastEthernet 2/0
 ip address 192.168.1.17 255.255.255.248
 no shut
Interface Serial 1/1
 ip address 192.168.1.1 255.255.255.252
 no shut
Interface Serial 1/0
 ip address 192.168.1.1 255.255.255.252
 no shut
ip route 192.168.1.24 255.255.255.248 192.168.1.13
```

**Router-1**

```
Interface Serial 1/0
 ip address 192.168.1.2 255.255.255.252
 no shut
Interface Serial 1/1
 ip address 192.168.1.5 255.255.255.252
 no shut
ip route 192.168.1.16 255.255.255.248 192.168.1.1
ip route 192.168.1.24 255.255.255.248 192.168.1.6
interface Loopback 0
 ip address 10.10.10.10 255.255.255.255
```

**Router-3**

```
Interface FastEthernet 2/0
 ip address 192.168.2.2 255.255.255.248
 no shut
Interface Serial 1/0
 ip address 192.168.1.6 255.255.255.252
 no shut
Interface Serial 1/1
 ip address 192.168.1.9 255.255.255.252
 no shut
ip route 192.168.1.16 255.255.255.248 192.168.1.15
```

**Router-4**

```
Interface Serial 1/0
 ip address 192.168.1.10 255.255.255.252
 no shut
```

```
Interface Serial 1/1
 ip address 192.168.1.13 255.255.255.252
 no shut
ip route 192.168.1.24 255.255.255.248 192.168.1.9
ip route 192.168.1.16 255.255.255.248 192.168.1.14
interface Loopback 0
 ip address 20.20.20.20 255.255.255.255
```

Tracert from PC2 → PC3

```
C:\Users\itplab>tracert 192.168.1.26

Tracing route to ITPLAB-PC [192.168.1.26]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  192.168.1.17
  2     1 ms     1 ms     1 ms  192.168.1.13
  3     2 ms     2 ms     2 ms  192.168.1.9
  4     2 ms     2 ms     2 ms  ITPLAB-PC [192.168.1.26]

Trace complete.
```

Tracert PC3 → PC2

```
C:\Users\itplab>tracert 192.168.1.18

Tracing route to ITPLAB-PC [192.168.1.18]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  192.168.1.25
  2     1 ms     1 ms     1 ms  192.168.1.5
  3     2 ms     2 ms     2 ms  192.168.1.1
  4     2 ms     2 ms     2 ms  ITPLAB-PC [192.168.1.18]

Trace complete.
```

2A.

**Router-1**

```
router rip
 version 2
 network 140.140.140.0
interface Serial 1/0
 ip address 140.140.143.6 255.255.255.252
 no shut
interface FastEthernet 2/1
 ip address 140.140.141.1 255.255.255.252
 no shut
interface Loopback 0
 ip address 140.140.140.1 255.255.255.252
interface Loopback 1
 ip address 140.140.139.32 255.255.255.240
```

**Router-2**

```
router rip
```

```
 version 2
 network 140.140.142.0
interface Serial 1/1
 ip address 140.140.143.18 255.255.255.252
 no shut
interface FastEthernet 2/0
 ip address 140.140.141.1 255.255.255.252
 no shut
interface Loopback 0
 ip address 140.140.142.1 255.255.255.252
```

**Router-3**

```
router rip
 version 2
 network 140.140.140.4
interface Serial 1/1
 ip address 140.140.143.5 255.255.255.252
 no shut
interface Serial 1/0
 ip address 140.140.143.1 255.255.255.252
 no shut
interface Loopback 0
 ip address 140.140.139.17 255.255.255.240
```

2B.

```
R1(config)#do sh ip route
Codes: 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

Gateway of last resort is not set

     140.140.0.0/16 is variably subnetted, 7 subnets, 2 masks
R       140.140.140.4/30 [120/2] via 140.140.141.2, 00:00:10, FastEthernet2/0
C       140.140.140.0/30 is directly connected, Loopback2
C       140.140.141.0/30 is directly connected, FastEthernet2/0
R       140.140.142.0/30 [120/1] via 140.140.141.2, 00:00:10, FastEthernet2/0
R       140.140.143.0/30 [120/1] via 140.140.141.2, 00:00:10, FastEthernet2/0
R       140.140.139.16/30 [120/2] via 140.140.141.2, 00:00:10, FastEthernet2/0
C       140.140.139.32/28 is directly connected, Loopback1
```

**Switch**

```
interface FastEthernet 0/1
 switchport mode access
interface FastEthernet 0/3
 switchport mode access
interface FastEthernet 0/4
 switchport mode access
monitor session 1 source interface FastEthernet 0/3
```

monitor session 1 destination interface FastEthernet 0/1

2C.

Using wireshark I can see the response info that was sent from 140.140.141.1 with the protocol of RIPv2 and it is a response packet.

2D.

VLSM is seen when the subnet masks /28 and /30 are used. The variable length masks help with using the address space more efficiently. Auto summarization is for that all subnets can be summarized as belonging to a certain network and subnet mask.

2E.

You don't need static routes to support RIPv2 because it maps out the network automatically. It is a lot better than having to go through and manually enter the static routes ☺

2F.

Debug ip rip

```
R3#debug ip rip
RIP protocol debugging is on
R3#
*Sep 15 23:39:07.543: RIP: received v2 update from 140.140.143.2 on Serial1/0
*Sep 15 23:39:07.543:      140.140.141.0/30 via 0.0.0.0 in 1 hops
*Sep 15 23:39:18.771: RIP: sending v2 update to 224.0.0.9 via Serial1/0 (140.140.143.1)
*Sep 15 23:39:18.771: RIP: build update entries
*Sep 15 23:39:18.771:   140.140.143.4/30 via 0.0.0.0, metric 1, tag 0
*Sep 15 23:39:27.559: RIP: sending v2 update to 224.0.0.9 via Serial1/1 (140.140.143.5)
*Sep 15 23:39:27.559: RIP: build update entries
*Sep 15 23:39:27.559:   140.140.143.0/30 via 0.0.0.0, metric 1, tag 0
*Sep 15 23:39:29.047: RIP: received v2 update from 140.140.143.6 on Serial1/1
*Sep 15 23:39:29.047:      140.140.141.0/30 via 0.0.0.0 in 1 hops
*Sep 15 23:39:37.055: RIP: received v2 update from 140.140.143.2 on Serial1/0
*Sep 15 23:39:37.055:      140.140.141.0/30 via 0.0.0.0 in 1 hops
*Sep 15 23:39:47.535: RIP: sending v2 update to 224.0.0.9 via Serial1/0 (140.140.143.1)
*Sep 15 23:39:47.535: RIP: build update entries
*Sep 15 23:39:47.535:   140.140.143.4/30 via 0.0.0.0, metric 1, tag 0
*Sep 15 23:39:54.119: RIP: sending v2 update to 224.0.0.9 via Serial1/1 (140.140.143.5)
*Sep 15 23:39:54.119: RIP: build update entries
*Sep 15 23:39:54.119:   140.140.143.0/30 via 0.0.0.0, metric 1, tag 0
*Sep 15 23:39:58.547: RIP: received v2 update from 140.140.143.6 on Serial1/1
*Sep 15 23:39:58.547:      140.140.141.0/30 via 0.0.0.0 in 1 hops
*Sep 15 23:40:02.887: RIP: received v2 update from 140.140.143.2 on Serial1/0
*Sep 15 23:40:02.891:      140.140.141.0/30 via 0.0.0.0 in 1 hops
```

**2 Final Question**

The fastest way would be from R3 to go directly to R1. This does not match our routing table because it goes through R2 currently. I believe this is because it found network 139.32 through R2 and so it still routes it that way even though it is not the fastest.

3A.

**Router-2**

```
interface Loopback1
 ip address 172.16.0.1 255.255.0.0
 no shut
ip route 172.16.1.0 255.255.255.0 140.140.141.1
ip route 172.16.1.0 255.255.255.0 140.140.143.1
```

3B.

**Router-1**

```
ip route 0.0.0.0 0.0.0.0 172.16.0.1
ip route 172.16.0.0 255.255.255.0 140.140.141.2
```

**Router-3**

```
ip route 0.0.0.0 0.0.0.0 172.16.0.1
ip route 172.16.1.0 255.255.255.0 140.140.143.2
```

4A.

**Router-1**

```
interface Loopback 0
  ip address 192.168.1.0 255.255.255.192
interface FastEthernet 2/0
  ip address 192.168.1.225 255.255.255.248
  no shut
```

**Router-2**

```
interface Loopback 0
  ip address 192.168.1.209 255.255.255.240
interface Loopback 1
  ip address 192.168.1.113 255.255.255.240
interface FastEthernet 2/0
  ip address 192.168.1.226 255.255.255.248
  no shut
```

**Router-3**

```
interface Loopback 0
  ip address 192.168.1.193 255.255.255.240
interface Loopback 1
  ip address 192.168.1.65 255.255.255.224
interface FastEthernet 2/0
  ip address 192.168.1.227 255.255.255.248
  no shut
```

**Router-4**

```
interface Loopback 0
  ip address 192.168.1.129 255.255.255.224
interface Loopback 1
  ip address 192.168.1.97 255.255.255.240
interface Loopback 2
  ip address 192.168.1.161 255.255.255.224
interface FastEthernet 2/0
  ip address 192.168.1.228 255.255.255.248
  no shut
```

4B.

**Router-1**

```
router ospf 2
  network 192.168.1.0 0.0.0.63 area 0
  network 192.168.1.224 0.0.0.7 area 0
interface FastEthernet 2/0
  ip ospf priority 100
```

**Router-2**

```
router ospf 2
  network 192.168.1.112 0.0.0.15 area 0
  network 192.168.1.208 0.0.0.15 area 0
  network 192.168.1.224 0.0.0.7 area 0
interface FastEthernet 2/0
  ip ospf priority 90
```

**Router-3**

```
router ospf 2
  network 192.168.1.192 0.0.0.15 area 0
  network 192.168.1.64 0.0.0.31 area 0
  network 192.168.1.224 0.0.0.7 area 0
interface FastEthernet 2/0
  ip ospf priority 0
```

**Router-4**

```
router ospf 2
  network 192.168.1.192 0.0.0.15 area 0
  network 192.168.1.64 0.0.0.31 area 0
  network 192.168.1.224 0.0.0.7 area 0
interface FastEthernet 2/0
  ip ospf priority 80
```

**Stages**

Down where no hellos are received -> Attempt where hellos are sent-> int when the router has received hellos -> 2-Way the communication has been started -> Exchange info sent between neighbors-> Loading -> Full finally adjacent

4C.

Show ip ospf database shows the ARB and ASBR. Our network does not seem to have either.

4D.

```
R1#show adjacency
Protocol Interface                 Address
IP       FastEthernet2/0           192.168.1.227(9)
IP       FastEthernet2/0           192.168.1.226(9)
IP       FastEthernet2/0           192.168.1.228(11)
```

4E.

```
R1#show ip route
Codes: 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

Gateway of last resort is not set

     192.168.1.0/24 is variably subnetted, 9 subnets, 3 masks
O       192.168.1.97/32 [110/2] via 192.168.1.228, 00:33:39, FastEthernet2/0
O       192.168.1.113/32 [110/2] via 192.168.1.226, 00:33:39, FastEthernet2/0
O       192.168.1.65/32 [110/2] via 192.168.1.227, 00:33:39, FastEthernet2/0
C       192.168.1.0/26 is directly connected, Loopback0
C       192.168.1.224/29 is directly connected, FastEthernet2/0
O       192.168.1.193/32 [110/2] via 192.168.1.227, 00:33:39, FastEthernet2/0
O       192.168.1.209/32 [110/2] via 192.168.1.226, 00:33:40, FastEthernet2/0
O       192.168.1.161/32 [110/2] via 192.168.1.228, 00:33:40, FastEthernet2/0
O       192.168.1.129/32 [110/2] via 192.168.1.228, 00:33:40, FastEthernet2/0
```

4F.

```
O       192.168.1.97/32 [110/2] via 192.168.1.228, 00:33:39, FastEthernet2/0
```

Protocol , destination network , metric cost , source address , time alive , interface

4G.

Show ip ospf and show ip ospf database:

```
R3#show ip ospf
 Routing Process "ospf 2" with ID 192.168.1.193
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 Supports area transit capability
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Incremental-SPF disabled
 Minimum LSA interval 5 secs
 Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 Number of external LSA 0. Checksum Sum 0x000000
 Number of opaque AS LSA 0. Checksum Sum 0x000000
 Number of DCbitless external and opaque AS LSA 0
 Number of DoNotAge external and opaque AS LSA 0
 Number of areas in this router is 1. 1 normal 0 stub 0 nssa
 Number of areas transit capable is 0
 External flood list length 0
 IETF NSF helper support enabled
 Cisco NSF helper support enabled

R3#show ip ospf database

            OSPF Router with ID (192.168.1.193) (Process ID 2)

                Router Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum Link count
192.168.1.1     192.168.1.1     1562        0x80000004 0x00380C 2
192.168.1.161   192.168.1.161   575         0x80000006 0x001A69 4
192.168.1.193   192.168.1.193   822         0x80000005 0x00D26F 3
192.168.1.209   192.168.1.209   271         0x80000006 0x0035AC 3

                Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
192.168.1.225   192.168.1.1     579         0x80000004 0x00A7F6
```

Show ip ospf neighbor detail:

```
R3#show ip ospf neighbor detail
 Neighbor 192.168.1.1, interface address 192.168.1.225
    In the area 0 via interface FastEthernet2/0
    Neighbor priority is 4, State is FULL, 6 state changes
    DR is 192.168.1.225 BDR is 192.168.1.226
    Options is 0x52
    LLS Options is 0x1 (LR)
    Dead timer due in 00:00:35
    Neighbor is up for 00:48:31
    Index 1/1, retransmission queue length 0, number of retransmission 0
    First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum is 0 msec
 Neighbor 192.168.1.161, interface address 192.168.1.228
    In the area 0 via interface FastEthernet2/0
    Neighbor priority is 1, State is 2WAY, 2 state changes
    DR is 192.168.1.225 BDR is 192.168.1.226
    Options is 0x12
    LLS Options is 0x1 (LR)
    Dead timer due in 00:00:31
    Neighbor is up for 00:23:08
    Index 0/0, retransmission queue length 0, number of retransmission 0
    First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum is 0 msec
 Neighbor 192.168.1.209, interface address 192.168.1.226
    In the area 0 via interface FastEthernet2/0
    Neighbor priority is 3, State is FULL, 6 state changes
    DR is 192.168.1.225 BDR is 192.168.1.226
    Options is 0x52
    LLS Options is 0x1 (LR)
    Dead timer due in 00:00:39
    Neighbor is up for 00:47:33
    Index 2/2, retransmission queue length 0, number of retransmission 0
    First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum is 0 msec
```

**debuf ip ospf packet** turns on debugging for OSPF packets

**debuf ip ospf adj** turns on debugging for adjacency events
**debuf ip ospf hello** turns on debugging for OSPF hello events

5.

**Router-3**

```
router ospf 2
  network 192.168.1.88 0.0.0.3 area 1
interface Serial 1/0
  ip address 192.168.1.89 255.255.255.252
```

**Router-5**

```
router ospf 2
  network 192.168.1.64 0.0.0.7 area 1
  network 192.168.1.72 0.0.0.7 area 1
  network 192.168.1.80 0.0.0.7 area 1
  network 192.168.1.88 0.0.0.3 area 1
interface Serial 1/0
  ip address 192.168.1.90 255.255.255.252
  ip ospf priority 80
```

**Router-4**

```
router ospf 2
  network 192.168.1.148 0.0.0.3 area 1
interface Serial 1/0
  ip address 192.168.1.149 255.255.255.252
```

**Router-6**

```
router ospf 2
  network 192.168.1.128 0.0.0.7 area 1
  network 192.168.1.136 0.0.0.7 area 1
  network 192.168.1.144 0.0.0.7 area 1
  network 192.168.1.148 0.0.0.3 area 1
interface Serial 1/0
  ip address 192.168.1.150 255.255.255.252
  ip ospf priority 80
```

5F.

R3 & R4 are now ABRs is the difference I see

5G.

They are getting propagated through a virtual link. Since they all should have a link to area 0 you use a

virtual link so that they can all see each other.

5H.

No I do not see a route to each network. I do not see anything with the route summary currently.

6.

**Router-7**

```
router ospf 2
  network 192.168.1.160 0.0.0.7 area 1
  network 192.168.1.168 0.0.0.3 area 1
  area 0 virtual-link 192.168.1.170
interface Serial 1/0
  ip address 192.168.1.170 255.255.255.252
  ip ospf priority 80
```

**Router-3**

```
interface Serial 1/1
  ip address 192.168.1.169 255.255.255.252
router ospf 2
  area 0 virtual-link 192.168.1.193
```

6D.
On router 8 it shows that area 0 is reached which means that it is a virtual link.

I was not able to get to problems 7 & 8 after spending two full days in the lab.
7.
8.

**Questions:**

1. It is a way for the router to choose which routing protocol and path to take. It shows the reliability of the routing protocol.
2. It helps choose the best path to get to the destination.
3. How fast a group of routers comes together and all of the information propgates.
4. It determines the path to a network using the hop count.
5. Routing loops, count-to-infinity condition and the packet could never make it.
6. A routed protocol is a way for the data to be transferred while a routing protocol is the communication that happens between the routers. IP is a routed protocol. OSPF is a routing protocol.
7. It communicates information about the network that it has.
8. It will talk with other routers .
9. It means all the routers have the information about the network.
10. It is the route to take if you don't already have the address.

11. Routers will take some of the load as a whole to make one router not have too much traffic.
12. RIPv2 uses multicast to send them while RIPv1 uses broadcast.
14. It will show which routers have a route to a summarized network.
15.It does not advertise routes that are backwards.
16. v1 is a distance vector protocol. V1 is classful. V1 updates are sent as broadcasts.
17. It can decrease the complexity of a network.
18. Variable length subnetting which allows you to have different size subnets which is optimizes networks.
19. It does not automatically occur. It should though.
20. If the two hosts were really far away from each other.
21. It helps determine the BR and BDR.
22. BR, BDR and RI.
23. The lite version does not have as many features.

**Very Useful Commands:**

Ip route <gateway> <mask><destination> -- static route setup
Debug ip rip --- debugging for rip
Show ip protocols --- show the OSPF info
Show ip ospf neighbor --- show ospf nodes around

-------- BEST COMMAND EVER-------
**no logging console --- remove the fan logs**
**no logging monitor**