ECE461 Lab4 Lab Report

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Exercise 2

1. **Use the captured data of a single RIP packet and explain the fields in a RIP message**

```
No.   Time        Source     Destination      Protocol   Info
  1   0.000000    10.0.1.1   224.0.0.9        RIPv2      Response
Frame 1 (106 bytes on wire, 106 bytes captured)
......
Routing Information Protocol
      Command: Response (2)
      Version: RIPv2 (2)
      Routing Domain: 0
      IP Address: 10.0.2.0, Metric: 1
      Address Family: IP (2)
      Route Tag: 0
      IP Address: 10.0.2.0 (10.0.2.0)
      Netmask: 255.255.255.0 (255.255.255.0)
      Next Hop: 0.0.0.0 (0.0.0.0)
      Metric: 1
......
```

The following fields are included in the RIP message above

- Command
  Command field identifies the type of the the RIP message, such as response or reply
- Version
  Version field identifies the RIP version, such as RIPv2
- Routing Domain
  Routing domain field is an identifier used to specify the routing instance. A routing domain of 0 indicates the default routing domain
- IP Address
  IP address field specifies the IP address for the entry
- Address Family
  Address family field specifies the address family used
- Route Tag
  Route tag field provides a method for distinguishing between internal routes (learned by RIP) and external routes (learned from other protocols).
- Netmask
  Netmask field contains the subnet mask for the entry
- Next Hop
  Next hop field indicates the IP address of the next hop to which packets for the entry should be forwarded.
- Metric

Metric field indicates how many internetwork hops (routers) have been traversed in the trip to the destination

2. **For PC1, include the output of the commands *show ip route* and *netstat -rn* from steps 4 and 5. Discuss the differences in the output of the commands**

```
ripd# show ip rip
Codes: R - RIP, C - connected, O - OSPF, B - BGP
     (n) - normal, (s) - static, (d) - default, (r) -
redistribute,
     (i) - interface
     Network          Next Hop   Metric     From        Time
C(i) 10.0.1.0/24      0.0.0.0    1          self
R(n) 10.0.2.0/24      10.0.1.1   2          10.0.1.1    03:00
R(n) 10.0.3.0/24      10.0.1.1   3          10.0.1.1    03:00
R(n) 10.0.4.0/24      10.0.1.1   4          10.0.1.1    03:00

[root@PC1 root]# netstat -rn
Kernel IP routing table
Destination Gateway   Genmask        Flags  MSS  Window  irtt
Iface
10.0.4.0    10.0.1.1  255.255.255.0  UG     0     0       0     eth0
10.0.1.0    0.0.0.0   255.255.255.0  U      0     0       0     eth0
10.0.2.0    10.0.1.1  255.255.255.0  UG     0     0       0     eth0
10.0.3.0    10.0.1.1  255.255.255.0  UG     0     0       0     eth0
127.0.0.0   0.0.0.0   255.0.0.0      U      0     0       0     lo
```

The *show ip rip* command includes the metric, update time and the routing protocol type, which are not included in the result of *netstat -rn* command.The *netstat -rn* command displays the loopback address and other settings including MSS, window, itrr, and interface, which are now shown in the output of command *show ip rip*.

3. **Include the output of traceroute from step 7.**

```
[root@PC1 root]# traceroute 10.0.4.10
traceroute to 10.0.4.10 (10.0.4.10), 30 hops max, 38 byte packets
 1  10.0.1.1 (10.0.1.1)  3.416 ms  0.429 ms  0.405 ms
 2  10.0.2.2 (10.0.2.2)  0.665 ms  0.484 ms  0.457 ms
 3  10.0.3.3 (10.0.3.3)  0.733 ms  0.531 ms  0.545 ms
 4  10.0.4.10 (10.0.4.10)  4.437 ms  0.267 ms  0.238 ms
```

4. **Answer the questions posed in Step 8. For each answer, include captured packets to support your answers.**
   a. **What is the destination IP address of RIP packets?**
   The destination IP address of RIP packets is 224.0.0.9. The following is an RIP packet captured on PC1.

```
No.  Time      Source    Destination   Protocol Info
1    0.000000  10.0.1.1  224.0.0.9     RIPv2    Response
Frame 1 (106 bytes on wire, 106 bytes captured)
```

```
Ethernet II, Src: 00:1c:58:45:34:08 (00:1c:58:45:34:08), Dst:
01:00:5e:00:00:09 (01:00:5e:00:00:09)
Internet Protocol, Src: 10.0.1.1 (10.0.1.1), Dst: 224.0.0.9
(224.0.0.9)
User Datagram Protocol, Src Port: router (520), Dst Port:
router (520)
Routing Information Protocol
......
```

b. Do routers forward RIP packets? In other words, does PC1 receive RIP packets sent from Router 3?

Routers do not forward RIP packets. RIP protocol is restricted to directly connected entities. To reach PC1, Router 3 must go through Router 1. As a result, PC1 will not receive any RIP packets sent from Router 3. The following is a list of RIP packets received by PC1.

```
No.  Time       Source     Destination   Protocol Info
1    0.000000   10.0.1.1   224.0.0.9     RIPv2    Response
5    27.064320  10.0.1.1   224.0.0.9     RIPv2    Response
8    53.784737  10.0.1.1   224.0.0.9     RIPv2    Response
12   81.253071  10.0.1.1   224.0.0.9     RIPv2    Response
16   108.569396 10.0.1.1   224.0.0.9     RIPv2    Response
19   135.389813 10.0.1.1   224.0.0.9     RIPv2    Response
```

c. Which types of routing RIP messages do you observe? The type of a RIP message is indicated by the value of the field *command*. For each packet type that you observed, explain the role that this message type plays in the RIP protocol.

The type of routing RIP messages is response. This is observed in the command field.

```
......
Command: Response (2)
Version: RIPv2 (2)
Routing Domain: 0
......
```

d. A RIP message may contain multiple routing table entries. How many bytes are consumed in a RIP message to contain a routing table entry? Which information is transmitted for each message?

The following information in an RIP packet represents a routing table entry.

```
......
IP Address: 10.0.2.0, Metric: 1
Address Family: IP (2)
Route Tag: 0
IP Address: 10.0.2.0 (10.0.2.0)
Netmask: 255.255.255.0 (255.255.255.0)
Next Hop: 0.0.0.0 (0.0.0.0)
Metric: 1
......
```

20 bytes are consumed to contain one routing table entry. The information transmitted includes IP address, address family, route tag, netmast, next hop, and metric.

Exercise 3(A)

Include the routing tables of the linux PCs before the topology was changed (Step 2)and after Router 4 has been added and the routing tables have been updated (Step 5). Discuss the time it took to update the routing table.

The following are routing tables of the linux PCs **before** the topology change.

```
[root@PC1 root]# netstat -rn
Kernel IP routing table
Destination Gateway   Genmask       Flags  MSS  Window  irtt
Iface
10.0.4.0    10.0.1.1  255.255.255.0  UG    0     0      0     eth0
10.0.1.0    0.0.0.0   255.255.255.0  U     0     0      0     eth0
10.0.2.0    10.0.1.1  255.255.255.0  UG    0     0      0     eth0
10.0.3.0    10.0.1.1  255.255.255.0  UG    0     0      0     eth0
127.0.0.0   0.0.0.0   255.0.0.0      U     0     0      0     lo

[root@PC2 root]# netstat -rn
Kernel IP routing table
Destination Gateway   Genmask       Flags  MSS  Window  irtt
Iface
10.0.4.0    10.0.2.2  255.255.255.0   UG    0    0       0    eth0
10.0.1.0    10.0.2.1  255.255.255.0   UG    0    0       0    eth0
10.0.2.0    0.0.0.0   255.255.255.0   U     0    0       0    eth0
10.0.3.0    10.0.2.2  255.255.255.0   UG    0    0       0    eth0
127.0.0.0   0.0.0.0   255.0.0.0       U     0    0       0    lo

[root@PC3 root]# netstat -rn
Kernel IP routing table
Destination Gateway   Genmask       Flags  MSS  Window  irtt
Iface
10.0.4.0    10.0.3.3  255.255.255.0   UG    0    0       0    eth0
10.0.1.0    10.0.3.2  255.255.255.0   UG    0    0       0    eth0
10.0.2.0    10.0.3.2  255.255.255.0   UG    0    0       0    eth0
10.0.3.0    0.0.0.0   255.255.255.0   U     0    0       0    eth0
127.0.0.0   0.0.0.0   255.0.0.0       U     0    0       0    lo

[root@PC4 root]# netstat -rn
Kernel IP routing table
Destination Gateway   Genmask       Flags  MSS  Window  irtt
Iface
10.0.4.0    0.0.0.0   255.255.255.0   U     0    0       0    eth0
10.0.1.0    10.0.4.3  255.255.255.0   UG    0    0       0    eth0
```

```
10.0.2.0     10.0.4.3  255.255.255.0   UG    0    0         0    eth0
10.0.3.0     10.0.4.3  255.255.255.0   UG    0    0         0    eth0
127.0.0.0    0.0.0.0   255.0.0.0       U     0    0         0    lo
```

The following are routing tables of the linux PCs **after** the topology change.

```
[root@PC1 root]# netstat -rn
Kernel IP routing table
Destination Gateway    Genmask        Flags  MSS   Window   irtt
Iface
10.0.4.0     10.0.1.1  255.255.255.0   UG    0      0        0
eth0
10.0.1.0     0.0.0.0   255.255.255.0   U     0      0        0
eth0
10.0.2.0     10.0.1.1  255.255.255.0   UG    0      0        0
eth0
10.0.3.0     10.0.1.1  255.255.255.0   UG    0      0        0
eth0
127.0.0.0    0.0.0.0   255.0.0.0       U     0      0        0     lo
```

```
[root@PC2 root]# netstat -rn
Kernel IP routing table
Destination Gateway    Genmask        Flags  MSS   Window   irtt
Iface
10.0.4.0     10.0.2.4   255.255.255.0   UG    0      0        0
eth0
10.0.1.0     10.0.2.1  255.255.255.0   UG    0      0        0
eth0
10.0.2.0     0.0.0.0   255.255.255.0   U     0      0        0
eth0
10.0.3.0     10.0.2.2  255.255.255.0   UG    0      0        0
eth0
127.0.0.0    0.0.0.0   255.0.0.0       U     0      0        0     lo
```

```
[root@PC3 root]# netstat -rn
Kernel IP routing table
Destination Gateway    Genmask        Flags  MSS   Window   irtt
Iface
10.0.4.0     10.0.3.3  255.255.255.0   UG    0      0        0
eth0
10.0.1.0     10.0.3.2  255.255.255.0   UG    0      0        0
eth0
10.0.2.0     10.0.3.2  255.255.255.0   UG    0      0        0
eth0
10.0.3.0     0.0.0.0   255.255.255.0   U     0      0        0
eth0
127.0.0.0    0.0.0.0   255.0.0.0       U     0      0        0     lo
```

```
[root@PC4 root]# netstat -rn
Kernel IP routing table
Destination Gateway   Genmask        Flags  MSS  Window  irtt
Iface
10.0.4.0    0.0.0.0   255.255.255.0   U      0     0      0
eth0
10.0.1.0    10.0.4.4   255.255.255.0   UG     0     0      0
eth0
10.0.2.0    10.0.4.4   255.255.255.0   UG     0     0      0
eth0
10.0.3.0    10.0.4.3  255.255.255.0   UG     0     0      0
eth0
127.0.0.0   0.0.0.0   255.0.0.0       U      0     0      0     lo
```

Routing table in PC2 and PC2 are updated after the the topology change. It takes approximately 10 seconds for the update to happen.

Exercise 3(B)

Count the number of lost packets and calculate the time it took RIP to update the routing table.

The packets with sequence numbers between 18 and 216 are lost. The total number of lost packets is 198. Since the ping command issues an ICMP echo request message approximately once every second, the time it takes RIP to update the routing table is 198 seconds (3 minutes 18 seconds).

Exercise 5(C)

1. **Count the number of lost packets and calculates the time it took OSPF to update the routing tables.**

The packets with sequence numbers between 9 and 35 are lost. The total number of lost packets is 24. Since the ping command issues an ICMP echo request message approximately once every second, the time it takes RIP to update the routing table is 24 seconds.

2. **From your saved *ethereal* output, include one packet from each of the different OSPF packet type that you have observed.**

There are three types of OSPF packets we have observed. They are OSPF hello packets, Link State update packets and Link State acknowledge packets.

- OSPF hello packets

```
No.   Time       Source     Destination   Protocol   Info
1     0.000000   10.0.1.1   224.0.0.5     OSPF        Hello Packet
```

- OSPF Link State update packets

```
No.   Time       Source     Destination   Protocol   Info
62   51.868536  10.0.1.2   224.0.0.5     OSPF       LS Update
```

- OSPF Link State acknowledge packets

```
No.   Time       Source     Destination   Protocol   Info
64   53.520036  10.0.1.1   224.0.0.5     OSPF       LS Acknowledge
```

3. **Include the output of the link state database of PC2.**

```
ospfd> show ip ospf database
                  OSPF Router with ID (10.0.1.2)
                 Router Link States (Area 0.0.0.1)
Link ID         ADV Router      Age  Seq#       CkSum  Link count
10.0.1.1        10.0.1.1         155 0x80000008 0x30ac 2
10.0.1.2        10.0.1.2         155 0x80000005 0x1bb7 2
10.0.2.1        10.0.2.1        1625 0x80000009 0x3d84 2
10.0.3.2        10.0.3.2        1629 0x80000008 0x9b1d 2
10.0.3.4        10.0.3.4           9 0x80000004 0x0fb6 2
10.0.4.3        10.0.4.3         908 0x8000000a 0x7828 2
10.0.4.4        10.0.4.4         831 0x8000000d 0x3e98 1
10.0.6.7        10.0.6.7         776 0x80000012 0x654c 2
10.0.7.7        10.0.7.7        1700 0x80000002 0x4c55 2
```

```
                Net Link States (Area 0.0.0.1)
Link ID         ADV Router      Age  Seq#       CkSum
10.0.1.2        10.0.1.2         155 0x80000002 0x61c4
10.0.2.3        10.0.2.1         296 0x80000005 0x5499
10.0.3.4        10.0.3.4          12 0x80000002 0x5cbc
10.0.4.4        10.0.3.4          16 0x80000002 0x5cb9
10.0.5.6        10.0.4.3        1943 0x80000004 0x6676
10.0.6.7        10.0.6.7         904 0x80000002 0x6d95
```

4. **Pick a single link state advertisement packet captured by *ethereal*, and describe how to interpret the information contained in the link state advertisement.**

The following is a LS update packet captured by *ethereal*.

```
LS Update Packet
     Number of LSAs: 1
     LS Type: Network-LSA
     LS Age: 3600 seconds
     Options: 0x02 (E)
       0... .... = DN: DN-bit is NOT set
       .0.. .... = O: O-bit is NOT set
       ..0. .... = DC: Demand circuits are NOT supported
       ...0 .... = L: The packet does NOT contain LLS data block
       .... 0... = NP: Nssa is NOT supported
       .... .0.. = MC: NOT multicast capable
       .... ..1. = E: ExternalRoutingCapability
     Link-State Advertisement Type: Network-LSA (2)
     Link State ID: 10.0.7.7
     Advertising Router: 10.0.6.7 (10.0.6.7)
     LS Sequence Number: 0x80000001
     LS Checksum: b941
     Length: 32
     Netmask: 255.255.255.0
     Attached Router: 10.0.6.7
     Attached Router: 10.0.7.8
```

The LSA (LS Update) packet is divided into two portions, LSA header and LSA data. The header carries information including , LS age, link-state advertisement type, link state ID, advertising router, LS sequence number LS checksum, and length. In this case, the LS age is 3600 seconds; the link-state advertisement type is Network-LSA (2); link state ID is 10.0.7.7; advertising router is 10.0.6.7 (10.0.6.7); LS sequence number is 0x80000001; LS Cchecksum is b941; and length is 32. The LSA data contains information including netmask, and 2 attached routers. In this case, netmask is 255.255.255.0 and the attached routers are 10.0.6.7 and 10.0.7.8.

5. **Answer the questions from Step 5 and 9.**
   a. **How quickly are OSPF messages sent after the cable is disconnected?**
      Before disconnecting the cable, OSPF hello messages are sent approximately every 10 seconds. After disconnecting the cable, OSPF stops sending hello messages. Instead, OSPF update messages are sent every 3 seconds to get new routing info.
   b. **How many OSPF messages are sent?**
      A total of **15** OSPF messages are sent. There are 15 OSPF update messages between two continuous series of OSPF hello messages. The number of OSPF messages sent when disconnected are determined through the fact that there are no hello messages when disconnecting. If excluding Hello Packets, 5 OSPF messages consisting of 3 LS updates and 2 LS Acks are sent.
   c. **Which type of OSPF packet is used for flooding link state information?**
      LS Update messages are used for flooding link state information
   d. **Describe the flooding of LSAs to all routers.**
      How flooding works is to copy a received packet to all neighbours. In the case of LSAs, a router sends and re-floods LSA-Updates, whenever the topology or link cost changes. In detail, if a change occurs at a router, it will update its database and send out LS update messages to all its neighbours. These neighbours will update their own databases and reply with LS ack messages. These neighbours will also send out LS update message to their neighbors until all nodes in the network are synchronized.
   e. **Which type of encapsulation is used for OSPF packets (TCP, UDP, or other)?**
      As we can see in the captured data that it has Type: IP (0x0800) in the packets. It means OSPF packets are encapsulated within IP headers.
   f. **What is the destination address of OSPF packets?**
      The destination is 224.0.0.5.

```
No. Time     Source      Destination   Protocol  Info
1   0.000000 10.0.1.1    224.0.0.5     OSPF       Hello Packet
```

g. **Can you confirm that the link state databases are identical? Compare the output of the command *show ip ospf database* from the Cisco routers and the Linux PCs.**
All of the OSPF databases are identical due to flooding.

```
Router1#show ip ospf database
            OSPF Router with ID (10.0.2.1) (Process ID 1)
                Router Link States (Area 1)
Link ID    ADV Router   Age    Seq#       Checksum  Link count
10.0.1.1   10.0.1.1    1549    0x80000007 0x0032AB   2
10.0.1.2   10.0.1.2    1550    0x80000004 0x001DB6   2
10.0.2.1   10.0.2.1    1216    0x80000009 0x003D84   2
10.0.3.2   10.0.3.2    1221    0x80000008 0x009B1D   2
10.0.3.4   10.0.3.4    1400    0x80000003 0x0011B5   2
10.0.4.3   10.0.4.3     503    0x8000000A 0x007828   2
10.0.4.4   10.0.4.4     426    0x8000000D 0x003E98   1
10.0.6.7   10.0.6.7     371    0x80000012 0x00654C   2
10.0.7.7   10.0.7.7    1296    0x80000002 0x004C55   2
                Net Link States (Area 1)
Link ID         ADV Router      Age         Seq#       Checksum
10.0.1.2        10.0.1.2        1550        0x80000001 0x0063C3
10.0.2.3        10.0.2.1        1801        0x80000004 0x005698
10.0.3.4        10.0.3.4        1404        0x80000001 0x005EBB
10.0.4.4        10.0.3.4        1409        0x80000001 0x005EB8
10.0.5.6        10.0.4.3        1539        0x80000004 0x006676
10.0.6.7        10.0.6.7        501         0x80000002 0x006D95

Router2#show ip ospf database
            OSPF Router with ID (10.0.3.2) (Process ID 1)
                Router Link States (Area 1)
Link ID    ADV Router   Age    Seq#       Checksum  Link count
10.0.1.1   10.0.1.1     197    0x80000008 0x0030AC    2
10.0.1.2   10.0.1.2     198    0x80000005 0x001BB7    2
10.0.2.1   10.0.2.1    1666    0x80000009 0x003D84    2
10.0.3.2   10.0.3.2    1669    0x80000008 0x009B1D    2
10.0.3.4   10.0.3.4      48    0x80000004 0x000FB6    2
10.0.4.3   10.0.4.3     952    0x8000000A 0x007828    2
10.0.4.4   10.0.4.4     875    0x8000000D 0x003E98    1
10.0.6.7   10.0.6.7     820    0x80000012 0x00654C    2
10.0.7.7   10.0.7.7    1744    0x80000002 0x004C55    2
                Net Link States (Area 1)
Link ID         ADV Router      Age         Seq#       Checksum
10.0.1.2        10.0.1.2        198         0x80000002 0x0061C4
10.0.2.3        10.0.2.1        337         0x80000005 0x005499
10.0.3.4        10.0.3.4        53          0x80000002 0x005CBC
10.0.4.4        10.0.3.4        57          0x80000002 0x005CB9
10.0.5.6        10.0.4.3        37          0x80000005 0x006477
10.0.6.7        10.0.6.7        949         0x80000002 0x006D95
```

```
Router3#show ip ospf database
            OSPF Router with ID (10.0.4.3) (Process ID 1)
                Router Link States (Area 1)
Link ID    ADV Router   Age    Seq#        Checksum  Link count
10.0.1.1   10.0.1.1    1417    0x80000007 0x0032AB    2
10.0.1.2   10.0.1.2    1416    0x80000004 0x001DB6    2
10.0.2.1   10.0.2.1    1086    0x80000009 0x003D84    2
10.0.3.2   10.0.3.2    1090    0x80000008 0x009B1D    2
10.0.3.4   10.0.3.4    1270    0x80000003 0x0011B5    2
10.0.4.3   10.0.4.3     367    0x8000000A 0x007828    2
10.0.4.4   10.0.4.4     291    0x8000000D 0x003E98    1
10.0.6.7   10.0.6.7     235    0x80000012 0x00654C    2
10.0.7.7   10.0.7.7    1160    0x80000002 0x004C55    2
                Net Link States (Area 1)
Link ID         ADV Router      Age          Seq#       Checksum
10.0.1.2        10.0.1.2        1416         0x80000001 0x0063C3
10.0.2.3        10.0.2.1        1671         0x80000004 0x005698
10.0.3.4        10.0.3.4        1274         0x80000001 0x005EBB
10.0.4.4        10.0.3.4        1278         0x80000001 0x005EB8
10.0.5.6        10.0.4.3        1403         0x80000004 0x006676
10.0.6.7        10.0.6.7        365          0x80000002 0x006D95

Router4#show ip ospf database
            OSPF Router with ID (10.0.4.4) (Process ID 1)
                Router Link States (Area 1)
Link ID    ADV Router   Age    Seq#        Checksum  Link count
10.0.1.1   10.0.1.1     547    0x80000008 0x0030AC    2
10.0.1.2   10.0.1.2     547    0x80000005 0x001BB7    2
10.0.2.1   10.0.2.1     187    0x8000000A 0x003B85    2
10.0.3.2   10.0.3.2    2021    0x80000008 0x009B1D    2
10.0.3.4   10.0.3.4     401    0x80000004 0x000FB6    2
10.0.4.3   10.0.4.3    1299    0x8000000A 0x007828    2
10.0.4.4   10.0.4.4    1221    0x8000000D 0x003E98    1
10.0.6.7   10.0.6.7    1167    0x80000012 0x00654C    2
10.0.7.7   10.0.7.7    2091    0x80000002 0x004C55    2
                Net Link States (Area 1)
Link ID         ADV Router      Age          Seq#       Checksum
10.0.1.2        10.0.1.2        547          0x80000002 0x0061C4
10.0.2.3        10.0.2.1        688          0x80000005 0x005499
10.0.3.4        10.0.3.4        405          0x80000002 0x005CBC
10.0.4.4        10.0.3.4        409          0x80000002 0x005CB9
10.0.5.6        10.0.4.3        384          0x80000005 0x006477
10.0.6.7        10.0.6.7        1297         0x80000002 0x006D95

PC1
```

```
ospfd> show ip ospf database
                OSPF Router with ID (10.0.1.1)
                Router Link States (Area 0.0.0.1)
Link ID         ADV Router      Age  Seq#       CkSum  Link count
10.0.1.1        10.0.1.1        1520 0x80000007 0x32ab 2
10.0.1.2        10.0.1.2        1521 0x80000004 0x1db6 2
10.0.2.1        10.0.2.1        1189 0x80000009 0x3d84 2
10.0.3.2        10.0.3.2        1193 0x80000008 0x9b1d 2
10.0.3.4        10.0.3.4        1373 0x80000003 0x11b5 2
10.0.4.3        10.0.4.3         474 0x8000000a 0x7828 2
10.0.4.4        10.0.4.4         397 0x8000000d 0x3e98 1
10.0.6.7        10.0.6.7         342 0x80000012 0x654c 2
10.0.7.7        10.0.7.7        1267 0x80000002 0x4c55 2
                Net Link States (Area 0.0.0.1)
Link ID         ADV Router      Age  Seq#       CkSum
10.0.1.2        10.0.1.2        1521 0x80000001 0x63c3
10.0.2.3        10.0.2.1        1774 0x80000004 0x5698
10.0.3.4        10.0.3.4        1376 0x80000001 0x5ebb
10.0.4.4        10.0.3.4        1380 0x80000001 0x5eb8
10.0.5.6        10.0.4.3        1509 0x80000004 0x6676
10.0.6.7        10.0.6.7         470 0x80000002 0x6d95
```

PC2

```
ospfd> show ip ospf database
                OSPF Router with ID (10.0.1.2)
                Router Link States (Area 0.0.0.1)
Link ID         ADV Router      Age  Seq#       CkSum  Link count
10.0.1.1        10.0.1.1         155 0x80000008 0x30ac 2
10.0.1.2        10.0.1.2         155 0x80000005 0x1bb7 2
10.0.2.1        10.0.2.1        1625 0x80000009 0x3d84 2
10.0.3.2        10.0.3.2        1629 0x80000008 0x9b1d 2
10.0.3.4        10.0.3.4           9 0x80000004 0x0fb6 2
10.0.4.3        10.0.4.3         908 0x8000000a 0x7828 2
10.0.4.4        10.0.4.4         831 0x8000000d 0x3e98 1
10.0.6.7        10.0.6.7         776 0x80000012 0x654c 2
10.0.7.7        10.0.7.7        1700 0x80000002 0x4c55 2
                Net Link States (Area 0.0.0.1)
Link ID         ADV Router      Age  Seq#       CkSum
10.0.1.2        10.0.1.2         155 0x80000002 0x61c4
10.0.2.3        10.0.2.1         296 0x80000005 0x5499
10.0.3.4        10.0.3.4          12 0x80000002 0x5cbc
10.0.4.4        10.0.3.4          16 0x80000002 0x5cb9
10.0.5.6        10.0.4.3        1943 0x80000004 0x6676
10.0.6.7        10.0.6.7         904 0x80000002 0x6d95
```

PC3

```
ospfd# show ip ospf database
                OSPF Router with ID (10.0.3.4)
                Router Link States (Area 0.0.0.1)
Link ID         ADV Router      Age  Seq#       CkSum  Link count
10.0.1.1        10.0.1.1        1368 0x80000007 0x32ab 2
10.0.1.2        10.0.1.2        1369 0x80000004 0x1db6 2
10.0.2.1        10.0.2.1        1036 0x80000009 0x3d84 2
10.0.3.2        10.0.3.2        1040 0x80000008 0x9b1d 2
10.0.3.4        10.0.3.4        1218 0x80000003 0x11b5 2
10.0.4.3        10.0.4.3         323 0x8000000a 0x7828 2
10.0.4.4        10.0.4.4         246 0x8000000d 0x3e98 1
10.0.6.7        10.0.6.7         191 0x80000012 0x654c 2
10.0.7.7        10.0.7.7        1115 0x80000002 0x4c55 2
                Net Link States (Area 0.0.0.1)
Link ID         ADV Router      Age  Seq#       CkSum
10.0.1.2        10.0.1.2        1369 0x80000001 0x63c3
10.0.2.3        10.0.2.1        1622 0x80000004 0x5698
10.0.3.4        10.0.3.4        1221 0x80000001 0x5ebb
10.0.4.4        10.0.3.4        1225 0x80000001 0x5eb8
10.0.5.6        10.0.4.3        1357 0x80000004 0x6676
10.0.6.7        10.0.6.7         319 0x80000002 0x6d95

PC4
ospfd> show ip ospf database
                OSPF Router with ID (10.0.6.7)
                Router Link States (Area 0.0.0.1)
Link ID         ADV Router      Age  Seq#       CkSum  Link count
10.0.1.1        10.0.1.1         504 0x80000008 0x30ac 2
10.0.1.2        10.0.1.2         503 0x80000005 0x1bb7 2
10.0.2.1        10.0.2.1         144 0x8000000a 0x3b85 2
10.0.3.2        10.0.3.2        1978 0x80000008 0x9b1d 2
10.0.3.4        10.0.3.4         357 0x80000004 0x0fb6 2
10.0.4.3        10.0.4.3        1254 0x8000000a 0x7828 2
10.0.4.4        10.0.4.4        1179 0x8000000d 0x3e98 1
10.0.6.7        10.0.6.7        1121 0x80000012 0x654c 2
10.0.7.7        10.0.7.7        2045 0x80000002 0x4c55 2
                Net Link States (Area 0.0.0.1)
Link ID         ADV Router      Age  Seq#       CkSum
10.0.1.2        10.0.1.2         503 0x80000002 0x61c4
10.0.2.3        10.0.2.1         645 0x80000005 0x5499
10.0.3.4        10.0.3.4         360 0x80000002 0x5cbc
10.0.4.4        10.0.3.4         365 0x80000002 0x5cb9
10.0.5.6        10.0.4.3         339 0x80000005 0x6477
10.0.6.7        10.0.6.7        1249 0x80000002 0x6d95
```