

به نام خدا



پاسخ تمرینات عملی لایه دسترسی چندگانه

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۴۰۰۲۰۶۲۶۲

Question 1: L2 Switching

```
PC1> ping 192.168.62.2
84 bytes from 192.168.62.2 icmp_seq=1 ttl=64 time=0.759 ms
84 bytes from 192.168.62.2 icmp_seq=2 ttl=64 time=0.841 ms
84 bytes from 192.168.62.2 icmp_seq=3 ttl=64 time=0.873 ms
84 bytes from 192.168.62.2 icmp_seq=4 ttl=64 time=0.961 ms
84 bytes from 192.168.62.2 icmp_seq=5 ttl=64 time=0.750 ms

PC1> ping 192.168.62.3
84 bytes from 192.168.62.3 icmp_seq=1 ttl=64 time=1.100 ms
84 bytes from 192.168.62.3 icmp_seq=2 ttl=64 time=1.591 ms
84 bytes from 192.168.62.3 icmp_seq=3 ttl=64 time=1.052 ms
84 bytes from 192.168.62.3 icmp_seq=4 ttl=64 time=1.335 ms
84 bytes from 192.168.62.3 icmp_seq=5 ttl=64 time=1.576 ms

PC1> ping 192.168.62.4
84 bytes from 192.168.62.4 icmp_seq=1 ttl=64 time=1.071 ms
84 bytes from 192.168.62.4 icmp_seq=2 ttl=64 time=1.265 ms
84 bytes from 192.168.62.4 icmp_seq=3 ttl=64 time=1.561 ms
84 bytes from 192.168.62.4 icmp_seq=4 ttl=64 time=1.382 ms
84 bytes from 192.168.62.4 icmp_seq=5 ttl=64 time=1.479 ms
```

Figure 1-1: PC1->PC2, PC1->PC3, PC1->PC4

```
PC2> ping 192.168.62.1
84 bytes from 192.168.62.1 icmp_seq=1 ttl=64 time=0.497 ms
84 bytes from 192.168.62.1 icmp_seq=2 ttl=64 time=0.509 ms
84 bytes from 192.168.62.1 icmp_seq=3 ttl=64 time=1.119 ms
84 bytes from 192.168.62.1 icmp_seq=4 ttl=64 time=1.033 ms
84 bytes from 192.168.62.1 icmp_seq=5 ttl=64 time=1.146 ms

PC2> ping 192.168.62.3
84 bytes from 192.168.62.3 icmp_seq=1 ttl=64 time=1.569 ms
84 bytes from 192.168.62.3 icmp_seq=2 ttl=64 time=0.878 ms
84 bytes from 192.168.62.3 icmp_seq=3 ttl=64 time=0.802 ms
84 bytes from 192.168.62.3 icmp_seq=4 ttl=64 time=1.497 ms
84 bytes from 192.168.62.3 icmp_seq=5 ttl=64 time=1.518 ms

PC2> ping 192.168.62.4
84 bytes from 192.168.62.4 icmp_seq=1 ttl=64 time=1.060 ms
84 bytes from 192.168.62.4 icmp_seq=2 ttl=64 time=1.189 ms
84 bytes from 192.168.62.4 icmp_seq=3 ttl=64 time=0.836 ms
84 bytes from 192.168.62.4 icmp_seq=4 ttl=64 time=1.464 ms
84 bytes from 192.168.62.4 icmp_seq=5 ttl=64 time=1.483 ms
```

Figure 1-2: PC2->PC1, PC2->PC3, PC2->PC4

```
PC3> ping 192.168.62.1
84 bytes from 192.168.62.1 icmp_seq=1 ttl=64 time=1.598 ms
84 bytes from 192.168.62.1 icmp_seq=2 ttl=64 time=1.314 ms
84 bytes from 192.168.62.1 icmp_seq=3 ttl=64 time=0.739 ms
84 bytes from 192.168.62.1 icmp_seq=4 ttl=64 time=1.455 ms
84 bytes from 192.168.62.1 icmp_seq=5 ttl=64 time=0.714 ms

PC3> ping 192.168.62.2
84 bytes from 192.168.62.2 icmp_seq=1 ttl=64 time=1.206 ms
84 bytes from 192.168.62.2 icmp_seq=2 ttl=64 time=1.048 ms
84 bytes from 192.168.62.2 icmp_seq=3 ttl=64 time=0.956 ms
84 bytes from 192.168.62.2 icmp_seq=4 ttl=64 time=1.139 ms
84 bytes from 192.168.62.2 icmp_seq=5 ttl=64 time=1.151 ms

PC3> ping 192.168.62.4
84 bytes from 192.168.62.4 icmp_seq=1 ttl=64 time=1.740 ms
84 bytes from 192.168.62.4 icmp_seq=2 ttl=64 time=0.975 ms
84 bytes from 192.168.62.4 icmp_seq=3 ttl=64 time=0.579 ms
84 bytes from 192.168.62.4 icmp_seq=4 ttl=64 time=0.489 ms
84 bytes from 192.168.62.4 icmp_seq=5 ttl=64 time=0.844 ms
```

Figure 1-3: PC3->PC1, PC3->PC2, PC3->PC4

```
PC4> ping 192.168.62.1
84 bytes from 192.168.62.1 icmp_seq=1 ttl=64 time=1.094 ms
84 bytes from 192.168.62.1 icmp_seq=2 ttl=64 time=0.983 ms
84 bytes from 192.168.62.1 icmp_seq=3 ttl=64 time=1.535 ms
84 bytes from 192.168.62.1 icmp_seq=4 ttl=64 time=1.113 ms
84 bytes from 192.168.62.1 icmp_seq=5 ttl=64 time=1.333 ms

PC4> ping 192.168.62.2
84 bytes from 192.168.62.2 icmp_seq=1 ttl=64 time=0.768 ms
84 bytes from 192.168.62.2 icmp_seq=2 ttl=64 time=1.529 ms
84 bytes from 192.168.62.2 icmp_seq=3 ttl=64 time=1.517 ms
84 bytes from 192.168.62.2 icmp_seq=4 ttl=64 time=1.187 ms
84 bytes from 192.168.62.2 icmp_seq=5 ttl=64 time=1.136 ms

PC4> ping 192.168.62.3
84 bytes from 192.168.62.3 icmp_seq=1 ttl=64 time=1.052 ms
84 bytes from 192.168.62.3 icmp_seq=2 ttl=64 time=0.436 ms
84 bytes from 192.168.62.3 icmp_seq=3 ttl=64 time=0.536 ms
84 bytes from 192.168.62.3 icmp_seq=4 ttl=64 time=0.922 ms
84 bytes from 192.168.62.3 icmp_seq=5 ttl=64 time=0.984 ms
```

Figure 1-4: PC4->PC1, PC4->PC2, PC4->PC3

The IP addresses of each PC were set by using the command: *ip ip_address/netmask*.

Question 2: Static Routing

The addressing used in this question is shown in figure 2-1. The default gateway of the left-side and right-side PC's was set to 192.168.62.1/24 and 192.168.72.1/24 respectively. The screenshots of PC1-PC4 are provided below respectively. The extra ports that I added to the router were initially switchports, so every time I wanted to assign an ip to that interface I used the command *no switchport* to negate the command. This action was used whenever there was a switchport used in this and the following questions. I should note that I used 72 because my student id has two consecutive 62's!

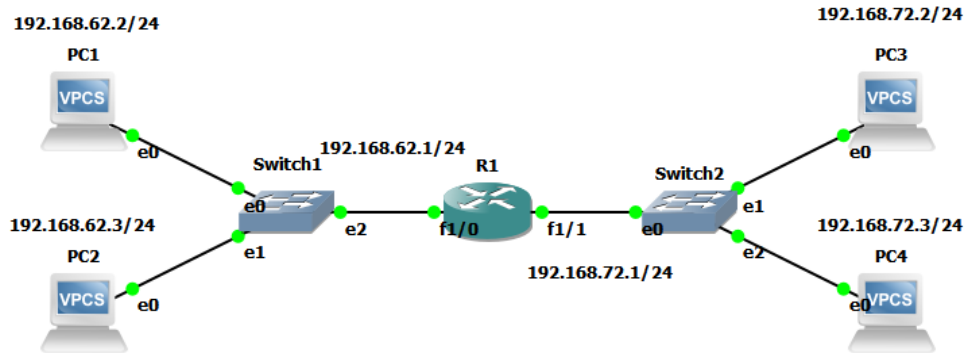


Figure 2-1: Topology of Question 2

```

Checking for duplicate address...
PC1 : 192.168.62.2 255.255.255.0 gateway 192.168.62.1

PC1> ping 192.168.62.3
84 bytes from 192.168.62.3 icmp_seq=1 ttl=64 time=1.031 ms
84 bytes from 192.168.62.3 icmp_seq=2 ttl=64 time=0.743 ms
84 bytes from 192.168.62.3 icmp_seq=3 ttl=64 time=0.826 ms
84 bytes from 192.168.62.3 icmp_seq=4 ttl=64 time=0.767 ms
84 bytes from 192.168.62.3 icmp_seq=5 ttl=64 time=0.561 ms

PC1> ping 192.168.72.2
84 bytes from 192.168.72.2 icmp_seq=1 ttl=63 time=31.047 ms
84 bytes from 192.168.72.2 icmp_seq=2 ttl=63 time=30.666 ms
84 bytes from 192.168.72.2 icmp_seq=3 ttl=63 time=31.275 ms
84 bytes from 192.168.72.2 icmp_seq=4 ttl=63 time=30.801 ms
84 bytes from 192.168.72.2 icmp_seq=5 ttl=63 time=30.831 ms

PC1> ping 192.168.72.3
84 bytes from 192.168.72.3 icmp_seq=1 ttl=63 time=32.005 ms
84 bytes from 192.168.72.3 icmp_seq=2 ttl=63 time=44.619 ms
84 bytes from 192.168.72.3 icmp_seq=3 ttl=63 time=30.836 ms
84 bytes from 192.168.72.3 icmp_seq=4 ttl=63 time=31.228 ms
84 bytes from 192.168.72.3 icmp_seq=5 ttl=63 time=31.912 ms

```

Figure 2-2: PC1->PC2, PC1->PC3, PC1->PC4

```

Checking for duplicate address...
PC1 : 192.168.62.3 255.255.255.0 gateway 192.168.62.1

PC2> ping 192.168.62.2
84 bytes from 192.168.62.2 icmp_seq=1 ttl=64 time=0.476 ms
84 bytes from 192.168.62.2 icmp_seq=2 ttl=64 time=0.959 ms
84 bytes from 192.168.62.2 icmp_seq=3 ttl=64 time=0.813 ms
84 bytes from 192.168.62.2 icmp_seq=4 ttl=64 time=0.890 ms
84 bytes from 192.168.62.2 icmp_seq=5 ttl=64 time=0.608 ms

PC2> ping 192.168.72.2
84 bytes from 192.168.72.2 icmp_seq=1 ttl=63 time=31.790 ms
84 bytes from 192.168.72.2 icmp_seq=2 ttl=63 time=30.262 ms
84 bytes from 192.168.72.2 icmp_seq=3 ttl=63 time=30.868 ms
84 bytes from 192.168.72.2 icmp_seq=4 ttl=63 time=31.216 ms
84 bytes from 192.168.72.2 icmp_seq=5 ttl=63 time=31.610 ms

PC2> ping 192.168.72.3
84 bytes from 192.168.72.3 icmp_seq=1 ttl=63 time=31.127 ms
84 bytes from 192.168.72.3 icmp_seq=2 ttl=63 time=30.710 ms
84 bytes from 192.168.72.3 icmp_seq=3 ttl=63 time=31.711 ms
84 bytes from 192.168.72.3 icmp_seq=4 ttl=63 time=30.887 ms
84 bytes from 192.168.72.3 icmp_seq=5 ttl=63 time=31.979 ms

```

Figure 2-3: PC2->PC1, PC2->PC3, PC2->PC4

```

Checking for duplicate address...
PC1 : 192.168.72.2 255.255.255.0 gateway 192.168.72.1

PC3> ping 192.168.62.2
192.168.62.2 icmp_seq=1 timeout
84 bytes from 192.168.62.2 icmp_seq=2 ttl=63 time=31.858 ms
84 bytes from 192.168.62.2 icmp_seq=3 ttl=63 time=31.320 ms
84 bytes from 192.168.62.2 icmp_seq=4 ttl=63 time=31.381 ms
84 bytes from 192.168.62.2 icmp_seq=5 ttl=63 time=31.886 ms

PC3> ping 192.168.62.3
84 bytes from 192.168.62.3 icmp_seq=1 ttl=63 time=30.175 ms
84 bytes from 192.168.62.3 icmp_seq=2 ttl=63 time=32.249 ms
84 bytes from 192.168.62.3 icmp_seq=3 ttl=63 time=31.852 ms
84 bytes from 192.168.62.3 icmp_seq=4 ttl=63 time=30.311 ms
84 bytes from 192.168.62.3 icmp_seq=5 ttl=63 time=31.746 ms

PC3> ping 192.168.72.3
84 bytes from 192.168.72.3 icmp_seq=1 ttl=64 time=0.916 ms
84 bytes from 192.168.72.3 icmp_seq=2 ttl=64 time=0.953 ms
84 bytes from 192.168.72.3 icmp_seq=3 ttl=64 time=0.684 ms
84 bytes from 192.168.72.3 icmp_seq=4 ttl=64 time=0.659 ms
84 bytes from 192.168.72.3 icmp_seq=5 ttl=64 time=0.932 ms

```

Figure 2-4: PC3->PC4, PC3->PC1, PC3->PC2

```

Checking for duplicate address...
PC1 : 192.168.72.3 255.255.255.0 gateway 192.168.72.1

PC4> ping 192.168.62.2
84 bytes from 192.168.62.2 icmp_seq=1 ttl=63 time=30.743 ms
84 bytes from 192.168.62.2 icmp_seq=2 ttl=63 time=30.447 ms
84 bytes from 192.168.62.2 icmp_seq=3 ttl=63 time=31.718 ms
84 bytes from 192.168.62.2 icmp_seq=4 ttl=63 time=30.401 ms
84 bytes from 192.168.62.2 icmp_seq=5 ttl=63 time=30.712 ms

PC4> ping 192.168.62.3
84 bytes from 192.168.62.3 icmp_seq=1 ttl=63 time=15.184 ms
84 bytes from 192.168.62.3 icmp_seq=2 ttl=63 time=31.796 ms
84 bytes from 192.168.62.3 icmp_seq=3 ttl=63 time=31.862 ms
84 bytes from 192.168.62.3 icmp_seq=4 ttl=63 time=31.809 ms
84 bytes from 192.168.62.3 icmp_seq=5 ttl=63 time=30.637 ms

PC4> ping 192.168.72.2
84 bytes from 192.168.72.2 icmp_seq=1 ttl=64 time=0.774 ms
84 bytes from 192.168.72.2 icmp_seq=2 ttl=64 time=0.806 ms
84 bytes from 192.168.72.2 icmp_seq=3 ttl=64 time=1.003 ms
84 bytes from 192.168.72.2 icmp_seq=4 ttl=64 time=0.738 ms
84 bytes from 192.168.72.2 icmp_seq=5 ttl=64 time=0.983 ms

```

Figure 2-5: PC4->PC3, PC4->PC1, PC4->PC2

The routing table of the router is in the figure below:

```

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

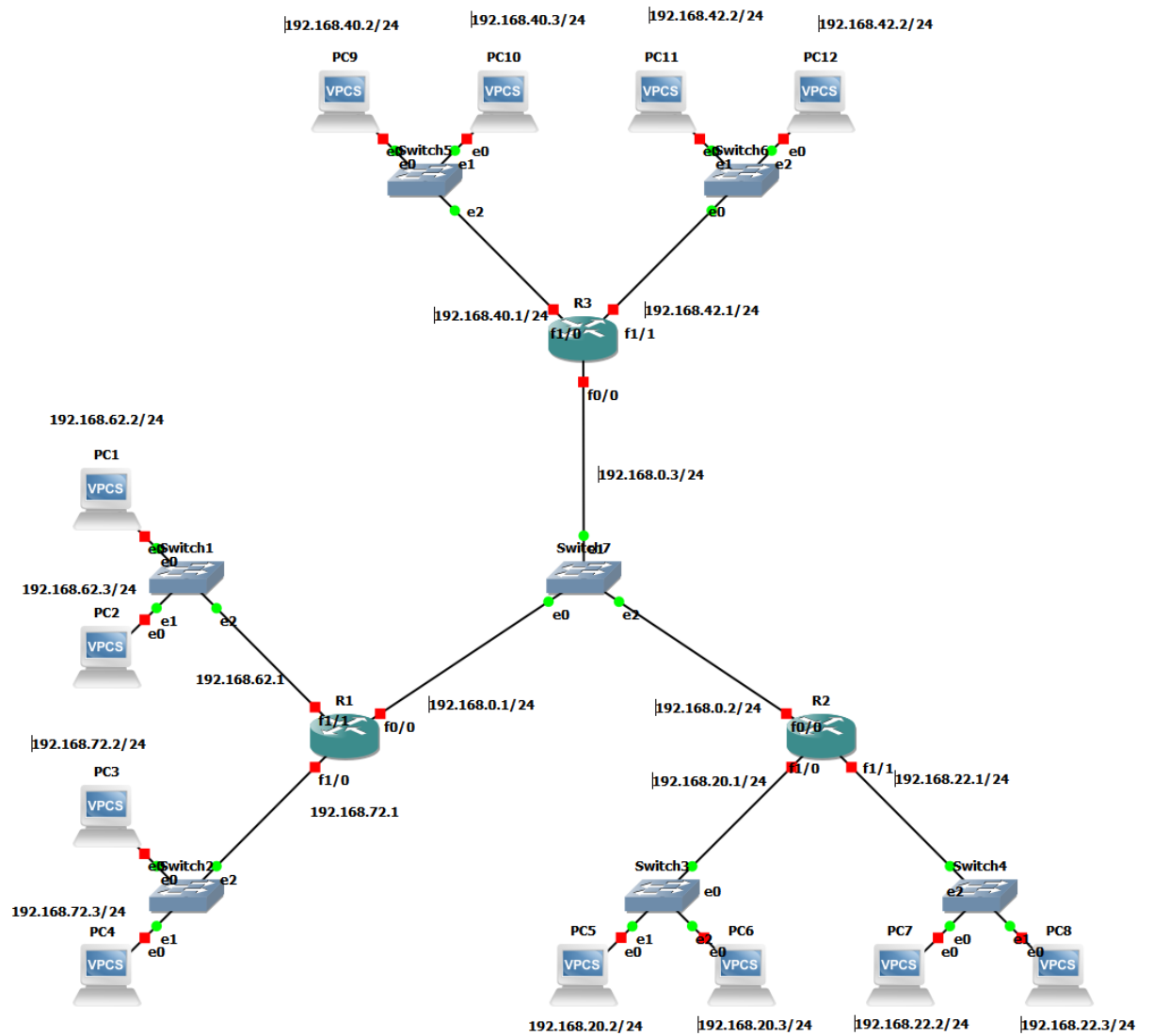
Gateway of last resort is not set

C    192.168.72.0/24 is directly connected, FastEthernet1/1
C    192.168.62.0/24 is directly connected, FastEthernet1/0

```

Question 3: Open Shortest Path First (OSPF)

- a) OSPF divides the network to a backbone (area 0) and some AS's (area 1, ...). If a node wants to transmit to another area, it must pass the backbone and for routing it uses link state protocol. The nodes send hello packets to the neighbors and using the Dijkstra's method the routing table is filled. Each router then has the link state stored.
- b) To fill the routing table, we must find the shortest path tree that has the lowest cost. This action takes a lot of computing and storage.
OSPF has a lot of advantages which is listed below:
 - It supports different metrics like throughput, delay,
 - It is a dynamic algorithm which can adapt to changes very fast
 - It supports routing based on the type of service
 - It does load balancing
 - It supports hierarchical systems
- c) The OSPF method is a dynamic algorithm. By dividing the network into areas, the algorithms used for finding shortest paths converge much faster.
- d) The following topology and ip addresses are used. I used some other values for x besides the numbers in my student id for some of the parts.



The IP's are set like the above figure. To use OSPF the following figure was used to configure R2. The same reasoning follows for other routers.

```

R2(config)#router ospf 1
R2(config-router)#network 192.168.20.1 0.0.0.255 area 2
R2(config-router)#network 192.168.22.1 0.0.0.255 area 2
R2(config-router)#network 192.168.0.2 0.0.0.255 area 0
R2(config-router)#
*Mar  1 00:37:18.999: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.72.1 on FastEthernet0/0 from L
OADING to FULL, Loading Done
R2(config-router)#
*Mar  1 00:38:53.939: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.42.1 on FastEthernet0/0 from L
OADING to FULL, Loading Done
R2(config-router)#
R2#
*Mar  1 00:38:58.299: %SYS-5-CONFIG_I: Configured from console by console
R2#wr
Building configuration...
[OK]

```

The following figures are the result of the pings for those asked in the question:

```

PC1> ping 192.168.40.3
192.168.40.3 icmp_seq=1 timeout
84 bytes from 192.168.40.3 icmp_seq=2 ttl=62 time=49.052 ms
84 bytes from 192.168.40.3 icmp_seq=3 ttl=62 time=46.209 ms
84 bytes from 192.168.40.3 icmp_seq=4 ttl=62 time=61.290 ms
84 bytes from 192.168.40.3 icmp_seq=5 ttl=62 time=62.588 ms

```

```

PC8> ping 192.168.42.3
192.168.42.3 icmp_seq=1 timeout
192.168.42.3 icmp_seq=2 timeout
84 bytes from 192.168.42.3 icmp_seq=3 ttl=62 time=59.597 ms
84 bytes from 192.168.42.3 icmp_seq=4 ttl=62 time=45.171 ms
84 bytes from 192.168.42.3 icmp_seq=5 ttl=62 time=61.864 ms

```

```

PC8> ping 192.168.42.3
192.168.42.3 icmp_seq=1 timeout
192.168.42.3 icmp_seq=2 timeout
84 bytes from 192.168.42.3 icmp_seq=3 ttl=62 time=59.597 ms
84 bytes from 192.168.42.3 icmp_seq=4 ttl=62 time=45.171 ms
84 bytes from 192.168.42.3 icmp_seq=5 ttl=62 time=61.864 ms

```

e) The following figures are the routing tables of R1, R2, and R3 respectively:

```
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

```
C    192.168.72.0/24 is directly connected, FastEthernet1/0
C    192.168.62.0/24 is directly connected, FastEthernet1/1
O IA 192.168.42.0/24 [110/11] via 192.168.0.3, 00:07:38, FastEthernet0/0
O IA 192.168.40.0/24 [110/11] via 192.168.0.3, 00:07:38, FastEthernet0/0
O IA 192.168.20.0/24 [110/11] via 192.168.0.2, 00:09:18, FastEthernet0/0
O IA 192.168.22.0/24 [110/11] via 192.168.0.2, 00:09:18, FastEthernet0/0
C    192.168.0.0/24 is directly connected, FastEthernet0/0
R1#
```

```
R2#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

```
O IA 192.168.72.0/24 [110/11] via 192.168.0.1, 00:09:23, FastEthernet0/0
O IA 192.168.62.0/24 [110/11] via 192.168.0.1, 00:09:23, FastEthernet0/0
O IA 192.168.42.0/24 [110/11] via 192.168.0.3, 00:07:38, FastEthernet0/0
O IA 192.168.40.0/24 [110/11] via 192.168.0.3, 00:07:38, FastEthernet0/0
C    192.168.20.0/24 is directly connected, FastEthernet1/0
C    192.168.22.0/24 is directly connected, FastEthernet1/1
C    192.168.0.0/24 is directly connected, FastEthernet0/0
R2#
```

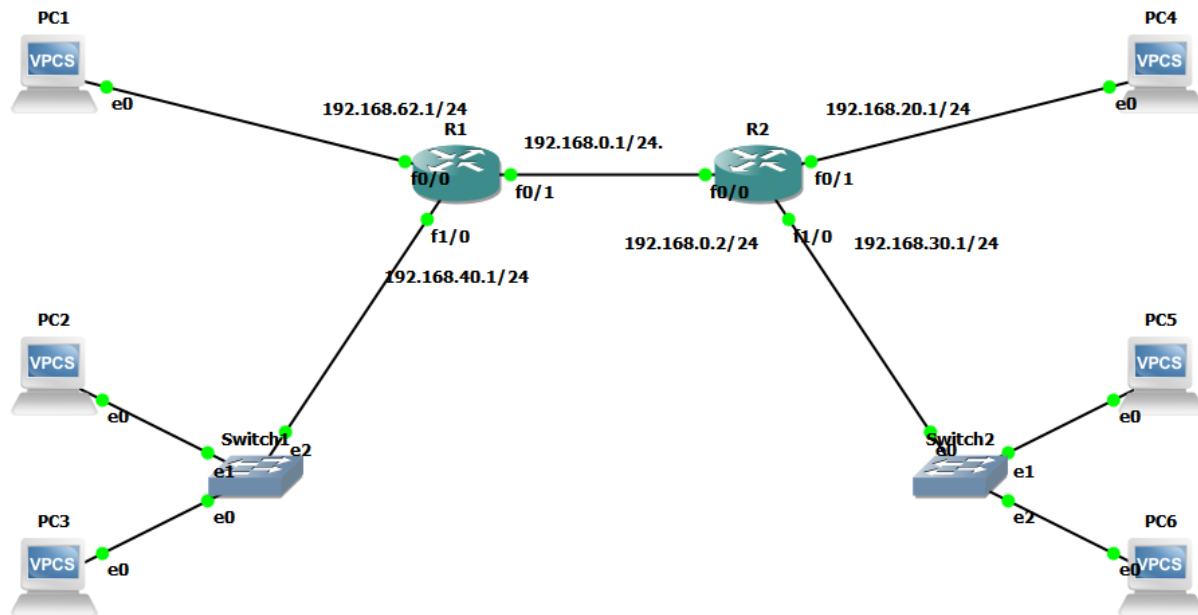
```
R3#show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, 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

```
O IA 192.168.72.0/24 [110/11] via 192.168.0.1, 00:07:43, FastEthernet0/0
O IA 192.168.62.0/24 [110/11] via 192.168.0.1, 00:07:43, FastEthernet0/0
C    192.168.42.0/24 is directly connected, FastEthernet1/1
C    192.168.40.0/24 is directly connected, FastEthernet1/0
O IA 192.168.20.0/24 [110/11] via 192.168.0.2, 00:07:43, FastEthernet0/0
O IA 192.168.22.0/24 [110/11] via 192.168.0.2, 00:07:43, FastEthernet0/0
C    192.168.0.0/24 is directly connected, FastEthernet0/0
R3#
```

Question 4: Dynamic Host Configuration Protocol (DHCP)

The following topology is used for the default gateways.



OSPF is set on both routers. The left side of R1 is area 1 and the right side of R2 is area 2. Area 0 is therefore between the two routers. Afterwards we set the DHCP on both routers. Then we can request an IP address for each PC. The configuration of the DHCP for R1 is in the following figure. R2 follows the same procedure.

```
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip dhcp pool lan1
R1(dhcp-config)#network 192.168.62.0 255.255.255.0
R1(dhcp-config)#default-r
R1(dhcp-config)#default-router 192.168.62.1
R1(dhcp-config)#dns
R1(dhcp-config)#dns-server 8.8.8.8
R1(dhcp-config)#exit
R1(config)#ip dhcp pool lan2
R1(dhcp-config)#network 192.168.40.0 255.255.255.0
R1(dhcp-config)#default-router 192.168.40.1
R1(dhcp-config)#dns-server 8.8.8.8
R1(dhcp-config)#exit
R1(config)#^Z
R1#wr
Building configuration...

*Mar  1 00:12:33.723: %SYS-5-CONFIG_I: Configured from console by console[OK]
```



```

R2(config)#ip dhcp pool lan1
R2(dhcp-config)#network 192.168.20.0 255.255.255.0
R2(dhcp-config)#defa
R2(dhcp-config)#default-router 192.168.20.1
R2(dhcp-config)#dns
R2(dhcp-config)#dns-server 8.8.8.8
R2(dhcp-config)#exit
R2(config)#ip dhcp pool lan 2
      ^
% Invalid input detected at '^' marker.

R2(config)#ip dhcp pool lan2
R2(dhcp-config)#netw
R2(dhcp-config)#network 192.168.30.0 255.255.255.0
R2(dhcp-config)#defa
R2(dhcp-config)#default-router 192.168.30.1
R2(dhcp-config)#dns
R2(dhcp-config)#dns-server 8.8.8.8
R2(dhcp-config)#exit
R2(config)#^Z
R2#wr
Building configuration...
[OK]
R2#
*Mar  1 00:11:50.319: %SYS-5-CONFIG_I: Configured from console by console

```

The IP's and the requested pings of all PC's are as follows:

```

PC1> ip dhcp
DDORA IP 192.168.62.2/24 GW 192.168.62.1

PC1> ping 192.168.30.2
192.168.30.2 icmp_seq=1 timeout
192.168.30.2 icmp_seq=2 timeout
84 bytes from 192.168.30.2 icmp_seq=3 ttl=62 time=62.102 ms
84 bytes from 192.168.30.2 icmp_seq=4 ttl=62 time=48.152 ms
84 bytes from 192.168.30.2 icmp_seq=5 ttl=62 time=64.052 ms
...

```

```

PC2> ip dhcp
DDORRA IP 192.168.40.2/24 GW 192.168.40.1

```

```

PC3> ip dhcp
DDORA IP 192.168.40.3/24 GW 192.168.40.1

PC3> ping 192.168.20.2
192.168.20.2 icmp_seq=1 timeout
192.168.20.2 icmp_seq=2 timeout
84 bytes from 192.168.20.2 icmp_seq=3 ttl=62 time=63.093 ms
84 bytes from 192.168.20.2 icmp_seq=4 ttl=62 time=62.139 ms
84 bytes from 192.168.20.2 icmp_seq=5 ttl=62 time=61.716 ms

```

```

PC4> ip dhcp
DDORRA IP 192.168.20.2/24 GW 192.168.20.1

```

```
PC5> ip dhcp
DDORRA IP 192.168.30.2/24 GW 192.168.30.1

PC5> ping 192.168.40.2
192.168.40.2 icmp_seq=1 timeout
192.168.40.2 icmp_seq=2 timeout
84 bytes from 192.168.40.2 icmp_seq=3 ttl=62 time=63.787 ms
84 bytes from 192.168.40.2 icmp_seq=4 ttl=62 time=60.474 ms
84 bytes from 192.168.40.2 icmp_seq=5 ttl=62 time=62.214 ms
```

```
PC6> ip dhcp
DDORA IP 192.168.30.3/24 GW 192.168.30.1
```

b) The following 3 figures are for R1

```
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

C    192.168.62.0/24 is directly connected, FastEthernet0/0
O IA 192.168.30.0/24 [110/11] via 192.168.0.2, 00:20:50, FastEthernet0/1
C    192.168.40.0/24 is directly connected, FastEthernet1/0
O IA 192.168.20.0/24 [110/20] via 192.168.0.2, 00:20:50, FastEthernet0/1
C    192.168.0.0/24 is directly connected, FastEthernet0/1
```

```

R1#show ip dhcp binding
Bindings from all pools not associated with VRF:
IP address          Client-ID/          Lease expiration    Type
                   Hardware address/
                   User name
192.168.40.2        0100.5079.6668.01   Mar 02 2002 12:13 AM Automatic
192.168.40.3        0100.5079.6668.02   Mar 02 2002 12:13 AM Automatic
192.168.62.2        0100.5079.6668.00   Mar 02 2002 12:12 AM Automatic
R1#show ip dhcp pool

```

```

Pool lan1 :
Utilization mark (high/low) : 100 / 0
Subnet size (first/next)    : 0 / 0
Total addresses              : 254
Leased addresses             : 1
Pending event                : none
1 subnet is currently in the pool :
Current index      IP address range      Leased addresses
192.168.62.3      192.168.62.1 - 192.168.62.254  1

```

```

Pool lan2 :
Utilization mark (high/low) : 100 / 0
Subnet size (first/next)    : 0 / 0
Total addresses              : 254
Leased addresses             : 2
Pending event                : none
1 subnet is currently in the pool :
Current index      IP address range      Leased addresses
192.168.40.4      192.168.40.1 - 192.168.40.254  2

```

```

R1#show ip dhcp server statistics
Memory usage          25434
Address pools         2
Database agents       0
Automatic bindings    3
Manual bindings       0
Expired bindings      0
Malformed messages    0
Secure arp entries    0

Message               Received
BOOTREQUEST           0
DHCPDISCOVER          6
DHCPREQUEST           4
DHCPDECLINE           0
DHCPRELEASE           0
DHCPINFORM            0

Message               Sent
BOOTREPLY             0
DHCPOFFER             6
DHCPACK               4
DHCPNAK               0

```

And for R2:

```

R2#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

O IA 192.168.62.0/24 [110/20] via 192.168.0.1, 00:21:28, FastEthernet0/0
C    192.168.30.0/24 is directly connected, FastEthernet1/0
O IA 192.168.40.0/24 [110/11] via 192.168.0.1, 00:21:28, FastEthernet0/0
C    192.168.20.0/24 is directly connected, FastEthernet0/1
C    192.168.0.0/24 is directly connected, FastEthernet0/0

```

```

R2#show ip dhcp binding
Bindings from all pools not associated with VRF:
IP address      Client-ID/      Lease expiration      Type
                Hardware address/
                User name
192.168.20.2    0100.5079.6668.03    Mar 02 2002 12:12 AM    Automatic
192.168.30.2    0100.5079.6668.04    Mar 02 2002 12:12 AM    Automatic
192.168.30.3    0100.5079.6668.05    Mar 02 2002 12:12 AM    Automatic
R2#show ip dhcp pool

```

```

Pool lan1 :
Utilization mark (high/low)      : 100 / 0
Subnet size (first/next)         : 0 / 0
Total addresses                   : 254
Leased addresses                  : 1
Pending event                     : none
1 subnet is currently in the pool :
Current index      IP address range      Leased addresses
192.168.20.3      192.168.20.1 - 192.168.20.254    1

```

```

Pool lan2 :
Utilization mark (high/low)      : 100 / 0
Subnet size (first/next)         : 0 / 0
Total addresses                   : 254
Leased addresses                  : 2
Pending event                     : none
1 subnet is currently in the pool :
Current index      IP address range      Leased addresses
192.168.30.4      192.168.30.1 - 192.168.30.254    2

```

```
R2#show ip dhcp server statistics
```

```
Memory usage      25434
Address pools     2
Database agents   0
Automatic bindings 3
Manual bindings   0
Expired bindings  0
Malformed messages 0
Secure arp entries 0
```

```
Message           Received
```

```
BOOTREQUEST       0
DHCPDISCOVER       6
DHCPREQUEST        5
DHCPDECLINE        0
DHCPRELEASE        0
DHCPINFORM         0
```

```
Message           Sent
```

```
BOOTREPLY         0
DHCPOFFER         6
DHCPACK           5
DHCPNAK           0
```