**OSPF in Stubby, Totally stubby and NSSA areas**

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![Map

Description automatically generated]()

Purpose

The purpose of this lab was to practice setting up Stubby, Totally Stubby, Not So Stubby areas and EIGRP. This lab also helped with reviewing to redistribute between OSPF and EIGRP from the NSSA and the EIGRP area. This lab also helped with learning to set up Stub and totally stub areas and it helped with seeing the difference from the two by checking the routes in each area.

Background Information

OSPF is a link-state interior gateway protocol. It’s used as a replacement for RIP when a larger network is configured. OSPF is faster and more efficient than RIP when setting up connections between different points in a network. The Autonomous System it uses decides what network traffic should flow through. OSPF can handle multi-area networks due to its features which allow for DRs and ABRs to be set up through out the network. A DR is the Designated Router in the network and it handles all the routing information needed for every router. The DR handles the LSAs, Link-state Advertisements, which is what gives the other routers in the network the information needed to be able to ping through every router. The ABRs are Area Border Routers and they connect between different areas, these routers are in charge of managing their own areas. They have to summarize their own sub networks in their area and send its routing information back to the backbone area which then sends it out to other ABRs so that there can be pings all around the network. Areas in OSPF are used to effectively reduce the bandwidth in large networks.

OSPF uses Stubby, Totally Stubby and NSSA (Not So Stubby Area) to control the way external routes behave in different areas, but to be able to understand Stubby, Totally Stubby and NSSA areas, we need to understand the different types of LSAs. As mentioned before, LSAs are Link-state Advertisements used in networks to send out information to the other routers in the networks. The first type of LSA is called the Router LSA. The Router LSA is always flooded within an area; this will include the information of all the directly connected links of the router. There are 4 types of links that are recorded. The first has the Neighbor router ID and it has the point-to-point connection to another router. The second is the connection to transit network and has the IP address of the DR. The third one is the connection to stub network (will be addressed later) and has the IP network. Last but not least is the Virtual Link and has the Neighbor router ID as well. The important thing about this LSA is that it always stays within the area.

Type 2 LSA is the Network LSA and it’s created for multi-access networks. OSPF protocol has broadcast and non-broadcast networks which both require a DR and BDRs. The Network LSA are generated by the DR and it contains the information of all the routers connected to the multi-access network as well as the DR and the prefix and subnet mask of the networks. This LSA also always stays within the area.

Type 3 LSA is called the Summary LSA. Since OSPF works with multiple areas, you want all the routers to know about all the different networks and LSA type 1 only stays within its area, its not possible to do it with that one so the routers use LSA type 3. This LSA will be flooded by the BDRs into Area 0, which is the backbone area, and then that will be flooded into the other BDRs into their own areas which will inform them of the other areas’ existence and their prefixes.

Type 4 LSA is a Type 4 Summary ASBR LSA. This LSA is used for when external connections are connected to an area that is not the backbone area. For this router to be recognized by the other areas, the router that’s connected to this external connection needs to become an ASBR (Autonomous System Border Router) which will allow for the external connection to be redistributed into the OSPF system. The ABR will then receive the LSA and create a Type 4 Summary ASBR LSA and flood it into the backbone area which floods it to all other areas. This allows for the external connection to be connected with the rest of the OSPF network.

Type 5 LSA is an External LSA. With the Type 4 Summary ASBR LSA, the OSPF areas know about the external connection since it flooded the backbone with its information. The External LSA will carry the prefixes of the external connection into OSPF, which will then flood it to the backbone and eventually the rest of the network and all of its areas.

LSA Type 6 is not really used and is not expected to be in used in the future. Its packets were designed for Multicast OSPF, or MOSPF, which supports multicast through OSPF but since its not supported by Cisco, its expected to be retired soon.

Finally, LSA Type 7 is another External LSA except this one is used in NSSA areas (will get into later). Since NSSA areas block type 5 LSAs, Type 7 LSAs are used to redistribute the LSAs from external networks into the NSSA areas. These LSA types are all very important and basically essential for OSPF in order to work.

Now that we know what the LSA types do we can talk about Stub areas, Totally Stubby areas and NSSA (Not-So-Stubby-Areas). Stub areas don’t accept LSA type 5 into their own network. This means that all external connections are blocked. Connections such as RIP and EIGRP will be blocked from the OSPF area and therefore will not show up in the routing table of the ABR in the Stub area. Stub areas also allow for the ABRs of the Stub area route information to external connections without having to maintain every single external connection.

Totally Stubby areas are similar to Stubby areas except they are more efficient. Totally Stubby areas don’t accept LSA types 3 and 5. Type 3 LSAs carry information from other Inter area networks and Type 5 LSAs carry information from external connections. By blocked both of these types of LSAs, the ABR’s routing table of the Totally Stubby area will be very smaller and therefore more efficient than the Stubby area. The Totally Stubby area will only see the OSPF connections from inside its own area and will filter all other connections through a default route. The default route is what makes the routing table of the ABR smaller because all the other networks will be gone and instead, the ABR will use the default route to communicate with the rest of the network.

NSSAs or Not-So-Stubby-Areas work in a similar manner. The NSSAs block out type 5 LSA but with LSA type 7 will accept connections from outer networks. Essentially, the connections going out of the NSSA will be turned into LSA type 5, but inside the NSSA they will be read as LSA type 7. This means that the NSSA will allow for ASBR and external networks because of LSA type 7. LSA type 7, as mentioned earlier, connects external networks to OSPF and by allowing LSA type 7 in the network, it allows for external connections using LSA type 7 into the system. These will also be able to be read by Stub and Totally Stub areas since they will be filtered through LSA type 5 into the backbone area, which will then transmit this information to the other ABRs and will be connected to the Stubby and Totally stubby areas through their default route.

These different types of areas were all designed by engineers who wanted to make connections in networks more efficient. These areas are more efficient by filtering traffic through their LSAs and by blocking LSAs. Stub areas are more efficient by blocking out LSA type 5, meaning the routing table will be smaller than a standard area. Totally Stubby areas are more efficient than Stub areas because they block out even more LSAs and filter traffic by blocking LSA type 3 and 5. This again makes the routing table smaller and more efficient. NSSAs help the networks by allowing for external connections but filtering them from LSA type 7 into 5 by the ABR which can then connect to the other networks from the backbone area through the default routes set up by the Stub and Totally Stubby areas.

Lab Summary

In Packet Tracer I set up 9 4321 routers. I connected most of the with gigabit connections and only 2 routers (R3 and R6) area connected by serial connections. There is a total of 8 networks in this topology, one network is in the Stub area (2.0.0.0/24), three networks are in the normal OSPF network ( 1.0.0.0/24, 3.0.0.0/24 5.0.0.0/24), one network in the Totally Stubby area (4.0.0.0/24), two in the NSSA (6.0.0.0/24, 7.0.0.0/24) and one in the EIGRP area (8.0.0.0/24). Only IPv4 was used in this lab so only OSPFv2 was used. All the networks and interfaces used are labeled in the topology.

Lab Commands

* Router ospf *process id*: starts the configuration of ospf for a router
* Network *network address wildmask address* area #: assigns a network to have ospf
* Traceroute *destination address*: traces how many hops it takes a route to ping
* Show ip ospf neighbor: shows the adjacent neighbors of the router
* Show ip ospf interface: shows the status of ospf in the interfaces of the router
* Show ip ospf: shows information regarding any ospf neighbors, interfaces, states, neighbor’s addresses, and router id
* Router-id *router id*: assigns the router an id
* Show ip route: shows ipv4 routing table
* Redistribute ospf 1 metric: distributes OSPF in EIGRP
* Redistribute eigrp 1 subnets: distributes EIGRP in OSPF
* Show ip eigrp topology: shows all the connections with EIGRP

Configurations:

Router 1:

Building configuration...

Current configuration : 814 bytes

version 15.4

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

hostname R1

no ip cef

no ipv6 cef

spanning-tree mode pvst

interface GigabitEthernet0/0/0

ip address 2.0.0.2 255.255.255.0

duplex auto

speed auto

interface GigabitEthernet0/0/1

no ip address

duplex auto

speed auto

shutdown

interface Serial0/1/0

no ip address

clock rate 2000000

shutdown

interface Serial0/1/1

no ip address

clock rate 2000000

shutdown

interface Vlan1

no ip address

shutdown

router ospf 1

router-id 1.1.1.1

log-adjacency-changes

area 1 stub

network 2.0.0.0 0.0.0.255 area 1

ip classless

ip flow-export version 9

line con 0

line aux 0

line vty 0 4

login

end

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, E - EGP

i - IS-IS, 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 2.0.0.1 to network 0.0.0.0

1.0.0.0/24 is subnetted, 1 subnets

O IA 1.0.0.0/24 [110/2] via 2.0.0.1, 00:22:19, GigabitEthernet0/0/0

2.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 2.0.0.0/24 is directly connected, GigabitEthernet0/0/0

L 2.0.0.2/32 is directly connected, GigabitEthernet0/0/0

3.0.0.0/24 is subnetted, 1 subnets

O IA 3.0.0.0/24 [110/3] via 2.0.0.1, 00:22:19, GigabitEthernet0/0/0

4.0.0.0/24 is subnetted, 1 subnets

O IA 4.0.0.0/24 [110/4] via 2.0.0.1, 00:22:19, GigabitEthernet0/0/0

5.0.0.0/24 is subnetted, 1 subnets

O IA 5.0.0.0/24 [110/66] via 2.0.0.1, 00:22:19, GigabitEthernet0/0/0

6.0.0.0/24 is subnetted, 1 subnets

O IA 6.0.0.0/24 [110/67] via 2.0.0.1, 00:22:04, GigabitEthernet0/0/0

7.0.0.0/24 is subnetted, 1 subnets

O IA 7.0.0.0/24 [110/68] via 2.0.0.1, 00:22:04, GigabitEthernet0/0/0

O\*IA 0.0.0.0/0 [110/2] via 2.0.0.1, 00:22:19, GigabitEthernet0/0/0

Neighbor ID Pri State Dead Time Address Interface

2.2.2.2 1 FULL/DR 00:00:31 2.0.0.1 GigabitEthernet0/0/0

GigabitEthernet0/0/0 is up, line protocol is up

Internet address is 2.0.0.2/24, Area 1

Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State BDR, Priority 1

Designated Router (ID) 2.2.2.2, Interface address 2.0.0.1

Backup Designated Router (ID) 1.1.1.1, Interface address 2.0.0.2

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:03

Index 1/1, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 2.2.2.2 (Designated Router)

Suppress hello for 0 neighbor(s)

Routing Process "ospf 1" with ID 1.1.1.1

Supports only single TOS(TOS0) routes

Supports opaque LSA

SPF schedule delay 5 secs, Hold time between two SPFs 10 secs

Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs

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. 0 normal 1 stub 0 nssa

External flood list length 0

Area 1

Number of interfaces in this area is 1

It is a stub area

Area has no authentication

SPF algorithm executed 69 times

Area ranges are

Number of LSA 10. Checksum Sum 0x05c5ea

Number of opaque link LSA 0. Checksum Sum 0x000000

Number of DCbitless LSA 0

Number of indication LSA 0

Number of DoNotAge LSA 0

Flood list length 0

**Pings:**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 1.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 3.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 4.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 5.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/5/12 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 6.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/13 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 7.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms

Router 2:

Building configuration...

Current configuration : 857 bytes

version 15.4

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

hostname R2

no ip cef

no ipv6 cef

spanning-tree mode pvst

interface GigabitEthernet0/0/0

ip address 2.0.0.1 255.255.255.0

duplex auto

speed auto

interface GigabitEthernet0/0/1

ip address 1.0.0.2 255.255.255.0

duplex auto

speed auto

interface Serial0/1/0

no ip address

clock rate 2000000

shutdown

interface Serial0/1/1

no ip address

clock rate 2000000

shutdown

interface Vlan1

no ip address

shutdown

router ospf 1

router-id 2.2.2.2

log-adjacency-changes

area 1 stub

network 1.0.0.0 0.0.0.255 area 0

network 2.0.0.0 0.0.0.255 area 1

ip classless

ip flow-export version 9

line con 0

line aux 0

line vty 0 4

login

end

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, E - EGP

i - IS-IS, 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

1.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 1.0.0.0/24 is directly connected, GigabitEthernet0/0/1

L 1.0.0.2/32 is directly connected, GigabitEthernet0/0/1

2.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 2.0.0.0/24 is directly connected, GigabitEthernet0/0/0

L 2.0.0.1/32 is directly connected, GigabitEthernet0/0/0

3.0.0.0/24 is subnetted, 1 subnets

O 3.0.0.0/24 [110/2] via 1.0.0.1, 01:53:56, GigabitEthernet0/0/1

4.0.0.0/24 is subnetted, 1 subnets

O 4.0.0.0/24 [110/3] via 1.0.0.1, 01:23:59, GigabitEthernet0/0/1

5.0.0.0/24 is subnetted, 1 subnets

O 5.0.0.0/24 [110/65] via 1.0.0.1, 02:22:29, GigabitEthernet0/0/1

6.0.0.0/24 is subnetted, 1 subnets

O IA 6.0.0.0/24 [110/66] via 1.0.0.1, 00:27:58, GigabitEthernet0/0/1

7.0.0.0/24 is subnetted, 1 subnets

O IA 7.0.0.0/24 [110/67] via 1.0.0.1, 00:27:58, GigabitEthernet0/0/1

8.0.0.0/24 is subnetted, 1 subnets

O E2 8.0.0.0/24 [110/20] via 1.0.0.1, 00:27:58, GigabitEthernet0/0/1

Neighbor ID Pri State Dead Time Address Interface

3.3.3.3 1 FULL/DR 00:00:37 1.0.0.1 GigabitEthernet0/0/1

1.1.1.1 1 FULL/BDR 00:00:37 2.0.0.2 GigabitEthernet0/0/0

GigabitEthernet0/0/1 is up, line protocol is up

Internet address is 1.0.0.2/24, Area 0

Process ID 1, Router ID 2.2.2.2, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State BDR, Priority 1

Designated Router (ID) 3.3.3.3, Interface address 1.0.0.1

Backup Designated Router (ID) 2.2.2.2, Interface address 1.0.0.2

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:05

Index 1/1, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 3.3.3.3 (Designated Router)

Suppress hello for 0 neighbor(s)

GigabitEthernet0/0/0 is up, line protocol is up

Internet address is 2.0.0.1/24, Area 1

Process ID 1, Router ID 2.2.2.2, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 2.2.2.2, Interface address 2.0.0.1

Backup Designated Router (ID) 1.1.1.1, Interface address 2.0.0.2

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:05

Index 2/2, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 1.1.1.1 (Backup Designated Router)

Suppress hello for 0 neighbor(s)

Routing Process "ospf 1" with ID 2.2.2.2

Supports only single TOS(TOS0) routes

Supports opaque LSA

It is an area border router

SPF schedule delay 5 secs, Hold time between two SPFs 10 secs

Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs

Number of external LSA 1. Checksum Sum 0x001084

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 2. 1 normal 1 stub 0 nssa

External flood list length 0

Area BACKBONE(0)

Number of interfaces in this area is 1

Area has no authentication

SPF algorithm executed 603 times

Area ranges are

Number of LSA 10. Checksum Sum 0x05ba87

Number of opaque link LSA 0. Checksum Sum 0x000000

Number of DCbitless LSA 0

Number of indication LSA 0

Number of DoNotAge LSA 0

Flood list length 0

Area 1

Number of interfaces in this area is 1

It is a stub area

generates stub default route with cost 1

Area has no authentication

SPF algorithm executed 31 times

Area ranges are

Number of LSA 10. Checksum Sum 0x05a5fa

Number of opaque link LSA 0. Checksum Sum 0x000000

Number of DCbitless LSA 0

Number of indication LSA 0

Number of DoNotAge LSA 0

Flood list length 0

**Pings:**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 1.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 3.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 4.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 5.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/9 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 6.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/9 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 7.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/6 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/6 ms

Router 3:

Building configuration...

Current configuration : 887 bytes

version 15.4

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

hostname R3

no ip cef

no ipv6 cef

spanning-tree mode pvst

interface GigabitEthernet0/0/0

ip address 1.0.0.1 255.255.255.0

duplex auto

speed auto

interface GigabitEthernet0/0/1

ip address 3.0.0.1 255.255.255.0

duplex auto

speed auto

interface Serial0/1/0

ip address 5.0.0.1 255.255.255.0

clock rate 2000000

interface Serial0/1/1

no ip address

clock rate 2000000

shutdown

interface Vlan1

no ip address

shutdown

router ospf 1

router-id 3.3.3.3

log-adjacency-changes

network 1.0.0.0 0.0.0.255 area 0

network 5.0.0.0 0.0.0.255 area 0

network 3.0.0.0 0.0.0.255 area 0

ip classless

ip flow-export version 9

line con 0

line aux 0

line vty 0 4

login

end

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, E - EGP

i - IS-IS, 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

1.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 1.0.0.0/24 is directly connected, GigabitEthernet0/0/0

L 1.0.0.1/32 is directly connected, GigabitEthernet0/0/0

2.0.0.0/24 is subnetted, 1 subnets

O IA 2.0.0.0/24 [110/2] via 1.0.0.2, 01:59:33, GigabitEthernet0/0/0

3.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 3.0.0.0/24 is directly connected, GigabitEthernet0/0/1

L 3.0.0.1/32 is directly connected, GigabitEthernet0/0/1

4.0.0.0/24 is subnetted, 1 subnets

O 4.0.0.0/24 [110/2] via 3.0.0.2, 01:59:33, GigabitEthernet0/0/1

5.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 5.0.0.0/24 is directly connected, Serial0/1/0

L 5.0.0.1/32 is directly connected, Serial0/1/0

6.0.0.0/24 is subnetted, 1 subnets

O IA 6.0.0.0/24 [110/65] via 5.0.0.2, 00:33:35, Serial0/1/0

7.0.0.0/24 is subnetted, 1 subnets

O IA 7.0.0.0/24 [110/66] via 5.0.0.2, 00:33:35, Serial0/1/0

8.0.0.0/24 is subnetted, 1 subnets

O E2 8.0.0.0/24 [110/20] via 5.0.0.2, 00:33:35, Serial0/1/0

Neighbor ID Pri State Dead Time Address Interface

6.6.6.6 0 FULL/ - 00:00:31 5.0.0.2 Serial0/1/0

2.2.2.2 1 FULL/BDR 00:00:31 1.0.0.2 GigabitEthernet0/0/0

4.4.4.4 1 FULL/DR 00:00:31 3.0.0.2 GigabitEthernet0/0/1

GigabitEthernet0/0/0 is up, line protocol is up

Internet address is 1.0.0.1/24, Area 0

Process ID 1, Router ID 3.3.3.3, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 3.3.3.3, Interface address 1.0.0.1

Backup Designated Router (ID) 2.2.2.2, Interface address 1.0.0.2

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:02

Index 1/1, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 2.2.2.2 (Backup Designated Router)

Suppress hello for 0 neighbor(s)

GigabitEthernet0/0/1 is up, line protocol is up

Internet address is 3.0.0.1/24, Area 0

Process ID 1, Router ID 3.3.3.3, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State BDR, Priority 1

Designated Router (ID) 4.4.4.4, Interface address 3.0.0.2

Backup Designated Router (ID) 3.3.3.3, Interface address 3.0.0.1

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:02

Index 2/2, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 4.4.4.4 (Designated Router)

Suppress hello for 0 neighbor(s)

Serial0/1/0 is up, line protocol is up

Internet address is 5.0.0.1/24, Area 0

Process ID 1, Router ID 3.3.3.3, Network Type POINT-TO-POINT, Cost: 64

Transmit Delay is 1 sec, State POINT-TO-POINT,

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:03

Index 3/3, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1 , Adjacent neighbor count is 1

Adjacent with neighbor 6.6.6.6

Suppress hello for 0 neighbor(s)

GigabitEthernet0/0/0 is up, line protocol is up

Internet address is 1.0.0.1/24, Area 0

Process ID 1, Router ID 3.3.3.3, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 3.3.3.3, Interface address 1.0.0.1

Backup Designated Router (ID) 2.2.2.2, Interface address 1.0.0.2

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:02

Index 1/1, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 2.2.2.2 (Backup Designated Router)

Suppress hello for 0 neighbor(s)

GigabitEthernet0/0/1 is up, line protocol is up

Internet address is 3.0.0.1/24, Area 0

Process ID 1, Router ID 3.3.3.3, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State BDR, Priority 1

Designated Router (ID) 4.4.4.4, Interface address 3.0.0.2

Backup Designated Router (ID) 3.3.3.3, Interface address 3.0.0.1

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:02

Index 2/2, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 4.4.4.4 (Designated Router)

Suppress hello for 0 neighbor(s)

Serial0/1/0 is up, line protocol is up

Internet address is 5.0.0.1/24, Area 0

Process ID 1, Router ID 3.3.3.3, Network Type POINT-TO-POINT, Cost: 64

Transmit Delay is 1 sec, State POINT-TO-POINT,

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:03

Index 3/3, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1 , Adjacent neighbor count is 1

Adjacent with neighbor 6.6.6.6

Suppress hello for 0 neighbor(s)

Routing Process "ospf 1" with ID 3.3.3.3

Supports only single TOS(TOS0) routes

Supports opaque LSA

SPF schedule delay 5 secs, Hold time between two SPFs 10 secs

Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs

Number of external LSA 1. Checksum Sum 0x001084

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

External flood list length 0

Area BACKBONE(0)

Number of interfaces in this area is 3

Area has no authentication

SPF algorithm executed 631 times

Area ranges are

Number of LSA 10. Checksum Sum 0x061228

Number of opaque link LSA 0. Checksum Sum 0x000000

Number of DCbitless LSA 0

Number of indication LSA 0

Number of DoNotAge LSA 0

Flood list length 0

**Pings:**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 1.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/1/5 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 3.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 4.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 5.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/6/19 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 6.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/6/12 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 7.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/5/12 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/11 ms

Router 4:

Building configuration...

Current configuration : 868 bytes

version 15.4

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

hostname R4

no ip cef

no ipv6 cef

spanning-tree mode pvst

interface GigabitEthernet0/0/0

ip address 3.0.0.2 255.255.255.0

duplex auto

speed auto

interface GigabitEthernet0/0/1

ip address 4.0.0.1 255.255.255.0

duplex auto

speed auto

interface Serial0/1/0

no ip address

clock rate 2000000

shutdown

interface Serial0/1/1

no ip address

clock rate 2000000

shutdown

interface Vlan1

no ip address

shutdown

router ospf 1

router-id 4.4.4.4

log-adjacency-changes

area 2 stub no-summary

network 3.0.0.0 0.0.0.255 area 0

network 4.0.0.0 0.0.0.255 area 2

ip classless

ip flow-export version 9

line con 0

line aux 0

line vty 0 4

login

end

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, E - EGP

i - IS-IS, 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

1.0.0.0/24 is subnetted, 1 subnets

O 1.0.0.0/24 [110/2] via 3.0.0.1, 00:38:10, GigabitEthernet0/0/0

2.0.0.0/24 is subnetted, 1 subnets

O IA 2.0.0.0/24 [110/3] via 3.0.0.1, 00:38:10, GigabitEthernet0/0/0

3.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 3.0.0.0/24 is directly connected, GigabitEthernet0/0/0

L 3.0.0.2/32 is directly connected, GigabitEthernet0/0/0

4.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 4.0.0.0/24 is directly connected, GigabitEthernet0/0/1

L 4.0.0.1/32 is directly connected, GigabitEthernet0/0/1

5.0.0.0/24 is subnetted, 1 subnets

O 5.0.0.0/24 [110/65] via 3.0.0.1, 02:32:40, GigabitEthernet0/0/0

6.0.0.0/24 is subnetted, 1 subnets

O IA 6.0.0.0/24 [110/66] via 3.0.0.1, 00:38:10, GigabitEthernet0/0/0

7.0.0.0/24 is subnetted, 1 subnets

O IA 7.0.0.0/24 [110/67] via 3.0.0.1, 00:38:10, GigabitEthernet0/0/0

8.0.0.0/24 is subnetted, 1 subnets

O E2 8.0.0.0/24 [110/20] via 3.0.0.1, 00:38:10, GigabitEthernet0/0/0

Neighbor ID Pri State Dead Time Address Interface

3.3.3.3 1 FULL/BDR 00:00:35 3.0.0.1 GigabitEthernet0/0/0

5.5.5.5 1 FULL/DR 00:00:35 4.0.0.2 GigabitEthernet0/0/1

GigabitEthernet0/0/0 is up, line protocol is up

Internet address is 3.0.0.2/24, Area 0

Process ID 1, Router ID 4.4.4.4, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 4.4.4.4, Interface address 3.0.0.2

Backup Designated Router (ID) 3.3.3.3, Interface address 3.0.0.1

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:06

Index 1/1, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 3.3.3.3 (Backup Designated Router)

Suppress hello for 0 neighbor(s)

GigabitEthernet0/0/1 is up, line protocol is up

Internet address is 4.0.0.1/24, Area 0

Process ID 1, Router ID 4.4.4.4, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State BDR, Priority 1

Designated Router (ID) 5.5.5.5, Interface address 4.0.0.2

Backup Designated Router (ID) 4.4.4.4, Interface address 4.0.0.1

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Index 2/2, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 0, Adjacent neighbor count is 0

Suppress hello for 0 neighbor(s)

GigabitEthernet0/0/1 is up, line protocol is up

Internet address is 4.0.0.1/24, Area 2

Process ID 1, Router ID 4.4.4.4, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State BDR, Priority 1

Designated Router (ID) 5.5.5.5, Interface address 4.0.0.2

Backup Designated Router (ID) 4.4.4.4, Interface address 4.0.0.1

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:06

Index 3/3, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 5.5.5.5 (Designated Router)

Suppress hello for 0 neighbor(s)

Routing Process "ospf 1" with ID 4.4.4.4

Supports only single TOS(TOS0) routes

Supports opaque LSA

It is an area border router

SPF schedule delay 5 secs, Hold time between two SPFs 10 secs

Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs

Number of external LSA 1. Checksum Sum 0x001084

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 2. 1 normal 1 stub 0 nssa

External flood list length 0

Area BACKBONE(0)

Number of interfaces in this area is 2

Area has no authentication

SPF algorithm executed 661 times

Area ranges are

Number of LSA 10. Checksum Sum 0x05bed2

Number of opaque link LSA 0. Checksum Sum 0x000000

Number of DCbitless LSA 0

Number of indication LSA 0

Number of DoNotAge LSA 0

Flood list length 0

Area 2

Number of interfaces in this area is 1

It is a stub area

generates stub default route with cost 1

Area has no authentication

SPF algorithm executed 28 times

Area ranges are

Number of LSA 4. Checksum Sum 0x017d08

Number of opaque link LSA 0. Checksum Sum 0x000000

Number of DCbitless LSA 0

Number of indication LSA 0

Number of DoNotAge LSA 0

Flood list length 0

**Pings:**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 1.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 3.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 4.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 5.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/7/11 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 6.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/8 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 7.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/8 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/7 ms

Router 5:

Building configuration...

Current configuration : 825 bytes

version 15.4

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

hostname R5

no ip cef

no ipv6 cef

spanning-tree mode pvst

interface GigabitEthernet0/0/0

ip address 4.0.0.2 255.255.255.0

duplex auto

speed auto

interface GigabitEthernet0/0/1

no ip address

duplex auto

speed auto

shutdown

interface Serial0/1/0

no ip address

clock rate 2000000

shutdown

interface Serial0/1/1

no ip address

clock rate 2000000

shutdown

interface Vlan1

no ip address

shutdown

router ospf 1

router-id 5.5.5.5

log-adjacency-changes

area 2 stub no-summary

network 4.0.0.0 0.0.0.255 area 2

ip classless

ip flow-export version 9

line con 0

line aux 0

line vty 0 4

login

end

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, E - EGP

i - IS-IS, 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 4.0.0.1 to network 0.0.0.0

4.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 4.0.0.0/24 is directly connected, GigabitEthernet0/0/0

L 4.0.0.2/32 is directly connected, GigabitEthernet0/0/0

O\*IA 0.0.0.0/0 [110/2] via 4.0.0.1, 04:21:39, GigabitEthernet0/0/0

Neighbor ID Pri State Dead Time Address Interface

4.4.4.4 1 FULL/BDR 00:00:37 4.0.0.1 GigabitEthernet0/0/0

GigabitEthernet0/0/0 is up, line protocol is up

Internet address is 4.0.0.2/24, Area 2

Process ID 1, Router ID 5.5.5.5, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 5.5.5.5, Interface address 4.0.0.2

Backup Designated Router (ID) 4.4.4.4, Interface address 4.0.0.1

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:04

Index 1/1, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 4.4.4.4 (Backup Designated Router)

Suppress hello for 0 neighbor(s)

Routing Process "ospf 1" with ID 5.5.5.5

Supports only single TOS(TOS0) routes

Supports opaque LSA

SPF schedule delay 5 secs, Hold time between two SPFs 10 secs

Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs

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. 0 normal 1 stub 0 nssa

External flood list length 0

Area 2

Number of interfaces in this area is 1

It is a stub area

Area has no authentication

SPF algorithm executed 17 times

Area ranges are

Number of LSA 4. Checksum Sum 0x017d08

Number of opaque link LSA 0. Checksum Sum 0x000000

Number of DCbitless LSA 0

Number of indication LSA 0

Number of DoNotAge LSA 0

Flood list length 0

**Pings:**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 1.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 3.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 4.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 5.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/12 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 6.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/11 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 7.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 2/4/7 ms

Router 6:

Building configuration...

Current configuration : 837 bytes

version 15.4

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

hostname R6

no ip cef

no ipv6 cef

spanning-tree mode pvst

interface GigabitEthernet0/0/0

ip address 6.0.0.1 255.255.255.0

duplex auto

speed auto

interface GigabitEthernet0/0/1

no ip address

duplex auto

speed auto

shutdown

interface Serial0/1/0

ip address 5.0.0.2 255.255.255.0

interface Serial0/1/1

no ip address

clock rate 2000000

shutdown

interface Vlan1

no ip address

shutdown

router ospf 1

router-id 6.6.6.6

log-adjacency-changes

area 3 nssa

network 5.0.0.0 0.0.0.255 area 0

network 6.0.0.0 0.0.0.255 area 3

ip classless

ip flow-export version 9

line con 0

line aux 0

line vty 0 4

login

end

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, E - EGP

i - IS-IS, 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

1.0.0.0/24 is subnetted, 1 subnets

O 1.0.0.0/24 [110/65] via 5.0.0.1, 01:15:00, Serial0/1/0

2.0.0.0/24 is subnetted, 1 subnets

O IA 2.0.0.0/24 [110/66] via 5.0.0.1, 01:15:00, Serial0/1/0

3.0.0.0/24 is subnetted, 1 subnets

O 3.0.0.0/24 [110/65] via 5.0.0.1, 01:15:00, Serial0/1/0

4.0.0.0/24 is subnetted, 1 subnets

O 4.0.0.0/24 [110/66] via 5.0.0.1, 01:15:00, Serial0/1/0

5.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 5.0.0.0/24 is directly connected, Serial0/1/0

L 5.0.0.2/32 is directly connected, Serial0/1/0

6.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 6.0.0.0/24 is directly connected, GigabitEthernet0/0/0

L 6.0.0.1/32 is directly connected, GigabitEthernet0/0/0

7.0.0.0/24 is subnetted, 1 subnets

O 7.0.0.0/24 [110/2] via 6.0.0.2, 02:40:53, GigabitEthernet0/0/0

8.0.0.0/24 is subnetted, 1 subnets

O N2 8.0.0.0/24 [110/20] via 6.0.0.2, 02:18:01, GigabitEthernet0/0/0

Neighbor ID Pri State Dead Time Address Interface

3.3.3.3 0 FULL/ - 00:00:36 5.0.0.1 Serial0/1/0

7.7.7.7 1 FULL/DR 00:00:36 6.0.0.2 GigabitEthernet0/0/0

Serial0/1/0 is up, line protocol is up

Internet address is 5.0.0.2/24, Area 0

Process ID 1, Router ID 6.6.6.6, Network Type POINT-TO-POINT, Cost: 64

Transmit Delay is 1 sec, State POINT-TO-POINT,

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:07

Index 1/1, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1 , Adjacent neighbor count is 1

Adjacent with neighbor 3.3.3.3

Suppress hello for 0 neighbor(s)

GigabitEthernet0/0/0 is up, line protocol is up

Internet address is 6.0.0.1/24, Area 3

Process ID 1, Router ID 6.6.6.6, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State BDR, Priority 1

Designated Router (ID) 7.7.7.7, Interface address 6.0.0.2

Backup Designated Router (ID) 6.6.6.6, Interface address 6.0.0.1

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:06

Index 2/2, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 7.7.7.7 (Designated Router)

Suppress hello for 0 neighbor(s)

Routing Process "ospf 1" with ID 6.6.6.6

Supports only single TOS(TOS0) routes

Supports opaque LSA

It is an area border router

SPF schedule delay 5 secs, Hold time between two SPFs 10 secs

Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs

Number of external LSA 2. Checksum Sum 0x001d0a

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 2. 1 normal 0 stub 1 nssa

External flood list length 0

Area BACKBONE(0)

Number of interfaces in this area is 1

Area has no authentication

SPF algorithm executed 850 times

Area ranges are

Number of LSA 10. Checksum Sum 0x0586f2

Number of opaque link LSA 0. Checksum Sum 0x000000

Number of DCbitless LSA 0

Number of indication LSA 0

Number of DoNotAge LSA 0

Flood list length 0

Area 3

Number of interfaces in this area is 1

It is a NSSA area

Perform type-7/type-5 LSA translation

Area has no authentication

SPF algorithm executed 35 times

Area ranges are

Number of LSA 11. Checksum Sum 0x058928

Number of opaque link LSA 0. Checksum Sum 0x000000

Number of DCbitless LSA 0

Number of indication LSA 0

Number of DoNotAge LSA 0

Flood list length 0

**Pings:**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 1.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 2/5/10 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 3/10/21 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 3.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 5/6/11 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 4.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/10 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 5.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 3/7/15 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 6.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 7.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Router 7:

Building configuration...

Current configuration : 857 bytes

version 15.4

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

hostname R7

no ip cef

no ipv6 cef

spanning-tree mode pvst

interface GigabitEthernet0/0/0

ip address 6.0.0.2 255.255.255.0

duplex auto

speed auto

interface GigabitEthernet0/0/1

ip address 7.0.0.1 255.255.255.0

duplex auto

speed auto

interface Serial0/1/0

no ip address

clock rate 2000000

shutdown

interface Serial0/1/1

no ip address

clock rate 2000000

shutdown

interface Vlan1

no ip address

shutdown

router ospf 1

router-id 7.7.7.7

log-adjacency-changes

area 3 nssa

network 6.0.0.0 0.0.0.255 area 3

network 7.0.0.0 0.0.0.255 area 3

ip classless

ip flow-export version 9

line con 0

line aux 0

line vty 0 4

login

end

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, E - EGP

i - IS-IS, 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

1.0.0.0/24 is subnetted, 1 subnets

O IA 1.0.0.0/24 [110/66] via 6.0.0.1, 02:47:37, GigabitEthernet0/0/0

2.0.0.0/24 is subnetted, 1 subnets

O IA 2.0.0.0/24 [110/67] via 6.0.0.1, 02:47:37, GigabitEthernet0/0/0

3.0.0.0/24 is subnetted, 1 subnets

O IA 3.0.0.0/24 [110/66] via 6.0.0.1, 02:47:37, GigabitEthernet0/0/0

4.0.0.0/24 is subnetted, 1 subnets

O IA 4.0.0.0/24 [110/67] via 6.0.0.1, 02:17:42, GigabitEthernet0/0/0

5.0.0.0/24 is subnetted, 1 subnets

O IA 5.0.0.0/24 [110/65] via 6.0.0.1, 03:11:54, GigabitEthernet0/0/0

6.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 6.0.0.0/24 is directly connected, GigabitEthernet0/0/0

L 6.0.0.2/32 is directly connected, GigabitEthernet0/0/0

7.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 7.0.0.0/24 is directly connected, GigabitEthernet0/0/1

L 7.0.0.1/32 is directly connected, GigabitEthernet0/0/1

8.0.0.0/24 is subnetted, 1 subnets

O N2 8.0.0.0/24 [110/20] via 7.0.0.2, 00:24:29, GigabitEthernet0/0/1

Neighbor ID Pri State Dead Time Address Interface

8.8.8.8 1 FULL/DR 00:00:32 7.0.0.2 GigabitEthernet0/0/1

6.6.6.6 1 FULL/BDR 00:00:31 6.0.0.1 GigabitEthernet0/0/0

GigabitEthernet0/0/0 is up, line protocol is up

Internet address is 6.0.0.2/24, Area 3

Process ID 1, Router ID 7.7.7.7, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 7.7.7.7, Interface address 6.0.0.2

Backup Designated Router (ID) 6.6.6.6, Interface address 6.0.0.1

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:07

Index 1/1, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 6.6.6.6 (Backup Designated Router)

Suppress hello for 0 neighbor(s)

GigabitEthernet0/0/1 is up, line protocol is up

Internet address is 7.0.0.1/24, Area 3

Process ID 1, Router ID 7.7.7.7, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State BDR, Priority 1

Designated Router (ID) 8.8.8.8, Interface address 7.0.0.2

Backup Designated Router (ID) 7.7.7.7, Interface address 7.0.0.1

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:07

Index 2/2, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 8.8.8.8 (Designated Router)

Suppress hello for 0 neighbor(s)

Routing Process "ospf 1" with ID 7.7.7.7

Supports only single TOS(TOS0) routes

Supports opaque LSA

SPF schedule delay 5 secs, Hold time between two SPFs 10 secs

Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs

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. 0 normal 0 stub 1 nssa

External flood list length 0

Area 3

Number of interfaces in this area is 2

It is a NSSA area

Perform type-7/type-5 LSA translation

Area has no authentication

SPF algorithm executed 38 times

Area ranges are

Number of LSA 11. Checksum Sum 0x058928

Number of opaque link LSA 0. Checksum Sum 0x000000

Number of DCbitless LSA 0

Number of indication LSA 0

Number of DoNotAge LSA 0

Flood list length 0

**Pings:**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 1.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/7 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 2/5/7 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 3.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/6/15 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 4.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/5 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 5.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/8/13 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 6.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 7.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Router 8:

Building configuration...

Current configuration : 959 bytes

version 15.4

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

hostname R8

no ip cef

no ipv6 cef

spanning-tree mode pvst

interface GigabitEthernet0/0/0

ip address 8.0.0.1 255.255.255.0

duplex auto

speed auto

interface GigabitEthernet0/0/1

ip address 7.0.0.2 255.255.255.0

duplex auto

speed auto

interface Serial0/1/0

no ip address

clock rate 2000000

shutdown

interface Serial0/1/1

no ip address

clock rate 2000000

shutdown

interface Vlan1

no ip address

shutdown

router eigrp 1

redistribute ospf 1 metric 1000 33 255 1 100

network 8.0.0.0 0.0.0.255

auto-summary

router ospf 1

router-id 8.8.8.8

log-adjacency-changes

area 3 nssa

redistribute eigrp 1 subnets

network 7.0.0.0 0.0.0.255 area 3

ip classless

ip flow-export version 9

line con 0

line aux 0

line vty 0 4

login

end

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, E - EGP

i - IS-IS, 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

1.0.0.0/24 is subnetted, 1 subnets

O IA 1.0.0.0/24 [110/67] via 7.0.0.1, 01:33:18, GigabitEthernet0/0/1

2.0.0.0/24 is subnetted, 1 subnets

O IA 2.0.0.0/24 [110/68] via 7.0.0.1, 01:33:18, GigabitEthernet0/0/1

3.0.0.0/24 is subnetted, 1 subnets

O IA 3.0.0.0/24 [110/67] via 7.0.0.1, 01:33:18, GigabitEthernet0/0/1

4.0.0.0/24 is subnetted, 1 subnets

O IA 4.0.0.0/24 [110/68] via 7.0.0.1, 01:33:18, GigabitEthernet0/0/1

5.0.0.0/24 is subnetted, 1 subnets

O IA 5.0.0.0/24 [110/66] via 7.0.0.1, 01:33:28, GigabitEthernet0/0/1

6.0.0.0/24 is subnetted, 1 subnets

O 6.0.0.0/24 [110/2] via 7.0.0.1, 01:33:28, GigabitEthernet0/0/1

7.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 7.0.0.0/24 is directly connected, GigabitEthernet0/0/1

L 7.0.0.2/32 is directly connected, GigabitEthernet0/0/1

8.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 8.0.0.0/24 is directly connected, GigabitEthernet0/0/0

L 8.0.0.1/32 is directly connected, GigabitEthernet0/0/0

Neighbor ID Pri State Dead Time Address Interface

7.7.7.7 1 FULL/BDR 00:00:37 7.0.0.1 GigabitEthernet0/0/1

IP-EIGRP neighbors for process 1

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

0 8.0.0.2 Gig0/0/0 12 01:34:29 40 1000 0 49

GigabitEthernet0/0/1 is up, line protocol is up

Internet address is 7.0.0.2/24, Area 3

Process ID 1, Router ID 8.8.8.8, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 8.8.8.8, Interface address 7.0.0.2

Backup Designated Router (ID) 7.7.7.7, Interface address 7.0.0.1

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:04

Index 1/1, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 7.7.7.7 (Backup Designated Router)

Suppress hello for 0 neighbor(s)

IP-EIGRP interfaces for process 1

Xmit Queue Mean Pacing Time Multicast Pending

Interface Peers Un/Reliable SRTT Un/Reliable Flow Timer Routes

Gig0/0/0 1 0/0 1236 0/10 0 0

Routing Process "ospf 1" with ID 8.8.8.8

Supports only single TOS(TOS0) routes

Supports opaque LSA

It is an autonomous system boundary router

SPF schedule delay 5 secs, Hold time between two SPFs 10 secs

Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs

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. 0 normal 0 stub 1 nssa

External flood list length 0

Area 3

Number of interfaces in this area is 1

It is a NSSA area

Perform type-7/type-5 LSA translation

Area has no authentication

SPF algorithm executed 34 times

Area ranges are

Number of LSA 11. Checksum Sum 0x055940

Number of opaque link LSA 0. Checksum Sum 0x000000

Number of DCbitless LSA 0

Number of indication LSA 0

Number of DoNotAge LSA 0

Flood list length 0

IP-EIGRP Topology Table for AS 1/ID(8.0.0.1)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - Reply status

P 1.0.0.0/24, 1 successors, FD is 2568448

via Redistributed (2568448/0)

P 2.0.0.0/24, 1 successors, FD is 2568448

via Redistributed (2568448/0)

P 3.0.0.0/24, 1 successors, FD is 2568448

via Redistributed (2568448/0)

P 4.0.0.0/24, 1 successors, FD is 2568448

via Redistributed (2568448/0)

P 5.0.0.0/24, 1 successors, FD is 2568448

via Redistributed (2568448/0)

P 6.0.0.0/24, 1 successors, FD is 2568448

via Redistributed (2568448/0)

P 7.0.0.0/24, 1 successors, FD is 2568448

via Redistributed (2568448/0)

P 8.0.0.0/24, 1 successors, FD is 2816

via Connected, GigabitEthernet0/0/0

**Pings:**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 1.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/6 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/5 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 3.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/12 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 4.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/7 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 5.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 6.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 7.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Router 9:

Building configuration...

Current configuration : 767 bytes

version 15.4

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

hostname R9

no ip cef

no ipv6 cef

spanning-tree mode pvst

interface GigabitEthernet0/0/0

ip address 8.0.0.2 255.255.255.0

duplex auto

speed auto

interface GigabitEthernet0/0/1

no ip address

duplex auto

speed auto

shutdown

interface Serial0/1/0

no ip address

clock rate 2000000

shutdown

interface Serial0/1/1

no ip address

clock rate 2000000

shutdown

interface Vlan1

no ip address

shutdown

router eigrp 1

network 8.0.0.0 0.0.0.255

auto-summary

ip classless

ip flow-export version 9

line con 0

line aux 0

line vty 0 4

login

end

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, E - EGP

i - IS-IS, 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

1.0.0.0/24 is subnetted, 1 subnets

D EX 1.0.0.0/24 [170/2568704] via 8.0.0.1, 01:42:26, GigabitEthernet0/0/0

2.0.0.0/24 is subnetted, 1 subnets

D EX 2.0.0.0/24 [170/2568704] via 8.0.0.1, 01:42:26, GigabitEthernet0/0/0

3.0.0.0/24 is subnetted, 1 subnets

D EX 3.0.0.0/24 [170/2568704] via 8.0.0.1, 01:42:26, GigabitEthernet0/0/0

4.0.0.0/24 is subnetted, 1 subnets

D EX 4.0.0.0/24 [170/2568704] via 8.0.0.1, 01:42:26, GigabitEthernet0/0/0

5.0.0.0/24 is subnetted, 1 subnets

D EX 5.0.0.0/24 [170/2568704] via 8.0.0.1, 01:42:36, GigabitEthernet0/0/0

6.0.0.0/24 is subnetted, 1 subnets

D EX 6.0.0.0/24 [170/2568704] via 8.0.0.1, 01:42:36, GigabitEthernet0/0/0

7.0.0.0/24 is subnetted, 1 subnets

D EX 7.0.0.0/24 [170/2568704] via 8.0.0.1, 01:42:55, GigabitEthernet0/0/0

8.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 8.0.0.0/24 is directly connected, GigabitEthernet0/0/0

L 8.0.0.2/32 is directly connected, GigabitEthernet0/0/0

IP-EIGRP neighbors for process 1

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

0 8.0.0.1 Gig0/0/0 12 01:49:29 40 1000 0 106

IP-EIGRP interfaces for process 1

Xmit Queue Mean Pacing Time Multicast Pending

Interface Peers Un/Reliable SRTT Un/Reliable Flow Timer Routes

Gig0/0/0 1 0/0 1236 0/10 0 0

IP-EIGRP Topology Table for AS 1/ID(8.0.0.2)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - Reply status

P 1.0.0.0/24, 1 successors, FD is 2568704

via Rstatic (2568704/2568448)

P 2.0.0.0/24, 1 successors, FD is 2568704

via Rstatic (2568704/2568448)

P 3.0.0.0/24, 1 successors, FD is 2568704

via Rstatic (2568704/2568448)

P 4.0.0.0/24, 1 successors, FD is 2568704

via Rstatic (2568704/2568448)

P 5.0.0.0/24, 1 successors, FD is 2568704

via Rstatic (2568704/2568448)

P 6.0.0.0/24, 1 successors, FD is 2568704

via Rstatic (2568704/2568448)

P 7.0.0.0/24, 1 successors, FD is 2568704

via Rstatic (2568704/2568448)

P 8.0.0.0/24, 1 successors, FD is 2816

via Connected, GigabitEthernet0/0/0

**Pings:**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 1.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/9 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 3.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 4.0.0.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 5.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 6.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/4 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 7.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.0.0.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Problems

This lab had quiet a lot of problems. When setting up stub areas, I had trouble when I only set the BDRs in the stub area and I didn’t set the router connecting the backbone area to the stub area with a stub area. This not only didn’t allow pings to go into the stub area as well as stopped pings from coming out of the stub area. I was able to fix this when I experimented with setting up the stub area in Router 2 in the 2.0.0.0/24 network. After this simple fix I was able to start pinging from the backbone area into the Stub area. When setting up the totally stubby area, I didn’t have problems setting it up as a stub area, but I was having trouble changing it into a totally stubby area. After doing some more research on totally stubby areas, I used the “area *area number* stub no-summary” command on both Router 4 and Router 5 for the network 4.0.0.0/24. This changed the stub area into a totally stubby area. I noticed it worked when I used the “show ip route” command to check the routing table. Once I saw that its only routes were the directly connected one and the default route for the outside routes, I knew the command had worked. There was not a lot of problems with the NSSA. The OSPF set up was pretty simple as it was with the other stub areas.

When I started working with EIGRP, there weren’t any problems at first until I tried redistributing. I did not run into any problems while setting up EIGRP and it was fairly simple to set up EIGRP with the “router eigrp 1” command and the network commands. I ran into problems while trying to do the “redistribute ospf 1 metrics” command in Router 8. I thought that would be enough to connect EIGRP with OSPF and the rest of the areas but that was not the case since I needed to redistribute from the OSPF side of the network. After this problem I used the “router ospf 1” command and the “redistribute eigrp 1 subnets.” This fixed the problem and after a few minutes of waiting, I was able to ping into Area 4 (EIGRP) from all the other areas as well as out of Area 4. I didn’t have any problems setting up normal OSPF in the backbone area (Area 0) as well as in the stub area (Area 1) and stubby area. NSSA didn’t need as many commands as I thought it would need.

Conclusion

Overall this lab helped review how to set up multiple OSPF areas. It allowed me to learn how to set up stub areas as well as totally stubby and NSSA areas, which helped me see how they work to communicate with each area. Setting up EIGRP became an obstacle when trying to get Area 0, 1, 2 and 3 to ping to Area 4. There was a lot of troubleshooting needed and I ended up using the “show ip route” command a lot to check whether the routers were able to see the other routes in the network. Pinging allowed me to really check if the routers were able to reach all the areas. Checking OSPF neighbors in each router helped me check if OSPF was working and EIGRP neighbors allowed me to check the same thing but with Router 9 and Router 8. In conclusion this lab was a good review for OSPF and EIGRP as well as stub, totally stubby and not so stubby areas.