

**5 Router**

**Multiarea OSPF**

Ryan Chen

9/13/2023

**Purpose:**

The primary purpose of this lab is to tie together previously learned CCNA concepts such as IPv4 subnetting, IPv6 subnetting, and core OSPF concepts (single and multi-area) in one lab to provide a thorough refresher. Technologies such as OSPFv2 and OSPFv3 will be used to connect devices in different areas. Furthermore, this lab serves as an introduction to setting up lab environments without any given outlines, to test skills of designing and creating networks independently, a skill that is needed in order to become a good network engineer.

**Background Information:**

Within every network, a device identifies itself to other devices using an IP address. IP addresses are similar to how names function for humans – they are unique, individual identifiers for computer devices. However, in larger industry networks with tens of hundreds of devices, it becomes hard to manually connect all the devices together so that they are aware of each other’s presence and can communicate with each other. Thus, this is where the use of OSPF comes into play.

Before we can use OSPF however, we must first determine our IP addressing scheme, aka the way that our IP’s are set. To do this, we must subnet the IP addresses, which is the process of splitting an entire range of IPs into smaller groups to segment them. In more common terms, each subnet can be thought of a different neighborhood, with each house in the neighborhood representing a single IP address.

OSPF is a network routing protocol that allows the various routers in a large network to easily exchange information amongst each other. OSPF is primarily used to distribute the shortest route that it takes to get to each router in a network. Routes can be thought of as physical directions to another router. Analogous to how a person would use a map to navigate to a destination, routers use distributed OSPF route information to know where to send their information based on a destination. More specifically, OSPF uses the SPF (Shortest Path First/Dijkstra) algorithm to calculate these routes, which are then distributed amongst every router in the network. Before all these routes can be distributed however, each router on the network must run an OSPF process. Upon initializing the process, routers must also establish neighbors – which are routers in a shared network running OSPF – before they can begin to distribute routing information. Each router subsequently distributes all their known routes to their neighbors, allowing the entire network to be connected.

OSPF is highly important in large enterprise networks as it allows routes to be distributed automatically when the OSPF process is activated. Traditionally, network engineers would need to manually add a multitude of routes to a new router in order to connect it to the rest of the network, but with OSPF these routes are populated as soon as the new router forms an adjacency with other neighboring OSPF routers in the network.

**Lab Summary:**

In our finished version of the lab, we were able to successfully get OSPF running on a multiarea network in both IPv4 and IPv6. This allowed two end PC users in different networks/areas to communicate with each other without the need to configure static routes. Furthermore, this OSPF multiarea network used a backbone area to facilitate the connection between the two different areas.

First off, we created our topology on paper, then assigned each of the subnets and IPs for every router. After finding out that our topology was poorly made, we restarted with a better topology. With the 5 routers that we had, we initialized OSPF on each router, assigned IPs, and finally configured OSPF. This resulted in a working network where end routers could ping each other. Our last step was to assign IPv4 and IPv6 end device addresses and ping, which eventually worked.

**Lab Commands:**

network

-Advertise OSPF networks and activate OSPF interfaces within a network

ip ospf [PROCESS\_ID] area [AREA\_ID]

-Alternate way to activate OSPF per interface basis

ipv6 unicast-routing

-Enables IPv6 on router, necessary for the IPv6 OSPF part of this lab

router ospf [PROCESS\_ID]

-Enables the OSPF process to allow for route propagation

clear ip ospf process

-Restarts the IPv4 OSPF process

clear ipv6 ospf process

-Restarts the IPv6 OSPF process

show ip route

-Shows all IPv4 routes

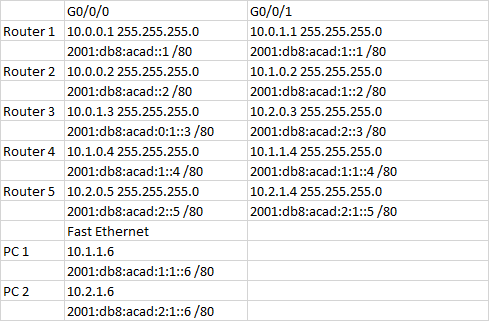
show ipv6 route

-Shows all IPv6 routes

**Network Diagram and IP Table:**

**A diagram of a diagram of a diagram

Description automatically generated**



**Configurations:**

**R1:**

hostname R1

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

ipv6 unicast-routing

subscriber templating

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO21491LXV

license accept end user agreement

license boot level securityk9

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

interface GigabitEthernet0/0/0

ip address 10.0.0.1 255.255.255.0

ip ospf 1 area 0

negotiation auto

ipv6 address 2001:DB8:ACAD::1/80

ipv6 ospf 1 area 0

interface GigabitEthernet0/0/1

ip address 10.0.1.1 255.255.255.0

ip ospf 1 area 0

negotiation auto

ipv6 address 2001:DB8:ACAD:0:1::1/80

ipv6 ospf 1 area 0

interface Serial0/1/0

no ip address

shutdown

interface Serial0/1/1

no ip address

shutdown

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

interface Vlan1

no ip address

shutdown

router ospf 1

router-id 1.1.1.1

network 10.0.0.0 0.0.255.255 area 0

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

ipv6 router ospf 1

router-id 1.1.1.1

control-plane

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

end

R1#show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, \* - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP

a - application route

+ - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks

C 10.0.0.0/24 is directly connected, GigabitEthernet0/0/0

L 10.0.0.1/32 is directly connected, GigabitEthernet0/0/0

C 10.0.1.0/24 is directly connected, GigabitEthernet0/0/1

L 10.0.1.1/32 is directly connected, GigabitEthernet0/0/1

O IA 10.1.0.0/24 [110/2] via 10.0.0.2, 00:01:05, GigabitEthernet0/0/0

O IA 10.1.1.0/24 [110/3] via 10.0.0.2, 00:01:05, GigabitEthernet0/0/0

O IA 10.2.0.0/24 [110/2] via 10.0.1.3, 00:33:23, GigabitEthernet0/0/1

O IA 10.2.1.0/24 [110/12] via 10.0.1.3, 00:04:55, GigabitEthernet0/0/1

R1#show ipv6 route

IPv6 Routing Table - default - 9 entries

Codes: C - Connected, L - Local, S - Static, U - Per-user Static route

B - BGP, R - RIP, H - NHRP, I1 - ISIS L1

I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP

EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination

NDr - Redirect, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1

OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2

a - Application

C 2001:DB8:ACAD::/80 [0/0]

via GigabitEthernet0/0/0, directly connected

L 2001:DB8:ACAD::1/128 [0/0]

via GigabitEthernet0/0/0, receive

C 2001:DB8:ACAD:0:1::/80 [0/0]

via GigabitEthernet0/0/1, directly connected

L 2001:DB8:ACAD:0:1::1/128 [0/0]

via GigabitEthernet0/0/1, receive

OI 2001:DB8:ACAD:1::/80 [110/2]

via FE80::B6A8:B9FF:FE47:92C0, GigabitEthernet0/0/0

OI 2001:DB8:ACAD:1:1::/80 [110/3]

via FE80::B6A8:B9FF:FE47:92C0, GigabitEthernet0/0/0

OI 2001:DB8:ACAD:2::/80 [110/2]

via FE80::B6A8:B9FF:FE01:AE50, GigabitEthernet0/0/1

OI 2001:DB8:ACAD:2:1::/80 [110/12]

via FE80::B6A8:B9FF:FE01:AE50, GigabitEthernet0/0/1

L FF00::/8 [0/0]

via Null0, receive

**R2:**

hostname R2

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

ipv6 unicast-routing

subscriber templating

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO214420QQ

license accept end user agreement

license boot level securityk9

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

interface GigabitEthernet0/0/0

ip address 10.0.0.2 255.255.255.0

ip ospf 1 area 0

negotiation auto

ipv6 address 2001:DB8:ACAD::2/80

ipv6 ospf 1 area 0

interface GigabitEthernet0/0/1

ip address 10.1.0.2 255.255.255.0

ip ospf 1 area 1

negotiation auto

ipv6 address 2001:DB8:ACAD:1::2/80

ipv6 ospf 1 area 1

interface Serial0/1/0

no ip address

shutdown

interface Serial0/1/1

no ip address

shutdown

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

interface Vlan1

no ip address

shutdown

router ospf 1

router-id 2.2.2.2

network 10.0.0.0 0.0.255.255 area 0

network 10.1.0.0 0.0.255.255 area 1

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

ipv6 router ospf 1

router-id 2.2.2.2

control-plane

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

End

R2#show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, \* - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP

a - application route

+ - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks

C 10.0.0.0/24 is directly connected, GigabitEthernet0/0/0

L 10.0.0.2/32 is directly connected, GigabitEthernet0/0/0

O 10.0.1.0/24 [110/2] via 10.0.0.1, 00:07:13, GigabitEthernet0/0/0

C 10.1.0.0/24 is directly connected, GigabitEthernet0/0/1

L 10.1.0.2/32 is directly connected, GigabitEthernet0/0/1

O 10.1.1.0/24 [110/2] via 10.1.0.4, 00:06:13, GigabitEthernet0/0/1

O IA 10.2.0.0/24 [110/3] via 10.0.0.1, 00:07:13, GigabitEthernet0/0/0

O IA 10.2.1.0/24 [110/13] via 10.0.0.1, 00:07:13, GigabitEthernet0/0/0

R2#show ipv6 route

IPv6 Routing Table - default - 9 entries

Codes: C - Connected, L - Local, S - Static, U - Per-user Static route

B - BGP, R - RIP, H - NHRP, I1 - ISIS L1

I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP

EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination

NDr - Redirect, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1

OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2

a - Application

C 2001:DB8:ACAD::/80 [0/0]

via GigabitEthernet0/0/0, directly connected

L 2001:DB8:ACAD::2/128 [0/0]

via GigabitEthernet0/0/0, receive

O 2001:DB8:ACAD:0:1::/80 [110/2]

via FE80::521C:B0FF:FE2D:7100, GigabitEthernet0/0/0

C 2001:DB8:ACAD:1::/80 [0/0]

via GigabitEthernet0/0/1, directly connected

L 2001:DB8:ACAD:1::2/128 [0/0]

via GigabitEthernet0/0/1, receive

O 2001:DB8:ACAD:1:1::/80 [110/2]

via FE80::227:90FF:FEC7:8DB0, GigabitEthernet0/0/1

OI 2001:DB8:ACAD:2::/80 [110/3]

via FE80::521C:B0FF:FE2D:7100, GigabitEthernet0/0/0

OI 2001:DB8:ACAD:2:1::/80 [110/13]

via FE80::521C:B0FF:FE2D:7100, GigabitEthernet0/0/0

L FF00::/8 [0/0]

via Null0, receive

**R3:**

hostname R3

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

ipv6 unicast-routing

subscriber templating

vtp domain cisco

vtp mode transparent

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO214420HY

license boot level securityk9

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

vlan 10,20

interface GigabitEthernet0/0/0

ip address 10.0.1.3 255.255.255.0

ip ospf 1 area 0

negotiation auto

ipv6 address 2001:DB8:ACAD:0:1::3/80

ipv6 ospf 1 area 0

interface GigabitEthernet0/0/1

ip address 10.2.0.3 255.255.255.0

ip ospf 1 area 2

negotiation auto

ipv6 address 2001:DB8:ACAD:2::3/80

ipv6 ospf 1 area 2

interface Serial0/1/0

no ip address

interface Serial0/1/1

no ip address

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

negotiation auto

interface Vlan1

no ip address

router ospf 1

router-id 3.3.3.3

network 10.0.0.0 0.0.255.255 area 0

network 10.2.0.0 0.0.255.255 area 2

ip forward-protocol nd

no ip http server

no ip http secure-server

ipv6 router ospf 1

router-id 3.3.3.3

control-plane

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

End

R3#show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, \* - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP

a - application route

+ - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks

O 10.0.0.0/24 [110/2] via 10.0.1.1, 00:25:11, GigabitEthernet0/0/0

C 10.0.1.0/24 is directly connected, GigabitEthernet0/0/0

L 10.0.1.3/32 is directly connected, GigabitEthernet0/0/0

O IA 10.1.0.0/24 [110/3] via 10.0.1.1, 00:05:07, GigabitEthernet0/0/0

O IA 10.1.1.0/24 [110/4] via 10.0.1.1, 00:05:07, GigabitEthernet0/0/0

C 10.2.0.0/24 is directly connected, GigabitEthernet0/0/1

L 10.2.0.3/32 is directly connected, GigabitEthernet0/0/1

10.2.1.0/24 [110/11] via 10.2.0.5, 00:08:58, GigabitEthernet0/0/1

R3#show ipv6 route

IPv6 Routing Table - default - 9 entries

Codes: C - Connected, L - Local, S - Static, U - Per-user Static route

B - BGP, R - RIP, H - NHRP, I1 - ISIS L1

I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP

EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination

NDr - Redirect, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1

OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2

a - Application

O 2001:DB8:ACAD::/80 [110/2]

via FE80::521C:B0FF:FE2D:7101, GigabitEthernet0/0/0

C 2001:DB8:ACAD:0:1::/80 [0/0]

via GigabitEthernet0/0/0, directly connected

L 2001:DB8:ACAD:0:1::3/128 [0/0]

via GigabitEthernet0/0/0, receive

OI 2001:DB8:ACAD:1::/80 [110/3]

via FE80::521C:B0FF:FE2D:7101, GigabitEthernet0/0/0

OI 2001:DB8:ACAD:1:1::/80 [110/4]

via FE80::521C:B0FF:FE2D:7101, GigabitEthernet0/0/0

C 2001:DB8:ACAD:2::/80 [0/0]

via GigabitEthernet0/0/1, directly connected

L 2001:DB8:ACAD:2::3/128 [0/0]

via GigabitEthernet0/0/1, receive

O 2001:DB8:ACAD:2:1::/80 [110/11]

via FE80::521C:B0FF:FE2C:4C80, GigabitEthernet0/0/1

L FF00::/8 [0/0]

via Null0, receive

**R4:**

hostname R4

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

ipv6 unicast-routing

subscriber templating

vtp domain cisco

vtp mode transparent

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO214333H6

license boot level securityk9

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

vlan 10,20

interface Tunnel0

no ip address

interface GigabitEthernet0/0/0

ip address 10.1.0.4 255.255.255.0

ip ospf 1 area 1

negotiation auto

ipv6 address 2001:DB8:ACAD:1::4/80

ipv6 ospf 1 area 1

interface GigabitEthernet0/0/1

ip address 10.1.1.4 255.255.255.0

ip ospf 1 area 1

negotiation auto

ipv6 address 2001:DB8:ACAD:1:1::4/80

ipv6 ospf 1 area 1

interface Serial0/1/0

no ip address

shutdown

interface Serial0/1/1

no ip address

shutdown

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

interface Vlan1

no ip address

shutdown

router ospf 1

router-id 4.4.4.4

network 10.1.0.0 0.0.255.255 area 1

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

ipv6 router ospf 1

router-id 4.4.4.4

control-plane

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

R4#show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, \* - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP

a - application route

+ - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks

O IA 10.0.0.0/24 [110/2] via 10.1.0.2, 00:04:44, GigabitEthernet0/0/0

O IA 10.0.1.0/24 [110/3] via 10.1.0.2, 00:04:44, GigabitEthernet0/0/0

C 10.1.0.0/24 is directly connected, GigabitEthernet0/0/0

L 10.1.0.4/32 is directly connected, GigabitEthernet0/0/0

C 10.1.1.0/24 is directly connected, GigabitEthernet0/0/1

L 10.1.1.4/32 is directly connected, GigabitEthernet0/0/1

O IA 10.2.0.0/24 [110/4] via 10.1.0.2, 00:04:44, GigabitEthernet0/0/0

O IA 10.2.1.0/24 [110/14] via 10.1.0.2, 00:00:02, GigabitEthernet0/0/0

End

R4#show ipv6 route

IPv6 Routing Table - default - 9 entries

Codes: C - Connected, L - Local, S - Static, U - Per-user Static route

B - BGP, R - RIP, H - NHRP, I1 - ISIS L1

I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP

EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination

NDr - Redirect, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1

OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2

a - Application

OI 2001:DB8:ACAD::/80 [110/2]

via FE80::B6A8:B9FF:FE47:92C1, GigabitEthernet0/0/0

OI 2001:DB8:ACAD:0:1::/80 [110/3]

via FE80::B6A8:B9FF:FE47:92C1, GigabitEthernet0/0/0

C 2001:DB8:ACAD:1::/80 [0/0]

via GigabitEthernet0/0/0, directly connected

L 2001:DB8:ACAD:1::4/128 [0/0]

via GigabitEthernet0/0/0, receive

C 2001:DB8:ACAD:1:1::/80 [0/0]

via GigabitEthernet0/0/1, directly connected

L 2001:DB8:ACAD:1:1::4/128 [0/0]

via GigabitEthernet0/0/1, receive

OI 2001:DB8:ACAD:2::/80 [110/4]

via FE80::B6A8:B9FF:FE47:92C1, GigabitEthernet0/0/0

OI 2001:DB8:ACAD:2:1::/80 [110/14]

via FE80::B6A8:B9FF:FE47:92C1, GigabitEthernet0/0/0

L FF00::/8 [0/0]

via Null0, receive

**R5:**

hostname R5

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

ipv6 unicast-routing

subscriber templating

vtp domain cisco

vtp mode transparent

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO21482HYV

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

vlan 2,10,20

vlan 996

name CUSTOMER\_NATIVE

interface GigabitEthernet0/0/0

ip address 10.2.0.5 255.255.255.0

ip ospf 1 area 2

negotiation auto

ipv6 address 2001:DB8:ACAD:2::5/80

ipv6 ospf 1 area 2

interface GigabitEthernet0/0/1

ip address 10.2.1.5 255.255.255.0

ip ospf 1 area 2

negotiation auto

ipv6 address 2001:DB8:ACAD:2:1::5/80

ipv6 ospf 1 area 2

interface Serial0/1/0

interface Serial0/1/1

interface GigabitEthernet0/2/0

negotiation auto

interface GigabitEthernet0/2/1

negotiation auto

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

interface Vlan1

no ip address

shutdown

router ospf 1

router-id 5.5.5.5

network 10.2.0.0 0.0.255.255 area 2

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

ipv6 router ospf 1

router-id 5.5.5.5

control-plane

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

End

R5(config)#do show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, \* - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP

a - application route

+ - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks

O IA 10.0.0.0/24 [110/3] via 10.2.0.3, 00:18:56, GigabitEthernet0/0/0

O IA 10.0.1.0/24 [110/2] via 10.2.0.3, 00:31:06, GigabitEthernet0/0/0

O IA 10.1.0.0/24 [110/4] via 10.2.0.3, 00:06:31, GigabitEthernet0/0/0

O IA 10.1.1.0/24 [110/5] via 10.2.0.3, 00:04:58, GigabitEthernet0/0/0

C 10.2.0.0/24 is directly connected, GigabitEthernet0/0/0

L 10.2.0.5/32 is directly connected, GigabitEthernet0/0/0

C 10.2.1.0/24 is directly connected, GigabitEthernet0/0/1

L 10.2.1.5/32 is directly connected, GigabitEthernet0/0/1

R5#show ipv6 route

IPv6 Routing Table - default - 9 entries

Codes: C - Connected, L - Local, S - Static, U - Per-user Static route

B - BGP, R - RIP, I1 - ISIS L1, I2 - ISIS L2

IA - ISIS interarea, IS - ISIS summary, D - EIGRP, EX - EIGRP external

ND - ND Default, NDp - ND Prefix, DCE - Destination, NDr - Redirect

O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2

ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, a - Application

OI 2001:DB8:ACAD::/80 [110/3]

via FE80::B6A8:B9FF:FE01:AE51, GigabitEthernet0/0/0

OI 2001:DB8:ACAD:0:1::/80 [110/2]

via FE80::B6A8:B9FF:FE01:AE51, GigabitEthernet0/0/0

OI 2001:DB8:ACAD:1::/80 [110/4]

via FE80::B6A8:B9FF:FE01:AE51, GigabitEthernet0/0/0

OI 2001:DB8:ACAD:1:1::/80 [110/5]

via FE80::B6A8:B9FF:FE01:AE51, GigabitEthernet0/0/0

C 2001:DB8:ACAD:2::/80 [0/0]

via GigabitEthernet0/0/0, directly connected

L 2001:DB8:ACAD:2::5/128 [0/0]

via GigabitEthernet0/0/0, receive

C 2001:DB8:ACAD:2:1::/80 [0/0]

via GigabitEthernet0/0/1, directly connected

L 2001:DB8:ACAD:2:1::5/128 [0/0]

via GigabitEthernet0/0/1, receive

L FF00::/8 [0/0]

via Null0, receive

**Problems:**

1. Poor topology planning for number of routers in each area

-At first we tried to use a design that incorporated only 2 routers in the backbone, and the other two areas having 1 and 2 routers each, respectively. This turned out to be much more complicated than necessary, and only made for unnecessary configuration. Eventually, we decided the easiest (and most logical) approach to separating the areas would be having the backbone area the largest, and the other two end-device areas one router each. This simplified our configuration a lot, and also demonstrated a more consistent topology which could be easily expanded.

1. Incorrect subnetting

-For a day or two, we encountered a constant issue of overlapping IP’s when setting interfaces, and eventually realized that the subnets within each area were overlapping, causing our interface IP’s to have issues. Initially, we used 192.168.x.x IP’s, but we decided to scrap this design and move to the larger private class of 10.x.x.x. Using this IP range, we were able to separate each area into its own subnet, subsequently removing any overlapping IP issues.

**Conclusion:**

This lab was a thorough review of old concepts and basic router configurations, as well as independent planning and troubleshooting. The biggest thing this lab taught us was the importance of planning your topology, IP’s, and subnets BEFORE starting your project. Creating a strong foundation for your project minimizes the chance of error when configuring in the future.

Multiarea OSPF Signoff Sheet

Ryan Chen, P3-4 Cisco CCNP, Mr. Mason

A white paper with a logo on it

Description automatically generated

