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Period 0-2

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9/13/23

Purpose:

The objective of this project was to implement Multi-area OSPF routing in a network consisting of 3 areas and 5 routers while configuring both IPv4 and IPv6 protocols.

Background Information on Lab Concepts:

OSPF, also known as OSPFv2, is an IPv4 routing protocol that utilizes a cost metric (a combination of bandwidth and router hop count) to determine the shortest path. It facilitates the creation of a routing map among routers, supported on CISCO and many other routers. OSPF supports multiple areas, simplifying routing tables by establishing a transfer gateway between areas, reducing the complexity of routing.

OSPFv3 closely resembles OSPFv2 but includes support for IPv6. It operates similarly to OSPFv2, being compatible with CISCO routers and supporting multiple areas. While it matches the functionality of OSPFv2, OSPFv3 adapts to the more expansive and intricate IPv6 addressing system.

The network design prioritized minimal device usage, with the trade-off being potential network degradation in case of router failure. However, this simplicity allowed for swift network expansion.

OSPF ensures a consistent routing table, automatically updating as devices change. It also handles failures and network expansion without manual intervention. Both OSPF and OSPFv3 were employed to maintain a uniform routing experience for both IPv4 and IPv6. OSPF was configured on all routers to enable effective communication. Unlike its competitor EIGRP, OSPF enjoys broader support on various routers, making network expansion and adjustments straightforward. It excels in serving large networks, quickly recalculating routing paths following network changes.

Multi-Area OSPF was selected for its advantages in simplifying routing tables. In this setup, the next-hop router in different areas appears only once in the routing table. Multi-Area OSPF expedites path recalculation and convergence after network changes, as routers only need to reroute and recalculate costs for routers within their network and the border routers connecting to other areas. This reduction in calculations reduces downtime and router load. The streamlined routing table also isolates network issues and expedites troubleshooting by minimizing the number of paths. Placing Area 0 as the central backbone, with Areas 1 and 2 branching out, further simplifies communication, records, and maintenance. This design isolates network changes, impacting only a small area and facilitating faster convergence.

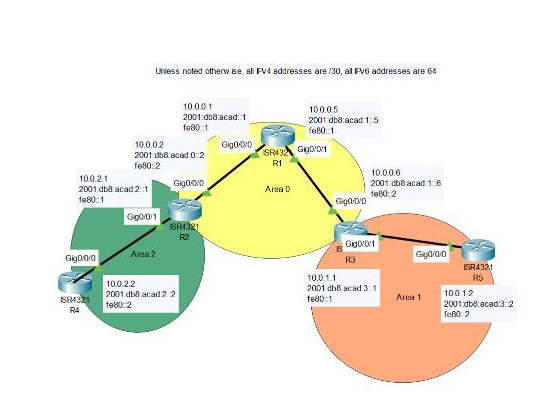
Lab Summary:

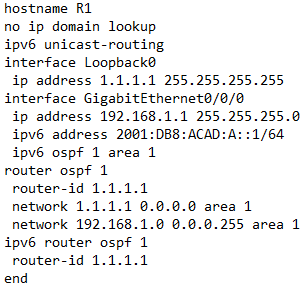
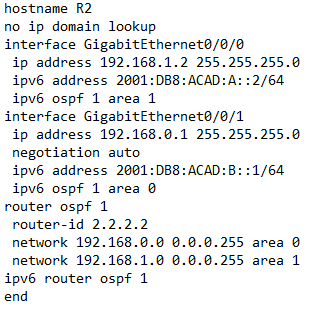
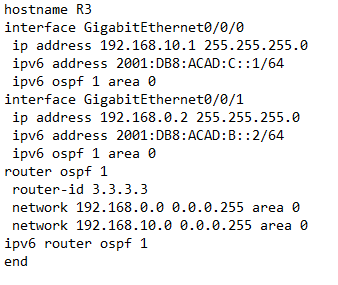
The lab involved initializing each router with a unique hostname, setting up interfaces with IPv4 and IPv6 addresses, and configuring OSPF and OSPFv3 with multiple areas to simplify routing.

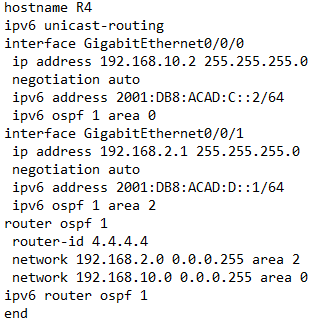
Lab Commands:

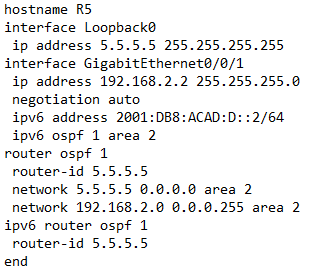
* show ip route: Displays all IPv4 routes, including OSPF and OSPF inter-area routes, useful for verifying OSPF functionality.
* show ipv6 route: Shows all IPv6 routes, including OSPFv3 and OSPFv3 inter-area routes, useful for confirming OSPFv3 functionality.
* ipv6 router ospf [process ID]: Initializes a new OSPFv3 process.
* clear ip ospf process: Restarts all IPv4 OSPF processes on the device.
* clear ipv6 ospf process: Restarts all IPv6 OSPFv3 processes on the device.
* show ip ospf: Displays IPv4 OSPF state, useful for troubleshooting.
* show ipv6 ospf: Displays IPv6 OSPFv3 state, useful for troubleshooting.
* show ip ospf interface: Shows IPv4 OSPF interfaces and their states, helpful for troubleshooting.
* show ipv6 ospf interface: Displays IPv6 OSPFv3 interfaces and their states, useful for troubleshooting.
* show ip ospf neighbor: Lists IPv4 OSPF neighbors and their states, confirming adjacencies.
* show ipv6 ospf neighbor: Lists IPv6 OSPFv3 neighbors and their states, confirming adjacencies.

Network Diagram:

Configurations:

R1 Configurations:  
  
R2 Configurations:R3 Configurations:

R4 Configurations:

R5 Configurations:R1 Pings:

R1#ping 192.168.1.2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.1.2, timeout is 2 seconds:

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

R1#ping 2001:db8:acad:a::2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:A::2, timeout is 2 seconds:

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

R1#ping 192.168.0.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.0.1, timeout is 2 seconds:

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

R1#ping 2001:db8:acad:b::1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:B::1, timeout is 2 seconds:

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

R1#ping 192.168.10.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.10.1, timeout is 2 seconds:

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

R1#ping 2001:db8:acad:c::1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:C::1, timeout is 2 seconds:

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

R1#ping 192.168.0.2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.0.2, timeout is 2 seconds:

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

R1#ping 2001:db8:acad:b::2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:B::2, timeout is 2 seconds:

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

R1#ping 192.168.10.2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.10.2, timeout is 2 seconds:

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

R1#ping 2001:db8:acad:c::2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:C::2, timeout is 2 seconds:

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

R1#ping 192.168.2.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.2.1, timeout is 2 seconds:

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

R1#ping 2001:db8:acad:d::1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:D::1, timeout is 2 seconds:

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

R1#ping 192.168.2.2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.2.2, timeout is 2 seconds:

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

R1#ping 2001:db8:acad:d::2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:D::2, timeout is 2 seconds:

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

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

1.0.0.0/32 is subnetted, 1 subnets

C 1.1.1.1 is directly connected, Loopback0

5.0.0.0/32 is subnetted, 1 subnets

O IA 5.5.5.5 [110/5] via 192.168.1.2, 00:06:52, GigabitEthernet0/0/0

O IA 192.168.0.0/24 [110/2] via 192.168.1.2, 00:06:52, GigabitEthernet0/0/0

192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.1.0/24 is directly connected, GigabitEthernet0/0/0

L 192.168.1.1/32 is directly connected, GigabitEthernet0/0/0

O IA 192.168.2.0/24 [110/4] via 192.168.1.2, 00:06:52, GigabitEthernet0/0/0

O IA 192.168.10.0/24 [110/3] via 192.168.1.2, 00:06:52, GigabitEthernet0/0/0

R1#show ipv6 route

IPv6 Routing Table - default - 6 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, la - LISP alt

lr - LISP site-registrations, ld - LISP dyn-eid, lA - LISP away

le - LISP extranet-policy, a - Application

C 2001:DB8:ACAD:A::/64 [0/0]

via GigabitEthernet0/0/0, directly connected

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

via GigabitEthernet0/0/0, receive

OI 2001:DB8:ACAD:B::/64 [110/2]

via FE80::267E:12FF:FE4D:F770, GigabitEthernet0/0/0

OI 2001:DB8:ACAD:C::/64 [110/3]

via FE80::267E:12FF:FE4D:F770, GigabitEthernet0/0/0

OI 2001:DB8:ACAD:D::/64 [110/4]

via FE80::267E:12FF:FE4D:F770, GigabitEthernet0/0/0

L FF00::/8 [0/0]

via Null0, receive

R1#traceroute

Type escape sequence to abort.

Tracing the route to 192.168.2.2

VRF info: (vrf in name/id, vrf out name/id)

1 192.168.1.2 1 msec 1 msec 0 msec

2 192.168.0.2 1 msec 1 msec 1 msec

3 192.168.10.2 1 msec 1 msec 1 msec

4 192.168.2.2 1 msec \* 1 msec

R5 Pings:

R5#ping 192.168.1.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:

!!!!!

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

R5#ping 2001:db8:acad:a::1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:A::1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/11 ms

R5#ping 192.168.1.2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.1.2, timeout is 2 seconds:

!!!!!

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

R5#ping 2001:db8:acad:a::2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:A::2, timeout is 2 seconds:

!!!!!

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

R5#ping 192.168.0.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.0.1, timeout is 2 seconds:

!!!!!

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

R5#ping 2001:db8:acad:b::1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:B::1, timeout is 2 seconds:

!!!!!

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

R5#ping 192.168.10.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.10.1, timeout is 2 seconds:

!!!!!

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

R5#ping 2001:db8:acad:c::1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:C::1, timeout is 2 seconds:

!!!!!

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

R5#ping 192.168.0.2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.0.2, timeout is 2 seconds:

!!!!!

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

R5#ping 2001:db8:acad:b::2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:B::2, timeout is 2 seconds:

!!!!!

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

R5#ping 192.168.10.2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.10.2, timeout is 2 seconds:

!!!!!

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

R5#ping 2001:db8:acad:c::2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:C::2, timeout is 2 seconds:

!!!!!

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

R5#ping 2001:db8:acad:d::1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:D::1, timeout is 2 seconds:

!!!!!

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

R5#ping ping 192.168.2.1

^

% Invalid input detected at '^' marker.

R5#ping 192.168.2.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.2.1, timeout is 2 seconds:

!!!!!

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

R2 Show IP Route:

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

1.0.0.0/32 is subnetted, 1 subnets

O 1.1.1.1 [110/2] via 192.168.1.1, 00:10:20, GigabitEthernet0/0/0

5.0.0.0/32 is subnetted, 1 subnets

O IA 5.5.5.5 [110/4] via 192.168.0.2, 00:09:35, GigabitEthernet0/0/1

192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.0.0/24 is directly connected, GigabitEthernet0/0/1

L 192.168.0.1/32 is directly connected, GigabitEthernet0/0/1

192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.1.0/24 is directly connected, GigabitEthernet0/0/0

L 192.168.1.2/32 is directly connected, GigabitEthernet0/0/0

O IA 192.168.2.0/24 [110/3] via 192.168.0.2, 00:09:35, GigabitEthernet0/0/1

O 192.168.10.0/24 [110/2] via 192.168.0.2, 00:09:35, GigabitEthernet0/0/1

R2#show ipv6 route

IPv6 Routing Table - default - 7 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, la - LISP alt

lr - LISP site-registrations, ld - LISP dyn-eid, lA - LISP away

le - LISP extranet-policy, a - Application

C 2001:DB8:ACAD:A::/64 [0/0]

via GigabitEthernet0/0/0, directly connected

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

via GigabitEthernet0/0/0, receive

C 2001:DB8:ACAD:B::/64 [0/0]

via GigabitEthernet0/0/1, directly connected

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

via GigabitEthernet0/0/1, receive

O 2001:DB8:ACAD:C::/64 [110/2]

via FE80::227:90FF:FED5:FAD1, GigabitEthernet0/0/1

OI 2001:DB8:ACAD:D::/64 [110/3]

via FE80::227:90FF:FED5:FAD1, GigabitEthernet0/0/1

L FF00::/8 [0/0]

via Null0, receive

R3 Show IP Route:

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

1.0.0.0/32 is subnetted, 1 subnets

O IA 1.1.1.1 [110/3] via 192.168.0.1, 00:15:07, GigabitEthernet0/0/1

5.0.0.0/32 is subnetted, 1 subnets

O IA 5.5.5.5 [110/3] via 192.168.10.2, 00:15:15, GigabitEthernet0/0/0

192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.0.0/24 is directly connected, GigabitEthernet0/0/1

L 192.168.0.2/32 is directly connected, GigabitEthernet0/0/1

O IA 192.168.1.0/24 [110/2] via 192.168.0.1, 00:15:07, GigabitEthernet0/0/1

O IA 192.168.2.0/24 [110/2] via 192.168.10.2, 00:15:15, GigabitEthernet0/0/0

192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.10.0/24 is directly connected, GigabitEthernet0/0/0

L 192.168.10.1/32 is directly connected, GigabitEthernet0/0/0

R3#show ipv6 route

IPv6 Routing Table - default - 7 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, la - LISP alt

lr - LISP site-registrations, ld - LISP dyn-eid, lA - LISP away

le - LISP extranet-policy, a - Application

OI 2001:DB8:ACAD:A::/64 [110/2]

via FE80::267E:12FF:FE4D:F771, GigabitEthernet0/0/1

C 2001:DB8:ACAD:B::/64 [0/0]

via GigabitEthernet0/0/1, directly connected

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

via GigabitEthernet0/0/1, receive

C 2001:DB8:ACAD:C::/64 [0/0]

via GigabitEthernet0/0/0, directly connected

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

via GigabitEthernet0/0/0, receive

OI 2001:DB8:ACAD:D::/64 [110/2]

via FE80::B6A8:B9FF:FE01:B990, GigabitEthernet0/0/0

L FF00::/8 [0/0]

via Null0, receive

R4 Show IP Route:

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

1.0.0.0/32 is subnetted, 1 subnets

O IA 1.1.1.1 [110/4] via 192.168.10.1, 00:18:51, GigabitEthernet0/0/0

5.0.0.0/32 is subnetted, 1 subnets

O 5.5.5.5 [110/2] via 192.168.2.2, 00:19:43, GigabitEthernet0/0/1

O 192.168.0.0/24 [110/2] via 192.168.10.1, 00:19:03, GigabitEthernet0/0/0

O IA 192.168.1.0/24 [110/3] via 192.168.10.1, 00:18:51, GigabitEthernet0/0/0

192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.2.0/24 is directly connected, GigabitEthernet0/0/1

L 192.168.2.1/32 is directly connected, GigabitEthernet0/0/1

192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.10.0/24 is directly connected, GigabitEthernet0/0/0

L 192.168.10.2/32 is directly connected, GigabitEthernet0/0/0

R4#show ipv6 route

IPv6 Routing Table - default - 7 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:A::/64 [110/3]

via FE80::227:90FF:FED5:FAD0, GigabitEthernet0/0/0

O 2001:DB8:ACAD:B::/64 [110/2]

via FE80::227:90FF:FED5:FAD0, GigabitEthernet0/0/0

C 2001:DB8:ACAD:C::/64 [0/0]

via GigabitEthernet0/0/0, directly connected

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

via GigabitEthernet0/0/0, receive

C 2001:DB8:ACAD:D::/64 [0/0]

via GigabitEthernet0/0/1, directly connected

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

via GigabitEthernet0/0/1, receive

L FF00::/8 [0/0]

via Null0, receive

R5 Show IP Route:

R5#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

1.0.0.0/32 is subnetted, 1 subnets

O IA 1.1.1.1 [110/5] via 192.168.2.1, 00:22:07, GigabitEthernet0/0/1

5.0.0.0/32 is subnetted, 1 subnets

C 5.5.5.5 is directly connected, Loopback0

O IA 192.168.0.0/24 [110/3] via 192.168.2.1, 00:22:19, GigabitEthernet0/0/1

O IA 192.168.1.0/24 [110/4] via 192.168.2.1, 00:22:07, GigabitEthernet0/0/1

192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.2.0/24 is directly connected, GigabitEthernet0/0/1

L 192.168.2.2/32 is directly connected, GigabitEthernet0/0/1

O IA 192.168.10.0/24 [110/2] via 192.168.2.1, 00:22:59, GigabitEthernet0/0/1

R5#show ipv6 route

IPv6 Routing Table - default - 6 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:A::/64 [110/4]

via FE80::B6A8:B9FF:FE01:B991, GigabitEthernet0/0/1

OI 2001:DB8:ACAD:B::/64 [110/3]

via FE80::B6A8:B9FF:FE01:B991, GigabitEthernet0/0/1

OI 2001:DB8:ACAD:C::/64 [110/2]

via FE80::B6A8:B9FF:FE01:B991, GigabitEthernet0/0/1

C 2001:DB8:ACAD:D::/64 [0/0]

via GigabitEthernet0/0/1, directly connected

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

via GigabitEthernet0/0/1, receive

L FF00::/8 [0/0]

via Null0, receive

R1 Show Run:

R1#show run

Building configuration...

Current configuration : 1710 bytes

!

! Last configuration change at 18:34:44 UTC Fri Sep 8 2023

!

version 16.9

service timestamps debug datetime msec

service timestamps log datetime msec

platform qfp utilization monitor load 80

no platform punt-keepalive disable-kernel-core

!

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

!

!

!

!

!

!

!

no ip domain lookup

!

!

!

login on-success log

!

!

!

!

!

!

!

subscriber templating

!

!

!

!

vtp domain cisco

vtp mode transparent

ipv6 unicast-routing

multilink bundle-name authenticated

!

!

!

!

!

!

license udi pid ISR4321/K9 sn FDO21482HZX

license boot level appxk9

no license smart enable

diagnostic bootup level minimal

!

spanning-tree extend system-id

!

!

!

!

redundancy

mode none

!

!

!

!

!

!

!

!

!

!

!

interface Loopback0

ip address 1.1.1.1 255.255.255.255

!

interface GigabitEthernet0/0/0

ip address 192.168.1.1 255.255.255.0

negotiation auto

ipv6 address 2001:DB8:ACAD:A::1/64

ipv6 ospf 1 area 1

!

interface GigabitEthernet0/0/1

no ip address

negotiation auto

!

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

!

router ospf 1

router-id 1.1.1.1

network 1.1.1.1 0.0.0.0 area 1

network 192.168.1.0 0.0.0.255 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 1.1.1.1

!

!

!

!

!

control-plane

!

!

line con 0

transport input none

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

!

!

!

!

!

!

end

R2 Show Run:

R2#show run

Building configuration...

Current configuration : 3941 bytes

!

! Last configuration change at 18:59:34 UTC Fri Sep 8 2023

!

version 16.9

service timestamps debug datetime msec

service timestamps log datetime msec

platform qfp utilization monitor load 80

platform punt-keepalive disable-kernel-core

!

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

!

!

!

!

!

!

!

no ip domain lookup

!

!

!

login on-success log

!

!

!

!

!

!

!

subscriber templating

!

!

!

!

vtp domain cisco

vtp mode transparent

ipv6 unicast-routing

multilink bundle-name authenticated

!

!

!

!

crypto pki trustpoint TP-self-signed-2105456491

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-2105456491

revocation-check none

rsakeypair TP-self-signed-2105456491

!

!

crypto pki certificate chain TP-self-signed-2105456491

certificate self-signed 01

30820330 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

31312F30 2D060355 04031326 494F532D 53656C66 2D536967 6E65642D 43657274

69666963 6174652D 32313035 34353634 3931301E 170D3233 30363036 31383232

32395A17 0D333030 31303130 30303030 305A3031 312F302D 06035504 03132649

4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D32 31303534

35363439 31308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201

0A028201 0100876A 184F35C6 0E929121 EE3811A8 28E1A40F FD6DDB23 539E0D71

8E7E6090 3554D474 46DF5C06 8E68CDAC B1FF1F90 ACF8D30E 20CD2F18 A3D2A9D8

AC5627B9 D2163758 C17AEB01 07A8C0CF 3C9C8CF9 ED7074F9 02991FB8 1E7409DD

74AEB5A2 40DC020A 5DE53722 7FFD0381 BD09A39C 11C123E4 BE55D472 1607DBD8

987513C4 03E13D0D B539E73B 7DF22B0C 7C34FEC8 89133906 8F3BB98B 6D8AD20E

0A490E56 48B00F73 80D3F9E9 A8B16B4D 64A6C0B4 C5C65E75 8FEAF49C 2B49687F

B150A1EC 6873780E 1AADEF00 CE9F01A6 17C6382D 4D71B2E6 1E4C78DA 5A46E715

3EE04254 0DC6B096 180F1EF5 FC4BE073 C1B9221D 3A4C9F87 C15B7860 0EF18D3E

54B842D5 0ABD0203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF

301F0603 551D2304 18301680 1440DDFF E73B2EAD ED3921BA A11AEE2E 6D45A59B

59301D06 03551D0E 04160414 40DDFFE7 3B2EADED 3921BAA1 1AEE2E6D 45A59B59

300D0609 2A864886 F70D0101 05050003 82010100 5B8F2495 D377BC11 0B345122

96F7CB9A 8003892D F80D3933 C744DFE8 D0C85690 A020EF0C D378F115 D2DFFBD5

7A915909 82581749 596387CB B7E832DF CBD3E80B 9C03DB26 DA183114 57E74C7D

27386F78 F616A79F 984C1F31 CEEBFC5A A7899161 15D25D18 0E3E64C0 1451C28A

E591F4F3 121F95BC E482E801 2886D58F 4B704519 75E997BC 751FCFA9 8C0FD4B5

707B872B BAAE459F A94760DE 290E7468 C566D6E4 C2E9AB64 DCD64D7E E4C533E1

02C26C97 342238B1 985B5E18 A43B10B3 69E0A5ED 30796592 C66037AE DAFA667A

782B7257 3E033740 86EB13DD 6D60C50E C84D2F03 0CF888C6 D1356561 7DB99621

79DC8347 077D1D63 E20BC2A1 AF6EC6E2 81F3D397

quit

!

license udi pid ISR4321/K9 sn FDO21482DWJ

license boot level appxk9

no license smart enable

diagnostic bootup level minimal

!

spanning-tree extend system-id

!

!

!

!

redundancy

mode none

!

!

!

!

!

!

!

!

!

!

!

interface GigabitEthernet0/0/0

ip address 192.168.1.2 255.255.255.0

negotiation auto

ipv6 address 2001:DB8:ACAD:A::2/64

ipv6 ospf 1 area 1

!

interface GigabitEthernet0/0/1

ip address 192.168.0.1 255.255.255.0

negotiation auto

ipv6 address 2001:DB8:ACAD:B::1/64

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

!

router ospf 1

router-id 2.2.2.2

network 192.168.0.0 0.0.0.255 area 0

network 192.168.1.0 0.0.0.255 area 1

!

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

ip tftp source-interface GigabitEthernet0

!

!

ipv6 router ospf 1

!

!

!

!

!

control-plane

!

!

line con 0

transport input none

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

!

!

!

!

!

!

end

R3 Show Run:

R3#show run

Building configuration...

Current configuration : 3923 bytes

!

! Last configuration change at 18:30:15 UTC Fri Sep 8 2023

!

version 16.9

service timestamps debug datetime msec

service timestamps log datetime msec

platform qfp utilization monitor load 80

platform punt-keepalive disable-kernel-core

!

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

!

!

!

!

!

!

!

!

!

!

login on-success log

!

!

!

!

!

!

!

subscriber templating

!

!

!

!

vtp domain cisco

vtp mode transparent

ipv6 unicast-routing

multilink bundle-name authenticated

!

!

!

!

crypto pki trustpoint TP-self-signed-2949602955

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-2949602955

revocation-check none

rsakeypair TP-self-signed-2949602955

!

!

crypto pki certificate chain TP-self-signed-2949602955

certificate self-signed 01

30820330 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

31312F30 2D060355 04031326 494F532D 53656C66 2D536967 6E65642D 43657274

69666963 6174652D 32393439 36303239 3535301E 170D3233 30363036 31383138

33395A17 0D333030 31303130 30303030 305A3031 312F302D 06035504 03132649

4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D32 39343936

30323935 35308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201

0A028201 0100C6B5 B6C310C4 166068B7 15C74E3E 53F7C254 939DBD5B E2434EC9

4FCA1119 86013DAA 104B9104 7AE81A7D 62DDA0AE 836E3586 DFDD1E84 5C287973

3328DD4D F48BF6D2 52662405 1841E05F B2FF3EC1 CC6A3955 064D5490 C240DEEF

3948256A 5BC47454 92A048CD DA5FCAD8 1D745E89 870637FB C36CFC5E 45760A8D

0E1BD89A 7EE17E9E 5EAE4702 46DDBF57 6C4D7E5F 2CA008E7 E7E6F775 74DAF7EF

D04D09A2 5B427C52 4AB66E61 38508337 E3BCF313 0A40F195 F368478D A335A20B

BB701646 D317E6D4 AE6A859F 5AE791B7 8EFC6926 0C73BA7D 7CB96288 7ECF7E1B

4B41CCBE 0F56B91F ACBCED21 A0B621ED 5D64DC14 60E2A166 C0245203 A43E7CF8

CDB7AE05 368D0203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF

301F0603 551D2304 18301680 149E38E7 4A07C2C4 CBC2185B 51B7256D F324FDDC

99301D06 03551D0E 04160414 9E38E74A 07C2C4CB C2185B51 B7256DF3 24FDDC99

300D0609 2A864886 F70D0101 05050003 82010100 221DD907 7E6116E7 361E4334

65D7ED95 6D1BB560 18432F68 9A4E4892 8BF9CD6F 2F1913AE 9B714EDA 2F37A0F0

531230DE 107289B1 628BB27F 3DC2CB84 D5E98C24 AB0D0D96 C8AEE293 3DEA769F

6DCA8267 1E50F272 EDDADF26 AC33371C B79A996A 83B6F7F7 DBF7FAEA D1B71FA3

07A5319B C545D7E5 7BC1C54F 1AC38B70 1AE6A10A 94A6F479 913EDB2C 971832C2

624DE6A7 3539E597 89CFAAAB 8B91A963 8B7A37FD 64EABCE8 C9A9AE43 92C3C0FF

86C8894E 21B2743D 07522338 EE69AE4A FD968EE7 A8FB88BF 42858824 86583368

C267EDAE 753390AB 5EFD923F 925102BF 9CCA72C1 2BA44FE4 8918CB12 B9D8A1FC

F2B9E102 5E585CE2 F980BAC1 D9C5AD01 338D1CB9

quit

!

license udi pid ISR4321/K9 sn FDO214420HW

license boot level appxk9

no license smart enable

diagnostic bootup level minimal

!

spanning-tree extend system-id

!

!

!

!

redundancy

mode none

!

!

!

!

!

!

!

!

!

!

!

interface GigabitEthernet0/0/0

ip address 192.168.10.1 255.255.255.0

negotiation auto

ipv6 address 2001:DB8:ACAD:C::1/64

ipv6 ospf 1 area 0

!

interface GigabitEthernet0/0/1

ip address 192.168.0.2 255.255.255.0

negotiation auto

ipv6 address 2001:DB8:ACAD:B::2/64

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

!

router ospf 1

router-id 3.3.3.3

network 192.168.0.0 0.0.0.255 area 0

network 192.168.10.0 0.0.0.255 area 0

!

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

ip tftp source-interface GigabitEthernet0

!

!

ipv6 router ospf 1

!

!

!

!

!

control-plane

!

!

line con 0

transport input none

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

!

!

!

!

!

!

end

R4 Show Run:

R4#show run

Building configuration...

Current configuration : 3805 bytes

!

! Last configuration change at 18:29:51 UTC Fri Sep 8 2023

!

version 16.9

service timestamps debug datetime msec

service timestamps log datetime msec

platform qfp utilization monitor load 80

platform punt-keepalive disable-kernel-core

!

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

!

!

!

!

login on-success log

!

!

!

!

!

!

!

subscriber templating

vtp domain cisco

vtp mode transparent

ipv6 unicast-routing

multilink bundle-name authenticated

!

!

!

crypto pki trustpoint TP-self-signed-262078645

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-262078645

revocation-check none

rsakeypair TP-self-signed-262078645

!

!

crypto pki certificate chain TP-self-signed-262078645

certificate self-signed 01

3082032E 30820216 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

30312E30 2C060355 04031325 494F532D 53656C66 2D536967 6E65642D 43657274

69666963 6174652D 32363230 37383634 35301E17 0D323330 39303831 37333834

335A170D 33303031 30313030 30303030 5A303031 2E302C06 03550403 1325494F

532D5365 6C662D53 69676E65 642D4365 72746966 69636174 652D3236 32303738

36343530 82012230 0D06092A 864886F7 0D010101 05000382 010F0030 82010A02

82010100 A831CFCC A92F76C9 42BFFF16 F509F38A 7A2EB40F 4D324C24 3BA8A02E

D5278C0A A67F3E0C FF45C2FD 90DB8728 6FC11327 9D3E6D19 10333754 B2B79379

305AA1A5 09A1CC67 083A25A8 A2DAFC72 3C91DDEF F140F030 CE238287 7FFB6C80

E42DB884 1274085B 047D7965 D885B9D5 91DADB21 2DEB8946 1DCD0F42 484F3102

3905E6B6 3A8E9917 34C9F5E8 63BB62DA FABF9A06 37CB7347 CFCE2CA8 09767E50

7E3A5DC3 774B6896 BD54D421 631E1C32 E929BE23 CC8823B3 6396C051 C4EDAE12

7DC64285 74FDE185 9D2204ED DC4D00FE C9688007 694AC131 EF32CEF0 569A5D16

DA0E7A08 4ADE97AD CF96DEBB DD8E4456 45479D60 6FA1EA41 C8EFBF17 F3F1C637

3DA19405 02030100 01A35330 51300F06 03551D13 0101FF04 05300301 01FF301F

0603551D 23041830 16801496 5C0B5F30 400A41C8 1D0513BA 714D678F 34504130

1D060355 1D0E0416 0414965C 0B5F3040 0A41C81D 0513BA71 4D678F34 5041300D

06092A86 4886F70D 01010505 00038201 010078B3 1721FA7D 60FA643A 0CF07BEB

8B009A57 F3E018CF 637B6062 4E648DE5 77EC7B0C 27365540 3828DC9A 13EE6F47

1E40881C 7B834FB5 FAF93AF0 6AA5FCAD B36F8360 0EE9139A 38DC69AE 87C3D542

6A018545 BBFC500A EE04821D EE131C3A 94518A78 4152B4D1 875F1EF7 DC07B04C

FA7B1D45 788DA57A D9694D8F 20715F60 CC964921 95A93A87 BC615F9E 6D469F87

6787DDD7 4DED2C68 B2A4E1A0 036BFA90 743806B1 9EEB47C4 401A1B68 A8E234A0

31B4A80D C649978C A62485F9 CA9E1068 3C88B8C7 DF672F35 048171FE 9AF65D61

B4819E70 0A68895B 74CE1CB4 3D558FAE 3FEC12F4 69198485 FAAF9D8D 66E6AC53

C5CFA3CA 2B9E3813 7370C88F 08DB5E07 5EAE

quit

!

license udi pid ISR4321/K9 sn FDO214421D1

no license smart enable

diagnostic bootup level minimal

!

spanning-tree extend system-id

!

!

!

!

redundancy

mode none

!

!

!

!

!

!

!

!

interface GigabitEthernet0/0/0

ip address 192.168.10.2 255.255.255.0

negotiation auto

ipv6 address 2001:DB8:ACAD:C::2/64

ipv6 ospf 1 area 0

!

interface GigabitEthernet0/0/1

ip address 192.168.2.1 255.255.255.0

negotiation auto

ipv6 address 2001:DB8:ACAD:D::1/64

ipv6 ospf 1 area 2

!

interface Serial0/1/0

!

interface Serial0/1/1

!

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

!

router ospf 1

router-id 4.4.4.4

network 192.168.2.0 0.0.0.255 area 2

network 192.168.10.0 0.0.0.255 area 0

!

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

ip tftp source-interface GigabitEthernet0

!

!

ipv6 router ospf 1

!

!

!

!

!

control-plane

!

!

line con 0

transport input none

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

!

!

!

!

!

!

end

R5 Show Run:

R5#show run

Building configuration...

Current configuration : 3912 bytes

!

! Last configuration change at 18:24:04 UTC Fri Sep 8 2023

!

version 16.9

service timestamps debug datetime msec

service timestamps log datetime msec

platform qfp utilization monitor load 80

no platform punt-keepalive disable-kernel-core

!

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

!

!

!

!

login on-success log

!

!

!

!

!

!

!

subscriber templating

vtp domain cisco

vtp mode transparent

ipv6 unicast-routing

multilink bundle-name authenticated

!

!

!

crypto pki trustpoint TP-self-signed-859896477

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-859896477

revocation-check none

rsakeypair TP-self-signed-859896477

!

!

crypto pki certificate chain TP-self-signed-859896477

certificate self-signed 01

3082032E 30820216 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

30312E30 2C060355 04031325 494F532D 53656C66 2D536967 6E65642D 43657274

69666963 6174652D 38353938 39363437 37301E17 0D323231 30313731 38323635

385A170D 33303031 30313030 30303030 5A303031 2E302C06 03550403 1325494F

532D5365 6C662D53 69676E65 642D4365 72746966 69636174 652D3835 39383936

34373730 82012230 0D06092A 864886F7 0D010101 05000382 010F0030 82010A02

82010100 CA31EE51 C97FF58C 76C72B4E 2B6CD51B 98CBA177 7EEF8D11 DAAB7CA8

47B3AA97 3B815AD1 09F637AE B1D98BB8 A2CAA1A9 0AFAF87A 3AFBFF9E 34875D72

0BD5EE8D E40F4D4A 3B4A38A7 09F1940D 013C18AE F29F2BEA 07085EB5 982E9BC8

F99C8CA7 1C7DD58E 67B89FCB 951C3C4C 6D11B8C7 8D24BF5C 973A32BF E16A3094

99E8DB22 7FEA5A30 6E9457F6 90485336 E953F3D2 942824E3 87D8DE52 E00336AC

09CA85F0 0BD105FA B4078F96 9A2EA846 C147AD42 B08CD3D2 16A06EB1 CC54E167

8F4677E9 2663D37D 7B1C3891 9ABF4B5B 83ECE428 AD426108 357B992E 792C850D

84C67187 BF0E10B5 B1D23A97 F2F1372F 7D0FA8C8 80E947DE 5E0FA234 7FA6A487

24A0DB83 02030100 01A35330 51300F06 03551D13 0101FF04 05300301 01FF301F

0603551D 23041830 168014E7 C71AF39E FCC743E7 C7395603 DBBCA771 4C734E30

1D060355 1D0E0416 0414E7C7 1AF39EFC C743E7C7 395603DB BCA7714C 734E300D

06092A86 4886F70D 01010505 00038201 010029B2 769B6033 C71585B8 DD1EE596

BDB3F81C 5C58921E AF7FBE2F A95F447D 7B870BCD B9AE5E5D 46FCE0E1 667295B7

4668DACB F848F91A 207FC6CD 203E64BF 6747B9E7 6FF304F1 491442EA 56EEBEE6

DE79EC87 F5BE7B9C B2482264 A58FAC1B 827F66C7 F16C0292 815AD1ED 86F2E167

9568FC20 9E2ADCB6 311B34E4 E93EC128 2DD25078 4F27E1F1 4DD309BA B2A0248A

C41F66C8 4A81C2B8 9D0E8A62 4E0443F6 F28B3203 28A14D43 0E06A98B 06DAB16D

66E0616A DB63132A 8FB53D9B 88A28660 F84CD05D EC8653F6 C3FC6446 94977DAC

0ED87E1C 9C0B372A 6E25729B FAD2B249 6FDF7BC6 3218B110 D167D3D5 AEACB17D

6E8CB48E ED168D18 8D9104DE BA9F3515 5662

quit

!

license udi pid ISR4321/K9 sn FLM240608PJ

no license smart enable

diagnostic bootup level minimal

!

spanning-tree extend system-id

!

!

!

!

redundancy

mode none

!

!

!

!

!

!

!

!

interface Loopback0

ip address 5.5.5.5 255.255.255.255

!

interface GigabitEthernet0/0/0

no ip address

shutdown

negotiation auto

!

interface GigabitEthernet0/0/1

ip address 192.168.2.2 255.255.255.0

negotiation auto

ipv6 address 2001:DB8:ACAD:D::2/64

ipv6 ospf 1 area 2

!

interface GigabitEthernet0/1/0

no ip address

shutdown

negotiation auto

!

interface GigabitEthernet0/1/1

no ip address

shutdown

negotiation auto

!

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

!

router ospf 1

router-id 5.5.5.5

network 5.5.5.5 0.0.0.0 area 2

network 192.168.2.0 0.0.0.255 area 2

!

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

ip tftp source-interface GigabitEthernet0

!

!

ipv6 router ospf 1

router-id 5.5.5.5

!

!

!

!

!

control-plane

!

!

line con 0

transport input none

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

!

!

!

!

!

!

end

Problems:

The lab encountered some issues with remembering the exact wording of commands, which were resolved using the question mark feature for command assistance.

One configuration error involved using network statements for IPv4 OSPF, while IPv6 OSPF required per-interface configuration. This necessitated adjustments in two separate places. However, the most time-consuming problem involved peculiar symptoms. While R1 could reach the IPv6 2001:db8:acad:3::/64 network, it couldn't access the 2001:db8:acad:2::/64 network, despite similar configurations. Initially, the focus was on hardware issues between R1, R2, and R4, but this assumption was incorrect. The solution emerged when it was discovered that for CISCO IOS devices, the interface mode between areas 1 and 2 needed to be set to point-to-point using the ipv6 ospf network point-to-point command on the interfaces not in area 0. This immediately resolved the issue.

Subsequently, when attempting to replicate the solution, there were recurrent issues where R1 and R2 couldn't ping their own IPv6 addresses on the connection between the routers. A router reload and a different configuration resolved this issue, although the exact cause remained unclear. Configurations were confirmed to be identical, with minor command ordering differences.

Interestingly, some other teams didn't need to use the ipv6 ospf network point-to-point command for OSPFv3 to function correctly. This discrepancy piqued curiosity, although the solution adopted was considered robust.

Conclusion:

The IPv4 portion of the lab was straightforward, serving as a refresher for OSPF and IP addressing concepts. In contrast, the IPv6 section presented challenges with unusual symptoms and a solution that required online research. Mysterious hardware-related issues also required multiple router reloads for resolution.

