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Single Area OSPFv2

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# Purpose

The purpose of this lab was to configure 5 cisco routers into a single area OSPF network. We use OSPF to dynamically manage routing tables on multiple routers

# Background Information

OSPF is a link-state routing protocol meaning that routers only exchange topology information with their neighbors. This topology information is then flooded throughout the network in link status advertisement messages. All the routers in the network then use these LSA’s to build a picture of the network and calculate the shortest possible path.

OSPF can also have different routing areas that can help reduce some load placed on the routers. When using multiple areas all routers must be physically or virtually connected to the backbone, area 0.

# Lab Summary

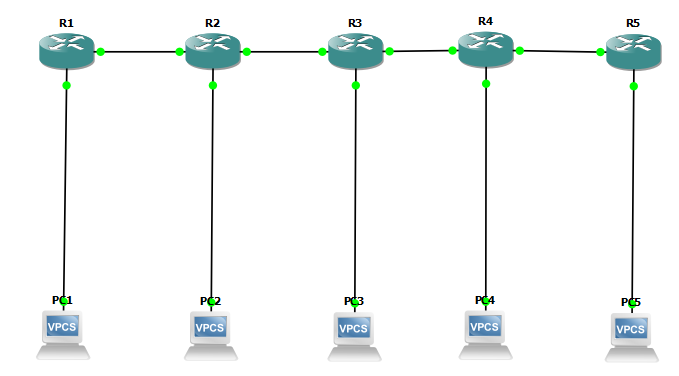
For this lab we had to design an IPv4 addressing scheme and set up 5 Cisco CSR1000V’s into a single area OSPF network.

# Lab Commands

This lab required the use of some new commands

* Router (config)# router osfp 1  
  This command starts the OSPF process of our router with a process id of 1
* Router (config-router)# router-id 1.1.1.1  
  This command sets a hopefully unique identification number on our router
* Router (config-router)# network 192.168.1.0 0.0.0.255  
  This command adds the network 192.168.1.0/24 to our OSPF process

# Network Diagram



# Configurations

## R1

R1#show run

Building configuration...

Current configuration : 3753 bytes

!

! Last configuration change at 15:10:47 UTC Fri Sep 10 2021

!

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

platform console serial

!

hostname R1

!

boot-start-marker

boot-end-marker

!

no ip domain lookup

!

ip dhcp pool 1

network 192.168.1.0 255.255.255.0

default-router 192.168.1.1

!

license udi pid CSR1000V sn 9UNIOQJAVRW

!

interface GigabitEthernet1

ip address 10.0.0.1 255.255.255.252

negotiation auto

no mop enabled

no mop sysid

!

interface GigabitEthernet2

ip address 192.168.1.1 255.255.255.0

negotiation auto

no mop enabled

no mop sysid

!

interface GigabitEthernet3

no ip address

shutdown

negotiation auto

no mop enabled

no mop sysid

!

interface GigabitEthernet4

no ip address

shutdown

negotiation auto

no mop enabled

no mop sysid

!

router ospf 1

router-id 0.0.0.1

network 10.0.0.0 0.0.0.3 area 0

network 10.0.0.4 0.0.0.3 area 0

network 192.168.1.0 0.0.0.255 area 0

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, 5 subnets, 2 masks

C 10.0.0.0/30 is directly connected, GigabitEthernet1

L 10.0.0.1/32 is directly connected, GigabitEthernet1

O 10.0.0.4/30 [110/2] via 10.0.0.2, 00:51:53, GigabitEthernet1

O 10.0.0.8/30 [110/3] via 10.0.0.2, 00:51:50, GigabitEthernet1

O 10.0.0.12/30 [110/4] via 10.0.0.2, 00:51:50, GigabitEthernet1

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

C 192.168.1.0/24 is directly connected, GigabitEthernet2

L 192.168.1.1/32 is directly connected, GigabitEthernet2

O 192.168.2.0/24 [110/2] via 10.0.0.2, 00:51:55, GigabitEthernet1

O 192.168.3.0/24 [110/3] via 10.0.0.2, 00:51:50, GigabitEthernet1

O 192.168.4.0/24 [110/4] via 10.0.0.2, 00:51:50, GigabitEthernet1

O 192.168.5.0/24 [110/5] via 10.0.0.2, 00:51:50, GigabitEthernet1

## R2

R2#show run

Building configuration...

Current configuration : 3727 bytes

!

! Last configuration change at 15:10:44 UTC Fri Sep 10 2021

!

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

platform console serial

!

hostname R2

!

boot-start-marker

boot-end-marker

!

no ip domain lookup

!

ip dhcp pool 1

network 192.168.2.0 255.255.255.0

default-router 192.168.2.1

!

license udi pid CSR1000V sn 9VIBRV4VJRB

!

interface GigabitEthernet1

ip address 10.0.0.2 255.255.255.252

negotiation auto

no mop enabled

no mop sysid

!

interface GigabitEthernet2

ip address 10.0.0.5 255.255.255.252

negotiation auto

no mop enabled

no mop sysid

!

interface GigabitEthernet3

ip address 192.168.2.1 255.255.255.0

negotiation auto

no mop enabled

no mop sysid

!

interface GigabitEthernet4

no ip address

shutdown

negotiation auto

no mop enabled

no mop sysid

!

router ospf 1

router-id 0.0.0.2

network 10.0.0.0 0.0.0.3 area 0

network 10.0.0.4 0.0.0.3 area 0

!

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, 6 subnets, 2 masks

C 10.0.0.0/30 is directly connected, GigabitEthernet1

L 10.0.0.2/32 is directly connected, GigabitEthernet1

C 10.0.0.4/30 is directly connected, GigabitEthernet2

L 10.0.0.5/32 is directly connected, GigabitEthernet2

O 10.0.0.8/30 [110/2] via 10.0.0.6, 00:53:32, GigabitEthernet2

O 10.0.0.12/30 [110/3] via 10.0.0.6, 00:53:32, GigabitEthernet2

O 192.168.1.0/24 [110/2] via 10.0.0.1, 00:53:33, GigabitEthernet1

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

C 192.168.2.0/24 is directly connected, GigabitEthernet3

L 192.168.2.1/32 is directly connected, GigabitEthernet3

O 192.168.3.0/24 [110/2] via 10.0.0.6, 00:53:32, GigabitEthernet2

O 192.168.4.0/24 [110/3] via 10.0.0.6, 00:53:32, GigabitEthernet2

O 192.168.5.0/24 [110/4] via 10.0.0.6, 00:53:30, GigabitEthernet2

## R3

R3#show run

Building configuration...

Current configuration : 3714 bytes

!

! Last configuration change at 15:10:48 UTC Fri Sep 10 2021

!

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

platform console serial

!

hostname R3

!

boot-start-marker

boot-end-marker

!

no ip domain lookup

!

ip dhcp pool 1

network 192.168.3.0 255.255.255.0

default-router 192.168.3.1

!

license udi pid CSR1000V sn 9XRACS6RXVQ

!

interface GigabitEthernet1

ip address 10.0.0.6 255.255.255.252

negotiation auto

no mop enabled

no mop sysid

!

interface GigabitEthernet2

ip address 10.0.0.9 255.255.255.252

negotiation auto

no mop enabled

no mop sysid

!

interface GigabitEthernet3

no ip address

shutdown

negotiation auto

no mop enabled

no mop sysid

!

interface GigabitEthernet4

no ip address

shutdown

negotiation auto

no mop enabled

no mop sysid

!

router ospf 1

router-id 0.0.0.3

network 10.0.0.4 0.0.0.3 area 0

network 10.0.0.8 0.0.0.3 area 0

!

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, 6 subnets, 2 masks

O 10.0.0.0/30 [110/2] via 10.0.0.5, 00:54:05, GigabitEthernet1

C 10.0.0.4/30 is directly connected, GigabitEthernet1

L 10.0.0.6/32 is directly connected, GigabitEthernet1

C 10.0.0.8/30 is directly connected, GigabitEthernet2

L 10.0.0.9/32 is directly connected, GigabitEthernet2

O 10.0.0.12/30 [110/2] via 10.0.0.10, 00:54:04, GigabitEthernet2

O 192.168.1.0/24 [110/3] via 10.0.0.5, 00:54:05, GigabitEthernet1

O 192.168.2.0/24 [110/2] via 10.0.0.5, 00:54:05, GigabitEthernet1

192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.3.0/24 is directly connected, GigabitEthernet3

L 192.168.3.1/32 is directly connected, GigabitEthernet3

O 192.168.4.0/24 [110/2] via 10.0.0.10, 00:54:06, GigabitEthernet2

O 192.168.5.0/24 [110/3] via 10.0.0.10, 00:54:02, GigabitEthernet2

## R4

R4>en

R4#show run

Building configuration...

Current configuration : 3717 bytes

!

! Last configuration change at 15:10:49 UTC Fri Sep 10 2021

!

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

platform console serial

!

hostname R4

!

boot-start-marker

boot-end-marker

!

no ip domain lookup

!

ip dhcp pool 1

network 192.168.4.0 255.255.255.0

default-router 192.168.4.1

!

license udi pid CSR1000V sn 9WNBNKGZVO3

interface GigabitEthernet1

ip address 10.0.0.10 255.255.255.252

negotiation auto

no mop enabled

no mop sysid

!

interface GigabitEthernet2

ip address 10.0.0.13 255.255.255.252

negotiation auto

no mop enabled

no mop sysid

!

interface GigabitEthernet3

no ip address

shutdown

negotiation auto

no mop enabled

no mop sysid

!

interface GigabitEthernet4

no ip address

shutdown

negotiation auto

no mop enabled

no mop sysid

!

router ospf 1

router-id 0.0.0.4

network 10.0.0.8 0.0.0.3 area 0

network 10.0.0.12 0.0.0.3 area 0

!

End

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, 6 subnets, 2 masks

O 10.0.0.0/30 [110/3] via 10.0.0.9, 00:54:31, GigabitEthernet1

O 10.0.0.4/30 [110/2] via 10.0.0.9, 00:54:35, GigabitEthernet1

C 10.0.0.8/30 is directly connected, GigabitEthernet1

L 10.0.0.10/32 is directly connected, GigabitEthernet1

C 10.0.0.12/30 is directly connected, GigabitEthernet2

L 10.0.0.13/32 is directly connected, GigabitEthernet2

O 192.168.1.0/24 [110/4] via 10.0.0.9, 00:54:31, GigabitEthernet1

O 192.168.2.0/24 [110/3] via 10.0.0.9, 00:54:31, GigabitEthernet1

O 192.168.3.0/24 [110/2] via 10.0.0.9, 00:54:35, GigabitEthernet1

192.168.4.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.4.0/24 is directly connected, GigabitEthernet3

L 192.168.4.1/32 is directly connected, GigabitEthernet3

O 192.168.5.0/24 [110/2] via 10.0.0.14, 00:54:33, GigabitEthernet2

## R5

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

!

license udi pid ISR4321/K9 sn FLM240608PH

!

interface GigabitEthernet0/0/0

ip address 10.0.4.2 255.255.255.0

negotiation auto

!

interface GigabitEthernet0/0/1

ip address 10.0.5.1 255.255.255.0

negotiation auto

!

interface GigabitEthernet0/2/0

no ip address

negotiation auto

!

interface GigabitEthernet0/2/1

no ip address

negotiation auto

!

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

!

router ospf 1

router-id 0.0.0.5

network 10.0.4.0 255.255.255.0 area 0

network 10.0.5.0 255.255.255.0 area 0

exit

!

End

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

10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks

O 10.0.0.0/30 [110/4] via 10.0.0.13, 00:54:57, GigabitEthernet1

O 10.0.0.4/30 [110/3] via 10.0.0.13, 00:55:00, GigabitEthernet1

O 10.0.0.8/30 [110/2] via 10.0.0.13, 00:55:00, GigabitEthernet1

C 10.0.0.12/30 is directly connected, GigabitEthernet1

L 10.0.0.14/32 is directly connected, GigabitEthernet1

O 192.168.1.0/24 [110/5] via 10.0.0.13, 00:54:57, GigabitEthernet1

O 192.168.2.0/24 [110/4] via 10.0.0.13, 00:54:57, GigabitEthernet1

O 192.168.3.0/24 [110/3] via 10.0.0.13, 00:55:00, GigabitEthernet1

O 192.168.4.0/24 [110/2] via 10.0.0.13, 00:55:00, GigabitEthernet1

192.168.5.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.5.0/24 is directly connected, GigabitEthernet2

L 192.168.5.1/32 is directly connected, GigabitEthernet2

# Conclusion

In summary we designed an IPv4 addressing scheme and configured 5 cisco routers for OSPF.

