OSPF Single Area Network

**Purpose:** The purpose of this lab was to set up and ipv4 and ipv6 single area OSPF network. This gives the ability for routers to establish neighbors with other routers in the same area. This way we do not have to set manual routes between routers. They can quickly and automatically establish routes.

**Background Info:** This lab put all our routers in a Single OSPF area. Open Shortest Path First is the protocol of finding the shortest path between routers. That means this protocol will cause routers find out what routers it is connected and how it can send messages to other routers. When it was enabled, it allowed our router to all communicate with each other.

**Lab Summary:** We configured 5 different routers with ipv4 and ipv6 address. We did that this on the g0/0/0 and g0/0/1 interface of the routers. We used the subnet address 255.255.255.252 to create groups of four. We then enabled OSPF on every router and set the process ID number. We then made sure every router had its own router-id number. After that we put every router in the same area, area 0. We then had to enable OSPF for IPv6 and assign a process-ID. For IPv6 we had to go into each interface and assign an interface to the OSPF area of 0. This allowed for the routers to form neighbors with each other and thus we now were able to ping throughout the network.

**Lab Commands:**

**-Router Ospf 1 [process ID]**

**-Network [Network address] [wildcard mask] area [#]**

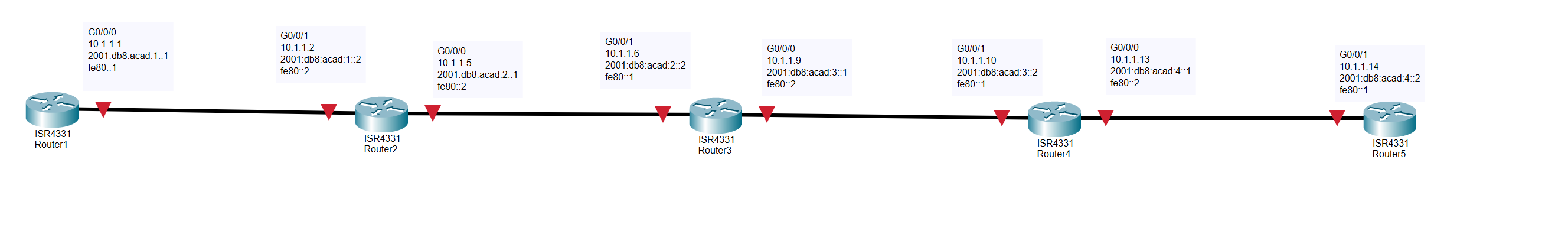
**-ipv6 routing ospf [process ID]**

**-IPv6 ospf [process ID] area [#]**

**-Router-ID [router id]**

**-Network**

Configuration Diagram:



Router 1:

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

ipv6 unicast-routing

subscriber templating

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO21482HZX

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

interface GigabitEthernet0/0/0

ip address 10.1.1.1 255.255.255.252

negotiation auto

ipv6 address FE80::1 link-local

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

ipv6 ospf 1 area 0

interface GigabitEthernet0/0/1

no ip address

shutdown

negotiation auto

ipv6 address FE80::1 link-local

interface Serial0/1/0

interface Serial0/1/1

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 10.1.1.0 0.0.0.3 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

Router 2:

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

ipv6 unicast-routing

subscriber templating

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO21482DWJ

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

interface GigabitEthernet0/0/0

ip address 10.1.1.5 255.255.255.252

negotiation auto

ipv6 address FE80::2 link-local

ipv6 address 2001:DB8:ACAD:2::1/64

ipv6 ospf 1 area 0

interface GigabitEthernet0/0/1

ip address 10.1.1.2 255.255.255.252

negotiation auto

ipv6 address FE80::2 link-local

ipv6 address 2001:DB8:ACAD:1::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

interface Vlan1

no ip address

shutdown

router ospf 1

network 10.1.1.0 0.0.0.3 area 0

network 10.1.1.4 0.0.0.3 area 0

router ospf 10

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

Router 3:

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

no ip domain lookup

ipv6 unicast-routing

subscriber templating

vtp domain cisco

vtp mode transparent

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO214420HW

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

interface GigabitEthernet0/0/0

ip address 10.1.1.9 255.255.255.252

negotiation auto

ipv6 address FE80::2 link-local

ipv6 address 2001:DB8:ACAD:3::1/64

ipv6 ospf 1 area 0

interface GigabitEthernet0/0/1

ip address 10.1.1.6 255.255.255.252

negotiation auto

ipv6 address FE80::1 link-local

ipv6 address 2001:DB8:ACAD:2::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

interface Vlan1

no ip address

shutdown

router ospf 1

router-id 3.3.3.3

network 10.1.1.4 0.0.0.3 area 0

network 10.1.1.8 0.0.0.3 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 3.3.3.3

control-plane

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

End

Router 4:

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

no ip domain lookup

ipv6 unicast-routing

subscriber templating

vtp domain cisco

vtp mode transparent

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO214421D1

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

interface GigabitEthernet0/0/0

ip address 10.1.1.13 255.255.255.252

negotiation auto

ipv6 address FE80::2 link-local

ipv6 address 2001:DB8:ACAD:4::1/64

ipv6 ospf 1 area 0

interface GigabitEthernet0/0/1

ip address 10.1.1.10 255.255.255.252

negotiation auto

ipv6 address FE80::1 link-local

ipv6 address 2001:DB8:ACAD:3::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

interface Vlan1

no ip address

shutdown

router ospf 1

router-id 4.4.4.4

network 10.1.1.8 0.0.0.3 area 0

network 10.1.1.12 0.0.0.3 area 0

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

ipv6 router ospf 1

control-plane

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

End

Router 5:

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

no ip domain lookup

login on-success log

subscriber templating

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 0D323230 39303831 34343730

355A170D 33303031 30313030 30303030 5A303031 2E302C06 03550403 1325494F

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

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

82010100 9A1E2F4A 544A3CB2 9696A496 9F2994BB 5B2899D6 EE2481D3 15CE7673

D6043F3D 8A2DF510 FA6F24C0 CB079A0B 9C19A07D 9E80328E 98702B44 BD2DEE9B

EDAF9D1A 2409001C B600927F 101D6FBF CA445F63 62AB7B22 B7CF7D29 0C770AB7

666730FF 02076B71 99BEE207 CA333594 014713DC CC592C47 2D6F9AE8 E1FCD1C3

F8002F68 170B38F3 1EF8427A B4AC2562 9281B9AC 264AB372 8EF35152 AA6E053E

F02B1E18 3481E3D1 CB892315 350E9849 C6657770 FFF86F70 3687B703 00255719

2DCFBB7B 1FD43AC2 89F7DB8E D1021989 DF149436 05630005 DDE9629B 3D723DA4

DB319200 8F51C8FB 5EDEFDA0 ECE5341A EBECFD87 976F1966 E85B1B5F AD708943

7EDF1E49 02030100 01A35330 51300F06 03551D13 0101FF04 05300301 01FF301F

0603551D 23041830 16801445 F855C938 C65ABE63 C9F84B1D 59C92764 05141630

1D060355 1D0E0416 041445F8 55C938C6 5ABE63C9 F84B1D59 C9276405 1416300D

06092A86 4886F70D 01010505 00038201 010093F4 65765D8A FBEE2380 5CC41529

D30B09FF 03259DF0 5B46902E A97D69CF 86E0DE57 F3F93CBE 92D25C25 742E695A

7DA90CF9 D243A004 A5D262D5 D2CD0DF5 82FEA405 B9D8F63B ACE3247A 628F2472

CBA4677E 0B7E9E87 B52770EA 1FAF49C4 F0734C95 C806E4E4 A359E9EE 7AB82BAE

5311E072 4F978094 1CE5B79F BABB14A5 93792D37 046D6A1A A7BFD17F A055B498

FBB21485 02049774 07C0CBF2 C1FE38E8 64AEC8F0 7B4BFF21 CF16CC41 19D6900A

0216736C 22B4EC52 DE11FE69 A7E03383 159BFF44 2363D28C F89AB825 533B2F9F

29322152 809CF712 6ACF0031 945C9A6F 8ED568DA 360679E8 C33A5368 7C34A516

8B8E6867 D4D149F9 672F878B E0D44F30 C96D

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 GigabitEthernet0/0/0

no ip address

negotiation auto

interface GigabitEthernet0/0/1

ip address 10.1.1.14 255.255.255.252

negotiation auto

ipv6 address FE80::1 link-local

ipv6 address 2001:DB8:ACAD:4::2/64

ipv6 ospf 1 area 0

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 10.1.1.12 0.0.0.3 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

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

**PROMBLEMS**: One of our first problems was on our first day back we had trouble deciding on a subnetting scheme that would work for ipv4 addresses. We tried using groups of 16 but somewhere along the way we made a mistake, and it was difficult to figure out where it was. We eventually decided to keep it simple and to just use groups of 4. With this we were able to get OSPF working for Ipv4 quite easily. Our other major problem was we couldn’t figure why our ipv6 OSPF wasn’t able to establish neighbor adjacencies. We figured out it was a very simple fix because we had set up our link local addresses incorrectly so once we noticed that it was an easy fix. So, we made sure that connecting ports between routers did **not** have the same link local address.

**CONCLUSION**: In conclusion, we configured five different routers into a single area OSPF network. They quickly created neighbor adjacencies with another routers. The routers were now able communicate across our network using both Ipv4 and IPv6.