

iBGP

Evan Choi | Cisco CCNP | 12/3/2021

**Purpose**

The purpose of this lab is to configure BGP to enable communications within an autonomous system. iBGP or interior border gateway protocol is used to provide more information to your internal routers.

**Background Information on lab concepts**

iBGP is an extension of the routing protocol BGP. It is used inside autonomous systems while its counterpart eBGP is used between autonomous systems. It is used to provide information to your internal routers. To configure it, all the devices in the same autonomous systems need to form a full mesh topology.

Since iBGP is an extension of BGP I'll explain how BGP works first. BGP manages how packets get routed between networks through the exchange of reachability and routing information between edge routers. It creates stability within its network by making sure routers can adapt to route failures. For example, when one route goes down, a new route is quicky found. It makes routing decisions based on paths, which are defined by rules or network policies that network administrators set. BGP is generally used in connecting individual networks managed by a large organization to other groups of networks managed by large organizations. These network groups are also called autonomous systems (AS). Each AS creates different rules and policies on how they want traffic to move in its network. Different AS organizations arrange peering agreements that allow traffic to travel in their networks. In BGP, the BGP routers at the edge of AS networks advertise to peers the prefixes of the IP addresses, they can send traffic to. These routers regularly send advertisements through network-prefix announcements so they can update each other's routing table. It works by using decision-making algorithms to analyze the data they gather. They then decide which peer is best to send each packet to. Generally, the path with the fewest number of hops is chosen, but if there is delay and congestion on that route, BGP may choose a longer router if it’s faster. Once traffic moves across an autonomous system and gets to another BGP router connected to a different autonomous system. This process is repeated until the data reaches the autonomous system where its destination is. For network operators to control routing in their networks and to exchange routing information with other internet server providers, they need autonomous system numbers (ASN). These numbers are assigned by IANA or the Internet Assigned Numbers Authority. Just like an IP address, ASNs are both 16-bit and 32-bit numbers.  
 There are many things that make iBGP different from eBGP. First, iBGP goes between two BGP routers in the same autonomous system. It also has an administrative distance of 200 compared to eBGPs 20. IBGP routers that are received from an IBGP peer cannot be advertised to other iBGP peers, but they can be advertised to an eBGP peer, while in eBGP routes received from an eBGP peer can be advertised to eBGP and iBGP peers. Another thing is that iBGP requires a full mesh topology while eBGP doesn’t. IBGP is also used within the same organization, and its default peers have a TTL of 255 while eBGP has a default TTL of 1. These are some of the things that make iBGP different from eBGP but the main difference is that iBGP is used inside autonomous systems while eBGP is used between autonomous systems.

**Lab Summary**

In this lab, I used seven 4321 Cisco Routers and six copper-straight through cables. Each router, except for the two border routers had two copper-straight throughs connected to them. One cable went in the GigabitEthernet 1 interface and the other went in the GigabitEthernet 0/0/1 interface. After that, I assigned the interfaces of each router an IPv4 and IPv6 address and configured loopback addresses on the routers. Then, I configured BGP on the routers. Finally, I pinged my routers with each other to verify connectivity and did other commands like show ip protocols and show ip bgp summary to ensure that BGP was working.

**Lab Commands**

Router(config)**#ipv6 unicast-routing**

This command globally enables IPv6 routing.

Router(config)**#**router **bgp <AS Number>**

This command enables BGP on the router and enters BGP configuration mode. The AS (autonomous system) number identifies the router’s BGP configuration group. When you configure external BGP, two connected routers should not have the same AS number, as that will signal they are in different groups.

Router(config-router) **#no bgp default ipv4-unicast**

This command disables the default behavior of BGPv4 to advertise only IPv4 unicast routes and enables multi-protocol BGP mode.

Router(config-router) **#address-family <Address Family>**

This command enters BGP address-family configuration mode. The address family parameter covers ipv4 and ipv6. Each one brings the router to its respective configuration mode for either BGPv4 or BGPv6.

Router(config-router)**#neighbor <IP Address> remote-as <Neighbor AS Number>**

This command configures a BGP neighbor. It can be either an IPv4 or IPv6 address. The Neighbor AS Number parameter requires the AS number of the adjacent router. This command statically configures BGP to create a neighbor connection. This command needs to be entered correctly on both routers in order for a neighbor connection to be formed. This command needs to be entered twice, once for IPv4 and once for IPv6, for dual stack operation.

Router(config-router-af)**#neighbor <IP Address> activate**

This command activates the BGP neighbor connection. It can be either an IPv4 or IPv6 address. You can enter it in either the IPv4 or IPv6 address family configuration mode to activate respective neighbor connections.

Router(config-router-af)**#network <IPv4 Address> mask <Subnet Mask>**

This command activates an IPv4 network for BGP information distribution.

Router(config-router-af)**#network <IPv6 Address>**

This command activates an IPv6 network for BGP information distribution.

Router(config-router-af)**#redistribute <protocol> <protocol number>**

This command allows BGP to distribute information from a different protocol. It can be either OSPF or EIGRP. The protocol number is the process-id of OSPF or the AS number of EIGRP.

Router(config-router)**#redistribute <protocol> <protocol number>**

This command is used in OSPF or EIGRP router configuration mode and allows them to distribute information from different routing protocols. The protocol parameter is only BGP. The protocol number is the AS number of the local BGP connection.

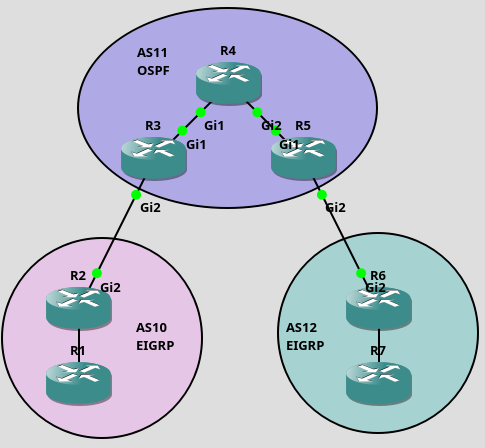
Router**#show ip/ipv6 protocols**

This command shows a summary of all the configured IPv4 and IPv6 protocols on the router.

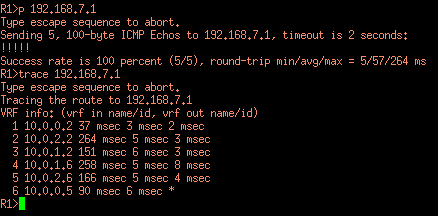
Router**#show ip bgp**

This command displays entries in the bgp routing table.

**Network Diagram with IP's**



|  |  |  |  |
| --- | --- | --- | --- |
| **Device** | **Interface** | **IP Address** | **IPv6 Address** |
| R1 | G1 | 10.0.0.1 /30 | 10:1::1/64 |
| Loopback 0 | 192.168.1.1 /24 | 100:1::1/64 |
| R2 | G1 | 10.0.0.2 /30 | 10:1::2/64 |
| G2 | 10.0.2.1 /30 | 10:2::1/64 |
| Loopback 0 | 192.168.2.1 /24 | 100:2::1/64 |
| R3 | G1 | 10.0.1.1 /30 | 10:3::1/64 |
| G2 | 10.0.2.2 /30 | 10:2::2/64 |
| Loopback 0 | 192.168.3.1 /24 | 100:3::1/64 |
| R4 | G1 | 10.0.1.2 /30 | 10:3::2/64 |
| G2 | 10.0.1.5 /30 | 10:4::1/64 |
| Loopback 0 | 192.168.4.1 /24 | 100:4::1/64 |
| R5 | G1 | 10.0.1.6 /30 | 10:4::2/64 |
| G2 | 10.0.2.5 /30 | 10:5::1/64 |
| Loopback 0 | 192.168.5.1 /24 | 100:5::1/64 |
| R6 | G1 | 10.0.0.6 /30 | 10:6::1/64 |
| G2 | 10.0.2.6 /30 | 10:5::2 /64 |
| Loopback 0 | 192.168.6.1 /24 | 100:6::1/64 |
| R7 | G1 | 10.0.0.5 /30 | 10:6::2/64 |
| Loopback 0 | 192.168.7.1 /24 | 100:7::1/64 |



**Configurations**

**Router 1**

**show run**

R1#show run

Building configuration...

Current configuration : 3847 bytes

!

! Last configuration change at 16:11:55 UTC Fri Jan 28 2022

!

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 aaa new-model

!

login on-success log

!

subscriber templating

!

ipv6 unicast-routing

multilink bundle-name authenticated

!

crypto pki trustpoint TP-self-signed-1237836489

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-1237836489

revocation-check none

rsakeypair TP-self-signed-1237836489

!

crypto pki certificate chain TP-self-signed-1237836489

certificate self-signed 01

30820330 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

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

69666963 6174652D 31323337 38333634 3839301E 170D3231 31323032 31383237

30365A17 0D333030 31303130 30303030 305A3031 312F302D 06035504 03132649

4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D31 32333738

33363438 39308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201

0A028201 0100C760 EBC0FE29 F7E32A8F 4B8BF38E 2A82EAC2 A6E31DF8 F490FB22

8DC8196D 3C4AF1E8 5DCBE8D1 BE26EA0E 30CAC9D2 AD15B0C0 C2800ACB 0F3A2A73

B0B49B58 C8B4256F 9BA3E796 5773FFEA 65EC4776 42A7C57C EE1BE388 71383DF1

2BB74A18 9B03654B 97317D8C E156E5FF 48B58198 2578B244 3C9B91C6 FCE35ABF

46663083 33ABAA79 74827341 0D7B40C5 5ECC7984 0FDC9350 21429BAC 2C6D091A

41655EF0 553C6722 A0619801 D0838BB2 E5ECA0D5 BE8B8E1D 46A3785A 49ECCF42

3A26ED6F B64C2C1F 2A6A6D0E 59919DFC F1BF5ADF 91031FFA 8A6985CE 2A1671A5

77919CAF 9A9306CB 2A130A11 1BF5FA72 F625370F 4600FAF8 21A531C4 9DABBBBA

60EA1FAC 29C30203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF

301F0603 551D2304 18301680 146E246F E90A4829 387FA423 40FA04AF CB38BDED

30301D06 03551D0E 04160414 6E246FE9 0A482938 7FA42340 FA04AFCB 38BDED30

300D0609 2A864886 F70D0101 05050003 82010100 4B0A0391 C11F50C1 0C5B7115

8FE927F0 03090108 FFE055A2 6F651F3C 21533AD3 3B3CA402 9A9A31FD D98F4CBA

71641198 4C66147A F0982E8D 59F518D7 9A763B27 F3EE5CC1 8ABA1A18 0F0E7A88

1DAC007E 5547490E 66ECBB3E 4A78D3F2 52C9A061 E222D156 2406A816 A21490BA

BB5E1AB8 10B27009 611FC632 E31CF7CD 33281C0E A36A4839 DDB42266 32FE4B3C

3F2F6865 96343D5D 22947F7F CA9A7E80 50A02A6E E2910488 60D62BD8 960F0F72

B608C831 3C124066 9A27C1CB 13BB7508 A4D813AC 980DDE03 4E9CD496 BC48611E

F431369D 4DDE2BB0 B699EB5F 12914767 E13E590F 89238D29 237D3C1D 5F6C7DFD

7F4E8541 89FB3035 4A86B8A5 01789A50 CD07F942

quit

!

license udi pid CSR1000V sn 9GZ1GHZN9DG

no license smart enable

diagnostic bootup level minimal

!

spanning-tree extend system-id

!

redundancy

!

interface Loopback0

ip address 192.168.1.1 255.255.255.0

ipv6 address 100:1::1/64

ipv6 eigrp 10

!

interface GigabitEthernet1

ip address 10.0.0.1 255.255.255.252

negotiation auto

ipv6 address 10:1::1/64

ipv6 eigrp 10

no mop enabled

no mop sysid

!

interface GigabitEthernet2

no ip address

shutdown

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 eigrp 1

network 10.0.0.0 0.0.0.3

network 192.168.1.0

!

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

!

ipv6 router eigrp 10

eigrp router-id 1.1.1.1

!

ipv6 router eigrp 1

eigrp router-id 1.1.1.1

redistribute connected

!

control-plane

!

line con 0

stopbits 1

line vty 0 4

login

!

end

**show ip/ipv6 route**

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

D EX 10.0.0.4/30 [170/281856] via 10.0.0.2, 00:50:36, GigabitEthernet1

D 10.0.2.0/30 [90/3072] via 10.0.0.2, 00:51:51, GigabitEthernet1

D EX 10.0.2.4/30 [170/281856] via 10.0.0.2, 00:50:36, GigabitEthernet1

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

C 192.168.1.0/24 is directly connected, Loopback0

L 192.168.1.1/32 is directly connected, Loopback0

D 192.168.2.0/24 [90/130816] via 10.0.0.2, 00:51:51, GigabitEthernet1

D EX 192.168.3.0/24 [170/281856] via 10.0.0.2, 00:50:36, GigabitEthernet1

D EX 192.168.5.0/24 [170/281856] via 10.0.0.2, 00:50:36, GigabitEthernet1

D EX 192.168.6.0/24 [170/281856] via 10.0.0.2, 00:50:36, GigabitEthernet1

D EX 192.168.7.0/24 [170/281856] via 10.0.0.2, 00:50:36, GigabitEthernet1

R1#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, 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, RL - RPL, 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 10:1::/64 [0/0]

via GigabitEthernet1, directly connected

L 10:1::1/128 [0/0]

via GigabitEthernet1, receive

C 100:1::/64 [0/0]

via Loopback0, directly connected

L 100:1::1/128 [0/0]

via Loopback0, receive

D 100:2::/64 [90/130816]

via FE80::E2B:4FFF:FEF8:0, GigabitEthernet1

EX 100:3::/64 [170/258816]

via FE80::E2B:4FFF:FEF8:0, GigabitEthernet1

L FF00::/8 [0/0]

via Null0, receive

**show ip/ipv6 protocols**

R1#show ip protocols

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "application"

Sending updates every 0 seconds

Invalid after 0 seconds, hold down 0, flushed after 0

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Maximum path: 32

Routing for Networks:

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 4)

Routing Protocol is "eigrp 1"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Default networks flagged in outgoing updates

Default networks accepted from incoming updates

EIGRP-IPv4 Protocol for AS(1)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 192.168.1.1

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 4

Maximum hopcount 100

Maximum metric variance 1

Automatic Summarization: disabled

Maximum path: 4

Routing for Networks:

10.0.0.0/30

192.168.1.0

Routing Information Sources:

Gateway Distance Last Update

10.0.0.2 90 00:00:47

Distance: internal 90 external 170

R1#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "application"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "eigrp 10"

EIGRP-IPv6 Protocol for AS(10)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 1.1.1.1

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 16

Maximum hopcount 100

Maximum metric variance 1

Interfaces:

Loopback0

GigabitEthernet1

Redistribution:

None

IPv6 Routing Protocol is "eigrp 1"

EIGRP-IPv6 Protocol for AS(1)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 1.1.1.1

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 16

Maximum hopcount 100

Maximum metric variance 1

Interfaces:

Redistribution:

Redistributing protocol connected

**Router 2**

**show run**

R2#show run

Building configuration...

Current configuration : 4419 bytes

!

! Last configuration change at 16:11:51 UTC Fri Jan 28 2022

!

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 aaa new-model

!

login on-success log

!

subscriber templating

!

ipv6 unicast-routing

multilink bundle-name authenticated

!

crypto pki trustpoint TP-self-signed-1914026840

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-1914026840

revocation-check none

rsakeypair TP-self-signed-1914026840

!

crypto pki certificate chain TP-self-signed-1914026840

certificate self-signed 01

30820330 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

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

69666963 6174652D 31393134 30323638 3430301E 170D3231 31323032 31383237

31305A17 0D333030 31303130 30303030 305A3031 312F302D 06035504 03132649

4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D31 39313430

32363834 30308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201

0A028201 010097D6 3025FBE9 912F1411 DC2FD614 55A836BA 7DF28BE1 7B6E4F2A

81ACBA6A 95304616 411A7742 88847BE7 8451377C 41A8AB30 7E46859A F4B5832D

E07BDC4F BC628C47 82836342 206A80F5 B2E35293 32EB9666 59ED5419 9B239767

7B2387B6 02B84DC7 2407C84A 58693C5D C0DA5E07 4AF96302 06F08E73 F9F2A916

9E92FE92 5C542BC5 0D3BF002 CE7418D6 9D6B8704 9D2B4098 747D0A3F 4864976E

C0B890C0 D79DB5F6 580EC7E0 57A1E079 DE18BB66 B3BD0B83 7E5A2717 1BA205DF

C6EC0865 629B974B E5CAD77B 5168B4B2 E98A7587 B514A810 F8EBD48D DE84B9FC

C13CE5EB 7A74AB47 165778CF DB632266 3A8D4ED4 7A9FDDF0 0E179A64 3B97F63B

1CE3134F 5CAB0203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF

301F0603 551D2304 18301680 14AA8B97 BA903F0C 2D66FD3F 04BD514C 05CE531F

92301D06 03551D0E 04160414 AA8B97BA 903F0C2D 66FD3F04 BD514C05 CE531F92

300D0609 2A864886 F70D0101 05050003 82010100 7100F75A 03F90531 F4A3CE11

9EE7EBF3 FB32B43D F6AF1104 5572BB6D F2E6A9AE E222B965 EA8BC5F7 63E0A694

3F404519 5DCEB0D2 2D82767D 2948936D B8D935B7 E7C70B26 5DA8EECA 3613DE40

BD408F51 001E8EF2 1705D7B8 43BD9C82 17AFC744 260E0EAB FA50C132 6A18908E

E2934778 3728B1FC 493F7F76 184A9EA0 C24BCFD8 3A88EABE 466AEF6A 3E61114A

94BEE9E3 56CB739C BD831DF3 683FE36E B55265E1 B6C0FBC6 736D40B3 11E77AAD

81F2684A FF50BDAF A4E291F7 2C9366E9 192592A3 86046427 9EBC979A E9E20C24

112C41DE 6625A642 AD2C0CC2 DF415A7A 3D0B792F 1F00563A C74A7CFB B60DBC13

B6BFC082 6AC68F11 0D4A5B14 45862B79 DF9C3F2C

quit

!

license udi pid CSR1000V sn 9VBM617NKNE

no license smart enable

diagnostic bootup level minimal

!

spanning-tree extend system-id

!

redundancy

!

interface Loopback0

ip address 192.168.2.1 255.255.255.0

ipv6 address 100:2::1/64

ipv6 eigrp 10

!

interface GigabitEthernet1

ip address 10.0.0.2 255.255.255.252

negotiation auto

ipv6 address 10:1::2/64

ipv6 eigrp 10

no mop enabled

no mop sysid

!

interface GigabitEthernet2

ip address 10.0.2.1 255.255.255.252

negotiation auto

ipv6 address 10:2::1/64

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 eigrp 1

network 10.0.0.0 0.0.0.3

network 10.0.2.0 0.0.0.3

network 192.168.2.0

redistribute bgp 10 metric 10000 100 255 240 65535

!

router bgp 10

bgp log-neighbor-changes

neighbor 10:2::2 remote-as 11

neighbor 10.0.2.2 remote-as 11

!

address-family ipv4

redistribute eigrp 1

no neighbor 10:2::2 activate

neighbor 10.0.2.2 activate

exit-address-family

!

address-family ipv6

redistribute connected

redistribute eigrp 10

neighbor 10:2::2 activate

exit-address-family

!

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

!

ipv6 router eigrp 10

eigrp router-id 2.2.2.2

redistribute bgp 10 metric 10000 10 254 254 65535

!

ipv6 router eigrp 1

eigrp router-id 2.2.2.2

redistribute bgp 10 metric 10000 10 254 254 65535

redistribute connected

!

control-plane

!

line con 0

stopbits 1

line vty 0 4

login

!

end

**show ip/ipv6 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

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

B 10.0.0.4/30 [20/0] via 10.0.2.2, 00:51:12

C 10.0.2.0/30 is directly connected, GigabitEthernet2

L 10.0.2.1/32 is directly connected, GigabitEthernet2

B 10.0.2.4/30 [20/0] via 10.0.2.2, 00:51:12

D 192.168.1.0/24 [90/130816] via 10.0.0.1, 00:52:29, GigabitEthernet1

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

C 192.168.2.0/24 is directly connected, Loopback0

L 192.168.2.1/32 is directly connected, Loopback0

B 192.168.3.0/24 [20/0] via 10.0.2.2, 00:51:12

B 192.168.5.0/24 [20/0] via 10.0.2.2, 00:51:12

B 192.168.6.0/24 [20/0] via 10.0.2.2, 00:51:12

B 192.168.7.0/24 [20/0] via 10.0.2.2, 00:51:12

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, RL - RPL, 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 10:1::/64 [0/0]

via GigabitEthernet1, directly connected

L 10:1::2/128 [0/0]

via GigabitEthernet1, receive

C 10:2::/64 [0/0]

via GigabitEthernet2, directly connected

L 10:2::1/128 [0/0]

via GigabitEthernet2, receive

D 100:1::/64 [90/130816]

via FE80::E08:33FF:FE05:0, GigabitEthernet1

C 100:2::/64 [0/0]

via Loopback0, directly connected

L 100:2::1/128 [0/0]

via Loopback0, receive

B 100:3::/64 [20/0]

via FE80::E9C:63FF:FE83:1, GigabitEthernet2

L FF00::/8 [0/0]

via Null0, receive

**show ip/ipv6 protocols**

R2#show ip protocols

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "application"

Sending updates every 0 seconds

Invalid after 0 seconds, hold down 0, flushed after 0

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Maximum path: 32

Routing for Networks:

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 4)

Routing Protocol is "eigrp 1"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Default networks flagged in outgoing updates

Default networks accepted from incoming updates

Redistributing: bgp 10

EIGRP-IPv4 Protocol for AS(1)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 192.168.2.1

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 4

Maximum hopcount 100

Maximum metric variance 1

Automatic Summarization: disabled

Maximum path: 4

Routing for Networks:

10.0.0.0/30

10.0.2.0/30

192.168.2.0

Routing Information Sources:

Gateway Distance Last Update

10.0.0.1 90 00:01:37

Distance: internal 90 external 170

Routing Protocol is "bgp 10"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

IGP synchronization is disabled

Automatic route summarization is disabled

Redistributing: eigrp 1

Neighbor(s):

Address FiltIn FiltOut DistIn DistOut Weight RouteMap

10.0.2.2

Maximum path: 1

Routing Information Sources:

Gateway Distance Last Update

10.0.2.2 20 00:00:22

Distance: external 20 internal 200 local 200

R2#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "application"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "bgp 10"

IGP synchronization is disabled

Redistribution:

Redistributing protocol connected

Redistributing protocol eigrp 10

Neighbor(s):

Address FiltIn FiltOut Weight RoutemapIn RoutemapOut

10:2::2

Distance:

IPv6 Routing Protocol is "eigrp 10"

EIGRP-IPv6 Protocol for AS(10)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 2.2.2.2

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 16

Maximum hopcount 100

Maximum metric variance 1

Interfaces:

Loopback0

GigabitEthernet1

Redistribution:

Redistributing protocol bgp 10 with metric 10000 10 254 254 65535

IPv6 Routing Protocol is "eigrp 1"

EIGRP-IPv6 Protocol for AS(1)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 2.2.2.2

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 16

Maximum hopcount 100

Maximum metric variance 1

Interfaces:

Redistribution:

Redistributing protocol connected

Redistributing protocol bgp 10 with metric 10000 10 254 254 65535

**show ip bgp**

R2#show ip bgp

BGP table version is 6, local router ID is 192.168.2.1

Status codes: s suppressed, d damped, h history, \* valid, > best, i - internal,

r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,

x best-external, a additional-path, c RIB-compressed,

t secondary path, L long-lived-stale,

Origin codes: i - IGP, e - EGP, ? - incomplete

RPKI validation codes: V valid, I invalid, N Not found

Network Next Hop Metric LocPrf Weight Path

\*> 10.0.0.0/30 0.0.0.0 0 32768 ?

\*> 10.0.2.0/30 0.0.0.0 0 32768 ?

\*> 192.168.1.0 10.0.0.1 130816 32768 ?

\*> 192.168.2.0 0.0.0.0 0 32768 ?

\*> 192.168.3.0 10.0.2.2 0 0 11 i

**show ip bgp summary**

R2#show ip bgp summary

BGP router identifier 192.168.2.1, local AS number 10

BGP table version is 11, main routing table version 11

10 network entries using 2480 bytes of memory

10 path entries using 1360 bytes of memory

5/5 BGP path/bestpath attribute entries using 1400 bytes of memory

2 BGP AS-PATH entries using 64 bytes of memory

0 BGP route-map cache entries using 0 bytes of memory

0 BGP filter-list cache entries using 0 bytes of memory

BGP using 5304 total bytes of memory

BGP activity 15/0 prefixes, 16/0 paths, scan interval 60 secs

Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd

10.0.2.2 4 11 8 6 6 0 0 00:01:48 6

**Router 3**

**show run**

R3#show run

Building configuration...

Current configuration : 4592 bytes

!

! Last configuration change at 16:01:58 UTC Fri Jan 28 2022

!

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 aaa new-model

!

login on-success log

!

subscriber templating

!

ipv6 unicast-routing

multilink bundle-name authenticated

!

crypto pki trustpoint TP-self-signed-3256851222

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-3256851222

revocation-check none

rsakeypair TP-self-signed-3256851222

!

crypto pki certificate chain TP-self-signed-3256851222

certificate self-signed 01

30820330 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

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

69666963 6174652D 33323536 38353132 3232301E 170D3231 31323032 31383237

30365A17 0D333030 31303130 30303030 305A3031 312F302D 06035504 03132649

4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D33 32353638

35313232 32308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201

0A028201 0100A065 F135F75D C5E7D46A EDE9D87A 24E3E677 4BD70C23 2501A802

CD6785A1 CD8FE331 B32D14AB 28A2A8DC E3662D89 F288EEA9 1C0B6CC1 EAF1B89A

FB83DDC9 D5579716 E54F4EA2 B39359F6 9E8AA42E E915E924 E1551BBB BC7A1D15

63CB8323 689F274C AD64793C C56EF742 9E039E6A D95082D3 51647D1D 208276DE

FDBC8E79 0C5BEA24 A8B4B55D 079BEDA9 F48A7D4D A4BA615E 146AA1A2 C2D4A5F7

95A0A998 2ED54426 F3A7493A 66868640 77C0261A C61CCB4A AF489919 EAF144A8

CE0F299B 8B2FA22E A016B9F3 935A2CF9 2B9DFDC6 99B5BE1B 59C9DFFB 422D191A

9E66D01E A848C92D D86BD896 A2B58F07 A1F352DB 51C1551B B35B9C68 20F974F3

4934B221 6FFB0203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF

301F0603 551D2304 18301680 148B1D26 8629FBD9 1A9AA9C1 FAF21390 313440EF

E5301D06 03551D0E 04160414 8B1D2686 29FBD91A 9AA9C1FA F2139031 3440EFE5

300D0609 2A864886 F70D0101 05050003 82010100 419E3E73 412BF1C7 50F01B68

F5F3A186 CC6E4F34 E552E89F A8507D75 F773A6F7 137FB23B 290E2942 AB6D7B66

7EAAF9F9 E6BCF741 AEFA960E FE843CA1 0C665172 8EECF08E 54894D3A 72374914

CC68AEB8 7B0046F0 24DBAD52 DEC24961 2E829FE0 0B2EB02B DA6BCF8B 9072A8C4

2D8C5923 3866B65F 94C86A54 9D5D38F4 5323BC24 15DB6A30 D81FA3AA 69B60FBE

90506C3B 2973A9E8 FDC96537 35BF0ACF D11803D8 26FB029C 92EE1CF5 88694443

1E6CE807 C0468536 2B58A220 97F1D214 9419DDBC 6EF751A1 1889E40D 02CF78E6

77137CDB F1EC737E DCA49DEB 1693DFD6 55C7EE93 78098BEA 6FD61BB3 9385227F

0C745C58 F0589487 4F3EAE8D 8DBCED68 2B9C0C72

quit

!

license udi pid CSR1000V sn 9MJCWK69HK6

no license smart enable

diagnostic bootup level minimal

!

spanning-tree extend system-id

!

redundancy

!

interface Loopback0

ip address 192.168.3.1 255.255.255.0

ipv6 address 100:3::1/64

ospfv3 11 ipv6 area 0

!

interface GigabitEthernet1

ip address 10.0.1.1 255.255.255.252

negotiation auto

ipv6 address 10:3::1/64

ospfv3 11 ipv6 area 0

no mop enabled

no mop sysid

!

interface GigabitEthernet2

ip address 10.0.2.2 255.255.255.252

negotiation auto

ipv6 address 10:2::2/64

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 ospfv3 11

!

address-family ipv6 unicast

redistribute bgp 11

router-id 3.3.3.3

exit-address-family

!

router ospf 1

router-id 3.3.3.3

redistribute bgp 11 subnets

network 10.0.1.0 0.0.0.3 area 0

network 10.0.2.0 0.0.0.3 area 0

network 192.168.3.0 0.0.0.255 area 0

!

router bgp 11

bgp log-neighbor-changes

neighbor 10:2::1 remote-as 10

neighbor 100:5::1 remote-as 11

neighbor 100:5::1 update-source Loopback0

neighbor 10.0.2.1 remote-as 10

neighbor 192.168.5.1 remote-as 11

neighbor 192.168.5.1 update-source Loopback0

!

address-family ipv4

network 192.168.3.1

no neighbor 10:2::1 activate

no neighbor 100:5::1 activate

neighbor 10.0.2.1 activate

neighbor 192.168.5.1 activate

exit-address-family

!

address-family ipv6

network 10:2::/64

network 100:3::/64

neighbor 10:2::1 activate

neighbor 100:5::1 activate

exit-address-family

!

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

!

control-plane

!

line con 0

stopbits 1

line vty 0 4

login

!

end

**show ip/ipv6 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

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

B 10.0.0.0/30 [20/0] via 10.0.2.1, 00:51:51

O E2 10.0.0.4/30 [110/1] via 10.0.1.2, 00:51:52, GigabitEthernet1

C 10.0.1.0/30 is directly connected, GigabitEthernet1

L 10.0.1.1/32 is directly connected, GigabitEthernet1

O 10.0.1.4/30 [110/2] via 10.0.1.2, 00:52:34, GigabitEthernet1

C 10.0.2.0/30 is directly connected, GigabitEthernet2

L 10.0.2.2/32 is directly connected, GigabitEthernet2

O 10.0.2.4/30 [110/3] via 10.0.1.2, 00:52:34, GigabitEthernet1

B 192.168.1.0/24 [20/130816] via 10.0.2.1, 00:51:51

B 192.168.2.0/24 [20/0] via 10.0.2.1, 00:51:51

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

C 192.168.3.0/24 is directly connected, Loopback0

L 192.168.3.1/32 is directly connected, Loopback0

192.168.4.0/32 is subnetted, 1 subnets

O 192.168.4.1 [110/2] via 10.0.1.2, 00:52:36, GigabitEthernet1

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

B 192.168.5.0/24 [200/0] via 192.168.5.1, 00:51:51

O 192.168.5.1/32 [110/3] via 10.0.1.2, 00:52:34, GigabitEthernet1

O E2 192.168.6.0/24 [110/1] via 10.0.1.2, 00:51:52, GigabitEthernet1

O E2 192.168.7.0/24 [110/1] via 10.0.1.2, 00:51:52, GigabitEthernet1

R3#show ipv6 route

IPv6 Routing Table - default - 13 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, RL - RPL, 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

B 10:1::/64 [20/0]

via FE80::E2B:4FFF:FEF8:1, GigabitEthernet2

C 10:2::/64 [0/0]

via GigabitEthernet2, directly connected

L 10:2::2/128 [0/0]

via GigabitEthernet2, receive

C 10:3::/64 [0/0]

via GigabitEthernet1, directly connected

L 10:3::1/128 [0/0]

via GigabitEthernet1, receive

O 10:4::/64 [110/2]

via FE80::E95:44FF:FEEE:0, GigabitEthernet1

B 100:1::/64 [20/130816]

via FE80::E2B:4FFF:FEF8:1, GigabitEthernet2

B 100:2::/64 [20/0]

via FE80::E2B:4FFF:FEF8:1, GigabitEthernet2

C 100:3::/64 [0/0]

via Loopback0, directly connected

L 100:3::1/128 [0/0]

via Loopback0, receive

O 100:4::1/128 [110/1]

via FE80::E95:44FF:FEEE:0, GigabitEthernet1

O 100:5::1/128 [110/2]

via FE80::E95:44FF:FEEE:0, GigabitEthernet1

L FF00::/8 [0/0]

via Null0, receive

**show ip/ipv6 protocols**

R3#show ip protocols

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "application"

Sending updates every 0 seconds

Invalid after 0 seconds, hold down 0, flushed after 0

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Maximum path: 32

Routing for Networks:

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 4)

Routing Protocol is "bgp 11"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

IGP synchronization is disabled

Automatic route summarization is disabled

Neighbor(s):

Address FiltIn FiltOut DistIn DistOut Weight RouteMap

10.0.2.1

192.168.5.1

Maximum path: 1

Routing Information Sources:

Gateway Distance Last Update

10.0.2.1 20 00:01:42

192.168.5.1 200 00:01:41

Distance: external 20 internal 200 local 200

Routing Protocol is "ospf 1"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 3.3.3.3

It is an autonomous system boundary router

Redistributing External Routes from,

bgp 11, includes subnets in redistribution

Number of areas in this router is 1. 1 normal 0 stub 0 nssa

Maximum path: 4

Routing for Networks:

10.0.1.0 0.0.0.3 area 0

10.0.2.0 0.0.0.3 area 0

192.168.3.0 0.0.0.255 area 0

Routing Information Sources:

Gateway Distance Last Update

5.5.5.5 110 00:01:41

4.4.4.4 110 00:02:33

Distance: (default is 110)

R3#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "application"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "ospf 11"

Router ID 3.3.3.3

Autonomous system boundary router

Number of areas: 1 normal, 0 stub, 0 nssa

Interfaces (Area 0):

Loopback0

GigabitEthernet1

Redistribution:

Redistributing protocol bgp 11

IPv6 Routing Protocol is "bgp 11"

IGP synchronization is disabled

Redistribution:

None

Neighbor(s):

Address FiltIn FiltOut Weight RoutemapIn RoutemapOut

10:2::1

100:5::1

Distance:

**show ip bgp**

R3#show ip bgp

BGP table version is 11, local router ID is 192.168.3.1

Status codes: s suppressed, d damped, h history, \* valid, > best, i - internal,

r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,

x best-external, a additional-path, c RIB-compressed,

t secondary path, L long-lived-stale,

Origin codes: i - IGP, e - EGP, ? - incomplete

RPKI validation codes: V valid, I invalid, N Not found

Network Next Hop Metric LocPrf Weight Path

\*> 10.0.0.0/30 10.0.2.1 0 0 10 ?

r>i 10.0.0.4/30 10.0.2.6 0 100 0 12 ?

r> 10.0.2.0/30 10.0.2.1 0 0 10 ?

r>i 10.0.2.4/30 10.0.2.6 0 100 0 12 ?

\*> 192.168.1.0 10.0.2.1 130816 0 10 ?

\*> 192.168.2.0 10.0.2.1 0 0 10 ?

\*> 192.168.3.0 0.0.0.0 0 32768 i

\*>i 192.168.5.0 192.168.5.1 0 100 0 i

r>i 192.168.6.0 10.0.2.6 0 100 0 12 ?

r>i 192.168.7.0 10.0.2.6 130816 100 0 12 ?

**show ip bgp summary**

R3#show ip bgp summary

BGP router identifier 192.168.3.1, local AS number 11

BGP table version is 11, main routing table version 11

10 network entries using 2480 bytes of memory

10 path entries using 1360 bytes of memory

6/6 BGP path/bestpath attribute entries using 1680 bytes of memory

2 BGP AS-PATH entries using 48 bytes of memory

0 BGP route-map cache entries using 0 bytes of memory

0 BGP filter-list cache entries using 0 bytes of memory

BGP using 5568 total bytes of memory

BGP activity 15/0 prefixes, 16/0 paths, scan interval 60 secs

Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd

10.0.2.1 4 10 8 9 11 0 0 00:03:04 4

192.168.5.1 4 11 9 8 11 0 0 00:02:38 5

0 00:10:22 5

**Router 4**

**show run**

R4#show run

Building configuration...

Current configuration : 3969 bytes

!

! Last configuration change at 15:35:41 UTC Fri Jan 28 2022

!

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 aaa new-model

!

login on-success log

!

subscriber templating

!

ipv6 unicast-routing

multilink bundle-name authenticated

!

crypto pki trustpoint TP-self-signed-1811833109

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-1811833109

revocation-check none

rsakeypair TP-self-signed-1811833109

!

crypto pki certificate chain TP-self-signed-1811833109

certificate self-signed 01

30820330 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

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

69666963 6174652D 31383131 38333331 3039301E 170D3231 31323032 31383237

31315A17 0D333030 31303130 30303030 305A3031 312F302D 06035504 03132649

4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D31 38313138

33333130 39308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201

0A028201 0100EB43 49584F16 16A7F6C0 7979ECB3 95B9E427 2B91F0DC 81C2E1C4

C0EB0BDD 0388A6F9 A466E618 ED6C0AF6 C535AC06 BB14D11F 7C085264 FBF1BC4B

017D642E 8D977704 E867B5D3 3ECA1018 F9E48D3C 3B98F482 022C02A0 23494179

DB6CCC5F 5069543E 5DD32B36 85DA230A 5643E5BD 43019DBC E3544D29 070F3FF1

4D415A69 73ECE401 D25EC14C 16F50BD0 2506F21E 9754D338 AF2AD857 EFF2893A

34E0E887 098FA126 0E526EDC 3E4BC4FA BC86AB3A 10AD349F 25FE40DA 060FC7E4

79EA1F55 5413DF1B 1E2695C2 38DFCD16 4735E78A A1B54392 BD8BDAB5 D79D5D16

E57388C7 B48C96C0 20178E3B 401465DF 7B421656 527899CC 551F83F7 D40BFE67

DEBBB962 B8E10203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF

301F0603 551D2304 18301680 1464B764 59609163 AD8232D1 92B9242C 2C1A11A6

54301D06 03551D0E 04160414 64B76459 609163AD 8232D192 B9242C2C 1A11A654

300D0609 2A864886 F70D0101 05050003 82010100 95D9F4AF 39D6FF70 749E456A

06DF62FA 0E1D4B42 7427587F 4E1A3964 E66100DD 0E98380F 7E051AB6 75A11499

6C32C33D C725532C 2A281E10 82970CA6 0D07C137 0E596057 2CA18C85 CCABFD53

5E6C5CCF B3B7A53B FFBBA7E8 0DC18A05 A3FD0C0A C5BADAB9 A4BF8E07 03CF4234

ABE9B7FD D575B83A 02BA482E E78D329F F3329B7D 1C1BB5BD 64425652 6150E639

838E713F 4DA012CC 3D96C1EC 5B72F94B C1EF70E0 D157084A 24ECE335 FEB2DDCE

CC09E14B 53C38FA7 A3E7B52A 9745E46C 23C890BD F9F70851 7388CDFF 71E2F994

3FCE2C67 B91090A6 92753A45 67CAA92B B354E643 B917822B 08FDB884 AA60C035

B854ADA1 DF113B55 56EDD3FA C94F9401 483B0192

quit

!

license udi pid CSR1000V sn 9YWWWYO4ZO0

no license smart enable

diagnostic bootup level minimal

!

spanning-tree extend system-id

!

redundancy

!

interface Loopback0

ip address 192.168.4.1 255.255.255.0

ipv6 address 100:4::1/64

ospfv3 11 ipv6 area 0

!

interface GigabitEthernet1

ip address 10.0.1.2 255.255.255.252

negotiation auto

ipv6 address 10:3::2/64

ospfv3 11 ipv6 area 0

no mop enabled

no mop sysid

!

interface GigabitEthernet2

ip address 10.0.1.5 255.255.255.252

negotiation auto

ipv6 address 10:4::1/64

ospfv3 11 ipv6 area 0

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 ospfv3 11

!

address-family ipv6 unicast

router-id 4.4.4.4

exit-address-family

!

router ospf 1

router-id 4.4.4.4

network 10.0.1.0 0.0.0.3 area 0

network 10.0.1.4 0.0.0.3 area 0

network 192.168.4.0 0.0.0.255 area 0

!

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

!

control-plane

!

line con 0

stopbits 1

line vty 0 4

login

!

end

**show ip/ipv6 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

10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks

B 10.0.0.0/24 [20/3072] via 10.0.2.1, 00:15:18

B 10.0.1.0/24 [20/0] via 10.0.2.1, 00:15:18

C 10.0.2.0/24 is directly connected, GigabitEthernet0/0/1

L 10.0.2.2/32 is directly connected, GigabitEthernet0/0/1

C 10.0.3.0/24 is directly connected, GigabitEthernet0/0/0

L 10.0.3.1/32 is directly connected, GigabitEthernet0/0/0

O 10.0.4.0/24 [110/2] via 10.0.3.2, 00:15:33, GigabitEthernet0/0/0

B 192.168.1.0/24 [20/131072] via 10.0.2.1, 00:15:18

B 192.168.2.0/24 [20/130816] via 10.0.2.1, 00:15:18

B 192.168.3.0/24 [20/0] via 10.0.2.1, 00:15:18

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

C 192.168.4.0/24 is directly connected, Loopback0

L 192.168.4.1/32 is directly connected, Loopback0

192.168.5.0/32 is subnetted, 1 subnets

O 192.168.5.1 [110/2] via 10.0.3.2, 00:15:33, GigabitEthernet0/0/0

192.168.6.0/32 is subnetted, 1 subnets

O 192.168.6.1 [110/3] via 10.0.3.2, 00:15:33, GigabitEthernet0/0/0

R4#show ipv6 route

IPv6 Routing Table - default - 13 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

B 10:1::/64 [20/3072]

via FE80::227:90FF:FED4:F30, GigabitEthernet0/0/1

C 10:3::/64 [0/0]

via GigabitEthernet0/0/1, directly connected

L 10:3::2/128 [0/0]

via GigabitEthernet0/0/1, receive

C 10:4::/64 [0/0]

via GigabitEthernet0/0/0, directly connected

L 10:4::1/128 [0/0]

via GigabitEthernet0/0/0, receive

O 10:5::/64 [110/2]

via FE80::B6A8:B9FF:FE01:B5A1, GigabitEthernet0/0/0

B 100:1::/64 [20/131072]

via FE80::227:90FF:FED4:F30, GigabitEthernet0/0/1

B 100:2::/64 [20/130816]

via FE80::227:90FF:FED4:F30, GigabitEthernet0/0/1

C 100:4::/64 [0/0]

via Loopback0, directly connected

L 100:4::1/128 [0/0]

via Loopback0, receive

O 100:5::1/128 [110/1]

via FE80::B6A8:B9FF:FE01:B5A1, GigabitEthernet0/0/0

O 100:6::1/128 [110/2]

via FE80::B6A8:B9FF:FE01:B5A1, GigabitEthernet0/0/0

L FF00::/8 [0/0]

via Null0, receive

**show ip/ipv6 protocols**

R4#show ip protocols

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "application"

Sending updates every 0 seconds

Invalid after 0 seconds, hold down 0, flushed after 0

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Maximum path: 32

Routing for Networks:

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 4)

Routing Protocol is "ospf 1"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 4.4.4.4

Number of areas in this router is 1. 1 normal 0 stub 0 nssa

Maximum path: 4

Routing for Networks:

10.0.1.0 0.0.0.3 area 0

10.0.1.4 0.0.0.3 area 0

192.168.4.0 0.0.0.255 area 0

Routing Information Sources:

Gateway Distance Last Update

5.5.5.5 110 00:02:12

3.3.3.3 110 00:02:13

Distance: (default is 110)

R4#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "application"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "ospf 11"

Router ID 4.4.4.4

Number of areas: 1 normal, 0 stub, 0 nssa

Interfaces (Area 0):

Loopback0

GigabitEthernet2

GigabitEthernet1

Redistribution:

None

**Router 5**

**show run**

R5#show run

Building configuration...

Current configuration : 4529 bytes

!

! Last configuration change at 16:02:33 UTC Fri Jan 28 2022

!

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 R5

!

boot-start-marker

boot-end-marker

!

no aaa new-model

!

login on-success log

!

subscriber templating

!

ipv6 unicast-routing

multilink bundle-name authenticated

!

crypto pki trustpoint TP-self-signed-2979605039

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-2979605039

revocation-check none

rsakeypair TP-self-signed-2979605039

!

crypto pki certificate chain TP-self-signed-2979605039

certificate self-signed 01

30820330 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

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

69666963 6174652D 32393739 36303530 3339301E 170D3231 31323032 31383237

33315A17 0D333030 31303130 30303030 305A3031 312F302D 06035504 03132649

4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D32 39373936

30353033 39308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201

0A028201 0100A139 81AA6382 1360562A FCA73149 05108E6C 0FA5D86F 3B6B6E33

F585A4C6 D5896A04 7E2AA2BE 53AF509D 1D0BA9A1 DE79D5C9 8E8D8BDF 4377DCEB

EC730BAE EFFCDD3D 012303E0 BE2C139E 8A3ECE7F 0B14EBF5 A9E1B46D F8ED0528

915A5A95 4D940588 E760AD29 90F5E449 59D44EDD DE593599 D7744A6C DC0AD45A

FCCC6329 043CF5CB 2D4A4F88 0E70C572 9A8F77D5 10CB5699 E9EC07AD A88CD9C6

059E3A91 2496D631 7692CD6D 89AA82DF 99570930 B194C9EA FAF13A89 B5C061ED

A0F309D9 08DD1400 0CB83238 9B1F6F0B 02B13FBD CDDDBBCF 44902FB7 912871B3

75957D16 38377414 A7AB380E 035D1169 7C36D8F7 53D03CC7 B57C465A 89F4C021

C51AC1D7 09E70203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF

301F0603 551D2304 18301680 14A7B1EF 3F1A2FE9 05069C81 CDFB02FB 99C9B9C7

54301D06 03551D0E 04160414 A7B1EF3F 1A2FE905 069C81CD FB02FB99 C9B9C754

300D0609 2A864886 F70D0101 05050003 82010100 21D32C83 44B9238B DB885DE2

A9050085 4CB1749B 6172853C 884F6BEB 97717CD9 061B7ABF 3D8D0C47 31466085

0E517137 4CAE8DC8 56EDEA80 338B45EF CC0E5783 36F04326 90DB2203 67FE3EBD

C218E563 5DDEB30E B9C8A5D2 B7417532 6CCFF874 E38E4741 E66B741F 2DC7CAF9

040166E2 5671FC34 C2DBEEDA A407FA46 E0AE456E 150B7539 6B72B5C3 76B5FB15

11C165DD 76484EDC 9375203A C781219C 6E9EED35 98AFA47E 4B1541BC 7169DF06

DD0FB05D 7D4F7DBC 54918757 3853F506 BF5B0C35 9D02D5E8 A87BACB3 5F0E7BD9

D90DB34C 818E3712 74C63DB4 996E3A11 4FBC4351 0208DE23 6F322F82 32CCC8B2

0B1A77D5 80A8D0A7 40F9B4CD 450146C3 E7507186

quit

!

license udi pid CSR1000V sn 90LGOYKMJ18

no license smart enable

diagnostic bootup level minimal

!

spanning-tree extend system-id

!

redundancy

!

interface Loopback0

ip address 192.168.5.1 255.255.255.0

ipv6 address 100:5::1/64

ospfv3 11 ipv6 area 0

!

interface GigabitEthernet1

ip address 10.0.1.6 255.255.255.252

negotiation auto

ipv6 address 10:4::2/64

ospfv3 11 ipv6 area 0

no mop enabled

no mop sysid

!

interface GigabitEthernet2

ip address 10.0.2.5 255.255.255.252

negotiation auto

ipv6 address 10:5::1/64

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 ospfv3 11

!

address-family ipv6 unicast

router-id 5.5.5.5

exit-address-family

!

router ospf 1

router-id 5.5.5.5

redistribute bgp 11 subnets

network 10.0.1.4 0.0.0.3 area 0

network 10.0.2.4 0.0.0.3 area 0

network 192.168.5.0 0.0.0.255 area 0

!

router bgp 11

bgp log-neighbor-changes

neighbor 10:5::2 remote-as 12

neighbor 100:3::1 remote-as 11

neighbor 100:3::1 update-source Loopback0

neighbor 10.0.2.6 remote-as 12

neighbor 192.168.3.1 remote-as 11

neighbor 192.168.3.1 update-source Loopback0

!

address-family ipv4

network 192.168.5.0

no neighbor 10:5::2 activate

no neighbor 100:3::1 activate

neighbor 10.0.2.6 activate

neighbor 192.168.3.1 activate

exit-address-family

!

address-family ipv6

neighbor 10:5::2 activate

neighbor 100:3::1 activate

exit-address-family

!

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

!

control-plane

!

line con 0

stopbits 1

line vty 0 4

login

!

end

**show ip/ipv6 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

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

O E2 10.0.0.0/30 [110/1] via 10.0.1.5, 00:53:09, GigabitEthernet1

B 10.0.0.4/30 [20/0] via 10.0.2.6, 00:53:11

O 10.0.1.0/30 [110/2] via 10.0.1.5, 00:53:53, GigabitEthernet1

C 10.0.1.4/30 is directly connected, GigabitEthernet1

L 10.0.1.6/32 is directly connected, GigabitEthernet1

O 10.0.2.0/30 [110/3] via 10.0.1.5, 00:53:53, GigabitEthernet1

C 10.0.2.4/30 is directly connected, GigabitEthernet2

L 10.0.2.5/32 is directly connected, GigabitEthernet2

O E2 192.168.1.0/24 [110/1] via 10.0.1.5, 00:53:09, GigabitEthernet1

O E2 192.168.2.0/24 [110/1] via 10.0.1.5, 00:53:09, GigabitEthernet1

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

B 192.168.3.0/24 [200/0] via 192.168.3.1, 00:53:09

O 192.168.3.1/32 [110/3] via 10.0.1.5, 00:53:53, GigabitEthernet1

192.168.4.0/32 is subnetted, 1 subnets

O 192.168.4.1 [110/2] via 10.0.1.5, 00:53:53, GigabitEthernet1

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

C 192.168.5.0/24 is directly connected, Loopback0

L 192.168.5.1/32 is directly connected, Loopback0

B 192.168.6.0/24 [20/0] via 10.0.2.6, 00:53:11

B 192.168.7.0/24 [20/130816] via 10.0.2.6, 00:53:11

R5#show ipv6 route

IPv6 Routing Table - default - 15 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, RL - RPL, 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

OE2 10:1::/64 [110/1]

via FE80::E95:44FF:FEEE:1, GigabitEthernet1

B 10:2::/64 [200/0]

via 100:3::1

O 10:3::/64 [110/2]

via FE80::E95:44FF:FEEE:1, GigabitEthernet1

C 10:4::/64 [0/0]

via GigabitEthernet1, directly connected

L 10:4::2/128 [0/0]

via GigabitEthernet1, receive

C 10:5::/64 [0/0]

via GigabitEthernet2, directly connected

L 10:5::1/128 [0/0]

via GigabitEthernet2, receive

OE2 100:1::/64 [110/1]

via FE80::E95:44FF:FEEE:1, GigabitEthernet1

OE2 100:2::/64 [110/1]

via FE80::E95:44FF:FEEE:1, GigabitEthernet1

B 100:3::/64 [200/0]

via 100:3::1

O 100:3::1/128 [110/2]

via FE80::E95:44FF:FEEE:1, GigabitEthernet1

O 100:4::1/128 [110/1]

via FE80::E95:44FF:FEEE:1, GigabitEthernet1

C 100:5::/64 [0/0]

via Loopback0, directly connected

L 100:5::1/128 [0/0]

via Loopback0, receive

L FF00::/8 [0/0]

via Null0, receive

**show ip/ipv6 protocols**

R5#show ip protocols

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "application"

Sending updates every 0 seconds

Invalid after 0 seconds, hold down 0, flushed after 0

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Maximum path: 32

Routing for Networks:

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 4)

Routing Protocol is "ospf 1"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 5.5.5.5

It is an autonomous system boundary router

Redistributing External Routes from,

bgp 11, includes subnets in redistribution

Number of areas in this router is 1. 1 normal 0 stub 0 nssa

Maximum path: 4

Routing for Networks:

10.0.1.4 0.0.0.3 area 0

10.0.2.4 0.0.0.3 area 0

192.168.5.0 0.0.0.255 area 0

Routing Information Sources:

Gateway Distance Last Update

3.3.3.3 110 00:02:49

4.4.4.4 110 00:03:40

Distance: (default is 110)

Routing Protocol is "bgp 11"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

IGP synchronization is disabled

Automatic route summarization is disabled

Neighbor(s):

Address FiltIn FiltOut DistIn DistOut Weight RouteMap

10.0.2.6

192.168.3.1

Maximum path: 1

Routing Information Sources:

Gateway Distance Last Update

10.0.2.6 20 00:02:49

192.168.3.1 200 00:02:49

Distance: external 20 internal 200 local 200

R5#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "application"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "ospf 11"

Router ID 5.5.5.5

Number of areas: 1 normal, 0 stub, 0 nssa

Interfaces (Area 0):

Loopback0

GigabitEthernet1

Redistribution:

None

IPv6 Routing Protocol is "bgp 11"

IGP synchronization is disabled

Redistribution:

None

Neighbor(s):

Address FiltIn FiltOut Weight RoutemapIn RoutemapOut

10:5::2

100:3::1

Distance:

**show ip bgp**

R5#show ip bgp

BGP table version is 11, local router ID is 192.168.5.1

Status codes: s suppressed, d damped, h history, \* valid, > best, i - internal,

r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,

x best-external, a additional-path, c RIB-compressed,

t secondary path, L long-lived-stale,

Origin codes: i - IGP, e - EGP, ? - incomplete

RPKI validation codes: V valid, I invalid, N Not found

Network Next Hop Metric LocPrf Weight Path

r>i 10.0.0.0/30 10.0.2.1 0 100 0 10 ?

\*> 10.0.0.4/30 10.0.2.6 0 0 12 ?

r>i 10.0.2.0/30 10.0.2.1 0 100 0 10 ?

r> 10.0.2.4/30 10.0.2.6 0 0 12 ?

r>i 192.168.1.0 10.0.2.1 130816 100 0 10 ?

r>i 192.168.2.0 10.0.2.1 0 100 0 10 ?

\*>i 192.168.3.0 192.168.3.1 0 100 0 i

\*> 192.168.5.0 0.0.0.0 0 32768 i

\*> 192.168.6.0 10.0.2.6 0 0 12 ?

\*> 192.168.7.0 10.0.2.6 130816 0 12 ?

**show ip bgp summary**

R5#show ip bgp summary

BGP router identifier 192.168.5.1, local AS number 11

BGP table version is 11, main routing table version 11

10 network entries using 2480 bytes of memory

10 path entries using 1360 bytes of memory

6/6 BGP path/bestpath attribute entries using 1680 bytes of memory

2 BGP AS-PATH entries using 48 bytes of memory

0 BGP route-map cache entries using 0 bytes of memory

0 BGP filter-list cache entries using 0 bytes of memory

BGP using 5568 total bytes of memory

BGP activity 15/0 prefixes, 15/0 paths, scan interval 60 secs

Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd

10.0.2.6 4 12 9 11 11 0 0 00:04:05 4

192.168.3.1 4 11 10 10 11 0 0 00:03:45 5

**Router 6**

**show run**

R6#show run

Building configuration...

Current configuration : 4372 bytes

!

! Last configuration change at 16:04:18 UTC Fri Jan 28 2022

!

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 R6

!

boot-start-marker

boot-end-marker

!

no aaa new-model

!

login on-success log

!

subscriber templating

!

ipv6 unicast-routing

multilink bundle-name authenticated

!

crypto pki trustpoint TP-self-signed-1231818338

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-1231818338

revocation-check none

rsakeypair TP-self-signed-1231818338

!

crypto pki certificate chain TP-self-signed-1231818338

certificate self-signed 01

30820330 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

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

69666963 6174652D 31323331 38313833 3338301E 170D3231 31323032 31383237

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

4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D31 32333138

31383333 38308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201

0A028201 0100B95B 8AB69695 F52F1439 D37CCEB7 7422F22C 4849F98F 09AC7785

05DD562C 4CECCCDD EC73A0FE C00D28AE 938B625D 267955D7 C69C2790 A476C210

A9C23059 29FB6C1C 388B8588 8E6AE913 4493651C 750F64F0 A6AD8B5D 77978577

9F5C4165 CACADD31 3EB20009 583DE085 D02D9B7B A2C47C69 A1B05AC3 7CC383FA

4A7AB9A7 28E79C46 718F9331 2C730B0D 36300CEB 7E6E0BA4 1809B5A2 4D6794B8

455149B6 FC04A8DF 245EB7E5 3D0D486B C38C5ED9 48B53DD3 75559FD7 EB486B41

3C4FEAFD 69314353 D12F9CAF AEFCCB85 86984D5F 89EA34F1 FF765BF8 F5C0D106

CBFCE2B6 49AB9B63 53AC6941 E4EF8DBE 4364E338 EDAADD9B 7AA9FA9A BB8D56FB

40D473E1 7AA90203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF

301F0603 551D2304 18301680 14955751 E3AF2659 3E2624F7 6E4A3C58 D1194824

74301D06 03551D0E 04160414 955751E3 AF26593E 2624F76E 4A3C58D1 19482474

300D0609 2A864886 F70D0101 05050003 82010100 37474B1B 13CBDBE4 677F06C1

CCD263CC 2813584E F4C1BBA8 31B3FC8B 690131C5 6F27EED0 D6D279A0 F35098D2

A72FB6EC 0B212839 1D629CEF FB470010 3FB04731 3D9CDC88 00E12A09 CE27F717

78C8F671 37410F52 3D9FEE79 D6750657 A6038E6E 707484A2 687ECD7D 2A17D8DD

6D3AAFCC 07671A3D 97D71F5D 1A3A73F6 1AFA099F FD835ECB 9F8367E3 B2573769

DF20BAC7 EAA0E035 91C5F057 9F2D1DCA 6623C77B 7E96983C 03E808FF BA2B3ED4

5AA6FB71 7294E0DF 8748D303 6C31687E 62BF87ED 56AAC961 B5D2D872 44C3FB8B

DA1A42D0 BECFB591 71C8060A 0E440B2C D05AAA3D 0F6F6B66 6314B942 87FF3D3A

0048F7C2 BB1F54A0 B2028182 002A8C12 9C66776D

quit

!

license udi pid CSR1000V sn 98GB0MFTGTD

no license smart enable

diagnostic bootup level minimal

!

spanning-tree extend system-id

!

redundancy

!

interface Loopback0

ip address 192.168.6.1 255.255.255.0

ipv6 address 100:6::1/64

ipv6 eigrp 12

!

interface GigabitEthernet1

ip address 10.0.0.6 255.255.255.252

negotiation auto

ipv6 address 10:6::1/64

ipv6 eigrp 12

no mop enabled

no mop sysid

!

interface GigabitEthernet2

ip address 10.0.2.6 255.255.255.252

negotiation auto

ipv6 address 10:5::2/64

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 eigrp 2

network 10.0.0.4 0.0.0.3

network 10.0.2.4 0.0.0.3

network 192.168.6.0

redistribute bgp 12 metric 10000 100 255 240 65535

!

router bgp 12

bgp log-neighbor-changes

neighbor 10:5::1 remote-as 11

neighbor 10.0.2.5 remote-as 11

!

address-family ipv4

redistribute eigrp 2

no neighbor 10:5::1 activate

neighbor 10.0.2.5 activate

exit-address-family

!

address-family ipv6

neighbor 10:5::1 activate

exit-address-family

!

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

!

ipv6 router eigrp 12

eigrp router-id 6.6.6.6

redistribute bgp 12 metric 10000 100 254 254 65535

!

ipv6 router eigrp 2

eigrp router-id 6.6.6.6

redistribute bgp 12 metric 10000 100 254 254 65535

redistribute connected

!

control-plane

!

line con 0

stopbits 1

line vty 0 4

login

!

end

**show ip/ipv6 route**

R6#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

B 10.0.0.0/30 [20/0] via 10.0.2.5, 00:53:10

C 10.0.0.4/30 is directly connected, GigabitEthernet1

L 10.0.0.6/32 is directly connected, GigabitEthernet1

B 10.0.2.0/30 [20/0] via 10.0.2.5, 00:53:10

C 10.0.2.4/30 is directly connected, GigabitEthernet2

L 10.0.2.6/32 is directly connected, GigabitEthernet2

B 192.168.1.0/24 [20/0] via 10.0.2.5, 00:53:10

B 192.168.2.0/24 [20/0] via 10.0.2.5, 00:53:10

B 192.168.3.0/24 [20/0] via 10.0.2.5, 00:53:10

B 192.168.5.0/24 [20/0] via 10.0.2.5, 00:53:41

192.168.6.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.6.0/24 is directly connected, Loopback0

L 192.168.6.1/32 is directly connected, Loopback0

D 192.168.7.0/24 [90/130816] via 10.0.0.5, 00:54:58, GigabitEthernet1

R6#show ipv6 route

IPv6 Routing Table - default - 13 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, RL - RPL, 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

B 10:1::/64 [20/0]

via FE80::E1D:10FF:FE5D:1, GigabitEthernet2

B 10:2::/64 [20/0]

via FE80::E1D:10FF:FE5D:1, GigabitEthernet2

C 10:5::/64 [0/0]

via GigabitEthernet2, directly connected

L 10:5::2/128 [0/0]

via GigabitEthernet2, receive

C 10:6::/64 [0/0]

via GigabitEthernet1, directly connected

L 10:6::1/128 [0/0]

via GigabitEthernet1, receive

B 100:1::/64 [20/0]

via FE80::E1D:10FF:FE5D:1, GigabitEthernet2

B 100:2::/64 [20/0]

via FE80::E1D:10FF:FE5D:1, GigabitEthernet2

B 100:3::/64 [20/0]

via FE80::E1D:10FF:FE5D:1, GigabitEthernet2

C 100:6::/64 [0/0]

via Loopback0, directly connected

L 100:6::1/128 [0/0]

via Loopback0, receive

D 100:7::/64 [90/130816]

via FE80::EAB:E1FF:FE01:0, GigabitEthernet1

L FF00::/8 [0/0]

via Null0, receive

**show ip/ipv6 protocols**

R6#show ip protocols

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "application"

Sending updates every 0 seconds

Invalid after 0 seconds, hold down 0, flushed after 0

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Maximum path: 32

Routing for Networks:

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 4)

Routing Protocol is "eigrp 2"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Default networks flagged in outgoing updates

Default networks accepted from incoming updates

Redistributing: bgp 12

EIGRP-IPv4 Protocol for AS(2)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 192.168.6.1

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 4

Maximum hopcount 100

Maximum metric variance 1

Automatic Summarization: disabled

Maximum path: 4

Routing for Networks:

10.0.0.4/30

10.0.2.4/30

192.168.6.0

Routing Information Sources:

Gateway Distance Last Update

10.0.0.5 90 00:04:46

Distance: internal 90 external 170

Routing Protocol is "bgp 12"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

IGP synchronization is disabled

Automatic route summarization is disabled

Redistributing: eigrp 2

Neighbor(s):

Address FiltIn FiltOut DistIn DistOut Weight RouteMap

10.0.2.5

Maximum path: 1

Routing Information Sources:

Gateway Distance Last Update

10.0.2.5 20 00:03:33

Distance: external 20 internal 200 local 200

R6#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "application"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "bgp 12"

IGP synchronization is disabled

Redistribution:

None

Neighbor(s):

Address FiltIn FiltOut Weight RoutemapIn RoutemapOut

10:5::1

Distance:

IPv6 Routing Protocol is "eigrp 12"

EIGRP-IPv6 Protocol for AS(12)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 6.6.6.6

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 16

Maximum hopcount 100

Maximum metric variance 1

Interfaces:

Loopback0

GigabitEthernet1

Redistribution:

Redistributing protocol bgp 12 with metric 10000 100 254 254 65535

**show ip bgp**

R6#show ip bgp

BGP table version is 11, local router ID is 192.168.6.1

Status codes: s suppressed, d damped, h history, \* valid, > best, i - internal,

r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,

x best-external, a additional-path, c RIB-compressed,

t secondary path, L long-lived-stale,

Origin codes: i - IGP, e - EGP, ? - incomplete

RPKI validation codes: V valid, I invalid, N Not found

Network Next Hop Metric LocPrf Weight Path

\*> 10.0.0.0/30 10.0.2.5 0 11 10 ?

\*> 10.0.0.4/30 0.0.0.0 0 32768 ?

\*> 10.0.2.0/30 10.0.2.5 0 11 10 ?

\*> 10.0.2.4/30 0.0.0.0 0 32768 ?

\*> 192.168.1.0 10.0.2.5 0 11 10 ?

\*> 192.168.2.0 10.0.2.5 0 11 10 ?

\*> 192.168.3.0 10.0.2.5 0 11 i

\*> 192.168.5.0 10.0.2.5 0 0 11 i

\*> 192.168.6.0 0.0.0.0 0 32768 ?

\*> 192.168.7.0 10.0.0.5 130816 32768 ?

**show ip bgp summary**

R6#show ip bgp summary

BGP router identifier 192.168.6.1, local AS number 12

BGP table version is 11, main routing table version 11

10 network entries using 2480 bytes of memory

10 path entries using 1360 bytes of memory

5/5 BGP path/bestpath attribute entries using 1400 bytes of memory

2 BGP AS-PATH entries using 64 bytes of memory

0 BGP route-map cache entries using 0 bytes of memory

0 BGP filter-list cache entries using 0 bytes of memory

BGP using 5304 total bytes of memory

BGP activity 15/0 prefixes, 15/0 paths, scan interval 60 secs

Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd

10.0.2.5 4 11 12 10 11 0 0 00:04:54 6

**Router 7**

**show run**

R7#show run

Building configuration...

Current configuration : 3839 bytes

!

! Last configuration change at 15:55:56 UTC Fri Jan 28 2022

!

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 R7

!

boot-start-marker

boot-end-marker

!

no aaa new-model

!

login on-success log

!

subscriber templating

!

ipv6 unicast-routing

multilink bundle-name authenticated

!

crypto pki trustpoint TP-self-signed-330298951

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-330298951

revocation-check none

rsakeypair TP-self-signed-330298951

!

!

crypto pki certificate chain TP-self-signed-330298951

certificate self-signed 01

3082032E 30820216 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

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

69666963 6174652D 33333032 39383935 31301E17 0D323131 32303231 38323930

325A170D 33303031 30313030 30303030 5A303031 2E302C06 03550403 1325494F

532D5365 6C662D53 69676E65 642D4365 72746966 69636174 652D3333 30323938

39353130 82012230 0D06092A 864886F7 0D010101 05000382 010F0030 82010A02

82010100 8A239379 7A68EC29 07C99DBE F695FBCE 33BD9150 09991018 AF04E93A

AAA44175 7D8B67B2 DD2432E3 90E82630 68332BEF A90FE802 5AA84BCC 5290B060

03CDA6DC E4FC7C2F 6EE15FDD 8606F796 D6B99B50 5D6328F5 A43FF0FA 7C0DDDF1

42454621 BC7F6EB1 CBE6FBDE 50C7C1C0 F28E959B C9748CA4 57E6D7DC A91BBACE

C4D5B478 41E3EE68 1895B3C1 EE330F9F 30816D7C 9064AE39 1722539F 0750D1F1

26F077BB 09302B69 F369795C 265FDF7C A5974FD8 7F8DA55C 66EB3FB8 598F5F24

129B125F 1CC6DFF7 44FA0172 A5631AF1 337C00F7 3ACE36BA 56FD2B75 5B6E028E

716CBD08 185B6B49 4D001D65 A0D6D093 0B71FE00 8F856792 971F5AEC ADCA6498

3C0EDA67 02030100 01A35330 51300F06 03551D13 0101FF04 05300301 01FF301F

0603551D 23041830 16801419 528A450D B0AE52F4 BA5A4DD2 7F1CD265 A33C7C30

1D060355 1D0E0416 04141952 8A450DB0 AE52F4BA 5A4DD27F 1CD265A3 3C7C300D

06092A86 4886F70D 01010505 00038201 01007D97 0C0E76BA 356BF144 6FFA2ED8

9893C16D D970260B E88363F3 8F0B2434 EEA6A1DA D52AD632 512D50BE 79ADA2E6

ADE92D3E 73D079A0 0CC08EB7 241A2013 B6EAF356 BBD4D7E8 CD3B5036 9316E18A

41E59DE7 E2CF0C2E CDD4DF5A 64C502A7 0F856E06 083DDC8B A8A74E78 42498AA9

6042211A 3BE939A8 BB25CB49 757EE2CA 01807D50 F85CE50B 6C0337C9 0DDD8473

C26E1A7B F6F08085 2D3108E7 C495A7A2 ABB74CC7 CEA3CABA F9E4AAC7 FCC6E159

14A4295A 237657E5 5FF78D8B EC25C464 FC3888E6 F29B1884 BF1F84FE 9E4B9299

E6545242 0C335E7B 996340CF C0DB3B49 9B185C9F 69D6C689 D0EAF6D3 8411BFEE

8ED72288 A9BF2FCD 9448BA12 14E431F0 A937

quit

!

license udi pid CSR1000V sn 9EWKOY7WCO0

no license smart enable

diagnostic bootup level minimal

!

spanning-tree extend system-id

!

redundancy

!

interface Loopback0

ip address 192.168.7.1 255.255.255.0

ipv6 address 100:7::1/64

ipv6 eigrp 12

!

interface GigabitEthernet1

ip address 10.0.0.5 255.255.255.252

negotiation auto

ipv6 address 10:6::2/64

ipv6 eigrp 12

no mop enabled

no mop sysid

!

interface GigabitEthernet2

no ip address

shutdown

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 eigrp 2

network 10.0.0.4 0.0.0.3

network 192.168.7.0

!

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

ipv6 router eigrp 12

eigrp router-id 7.7.7.7

!

ipv6 router eigrp 2

eigrp router-id 7.7.7.7

redistribute connected

!

control-plane

!

line con 0

stopbits 1

line vty 0 4

login

!

end

**show ip/ipv6 route**

R7#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

D EX 10.0.0.0/30 [170/281856] via 10.0.0.6, 00:53:53, GigabitEthernet1

C 10.0.0.4/30 is directly connected, GigabitEthernet1

L 10.0.0.5/32 is directly connected, GigabitEthernet1

D EX 10.0.2.0/30 [170/281856] via 10.0.0.6, 00:53:53, GigabitEthernet1

D 10.0.2.4/30 [90/3072] via 10.0.0.6, 00:55:40, GigabitEthernet1

D EX 192.168.1.0/24 [170/281856] via 10.0.0.6, 00:53:53, GigabitEthernet1

D EX 192.168.2.0/24 [170/281856] via 10.0.0.6, 00:53:53, GigabitEthernet1

D EX 192.168.3.0/24 [170/281856] via 10.0.0.6, 00:53:53, GigabitEthernet1

D EX 192.168.5.0/24 [170/281856] via 10.0.0.6, 00:54:24, GigabitEthernet1

D 192.168.6.0/24 [90/130816] via 10.0.0.6, 00:55:40, GigabitEthernet1

192.168.7.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.7.0/24 is directly connected, Loopback0

L 192.168.7.1/32 is directly connected, Loopback0

R7#show ipv6 route

IPv6 Routing Table - default - 11 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, RL - RPL, 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

EX 10:1::/64 [170/281856]

via FE80::E64:D0FF:FEDF:0, GigabitEthernet1

EX 10:2::/64 [170/281856]

via FE80::E64:D0FF:FEDF:0, GigabitEthernet1

C 10:6::/64 [0/0]

via GigabitEthernet1, directly connected

L 10:6::2/128 [0/0]

via GigabitEthernet1, receive

EX 100:1::/64 [170/281856]

via FE80::E64:D0FF:FEDF:0, GigabitEthernet1

EX 100:2::/64 [170/281856]

via FE80::E64:D0FF:FEDF:0, GigabitEthernet1

EX 100:3::/64 [170/281856]

via FE80::E64:D0FF:FEDF:0, GigabitEthernet1

D 100:6::/64 [90/130816]

via FE80::E64:D0FF:FEDF:0, GigabitEthernet1

C 100:7::/64 [0/0]

via Loopback0, directly connected

L 100:7::1/128 [0/0]

via Loopback0, receive

L FF00::/8 [0/0]

via Null0, receive

**show ip/ipv6 protocols**

R7#show ip protocols

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "application"

Sending updates every 0 seconds

Invalid after 0 seconds, hold down 0, flushed after 0

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Maximum path: 32

Routing for Networks:

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 4)

Routing Protocol is "eigrp 2"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Default networks flagged in outgoing updates

Default networks accepted from incoming updates

EIGRP-IPv4 Protocol for AS(2)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 192.168.7.1

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 4

Maximum hopcount 100

Maximum metric variance 1

Automatic Summarization: disabled

Maximum path: 4

Routing for Networks:

10.0.0.4/30

192.168.7.0

Routing Information Sources:

Gateway Distance Last Update

10.0.0.6 90 00:04:10

Distance: internal 90 external 170

R7#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "application"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "eigrp 12"

EIGRP-IPv6 Protocol for AS(12)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 7.7.7.7

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 16

Maximum hopcount 100

Maximum metric variance 1

Interfaces:

Loopback0

GigabitEthernet1

Redistribution:

None

**Problems**

A problem I faced was that some of my BGP routers didn’t have IPv6 routes to networks directly connected to the other BGP router. I concluded that because the only routes missing were the ones directly connected to the other BGP router, the problem was probably that BGP was unable to communicate with the directly connected routes. After looking for different ways to fix this, I ran the **redistribute connected** command so BGP could send its directly connected routes to the other router with BGP. After running this command, I checked my BGP routers’ routing tables and they were fixed, and when I looked at my IPv6 routes for the middle routers, they were there.

**Conclusion**

iBGP is an extension of the BGP routing protocol and is used to provide more information to your internal routers.. To configure eBGP you need to use BGP specific commands such as **router bgp <AS Number>** and **redistribute <protocol> <protocol number>.** There are also some BGP specific show commands that are helpful to verify BGP is working correctly after configuring it. These include **show ip bgp** and **show ip bgp summary.** I was able to configure an eBGP network that enabled communications between two separate autonomous systems, on 6 Cisco 4321 routers. Although I had some problems with my IPv6 routes, I was able to troubleshoot them to get BGP to work. Through this lab, I learned how to configure BGP in both ipv6 and ipv6, as well as develop a deeper understanding of everything needed to make it work.

**Teacher Signoff Page of Lab Completed**

**Evan Choi has completed this BGP Lab**

**December 3, 2021**

