Packet Tracer OSPF, EIGRP and eBGP Redistribution in IPv6

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Purpose

The purpose of this lab was to set up OSPF, EIGRP and BGP in IPv6 and redistribute between the protocols. I learned how to use the address-family command to set up BGP in IPv6 as well as enforced my ability to set up OSPF and EIGRP in IPv6. I also practiced my troubleshooting skills to solve problems throughout the lab.

Background Information

IPv6 Border Gateway Protocol (IPv6 BGP) was created in 1995. BGP is an exterior gateway protocol that uses Autonomous Systems to exchange data across the internet. BGP uses various address families when communicating with other devices, and if multiprotocol extensions are present during peering, the BGP speaker will be able to advertise address family prefixes. These address family prefixes include, IPv4, IPv6, IPv4/IPv6 Virtual Private Networks and multicast BGP. In our lab we had to configure IPv6 eBGP through link-local addresses on each device. BGP allows for having multiple paths to a given destination on a network. BGP enabled devices constantly update their routes as they find new best paths. All in all, BGP allows for devices to advertise IPv4 and IPv6 networks to other BGP neighbors and BGP allows you to control which routes are added to the routing table for effective traffic control.

Lab Summary

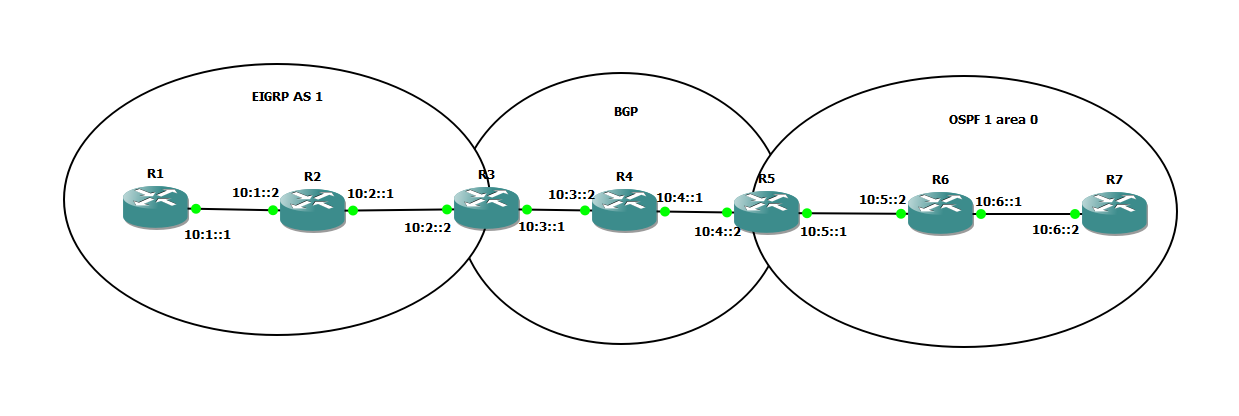
In GNS3 I set up 7 routers. Each router was connected via fast ethernet ports making for a total of 6 networks. The 6 networks were separated into 3 different routing protocols, OSPF, EIGRP, and BGP for a total of 2 networks per protocol. R3 and R5 were the border routers between protocols so they were set with redistribute commands to redistribute between protocols.

Lab Commands

* IPv6 Router OSPF: Indicates the beginning of the OSPFv3 configuration on the router
* Network area: Advertise the interfaces whose addresses fill in the specified network command
* Show IPv6 route: Displays the IPv6 configurations and routes between the interfaces and routers
* Interface: Allows you to configure an interface
* Redistribute OSPF: Redistributes OPSF to be used with other routing protocols
* Redistribute EIGRP: Redistributes EIGRP to be used with other routing protocols
* Redistribute BGP: Redistributes BGP to be used with other routing protocols
* Router BGP: Allows you to go into the BGP configuration on the router
* Address-family IPv6: Allows you to set up the IPv6 portion of BGP
* IPv6 Router EIGRP: Allows you to go into theIPv6 EIGRP configuration on the router

Network Diagram with IP’s

|  |  |  |  |
| --- | --- | --- | --- |
| R1 | F0/0 | 10:1::1/64 | AS 1 |
| R2 | F0/0 | 10:1::2/64 | AS 1 |
|  | F0/1 | 10:2::1/64 | AS 1 |
| R3 | F0/0 | 10:3::1/64 | BGP AS 1 |
|  | F0/1 | 10:2::2/64 | AS 1 |
| R4 | F0/0 | 10:3::2/64 | BGP AS 2 |
|  | F0/1 | 10:4::1/64 | BGP AS 2 |
| R5 | F0/0 | 10:5::1/64 | Area 0 |
|  | F0/1 | 10:4::2/64 | BGP AS 3 |
| R6 | F0/0 | 10:5::2/64 | Area 0 |
|  | F0/1 | 10:6::1/64 | Area 0 |
| R7 | F0/1 | 10:6::2/64 | Area 0 |



Configurations

Router 1

Show run

interface FastEthernet0/0

ipv6 address 10:1::1/64

ipv6 eigrp 1

ipv6 router eigrp 1

eigrp router-id 1.1.1.1

Show ipv6 route

C 10:1::/64 [0/0]

via FastEthernet0/0, directly connected

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

via FastEthernet0/0, receive

D 10:2::/64 [90/30720]

via FE80::C802:42FF:FE88:8, FastEthernet0/0

EX 10:4::/64 [170/286720]

via FE80::C802:42FF:FE88:8, FastEthernet0/0

EX 10:6::/64 [170/286720]

via FE80::C802:42FF:FE88:8, FastEthernet0/0

L FF00::/8 [0/0]

via Null0, receive

Show ipv6 eigrp interface

EIGRP-IPv6 Interfaces for AS(1)

Xmit Queue PeerQ Mean Pacing Time Multicast Pending

Interface Peers Un/Reliable Un/Reliable SRTT Un/Reliable Flow Timer Routes

Fa0/0 1 0/0 0/0 834 0/0 4128 0

Show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "eigrp 1"

EIGRP-IPv6 Protocol for AS(1)

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

NSF-aware route hold timer is 240

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:

FastEthernet0/0

Redistribution:

None

Router 2

Show run

interface FastEthernet0/0

ipv6 address 10:1::2/64

ipv6 eigrp 1

interface FastEthernet0/1

ipv6 address 10:2::1/64

ipv6 eigrp 1

ipv6 router eigrp 1

eigrp router-id 2.2.2.2

Show ipv6 route

C 10:1::/64 [0/0]

via FastEthernet0/0, directly connected

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

via FastEthernet0/0, receive

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

via FastEthernet0/1, directly connected

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

via FastEthernet0/1, receive

EX 10:4::/64 [170/284160]

via FE80::C803:3EFF:FEA4:6, FastEthernet0/1

EX 10:6::/64 [170/284160]

via FE80::C803:3EFF:FEA4:6, FastEthernet0/1

L FF00::/8 [0/0]

via Null0, receive

Show ipv6 eigrp interface

EIGRP-IPv6 Interfaces for AS(1)

Xmit Queue PeerQ Mean Pacing Time Multicast Pending

Interface Peers Un/Reliable Un/Reliable SRTT Un/Reliable Flow Timer Routes

Fa0/0 1 0/0 0/0 56 0/0 224 0

Fa0/1 1 0/0 0/0 1020 0/0 5044 0

Show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "eigrp 1"

EIGRP-IPv6 Protocol for AS(1)

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

NSF-aware route hold timer is 240

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:

FastEthernet0/0

FastEthernet0/1

Redistribution:

None

Router 3

Show run

interface FastEthernet0/0

ipv6 address 10:3::1/64

interface FastEthernet0/1

ipv6 address 10:2::2/64

ipv6 eigrp 1

router bgp 1

bgp router-id 3.3.3.3

bgp log-neighbor-changes

neighbor 10:3::2 remote-as 2

address-family ipv6

redistribute eigrp 1

network 10:3::/64

neighbor 10:3::2 activate

ipv6 router eigrp 1

eigrp router-id 3.3.3.3

redistribute bgp 1 metric 1000000 1000 255 20 4

Show ipv6 route

D 10:1::/64 [90/30720]

via FE80::C802:42FF:FE88:6, FastEthernet0/1

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

via FastEthernet0/1, directly connected

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

via FastEthernet0/1, receive

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

via FastEthernet0/0, directly connected

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

via FastEthernet0/0, receive

B 10:4::/64 [20/0]

via FE80::CE04:8EFF:FED4:0, FastEthernet0/0

B 10:6::/64 [20/0]

via FE80::CE04:8EFF:FED4:0, FastEthernet0/0

L FF00::/8 [0/0]

via Null0, receive

Show ipv6 eigrp interface

EIGRP-IPv6 Interfaces for AS(1)

Xmit Queue PeerQ Mean Pacing Time Multicast Pending

Interface Peers Un/Reliable Un/Reliable SRTT Un/Reliable Flow Timer Routes

Fa0/1 1 0/0 0/0 54 0/0 212 0

Show ipv6 protocols

EIGRP-IPv6 Interfaces for AS(1)

Xmit Queue PeerQ Mean Pacing Time Multicast Pending

Interface Peers Un/Reliable Un/Reliable SRTT Un/Reliable Flow Timer Routes

Fa0/1 1 0/0 0/0 54 0/0 212 0

R3#

R3#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "bgp 1"

IGP synchronization is disabled

Redistribution:

Redistributing protocol eigrp 1

Neighbor(s):

Address FiltIn FiltOut Weight RoutemapIn RoutemapOut

10:3::2

IPv6 Routing Protocol is "eigrp 1"

EIGRP-IPv6 Protocol for AS(1)

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

NSF-aware route hold timer is 240

Router-ID: 3.3.3.3

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 16

Maximum hopcount 100

Maximum metric variance 1

Interfaces:

FastEthernet0/1

Redistribution:

Redistributing protocol bgp 1 with metric 1000000 1000 255 20 4

Router 4

Show run

interface FastEthernet0/0

ipv6 address 10:3::2/64

interface FastEthernet0/1

ipv6 address 10:4::1/64

router bgp 2

no synchronization

bgp router-id 4.4.4.4

bgp log-neighbor-changes

neighbor 10:3::1 remote-as 1

neighbor 10:4::2 remote-as 3

no auto-summary

address-family ipv6

neighbor 10:3::1 activate

neighbor 10:4::2 activate

network 10:3::/64

network 10:4::/64

Show ipv6 route

B 10:1::/64 [20/30720]

via FE80::C803:3EFF:FEA4:8, FastEthernet0/0

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

via ::, FastEthernet0/0

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

via ::, FastEthernet0/0

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

via ::, FastEthernet0/1

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

via ::, FastEthernet0/1

B 10:6::/64 [20/2]

via FE80::CE05:41FF:FE24:1, FastEthernet0/1

L FE80::/10 [0/0]

via ::, Null0

L FF00::/8 [0/0]

via ::, Null0

Show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "static"

IPv6 Routing Protocol is "bgp 2"

IGP synchronization is disabled

Redistribution:

None

Neighbor(s):

Address FiltIn FiltOut Weight RoutemapIn RoutemapOut

10:3::1

10:4::2

IPv6 Routing Protocol is "bgp multicast"

IGP synchronization is disabled

Redistribution:

None

Neighbor(s):

Address FiltIn FiltOut Weight RoutemapIn RoutemapOut

10:3::1

10:4::2

Router 5

Show run

interface FastEthernet0/0

ipv6 address 10:5::1/64

ipv6 ospf 1 area 0

interface FastEthernet0/1

ipv6 address 10:4::2/64

router bgp 3

no synchronization

bgp router-id 5.5.5.5

bgp log-neighbor-changes

neighbor 10:4::1 remote-as 2

no auto-summary

address-family ipv6

neighbor 10:4::1 activate

network 10:4::2/64

redistribute ospf 1

no synchronization

exit-address-family

ipv6 router ospf 1

router-id 5.5.5.5

log-adjacency-changes

redistribute bgp 3 metric 1

Show ipv6 route

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

via FE80::CE04:8EFF:FED4:1, FastEthernet0/1

B 10:3::/64 [20/0]

via FE80::CE04:8EFF:FED4:1, FastEthernet0/1

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

via ::, FastEthernet0/1

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

via ::, FastEthernet0/1

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

via ::, FastEthernet0/0

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

via ::, FastEthernet0/0

O 10:6::/64 [110/2]

via FE80::CE06:3CFF:FE38:0, FastEthernet0/0

L FE80::/10 [0/0]

via ::, Null0

L FF00::/8 [0/0]

via ::, Null0

Show ipv6 ospf interface

FastEthernet0/0 is up, line protocol is up

Link Local Address FE80::CE05:41FF:FE24:0, Interface ID 4

Area 0, Process ID 1, Instance ID 0, Router ID 5.5.5.5

Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State BDR, Priority 1

Designated Router (ID) 6.6.6.6, local address FE80::CE06:3CFF:FE38:0

Backup Designated router (ID) 5.5.5.5, local address FE80::CE05:41FF:FE24:0

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:06

Index 1/1/1, flood queue length 0

Next 0x0(0)/0x0(0)/0x0(0)

Last flood scan length is 4, maximum is 4

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 6.6.6.6 (Designated Router)

Suppress hello for 0 neighbor(s)

Show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "static"

IPv6 Routing Protocol is "ospf 1"

Interfaces (Area 0):

FastEthernet0/0

Redistribution:

Redistributing protocol bgp 3 with metric 1

IPv6 Routing Protocol is "bgp 3"

IGP synchronization is disabled

Redistribution:

Redistributing protocol ospf 1

Neighbor(s):

Address FiltIn FiltOut Weight RoutemapIn RoutemapOut

10:4::1

IPv6 Routing Protocol is "bgp multicast"

IGP synchronization is disabled

Redistribution:

None

Neighbor(s):

Address FiltIn FiltOut Weight RoutemapIn RoutemapOut

10:4::1

Router 6

Show run

interface FastEthernet0/0

ipv6 address 10:5::2/64

ipv6 ospf 1 area 0

interface FastEthernet0/1

ipv6 address 10:6::1/64

ipv6 ospf 1 area 0

ipv6 router ospf 1

router-id 6.6.6.6

log-adjacency-changes

Show ipv6 route

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

via FE80::CE05:41FF:FE24:0, FastEthernet0/0

OE2 10:3::/64 [110/1]

via FE80::CE05:41FF:FE24:0, FastEthernet0/0

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

via ::, FastEthernet0/0

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

via ::, FastEthernet0/0

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

via ::, FastEthernet0/1

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

via ::, FastEthernet0/1

L FE80::/10 [0/0]

via ::, Null0

L FF00::/8 [0/0]

via ::, Null0

Show ipv6 ospf interface

FastEthernet0/1 is up, line protocol is up

Link Local Address FE80::CE06:3CFF:FE38:1, Interface ID 5

Area 0, Process ID 1, Instance ID 0, Router ID 6.6.6.6

Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State BDR, Priority 1

Designated Router (ID) 7.7.7.7, local address FE80::CE07:3DFF:FEC8:1

Backup Designated router (ID) 6.6.6.6, local address FE80::CE06:3CFF:FE38:1

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:06

Index 1/2/2, flood queue length 0

Next 0x0(0)/0x0(0)/0x0(0)

Last flood scan length is 4, maximum is 4

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 7.7.7.7 (Designated Router)

Suppress hello for 0 neighbor(s)

FastEthernet0/0 is up, line protocol is up

Link Local Address FE80::CE06:3CFF:FE38:0, Interface ID 4

Area 0, Process ID 1, Instance ID 0, Router ID 6.6.6.6

Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 6.6.6.6, local address FE80::CE06:3CFF:FE38:0

Backup Designated router (ID) 5.5.5.5, local address FE80::CE05:41FF:FE24:0

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:09

Index 1/1/1, flood queue length 0

Next 0x0(0)/0x0(0)/0x0(0)

Last flood scan length is 4, maximum is 4

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 5.5.5.5 (Backup Designated Router)

Suppress hello for 0 neighbor(s)

Show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "static"

IPv6 Routing Protocol is "ospf 1"

Interfaces (Area 0):

FastEthernet0/1

FastEthernet0/0

Redistribution:

None

Router 7

Show run

interface FastEthernet0/1

ipv6 address 10:6::2/64

ipv6 ospf 1 area 0

ipv6 router ospf 1

router-id 7.7.7.7

log-adjacency-changes

Show ipv6 route

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

via FE80::CE06:3CFF:FE38:1, FastEthernet0/1

OE2 10:3::/64 [110/1]

via FE80::CE06:3CFF:FE38:1, FastEthernet0/1

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

via FE80::CE06:3CFF:FE38:1, FastEthernet0/1

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

via ::, FastEthernet0/1

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

via ::, FastEthernet0/1

L FE80::/10 [0/0]

via ::, Null0

L FF00::/8 [0/0]

via ::, Null0

Show ipv6 ospf interface

FastEthernet0/1 is up, line protocol is up

Link Local Address FE80::CE07:3DFF:FEC8:1, Interface ID 5

Area 0, Process ID 1, Instance ID 0, Router ID 7.7.7.7

Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 7.7.7.7, local address FE80::CE07:3DFF:FEC8:1

Backup Designated router (ID) 6.6.6.6, local address FE80::CE06:3CFF:FE38:1

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:04

Index 1/1/1, flood queue length 0

Next 0x0(0)/0x0(0)/0x0(0)

Last flood scan length is 0, maximum is 4

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 6.6.6.6 (Backup Designated Router)

Suppress hello for 0 neighbor(s)

Show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "static"

IPv6 Routing Protocol is "ospf 1"

Interfaces (Area 0):

FastEthernet0/1

Redistribution:

None

Problems

One problem I faced was I forgot to add router-ids to each of the routing protocols on every device. This resulted in none of the routing protocols communicating with each other, so routers were not added to the routing tables. To fix this issue I set router-ids on each device using the **router-id** command and **bgp router-id** command. This allowed for the protocols to communicate with each other.

Another problem I faced was I accidentally set up OSPF on R1 instead of EIGRP which resulted in R1 not communicating with any of the other devices. To fix this problem I set up EIGRP on R1 using the **IPv6 router EIGRP 1** command and added the networks into EIGRP instead of OSPF. This enabled the router to connect to the EIGRP network allowing the router to communicate with other routers.

Conclusion

In this lab I learned how to, through the use of address-family, set up BGP in IPv6. I also refreshed on how to set up OSPF and EIGRP in IPV6. I gained troubleshooting skills through the problems I had of missing router-ids and using the wrong routing protocol. All in all I learned how to set up IPv6 BGP and practiced setting up OSPF and EIGRP in IPv6.