Packet Tracer eBGP and iBGP Lab Redistribution in IPv6

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Purpose

The purpose of this lab was to set up eBGP and iBGP with OSPF. I learned how to set up iBGP in both IPv4 and IPv6 as well as reinforced my ability to set up eBGP, OSPF and redistribute between the protocols. I also strengthened my troubleshooting skills with these protocols throughout the lab.

Background Information

Border Gateway Protocol or BGP is an exterior gateway protocol created in 1994. IPv6 BGP was created in 1995 and was later improved in 1998. In this lab we used both External Border Gateway Protocol (eBGP) and Internal Border Gateway Protocol (iBGP). The difference between iBGP and eBGP is through routes. When an eBGP enabled interface learns a route it sends the route to all eBGP and iBGP peers whereas an iBGP enabled interface will only send the routes to other eBGP interfaces. eBGP uses different autonomous system number when being configured and must be neighbors to communicate. Unlike eBGP, iBGP enabled devices use the same autonomous system number when configuring BGP and can two devices enabled iBGP can be multiple devices away from each other rather than neighbors. Enabling iBGP allows a user to have a route to a remote destination without storing all the routes of a network which allows BGP to function on the internet. BGP routers constantly calculate the best path, so the less routes stored in a device the less strain there is on the device. All in all, iBGP enables a user to connect to remote neighbors while staying in one Autonomous system.

Lab Summary

In GNS3 I set up 5 routers. Each router was connected via fast ethernet ports for a total of 4 networks. Each port on every router is configured with an IPv4 and IPv6 address and the loopback interface on R2 and R4 have an IPv4 and IPv6 address set. R1, R2, R4 and R5 are running eBGP. R2 and R4 are running iBGP. R2, R3 and R4 are running OSPF. Redistributions are set between OSPF and eBGP networks.

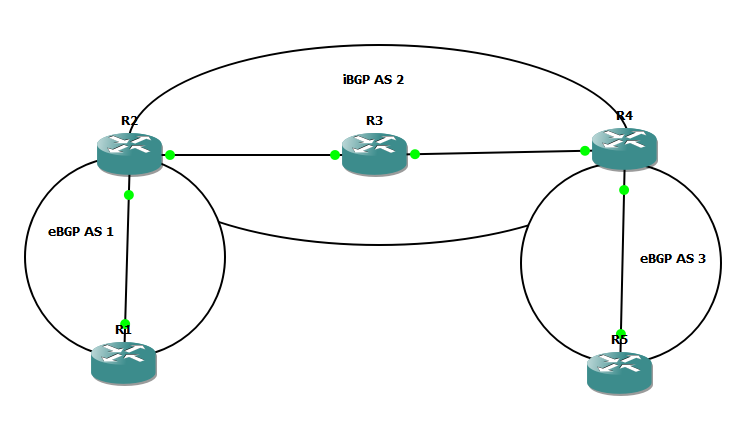
Lab Commands

* 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 | 10.0.0.1/24 | AS 2 |
| R2 | F0/0 | 10.0.0.2/24 | AS 1 |
|  | F0/1 | 10.1.0.1/24 | Area 0 |
|  | Lo0 | 10.4.0.1/32 | Area 0 |
| R3 | F0/0 | 10.2.0.1/24 | Area 0 |
|  | F0/1 | 10.1.0.2/24 | Area 0 |
| R4 | F0/0 | 10.2.0.2/24 | Area 0 |
|  | F0/1 | 10.3.0.1/24 | AS 1 |
|  | Lo0 | 10.4.0.2/32 | Area 0 |
| R5 | F0/1 | 10.3.0.2/24 | AS 3 |

|  |  |  |  |
| --- | --- | --- | --- |
| R1 | F0/0 | 10::1/64 | AS 2 |
| R2 | F0/0 | 10::2/64 | AS 1 |
|  | F0/1 | 10:1::1/64 | Area 0 |
|  | Lo0 | 10:4::1/128 | Area 0 |
| R3 | F0/0 | 10:2::1/64 | Area 0 |
|  | F0/1 | 10:1::2/64 | Area 0 |
| R4 | F0/0 | 10:2::2/64 | Area 0 |
|  | F0/1 | 10:3::1/64 | AS 1 |
|  | Lo0 | 10:4::2/128 | Area 0 |
| R5 | F0/1 | 10:3::2/64 | AS 3 |



Configurations

Router 1

Show run

interface FastEthernet0/0

ip address 10.0.0.1 255.255.255.0

duplex auto

speed auto

ipv6 address 10::1/64

router bgp 1

bgp log-neighbor-changes

neighbor 10::2 remote-as 2

neighbor 10.0.0.2 remote-as 2

address-family ipv4

no neighbor 10::2 activate

neighbor 10.0.0.2 activate

no auto-summary

no synchronization

network 10.0.0.0

address-family ipv6

neighbor 10::2 activate

network 10::/64

Show ip protocols

Routing Protocol is "bgp 1"

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

10.0.0.2

Maximum path: 1

Routing Information Sources:

Gateway Distance Last Update

10.0.0.2 20 00:16:33

Distance: external 20 internal 200 local 200

Show ip route

10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks

B 10.2.0.0/24 [20/2] via 10.0.0.2, 00:17:01

B 10.3.0.0/24 [20/3] via 10.0.0.2, 00:17:01

C 10.0.0.0/24 is directly connected, FastEthernet0/0

B 10.1.0.0/24 [20/0] via 10.0.0.2, 00:17:01

B 10.4.0.2/32 [20/3] via 10.0.0.2, 00:17:01

B 10.4.0.1/32 [20/0] via 10.0.0.2, 00:17:01

Show ipv6 route

C 10::/64 [0/0]

via ::, FastEthernet0/0

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

via ::, FastEthernet0/0

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

via FE80::CE02:1BFF:FE70:0, FastEthernet0/0

B 10:4::1/128 [20/0]

via FE80::CE02:1BFF:FE70:0, FastEthernet0/0

L FE80::/10 [0/0]

via ::, Null0

L FF00::/8 [0/0]

via ::, Null0

Show ip bgp ipv4 unicast neighbor

BGP neighbor is 10.0.0.2, remote AS 2, external link

BGP version 4, remote router ID 10.4.0.1

BGP state = Established, up for 00:01:00

Last read 00:00:00, last write 00:00:00, hold time is 180, keepalive interval is 60 seconds

Neighbor capabilities:

Route refresh: advertised and received(old & new)

Address family IPv4 Unicast: advertised and received

Message statistics:

InQ depth is 0

OutQ depth is 0

Sent Rcvd

Opens: 1 1

Notifications: 0 0

Updates: 0 3

Keepalives: 3 3

Route Refresh: 0 0

Total: 4 7

Default minimum time between advertisement runs is 30 seconds

For address family: IPv4 Unicast

BGP table version 8, neighbor version 8/0

Output queue size : 0

Index 1, Offset 0, Mask 0x2

1 update-group member

Sent Rcvd

Prefix activity: ---- ----

Prefixes Current: 0 6 (Consumes 312 bytes)

Prefixes Total: 0 6

Implicit Withdraw: 0 0

Explicit Withdraw: 0 0

Used as bestpath: n/a 6

Used as multipath: n/a 0

Outbound Inbound

Local Policy Denied Prefixes: -------- -------

Bestpath from this peer: 6 n/a

Total: 6 0

Number of NLRIs in the update sent: max 0, min 0

Connections established 1; dropped 0

Last reset never

Connection state is ESTAB, I/O status: 1, unread input bytes: 0

Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 1

Local host: 10.0.0.1, Local port: 44536

Foreign host: 10.0.0.2, Foreign port: 179

Enqueued packets for retransmit: 0, input: 0 mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x186D0):

Timer Starts Wakeups Next

Retrans 6 1 0x0

TimeWait 0 0 0x0

AckHold 4 2 0x0

SendWnd 0 0 0x0

KeepAlive 0 0 0x0

GiveUp 0 0 0x0

PmtuAger 0 0 0x0

DeadWait 0 0 0x0

iss: 3088029862 snduna: 3088029965 sndnxt: 3088029965 sndwnd: 16282

irs: 1292661421 rcvnxt: 1292661694 rcvwnd: 16112 delrcvwnd: 272

SRTT: 124 ms, RTTO: 1405 ms, RTV: 1281 ms, KRTT: 0 ms

minRTT: 24 ms, maxRTT: 300 ms, ACK hold: 200 ms

Flags: active open, nagle

IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):

Rcvd: 8 (out of order: 0), with data: 4, total data bytes: 272

Sent: 8 (retransmit: 1, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 4, total data bytes: 102

Router 2

Show run

interface Loopback0

ip address 10.4.0.1 255.255.255.255

ipv6 address 10:4::1/128

interface FastEthernet0/0

ip address 10.0.0.2 255.255.255.0

duplex auto

speed auto

ipv6 address 10::2/64

interface FastEthernet0/1

ip address 10.1.0.1 255.255.255.0

duplex auto

speed auto

ipv6 address 10:1::2/64

ipv6 ospf 1 area 0

router ospf 1

log-adjacency-changes

network 10.0.0.0 0.0.0.255 area 0

network 10.1.0.0 0.0.0.255 area 0

network 10.4.0.1 0.0.0.0 area 0

router bgp 2

bgp log-neighbor-changes

neighbor 10::1 remote-as 1

neighbor 10.0.0.1 remote-as 1

neighbor 10.4.0.2 remote-as 2

neighbor 10.4.0.2 update-source Loopback0

address-family ipv4

redistribute ospf 1

no neighbor 10::1 activate

neighbor 10.0.0.1 activate

neighbor 10.4.0.2 activate

no auto-summary

no synchronization

network 10.0.0.0

network 10.1.0.0

network 10.4.0.1

exit-address-family

address-family ipv6

neighbor 10::1 activate

network 10::/64

network 10:1::/64

network 10:4::1/128

exit-address-family

Show ip protocols

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 10.4.0.1

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

Maximum path: 4

Routing for Networks:

10.0.0.0 0.0.0.255 area 0

10.1.0.0 0.0.0.255 area 0

10.4.0.1 0.0.0.0 area 0

Reference bandwidth unit is 100 mbps

Routing Information Sources:

Gateway Distance Last Update

10.2.0.1 110 00:50:00

10.4.0.2 110 00:34:42

Distance: (default is 110)

Routing Protocol is "bgp 2"

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: ospf 1

Neighbor(s):

Address FiltIn FiltOut DistIn DistOut Weight RouteMap

10.0.0.1

10.4.0.2

Maximum path: 1

Routing Information Sources:

Gateway Distance Last Update

Distance: external 20 internal 200 local 200

Show ip route

10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks

O 10.2.0.0/24 [110/2] via 10.1.0.2, 00:36:05, FastEthernet0/1

O 10.3.0.0/24 [110/3] via 10.1.0.2, 00:36:05, FastEthernet0/1

C 10.0.0.0/24 is directly connected, FastEthernet0/0

C 10.1.0.0/24 is directly connected, FastEthernet0/1

O 10.4.0.2/32 [110/3] via 10.1.0.2, 00:36:05, FastEthernet0/1

C 10.4.0.1/32 is directly connected, Loopback0

Show ipv6 route

C 10::/64 [0/0]

via ::, FastEthernet0/0

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

via ::, FastEthernet0/0

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

via ::, FastEthernet0/1

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

via FE80::CE03:4DFF:FE60:1, FastEthernet0/1

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

via ::, Loopback0

L FE80::/10 [0/0]

via ::, Null0

L FF00::/8 [0/0]

via ::, Null0

Show ip bgp ipv4 unicast neighbor

BGP neighbor is 10.0.0.1, remote AS 1, external link

BGP version 4, remote router ID 10.0.0.1

BGP state = Established, up for 00:01:11

Last read 00:00:11, last write 00:00:11, hold time is 180, keepalive interval is 60 seconds

Neighbor capabilities:

Route refresh: advertised and received(old & new)

Address family IPv4 Unicast: advertised and received

Message statistics:

InQ depth is 0

OutQ depth is 0

Sent Rcvd

Opens: 1 1

Notifications: 0 0

Updates: 3 0

Keepalives: 3 3

Route Refresh: 0 0

Total: 7 4

Default minimum time between advertisement runs is 30 seconds

For address family: IPv4 Unicast

BGP table version 7, neighbor version 7/0

Output queue size : 0

Index 2, Offset 0, Mask 0x4

2 update-group member

Sent Rcvd

Prefix activity: ---- ----

Prefixes Current: 6 0

Prefixes Total: 6 0

Implicit Withdraw: 0 0

Explicit Withdraw: 0 0

Used as bestpath: n/a 0

Used as multipath: n/a 0

Outbound Inbound

Local Policy Denied Prefixes: -------- -------

Total: 0 0

Number of NLRIs in the update sent: max 3, min 1

Connections established 1; dropped 0

Last reset never

R2#Show ip bgp ipv4 unicast neighbor

BGP neighbor is 10.0.0.1, remote AS 1, external link

BGP version 4, remote router ID 10.0.0.1

BGP state = Established, up for 00:02:15

Last read 00:00:15, last write 00:00:15, hold time is 180, keepalive interval is 60 seconds

Neighbor capabilities:

Route refresh: advertised and received(old & new)

Address family IPv4 Unicast: advertised and received

Message statistics:

InQ depth is 0

OutQ depth is 0

Sent Rcvd

Opens: 1 1

Notifications: 0 0

Updates: 3 0

Keepalives: 4 4

Route Refresh: 0 0

Total: 8 5

Default minimum time between advertisement runs is 30 seconds

For address family: IPv4 Unicast

BGP table version 7, neighbor version 7/0

Output queue size : 0

Index 2, Offset 0, Mask 0x4

2 update-group member

Sent Rcvd

Prefix activity: ---- ----

Prefixes Current: 6 0

Prefixes Total: 6 0

Implicit Withdraw: 0 0

Explicit Withdraw: 0 0

Used as bestpath: n/a 0

Used as multipath: n/a 0

Outbound Inbound

Local Policy Denied Prefixes: -------- -------

Total: 0 0

Number of NLRIs in the update sent: max 3, min 1

Connections established 1; dropped 0

Last reset never

Connection state is ESTAB, I/O status: 1, unread input bytes: 0

Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 1

Local host: 10.0.0.2, Local port: 179

Foreign host: 10.0.0.1, Foreign port: 44536

Enqueued packets for retransmit: 0, input: 0 mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x29F48):

Timer Starts Wakeups Next

Retrans 6 0 0x0

TimeWait 0 0 0x0

AckHold 5 4 0x0

SendWnd 0 0 0x0

KeepAlive 0 0 0x0

GiveUp 0 0 0x0

PmtuAger 0 0 0x0

DeadWait 0 0 0x0

iss: 1292661421 snduna: 1292661713 sndnxt: 1292661713 sndwnd: 16093

irs: 3088029862 rcvnxt: 3088029984 rcvwnd: 16263 delrcvwnd: 121

SRTT: 165 ms, RTTO: 1172 ms, RTV: 1007 ms, KRTT: 0 ms

minRTT: 28 ms, maxRTT: 300 ms, ACK hold: 200 ms

Flags: passive open, nagle, gen tcbs

IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):

Rcvd: 10 (out of order: 0), with data: 5, total data bytes: 121

Sent: 10 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 5, total data bytes: 291

BGP neighbor is 10.4.0.2, remote AS 2, internal link

BGP version 4, remote router ID 10.4.0.2

BGP state = Established, up for 00:01:52

Last read 00:00:52, last write 00:00:52, hold time is 180, keepalive interval is 60 seconds

Neighbor capabilities:

Route refresh: advertised and received(old & new)

Address family IPv4 Unicast: advertised and received

Message statistics:

InQ depth is 0

OutQ depth is 0

Sent Rcvd

Opens: 1 1

Notifications: 0 0

Updates: 3 3

Keepalives: 3 3

Route Refresh: 0 0

Total: 7 7

Default minimum time between advertisement runs is 0 seconds

For address family: IPv4 Unicast

BGP table version 7, neighbor version 7/0

Output queue size : 0

Index 1, Offset 0, Mask 0x2

1 update-group member

Sent Rcvd

Prefix activity: ---- ----

Prefixes Current: 6 6 (Consumes 312 bytes)

Prefixes Total: 6 6

Implicit Withdraw: 0 0

Explicit Withdraw: 0 0

Used as bestpath: n/a 0

Used as multipath: n/a 0

Outbound Inbound

Local Policy Denied Prefixes: -------- -------

Total: 0 0

Number of NLRIs in the update sent: max 3, min 1

Connections established 1; dropped 0

Last reset never

Connection state is ESTAB, I/O status: 1, unread input bytes: 0

Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 255

Local host: 10.4.0.1, Local port: 50001

Foreign host: 10.4.0.2, Foreign port: 179

Enqueued packets for retransmit: 0, input: 0 mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x2B62C):

Timer Starts Wakeups Next

Retrans 6 0 0x0

TimeWait 0 0 0x0

AckHold 3 1 0x0

SendWnd 0 0 0x0

KeepAlive 0 0 0x0

GiveUp 0 0 0x0

PmtuAger 0 0 0x0

DeadWait 0 0 0x0

iss: 1453034548 snduna: 1453034830 sndnxt: 1453034830 sndwnd: 16103

irs: 3717515531 rcvnxt: 3717515813 rcvwnd: 16103 delrcvwnd: 281

SRTT: 165 ms, RTTO: 1172 ms, RTV: 1007 ms, KRTT: 0 ms

minRTT: 56 ms, maxRTT: 300 ms, ACK hold: 200 ms

Flags: active open, nagle

IP Precedence value : 6

Datagrams (max data segment is 536 bytes):

Rcvd: 7 (out of order: 0), with data: 4, total data bytes: 281

Sent: 8 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 5, total data bytes: 281

Router 3

Show run

interface FastEthernet0/0

ip address 10.2.0.1 255.255.255.0

duplex auto

speed auto

ipv6 address 10:2::1/64

ipv6 ospf 1 area 0

interface FastEthernet0/1

ip address 10.1.0.2 255.255.255.0

duplex auto

speed auto

ipv6 address 10:1::2/64

ipv6 ospf 1 area 0

router ospf 1

log-adjacency-changes

network 10.1.0.0 0.0.0.255 area 0

network 10.2.0.0 0.0.0.255 area 0

Show ip protocols

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 10.2.0.1

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

Maximum path: 4

Routing for Networks:

10.1.0.0 0.0.0.255 area 0

10.2.0.0 0.0.0.255 area 0

Reference bandwidth unit is 100 mbps

Routing Information Sources:

Gateway Distance Last Update

10.4.0.2 110 00:42:59

10.4.0.1 110 00:42:59

Distance: (default is 110)

Show ip route

10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks

C 10.2.0.0/24 is directly connected, FastEthernet0/0

O 10.3.0.0/24 [110/2] via 10.2.0.2, 00:43:31, FastEthernet0/0

O 10.0.0.0/24 [110/2] via 10.1.0.1, 00:43:31, FastEthernet0/1

C 10.1.0.0/24 is directly connected, FastEthernet0/1

O 10.4.0.2/32 [110/2] via 10.2.0.2, 00:43:31, FastEthernet0/0

O 10.4.0.1/32 [110/2] via 10.1.0.1, 00:43:31, FastEthernet0/1

Show ipv6 route

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

via ::, FastEthernet0/1

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

via ::, FastEthernet0/1

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

via ::, FastEthernet0/0

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

via ::, FastEthernet0/0

L FE80::/10 [0/0]

via ::, Null0

L FF00::/8 [0/0]

via ::, Null0

Router 4

Show run

interface Loopback0

ip address 10.4.0.2 255.255.255.255

ipv6 address 10:4::2/128

interface FastEthernet0/0

ip address 10.2.0.2 255.255.255.0

duplex auto

speed auto

ipv6 address 10:2::2/64

ipv6 ospf 1 area 0

interface FastEthernet0/1

ip address 10.3.0.1 255.255.255.0

duplex auto

speed auto

ipv6 address 10:3::1/64

router ospf 1

log-adjacency-changes

network 10.2.0.0 0.0.0.255 area 0

network 10.3.0.0 0.0.0.255 area 0

network 10.4.0.2 0.0.0.0 area 0

router bgp 2

bgp log-neighbor-changes

neighbor 10:3::2 remote-as 1

neighbor 10.3.0.2 remote-as 1

neighbor 10.4.0.1 remote-as 2

neighbor 10.4.0.1 update-source Loopback0

address-family ipv4

redistribute ospf 1

no neighbor 10:3::2 activate

neighbor 10.3.0.2 activate

neighbor 10.4.0.1 activate

no auto-summary

no synchronization

network 10.2.0.0

network 10.3.0.0

network 10.4.0.2

exit-address-family

address-family ipv6

neighbor 10:3::2 activate

network 10:2::/64

network 10:3::/64

network 10:4::2/128

exit-address-family

Show ip protocols

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 10.4.0.2

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

Maximum path: 4

Routing for Networks:

10.2.0.0 0.0.0.255 area 0

10.3.0.0 0.0.0.255 area 0

10.4.0.2 0.0.0.0 area 0

Reference bandwidth unit is 100 mbps

Routing Information Sources:

Gateway Distance Last Update

10.4.0.1 110 00:45:03

Distance: (default is 110)

Routing Protocol is "bgp 2"

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: ospf 1

Neighbor(s):

Address FiltIn FiltOut DistIn DistOut Weight RouteMap

10.3.0.2

10.4.0.1

Maximum path: 1

Routing Information Sources:

Gateway Distance Last Update

Distance: external 20 internal 200 local 200

Show ip route

10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks

C 10.2.0.0/24 is directly connected, FastEthernet0/0

C 10.3.0.0/24 is directly connected, FastEthernet0/1

O 10.0.0.0/24 [110/3] via 10.2.0.1, 00:45:30, FastEthernet0/0

O 10.1.0.0/24 [110/2] via 10.2.0.1, 00:45:30, FastEthernet0/0

C 10.4.0.2/32 is directly connected, Loopback0

O 10.4.0.1/32 [110/3] via 10.2.0.1, 00:45:30, FastEthernet0/0

Show ipv6 route

O 10:1::/64 [110/2]

via FE80::CE03:4DFF:FE60:0, FastEthernet0/0

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

via ::, FastEthernet0/0

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

via ::, FastEthernet0/0

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

via ::, FastEthernet0/1

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

via ::, FastEthernet0/1

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

via ::, Loopback0

L FE80::/10 [0/0]

via ::, Null0

L FF00::/8 [0/0]

via ::, Null0

Show ip bgp ipv4 unicast neighbor

BGP neighbor is 10.3.0.2, remote AS 1, external link

BGP version 4, remote router ID 10.3.0.2

BGP state = Established, up for 00:01:48

Last read 00:00:47, last write 00:00:47, hold time is 180, keepalive interval is 60 seconds

Neighbor capabilities:

Route refresh: advertised and received(old & new)

Address family IPv4 Unicast: advertised and received

Message statistics:

InQ depth is 0

OutQ depth is 0

Sent Rcvd

Opens: 1 1

Notifications: 0 0

Updates: 3 0

Keepalives: 3 3

Route Refresh: 0 0

Total: 7 4

Default minimum time between advertisement runs is 30 seconds

For address family: IPv4 Unicast

BGP table version 7, neighbor version 7/0

Output queue size : 0

Index 2, Offset 0, Mask 0x4

2 update-group member

Sent Rcvd

Prefix activity: ---- ----

Prefixes Current: 6 0

Prefixes Total: 6 0

Implicit Withdraw: 0 0

Explicit Withdraw: 0 0

Used as bestpath: n/a 0

Used as multipath: n/a 0

Outbound Inbound

Local Policy Denied Prefixes: -------- -------

Total: 0 0

Number of NLRIs in the update sent: max 3, min 1

Connections established 1; dropped 0

Last reset never

Connection state is ESTAB, I/O status: 1, unread input bytes: 0

Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 1

Local host: 10.3.0.1, Local port: 46989

Foreign host: 10.3.0.2, Foreign port: 179

Enqueued packets for retransmit: 0, input: 0 mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x25BEC):

Timer Starts Wakeups Next

Retrans 8 1 0x0

TimeWait 0 0 0x0

AckHold 4 3 0x0

SendWnd 0 0 0x0

KeepAlive 0 0 0x0

GiveUp 0 0 0x0

PmtuAger 0 0 0x0

DeadWait 0 0 0x0

iss: 385866427 snduna: 385866719 sndnxt: 385866719 sndwnd: 16093

irs: 2587476551 rcvnxt: 2587476673 rcvwnd: 16263 delrcvwnd: 121

SRTT: 165 ms, RTTO: 1172 ms, RTV: 1007 ms, KRTT: 0 ms

minRTT: 28 ms, maxRTT: 300 ms, ACK hold: 200 ms

Flags: active open, nagle

IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):

Rcvd: 7 (out of order: 0), with data: 4, total data bytes: 121

Sent: 11 (retransmit: 1, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 6, total data bytes: 291

BGP neighbor is 10.4.0.1, remote AS 2, internal link

BGP version 4, remote router ID 10.4.0.1

BGP state = Established, up for 00:01:39

Last read 00:00:39, last write 00:00:39, hold time is 180, keepalive interval is 60 seconds

Neighbor capabilities:

Route refresh: advertised and received(old & new)

Address family IPv4 Unicast: advertised and received

Message statistics:

InQ depth is 0

OutQ depth is 0

Sent Rcvd

Opens: 1 1

Notifications: 0 0

Updates: 3 3

Keepalives: 3 3

Route Refresh: 0 0

Total: 7 7

Default minimum time between advertisement runs is 0 seconds

For address family: IPv4 Unicast

BGP table version 7, neighbor version 7/0

Output queue size : 0

Index 1, Offset 0, Mask 0x2

1 update-group member

Sent Rcvd

Prefix activity: ---- ----

Prefixes Current: 6 6 (Consumes 312 bytes)

Prefixes Total: 6 6

Implicit Withdraw: 0 0

Explicit Withdraw: 0 0

Used as bestpath: n/a 0

Used as multipath: n/a 0

Outbound Inbound

Local Policy Denied Prefixes: -------- -------

Total: 0 0

Number of NLRIs in the update sent: max 3, min 1

Connections established 1; dropped 0

Last reset never

Connection state is ESTAB, I/O status: 1, unread input bytes: 0

Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 255

Local host: 10.4.0.2, Local port: 179

Foreign host: 10.4.0.1, Foreign port: 50001

Enqueued packets for retransmit: 0, input: 0 mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x4CF80):

Timer Starts Wakeups Next

Retrans 7 0 0x0

TimeWait 0 0 0x0

AckHold 8 2 0x0

SendWnd 0 0 0x0

KeepAlive 0 0 0x0

GiveUp 0 0 0x0

PmtuAger 0 0 0x0

DeadWait 0 0 0x0

iss: 3717515531 snduna: 3717515870 sndnxt: 3717515870 sndwnd: 16046

irs: 1453034548 rcvnxt: 1453034887 rcvwnd: 16046 delrcvwnd: 338

SRTT: 182 ms, RTTO: 1073 ms, RTV: 891 ms, KRTT: 0 ms

minRTT: 60 ms, maxRTT: 300 ms, ACK hold: 200 ms

Flags: passive open, nagle, gen tcbs

IP Precedence value : 6

Datagrams (max data segment is 536 bytes):

Rcvd: 14 (out of order: 0), with data: 8, total data bytes: 338

Sent: 10 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 7, total data bytes: 338

Router 5

Show run

interface FastEthernet0/0

no ip address

shutdown

duplex auto

speed auto

interface FastEthernet0/1

ip address 10.3.0.2 255.255.255.0

duplex auto

speed auto

ipv6 address 10:3::2/64

router bgp 1

bgp log-neighbor-changes

neighbor 10:3::1 remote-as 2

neighbor 10.3.0.1 remote-as 2

address-family ipv4

no neighbor 10:3::1 activate

neighbor 10.3.0.1 activate

no auto-summary

no synchronization

network 10.3.0.0

exit-address-family

address-family ipv6

neighbor 10:3::1 activate

network 10:3::/64

exit-address-family

Show ip protocols

Routing Protocol is "bgp 1"

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

10.3.0.1

Maximum path: 1

Routing Information Sources:

Gateway Distance Last Update

10.3.0.1 20 00:54:15

Distance: external 20 internal 200 local 200

Show ip route

10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks

B 10.2.0.0/24 [20/0] via 10.3.0.1, 00:54:33

C 10.3.0.0/24 is directly connected, FastEthernet0/1

B 10.0.0.0/24 [20/3] via 10.3.0.1, 00:54:33

B 10.1.0.0/24 [20/2] via 10.3.0.1, 00:54:33

B 10.4.0.2/32 [20/0] via 10.3.0.1, 00:54:33

B 10.4.0.1/32 [20/3] via 10.3.0.1, 00:54:33

Show ipv6 route

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

via FE80::CE04:31FF:FE90:1, FastEthernet0/1

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

via ::, FastEthernet0/1

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

via ::, FastEthernet0/1

B 10:4::2/128 [20/0]

via FE80::CE04:31FF:FE90:1, FastEthernet0/1

L FE80::/10 [0/0]

via ::, Null0

L FF00::/8 [0/0]

via ::, Null0

Show ip bgp ipv4 unicast neighbor

BGP neighbor is 10.3.0.1, remote AS 2, external link

BGP version 4, remote router ID 10.4.0.2

BGP state = Established, up for 00:00:04

Last read 00:00:04, last write 00:00:04, hold time is 180, keepalive interval is 60 seconds

Neighbor capabilities:

Route refresh: advertised and received(old & new)

Address family IPv4 Unicast: advertised and received

Message statistics:

InQ depth is 0

OutQ depth is 0

Sent Rcvd

Opens: 1 1

Notifications: 0 0

Updates: 0 0

Keepalives: 1 1

Route Refresh: 0 0

Total: 2 2

Default minimum time between advertisement runs is 30 seconds

For address family: IPv4 Unicast

BGP table version 1, neighbor version 0/0

Output queue size : 0

Index 1, Offset 0, Mask 0x2

1 update-group member

Sent Rcvd

Prefix activity: ---- ----

Prefixes Current: 0 0

Prefixes Total: 0 0

Implicit Withdraw: 0 0

Explicit Withdraw: 0 0

Used as bestpath: n/a 0

Used as multipath: n/a 0

Outbound Inbound

Local Policy Denied Prefixes: -------- -------

Total: 0 0

Number of NLRIs in the update sent: max 0, min 0

Connections established 1; dropped 0

Last reset never

Connection state is ESTAB, I/O status: 1, unread input bytes: 0

Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 1

Local host: 10.3.0.2, Local port: 179

Foreign host: 10.3.0.1, Foreign port: 53146

Enqueued packets for retransmit: 0, input: 0 mis-ordered: 0 (0 bytes)

Event Timers (current time is 0xB674):

Timer Starts Wakeups Next

Retrans 2 0 0x0

TimeWait 0 0 0x0

AckHold 2 1 0x0

SendWnd 0 0 0x0

KeepAlive 0 0 0x0

GiveUp 0 0 0x0

PmtuAger 0 0 0x0

DeadWait 0 0 0x0

iss: 864796216 snduna: 864796281 sndnxt: 864796281 sndwnd: 16320

irs: 174826747 rcvnxt: 174826812 rcvwnd: 16320 delrcvwnd: 64

SRTT: 70 ms, RTTO: 1683 ms, RTV: 1613 ms, KRTT: 0 ms

minRTT: 28 ms, maxRTT: 300 ms, ACK hold: 200 ms

Flags: passive open, nagle, gen tcbs

IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):

Rcvd: 4 (out of order: 0), with data: 2, total data bytes: 64

Sent: 3 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 1, total data bytes: 64

Problems

The first problem was I forgot to set up ospf on R3. This resulted in R2 and R4 not being able to communicate. I fixed this problem through enabling ospf on R3 using **router ospf 1** and then configuring ospf.

The second problem I faced was I didn’t enable IPv6 on any of my routers. This caused IPv6 to not function at all on my networks. To fix this issue I typed **IPv6 unicast-routing** on every device.

The third issue I faced was I wrote the wrong addresses in for the **neighbor** command. This caused R2 and R4 to not communicate with any other routers using BGP. To solve this problem, I went to the IPv4 and IPv6 address families using the **address-family** command, then, using the **no** command, I removed the previous **neighbor** statements. Then I reset up the **neighbor** statements using the Ip address of the interfaces rather than the network address. This allowed both iBGP and eBGP to work on R2 and R4.

Conclusion

In this lab I learned how to set up iBGP in both IPv4 and IPv6 using loopback interfaces. I also learned how to connect iBGP to eBGP. In this lab, I also practiced how to set up eBGP and OSPF in IPv4 and IPv6. I practiced troubleshooting strategies to solve issues with BGP. All in all, I learned how to set up iBGP and practices setting up eBGP and OSPF in IPv4 and IPv6.