GNS3 iBGP and eBGP Distribution

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Purpose

The purpose of this lab was to configure OSPFv2 as well as eBGP and iBGP on two networks and redistribute the routing protocols. After this lab, I learned how to configure iBGP after learning to configure eBGP from the previous lab. Additionally, I learned how to correctly distribute the routing information between OSPF, iBGP and eBGP.

Background Information

BGP (Border Gateway Protocol) is an IETF (Internet Engineering Task Force) standardized gateway protocol made to exchange routing and reachability information between autonomous systems (AS) on the internet. This protocol can be used to connect any internet work of autonomous systems. In this lab, the goal was the configure eBGP and iBGP along with OSPF on two networks. iBGP stands for Internal Border Gateway Protocol. iBGP is BGP used internally as a mechanism to exchange BGP information between multiple BGP border routers. Internal BGP is a mechanism to provide more information to your internal routers. It runs between two BGP routers in different autonomous system. It runs between two BGP routers in the same autonomous system. External Border Gateway Protocol (EBGP) is a Border Gateway Protocol (BGP) extension that is used for communication between distinct autonomous systems (AS). The main advantage of BGP includes having multiple paths in the network. All BGP routers on the internet are constantly updating each other and the BGP router is constantly calculating the best path. Overall, iBGP is used for distributing the routes from the eBGP router to the other routers within your own AS.

Lab Summary

In this lab, I setup a topology with 5 routers interconnected on fast ethernet interfaces. I setup OSPF on routers 1-5. I also setup iBGP on R2, R3, R4 and eBGP on R1 and R5. For this lab I setup redistribution protocols on R1 and R5.

Lab Commands

* Router OSPF: Indicates the beginning of the OSPF configuration on the router
* Router-id: Assigns the router an OSPF ID to advertise to neighbor networks
* Network area: Advertise the interfaces whose addresses fill in the specified network command
* Show ip ospf interface: Displays the OSPF configuration for the certain interface
* Show ip route: Displays the IPv4 configurations and routes between the interfaces and routers
* Interface: Allows you to configure a particular interface
* Clock rate: Synchronizing routers to connect to the same rate
* Address-family ipv6: Places the router in address family configuration mode from which you can configure routing sessions that use standard IPv6 address prefixes
* Redistribute OSPF: Redistributes OPSF 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

Network Diagram with IP’sDiagram

Description automatically generated

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| R1 | Fa0/0 | 10.0.0.1/24 | 2001::1/64 | Area 0 |
| R2 | Fa0/0 | 10.0.0.2/24 | 2002::1/64 | BGP AS 3 |
|  | Fa1/0 | 10.1.0.1/24 | 2007::1/64 | Area 0 |
| R3 | Fa0/0 | 10.2.0.1/24 | 2003::1/64 | BGP AS 3 |
|  | Fa1/0 | 10.1.0.2/24 | 2007::2/64 | BGP AS 3 |
| R4 | Fa0/0 | 10.2.0.2/24 | 2004::1/64 | BGP AS 3 |
|  | Fa1/0 | 10.3.0.1/24 | 2008::5/24 | Area 1 |
| R5 | Fa1/0 | 10.3.0.2/24 | 2008::6/64 | Area 1 |

Configurations

(configurations of the routers and interfaces)

(examples below, no exclamation points) (copy and paste configs and put font as courier and size 11. Put one space in between each section of config and router)

Router 1

Show run

interface FastEthernet0/0  
 ip address 10.0.0.1 255.255.255.0  
 shutdown  
 duplex auto  
 speed auto  
 ipv6 address 2001::1/64  
  
interface FastEthernet0/1  
 no ip address  
 duplex auto  
 speed auto  
  
interface FastEthernet1/0  
 ip address 10.0.0.2 255.255.255.0  
 duplex auto  
 speed auto  
 ipv6 address 2002::1/64  
  
interface FastEthernet2/0  
 no ip address  
 shutdown  
 duplex auto  
 speed auto  
  
interface FastEthernet3/0  
 no ip address  
 shutdown  
 duplex auto  
 speed auto  
  
interface FastEthernet4/0  
  
interface FastEthernet4/1  
  
interface FastEthernet4/2  
  
interface FastEthernet4/3  
  
interface FastEthernet4/4  
  
interface FastEthernet4/5  
  
interface FastEthernet4/6  
  
interface FastEthernet4/7  
  
interface FastEthernet4/8  
  
interface FastEthernet4/9  
  
interface FastEthernet4/10  
  
interface FastEthernet4/11  
  
interface FastEthernet4/12  
  
interface FastEthernet4/13  
  
interface FastEthernet4/14  
  
interface FastEthernet4/15  
  
interface Vlan1  
 no ip address  
  
  
router ospf 10  
 router-id 10.0.0.0  
 log-adjacency-changes  
 network 10.0.0.0 0.255.255.255 area 0  
  
router bgp 10  
 no synchronization  
 bgp log-neighbor-changes  
 network 10.0.0.0  
 neighbor 10.2.0.1 remote-as 3  
 neighbor 10.3.0.2 remote-as 5  
 neighbor 2003::1 remote-as 3  
 neighbor 2008::6 remote-as 5  
 no auto-summary

Show ip ospf interface

FastEthernet1/0 is up, line protocol is up  
  Internet Address 10.0.0.0/24, Area 0  
  Process ID 10, Router ID 10.0.0.0, Network Type BROADCAST, Cost: 1  
  Transmit Delay is 1 sec, State DR, Priority 1  
  Designated Router (ID) 10.0.0.0, Interface address 10.0.0.2  
  No backup designated router on this network  
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5  
    oob-resync timeout 40  
    Hello due in 00:00:05  
  Supports Link-local Signaling (LLS)  
  Index 2/2, flood queue length 0  
  Next 0x0(0)/0x0(0)  
  Last flood scan length is 0, maximum is 0  
  Last flood scan time is 0 msec, maximum is 0 msec  
  Neighbor Count is 0, Adjacent neighbor count is 0  
  Suppress hello for 0 neighbor(s)  
FastEthernet0/0 is administratively down, line protocol is down  
  Internet Address 10.0.0.0/24, Area 0  
  Process ID 10, Router ID 10.0.0.0, Network Type BROADCAST, Cost: 1  
  Transmit Delay is 1 sec, State DOWN, Priority 1  
  No designated router on this network  
  No backup designated router on this network  
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5  
    oob-resync timeout 40

Show ip ospf neighbor

Neighbor ID Pri State Dead Time Address Interface

10.1.0.0 1 FULL/BDR 00:00:34 10.0.0.2 FastEthernet0/0

Show ip ospf protocols

Routing Protocol is "ospf 10"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 10.0.0.0

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

Maximum path: 4

Routing for Networks:

10.0.0.0 0.255.255.255 area 0

Reference bandwidth unit is 100 mbps

Routing Information Sources:

Gateway Distance Last Update

10.2.0.0 110 03:46:23

10.1.0.0 110 03:46:23

Distance: (default is 110)

Router 2

Show run

interface FastEthernet0/0  
 ip address 10.0.0.2 255.255.255.0  
 duplex auto  
 speed auto  
 ipv6 address 2002::1/64  
  
interface FastEthernet0/1  
 no ip address  
 shutdown  
 duplex auto  
 speed auto  
  
interface FastEthernet1/0  
 ip address 10.1.0.1 255.255.255.0  
 duplex auto  
 speed auto  
 ipv6 address 2007::1/64  
  
interface FastEthernet2/0  
 no ip address  
 shutdown  
 duplex auto  
 speed auto  
  
interface FastEthernet3/0  
 no ip address  
 shutdown  
 duplex auto  
 speed auto  
  
interface FastEthernet4/0  
  
interface FastEthernet4/1  
  
interface FastEthernet4/2  
  
interface FastEthernet4/3  
  
interface FastEthernet4/4  
  
interface FastEthernet4/5  
  
interface FastEthernet4/6  
  
interface FastEthernet4/7  
  
interface FastEthernet4/8  
  
interface FastEthernet4/9  
  
interface FastEthernet4/10  
  
interface FastEthernet4/11  
  
interface FastEthernet4/12  
  
interface FastEthernet4/13  
  
interface FastEthernet4/14  
  
interface FastEthernet4/15  
  
interface Vlan1  
 no ip address  
  
  
router bgp 3

router-id 10.1.0.0

log-adjacency-changes  
 bgp log-neighbor-changes  
 network 10.0.0.0 0.255.255.255

Show ip protocols

Routing Protocol is "bgp 3"  
  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  
  Maximum path: 1  
  Routing Information Sources:  
    Gateway         Distance      Last Update  
  Distance: external 20 internal 200 local 200

Router 3

Show run

interface FastEthernet0/0

ip address 10.2.0.1 255.255.255.0

duplex auto

speed auto

ipv6 address 2003::1/64

interface FastEthernet0/1

no ip address

shutdown

duplex auto

speed auto

interface FastEthernet1/0

ip address 10.1.0.2 255.255.255.0

duplex auto

speed auto

ipv6 address 2007::2/64

interface FastEthernet2/0

no ip address

shutdown

duplex auto

speed auto

interface FastEthernet3/0

no ip address

shutdown

duplex auto

speed auto

interface FastEthernet4/0

interface FastEthernet4/1

interface FastEthernet4/2

interface FastEthernet4/3

interface FastEthernet4/4

interface FastEthernet4/5

interface FastEthernet4/6

interface FastEthernet4/7

interface FastEthernet4/8

interface FastEthernet4/9

interface FastEthernet4/10

interface FastEthernet4/11

interface FastEthernet4/12

interface FastEthernet4/13

interface FastEthernet4/14

interface FastEthernet4/15

interface Vlan1

no ip address

router ospf 10

router-id 10.2.0.0

log-adjacency-changes

network 10.0.0.0 0.255.255.255 area 0

router bgp 3

no bgp default ipv4-unicast

bgp log-neighbor-changes

neighbor 10.2.0.2 remote-as 4

neighbor 2004::1 remote-as 4

address-family ipv4

redistribute ospf 10

neighbor 10.2.0.2 activate

no auto-summary

no synchronization

network 10.0.0.0

exit-address-family

address-family ipv6

neighbor 2004::1 activate

redistribute connected

redistribute static

redistribute ospf 10

no synchronization

exit-address-family

Show ip ospf interface

FastEthernet1/0 is up, line protocol is up

Internet Address 10.1.0.2/24, Area 0

Process ID 10, Router ID 10.2.0.0, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State BDR, Priority 1

Designated Router (ID) 10.1.0.0, Interface address 10.1.0.1

Backup Designated router (ID) 10.2.0.0, Interface address 10.1.0.2

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

oob-resync timeout 40

Hello due in 00:00:03

Supports Link-local Signaling (LLS)

Index 2/2, flood queue length 0

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

Last flood scan length is 1, maximum is 1

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

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 10.1.0.0 (Designated Router)

Suppress hello for 0 neighbor(s)

FastEthernet0/0 is up, line protocol is up

Internet Address 10.2.0.1/24, Area 0

Process ID 10, Router ID 10.2.0.0, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 10.2.0.0, Interface address 10.2.0.1

No backup designated router on this network

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

oob-resync timeout 40

Hello due in 00:00:00

Supports Link-local Signaling (LLS)

Index 1/1, flood queue length 0

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

Last flood scan length is 0, maximum is 0

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

Neighbor Count is 0, Adjacent neighbor count is 0

Suppress hello for 0 neighbor(s)

Router 4

Show run

interface FastEthernet0/0

ip address 10.2.0.2 255.255.255.0

duplex auto

speed auto

ipv6 address 2004::1/64

interface FastEthernet0/1

no ip address

shutdown

duplex auto

speed auto

interface FastEthernet1/0

ip address 10.3.0.1 255.255.255.0

duplex auto

speed auto

ipv6 address 2008::5/24

interface FastEthernet2/0

no ip address

shutdown

duplex auto

speed auto

interface FastEthernet3/0

no ip address

shutdown

duplex auto

speed auto

interface FastEthernet4/0

interface FastEthernet4/1

interface FastEthernet4/2

interface FastEthernet4/3

interface FastEthernet4/4

interface FastEthernet4/5

interface FastEthernet4/6

interface FastEthernet4/7

interface FastEthernet4/8

interface FastEthernet4/9

interface FastEthernet4/10

interface FastEthernet4/11

interface FastEthernet4/12

interface FastEthernet4/13

interface FastEthernet4/14

interface FastEthernet4/15

interface Vlan1

no ip address

router bgp 4

no synchronization

bgp log-neighbor-changes

network 10.0.0.0

neighbor 10.2.0.1 remote-as 3

neighbor 2003::1 remote-as 3

no auto-summary

address-family ipv6

neighbor 2003::1 activate

neighbor 2008::6 activate

redistribute connected

redistribute static

redistribute ospf 10

no synchronization

exit-address-family

Show ip protocols

Routing Protocol is "bgp 4"

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

10.2.0.1

10.3.0.2

Maximum path: 1

Routing Information Sources:

Gateway Distance Last Update

10.2.0.1 20 00:00:00

10.3.0.2 20 00:00:00

Distance: external 20 internal 200 local 200

Router 5

Show run

interface FastEthernet0/0

 no ip address  
 shutdown  
 duplex auto  
 speed auto  
  
interface FastEthernet0/1  
 no ip address  
 shutdown  
 duplex auto  
 speed auto  
  
interface FastEthernet1/0  
 ip address 10.3.0.2 255.255.255.0  
 duplex auto  
 speed auto  
 ipv6 address 2008::6/64

interface FastEthernet2/0  
 no ip address  
 shutdown  
 duplex auto  
 speed auto  
  
interface FastEthernet3/0  
 no ip address  
 shutdown  
 duplex auto  
 speed auto  
  
interface FastEthernet4/0  
  
interface FastEthernet4/1

interface FastEthernet4/2  
  
interface FastEthernet4/3  
  
interface FastEthernet4/4  
  
interface FastEthernet4/5  
  
interface FastEthernet4/6  
  
interface FastEthernet4/7  
  
interface FastEthernet4/8  
  
interface FastEthernet4/9  
  
interface FastEthernet4/10  
  
interface FastEthernet4/11  
  
interface FastEthernet4/12  
  
interface FastEthernet4/13  
  
interface FastEthernet4/14  
  
interface FastEthernet4/15  
  
interface Vlan1  
 no ip address  
  
  
router ospf 10

 router-id 10.3.0.0  
 log-adjacency-changes  
 network 10.0.0.0 0.255.255.255 area 0

Show ip ospf protocols

Routing Protocol is "ospf 10"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 10.0.0.0

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

Maximum path: 4

Routing for Networks:

10.0.0.0 0.255.255.255 area 0

Reference bandwidth unit is 100 mbps

Routing Information Sources:

Gateway Distance Last Update

10.2.0.0 110 03:46:23

10.1.0.0 110 03:46:23

Distance: (default is 110)

Show ip ospf interface

FastEthernet1/0 is up, line protocol is up  
  Internet Address 10.0.0.0/24, Area 0  
  Process ID 10, Router ID 10.0.0.0, Network Type BROADCAST, Cost: 1  
  Transmit Delay is 1 sec, State DR, Priority 1  
  Designated Router (ID) 10.0.0.0, Interface address 10.0.0.2  
  No backup designated router on this network  
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5  
    oob-resync timeout 40  
    Hello due in 00:00:05  
  Supports Link-local Signaling (LLS)  
  Index 2/2, flood queue length 0  
  Next 0x0(0)/0x0(0)  
  Last flood scan length is 0, maximum is 0  
  Last flood scan time is 0 msec, maximum is 0 msec  
  Neighbor Count is 0, Adjacent neighbor count is 0  
  Suppress hello for 0 neighbor(s)  
FastEthernet0/0 is administratively down, line protocol is down  
  Internet Address 10.0.0.0/24, Area 0  
  Process ID 10, Router ID 10.0.0.0, Network Type BROADCAST, Cost: 1  
  Transmit Delay is 1 sec, State DOWN, Priority 1  
  No designated router on this network  
  No backup designated router on this network  
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5  
    oob-resync timeout 40

Problems

In this lab, I had some trouble with the concept of iBGP and researching it before the I began the lab to configure iBGP. After I took some time to research what iBGP and eBGP was being used for. I found out more about iBGP and how iBGP is used as a mechanism to exchange BGP information between multiple BGP border routers. Another issue I encountered was properly configuring the neighbors on the routers and BGP configurations. One problem that I wanted to solve but couldn’t in this lab was figure out how to incorporate loopback interfaces since I wasn’t able to add it in GNS3 and find out how to configure it within the network. Overall, after this lab I still want to learn how to configure iBGP and eBGP with loopback interfaces.

Conclusion

In this lab, I learned how to configure iBGP and eBGP on 2 networks and redistribute the needed protocols. This helped me review setting up eBGP as well configure IPv6 addresses along with that. I also got to research a lot of information about iBGP and how it is used to transmit BGP information from border router to border router. Additionally, I learned how to redistribute the routing protocols and organize the overall topology for the objective of this lab. Some issues I had was the research generally about iBGP as well as learning what iBGP’s purpose is. After researching I found out the main role for iBGP. One more issue I went through was adding loopback interfaces since I had some errors adding them as well as figuring out how to do it in general. I learned that the main advantage of BGP includes having multiple paths in the network. All BGP routers on the internet are constantly updating each other and the BGP router is constantly calculating the best path and with iBGP it is transmitting the BGP information from border router to border router. In conclusion, I had more issues in this lab than before, but I learned more about BGP and the role of iBGP as well, and it was also a good review of setting up BGP and OSPF along with setting up iBGP.