Networking Academy:
External Border Gateway Protocol

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Contents

Purpose

The purpose of this lab is to set up 3 AS's and use eBGP (external border gateway protocol) to route between the 3 AS's. To complete this lab, one needs to know how to redistribute routes between gateway protocols and routing protocols, create address-families, and declare eBGP neighbors. And although not central to the eBGP, one still must have the skills needed to set up networks with routing protocols, including advertising interfaces, subnetting, and debugging.

Background Information

External Border Gateway Protocol (eBGP) is an external gateway protocol, which means that it can share routing information between autonomous systems (AS's). Each AS has one process or AS of a routing protocol running for it. For example, one organization uses OSPF, while another uses OSPF in a different process or a different routing protocol; these two organizations can establish communication between their own AS's by using eBGP. What allows this to happen is eBGP's ability to redistribute routes. Routes can be redistributed into eBGP, then eBGP can redistribute those routes into any other routing protocol, sharing route information. This is extremely important because it allows Internet Service Providers (ISPs) to use different routing protocols. But another problem can crop up: having multiple routes to one destination. Although this isn't a problem in and of itself, it's important for eBGP to choose a route logically. There are many ways to manually influence the path selection for eBGP, like weight and local preference. If eBGP is not manually set to influence the path selection, it will depend on a series of attributes to determine the shortest path to the destination.

Routing protocols can automate the process of getting destination routes to other networks in some manner, requiring some initial setup.

Open Shortest Path First (OSPF) is a link-state routing protocol for Internet Protocol (IP). OSPF supplies destination routes to its routers by gathering information from the links on each router; then each router will forward that link-state information throughout the entire network. Other routers will use this information to create a topology of the network, which will supply the routes for each router.

Enhanced Interior Gateway Routing Protocol (EIGRP) is a distance-vector routing protocol that uses distance, calculated with bandwidth and delay, for routing decisions in the network. EIGRP keeps a topology table created with information gathered by neighbors, which EIGRP will use to decide which routes to give to the router. It is worth noting that unlike other distance-vector routing protocols, EIGRP doesn't send its table periodically, but only when a topology or link-state change has occurred.

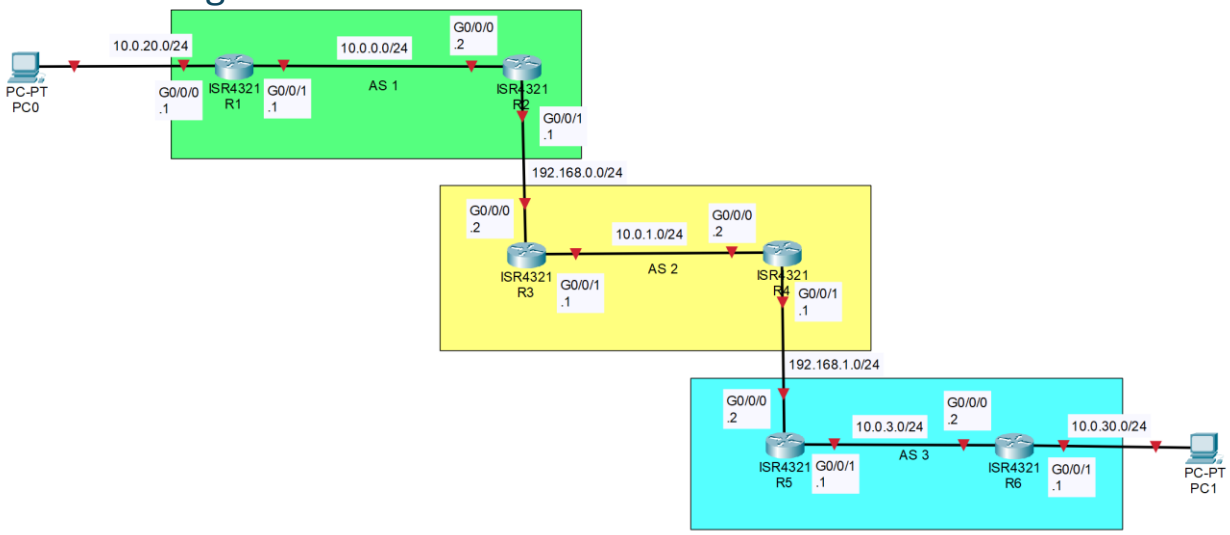
Intermediate System to Intermediate System (IS-IS) is also a link-state routing protocol. Though there are some differences between it and OSPF: IS-IS can route for IPv4 and IPv6 in the same instance and IS-IS can do partial route calculation, allowing for the network to converge quicker. Other than these differences, IS-IS and OSPF are quite similar protocols.

Lab Summary

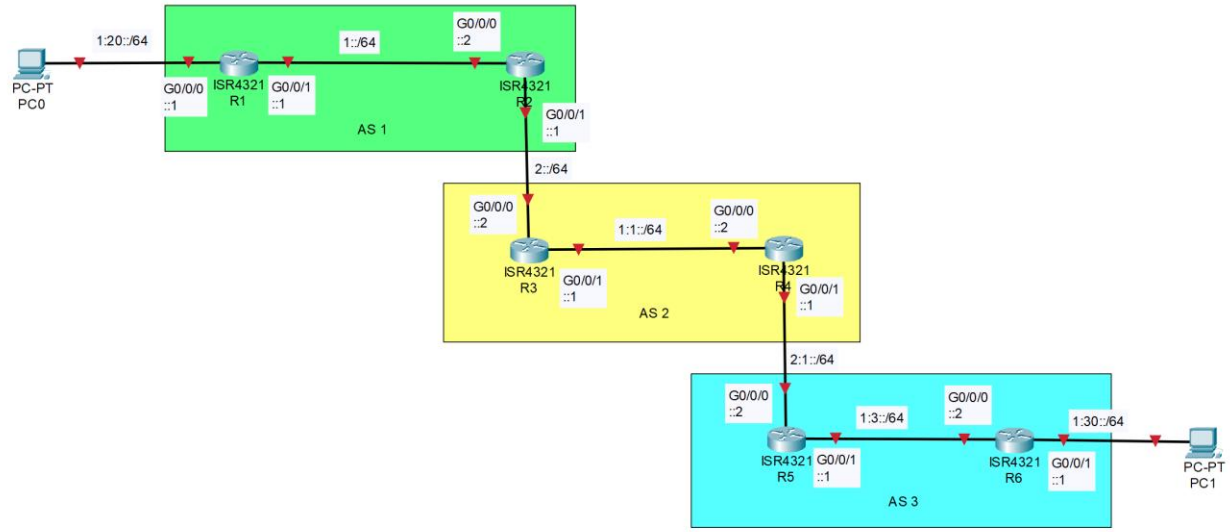
In this lab 3 AS's were set up with eBGP connecting the 3 AS's together. There are two host devices that are PCs and there are six 4321 routers that are connected via ethernet. To allow host devices to communicate with each other, the routers needed IPv6 and IPv4 routes to

redistribute in and out of eBGP. Further information related to the setup of this lab is available here: https://github.com/101zh/eBGPLab/.

Network Diagrams



IPv4 Diagram



IPv6 Diagram

Lab Commands

`router bgp` [*`autonomous-system-number`*]

- Creates and enters a configuration of an instance of BGP with the specified autonomous system number. (terminal configuration mode)

  `bgp router-id` [*`id`*]
  - Sets the router-id, helps identify the router to other routers running BGP.

  `neighbor` [*`ip-address`*] **`remote-as`** [*`autonomous-system-number`*]
  - Configures a neighbor router with the specified autonomous system number

  `address-family ipv4`

    - Enters IPv4 address-family configuration for BGP

      redistribute connected
        - Redistributes directly connected IPv6 routes

      redistribute [*protocol*] [*process-id* | *as-number*]
        - Redistributes IPv4 routes from a specified routing protocol

      neighbor [*ipv4-address*] **activate**
        - Activates a neighbor with the specified IPv4 address to share route information with

  address-family ipv6
    - Enters IPv6 address-family configuration for BGP

      redistribute connected
        - Redistributes directly connected IPv6 routes

      redistribute [*protocol*] [*process-id* | *as-number*]
        - Redistributes IPv4 routes from a specified routing protocol

      neighbor [*ipv6-address*] **activate**
        - Activates a neighbor with the specified IPv6 address to share route information with

router ospf [*process-id*]

- Creates and enters a configuration of an instance of OSPF with the specified process id. (terminal configuration mode)

  redistribute [*protocol*] [*autonomous-system-number*] [**metric** {*metric value}*]
    - Redistributes IPv4 routes from a specified protocol and gives it the specified metric

ipv6 router ospf [*process-id*]

- Creates and enters a configuration of an instance of IPv6 OSPF with the specified process id. (terminal configuration mode)

  redistribute [*protocol*] [*autonomous-system-number*] [**metric** {*metric value}*]
    - Redistributes IPv6 routes from a specified protocol and gives it the specified metric

ipv6 eigrp [*autonomous-system-number*]

- Indicates a link to advertise to IPv6 EIGRP. (On an interface)

router eigrp [*autonomous-system-number*]

- Creates and enters a configuration of an instance of IPv4 EIGRP with the specified autonomous system number. (terminal configuration mode)

  network [*ip-address*] [*wildcard-mask*]
    - Indicates which link to advertise to EIGRP.

  redistribute [*protocol*] [*process-id* | *as-number*] [**metric** {*bw, delay, reliability, load, mtu*}]
    - Redistributes IPv4 routes from a specified protocol and gives it the specified metric

  eigrp router-id [*id*]
    - Sets the router-id, which helps identify the router to other routers running EIGRP

ipv6 router eigrp [*autonomous-system-number*]

- Creates and enters a configuration of an instance of IPv6 EIGRP with the specified autonomous system number. (terminal configuration mode)
  redistribute *protocol* [*process-id* | *as-number*] [**metric** {*bw, delay reliability, load, mtu*}]
    - Redistributes IPv6 routes from a specified protocol and gives it the specified metric
  eigrp router-id [*id*]
    - Sets the router-id, which helps identify the router to other routers running EIGRP

ip router isis

- Indicates a link with an IPv4 address to advertise to IS-IS. (On an interface)

ipv6 router isis

- Indicates a link with an IPv6 address to advertise to IS-IS. (On an interface)

router isis

- Creates and enters a configuration of an instance of IS-IS
  net [*network-entity-title*]
    - Sets the network entity title, which is formatted like this: "49.0002.0000.0000.0001.00". "49" is the Address Family Identifier (AFI); "0002" is the area; "0000.0000.0001" is the system ID, unique to each router; and "00" must end the network entity title (NET).
  is-type [type]
    - Configures the routing level for an instance of the IS-IS routing process.
  metric-style [style]
    - Sets the metric-style. This lab used "wide" because new style TLVs (Tuple: Type, Length, Value) are required for IPv4 and IPv6. "narrow" style only allows for old style TLVs and "transition" style new and old style TLVs
  redistribute [*protocol*] [autonomous-system-number] [**metric** {*metric value}*] [level]
    - Redistributes IPv4 routes from a specified protocol and gives it the specified metric
  address-family ipv6
    - Enters IPv6 address-family configuration for IS-IS
      redistribute [*protocol*] [autonomous-system-number] [**metric** {*metric value}*] [level]
        - Redistributes IPv6 routes from a specified protocol and gives it the specified metric

Problems

In this lab, many problems were encountered. The first problem and the simplest problem to fix was how the network between R5 and R6 wasn't redistributing in the eBGP, so I used the command "`redistribute connected`" to get that network to be put into eBGP. I didn't notice this problem in the other AS's, which likely indicates a difference between IS-IS and the other routing protocols used. Another problem that was met was how routes in the 2nd AS weren't redistributing out. This was a hard problem to solve since the configuration already had the "`redistribute bgp 2`" command in the router configuration for EIGRP. One fix that worked was to enter in the parameters for "`metric`" in the redistribution command. Lastly the hardest problem to solve was IPv6 pings flickering, meaning some pings fail, but others succeed in an

extremely inconsistent manner. The main issue at hand was figuring out what exactly was causing this flickering. Initially I checked if there were any missing IPv6 routes or any interfaces that had duplex mismatches or mismatching configurations. This proved fruitless. Then I did a repeated ping on both PCs to see if there was a pattern to the flickering; there was no pattern. Later after much testing and probing, I realized that the IPv6 routes were disappearing when the PCs couldn't ping each other. After a while, I realized that the 2 routers in AS 2 were set up as eBGP neighbors. This is a problem because it would cause conflicting routes to appear and for those routes to fight over each other, which was what caused the flickering pings. To fix this, the routers were disactivated neighbors and the corresponding neighbor statements were removed.

Conclusion

Though many issues were met in this lab and many new concepts had to be learned, the lab was completed. This lab really depended on what I learned in the CCNA on how to set up routing protocols, so that I could add eBGP on top of that to route between AS's. despite the fact that eBGP is quite a hard protocol to set up, I was able to eventually successfully configure after much time.

Configurations

R1 Configuration

```
version 16.9
!
hostname R1
!
!
ipv6 unicast-routing
!
!
interface GigabitEthernet0/0/0
 ip address 10.0.20.1 255.255.255.0
 negotiation auto
 ipv6 address 1:20::1/64
 ipv6 ospf 1 area 0
 no shut
!
interface GigabitEthernet0/0/1
 ip address 10.0.0.1 255.255.255.0
 negotiation auto
 ipv6 address 1::1/64
 ipv6 ospf 1 area 0
 no shut
!
!
router ospf 1
 router-id 1.1.1.1
 network 10.0.0.0 0.0.0.255 area 0
 network 10.0.20.0 0.0.0.255 area 0
!
ipv6 router ospf 1
```

```
 router-id 1.1.1.1
!
!
end
```

R2 Configuration

```
version 16.9
!
hostname R2
!
!
ipv6 unicast-routing
!
!
interface GigabitEthernet0/0/0
 ip address 10.0.0.2 255.255.255.0
 negotiation auto
 ipv6 address 1::2/64
 ipv6 ospf 1 area 0
 no shut
!
interface GigabitEthernet0/0/1
 ip address 192.168.0.1 255.255.255.0
 negotiation auto
 ipv6 address 2::1/64
 ipv6 ospf 1 area 0
 no shut
!
router ospf 1
 router-id 2.2.2.2
 redistribute bgp 1 metric 10
 network 10.0.0.0 0.0.0.255 area 0
 network 192.168.0.0 0.0.0.255 area 0
!
router bgp 1
 bgp router-id 2.2.2.2
 bgp log-neighbor-changes
 neighbor 2::2 remote-as 2
 neighbor 192.168.0.2 remote-as 2
 !
 address-family ipv4
  redistribute connected
  redistribute ospf 1
  no neighbor 2::2 activate
  neighbor 192.168.0.2 activate
 exit-address-family
 !
 address-family ipv6
  redistribute connected
  redistribute ospf 1 metric 10
```

```
  neighbor 2::2 activate
 exit-address-family
!
ipv6 router ospf 1
 router-id 2.2.2.2
 redistribute bgp 1 metric 10
!
!
!
end
```

R3 Configuration

```
version 16.9
!
hostname R3
!
!
ipv6 unicast-routing
!
!
interface GigabitEthernet0/0/0
 ip address 192.168.0.2 255.255.255.0
 negotiation auto
 ipv6 address 2::2/64
 ipv6 eigrp 1
 no shut
!
interface GigabitEthernet0/0/1
 ip address 10.0.1.1 255.255.255.0
 negotiation auto
 ipv6 address 1:1::1/64
 ipv6 eigrp 1
 no shut
!
!
router eigrp 1
 network 10.0.1.0 0.0.0.255
 network 192.168.0.0
 redistribute bgp 2 metric 100 1 255 1 1500
 eigrp router-id 3.3.3.3
!
router bgp 2
 bgp router-id 3.3.3.3
 bgp log-neighbor-changes
 neighbor 2::1 remote-as 1
 neighbor 192.168.0.1 remote-as 1
 !
 address-family ipv4
  redistribute connected
  redistribute eigrp 1
```

```
  no neighbor 2::1 activate
  neighbor 192.168.0.1 activate
 exit-address-family
 !
 address-family ipv6
  redistribute connected
  redistribute eigrp 1
  neighbor 2::1 activate
 exit-address-family
!
ipv6 router eigrp 1
 eigrp router-id 3.3.3.3
 redistribute bgp 2 metric 100 1 255 1 1500
!
!
!
end
```

R4 Configuration

```
version 16.9
!
hostname R4
!
!
ipv6 unicast-routing
!
!
interface GigabitEthernet0/0/0
 ip address 10.0.1.2 255.255.255.0
 negotiation auto
 ipv6 address 1:1::2/64
 ipv6 eigrp 1
 no shut
!
interface GigabitEthernet0/0/1
 ip address 192.168.1.1 255.255.255.0
 negotiation auto
 ipv6 address 2:1::1/64
 ipv6 eigrp 1
 no shut
!
!
router eigrp 1
 network 10.0.1.0 0.0.0.255
 network 192.168.1.0
 redistribute bgp 2 metric 100 1 255 1 1500
 eigrp router-id 4.4.4.4
!
router bgp 2
 bgp router-id 4.4.4.4
```

```
 bgp log-neighbor-changes
 neighbor 2:1::2 remote-as 3
 neighbor 192.168.1.2 remote-as 3
 !
 address-family ipv4
  redistribute connected
  redistribute eigrp 1
  no neighbor 2:1::2 activate
  neighbor 192.168.1.2 activate
 exit-address-family
 !
 address-family ipv6
  redistribute connected
  redistribute eigrp 1
  neighbor 2:1::2 activate
 exit-address-family
!
ipv6 router eigrp 1
 eigrp router-id 4.4.4.4
 redistribute bgp 2 metric 100 1 255 1 1500
!
!
!
end
```

R5 Configuration

```
version 16.9
!
hostname R5
!
!
ipv6 unicast-routing
!
!
interface GigabitEthernet0/0/0
 ip address 192.168.1.2 255.255.255.0
 ip router isis
 negotiation auto
 ipv6 address 2:1::2/64
 ipv6 router isis
 no shut
!
interface GigabitEthernet0/0/1
 ip address 10.0.3.1 255.255.255.0
 ip router isis
 negotiation auto
 ipv6 address 1:3::1/64
 ipv6 router isis
 no shut
!
```

```
router isis
 net 49.0012.0000.0000.0005.00
 is-type level-1
 metric-style wide
 log-adjacency-changes
 redistribute bgp 3 metric 30 level-1
 !
 address-family ipv6
  redistribute bgp 3 metric 30 level-1
 exit-address-family
!
router bgp 3
 bgp router-id 5.5.5.5
 bgp log-neighbor-changes
 no bgp default ipv4-unicast
 neighbor 2:1::1 remote-as 2
 neighbor 192.168.1.1 remote-as 2
 !
 address-family ipv4
  redistribute connected
  redistribute isis level-1 metric 10
  neighbor 192.168.1.1 activate
 exit-address-family
 !
 address-family ipv6
  redistribute connected
  redistribute isis metric 10 level-1
  neighbor 2:1::1 activate
 exit-address-family
!
!
!
end
```

R6 Configuration

```
version 16.9
!
hostname R6
!
!
ipv6 unicast-routing
!
!
interface GigabitEthernet0/0/0
 ip address 10.0.3.2 255.255.255.0
 ip router isis
 negotiation auto
 ipv6 address 1:3::2/64
 ipv6 router isis
 no shut
```

```
!
interface GigabitEthernet0/0/1
 ip address 10.0.30.1 255.255.255.0
 ip router isis
 negotiation auto
 ipv6 address 1:30::1/64
 ipv6 router isis
 no shut
!
!
router isis
 net 49.0012.0000.0000.0006.00
 is-type level-1
 metric-style wide
 log-adjacency-changes
!
!
!
end
```

Routes

R1 Routes

```
R1#show ip route

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
C        10.0.0.0/24 is directly connected, GigabitEthernet0/0/1
L        10.0.0.1/32 is directly connected, GigabitEthernet0/0/1
O E2     10.0.1.0/24 [110/10] via 10.0.0.2, 01:07:00, GigabitEthernet0/0/1
O E2     10.0.3.0/24 [110/10] via 10.0.0.2, 01:06:30, GigabitEthernet0/0/1
C        10.0.20.0/24 is directly connected, GigabitEthernet0/0/0
L        10.0.20.1/32 is directly connected, GigabitEthernet0/0/0
O E2     10.0.30.0/24 [110/10] via 10.0.0.2, 01:06:30, GigabitEthernet0/0/1
O     192.168.0.0/24 [110/2] via 10.0.0.2, 01:09:00, GigabitEthernet0/0/1
O E2  192.168.1.0/24 [110/10] via 10.0.0.2, 01:06:30, GigabitEthernet0/0/1

R1#show ipv6 route

C   1::/64 [0/0]
     via GigabitEthernet0/0/1, directly connected
OE2 1:1::/64 [110/10]
     via FE80::CE7F:76FF:FE6A:B5E0, GigabitEthernet0/0/1
OE2 1:3::/64 [110/10]
     via FE80::CE7F:76FF:FE6A:B5E0, GigabitEthernet0/0/1
C   1:20::/64 [0/0]
     via GigabitEthernet0/0/0, directly connected
L   1:20::1/128 [0/0]
     via GigabitEthernet0/0/0, receive
```

```
OE2 1:30::/64 [110/10]
     via FE80::CE7F:76FF:FE6A:B5E0, GigabitEthernet0/0/1
O   2::/64 [110/2]
     via FE80::CE7F:76FF:FE6A:B5E0, GigabitEthernet0/0/1
OE2 2:1::/64 [110/10]
     via FE80::CE7F:76FF:FE6A:B5E0, GigabitEthernet0/0/1
L   FF00::/8 [0/0]
     via Null0, receive
```

R2 Routes

```
R2#show ip route

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
C        10.0.0.0/24 is directly connected, GigabitEthernet0/0/0
L        10.0.0.2/32 is directly connected, GigabitEthernet0/0/0
B        10.0.1.0/24 [20/0] via 192.168.0.2, 01:06:51
B        10.0.3.0/24 [20/25600512] via 192.168.0.2, 01:06:21
O        10.0.20.0/24 [110/2] via 10.0.0.1, 00:11:26, GigabitEthernet0/0/0
B        10.0.30.0/24 [20/25600512] via 192.168.0.2, 01:06:21
      192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.0.0/24 is directly connected, GigabitEthernet0/0/1
L        192.168.0.1/32 is directly connected, GigabitEthernet0/0/1
B     192.168.1.0/24 [20/3072] via 192.168.0.2, 01:06:21

R2#show ipv6 route

C   1::/64 [0/0]
     via GigabitEthernet0/0/0, directly connected
L   1::1/128 [0/0]
     via GigabitEthernet0/0/0, receive
L   1::2/128 [0/0]
     via GigabitEthernet0/0/0, receive
B   1:1::/64 [20/0]
     via FE80::B6A8:B9FF:FE01:B750, GigabitEthernet0/0/1
B   1:3::/64 [20/25600512]
     via FE80::B6A8:B9FF:FE01:B750, GigabitEthernet0/0/1
O   1:20::/64 [110/2]
     via FE80::CE7F:76FF:FED1:ADC1, GigabitEthernet0/0/0
B   1:30::/64 [20/25600512]
     via FE80::B6A8:B9FF:FE01:B750, GigabitEthernet0/0/1
C   2::/64 [0/0]
     via GigabitEthernet0/0/1, directly connected
L   2::1/128 [0/0]
     via GigabitEthernet0/0/1, receive
B   2:1::/64 [20/3072]
     via FE80::B6A8:B9FF:FE01:B750, GigabitEthernet0/0/1
L   FF00::/8 [0/0]
     via Null0, receive
```

R3 Routes

```
R3#show ip route

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
B        10.0.0.0/24 [20/0] via 192.168.0.1, 01:09:58
C        10.0.1.0/24 is directly connected, GigabitEthernet0/0/1
L        10.0.1.1/32 is directly connected, GigabitEthernet0/0/1
D EX     10.0.3.0/24
           [170/25600512] via 10.0.1.2, 01:07:55, GigabitEthernet0/0/1
B        10.0.20.0/24 [20/2] via 192.168.0.1, 00:12:37
D EX     10.0.30.0/24
           [170/25600512] via 10.0.1.2, 01:07:55, GigabitEthernet0/0/1
      192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.0.0/24 is directly connected, GigabitEthernet0/0/0
L        192.168.0.2/32 is directly connected, GigabitEthernet0/0/0
D     192.168.1.0/24 [90/3072] via 10.0.1.2, 01:07:55, GigabitEthernet0/0/1

R3#show ipv6 route

B   1::/64 [20/0]
     via FE80::CE7F:76FF:FE6A:B5E1, GigabitEthernet0/0/0
C   1:1::/64 [0/0]
     via GigabitEthernet0/0/1, directly connected
L   1:1::1/128 [0/0]
     via GigabitEthernet0/0/1, receive
EX  1:3::/64 [170/25600512]
     via FE80::2F8:2CFF:FE7F:7190, GigabitEthernet0/0/1
B   1:20::/64 [20/10]
     via FE80::CE7F:76FF:FE6A:B5E1, GigabitEthernet0/0/0
EX  1:30::/64 [170/25600512]
     via FE80::2F8:2CFF:FE7F:7190, GigabitEthernet0/0/1
C   2::/64 [0/0]
     via GigabitEthernet0/0/0, directly connected
L   2::2/128 [0/0]
     via GigabitEthernet0/0/0, receive
D   2:1::/64 [90/3072]
     via FE80::2F8:2CFF:FE7F:7190, GigabitEthernet0/0/1
L   FF00::/8 [0/0]
     via Null0, receive
```

R4 Routes

```
R4#show ip route

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
D EX     10.0.0.0/24
           [170/25600512] via 10.0.1.1, 01:08:02, GigabitEthernet0/0/0
```

```
C        10.0.1.0/24 is directly connected, GigabitEthernet0/0/0
L        10.0.1.2/32 is directly connected, GigabitEthernet0/0/0
B        10.0.3.0/24 [20/0] via 192.168.1.2, 01:08:50
D EX     10.0.20.0/24
           [170/25600512] via 10.0.1.1, 00:12:39, GigabitEthernet0/0/0
B        10.0.30.0/24 [20/10] via 192.168.1.2, 01:08:20
D     192.168.0.0/24 [90/3072] via 10.0.1.1, 01:08:02, GigabitEthernet0/0/0
      192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.1.0/24 is directly connected, GigabitEthernet0/0/1
L        192.168.1.1/32 is directly connected, GigabitEthernet0/0/1

R4#show ipv6 route

EX  1::/64 [170/25600512]
     via FE80::B6A8:B9FF:FE01:B751, GigabitEthernet0/0/0
C   1:1::/64 [0/0]
     via GigabitEthernet0/0/0, directly connected
L   1:1::2/128 [0/0]
     via GigabitEthernet0/0/0, receive
B   1:3::/64 [20/0]
     via FE80::B6A8:B9FF:FE47:8E40, GigabitEthernet0/0/1
EX  1:20::/64 [170/25600512]
     via FE80::B6A8:B9FF:FE01:B751, GigabitEthernet0/0/0
B   1:30::/64 [20/10]
     via FE80::B6A8:B9FF:FE47:8E40, GigabitEthernet0/0/1
D   2::/64 [90/3072]
     via FE80::B6A8:B9FF:FE01:B751, GigabitEthernet0/0/0
C   2:1::/64 [0/0]
     via GigabitEthernet0/0/1, directly connected
L   2:1::1/128 [0/0]
     via GigabitEthernet0/0/1, receive
L   FF00::/8 [0/0]
     via Null0, receive
```

R5 Routes

```
R5#show ip route

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
B        10.0.0.0/24 [20/25600512] via 192.168.1.1, 01:08:36
B        10.0.1.0/24 [20/0] via 192.168.1.1, 01:08:36
C        10.0.3.0/24 is directly connected, GigabitEthernet0/0/1
L        10.0.3.1/32 is directly connected, GigabitEthernet0/0/1
B        10.0.20.0/24 [20/25600512] via 192.168.1.1, 00:13:26
i L1     10.0.30.0/24 [115/20] via 10.0.3.2, 01:09:22, GigabitEthernet0/0/1
B     192.168.0.0/24 [20/3072] via 192.168.1.1, 01:08:36
      192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.1.0/24 is directly connected, GigabitEthernet0/0/0
L        192.168.1.2/32 is directly connected, GigabitEthernet0/0/0
```

```
R5#show ipv6 route

B   1::/64 [20/25600512]
     via FE80::2F8:2CFF:FE7F:7191, GigabitEthernet0/0/0
B   1:1::/64 [20/0]
     via FE80::2F8:2CFF:FE7F:7191, GigabitEthernet0/0/0
C   1:3::/64 [0/0]
     via GigabitEthernet0/0/1, directly connected
L   1:3::1/128 [0/0]
     via GigabitEthernet0/0/1, receive
B   1:20::/64 [20/25600512]
     via FE80::2F8:2CFF:FE7F:7191, GigabitEthernet0/0/0
I1  1:30::/64 [115/20]
     via FE80::B6A8:B9FF:FE01:B2D0, GigabitEthernet0/0/1
B   2::/64 [20/3072]
     via FE80::2F8:2CFF:FE7F:7191, GigabitEthernet0/0/0
C   2:1::/64 [0/0]
     via GigabitEthernet0/0/0, directly connected
L   2:1::2/128 [0/0]
     via GigabitEthernet0/0/0, receive
L   FF00::/8 [0/0]
     via Null0, receive
```

R6 Routes

```
R6#show ip route

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
i L1     10.0.0.0/24 [115/40] via 10.0.3.1, 01:08:35, GigabitEthernet0/0/0
i L1     10.0.1.0/24 [115/40] via 10.0.3.1, 01:08:35, GigabitEthernet0/0/0
C        10.0.3.0/24 is directly connected, GigabitEthernet0/0/0
L        10.0.3.2/32 is directly connected, GigabitEthernet0/0/0
i L1     10.0.20.0/24 [115/40] via 10.0.3.1, 00:13:24, GigabitEthernet0/0/0
C        10.0.30.0/24 is directly connected, GigabitEthernet0/0/1
L        10.0.30.1/32 is directly connected, GigabitEthernet0/0/1
i L1  192.168.0.0/24 [115/40] via 10.0.3.1, 01:08:35, GigabitEthernet0/0/0
i L1  192.168.1.0/24 [115/20] via 10.0.3.1, 01:09:26, GigabitEthernet0/0/0

R6#show ipv6 route

I1  1::/64 [115/40]
     via FE80::B6A8:B9FF:FE47:8E41, GigabitEthernet0/0/0
I1  1:1::/64 [115/40]
     via FE80::B6A8:B9FF:FE47:8E41, GigabitEthernet0/0/0
C   1:3::/64 [0/0]
     via GigabitEthernet0/0/0, directly connected
L   1:3::2/128 [0/0]
     via GigabitEthernet0/0/0, receive
```

```
I1  1:20::/64 [115/40]
     via FE80::B6A8:B9FF:FE47:8E41, GigabitEthernet0/0/0
C   1:30::/64 [0/0]
     via GigabitEthernet0/0/1, directly connected
L   1:30::1/128 [0/0]
     via GigabitEthernet0/0/1, receive
I1  2::/64 [115/40]
     via FE80::B6A8:B9FF:FE47:8E41, GigabitEthernet0/0/0
I1  2:1::/64 [115/20]
     via FE80::B6A8:B9FF:FE47:8E41, GigabitEthernet0/0/0
L   FF00::/8 [0/0]
     via Null0, receive
```