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| iBGP eBGP in GNS3 |  |
|  |  |
|  | 03/27/2021CISCO CCNP |
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Purpose

Set A system of network with 5 routers that has iBGP and eBGP running in ipv4. There should be three routers running in iBGP, two routers running in eBGP, and two routers will have two protocol running at the same time. Routers should have routes to all other networks, and devices should be able to ping any other device. This lab should include loopback address on the routers.

Background Information on Lab Concepts

Border Gateway Protocol (BGP) is a standardized exterior gateway protocol designed to exchange routing and reachability information between autonomous systems (AS). BGP is used as the routing protocol in the internet, and AS typically belongs to ISPs or government. EBGP is used between autonomous systems. It is used and implemented at the edge or border router that provides inter-connectivity for two or more autonomous system. It functions as the protocol responsible for interconnection of networks from different organizations or the Internet. IBGP is used inside the autonomous systems. It is used to provide information to internal routers having the same AS. It requires all the devices in same autonomous systems to form full mesh topology or either of Route reflectors. iBGP is used in small private networks where eBGP is used in large public networks.

Lab Summary

In GNS3, I placed 5 CISCO 4321 routers and added NIM-2T module on each one. I connected routers’ serial ports to their neighbors. I set up the iBGP protocol on router 2, 3, and 4 by enabling it on the routers and addressing their directly connected networks and neighbors. Then I set up eBGP protocol connection on router 1, 2, 4 and 5 by enabling BGP on routers and addressing their connected networks and neighbors. At last I updated their neighbor loopback address so that they can reach their neighbor’s loopback address.

Lab Commands

Router (Config) # interface ? ----- enter an interface

Router (Config) # ipv6 unicast-routing ----- enable IPv6 on router

Router (Config-if) # ip address ? subnet-mask ? ----- set ipv4 address on an interface

Router (Config-if) # ip route ? ----- set ipv4 route

Router (Config) # router bgp ? ----- enable BGP on router

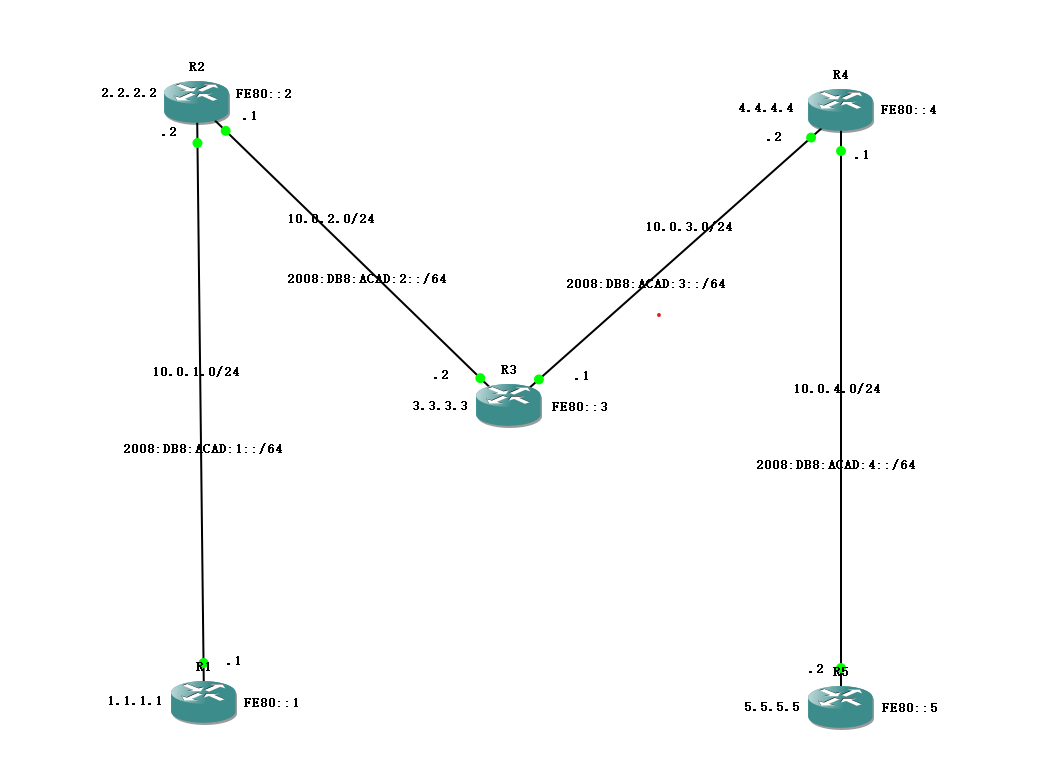
Router (Config-router) # network ? mask ? ----- network statement

Router (Config-router) # neighbor ? remote-as ? ----- set neighbors

Router (Config-router) # neighbor ? ebgp-multihop ? ----- set ebgp hop counts

Router (Config-router) # neighbor ? update-source Loopback? ----- make neighbor loopback address reachable

Network Diagram



Configuration

R1:

*Current configuration : 1293 bytes*

*Last configuration change at 12:51:03 UTC Fri Apr 30 2021*

*version 15.2*

*service timestamps debug datetime msec*

*service timestamps log datetime msec*

*hostname R1*

*boot-start-marker*

*boot-end-marker*

*no aaa new-model*

*no ip icmp rate-limit unreachable*

*ip cef*

*no ip domain lookup*

*ipv6 unicast-routing*

*ipv6 cef*

*multilink bundle-name authenticated*

*ip tcp synwait-time 5*

*interface Loopback0*

*ip address 1.1.1.1 255.255.255.255*

*interface FastEthernet0/0*

*no ip address*

*shutdown*

*speed auto*

*duplex auto*

*interface FastEthernet0/1*

*ip address 10.0.1.1 255.255.255.0*

*speed auto*

*duplex auto*

*ipv6 address FE80::1 link-local*

*ipv6 address 2088:DB8:ACAD:1::1/64*

*ipv6 enable*

*router bgp 1*

*bgp log-neighbor-changes*

*network 1.1.1.1 mask 255.255.255.255*

*network 10.0.1.0 mask 255.255.255.0*

*neighbor 2.2.2.2 remote-as 2*

*neighbor 2.2.2.2 ebgp-multihop 4*

*neighbor 2.2.2.2 update-source Loopback0*

*ip forward-protocol nd*

*no ip http server*

*no ip http secure-server*

*ip route 2.2.2.2 255.255.255.255 10.0.1.2*

*control-plane*

*line con 0*

*exec-timeout 0 0*

*privilege level 15*

*logging synchronous*

*stopbits 1*

*line aux 0*

*exec-timeout 0 0*

*privilege level 15*

*logging synchronous*

*stopbits 1*

*line vty 0 4*

*login*

*End*

*////*

*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*

*+ - replicated route, % - next hop override*

*Gateway of last resort is not set*

*1.0.0.0/32 is subnetted, 1 subnets*

*C 1.1.1.1 is directly connected, Loopback0*

*2.0.0.0/32 is subnetted, 1 subnets*

*S 2.2.2.2 [1/0] via 10.0.1.2*

*3.0.0.0/32 is subnetted, 1 subnets*

*B 3.3.3.3 [20/0] via 2.2.2.2, 03:28:13*

*4.0.0.0/32 is subnetted, 1 subnets*

*B 4.4.4.4 [20/0] via 2.2.2.2, 02:13:48*

*10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks*

*C 10.0.1.0/24 is directly connected, FastEthernet0/1*

*L 10.0.1.1/32 is directly connected, FastEthernet0/1*

*B 10.0.2.0/24 [20/0] via 2.2.2.2, 03:28:13*

*B 10.0.3.0/24 [20/2] via 2.2.2.2, 02:13:17*

*B 10.0.4.0/24 [20/0] via 2.2.2.2, 02:13:48*

R2:

*Current configuration : 1788 bytes*

*Last configuration change at 13:12:15 UTC Fri Apr 30 2021*

*version 15.2*

*service timestamps debug datetime msec*

*service timestamps log datetime msec*

*hostname R2*

*boot-start-marker*

*boot-end-marker*

*no aaa new-model*

*no ip icmp rate-limit unreachable*

*ip cef*

*no ip domain lookup*

*ipv6 unicast-routing*

*ipv6 cef*

*multilink bundle-name authenticated*

*ip tcp synwait-time 5*

*interface Loopback0*

*ip address 2.2.2.2 255.255.255.255*

*interface FastEthernet0/0*

*ip address 10.0.1.2 255.255.255.0*

*speed auto*

*duplex auto*

*ipv6 address FE80::2 link-local*

*ipv6 address 2008:DB8:ACAD:1::2/64*

*ipv6 enable*

*interface FastEthernet0/1*

*ip address 10.0.2.1 255.255.255.0*

*speed auto*

*duplex auto*

*ipv6 address FE80::2 link-local*

*ipv6 address 2008:DB8:ACAD:2::1/64*

*ipv6 enable*

*ipv6 ospf 1 area 0*

*router ospf 1*

*network 2.2.2.2 0.0.0.0 area 0*

*network 10.0.2.0 0.0.0.255 area 0*

*router bgp 2*

*bgp log-neighbor-changes*

*network 2.2.2.2 mask 255.255.255.255*

*network 10.0.1.0 mask 255.255.255.0*

*network 10.0.2.0 mask 255.255.255.0*

*network 10.0.3.0 mask 255.255.255.0*

*neighbor 1.1.1.1 remote-as 1*

*neighbor 1.1.1.1 ebgp-multihop 4*

*neighbor 1.1.1.1 update-source Loopback0*

*neighbor 3.3.3.3 remote-as 2*

*neighbor 3.3.3.3 update-source Loopback0*

*neighbor 4.4.4.4 remote-as 2*

*neighbor 4.4.4.4 update-source Loopback0*

*ip forward-protocol nd*

*no ip http server*

*no ip http secure-server*

*ip route 1.1.1.1 255.255.255.255 10.0.1.1*

*ip route 3.3.3.3 255.255.255.255 10.0.2.2*

*ipv6 router ospf 1*

*router-id 2.2.2.2*

*control-plane*

*line con 0*

*exec-timeout 0 0*

*privilege level 15*

*logging synchronous*

*stopbits 1*

*line aux 0*

*exec-timeout 0 0*

*privilege level 15*

*logging synchronous*

*stopbits 1*

*line vty 0 4*

*login*

*End*

*////*

*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*

*+ - replicated route, % - next hop override*

*Gateway of last resort is not set*

*1.0.0.0/32 is subnetted, 1 subnets*

*S 1.1.1.1 [1/0] via 10.0.1.1*

*2.0.0.0/32 is subnetted, 1 subnets*

*C 2.2.2.2 is directly connected, Loopback0*

*3.0.0.0/32 is subnetted, 1 subnets*

*S 3.3.3.3 [1/0] via 10.0.2.2*

*4.0.0.0/32 is subnetted, 1 subnets*

*O 4.4.4.4 [110/3] via 10.0.2.2, 03:23:04, FastEthernet0/1*

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

*C 10.0.1.0/24 is directly connected, FastEthernet0/0*

*L 10.0.1.2/32 is directly connected, FastEthernet0/0*

*C 10.0.2.0/24 is directly connected, FastEthernet0/1*

*L 10.0.2.1/32 is directly connected, FastEthernet0/1*

*O 10.0.3.0/24 [110/2] via 10.0.2.2, 03:23:04, FastEthernet0/1*

*B 10.0.4.0/24 [200/0] via 4.4.4.4, 02:17:22*

R3:

*Current configuration : 1638 bytes*

*version 15.2*

*service timestamps debug datetime msec*

*service timestamps log datetime msec*

*hostname R3*

*boot-start-marker*

*boot-end-marker*

*no aaa new-model*

*no ip icmp rate-limit unreachable*

*ip cef*

*no ip domain lookup*

*ipv6 unicast-routing*

*ipv6 cef*

*multilink bundle-name authenticated*

*ip tcp synwait-time 5*

*interface Loopback0*

*ip address 3.3.3.3 255.255.255.255*

*interface FastEthernet0/0*

*ip address 10.0.2.2 255.255.255.0*

*speed auto*

*duplex auto*

*ipv6 address FE80::3 link-local*

*ipv6 address 2008:DB8:ACAD:2::2/64*

*ipv6 enable*

*ipv6 ospf 1 area 0*

*interface FastEthernet0/1*

*ip address 10.0.3.1 255.255.255.0*

*speed auto*

*duplex auto*

*ipv6 address FE80::3 link-local*

*ipv6 address 2008:DB8:ACAD:3::1/64*

*ipv6 enable*

*ipv6 ospf 1 area 0*

*router ospf 1*

*network 3.3.3.3 0.0.0.0 area 0*

*network 10.0.2.0 0.0.0.255 area 0*

*network 10.0.3.0 0.0.0.255 area 0*

*router bgp 2*

*bgp log-neighbor-changes*

*network 3.3.3.3 mask 255.255.255.255*

*network 10.0.2.0 mask 255.255.255.0*

*network 10.0.3.0 mask 255.255.255.0*

*neighbor 2.2.2.2 remote-as 2*

*neighbor 2.2.2.2 update-source Loopback0*

*neighbor 4.4.4.4 remote-as 2*

*neighbor 4.4.4.4 update-source Loopback0*

*ip forward-protocol nd*

*no ip http server*

*no ip http secure-server*

*ip route 2.2.2.2 255.255.255.255 10.0.2.1*

*ip route 4.4.4.4 255.255.255.255 10.0.3.2*

*ipv6 router ospf 1*

*router-id 3.3.3.3*

*control-plane*

*line con 0*

*exec-timeout 0 0*

*privilege level 15*

*logging synchronous*

*stopbits 1*

*line aux 0*

*exec-timeout 0 0*

*privilege level 15*

*logging synchronous*

*stopbits 1*

*line vty 0 4*

*login*

*End*

*////*

*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*

*+ - replicated route, % - next hop override*

*Gateway of last resort is not set*

*2.0.0.0/32 is subnetted, 1 subnets*

*S 2.2.2.2 [1/0] via 10.0.2.1*

*3.0.0.0/32 is subnetted, 1 subnets*

*C 3.3.3.3 is directly connected, Loopback0*

*4.0.0.0/32 is subnetted, 1 subnets*

*S 4.4.4.4 [1/0] via 10.0.3.2*

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

*B 10.0.1.0/24 [200/0] via 2.2.2.2, 03:28:03*

*C 10.0.2.0/24 is directly connected, FastEthernet0/0*

*L 10.0.2.2/32 is directly connected, FastEthernet0/0*

*C 10.0.3.0/24 is directly connected, FastEthernet0/1*

*L 10.0.3.1/32 is directly connected, FastEthernet0/1*

*B 10.0.4.0/24 [200/0] via 4.4.4.4, 03:28:04*

R4:

*Current configuration : 1788 bytes*

*Last configuration change at 13:12:58 UTC Fri Apr 30 2021*

*version 15.2*

*service timestamps debug datetime msec*

*service timestamps log datetime msec*

*hostname R4*

*boot-start-marker*

*boot-end-marker*

*no aaa new-model*

*no ip icmp rate-limit unreachable*

*ip cef*

*no ip domain lookup*

*ipv6 unicast-routing*

*ipv6 cef*

*multilink bundle-name authenticated*

*ip tcp synwait-time 5*

*interface Loopback0*

*ip address 4.4.4.4 255.255.255.255*

*interface FastEthernet0/0*

*ip address 10.0.3.2 255.255.255.0*

*speed auto*

*duplex auto*

*ipv6 address FE80::4 link-local*

*ipv6 address 2008:DB8:ACAD:3::2/64*

*ipv6 enable*

*ipv6 ospf 1 area 0*

*interface FastEthernet0/1*

*ip address 10.0.4.1 255.255.255.0*

*speed auto*

*duplex auto*

*ipv6 address FE80::4 link-local*

*ipv6 address 2008:DB8:ACAD:4::1/64*

*ipv6 enable*

*router ospf 1*

*network 4.4.4.4 0.0.0.0 area 0*

*network 10.0.3.0 0.0.0.255 area 0*

*router bgp 2*

*bgp log-neighbor-changes*

*network 4.4.4.4 mask 255.255.255.255*

*network 10.0.2.0 mask 255.255.255.0*

*network 10.0.3.0 mask 255.255.255.0*

*network 10.0.4.0 mask 255.255.255.0*

*neighbor 2.2.2.2 remote-as 2*

*neighbor 2.2.2.2 update-source Loopback0 neighbor 3.3.3.3 remote-as 2*

*neighbor 3.3.3.3 update-source Loopback0*

*neighbor 5.5.5.5 remote-as 3*

*neighbor 5.5.5.5 ebgp-multihop 4*

*neighbor 5.5.5.5 update-source Loopback0*

*ip forward-protocol nd*

*no ip http server*

*no ip http secure-server*

*ip route 3.3.3.3 255.255.255.255 10.0.3.1*

*ip route 5.5.5.5 255.255.255.255 10.0.4.2*

*ipv6 router ospf 1*

*router-id 4.4.4.4*

*control-plane*

*line con 0*

*exec-timeout 0 0*

*privilege level 15*

*logging synchronous*

*stopbits 1*

*line aux 0*

*exec-timeout 0 0*

*privilege level 15*

*logging synchronous*

*stopbits 1*

*line vty 0 4*

*login*

*end*

*////*

*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*

*+ - replicated route, % - next hop override*

*Gateway of last resort is not set*

*2.0.0.0/32 is subnetted, 1 subnets*

*O 2.2.2.2 [110/3] via 10.0.3.1, 03:57:20, FastEthernet0/0*

*3.0.0.0/32 is subnetted, 1 subnets*

*S 3.3.3.3 [1/0] via 10.0.3.1*

*4.0.0.0/32 is subnetted, 1 subnets*

*C 4.4.4.4 is directly connected, Loopback0*

*5.0.0.0/32 is subnetted, 1 subnets*

*S 5.5.5.5 [1/0] via 10.0.4.2*

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

*B 10.0.1.0/24 [200/0] via 2.2.2.2, 02:51:13*

*O 10.0.2.0/24 [110/2] via 10.0.3.1, 03:57:30, FastEthernet0/0*

*C 10.0.3.0/24 is directly connected, FastEthernet0/0*

*L 10.0.3.2/32 is directly connected, FastEthernet0/0*

*C 10.0.4.0/24 is directly connected, FastEthernet0/1*

*L 10.0.4.1/32 is directly connected, FastEthernet0/1*

R5:

*Current configuration : 1231 bytes*

*version 15.2*

*service timestamps debug datetime msec*

*service timestamps log datetime msec*

*hostname R5*

*boot-start-marker*

*boot-end-marker*

*no aaa new-model*

*no ip icmp rate-limit unreachable*

*ip cef*

*no ip domain lookup*

*ipv6 unicast-routing*

*ipv6 cef*

*multilink bundle-name authenticated*

*ip tcp synwait-time 5*

*interface Loopback0*

*ip address 5.5.5.5 255.255.255.255*

*interface FastEthernet0/0*

*ip address 10.0.4.2 255.255.255.0*

*speed auto*

*duplex auto*

*ipv6 address FE80::5 link-local*

*ipv6 address 2008:DB8:ACAD:4::2/64*

*ipv6 enable*

*interface FastEthernet0/1*

*no ip address*

*shutdown*

*speed auto*

*duplex auto*

*router bgp 3*

*bgp log-neighbor-changes*

*network 5.5.5.5 mask 255.255.255.255*

*network 10.0.4.0 mask 255.255.255.0*

*neighbor 4.4.4.4 remote-as 2*

*neighbor 4.4.4.4 ebgp-multihop 4*

*neighbor 4.4.4.4 update-source Loopback0*

*ip forward-protocol nd*

*no ip http server*

*no ip http secure-server*

*ip route 4.4.4.4 255.255.255.255 10.0.4.1*

*control-plane*

*line con 0*

*exec-timeout 0 0*

*privilege level 15*

*logging synchronous*

*stopbits 1*

*line aux 0*

*exec-timeout 0 0*

*privilege level 15*

*logging synchronous*

*stopbits 1*

*line vty 0 4*

*login*

*end*

*////*

*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*

*+ - replicated route, % - next hop override*

*Gateway of last resort is not set*

*2.0.0.0/32 is subnetted, 1 subnets*

*B 2.2.2.2 [20/0] via 4.4.4.4, 02:48:15*

*3.0.0.0/32 is subnetted, 1 subnets*

*B 3.3.3.3 [20/0] via 4.4.4.4, 03:52:39*

*4.0.0.0/32 is subnetted, 1 subnets*

*S 4.4.4.4 [1/0] via 10.0.4.1*

*5.0.0.0/32 is subnetted, 1 subnets*

*C 5.5.5.5 is directly connected, Loopback0*

*10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks*

*B 10.0.1.0/24 [20/0] via 4.4.4.4, 02:48:15*

*B 10.0.2.0/24 [20/2] via 4.4.4.4, 02:48:46*

*B 10.0.3.0/24 [20/0] via 4.4.4.4, 03:53:10*

*C 10.0.4.0/24 is directly connected, FastEthernet0/0*

*L 10.0.4.2/32 is directly connected, FastEthernet0/0*

Problems

When I First set up the connections between routers, no ping can go through more than three routers. I troubleshoot and I saw I have neighbor relationship up between routers. At last I found that I need to set up neighbor relationship between all the iBGP routers and the problem was solved by having three neighbors on the iBGP routers.

Conclusion

R1:

*R1#show ip bgp*

*BGP table version is 10, local router ID is 1.1.1.1*

*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,*

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

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

*Network Next Hop Metric LocPrf Weight Path*

*\*> 1.1.1.1/32 0.0.0.0 0 32768 i*

*r> 2.2.2.2/32 2.2.2.2 0 0 2 i*

*\*> 3.3.3.3/32 2.2.2.2 0 2 i*

*\*> 4.4.4.4/32 2.2.2.2 0 2 i*

*\* 10.0.1.0/24 2.2.2.2 0 0 2 i*

*\*> 0.0.0.0 0 32768 i*

*\*> 10.0.2.0/24 2.2.2.2 0 0 2 i*

*\*> 10.0.3.0/24 2.2.2.2 2 0 2 i*

*\*> 10.0.4.0/24 2.2.2.2 0 2 i*

R2:

*R2#show ip bgp*

*BGP table version is 10, local router ID is 2.2.2.2*

*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,*

*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> 1.1.1.1/32 1.1.1.1 0 0 1 i*

*\*> 2.2.2.2/32 0.0.0.0 0 32768 i*

*r>i 3.3.3.3/32 3.3.3.3 0 100 0 i*

*r>i 4.4.4.4/32 4.4.4.4 0 100 0 i*

*\* i 5.5.5.5/32 5.5.5.5 0 100 0 3 i*

*\*> 10.0.1.0/24 0.0.0.0 0 32768 i*

*\* 1.1.1.1 0 0 1 i*

*\* i 10.0.2.0/24 10.0.3.1 2 100 0 i*

*\* i 3.3.3.3 0 100 0 i*

*\*> 0.0.0.0 0 32768 i*

*\*> 10.0.3.0/24 10.0.2.2 2 32768 i*

*\* i 4.4.4.4 0 100 0 i*

*\* i 3.3.3.3 0 100 0 i*

*\*>i 10.0.4.0/24 4.4.4.4 0 100 0 i*

R3:

*R3#show ip bgp*

*BGP table version is 8, local router ID is 3.3.3.3*

*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,*

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

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

*Network Next Hop Metric LocPrf Weight Path*

*\* i 1.1.1.1/32 1.1.1.1 0 100 0 1 i*

*r>i 2.2.2.2/32 2.2.2.2 0 100 0 i*

*\*> 3.3.3.3/32 0.0.0.0 0 32768 i*

*r>i 4.4.4.4/32 4.4.4.4 0 100 0 i*

*\* i 5.5.5.5/32 5.5.5.5 0 100 0 3 i*

*\*>i 10.0.1.0/24 2.2.2.2 0 100 0 i*

*\* i 10.0.2.0/24 2.2.2.2 0 100 0 i*

*\*> 0.0.0.0 0 32768 i*

*\* i 10.0.3.0/24 4.4.4.4 0 100 0 i*

*\*> 0.0.0.0 0 32768 i*

*\*>i 10.0.4.0/24 4.4.4.4 0 100 0 i*

R4:

*R4#show ip bgp*

*BGP table version is 10, local router ID is 4.4.4.4*

*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,*

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

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

*Network Next Hop Metric LocPrf Weight Path*

*\* i 1.1.1.1/32 1.1.1.1 0 100 0 1 i*

*r>i 2.2.2.2/32 2.2.2.2 0 100 0 i*

*r>i 3.3.3.3/32 3.3.3.3 0 100 0 i*

*\*> 4.4.4.4/32 0.0.0.0 0 32768 i*

*r> 5.5.5.5/32 5.5.5.5 0 0 3 i*

*\*>i 10.0.1.0/24 2.2.2.2 0 100 0 i*

*\* i 10.0.2.0/24 2.2.2.2 0 100 0 i*

*\*> 10.0.3.1 2 32768 i*

*\* i 3.3.3.3 0 100 0 i*

*\* i 10.0.3.0/24 10.0.2.2 2 100 0 i*

*\* i 3.3.3.3 0 100 0 i*

*\*> 0.0.0.0 0 32768 i*

*\* 10.0.4.0/24 5.5.5.5 0 0 3 i*

*\*> 0.0.0.0 0 32768 i*

R5:

*R5#show ip bgp*

*BGP table version is 11, local router ID is 5.5.5.5*

*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,*

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

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

*Network Next Hop Metric LocPrf Weight Path*

*\*> 2.2.2.2/32 4.4.4.4 0 2 i*

*\*> 3.3.3.3/32 4.4.4.4 0 2 i*

*r> 4.4.4.4/32 4.4.4.4 0 0 2 i*

*\*> 5.5.5.5/32 0.0.0.0 0 32768 i*

*\*> 10.0.1.0/24 4.4.4.4 0 2 i*

*\*> 10.0.2.0/24 4.4.4.4 2 0 2 i*

*\*> 10.0.3.0/24 4.4.4.4 0 0 2 i*

*\*> 10.0.4.0/24 0.0.0.0 0 32768 i*

*\* 4.4.4.4 0 0 2 i*

Ping:

*R1#ping 10.0.4.2*

*Type escape sequence to abort.*

*Sending 5, 100-byte ICMP Echos to 10.0.4.2, timeout is 2 seconds:*

*!!!!!*

*Success rate is 100 percent (5/5), round-trip min/avg/max = 92/95/100 ms*

*R1#*

All networks are connected to each other. In this lab, I used the concept of iBGP and eBGP. The lab took about ten hours to complete.