

LAB 5 ibgp



Mohul Sarkar

Newport High School

Cisco Networking



Mohul Sarkar

**Purpose:**

The purpose of this lab was to set up three autonomous systems interconnected with BGP, IBGP and EIGRP. There are 7 routers with one backbone in the middle with IBGP.

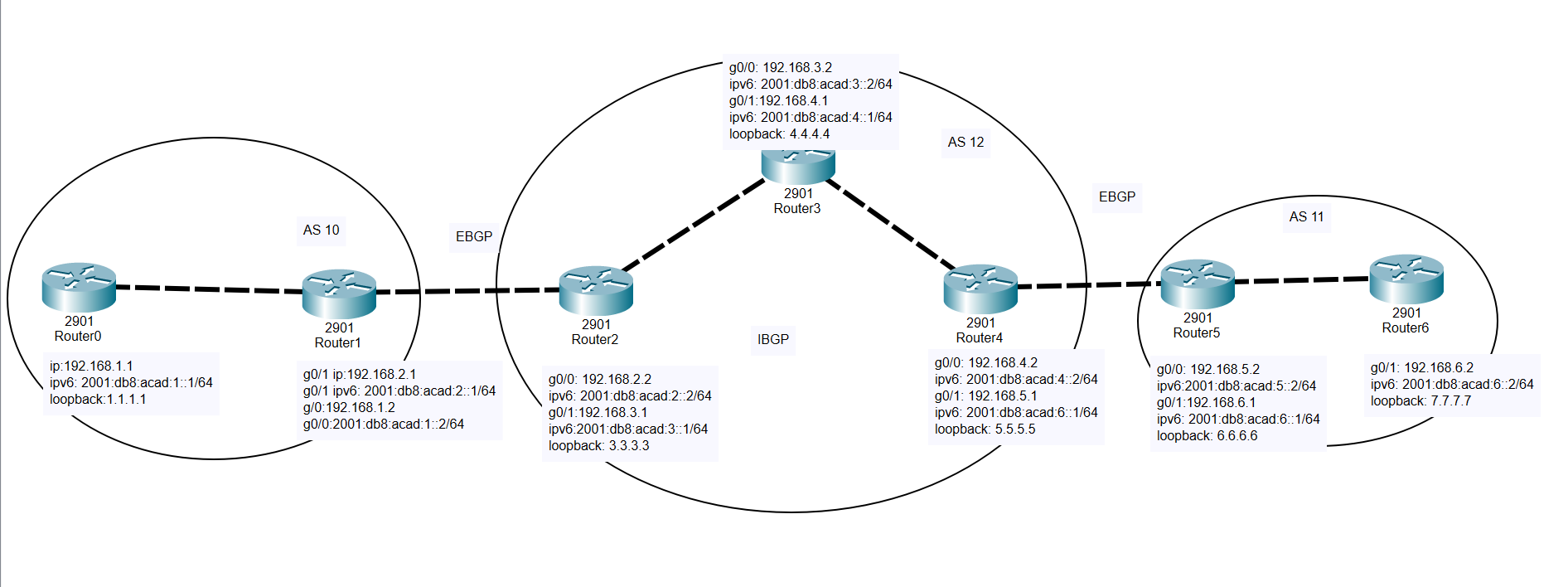
**Background information on lab concepts:**

By using IBGP, route advertisements can be sent throughout the network, which is the purpose of the service. A solution to this problem is to redistribute all of the EBGP routes into an interior gateway protocol (IGP), such as OSPF or IS-IS. There might be a lot easier routing protocols to use such as OSPF, but IBGP allows for a large amount of scalability. Using BGP is a distance-vector meaning it is efficient at modifying routing information. neighbors in the same autonomous system (AS) are connected using iBGP. iBGP neighbors do not have to be directly connected to each other, but they must be in the same AS and communicate through TCP. Interior gateway protocols are limited to the border router and are used within an organization's network. To connect the various Autonomous Systems, exterior gateway protocols are utilized (ASs). A basic definition for a border router is one that has a foot in two worlds: one that connects to the Internet and another that is located within the organization. The routers in my topology show three different ASs that the routers in their own clouds support. Within each cloud, a single router connects to the ISP and its AS. These are the border routers for each AS, and they must support both the outside gateway protocol (in this case, BGP) and the interior gateway protocol.

**Lab Summary:**

We set up 2 outside routers with EIGRP interconnected to the middle 3 routers with bgp. 2 of the middle routers are connected with IBGP and the middle router is the backbone of the topology.

**Lab Commands**:



**Network Diagram with IP’s:**

**Configurations:**

**R1:**  
**Config:**

Building configuration...

Current configuration : 1573 bytes

Last configuration change at 16:24:28 UTC Wed Dec 15 2021

version 15.5

service timestamps debug datetime msec

service timestamps log datetime msec

no platform punt-keepalive disable-kernel-core

hostname R1

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

ipv6 unicast-routing

subscriber templating

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO21482HZX

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

interface Loopback0

ip address 1.1.1.1 255.255.255.252

ip ospf network point-to-point

ip ospf 1 area 0

ipv6 address 2001:DB8:ACAD:A::1/64

ipv6 ospf 1 area 0

interface GigabitEthernet0/0/0

ip address 192.168.1.1 255.255.255.252

ip ospf network point-to-point

ip ospf 1 area 0

negotiation auto

ipv6 address 2001:DB8:ACAD:1::1/64

ipv6 ospf 1 area 0

no shutdown

interface GigabitEthernet0/0/1

no ip address

shutdown

negotiation auto

interface Serial0/1/0

no ip address

shutdown

interface Serial0/1/1

no ip address

shutdown

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

interface Vlan1

no ip address

shutdown

router ospf 1

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

ipv6 router ospf 1

router-id 1.1.2.1

control-plane

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

end

**R2:**

**Config:**

Building configuration…

Current configuration : 2143 bytes

version 15.5

service timestamps debug datetime msec

service timestamps log datetime msec

no platform punt-keepalive disable-kernel-core

hostname R2

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

ipv6 unicast-routing

subscriber templating

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO21482DWJ

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

interface Loopback0

ip address 2.2.2.1 255.255.255.252

ip ospf network point-to-point

ip ospf 1 area 0

ipv6 address 2001:DB8:ACAD:B::1/64

ipv6 ospf 1 area 0

interface GigabitEthernet0/0/0

ip address 192.168.1.2 255.255.255.252

ip ospf network point-to-point

ip ospf 1 area 0

negotiation auto

ipv6 address 2001:DB8:ACAD:1::2/64

ipv6 ospf 1 area 0

no shutdown

interface GigabitEthernet0/0/1

ip address 192.168.2.1 255.255.255.252

ip ospf 1 area 0

negotiation auto

ipv6 address 2001:DB8:ACAD:2::1/64

ipv6 ospf 1 area 0

no shutdown

interface Serial0/1/0

no ip address

shutdown

interface Serial0/1/1

no ip address

shutdown

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

interface Vlan1

no ip address

shutdown

router ospf 1

redistribute bgp 10 subnets

router bgp 10

bgp router-id 2.2.7.0

bgp log-neighbor-changes

neighbor 2001:DB8:ACAD:2::2 remote-as 12

neighbor 192.168.2.2 remote-as 12

address-family ipv4

bgp redistribute-internal

network 192.168.2.0 mask 255.255.255.252

redistribute connected

redistribute ospf 1

no neighbor 2001:DB8:ACAD:2::2 activate

neighbor 192.168.2.2 activate

exit-address-family

address-family ipv6

redistribute connected

redistribute ospf 1

network 2001:DB8:ACAD:2::/64

neighbor 2001:DB8:ACAD:2::2 activate

exit-address-family

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

ipv6 router ospf 1

redistribute bgp 10

control-plane

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

end

**R3:**

**Config:**

Building configuration...

Current configuration : 2281 bytes

version 15.5

service timestamps debug datetime msec

service timestamps log datetime msec

no platform punt-keepalive disable-kernel-core

hostname R3

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

ipv6 unicast-routing

subscriber templating

vtp domain cisco

vtp mode transparent

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO214420HW

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

interface Loopback0

ip address 3.3.3.1 255.255.255.252

ipv6 address 2001:DB8:ACAD:C::1/64

ipv6 enable

ipv6 eigrp 1

interface GigabitEthernet0/0/0

ip address 192.168.3.1 255.255.255.252

negotiation auto

ipv6 address 2001:DB8:ACAD:3::1/64

ipv6 enable

ipv6 eigrp 1

no shutdown

interface GigabitEthernet0/0/1

ip address 192.168.2.2 255.255.255.252

negotiation auto

ipv6 address 2001:DB8:ACAD:2::2/64

ipv6 enable

ipv6 eigrp 1

no shutdown

interface Serial0/1/0

no ip address

shutdown

interface Serial0/1/1

no ip address

shutdown

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

interface Vlan1

no ip address

shutdown

router eigrp 1

network 3.3.3.0 0.0.0.3

network 192.168.3.0 0.0.0.3

router bgp 12

bgp router-id 3.3.7.0

bgp log-neighbor-changes

neighbor 4.4.4.1 remote-as 12

neighbor 5.5.5.1 remote-as 12

neighbor 5.5.5.1 update-source Loopback0

neighbor 2001:DB8:ACAD:2::1 remote-as 10

neighbor 2001:DB8:ACAD:E::1 remote-as 12

neighbor 2001:DB8:ACAD:E::1 update-source lo0

neighbor 2001:DB8:ACAD:D::1 remote-as 12

neighbor 2001:DB8:ACAD:D::1 update-source Loopback0

neighbor 192.168.2.1 remote-as 10

address-family ipv4

bgp redistribute-internal

network 192.168.4.0 mask 255.255.255.252

network 192.168.2.0 mask 255.255.255.252

redistribute connected

redistribute eigrp 1

neighbor 4.4.4.1 activate

neighbor 5.5.5.1 activate

neighbor 192.168.2.1 activate

exit-address-family

address-family ipv6

redistribute connected

redistribute eigrp 1

bgp redistribute-internal

network 2001:DB8:ACAD:2::/64

neighbor 2001:DB8:ACAD:2::1 activate

neighbor 2001:DB8:ACAD:D::1 activate

neighbor 2001:DB8:ACAD:E::1 activate

exit-address-family

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

ipv6 router eigrp 1

control-plane

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

end

**R4:**

**Config:**

version 15.5

service timestamps debug datetime msec

service timestamps log datetime msec

no platform punt-keepalive disable-kernel-core

hostname R4

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

ipv6 unicast-routing

subscriber templating

vtp domain cisco

vtp mode transparent

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO214421D1

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

interface Loopback0

ip address 4.4.4.1 255.255.255.252

ipv6 address 2001:DB8:ACAD:D::1/64

ipv6 enable

ipv6 eigrp 1

interface GigabitEthernet0/0/0

ip address 192.168.3.2 255.255.255.252

negotiation auto

ipv6 address 2001:DB8:ACAD:3::2/64

ipv6 enable

ipv6 eigrp 1

no shutdown

interface GigabitEthernet0/0/1

ip address 192.168.4.1 255.255.255.252

negotiation auto

ipv6 address 2001:DB8:ACAD:4::1/64

ipv6 enable

ipv6 eigrp 1

no shutdown

interface Serial0/1/0

no ip address

shutdown

interface Serial0/1/1

no ip address

shutdown

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

interface Vlan1

no ip address

shutdown

router eigrp 1

network 4.4.4.0 0.0.0.3

network 192.168.3.0 0.0.0.3

network 192.168.4.0 0.0.0.3

router bgp 12

bgp router-id 3.2.5.9

bgp log-neighbor-changes

neighbor 3.3.3.1 remote-as 12

neighbor 3.3.3.1 update-source Loopback0

neighbor 5.5.5.1 remote-as 12

neighbor 5.5.5.1 update-source Loopback0

neighbor 2001:DB8:ACAD:C::1 remote-as 12

neighbor 2001:DB8:ACAD:C::1 update-source Loopback0

neighbor 2001:DB8:ACAD:E::1 remote-as 12

neighbor 2001:DB8:ACAD:E::1 update-source Loopback0

address-family ipv4

bgp redistribute-internal

network 192.168.3.0 mask 255.255.255.252

network 192.168.4.0 mask 255.255.255.252

neighbor 3.3.3.1 activate

neighbor 5.5.5.1 activate

no neighbor 2001:DB8:ACAD:C::1 activate

no neighbor 2001:DB8:ACAD:E::1 activate

exit-address-family

address-family ipv6

bgp redistribute-internal

neighbor 2001:DB8:ACAD:C::1 activate

neighbor 2001:DB8:ACAD:E::1 activate

exit-address-family

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

ipv6 router eigrp 1

control-plane

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

end

**R5:**

**Config:**

version 16.9

service timestamps debug datetime msec

service timestamps log datetime msec

platform qfp utilization monitor load 80

platform punt-keepalive disable-kernel-core

hostname R5

boot-start-marker

boot-end-marker

!

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

login on-success log

subscriber templating

ipv6 unicast-routing

multilink bundle-name authenticated

crypto pki trustpoint TP-self-signed-859896477

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-859896477

revocation-check none

rsakeypair TP-self-signed-859896477

crypto pki certificate chain TP-self-signed-859896477

certificate self-signed 01

3082032E 30820216 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

30312E30 2C060355 04031325 494F532D 53656C66 2D536967 6E65642D 43657274

69666963 6174652D 38353938 39363437 37301E17 0D323131 32313531 36303435

345A170D 33303031 30313030 30303030 5A303031 2E302C06 03550403 1325494F

532D5365 6C662D53 69676E65 642D4365 72746966 69636174 652D3835 39383936

34373730 82012230 0D06092A 864886F7 0D010101 05000382 010F0030 82010A02

82010100 A5B947F9 950A4A26 564E8500 D27814A9 1A0F4E28 19CA92CC 516B0091

4F158EA8 14AB377E 055A119C BF995362 EF8EC8EA 2F3E6483 8E8DAE90 DA40C276

49C07858 FB3EFB4A 369B12F7 FF709B65 3738DB44 65055E65 BA2BA77D 8D68391E

38DBD08D 14B23A98 811439CC 99A0AB64 6AFEA264 F5A6A2FF EC30271C DC39BBDD

740D9731 ECA2C012 03A5D570 25C1676A 1D6AE6E9 1A9C5D89 44353F60 AB9AB0F0

7F89AB04 878B9F40 D1CD549F 445A25BB 9CD34D1A FF3A33FC FE8B35A4 DC6D7CF9

A0928058 5908D9A1 844131C0 4FFAC242 9EF7DDB5 E44400A7 9B012F9C B7F97DF2

801ACA77 03C081A6 3F2D1EE8 0F92C694 61502725 FB79DD16 EC028009 2D90A1F9

BEB0956B 02030100 01A35330 51300F06 03551D13 0101FF04 05300301 01FF301F

0603551D 23041830 16801492 55E8ABD0 1B8FB3F0 9FEFFE32 F061A612 F3E8A730

1D060355 1D0E0416 04149255 E8ABD01B 8FB3F09F EFFE32F0 61A612F3 E8A7300D

06092A86 4886F70D 01010505 00038201 0100584A 705A8447 8BE94C1F 2EC28DCC

5B731554 9C313862 CCEF53EF B474B558 FEF91ECC A637B394 2E37FB79 B28E4D2A

1E6D8BB7 B3D31C7A DA04722B C3989408 ACD3DB72 29BE1523 B4C1D6D2 37AC1110

9AC6752D 86CF7788 5CFDB3B9 B15D9063 B1FBB339 D8A5F401 FEEB4B1D D4E46CB8

7C2C4D82 E3E4DD0B A45B4959 E0D3D1FA C478B25B 05152F2F 97C9FBA9 AFB5B4B7

35707FF9 40D4DD98 AC15288C A8C726A2 568B46EE 95631622 1A65603E 40767317

4CF51886 B50676A6 2360447E D75D73FD 68C76A17 47D4F141 5163647B B9FA0A83

16649BB1 EB7DEBDB 5091AAD6 EC9A0B61 E1A1AC8E 14F3B18E 2FD6080F DF82ADDC

94B4D79C 52E0570C FDE55E3E 84FD00E8 5BB1

quit

license udi pid ISR4321/K9 sn FLM240608PJ

no license smart enable

diagnostic bootup level minimal

spanning-tree extend system-id

redundancy

mode none

interface Loopback0

ip address 5.5.5.1 255.255.255.252

ipv6 address 2001:DB8:ACAD:E::1/64

ipv6 enable

ipv6 eigrp 1

interface GigabitEthernet0/0/0

ip address 192.168.5.1 255.255.255.252

negotiation auto

ipv6 address 2001:DB8:ACAD:5::1/64

ipv6 enable

ipv6 eigrp 1

no shutdown

interface GigabitEthernet0/0/1

ip address 192.168.4.2 255.255.255.252

negotiation auto

ipv6 address 2001:DB8:ACAD:4::2/64

ipv6 enable

ipv6 eigrp 1

no shutdown

interface GigabitEthernet0/1/0

no ip address

shutdown

negotiation auto

interface GigabitEthernet0/1/1

no ip address

shutdown

negotiation auto

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

router eigrp 1

network 5.5.5.0 0.0.0.3

network 192.168.4.0 0.0.0.3

router bgp 12

bgp router-id 4.9.3.1

bgp log-neighbor-changes

neighbor 3.3.3.1 remote-as 12

neighbor 3.3.3.1 update-source Loopback0

neighbor 4.4.4.1 remote-as 12

neighbor 2001:DB8:ACAD:5::2 remote-as 11

neighbor 2001:DB8:ACAD:D::1 remote-as 12

neighbor 2001:DB8:ACAD:D::1 update-source Loopback0

neighbor 2001:DB8:ACAD:C::1 remote-as 12

neighbor 2001:DB8:ACAD:C::1 update-source Loopback0

neighbor 192.168.5.2 remote-as 11

address-family ipv4

bgp redistribute-internal

network 192.168.4.0 mask 255.255.255.252

network 192.168.5.0 mask 255.255.255.252

redistribute connected

redistribute eigrp 1

neighbor 3.3.3.1 activate

neighbor 4.4.4.1 activate

neighbor 192.168.5.2 activate

exit-address-family

address-family ipv6

redistribute connected

redistribute eigrp 1

network 2001:DB8:ACAD:5::/64

neighbor 2001:DB8:ACAD:5::2 activate

neighbor 2001:DB8:ACAD:D::1 activate

neighbor 2001:DB8:ACAD:C::1 activate

exit-address-family

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

ip tftp source-interface GigabitEthernet0

ipv6 router eigrp 1

control-plane

line con 0

transport input none

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

end

**R6:**

**Config:**

version 16.9

service timestamps debug datetime msec

service timestamps log datetime msec

platform qfp utilization monitor load 80

platform punt-keepalive disable-kernel-core

hostname R6

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

login on-success log

subscriber templating

ipv6 unicast-routing

multilink bundle-name authenticated

crypto pki trustpoint TP-self-signed-4288135047

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-4288135047

revocation-check none

rsakeypair TP-self-signed-4288135047

crypto pki certificate chain TP-self-signed-4288135047

certificate self-signed 01

30820330 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

31312F30 2D060355 04031326 494F532D 53656C66 2D536967 6E65642D 43657274

69666963 6174652D 34323838 31333530 3437301E 170D3231 31323036 31363239

30375A17 0D333030 31303130 30303030 305A3031 312F302D 06035504 03132649

4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D34 32383831

33353034 37308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201

0A028201 0100B914 ACE71976 DD927365 40E1DADD 088E0872 C8A9FE10 187222C7

AACA35A9 E1B9260B F0D03EC3 7078F67B 20F6504D 0BE4255B ED285FC3 282ACBE8

D33B483A 7E68432D 9A75F516 3B220F76 F33AA5C6 2E79B32B D474975D 5C9B20D2

D3B3A8B9 2C166425 C2A2B6D7 0946BF64 BA98AF3F 948CE941 1BBDC673 57EAE72E

D6CB0724 A3A33080 F8F145A7 0C94585D 99A19A4F 87D04FEA 8B7F369B 1E1EDD91

294D9079 76C524C0 89A93953 ECAC3C35 D90B5932 80613DAC 0489F7A6 67EC27CB

6FEDBE3E BE2031FC 2D14AC29 98C4061E 337064A5 A1972D2E 66E88258 67840530

A704F0F4 CFECF3F3 2EE56C53 1B952A20 DDCC6515 1F4E5D1E 78F5B4F6 AA8A804D

870A298A 2CDF0203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF

301F0603 551D2304 18301680 14CE82C3 004C8FB7 E7C60E73 D27C3284 A569CF32

FB301D06 03551D0E 04160414 CE82C300 4C8FB7E7 C60E73D2 7C3284A5 69CF32FB

300D0609 2A864886 F70D0101 05050003 82010100 AB1C4AE1 C5BD8C6E 561FCA18

0B919B7C 1A4AC8E5 5E793AA6 54C4A048 CAA1E5A4 9AEF6528 CD95A6F7 EBA7A715

BB4C58EA ACA4813C BA7DA372 A13F09A6 4C96F63E 182CEA39 69EF4C2E 70D6112F

7D8289A0 248A4790 B142A368 A7A099D4 BC0F3CA3 863993E0 5D5806FC B3A90248

CC139410 A846DA08 0AAE2E3B C35849CE EE209962 D2C07932 F9BC35FA 76EF1286

0EDA0D51 7551FBB3 A462C97D FD3E9C23 F96F2D8D 68A7877C ABB16182 B184BA69

9AEF6E27 A8319ABE 2471DF8D 376D058F 1997C964 EB54A8E5 9F7D8087 25959501

7B2AA35D 057D9354 E5A68E62 A797619F 2EA1EB6D 80154056 5075CC6F 121B89FB

410E2320 5D85AB20 D30C5297 96A057FB 897F0248

quit

license udi pid ISR4321/K9 sn FLM2406090M

no license smart enable

diagnostic bootup level minimal

spanning-tree extend system-id

redundancy

mode none

interface Loopback0

ip address 6.6.6.1 255.255.255.252

ip ospf network point-to-point

ip ospf 2 area 0

ipv6 address 2001:DB8:ACAD:F::1/64

ipv6 ospf 2 area 0

interface GigabitEthernet0/0/0

ip address 192.168.5.2 255.255.255.252

ip ospf 2 area 0

negotiation auto

ipv6 address 2001:DB8:ACAD:5::2/64

ipv6 ospf 2 area 0

no shutdown

interface GigabitEthernet0/0/1

ip address 192.168.6.1 255.255.255.252

ip ospf network point-to-point

ip ospf 2 area 0

negotiation auto

ipv6 address 2001:DB8:ACAD:6::1/64

ipv6 ospf 2 area 0

no shutdown

interface GigabitEthernet0/1/0

no ip address

shutdown

negotiation auto

interface GigabitEthernet0/1/1

no ip address

shutdown

negotiation auto

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

router ospf 2

redistribute bgp 11 subnets

router bgp 11

bgp router-id 2.9.5.8

bgp log-neighbor-changes

neighbor 2001:DB8:ACAD:5::1 remote-as 12

neighbor 192.168.5.1 remote-as 12

address-family ipv4

bgp redistribute-internal

network 192.168.5.0 mask 255.255.255.252

redistribute connected

redistribute ospf 2

neighbor 192.168.5.1 activate

exit-address-family

address-family ipv6

redistribute connected

redistribute ospf 2

network 2001:DB8:ACAD:5::/64

neighbor 2001:DB8:ACAD:5::1 activate

exit-address-family

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

ip tftp source-interface GigabitEthernet0

ipv6 router ospf 2

redistribute bgp 11

control-plane

line con 0

transport input none

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

end

**Ip routes:**

R6#sh ip route

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

a - application route

+ - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

1.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

D EX 1.1.1.0/30 [170/256512] via 6.6.6.1, 00:08:37, GigabitEthernet0/0/1

D EX 1.1.1.5/32 [170/256512] via 6.6.6.1, 00:08:35, GigabitEthernet0/0/1

2.0.0.0/30 is subnetted, 1 subnets

D 2.2.2.4 [90/130816] via 6.6.6.1, 00:52:17, GigabitEthernet0/0/1

3.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

D EX 3.3.3.0/30 [170/256512] via 6.6.6.1, 00:08:35, GigabitEthernet0/0/1

D EX 3.3.3.5/32 [170/256512] via 6.6.6.1, 00:08:35, GigabitEthernet0/0/1

4.0.0.0/30 is subnetted, 2 subnets

D 4.4.4.0 [90/3072] via 6.6.6.1, 00:52:17, GigabitEthernet0/0/1

D 4.4.4.4 [90/131072] via 6.6.6.1, 00:52:17, GigabitEthernet0/0/1

5.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

D EX 5.5.5.0/30 [170/256512] via 6.6.6.1, 00:08:35, GigabitEthernet0/0/1

D EX 5.5.5.5/32 [170/256512] via 6.6.6.1, 00:08:35, GigabitEthernet0/0/1

6.0.0.0/8 is variably subnetted, 4 subnets, 2 masks

C 6.6.6.0/30 is directly connected, GigabitEthernet0/0/1

L 6.6.6.2/32 is directly connected, GigabitEthernet0/0/1

C 6.6.6.4/30 is directly connected, Loopback0

L 6.6.6.5/32 is directly connected, Loopback0

**Ipv6:**

R6#sh ipv6 route

IPv6 Routing Table - default - 14 entries

Codes: C - Connected, L - Local, S - Static, U - Per-user Static route

B - BGP, R - RIP, I1 - ISIS L1, I2 - ISIS L2

IA - ISIS interarea, IS - ISIS summary, D - EIGRP, EX - EIGRP external

ND - ND Default, NDp - ND Prefix, DCE - Destination, NDr - Redirect

O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2

ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, a - Application

EX 2001:DB8:ACAD:1::/64 [170/26112]

via FE80::B6A8:B9FF:FE01:B991, GigabitEthernet0/0/1

D 2001:DB8:ACAD:2::/64 [90/130816]

via FE80::B6A8:B9FF:FE01:B991, GigabitEthernet0/0/1

EX 2001:DB8:ACAD:3::1/128 [170/26112]

via FE80::B6A8:B9FF:FE01:B991, GigabitEthernet0/0/1

D 2001:DB8:ACAD:4::/64 [90/131072]

via FE80::B6A8:B9FF:FE01:B991, GigabitEthernet0/0/1

EX 2001:DB8:ACAD:5::1/128 [170/26112]

via FE80::B6A8:B9FF:FE01:B991, GigabitEthernet0/0/1

C 2001:DB8:ACAD:6::/64 [0/0]

via Loopback0, directly connected

L 2001:DB8:ACAD:6::1/128 [0/0]

via Loopback0, receive

D 2001:DB8:ACAD:A::/64 [90/1792256]

via FE80::B6A8:B9FF:FE01:B991, GigabitEthernet0/0/1

EX 2001:DB8:ACAD:B::/64 [170/26112]

via FE80::B6A8:B9FF:FE01:B991, GigabitEthernet0/0/1

EX 2001:DB8:ACAD:C::/64 [170/26112]

via FE80::B6A8:B9FF:FE01:B991, GigabitEthernet0/0/1

D 2001:DB8:ACAD:E::/64 [90/3072]

via FE80::B6A8:B9FF:FE01:B991, GigabitEthernet0/0/1

C 2001:DB8:ACAD:F::/64 [0/0]

via GigabitEthernet0/0/1, directly connected

L 2001:DB8:ACAD:F::2/128 [0/0]

via GigabitEthernet0/0/1, receive

L FF00::/8 [0/0]

via Null0, receive

**R4:**

R4#sh ip route

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

a - application route

+ - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

1.0.0.0/8 is variably subnetted, 3 subnets, 2 masks

C 1.1.1.0/30 is directly connected, Serial0/1/0

L 1.1.1.1/32 is directly connected, Serial0/1/0

B 1.1.1.5/32 [20/0] via 1.1.1.2, 00:12:48

2.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C 2.2.2.4/30 is directly connected, Loopback0

L 2.2.2.5/32 is directly connected, Loopback0

3.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

B 3.3.3.0/30 [20/0] via 1.1.1.2, 00:12:48

B 3.3.3.5/32 [20/2] via 1.1.1.2, 00:12:48

4.0.0.0/8 is variably subnetted, 3 subnets, 2 masks

C 4.4.4.0/30 is directly connected, GigabitEthernet0/0/0

L 4.4.4.1/32 is directly connected, GigabitEthernet0/0/0

D 4.4.4.4/30 [90/130816] via 4.4.4.2, 00:58:37, GigabitEthernet0/0/0

5.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

B 5.5.5.0/30 [20/0] via 1.1.1.2, 00:12:48

B 5.5.5.5/32 [20/2] via 1.1.1.2, 00:12:48

6.0.0.0/8 is variably subnetted, 3 subnets, 2 masks

C 6.6.6.0/30 is directly connected, GigabitEthernet0/0/1

L 6.6.6.1/32 is directly connected, GigabitEthernet0/0/1

D 6.6.6.4/30 [90/130816] via 6.6.6.2, 00:56:24, GigabitEthernet0/0/1

**Ipv6:**

R6#sh ipv6 route

IPv6 Routing Table - default - 16 entries

Codes: C - Connected, L - Local, S - Static, U - Per-user Static route

B - BGP, R - RIP, I1 - ISIS L1, I2 - ISIS L2

IA - ISIS interarea, IS - ISIS summary, D - EIGRP, EX - EIGRP external

ND - ND Default, NDp - ND Prefix, DCE - Destination, NDr - Redirect

O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2

ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, a - Application

B 2001:DB8:ACAD:1::/64 [20/0]

via FE80::267E:12FF:FE4D:F770, Serial0/1/0

C 2001:DB8:ACAD:2::/64 [0/0]

via Loopback0, directly connected

L 2001:DB8:ACAD:2::1/128 [0/0]

via Loopback0, receive

B 2001:DB8:ACAD:3::1/128 [20/1]

via FE80::267E:12FF:FE4D:F770, Serial0/1/0

D 2001:DB8:ACAD:4::/64 [90/130816]

via FE80::CE7F:76FF:FECE:9BF0, GigabitEthernet0/0/0

B 2001:DB8:ACAD:5::1/128 [20/1]

via FE80::267E:12FF:FE4D:F770, Serial0/1/0

D 2001:DB8:ACAD:6::/64 [90/130816]

via FE80::CE7F:76FF:FEC8:A1F1, GigabitEthernet0/0/1

C 2001:DB8:ACAD:A::/64 [0/0]

via Serial0/1/0, directly connected

L 2001:DB8:ACAD:A::1/128 [0/0]

via Serial0/1/0, receive

B 2001:DB8:ACAD:B::/64 [20/0]

via FE80::267E:12FF:FE4D:F770, Serial0/1/0

B 2001:DB8:ACAD:C::/64 [20/0]

via FE80::267E:12FF:FE4D:F770, Serial0/1/0

C 2001:DB8:ACAD:E::/64 [0/0]

via GigabitEthernet0/0/0, directly connected

L 2001:DB8:ACAD:E::1/128 [0/0]

via GigabitEthernet0/0/0, receive

C 2001:DB8:ACAD:F::/64 [0/0]

via GigabitEthernet0/0/1, directly connected

L 2001:DB8:ACAD:F::1/128 [0/0]

via GigabitEthernet0/0/1, receive

L FF00::/8 [0/0]

via Null0, receive

**Problem Section:**

A problem I had with IBGP was really figuring out how to configure it. Since this was a lot different compared to the other routing protocols I’ve used, so it took a lot longer to interpret the tutorials. After understanding how to set up the two IBGP routers I only had a few issues with the other routers, but since I already knew how to set up BGP and OSPF from my previous labs, I was able to configure the border routers easily. Another problem we had was the different areas not connecting to one another. I had to look at other show run configs and cross reference mine to see later that I was missing a piece of IBGP configuration that wasn’t a part of EBGP. Something that proved to be a challenge was also configuring the loopback addresses for ipv6 because they were not showing up on the ip routes and took a few tries to get them to be able to start pinging on the show ip route commands.

**Conclusion:**

I set up 7 routers connected with 3 Autonomous Systems (AS) using 3 different routing protocols. My 4 outside routers were connected with EIGRP and connected to the inside routers with BGP, and the inside routers were connected to one another with IBGP. This was the first introduction of Autonomous Systems into my topologies which brought some issues that were later resolved after research on IBGP. A major problem I had was the ipv6 loopbacks not showing up on any of my show ip routes.