

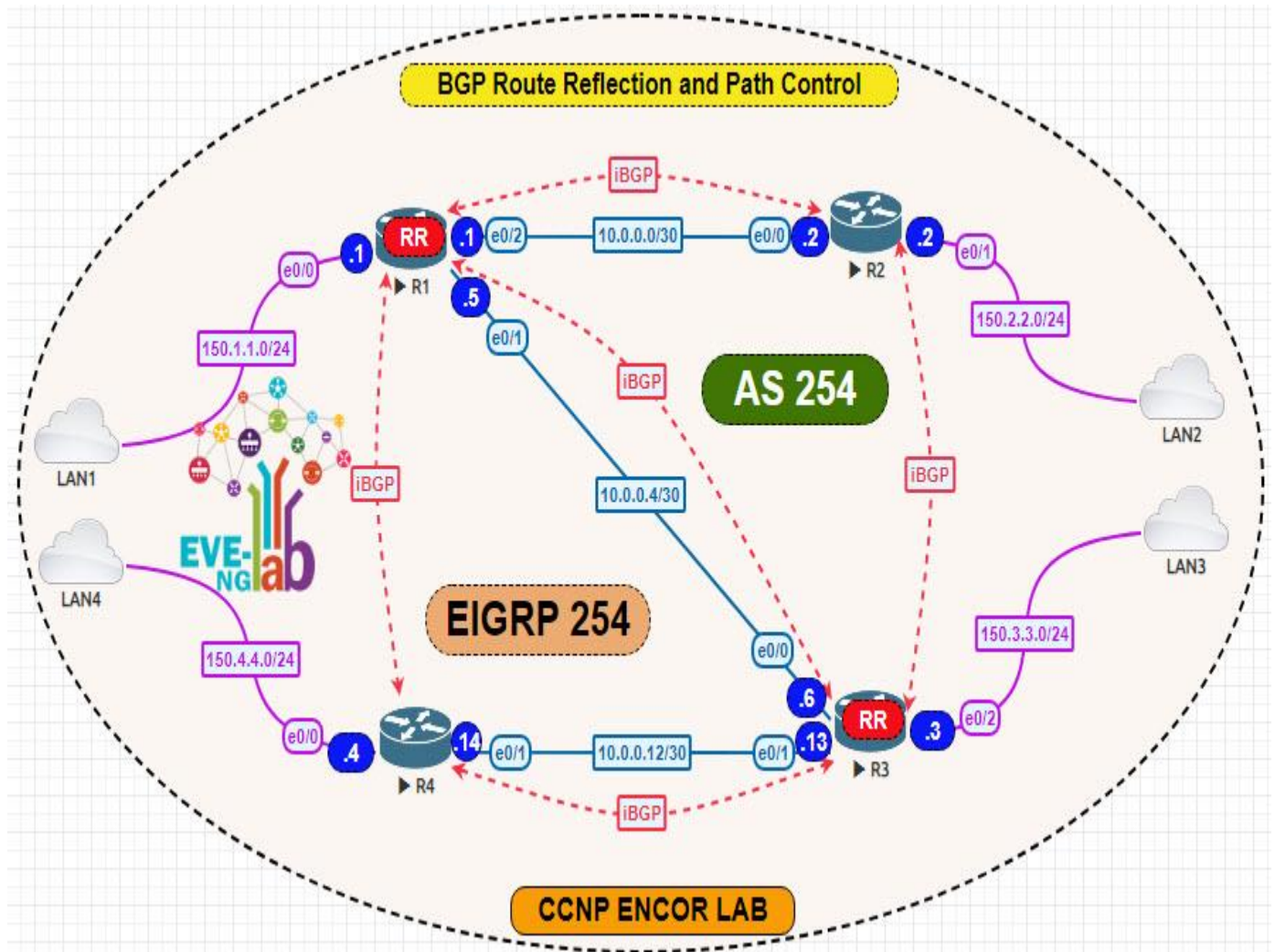
BGP Route Reflection and Path Control

Lab Objective:

The focus of this lab is to understand BGP implementation and configuration in Cisco IOS routers. Additional technologies tested include route reflection and path control.

Lab Topology:

The lab network topology is illustrated below:



Task 1

Configure hostnames and IP addressing on all routers as illustrated in the network topology.

Task 2

Configure the following Loopback 0 interfaces on all routers:

R1 - Loopback 0: IP Address 1.1.1.1/32

R2 - Loopback 0: IP Address 2.2.2.2/32

R3 - Loopback 0: IP Address 3.3.3.3/32

R4 - Loopback 0: IP Address 4.4.4.4/32

Next, configure EIGRP, using AS 254, on all routers and enable EIGRP for all interfaces EXCEPT for the 150.x.x.x/24 LAN subnets connected to R1, R2, R3, and R4. Verify your configuration.

Task 3

Configure internal BGP on R1, R2, R3, and R4 shown below. Use peer-group configuration on R2 and R4 but NOT on R1 and R3:

1. All routers should use their Loopback 0 interface addresses as their router IDs
2. All routers should peer using their Loopback 0 interface addresses
3. R1 and R3 should be configured as Route Reflectors
4. R2 should peer with R1 and R3
5. R4 should peer with R1 and R3
6. R1 and R3 belong to the same cluster to reduce the size of the RIB
7. All routers should use TCP MD5 authentication with a password of 'CCNP'
8. BGP Hellos should be sent every 5 seconds and the Hold Time should be set to 15 seconds

Verify your configuration using the appropriate commands.

Task 4

Advertise the 150.x.x.x/24 subnets on all routers via BGP. These prefixes should be redistributed into BGP on every router. In the future, there will be external BGP connections to one or more ISPs. Management has decided that the 150.x.x.x/24 subnets should never be advertised to these ISPs. Ensure that these prefixes are NEVER advertised out of AS 254. You are NOT allowed to use prefix lists or any type of filters. Verify your configuration using the appropriate commands. Verify that each router can also ping every other router's 150.x.x.x/24 LAN subnet.

Task 5

Ensure that R2 and R4 always prefer routes received from R3 to those received from R1 for each other's 150.x.x.x/24 prefixes. You are only allowed to configure ONE router. Your solution should be globally significant; however, you are NOT allowed to modify any of the BGP default administrative distance values. You can modify BGP attributes as you see fit. Verify the configuration using the appropriate commands.



Configuration

Task 1

Configure hostnames and IP addressing on all routers as illustrated in the network topology.

Task 2

Configure the following Loopback 0 interfaces on all routers:

R1 - Loopback 0: IP Address 1.1.1.1/32

R2 - Loopback 0: IP Address 2.2.2.2/32

R3 - Loopback 0: IP Address 3.3.3.3/32

R4 - Loopback 0: IP Address 4.4.4.4/32

Next, configure EIGRP, using AS 254, on all routers and enable EIGRP for all interfaces EXCEPT for the 150.x.x.x/24 LAN subnets connected to R1, R2, R3, and R4. Verify your configuration.

a.

R-1	R-2	R-3	R-4
en conf t hostname R-1 inter e0/0 ip add 10.0.0.2 255.255.255.252 no shu exit inter e0/1 ip add 150.2.2.2 255.255.255.0 no shu exit inter loo 0 ip add 1.1.1.1 255.255.255.255 exit	en conf t hostname R-2 inter e0/0 ip add 10.0.0.2 255.255.255.252 no shu exit inter e0/1 ip add 150.2.2.2 255.255.255.0 no shu exit inter loo 0 ip add 2.2.2.2 255.255.255.255 exit	en conf t hostname R-3 inter e0/0 ip add 10.0.0.2 255.255.255.252 no shu exit inter e0/1 ip add 150.2.2.2 255.255.255.0 no shu exit inter loo 0 ip add 3.3.3.3 255.255.255.255 exit	en conf t hostname R-4 inter e0/0 ip add 10.0.0.2 255.255.255.252 no shu exit inter e0/1 ip add 150.2.2.2 255.255.255.0 no shu exit inter loo 0 ip add 4.4.4.4 255.255.255.255 exit

- Next, configure EIGRP, using AS 254, on all routers and enable EIGRP for all interfaces EXCEPT for the 150.x.x.x/24 LAN subnets connected to R1, R2, R3, and R4. Verify your configuration.

b.

R-1	R-2	R-3	R-4
En Conf t router eigrp 254 network 1.1.1.1 passive-interface default no passive-interface Ethernet0/1 no passive-interface Ethernet0/2 network 10.0.0.0 0.0.0.3 network 10.0.0.4 0.0.0.3 no auto-summary exit	En Conf t router eigrp 254 network 2.2.2.2 passive-interface default no passive-interface Ethernet0/0 network 10.0.0.0 0.0.0.3 no auto-summary exit	En Conf t router eigrp 254 network 3.3.3.3 passive-interface default no passive-interface Ethernet0/0 no passive-interface Ethernet0/1 network 10.0.0.4 0.0.0.3 network 10.0.0.12 0.0.0.3 no auto-summary exit	En Conf t router eigrp 254 network 4.4.4.4 passive-interface default no passive-interface Ethernet0/1 network 10.0.0.12 0.0.0.3 no auto-summary exit

Verification.

R-1 # show ip route

The screenshot shows a terminal window titled 'R1' with a menu bar (File, Edit, View, Options, Transfer, Script, Tools, Window, Help) and a toolbar. Below the toolbar, there are status indicators for R1, R2, R3, and R4. The main terminal area displays the output of the 'show ip route' command. The output includes a legend for route types (o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP, a - application route, + - replicated route, % - next hop override) and a message 'Gateway of last resort is not set'. It then lists various routes, including directly connected routes (1.1.1.1, 10.0.0.0/30, 10.0.0.1/32, 10.0.0.4/30, 10.0.0.5/32, 150.1.1.0/24, 150.1.1.1/32) and subnets (2.0.0.0/32, 3.0.0.0/32, 4.0.0.0/32, 10.0.0.0/8, 150.1.0.0/16). The terminal ends with the prompt 'R1(config-if)#'.

```
o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
a - application route
+ - 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
D    2.0.0.0/32 is subnetted, 1 subnets
D    2.2.2.2 [90/409600] via 10.0.0.2, 00:45:51, Ethernet0/2
D    3.0.0.0/32 is subnetted, 1 subnets
D    3.3.3.3 [90/409600] via 10.0.0.6, 00:45:51, Ethernet0/1
D    4.0.0.0/32 is subnetted, 1 subnets
D    4.4.4.4 [90/435200] via 10.0.0.6, 00:45:51, Ethernet0/1
D    10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks
C    10.0.0.0/30 is directly connected, Ethernet0/2
L    10.0.0.1/32 is directly connected, Ethernet0/2
C    10.0.0.4/30 is directly connected, Ethernet0/1
L    10.0.0.5/32 is directly connected, Ethernet0/1
D    10.0.0.12/30 [90/307200] via 10.0.0.6, 00:45:51, Ethernet0/1
D    150.1.0.0/16 is variably subnetted, 2 subnets, 2 masks
C    150.1.1.0/24 is directly connected, Ethernet0/0
L    150.1.1.1/32 is directly connected, Ethernet0/0
R1(config-if)#
```

show ip eigrp neighbor

R-1	<pre>R1(config-if)#do sho ip eigrp nei EIGRP-IPv4 Neighbors for AS(254) H Address Interface Hold Uptime SRTT RTO Q Seq (sec) (ms) (sec) Cnt Num 1 10.0.0.2 Et0/2 11 00:59:55 1596 5000 0 4 0 10.0.0.6 Et0/1 13 00:59:55 1598 5000 0 8 R1(config-if)#</pre>
R-2	<pre>R2(config)#do sho ip eigrp neighbor EIGRP-IPv4 Neighbors for AS(254) H Address Interface Hold Uptime SRTT RTO Q Seq (sec) (ms) (sec) Cnt Num 0 10.0.0.1 Et0/0 13 01:07:54 10 100 0 6 R2(config)#</pre>
R-3	<pre>R3(config)#do sho ip eigrp neighbor EIGRP-IPv4 Neighbors for AS(254) H Address Interface Hold Uptime SRTT RTO Q Seq (sec) (ms) (sec) Cnt Num 1 10.0.0.5 Et0/0 13 01:10:44 9 100 0 5 0 10.0.0.14 Et0/1 11 01:10:44 9 100 0 5 R3(config)#</pre>
R-4	<pre>R4(config)#do sho ip eigrp neighbor EIGRP-IPv4 Neighbors for AS(254) H Address Interface Hold Uptime SRTT RTO Q Seq (sec) (ms) (sec) Cnt Num 0 10.0.0.13 Et0/1 11 01:13:16 12 100 0 9 R4(config)#</pre>

	# do ping
R-1	<pre> R1(config-if)#do ping 10.0.0.2 Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 10.0.0.2, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms R1(config-if)#do ping 10.0.0.6 Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 10.0.0.6, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/5 ms R1(config-if)#do ping 10.0.0.14 Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 10.0.0.14, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms R1(config-if)# </pre>



Task 3

Configure internal BGP on R1, R2, R3, and R4 shown below. Use peer-group configuration on R2 and R4 but NOT on R1 and R3:

1. All routers should use their Loopback 0 interface addresses as their router IDs
2. All routers should peer using their Loopback 0 interface addresses
3. R1 and R3 should be configured as Route Reflectors
4. R2 should peer with R1 and R3
5. R4 should peer with R1 and R3
6. R1 and R3 belong to the same cluster to reduce the size of the RIB
7. All routers should use TCP MD5 authentication with a password of 'CCNP'
8. BGP Hellos should be sent every 5 seconds and the Hold Time should be set to 15 seconds

Verify your configuration using the appropriate commands

Configure internal BGP on R1, R2, R3, and R4

c.

R-1	R-2	R-3	R-4
En Conf t router bgp 254 neighbor 10.0.0.2 remote-as 254 neighbor 10.0.0.2 next-hop-self neighbor 10.0.0.6 remote-as 254 neighbor 10.0.0.6 next-hop-self neighbor 10.0.0.14 remote-as 254	En Conf t router bgp 254 neighbor 10.0.0.1 remote-as 254 neighbor 10.0.0.1 next-hop-self neighbor 10.0.0.6 remote-as 254 neighbor 10.0.0.6 next-hop-self neighbor 1.1.1.1 remote-as 254	En Conf t router bgp 254 neighbor 10.0.0.2 remote-as 254 neighbor 10.0.0.2 next-hop-self neighbor 10.0.0.5 remote-as 254 neighbor 10.0.0.5 next-hop-self neighbor 10.0.0.14 remote-as 254	En Conf t router bgp 254 neighbor 10.0.0.5 remote-as 254 neighbor 10.0.0.5 next-hop-self neighbor 10.0.0.13 remote-as 254 neighbor 10.0.0.13 next-hop-self neighbor 20.0.0.1 remote-as 100

neighbor 10.0.0.14 next-hop-self neighbor 2.2.2.2 remote-as 254 neighbor 3.3.3.3 remote-as 254 neighbor 4.4.4.4 remote-as 254 neighbor 2.2.2.2 next-hop-self neighbor 3.3.3.3 next-hop-self neighbor 4.4.4.4 next-hop-self neighbor 2.2.2.2 update-source loopback0 neighbor 3.3.3.3 update-source loopback0 neighbor 4.4.4.4 update-source loopback0 network 150.1.1.0 mask 255.255.255.0 exit	neighbor 3.3.3.3 remote-as 254 neighbor 1.1.1.1 next-hop-self neighbor 3.3.3.3 next-hop-self neighbor 1.1.1.1 update-source loopback0 neighbor 3.3.3.3 update-source loopback0 network 150.2.2.0 mask 255.255.255.0 exit	neighbor 10.0.0.14 next-hop-self neighbor 1.1.1.1 remote-as 254 neighbor 2.2.2.2 remote-as 254 neighbor 4.4.4.4 remote-as 254 neighbor 1.1.1.1 next-hop-self neighbor 2.2.2.2 next-hop-self neighbor 4.4.4.4 next-hop-self neighbor 1.1.1.1 update-source loopback0 neighbor 2.2.2.2 update-source loopback0 neighbor 4.4.4.4 update-source loopback0 network 150.3.3.0 mask 255.255.255.0 exit	neighbor 20.0.0.1 next-hop-self neighbor 1.1.1.1 remote-as 254 neighbor 3.3.3.3 remote-as 254 neighbor 1.1.1.1 next-hop-self neighbor 3.3.3.3 next-hop-self neighbor 1.1.1.1 update-source loopback0 neighbor 3.3.3.3 update-source loopback0 network 150.4.4.0 mask 255.255.255.0 exit do wr
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Use peer-group configuration on R2 and R4

- should be configured as Route R1 and R3 Reflectors.
- 6. R1 and R3 belong to the same cluster to reduce the size of the RIB.

d.

R-1	R-2	R-3	R-4
En Conf t router bgp 254 neighbor 2.2.2.2 route-reflector-client neighbor 3.3.3.3 route-reflector-client exit	En Conf t router bgp 254 neighbor ibgp peer-group neighbor ibgp remote-as 254 neighbor ibgp next-hop-self neighbor ibgp update-source Loopback0 neighbor ibgp password CCNP neighbor ibgp version 4 neighbor ibgp timers 5 15 15 neighbor 4.4.4.4 peer-group ibgp exit	En Conf t router bgp 254 neighbor 1.1.1.1 route-reflector-client neighbor 4.4.4.4 route-reflector-client exit	En Conf t router bgp 254 neighbor ibgp peer-group neighbor ibgp remote-as 254 neighbor ibgp next-hop-self neighbor ibgp update-source Loopback0 neighbor ibgp password CCNP neighbor ibgp version 4 neighbor ibgp timers 5 15 15 neighbor 2.2.2.2 peer-group ibgp exit do wr

- 7. All routers should use TCP MD5 authentication with a password of 'CCNP'

R-1	R-3
En Conf t Router bgp 254 Neighbor 3.3.3.3 password CCNP exit	En Conf t Router bgp 254 Neighbor 1.1.1.1 password CCNP exit

**Note already configure R2 and R4 in peer-group(d.)

- 8. BGP Hellos should be sent every 5 seconds and the Hold Time should be set to 15 seconds
Verify your configuration using the appropriate commands

	R2(config)#do show ip bgp neighbors section hold time
R-2	<pre> R2(config-router)#do show ip bgp neighbors section hold time Last read 00:00:24, last write 00:00:15, hold time is 180, keepalive interval is 60 seconds Last read 00:00:42, last write 00:00:19, hold time is 180, keepalive interval is 60 seconds Last read 00:00:03, last write 00:00:03, hold time is 15, keepalive interval is 5 seconds Configured hold time is 15, keepalive interval is 5 seconds R2(config-router)# </pre>
R-4	<pre> R4(config-router)#do show ip bgp neighbors section hold time Last read 00:00:47, last write 00:00:08, hold time is 180, keepalive interval is 60 seconds Last read 00:00:00, last write 00:00:00, hold time is 15, keepalive interval is 5 seconds Configured hold time is 15, keepalive interval is 5 seconds Last read 00:00:41, last write 00:00:56, hold time is 180, keepalive interval is 60 seconds R4(config-router)# </pre>

Cluster verify: -

	R-2 #do show ip bgp 150.4.4.4
R-2	<pre> R2(config-router)#do show ip bgp 150.4.4.4 BGP routing table entry for 150.4.4.0/24, version 7 Paths: (3 available, best #3, table default) Not advertised to any peer Refresh Epoch 1 Local 4.4.4.4 (metric 460800) from 3.3.3.3 (3.3.3.3) Origin IGP, metric 0, localpref 100, valid, internal Originator: 4.4.4.4, Cluster list: 3.3.3.3 rx pathid: 0, tx pathid: 0 Refresh Epoch 1 Local 4.4.4.4 (metric 460800) from 1.1.1.1 (1.1.1.1) Origin IGP, metric 0, localpref 100, valid, internal Originator: 4.4.4.4, Cluster list: 1.1.1.1 rx pathid: 0, tx pathid: 0 Refresh Epoch 1 Local 4.4.4.4 (metric 460800) from 4.4.4.4 (4.4.4.4) Origin IGP, metric 0, localpref 100, valid, internal, best rx pathid: 0, tx pathid: 0x0 R2(config-router)# </pre>

R-4 #do show ip bgp 150.2.2.2

```
R4 R4(config-router)#do show ip bgp 150.2.2.2
BGP routing table entry for 150.2.2.0/24, version 11
Paths: (3 available, best #3, table default)
  Not advertised to any peer
  Refresh Epoch 2
  Local
    2.2.2.2 (metric 460800) from 3.3.3.3 (3.3.3.3)
      Origin IGP, metric 0, localpref 100, valid, internal
      Originator: 2.2.2.2, Cluster list: 3.3.3.3
      rx pathid: 0, tx pathid: 0
  Refresh Epoch 1
  Local
    2.2.2.2 (metric 460800) from 1.1.1.1 (1.1.1.1)
      Origin IGP, metric 0, localpref 100, valid, internal
      Originator: 2.2.2.2, Cluster list: 1.1.1.1
      rx pathid: 0, tx pathid: 0
  Refresh Epoch 1
  Local
    2.2.2.2 (metric 460800) from 2.2.2.2 (2.2.2.2)
      Origin IGP, metric 0, localpref 100, valid, internal, best
      rx pathid: 0, tx pathid: 0x0
R4 R4(config-router)#
```

Task 4

Advertise the 150.x.x.x/24 subnets on all routers via BGP. These prefixes should be redistributed into BGP on every router. In the future, there will be external BGP connections to one or more ISPs. Management has decided that the 150.x.x.x/24 subnets should never be advertised to these ISPs. Ensure that these prefixes are NEVER advertised out of AS 254. You are NOT allowed to use prefix lists or any type of filters. Verify your configuration using the appropriate commands. Verify that each router can also ping every other router's 150.x.x.x/24 LAN subnet.

e.

Already advertise the 150.x.x.x/24 subnet on all routers via BGP check (C.).

- These prefixes should be redistributed into BGP on every router. For this: - Redistribute EIGRP into BGP vis-versa. Command is in blow table.
- Ensure that these prefixes are NEVER advertised out of AS 254. You are NOT allowed to use prefix lists or any type of filters. Verify your configuration using the appropriate commands.
- For this: - To achieve this task I have to enable **synchronization** rule. (By default now a days CISCO decided to disable this rule.) commend as below table.
- By enabling synchronization in every router, **iBGP** route's will not advertise to **eBGP**. And also we cannot ping this **150.x.x.x/24 subnets**.
- For this we have to advertise these subnets in **IGP** protocols like (RIP, OSPF, EIGRP or ISIS).
- We already run EIGRP so we can advertise this subnet's. Check below table.

R-1	R-2	R-3	R-4
en conf t ! router eigrp 254 network 150.1.1.0 0.0.0.255	en conf t ! router eigrp 254 network 150.2.2.0 0.0.0.255 exit !	en conf t ! synchronization router bgp 254 redistribute eigrp 254 metric 10000 exit	en conf t ! router bgp 254 synchronization ! exit !

redistribute bgp 254 metric 10000 1000 255 255 1500 exit ! router bgp 254 synchronization ! exit	router bgp 254 synchronization ! exit	! router eigrp 254 network 150.3.3.0 0.0.0.255 ! exit	router eigrp 254 network 150.3.3.0 0.0.0.255 ! exit
--	--	--	---

R-1#do ping

```
R1#ping 150.4.4.4
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 150.4.4.4, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/17 ms
R1#ping 150.3.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 150.3.3.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
R1#ping 150.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 150.2.2.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
R1#
```

**Now we able to ping with every router with 150.x.x.x/24 subnet, because of redistribution in IGP.

R-3#show ip bgp

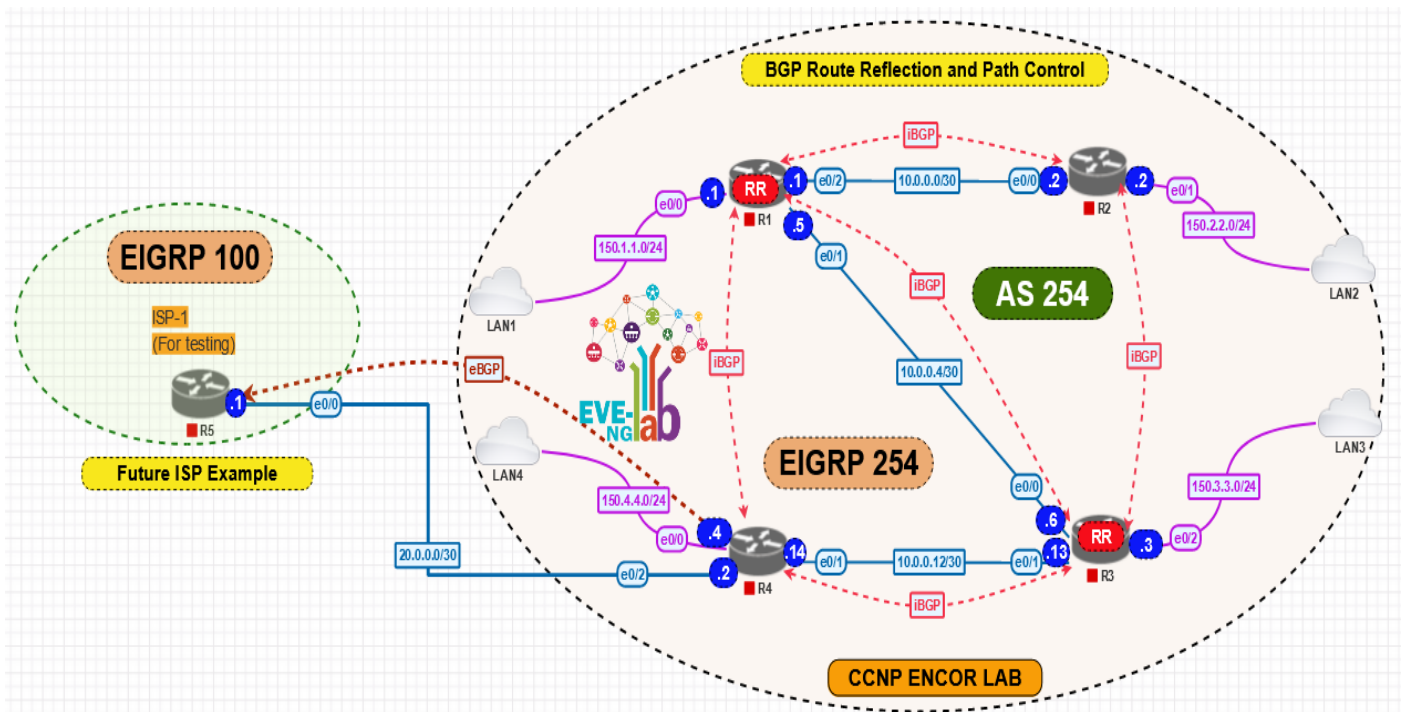
R3>
R3>en
R3#sho ip bgp
BGP table version is 13, local router ID is 3.3.3.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 1.1.1.1/32	10.0.0.5	10000		32768	?
*> 2.2.2.2/32	10.0.0.5	10000		32768	?
*> 3.3.3.3/32	0.0.0.0	0		32768	?
*> 4.4.4.4/32	10.0.0.14	10000		32768	?
*> 10.0.0.0/30	10.0.0.5	10000		32768	?
*> 10.0.0.4/30	0.0.0.0	0		32768	?
*> 10.0.0.12/30	0.0.0.0	0		32768	?
*> 20.0.0.0/30	10.0.0.14	10000		32768	?
*> 150.1.1.0/24	1.1.1.1	0	100	0	i
*> 150.2.2.0/24	10.0.0.5	0	100	0	i
*> 150.3.3.0/24	10.0.0.2	0	100	0	i
*> 150.4.4.0/24	10.0.0.14	0	100	0	i
*> 10.0.0.14	10.0.0.14	10000		32768	?

R3#
R3#

**When we enable synchronization, bgp route's not selected as a best path.

To proof this, I add one more router as ISP-1 enable eBGP connectivity with R4.



no synchronization command in iBGP

R5

File Edit View Options Transfer Script Tools Window Help

Enter host <Alt+R>

R1 R2 R3 R4 R5

```

ISP-1(config-router)#do sh ip bgp
BGP table version is 37, local router ID is 8.8.8.8
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      20.0.0.2              0      254 ?
* > 2.2.2.2/32      20.0.0.2              0      254 ?
* > 3.3.3.3/32      20.0.0.2              0      254 ?
* > 4.4.4.4/32      20.0.0.2              0      254 ?
* > 5.5.5.5/32      0.0.0.0                0      32768 i
* > 10.0.0.0/30     20.0.0.2              0      254 ?
* > 10.0.0.4/30     20.0.0.2              0      254 ?
* > 10.0.0.12/30    20.0.0.2              0      254 ?
* > 20.0.0.0/30     20.0.0.2              0      254 ?
* >                0.0.0.0                0      32768 i
* > 150.1.1.0/24    20.0.0.2              0      254 i
* > 150.2.2.0/24    20.0.0.2              0      254 i
* > 150.3.3.0/24    20.0.0.2              0      254 i
* > 150.4.4.0/24    20.0.0.2              0      254 i
ISP-1(config-router)#

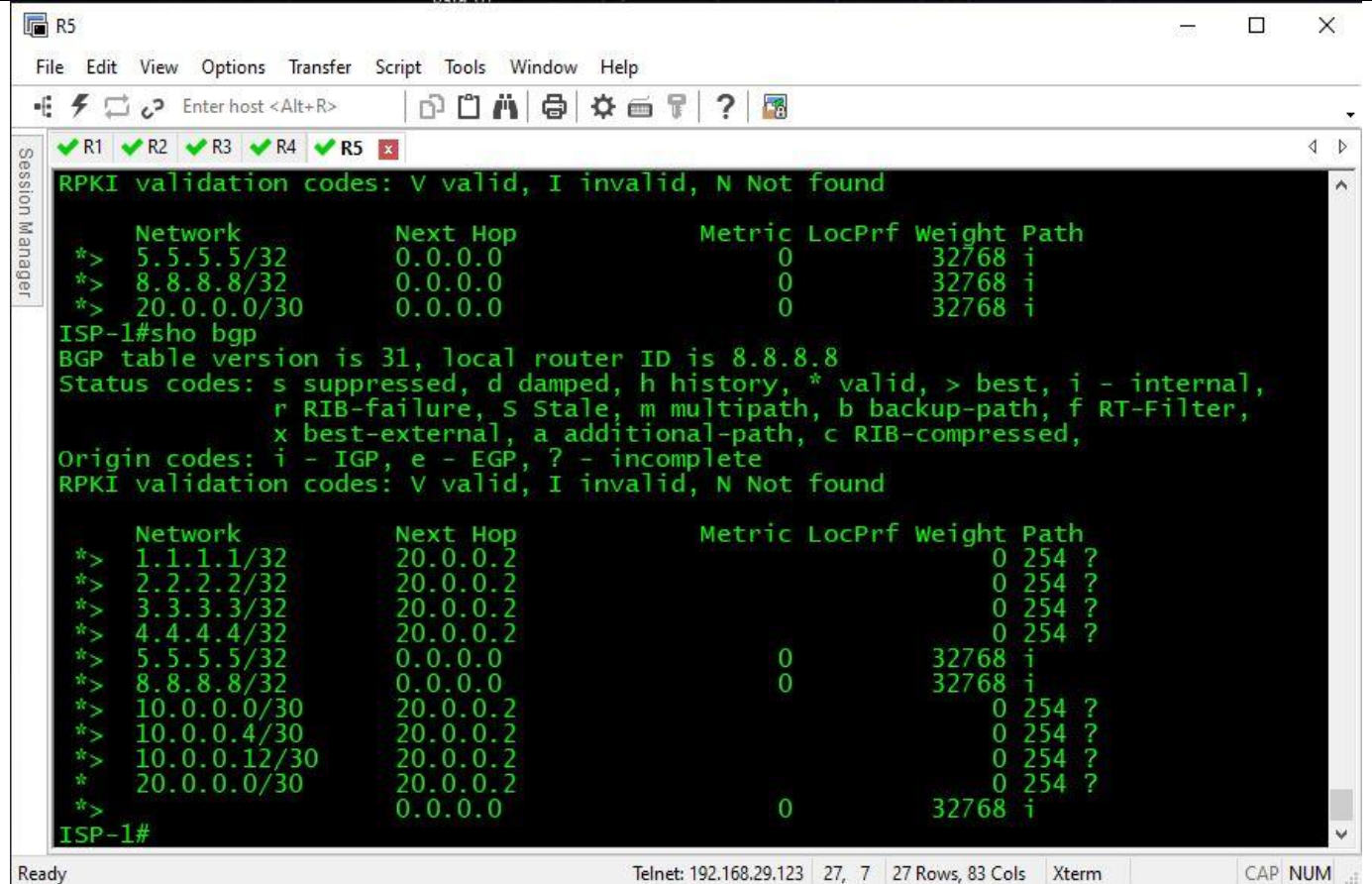
```

Ready Telnet: 192.168.29.123 24, 22 24 Rows, 83 Cols Xterm CAP NUM

Before

**Note: If simulator give error value then restart your router. Sometime some command not extenuated well.

synchronization command in iBGP



The screenshot shows a Telnet session on router R5. The top menu bar includes File, Edit, View, Options, Transfer, Script, Tools, Window, and Help. Below the menu is a toolbar with icons for various functions. The main window displays the following text:

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

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 5.5.5.5/32	0.0.0.0	0		32768	i
*> 8.8.8.8/32	0.0.0.0	0		32768	i
*> 20.0.0.0/30	0.0.0.0	0		32768	i

```
ISP-1#sho bgp
BGP table version is 31, local router ID is 8.8.8.8
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
```

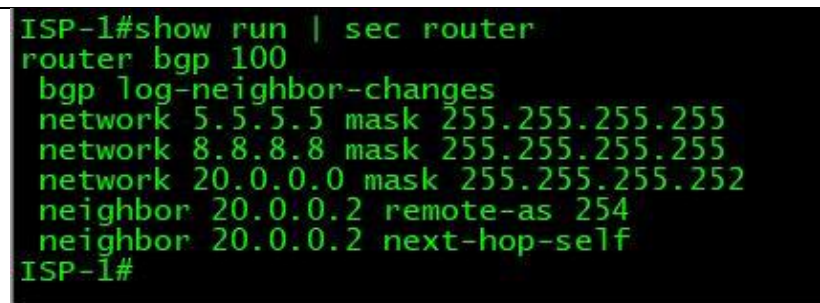
Network	Next Hop	Metric	LocPrf	Weight	Path
*> 1.1.1.1/32	20.0.0.2			0	254 ?
*> 2.2.2.2/32	20.0.0.2			0	254 ?
*> 3.3.3.3/32	20.0.0.2			0	254 ?
*> 4.4.4.4/32	20.0.0.2			0	254 ?
*> 5.5.5.5/32	0.0.0.0	0		32768	i
*> 8.8.8.8/32	0.0.0.0	0		32768	i
*> 10.0.0.0/30	20.0.0.2			0	254 ?
*> 10.0.0.4/30	20.0.0.2			0	254 ?
*> 10.0.0.12/30	20.0.0.2			0	254 ?
*> 20.0.0.0/30	20.0.0.2			0	254 ?
*>	0.0.0.0	0		32768	i

```
ISP-1#
```

The bottom status bar shows: Ready, Telnet: 192.168.29.123, 27, 7, 27 Rows, 83 Cols, Xterm, CAP, NUM.

After

ISP-1#show run | sec router



```
ISP-1#show run | sec router
router bgp 100
  bgp log-neighbor-changes
  network 5.5.5.5 mask 255.255.255.255
  network 8.8.8.8 mask 255.255.255.255
  network 20.0.0.0 mask 255.255.255.252
  neighbor 20.0.0.2 remote-as 254
  neighbor 20.0.0.2 next-hop-self
ISP-1#
```

ISP-1#show run | b r b

```
router bgp 100
network 5.5.5.5 mask 255.255.255.255
network 8.8.8.8 mask 255.255.255.255
network 20.0.0.0 mask 255.255.255.252
neighbor 20.0.0.2 remote-as 254
neighbor 20.0.0.2 next-hop-self
```


Task 5

Ensure that R2 and R4 always prefer routes received from R3 to those received from R1 for each other's 150.x.x.x/24 prefixes. You are only allowed to configure ONE router. Your solution should be globally significant; however, you are NOT allowed to modify any of the BGP default administrative distance values. You can modify BGP attributes as you see fit. Verify the configuration using the appropriate commands.

- R2 and R4 always prefer routes received from R3
- You are only allowed to configure ONE router.
- You can modify BGP attributes as you see fit.

For this: we use **local-preference** attribute in router **R3**.

Do not forget to clear ip bgp ☺

R-1	R-2	R-3	R-4
		<pre> en conf t ! router bgp 254 bgp local-preference 200 exit ! do clear ip bgp * ! </pre>	

R-2 #do show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
r i 1.1.1.1/32	10.0.0.6	10000	200	0	?
r i 1.1.1.1/32	3.3.3.3	10000	200	0	?
r i 1.1.1.1/32	10.0.0.6	10000	200	0	?
r i 2.2.2.2/32	10.0.0.6	10000	200	0	?
r i 2.2.2.2/32	3.3.3.3	10000	200	0	?
r i 2.2.2.2/32	10.0.0.6	10000	200	0	?
r i 3.3.3.3/32	10.0.0.6	0	200	0	?
r i 3.3.3.3/32	3.3.3.3	0	200	0	?
r i 3.3.3.3/32	10.0.0.6	0	200	0	?
r i 4.4.4.4/32	10.0.0.6	10000	200	0	?
r i 4.4.4.4/32	3.3.3.3	10000	200	0	?
r i 4.4.4.4/32	10.0.0.6	10000	200	0	?
* i 5.5.5.5/32	4.4.4.4	0	100	0	100 i
* i 8.8.8.8/32	4.4.4.4	0	100	0	100 i
r i 10.0.0.0/30	10.0.0.6	10000	200	0	?
r i 10.0.0.0/30	3.3.3.3	10000	200	0	?
r i 10.0.0.4/30	10.0.0.6	10000	200	0	?
r i 10.0.0.4/30	10.0.0.6	0	200	0	?
r i 10.0.0.4/30	3.3.3.3	0	200	0	?
r i 10.0.0.12/30	10.0.0.6	0	200	0	?
r i 10.0.0.12/30	3.3.3.3	0	200	0	?
r i 10.0.0.12/30	10.0.0.6	0	200	0	?
r i 20.0.0.0/30	3.3.3.3	10000	200	0	?
r i 20.0.0.0/30	10.0.0.6	10000	200	0	?
r i 20.0.0.0/30	10.0.0.6	10000	200	0	?
r i 150.1.1.0/24	3.3.3.3	10000	200	0	?
r i 150.1.1.0/24	10.0.0.6	10000	200	0	?
r i 150.1.1.0/24	1.1.1.1	0	100	0	i
* i 150.2.2.0/24	10.0.0.1	0	100	0	i
* i 150.2.2.0/24	10.0.0.6	10000	200	0	?
* i 150.2.2.0/24	3.3.3.3	10000	200	0	?
* i 150.2.2.0/24	10.0.0.6	10000	200	0	?
* i 150.3.3.0/24	0.0.0.0	0	32768	0	i
r i 150.3.3.0/24	10.0.0.6	0	200	0	i
r i 150.3.3.0/24	3.3.3.3	0	200	0	i
r i 150.3.3.0/24	10.0.0.6	0	200	0	i
r i 150.4.4.0/24	3.3.3.3	10000	200	0	?
r i 150.4.4.0/24	10.0.0.6	10000	200	0	?
r i 150.4.4.0/24	4.4.4.4	0	100	0	i
r i 150.4.4.0/24	10.0.0.6	10000	200	0	?

R-4 #show ip bgp

```

R4
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
Session Manager
R1 R2 R3 R4 R5
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
R4> 1.1.1.1/32      10.0.0.13         10000   200    0 ?
R4> 1.1.1.1/32      3.3.3.3           10000   200    0 ?
R4> 2.2.2.2/32      10.0.0.13         10000   200    0 ?
R4> 2.2.2.2/32      3.3.3.3           10000   200    0 ?
R4> 3.3.3.3/32      10.0.0.13         0       200    0 ?
R4> 3.3.3.3/32      3.3.3.3           0       200    0 ?
R4> 4.4.4.4/32      10.0.0.13         10000   200    0 ?
R4> 4.4.4.4/32      3.3.3.3           10000   200    0 ?
R4> * 5.5.5.5/32     20.0.0.1          0       0      0 100 i
R4> * 8.8.8.8/32     20.0.0.1          0       0      0 100 i
R4> 10.0.0.0/30      10.0.0.13         10000   200    0 ?
R4> 10.0.0.0/30      3.3.3.3           10000   200    0 ?
R4> 10.0.0.4/30      10.0.0.13         0       200    0 ?
R4> 10.0.0.4/30      3.3.3.3           0       200    0 ?
R4> 10.0.0.12/30     10.0.0.13         0       200    0 ?
R4> 10.0.0.12/30     3.3.3.3           0       200    0 ?
R4> 20.0.0.0/30      10.0.0.13         10000   200    0 ?
R4> 20.0.0.0/30      3.3.3.3           10000   200    0 ?
R4> 20.0.0.0/30      20.0.0.1          0       0      0 100 i
R4> 150.1.1.0/24     10.0.0.13         10000   200    0 ?
R4> 150.1.1.0/24     3.3.3.3           10000   200    0 ?
R4> 150.1.1.0/24     1.1.1.1           0       100    0 i
R4> 150.1.1.0/24     10.0.0.5          0       100    0 i
R4> 150.2.2.0/24     10.0.0.13         10000   200    0 ?
R4> 150.2.2.0/24     3.3.3.3           10000   200    0 ?
R4> 150.2.2.0/24     2.2.2.2           0       100    0 i
R4> 150.3.3.0/24     10.0.0.13         0       200    0 i
R4> 150.3.3.0/24     3.3.3.3           0       200    0 i
R4> * 150.4.4.0/24    10.0.0.13         10000   200    0 ?
R4> * 150.4.4.0/24    3.3.3.3           10000   200    0 ?
R4> * 150.4.4.0/24    0.0.0.0           0       32768 0 i
R4#

```

Ready Telnet: 192.168.29.123 37, 4 37 Rows, 77 Cols Xterm

Now all prefer routes received from R3.

All Task Completed 😊

Useful Verification Command's

```

#show run | sec bgp
#show run | sec eigrp
#show run | sec router
#show run | b r b
# show ip eigrp neighbor
#do show ip bgp neighbors | section hold time
#do show ip protocols | sec bgp
#do show bgp summary
#do show ip bgp
#do show ip bgp 150.4.4.4

```