BGP Lab Manual

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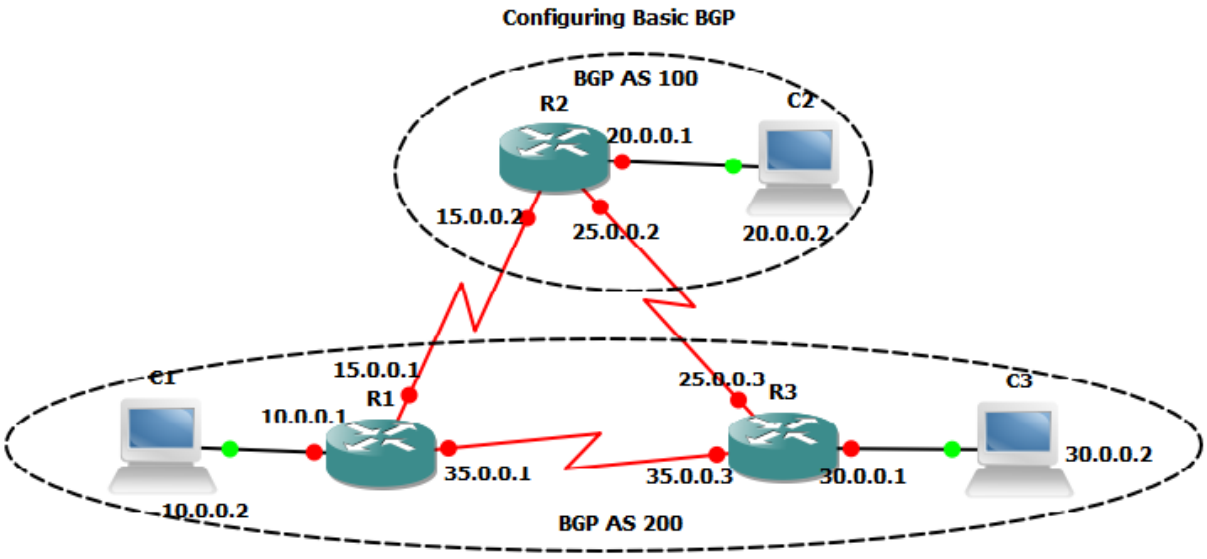
Lab 1

Basic BGP Configuration

Objective:

The main target of this lab is configure basic BGP configuration, and to check the BGP & routing table.

Diagram:



Preliminary Tasks:

Connect the network as shown in the diagram, and assign the described IP addresses.

Task 1:

Configure BGP neighbor relationship between R1, R2 & R3. R1 & R3 should be in AS 200, R1 should be in AS 100. Then advertise all the connected network into BGP.

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```
!R1
router bgp 200
network 10.0.0.0
 network 15.0.0.0
 network 35.0.0.0
 neighbor 15.0.0.2 remote-as 100
 neighbor 35.0.0.3 remote-as 200

!R2
router bgp 100
network 15.0.0.0
 network 20.0.0.0
 network 25.0.0.0
 neighbor 15.0.0.1 remote-as 200
 neighbor 25.0.0.3 remote-as 200

!R3
router bgp 200
 network 25.0.0.0
 network 30.0.0.0
 network 35.0.0.0
 neighbor 25.0.0.2 remote-as 100
```

neighbor 35.0.0.1 remote-as 200

!

Verification

R1#sh ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
15.0.0.2	4	100	14	15	8	0	0	00:10:38	3
35.0.0.3	4	200	15	14	8	0	0	00:08:26	4

R1#

R1#sh ip route

C 35.0.0.0/8 is directly connected, Serial1/1

B 20.0.0.0/8 [20/0] via 15.0.0.2, 00:11:22

B 25.0.0.0/8 [200/0] via 35.0.0.3, 00:09:51

C 10.0.0.0/8 is directly connected, FastEthernet0/0

B 30.0.0.0/8 [200/0] via 35.0.0.3, 00:09:57

C 15.0.0.0/8 is directly connected, Serial1/0

R1#

R1#sh ip bgp

```
   Network          Next Hop            Metric LocPrf Weight Path
*> 10.0.0.0         0.0.0.0                  0         32768 i
*  15.0.0.0         15.0.0.2                 0             0 100 i
*>                  0.0.0.0                  0         32768 i
* i20.0.0.0         25.0.0.2                 0    100      0 100 i
*>                  15.0.0.2                 0             0 100 i
*>i25.0.0.0         35.0.0.3                 0    100      0 i
*                   15.0.0.2                 0             0 100 i
*>i30.0.0.0         35.0.0.3                 0    100      0 i
* i35.0.0.0         35.0.0.3                 0    100      0 i
*>                  0.0.0.0                  0         32768 i
R1#
```

Ping Should be successful between All PCs.....

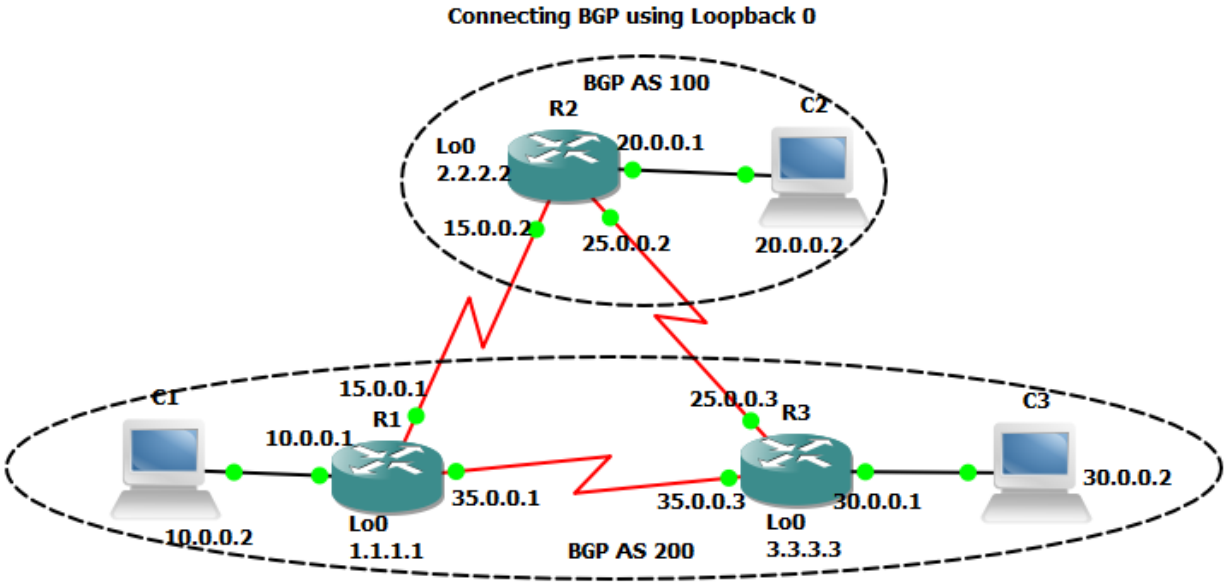
Lab 2

Connecting BGP Using Loopback 0/and Applying Ebgp multi-hop Command

Objective:

The main target of this lab is to configure BGP using loopback addresses, and to configure ebgp-multihop on the ebgp neighbor relation.

Diagram:



Task 1:

Following Lab 1, remove the bgp configuration on all routers. Then configure loopback interfaces on all routers as shown in the diagram.

!R1/R3

no router bgp 200

!R2

no router bgp 100

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!

!R1

int lo0

ip add 1.1.1.1 255.255.255.255

!R2

int lo0

ip add 2.2.2.2 255.255.255.255

!

!R3

int lo0

ip add 3.3.3.3 255.255.255.255

Task 2:

Configure static routes on all routers to point to the neighbor router's loopback addresses, as the BGP won't establish peering with addresses that can't reach in IGP.

!R1

ip route 2.2.2.2 255.255.255.255 15.0.0.2

ip route 3.3.3.3 255.255.255.255 35.0.0.3

!R2

ip route 1.1.1.1 255.255.255.255 15.0.0.1

ip route 3.3.3.3 255.255.255.255 25.0.0.3

!R3

ip route 2.2.2.2 255.255.255.255 25.0.0.2

ip route 1.1.1.1 255.255.255.255 35.0.0.2

Task 3:

Configure BGP as shown in the diagram, and use loopback 0 for peering instead of the physical interfaces. However, don't forget the ebgp-multihop command when you do ebgp peering, as the ebgp peering is expected to peer up by default with the physical interface, and to have the ebgp neighbor directly connected. So, we configure the command ebgp multi-hop to allow multiple hops between ebgp neighbors.

!R1

router bgp 200

neighbor 2.2.2.2 remote-as 100

neighbor 2.2.2.2 update-source lo0

neighbor 2.2.2.2 ebgp-multihop 2

neighbor 3.3.3.3 remote-as 200

neighbor 3.3.3.3 update-source lo0

network 10.0.0.0

network 15.0.0.0

network 35.0.0.0

```
!R2
router bgp 100
neighbor 1.1.1.1 remote-as 200
neighbor 1.1.1.1 update-source lo0
neighbor 1.1.1.1 ebgp-multihop 2
neighbor 3.3.3.3 remote-as 200
neighbor 3.3.3.3 update-source lo0
neighbor 3.3.3.3 ebgp-multihop 2
network 20.0.0.0
network 25.0.0.0
network 15.0.0.0

!R3
router bgp 200
neighbor 2.2.2.2 remote-as 100
neighbor 2.2.2.2 update-source lo0
neighbor 2.2.2.2 ebgp-multihop 2
neighbor 1.1.1.1 remote-as 200
neighbor 1.1.1.1 update-source lo0
network 30.0.0.0
network 25.0.0.0
network 35.0.0.0
```

Verification:

R1#sh ip bgp summary

```
Neighbor        V    AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
2.2.2.2         4   100       6       6        8    0    0 00:02:27        3
3.3.3.3         4   200       6       7        8    0    0 00:01:58        4
```

R1#sh ip bgp

```
   Network          Next Hop            Metric LocPrf Weight Path
*> 10.0.0.0         0.0.0.0                  0         32768 i
*  15.0.0.0         2.2.2.2                  0             0 100 i
*>                  0.0.0.0                  0         32768 i
* i20.0.0.0         2.2.2.2                  0    100      0 100 i
*>                  2.2.2.2                  0             0 100 i
*>i25.0.0.0         3.3.3.3                  0    100      0 i
*                   2.2.2.2                  0             0 100 i
*>i30.0.0.0         3.3.3.3                  0    100      0 i
* i35.0.0.0         3.3.3.3                  0    100      0 i
*>                  0.0.0.0                  0         32768 i
```

Ping should still be working between devices....

Task 4:

Remove ebgp-multihop associated with ebgp neighbor , and put enable disable connected check feature, and make sure the ebgp neighbor is also get established this way.

!R1

router bgp 200

no neighbor 2.2.2.2 ebgp-multihop 2

neighbor 2.2.2.2 disable-connected-check

!R3

router bgp 200

no neighbor 2.2.2.2 ebgp-multihop 2

neighbor 2.2.2.2 disable-connected-check

!R2

router bgp 100

no neighbor 1.1.1.1 ebgp-multihop 2

neighbor 1.1.1.1 disable-connected-check

no neighbor 3.3.3.3 ebgp-multihop 2

neighbor 3.3.3.3 disable-connected-check

!Verification

!R1

Show ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
2.2.2.2	4	100	13	14	7	0	0	00:09:17	3
3.3.3.3	4	200	12	12	7	0	0	00:07:18	3

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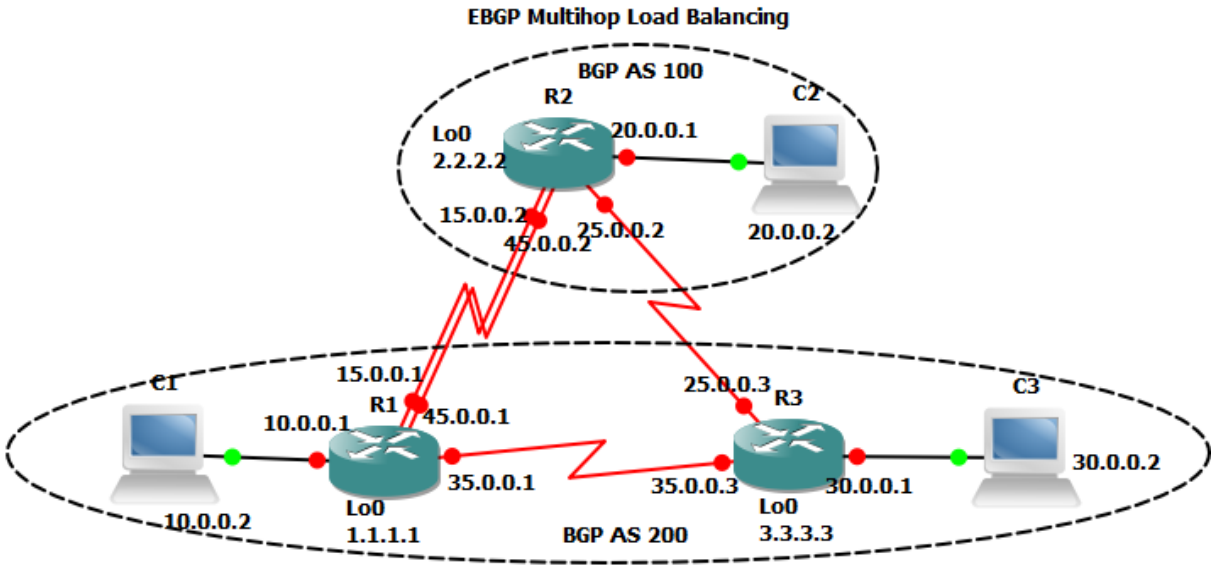
Lab 3

EBGP Multihop Load Balancing

Objective:

The main target of this lab is to configure load balancing design between two ebgp neighbors.

Diagram:



Preliminary Task:

Based on Lab 2, Connect additional serial cable between R1 & R2, configure the new IP addresses for the two serial ports.

Task 1:

Configure static route on R1 & R2 to point out to the loopback interfaces of R2/R1 through the new serial connection.

!R1

ip route 2.2.2.2 255.255.255.255 45.0.0.2

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!R2

ip route 1.1.1.1 255.255.255.255 45.0.0.1

Verification:

R1#sh ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
2.2.2.2	4	100	15	14	7	0	0	00:10:53	3
3.3.3.3	4	200	14	14	7	0	0	00:10:56	4

R1#

R1#show ip route

```
    1.0.0.0/32 is subnetted, 1 subnets
C       1.1.1.1 is directly connected, Loopback0
C    35.0.0.0/8 is directly connected, Serial1/1
    2.0.0.0/32 is subnetted, 1 subnets
S       2.2.2.2 [1/0] via 45.0.0.2
                [1/0] via 15.0.0.2
    3.0.0.0/32 is subnetted, 1 subnets
S       3.3.3.3 [1/0] via 35.0.0.3
B    20.0.0.0/8 [20/0] via 2.2.2.2, 00:11:13
B    25.0.0.0/8 [200/0] via 3.3.3.3, 00:11:14
C    10.0.0.0/8 is directly connected, FastEthernet0/0
```

C 45.0.0.0/8 is directly connected, Serial1/2

B 30.0.0.0/8 [200/0] via 3.3.3.3, 00:11:14

C 15.0.0.0/8 is directly connected, Serial1/0

R1#traceroute 2.2.2.2

1 45.0.0.2 72 msec

15.0.0.2 20 msec

45.0.0.2 44 msec

R1#

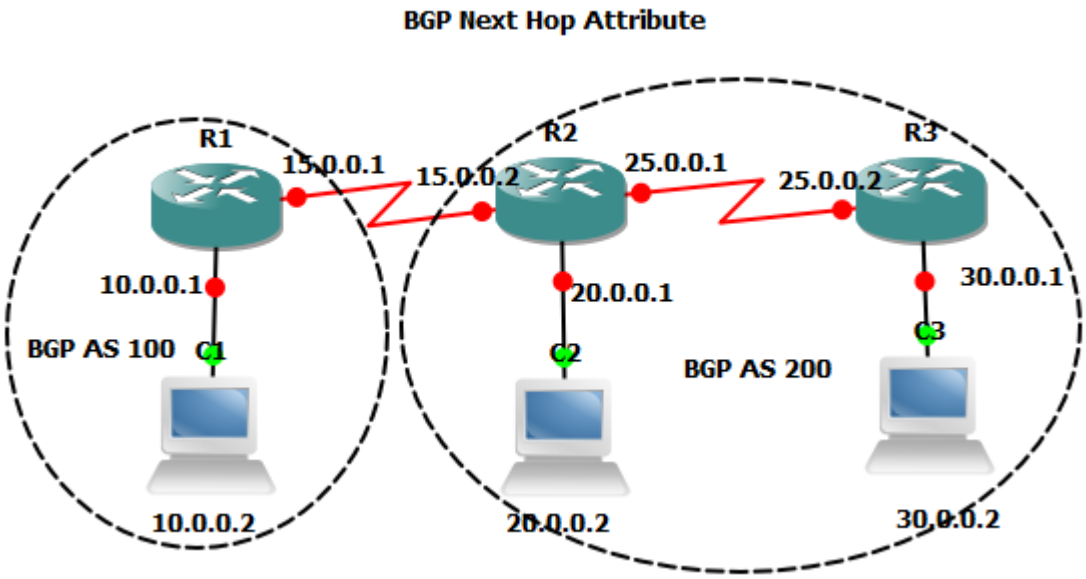
Lab 4

BGP Next Hop Attribute

Objective:

The target of this lab is to configure Next Hop Self command, to resolve the problems that could arise from advertising an ebgp route to an ibgp neighbor using default bgp configuration.

Diagram:



Preliminary Task:

Connect the network as shown in the diagram, and assign the ip addresses as explained in the above figure.

Task 1:

Configure BGP neighbor relation between R1 & R2, R2 & R3 relation according to AS numbers explained in the figure. Then advertise all the Ethernet networks into BGP.

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!R1

router bgp 100

neighbor 15.0.0.2 remote-as 200

network 10.0.0.0

!R2

router bgp 200

neighbor 15.0.0.1 remote-as 100

neighbor 25.0.0.3 remote-as 200

network 20.0.0.0

!R3

router bgp 200

neighbor 25.0.0.2 remote-as 200

network 30.0.0.0

Verification:

R3#sh ip route

B 20.0.0.0/8 [200/0] via 25.0.0.2, 00:06:14

C 25.0.0.0/8 is directly connected, Serial1/0

C 30.0.0.0/8 is directly connected, FastEthernet0/0

Note: Network 10.0.0.0 is not in R3's routing table

R3#sh ip bgp

BGP table version is 9, local router ID is 30.0.0.1

Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,

r RIB-failure, S Stale

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

Network	Next Hop	Metric	LocPrf	Weight	Path
* i10.0.0.0	15.0.0.1	0	100	0	100 i
*>i20.0.0.0	25.0.0.2	0	100	0	i
*> 30.0.0.0	0.0.0.0	0		32768	i

Network 10.0.0.0 is in the BGP table, but it hasn't been indicated as a best route, because the next hop (15.0.0.1) is not known in R3's routing table.

Task 2:

Configure R2 to advertise BGP routes to R1 & R3 with a next hop set to be R2's physical interface.

!R2

router bgp 200

neighbor 15.0.0.1 next-hop-self

neighbor 25.0.0.3 next-hop-self

Verification:

R3#sh ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*>i10.0.0.0	25.0.0.2	0	100	0	100 i
*>i20.0.0.0	25.0.0.2	0	100	0	i
*> 30.0.0.0	0.0.0.0	0		32768	i

R3#

R3#sh ip route

B 20.0.0.0/8 [200/0] via 25.0.0.2, 00:17:53

C 25.0.0.0/8 is directly connected, Serial1/0

B 10.0.0.0/8 [200/0] via 25.0.0.2, 00:01:10

C 30.0.0.0/8 is directly connected, FastEthernet0/0

R3#

Note: Network 10.0.0.0 has shown up in R3's routing table after changing the next hop.

Ping between all devices should be working fine.....

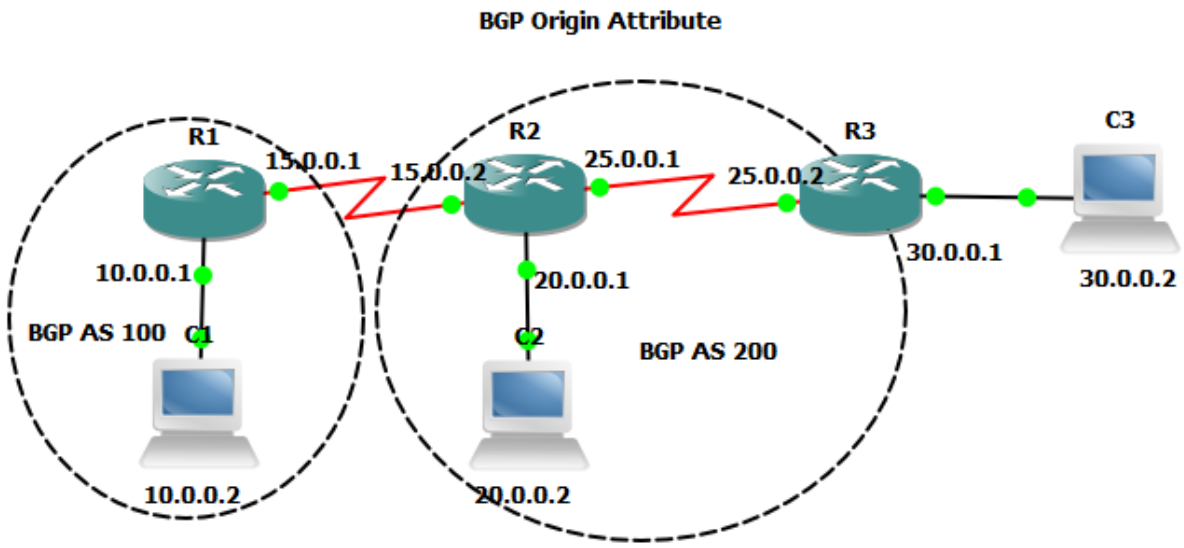
Lab 5

BGP Origin Attribute

Objective:

The main target of this lab is to configure BGP network that shows the different types of Origin Attribute, and its influence in BGP selection criteria.

Diagram:



Task 1:

Continuing on Lab 4, disable BGP configuration on all routers, and then configure BGP as shown in the diagram, and advertise all the connected networks that fall within the BGP domain (Don't Advertise network 30.0.0.0 into the BGP).

!R1

no router BGP 100

!R2/R3

no router BGP 200

!R1

router bgp 100

neighbor 15.0.0.2 remote-as 200

network 10.0.0.0

network 15.0.0.0

!R2

router bgp 200

neighbor 15.0.0.1 remote-as 100

neighbor 25.0.0.3 remote-as 200

network 15.0.0.0

network 25.0.0.0

network 20.0.0.0

!R3

router bgp 200

neighbor 25.0.0.2 remote-as 200

network 25.0.0.0

!Verification:

R2#sh ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
15.0.0.1	4	100	6	7	8	0	0	00:02:53	2
25.0.0.3	4	200	6	9	8	0	0	00:02:55	2

Task 2:

Configure a Static Route on R2 to point out to network 30.0.0.0, then redistribute this route into BGP.

!R2

ip route 30.0.0.0 255.0.0.0 25.0.0.3

router bgp 200

redistribute static

!Verification:

R1#sh ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	0.0.0.0	0		32768	i
* 15.0.0.0	15.0.0.2	0		0	200 i
*>	0.0.0.0	0		32768	i
*> 20.0.0.0	15.0.0.2	0		0	200 i
*> 25.0.0.0	15.0.0.2	0		0	200 i
*> 30.0.0.0	15.0.0.2	0		0	200 ?

Note: On R1 BGP table, the 200? explains that the network has been learned through redistribution.

Ping should be working fine between all devices....

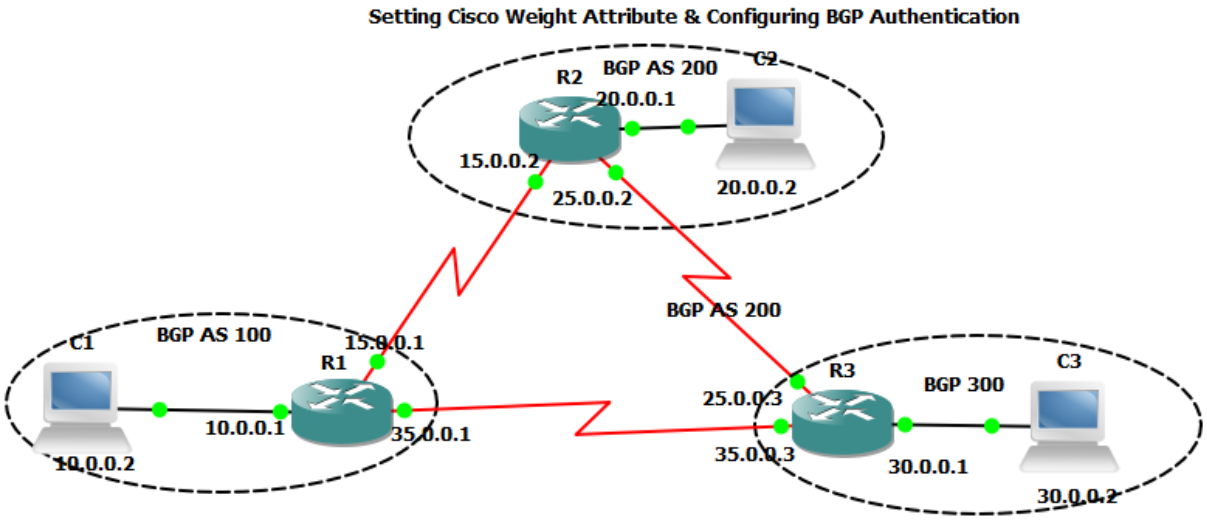
Lab 6

Setting Cisco Weight Attribute & Configuring BGP Authentication

Objective:

The main target of this lab is to set the Cisco Weight attribute as a selection criteria, and establish a secure BGP neighbor relationship.

Diagram:



Preliminary Task :

Connect the network as shown in the diagram, and assign the ip addresses as described in the figure above.

Task 1:

Configure BGP on all routers as shown in the figure using secure neighbor relationship, then advertise all the connected network in BGP.

!R1

router bgp 100

neighbor 15.0.0.2 remote-as 200

neighbor 15.0.0.2 password 123

neighbor 35.0.0.3 remote-as 300

neighbor 35.0.0.3 password 123

network 10.0.0.0

network 15.0.0.0

network 35.0.0.0

!R2

router bgp 200

neighbor 15.0.0.1 remote-as 100

neighbor 15.0.0.1 password 123

neighbor 25.0.0.3 remote-as 300

neighbor 25.0.0.3 password 123

network 20.0.0.0

network 25.0.0.0

network 15.0.0.0

!R3

router bgp 300

neighbor 25.0.0.2 remote-as 200

neighbor 25.0.0.2 password 123

neighbor 35.0.0.1 remote-as 100

neighbor 35.0.0.1 password 123

network 30.0.0.0

network 25.0.0.0

network 35.0.0.0

!Verification:

R2#sh ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
15.0.0.1	4	100	6	6	7	0	0	00:02:53	3
25.0.0.3	4	300	6	6	7	0	0	00:01:33	4

R2#

R1#sh ip bgp

	Network	Next Hop	Metric	LocPrf	Weight	Path
*>	10.0.0.0	0.0.0.0	0		32768	i
*	15.0.0.0	35.0.0.3			0	300 200 i
*		15.0.0.2	0		0	200 i
*>		0.0.0.0	0		32768	i
*	20.0.0.0	35.0.0.3			0	300 200 i
*>		15.0.0.2	0		0	200 i
*	25.0.0.0	35.0.0.3	0		0	300 i
*>		15.0.0.2	0		0	200 i

*> 30.0.0.0 35.0.0.3 0 0 300 i

* 15.0.0.2 0 200 300 i

* 35.0.0.0 35.0.0.3 0 0 300 i

*> 0.0.0.0 0 32768 i

R1#

Task 2:

As highlighted in the previous BGP table of R1, network 20.0.0.0 has been preferred through R2, because of the shorter AS-path Attribute. Change the weight parameter on R1 to prefer network through R3.

!R1

router bgp 100

neighbor 35.0.0.3 weight 1000

R1#clear ip bgp 35.0.0.3 soft in

R1#sh ip bgp

Network Next Hop Metric LocPrf Weight Path

*> 10.0.0.0 0.0.0.0 0 32768 i

* 15.0.0.0 35.0.0.3 1000 300 200 i

* 15.0.0.2 0 0 200 i

*> 0.0.0.0 0 32768 i

```
*> 20.0.0.0       35.0.0.3                  1000 300 200 i
*                 15.0.0.2          0       0 200 i
*> 25.0.0.0       35.0.0.3          0       1000 300 i
*                 15.0.0.2          0       0 200 i
*> 30.0.0.0       35.0.0.3          0       1000 300 i
*                 15.0.0.2                  0 200 300 i
*  35.0.0.0       35.0.0.3          0       1000 300 i
*>                0.0.0.0           0       32768 i
R1#
```

Note: After changing the weight Parameter on R1, the router prefers the network 20.0.0.0 through R3 instead.

Ping should be working fine between PCs....

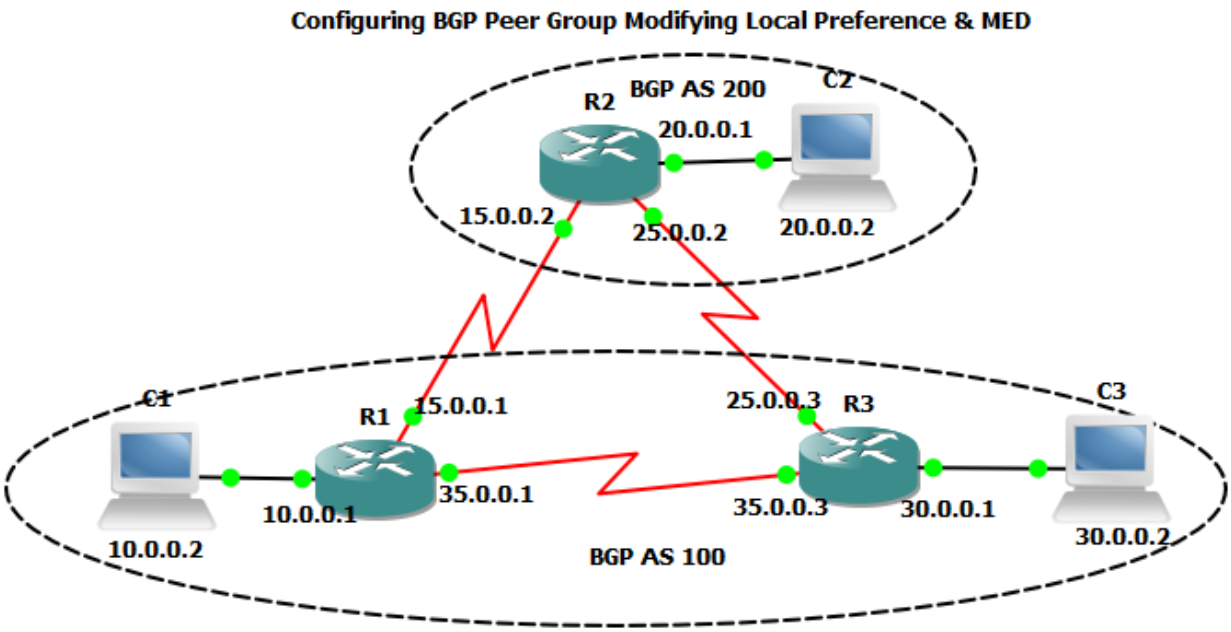
Lab 7

Configuring BGP using Peer Group, Modifying Local Preference & MED

Objective:

The main goal of this lab is configure BGP using Peer Group Feature, and to do modification on Local Preference & MED to change the route for certain networks.

Diagram:



Task 1:

Continuing on Lab 6, disable BGP configuration on all routers, then reconfigure BGP as shown in the figure. However, Use BGP peer group command when configuring R2. Then advertise all connected networks into BGP.

!R1

no router bgp 100

!R2

no router bgp 200

!R3

no router bgp 300

!R1

router bgp 100

neighbor 15.0.0.2 remote-as 200

neighbor 35.0.0.3 remote-as 100

network 10.0.0.0

network 15.0.0.0

network 35.0.0.0

!R2

router bgp 200

neighbor EBGP_Peers peer-group

neighbor EBGP_Peers remote-as 100

neighbor 15.0.0.1 peer-group EBGP_Peers

neighbor 25.0.0.3 peer-group EBGP_Peers

network 20.0.0.0

network 15.0.0.0

network 25.0.0.0

!R3

router bgp 100

neighbor 35.0.0.1 remote-as 100

neighbor 25.0.0.2 remote-as 200

network 30.0.0.0

network 25.0.0.0

network 15.0.0.0

!Verification:

R1#sh ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
15.0.0.2	4	200	2	3	0	0	0	00:00:57	0
35.0.0.3	4	100	2	2	0	0	0	00:00:44	0

R1#

R1#sh ip bgp

	Network	Next Hop	Metric	LocPrf	Weight	Path
*>	10.0.0.0	0.0.0.0	0		32768	i
*	15.0.0.0	15.0.0.2	0		0	200 i
*>		0.0.0.0	0		32768	i
* i	20.0.0.0	25.0.0.2	0	100	0	200 i
*>		15.0.0.2	0		0	200 i

*>i25.0.0.0 35.0.0.3 0 100 0 i

* 15.0.0.2 0 0 200 i

*>i30.0.0.0 35.0.0.3 0 100 0 i

*> 35.0.0.0 0.0.0.0 0 32768 i

R1#

Task 2:

Modify BGP configuration using local preference attribute in AS 100, so network 20.0.0.0 is to be preferred through R3 for all customers in AS 100.

!R3

access-list 1 permit 20.0.0.0 0.255.255.255

!

route-map local permit 10

match ip address 1

set local-preference 200

route-map local permit 100

!

router bgp 100

neighbor 25.0.0.2 route-map local in

!Verification:

R3#clear ip bgp 25.0.0.2 soft in

R3#sh ip bgp

```
   Network          Next Hop            Metric LocPrf Weight Path
*>i10.0.0.0         35.0.0.1                 0    100      0 i
*>i15.0.0.0         35.0.0.1                 0    100      0 i
*                   25.0.0.2                 0             0 200 i
*> 20.0.0.0         25.0.0.2                 0    200      0 200 i
*  25.0.0.0         25.0.0.2                 0             0 200 i
*>                  0.0.0.0                  0         32768 i
*> 30.0.0.0         0.0.0.0                  0         32768 i
r>i35.0.0.0         35.0.0.1                 0    100      0 i
R3#


R1#sh ip bgp
BGP table version is 8, local router ID is 35.0.0.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*> 10.0.0.0         0.0.0.0                  0         32768 i
*  15.0.0.0         15.0.0.2                 0             0 200 i
*>                  0.0.0.0                  0         32768 i
*>i20.0.0.0         25.0.0.2                 0    200      0 200 i
```

```
*              15.0.0.2             0          0 200 i
*>i25.0.0.0      35.0.0.3             0    100      0 i
*              15.0.0.2             0          0 200 i
*>i30.0.0.0      35.0.0.3             0    100      0 i
*> 35.0.0.0      0.0.0.0              0        32768 i
R1#
```

Note: R1 preferred network 20.0.0.0 through R3, because its having a higher Local Preference Value.

Task 3:

Modify the BGP configuration on AS 100 so all incoming traffic from AS 200 for network 10.0.0.0 & 30.0.0.0 is to come through R1.

```
!R1
access-list 11 permit 10.0.0.0 0.255.255.255
access-list 11 permit 30.0.0.0 0.255.255.255
route-map med permit 10
match ip add 11
set metric 50
route-map med permit 100
!
router bgp 100
neighbor 15.0.0.2 route-map med out
```

!R3

access-list 33 permit 10.0.0.0 0.255.255.255

access-list 33 permit 30.0.0.0 0.255.255.255

route-map med permit 10

match ip address 33

set metric 100

route-map med permit 100

!

router bgp 100

neighbor 25.0.0.2 route-map med out

!Verification:

R1#clear ip bgp 15.0.0.2 soft out

R3#clear ip bgp 25.0.0.2 soft out

R2#sh ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
* 10.0.0.0	25.0.0.3	100		0	100 i
*>	15.0.0.1	50		0	100 i
* 15.0.0.0	25.0.0.3			0	100 i
*	15.0.0.1	0		0	100 i
*>	0.0.0.0	0		32768	i
*> 20.0.0.0	0.0.0.0	0		32768	i

```
*  25.0.0.0        15.0.0.1                    0 100 i
*                  25.0.0.3             0      0 100 i
*>                 0.0.0.0              0      32768 i
*> 30.0.0.0        15.0.0.1             50     0 100 i
*                  25.0.0.3             100    0 100 i
*> 35.0.0.0        25.0.0.3                    0 100 i
*                  15.0.0.1             0      0 100 i
R2#
```

Note: All the networks o R2 as shown, has been preferred to go through R1, after we changed the MED attribute (Lowest MED is preferred).

Ping between all devices should work fine.....

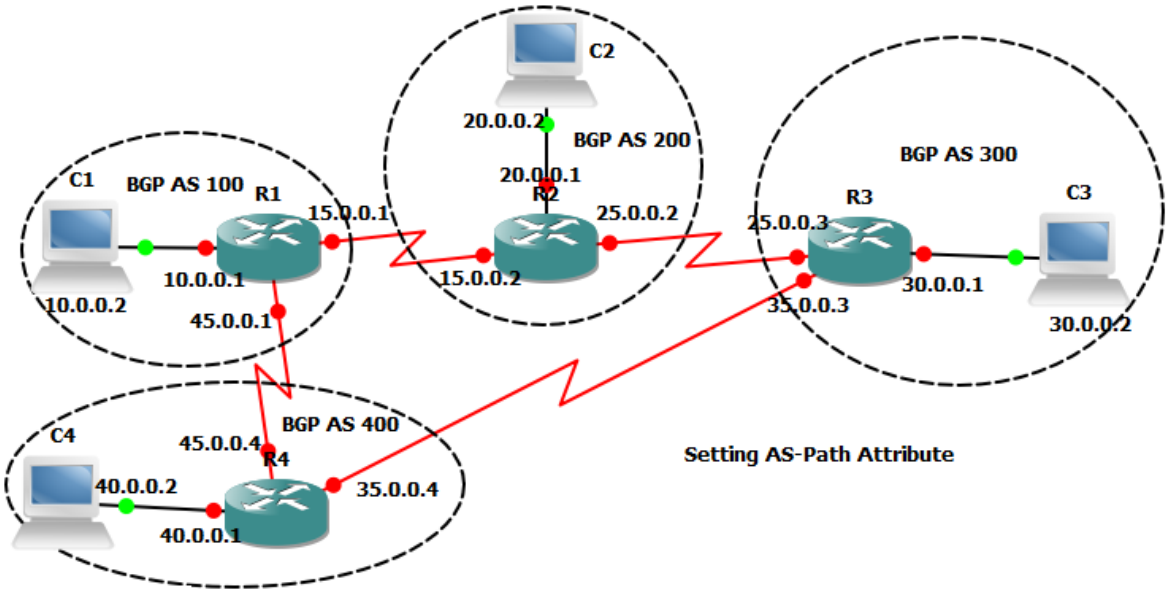
Lab 8

AS Path Attribute

Objective:

The main goal of this lab is to modify the AS path Attribute to Influence the outbound traffic for a certain BGP AS.

Diagram:



Preliminary Task:

Connect the network as shown in the diagram, and assign IP addresses ad described in the above figure.

Task 1:

Configure BGP on all routers as explained in the diagram, and advertise all the connected network into BGP.

!R1

router bgp 100

neighbor 15.0.0.2 remote-as 200

neighbor 45.0.0.4 remote-as 400

network 10.0.0.0

network 15.0.0.0

network 45.0.0.0

!R2

router bgp 200

neighbor 15.0.0.1 remote-as 100

neighbor 25.0.0.3 remote-as 300

network 20.0.0.0

network 15.0.0.0

network 25.0.0.0

!R3

router bgp 300

neighbor 25.0.0.2 remote-as 200

neighbor 35.0.0.4 remote-as 400

network 30.0.0.0

network 25.0.0.0

network 35.0.0.0

!R4

router bgp 400

neighbor 45.0.0.1 remote-as 100

neighbor 35.0.0.3 remote-as 300

network 40.0.0.0

network 35.0.0.0

network 45.0.0.0

!Verification:

R4#sh ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
35.0.0.3	4	300	2	2	0	0	0	00:00:21	0
45.0.0.1	4	100	5	2	0	0	0	00:00:21	5

R4#sh ip bgp

	Network	Next Hop	Metric	LocPrf	Weight	Path
*	10.0.0.0	35.0.0.3			0	300 200 100 i
*>		45.0.0.1	0		0	100 i
*	15.0.0.0	35.0.0.3			0	300 200 i
*>		45.0.0.1	0		0	100 i
*>	20.0.0.0	35.0.0.3			0	300 200 i
*		45.0.0.1			0	100 200 i

Prepared By:Waleed Adlan-CCIE 41999-waleed_hashim@hotmail.com

*> 25.0.0.0 35.0.0.3 0 0 300 i

* 45.0.0.1 0 100 200 i

* 30.0.0.0 45.0.0.1 0 100 200 300 i

*> 35.0.0.3 0 0 300 i

* 35.0.0.0 35.0.0.3 0 0 300 i

*> 0.0.0.0 0 32768 i

*> 40.0.0.0 0.0.0.0 0 32768 i

* 45.0.0.0 45.0.0.1 0 0 100 i

*> 0.0.0.0 0 32768 i

R4#

Note: We can see that most of EBGP routes have been selected based on the shorter AS-Path.

Task 2:

Configure R4 to select all EBGP routes through R1 based on the AS-Path Attribute.

!R4

route-map aspath permit 10

set as-path-prepend 400 400 400

router bgp 400

neighbor 35.0.0.3 route-map aspath in

!

!Verification:

```
 R4#clear ip bgp 35.0.0.3 soft in
R4#sh ip bgp
BGP table version is 12, local router ID is 45.0.0.4
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
* 10.0.0.0         35.0.0.3                               0 400 400 400 300 200 100 i
*>                 45.0.0.1                 0             0 100 i
* 15.0.0.0         35.0.0.3                               0 400 400 400 300 200 i
*>                 45.0.0.1                 0             0 100 i
* 20.0.0.0         35.0.0.3                               0 400 400 400 300 200 i
*>                 45.0.0.1                               0 100 200 i
* 25.0.0.0         35.0.0.3                 0             0 400 400 400 300 i
*>                 45.0.0.1                               0 100 200 i
*> 30.0.0.0        45.0.0.1                               0 100 200 300 i
*                  35.0.0.3                 0             0 400 400 400 300 i
* 35.0.0.0         35.0.0.3                 0             0 400 400 400 300 i
*>                 0.0.0.0                  0         32768 i
*> 40.0.0.0        0.0.0.0                  0         32768 i
```

Prepared By:Waleed Adlan-CCIE 41999-waleed_hashim@hotmail.com

```
* 45.0.0.0        45.0.0.1               0          0 100 i
  Network         Next Hop          Metric LocPrf Weight Path
*>                0.0.0.0                  0        32768 i

R4#sh ip route
C    35.0.0.0/8 is directly connected, Serial1/0
B    20.0.0.0/8 [20/0] via 45.0.0.1, 00:03:11
B    25.0.0.0/8 [20/0] via 45.0.0.1, 00:03:11
C    40.0.0.0/8 is directly connected, FastEthernet0/0
B    10.0.0.0/8 [20/0] via 45.0.0.1, 00:18:17
C    45.0.0.0/8 is directly connected, Serial1/1
B    30.0.0.0/8 [20/0] via 45.0.0.1, 00:03:11
B    15.0.0.0/8 [20/0] via 45.0.0.1, 00:18:17
R4#
```

Ping between all device should be working.....

Lab9

BGP Route Reflector

Topology:

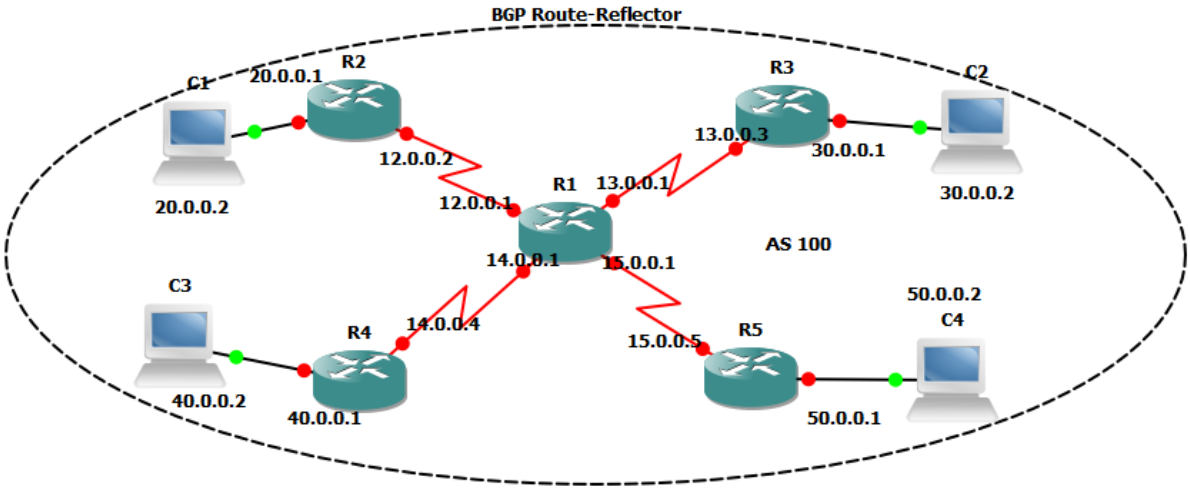


Figure 1.1

Task 1: Preliminary Configuration

- Connect the topology as shown in the figure
- Configure the IP addresses as shown in the figure

Task 2:

Configure all routers to run BGP AS 100, and to configure BGP neighbor relationship between every router and R1 (The proposed Route Reflector)

!R2

router bgp 100

no synchronization

bgp log-neighbor-changes

```
 neighbor 12.0.0.1 remote-as 100
 no auto-summary
!R3
router bgp 100
 no synchronization
 bgp log-neighbor-changes
 neighbor 13.0.0.1 remote-as 100
 no auto-summary
!R4
router bgp 100
 no synchronization
 bgp log-neighbor-changes
 neighbor 14.0.0.1 remote-as 100
 no auto-summary
!R5
router bgp 100
 no synchronization
 bgp log-neighbor-changes
 neighbor 15.0.0.1 remote-as 100
 no auto-summary
```

!R1

```
router bgp 100
 no synchronization
 bgp log-neighbor-changes
 neighbor 12.0.0.2 remote-as 100
neighbor 13.0.0.3 remote-as 100
neighbor 14.0.0.4 remote-as 100
neighbor 15.0.0.5 remote-as 100
no auto-summary
```

! **verification commands**

```
R1#show ip bgp summary
Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down
State/PfxRcd
12.0.0.2        4          100       3       2        0    0    0 00:00:14        0
13.0.0.3        4          100       2       2        0    0    0 00:00:12        0
14.0.0.4        4          100       2       2        0    0    0 00:00:14        0
15.0.0.5        4          100       2       2        0    0    0 00:00:12        0
```

Task 3:

Configure R1 as a Route Reflector and advertise the LAN network in BGP for Routers

R2/R3/R4/R5

!R1

router bgp 100

neighbor 12.0.0.2 route-reflector-client

neighbor 13.0.0.3 route-reflector-client

neighbor 14.0.0.4 route-reflector-client

neighbor 15.0.0.5 route-reflector-client

!R2

router bgp 100

network 20.0.0.0

!R3

router bgp 100

network 30.0.0.0

!R4

router bgp 100

network 40.0.0.0

!R5

router bgp 100

network 50.0.0.0

!Verification:

R1#show ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
12.0.0.2	4	100	13	13	5	0	0	00:03:38	1
13.0.0.3	4	100	12	14	5	0	0	00:02:53	1
14.0.0.4	4	100	12	14	5	0	0	00:02:39	1
15.0.0.5	4	100	12	14	5	0	0	00:02:47	1

R1#

R3#show ip bgp

BGP table version is 2, local router ID is 30.0.0.1

Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,

r RIB-failure, S Stale

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

	Network	Next Hop	Metric	LocPrf	Weight	Path
* i	20.0.0.0	12.0.0.2	0	100	0	i
*>	30.0.0.0	0.0.0.0	0		32768	i
* i	40.0.0.0	14.0.0.4	0	100	0	i
* i	50.0.0.0	15.0.0.5	0	100	0	i

Note: We can notice the other routers LAN networks is not considered valid in the bgp table, because the next hop is not reachable.

Task 4:

Configure R1 to advertise all its connected network in BGP

!R1

router bgp 100

network 12.0.0.0

network 13.0.0.0

network 14.0.0.0

network 15.0.0.0

!Verification commands:

R3#show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*>i12.0.0.0	13.0.0.1	0	100	0	i
r>i13.0.0.0	13.0.0.1	0	100	0	i
*>i14.0.0.0	13.0.0.1	0	100	0	i
*>i15.0.0.0	13.0.0.1	0	100	0	i
*>i20.0.0.0	12.0.0.2	0	100	0	i
*> 30.0.0.0	0.0.0.0	0		32768	i
*>i40.0.0.0	14.0.0.4	0	100	0	i
*>i50.0.0.0	15.0.0.5	0	100	0	i

R3#show ip route

B 50.0.0.0/8 [200/0] via 15.0.0.5, 00:01:31

B 20.0.0.0/8 [200/0] via 12.0.0.2, 00:01:31

B 40.0.0.0/8 [200/0] via 14.0.0.4, 00:01:31

B 12.0.0.0/8 [200/0] via 13.0.0.1, 00:01:36

C 13.0.0.0/8 is directly connected, Serial1/0

B 14.0.0.0/8 [200/0] via 13.0.0.1, 00:01:35

C 30.0.0.0/8 is directly connected, FastEthernet0/0

B 15.0.0.0/8 [200/0] via 13.0.0.1, 00:01:35

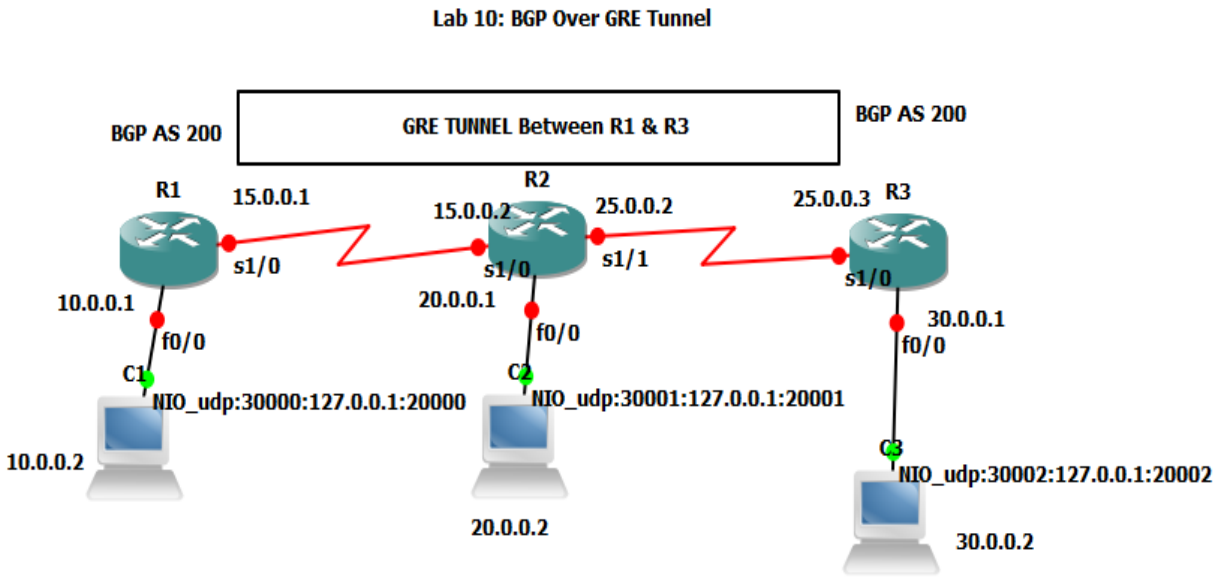
R3#

Now the ping between the devices should be working, after the bgp next hop behavior has been resolved.

Lab 10

BGP Over GRE Tunnels

Topology:



Task 1:

Connect the above network , and assign IP addresses as depicted in the diagram. Configure GRE tunnel Between R1 & R3, and assign them 40.0.0.0/8 network. Configure also a default route in R1 & R3 pointing to R2 so that to enable the BGP session to be established.

!R1

Ip route 0.0.0.0 0.0.0.0 s1/0

Int tunnel 0

Ip address 40.0.0.1 255.0.0.0

Tunnel source s1/0

Tunnel destination 25.0.0.3

Tunnel mode gre ip

Exit

!R3

Ip route 0.0.0.0 0.0.0.0 s1/0

Interface tunnel 0

Ip address 40.0.0.2 255.0.0.0

Tunnel source s1/0

Tunnel destination 15.0.0.1

Tunnel mode gre ip

Exit

!Verification:

!R1

Show ip int brief

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	10.0.0.1	YES	manual	up	up
FastEthernet0/1	unassigned	YES	unset	administratively down	down
Serial1/0	15.0.0.1	YES	manual	up	up
Serial1/1	unassigned	YES	unset	administratively down	down

Serial1/2 unassigned YES unset administratively down down

Serial1/3 unassigned YES unset administratively down down

SSLVPN-VIF0 unassigned NO unset up up

Tunnel0 40.0.0.1 YES manual up up

Task 2:

Configure R1 & R3 to run BGP AS200, use the tunnel address as BGP session neighbor. Ensure network connectivity between PCs.

!R1

Router bgp 200

Neighbor 40.0.0.2 remote-as 200

Network 10.0.0.0

!R3

Router bgp 200

Neighbor 40.0.0.1 remote-as 200

Network 30.0.0.0

!Verification:

!R1

Show ip bgp summary

Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd

40.0.0.2 4 200 2 2 0 0 0 00:00:32 0

R1#

!R1

Show ip route

C 40.0.0.0/8 is directly connected, Tunnel0

C 10.0.0.0/8 is directly connected, FastEthernet0/0

B 30.0.0.0/8 [200/0] via 40.0.0.2, 00:00:32

C 15.0.0.0/8 is directly connected, Serial1/0

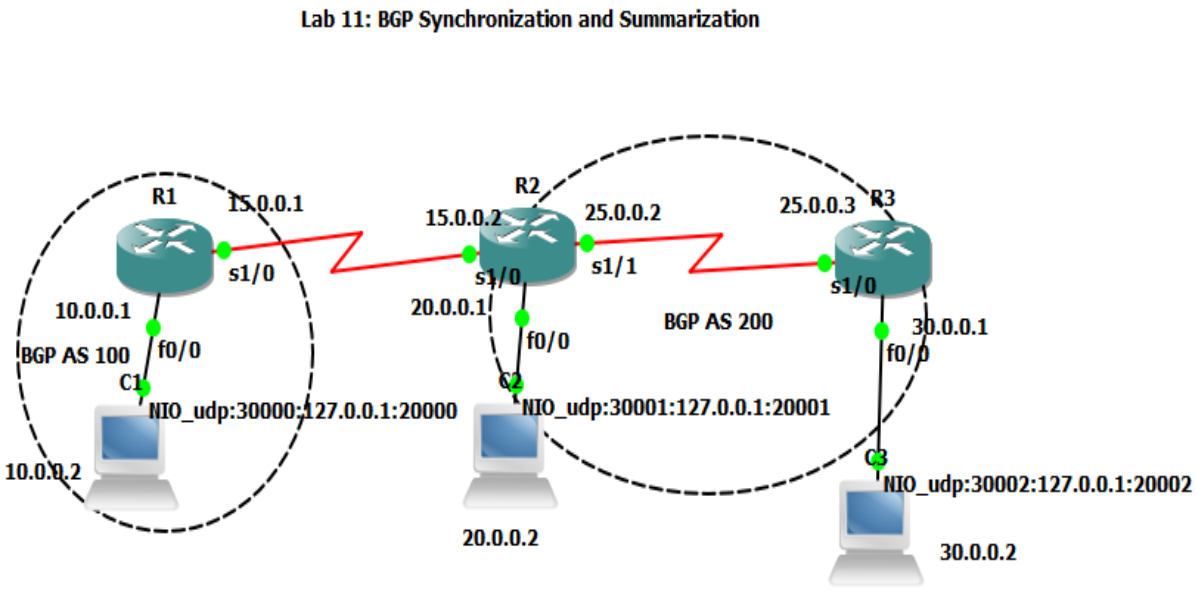
S* 0.0.0.0/0 is directly connected, Serial1/0

Ping Between PCs should be working normally

Lab 11

BGP Synchronization and Summarization

Topology:



Task 1:

Connect the above network and assign IP addresses as shown in the diagram. Configure R1 in AS 100, R2& R3 in AS 200. Ensure BGP session is established properly and LAN networks are advertised between BGP neighbors.

!R1

Router bgp 100

Neighbor 15.0.0.2 remote-as 200

Network 10.0.0.0

Network 15.0.0.0

!R2

Router bgp 200

Neighbor 15.0.0.1 remote-as 100

Neighbor 25.0.0.3 remote-as 200

Network 20.0.0.0

Network 15.0.0.0

Network 25.0.0.0

!R3

Router bgp 200

Neighbor 25.0.0.2 remote-as 200

Network 30.0.0.0

Network 25.0.0.0

!Verification:

!R2

Show ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/ PfxRcd
15.0.0.1	4	100	6	6	6	0	0	00:03:37	2
25.0.0.3	4	200	5	6	6	0	0	00:02:47	2

Show ip bgp

R2#show ip bgp

```
  Network          Next Hop            Metric LocPrf Weight Path
*> 10.0.0.0        15.0.0.1                 0             0 100 i
*  15.0.0.0        15.0.0.1                 0             0 100 i
*>                 0.0.0.0                  0         32768 i
*> 20.0.0.0        0.0.0.0                  0         32768 i
* i25.0.0.0        25.0.0.3                 0    100      0 i
*>                 0.0.0.0                  0         32768 i
*>i30.0.0.0        25.0.0.3                 0    100      0 i
```

Task 2:

Enable Synchronization in three routers and check again the bgp table

!R1

Route bgp 100

Synchronization

!R2/R3

Router bgp 200

Synchronization

!R2

Show ip bgp

Network Next Hop Metric LocPrf Weight Path

*> 10.0.0.0 15.0.0.1 0 0 100 i

*> 15.0.0.0 0.0.0.0 0 32768 i

* 15.0.0.1 0 0 100 i

*> 20.0.0.0 0.0.0.0 0 32768 i

*> 25.0.0.0 0.0.0.0 0 32768 i

* i 25.0.0.3 0 100 0 i

* i30.0.0.0 25.0.0.3 0 100 0 i

R2#

Show ip bgp 30.0.0.0

BGP routing table entry for 30.0.0.0/8, version 5

Paths: (1 available, no best path)

Not advertised to any peer

Local

25.0.0.3 from 25.0.0.3 (30.0.0.1)

Origin IGP, metric 0, localpref 100, valid, internal, not synchronized

R2#

Task 3:

Disable Synchronization in all three routers, then configure four loopback interfaces in R1 and assign them ip addresses 172.16.0.1 to 172.16.3.1/24 .Finally enable auto summary in all BGP routers.

!R1

Router bgp 100

No synchronization

Auto-summary

!R2/R3

Router bgp 200

No synchronization

Auto-summary

!

!R1

Interface loopback 0

Ip address 172.16.0.1 255.255.255.0

!

Interface loopback 1

Ip address 172.16.1.1 255.255.255.0

!

Interface loopback 2

Ip address 172.16.2.1 255.255.255.0

!

Interface loopback 3

Ip address 172.16.3.1 255.255.255.0

!

Router bgp 100

Network 172.16.0.0

!Verification

!R2

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	15.0.0.1	0		0	100 i
*> 15.0.0.0	0.0.0.0	0		32768	i
*	15.0.0.1	0		0	100 i
*> 20.0.0.0	0.0.0.0	0		32768	i
*> 25.0.0.0	0.0.0.0	0		32768	i
* i	25.0.0.3	0	100	0	i
* i30.0.0.0	25.0.0.3	0	100	0	i
*> 172.16.0.0	15.0.0.1	0		0	100 i

R2#

Task 4:

Disable Summarization in all three routers, then configure R1 to make aggregate summarization to R2 & R3.

!R1

Router bgp 100

No auto-summary

Aggregate-address 172.16.0.0 255.255.252.0

Network 172.16.0.0 mask 255.255.255.0

Network 172.16.1.0 mask 255.255.255.0

Network 172.16.2.0 mask 255.255.255.0

Network 172.16.3.0 mask 255.255.255.0

!R2/R3

Router bgp 200

No auto-summary

!Verification:

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	15.0.0.1	0		0	100 i

```
*  15.0.0.0        15.0.0.1              0          0 100 i
*>                 0.0.0.0               0       32768 i
*> 20.0.0.0        0.0.0.0               0       32768 i
*> 25.0.0.0        0.0.0.0               0       32768 i
* i                25.0.0.3              0    100     0 i
*>i30.0.0.0        25.0.0.3              0    100     0 i
*> 172.16.0.0/24   15.0.0.1              0          0 100 i
*> 172.16.0.0/22   15.0.0.1              0          0 100 i
*> 172.16.1.0/24   15.0.0.1              0          0 100 i
*> 172.16.2.0/24   15.0.0.1              0          0 100 i
*> 172.16.3.0/24   15.0.0.1              0          0 100 i
R2#
```

Note: you can notice the summary route is advertised, but also the summary components are also advertised.

Task 5:

Enable Summary-only feature so that to allow R1 advertise only summary route and suppressing all component routes

!R1

Router bgp 100

Aggregate-address 172.16.0.0 255.255.252.0 summary-only

!Verification:

!R2

Show ip bgp

```
   Network          Next Hop            Metric LocPrf Weight Path
*> 10.0.0.0         15.0.0.1                 0             0 100 i
*  15.0.0.0         15.0.0.1                 0             0 100 i
*>                  0.0.0.0                  0         32768 i
*> 20.0.0.0         0.0.0.0                  0         32768 i
*> 25.0.0.0         0.0.0.0                  0         32768 i
* i                 25.0.0.3                 0    100      0 i
*>i30.0.0.0         25.0.0.3                 0    100      0 i
*> 172.16.0.0/22    15.0.0.1                 0             0 100 i
R2#
```

Now we can notice that all components routes are suppressed.

Task 6:

Disable summary-only feature, but suppress 172.16.0.0/24 network and allow all other summary components and the summary route to be advertised to R2

!

!R1

Access-list 1 permit 172.16.0.0 0.0.0.255

!

Route-map suppress permit 10

Match ip address 1

!

Router bgp 100

No aggregate-address 172.16.0.0 255.255.252.0 summary-only

Aggregate-address 172.16.0.0 255.255.252.0 suppress-map suppress

!

!R2

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	15.0.0.1	0		0	100 i
* 15.0.0.0	15.0.0.1	0		0	100 i
*>	0.0.0.0	0		32768	i
*> 20.0.0.0	0.0.0.0	0		32768	i
*> 25.0.0.0	0.0.0.0	0		32768	i
* i	25.0.0.3	0	100	0	i
*>i30.0.0.0	25.0.0.3	0	100	0	i
*> 172.16.0.0/22	15.0.0.1	0		0	100 i

Prepared By:Waleed Adlan-CCIE 41999-waleed_hashim@hotmail.com

*> 172.16.1.0/24 15.0.0.1 0 0 100 i

*> 172.16.2.0/24 15.0.0.1 0 0 100 i

*> 172.16.3.0/24 15.0.0.1 0 0 100 i

R2#

Note you can find the 172.16.1.0/24 network is missing.

Task 7:

Configure summary only feature in R1, and allow R1 to un-suppress 172.16.0.0

!

!R1

Access-list 1 permit 172.16.1.0 0.0.0.255

!

Route-map unsupress permit 10

Match ip address 1

!

Router bgp 100

Aggregate-address 172.16.0.0 255.255.252.0 summary-only

Neighbor 15.0.0.2 unsupress-map unsupress

Exit

!Verification:

!R2

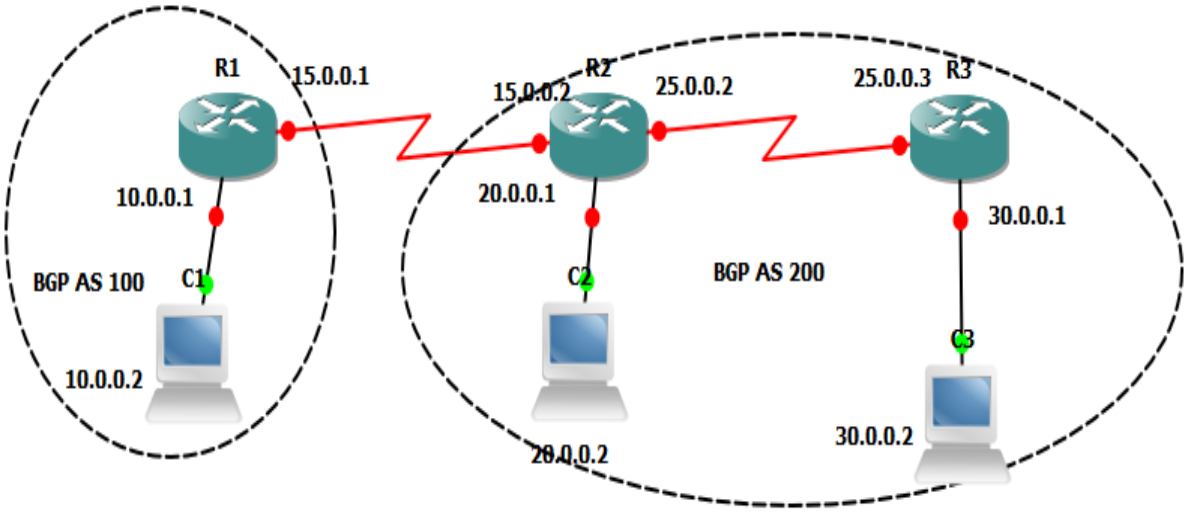
Show ip bgp

```
   Network          Next Hop            Metric LocPrf Weight Path
*> 10.0.0.0         15.0.0.1                 0             0 100 i
*  15.0.0.0         15.0.0.1                 0             0 100 i
*>                  0.0.0.0                  0         32768 i
*> 20.0.0.0         0.0.0.0                  0         32768 i
*> 25.0.0.0         0.0.0.0                  0         32768 i
* i                 25.0.0.3                 0    100      0 i
*>i30.0.0.0         25.0.0.3                 0    100      0 i
*> 172.16.0.0/24    15.0.0.1                 0             0 100 i
*> 172.16.0.0/22    15.0.0.1                 0             0 100 i
R2#
```

Lab 12

BGP Communities

Topology:



Task 1:

Connect the above network and assign IP addresses as shown in the diagram, and configure BGP as depicted in the figure.

!R1

Router bgp 100

Neighbor 15.0.0.2 remote-as 200

Network 10.0.0.0

Network 15.0.0.0

Prepared By:Waleed Adlan-CCIE 41999-waleed_hashim@hotmail.com

!R2

Router bgp 200

Neighbor 15.0.0.1 remote-as 100

Neighbor 25.0.0.3 remote-as 200

Network 20.0.0.0

Network 25.0.0.0

Network 15.0.0.0

!R3

Router bgp 200

Neighbor 25.0.0.2 remote-as 200

Network 30.0.0.0

Network 25.0.0.0

!Verification:

!R2

Show ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/ PfxRcd
15.0.0.1	4	100	4	3	0	0	0	00:01:23	2
25.0.0.3	4	200	2	2	0	0	0	00:00:28	0

Task 2:

Configure R1 to advertise its networks to R2 with community 100:100, and configure R3 not to accept routes with 100:100 community.

!R1/R2/R3

Ip bgp-community new-format

!

!R1

Route-map comm permit 10

Set community 100:100

!

Router bgp 100

Neighbor 15.0.0.2 route-map comm out

Neighbor 15.0.0.2 send-community

!R3

Ip community-list standard from_r1 permit 100:100

!

Route-map router1 deny 10

Match community from_r1

Route-map router1 permit 100

!

Router bgp 200

Neighbor 25.0.0.2 route-map router1 in

!R2

Router bgp 200

Neighbor 25.0.0.3 send-community

!Verification

!R2

Show ip bgp 10.0.0.0

BGP routing table entry for 10.0.0.0/8, version 7

Paths: (1 available, best #1, table Default-IP-Routing-Table)

Flag: 0x880

Advertised to update-groups:

1

100

15.0.0.1 from 15.0.0.1 (15.0.0.1)

Origin IGP, metric 0, localpref 100, valid, external, best

Community: 100:100

!R3

Show ip bgp

*>i15.0.0.0 25.0.0.2 0 100 0 i

*>i20.0.0.0 25.0.0.2 0 100 0 i

* i25.0.0.0 25.0.0.2 0 100 0 i

*> 0.0.0.0 0 32768 i

*> 30.0.0.0 0.0.0.0 0 32768 i

You can notice that 10.0.0.0 network get filtered, according to the route-map

Task 3:

Configure R3 to advertise network 30.0.0.0 with no-advertise community, and check R1 shouldn't be having the 30.0.0.0 network in its BGP table

!R3

Access-list 3 permit 30.0.0.0 0.255.255.255

!

Route-map noadvertise permit 10

Match ip address 3

Set community no-advertise

Route-map noadvertise permit 100

!

Router bgp 200

Neighbor 25.0.0.2 route-map noadvertise out

Neighbor 25.0.0.2 send-community

!Verification:

!R2

Show ip bgp 30.0.0.0

BGP routing table entry for 30.0.0.0/8, version 8

Paths: (1 available, best #1, table Default-IP-Routing-Table, not advertised to any peer)

Flag: 0x880

Not advertised to any peer

Local

25.0.0.3 from 25.0.0.3 (30.0.0.1)

Origin IGP, metric 0, localpref 100, valid, internal, best

Community: no-advertise

!R1

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	0.0.0.0	0		32768	i
* 15.0.0.0	15.0.0.2	0		0	200 i
*>	0.0.0.0	0		32768	i
*> 20.0.0.0	15.0.0.2	0		0	200 i
*> 25.0.0.0	15.0.0.2	0		0	200 i

You can notice that R1 is not having network 30.0.0.0 in its BGP Table

Task 4:

Modify R3 to advertise network 30.0.0.0 with no-export community, and check R1 shouldn't be having the 30.0.0.0 network in its BGP table, but if we were having an IBGP neighbor, we can advertise 30.0.0.0 to it.

!R3

Route-map noadvertise permit 10

Match ip address 3

Set community none

Set community no-export

!Verification:

!R2

Show ip bgp 30.0.0.0

BGP routing table entry for 30.0.0.0/8, version 11

Paths: (1 available, best #1, table Default-IP-Routing-Table, not advertised to EBGP peer)

Flag: 0x880

Advertised to update-groups:

2

Local

25.0.0.3 from 25.0.0.3 (30.0.0.1)

Origin IGP, metric 0, localpref 100, valid, internal, best

Community: no-export

!R1

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	0.0.0.0	0		32768	i
* 15.0.0.0	15.0.0.2	0		0	200 i
*>	0.0.0.0	0		32768	i
*> 20.0.0.0	15.0.0.2	0		0	200 i
*> 25.0.0.0	15.0.0.2	0		0	200 i

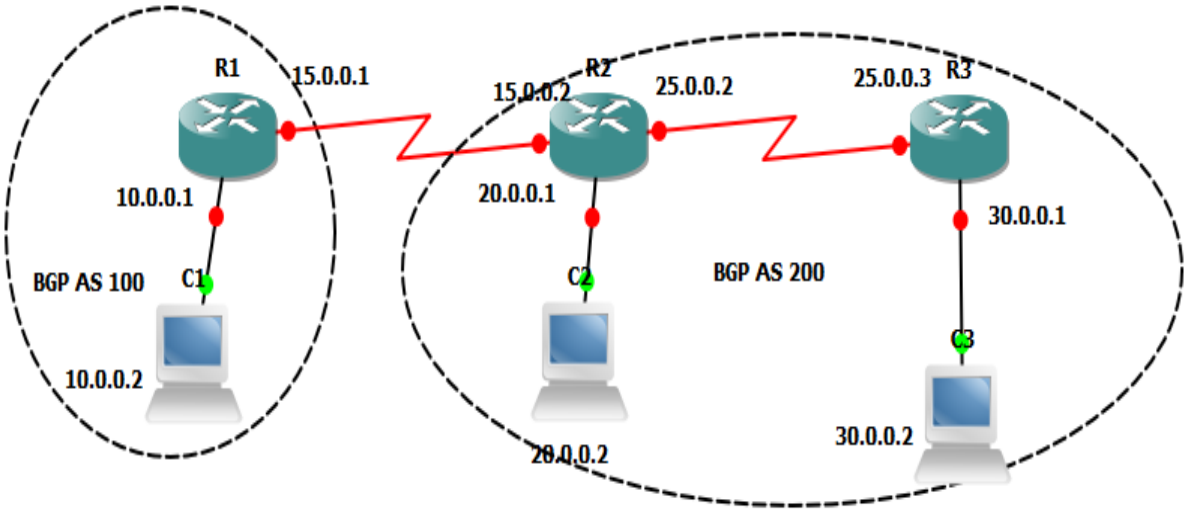
R1#

R1 again is not having 30.0.0.0 in its BGP table, but this time because of using no-export community.

Lab 13

BGP Filtering Using ACL/Prefix-List

Topology:



Task 1:

Connect the above network and assign IP addresses and configure BGP as shown in the diagram.

!R1

Router bgp 100

Neighbor 15.0.0.2 remote-as 200

Network 10.0.0.0

Network 15.0.0.0

Prepared By:Waleed Adlan-CCIE 41999-waleed_hashim@hotmail.com

!R2

Router bgp 200

Neighbor 15.0.0.1 remote-as 100

Neighbor 25.0.0.3 remote-as 200

Network 20.0.0.0

Network 15.0.0.0

Network 25.0.0.0

!R3

Router bgp 200

Neighbor 25.0.0.2 remote-as 200

Network 30.0.0.0

Network 25.0.0.0

!Verification:

show ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
15.0.0.1	4	100	5	6	6	0	0	00:02:03	2
25.0.0.3	4	200	4	5	6	0	0	00:00:11	2

Task 2

Configure R2 not to receive 30.0.0.0 network from R3 using ACL & Distribute-list, and to configure R3 not to receive 20.0.0.0 network using IP Prefix-list

!R2

Access-list 2 deny 30.0.0.0 0.255.255.255

Access-list 2 permit any

!

Router bgp 200

Neighbor 25.0.0.3 distribute-list 2 in

!

!R3

Ip prefix-list fromr2 permit 20.0.0.0/8

!

Route-map fromr2 deny 10

Match ip address prefix fromr2

Route-map fromr2 permit 100

!

Router bgp 200

Neighbor 25.0.0.2 route-map fromr2 in

!Verification:

!R2

Show ip bgp

```
Network          Next Hop            Metric LocPrf Weight Path
*> 10.0.0.0      15.0.0.1                 0             0 100 i
*  15.0.0.0      15.0.0.1                 0             0 100 i
*>               0.0.0.0                  0         32768 i
*> 20.0.0.0      0.0.0.0                  0         32768 i
* i25.0.0.0      25.0.0.3                 0    100      0 i
*>               0.0.0.0                  0         32768 i
R2#
```

You can notice that network 30.0.0.0 is missing due to Distribute list filtering

!R3

Show ip bgp

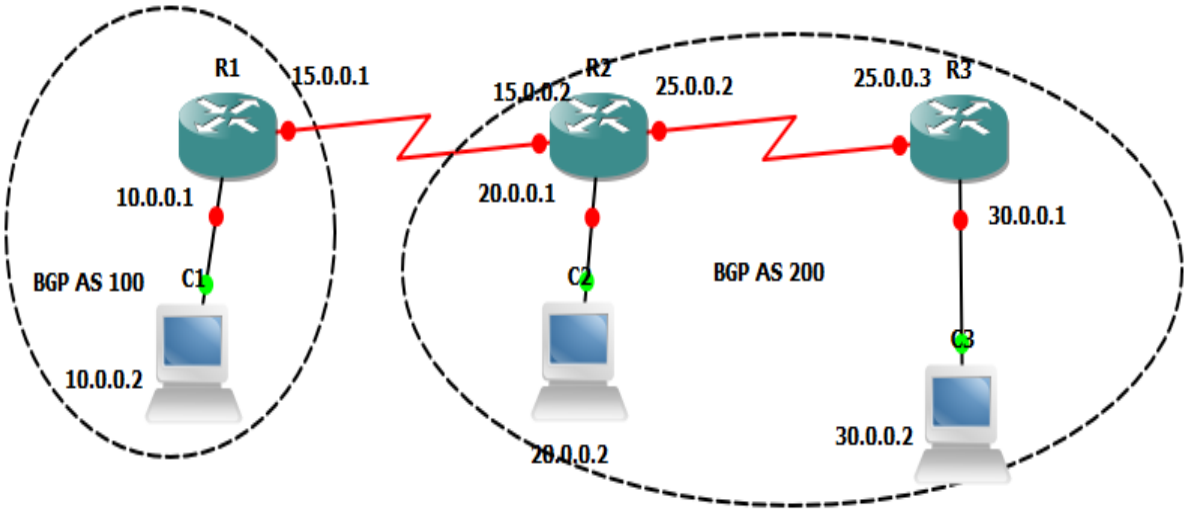
```
  Network          Next Hop            Metric LocPrf Weight Path
*>i10.0.0.0      15.0.0.1                 0    100      0 100 i
*>i15.0.0.0      25.0.0.2                 0    100      0 i
* i25.0.0.0      25.0.0.2                 0    100      0 i
*>               0.0.0.0                  0         32768 i
*> 30.0.0.0      0.0.0.0                  0         32768 i
R3#
```

You can also notice that network 20.0.0.0 is missing due to prefix-list filtering

Lab 14

BGP Conditional Advertisement

Topology:



Task 1:

Connect the network as shown in the figure and assign IP addresses and configure BGP in All three routers

!R1

Router bgp 100

Neighbor 15.0.0.2 remote-as 200

Network 10.0.0.0

Network 15.0.0.0

Prepared By:Waleed Adlan-CCIE 41999-waleed_hashim@hotmail.com

!R2

Router bgp 200

Neighbor 15.0.0.1 remote-as 100

Neighbor 25.0.0.3 remote-as 200

Network 20.0.0.0

Network 15.0.0.0

Network 25.0.0.0

!R3

Router bgp 200

Neighbor 25.0.0.2 remote-as 200

Network 30.0.0.0

Network 25.0.0.0

! Verification:

!R2

Show ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/ PfxRcd
15.0.0.1	4	100	6	7	6	0	0	00:03:52	2

25.0.0.3 4 200 6 7 6 0 0 00:03:40 2

Task 2:

Configure R1 not to advertise network 10.0.0.0 until the existence of network 50.0.0.0 in the BGP table

!R1

Access-list 1 permit 10.0.0.0 0.255.255.255

Access-list 2 permit 50.0.0.0 0.255.255.255

!

Route-map advmap permit 10

Match ip address 1

!

Route-map exist permit 10

Match ip address 2

!

Router bgp 100

Neighbor 15.0.0.2 advertise-map advmap exist-map exist

!**Verification:**

!R2

Show ip bgp

Network Next Hop Metric LocPrf Weight Path

* 15.0.0.0 15.0.0.1 0 0 100 i

*> 0.0.0.0 0 32768 i

*> 20.0.0.0 0.0.0.0 0 32768 i

* i25.0.0.0 25.0.0.3 0 100 0 i

*> 0.0.0.0 0 32768 i

*>i30.0.0.0 25.0.0.3 0 100 0 i

R2#

Note you can notice that R2 is not receiving network 10.0.0.0, because network 50.0.0.0 is not in the bgp table of R1

!R1

Ip route 50.0.0.0 255.0.0.0 null0

!

Router bgp 100

Network 50.0.0.0

!R2

Show ip bgp

Network Next Hop Metric LocPrf Weight Path

*> 10.0.0.0 15.0.0.1 0 0 100 i

* 15.0.0.0 15.0.0.1 0 0 100 i

*> 0.0.0.0 0 32768 i

*> 20.0.0.0 0.0.0.0 0 32768 i

* i25.0.0.0 25.0.0.3 0 100 0 i

*> 0.0.0.0 0 32768 i

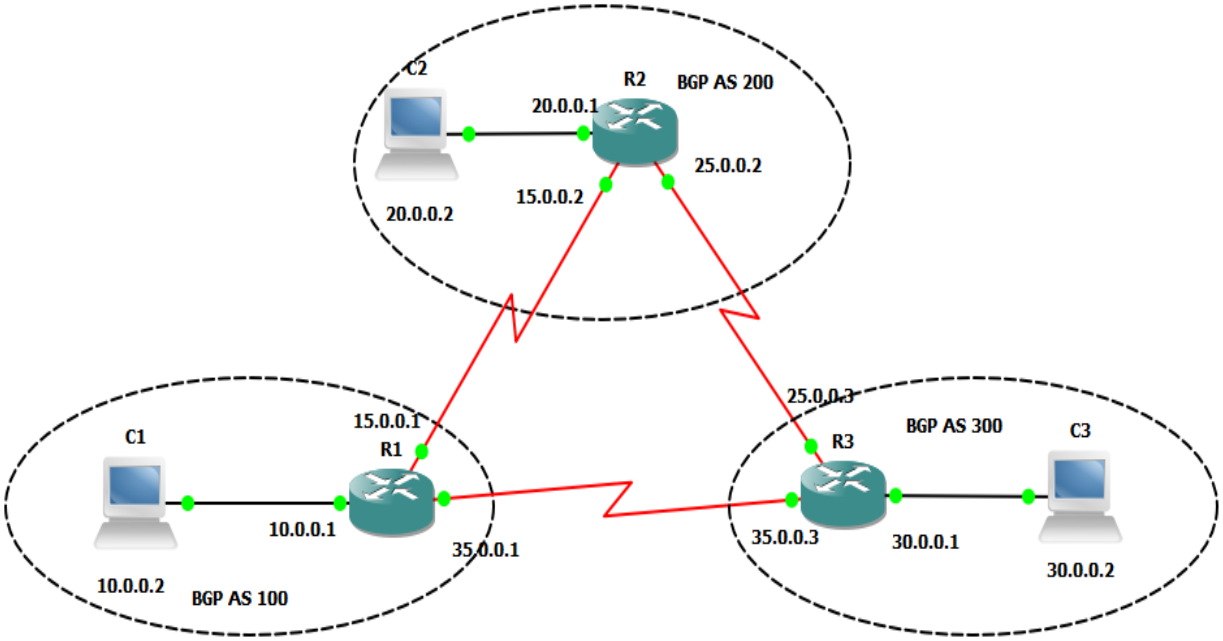
*>i30.0.0.0 25.0.0.3 0 100 0 i

*> 50.0.0.0 15.0.0.1 0 0 100 i

Lab 15

BGP Regular Expression/Default-Routing

Topology:



Task 1:

Connect the network as shown in the diagram, and assign IP addresses and configure BGP as depicted in the figure.

!R1

Router bgp 100

Neighbor 15.0.0.2 remote-as 200

Neighbor 35.0.0.3 remote-as 300

Network 10.0.0.0

Network 15.0.0.0

Prepared By:Waleed Adlan-CCIE 41999-waleed_hashim@hotmail.com

Network 35.0.0.0

!R2

Router bgp 200

Neighbor 25.0.0.3 remote-as 300

Neighbor 15.0.0.1 remote-as 100

Network 20.0.0.0

Network 15.0.0.0

Network 25.0.0.0

!R3

Router bgp 300

Neighbor 35.0.0.1 remote-as 100

Neighbor 25.0.0.2 remote-as 200

Network 30.0.0.0

Network 35.0.0.0

Network 25.0.0.0

!Verification:

!R2

Show ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
15.0.0.1	4	100	6	5	6	0	0	00:00:14	5
25.0.0.3	4	300	6	5	6	0	0	00:01:34	4

!R1

Show ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
15.0.0.2	4	200	36	36	8	0	0	00:01:01	5
35.0.0.3	4	300	6	6	8	0	0	00:03:20	5

Task 2:

Use BGP regular expression to make R1 having local preference of 200 for networks originated from AS 200

!R1

Ip as-path access-list 1 Permit _200$

!

Route-map aspath permit 10

Match as-path 1

Set local-preference 200

Route-map aspath permit 100

!

Router bgp 100

Neighbor 15.0.0.2 route-map aspath in

!Verification:

!R1

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	0.0.0.0	0		32768	i
* 15.0.0.0	15.0.0.2	0	200	0	200 i
*	35.0.0.3			0	300 200 i
*>	0.0.0.0	0		32768	i
*> 20.0.0.0	15.0.0.2	0	200	0	200 i
*	35.0.0.3			0	300 200 i
*> 25.0.0.0	15.0.0.2	0	200	0	200 i
*	35.0.0.3	0		0	300 i
* 30.0.0.0	15.0.0.2			0	200 300 i
*>	35.0.0.3	0		0	300 i
* 35.0.0.0	15.0.0.2			0	200 300 i
*	35.0.0.3	0		0	300 i

*> 0.0.0.0 0 32768 i

R1#

Note: You can notice that all networks that were originated from AS 200 is having local preference of 200

Task 3:

In R2, use BGP Regular expression to modify the metric to 50 for prefixes received from direct adjacent neighbor of AS 300.

!R2

Ip as-path access-list 1 Permit ^300_

!

Route-map aspath permit 10

Match as-path 1

Set metric 50

!

Route-map aspath permit 100

!

Router bgp 200

Neighbor 15.0.0.1 route-map aspath in

Neighbor 25.0.0.3 route-map aspath in

!Verification:

!R2

Show ip bgp

```
   Network          Next Hop            Metric LocPrf Weight Path
*> 10.0.0.0         15.0.0.1                 0             0 100 i
*                   25.0.0.3                50             0 300 100 i
*  15.0.0.0         15.0.0.1                 0             0 100 i
*>                  0.0.0.0                  0         32768 i
*> 20.0.0.0         0.0.0.0                  0         32768 i
*  25.0.0.0         25.0.0.3                50             0 300 i
*>                  0.0.0.0                  0         32768 i
*  30.0.0.0         15.0.0.1                               0 100 300 i
*>                  25.0.0.3                50             0 300 i
*  35.0.0.0         15.0.0.1                 0             0 100 i
*>                  25.0.0.3                50             0 300 i
R2#
```

Note: We can notice that all prefixes received from Adjacent neighbor of 300 has got a metric of 50.

Task 4:

Configure R1 to advertise a default route to R2&R3

!R1

Router bgp 100

Neighbor 15.0.0.2 default-originate

Neighbor 35.0.0.3 default-originate

!Verification:

!R2

Show ip bgp

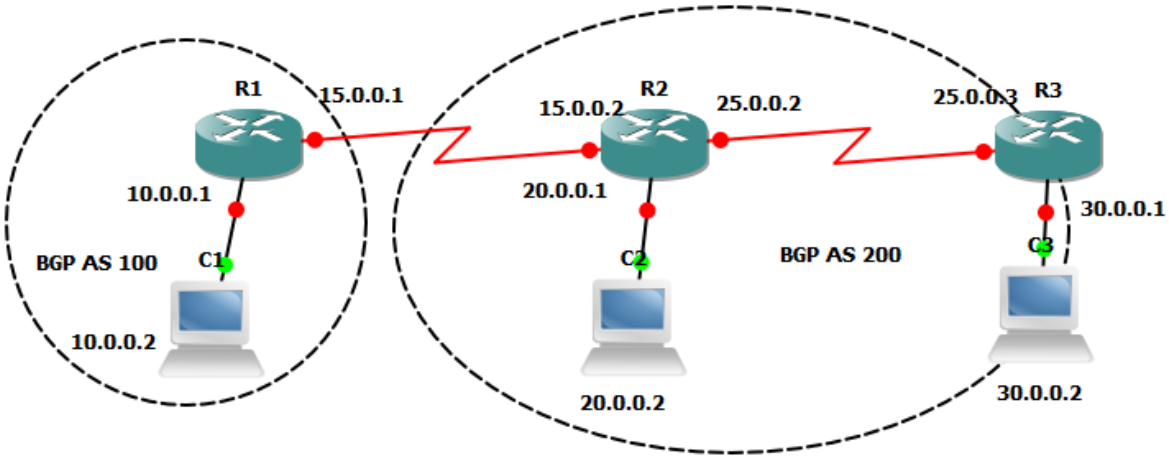
Network	Next Hop	Metric	LocPrf	Weight	Path
* 0.0.0.0	25.0.0.3	50		0	300 100 i
*>	15.0.0.1	0		0	100 i
*> 10.0.0.0	15.0.0.1	0		0	100 i
*	25.0.0.3	50		0	300 100 i
* 15.0.0.0	15.0.0.1	0		0	100 i
*>	0.0.0.0	0		32768	i
*> 20.0.0.0	0.0.0.0	0		32768	i
* 25.0.0.0	25.0.0.3	50		0	300 i
*>	0.0.0.0	0		32768	i
* 30.0.0.0	15.0.0.1			0	100 300 i
*>	25.0.0.3	50		0	300 i

```
* 35.0.0.0        15.0.0.1               0          0 100 i
*>               25.0.0.3               50         0 300 i
R2#
```

Lab 16

BGP Local AS/Replace AS/DUAL AS

Topology:



Task 1:

Connect the network as shown in the figure, assign IP addresses and configure BGP as depicted in the diagram. Assume AS 100 is the new AS number for router 1 instead of 300. However R2 is still considering R1 is in AS 300, Resolve the issue by applying Local-as feature with and without no-prepend feature.

!R1

Router bgp 100

Neighbor 15.0.0.2 remote-as 200

Neighbor 15.0.0.2 local-as 300 no-prepend

Network 10.0.0.0

Network 15.0.0.0

Prepared By:Waleed Adlan-CCIE 41999-waleed_hashim@hotmail.com

!R2

Router bgp 200

Neighbor 15.0.0.1 remote-as 300

Neighbor 25.0.0.3 remote-as 200

Network 20.0.0.0

Network 15.0.0.0

Network 25.0.0.0

!R3

Router bgp 200

Neighbor 25.0.0.2 remote-as 200

Network 30.0.0.0

Network 25.0.0.0

!Verification:

Without no-prepend feature

!R1

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	0.0.0.0	0		32768	i
* 15.0.0.0	15.0.0.2	0		0	300 200 i
*>	0.0.0.0	0		32768	i

*> 20.0.0.0 15.0.0.2 0 0 300 200 i

*> 25.0.0.0 15.0.0.2 0 0 300 200 i

R1#

!R2

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	15.0.0.1	0		0	300 100 i
* 15.0.0.0	15.0.0.1	0		0	300 100 i
*>	0.0.0.0	0		32768	i
*> 20.0.0.0	0.0.0.0	0		32768	i
* i25.0.0.0	25.0.0.3	0	100	0	i
*>	0.0.0.0	0		32768	i
*>i30.0.0.0	25.0.0.3	0	100	0	i

R2#

Note: without no-prepend feature, we can notice that the old AS number, is shown in R1 & R2 as path

After applying the no-prepend feature in R1, We can see the difference in R1 only, but R2 remains the same.

!R1

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	0.0.0.0	0		32768	i
* 15.0.0.0	15.0.0.2	0		0	200 i
*>	0.0.0.0	0		32768	i
*> 20.0.0.0	15.0.0.2	0		0	200 i
*> 25.0.0.0	15.0.0.2	0		0	200 i
*> 30.0.0.0	15.0.0.2			0	200 i

R1#

Note the old as number is disappeared in the AS path in R1, while it is still shown in R2

!R2

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	15.0.0.1	0		0	300 100 i
* 15.0.0.0	15.0.0.1	0		0	300 100 i
*>	0.0.0.0	0		32768	i
*> 20.0.0.0	0.0.0.0	0		32768	i
* i25.0.0.0	25.0.0.3	0	100	0	i

*> 0.0.0.0 0 32768 i

*>i30.0.0.0 25.0.0.3 0 100 0 i

R2#

Task 2:

Configure R1 to totally hide the new as 100 when advertising to R2, by using the feature replace-as

!R1

Router bgp 100

Neighbor 15.0.0.2 local-as 300 no-prepend replace-as

!Verification

!R2

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	15.0.0.1	0		0	300 i
* 15.0.0.0	15.0.0.1	0		0	300 i
*>	0.0.0.0	0		32768	i
*> 20.0.0.0	0.0.0.0	0		32768	i
* i25.0.0.0	25.0.0.3	0	100	0	i
*>	0.0.0.0	0		32768	i
*>i30.0.0.0	25.0.0.3	0	100	0	i

R2#

Note: We can notice that in R2, the new as of R1 100 is totally get replaced by the old one 300

Task 3:

Configure R1 to establish a neighbor with R2, if R2 used either 100 or 300 as a remote-as in its configuration, by using dual-as feature in R1.

!

!R1

Router bgp 100

Neighbor 15.0.0.2 local-as 300 no-prepend replace-as dual-as

!Verification

!R2

Show ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/ PfxRcd
15.0.0.1	4	300	36	38	12	0	0	00:00:17	2
25.0.0.3	4	200	23	29	12	0	0	00:20:20	2

R2#

!R2

Router bgp 200

No neighbor 15.0.0.1 remote-as 300

Neighbor 15.0.0.1 remote-as 100

!R2

Show ip bgp summary

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
15.0.0.1	4	100	4	5	13	0	0	00:00:08	2
25.0.0.3	4	200	24	32	14	0	0	00:21:21	2

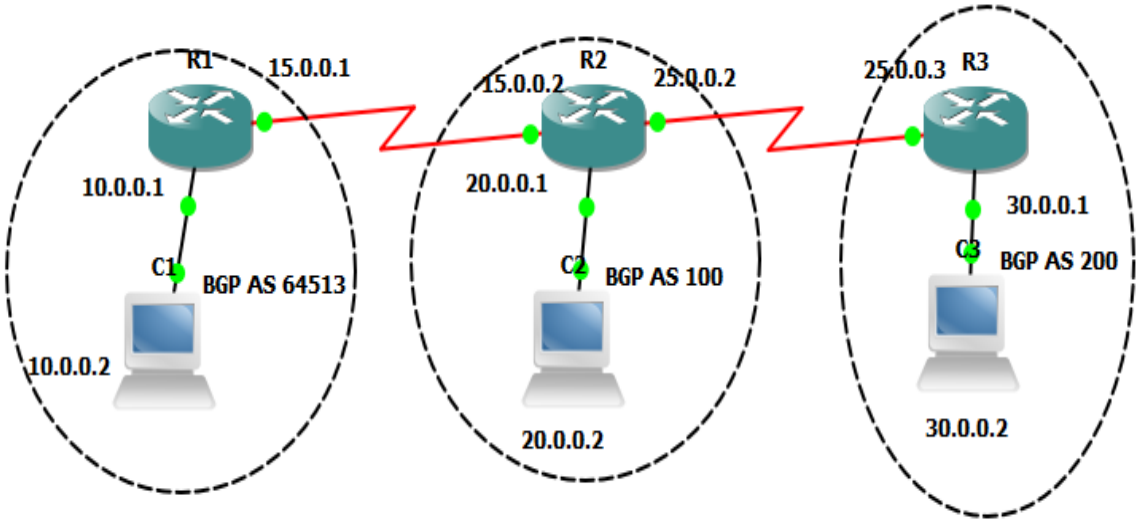
R2#

Note: the BGP neighbor get established between R1 & R2 in both cases. This is the main benefit of Dual-as feature.

Lab 17

BGP Remove-Private-AS/Allowas in

Topology:



Task 1:

Connect the network as shown in the diagram, and assign IP addresses/configure BGP as depicted in the diagram.

!R1

Router bgp 64513

Neighbor 15.0.0.2 remote-as 100

Network 10.0.0.0

Network 15.0.0.0

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!R2

Router bgp 100

Neighbor 15.0.0.1 remote-as 64513

Neighbor 25.0.0.3 remote-as 200

Network 20.0.0.0

Network 15.0.0.0

Network 25.0.0.0

!R3

Router bgp 200

Neighbor 25.0.0.2 remote-as 100

Network 30.0.0.0

Network 25.0.0.0

!Verification:

!R2

Show ip bgp summary

Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd

15.0.0.1 4 64513 4 5 5 0 0 00:01:24 2

25.0.0.3 4 200 7 8 5 0 0 00:01:00 2

R2#

!R3

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	25.0.0.2			0	100 64513 i
*> 15.0.0.0	25.0.0.2	0		0	100 i
*> 20.0.0.0	25.0.0.2	0		0	100 i
* 25.0.0.0	25.0.0.2	0		0	100 i
*>	0.0.0.0	0		32768	i
*> 30.0.0.0	0.0.0.0	0		32768	i

R3#

Task 2:

Configure R2 to remove private as numbers when advertising to R3

!R2

Router bgp 100

Neighbor 25.0.0.3 remove-private-as

!Verification

!R3

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0	25.0.0.2			0	100 i
*> 15.0.0.0	25.0.0.2	0		0	100 i
*> 20.0.0.0	25.0.0.2	0		0	100 i
* 25.0.0.0	25.0.0.2	0		0	100 i
*>	0.0.0.0	0		32768	i
*> 30.0.0.0	0.0.0.0	0		32768	i

R3#

Note:R2 is remove private as system numbers when advertising to R3.

Task 3:

Configure R1 to be using AS 200, and modify R1 & R2 configuration accordingly

!R1

No router bgp 64513

Router bgp 200

Neighbor 15.0.0.2 remote-as 100

!R2

Router bgp 100

Neighbor 15.0.0.1 remote-as 200

!Verification:

!R1

Show ip bgp summary

Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd

15.0.0.2 4 100 7 5 5 0 0 00:00:13 3

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
r> 15.0.0.0	15.0.0.2	0		0	100 i
*> 20.0.0.0	15.0.0.2	0		0	100 i
*> 25.0.0.0	15.0.0.2	0		0	100 i

R1#

Note that BGP neighbor is established, however network 30.0.0.0 is not shown in the bgp table of R1, because it is originated from R3 which does have the same AS number of R1.

Task 4:

Configure R1 to allow receiving networks from originated or transiting AS that have the same number of R1, by using allowas-in feature

!R1

Router bgp 200

Neighbor 15.0.0.2 allowas in

!Verification:

Show ip bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
r> 15.0.0.0	15.0.0.2	0		0	100 i
*> 20.0.0.0	15.0.0.2	0		0	100 i
*> 25.0.0.0	15.0.0.2	0		0	100 i
*> 30.0.0.0	15.0.0.2			0	100 200 i

R1#

Note: Now we can notice that R1 received network 30.0.0.0.