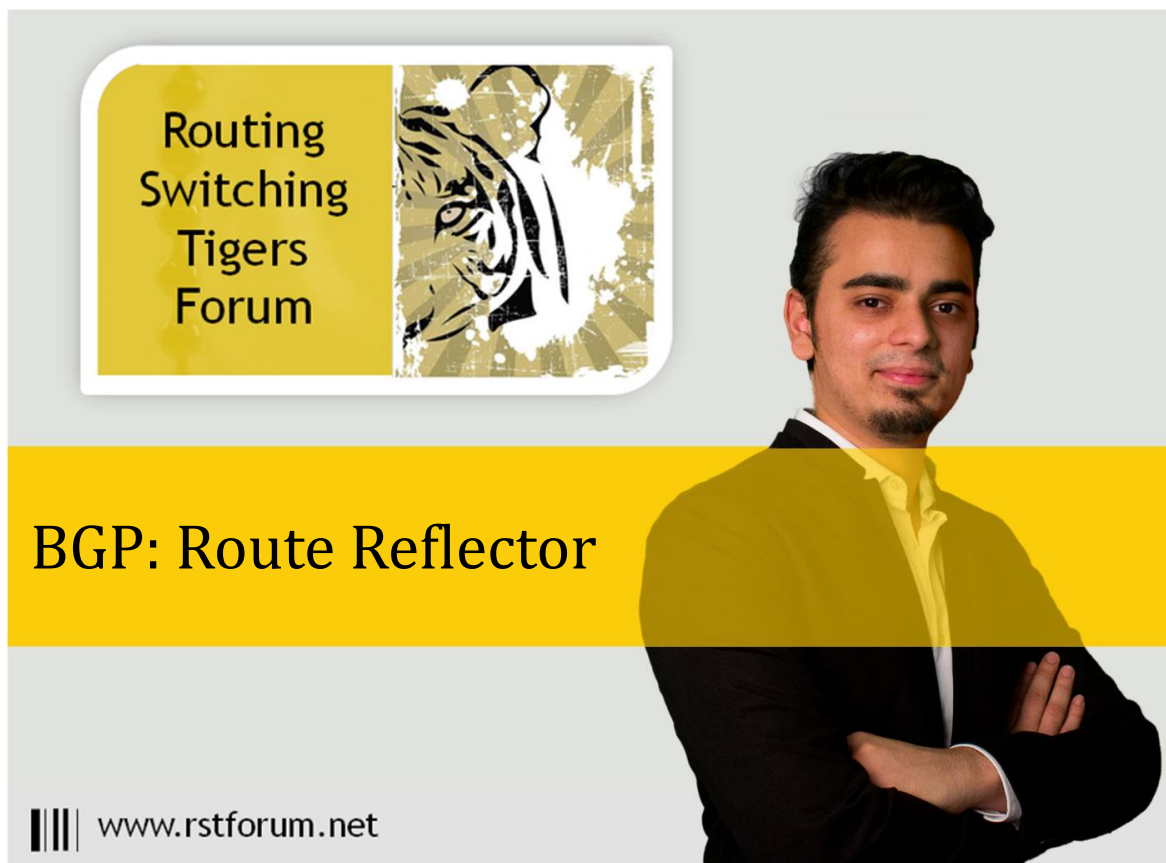


LAB8: BGP – IPv4

Disclaimer

This Configuration Guide is designed to assist members to enhance their skills in respective technology area. While every effort has been made to ensure that all material is as complete and accurate as possible, the enclosed material is presented on an “as is” basis. Neither the authors nor Forum assume any liability or responsibility to any person or entity with respect to loss or damages incurred from the information contained in this guide. This Lab Guide was developed by RSTForum. Any similarities between material presented in this configuration guide and any other material is completely coincidental.



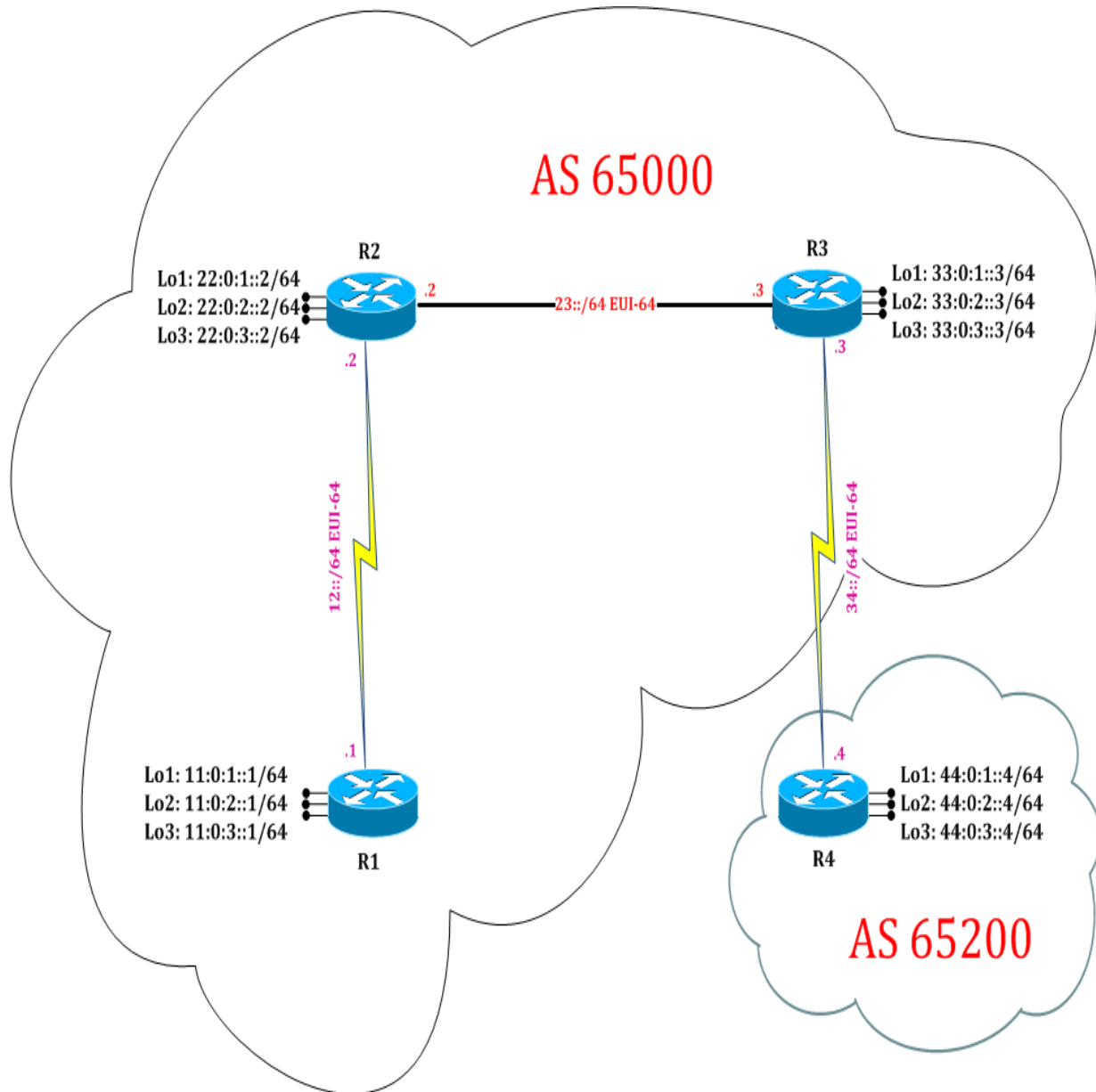
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BGP: Route Reflector

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LAB 8: Diagram

Note: This Lab was developed on Cisco IOS Version 15.2(4) M1 ADVENTERPRISEK9-M.



LAB 8: Configure BGP Route Reflector

Task 1: Configure IPv4 BGP Process for Autonomous

Step 1 In the configuration mode of router configure IPv4 BGP Process by following command:

R1:

```
router bgp 65000
neighbor 22.0.1.2 remote-as 65000
neighbor 22.0.1.2 update-source Loopback1
neighbor 22.0.1.2 soft-reconfiguration inbound
exit
```

R2:

```
router bgp 65000
neighbor 11.0.1.1 remote-as 65000
neighbor 11.0.1.1 update-source Loopback1
neighbor 11.0.1.1 soft-reconfiguration inbound
neighbor 33.0.1.3 remote-as 65000
neighbor 33.0.1.3 update-source Loopback1
neighbor 33.0.1.3 soft-reconfiguration inbound
exit
```

R3:

```
router bgp 65000
neighbor 22.0.1.2 remote-as 65000
neighbor 22.0.1.2 update-source loopback 1
neighbor 22.0.1.2 soft-reconfiguration inbound
neighbor 44.0.1.4 remote-as 65200
neighbor 44.0.1.4 ebgp-multihop 5
neighbor 44.0.1.4 update-source loopback 1
neighbor 44.0.1.4 soft-reconfiguration inbound
exit
```

R4:

```
router bgp 65200
neighbor 33.0.1.3 remote-as 65000
neighbor 33.0.1.3 ebgp-multihop 5
neighbor 33.0.1.3 update-source loopback 1
neighbor 33.0.1.3 soft-reconfiguration inbound
exit
```

Step 2 In the configuration mode of router configure IPv4 OSPF Process by following command:

```
R1:  
router ospf 1  
network 0.0.0.0 0.0.0.0 area 0  
exit
```

```
R2:  
router ospf 1  
network 0.0.0.0 0.0.0.0 area 0  
exit
```

```
R3:  
router ospf 1  
network 0.0.0.0 0.0.0.0 area 0  
exit
```

```
R4:  
router ospf 1  
network 0.0.0.0 0.0.0.0 area 0  
exit
```

Step 3 Announce the network in BGP Process

```
R1:  
router bgp 65000  
address-family ipv4  
network 11.0.1.0 mask 255.255.255.0  
network 11.0.2.0 mask 255.255.255.0  
network 11.0.3.0 mask 255.255.255.0  
exit
```

```
R2:  
router bgp 65000  
address-family ipv4  
network 22.0.1.0 mask 255.255.255.0  
network 22.0.2.0 mask 255.255.255.0  
network 22.0.3.0 mask 255.255.255.0  
exit
```

```
R3:  
router bgp 65000  
address-family ipv4  
network 33.0.1.0 mask 255.255.255.0  
network 33.0.2.0 mask 255.255.255.0  
network 33.0.3.0 mask 255.255.255.0  
exit
```

```
R4:
router bgp 65200
address-family ipv4
network 44.0.1.0 mask 255.255.255.0
network 44.0.2.0 mask 255.255.255.0
network 44.0.3.0 mask 255.255.255.0
exit
```

Step 4 Verify IPv4 BGP routes by following command:

```
R1#show ip bgp
BGP table version is 7, local router ID is 11.0.3.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
```

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 11.0.1.0/24	0.0.0.0	0		32768	i
*> 11.0.2.0/24	0.0.0.0	0		32768	i
*> 11.0.3.0/24	0.0.0.0	0		32768	i
*>i 22.0.1.0/24	22.0.1.2	0	100	0	i
*>i 22.0.2.0/24	22.0.1.2	0	100	0	i
*>i 22.0.3.0/24	22.0.1.2	0	100	0	i

(Split Horizon doesn't allow R2 to forward R3 BGP Routes to R1, because rule is Routes received from one IBGP neighbor is not forwarded to other IBGP neighbor. Hence R1 doesn't received R3 & R4 routes.)

```
R2#show ip bgp
```

```
BGP table version is 13, local router ID is 22.0.3.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
```

Network	Next Hop	Metric	LocPrf	Weight	Path
*>i 11.0.1.0/24	11.0.1.1	0	100	0	i
*>i 11.0.2.0/24	11.0.1.1	0	100	0	i
*>i 11.0.3.0/24	11.0.1.1	0	100	0	i
*> 22.0.1.0/24	0.0.0.0	0		32768	i
*> 22.0.2.0/24	0.0.0.0	0		32768	i
*> 22.0.3.0/24	0.0.0.0	0		32768	i
*>i 33.0.1.0/24	33.0.1.3	0	100	0	i
*>i 33.0.2.0/24	33.0.1.3	0	100	0	i

```

*>i 33.0.3.0/24 33.0.1.3 0 100 0 i
*>i 44.0.1.0/24 44.0.1.4 0 100 0 65200 i
*>i 44.0.2.0/24 44.0.1.4 0 100 0 65200 i
*>i 44.0.3.0/24 44.0.1.4 0 100 0 65200 i

```

R3#show ip bgp

BGP table version is 10, local router ID is 33.0.3.3

Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
x best-external, a additional-path, c RIB-compressed,

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

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

Network	Next Hop	Metric	LocPrf	Weight	Path
*>i 22.0.1.0/24	22.0.1.2	0	100	0	i
*>i 22.0.2.0/24	22.0.1.2	0	100	0	i
*>i 22.0.3.0/24	22.0.1.2	0	100	0	i
*> 33.0.1.0/24	0.0.0.0	0		32768	i
*> 33.0.2.0/24	0.0.0.0	0		32768	i
*> 33.0.3.0/24	0.0.0.0	0		32768	i
*> 44.0.1.0/24	44.0.1.4	0		0	65200 i
*> 44.0.2.0/24	44.0.1.4	0		0	65200 i
*> 44.0.3.0/24	44.0.1.4	0		0	65200 i

(Split Horizon doesn't allow R2 to forward R1 BGP Routes to R3, because rule is Routes received from one IBGP neighbor is not forwarded to other IBGP neighbor. Hence R3 doesn't received R1 routes.)

R4#show ip bgp

BGP table version is 10, local router ID is 44.0.3.4

Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
x best-external, a additional-path, c RIB-compressed,

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

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

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 22.0.1.0/24	33.0.1.3		0		65000 i
*> 22.0.2.0/24	33.0.1.3		0		65000 i
*> 22.0.3.0/24	33.0.1.3		0		65000 i
*> 33.0.1.0/24	33.0.1.3	0	0		65000 i
*> 33.0.2.0/24	33.0.1.3	0	0		65000 i
*> 33.0.3.0/24	33.0.1.3	0	0		65000 i
*> 44.0.1.0/24	0.0.0.0	0		32768	i
*> 44.0.2.0/24	0.0.0.0	0		32768	i
*> 44.0.3.0/24	0.0.0.0	0		32768	i

Task 2: Configure BGP Route Reflector

Step 1 Configure BGP Route Reflector

```
R2:
router bgp 65000
neighbor 11.0.1.1 remote-as 65000
address-family ipv4
neighbor 11.0.1.1 route-reflector-client
exit
neighbor 33.0.1.3 remote-as 65000
exit
```

Step 2 Verify IPv4 BGP routes by following command:

```
R1#show ip bgp
```

BGP table version is 19, local router ID is 11.0.3.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,

r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
x best-external, a additional-path, c RIB-compressed,

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

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

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 11.0.1.0/24	0.0.0.0	0			32768 i
*> 11.0.2.0/24	0.0.0.0	0			32768 i
*> 11.0.3.0/24	0.0.0.0	0			32768 i
*>i 22.0.1.0/24	22.0.1.2	0	100	0	i
*>i 22.0.2.0/24	22.0.1.2	0	100	0	i
*>i 22.0.3.0/24	22.0.1.2	0	100	0	i
*>i 33.0.1.0/24	33.0.1.3	0	100	0	i
*>i 33.0.2.0/24	33.0.1.3	0	100	0	i
*>i 33.0.3.0/24	33.0.1.3	0	100	0	i
*>i 44.0.1.0/24	44.0.1.4	0	100	0	65200 i
*>i 44.0.2.0/24	44.0.1.4	0	100	0	65200 i
*>i 44.0.3.0/24	44.0.1.4	0	100	0	65200 i

(Using Route Reflector, R1 router is configured as route reflector client and R3 router as route reflector non-client. Client to Non-client BGP routes forwarding is allowed and therefore R1 now receives BGP routes from R3 as well as R4 along with R2. Therefore now all BGP routes are seen on R1 router.)

R2#show ip bgp

BGP table version is 19, local router ID is 22.0.3.2

Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
x best-external, a additional-path, c RIB-compressed,

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

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

Network	Next Hop	Metric	LocPrf	Weight	Path
*>i 11.0.1.0/24	11.0.1.1	0	100	0	i
*>i 11.0.2.0/24	11.0.1.1	0	100	0	i
*>i 11.0.3.0/24	11.0.1.1	0	100	0	i
*> 22.0.1.0/24	0.0.0.0	0		32768	i
*> 22.0.2.0/24	0.0.0.0	0		32768	i
*> 22.0.3.0/24	0.0.0.0	0		32768	i
*>i 33.0.1.0/24	33.0.1.3	0	100	0	i
*>i 33.0.2.0/24	33.0.1.3	0	100	0	i
*>i 33.0.3.0/24	33.0.1.3	0	100	0	i
*>i 44.0.1.0/24	44.0.1.4	0	100	0	65200 i
*>i 44.0.2.0/24	44.0.1.4	0	100	0	65200 i
*>i 44.0.3.0/24	44.0.1.4	0	100	0	65200 i

R3#show ip bgp

BGP table version is 13, local router ID is 33.0.3.3

Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
x best-external, a additional-path, c RIB-compressed,

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

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

Network	Next Hop	Metric	LocPrf	Weight	Path
*>i 11.0.1.0/24	11.0.1.1	0	100	0	i
*>i 11.0.2.0/24	11.0.1.1	0	100	0	i
*>i 11.0.3.0/24	11.0.1.1	0	100	0	i
*>i 22.0.1.0/24	22.0.1.2	0	100	0	i
*>i 22.0.2.0/24	22.0.1.2	0	100	0	i
*>i 22.0.3.0/24	22.0.1.2	0	100	0	i
*> 33.0.1.0/24	0.0.0.0	0		32768	i
*> 33.0.2.0/24	0.0.0.0	0		32768	i
*> 33.0.3.0/24	0.0.0.0	0		32768	i
*> 44.0.1.0/24	44.0.1.4	0		0	65200 i
*> 44.0.2.0/24	44.0.1.4	0		0	65200 i
*> 44.0.3.0/24	44.0.1.4	0		0	65200 i

(Using Route Reflector, R1 router is configured as route reflector client and R3 router as route reflector non-client. Non-client to client BGP routes forwarding is allowed and therefore R3 now receives BGP routes from R1 along with R2 and R4. Therefore now all BGP routes are seen on R3 router.)

```
R4#show ip bgp
```

BGP table version is 13, local router ID is 44.0.3.4

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

r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
x best-external, a additional-path, c RIB-compressed,

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

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

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 11.0.1.0/24	33.0.1.3			0	65000 i
*> 11.0.2.0/24	33.0.1.3			0	65000 i
*> 11.0.3.0/24	33.0.1.3			0	65000 i
*> 22.0.1.0/24	33.0.1.3			0	65000 i
*> 22.0.2.0/24	33.0.1.3			0	65000 i
*> 22.0.3.0/24	33.0.1.3			0	65000 i
*> 33.0.1.0/24	33.0.1.3	0		0	65000 i
*> 33.0.2.0/24	33.0.1.3	0		0	65000 i
*> 33.0.3.0/24	33.0.1.3	0		0	65000 i
*> 44.0.1.0/24	0.0.0.0	0		32768	i
*> 44.0.2.0/24	0.0.0.0	0		32768	i
*> 44.0.3.0/24	0.0.0.0	0		32768	i