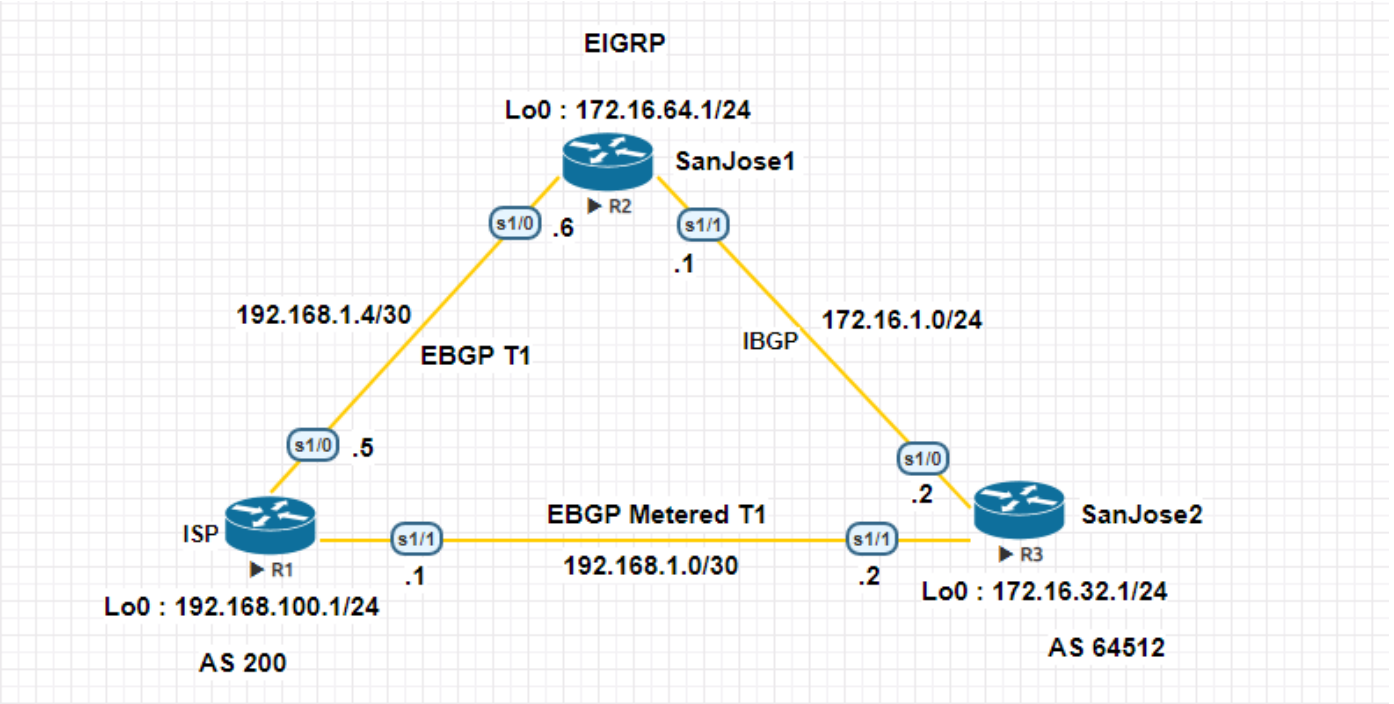
PRACTICAL NO 3: Configuring IBGP and EBGP Sessions, Local Preference, and MED

NETWORK TOPOLOGY



TASKS

- **For IBGP peers to correctly exchange routing information, use the next-hop-self command with the Local-Preference and MED attributes.**
- **Ensure that the flat-rate, unlimited-use T1 link is used for sending and receiving data to and from the AS 200 on ISP and that the metered T1 only be used in the event that the primary T1 link has failed**

R1(ISP)

Router>enable

Router#conf t

Router(config)#hostname ISP

ISP(config)#interface Loopback0

ISP(config-if)#ip address 192.168.100.1 255.255.255.0

ISP(config-if)#exit

ISP(config)#interface Serial1/0

ISP(config-if)#ip address 192.168.1.5 255.255.255.252

ISP(config-if)#no shutdown

ISP(config-if)#exit

ISP(config)#interface Serial1/1

ISP(config-if)#ip address 192.168.1.1 255.255.255.252

ISP(config-if)#no shutdown

ISP(config-if)#exit

ISP(config)#router bgp 200

ISP(config-router)#network 192.168.100.0

ISP(config-router)#neighbor 192.168.1.6 remote-as 64512

ISP(config-router)#neighbor 192.168.1.2 remote-as 64512

ISP(config-router)#exit

ISP#sh ip bgp

BGP table version is 3, local router ID is 192.168.100.1

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
*	172.16.0.0	192.168.1.2	0		0	64512 i
*>		192.168.1.6	0		0	64512 i
*>	192.168.100.0	0.0.0.0	0		32768	i

ISP#ping 172.16.1.1 source 192.168.100.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 172.16.1.1, timeout is 2 seconds:

Packet sent with a source address of 192.168.100.1

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 10/10/11 ms

ISP#ping 172.16.32.1 source 192.168.100.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 172.16.32.1, timeout is 2 seconds:

Packet sent with a source address of 192.168.100.1

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 15/15/16 ms

ISP#ping 172.16.1.2 source 192.168.100.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 172.16.1.2, timeout is 2 seconds:

Packet sent with a source address of 192.168.100.1

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 15/17/25 ms

ISP(config)#router bgp 200

ISP(config-router)#network 192.168.1.0 mask 255.255.255.252

ISP(config-router)#network 192.168.1.4 mask 255.255.255.252

ISP(config-router)#exit

ISP#sh ip bgp

BGP table version is 5, local router ID is 192.168.100.1

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
*	172.16.0.0	192.168.1.6	0		0	64512 i
*>		192.168.1.2	0		0	64512 i
*>	192.168.1.0/30	0.0.0.0	0		32768	i
*>	192.168.1.4/30	0.0.0.0	0		32768	i
*>	192.168.100.0	0.0.0.0	0		32768	i

ISP#sh ip bgp

BGP table version is 6, local router ID is 192.168.100.1

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
*>	172.16.0.0	192.168.1.6	50		0	64512 i
*		192.168.1.2	75		0	64512 i
*>	192.168.1.0/30	0.0.0.0		0	32768	i
*>	192.168.1.4/30	0.0.0.0		0	32768	i
*>	192.168.100.0	0.0.0.0		0	32768	i

ISP#ping 172.16.1.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 172.16.1.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 9/10/11 ms

ISP#ping 172.16.1.2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 172.16.1.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 20/21/25 ms

ISP#traceroute 172.16.1.1

Type escape sequence to abort.

Tracing the route to 172.16.1.1

VRF info: (vrf in name/id, vrf out name/id)

1 192.168.1.6 10 msec 10 msec *

ISP#traceroute 172.16.1.2

Type escape sequence to abort.

Tracing the route to 172.16.1.2

VRF info: (vrf in name/id, vrf out name/id)

1 192.168.1.6 10 msec 10 msec 13 msec

2 172.16.1.2 [AS 64512] 20 msec 19 msec *

R2 (SanJose1)

Router>enable

Router#conf t

Router(config)#hostname SanJose1

SanJose1(config)#interface Loopback0

SanJose1(config-if)#ip address 172.16.64.1 255.255.255.0

SanJose1(config-if)#ip address 172.16.64.1 255.255.255.0

SanJose1(config-if)#exit

SanJose1(config)#interface Serial1/0

SanJose1(config-if)#ip address 192.168.1.6 255.255.255.252

SanJose1(config-if)#no shutdown

SanJose1(config-if)#exit

```
SanJose1(config)#interface Serial1/1
SanJose1(config-if)#ip address 172.16.1.1 255.255.255.0
SanJose1(config-if)#no shutdown
SanJose1(config-if)#exit
SanJose1(config)#router eigrp 64512
SanJose1(config-router)#network 172.16.0.0
SanJose1(config-router)#no auto-summary
SanJose1(config-router)#exit
SanJose1(config)#router bgp 64512
SanJose1(config-router)#neighbor 172.16.32.1 remote-as 64512
SanJose1(config-router)#neighbor 172.16.32.1 update-source loopback0
SanJose1(config-router)#exit
SanJose1(config)#ip route 172.16.0.0 255.255.0.0 null 0
SanJose1(config)#router bgp 64512
SanJose1(config-router)#network 172.16.0.0
SanJose1(config-router)#neighbor 192.168.1.5 remote-as 200
SanJose1(config-router)#exit
SanJose1(config)#router bgp 64512
SanJose1(config-router)#neighbor 172.16.32.1 next-hop-self
SanJose1(config-router)#exit

SanJose1#sh ip bgp
BGP table version is 5, local router ID is 172.16.64.1
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
* i 172.16.0.0       172.16.32.1              0    100      0 i
*>                    0.0.0.0                  0         32768 i
* i 192.168.1.0/30   172.16.32.1              0    100      0 200 i
*>                    192.168.1.5              0             0 200 i
r i 192.168.1.4/30   172.16.32.1              0    100      0 200 i
r>                    192.168.1.5              0             0 200 i
* i 192.168.100.0    172.16.32.1              0    100      0 200 i
*>                    192.168.1.5              0             0 200 i

SanJose1(config)#route-map PRIMARY_T1_IN permit 10
SanJose1(config-route-map)#set local-preference 160
SanJose1(config-route-map)#exit
SanJose1(config)#router bgp 64512
SanJose1(config-router)#neighbor 192.168.1.5 route-map PRIMARY_T1_IN in
SanJose1(config-router)#exit
SanJose1#clear ip bgp * soft

SanJose1#sh ip bgp
BGP table version is 8, local router ID is 172.16.64.1
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
* i	172.16.0.0	172.16.32.1	0	100	0	i
*>	0.0.0.0		0		32768	i
*>	192.168.1.0/30	192.168.1.5	0	160	0	200 i
r>	192.168.1.4/30	192.168.1.5	0	160	0	200 i
*>	192.168.100.0	192.168.1.5	0	160	0	200 i

SanJose1(config)#route-map PRIMARY_T1_MED_OUT permit 10

SanJose1(config-route-map)#set Metric 50

SanJose1(config-route-map)#exit

SanJose1(config)#router bgp 64512

SanJose1(config-router)#neighbor 192.168.1.5 route-map PRIMARY_T1_MED_OUT out

SanJose1(config-router)#exit

SanJose1(config)#exit

SanJose1#clear ip bgp * soft

SanJose1#sh ip bgp

BGP table version is 8, local router ID is 172.16.64.1

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
* i 172.16.0.0      172.16.32.1              0    100      0 i
*>                  0.0.0.0                  0         32768 i
*>  192.168.1.0/30   192.168.1.5             0    160      0 200 i
r>  192.168.1.4/30   192.168.1.5             0    160      0 200 i
*>  192.168.100.0    192.168.1.5             0    160      0 200 i

SanJose1#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       a - application route
       + - replicated route, % - next hop override

Gateway of last resort is not set

      172.16.0.0/16 is variably subnetted, 6 subnets, 3 masks
S        172.16.0.0/16 is directly connected, Null0
C        172.16.1.0/24 is directly connected, Serial1/1
L        172.16.1.1/32 is directly connected, Serial1/1
D        172.16.32.0/24 [90/2297856] via 172.16.1.2, 01:28:25, Serial1/1
```

C 172.16.64.0/24 is directly connected, Loopback0

L 172.16.64.1/32 is directly connected, Loopback0

192.168.1.0/24 is variably subnetted, 3 subnets, 2 masks

B 192.168.1.0/30 [20/0] via 192.168.1.5, 00:45:28

C 192.168.1.4/30 is directly connected, Serial1/0

L 192.168.1.6/32 is directly connected, Serial1/0

B 192.168.100.0/24 [20/0] via 192.168.1.5, 00:45:28

After issuing ip default-network

SanJose1(config)#ip default-network 192.168.100.0

SanJose1(config)#end

SanJose1#sh ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, * - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP

a - application route

+ - replicated route, % - next hop override

Gateway of last resort is 192.168.1.5 to network 192.168.100.0

S* 0.0.0.0/0 [20/0] via 192.168.1.5

172.16.0.0/16 is variably subnetted, 6 subnets, 3 masks

S 172.16.0.0/16 is directly connected, Null0

C 172.16.1.0/24 is directly connected, Serial1/1

L 172.16.1.1/32 is directly connected, Serial1/1

D 172.16.32.0/24 [90/2297856] via 172.16.1.2, 01:33:38, Serial1/1

C 172.16.64.0/24 is directly connected, Loopback0

L 172.16.64.1/32 is directly connected, Loopback0

192.168.1.0/24 is variably subnetted, 3 subnets, 2 masks

B 192.168.1.0/30 [20/0] via 192.168.1.5, 00:50:41

C 192.168.1.4/30 is directly connected, Serial1/0

L 192.168.1.6/32 is directly connected, Serial1/0

B* 192.168.100.0/24 [20/0] via 192.168.1.5, 00:50:41

SanJose1#ping 192.168.1.2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.1.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 14/15/16 ms

SanJose1#traceroute 192.168.1.2

Type escape sequence to abort.

Tracing the route to 192.168.1.2

VRF info: (vrf in name/id, vrf out name/id)

1 192.168.1.5 [AS 200] 10 msec 10 msec 10 msec

2 192.168.1.2 [AS 200] 15 msec 15 msec *

SanJose1#ping 192.168.1.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 9/9/11 ms

SanJose1#traceroute 192.168.1.1

Type escape sequence to abort.

Tracing the route to 192.168.1.1

VRF info: (vrf in name/id, vrf out name/id)

1 192.168.1.5 [AS 200] 10 msec 11 msec *

R3 (SanJose2)

Router>en

Router#conf t

Router(config)#hostname SanJose2

SanJose2(config)#interface Loopback0

SanJose2(config-if)#ip address 172.16.32.1 255.255.255.0

SanJose2(config-if)#exit

SanJose2(config)#interface Serial1/1

SanJose2(config-if)#ip address 192.168.1.2 255.255.255.252

SanJose2(config-if)#no shutdown

SanJose2(config-if)#exit

SanJose2(config)#interface Serial1/0

SanJose2(config-if)#ip address 172.16.1.2 255.255.255.0

SanJose2(config-if)#no shutdown

SanJose2(config-if)#exit

SanJose2(config)#router eigrp 64512

SanJose2(config-router)#network 172.16.0.0

SanJose2(config-router)#no auto-summary

SanJose2(config-router)#exit

SanJose2(config)#router bgp 64512

SanJose2(config-router)#neighbor 172.16.64.1 remote-as 64512

SanJose2(config-router)#neighbor 172.16.64.1 update-source loopback0

SanJose2(config-router)#exit

SanJose2(config)#ip route 172.16.0.0 255.255.0.0 null 0

SanJose2(config)#router bgp 64512

SanJose2(config-router)#network 172.16.0.0

SanJose2(config-router)#neighbor 192.168.1.1 remote-as 200

SanJose2(config-router)#exit

SanJose2#sh ip bgp summary

BGP router identifier 172.16.32.1, local AS number 64512

BGP table version is 4, main routing table version 4

2 network entries using 280 bytes of memory

4 path entries using 320 bytes of memory

4/2 BGP path/bestpath attribute entries using 576 bytes of memory

1 BGP AS-PATH entries using 24 bytes of memory

0 BGP route-map cache entries using 0 bytes of memory

0 BGP filter-list cache entries using 0 bytes of memory

BGP using 1200 total bytes of memory

BGP activity 2/0 prefixes, 4/0 paths, scan interval 60 secs

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

```
172.16.64.1     4       64512      31      32       4    0    0 00:24:41       2
192.168.1.1     4         200       8       6       4    0    0 00:01:22       1

SanJose2#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       a - application route
       + - replicated route, % - next hop override

Gateway of last resort is not set

      172.16.0.0/16 is variably subnetted, 6 subnets, 3 masks
S        172.16.0.0/16 is directly connected, Null0
C        172.16.1.0/24 is directly connected, Serial1/0
L        172.16.1.2/32 is directly connected, Serial1/0
C        172.16.32.0/24 is directly connected, Loopback0
L        172.16.32.1/32 is directly connected, Loopback0
D        172.16.64.0/24 [90/2297856] via 172.16.1.1, 00:08:46, Serial1/0
      192.168.1.0/24 is variably subnetted, 3 subnets, 2 masks
C        192.168.1.0/30 is directly connected, Serial1/1
L        192.168.1.2/32 is directly connected, Serial1/1
```

```
B       192.168.1.4/30 [20/0] via 192.168.1.1, 00:02:19
B     192.168.100.0/24 [20/0] via 192.168.1.1, 00:07:40

SanJose2#sh ip bgp
BGP table version is 5, local router ID is 172.16.32.1
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
 * i 172.16.0.0      172.16.64.1              0    100      0 i
 *>                  0.0.0.0                  0         32768 i
 r i 192.168.1.0/30  192.168.1.5              0    100      0 200 i
 r>                  192.168.1.1              0             0 200 i
 * i 192.168.1.4/30  192.168.1.5              0    100      0 200 i
 *>                  192.168.1.1              0             0 200 i
 * i 192.168.100.0   192.168.1.5              0    100      0 200 i
 *>                  192.168.1.1              0             0 200 i

SanJose2(config)#router bgp 64512
SanJose2(config-router)#neighbor 172.16.64.1 next-hop-self
SanJose2(config-router)#exit

SanJose2#sh ip bgp
```

BGP table version is 5, local router ID is 172.16.32.1

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
* i 172.16.0.0	172.16.64.1	0	100	0	i
*>	0.0.0.0	0		32768	i
r i 192.168.1.0/30	172.16.64.1	0	100	0	200 i
r>	192.168.1.1	0		0	200 i
* i 192.168.1.4/30	172.16.64.1	0	100	0	200 i
*>	192.168.1.1	0		0	200 i
* i 192.168.100.0	172.16.64.1	0	100	0	200 i
*>	192.168.1.1	0		0	200 i

SanJose2(config)#route-map SECONDARY_T1_IN permit 10

SanJose2(config-route-map)#set local-preference 125

SanJose2(config-route-map)#exit

SanJose2(config)#router bgp 64512

SanJose2(config-router)#neighbor 192.168.1.1 route-map SECONDARY_T1_IN in

SanJose2(config-router)#exit

SanJose2#clear ip bgp * soft

SanJose2#sh ip bgp

BGP table version is 8, local router ID is 172.16.32.1

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
* i 172.16.0.0      172.16.64.1              0    100      0 i
*>                  0.0.0.0                  0         32768 i
r>i 192.168.1.0/30  172.16.64.1              0    160      0 200 i
r                   192.168.1.1              0    125      0 200 i
*>i 192.168.1.4/30  172.16.64.1              0    160      0 200 i
*                   192.168.1.1              0    125      0 200 i
*>i 192.168.100.0   172.16.64.1              0    160      0 200 i
*                   192.168.1.1              0    125      0 200 i
SanJose2(config)#route-map SECONDARY_T1_MED_OUT permit 10
SanJose2(config-route-map)#set Metric 75
SanJose2(config-route-map)#exit
SanJose2(config)#router bgp 64512
SanJose2(config-router)#$2.168.1.1 route-map SECONDARY_T1_MED_OUT
out
SanJose2(config-router)#end
SanJose2#clear ip bgp * soft
SanJose2#sh ip bgp
BGP table version is 8, local router ID is 172.16.32.1
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
* i	172.16.0.0	172.16.64.1	0	100	0	i
*>		0.0.0.0	0		32768	i
r>i	192.168.1.0/30	172.16.64.1	0	160	0	200 i
r		192.168.1.1	0	125	0	200 i
*>i	192.168.1.4/30	172.16.64.1	0	160	0	200 i
*		192.168.1.1	0	125	0	200 i
*>i	192.168.100.0	172.16.64.1	0	160	0	200 i
*		192.168.1.1	0	125	0	200 i