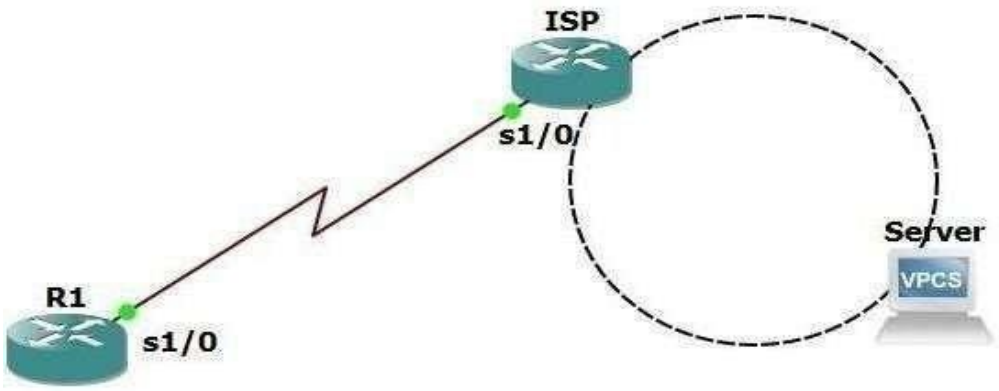
Practical No: 1

Aim: Configure IP SLA (On GNS3).



Device	Interface	IP address	Network Mask
R1	s1/0	209.165.200.9	255.255.255.252
ISP	s1/0	209.165.200.10	255.255.255.252
	Lo 0	198.133.209.1	255.255.255.255

Configure R1 R1#conf
t
R1(config)#int s1/0
R1(config-if)#ip add 209.165.200.9 255.255.255.252
R1(config-if)#no shut
R1(config-if)#ip route
R1(config-if)#ip route 0.0.0.0 0.0.0.0 209.165.200.10
R1(config)#exit

Configure ISP
R2#conf t
R2(config)#hostname ISP
ISP(config)#int s1/0
ISP(config-if)#ip add 209.165.200.10 255.255.255.252
ISP(config-if)#clock rate 4032000 ISP(config-
if)#exit
ISP(config)#no ip domain-lookup
ISP(config)#int loopback 0
ISP(config-if)#ip add 198.133.219.1 255.255.255.255
ISP(config-if)#no shut
ISP(config-if)#exit
ISP(config)#int s1/0
ISP(config-if)#no shut
ISP(config-if)#exit

Check connectivity on ISP server

```
ISP#ping 198.133.219.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 198.133.219.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/4 ms
ISP#
```

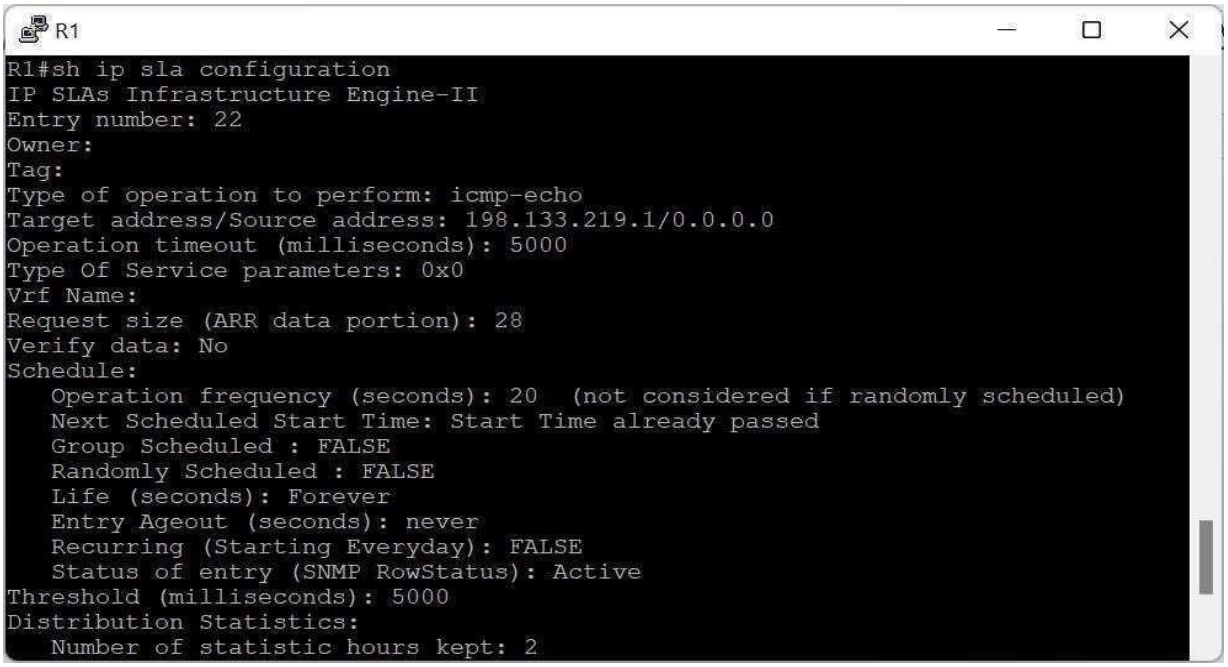
Check connectivity on R1 to ISP and server

```
R1#ping 209.165.200.10

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/64/76 ms
R1#ping 198.133.219.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 198.133.219.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 68/68/72 ms
R1#
```

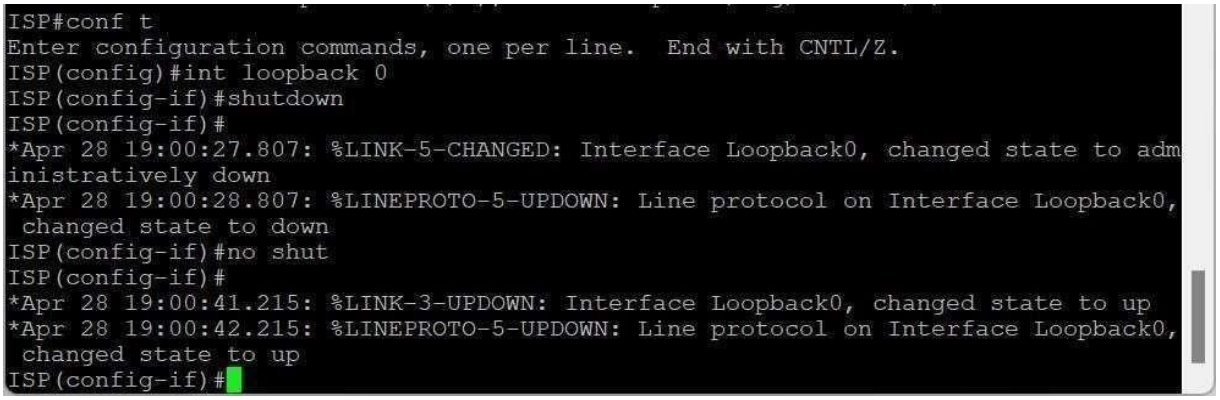
Configure IP SLA on R1
R1#conf t

R1(config)#ip sla 22
R1(config-ip-sla)#icmp-echo 198.133.219.1
R1(config-ip-sla-echo)#frequency 20
R1(config-ip-sla-echo)#ip sla schedule 22 start-time now life forever
R1(config)#end

Check IP SLA configuration



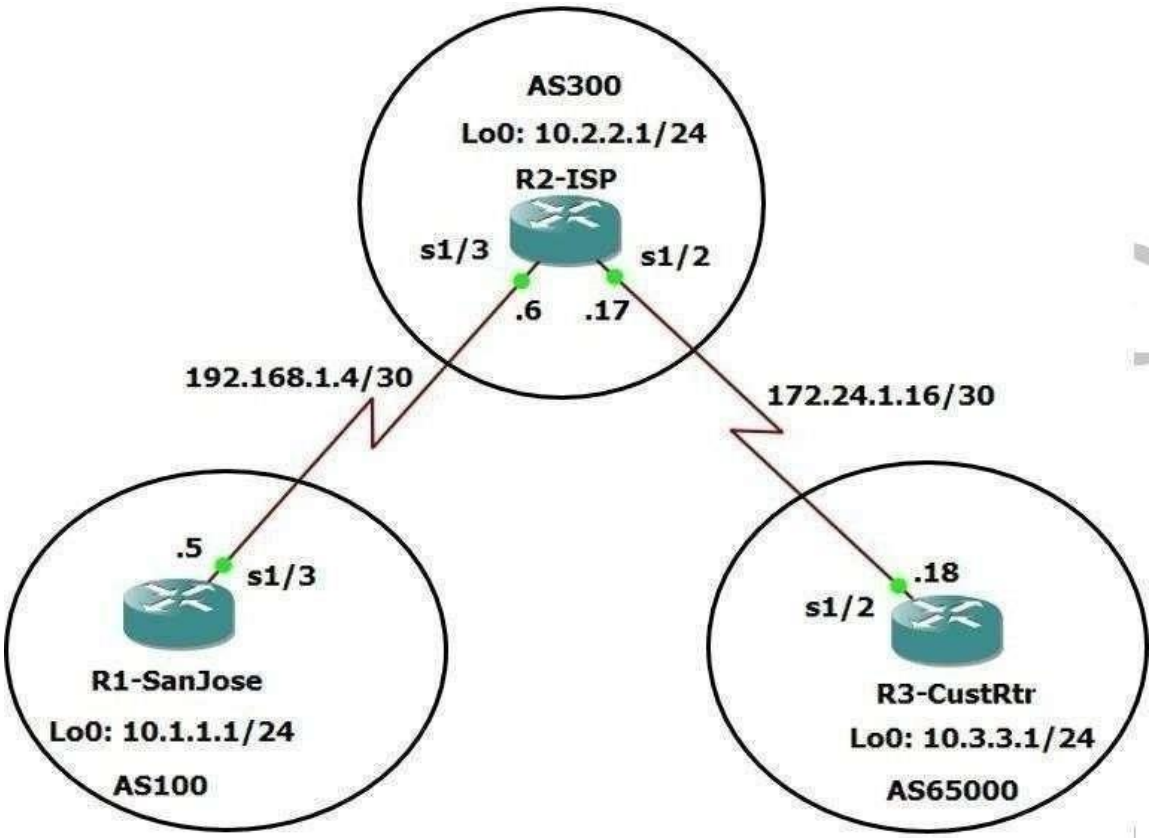
Refresh ISP



Check IP SLA statistics

Practical No: 2

Aim: Using the AS_PATH Attribute (On GNS3).



Step 1: Configure hostname and interfaces on all routers.

Router 1-SanJose

```
R1#en
R1#conf t
R1(config)#hostname R1-SanJose
R1-SanJose(config)#int lo 0
R1-SanJose(config-if)#ip add 10.1.1.1 255.255.255.0
R1-SanJose(config-if)#no shut
R1-SanJose(config-if)#int se1/3
R1-SanJose(config-if)#ip add 192.168.1.5 255.255.255.252
R1-SanJose(config-if)#no shut
R1-SanJose(config-if)#exit
R1-SanJose(config)#exit
R1-SanJose#
```

Router 2-ISP

```
R2#en
R2#conf t
R2-ISP(config)#int lo 0
R2-ISP(config-if)#ip add 10.2.2.1 255.255.255.0
R2-ISP(config-if)#no shut
R2-ISP(config-if)#int se1/3
R2-ISP(config-if)#ip add 192.168.1.6 255.255.255.252
R2-ISP(config-if)#no shut
R2-ISP(config-if)#int se1/2
R2-ISP(config-if)#ip add 172.24.1.17 255.255.255.252
R2-ISP(config-if)#no shut
R2-ISP(config-if)#exit
R2-ISP(config)#exit
```

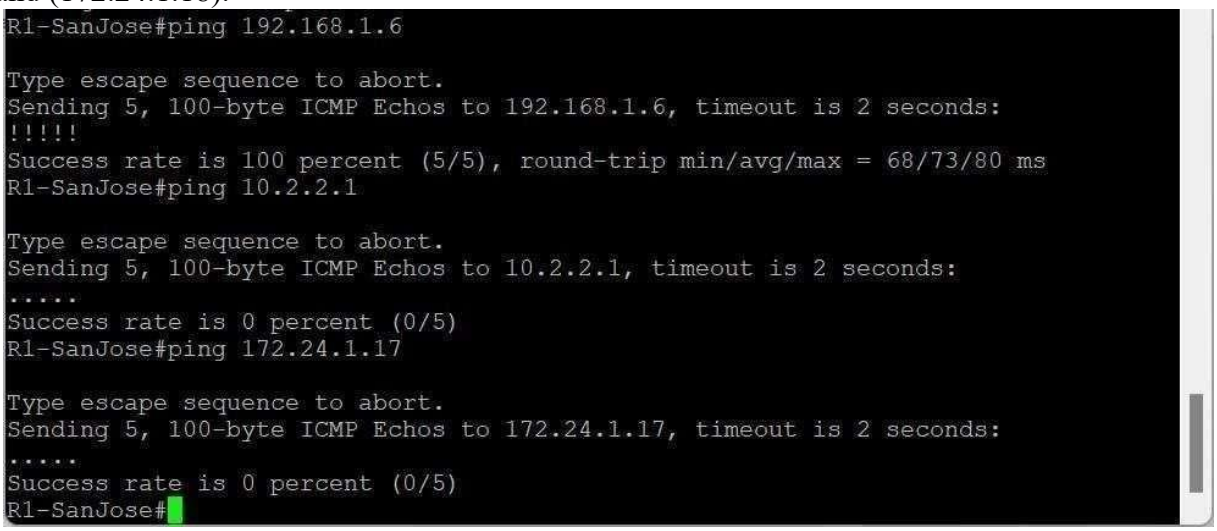
Router 3-CustRtr

```
R3#en
R3#conf t
R3(config)#hostname R3-CustRtr
R3-CustRtr(config)#int lo 0
R3-CustRtr(config-if)#ip add 10.3.3.1 255.255.255.0
R3-CustRtr(config-if)#no shut
R3-CustRtr(config-if)#int se1/2
R3-CustRtr(config-if)#ip add 172.24.1.18 255.255.255.252
R3-CustRtr(config-if)#no shut
R3-CustRtr(config-if)#exit
R3-CustRtr(config)#exit
```

Step 2: Check Connectivity

Use **ping** to test the connectivity between the directly connected routers.

SanJose will not be able to reach either Iso's loopback (10.2.2.1) or CustRtr's loopback (10.3.3.1), nor will it be reach either end of the link joining ISP to CustRtr (172.24.1.17) and (172.24.1.18).



Step 3: Configure BGP

R1-SanJose#conf t
R1-SanJose(config)#router bgp 100
R1-SanJose(config-router)#neighbor 192.168.1.6 remote-as 300
R1-SanJose(config-router)#network 10.1.1.0 mask 255.255.25.0
R1-SanJose(config-router)#^Z
R1-SanJose#

R2-ISP#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2-ISP(config)#router bgp 300
R2-ISP(config-router)#neighbor 192.168.1.5 remote-as 100
R2-ISP(config-router)#%BGP-5-ADJCHANGE: neighbor 192.168.1.5 Up
R2-ISP(config-router)#neighbor 172.24.1.18 remote-as 65000
R2-ISP(config-router)#network 10.2.2.0 mask 255.255.255.0
R2-ISP(config-router)#^Z
R2-ISP#

R3-CustRtr#conf t
R3-CustRtr(config)#router bgp 65000
R3-CustRtr(config-router)#neighbor 172.24.1.17 remote-as 300
R3-CustRtr(config-router)#%BGP-5-ADJCHANGE: neighbor 172.24.1.17 Up
R3-CustRtr(config-router)#network 10.3.3.0 mask 255.255.255.0
R3-CustRtr(config-router)#^Z R3-
CustRtr#

Step 4: Verify that these routers have establish the appropriate neighbor relationships by issuing the show ip bgp neighbors command on each router.

```
R2-ISP#sh ip bgp neighbors
BGP neighbor is 172.24.1.18,  remote AS 65000, external link
  BGP version 4, remote router ID 10.3.3.1
  BGP state = Established, up for 00:11:04
```

```
BGP neighbor is 192.168.1.5,  remote AS 100, external link
  BGP version 4, remote router ID 10.1.1.1
  BGP state = Established, up for 00:15:06
```

Step 5: remove the private AS

a. Display the SanJose routing table using the **show ip route** command. SanJose should have a route to both 10.2.2.0 and 10.3.3.0

```
R1-SanJose#sh ip route
Codes: 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

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 3 subnets
B       10.3.3.0 [20/0] via 192.168.1.6, 00:39:54
B       10.2.2.0 [20/0] via 192.168.1.6, 00:42:36
C       10.1.1.0 is directly connected, Loopback0
     192.168.1.0/30 is subnetted, 1 subnets
C       192.168.1.4 is directly connected, Serial1/3
R1-SanJose#
```

b. Ping the 10.3.3.1 address from SanJose.

```
R1-SanJose#ping 10.3.3.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.3.3.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R1-SanJose#
```

c. Ping again.

```
R1-SanJose#ping
Protocol [ip]:
Target IP address: 10.3.3.1
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]: y
Source address or interface: 10.1.1.1
Type of service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.3.3.1, timeout is 2 seconds:
Packet sent with a source address of 10.1.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/63/88 ms
R1-SanJose#ping 10.3.3.1 source 10.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.3.3.1, timeout is 2 seconds:
Packet sent with a source address of 10.1.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/66/96 ms
R1-SanJose#
```

OR

```
R1-SanJose#ping 10.3.3.1 source 10.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.3.3.1, timeout is 2 seconds:
Packet sent with a source address of 10.1.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/66/96 ms
```

d. Check the **BGP** table from SanJose by using **show ip bgp** command. Note the AS path for the 10.3.3.0 network. The AS 65000 sould be listed in the path to 10.3.3.0

```
R1-SanJose#sh ip bgp
BGP table version is 4, local router ID is 10.1.1.1
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
*> 10.1.1.0/24      0.0.0.0                  0         32768 i
*> 10.2.2.0/24      192.168.1.6              0             0 300 i
*> 10.3.3.0/24      192.168.1.6                            0 300 65000 i
R1-SanJose#
```

e. Configure ISP to strip the private numbers from BGP routes exchanged with SanJose using the following commands.

R2-ISP#conf t
R2-ISP(config)#router bgp 300
R2-ISP(config-router)#neighbor 192.168.1.5 remove-private-as R2-ISP(config-router)#^Z

```
R2-ISP#clear ip bgp *
R2-ISP#
*Apr 28 20:55:26.451: %BGP-5-ADJCHANGE: neighbor 172.24.1.18 Down User reset
*Apr 28 20:55:26.455: %BGP-5-ADJCHANGE: neighbor 192.168.1.5 Down User reset
R2-ISP#
*Apr 28 20:55:28.511: %BGP-5-ADJCHANGE: neighbor 172.24.1.18 Up
*Apr 28 20:55:28.523: %BGP-5-ADJCHANGE: neighbor 192.168.1.5 Up
R2-ISP#
```

f. SanJose should be able to ping 10.3.3.1 using its loopback 0 interface as the source ofthe ping.

```
R1-SanJose#ping 10.3.3.1 source lo 0

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.3.3.1, timeout is 2 seconds:
Packet sent with a source address of 10.1.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/59/88 ms
R1-SanJose#
```

g. Now check the BGP table on SanJose. The AS_PATH to the 10.3.3.0 network should bs AS 300. It no longer has the private As in the path.

```
R1-SanJose#ping 10.3.3.1 source lo 0

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.3.3.1, timeout is 2 seconds:
Packet sent with a source address of 10.1.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/59/88 ms
R1-SanJose#
```

Step 6: Use AS_PATH attribute to filter routes.

a. Configure a special kind of access list to match BGP with an AS_PATH attribute that both begins and ends with the number 100. Enter the following commands on ISP.

R2-ISP#conf t

R2-ISP(config)#ip as-path access-list 1 deny ^100$

R2-ISP(config)#ip as-path access-list 1 permit .* R2- ISP(config)#

The first command uses the ^ character to indicate the the AS path must begin with the given number 100. The $ character indicates that the AS_PATH attribute must also end with 100.

Essentially, this statement matches only paths that are sources from AS 100. Other paths, which might include AS 100 along the way, will not match this list.
In the second statement, the . (period) is a wildcard, and the * (asterisk) stand for a repetition Of the wildcard. Together, .* matches any value of the AS_PATH attribute, which in effect permits any update that has not been denied by the previous **access-list** statement.

b. Apply the cpnfigured access list using the **neighbor** command with the **filterlist** option.

R2-ISP#conf t
R2-ISP(config)#router bgp 300

R2-ISP(config-router)#neighbor 172.24.1.18 filter-list 1 out
R2-ISP(config-router)#^Z R2-ISP#
The out keyword specifies that the list is applied to routing information sent to this neighbor.

C. Use the **clear ip bgp *** command to reset the routing information. Wait several seconds and then check the routing table for ISP. The route to 10.1.1.0 should be in the routing table.

```
R2-ISP#clear ip bgp *
R2-ISP#
*Apr 28 21:12:51.315: %BGP-5-ADJCHANGE: neighbor 172.24.1.18 Down User reset
*Apr 28 21:12:51.315: %BGP-5-ADJCHANGE: neighbor 192.168.1.5 Down User reset
R2-ISP#
*Apr 28 21:12:52.599: %BGP-5-ADJCHANGE: neighbor 192.168.1.5 Up
*Apr 28 21:12:53.375: %BGP-5-ADJCHANGE: neighbor 172.24.1.18 Up
R2-ISP#sh ip route
Codes: 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

Gateway of last resort is not set

     172.24.0.0/30 is subnetted, 1 subnets
C       172.24.1.16 is directly connected, Serial1/2
     10.0.0.0/24 is subnetted, 2 subnets
B       10.3.3.0 [20/0] via 172.24.1.18, 00:00:17
C       10.2.2.0 is directly connected, Loopback0
     192.168.1.0/30 is subnetted, 1 subnets
C       192.168.1.4 is directly connected, Serial1/3
R2-ISP#
```

c. Check the routing table for CustRtr . It should not have a route to 10.1.1.0 in its routing table.

```
R3-CustRtr#sh ip route
Codes: 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

Gateway of last resort is not set

     172.24.0.0/30 is subnetted, 1 subnets
C       172.24.1.16 is directly connected, Serial1/2
     10.0.0.0/24 is subnetted, 2 subnets
C       10.3.3.0 is directly connected, Loopback0
B       10.2.2.0 [20/0] via 172.24.1.17, 00:03:19
R3-CustRtr#
```

e. Return to ISP and verify that the filter is working as intended. Issue **the show ip bgp regexp ^100$** command.

```
R2-ISP#show ip bgp regexp ^100$
BGP table version is 4, local router ID is 10.2.2.1
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
*> 10.1.1.0/24      192.168.1.5              0             0 100 i
R2-ISP#
```

The output of this command shows all matches for the regular expression that were used in the access list. The path to 10.1.1.0 matches the access list and is filtered from updates to CustRtr.

Now all pings from ISP should be successful.

```
R2-ISP#ping 10.1.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/24/36 ms
R2-ISP#ping 10.2.2.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.2.2.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
R2-ISP#ping 10.3.3.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.3.3.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/28/32 ms
R2-ISP#ping 192.168.1.5
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.5, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/27/32 ms
R2-ISP#ping 192.168.1.6
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.6, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/56/64 ms
R2-ISP#ping 172.24.1.17
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.24.1.17, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/59/68 ms
R2-ISP#ping 172.24.1.18
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.24.1.18, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/28/32 ms
R2-ISP#
```

SanJose should not be able to ping the CustRtr loopback 10.3.3.1 or the WAN link 172.24.1.16/30.

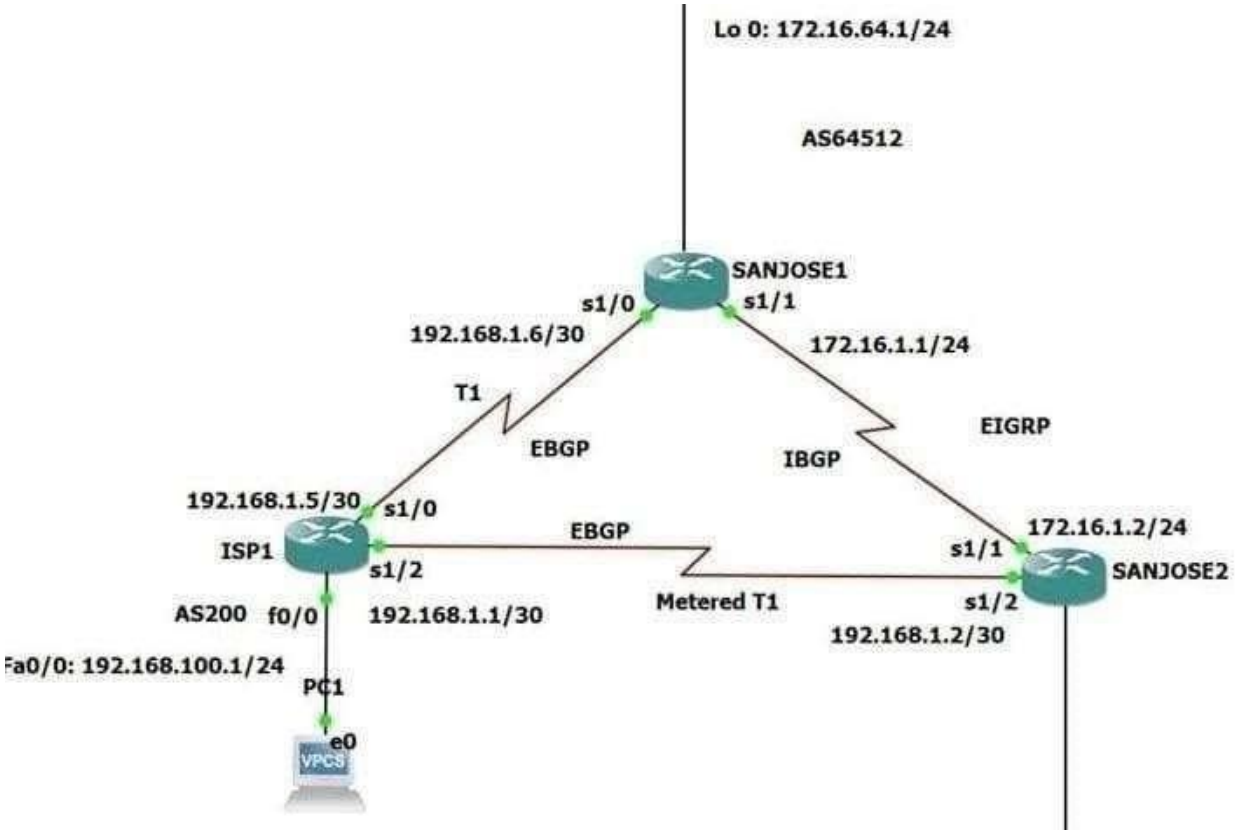
```
R1-SanJose#ping 10.3.3.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.3.3.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R1-SanJose#ping 172.24.1.16
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.24.1.16, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R1-SanJose#
```

CustRtr should not be able to ping the Sanjose loopback 10.1.1.1 or the WAN link 192.168.1.4/30.

```
R3-CustRtr#ping 10.1.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R3-CustRtr#ping 192.168.1.4
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.4, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R3-CustRtr#
```

Practical No : 3

Aim: Configuring IBGP and EBGP Sessions, Local Preference and MED .



Step 1: Configure all routers and test Connectivity to connected interfaces.

ISP1#
ISP1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ISP1(config)#int s1/0
ISP1(config-if)#ip add 192.168.1.5 255.255.255.252
ISP1(config-if)#no shut
ISP1(config-if)#
*Jun 24 09:43:40.579: %LINK-3-UPDOWN: Interface Serial1/0, changed state to up
ISP1(config-if)#
*Jun 24 09:43:40.579: %ENTITY_ALARM-6-INFO: CLEAR INFO Se1/0 Physical Port Administrative State Down
ISP1(config-if)#
*Jun 24 09:43:41.583: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0, changed state to up
ISP1(config-if)#int s1/2
ISP1(config-if)#ip add 192.168.1.1 255.255.255.252

*Jun 24 09:44:08.191: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0, changed state to down
ISP1(config-if)#ip add 192.168.1.1 255.255.255.252
ISP1(config-if)#no shut
ISP1(config-if)#int fa0/0
ISP1(config-if)#ip add 192.168.100.1 255.255.255.252
ISP1(config-if)#ip add 192.168.100.1 255.255.255.0
ISP1(config-if)#no shut
ISP1(config-if)#

SANJOSE1#
SANJOSE1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SANJOSE1(config)#int s1/0
SANJOSE1(config-if)#ip add 192.168.1.6 255.255.255.252
SANJOSE1(config-if)#no shut
SANJOSE1(config-if)#int s1/1
SANJOSE1(config-if)#ip add 172.16.1.1 255.255.255.0
SANJOSE1(config-if)#no shut
SANJOSE1(config-if)#int lo 0
SANJOSE1(config-if)#ip add 172.16.64.1 255.255.255.0
SANJOSE1(config-if)#no shut
SANJOSE1(config-if)#^Z
SANJOSE1#

SANJOSE2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SANJOSE2(config)#int s1/1
SANJOSE2(config-if)#ip add 172.16.1.2 255.255.255.0

SANJOSE2(config-if)#no shut
SANJOSE2(config-if)#int s1/2
SANJOSE2(config-if)#ip add 172.168.1.2 255.255.255.252
SANJOSE2(config-if)#no shut
SANJOSE2(config-if)#int lo 0

SANJOSE2(config-if)#ip add 172.16.32.1 255.255.255.0
SANJOSE2(config-if)#no shut
SANJOSE2(config-if)#^Z
SANJOSE2#

Step2 Configure EIGRP between the SanJose1 and SanJose2 routers with the same commands as follows:

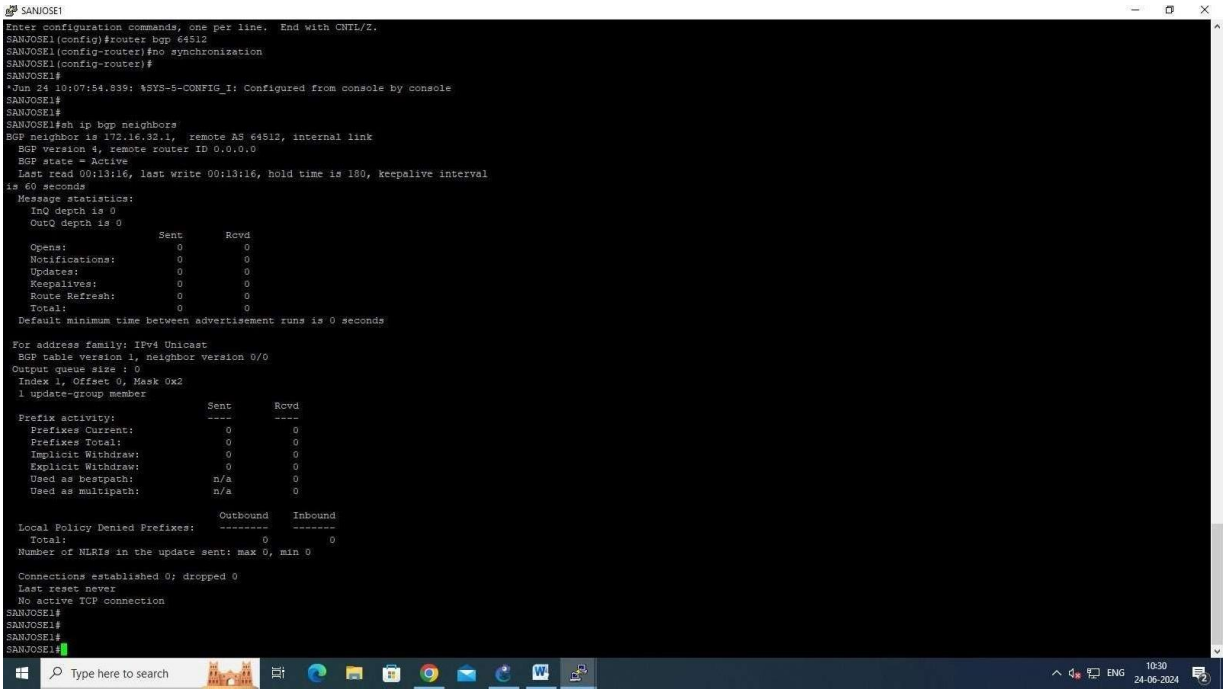
```
SANJOSE1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SANJOSE1(config)#router eigrp 64512
SANJOSE1(config-router)#network 172.16.0.0
SANJOSE1(config-router)#exit
SANJOSE1(config)#

SANJOSE2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SANJOSE2(config)#router eigrp 64512
SANJOSE2(config-router)#network 172.16.0.0
SANJOSE2(config-router)#exit
SANJOSE2(config)#
```

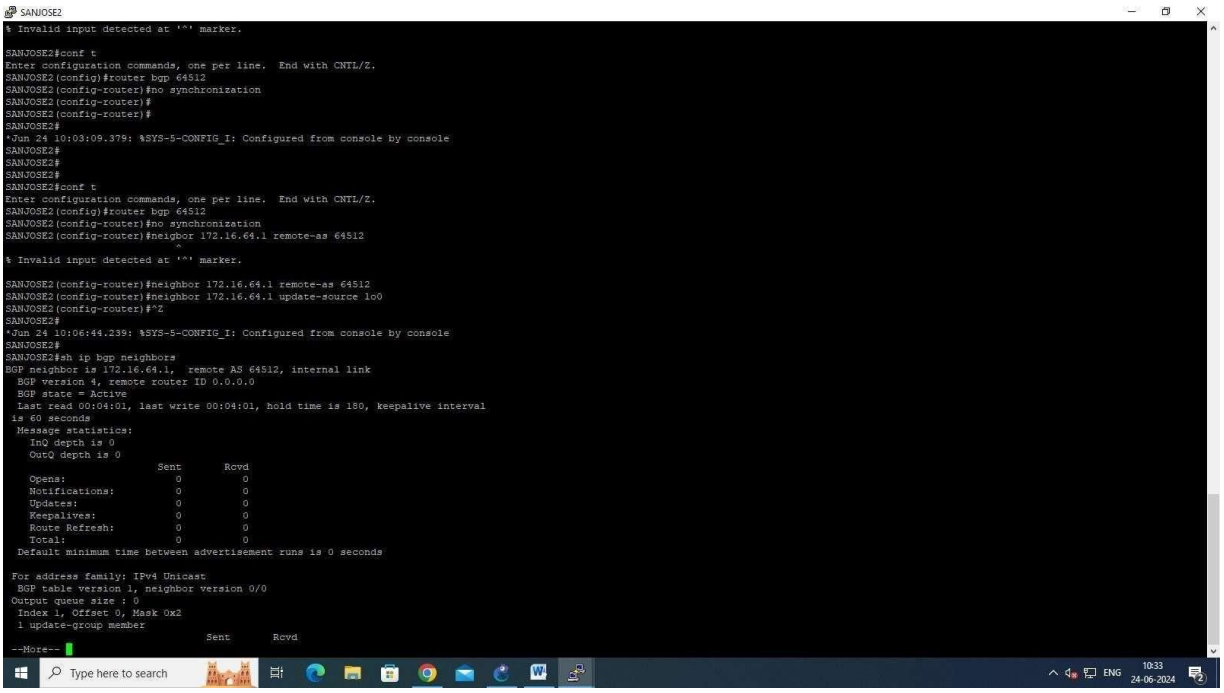
Step3 Configure IBGP between the SanJose1 and SanJose2 routers. On the SanJose1 router, enter the followings :

```
SANJOSE1#
SANJOSE1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SANJOSE1(config)#router bgp 64512
SANJOSE1(config-router)#no auto-summary

SANJOSE1(config-router)#neighbor 172.16.32.1 remote-as 64512
SANJOSE1(config-router)#neighbor 172.16.32.1 update-source lo 0
SANJOSE1(config-router)#^Z
SANJOSE1#
*Jun 24 10:03:18.479: %SYS-5-CONFIG_I: Configured from console by console

SANJOSE1#
SANJOSE1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SANJOSE1(config)#router bgp 64512
SANJOSE1(config-router)#no synchronization
SANJOSE1(config-router)#

SANJOSE2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SANJOSE2(config)#router bgp 64512
SANJOSE2(config-router)#no synchronization
SANJOSE2(config-router)#
SANJOSE2(config-router)#
```

Step-4 Complete the Ibgp Configurations on Sanjose2 by entering the commands.

SANJOSE2#
SANJOSE2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SANJOSE2(config)#router bgp 64512
SANJOSE2(config-router)#no synchronization
SANJOSE2(config-router)#neighbor 172.16.64.1 remote-as 64512
SANJOSE2(config-router)#neighbor 172.16.64.1 update-source lo0
SANJOSE2(config-router)#^Z
SANJOSE2#





Step 5: Configure ISP1 to run EBGP with SanJose1 and SanJose2. Enter the following Commonds on ISP1 as shown in the following:

```
ISP1#
ISP1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ISP1(config)#router bgp 200
ISP1(config-router)#no auto-summary
ISP1(config-router)#neighbor 192.168.1.6 remote-as 64512
ISP1(config-router)#neighbor 192.168.1.2 remote-as 64512
ISP1(config-router)#network 192.168.100.0
ISP1(config-router)#
```

Step6: Configure SanJose1 as an EBGP peer to ISP1 as shown in the following:

```
SANJOSE1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SANJOSE1(config)#ip route 172.16.0.0 255.255.0.0 null0
SANJOSE1(config)#router bgp 64512
SANJOSE1(config-router)#neighbor 192.168.1.5 remote-as 200
SANJOSE1(config-router)#
SANJOSE1(config-router)#network 172.16.0.0
SANJOSE1(config-router)#
*Jun 24 11:00:14.303: %BGP-5-ADJCHANGE: neighbor 192.168.1.5 Up
SANJOSE1(config-router)#^Z
SANJOSE1#
```

Use the Show ip bgp neighbors:

```
BGP neighbor is 192.168.1.5,  remote AS 200, external link
  BGP version 4, remote router ID 192.168.100.1
  BGP state = Established, up for 00:01:00
```

Step7: Configure SAnJose1 As an EBGP peer to ISP1:-

```
SANJOSE2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SANJOSE2(config)#ip route 172.16.0.0 255.255.0.0 null0
SANJOSE2(config)#router bgp 64512
SANJOSE2(config-router)#neighbor 192.168.1.1 remote-as 200
SANJOSE2(config-router)#
```

SANJOSE2(config-router)#network 172.16.0.0
SANJOSE2(config-router)#

```
SANJOSE2#show ip bgp summary
BGP router identifier 172.16.32.1, local AS number 64512
BGP table version is 3, main routing table version 3
1 network entries using 144 bytes of memory
2 path entries using 160 bytes of memory
2/1 BGP path/bestpath attribute entries using 272 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 576 total bytes of memory
BGP activity 1/0 prefixes, 2/0 paths, scan interval 60 secs

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.64.1     4        64512      15      15        3    0    0 00:09:54        1
192.168.1.1     4          200       6       6        3    0    0 00:00:42        0
SANJOSE2#
```

Step8:

Test whether ISP1 can ping the Loopback 0 address of 172.16.64.1 from SanJosel, as well as the serial link between San Josel and San Jose2, 172.16.1.1.

```
ISP1#ping 172.16.64.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.64.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/31/44 ms
ISP1#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 = 28/29/32 ms
ISP1#
```

Now ping from ISP1 to the Loopback 0 address of 172.16.32.1 from San Jose2, as well as the serial link between San Josel and SanJose2. This time try 172.16.1.2.

```
ISP1#ping 172.16.32.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.32.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
ISP1#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 0 percent (0/5)
ISP1#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 - i
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-
              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
```

At this point, the be able to get to each network connected to San Jose2 from the FastEthernet address 192.168.100.1.

ISP1#ping
Protocol [ip]:
Target IP address: 172.16.64.1 Repeat
count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]: y
Source address or interface: 192.168.100.1 Type
of service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose [none]:
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.64.1, 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 = 20/27/36 ms
ISP1#ping

Protocol [ip]:
Target IP address: 172.16.1.1 Repeat
count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Source address or interface: 192.168.100.1
Extended commands [n]: y Set DF bit in IP
header? [no]:
Type of service [0]:
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Sweep range of sizes [n]:
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 Thakkar
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/29/40 ms

ISP1#ping
Protocol [ip]:
Target IP address: 172.16.32.1 Repeat
count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]: y
Source address or interface: 192.168.100.1 Type
of service [0]:
Set DF bit in IP header? [no]: Validate
reply data? [no]:
Data pattern [0xABCD]
Binita
Loose, Strict, Record, Timestamp, Verbose [none]:
Sweep range of sizes [n]:
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 = 40/45/52 ms

ISP1#ping
Protocol [ip]:
Target IP address: 172.16.1.2 Repeat
count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]: y

Source address or interface: 192.168.100.1 Type
of service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp. Verbose[none]:
Sweep range of sizes [n]:
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 = 40/45/48 ms ISP1#

Complete reachability was proven between the ISP1 router and both San Josel and SanJose2.

Step9:

Before the ISP can successfully ping the internal serial interfaces of AS 64512, two issues need to be resolved. First, SanJosel does not know about the link between the ISP and SanJose2. Second, San Jose2 is unaware of the link between the ISP and San Josel. This can be resolved by an advertisement of these serial links by way of BGP router. This can also be resolved by way of EIGRP on each of the San Jose routers. The preferred method is for the ISP to advertise these links. If they are advertised and then, at a future date, a BGP link is activated to another ISP in addition to a risk of becoming a Transit AS. Binita AS 200, then there is

ISP1#conf t
ISP1 (config)#router bgp 200
ISP1 (config-router)#network 192.168.1.0 mask 255.255.255.252
ISP1(config-router)#network 192.168.1.4 mask 255.255.255.252
ISP1 (config-router)#^Z
ISP1#
*May 15 09:41:45.207: %SYS-5-CONFIG_I: Configured from console by console ISP1#

```
ISP1#clear ip bgp *
ISP1#
*May 15 09:42:49.523: %BGP-5-ADJCHANGE: neighbor 192.168.1.2 Down User reset
*May 15 09:42:49.527: %BGP_SESSION-5-ADJCHANGE: neighbor 192.168.1.2 IPv4 Unicast topology base removed from session  User reset
*May 15 09:42:49.531: %BGP-5-ADJCHANGE: neighbor 192.168.1.6 Down User reset
*May 15 09:42:49.531: %BGP_SESSION-5-ADJCHANGE: neighbor 192.168.1.6 IPv4 Unicast topology base removed from session  User reset
*May 15 09:42:50.411: %BGP-5-ADJCHANGE: neighbor 192.168.1.6 Up
*May 15 09:42:50.411: %BGP-5-ADJCHANGE: neighbor 192.168.1.2 Up
```

```
ISP1#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       192.168.1.2              0             0 64512 i
 *                    192.168.1.6              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
ISP1#
```

Verify on San Josel and San Jose2 that the opposite WAN link is included in the routing table.
The output from San Jose2 is shown as follows:

```
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
       + - 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        172.16.1.2/32 is directly connected, Serial1/1
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, 00:36:15, Serial1/1
      192.168.1.0/24 is variably subnetted, 3 subnets, 2 masks
C        192.168.1.0/30 is directly connected, Serial1/2
L        192.168.1.2/32 is directly connected, Serial1/2
B        192.168.1.4/30 [20/0] via 192.168.1.1, 00:01:02
B     192.168.100.0/24 [20/0] via 192.168.1.1, 00:01:02
SANJOSE2#
```

2nd last line of output

The next issue to consider is BGP policy routing between AS systems. BGP routers do not increment the next hop address to their IBGP peers. The San Jose2 router is passing a policy to SanJosel and vice versa. The policy for routing from AS 64512 to AS 200 is to forward packets to the 192.168.1.1 interface. SanJosel has a similar yet opposite policy, forwarding requests to the 192.168.1.5 interface. In the event that either WAN link fails, it is critical that the opposite router become a valid gateway. This is only achieved if the next-hop-self command is configured on SanJosel and San Jose2.

```
SANJOSE2#show ip bgp
BGP table version is 15, 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
 *>  172.16.0.0       0.0.0.0                  0         32768 i
 * i                  172.16.64.1              0    100      0 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#
```

SANJOSE1 #conf t
SANJOSE1 (config)#router bgp 64512
SANJOSE1 (config-router)#neighbor 172.16.32.1 next-hop-self Tha
SANJOSE1 (config-router)#^Z
SANJOSE2#conf t
SANJOSE2 (config)#router bgp 64512
SANJOSE2 (config-router) #neighbor 172.16.64.1 next-hop-self
SANJOSE2(config-router)#^Z

```
SANJOSE2#clear ip bgp *
SANJOSE2#
*May 15 09:49:46.755: %BGP-5-ADJCHANGE: neighbor 172.16.64.1 Down User reset
*May 15 09:49:46.759: %BGP_SESSION-5-ADJCHANGE: neighbor 172.16.64.1 IPv4 Unicast topology base removed from session  User reset
*May 15 09:49:46.763: %BGP-5-ADJCHANGE: neighbor 192.168.1.1 Down User reset
*May 15 09:49:46.767: %BGP_SESSION-5-ADJCHANGE: neighbor 192.168.1.1 IPv4 Unicast topology base removed from session  User reset
*May 15 09:49:47.375: %BGP-5-ADJCHANGE: neighbor 172.16.64.1 Up
*May 15 09:49:47.375: %BGP-5-ADJCHANGE: neighbor 192.168.1.1 Up
SANJOSE2#
```

```
SANJOSE2#show ip bgp
BGP table version is 1, 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
 *   172.16.0.0       0.0.0.0                  0         32768 i
 * i                  172.16.64.1              0    100      0 i
 *   192.168.1.0/30   192.168.1.1              0             0 200 i
 * i                  172.16.64.1              0    100      0 200 i
 *   192.168.1.4/30   192.168.1.1              0             0 200 i
 * i                  172.16.64.1              0    100      0 200 i
 *   192.168.100.0    192.168.1.1              0             0 200 i
 * i                  172.16.64.1              0    100      0 200 i
SANJOSE2#
```

Step10:

At this point, everything looks good with the exception of default routes, the outbound flow of data, and inbound packet flow. Since the local preference value is shared between IBGP neighbors, configure a simple route-map that references local preference value on SanJosel and San Jose2. This policy will adjustoutbound traffic to prefer the link off the SanJosel router instead of the metered T1 off San Jose2.

SANJOSE1#conf t
SANJOSE1 (config)#route-map PRIMARY_T1_IN permit 10
SANJOSE1 (config-route-map) #set local-preference 150
SANJOSE1 (config-route-map)#
SANJOSE1 (config)#router bgp 64512
SANJOSE1 (config-router)#neighbor 192.168.1.5 route-map PRIMARY_T1_IN i
SANJOSE1 (config-router)#^Z
SANJOSE2#conf t
SANJOSE2 (config)#route-map SECONDARY_T1_IN permit 10
SANJOSE2 (config-route-map) #set local-preference 125
SANJOSE2 (config-route-map) #router bgp 64512
SANJOSE2 (config-router)#neighbor 192.168.1.1 route-map SECONDARY_T1_IN in
SANJOSE2 (config-router)#^Z

Use clear ip bgp *

```
SANJOSE1#clear ip bgp *
SANJOSE1#
*May 15 09:55:02.459: %BGP-5-ADJCHANGE: neighbor 172.16.32.1 Down User reset
*May 15 09:55:02.463: %BGP_SESSION-5-ADJCHANGE: neighbor 172.16.32.1 IPv4 Unicast topology base removed from session  User reset
*May 15 09:55:02.467: %BGP-5-ADJCHANGE: neighbor 192.168.1.5 Down User reset
*May 15 09:55:02.467: %BGP_SESSION-5-ADJCHANGE: neighbor 192.168.1.5 IPv4 Unicast topology base removed from session  User reset
*May 15 09:55:02.587: %BGP-5-ADJCHANGE: neighbor 172.16.32.1 Up
*May 15 09:55:02.615: %BGP-5-ADJCHANGE: neighbor 192.168.1.5 Up
SANJOSE1#
```

```
SANJOSE1#sh ip bgp
BGP table version is 1, 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
 *   172.16.0.0       0.0.0.0                  0         32768 i
 * i                  172.16.32.1              0    100      0 i
 *   192.168.1.0/30   192.168.1.5              0    150      0 200 i
 * i                  172.16.32.1              0    100      0 200 i
 *   192.168.1.4/30   192.168.1.5              0    150      0 200 i
 * i                  172.16.32.1              0    100      0 200 i
 *   192.168.100.0    192.168.1.5              0    150      0 200 i
 * i                  172.16.32.1              0    100      0 200 i
SANJOSE1#
```

```
SANJOSE2#clear ip bgp *
SANJOSE2#
*May 15 09:57:34.999: %BGP-5-ADJCHANGE: neighbor 172.16.64.1 Down User reset
*May 15 09:57:34.999: %BGP_SESSION-5-ADJCHANGE: neighbor 172.16.64.1 IPv4 Unicast topology base removed from session  User reset
*May 15 09:57:35.007: %BGP-5-ADJCHANGE: neighbor 192.168.1.1 Down User reset
*May 15 09:57:35.007: %BGP_SESSION-5-ADJCHANGE: neighbor 192.168.1.1 IPv4 Unicast topology base removed from session  User reset
*May 15 09:57:35.399: %BGP-5-ADJCHANGE: neighbor 172.16.64.1 Up
*May 15 09:57:35.399: %BGP-5-ADJCHANGE: neighbor 192.168.1.1 Up
SANJOSE2#sh ip bgp
BGP table version is 1, 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
 *   192.168.1.0/30   192.168.1.1              0    125      0 200 i
 * i                  172.16.64.1              0    150      0 200 i
 *   192.168.1.4/30   192.168.1.1              0    125      0 200 i
 * i                  172.16.64.1              0    150      0 200 i
 *   192.168.100.0    192.168.1.1              0    125      0 200 i
 * i                  172.16.64.1              0    150      0 200 i
SANJOSE2#
```

Step11:

How will traffic return from network 192.168.100.0/24? Through San Josel or SanJose2? Issue s hip bgp on ISP1.

SANJOSE2#ping

Protocol [ip]:

Target IP address: 192.168.100.1

Repeat count [5]: 2 Datagram size [100]:

Timeout in seconds [2]:

Extended commands [n]: y
Source
Type of service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0xABCD]:

Loose. Strict, Record, Timestamp, Verbose[none]: record Number
of hops [9]:

Loose, Strict, Record, Timestamp, Verbose [RV]:
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 2, 100-byte ICMP Echos to 192.168.100.1, timeout is 2 seconds:
Packet sent with a source address of 172.16.32.1
Packet has IP options: Total option bytes= 39, padded length=40 Record
route: <*>

(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
Reply to request 0 (52 ms). Received packet has options
Total option bytes= 40, padded length=40 Record route:
(172.16.1.2)
(192.168.1.6)
(192.168.1.5)
(192.168.1.5)
(172.16.1.1)
(172.16.1.2) <*>

(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
End of list

Reply to request 1 (52 ms). Received packet has options
Total option bytes= 40. padded length Record route:

(172.16.1.2)

(192.168.1.6)
(192.168.1.5)
(192.168.1.5)
(172.16.1.1)
(172.16.1.2) <*>
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
End of list
Success rate is 100 percent (2/2), round-trip min/avg/max = 52/52/52 ms

SANJOSE2#

The next step is to create a new policy to force ISP to return all traffic via SanJosel. Create a second route-map utilizing MED (metric) which is shared between EBGP neighbors.

```
SANJOSE1#conf t
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)#
SANJOSE2#conf t
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)#
```

As before, issue clear ip bgp * after issuing new policy

```
SANJOSE1#clear ip bgp *
SANJOSE1#
*May 15 10:13:56.855: %BGP-5-ADJCHANGE: neighbor 172.16.32.1 Down User reset
*May 15 10:13:56.859: %BGP_SESSION-5-ADJCHANGE: neighbor 172.16.32.1 IPv4 Unicast topology base removed from session  User reset
*May 15 10:13:56.863: %BGP-5-ADJCHANGE: neighbor 192.168.1.5 Down User reset
*May 15 10:13:56.867: %BGP_SESSION-5-ADJCHANGE: neighbor 192.168.1.5 IPv4 Unicast topology base removed from session  User reset
*May 15 10:13:57.183: %BGP-5-ADJCHANGE: neighbor 192.168.1.5 Up
*May 15 10:13:57.183: %BGP-5-ADJCHANGE: neighbor 172.16.32.1 Up
SANJOSE1#
*May 15 10:14:05.611: %BGP-5-NBR_RESET: Neighbor 172.16.32.1 reset (Peer closed the session)
*May 15 10:14:05.619: %BGP-5-ADJCHANGE: neighbor 172.16.32.1 Down Peer closed the session
*May 15 10:14:05.619: %BGP_SESSION-5-ADJCHANGE: neighbor 172.16.32.1 IPv4 Unicast topology base removed from session  Peer closed the session
SANJOSE1#
*May 15 10:14:06.623: %BGP-5-ADJCHANGE: neighbor 172.16.32.1 Up
SANJOSE1#
```

```
SANJOSE2#clear ip bgp *
SANJOSE2#
*May 15 10:14:05.559: %BGP-5-ADJCHANGE: neighbor 172.16.64.1 Down User reset
*May 15 10:14:05.559: %BGP_SESSION-5-ADJCHANGE: neighbor 172.16.64.1 IPv4 Unicast topology base removed from session  User reset
*May 15 10:14:05.567: %BGP-5-ADJCHANGE: neighbor 192.168.1.1 Down User reset
*May 15 10:14:05.567: %BGP_SESSION-5-ADJCHANGE: neighbor 192.168.1.1 IPv4 Unicast topology base removed from session  User reset
SANJOSE2#
*May 15 10:14:06.591: %BGP-5-ADJCHANGE: neighbor 192.168.1.1 Up
*May 15 10:14:06.603: %BGP-5-ADJCHANGE: neighbor 172.16.64.1 Up
SANJOSE2#
```

```
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
 *>  192.168.1.0/30   192.168.1.5              0    150      0 200 i
 r>  192.168.1.4/30   192.168.1.5              0    150      0 200 i
 *>  192.168.100.0    192.168.1.5              0    150      0 200 i
SANJOSE1#
```

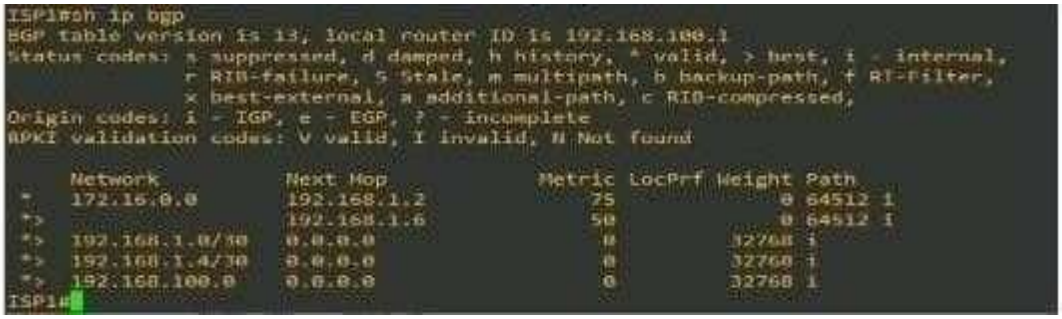
Reissue extended ping command with record command
SANJOSE2#ping
Protocol [ip]:
Target IP address: 192.168.100.1
Repeat count [5]: 2 Datagram
size [100]:
Timeout in seconds [2]:
Extended commands [n]: y
Source address or interface: 172.16.32.1 Type
of service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose[none]: record Number
of hops [9]:
Loose, Strict, Record, Timestamp, Verbose[RV]:
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 2, 100-byte ICMP Echos to 192.168.100.1. timeout is 2 seconds:
Packet sent with a source address of 172.16.32.1
Packet has IP options: Total option bytes= 39, padded length-40
Record route: <*>
(0.0.0.0)

(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
Reply to request 0 (56 ms). Received packet has options

Total option bytes 40, padded length-40 Record
route:
(172.16.1.2)
(192.168.1.6)
(192.168.1.5)
(192.168.1.5)
(172.16.1.1)
(172.16.1.2) <*>
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)

End of list
Reply to request 1 (48 ms). Received packet has options
Total option bytes=40, padded length=40 Record route:
(172.16.1.2)
(192.168.1.6)
(192.168.1.5)
(192.168.1.5)
(172.16.1.1)
(172.16.1.2) <*>
(0.0.0.0)
(0.0.0.0)
(0.0.0.0)
End of list

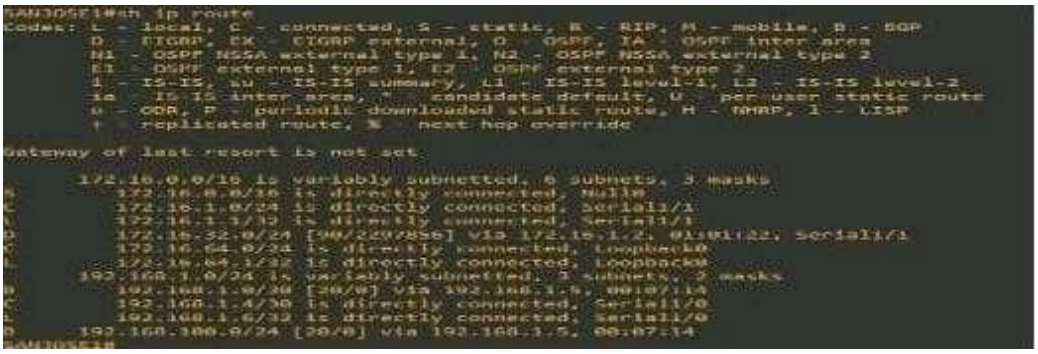
Issue sh ip bgp on ISP to check the updated MED value used,



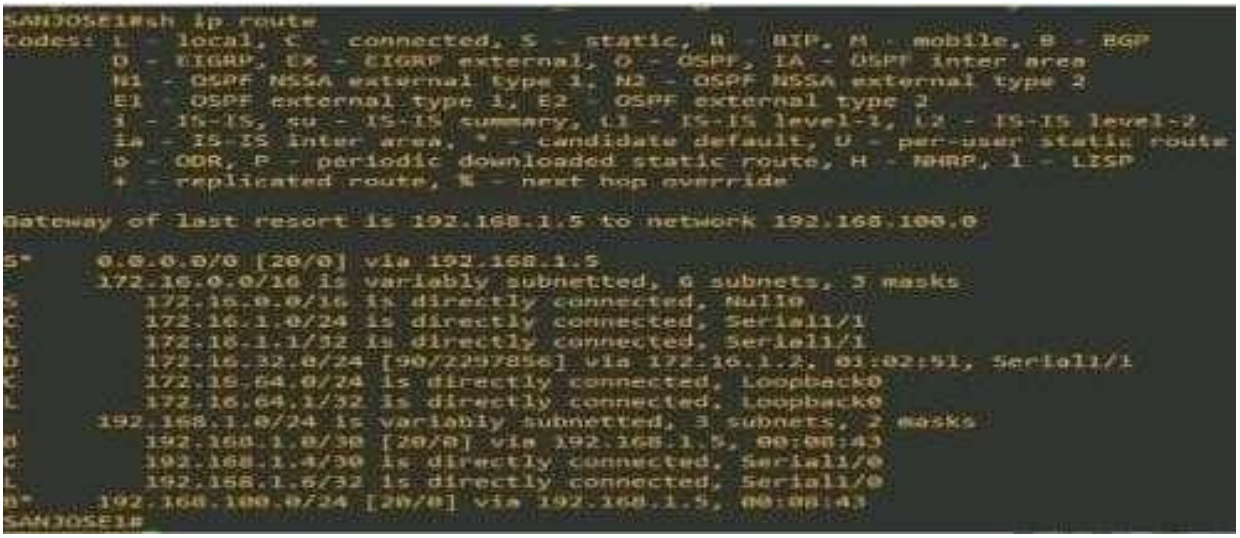
Step 12:

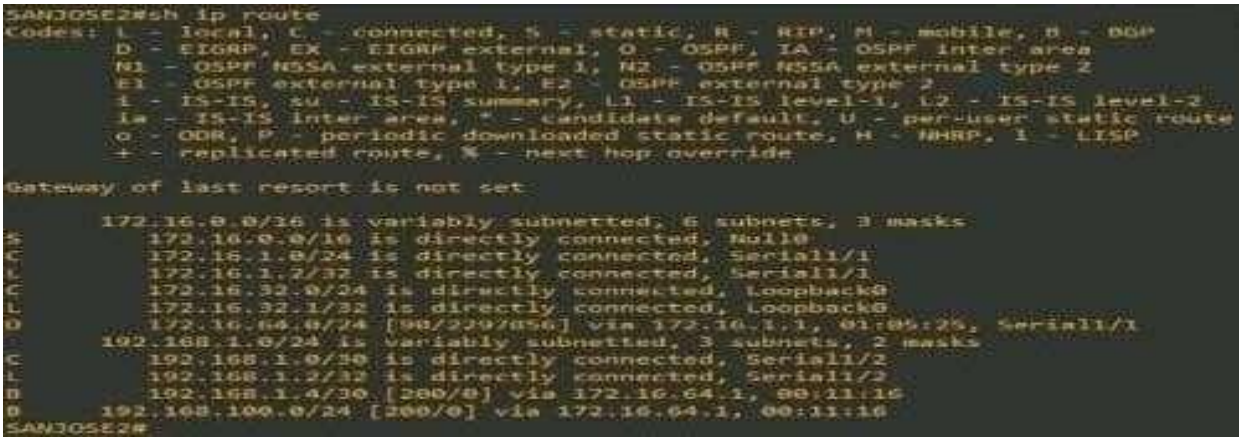
Modern Networking

Establish a default route that uses a policy statement that will adjust to changes in the network. Configure both San Josel and Sanjose2 to use 192.168.100.0/24 as the default network.



SANJOSEI#conft
SANJOSEI (config)#ip default-network 192.168.100.0



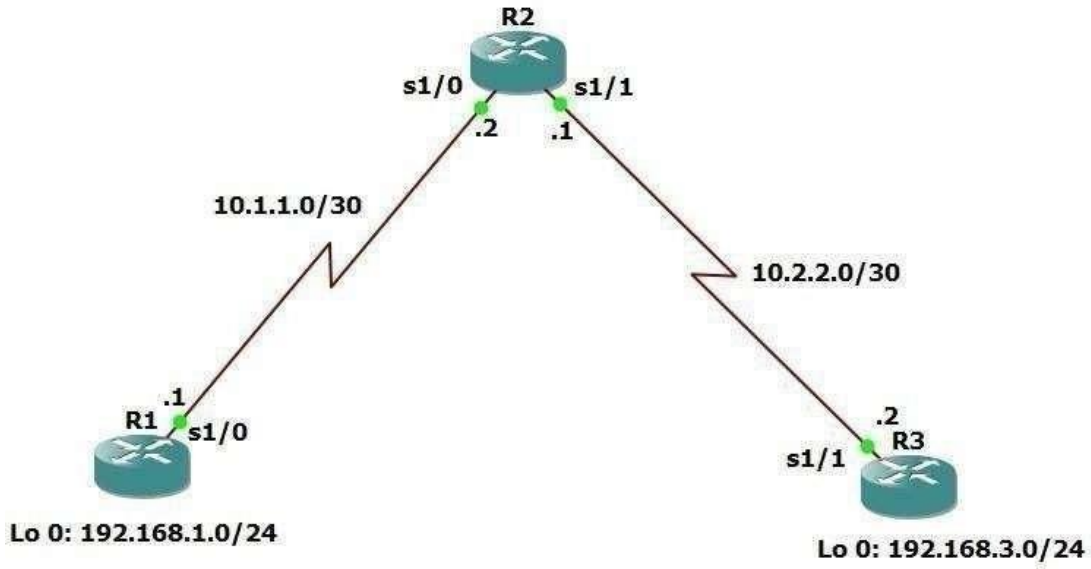


SANJOSE2#conf t
SANJOSE2 (config)#ip default-network 192.168.100.0
SANJOSE2 (config)

```
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
       + - replicated route, % - next hop override

Gateway of last resort is 172.16.64.1 to network 192.168.100.0

S*    0.0.0.0/0 [200/0] via 172.16.64.1
      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        172.16.1.2/32 is directly connected, Serial1/1
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, 01:05:56, Serial1/1
      192.168.1.0/24 is variably subnetted, 3 subnets, 2 masks
C        192.168.1.0/30 is directly connected, Serial1/2
L        192.168.1.2/32 is directly connected, Serial1/2
B        192.168.1.4/30 [200/0] via 172.16.64.1, 00:11:47
B*    192.168.100.0/24 [200/0] via 172.16.64.1, 00:11:47
SANJOSE2#
```

Practical :04

Aim: Configuring Secure Management Plane (On GNS3)



Step 1: Configure loopbacks and assign addresses.

```
R1#conf t
R1(config)#int lo 0
R1(config-if)#ip add 192.168.1.1 255.255.255.0
R1(config-if)#exit
R1(config)#int se1/0
R1(config-if)#ip add 10.1.1.1 255.255.255.252
R1(config-if)#no shut
R1(config-if)#exit

R2#conf t
R2(config)#int se1/0
R2(config-if)#ip add 10.1.1.2 255.255.255.252
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#int se1/1
R2(config-if)#ip add 10.2.2.1 255.255.255.252
R2(config-if)#no shut
```

R2(config-if)#exit

R3#conf t
R3(config)#int lo 0
R3(config-if)#ip add 192.168.3.1 255.255.255.0
R3(config-if)#exit
R3(config)#int se1/1
R3(config-if)#ip add 10.2.2.2 255.255.255.252
R3(config-if)#no shut
R3(config-if)#exit

Step 2: Configure static routes.
R1#conf t
R1(config)#ip route 0.0.0.0 0.0.0.0 10.1.1.2

R3#conf t
R3(config)#ip route 0.0.0.0 0.0.0.0 10.2.2.1

R2#conf t
R2(config)#ip route 192.168.1.0 255.255.255.0 10.1.1.1
R2(config)#ip route 192.168.3.0 255.255.255.0 10.2.2.2

Verify connectivity from R1

```
R1#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 = 1/3/8 ms
R1#ping 10.1.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 56/64/76 ms
R1#ping 10.1.1.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/31/48 ms
R1#ping 10.2.2.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.2.2.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/27/32 ms
R1#ping 10.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.2.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 56/58/60 ms
R1#ping 192.168.3.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.3.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/56/64 ms
R1#
```

Step 3: Secure management access.

a. On R1, use the **security passwords** command to set a minimum password length of 10 characters.

R1(config)#security passwords min-length 10

b. Configure the enable secret encrypted password on both routers.

R1(config)#enable secret class12345

c. Configure a console password and enable login for routers. For additional security, the **exectimeout** command causes the line to log out after 5 minutes of inactivity. The **logging synchronous** command prevents console messages from interrupting command entry. **Note**: To avoid repetitive logins during this lab, the **exec-timeout** command can be set to 0 0, which prevents it from expiring.

R1(config)#line console 0
R1(config-line)#password ciscoconpass
R1(config-line)#exec-timeout 5 0
R1(config-line)#login
R1(config-line)#logging synchronous
R1(config-line)#exit

d. Configure the password on the vty lines for router R1.

R1(config)#line vty 0 4
R1(config-line)#password ciscovtypass
R1(config-line)#exec-timeout 5 0
R1(config-line)#login
R1(config-line)#exit

e. The aux port is a legacy port used to manage a router remotely using a modem and is hardly ever used. Therefore, disable the aux port.

R1(config)#line aux 0
R1(config-line)#no exec
R1(config-line)#end

f. Use the **service password-encryption** command to encrypt the line console and vty passwords.

R1#conf t
R1(config)#service password-encryption

g. Configure a warning to unauthorized users with a message-of-the-day (MOTD) banner using the **banner motd** command. When a user connects to one of the routers, the MOTD banner appears before the login prompt. In this example, the dollar sign ($) is used to start and end the message.

R1(config)#banner motd $Unauthorized access strictly prohibited!$
R1(config)#exit

Repeat the configuration portion of steps 3a through 3g on router R3.

```
R3#conf t
R3(config)#security passwords min-length 10
R3(config)#enable secret class12345
R3(config)#line console 0
R3(config-line)#password ciscoconpass
R3(config-line)#exec-timeout 5 0
R3(config-line)#login
R3(config-line)#logging synchronous
R3(config-line)#exit

R3(config)#line vty 0 4
R3(config-line)#password ciscovtypass
R3(config-line)#exec-timeout 5 0
R3(config-line)#login
R3(config-line)#exit

R3(config)#line aux 0
R3(config-line)#no exec
R3(config-line)#end

R3#conf t
R3(config)#service password-encryption
R3(config)#banner motd $Unauthorized access strictly prohibited!$
R3(config)#exit
```

Step 4: Configure enhanced username password security.

a. To create local database entry encrypted to level 4 (SHA256), use the **username** *name* **secret** *password* global configuration command. In global configuration mode, enter the following command:

```
R1#conf t
R1(config)#username JR-ADMIN secret class12345 R1(config)#username
ADMIN secret class54321
```

b. Set the console line to use the locally defined login accounts.

```
R1(config)#line console 0
R1(config-line)#login local
R1(config-line)#exit
```

c. Set the vty lines to use the locally defined login accounts.

```
R1(config)#line vty 0 4
R1(config-line)#login local
R1(config-line)#end
R1#
```

d. Repeat the steps 4a to 4c on R3.

```
R3#conf t
```

R3(config)#username JR-ADMIN secret class12345
R3(config)#username ADMIN secret class54321
R3(config)#line console 0
R3(config-line)#login local
R3(config-line)#exit
R3(config)#line vty 0 4
R3(config-line)#login local
R3(config-line)#end

e. To verify the configuration, telnet to R3 from R1 and login using the ADMIN local database account.

Step 5: Enabling AAA RADIUS Authentication with Local User for Backup.

a. Always have local database accounts created before enabling AAA. Since we created two local database accounts in the previous step, then we can proceed and enable AAA on R1. R1(config)#aaa new-model

b. Configure the specifics for the first RADIUS server located at 192.168.1.101. Use **RADIUS1-pa55w0rd** as the server password.

R1(config)#radius server RADIUS-1
R1(config-radius-server)#address ipv4 192.168.1.101
R1(config-radius-server)#key RADIUS-1-pa55w0rd R1(config-radius-server)#exit

c. Configure the specifics for the second RADIUS server located at 192.168.1.102. Use **RADIUS-2-pa55w0rd** as the server password.

R1(config)#radius server RADIUS-2
R1(config-radius-server)#address ipv4 192.168.1.102
R1(config-radius-server)#key RADIUS-2-pa55w0rd R1(config-radius-server)#exit

d. Assign both RADIUS servers to a server group. R1(config)#aaa group server radius RADIUS-GROUP

R1(config-sg-radius)#server name RADIUS-1
R1(config-sg-radius)#server name RADIUS-2
R1(config-sg-radius)#exit

e. Enable the default AAA authentication login to attempt to validate against the server group. If they are not available, then authentication should be validated against the local database..

R1(config)#aaa authentication login default group RADIUS-GROUP local

f. Enable the default AAA authentication Telnet login to attempt to validate against the server group. If they are not available, then authentication should be validated against a case sensitive local database.

```
R1(config)#aaa authentication login TELNET-LOGIN group RADIUS-GROUP local-case
```

g. Alter the VTY lines to use the TELNET-LOGIN AAA authentiaiton method.

```
R1(config)#line vty 0 4
R1(config-line)#login authentication TELNET-LOGIN
R1(config-line)#exit
R1(config)#
```

h. Repeat the steps 5a to 5g on R3.

```
R3#conf t
R3(config)#aaa new-model
R3(config)#radius server RADIUS-1
R3(config-radius-server)#address ipv4 192.168.1.101
R3(config-radius-server)#key RADIUS-1-pa55w0rd
R3(config-radius-server)#exit
R3(config)#radius server RADIUS-2
R3(config-radius-server)#address ipv4 192.168.1.102
R3(config-radius-server)#key RADIUS-2-pa55w0rd
R3(config-radius-server)#exit
R3(config)#aaa group server radius RADIUS-GROUP
R3(config-sg-radius)#server name RADIUS-1
R3(config-sg-radius)#server name RADIUS-2
R3(config-sg-radius)#exit
R3(config)#aaa authentication login default group RADIUS-GROUP local
R3(config)#aaa authentication login TELNET-LOGIN group RADIUS-GROUP local-case
R3(config)#line vty 0 4
R3(config-line)#login authentication TELNET-LOGIN
R3(config-line)#exit
R3(config)#
```

i. To verify the configuration, telnet to R3 from R1 and login using the ADMIN local database

```
R1#telnet 10.2.2.2
Trying 10.2.2.2 ... Open
Unauthorized access strictly prohibited!
User Access Verification

Username: admin
Password:

% Authentication failed
```

```
R1#telnet 10.2.2.2
Trying 10.2.2.2 ... Open
Unauthorized access strictly prohibited!

User Access Verification

Username: ADMIN
Password:

R3>
```

Note: The actual login time is longer since the RADIUS servers are not available.

Step 6: Enabling secure remote management using SSH.

a. SSH requires that a device name and a domain name be configured. Since the router already has a name assigned, configure the domain name.

```
R1#conf t
R1(config)#ip domain-name ccnasecurity.com
```

b. The router uses the RSA key pair for authentication and encryption of transmitted SSH data. Although optional it may be wise to erase any existing key pairs on the router.

```
R1(config)#crypto key zeroize rsa
% No Signature Keys found in configuration.
```

c. Generate the RSA encryption key pair for the router. Configure the RSA keys with **1024** for the number of modulus bits. The default is 512, and the range is from 360 to 2048.

```
R1(config)#crypto key generate rsa general-keys modulus 1024 The
name for the keys will be: R1.ccnasecurity.com

% The key modulus size is 1024 bits
% Generating 1024 bit RSA keys, keys will be non-exportable... [OK]
(elapsed time was 1 seconds)

R1(config)#
*Apr 9 18:21:15.683: %SSH-5-ENABLED: SSH 1.99 has been enabled
```

d. Configure SSH version 2 on R1.

```
R1#conf t
R1(config)#ip ssh version 2
```

e. Configure the vty lines to use only SSH connections.

```
R1(config)#line vty 0 4
R1(config-line)#transport input ssh
R1(config-line)#end
R1#
```

f. Verify the SSH configuration using the **show ip ssh** command.

```
R1#sh ip ssh
SSH Enabled - version 2.0
Authentication timeout: 120 secs; Authentication retries: 3
Minimum expected Diffie Hellman key size : 1024 bits
IOS Keys in SECSH format(ssh-rsa, base64 encoded):
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAAAgQCusWpZxSxci4AXX7csxYc5winMsKCEdmk1t+PuK2aU
30msvz62cjmENZXcg582wcW6MsqNqCmQxWXeQuwt672MWsZ9x+8EncVJsmbPKPzO4tioSi0IRbpicD7A
fUFtMiqzreuJ5U6Uhpo8b9EBFJqnczLJAkUMyzDRq8OcRgFOTw==
R1#
```

g. Repeat the steps 6a to 6f on R3.

```
R3#conf t
```

R3(config)#ip domain-name ccnasecurity.com
R3(config)#crypto key zeroize rsa
% No Signature Keys found in configuration.

R3(config)#crypto key generate rsa general-keys modulus 1024
The name for the keys will be: R3.ccnasecurity.com

% The key modulus size is 1024 bits
% Generating 1024 bit RSA keys, keys will be non-exportable...
[OK] (elapsed time was 0 seconds)

R3(config)#
*Apr 9 18:24:19.763: %SSH-5-ENABLED: SSH 1.99 has been enabled
R3(config)#ip ssh version 2
R3(config)#line vty 0 4
R3(config-line)#transport input ssh
R3(config-line)#end
R3#

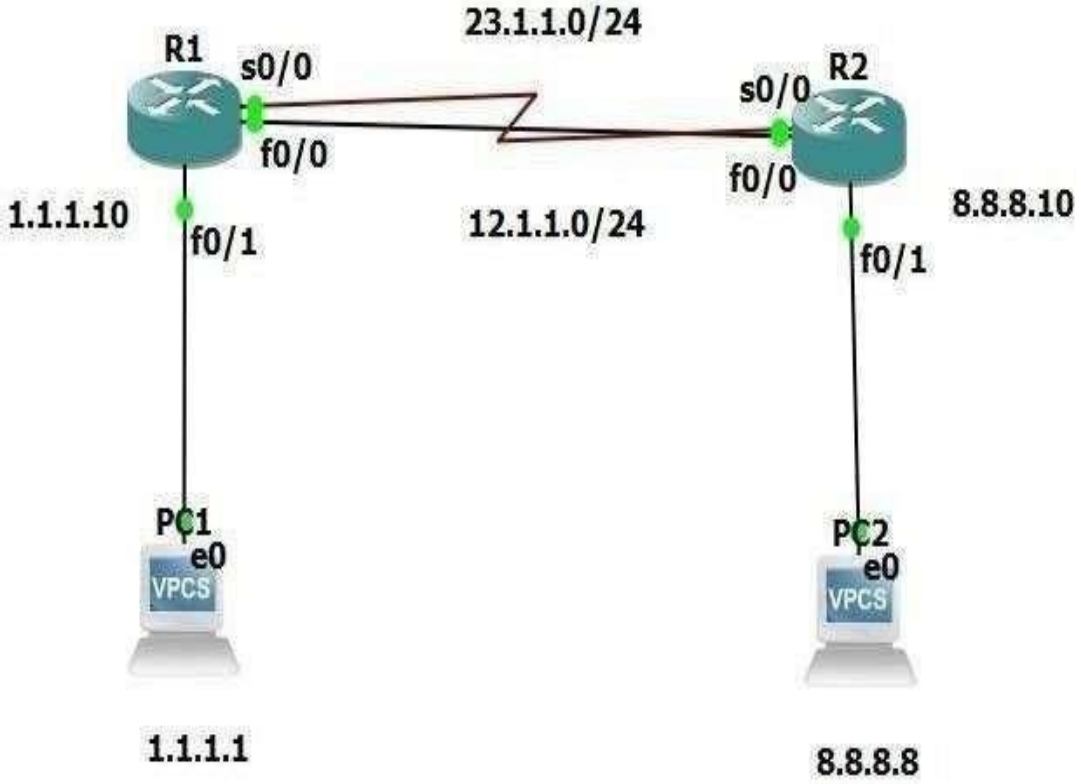
```
R3#sh ip ssh
SSH Enabled - version 2.0
Authentication timeout: 120 secs; Authentication retries: 3
Minimum expected Diffie Hellman key size : 1024 bits
IOS Keys in SECSH format(ssh-rsa, base64 encoded):
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAAAgQCizxUKc0w5wB/m8wbM9o0m17xXFJagVcTOWkQY3bfQ
sKai44Y6J/6ycE7ZnwUjRUOvkNXrKFUcd0BBtugSesjAxUV3LRilMpQWttab/V3klGNsZ+KaEKd8z09d
uAuXH5s+fdoPGkoDzb/xlFxRpGnDf7XNs0MsHjrWj32dp1p0Yw==
R3#
```

h. Although a user can SSH from a host using the SSH option of TeraTerm of PuTTY, a routercan also SSH to another SSH enabled device. SSH to R3 from R1

```
R1#ssh -l ADMIN 10.2.2.2
Password:
Unauthorized access strictly prohibited!R3>en
Password:
R3#
```

Practical 5:

Aim: configuring PBR (on GNS3)



Configure R1:

R1#conf t
R1(config)#int fa0/0
R1(config-if)#ip add 12.1.1.1 255.255.255.0 R1(config-if)#no shut
R1(config-if)#exit R1(config)#int s2/0
R1(config-if)#ip add 23.1.1.1 255.255.255.0
R1(config-if)#no shut
R1(config-if)#exit
R1(config)#int f1/0
R1(config-if)#ip add 1.1.1.10 255.255.255.0
R1(config-if)#no shut
R1(config)#exit

Configure R2:

R2#conf t
R2(config)#int fa0/0
R2(config-if)#ip add 12.1.1.2 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#int se2/0
R2(config-if)#ip add 23.1.1.2 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#int fa1/0
R2(config-if)#ip add 8.8.8.10 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit

Configure OSPF ON R1 R1#conf
t
R1(config)#router ospf 100
R1(config-router)#network 12.1.1.0 0.0.0.255 area 1
R1(config-router)#network 23.1.1.0 0.0.0.255 area 1
R1(config-router)#network 1.1.1.0 0.0.0.255 area 1
R1(config-router)#exit R1(config)#

Configure OSPF ON R2
R2#conf t
R2(config)#router ospf 100
R2(config-router)#network 12.1.1.0 0.0.0.255 area 1
R2(config-router)#network 12.1.1.0 0.0.0.255 area 1 R2(config-router)#network 23.1.1.0
0.0.0.255 area 1
R2(config-router)#network 23.1.1.0 0.0.0.255 area 1
R2(config-router)#network 8.8.8.0 0.0.0.255 area 1
R2(config-router)#exit
R2(config)#exit
Check connectivity on R1

```
R1#sh ip route
Codes: 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

Gateway of last resort is not set

     1.0.0.0/24 is subnetted, 1 subnets
C       1.1.1.0 is directly connected, FastEthernet1/0
     23.0.0.0/24 is subnetted, 1 subnets
C       23.1.1.0 is directly connected, Serial2/0
     8.0.0.0/24 is subnetted, 1 subnets
O       8.8.8.0 [110/2] via 12.1.1.2, 00:00:32, FastEthernet0/0
     12.0.0.0/24 is subnetted, 1 subnets
C       12.1.1.0 is directly connected, FastEthernet0/0
R1#
```

Check connectivity on R2

```
R2
R2(config)#exit
R2#
*Apr 29 12:21:22.347: %SYS-5-CONFIG_I: Configured from console by console
R2#
R2#sh ip route
Codes: 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

Gateway of last resort is not set

     1.0.0.0/24 is subnetted, 1 subnets
O       1.1.1.0 [110/2] via 12.1.1.1, 00:01:30, FastEthernet0/0
     23.0.0.0/24 is subnetted, 1 subnets
C       23.1.1.0 is directly connected, Serial2/0
     8.0.0.0/24 is subnetted, 1 subnets
C       8.8.8.0 is directly connected, FastEthernet1/0
     12.0.0.0/24 is subnetted, 1 subnets
C       12.1.1.0 is directly connected, FastEthernet0/0
R2#
```

Configure PC1

```
PC1> ip 1.1.1.1 255.255.255.0 1.1.1.0
Invalid gateway address

PC1> ip 1.1.1.1 255.255.255.0 1.1.1.10
Checking for duplicate address...
PC1 : 1.1.1.1 255.255.255.0 gateway 1.1.1.10

PC1>
PC1>
```

Configure PC2

```
PC2> ip 8.8.8.8 255.255.255.0 8.8.8.10
Checking for duplicate address...
PC1 : 8.8.8.8 255.255.255.0 gateway 8.8.8.10

PC2>
```

PC1> ping 8.8.8.8
8.8.8.8 icmp_seq=1 timeout
84 bytes from 8.8.8.8 icmp_seq=2 ttl=62 time=72.629 ms
84 bytes from 8.8.8.8 icmp_seq=3 ttl=62 time=44.246 ms
84 bytes from 8.8.8.8 icmp_seq=4 ttl=62 time=76.415 ms
84 bytes from 8.8.8.8 icmp_seq=5 ttl=62 time=55.456 ms

Configure PBR on R2

R2#conf t
R2(config)#access-list 100 permit icmp host 1.1.1.1 host 8.8.8.8
R2(config)#access-list 100 permit ip any any
R2(config)#access-list 101 permit icmp host 1.1.1.1 host 8.8.8.8
R2(config)#access-list 101 permit ip any any
R2(config)#int s2/0
R2(config-if)#ip access-group 100 in
R2(config-if)#exit
R2(config)#int fa0/0
R2(config-if)#ip access-group 101 in
R2(config-if)#exit
R2(config)#exit

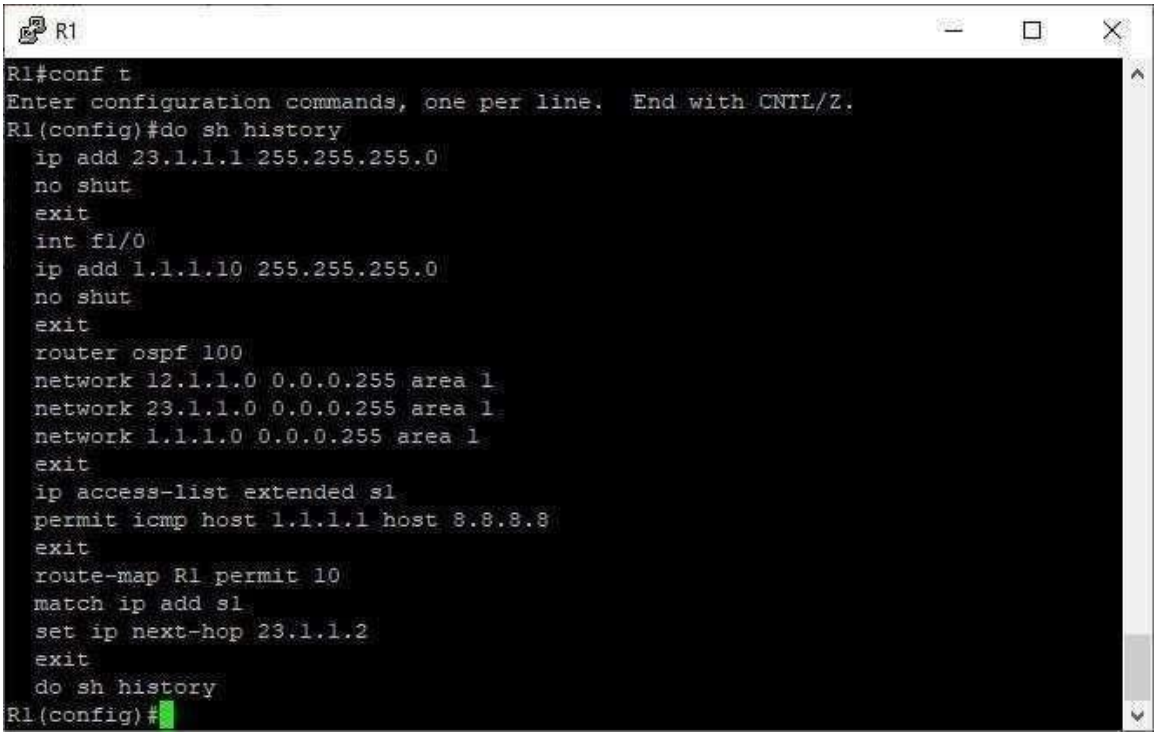
Check access-list on R2

```
R2#sh ip access-list
Extended IP access list 100
    10 permit icmp host 1.1.1.1 host 8.8.8.8
    20 permit ip any any (13 matches)
Extended IP access list 101
    10 permit icmp host 1.1.1.1 host 8.8.8.8
    20 permit ip any any (10 matches)
R2#
```

Configure PBR on R1

R1#conf t
R1(config)#ip access-list extended s1
R1(config-ext-nacl)#permit icmp host 1.1.1.1 host 8.8.8.8
R1(config-ext-nacl)#exit
R1(config)#route-map R1 permit 10
R1(config-route-map)#match ip add s1
R1(config-route-map)#set ip next-hop 23.1.1.2

R1(config-route-map)#exit
R1(config)#



R1(config)#int f1/0
R1(config-if)#ip policy route-map R1
R1(config-if)#do sh history

```
R1#sh route-map
route-map R1, permit, sequence 10
  Match clauses:
    ip address (access-lists): s1
  Set clauses:
    ip next-hop 23.1.1.2
  Policy routing matches: 0 packets, 0 bytes
R1#sh ip policy
Interface      Route map
Fa1/0          R1
R1#
```

```
R1#sh ip route
Codes: 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

Gateway of last resort is not set

     1.0.0.0/24 is subnetted, 1 subnets
C       1.1.1.0 is directly connected, FastEthernet1/0
     23.0.0.0/24 is subnetted, 1 subnets
C       23.1.1.0 is directly connected, Serial2/0
     8.0.0.0/24 is subnetted, 1 subnets
O       8.8.8.0 [110/2] via 12.1.1.2, 00:29:26, FastEthernet0/0
     12.0.0.0/24 is subnetted, 1 subnets
C       12.1.1.0 is directly connected, FastEthernet0/0
R1#
```

```
R2#sh ip access-list
Extended IP access list 100
    10 permit icmp host 1.1.1.1 host 8.8.8.8
    20 permit ip any any (13 matches)
Extended IP access list 101
    10 permit icmp host 1.1.1.1 host 8.8.8.8
    20 permit ip any any (10 matches)
R2#sh ip access-list
Extended IP access list 100
    10 permit icmp host 1.1.1.1 host 8.8.8.8
    20 permit ip any any (132 matches)
Extended IP access list 101
    10 permit icmp host 1.1.1.1 host 8.8.8.8
    20 permit ip any any (129 matches)
R2#
```

Practical No. : 6

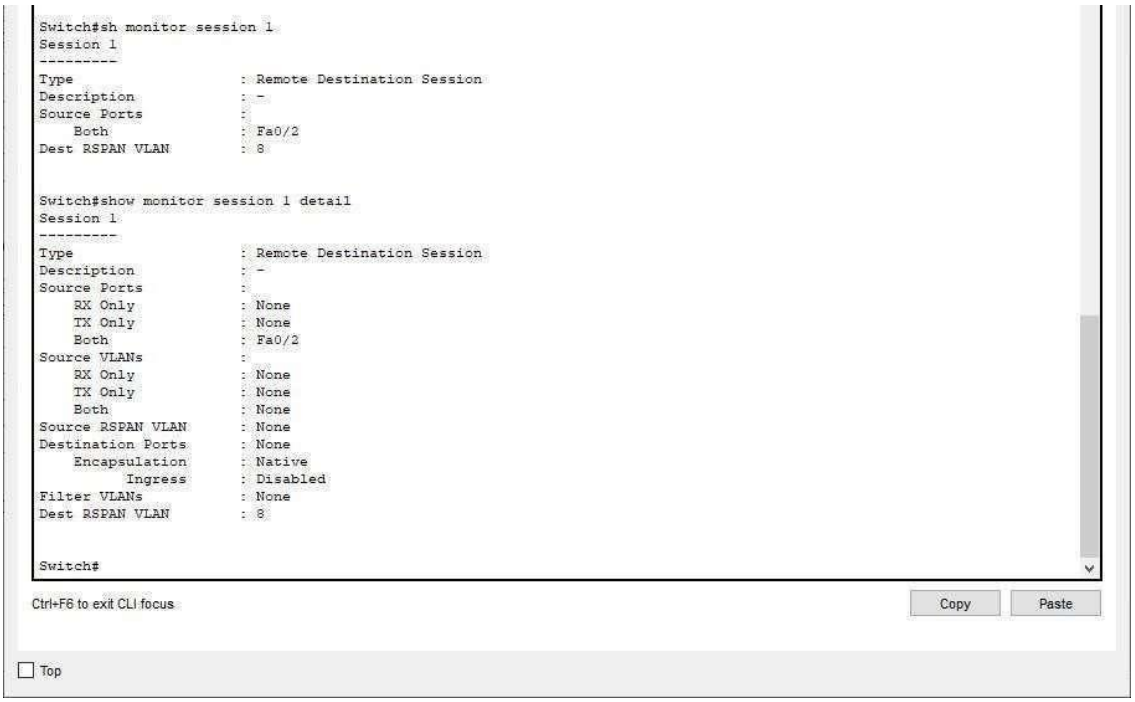
Aim: Configuring remote SPAN (On Cisco Packet Tracer)

Configure S1

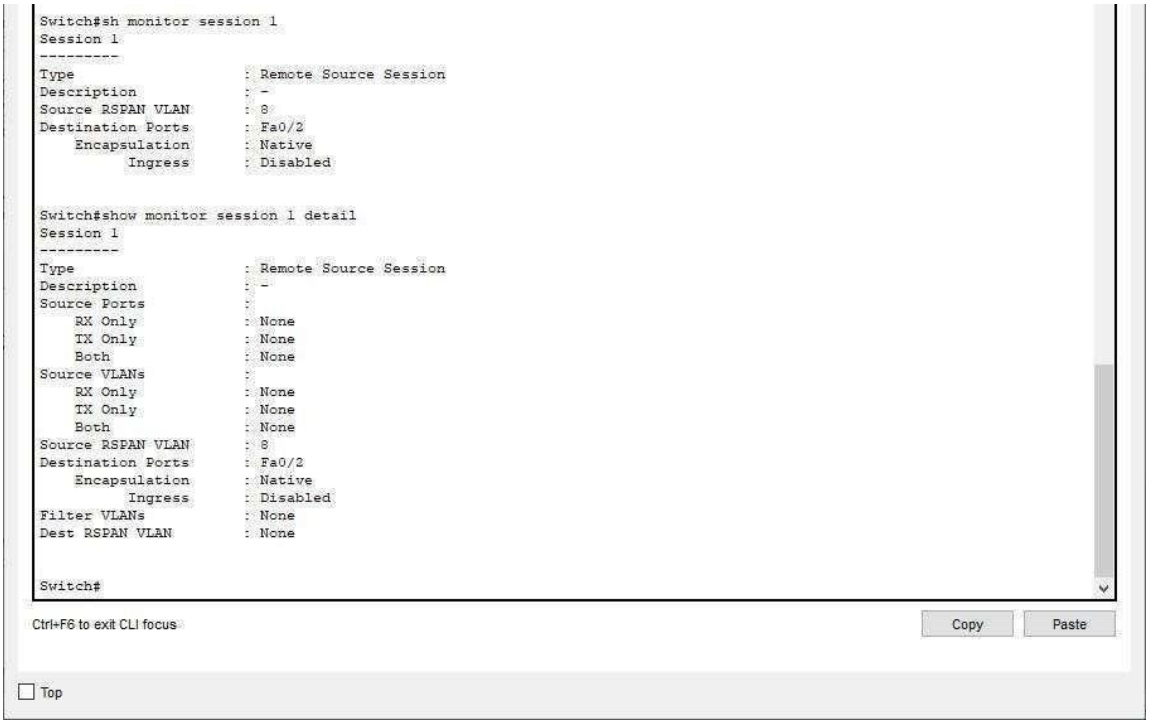
Switch>en
Switch#conf t
Switch(config)#vlan 8
Switch(config-vlan)#remote-span
Switch(config-vlan)#monitor session 1 source int fa0/2
Switch(config)#monitor session 1 destination remote vlan 8 reflector-port fa0/5
Switch(config)#^Z

Configure S2 Switch>en
Switch#conf t
Switch(config)#vlan 8
Switch(config-vlan)#remote-span
Switch(config-vlan)#monitor session 1 source remote vlan 8
Switch(config)#monitor session 1 destination int fa0/2 Switch(config)#^Z

Output S1:



Output S2:

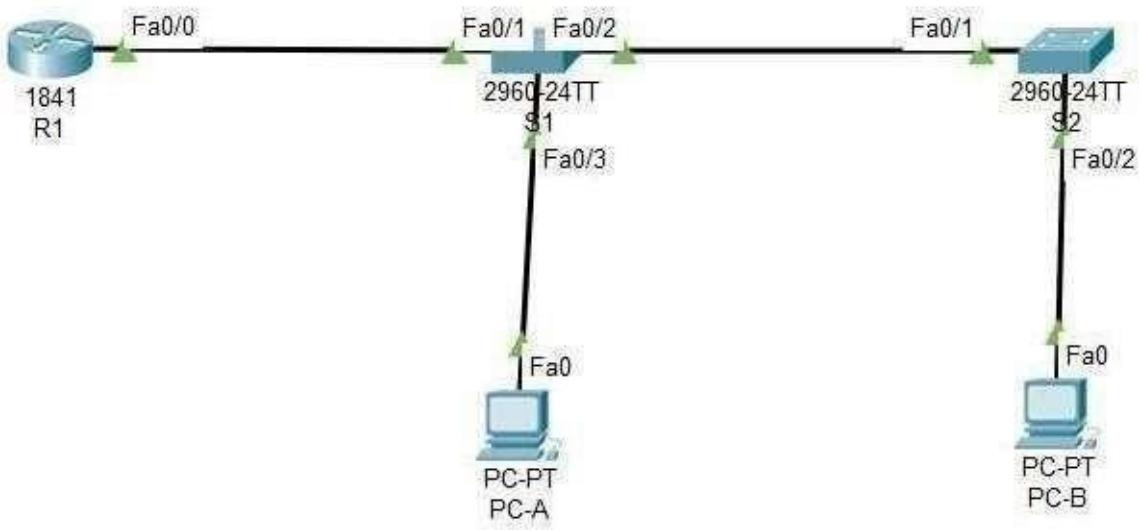

Switch#sh monitor session 1
Session 1

Type : Remote Source Session
Description : -
Source RSPAN VLAN : 8
Destination Ports : Fa0/2
Encapsulation : Native
Ingress : Disabled
Switch#show monitor session 1 detail
Session 1

Type : Remote Source Session
Description : -
Source Ports :
RX Only : None
TX Only : None
Both : None
Source VLANs :
RX Only : None
TX Only : None
Both : None
Source RSPAN VLAN : 8
Destination Ports : Fa0/2
Encapsulation : Native
Ingress : Disabled
Filter VLANs : None
Dest RSPAN VLAN : None
Switch#
Ctrl+F6 to exit CLI focus
Copy
Paste
Top

Practical :7

Aim: Configuring Inter-VLAN Routing(On Packet Tracer).



Addressing Table

Device	Interfaces	IP Address	Subnet Mask	Default Gateway
R1	F0/0.10	192.168.10.1	255.255.255.0	N/A
	F0/0.20	192.168.20.1	255.255.255.0	
	F0/0.30	192.168.30.1	255.255.255.0	
	F0/0.1000	N/A	N/A	
S1	VLAN 10	192.168.10.11	255.255.255.0	192.168.10.1
S2	VLAN 10	192.168.10.12	255.255.255.0	192.168.10.1
PC-A	NIC	192.168.20.3	255.255.255.0	192.168.20.1
PC-B	NIC	192.168.30.3	255.255.255.0	192.168.30.1

VLAN Table

VLAN	Name	Interface Assigned
10	Management	S1: VLAN 10
		S2: VLAN 10
20	Sales	S1: F0/3
30	Operations	S2: F0/2
999	Parking-Lot	S1: F0/4-24, G0/1-2
		S2: F0/3-24, G0/1-2
1000	Native	N/A

Assgining switch 1 for VLAN

Switch>en
Switch#conf t
Switch(config)#hostname S1
S1(config)#vlan 10
S1(config-vlan)#name Management
S1(config-vlan)#exit
S1(config)#vlan 20
S1(config-vlan)#name Sales
S1(config-vlan)#exit
S1(config)#vlan 30
S1(config-vlan)#name Opeartions
S1(config-vlan)#exit
S1(config)#vlan 999
S1(config-vlan)#name Parking-Lot
S1(config-vlan)#exit
S1(config)#vlan 1000
S1(config-vlan)#name Native
S1(config-vlan)#exit
S1(config)#end

Check VLAN on S1

```
S1#sh vlan br

VLAN Name                              Status    Ports
---- --------------------------------- ---------
-------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/3,
Fa0/4
                                                 Fa0/5, Fa0/6, Fa0/7,
Fa0/8
                                                 Fa0/9, Fa0/10,
Fa0/11, Fa0/12
                                                 Fa0/13, Fa0/14,
Fa0/15, Fa0/16
                                                 Fa0/17, Fa0/18,
Fa0/19, Fa0/20
                                                 Fa0/21, Fa0/22,
Fa0/23, Fa0/24
                                                 Gig0/1, Gig0/2
10   Management                        active
20   Sales                             active
30   Opeartions                        active
999  Parking-Lot                       active
1000 Native                            active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
S1#
```

Configure S1 for VLAN 10

S1#conf t
S1(config)#int vlan 10

```
ip add 192.168.10.11 255.255.255.0 S1(config-
if)#exit
S1(config)#ip default-gateway 192.168.10.1
S1(config)#int vlan 10
S1(config-if)#no shut
S1(config-if)#exit
S1(config)#end
S1#conf t
S1(config)#int range f0/4-24, g0/1-2
S1(config-if-range)#switchport mode access
S1(config-if-range)#switchport access vlan 999
S1(config-if-range)#shutdown
```

OUTPUT:

```
%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/6, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/9, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/10, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/11, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/12, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/13, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/14, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/15, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/16, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/17, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/18, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/19, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/20, changed state to administratively down
```

%LINK-5-CHANGED: Interface FastEthernet0/21, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/22, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/23, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/24, changed state to administratively down

%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to administratively down

%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to administratively down

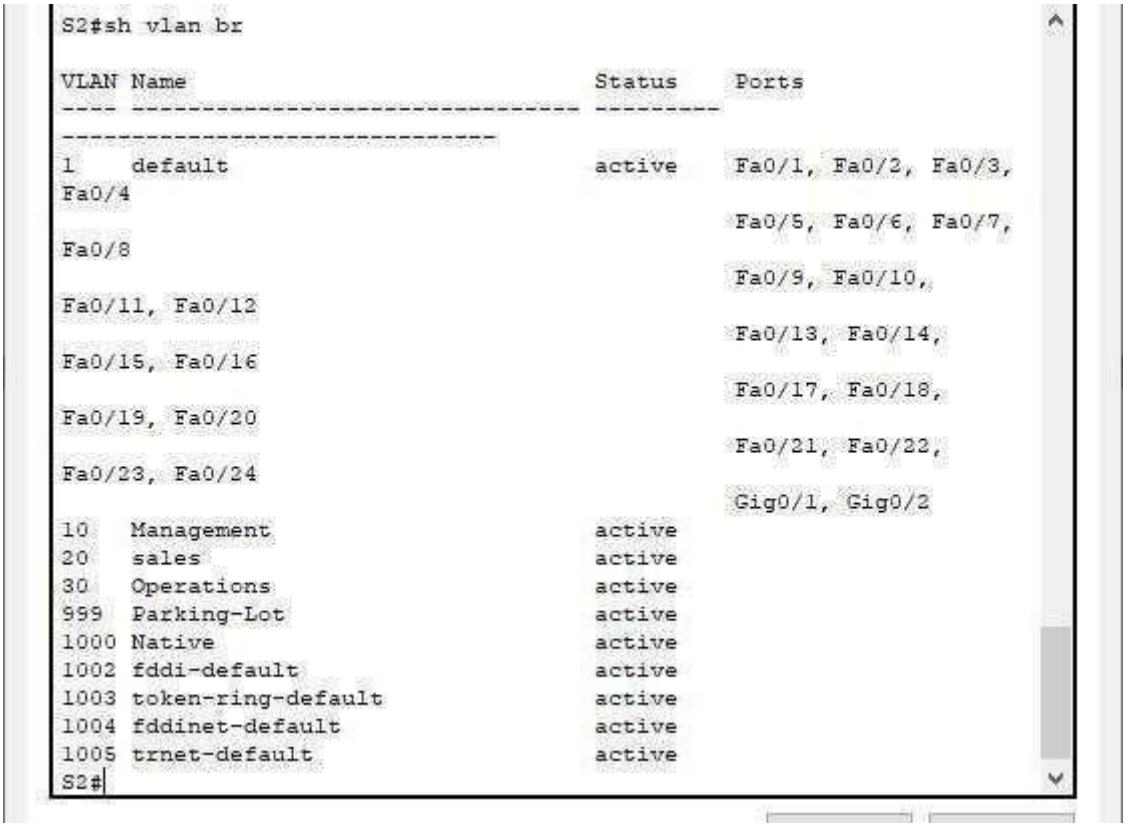
```
S1#sh vlan br

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/3
10   Management                        active
20   Sales                             active
30   Opeartions                        active
999  Parking-Lot                       active    Fa0/4, Fa0/5, Fa0/6, Fa0/7
                                                  Fa0/8, Fa0/9, Fa0/10, Fa0/11
                                                  Fa0/12, Fa0/13, Fa0/14, Fa0/15
                                                  Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                                  Fa0/20, Fa0/21, Fa0/22, Fa0/23
                                                  Fa0/24, Gig0/1, Gig0/2
1000 Native                            active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
S1#
```

Assign switch 2 for VLAN

Switch>en
Switch#conf t
Switch(config)#hostname S2
S2(config)#vlan 10
S2(config-vlan)#name Management
S2(config-vlan)#exit
S2(config)#vlan 20
S2(config-vlan)#name sales
S2(config-vlan)#exit
S2(config)#vlan 30
S2(config-vlan)#name Operations
S2(config-vlan)#exit
S2(config)#vlan 999
S2(config-vlan)#name Parking-Lot
S2(config-vlan)#exit
S2(config)#vlan 1000
S2(config-vlan)#name Native

S2(config-vlan)#exit
S2(config)#end

Check VLAN on S2



```
S2#sh vlan br

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/3,
Fa0/4
                                                 Fa0/5, Fa0/6, Fa0/7,
Fa0/8
                                                 Fa0/9, Fa0/10,
Fa0/11, Fa0/12
                                                 Fa0/13, Fa0/14,
Fa0/15, Fa0/16
                                                 Fa0/17, Fa0/18,
Fa0/19, Fa0/20
                                                 Fa0/21, Fa0/22,
Fa0/23, Fa0/24
                                                 Gig0/1, Gig0/2
10   Management                        active
20   sales                             active
30   Operations                        active
999  Parking-Lot                       active
1000 Native                            active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
S2#
```

Configure S2 for VLAN 10

S2#conf t
S2(config-if)#ip add 192.168.10.12 255.255.255.0
S2(config-if)#int vlan 10
S2(config-if)#no shut
S2(config-if)#exit
S2(config)#int range f0/3-24,g0/1-2
S2(config-if-range)#switchport mode access
S2(config-if-range)#switchport access vlan 999
S2(config-if-range)#shutdown

OUTPUT:

%LINK-5-CHANGED: Interface FastEthernet0/3, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/6, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/9, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/10, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/11, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/12, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/13, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/14, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/15, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/16, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/17, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/18, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/19, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/20, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/21, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/22, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/23, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/24, changed state to administratively down

%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to administratively down

%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to administratively down
S2(config-if-range)#end
S2#

```
S2#sh vlan br

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2
10   Management                        active
20   sales                             active
30   Operations                        active
999  Parking-Lot                       active    Fa0/3, Fa0/4, Fa0/5,
Fa0/6
                                                 Fa0/7, Fa0/8, Fa0/9,
Fa0/10
                                                 Fa0/11, Fa0/12,
Fa0/13, Fa0/14
                                                 Fa0/15, Fa0/16,
Fa0/17, Fa0/18
                                                 Fa0/19, Fa0/20,
Fa0/21, Fa0/22
                                                 Fa0/23, Fa0/24,
Gig0/1, Gig0/2
1000 Native                            active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
S2#
```

Assign vlan 20 to f0/3on S1

S1>en
S1#conf t
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 20
S1(config-if)#exit
S1(config)#end
S1#

```
S1#sh vlan br

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2
10   Management                        active
20   Sales                             active    Fa0/3
30   Opeartions                        active
999  Parking-Lot                       active    Fa0/4, Fa0/5, Fa0/6, Fa0/7
                                                 Fa0/8, Fa0/9, Fa0/10, Fa0/11
                                                 Fa0/12, Fa0/13, Fa0/14, Fa0/15
                                                 Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                                 Fa0/20, Fa0/21, Fa0/22, Fa0/23
                                                 Fa0/24, Gig0/1, Gig0/2
1000 Native                            active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
S1#
```

Assign VLAN 30 to f0/2 on S2

S2#en
S2#conf t

Enter configuration commands, one per line. End with CNTL/Z. S2(config)#int f0/2
S2(config-if)#switchport mode access
S2(config-if)#switchport access vlan 30
S2(config-if)#exit
S2(config)#end
S2#

```
S2#sh vlan br

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1
10   Management                        active
20   sales                             active
30   Operations                        active    Fa0/2
999  Parking-Lot                       active    Fa0/3, Fa0/4, Fa0/5,
Fa0/6
                                                 Fa0/7, Fa0/8, Fa0/9,
Fa0/10
                                                 Fa0/11, Fa0/12,
Fa0/13, Fa0/14
                                                 Fa0/15, Fa0/16,
Fa0/17, Fa0/18
                                                 Fa0/19, Fa0/20,
Fa0/21, Fa0/22
                                                 Fa0/23, Fa0/24,
Gig0/1, Gig0/2
1000 Native                            active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
S2#
```

S1 to S2 connection and vice-versa

S1#en S1#conft
Enter configuration commands, one per line. End with CNTL/Z. S1(config)#int f0/2
S1(config-if)#switchport mode trunk
S1(config-if)#switchport trunk allowed vlan 10,20,30,1000
S1(config-if)#exit
S1(config)#end

OUTPUT:

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10, changed state to up S2#conf t
S2(config)#int f0/1
S2(config-if)#switchport mode trunk
S2(config-if)#switchport trunk Native vlan 1000
S2(config-if)#switchport trunk allowed vlan 10,20,30,1000
S2(config-if)#exit

S2(config)#end

Configure R1

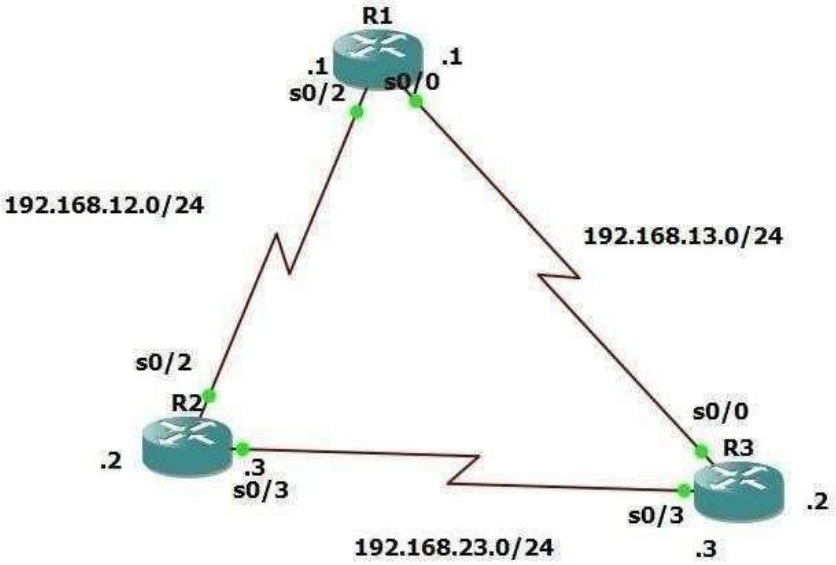
```
Router>en
Router#conf t
Router(config)#int f0/0.10
Router(config-subif)#description vlan 10
Router(config-subif)#encapsulation dot1q 10
Router(config-subif)#ip add 192.168.10.1 255.255.255.0
Router(config-subif)#exit
Router(config)#int f0/0.20
Router(config-subif)#description vlan 20
Router(config-subif)#encapsulation dot1q 20
Router(config-subif)#ip add 192.168.20.1 255.255.255.0
Router(config-subif)#exit
Router(config)#int f0/0.30
Router(config-subif)#description vlan 30
Router(config-subif)#ip add 192.168.30.1 255.255.255.0
Router(config-subif)#exit
Router(config)#int f0/0.1000
Router(config-subif)#description NATIVE
Router(config-subif)#encapsulation dot1q 1000 native
Router(config-subif)#exit
Router(config)#int f0/0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#end
```

```
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0,
changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.10,
changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.20,
changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.30,
changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.1000, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.1000,
changed state to up
```

```
Router#sh ip int br
Interface              IP-Address      OK? Method Status
Protocol
FastEthernet0/0        unassigned      YES unset  up
up
FastEthernet0/0.10     192.168.10.1    YES manual up
up
FastEthernet0/0.20     192.168.20.1    YES manual up
up
FastEthernet0/0.30     unassigned      YES unset  up
up
FastEthernet0/0.1000   unassigned      YES unset  up
up
FastEthernet0/1        unassigned      YES unset  administratively
down down
Vlan1                  unassigned      YES unset  administratively
down down
Router#
```

Practical No : 8 A

Aim: Configuring MPLS (On GNS3).



Configure router R1:-

R1#conf t R1(config)#int se1/0
R1(config-if)#ip add 192.168.13.1 255.255.255.0
R1(config-if)#no shut
R1(config-if)#exit
R1(config)#int se1/2
R1(config-if)#ip add 192.168.12.1 255.255.255.0
R1(config-if)#no shut
R1(config-if)#exit

Configure router R2

R2#conf t
R2(config)#int se1/2
R2(config-if)#ip add 192.168.12.2 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit

R2(config)#int se1/3
R2(config-if)#ip add 192.168.23.1 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit

Configure Router R3

R3#conf t
R3(config)#int se1/0
R3(config-if)#ip add 192.168.13.2 255.255.255.0
R3(config-if)#no shut
R3(config-if)#exit
R3(config)#int se1/3
R3(config-if)#ip add 192.168.23.2 255.255.255.0
R3(config-if)#no shut
R3(config-if)#exit

Configure OSPF on R1

R1#conf t
R1(config)#router ospf 1
R1(config-router)#network 192.168.12.0 255.255.255.0 area 0
R1(config-router)#network 192.168.13.0 255.255.255.0 area 0
R1(config-router)#end

Configure OSPF on R2

R2#conf t
R2(config)#router ospf 1
R2(config-router)#network 192.168.12.0 255.255.255.0 area 0
R2(config-router)#network 192.168.23.0 255.255.255.0 area 0 R2(config-router)#end

Configure OSPF on R3

R3#conf t
R3(config)#router ospf 1
R3(config-router)#network 192.168.13.0 255.255.255.0 area 0
R3(config-router)#network 192.168.13.0 255.255.255.0 area 0
R3(config-router)#network 192.168.23.0 255.255.255.0 area 0
R3(config-router)#end

Enable MPLS on R1 R1#conf
t
R1(config)#int se1/0
R1(config-if)#mpls ip
R1(config-if)#int se1/2
R1(config-if)#mpls ip

Enable MPLS on R2 R2#conf
t

R2(config)#int se1/2
R2(config-if)#mpls ip
R2(config-if)#int se1/3
R2(config-if)#mpls ip

Enable MPLS on R3

R3#conf t
R3(config)#int se1/0
R3(config-if)#mpls ip
R3(config-if)#int se1/3
R3(config-if)#mpls ip

Check MPLS interface

```
R1#sh mpls int
Interface              IP           Tunnel   Operational
Serial1/0              Yes (ldp)    No       Yes
Serial1/2              Yes (ldp)    No       Yes
R1#
```

Check MPLS interface

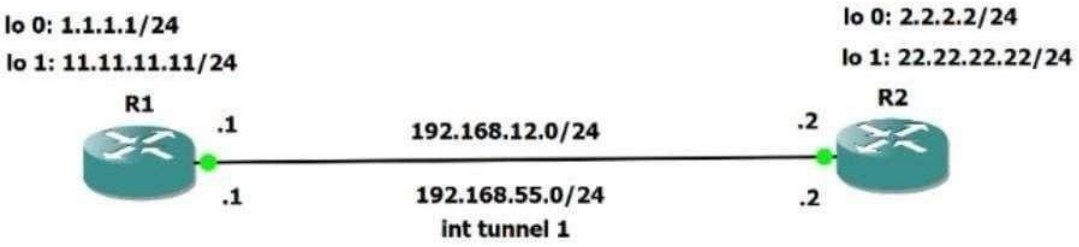
```
R2#sh mpls int
Interface              IP           Tunnel   Operational
Serial1/2              Yes (ldp)    No       Yes
Serial1/3              Yes (ldp)    No       Yes
R2#
```

Check MPLS interface

```
R3#sh mpls int
Interface              IP           Tunnel   Operational
Serial1/0              Yes (ldp)    No       Yes
Serial1/3              Yes (ldp)    No       Yes
R3#
```

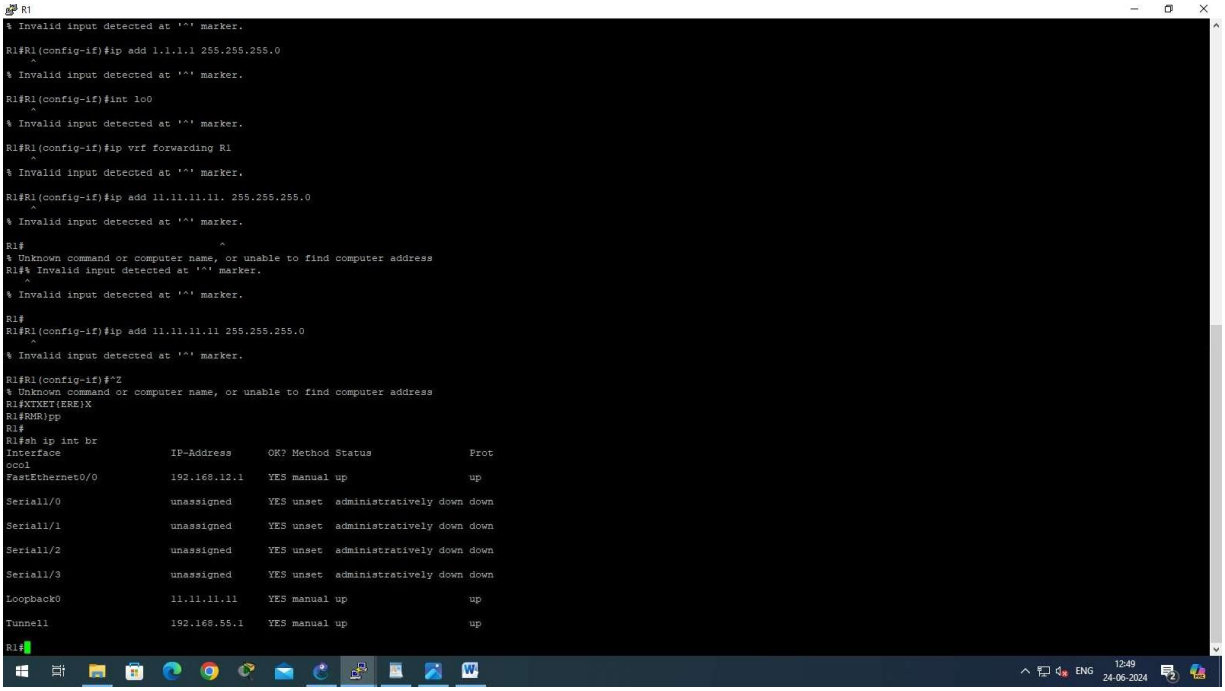
Practical 8B

Aim: Implement VRF



Configure R1/Dahanu:

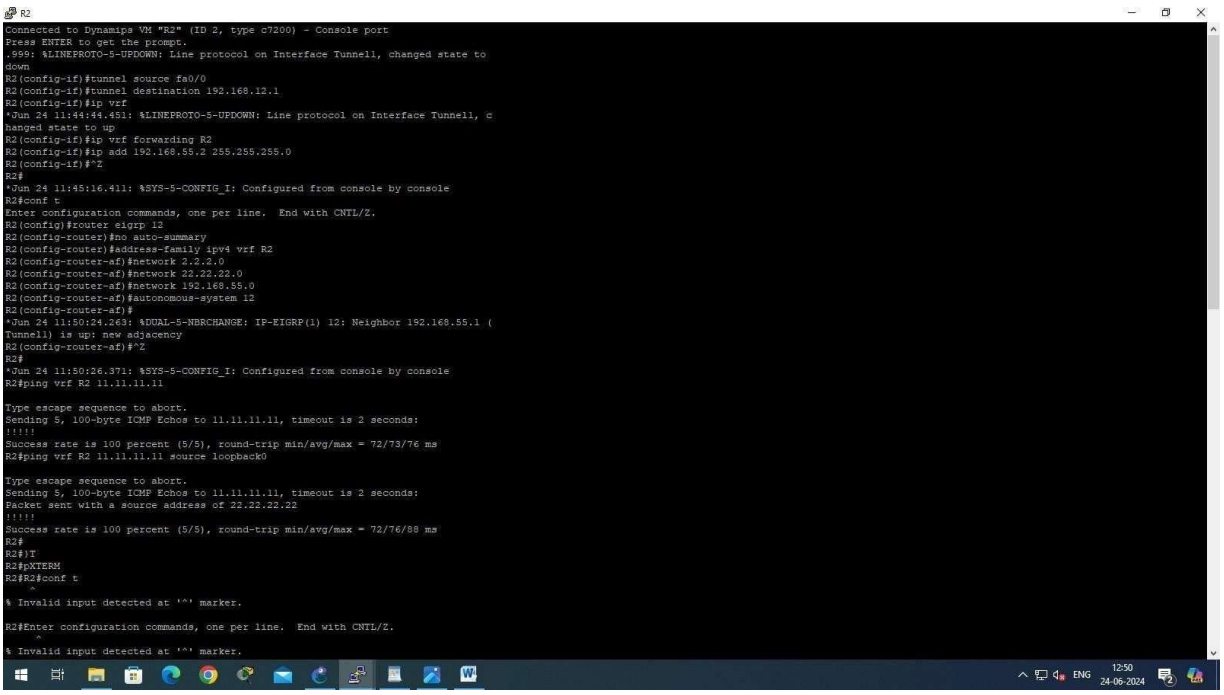
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#hostname R1
R1(config)#int fa0/0
R1(config-if)#ip add 192.168.12.1 255.255.255.0
R1(config-if)#no shut R1(config-
if)#exit
*Jun 24 11:39:17.951: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Jun 24 11:39:18.951: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up R1(config-if)#exit
R1(config)#ip vrf R1
R1(config-vrf)#exit
R1(config)#int lo0
R1(config-if)#int lo0
R1(config-if)#ip vrf forwarding R1
R1(config-if)#ip add 1.1.1.1 255.255.255.0
R1(config-if)#int lo0
R1(config-if)#ip vrf forwarding R1
R1(config-if)#ip add 11.11.11.11 255.255.255.0
R1(config-if)#^Z



Configure R2/Virar:

R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#hostname R2
R2(config)#int fa0/0
R2(config-if)#ip add 192.168.12.2 255.255.255.0

R2(config-if)#no shut
R2(config-if)#
*Jun 24 11:41:01.651: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R2(config-if)#
*Jun 24 11:41:01.651: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Jun 24 11:41:02.651: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up R2(config-if)#exit
R2(config)#ip vrf R2
R2(config-vrf)#exit
R2(config)#int lo0 R2(config-if)#ip
*Jun 24 11:41:26.487: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
R2(config-if)#ip vrf forwarding R2
R2(config-if)#ip add 2.2.2.2 255.255.255.0
R2(config-if)#int lo0
R2(config-if)#int lo0
R2(config-if)#ip vrf forwarding R2
R2(config-if)#ip add 22.22.22.22 255.255.255.0 R2(config-if)#^Z



Configure VRF on R1/Dahanu:

R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#int tunnel 1 R1(config-if)#t
*Jun 24 11:44:54.823: %LINEPROTO-5-UPDOWN: Line protocol on Interface Tunnel1, changed state to down
R1(config-if)#tunnel source fa0/0
R1(config-if)#tunnel destination 192.168.12.2

R1(config-if)#ip v
*Jun 24 11:45:20.927: %LINEPROTO-5-UPDOWN: Line protocol on Interface Tunnel1, changed state to up
R1(config-if)#ip vrf forwarding R1
R1(config-if)#ip add 192.168.55.1 255.255.255.0 R1(config-if)#^Z

Configure VRF on R2/Virar:

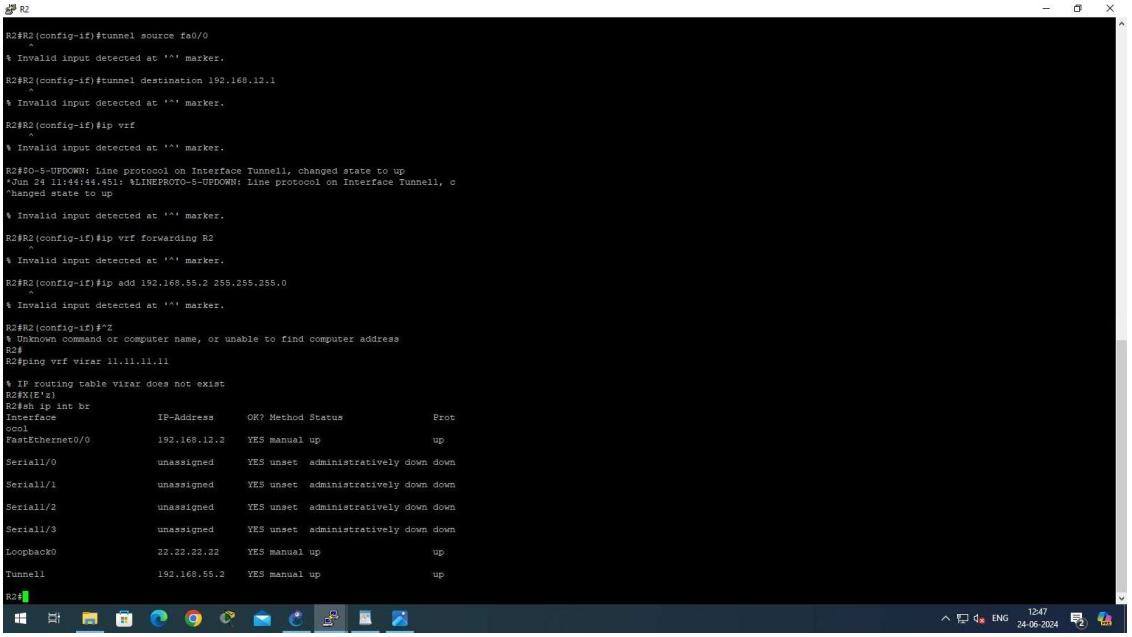
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#int tunnel 1
R2(config-if)#tunnel source fa0/0
R2(config-if)#tunnel destination 192.168.12.1
R2(config-if)#ip vrf forwarding R2
R2(config-if)#ip add 192.168.55.2 255.255.255.0
R2(config-if)#^Z

Configure VRF on R1/Dahanu:

R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router eigrp 12
R1(config-router)#no auto-summary
R1(config-router)#address-family ipv4 vrf R1
R1(config-router-af)#network 1.1.1.0
R1(config-router-af)#network 11.11.11.0
R1(config-router-af)#network 192.168.55.0
R1(config-router-af)#autonomous-system 12 R1(config-router-af)#^Z

Configure EIGRP on R2/Virar

R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router eigrp 12
R2(config-router)#no auto-summary
R2(config-router)#address-family ipv4 vrf R2
R2(config-router-af)#network 2.2.2.0
R2(config-router-af)#network 22.22.22.0
R2(config-router-af)#network 192.168.55.0
R2(config-router-af)#autonomous-system 12
R2(config-router-af)#^Z
*Jun 24 11:50:26.371: %SYS-5-CONFIG_I: Configured from console by console


R2
R2#R2(config-if)#tunnel source fa0/0
% Invalid input detected at '^' marker.
R2#R2(config-if)#tunnel destination 192.168.12.1
% Invalid input detected at '^' marker.
R2#R2(config-if)#ip vrf
% Invalid input detected at '^' marker.
R2#%0-5-UPDOWN: Line protocol on Interface Tunnel1, changed state to up
*Jun 24 11:44:44.451: %LINEPROTO-5-UPDOWN: Line protocol on Interface Tunnel1, c
^hanged state to up
% Invalid input detected at '^' marker.
R2#R2(config-if)#ip vrf forwarding R2
% Invalid input detected at '^' marker.
R2#R2(config-if)#ip add 192.168.55.2 255.255.255.0
% Invalid input detected at '^' marker.
R2#R2(config-if)#^Z
% Unknown command or computer name, or unable to find computer address
R2#
R2#ping vrf virar 11.11.11.11
% IP routing table virar does not exist
R2#X(E^z)
R2#sh ip int br
Interface IP-Address OK? Method Status Prot
ocol
FastEthernet0/0 192.168.12.2 YES manual up up
Serial1/0 unassigned YES unset administratively down down
Serial1/1 unassigned YES unset administratively down down
Serial1/2 unassigned YES unset administratively down down
Serial1/3 unassigned YES unset administratively down down
Loopback0 22.22.22.22 YES manual up up
Tunnel1 192.168.55.2 YES manual up up
R2#
ENG
12:47
24-06-2024