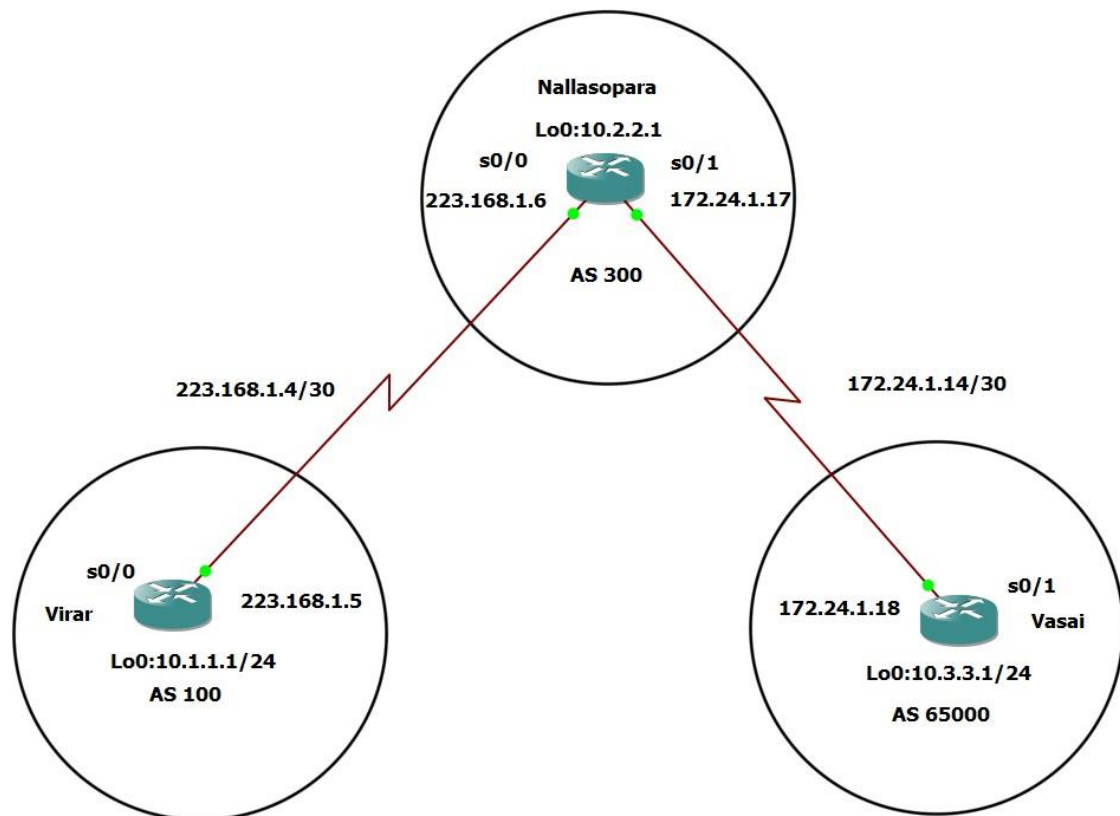


Practical No-2

Aim: Using AS_PATH Attribute

Topology:



Objective:

- Use BGP commands to prevent private AS numbers from being advertised to the outside world.
- Use the AS_PATH attribute to filter BGP routes Based on their sources AS number.

Step 1: Prepare the routers for the lab.

Cable the network as shown in the topology diagram. Erase the Startup configuration and reload each router to clear previous configurations.

Step 2: Configure the hostname and interface addresses.

- a. You can copy and paste the following configurations into your routers to begin

Router R1(hostname Virar)

```
Virar(config)# interface Loopback 0
Virar(config-if) #ip address 10.1.1.1 255.255.255.255
#
Virar(config-if) #exit
Virar(config-if) #int s0/0
Virar(config-if) #ip address 223.168.1.5 255.255.255.252
Virar(config-if) #no shutdown
Virar(config-if) #end
Virar#
```

```
Virar#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Virar(config)#interface Loopback0
Virar(config-if)#
*Mar  1 00:01:55.115: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
  changed state to up
Virar(config-if)#ip address 10.1.1.1 255.255.255.0
Virar(config-if)#exit
Virar(config)#int s0/0
Virar(config-if)#ip address 223.168.1.5 255.255.255.252
Virar(config-if)#no shutdown
Virar(config-if)#
*Mar  1 00:04:18.019: %LINK-3-UPDOWN: Interface Serial0/0, changed state to up
Virar(config-if)#
*Mar  1 00:04:19.023: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0,
  changed state to up
```

Router R2(hostname Nallasopara)

```
Nallasopara(config) #interface Loopback 0
Nallasopara(config-if) #ip address 10.2.2.1 255.255.255.0
Nallasopara(config-if) #exit
Nallasopara(config-if) #int s0/0
Nallasopara(config-if) #ip address 223.168.1.6 255.255.255.252
Nallasopara(config-if) #no shutdown
Nallasopara(config-if) #exit
```

Nallasopara(config-if) #int s0/1

Nallasopara(config-if) #ip address 172.24.1.17 255.255.255.252

Nallasopara(config-if) #no shutdown

Nallasopara(config-if) #end

Nallasopara#

```
Nallasopara#
Nallasopara#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Nallasopara(config)#interface loopback 0
Nallasopara(config-if)#
*Mar 1 00:19:06.143: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
changed state to up
Nallasopara(config-if)#ip address 10.2.2.1 255
% Incomplete command.

Nallasopara(config-if)#ip address 10.2.2.1 255.255.255.0
Nallasopara(config-if)#exit
Nallasopara(config)#int s0/0
Nallasopara(config-if)#ip address 223.168.1.6 255.255.255.252
Nallasopara(config-if)#no shutdown
Nallasopara(config-if)#exit
*Mar 1 00:21:13.879: %LINK-3-UPDOWN: Interface Serial0/0, changed state to up
Nallasopara(config-if)#exit
```

Router 3(hostname Vasai)

Vasai(config)# interface Loopback 0

Vasai(config-if) #ip address 10.3.3.1 255.255.255.0

Vasai(config-if) #exit

Vasai(config-if) #int s0/1

Vasai(config-if) #ip address 172.24.1.18 255.255.255.252

Vasai(config-if) #no shutdown

Vasai(config-if) #end

Vasai#

```
Nallasopara(config)#int s0/1
Nallasopara(config-if)#ip address 172.24.1.17 255.255.255.252
Nallasopara(config-if)#no shutdown
Nallasopara(config-if)#
*Mar 1 00:25:57.127: %LINK-3-UPDOWN: Interface Serial0/1, changed state to up
Nallasopara(config-if)#
```

```

Vasai#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Vasai(config)#interface loopback 0
Vasai(config-if)#
*Mar 1 00:32:27.599: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
changed state to up
Vasai(config-if)#ip address 10.3.3.1 255.255.255.0
Vasai(config-if)#exit
Vasai(config)#int s0/1
Vasai(config-if)#ip address 172.24.1.18 255.255.255.252
Vasai(config-if)#no shutdown
Vasai(config-if)#
*Mar 1 00:33:59.403: %LINK-3-UPDOWN: Interface Serial0/1, changed state to up
*Mar 1 00:34:00.403: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1,
changed state to up

```

- b. Use Ping to test the Connectivity between the directly connected routers.

```

Nallasopara#ping 223.168.1.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 223.168.1.5, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/6/16 ms
Nallasopara#
Nallasopara#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 = 1/10/48 ms

```

Step 3: Configure BGP.

- a. Configure BGP for normal operation. Enter the Appropriate BGP commands on each Router so that they identify their BGP neighbors and advertise their loopback networks.

```

Virar(config)# router bgp 100
Virar(config-router) #neighbor 223.168.1.6 remote-as 300
Virar(config-router) #network 10.1.1.0 mask 255.255.255.0
Virar(config-router) #

```

```

Virar(config)#
Virar(config)#router bgp 100
Virar(config-router)#neighbor 223.168.1.6 remote-as 300
Virar(config-router)#network 10.1.1.0 mask 255.255.255.0
Virar(config-router)#

```

```
Nallasopara(config)# router bgp 300
Nallasopara(config-router) #neighbor 223.168.1.5 remote-as 100
Nallasopara(config-router) #neighbor 172.24.1.18 remote-as 65000
Nallasopara(config-router) #10.20.2.0 mask 255.255.255.0
```

```
Nallasopara#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Nallasopara(config)#router bgp 300
Nallasopara(config-router)#neighbor 223.168.1.5 remote-as 100
Nallasopara(config-router)#
Nallasopara(config-router)#
*Mar 1 00:56:33.991: %BGP-5-ADJCHANGE: neighbor 223.168.1.5 Up
Nallasopara(config-router)#neighbor 172.24.1.18 remote-as 65000
Nallasopara(config-router)#network 10.2.2.0 mask 255.255.255.0
Nallasopara(config-router)#
```

```
Vasai(config) #router bgp 65000
Vasai(config-router) #neighbor 172.24.1.17 remote-as 300
Vasai(config-router) #network 10.3.3.0 mask 255.255.255.0
```

```
Vasai(config)#
Vasai(config)#router bgp 65000
Vasai(config-router)#nighbor 172.24.1.17 remote-as 300
^
% Invalid input detected at '^' marker.

Vasai(config-router)#neighbor 172.24.1.17 remote-as 300
Vasai(config-router)#
*Mar 1 01:29:13.087: %BGP-5-ADJCHANGE: neighbor 172.24.1.17 Up
Vasai(config-router)#network 10.3.3.0 mask 255.255.255.0
Vasai(config-router)#
```

- b. Verify that these routers have established the appropriate neighbor relationships by issuing the show ip bgp neighbors command each router.

Nallasopara# show ip bgp neighbors

```
Nallasopara#
Nallasopara#show 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 00:07:34
  Last read 00:00:34, last write 00:00:34, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0

      Sent      Rcvd
  Opens:         1         1
  Notifications: 0         0
  Updates:       3         1
  Keepalives:    10        10
  Route Refresh: 0         0
  Total:        14        12
  Default minimum time between advertisement runs is 30 seconds
```

Step 4: Remove the Private AS.

- a. Nallasopara the Virar routing table using the show ip route command. Virar should have a route to both 10.2.2.0 and 10.3.3.0 Troubleshoot if necessary.

Virar# Show ip route

```

Virar#
Virar#show 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

    223.168.1.0/30 is subnetted, 1 subnets
C       223.168.1.4 is directly connected, Serial0/0
    10.0.0.0/24 is subnetted, 3 subnets
B       10.3.3.0 [20/0] via 223.168.1.6, 00:13:30
B       10.2.2.0 [20/0] via 223.168.1.6, 00:45:15
C       10.1.1.0 is directly connected, Loopback0

```

- b. Ping Again, this time as an extended ping, sourcing from the Loopback 0 interface address. Ping 10.3.3.1 source 10.1.1.1 or ping 10.3.3.1 source Lo0

```

Virar#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 = 1/1/4 ms
Virar#
Virar#show 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     223.168.1.6         0           0 300 i
*> 10.3.3.0/24     223.168.1.6         0           0 300 65000 i

```

- c. Now check the BGP table on Virar. The AS_PATH to the 10.3.3.0 network should be AS 300. It no longer has the private AS in the path.

Virar# show ip bgp

```

Virar#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 = 1/1/4 ms
Virar#
Virar#show 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     223.168.1.6         0           0 300 i
*> 10.3.3.0/24     223.168.1.6         0           0 300 65000 i

```

Step 5: Use the AS_PATH attribute to filter routes.

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

Nallasopara(config) #ip as_path access-list 1 deny ^100\$

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

```

Nallasopara#
Nallasopara#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Nallasopara(config)#ip as-path access-list 1 deny ^100$
Nallasopara(config)#
Nallasopara(config)#ip as-path access-list 1 permit .*

```

- b. Apply the Configured access list using the neighbor command with the filter-list option.

Nallasopara(config) #router bgp 300

Nallasopara(config-router) #neighbor 223.168.1.5 remove-private-as

```

Nallasopara(config)#
Nallasopara(config)#router bgp 300
Nallasopara(config-router)#neighbor 172.24.1.18 filter-list 1 out
Nallasopara(config-router)#exit

```

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

Virar# show ip route

```

Virar#
Virar#show 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

    223.168.1.0/30 is subnetted, 1 subnets
C       223.168.1.4 is directly connected, Serial0/0
    10.0.0.0/24 is subnetted, 3 subnets
B       10.3.3.0 [20/0] via 223.168.1.6, 00:13:30
B       10.2.2.0 [20/0] via 223.168.1.6, 00:45:15
C       10.1.1.0 is directly connected, Loopback0

```

- d. Return to Nallasopara and Verify that the filter is working as intended.

Nallasopara# show ip bgp regexp ^100\$

```

Nallasopara#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      223.168.1.5             0         0 100 i

```

- e. Run the following TCL scripts on all routers to verify whether there is connectivity.
All pings from Nallasopara should be successful. Virar should not be able to ping the

Vasai loopback 10.3.3.1 or The WAN link 172.24.1.6/30. Vasai should not be able to ping Virar Loopback 10.1.1.1 or the WAN link 223.168.1.4/30.

```

Nallasopara(tcl)#foreach address {
+>10.1.1.1
+>10.2.2.1
+>10.3.3.1
+>223.168.1.5
+>223.168.1.6
+>172.24.1.17
+>172.24.1.18
+>} { ping $address }

```



```
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 = 1/1/1 ms
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 = 1/1/4 ms
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 = 1/1/1 ms
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 223.168.1.5, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 223.168.1.6, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/16 ms
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 = 1/3/12 ms
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 = 1/1/4 ms
```