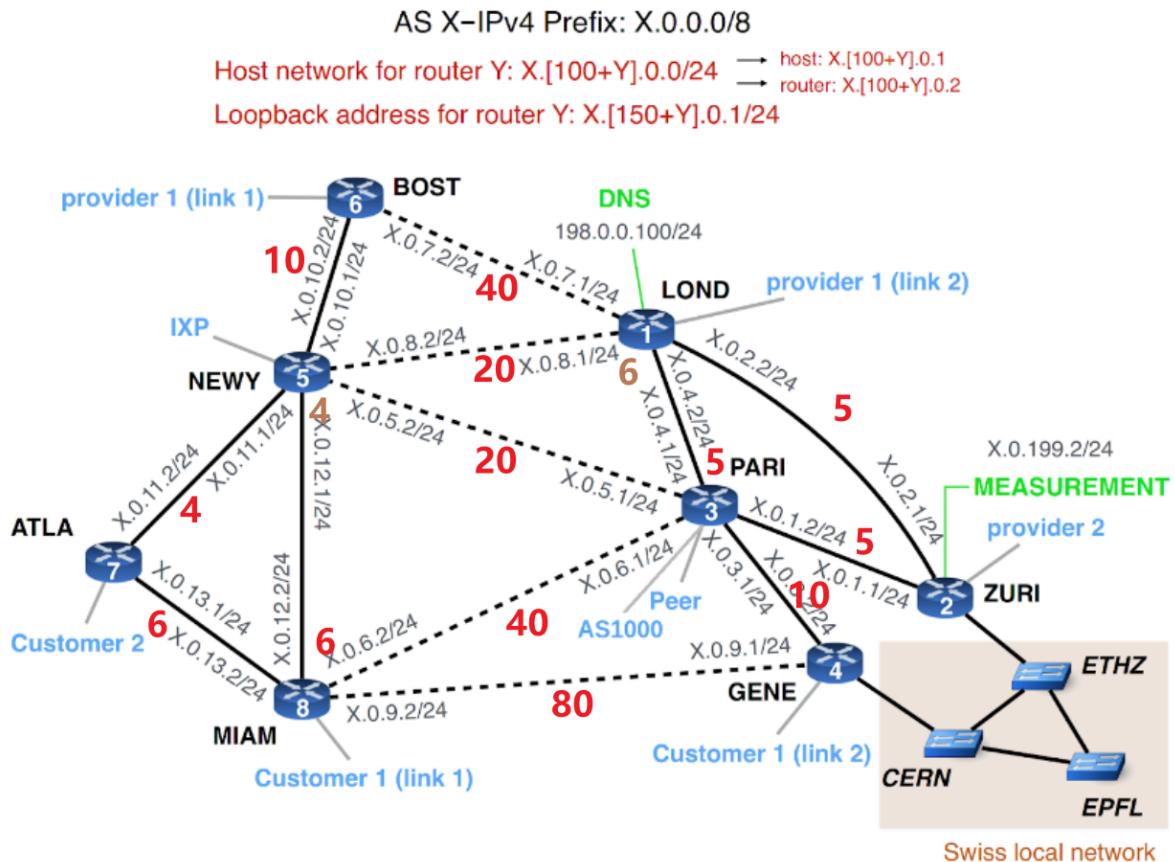


CSEE4119 Project 2 Stage C Report

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Task - Implement intradomain routing policy



Goal 1

The diagram above shows the configuration of ospf weight for each interface. The land links, which are solid lines, given a much lower cost than undersea lines. In this case, if two nodes are able to connect by full land link, than it will prefer land link by calculating the cost. For example, the link between BOST and MIAM, if using traceroute to test, the packets will trace to NEWY but not other nodes.

```
[00:23:16] 50 root@BOST_host:~# traceroute 49.158.0.1
[00:23:16] 51 traceroute to 49.158.0.1 (49.158.0.1), 30 hops max, 60 byte packets
[00:23:27] 52 1 49.106.0.2 (49.106.0.2) 0.969 ms 0.691 ms 0.664 ms
[00:23:37] 53 2 49.0.10.1 (49.0.10.1) 0.911 ms 0.886 ms 0.864 ms
[00:23:47] 54 3 49.158.0.1 (49.158.0.1) 1.249 ms 1.226 ms 1.199 ms
[00:23:47] 55 root@BOST_host:~#
```

Goal 2

As shown in the diagram above, each undersea links are set to different cost according to the category. By using iperf3, the configuration should be 2. Diagrams below shows the result from iperf3 in different nodes.

The link of `LOND <-> BOST` has bandwidth 10 Mbps, which is **Medium BW**.

```
[22:43:55] 29 root@LOND_host:~# iperf3 --server --one-off
[22:43:55] 30 -----
[22:43:55] 31 Server listening on 5201
[22:43:55] 32 -----
[22:44:04] 33 Accepted connection from 49.106.0.1, port 53126
[22:44:04] 34 [ 5] local 49.101.0.1 port 5201 connected to 49.106.0.1 port 53130
[22:44:05] 35 [ ID] Interval Transfer Bandwidth
[22:44:05] 36 [ 5] 0.00-1.00 sec 2.02 MBytes 17.0 Mbits/sec
[22:44:06] 37 [ 5] 1.00-2.00 sec 1.18 MBytes 9.90 Mbits/sec
[22:44:07] 38 [ 5] 2.00-3.00 sec 1.23 MBytes 10.3 Mbits/sec
[22:44:08] 39 [ 5] 3.00-4.00 sec 1.16 MBytes 9.72 Mbits/sec
[22:44:09] 40 [ 5] 4.00-5.00 sec 1.17 MBytes 9.82 Mbits/sec
[22:44:09] 41 [ 5] 5.00-5.05 sec 56.6 KBytes 10.3 Mbits/sec
[22:44:09] 42 -----
[22:44:09] 43 [ ID] Interval Transfer Bandwidth
[22:44:09] 44 [ 5] 0.00-5.05 sec 0.00 Bytes 0.00 bits/sec sender
[22:44:09] 45 [ 5] 0.00-5.05 sec 6.82 MBytes 11.3 Mbits/sec receiver
[22:44:09] 46 root@LOND_host:~#
```

The link of LOND <-> NEWY has bandwidth 50 Mbps, which is **High BW**.

```
[22:48:19] 44 root@NEWY_host:~# iperf3 --server --one-off
[22:48:19] 45 -----
[22:48:19] 46 Server listening on 5201
[22:48:19] 47 -----
[22:48:28] 48 Accepted connection from 49.101.0.1, port 45134
[22:48:28] 49 [ 5] local 49.105.0.1 port 5201 connected to 49.101.0.1 port 45136
[22:48:29] 50 [ ID] Interval Transfer Bandwidth
[22:48:29] 51 [ 5] 0.00-1.00 sec 5.40 MBytes 45.3 Mbits/sec
[22:48:30] 52 [ 5] 1.00-2.00 sec 6.55 MBytes 54.9 Mbits/sec
[22:48:31] 53 [ 5] 2.00-3.00 sec 7.48 MBytes 62.8 Mbits/sec
[22:48:32] 54 [ 5] 3.00-4.00 sec 5.76 MBytes 48.4 Mbits/sec
[22:48:33] 55 [ 5] 4.00-5.00 sec 4.65 MBytes 39.0 Mbits/sec
[22:48:33] 56 [ 5] 5.00-5.04 sec 0.00 Bytes 0.00 bits/sec
[22:48:33] 57 -----
[22:48:33] 58 [ ID] Interval Transfer Bandwidth
[22:48:33] 59 [ 5] 0.00-5.04 sec 0.00 Bytes 0.00 bits/sec sender
[22:48:33] 60 [ 5] 0.00-5.04 sec 29.8 MBytes 49.6 Mbits/sec receiver
[22:48:33] 61 root@NEWY_host:~#
```

The link of PARI <-> NEWY has bandwidth 100 Mbps, which is **High BW**.

```
[22:42:08] 94 root@PARI_host:~# iperf3 --server --one-off
[22:42:08] 95 -----
[22:42:08] 96 Server listening on 5201
[22:42:08] 97 -----
[22:42:50] 98 Accepted connection from 49.105.0.1, port 56322
[22:42:50] 99 [ 5] local 49.103.0.1 port 5201 connected to 49.105.0.1 port 56324
[22:42:51] 100 [ ID] Interval Transfer Bandwidth
[22:42:51] 101 [ 5] 0.00-1.00 sec 12.2 MBytes 103 Mbits/sec
[22:42:52] 102 [ 5] 1.00-2.00 sec 12.0 MBytes 100 Mbits/sec
[22:42:53] 103 [ 5] 2.00-3.00 sec 11.7 MBytes 98.5 Mbits/sec
[22:42:54] 104 [ 5] 3.00-4.00 sec 12.0 MBytes 100 Mbits/sec
[22:42:55] 105 [ 5] 4.00-5.00 sec 11.7 MBytes 98.0 Mbits/sec
[22:42:55] 106 [ 5] 5.00-5.04 sec 667 KBytes 135 Mbits/sec
[22:42:55] 107 -----
[22:42:55] 108 [ ID] Interval Transfer Bandwidth
[22:42:55] 109 [ 5] 0.00-5.04 sec 0.00 Bytes 0.00 bits/sec sender
[22:42:55] 110 [ 5] 0.00-5.04 sec 60.3 MBytes 100 Mbits/sec receiver
[22:42:55] 111 root@PARI_host:~#
```

The link of PARI <-> MIAM has bandwidth 10 Mbps, which is **Medium BW**.

```
[22:50:34] 31 root@MIAM_host:~# iperf3 --server --one-off
[22:50:34] 32 -----
[22:50:34] 33 Server listening on 5201
[22:50:34] 34 -----
[22:50:44] 35 Accepted connection from 49.103.0.1, port 39500
[22:50:44] 36 [ 5] local 49.108.0.1 port 5201 connected to 49.103.0.1 port 39512
[22:50:45] 37 [ ID] Interval Transfer Bandwidth
[22:50:45] 38 [ 5] 0.00-1.00 sec 1.96 MBytes 16.5 Mbits/sec
[22:50:46] 39 [ 5] 1.00-2.00 sec 1.32 MBytes 11.0 Mbits/sec
[22:50:47] 40 [ 5] 2.00-3.00 sec 1.07 MBytes 8.99 Mbits/sec
[22:50:48] 41 [ 5] 3.00-4.00 sec 1.10 MBytes 9.21 Mbits/sec
[22:50:49] 42 [ 5] 4.00-5.00 sec 1.23 MBytes 10.4 Mbits/sec
[22:50:49] 43 [ 5] 5.00-5.04 sec 0.00 Bytes 0.00 bits/sec
[22:50:49] 44 -----
[22:50:49] 45 [ ID] Interval Transfer Bandwidth
[22:50:49] 46 [ 5] 0.00-5.04 sec 0.00 Bytes 0.00 bits/sec
[22:50:49] 47 [ 5] 0.00-5.04 sec 6.68 MBytes 11.1 Mbits/sec
[22:50:49] 48 root@MIAM_host:~#
```

To validate the configuration, the screenshot below shows the traceroute from LOND host to BOST loopback. If no configuration set, the packets will go through LOND \rightarrow BOST since it is directly connected. However, after configure the weight, packets will go through NEWY then BOST, which has less cost.

```
[00:28:37] 61 root@LOND_host:~# traceroute 49.156.0.1
[00:28:37] 62 traceroute to 49.156.0.1 (49.156.0.1), 30 hops max, 60 byte packets
[00:28:37] 63 1 LOND-host.group49 (49.101.0.2) 1.134 ms 0.886 ms 0.864 ms
[00:28:37] 64 2 NEWY-LOND.AS49 (49.0.8.2) 1.357 ms 1.328 ms 1.310 ms
[00:28:37] 65 3 49.156.0.1 (49.156.0.1) 1.415 ms 1.396 ms 1.380 ms
[00:28:37] 66 root@LOND_host:~#
```

Goal 3

From the diagram above can know that the cost for interface port_ATLA and port_NEWY are set as the same, so the packet will balanced go through two nodes. To validate it, the screenshot below shows the traceroute from MIAM host to NEWY loopback, which shows that the packets will be load balanced.

```
[00:31:33] 48 root@MIAM_host:~# traceroute 49.155.0.1
[00:31:33] 49 traceroute to 49.155.0.1 (49.155.0.1), 30 hops max, 60 byte packets
[00:31:43] 50 1 49.108.0.2 (49.108.0.2) 1.536 ms 1.101 ms 1.081 ms
[00:32:03] 51 2 49.155.0.1 (49.155.0.1) 1.439 ms 49.0.13.1 (49.0.13.1) 1.639 ms 1.622 ms
[00:32:03] 52 root@MIAM_host:~#
```

Goal 4

From the diagram above can know that the cost for interface port_LOND and port_PARI are set as the same, so the packet will balanced go through two nodes. For the LOND side, interface port_PARI is set weight to 6, which is higher than port_ZURI, so the packets from LOND to PARI will pass ZURI.

Goal 5

As shown in the diagram above, two high bandwidth undersea links are set lower cost than other undersea links, and ATLA is directed to prefer NEWY rather than load balance, so packets between ATLA and ZURI will go through high bandwidth in balance. To validate it, the screenshot below shows the traceroute from ATLA host to ZURI loopback, which shows that the packets will be load balanced.

```
[00:42:53] 53 root@ATLA_host:~# traceroute 49.152.0.1
[00:42:53] 54 traceroute to 49.152.0.1 (49.152.0.1), 30 hops max, 60 byte packets
[00:43:03] 55 1 49.107.0.2 (49.107.0.2) 0.325 ms 0.067 ms 0.018 ms
[00:43:13] 56 2 49.0.11.1 (49.0.11.1) 0.320 ms 0.286 ms 0.259 ms
[00:43:33] 57 3 49.0.8.1 (49.0.8.1) 0.540 ms 0.510 ms 49.0.5.1 (49.0.5.1) 2.403 ms
[00:43:43] 58 4 49.152.0.1 (49.152.0.1) 2.864 ms 2.833 ms 2.807 ms
```

Traceroute from ATLA-host to ZURI loopback

```
[00:05:33] 47 root@ATLA_host:~# traceroute 49.152.0.1
[00:05:33] 48 traceroute to 49.152.0.1 (49.152.0.1), 30 hops max, 60 byte packets
[00:05:43] 49  1  49.107.0.2 (49.107.0.2)  0.291 ms  0.064 ms  0.022 ms
[00:05:53] 50  2  49.0.11.1 (49.0.11.1)  0.365 ms  0.315 ms  0.277 ms
[00:06:23] 51  3  49.0.5.1 (49.0.5.1)  2.368 ms  49.0.8.1 (49.0.8.1)  0.547 ms  49.0.5.1 (49.0.5.1)  2.319 ms
[00:06:33] 52  4  49.152.0.1 (49.152.0.1)  2.699 ms  2.670 ms  2.644 ms
[00:06:33] 53 root@ATLA_host:~#
```

The expected result can be seen from the screenshot, since the packets are balanced to LOND and PARI.

Task - Advertise your prefix at the IXP

Screenshot of the relevant parts of the out route-map

```
[23:41:34] 653 address-family ipv4 unicast
[23:41:34] 654 network 49.0.0.0/8
[23:41:34] 655 neighbor 49.151.0.1 next-hop-self
[23:41:34] 656 neighbor 49.152.0.1 next-hop-self
[23:41:34] 657 neighbor 49.153.0.1 next-hop-self
[23:41:34] 658 neighbor 49.154.0.1 next-hop-self
[23:41:34] 659 neighbor 49.156.0.1 next-hop-self
[23:41:34] 660 neighbor 49.157.0.1 next-hop-self
[23:41:34] 661 neighbor 49.158.0.1 next-hop-self
[23:41:34] 662 neighbor 180.89.0.89 route-map tasktwo out
[23:41:34] 663 exit-address-family
[23:41:34] 664 !
[23:41:34] 665 router ospf
[23:41:34] 666 network 49.0.5.0/24 area 0
[23:41:34] 667 network 49.0.8.0/24 area 0
[23:41:34] 668 network 49.0.10.0/24 area 0
[23:41:34] 669 network 49.0.11.0/24 area 0
[23:41:34] 670 network 49.0.12.0/24 area 0
[23:41:34] 671 network 49.0.199.0/24 area 0
[23:41:34] 672 network 49.105.0.0/24 area 0
[23:41:34] 673 network 49.155.0.0/24 area 0
[23:41:34] 674 network 198.0.0.0/24 area 0
[23:41:34] 675 !
[23:41:34] 676 route-map tasktwo permit 1
[23:41:34] 677 set community 89:58 89:60 89:62 89:64 89:66 89:68 89:70
[23:41:34] 678 set local-preference 1000
[23:41:34] 679 !
[23:41:34] 680 line vty
[23:41:34] 681 !
[23:41:34] 682 end
[23:41:34] 683 root@g49-proxy:~/configs_12-18-2022_04-41-07#
```

The route map “tasktwo” is set to contain the community value of my peers on the different group, and set the local preference to 1000 to ensure follow the map. Then, set the IXP neighbour to apply the route map on the outgoing router.

Looking Glass entry of another AS

http://34.171.188.127:2500/66_NEWYrouter.txt

```
*> 43.0.0.0/8    180.89.0.43      0          0 43 i
*> 44.0.0.0/8    180.89.0.43      0          0 43 46 44 i
*> 45.0.0.0/8    180.89.0.45      0          0 45 i
*> 46.0.0.0/8    180.89.0.43      0          0 43 46 i
*> 47.0.0.0/8    180.89.0.45      0          0 45 47 i
*> 48.0.0.0/8    180.89.0.45      0          0 45 48 i
*> 49.0.0.0/8    180.89.0.49      0          0 49 i
*> 50.0.0.0/8    180.89.0.49      0          0 49 50 i
*> 51.0.0.0/8    180.89.0.49      0          0 49 51 i
*> 52.0.0.0/8    180.89.0.49      0          0 49 52 i
*> 53.0.0.0/8    180.89.0.49      0          0 49 52 53 i
*> 54.0.0.0/8    180.89.0.45      0          0 45 48 35 37 54 i
*> 55.0.0.0/8    180.89.0.55      0          0 55 i
*> 56.0.0.0/8    180.89.0.43      0          0 43 46 56 i
* 57.0.0.0/8     180.89.0.45      100        0 45 48 46 43 57 i
*_i   66.152.0.1           100        0 63 61 59 57 i
```

Which shows that the connection between AS66 and AS49 goes through the IXP.

Traceroute from another AS

```
[23:14:21] 337 root@b4363168259c:~# ./launch_traceroute.sh 66 49.105.0.1
[23:14:23] 338 Hop 1: 66.0.199.1 TTL=0 during transit
[23:14:25] 339 Hop 2: 66.0.1.2 TTL=0 during transit
[23:14:27] 340 Hop 3: 66.0.8.2 TTL=0 during transit
[23:14:29] 341 Hop 4: 180.89.0.49 TTL=0 during transit
[23:14:31] 342 Hop 5: 49.105.0.1 Echo reply (type=0/code=0)
[23:14:33] 343 Hop 6: 49.105.0.1 Echo reply (type=0/code=0)
[23:14:36] 344 Hop 7: ^Croot@b4363168259c:~#
[23:14:36] 345 root@b4363168259c:~#
```

Where the traceroute goes through the IXP.

Task - Implement policy at IXP

Screenshot of the relevant parts of the route-map at NEWY

```

67 neighbor 180.89.0.89 route-map inmap in
68 neighbor 180.89.0.89 route-map tasktwo out
69 exit-address-family
70 !
71 router ospf
72 network 49.0.5.0/24 area 0
73 network 49.0.8.0/24 area 0
74 network 49.0.10.0/24 area 0
75 network 49.0.11.0/24 area 0
76 network 49.0.12.0/24 area 0
77 network 49.0.199.0/24 area 0
78 network 49.105.0.0/24 area 0
79 network 49.155.0.0/24 area 0
80 network 198.0.0.0/24 area 0
81 !
82 ip prefix-list NOLOCALIXP seq 5 permit 43.0.0.0/8
83 ip prefix-list NOLOCALIXP seq 10 permit 44.0.0.0/8
84 ip prefix-list NOLOCALIXP seq 15 permit 45.0.0.0/8
85 ip prefix-list NOLOCALIXP seq 20 permit 46.0.0.0/8
86 ip prefix-list NOLOCALIXP seq 25 permit 47.0.0.0/8
87 ip prefix-list NOLOCALIXP seq 30 permit 48.0.0.0/8
88 ip prefix-list NOLOCALIXP seq 35 permit 50.0.0.0/8
89 ip prefix-list NOLOCALIXP seq 40 permit 51.0.0.0/8
90 ip prefix-list NOLOCALIXP seq 45 permit 52.0.0.0/8
91 ip prefix-list NOLOCALIXP seq 50 permit 53.0.0.0/8
92 ip prefix-list NOLOCALIXP seq 55 permit 54.0.0.0/8
93 ip prefix-list NOLOCALIXP seq 60 permit 55.0.0.0/8
94 ip prefix-list NOLOCALIXP seq 65 permit 56.0.0.0/8
95 !
96 route-map tasktwo permit 10
97 set community 89:58 89:60 89:62 89:64 89:66 89:68 89:70
98 set local-preference 1000
99 !
100 route-map tasktwo deny 20
101 match ip address prefix-list NOLOCALIXP
102 !
103 route-map tasktwo permit 30
104 !
105 route-map inmap deny 10
106 match ip address prefix-list NOLOCALIXP
107 !
108 route-map inmap permit 20
109 !

```

The prefix list contains all IP address of the ASes from the same block. Use route-map to block the advertisement. Add additional permit with higher preference to allow advertise to irrelevant ASes.

show ip bgp in router NEWY

[14:15:13]	145	*>i	49.157.0.1	150	0 52 33 37 40 i
[14:15:13]	146	* 41.0.0.0/8	180.89.0.66		0 66 43 46 41 i
[14:15:13]	147	*>i	49.157.0.1	150	0 52 41 i
[14:15:13]	148	* 42.0.0.0/8	180.89.0.66		0 66 43 46 29 32 42
[14:15:13]	149	*>i	49.157.0.1	150	0 52 29 32 42 i
[14:15:13]	150	*>i43.0.0.0/8	49.158.0.1	150	0 51 66 43 i
[14:15:13]	151	* i	49.154.0.1	150	0 51 66 43 i
[14:15:13]	152	*>i44.0.0.0/8	49.157.0.1	150	0 52 35 37 44 i
[14:15:13]	153	*>i45.0.0.0/8	49.158.0.1	150	0 51 66 45 i
[14:15:13]	154	* i	49.154.0.1	150	0 51 66 45 i
[14:15:13]	155	* 46.0.0.0/8	49.158.0.1	150	0 51 66 43 46 i
[14:15:13]	156	*>i	49.157.0.1	150	0 52 50 48 46 i
[14:15:13]	157	* i	49.154.0.1	150	0 51 50 48 46 i
[14:15:13]	158	* 47.0.0.0/8	49.158.0.1	150	0 51 66 47 i
[14:15:13]	159	*>i	49.157.0.1	150	0 52 50 47 i
[14:15:13]	160	* i	49.154.0.1	150	0 51 50 47 i
[14:15:13]	161	* 48.0.0.0/8	49.158.0.1	150	0 51 50 48 i
[14:15:13]	162	*>i	49.157.0.1	150	0 52 50 48 i
[14:15:13]	163	* i	49.154.0.1	150	0 51 50 48 i
[14:15:13]	164	* 49.0.0.0/8	49.153.0.1	0 100	0 i
[14:15:13]	165	*>	0.0.0.0	0	32768 i
[14:15:13]	166	* 50.0.0.0/8	49.158.0.1	150	0 51 50 i
[14:15:13]	167	*>i	49.157.0.1	150	0 52 50 i
[14:15:13]	168	* i	49.154.0.1	150	0 51 50 i
[14:15:13]	169	*>i51.0.0.0/8	49.158.0.1	0	0 51 i
[14:15:13]	170	* i	49.154.0.1	0	0 51 i
[14:15:13]	171	*>i52.0.0.0/8	49.157.0.1	150	0 52 i
[14:15:13]	172	* 53.0.0.0/8	49.158.0.1	150	0 51 53 i
[14:15:13]	173	*>i	49.157.0.1	150	0 52 53 i
[14:15:13]	174	* i	49.154.0.1	150	0 51 53 i
[14:15:13]	175	*>i54.0.0.0/8	49.157.0.1	150	0 52 54 i
[14:15:13]	176	*>i55.0.0.0/8	49.158.0.1	150	0 51 55 i
[14:15:13]	177	* i	49.154.0.1	150	0 51 55 i
[14:15:13]	178	*>i56.0.0.0/8	49.157.0.1	150	0 52 56 i
[14:15:13]	179	* 57.0.0.0/8	180.89.0.60		0 60 61 59 57 i
[14:15:13]	180	*>i	49.158.0.1	150	0 51 60 61 59 57 i
[14:15:13]	181	* i	49.154.0.1	150	0 51 60 61 59 57 i
[14:15:13]	182	* 58.0.0.0/8	180.89.0.58	0	0 58 i
[14:15:13]	183	*>i	49.158.0.1	150	0 51 58 i
[14:15:13]	184	* i	49.154.0.1	150	0 51 58 i

Looking Glass for the router ZURI of the stub AS

* 43.0.0.0/8	179.1.88.1	20	0 54 53 66 43 i
*	179.1.82.1	20	0 53 66 43 i
*>	180.89.0.66	50	0 66 43 i
*> 44.0.0.0/8	180.89.0.66	50	0 66 43 46 44 i
*	179.1.88.1	20	0 54 53 52 35 37 44 i
*	179.1.82.1	20	0 53 52 35 37 44 i
* 45.0.0.0/8	179.1.88.1	20	0 54 53 51 66 45 i
*	179.1.82.1	20	0 53 51 66 45 i
*>	180.89.0.66	50	0 66 45 i
* 46.0.0.0/8	179.1.88.1	20	0 54 53 51 49 48 46 i
*	179.1.82.1	20	0 53 51 49 48 46 i
*>	180.89.0.66	50	0 66 43 46 i
*> 47.0.0.0/8	180.89.0.66	50	0 66 49 47 i
*	179.1.88.1	20	0 54 53 51 49 47 i
*	179.1.82.1	20	0 53 51 49 47 i
* 48.0.0.0/8	179.1.82.1	20	0 53 51 49 48 i
*	179.1.88.1	20	0 54 53 51 49 48 i
*>	180.89.0.66	50	0 66 45 48 i
* 49.0.0.0/8	179.1.82.1	20	0 53 51 49 i
*	179.1.88.1	20	0 54 53 51 49 i
*>	180.89.0.66	50	0 66 49 i
* 50.0.0.0/8	179.1.82.1	20	0 53 51 50 i
*	179.1.88.1	20	0 54 53 51 50 i
*>	180.89.0.66	50	0 66 49 50 i
* 51.0.0.0/8	179.1.82.1	20	0 53 51 i
*	179.1.88.1	20	0 54 53 51 i
*>	180.89.0.66	50	0 66 53 51 i
* 52.0.0.0/8	179.1.82.1	20	0 53 52 i
*	179.1.88.1	20	0 54 53 52 i
*>	180.89.0.66	50	0 66 53 52 i
* 53.0.0.0/8	179.1.82.1	20	0 53 i
*	179.1.88.1	20	0 54 53 i
*>	180.89.0.66	50	0 66 53 i
* 54.0.0.0/8	179.1.82.1	20	0 53 52 35 37 54 i
*>	180.89.0.66	50	0 66 45 48 35 37 54 i
*	179.1.88.1	0	0 54 i
* i55.0.0.0/8	55.151.0.1	0	100 0 i
*>	0.0.0.0	0	32768 i
* 56.0.0.0/8	179.1.82.1	20	0 53 52 56 i
*	179.1.88.1	20	0 54 56 i
*	180.89.0.66	50	0 66 43 46 56 i
*>	179.2.62.2	0	0 56 i

Looking Glass for the AS in another group but connected to the same IXP

http://34.171.188.127:2500/66_NEWYrouter.txt

*> 31.0.0.0/8	180.89.0.49		0 49 52 33 31 i
*> 32.0.0.0/8	180.89.0.45		0 45 48 29 32 i
*> 33.0.0.0/8	180.89.0.49		0 49 52 33 i
*> 34.0.0.0/8	180.89.0.49		0 49 52 35 34 i
*> 35.0.0.0/8	180.89.0.45		0 45 48 35 i
*> 36.0.0.0/8	180.89.0.49		0 49 52 33 36 i
*> 38.0.0.0/8	180.89.0.45		0 45 48 33 36 38 i
*> 39.0.0.0/8	180.89.0.49		0 49 52 35 38 40 39 i
*> 40.0.0.0/8	180.89.0.45		0 45 48 35 38 40 i
*> 41.0.0.0/8	180.89.0.45		0 45 48 41 i
*> 42.0.0.0/8	180.89.0.45		0 45 48 29 32 42 i
*> 43.0.0.0/8	180.89.0.43	0	0 43 i
*> 44.0.0.0/8	180.89.0.45		0 45 48 31 44 i
*> 45.0.0.0/8	180.89.0.45	0	0 45 i
*> 46.0.0.0/8	180.89.0.43		0 43 46 i
*> 47.0.0.0/8	180.89.0.47		0 47 i
*> 48.0.0.0/8	180.89.0.45		0 45 48 i
*> 49.0.0.0/8	180.89.0.49	0	0 49 i
*> 50.0.0.0/8	180.89.0.47		0 47 50 i
*> 51.0.0.0/8	180.89.0.51	0	0 51 i
*> 52.0.0.0/8	180.89.0.53		0 53 52 i
*> 53.0.0.0/8	180.89.0.53		0 53 i
*> 54.0.0.0/8	180.89.0.53		0 53 54 i
*> 55.0.0.0/8	180.89.0.55	0	0 55 i
*> 56.0.0.0/8	180.89.0.45		0 45 48 56 i
*>i57.0.0.0/8	66.152.0.1	100	0 63 62 59 57 i
*=i58.0.0.0/8	66.156.0.1	100	0 64 53 58 i
*>i	66.151.0.1	100	0 64 53 58 i
*>i59.0.0.0/8	66.151.0.1	100	0 64 53 58 59 i
*=i	66.156.0.1	100	0 64 53 58 59 i
*=i60.0.0.0/8	66.156.0.1	100	0 64 53 60 i
*>i	66.151.0.1	100	0 64 53 60 i
*>i61.0.0.0/8	66.152.0.1	100	0 63 62 61 i

Task - Implement BGP routing policy

No-valley Routing

Use the IP prefix-list to record the IP prefix of each peer and providers. Then, use route map to deny the prefix-list and set the community to no-advertise.

Prefer-customer Routing

Use the route map to set the local preference. The provider has the minimum preference value, and the customer has the largest. Then, apply the route map on each routers for the neighbour BGP outgoing link.

Configuration

ATLA

```
ATLA.txt      X  BOST.txt      | GENE.txt

8 no ipv6 forwarding
9 !
10 interface ext_52_ZURI
11 ip address 49.52.0.1/24
12 !
13 interface host
14 ip address 49.107.0.2/24
15 !
16 interface lo
17 ip address 49.157.0.1/24
18 !
19 interface port_MIAM
20 ip address 49.0.13.1/24
21 ip ospf cost 6
22 !
23 interface port_NEWY
24 ip address 49.0.11.2/24
25 ip ospf cost 4
26 !
27 router bgp 49
28 no bgp ebgp-requires-policy
29 no bgp network import-check
30 neighbor 49.52.0.2 remote-as 52
31 neighbor 49.151.0.1 remote-as 49
32 neighbor 49.151.0.1 update-source lo
33 neighbor 49.152.0.1 remote-as 49
34 neighbor 49.152.0.1 update-source lo
35 neighbor 49.153.0.1 remote-as 49
36 neighbor 49.153.0.1 update-source lo
37 neighbor 49.154.0.1 remote-as 49
38 neighbor 49.154.0.1 update-source lo
39 neighbor 49.155.0.1 remote-as 49
40 neighbor 49.155.0.1 update-source lo
41 neighbor 49.156.0.1 remote-as 49
42 neighbor 49.156.0.1 update-source lo
43 neighbor 49.158.0.1 remote-as 49
44 neighbor 49.158.0.1 update-source lo
45 !
46 address-family ipv4 unicast
47 neighbor 49.52.0.2 next-hop-self
48 neighbor 49.52.0.2 route-map CUSTOMER out
49 neighbor 49.151.0.1 next-hop-self
50 neighbor 49.152.0.1 next-hop-self
51 neighbor 49.153.0.1 next-hop-self
52 neighbor 49.154.0.1 next-hop-self
53 neighbor 49.155.0.1 next-hop-self
54 neighbor 49.156.0.1 next-hop-self
55 neighbor 49.158.0.1 next-hop-self
56 exit-address-family
57 !
58 router ospf
59 network 49.0.11.0/24 area 0
60 network 49.0.13.0/24 area 0
61 network 49.0.199.0/24 area 0
```

```
52 network 45.107.0.0/24 area 0
53 network 49.157.0.0/24 area 0
54 network 198.0.0.0/24 area 0
55 !
56 route-map PROVIDER permit 10
57 set local-preference 50
58 !
59 route-map PEER permit 10
60 set local-preference 110
61 !
62 route-map CUSTOMER permit 10
63 set local-preference 150
64 !
65 line vty
66 !
67 end
68
```

BOST

```

= | ATLA.txt      BOST.txt      X  GENE.txt |
 45 !
 46 address-family ipv4 unicast
 47 neighbor 47.49.0.1 next-hop-self
 48 neighbor 47.49.0.1 route-map inmap in
 49 neighbor 47.49.0.1 route-map PROVIDER out
 50 neighbor 49.151.0.1 next-hop-self
 51 neighbor 49.152.0.1 next-hop-self
 52 neighbor 49.153.0.1 next-hop-self
 53 neighbor 49.154.0.1 next-hop-self
 54 neighbor 49.155.0.1 next-hop-self
 55 neighbor 49.157.0.1 next-hop-self
 56 neighbor 49.158.0.1 next-hop-self
 57 exit-address-family
 58 !
 59 router ospf
 60 network 49.0.7.0/24 area 0
 61 network 49.0.10.0/24 area 0
 62 network 49.0.199.0/24 area 0
 63 network 49.106.0.0/24 area 0
 64 network 49.156.0.0/24 area 0
 65 network 198.0.0.0/24 area 0
 66 !
 67 ip prefix-list 47PROVIDER seq 5 permit 47.0.0.0/8
 68 ip prefix-list NOVALLEY seq 5 permit 47.0.0.0/8
 69 ip prefix-list BLOCK47 seq 5 permit 47.0.0.0/8
 70 ip prefix-list BLOCK47 seq 10 permit 47.49.0.0/16
 71 ip prefix-list BLOCK47 seq 15 permit 49.47.0.0/16
 72 ip prefix-list BLOCK47 seq 20 permit 49.0.0.0/8
 73 !
 74 route-map PROVIDER permit 10
 75 set local-preference 50
 76 !
 77 route-map PROVIDER permit 30
 78 !
 79 route-map PROVIDER deny 20
 80 match ip address prefix-list NOVALLEY
 81 set community no-advertise
 82 !
 83 route-map PEER permit 10
 84 set local-preference 110
 85 !
 86 route-map CUSTOMER permit 10
 87 set local-preference 150
 88 !
 89 route-map NOLOCALIXP deny 10
 90 match ip address 47.49.0.1
 91 match ip address prefix-list 47PROVIDER
 92 set community no-advertise
 93 !
 94 route-map NOLOCALIXP permit 20
 95 !
 96 route-map TaskFive deny 30
 97 match ip address prefix-list 47.0.0.0/8
 98 set as-path prepend 49
99 !

```

```
100 route-map inmap permit 40
101 !
102 route-map inmap permit 30
103   match ip address prefix-list 47PROVIDER
104   set metric 0
105 !
106 route-map tmp permit 10
107   match ip address prefix-list 47PROVIDER
108   set metric 0
109 !
110 route-map tmp permit 20
111 !
112 line vty
113 !
114 end
115
```

GENE

	ATLA.txt	BOST.txt	GENE.txt	X	LOND.txt
13	interface lo				
14	ip address 49.154.0.1/24				
15	!				
16	interface port_MIAM				
17	ip address 49.0.9.1/24				
18	ip ospf cost 80				
19	!				
20	interface port_PARI				
21	ip address 49.0.3.2/24				
22	ip ospf cost 10				
23	!				
24	router bgp 49				
25	no bgp ebgp-requires-policy				
26	no bgp network import-check				
27	neighbor 49.51.1.2 remote-as 51				
28	neighbor 49.151.0.1 remote-as 49				
29	neighbor 49.151.0.1 update-source lo				
30	neighbor 49.152.0.1 remote-as 49				
31	neighbor 49.152.0.1 update-source lo				
32	neighbor 49.153.0.1 remote-as 49				
33	neighbor 49.153.0.1 update-source lo				
34	neighbor 49.155.0.1 remote-as 49				
35	neighbor 49.155.0.1 update-source lo				
36	neighbor 49.156.0.1 remote-as 49				
37	neighbor 49.156.0.1 update-source lo				
38	neighbor 49.157.0.1 remote-as 49				
39	neighbor 49.157.0.1 update-source lo				
40	neighbor 49.158.0.1 remote-as 49				
41	neighbor 49.158.0.1 update-source lo				
42	!				
43	address-family ipv4 unicast				
44	neighbor 49.51.1.2 next-hop-self				
45	neighbor 49.51.1.2 route-map CUSTOMER out				
46	neighbor 49.151.0.1 next-hop-self				
47	neighbor 49.152.0.1 next-hop-self				
48	neighbor 49.153.0.1 next-hop-self				
49	neighbor 49.155.0.1 next-hop-self				
50	neighbor 49.156.0.1 next-hop-self				
51	neighbor 49.157.0.1 next-hop-self				
52	neighbor 49.158.0.1 next-hop-self				
53	exit-address-family				
54	!				
55	router ospf				
56	network 49.0.3.0/24 area 0				
57	network 49.0.9.0/24 area 0				
58	network 49.0.199.0/24 area 0				
59	network 49.104.0.0/24 area 0				
60	network 49.154.0.0/24 area 0				
61	network 198.0.0.0/24 area 0				
62	!				
63	ip prefix-list 47PROVIDER seq 5 permit 47.0.0.0/8				
64	!				
65	route-map PROVIDER permit 10				
66	set local-preference 50				

```
57 .
68 route-map PEER permit 10
69   set local-preference 110
70 !
71 route-map CUSTOMER permit 10
72   set local-preference 150
73 !
74 route-map TaskFive deny 10
75   match ip address prefix-list 47PROVIDER
76   set as-path prepend 49
77 !
78 route-map TaskFive permit 20
79 !
80 line vty
81 !
82 end
83
```

LOND

	ATLA.txt	BOST.txt	GENE.txt	LOND.txt	X	MIAM.b
54	neighbor 49.157.0.1 remote-as 49					
55	neighbor 49.157.0.1 update-source lo					
56	neighbor 49.158.0.1 remote-as 49					
57	neighbor 49.158.0.1 update-source lo					
58	!					
59	address-family ipv4 unicast					
60	neighbor 49.47.0.1 next-hop-self					
61	neighbor 49.47.0.1 route-map inmap in					
62	neighbor 49.47.0.1 route-map PROVIDER out					
63	neighbor 49.152.0.1 next-hop-self					
64	neighbor 49.153.0.1 next-hop-self					
65	neighbor 49.154.0.1 next-hop-self					
66	neighbor 49.155.0.1 next-hop-self					
67	neighbor 49.156.0.1 next-hop-self					
68	neighbor 49.157.0.1 next-hop-self					
69	neighbor 49.158.0.1 next-hop-self					
70	exit-address-family					
71	!					
72	router ospf					
73	network 49.0.2.0/24 area 0					
74	network 49.0.4.0/24 area 0					
75	network 49.0.7.0/24 area 0					
76	network 49.0.8.0/24 area 0					
77	network 49.0.199.0/24 area 0					
78	network 49.101.0.0/24 area 0					
79	network 49.151.0.0/24 area 0					
80	network 198.0.0.0/24 area 0					
81	!					
82	access-list 1 seq 5 permit 49.47.0.1 0.0.0.255					
83	!					
84	ip prefix-list 47PROVIDER seq 5 permit 47.0.0.0/8					
85	ip prefix-list BLOCK47 seq 5 permit 47.0.0.0/8					
86	ip prefix-list BLOCK47 seq 10 permit 47.0.0.0/8					
87	ip prefix-list BLOCK47 seq 15 permit 47.49.0.0/16					
88	ip prefix-list BLOCK47 seq 20 permit 49.47.0.0/16					
89	ip prefix-list BLOCK47 seq 25 permit 49.0.0.0/8					
90	ip prefix-list NOVALLEY seq 5 permit 47.0.0.0/8					
91	ip prefix-list PROVIDER1 seq 5 permit 47.0.0.0/8					
92	ip prefix-list PROVIDER2 seq 5 permit 48.0.0.0/8					
93	!					
94	route-map PROVIDER permit 10					
95	set local-preference 50					
96	!					
97	route-map PROVIDER permit 30					
98	!					
99	route-map PROVIDER permit 20					
100	set metric 100					
101	!					
102	route-map PROVIDER deny 25					
103	match ip address prefix-list NOVALLEY					
104	set community no-advertise					
105	!					
106	route-map PEER permit 10					
107	set local-preference 110					
108	!					
109	route-map CUSTOMER permit 10					

```
110 set local-preference 150
111 !
112 route-map NOLOCALIXP permit 20
113 !
114 route-map MED permit 10
115 match ip address prefix-list PROVIDER1
116 set metric 100
117 !
118 route-map inmap permit 30
119 set metric 100
120 !
121 line vty
122 !
123 end
124
```

MIAM

```

    | ATLA.txt      | BOST.txt      | GENE.txt      | LOND.txt      | MIAM.txt
18 !
19 interface port_ATLA
20 ip address 49.0.13.2/24
21 ip ospf cost 6
22 !
23 interface port_GENE
24 ip address 49.0.9.2/24
25 ip ospf cost 80
26 !
27 interface port_NEWT
28 ip address 49.0.12.2/24
29 ip ospf cost 10
30 !
31 interface port_PARI
32 ip address 49.0.6.2/24
33 ip ospf cost 40
34 !
35 router bgp 49
36 no bgp ebgp-requires-policy
37 no bgp network import-check
38 neighbor 49.51.0.2 remote-as 51
39 neighbor 49.151.0.1 remote-as 49
40 neighbor 49.151.0.1 update-source lo
41 neighbor 49.152.0.1 remote-as 49
42 neighbor 49.152.0.1 update-source lo
43 neighbor 49.153.0.1 remote-as 49
44 neighbor 49.153.0.1 update-source lo
45 neighbor 49.154.0.1 remote-as 49
46 neighbor 49.154.0.1 update-source lo
47 neighbor 49.155.0.1 remote-as 49
48 neighbor 49.155.0.1 update-source lo
49 neighbor 49.156.0.1 remote-as 49
50 neighbor 49.156.0.1 update-source lo
51 neighbor 49.157.0.1 remote-as 49
52 neighbor 49.157.0.1 update-source lo
53 !
54 address-family ipv4 unicast
55 neighbor 49.51.0.2 next-hop-self
56 neighbor 49.51.0.2 route-map CUSTOMER out
57 neighbor 49.151.0.1 next-hop-self
58 neighbor 49.152.0.1 next-hop-self
59 neighbor 49.153.0.1 next-hop-self
60 neighbor 49.154.0.1 next-hop-self
61 neighbor 49.155.0.1 next-hop-self
62 neighbor 49.156.0.1 next-hop-self
63 neighbor 49.157.0.1 next-hop-self
64 exit-address-family
65 !
66 router ospf
67 network 49.0.6.0/24 area 0
68 network 49.0.9.0/24 area 0
69 network 49.0.12.0/24 area 0
70 network 49.0.13.0/24 area 0
71 network 49.0.199.0/24 area 0
72 network 49.108.0.0/24 area 0
73 network 49.158.0.0/24 area 0
74 network 198.0.0.0/24 area 0
75 !
76 route-map PROVIDER permit 10
77 set local-preference 50
78 !

```

```
79 route-map PEER permit 10
80   set local-preference 110
81 !
82 route-map CUSTOMER permit 10
83   set local-preference 150
84 !
85 line vty
86 !
87 end
88
```

NEWY

```

58 address-family ipv4 unicast
59   network 49.0.0.0/8
60   neighbor 49.151.0.1 next-hop-self
61   neighbor 49.152.0.1 next-hop-self
62   neighbor 49.153.0.1 next-hop-self
63   neighbor 49.154.0.1 next-hop-self
64   neighbor 49.156.0.1 next-hop-self
65   neighbor 49.157.0.1 next-hop-self
66   neighbor 49.158.0.1 next-hop-self
67   neighbor 180.89.0.89 route-map inmap in
68   neighbor 180.89.0.89 route-map tasktwo out
69 exit-address-family
70 !
71 router ospf
72   network 49.0.5.0/24 area 0
73   network 49.0.8.0/24 area 0
74   network 49.0.10.0/24 area 0
75   network 49.0.11.0/24 area 0
76   network 49.0.12.0/24 area 0
77   network 49.0.199.0/24 area 0
78   network 49.105.0.0/24 area 0
79   network 49.155.0.0/24 area 0
80   network 198.0.0.0/24 area 0
81 !
82 ip prefix-list NOLOCALIXP seq 5 permit 43.0.0.0/8
83 ip prefix-list NOLOCALIXP seq 10 permit 44.0.0.0/8
84 ip prefix-list NOLOCALIXP seq 15 permit 45.0.0.0/8
85 ip prefix-list NOLOCALIXP seq 20 permit 46.0.0.0/8
86 ip prefix-list NOLOCALIXP seq 25 permit 47.0.0.0/8
87 ip prefix-list NOLOCALIXP seq 30 permit 48.0.0.0/8
88 ip prefix-list NOLOCALIXP seq 35 permit 50.0.0.0/8
89 ip prefix-list NOLOCALIXP seq 40 permit 51.0.0.0/8
90 ip prefix-list NOLOCALIXP seq 45 permit 52.0.0.0/8
91 ip prefix-list NOLOCALIXP seq 50 permit 53.0.0.0/8
92 ip prefix-list NOLOCALIXP seq 55 permit 54.0.0.0/8
93 ip prefix-list NOLOCALIXP seq 60 permit 55.0.0.0/8
94 ip prefix-list NOLOCALIXP seq 65 permit 56.0.0.0/8
95 !
96 route-map tasktwo permit 10
97   set community 89:58 89:60 89:62 89:64 89:66 89:68 89:70
98 !
99 route-map tasktwo permit 20
100  set local-preference 110
101 !
102 route-map inmap deny 10
103  match ip address prefix-list NOLOCALIXP
104 !
105 route-map inmap permit 20
106 !
107 route-map PROVIDER permit 10
108  set local-preference 50
109 !
110 route-map PEER permit 10
111  set local-preference 110
112 !
113 route-map CUSTOMER permit 10

```

```
114 set local-preference 150
115 !
116 line vty
117 !
118 end
119
```

PARI

```
45 ip ospf cost 5
46 !
47 router bgp 49
48 no bgp ebgp-requires-policy
49 no bgp network import-check
50 neighbor 49.151.0.1 remote-as 49
51 neighbor 49.151.0.1 update-source lo
52 neighbor 49.152.0.1 remote-as 49
53 neighbor 49.152.0.1 update-source lo
54 neighbor 49.154.0.1 remote-as 49
55 neighbor 49.154.0.1 update-source lo
56 neighbor 49.155.0.1 remote-as 49
57 neighbor 49.155.0.1 update-source lo
58 neighbor 49.156.0.1 remote-as 49
59 neighbor 49.156.0.1 update-source lo
60 neighbor 49.157.0.1 remote-as 49
61 neighbor 49.157.0.1 update-source lo
62 neighbor 49.158.0.1 remote-as 49
63 neighbor 49.158.0.1 update-source lo
64 neighbor 50.49.0.1 remote-as 50
65 neighbor 180.0.49.2 remote-as 100
66 !
67 address-family ipv4 unicast
68 network 49.0.0.0/8
69 neighbor 49.151.0.1 next-hop-self
70 neighbor 49.152.0.1 next-hop-self
71 neighbor 49.154.0.1 next-hop-self
72 neighbor 49.155.0.1 next-hop-self
73 neighbor 49.156.0.1 next-hop-self
74 neighbor 49.157.0.1 next-hop-self
75 neighbor 49.158.0.1 next-hop-self
76 neighbor 50.49.0.1 next-hop-self
77 neighbor 50.49.0.1 route-map inmap in
78 neighbor 50.49.0.1 route-map PEER out
79 exit-address-family
80 !
81 router ospf
82 network 49.0.1.0/24 area 0
83 network 49.0.3.0/24 area 0
84 network 49.0.4.0/24 area 0
85 network 49.0.5.0/24 area 0
86 network 49.0.6.0/24 area 0
87 network 49.0.198.0/24 area 0
88 network 49.0.199.0/24 area 0
89 network 49.103.0.0/24 area 0
90 network 49.153.0.0/24 area 0
91 network 198.0.0.0/24 area 0
92 !
93 ip prefix-list NOVALLEY seq 5 permit 50.0.0.0/8
94 !
95 route-map PROVIDER permit 10
96 set local-preference 50
97 !
98 route-map PEER permit 10
99 set local-preference 110
100 !
```

```
L01 route-map PEER permit 30
L02 !
L03 route-map PEER deny 20
L04 match ip address prefix-list NOVALLEY
L05 set community no-advertise
L06 !
L07 route-map CUSTOMER permit 10
L08 set local-preference 150
L09 !
L10 route-map inmap permit 20
L11 !
L12 line vty
L13 !
L14 end
L15
```

ZURI

```
17 ip address 49.0.199.1/24
18 !
19 interface port_LOND
20 ip address 49.0.2.1/24
21 ip ospf cost 5
22 !
23 interface port_PARI
24 ip address 49.0.1.1/24
25 ip ospf cost 5
26 !
27 router bgp 49
28 no bgp ebgp-requires-policy
29 no bgp network import-check
30 neighbor 48.49.0.1 remote-as 48
31 neighbor 49.151.0.1 remote-as 49
32 neighbor 49.151.0.1 update-source lo
33 neighbor 49.153.0.1 remote-as 49
34 neighbor 49.153.0.1 update-source lo
35 neighbor 49.154.0.1 remote-as 49
36 neighbor 49.154.0.1 update-source lo
37 neighbor 49.155.0.1 remote-as 49
38 neighbor 49.155.0.1 update-source lo
39 neighbor 49.156.0.1 remote-as 49
40 neighbor 49.156.0.1 update-source lo
41 neighbor 49.157.0.1 remote-as 49
42 neighbor 49.157.0.1 update-source lo
43 neighbor 49.158.0.1 remote-as 49
44 neighbor 49.158.0.1 update-source lo
45 !
46 address-family ipv4 unicast
47 neighbor 48.49.0.1 next-hop-self
48 neighbor 48.49.0.1 route-map inmap in
49 neighbor 48.49.0.1 route-map PROVIDER out
50 neighbor 49.151.0.1 next-hop-self
51 neighbor 49.153.0.1 next-hop-self
52 neighbor 49.154.0.1 next-hop-self
53 neighbor 49.155.0.1 next-hop-self
54 neighbor 49.156.0.1 next-hop-self
55 neighbor 49.157.0.1 next-hop-self
56 neighbor 49.158.0.1 next-hop-self
57 exit-address-family
58 !
59 router ospf
60 network 49.0.1.0/24 area 0
61 network 49.0.2.0/24 area 0
62 network 49.0.199.0/24 area 0
63 network 49.102.0.0/24 area 0
64 network 49.152.0.0/24 area 0
65 !
66 ip prefix-list 47PROVIDER seq 5 permit 47.0.0.0/8
67 ip prefix-list NOVALLEY seq 5 permit 48.0.0.0/8
68 !
69 route-map PROVIDER permit 10
70 set local-preference 50
71 !
72 route-map PROVIDER permit 30
```

```

73 !
74 route-map PROVIDER deny 20
75 match ip address prefix-list NOVALLEY
76 set community no-advertise
77 !
78 route-map PEER permit 10
79 set local-preference 110
80 !
81 route-map CUSTOMER permit 10
82 set local-preference 150
83 !
84 line vty
85 !
86 end
87

```

Prove the no-valley routing

http://34.171.188.127:2500/47_NEWYrouter.txt

* i46.0.0.0/8	47.158.0.1	200	0 49 51 60 62 43 46 i
* i	47.154.0.1	200	0 49 51 60 62 43 46 i
*>i	47.157.0.1	200	0 50 51 60 62 43 46 i
*	180.89.0.60	150	0 60 62 43 46 i
*>i47.0.0.0/8	47.153.0.1	0 100	0 i
* 48.0.0.0/8	180.89.0.60	150	0 60 62 45 48 i
*>i	47.157.0.1	200	0 50 48 i
*>i49.0.0.0/8	47.158.0.1	200	0 49 i
* i	47.154.0.1	200	0 49 i
*	180.89.0.60	150	0 60 62 49 i
*>i50.0.0.0/8	47.157.0.1	200	0 50 i
* i51.0.0.0/8	47.158.0.1	200	0 49 51 i
* i	47.154.0.1	200	0 49 51 i
*	180.89.0.60	150	0 60 62 51 i
*>i	47.157.0.1	200	0 50 51 i

http://34.171.188.127:2500/48_NEWYrouter.txt

*>i46.0.0.0/8	48.157.0.1	100	0 49 51 60 62 43 46 i
* i	48.154.0.1	100	0 50 51 60 62 43 46 i
* i	48.158.0.1	100	0 50 51 60 62 43 46 i
*	180.88.0.35	0 35 38 40 23 25 30 32 29 46 i	
*>i47.0.0.0/8	48.153.0.1	0 100	0 47 i
*	180.88.0.31	0 31 50 47 i	
* i48.0.0.0/8	48.158.0.1	0 100	0 i
* i	48.157.0.1	0 100	0 i
* i	48.156.0.1	0 100	0 i
*>	0.0.0.0	0 32768	i
* i	48.154.0.1	0 100	0 i
* i	48.152.0.1	0 100	0 i
* i	48.151.0.1	0 100	0 i
* i	48.153.0.1	0 100	0 i
* 49.0.0.0/8	180.88.0.31	0 31 50 49 i	
*>i	48.157.0.1	100	0 49 i
* 50.0.0.0/8	180.88.0.31	0 31 50 i	
*>i	48.158.0.1	100	0 50 i
* i	48.154.0.1	100	0 50 i
*>i51.0.0.0/8	48.157.0.1	100	0 49 51 i
*	180.88.0.31	0 31 50 51 i	
* i	48.154.0.1	100	0 50 51 i
* i	48.158.0.1	100	0 50 51 i

http://34.171.188.127:2500/50_NEWYrouter.txt

*> 44.0.0.0/8	180.88.0.31	0	31	44	i
*>i45.0.0.0/8	50.156.0.1	100	0	48	45 i
* i	50.151.0.1	100	0	48	45 i
*	180.88.0.31		0	31	44 45 i
* 46.0.0.0/8	180.88.0.35		0	35	38 40 23 25 30 32 29 46 i
*>i	50.157.0.1	100	0	51	60 62 43 46 i
*>i47.0.0.0/8	50.152.0.1	100	0	47	i
*>i48.0.0.0/8	50.156.0.1	0	100	0	48 i
* i	50.151.0.1	0	100	0	48 i
*>i49.0.0.0/8	50.153.0.1	0	100	0	49 i
*>i50.0.0.0/8	50.153.0.1	0	100	0	i
*>i51.0.0.0/8	50.157.0.1	0	100	0	51 i
* i52.0.0.0/8	50.154.0.1	100	0	52	i
*>i	50.158.0.1	100	0	52	i

From the screenshots above, the providers and peer do not receive other providers and peer advertise from AS49.

Prove the prefer-customer routing

[00:38:10]	688	NEWY_router# traceroute 50.105.0.1
[00:38:10]	689	traceroute to 50.105.0.1 (50.105.0.1), 64 hops max
[00:38:10]	690	1 49.0.11.2 0.458ms 0.303ms 0.393ms
[00:38:11]	691	2 49.52.0.2 2.864ms 2.607ms 2.429ms
[00:38:11]	692	3 52.0.2.2 4.654ms 4.653ms 4.820ms
[00:38:11]	693	4 52.0.2.2 4.520ms 3.850ms 3.693ms
[00:38:11]	694	5 50.0.3.2 5.092ms 5.256ms 8.240ms
[00:38:11]	695	6 50.0.2.2 10.643ms 6.985ms 6.949ms
[00:38:11]	696	7 50.0.2.2 6.232ms 6.073ms 7.693ms
[00:38:11]	697	8 50.105.0.1 7.186ms 6.188ms 6.064ms
[00:38:46]	709	NEWY_router# traceroute 48.105.0.1
[00:38:46]	710	traceroute to 48.105.0.1 (48.105.0.1), 64 hops max
[00:38:46]	711	1 49.0.5.1 2.239ms 2.166ms 2.542ms
[00:38:46]	712	2 50.49.0.1 4.577ms 5.429ms 6.387ms
[00:38:46]	713	3 50.0.2.2 5.794ms 6.021ms 5.585ms
[00:38:46]	714	4 48.0.9.1 6.423ms 6.726ms 7.118ms
[00:38:46]	715	5 48.0.5.1 6.926ms 6.921ms 6.841ms
[00:38:46]	716	6 48.0.11.1 6.961ms 6.797ms 7.211ms
[00:38:46]	717	7 48.105.0.1 8.224ms 7.121ms 7.341ms

The first screenshot shows the traceroute to peer, the trace will go to AS52 (customer), then is the peer.

The second screenshot shows the traceroute to provider, the trace will go to AS50 (peer), then is the provider.

Two screenshots shows the relationship and order between provider, peer, and customer.

Task - Implement inbound traffic engineering

Make provider arrives in priority via BOST

Use the `set metric` sentence in route map, set the MED of the link from LOND to AS47 (provider) to 100. Then apply the metric to the inbound eBGP.

```
59 address-family ipv4 unicast
60   neighbor 49.47.0.1 next-hop-self
61   neighbor 49.47.0.1 route-map inmap in
62   neighbor 49.47.0.1 route-map PROVIDER out
63   neighbor 49.152.0.1 next-hop-self
64   neighbor 49.153.0.1 next-hop-self
65   neighbor 49.154.0.1 next-hop-self
66   neighbor 49.155.0.1 next-hop-self
67   neighbor 49.156.0.1 next-hop-self
68   neighbor 49.157.0.1 next-hop-self
69   neighbor 49.158.0.1 next-hop-self
70 exit-address-family
71 !
72 router ospf
73   network 49.0.2.0/24 area 0
74   network 49.0.4.0/24 area 0
75   network 49.0.7.0/24 area 0
76   network 49.0.8.0/24 area 0
77   network 49.0.199.0/24 area 0
78   network 49.101.0.0/24 area 0
79   network 49.151.0.0/24 area 0
80   network 198.0.0.0/24 area 0
81 !
82 access-list 1 seq 5 permit 49.47.0.1 0.0.0.255
83 !
84 ip prefix-list 47PROVIDER seq 5 permit 47.0.0.0/8
85 ip prefix-list BLOCK47 seq 5 permit 47.0.0.0/8
86 ip prefix-list BLOCK47 seq 10 permit 47.0.0.0/8
87 ip prefix-list BLOCK47 seq 15 permit 47.49.0.0/16
88 ip prefix-list BLOCK47 seq 20 permit 49.47.0.0/16
89 ip prefix-list BLOCK47 seq 25 permit 49.0.0.0/8
90 ip prefix-list NOVALLEY seq 5 permit 47.0.0.0/8
91 ip prefix-list PROVIDER1 seq 5 permit 47.0.0.0/8
92 ip prefix-list PROVIDER2 seq 5 permit 48.0.0.0/8
93 !
94 route-map PROVIDER permit 10
95   set local-preference 50
96 !
97 route-map PROVIDER permit 30
98 !
99 route-map PROVIDER permit 20
100  set metric 100
101 !
102 route-map PEER permit 10
103  set local-preference 110
104 !
105 route-map CUSTOMER permit 10
106  set local-preference 150
107 !
108 route-map NOLOCALXP permit 20
109 !
110 route-map MED permit 10
111  match ip address prefix-list PROVIDER1
112  set metric 100
113 !
114 route-map inmap permit 30
```

```
15 set metric 100
16 !
17 line vty
18 !
19 end
20
```

http://34.171.188.127:2500/47_MIAMrouter.txt

			0	1	2	3	4	5	6	7	8	9	i
*>i29.0.0.0/8	47.157.0.1	200	0	50	29	i							
*	47.49.0.2	200	0	49	52	29	i						
*>i30.0.0.0/8	47.157.0.1	200	0	50	29	32	30	i					
*	47.49.0.2	200	0	49	52	29	32	30	i				
*>i31.0.0.0/8	47.157.0.1	200	0	50	29	31	31	i					
*	47.49.0.2	200	0	49	52	29	31	31	i				
*>i32.0.0.0/8	47.157.0.1	200	0	50	29	32	i						
*	47.49.0.2	200	0	49	52	29	32	i					
*>i33.0.0.0/8	47.157.0.1	200	0	50	33	i							
*	47.49.0.2	200	0	49	52	33	i						
*>i34.0.0.0/8	47.157.0.1	200	0	50	35	34	i						
*	47.49.0.2	200	0	49	52	35	34	i					
*>i35.0.0.0/8	47.157.0.1	200	0	50	35	i							
*	47.49.0.2	200	0	49	52	35	i						
*>i36.0.0.0/8	47.157.0.1	200	0	50	33	36	i						
*	47.49.0.2	200	0	49	52	33	36	i					
*>i38.0.0.0/8	47.157.0.1	200	0	50	33	36	38	i					
*	47.49.0.2	200	0	49	52	33	36	38	i				
*>i39.0.0.0/8	47.157.0.1	200	0	50	35	38	40	39	i				
*	47.49.0.2	200	0	49	52	35	38	40	39	i			
*>i40.0.0.0/8	47.157.0.1	200	0	50	35	38	40	i					
*	47.49.0.2	200	0	49	52	35	38	40	i				
*>i41.0.0.0/8	47.157.0.1	200	0	50	41	i							
*	47.49.0.2	200	0	49	52	41	i						
*>i42.0.0.0/8	47.157.0.1	200	0	50	29	32	42	i					
*	47.49.0.2	200	0	49	52	29	32	42	i				
* i43.0.0.0/8	47.154.0.1	200	0	49	51	60	62	43	i				
*>	47.49.0.2	200	0	49	51	60	62	43	i				
* i	47.157.0.1	200	0	50	51	60	62	43	i				
* 44.0.0.0/8	47.49.0.2	200	0	49	52	31	44	i					
*>i	47.157.0.1	200	0	50	31	44	i						
* 45.0.0.0/8	47.49.0.2	200	0	49	50	48	45	i					
*>i	47.157.0.1	200	0	50	48	45	i						
* i46.0.0.0/8	47.154.0.1	200	0	49	51	60	62	43	46	i			
* i	47.157.0.1	200	0	50	51	60	62	43	46	i			
*>	47.49.0.2	200	0	49	51	60	62	43	46	i			
*>i47.0.0.0/8	47.153.0.1	0	100	0	i								
* 48.0.0.0/8	47.49.0.2	200	0	49	50	48	i						
*>i	47.157.0.1	200	0	50	48	i							
* i49.0.0.0/8	47.154.0.1	200	0	49	i								
*>	47.49.0.2	200	0	49	i								
*>i50.0.0.0/8	47.157.0.1	200	0	50	i								
* i51.0.0.0/8	47.154.0.1	200	0	49	51	i							
* i	47.157.0.1	200	0	50	51	i							
*>	47.49.0.2	200	0	49	51	i							
* i52.0.0.0/8	47.154.0.1	200	0	49	52	i							
* i	47.157.0.1	200	0	50	52	i							
*>	47.49.0.2	200	0	49	52	i							
* i53.0.0.0/8	47.154.0.1	200	0	49	51	53	i						
* i	47.157.0.1	200	0	50	52	53	i						
*>	47.49.0.2	200	0	49	52	53	i						
* i54.0.0.0/8	47.154.0.1	200	0	49	52	54	i						
*>	47.49.0.2	200	0	49	52	54	i						
* i	47.157.0.1	200	0	50	52	54	i						
* i55.0.0.0/8	47.154.0.1	200	0	49	51	55	i						
* i	47.157.0.1	200	0	50	51	55	i						
*>	47.49.0.2	200	0	49	51	55	i						
* i56.0.0.0/8	47.154.0.1	200	0	49	52	56	i						
* i	47.157.0.1	200	0	50	48	56	i						
*>	47.49.0.2	200	0	49	52	56	i						
* i57.0.0.0/8	47.154.0.1	200	0	49	60	62	59	57	i				
*>	47.49.0.2	200	0	49	60	62	59	57	i				
* i58.0.0.0/8	47.154.0.1	200	0	49	58	i							
*>	47.49.0.2	200	0	49	58	i							
* i59.0.0.0/8	47.154.0.1	200	0	49	58	59	i						
*>	47.49.0.2	200	0	49	58	59	i						
* i60.0.0.0/8	47.154.0.1	200	0	49	60	i							
*>	47.49.0.2	200	0	49	60	i							
* i61.0.0.0/8	47.154.0.1	200	0	49	60	61	i						
*>	47.49.0.2	200	0	49	60	61	i						
* i62.0.0.0/8	47.154.0.1	200	0	49	60	62	i						
*>	47.49.0.2	200	0	49	60	62	i						

* i63.0.0.0/8	47.154.0.1	200	0 49 64 65 63 i
*>	47.49.0.2	200	0 49 64 65 63 i
* i64.0.0.0/8	47.154.0.1	200	0 49 64 i
*>	47.49.0.2	200	0 49 64 i
* i65.0.0.0/8	47.154.0.1	200	0 49 64 65 i
*>	47.49.0.2	200	0 49 64 65 i
* i66.0.0.0/8	47.154.0.1	200	0 49 66 i
*>	47.49.0.2	200	0 49 66 i
* i67.0.0.0/8	47.154.0.1	200	0 49 64 65 67 i
*>	47.49.0.2	200	0 49 64 65 67 i
* i68.0.0.0/8	47.154.0.1	200	0 49 68 i
*>	47.49.0.2	200	0 49 68 i
* i69.0.0.0/8	47.154.0.1	200	0 49 68 69 i
*>	47.49.0.2	200	0 49 68 69 i
* i70.0.0.0/8	47.154.0.1	200	0 49 70 i

The MIAM router of AS47 shows that it will prefer to enter via BOST.