

# Report for Lab 3

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## 1. Specific configuration command that you issued attached with reason and effect.

(1) What commands did you use to set up SEAT-server2?

Answer: "ifconfig server2-eth0 2.0.109.3" and "route add default gw 2.109.0.4" command. Use that command to assign ip address and default gateway to server2 and then server2 can ping SEAT. Actually, the configuration of server2 is default there, I didn't change anything.

(2) How does the router interact with each other after one router advertise for a specific subnet, or setting up a specific ospf route.

Answer: For routers in different ASes, they interact via eBGP session. For routers in the same AS, they interact via OSPF for the routes in this AS, and via iBGP session for the routes received from other ASes.

(3) What commands did you use to set up BGP?

Answer: To set up BGP, these commands are used:

- "router bgp [AS\_NUM]" to indicate the AS number
- "bgp router-id [ROUTER\_ID]" to clarify router id.
- "neighbor [IP\_ADDR] remote-as [AS\_NUM]" to set [IP\_ADDR] as a BGP neighbor and clarify the AS which the neighbor belongs to.
- "neighbor [IP\_ADDR] update-source host" to set host interface as the router's interface for iBGP. This is done in Lab 2 too.
- "neighbor [IP\_ADDR] next-hop-self" to set next hop the router itself for iBGP. This is done in Lab 2 too.
- "network [PREFIX]" to advertise prefix to other routers.

Using these commands, the iBGP and eBGP sessions are established and routers can communicate through different ASes.

(4) Did you do anything different than lab2 to set up OSPF?

Answer: Yes, there are something different.

- The link between NEWY and CHIC is cancelled.
- The link between NEWY and WASH is modified, the ip address is changes and the ospf weight is removed.
- The ip address of SEAT-host is changed to 2.109.10.1 and the ip address of the host interface of SEAT is changed to 2.109.10.2 because of the original subnet of SEAT-host is the same as server2. Thus, the subnet of SEAT-host to set up OSPF is changed to 2.109.10.2/24

## 2. Specific scenarios that you didn't expect, and explain the reason why that happened and how you fixed / dealt with that.

(1) Any test case failure, e.g. ping, traceroute, etc.

Answer:

- Sometimes after restarting the mininet, all the bgp sessions become active and the network becomes unreachable. This is because it needs time for bgp sessions to interact and update the routing information. To solve this, just wait a little bit and then all the bgp sessions will be established correctly.
- Besides, there is some case failure due to Quagga's bug. For example, I cannot ping 2.0.3.2 (interface of CHIC) from WASH. That's because the packets sent to 2.0.3.2 from WASH is via route WASH→ATLA→CHIC, which is not the lowest cost path from WASH to CHIC. And in CHIC's routing table, the route to WASH is CHIC→WASH, so the reply signal is not sent back to WASH, and so it appears that WASH cannot ping 2.0.3.2. This is a bug and cannot be fixed.

(2) Route missing in routing table.

Answer: There is no route missing in the routing table, which means every router can reach and can be reached by any other router. However, due to the Quagga bug pointed above, some routes are not the best routes (with lowest OSPF cost). For example, see below:

```
0>* 2.0.3.0/24 [110/1745] via 2.0.5.2, atla, 00:04:01
0> 2.0.5.0/24 [110/700] is directly connected, atla
```

This is the route to subnet 2.0.3.0/24 from router WASH. For OSPF, it should show route with lowest cost 905, which is WASH→CHIC, but because of Quagga bug, it shows the route with cost 1745, which is WASH→ATLA→CHIC (700+1045).

### 3. Investigative experiments that you carried out throughout the configuration process.

Answering questions like:

(1) What would happen if ISP had the same subnet as AS 2 or AS 4?

Answer: The routers in AS 2 or AS 4 will be able to reach other routers via different protocols, e.g. OSPF and eBGP. Thus, Administrative Distance (AD) is used to determine which protocol should be used. Generally, the value of AD for eBGP is smaller than that of OSPF, which means router prefers eBGP routes than OSPF. But the value of AD can be changed too, so it still depends on detailed configurations.

(2) Do we need to config OSPF route for the inter-AS link, why?

Answer: no. Because for the inter-AS link, we need to set up eBGP session, no OSPF link between the two border routers.

(3) What other test cases did you run?

Answer:

- Ping non-existing interfaces to check destination net unreachable.
- Bring down links and ping interfaces to check destination host unreachable.
- Test downloading large files (near 60 MB) from server1 and server2