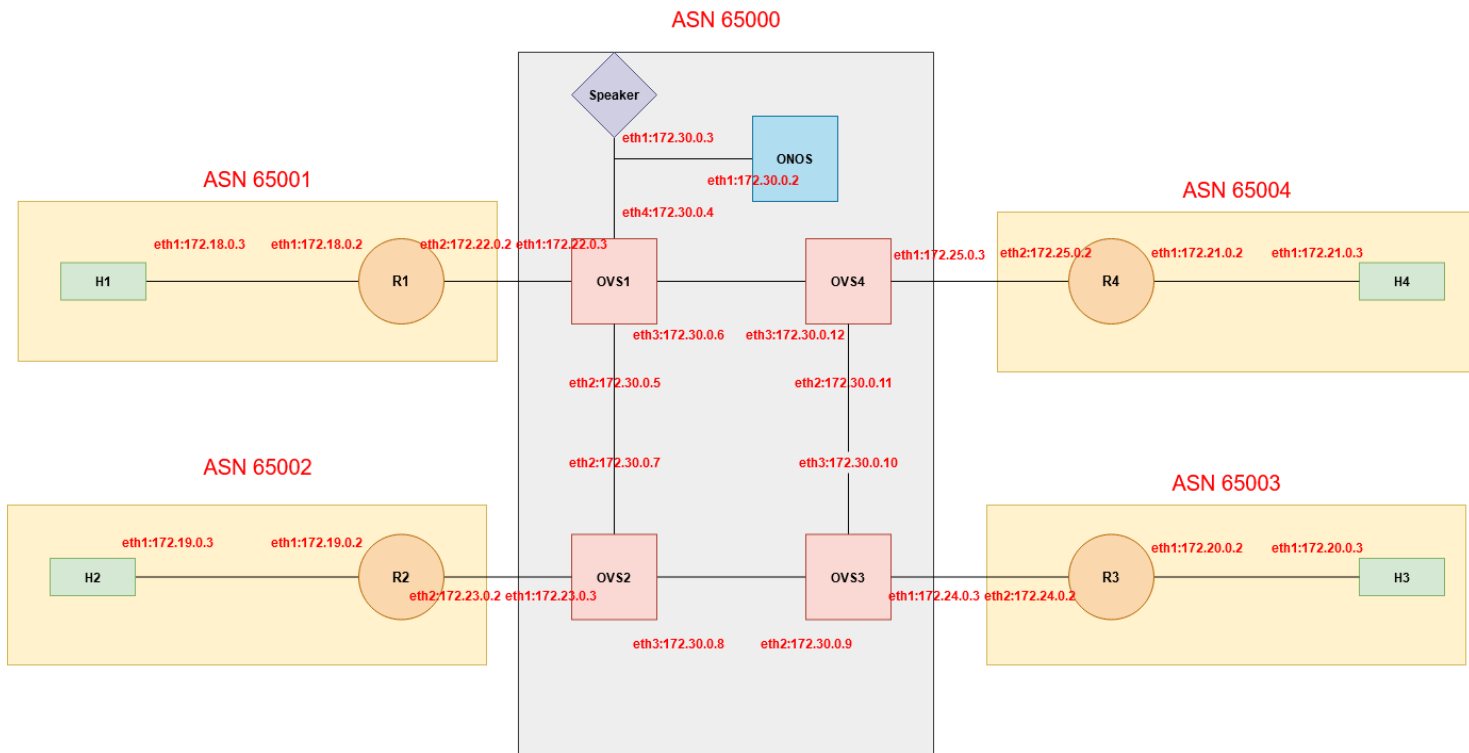
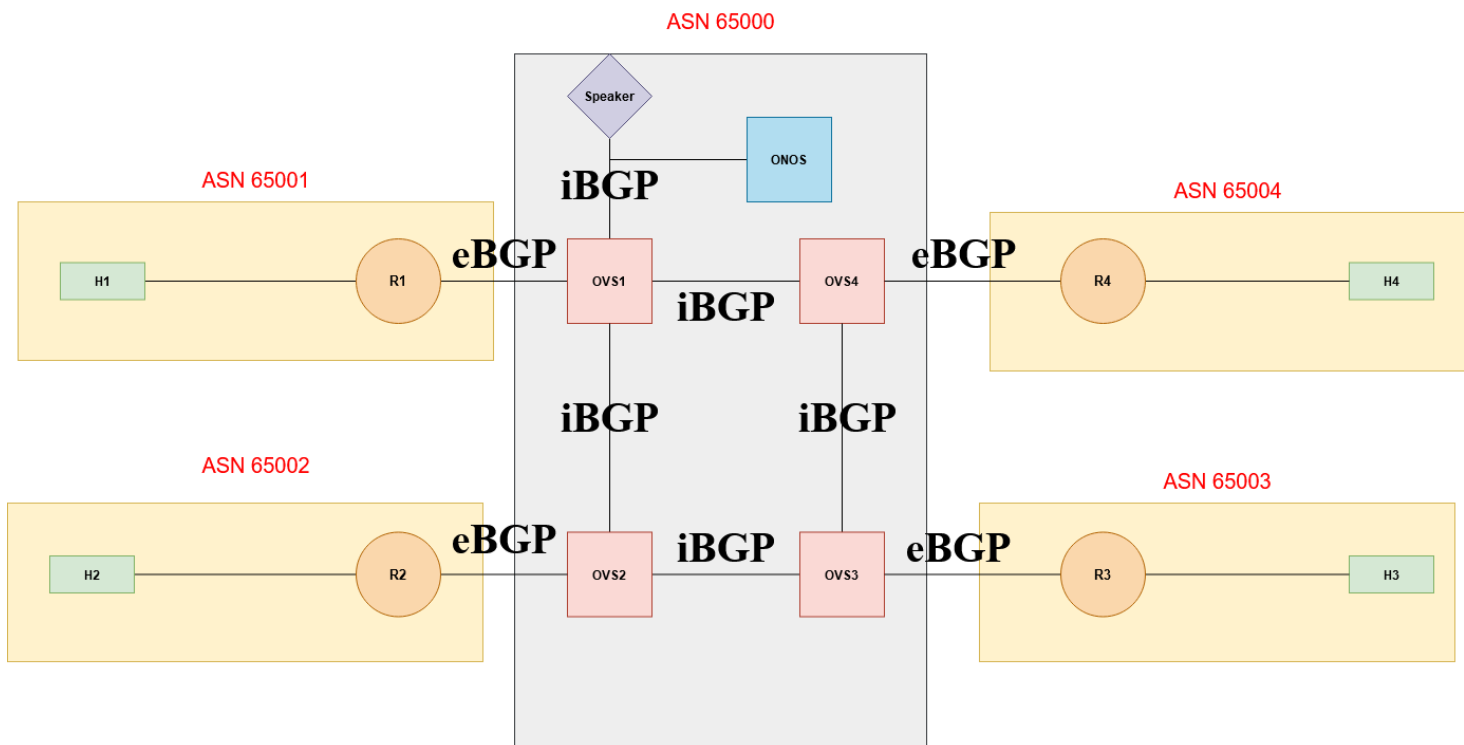


Final Project

1. Topology

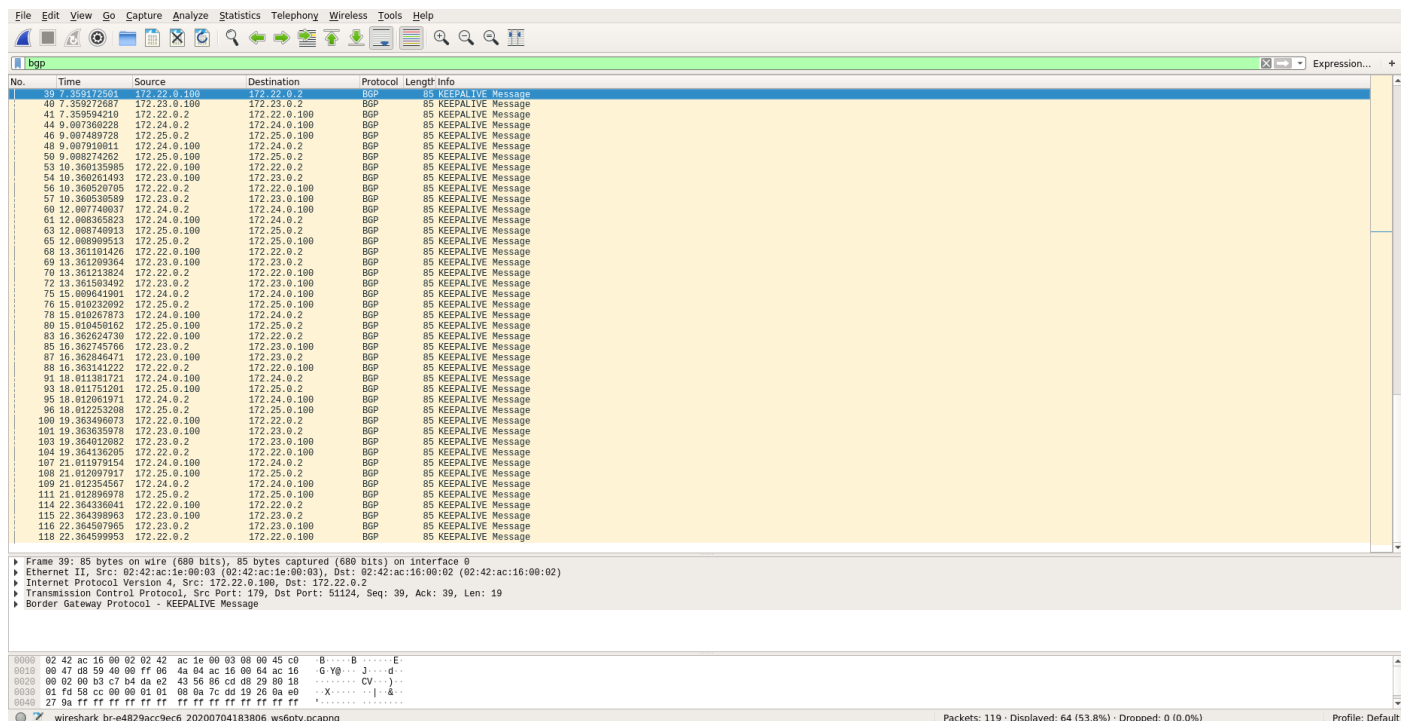


2. eBGP AND iBGP



3. Capture BGP packets in speaker path

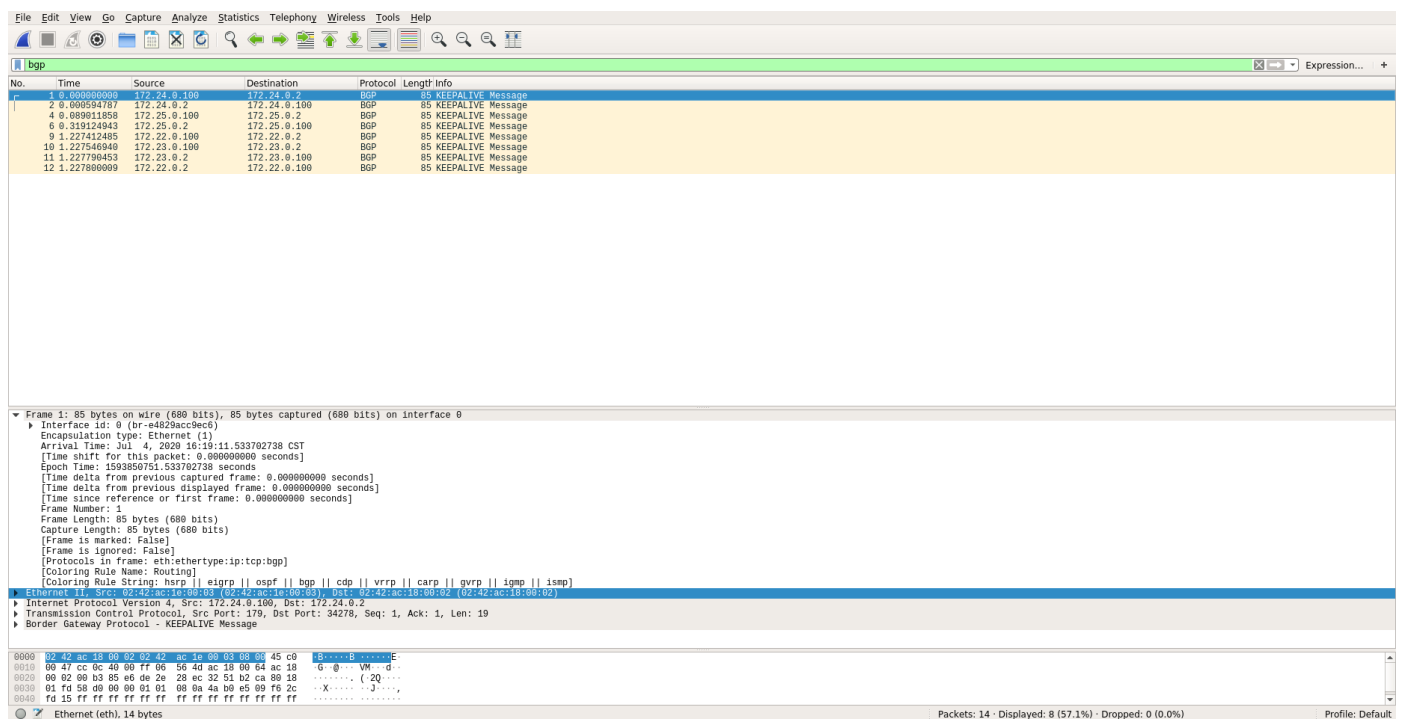
可從下圖看到有處理 172.22.x.x~172.25.x.x 的 BGP，故下圖是在 Speaker path 中擷取的 BGP packets



The screenshot shows a Wireshark capture of BGP packets. The packet list pane displays a series of BGP KEEPALIVE messages from source 172.22.0.100 to destination 172.25.0.100. The packet details pane shows the structure of a BGP message, including Ethernet II, Internet Protocol Version 4, Transmission Control Protocol, and Border Gateway Protocol - KEEPALIVE Message. The packet bytes pane shows the raw data in hexadecimal and ASCII.

No.	Time	Source	Destination	Protocol	Length	Info
39	7.359172501	172.22.0.100	172.22.0.2	BGP	85	KEEPALIVE Message
40	7.359222507	172.22.0.100	172.22.0.2	BGP	85	KEEPALIVE Message
41	7.359594210	172.22.0.2	172.22.0.100	BGP	85	KEEPALIVE Message
44	9.007360228	172.24.0.2	172.24.0.100	BGP	85	KEEPALIVE Message
46	9.007409728	172.25.0.2	172.25.0.100	BGP	85	KEEPALIVE Message
48	9.007910011	172.24.0.100	172.24.0.2	BGP	85	KEEPALIVE Message
50	9.008274262	172.25.0.100	172.25.0.2	BGP	85	KEEPALIVE Message
53	10.360335985	172.22.0.100	172.22.0.2	BGP	85	KEEPALIVE Message
54	10.360261493	172.23.0.100	172.23.0.2	BGP	85	KEEPALIVE Message
56	10.360520705	172.22.0.2	172.22.0.100	BGP	85	KEEPALIVE Message
57	10.360530509	172.23.0.100	172.23.0.2	BGP	85	KEEPALIVE Message
60	12.007740037	172.24.0.2	172.24.0.100	BGP	85	KEEPALIVE Message
61	12.008365823	172.24.0.100	172.24.0.2	BGP	85	KEEPALIVE Message
63	12.008740013	172.25.0.100	172.25.0.2	BGP	85	KEEPALIVE Message
65	12.008989513	172.25.0.2	172.25.0.100	BGP	85	KEEPALIVE Message
68	13.361101426	172.22.0.100	172.22.0.2	BGP	85	KEEPALIVE Message
69	13.361200364	172.23.0.100	172.23.0.2	BGP	85	KEEPALIVE Message
70	13.361213824	172.22.0.2	172.22.0.100	BGP	85	KEEPALIVE Message
72	13.361503492	172.23.0.2	172.23.0.100	BGP	85	KEEPALIVE Message
75	15.000641901	172.24.0.2	172.24.0.100	BGP	85	KEEPALIVE Message
76	15.010232092	172.25.0.2	172.25.0.100	BGP	85	KEEPALIVE Message
78	15.010267873	172.24.0.100	172.24.0.2	BGP	85	KEEPALIVE Message
80	15.010450102	172.25.0.100	172.25.0.2	BGP	85	KEEPALIVE Message
83	16.362624730	172.22.0.100	172.22.0.2	BGP	85	KEEPALIVE Message
85	16.362745706	172.23.0.2	172.23.0.100	BGP	85	KEEPALIVE Message
87	16.362846471	172.23.0.100	172.23.0.2	BGP	85	KEEPALIVE Message
88	16.363141222	172.22.0.2	172.22.0.100	BGP	85	KEEPALIVE Message
91	18.011381721	172.24.0.100	172.24.0.2	BGP	85	KEEPALIVE Message
93	18.011751201	172.25.0.100	172.25.0.2	BGP	85	KEEPALIVE Message
95	18.012061971	172.24.0.2	172.24.0.100	BGP	85	KEEPALIVE Message
96	18.012253200	172.25.0.2	172.25.0.100	BGP	85	KEEPALIVE Message
100	19.363406073	172.22.0.100	172.22.0.2	BGP	85	KEEPALIVE Message
101	19.363635978	172.23.0.100	172.23.0.2	BGP	85	KEEPALIVE Message
103	19.364012002	172.23.0.2	172.23.0.100	BGP	85	KEEPALIVE Message
104	19.364136205	172.22.0.2	172.22.0.100	BGP	85	KEEPALIVE Message
107	21.011979154	172.24.0.100	172.24.0.2	BGP	85	KEEPALIVE Message
108	21.012097917	172.25.0.2	172.25.0.100	BGP	85	KEEPALIVE Message
109	21.012354567	172.24.0.2	172.24.0.100	BGP	85	KEEPALIVE Message
111	21.012896978	172.25.0.2	172.25.0.100	BGP	85	KEEPALIVE Message
114	22.364336041	172.22.0.100	172.22.0.2	BGP	85	KEEPALIVE Message
115	22.364398963	172.23.0.100	172.23.0.2	BGP	85	KEEPALIVE Message
116	22.364507965	172.23.0.2	172.23.0.100	BGP	85	KEEPALIVE Message
118	22.364599953	172.22.0.2	172.22.0.100	BGP	85	KEEPALIVE Message

➤ Send



The screenshot shows a Wireshark capture of BGP packets. The packet list pane displays a series of BGP KEEPALIVE messages from source 172.24.0.100 to destination 172.24.0.2. The packet details pane shows the structure of a BGP message, including Ethernet II, Internet Protocol Version 4, Transmission Control Protocol, and Border Gateway Protocol - KEEPALIVE Message. The packet bytes pane shows the raw data in hexadecimal and ASCII.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	172.24.0.100	172.24.0.2	BGP	85	KEEPALIVE Message
2	0.000050419	172.24.0.2	172.24.0.100	BGP	85	KEEPALIVE Message
4	0.000901858	172.25.0.100	172.25.0.2	BGP	85	KEEPALIVE Message
6	0.319124943	172.25.0.2	172.25.0.100	BGP	85	KEEPALIVE Message
9	1.227412405	172.22.0.100	172.22.0.2	BGP	85	KEEPALIVE Message
10	1.227546040	172.23.0.100	172.23.0.2	BGP	85	KEEPALIVE Message
11	1.227790453	172.23.0.2	172.23.0.100	BGP	85	KEEPALIVE Message
12	1.227800009	172.22.0.2	172.22.0.100	BGP	85	KEEPALIVE Message

➤ Receive

The image shows a Wireshark packet capture of BGP traffic. The packet list pane displays several BGP KEEPALIVE messages between 172.24.0.100 and 172.22.0.2. The packet details pane for the selected packet (No. 2) shows the encapsulation type as Ethernet II, the protocols as IP and BGP, and the BGP message as a KEEPALIVE Message. The packet bytes pane shows the raw data in hexadecimal and ASCII.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	172.24.0.100	172.24.0.2	BGP	85	KEEPALIVE Message
2	0.000001157	172.24.0.2	172.24.0.100	BGP	85	KEEPALIVE Message
4	0.000011053	172.25.0.100	172.25.0.2	BGP	85	KEEPALIVE Message
6	0.319124043	172.25.0.2	172.25.0.100	BGP	85	KEEPALIVE Message
9	1.227412485	172.22.0.100	172.22.0.2	BGP	85	KEEPALIVE Message
10	1.227546040	172.23.0.100	172.23.0.2	BGP	85	KEEPALIVE Message
11	1.227790453	172.23.0.2	172.23.0.100	BGP	85	KEEPALIVE Message
12	1.227800009	172.22.0.2	172.22.0.100	BGP	85	KEEPALIVE Message

4. Telnet bgpd daemons of Speaker

```
root@a9778c6945db:/# telnet localhost 2605
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.

Hello, this is Quagga (version 0.99.24.1).
Copyright 1996-2005 Kunihiro Ishiguro, et al.
```

User Access Verification

Password:

```
Speakerbgp> show ip bgp summary
BGP router identifier 172.17.0.100, local AS number 65000
RIB entries 7, using 784 bytes of memory
Peers 5, using 22 KiB of memory
```

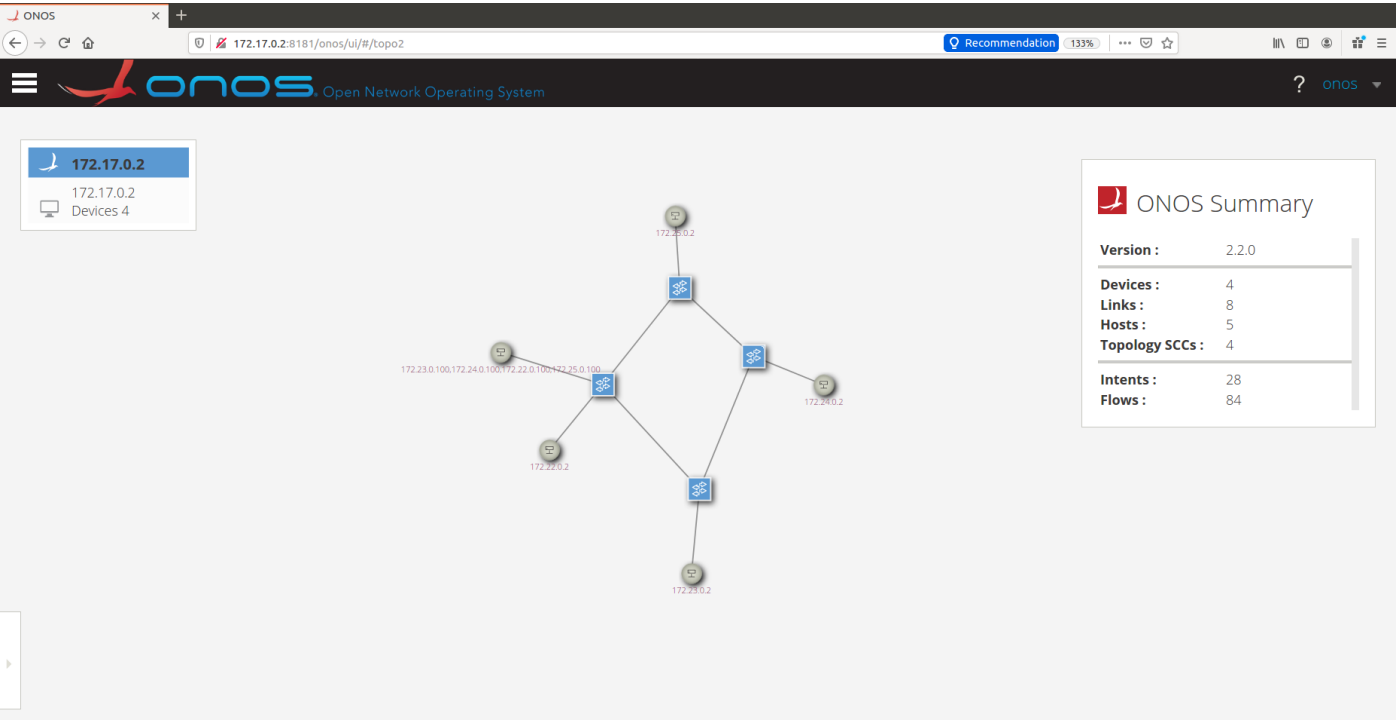
Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.17.0.2	4	65000	2664	2757	0	0	0	02:17:36	0
172.22.0.2	4	65001	2226	2230	0	0	0	01:51:15	1
172.23.0.2	4	65002	2226	2230	0	0	0	01:51:15	1
172.24.0.2	4	65003	2227	2231	0	0	0	01:51:16	1
172.25.0.2	4	65004	2227	2231	0	0	0	01:51:16	1

Total number of neighbors 5

```
Speakerbgp> █
```

5. Topology and intents

➤ topology



➤ intents

The screenshot shows the ONOS web interface for the intents view. The table lists 28 intents, each with an application ID, key, type, priority, and state. The application ID for all intents is 'org.onosproject.sdnip'. The keys represent various network addresses and their associated intents. The types are 'MultiPointToSinglePointIntent' and 'PointToPointIntent'. The priorities are 180 and 1000. The state for all intents is 'Installed'.

APPLICATION ID	KEY	TYPE	PRIORITY	STATE
org.onosproject.sdnip	172.18.0.0/16	MultiPointToSinglePointIntent	180	Installed
org.onosproject.sdnip	172.19.0.0/16	MultiPointToSinglePointIntent	180	Installed
org.onosproject.sdnip	172.20.0.0/16	MultiPointToSinglePointIntent	180	Installed
org.onosproject.sdnip	172.21.0.0/16	MultiPointToSinglePointIntent	180	Installed
org.onosproject.sdnip	172.22.0.100-172.22.0.2-dst	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.22.0.100-172.22.0.2-icmp	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.22.0.100-172.22.0.2-src	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.22.0.2-172.22.0.100-dst	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.22.0.2-172.22.0.100-icmp	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.22.0.2-172.22.0.100-src	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.23.0.100-172.23.0.2-dst	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.23.0.100-172.23.0.2-icmp	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.23.0.100-172.23.0.2-src	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.23.0.2-172.23.0.100-dst	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.23.0.2-172.23.0.100-icmp	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.23.0.2-172.23.0.100-src	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.24.0.100-172.24.0.2-dst	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.24.0.100-172.24.0.2-icmp	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.24.0.100-172.24.0.2-src	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.24.0.2-172.24.0.100-dst	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.24.0.2-172.24.0.100-icmp	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.24.0.2-172.24.0.100-src	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.25.0.100-172.25.0.2-dst	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.25.0.100-172.25.0.2-icmp	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.25.0.100-172.25.0.2-src	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.25.0.2-172.25.0.100-dst	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.25.0.2-172.25.0.100-icmp	PointToPointIntent	1000	Installed
org.onosproject.sdnip	172.25.0.2-172.25.0.100-src	PointToPointIntent	1000	Installed

6. Discuss

這次實驗讓我學會如何用 SDN-IP 讓不同的 AS 溝通，也學會 OVS 相關的操作，這次實驗有助教詳細的講解和 LAB5 的經驗後，基本上沒遇到問題。