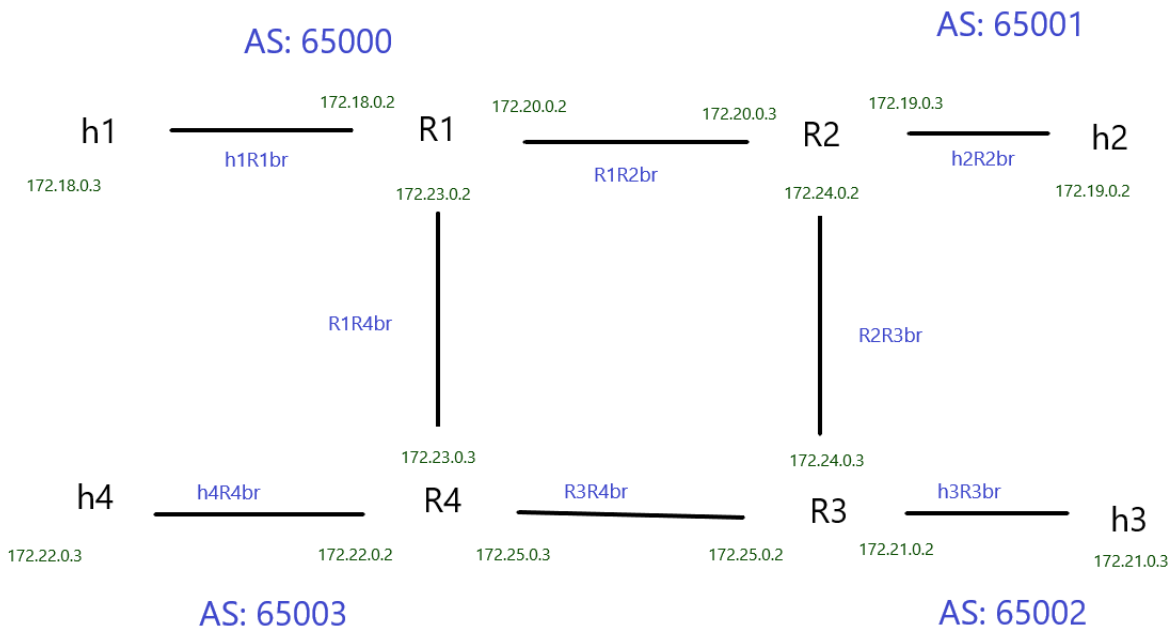


Project6

310551100

Show topology with IP addresses, interfaces and ASNs

整體的 topology



H1&R1 ifconfig

```
root@de8c3f92cab2: /# ifconfig
eth0      Link encap:Ethernet  HWaddr 02:42:ac:11:00:02
          inet addr:172.17.0.2  Bcast:172.17.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:134 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:18072 (18.0 KB)  TX bytes:0 (0.0 B)

eth1      Link encap:Ethernet  HWaddr 02:42:ac:12:00:03
          inet addr:172.18.0.3  Bcast:172.18.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2833 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1507 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:21614374 (21.6 MB)  TX bytes:87945 (87.9 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:16 errors:0 dropped:0 overruns:0 frame:0
          TX packets:16 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1340 (1.3 KB)  TX bytes:1340 (1.3 KB)

root@de8c3f92cab2: /#

root@7638d495ce95: /# ifconfig
eth0      Link encap:Ethernet  HWaddr 02:42:ac:11:00:04
          inet addr:172.17.0.4  Bcast:172.17.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:105 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:13609 (13.6 KB)  TX bytes:0 (0.0 B)

eth1      Link encap:Ethernet  HWaddr 02:42:ac:12:00:02
          inet addr:172.18.0.2  Bcast:172.18.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:128 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:16946 (16.9 KB)  TX bytes:0 (0.0 B)

eth2      Link encap:Ethernet  HWaddr 02:42:ac:14:00:02
          inet addr:172.20.0.2  Bcast:172.20.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:7001 errors:0 dropped:0 overruns:0 frame:0
          TX packets:4609 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:36877331 (36.8 MB)  TX bytes:314620 (314.6 KB)

eth3      Link encap:Ethernet  HWaddr 02:42:ac:17:00:02
          inet addr:172.23.0.2  Bcast:172.23.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1332 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1221 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:110227 (110.2 KB)  TX bytes:94156 (94.1 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:246 errors:0 dropped:0 overruns:0 frame:0
          TX packets:246 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:16952 (16.9 KB)  TX bytes:16952 (16.9 KB)

root@7638d495ce95: /#
```

H2&R2 ifconfig

```
root@a12d52420631:/# ifconfig
eth0      Link encap:Ethernet  HWaddr 02:42:ac:11:00:03
          inet addr:172.17.0.3  Bcast:172.17.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:112 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:14981 (14.9 KB)  TX bytes:0 (0.0 B)

eth1      Link encap:Ethernet  HWaddr 02:42:ac:13:00:02
          inet addr:172.19.0.2  Bcast:172.19.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:3113 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1888 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:21632211 (21.6 MB)  TX bytes:108527 (108.5 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:14 errors:0 dropped:0 overruns:0 frame:0
          TX packets:14 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1156 (1.1 KB)  TX bytes:1156 (1.1 KB)

root@a12d52420631:/#
```

```
root@e16acf423aa1:/# ifconfig
eth0      Link encap:Ethernet  HWaddr 02:42:ac:11:00:05
          inet addr:172.17.0.5  Bcast:172.17.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:112 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:14981 (14.9 KB)  TX bytes:0 (0.0 B)

eth1      Link encap:Ethernet  HWaddr 02:42:ac:13:00:03
          inet addr:172.19.0.3  Bcast:172.19.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:117 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:15682 (15.6 KB)  TX bytes:0 (0.0 B)

eth2      Link encap:Ethernet  HWaddr 02:42:ac:14:00:03
          inet addr:172.20.0.3  Bcast:172.20.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:6840 errors:0 dropped:0 overruns:0 frame:0
          TX packets:4911 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:36869405 (36.8 MB)  TX bytes:331776 (331.7 KB)

eth3      Link encap:Ethernet  HWaddr 02:42:ac:18:00:02
          inet addr:172.24.0.2  Bcast:172.24.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1234 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1025 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:101860 (101.8 KB)  TX bytes:78623 (78.6 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:139 errors:0 dropped:0 overruns:0 frame:0
          TX packets:139 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:10263 (10.2 KB)  TX bytes:10263 (10.2 KB)

root@e16acf423aa1:/#
```

H3&R3 ifconfig

```
root@d04ba196a88d:/# ifconfig
eth0      Link encap:Ethernet  HWaddr 02:42:ac:11:00:06
          inet addr:172.17.0.6  Bcast:172.17.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:93 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:13139 (13.1 KB)  TX bytes:0 (0.0 B)

eth1      Link encap:Ethernet  HWaddr 02:42:ac:15:00:03
          inet addr:172.21.0.3  Bcast:172.21.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2503 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1424 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:21598897 (21.5 MB)  TX bytes:83463 (83.4 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:20 errors:0 dropped:0 overruns:0 frame:0
          TX packets:20 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1662 (1.6 KB)  TX bytes:1662 (1.6 KB)

root@d04ba196a88d:/#
```

```
root@c38a84976eea:/# ifconfig
eth0      Link encap:Ethernet  HWaddr 02:42:ac:11:00:08
          inet addr:172.17.0.8  Bcast:172.17.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:92 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:13069 (13.0 KB)  TX bytes:0 (0.0 B)

eth1      Link encap:Ethernet  HWaddr 02:42:ac:15:00:02
          inet addr:172.21.0.2  Bcast:172.21.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:130 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:18081 (18.0 KB)  TX bytes:0 (0.0 B)

eth2      Link encap:Ethernet  HWaddr 02:42:ac:18:00:03
          inet addr:172.24.0.3  Bcast:172.24.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:5558 errors:0 dropped:0 overruns:0 frame:0
          TX packets:3394 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:36767568 (36.7 MB)  TX bytes:218262 (218.2 KB)

eth3      Link encap:Ethernet  HWaddr 02:42:ac:19:00:02
          inet addr:172.25.0.2  Bcast:172.25.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1799 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1840 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:146600 (146.6 KB)  TX bytes:139563 (139.5 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:228 errors:0 dropped:0 overruns:0 frame:0
          TX packets:228 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:14717 (14.7 KB)  TX bytes:14717 (14.7 KB)

root@c38a84976eea:/#
```

H4&R4 ifconfig

```
root@Scee20064631:/# ifconfig
eth0      Link encap:Ethernet  HWaddr 02:42:ac:11:00:07
          inet addr:172.17.0.7  Bcast:172.17.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:92 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:13069 (13.0 KB)  TX bytes:0 (0.0 B)

eth1      Link encap:Ethernet  HWaddr 02:42:ac:16:00:03
          inet addr:172.22.0.3  Bcast:172.22.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2672 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1384 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:21607979 (21.6 MB)  TX bytes:81291 (81.2 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:16 errors:0 dropped:0 overruns:0 frame:0
          TX packets:16 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1294 (1.2 KB)  TX bytes:1294 (1.2 KB)

root@Scee20064631:/#

root@fce61de9f762:/# ifconfig
eth0      Link encap:Ethernet  HWaddr 02:42:ac:11:00:09
          inet addr:172.17.0.9  Bcast:172.17.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:92 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:13069 (13.0 KB)  TX bytes:0 (0.0 B)

eth1      Link encap:Ethernet  HWaddr 02:42:ac:16:00:02
          inet addr:172.22.0.2  Bcast:172.22.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:130 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:18081 (18.0 KB)  TX bytes:0 (0.0 B)

eth2      Link encap:Ethernet  HWaddr 02:42:ac:17:00:03
          inet addr:172.23.0.3  Bcast:172.23.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:6432 errors:0 dropped:0 overruns:0 frame:0
          TX packets:4149 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:36820372 (36.8 MB)  TX bytes:263772 (263.7 KB)

eth3      Link encap:Ethernet  HWaddr 02:42:ac:19:00:03
          inet addr:172.25.0.3  Bcast:172.25.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1982 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1685 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:158546 (158.5 KB)  TX bytes:129745 (129.7 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:146 errors:0 dropped:0 overruns:0 frame:0
          TX packets:146 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:10614 (10.6 KB)  TX bytes:10614 (10.6 KB)

root@fce61de9f762:/#
```

Capture one pair of BGP packets from wireshark and show screenshots

我是抓 R1 跟 R4 之間的封包，這張圖是 R1 -> R4 的

bgp					
No.	Time	Source	Destination	Protocol	Length Info
1	0.000000000	172.23.0.3	172.23.0.2	BGP	85 KEEPALIVE Message
2	0.000010691	172.23.0.2	172.23.0.3	BGP	85 KEEPALIVE Message
5	2.218803080	172.23.0.3	172.23.0.2	BGP	87 NOTIFICATION Message
8	2.219123330	172.23.0.3	172.23.0.2	BGP	87 NOTIFICATION Message
13	13.255569223	172.23.0.3	172.23.0.2	BGP	125 OPEN Message
19	17.997016008	172.23.0.2	172.23.0.3	BGP	125 OPEN Message
21	17.997232818	172.23.0.3	172.23.0.2	BGP	144 OPEN Message, KEEPALIVE Message
23	17.997336028	172.23.0.2	172.23.0.3	BGP	104 KEEPALIVE Message, KEEPALIVE Message
24	17.997400828	172.23.0.3	172.23.0.2	BGP	85 KEEPALIVE Message
26	18.997484113	172.23.0.2	172.23.0.3	BGP	249 UPDATE Message, UPDATE Message, UPDATE Message, UPDATE Message
27	18.997708583	172.23.0.3	172.23.0.2	BGP	249 UPDATE Message, UPDATE Message, UPDATE Message, UPDATE Message
29	20.997724804	172.23.0.2	172.23.0.3	BGP	85 KEEPALIVE Message
30	20.997836633	172.23.0.3	172.23.0.2	BGP	85 KEEPALIVE Message
32	23.998875979	172.23.0.3	172.23.0.2	BGP	85 KEEPALIVE Message
34	23.999014269	172.23.0.2	172.23.0.3	BGP	85 KEEPALIVE Message
36	26.999734514	172.23.0.3	172.23.0.2	BGP	85 KEEPALIVE Message
37	26.999756195	172.23.0.2	172.23.0.3	BGP	85 KEEPALIVE Message
40	30.000710940	172.23.0.3	172.23.0.2	BGP	85 KEEPALIVE Message
41	30.000723840	172.23.0.2	172.23.0.3	BGP	85 KEEPALIVE Message
44	33.000952996	172.23.0.3	172.23.0.2	BGP	85 KEEPALIVE Message
46	33.001080966	172.23.0.2	172.23.0.3	BGP	85 KEEPALIVE Message
48	36.001985531	172.23.0.3	172.23.0.2	BGP	85 KEEPALIVE Message
49	36.001999771	172.23.0.2	172.23.0.3	BGP	85 KEEPALIVE Message
▶ Frame 19: 125 bytes on wire (1000 bits), 125 bytes captured (1000 bits) on interface 0					
▶ Ethernet II, Src: 02:42:ac:17:00:02 (02:42:ac:17:00:02), Dst: 02:42:ac:17:00:03 (02:42:ac:17:00:03)					
▶ Internet Protocol Version 4, Src: 172.23.0.2, Dst: 172.23.0.3					
▶ Transmission Control Protocol, Src Port: 39120, Dst Port: 179, Seq: 1, Ack: 1, Len: 59					
▼ Border Gateway Protocol - OPEN Message					
Marker: ffffffff					
Length: 59					
Type: OPEN Message (1)					
Version: 4					
My AS: 65000					
Hold Time: 9					
BGP Identifier: 172.23.0.2					
Optional Parameters Length: 30					
▶ Optional Parameters					

這張圖是 $R4 \rightarrow R1$ 的

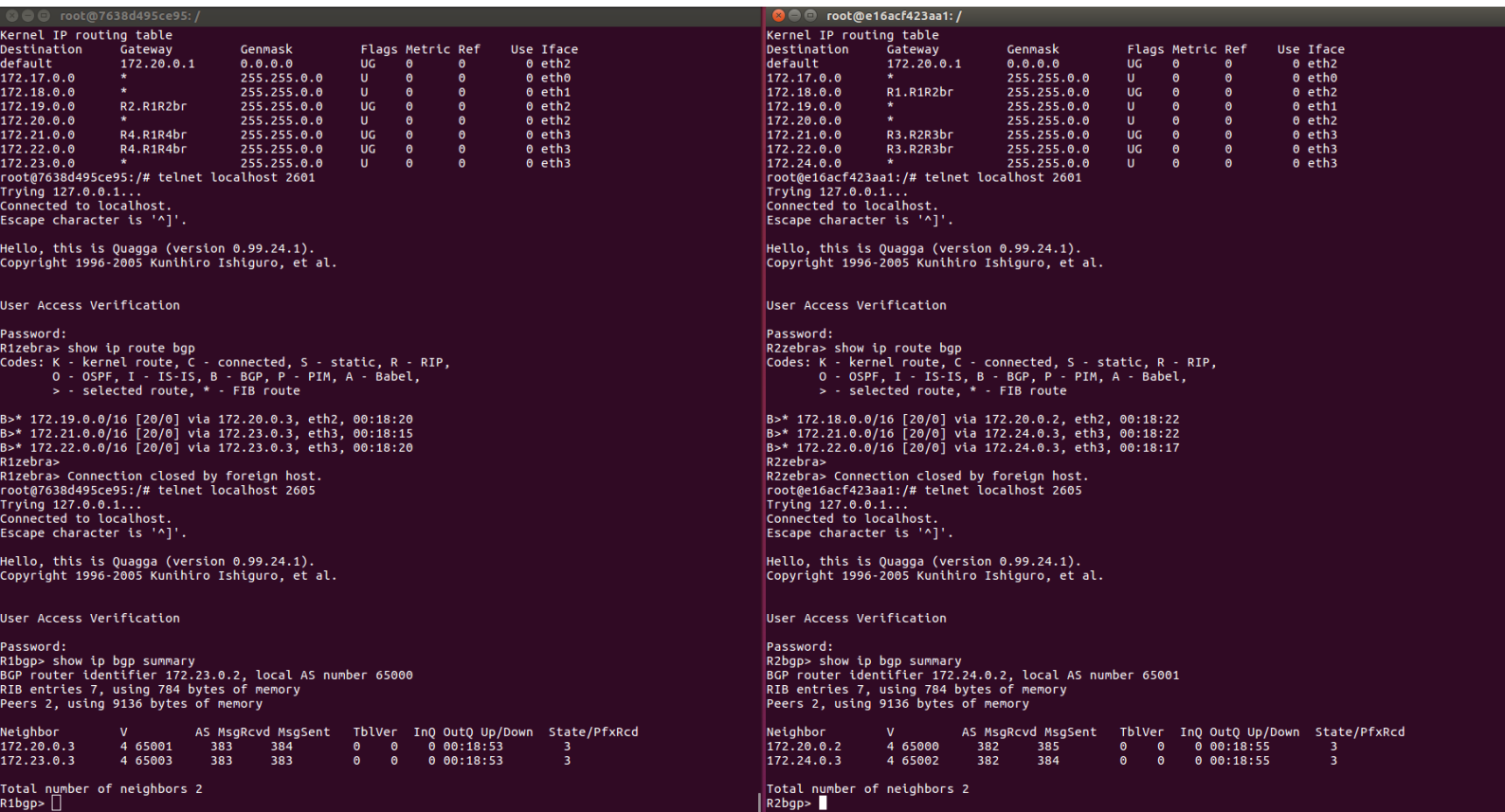
No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	172.23.0.3	172.23.0.2	BGP	85	KEEPALIVE Message
2	0.000010691	172.23.0.2	172.23.0.3	BGP	85	KEEPALIVE Message
5	2.218803080	172.23.0.3	172.23.0.2	BGP	87	NOTIFICATION Message
8	2.219123330	172.23.0.3	172.23.0.2	BGP	87	NOTIFICATION Message
13	13.255569223	172.23.0.3	172.23.0.2	BGP	125	OPEN Message
19	17.997016008	172.23.0.2	172.23.0.3	BGP	125	OPEN Message
21	17.997232818	172.23.0.3	172.23.0.2	BGP	144	OPEN Message, KEEPALIVE Message
23	17.997336028	172.23.0.2	172.23.0.3	BGP	104	KEEPALIVE Message, KEEPALIVE Message
24	17.997400828	172.23.0.3	172.23.0.2	BGP	85	KEEPALIVE Message
26	18.997484113	172.23.0.2	172.23.0.3	BGP	249	UPDATE Message, UPDATE Message, UPDATE Message, UPDATE Message
27	18.997708583	172.23.0.3	172.23.0.2	BGP	249	UPDATE Message, UPDATE Message, UPDATE Message, UPDATE Message
29	20.997724804	172.23.0.2	172.23.0.3	BGP	85	KEEPALIVE Message
30	20.997836633	172.23.0.3	172.23.0.2	BGP	85	KEEPALIVE Message
32	23.998875979	172.23.0.3	172.23.0.2	BGP	85	KEEPALIVE Message
34	23.999014269	172.23.0.2	172.23.0.3	BGP	85	KEEPALIVE Message
36	26.999734514	172.23.0.3	172.23.0.2	BGP	85	KEEPALIVE Message
37	26.999756195	172.23.0.2	172.23.0.3	BGP	85	KEEPALIVE Message
40	30.000710940	172.23.0.3	172.23.0.2	BGP	85	KEEPALIVE Message
41	30.000723840	172.23.0.2	172.23.0.3	BGP	85	KEEPALIVE Message
44	33.000952996	172.23.0.3	172.23.0.2	BGP	85	KEEPALIVE Message
46	33.001080966	172.23.0.2	172.23.0.3	BGP	85	KEEPALIVE Message
48	36.001985531	172.23.0.3	172.23.0.2	BGP	85	KEEPALIVE Message
49	36.001999771	172.23.0.2	172.23.0.3	BGP	85	KEEPALIVE Message

▶ Frame 21: 144 bytes on wire (1152 bits), 144 bytes captured (1152 bits) on interface 0
 ▶ Ethernet II, Src: 02:42:ac:17:00:03 (02:42:ac:17:00:03), Dst: 02:42:ac:17:00:02 (02:42:ac:17:00:02)
 ▶ Internet Protocol Version 4, Src: 172.23.0.3, Dst: 172.23.0.2
 ▶ Transmission Control Protocol, Src Port: 179, Dst Port: 39120, Seq: 1, Ack: 60, Len: 78
 ▼ **Border Gateway Protocol - OPEN Message**
 Marker: ffffffffffffffffffffffffffffffff
 Length: 59
 Type: OPEN Message (1)
 Version: 4
 My AS: 65003
 Hold Time: 9
 BGP Identifier: 172.23.0.3
 Optional Parameters Length: 30
 ▶ **Optional Parameters**
 ▶ Border Gateway Protocol - KEEPALIVE Message

Telnet zebra and bgpd daemons of each route and show route

screenshots

左邊是 R1 · 右邊是 R2



左邊是 R3，右邊是 R4

```
root@c38a84976eea: /
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
default 172.24.0.1 0.0.0.0 UG 0 0 0 eth2
172.17.0.0 * 255.255.0.0 U 0 0 0 eth0
172.18.0.0 R4.R3R4br 255.255.0.0 UG 0 0 0 eth3
172.19.0.0 R2.R2R3br 255.255.0.0 UG 0 0 0 eth2
172.21.0.0 * 255.255.0.0 U 0 0 0 eth1
172.22.0.0 R4.R3R4br 255.255.0.0 UG 0 0 0 eth3
172.24.0.0 * 255.255.0.0 U 0 0 0 eth2
172.25.0.0 * 255.255.0.0 U 0 0 0 eth3
root@c38a84976eea:/# telnet localhost 2601
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^J'.

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

User Access Verification

Password:
R3zebra> show ip route bgp
Codes: K - kernel route, C - connected, S - static, R - RIP,
O - OSPF, I - IS-IS, B - BGP, P - PIM, A - Babel,
> - selected route, * - FIB route

B>* 172.18.0.0/16 [20/0] via 172.25.0.3, eth3, 00:21:33
B>* 172.19.0.0/16 [20/0] via 172.24.0.2, eth2, 00:21:35
B>* 172.22.0.0/16 [20/0] via 172.25.0.3, eth3, 00:21:33
R3zebra>
R3zebra> Connection closed by foreign host.
root@c38a84976eea:/# telnet localhost 2605
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^J'.

Hello, this is Quagga (version 0.99.24.1).
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User Access Verification

Password:
R3bgp> show ip bgp summary
BGP router identifier 172.24.0.3, local AS number 65002
RIB entries 7, using 784 bytes of memory
Peers 2, using 9136 bytes of memory

Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd
172.24.0.2 4 65001 448 450 0 0 0 00:22:11 2
172.25.0.3 4 65003 446 449 0 0 0 00:22:09 2

Total number of neighbors 2
R3bgp>

root@fce61de9f762: /
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
default 172.23.0.1 0.0.0.0 UG 0 0 0 eth2
172.17.0.0 * 255.255.0.0 U 0 0 0 eth0
172.18.0.0 R1.R1R4br 255.255.0.0 UG 0 0 0 eth2
172.19.0.0 R3.R3R4br 255.255.0.0 UG 0 0 0 eth3
172.21.0.0 R3.R3R4br 255.255.0.0 UG 0 0 0 eth3
172.22.0.0 * 255.255.0.0 U 0 0 0 eth1
172.23.0.0 * 255.255.0.0 U 0 0 0 eth2
172.25.0.0 * 255.255.0.0 U 0 0 0 eth3
root@fce61de9f762:/# telnet localhost 2601
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^J'.

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User Access Verification

Password:
R4zebra> show ip route bgp
Codes: K - kernel route, C - connected, S - static, R - RIP,
O - OSPF, I - IS-IS, B - BGP, P - PIM, A - Babel,
> - selected route, * - FIB route

B>* 172.18.0.0/16 [20/0] via 172.23.0.2, eth2, 00:21:37
B>* 172.19.0.0/16 [20/0] via 172.25.0.2, eth3, 00:21:35
B>* 172.21.0.0/16 [20/0] via 172.25.0.2, eth3, 00:21:35
R4zebra>
R4zebra> Connection closed by foreign host.
root@fce61de9f762:/# telnet localhost 2605
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^J'.

Hello, this is Quagga (version 0.99.24.1).
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User Access Verification

Password:
R4bgp> show ip bgp summary
BGP router identifier 172.23.0.3, local AS number 65003
RIB entries 7, using 784 bytes of memory
Peers 2, using 9136 bytes of memory

Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd
172.23.0.2 4 65000 448 452 0 0 0 00:22:13 2
172.25.0.2 4 65002 448 449 0 0 0 00:22:11 2

Total number of neighbors 2
R4bgp>
```

Write down what you have learned or solved.

I have been learned Quagga and BGP from the lecture. However, the real implementation made me experience their functions in the network. Using Quagga and BGP for Connecting neighbor autonomous systems and the procedure of expanding the whole topology, which allowed me to deepen my memory for these functionalities.