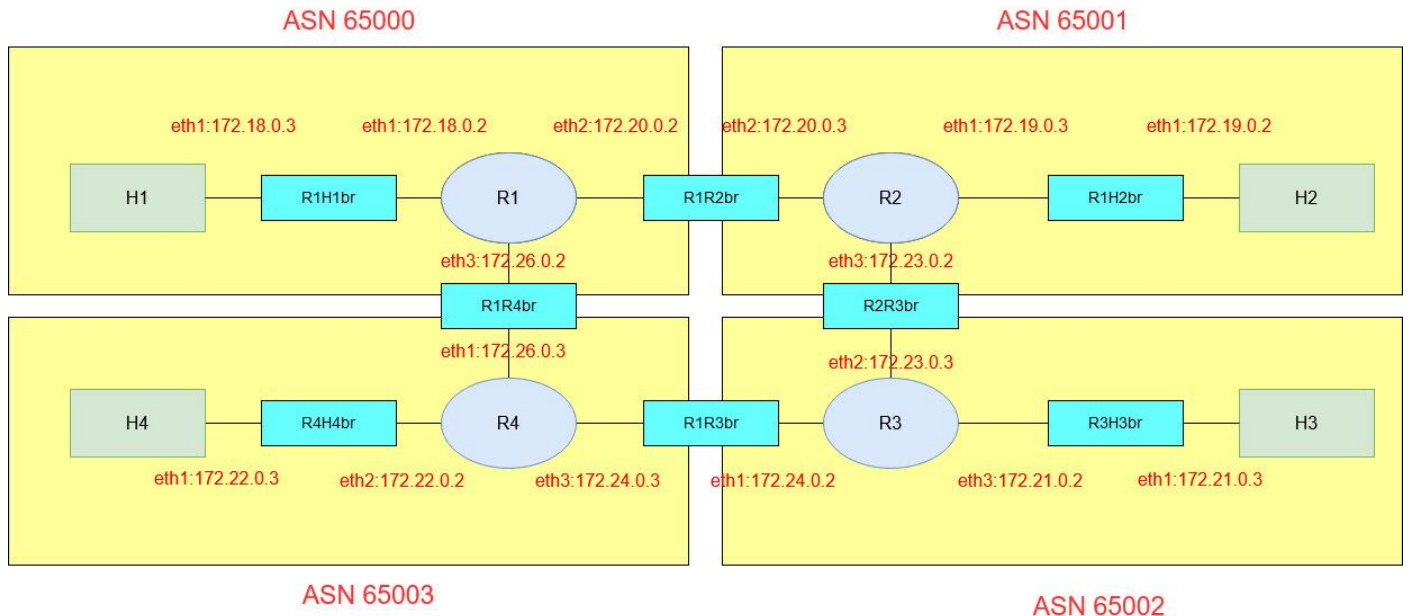


Project5

VNF – Virtual Router

1. Topology



2. BGP packet

The image shows a Wireshark capture of a BGP packet. The packet list pane shows a BGP packet (No. 104) with a length of 85 bytes. The packet details pane shows the following structure:

- Frame 104: 85 bytes on wire (688 bits), 85 bytes captured (688 bits) on interface 0
- Interface id: 0 (vethbfff9d8)
- Encapsulation type: Ethernet (1)
- Arrival Time: May 21, 2020 16:16:20.874266308 CST
- [Time shift for this packet: 0.000000000 seconds]
- Epoch Time: 1590040989.874266308 seconds
- [Time delta from previous captured frame: 1.256053340 seconds]
- [Time delta from previous displayed frame: 3.060859479 seconds]
- [Time since reference or first frame: 75.140190831 seconds]
- Frame Number: 104
- Frame Length: 85 bytes (688 bits)
- Capture Length: 85 bytes (688 bits)
- [Frame is marked: false]
- [Frame is ignored: false]
- Ethernet II, Src: 02:42:ac:14:00:03 (02:42:ac:14:00:03), Dst: 02:42:ac:14:00:02 (02:42:ac:14:00:02)
- Internet Protocol Version 4, Src: 172.20.0.3, Dst: 172.20.0.2
- Transmission Control Protocol, Src Port: 54926, Dst Port: 179, Seq: 476, Ack: 476, Len: 19
- Source Port: 54926
- Destination Port: 179
- [Stream index: 0]
- [TCP Segment Len: 19]
- Sequence number: 476 (relative sequence number)
- [Next sequence number: 495 (relative sequence number)]
- Acknowledgment number: 476 (relative ack number)
- 1000... = Header Length: 32 bytes (8)
- Flags: 0x019 (PSH, ACK)
- Window size value: 229
- [Calculated window size: 229]
- [Window size scaling factor: -1 (unknown)]
- Checksum: 0x5867 [unverified]
- [Checksum Status: Unverified]
- Unparsed data: 0..0
- BGP, Version 4, Src: 172.20.0.3, Dst: 172.20.0.2
- KEEPALIVE Message

Capture this BGP packet between R1 and R2.

3. Telnet zebra and bgpd daemons of each route and show route screenshots

R1

```
Terminal
root@0e9c8ac0492c:/

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

User Access Verification

Password:
R1zebra> 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>* 172.19.0.0/16 [20/0] via 172.20.0.3, eth2, 00:27:49
B>* 172.21.0.0/16 [20/0] via 172.26.0.3, eth3, 00:27:48
B>* 172.22.0.0/16 [20/0] via 172.26.0.3, eth3, 00:27:48
R1zebra> exit
Connection closed by foreign host.
root@0e9c8ac0492c:/# telnet localhost 2605
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^J'.

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

User Access Verification

Password:
R1# show ip bgp summary
BGP router identifier 172.26.0.2, local AS number 65000
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
172.20.0.3    4 65001    574    576      0    0 00:28:30        3
172.26.0.3    4 65003    573    576      0    0 00:28:29        2

Total number of neighbors 2
R1# exit
Connection closed by foreign host.

root@0e9c8ac0492c:/# route
Kernel IP routing table
Destination Gateway      Genmask      Flags Metric Ref    Use Iface
default     172.18.0.1  0.0.0.0      UG    0     0    0 eth1
172.17.0.0  *          255.255.0.0  U     0     0    0 eth0
172.18.0.0  *          255.255.0.0  U     0     0    0 eth1
172.19.0.0  R2.R1R2br  255.255.0.0  UG    0     0    0 eth2
172.20.0.0  *          255.255.0.0  U     0     0    0 eth2
172.21.0.0  R4.R1R4br  255.255.0.0  UG    0     0    0 eth3
172.22.0.0  R4.R1R4br  255.255.0.0  UG    0     0    0 eth3
172.26.0.0  *          255.255.0.0  U     0     0    0 eth3
```

R2

```
Terminal
root@93c16bde7d45:/

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

User Access Verification

Password:
R2zebra> 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 172.20.0.2, eth2, 00:27:45
B>* 172.21.0.0/16 [20/0] via 172.23.0.3, eth3, 00:27:44
B>* 172.22.0.0/16 [20/0] via 172.23.0.3, eth3, 00:27:44
R2zebra> exit
Connection closed by foreign host.
root@93c16bde7d45:/# telnet localhost 2605
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^J'.

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

User Access Verification

Password:
R2# show ip bgp summary
BGP router identifier 172.23.0.2, local AS number 65001
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
172.20.0.2    4 65000    575    576      0    0 00:28:26        3
172.23.0.3    4 65002    573    574      0    0 00:28:27        2

Total number of neighbors 2
R2# exit
Connection closed by foreign host.

root@93c16bde7d45:/# route
Kernel IP routing table
Destination Gateway      Genmask      Flags Metric Ref    Use Iface
default     172.20.0.1  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.R1R2br  255.255.0.0  UG    0     0    0 eth2
172.19.0.0  *          255.255.0.0  U     0     0    0 eth1
172.20.0.0  *          255.255.0.0  U     0     0    0 eth2
172.21.0.0  R3.R2R3br  255.255.0.0  UG    0     0    0 eth3
172.22.0.0  R3.R2R3br  255.255.0.0  UG    0     0    0 eth3
172.23.0.0  *          255.255.0.0  U     0     0    0 eth3
```

R3

```
Terminal
root@af2258cd2b24:/

Hello, this is Quagga (version 0.99.24.1).
Copyright 1996-2005 Kunihiro 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 172.23.0.2, eth2, 00:30:56
B>* 172.19.0.0/16 [20/0] via 172.23.0.2, eth2, 00:30:56
B>* 172.22.0.0/16 [20/0] via 172.24.0.3, eth1, 00:30:56
R3zebra> exit
Connection closed by foreign host.
root@af2258cd2b24:/# telnet localhost 2605
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^J'.

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

User Access Verification

Password:
R3# show ip bgp summary
BGP router identifier 172.24.0.2, 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
172.23.0.2    4 65001    640    643      0    0 00:31:51        2
172.24.0.3    4 65003    642    643      0    0 00:31:52        3

Total number of neighbors 2
R3# exit
Connection closed by foreign host.

root@af2258cd2b24:/# route
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  R2.R2R3br  255.255.0.0  UG    0     0    0 eth2
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 eth3
172.22.0.0  R4.R3R4br  255.255.0.0  UG    0     0    0 eth1
172.23.0.0  *          255.255.0.0  U     0     0    0 eth2
172.24.0.0  *          255.255.0.0  U     0     0    0 eth1
```

R4

```
Terminal
root@9c7ede0a3adf:/

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

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 172.26.0.2, eth1, 00:31:04
B>* 172.19.0.0/16 [20/0] via 172.26.0.2, eth1, 00:31:04
B>* 172.21.0.0/16 [20/0] via 172.24.0.2, eth3, 00:31:04
R4zebra> exit
Connection closed by foreign host.
root@9c7ede0a3adf:/# 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:
R4# show ip bgp summary
BGP router identifier 172.24.0.3, 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
172.24.0.2    4 65002    639    642      0    0 00:31:46        3
172.26.0.2    4 65000    639    640      0    0 00:31:45        2

Total number of neighbors 2
R4# route
% [BGP] Unknown command: route
R4# exit
Connection closed by foreign host.

root@9c7ede0a3adf:/# route
Kernel IP routing table
Destination Gateway      Genmask      Flags Metric Ref    Use Iface
default     172.26.0.1  0.0.0.0      UG    0     0    0 eth1
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 eth1
172.19.0.0  R1.R1R4br  255.255.0.0  UG    0     0    0 eth1
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 eth2
172.24.0.0  *          255.255.0.0  U     0     0    0 eth3
172.26.0.0  *          255.255.0.0  U     0     0    0 eth1
```

4. Discussion

因為之前只對 Docker 略有耳聞，這次作業讓我實際了基本操作，有這次經驗非常不錯，除了學會利用 container 部屬 Virtual Router，也讓我對 BGP... 等 protocol 有更深的認識，但這次作業反而是讓我做最久的一次之一，花了大量時間環境上，雖然最後換個電腦就解決問題了，但老實說依舊對原本的問題一頭霧水，且對許多參數還需要深入研究，希望之後能解決問題。