# **CN Assignment 4**

Navneet Agarwal 2018348

# **Simulation**

For the coding part of Q1, Q2, Q3 and Q4, please find attached 2018348.cc.

# Q4. Output

```
--- 10.0.16.1 ping statistics ---
80 packets transmitted, 63 received, 21% packet loss, time +8e+04ms
rtt min/avg/max/mdev = 37/42.35/59/3.781 ms
--- 10.0.13.1 ping statistics ---
80 packets transmitted, 67 received, 16% packet loss, time +8e+04ms
rtt min/avg/max/mdev = 29/32.67/57/5.988 ms
navneet@navneet-Inspiron:~/repos/ns-3-allinone/ns-3.32$
```

# 10.0.16.1 denotes K, thus the statistics for A pings K are:

Packet Loss: 21% Average RTT: 42.35 ms

### 10.0.13.1 denotes H, thus the statistics for G pings H are:

Packet Loss: 16% Average RTT: 32.67 ms

# **Tracing**

# 1. Pcap

- Number of ICMP packets in pcap file of A = 143
   Number of ICMP packets in pcap file of G = 147
   Number of ICMP packets in pcap file of H = 134
   Number of ICMP packets in pcap file of K = 126
- b. Number of ARP packets in pcap file of A = 4
   Number of ARP packets in pcap file of G = 4
   Number of ARP packets in pcap file of H = 4
   Number of ARP packets in pcap file of K = 4

# 2. Routing tables

```
Node: 11, Time: +10s, Local time: +10s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 11, Time: +10s, Local time: +10s, IPv4 RIP table
Destination Gateway
                                            Flags Metric Ref
                                                                      Use Iface
                                Genmask
                        10.0.7.2 255.255.255.0
10.0.7.2 255.255.255.0
        10.0.6.0
                                                    UGS
        10.0.5.0
                                                     UGS
                                                              4-
                                                                           4
                                  255.255.255.0
        10.0.4.0
                       10.0.7.2
                                                     UGS
                                                              4-
                                                                           4
                                  255.255.255.0
        10.0.3.0
                       10.0.7.2
                                                     UGS
                                  255.255.255.0
255.255.255.0
255.255.255.0
255.255.255.0
       10.0.16.0
                        10.0.7.2
                                                     UGS
                                                                           4
       10.0.15.0
                        10.0.7.2
                                                    UGS
                                                                           4
       10.0.10.0
                        10.0.7.2
                                                     UGS
        10.0.9.0
                        10.0.7.2
                                                     UGS
                        10.0.7.2 255.255.255.0
        10.0.8.0
                                                    UGS
       10.0.11.0
                        10.0.7.2
                                  255.255.255.0
                                                    UGS
                                  255.255.255.0
                                                   UGS
      10.0.12.0
                        10.0.7.2
                                  255.255.255.0
255.255.255.0
                                                                           4
       10.0.13.0
                        10.0.7.2
                                                    UGS
       10.0.14.0
                        10.0.7.2
                                    255.255.255.0
                                                    UGS
                                  255.255.255.0
        10.0.0.0
                         0.0.0.0
                                                                           1
                                  255.255.255.0
        10.0.1.0
                         0.0.0.0
                                    255.255.255.0
        10.0.2.0
                         0.0.0.0
                                                                           3
        10.0.7.0
                         0.0.0.0
                                    255.255.255.0
```

```
Node: 11, Time: +40s, Local time: +40s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 11, Time: +40s, Local time: +40s, IPv4 RIP table
Destination
            Gateway
                            Genmask
                                               Flags Metric Ref
                                                                   Use Iface
10.0.6.0
               10.0.7.2
                               255.255.255.0
                                               UGS 9
                                               UGS
                               255.255.255.0
10.0.5.0
               10.0.7.2
                                                                       4
10.0.4.0
               10.0.7.2
                               255.255.255.0
                                               UGS
                                               UGS
10.0.3.0
               10.0.7.2
                               255.255.255.0
                                                                       4
                                               UGS
10.0.16.0
               10.0.7.2
                              255.255.255.0
10.0.15.0
               10.0.7.2
                              255.255.255.0
                                               UGS 9
                                              UGS 2
UGS 8
UGS 3
                              255.255.255.0
10.0.10.0
               10.0.7.2
                                                                       4
10.0.8.0
               10.0.7.2
                               255.255.255.0
10.0.11.0
               10.0.7.2
                               255.255.255.0
                                               UGS
                                                                       4
                                               UGS
10.0.12.0
               10.0.7.2
                              255.255.255.0
                                                     8
10.0.13.0
               10.0.7.2
                              255.255.255.0
                                               UGS
10.0.14.0
               10.0.7.2
                               255.255.255.0
                                               UGS
                                                                       4
                                                     3
10.0.0.0
               0.0.0.0
                               255.255.255.0
                                               U
10.0.1.0
               0.0.0.0
                               255.255.255.0
                               255.255.255.0
10.0.2.0
               0.0.0.0
                                                                       3
10.0.7.0
                               255.255.255.0
               0.0.0.0
```

```
Node: 11, Time: +80s, Local time: +80s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 11, Time: +80s, Local time: +80s, IPv4 RIP table
                                                Flags Metric Ref
Destination
               Gateway
                               Genmask
                                                                    Use Iface
                                                UGS
10.0.6.0
                10.0.7.2
                                255.255.255.0
                                255.255.255.0
10.0.5.0
                10.0.7.2
                                                      9
10.0.4.0
                10.0.7.2
                                255.255.255.0
10.0.3.0
                10.0.7.2
                                255.255.255.0
                                                UGS
                                255.255.255.0
10.0.16.0
                10.0.7.2
                                                UGS
                                255.255.255.0
10.0.15.0
                10.0.7.2
                                                UGS
10.0.10.0
                10.0.7.2
                                255.255.255.0
                                                UGS
                10.0.7.2
10.0.8.0
                                255.255.255.0
                                                UGS
                                                      8
                                255.255.255.0
10.0.11.0
                10.0.7.2
                                                UGS
10.0.12.0
                10.0.7.2
                                255.255.255.0
                                                UGS
10.0.13.0
                10.0.7.2
                                255.255.255.0
                                                UGS
                10.0.7.2
10.0.14.0
                                255.255.255.0
                                                UGS
                                255.255.255.0
10.0.0.0
                0.0.0.0
10.0.1.0
                0.0.0.0
                                255.255.255.0
                                                U
                                                                        2
10.0.2.0
               0.0.0.0
                                255.255.255.0
                                255.255.255.0
10.0.7.0
               0.0.0.0
```

```
Node: 12, Time: +10s, Local time: +10s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 12, Time: +10s, Local time: +10s, IPv4 RIP table
                                                Flags Metric Ref
                Gateway
                                                                     Use Iface
Destination
                                Genmask
10.0.15.0
                10.0.8.2
                                255.255.255.0
                                                UGS
                                255.255.255.0
10.0.16.0
                10.0.8.2
                                                UGS
10.0.7.0
                10.0.8.2
                                255.255.255.0
                                                UGS
                                                       3
10.0.0.0
                10.0.8.2
                                255.255.255.0
                                                UGS
10.0.1.0
                10.0.8.2
                                255.255.255.0
                                                UGS
                                255.255.255.0
                                                                         5
10.0.2.0
                10.0.8.2
                                                UGS
10.0.10.0
                10.0.8.2
                                255.255.255.0
                                                UGS
                10.0.8.2
                                255.255.255.0
10.0.13.0
                                                UGS
10.0.14.0
                10.0.8.2
                                255.255.255.0
                                                UGS
10.0.12.0
                10.0.8.2
                                255.255.255.0
                                                UGS
10.0.11.0
                10.0.8.2
                                255.255.255.0
10.0.9.0
                10.0.8.2
                                255.255.255.0
                                                UGS
10.0.3.0
                                255.255.255.0
                0.0.0.0
10.0.4.0
                                255.255.255.0
                0.0.0.0
                                255.255.255.0
10.0.5.0
                0.0.0.0
10.0.6.0
                0.0.0.0
                                255.255.255.0
                                                                         4
10.0.8.0
                                255.255.255.0
                0.0.0.0
```

```
Node: 12, Time: +40s, Local time: +40s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 12, Time: +40s, Local time: +40s, IPv4 RIP table
               Gateway
10.0.8.2
                                                Flags Metric Ref
Destination
                                Genmask
                                                                     Use Iface
10.0.15.0
                                255.255.255.0
10.0.16.0
                10.0.8.2
                                255.255.255.0
                                                UGS
10.0.7.0
                10.0.8.2
                                255.255.255.0
                                                UGS
                                                       8
10.0.0.0
                10.0.8.2
                                255.255.255.0
                                                UGS 9
                                                                         5
10.0.1.0
                10.0.8.2
                                255.255.255.0
                                255.255.255.0
10.0.2.0
                10.0.8.2
                                                UGS
10.0.10.0
                10.0.8.2
                                255.255.255.0
                                                UGS
                                                                         5
10.0.13.0
                10.0.8.2
                                255.255.255.0
                                                UGS
                10.0.8.2
                                255.255.255.0
10.0.14.0
                                                UGS
10.0.12.0
                10.0.8.2
                                255.255.255.0
                                                UGS
                10.0.8.2
10.0.11.0
                                255.255.255.0
                                                UGS
10.0.3.0
                0.0.0.0
                                255.255.255.0
10.0.4.0
                0.0.0.0
                                255.255.255.0
10.0.5.0
                0.0.0.0
                                255.255.255.0
                                                                         3
10.0.6.0
                0.0.0.0
                                255.255.255.0
                                                                         4
10.0.8.0
                0.0.0.0
                                255.255.255.0
                                                                         5
```

```
Node: 12, Time: +80s, Local time: +80s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 12, Time: +80s, Local time: +80s, IPv4 RIP table
                Gateway
                                Genmask
                                                 Flags Metric Ref
                                                                      Use Iface
Destination
10.0.15.0
                10.0.8.2
                                 255.255.255.0
                                                 UGS
10.0.16.0
                10.0.8.2
                                255.255.255.0
                                                 UGS
                                255.255.255.0
255.255.255.0
10.0.7.0
                10.0.8.2
                                                 UGS
10.0.0.0
                10.0.8.2
                                                 UGS
10.0.1.0
                10.0.8.2
                                255.255.255.0
                                                 UGS
                                255.255.255.0
                                                 UGS 9
10.0.2.0
                10.0.8.2
10.0.10.0
                10.0.8.2
                                255.255.255.0
                                                 UGS
                                255.255.255.0
10.0.13.0
                10.0.8.2
                                                 UGS
10.0.14.0
                                255.255.255.0
                10.0.8.2
10.0.12.0
                10.0.8.2
                                255.255.255.0
                                                 UGS
                                255.255.255.0
10.0.11.0
                10.0.8.2
                                                 UGS
                                 255.255.255.0
10.0.3.0
                0.0.0.0
                                255.255.255.0
10.0.4.0
                0.0.0.0
10.0.5.0
                0.0.0.0
                                 255.255.255.0
                                                                          3
10.0.6.0
                0.0.0.0
                                 255.255.255.0
                                                                          4
10.0.8.0
                0.0.0.0
                                 255.255.255.0
```

```
Node: 13, Time: +10s, Local time: +10s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 13, Time: +10s, Local time: +10s, IPv4 RIP table
                Gateway
10.0.9.2
                                                 Flags Metric Ref
                                                                     Use Iface
Destination
                                Genmask
                                255.255.255.0
10.0.15.0
                                               UGS
10.0.16.0
                10.0.9.2
                                255.255.255.0
                                                UGS
                                255.255.255.0
10.0.3.0
                10.0.9.2
                                                UGS
                                255.255.255.0
10.0.4.0
                10.0.9.2
                                                UGS
10.0.5.0
                10.0.9.2
                                255.255.255.0
                                                UGS
10.0.6.0
                10.0.9.2
                                255.255.255.0
                                255.255.255.0
10.0.14.0
                10.0.10.2
                                                UGS
                                255.255.255.0
10.0.13.0
                                                UGS
                10.0.10.2
                                                                         3
                                255.255.255.0
10.0.12.0
                10.0.9.2
10.0.11.0
                10.0.9.2
                                255.255.255.0
                                                 UGS
                                255.255.255.0
10.0.8.0
                10.0.9.2
                                                 UGS
                10.0.7.1
                                255.255.255.0
                                                 UGS
10.0.2.0
                                                                          1
                                255.255.255.0
10.0.1.0
                10.0.7.1
                                                 UGS
10.0.0.0
                10.0.7.1
                                255.255.255.0
                                                 UGS
10.0.7.0
                0.0.0.0
                                255.255.255.0
                                255.255.255.0
10.0.9.0
                0.0.0.0
10.0.10.0
                                255.255.255.0
                0.0.0.0
```

```
Node: 13, Time: +40s, Local time: +40s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 13, Time: +40s, Local time: +40s, IPv4 RIP table
                Gateway
                                                 Flags Metric Ref
Destination
                                Genmask
                                                                     Use Iface
10.0.15.0
                10.0.10.2
                                255.255.255.0
10.0.16.0
                10.0.10.2
                                255.255.255.0
                                                UGS
                                                                         3
                                                UGS 8
                                255.255.255.0
10.0.3.0
                10.0.10.2
10.0.4.0
                10.0.10.2
                                255.255.255.0
                                                UGS 8
UGS 8
UGS 8
10.0.5.0
                10.0.10.2
                                255.255.255.0
                10.0.10.2
                                255.255.255.0
10.0.6.0
                                                                         3
                                255.255.255.0
10.0.14.0
                10.0.10.2
                                                UGS
10.0.13.0
                10.0.10.2
                                255.255.255.0
                                                 UGS
                10.0.10.2
                                255.255.255.0
                                                UGS
10.0.12.0
                                                                         3
                                255.255.255.0
10.0.11.0
                10.0.10.2
                                                HGS
10.0.8.0
                10.0.10.2
                                255.255.255.0
                                                UGS
10.0.2.0
                10.0.7.1
                                255.255.255.0
                                                UGS
                                255.255.255.0
                10.0.7.1
10.0.1.0
                                                HIGS
10.0.0.0
                10.0.7.1
                                255.255.255.0
                                                 UGS
10.0.7.0
                0.0.0.0
                                255.255.255.0
10.0.10.0
                0.0.0.0
                                255.255.255.0
```

```
Node: 13, Time: +80s, Local time: +80s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 13, Time: +80s, Local time: +80s, IPv4 RIP table
Destination
               Gateway
                               Genmask
                                                Flags Metric Ref
                                                                    Use Iface
10.0.15.0
                10.0.10.2
                                255.255.255.0
                                                UGS 8
                                255.255.255.0
10.0.16.0
                10.0.10.2
                                                UGS
                                                                         3
10.0.3.0
                10.0.10.2
                                255.255.255.0
                                                UGS
10.0.4.0
                10.0.10.2
                                255.255.255.0
                                                UGS
                                                      8
                                                                        3
10.0.5.0
                10.0.10.2
                                255.255.255.0
                                                UGS
                                                      8
                                                                        3
10.0.6.0
                10.0.10.2
                                255.255.255.0
                                                UGS
                                255.255.255.0
                                                UGS
10.0.14.0
                10.0.10.2
                                                                        3
10.0.13.0
                10.0.10.2
                                255.255.255.0
                                                UGS
                                                                        3
                                255.255.255.0
10.0.12.0
                10.0.10.2
                                                UGS
10.0.11.0
                                255.255.255.0
                10.0.10.2
                                                                        3
10.0.8.0
                10.0.10.2
                                255.255.255.0
                                                UGS
                10.0.7.1
10.0.2.0
                                255.255.255.0
                                                UGS
10.0.1.0
                10.0.7.1
                                255.255.255.0
                                                UGS
                                                                         1
10.0.0.0
                10.0.7.1
                                255.255.255.0
                                                UGS
                                255.255.255.0
10.0.7.0
               0.0.0.0
10.0.9.0
                10.0.10.2
                                255.255.255.0
                                                UGS
                                                      16
               0.0.0.0
                                255.255.255.0
10.0.10.0
```

```
Node: 14, Time: +10s, Local time: +10s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 14, Time: +10s, Local time: +10s, IPv4 RIP table
Destination
                                                Flags Metric Ref
                                                                     Use Iface
               Gateway
                                Genmask
                                255.255.255.0
10.0.6.0
                10.0.8.1
                                                UGS 2
10.0.5.0
                                255.255.255.0
                                                UGS
                10.0.8.1
10.0.4.0
                10.0.8.1
                                255.255.255.0
                                                UGS
                                255.255.255.0
10.0.3.0
                10.0.8.1
                                                UGS
10.0.14.0
                10.0.9.1
                                255.255.255.0
                                                UGS
                                255.255.255.0
                                                                         2 2
10.0.13.0
                10.0.9.1
                                                LIGS
                                255.255.255.0
10.0.10.0
                10.0.9.1
                                                UGS
                10.0.9.1
                                255.255.255.0
                                                UGS
10.0.2.0
10.0.1.0
                10.0.9.1
                                255.255.255.0
                                                UGS
10.0.0.0
                10.0.9.1
                                255.255.255.0
                                                UGS
10.0.7.0
                                255.255.255.0
                10.0.9.1
                                                UGS
10.0.16.0
                10.0.12.2
                                255.255.255.0
                                                UGS
                                                                         4
                                255.255.255.0
10.0.15.0
                10.0.12.2
                                                UGS
10.0.8.0
                0.0.0.0
                                255.255.255.0
                                                                         1
10.0.9.0
                0.0.0.0
                                255.255.255.0
                                                                         2
10.0.11.0
                                255.255.255.0
                0.0.0.0
10.0.12.0
                                255.255.255.0
               0.0.0.0
                                                                         4
```

```
Node: 14, Time: +40s, Local time: +40s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 14, Time: +40s, Local time: +40s, IPv4 RIP table
Destination
                Gateway
                               Genmask
                                               Flags Metric Ref
                                                                    Use Iface
10.0.6.0
                10.0.8.1
                                255.255.255.0
                                                UGS
                                              UGS
10.0.5.0
                10.0.8.1
                                255.255.255.0
10.0.4.0
                                255.255.255.0
                10.0.8.1
                10.0.8.1
                                255.255.255.0
                                                UGS
10.0.3.0
                                255.255.255.0
10.0.14.0
                10.0.11.2
                                                UGS
                                255.255.255.0
10.0.13.0
                10.0.11.2
                                                UGS
10.0.10.0
                10.0.11.2
                                255.255.255.0
                                                UGS
10.0.2.0
                10.0.11.2
                                255.255.255.0
                                                UGS
                                                      8
10.0.1.0
                10.0.11.2
                                255.255.255.0
                                                UGS
                                                      8
10.0.0.0
                10.0.11.2
                                255.255.255.0
                                                UGS
                                                      8
                10.0.11.2
10.0.7.0
                                255.255.255.0
                                                UGS
                                                                        3
10.0.16.0
                                255.255.255.0
                10.0.12.2
                                255.255.255.0
10.0.15.0
                                                UGS
                10.0.12.2
                                                                        4
10.0.8.0
                0.0.0.0
                                255.255.255.0
                                255.255.255.0
10.0.11.0
                0.0.0.0
                                                                        3
10.0.12.0
                0.0.0.0
                                255.255.255.0
```

```
Node: 14, Time: +80s, Local time: +80s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 14, Time: +80s, Local time: +80s, IPv4 RIP table
Destination
                              Genmask
                                               Flags Metric Ref
                                                                     Use Iface
                Gateway
                10.0.8.1
                                255.255.255.0
10.0.6.0
                                                UGS
10.0.5.0
                10.0.8.1
                                255.255.255.0
                                                UGS
10.0.4.0
                10.0.8.1
                                255.255.255.0
                                                UGS
                                255.255.255.0
10.0.3.0
                10.0.8.1
                                                UGS
                10.0.11.2
                                255.255.255.0
                                                UGS
10.0.14.0
                                255.255.255.0
                10.0.11.2
                                                UGS
10.0.13.0
                                                      6
                                                                         3
10.0.10.0
                10.0.11.2
                                255.255.255.0
                                                UGS
10.0.2.0
                10.0.11.2
                                255.255.255.0
                                                UGS
                                                      8
10.0.1.0
                10.0.11.2
                                255.255.255.0
                                                UGS
                                                       8
10.0.0.0
                10.0.11.2
                                255.255.255.0
                                                UGS
10.0.7.0
                                255.255.255.0
                                                UGS
                10.0.11.2
10.0.16.0
                                255.255.255.0
                10.0.12.2
                                                UGS
10.0.15.0
                10.0.12.2
                                255.255.255.0
                                                UGS
                                                                         4
                                255.255.255.0
                                                                         1
10.0.8.0
                0.0.0.0
10.0.9.0
                10.0.11.2
                                255.255.255.0
                                                UGS
                0.0.0.0
                                255.255.255.0
10.0.11.0
                                                U
                                                                         3
10.0.12.0
                0.0.0.0
                                255.255.255.0
```

```
Node: 15, Time: +10s, Local time: +10s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 15, Time: +10s, Local time: +10s, IPv4 RIP table
                Gateway
                                Genmask
                                                 Flags Metric Ref
                                                                     Use Iface
10.0.15.0
                10.0.10.1
                                255.255.255.0
                                                     4
                                255.255.255.0
10.0.16.0
                10.0.10.1
                                                 UGS
10.0.3.0
                10.0.10.1
                                255.255.255.0
                                                 UGS
                10.0.10.1
                                255.255.255.0
10.0.4.0
                                                 UGS
                                255.255.255.0
10.0.5.0
                10.0.10.1
                                                 UGS
10.0.6.0
                10.0.10.1
                                255.255.255.0
                                                 UGS
10.0.9.0
                10.0.10.1
                                255.255.255.0
                                                 UGS
10.0.7.0
                10.0.10.1
                                255.255.255.0
                                                 UGS
10.0.0.0
                10.0.10.1
                                255.255.255.0
                                                 UGS
10.0.1.0
                10.0.10.1
                                255.255.255.0
                                255.255.255.0
10.0.2.0
                10.0.10.1
                                                 UGS
10.0.8.0
                10.0.10.1
                                255.255.255.0
                                                 UGS
10.0.12.0
                10.0.10.1
                                 255.255.255.0
                                                 UGS
                0.0.0.0
                                 255.255.255.0
10.0.10.0
10.0.11.0
                                255.255.255.0
                0.0.0.0
10.0.13.0
                0.0.0.0
                                 255.255.255.0
                                                                          3
                                 255.255.255.0
10.0.14.0
                0.0.0.0
```

```
Node: 15, Time: +40s, Local time: +40s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 15, Time: +40s, Local time: +40s, IPv4 RIP table
                Gateway
Destination
                                Genmask
                                                 Flags Metric Ref
                                                                     Use Iface
10.0.15.0
                10.0.11.1
                                255.255.255.0
                                                 UGS
                                255.255.255.0
                                                 UGS
10.0.16.0
                10.0.11.1
                                                                          2
10.0.3.0
                                255.255.255.0
                10.0.11.1
                                                 UGS
10.0.4.0
                10.0.11.1
                                255.255.255.0
                                                 UGS
                                                                          2
                10.0.11.1
                                255.255.255.0
10.0.5.0
                                                 UGS
10.0.6.0
                                255.255.255.0
                10.0.11.1
                                                 UGS
                                                                          2
10.0.7.0
                10.0.10.1
                                255.255.255.0
                10.0.10.1
10.0.0.0
                                255.255.255.0
                                                 UGS
10.0.1.0
                                255.255.255.0
                10.0.10.1
10.0.2.0
                10.0.10.1
                                255.255.255.0
                                                 UGS
10.0.8.0
                10.0.11.1
                                255.255.255.0
                                                 UGS
10.0.12.0
                10.0.11.1
                                255.255.255.0
                                                 UGS
                                                       6
                                                                          2
10.0.10.0
                0.0.0.0
                                255.255.255.0
10.0.11.0
                0.0.0.0
                                255.255.255.0
                                255.255.255.0
10.0.13.0
                0.0.0.0
                                                 U
10.0.14.0
                0.0.0.0
                                255.255.255.0
                                                                          4
```

```
Node: 15, Time: +80s, Local time: +80s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 15, Time: +80s, Local time: +80s, IPv4 RIP table
Destination
               Gateway
                                Genmask
                                                 Flags Metric Ref
                                                                     Use Iface
                10.0.11.1
10.0.15.0
                                255.255.255.0
                                                 UGS
                                255.255.255.0
10.0.16.0
                10.0.11.1
10.0.3.0
                                255.255.255.0
                                                 UGS
                10.0.11.1
                                255.255.255.0
10.0.4.0
                10.0.11.1
10.0.5.0
                                255.255.255.0
                10.0.11.1
                                                 UGS
10.0.6.0
                10.0.11.1
                                255.255.255.0
                                255.255.255.0
10.0.7.0
                10.0.10.1
                                                 UGS
                                255.255.255.0
10.0.0.0
                10.0.10.1
                                                 UGS
                                                                          1
                                255.255.255.0
10.0.1.0
                10.0.10.1
10.0.2.0
                10.0.10.1
                                255.255.255.0
10.0.8.0
                10.0.11.1
                                255.255.255.0
                                                 UGS
10.0.12.0
                10.0.11.1
                                255.255.255.0
                                                 UGS
10.0.10.0
                0.0.0.0
                                255.255.255.0
10.0.11.0
                0.0.0.0
                                255.255.255.0
                                                                          2
10.0.13.0
                                255.255.255.0
                0.0.0.0
10.0.14.0
                0.0.0.0
                                255.255.255.0
```

```
Node: 16, Time: +10s, Local time: +10s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 16, Time: +10s, Local time: +10s, IPv4 RIP table
Destination
                                                 Flags Metric Ref
                Gateway
                                Genmask
                                                                     Use Iface
10.0.7.0
                10.0.12.1
                                255.255.255.0
                                255.255.255.0
10.0.0.0
                10.0.12.1
                                                 UGS
                                                                          1
10.0.1.0
                10.0.12.1
                                255.255.255.0
                                                 UGS
10.0.2.0
                10.0.12.1
                                255.255.255.0
                                                 UGS
                                255.255.255.0
10.0.10.0
                10.0.12.1
                                                 UGS
10.0.13.0
                10.0.12.1
                                255.255.255.0
                                                 UGS
10.0.14.0
                10.0.12.1
                                255.255.255.0
                                                 UGS
10.0.3.0
                                255.255.255.0
                10.0.12.1
10.0.4.0
                10.0.12.1
                                255.255.255.0
                                                 UGS
10.0.5.0
                10.0.12.1
                                255.255.255.0
                                                 UGS
                                255.255.255.0
10.0.6.0
                                                 UGS
                10.0.12.1
10.0.11.0
                10.0.12.1
                                255.255.255.0
                                                 UGS
                10.0.12.1
                                255.255.255.0
10.0.9.0
                                                 UGS
                                255.255.255.0
10.0.8.0
                10.0.12.1
                                                 UGS
10.0.12.0
                                255.255.255.0
                0.0.0.0
                                255.255.255.0
10.0.15.0
                0.0.0.0
                0.0.0.0
                                255.255.255.0
                                                                          3
10.0.16.0
```

```
Node: 16, Time: +40s, Local time: +40s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 16, Time: +40s, Local time: +40s, IPv4 RIP table
                Gateway
                                Genmask
                                                 Flags Metric Ref
                                                                      Use Iface
Destination
                10.0.12.1
                                255.255.255.0
10.0.7.0
                                                 UGS
                                255.255.255.0
10.0.0.0
                10.0.12.1
                                                 UGS
10.0.1.0
                                255.255.255.0
                10.0.12.1
                                                 UGS
                                255.255.255.0
10.0.2.0
                10.0.12.1
                                                 UGS
                                255.255.255.0
10.0.10.0
                10.0.12.1
10.0.13.0
                10.0.12.1
                                255.255.255.0
                                                 UGS
                                255.255.255.0
                                                 UGS
10.0.14.0
                10.0.12.1
10.0.3.0
                                255.255.255.0
                10.0.12.1
10.0.4.0
                10.0.12.1
                                255.255.255.0
                                255.255.255.0
10.0.5.0
                10.0.12.1
                                                 UGS
                                255.255.255.0
                                                 UGS
10.0.6.0
                10.0.12.1
                                                                          1
                                255.255.255.0
10.0.11.0
                10.0.12.1
10.0.8.0
                10.0.12.1
                                255.255.255.0
                                                 UGS
10.0.12.0
                0.0.0.0
                                255.255.255.0
                                255.255.255.0
10.0.15.0
                0.0.0.0
                                                                          2
                                255.255.255.0
10.0.16.0
                0.0.0.0
```

```
Node: 16, Time: +80s, Local time: +80s, Ipv4ListRouting table
 Priority: 0 Protocol: ns3::Rip
Node: 16, Time: +80s, Local time: +80s, IPv4 RIP table
                                                 Flags Metric Ref
                                                                      Use Iface
Destination
                Gateway
                                Genmask
10.0.7.0
                10.0.12.1
                                255.255.255.0
                                 255.255.255.0
10.0.0.0
                10.0.12.1
                                                 UGS
10.0.1.0
                10.0.12.1
                                255.255.255.0
                                                 UGS
                                255.255.255.0
10.0.2.0
                10.0.12.1
                                                 UGS
                                255.255.255.0
                                                 UGS
10.0.10.0
                10.0.12.1
10.0.13.0
                10.0.12.1
                                255.255.255.0
                                                 UGS
10.0.14.0
                10.0.12.1
                                 255.255.255.0
                                255.255.255.0
10.0.3.0
                10.0.12.1
                                                 UGS
10.0.4.0
                10.0.12.1
                                255.255.255.0
                                                 UGS
10.0.5.0
                10.0.12.1
                                255.255.255.0
                                                 UGS
10.0.6.0
                                 255.255.255.0
                10.0.12.1
                                                 UGS
10.0.11.0
                10.0.12.1
                                 255.255.255.0
                                                 UGS
                                255.255.255.0
10.0.8.0
                10.0.12.1
                                                 UGS
10.0.12.0
                0.0.0.0
                                255.255.255.0
                                255.255.255.0
10.0.15.0
                0.0.0.0
10.0.16.0
                0.0.0.0
                                 255.255.255.0
```

The major difference in Costs to reach different networks at different points of time from R4						
Destination	Cost & Gateway at Given Time					
	10 seconds		40 seconds		80 seconds	
	Cost	Gateway	Cost	Gateway	Cost	Gateway
10.0.0.0 (Network between A & R1)	3	10.0.9.1	8	10.0.11.2	8	10.0.11.2
10.0.1.0 (Network between B & R1)	3	10.0.9.1	8	10.0.11.2	8	10.0.11.2
10.0.2.0 (Network between C & R1)	3	10.0.9.1	8	10.0.11.2	8	10.0.11.2
10.0.7.0 (Network between R1 & R3)	2	10.0.9.1	7	10.0.11.2	7	10.0.11.2
10.0.9.0 (Network between R3 & R4)	1	0.0.0.0	NA	NA	16	10.0.11.2
10.0.10.0 (Network between R3 & R5)	2	10.0.9.1	6	10.0.11.2	6	10.0.11.2
10.0.13.0 (Network between H & R5)	3	10.0.9.1	6	10.0.11.2	6	10.0.11.2
10.0.14.0 (Network between I & R5)	3	10.0.9.1	6	10.0.11.2	6	10.0.11.2

# Differences in table at timestamp 10 seconds and 40 seconds

- We observe that the cost to reach the network link between (A & R1), (B & R1), (C & R1) and (R1 & R3) increases by 5 and the gateway to use changes from 10.0.9.1 (present on the link R4-R3) to 10.0.11.2 (present on the link R4-R5). This happens because the link between R3 and R4 is turned down at 25 seconds and R4 uses this network to reach the above mentioned network links.
- For timestamp 10 seconds and 40 seconds, we observe that the cost to reach the network link between (R3 & R5) increases by 4 and the gateway to use changes from 10.0.9.1 (present on the link R4-R3) to 10.0.11.2 (present on the link R4-R5). This happens because the link between R3 and R4 is turned down at 25 seconds and R4 uses this path to reach the above mentioned network links.
- For timestamp 10 seconds and 40 seconds, we observe that the cost to reach the network link between (H & R5) and (I & R5) increases by 3 and the gateway to use changes from 10.0.9.1 (present on the link R4-R3) to 10.0.11.2 (present on the link R4-R5). This happens because the link between R3 and R4 is turned down at 25 seconds and R4 uses this path to reach the above mentioned network links.
- There was no entry for the destination 10.0.9.0 at 40 seconds ,i.e. the link between R3 and R4. This is also because the link was turned down and until now no other router has found the path to this network. So, it's entry is not present in the table.

#### Differences in table at timestamp 40 seconds and 80 seconds

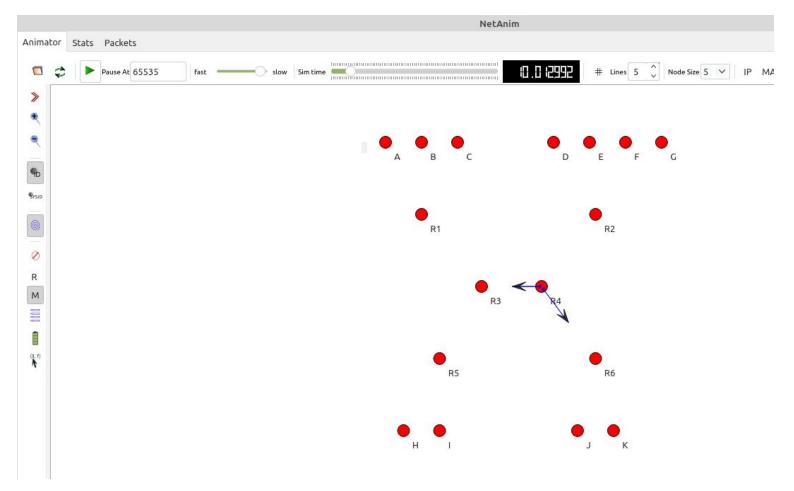
 At 80 seconds, we get an entry for the destination 10.0.9.0 in the routing table with a 16 as cost. Since the largest number of hops allowed in RIP are 15, so 16 denotes the infinite value. This means that now this network link cannot be reached.

### Visualization

**Q1.** PFA 2018348.xml for the visualization part. **Q2**.

# **Observations**

 In the starting distance vectors advertisement takes place between the neighbouring routers till a stabilization point is reached



- Some data packets are also sent from the hosts A,G,H and K to the first routers they are connected to. On checking the pcap files, I found that these are ARP packets and they are enquiring for the node which has a particular Mac Address.
- Some of the ICMP packets get dropped from routers in the starting (upto 6 seconds for packets sent from A and upto 3 seconds for packets sent from G). On printing the routing tables, I observed that the routers did not have routing information to the particular destination, so these packets might have been dropped.
- Then until 25 seconds all the ICMP packets are sent from A to K via A -> R1 -> R3 -> R4
   R6 -> K. All the ICMP packets from G to H are sent via G -> R2 -> R4 -> R3 -> R5-> H.
- Since at 25 seconds the network link between R3 and R4 is turned down, some of the packets from A and G are again lost.
- After 25 seconds, the distance vectors also start getting advertised between neighbouring routers until a stabilization point is reached.
- Now the path taken by ICMP packets for A -> K and G-> H also changes.
   Icmp packets for A to K now move through A -> R1 -> R3 -> R5 -> R4 -> R6 -> K.
   Icmp packets for A to K now move through G -> R2 -> R4 -> R5 -> K.