

CN Assignment 4

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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

- a. 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

Router R1

```
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      Genmask      Flags Metric Ref    Use Iface
10.0.6.0         10.0.7.2    255.255.255.0 UGS      4-    -     -   4
10.0.5.0         10.0.7.2    255.255.255.0 UGS      4-    -     -   4
10.0.4.0         10.0.7.2    255.255.255.0 UGS      4-    -     -   4
10.0.3.0         10.0.7.2    255.255.255.0 UGS      4-    -     -   4
10.0.16.0        10.0.7.2    255.255.255.0 UGS      4-    -     -   4
10.0.15.0        10.0.7.2    255.255.255.0 UGS      4-    -     -   4
10.0.10.0        10.0.7.2    255.255.255.0 UGS      2-    -     -   4
10.0.9.0         10.0.7.2    255.255.255.0 UGS      2-    -     -   4
10.0.8.0         10.0.7.2    255.255.255.0 UGS      3-    -     -   4
10.0.11.0        10.0.7.2    255.255.255.0 UGS      3-    -     -   4
10.0.12.0        10.0.7.2    255.255.255.0 UGS      3-    -     -   4
10.0.13.0        10.0.7.2    255.255.255.0 UGS      3-    -     -   4
10.0.14.0        10.0.7.2    255.255.255.0 UGS      3-    -     -   4
10.0.0.0         0.0.0.0     255.255.255.0 U        1-    -     -   1
10.0.1.0         0.0.0.0     255.255.255.0 U        1-    -     -   2
10.0.2.0         0.0.0.0     255.255.255.0 U        1-    -     -   3
10.0.7.0         0.0.0.0     255.255.255.0 U        1-    -     -   4
```

```
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     -     -   4
10.0.5.0         10.0.7.2    255.255.255.0 UGS      9     -     -   4
10.0.4.0         10.0.7.2    255.255.255.0 UGS      9     -     -   4
10.0.3.0         10.0.7.2    255.255.255.0 UGS      9     -     -   4
10.0.16.0        10.0.7.2    255.255.255.0 UGS      9     -     -   4
10.0.15.0        10.0.7.2    255.255.255.0 UGS      9     -     -   4
10.0.10.0        10.0.7.2    255.255.255.0 UGS      2     -     -   4
10.0.8.0         10.0.7.2    255.255.255.0 UGS      8     -     -   4
10.0.11.0        10.0.7.2    255.255.255.0 UGS      3     -     -   4
10.0.12.0        10.0.7.2    255.255.255.0 UGS      8     -     -   4
10.0.13.0        10.0.7.2    255.255.255.0 UGS      3     -     -   4
10.0.14.0        10.0.7.2    255.255.255.0 UGS      3     -     -   4
10.0.0.0         0.0.0.0     255.255.255.0 U        1     -     -   1
10.0.1.0         0.0.0.0     255.255.255.0 U        1     -     -   2
10.0.2.0         0.0.0.0     255.255.255.0 U        1     -     -   3
10.0.7.0         0.0.0.0     255.255.255.0 U        1     -     -   4
```

```
Node: 11, Time: +80s, Local time: +80s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 11, Time: +80s, Local time: +80s, 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     -     -   4
10.0.5.0         10.0.7.2    255.255.255.0 UGS      9     -     -   4
10.0.4.0         10.0.7.2    255.255.255.0 UGS      9     -     -   4
10.0.3.0         10.0.7.2    255.255.255.0 UGS      9     -     -   4
10.0.16.0        10.0.7.2    255.255.255.0 UGS      9     -     -   4
10.0.15.0        10.0.7.2    255.255.255.0 UGS      9     -     -   4
10.0.10.0        10.0.7.2    255.255.255.0 UGS      2     -     -   4
10.0.8.0         10.0.7.2    255.255.255.0 UGS      8     -     -   4
10.0.11.0        10.0.7.2    255.255.255.0 UGS      3     -     -   4
10.0.12.0        10.0.7.2    255.255.255.0 UGS      8     -     -   4
10.0.13.0        10.0.7.2    255.255.255.0 UGS      3     -     -   4
10.0.14.0        10.0.7.2    255.255.255.0 UGS      3     -     -   4
10.0.0.0         0.0.0.0     255.255.255.0 U        1     -     -   1
10.0.1.0         0.0.0.0     255.255.255.0 U        1     -     -   2
10.0.2.0         0.0.0.0     255.255.255.0 U        1     -     -   3
10.0.7.0         0.0.0.0     255.255.255.0 U        1     -     -   4
```

Router R2

```
Node: 12, Time: +10s, Local time: +10s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 12, Time: +10s, Local time: +10s, IPv4 RIP table
Destination Gateway Genmask Flags Metric Ref Use Iface
10.0.15.0 10.0.8.2 255.255.255.0 UGS 3 - - 5
10.0.16.0 10.0.8.2 255.255.255.0 UGS 3 - - 5
10.0.7.0 10.0.8.2 255.255.255.0 UGS 3 - - 5
10.0.0.0 10.0.8.2 255.255.255.0 UGS 4 - - 5
10.0.1.0 10.0.8.2 255.255.255.0 UGS 4 - - 5
10.0.2.0 10.0.8.2 255.255.255.0 UGS 4 - - 5
10.0.10.0 10.0.8.2 255.255.255.0 UGS 3 - - 5
10.0.13.0 10.0.8.2 255.255.255.0 UGS 4 - - 5
10.0.14.0 10.0.8.2 255.255.255.0 UGS 4 - - 5
10.0.12.0 10.0.8.2 255.255.255.0 UGS 2 - - 5
10.0.11.0 10.0.8.2 255.255.255.0 UGS 2 - - 5
10.0.9.0 10.0.8.2 255.255.255.0 UGS 2 - - 5
10.0.3.0 0.0.0.0 255.255.255.0 U 1 - - 1
10.0.4.0 0.0.0.0 255.255.255.0 U 1 - - 2
10.0.5.0 0.0.0.0 255.255.255.0 U 1 - - 3
10.0.6.0 0.0.0.0 255.255.255.0 U 1 - - 4
10.0.8.0 0.0.0.0 255.255.255.0 U 1 - - 5
```

```
Node: 12, Time: +40s, Local time: +40s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 12, Time: +40s, Local time: +40s, IPv4 RIP table
Destination Gateway Genmask Flags Metric Ref Use Iface
10.0.15.0 10.0.8.2 255.255.255.0 UGS 3 - - 5
10.0.16.0 10.0.8.2 255.255.255.0 UGS 3 - - 5
10.0.7.0 10.0.8.2 255.255.255.0 UGS 8 - - 5
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 UGS 9 - - 5
10.0.2.0 10.0.8.2 255.255.255.0 UGS 9 - - 5
10.0.10.0 10.0.8.2 255.255.255.0 UGS 7 - - 5
10.0.13.0 10.0.8.2 255.255.255.0 UGS 7 - - 5
10.0.14.0 10.0.8.2 255.255.255.0 UGS 7 - - 5
10.0.12.0 10.0.8.2 255.255.255.0 UGS 2 - - 5
10.0.11.0 10.0.8.2 255.255.255.0 UGS 2 - - 5
10.0.3.0 0.0.0.0 255.255.255.0 U 1 - - 1
10.0.4.0 0.0.0.0 255.255.255.0 U 1 - - 2
10.0.5.0 0.0.0.0 255.255.255.0 U 1 - - 3
10.0.6.0 0.0.0.0 255.255.255.0 U 1 - - 4
10.0.8.0 0.0.0.0 255.255.255.0 U 1 - - 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
Destination Gateway Genmask Flags Metric Ref Use Iface
10.0.15.0 10.0.8.2 255.255.255.0 UGS 3 - - 5
10.0.16.0 10.0.8.2 255.255.255.0 UGS 3 - - 5
10.0.7.0 10.0.8.2 255.255.255.0 UGS 8 - - 5
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 UGS 9 - - 5
10.0.2.0 10.0.8.2 255.255.255.0 UGS 9 - - 5
10.0.10.0 10.0.8.2 255.255.255.0 UGS 7 - - 5
10.0.13.0 10.0.8.2 255.255.255.0 UGS 7 - - 5
10.0.14.0 10.0.8.2 255.255.255.0 UGS 7 - - 5
10.0.12.0 10.0.8.2 255.255.255.0 UGS 2 - - 5
10.0.11.0 10.0.8.2 255.255.255.0 UGS 2 - - 5
10.0.3.0 0.0.0.0 255.255.255.0 U 1 - - 1
10.0.4.0 0.0.0.0 255.255.255.0 U 1 - - 2
10.0.5.0 0.0.0.0 255.255.255.0 U 1 - - 3
10.0.6.0 0.0.0.0 255.255.255.0 U 1 - - 4
10.0.8.0 0.0.0.0 255.255.255.0 U 1 - - 5
```


Router R3

```
Node: 13, Time: +10s, Local time: +10s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 13, Time: +10s, Local time: +10s, IPv4 RIP table
Destination Gateway Genmask Flags Metric Ref Use Iface
10.0.15.0 10.0.9.2 255.255.255.0 UGS 3 - - 2
10.0.16.0 10.0.9.2 255.255.255.0 UGS 3 - - 2
10.0.3.0 10.0.9.2 255.255.255.0 UGS 3 - - 2
10.0.4.0 10.0.9.2 255.255.255.0 UGS 3 - - 2
10.0.5.0 10.0.9.2 255.255.255.0 UGS 3 - - 2
10.0.6.0 10.0.9.2 255.255.255.0 UGS 3 - - 2
10.0.14.0 10.0.10.2 255.255.255.0 UGS 2 - - 3
10.0.13.0 10.0.10.2 255.255.255.0 UGS 2 - - 3
10.0.12.0 10.0.9.2 255.255.255.0 UGS 2 - - 2
10.0.11.0 10.0.9.2 255.255.255.0 UGS 2 - - 2
10.0.8.0 10.0.9.2 255.255.255.0 UGS 2 - - 2
10.0.2.0 10.0.7.1 255.255.255.0 UGS 2 - - 1
10.0.1.0 10.0.7.1 255.255.255.0 UGS 2 - - 1
10.0.0.0 10.0.7.1 255.255.255.0 UGS 2 - - 1
10.0.7.0 0.0.0.0 255.255.255.0 U 1 - - 1
10.0.9.0 0.0.0.0 255.255.255.0 U 1 - - 2
10.0.10.0 0.0.0.0 255.255.255.0 U 1 - - 3

Node: 13, Time: +40s, Local time: +40s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 13, Time: +40s, Local time: +40s, 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 - - 3
10.0.16.0 10.0.10.2 255.255.255.0 UGS 8 - - 3
10.0.3.0 10.0.10.2 255.255.255.0 UGS 8 - - 3
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 8 - - 3
10.0.14.0 10.0.10.2 255.255.255.0 UGS 2 - - 3
10.0.13.0 10.0.10.2 255.255.255.0 UGS 2 - - 3
10.0.12.0 10.0.10.2 255.255.255.0 UGS 7 - - 3
10.0.11.0 10.0.10.2 255.255.255.0 UGS 2 - - 3
10.0.8.0 10.0.10.2 255.255.255.0 UGS 7 - - 3
10.0.2.0 10.0.7.1 255.255.255.0 UGS 2 - - 1
10.0.1.0 10.0.7.1 255.255.255.0 UGS 2 - - 1
10.0.0.0 10.0.7.1 255.255.255.0 UGS 2 - - 1
10.0.7.0 0.0.0.0 255.255.255.0 U 1 - - 1
10.0.10.0 0.0.0.0 255.255.255.0 U 1 - - 3

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 - - 3
10.0.16.0 10.0.10.2 255.255.255.0 UGS 8 - - 3
10.0.3.0 10.0.10.2 255.255.255.0 UGS 8 - - 3
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 8 - - 3
10.0.14.0 10.0.10.2 255.255.255.0 UGS 2 - - 3
10.0.13.0 10.0.10.2 255.255.255.0 UGS 2 - - 3
10.0.12.0 10.0.10.2 255.255.255.0 UGS 7 - - 3
10.0.11.0 10.0.10.2 255.255.255.0 UGS 2 - - 3
10.0.8.0 10.0.10.2 255.255.255.0 UGS 7 - - 3
10.0.2.0 10.0.7.1 255.255.255.0 UGS 2 - - 1
10.0.1.0 10.0.7.1 255.255.255.0 UGS 2 - - 1
10.0.0.0 10.0.7.1 255.255.255.0 UGS 2 - - 1
10.0.7.0 0.0.0.0 255.255.255.0 U 1 - - 1
10.0.9.0 10.0.10.2 255.255.255.0 UGS 16 - - 3
10.0.10.0 0.0.0.0 255.255.255.0 U 1 - - 3
```

Router R4

```
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      Gateway      Genmask      Flags Metric Ref    Use Iface
10.0.6.0         10.0.8.1     255.255.255.0 UGS 2     -     -    1
10.0.5.0         10.0.8.1     255.255.255.0 UGS 2     -     -    1
10.0.4.0         10.0.8.1     255.255.255.0 UGS 2     -     -    1
10.0.3.0         10.0.8.1     255.255.255.0 UGS 2     -     -    1
10.0.14.0        10.0.9.1     255.255.255.0 UGS 3     -     -    2
10.0.13.0        10.0.9.1     255.255.255.0 UGS 3     -     -    2
10.0.10.0        10.0.9.1     255.255.255.0 UGS 2     -     -    2
10.0.2.0         10.0.9.1     255.255.255.0 UGS 3     -     -    2
10.0.1.0         10.0.9.1     255.255.255.0 UGS 3     -     -    2
10.0.0.0         10.0.9.1     255.255.255.0 UGS 3     -     -    2
10.0.7.0         10.0.9.1     255.255.255.0 UGS 2     -     -    2
10.0.16.0        10.0.12.2    255.255.255.0 UGS 2     -     -    4
10.0.15.0        10.0.12.2    255.255.255.0 UGS 2     -     -    4
10.0.8.0         0.0.0.0      255.255.255.0 U    1     -     -    1
10.0.9.0         0.0.0.0      255.255.255.0 U    1     -     -    2
10.0.11.0        0.0.0.0      255.255.255.0 U    1     -     -    3
10.0.12.0        0.0.0.0      255.255.255.0 U    1     -     -    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 2     -     -    1
10.0.5.0         10.0.8.1     255.255.255.0 UGS 2     -     -    1
10.0.4.0         10.0.8.1     255.255.255.0 UGS 2     -     -    1
10.0.3.0         10.0.8.1     255.255.255.0 UGS 2     -     -    1
10.0.14.0        10.0.11.2    255.255.255.0 UGS 6     -     -    3
10.0.13.0        10.0.11.2    255.255.255.0 UGS 6     -     -    3
10.0.10.0        10.0.11.2    255.255.255.0 UGS 6     -     -    3
10.0.2.0         10.0.11.2    255.255.255.0 UGS 8     -     -    3
10.0.1.0         10.0.11.2    255.255.255.0 UGS 8     -     -    3
10.0.0.0         10.0.11.2    255.255.255.0 UGS 8     -     -    3
10.0.7.0         10.0.11.2    255.255.255.0 UGS 7     -     -    3
10.0.16.0        10.0.12.2    255.255.255.0 UGS 2     -     -    4
10.0.15.0        10.0.12.2    255.255.255.0 UGS 2     -     -    4
10.0.8.0         0.0.0.0      255.255.255.0 U    1     -     -    1
10.0.11.0        0.0.0.0      255.255.255.0 U    1     -     -    3
10.0.12.0        0.0.0.0      255.255.255.0 U    1     -     -    4
```

```
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      Gateway      Genmask      Flags Metric Ref    Use Iface
10.0.6.0         10.0.8.1     255.255.255.0 UGS 2     -     -    1
10.0.5.0         10.0.8.1     255.255.255.0 UGS 2     -     -    1
10.0.4.0         10.0.8.1     255.255.255.0 UGS 2     -     -    1
10.0.3.0         10.0.8.1     255.255.255.0 UGS 2     -     -    1
10.0.14.0        10.0.11.2    255.255.255.0 UGS 6     -     -    3
10.0.13.0        10.0.11.2    255.255.255.0 UGS 6     -     -    3
10.0.10.0        10.0.11.2    255.255.255.0 UGS 6     -     -    3
10.0.2.0         10.0.11.2    255.255.255.0 UGS 8     -     -    3
10.0.1.0         10.0.11.2    255.255.255.0 UGS 8     -     -    3
10.0.0.0         10.0.11.2    255.255.255.0 UGS 8     -     -    3
10.0.7.0         10.0.11.2    255.255.255.0 UGS 7     -     -    3
10.0.16.0        10.0.12.2    255.255.255.0 UGS 2     -     -    4
10.0.15.0        10.0.12.2    255.255.255.0 UGS 2     -     -    4
10.0.8.0         0.0.0.0      255.255.255.0 U    1     -     -    1
10.0.9.0         10.0.11.2    255.255.255.0 UGS 16    -     -    3
10.0.11.0        0.0.0.0      255.255.255.0 U    1     -     -    3
10.0.12.0        0.0.0.0      255.255.255.0 U    1     -     -    4
```

Router R5

```
Node: 15, Time: +10s, Local time: +10s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 15, Time: +10s, Local time: +10s, IPv4 RIP table
Destination Gateway Genmask Flags Metric Ref Use Iface
10.0.15.0 10.0.10.1 255.255.255.0 UGS 4 - - 1
10.0.16.0 10.0.10.1 255.255.255.0 UGS 4 - - 1
10.0.3.0 10.0.10.1 255.255.255.0 UGS 4 - - 1
10.0.4.0 10.0.10.1 255.255.255.0 UGS 4 - - 1
10.0.5.0 10.0.10.1 255.255.255.0 UGS 4 - - 1
10.0.6.0 10.0.10.1 255.255.255.0 UGS 4 - - 1
10.0.9.0 10.0.10.1 255.255.255.0 UGS 2 - - 1
10.0.7.0 10.0.10.1 255.255.255.0 UGS 2 - - 1
10.0.0.0 10.0.10.1 255.255.255.0 UGS 3 - - 1
10.0.1.0 10.0.10.1 255.255.255.0 UGS 3 - - 1
10.0.2.0 10.0.10.1 255.255.255.0 UGS 3 - - 1
10.0.8.0 10.0.10.1 255.255.255.0 UGS 3 - - 1
10.0.12.0 10.0.10.1 255.255.255.0 UGS 3 - - 1
10.0.10.0 0.0.0.0 255.255.255.0 U 1 - - 1
10.0.11.0 0.0.0.0 255.255.255.0 U 1 - - 2
10.0.13.0 0.0.0.0 255.255.255.0 U 1 - - 3
10.0.14.0 0.0.0.0 255.255.255.0 U 1 - - 4
```

```
Node: 15, Time: +40s, Local time: +40s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 15, Time: +40s, Local time: +40s, IPv4 RIP table
Destination Gateway Genmask Flags Metric Ref Use Iface
10.0.15.0 10.0.11.1 255.255.255.0 UGS 7 - - 2
10.0.16.0 10.0.11.1 255.255.255.0 UGS 7 - - 2
10.0.3.0 10.0.11.1 255.255.255.0 UGS 7 - - 2
10.0.4.0 10.0.11.1 255.255.255.0 UGS 7 - - 2
10.0.5.0 10.0.11.1 255.255.255.0 UGS 7 - - 2
10.0.6.0 10.0.11.1 255.255.255.0 UGS 7 - - 2
10.0.7.0 10.0.10.1 255.255.255.0 UGS 2 - - 1
10.0.0.0 10.0.10.1 255.255.255.0 UGS 3 - - 1
10.0.1.0 10.0.10.1 255.255.255.0 UGS 3 - - 1
10.0.2.0 10.0.10.1 255.255.255.0 UGS 3 - - 1
10.0.8.0 10.0.11.1 255.255.255.0 UGS 6 - - 2
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 U 1 - - 1
10.0.11.0 0.0.0.0 255.255.255.0 U 1 - - 2
10.0.13.0 0.0.0.0 255.255.255.0 U 1 - - 3
10.0.14.0 0.0.0.0 255.255.255.0 U 1 - - 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
10.0.15.0 10.0.11.1 255.255.255.0 UGS 7 - - 2
10.0.16.0 10.0.11.1 255.255.255.0 UGS 7 - - 2
10.0.3.0 10.0.11.1 255.255.255.0 UGS 7 - - 2
10.0.4.0 10.0.11.1 255.255.255.0 UGS 7 - - 2
10.0.5.0 10.0.11.1 255.255.255.0 UGS 7 - - 2
10.0.6.0 10.0.11.1 255.255.255.0 UGS 7 - - 2
10.0.7.0 10.0.10.1 255.255.255.0 UGS 2 - - 1
10.0.0.0 10.0.10.1 255.255.255.0 UGS 3 - - 1
10.0.1.0 10.0.10.1 255.255.255.0 UGS 3 - - 1
10.0.2.0 10.0.10.1 255.255.255.0 UGS 3 - - 1
10.0.8.0 10.0.11.1 255.255.255.0 UGS 6 - - 2
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 U 1 - - 1
10.0.11.0 0.0.0.0 255.255.255.0 U 1 - - 2
10.0.13.0 0.0.0.0 255.255.255.0 U 1 - - 3
10.0.14.0 0.0.0.0 255.255.255.0 U 1 - - 4
```


Router R6

```
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      Gateway      Genmask      Flags Metric Ref    Use Iface
10.0.7.0         10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.0.0         10.0.12.1   255.255.255.0 UGS    4    -    -    1
10.0.1.0         10.0.12.1   255.255.255.0 UGS    4    -    -    1
10.0.2.0         10.0.12.1   255.255.255.0 UGS    4    -    -    1
10.0.10.0        10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.13.0        10.0.12.1   255.255.255.0 UGS    4    -    -    1
10.0.14.0        10.0.12.1   255.255.255.0 UGS    4    -    -    1
10.0.3.0         10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.4.0         10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.5.0         10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.6.0         10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.11.0        10.0.12.1   255.255.255.0 UGS    2    -    -    1
10.0.9.0         10.0.12.1   255.255.255.0 UGS    2    -    -    1
10.0.8.0         10.0.12.1   255.255.255.0 UGS    2    -    -    1
10.0.12.0        0.0.0.0     255.255.255.0 U      1    -    -    1
10.0.15.0        0.0.0.0     255.255.255.0 U      1    -    -    2
10.0.16.0        0.0.0.0     255.255.255.0 U      1    -    -    3
```

```
Node: 16, Time: +40s, Local time: +40s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 16, Time: +40s, Local time: +40s, IPv4 RIP table
Destination      Gateway      Genmask      Flags Metric Ref    Use Iface
10.0.7.0         10.0.12.1   255.255.255.0 UGS    8    -    -    1
10.0.0.0         10.0.12.1   255.255.255.0 UGS    9    -    -    1
10.0.1.0         10.0.12.1   255.255.255.0 UGS    9    -    -    1
10.0.2.0         10.0.12.1   255.255.255.0 UGS    9    -    -    1
10.0.10.0        10.0.12.1   255.255.255.0 UGS    7    -    -    1
10.0.13.0        10.0.12.1   255.255.255.0 UGS    7    -    -    1
10.0.14.0        10.0.12.1   255.255.255.0 UGS    7    -    -    1
10.0.3.0         10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.4.0         10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.5.0         10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.6.0         10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.11.0        10.0.12.1   255.255.255.0 UGS    2    -    -    1
10.0.8.0         10.0.12.1   255.255.255.0 UGS    2    -    -    1
10.0.12.0        0.0.0.0     255.255.255.0 U      1    -    -    1
10.0.15.0        0.0.0.0     255.255.255.0 U      1    -    -    2
10.0.16.0        0.0.0.0     255.255.255.0 U      1    -    -    3
```

```
Node: 16, Time: +80s, Local time: +80s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 16, Time: +80s, Local time: +80s, IPv4 RIP table
Destination      Gateway      Genmask      Flags Metric Ref    Use Iface
10.0.7.0         10.0.12.1   255.255.255.0 UGS    8    -    -    1
10.0.0.0         10.0.12.1   255.255.255.0 UGS    9    -    -    1
10.0.1.0         10.0.12.1   255.255.255.0 UGS    9    -    -    1
10.0.2.0         10.0.12.1   255.255.255.0 UGS    9    -    -    1
10.0.10.0        10.0.12.1   255.255.255.0 UGS    7    -    -    1
10.0.13.0        10.0.12.1   255.255.255.0 UGS    7    -    -    1
10.0.14.0        10.0.12.1   255.255.255.0 UGS    7    -    -    1
10.0.3.0         10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.4.0         10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.5.0         10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.6.0         10.0.12.1   255.255.255.0 UGS    3    -    -    1
10.0.11.0        10.0.12.1   255.255.255.0 UGS    2    -    -    1
10.0.8.0         10.0.12.1   255.255.255.0 UGS    2    -    -    1
10.0.12.0        0.0.0.0     255.255.255.0 U      1    -    -    1
10.0.15.0        0.0.0.0     255.255.255.0 U      1    -    -    2
10.0.16.0        0.0.0.0     255.255.255.0 U      1    -    -    3
```

Q3.

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.

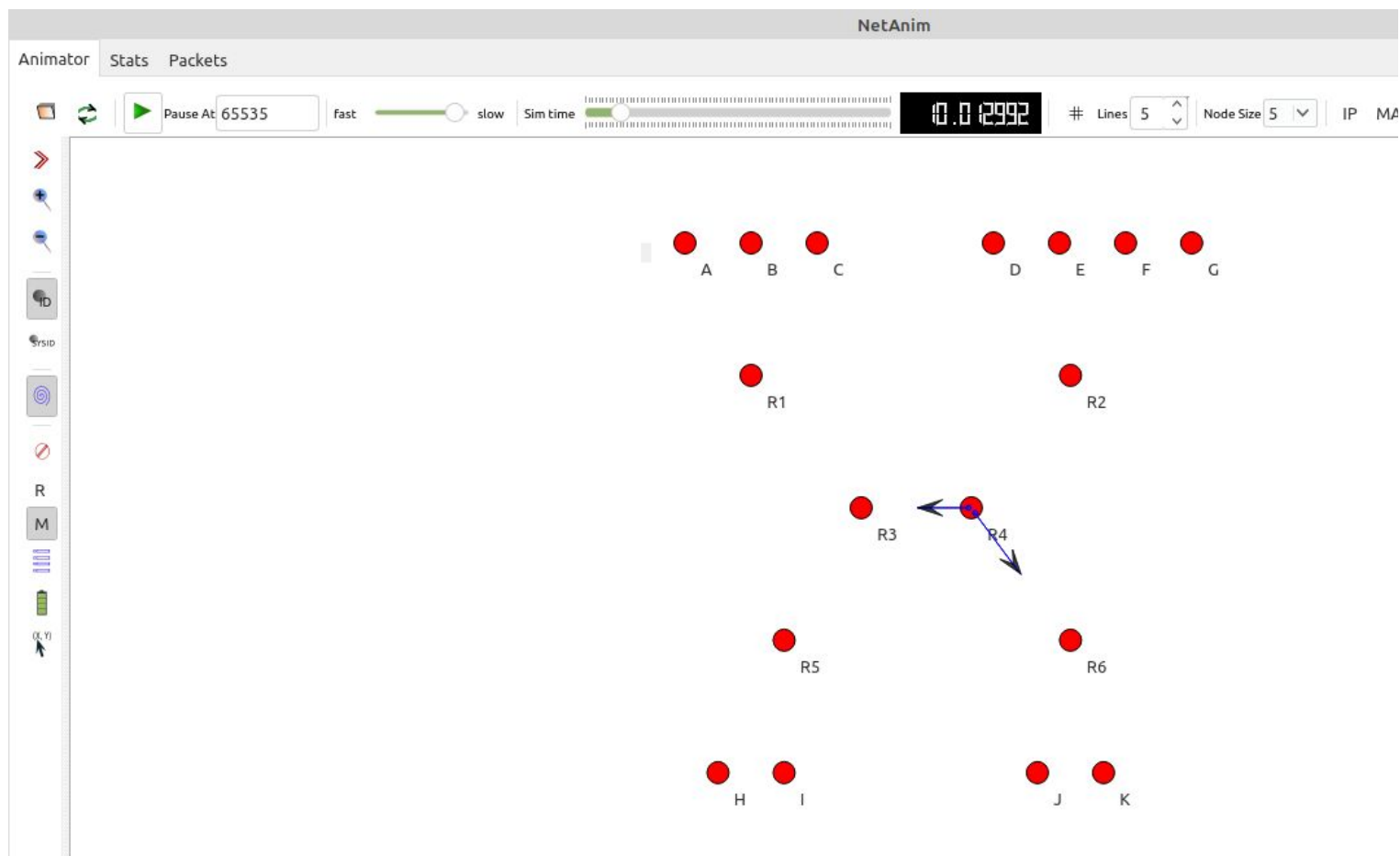
Visualization

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.