

## Part B

### B1. RIP Daemon

- myRip.py added
- Routing tables at each node

```
mininet> h1 route
Kernel IP routing table
Destination      Gateway          Genmask          Flags Metric Ref    Use Iface
default          191.7.7.1       0.0.0.0          UG        0      0      0 h1-eth0
191.7.7.0        0.0.0.0         255.255.255.0    U         0      0      0 h1-eth0
mininet> h2 route
Kernel IP routing table
Destination      Gateway          Genmask          Flags Metric Ref    Use Iface
default          191.7.5.1       0.0.0.0          UG        0      0      0 h2-eth0
191.7.5.0        0.0.0.0         255.255.255.0    U         0      0      0 h2-eth0
mininet> r1 route
Kernel IP routing table
Destination      Gateway          Genmask          Flags Metric Ref    Use Iface
191.7.1.0        0.0.0.0         255.255.255.0    U         0      0      0 r1-eth1
191.7.1.0        0.0.0.0         255.255.255.0    U        32      0      0 r1-eth1
191.7.2.0        0.0.0.0         255.255.255.0    U         0      0      0 r1-eth2
191.7.2.0        0.0.0.0         255.255.255.0    U        32      0      0 r1-eth2
191.7.3.0        191.7.1.3       255.255.255.0    UG        32      0      0 r1-eth1
191.7.4.0        191.7.2.3       255.255.255.0    UG        32      0      0 r1-eth2
191.7.5.0        191.7.1.3       255.255.255.0    UG        32      0      0 r1-eth1
191.7.7.0        0.0.0.0         255.255.255.0    U         0      0      0 r1-eth0
191.7.7.0        0.0.0.0         255.255.255.0    U        32      0      0 r1-eth0
mininet> r2 route
Kernel IP routing table
Destination      Gateway          Genmask          Flags Metric Ref    Use Iface
191.7.1.0        0.0.0.0         255.255.255.0    U         0      0      0 r2-eth0
191.7.1.0        0.0.0.0         255.255.255.0    U        32      0      0 r2-eth0
191.7.2.0        191.7.1.2       255.255.255.0    UG        32      0      0 r2-eth0
191.7.3.0        0.0.0.0         255.255.255.0    U         0      0      0 r2-eth1
191.7.3.0        0.0.0.0         255.255.255.0    U        32      0      0 r2-eth1
191.7.4.0        191.7.3.5       255.255.255.0    UG        32      0      0 r2-eth1
191.7.5.0        191.7.3.5       255.255.255.0    UG        32      0      0 r2-eth1
191.7.7.0        191.7.1.2       255.255.255.0    UG        32      0      0 r2-eth0
```

```
mininet> r3 route
Kernel IP routing table
Destination      Gateway         Genmask         Flags Metric Ref    Use Iface
191.7.1.0        191.7.2.2      255.255.255.0   UG      32    0      0 r3-eth0
191.7.2.0        0.0.0.0        255.255.255.0   U        0    0      0 r3-eth0
191.7.2.0        0.0.0.0        255.255.255.0   U       32    0      0 r3-eth0
191.7.3.0        191.7.4.5      255.255.255.0   UG      32    0      0 r3-eth1
191.7.4.0        0.0.0.0        255.255.255.0   U        0    0      0 r3-eth1
191.7.4.0        0.0.0.0        255.255.255.0   U       32    0      0 r3-eth1
191.7.5.0        191.7.4.5      255.255.255.0   UG      32    0      0 r3-eth1
191.7.7.0        191.7.2.2      255.255.255.0   UG      32    0      0 r3-eth0
mininet> r4 route
Kernel IP routing table
Destination      Gateway         Genmask         Flags Metric Ref    Use Iface
191.7.1.0        191.7.3.4      255.255.255.0   UG      32    0      0 r4-eth1
191.7.2.0        191.7.4.4      255.255.255.0   UG      32    0      0 r4-eth2
191.7.3.0        0.0.0.0        255.255.255.0   U        0    0      0 r4-eth1
191.7.3.0        0.0.0.0        255.255.255.0   U       32    0      0 r4-eth1
191.7.4.0        0.0.0.0        255.255.255.0   U        0    0      0 r4-eth2
191.7.4.0        0.0.0.0        255.255.255.0   U       32    0      0 r4-eth2
191.7.5.0        0.0.0.0        255.255.255.0   U        0    0      0 r4-eth0
191.7.5.0        0.0.0.0        255.255.255.0   U       32    0      0 r4-eth0
191.7.7.0        191.7.3.4      255.255.255.0   UG      32    0      0 r4-eth1
```

### c. Trace route output - h1 traceroute h2

```
*** Starting CLI:
mininet> h1 traceroute h2
traceroute to 191.7.5.2 (191.7.5.2), 30 hops max, 60 byte packets
 1  191.7.7.1 (191.7.7.1)  0.061 ms  0.012 ms  0.006 ms
 2  191.7.2.3 (191.7.2.3)  0.015 ms  0.010 ms  0.008 ms
 3  191.7.4.5 (191.7.4.5)  0.018 ms  0.017 ms  0.011 ms
 4  191.7.5.2 (191.7.5.2)  0.034 ms  0.015 ms  0.015 ms
```

Here:

1. 191.7.7.1 corresponds to R1
2. 191.7.2.3 corresponds to R3
3. 191.7.4.5 corresponds to R4
4. 191.7.5.2 corresponds to H2

## d. BIRD Config file

Example for h1:

```
debug protocols all;
```

```
protocol kernel{  
    ipv4{  
        import all;  
        export all;  
    };  
}
```

```
protocol device{}
```

```
protocol direct{  
    ipv4;  
    interface "-arc","*";  
}
```

```
protocol rip h1RIP{  
    ipv4{  
        import all;  
        export all;  
    };  
    interface "h1-eth*"{  
        mode broadcast;  
    };  
}
```

Remaining files have been attached.

## B2. Bring the link down

### a. How to get the link down

*link <node 1> <node 2> down*

The above command is used to get the link between node 1 and node 2 down. In the initial trace route output, we see that the routing occurs through *link r1 r3*. We get this link to go down using **link r1 r3 down**.

## b. Trace route output - h1 traceroute h2

```
mininet> link r1 r3 down
mininet> h1 traceroute h2
traceroute to 191.7.5.2 (191.7.5.2), 30 hops max, 60 byte packets
 1  191.7.7.1 (191.7.7.1)  0.030 ms  0.007 ms  0.006 ms
 2  191.7.1.3 (191.7.1.3)  0.016 ms  0.009 ms  0.009 ms
 3  191.7.3.5 (191.7.3.5)  0.017 ms  0.013 ms  0.011 ms
 4  191.7.5.2 (191.7.5.2)  0.018 ms  0.020 ms  0.013 ms
mininet> h1 traceroute h2
traceroute to 191.7.5.2 (191.7.5.2), 30 hops max, 60 byte packets
 1  191.7.7.1 (191.7.7.1)  0.030 ms  0.008 ms  0.006 ms
 2  191.7.1.3 (191.7.1.3)  0.013 ms  0.008 ms  0.015 ms
 3  191.7.3.5 (191.7.3.5)  0.013 ms  0.010 ms  0.010 ms
 4  191.7.5.2 (191.7.5.2)  0.017 ms  0.013 ms  0.012 ms
```

Here,

1. 191.7.7.1 corresponds to R1
2. 191.7.1.3 corresponds to R2
3. 191.7.3.5 corresponds to R4
4. 191.7.5.2 corresponds to H2