COL334
Assignment-4 Part B

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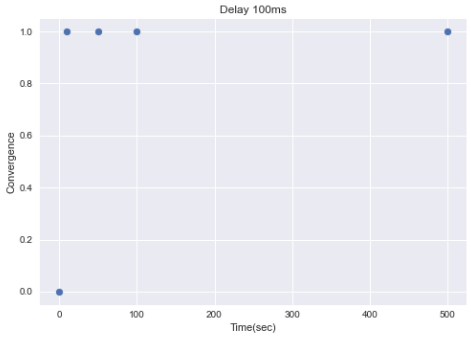
2019PH10629

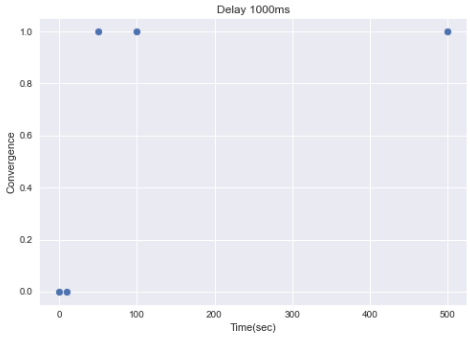
Part B.i)

a) Convergence plots for different delay in CSMA channel

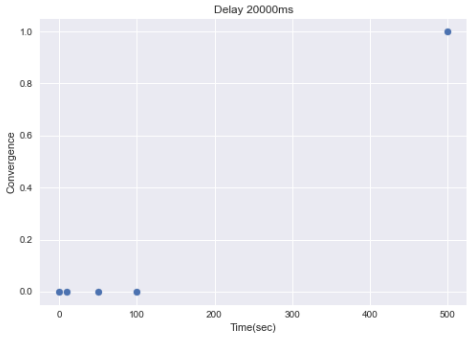
y=1 represents all tables have converged at that time
y=0 represents all tables have not converged at that time



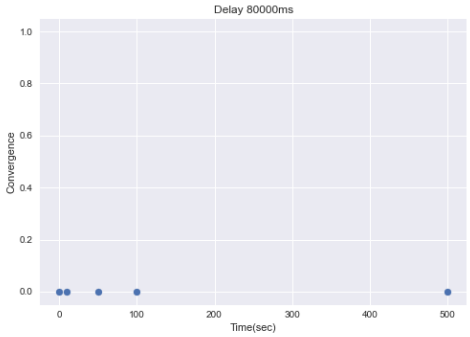
1. CSMA delay 100ms



2. CSMA delay 1000ms



3. CSMA delay 20000ms



4. CSMA delay 80000ms

b) Explain the trend observed in part a). Why does this behaviour happen?

From the plots we can observe that as the delay increases, the convergence of the routing tables also delays. This can be explained

by the fact that information exchange between routers becomes slower as the delay increases hence routing tables also take more time to update.

Part B.ii)

a) Routing tables

Table for **R1** at t = **121sec**

```
Node: 2, Time: +121.0s, Local time: +121.0s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 2, Time: +121.0s, Local time: +121.0s, IPv4 RIP table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.0.0.0        0.0.0.0         255.255.255.0   U     1      -      -   1
```

Table for **R2** at t = **121sec**

```
Node: 3, Time: +121.0s, Local time: +121.0s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 3, Time: +121.0s, Local time: +121.0s, IPv4 RIP table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.0.4.0        10.0.3.2        255.255.255.0   UGS   2      -      -   2
10.0.2.0        10.0.3.2        255.255.255.0   UGS   2      -      -   2
10.0.0.0        10.0.3.2        255.255.255.0   UGS   3      -      -   2
10.0.3.0        0.0.0.0         255.255.255.0   U     1      -      -   2
```

Table for **R3** at t = **121sec**

```
Node: 4, Time: +121.0s, Local time: +121.0s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 4, Time: +121.0s, Local time: +121.0s, IPv4 RIP table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.0.1.0        10.0.3.1        255.255.255.0   UGS   16     -      -   2
10.0.3.0        0.0.0.0         255.255.255.0   U     1      -      -   2
10.0.4.0        0.0.0.0         255.255.255.0   U     1      -      -   3
```

Table for **R1** at t = **180sec**

```
Node: 2, Time: +180.0s, Local time: +180.0s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 2, Time: +180.0s, Local time: +180.0s, IPv4 RIP table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.0.0.0        0.0.0.0         255.255.255.0   U     1      -      -   1
```

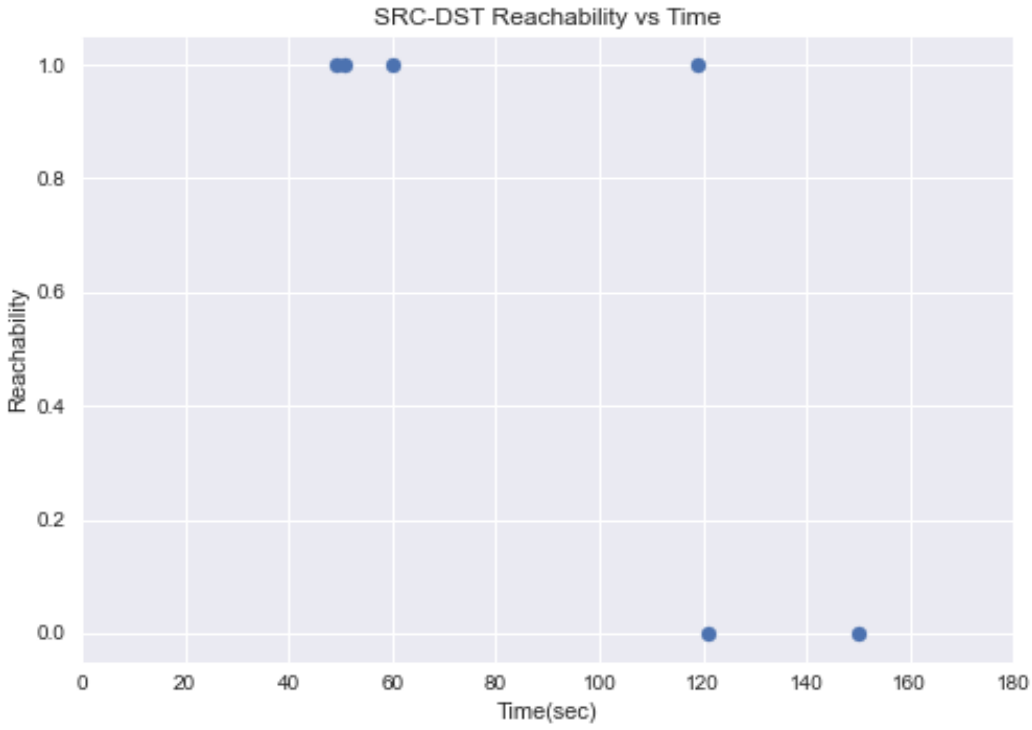
Table for **R2** at t = **180sec**

```
Node: 3, Time: +180.0s, Local time: +180.0s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 3, Time: +180.0s, Local time: +180.0s, IPv4 RIP table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.0.4.0        10.0.3.2        255.255.255.0   UGS   2      -      -   2
10.0.3.0        0.0.0.0         255.255.255.0   U     1      -      -   2
```

Table for **R3** at t = **180sec**

```
Node: 4, Time: +180.0s, Local time: +180.0s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 4, Time: +180.0s, Local time: +180.0s, IPv4 RIP table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.0.1.0        10.0.3.1        255.255.255.0   UGS   16     -      -   2
10.0.3.0        0.0.0.0         255.255.255.0   U     1      -      -   2
10.0.4.0        0.0.0.0         255.255.255.0   U     1      -      -   3
```

b) Plot for Source-Destination Reachability



From the plot we can see that the destination is reachable at t = 49s, 51s, 60s and 119s but becomes unreachable at t = 121s and t = 150s once the links are teared down.

c) In part b above, what is the similarity/difference between the reachability behaviour at t=51sec vs at t=119sec vs at t=121sec? Explain why does it happen.

At t = 50secs the link between R1-R2 is teared down. We can see that destination is still reachable via R1-R3 link. But it becomes unreachable when the R1-R3 link is also broken at t = 120secs.

Hence, destination is reachable at t = 51sec and t = 119sec but not reachable at t = 121sec.
Now at t = 51sec, R2 is not reachable from source but at t = 119sec R2 is also shown to be reachable from source but with a metric of 16 which is very high compared to metrics of other paths.

Part B.iii)

a) Routing tables

Table for **R1** at t = **70sec**

```
Node: 2, Time: +70.0s, Local time: +70.0s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 2, Time: +70.0s, Local time: +70.0s, IPv4 RIP table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.0.0.0        0.0.0.0         255.255.255.0   U     1      -      -   1
```

Table for **R2** at t = **70sec**

```
Node: 3, Time: +70.0s, Local time: +70.0s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 3, Time: +70.0s, Local time: +70.0s, IPv4 RIP table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.0.4.0        10.0.3.2        255.255.255.0   UGS   2      -      -   2
10.0.3.0        0.0.0.0         255.255.255.0   U     1      -      -   2
```

Table for **R3** at t = **70sec**

```
Node: 4, Time: +70.0s, Local time: +70.0s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 4, Time: +70.0s, Local time: +70.0s, IPv4 RIP table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.0.3.0        0.0.0.0         255.255.255.0   U     1      -      -   2
10.0.4.0        0.0.0.0         255.255.255.0   U     1      -      -   3
```

Table for **R1** at t = **180sec**

```
Node: 2, Time: +180.0s, Local time: +180.0s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 2, Time: +180.0s, Local time: +180.0s, IPv4 RIP table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.0.4.0        10.0.2.2        255.255.255.0   UGS   2      -      -   3
10.0.3.0        10.0.1.2        255.255.255.0   UGS   2      -      -   2
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
```

Table for **R2** at t = **180sec**

```
Node: 3, Time: +180.0s, Local time: +180.0s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 3, Time: +180.0s, Local time: +180.0s, IPv4 RIP table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.0.4.0        10.0.3.2        255.255.255.0   UGS   2      -      -   2
10.0.2.0        10.0.1.1        255.255.255.0   UGS   2      -      -   1
10.0.0.0        10.0.1.1        255.255.255.0   UGS   2      -      -   1
10.0.1.0        10.0.3.2        255.255.255.0   UGS   3      -      -   2
10.0.3.0        0.0.0.0         255.255.255.0   U     1      -      -   2
10.0.1.0        0.0.0.0         255.255.255.0   U     1      -      -   1
```

Table for **R3** at t = **180sec**

```
Node: 4, Time: +180.0s, Local time: +180.0s, Ipv4ListRouting table
  Priority: 0 Protocol: ns3::Rip
Node: 4, Time: +180.0s, Local time: +180.0s, IPv4 RIP table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.0.1.0        10.0.2.1        255.255.255.0   UGS   2      -      -   1
10.0.0.0        10.0.2.1        255.255.255.0   UGS   2      -      -   1
10.0.2.0        10.0.3.1        255.255.255.0   UGS   3      -      -   2
10.0.3.0        0.0.0.0         255.255.255.0   U     1      -      -   2
10.0.4.0        0.0.0.0         255.255.255.0   U     1      -      -   3
10.0.2.0        0.0.0.0         255.255.255.0   U     1      -      -   1
```

b) Plot for Source-Destination Reachability

From the plot we can see that the destination is not reachable at t = 119s and 121s but becomes reachable at t = 140s and t = 200s once the links are up.

Included Files

Part B/

1. **First.cc:** Code file for PartB.i). After running the file, it asks to enter a value for delay for the csma channel.

2. **Second.cc:** Code file for PartB.ii).

3. **Third.cc:** Code file for PartB.iii).

4. 2019PH10629_Report_PartB.