CSE 232 Section B,
Computer Networks; Programming Assignment 4:
NS3

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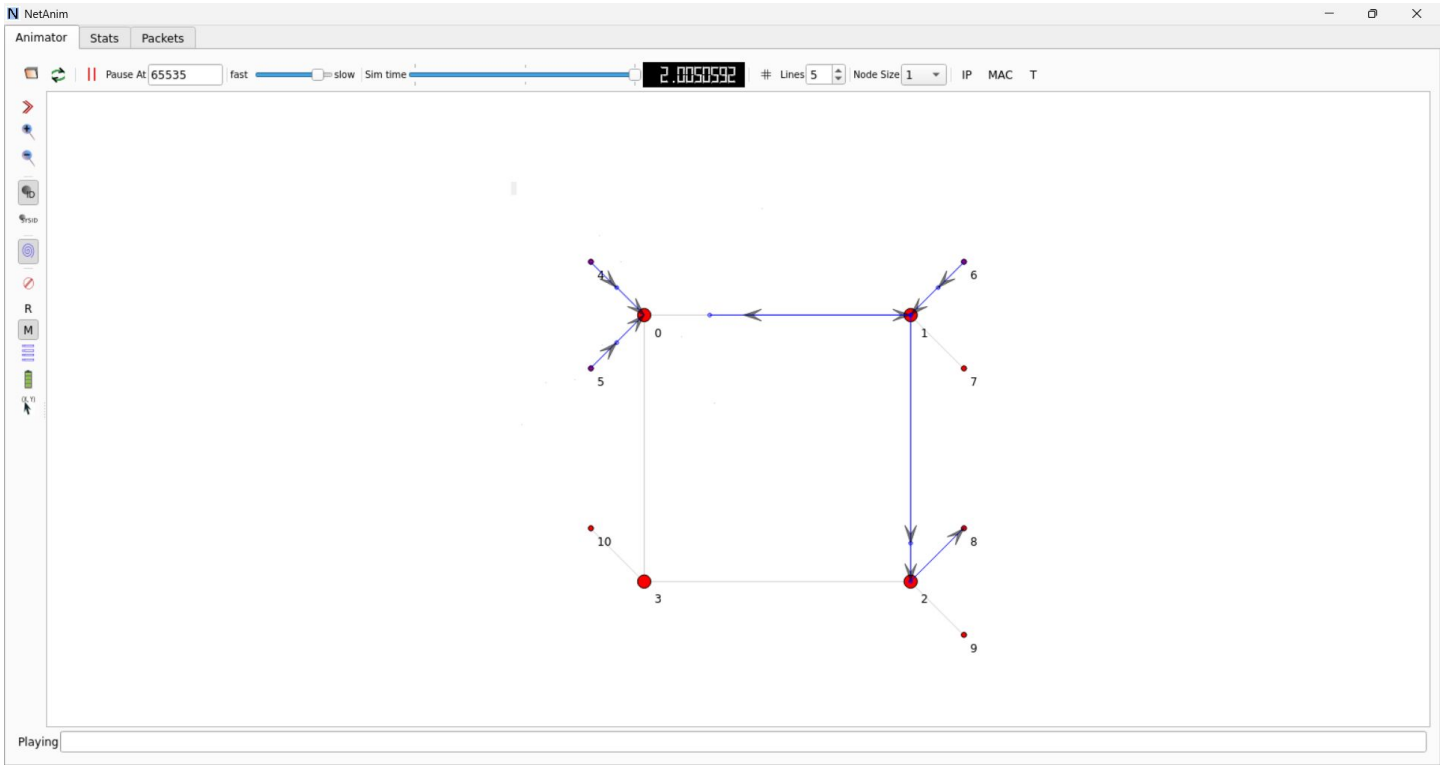
Topology


NetAnim
Animator
Stats
Packets
Pause At 65535
fast
slow
Sim time
2.0050592
Lines 5
Node Size 1
IP
MAC
T
R
M
Playing
0
1
2
3
4
5
6
7
8
9
10

Initial Parameters and Traffic Matrix

```
// Set up the simulation parameters
uint32_t packet_size = 256;  // 256 bytes  = 2048 bits
double Simulation_time = 60; // 1 min
const std::string propagation_delay = "1ms";
const double packet_drop_rate = 0.001;
// Traffic matrix representing average number of packets sent between nodes
int trafficMatrix[7][7] = {
    {0, 13, 17, 17, 9, 13, 13}, // A -> A, B, C, D, ..., G
    {13, 0, 18, 5, 6, 9, 7},    // B -> ...
    {9, 11, 0, 14, 16, 11, 10}, // C -> ...
    {12, 7, 7, 0, 3, 13, 6},    // D -> ...
    {9, 11, 12, 8, 0, 7, 7},    // E -> ...
    {14, 7, 11, 10, 9, 0, 13},  // F -> ...
    {9, 8, 14, 11, 8, 10, 0}    // G -> ...
};
```

Link Capacities

```
// Create and force propagation delay for router connections
CreateLink(routers.Get(0), routers.Get(1), "3Mbps", propagation_delay, "10.1.1.0", packet_drop_rate);   // R1 - R2 (1% drop rate)
CreateLink(routers.Get(1), routers.Get(2), "2.5Mbps", propagation_delay, "10.1.2.0", packet_drop_rate); // R2 - R3 (1% drop rate)
CreateLink(routers.Get(2), routers.Get(3), "1.5Mbps", propagation_delay, "10.1.3.0", packet_drop_rate); // R3 - R4 (1% drop rate)
CreateLink(routers.Get(3), routers.Get(0), "1Mbps", propagation_delay, "10.1.4.0", packet_drop_rate);   // R4 - R1 (1% drop rate)

// Connect workstations to routers
workstationInterfaces[0] = CreateLink(routers.Get(0), workstations.Get(0), "1Mbps", propagation_delay, "10.1.5.0", packet_drop_rate);  // R1 - A
workstationInterfaces[1] = CreateLink(routers.Get(0), workstations.Get(1), "1Mbps", propagation_delay, "10.1.6.0", packet_drop_rate);  // R1 - B
workstationInterfaces[2] = CreateLink(routers.Get(1), workstations.Get(2), "1Mbps", propagation_delay, "10.1.7.0", packet_drop_rate);  // R2 - C
workstationInterfaces[3] = CreateLink(routers.Get(1), workstations.Get(3), "2Mbps", propagation_delay, "10.1.8.0", packet_drop_rate);  // R2 - D
workstationInterfaces[4] = CreateLink(routers.Get(2), workstations.Get(4), "1Mbps", propagation_delay, "10.1.9.0", packet_drop_rate);  // R3 - E
workstationInterfaces[5] = CreateLink(routers.Get(2), workstations.Get(5), "1Mbps", propagation_delay, "10.1.10.0", packet_drop_rate); // R3 - F
workstationInterfaces[6] = CreateLink(routers.Get(3), workstations.Get(6), "1Mbps", propagation_delay, "10.1.11.0", packet_drop_rate); // R4 - G
```

i. End-to-end one-way delays - observations.txt

ii. Packet drops – observations.txt

iii. Queue lengths at each of the outgoing links in routers - 0 for all routers because of higher link capacities

iv. Traces of a few packets - Use other traffic_matrix