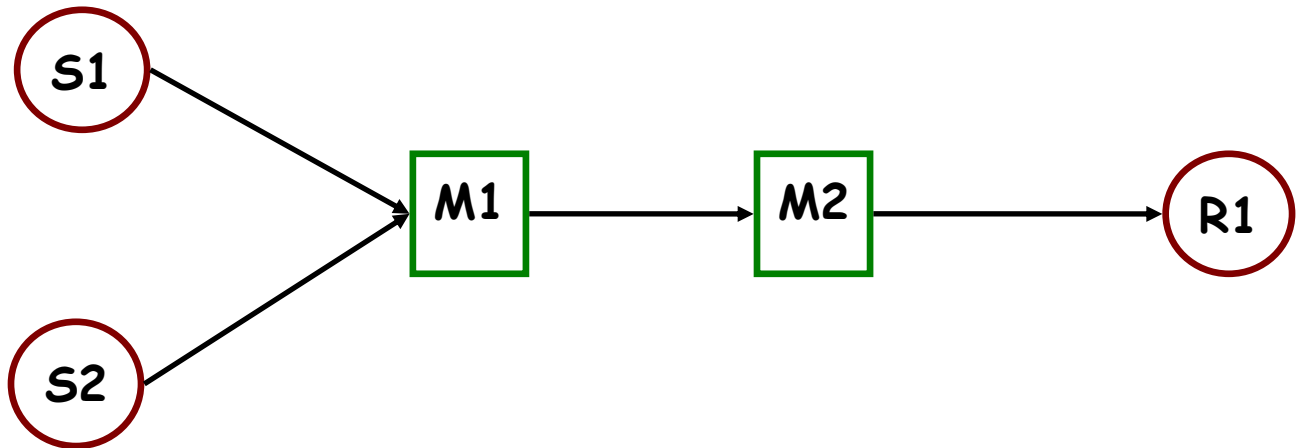


Lab 5 {Note Lab 5 runs for two weeks}
Simulating Packet Transmissions in C++

10 points



In Program 5, you must simulate **MANET** nodes. To assist the student in breaking up a large programming assignment into smaller design components, Lab 5 addresses an easier problem, simulating the end-to-end transmission of network packets when the mule nodes are not moving.

For this simulation, time will be in simulated units (**sims**) which are 100 milliseconds.

Assume you have two sending Host source nodes (S1 and S2) sending packets to one receiver Host node (R1). Two intermediate mule nodes (M1 and M2) employ FCFS packet queues. Both source hosts transmit packets to intermediate node M1. M1 transmits packets to M2. M2 transmits packets to the final destination R1.

In this simulation all packets are the same size. Sending a packet has two components transmission time and propagation time. Transmission time is a function of the channel capacity and the packet size. The transmission time for packets from S1 and S2 to M1 is **1 sim** and the transmission time for packets from M1 and M2 is **2 sims**. Propagation time begins when the last bit of a packet has been transmitted (namely, at the end of a packet's transmission time). The propagation times for the four nodes sending packets (S1, S2, M1 and M2) are 2, 2, 3, and 5 sims, respectfully. Note – you will likely need an event to indicate the end of transmission time and an event to indicate the end of propagation time for each packet sent. End of propagation time is the same as the time that the packet arrives at the next node or host.

Simulation Internal Details

The following are **internal** details for this simple simulation:

S1 and S2 each send 100 packets. S1 starts sending packets at time 0. S2 starts sending packets at time 3 sims.

This lab is designed as an important opportunity to realize **code reuse**. The assumption is that you will be able to reuse your event list and FCFS queue implementations from Program 3. If you do not have a working version of Program 3, we will make a working version of Program 3 available early in the a.m. on Tuesday, February 18th. However, you must convert this code into C++ using classes for this lab submission.

Main Assignment

This lab assignment runs over two labs with attending the second lab being optional. Your **C++ program** simulates the scenario detailed above. Your program should print out the packet response time for every packet that traverses the network (identifying the source) and the average packet response time for S1 and S2 packets. For bottleneck analysis also print out the maximum queue size experienced for both the M1 and M2 queues.

Design Choice

Note, there are (at least) two possible strategies for driving this simulation:

1. (Naïve approach) Start by putting all 200 packet transmission events on the event list before starting the simulation. This is acceptable but NOT recommended for this lab but definitely ‘clunky’. In Program 5 it is conceivable that a simulation involves sending **thousands of packets!!**
2. Design the routine that processes the event simulating the arrival of a packet at M1 such that the completion of transmission of packet **n** from Host **S** **triggers the insertion of new events** in the event list for the transmission and propagation of packet **n+1** from Host **S**. This is more complex, but the calculation of this future event is possible in this case because packets cannot be sent out of order and all packets arrive safely at the destination.

Lab 5 Assignment

0. Prior to coming to the lab prepare a preliminary solution to the program above.
1. Create a make file.
2. Note there is no test data for this lab.
3. Run the program redirecting the output to packetsim.txt.
4. Create a README file that contains any useful information to assist in the grading of your lab program.
5. Create a tarred file that contains all the source and header files, the make file and the README file and your output file.
6. Use the Unix version of the 'turnin' to turn-in the tarred file. [The deadline for all lab turn-ins is eight days after the beginning of your assigned lab 5.]