Homework Set 3 Fall 2012
Due on Monday, September 17 before 11:55PM
Work in your groups for this homework - Be prepared to present your work.

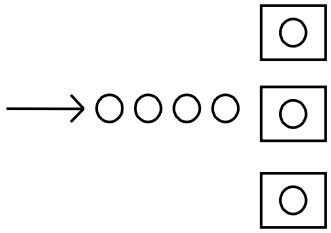
Objective: Understanding Sigma by building event graph models for simple queues.

Exercises: Implement each of the following systems in Sigma. Your submission should be a MOD file for each of the systems. The naming format MUST be hw_3_problem_1.mod. Replace the latter number with the number of the problem. For each of the models, please provide descriptions for ALL your variables, verticies / nodes, and edges / arcs. These descriptions are good practice, and will help us understand your thought process in the event that we need to give partial credit. Assume all the delay times given below, be them random or deterministic are in minutes.

1. *N* identical servers working on the same queue of identical jobs. Note for example if the initial queue size is 3, and *N* = 5, that is 5 servers are available, all 3 customers / queue items should immediately begin service, that is, at time 0.

Run Parameters:
QUEUE (The initial queue size)
SERVERS (The number of servers)

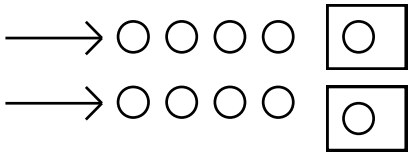
Delays:
Customer Arrival Rate: Uniform(5, 10)
Server Completion Time: Uniform(8, 15)



2. 2 different kinds of servers (say, slow and fast) working on two different queues with separate arrival patterns.

Run Parameters:
None

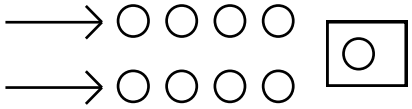
Delays:
C1 Arrival Rate: Uniform(5, 10)
C2 Arrival Rate: Uniform(3, 5)
S1 Completion Time: Normal($\mu = 8, \sigma = 3.5$)
S2 Completion Time: Normal($\mu = 4, \sigma = 2$)



3. One server working on 2 queues with different, non-preemptive priorities.

Run Parameters:
None

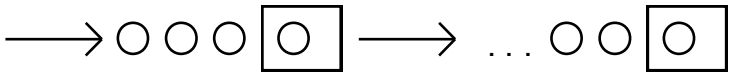
Delays:
C1 Arrival Rate: Uniform(5, 10)
C2 Arrival Rate: Uniform(1, 5)
Server Completion Time: Uniform(2, 8)



4. 2 servers in tandem with unlimited buffer space for waiting jobs between them.

Run Parameters:
None

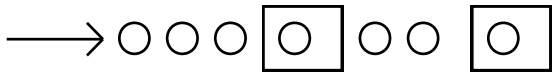
Delays:
Customer Arrival Rate: Exponential($\lambda = 0.5$)
S1 Completion Time: Uniform(3, 5)
S2 Completion Time: Uniform(4, 8)



5. Two servers in tandem with limited buffer space for B jobs between them. The upstream server is not able to unload a job and start the next job unless there is an open buffer space when it finishes processing...

Run Parameters:
BUFFER (The size of the intermediate buffer)

Delays:
Customer Arrival Rate: Exponential($\lambda = 0.5$)
S1 Completion Time: Uniform(3, 5)
S2 Completion Time: Uniform(4, 8)



6. *N* workers tending *M* semi-automatic machines working in parallel on a single queue of identical jobs. A worker must load and unload each machine, but the processing is automatic.

Run Parameters:
WORKERS (The number of workers, *N*)
MACHINES (The number of machines, *M*)

Delays:
Job Arrival Rate: Uniform(3, 5)
Machine Completion Time: Uniform(5, 12)
Load Time: 0.75
Un-Load Time: 1