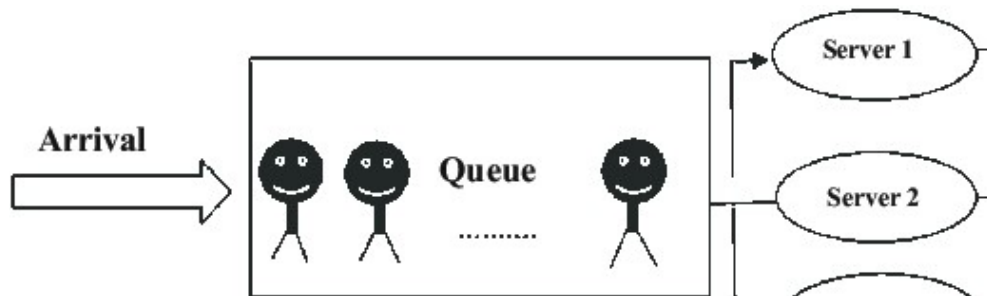




**College of Engineering**  
**Master of Engineering Management Program**  
**MEM506 (Simulation HW3)**

**Multiple Server System Simulation**

You are an engineering manager in charge of a service center where customers arrive to the center with an arrival rate  $\lambda = 30$  customer/hr. As shown in below figure, the service center has parallel 3 service stations each with a service rate  $\mu = 12$  customer/hr. Both inter-arrival and service times are exponential.



As an Engineering Manager of the service center, you decided to use the following five key performance measures (KPIs) are:

- Avg. customer waiting time ( $W_q$ )
- Avg. time a customer spends in the service center ( $W$ )
- Avg. number of customers waiting in the queue ( $L_q$ )
- Avg. number of customers in the service center ( $L$ )
- Avg. server utilization ( $U$ )

Based on the given information, you need to estimate the five KPIs for the service center in order to monitor and improve its performance.

**Procedure:**

- Use queuing formulas in QM for Windows to estimate the 5 KPIs.
- Name the model with your name
- Show a screen shot your input and output screens
- Build an ARENA model of the service center
- Name the ARENA model with your name
- Show a screen shot of details of each model element (Create, Process, etc.)
- Show the complete model picture.
- Run the model for 40 hours (one week) of operation and obtain results report.
- Study and understand all the elements of the simulation report.
- Include the report of simulation results in the appendix.
- Use the simulation results to estimate the averages of same five KPIs.
- Compare QM to ARENA simulation results to simulation results and show differences (Use a table to compare results).
- What can you do to improve the accuracy of ARENA simulation results?
- Use ARENA to sketch one server utilization with run time (40 hrs), what do you conclude?