README

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Experiment 1

In first experiment, we have used an M/M/1 service node with exponential interarrival, exponential service times and one server. We know that the service rate μ is equals to $\frac{1}{s} = \frac{10}{9}$. so the theoretical average sojourn time is $\frac{1}{\mu-1} = \frac{1}{\frac{10}{9}-1} = 9$.

Experiment 2

In second experiment, we have M/G/1 service node with exponential distribution of interarrival, gamma distribution of service times and one server. We know that the service rate is equals to $\frac{1}{k\theta} = \frac{1}{0.9} = \frac{10}{9}$. And we found that M/G/1 has the same theoretical average sojourn time as M/M/1.

Experiment 3

In third experiment, we have M/G/1 service node but with different parameters– shape$k = 1.05$ and scale$\theta = 0.9$. So the service rate is equals to $\frac{1}{k\theta} = \frac{1}{1.05*0.9} \approx 1.0582$. And we found that this service function results in higher theoretical average sojourn time(about 20 mins) compared to last two experiments.

Experiment 4

In the fourth experiment, we still have M/G/1 service node but with different parameters– shape$k = 1.1$ and scale$\theta = 0.9$. And we found that the service rate now becomes $\frac{1}{1.1*0.9} \approx 1.0101$. And now the theoretical average sojourn time returns even higher(around 100 mins). Furthermore, I notice that the 5000 jobs is not enough to reach the "steady-state" where the simulated average sojourn time is well-below the theoretical line and this Thus, I decide to increase the number of jobs processed in this system. I first try 10000 jobs and the statistics still looks erratic. As I continue to increase the number of jobs up to 20000, the steady-state finally reached.