Scheduling disciplines for the G/G/k queue - Homework Assignment (DM), Évaluation de Performances, INFO4 Polytech Grenoble

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Votre devoir sera rédigé en français ou en anglais sous forme d'un document HTML généré à l'aide de R/Markdown et publié sur rpubs en prenant soin de bien laisser le code apparent et de fixer la graine de votre générateur à l'aide de la fonction set.seed au tout début du document afin qu'il soit possible de reproduire vos données avec exactitude.

Vous enverrez l'url rpubs de votre devoir par mail à jonatha.anselmi AT inria.fr avant le 2024-03-31 en indiquant dans le sujet [INFO4-EP] DM.

Objective

The aim of this homework assignment is to be able to simulate and compare the dynamics of a G/G/k queue adopting a number of scheduling disciplines.

The student will rely on the code written in class for simulating the dynamics of the G/G/1 queue, which is available at https://rpubs.com/janselmi/GG1_scheduling_disciplines

Roadmap

1. Extend the R code of the G/G/1 queue to be able to simulate the G/G/k queue under the scheduling disciplines FCFS, LCFS, ROS and SRPT.
2. Take $k = 3$. Simulate the dynamics induced by 10 arrivals and provide numerical evidence that your code is correct (using the print command or similar commands).
3. Now, the goal is to compare the G/G/k queue with a G/G/1 queue having one server that is k times faster. For increasing values of the load (i.e., arrival rate divided by service rate) and $k = 5$, plot the ratio between the average response time obtained by a G/G/k/FCFS queue and the average response time obtained by a G/G/1/FCFS queue with a server that operates at speed k.
4. Find the value of the ratio defined in the previous point in a limiting regime where the load approaches one from below. Provide some intuition for the obtained value.

Assumptions

- For the inter-arrival and service times, the student is free to choose the probability distributions of their choice.
- In the G/G/k queue, it is assumed that each server processes jobs with speed one.

Notes

Beyond the correctness of the 4 points above, the final note will depend on how the student will make their homework clear. In particular,

- Justify any further assumption made.
- Add comments in the code to explain what you are doing.
- Make sure your plots are *robust* (in terms of number of simulated jobs, choices of k, etc.).