Principles of Communications Networks

Homework assignment 2

Due date: 2017/5/19

1. [20%] Please write a channel request generator. The arrival rate of the channel request follows Poisson distribution with mean 0.5. In addition, please show the inter-arrival time distribution of these channel requests is Exponential distribution. [Hint: you can plot the pdf of the inter-arrival time]
2. [80%] Considering the cell planning in the figure below. The cluster size is 3 (cells with the same color are in a cluster); the cell radius and the frequency reuse distance are 100 m and 300 m, respectively. In addition, each cell is allocated 5 traffic channels, while the channels may be lent to neighboring cells when needed. We assume that the arrival process and service time of calls in each cells follow the Poisson distribution and Exponential distribution, respectively. We define $\lambda = 1/\text{min}$ and $\mu = 0.2/\text{min}$. As for cell i, the mean arrival rate λ_i and mean service rate μ_i are $[(i \mod 4) + 1] \times \lambda$ and $[(i \mod 4) + 1] \times \mu$, respectively. The simulation time is 100 min.
   (1) Without channel borrowing scheme, what the average blocking probability of the cellular system?
   (2) When a cell can borrow channels from its richest neighboring cell (must return the borrowed channel when one nominal channel becomes free), what the average blocking probability? What's the average time consumption to borrow a channel?