Description

Simulate a Shawarma restaurant where there are n_c stands providing sliced chicken for wraps with a weight of r_c units where r_c is a random variable following normal distribution with mean μ_c and variance ${\sigma_c}^2$ (but lowest possible amount is 0.1). Similarly, there are n_m beef stands with analogous parameters r_m, μ_m, and ${\sigma_m}^2$. The time instance at which a stand provides an amount r_c or r_m depends on the strategy P. Excess meat is kept aside (stored in queue) waiting to be served in a wrap to a customer. Each wrap requires a total of 1 unit of sliced meat. A new customer arrives every t_s time units where t_s is an exponential random variable with average c_s. The customer either requests a beef wrap or a chicken wrap with equal probability drawn from Bernoulli distribution with $p = 0.5$. Customers wait in two separate queues (associated with beef and chicken requests) and are served in FIFO order. There are n_w employees responsible for making the wraps using the available (queued) meat. For a waiting customer to be served, an employee responsible for wrapping should be available, and enough meat of the requested type should be provided by the respective meat queue. If these conditions are met, it takes t_w time units for the wrapping employee to serve the customer. When a wrapping employee is available it selects the queue from which the next customer is served according to the strategy S.

Simulate the restaurant described above and determine:

1. Average customer waiting time,
2. Average storage time of sliced meat before being served,
3. Average queue length, and
4. Average utilization of wrapping employees' times.

Parameters

	Strategy $\boldsymbol{P}$ (trigger for slicing meat)	Language
$\boldsymbol{P_1}$	Meat of a given type is sliced whenever a wrapping employee is free and there is a customer awaiting to be served a wrap of same type.	C++
$\boldsymbol{P_2}$	Every T, meat is sliced from all stands. However, each stand can store up to a maximum of N units of sliced meat (respectively , a total of $N \times n_c$ and $N \times n_m$ in chicken and meat queues can accumulate). If the queue is full no meat is sliced.	Python

	Strategy $\boldsymbol{S}$ (queue selection for wrapping service strategy)
$\boldsymbol{S_1}$	Free wrapping employee selects the queue with highest number of customers
$\boldsymbol{S_2}$	Free wrapping employee selects the queue with first customer waiting for service
$\boldsymbol{S_3}$	Random selection from Bernoulli distribution with $p = 0.5$

	Simulation method
MT1	Activity scanning (C++ only)
MT2	Event scheduling

MT3	ABC approach
MT4	Process interaction

	D_1	D_2
$n_c, \mu_c, {\sigma_c}^2$	$2, 3, 0.5^2$	$2, 2, 0.3^2$
$n_m, \mu_m, {\sigma_m}^2$	$1, 3, 0.8^2$	$5, 1, 1.1^2$
c_s	0.5	0.9
n_w	2	1
t_w	1.1	0.6
T (in case P_2 is selected)	4	8
N (in case P_2 is selected)	5	4