"I pledge my honor that I have abided by the Stevens Honor System." X Min Su Park X Ahsan Shahab

Min Su Park and Ahsan Shahab Assignment 1
CPE/CS 492–A Due March 5, 2018

Analysis of Assignment 1 Results

For this assignment, the team simulated a producer-consumer system utilizing threads, mutexes, condition variables, and scheduling. Parameters that varied in each simulation are the number of available producer and consumer threads, the number of total products, and the scheduling algorithm used to schedule the consumption of products. The team came up with a set of test inputs that accounted for all permutations of the parameters listed above. The resulting output logs for each of the test inputs are included in the zip file for reference.

The team defined *total time* as the sum of each product's processing time (following the instructions of the CAs). The biggest parameter that affects this is the number of products: the more products there are, the longer the total time is. In round robin scheduling, a lower time quantum results in a higher total time.

Turn-around time is defined as the time from when a product is produced until when it has been completely consumed. The biggest parameter affecting this time is the number of consumer threads available. If there are more consumer threads, the lower the average turn-around time is. Queue size is another significant parameter, as the turn-around time increases a lot if the queue size is large. If the queue size is small, and the queue is filled more frequently as a result, products are not produced and turn-around time is limited. Lastly, the number of products are directly proportional to the turn-around time; more products result in a larger turn-around time.

Wait time is defined as the time a product spends waiting in the consumer queue. Similar to turn-around time, the more consumer threads available, the shorter the wait time becomes. As a result, parameters such as queue size and total number of products affect wait time in the same way it affects turn-around time.

Lastly, *producer throughput* and *consumer throughput* are defined as the total time that the producers and consumers run respectively, divided by the total number of products. Here, the most significant parameter is either the number of producers or consumers available. The producer throughput speeds up with many producers. The same can be said about consumers and consumer throughput. In round robin, the time quantum also impacts the throughput values quite a bit. The higher the time quantum, the faster the throughput is for both producers and consumers. Lastly, varying queue sizes can cause a change in producer throughput. A larger, or unlimited queue, greatly speeds up the producer throughput, as the producers can create the products at a more frequent pace.

When comparing first-come, first-serve and round robin, the biggest factor is the time quantum. If the time quantum is too low, round robin spends more time switching between products than actually consuming. If the time quantum is too high, round robin effectively runs as FCFS. Round robin only surpasses FCFS when the time quantum is at a median range, when products with lower lifespans are consumed in one pass and products with larger lifespans do not take too much time in a consumer.