ECE 254: Lab 4

Producer Consumer Problem

Ramie Raufdeen & Sadman khan

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# Overview

In this lab, the objective was to use the POSIX API’s functionalities to solve the classic producer-consumer problem. The code was then used to generate timings for various factors such as the number of queued messages, initialization of the system, and the data transmission as a whole.

There is potential for bias with the data below as the *printf()* function could cause a delay in the program with its IO wait. This could mean that the data might be a bit skewed.

# Timing Data

## Initialization Time

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Average System Initialization Time | | | | | |
| N\B | 1 | 2 | 4 | 8 | 10 |
| 20 | 0.000259 | 0.000267 | 0.000262 | 0.000259 | 0.000271 |
| 40 | 0.000279 | 0.000269 | 0.000262 | 0.000272 | 0.000276 |
| 80 | 0.000249 | 0.000262 | 0.00031 | 0.000262 | 0.000259 |
| 160 | 0.00027 | 0.000271 | 0.000263 | 0.000261 | 0.000259 |
| 320 | 0.000254 | 0.000249 | 0.00026 | 0.000265 | 0.00025 |
| Standard Deviation of System Initialization Time | | | | | |
| N\B | 1 | 2 | 4 | 8 | 10 |
| 20 | 0.000251 | 0.000263 | 0.000244 | 0.000243 | 0.000253 |
| 40 | 0.000279 | 0.000271 | 0.000256 | 0.000276 | 0.000293 |
| 80 | 0.000233 | 0.000257 | 0.001186 | 0.000252 | 0.000236 |
| 160 | 0.0003 | 0.000284 | 0.000254 | 0.000262 | 0.000253 |
| 320 | 0.000246 | 0.000221 | 0.000258 | 0.000259 | 0.000231 |

## Data Transmission Time

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Average Data Transmission Time | | | | | |
| N\B | 1 | 2 | 4 | 8 | 10 |
| 20 | 0.001322 | 0.001347 | 0.001331 | 0.001476 | 0.001564 |
| 40 | 0.001413 | 0.001446 | 0.001457 | 0.001406 | 0.001399 |
| 80 | 0.001542 | 0.001525 | 0.001494 | 0.0015 | 0.001491 |
| 160 | 0.001782 | 0.001718 | 0.001664 | 0.001643 | 0.001627 |
| 320 | 0.002196 | 0.002108 | 0.00202 | 0.002013 | 0.002094 |
| Standard Deviation of Data Transmission Time | | | | | |
| N\B | 1 | 2 | 4 | 8 | 10 |
| 20 | 0.000425 | 0.000429 | 0.00043 | 0.000493 | 0.006447 |
| 40 | 0.000492 | 0.000484 | 0.000556 | 0.00045 | 0.000492 |
| 80 | 0.000469 | 0.000503 | 0.00048 | 0.000477 | 0.000477 |
| 160 | 0.000595 | 0.000549 | 0.00047 | 0.000514 | 0.000499 |
| 320 | 0.000681 | 0.000626 | 0.000591 | 0.000594 | 0.000584 |

## Graphs

### System Initialization Time

The plot above shows that for any fixed N and a change in buffer size, the resulting initialization time in seconds. Analyzing this graph, one can note there is a steady range of approximately 0.25ms to 0.29ms (excluding the outlier of 0.31ms from n=80) for the initialization time regardless of buffer size. One can conclude from the graph that there is no relationship between the buffer size, number of messages, and the initialization time.

### Data Transmission Time

For a fixed N, there is a change in data transmission time as the buffer size changes. In the plot, there is a decrease in average data transmission time as the buffer size increases.

### Histogram