

CSC 464 Assignment 1

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October 11th 2018

1 Introduction

All code in this assignment was written by me, Sterling Laird with some solutions inspired by concepts in *The Little Book of Semaphores*. All implementations can be found on my Github page (<https://github.com/sterlinglaird/CSC-464>).

Performance metrics were collected on a windows 10 PC with an Intel 4770k processor. Go code was compiled with Go version 1.11 and C++ code was compiled with platform toolset v141.

2 Dining Hall Problem

1. In this problem, threads (or some other concurrent construct) do some action individually before getting ready to leave. However if there is only one thread performing actions beforehand, than a thread ready to leave must wait. This problem could model the real world problem of having workers and jobs in a distributed system. If there is a worker performing a job, there could be the constraint that there must be another working waiting in case it needs to take over the job (say if the server the original worker is on goes offline).
- 2.

Language	Number of students	Number of rounds	Time taken
Go	10	100000	0.204s
C++	10	100000	0.124s
Go	10	1000000	2.016s
C++	10	1000000	1.142s
Go	1000	10000	1.992s
C++	1000	10000	1.276s
Go	10000	10000	23.699s
C++	10000	10000	12.512s

3 Dining Savages Problem

- 1.
- 2.

Language	Savages	Servings per pot	Cook iterations	Time taken
Go	10	10	100000	0.766s
C++	10	10	100000	0.174s
Go	1000	10	10000	5.197s
C++	1000	10	10000	8.153s
Go	10000	10	1000	5.902s
C++	10000	10	1000	54.207s
Go	1000	100000	1000	12.635s
C++	1000	100000	1000	5.566s

4 Producer Consumer Problem

- 1.
- 2.

Language	Buffer size	Producers	Consumers	Produced per producer	Time taken
Go	10	10	10	100000	0.303s
C++	10	10	10	100000	0.623s
Go	10	1000	10	10000	4.170s
C++	10	1000	10	10000	8.178s
Go	10	10	1000	1000000	3.721s
C++	10	10	1000	1000000	6.930s
Go	10000	10	10	1000000	2.303s
C++	10000	10	10	1000000	2.627s

5 Propagation Problem

- 1.
- 2.

Language	Copies	Number of rounds	Time taken
Go	10	1000000	2.454s
C++	10	1000000	0.271s
Go	1000	10000	2.218s
C++	1000	10000	0.100s
Go	10000	1000	2.338s
C++	10000	1000	0.742s
Go	100000	100	3.014s
C++	100000	100	7.303s

6 Readers Writers Problem

- 1.
- 2.

Language	Readers	Writers	Actions per	Time taken
Go	10	10	100000	0.599s
C++	10	10	100000	0.250s
Go	1000	10	10000	1.970s
C++	1000	10	10000	0.925s
Go	10000	10	1000	4.452s
C++	10000	10	1000	1.478s
Go	1000	100000	1000	6.297s
C++	1000	100000	1000	2.361s

7 Roller Coaster Problem

1.

2.

All with $\text{ppc} * \text{rounds} = \text{passengers}$

Language	Passengers per car	Passengers	Time taken
Go	1	100000	0.123s
C++	1	100000	5.774s
Go	1000	10000	2.218s
C++	1000	10000	0.100s
Go	10000	1000	2.338s
C++	10000	1000	0.742s
Go	10	1000	0.001s
C++	10	1000	0.088s