Operating System

"Pthreads"

Shu Sakamoto
71775236
t17523ss

Problem 1

> Determine the number of cores on your CPU.

By using `grep cpu.cores /proc/cpuinfo | sort -u`, which returns
`cpu cores : 4`,
we can determine that the number of cores on my CPU is 4.
(Reference: https://access.redhat.com/ja/solutions/2159401)

Problem 2

> Vary NUM_THREADS from 1 to 1000 in some reasonable step size. Execute and record the
> time taken. On a Mac or Linux, use the "time" command. You should have real (wall clock),
> user and system time.

I have ran `t2-lock-var.c` 10 times each with NUM_THREADS varying in a log-ish scale (`1, 2, 3, ..., 10, 20, 30, ..., 100, 200, 300, ..., 1000`). THRESHOLD also varies but in an actual log scale (`1, 10, 100, ..., 100000000`). Result of `time` command was redirected to a file `result.txt`, and this was formatted in to `result.csv` using regular expression replacement (replacing `\nreal\t0m(\d+\.\d+)s\nuser\t0m(\d+\.\d+)s\nsys\t0m(\d+\.\d+)s` with `$1,$2,$3`). From `result.csv`, average run time was calculated with some graphs drawn (`result.xlsx`). See `lock.sh` for actual implemantation.

Problem 3

> Plot those in interesting/pretty ways that tell us something about the performance. What
> number of threads performs best? Is that constant, or does it depend on the size of the
> update threshold?

real time, 10 trials average
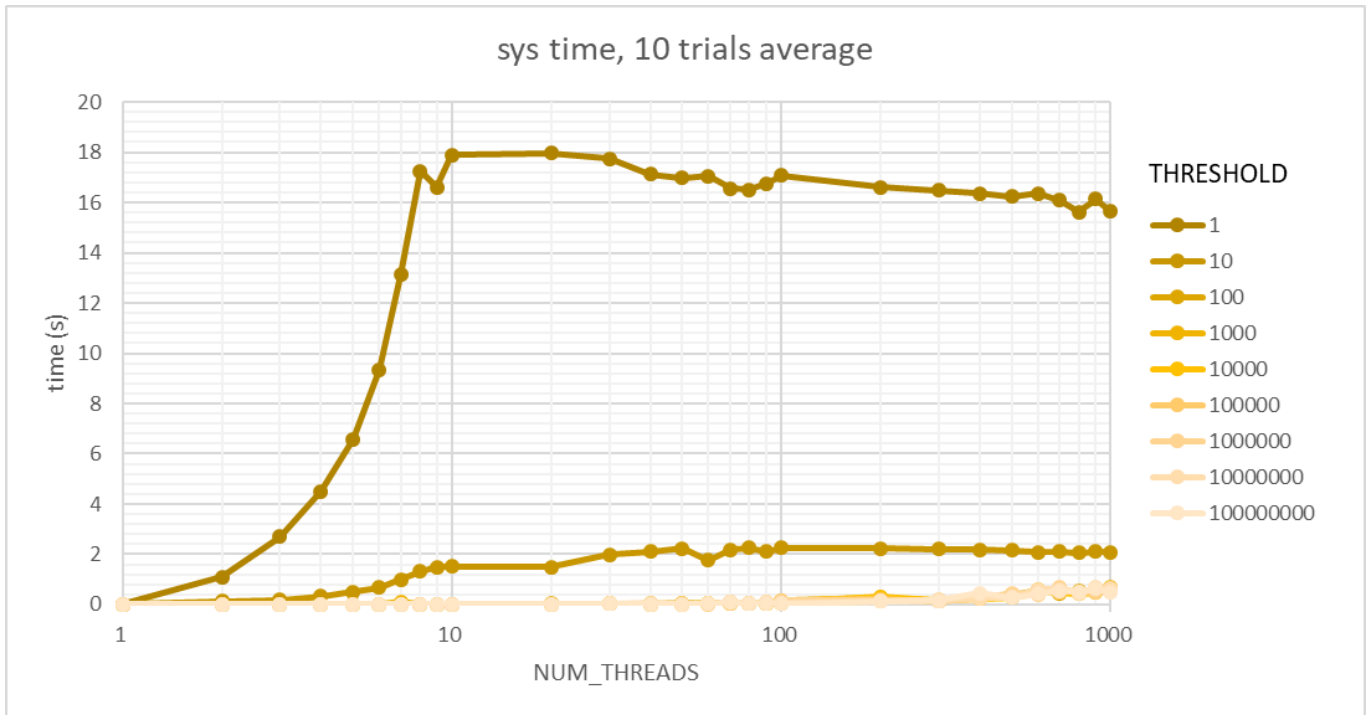

user time, 10 trials average
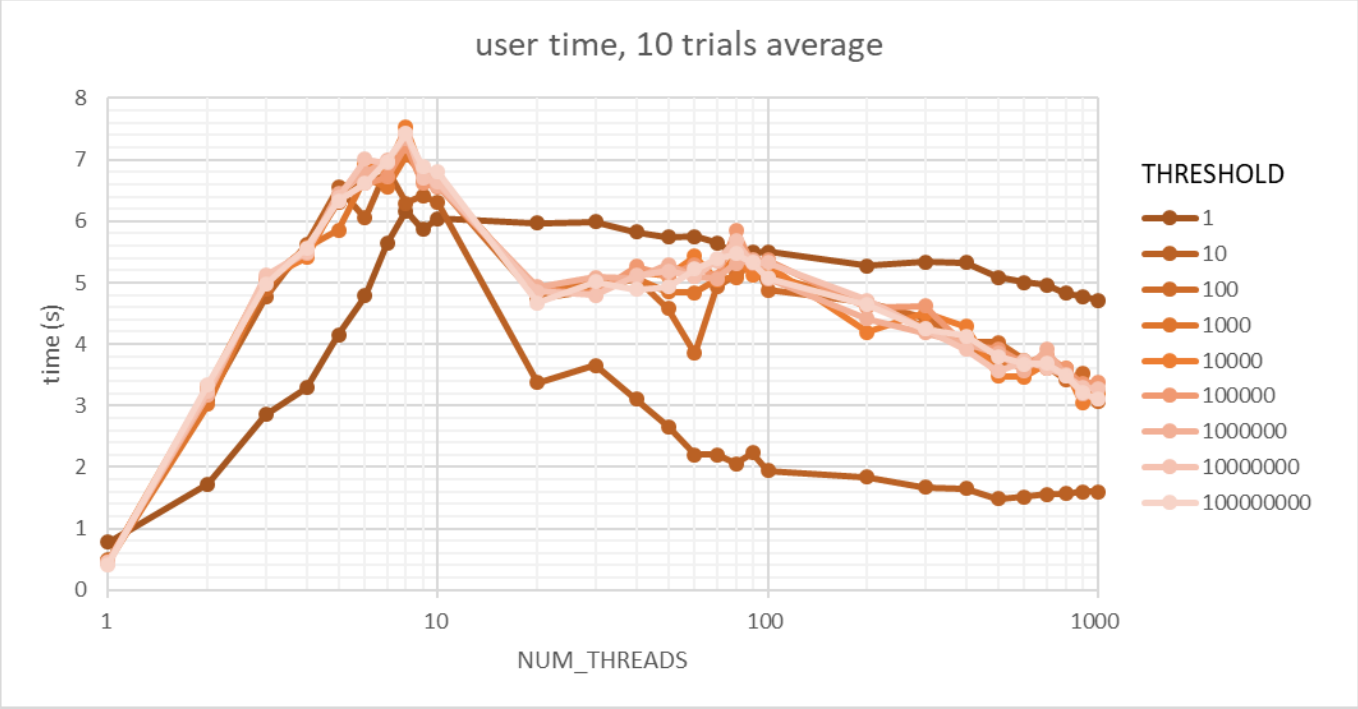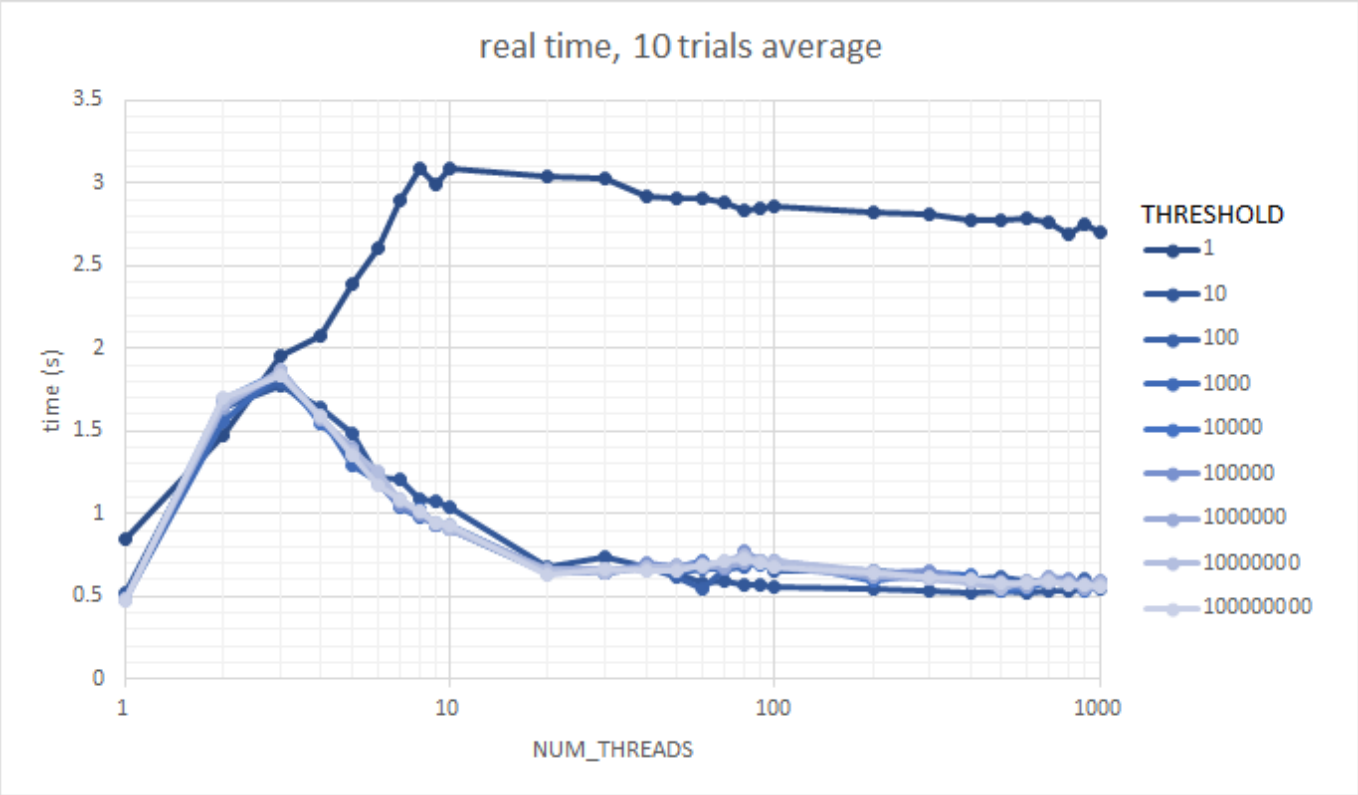
Fig. 1. A line plot graph of `time ./t2-lock-var.out`. Average of 10 trials are plotted in seconds.
real (top), user (middle), sys (bottom) time are shown.

- We can notice that for most THRESHOLD, real time makes its peak when
  NUM_THREADS==3, user time does when NUM_THREADS==9, and sys time does not.
- real-wise, multiprocessing is most inefficient when NUM_THREADS equals to the number of
  CPU cores?
- user-wise, multiprocessing is most inefficient when NUM_THREADS equals to two times the
  number of CPU cores?
- It is interesting to see that when THRESHOLD==1, real and sys time (and maybe user
  time?) is constant after NUM_THREADS>8, two times the number of CPU cores.