Chapter 29

1. We'll start by redoing the measurements within this chapter. Use the call gettimeofday() to measure time within your program.

(1) How accurate is this timer?

The accuracy of gettimeofday() depends on the underlying hardware and system configuration. However, it is generally 1 microsecond, one millionth of a second.

(2) What is the smallest interval it can measure?

The smallest interval that gettimeofday() can measure is one microsecond, but it might be limited by the underlying hardware and system load.

2. Now, build a simple concurrent counter and

(1) measure how long it takes to increment the counter many times as the number of threads increases.

(2) How many CPUs are available on the system you are using?

(3) Does this number impact your measurements at all?

See code in [Q2_simple_concurrent_counter.c]

(1)

I set the thread number from 1 to 4, and the simple concurrent counter counts to 1000000 in every thread. The result is listed below.

Expected Value: 1000000
Count Value: 1000000
Number of Threads: 1
Time Used: 16009 microseconds

Expected Value: 2000000
Count Value: 2000000
Number of Threads: 2
Time Used: 49301 microseconds

Expected Value: 3000000
Count Value: 3000000
Number of Threads: 3
Time Used: 69992 microseconds

Expected Value: 4000000
Count Value: 4000000
Number of Threads: 4
Time Used: 94066 microseconds

(2) There are 4 cores on the CPU of my PC.
(3) Not sure. It should have influence on the measurements. Further research and tests are needed.

3. Next, build a version of the approximate counter.
(1) once again, measure its performance as the number of threads varies, as well as the threshold.
(2) Do the numbers match what you see in the chapter?

See code in [Q3_simple_concurrent_approximate_counter.c]

(1) Firstly set the thread number from 1 to 4, threshold as 1024, and the counter counts to 1000000 in every thread. The result is listed below.

```
Expected Value:         1000000
Count Value:            999424
Number of Threads:      1
Threshold:              1024
Time Used:              16076           microseconds


Expected Value:         2000000
Count Value:            1998848
Number of Threads:      2
Threshold:              1024
Time Used:              73476           microseconds


Expected Value:         3000000
Count Value:            2998272
Number of Threads:      3
Threshold:              1024
Time Used:              142090          microseconds


Expected Value:         4000000
Count Value:            3997696
Number of Threads:      4
Threshold:              1024
Time Used:              145094          microseconds
```

(2) Not exactly match the Figure 29.5.