Cicelia Siu

Assignment 10

**Question 1. How many CPU cores are being used on your virtual machine?**

4 CPU Cores

**Question 2. How many CPU cores exist on the actual hardware?**

8 CPU cores exist

**Question 3. How much real time does it take for the program to execute?**

18.048 seconds

**Question 4. How much real time does it take for the program to execute with only one thread?**

1 minute 8.363 seconds

**Question 5. What is the speedup factor of using 6 threads versus 1? Speedup = 1 Thread Time / 6 Threads Time**

Speedup = 18.048 seconds/68.363 seconds = 3.78784353

**Question 6. Assuming the entire program could be run in parallel, what is the theoretical maximum speedup you would expect from using six threads versus 1?**

Amdahl’s Law: speed up factor = 1/ [(1-p) + (p/threads)]

p = 1.00 (or 100%)

threads = 6

theoretical maximum speed up = 6x faster.

However, unlikely for the whole program to be 100% parallelized.

**Question 7. How does the number of abundant values found compare to when the instruction was not commented out?**

Commented out: 49574, 49561, 49533, 49565

Not Commented out: 49481, 49481, 49481, 49481

**Question 8. Briefly explain what might be causing the difference in results between calling obtain Lock and not.**

Calling the Lock changes the possibility of another thread changing it while reading it to 0. Commenting it out means threads can cause a race condition, thus changing the results.

**Question 9. How does the number of abundant values found compare to the original?**

Original: 49481, 49481, 49481

Changed: 49480, 49479, 49481,

**Question 10. Again, briefly explain what is causing the difference in results when the increment is not locked.**

There isn’t a big difference except for the fact that when lock is commented out, there is a possibility of causing a race condition. Without the lock, there may be threads that change a variable while another is reading it.

**Question 11. How does the program performance compare between 100 and 6 threads? Explain why it does not have the same increase in performance compared to 1 and 6 threads**

100 Threads

Real Time: 18.668s

6 Threads

Real Time: 18.048 seconds

They have around the same real time. Excessive amounts of threads will create unusable threads. The only benefit of having more unusable threads increases the likelihood of getting scheduled by the Operating System. It does not speed up the time.