Shawn Berg
bergsha@oregonstate.edu
April 8th, 2019
CS 475

Project 0
Simple OpenMP Experiment
Writeup

1. Machine this was run on.
    a. **I ran the simple openMP on, my local machine, the OSU server and a Google Cloud Platform Instance.**
    b. **My local machine is a 2009 Macbook Pro with an Intel Core 2 Duo Processor with a clock speed of 2.26GHz. It has two processors.**
    c. **The OSU server appears to be a 24 core Intel Xeon CPU with a clock speed of 2.67GHz**
    d. **The GCP is an 8 core Intel Xeon CPU with a clock speed of 2.3 GHz**
2. Performance Results (100,000 Arraysize, 100,000 Tries)
    a. **Results on Macbook Pro:**
        i. **Using 1 thread:**
            1. Peak Performance = 253.13 MegaMults/Sec
            2. Min Time = 0.3891 microseconds
        ii. **Using 4 threads:**
            1. Peak Performance = 401.37 MegaMults/Sec
            2. Min Time = 0.2449 microseconds
    b. **Results on OSU Server**
        i. **Using 1 thread:**
            1. Peak Performance = 326.75 MegaMults/Sec
            2. Min Time = 0.3060 microseconds
        ii. **Using 4 threads:**
            1. Peak Performance = 1201.11 MegaMults/Sec
            2. Min Time = 0.0833 microseconds
    c. **Results on GCP**
        i. **Using 1 thread:**
            1. Peak Performance = 359.4 MegaMults/Sec
            2. Min Time = 0.2782 microseconds
        ii. **Using 4 threads:**
            1. Peak Performance = 1414.41 MegaMults/Sec
            2. Min Time = 0.0707 microseconds
3. 4-thread-to-one-thread speedup
    a. **Speedup on Macbook Pro:**
        i. 0.3891 / 0.2449 = 1.5888
    b. **Speedup on OSU Server**
        i. 0.3060 / 0.0833 = 3.6735

       c. **Speedup on GCP**
-       i.   0.2782 / 0.0707 = 3.9349

4. If speedup < 4, why?
   - a. **Speedup on Macbook pro is less than 4 most likely because the processor only has 2 cores and is therefore unable to allocate a single thread per core. This also likely why the speedup is ~1.5 (closer to 2 than 4)**
   - b. **Speedup on the OSU server could be less than 4 for a variety of reasons. The most likely reason is that the OSU servers are a shared resource, and are generally being utilized during the experiment. This would produce suboptimal conditions for the test.**
   - c. **Speedup on the GCP is closest to 4 out of the 3 test environments. Similarly, theoretical results aren't always reproducible in practice. In this case, the processors on the instance may be being utilized for system tasks while conducting the test, as well as overhead for openMP.**

5. What was the parallel fraction?
   - a. **Parallel Fraction for Macbook Pro:**
     - i.   (4/3) * (1 - (1/1.5888)) = .494
   - b. **Parallel Fraction for OSU Server:**
     - i.   (4/3) * (1 - (1/3.6735)) = .970
   - c. **Parallel Fraction for GCP:**
     - i.   (4/3) * (1 - (1/3.6735)) = .994

Additional Commentary

The majority of this assignment was spent setting up my computing environment as well as testing differences across the different computing environments I had access to. I was especially curious to see the performance differences between my 2009 Macbook Pro with a 2 core processor compared to the computing power of the OSU server and the GCP instance. The results predictably show better performance on the OSU server and the GCP instance compared to my laptop. Between the OSU server and the GCP instance, the results were much closer, however the GCP instance provided results closer to the expected. I hypothesize this is due to the GCP instance being completely unutilized by anyone other than me, whereas the computing resources from OSU must be shared with other students. Moving forward, barring any unforeseen technical circumstances, I will be doing most of my computing in this class using GCP.