CSE 420 Computer Architecture Assignment -1 Report

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Please view Graphs.xlsx to see the graphs and Memory Mountain diagrams.

1. Is this average access time represents the latency or throughput of memory hierarchy? Why? How did you mitigate the overhead in measurement, or how did you improve the accuracy of your measurement?

Ans : The average access time represents the latency of the memory hierarchy. This is because of the very way the memory hierarchy is wherein L1 is within the cpu, thus causing less delay in data transfer, compared to main memory.

I mitigated overhead by keeping my for-loop clean i.e. I tried to remove lines with required some processing(for example, pointer increment ptr++ within the for-loop would cause unwanted overhead)

2. What makes the access time different for linear access pattern and random access pattern? Is there difference for read and write? Why?

Ans : As we can see from the generated graphs, the access time for linear access is pretty much constant with the increase in the array size. But the access time for random access keeps increasing with the increase in array size. The reason for this is, in the case of linear access, due to hardware pre-fetching the compiler predicts the all the values are in a single sequence and brings it to cache, whereas for pre-fetching is not possible in the case of random as it cannot predict what the next values are going to be. And, yes, there is difference between read and write, although minute. The minute difference is because the cache has to sometime write the data to the main memory during Write-Through case during data overlap.

3. Did you considered the influence of virtual memory and TLB in your measurement? How big is it? How to make this influence as little as possible?

Ans : Using the “perf” command I was able to test the TLB miss ratio for my code. I found that the miss ratio was very less to be even accounted for. Also, for the interaction between the different levels of cache and main memory, virtual memory is irrelevant. Virtual memory is basically a programmers view of memory and is managed by the Operating System rather than hardware. Hence, I have not considered its influence.