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Hierarchy of Memory Writeup

1. According to my run, it would take approximately .75 milliseconds to process 50 kB of data through the CPU. Most of this time is latency time because there is no cache to take care of it. The use of a cache causes the latency time to be much lower. We can definitely not get away with skipping out on the hierarchy of memory because of the unreasonable time costs. Without the cache, many of the things that we do on computers would be impossible because of the amount of time that they would take to complete. In computing, time costs are a big priority, and the negligence of the hierarchy of memory would be heavily frowned upon.

2a. I think the processing of data is faster with a cache because the cache stores a block of memory for quick access by the CPU. Using a cache only incurs latency time when there is a cache miss so in this example there were a minimal amount of misses that allowed for a much faster time. Without a cache the CPU must repeatedly access RAM instead of having the ability to check the cache which is why the latency time is longer.

2b. The cache implementation is slowed down because the memory addresses are randomized. With the contiguous and semicontiguous implementations, it was reasonable to assume that the CPU would utilize one block of memory in the cache many times before loading a new block. However, with the randomized addresses this made the cache simply useless because of the read, write, and latency costs of every block from memory. Memory addresses were all over the place with incurred an unnecessary amount of loading and reading from memory. Since there was a ridiculous amount of loading and reading of memory the time costs accrued were significantly higher than the implementation without a cache.

3. The use of a cache is justified because the time cost is much lower. Without the cache there is so much latency time used by writing and reading from RAM that makes it so unreasonable to use. A cache decreases these time costs greatly because of the absence of all of the reading and writing that hurts the implementation without the cache. The only time costs that are endured with the cache are latency costs because of the time accessing the different memory devices. So, I do think that the use of a cache is justified here because of the increase in speed compared to the other implementation.