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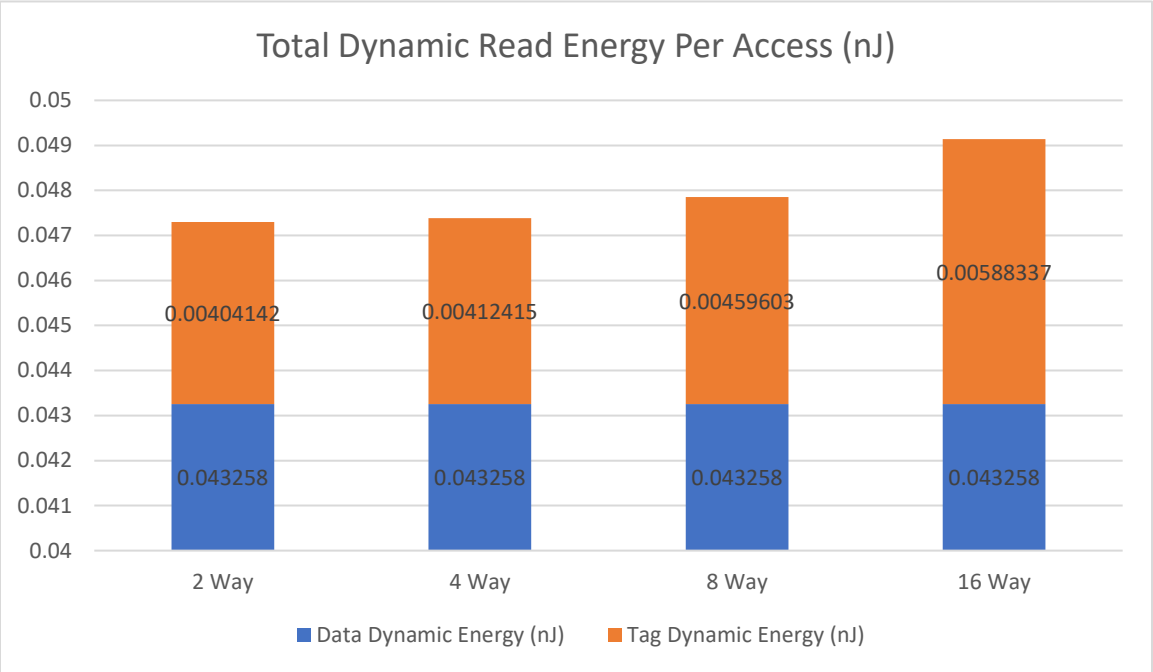
ECE 3058

Lab 6

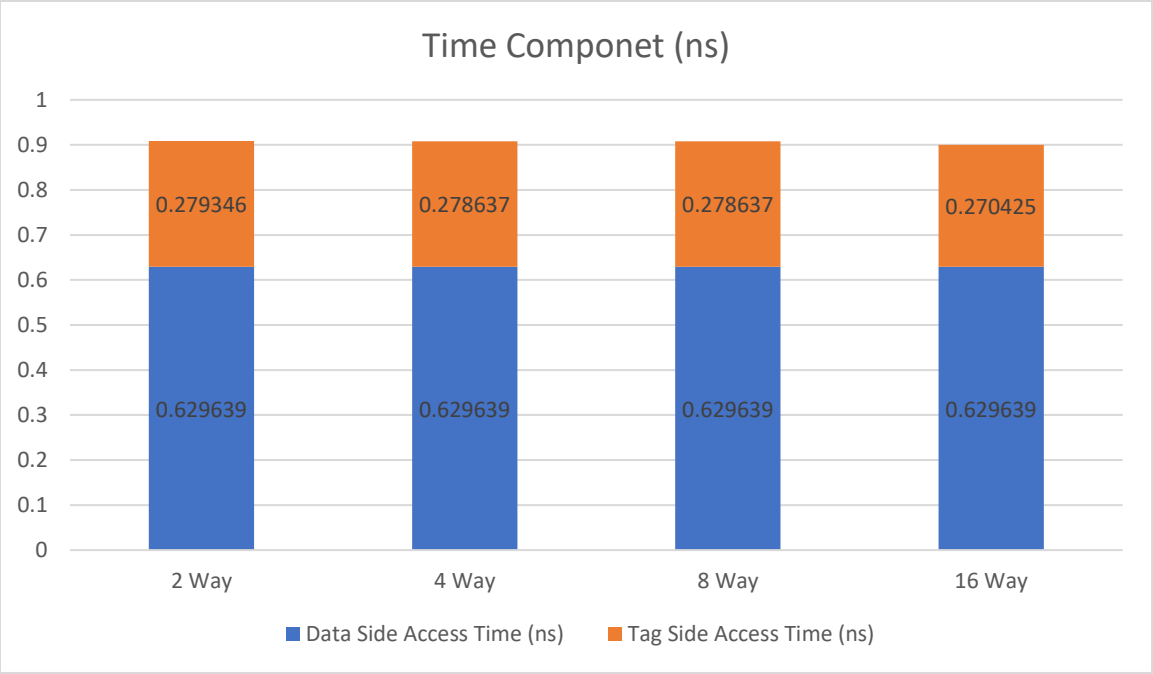
6 May, 2021

Energy Analysis:



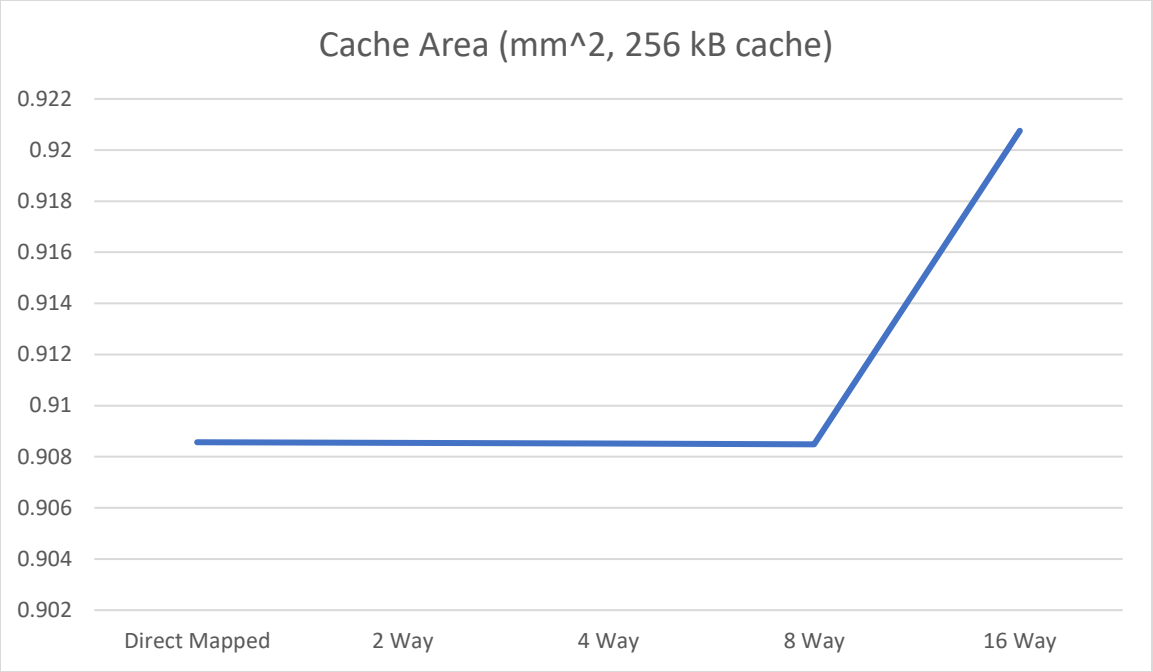
In this chart, we observe the dynamic read access energy as a function of associativity for a 256 kB cache. From the data, we can observe that the Data dynamic energy is not affected by the varying associativity, however, the tag dynamic energy increases as the associativity does. The consistency in data energy consumption can be drawn from the fact that cache and block sizes are the same for each of these varied associativity caches – the physical architecture will remain the same for the data portion of the cache. The increasing tag energy consumption can be drawn from the fact that more comparing mechanisms will be required to check the tags of each data block, thus consuming more energy.

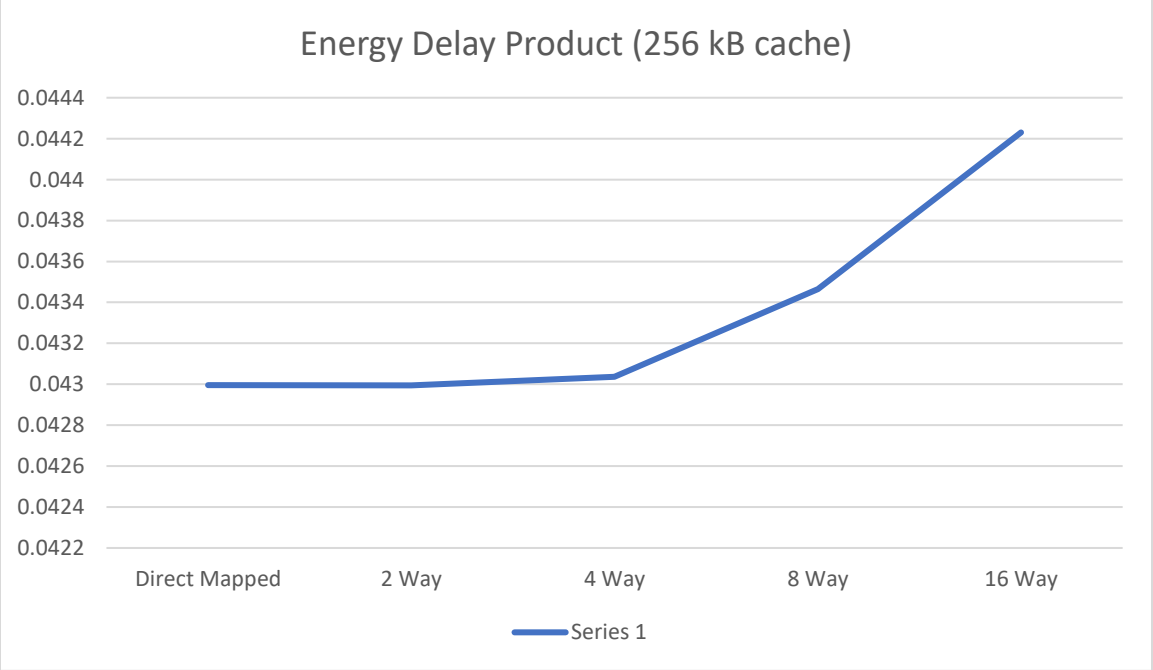
Performance Analysis



In this chart, we can see a consistency in data side access time along a varying associativity while having a decreasing tag side access time as associativity increases. This decreasing pattern occurs due to the lower number of misses (time consuming) that occur when comparing tag arrays as associativity increases. Since the overall size of the array does not change, we do not see the decrease in data side access time.

Configuration Analysis





From the above analysis of Cache area and energy delay versus associativity, we can see that that using a higher associativity better fulfills our 1mm^2 requirement, but we get a higher energy delay product. The high energy delay product for higher associativity is a major drawback. Since all of the non 16-way caches utilize a similar space, we can go with the direct mapped cache in order to maximize our requirements since it has the lowest energy delay product.