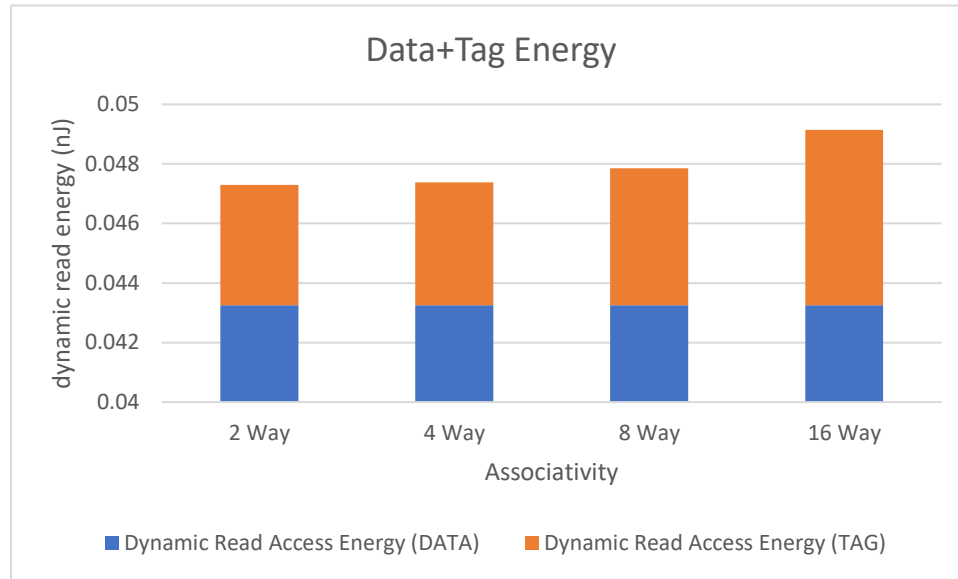


ECE 3056 Lab 5 Analysis

1. Energy Analysis:

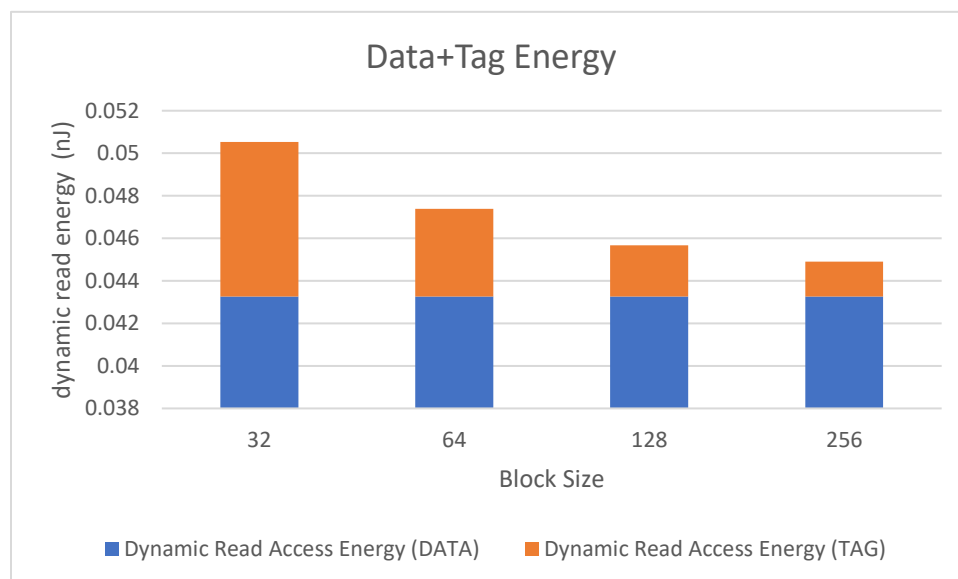
- a. Bar Chart of the dynamic read access energy as a function of associativity (2,4,8,16) with a block size of 64 bytes.

Total dynamic read access energy increases as the associativity increases. This occurs since an increase in associativity leads to the slower fetch times for tags which causes an increase in energy consumption. As associativity increases, more comparisons are required to find a tag which increases the tag energy while the data energy remains constant.



- b. Bar chart of the dynamic read access energy as a function of block size (32, 64, 128, 256) with an associativity of 4.

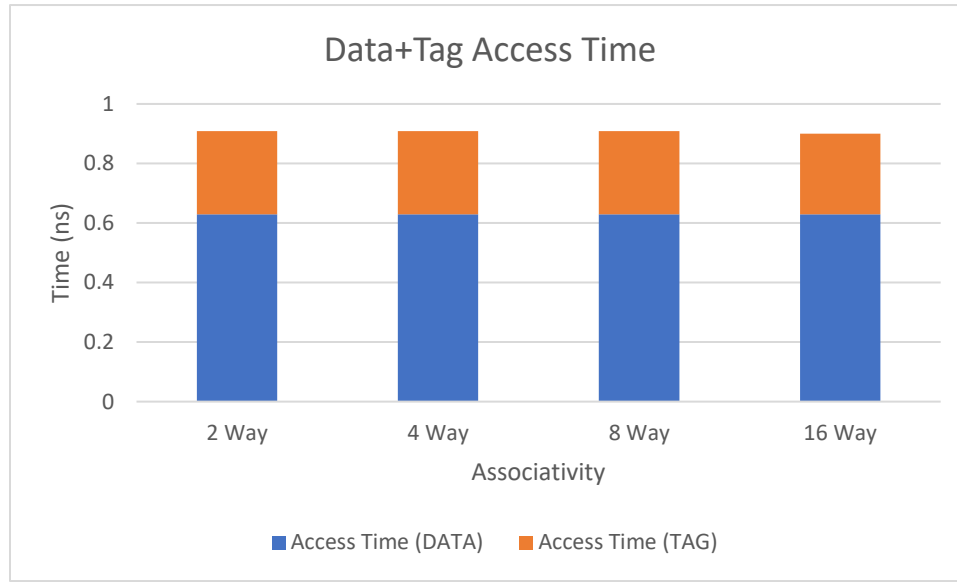
Total dynamic read access energy decreases as the block size increases. This occurs since an increase in block size leads to a decrease in the number of cache lines since the associativity remains fixed. Since the cache lines go down, you are making less comparisons to find tag and the tag energy goes down.



2. Time Analysis:

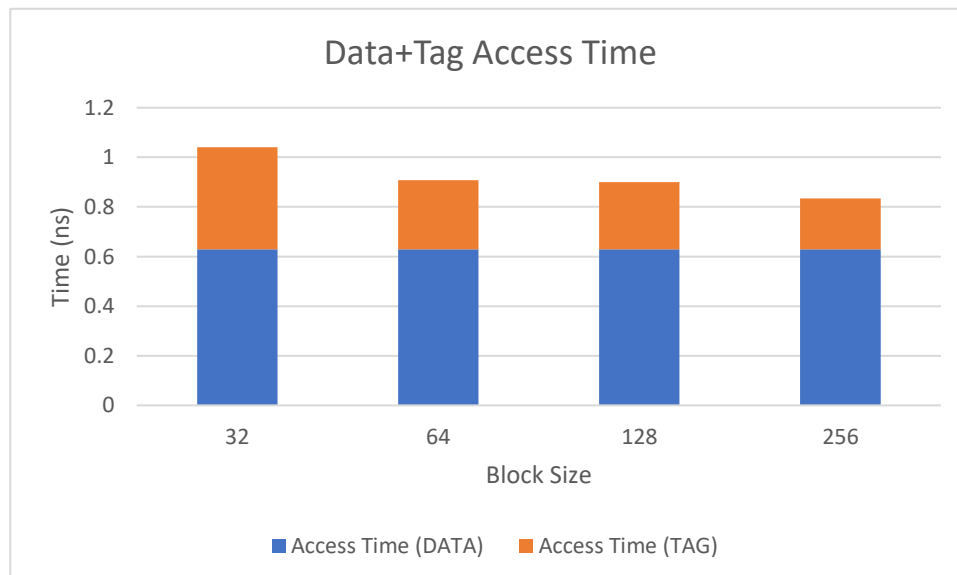
- a. Bar chart of the access time as a function of associativity (2,4,8, 16) with a 64-byte block size.

As the number of associativity increases, the number of tag comparisons increase as well. Since the comparisons are occurring in parallel, there is negligible change in time.



- b. Bar chart of the access time as a function of block size (32,64, 128, 256) for an associativity of 4.

The access time decreases as the block size decreases. This is similar to 1 b) since the size of the block increases, you are required to make less comparisons to find a tag since the associativity remains same. As a result, the time required to access the tag decreases.



3. Configuration Analysis:

- a. A set associative cache configuration that fits as closely as possible in 1mm^2 (configuration parameters must be a power of 2), and has minimum energy-delay product (product of dynamic read access energy and 3 access time).

The best configuration seems to be a 256 KB cache with 2048 B block size that is 8 way associative. This configuration best matches the 1 mm^2 which also has the minimum energy delay product. There is an inverse relationship between the energy delay product and the block size. I noticed that an increase in block size is causes a decrease in energy delay product. The 8 way associativity provides the best results when the block size is 2048 B.