

Cache Vocabulary

- Cache characterization: $C = (S, E, B, m)$
- Temporal locality: when a recently accessed memory location is repeatedly accessed in the near future
- Spacial locality when a recently accessed memory location is followed by accessing memory that is nearby
- Stride: step size (in words) between sequential access in blocks
- Cache block: a unit of memory transferred between main memory and cache levels
- In IA-32: 32 bytes/block -> assume this unless the question specifies something else
 - M: # of bytes in the Virtual Address Space
 - m: # of bits in an address
 - $M = 2^m$
 - $m = \log_2(M)$
 - B: block size = # of bytes in a block = number of bytes that a cache operation fetches from memory into the cache line at once
 - b: # of bits to identify which byte in a block
 - Word offset: identifies which word in a block
 - For a 32 bit computer: $32/4 = 8$, therefore we need 3 bits ($2^3 = 8$) to get the word in a block
 - Byte offset: identifies which byte in a word
 - 2 bits needed to get the byte in a word
 - $B = 2^b$
 - $b = \log_2(B)$
 - E: Associativity = number of lines per set
 - Direct Mapped: $E = 1$
 - Set associative cache: $E = \# \text{ of lines per set}$ (for a 2 way set associative cache, $E=2$)
 - Fully associative cache: $E = \text{total } \# \text{ of lines in cache}$
 - C: cache size = $S * E * B$
 - This formula can also be rearranged to solve for other variables
 - This formula does not include t bits since it is only measuring the data storage capacity of the cache, not the main memory size of the system