

## Cache Vocabulary

- Cache characterization:  $C = (S, E, B, m)$
- Temporal locality: when a recently accessed memory location is repeatedly accessed in the near future
- Spatial 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  $\rightarrow$  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:  $E = \#$  of lines per set (for a 2 way set associative cache,  $E=2$ )
- Fully associative cache:  $E = \text{total \# of lines in cache}$
- $C$ : 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