

Assignment 2 Cache

CSCI 6303

1. What are the differences among direct mapping, associative mapping, and set-associative mapping?
2. For a direct-mapped cache, a main memory address is viewed as consisting of three fields. List and define the three fields.
3. For an associative cache, a main memory address is viewed as consisting of two fields. List and define the two fields.
4. For a set-associative cache, a main memory address is viewed as consisting of three fields. List and define the three fields.
5. What is the distinction between spatial locality and temporal locality?
6. Display the direct-mapped cache address structure for a system that has a memory size of 32MB, a cache size of 256KB and a block size of 4B. Make note that the system is byte addressable.
7. Consider a machine with a byte addressable main memory of 2^{16} bytes and block size of 8 bytes. Assume that a direct mapped cache consisting of 32 lines is used with this machine.

A. How is a 16-bit memory address divided into tag, line number, and byte number?

B. Into what line would bytes with each of the following addresses be stored?

0001 0001 0001 1011

1100 0011 0011 0100

1101 0000 0001 1101

1010 1010 1010 1010

C. Suppose the byte with address 001 1010 0001 1010 is stored in the cache.

What are the addresses of the other bytes stored along with it?

D. How many total bytes of memory can be stored in the cache?

E. Why is the tag also stored in the cache?