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CSE 031

Lab 10 TPS:

TPS Activity #1:

1. Cache is a copy of a subset of the main memory, acts as a buffer between the CPU and the main memory. We need cache to increase the performance of the pc, hold data, and retrieve instructions much more quickly from the RAM.
2. We need 4 bits for 16B. f(blockSize) = log2(blockSize). It is not practical because every time you access the memory you need retrieve more than 1 byte.
3. We need 6 bits for the index, given there are 64 blocks. f(blocks) = log2(blocks).
4. Yes, we know the total size of the cache, which is 64 blocks x 16 bytes. Cache size = (#block x #block size).
5. The remaining bits are placed into the tag. This is important because the tag will tell us weather we have a hit or miss at the location. It also tells if the data we retrieve is the same information that the CPU is requesting for.
6. a.) The main memory is of size = 2^20 bytes = 1 MB

b.)There are: bits = log2(8B) = 3 bits

c.) 128B = (blocks of rows) x 8B. Therefore, there are 16 blocks of rows.

d.) Index = log2(16B) = 4 bits

e.) Tag = 20 – 4 – 3 = 13 bits

f.) There will be 64 blocks.

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| --- | --- | --- | --- |
| 1 valid bit | 1 dirty bit | 13 tag bits | 64 offset bits |

g.) tag + valid bit + dirty bit + offset bits = 13 + 1 + 1 + 64 = 79 bits

TPS Activity #2:

1. The issue with a direct -mapped cache is that multiple memory address can map to the same cache index, which result in many misses because you can only bring one memory location to the cache at a time. This causes Conflict misses, which occur when multiple memory address map to the same cache location.
2. We need 8 bits for the index. Index = log2(#blocks/N).
3. a.) The main memory is of size = 2^20 bytes = 1 MB

b.) There are: bits = log2(8B) = 3 bits

c.) 128B = (blocks of rows) x 8B. Therefore, there are 16 blocks of rows.

d.) There are 8 set in the cache. Set = blocks/N.

e.) Index = log2(set) = log2(8B) = 3 bits

f.) Tag = 20 – 3 – 3 = 14 bits

g.) There are 16 blocks per set.

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| --- | --- | --- | --- |
| 1 valid bit | 1 dirty bit | 14 tag bits | 64 offset bits |

|  |  |  |  |
| --- | --- | --- | --- |
| 1 valid bit | 1 dirty bit | 14 tag bits | 64 off bits |

h.) tag + valid bit + dirty bit + offset bits = 14 + 1 + 1 + 64 = 80 bits

Cache in your Computer:

1. My computer has 3 levels of cache. Yes, there is separate L1 data and instructions.
2. Both L1 caches are 64 KB. Size of L2 = 256 KB. Size of L3 = 4MB.
3. The block size is 64 bytes
4. Both L1 caches are 8-way set associativity. L2 is 4-way set associativity. L3 is 16-way set associativity.
5. Index = log2(set) = log2(64000B/(log2(64B)) =