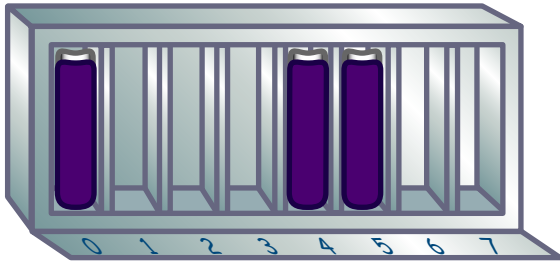




Cache Associativity

Just as bookshelves come in different shapes and sizes, caches can also take on a variety of forms and capacities. But no matter how large or small they are, caches fall into one of three categories: direct mapped, n-way set associative, and fully associative.

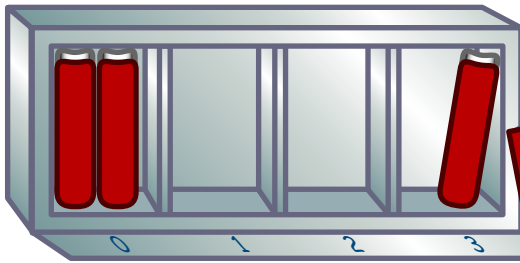
Direct Mapped



Tag	Index	Offset
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A cache block can only go in one spot in the cache. It makes a cache block very easy to find, but it's not very flexible about where to put the blocks.

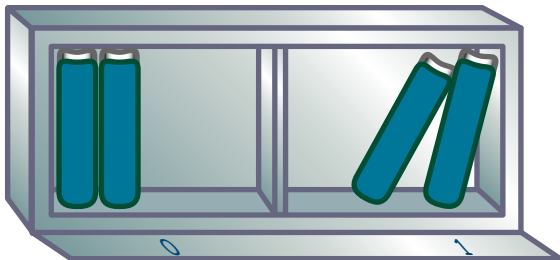
2-Way Set Associative



Tag	Index	Offset
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This cache is made up of sets that can fit two blocks each. The index is now used to find the set, and the tag helps find the block within the set.

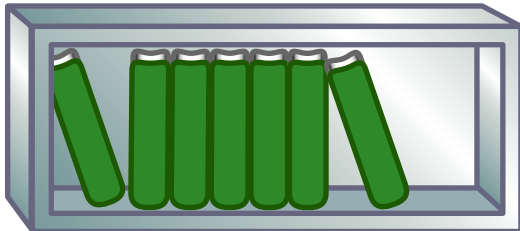
4-Way Set Associative



Tag	Index	Offset
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Each set here fits four blocks, so there are fewer sets. As such, fewer index bits are needed.

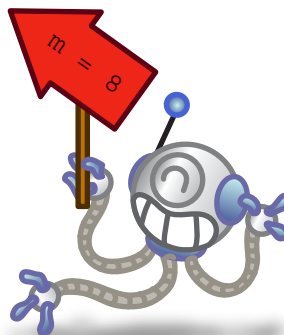
Fully Associative



Tag	Offset
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No index is needed, since a cache block can go anywhere in the cache. Every tag must be compared when finding a block in the cache, but block placement is very flexible!

They all look set associative to me...



That's because they are! The direct mapped cache is just a 1-way set associative cache, and a fully associative cache of m blocks is an m-way set associative cache!