

Tom Giagtzoglou

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CS318

1) Why is the hit ratio for the sequential read method 0.75 for all three cache mappings? Identify aspects of the cache design and patterns of read access that cause this result.

This occurs because the read is for  $\frac{1}{4}$  of the cache size. For instance if each read brings in 32 bits, 8 of those are the requested memory, so if a miss occurs, the following 3 reads will result in a miss, because the following 24 bits from the initial miss are already in cache for the next 3 reads.

2) Why does the repeat reads method have a higher hit ratio than the random reads method? This is true for all three cache mappings. Identify aspects of the patterns of read access that cause this result.

Repeated reads takes advantage of temporal locality, while sequential reads take advantage of spatial locality. Repeated reads take neither of those into account, so two subsequent reads are no more likely to be near in memory or accessed again.

3) Why does the direct mapped cache have a lower hit ratio than both of the associative caches for the repeat reads method? Identify aspects of the cache design that could cause this result.

This occurs because direct mapped means there is only one line in each set, so during repeated reads, when another line maps to the same cache then the first is removed from cache, resulting in a lower hit-ratio. In other words, iterating over the same parts of memory means that if there are two blocks that map to the same cache within the repeatedly read memory, each read will result in a cache miss.