**IMPROVING CACHE PERFORMANCE**

* Cold misses = 2 \* as every 16th iteration will miss on the load to X and to Y for the first time
* Conflict misses = 4096 + \* 4096 = 7936 as every store to X will miss because it was displaced by the previous load to Y and as every load to the remaining 15 elements of Y in a line will miss because they were displaced by the previous store to X
* Total misses = 512 + 7936 = 8448 misses
* Hence missrate = = 0.6875 = 68.75% as there are 3 \* 4096 = 12288 memory references in the loop

1. Alternative 1

* Merge arrays X and Y interleaving their elements where now 8 elements of each array fit in the same line
* Cold misses = = 512 as every 8th iteration will miss on the load to X
* Conflict misses = 0
* Total misses = 512 misses
* Hence missrate = = 0.0417 = 4.17%

1. Alternative 2

* Separate arrays X and Y in memory by a distance not multiple of 16KB
* Cold misses = 2 \* as every 16th iteration will miss on the load to X and on the load to Y
* Conflict misses = 0
* Total misses = 512
* Hence missrate = = 0.0417 = 4.17%

1. Alternative 1

* Double the cache size to 32KB
* Cold misses = 2 \* as every 16th iteration will miss on the load to X and on the load to Y
* Conflict misses = 0
* Total misses = 512
* Hence missrate = = 0.0417 = 4.17%

1. Alternative 2

* Make the cache sort associative
* Cold misses = 2 \* as every 16th iteration will miss on the load to X and on the load to Y
* Conflict misses = 0
* Total misses = 512
* Hence missrate = = 0.0417 = 4.17%

1. Alternative 3

* Increase the block size by z times
* Cold misses = as every 16 \* z’th iteration will miss on the load to X
* Conflict misses = 2 \* 4096 = 8192 as every load to Y will cause a conflict with the just-loaded line of X and every store to X will cause a conflict with the just-loaded line of Y

1. Alternative 4

* Add a next line prefetcher
* Cold misses = 2 \* the next-line prefetcher cuts the cold misses in 2
* Conflict misses = 4096 + \* 4096 = 8064
* Total misses = 256 + 8064 = 8320
* Hence missrate = = 0.667 = 6.67%

1. Alternative 5

* Add a victim cache
* Cold misses = = 256 as every 16th iteration will miss on the load to X and the other 15 iterations reuse the line left over from the store to X
* Conflict misses = 4096 as every load to Y will cause a conflict with the just loaded line of X and the stores to X now hit in the victim cache
* Total misses = 256 + 4096 = 4352
* Hence missrate = = 0.3542 = 35.42%