**CDA3101 Cache Simulation**

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**Introduction:**

For my cache simulation a user can select a file to run a simulation which my program will be able to simulate the “hits” and “misses” from memory trace files. The user can select what parameters they want to use to simulate a memory cache with many different configurations:

Full associative with FIFO and LRU replacement types, direct mapped, and set associativity with LRU and FIFO replacement types along with 2-way, 4-way, etc… associativity.

**Description of tests:**

The parameters for each tests were the following:

Full Associativity

|  |  |  |
| --- | --- | --- |
| Cache Size | Block Size | Replacement Type |
| 1024 | 64 | FIFO |
| 2048 | 64 | FIFO |
| 4096 | 64 | FIFO |
| 1024 | 64 | LRU |
| 2048 | 64 | LRU |
| 4096 | 64 | LRU |

Direct Mapped

|  |  |
| --- | --- |
| Cache Size | Replacement Type |
| 1024 | N/A |
| 2048 | N/A |
| 4096 | N/A |

Set associative

|  |  |  |  |
| --- | --- | --- | --- |
| Cache Size | Block Size | Replacement Type | Associativity |
| 1024 | 64 | FIFO | 2-Way |
| 2048 | 64 | FIFO | 2-Way |
| 4096 | 64 | FIFO | 2-Way |
| 1024 | 64 | LRU | 2-Way |
| 2048 | 64 | LRU | 2-Way |
| 4096 | 64 | LRU | 2-Way |

Firstly I chose to make these parameters constant between all cache types to create a trend directly with a block size of 64. My reasoning for this was I wanted to see a direct change between the cache size and the replacement type without a change In the block size.

**Results:**

Fully Associative

|  |  |  |  |
| --- | --- | --- | --- |
| Cache Size | Block Size | Replacement Type | Ratio |
| 1024 | 64 | FIFO | 0.91 |
| 2048 | 64 | FIFO | 0.93 |
| 4096 | 64 | FIFO | 0.97 |
| 1024 | 64 | LRU | 0.94 |
| 2048 | 64 | LRU | 0.96 |
| 4096 | 64 | LRU | 0.98 |

Direct Mapped

|  |  |  |
| --- | --- | --- |
| Cache Size | Replacement Type | Ratio |
| 1024 | N/A | 0.84 |
| 2048 | N/A | 0.88 |
| 4096 | N/A | 0.93 |

Set associative

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cache Size | Block Size | Replacement Type | Associativity | | Ratio |
| 1024 | 64 | FIFO | 2-Way | | 0.87 |
| 2048 | 64 | FIFO | 2-Way | | 0.91 |
| 4096 | 64 | FIFO | 2-Way | | 0.95 |
| 1024 | 64 | LRU | 2-Way | | 0.90 |
| 2048 | 64 | LRU | 2-Way | | 0.93 |
| 4096 | 64 | LRU | 2-Way | 0.95 | |

**Conclusions:**

**Overall full associative performed the best, with LRU replacement having a better hit ratio then FIFO. With respect to cache size, the higher the cache size the higher the hit ratio as well. In my cache analysis, LRU replacement type received higher hit ratios than the FIFO replacement type.**