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 Page Replacement Algorithms Simulator Report

Our simulation would generate 150 random processes, with different page size and different expected running time. We have a scheduler to manage the process running, and a page table to manage the physical.

Each memory access request would go through the page table object, the inner structure and metadata for the page table entry are transparent outside the page table class. Upon each access request, the page table class would check for free page count and the victim page to get swapped out according to the algorithm. Then it would return the physical frame number to the requester, the scheduler. Any positive number represents a successful access, and negative value -1 represents the page access denied, which is caused by the insufficient free page count for a new process.

The scheduler would store a constant process queue, representing our simulation work load. During each run, even if the algorithm is the same, the scheduler would clean up its waiting queue, running queue, and complete queue, and reset the arriving queue to its previous status. This would make sure each run would have the identical work load. The scheduler would last 100s for each run. It would print out 100 reference events during the 200th to 300th memory reference (the first 100 references are almost the same, getting a new free page), and generate the hit/miss ration.

LRU algorithm would swap the page, which has the lowest “last reference time”. MFU and LFU are almost identical with each other. The only different is MFU would replace the page with highest reference frequency, while the LFU would replace the page with lowest reference frequency. FIFO would replace the page with lowest “first reference time”. Random Pick would replace a random frame number.

Our simulation suggests that the LRU has the lowest hit/miss ratio, which is the best among these 5. The FIFO has the worst performance relating to hit/miss ratio.

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| Policy | hit/miss ratio |
| LRU | 1.3461 |
| LFU | 0.5691 |
| MFU | 0.6102 |
| FIFO | 0.5396 |
| Random | 0.9747 |