Project Report

Test Setup:

A comparative analysis was conducted to evaluate the performance of two distinct buffer replacement algorithms: First-In-First-Out (FIFO) and Clock Sweep. The assessment utilized two specific test scenarios, referred to as buffertest1 and buffertest2, to measure the execution time for each method. The primary goal of this experiment was to gauge the efficiency of both policies and identify which one is better suited for the given workload.

Test Case	FIFO (10K) (in seconds)	Clock Sweep (10K) (in seconds)	FIFO (100K) (in seconds)	Clock Sweep (100K) (in seconds)
buffertest1	**0.234244**	**0.236283**	**0.286140**	**0.283149**
buffertest2	**0.346604**	**0.291798**	**0.304076**	**0.299520**

Conclusion:

buffertest1 Results:

Difference: FIFO is approximately 2 milliseconds faster than Clock Sweep for the 10K cache size, but approximately 3 milliseconds slower for the 100K cache size in this test case.

buffertest2 Results:

Difference: FIFO is approximately 5.5 milliseconds slower than Clock Sweep for the 10K cache size and approximately 4.5 milliseconds slower for the 100K cache size in this test case.

Explanation of Results

Clock Sweep Efficiency:

The Clock Sweep algorithm demonstrates better performance in most scenarios, particularly in buffertest2. This is because Clock Sweep uses a circular buffer and a simple mechanism to track buffer usage, which minimizes overhead and results in faster execution times. Its efficiency becomes more apparent as the workload increases, as seen in buffertest2.

FIFO Performance:

FIFO performs slightly worse overall due to its higher overhead. Maintaining a strict order of buffer eviction (based on arrival time) requires additional bookkeeping, which can slow down execution. This effect is more noticeable in larger workloads, such as those in buffertest2.

Test Case Comparison:

The performance difference between FIFO and Clock Sweep is relatively small in buffertest1, especially for the 10K cache size. However, as the workload increases (buffertest2), Clock Sweep consistently outperforms FIFO due to its simpler design and lower computational overhead. This suggests that Clock Sweep scales better with heavier workloads.

Conclusion

Clock Sweep generally outperforms FIFO across both test cases and cache sizes, particularly in buffertest2. Its lightweight design and efficient buffer replacement strategy make it better suited for scenarios with larger workloads or higher demands on system performance. While FIFO lags slightly behind due to its more complex management requirements, the difference in performance is relatively minor and may not significantly impact all applications.