Computer Architecture Project Proposal

Project Name: Implementing and Comparing Write-Back vs. Write-Through Cache Policies

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Team Name: Cache Money

Cache memory is an important part of modern CPUs to improve memory access time. Throughout modern computing history, computer architects have formulated several methods of optimizing the average memory access time, complexity, and hardware footprint of caches. We plan on investigating the effect of differing cache write policies on cache and memory hierarchy performance. Specifically, we plan on implementing a non-blocking write-through cache (with a write-buffer), a blocking write-through cache, and a write-back cache. Each of these variations will be compared using multiple different metrics. Specifically, the attributes we plan on measuring will be the AMAT (average memory access time), the complexity or simplicity of implementation for each policy, and the size of hardware footprint necessary to best use each of the write policies.

We intend to investigate these write policies via a utilization of the SimpleScalar hardware modeling and software analysis tool. There will be three experimental variables tested in this investigation when it comes to caches: the write-back policy, the size, and the replacement policy. The goal of changing all these variables is to characterize the best cache profile for a non-blocking write-through cache, blocking write-through cache, and a write-back cache, as well as to identify the most impactful variables that will change with different cache write policies.