CSCE 614 Computer Architecture
Term Project Proposal

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Introduction

For this project , we propose to implementation a high performance method for cache replacement that works by predicting re-reference interval for each block in the cache. This is a new method presented as an improvement over traditional Least Recently Used (LRU) method in the paper listed in reference. We would try to replicate this new method and compare its results to the traditional LRU method. We hope to show up to 4-10% performance improvement as mentioned in the paper as measured over various benchmarks.

The paper talks about two variations of the method - Static RRIP and Dynamic RRIP. Static method is scan-resistant while dynamic method is both scan-resistant and thrash-resistant. We plan to implement at least one of these method and if time permits we will implement the other. The paper also compares scan-resistant Least frequently Used (LFU) method with RRIP and show significant improvement. We are not going to make this comparison.

Implementation:

There are many ways to implement this but it looks like that the paper doesn't present a form of software for its tests and studies. but It does present the architecture for development the way that we can implement this and provide a software form of architecture development to copy the multiple architectures presented in the paper. The major implementation is a cache system that uses Re Reference Integrated Prediction (RRIP) for the level based cache system. We are to use their implementation to produce one that has a similar results.

RRIP Implementation:

- Uses LRU replacement and it's approximations now if there are distant and immediate re-reference intervals for blocks it doesn't work well.
- Use a chain-based LRU replacement for High associative caches and then NRU(replacement policy)

Result:

We plan on using what they used which was CMP$im and a Pin[21] based trace driven x86 simulator for performance studies. we plan on graphing the output code and with the output we will use the cache

performance, system performance, and replacement policy performance which was similar to the paper to produce the same results.

References:

A. Jaleel, K. Theobald, S. C. S. Jr, and J. Emer, "High performance cache replacement using re-reference interval prediction (RRIP)," in Proc. of the 37th annual Intl. Symp. on Computer Architecture, 2010