1 Summary

Recycling Data Slack in Out-of-Order Cores (2019):
The authors propose a mechanism called ReDSOC that dynamically identifies data slack and recycles it efficiently, improving performance even in OOO cores. Microarchitecture designes can sacrifice energy efficiency and performance in favor of reliablility through more complex ISA semantics and the conservative time margins for clock cycles that accommodate them, which itself leads to clock cycle slack when nonusefule work is done; data slack, in particular, is from the inactive critical paths, is data dependent, and varies widely, potentially wasting half a clock cycle. The authors detail how the different aspects of ReDSOC are implemented in general OOO cores and show that ReDSOC achieves application speedups (about 5%-25%) and can even outperform competing mechanisms.

2 Strengths

- The section 2 intro and Figure 1 both support the authors' data slack classifications with qualifying quantitative observations, which helps justify the descriptive categories of data slack according to slack sources. The three categories of data slack themselves were also explained thoroughly.
- The authors tested their ReDSOC implementation thoroughly across some variety of processors and applications, rather than with a narrow breadth of testing that was seen in the last few papers, and even included some comparisons of ReDSOC against competing proposals to address data slack.

3 Weaknesses

- Section 2's topic on slack estimation would improve with the inclusion of a figure to visualize how their data-width predictor works or fits into the overall mechanism.
- Section 4 has a few instances of in-depth example walk-throughs of the slack-aware scheduling mechanism that make this discussion section more long-winded than necessary. The higher-level explanations, key takeaways, and even specific problems they are trying to address can get lost. Section 4 could be split into 2+ sections or the walk-throughs could be done in an appendix.

4 Rating: 4

5 Comments

This paper is