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Report on "Storage-Free Memory Dependency Prediction"

The purpose of this paper was to attempt to develop a unified branch and memory dependency predictor. The authors built a sophisticated predictor built on top of TAGE, which is a global history predictor featuring several partially tagged tables that are backed by a direct-mapped bimodal predictor. The way TAGE works is to use a geometric series of global histories and capture correlation between very close and distant branches. The authors built the predictor so that all tables may be accessed in parallel, allowing the predictor to use the table with the longest history. To test the performance of their predictor the authors evaluated their predictor through cycle-level simulation on the gem5 simulator using the ARMv8 ISA. The authors found that in some tests there was a noticeable improvement, hinting that explicit path information is beneficial to memory dependency prediction. Overall, the authors find that their predictor performs at the same level as Store Sets (another memory dependency predictor).

The final conclusion of the authors was that the TAGE branch predictor could be adapted to perform memory dependency prediction at almost zero storage overhead, achieving performance on par with Store Sets.

Reference

[1] Perais, Arthur, and Andre Seznec. "Storage-Free Memory Dependency Prediction." IEEE Computer Architecture Letters, vol. 16, no. 2, 2017, pp. 149–152., doi:10.1109/lca.2016.2628379.