Why Software Solutions aren’t Sufficient

Motivation

Main Memory sizes are increasing, but moving data from main memory into hardware is challenging. Fabrication advances have made this possible, and we could potentially surpass the memory wall.

Why Software Solutions aren’t Sufficient

Fundamentally, all algorithmic and software solutions to the memory wall still require moving data upstream in the memory hierarchy.

Near-Data Processing

Near-data processing (NDP) moves computation down to the memory hierarchy, reducing memory bus utilization, freeing the CPU to do other useful work, and creating new opportunities for DB architectures.

JAFAR Design

JAFAR is a simple yet effective NDP selection system:
- Lives on the DRAM module
- Two ALUs for comparisons
- Write output to a page size buffer
- Opcodes programmed by the CPU

Experimental Results

We achieve up to a 9x speedup depending on data size. Speedup is linearly correlated with query selectivity.

Future Work

Develop similar hardware to handle more DB operators. Investigate how to break the memory wall without breaking the memory abstraction.

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