TECHNISCHE UNIVERSITÄT DRESDEN

Fakultät Informatik Institut für Systemarchitektur, Professur für Betriebssysteme

Aufgabenstellung für die Anfertigung einer Bachelor-Arbeit

Studiengang:	Bachelor
Studienrichtung:	Informatik (2009)
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Matrikelnummer:	4929314
Titel:	Data Movement in Heterogeneous Memories with Intel Data Streaming Accelerator

Developments in main memory technologies like Non-Volatile RAM (NVRAM), High Bandwidth Memory (HBM), NUMA, or Remote Memory, lead to heterogeneous memory systems that, instead of providing one monolithic main memory, deploy multiple memory devices with different non-functional memory properties. To reach optimal performance on such systems, it becomes increasingly important to move data, ahead of time, to the memory device with non-functional properties tailored for the intended workload, making data movement operations increasingly important for data intensive applications. Unfortunately, while copying, the CPU is mostly busy with waiting for the main memory, and cannot work on other computations. To tackle this problem Intel implements the Intel Data Streaming Accelerator (Intel DSA), an engine to explicitly offload data movement operations from the CPU, in their newly released Intel Xeon CPU Max processors.

The goal of this bachelor thesis is to analyze and characterize the architecture of the Intel DSA and the vendor-provided APIs. The student should benchmark the performance of Intel DSA and compare it to the CPU's performance, concentrating on data transfers between DDR5-DRAM and HBM and between different NUMA nodes. Additionally, the student should find out in what way and to what extent parallel processes copying data interfere with each other. Analyzing the performance information, the thesis should outline a gainful utilization of the Intel DSA and demonstrate its potential by extending the Query-driven Prefetching concept, which aims to speed up database query execution in heterogeneous memory systems.

Gutachter:	Prof. Dr.-Ing. Dirk Habich
Betreuer:	André Berthold, M.Sc.
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