Micro-architectural Analysis of OLAP Systems on Persistent Memory

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ABSTRACT

Databases on byte-addressable persistent memory (PM) has been a hot research topic in both academia and industry. However, there lacks a systematic study about hardware utilization of modern Online Analytical Processing (OLAP) systems including the commercial and open-source industry. In this paper, we present microarchitectural analysis of six OLAP systems running directly on PM in comparison with on DRAM. From the experimental results, the six OLAP systems perform very differently with respect to the readwrite asymmetry and bandwidth interference. None of them can dominate others in all the tested workloads. Despite that, we make some common observations: 1) data cache stalls are much more significant in OLAP systems running on PM, contributing up to 90% of CPU cycles in TPC-H workloads; 2) although OLAP workloads are mostly read-only, writes of the intermediate results contribute to the slowdown of up to 1.4x due to read-write asymmetry of PM; 3) OLAP systems on PM suffer from bandwidth saturation and interference among concurrent query executions.

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