B+-Tree Indexes in In-Memory HTAP Engine

Keywords: DBMS, OLTP, HTAP, OLAP, Concurrent Programming, Data Structures

Problem: B+-tree have been de-facto standard for indexes in database management systems. B+-tree are highly optimized for memory hierarchies of machines, involving caches, main-memory and disks for persistent storage. However, they have been a focus of study mostly in context of either online-transaction processing (OLTP) or online-analytical processing (OLAP) but not in the case of hybrid analytical and transactional processing (HTAP). Furthermore, with high-performance in-memory engines having runtime code-generation for OLAP and TwinColumns for OLTP snapshot, B+-tree needs to be revisited in context of HTAP and optimized for hybrid workloads.

Project: In this project, student will implement and analyze B+-tree indexes in an in-memory HTAP engine. He/she will familiarize himself/herself with indexes, concurrency control and transactional protocols related to indexes. Furthermore, the student will analyze the difference in bottlenecks in HTAP engine from standalone OLTP or OLAP engines.

Plan:
1. Implement B+-tree index.
2. Analyze performance gains and bottlenecks compared to hash-indexes.
3. Analyze performance implications in an HTAP setting.

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Duration: 6 months