Log-structured Merge Tree (LSM)
Big Data Indexing

- We covered the two-layered global/local indexing scheme
- Ideal for static data
- Question: How to update these indexes?
- HDFS limitation: Random updates are not allowed
- Naïve approach: Rebuild the index after each (batch) insert
- A better approach: Log-structured Merge Tree
DBMS Indexing

New record → Log → Index
Index Update

New record

Randomly updated disk page(s)

Append a disk page
LSM Tree

- Key idea: Use the log as the index
- Regularly: Merge the logs to consolidate the index (i.e., remove redundant entries)

LSM in Big Data

- First major application: BigTable (Google)

First report from Google mentioning LSM

Citations

- BigTable paper
LSM in Big Data

- Buffer data in memory (memory component)
- Flush records to disk into an LSM as a disk component (sequential write)
- Disk components are sorted by key
- Compact (merge) disk components in the background (sequential read/write)