Implementing an Efficient Shuffle Operator for Streaming Database Systems

Bachelor Thesis

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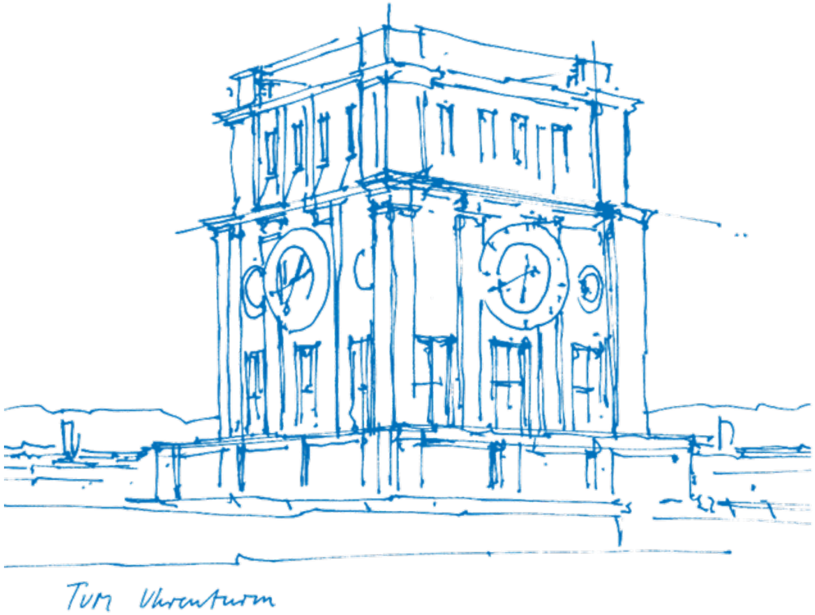

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Technical University of Munich

Problem Setting

Key Contribution: Efficient, multithreaded shuffle operator implementations.

Shuffle-Simulation Process:

1. **Tuple Generation:** Randomly generated tuples with 32-bit keys and optional data fields.
2. **Data Shuffle:** Tuples stored in partition buckets using slotted pages.
3. **Storing on Slotted Pages:** Thread-local vs. shared (locking/lock-free) write-out strategies.

Implementations

Evaluation

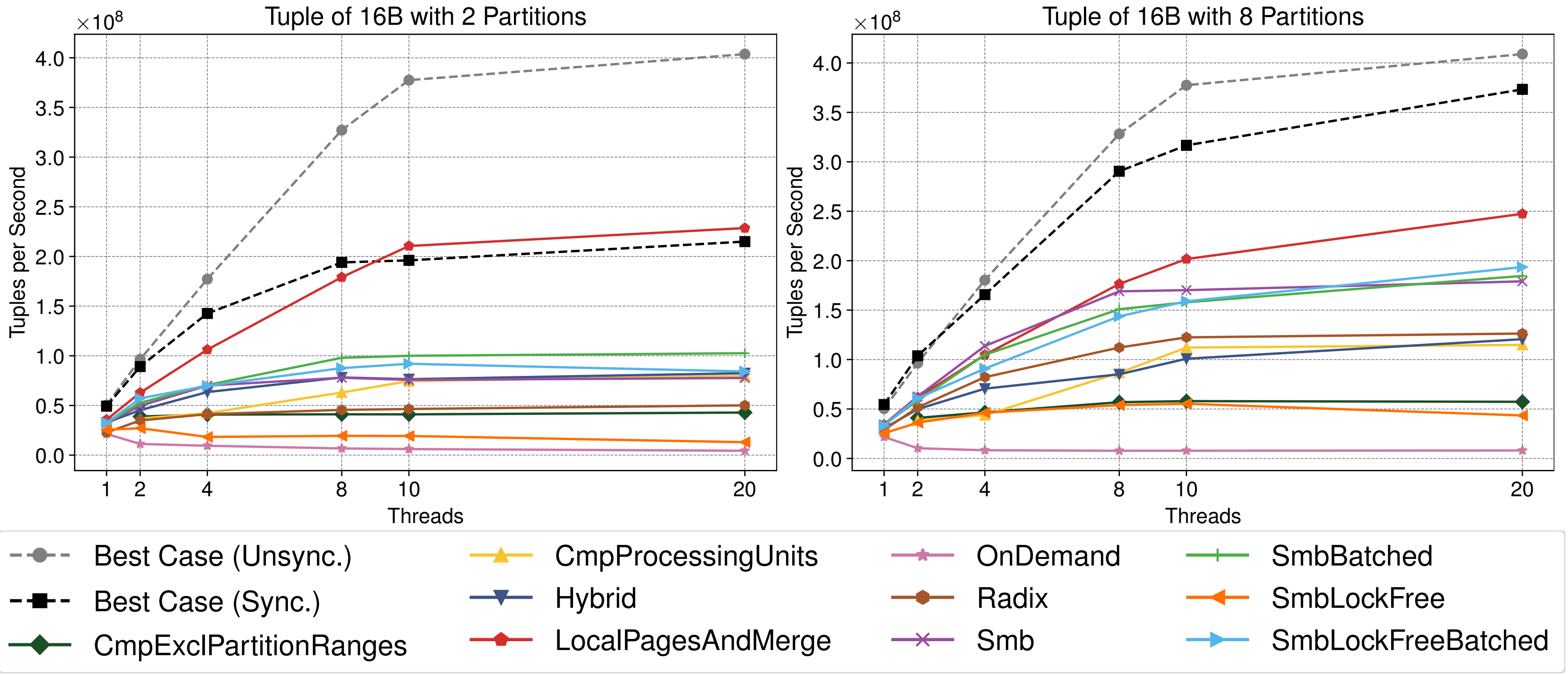

Figure: Benchmark Plots for Tuple of 16B with 2 and 8 Partitions

Evaluation

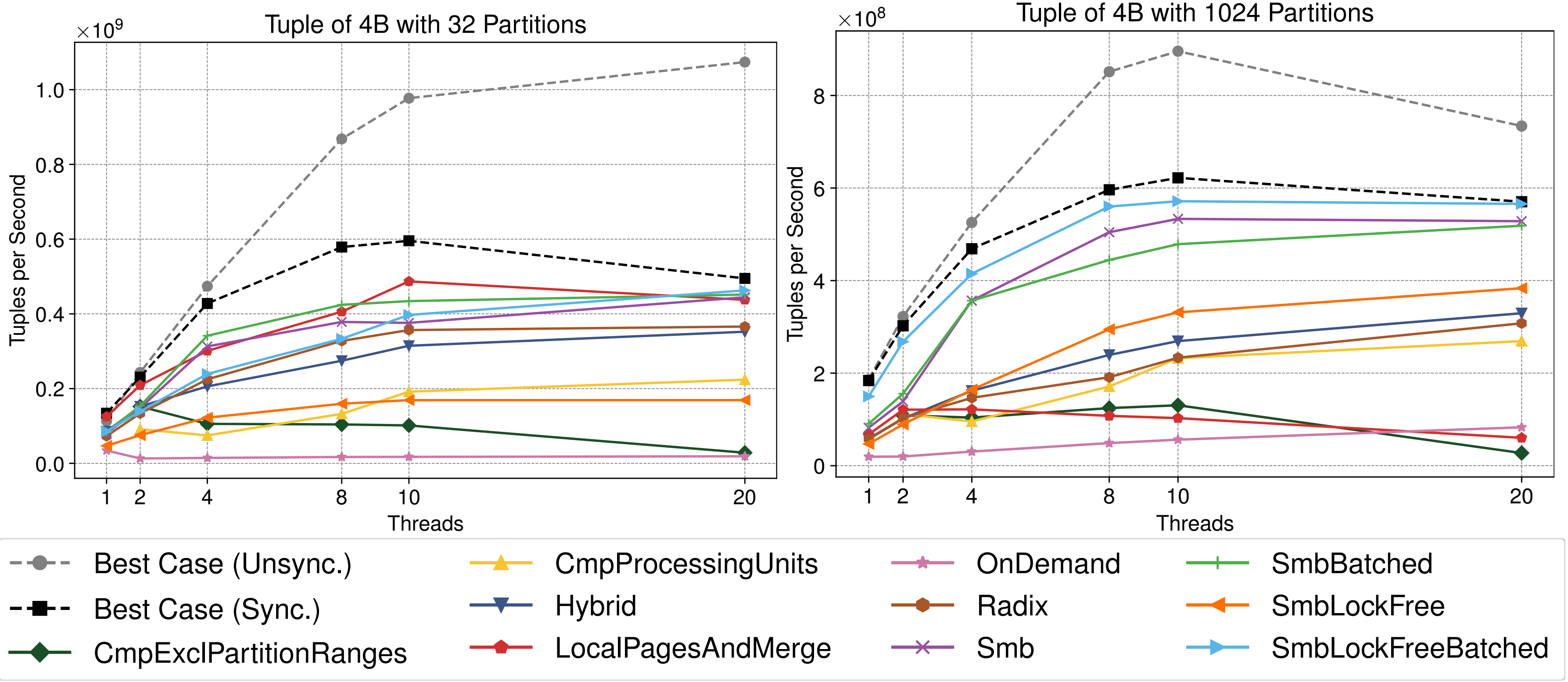

Figure: Benchmark Plots for Tuple of 4B with 32 and 1024 Partitions

Evaluation

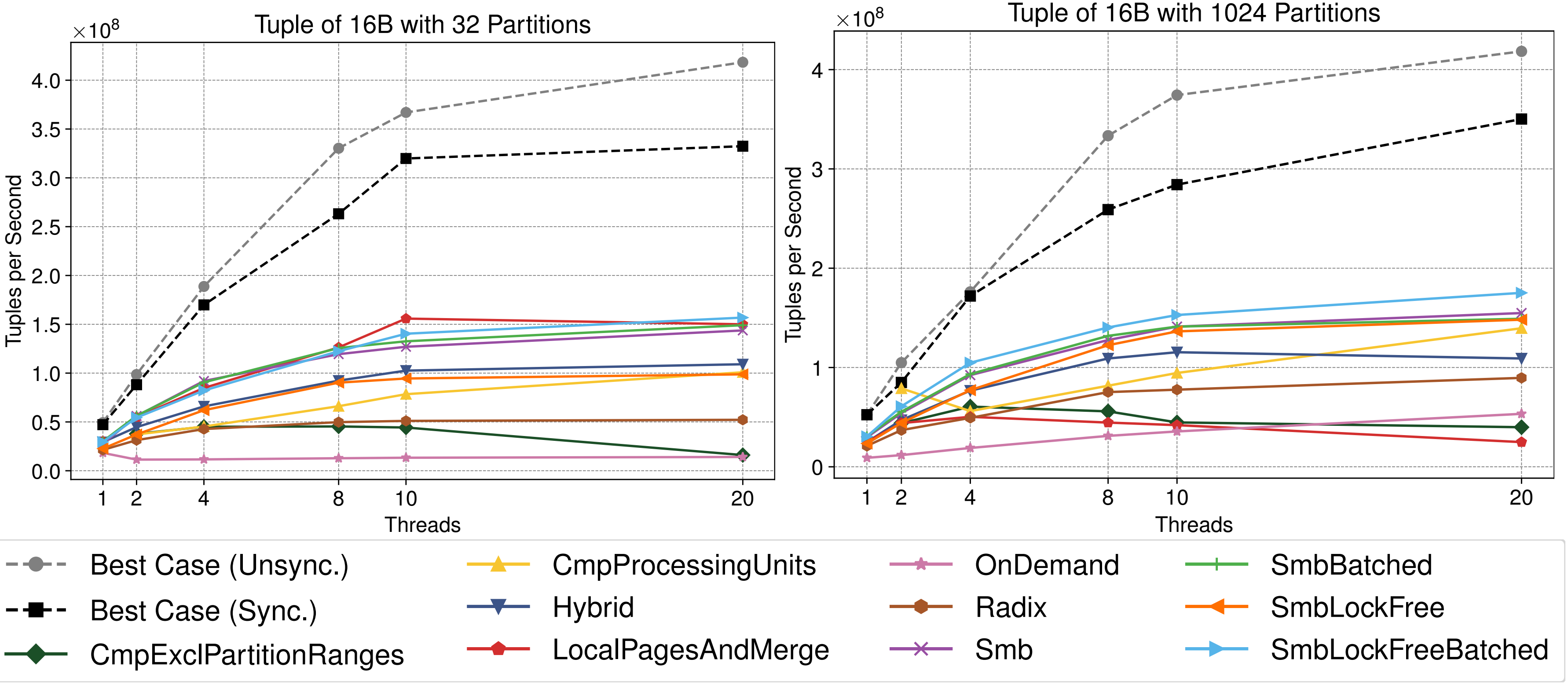

Figure: Benchmark Plots for Tuple of 16B with 32 and 1024 Partitions

Evaluation

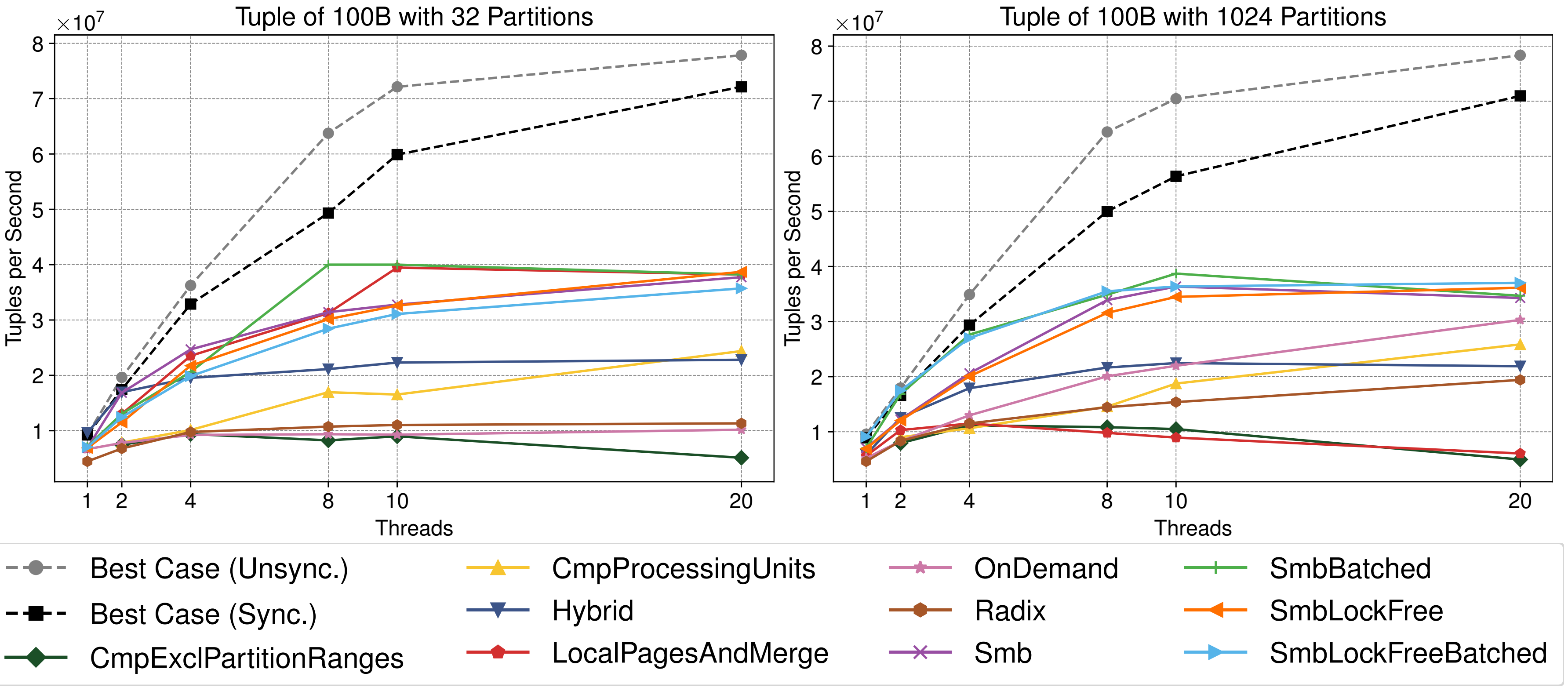

Figure: Benchmark Plots for Tuple of 100B with 32 and 1024 Partitions

Peak Heap Memory

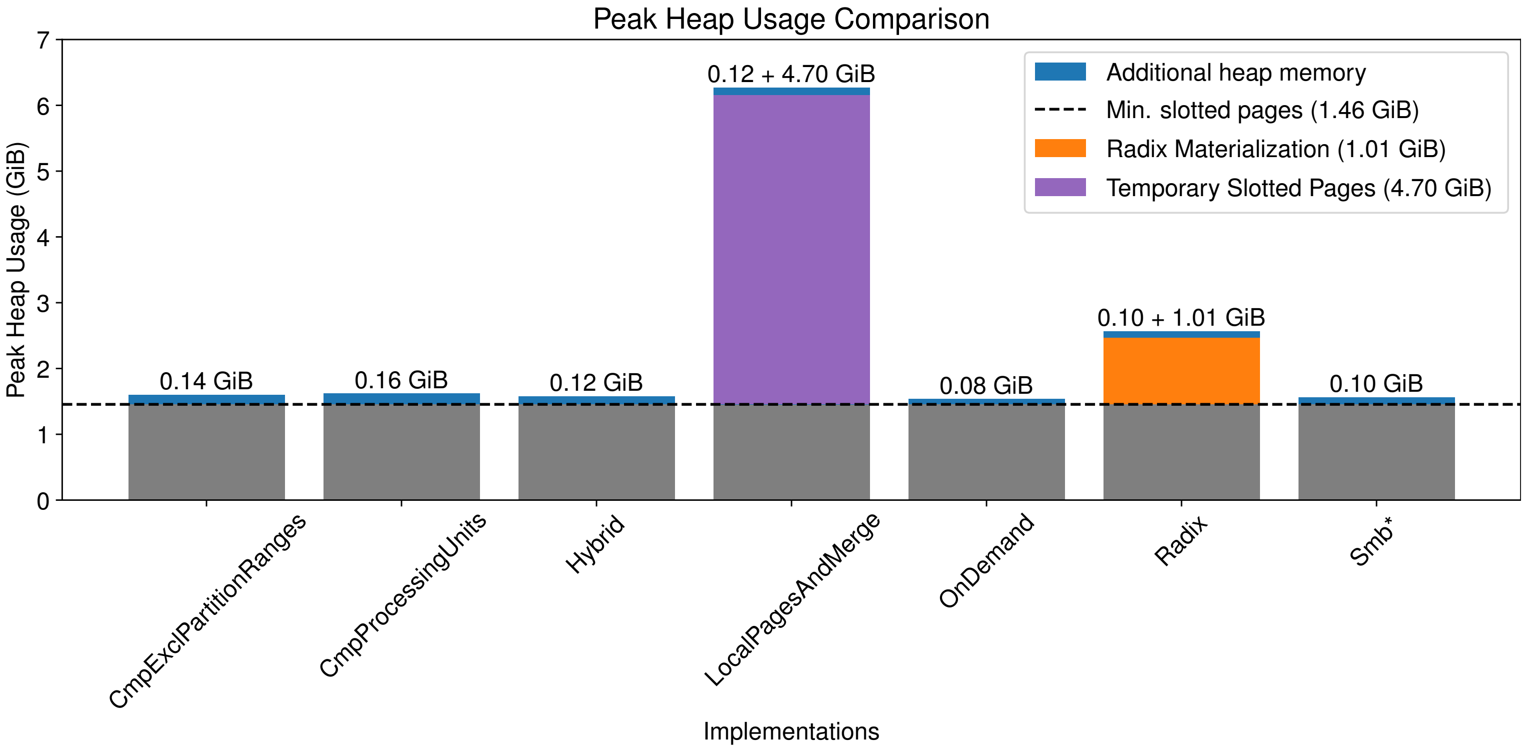

Figure: Peak Heap Usage when using 32 Partitions, 40 Threads and 67.2 Mio. 16B Tuples (1 GiB)

Comparison with Apache Flink

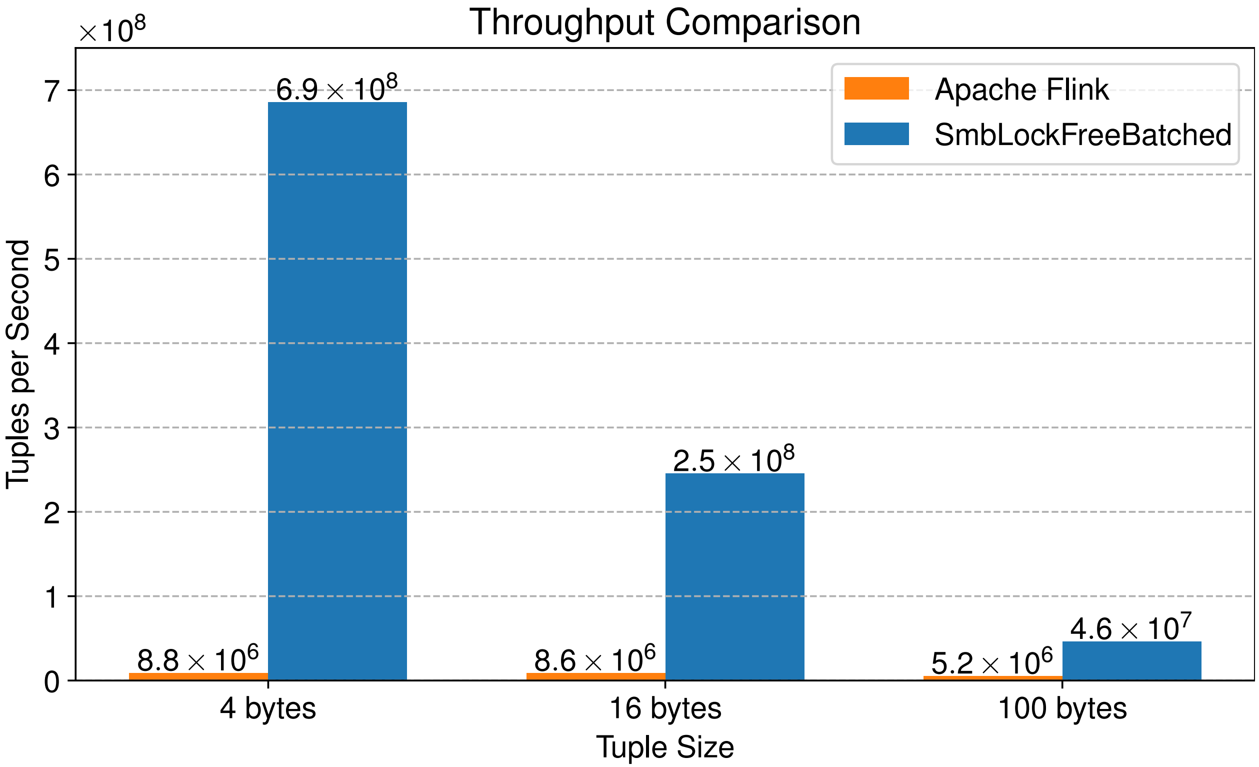

Figure: Tuples per Second Comparision when using 1024 Partitions

Future Work