INF FAKULTÄT FÜR INFORMATIK

Build Your Own OctopusDB: Blinktopus Edition

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Scientific Project: Databases for Multi-Dimensional Data, Genomics and Modern Hardware

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Motivation

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   ⇒ Need for *one size fits all system* (e.g. HTAP)
2. Support OLAP queries for analysis over real-time data (i.e., freshness).
   ⇒ Explore the techniques related to more interactive queries (e.g. *Approximate Query Processing*)

Background

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   - uses logs as a primary storage;
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2. **BlinkDB**
   - successfully integrates AQP techniques into its architecture.

Conceptual Idea and Implementation

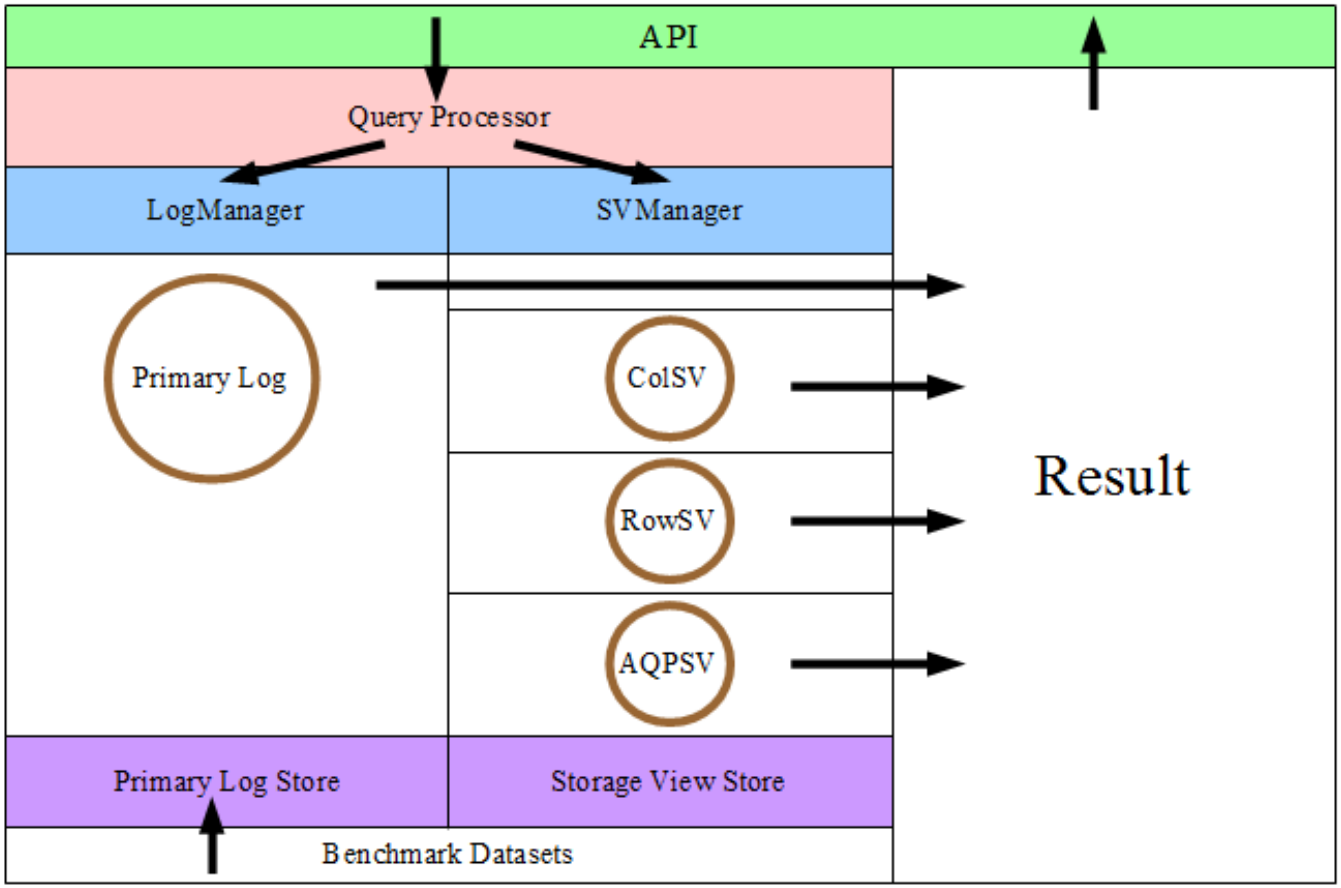

Figure 1: OctopusDB Architecture.

Conceptual Idea and Implementation

Which synopses to pick?

[1] https://datasketches.github.io

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- Equi-depth histograms
  - suitable for range queries;
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Conceptual Idea and Implementation

Which synopses to pick?

- Equi-depth histograms
  - suitable for range queries;
  - simple to implement and interpretate.
- Sketches
  - DISTINCT COUNT queries;
  - *HyperLogLog*;
  - *DataSketches* library by *Yahoo!* [1]

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Evaluation Setup

Evaluation Setup

Machine

- CentOS Linux 7.1.1503
- Java SDK 8u131-b11-linux-x64
- 2 Intel(r) Xeon (TM) E5-2630 v3s CPU @ 3.2GHz processors (8 cores each) and 1024 GiB memory

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Benchmark Datasets

- TPC-H datasets (Orders and Lineitems)

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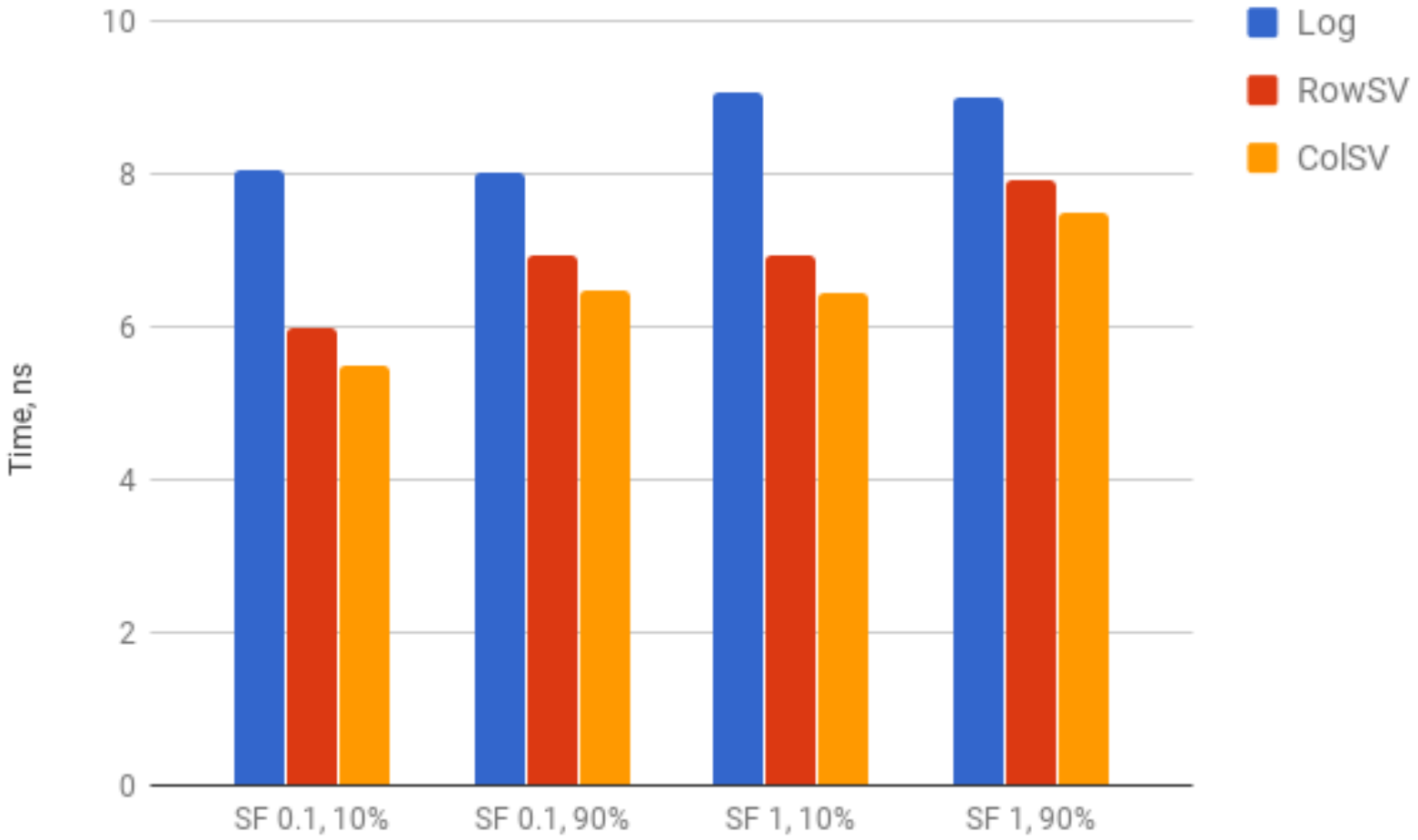
Benchmark Datasets

- TPC-H datasets (Orders and Lineitems)

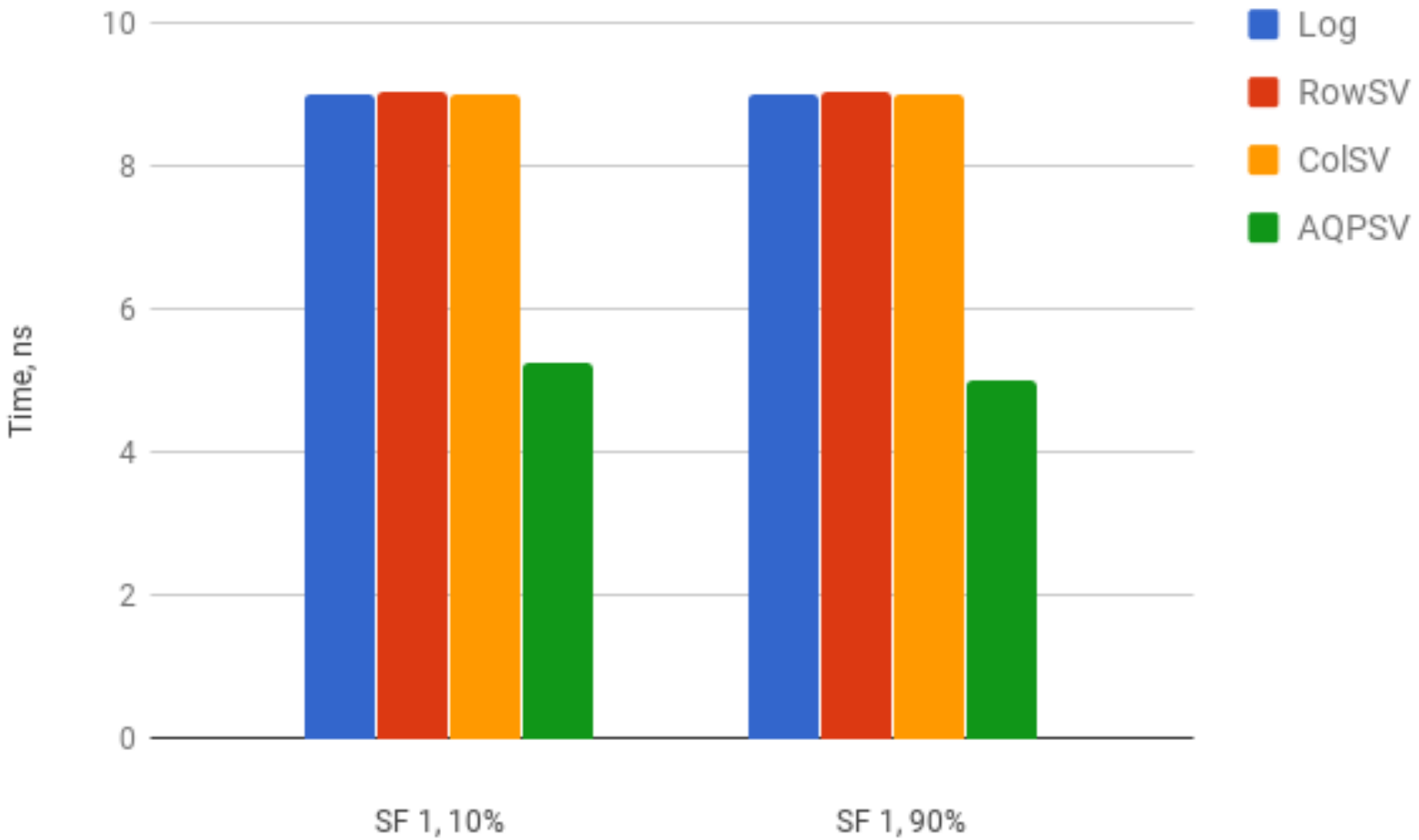
Experiments

1. Average response time for a range query on the Orders table with various scaling factors and predicate selectivity.
2. Average response time for a count-range query on the Orders table. Comparison with an equi-depth histogram.
3. Average response time for a count distinct query on the Orders table. Comparison with a HLL sketch.

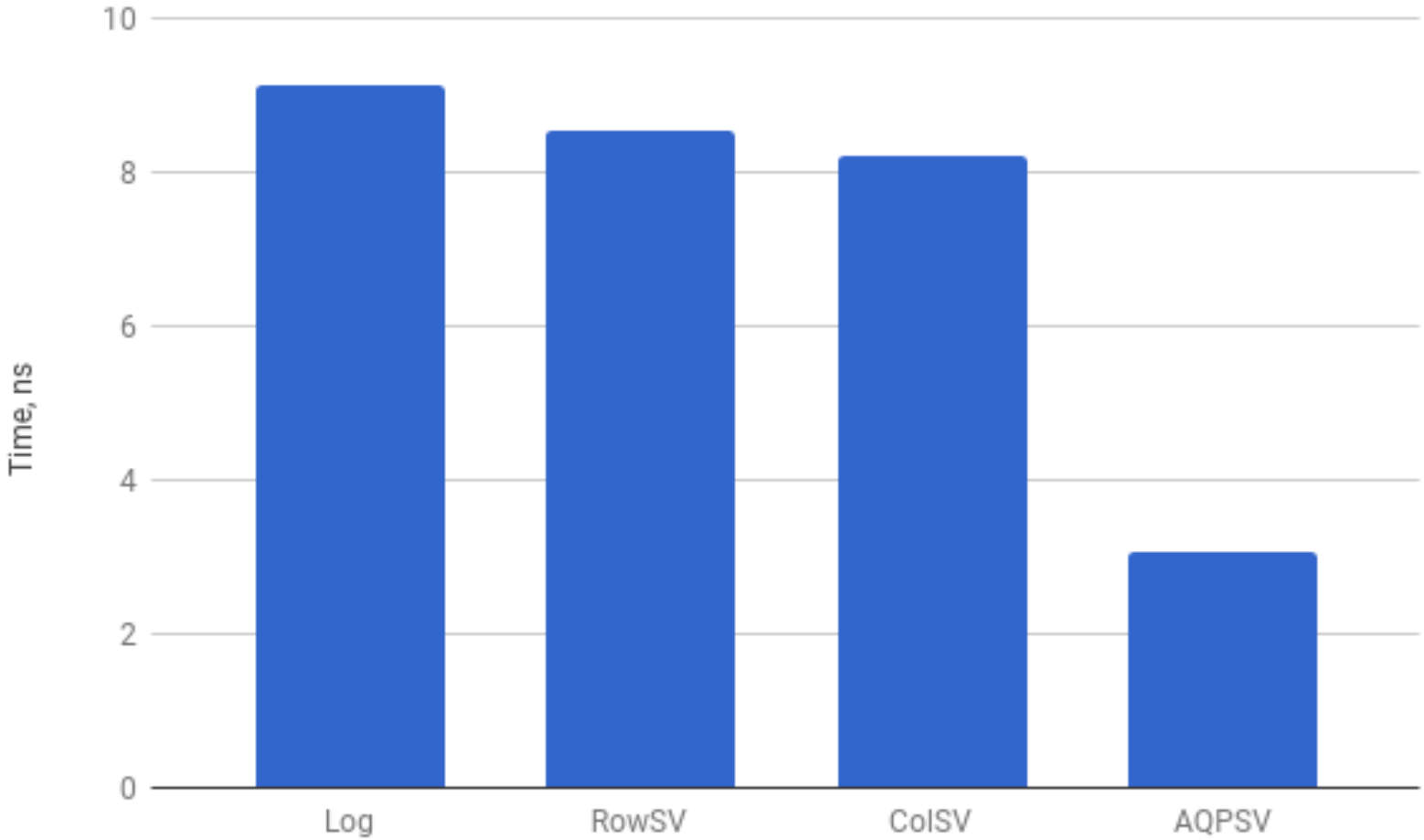
Results. Experiment 1



Results. Experiment 2



Results. Experiment 3



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2. **Rodent Store**
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   - provides DBAs a high-level interface to specify the data physical representation by means of storage algebra.
3. **Snappy Data**
   - AQP Support;
   - uses numerous types of synopses (samples, sketches);
   - user defines the level of accuracy and the number of column sets to approximate the results.

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- OLAP queries can benefit from AQP techniques.
- Non-optimized central log as a primary storage is quite prohibitive.

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- optimize centralized log (e.g. log replication, garbage collection);
- evaluate the efficiency of the concurrency control scheme of OctopusDB;
- evaluate the memory footprint of histograms and sketches;
- extend Blinktopus architecture to support transactional model;
- extend query classes by implementing sample-based data synopses.

Demonstration

Thank you!

Questions? Recommendations? Remarks?