

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

1. OctopusDB

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- mimicks several types of systems (OLAP, OLTP, etc.) by representing them as *Storage Views*

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2. BlinkDB

- Successfully integrates AQP techniques into its architecture

Conceptual Idea and Implementation

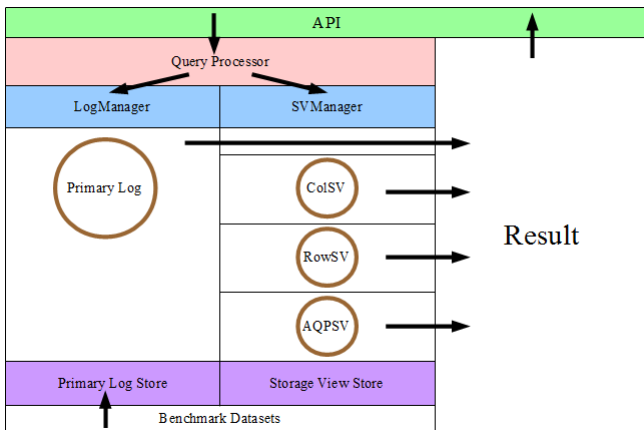


Figure 1: OctopusDB Architecture.

Conceptual Idea and Implementation

Which synopses to pick?

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

¹<https://yahooeng.tumblr.com/post/125390948446/data-sketches>

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

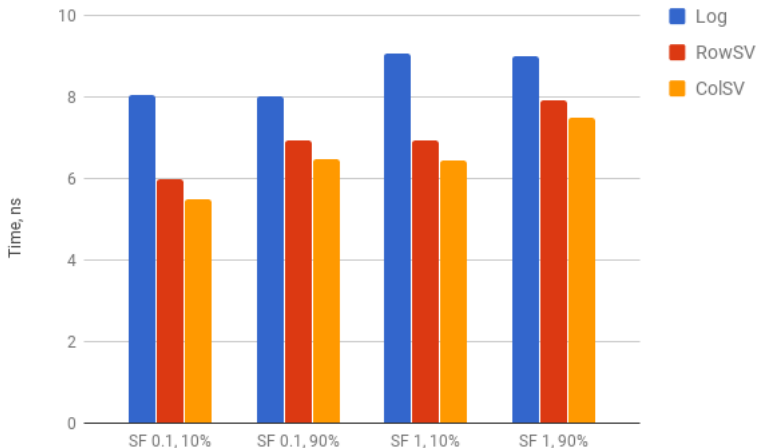
Benchmark Datasets

- TPC-H datasets (Orders and Lineitems)

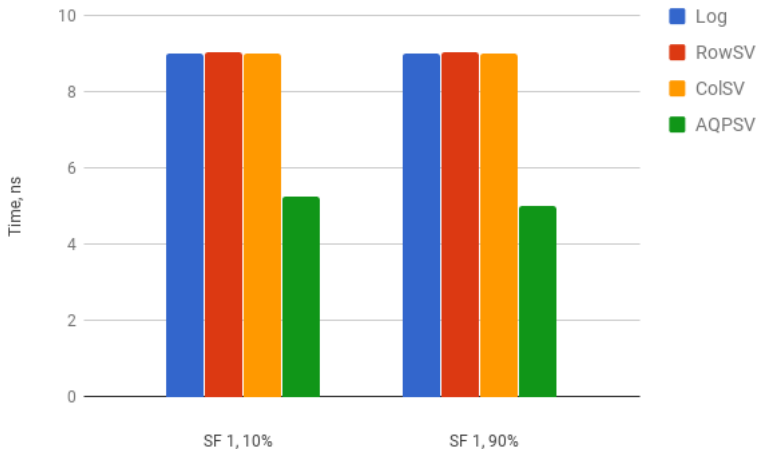
Experiments

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

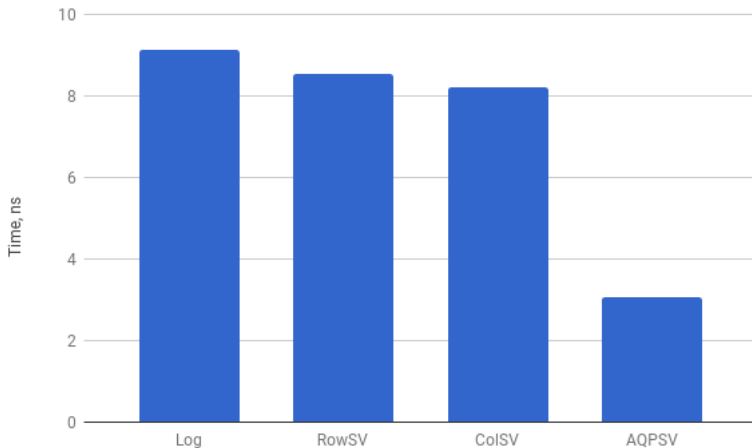
Results. Experiment 1



Results. Experiment 2



Results. Experiment 3



Related Work

1. Apache Samza

- logs as a primary structure
- replicates logs on multiple nodes

2. Rodent Store

- represents data in the various physical layouts
- 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

Thank you! Any questions?

Literature

1. Jindal, Alekh. "The mimicking octopus: Towards a one-size-fits-all database architecture." VLDB PhD Workshop. 2010.
2. Dittrich, Jens, and Alekh Jindal. "Towards a One Size Fits All Database Architecture." CIDR. 2011.
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5. Cormode, Graham, Minos Garofalakis, Peter J. Haas, and Chris Jermaine. "Synopsis for massive data: Samples, histograms, wavelets, sketches." Foundations and Trends in Databases 4, no. 13 (2012): 1-294.