In Memory Databases
A Real Time Analytics Solution

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Mass Street Analytics

Who is Mass Street?

- Boutique data consultancy
- Looks to provide organizations with analytics expertise

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What We’re Gonna Talk About

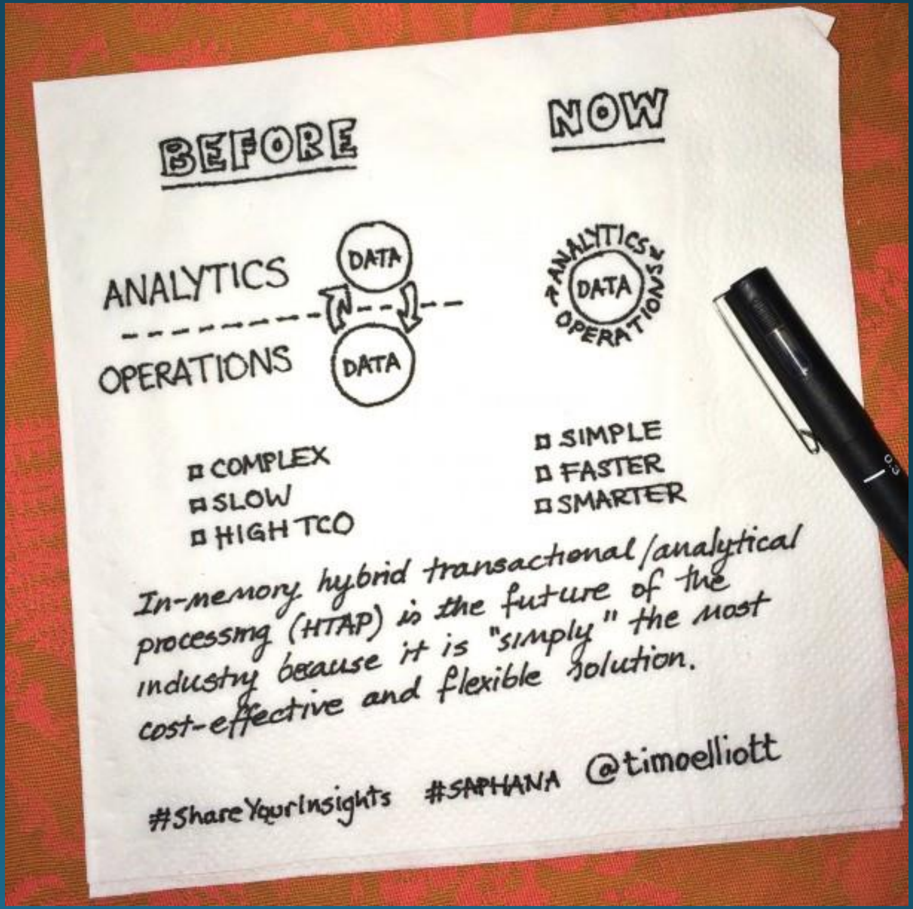
1. HTAP
2. Real Time Analytics
3. In memory databases

What We’re NOT Gonna Talk About

- Deep technical info on how in memory DBs work.
- The advancement of in memory technology.

What Is HTAP?

Hybrid Transactional Analytic Processing



□ COMPLEX
□ SLOW
□ HIGH TCO

□ SIMPLE
□ FASTER
□ SMARTER

In-memory hybrid transactional/analytical processing (HTAP) is the future of the industry because it is "simply" the most cost-effective and flexible solution.

#ShareYourInsights #SAPHANA @timoelliott

Image Source: Timo Elliott

Challenges Tackled By HTAP

- Removes need to ETL data to warehouse
- Transactional data readily available
- Aggregates points to fresh HTAP data
- Cuts the need for copies of data

Source: Gartner, Inc.

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What Is Real Time

- I don’t think we have a standard definition yet
- Real time = instantaneous
- More Practical
  - Arbitrarily close enough to instantaneous to go ahead and call it real time.

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Why Real Time Analytics

- Gaining competitive edge
- Everybody wants their data right no
- Enabling IoT

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Use Cases for Real Time

- “Traditional Use Cases”
  - asset trading
  - app performance monitoring
- Um. Everything.

Use Cases for Real Time

Everything is an event that occurs over time.

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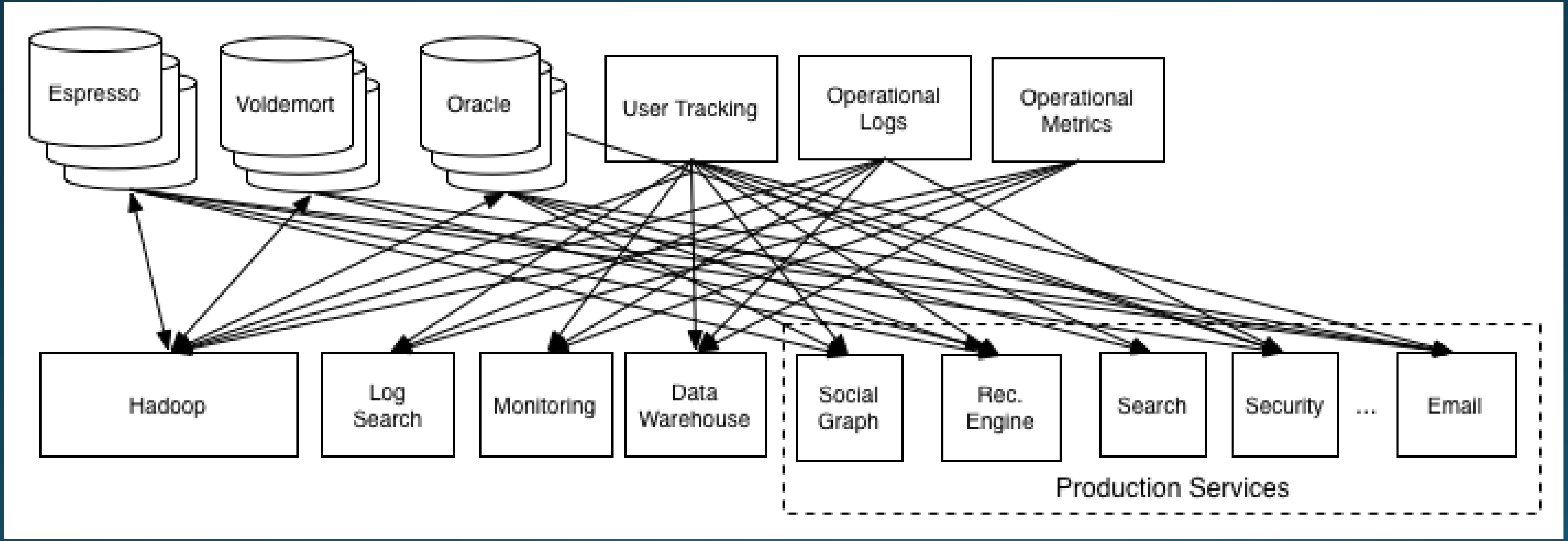
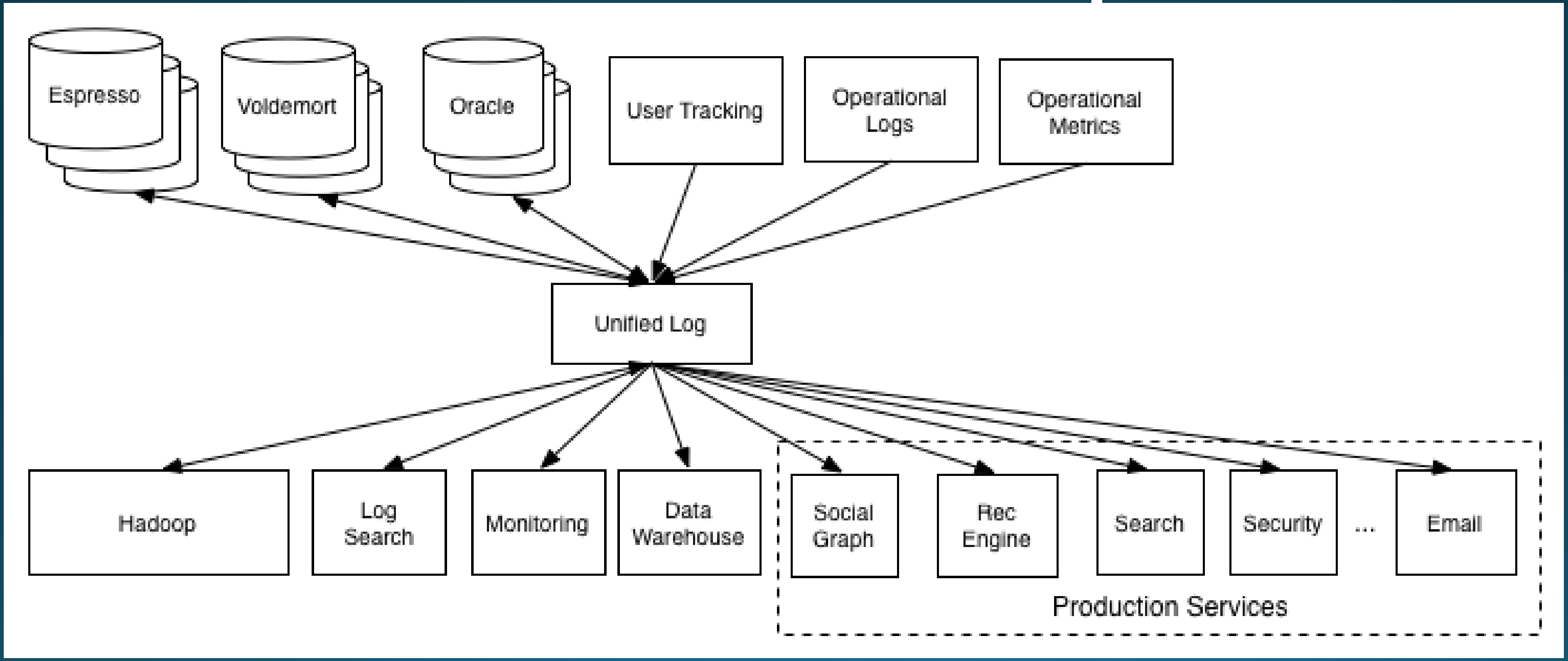
The Log: A Unifying Abstraction For Data Transport



The Log: A Unifying Abstraction For Data Transport



Real Time In The Real World

- Kafka/Storm Hadoop < 1 minute
- SQL Server Replication ~ 5 min
- SSIS Job ~ 15 min

I want to speed up analytics but…

- I’m having performance issues in my DB.
- My architecture is clunky.
- My read/writes are colliding.
- I don’t know how to make it happen.

Enter In Memory Databases

- Not the same as having a caching layer
- Data MUST be stored in main memory
- Data accessed without disk I/O instructions

Comparison Of Various DB Technologies

	Open Source	In Memory	Notes
MemSQL		X	My pick
VoltDB	X	X	In memory only
NuoDB		X	What?
MySQL Cluster	X	X	Since when?
Netezza			$$$
MS PDW			$$$
Cassandra	X		OLTP only

Introduction to MemSQL

- Built for real time
- Horizontal scale out on commodity hardware
- ACID compliant
- SQL complaint
- Mixed OLTP and OLAP workloads

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Introduction to MemSQL

- Uses MySQL wire protocol
- MVCC + lock free data structures
  - Goodbye WITH NOLOCK
- JSON data type
- Row store and a column store

Introduction to MemSQL

- JDBC/ODBC compliant
- Connects to Tableau
  - enables self serve BI
- Spark Connector

Introduction to MemSQL

- Client with 500 nodes.

Introduction to MemSQL

- All queries get turned into compiled code.
- Shared nothing architecture.

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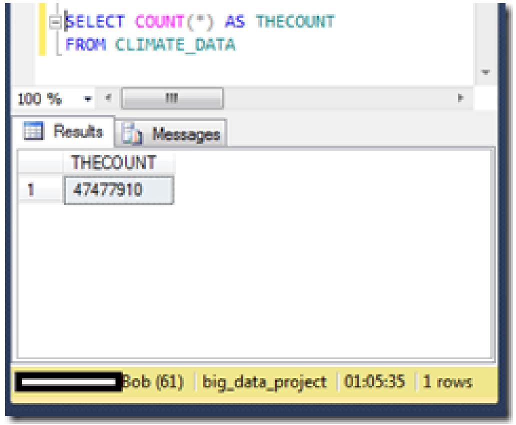
Experimentation with MemSQL

- Assignment: Store some “big data” and analyze it
- Easy installation
- Connect in with SQuirreL

My Personal Computer Lab Setup

- 1 off the shelf windows box
  - Intel 3.3 GHz
  - 4 GB RAM
  - 1TB HDD
- 1 Custom box running Ubuntu 14.4
  - AMD 3 GHz
  - 32 GB RAM
  - 1 TB HDD
- 2 off the shelf servers running Ubuntu 14.4
  - AMD 3GHz
  - 32 GB RAM
  - 3TB HDD

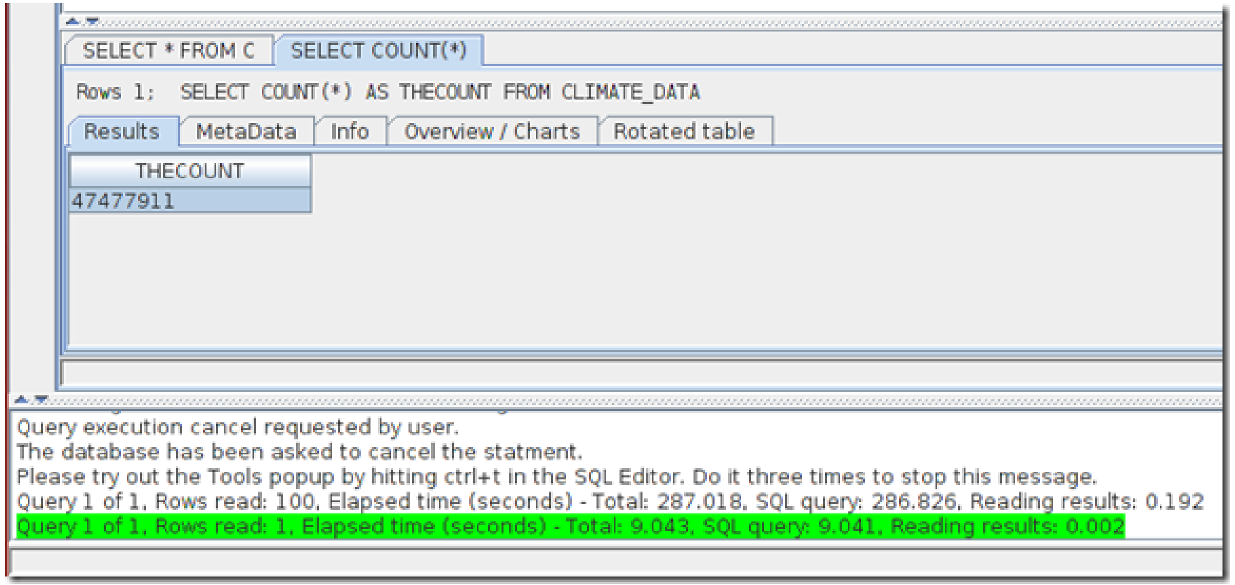
SQL Server vs. MemSQL



```
SELECT COUNT(*) AS THECOUNT
FROM CLIMATE_DATA
```

```
  THECOUNT
1 47477910
```

[redacted] Bob (61) | big_data_project | 01:05:35 | 1 rows



```
Rows 1;  SELECT COUNT(*) AS THECOUNT FROM CLIMATE_DATA
```

```
THECOUNT
47477911
```

```
Query execution cancel requested by user.
The database has been asked to cancel the statment.
Please try out the Tools popup by hitting ctrl+t in the SQL Editor. Do it three times to stop this message.
Query 1 of 1, Rows read: 100, Elapsed time (seconds) - Total: 287.018, SQL query: 286.826, Reading results: 0.192
Query 1 of 1, Rows read: 1, Elapsed time (seconds) - Total: 9.043, SQL query: 9.041, Reading results: 0.002
```

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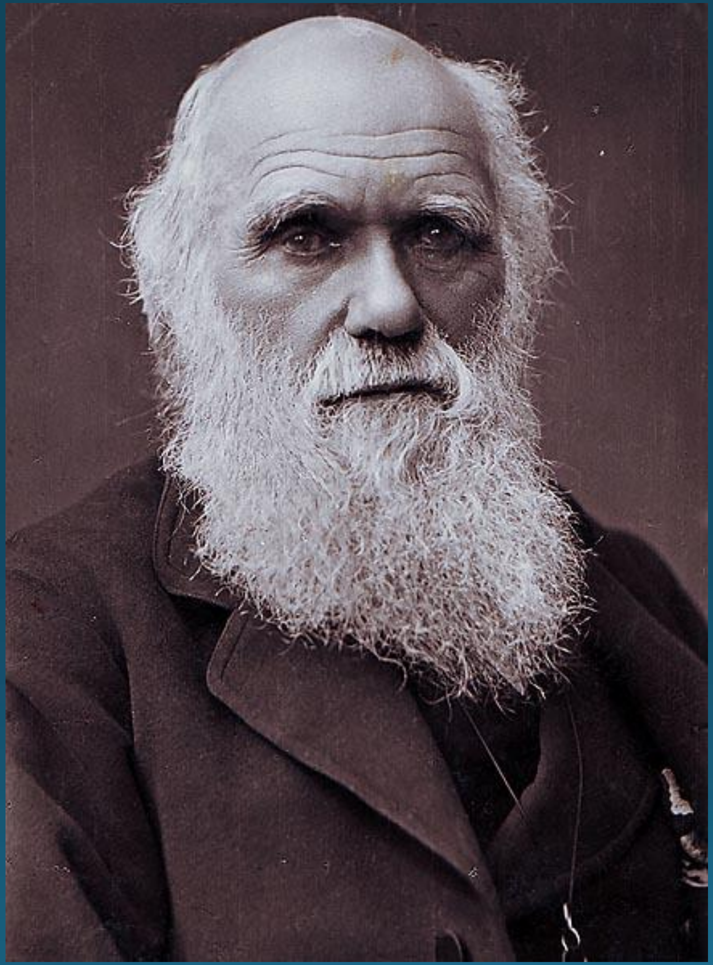
Evolution Of An Architecture



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We are experiencing technical difficulties! For a demonstration of MemSql Ops, please see the link in the video description!

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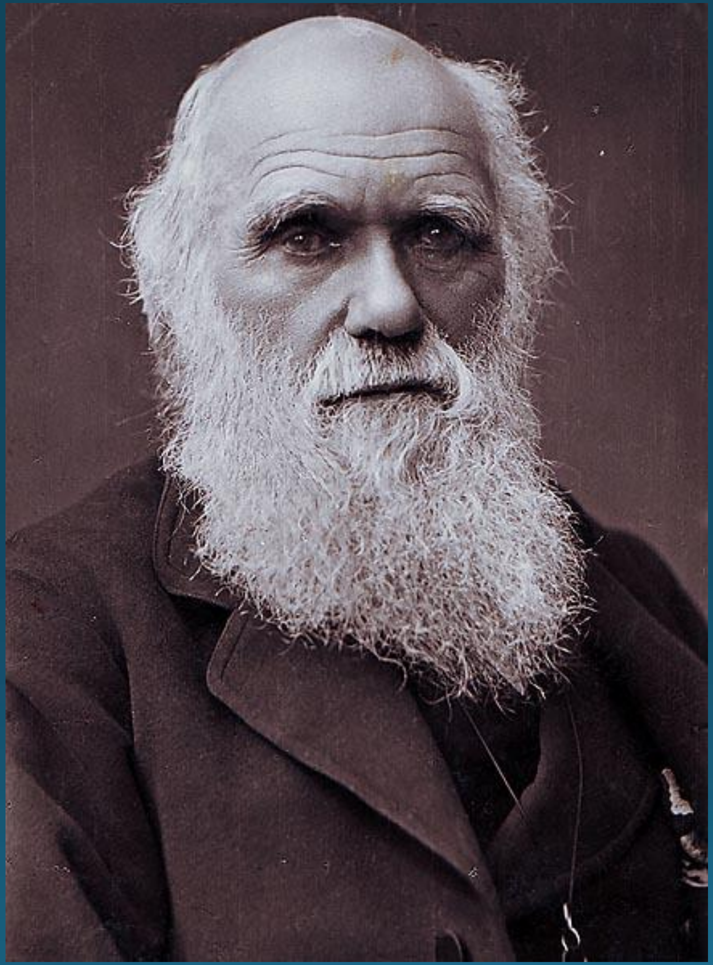
Evolution Of An Architecture



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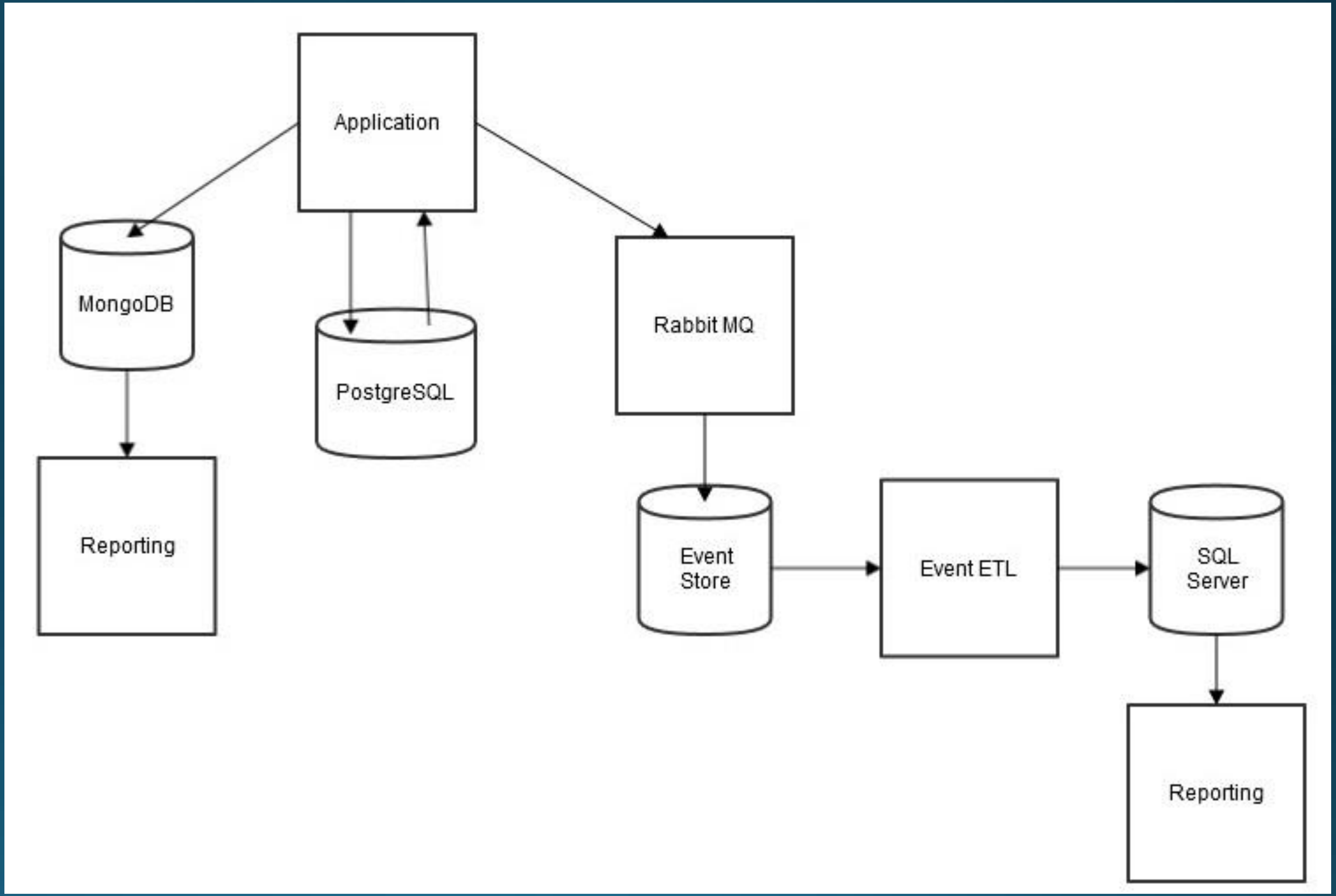
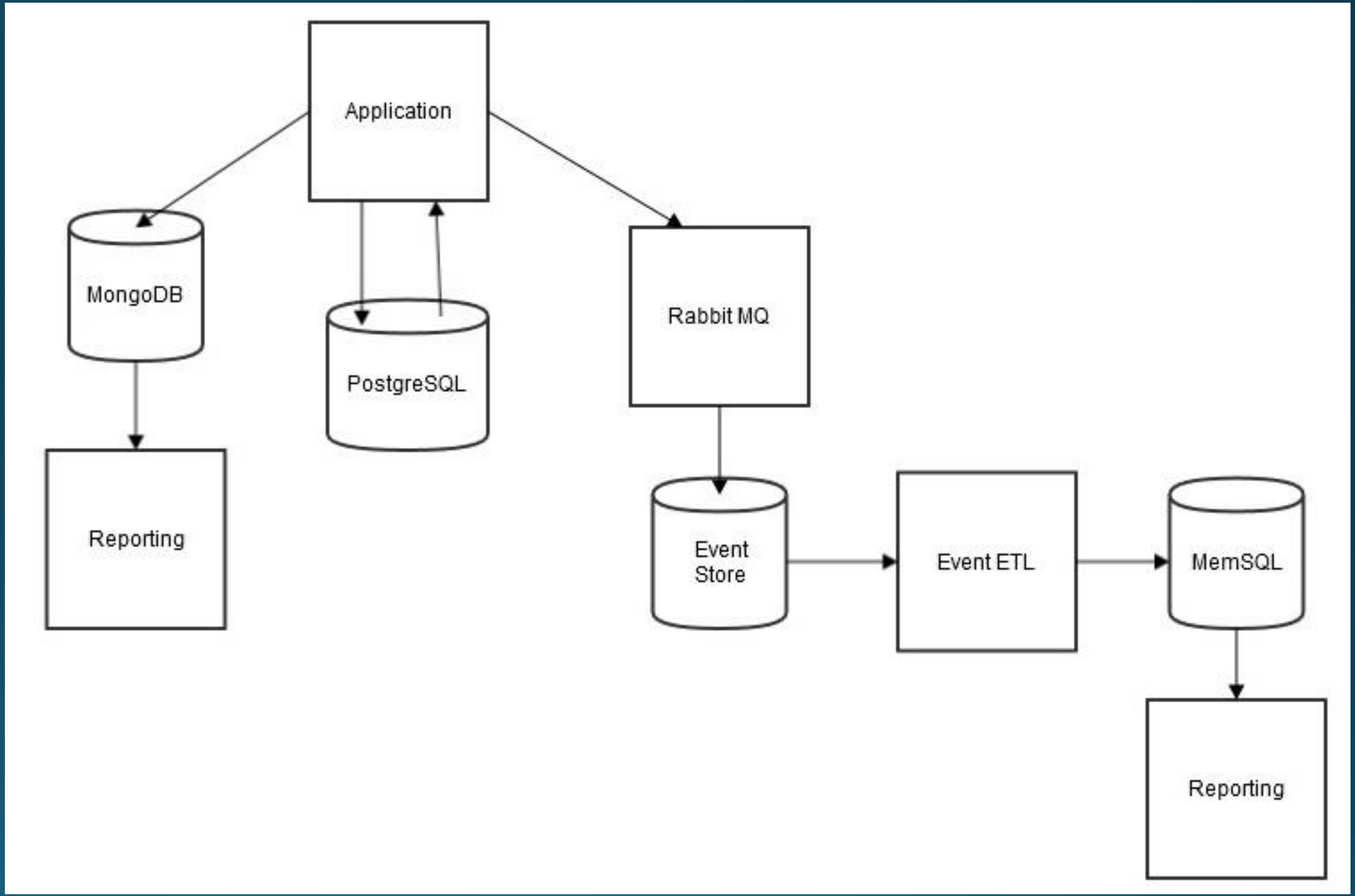
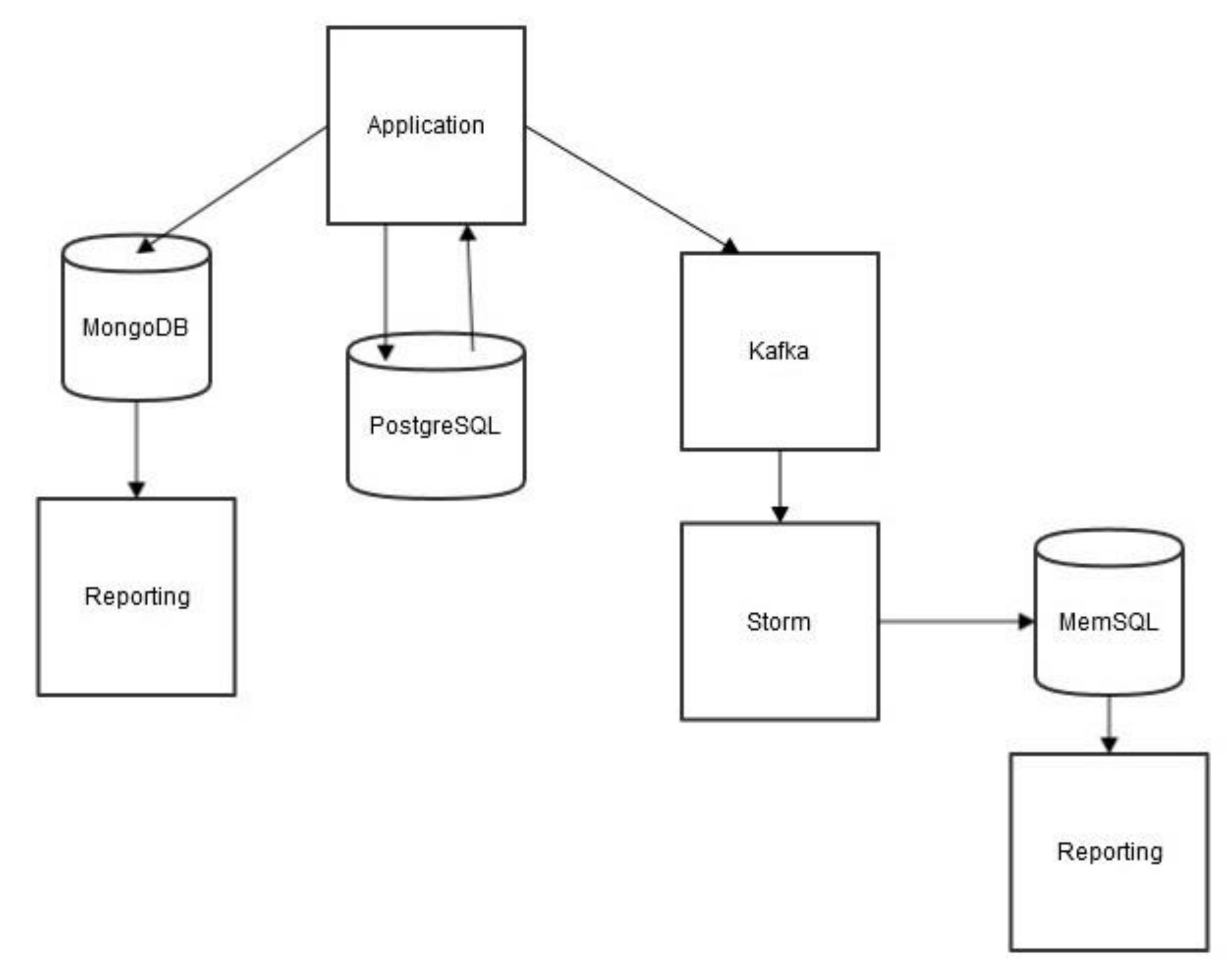
Initial State



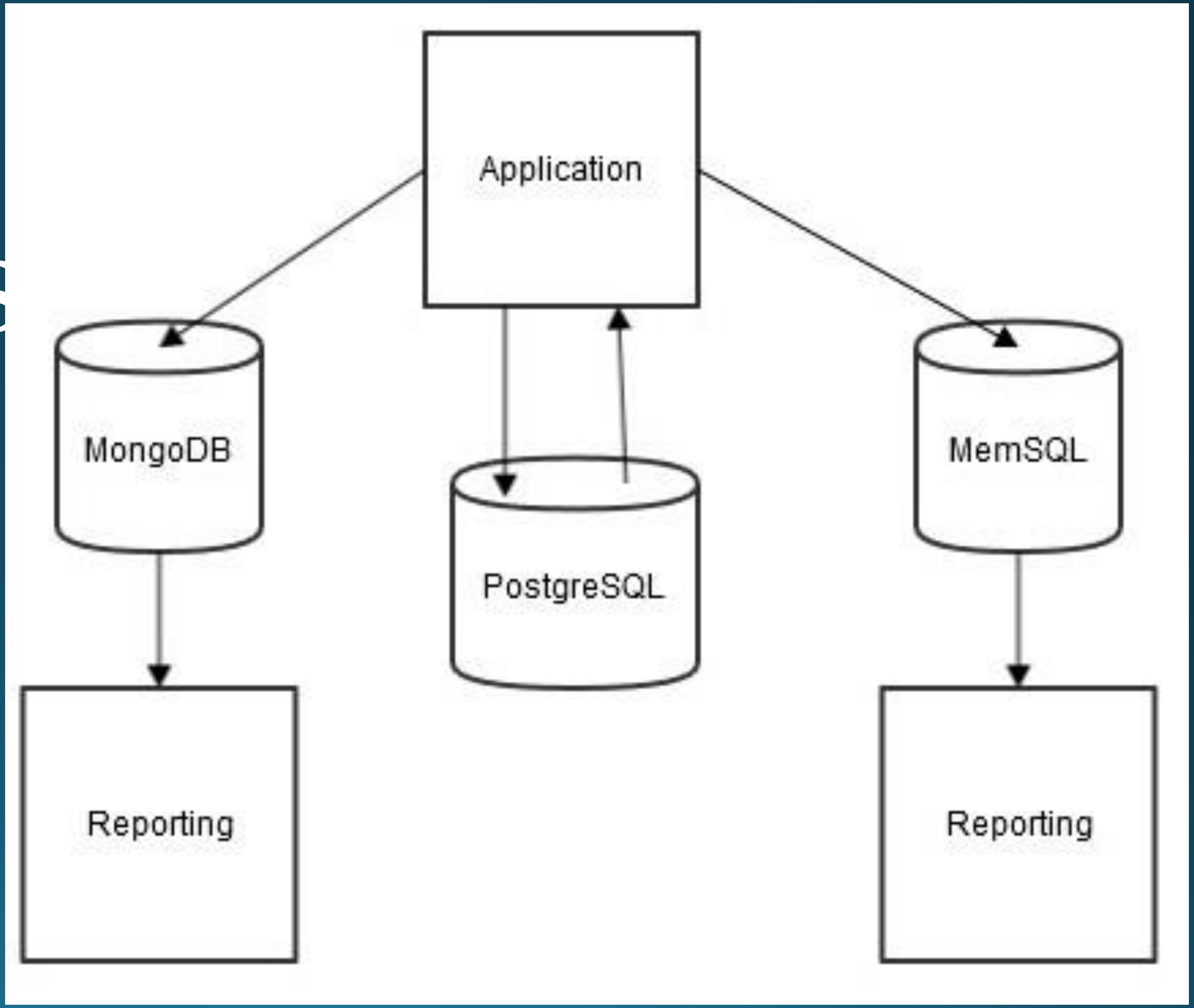
V1 Eliminate Batch Processin g



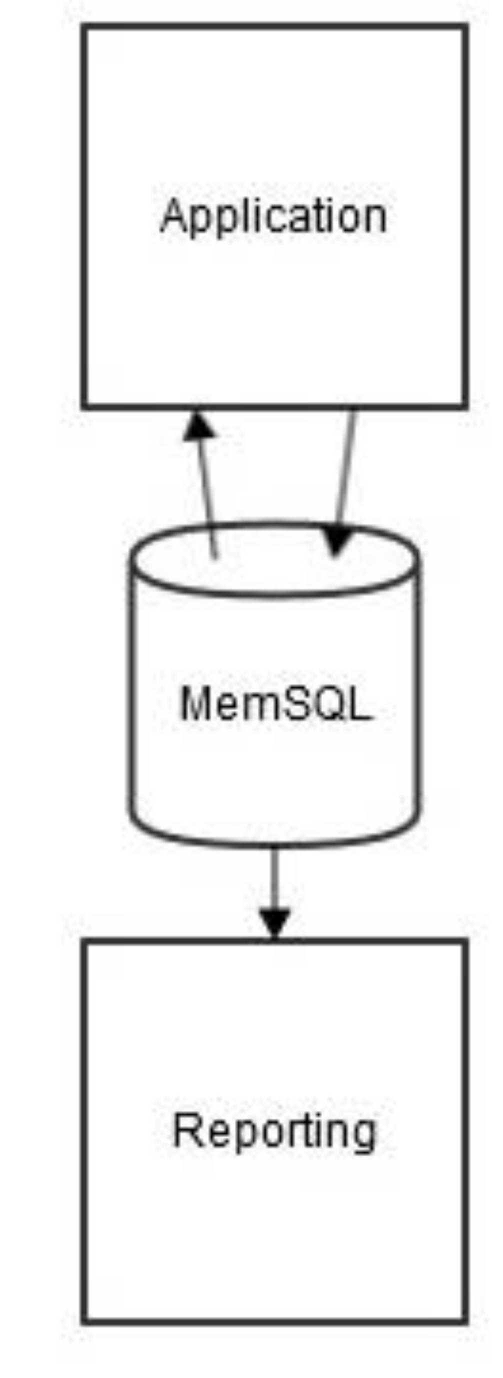
V2
Replace transport elements with Apache software



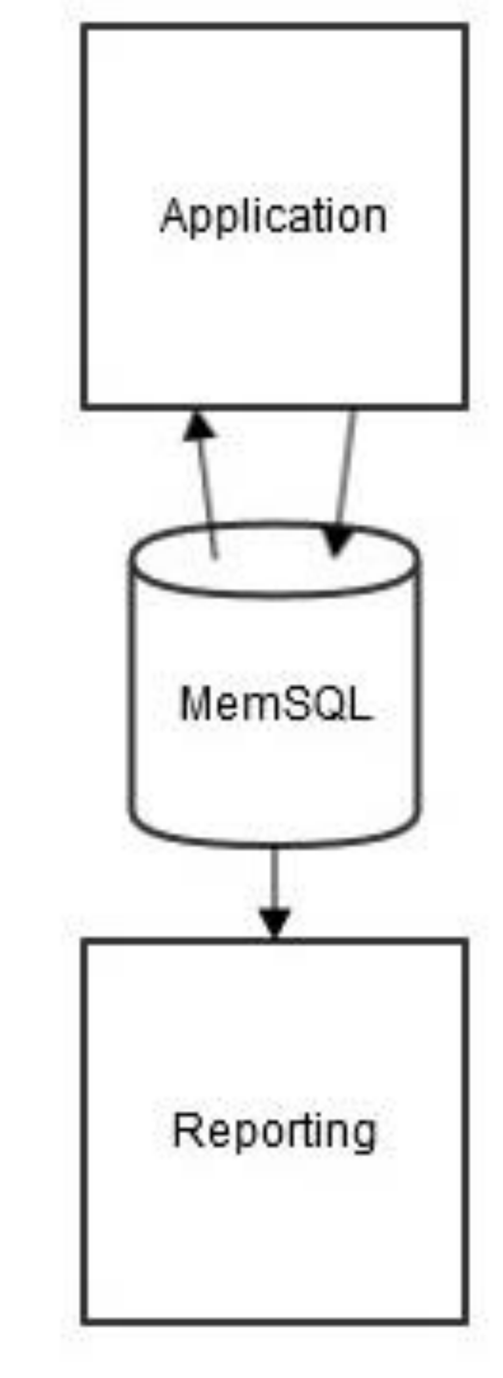
V3
Remove elements that are theoretically unnecessary



V4
The ultimate incarnation of HTAP



V4
The ultimate incarnation of HTAP



Engineering Food For Thought

- Everyone says HTAP needs to be done in memory. What if you have more data than RAM? Is that even a big deal?
- Do you just keep the warm data then send the cold stuff to Hadoop then federate it with virtualization?
- If disk I/O is a bottle neck, could the problem be alleviated with SSDs?

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If you want more technical info

- http://developers.memsql.com