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Evolution of the Big Data Stack

Jonathan Hsieh | Tech Lead / Software engineer @ Cloudera

BigDataCamp LA '14

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Who Am I?

- **Cloudera since 2009**
  - **Tech Lead HBase Team**
  - **Software Engineer**
  - **Apache HBase** committer / PMC
  - **Apache Flume** founder / PMC
- **U of Washington:**
  - Research in Distributed Systems

Big Data Stack Evolution

- Inspiration
- Imitation
- Innovation

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Inspiration

Emergence of Big Data

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> Every two days we create as much information as we did from the dawn of civilization up until 2003.
>
> -- Eric Schmidt
> Google CEO, 2010

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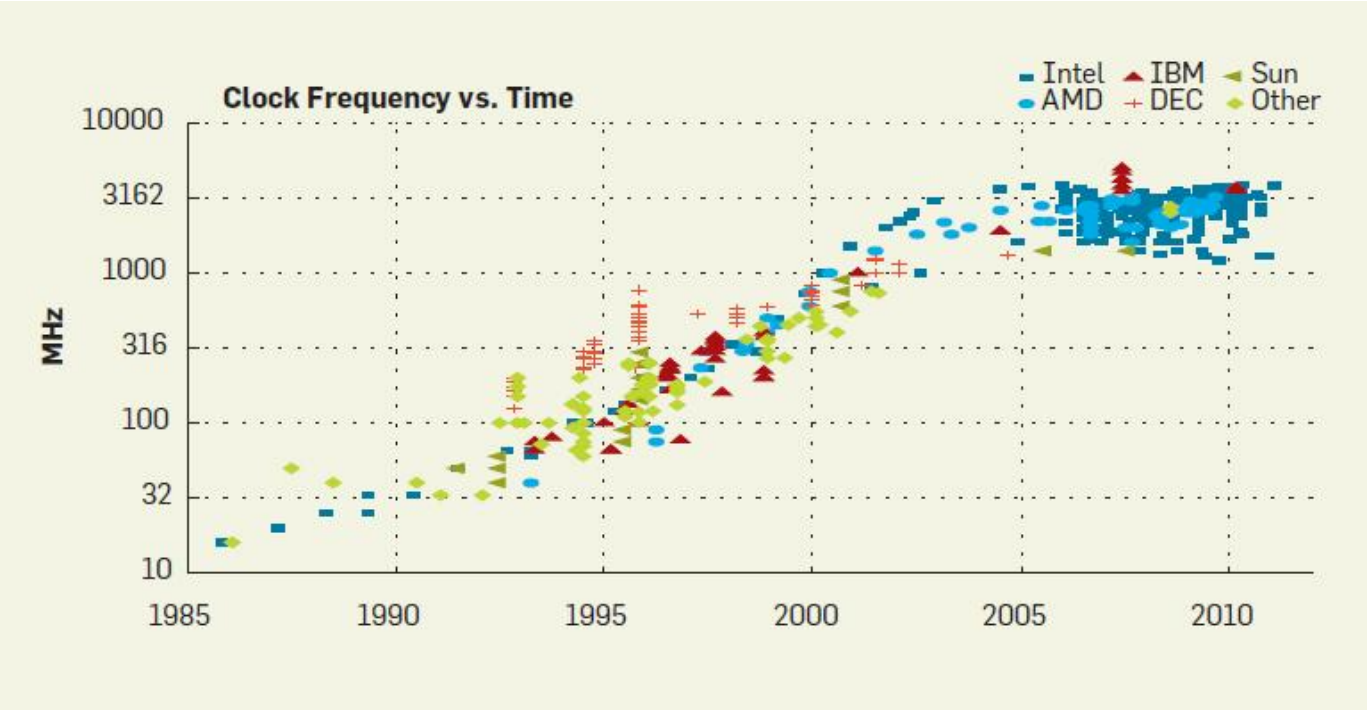
> The volume, variety and velocity of human communications make our mission more difficult each day.
>
> -- Michael V Hayden
> Director NSA (DIRNSA), 2002

The brute force solution

1. Collect **all** the data
2. Analyze **all** the data
3. Serve the results

End of free MHz coincides with Rise of Big Data



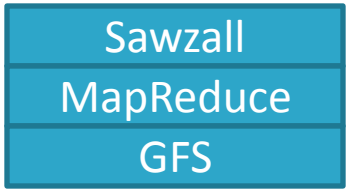
http://cacm.acm.org/magazines/2012/4/147359-cpu-db-recording-microprocessor-history/abstract

A Move towards Distributed Systems

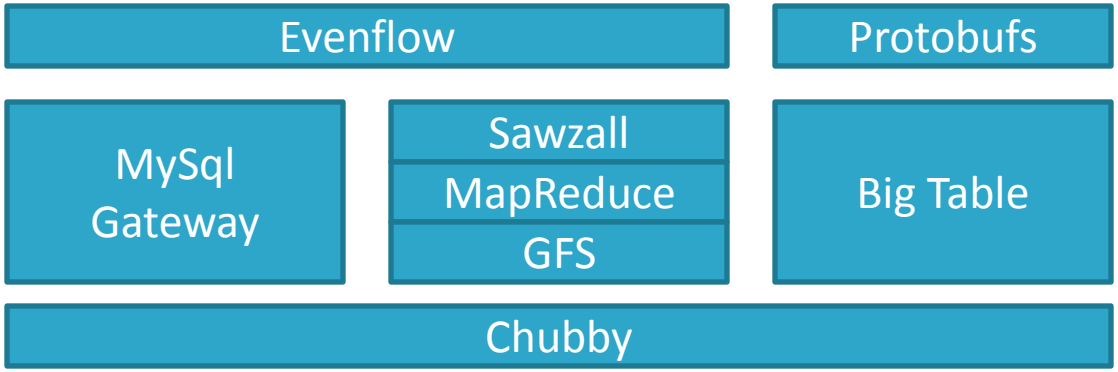
- Scaling **Horizontally** instead of Vertically

- Challenges:
  - Reliability
  - Fault tolerance
    - Atomicity / Consistency / Isolation / Durability
  - High-Availability
  - Latency Predictability

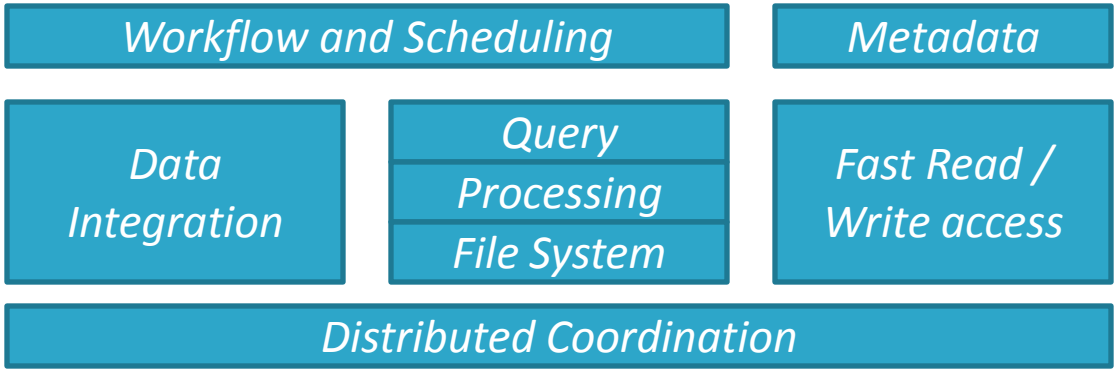
Google built a Big Data Stack



Google built a Big Data Stack



The core of a Big Data Stack



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Imitation

Big Data for the rest of us

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> The future is already here — it's just not very evenly distributed.
>
> -- William Gibson

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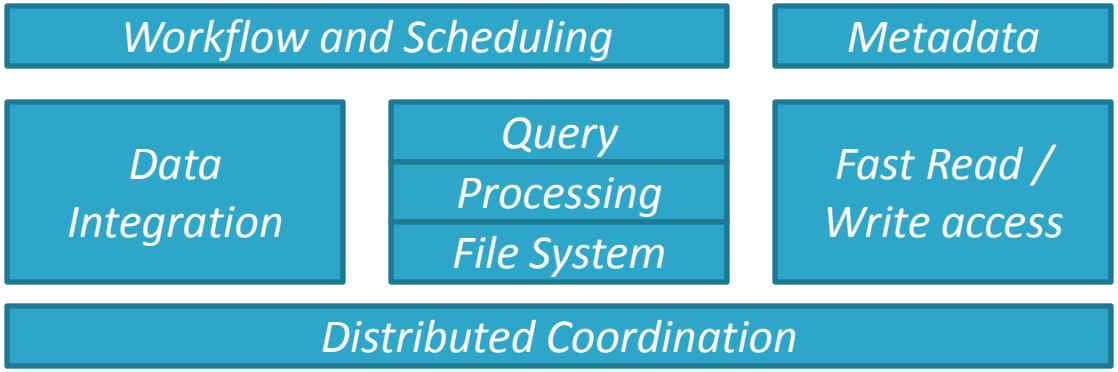
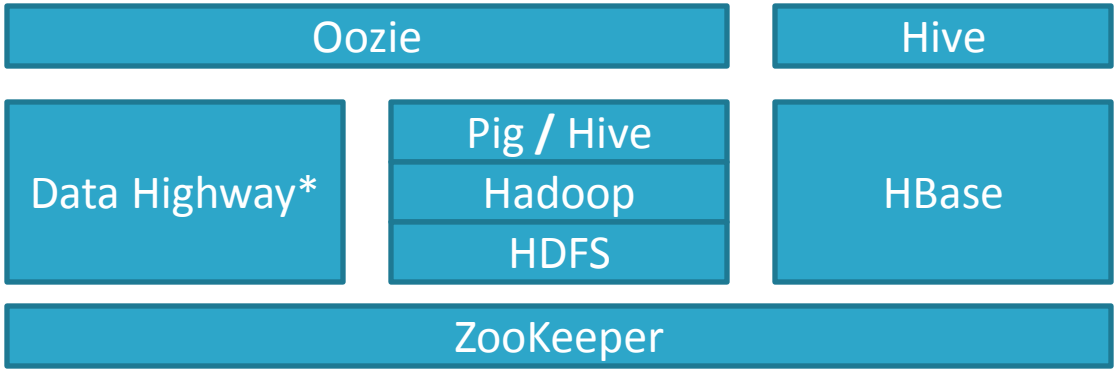
The core of a Hadoop stack



YAHOO! built a Big Data stack



- Donated Hadoop + Friends to the Apache Software Foundation

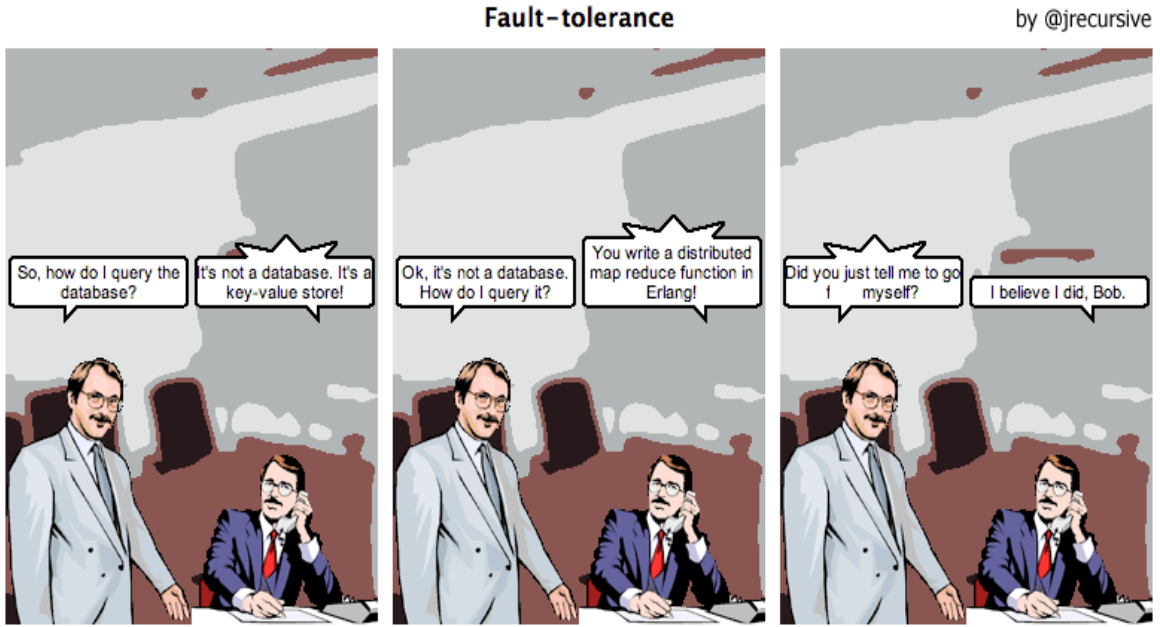
Parallel Components

Function	Google	Yahoo!	Facebook	The Rest of Us
File system	GFS => Colossus	HDFS	HDFS	HDFS
Low latency Data store (NoSQL)	BigTable => Megastore => Spanner	PNUTS => Hbase	HBase	Hbase
Batch processing	Google MapReduce	Hadoop MapReduce	Hadoop MapReduce	Hadoop MapReduce Spark
Batch query	Sawzall, Tenzing, FlumeJava	Pig	Hive	Pig, Hive, Impala, Drill, Crunch
Resource Management	Borg => Omega	=> YARN	=> Corona	YARN Mesos
Ingest	EvenFlow Custom MySQL Proxy	Custom	Scribe / Calligraphus Custom proxy	Sqoop Flume Kafka
Coordination	Chubby	Zookeeper	Zookeeper	Zookeeper
Graph Processing	Pregel		Giraph	Giraph, Golden orb Hama, Titan
Stream processing	MillWheel	S3 => Storm	Puma/PTail	Storm, Spark

Simplify and remove features to enable scaling

- Scalable and simple first
- Focus only on needed features. Exclude others.
- Re-add them later.

- Ex: NoSQL
  - No transactions
  - No Schema



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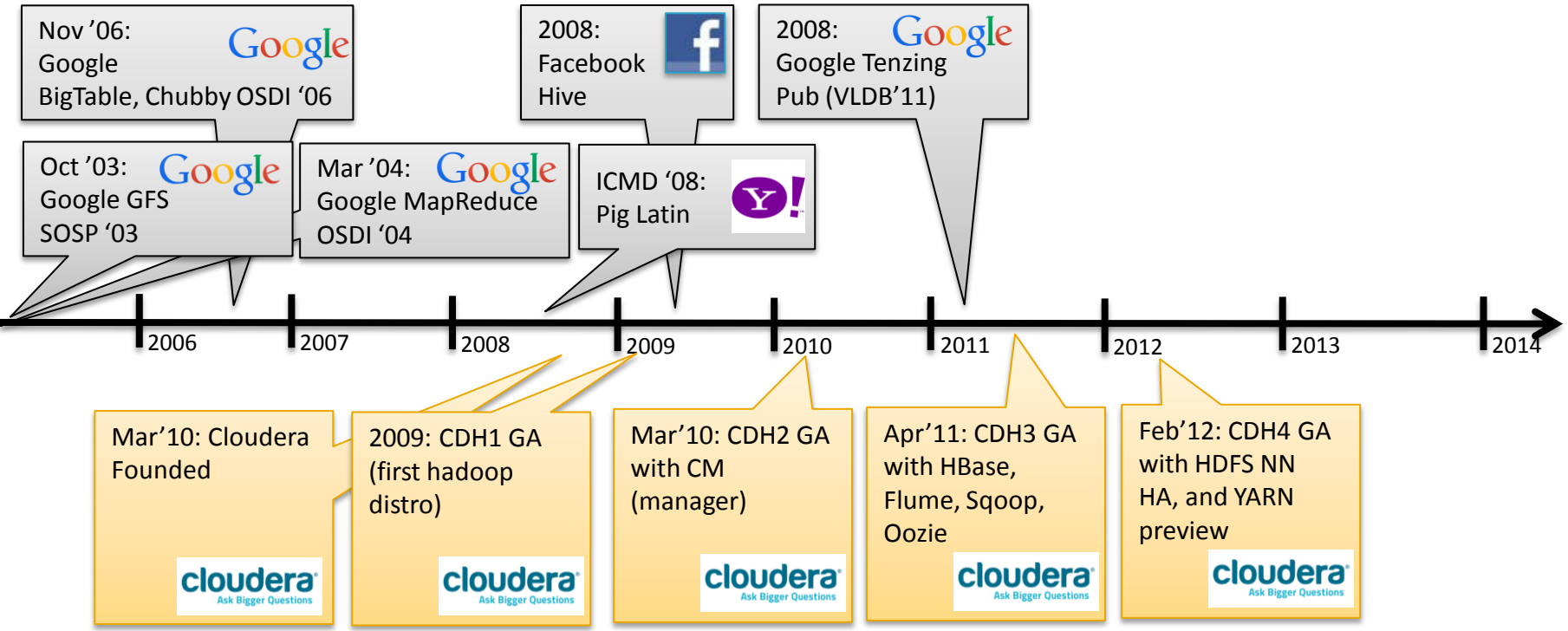
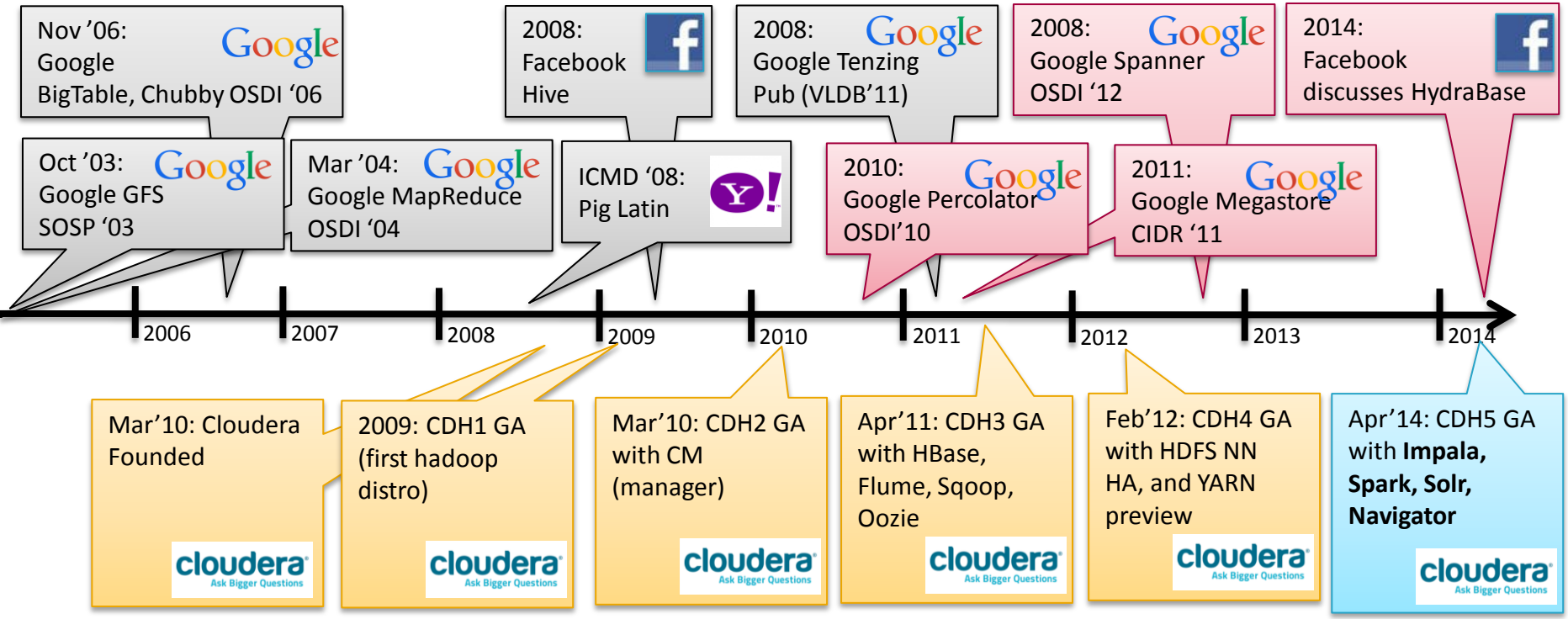
Innovation

Big Data industry steps up

Big Data Stack Timeline



Big Data Stack Timeline



Usability


HUE
HIVE
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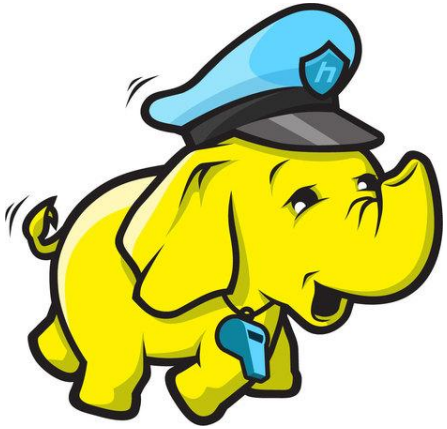
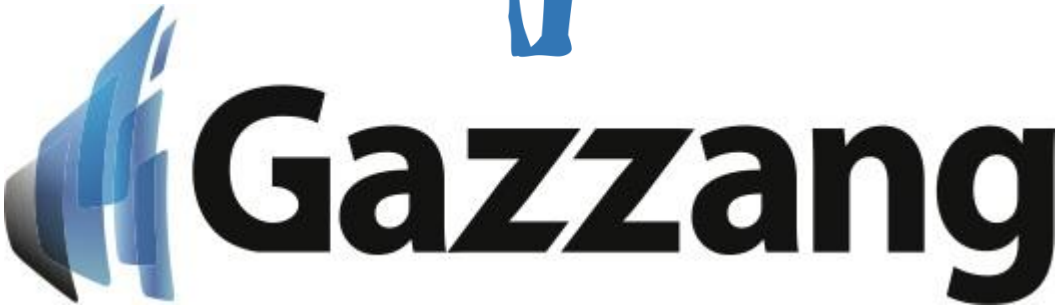
IMPALA
Phoenix
"We put the SQL back in NoSQL"
Trafodion
splice
MACHINE
CONTINUUITY

Security + Integration



KNOX



New directions

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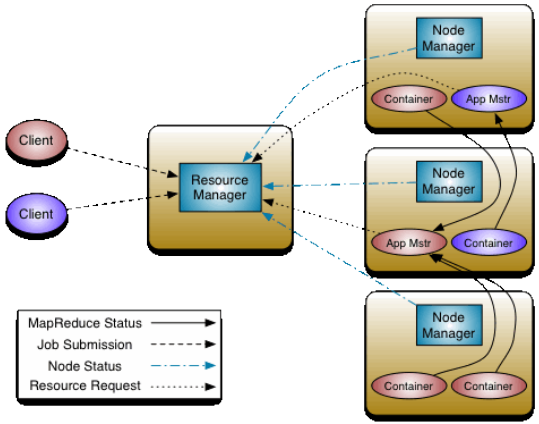
Spark



MESOS

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Thanks!
@jmhsieh