

Apache Hadoop Today & Tomorrow

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- ❑ Brief Overview of Apache Hadoop
- ❑ Where Apache Hadoop is Used
- ❑ Apache Hadoop Core
 - ❑ Hadoop Distributed File System (HDFS)
 - ❑ Map/Reduce
- ❑ Where Apache Hadoop Is Going
- ❑ Q&A

What is Apache Hadoop?



A set of **open source** projects owned by the **Apache Foundation** that transforms **commodity computers** and network into a **distributed service**

- HDFS – Stores petabytes of data reliably
- Map-Reduce – Allows huge distributed computations

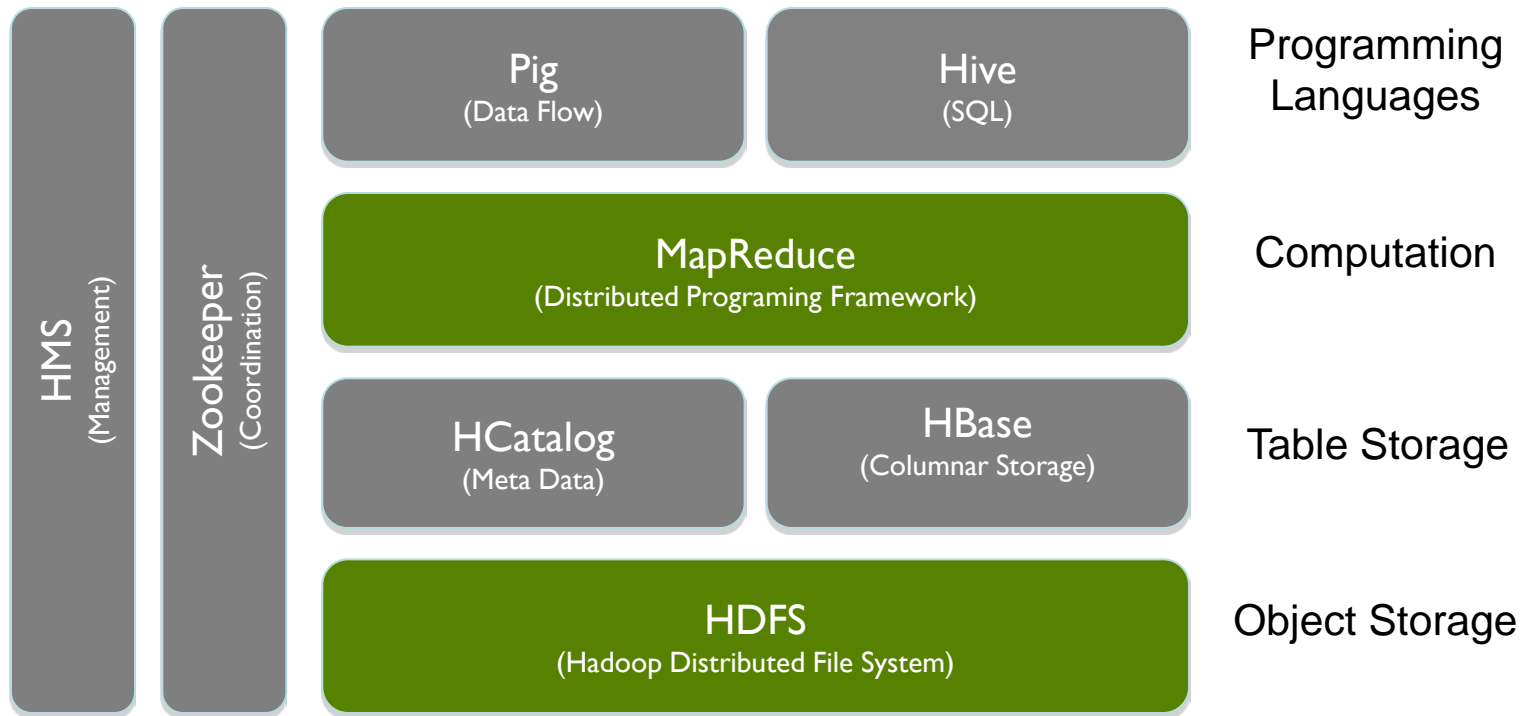
Key Attributes

- Reliable and Redundant – Doesn't slow down or loose data even as hardware fails
- Simple and Flexible APIs – Our rocket scientists use it directly!
- Very powerful – Harnesses huge clusters, supports best of breed analytics
- Batch processing centric – Hence its great simplicity and speed, not a fit for all use cases

What is it used for?

- ❑ Internet scale data
 - ❑ Web logs – Years of logs at many TB/day
 - ❑ Web Search – All the web pages on earth
 - ❑ Social data – All message traffic on facebook
- ❑ Cutting edge analytics
 - ❑ Machine learning, data mining...
- ❑ Enterprise apps
 - ❑ Network instrumentation, Mobil logs
 - ❑ Video and Audio processing
 - ❑ Text mining
- ❑ And lots more!

Apache Hadoop Projects



 Core Apache Hadoop  Related Apache Projects

Where Hadoop is Used

Everywhere!

2006

YAHOO!



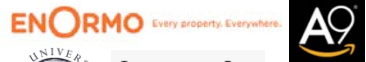
2007



Powerset



2008



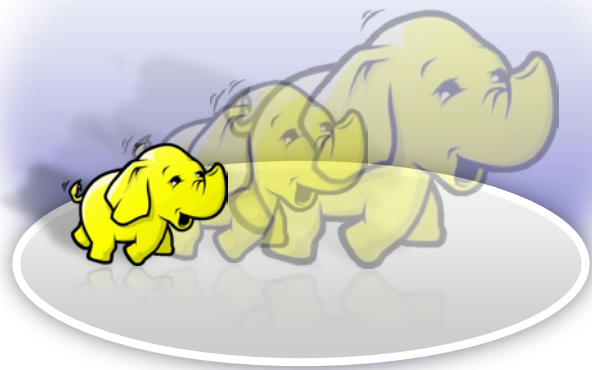
2009



2010



HADOOP @ YAHOO!



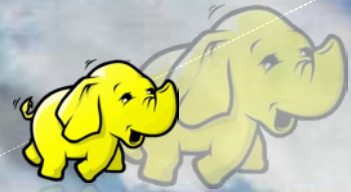
40K+ Servers

170 PB Storage

5M+ Monthly Jobs

1000+ Active users

CASE STUDY YAHOO! HOMEPAGE



Personalized
for each visitor

Result:
twice the engagement



Recommended links

+79% clicks
vs. randomly selected

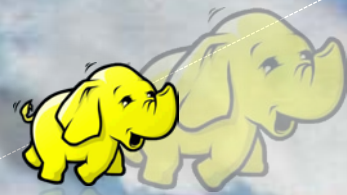
News Interests

+160% clicks
vs. one size fits all

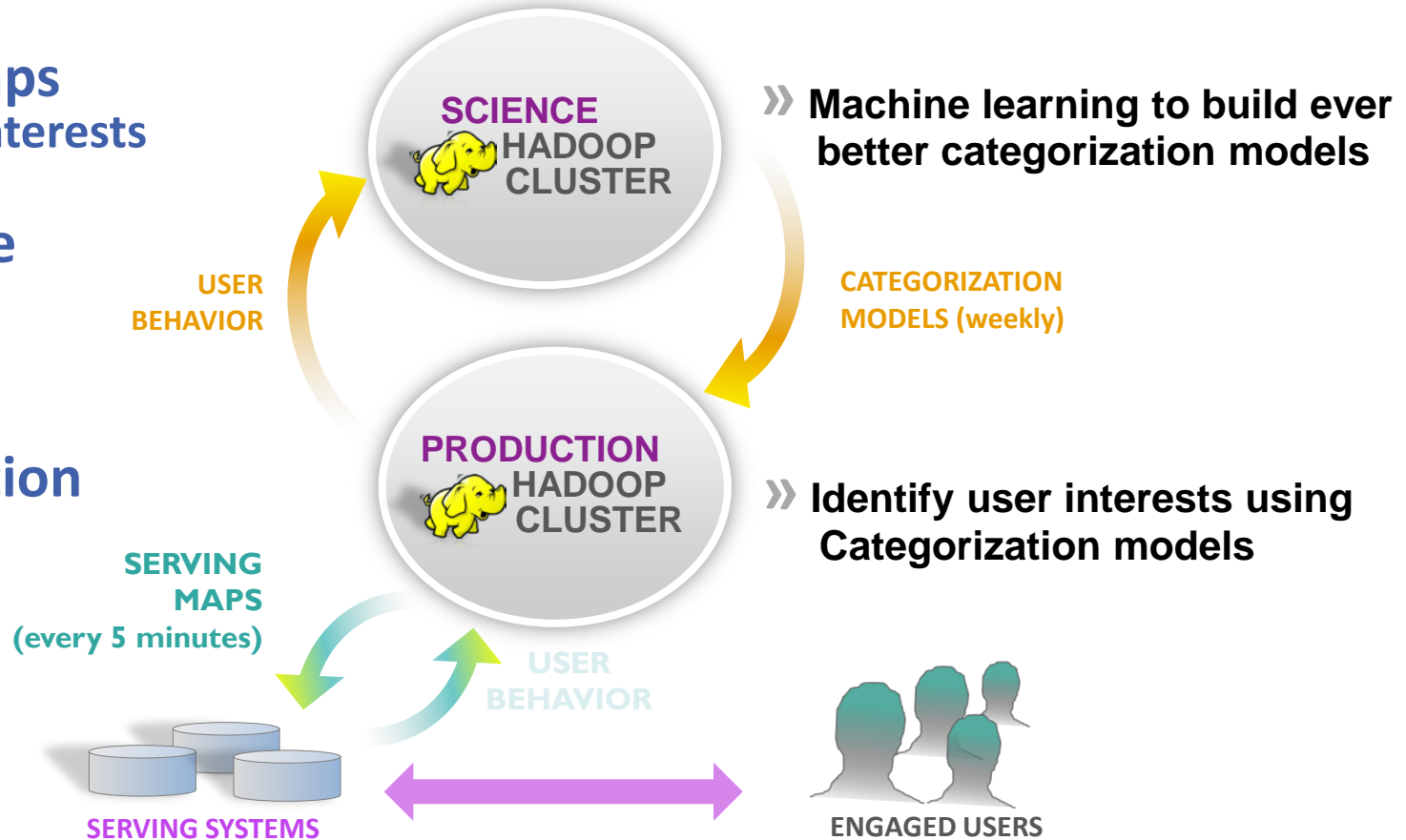
Top Searches

+43% clicks
vs. editor selected

CASE STUDY YAHOO! HOMEPAGE

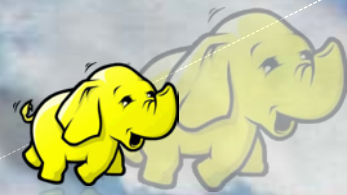


- **Serving Maps**
 - Users - Interests
- **Five Minute Production**
- **Weekly Categorization models**

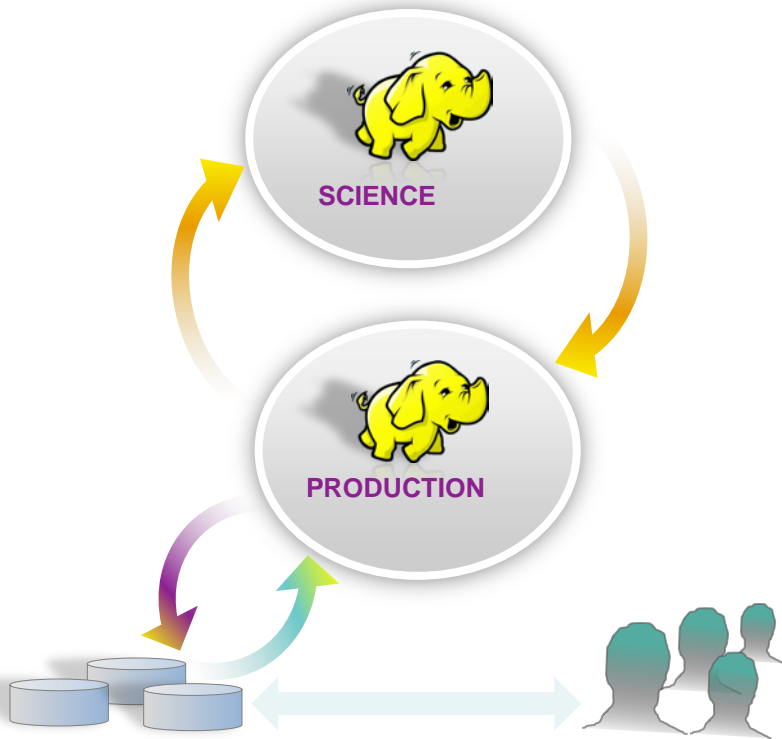


Build customized home pages with latest data (thousands / second)

CASE STUDY YAHOO! MAIL



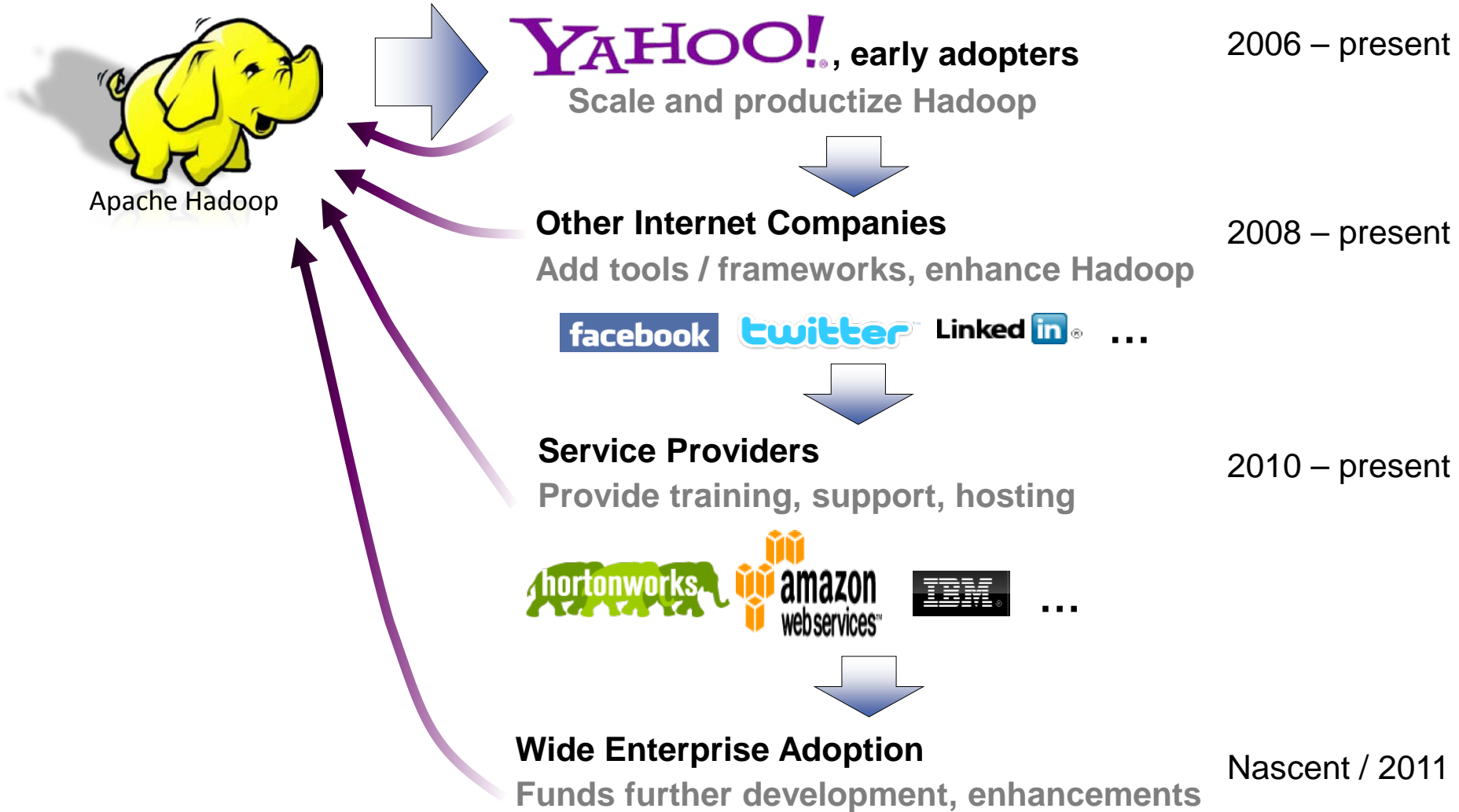
Enabling quick response in the spam arms race



- 450M mail boxes
- 5B+ deliveries/day
- Antispam models retrained every few hours on Hadoop

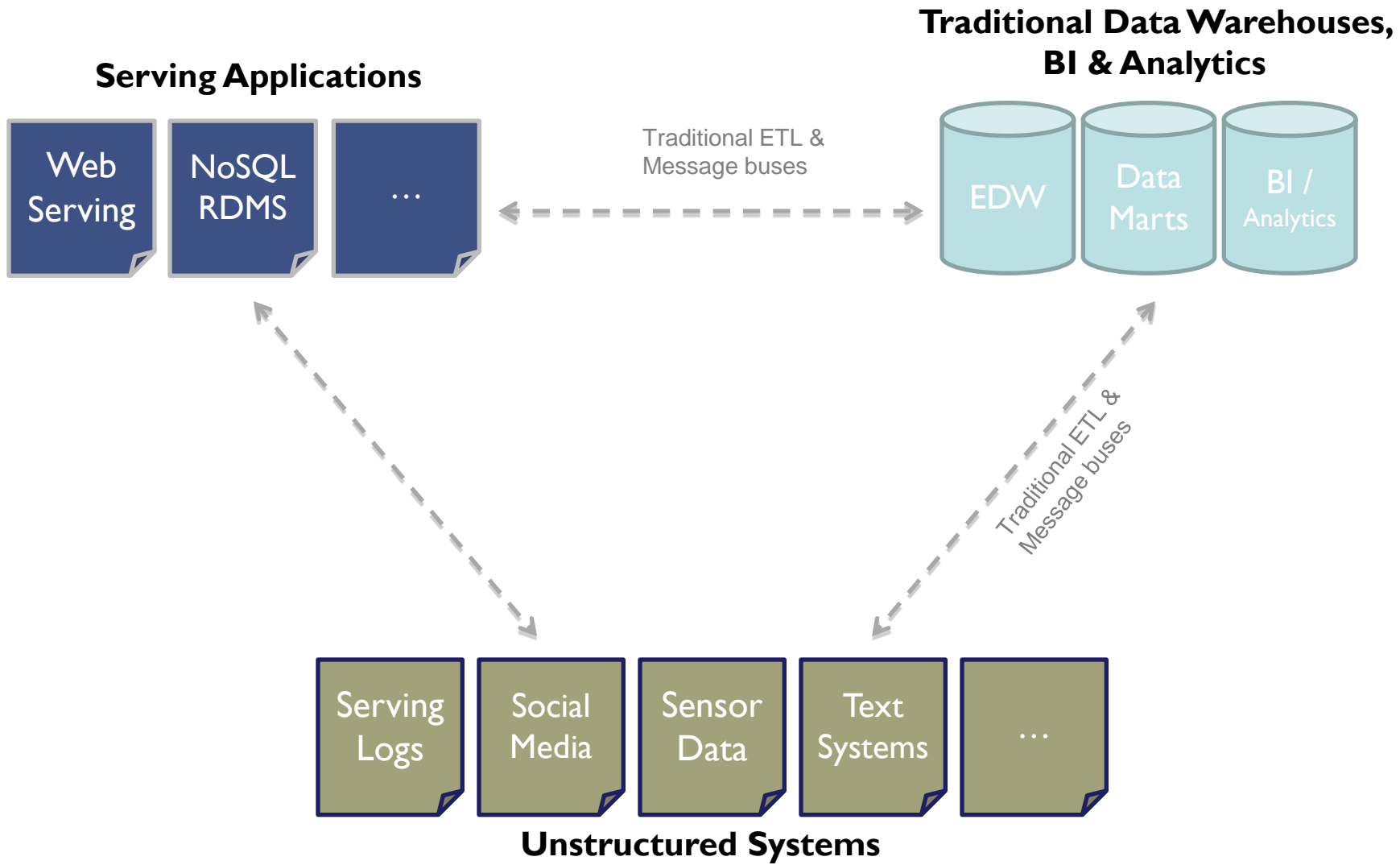
“ 40% less spam than Hotmail and 55% less spam than Gmail ”

A Brief History



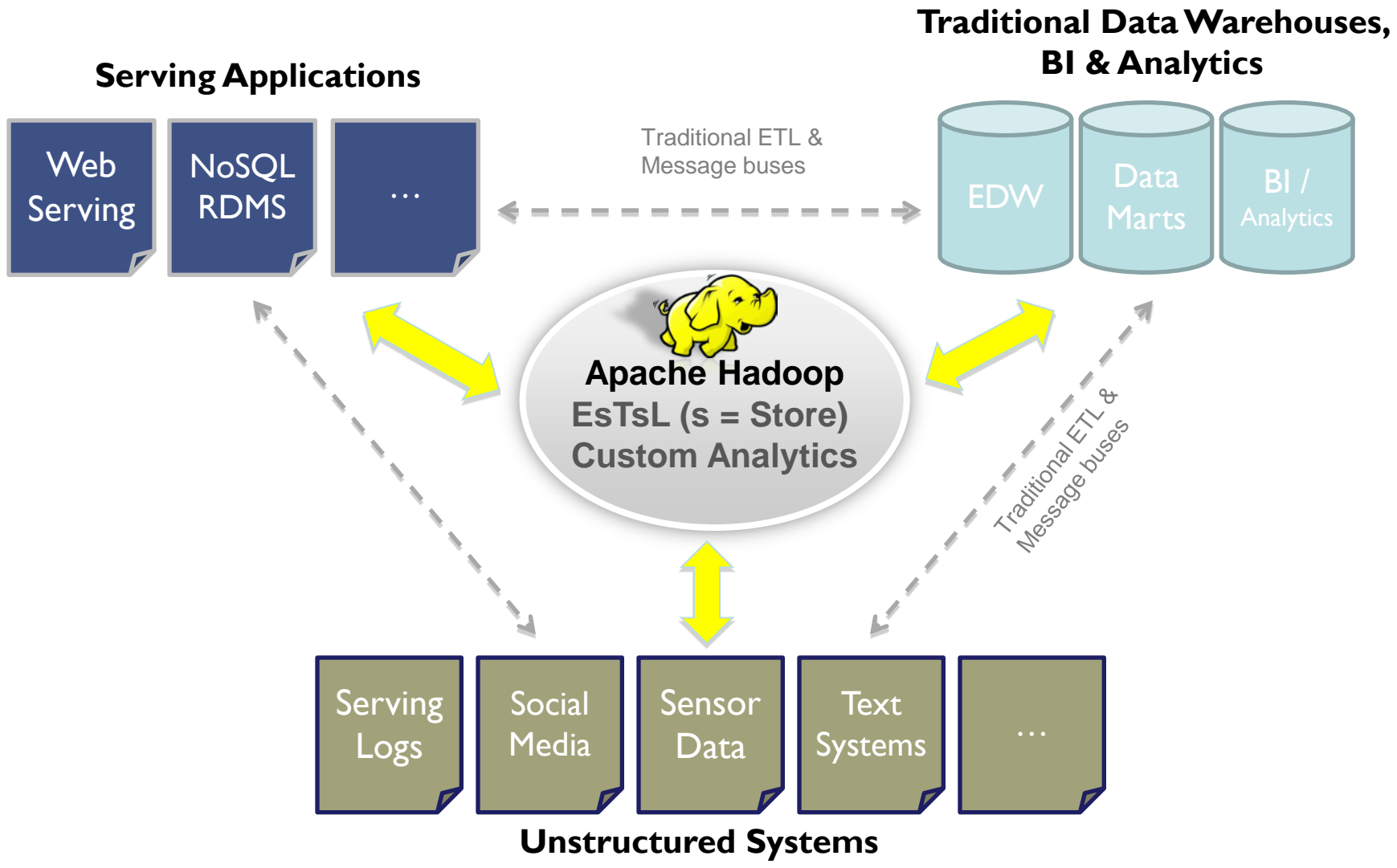
Traditional Enterprise Architecture

Data Silos + ETL



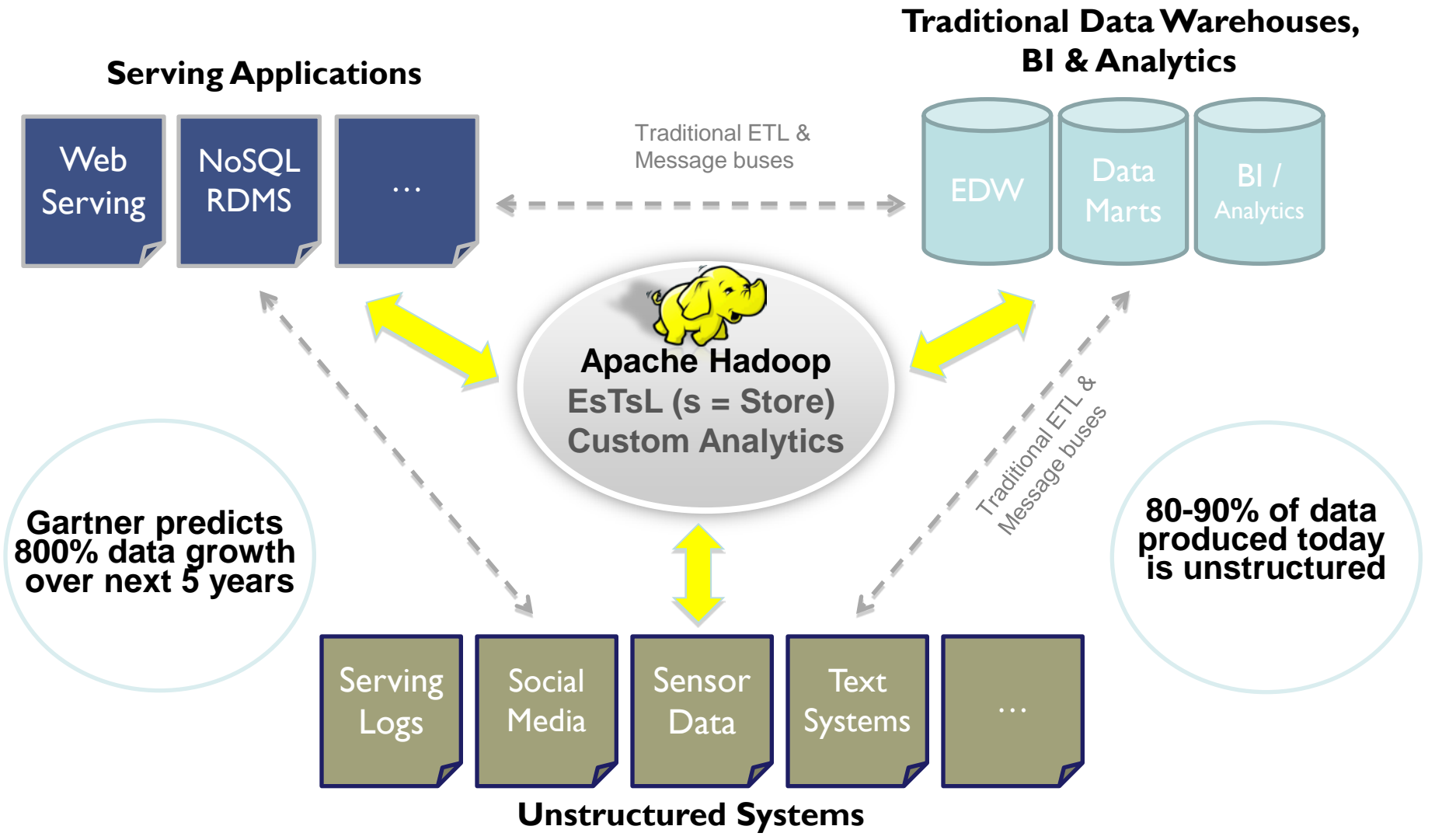
Hadoop Enterprise Architecture

Connecting All of Your Big Data



Hadoop Enterprise Architecture

Connecting All of Your Big Data



What is Driving Adoption?

❑ Business drivers

- ❑ Identified high value projects that require use of more data
- ❑ Belief that there is great ROI in mastering big data

❑ Financial drivers

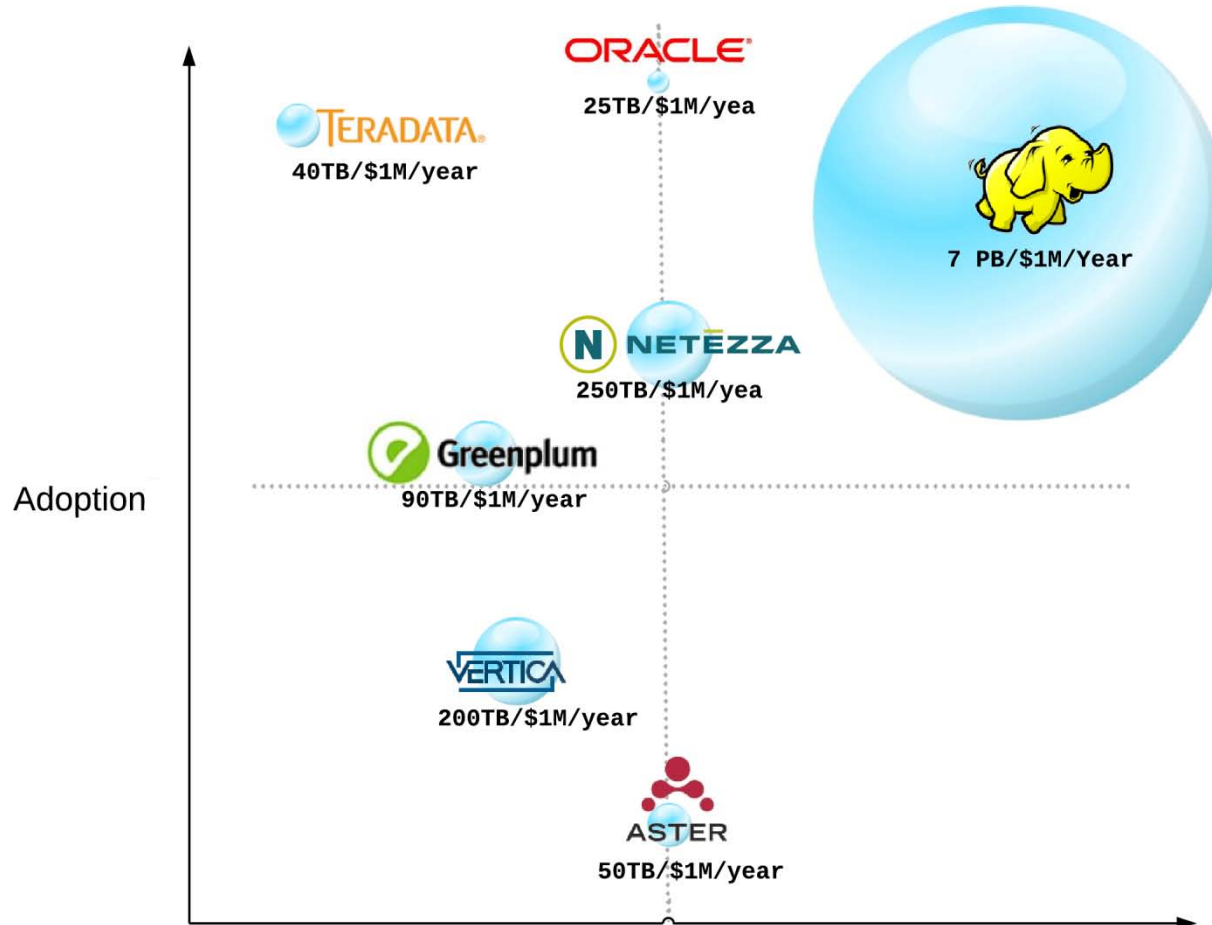
- ❑ Growing cost of data systems as proportion of IT spend
- ❑ Cost advantage of commodity hardware + open source
 - ❑ Enables departmental-level big data strategies

❑ Technical drivers

- ❑ Existing solutions failing under growing requirements
 - ❑ 3Vs - Volume, velocity, variety
- ❑ Proliferation of unstructured data

Big Data Platforms

Cost per TB, Adoption



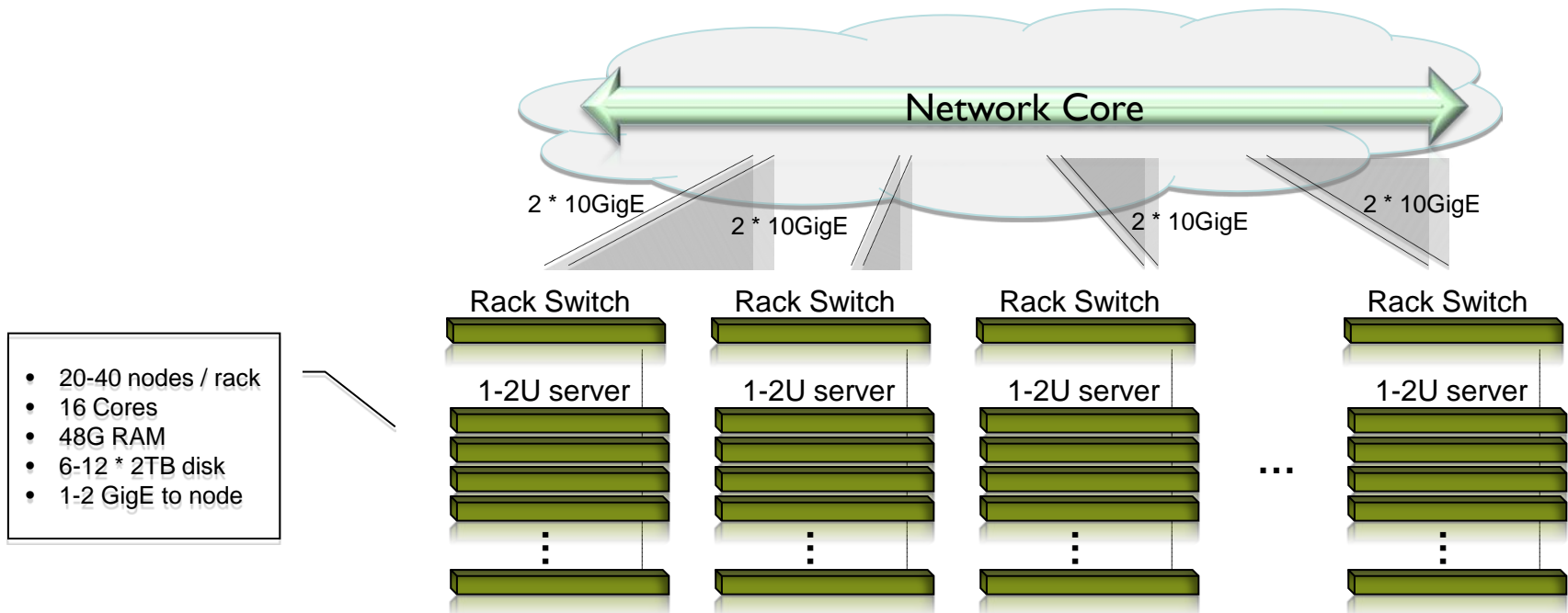
Size of bubble = cost effectiveness of solution

Source:

THINK BIG
ANALYTICS

Apache Hadoop Core

- ❑ Frameworks share *commodity* hardware
 - ❑ Storage - HDFS
 - ❑ Processing - MapReduce

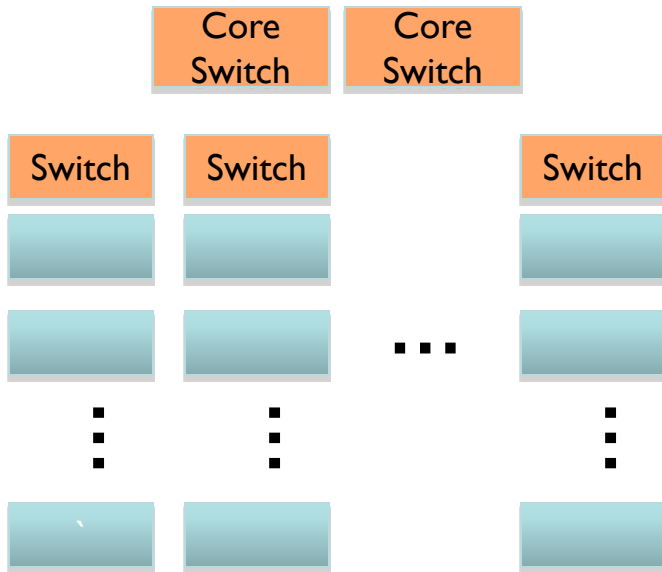


- ❑ Map/Reduce is a distributed computing programming model
- ❑ It works like a Unix pipeline:
 - ❑ `cat input | grep | sort | uniq -c > output`
 - ❑ **Input** | **Map** | **Shuffle & Sort** | **Reduce** | **Output**
- ❑ Strengths:
 - ❑ Easy to use! Developer just writes a couple of functions
 - ❑ Moves compute to data
 - ❑ Schedules work on HDFS node with data if possible
 - ❑ Scans through data, reducing seeks
 - ❑ Automatic reliability and re-execution on failure

HDFS: Scalable, Reliable, Managable

Scale IO, Storage, CPU

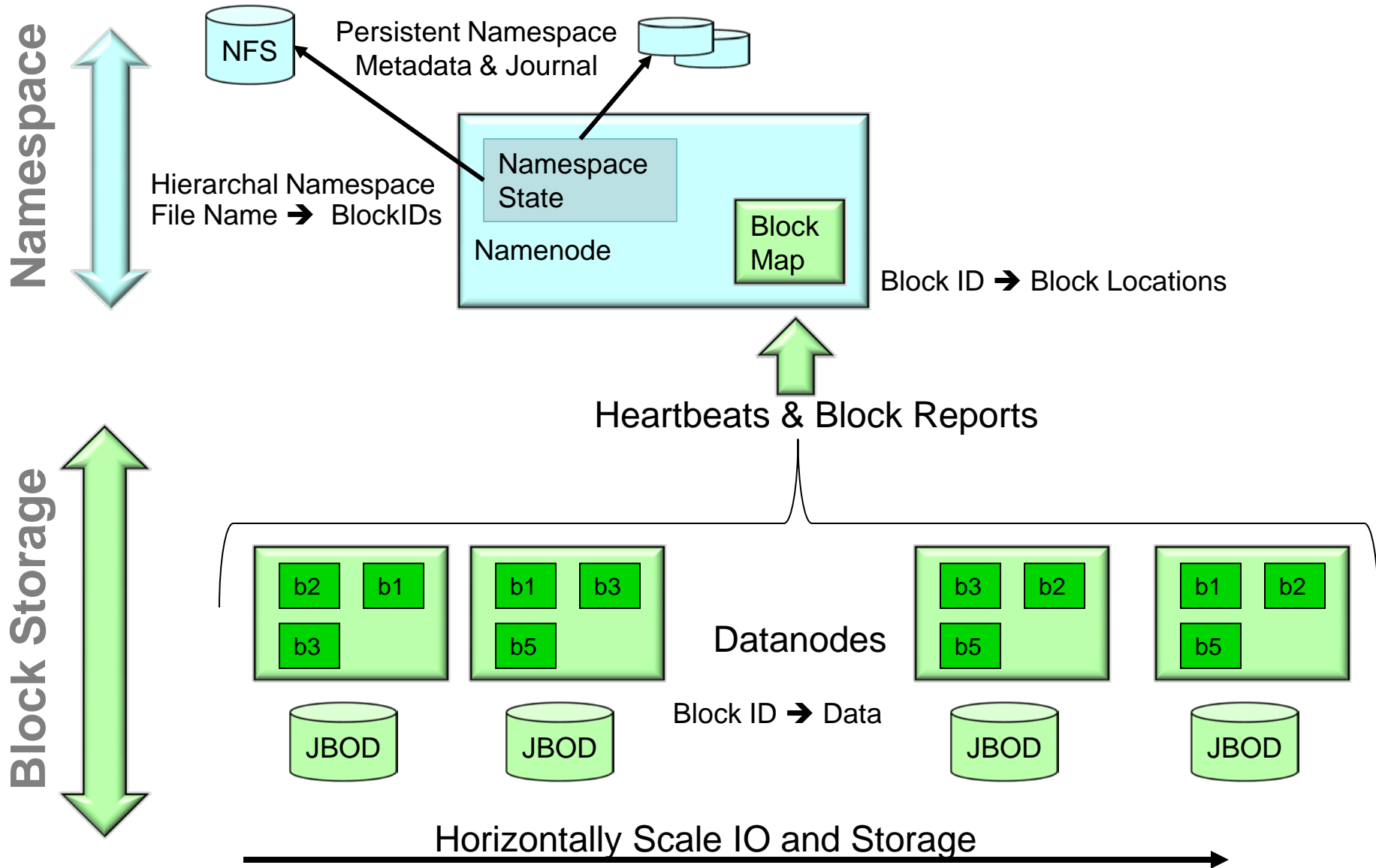
- Add **commodity** servers & **JBODs**
- 4K nodes in cluster, 80



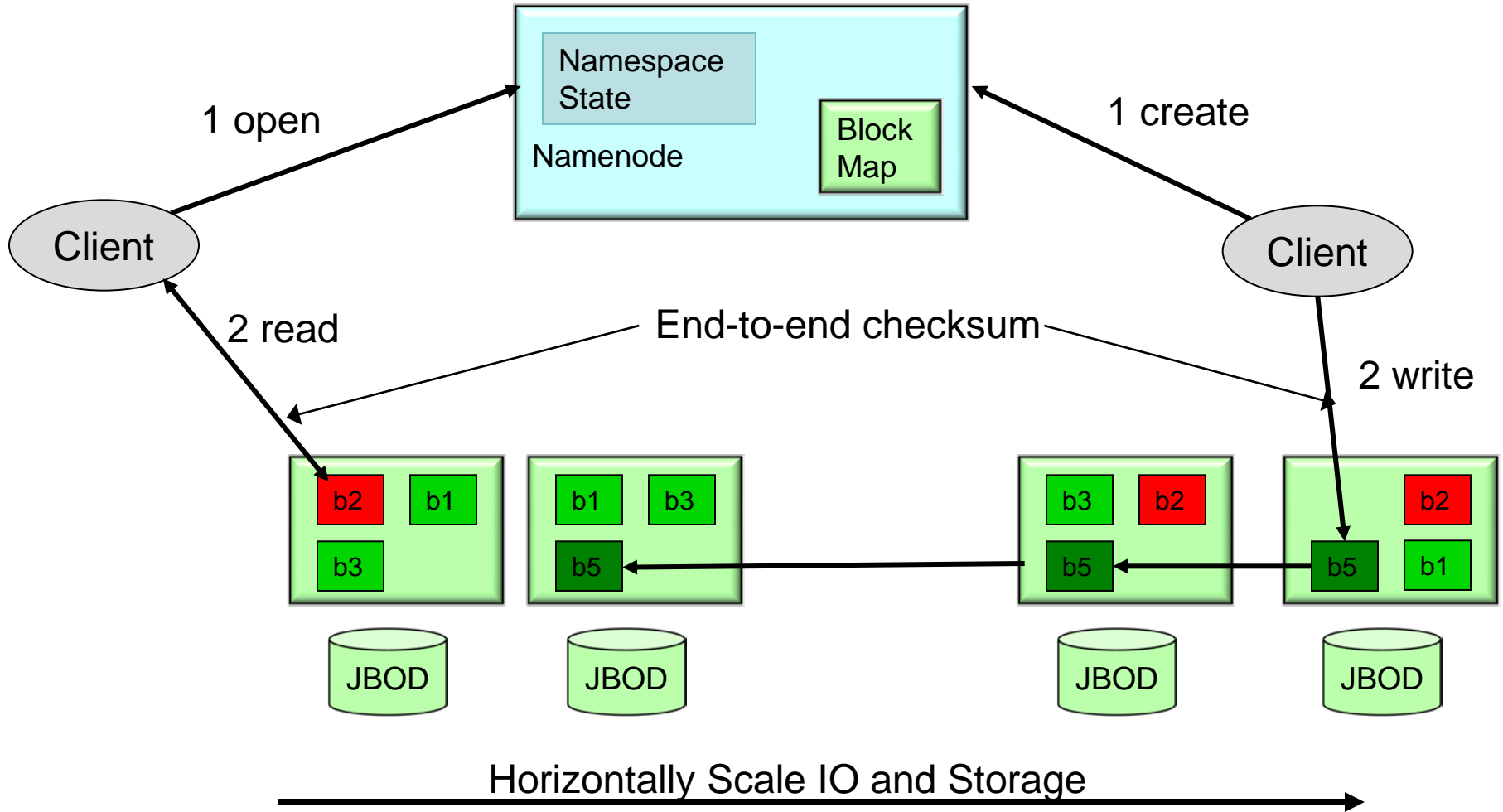
- ❑ Fault Tolerant & Easy management
 - ❑ Built in redundancy
 - ❑ Tolerate disk and node failures
 - ❑ Automatically manage addition/removal of nodes
 - ❑ One operator per 8K nodes!!
- ❑ Storage server used for computation
 - ❑ Move computation to data
- ❑ Not a SAN
 - ❑ But high-bandwidth network access to data via Ethernet
- ❑ Immutable file system
 - ❑ Read, Write, sync/flush
 - ❑ No random writes

- ❑ Petabytes of unstructured data for parallel, distributed analytics processing using commodity hardware
- ❑ Solve problems that cannot be solved using traditional systems at a cheaper price
 - ❑ Large storage capacity (>100PB raw)
 - ❑ Large IO/Computation bandwidth (>4K servers)
 - ❑ > 4 Terabit bandwidth to disk! (conservatively)
 - ❑ Scale by adding commodity hardware
 - ❑ Cost per GB \approx \$1.5, includes MapReduce cluster

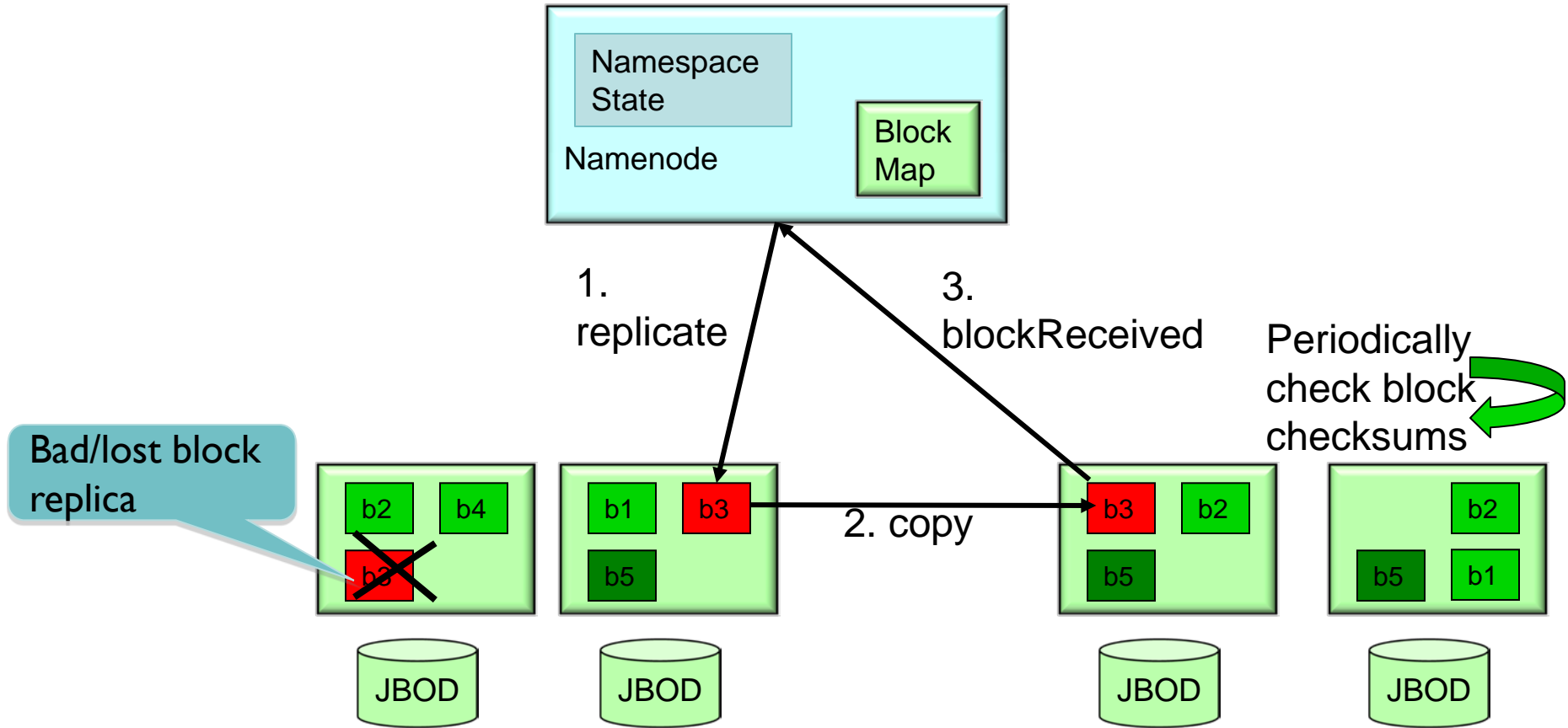
HDFS Architecture



Client Read & Write Directly from Closest Server



Actively maintain data reliability



- ❑ Hadoop ecosystem Database, based on Google BigTable
- ❑ Goal: Hosting of very large tables (billions of rows X millions of columns) on commodity hardware.
 - ❑ Multidimensional sorted Map
 - ❑ Table => Row => Column => Version => Value
 - ❑ Distributed column-oriented store
 - ❑ Scale – Sharding etc. done automatically
 - ❑ No SQL, CRUD etc.

What's Next

- ❑ **Founded** – July 1st, 2011
 - ❑ 22 Architects & committers from Yahoo!

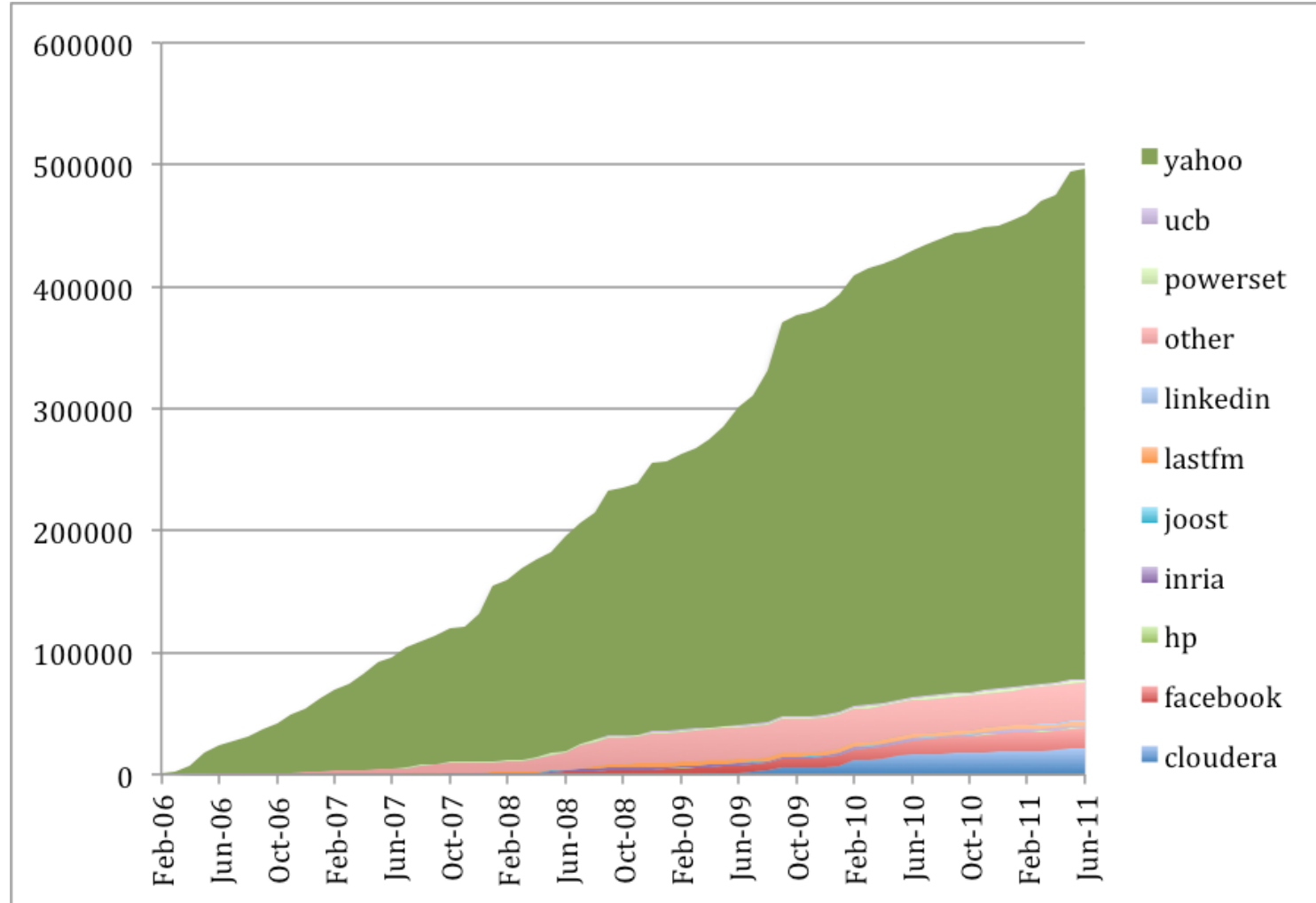
- ❑ **Mission** – Architect the future of Big Data
 - ❑ Revolutionize and commoditize the storage and processing of Big Data via open source

- ❑ **Vision** – Half of the worlds data will be stored in Hadoop within five years

- ❑ Support the growth of a huge Apache Hadoop ecosystem
 - ❑ Invest in ease of use, management, and other enterprise features
 - ❑ Define APIs for ISVs, OEMs and others to integrate with Apache Hadoop
 - ❑ Continue to invest in advancing the Hadoop core, remain the experts
 - ❑ Contribute all of our work to Apache

- ❑ Profit by providing training & support to the Hadoop community

Lines of Code Contributed to Apache Hadoop



Apache Hadoop Roadmap

Phase 1 – Making Apache Hadoop Accessible

2011

- Release the most stable version of Hadoop ever (Hadoop 0.20.205)
 - Frequent sustaining releases
- Release directly usable code via Apache (RPMs, .debs...)
- Improve project integration (HBase support)

Phase 2 – Next-Generation Apache Hadoop

2012

- Address key product gaps (HA, Management...)
- Enable partner innovation via open APIs
- Enable community innovation via modular architecture

(Alphas in Q4
2011)

□ Core

- HDFS Federation – Scale out and innovation via new APIs
 - Will run on 6000 node clusters with 24TB disk / node = 144PB in next release
- Next Gen MapReduce – Support for MPI and many other programming models
- HA (no SPOF) and Wire compatibility

□ Data - HCatalog 0.3

- Pig, Hive, MapReduce and Streaming as clients
- HDFS and HBase as storage systems
- Performance and storage improvements

□ Management & Ease of use

- Ambari – A Apache Hadoop Management & Monitoring System
- Stack installation and centralized config management
- REST and GUI for user & administrator tasks

Thank You!

Questions

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