



**Evaluator Group**

# Can Storage Fix Hadoop



John Webster, Senior Partner



# Agenda

- What is the Internet Data Center and how is it different from Enterprise Data Center?
  - How is the Apache Software Foundation (ASF) addressing the issues?
  - What needs fixing from the perspective of Enterprise Storage vendors and the Enterprise Storage world?
  - What are the proposed fixes?
  - Can Hadoop fix Enterprise storage?
  - Can the Internet Data Center/Enterprise Data Center Chasm be Crossed?
- FYI: I will use vendor names and products as examples only—no explicit or implied endorsements



# The Data Center Chasm



Internet  
Data  
Center



Enterprise  
Data  
Center



# Defining the Data Center Chasm



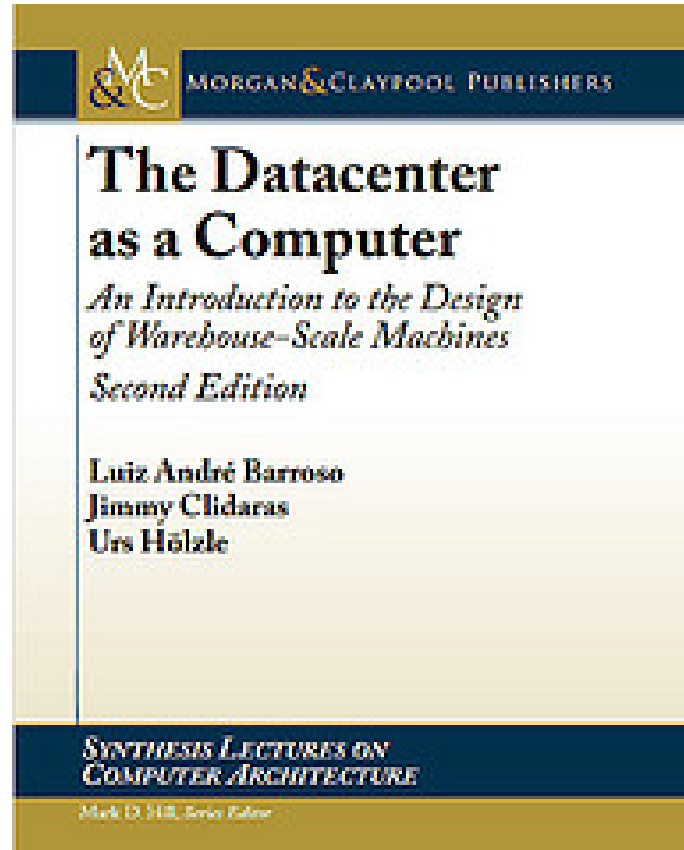
## Internet Data Center

- Embraces open source
- Automates IT
- Comfortable with systems that run in “failure mode”
- “Cheep and deep” – hardware inefficiency not an obvious issue
- More willing to build their own systems and self-support
- Manages storage from a systems perspective

## Enterprise Data Center

- Prefers proprietary but learning open source
- Approaches IT automation conservatively
- Doesn't get “failure mode”
- Hardware efficiency-conscious
- More willing to buy from proprietary vendors and deal with them for support
- Sees value in storage environment as a place for data and storage management





# What has the ASF Fixed in HDFS?

- NameNode SPOF
  - NameNode active/standby failover support
- Snapshot
  - Read-only Copy on Write (COW) included in latest v2 Beta (2.1.0)
- NFS support
  - Support for NFSv3 in latest v2 Beta (2.1.0)
- DR Support
  - Distributed Copy (distcp)



# What Needs to be Fixed – the Enterprise Storage Vendor Perspective

- Hadoop NameNode is a single point of failure in V1. Manual failover in v2 (Beta).
- JobTracker is also a single point of failure
- For data integrity and protection, HDFS creates three full clone copies of data
  - 3x the storage for each file – slow and inefficient
  - If all three copies are corrupted, you're still hosed (reload and start over)
- 60% of Enterprise Hadoop projects fail or are put on hold
- Steep learning curve—six months is not uncommon for those that actually go from pilot to production
- No storage tiering
- Limited (if any) ways to respond to corporate security and data governance policies
- Difficult to move between cloud and data center
- Fundamentally a batch process
- Data in/out processes can take longer than the actual query process
- Inability to dis-aggregate storage from compute so that the two can be scaled independently
- Dearth of applications built on top
- Dearth of people available in the job market to run this beast and the ones that can go for big bucks
- ....and more leading some analysts to believe that Big Data has entered the “trough of disillusion”



# What Needs to be Fixed— the Enterprise Storage Vendor Perspective

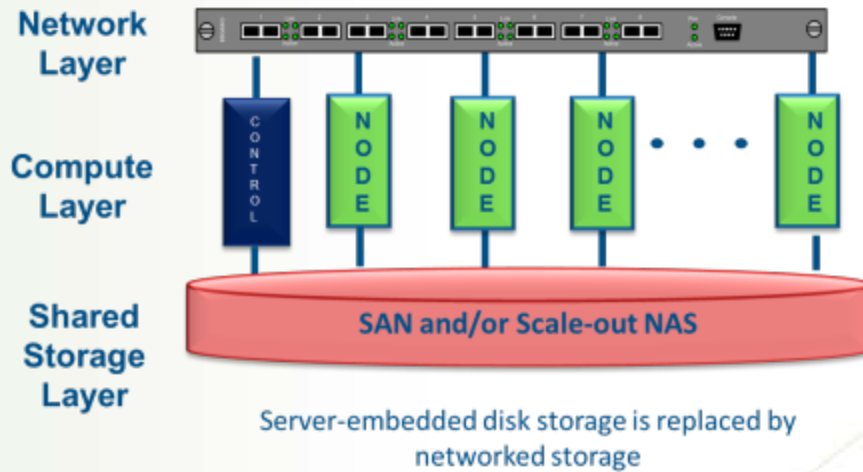
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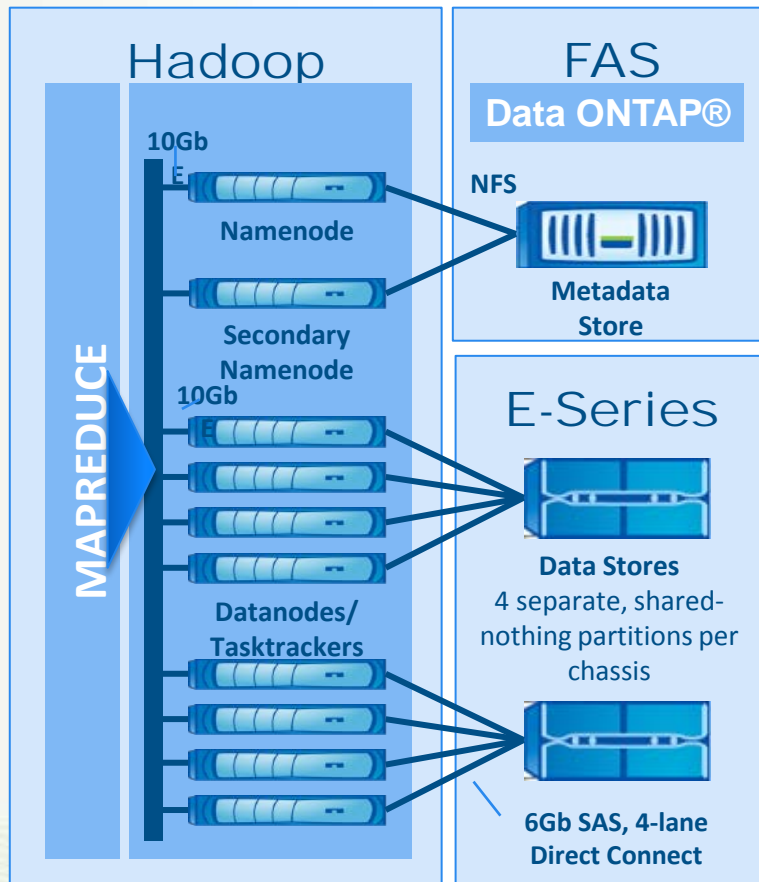


# Hadoop External Storage - EMC Isilon Example

- Shared storage replaces node-level DAS
- HDFS implemented as “over the wire” protocol on OneFS
- Isilon cluster nodes emulate NameNodes and DataNodes
- NameNode SPOF eliminated
- Decoupled storage and compute layers
- Data protection and DR by OneFS



# Hadoop External Storage - NetApp Example



- Preserves shared nothing architecture and HDFS
- Decouple compute and storage
- Hardware RAID: reduction in copies from 3 to 2
- NameNode metadata in separate array for faster NameNode recovery
- Datanode drive failures do not “blacklist” the Datanode
- Apply built-in enterprise data and storage management functionality to Hadoop data

Source: NetApp



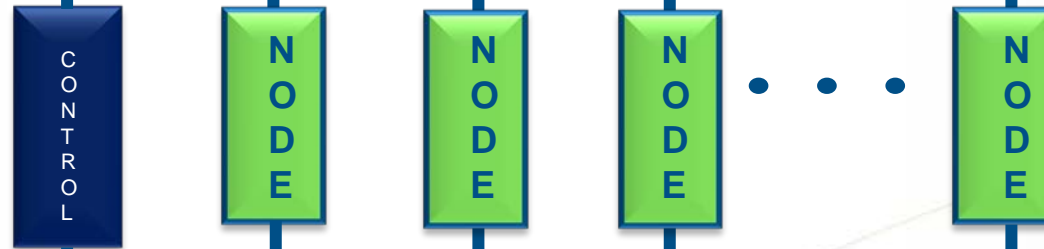
# Shared Storage as Secondary Storage



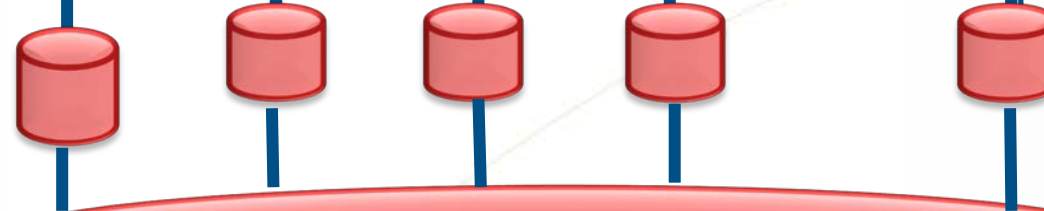
**Network Layer**



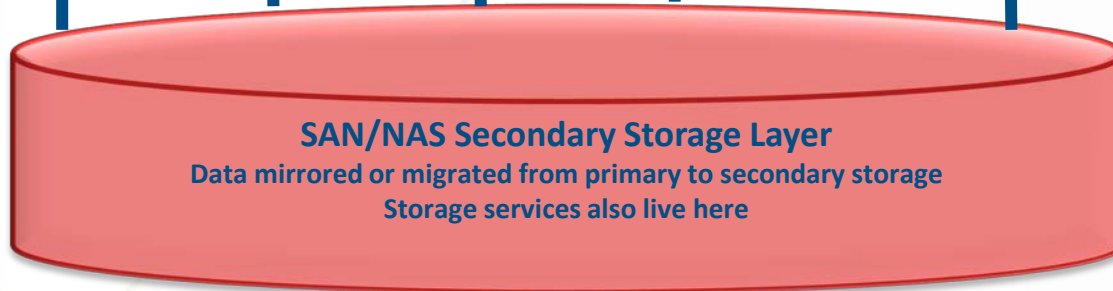
**Compute Layer**



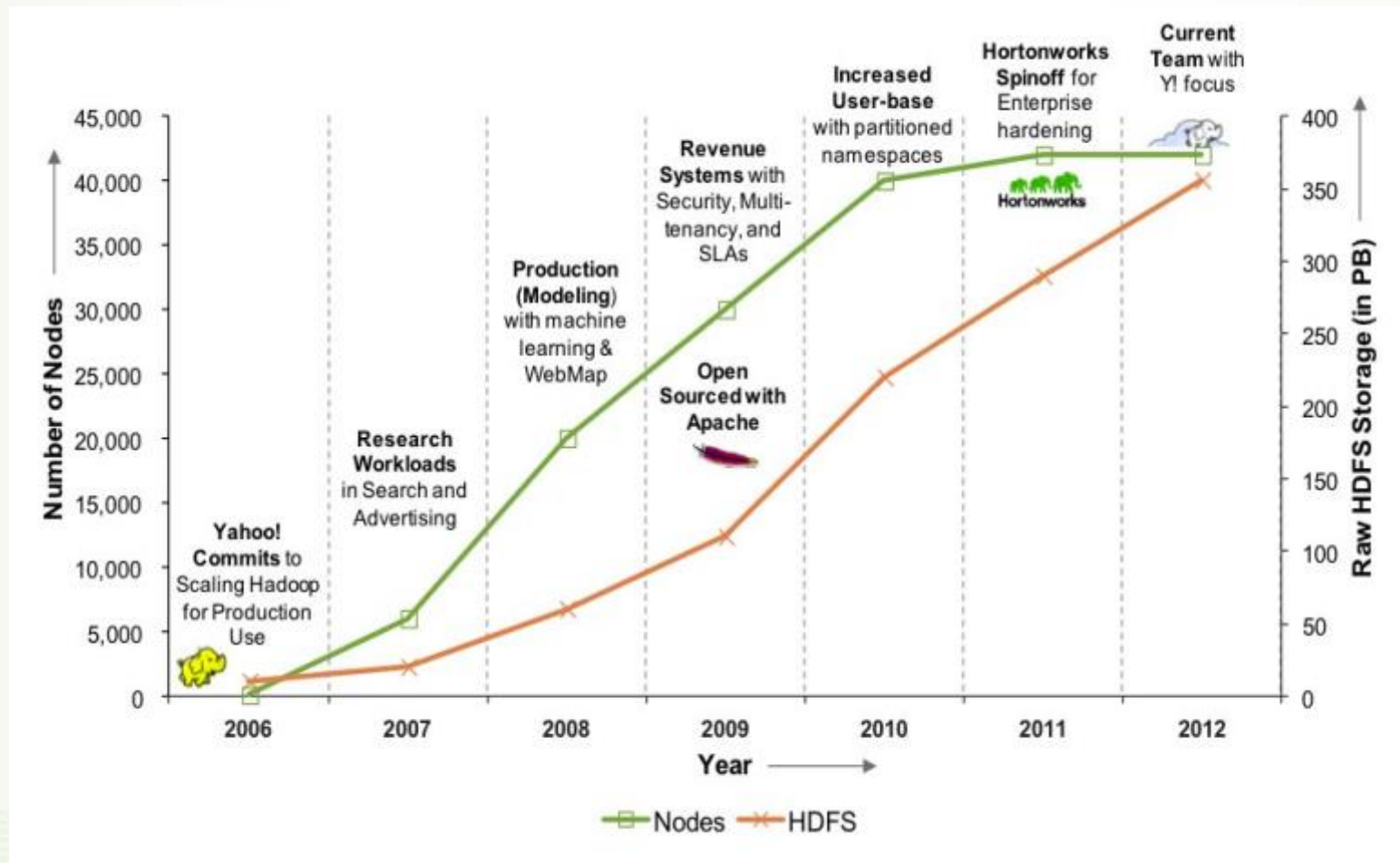
**Primary Storage Layer**



**Secondary Storage Layer**



# Progression of Hadoop @ Yahoo!



Source: Yahoo!

# Is Hadoop a new Storage Platform?

## No

- It's a distributed computing platform for analytics

## Yes

- HDFS - Embedded, distributed file system (like scale-out NAS)
- Data protection and management built-in (like Enterprise Storage)
- Storage performance at scale and low cost and with native intelligence
- Growing use case as data repository for existing enterprise BI and Data Warehousing apps – the “Data Lake”



# What Does the Enterprise Want from Big Data?



“If we could harness all of our data, we would be a much stronger business.”\*

\* From CompTIA survey where two thirds of respondents either agreed or strongly agreed with the statement



# Can the Chasm Be Crossed?



Internet  
Data  
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