

# cloudera

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Hadoop Data Engineering  
In the Cloud

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\$ whoami

**cloudera**<sup>®</sup>

Software Engineer, Cloudera



Apache Hadoop Committer/PMC

# Overview

- Cloud Adoption
- Cloud Deployment Model
- Cloud Connectors
- Cloudera Altus

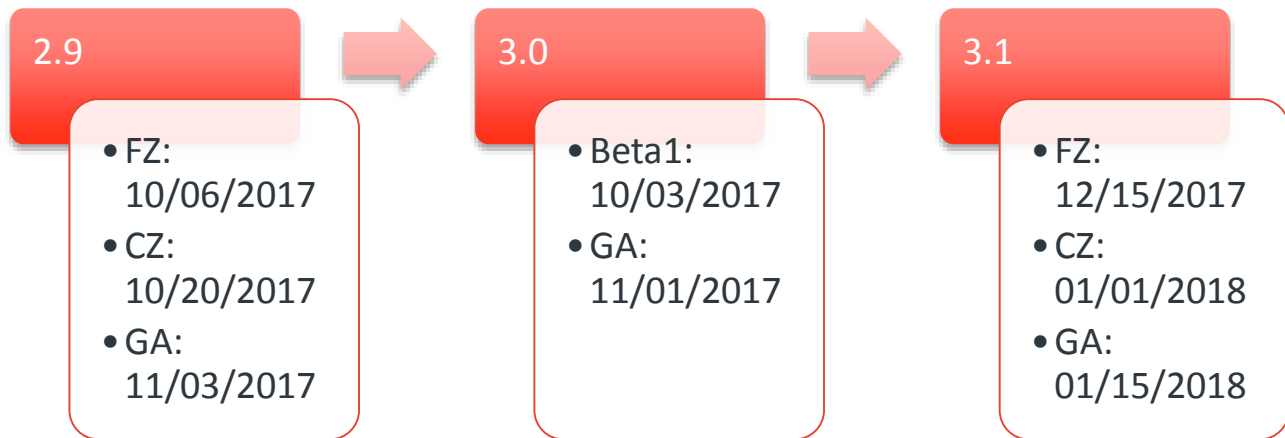
# Hadoop 3.0.0-beta1!!

Vote it, download it, use it and file bug reports!

<http://home.apache.org/~wang/3.0.0-beta1-RC0/>



# Future Hadoop Release Plan



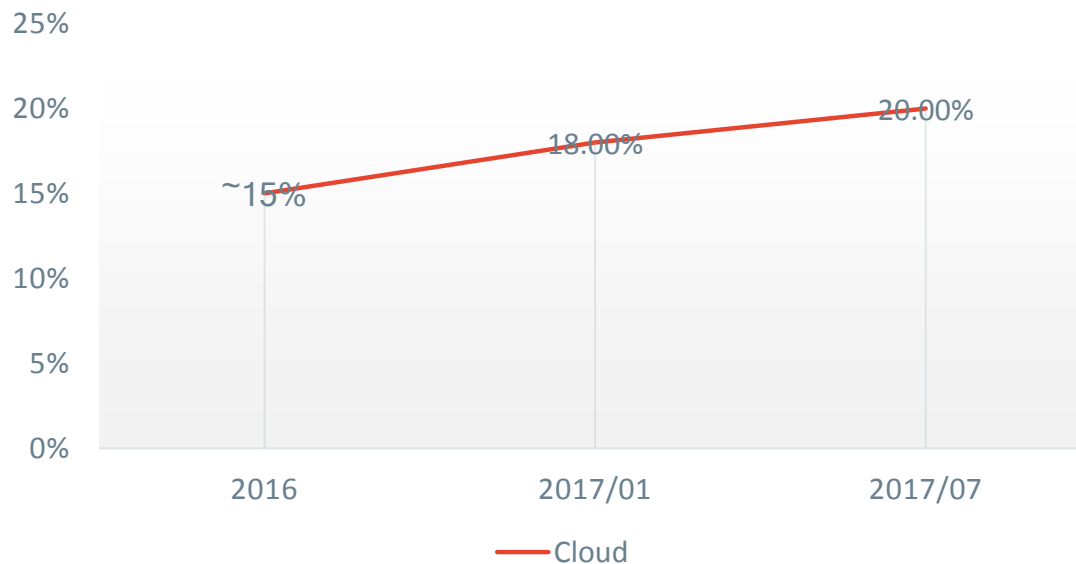
“Production deployment sponsor”

<https://cwiki.apache.org/confluence/display/HADOOP/Roadmap>

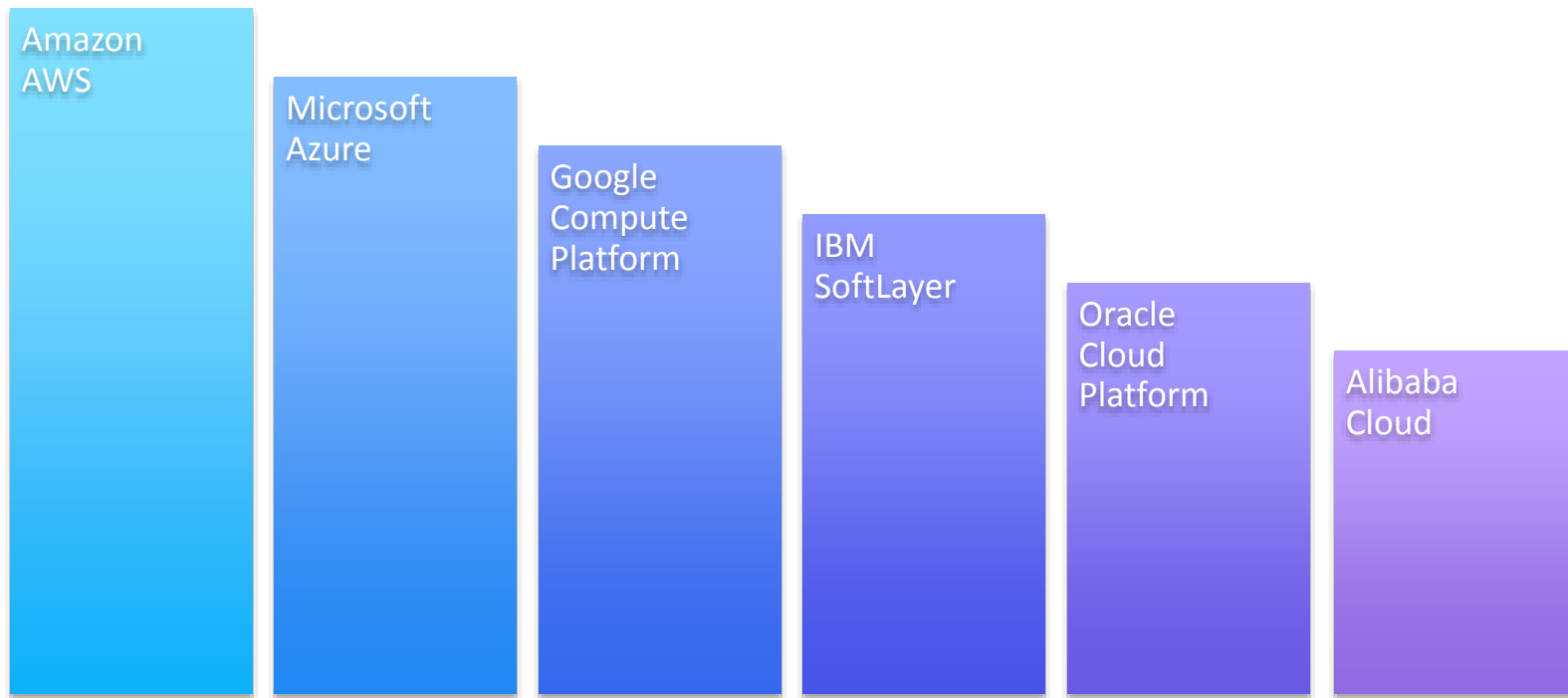
# Cloud Adoption

Cloud adoption rate among Cloudera's customers

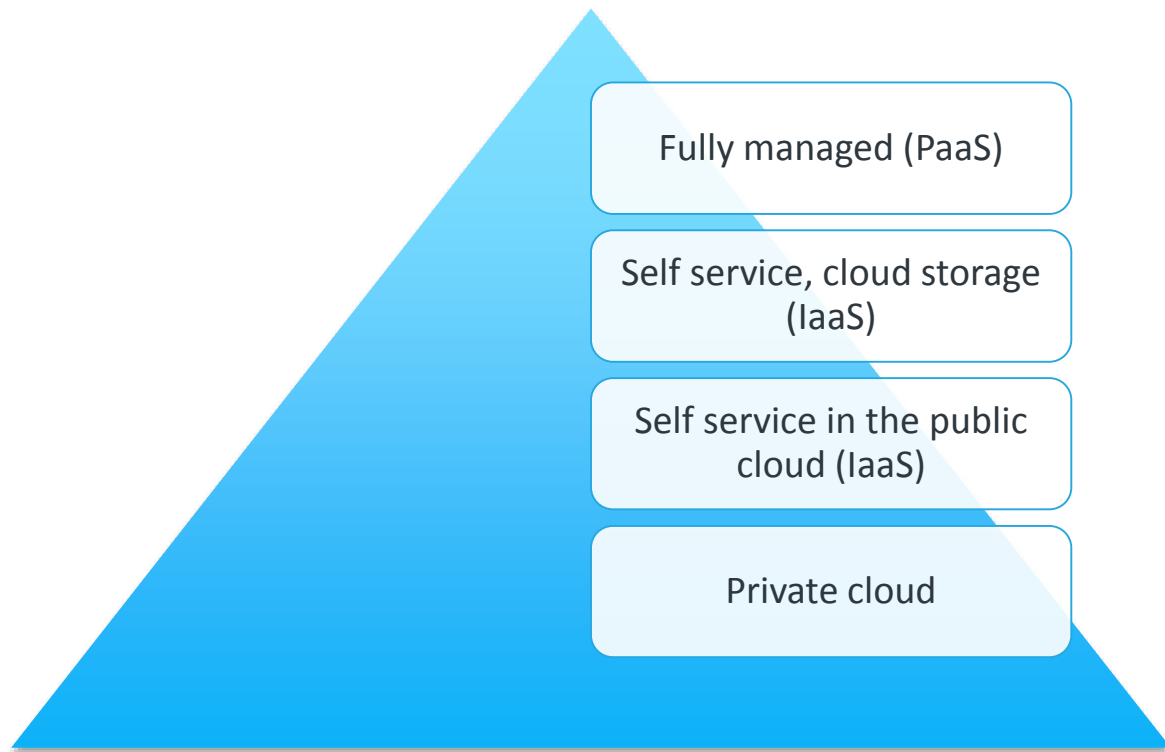
\* Global 8000



# Cloud Infrastructure Market Share



# Cloud Deployment Model



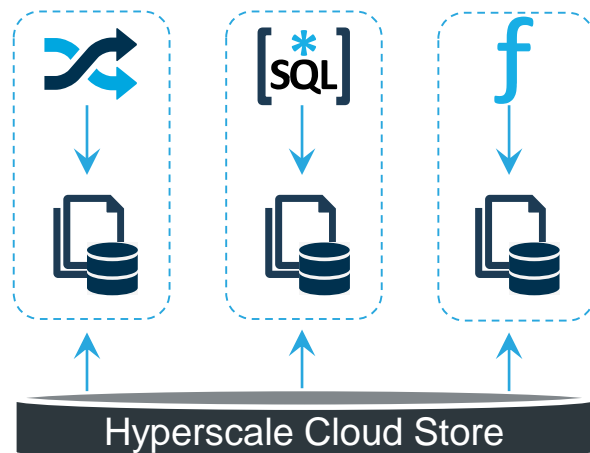
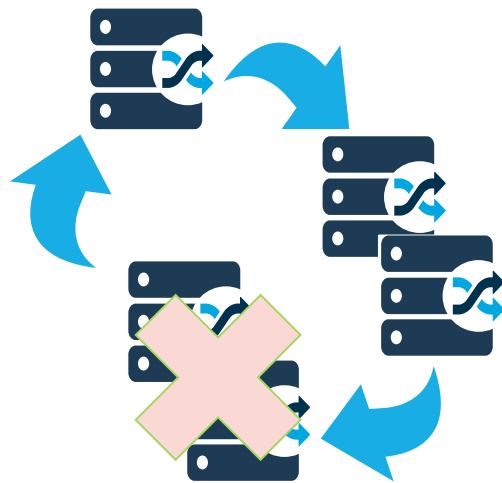
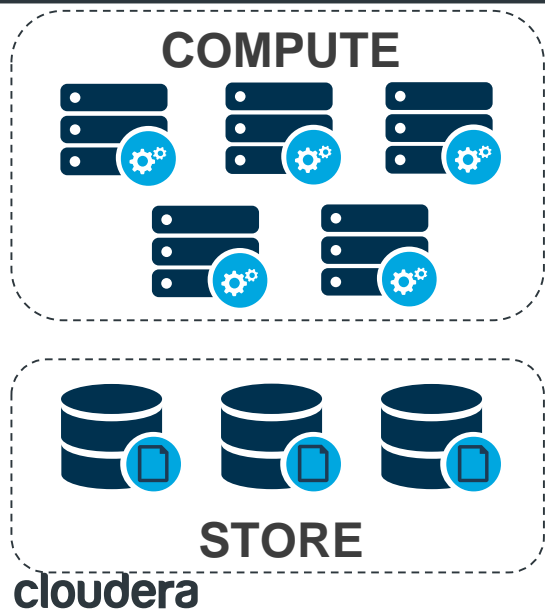


# Cloud-native architecture

Grow Storage and Compute Discretely for Efficiency

Embrace Transience for Lower Costs

Compartmentalize for Optimal Performance



# Private Cloud

# Cloudera Enterprise Reference Architecture for OpenStack

Private cloud vs bare metal [http://www.cloudera.com/documentation/other/reference-architecture/PDF/cloudera\\_ref\\_arch\\_redhat\\_osp11.pdf](http://www.cloudera.com/documentation/other/reference-architecture/PDF/cloudera_ref_arch_redhat_osp11.pdf)

Red Hat Open Stack Platform 11  
CDH 5.11+

Network topology tradeoffs

Compute: CPU/memory over-subscription ratio 1:1

Storage: ephemeral, local storage (Cinder + LVM)

- Cloudera does not support Ceph nor Swift storage systems.

Hadoop Virtualization Extensions (HVE)

# Cloud storage

# Cloud connectors

Cloudera “Full  
stack support”

s3a://

adl://

wasb://

Hadoop community  
support

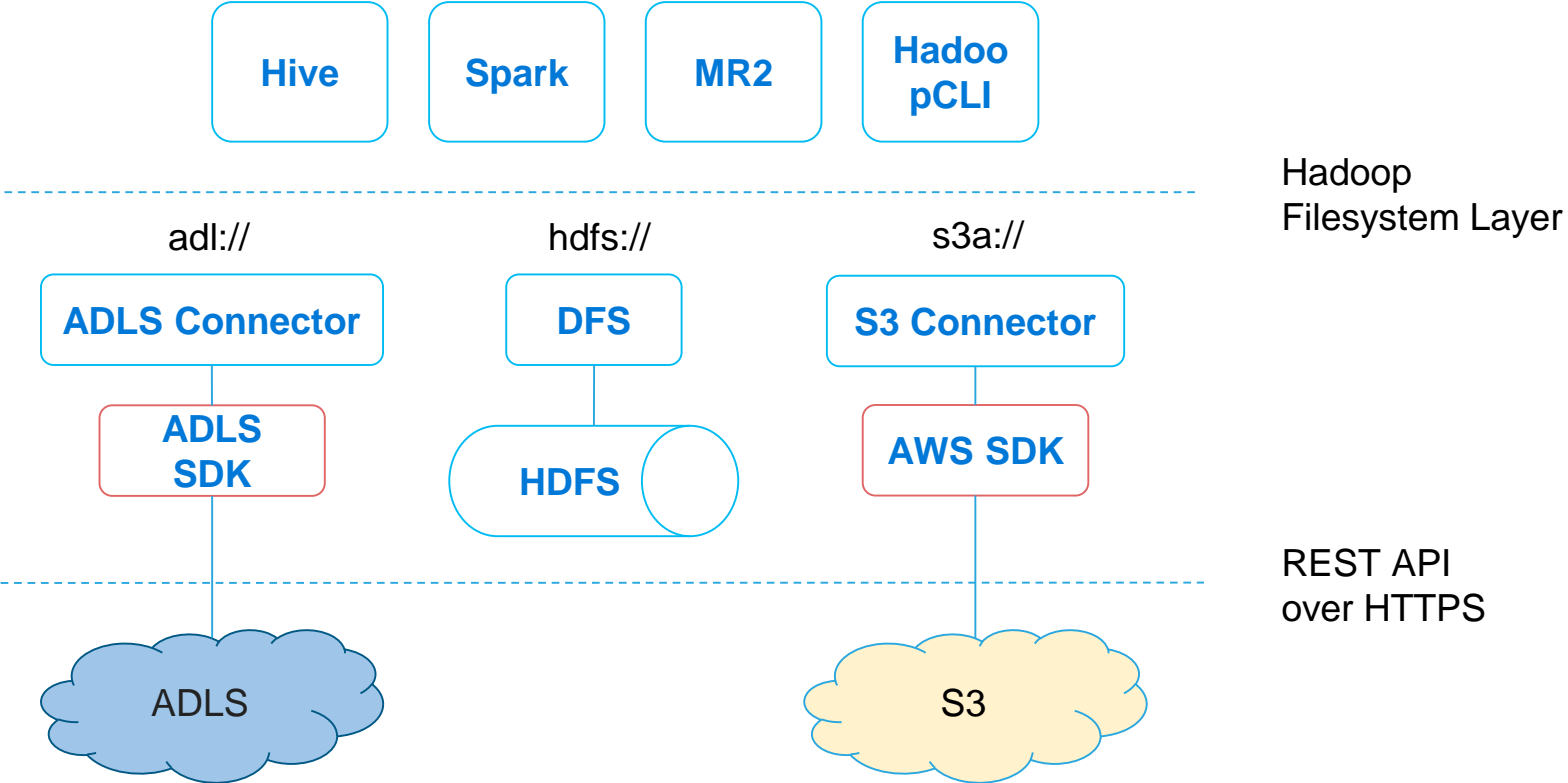
swift://

oss://

Unsupported/ext  
ernal support

gcs://

# Hadoop Cloud Connector Stack



# S3 Connectors

# S3 Connectors



Removed from Hadoop 3

Hadoop 2 ~ 2.6

Hadoop 2.7 ~



# S3 connector made easy

cloudera MANAGER

## Add Service to Cluster 1

Select the type of service you want to add.

Administration ▾

Settings

Alerts

Users

Security

License

Language

AWS Credentials

Altus Credentials

☐ S3 Connector

The S3 Connector Service securely provides a single set of AWS credentials to Impala and Hue. This enables Hue administrators to browse the S3 filesystem and define Impala tables backed by S3 data authorized to that AWS identity, and also enables Impala users to query S3-backed tables without directly providing AWS credentials, subject to having the proper permissions defined via Sentry. The S3 Connector only supports the S3A protocol.

## S3: An Inconvenient Truth

### Eventual consistency

(n.) if no new updates are made to a given data item, **eventually** all accesses to that item will return the last updated value.

--- Wikipedia

That means,

- Many applications using S3 connector simply fail flat.
  - FileNotFoundException
  - Distcp
  - Oozie
  - Multi-step ELT

# S3Guard: Improved Consistency for S3A (HADOOP-13345)

“See-guard”

Based on S3A (shipped in Hadoop 2.6)

Inspired by Netflix’s [S3mper](#)

Hadoop 3.0.0-beta1 / CDH 5.11.0

Development 07/2016 ~ 09/2017

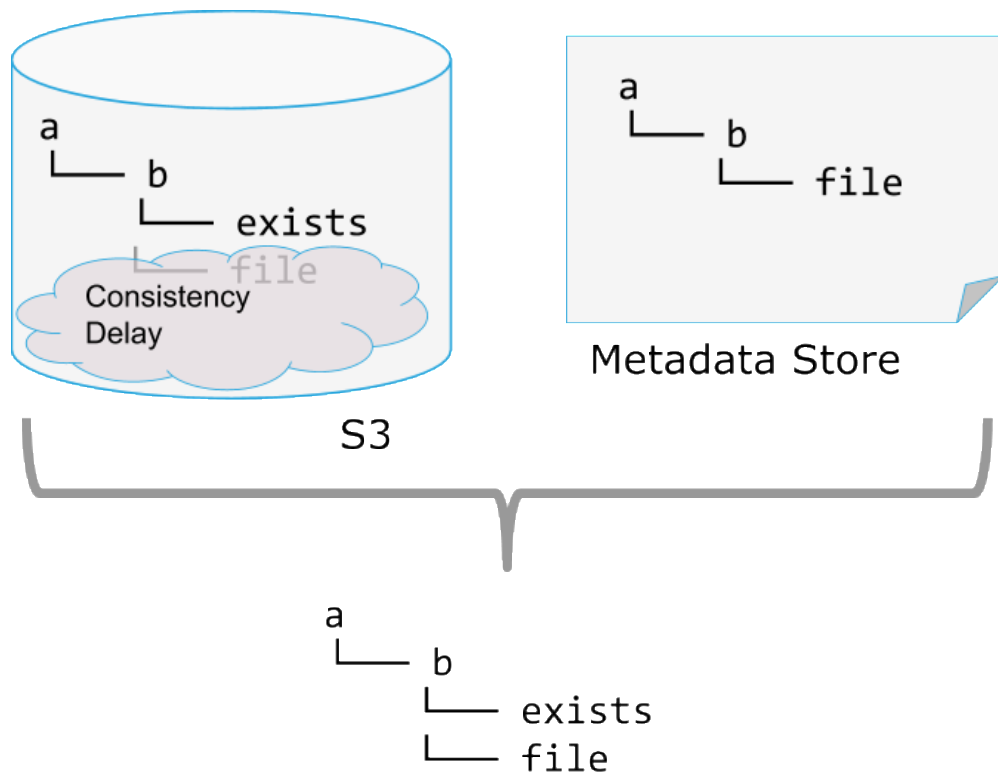
Consistent Metadata Store

DynamoDB

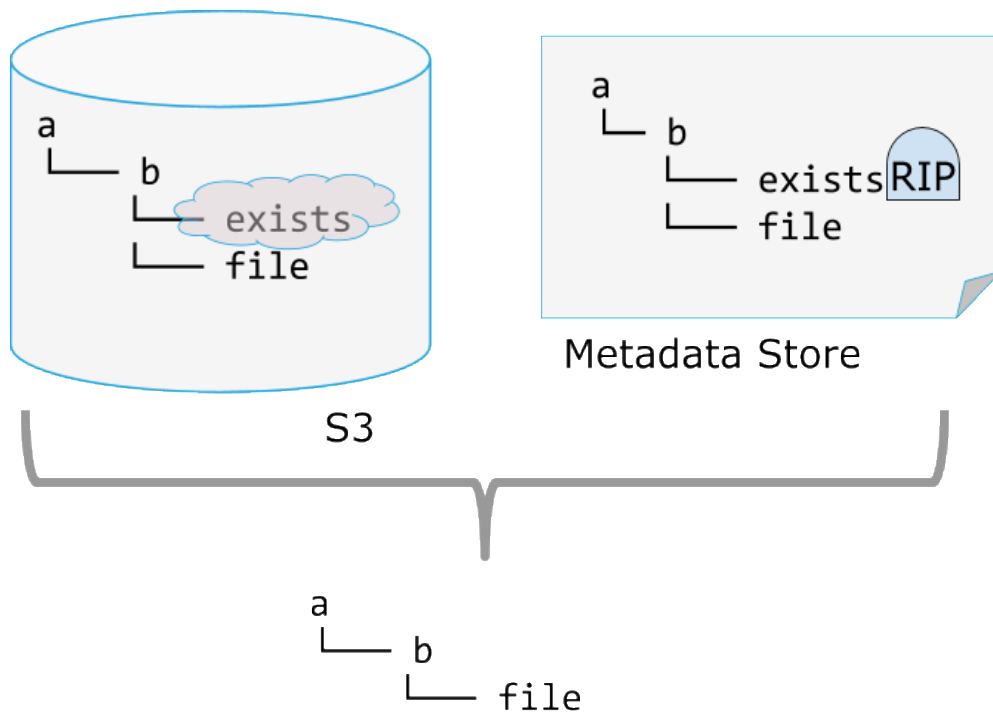
Joint effort between Hortonworks and Cloudera

Steve Loughran, Chris Nauroth, Mingliang Liu, Aaron Fabbri, Sean Mackroy, Lei Xu...

## List after create



# Delete tracking



# S3 Connector Future Development

The story doesn't end here...

S3A optimization (2.8, and post 2.8)

Upgrade to latest CDH (CDH5.11/5.12/5.13) if the primary use case is S3

O(1) rename

Support Amazon Snowball

[HADOOP-14831](#), [HADOOP-14825](#), [HADOOP-13204](#)

# ADLS

# ADLS Support

- **Azure Data Lake Store** is a hierarchical file system accessed through a REST API
- Acts as a persistent storage layer for CDH clusters running on Azure.
- Unlike S3, ADLS more closely resembles HDFS behavior
  - Consistent, directory structure, POSIX ACLs
- Support for MR, Hive on MR, and Spark 1.6x
- Accessed via the 'adl' connector (analogous to 's3a'):  
`adl://<data_lake_store_name>.azuredatalakestore.net`



# ADLS Cost Comparison

	Premium	Standard	ADLS
Cost / TB	\$135	\$77	\$26
Effective Cost / TB*	\$405	\$231	\$26
1M reads	\$0	\$0.036	\$1
1M writes	\$0	\$0.036	\$5
Target Application	(Best Perf)	Analytic DB	Data Engineering

\* Assuming 3x HDFS replication

# Preliminary Performance Considerations

- General considerations
  - Increase I/O concurrency for throughput
  - Expect higher latency per request compared to HDFS
  - Optimization to avoid rename is not necessary
- DistCp tip
  - Build copy list in parallel with option “-numListstatusThreads”
  - Parallel copy one large file (CDH5.12 and above)

# Fun facts

- ADLS connector had two versions
  1. V1 was based on Hadoop WebHDFS protocol.
  2. V2 is based on Hadoop Compatible File System interface.
- Microsoft Azure team is very cooperative.
- Trash handling
- HBase on ADLS: design decision WAL on HDFS
- MapReduce staging files shuffle files on HDFS.

# Fully Managed PaaS

# Fully Managed (PaaS)

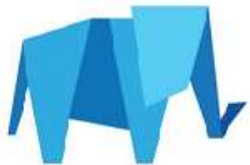


Amazon EMR

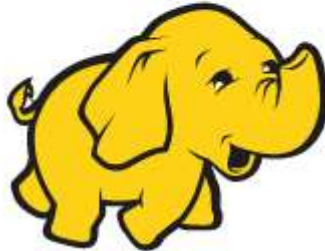
HDInsight



databricks<sup>®</sup> Google Cloud Platform



IBM  
BigInsight  
Big SQL



cloudera



altiscale

# Cloudera Altus™

## Platform-as-a-service

Now it's easier than ever to process big data in the cloud.

Learn more at [cloudera.com/altus](https://cloudera.com/altus)

- Move processing to the cloud without risk
- Focus on your workload, not cluster operations
- Simplify and unify your analytics



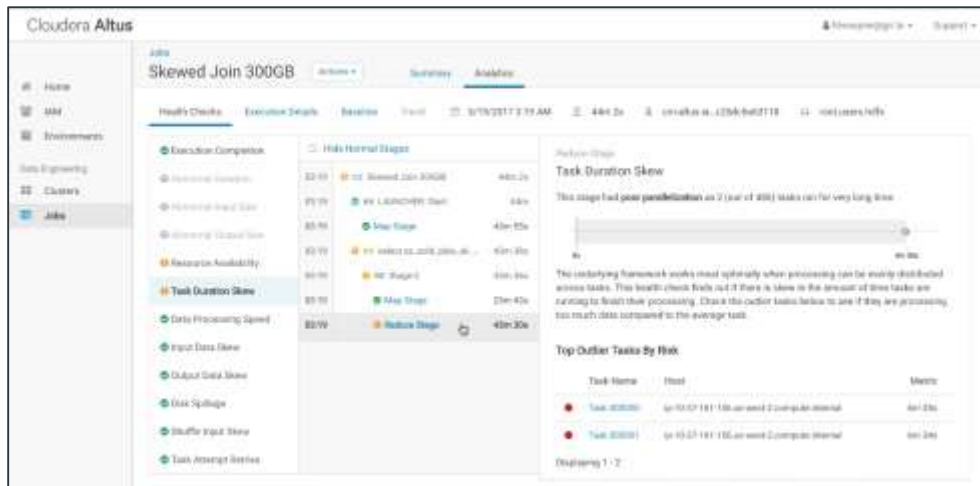
# Everything you don't have to do

- Install any software to start working
- Install any hardware
- Worry about cluster configuration
- Upgrade/reconfigure clusters
- OS upgrades/patching
- Resource Management



# Workload troubleshooting and analytics

- Troubleshoot jobs after cluster termination through job log and configuration browsing
- Insight into causes of job failure
- Identification and root cause analysis of slow jobs



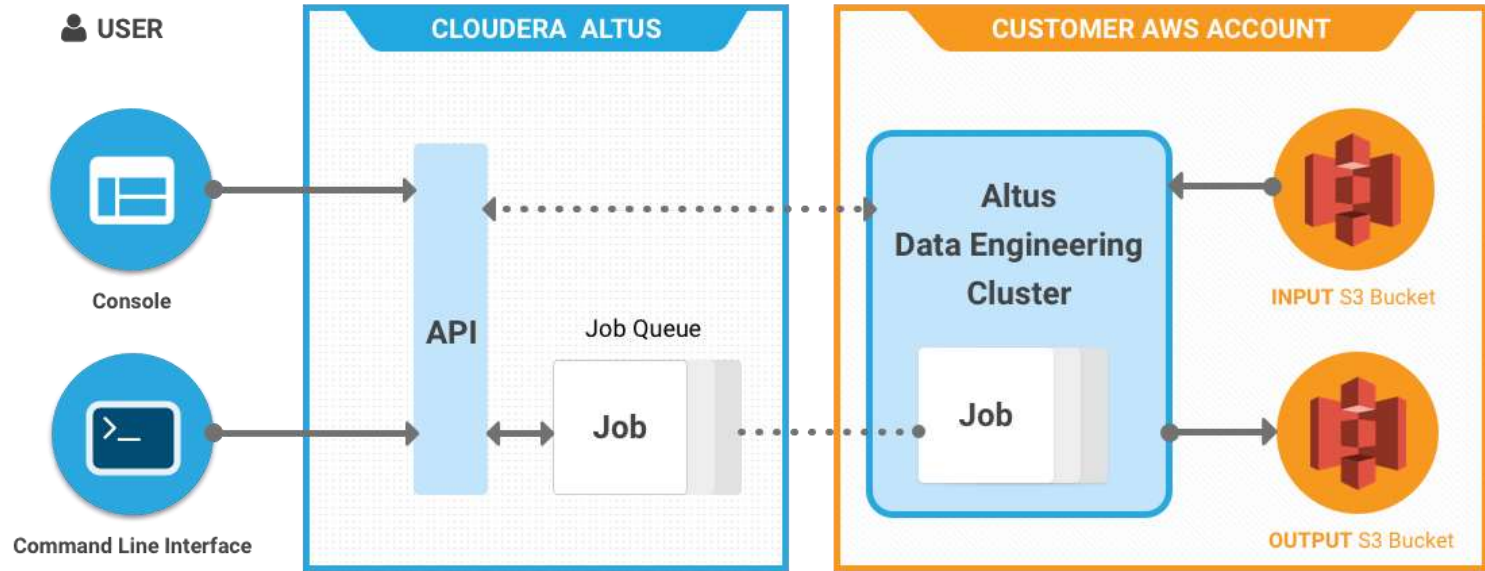


<https://console.altus.cloudera.com>

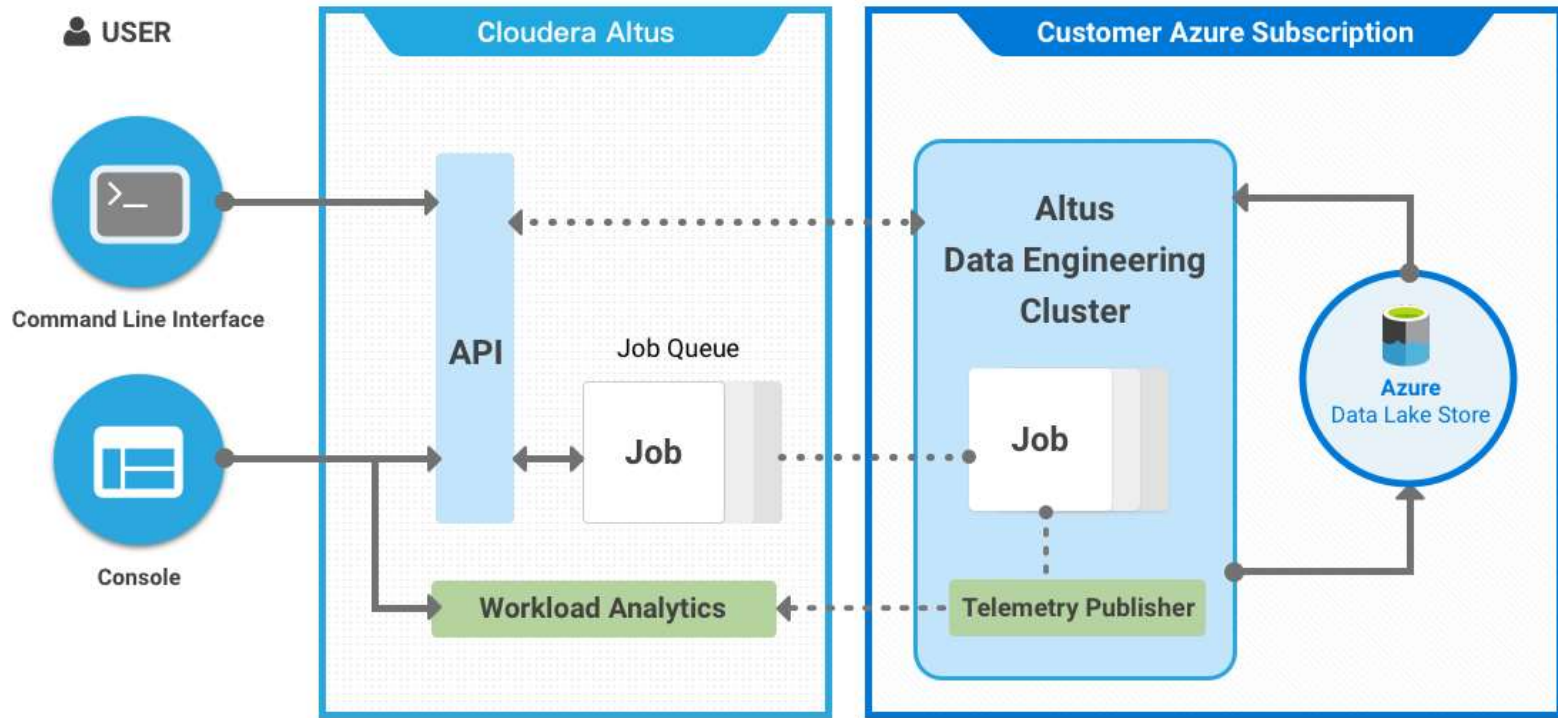
The screenshot displays the Cloudera Altus console interface. At the top, the header shows 'Cloudera Altus' and a user profile 'jwu@cloudera.com' with a 'Support' link. Below the header, a navigation sidebar on the left lists 'Home', 'IAM', 'Environments', 'Data Engineering', 'Clusters', and 'Jobs'. The main content area is divided into several sections:

- Summary Cards:** A row of five cards showing 'Jennifer's Home' (1), 'My Running Jobs' (0), 'My Queued Jobs' (0), 'Running Clusters' (9), and 'Environments' (31).
- Job Activity:** A section titled 'Job Activity' with a subtitle 'Last 5 jobs run in last 24 hours. View All'. It includes a 'Submit Jobs' button and a table with columns 'Name', 'Status', 'Cluster', and 'Start Time'. The table contains one entry: 'Spark Medical Demo' with status 'SP', cluster 'jwu-spark-west1', and start time 'a few seconds ago'.
- Running Clusters:** A section titled 'Running Clusters' with a 'Create Cluster' button. It displays a list of environments with their respective cluster counts: 'cloudera-sase-us-west-2' (3 clusters), 'nav\_nmc' (2 clusters), 'mastodon-test' (1 cluster), 'altus-eng-env\_vinithra' (1 cluster), 'cloudera-sase-eu-west-1' (1 cluster), and 'jwu-demo-west1' (1 cluster).
- What's New:** A section on the right titled 'What's New' containing three items: 'Altus General Availability' (describing Altus as a new Platform-as-a-service), 'Environments' (describing the quickstart wizard), and 'Clusters' (describing the configuration of data engineering clusters).

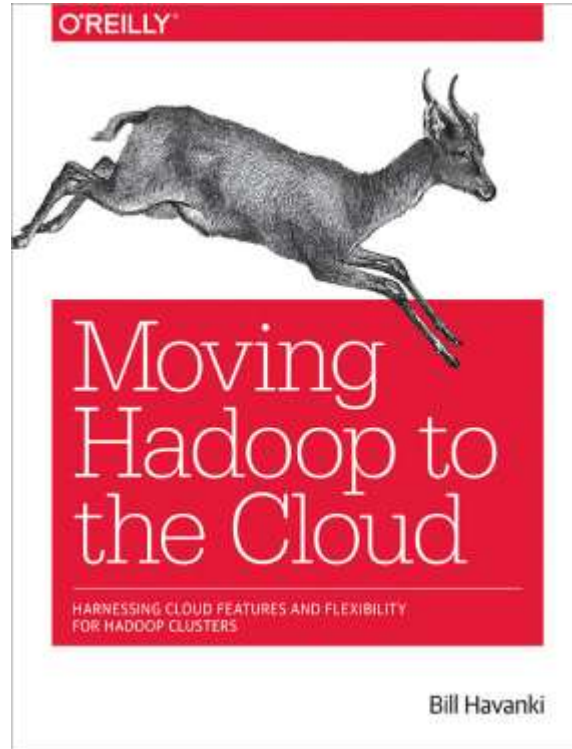
# Altus Service Architecture



# Altus on Azure (beta) coming soon



# Altus Demo



# Questions?

# Thank you

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Wei-Chiu Chuang