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~~Hadoop~~ Data Engineering In the Cloud

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$ whoami

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/

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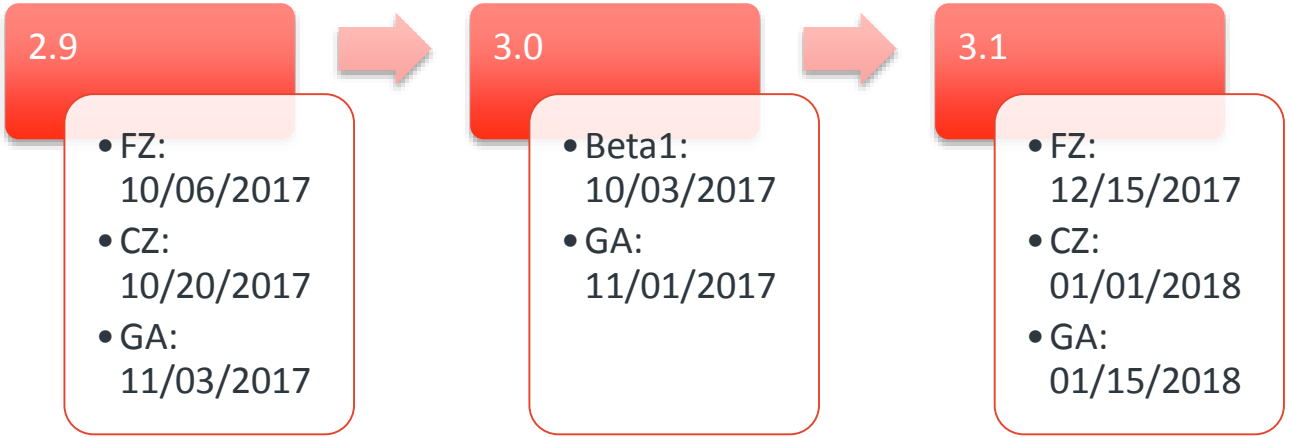
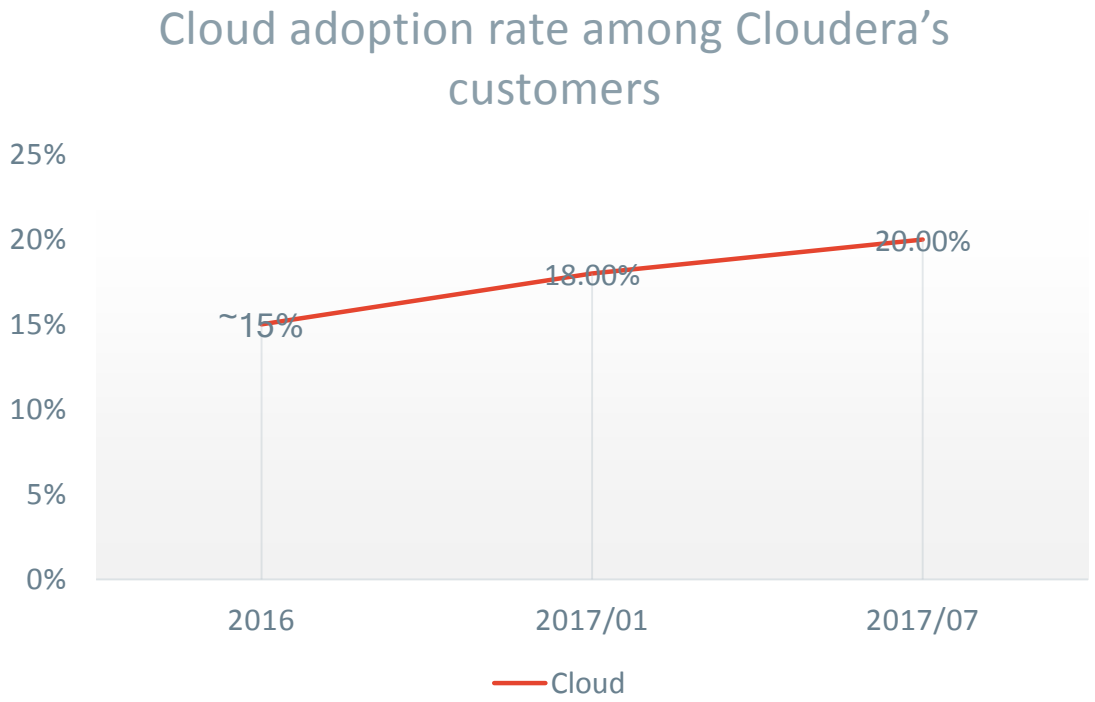
Future Hadoop Release Plan



“Production deployment sponsor”

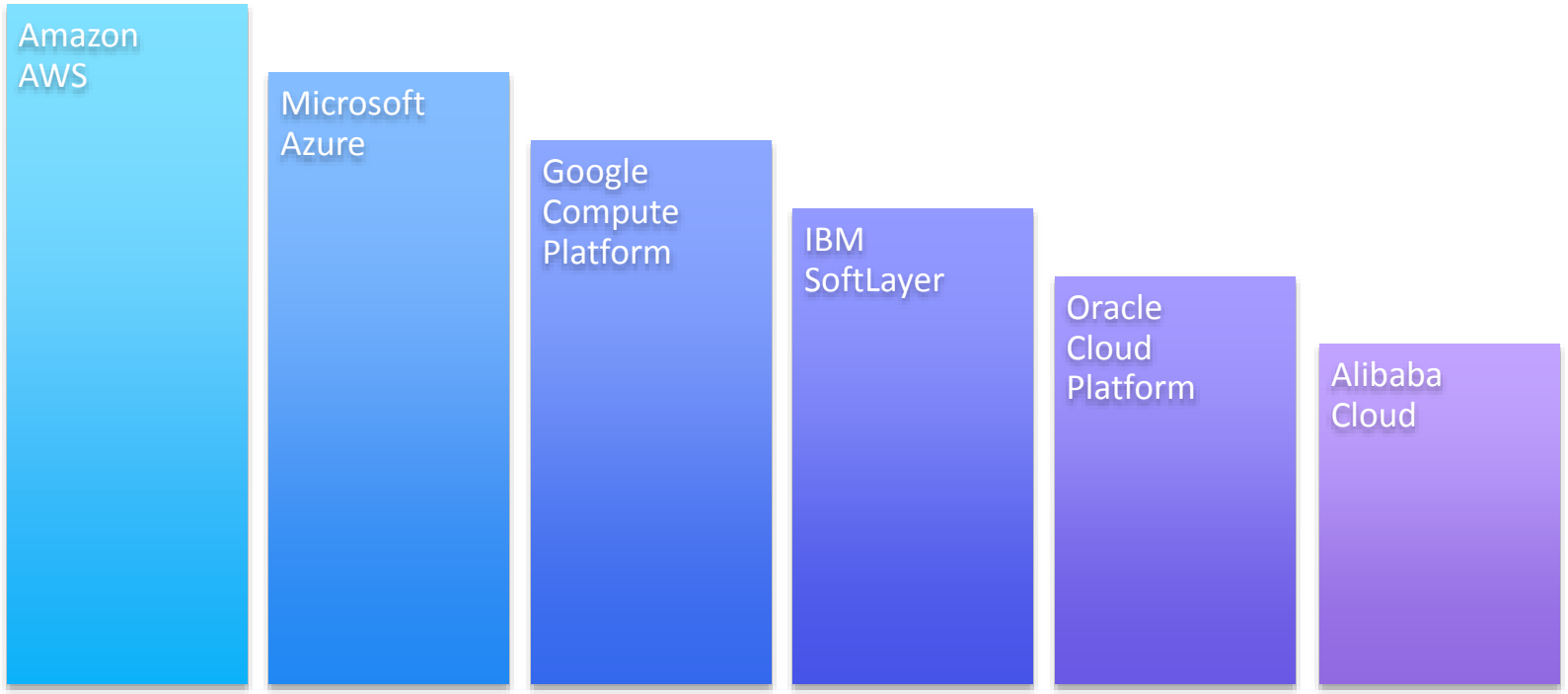
https://cwiki.apache.org/confluence/display/HADOOP/Roadmap

Cloud Adoption



* Global 8000

Cloud Infrastructure Market Share



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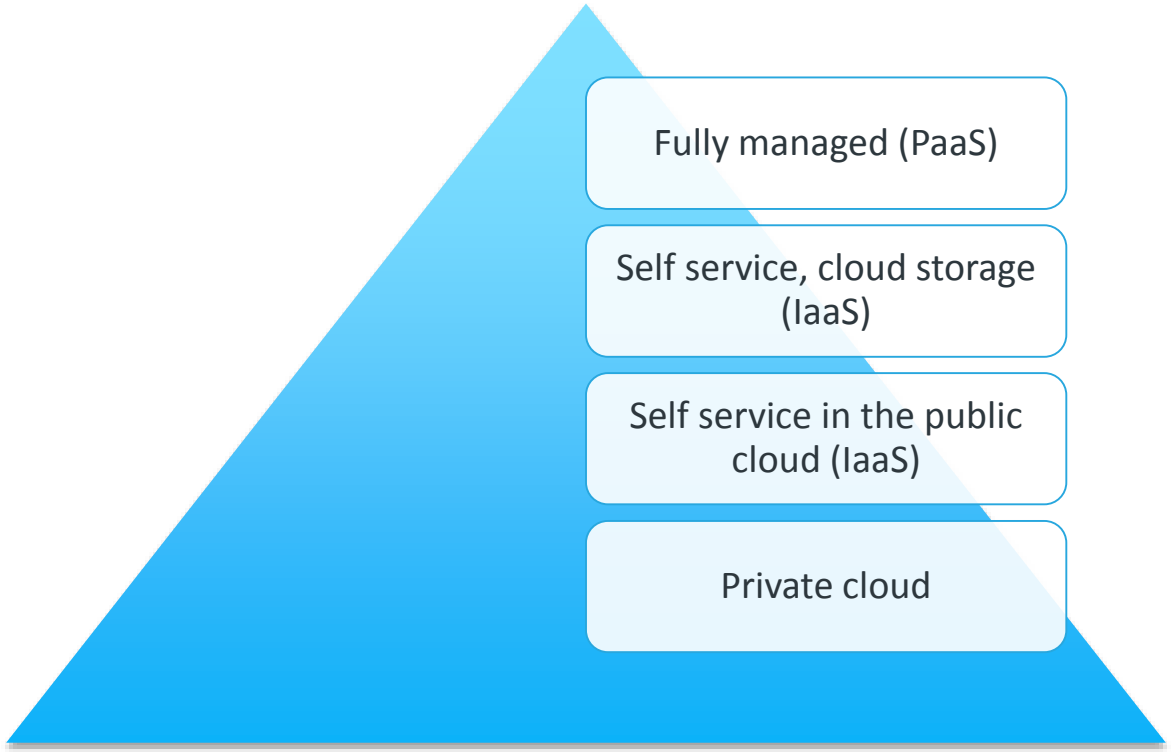
Cloud Deployment Model



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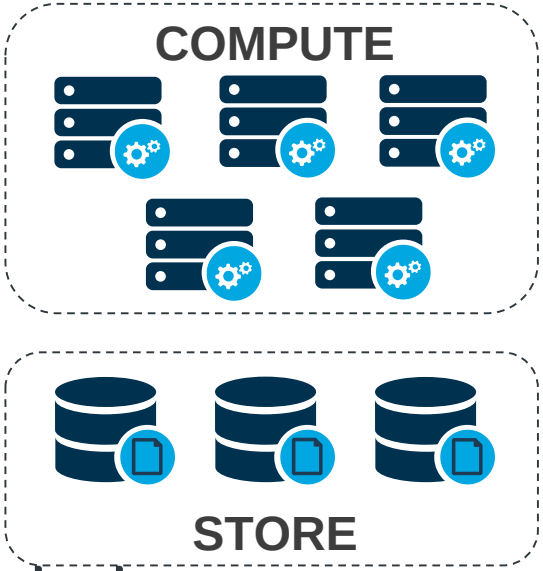
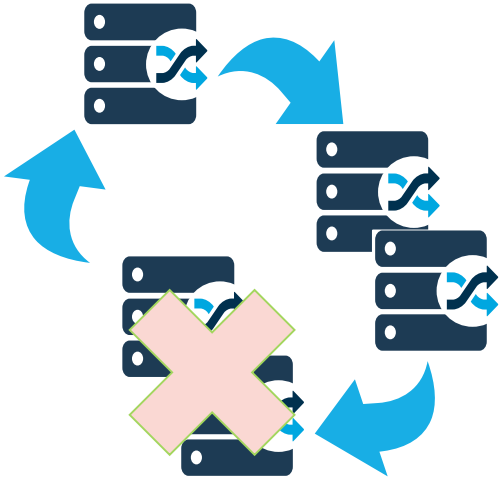
Cloud-native architecture

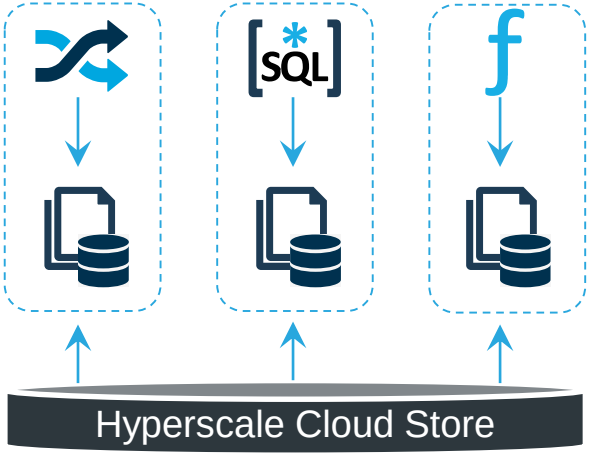
Grow Storage and Compute Discretely for Efficiency



Embrace Transience for Lower Costs



Compartmentalize for Optimal Performance



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Private Cloud

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Cloudera Enterprise Reference Architecture for OpenStack

http://www.cloudera.com/documentation/other/reference-architecture/PDF/cloudera_ref_arch_redhat_osp11.pdf

Private cloud vs bare metal

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)

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Cloud storage

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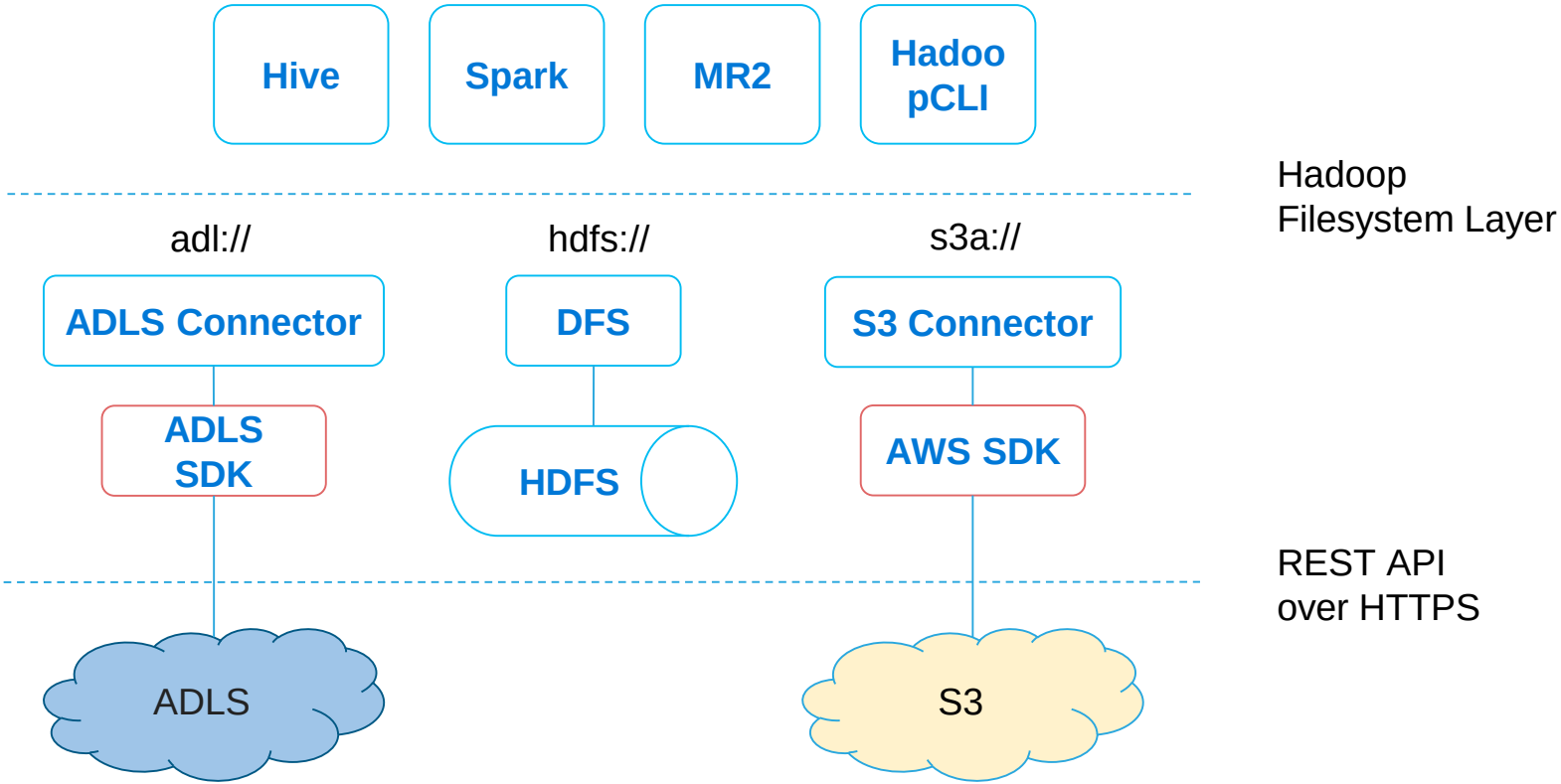
Cloud connectors

Cloudera “Full stack support”	Hadoop community support	Unsupported/external support
s3a://	swift://	gcs://
adl://	oss://	
wasb://		

Hadoop Cloud Connector Stack



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S3 Connectors

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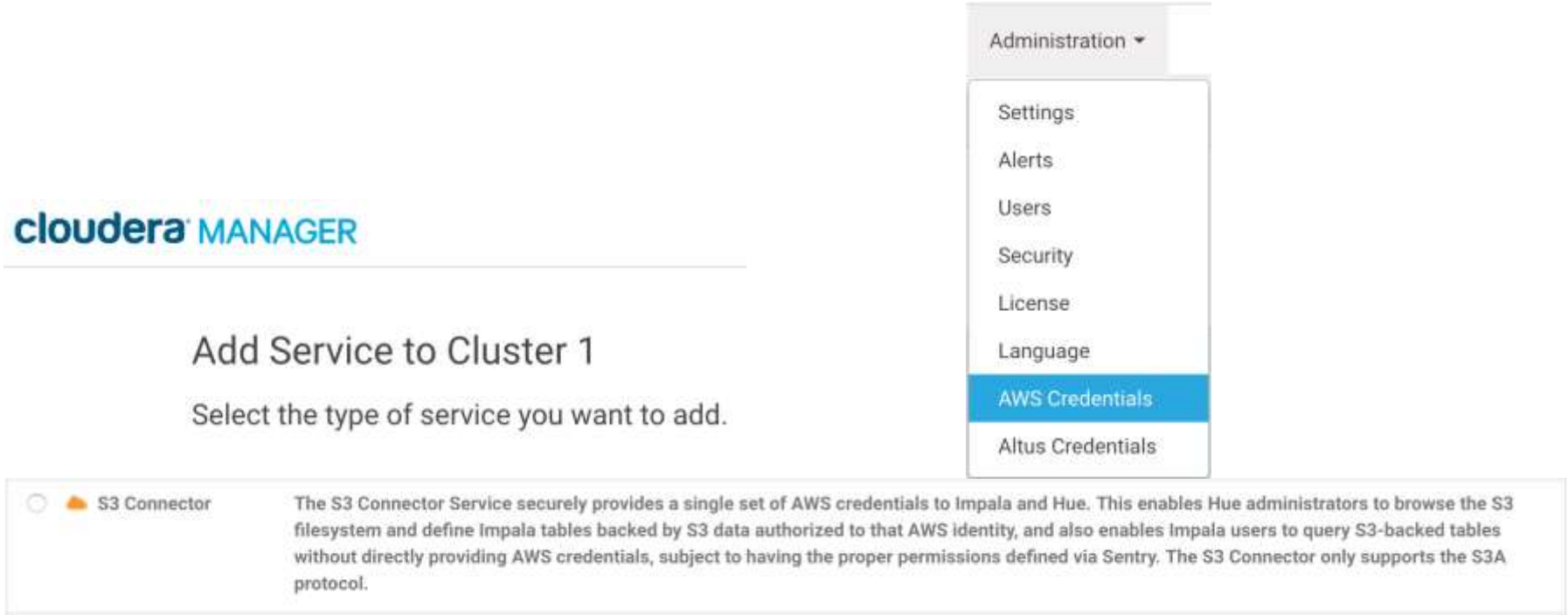
S3 Connectors

Removed from Hadoop 3 | Hadoop 2 ~ 2.6 | Hadoop 2.7 ~

S3 connector made easy



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

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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

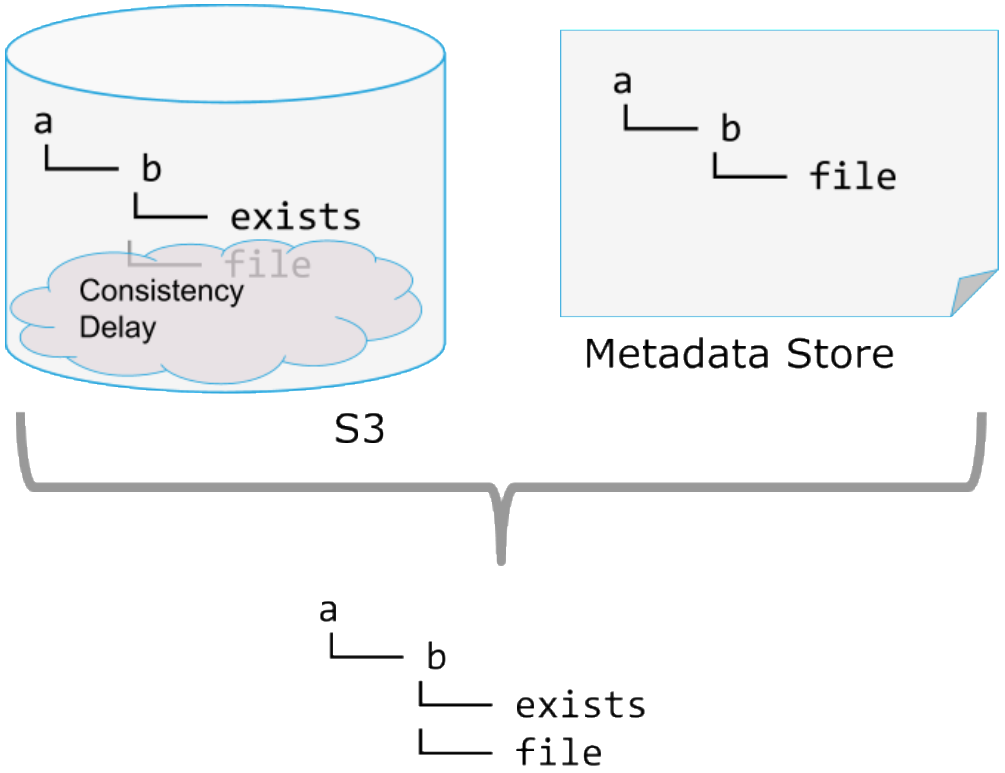
Consistent Metadata Store

- DynamoDB

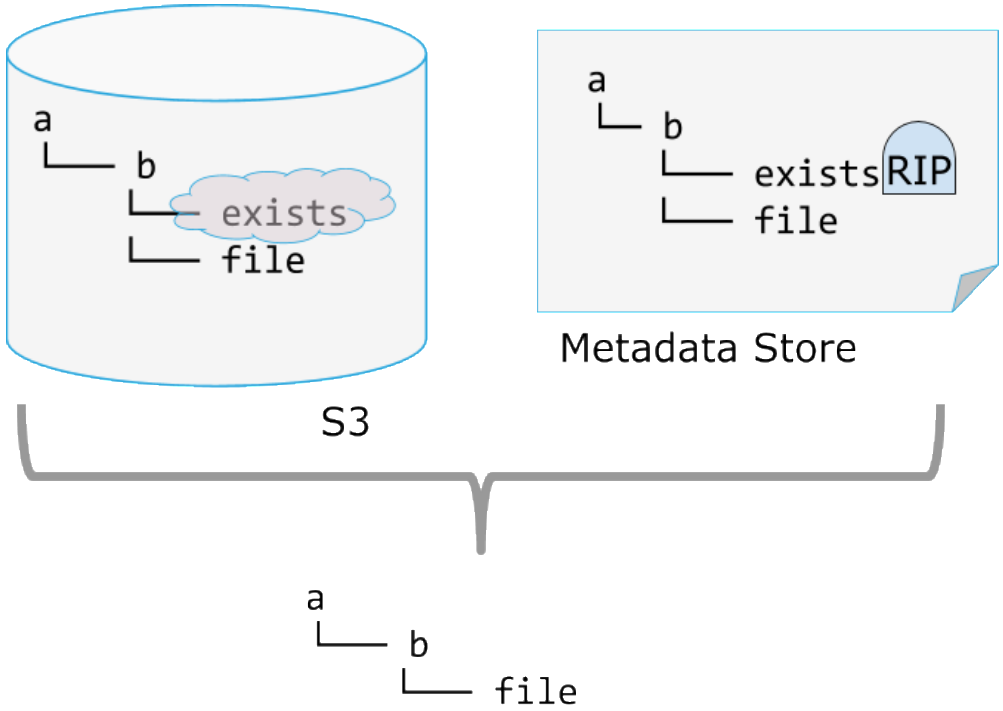
Joint effort between Hortonworks and Cloudera

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

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ADLS

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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

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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

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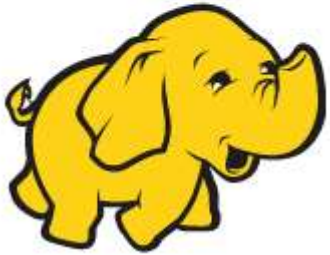
Fully Managed (PaaS)

HDInsight

databricks

Google Cloud Platform

IBM
BigInsight
Big SQL



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Platform-as-a-service
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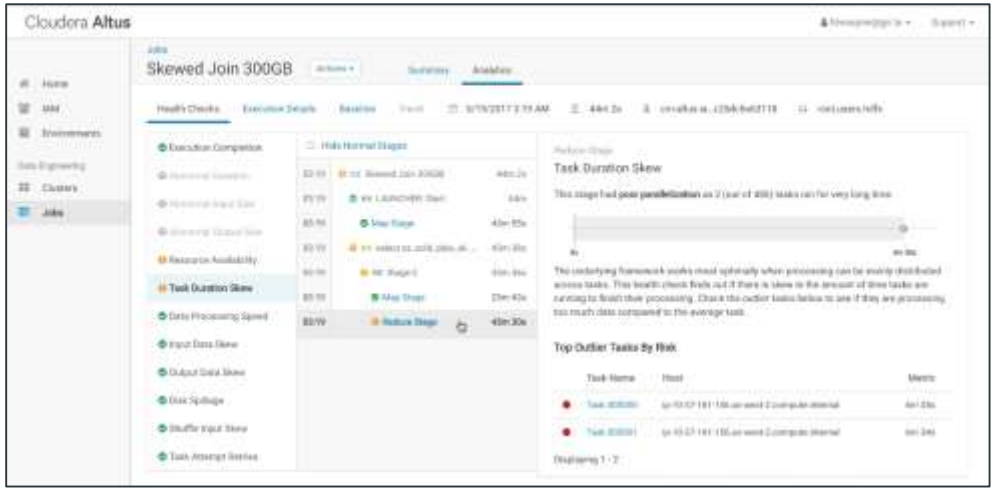
Learn more at cloudera.com/altus
• Move processing to the cloud without risk
• Focus on your workload, not cluster operations
• Simplify and unify your analytics

Everything you don't have to do

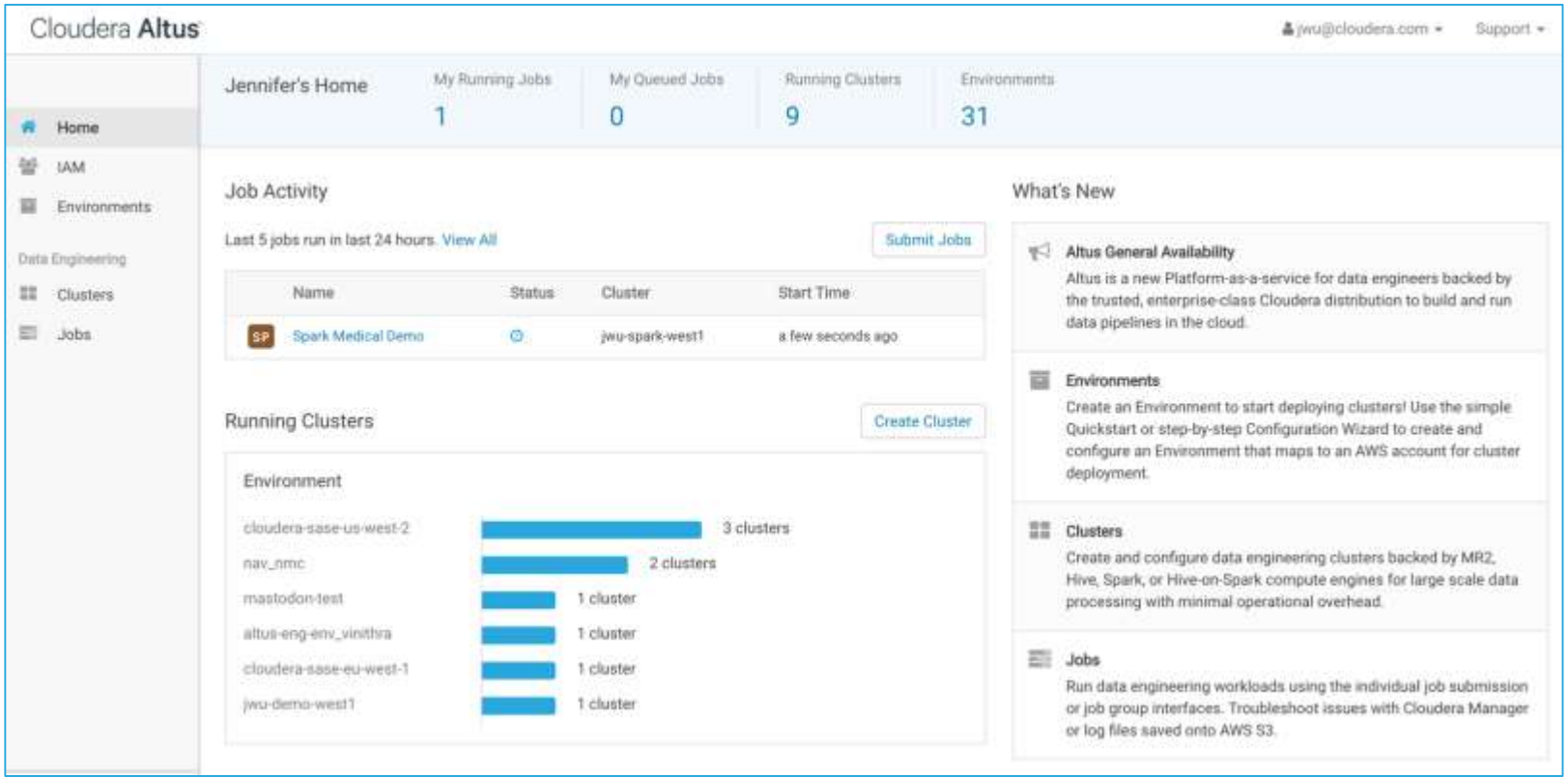
- Install any software to start working
- Install any hardware
- Worry about cluster configuration
- Upgrade/reconfigure clusters
- OS upgrades/patching
- Resource Management

Workload troubleshooting and analytics

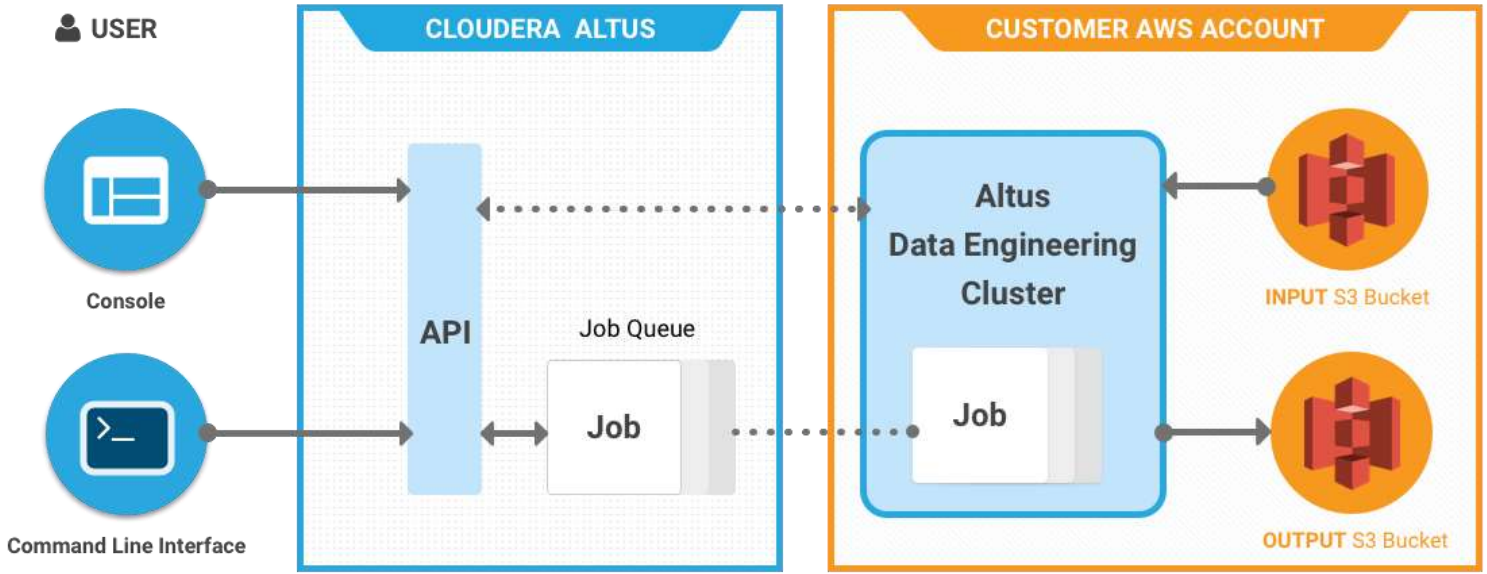
- Troubleshoot jobs after cluster termination through job log and configuration browsing
- Insight into causes of job failure
- Identification and root cause analysis of slow jobs



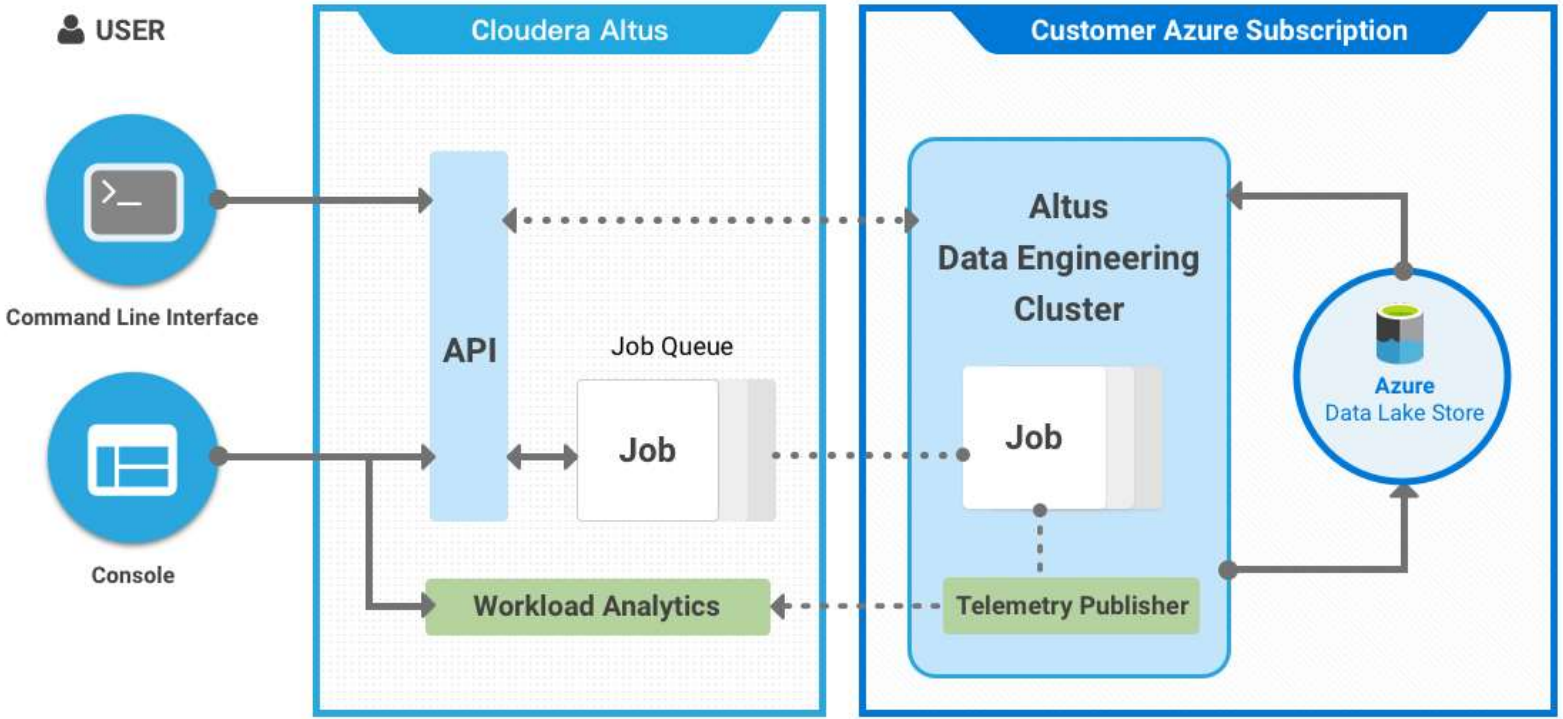
https://console.altus.cloudera.com



Altus Service Architecture



Altus on Azure (beta) coming soon



Altus Demo

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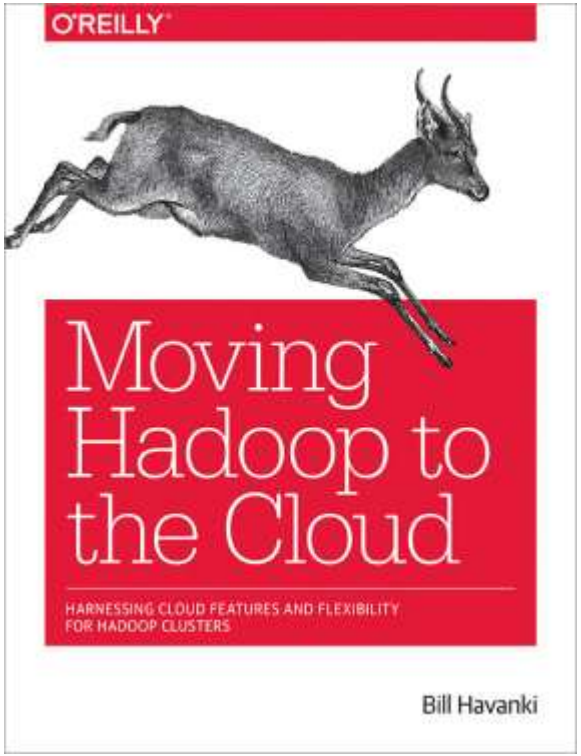

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Questions?

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Thank you

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