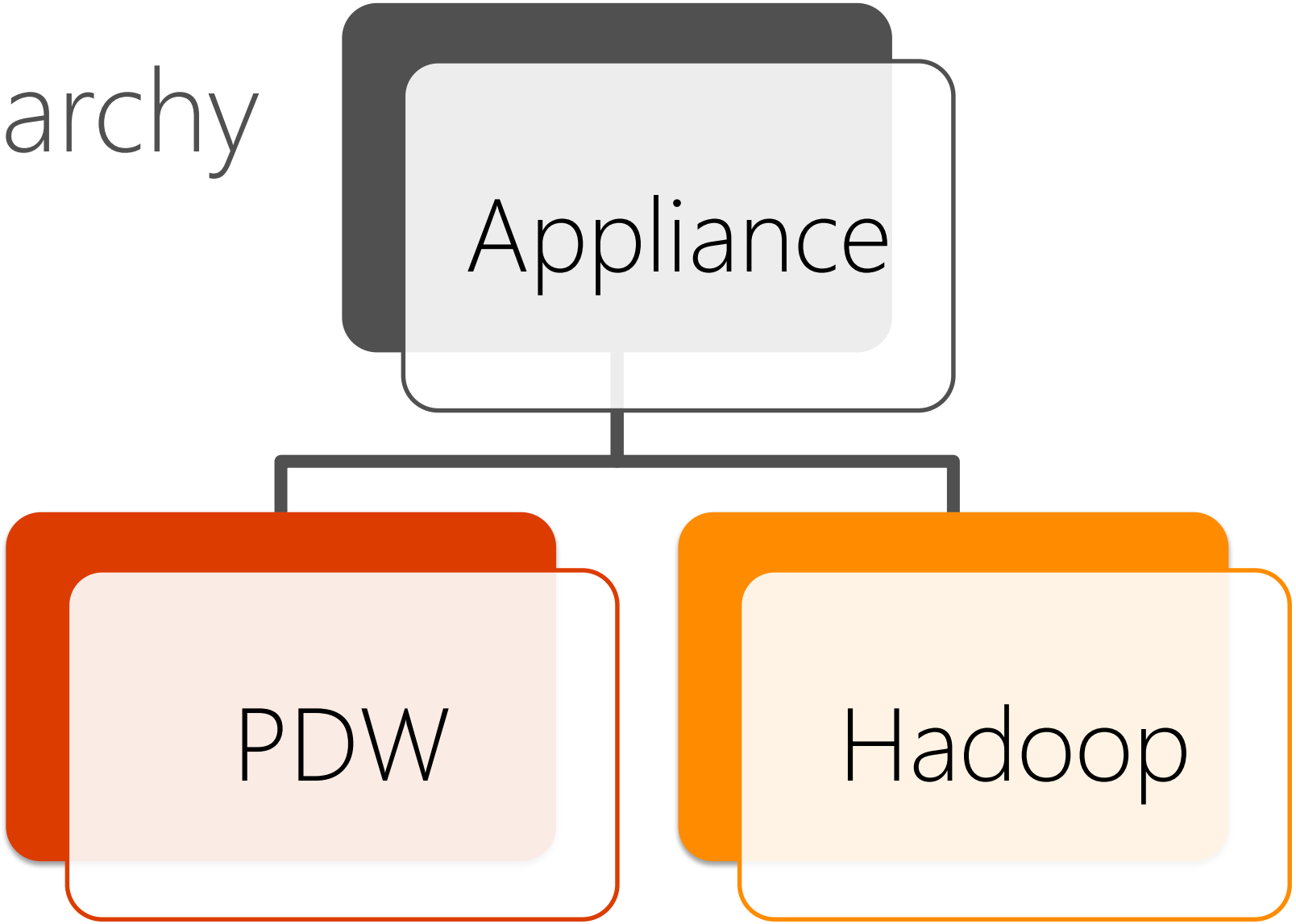

Microsoft
Hadoop Region
HDInsight Inside the Appliance

Agenda

- Region Overview
- Tooling
- Configuration
- Management
- Security
- Working with Hadoop

Region Overview

Region Hierarchy



APPLIANCE

PDW Region

WFC

VMM

AD

CTL01

MAD01

CMP01

CMP02

CMP03

CMP04

CMP05

CMP06

Hadoop Region

WFC

HMN01

HHN01

HSN01

HDN001

HDN003

HDN005

HDN002

HDN004

HDN006

HDN007

HDN009

HDN011

HDN008

HDN010

HDN012

Hadoop Region & HDInsight

- HDInsight = Microsoft branding
- Hortonworks distribution (HDP)
- Hadoop region based on HDP 1.3
- Basic authentication
- High Availability built in to all nodes

Hadoop Region Dependency

Depends on the PDW Region

- Active Directory for the hosts (fabric)
- Virtual Machine Manager (deployment)
- Common manageability infrastructure
- Licensing

Supported Projects

- Hadoop Core (HDFS & MapReduce)
- Hive
- Templeton
- Pig
- Oozie
- Sqoop

HDFS

- Distributed File System
- Application data spread across the Data Nodes of the cluster
- Data location held by the Namenode
- Data is replicated for both availability and performance (localisation)

MapReduce (Hadoop 1.3)

Batch Programming engine

- Mapper
- Reducer

Execution Framework

- Jobtracker
- Tasktrackers

MapReduce (Hadoop 2.0)

- Batch Programming engine only
- Execution framework de-coupled

Future version of APS Hadoop Region to support YARN & Hadoop 2.0

YARN

- New Apache project
- Owns execution framework
- Enables new programming engines (TEZ, REEF)

Hive 

- Data Warehouse Engine over HDFS
- Generates MapReduce jobs (today)
- Hive Query Language
- Incorporates HCatalog

Look out for Stinger

- Speed (100x)
- Scale (columnar)
- SQL (semantically)

Templeton

- REST-like web API for HCatalog and Hadoop
- Used for Remote Job Submission
- Also known as WebHCat

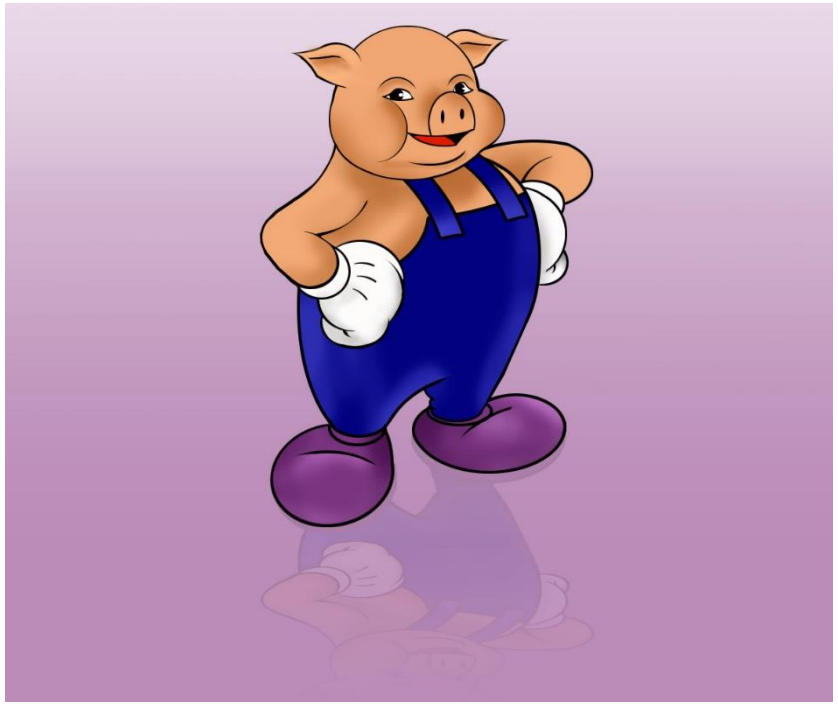
Oozie 

- Scheduler
- Java Web application for job submission

Oozie jobs

- Workflow jobs – specify sequences of actions to execute
- Coordinator jobs – recurring workflow jobs triggered by time & data availability
- Bundle – package coordinator & workflow jobs

Pig



- Scripting language
- Data transformation
- Generates MapReduce
- Extensible framework using UDFs
- Exposed via Oozie only (i.e. not directly)

Sqoop 

- Import from RDBMS
- Export to RDBMS
- Uses MapReduce to perform import / export
- Works for many RDBMS
- Implemented for connector completeness
- Consider PDW & Polybase strongly here

Hadoop Region Architecture

Nodes

Hadoop Region

- Head Node
- Secure Gateway
- Management Node
- Data Node

Dependency Nodes

- Control Node
- Active Directory
- Virtual Machine Manager

HDI Node Services

Head Node

- AMBARI Agent
- Namenode
- Secondary Namenode
- Job Tracker
- HistoryServer
- HiveServer2
- HiveMetastore
- OozieService
- Webhcatserver (Templeton)

HDI Node Services

Management Node

- IIS
  - AMBARI
- SQL Server
  - HCatalog metastore
  - Oozie metastore
  - Ambari monitoring data store
  - Configuration backup database
- AD
- DNS

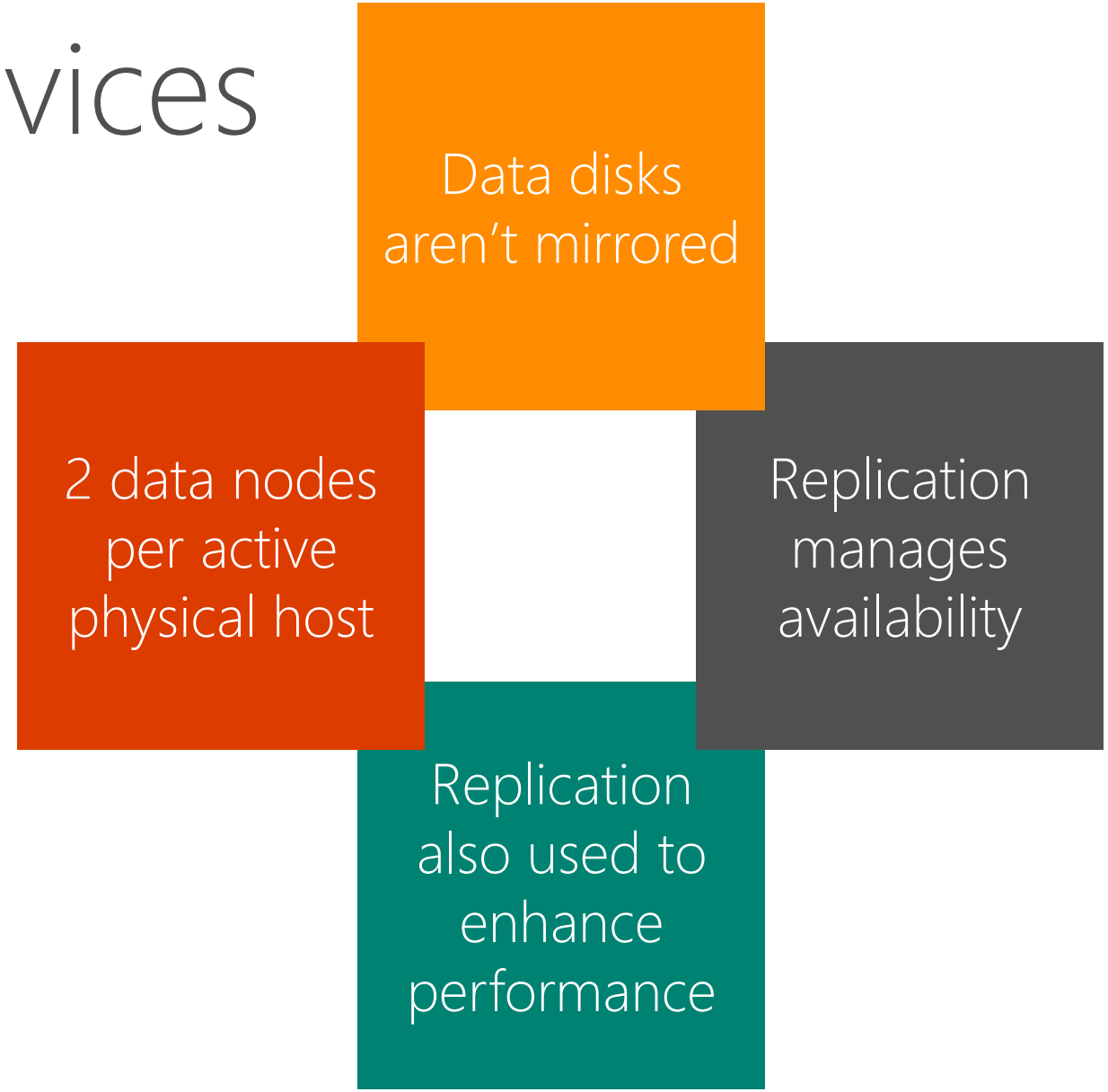
Secure Gateway Node

- IIS
  - Developer Dashboard
  - Secure Gateway

HDI Node Services

Data Node

- Ambari Agent
- Datanode
- TaskTracker



Finding HDI Region Nodes

```
SELECT *
FROM sys.dm_pdw_nodes
WHERE region = 'HDI';
```

	pdw_node_id	type	name	address	is_passive	region
1	601005	HOST	FTUKIA-HST03	172.16.254.19	0	HDI
2	601006	HOST	FTUKIA-HST04	172.16.254.20	1	HDI
3	601007	HOST	FTUKIA-HSA03	172.16.254.21	0	HDI
4	601008	HOST	FTUKIA-HSA04	172.16.254.22	0	HDI
5	701001	HDIHEAD	HTUKIA-HHN01	172.16.254.23	0	HDI
6	801001	HDISECURE	HTUKIA-HSN01	172.16.254.25	0	HDI
7	901001	HDIMANAGEMENT	HTUKIA-HMN01	172.16.254.27	0	HDI
8	1001001	HDIDATA	HTUKIA-HDN001	172.16.254.29	0	HDI
9	1001002	HDIDATA	HTUKIA-HDN002	172.16.254.31	0	HDI
10	1001003	HDIDATA	HTUKIA-HDN003	172.16.254.33	0	HDI
11	1001004	HDIDATA	HTUKIA-HDN004	172.16.254.35	0	HDI

HDInsight APIs

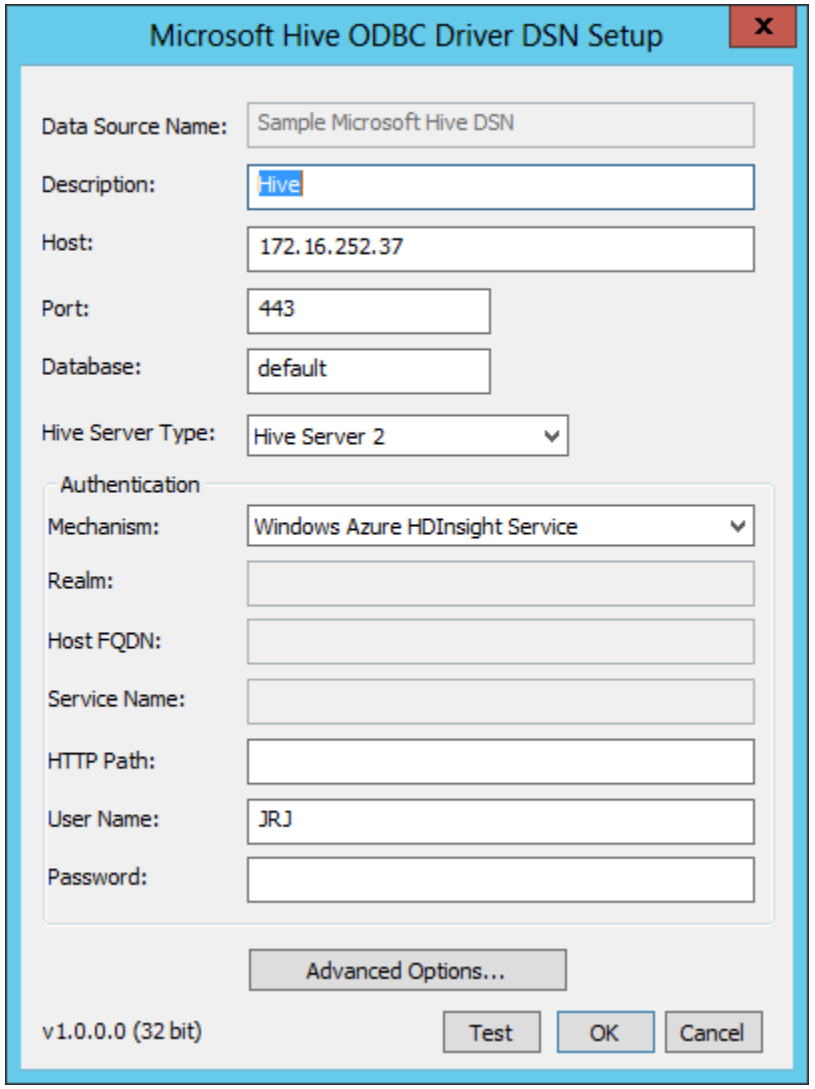
WebHDFS
- Remote HDFS file system management

WebHCat
- Remote job submission and monitoring

Oozie
- Remote workflow submission and scheduling

HiveServer2
- ODBC Connectivity to Hive

Hive ODBC Connector (Excel)

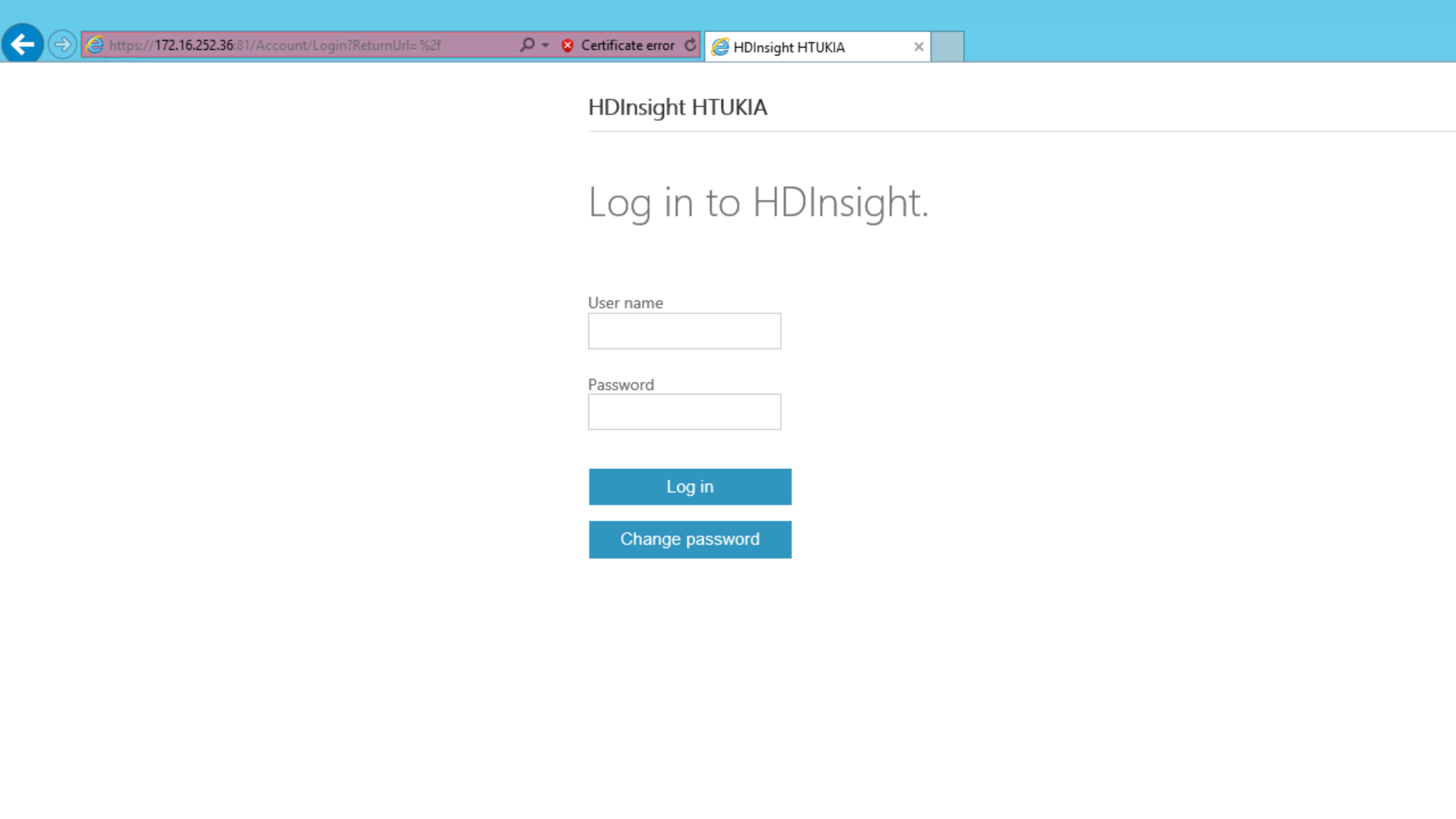


- Setup same as cloud HDI
- Secure Node Cluster IP
- Port 443
- Externally trusted certificate required

HDInsight Tooling

Developer Dashboard

- Web Console
- Runs on the Secure Node
- Connect via https://securenodeip:81/


https://172.16.252.36:81/Account/Login?ReturnUrl=%2f
Certificate error
HDInsight HTUKIA
HDInsight HTUKIA
Log in to HDInsight.
User name
Password
Log in
Change password

HDInsight HTUKIA

Logout

Your cluster HTUKIA is running

Jobs

Create Job

Hive Console

Upload File

Job History (WebHCat)

Status / Logs / Files

Name Node

Map Reduce

HDInsight HTUKIA

Create Job

Standalone JAR Hadoop Streaming

* Job Name

Please specify job name.

* Mapper

Browse...

Please select a file

* Reducer

Browse...

Please select a file

Parameters

Parameter 0

-input <enter_your_input_file_or_folder>

Parameter 1

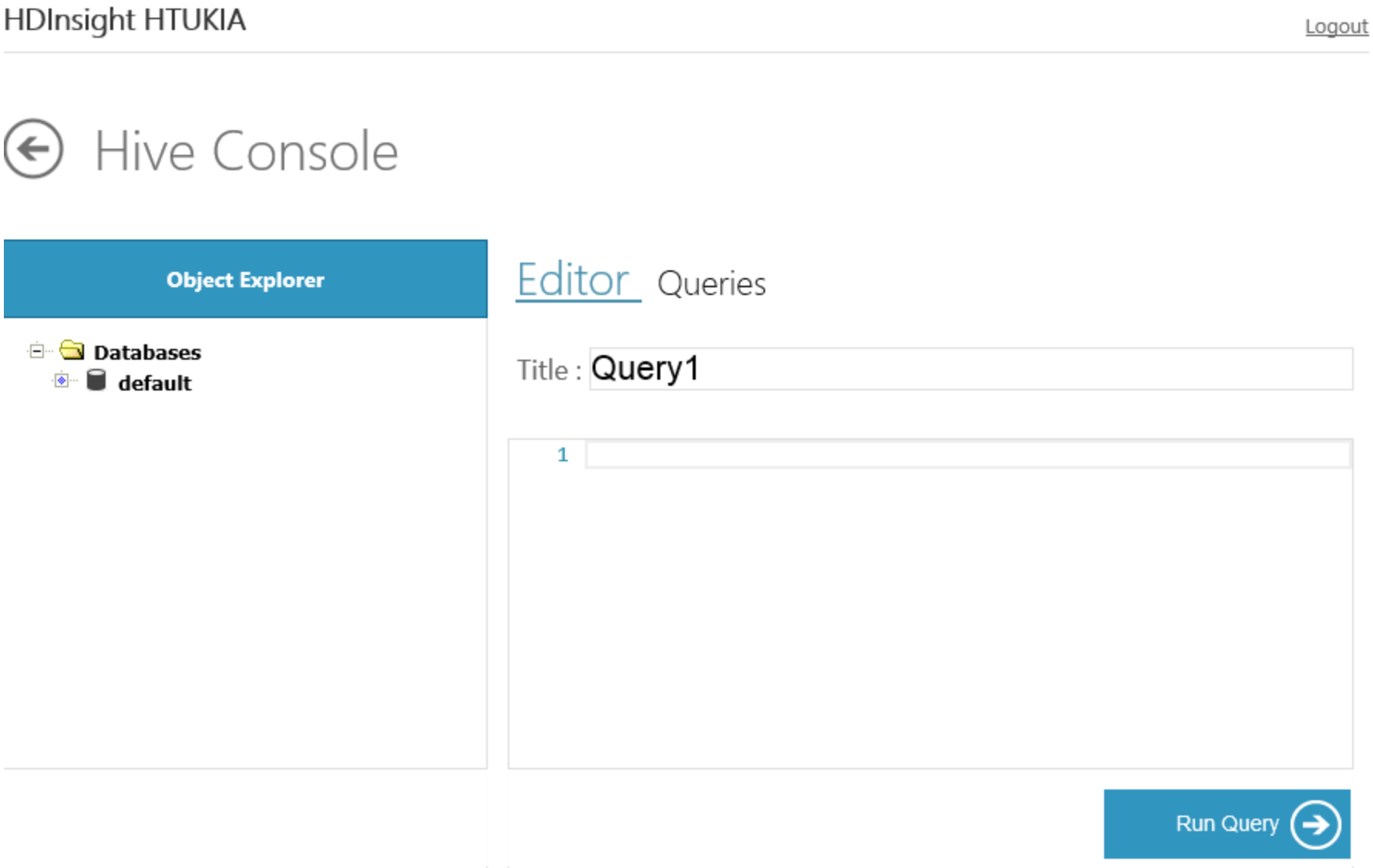
-output <enter_your_output_file_or_folder>

Add parameter

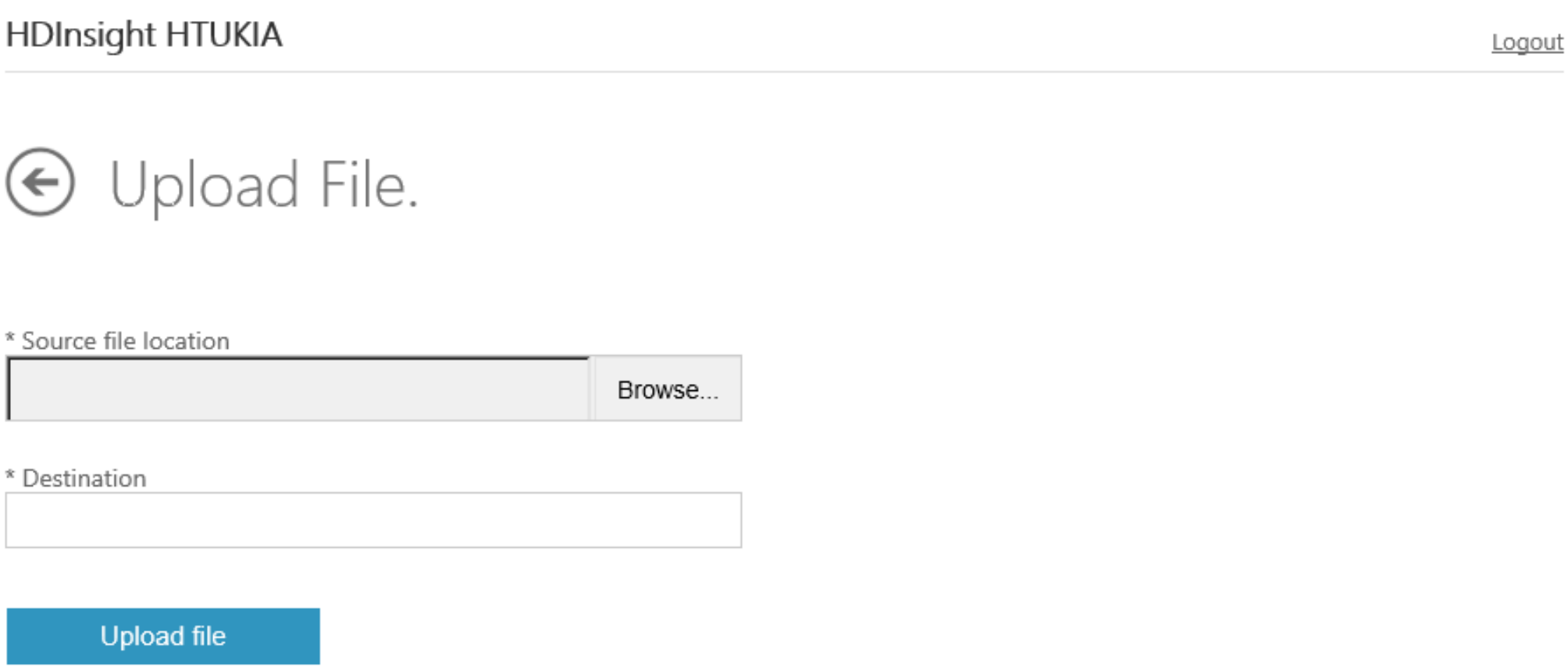
Final Command

Hadoop jar

Hive Console



Upload File


HDInsight HTUKIA
Logout
Upload File.
* Source file location
Browse...
* Destination
Upload file

Job History

HDInsight HTUKIA

Logout

Job History (WebHCat)

Loaded last 3 of 3

View All Jobs

Job Name	Job Type	Arguments	Start_time	Status
Hive job	Hive	DROP DATABASE test_hive CASCADE;	4/20/2014 12:55:19 AM	SUCCEEDED
Hive job	Hive	DROP DATABASE tpcds CASCADE	4/20/2014 12:53:53 AM	SUCCEEDED
Hive job	Hive	DROP DATABASE tpcds	4/20/2014 12:49:39 AM	FAILED (1)

NameNode 'HTUKIA-C-HHN01:8020'

Started: Thu Mar 20 22:37:00 PDT 2014
Version: 1.2.0.1.3.4.0-027, r5d03ce9dbc2336f93c2a3d94a3bc8f349cd5fec6
Compiled: Thu Jan 30 13:23:22 Pacific Standard Time 2014 by jenkins
Upgrades: There are no upgrades in progress.

Browse the filesystem
Namenode Logs

Cluster Summary

160 files and directories, 129 blocks = 289 total. Heap Size is 1.37 GB / 3.56 GB (38%)

Configured Capacity	:	87.09 TB
DFS Used	:	132.94 MB
Non DFS Used	:	8.62 GB
DFS Remaining	:	87.08 TB
DFS Used%	:	0 %
DFS Remaining%	:	99.99 %
Live Nodes	:	4
Dead Nodes	:	0
Decommissioning Nodes	:	0
Number of Under-Replicated Blocks	:	0

https://172.16.252.36/namenode/dfshealth.jsp

NameNode Storage:

Storage Directory	Type	State
c:\Hadoop\disk01\hdfs\nn	IMAGE_AND_EDITS	Active
c:\Hadoop\disk02\hdfs\nn	IMAGE_AND_EDITS	Active

This is Apache Hadoop release 1.2.0.1.3.4.0-027

Quick Links

HTUKIA-C-HHN01 Hadoop Map/Reduce Administration

State: RUNNING
Started: Thu Mar 20 22:37:25 PDT 2014
Version: 1.2.0.1.3.4.0-027, r5d03ce9dbc2336f93c2a3d94a3bc8f349cd5fec6
Compiled: Thu Jan 30 13:23:22 Pacific Standard Time 2014 by jenkins
Identifier: 201403202237
SafeMode: OFF

Cluster Summary (Heap Size is 1.34 GB/3.56 GB)

Running Map Tasks	Running Reduce Tasks	Total Submissions	Nodes	Occupied Map Slots	Occupied Reduce Slots	Reserved Map Slots	Reserved Reduce Slots	Map Task Capacity	Reduce Task Capacity	Avg. Tasks/Node	Blacklisted Nodes	Graylisted Nodes	Excluded Nodes
0	0	0	4	0	0	0	0	64	32	24.00	0	0	0

Scheduling Information

Queue Name	State	Scheduling Information
joblauncher	running	Queue configuration Capacity Percentage: 25.0% User Limit: 100% Priority Supported: NO ---------- Map tasks Capacity: 16 slots Maximum capacity: 16 slots Used capacity: 0 (0.0% of Capacity) Running tasks: 0 ---------- Reduce tasks Capacity: 8 slots Maximum capacity: 8 slots Used capacity: 0 (0.0% of Capacity) Running tasks: 0 ---------- Job info Number of Waiting Jobs: 0 Number of Initializing Jobs: 0 Number of users who have submitted jobs: 0

https://xxx.xx.xxx.xx/jobtracker/jobtracker.jsp

default	running	Queue configuration Capacity Percentage: 75.0% User Limit: 100% Priority Supported: NO ---------- Map tasks Capacity: 48 slots Used capacity: 0 (0.0% of Capacity) Running tasks: 0 ---------- Reduce tasks Capacity: 24 slots Used capacity: 0 (0.0% of Capacity) Running tasks: 0 ---------- Job info Number of Waiting Jobs: 0 Number of Initializing Jobs: 0 Number of users who have submitted jobs: 0

Filter (Jobid, Priority, User, Name)

Example: 'user:smith 3200' will filter by 'smith' only in the user field and '3200' in all fields

Running Jobs

none

Retired Jobs

none

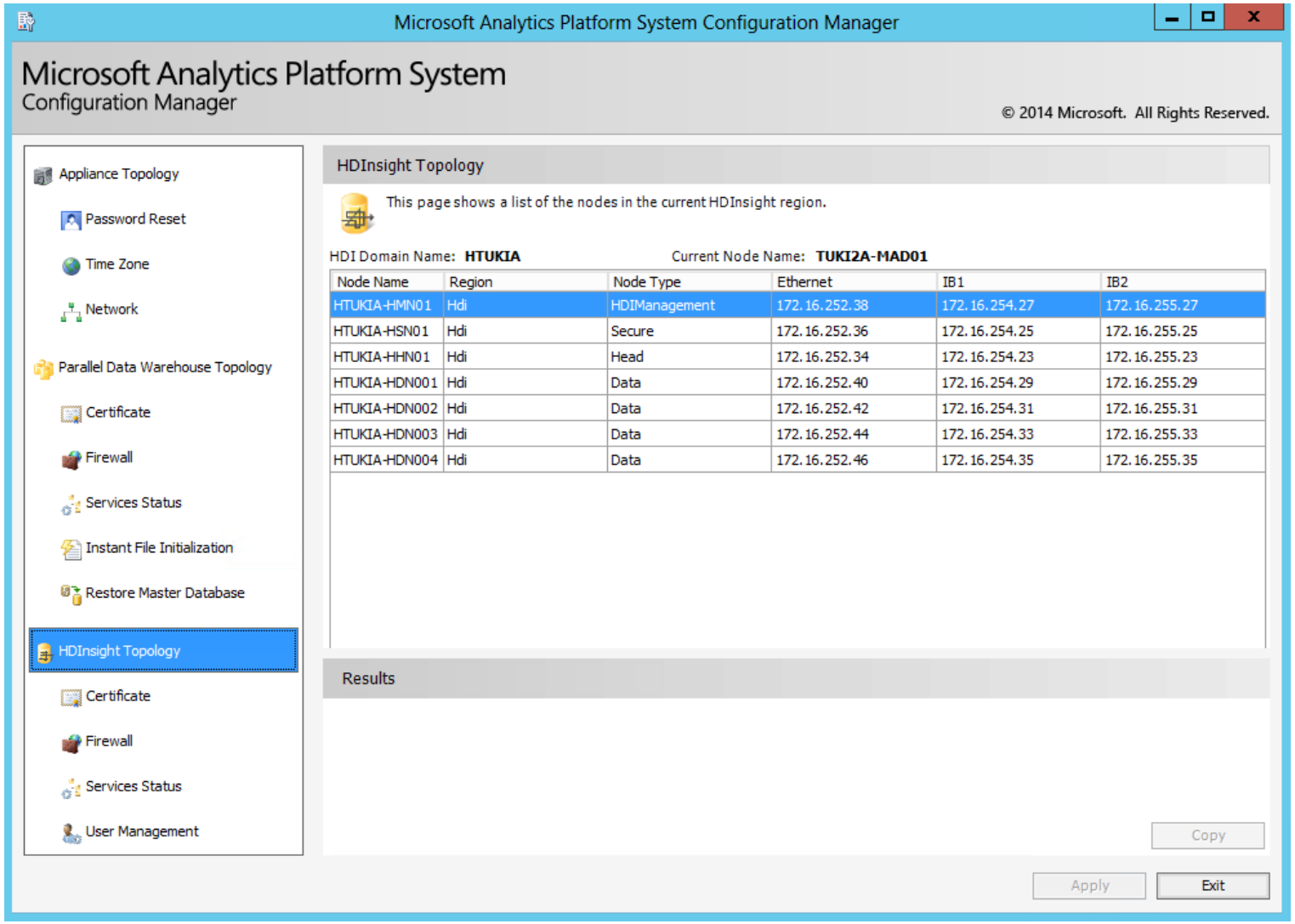
Local Logs

Log directory, Job Tracker History

Configuration

Basic Configuration

- dwconfig



Advanced Configuration

- Use Remote Desktop
- Connect to region nodes

Used for

- Log Collection & inspection
- Customised configuration
- Installation of additional libraries

Configuration Utility

- Powershell Script
- Located on the head node
  - C:\HadoopConfBackupRoot\HDInsightConfigurationUtility.ps1
- Used to backup & restore config files
- Run script after each configuration change

```
HDInsightConfigurationUtility.ps1
–backup | -restore
–Username <name>
-Password <pw>
-force
```

Using Configuration Utility

Use it

- After every configuration change
- Revert to last known good

Remote Desktop Support

Two step process

- RDP first to Secure Gateway Node (HSN01)
- Then RDP to any HDI node

Notes

- Must be a Cluster Admin to use RDP
- Max 2 connections

HDInsight Customisation

HDInsight only supports whitelisted changes to the following files

- Core-site.xml
- Log4J.properties
- Hdfs-site.xml
- Mapred-site.xml
- Oozie-site.xml

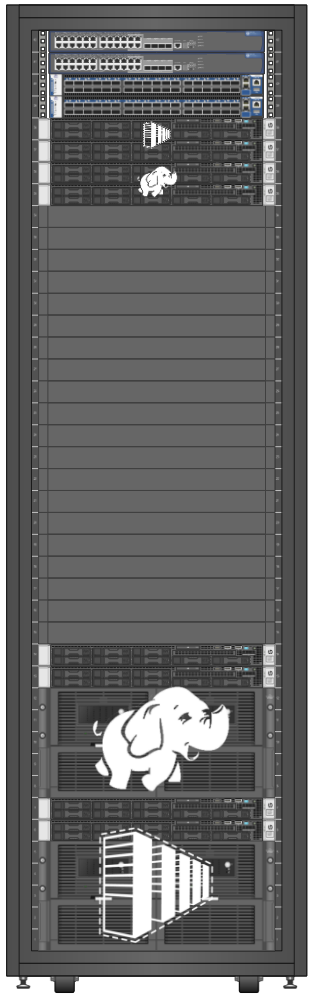
Only specific properties can be changed (see help file)

Installing additional projects into HDInsight is not supported

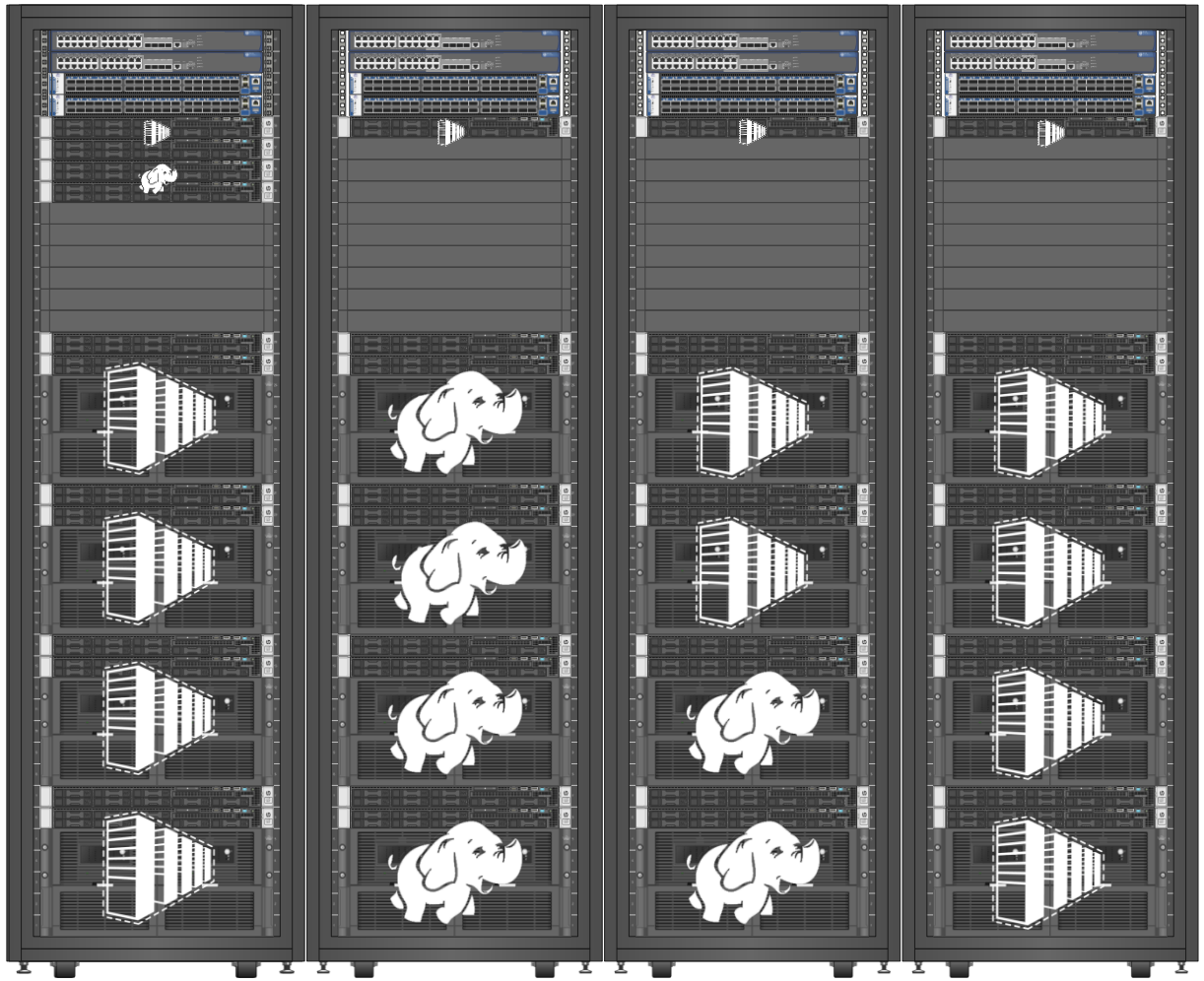
Restricted Activity

Restricted Action	Supported Alternative
Stopping / Starting services on Nodes	dwconfig – stop/start services
Managing Users in Active Directory	dwconfig – user management
Remote Desktop for normal users	Developer dashboard / Rest APIs
Changing IIS	None
SQL Server configuration on HMN01	None
Hadoop Commands; run daemons	dwconfig – stop/start services

Minimum Configuration



Adding a Hadoop Region



Hadoop Region Sizing

APS supports

- 1 Hadoop Region
- 1 Hadoop cluster within that region

APS does not support

- Adding nodes to Hadoop region

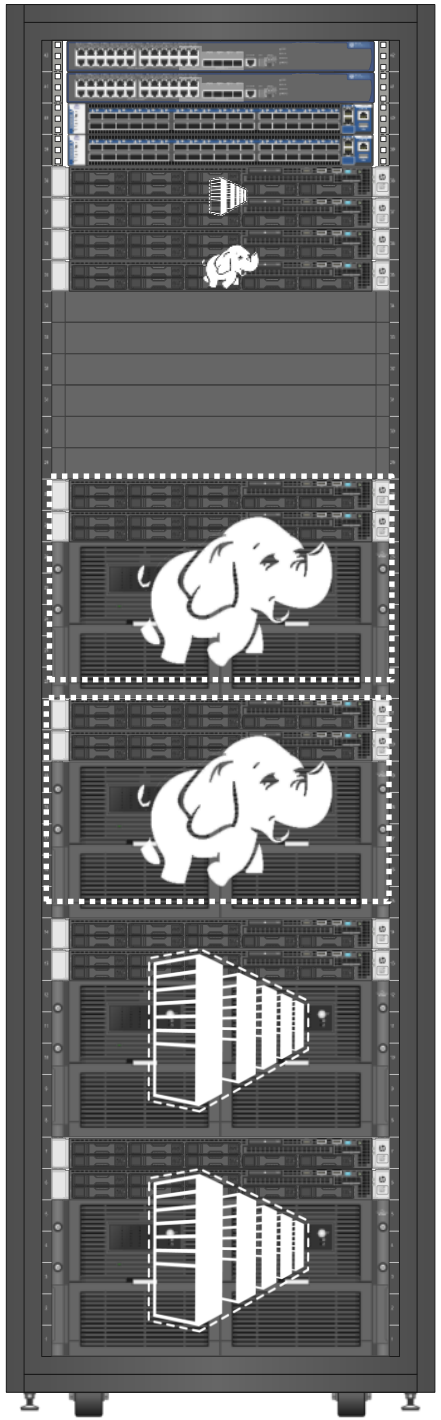
Add a node functionality is scheduled for a future release

Very important to think through your requirements when sizing your region

Understanding Replication

- Hadoop replicates data across the data nodes as part of availability strategy
- Introduces node groups to ensure replication distribution across scale units

#Scale Units	Replication Factor	Polybase RF
=1	2	3
>1	3	3



Disk Allocation

Each Data Node is allocated

- 16 disks
- 12 for storage
- 4 for MapReduce job results

Two Data Nodes per active host

HP has 2 active hosts per scale unit

Dell & Quanta have 3 active hosts per scale unit

Sizing by Storage - HP

# Scale Units	# Compute Nodes	#CPU Cores	#Data Nodes	# Data Disks	Raw Capacity 1024	Raw Capacity 2048	Raw Capacity 3072	Repl Factor	Usable Capacity 1024	Usable Capacity 2048	Usable Capacity 3072
1	2	32	4	48	48	96	144	2	24	48	72
2	4	64	8	96	96	192	288	3	32	64	96
3	6	96	12	144	144	288	432	3	48	96	144
5	10	160	20	240	240	480	720	3	80	160	240
7	14	224	28	336	336	672	1008	3	112	224	336
11	22	352	44	528	528	1056	1584	3	176	352	528
15	30	480	60	720	720	1440	2160	3	240	480	720
19	38	608	76	912	912	1824	2736	3	304	608	912
23	46	736	92	1104	1104	2208	3312	3	368	736	1104
27	54	864	108	1296	1296	2592	3888	3	432	864	1296

Sizing by Storage – DELL / Quanta

# Scale Units	# Compute Nodes	#CPU Cores	#Data Nodes	# Data Disks	Raw Capacity 1024	Raw Capacity 2048	Raw Capacity 3072	Repl Factor	Usable Capacity 1024	Usable Capacity 2048	Usable Capacity 3072
1	3	48	6	72	72	144	216	2	36	72	108
2	6	96	12	144	144	288	432	3	48	96	144
3	9	144	18	216	216	432	648	3	72	144	216
4	12	192	24	288	288	576	864	3	96	192	288
5	15	240	30	360	360	720	1080	3	120	240	360
8	24	384	48	576	576	1152	1728	3	192	384	576
11	33	528	66	792	792	1584	2376	3	264	528	792
14	42	672	84	1008	1008	2016	3024	3	336	672	1008
17	51	816	102	1224	1224	2448	3672	3	408	816	1224

Sizing Limitations

New Purchase

- No constraints

Upgrade Existing

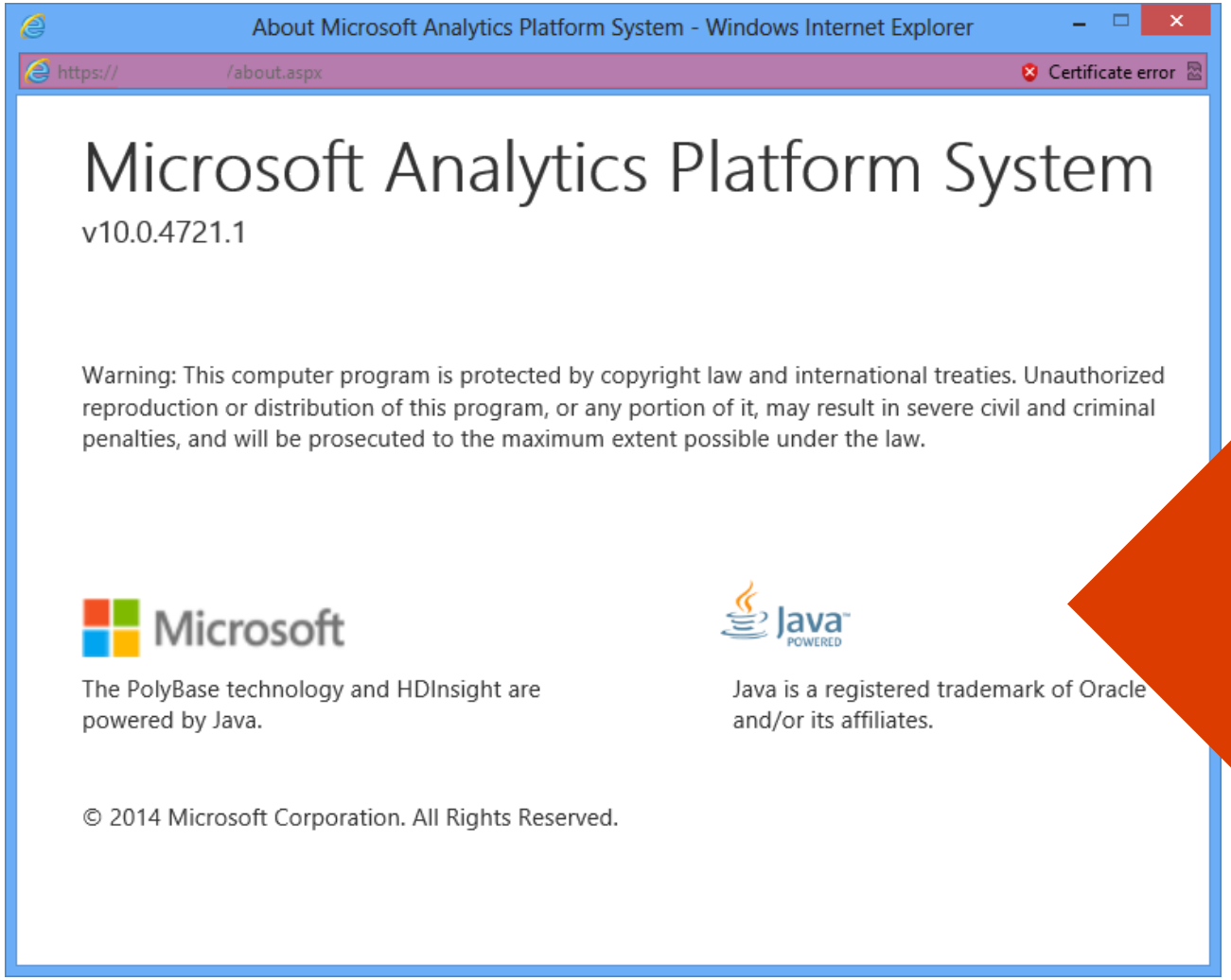
- Not supported on V1 hardware
- Disk size must be the same as PDW

Management

Microsoft & Oracle Relationship

Cloud integration changes the name of the game

OSS integration = Better Together



Java automatically redistributed in AU1

appliance
parallel data warehouse
hdinsight
HOME
HDFS
MAP/REDUCE
HEALTH
STORAGE
PERFORMANCE MONITOR

hdinsight h15510

HDFS
DATA NODES
4 LIVE
0 DEAD

MAP/REDUCE
0 ACTIVE MAPPERS
0 ACTIVE REDUCERS

HEALTH
0 ERRORS
0 WARNINGS
0 FAILOVERS

STORAGE

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appliance

parallel data warehouse

hdinsight

HOME

HDFS

MAP/REDUCE

HEALTH

STORAGE

PERFORMANCE MONITOR

hdinsight h15510: hdfs

NAME NODE

NAME H15510-C-HHN01

STATE Started

SAFE MODE

UPTIME 034:54:42:308

GC TIME (MS) 2004

HEAP (MB)

USED 95.42

COMMITTED 108.68

MAX 3640.93

USED (%) 2.62

THREADS

RUNNABLE 9

BLOCKED 0

WAITING 16

TIMED WAITING 8

HDFS

FILES 104

CREATED 2

APPENDED 0

DELETED 1

BLOCKS

TOTAL 88

CORRUPT 0

MISSING 0

UNDER-REPLICATED 0

DATA NODES

LIVE 4

DEAD 0

DECOMMISSIONED 0

RPC TRAFFIC (MB)

SENT 23

RECEIVED 51

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appliance
parallel data warehouse
hdinsight
HOME
HDFS
MAP/REDUCE
HEALTH
STORAGE
PERFORMANCE MONITOR

hdinsight h15510: map/reduce

SUMMARY **JOBS**

20

JOB ID	NAME	START TIME	STATE	LOGIN

20

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appliance
parallel data warehouse
hdinsight
HOME
HDFS
MAP/REDUCE
HEALTH
STORAGE
PERFORMANCE MONITOR

hdinsight h15510: health

STATUS ALERTS ALL ALERTS **ERRORS**

20

NODE	TYPE	SESSION ID	REQUEST ID	THREAD ID	SOURCE	CREATE DATE

20

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appliance
parallel data warehouse
hdinsight
HOME
HDFS
MAP/REDUCE
HEALTH
STORAGE
PERFORMANCE MONITOR

hdinsight h15510: storage

appliance space utilization

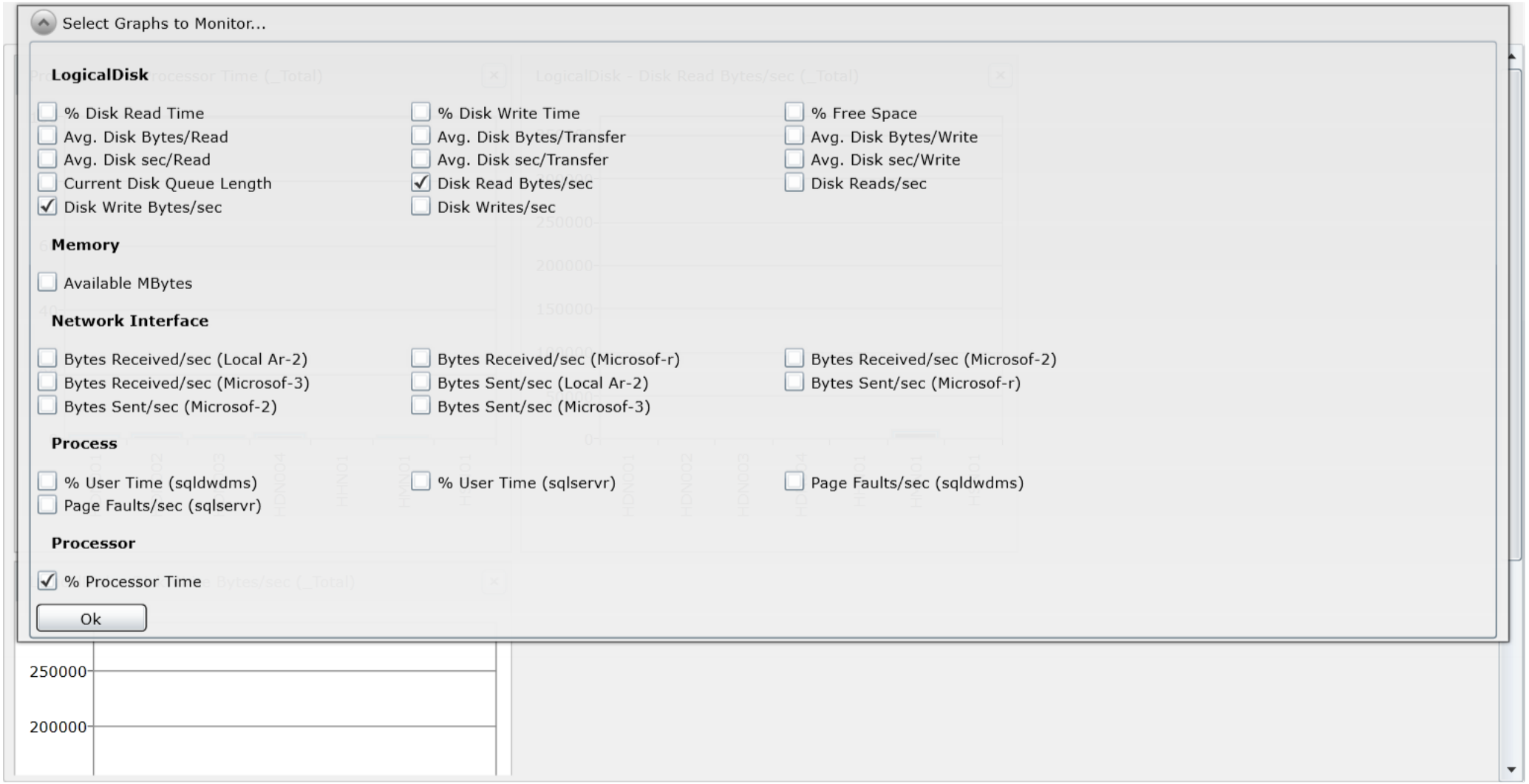
OS
44.8%
USED 141.2 GB
FREE 173.8 GB

DATA
0.5%
USED 17.3 GB
FREE 3,441.1 GB

1 20

NODE	TYPE	USED GB	FREE GB	TOTAL GB	PERCENT USED
H15510-HHN01	OS	20.6	24.4	45.0	45.8%
H15510-HHN01	DATA	0.2	49.5	49.7	0.4%
H15510-HSN01	OS	18.8	26.2	45.0	41.8%
H15510-HMN01	OS	20.8	24.1	45.0	46.3%
H15510-HMN01	DATA	10.8	14.0	24.9	43.5%
H15510-HDN001	OS	20.2	24.8	45.0	45.0%
H15510-HDN001	DATA	1.6	844.4	846.0	0.2%
H15510-HDN002	OS	20.2	24.8	45.0	45.0%
H15510-HDN002	DATA	1.6	844.4	846.0	0.2%
H15510-HDN003	OS	20.2	24.8	45.0	45.0%
H15510-HDN003	DATA	1.6	844.4	846.0	0.2%

hdinsight h15510: performance monitor



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Monitoring with System Center

Data collected by AMBARI

- View Cluster Topology
- Monitor cluster health
- Monitor alerts
- Access History
- Collect Performance Counter
- Start/Stop host components and services

Monitoring

- Monitoring
  - Active Alerts
  - Discovered Inventory
  - Distributed Applications
  - Task Status
  - UNIX/Linux Computers
  - Windows Computers
  - Agentless Exception Monitoring
  - Application Monitoring
  - bswan two
  - Data Warehouse
  - Microsoft Audit Collection Services
  - Microsoft HDInsight
    - Active Alerts
    - Cluster Services Performance
    - Cluster State
    - Cluster Summary
    - Clusters Diagram
    - HDFS Summary
    - Host Components Performance
    - Hosts
    - JobTracker Summary
    - MapReduce Summary
    - NameNode Summary
  - Microsoft Windows Client
  - Microsoft Windows Server
  - Network Monitoring
  - Operations Manager
  - Synthetic Transaction
  - UNIX/Linux Computers
  - Web Application Transaction Monitoring
  - Windows Service And Process Monitoring

Show or Hide Views...

New View

Monitoring

Authoring

Administration

My Workspace

Cluster Summary

Health	Cluster Name	Maintenance Mode
✗	ed52dc59a6ff4482bab621dc3d5c3123	

Cluster Services (2)

Health	Name	Maintenance Mode
✗	HDFS	
✓	MapReduce	

Participating Hosts (5)

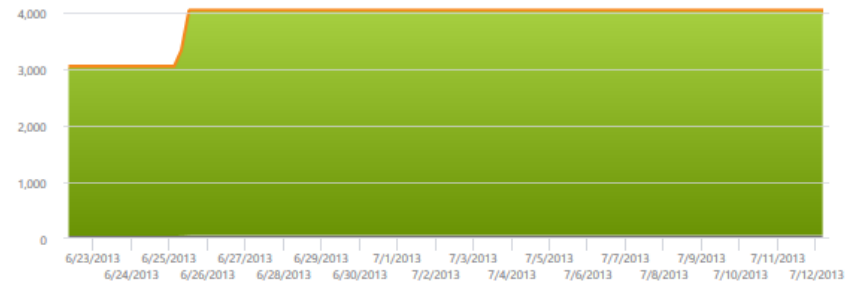
Filter

Health	Component	Host	Maintenance Mode
✓	datanode	10.238.44.11	
✓	datanode	10.238.50.12	
✓	datanode	10.238.2.44	
✓	datanode	10.238.8.12	
✓	namenode	10.238.54.14	

Live vs. Dead Nodes

Color	Metric	C...	A...	M...
	Live Nodes	4	3....	4
	Dead Nodes	0	0....	1

Space Utilization (GB)



Color	Metric	C...	A...	M...
	Total	4...	3...	4...
	Used	0	0	0
	Non-DFS Used	41	3...	41
	Free	3...	3...	3...

Ready

Security Model

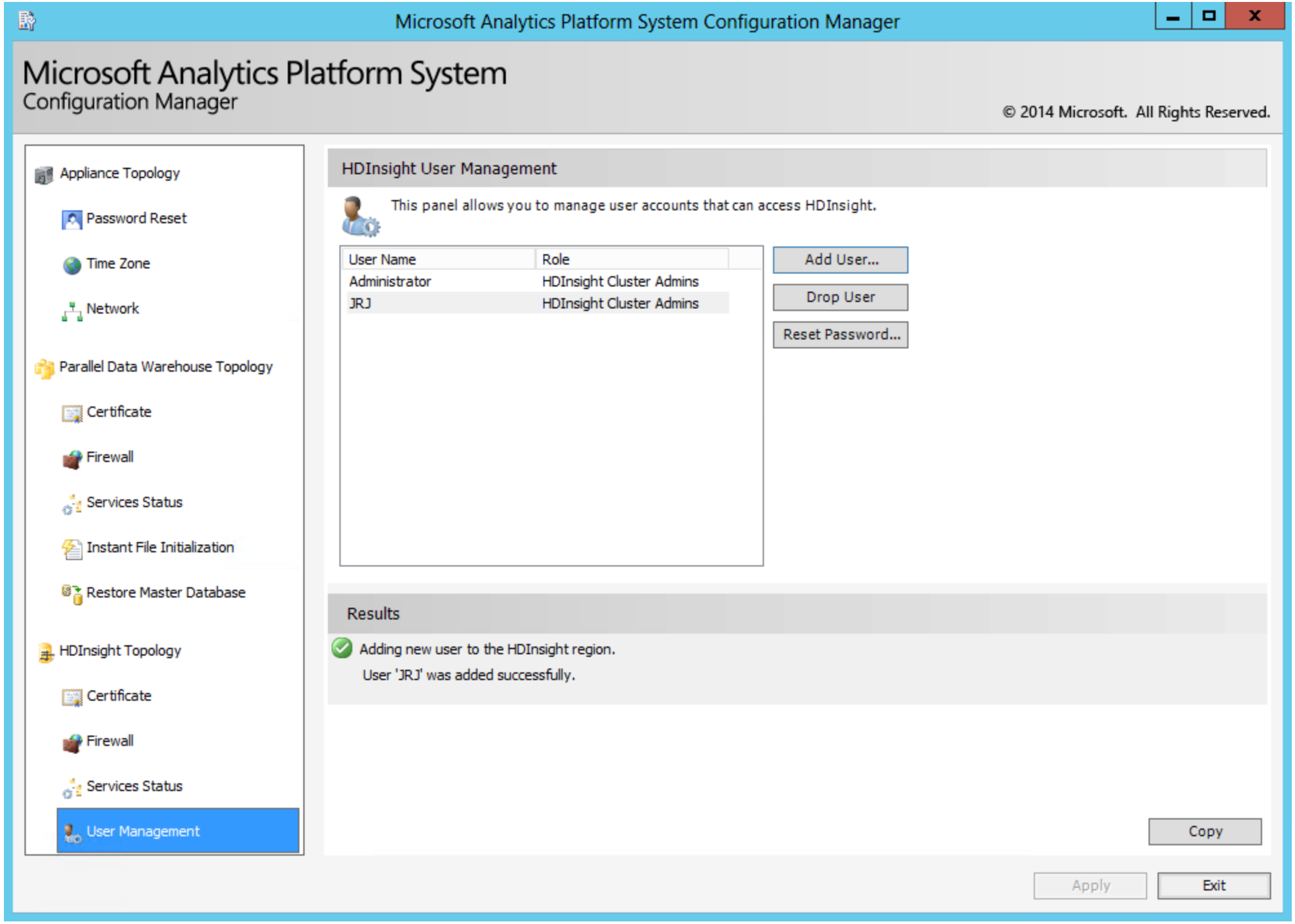
Security Model

- HDInsight Region has its own AD
- Supports Multi-User Authentication
- Security context for data access: HDP service account
- HDP services run under Managed Service Accounts
- Users can’t remotely connect to the cluster using RDP
- Users access via Developer Dashboard or via Polybase
- Firewall rules prevent direct access to HDP endpoints
- Firewall rules seal the cluster for enhanced security

User Types

- HDInsight Domain Administrator
- HDInsight Cluster Administrator
- HDInsight User

Users persisted in the HDI Active Directory


Microsoft Analytics Platform System Configuration Manager
Microsoft Analytics Platform System
Configuration Manager
© 2014 Microsoft. All Rights Reserved.
Appliance Topology
Password Reset
Time Zone
Network
Parallel Data Warehouse Topology
Certificate
Firewall
Services Status
Instant File Initialization
Restore Master Database
HDInsight Topology
Certificate
Firewall
Services Status
User Management
HDInsight User Management
This panel allows you to manage user accounts that can access HDInsight.
User Name
Role
Administrator
HDInsight Cluster Admins
JRJ
HDInsight Cluster Admins
Add User...
Drop User
Reset Password...
Results
Adding new user to the HDInsight region.
User 'JRJ' was added successfully.
Copy
Apply
Exit

Working with Hadoop

Agenda

- Working with WebHDFS
- Loading Data into HDFS
- Working with Hive

Working with WebHDFS

Introducing cURL

- Open Source utility for transferring data using URL syntax
- http://curl.haxx.se/

Common cURL command parameters

- -i includes protocol headers in the output
- -k allows connections to secure sites without certs
- -H custom header to pass to server
- -X command to pass e.g. PUT
- -u username and password <user>:<password>
- -L follow redirects

Managing HDFS with WebHDFS

Rest API for managing file system

- Use cURL for interacting with the REST API

HDI specific requirements - Secure by default

- https:// connections only
  - -k allows secure connections without certificates
- Anonymous calls aren't allowed
  - -u <user-name>:<password> required parameters
  - user.name parameter must be passed in web request
- Content Length must be passed
  - -H "Content-Length:0"

webHDFS http operations

HTTP GET
- OPEN
- GETFILESTATUS
- LISTSTATUS
- GETCONTENTSUMMARY
- GETFILECHECKSUM
- GETHOMEDIRECTORY

HTTP POST
- APPEND

HTTP PUT
- CREATE
- MKDIRS
- RENAME
- SETREPLICATION
- SETOWNER
- SETPERMISSION
- SETTIMES

HTTP DELETE
- DELETE

Folder Management

Create a Folder

```
curl -i -k -H "Content-Length:0" -u <user>:<password> -X PUT
"https://XXX.XXX.XXX.XXX/webhdfs/v1/TPCDS/
?op=MKDIRS&user.name=<user>"
```

Deleting a folder

```
curl -i -k -H "Content-Length:0" -u <user>:<password> -X DELETE
"https://XXX.XXX.XXX.XXX/webhdfs/v1/TPCDS/
?op=DELETE&user.name=<user>&recursive=false"
```

Renaming a folder

```
curl -i -k -H "Content-Length:0" -u <user>:<password> -X PUT
"https://XXX.XXX.XXX.XXX/webhdfs/v1/TPCDS/
?op=RENAME&user.name=<user>&destination=/TPCDS2/"
```

Folder Management

Listing a Folders Contents

```
curl -i -k -H "Content-Length:0" -u <user>:<password>
"https://XXX.XXX.XXX.XXX/webhdfs/v1/TPCDS/?op=LISTSTATUS&user.name=<user>"
```

Read a File

```
curl -i -k -H "Content-Length:0" -u <user>:<password> -L
"https://XXX.XXX.XXX.XXX/webhdfs/v1/TPCDS/WAREHOUSE/warehouse.dat?op=OPEN&user.nam
e=<user>"
```

Reading File Metadata

```
curl -i -k -H "Content-Length:0" -u <user>:<password>
"https://XXX.XXX.XXX.XXX/webhdfs/v1/TPCDS/WAREHOUSE/warehouse.dat?op=GETFILESTATUS
&user.name=<user>"
```

Loading Data into HDFS

Loading Data

From Flat Files

- Map Job
- Developer Dashboard
- WebHDFS
- Hive

Designed for

- Batch loading
- Small files (<20MB)
- Medium files
- From HDFS

Loading Data

From a Database

- Polybase
- SQOOP

Designed for

- Hybrid integration
- Database integration

If your source database is PDW then use Polybase not SQOOP

Loading Data with REST API

Leveraging the –L parameter of cURL to load files

```
curl -i -k -H "Content-Length:0" -u <user>:<password> -X PUT -L
"https://XXX.XXX.XXX.XXX/webhdfs/v1/TPCDS/WAREHOUSE/target_file.dat?op=CREATE&user
.name=<user>" -T source_file.dat
```

Loading data with Hive

- LOAD DATA
  - Moves the data into the table
- LOAD DATA LOCAL
  - Copies the data into the table
- INSERT OVERWRITE
  - Overwrites existing data in table or partition
- INSERT INTO
  - Appends to table

Data must already exist inside HDFS to load data with Hive

Working with Hive

Creating a Database in Hive

```
CREATE DATABASE [IF NOT EXISTS] db_name;
  [COMMENT database_comment]
  [LOCATION hdfs_path]
  [WITH DBPROPERTIES (property_name=property_value,
...)];
```

Creating a Hive Database

- Only Create Database is required
- If you specify a location you must have created the location first
- If you don’t specify a location Hadoop will create the database in the /hive/ folder
- You can create properties but you cannot remove them

Creating a Hive Table

Create Table

- Data Type
- Comment (table & column)
- Partitions
- Clustering
- Sorting / Bucketing
- Row Format
- Storage Format

Create External Table

- Specify an alternate location in HDFS
- When dropped only the definition is dropped not the data

Creating Hive Tables

CREATE TABLE AS SELECT

- Defines and Populates table with SELECT
- Cannot be partitioned
- Cannot be an external table

CREATE TABLE LIKE

- Copies the table definition without copying the data
- Can create a table based on a view definition

Querying Data

- Looks like SQL, Behaves like SQL, its not SQL
  - HQL – not SQL
- Hive does not offer guarantees of RDBMS
- Hive queries data inside HDFS only
- No Updates or Delete
- Whole Partitions can be re-written

Field Notes

HDInsight currently supports 0.11 Hive

- Very limited data type support
- Much Improved with 0.12 (Hadoop 2.0)