Johnson & Johnson

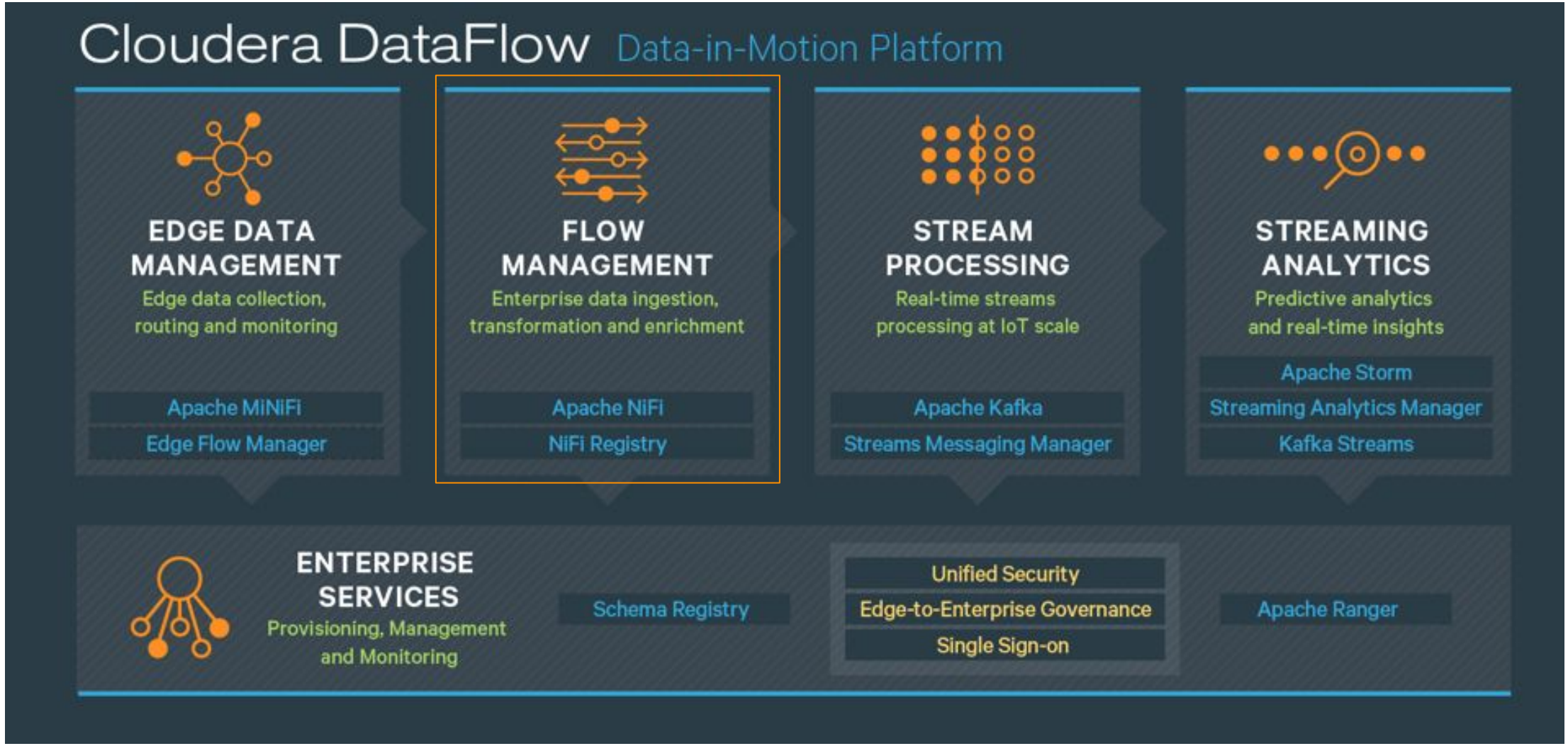
cloudera

CLOUDERA DATAFLOW (CDF)

NiFi POC Setup Guidance

April 16, 2019

CDF ECOSYSTEM



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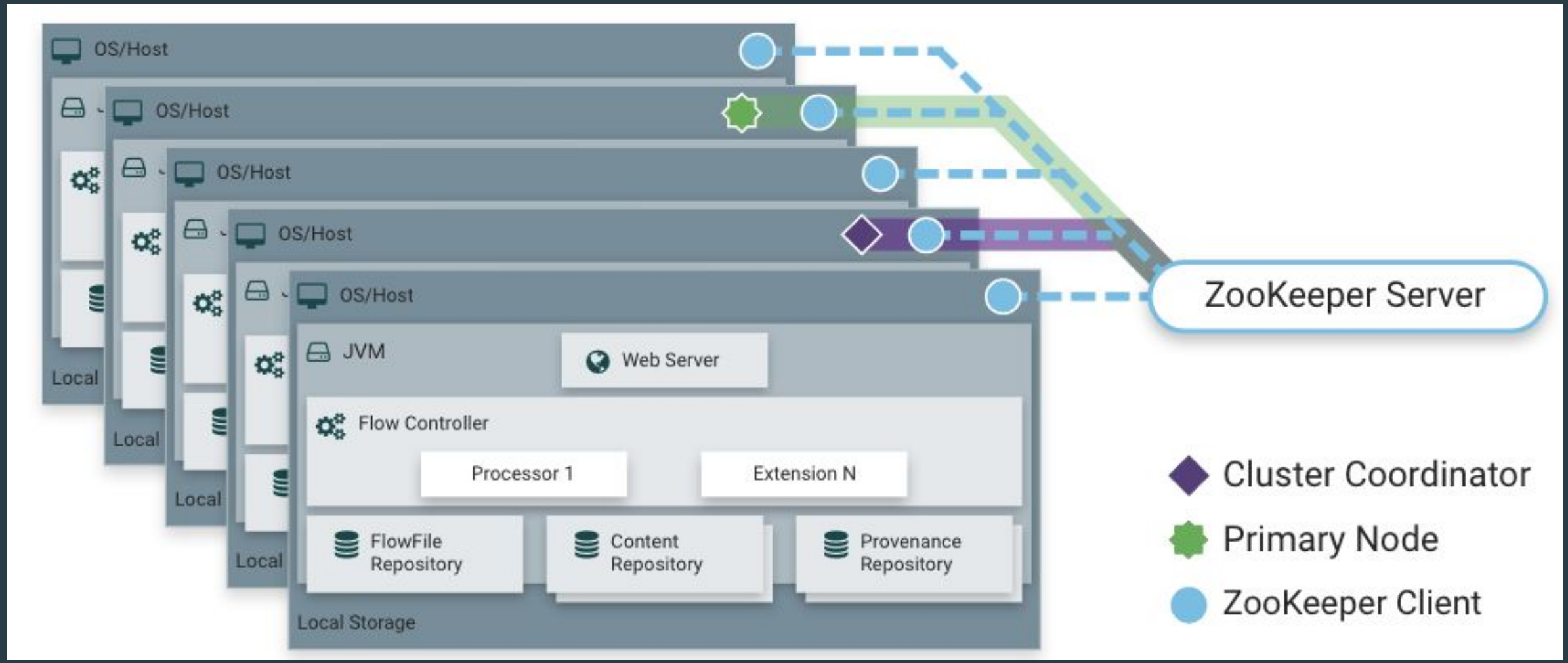
NIFI - ARCHITECTURE, SIZING & DEPLOYMENT GUIDELINES

NiFi Cluster Architecture



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Hardware Considerations for DF

General Hardware

A key design point of NiFi is to use typical enterprise class application servers.

Hardware failure:

- Nodes are typically configured with RAID 5/10 to handle hardware failures through replication, redundancy.
- More nodes means less impact from failure.
- More nodes provide increased throughput.

Machine Class

A NiFi cluster consists of a single class of machine

Balanced NiFi Node:

- 8 CPU cores per node minimum.
- 6 Hard disks per node minimum, Spinning or SSD base on throughput requirements.
- 16 GB of RAM per node minimum.
- Designed for availability.
- Typical enterprise class application server.
- Resilience built into the server itself (RAID)
- Cost reduced where possible to strike proper price/performance ratio owing to volume.

Networking

Network decisions play a role due to the clustered nature of data processing.

In-rack backplane/Top-of-rack Switch:

- Keeps traffic local and reduces load on expensive aggregate switches.

Dual NIC Recommended:

- Depends on NTW requirements.

10G Recommended:

- Immediate cost vs Future-proofing.
- Investment in 10G upfront will survive next 2-3 server hardware upgrades.
- In-rack/top-of-rack switches allow Cat6 copper or Twinax to reduce 10G costs.

Apache NiFi H/W Expectations

Apache NiFi is designed to take advantage of:

- all the cores on a machine
- all the network capacity
- all the disk speed
- many GB of RAM (though usually not all) on a system

Average flow defined as:

Those in which data arrives via some fairly consistent rate with a few operations performed on each event/data comprised of attribute extraction, routing, transformation, compression, and follow-on delivery.

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Apache NiFi: Hardware Driving Factors

Apache NiFi is designed to take advantage of:

- all the cores on a machine
- all the network capacity
- all the disk speed
- many GB of RAM (though usually not all) on a system

Most important hardware factors :

- Top-end disk throughput as configured which is a combination of seek time and raw performance
- Network speed

CPU only a concern when there is a lot of compression, encryption, or media analytics

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Apache NiFi: Default Cluster Recommendation

When not provided with information to gauge the rate and complexity of data flow, start with a default cluster of three nodes. Three nodes are needed for HA by Zookeeper Quorum process.

So, starting cluster for, say, 50MB/s sustained throughput for average Flow is:

- **3 nodes each with:**
  - **CPU: 8+ cores (16 is preferred)**
  - **Memory: 16+ GB**
  - **Disk: 6 disks, each 1TB disks (could be spinning or SSD)**

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Apache NiFi Clusters Scale Linearly

Throughput Target	Number of NiFi nodes	CPU Cores/node	Number of disks/node, size of each disk (RAID 5/10)	RAM/node	Ideal Networking Setup
50 MB/s, 1000 events/s	3	16+	6+, 1TB	16+ GB	1 Gigabit bonded NICs
100 MB/s, 10,000 events/s	5	16+	6+, 2TB	16+ GB	1 Gigabit bonded NICs
200 MB/s, 100,000 events/s	7	24+	12+, 4TB	32+ GB	10 Gigabit bonded NICs
400 MB/s, 100,000+ events/s	9	24+	12+, 8TB	32+ GB	10 Gigabit bonded NICs

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Hardware Profile

- Separate disk for Repos

Flow

Content

Provenance

- Minimum 1 TB disk for nodes with ZK

Apache NiFi Disk

- RAID1 – Will provide best performance/throughput
- RAID10 – Small/Negligible performance hit; however, adds additional level of data loss tolerance
- Must have separate disk for Repos
- Use typical OS RAID (enterprise requirements). Typically RAID1

CDF - CFM/HDF SUPPORT MATRIX

Operating Systems (20/65)

Name	Version									
RHEL	7.6	7.5	7.4	7.3	7.2	7.1	7.0			
	6.10	6.9	6.8	6.7	6.6	6.5	6.4	6.3	6.2	6.1
CentOS	7.6	7.5	7.4	7.3	7.2	7.1	7.0			
	6.10	6.9	6.8	6.7	6.6	6.5	6.4	6.3	6.2	6.1
Oracle	7.6	7.5	7.4	7.3	7.2	7.1	7.0			
	6.10	6.9	6.8	6.7	6.6	6.5	6.4	6.3	6.2	6.1
Amazon Linux	2									
Ubuntu	18.04									
	16.04									
	14.04									
	12.04									
Debian	9									
	7.8	7								
	6									
SUSE	12 SP3	12 SP2	12 SP1							
	11 SP4	11 SP3								

Databases (6/15)

Name	Version						
OracleDB	12c	11gr2					
PostgreSQL	10.2	9.6	9.5	9.4	9.3	9.2	9.1.13+
MySQL	5.7	5.6	5.5				
MariaDB	10.2	10.1	10				

JDK (2/4)

Name	Version	
OpenJDK	JDK8	JDK7
OracleJDK	JDK8	JDK7

Processor (3/3)

Name	Version	
IBM Power Systems	Power 8	Power 9
x86	x86-64	

https://supportmatrix.hortonworks.com/

HDF	3.4	3.4.0			
	3.3	3.3.1	3.3.0		
	3.2	3.2.0			
	3.1	3.1.2	3.1.1	3.1.0	
	3.0	3.0.2	3.0.1.1	3.0.1	3.0.0

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CFM 1.0 - PARCEL INSTALL

CFM 1.0 - Parcel Installation

Prerequisites

- CDH version 5.5.6 + already installed
- Servers under Cloudera Manager control that meet CFM installation specifications for NiFi installation
- Zookeeper installed or CM admin to install it
- Java 1.8 installed on all nodes targeted for CFM
  - System administrator if Java 1.8 install will be required
- Cloudera Manager Admin to add new parcel location
- Cloudera Manager will require a restart by the systems administrator
- System administrator to install CSDs on Cloudera Manager server

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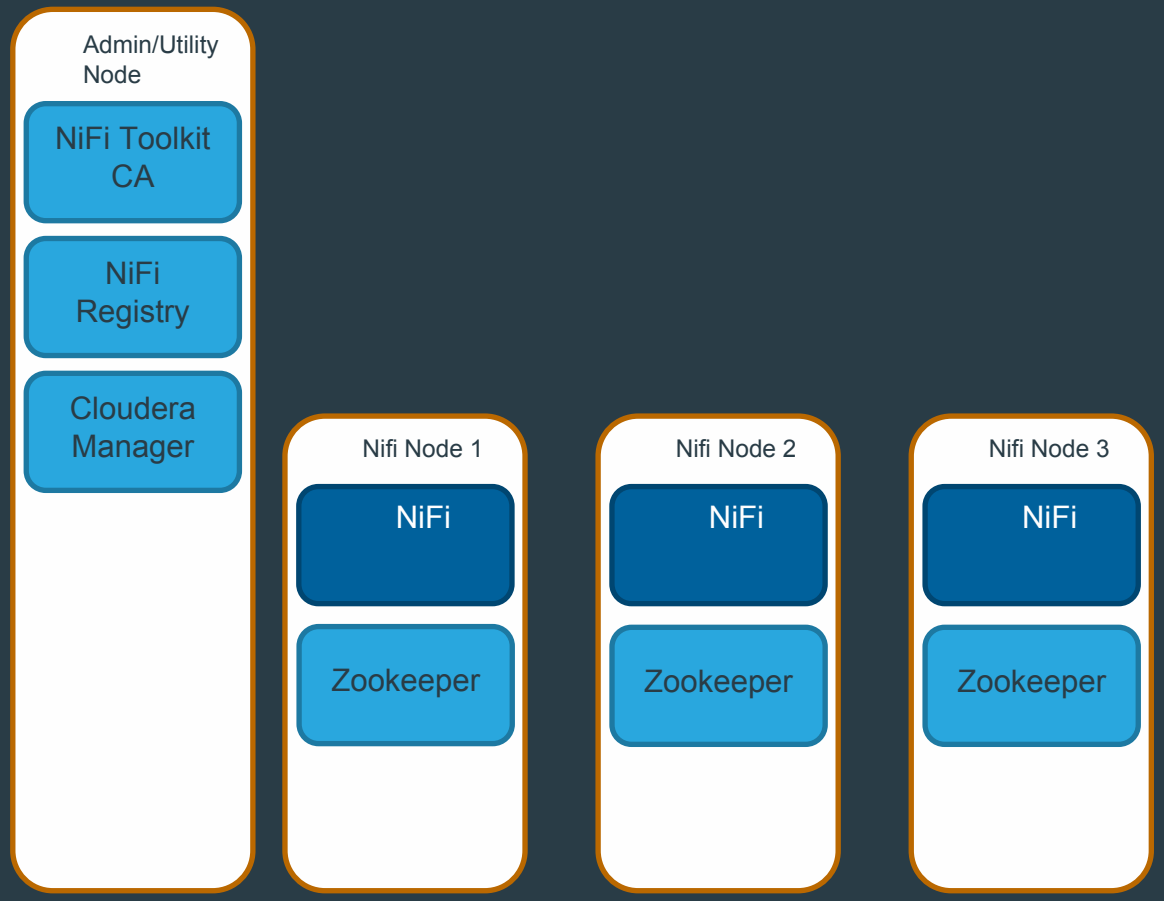
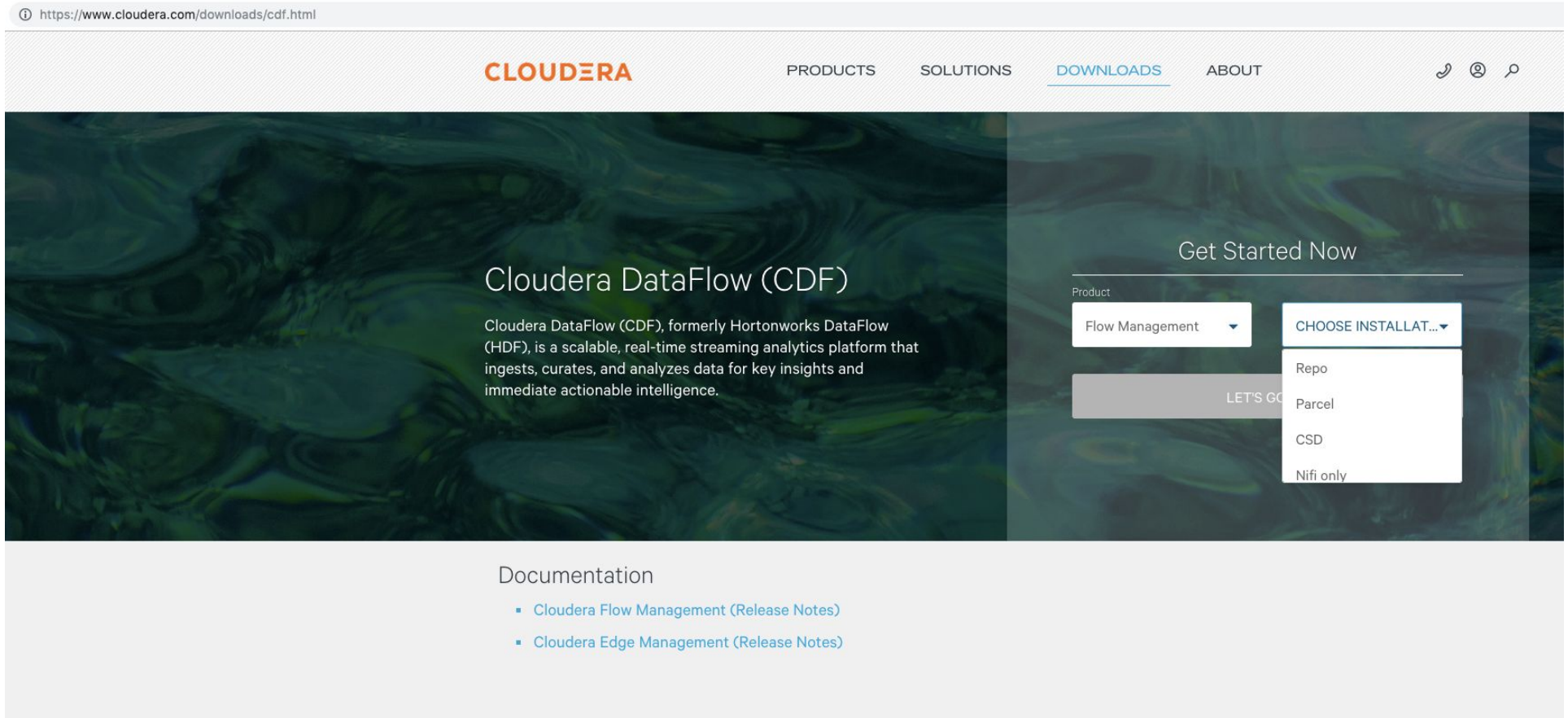
CFM Cluster – With Operations Mgmnt & Security



CFM 1.0 - Parcel Installation

Step 1 - Obtain artifacts



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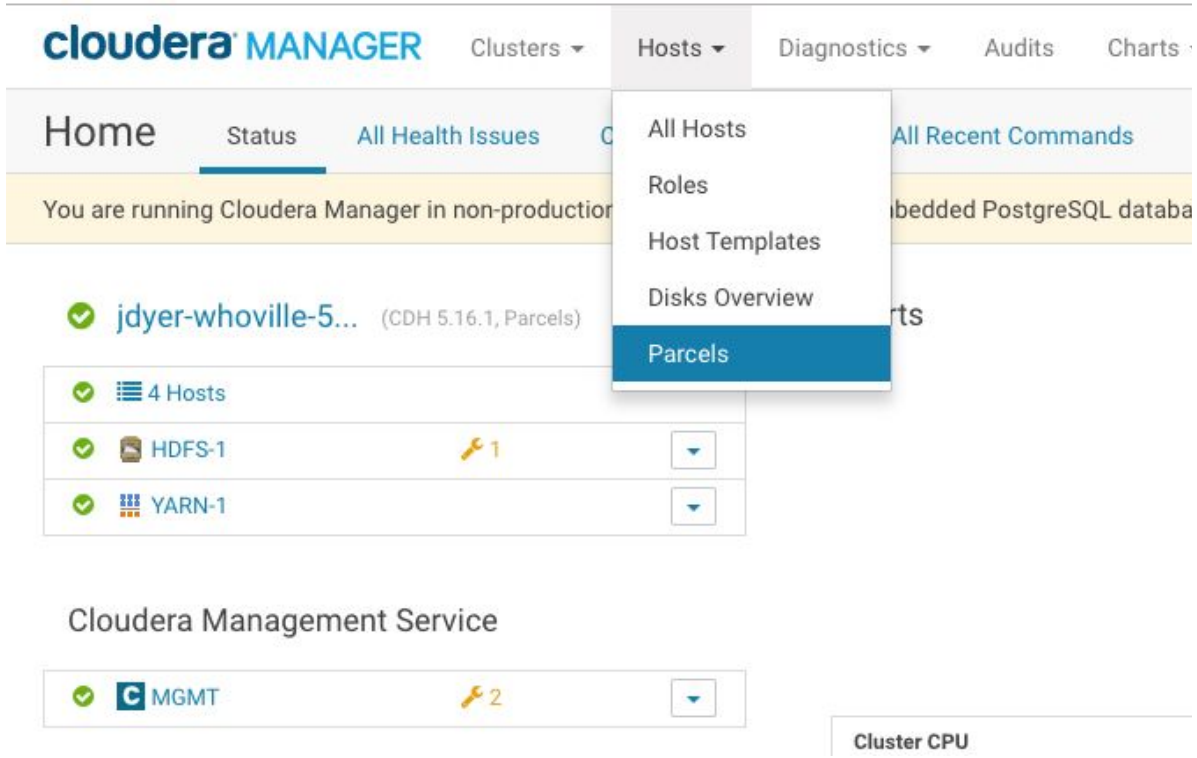
CFM 1.0 - Parcel Installation

Step 2 - Download CSDs

- wget .jar files from public repo to /opt/cloudera/csd
- chown -R cloudera-scm:cloudera-scm /opt/cloudera/csd/*
- chmod 644 /opt/cloudera/csd/*
- Service cloudera-scm-server restart



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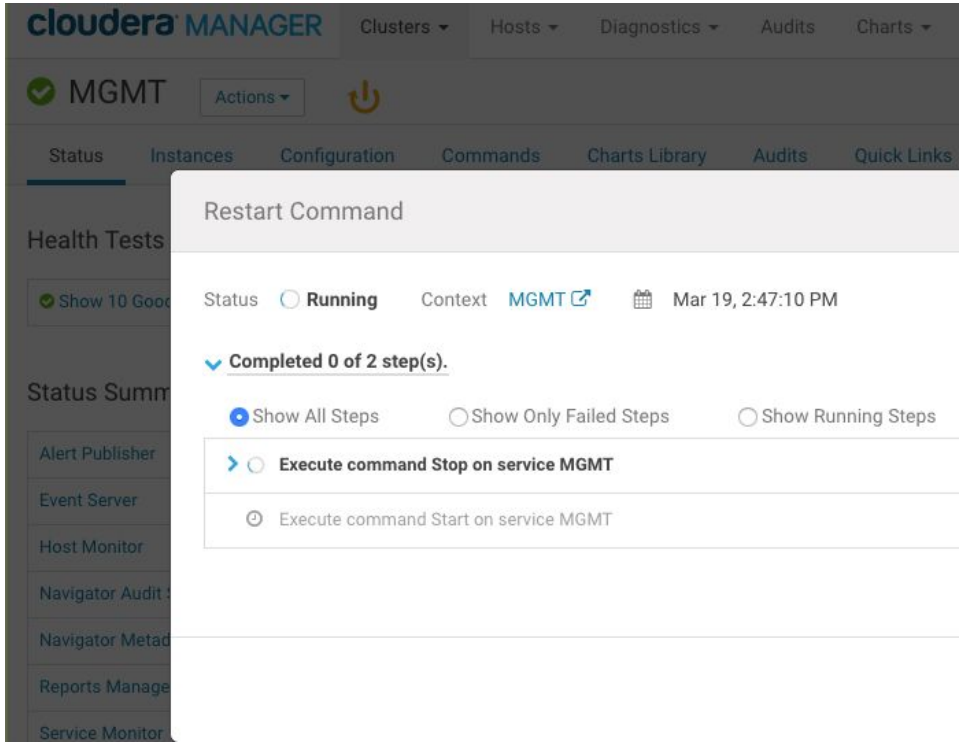
TWO COLUMN WITH IMAGE ON LEFT (KEEP TITLE TO 1 LINE)

Step 3 - Restarting Cloudera Management Service



- Clusters > Cloudera Management Service > Cloudera Management Service
- Actions > Restart
- Just takes a few minutes

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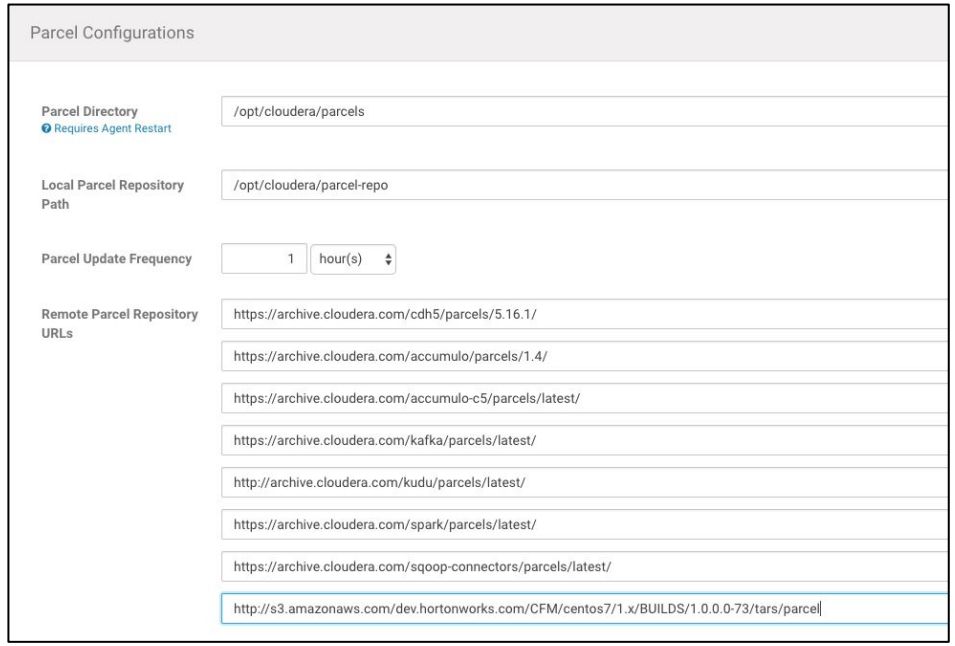
CFM 1.0 - Parcel Installation

Step 4 - Add Parcels

- Hosts -> parcels -> configuration
- Add repository location for the CFM parcels



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TWO COLUMN WITH IMAGE ON LEFT (KEEP TITLE TO 1 LINE)

Step 5 - Download, Distribute, Activate Parcels

jdyer-whoville-5-16-1

Parcel Name	Version	Status	
ACCUMULO	1.7.2-5.5.0.ACCUMULO5.5.0.p0.8	Available Remotely	Download
	1.4.4-1.cdh4.5.0.p0.65	Unavailable	
• Error for parcel ACCUMULO-1.4.4-1.cdh4.5.0.p0.65-el7 : Parcel not available for OS Distribution RHEL7.			
CDH 5	**5.16.1-1.cdh5.16.1.p0.3**	**Distributed, Activated**	Deactivate
CFM	1.0.0.0	Downloading 478.3 MiB/1.6 GiB	Cancel
KAFKA	3.1.1-1.3.1.1.p0.2	Available Remotely	Download
KUDU	1.4.0-1.cdh5.12.2.p0.8	Available Remotely	Download
NIFI	1.9.0.1.0.0.0-73	Available Remotely	Download
NIFIREGISTRY	0.3.0.1.0.0.0-73	Available Remotely	Download
NIFITOOLKIT	1.9.0.1.0.0.0-73	Available Remotely	Download
SPARK	0.9.0-1.cdh4.6.0.p0.98	Unavailable	
• Error for parcel SPARK-0.9.0-1.cdh4.6.0.p0.98-el7 : Parcel not available for OS Distribution RHEL7.			
SQOOP_NETEZZA_CONNECTOR	1.5.1c5	Available Remotely	Download
SQOOP_TERADATA_CONNECTOR	1.7c5	Available Remotely	Download

- Download CFM Parcel in CM UI
- Distribute CFM Parcel in CM UI
- Activate CFM Parcel in CM UI

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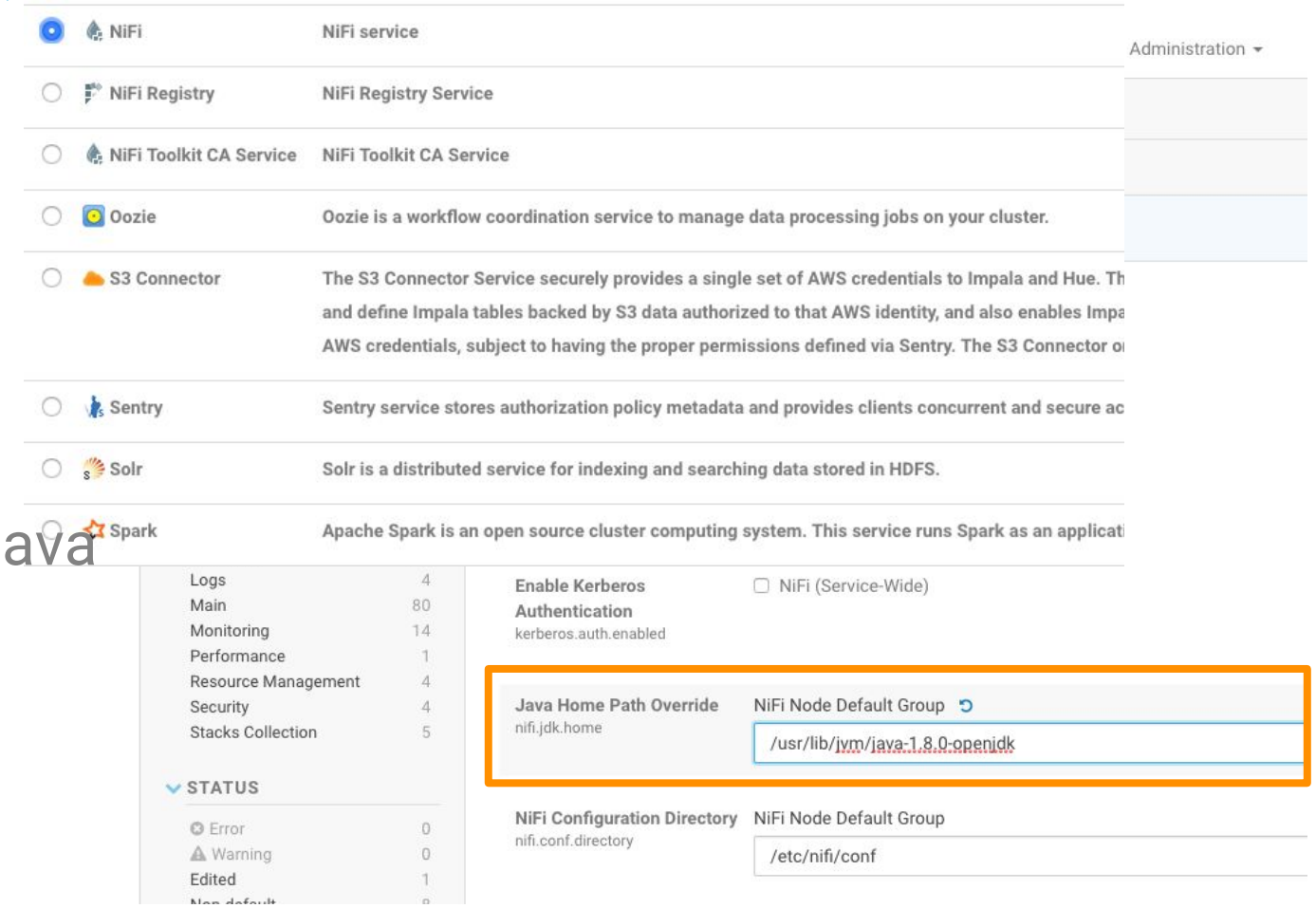
CFM 1.0 - Parcel Installation

Step 6 - Add NiFi-Toolkit, NiFi-Registry, and NiFi Services

- Add NiFi Toolkit service
- Add NiFi Registry service
- Add NiFi Service
- Note that since services require Java 1.8 “Java Home Path Override” should be set to Java 1.8 install



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Cloudera Manager | Clusters | Hosts | Diagnostics | Audits | Charts | Backup | Administration | Search | Support | admin

Home | Status | All Health Issues 1 | Configuration 11 | All Recent Commands | Add Cluster

You are running Cloudera Manager in non-production mode, which uses an embedded PostgreSQL database. Switch to using a supported external database before moving into production. More Details

Cluster 1 (CDH 6.1.1, Parcels)

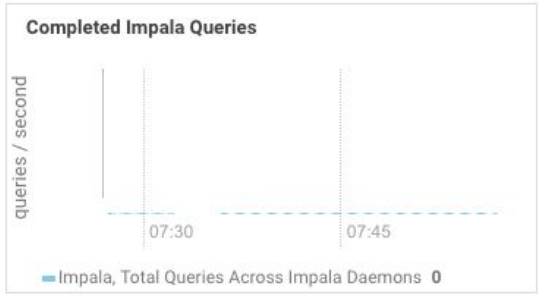
- 8 Hosts
- HBase
- HDFS 3
- Hive
- Hue 1
- Impala
- Kafka 1
- Key-Value Stor...
- Kudu 1
- NiFi
- Oozie
- Solr
- Spark
- YARN (MR2 In... 1
- ZooKeeper 1

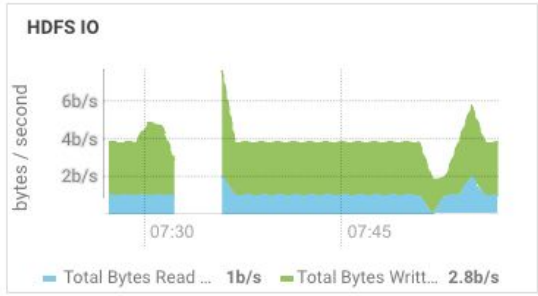
Cloudera Management Service

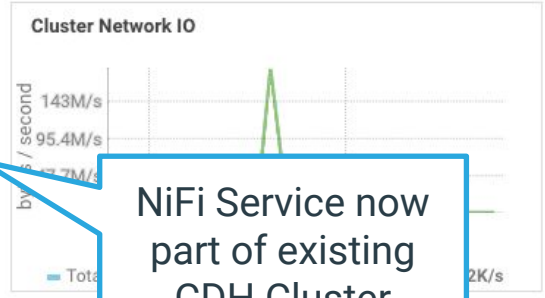
- Cloudera Man... 4

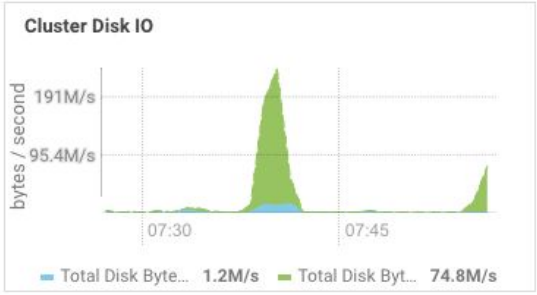
Charts

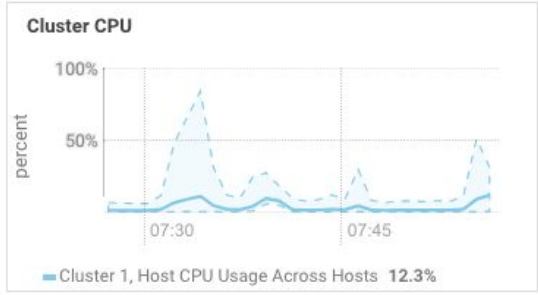
30m 1h 2h 6h 12h 1d 7d 30d











NiFi Service now part of existing CDH Cluster

Cloudera Manager | Clusters | Hosts | Diagnostics | Audits | Charts | Backup | Administration | Search | Support | admin

Cluster 1

NiFi | Actions

30 minutes preceding Feb 22, 7:57 PM UTC

Status | Instances | Configuration | Commands | Charts Library | Audits | Web UI | Quick Links

NiFi Service Home Page. Select link in Web UI to go to NiFi UI

Health Tests

Create Trigger

Status Summary

NiFi Node	3 Good Health
Hosts	3 Good Health

Health History

No health changes in this time period.

Charts

30m 1h 2h 6h 12h 1d 7d 30d

Importa

events

NO DATA

Informational Events

events

NO DATA

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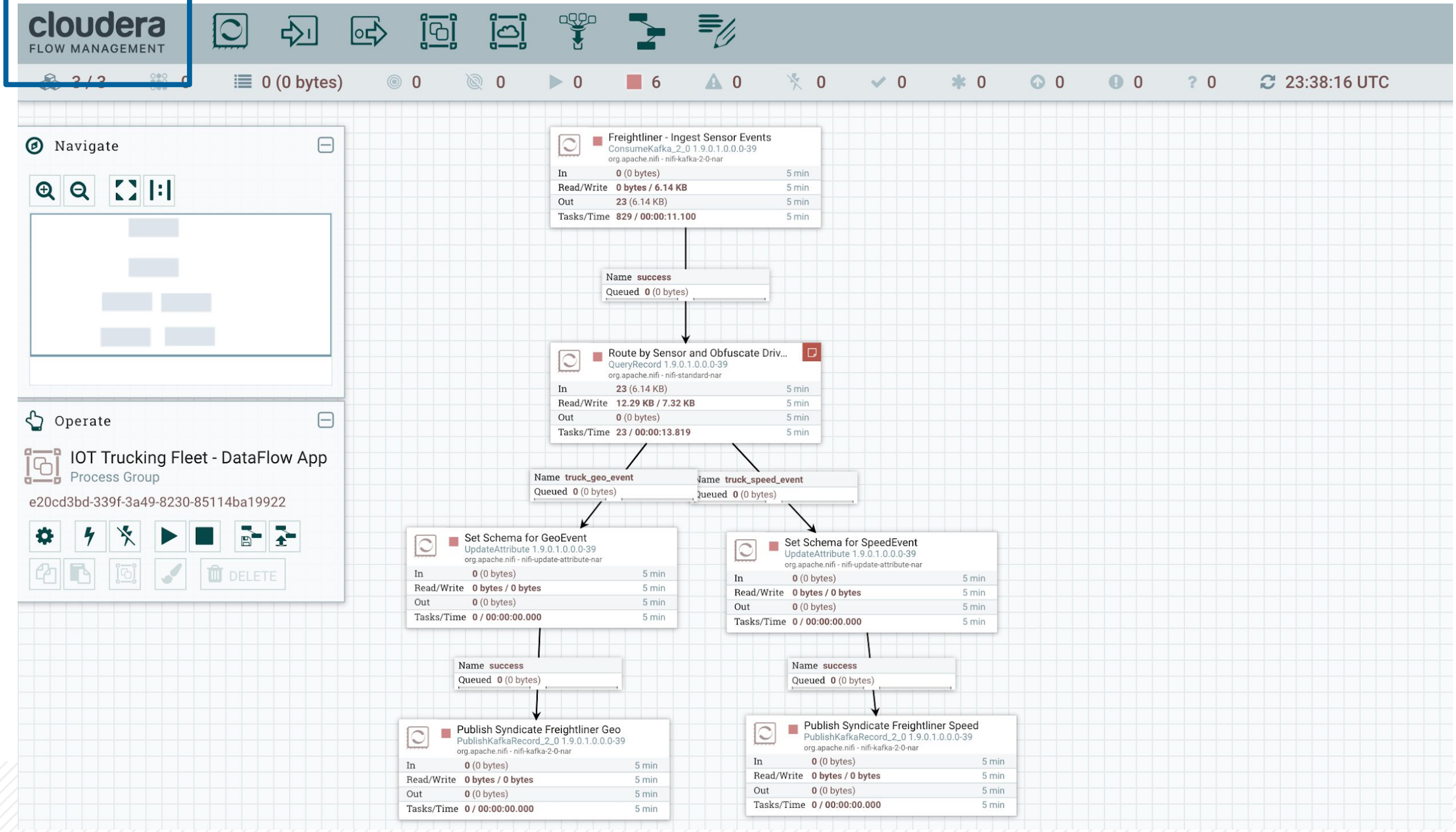
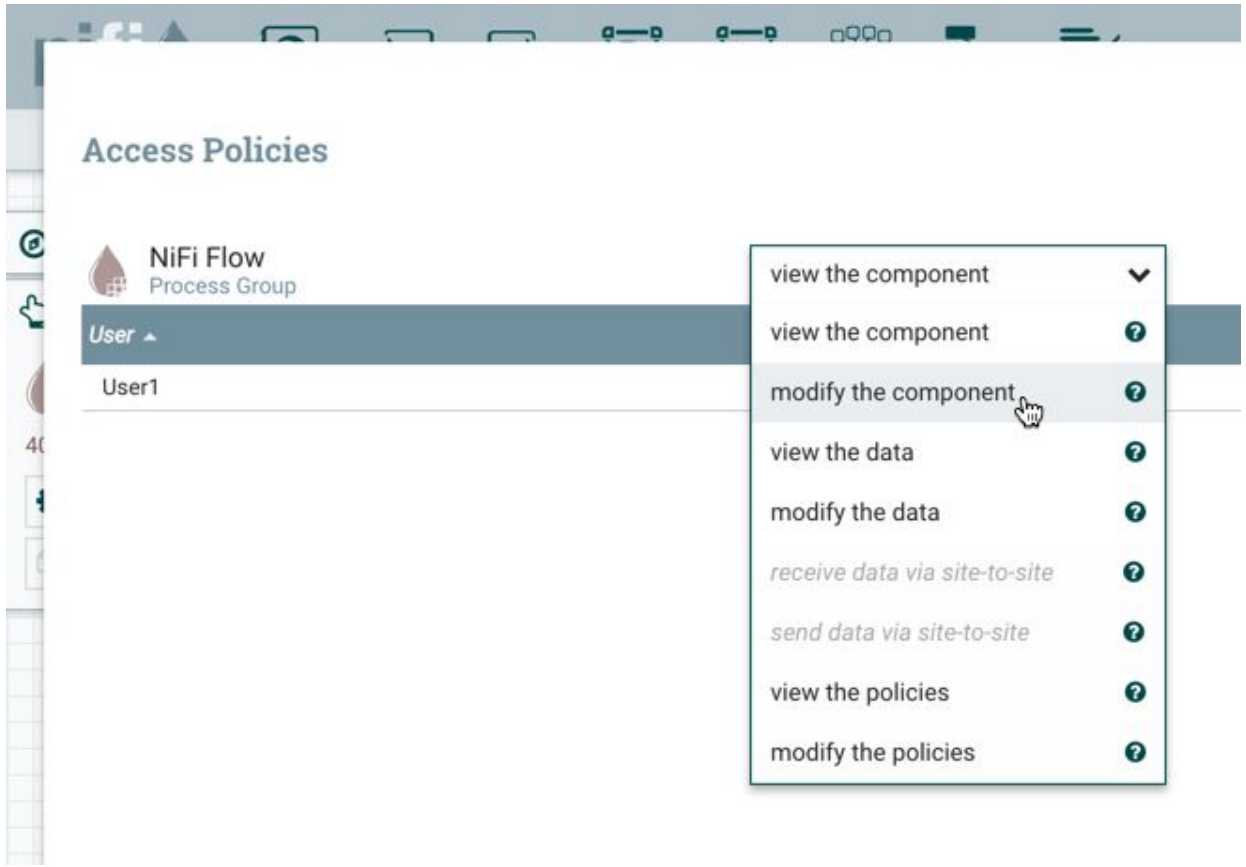

cloudera
FLOW MANAGEMENT
3 / 3
0
0 (0 bytes)
0
0
0
6
0
0
0
0
0
0
0
23:38:16 UTC
Navigate
Operate
IOT Trucking Fleet - DataFlow App
Process Group
e20cd3bd-339f-3a49-8230-85114ba19922
DELETE
Freightliner - Ingest Sensor Events
ConsumeKafka_2_0 1.9.0.1.0.0.0-39
org.apache.nifi - nifi-kafka-2-0-nar
In 0 (0 bytes) 5 min
Read/Write 0 bytes / 6.14 KB 5 min
Out 23 (6.14 KB) 5 min
Tasks/Time 829 / 00:00:11.100 5 min
Name success
Queued 0 (0 bytes)
Route by Sensor and Obfuscate Driv...
QueryRecord 1.9.0.1.0.0.0-39
org.apache.nifi - nifi-standard-nar
In 23 (6.14 KB) 5 min
Read/Write 12.29 KB / 7.32 KB 5 min
Out 0 (0 bytes) 5 min
Tasks/Time 23 / 00:00:13.819 5 min
Name truck_geo_event
Queued 0 (0 bytes)
Name truck_speed_event
Queued 0 (0 bytes)
Set Schema for GeoEvent
UpdateAttribute 1.9.0.1.0.0.0-39
org.apache.nifi - nifi-update-attribute-nar
In 0 (0 bytes) 5 min
Read/Write 0 bytes / 0 bytes 5 min
Out 0 (0 bytes) 5 min
Tasks/Time 0 / 00:00:00.000 5 min
Set Schema for SpeedEvent
UpdateAttribute 1.9.0.1.0.0.0-39
org.apache.nifi - nifi-update-attribute-nar
In 0 (0 bytes) 5 min
Read/Write 0 bytes / 0 bytes 5 min
Out 0 (0 bytes) 5 min
Tasks/Time 0 / 00:00:00.000 5 min
Name success
Queued 0 (0 bytes)
Name success
Queued 0 (0 bytes)
Publish Syndicate Freightliner Geo
PublishKafkaRecord_2_0 1.9.0.1.0.0.0-39
org.apache.nifi - nifi-kafka-2-0-nar
In 0 (0 bytes) 5 min
Read/Write 0 bytes / 0 bytes 5 min
Out 0 (0 bytes) 5 min
Tasks/Time 0 / 00:00:00.000 5 min
Publish Syndicate Freightliner Speed
PublishKafkaRecord_2_0 1.9.0.1.0.0.0-39
org.apache.nifi - nifi-kafka-2-0-nar
In 0 (0 bytes) 5 min
Read/Write 0 bytes / 0 bytes 5 min
Out 0 (0 bytes) 5 min
Tasks/Time 0 / 00:00:00.000 5 min

CFM

NiFi Native Security

- 3 providers in CFM
  - Client certificates
  - Kerberos
  - LDAP
- Authentication
- Authorization
  - NiFi policies
  - Fine grained authorization
  - Separate control admin concerns from user processor concerns
- Methods used in NiFi at the NSA



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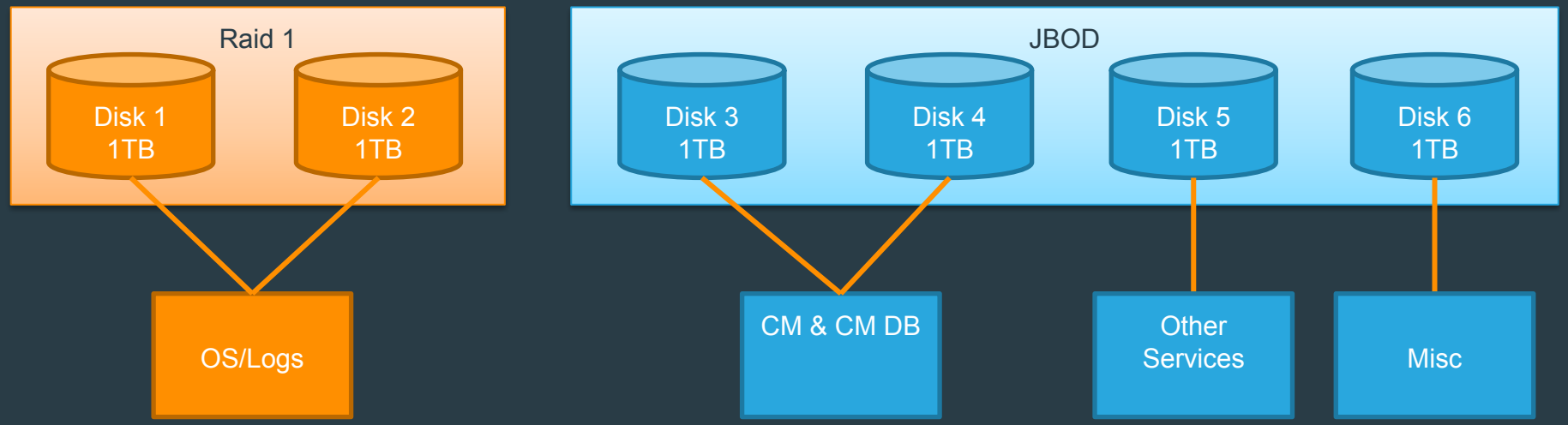
NIFI DEPLOYMENT - DISK LAYOUT

Disk Partitioning – Utility/Edge/Admin Nodes

Admin/Utility Node



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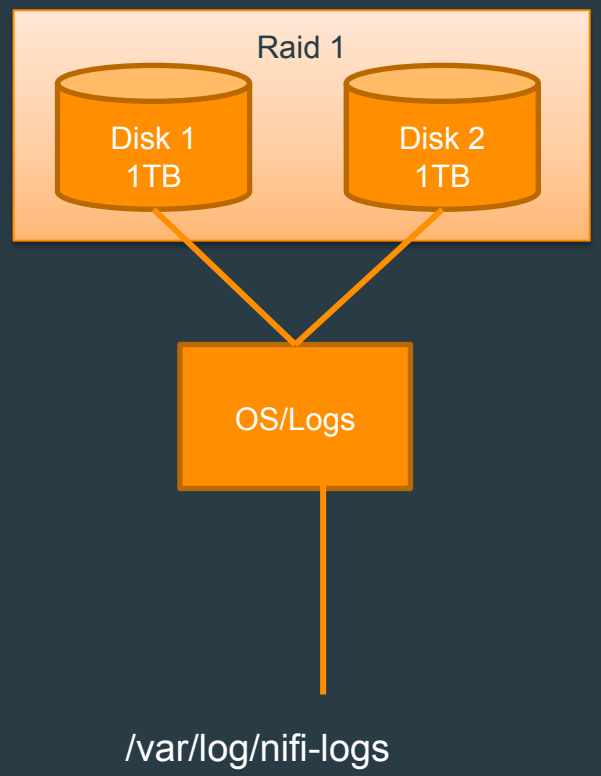
Disk Partitioning – Apache NiFi Nodes (OS, Logs and Zookeeper)



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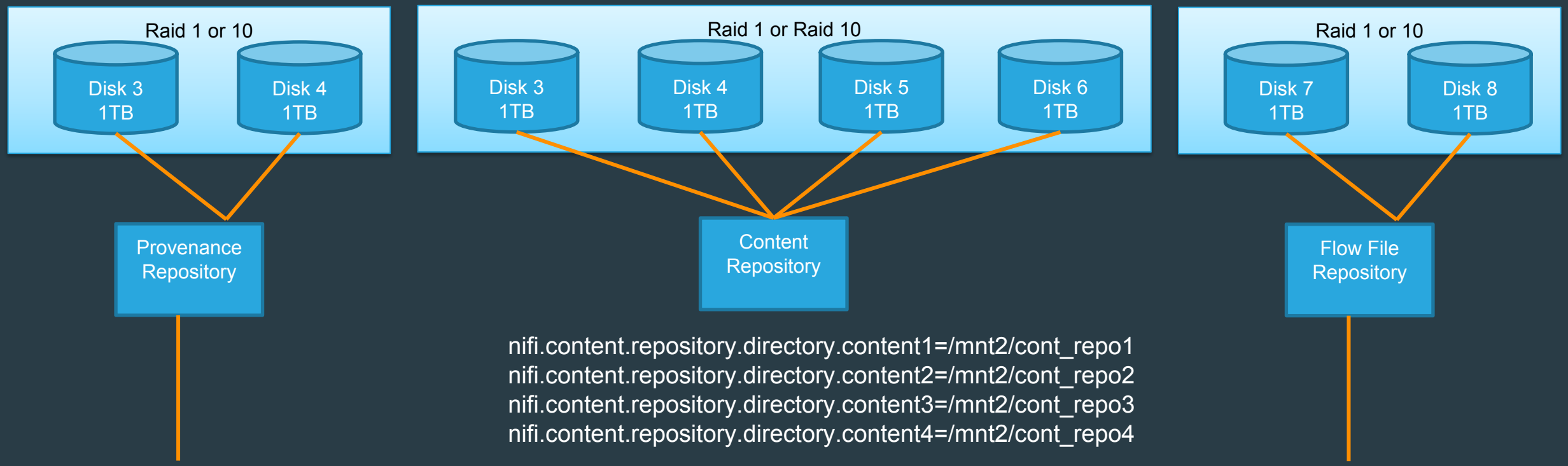
Disk Partitioning – Apache Nifi Nodes (Repositories)



nifi.content.repository.directory.content1=/mnt2/cont_repo1
nifi.content.repository.directory.content2=/mnt2/cont_repo2
nifi.content.repository.directory.content3=/mnt2/cont_repo3
nifi.content.repository.directory.content4=/mnt2/cont_repo4

nifi.provenance.repository.directory.content1=/mnt1/prov_repo1
nifi.provenance.repository.directory.content1=/mnt1/prov_repo2

nifi.database.directory=/mnt3/database_repository
nifi.flowfile.repository.directory =/mnt3/flowfile_repository

/opt/nifi
/opt/configuration-resources

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Disk Partition Baseline

OS Disk	
/	50G
/dev	32G
/boot	1008M
/opt	100G
/var	**200G**
/tmp	**200G+**

HDF Disk Partition Baseline

```
/
|--> opt/
|     |--> nifi-current_version
|     |     |--> LICENSE
|     |     |--> NOTICE
|     |     |--> README
|     |     |--> bin/
|     |     |--> conf/
|     |     |--> docs/
|     |     |--> lib/
|     |     |--> work/
|     |
|     |--> Configuration_resources/
|     |     |--> authorized-users.xml
|     |     |--> flow.xml.gz
|     |     |--> templates/
|     |     |--> custom_lib/
|
|--> database_repository/
|--> content_repository_1/
|--> content_repository_N
|--> flowfile_repository/
|--> NiFi-logs/
|--> provenance_repository_1/
|--> provenance_repository_N/
```

Nifi Node		
Logs	**/var/log/nifi-logs Or /nifi-logs**	500G
Nifi Binaries and Config.	/opt/nifi /opt/configuration-resources	100 MB 100 MB
Provenance Repository	**/mnt1/${N}/provenance_repository**	1 TB
Content Repository	**/mnt2/${N}/content_repository**	**1 TB**
Flow File Repository	**/mnt3/flowfile_repository**	**500G+**
Database Repository	**/mnt3/database_repository**	**100G+**
Zookeeper	**/mnt4/zookeeper**	**500G+**

THANK YOU