HADOOP ADMINISTRATION USING CLOUDERA

STUDENT LAB GUIDEBOOK

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LAB: Installing CDH5 using Cloudera Manager:

Step: 1 Meet the prerequisites: Ensure following are met before installing CDH5.

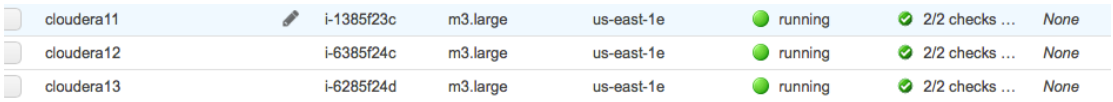
The hosts in a Cloudera Manager deployment must satisfy the following networking and security requirements:

Cluster hosts must have a working network name resolution system and correctly formatted /etc/hosts file.

All cluster hosts must have properly configured forward and reverse host resolution through DNS.

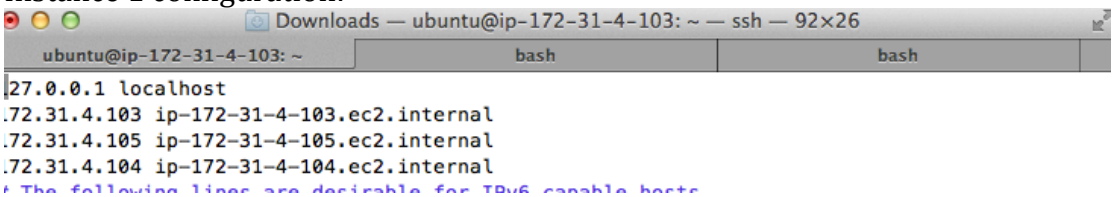
- The /etc/hosts files must Contain consistent information about hostnames and IP addresses across all hosts
- Not contain uppercase hostnames
- Not contain duplicate IP addresses.

Step: 2 In our case we have following Ubuntu instances configured in amazon aws as specified in the picture below:(Ask administrator for instance details).

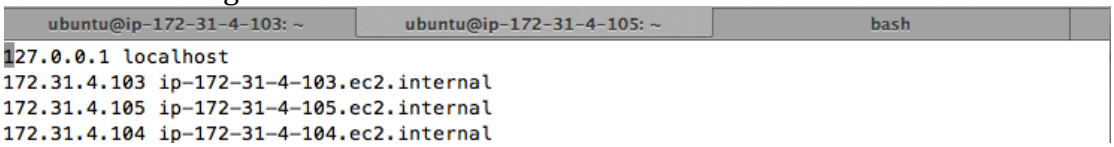


Step:3 Following are the private IP and the edited /etc/hosts as specified below, configure the same in your instances using putty or ssh client connecting to the instances as specified below.

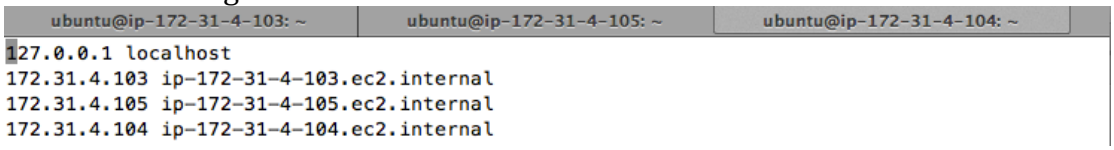
Instance 1 configuration:



Instance 2 Configuration:



Instance 3 Configuration:



Step:4 Select instance to install CM5 package as specified below and download the utility as specified below:

```
Downloads — ubuntu@ip-172-31-8-130: ~ — ssh — 132×27
ubuntu@ip-172-31-8-130:~$ wget http://archive.cloudera.com/cm5/installer/latest/cloudera-manager-installer.bin
--2015-01-19 13:56:55--  http://archive.cloudera.com/cm5/installer/latest/cloudera-manager-installer.bin
Resolving archive.cloudera.com (archive.cloudera.com)... 54.230.19.29, 54.240.160.223, 54.230.16.118, ...
Connecting to archive.cloudera.com (archive.cloudera.com)|54.230.19.29|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 514295 (502K) [application/octet-stream]
Saving to: `cloudera-manager-installer.bin'

100%[======================================================================================>] 514,295     --.-K/s   in 0.02

2015-01-19 13:56:55 (26.5 MB/s) - `cloudera-manager-installer.bin' saved [514295/514295]
```

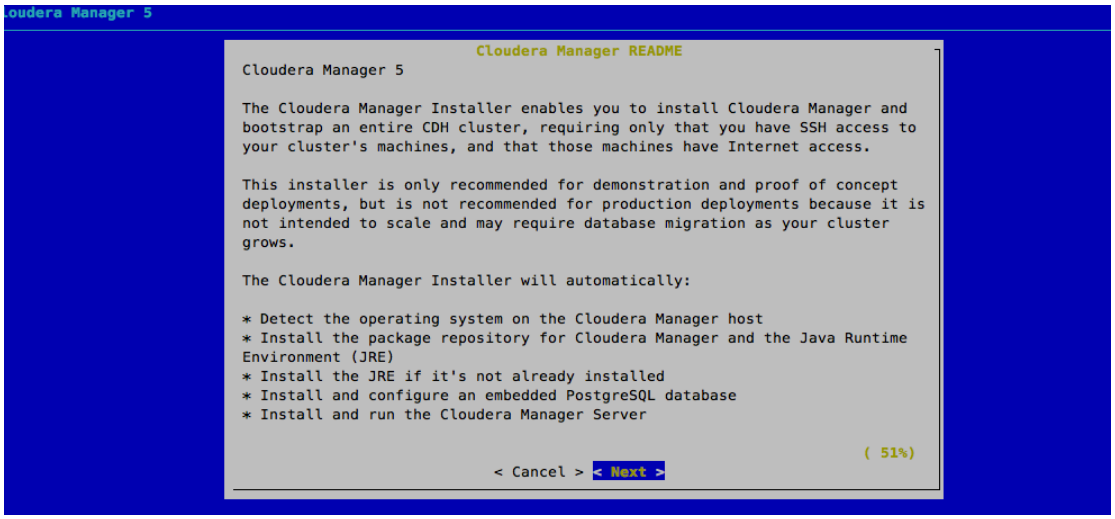
Step:5 Once your wget runs properly do ls to get the installation binary.

```
ubuntu@ip-172-31-4-103:~$ ls
cloudera-manager-installer.bin
ubuntu@ip-172-31-4-103:~$
```

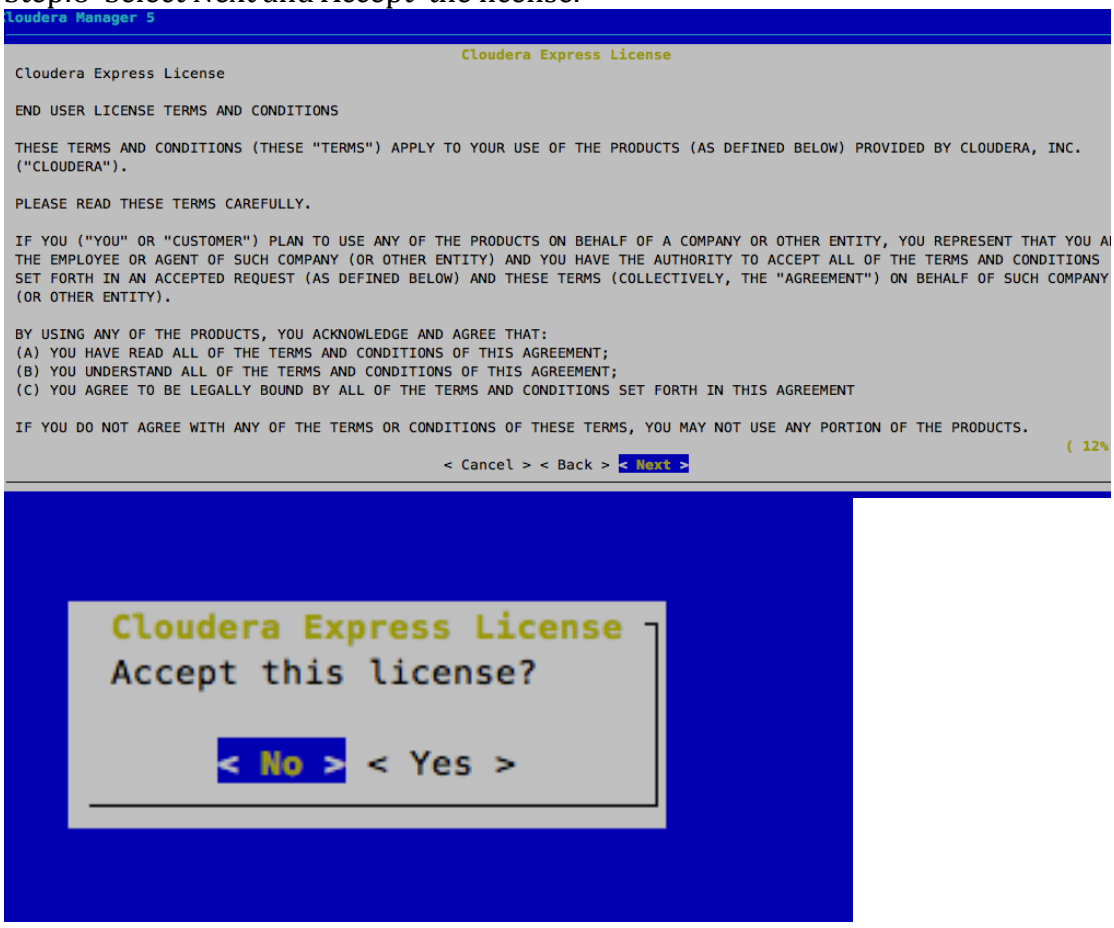
Step:6 Run the installer(ensure as root user)

```
ubuntu@ip-172-31-4-103:~$ sudo ./cloudera-manager-installer.bin
```

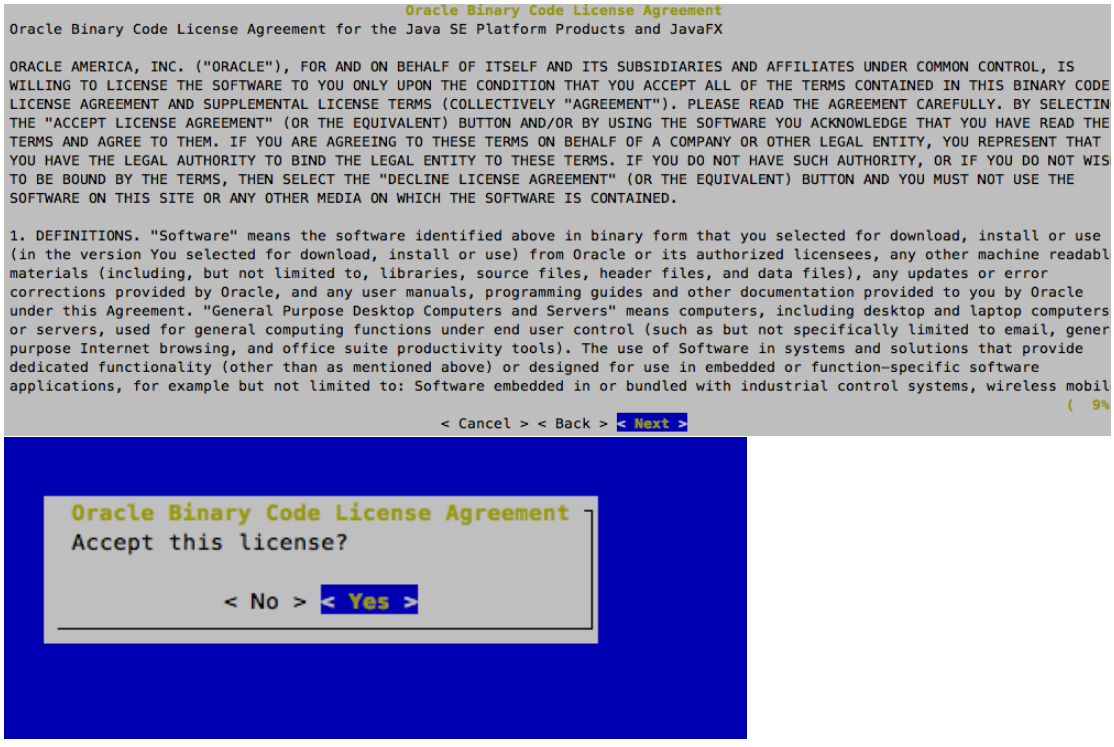
Step:7 From here specify follow the wizard.Follow the wizard as specified in below diagrams:



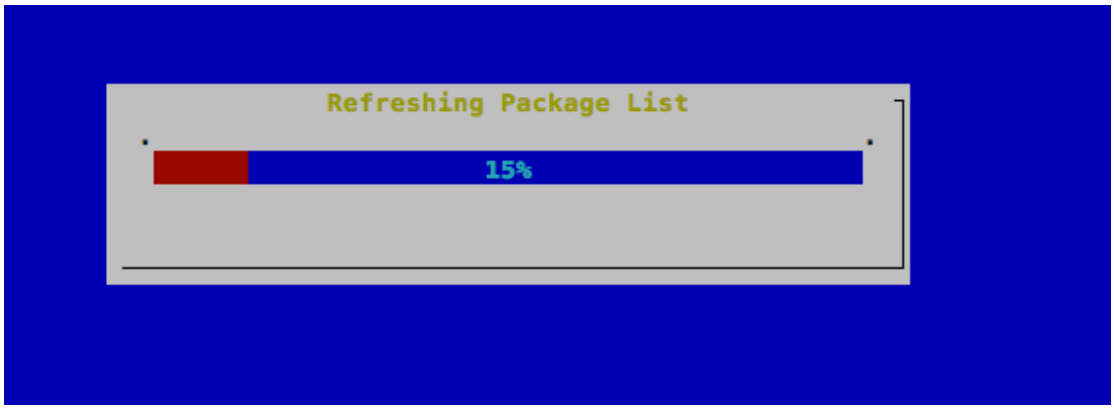
Step:8 Select Next and Accept the license.

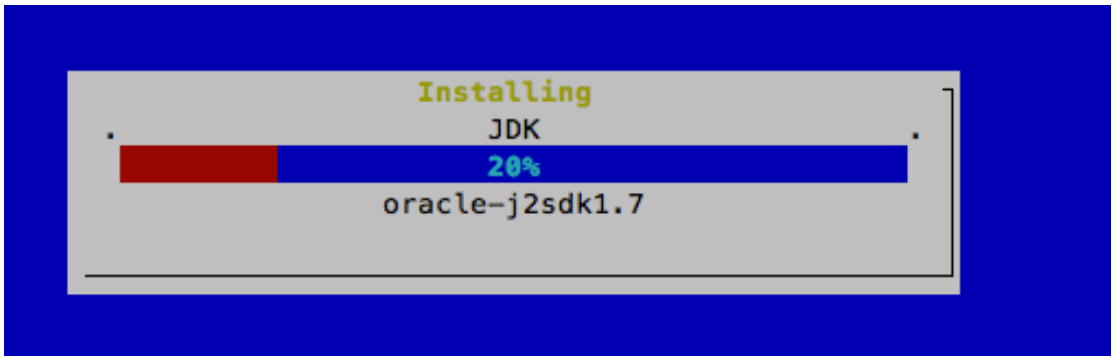


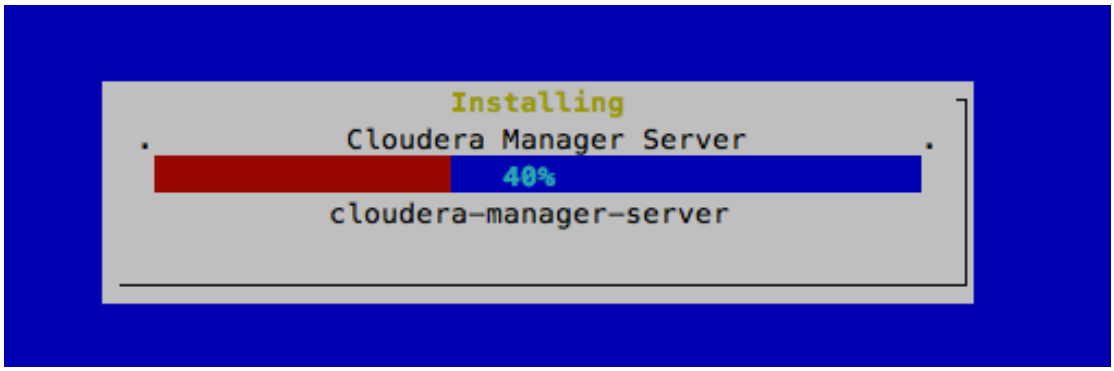
Step: 9 Accept non-cloudera licenses.



Step: 10 It starts installation with following tasks .

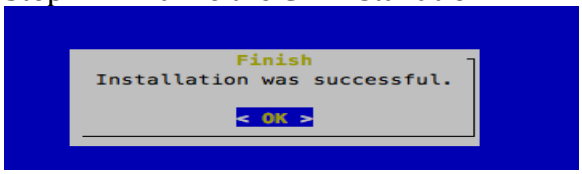




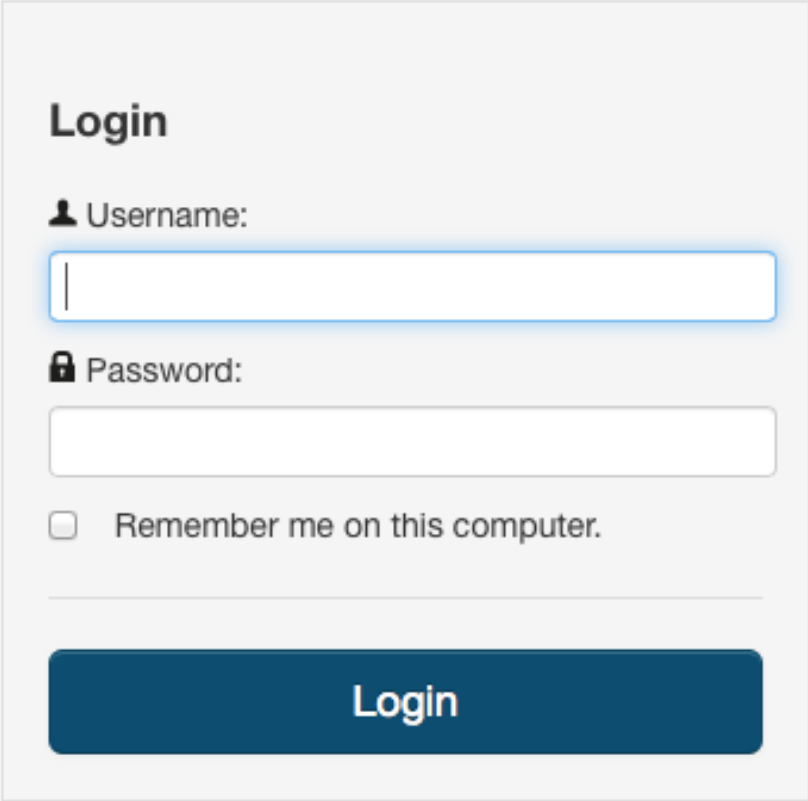


Step:11 Once installation is done browse using 7180 tcp port as indicated in last steps.

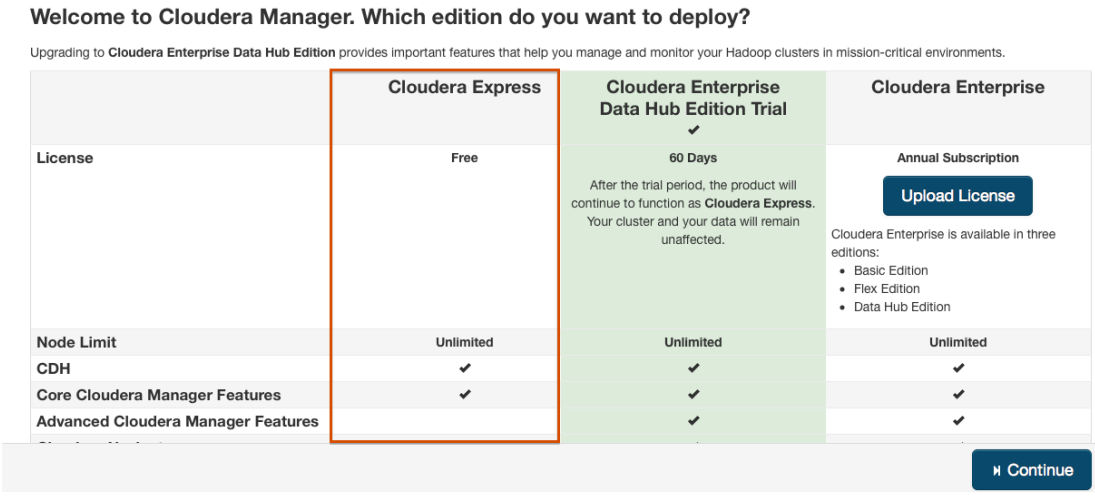
Step:12 Finalize the CM installation.



Step:13 Login in the CM using admin as userid and admin as password.

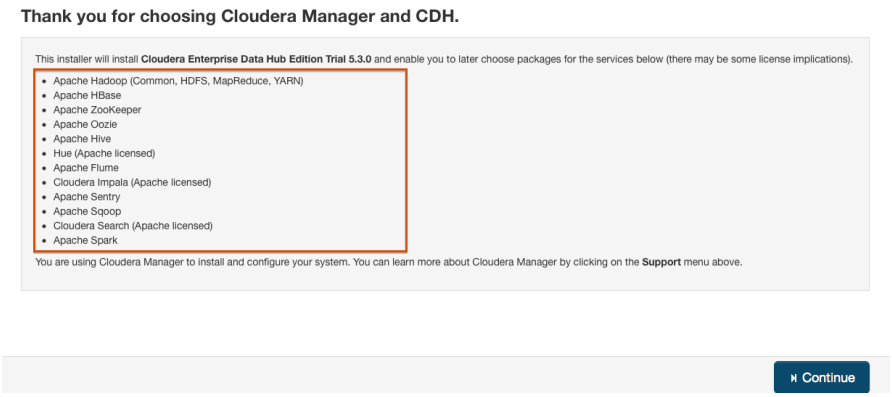


Step:14 Select the right distribution for installation .We would be selecting express since no licenses are required

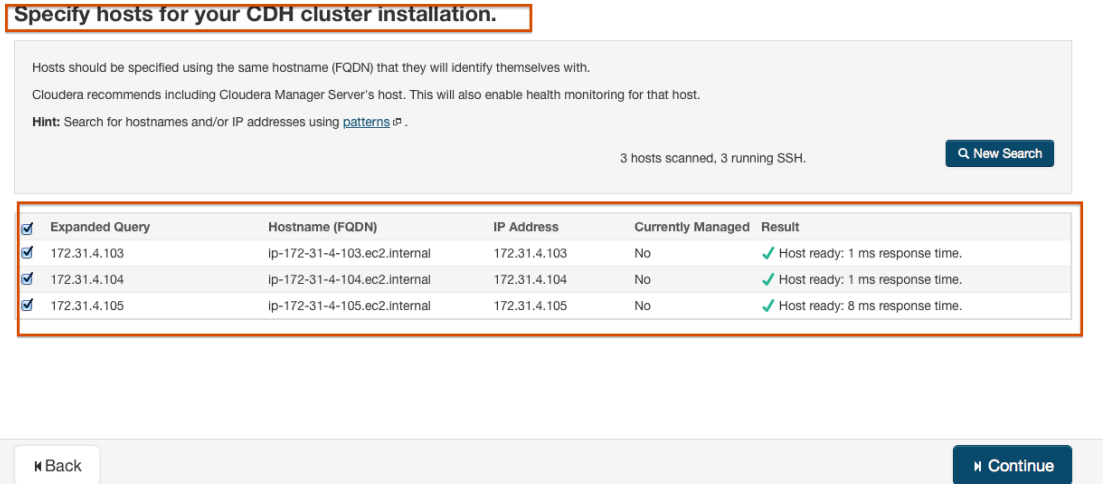


Compare the feature and select the right one as per your production need.

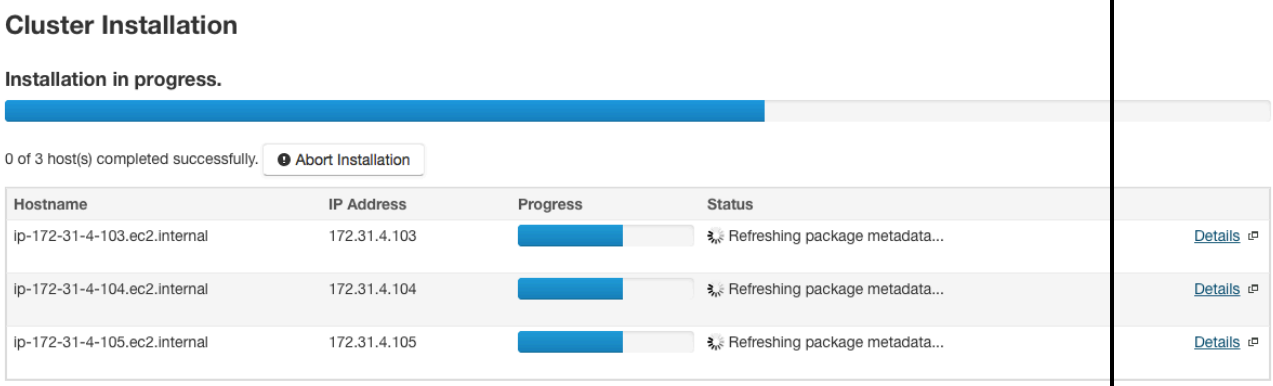
Step:15 Click on continue to reach to the products overview page as specified below.



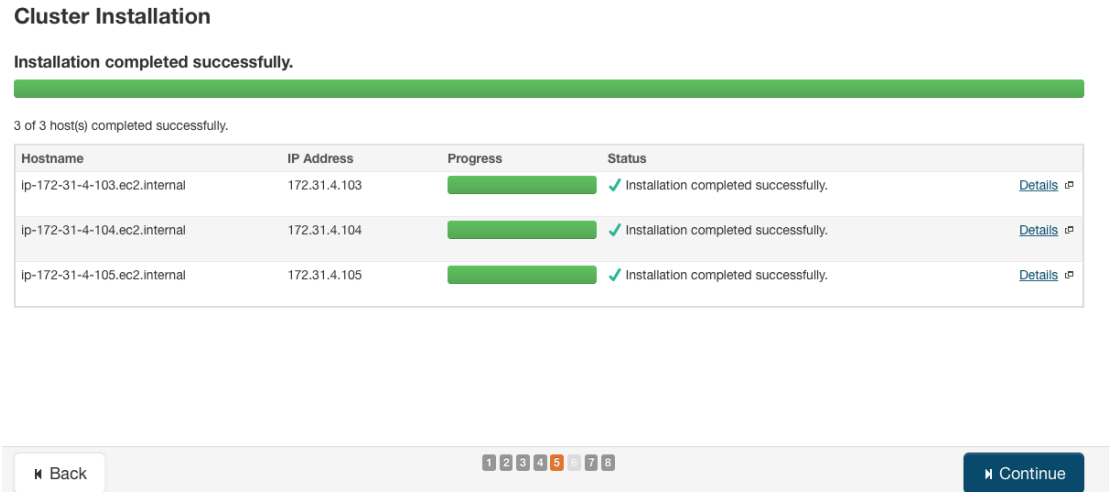
Step:16 Select the host as specified below ensure the ip addresses selected are correct as given/specified by administrator.



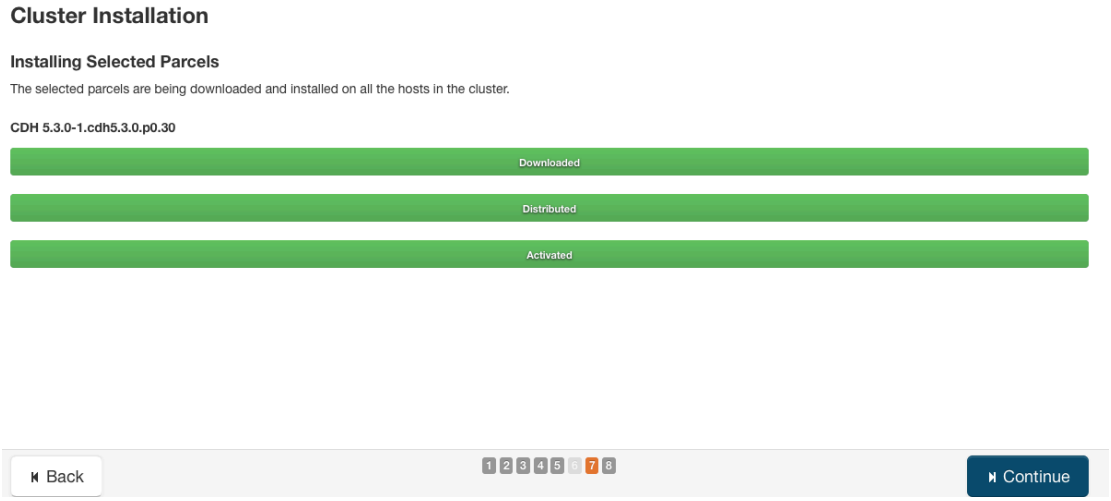
Step:17 Mark the progress of cluster installation



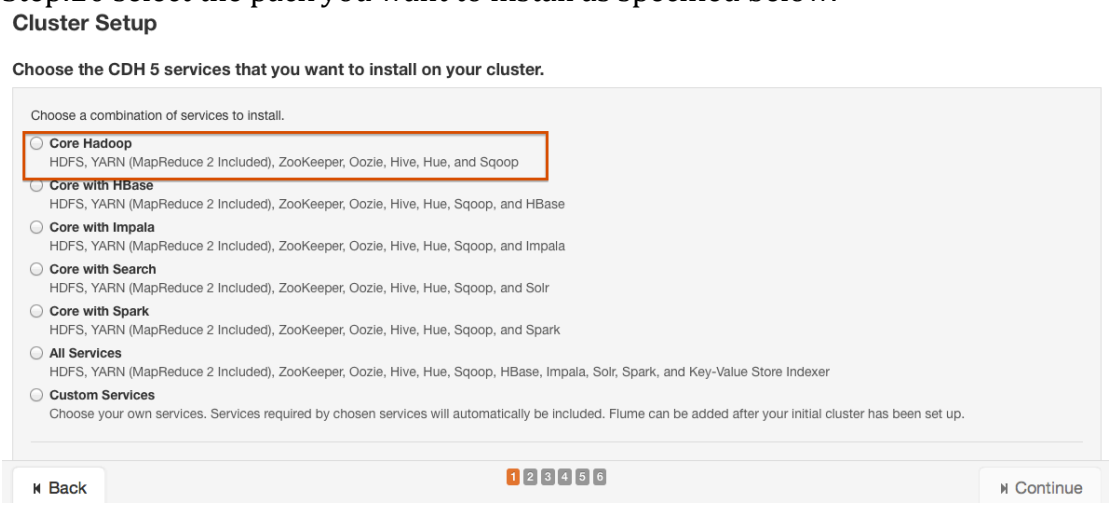
Step:18 Once everything goes fine you will see the below screen marking successful installation of cluster packages .



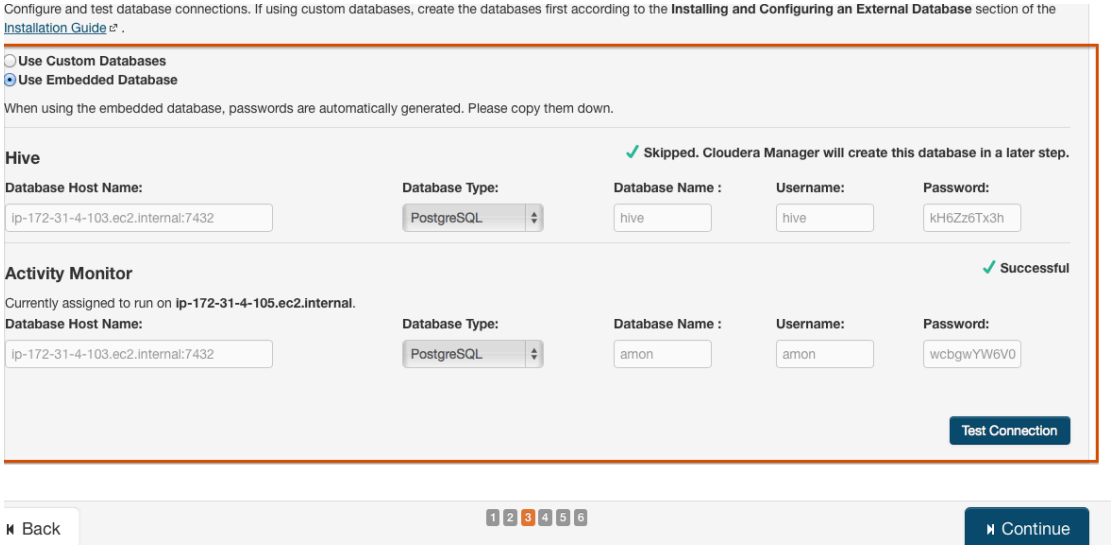
Step: 19 Click on continue to mark the CDH5 parcel as specified below.



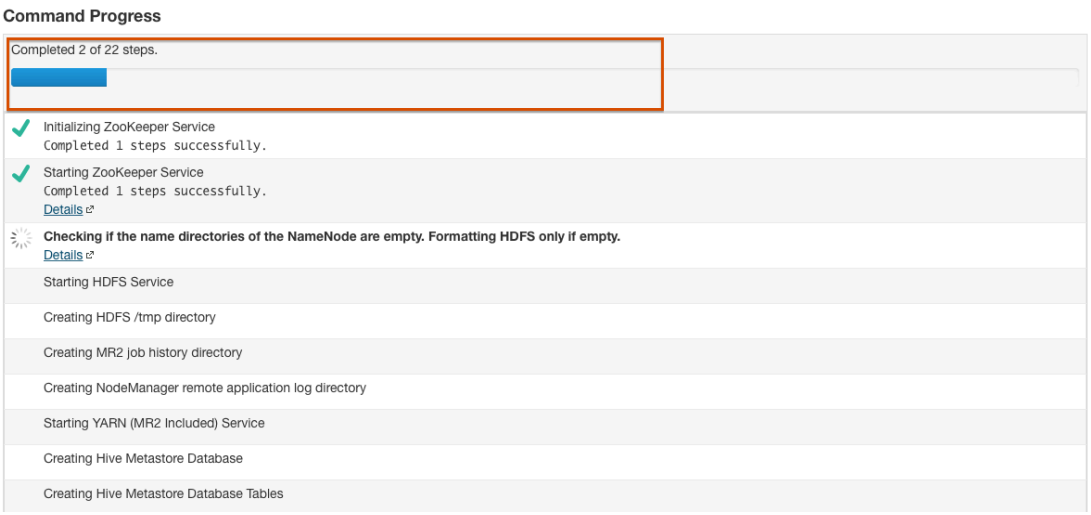
Step:20 select the pack you want to install as specified below.



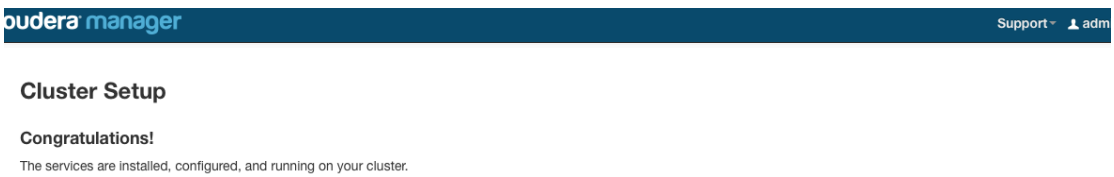
Step:21 Configure the required databases (don't worry its automatically done)



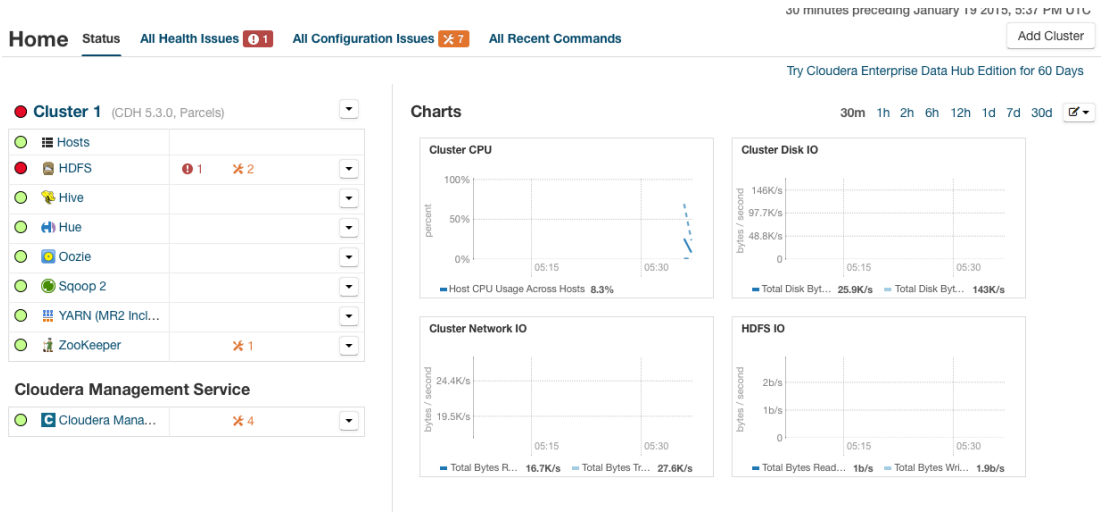
Step:22 In the following steps CM configures and starts the services as specified below.Its a 22 step task keep patience till it succeeds.



Step:23 once all 22 services are installed and done you get the below message as specified .



Step:24 once everything is done click on finish and you get a Dashboard for provisioning and configuring the hadoop services as specified below.



Step:25 you may find some warnings ignore for now.Your cloudera CDH5(Hadoop is up and running).

LAB: Working with Hadoop user and administrative Commands

Task:1 Finding the version of Hadoop Installed

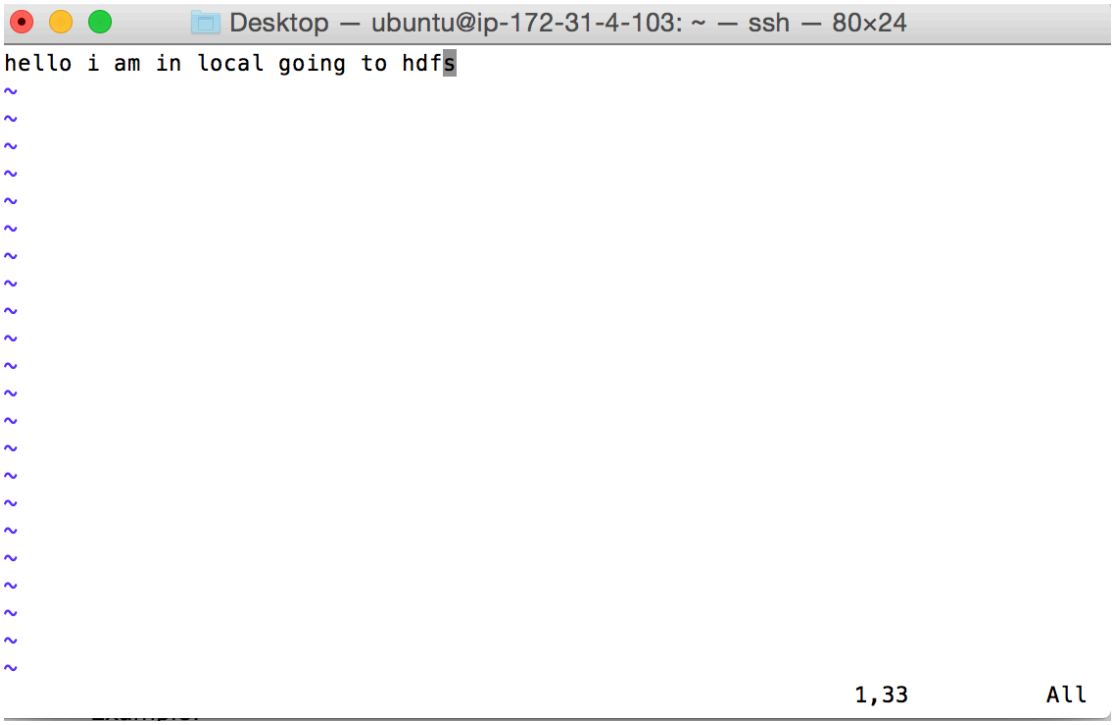
```
ubuntu@ip-172-31-4-103:~$ hadoop version
Hadoop 2.5.0-cdh5.3.0
Subversion http://github.com/cloudera/hadoop -r f19097cda2536da1df41ff6713556c8f7284174d
Compiled by jenkins on 2014-12-17T03:03Z
Compiled with protoc 2.5.0
From source with checksum 9c4267e6915cf5bbd4c6e08be54d54e0
This command was run using /opt/cloudera/parcels/CDH-5.3.0-1.cdh5.3.0.p0.30/jars/hadoop-common-2.5.0-cdh5.3.0.jar
```

Task:2 Creating a Directory:

```
ubuntu@ip-172-31-4-103:~$ sudo -u hdfs hadoop fs -mkdir /test
ubuntu@ip-172-31-4-103:~$ sudo -u hdfs hadoop fs -ls
Found 1 items
drwxr-xr-x   - hdfs supergroup          0 2015-01-20 00:00 .Trash
ubuntu@ip-172-31-4-103:~$ sudo -u hdfs hadoop fs -ls /
Found 3 items
drwxr-xr-x   - hdfs supergroup          0 2015-01-20 11:07 /test
drwxrwxrwt   - hdfs supergroup          0 2015-01-19 17:40 /tmp
drwxr-xr-x   - hdfs supergroup          0 2015-01-19 17:41 /user
```

Task:3 Creating a local file and copying it to HDFS

```
ubuntu@ip-172-31-4-103:~$ sudo  vi test.txt
```



```
~
~
:wq
```

Copy from Local to HDFS:

```
ubuntu@ip-172-31-4-103:~$ sudo -u hdfs hadoop fs -copyFromLocal /home/ubuntu/tes
t.txt /test/test.txt
```

List the directory to confirm file transfer.

```
ubuntu@ip-172-31-4-103:~$ sudo -u hdfs hadoop fs -ls /test
Found 1 items
-rw-r--r--   3 hdfs supergroup         17 2015-01-20 11:14 /test/test.txt
ubuntu@ip-172-31-4-103:~$
```

Task:4 expunge a file

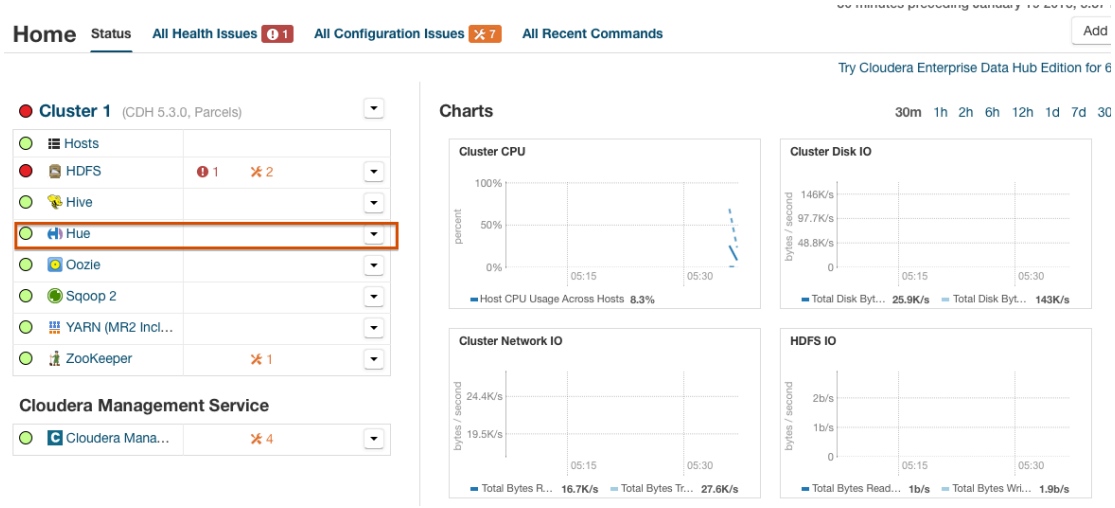
```
ubuntu@ip-172-31-4-103:~$ sudo -u hdfs hadoop fs -expunge
15/01/20 11:25:57 INFO fs.TrashPolicyDefault: Namenode trash configuration: Dele
tion interval = 1 minutes, Emptier interval = 0 minutes.
15/01/20 11:25:57 INFO fs.TrashPolicyDefault: Deleted trash checkpoint: /user/hd
fs/.Trash/150120000000
```

Use Instructors Guidance to try out rest of the commands.

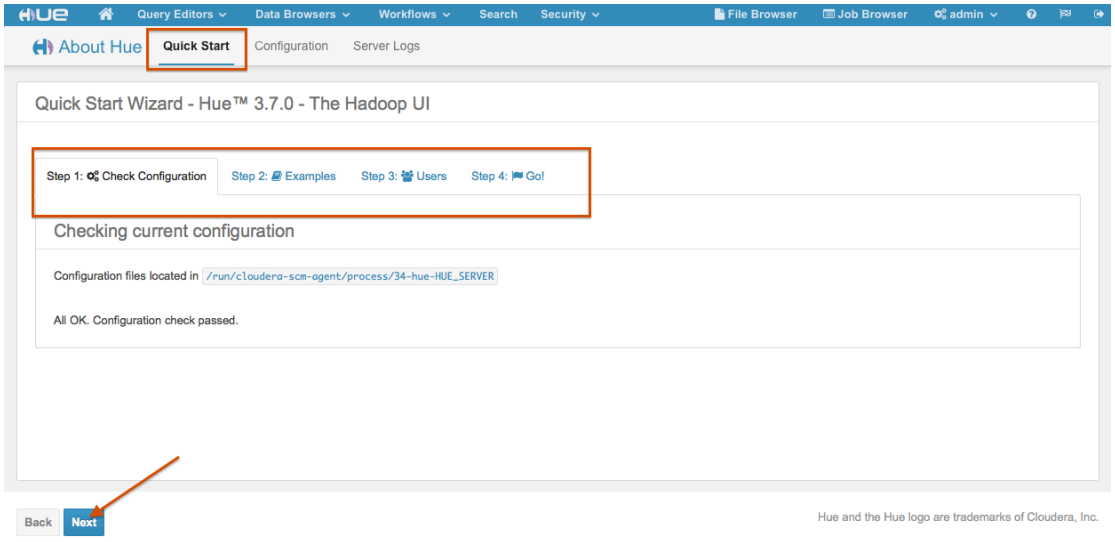
LAB : Configuring and Working with Hue

Hue is a Web interface for analyzing data with Apache Hadoop. It supports a file and job browser, Hive, Pig, Impala, Spark, Oozie editors, Solr Search dashboards, HBase, Sqoop2, and more.Cloudera CM can be configured to use Hue.

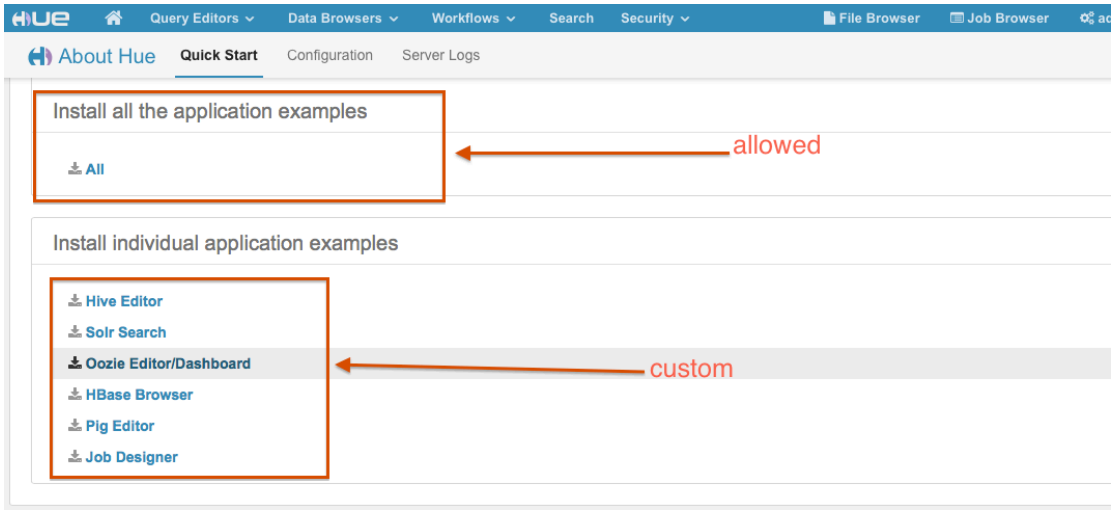
Step:1 Go to Home and select Hue to configure it as specified below.



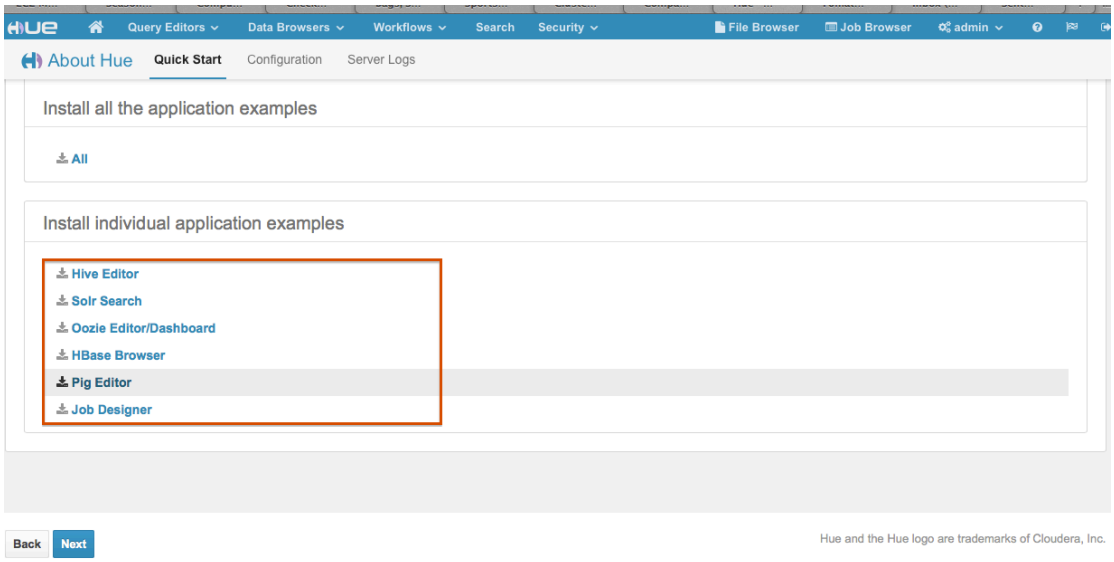
Step:2 Launch the wizard to prepare Hue use http://<ip>:8888 port to launch hue configuration wizard.



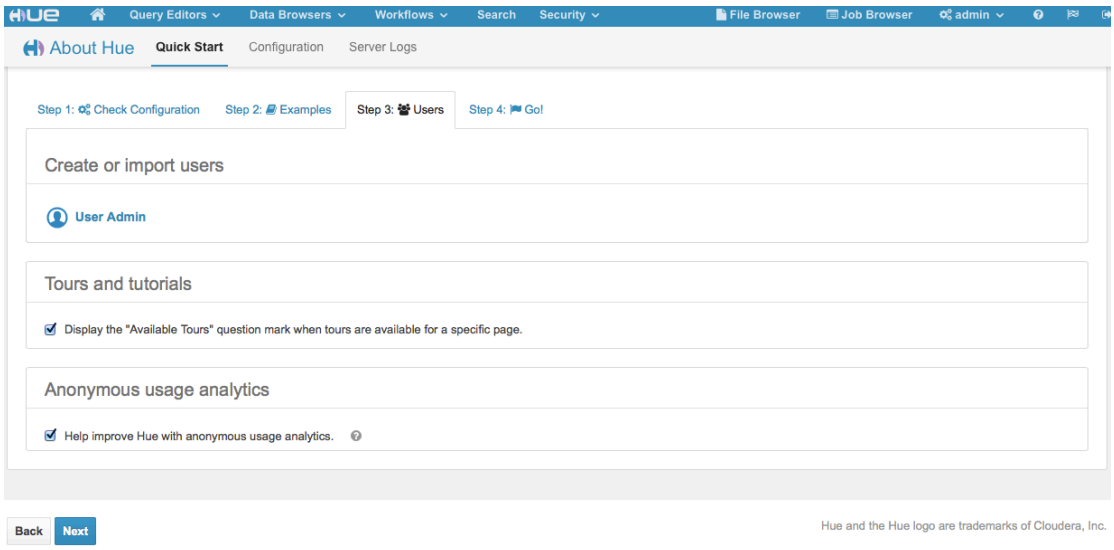
Step:3 Select the utilities you need to make Hue productive. You have two options .(All and individual applications).



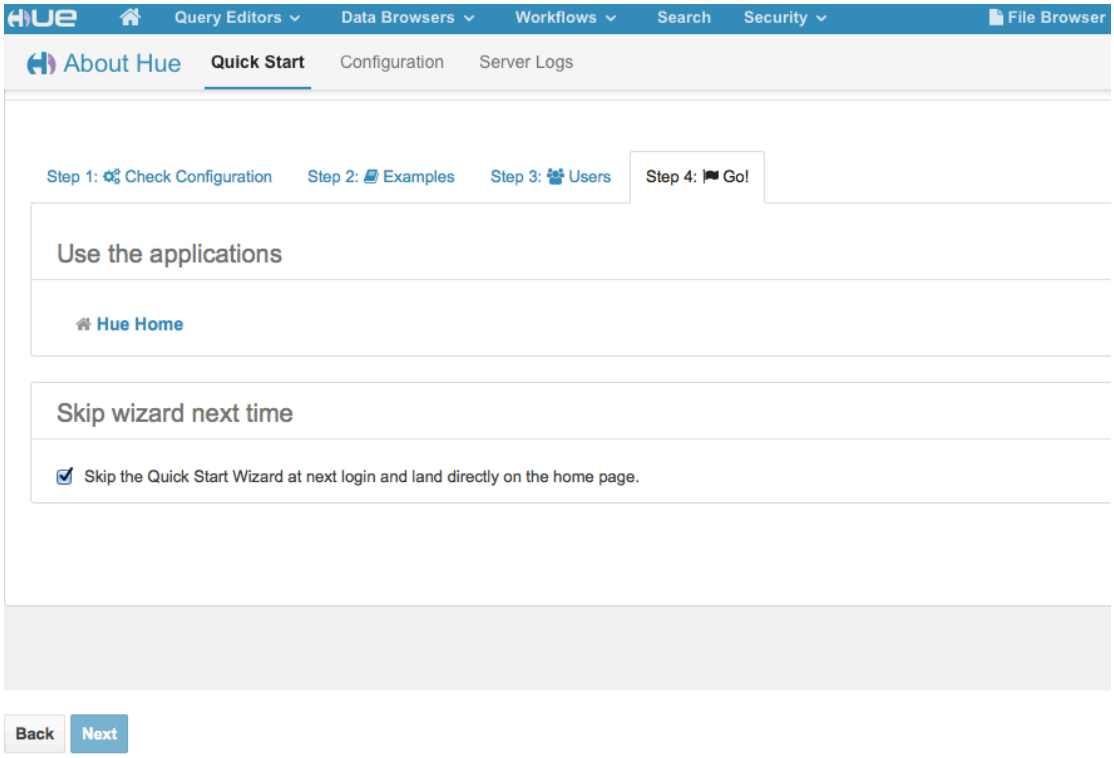
Step:4 Install following utilities



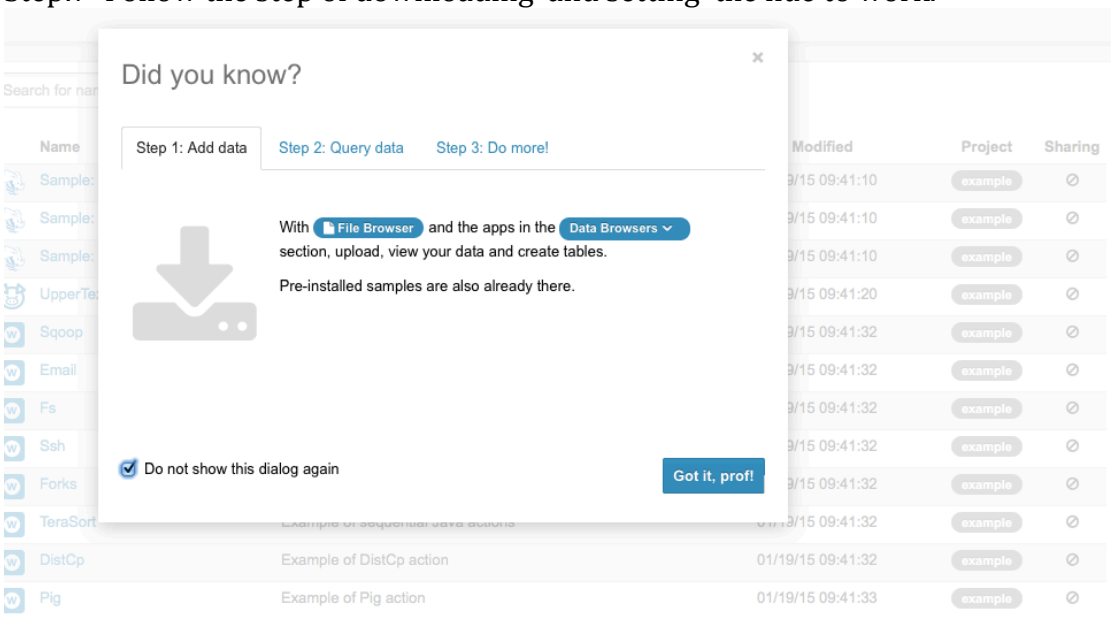
Step:5 Configure user as specified in below pictures.



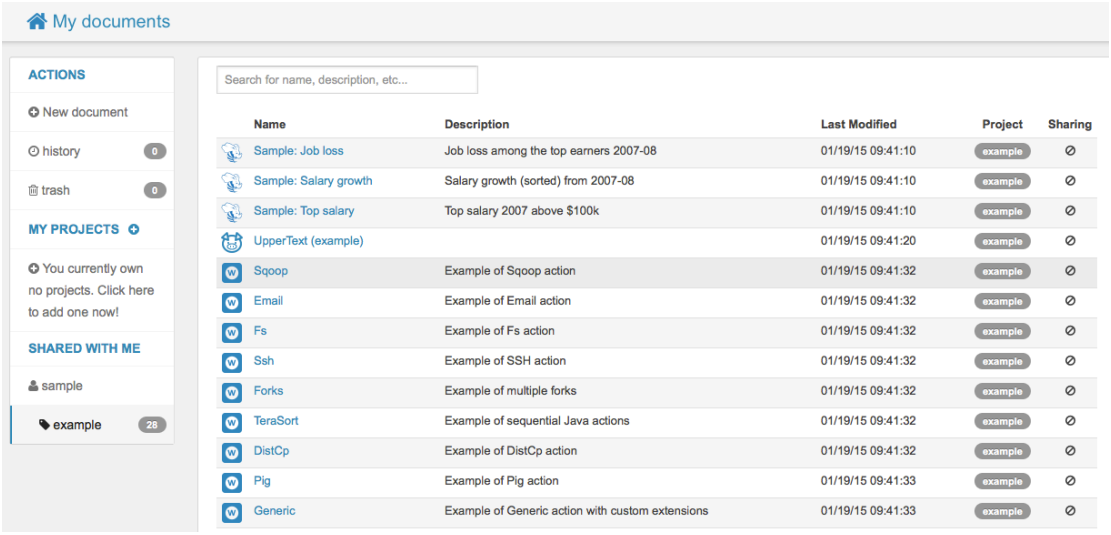
Step:6 Complete the last steps as specified below.



Step:7 Follow the step of downloading and setting the hue to work.



Step: 8 once we download we get hue dashboard to start using.



Step: 9 Hue is ready to work. Try visiting some tools by navigating options.

LAB: Configuring High Availability using CM5.

Before we configure High Availability we need to ensure we have proper hardware checklist ready. Some guidelines to be followed are as follows.

- Hardware Configuration for Quorum-based Storage
- In order to deploy an HA cluster using Quorum-based Storage, you should prepare the following:
    - **NameNode machines** - the machines on which you run the Active and Standby NameNodes should have equivalent hardware to each other, and equivalent hardware to what would be used in a non-HA cluster.
    - **JournalNode machines** - the machines on which you run the JournalNodes.
    - **The JournalNode daemon** is relatively lightweight, so these daemons can reasonably be collocated on machines with other Hadoop daemons, for example NameNodes, the JobTracker, or the YARN ResourceManager.
    - *Cloudera recommends that you deploy the JournalNode daemons on the "master" host or hosts (NameNode, Standby NameNode, JobTracker, etc.) so the JournalNodes' local directories can use the reliable local storage on those machines. You should not use SAN or NAS storage for these directories.*

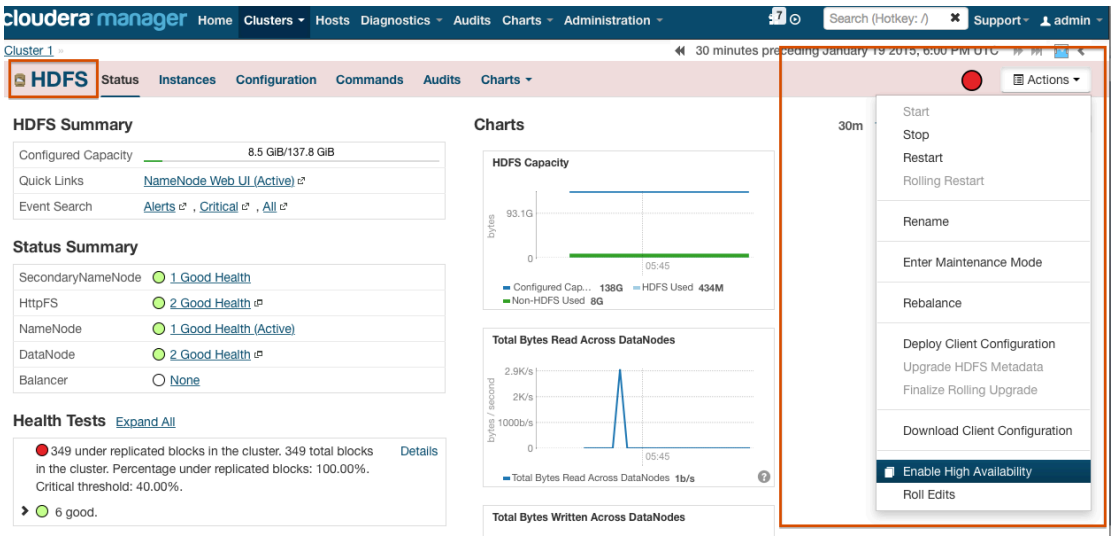
- There must be at least three JournalNode daemons, since edit log modifications must be written to a majority of JournalNodes. This will allow the system to tolerate the failure of a single machine.

- You can also run more than three JournalNodes, but in order to actually increase the number of failures the system can tolerate, you should run an odd number of JournalNodes, (three, five, seven, etc.)

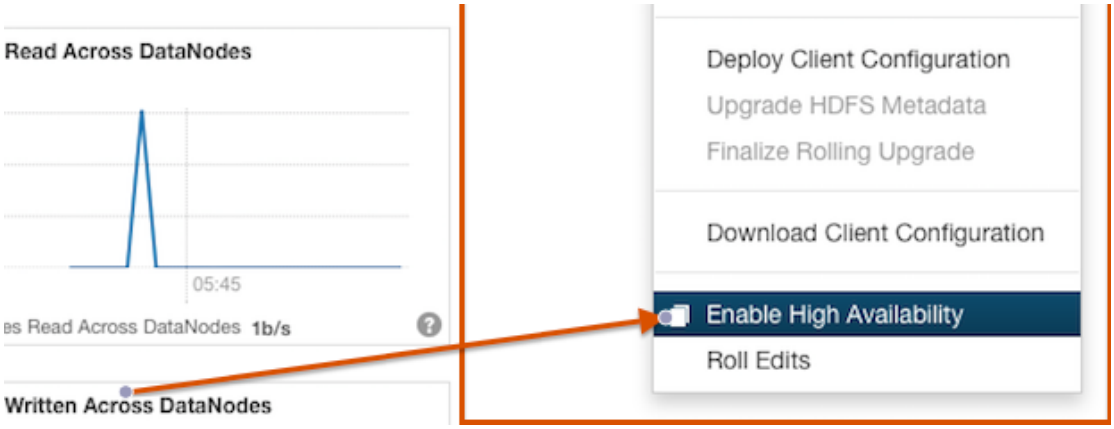
- Note that when running with N JournalNodes, the system can tolerate at most (N - 1) / 2 failures and continue to function normally. If the requisite quorum is not available, the NameNode will not format or start, and you will see an error similar to this:

```
12/10/01 17:34:18 WARN namenode.FSEditLog: Unable to determine input streams from QJM to [10.0.1.10:8485,
10.0.1.10:8486, 10.0.1.10:8487]. Skipping.
java.io.IOException: Timed out waiting 20000ms for a quorum of nodes to respond.
```

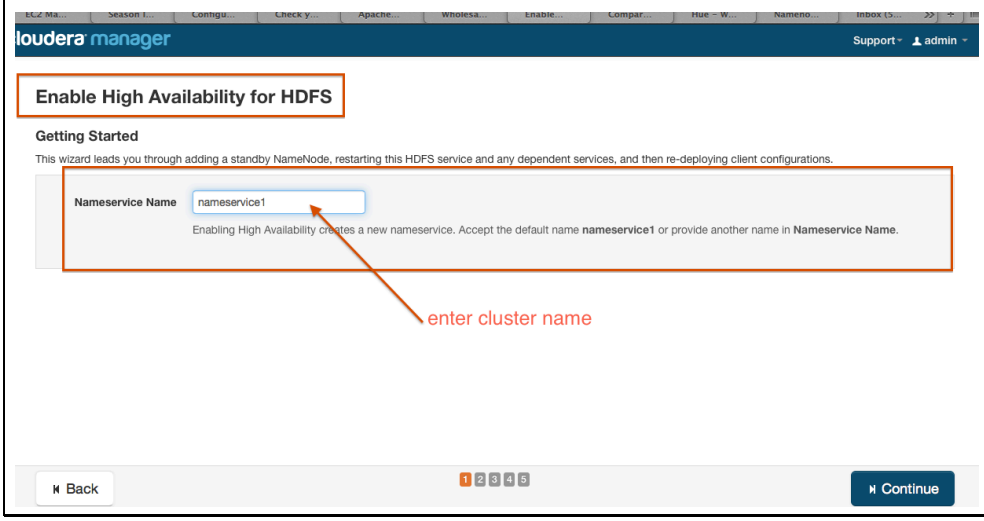
Step:1 On the previous cluster installation we have three nodes .We will be using same nodes to configure high availiability.go to home select HDFS to see the following .



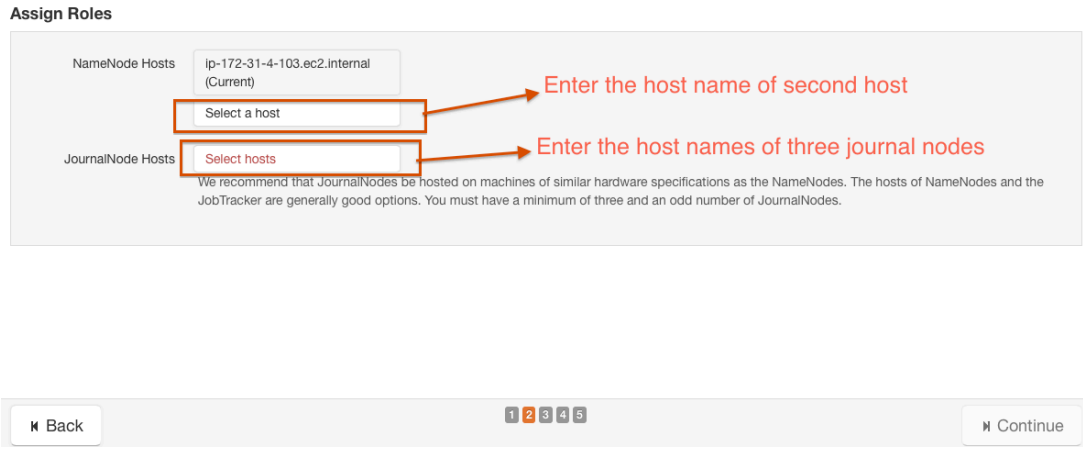
Step:2 Click on action button as specified and select Enable High Availiability.



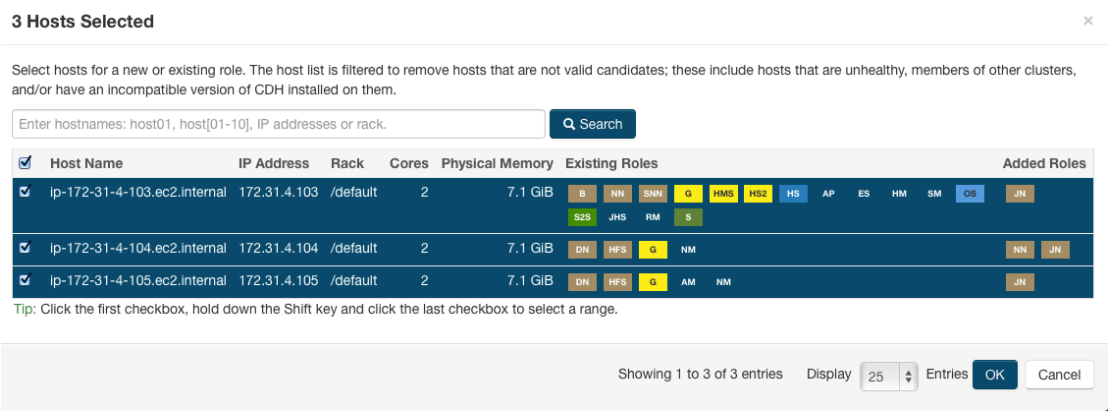
Step:3 Specify the name of the cluster which will have two namenodes.



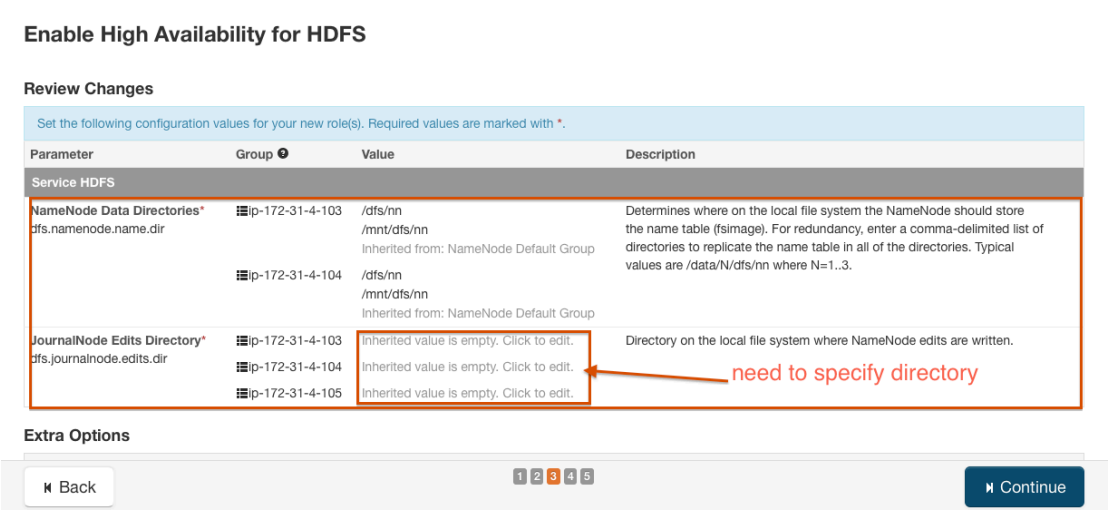
Step:4 Click on continue and you move to next step where you have to specify name of second name node and three journal nodes as specified below.



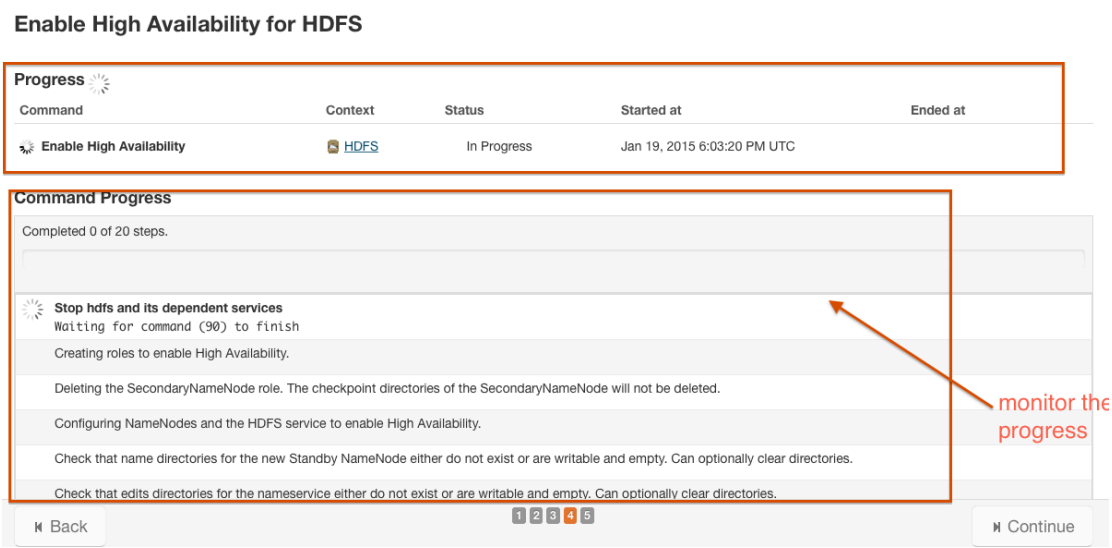
Step:5 Below picture shows the node selection pane.



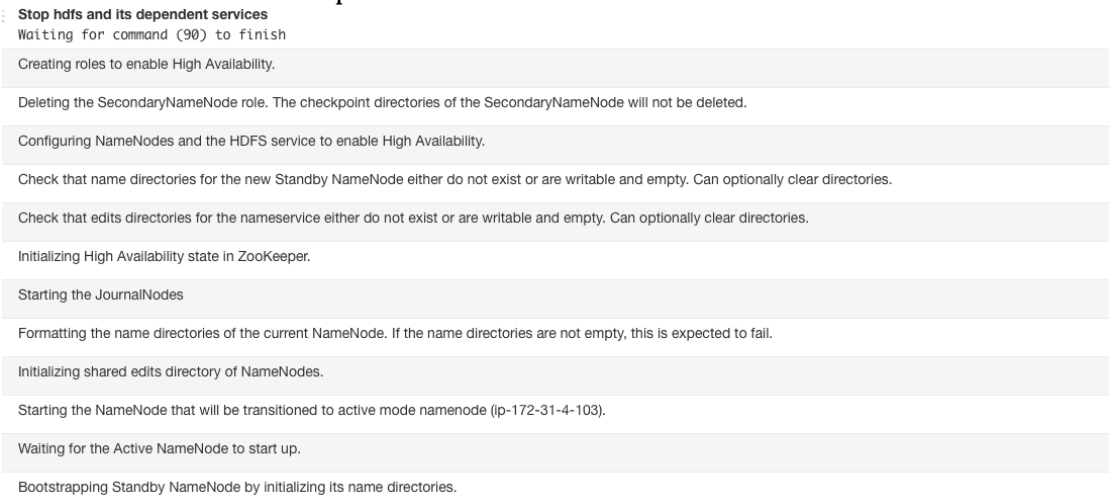
Step:6 in Next steps we will specify the directory structure as specified below



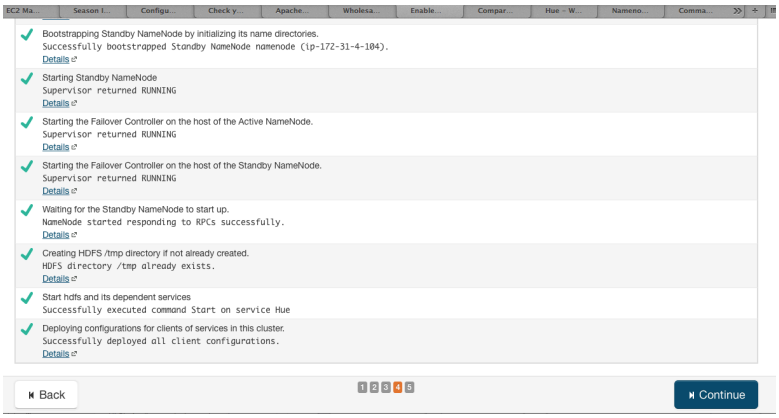
Step:7 Click on continue to complete the process .monitor the progress of activities.



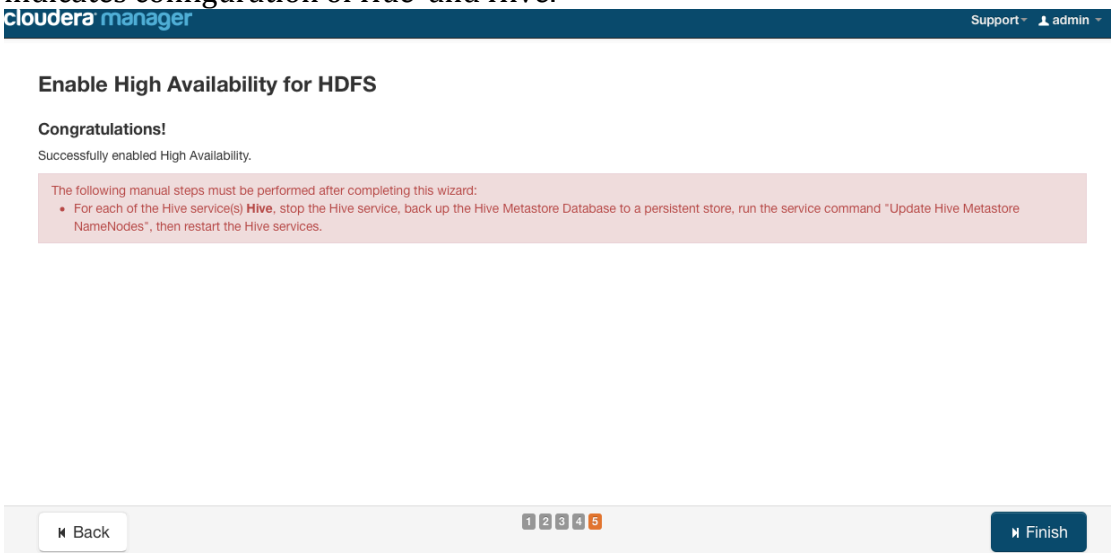
Step:8 Monitor the progress and ensure all tasks are completed successfully. Some of the task are as specified below.



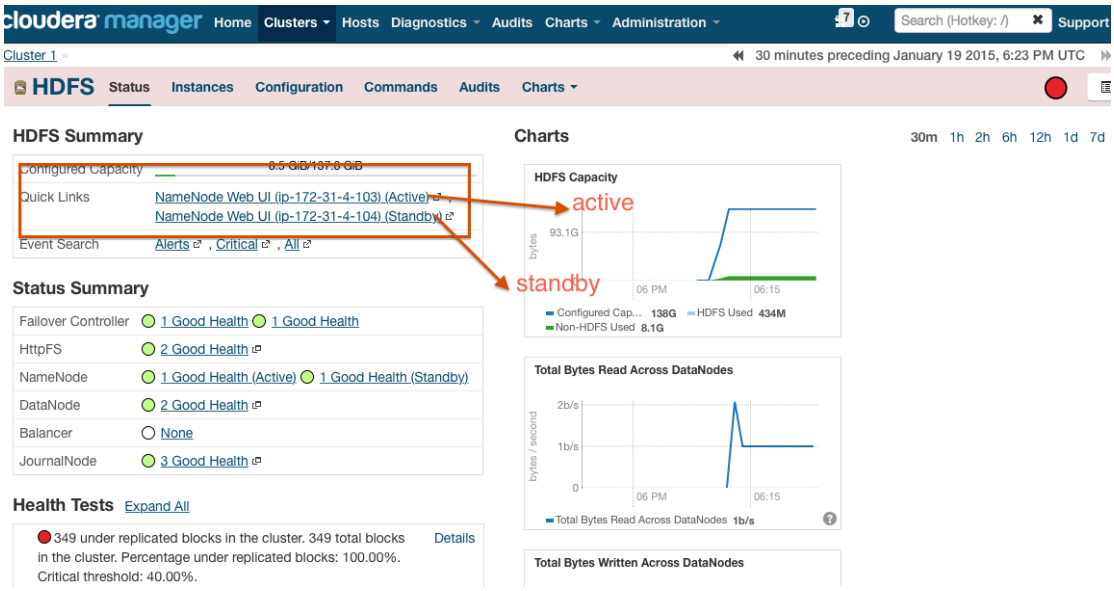
Step:9 Once the task completes you would find the status as specified below.



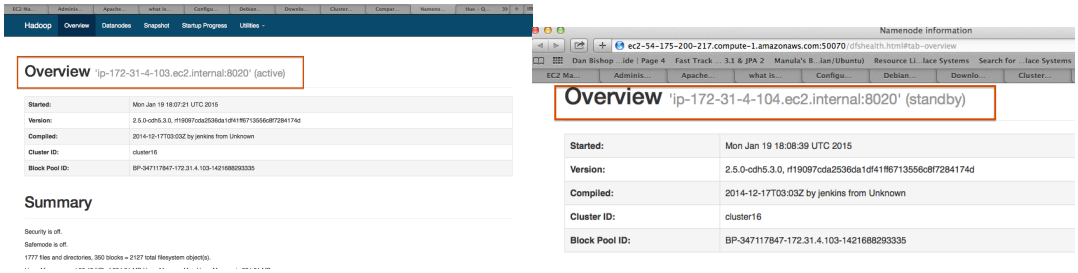
Step:10 Upon successful startup of all services we find below message that indicates configuration of Hue and Hive.



Step:11 See the dashboard and you will find the two namenodes configured in form of active and standby.



Step:12 Click on the Quick links of Both and you will find the appropriate webUI with details indicating status as specified below.



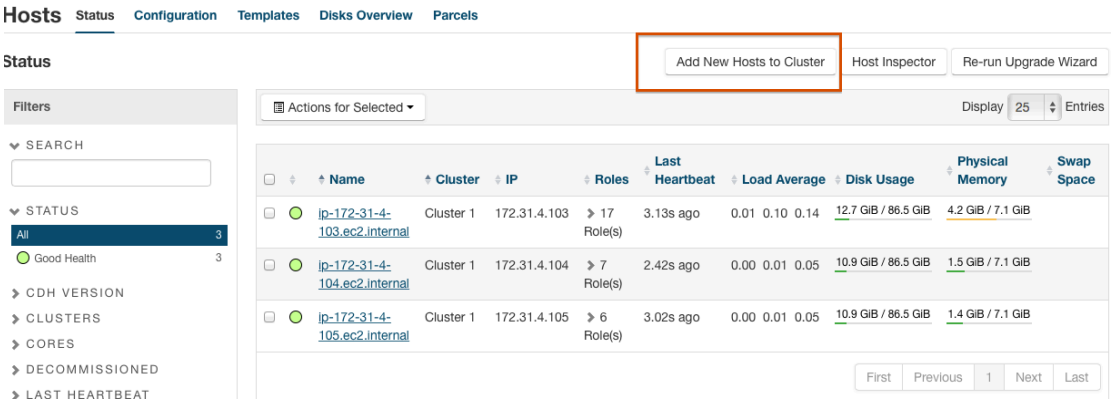
LAB: Adding New node to cluster

Step:1 For Adding extra host to existing cluster we need extra node which is configured and provided to you by administrator. In current case we have created an extra instance in amazon EWS as specified below.

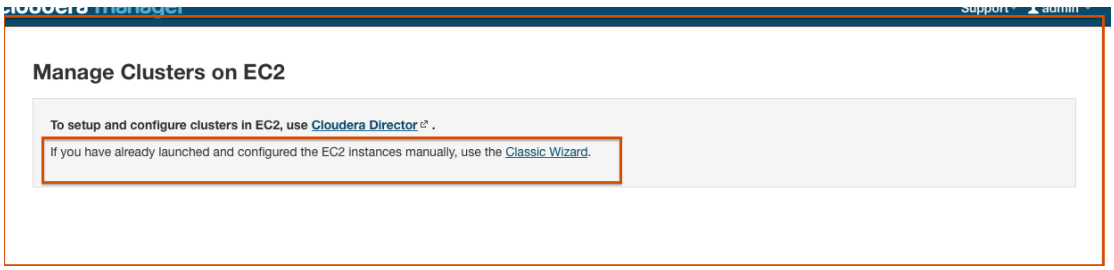
Instance ID	i-4fa67abe	**Public DNS**	ec2-54-175-135-73.compute-1.amazonaws.com
Instance state	running	**Public IP**	54.175.135.73
Instance type	m3.medium	**Elastic IP**	-
Private DNS	ip-172-31-58-173.ec2.internal	**Availability zone**	us-east-1d
Private IPs	172.31.58.173	**Security groups**	launch-wizard-4. view rules
Secondary private IPs		**Scheduled events**	No scheduled events
VPC ID	vpc-99ea7ffc	**AMI ID**	NN_JN1 (ami-401a7d28)

Note:This exercise is optional and demonstration need to be done by Mentor.

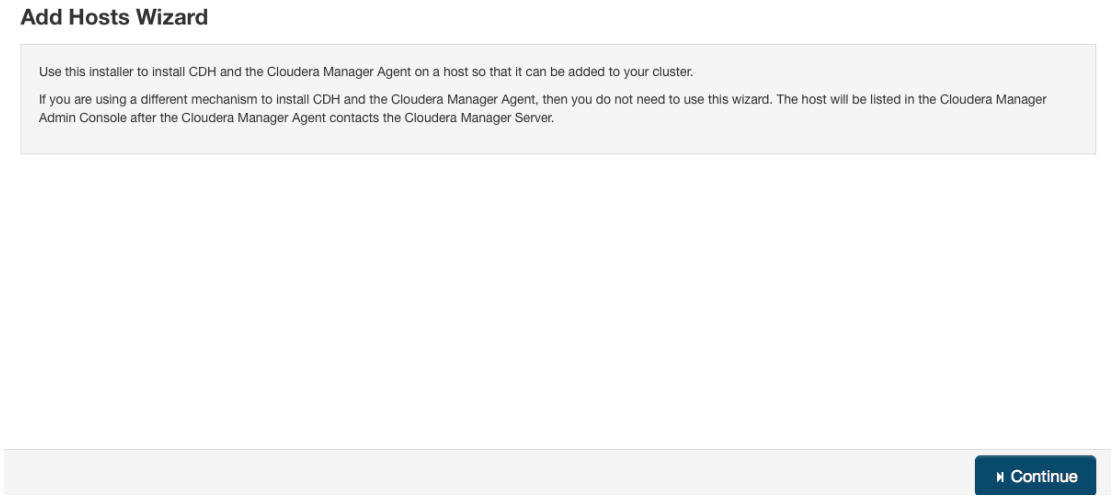
Step:2 Go to hosts and click on it to proceed with adding a new host wizard.



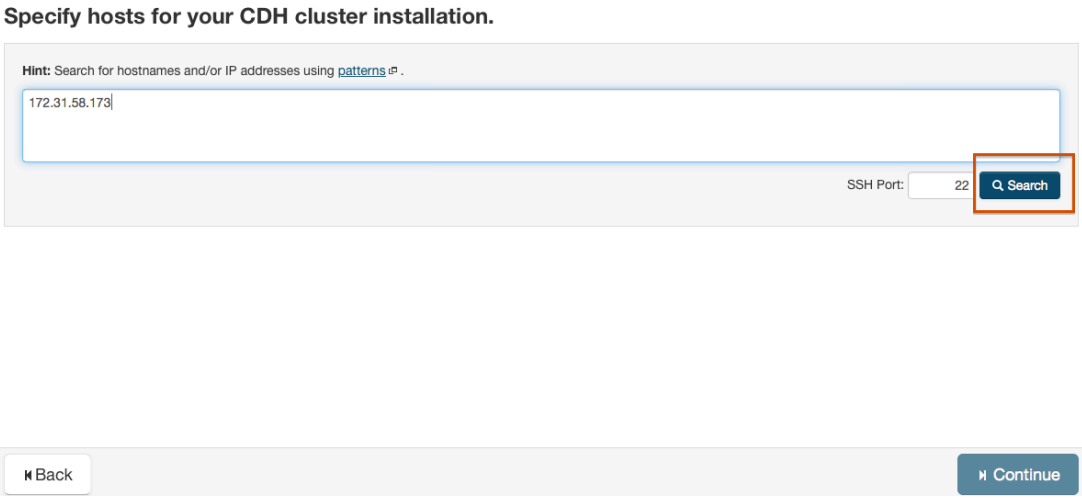
Step:3 Launch wizard to add new node as specified below.



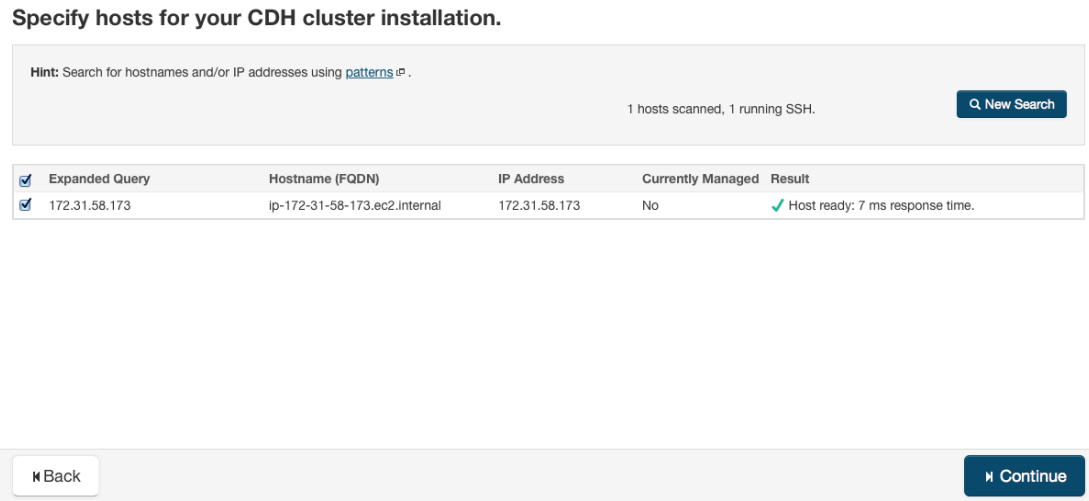
Step:4 Launch add host wizard as specified below.



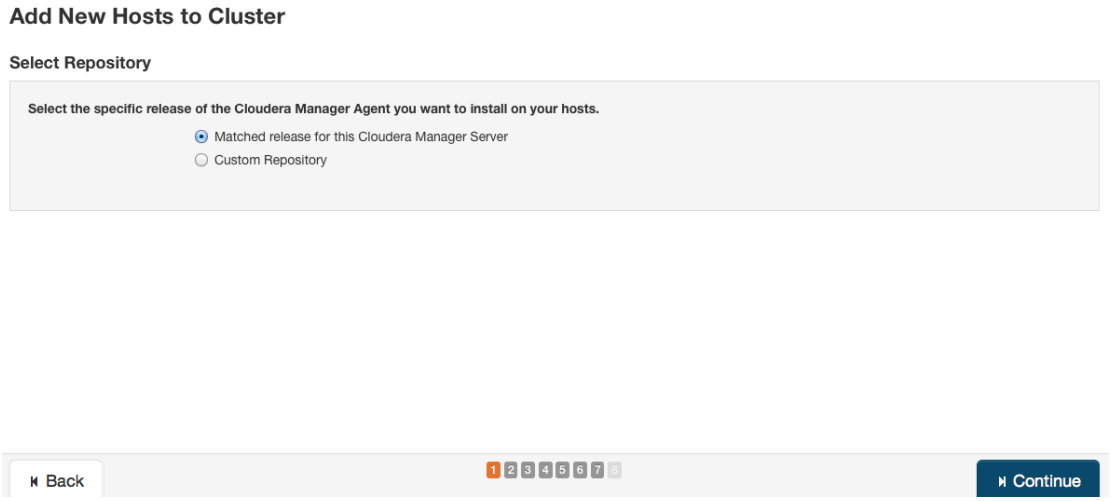
Step:5 Specify the ip and search for host .



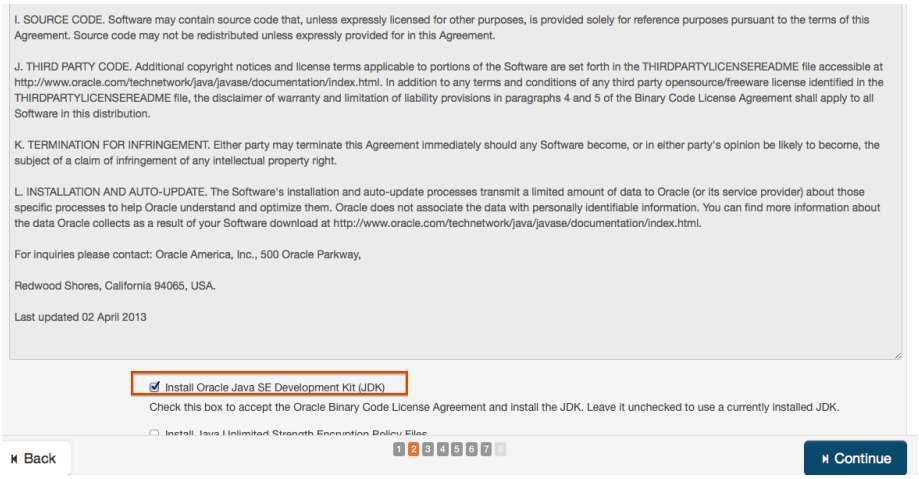
Step:6 Ensure host specified by you is part of successfully discovered host as specified below.



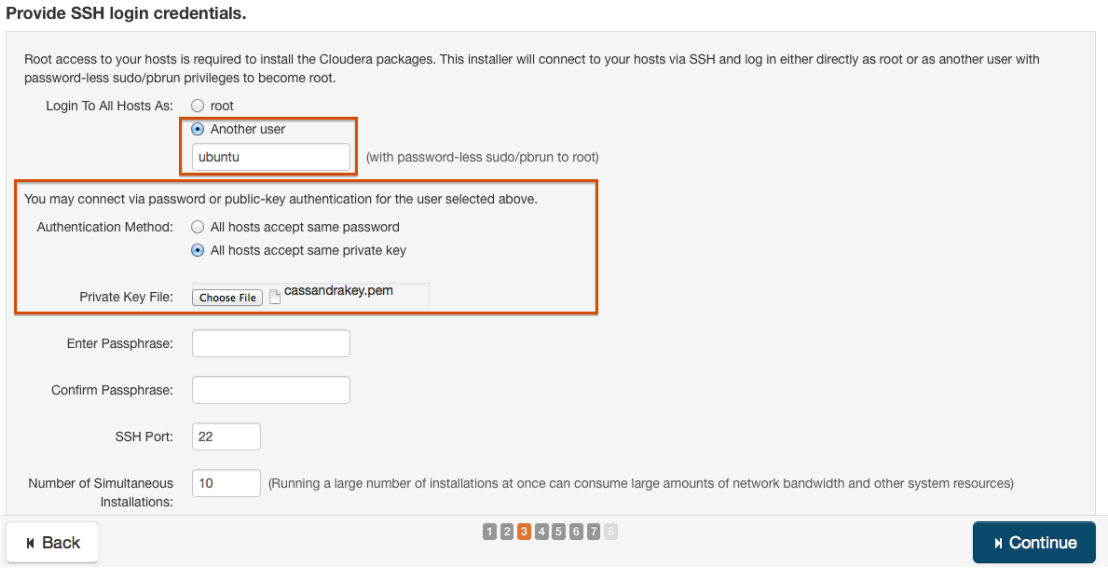
Step:7 Select repository to be installed on the host.



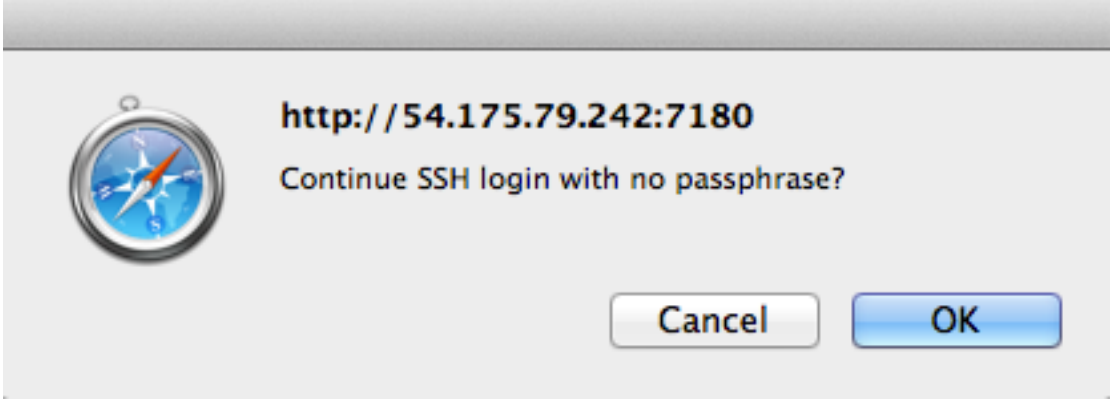
Step:8 Install jdk (prompted by wizard)



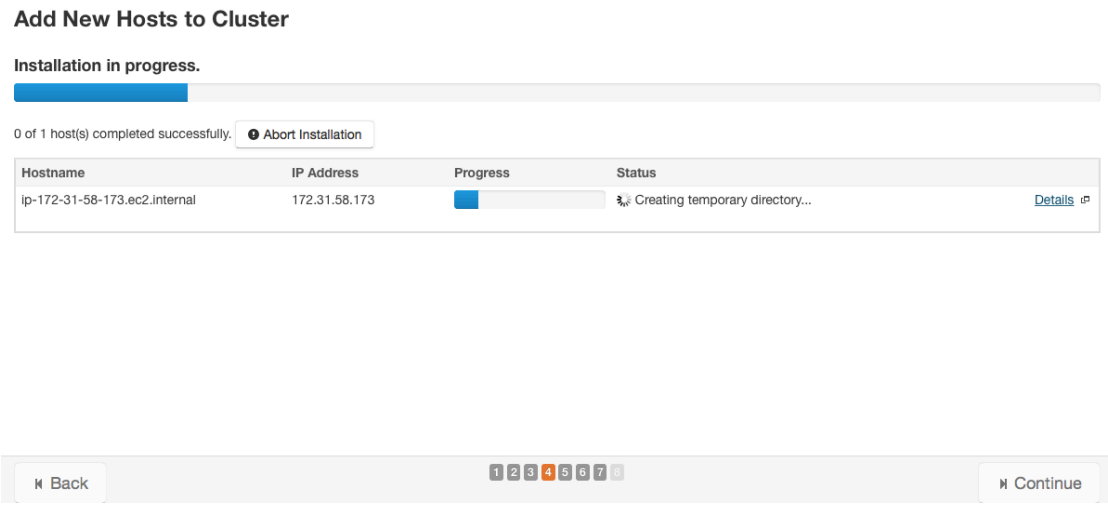
Step:9 Select user and the key as specified below for ssh credentials.



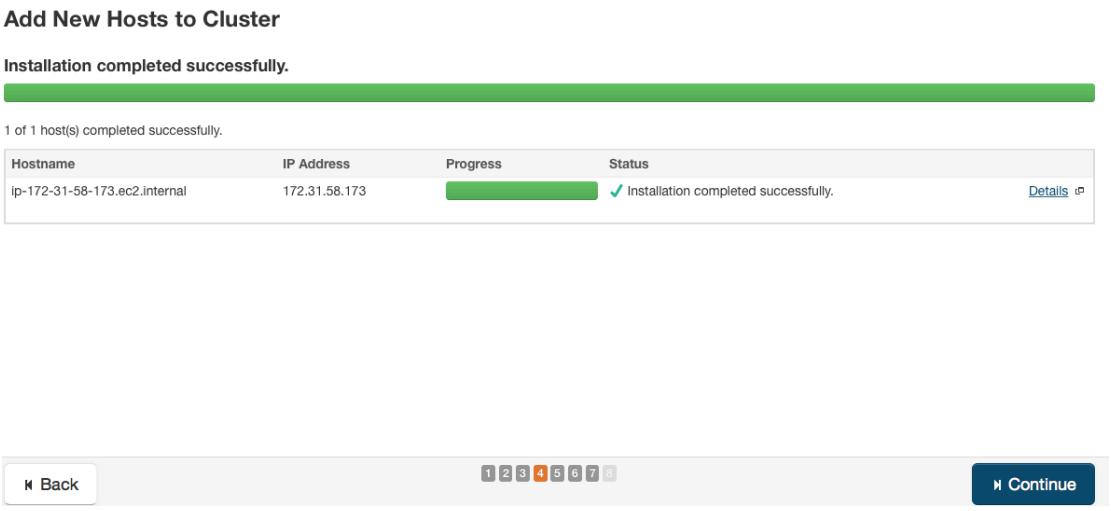
Step:10 click on ok



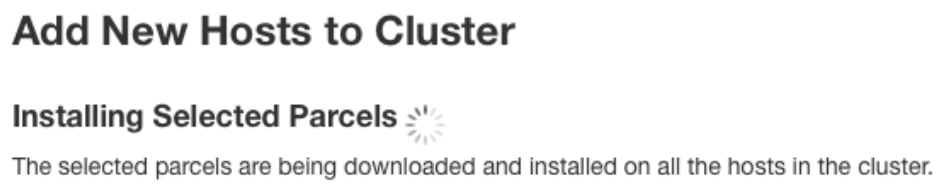
Step:11 Ensure that auto install is successful.



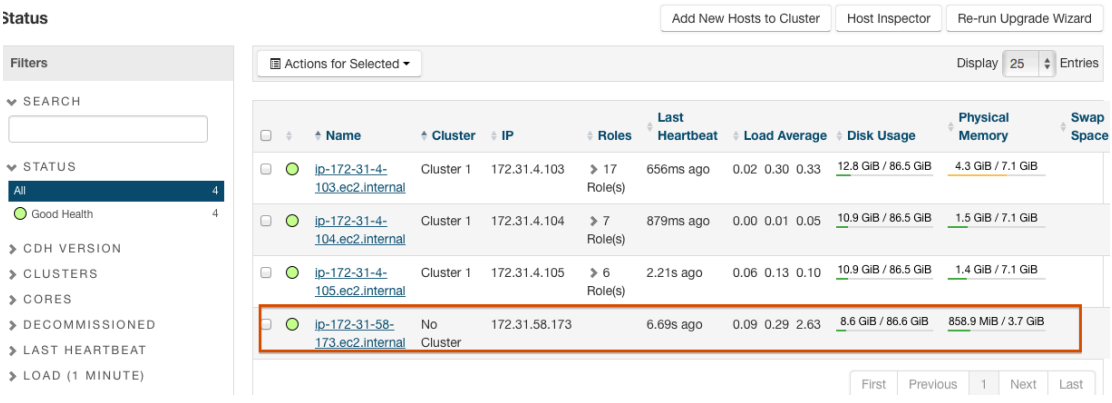
Step:12 Once you see the below diagram it ensures your installation is successful.



Step:13 Next step installs parcel giving you opportunity of selecting component you want on the host added.



Step: 14 once prompted select the packages you want and finalize the process. Go to hosts and see that host is added as specified below.



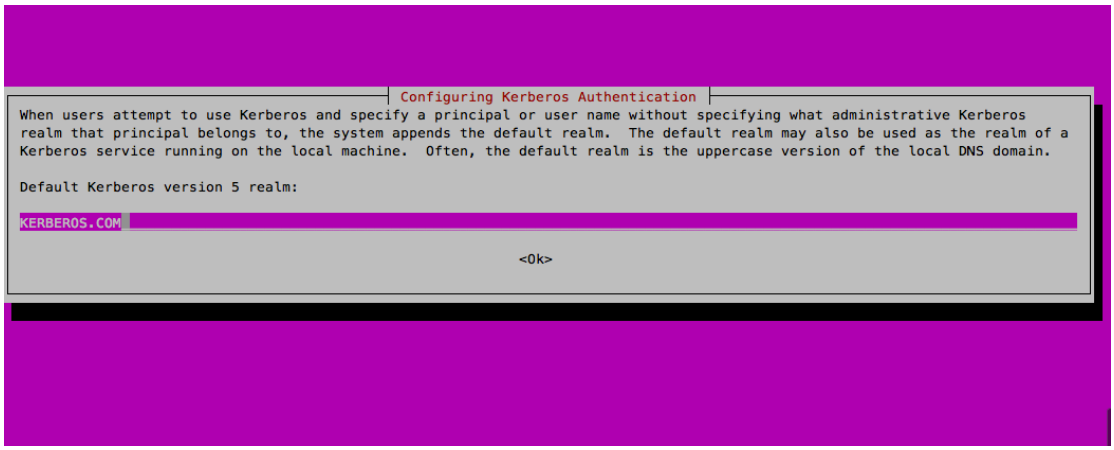
LAB: Installing Kerberos

Step:1 on Ubuntu use the following command to install Kerberos

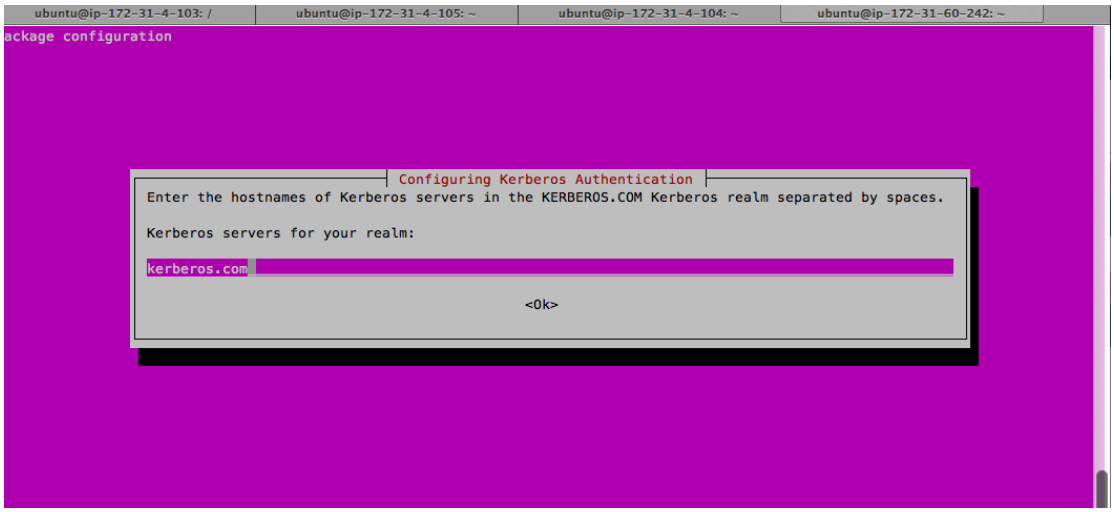
$sudo apt-get install krb5*

This installs all the untilities and prompts you to follow a wizard as specified below.

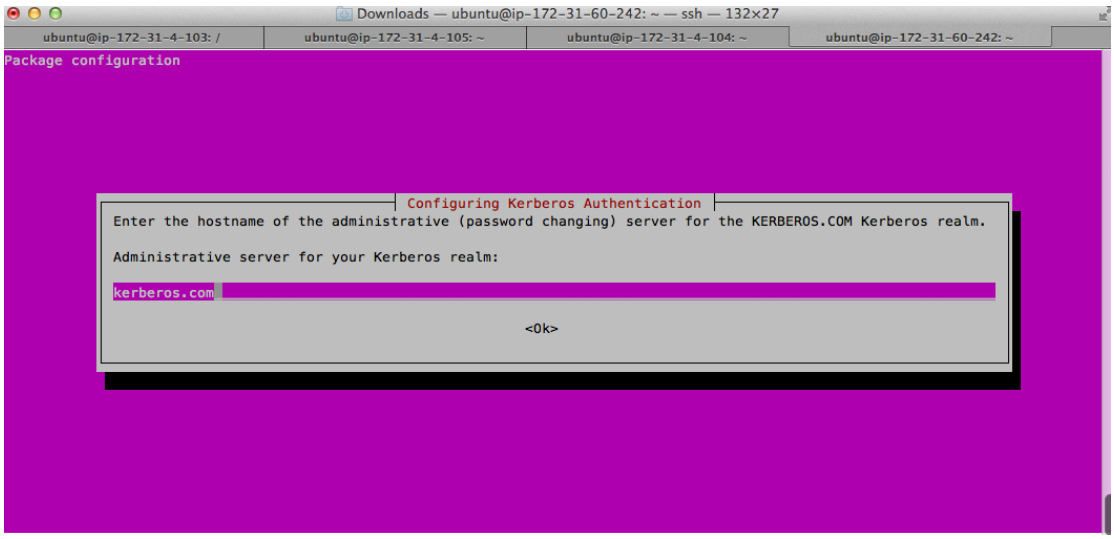
Step:2 Enter the realm as HADOOP.COM



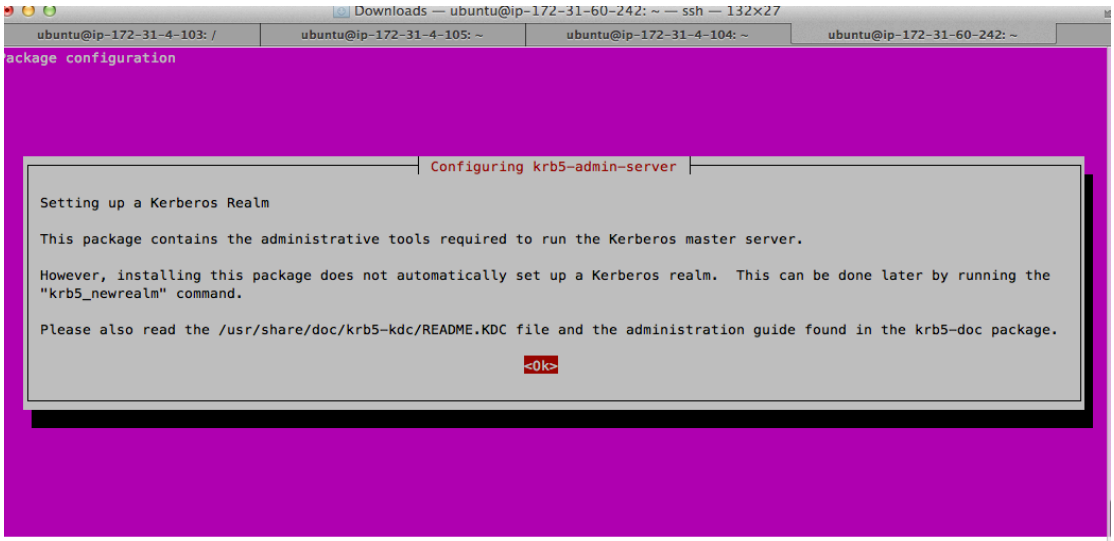
Step:3 Enter the hostname /IP of KDC as per your image (IP of your host).



Step:4 Enter the administrative host in our case it's the same value.



Step:5 Finalize the process to initiate setup of realm



Step:6 Enter following command to configure realm

$sudo krb5_newrealm

This creates a realm with the inputs provided in the wizard.you get something similar diagram specified below.

```
nis script should be run on the master KDC/admin server to initialize
 Kerberos realm.  It will ask you to type in a master key password.
his password will be used to generate a key that is stored in
etc/krb5kdc/stash.  You should try to remember this password, but it
s much more important that it be a strong password than that it be
emembered.  However, if you lose the password and /etc/krb5kdc/stash,
ou cannot decrypt your Kerberos database.
oading random data
nitializing database '/etc/krb5kdc/principal' for realm 'HADOOP.COM',
aster key name 'K/M@HADOOP.COM'
ou will be prompted for the database Master Password.
t is important that you NOT FORGET this password.
nter KDC database master key:
```

Step:7 use kadmin.local to create and add new principals as specified below

```
ubuntu@ip-172-31-4-103:~$ sudo kadmin.local
Authenticating as principal root/admin@HADOOP.COM with password.
kadmin.local:
```

Step:8 use addprinc to create new principals as specified below

```
ubuntu@ip-172-31-4-103:~$ sudo kadmin.local
Authenticating as principal root/admin@HADOOP.COM with password.
kadmin.local:  addprinc root/admin
WARNING: no policy specified for root/admin@HADOOP.COM; defaulting to no policy
Enter password for principal "root/admin@HADOOP.COM":
Re-enter password for principal "root/admin@HADOOP.COM":
Principal "root/admin@HADOOP.COM" created.
```

Step:9 Test whether you have principals listed and added properly to database use listprincs command as specified below.

```
kadmin.local:  listprincs
K/M@HADOOP.COM
kadmin/admin@HADOOP.COM
kadmin/changepw@HADOOP.COM
kadmin/ip-172-31-4-103.ec2.internal@HADOOP.COM
krbtgt/HADOOP.COM@HADOOP.COM
root/admin@HADOOP.COM
kadmin.local:
```

Step:10 Create a principal as client principal called Ubuntu as specified below.

```
kadmin.local:  addprinc ubuntu
WARNING: no policy specified for ubuntu@HADOOP.COM; defaulting to no
Enter password for principal "ubuntu@HADOOP.COM":
Re-enter password for principal "ubuntu@HADOOP.COM":
Principal "ubuntu@HADOOP.COM" created.
```

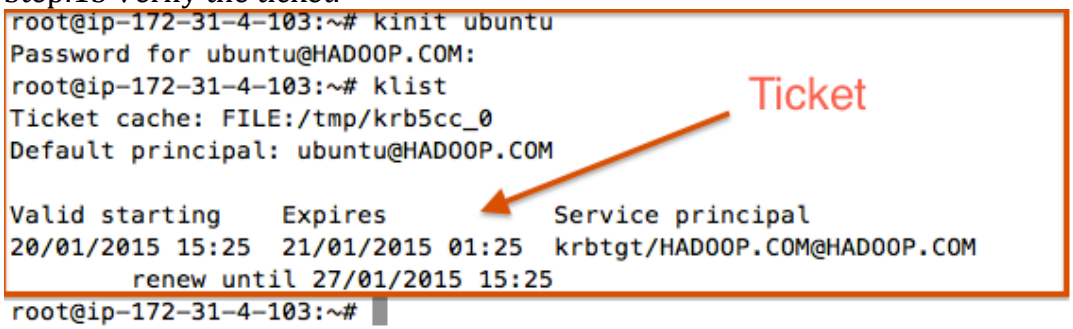
Step:11 quit and test

```
ubuntu@HADOOP.COM
kadmin.local:  quit
```

Step:12 Test using Ubuntu principal

```
buntu@ip-172-31-4-103:~$ kinit ubuntu
assword for ubuntu@HADOOP.COM:
```

Step:13 Verify the ticket.

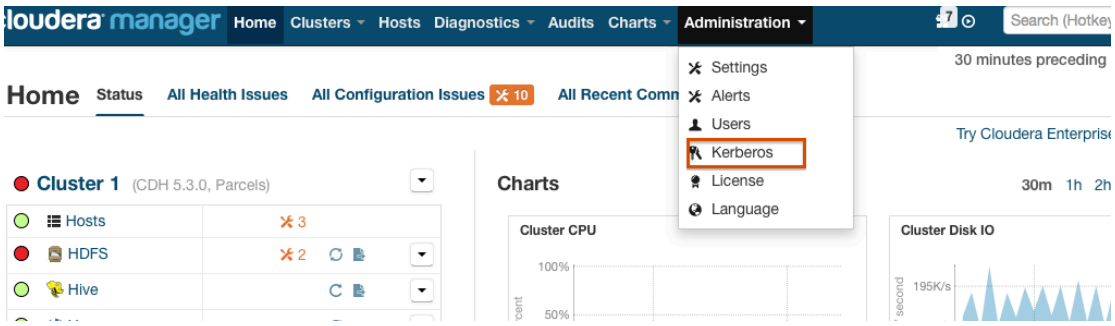


This lab installs and configures Kerberos and this would be used in cloudera.

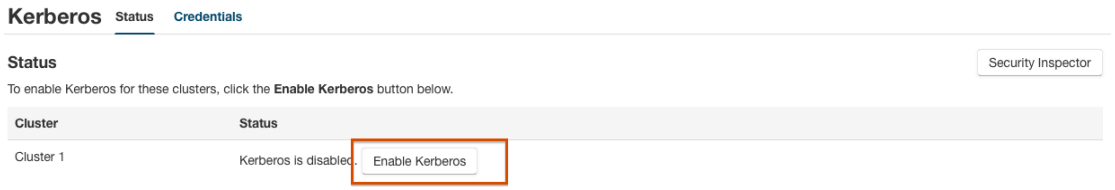
LAB: Securing Hadoop using Kerberos

Assuming that Kerberos server is installed we need to follow following steps to secure hadoop instances with authentication mechanism.

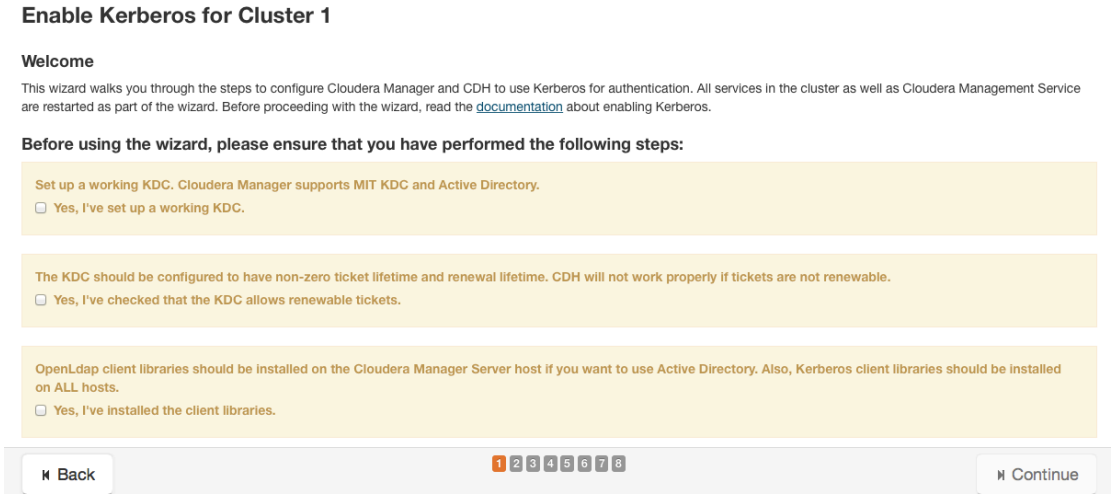
Step:1 Use Cloudera manager to launch the Kerberos wizard as specified below.



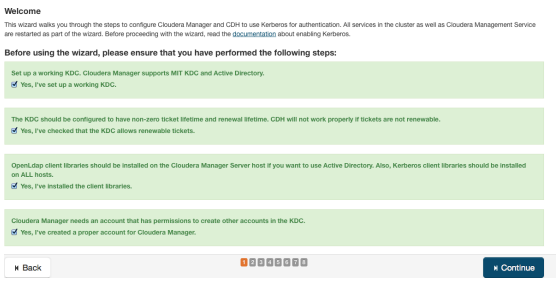
Step:2 Enable Kerberos



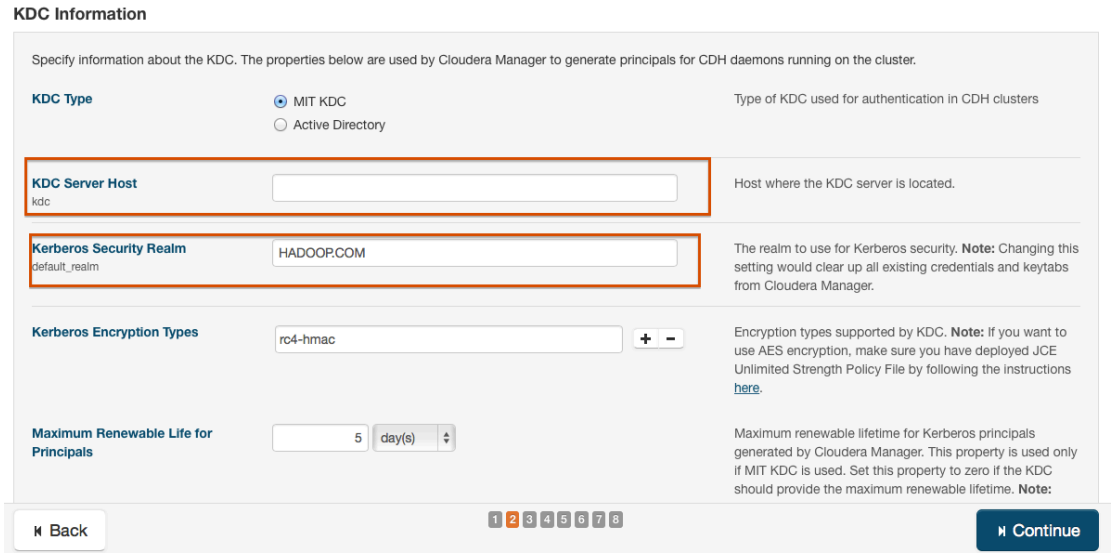
Step:3 Verify your Kerberos setup using cloudera guidelines specified below and ensure all requirements are met.



Ensure you check all the prerequisites check boxes.

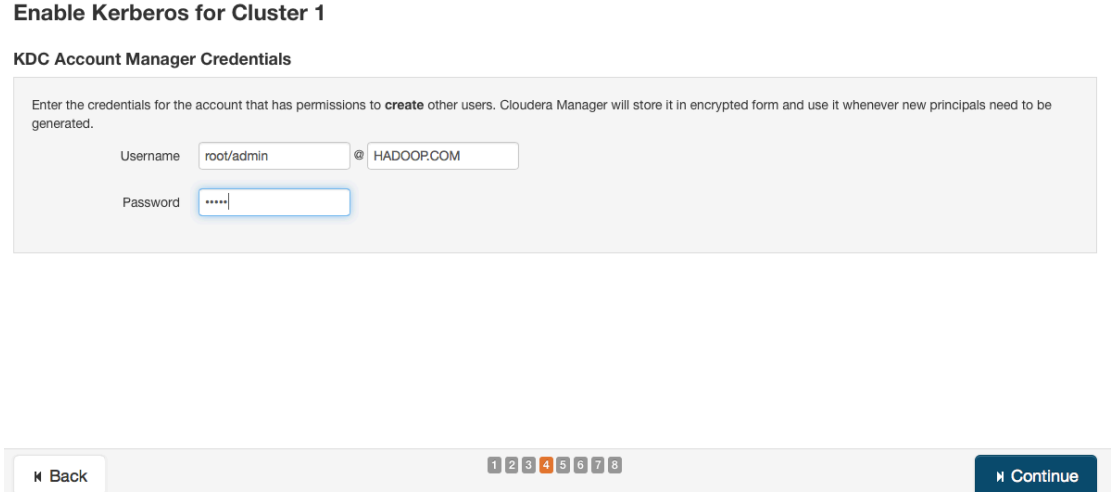


Step:4 Specify the required Kerberos server details in the below page.Since we are using MIT we have selected MIT(default).

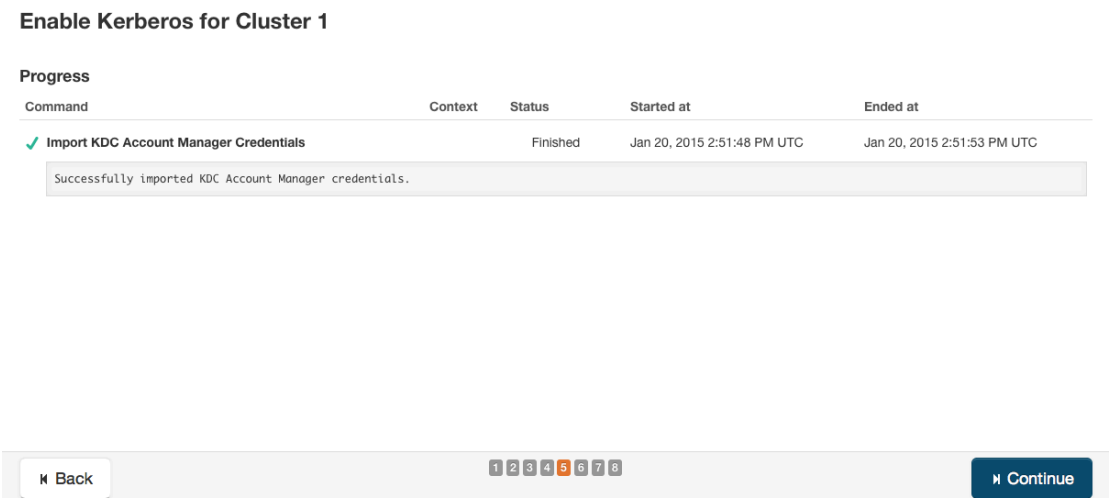


Step:5 Consult your Kerberos administrator and add the required details of KDC server host and realm.in our case it is the hostname of the master node.

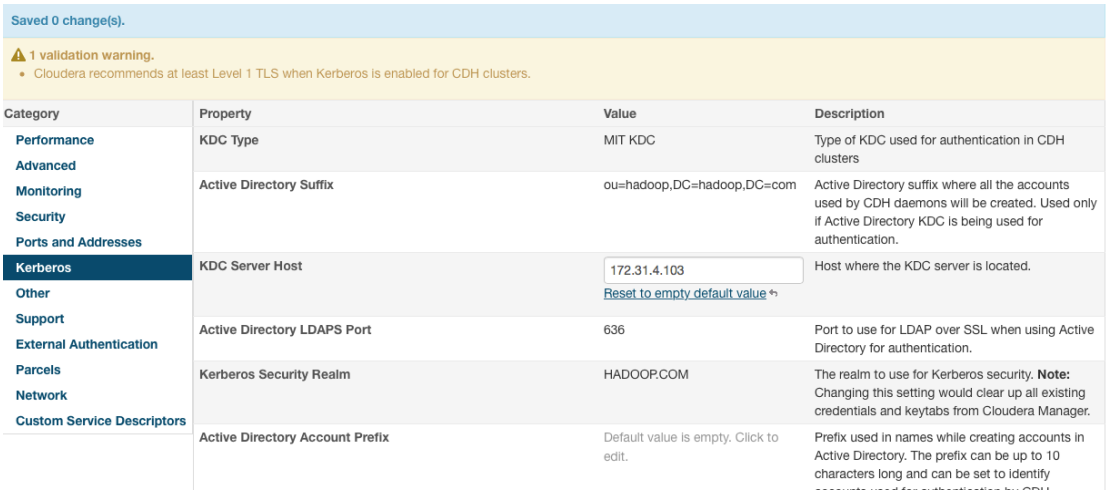
Step:6 Enter the credentials having create user privileges.



Step:7 This step imports account manager credentials as specified below.



Step: 8 Follow through the steps and Kerberos gets enabled .To confirm walkthrough settings as specified .



Step: 9 Test Kerberos client using below commands.

```
ubuntu@ip-172-31-4-103:~$ sudo kadmin
Authenticating as principal root/admin@HADOOP.COM with password.
Password for root/admin@HADOOP.COM:
kadmin:
```

Since we are able to get kadmin it confirms that client interacts with Kerberos server.

LAB: Installing CDH 5 with YARN on a Single Linux Node in Pseudo-distributed mode

Oracle JDK Installation

Download Java SE Development Kit 7u45 (http://www.oracle.com/technetwork/java/javase/downloads/java-archive-downloads-javase7-521261.html)

```
$ tar -xvf ~/Downloads/jdk-7u45-linux-x64.gz

$ sudo mkdir -p /usr/java/jdk.1.7.0_45

$ sudo mv ~/Downloads/jdk1.7.0_45/* /usr/java/jdk.1.7.0_45

$ sudo vim  /etc/profile
   JAVA_HOME=/usr/java/jdk.1.7.0_45
   PATH=$PATH:$HOME/bin:$JAVA_HOME/bin
   JRE_HOME=/usr/java/jdk.1.7.0_45/jre
   PATH=$PATH:$HOME/bin:$JRE_HOME/bin
   export JAVA_HOME
   export JRE_HOME
   export PATH

$ source /etc/profile

$ vi /etc/sudoers
   Defaults env_keep+=JAVA_HOME

$ sudo init 6
```

Installing CDH 5 with YARN on a Single Linux Node in Pseudo-distributed mode http://www.cloudera.com/content/cloudera-content/cloudera-docs/CDH5/latest/CDH5-Quick-Start/cdh5qs_yarn_pseudo.html

Download the CDH 5 "1-click Install" package: "this link for a Precise system"

```
$ sudo dpkg -i cdh5-repository_1.0_all.deb

$ curl -s
http://archive.cloudera.com/cdh5/ubuntu/precise/amd64/cdh/archive.key |
sudo apt-key add -
```

Install Hadoop in pseudo-distributed mode: To install Hadoop with YARN:

```
$ sudo apt-get update
$ sudo apt-get install hadoop-conf-pseudo
```

Starting Hadoop and Verifying it is Working Properly
For YARN, a pseudo-distributed Hadoop installation consists of one node running all five Hadoop daemons: namenode, secondarynamenode, resourcemanager, datanode, and nodemanager.

To view the files on Ubuntu systems:

$ dpkg -L hadoop-conf-pseudo

The new configuration is self-contained in the /etc/hadoop/conf.pseudo directory.

Step 1: Format the NameNode.

$ sudo -u hdfs hdfs namenode -format

Step 2: Start HDFS

if occured "Error: JAVA_HOME is not set" set java home in hadoop-env configuration file in etc/hadoop/conf directory
$ sudo vim /etc/hadoop/conf/hadoop-env.sh
export JAVA_HOME=/usr/java/jdk.1.7.0_45

$ for x in `cd /etc/init.d ; ls hadoop-hdfs-*` ; do sudo service $x start ; done

The NameNode provides a web console http://localhost:50070/ for viewing your Distributed File System (DFS) capacity, number of DataNodes, and logs

---

Step 3: Create the /tmp, Staging and Log Directories
Remove the old /tmp if it exists:

$ sudo -u hdfs hadoop fs -rm -r /tmp

Create the new directories and set permissions:
$ sudo -u hdfs hadoop fs -mkdir -p /tmp/hadoop-yarn/staging/history/done_intermediate
$ sudo -u hdfs hadoop fs -chown -R mapred:mapred /tmp/hadoop-yarn/staging
$ sudo -u hdfs hadoop fs -chmod -R 1777 /tmp
$ sudo -u hdfs hadoop fs -mkdir -p /var/log/hadoop-yarn
$ sudo -u hdfs hadoop fs -chown yarn:mapred /var/log/hadoop-yarn

Note: You need to create /var/log/hadoop/yarn because it is the parent of /var/log/hadoop-yarn/apps which is explicitly configured in yarn-site.xml.

Step 4: Verify the HDFS File Structure:
Run the following command:

$ sudo -u hdfs hadoop fs -ls -R /

Step 5: Start YARN
$ sudo service hadoop-yarn-resourcemanager start
$ sudo service hadoop-yarn-nodemanager start
$ sudo service hadoop-mapreduce-historyserver start

Step 6: Create User Directories
Create a home directory for each MapReduce user. It is best to do this on the NameNode; for example:

$ sudo -u hdfs hadoop fs -mkdir /user/$USER
$ sudo -u hdfs hadoop fs -chown $USER /user/$USER

$ sudo -u hdfs hadoop fs -ls /
$ sudo -u hdfs hadoop fs -mkdir /user
$ sudo -u hdfs hadoop fs -mkdir /user/ercan
$ sudo -u hdfs hadoop fs -chown ercan /user/ercan

Running an example application with YARN
$ hadoop fs -mkdir input # create new directory in /user/ercan/ directory

Run MR job samples
$ hadoop jar /usr/lib/hadoop-mapreduce/hadoop-mapreduce-examples.jar grep input output23 'dfs[a-z.]+'

$ hadoop fs -ls
Found 2 items
drwxr-xr-x - joe supergroup 0 2009-08-18 18:36 /user/ercan/input
drwxr-xr-x - joe supergroup 0 2009-08-18 18:38 /user/ercan/output23

$ hadoop fs -cat output23/part-r-00000 | head
1 dfs.safemode.min.datanodes
1 dfs.safemode.extension
1 dfs.replication
1 dfs.namenode.name.dir
1 dfs.namenode.checkpoint.dir
1 dfs.datanode.data.dir

Lab Manual CDH5 Installation: Hadoop Installation

Step:1 Add the CDH 5 repository

```
$sudo wget
'http://archive.cloudera.com/cdh5/ubuntu/wheezy/amd64
/cdh/cloudera.list' \
    -O /etc/apt/sources.list.d/cloudera.list
```

Step: 2 Update repositories

```
sudo apt-get update
```

Step: 3 Add a repository key

```
$ wget
http://archive.cloudera.com/cdh5/ubuntu/precise/amd64
/cdh/archive.key -O archive.key

$ sudo apt-key add archive.key
```

Step: 4 Our current installation is not HA for HA it is recommended to install zookeeper .

```
$sudo apt-get install zookeeper-server
```

Step:5 create /var/lib/zookeeper and set permissions.

```
$mkdir -p /var/lib/zookeeper
$chown -R zookeeper /var/lib/zookeeper/
```

ZooKeeper may start automatically on installation on Ubuntu and other Debian systems. This automatic start will happen only if the data directory exists; otherwise you will be prompted to initialize as shown below.

Step:6 Install each type of daemon package on the appropriate systems(s).

6.1 On Resource manage node install

```
sudo apt-get update;
sudo apt-get install hadoop-yarn-resourcemanager
```

6.2 NameNode Host will have following

```
sudo apt-get install
hadoop-hdfs-secondarynamenode
```

6.3 On all other nodes except those where Resource Manage is running$sudo apt-get install hadoop-yarn-nodemanager hadoop-hdfs-datanode hadoop-mapreduce

6.4 On all client hosts

```
$sudo apt-get install hadoop-client.
```

Step:7 Setting up hadoop configuration files:

7.1 Copy the default configuration to your custom directory:

```
$ sudo cp -r /etc/hadoop/conf.empty
/etc/hadoop/conf.my_cluster
```

7.2 CDH uses the alternatives setting to determine which Hadoop configuration to use. Set alternatives to point to your custom directory, as follows.

```
$sudo update-alternatives --install /etc/hadoop/conf
hadoop-conf /etc/hadoop/conf.my_cluster 50

$ sudo update-alternatives --set hadoop-conf
/etc/hadoop/conf.my_cluster
```

7.3 Display current settings as follows

```
$sudo update-alternatives --display hadoop-conf
```

Output of the above program would be something similar to below given diagram

```
hadoop-conf - status is auto.
link currently points to /etc/hadoop/conf.my_cluster
/etc/hadoop/conf.my_cluster - priority 50
/etc/hadoop/conf.empty - priority 10
Current `best' version is
/etc/hadoop/conf.my_cluster.
```

Step: 8.Customize Configuration files:

core-site.xml:

```
<property>
 <name>fs.defaultFS</name>
 <value>hdfs://namenode-host.company.com:8020</value>
</property>
```

hdfs-site.xml:

```
<property>
 <name>dfs.permissions.superusergroup</name>
 <value>hadoop</value>
</property>
```

Step:9 Configure directories.Below is the sample for namenode and datanode local directories change it with your directories.

hdfs-site.xml on the NameNode:

```
<property>
 <name>dfs.namenode.name.dir</name>
 <value>file:///data/1/dfs/nn,file:///nfsmount/dfs/nn</value>
</property>
```

hdfs-site.xml on each DataNode:

```
<property>
 <name>dfs.datanode.data.dir</name>
 <value>file:///data/1/dfs/dn,file:///data/2/dfs/dn,file:///data/3/dfs/dn,file:///data/4/dfs/dn</value>
</property>
```

Step: 10 Configuring local directories used for HDFS.

10.1 On a NameNode host: create the dfs.name.dir or dfs.namenode.name.dir local directories:

```
$ sudo mkdir -p /data/1/dfs/nn /nfsmount/dfs/nn
```

10.2 On all DataNode hosts: create the dfs.data.dir or dfs.datanode.data.dir local directories:

```
$ sudo mkdir -p /data/1/dfs/dn /data/2/dfs/dn /data/3/dfs/dn /data/4/dfs/dn
```

10.3 Configure the owner of the dfs.name.dir or dfs.namenode.name.dir directory, and of the dfs.data.dir or dfs.datanode.data.dir directory, to be the hdfs user:

```
$ sudo chown -R hdfs:hdfs /data/1/dfs/nn /nfsmount/dfs/nn /data/1/dfs/dn /data/2/dfs/dn /data/3/dfs/dn
/data/4/dfs/dn
```

10.4 Change permission to correct permission as specified below

```
$ sudo chmod 700 /data/1/dfs/nn /nfsmount/dfs/nn
```

or

```
$ sudo chmod go-rx /data/1/dfs/nn /nfsmount/dfs/nn
```

Step: 11 Format the NameNode as specified below.

```
$ sudo -u hdfs hdfs namenode -format
```

Step:12 Configuring a secondary NameNode.
Add the following entry in hdfs-site.xml

```
<property>
  <name>dfs.namenode.http-address</name>
  <value><namenode.host.address>:50070</value>
  <description>
    The address and the base port on which the dfs NameNode Web UI will listen.
  </description>
</property>
```

Step: 12 Enable WebHDFS.

If you want to use WebHDFS, you must first enable it.DO the following changes in hdfs-site.xml as specified below.

```
<property>
  <name>dfs.webhdfs.enabled</name>
  <value>true</value>
</property>
```

Step:13 Deploy the configuration push your custom directory to each host as specified below. Use the correct ips.

```
$ scp -r /etc/hadoop/conf.my_cluster myuser@myCDHnode-<n>.mycompany.com:/etc/hadoop/conf.my_cluster
```

Step:14 Manually set the configuration as specified below.

```
$ sudo update-alternatives --install /etc/hadoop/conf hadoop-conf /etc/hadoop/conf.my_cluster 50
$ sudo update-alternatives --set hadoop-conf /etc/hadoop/conf.my_cluster
```

Step:15 Start the HDFS

```
for x in `cd /etc/init.d ; ls hadoop-hdfs-*` ; do sudo service $x start ; done
```

Step:16 Create tmp directory (if not created you may run into problem).Also specify the right permission to the file as shown below.

```
$ sudo -u hdfs hadoop fs -mkdir /tmp
$ sudo -u hdfs hadoop fs -chmod -R 1777 /tmp
```

LAB: Configuring YARN in Cloudera

The default installation in CDH 5 is MapReduce 2.x (MRv2) built on the YARN framework. In this document we usually refer to this new version as YARN. The fundamental idea of MRv2's YARN architecture is to split up the two primary responsibilities of the JobTracker — resource management and job scheduling/monitoring — into separate daemons: a global ResourceManager (RM) and per-application ApplicationMasters (AM). With MRv2, the ResourceManager (RM) and per-node NodeManagers (NM), form the data-computation framework. The ResourceManager service effectively replaces the functions of the JobTracker, and NodeManagers run on slave nodes instead of TaskTracker daemons.

Step: 1 Configure YARN for CDH5 for cluster as specified below

mapred-site.xml:

```
<property>
  <name>mapreduce.framework.name</name>
  <value>yarn</value>
</property>
```

Step: 2 Configure the YARN Daemons Create yarn-site.xml file as specified below.

```
<property>
    <name>yarn.resourcemanager.hostname</name>
    <value>resourcemanager.company.com</value>
  </property>
  <property>
    <description>Classpath for typical applications.</description>
    <name>yarn.application.classpath</name>
    <value>
        $HADOOP_CONF_DIR,
        $HADOOP_COMMON_HOME/*,$HADOOP_COMMON_HOME/lib/*,
        $HADOOP_HDFS_HOME/*,$HADOOP_HDFS_HOME/lib/*,
        $HADOOP_MAPRED_HOME/*,$HADOOP_MAPRED_HOME/lib/*,
        $HADOOP_YARN_HOME/*,$HADOOP_YARN_HOME/lib/*
    </value>
  </property>
  <property>
    <name>yarn.nodemanager.aux-services</name>
    <value>mapreduce_shuffle</value>
  </property>
  <property>
    <name>yarn.nodemanager.local-dirs</name>

<value>file:///data/1/yarn/local,file:///data/2/yarn/local,file:///data/3/ya
rn/local</value>
  </property>
  <property>
    <name>yarn.nodemanager.log-dirs</name>

<value>file:///data/1/yarn/logs,file:///data/2/yarn/logs,file:///data/3/yarn
/logs</value>
  </property>
  <property>
    <name>yarn.log.aggregation-enable</name>
    <value>true</value>
  </property>
  <property>
```

```
    <description>Where to aggregate logs</description>
    <name>yarn.nodemanager.remote-app-log-dir</name>
    <value>hdfs://<namenode-host.company.com>:8020/var/log/hadoop-
yarn/apps</value>
  </property>
```

Step: 3 create the directories and assign the correct file permissions to them on each node in your cluster.(ensure you use directories created by you on your system)

1. Create the `yarn.nodemanager.local-dirs` local directories:

```
$ sudo mkdir -p /data/1/yarn/local /data/2/yarn/local /data/3/yarn/local /data/4/yarn/local
```

2. Create the `yarn.nodemanager.log-dirs` local directories:

```
$ sudo mkdir -p /data/1/yarn/logs /data/2/yarn/logs /data/3/yarn/logs /data/4/yarn/logs
```

3. Configure the owner of the `yarn.nodemanager.local-dirs` directory to be the `yarn` user:

```
$ sudo chown -R yarn:yarn /data/1/yarn/local /data/2/yarn/local /data/3/yarn/local /data/4/yarn/local
```

4. Configure the owner of the `yarn.nodemanager.log-dirs` directory to be the `yarn` user:

```
$ sudo chown -R yarn:yarn /data/1/yarn/logs /data/2/yarn/logs /data/3/yarn/logs /data/4/yarn/logs
```

Step: 4 Configure mapred-site.xml If you have decided to run YARN on your cluster instead of MRv1, you should also run the MapReduce JobHistory Server. The following table shows the most important properties that you must configure in mapred-site.xml.

ıadoop.proxyuser.mapred.groups	*	Allows the mapreduser to move files belonging to users in these groups
ıadoop.proxyuser.mapred.hosts	*	Allows the mapreduser to move files belonging on these hosts
mapreduce.jobhistory.address	historyserver.company.com:10020	The address of the JobHistory Server host:port
mapreduce.jobhistory.webapp.address	historyserver.company.com:19888	The address of the JobHistory Server web application host:port

Step:5 YARN By default it creates /tmp/hadoop-yarn/staging with restrictive permissions that may prevent your users from running jobs. To forestall this, you should configure and create the staging directory yourself; in the example that follows we use /user(make following entries in mapred-site.xml.

```
<property>
    <name>yarn.app.mapreduce.am.staging-dir</name>
    <value>/user</value>
</property>
```

Once HDFS is up and running, you will create this directory and a history subdirectory under it.

Step: 6 Create the history Directory and Set Permissions and Owner. See the below statement and do the needful .

```
sudo -u hdfs hadoop fs -mkdir -p /user/history
sudo -u hdfs hadoop fs -chmod -R 1777 /user/history
sudo -u hdfs hadoop fs -chown mapred:hadoop /user/history
```

Step: 7 create log directories as specified below

```
sudo -u hdfs hadoop fs -mkdir -p /var/log/hadoop-yarn
sudo -u hdfs hadoop fs -chown yarn:mapred /var/log/hadoop-yarn
```

Step:8 Verify using HDFS command specified below

```
$ sudo -u hdfs hadoop fs -ls -R /
```

You will see the following structure as follows

```
drwxrwxrwt   - hdfs supergroup          0 2012-04-19 14:31 /tmp
drwxr-xr-x   - hdfs supergroup          0 2012-05-31 10:26 /user
drwxrwxrwt   - mapred hadoop          0 2012-04-19 14:31 /user/history
drwxr-xr-x   - hdfs   supergroup        0 2012-05-31 15:31 /var
drwxr-xr-x   - hdfs   supergroup        0 2012-05-31 15:31 /var/log
drwxr-xr-x   - yarn   mapred            0 2012-05-31 15:31 /var/log/hadoop-yarn
```

Step:9 Start YARN and MapReduce jobHistory server

```
$ sudo service hadoop-yarn-resourcemanager start
```

On each NodeManager system (typically the same ones where DataNode service runs):

```
$ sudo service hadoop-yarn-nodemanager start
```

Step :10 Start MapReduce and JobHistory Server.

```
$ sudo service hadoop-mapreduce-historyserver start
```

Step: 11 Create home directory for each MapReduce user.

```
$ sudo -u hdfs hadoop fs -mkdir  /user/<user>
$ sudo -u hdfs hadoop fs -chown <user> /user/<user>
```

LAB: Installing and configuring Sqoop.

Sqoop 2 is a server-based tool designed to transfer data between Hadoop and relational databases. You can use Sqoop 2 to import data from a relational database management system (RDBMS) such as MySQL or Oracle into the Hadoop Distributed File System (HDFS), transform the data with Hadoop MapReduce, and then export it back into an RDBMS.

In this Lab we will wouk exclusively with Sqoop components 1.Sqoop-server 2.Sqoop-client.

Note:

We need to install the server package **on one node in the cluster**; because the Sqoop 2 server acts as a MapReduce client this node must have Hadoop installed and configured.

Install the client package on each node that will act as a client. A Sqoop 2 client will always connect to the Sqoop 2 server to perform any actions, so Hadoop does not need to be installed on the client nodes.

Step: 1 Install the Sqoop 2 server package on an Ubuntu.

```
$ sudo apt-get install sqoop2-server
```

Step: 2 install the Sqoop 2 client package on an Ubuntu

```
$ sudo apt-get install sqoop2-client
```

Step: 3 Configure Sqoop2 to work with MapReduce Mrv1 and YARN. The Sqoop 2 server can work with either MRv1 or YARN. It cannot work with both simultaneously. We need to configure CATALINA_BASE variable in the /etc/defaults/sqoop2-server file. By default, CATALINA_BASE is set to /usr/lib/sqoop2/sqoop-server. This setting configures the Sqoop 2 server to work with YARN. You need to change it to /usr/lib/sqoop2/sqoop-server-0.20 to switch to MRv1.

Use following statements to configure Sqoop2 to work with your selected mode.

```
CATALINA_BASE=/usr/lib/sqoop2/sqoop-server
```

or

```
CATALINA_BASE=/usr/lib/sqoop2/sqoop-server-0.20
```

Step: 4 Next is to install the required database driver. In our case its mysql java driver.(download and extract to get the driver).

```
; sudo wget http://dev.mysql.com/get/Downloads/Connector-J/mysql-connector-java-5.1.18.tar.gz/from/http://mysql.mirrors.pair.com/
```

```
buntu@ip-172-31-4-103:/$ sudo tar -xzf index.html.1
```

```
$ sudo cp mysql-connector-java-version/mysql-connector-java-version-bin.jar /var/lib/sqoop2/
```

Step: 5 Starting Sqoop2 Server

```
$ sudo /sbin/service sqoop2-server start
```

Step: 6 Confirming server startup

```
$ wget -qO - localhost:12000/sqoop/version
{"version":"1.99.1-cdh4.4.0",...}
```

Step: 7 Stopping Sqoop2 Server.

```
$ sudo /sbin/service sqoop2-server stop
```

Step: 8 Accessing the Sqoop 2 Server with the Sqoop 2 Client

Step: 8.1 Lets Start the Sqoop 2 client.

```
sqoop2
```

Step: 8.2 Lets identify the host where your server is running (localhost/ip of the server).

```
sqoop:000> set server --host your.host.com --port 12000 --webapp sqoop
```

Step: 8.3 Test the connection as shown below.

```
sqoop:000> show version --all
server version:
  Sqoop 1.99.1-cdh4.4.0 revision ...
  Compiled by jenkins on ...
client version:
  Sqoop 1.99.1-cdh4.4.0 revision ...
  Compiled by jenkins on ...
Protocol version:
  [1]
```

Note: Sqoop is using numerical identifiers to identify various meta data structures (connectors, connections, jobs). Each meta data structures have it's own pool of identifiers and thus it's perfectly valid when Sqoop have connector with id 1, connection with id 1 and job with id 1 at the same time.

Step: 9 Lets check what connectors are available on your Sqoop server.

```
sqoop:000> show connector --all
1 connector(s) to show:
Connector with id 1:
  Name: generic-jdbc-connector
  Class: org.apache.sqoop.connector.jdbc.GenericJdbcConnector
  Supported job types: [EXPORT, IMPORT]
...
```

Step: 10 Create a connector as specified below. It creates a new connection object will be created with assigned id 1.

```
sqoop:000> create connection --cid 1
Creating connection for connector with id 1
Please fill following values to create new connection object
Name: First connection

Configuration configuration
JDBC Driver Class: com.mysql.jdbc.Driver
JDBC Connection String: jdbc:mysql://mysql.server/database
Username: sqoop
Password: *****
JDBC Connection Properties:
There are currently 0 values in the map:
entry#

Security related configuration options
Max connections: 0
New connection was successfully created with validation status FINE and persistent id 1
```

Step: 11 Create Job Obect as specified below. List of supported job types for each connector might be seen in the output of show connector command as shown below.

```
sqoop:000> show connector --all
...
  Name: generic-jdbc-connector
...
  Supported job types: [EXPORT, IMPORT]
...
```

Step: 12 Create import job for connection object created in previous step.

```
sqoop:000> create job --xid 1 --type import
Creating job for connection with id 1
Please fill following values to create new job object
Name: First job

Database configuration
Table name: users
Table SQL statement:
Table column names:
Partition column name:
Boundary query:

Output configuration
Storage type:
  0 : HDFS
Choose: 0
Output directory: /user/jarcec/users
New job was successfully created with validation status FINE and persistent id 1
```

Step: 13 Moving data around. Submit Hadoop job using submission start as specified below.

```
sqoop:000> submission start --jid 1
Submission details
Job id: 1
Status: BOOTING
Creation date: 2012-12-23 13:20:34 PST
Last update date: 2012-12-23 13:20:34 PST
External Id: job_1353136146286_0004
        http://hadoop.cluster.com:8088/proxy/application_1353136146286_0004/
Progress: Progress is not available
```

Step: 14 Check the running job as specified below.

```
sqoop:000> submission status --jid 1
Submission details
Job id: 1
Status: RUNNING
Creation date: 2012-12-23 13:21:45 PST
Last update date: 2012-12-23 13:21:56 PST
External Id: job_1353136146286_0005
        http://hadoop.cluster.com:8088/proxy/application_1353136146286_0004/
Progress: 0.00 %
```

Step: 15 Stop running job as specified below.

```
sqoop:000> submission stop --jid 1
Submission details
Job id: 1
Status: FAILED
Creation date: 2012-12-23 13:22:39 PST
Last update date: 2012-12-23 13:22:42 PST
External Id: job_1353136146286_0006
        http://hadoop.cluster.com:8088/proxy/application_1353136146286_0004/
```

LAB: Installing and working with Pig.

Pig is a high level scripting language that is used with Apache Hadoop. Pig enables data workers to write complex data transformations without knowing Java. Pig's simple SQL-like scripting language is called Pig Latin, and appeals to developers already familiar with scripting languages and SQL.

Step: 1 Install Pig.

```
$ sudo apt-get install pig
```

Step: 2 Starting Pig in interactive mode with YARN .

For each user who will be submitting MapReduce jobs using MapReduce v2 (YARN), or running Pig, Hive, or Sqoop in a YARN installation, make sure that the HADOOP_MAPRED_HOME environment variable is set correctly, as follows:

```
$ export HADOOP_MAPRED_HOME=/usr/lib/hadoop-mapreduce
```

For each user who will be submitting MapReduce jobs using MapReduce v1 (MRv1), or running Pig, Hive, or Sqoop in an MRv1 installation, set the HADOOP_MAPRED_HOME environment variable as follows:

```
$ export HADOOP_MAPRED_HOME=/usr/lib/hadoop-0.20-mapreduce
```

Step: 3 Start Pig

```
$ pig
```

Step: 4 Verify Pig Installation as specified below.

```
grunt> ls
hdfs://localhost/user/joe/input <dir>
hdfs://localhost/user/joe/output <dir>
```

Step: 5 Write a Pig Script and test the Pig Response

```
grunt> A = LOAD 'input';
grunt> B = FILTER A BY $0 MATCHES '.*dfs[a-z.]+.*';
grunt> DUMP B;
```

Step: 6 Test the output on the console (Installation of Pig is verified).

LAB: Installing and Configuring Zookeeper on CDH5

ZooKeeper is a centralized service for maintaining configuration information, naming, providing distributed synchronization, and providing group services. All of these kinds of services are used in some form or another by distributed applications. Each time they are implemented there is a lot of work that goes into fixing the bugs and race conditions that are inevitable. Because of the difficulty of implementing these kinds of services, applications initially usually skimp on them, which make them brittle in the presence of change and difficult to manage. Even when done correctly, different implementations of these services lead to management complexity when the applications are deployed.

There are two ZooKeeper server packages:

- The zookeeper base package provides the basic libraries and scripts that are necessary to run ZooKeeper servers and clients. The documentation is also included in this package.

- The zookeeper-server package contains the init.d scripts necessary to run ZooKeeper as a daemon process. Because zookeeper-server depends on zookeeper, installing the server package automatically installs the base package.

Installing Zookeeper on Single Host:

Step: 1 Install zookeeper Base Packages using

```
$ sudo apt-get install zookeeper
```

Step: 2 Installing the ZooKeeper Server Package and Starting ZooKeeper on a Single Server (not recommended for production).

```
$ sudo apt-get install zookeeper-server
```

Step: 3 Create the /var/lib/zookeeper and set permissions on it as specified below.

```
mkdir -p /var/lib/zookeeper
chown -R zookeeper /var/lib/zookeeper/
```

Step: 4 Starting Zookeeper after first time install.

```
$ sudo service zookeeper-server init
$ sudo service zookeeper-server start
```

Installing Zookeeper on multimode hosts (Production):

Note: In a production environment, you should deploy ZooKeeper as an ensemble with an odd number of servers. As long as a majority of the servers in the ensemble are available, the ZooKeeper service will be available. The minimum recommended ensemble size is three ZooKeeper servers, and Cloudera recommends that each server run on a separate machine. In addition, the ZooKeeper server process should have its own dedicated disk storage if possible.

Step: 1 Use the following steps on each hosts you want to install zookeeper.

Step: 1.1 Install zookeeper Base Packages using

```
$ sudo apt-get install zookeeper
```

Step: 1.2 Installing the ZooKeeper Server Package and Starting ZooKeeper on a Single Server (not recommended for production).

```
$ sudo apt-get install zookeeper-server
```

Step: 1.3 Create the /var/lib/zookeeper and set permissions on it as specified below.

```
mkdir -p /var/lib/zookeeper
chown -R zookeeper /var/lib/zookeeper/
```

Step:2 On each host Test the expected loads to set the Java heap size so as to avoid swapping. Make sure you are well below the threshold at which the system would start swapping; for example 12GB for a machine with 16GB of RAM.

Step:3 On each host Create a configuration file with following entries.

```
tickTime=2000
dataDir=/var/lib/zookeeper/
clientPort=2181
initLimit=5
syncLimit=2
server.1=zoo1:2888:3888
server.2=zoo2:2888:3888
server.3=zoo3:2888:3888
```

Step:4 On each Host create a file named myid in the server's DataDir; in this example, /var/lib/zookeeper/myid . The file must contain only a single line, and

that line must consist of a single unique number between 1 and 255; this is the id component mentioned in the previous step. In this example, the server whose hostname is zoo1 must have a myid file that contains only 1.

Step: 5 Start servers on each host.

```
$ sudo service zookeeper-server init
$ sudo service zookeeper-server start
```

Step:6 Test the deployment by running a ZooKeeper client.

```
zookeeper-client -server hostname:port
```

In our case it would be as specified below:

```
zookeeper-client -server zoo1:2181
```

Note: Cloudera recommends that you fully automate this process by configuring a supervisory service to manage each server, and restart the ZooKeeper server process automatically if it fails.

LAB: Installing and configuring Hive in CDH5

The Apache Hive project provides a data warehouse view of the data in HDFS. Using a SQL-like language Hive lets you create summarizations of your data, perform ad-hoc queries, and analysis of large datasets in the Hadoop cluster. The overall approach with Hive is to project a table structure on the dataset and then manipulate it with HiveQL. Since you are using data in HDFS your operations can be scaled across all the datanodes and you can manipulate huge datasets.

Step: 1 For in CDH5 we need to install following packages.

- hive – base package that provides the complete language and runtime
- hive-metastore – provides scripts for running the metastore as a standalone service (optional)
- hive-server2 – provides scripts for running HiveServer2

Step: 2 Configure Heap size depending on your cluster size some Cloudera benchmarks are specified below.

Cluster Size	HiveServer2 Heap Size	Hive Metastore Heap Size
100 nodes or larger	24 GB	24 GB
50-99 nodes	12 GB	12 GB
11-49 nodes	6 GB	6 GB
2-10 nodes	2 GB	2 GB
1 node	256 MB	256 MB

To configure the heap size for HiveServer2 and Hive metastore, use the hive-env.sh advanced configuration snippet if you use Cloudera Manager, or edit /etc/hive/hive-env.sh otherwise, and set the -Xmx parameter in the HADOOP_OPTS variable to the desired maximum heap size.Below script sets the heap size of the components as required by our cluster.

```
if [ "$SERVICE" = "cli" ]; then
  if [ -z "$DEBUG" ]; then
    export HADOOP_OPTS="$HADOOP_OPTS -XX:NewRatio=12 -Xmx12288m -Xms10m -XX:MaxHeapFreeRatio=40 -
XX:MinHeapFreeRatio=15 -XX:+useParNewGC -XX:-useGCOverheadLimit"
  else
    export HADOOP_OPTS="$HADOOP_OPTS -XX:NewRatio=12 -Xmx12288m -Xms10m -XX:MaxHeapFreeRatio=40 -
XX:MinHeapFreeRatio=15 -XX:-useGCOverheadLimit"
  fi
fi

export HADOOP_HEAPSIZE=2048
```

Use the hive-env.sh advanced configuration snippet if you use Cloudera Manager, or edit /etc/hive/hive-env.sh otherwise, and set the HADOOP_HEAPSIZE environment variable before starting the Beehive CLI.

Step: 3 Configure WebHat(Optional).

```
export PYTHON_CMD=/usr/bin/python
```

Step:4 Configure Hive to use a remote database(embedded an d local are other modes).

Step: 4.1 Install mysql on a box using following command.

```
$ sudo apt-get install mysql-server
```

Step:4.2 Install mysql-connector (Driver)

```
$ sudo apt-get install libmysql-java
$ ln -s /usr/share/java/libmysql-java.jar /usr/lib/hive/lib/libmysql-java.jar
```

Step:4.3 Configure To make sure the MySQL server starts at boot.

```
$ sudo chkconfig mysql on
```

Step:4.4 Create the database and user using following statements.

Note: use the hive-schema-0.12.0.mysql.sql file instead; that file is located in the /usr/lib/hive/scripts/metastore/upgrade/mysql directory. Proceed as follows if you decide to use hive-schema-0.12.0.mysql.sql.

```
$ mysql -u root -p
Enter password:
mysql> CREATE DATABASE metastore;
mysql> USE metastore;
mysql> SOURCE /usr/lib/hive/scripts/metastore/upgrade/mysql/hive-schema-0.12.0.mysql.sql;
```

Step:4.5 You also need a MySQL user account for Hive to use to access the metastore. It is very important to prevent this user account from creating or altering tables in the metastore database schema.

```
nysql> CREATE USER 'hive'@'metastorehost' IDENTIFIED BY 'mypassword';
...
nysql> REVOKE ALL PRIVILEGES, GRANT OPTION FROM 'hive'@'metastorehost';
nysql> GRANT ALL PRIVILEGES ON metastore.* TO 'hive'@'metastorehost';
nysql> FLUSH PRIVILEGES;
```

Step:5 Configure the metastore service to communicate with the MySQL database.

Note: This step shows the configuration properties you need to set in hive-site.xml (/usr/lib/hive/conf/hive-site.xml) to configure the metastore service to communicate with the MySQL database, and provides sample settings. Though you can use the same hive-site.xml on all hosts (client, metastore, HiveServer), hive.metastore.uris is the only property that must be configured on all of them; the others are used only on the metastore host.

Edit the file to make sure following entries in hive-site.xml.

```
<property>
 <name>javax.jdo.option.ConnectionURL</name>
 <value>jdbc:mysql://myhost/metastore</value>
 <description>the URL of the MySQL database</description>
</property>

<property>
 <name>javax.jdo.option.ConnectionDriverName</name>
 <value>com.mysql.jdbc.Driver</value>
</property>

<property>
 <name>javax.jdo.option.ConnectionUserName</name>
 <value>hive</value>
</property>

<property>
 <name>javax.jdo.option.ConnectionPassword</name>
 <value>mypassword</value>
</property>

<property>
 <name>datanucleus.autoCreateSchema</name>
 <value>false</value>
</property>

<property>
 <name>datanucleus.fixedDatastore</name>
 <value>true</value>
</property>

<property>
 <name>datanucleus.autoStartMechanism</name>
 <value>SchemaTable</value>
</property>

<property>
 <name>hive.metastore.uris</name>
 <value>thrift://<n.n.n.n>:9083</value>
 <description>IP address (or fully-qualified domain name) and port of the
metastore host</description>
</property>

<property>
<name>hive.metastore.schema.verification</name>
<value>true</value>
</property>
```

Step:6 Configure HiverServer2 as specified below.

You must properly configure and enable Hive's Table Lock Manager. This requires installing ZooKeeper and setting up a ZooKeeper ensemble.
setting properties in /etc/hive/conf/hive-site.xml as follows (substitute your actual ZooKeeper node names for those in the example):

```
<property>
  <name>hive.support.concurrency</name>
  <description>Enable Hive's Table Lock Manager Service</description>
  <value>true</value>
</property>

<property>
  <name>hive.zookeeper.quorum</name>
  <description>Zookeeper quorum used by Hive's Table Lock Manager</description>
  <value>zk1.myco.com,zk2.myco.com,zk3.myco.com</value>
</property>
```

Step:7 If ZooKeeper is not using the default value for ClientPort, you need to set hive.zookeeper.client.port in /etc/hive/conf/hive-site.xml to the same value that ZooKeeper is using. Check /etc/zookeeper/conf/zoo.cfg to find the value for ClientPort. If ClientPort is set to any value other than 2181 (the default), set hive.zookeeper.client.port to the same value.

```
<property>
  <name>hive.zookeeper.client.port</name>
  <value>2222</value>
  <description>
  The port at which the clients will connect.
  </description>
</property>
```

Step:8 Running HiveServer2 and HiveServer. HiveServer2 and HiveServer1 can be run concurrently on the same system, sharing the same data sets. This allows you to run HiveServer1 to support, for example, Perl or Python scripts that use the native HiveServer1 Thrift bindings.
Both HiveServer2 and HiveServer1 bind to port 10000 by default, so at least one of them must be configured to use a different port. You can set the port for HiveServer2 in hive-site.xml by means of the hive.server2.thrift.port property.

```
<property>
  <name>hive.server2.thrift.port</name>
  <value>10001</value>
  <description>TCP port number to listen on, default 10000</description>
</property>
```

Step:9 Start the meta service as specified below.

```
$ sudo service hive-metastore start
```

Step:10 Setting the permissions as specified .

Your Hive data is stored in HDFS, normally under /user/hive/warehouse. The /user/hive and /user/hive/warehouse directories need to be created if they don't already exist. Make sure this location (or any path you specify as hive.metastore.warehouse.dir in your hive-site.xml) exists and is writable by the users whom you expect to be creating tables.

Note : If you do not enable impersonation, HiveServer2 by default executes all Hive tasks as the user ID that starts the Hive server; for clusters that use Kerberos authentication, this is the ID that maps to the Kerberos principal used with HiveServer2. Setting permissions to 1777, as recommended above, allows this user access to the Hive warehouse directory.

Change the behavior making **hive.metastore.execute.setugi** to **true** on both the server and client. This setting causes the metastore server to use the client's user and group permissions.

Step:11 Start/Stop/verify HiveServer2

```
$ sudo service hive-server2 start
```

```
$ sudo service hive-server2 stop
```

```
$ /usr/lib/hive/bin/beeline
beeline> !connect jdbc:hive2://localhost:10000 username password org.apache.hive.jdbc.HiveDriver
0: jdbc:hive2://localhost:10000> SHOW TABLES;
show tables;
+-----------+
| tab_name  |
+-----------+
+-----------+
No rows selected (0.238 seconds)
0: jdbc:hive2://localhost:10000>
```

Once you are able to see this output it ensures setup is successful.

Step: 12 In beeline feature we still don't have some features sometimes we would like to use hiveservr1 and hive console. Following pictures helps you to start HiveServer1 and use Hive console as specified below.

```
$ sudo service hiveserver start
```

```
$ hive
hive>
```

Once you see prompt type the following

```
hive> show tables;
OK
Time taken: 10.345 seconds
```

your HiverServer1 and hive prompts are configured properly.

LAB: Working with Flume

Apache Flume is a distributed, reliable, and available system for efficiently collecting; aggregating and moving large amounts of log data from many different sources to a centralized data store.

The use of Apache Flume is not only restricted to log data aggregation. Since data sources are customizable, Flume can be used to transport massive quantities of event data including but not limited to network traffic data, social-media-generated data, email messages and pretty much any data source possible.

Step: 1 Installing Flume on CDH5:

```
$ sudo apt-get install flume-ng
```

Step: 2 Lets install the Flume agent so Flume starts automatically on boot on Ubuntu.

```
$ sudo apt-get install flume-ng-agent
```

Step: 3 Install Documentation as specified below.

```
$ sudo apt-get install flume-ng-doc
```

Step: 4 Configure Flume.

Flume 1.x provides a template configuration file for flume.conf called conf/flume-conf.properties.template and a template for flume-env.sh called conf/flume-env.sh.template.Follow the following steps as specified below.

Step: 5 Copy the Flume template property file conf/flume-conf.properties.template to conf/flume.conf.

```
$ sudo cp conf/flume-conf.properties.template conf/flume.conf
```

Step:6 Edit the configuration file as specified below to describe a single-node Flume deployment. This configuration lets a user generate events and subsequently logs them to the console. Edit the file as specified below.

A single-node Flume configuration

```
# Name the components on this agent
a1.sources = r1
a1.sinks = k1
a1.channels = c1

# Describe/configure the source
a1.sources.r1.type = netcat
a1.sources.r1.bind = localhost
a1.sources.r1.port = 44444
```

```
# Describe the sink
a1.sinks.k1.type = logger

# Use a channel which buffers events in memory
a1.channels.c1.type = memory
a1.channels.c1.capacity = 1000
a1.channels.c1.transactionCapacity = 100

# Bind the source and sink to the channel
a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
```

Step: 6 The flume-ng executable looks for a file named flume-env.sh in the conf directory, and sources it if it finds it. Some use cases for using flume-env.sh are to specify a bigger heap size for the flume agent.

```
$ sudo cp conf/flume-env.sh.template conf/flume-env.sh
```

Step: 7 verify the installation.

```
$ flume-ng help
```

You get following output as specified below.

```
Usage: /usr/bin/flume-ng <command> [options]...

commands:
  help                  display this help text
  agent                 run a Flume agent
  avro-client           run an avro Flume client
  version               show Flume version info

global options:
  --conf,-c <conf>      use configs in <conf> directory
  --classpath,-C <cp>   append to the classpath
  --dryrun,-d           do not actually start Flume, just print the command
  --Dproperty=value     sets a JDK system property value

agent options:
  --conf-file,-f <file> specify a config file (required)
  --name,-n <name>      the name of this agent (required)
  --help,-h             display help text

avro-client options:
  --rpcProps,-P <file>  RPC client properties file with server connection params
  --host,-H <host>      hostname to which events will be sent (required)
  --port,-p <port>      port of the avro source (required)
  --dirname <dir>       directory to stream to avro source
  --filename,-F <file>  text file to stream to avro source [default: std input]
  --headerFile,-R <file> headerFile containing headers as key/value pairs on each new line
  --help,-h             display help text

  Either --rpcProps or both --host and --port must be specified.
```

Step: 8 Look at your configuration file to test Flume. This configuration defines a single agent named a1. a1 has a source that listens for data on port 44444, a channel that buffers event data in memory, and a sink that logs event data to the

console. The configuration file names the various components, then describes their types and configuration parameters. Use the following commands as specified below to start Flume.

```
$ bin/flume-ng agent --conf conf --conf-file
example.conf --name a1 -
Dflume.root.logger=INFO,console
```

Step: 9 Test the Flume launch a separate terminal and do telnet as specified below.

```
$ telnet localhost 44444
Trying 127.0.0.1...
Connected to localhost.localdomain (127.0.0.1).
Escape character is '^]'.
Hello world! <ENTER>
OK
```

Step: 10 Check the original Flume terminal and you will find the below log .

```
12/06/19 15:32:19 INFO source.NetcatSource: Source
starting
12/06/19 15:32:19 INFO source.NetcatSource: Created
serverSocket:sun.nio.ch.ServerSocketChannelImpl[/127.
0.0.1:44444]
12/06/19 15:32:34 INFO sink.LoggerSink: Event: {
headers:{} body: 48 65 6C 6C 6F 20 77 6F 72 6C 64 21
0D          Hello world!. }
```

LAB: Installation and configuration of HBase.

Apache™ HBase is a non-relational (NoSQL) database that runs on top of the Hadoop® Distributed File System (HDFS). It is columnar and provides fault-tolerant storage and quick access to large quantities of sparse data. It also adds transactional capabilities to Hadoop, allowing users to conduct updates, inserts and deletes.

Following Lab helps to install HBase from CDH5 distribution

Step: 1 To install HBase on Ubuntu:

$ sudo apt-get install hbase

Step: 2 To list the installed files on Ubuntu:

$ dpkg -L hbase

TODO - You are now ready to enable the server daemons you want to use with Hadoop. You can also enable Java-based client access by adding the JAR files in /usr/lib/hbase/ and /usr/lib/hbase/lib/ to your Java class path.

Step:3 Settings for HBase

Using DNS with HBase

TODO (if necessary) - HBase uses the local hostname to report its IP address. Both forward and reverse DNS resolving should work. If your machine has multiple interfaces, HBase uses the interface that the primary hostname resolves to. If this is insufficient, you can set hbase.regionserver.dns.interface in the hbase-site.xml file to indicate the primary interface.Setting User Limits for HBase If you get these errors then set following –

hdfs - nofile 32768
hbase - nofile 32768

Note :Only the root user can edit this file.

If this change does not take effect, check other configuration files in the /etc/security/limits.d directory for lines containing the hdfs or hbase user and the nofile value.

Such entries may be overriding the entries in /etc/security/limits.conf.

Step: 4 To apply the changes in /etc/security/limits.conf on Ubuntu and Debian systems, add the following line in the /etc/pam.d/common-session file:
Session required pam_limits.so

Step: 5 Using dfs.datanode.max.xcievers with HBase

If you get below error set theproperties as –

10/12/08 20:10:31 INFO hdfs.DFSClient: Could not obtain block blk_XXXXXXXXXXXXXXXXXXXXXX_YYYYYYYY from any node: java.io.IOException: No live nodes contain current block. Will get new block locations from namenode and retry...

/etc/hadoop/conf/hdfs-site.xml

```
<property>
  <name>dfs.datanode.max.xcievers</name>
  <value>4096</value>
</property>
```

Step: 6 Starting HBase in standalone mode

Step: 6.1 Install the HBase Master using the below statement.

$ sudo apt-get install hbase-master

Step: 6.2 Starting the HBase Master

$ sudo service hbase-master start

Step:6.3 Verify the installation

http://localhost:60010. The list of Region Servers at the bottom of the page should include one entry for your local machine.

Step:7 Accessing HBase by using the HBase Shell

After you have started HBase, you can access the database by using the HBase Shell:

$ hbase shell

Step: 8 Installing and Configuring REST

$ sudo apt-get install hbase-rest

Step: 9 Run the service

$sudo service hbase-rest start

If the service does not start at port 8080, change the configuration as per below – configure it in hbase-site.xml,

```
<property>
  <name>hbase.rest.port</name>
  <value>60050</value>
</property>
```

Step: 10 Test it again and your HBase is set to run.

Appendix: A

Ports Used by Components of CDH 5All ports listed are TCP.

Component	Service	Qualifier	Port	Access Requirement
Hadoop HDFS	DataNode		50010	External
	DataNode	Secure	1004	External
	DataNode		50075	External
	DataNode		50475	External
	DataNode	Secure	1006	External
	DataNode		50020	External
	NameNode		8020	External
	NameNode		8022	External
	NameNode		50070	External
	NameNode	Secure	50470	External
	Secondary NameNode		50090	Internal
	Secondary NameNode	Secure	50495	Internal
	JournalNode		8485	Internal
	JournalNode		8480	Internal
	JournalNode		8481	Internal
	Failover Controller		8019	Internal
	NFS gateway		2049	
	NFS gateway		4242	
	NFS gateway		111	
Hadoop MapReduce (MRv1)	JobTracker		8021	External
	JobTracker		8023	External
	JobTracker		50030	External
	JobTracker	Thrift Plugin	9290	Internal
	TaskTracker		50060	External
	TaskTracker		0	Localhost
	Failover Controller		8018	Internal
Hadoop YARN (MRv2)	ResourceManager		8032	External
	ResourceManager		8030	Internal
	ResourceManager		8031	Internal
	ResourceManager		8033	External
	ResourceManager		8088	External
	ResourceManager		8090	
	NodeManager		8040	Internal
	NodeManager		8041	Internal
	NodeManager		8042	External
	NodeManager		8044	External
	JobHistory Server		10020	Internal

	JobHistory Server		10033	Internal
	Shuffle HTTP		13562	Internal
	JobHistory Server		19888	External
	JobHistory Server		19890	External
Flume	Flume Agent		41414	External
Hadoop KMS	Key Management Server		16000	External
	Key Management Server		16001	Localhost
HBase	Master		60000	External
	Master		60010	External
	RegionServer		60020	External
	RegionServer		60030	External
	HQuorumPeer		2181	
	HQuorumPeer		2888	
	HQuorumPeer		3888	
	REST	Non-CM-managed	8080	External
	REST	CM-Managed	20550	External
	REST UI		8085	External
	ThriftServer	Thrift Server	9090	External
	ThriftServer		9095	External
		Avro server	9090	External
	hbase-solr-indexer	Lily Indexer	11060	External
Hive	Metastore		9083	External
	HiveServer2		10000	External
	WebHCat Server		50111	External
Sentry	Sentry Server		8038	External
	Sentry Server		51000	External
Sqoop	Metastore		16000	External
Sqoop 2	Sqoop 2 server		8005	Localhost
	Sqoop 2 server		12000	External
	Sqoop 2		12001	External
ZooKeeper	Server (with CDH 5 and/or Cloudera Manager 5)		2181	External
	Server (with CDH 5 only)		2888	Internal
	Server (with CDH 5 only)		3888	Internal
	Server (with CDH 5 and Cloudera Manager 5)		3181	Internal
	Server (with CDH 5 and Cloudera Manager 5)		4181	Internal

	ZooKeeper JMX port		9010	Internal
Hue	Server		8888	External
Oozie	Oozie Server		11000	External
	Oozie Server	SSL	11443	External
	Oozie Server		11001	localhost
Spark	Default Master RPC port		7077	External
	Default Worker RPC port		7078	
	Default Master web UI port		18080	External
	Default Worker web UI port		18081	
	History Server		18088	External
HttpFS	HttpFS		14000	
	HttpFS		14001	

APPENDIX: B

Permission Requirements with Cloudera Manager

Table 1:
Permission Requirements with Cloudera Manager:

TASK	PERMISSION REQUIRED
Install Cloudera Manager (via cloudera-manager-installer.bin)	root and/or sudo access on a single host
Manually start/stop/restart the Cloudera Manager Server (that is, log onto the host running Cloudera Manager and execute: service cloudera-scm-server action)	root and/or sudo
Run Cloudera Manager Server.	cloudera-scm
Install CDH components through Cloudera Manager.	One of the following, configured during initial installation of Cloudera Manager: Direct access to root user via the root password. Direct access to root user using a SSH key file. Passwordless sudo access for a specific user. This is the same requirement as the installation of CDH components on individual hosts, which is a requirement of the UNIX system in general. You cannot use another system (such as PowerBroker) that provides root/sudo privileges.
Install the Cloudera Manager Agent through Cloudera Manager.	One of the following, configured during initial installation of Cloudera Manager: Direct access to root user via the root password. Direct access to root user using a SSH key file. Passwordless sudo access for a specific user. This is the same requirement as the installation of CDH components on individual hosts, which is a requirement of the UNIX system in general. You cannot use another system (such as PowerBroker) that provides root/sudo privileges.

Run the Cloudera Manager Agent.	If single user node is not enabled, access to the root account during runtime, through one of the following scenarios: During Cloudera Manager and CDH installation, the Agent is automatically started if installation is successful. It is then started via one of the following, as configured during the initial installation of Cloudera Manager: Direct access to root user via the root password Direct access to root user using a SSH key file Passwordless sudo access for a specific user Using another system (such as PowerBroker) that provides root/sudo privileges is not acceptable. Through automatic startup during system boot, via init.
Manually start/stop/restart the Cloudera Manager Agent process.	If single user node is not enabled, root and/or sudo access. This permission requirement ensures that services managed by the Cloudera Manager Agent assume the appropriate user (that is, the HDFS service assumes the hdfs user) for correct privileges. Any action request for a CDH service managed within Cloudera Manager does not require root and/or sudo access, because the action is handled by the Cloudera Manager Agent, which is already running under the root user.

Table 2:
Permission Requirements without Cloudera Manager

TASK	PERMISSION REQUIRED
Install CDH products.	root and/or sudo access for the installation of any RPM-based package during the time of installation and service startup/shut down. Passwordless SSH under the root user is not required for the installation (SSH root keys).
Upgrade a previously installed CDH package.	Passwordless SSH as root (SSH root keys), so that scripts can be used to help manage the CDH package and configuration across the cluster.
Manually install or upgrade hosts in a CDH ready cluster.	Passwordless SSH as root (SSH root keys), so that scripts can be used to help manage the CDH package and configuration across the cluster.
Change the CDH package (for example: RPM upgrades, configuration changes the require CDH service restarts, addition of CDH services).	root and/or sudo access to restart any host impacted by this change, which could cause a restart of a given service on each host in the cluster.
Start/stop/restart a CDH service.	root and/or sudo according to UNIX standards.