EX.NO: 09 REG.NO:210701515

HADOOP SET UP A SINGLE HADOOP CLUSTER AND SHOW THE PROCESSUSING WEB UI

AIM:

To set-up one node Hadoop cluster.

PROCEDURE:

1. System Update
2. Install Java
3. Add a dedicated Hadoop user
4. Install SSH and setup SSH certificates
5. Check if SSH works
6. Install Hadoop
7. Modify Hadoop config files
8. Format Hadoop filesystem
9. Start Hadoop
10. Check Hadoop through web UI
11. Stop Hadoop

THEORY

Hadoop is an Apache open source framework written in java that allows distributed processing of large datasets across clusters of computers using simple programming models. A Hadoop frame-worked application works in an environment that provides distributed storage and computation across clusters of computers. Hadoop is designed to scale up from a single server to thousands of machines, each offering local computation and storage.

HADOOP ARCHITECTURE

Hadoop framework includes following four modules:

Hadoop Common: These are Java libraries and utilities required by other Hadoop modules. These libraries provide filesystem and OS level abstractions and contain the necessary Java files and scripts required to start Hadoop.

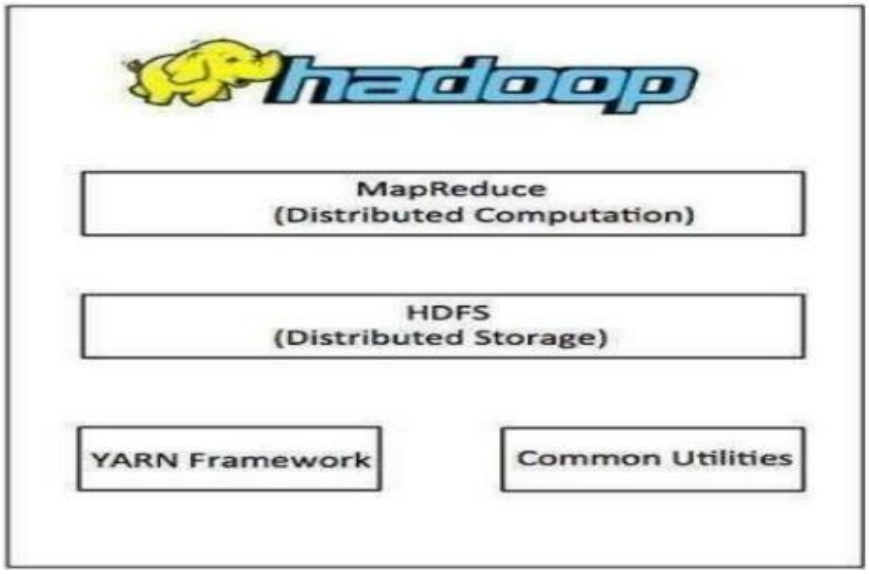
Hadoop YARN: This is a framework for job scheduling and cluster resource management

Hadoop Distributed File System (HDFS): A distributed file system that provides highthroughput access to application data.

Hadoop MapReduce: This is a YARN-based system for parallel processing of large data sets.

We can use following diagram to depict these four components available in Hadoop

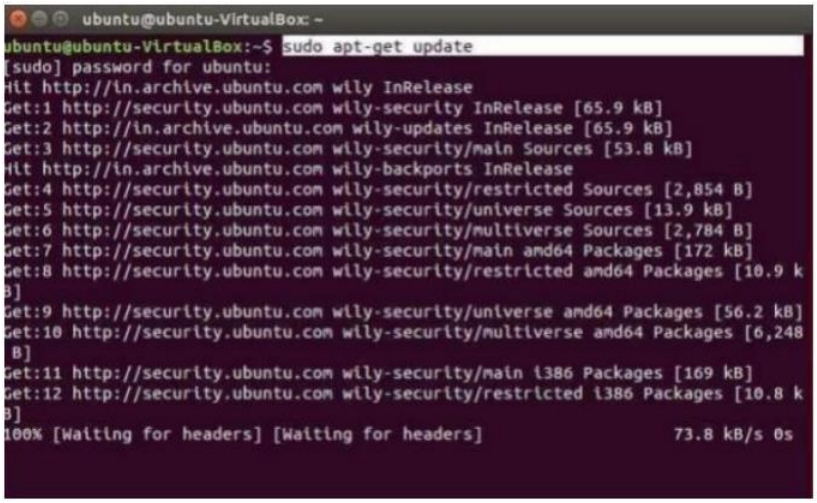
Framework.



PROCEDURE

Step 1 – System Update

$ sudo apt-get update



Step 2 – Install Java and Set JAVA_HOME

//This first thing to do is to setup the webupd8 ppa on your system. Run the following command and proceed.

$ sudo apt-add-repository ppa:webupd8team/java

$ sudo apt-get update

//After setting up the ppa repository, update the package cache as well.

//Install the Java 8 installer

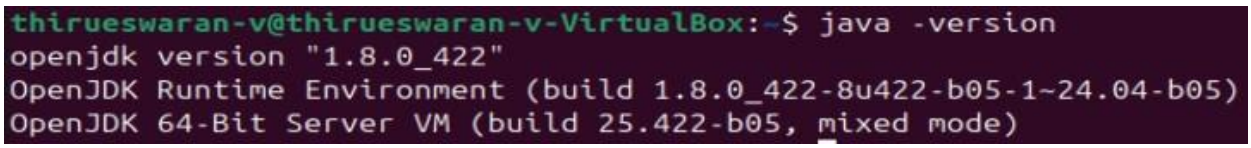
$ sudo apt-get install oracle-java8-installer

// After the installation is finished, Oracle Java is setup. Run the java command again to check the version and vendor.

OR

$ sudo apt-get install default-jdk

$ java –version



Step 3 – Add a dedicated Hadoop user

$ sudo addgroup hadoop

```
ubuntu@ubuntu-VirtualBox:~$ sudo addgroup hadoop
Adding group `hadoop' (GID 1001) ...
Done.
```

$ sudo adduser --ingroup hadoop hduse

```
ubuntu@ubuntu-VirtualBox:~$ sudo adduser --ingroup hadoop hduser
Adding user `hduser' ...
Adding new user `hduser' (1001) with group `hadoop' ...
Creating home directory `/home/hduser' ...
Copying files from `/etc/skel' ...
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
Changing the user information for hduser
Enter the new value, or press ENTER for the default
        Full Name []:
        Room Number []:
        Work Phone []:
        Home Phone []:
        Other []:
Is the information correct? [Y/n] y
```

// Add hduser to sudo user group

$ sudo adduser hduser sudo

```
ubuntu@ubuntu-VirtualBox:~$ sudo adduser hduser sudo
Adding user `hduser' to group `sudo' ...
Adding user hduser to group sudo
Done.
ubuntu@ubuntu-VirtualBox:~$
```

Step 4 – Install SSH and Create Certificates

$ sudo apt-get install ssh

```
ubuntu@ubuntu-VirtualBox:~$ sudo apt-get install ssh
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libntdb1 python-ntdb
Use 'apt-get autoremove' to remove them.
The following extra packages will be installed:
  libck-connector0 ncurses-term openssh-server openssh-sftp-server
  ssh-import-id
Suggested packages:
  rssh molly-guard monkeysphere
The following NEW packages will be installed:
  libck-connector0 ncurses-term openssh-server openssh-sftp-server ssh
  ssh-import-id
0 upgraded, 6 newly installed, 0 to remove and 8 not upgraded.
Need to get 661 kB of archives.
```

$ su hduser

```
ubuntu@ubuntu-VirtualBox:~$ su hduser
Password:
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.
```

$ ssh-keygen -t rsa -P ""

```
hduser@ubuntu-VirtualBox:~$ ssh-keygen -t rsa -P ""
Generating public/private rsa key pair.
Enter file in which to save the key (/home/hduser/.ssh/id_rsa):
Created directory '/home/hduser/.ssh'.
Your identification has been saved in /home/hduser/.ssh/id_rsa.
Your public key has been saved in /home/hduser/.ssh/id_rsa.pub.
The key fingerprint is:
SHA256:K/F5oNmAqhY02Axp0vzew4EnrN+UGgDTgxIiFPHpT7Q hduser@ubuntu-VirtualBox
The key's randomart image is:
+---[RSA 2048]----+
|=@o              |
|@.* .            |
|=* * o           |
|.o= *.+          |
|. .=.EooS        |
| ...= *B +       |
|  o. *+.= .      |
| o  o .. .       |
|o                |
+----[SHA256]-----+
```

// Set Environmental variables

$ cat $HOME/.ssh/id_rsa.pub >> $HOME/.ssh/authorized_keys

```
hduser@ubuntu-VirtualBox:~$ cat $HOME/.ssh/id_rsa.pub >> $HOME/.ssh/authorized_k
eys
```

Step 6 – Install Hadoop

$ wget https://archive.apache.org/dist/hadoop/core/hadoop-2.8.4/hadoop-2.8.4.tar.gz

// Extract Hadoop-2.8.4

$ sudo tar xvzf hadoop-2.8.4.tar.gz

```
hduser@ubuntu-VirtualBox:~$ tar xvzf hadoop-2.7.2.tar.gz
```

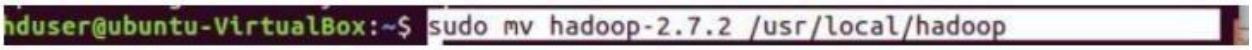
// Create a folder ‘hadoop’ in /usr/local

$ sudo mkdir –p /usr/local/hadoop

```
hduser@ubuntu-VirtualBox:~$ sudo mkdir -p /usr/local/hadoop
[sudo] password for hduser:
```

// Move the Hadoop folder to /usr/local/hadoop

$ sudo mv hadoop-2.8.4 /usr/local/hadoop



// Assigning read and write access to Hadoop folder

$ sudo chown –R hduser:hadoop /usr/local/hadoop

Step 7 - Modify Hadoop config files

//Hadoop Environmental variable setting – The following files will be modified

1. ~/.bashrc

2. /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/hadoop-env.sh

3. /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/core-site.xml

4. /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/hdfs-site.xml

5. /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/yarn-site.xml

6. /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/mapred-site.xml.template

$ sudo nano ~/.bashrc

// Add the following lines at the end of the file

export JAVA_HOME=/usr/lib/jvm/java-8-oracle

export HADOOP_HOME=/usr/local/hadoop/hadoop-2.8.4 export

PATH=$PATH:$HADOOP_HOME/bin

export PATH=$PATH:$HADOOP_HOME/sbin

export HADOOP_MAPRED_HOME=$HADOOP_HOME export

HADOOP_COMMON_HOME=$HADOOP_HOME export

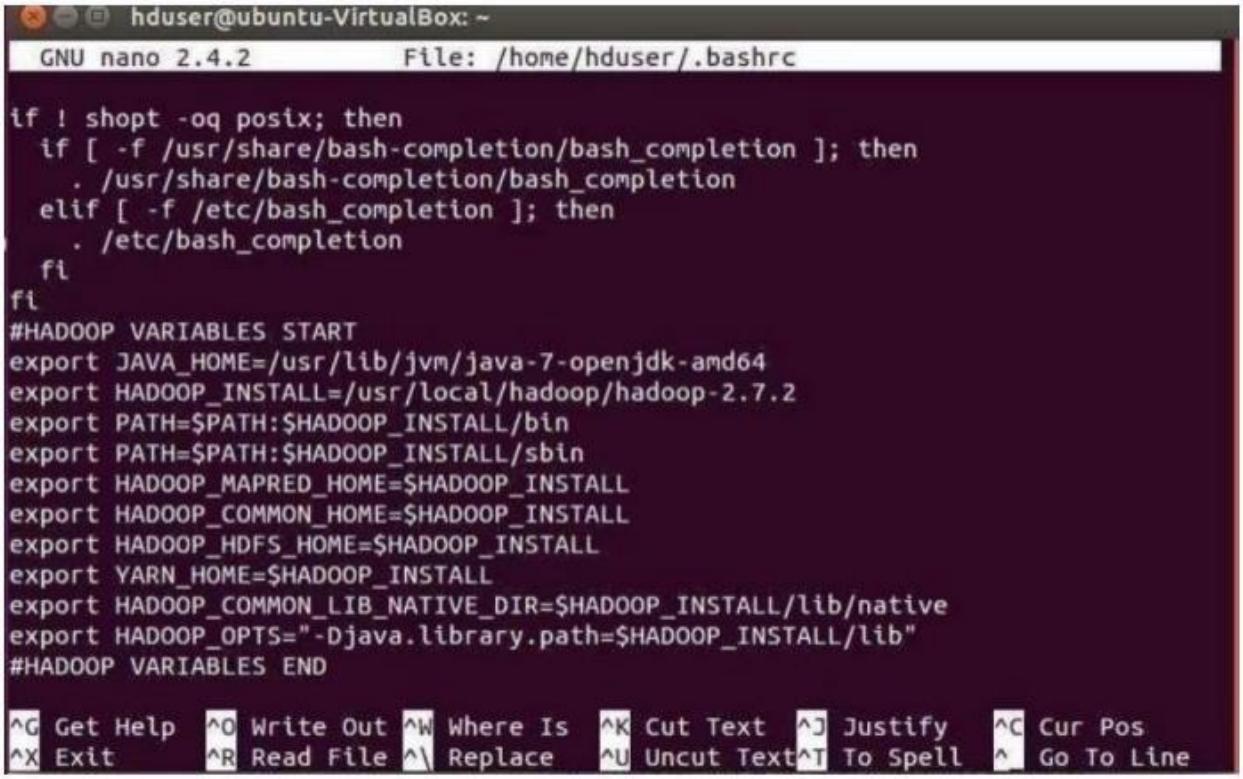
HADOOP_HDFS_HOME=$HADOOP_HOME

export YARN_HOME=$HADOOP_HOME

HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_HOME/lib/native export

HADOOP_OPTS="-D.java.library.path=$HADOOP_HOME/lib" export

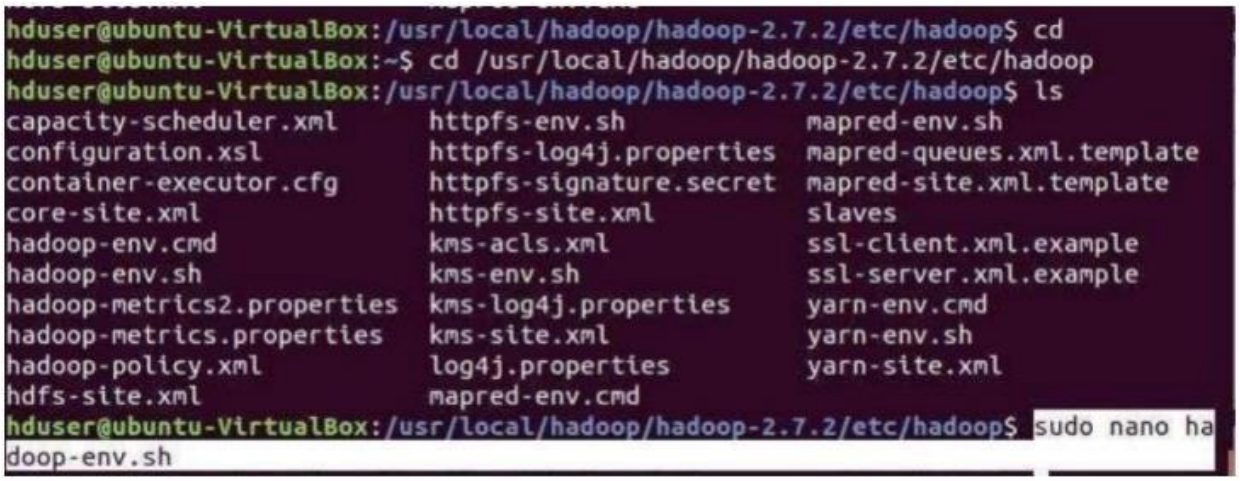
PATH=$PATH:/usr/local/hadoop/hadoop-2.8.4/bin



// Configure Hadoop Files

$ cd /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/

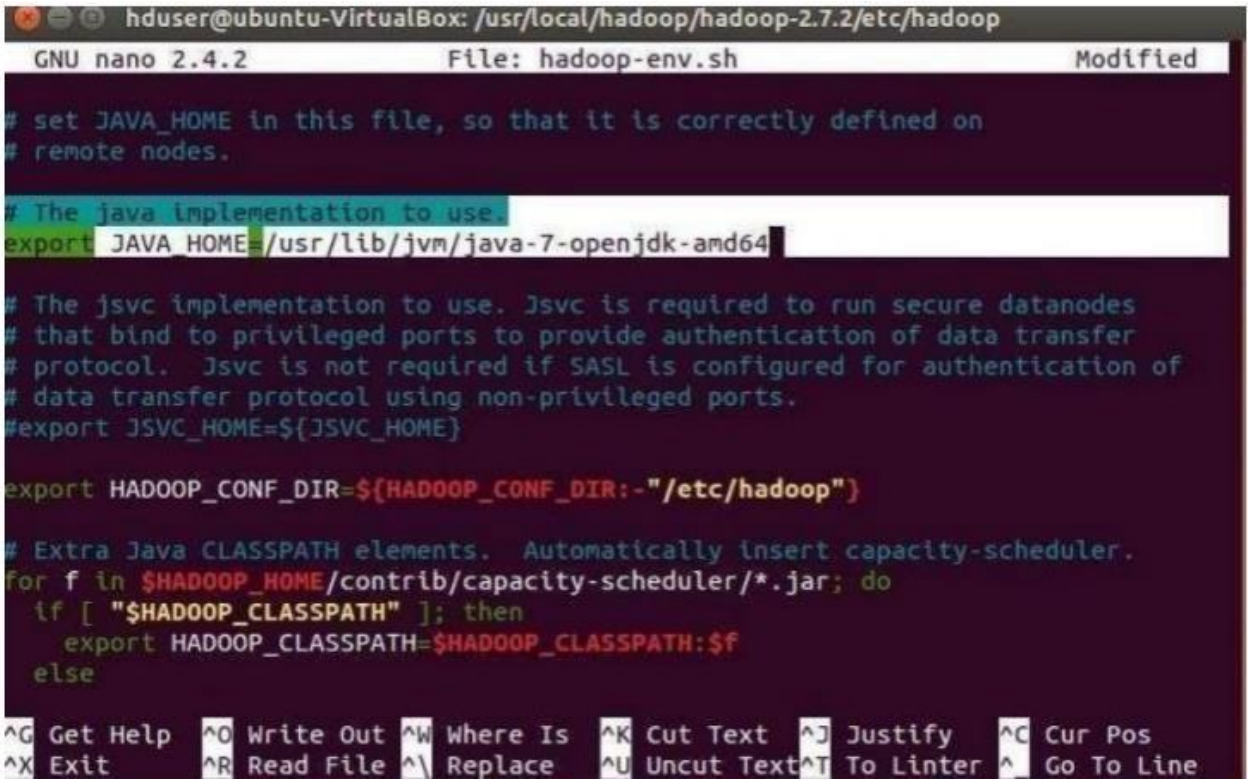
$ sudo nano hadoop-env.sh



// Add following line in hadoop-env.sh – Set JAVA variable in Hadoop

The java implementation to use.

export JAVA_HOME=/usr/lib/jvm/java-8-oracle



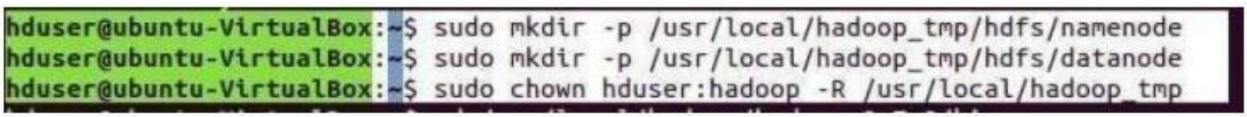
// Create datanode and namenode

$ sudo mkdir –p /usr/local/hadoop_tmp/hdfs/namenode

$ sudo mkdir –p /usr/local/hadoop_tmp/hdfs/datanode

// Changing ownership to hadoop_tmp

$ sudo chown –R hduser:hadoop /usr/local/hadoop_tmp



// Edit hdfs-site.xml

$ sudo nano hdfs-site.xml

// Add the following lines between <configuration> …… </configuration>

<configuration>

<property>

<name>dfs.replication</name>

<value>1</value>

</property>

<property>

<name>dfs.namenode.name.dir</name>

<value>file:/usr/local/hadoop_tmp/hdfs/namenode</value>

</property>

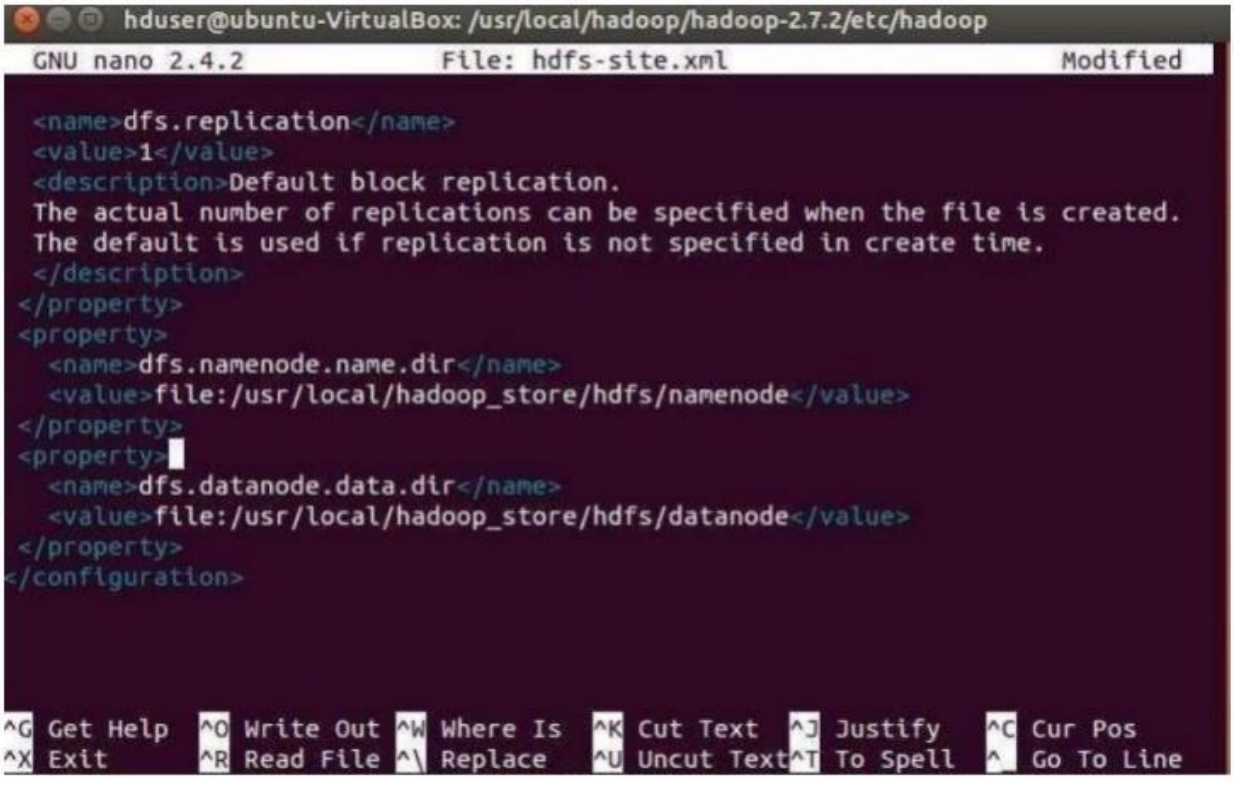
<property>

<name>dfs.datanode.data.dir</name>

<value>file:/usr/local/hadoop_tmp/hdfs/datanode</value>

</property>

</configuration>



// Edit core-site.xml

$ sudo nano core-site.xml

// Add the following lines between <configuration> …… </configuration>

<configuration>

<property>

<name>fs.default.name</name>

<value>hdfs://localhost:9000</value>

</property>

</configuration>

// Edit yarn-site.xml

$ sudo nano yarn-site.xml

// Add the following lines between <configuration> …… </configuration>

<configuration>

<property>

<name>yarn.nodemanager.aux-services</name>

<value>mapreduce_shuffle</value>

</property>

<property>

<name>yarn.nodemanager.aux-services.mapreduce.shuffle.class</name>

<value>org.apache.hadoop.mapred.Shuffle-Handler</value>

</property>

</configuration>

// Edit mapred-site.xml

$ cp /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/mapred-site.xml.template

/usr/local/hadoop/hadoop-2.8.4/etc/hadoop/mapred-site.xml

```
hduser@ubuntu-VirtualBox:~$ cp /usr/local/hadoop/hadoop-2.7.2/etc/hadoop/mapred-
site.xml.template /usr/local/hadoop/hadoop-2.7.2/etc/hadoop/mapred-site.xml
```

$ sudo nano mapred-site.xml

// Add the following lines between <configuration> …… </configuration>

<configuration>

<property>

<name>mapreduce.framework.name</name>

<value>yarn</value>

</property>

</configuration>

Step 8 – Format Hadoop File System

$ cd /usr/local/hadoop/hadoop-2.8.4/bin

$ hadoop namenode –format

```
hduser@ubuntu-VirtualBox:/usr/local/hadoop$  hadoop namenode -format
DEPRECATED: Use of this script to execute hdfs command is deprecated.
Instead use the hdfs command for it.

16/07/15 22:50:27 INFO namenode.NameNode: STARTUP_MSG:
/************************************************************
STARTUP_MSG: Starting NameNode
```

Step 9 - Start Hadoop

$ cd /usr/local/hadoop/hadoop-2.8.4/sbin

// Starting dfs services

$ start-dfs.sh

```
hduser@ubuntu-VirtualBox:/usr/local/hadoop/hadoop-2.7.2/sbin$ start-dfs.sh
16/07/15 22:55:47 WARN util.NativeCodeLoader: Unable to load native-hadoop libra
ry for your platform... using builtin-java classes where applicable
Starting namenodes on [localhost]
localhost: starting namenode, logging to /usr/local/hadoop/hadoop-2.7.2/logs/had
oop-hduser-namenode-ubuntu-VirtualBox.out
localhost: starting datanode, logging to /usr/local/hadoop/hadoop-2.7.2/logs/had
oop-hduser-datanode-ubuntu-VirtualBox.out
Starting secondary namenodes [0.0.0.0]
The authenticity of host '0.0.0.0 (0.0.0.0)' can't be established.
ECDSA key fingerprint is SHA256:+j+WF1JPsOOvl5mgcc7v9A/rU8jVQEHE8WfLmt2aEo8.
Are you sure you want to continue connecting (yes/no)? yes
0.0.0.0: Warning: Permanently added '0.0.0.0' (ECDSA) to the list of known hosts
.
0.0.0.0: starting secondarynamenode, logging to /usr/local/hadoop/hadoop-2.7.2/l
ogs/hadoop-hduser-secondarynamenode-ubuntu-VirtualBox.out
```

// Starting mapreduce services

$ start-yarn.sh

```
hduser@ubuntu-VirtualBox:/usr/local/hadoop/hadoop-2.7.2/sbin$ start-yarn.sh
starting yarn daemons
starting resourcemanager, logging to /usr/local/hadoop/hadoop-2.7.2/logs/yarn-hd
user-resourcemanager-ubuntu-VirtualBox.out
localhost: starting nodemanager, logging to /usr/local/hadoop/hadoop-2.7.2/logs/
yarn-hduser-nodemanager-ubuntu-VirtualBox.out
```

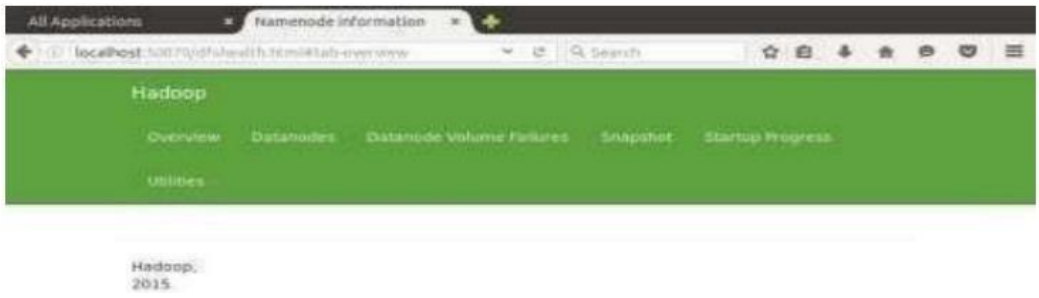
$ jps

```
hduser@ubuntu-VirtualBox:/usr/local/hadoop/hadoop-2.7.2/sbin$ jps
12425 SecondaryNameNode
12609 ResourceManager
12733 NodeManager
13131 Jps
12205 DataNode
12080 NameNode
```

Step 10 - Check Hadoop through web UI

Go to browser type http://localhost:8088 – All Applications Hadoop Cluster

Go to browser type http://localhost:50070 – Hadoop Namenode



Step 11 - Stop Hadoop

$ stop-dfs.sh

$ stop-yarn.sh

RESULT:

Thus the procedure to install single-node Hadoop is executed successfully.