PRACTICAL BOOK

MSC CS (PART II) SEMESTER - III

2022-23

SUBJECT

Big Data Analytics

SUBMITTED BY

Samreen Bano Raeen

Seat No. **CS21019**

Submitted in partial fulfilment of the requirement for Qualifying

M.Sc. CS Part II Semester III Examination

2022-23

University of Mumbai

Department of Computer Science

R.D & S.H National & W.A Science College

Linking Road, Bandra (w), Mumbai-50

Big Data Analytics

INDEX

Sr. No.	PRACTICAL	Sign
1	Installing and setting environment variables for Working with Apache Hadoop and Implementing Map-Reduce Program for Word Count problem	
2	Write a Spark code for the given application and handle error and recovery of data	
3	Install Hive and use Hive Create and store structured databases	
4	Install HBase and use the HBase Data model Store and retrieve data.	
5	Perform importing and exporting of data between SQL and Hadoop using Sqoop.	
6	Write a Pig Script for solving counting problems.	
7	Use Flume and transport the data from the various sources to a centralized data store.	

R. D. National & W. A. Science College

Bandra (W), Mumbai – 4000 50

Department of Computer Science
M.Sc. (CS)

Certificate

This is to certify that **Raeen Samreen bano** of **M.Sc Part II(Sem III)** class has satisfactorily completed **7** Practical in the subject of **Big Data Analytics** as a part of M.Sc. Degree Course in Computer Science during the academic year 2022 – 2023.

.

Lecturer In charge **External Examiner** **Head of Department**

College Stamp

Practical 1

Aim: Writing a Map-Reduce Program to Count Words.

What is Hadoop?

Apache Hadoop is an open-source framework that is used to efficiently store and process large datasets ranging in size from gigabytes to petabytes of data. Instead of using one large computer to store and process the data, Hadoop allows clustering multiple computers to analyse massive datasets in parallel more quickly.

Hadoop consists of four main modules:

- Hadoop Distributed File System (HDFS) – A distributed file system that runs on standard or low-end hardware. HDFS provides better data throughput than traditional file systems, in addition to high fault tolerance and native support of large datasets.
- Yet Another Resource Negotiator (YARN) – Manages and monitors cluster nodes and resource usage. It schedules jobs and tasks.
- MapReduce – A framework that helps programs do the parallel computation on data. The map task takes input data and converts it into a dataset that can be computed in key value pairs. The output of the map task is consumed by reduce tasks to aggregate output and provide the desired result.
- Hadoop Common – Provides common Java libraries that can be used across all modules.

Hadoop makes it easier to use all the storage and processing capacity in cluster servers, and to execute distributed processes against huge amounts of data. Hadoop provides the building blocks on which other services and applications can be built.

Applications that collect data in various formats can place data into the Hadoop cluster by using an API operation to connect to the NameNode. The NameNode tracks the file directory structure and placement of "chunks" for each file, replicated across DataNodes. To run a job to query the data, provide a MapReduce job made up of many map and reduce tasks that run against the data in HDFS spread across the DataNodes. Map tasks run on each node against the input files supplied, and reducers run to aggregate and organize the final output.

What is MapReduce?

MapReduce is a programming paradigm that enables massive scalability across hundreds or thousands of servers in a Hadoop cluster. As the processing component, MapReduce is the heart of Apache Hadoop. The term "MapReduce" refers to two separate and distinct tasks that Hadoop programs perform. The first is the map job, which takes a set of data and converts it into another set of data, where individual elements are broken down into tuples (key/value pairs).

The reduce job takes the output from a map as input and combines those data tuples into a smaller set of tuples. As the sequence of the name MapReduce implies, the reduce job is always performed after the map job.

MapReduce programming offers several benefits to help you gain valuable insights from your big data:

- Scalability: Businesses can process petabytes of data stored in the Hadoop Distributed File System (HDFS).
- Flexibility: Hadoop enables easier access to multiple sources of data and multiple types of data.
- Speed: With parallel processing and minimal data movement, Hadoop offers fast processing of massive amounts of data.
- Simple: Developers can write code in a choice of languages, including Java, C++, and Python.

Pre-requisites:

1. Check the version of Java that is currently available on your system.

```
┌──(kali㉿kali)-[~]
└─$ java -version
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
openjdk version "17.0.5" 2022-10-18
OpenJDK Runtime Environment (build 17.0.5+8-Debian-2)
OpenJDK 64-Bit Server VM (build 17.0.5+8-Debian-2, mixed mode, sharing)
```

2. Update the linux distribution on your system.

```
┌──(kali㉿kali)-[~]
└─$ sudo apt-get install update
[sudo] password for kali:
Reading package lists ... Done
Building dependency tree ... Done
Reading state information ... Done
E: Unable to locate package update
```

3. Update your Java Development Kit (JDK)

```
┌──(kali㉿kali)-[~]
└─$ sudo apt-get install default-jdk
Reading package lists ... Done
Building dependency tree ... Done
Reading state information ... Done
The following packages were automatically installed and are no longer required:
  libatk1.0-data libev4 libexporter-tiny-perl libflac8 libfmt8 libgs9-common libgssdp-1.2-0 libgupnp-1.2-1
  libhttp-server-simple-perl libilmbase25 liblerc3 liblist-moreutils-perl liblist-moreutils-xs-perl libopenexr25 libopenh264-6
  libperl5.34 libplacebo192 libpoppler118 libpython3.9-minimal libpython3.9-stdlib libsvtav1enc0 libwebsockets16 libwireshark15
  libwiretap12 libwsutil13 openjdk-11-jre perl-modules-5.34 python3-dataclasses-json python3-limiter python3-marshmallow-enum
  python3-mypy-extensions python3-responses python3-spyse python3-token-bucket python3-typing-inspect python3.9 python3.9-minimal
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  default-jdk-headless libice-dev libpthread-stubs0-dev libsm-dev libx11-dev libxau-dev libxcb1-dev libxdmcp-dev libxt-dev
  openjdk-17-jdk openjdk-17-jdk-headless x11proto-dev xorg-sgml-doctools xtrans-dev
Suggested packages:
  libice-doc libsm-doc libx11-doc libxcb-doc libxt-doc openjdk-17-demo openjdk-17-source visualvm
The following NEW packages will be installed:
  default-jdk default-jdk-headless libice-dev libpthread-stubs0-dev libsm-dev libx11-dev libxau-dev libxcb1-dev libxdmcp-dev
  libxt-dev openjdk-17-jdk openjdk-17-jdk-headless x11proto-dev xorg-sgml-doctools xtrans-dev
0 upgraded, 15 newly installed, 0 to remove and 310 not upgraded.
Need to get 236 MB of archives.
After this operation, 250 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

4. Note that, in order to use Hadoop, you require Java 8 (jdk1.8.0_341)
Here I have downloaded and jdk1.8.0_341 x64 Linux Distribution from Oracle.

```
┌──(kali㉿kali)-[~]
└─$ java -version
openjdk version "17.0.5" 2022-10-18
OpenJDK Runtime Environment (build 17.0.5+8-Debian-2)
OpenJDK 64-Bit Server VM (build 17.0.5+8-Debian-2, mixed mode, sharing)
┌──(kali㉿kali)-[~]
└─$ cd /usr/lib/jvm

┌──(kali㉿kali)-[/usr/lib/jvm]
└─$ ls
default-java                java-1.17.0-openjdk-amd64  java-17-openjdk-amd64
java-1.11.0-openjdk-amd64   java-11-openjdk-amd64      openjdk-17

┌──(kali㉿kali)-[/usr/lib/jvm]
└─$ sudo tar -xvzf ~/Downloads/jdk-8u341-linux-x64.tar.gz
[sudo] password for kali:
jdk1.8.0_341/COPYRIGHT
jdk1.8.0_341/LICENSE
jdk1.8.0_341/README.html
jdk1.8.0_341/THIRDPARTYLICENSEREADME.txt
```

Also remember to add the path in the /etc/environment file where your java package is installed. Add the path “usr/lib/jvm/jdk1.8.0_341/bin:usr/lib/j vm/jdk1.8.0_341/jre/bin” after “games:”

I have to use the “update-alternatives” command to set-up the version of “java” and “javac”. Note, using the correct version of java and javac is especially important, make sure that they are both set to 1.8.0_341.

```
┌──(kali㉿kali)-[/usr/lib/jvm]
└─$ ls
default-java                java-1.17.0-openjdk-amd64  java-17-openjdk-amd64  openjdk-17
java-1.11.0-openjdk-amd64   java-11-openjdk-amd64      jdk1.8.0_341

┌──(kali㉿kali)-[/usr/lib/jvm]
└─$ cd jdk1.8.0_341

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo nano /etc/environment

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo nano /etc/environment

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo nano /etc/environment

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --install "/usr/bin/java""java""/usr/lib/jvm/jdk1.8.0_341/bin/java" 0
update-alternatives: --install needs <link> <name> <path> <priority>

Use 'update-alternatives --help' for program usage information.

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --install "/usr/bin/java" "java" "/usr/lib/jvm/jdk1.8.0_341/bin/java" 0

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --install "/usr/bin/java" "java" "/usr/lib/jvm/jdk1.8.0_341/bin/javac" 0

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --set java /usr/lib/jvm/jdk1.8.0_341/bin/java
update-alternatives: using /usr/lib/jvm/jdk1.8.0_341/bin/java to provide /usr/bin/java (java) in manual mode

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --set java /usr/lib/jvm/jdk1.8.0_341/bin/javac
update-alternatives: using /usr/lib/jvm/jdk1.8.0_341/bin/javac to provide /usr/bin/java (java) in manual mode
```

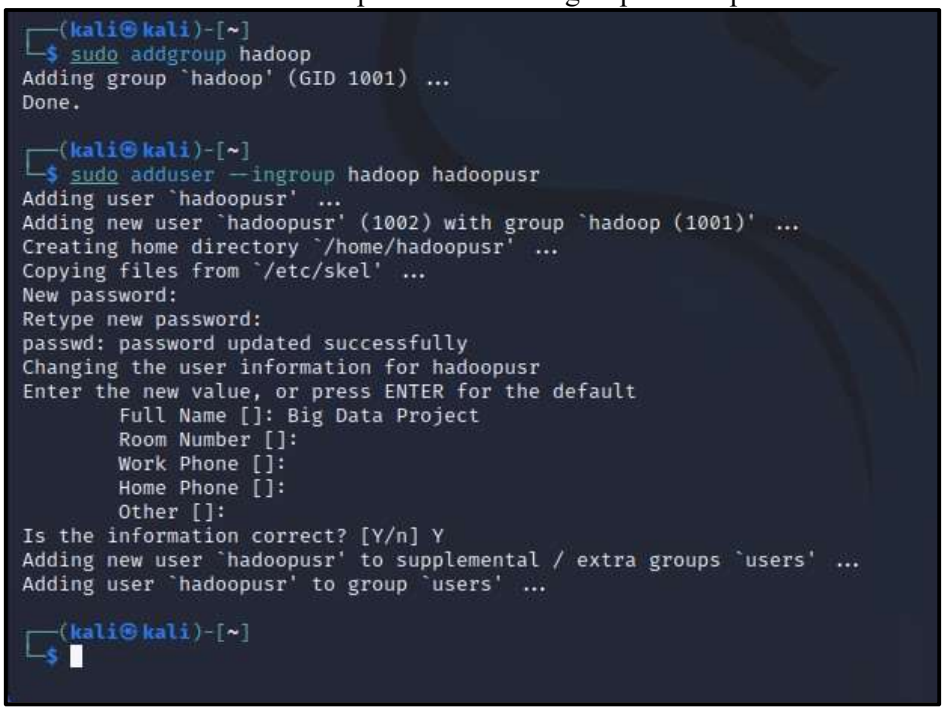
```
┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --config java
There are 4 choices for the alternative java (providing /usr/bin/java).

  Selection    Path                                          Priority   Status
------------------------------------------------------------
  0            /usr/lib/jvm/java-17-openjdk-amd64/bin/java   1711      auto mode
  1            /usr/lib/jvm/java-11-openjdk-amd64/bin/java   1111      manual mode
  2            /usr/lib/jvm/java-17-openjdk-amd64/bin/java   1711      manual mode
  3            /usr/lib/jvm/jdk1.8.0_341/bin/java            0         manual mode
* 4            /usr/lib/jvm/jdk1.8.0_341/bin/javac           0         manual mode

Press <enter> to keep the current choice[*], or type selection number: 3
update-alternatives: using /usr/lib/jvm/jdk1.8.0_341/bin/java to provide /usr/bin/java (java) in manual mode

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ java -version
java version "1.8.0_341"
Java(TM) SE Runtime Environment (build 1.8.0_341-b10)
Java HotSpot(TM) 64-Bit Server VM (build 25.341-b10, mixed mode)

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$
```

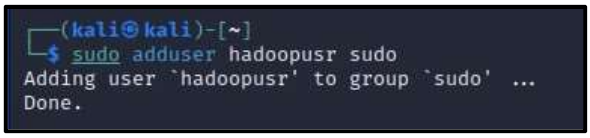
```
┌──(hadoopusr㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --install "/usr/bin/javac" "javac" "/usr/lib/jvm/jdk1.8.0_341/bin/javac" 1

┌──(hadoopusr㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --set javac /usr/lib/jvm/jdk1.8.0_341/bin/javac
update-alternatives: using /usr/lib/jvm/jdk1.8.0_341/bin/javac to provide /usr/bin/javac (javac) in manual mode

┌──(hadoopusr㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --config javac
There are 2 choices for the alternative javac (providing /usr/bin/javac).

  Selection    Path                                          Priority   Status
------------------------------------------------------------
  0            /usr/lib/jvm/java-17-openjdk-amd64/bin/javac   1711      auto mode
  1            /usr/lib/jvm/java-17-openjdk-amd64/bin/javac   1711      manual mode
* 2            /usr/lib/jvm/jdk1.8.0_341/bin/javac           1         manual mode

Press <enter> to keep the current choice[*], or type selection number: 2
```

5. Check if Java was successfully installed

```
┌──(hadoopusr㉿kali)-[/home/kali/Desktop/WordCountProgram]
└─$ java -version
javac 1.8.0_341

┌──(hadoopusr㉿kali)-[/home/kali/Desktop/WordCountProgram]
└─$ javac -version
javac 1.8.0_341

┌──(hadoopusr㉿kali)-[/home/kali/Desktop/WordCountProgram]
└─$
```

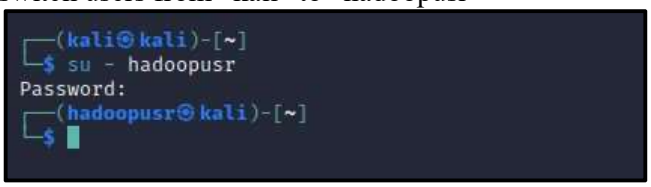
6. Create a separate user on linux to install Hadoop.
Here we will create a user “hadoopusr” in the user-group “hadoop”.



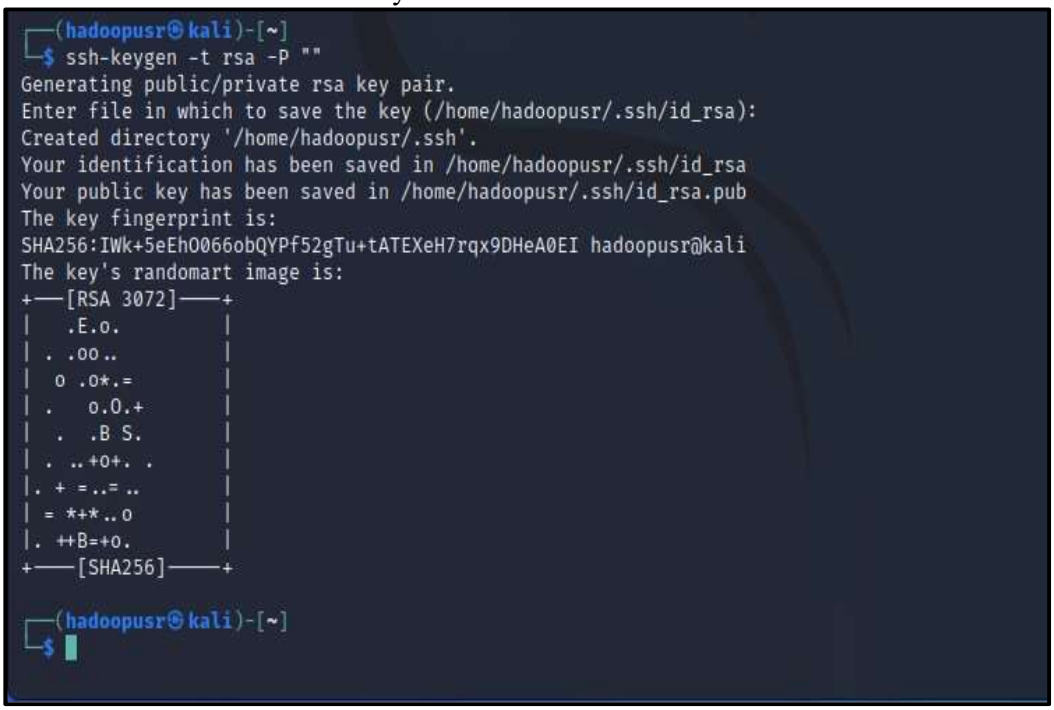


7. Now we will install the SSH Server.
This is necessary in order for us to start the various components in Hadoop.

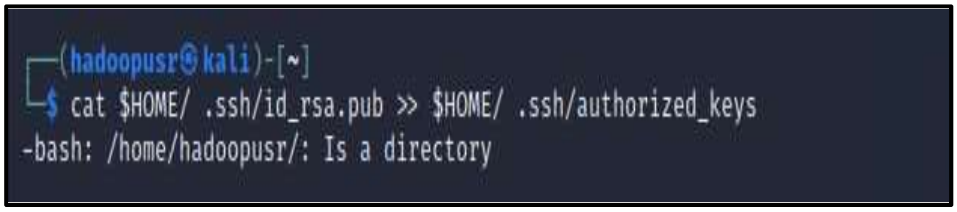
8. Now we will switch users from “kali” to “hadoopusr”



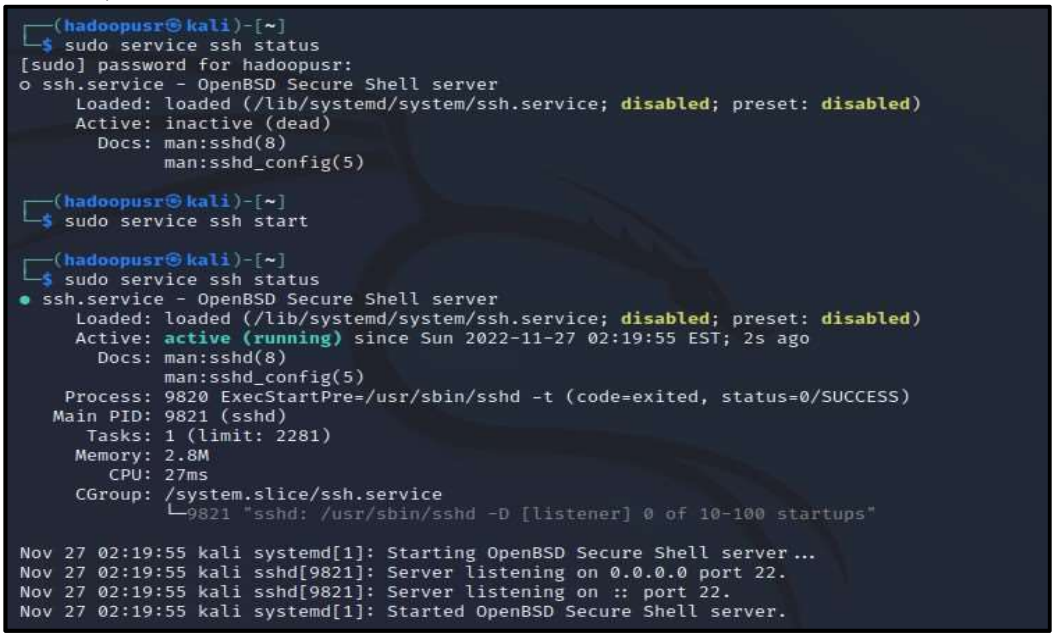
9. Then we will create a SSH key.



10. Then we have to save the key.



11. Now, we will start a SSH server on localhost.



```
┌──(hadoopusr㉿kali)-[~]
└─$ ssh localhost
The authenticity of host 'localhost (::1)' can't be established.
ED25519 key fingerprint is SHA256:d90PVKUb7nPhTRKzzQStWW/1r3757yecGCwlhyXJys4.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'localhost' (ED25519) to the list of known hosts.
hadoopusr@localhost's password:
Linux kali 5.19.0-kali2-amd64 #1 SMP PREEMPT_DYNAMIC Debian 5.19.11-1kali2 (2022-10-10) x86_64

The programs included with the Kali GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Kali GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
┌──(hadoopusr㉿kali)-[~]
└─$
```

12. Now we will exit the "hadoopusr"

```
┌──(hadoopusr㉿kali)-[~]
└─$ exit
logout
Connection to localhost closed.

┌──(hadoopusr㉿kali)-[~]
└─$
```

13. Next. We will download Apache Hadoop 2.9.0.

https://archive.apache.org/dist/hadoop/common/hadoop-2.9.0/

Kali Linux Kali Tools Kali Docs Kali Forums Kali NetHunter Exploit-DB Google Hacking DB OffSec

Index of /dist/hadoop/common/hadoop-2.9.0

Name	Last modified	Size	Description
Parent Directory		-	
hadoop-2.9.0-src.tar.gz	2017-11-17 23:08	37M	
hadoop-2.9.0-src.tar.gz.asc	2017-11-17 23:08	819	
hadoop-2.9.0-src.tar.gz.md5	2017-11-17 23:08	162	
hadoop-2.9.0-src.tar.gz.mds	2017-11-17 23:08	1.0K	
hadoop-2.9.0-src.tar.gz.sha256	2018-03-13 20:32	90	
hadoop-2.9.0.tar.gz	2017-11-17 23:10	350M	
hadoop-2.9.0.tar.gz.asc	2017-11-17 23:08	819	
hadoop-2.9.0.tar.gz.md5	2017-11-17 23:08	154	
hadoop-2.9.0.tar.gz.mds	2017-11-17 23:08	1.0K	
hadoop-2.9.0.tar.gz.sha256	2018-03-13 20:32	86	

14. Then we will install it.

```
┌──(hadoopusr㉿kali)-[~]
└─$ cd /home/kali/Desktop

┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$ ls
hadoop-2.9.0.tar.gz
```

```
┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$ sudo tar -xvzf hadoop-2.9.0.tar.gz
hadoop-2.9.0/
hadoop-2.9.0/include/
hadoop-2.9.0/include/Pipes.hh
hadoop-2.9.0/include/SerialUtils.hh
hadoop-2.9.0/include/hdfs.h
hadoop-2.9.0/include/StringUtils.hh
hadoop-2.9.0/include/TemplateFactory.hh
hadoop-2.9.0/NOTICE.txt
hadoop-2.9.0/lib/
hadoop-2.9.0/lib/native/
hadoop-2.9.0/lib/native/libhdfs.a
hadoop-2.9.0/lib/native/libhadoop.so
hadoop-2.9.0/lib/native/libhadoop.so.1.0.0
hadoop-2.9.0/lib/native/libhdfs.so.0.0.0
hadoop-2.9.0/lib/native/libhadoop.a
hadoop-2.9.0/lib/native/libhdfs.so
hadoop-2.9.0/lib/native/examples/
```

15. Now we will move the file to the “hadoopusr” and transfer ownership to the “hadoopusr”.

```
┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$ ls
hadoop-2.9.0  hadoop-2.9.0.tar.gz

┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$ sudo mv hadoop-2.9.0 /usr/local/hadoop

┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$ sudo chown -R hadoopusr /usr/local

┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$
```

16. Make the configurations to the “bashrc” file using nano

```
┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$ sudo nano ~/.bashrc
```

The Configurations are:
export JAVA_HOME=/usr/lib/jvm/jdk1.8.0_341 export JAVA_PATH=$PATH:$JAVA_HOME/bin
export HADOOP_HOME=/usr/local/hadoop 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 export
HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_HOME/native
export HADOOP_OPTS="-Djava.library.path=$HADOOP_HOME/native"

```
# You may want to put all your additions into a separate file like
# ~/.bash_aliases, instead of adding them here directly.
# See /usr/share/doc/bash-doc/examples in the bash-doc package.

if [ -f ~/.bash_aliases ]; then
    . ~/.bash_aliases
fi

# enable programmable completion features (you don't need to enable
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
# sources /etc/bash.bashrc).
if ! shopt -oq posix; then
  if [ -f /usr/share/bash-completion/bash_completion ]; then
    . /usr/share/bash-completion/bash_completion
  elif [ -f /etc/bash_completion ]; then
    . /etc/bash_completion
  fi
fi
export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64
export HADOOP_HOME=/usr/local/hadoop
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
export HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_HOME/native
export HADOOP_OPTS="-Djava.library.path=$HADOOP_HOME/native"

^G Help        ^O Write Out   ^W Where Is    ^K Cut         ^T Execute     ^C Location    M-U Undo       M-A Set Mark
^X Exit        ^R Read File   ^\ Replace     ^U Paste       ^J Justify     ^/ Go To Line  M-E Redo       M-6 Copy
```

Then we will run “source ~/.bashrc” to enable the changes.

```
┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$ source ~/.bashrc
┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$
```

17. Next we will make some changes to the hadoop environment file
We will run the command “sudo nano /usr/local/hadoop/etc/hadoop/hadoop-env.sh”

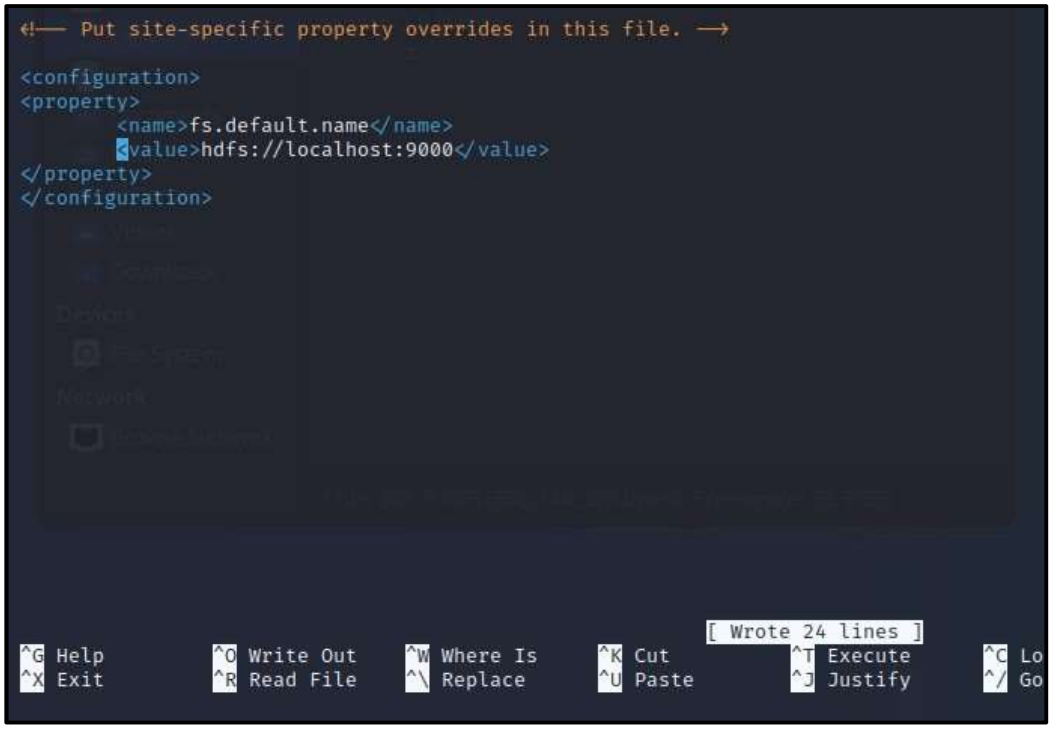
```
┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$ sudo nano /usr/local/hadoop/etc/hadoop/hadoop-env.sh
```

Here we will set the path of JAVA_HOME to “JAVA_HOME=/usr/lib/jvm/jdk1.8.0_341”.

```
# The java implementation to use.
#export JAVA_HOME=${JAVA_HOME}
export JAVA_HOME=/usr/lib/jvm/jdk1.8.0_341

# The jsvc implementation to use. Jsvc is required to run secure datanodes
# that bind to privileged ports to provide authentication of data transfer
# protocol.  Jsvc is not required if SASL is configured for authentication of
# data transfer protocol using non-privileged ports.
#export JSVC_HOME=${JSVC_HOME}

export HADOOP_CONF_DIR=${HADOOP_CONF_DIR:-"/etc/hadoop"}

# Extra Java CLASSPATH elements.  Automatically insert capacity-scheduler.
for f in $HADOOP_HOME/contrib/capacity-scheduler/*.jar; do
  if [ "$HADOOP_CLASSPATH" ]; then
    export HADOOP_CLASSPATH=$HADOOP_CLASSPATH:$f
  else
    export HADOOP_CLASSPATH=$f
  fi
done

# The maximum amount of heap to use, in MB. Default is 1000.
#export HADOOP_HEAPSIZE=
#export HADOOP_NAMENODE_INIT_HEAPSIZE=""

^G Help        ^O Write Out   ^W Where Is    ^K Cut         ^T Execute     ^C Location
^X Exit        ^R Read File   ^\ Replace     ^U Paste       ^J Justify     ^/ Go To Line
```

18. Now we will make some changes to the core-site.xml file.
Core-Site.xml configuration:

<property>
<name>fs.default.name</name>
<value>hdfs://localhost:9000</value>
</property>



19. Now we will make some changes to the hdfs-site.xml HDFS-Site.xml configuration:
<property>
<name>dfs.replication</name>
<value>1</value>
</property>
<property>
<name>dfs.name.name.dir</name>
<value>file:/usr/local/hadoop_tmp/hdfs/namenode</value>
</property>
<property>
<name>dfs.data.data.dir</name>
<value>file:/usr/local/hadoop_tmp/hdfs/datanode</value> </property>

```
<!-- Put site-specific property overrides in this file. -->

<configuration>
<property>
        <name>dfs.replication</name>
        <value>1</value>
</property>
<property>
        <name>dfs.name.name.dir</name>
        <value>file:/usr/local/hadoop_tmp/hdfs/namenode</value>
</property>
<property>
        <name>dfs.data.data.dir</name>
        <value>file:/usr/local/hadoop_tmp/hdfs/datanode</value>
</property>
</configuration>

^G Help      ^O Write Out   ^W Where Is   ^K Cut       ^T Execute   ^C Loca
^X Exit      ^R Read File   ^\ Replace    ^U Paste     ^J Justify   ^/ Go
```

20. Now we will configure the yarn-site.xml YARN-Site.xml configuration:

```
<property>
        <name>yarn.nodemanager.aux-services</name>
        <value>mapreduce_shuffle</value>
</property>
```

```
<configuration>
<property>
        <name>yarn.nodemanager.aux-services</name>
        <value>mapreduce_shuffle</value>
</property>
<!-- Site specific YARN configuration properties -->

</configuration>
```

21. Now we will configure the mapred-site.xml Mapred-site.xml configuration:

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

```
<!-- Put site-specific property overrides in this file. -->

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

22. Next, we will create the following directories and transfer the ownership to the "hadoopusr".

These directories are where hadoop will store data about the namenode and the datanode.

```
┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$ sudo mkdir -p /usr/local/hadoop_space

┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$ sudo mkdir -p /usr/local/hadoop_space/hdfs/namenode

┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$ sudo mkdir -p /usr/local/hadoop_space/hdfs/datanode

┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$ sudo chown -R hadoopusr /usr/local/hadoop_space

┌──(hadoopusr㉿kali)-[/home/kali/Desktop]
└─$
```

23. Then we format the namenode in the HDFS file structure.

```
┌──(hadoopusr㉿kali)-[~]
└─$ hdfs namenode -format
22/11/27 03:34:09 INFO namenode.NameNode: STARTUP_MSG:
/************************************************************
STARTUP_MSG: Starting NameNode
STARTUP_MSG:   host = kali/127.0.1.1
STARTUP_MSG:   args = [-format]
STARTUP_MSG:   version = 2.9.0
STARTUP_MSG:   classpath = /usr/local/hadoop/etc/hadoop:/usr/local/hadoop/share/hadoop/common/lib/java-xml
builder-0.4.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-digester-1.8.jar:/usr/local/hadoop/share
/hadoop/common/lib/slf4j-api-1.7.25.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-net-3.1.jar:/usr
/local/hadoop/share/hadoop/common/lib/mockito-all-1.8.5.jar:/usr/local/hadoop/share/hadoop/common/lib/gson
-2.2.4.jar:/usr/local/hadoop/share/hadoop/common/lib/snappy-java-1.0.5.jar:/usr/local/hadoop/share/hadoop/
common/lib/commons-codec-1.4.jar:/usr/local/hadoop/share/hadoop/common/lib/xz-1.0.jar:/usr/local/hadoop/sh
are/hadoop/common/lib/jettison-1.1.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-lang-2.6.jar:/usr
```

24. Next we will start the Distributed file system.

```
┌──(hadoopusr㉿kali)-[~]
└─$ start-dfs.sh
22/11/27 03:36:31 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... us
ing builtin-java classes where applicable
Starting namenodes on [localhost]
hadoopusr@localhost's password:
localhost: starting namenode, logging to /usr/local/hadoop/logs/hadoop-hadoopusr-namenode-kali.out
hadoopusr@localhost's password:
localhost: starting datanode, logging to /usr/local/hadoop/logs/hadoop-hadoopusr-datanode-kali.out
Starting secondary namenodes [0.0.0.0]
The authenticity of host '0.0.0.0 (0.0.0.0)' can't be established.
ED25519 key fingerprint is SHA256:d90PVKUb7nPhTRKzzQStWW/1r3757yecGCwlhyXJys4.
This host key is known by the following other names/addresses:
    ~/.ssh/known_hosts:1: [hashed name]
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
0.0.0.0: Warning: Permanently added '0.0.0.0' (ED25519) to the list of known hosts.
hadoopusr@0.0.0.0's password:
0.0.0.0: starting secondarynamenode, logging to /usr/local/hadoop/logs/hadoop-hadoopusr-secondarynamenode-
kali.out
22/11/27 03:37:27 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... us
ing builtin-java classes where applicable
```

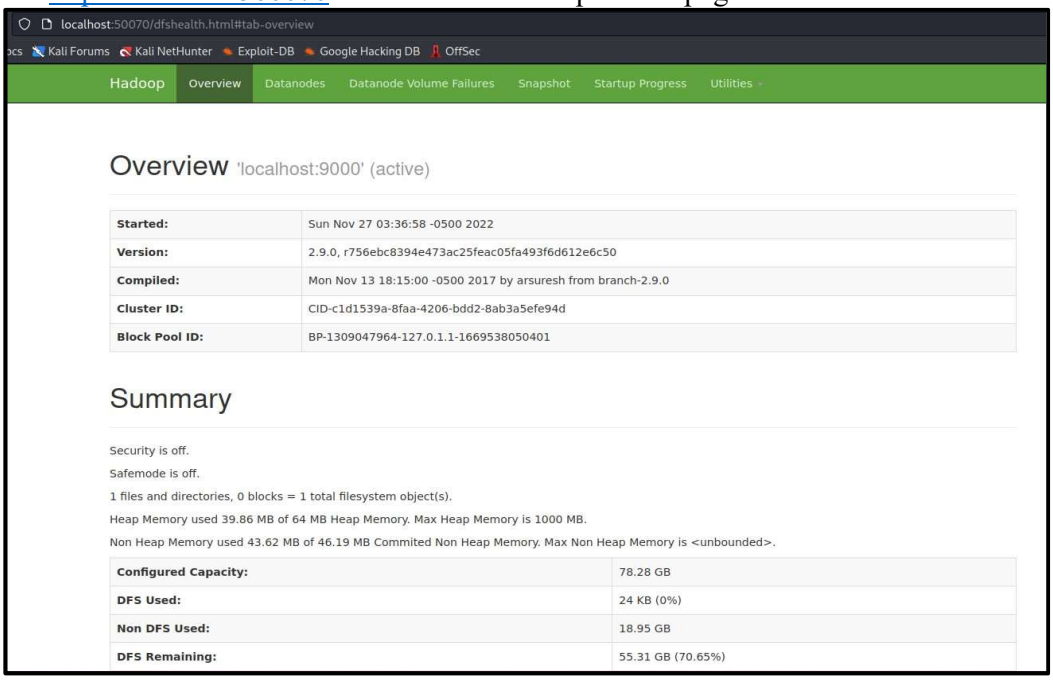
25. Followed by the YARN system.

```
┌──(hadoopusr㉿kali)-[~]
└─$ start-yarn.sh
starting yarn daemons
starting resourcemanager, logging to /usr/local/hadoop/logs/yarn-hadoopusr-resourcemanager-kali.out
hadoopusr@localhost's password:
localhost: starting nodemanager, logging to /usr/local/hadoop/logs/yarn-hadoopusr-nodemanager-kali.out
```

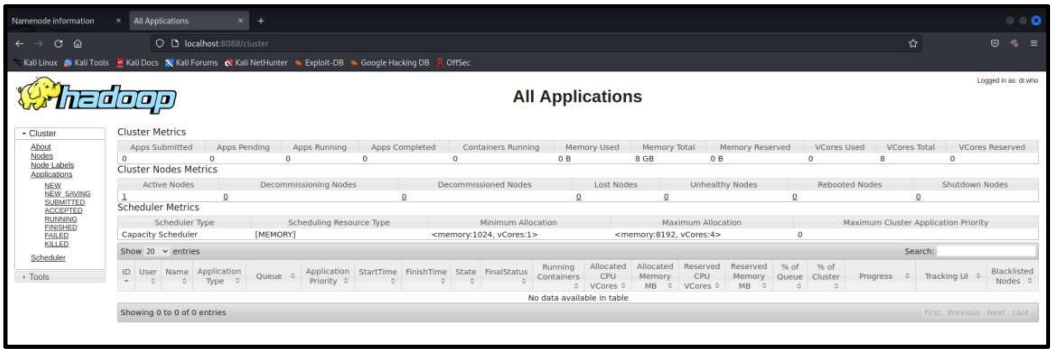
26. Check if all the systems are running

```
┌──(hadoopusr㉿kali)-[~]
└─$ start-all.sh
This script is Deprecated. Instead use start-dfs.sh and start-yarn.sh
22/11/27 03:43:30 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... us
ing builtin-java classes where applicable
Starting namenodes on [localhost]
hadoopusr@localhost's password:
localhost: namenode running as process 29427. Stop it first.
hadoopusr@localhost's password:
localhost: datanode running as process 29636. Stop it first.
Starting secondary namenodes [0.0.0.0]
hadoopusr@0.0.0.0's password:
0.0.0.0: secondarynamenode running as process 29875. Stop it first.
22/11/27 03:43:49 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... us
ing builtin-java classes where applicable
starting yarn daemons
starting resourcemanager, logging to /usr/local/hadoop/logs/yarn-hadoopusr-resourcemanager-kali.out
hadoopusr@localhost's password:
localhost: starting nodemanager, logging to /usr/local/hadoop/logs/yarn-hadoopusr-nodemanager-kali.out

┌──(hadoopusr㉿kali)-[~]
└─$ jps
29875 SecondaryNameNode
29427 NameNode
29636 DataNode
32859 Jps
```

27. Here we can see that hadoop has been successfully installed and activated We have to go the url http://localhost:500070 to access the Hadoop Server page.



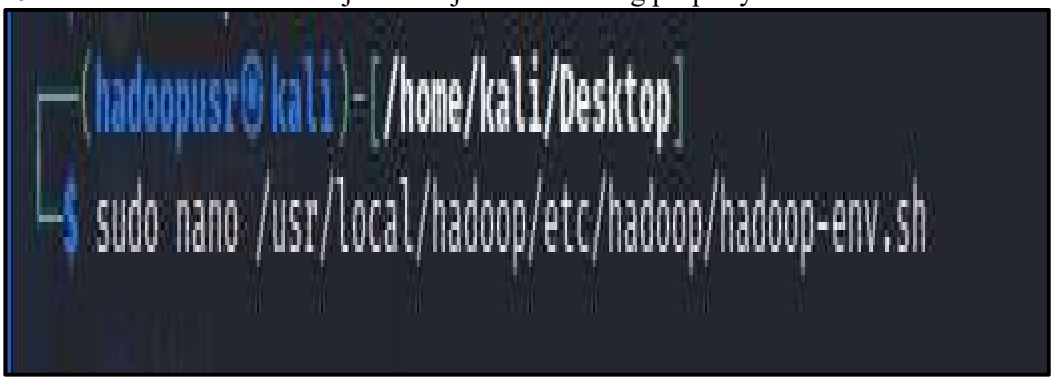
We can also see the information of the cluster.



28. Now we will perform the Word-Count program on Hadoop MapReduce. First we will check the hadoop version.

```
┌──(hadoopusr㉿kali)-[~]
└─$ hadoop version
Hadoop 2.9.0
Subversion https://git-wip-us.apache.org/repos/asf/hadoop.git -r 756ebc8394e473ac25feac05fa493f6d612e6c50
Compiled by arsuresh on 2017-11-13T23:15Z
Compiled with protoc 2.5.0
From source with checksum 0a76a9a32a5257331741f8d5932f183
This command was run using /usr/local/hadoop/share/hadoop/common/hadoop-common-2.9.0.jar
```

29. Then we make sure that java and javac is running properly.



30. Next we will write the WordCount program in java.
Code: import java.io.IOException;
import java.util.StringTokenizer;

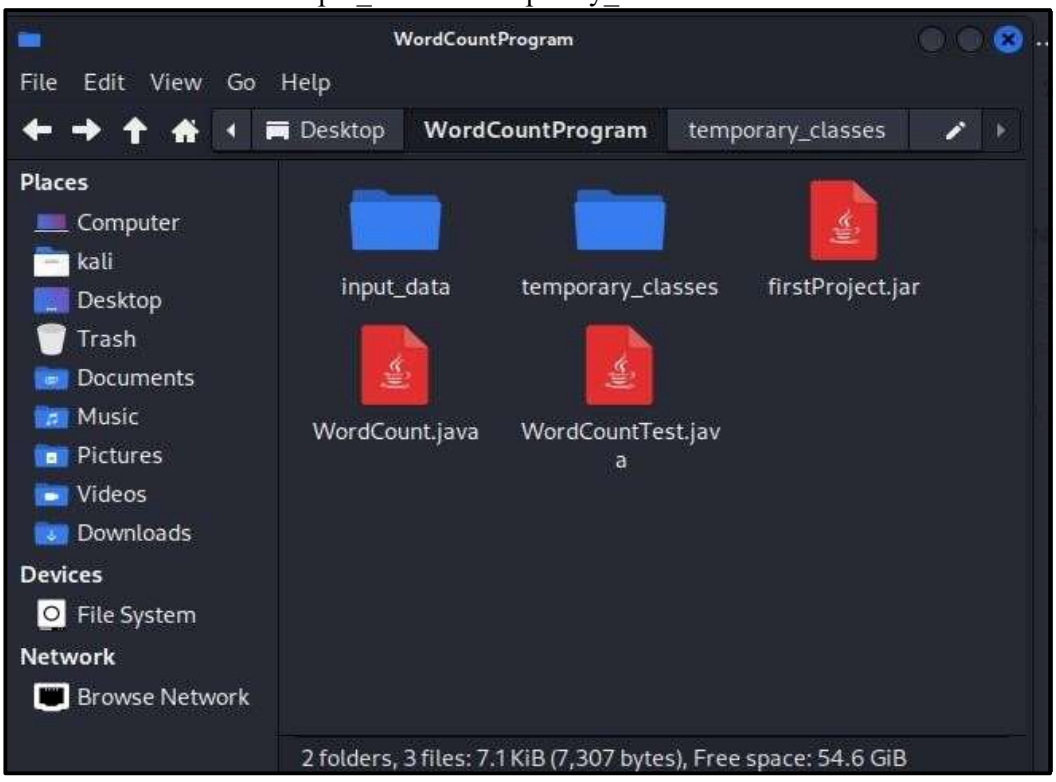
import org.apache.hadoop.conf.Configuration; import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable; import org.apache.hadoop.io.Text; import
org.apache.hadoop.mapreduce.Job; import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.Reducer; import
org.apache.hadoop.mapreduce.lib.input.FileInputFormat; import
org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;

public class WordCount {

```
  public static class TokenizerMapper
       extends Mapper<Object, Text, Text, IntWritable>{

    private final static IntWritable one = new IntWritable(1);     private Text word = new
Text();

    public void map(Object key, Text value, Context context                    ) throws
IOException, InterruptedException {       StringTokenizer itr = new
StringTokenizer(value.toString());       while (itr.hasMoreTokens()) {
word.set(itr.nextToken());         context.write(word, one);
      }
    }
  }

  public static class IntSumReducer        extends
Reducer<Text,IntWritable,Text,IntWritable> {
    private IntWritable result = new IntWritable();
    public void reduce(Text key, Iterable<IntWritable> values,
```

```
                Context context
                ) throws IOException, InterruptedException {       int sum = 0;
for (IntWritable val : values) {        sum += val.get();
     }       result.set(sum);
     context.write(key, result);
   }
  }
  public static void main(String[] args) throws Exception {
    Configuration conf = new Configuration();     Job job =
Job.getInstance(conf, "word count");     job.setJarByClass(WordCount.class);
job.setMapperClass(TokenizerMapper.class);
job.setCombinerClass(IntSumReducer.class);
job.setReducerClass(IntSumReducer.class);
job.setOutputKeyClass(Text.class);
job.setOutputValueClass(IntWritable.class);
FileInputFormat.addInputPath(job, new Path(args[0]));
    FileOutputFormat.setOutputPath(job, new Path(args[1]));
    System.exit(job.waitForCompletion(true) ? 0 : 1);
  }
}
```

31. Then we create a folder input_data and temporary_classes.



32. Then we create a text file in the input_data folder which will contain our input values The Input: Cars, Sleep, School, Apple, Dog, Speed, Blast, Cars, Mumbai, Delhi, Apple, Sleep, Car, Car, Sleep, Sleep, School.

33. Then we will set the class path for Hadoop.

```
┌──(hadoopusr㉿kali)-[~]
└─$ export HADOOP_CLASSPATH=$(hadoop classpath)

┌──(hadoopusr㉿kali)-[~]
└─$ echo $HADOOP_CLASSPATH
/usr/local/hadoop/etc/hadoop:/usr/local/hadoop/share/hadoop/common/lib/*:/usr/local/hadoop/share/hadoop/co
mmon/*:/usr/local/hadoop/share/hadoop/hdfs:/usr/local/hadoop/share/hadoop/hdfs/lib/*:/usr/local/hadoop/sha
re/hadoop/hdfs/*:/usr/local/hadoop/share/hadoop/yarn:/usr/local/hadoop/share/hadoop/yarn/lib/*:/usr/local/
hadoop/share/hadoop/yarn/*:/usr/local/hadoop/share/hadoop/mapreduce/lib/*:/usr/local/hadoop/share/hadoop/m
apreduce/*:/usr/local/hadoop/contrib/capacity-scheduler/*.jar
```

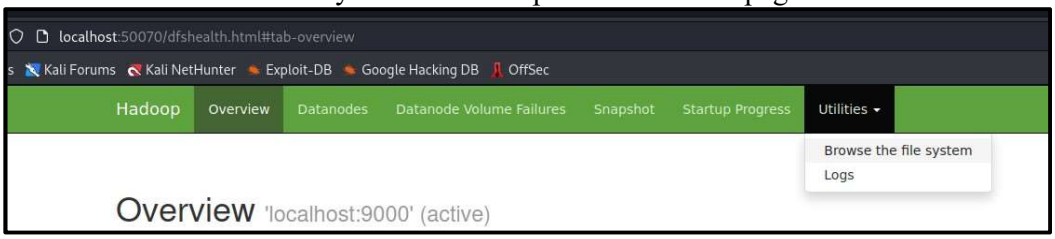
34. Then we will create a directory on the HDFS.

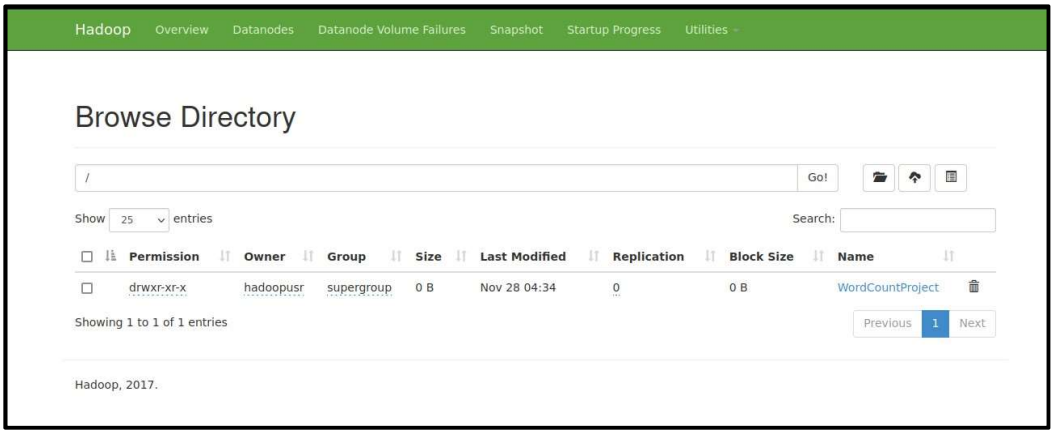
```
┌──(hadoopusr㉿kali)-[~]
└─$ hadoop fs -mkdir /WordCountExample
22/11/27 04:07:28 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... us
ing builtin-java classes where applicable
```

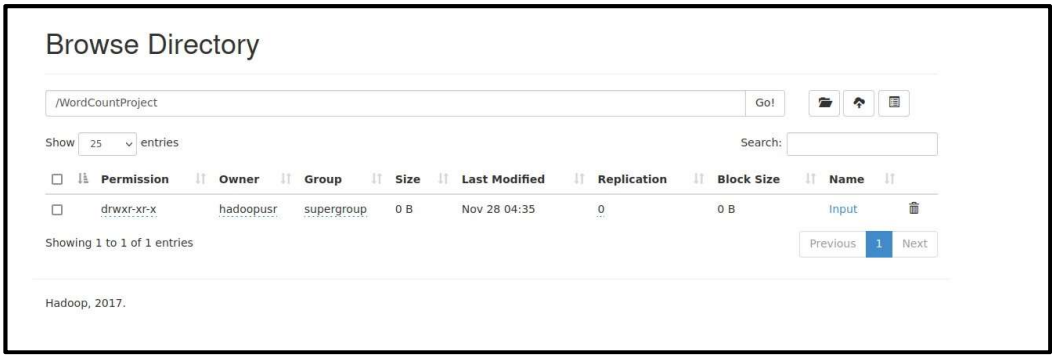
35. Then we will create a directory inside the folder WordCountExample for the input file.

```
┌──(hadoopusr㉿kali)-[~]
└─$ hadoop fs -mkdir /WordCountExample/Input
22/11/27 04:09:02 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... us
ing builtin-java classes where applicable

┌──(hadoopusr㉿kali)-[~]
└─$
```

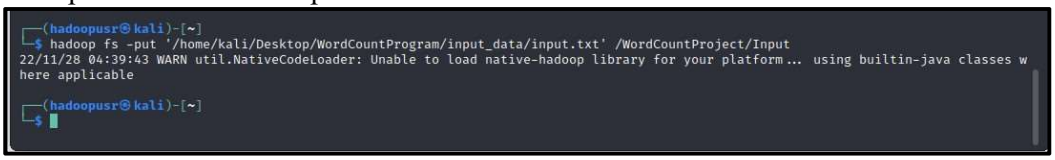
36. Then we check the filesystem on Hadoop Administration page that is accessible at localhost:50070

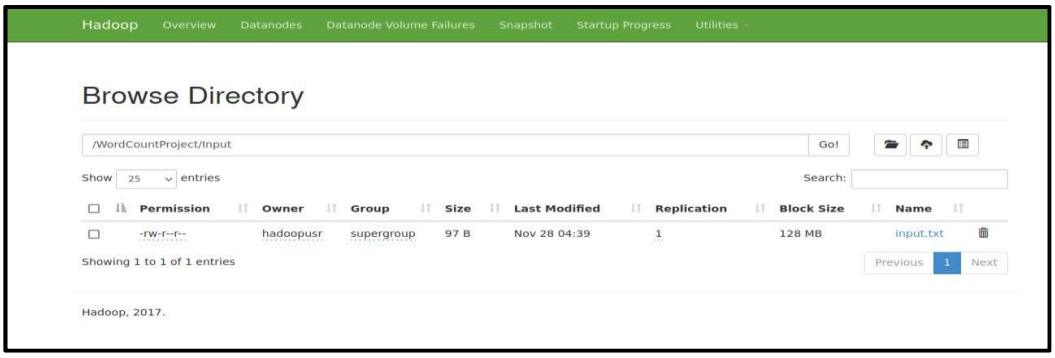




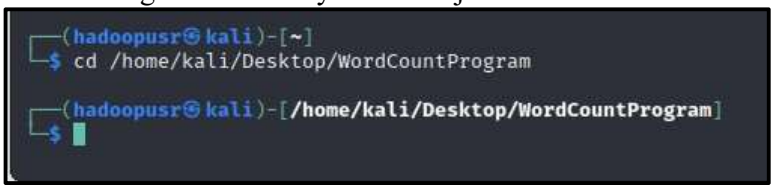


37. Now we will add our input file to the hadoop server





38. Next, we will change our directory to the Project Folder.



39. Now we will compile the java code and create a jar file

```
┌──(hadoopusr㉿kali)-[/home/kali/Desktop/WordCountProgram]
└─$ sudo javac -classpath ${HADOOP_CLASSPATH} -d '/home/kali/Desktop/WordCountProgram/temporary_classes' '/home/kali/Desktop/WordCou
ntProgram/WordCount.java'

┌──(hadoopusr㉿kali)-[/home/kali/Desktop/WordCountProgram]
└─$ sudo jar -cvf firstProject.jar -C temporary_classes/ .
added manifest
adding: WordCount$IntSumReducer.class(in = 1755) (out= 751)(deflated 57%)
adding: WordCount$TokenizerMapper.class(in = 1752) (out= 769)(deflated 56%)
adding: WordCount.class(in = 1511) (out= 833)(deflated 44%)

┌──(hadoopusr㉿kali)-[/home/kali/Desktop/WordCountProgram]
└─$
```

40. Next, we will use hadoop to perform a MapReduce operation
Here we will use the jar file to execute the WordCount program on Hadoop.

```
┌──(hadoopusr㉿kali)-[/home/kali/Desktop/WordCountProgram]
└─$ hadoop jar '/home/kali/Desktop/WordCountProgram/firstProject.jar' WordCount /WordCountProject/Input /WordCountProject/Output
22/11/28 05:59:29 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes w
here applicable
22/11/28 05:59:30 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0:8032
22/11/28 05:59:31 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface
 and execute your application with ToolRunner to remedy this.
22/11/28 05:59:31 INFO input.FileInputFormat: Total input files to process : 1
22/11/28 05:59:31 INFO mapreduce.JobSubmitter: number of splits:1
22/11/28 05:59:31 INFO Configuration.deprecation: yarn.resourcemanager.system-metrics-publisher.enabled is deprecated. Instead, use
yarn.system-metrics-publisher.enabled
22/11/28 05:59:31 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1669627693237_0001
22/11/28 05:59:32 INFO impl.YarnClientImpl: Submitted application application_1669627693237_0001
22/11/28 05:59:32 INFO mapreduce.Job: The url to track the job: http://kali:8088/proxy/application_1669627693237_0001/
22/11/28 05:59:32 INFO mapreduce.Job: Running job: job_1669627693237_0001
22/11/28 05:59:41 INFO mapreduce.Job: Job job_1669627693237_0001 running in uber mode : false
22/11/28 05:59:41 INFO mapreduce.Job:  map 0% reduce 0%
22/11/28 05:59:46 INFO mapreduce.Job:  map 100% reduce 0%
22/11/28 05:59:53 INFO mapreduce.Job:  map 100% reduce 100%
22/11/28 05:59:53 INFO mapreduce.Job: Job job_1669627693237_0001 completed successfully
22/11/28 05:59:53 INFO mapreduce.Job: Counters: 49
        File System Counters
                FILE: Number of bytes read=123
                FILE: Number of bytes written=404007
                FILE: Number of read operations=0
```

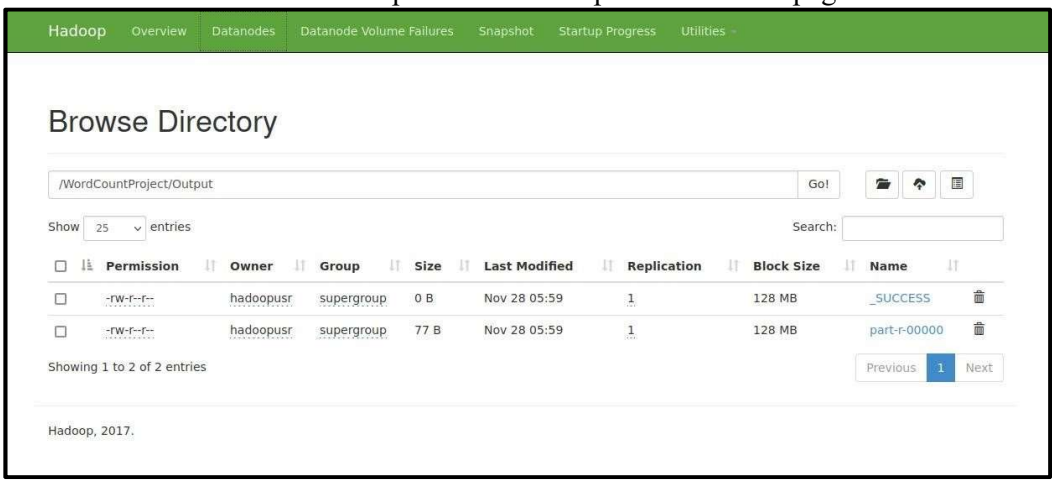
```
                Spilled Records=20
                Shuffled Maps =1
                Failed Shuffles=0
                Merged Map outputs=1
                GC time elapsed (ms)=117
                CPU time spent (ms)=1160
                Physical memory (bytes) snapshot=494956544
                Virtual memory (bytes) snapshot=3898376192
                Total committed heap usage (bytes)=299892736
        Shuffle Errors
                BAD_ID=0
                CONNECTION=0
                IO_ERROR=0
                WRONG_LENGTH=0
                WRONG_MAP=0
                WRONG_REDUCE=0
        File Input Format Counters
                Bytes Read=97
        File Output Format Counters
                Bytes Written=77

┌──(hadoopusr㉿kali)-[/home/kali/Desktop/WordCountProgram]
└─$
```

41. Now we will check the output.

```
┌──(hadoopusr㉿kali)-[/home/kali/Desktop/WordCountProgram]
└─$ hadoop dfs -cat /WordCountProject/Output/*
DEPRECATED: Use of this script to execute hdfs command is deprecated.
Instead use the hdfs command for it.

22/11/28 06:03:05 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes w
here applicable
Apple   2
Blast   1
Car     2
Cars    2
Delhi   1
Dog     1
Mumbai  1
School  2
Sleep   4
Speed   1

┌──(hadoopusr㉿kali)-[/home/kali/Desktop/WordCountProgram]
└─$
```

As we have we can see in the above output, MapReduce has been performed on the input text file, here we can see the output of the WordCount program that just shows the number of times a word has occurred in a given input set.

42. We can also see the final output in the Hadoop Administrator page.



Practical 2

Aim: Write a Spark code for the given application and handle error and recovery of data. Write a Spark code to Handle the Streaming of data.

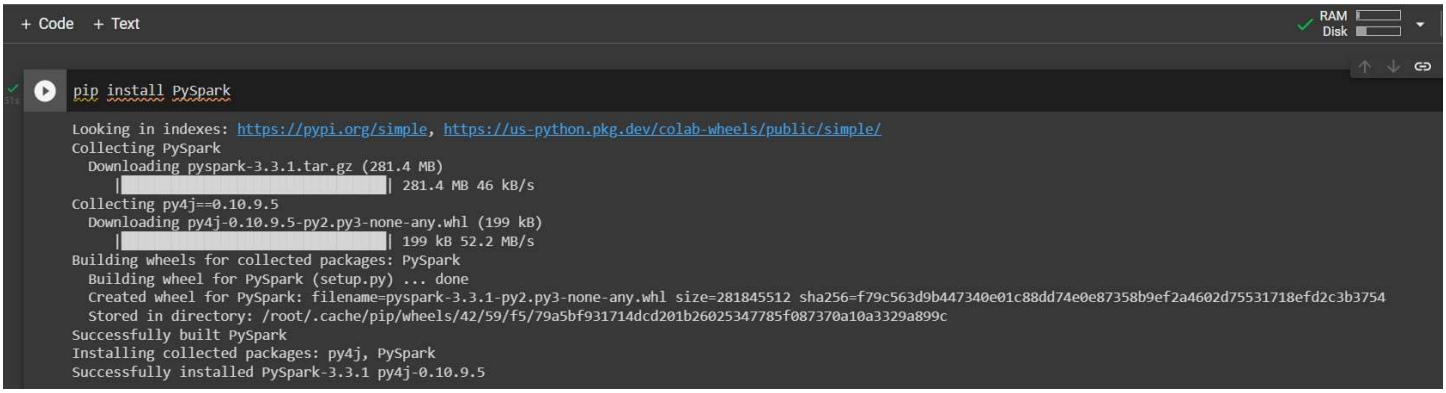
Apache Spark: is a powerful tool for real-time analysis and ML model building, which was a research output of a class project at UC Berkeley in 2010. Spark is not a programming language like Python or Java, it is a distributed data processing framework — useful for big data processing for scalability and computational power.

PySpark: is an interface for Apache Spark that allows users to write Spark applications using python APIs as well as to interactively analyze big data in distributed systems. Most of the Spark features are available in PySpark such as Spark SQL, DataFrame, Streaming, MLlib (Machine Learning Library), and Spark Core.

Google Colaboratory: is a free Jupyter Notebook environment with many pre-installed libraries like **PySpark**, Tensorflow, Pytorch, Keras, OpenCV, and many more. It is one of the cloud services that support GPU and TPU for free. Importing a dataset and training models on the data in the Colab facilitate coding experience. We can apply different ways to import and download data in Colab.

- **Installing PySpark on Colab**

  Previously, setting up PySpark required installing Java, Spark, and Hadoop into the system. However, currently, an easier and simple way is available • **pip install PySpark.**



- **Spark Session**

is the entry point for the programming Spark with dataset and DataFrame API.

from pyspark.sql import SparkSession spark =

SparkSession.builder

.master("local")

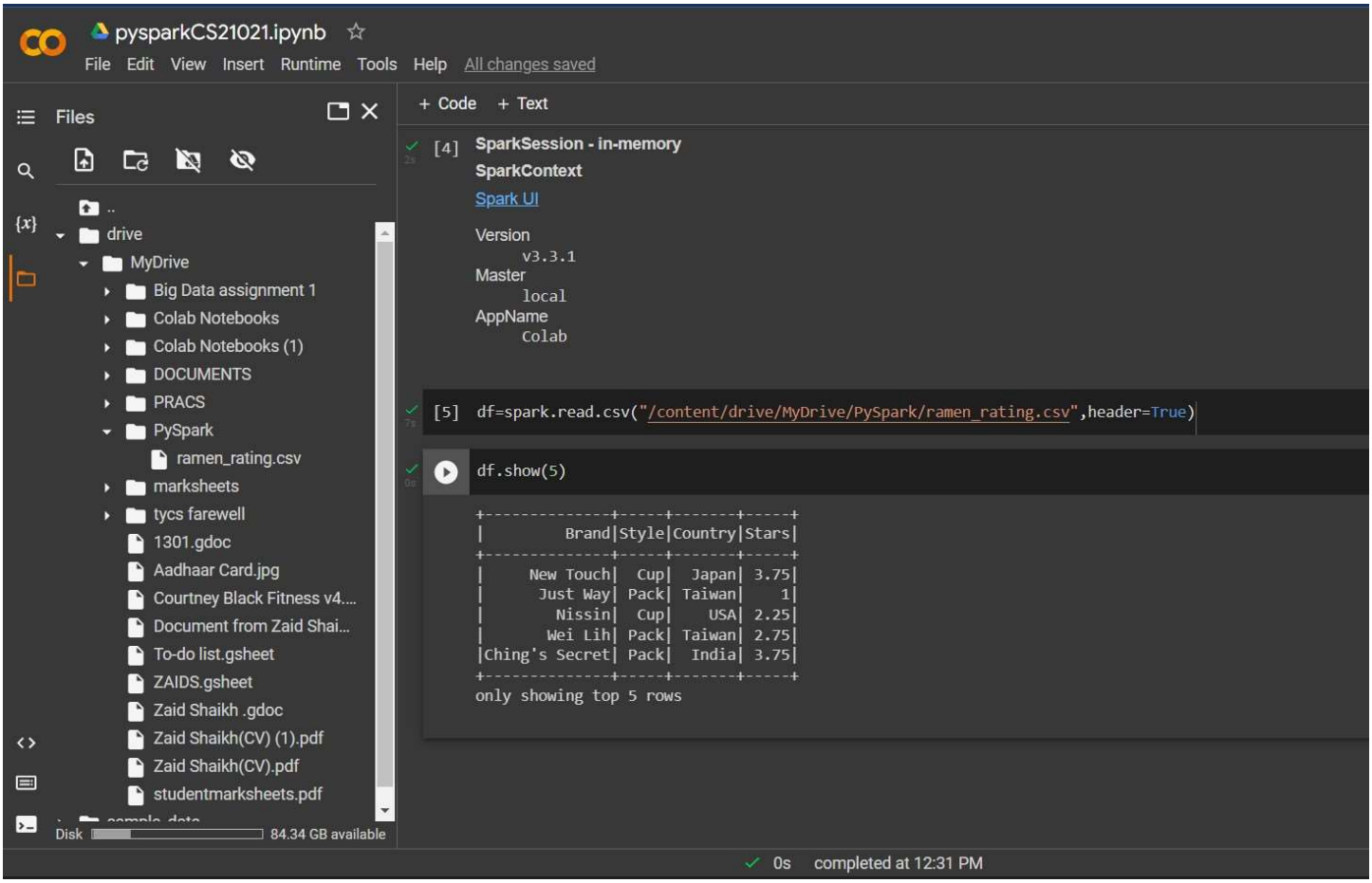
.appName("Colab")

.config('spark.ui.port', '4050')

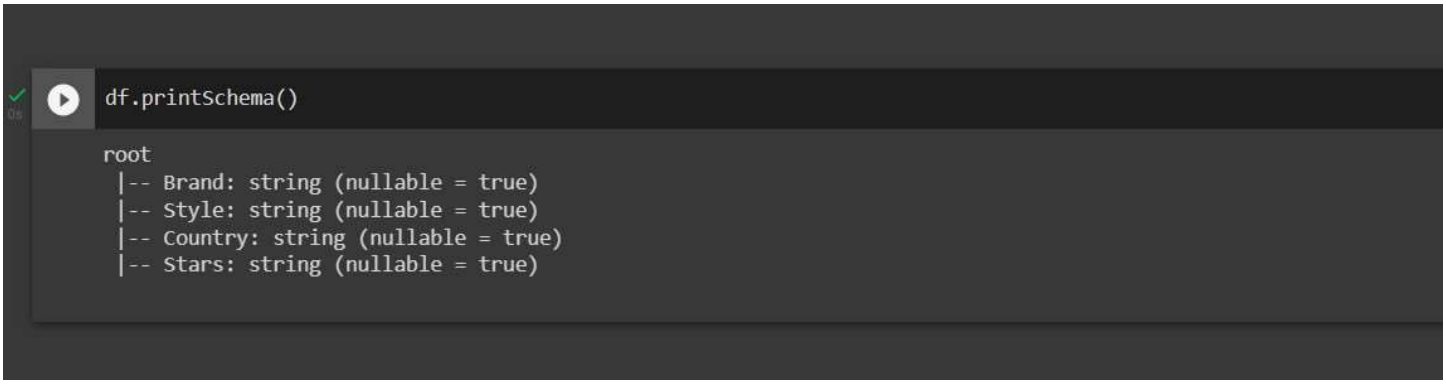
.getOrCreate()

- **Loading data into PySpark**

I had saved the .csv in Google drive and loaded it from there



We can print out the schema in tree format, which shows the datatypes as well:



- **OPERATIONS**

Once the Data is loaded and DataFrame is ready we can perform various operations on it. **1. Filter**

```
df.filter('Stars < 3').show()
```

```
+----------------+-----+-----------+-----+
|           Brand|Style|    Country|Stars|
+----------------+-----+-----------+-----+
|        Just Way| Pack|     Taiwan|    1|
|          Nissin|  Cup|        USA| 2.25|
|         Wei Lih| Pack|     Taiwan| 2.75|
|      Ripe'n'Dry| Pack|      Japan| 0.25|
|            KOKA| Pack|  Singapore|  2.5|
|          Lipton|  Box|        USA|  1.5|
|         Acecook| Tray|      Japan|  1.5|
|          Ottogi| Pack|South Korea|    2|
|   Uni-President| Pack|    Vietnam|    0|
|     Guava Story| Tray|South Korea|    1|
|Sichuan Guangyou| Bowl|      China|    0|
|         Indomie| Pack|    Nigeria|  1.5|
|    Tokyo Noodle| Pack|      Japan|    2|
|            Wang| Bowl|South Korea|    2|
|       Ajinatori| Pack|      Japan|  2.5|
| Dr. McDougall's|  Cup|        USA|    0|
|          Nissin|  Cup|  Hong Kong|  2.5|
|Sichuan Guangyou| Pack|      China| 0.25|
| Liang Cheng Mai| Tray|      China|    1|
|        Nongshim|  Cup|South Korea|  0.5|
+----------------+-----+-----------+-----+
only showing top 20 rows
```

2. Group By

```
df.groupby('style').count().show()
```

```
+-----+-----+
|style|count|
+-----+-----+
| Bowl|  481|
|  Bar|    1|
|  Box|    6|
| null|    2|
| Pack| 1531|
|  Cup|  450|
| Tray|  108|
|  Can|    1|
+-----+-----+
```

3. Rename Column Names

```
df = df.withColumnRenamed('Stars','Ratings')
df.show()
```

```
+--------------+-----+-----------+-------+
|         Brand|Style|    Country|Ratings|
+--------------+-----+-----------+-------+
|     New Touch|  Cup|      Japan|   3.75|
|      Just Way| Pack|     Taiwan|      1|
|        Nissin|  Cup|        USA|   2.25|
|       Wei Lih| Pack|     Taiwan|   2.75|
|Ching's Secret| Pack|      India|   3.75|
| Samyang Foods| Pack|South Korea|   4.75|
|       Acecook|  Cup|      Japan|      4|
|   Ikeda Shoku| Tray|      Japan|   3.75|
|    Ripe'n'Dry| Pack|      Japan|   0.25|
|          KOKA| Pack|  Singapore|    2.5|
|   Tao Kae Noi| Pack|   Thailand|      5|
|      Yamachan| Pack|        USA|      5|
|      Nongshim| Pack|South Korea|   4.25|
|        Nissin| Bowl|      Japan|    4.5|
|        Nissin| Pack|  Hong Kong|      5|
|          KOKA|  Cup|  Singapore|    3.5|
|          TRDP| Pack|      India|   3.75|
|      Yamachan| Pack|        USA|      5|
|      Binh Tay| Pack|    Vietnam|      4|
|         Paldo| Pack|South Korea|      4|
+--------------+-----+-----------+-------+
only showing top 20 rows
```

4. calculating the % average based on Ratings column

```
[28] df = df.withColumn('Percentage',df.Ratings*20)
     df.show()
```

```
+--------------+-----+-----------+-------+----------+
|         Brand|Style|    Country|Ratings|Percentage|
+--------------+-----+-----------+-------+----------+
|     New Touch|  Cup|      Japan|   3.75|      75.0|
|      Just Way| Pack|     Taiwan|      1|      20.0|
|        Nissin|  Cup|        USA|   2.25|      45.0|
|       Wei Lih| Pack|     Taiwan|   2.75|      55.0|
|Ching's Secret| Pack|      India|   3.75|      75.0|
| Samyang Foods| Pack|South Korea|   4.75|      95.0|
|       Acecook|  Cup|      Japan|      4|      80.0|
|   Ikeda Shoku| Tray|      Japan|   3.75|      75.0|
|    Ripe'n'Dry| Pack|      Japan|   0.25|       5.0|
|          KOKA| Pack|  Singapore|    2.5|      50.0|
|   Tao Kae Noi| Pack|   Thailand|      5|     100.0|
|      Yamachan| Pack|        USA|      5|     100.0|
|      Nongshim| Pack|South Korea|   4.25|      85.0|
|        Nissin| Bowl|      Japan|    4.5|      90.0|
|        Nissin| Pack|  Hong Kong|      5|     100.0|
|          KOKA|  Cup|  Singapore|    3.5|      70.0|
|          TRDP| Pack|      India|   3.75|      75.0|
|      Yamachan| Pack|        USA|      5|     100.0|
|      Binh Tay| Pack|    Vietnam|      4|      80.0|
|         Paldo| Pack|South Korea|      4|      80.0|
+--------------+-----+-----------+-------+----------+
only showing top 20 rows
```

SQL OPERATIONS

- Temp View

The Dataframe can be saved as temporary view which is present as long as that spark session is active

```
df.createOrReplaceTempView('Temp')
```

Above view can be used to perform Spark SQL queries

```
spark.sql("select * from Temp ").show()
```

```
+--------------+-----+-----------+-------+----------+
|         Brand|Style|    Country|Ratings|Percentage|
+--------------+-----+-----------+-------+----------+
|     New Touch|  Cup|      Japan|   3.75|      75.0|
|      Just Way| Pack|     Taiwan|      1|      20.0|
|        Nissin|  Cup|        USA|   2.25|      45.0|
|       Wei Lih| Pack|     Taiwan|   2.75|      55.0|
|Ching's Secret| Pack|      India|   3.75|      75.0|
| Samyang Foods| Pack|South Korea|   4.75|      95.0|
|       Acecook|  Cup|      Japan|      4|      80.0|
|   Ikeda Shoku| Tray|      Japan|   3.75|      75.0|
|    Ripe'n'Dry| Pack|      Japan|   0.25|       5.0|
|          KOKA| Pack|  Singapore|    2.5|      50.0|
|   Tao Kae Noi| Pack|   Thailand|      5|     100.0|
|      Yamachan| Pack|        USA|      5|     100.0|
|      Nongshim| Pack|South Korea|   4.25|      85.0|
|        Nissin| Bowl|      Japan|    4.5|      90.0|
|        Nissin| Pack|  Hong Kong|      5|     100.0|
|          KOKA|  Cup|  Singapore|    3.5|      70.0|
|          TRDP| Pack|      India|   3.75|      75.0|
|      Yamachan| Pack|        USA|      5|     100.0|
|      Binh Tay| Pack|    Vietnam|      4|      80.0|
|         Paldo| Pack|South Korea|      4|      80.0|
+--------------+-----+-----------+-------+----------+
only showing top 20 rows
```

- **Get Max Percentage from the dataset**

```
spark.sql("select max(Percentage) as max_Percentage from Temp").show()
```

```
+--------------+
|max_Percentage|
+--------------+
|         100.0|
+--------------+
```

- **Droping Percentage**

```
[35] df.drop('Percentage').show()
```

```
+--------------+-----+-----------+-------+
|         Brand|Style|    Country|Ratings|
+--------------+-----+-----------+-------+
|     New Touch|  Cup|      Japan|   3.75|
|      Just Way| Pack|     Taiwan|      1|
|        Nissin|  Cup|        USA|   2.25|
|       Wei Lih| Pack|     Taiwan|   2.75|
|Ching's Secret| Pack|      India|   3.75|
| Samyang Foods| Pack|South Korea|   4.75|
|       Acecook|  Cup|      Japan|      4|
|   Ikeda Shoku| Tray|      Japan|   3.75|
|    Ripe'n'Dry| Pack|      Japan|   0.25|
|          KOKA| Pack|  Singapore|    2.5|
|   Tao Kae Noi| Pack|   Thailand|      5|
|      Yamachan| Pack|        USA|      5|
|      Nongshim| Pack|South Korea|   4.25|
|        Nissin| Bowl|      Japan|    4.5|
|        Nissin| Pack|  Hong Kong|      5|
|          KOKA|  Cup|  Singapore|    3.5|
|          TRDP| Pack|      India|   3.75|
|      Yamachan| Pack|        USA|      5|
|      Binh Tay| Pack|    Vietnam|      4|
|         Paldo| Pack|South Korea|      4|
+--------------+-----+-----------+-------+
only showing top 20 rows
```

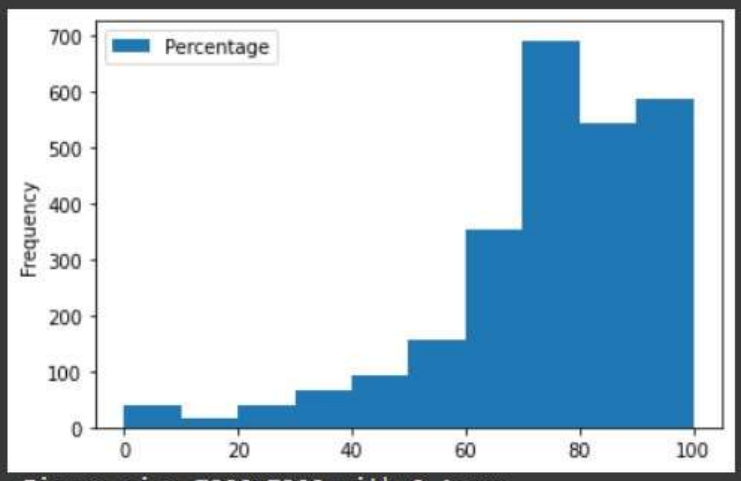
- **Using Pandas for plotting DataFrames:**

It converts the PySpark DataFrame into a Pandas DataFrame. After conversion, it's easy to create charts from pandas DataFrames using matplotlib or seaborn plotting tools.

```
[54] df_pandas = df.toPandas()
```

```
[56] import matplotlib.pyplot as plt
```

```
df_pandas.plot(kind='hist',x="Style",y="Percentage")
plt.figure(figsize=(100, 100))
plt.show(20)
```




```
<Figure size 7200x7200 with 0 Axes>
```

Practical 3

Aim : Implementation of hive

Hadoop : Hadoop is an open-source framework to store and process Big Data in a distributed environment. It contains two modules, one is MapReduce and another is Hadoop Distributed File System (HDFS).

1. MapReduce
2. HDFS

The Hadoop ecosystem contains different sub-projects (tools) such as Sqoop, Pig, and Hive that are used to help Hadoop modules

1. Sqoop
2. Pig

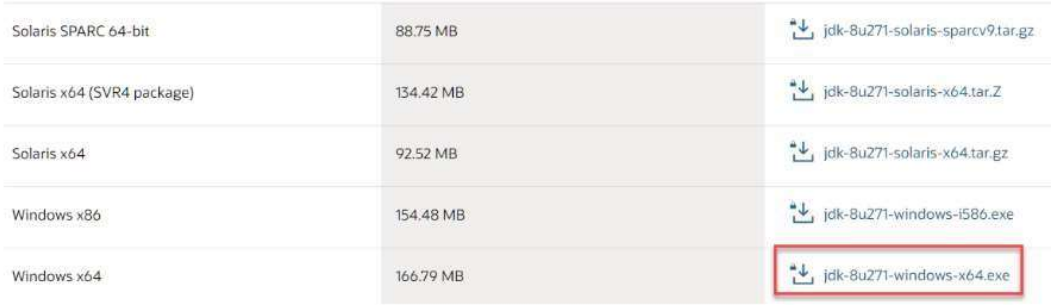
3.Hive

Step 1: Java-Installation

For hive installation first we have to verify java and Hadoop in our system

• Download the 8 version of java

Step 1: Run the Downloaded File Double-click the downloaded file to start the installation

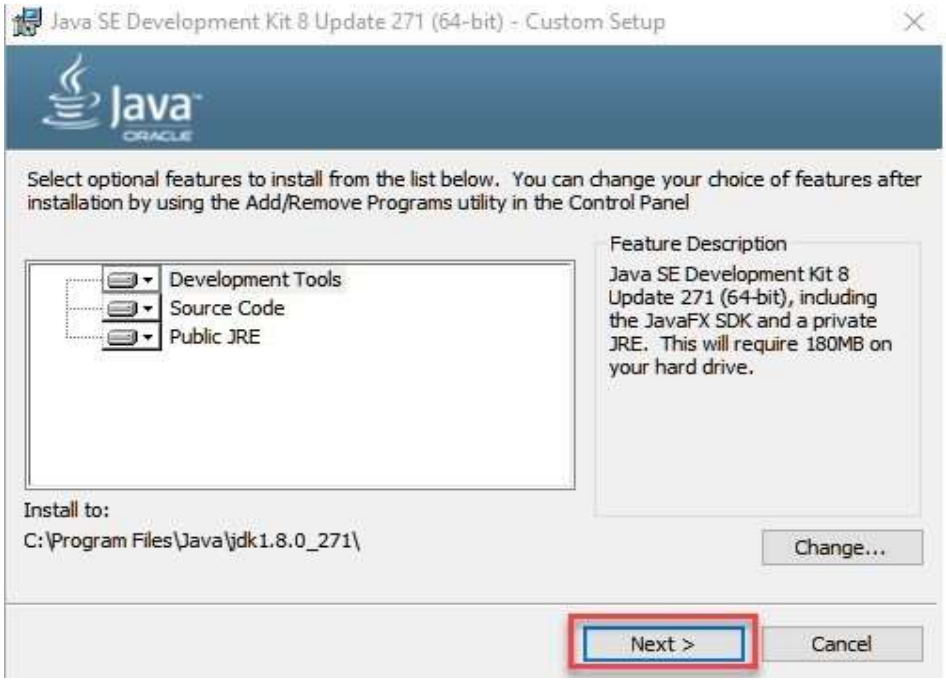


Solaris SPARC 64-bit	88.75 MB	jdk-8u271-solaris-sparcv9.tar.gz
Solaris x64 (SVR4 package)	134.42 MB	jdk-8u271-solaris-x64.tar.Z
Solaris x64	92.52 MB	jdk-8u271-solaris-x64.tar.gz
Windows x86	154.48 MB	jdk-8u271-windows-i586.exe
Windows x64	166.79 MB	jdk-8u271-windows-x64.exe

NOTE: You will be required to create an Oracle Account to start Java 8 download of the file.

Step 2: Once the Java JDK 8 download is complete, run the exe for install JDK. Click Next

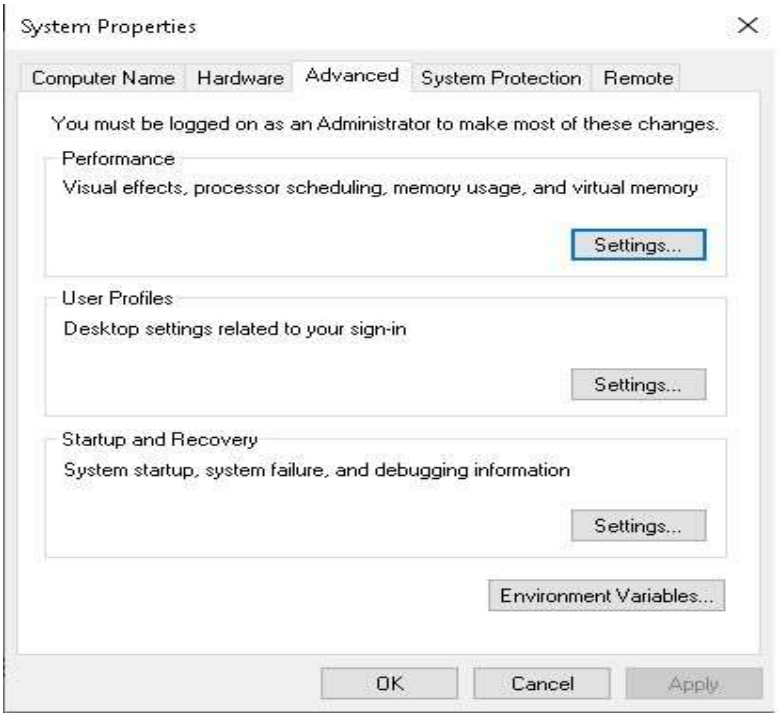
Step 3: Select the PATH to install Java in Windows… You can leave it Default. Click next.



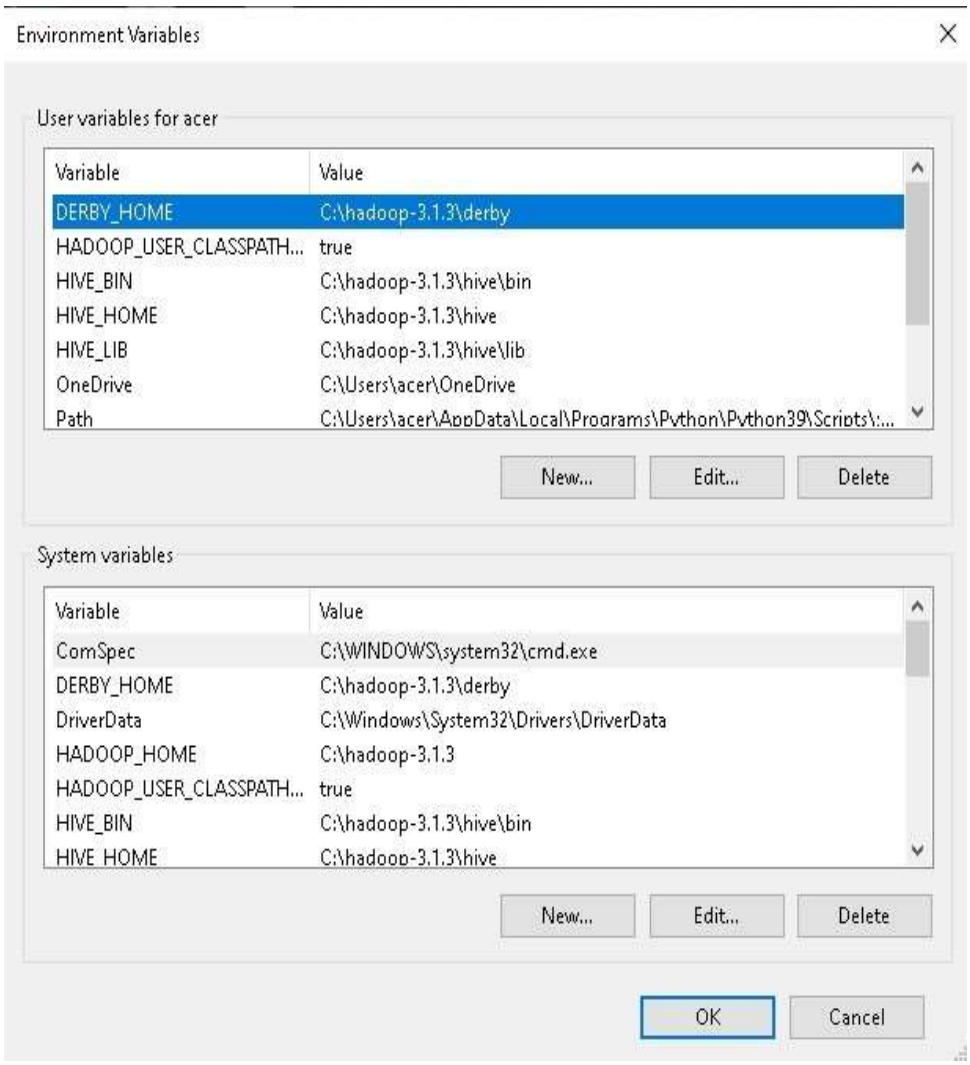
NOTE: Follow the onscreen instructions in succeeding steps to install Java 8 on Windows 10.

Step 4: Once you install Java in windows, click Close

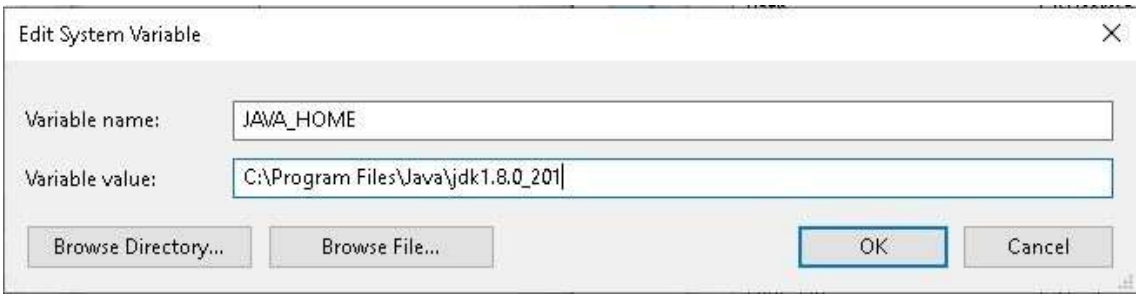
Step 5: Click on Environment Variables to set Java runtime environment



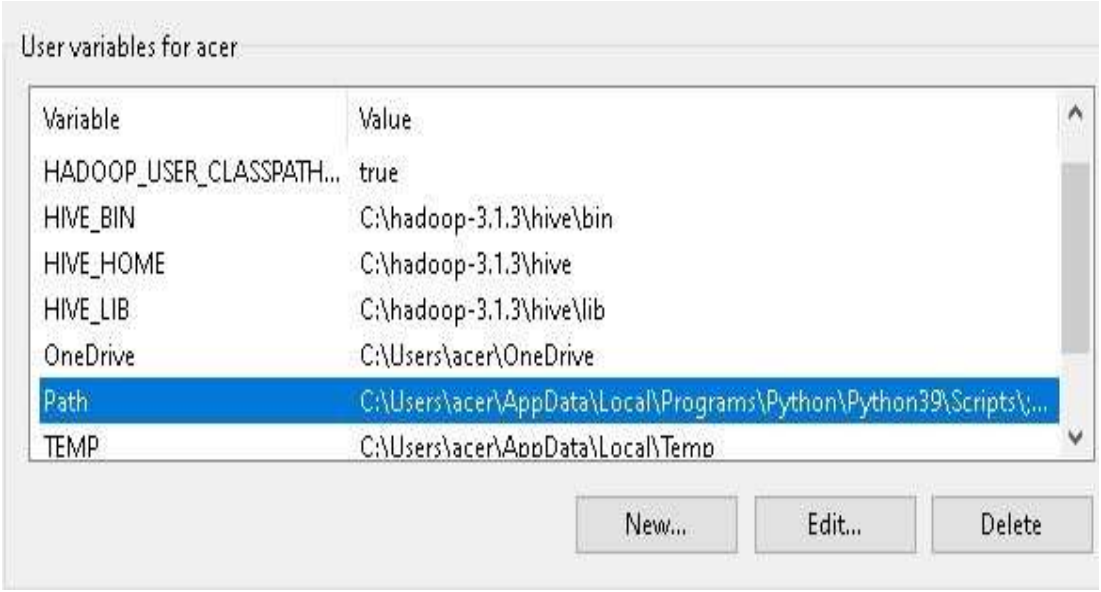
Step 6: Click on new Button of User variables/system variables



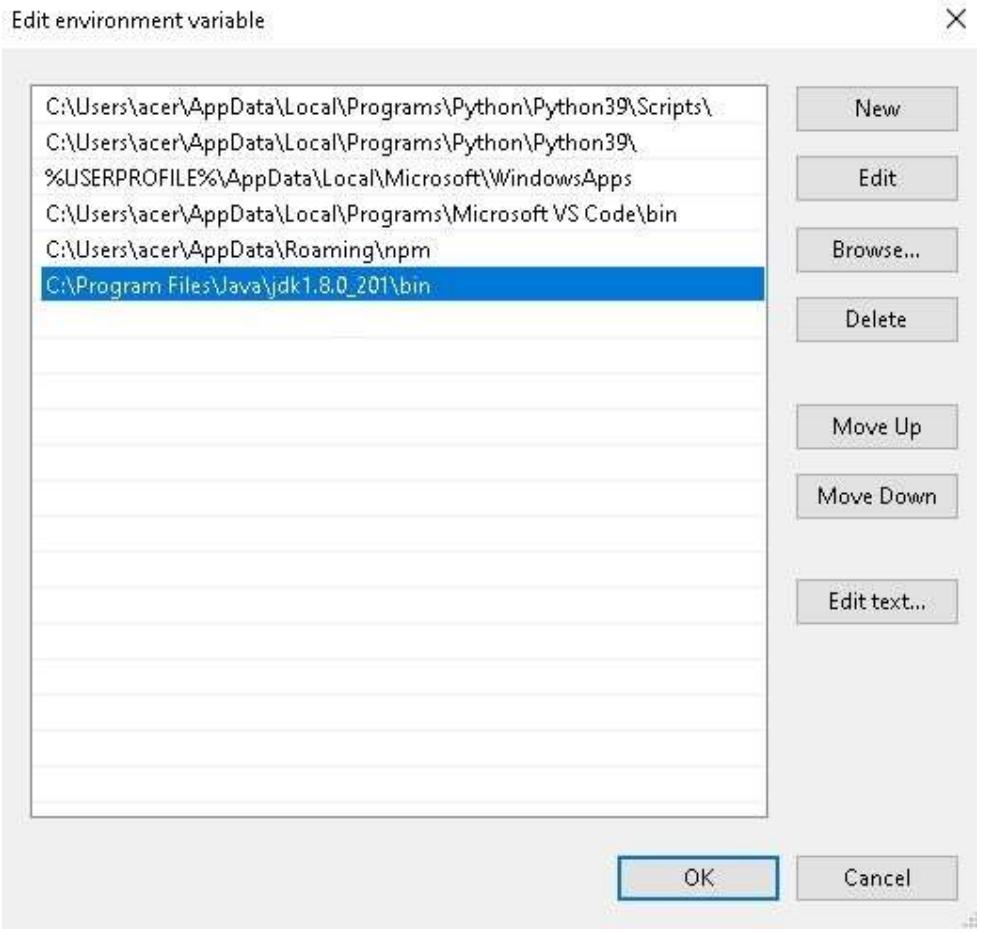
Step 7: Type JAVE_HOME in the Variable name.



- Step 8 : Go to PATH



- Step 9: go to edit and add the path of java jdk 8



Step 10: Go to command prompt and type “javac”and “java –version “

```
C:\Users\acer>javac
Usage: javac <options> <source files>
where possible options include:
  -g                         Generate all debugging info
  -g:none                    Generate no debugging info
  -g:{lines,vars,source}     Generate only some debugging info
  -nowarn                    Generate no warnings
  -verbose                   Output messages about what the compiler is doing
  -deprecation               Output source locations where deprecated APIs are us
  -classpath <path>          Specify where to find user class files and annotatio
  -cp <path>                 Specify where to find user class files and annotatio
  -sourcepath <path>         Specify where to find input source files
  -bootclasspath <path>      Override location of bootstrap class files
  -extdirs <dirs>            Override location of installed extensions
  -endorseddirs <dirs>       Override location of endorsed standards path
  -proc:{none,only}          Control whether annotation processing and/or compila
  -processor <class1>[,<class2>,<class3>...] Names of the annotation processors t
ss
  -processorpath <path>      Specify where to find annotation processors
  -parameters                Generate metadata for reflection on method parameter
  -d <directory>             Specify where to place generated class files
  -s <directory>             Specify where to place generated source files
  -h <directory>             Specify where to place generated native header files
  -implicit:{none,class}     Specify whether or not to generate class files for i
  -encoding <encoding>       Specify character encoding used by source files
  -source <release>          Provide source compatibility with specified release
  -target <release>          Generate class files for specific VM version
```

```
C:\Users\acer>java -version
java version "1.8.0_201"
Java(TM) SE Runtime Environment (build 1.8.0_201-b09)
Java HotSpot(TM) 64-Bit Server VM (build 25.201-b09, mixed mode)
```

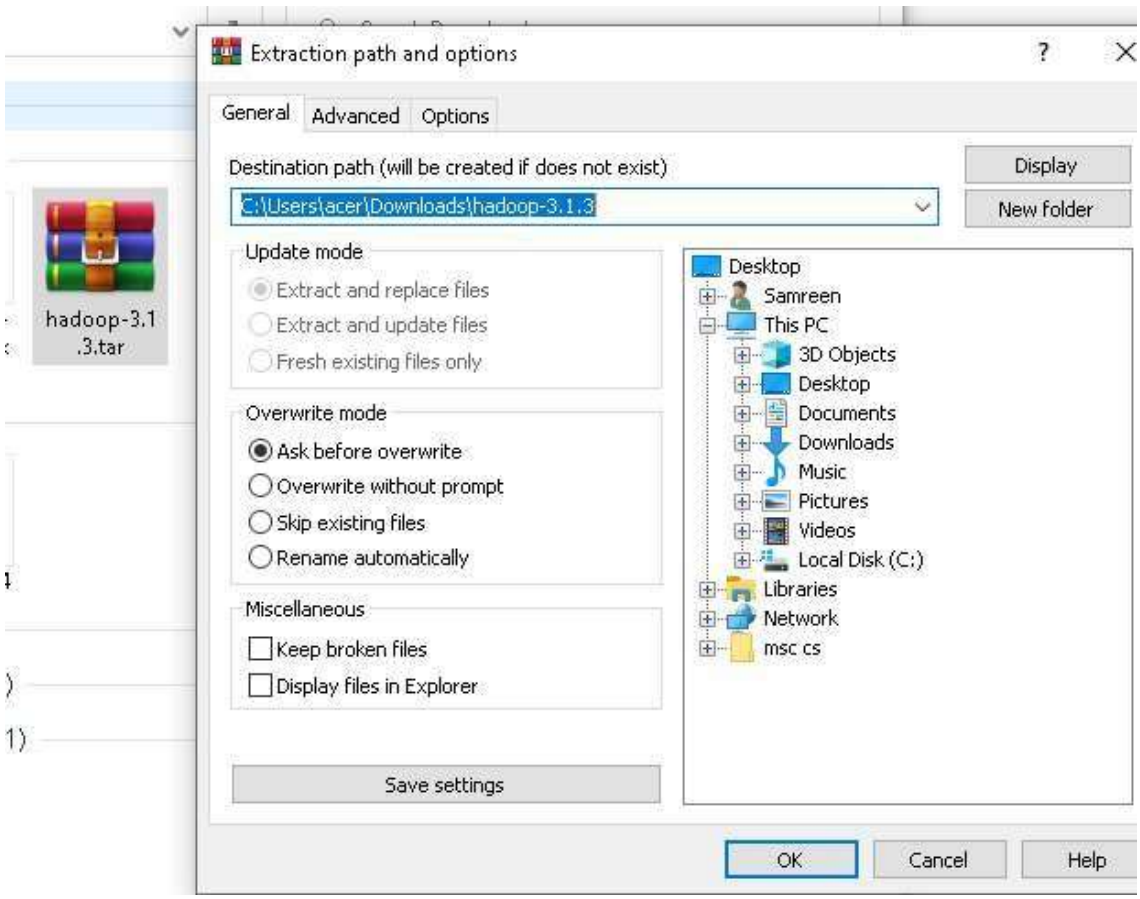
Step 2:Installing Hadoop 3.2.1

Step 1: Download Hadoop tar file of Hadoop 3.2.1

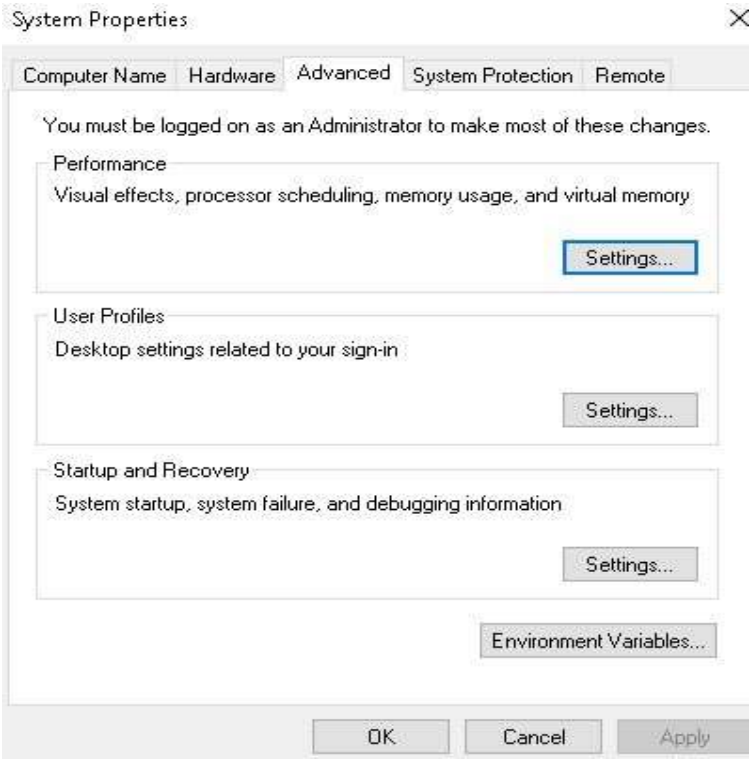
Index of /dist/hadoop/common/hadoop-3.1.

Name	Last modified	Size	Description
Parent Directory		-	
CHANGES.md	2020-07-03 04:36	50K	
CHANGES.md.asc	2020-07-03 04:37	473	
CHANGES.md.sha512	2020-07-03 04:36	182	
RELEASENOTES.md	2020-07-03 04:36	2.8K	
RELEASENOTES.md.asc	2020-07-03 04:36	473	
RELEASENOTES.md.sha512	2020-07-03 04:37	187	
hadoop-3.1.3-rat.txt	2020-07-03 04:36	1.7M	
hadoop-3.1.3-rat.txt.asc	2020-07-03 04:36	473	
hadoop-3.1.3-rat.txt.sha512	2020-07-03 04:37	192	
hadoop-3.1.3-site.tar.gz	2020-07-03 04:36	38M	
hadoop-3.1.3-site.tar.gz.asc	2020-07-03 04:36	473	
hadoop-3.1.3-site.tar.gz.sha512	2020-07-03 04:36	196	
hadoop-3.1.3-src.tar.gz	2020-07-03 04:37	28M	

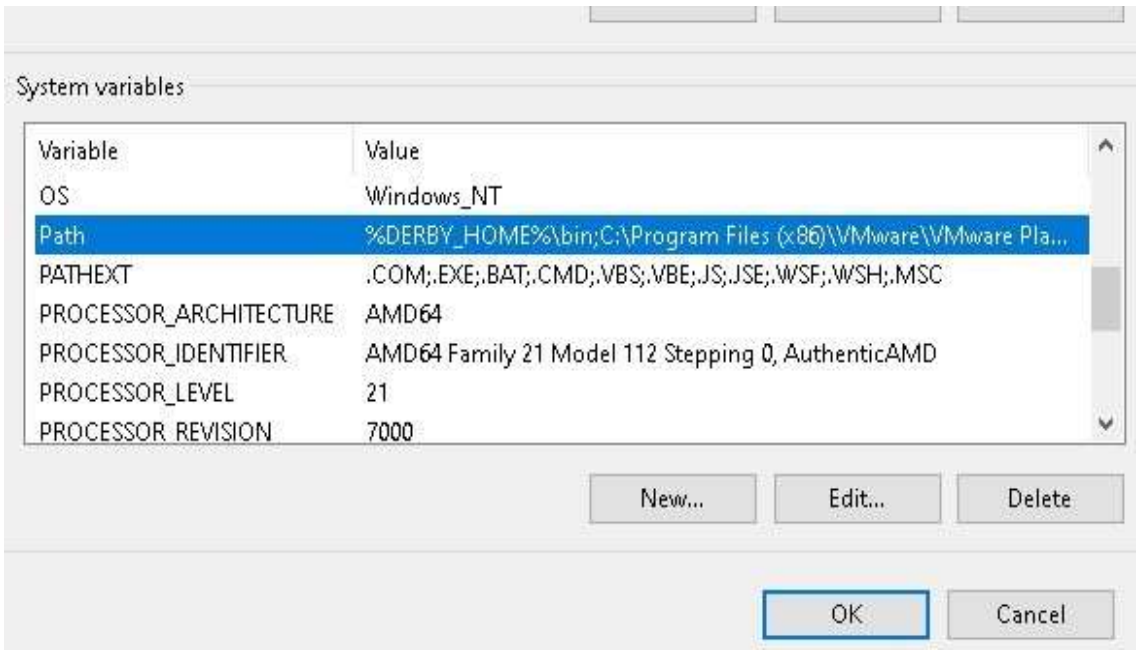
Step 2: extract hadoop file in c drive



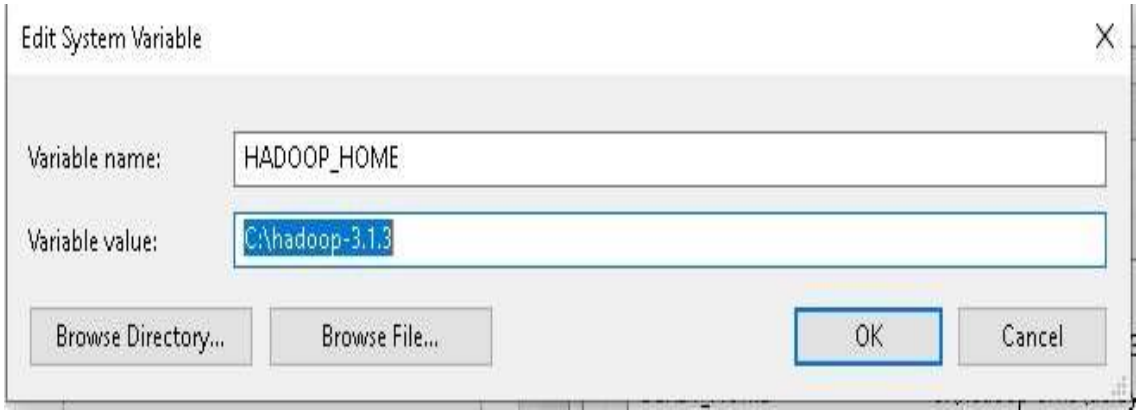
Step 3: after extracting file go to system and environment

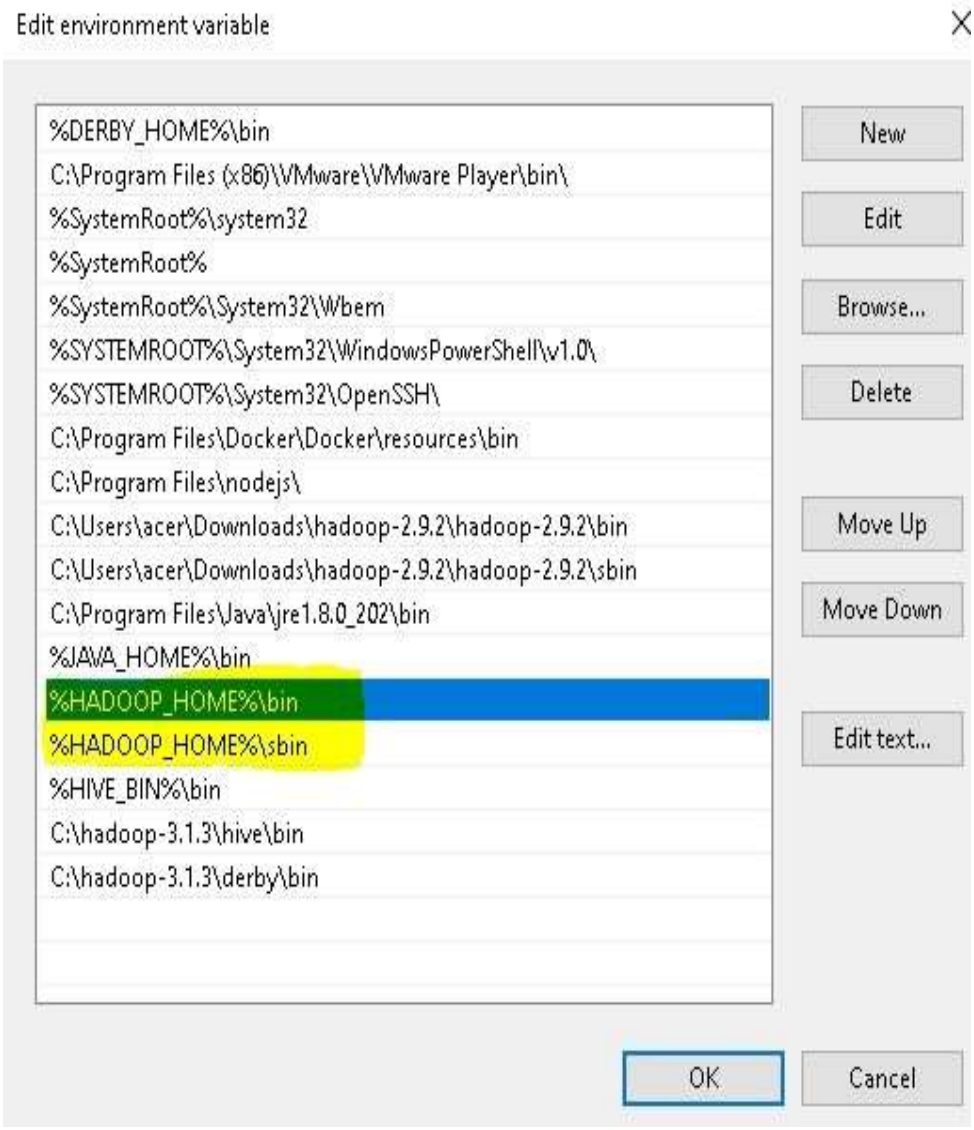


Step 4 : Add a path of Hadoop in environment



Note : Hadoop bin and sbin both path should added in environment variable





Step 5:Configuring Hadoop cluster

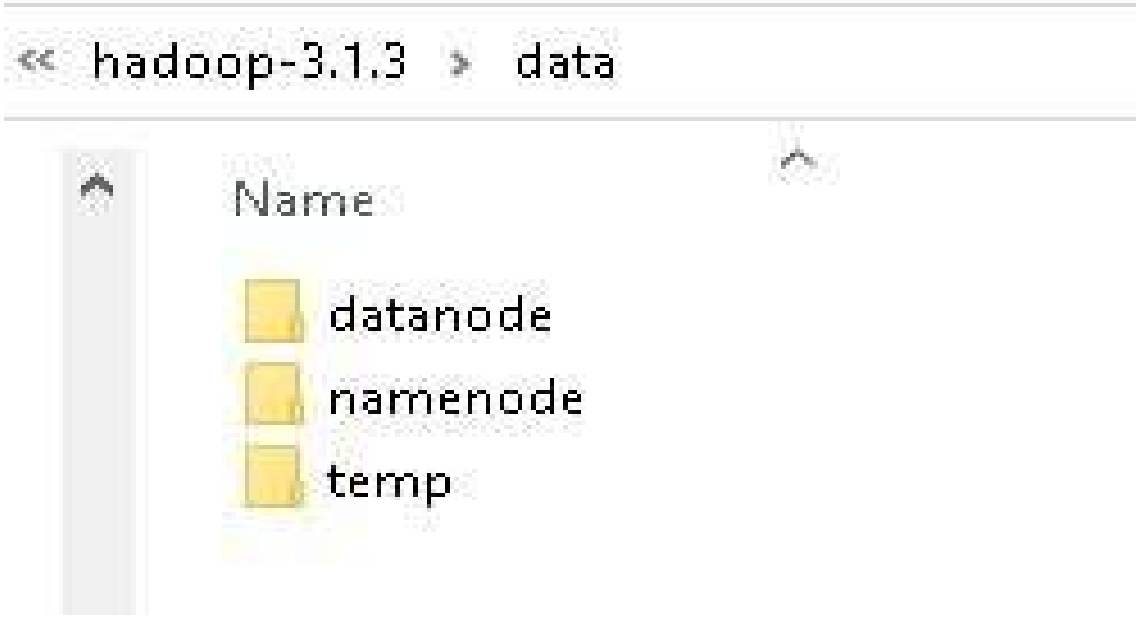
1. %HADOOP_HOME%\etc\hadoop\hdfs-site.xml
2. %HADOOP_HOME%\etc\hadoop\core-site.xml
3. %HADOOP_HOME%\etc\hadoop\mapred-site.xml
4. %HADOOP_HOME%\etc\hadoop\yarn-site.xml

Step 6: Create a directory to store all master node

1 namenode

2 datanode

3 temp



Step 7: Open “C:\hadoop-3.1.3\etc\Hadoop\hdfs-site.xml” file location and add the following properties

```
<configuration>
<property>
<name>dfs.namenode.name.dir</name>
<value>file:///opt/hdfs/namenode</value>
<description>NameNode directory for namespace and transaction logs storage.</description>
</property>
<property>
<name>dfs.datanode.data.dir</name>
<value>file:///opt/hdfs/datanode</value>
<description>DataNode directory</description>
</property>
<property>
<name>dfs.replication</name>
<value>3</value>
</property>
<property>
<name>dfs.permissions</name>
<value>false</value>
</property>
<property>
<name>dfs.datanode.use.datanode.hostname</name>
<value>false</value>
</property>
<property>
<name>dfs.namenode.datanode.registration.ip-hostname-check</name>
<value>false</value>
</property>
</configuration>
```

Step 8: Open “C:\hadoop-3.1.3\etc\Hadoop\core-site.xml” file location and add the following properties

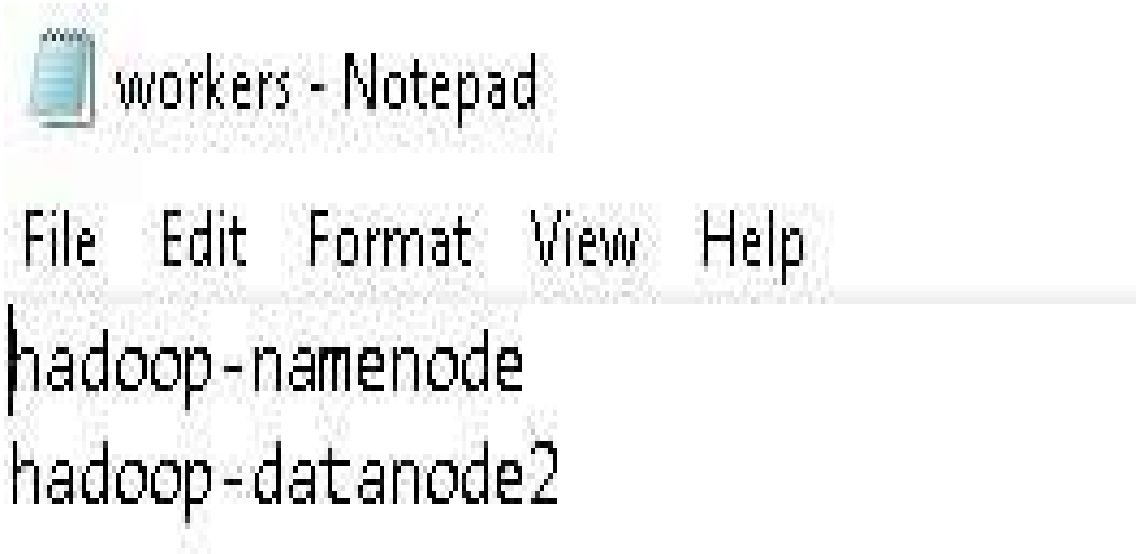
```
<configuration>
<property>
<name>fs.defaultFS</name>
<value>hdfs://hadoop-namenode:9820/</value>
<description>NameNode URI</description>
</property>
<property>
<name>io.file.buffer.size</name>
<value>131072</value>
<description>Buffer size</description>
</property>
</configuration>
```

Step 9: Open “C:\hadoop-3.1.3\etc\Hadoop\yarn-site.xml” file location and add the following properties

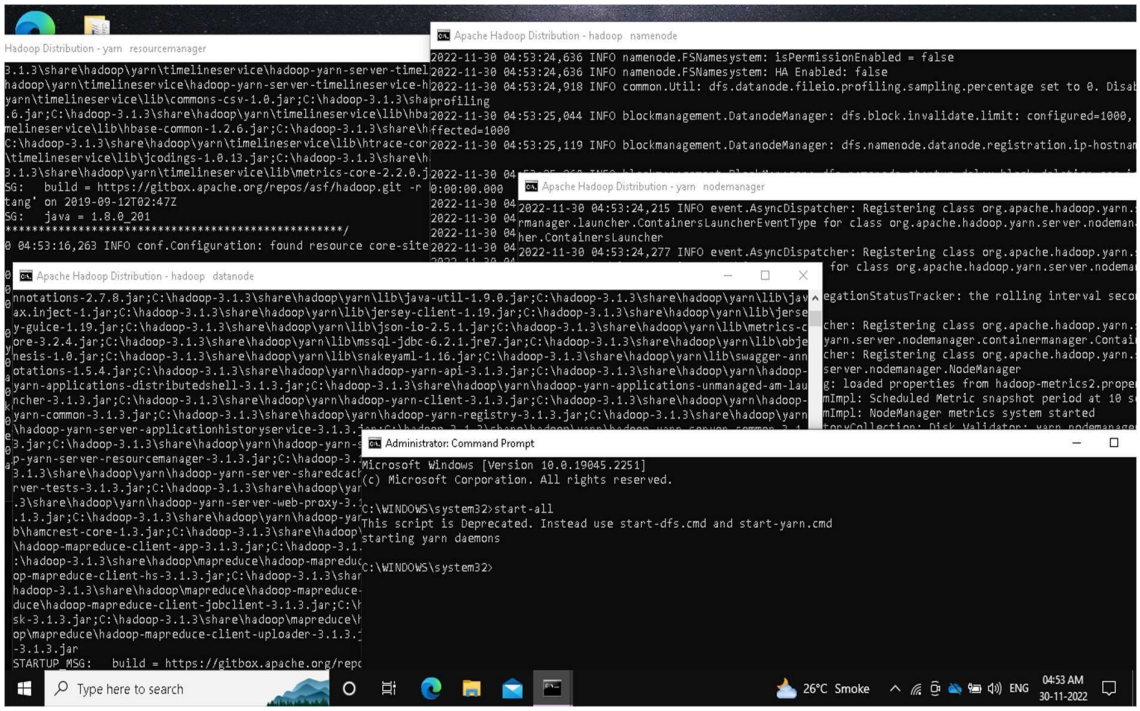
Step 10: Open “C:\hadoop-3.1.3\etc\Hadoop\mapred-site.xml” file location and add the following properties

```
<configuration>
<property>
<name>mapreduce.framework.name</name>
<value>yarn</value>
<description>MapReduce framework name</description>
</property>
<property>
<name>mapreduce.jobhistory.address</name>
<value>hadoop-namenode:10020</value>
<description>Default port is 10020.</description>
</property>
<property>
<name>mapreduce.jobhistory.webapp.address</name>
<value> hadoop-namenode:19888</value>
<description>Default port is 19888.</description>
</property>
<property>
<name>mapreduce.jobhistory.intermediate-done-dir</name>
<value>/mr-history/tmp</value>
<description>Directory where history files are written by MapReduce jobs.</description>
</property>
<property>
<name>mapreduce.jobhistory.done-dir</name>
<value>/mr-history/done</value>
<description>Directory where history files are managed by the MR JobHistory Server.</description>
</property>
</configuration>
```

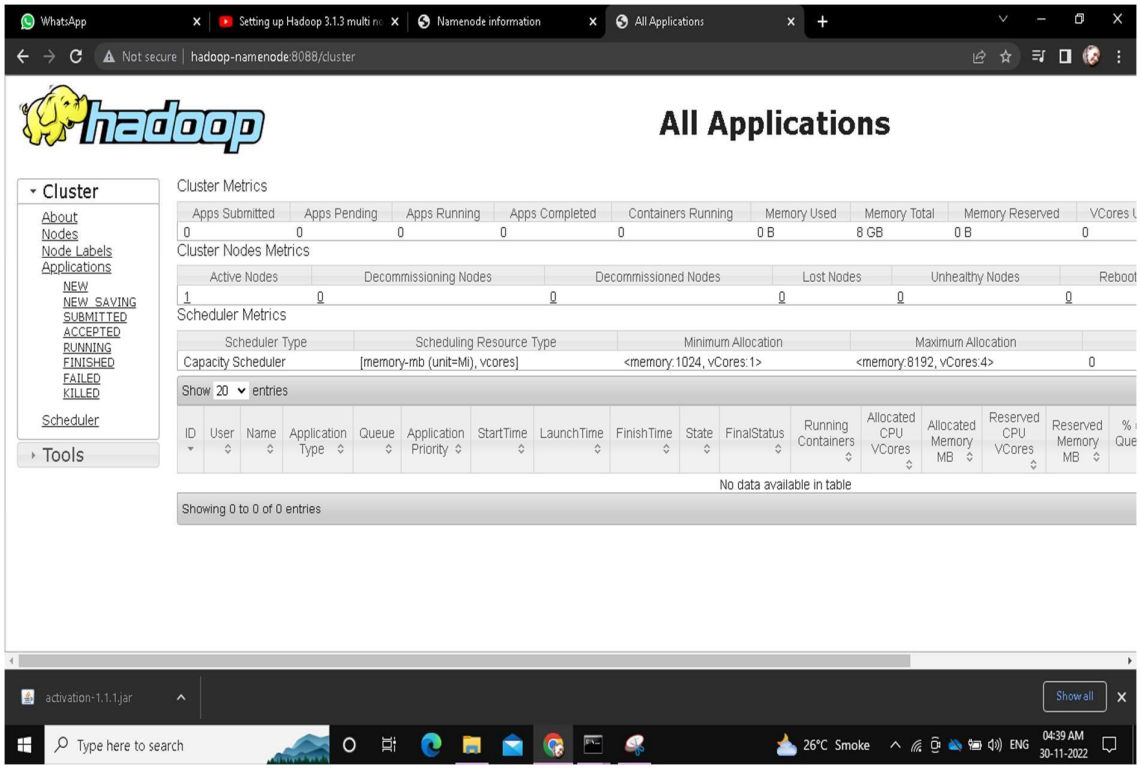
Step 11: Add you namenode and data node in workers file C:\hadoop-3.1.3\etc\Hadoop\workers



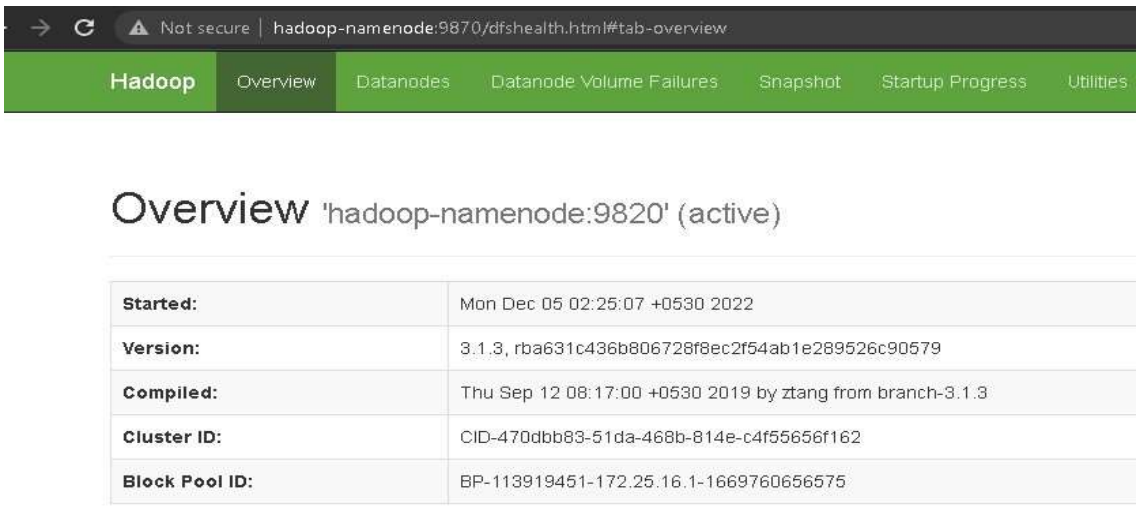
Step 12: Go to cmd run as administration and type command “startall”



Step 13: Go to browser and type “Hadoop-namenode:8088



Step 15 :Accessing Hadoop on Browser



Step 3: Hive – Installation

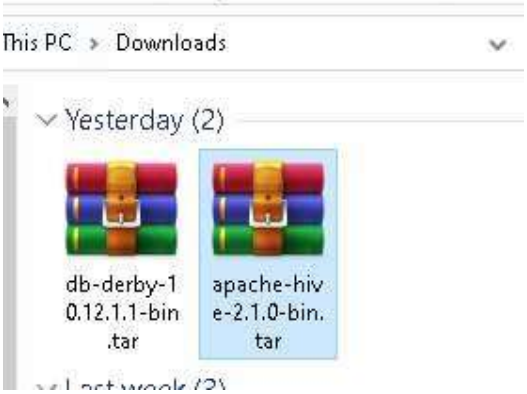
Step 1 : downloading hive tar file

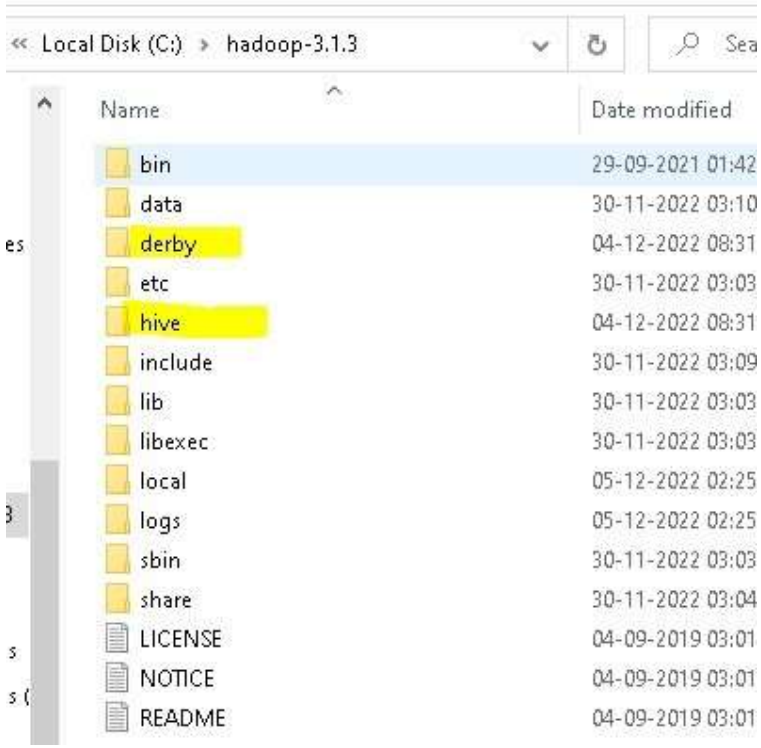
Step 2 : Download derby file after extracting copy a lib file of derby and paste it in hive lib file

Step 3 : Download the hive-xml file and after extracting the file this file copy paste in hive conf file location

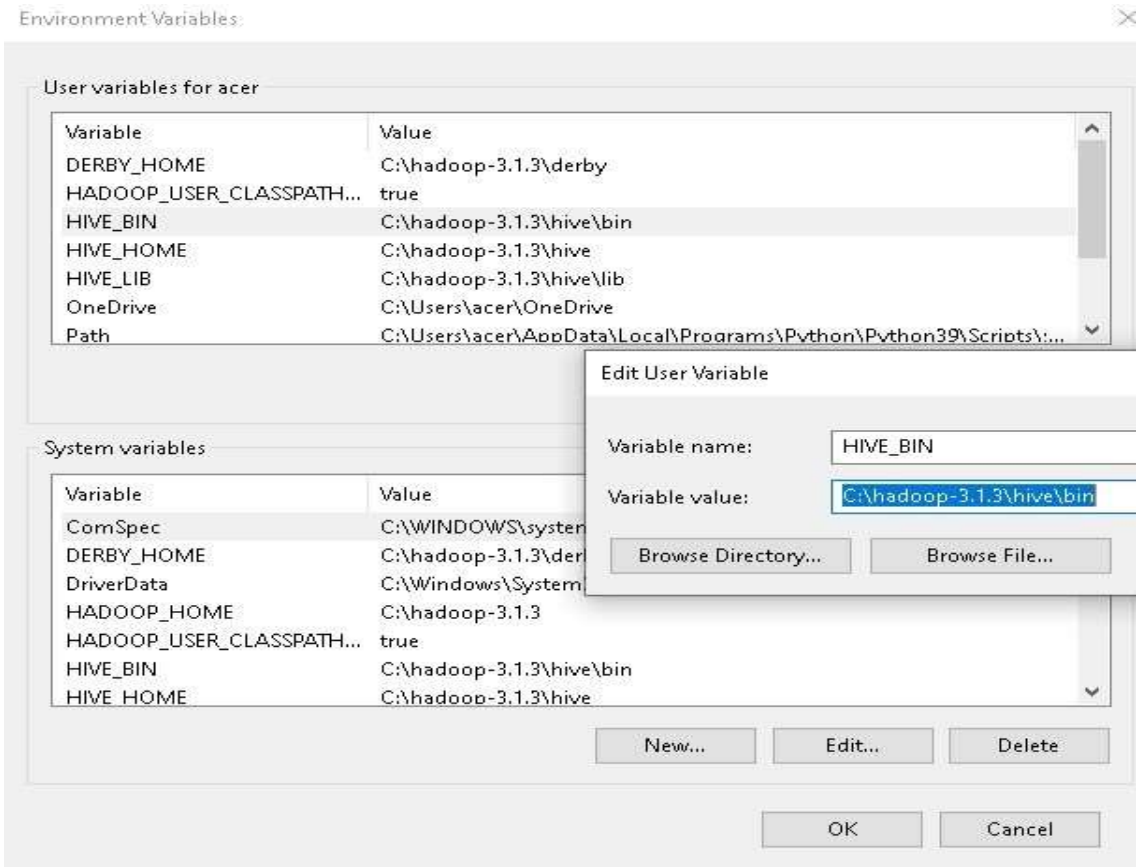
```
<?xml version="1.0"?>
<?xml-stylesheet type="text/xsl" href="configuration.xsl"?>
<configuration><property> <name>javax.jdo.option.ConnectionURL</name>
<value>jdbc:derby://localhost:1527/metastore_db;create=true</value>
<description>JDBC connect string for a JDBC metastore</description>
</property><property>
<name>javax.jdo.option.ConnectionDriverName</name>
<value>org.apache.derby.jdbc.ClientDriver</value>
<description>Driver class name for a JDBC metastore</description>
</property>
<property>
<name>hive.server2.enable.impersonation</name>
<description>Enable user impersonation for HiveServer2</description>
<value>true</value>
</property>
<property>
<name>hive.server2.authentication</name>
<value>NONE</value>
<description> Client authentication types. NONE: no authentication check LDAP: LDAP/AD based authentication KERBEROS:
Kerberos/GSSAPI authentication CUSTOM: Custom authentication provider (Use with property
hive.server2.custom.authentication.class) </description>
</property>
<property>
<name>datanucleus.autoCreateTables</name>
<value>True</value>
</property>
</configuration>
```

Step 4: Extract the hive tar file in Hadoop file





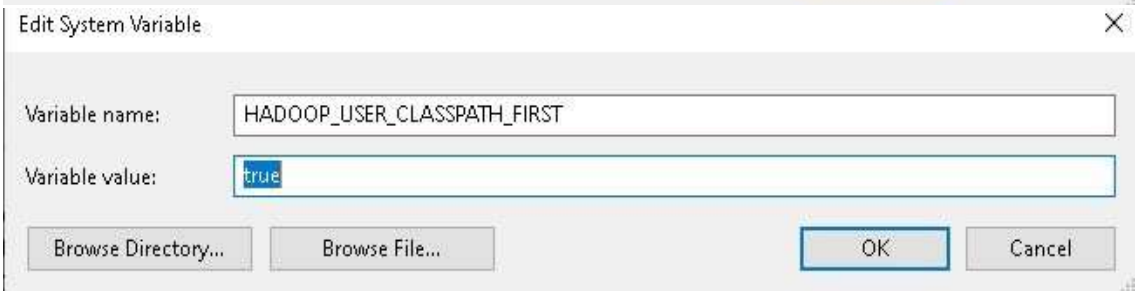
Step 5 :Set the path in environment variable

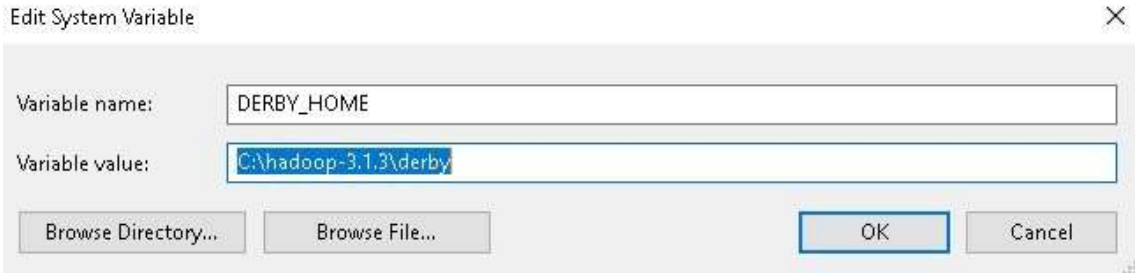


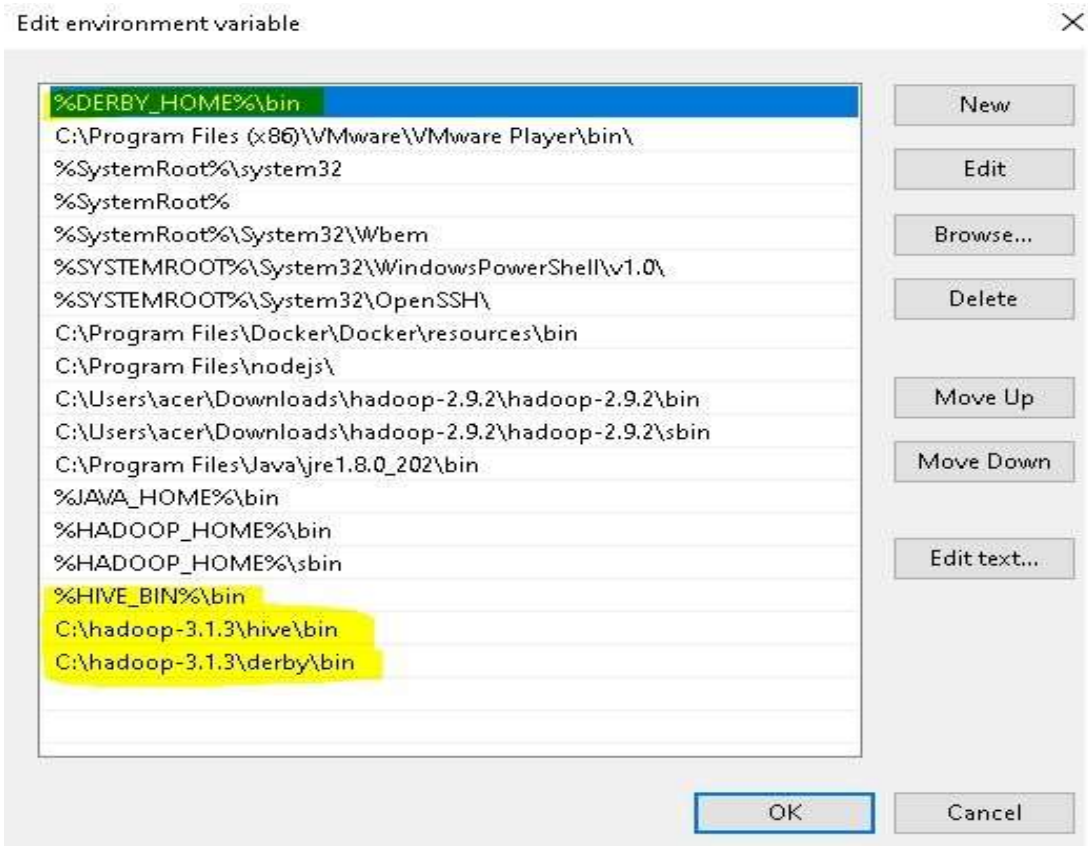

Edit User Variable
Variable name:
HIVE_HOME
Variable value:
C:\hadoop-3.1.3\hive
Browse Directory...
Browse File...
OK
Cancel


Edit User Variable
Variable name:
HIVE_LIB
Variable value:
C:\hadoop-3.1.3\hive\lib
Browse Directory...
Browse File...
OK
Cancel

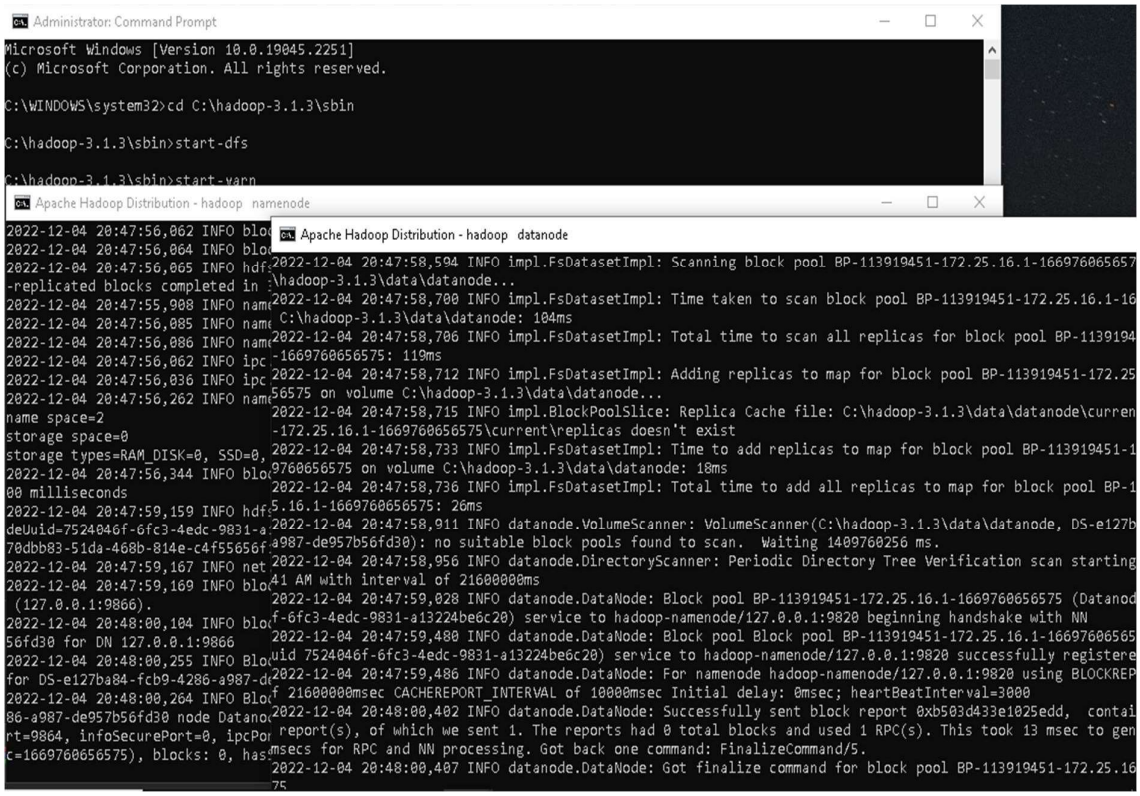

Edit User Variable
Variable name:
HIVE_BIN
Variable value:
C:\hadoop-3.1.3\hive\bin
Browse Directory...
Browse File...
OK
Cancel


Edit System Variable
Variable name:
HADOOP_USER_CLASSPATH_FIRST
Variable value:
true
Browse Directory...
Browse File...
OK
Cancel

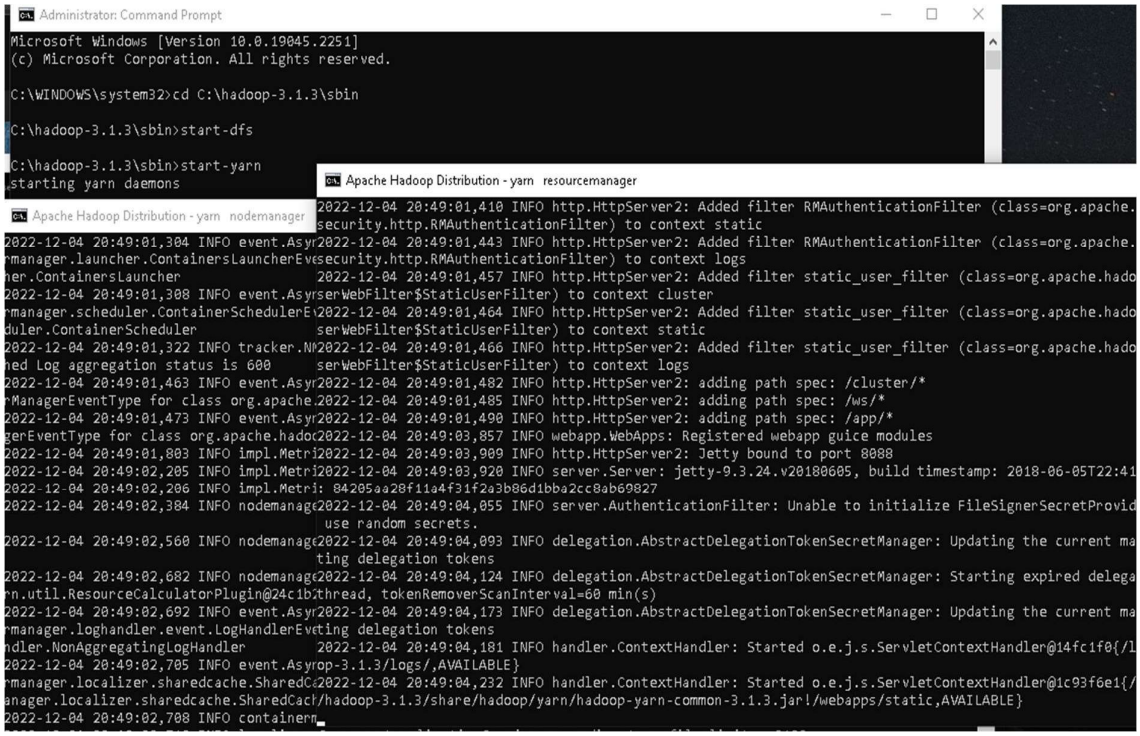

Edit System Variable
Variable name:
DERBY_HOME
Variable value:
C:\hadoop-3.1.3\derby
Browse Directory...
Browse File...
OK
Cancel



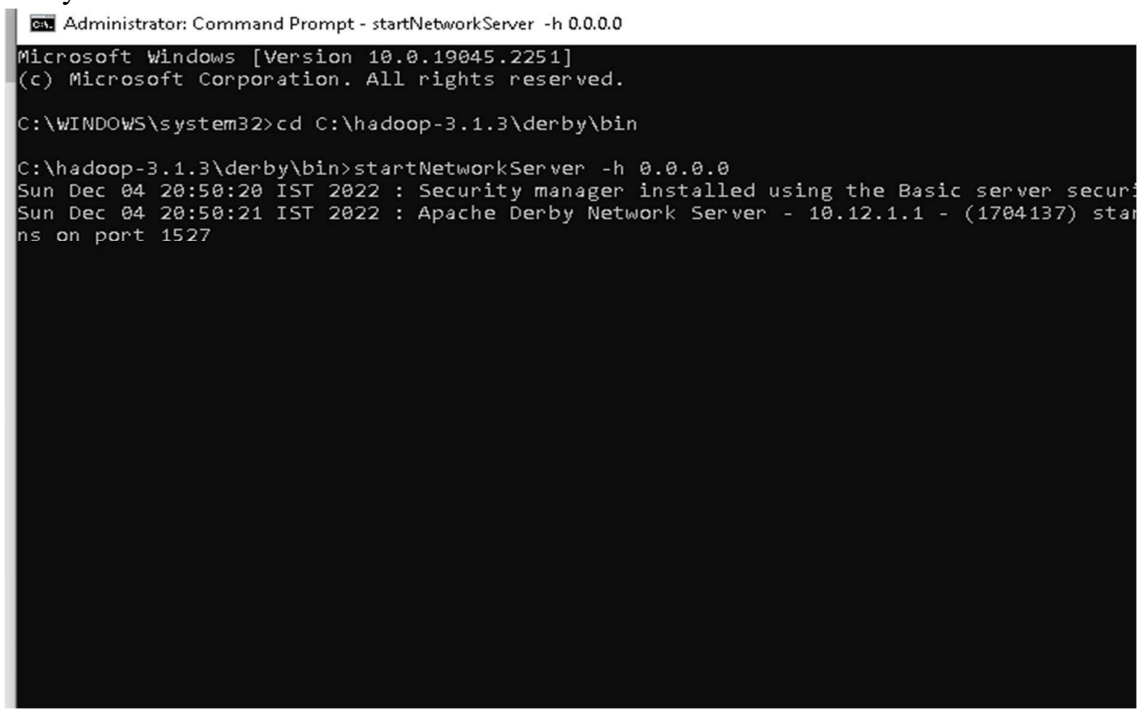
Step 6: First start Hadoop by using command 'start-dfs'



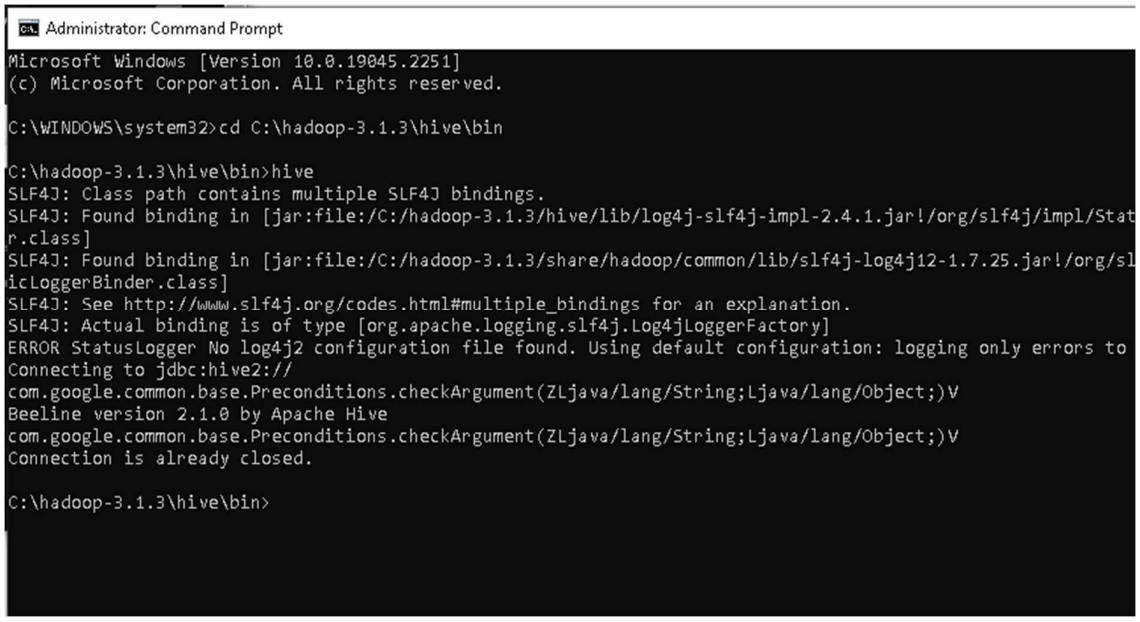
Step 7: Then start yarn by using command 'start-yarn' in cmd



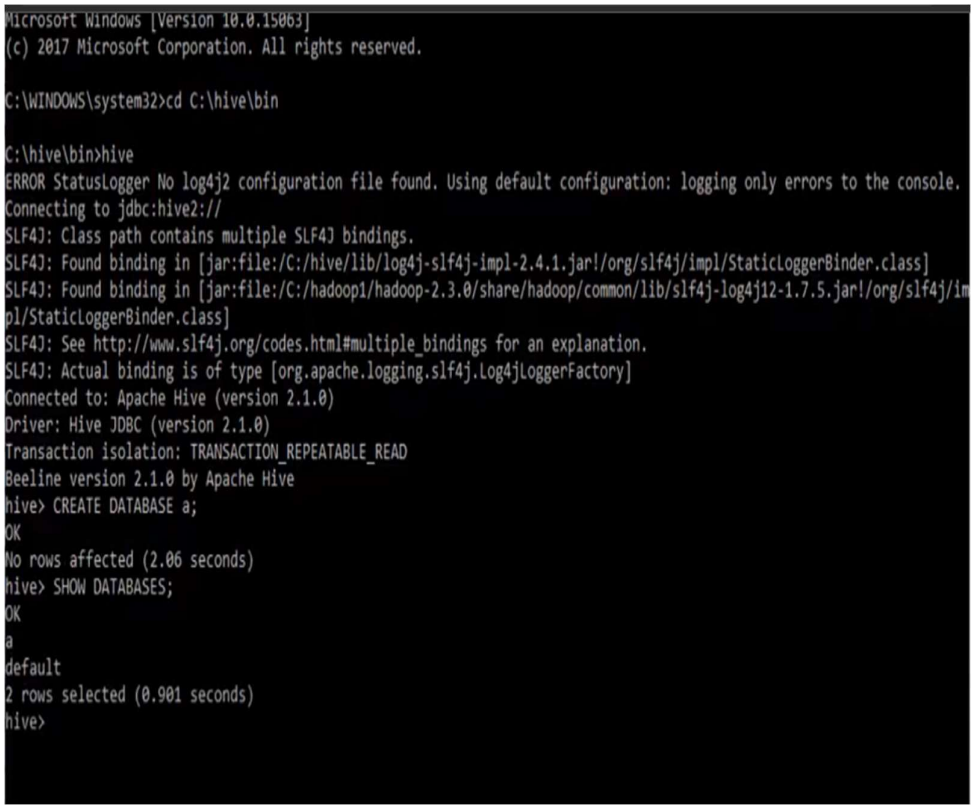
Step 8:Open new cmd and change the directory by derby bin "c\:hadoop\derby\bin" run command "startNetworkServer –h 0.0.0.0



Step 9: Open new cmd and change directory by hive bin and run command "hive"



Step 10: Hive as installed Now we can use hive shell



Step 11: Commands in Hive

1.Create : It is used to create a table or database

```
hive> create  database IF NOT EXISTS college;
OK
Time taken: 0.062 seconds
```

2. Show : It is used to show Database, Table, Properties, etc

```
hive> Show databases;
OK
default
firstdb
Time taken: 0.039 seconds, Fetched: 2 row(s)
```

3. ALTER : It is used to make changes to the existing table

Command ALTER TABLE [db_name].old_table_name RENAME
TO [db_name].new_table_name;

```
hive> ALTER TABLE college.senior_students RENAME TO college.college_students;
OK
Time taken: 0.247 seconds
```

4. DESCRIBE: It describes the table columns

Command DESCRIBE [db_name.] table_name[.col_name ([.field_name])

```
hive> describe college.college_students;
OK
id                      bigint                  unique id for each student
name                    string                  student name
age                     int                     sudent age between 16-26
fee                     double                  student college fee
city                    string                  cities to which students belong
state                   string                  student home address streets
zip                     bigint                  student address zip code
Time taken: 0.064 seconds, Fetched: 7 row(s)
```

5. TRUNCATE:Used to permanently truncate and delete the rows of table

Command " truncate table [db_name].table_name"

```
hive>  truncate table college.senior_students;
OK
Time taken: 0.141 seconds
```

6. Create : It use to create table in hive warehouse location

```
hive> create table txnrecords(txnno INT, txndate STRING, custno INT, amount DOUBLE,category STRING, product STRING, city STRIN
G, state STRING, spendby STRING) row format delimited fields terminated by ',' stored as textfile;
OK
Time taken: 1.163 seconds
hive>
```

7 Load : Load operation is used to move the data into corresponding Hive table.

```
hive> LOAD DATA INPATH '/txns1.txt' OVERWRITE INTO TABLE txnrecords;
Loading data to table retail.txnrecords
Deleted hdfs://localhost/user/hive/warehouse/retail.db/txnrecords
OK
Time taken: 0.263 seconds
hive>
```

8 Count : Count aggregate function is used count the total number of the records in a table.

```
hive> select count(*) from txnrecords;
Total MapReduce jobs = 1
Launching Job 1 out of 1
Number of reduce tasks determined at compile time: 1
In order to change the average load for a reducer (in bytes):
  set hive.exec.reducers.bytes.per.reducer=<number>
In order to limit the maximum number of reducers:
  set hive.exec.reducers.max=<number>
In order to set a constant number of reducers:
  set mapred.reduce.tasks=<number>
Starting Job = job_201402270420_0005, Tracking URL = http://localhost:50030/jobdetails.jsp?jobid=job_201402270420_0005
Kill Command = /usr/lib/hadoop/bin/hadoop job  -Dmapred.job.tracker=localhost:8021 -kill job_201402270420_0005
2014-02-28 20:02:41,231 Stage-1 map = 0%,  reduce = 0%
2014-02-28 20:02:48,293 Stage-1 map = 50%,  reduce = 0%
2014-02-28 20:02:49,309 Stage-1 map = 100%,  reduce = 0%
2014-02-28 20:02:55,350 Stage-1 map = 100%,  reduce = 33%
2014-02-28 20:02:56,367 Stage-1 map = 100%,  reduce = 100%
Ended Job = job_201402270420_0005
OK
50000
Time taken: 19.027 seconds
```

Practical 4

Aim: Implementation of HBASE

What is Hadoop?

Apache Hadoop is an open-source framework that is used to efficiently store and process large datasets ranging in size from gigabytes to petabytes of data. Instead of using one large computer to store and process the data, Hadoop allows clustering multiple computers to analyse massive datasets in parallel more quickly.

Hadoop consists of four main modules:

1. Hadoop Distributed File System (HDFS) – A distributed file system that runs on standard or low-end hardware. HDFS provides better data throughput than traditional file systems, in addition to high fault tolerance and native support of large datasets.
2. Yet Another Resource Negotiator (YARN) – Manages and monitors cluster nodes and resource usage. It schedules jobs and tasks.
3. MapReduce – A framework that helps programs do the parallel computation on data. The map task takes input data and converts it into a dataset that can be computed in key value pairs. The output of the map task is consumed by reduce tasks to aggregate output and provide the desired result.
4. Hadoop Common – Provides common Java libraries that can be used across all modules.

What is HBase?

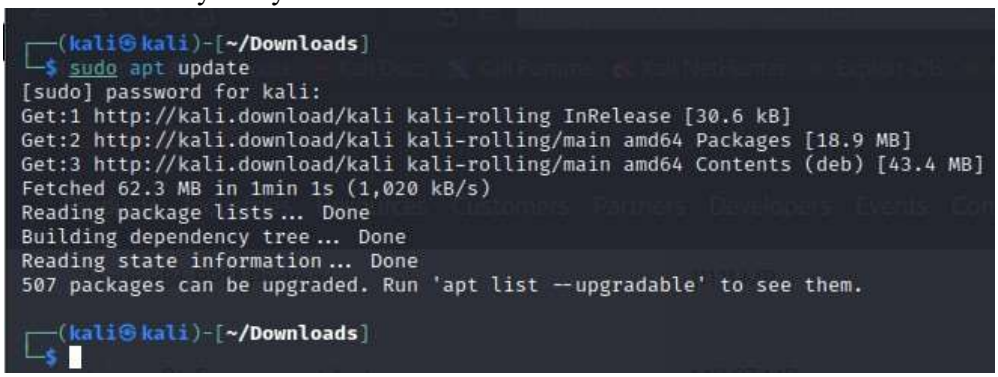
Apache HBase is an open-source, NoSQL, distributed big data store. It enables random, strictly consistent, real-time access to petabytes of data. HBase is very effective for handling large, sparse datasets.
HBase integrates seamlessly with Apache Hadoop and the Hadoop ecosystem and runs on top of the Hadoop Distributed File System (HDFS) or Amazon S3 using Amazon Elastic MapReduce (EMR) file system, or EMRFS. HBase serves as a direct input and output to the Apache MapReduce framework for Hadoop, and works with Apache Phoenix to enable SQL-like queries over HBase tables.

Installation:

A. Java 8:

(Note: in order to run Hadoop, we will require Java 8, i.e., jdk1.8.0_341)

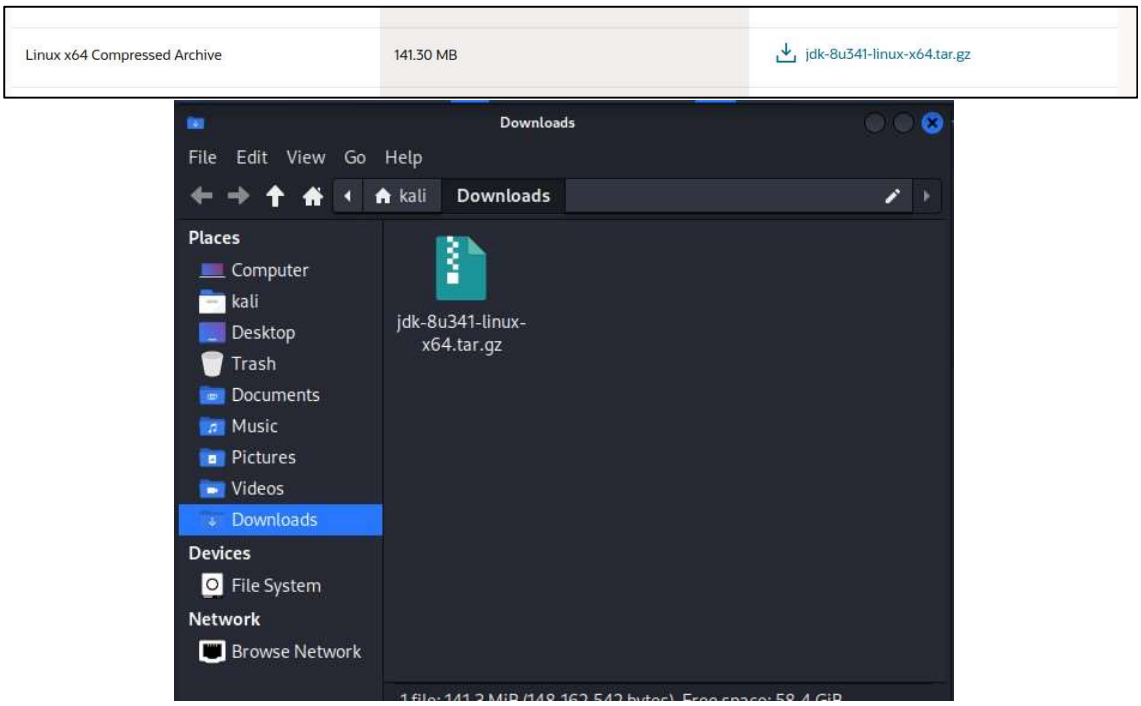
1. Update the Linux distribution on your system



2. Update your Java Development Kit (JDK)

```
┌──(kali㉿kali)-[~/Downloads]
└─$ sudo apt-get install default-jdk
Reading package lists ... Done
Building dependency tree ... Done
Reading state information ... Done
The following packages were automatically installed and are no longer required:
  libatk1.0-data libev4 libexporter-tiny-perl libflac8 libfmt8 libhttp-server-simple-perl libilmbase25 liblerc3 liblist-moreutils-perl
  liblist-moreutils-xs-perl libopenexr25 libopenh264-6 libperl5.34 libplacebo192 libpoppler118 libpython3.9-minimal libpython3.9-stdlib libsvtav1enc0
  libwebsockets16 libwireshark15 libwiretap12 libwsutil13 openjdk-11-jre perl-modules-5.34 python3-dataclasses-json python3-limiter
  python3-marshmallow-enum python3-mypy-extensions python3-responses python3-spyse python3-token-bucket python3-typing-inspect python3.9
  python3.9-minimal
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  default-jdk-headless default-jre default-jre-headless java-common libice-dev libpthread-stubs0-dev libsm-dev libx11-dev libxau-dev libxcb1-dev
  libxdmcp-dev libxt-dev openjdk-17-jdk openjdk-17-jdk-headless openjdk-17-jre openjdk-17-jre-headless x11proto-dev xorg-sgml-doctools xtrans-dev
Suggested packages:
  libice-doc libsm-doc libx11-doc libxcb-doc libxt-doc openjdk-17-demo openjdk-17-source visualvm fonts-ipafont-gothic fonts-ipafont-mincho
  fonts-wqy-microhei | fonts-wqy-zenhei fonts-indic
The following NEW packages will be installed:
  default-jdk default-jdk-headless libice-dev libpthread-stubs0-dev libsm-dev libx11-dev libxau-dev libxcb1-dev libxdmcp-dev libxt-dev openjdk-17-jdk
  openjdk-17-jdk-headless openjdk-17-jre openjdk-17-jre-headless x11proto-dev xorg-sgml-doctools xtrans-dev
The following packages will be upgraded:
  default-jre default-jre-headless java-common
3 upgraded, 17 newly installed, 0 to remove and 504 not upgraded.
Need to get 280 MB of archives.
After this operation, 442 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://kali.download/kali kali-rolling/main amd64 java-common all 0.73 [6,268 B]
Get:2 http://http.kali.org/kali kali-rolling/main amd64 openjdk-17-jre-headless amd64 17.0.5+8-2 [43.6 MB]
Get:3 http://kali.download/kali kali-rolling/main amd64 default-jre amd64 2:1.17-73 [1,060 B]
Get:4 http://kali.download/kali kali-rolling/main amd64 default-jre-headless amd64 2:1.17-73 [2,812 B]
```

3. Download Java from the given link:
https://www.oracle.com/java/technologies/javase/javase8u211-later-archivedownloads.html



As seen in the image below, the Java version is 17.
Path "/usr/lib/jvm" is where all the java files are available.

```
┌──(kali㉿kali)-[~]
└─$ java --version
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
openjdk 17.0.5 2022-10-18
OpenJDK Runtime Environment (build 17.0.5+8-Debian-2)
OpenJDK 64-Bit Server VM (build 17.0.5+8-Debian-2, mixed mode, sharing)

┌──(kali㉿kali)-[~]
└─$ cd /usr/lib/jvm/

┌──(kali㉿kali)-[/usr/lib/jvm]
└─$ ll
total 12
lrwxrwxrwx 1 root root   25 Oct 31 14:07 default-java → java-1.17.0-openjdk-amd64
lrwxrwxrwx 1 root root   21 Jul 20 04:54 java-1.11.0-openjdk-amd64 → java-11-openjdk-amd64
lrwxrwxrwx 1 root root   21 Oct 19 10:23 java-1.17.0-openjdk-amd64 → java-17-openjdk-amd64
drwxr-xr-x 7 root root 4096 Aug  8 06:05 java-11-openjdk-amd64
drwxr-xr-x 9 root root 4096 Dec  1 03:01 java-17-openjdk-amd64
drwxr-xr-x 2 root root 4096 Dec  1 03:02 openjdk-17

┌──(kali㉿kali)-[/usr/lib/jvm]
└─$
```

4. Extract Java 8 files in the path "/usr/lib/jvm".

```
┌──(kali㉿kali)-[/usr/lib/jvm]
└─$ sudo tar -xvzf ~/Downloads/jdk-8u341-linux-x64.tar.gz
[sudo] password for kali:
jdk1.8.0_341/COPYRIGHT
jdk1.8.0_341/LICENSE
jdk1.8.0_341/README.html
jdk1.8.0_341/THIRDPARTYLICENSEREADME.txt
jdk1.8.0_341/bin/java-rmi.cgi
jdk1.8.0_341/bin/appletviewer
jdk1.8.0_341/bin/extcheck
jdk1.8.0_341/bin/idlj
jdk1.8.0_341/bin/jar
jdk1.8.0_341/bin/jarsigner
jdk1.8.0_341/bin/javac
```

As seen in the image below files are extract in the folder "jdk1.8.0_341".

```
┌──(kali㉿kali)-[/usr/lib/jvm]
└─$ ll
total 16
lrwxrwxrwx 1 root root   25 Oct 31 14:07 default-java → java-1.17.0-openjdk-amd64
lrwxrwxrwx 1 root root   21 Jul 20 04:54 java-1.11.0-openjdk-amd64 → java-11-openjdk-amd64
lrwxrwxrwx 1 root root   21 Oct 19 10:23 java-1.17.0-openjdk-amd64 → java-17-openjdk-amd64
drwxrwxrwx 7 root root 4096 Aug  8 06:05 java-11-openjdk-amd64
drwxrwxrwx 9 root root 4096 Dec  1 03:01 java-17-openjdk-amd64
drwxrwxrwx 8 root root 4096 Dec  1 12:10 jdk1.8.0_341
drwxrwxrwx 2 root root 4096 Dec  1 03:02 openjdk-17
```

5. Add the files path in the environment file as shown in the image.
We need to add

a. "/usr/lib/jvm/jdk1.8.0_341/bin"
b. "/usr/lib/jvm/jdk1.8.0_341/jre/bin"

```
┌──(kali㉿kali)-[/usr/lib/jvm]
└─$ cd jdk1.8.0_341

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ vi /etc/environment

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo vi /etc/environment

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo vi /etc/environment

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ more /etc/environment
# START KALI-DEFAULTS CONFIG
# Everything from here and until STOP KALI-DEFAULTS CONFIG
# was installed by the kali-defaults package, and it will
# be removed if ever the kali-defaults package is removed.
# If you want to disable a line, please do NOT remove it,
# as it would be added back when kali-defaults is upgraded.
# Instead, comment the line out, and your change will be
# preserved across upgrades.
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/local/games:/usr/games:/usr/lib/jvm/jdk1.8.0_341/bin:/usr/lib/jvm/jdk1.8.0_341/jre/bin
COMMAND_NOT_FOUND_INSTALL_PROMPT=1
POWERSHELL_UPDATECHECK=Off
POWERSHELL_TELEMETRY_OPTOUT=1
DOTNET_CLI_TELEMETRY_OPTOUT=1
# STOP KALI-DEFAULTS CONFIG
```

6. Now we have to update the Java version to the Java 8.

```
┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --install "/usr/bin/java" "java" "/usr/lib/jvm/jdk1.8.0_341/bin/java" 0

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --install "/usr/bin/java" "java" "/usr/lib/jvm/jdk1.8.0_341/bin/javac" 0

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --set java /usr/lib/jvm/jdk1.8.0_341/bin/java
update-alternatives: using /usr/lib/jvm/jdk1.8.0_341/bin/java to provide /usr/bin/java (java) in manual mode

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --set java /usr/lib/jvm/jdk1.8.0_341/bin/javac
update-alternatives: using /usr/lib/jvm/jdk1.8.0_341/bin/javac to provide /usr/bin/java (java) in manual mode

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$
```

```
┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --config java
There are 4 choices for the alternative java (providing /usr/bin/java).

  Selection    Path                                            Priority   Status
------------------------------------------------------------
  0            /usr/lib/jvm/java-17-openjdk-amd64/bin/java      1711      auto mode
  1            /usr/lib/jvm/java-11-openjdk-amd64/bin/java      1111      manual mode
  2            /usr/lib/jvm/java-17-openjdk-amd64/bin/java      1711      manual mode
  3            /usr/lib/jvm/jdk1.8.0_341/bin/java               0         manual mode
* 4            /usr/lib/jvm/jdk1.8.0_341/bin/javac              0         manual mode

Press <enter> to keep the current choice[*], or type selection number: 3
update-alternatives: using /usr/lib/jvm/jdk1.8.0_341/bin/java to provide /usr/bin/java (java) in manual mode

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ java -version
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
java version "1.8.0_341"
Java(TM) SE Runtime Environment (build 1.8.0_341-b10)
Java HotSpot(TM) 64-Bit Server VM (build 25.341-b10, mixed mode)

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$
```

```
┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --install "/usr/bin/javac" "javac" "/usr/lib/jvm/jdk1.8.0_341/bin/javac" 1

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --set javac /usr/lib/jvm/jdk1.8.0_341/bin/javac
update-alternatives: using /usr/lib/jvm/jdk1.8.0_341/bin/javac to provide /usr/bin/javac (javac) in manual mode

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --config javac
There are 2 choices for the alternative javac (providing /usr/bin/javac).

  Selection    Path                                           Priority   Status
------------------------------------------------------------
  0            /usr/lib/jvm/java-17-openjdk-amd64/bin/javac    1711      auto mode
  1            /usr/lib/jvm/java-17-openjdk-amd64/bin/javac    1711      manual mode
* 2            /usr/lib/jvm/jdk1.8.0_341/bin/javac             1         manual mode

Press <enter> to keep the current choice[*], or type selection number: 2

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$
```

As shown in the below image, the Java version is changed to Java 8.

```
┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ java -version
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
java version "1.8.0_341"
Java(TM) SE Runtime Environment (build 1.8.0_341-b10)
Java HotSpot(TM) 64-Bit Server VM (build 25.341-b10, mixed mode)

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ javac -version
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
javac 1.8.0_341

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$
```

B. Hadoop:

1. Create a separate user for Hadoop. For installation as well as execution.

```
┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo addgroup hadoop
Adding group `hadoop' (GID 1001) ...
Done.

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo adduser --ingroup hadoop dion
Adding user `dion' ...
Adding new user `dion' (1002) with group `hadoop (1001)' ...
Creating home directory `/home/dion' ...
Copying files from `/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for dion
Enter the new value, or press ENTER for the default
        Full Name []: Big Data Project Dion
        Room Number []:
        Work Phone []:
        Home Phone []:
        Other []:
Is the information correct? [Y/n] Y
Adding new user `dion' to supplemental / extra groups `users' ...
Adding user `dion' to group `users' ...

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo adduser dion sudo
Adding user `dion' to group `sudo' ...
Done.

┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$
```

2. Now we will install the SSH Server.
This is necessary for us to start the various components in Hadoop.

```
┌──(kali㉿kali)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo apt install openssh-server openssh-client -y
Reading package lists ... Done
Building dependency tree ... Done
Reading state information ... Done
openssh-server is already the newest version (1:9.0p1-1+b2).
openssh-server set to manually installed.
openssh-client is already the newest version (1:9.0p1-1+b2).
The following packages were automatically installed and are no longer required:
  libatk1.0-data libev4 libexporter-tiny-perl libflac8 libfmt8 libhttp-server-simple-perl libilmbase25 liblerc3 liblist-moreutils-perl
  liblist-moreutils-xs-perl libopenexr25 libopenh264-6 libperl5.34 libplacebo192 libpoppler118 libpython3.9-minimal libpython3.9-stdlib libsvtav1enc0
  libwebsockets16 libwireshark15 libwiretap12 libwsutil13 openjdk-11-jre perl-modules-5.34 python3-dataclasses-json python3-limiter
  python3-marshmallow-enum python3-mypy-extensions python3-responses python3-spyse python3-token-bucket python3-typing-inspect python3.9
  python3.9-minimal
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 504 not upgraded.
```

3. Switch user from “kali” to “dion”.

4. Create SSH key

5. Save the Key.

6. Now, we will start a SSH server on localhost.

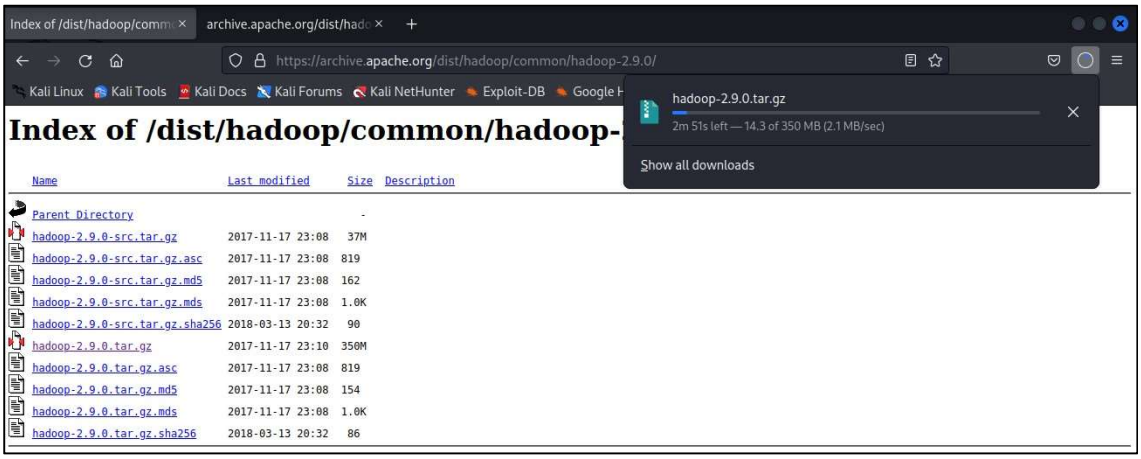
```
┌──(dion㉿kali)-[~]
└─$ sudo service ssh status
[sudo] password for dion:
○ ssh.service - OpenBSD Secure Shell server
     Loaded: loaded (/lib/systemd/system/ssh.service; disabled; preset: disabled)
     Active: inactive (dead)
       Docs: man:sshd(8)
             man:sshd_config(5)

┌──(dion㉿kali)-[~]
└─$ sudo service ssh start

┌──(dion㉿kali)-[~]
└─$ sudo service ssh status
● ssh.service - OpenBSD Secure Shell server
     Loaded: loaded (/lib/systemd/system/ssh.service; disabled; preset: disabled)
     Active: active (running) since Fri 2022-12-02 04:57:30 EST; 10s ago
       Docs: man:sshd(8)
             man:sshd_config(5)
    Process: 33683 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS)
   Main PID: 33691 (sshd)
      Tasks: 1 (limit: 4619)
     Memory: 2.8M
        CPU: 2.735s
     CGroup: /system.slice/ssh.service
             └─33691 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"

Dec 02 04:57:27 kali systemd[1]: Starting OpenBSD Secure Shell server...
Dec 02 04:57:30 kali sshd[33691]: Server listening on 0.0.0.0 port 22.
Dec 02 04:57:30 kali sshd[33691]: Server listening on :: port 22.
Dec 02 04:57:30 kali systemd[1]: Started OpenBSD Secure Shell server.

┌──(dion㉿kali)-[~]
└─$
```

```
┌──(dion㉿kali)-[~]
└─$ ssh localhost
The authenticity of host 'localhost (::1)' can't be established.
ED25519 key fingerprint is SHA256:4d/aOZ+eRqT6Fo3x+/YXef9MGbJpSqX5OTzGKfftfu4.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'localhost' (ED25519) to the list of known hosts.
dion@localhost's password:
Linux kali 5.19.0-kali2-amd64 #1 SMP PREEMPT_DYNAMIC Debian 5.19.11-1kali2 (2022-10-10) x86_64

The programs included with the Kali GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Kali GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
```

7. Close the session.

```
┌──(dion㉿kali)-[~]
└─$ exit
logout
Connection to localhost closed.
```

8. Download Hadoop from the below link as shown in the image:



https://archive.apache.org/dist/hadoop/common/hadoop-2.9.0/ 9. After downloading the file, extract the tar file.

```
┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ ll
total 358156
-rwxrwxrwx 1 kali kali 366744329 Dec  2 05:15 hadoop-2.9.0.tar.gz

┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ sudo tar -xvzf hadoop-2.9.0.tar.gz
[sudo] password for dion:
hadoop-2.9.0/
hadoop-2.9.0/include/
hadoop-2.9.0/include/Pipes.hh
hadoop-2.9.0/include/SerialUtils.hh
hadoop-2.9.0/include/hdfs.h
hadoop-2.9.0/include/StringUtils.hh
hadoop-2.9.0/include/TemplateFactory.hh
hadoop-2.9.0/NOTICE.txt
hadoop-2.9.0/lib/
hadoop-2.9.0/lib/native/
hadoop-2.9.0/lib/native/libhdfs.a
hadoop-2.9.0/lib/native/libhadoop.so
```

10. Move all the content in the file to the “hadoop” file in the local system. As well as give rights for user “dion” to access it.

```
┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ ll
total 358160
drwxrwxrwx 9 kali kali      4096 Nov 13  2017 hadoop-2.9.0
-rwxrwxrwx 1 kali kali 366744329 Dec  2 05:15 hadoop-2.9.0.tar.gz

┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ sudo mv hadoop-2.9.0 /usr/local/hadoop

┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ ll hadoop-2.9.0
ls: cannot access 'hadoop-2.9.0': No such file or directory

┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ ll
total 358156
-rwxrwxrwx 1 kali kali 366744329 Dec  2 05:15 hadoop-2.9.0.tar.gz

┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ sudo chown -R dion /usr/local

┌──(dion㉿kali)-[/home/kali/Downloads]
└─$
```

11. Add Configurations in the profile of the system("bashrc").

```
┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ sudo vi ~/.bashrc
```

The Configurations are:
export JAVA_HOME=/usr/lib/jvm/jdk1.8.0_341 export
JAVA_PATH=$PATH:$JAVA_HOME/bin export
HADOOP_HOME=/usr/local/hadoop 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 export
HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_HOME/native export
HADOOP_OPTS="-Djava.library.path=$HADOOP_HOME/native"

Run "source ~/.bashrc" to enable the changes.

```
┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ source ~/.bashrc
```

12. Add the Java Path in Hadoop environment file

```
┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ sudo vi /usr/local/hadoop/etc/hadoop/hadoop-env.sh
```

```
# The java implementation to use.
#export JAVA_HOME=${JAVA_HOME}
export JAVA_HOME=/usr/lib/jvm/jdk1.8.0_341
```

13. Make changes in "core-site.xml".

core-site.xml:
The core-site.xml file contains information such as the port number used for Hadoop instance, memory allocated for file system, memory limit for storing data, and the size of Read/Write buffers.

Core-Site.xml configuration:
<property>
<name>fs.default.name</name>
<value>hdfs://localhost:9000</value>
</property>

```
┌──(dion㉿kali)-[/usr/local/hadoop/etc/hadoop]
└─$ vi core-site.xml
```

```
<configuration>
        <property>
                <name>fs.default.name</name>
                <value>hdfs://localhost:9000</value>
        </property>
</configuration>
```

14. Make changes in “hdfs-site.xml”.

hdfs-site.xml:
The hdfs-site.xml file contains information such as the value of replication data, namenode path, and datanode path of your local file systems, where you want to store the Hadoop infrastructure.

HDFS-Site.xml configuration:
<property>
<name>dfs.replication</name>
<value>1</value>
</property>
<property>
<name>dfs.name.name.dir</name>
<value>file:/usr/local/hadoop_tmp/hdfs/namenode</value>
</property>
<property>
<name>dfs.data.data.dir</name>
<value>file:/usr/local/hadoop_tmp/hdfs/datanode</value>
</property>

```
┌──(dion㉿kali)-[/usr/local/hadoop/etc/hadoop]
└─$ vi hdfs-site.xml
```

```
<configuration>
        <property>
                <name>dfs.replication</name>
                <value>1</value>
        </property>
        <property>
                <name>dfs.name.name.dir</name>
                <value>file:/usr/local/hadoop_tmp/hdfs/namenode</value>
        </property>
        <property>
                <name>dfs.data.data.dir</name>
                <value>file:/usr/local/hadoop_tmp/hdfs/datanode</value>
        </property>
</configuration>
```

15. Make changes in “yarn-site.xml”.

yarn-site.xml:
This file is used to configure yarn into Hadoop.

YARN-Site.xml configuration:
<property>
<name>yarn.nodemanager.aux-services</name>
<value>mapreduce_shuffle</value>
</property>

```
┌──(dion㉿kali)-[/usr/local/hadoop/etc/hadoop]
└─$ vi yarn-site.xml
```

```
<configuration>
        <property>
                <name>yarn.nodemanager.aux-services</name>
                <value>mapreduce_shuffle</value>
        </property>
</configuration>
```

16. Now we must configure the mapred-site.xml.

In order to do this we will have to create the file “mapred-site.xml” by copy it from “mapred-site.xml.template” as show in the image below.

```
┌──(dion㉿kali)-[/usr/local/hadoop/etc/hadoop]
└─$ cat mapred-site.xml.template > mapred-site.xml

┌──(dion㉿kali)-[/usr/local/hadoop/etc/hadoop]
└─$ chmod -R 777 *

┌──(dion㉿kali)-[/usr/local/hadoop/etc/hadoop]
└─$ ll
total 160
-rwxrwxrwx 1 dion kali    7861 Nov 13  2017 capacity-scheduler.xml
-rwxrwxrwx 1 dion kali    1335 Nov 13  2017 configuration.xsl
-rwxrwxrwx 1 dion kali    1211 Nov 13  2017 container-executor.cfg
-rwxrwxrwx 1 dion kali     869 Dec  2 06:11 core-site.xml
-rwxrwxrwx 1 dion kali    3804 Nov 13  2017 hadoop-env.cmd
-rwxrwxrwx 1 dion kali    4710 Dec  2 05:59 hadoop-env.sh
-rwxrwxrwx 1 dion kali    2598 Nov 13  2017 hadoop-metrics2.properties
-rwxrwxrwx 1 dion kali    2490 Nov 13  2017 hadoop-metrics.properties
-rwxrwxrwx 1 dion kali   10206 Nov 13  2017 hadoop-policy.xml
-rwxrwxrwx 1 dion kali    1081 Dec  2 06:13 hdfs-site.xml
-rwxrwxrwx 1 dion kali    2230 Nov 13  2017 httpfs-env.sh
-rwxrwxrwx 1 dion kali    1657 Nov 13  2017 httpfs-log4j.properties
-rwxrwxrwx 1 dion kali      21 Nov 13  2017 httpfs-signature.secret
-rwxrwxrwx 1 dion kali     620 Nov 13  2017 httpfs-site.xml
-rwxrwxrwx 1 dion kali    3518 Nov 13  2017 kms-acls.xml
-rwxrwxrwx 1 dion kali    3139 Nov 13  2017 kms-env.sh
-rwxrwxrwx 1 dion kali    1788 Nov 13  2017 kms-log4j.properties
-rwxrwxrwx 1 dion kali    5939 Nov 13  2017 kms-site.xml
-rwxrwxrwx 1 dion kali   14016 Nov 13  2017 log4j.properties
-rwxrwxrwx 1 dion kali    1076 Nov 13  2017 mapred-env.cmd
-rwxrwxrwx 1 dion kali    1507 Nov 13  2017 mapred-env.sh
-rwxrwxrwx 1 dion kali    4113 Nov 13  2017 mapred-queues.xml.template
-rwxrwxrwx 1 dion hadoop   758 Dec  2 06:17 mapred-site.xml
-rwxrwxrwx 1 dion kali     758 Nov 13  2017 mapred-site.xml.template
-rwxrwxrwx 1 dion kali      10 Nov 13  2017 slaves
-rwxrwxrwx 1 dion kali    2316 Nov 13  2017 ssl-client.xml.example
-rwxrwxrwx 1 dion kali    2697 Nov 13  2017 ssl-server.xml.example
-rwxrwxrwx 1 dion kali    2250 Nov 13  2017 yarn-env.cmd
-rwxrwxrwx 1 dion kali    4876 Nov 13  2017 yarn-env.sh
-rwxrwxrwx 1 dion kali     740 Dec  2 06:16 yarn-site.xml

┌──(dion㉿kali)-[/usr/local/hadoop/etc/hadoop]
└─$ vi mapred-site.xml
```

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

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

17. Next, we will create the following directories and transfer the ownership to the "dion". These directories are where hadoop will store data about the namenode and the datanode.

```
┌──(dion㉿kali)-[/usr/local/hadoop/etc/hadoop]
└─$ sudo mkdir -p /usr/local/hadoop_space
[sudo] password for dion:
Sorry, try again.
[sudo] password for dion:

┌──(dion㉿kali)-[/usr/local/hadoop/etc/hadoop]
└─$ sudo mkdir -p /usr/local/hadoop_space/hdfc/namenode

┌──(dion㉿kali)-[/usr/local/hadoop/etc/hadoop]
└─$ sudo mkdir -p /usr/local/hadoop_space/hdfc/datanode

┌──(dion㉿kali)-[/usr/local/hadoop/etc/hadoop]
└─$ sudo chown -R dion /usr/local/hadoop_space

┌──(dion㉿kali)-[/usr/local/hadoop/etc/hadoop]
└─$
```

18. Then we format the namenode in the HDFS file structure.

```
┌──(dion㉿kali)-[~]
└─$ hdfs namenode -format
22/12/02 06:26:36 INFO namenode.NameNode: STARTUP_MSG:
/************************************************************
STARTUP_MSG: Starting NameNode
STARTUP_MSG:   host = kali/127.0.1.1
STARTUP_MSG:   args = [-format]
STARTUP_MSG:   version = 2.9.0
STARTUP_MSG:   classpath = /usr/local/hadoop/etc/hadoop:/usr/lo
4.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-digeste
lf4j-api-1.7.25.jar:/usr/local/hadoop/share/hadoop/common/lib/c
mon/lib/mockito-all-1.8.5.jar:/usr/local/hadoop/share/hadoop/co
p/common/lib/snappy-java-1.0.5.jar:/usr/local/hadoop/share/hado
/share/hadoop/common/lib/xz-1.0.jar:/usr/local/hadoop/share/had
```

19. Next we will start the Distributed file system.

```
┌──(dion㉿kali)-[~]
└─$ start-dfs.sh
22/12/02 06:27:49 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builti
n-java classes where applicable
Starting namenodes on [localhost]
dion@localhost's password:
localhost: starting namenode, logging to /usr/local/hadoop/logs/hadoop-dion-namenode-kali.out
dion@localhost's password:
localhost: starting datanode, logging to /usr/local/hadoop/logs/hadoop-dion-datanode-kali.out
Starting secondary namenodes [0.0.0.0]
The authenticity of host '0.0.0.0 (0.0.0.0)' can't be established.
ED25519 key fingerprint is SHA256:4d/aOZ+eRqT6Fo3x+/YXef9MGbJpSqX5OTzGKfftfu4.
This host key is known by the following other names/addresses:
    ~/.ssh/known_hosts:1: [hashed name]
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
0.0.0.0: Warning: Permanently added '0.0.0.0' (ED25519) to the list of known hosts.
dion@0.0.0.0's password:
0.0.0.0: starting secondarynamenode, logging to /usr/local/hadoop/logs/hadoop-dion-secondarynamenode-kali.out
22/12/02 06:31:35 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builti
n-java classes where applicable
```

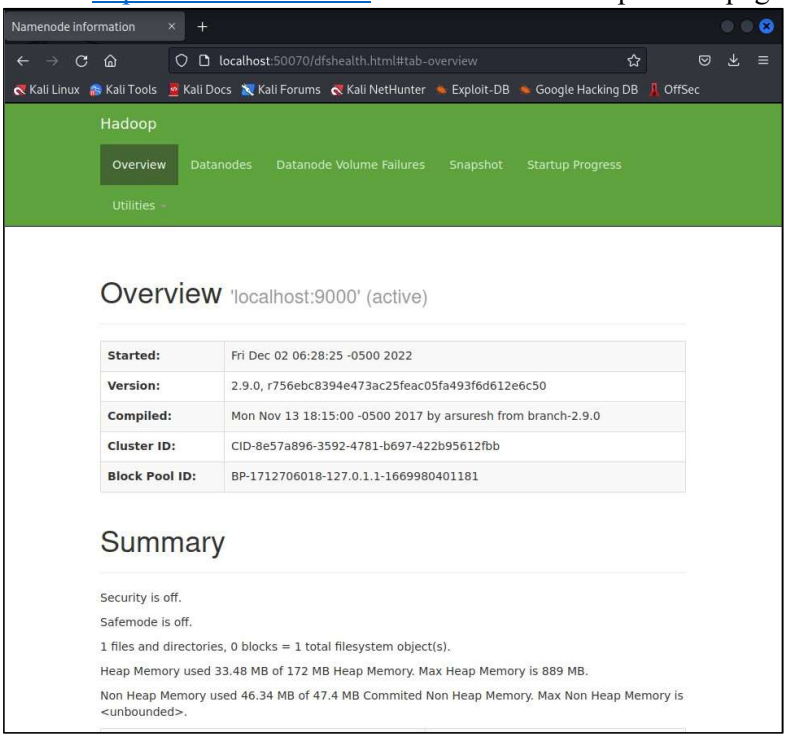
20. Followed by the YARN system.

```
┌──(dion㉿kali)-[~]
└─$ start-yarn.sh
starting yarn daemons
starting resourcemanager, logging to /usr/local/hadoop/logs/yarn-dion-resourcemanager-kali.out
dion@localhost's password:
localhost: starting nodemanager, logging to /usr/local/hadoop/logs/yarn-dion-nodemanager-kali.out
```

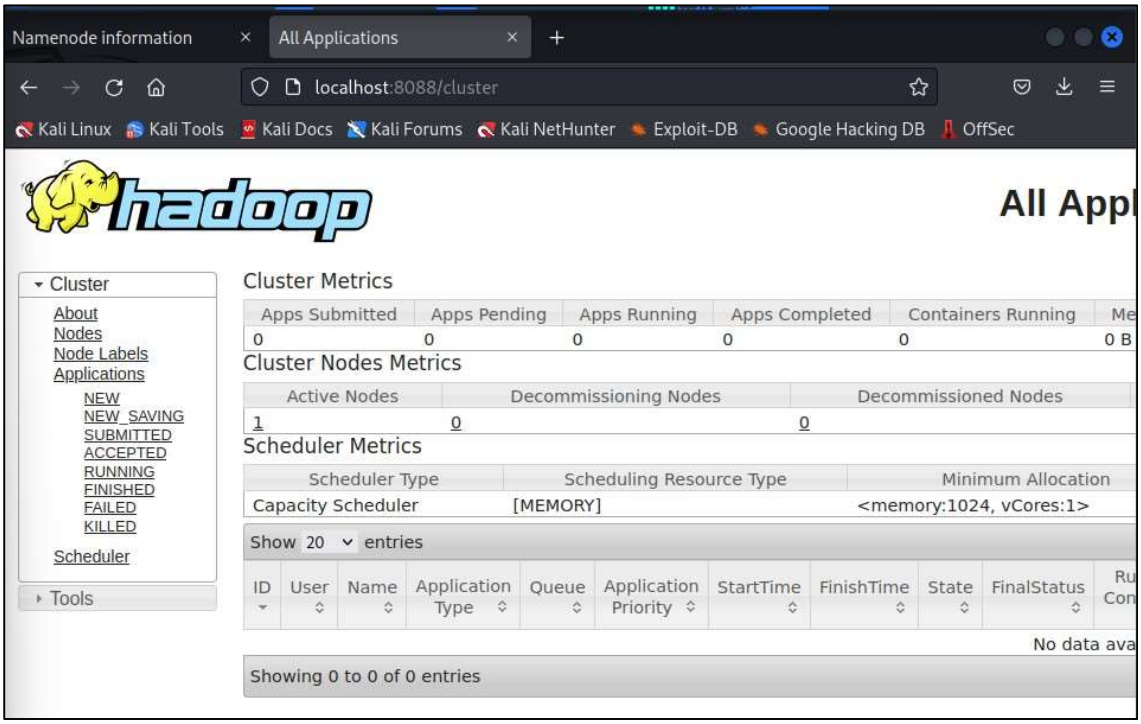
21. Run “start-all.sh” to run all daemons and Check if all the daemons are running

```
┌──(dion㉿kali)-[~]
└─$ start-all.sh
This script is Deprecated. Instead use start-dfs.sh and start-yarn.sh
22/12/02 06:48:32 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builti
n-java classes where applicable
Starting namenodes on [localhost]
dion@localhost's password:
localhost: namenode running as process 56030. Stop it first.
dion@localhost's password:
localhost: datanode running as process 56213. Stop it first.
Starting secondary namenodes [0.0.0.0]
dion@0.0.0.0's password:
0.0.0.0: secondarynamenode running as process 56714. Stop it first.
22/12/02 06:48:48 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builti
n-java classes where applicable
starting yarn daemons
resourcemanager running as process 57508. Stop it first.
dion@localhost's password:
localhost: nodemanager running as process 58225. Stop it first.

┌──(dion㉿kali)-[~]
└─$ jps
61600 Jps
58225 NodeManager
57508 ResourceManager
56213 DataNode
56714 SecondaryNameNode
56030 NameNode
```

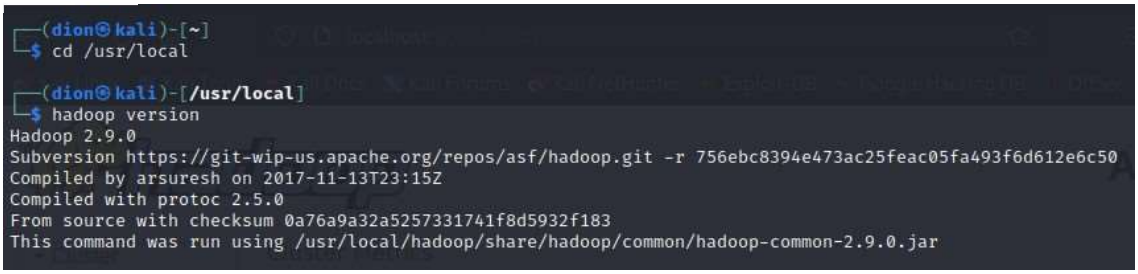
22. As we can see that Hadoop has been successfully installed and activated.
We must go the URL http://localhost:500070 to access the Hadoop Server page.



We can also see the information of the cluster.



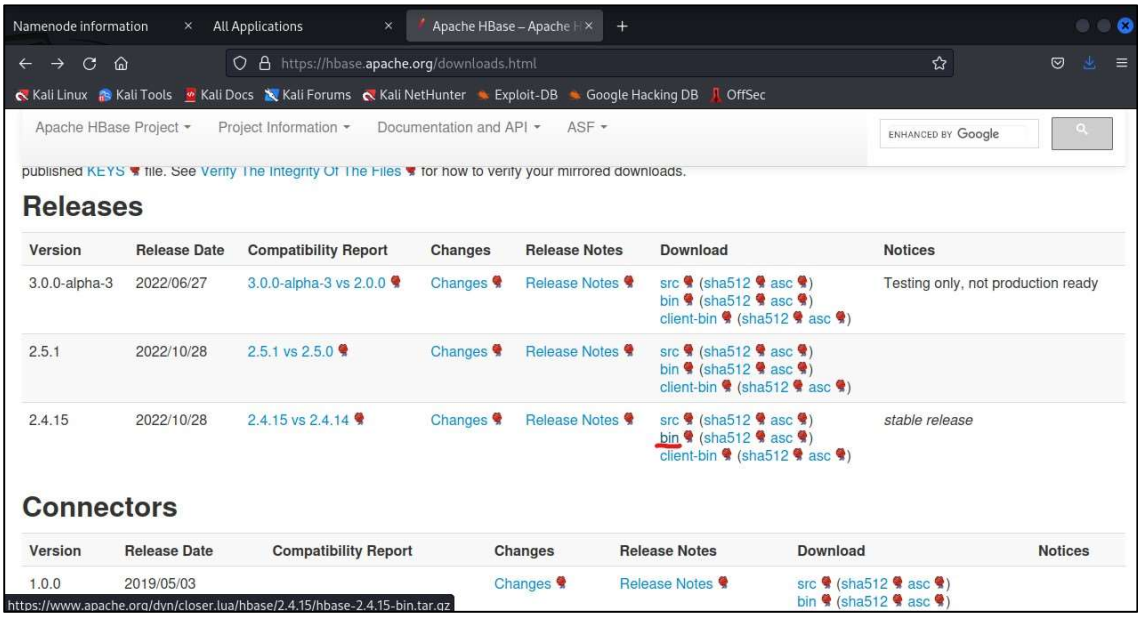
Hadoop Version



Java Version

C. HBASE:

1. Download HBASE from the given link below as shown in the image. *(Note: choose stable version and choose bin)* https://hbase.apache.org/downloads.html




```
┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ ll
total 277576
-rwxrwxrwx 1 kali kali 284230281 Dec  2 09:04 hbase-2.4.15-bin.tar.gz
```

2. Extract the files and move them to the “hbase” folder in local system while giving right for user “dion”.

```
┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ sudo tar -xvzf hbase-2.4.15-bin.tar.gz
hbase-2.4.15/LICENSE.txt
hbase-2.4.15/NOTICE.txt
hbase-2.4.15/LEGAL
hbase-2.4.15/docs/
hbase-2.4.15/docs/apidocs/
hbase-2.4.15/docs/apidocs/org/
hbase-2.4.15/docs/apidocs/org/apache/
hbase-2.4.15/docs/apidocs/org/apache/hadoop/
hbase-2.4.15/docs/apidocs/org/apache/hadoop/hbase/
hbase-2.4.15/docs/apidocs/org/apache/hadoop/hbase/backup/
hbase-2.4.15/docs/apidocs/org/apache/hadoop/hbase/chaos/
hbase-2.4.15/docs/apidocs/org/apache/hadoop/hbase/chaos/class-use/
hbase-2.4.15/docs/apidocs/org/apache/hadoop/hbase/class-use/
```

```
┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ ll
total 277580
drwxrwxrwx 7 root root      4096 Dec  2 09:24 hbase-2.4.15
-rwxrwxrwx 1 kali kali 284230281 Dec  2 09:04 hbase-2.4.15-bin.tar.gz
```

```
┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ sudo mv hbase-2.4.15 /usr/local/hbase

┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ sudo chown -R dion /usr/local
```

3. Add these Configuration in “bashrc” for HBASE/

```
┌──(dion㉿kali)-[/home/kali/Downloads]
└─$ sudo vi ~/.bashrc
```

Configurations:
export HBASE_HOME= /usr/local/hbase
export PATH=$PATH:$HBASE_HOME/bin

```
export HADOOP_OPTS="-Djava.library.path
export HBASE_HOME=/usr/local/hbase
export PATH=$PATH:$HBASE_HOME/bin
```

4. “source” to save and enable the changes.

```
(dion㉿kali)-[/home/kali/Downloads]
$ source ~/.bashrc
```

5. Add Java path in HBASE environment file.

```
(dion㉿kali)-[/usr/local/hbase/conf]
$ vi hbase-env.sh
```

```
# The java implementation to use.  Java 1.8+ required.
export JAVA_HOME=/usr/lib/jvm/jdk1.8.0_341
```

6. Add these configurations in hbase-site.xml.

HBASE-site.xml:

```
<property>
    <name>hbase.rootdir</name>
    <value>file:/usr/local/hbase/hfiles</value>
  </property>
 <property>
   <name>hbase.zookeeper.property.dataDir</name>
   <value>/usr/local/zookeeper</value>
 </property>
 <property>
   <name>hbase.tmp.dir</name>
   <value>./tmp</value>
 </property>
 <property>
   <name>hbase.unsafe.stream.capability.enforce</name>
   <value>false</value>
 </property>
 <property>
   <name>hbase.cluster.distributed</name>
  <value>true</value>
 </property>
 <property>
   <name>hbase.rootdir</name>
   <value>hdfs://localhost:9000/hbase</value>
 </property>
```

```
┌──(dion㉿kali)-[/usr/local/hbase/conf]
└─$ vi hbase-site.xml
```

```
<property>
      <name>hbase.rootdir</name>
      <value>file:/usr/local/hbase/hfiles</value>
   </property>
  <property>
    <name>hbase.zookeeper.property.dataDir</name>
    <value>/usr/local/zookeeper</value>
  </property>
  <property>
    <name>hbase.tmp.dir</name>
    <value>./tmp</value>
  </property>
  <property>
    <name>hbase.unsafe.stream.capability.enforce</name>
    <value>false</value>
  </property>
  <property>
    <name>hbase.cluster.distributed</name>
   <value>true</value>
  </property>
  <property>
    <name>hbase.rootdir</name>
    <value>hdfs://localhost:9000/hbase</value>
  </property>
</configuration>
```

7. Start HBASE.

```
┌──(dion㉿kali)-[/usr/local/hbase/conf]
└─$ cd /usr/local/hbase/bin

┌──(dion㉿kali)-[/usr/local/hbase/bin]
└─$ ./start-hbase.sh
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/local/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/local/hbase/lib/client-facing-thirdparty/slf4j-reload4j-1.7.33.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
running master, logging to /usr/local/hbase/logs/hbase-dion-master-kali.out
```

8. Check if all the daemons are running especially “HMaster”.

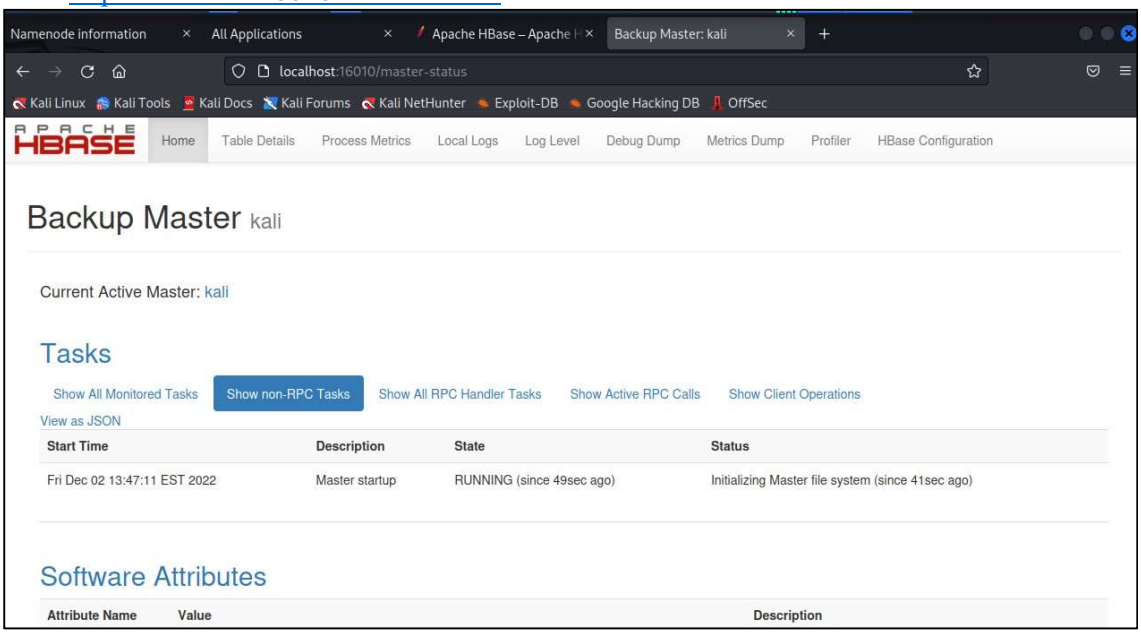
```
┌──(dion㉿kali)-[/usr/local/hbase/conf]
└─$ jps
35026 HQuorumPeer
35142 HMaster
17942 DataNode
17718 NameNode
14631 ResourceManager
35271 HRegionServer
18554 NodeManager
35468 Jps
18141 SecondaryNameNode
```

9. To run HBASE shell, type “hbase shell”.

```
┌──(dion㉿kali)-[~]
└─$ hbase shell
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/local/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/local/hbase/lib/client-facing-thirdparty/slf4j-reload4j-1.7.33.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2022-12-04 23:04:02,937 WARN  [main] util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where appl
icable
HBase Shell
Use "help" to get list of supported commands.
Use "exit" to quit this interactive shell.
For Reference, please visit: http://hbase.apache.org/2.0/book.html#shell
Version 2.4.15, r35310fcd6b11a1d04d75eb7db2e592dd34e4d5b6, Thu Oct 13 11:42:20 PDT 2022
Took 0.0032 seconds
hbase:001:0> version
2.4.15, r35310fcd6b11a1d04d75eb7db2e592dd34e4d5b6, Thu Oct 13 11:42:20 PDT 2022
Took 0.0004 seconds
hbase:002:0> status
1 active master, 0 backup masters, 1 servers, 0 dead, 2.0000 average load
Took 2.8305 seconds
hbase:003:0>
```

10. Since HBASE is working. We can check the web interface by going to the

URL http://localhost:16010/master-status



Implementation:

Here we will create a "Student" table with details such as

a. S_ID,
b. S_NAME(where we will have F_NAME and L_NAME),
c. DOB,
d. GENDER,
e. S_ADDRESS,
f. S_PHONE_NO

Table representation:

S_ID	S_NAME		DOB	GENDER	S_ADDRESS	S_PHONE_NO
	F_NAME	L_NAME				
CS21001	DION	FERNANDES	01-04-2000	M	BANDRA	9999990001
CS21002	RUDRA	RAO	05-12-1998	M	MAHIM	9999990002
CS21003	ZAID	SHAIKH	23-07-2000	M	SION	9999990003
CS21004	RAJ	KUMAR	30-11-1999	M	DADAR	9999990004

1. Run "version" and "status" to check if HBASE is running.

```
hbase:001:0> version
2.4.15, r35310fcd6b11a1d04d75eb7db2e592dd34e4d5b6, Thu Oct 13 11:42:20 PDT 2022
Took 0.0004 seconds
hbase:002:0> status
1 active master, 0 backup masters, 1 servers, 0 dead, 2.0000 average load
Took 2.8305 seconds
```

2. Run “list” to list down the tables available.

```
hbase:004:0> list
TABLE
0 row(s)
Took 0.1644 seconds
⇒ []
hbase:005:0>
```

3. Create table “Student” and check if it is created.

```
hbase:006:0> create 'Student','S_ID','S_NAME','DOB','GENDER','S_ADDRESS','S_PHONE_NO'
Created table Student
Took 1.4548 seconds
⇒ Hbase::Table - Student
hbase:007:0> list
TABLE
Student
1 row(s)
Took 0.0303 seconds
⇒ ["Student"]
hbase:008:0>
```

4. Run “describe ‘Student’”

```
hbase:010:0> describe 'Student'
Table Student is ENABLED
Student
COLUMN FAMILIES DESCRIPTION
{NAME ⇒ 'DOB', BLOOMFILTER ⇒ 'ROW', IN_MEMORY ⇒ 'false', VERSIONS ⇒ '1', KEEP_DELETED_CELLS ⇒ 'FALSE', DATA_BLOCK_ENCODING ⇒ 'NONE', COMPRESSION ⇒ 'NONE
', TTL ⇒ 'FOREVER', MIN_VERSIONS ⇒ '0', BLOCKCACHE ⇒ 'true', BLOCKSIZE ⇒ '65536', REPLICATION_SCOPE ⇒ '0'}

{NAME ⇒ 'GENDER', BLOOMFILTER ⇒ 'ROW', IN_MEMORY ⇒ 'false', VERSIONS ⇒ '1', KEEP_DELETED_CELLS ⇒ 'FALSE', DATA_BLOCK_ENCODING ⇒ 'NONE', COMPRESSION ⇒ 'N
ONE', TTL ⇒ 'FOREVER', MIN_VERSIONS ⇒ '0', BLOCKCACHE ⇒ 'true', BLOCKSIZE ⇒ '65536', REPLICATION_SCOPE ⇒ '0'}

{NAME ⇒ 'S_ADDRESS', BLOOMFILTER ⇒ 'ROW', IN_MEMORY ⇒ 'false', VERSIONS ⇒ '1', KEEP_DELETED_CELLS ⇒ 'FALSE', DATA_BLOCK_ENCODING ⇒ 'NONE', COMPRESSION ⇒
 'NONE', TTL ⇒ 'FOREVER', MIN_VERSIONS ⇒ '0', BLOCKCACHE ⇒ 'true', BLOCKSIZE ⇒ '65536', REPLICATION_SCOPE ⇒ '0'}

{NAME ⇒ 'S_ID', BLOOMFILTER ⇒ 'ROW', IN_MEMORY ⇒ 'false', VERSIONS ⇒ '1', KEEP_DELETED_CELLS ⇒ 'FALSE', DATA_BLOCK_ENCODING ⇒ 'NONE', COMPRESSION ⇒ 'NON
E', TTL ⇒ 'FOREVER', MIN_VERSIONS ⇒ '0', BLOCKCACHE ⇒ 'true', BLOCKSIZE ⇒ '65536', REPLICATION_SCOPE ⇒ '0'}

{NAME ⇒ 'S_NAME', BLOOMFILTER ⇒ 'ROW', IN_MEMORY ⇒ 'false', VERSIONS ⇒ '1', KEEP_DELETED_CELLS ⇒ 'FALSE', DATA_BLOCK_ENCODING ⇒ 'NONE', COMPRESSION ⇒ 'N
ONE', TTL ⇒ 'FOREVER', MIN_VERSIONS ⇒ '0', BLOCKCACHE ⇒ 'true', BLOCKSIZE ⇒ '65536', REPLICATION_SCOPE ⇒ '0'}

{NAME ⇒ 'S_PHONE_NO', BLOOMFILTER ⇒ 'ROW', IN_MEMORY ⇒ 'false', VERSIONS ⇒ '1', KEEP_DELETED_CELLS ⇒ 'FALSE', DATA_BLOCK_ENCODING ⇒ 'NONE', COMPRESSION =
> 'NONE', TTL ⇒ 'FOREVER', MIN_VERSIONS ⇒ '0', BLOCKCACHE ⇒ 'true', BLOCKSIZE ⇒ '65536', REPLICATION_SCOPE ⇒ '0'}

6 row(s)
Quota is disabled
Took 1.1976 seconds
hbase:011:0>
```

5. Now we will add data in the table ‘Student’. Code: put
'Student','CS21001','S_NAME:F_NAME','DION' put
'Student','CS21001','S_NAME:L_NAME','FERNANDES'
put 'Student','CS21001','DOB','01-04-2000' put
'Student','CS21001','GENDER','M' put
'Student','CS21001','S_ADDRESS','BANDRA'
put 'Student','CS21001','S_PHONE_NO','9999990001'

put 'Student','CS21002','S_NAME:F_NAME','RUDRA' put
'Student','CS21002','S_NAME:L_NAME','RAO' put
'Student','CS21002','DOB','05-12-1998' put 'Student','CS21002','GENDER','M'
put 'Student','CS21002','S_ADDRESS','MAHIM'
put 'Student','CS21002','S_PHONE_NO','9999990002'

put 'Student','CS21003','S_NAME:F_NAME','ZAID' put
'Student','CS21003','S_NAME:L_NAME','SHAIKH'
put 'Student','CS21003','DOB','23-07-2000' put
'Student','CS21003','GENDER','M' put
'Student','CS21003','S_ADDRESS','SION'
put 'Student','CS21003','S_PHONE_NO','9999990003'

put 'Student','CS21004','S_NAME:F_NAME','RAJ' put
'Student','CS21004','S_NAME:L_NAME','KUMAR'
put 'Student','CS21004','DOB','30-11-1999' put
'Student','CS21004','GENDER','M' put
'Student','CS21004','S_ADDRESS','DADAR' put
'Student','CS21004','S_PHONE_NO','9999990004'

```
hbase:011:0> put 'Student','CS21001','S_NAME:F_NAME','DION'
Took 0.9969 seconds
hbase:012:0> put 'Student','CS21001','S_NAME:L_NAME','FERNANDES'
Took 0.0284 seconds
hbase:013:0> put 'Student','CS21001','DOB','01-04-2000'
Took 0.0131 seconds
hbase:014:0> put 'Student','CS21001','GENDER','M'
Took 0.1835 seconds
hbase:015:0> put 'Student','CS21001','S_ADDRESS','BANDRA'
Took 0.1031 seconds
hbase:016:0> put 'Student','CS21001','S_PHONE_NO','9999990001'
Took 0.0129 seconds
hbase:017:0> scan 'Student'
ROW                                   COLUMN+CELL
 CS21001                              column=DOB:, timestamp=2022-12-04T23:31:44.651, value=01-04-2000
 CS21001                              column=GENDER:, timestamp=2022-12-04T23:31:44.939, value=M
 CS21001                              column=S_ADDRESS:, timestamp=2022-12-04T23:31:45.247, value=BANDRA
 CS21001                              column=S_NAME:F_NAME, timestamp=2022-12-04T23:31:19.390, value=DION
 CS21001                              column=S_NAME:L_NAME, timestamp=2022-12-04T23:31:44.412, value=FERNANDES
 CS21001                              column=S_PHONE_NO:, timestamp=2022-12-04T23:31:49.310, value=9999990001
1 row(s)
Took 0.2246 seconds
hbase:018:0>
```

6. Run “scan ‘Student’” to display the table values.

```
hbase:048:0> scan 'Student'
ROW                                   COLUMN+CELL
 CS21001                              column=DOB:, timestamp=2022-12-04T23:31:44.651, value=01-04-2000
 CS21001                              column=GENDER:, timestamp=2022-12-04T23:31:44.939, value=M
 CS21001                              column=S_ADDRESS:, timestamp=2022-12-04T23:31:45.247, value=BANDRA
 CS21001                              column=S_NAME:F_NAME, timestamp=2022-12-04T23:31:19.390, value=DION
 CS21001                              column=S_NAME:L_NAME, timestamp=2022-12-04T23:31:44.412, value=FERNANDES
 CS21001                              column=S_PHONE_NO:, timestamp=2022-12-04T23:31:49.310, value=9999990001
 CS21002                              column=DOB:, timestamp=2022-12-04T23:33:25.567, value=05-12-1998
 CS21002                              column=GENDER:, timestamp=2022-12-04T23:33:26.006, value=M
 CS21002                              column=S_ADDRESS:, timestamp=2022-12-04T23:33:26.425, value=MAHIM
 CS21002                              column=S_NAME:F_NAME, timestamp=2022-12-04T23:33:23.722, value=RUDRA
 CS21002                              column=S_NAME:L_NAME, timestamp=2022-12-04T23:33:25.067, value=RAO
 CS21002                              column=S_PHONE_NO:, timestamp=2022-12-04T23:33:26.561, value=9999990002
 CS21003                              column=DOB:, timestamp=2022-12-04T23:33:27.034, value=23-07-2000
 CS21003                              column=GENDER:, timestamp=2022-12-04T23:33:27.201, value=M
 CS21003                              column=S_ADDRESS:, timestamp=2022-12-04T23:33:27.262, value=SION
 CS21003                              column=S_NAME:F_NAME, timestamp=2022-12-04T23:33:26.739, value=ZAID
 CS21003                              column=S_NAME:L_NAME, timestamp=2022-12-04T23:33:26.849, value=SHAIKH
 CS21003                              column=S_PHONE_NO:, timestamp=2022-12-04T23:33:27.357, value=9999990003
 CS21004                              column=DOB:, timestamp=2022-12-04T23:33:27.614, value=30-11-1999
 CS21004                              column=GENDER:, timestamp=2022-12-04T23:33:27.681, value=M
 CS21004                              column=S_ADDRESS:, timestamp=2022-12-04T23:33:27.734, value=DADAR
 CS21004                              column=S_NAME:F_NAME, timestamp=2022-12-04T23:33:27.487, value=RAJ
 CS21004                              column=S_NAME:L_NAME, timestamp=2022-12-04T23:33:27.553, value=KUMAR
4 row(s)
Took 0.3028 seconds
hbase:049:0>
```

7. We can use “get” to get the values of specific row.

```
hbase:049:0> get 'Student','CS21001'
COLUMN                                CELL
 DOB:                                 timestamp=2022-12-04T23:31:44.651, value=01-04-2000
 GENDER:                              timestamp=2022-12-04T23:31:44.939, value=M
 S_ADDRESS:                           timestamp=2022-12-04T23:31:45.247, value=BANDRA
 S_NAME:F_NAME                        timestamp=2022-12-04T23:31:19.390, value=DION
 S_NAME:L_NAME                        timestamp=2022-12-04T23:31:44.412, value=FERNANDES
 S_PHONE_NO:                          timestamp=2022-12-04T23:31:49.310, value=9999990001
1 row(s)
Took 0.3466 seconds
hbase:050:0>
```

```
hbase:003:0> get 'Student','CS21003','S_NAME:L_NAME'
COLUMN                                CELL
 S_NAME:L_NAME                        timestamp=2022-12-04T23:33:26.849, value=SHAIKH
1 row(s)
Took 0.1788 seconds
hbase:004:0>
```

```
hbase:007:0> get 'Student','CS21004','S_PHONE_NO'
COLUMN                               CELL
 S_PHONE_NO:                         timestamp=2022-12-04T23:53:38.742, value=9999990004\x0A
1 row(s)
Took 0.0312 seconds
hbase:008:0>
```

As seen in the image on top there is an invalid phone number value for Student “CS21004”. In order to change the value, we will update the value.

8. To update the value use “put”.

```
hbase:008:0> put 'Student','CS21004','S_PHONE_NO','9999990444'
Took 0.0721 seconds
hbase:009:0> get 'Student','CS21004','S_PHONE_NO'
COLUMN                                CELL
 S_PHONE_NO:                          timestamp=2022-12-04T23:58:34.702, value=9999990444
1 row(s)
Took 0.0613 seconds
hbase:010:0>
```

9. Now we will perform “delete” operations.

a. Deleting the last name of Student “CS21002”. Code: delete 'Student','CS21002','S_NAME:L_NAME'

```
hbase:003:0> delete 'Student','CS21002','S_NAME:L_NAME'
Took 0.6181 seconds
hbase:004:0> get 'Student','CS21002','S_NAME:L_NAME'
COLUMN                                CELL
0 row(s)
Took 0.1921 seconds
hbase:005:0> get 'Student','CS21002'
COLUMN                                CELL
 DOB:                                 timestamp=2022-12-04T23:33:25.567, value=05-12-1998
 GENDER:                              timestamp=2022-12-04T23:33:26.006, value=M
 S_ADDRESS:                           timestamp=2022-12-04T23:33:26.425, value=MAHIM
 S_NAME:F_NAME                        timestamp=2022-12-04T23:33:23.722, value=RUDRA
 S_PHONE_NO:                          timestamp=2022-12-04T23:33:26.561, value=9999990002
1 row(s)
Took 0.1696 seconds
hbase:006:0>
```

b. Deleting the address of Student “CS21004”. Code: delete 'Student','CS21004','S_ADDRESS'

```
hbase:008:0> delete 'Student','CS21004','S_ADDRESS:'
Took 0.0292 seconds
hbase:009:0> get 'Student','CS21004'
COLUMN                                  CELL
 DOB:                                   timestamp=2022-12-04T23:33:27.614, value=30-11-1999
 GENDER:                                timestamp=2022-12-04T23:33:27.681, value=M
 S_NAME:F_NAME                          timestamp=2022-12-04T23:33:27.487, value=RAJ
 S_NAME:L_NAME                          timestamp=2022-12-04T23:33:27.553, value=KUMAR
 S_PHONE_NO:                            timestamp=2022-12-04T23:58:34.702, value=9999990444
1 row(s)
Took 0.0324 seconds
hbase:010:0>
```

c. Deleting the entire record of Student “CS21004”.
Code: deleteall 'Student','CS21004'

```
hbase:010:0> deleteall 'Student','CS21004'
Took 0.1360 seconds
hbase:011:0> get 'Student','CS21004'
COLUMN                                  CELL
0 row(s)
Took 0.0071 seconds
hbase:012:0>
```

10. Run “count” to count the number of rows in a table.

```
hbase:012:0> count 'Student'
3 row(s)
Took 0.3053 seconds
⇒ 3
```

11. Truncating the table ‘Student’ will remove all the date from the table.

```
hbase:015:0> truncate 'Student'
Truncating 'Student' table (it may take a while):
Disabling table...
Truncating table...
Took 57.6435 seconds
hbase:016:0> scan 'Student'
ROW                                     COLUMN+CELL
0 row(s)
Took 5.2316 seconds
hbase:017:0>
```

12. Dropping the table ‘Student’.
(Note: in order to delete the table, we will have to first disable it)

First, we check if the table is disabled or not.

```
hbase:017:0> is_disabled 'Student'
false
Took 0.0461 seconds
⇒ false
hbase:018:0>
```

Since it is not disabled, we will have to disable it.
As seen in the image below, the table is now disabled.

```
hbase:018:0> disable 'Student'
Took 1.4735 seconds
hbase:019:0> scan 'Student'
ROW                                    COLUMN+CELL
org.apache.hadoop.hbase.TableNotEnabledException: Student is disabled.
        at org.apache.hadoop.hbase.client.ScannerCallable.prepare(ScannerCallable.java:157)
        at org.apache.hadoop.hbase.client.ScannerCallableWithReplicas$RetryingRPC.prepare(ScannerCallableWithReplicas.java:405)
        at org.apache.hadoop.hbase.client.RpcRetryingCallerImpl.callWithRetries(RpcRetryingCallerImpl.java:102)
        at org.apache.hadoop.hbase.client.ResultBoundedCompletionService$QueueingFuture.run(ResultBoundedCompletionService.java:74)
        at java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoolExecutor.java:1149)
        at java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.java:624)
        at java.lang.Thread.run(Thread.java:750)

ERROR: Table Student is disabled!

For usage try 'help "scan"'

Took 0.1341 seconds
hbase:020:0>
```

Since it is disabled, we can drop the table “Student”.
We can also use ‘exist’ to check if the table is deleted or no.

```
hbase:020:0> drop 'Student'
Took 1.4421 seconds
hbase:021:0> exists 'Student'
Table Student does not exist
Took 0.0875 seconds
⇒ false
hbase:022:0>
```

We can also use ‘list’ to check if the table is deleted or no.

```
hbase:022:0> list
TABLE
0 row(s)
Took 0.3576 seconds
⇒ []
hbase:023:0>
```

Conclusion:

In this project, we understood the basic requirements to Implement HBase. Such as:

1. Java:
    a. Installation
    b. Required Version for Hadoop
    c. Environmental Configuration 2. Hadoop:
    a. Installation
    b. Environmental Configuration
    c. Required Daemons
    d. Displaying the Hadoop Server page as well as the Cluster page.
3. HBase:
    a. Installation
    b. Environmental Configuration
    c. Implementation

In the Implementation, we have understood the requirements for HBase shell. As well as created a table “Student” while adding and manipulating the data init. We also understood few of the key words that can be used. Including few important notes to keep in mind.

Practical 5

Aim: Perform importing and exporting of data between SQL and Hadoop using Sqoop.

Sqoop Introductions

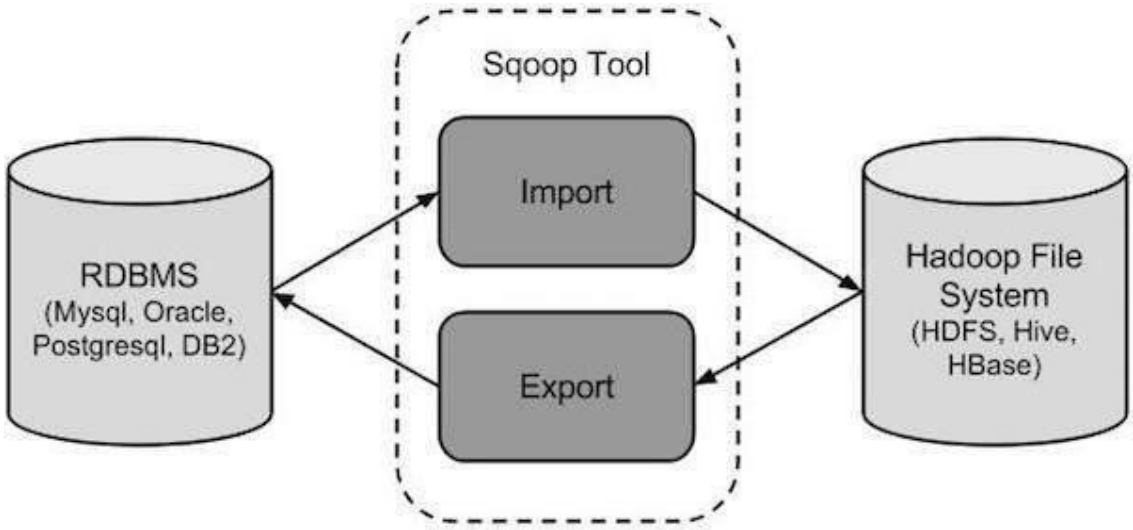
The traditional application management system, that is, the interaction of applications with relational database using RDBMS, is one of the sources that generate Big Data. Such Big Data, generated by RDBMS, is stored in Relational Database Servers in the relational database structure.

When Big Data storages and analyzers such as MapReduce, Hive, HBase, Cassandra, Pig, etc. of the Hadoop ecosystem came into picture, they required a tool to interact with the relational database servers for importing and exporting the Big Data residing in them. Here, Sqoop occupies a place in the Hadoop ecosystem to provide feasible interaction between relational database server and Hadoop's HDFS.

Sqoop − "SQL to Hadoop and Hadoop to SQL"

Sqoop is a tool designed to transfer data between Hadoop and relational database servers. It is used to import data from relational databases such as MySQL, Oracle to Hadoop HDFS, and export from Hadoop file system to relational databases. It is provided by the Apache Software Foundation.

Method of Sqoop



Sqoop Import

The import tool imports individual tables from RDBMS to HDFS. Each row in a table is treated as a record in HDFS. All records are stored as text data in text files

Sqoop Export

The export tool exports a set of files from HDFS back to an RDBMS. The files given as input to Sqoop contain records, which are called as rows in table. Those are read and parsed into a set of records and delimited with user-specified delimiter.

Prerequisite for Sqoop Implementations

1. Installations of Java JDK.
2. Installations of Hadoop.
3. Installations of Sqoob package.

1. Installations of Java JDK

Step 1 - Update Kali
Command: - sudo apt update

```
┌──(kali㉿kali)-[~]
└─$ sudo apt update
[sudo] password for kali:
Get:1 http://ftp.harukasan.org/kali kali-rolling InRelease [30.5 kB]
Get:2 http://ftp.harukasan.org/kali kali-rolling/main amd64 Packages [17.7 MB]
Get:3 http://ftp.harukasan.org/kali kali-rolling/contrib amd64 Packages [108 kB]
Get:4 http://ftp.harukasan.org/kali kali-rolling/non-free amd64 Packages [199 kB]
Fetched 18.1 MB in 6min 39s (45.3 kB/s)
Reading package lists ... Done
Building dependency tree ... Done
Reading state information ... Done
308 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

Step 2 - Install default JDK on
Kali

Command: - sudo apt install default-jdk

```
┌──(kali㉿kali)-[~]
└─$ sudo apt install default-jdk
[sudo] password for kali:
Reading package lists ... Done
Building dependency tree ... Done
Reading state information ... Done
The following packages were automatically installed and are no longer required:
  libexo-1-0 libpython3.8-dev libsane node-jquery python3.8-dev qt5-gtk2-platformtheme xfce4-mailwatch-plugin xfce4-s
  xfce4-weather-plugin
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  default-jdk-headless libice-dev libpthread-stubs0-dev libsm-dev libx11-dev libxau-dev libxcb1-dev libxdmcp-dev libx
  x11proto-dev xorg-sgml-doctools xtrans-dev
Suggested packages:
  libice-doc libsm-doc libx11-doc libxcb-doc libxt-doc openjdk-11-demo openjdk-11-source visualvm
The following NEW packages will be installed:
  default-jdk default-jdk-headless libice-dev libpthread-stubs0-dev libsm-dev libx11-dev libxau-dev libxcb1-dev libxc
  openjdk-11-jdk-headless x11proto-dev xorg-sgml-doctools xtrans-dev
0 upgraded, 15 newly installed, 0 to remove and 308 not upgraded.
Need to get 226 MB of archives.
After this operation, 242 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

Step 3 - Check the installation

Command: - java –version

```
┌──(hadoopusr㉿kali)-[~]
└─$ java -version
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
openjdk version "11.0.17" 2022-10-18
OpenJDK Runtime Environment (build 11.0.17+8-post-Debian-2)
OpenJDK 64-Bit Server VM (build 11.0.17+8-post-Debian-2, mixed mode, sharing)
```

Step 4 – To update java jdk path in etc/environment path from root terminal.

Command: - sudo nano /etc/ environment

```
┌──(root㉿kali)-[~]
└─# sudo nano /etc/environment
```

```
  GNU nano 6.4                                /etc/environment
# START KALI-DEFAULTS CONFIG
# Everything from here and until STOP KALI-DEFAULTS CONFIG
# was installed by the kali-defaults package, and it will
# be removed if ever the kali-defaults package is removed.
# If you want to disable a line, please do NOT remove it,
# as it would be added back when kali-defaults is upgraded.
# Instead, comment the line out, and your change will be
# preserved across upgrades.
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/local/games:/usr/games
COMMAND_NOT_FOUND_INSTALL_PROMPT=1
POWERSHELL_UPDATECHECK=Off
POWERSHELL_TELEMETRY_OPTOUT=1
DOTNET_CLI_TELEMETRY_OPTOUT=1
# STOP KALI-DEFAULTS CONFIG

JAVA_HOME="/usr/lib/jvm/java-11-openjdk-amd64"

                                [ Read 16 lines ]
^G Help      ^O Write Out  ^W Where Is   ^K Cut       ^T Execute   ^C Location  M-U Undo
^X Exit      ^R Read File  ^\ Replace    ^U Paste     ^J Justify   ^/ Go To Line M-E Redo
```

Use Source to sink the file of etc/environment.

Command: - Source /etc/environment

```
┌──(root㉿kali)-[~]
└─# source /etc/environment
```

2. Installations of Hadoop.

Step 1: - installing ssh server in root terminal.

Command: - apt-get install ssh

```
┌──(root㉿kali)-[~]
└─# apt-get install ssh
Reading package lists ... Done
Building dependency tree ... Done
Reading state information ... Done
The following packages were automatically installed and are no longer required:
  freeglut3 libexporter-tiny-perl libhttp-server-simple-perl liblist-moreutils-perl
  liblist-moreutils-xs-perl libpython3.9-minimal libpython3.9-stdlib libwacom-bin python3-dataclasses-json
  python3-limiter python3-marshmallow-enum python3-mypy-extensions python3-responses python3-spyse
  python3-token-bucket python3-typing-inspect python3.9 python3.9-minimal
Use 'apt autoremove' to remove them.
The following NEW packages will be installed:
  ssh
0 upgraded, 1 newly installed, 0 to remove and 191 not upgraded.
Need to get 260 kB of archives.
After this operation, 276 kB of additional disk space will be used.
Get:1 http://kali.download/kali kali-rolling/main amd64 ssh all 1:9.0p1-1 [260 kB]
Fetched 260 kB in 1s (265 kB/s)
Selecting previously unselected package ssh.
(Reading database ... 338686 files and directories currently installed.)
Preparing to unpack .../ssh_1%3a9.0p1-1_all.deb ...
Unpacking ssh (1:9.0p1-1) ...
Setting up ssh (1:9.0p1-1) ...
```

Step 2: - Now, generate Public/Private rsa key pair:

Command: - ssh-keygen -t rsa -P ‘’

```
┌──(root㉿kali)-[~]
└─# ssh-keygen -t rsa -P ''
Generating public/private rsa key pair.
Enter file in which to save the key (/root/.ssh/id_rsa):
/root/.ssh/id_rsa already exists.
Overwrite (y/n)? y
Your identification has been saved in /root/.ssh/id_rsa
Your public key has been saved in /root/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:C7d8Bao+HHx3AnKkeBCpDdleqaN62q0YTc/S5NFprEI root@kali
The key's randomart image is:
+---[RSA 3072]----+
|    o.o .        |
|   o + o .       |
|    = = o  .     |
|   . *o+.o. .    |
|   E.o+*oS.  .   |
|  +.* +o=.oo..   |
| ..+ *..o+..o    |
| .+.+ .o  .      |
|ooo..  ..        |
+----[SHA256]-----+
```

Command: - cat $HOME/.ssh/id_rsa.pub >> $HOME/.ssh/authorized_keys

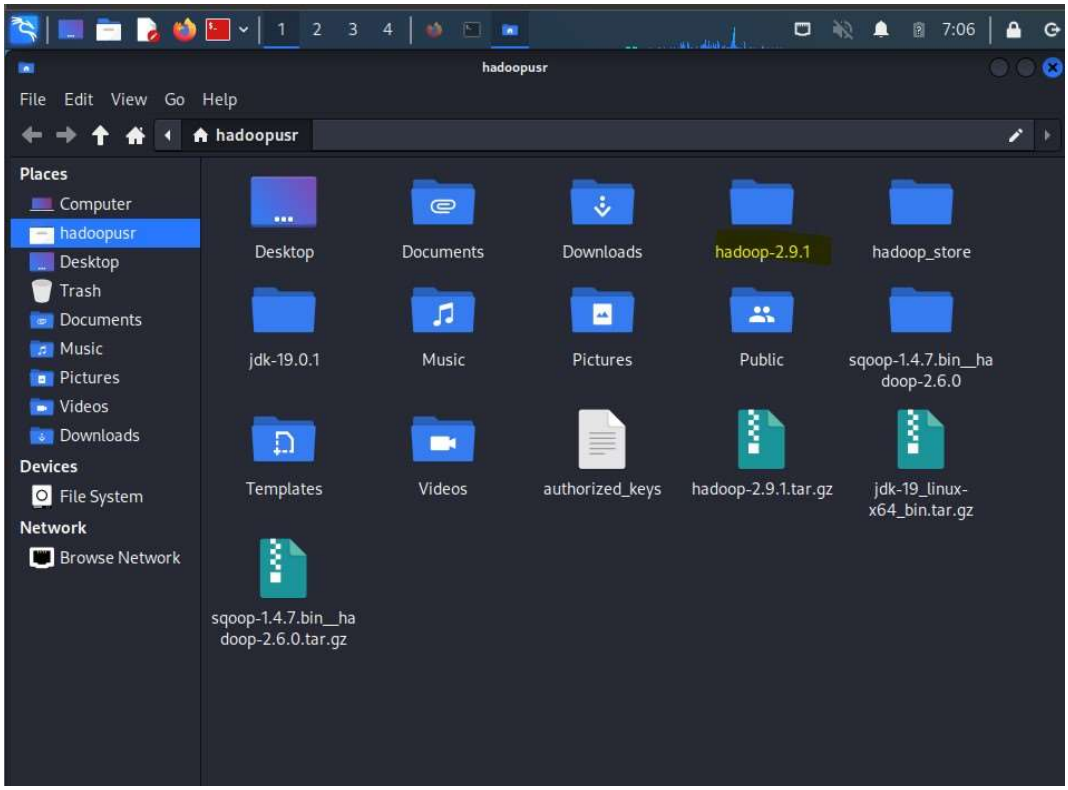
```
┌──(root㉿kali)-[~]
└─# cat $HOME/.ssh/id_rsa.pub >> $HOME/.ssh/authorized_keys
```

Command: - ssh localhost

Step 3: - Download Apache Hadoop 2.9.1 tar from below link

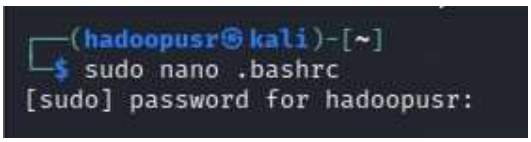
https://hadoop.apache.org/release/2.9.1.html

Once downloaded, Unzip in Home file.



Step 4: - Update Java JDK, Hadoop and other necessary path in .bashrc file.

Command: - Sudo nano .bashrc



```
export JAVA_HOME=/usr/lib/jvm/java-11-openjdk-amd64
export HADOOP_INSTALL=/home/hadoopusr/hadoop-2.9.1
export PATH=$PATH:$HADOOP_INSTALL/bin
export PATH=$PATH:$HADOOP_INSTALL/sbin
export HADOOP_MAPRED_HOME=$HADOOP_INSTALL
export HADOOP_COMMON_HOME=$HADOOP_INSTALL
export HADOOP_HDFS_HOME=$HADOOP_INSTALL
export YARN_HOME=$HADOOP_INSTALL
export HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_INSTALL/lib/native
export HADOOP_OPTS="-Djava.library.path=$HADOOP_INSTALL/lib"
#HADOOP VARIABLES END
```

Command: - source .bashrc

```
┌──(hadoopusr㉿kali)-[~]
└─$ source .bashrc
┌──(hadoopusr㉿kali)-[~]
└─$
```

Step 5: - Now, we need to configure some of Hadoop file below are the path and name.

Filepath:- /home/hadoopusr/hadoop-2.9.1/etc/hadoop/ hadoop-env.sh

~/hadoop-2.9.1/etc/hadoop/hadoop-env.sh - Mousepad

File Edit Search View Document Help

```
98 # Specify the JVM options to be used when starting the RBF Routers.
99 # These options will be appended to the options specified as HADOOP_OPTS
100 # and therefore may override any similar flags set in HADOOP_OPTS
101 #
102 # export HADOOP_DFSROUTER_OPTS=""
103 ###
104
105 ###
106 # Advanced Users Only!
107 ###
108
109 # The directory where pid files are stored. /tmp by default.
110 # NOTE: this should be set to a directory that can only be written to by
111 #       the user that will run the hadoop daemons.  Otherwise there is the
112 #       potential for a symlink attack.
113 export HADOOP_PID_DIR=${HADOOP_PID_DIR}
114 export HADOOP_SECURE_DN_PID_DIR=${HADOOP_PID_DIR}
115
116 # A string representing this instance of hadoop. $USER by default.
117 export HADOOP_IDENT_STRING=$USER
118
119 export JAVA_HOME=/usr/lib/jvm/java-11-openjdk-amd64
```

We have to make few directories.

hadoop_store – in same path where Hadoop-2.9.1/unzip Hadoop is there.
Command: - mkdir Hadoop_store
Command: - cd hadoop_store

Hdfs –under Hadoop_store

Command: - mkdir hdfs
Command: - cd hdfs

Namenode – under hdfs
Command: - mkdir namenode

Datanode: - under hdfs
Command: - mkdir datanode

File Path :- /home/hadoopusr/hadoop-2.9.1/etc/hadoop/ hdfs-site.xml **File Name:** - hdfs-site.xml place below code between configuration tag.

```
<property>
 <name>dfs.replication</name>
 <value>1</value>
 <description>Default block replication.
 The actual number of replications can be specified when the file is created.
 The default is used if replication is not specified in create time.
 </description>
</property>
<property>
  <name>dfs.namenode.name.dir</name>
 <value>file:######NAMENODE_FOLDER_PATH######</value>
</property>
<property>
  <name>dfs.datanode.data.dir</name>
  <value>file:######DATANODE_FOLDER_PATH######</value>
</property>
```

File Path: -/home/hadoopusr/hadoop-2.9.1/etc/hadoop/

File Name: - core-site.xml (For this, we have to create a Temp file in file path - /home/hadoopusr/hadoop-2.9.1/)

```
<property>
  <name>hadoop.tmp.dir</name>
```

<value>######TMP_FOLDER_PATH######</value>

<description>A base for other temporary directories.</description>

</property>

<property>

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

<value>hdfs://localhost:54310</value>

<description>The name of the default file system. A URI whose scheme and authority determine the FileSystem implementation. The uri's scheme determines the config property (fs.SCHEME.impl) naming the FileSystem implementation class. The uri's authority is used to determine the host, port, etc. for a filesystem.</description>

</property>

File Path: - /home/hadoopusr/hadoop-2.9.1/etc/hadoop/

File Name: - mapred-site.xml (This file won't be there, we need to copy mapredsite.xml.template ,paste it and rename it with mapred-site.xml)

for mapred-site.xml:

<property>

<name>mapred.job.tracker</name>

<value>localhost:54311</value>

<description>The host and port that the MapReduce job tracker runs at. If "local", then jobs are run in-process as a single map and reduce task. </description>

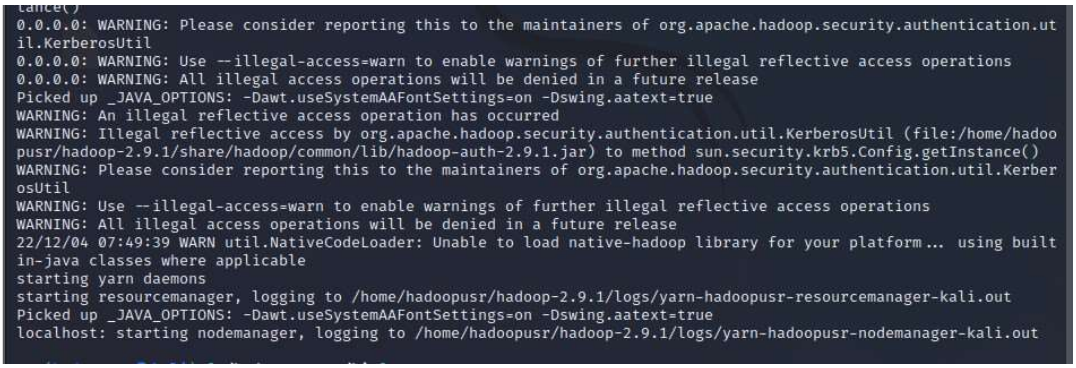
</property>

Step 6 :- Once above steps, are done. We need to run below command under Hadoop2.9.1 directory.

Command: - Hadoop namenode -format

Step 7: - once above commands is executed successfully, we need to start all daemons under bin directory

Command: - start-all.sh



Step 8: - To stop all daemons.

Command: - stop-all.sh

3. Installations of Sqoop package.

   Step 1:- First, we need to download scoop from below link.

   https://archive.apache.org/dist/sqoop/1.4.7/

   Step 2: - Unzip the sqoop tar file in home directories.

   Step 3: - Need to download mysql-connector-java.jar and copy under below path file path.

   /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/Lib

Before starting to implement SQOOB we need to start all 5 daemons of Hadoop.

1. First we will start MySql Server
2. SQL server from below command in terminal.

```
┌──(hadoopusr㉿kali)-[~]
└─$ service mysqld start
```

3. Now we have to start MySql

```
┌──(hadoopusr㉿kali)-[~]
└─$ sudo mysql -u root -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 54
Server version: 10.6.10-MariaDB-1+b1 Debian n/a

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.
```

4. We will create a product table and insert few data so later we can export that table while implementing SQOOB.

```
MariaDB [tsest2]> create table Product( P_id int, P_Name varchar(20), P_Prices int(10), P_Discount Varchar(10));
Query OK, 0 rows affected (0.065 sec)

MariaDB [tsest2]> Insert into Product values(1001,"Table",10000,1000);
Query OK, 1 row affected (0.011 sec)

MariaDB [tsest2]> Insert into Product values(1002,"Chair",2000,200);
Query OK, 1 row affected (0.003 sec)

MariaDB [tsest2]> Insert into Product values(1003,"Laptop",20000,2000);
Query OK, 1 row affected (0.008 sec)

MariaDB [tsest2]> Insert into Product values(1004,"Mobile",7000,700);
Query OK, 1 row affected (0.003 sec)

MariaDB [tsest2]> Insert into Product values(1005,"TV",20000,2000);
Query OK, 1 row affected (0.001 sec)

MariaDB [tsest2]> select * from product;
ERROR 1146 (42S02): Table 'tsest2.product' doesn't exist
MariaDB [tsest2]> select * from Product;
+------+---------+----------+------------+
| P_id | P_Name  | P_Prices | P_Discount |
+------+---------+----------+------------+
| 1001 | Table   |    10000 | 1000       |
| 1002 | Chair   |     2000 | 200        |
| 1003 | Laptop  |    20000 | 2000       |
| 1004 | Mobile  |     7000 | 700        |
| 1005 | TV      |    20000 | 2000       |
+------+---------+----------+------------+
5 rows in set (0.001 sec)
```

1. command to import data from MySql to HDFS(Hadoop).

   sqoop import <------ tool

   --connect jdbc:mysql://Localhost /Database name

   --username root

   -Password

   --table table name **Example**

   sqoop import --connect jdbc:mysql://localhost/tsest2 -username root -password kali --table Product -m1

```
┌──(hadoopusr㉿kali)-[~/sqoop-1.4.7.bin__hadoop-2.6.0]
└─$ bin/sqoop import --connect jdbc:mysql://localhost/tsest2 -username root -password kali --table Product -m1
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hbase does not exist! HBase imports will fail.
Please set $HBASE_HOME to the root of your HBase installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hcatalog does not exist! HCatalog jobs will fail.
Please set $HCAT_HOME to the root of your HCatalog installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../accumulo does not exist! Accumulo imports will fail.
Please set $ACCUMULO_HOME to the root of your Accumulo installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../zookeeper does not exist! Accumulo imports will fail.
Please set $ZOOKEEPER_HOME to the root of your Zookeeper installation.
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
22/12/03 10:12:17 INFO sqoop.Sqoop: Running Sqoop version: 1.4.7
22/12/03 10:12:17 WARN tool.BaseSqoopTool: Setting your password on the command-line is insecure. Consider using -P instead.
22/12/03 10:12:18 INFO manager.MySQLManager: Preparing to use a MySQL streaming resultset.
22/12/03 10:12:18 INFO tool.CodeGenTool: Beginning code generation
Loading class `com.mysql.jdbc.Driver'. This is deprecated. The new driver class is `com.mysql.cj.jdbc.Driver'. The driver is automatically registered via t
he SPI and manual loading of the driver class is generally unnecessary.
22/12/03 10:12:19 INFO manager.SqlManager: Executing SQL statement: SELECT t.* FROM `Product` AS t LIMIT 1
22/12/03 10:12:19 INFO manager.SqlManager: Executing SQL statement: SELECT t.* FROM `Product` AS t LIMIT 1
22/12/03 10:12:19 INFO orm.CompilationManager: HADOOP_MAPRED_HOME is /home/hadoopusr/hadoop-2.9.1
Note: /tmp/sqoop-hadoopusr/compile/7f351cd81b6c24f0204a5dbc40bdcee9/Product.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
22/12/03 10:12:25 INFO orm.CompilationManager: Writing jar file: /tmp/sqoop-hadoopusr/compile/7f351cd81b6c24f0204a5dbc40bdcee9/Product.jar
22/12/03 10:12:25 WARN manager.MySQLManager: It looks like you are importing from mysql.
22/12/03 10:12:25 WARN manager.MySQLManager: This transfer can be faster! Use the --direct
22/12/03 10:12:25 WARN manager.MySQLManager: option to exercise a MySQL-specific fast path.
22/12/03 10:12:25 INFO manager.MySQLManager: Setting zero DATETIME behavior to convertToNull (mysql)
22/12/03 10:12:25 INFO mapreduce.ImportJobBase: Beginning import of Product
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/common/li
b/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
```

```
22/12/03 10:12:32 INFO mapred.Task: Task attempt_local2044251549_0001_m_000000_0 is allowed to commit now
22/12/03 10:12:32 INFO output.FileOutputCommitter: Saved output of task 'attempt_local2044251549_0001_m_000000_0'
Product/_temporary/0/task_local2044251549_0001_m_000000
22/12/03 10:12:32 INFO mapred.LocalJobRunner: map
22/12/03 10:12:32 INFO mapred.Task: Task 'attempt_local2044251549_0001_m_000000_0' done.
22/12/03 10:12:32 INFO mapred.LocalJobRunner: Finishing task: attempt_local2044251549_0001_m_000000_0
22/12/03 10:12:32 INFO mapred.LocalJobRunner: map task executor complete.
22/12/03 10:12:32 INFO mapreduce.Job:  map 100% reduce 0%
22/12/03 10:12:33 INFO mapreduce.Job: Job job_local2044251549_0001 completed successfully
22/12/03 10:12:33 INFO mapreduce.Job: Counters: 20
        File System Counters
                FILE: Number of bytes read=7020
                FILE: Number of bytes written=509834
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=0
                HDFS: Number of bytes written=105
                HDFS: Number of read operations=4
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=3
        Map-Reduce Framework
                Map input records=5
                Map output records=5
                Input split bytes=87
                Spilled Records=0
                Failed Shuffles=0
                Merged Map outputs=0
                GC time elapsed (ms)=29
                Total committed heap usage (bytes)=116391936
        File Input Format Counters
                Bytes Read=0
        File Output Format Counters
                Bytes Written=105
22/12/03 10:12:33 INFO mapreduce.ImportJobBase: Transferred 105 bytes in 5.7622 seconds (18.2221 bytes/sec)
22/12/03 10:12:33 INFO mapreduce.ImportJobBase: Retrieved 5 records.
```

below are the steps/command to see if the data is import to HDFS.

Commands: - hadoop fs -ls

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -ls
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/common/li
b/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
22/12/03 10:16:25 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Found 3 items
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 06:54 Persons
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:12 Product
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 07:28 Student
```

Command: - Hadoop fs -ls Product

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -ls Product
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/common/lib/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
22/12/03 10:17:16 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Found 2 items
-rw-r--r--   1 hadoopusr supergroup          0 2022-12-03 10:12 Product/_SUCCESS
-rw-r--r--   1 hadoopusr supergroup        105 2022-12-03 10:12 Product/part-m-00000
```

Command: - Hadoop fs -cat Product/part-m-00000

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -cat Product/part-m-00000
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/common/lib/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
22/12/03 10:17:37 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
1001,Table,10000,1000
1002,Chair,2000,200
1003,Laptop,20000,2000
1004,Mobile,7000,700
1005,TV,20000,2000
```

2. To Import data in target directory. sqoop

import <------- tool

--connect jdbc:mysql://Localhost /database name

--username root

-P

--table Table name

--target-dir filepath<------ HDFS destination dir

Command: -

bin/sqoop import --connect jdbc:mysql://localhost/tsest2 --username root -password kali -table Product --target-dir /user/hadoopusr/Product2 -m1

```
┌──(hadoopusr㉿kali)-[~/sqoop-1.4.7.bin__hadoop-2.6.0]
└─$ bin/sqoop import --connect jdbc:mysql://localhost/tsest2 --username root -password kali --table Product --target-dir /user/hadoopusr/Product2 -m1
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hbase does not exist! HBase imports will fail.
Please set $HBASE_HOME to the root of your HBase installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hcatalog does not exist! HCatalog jobs will fail.
Please set $HCAT_HOME to the root of your HCatalog installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../accumulo does not exist! Accumulo imports will fail.
Please set $ACCUMULO_HOME to the root of your Accumulo installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../zookeeper does not exist! Accumulo imports will fail.
Please set $ZOOKEEPER_HOME to the root of your Zookeeper installation.
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
22/12/03 10:28:32 INFO sqoop.Sqoop: Running Sqoop version: 1.4.7
22/12/03 10:28:32 WARN tool.BaseSqoopTool: Setting your password on the command-line is insecure. Consider using -P instead.
22/12/03 10:28:32 INFO manager.MySQLManager: Preparing to use a MySQL streaming resultset.
22/12/03 10:28:32 INFO tool.CodeGenTool: Beginning code generation
Loading class `com.mysql.jdbc.Driver'. This is deprecated. The new driver class is `com.mysql.cj.jdbc.Driver'. The driver is automatically registered via t
he SPI and manual loading of the driver class is generally unnecessary.
22/12/03 10:28:33 INFO manager.SqlManager: Executing SQL statement: SELECT t.* FROM `Product` AS t LIMIT 1
22/12/03 10:28:33 INFO manager.SqlManager: Executing SQL statement: SELECT t.* FROM `Product` AS t LIMIT 1
22/12/03 10:28:33 INFO orm.CompilationManager: HADOOP_MAPRED_HOME is /home/hadoopusr/hadoop-2.9.1
Note: /tmp/sqoop-hadoopusr/compile/11f7c10bd6c3869fa59b66bdba45ad8f/Product.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
22/12/03 10:28:39 INFO orm.CompilationManager: Writing jar file: /tmp/sqoop-hadoopusr/compile/11f7c10bd6c3869fa59b66bdba45ad8f/Product.jar
22/12/03 10:28:39 WARN manager.MySQLManager: It looks like you are importing from mysql.
22/12/03 10:28:39 WARN manager.MySQLManager: This transfer can be faster! Use the --direct
22/12/03 10:28:39 WARN manager.MySQLManager: option to exercise a MySQL-specific fast path.
22/12/03 10:28:39 INFO manager.MySQLManager: Setting zero DATETIME behavior to convertToNull (mysql)
22/12/03 10:28:39 INFO mapreduce.ImportJobBase: Beginning import of Product
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/common/li
b/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
22/12/03 10:28:40 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
22/12/03 10:28:40 INFO Configuration.deprecation: mapred.jar is deprecated. Instead, use mapreduce.job.jar
22/12/03 10:28:42 INFO Configuration.deprecation: mapred.job.tracker is deprecated. Instead, use mapreduce.jobtracker.address
22/12/03 10:28:42 INFO Configuration.deprecation: session.id is deprecated. Instead, use dfs.metrics.session-id
```

```
Product2/_temporary/0/task_local1680430726_0001_m_000000
22/12/03 10:28:45 INFO mapred.LocalJobRunner: map
22/12/03 10:28:45 INFO mapred.Task: Task 'attempt_local1680430726_0001_m_000000_0' done.
22/12/03 10:28:45 INFO mapred.LocalJobRunner: Finishing task: attempt_local1680430726_0001_m_000000_0
22/12/03 10:28:45 INFO mapred.LocalJobRunner: map task executor complete.
22/12/03 10:28:45 INFO mapreduce.Job: Job job_local1680430726_0001 running in uber mode : false
22/12/03 10:28:45 INFO mapreduce.Job:  map 100% reduce 0%
22/12/03 10:28:45 INFO mapreduce.Job: Job job_local1680430726_0001 completed successfully
22/12/03 10:28:45 INFO mapreduce.Job: Counters: 20
        File System Counters
                FILE: Number of bytes read=7020
                FILE: Number of bytes written=509836
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=0
                HDFS: Number of bytes written=105
                HDFS: Number of read operations=4
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=3
        Map-Reduce Framework
                Map input records=5
                Map output records=5
                Input split bytes=87
                Spilled Records=0
                Failed Shuffles=0
                Merged Map outputs=0
                GC time elapsed (ms)=0
                Total committed heap usage (bytes)=141557760
        File Input Format Counters
                Bytes Read=0
        File Output Format Counters
                Bytes Written=105
22/12/03 10:28:45 INFO mapreduce.ImportJobBase: Transferred 105 bytes in 3.506 seconds (29.949 bytes/sec)
22/12/03 10:28:45 INFO mapreduce.ImportJobBase: Retrieved 5 records.
```

Command: - hadoop fs -ls

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -ls
\Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication
b/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflec
WARNING: All illegal access operations will be denied in a future release
22/12/03 10:29:56 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
Found 4 items
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 06:54 Persons
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:12 Product
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:28 Product2
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 07:28 Student
```

Command: - hadoop fs -ls Product2

```
$ hadoop fs -ls Product2
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/common/li
b/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
22/12/03 10:30:09 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Found 2 items
-rw-r--r--   1 hadoopusr supergroup          0 2022-12-03 10:28 Product2/_SUCCESS
-rw-r--r--   1 hadoopusr supergroup        105 2022-12-03 10:28 Product2/part-m-00000
```

Command: - hadoop fs -cat Product2/part-m-00000

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -cat  Product2/part-m-00000
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/common/li
b/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
22/12/03 10:30:36 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
1001,Table,10000,1000
1002,Chair,2000,200
1003,Laptop,20000,2000
1004,Mobile,7000,700
1005,TV,20000,2000
```

3. Where

sqoop import <---------- tool

--connect jdbc:mysql://Localhost /Database

--username root

-P

--table Table name

--where "productID < 1003"

--target-dir Filepath <------ HDFS destination dir

Command: -

bin/sqoop import --connect jdbc:mysql://localhost/tsest2 --username root -password kali -table Product --where "P_id < 1002" --target-dir /user/hadoopusr/Product3 -m1.

```
┌──(hadoopusr㉿kali)-[~/sqoop-1.4.7.bin__hadoop-2.6.0]
└─$ bin/sqoop import --connect jdbc:mysql://localhost/tsest2 --username root -password kali --table Product --where "P_id < 1002" --target-dir /user/hadoop
usr/Product3 -m1
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hbase does not exist! HBase imports will fail.
Please set $HBASE_HOME to the root of your HBase installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hcatalog does not exist! HCatalog jobs will fail.
Please set $HCAT_HOME to the root of your HCatalog installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../accumulo does not exist! Accumulo imports will fail.
Please set $ACCUMULO_HOME to the root of your Accumulo installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../zookeeper does not exist! Accumulo imports will fail.
Please set $ZOOKEEPER_HOME to the root of your Zookeeper installation.
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
22/12/03 10:52:18 INFO sqoop.Sqoop: Running Sqoop version: 1.4.7
22/12/03 10:52:18 WARN tool.BaseSqoopTool: Setting your password on the command-line is insecure. Consider using -P instead.
22/12/03 10:52:18 INFO manager.MySQLManager: Preparing to use a MySQL streaming resultset.
22/12/03 10:52:18 INFO tool.CodeGenTool: Beginning code generation
Loading class `com.mysql.jdbc.Driver'. This is deprecated. The new driver class is `com.mysql.cj.jdbc.Driver'. The driver is automatically registered via t
he SPI and manual loading of the driver class is generally unnecessary.
22/12/03 10:52:19 INFO manager.SqlManager: Executing SQL statement: SELECT t.* FROM `Product` AS t LIMIT 1
22/12/03 10:52:19 INFO manager.SqlManager: Executing SQL statement: SELECT t.* FROM `Product` AS t LIMIT 1
22/12/03 10:52:19 INFO orm.CompilationManager: HADOOP_MAPRED_HOME is /home/hadoopusr/hadoop-2.9.1
Note: /tmp/sqoop-hadoopusr/compile/8dbaa0611c48504828b40b4d5291b6d0/Product.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
22/12/03 10:52:25 INFO orm.CompilationManager: Writing jar file: /tmp/sqoop-hadoopusr/compile/8dbaa0611c48504828b40b4d5291b6d0/Product.jar
22/12/03 10:52:25 WARN manager.MySQLManager: It looks like you are importing from mysql.
22/12/03 10:52:25 WARN manager.MySQLManager: This transfer can be faster! Use the --direct
22/12/03 10:52:25 WARN manager.MySQLManager: option to exercise a MySQL-specific fast path.
22/12/03 10:52:25 INFO manager.MySQLManager: Setting zero DATETIME behavior to convertToNull (mysql)
22/12/03 10:52:25 INFO mapreduce.ImportJobBase: Beginning import of Product
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/common/li
b/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
```

```
22/12/03 10:52:31 INFO output.FileOutputCommitter: Saved output of task 'attempt_local1056239689_0001_m_000000_0' to hdfs://localhost:54310/user/hadoopusr/
Product3/_temporary/0/task_local1056239689_0001_m_000000
22/12/03 10:52:31 INFO mapred.LocalJobRunner: map
22/12/03 10:52:31 INFO mapred.Task: Task 'attempt_local1056239689_0001_m_000000_0' done.
22/12/03 10:52:31 INFO mapred.LocalJobRunner: Finishing task: attempt_local1056239689_0001_m_000000_0
22/12/03 10:52:31 INFO mapred.LocalJobRunner: map task executor complete.
22/12/03 10:52:31 INFO mapreduce.Job: Job job_local1056239689_0001 running in uber mode : false
22/12/03 10:52:31 INFO mapreduce.Job:  map 100% reduce 0%
22/12/03 10:52:31 INFO mapreduce.Job: Job job_local1056239689_0001 completed successfully
22/12/03 10:52:31 INFO mapreduce.Job: Counters: 20
        File System Counters
                FILE: Number of bytes read=7020
                FILE: Number of bytes written=510261
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=0
                HDFS: Number of bytes written=22
                HDFS: Number of read operations=4
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=3
        Map-Reduce Framework
                Map input records=1
                Map output records=1
                Input split bytes=87
                Spilled Records=0
                Failed Shuffles=0
                Merged Map outputs=0
                GC time elapsed (ms)=0
                Total committed heap usage (bytes)=135266304
        File Input Format Counters
                Bytes Read=0
        File Output Format Counters
                Bytes Written=22
22/12/03 10:52:31 INFO mapreduce.ImportJobBase: Transferred 22 bytes in 3.6259 seconds (6.0675 bytes/sec)
22/12/03 10:52:31 INFO mapreduce.ImportJobBase: Retrieved 1 records.
```

Command: - hadoop fs -ls

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -ls
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authenticati
b/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hado
WARNING: Use --illegal-access=warn to enable warnings of further illegal refl
WARNING: All illegal access operations will be denied in a future release
22/12/03 10:53:05 WARN util.NativeCodeLoader: Unable to load native-hadoop li
Found 5 items
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 06:54 Persons
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:12 Product
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:28 Product2
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:52 Product3
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 07:28 Student
```

Command: - hadoop fs -ls Product3

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -ls Product3
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.Ke
b/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.securit
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective acc
WARNING: All illegal access operations will be denied in a future release
22/12/03 10:53:23 WARN util.NativeCodeLoader: Unable to load native-hadoop library for
Found 2 items
-rw-r--r--   1 hadoopusr supergroup          0 2022-12-03 10:52 Product3/_SUCCESS
-rw-r--r--   1 hadoopusr supergroup         22 2022-12-03 10:52 Product3/part-m-00000
```

Command: - hadoop fs -cat Product3/part-m-00000

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -cat Product3/part-m-00000
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswi
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.securit
b/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.get
WARNING: Please consider reporting this to the maintainers of o
WARNING: Use --illegal-access=warn to enable warnings of furthe
WARNING: All illegal access operations will be denied in a futu
22/12/03 10:53:53 WARN util.NativeCodeLoader: Unable to load na
1001,Table,10000,1000
```

4. Query

sqoop import <---------- tool

--connect jdbc:mysql://Localhost/Database name

--username root

-P

--query 'select * from products WHERE $CONDITIONS' <--- import using query

--target-dir FilePath <---------- HDFS destination dir

Command: -

bin/sqoop import --connect jdbc:mysql://localhost/tsest2 --username root -password kali -query 'select * from Product where P_id> 1002 AND $CONDITIONS' --target-dir /user/hadoopusr/Product4 -m1

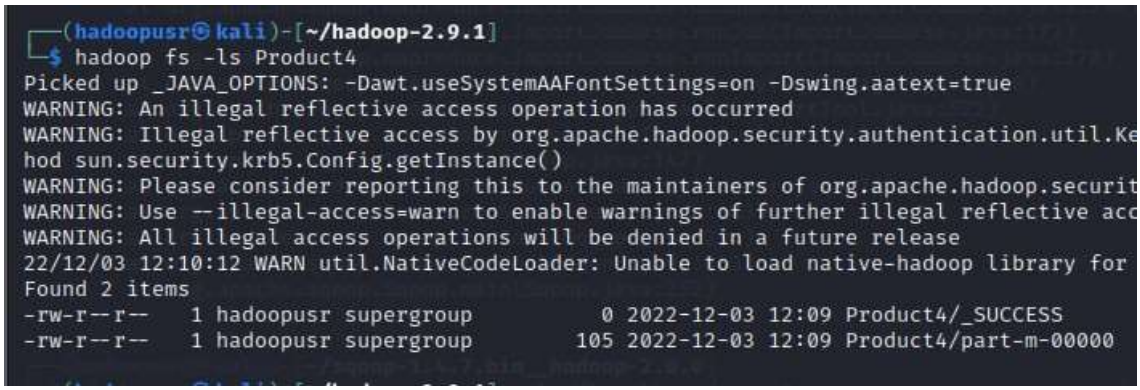
```
┌──(hadoopusr㉿kali)-[~/sqoop-1.4.7.bin__hadoop-2.6.0]
└─$

bin/sqoop import --connect jdbc:mysql://localhost/tsest2 --username root -password kali --query 'select * from Product where $CONDITIONS' --split-by P_id --target-dir /user/hadoopusr/Product4 -m1
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hbase does not exist! HBase imports will fail.
Please set $HBASE_HOME to the root of your HBase installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hcatalog does not exist! HCatalog jobs will fail.
Please set $HCAT_HOME to the root of your HCatalog installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../accumulo does not exist! Accumulo imports will fail.
Please set $ACCUMULO_HOME to the root of your Accumulo installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../zookeeper does not exist! Accumulo imports will fail.
Please set $ZOOKEEPER_HOME to the root of your Zookeeper installation.
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
22/12/03 12:08:54 INFO sqoop.Sqoop: Running Sqoop version: 1.4.7
22/12/03 12:08:54 WARN tool.BaseSqoopTool: Setting your password on the command-line is insecure. Consider using -P instead.
22/12/03 12:08:55 INFO manager.MySQLManager: Preparing to use a MySQL streaming resultset.
22/12/03 12:08:55 INFO tool.CodeGenTool: Beginning code generation
Loading class `com.mysql.jdbc.Driver'. This is deprecated. The new driver class is `com.mysql.cj.jdbc.Driver'. The driver is automatically registered via the SPI and manual loading of the driver class is generally unnecessary.
22/12/03 12:08:56 INFO manager.SqlManager: Executing SQL statement: select * from Product where  (1 = 0)
22/12/03 12:08:56 INFO manager.SqlManager: Executing SQL statement: select * from Product where  (1 = 0)
22/12/03 12:08:56 INFO manager.SqlManager: Executing SQL statement: select * from Product where  (1 = 0)
22/12/03 12:08:56 INFO orm.CompilationManager: HADOOP_MAPRED_HOME is /home/hadoopusr/hadoop-2.9.1
Note: /tmp/sqoop-hadoopusr/compile/b37ffb919eaff58193d0c4ea3514af5e/QueryResult.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
22/12/03 12:09:03 INFO orm.CompilationManager: Writing jar file: /tmp/sqoop-hadoopusr/compile/b37ffb919eaff58193d0c4ea3514af5e/QueryResult.jar
22/12/03 12:09:03 INFO mapreduce.ImportJobBase: Beginning query import.
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/common/lib/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
22/12/03 12:09:03 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
22/12/03 12:09:03 INFO Configuration.deprecation: mapred.jar is deprecated. Instead, use mapreduce.job.jar
22/12/03 12:09:05 INFO Configuration.deprecation: mapred.job.tracker is deprecated. Instead, use mapreduce.jobtracker.address
```

```
562889272_0001_m_000000
22/12/03 12:09:09 INFO mapred.LocalJobRunner: map
22/12/03 12:09:09 INFO mapred.Task: Task 'attempt_local562889272_0001_m_000000_0' done.
22/12/03 12:09:09 INFO mapred.LocalJobRunner: Finishing task: attempt_local562889272_0001_m_000000_0
22/12/03 12:09:09 INFO mapred.LocalJobRunner: map task executor complete.
22/12/03 12:09:10 INFO mapreduce.Job:  map 100% reduce 0%
22/12/03 12:09:10 INFO mapreduce.Job: Job job_local562889272_0001 completed successfully
22/12/03 12:09:10 INFO mapreduce.Job: Counters: 20
        File System Counters
                FILE: Number of bytes read=7108
                FILE: Number of bytes written=507699
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=0
                HDFS: Number of bytes written=105
                HDFS: Number of read operations=4
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=3
        Map-Reduce Framework
                Map input records=5
                Map output records=5
                Input split bytes=87
                Spilled Records=0
                Failed Shuffles=0
                Merged Map outputs=0
                GC time elapsed (ms)=35
                Total committed heap usage (bytes)=118489088
        File Input Format Counters
                Bytes Read=0
        File Output Format Counters
                Bytes Written=105
22/12/03 12:09:10 INFO mapreduce.ImportJobBase: Transferred 105 bytes in 4.6414 seconds (22.6226 bytes/sec)
22/12/03 12:09:10 INFO mapreduce.ImportJobBase: Retrieved 5 records.
```

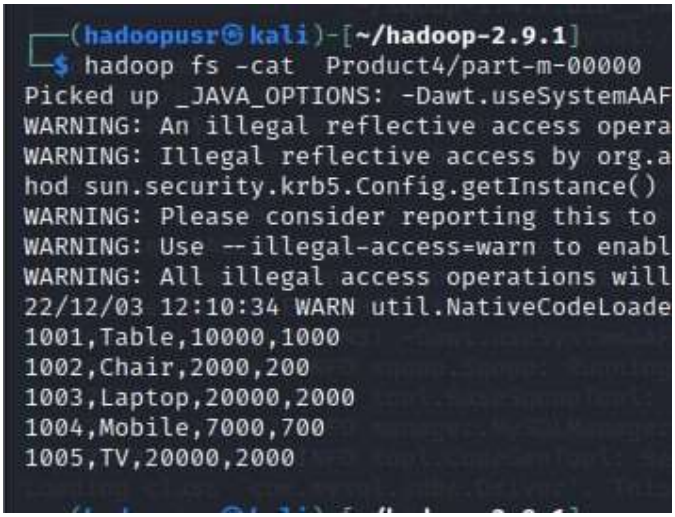
Command: - hadoop fs -ls

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -ls
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authenti
hod sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.
WARNING: Use --illegal-access=warn to enable warnings of further illegal
WARNING: All illegal access operations will be denied in a future release
22/12/03 12:09:42 WARN util.NativeCodeLoader: Unable to load native-hadoo
Found 6 items
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 06:54 Persons
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:12 Product
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:28 Product2
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:52 Product3
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 12:09 Product4
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 07:28 Student
```

Command: - hadoop fs -ls Product4



Command: - hadoop fs -cat Product4/part-m-00000



5. Query with WHERE

sqoop import <---------- tool

--connect jdbc:mysql://Localhost /Database name

--username root

-P

--query 'select * from products WHERE productID > 1003 AND $CONDITIONS' <--- import subset of query

--split-by productID

--target-dir Filepath<---------- HDFS destination dir

Command: -

bin/sqoop import --connect jdbc:mysql://localhost/tsest2 --username root -password kali -query 'select * from Product where P_id> 1002 AND $CONDITIONS' --target-dir /user/hadoopusr/Product5 -m1

```
┌──(hadoopusr㉿kali)-[~/sqoop-1.4.7.bin__hadoop-2.6.0]
└─$ bin/sqoop import --connect jdbc:mysql://localhost/tsest2 --username root -password kali --query 'select * from Product where P_id> 1002 AND $CONDITIONS' --target-dir /user/hadoopusr/
Product5 -m1
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hbase does not exist! HBase imports will fail.
Please set $HBASE_HOME to the root of your HBase installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hcatalog does not exist! HCatalog jobs will fail.
Please set $HCAT_HOME to the root of your HCatalog installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../accumulo does not exist! Accumulo imports will fail.
Please set $ACCUMULO_HOME to the root of your Accumulo installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../zookeeper does not exist! Accumulo imports will fail.
Please set $ZOOKEEPER_HOME to the root of your Zookeeper installation.
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
22/12/03 12:14:47 INFO sqoop.Sqoop: Running Sqoop version: 1.4.7
22/12/03 12:14:47 WARN tool.BaseSqoopTool: Setting your password on the command-line is insecure. Consider using -P instead.
22/12/03 12:14:47 INFO manager.MySQLManager: Preparing to use a MySQL streaming resultset.
22/12/03 12:14:47 INFO tool.CodeGenTool: Beginning code generation
Loading class `com.mysql.jdbc.Driver'. This is deprecated. The new driver class is `com.mysql.cj.jdbc.Driver'. The driver is automatically registered via the SPI and manual loading of th
e driver class is generally unnecessary.
22/12/03 12:14:48 INFO manager.SqlManager: Executing SQL statement: select * from Product where P_id> 1002 AND  (1 = 0)
22/12/03 12:14:48 INFO manager.SqlManager: Executing SQL statement: select * from Product where P_id> 1002 AND  (1 = 0)
22/12/03 12:14:48 INFO manager.SqlManager: Executing SQL statement: select * from Product where P_id> 1002 AND  (1 = 0)
22/12/03 12:14:48 INFO orm.CompilationManager: HADOOP_MAPRED_HOME is /home/hadoopusr/hadoop-2.9.1
Note: /tmp/sqoop-hadoopusr/compile/031c71cbafee61fc2106f28138c6f266/QueryResult.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
22/12/03 12:14:54 INFO orm.CompilationManager: Writing jar file: /tmp/sqoop-hadoopusr/compile/031c71cbafee61fc2106f28138c6f266/QueryResult.jar
22/12/03 12:14:54 INFO mapreduce.ImportJobBase: Beginning query import.
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/common/lib/hadoop-auth-2.9.1.jar) to met
hod sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
22/12/03 12:14:55 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
22/12/03 12:14:55 INFO Configuration.deprecation: mapred.jar is deprecated. Instead, use mapreduce.job.jar
22/12/03 12:14:57 INFO Configuration.deprecation: mapred.job.tracker is deprecated. Instead, use mapreduce.jobtracker.address
22/12/03 12:14:57 INFO Configuration.deprecation: session.id is deprecated. Instead, use dfs.metrics.session-id
22/12/03 12:14:57 INFO jvm.JvmMetrics: Initializing JVM Metrics with processName=JobTracker, sessionId=
22/12/03 12:14:57 INFO db.DBInputFormat: Using read commited transaction isolation
```

```
22/12/03 12:15:00 INFO output.FileOutputCommitter: Saved output of task 'attempt_local1253460493_0001_m_000000_0'
l1253460493_0001_m_000000
22/12/03 12:15:00 INFO mapred.LocalJobRunner: map
22/12/03 12:15:00 INFO mapred.Task: Task 'attempt_local1253460493_0001_m_000000_0' done.
22/12/03 12:15:00 INFO mapred.LocalJobRunner: Finishing task: attempt_local1253460493_0001_m_000000_0
22/12/03 12:15:00 INFO mapred.LocalJobRunner: map task executor complete.
22/12/03 12:15:00 INFO mapreduce.Job: Job job_local1253460493_0001 running in uber mode : false
22/12/03 12:15:00 INFO mapreduce.Job:  map 100% reduce 0%
22/12/03 12:15:01 INFO mapreduce.Job: Job job_local1253460493_0001 completed successfully
22/12/03 12:15:01 INFO mapreduce.Job: Counters: 20
        File System Counters
                FILE: Number of bytes read=7108
                FILE: Number of bytes written=509602
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=0
                HDFS: Number of bytes written=63
                HDFS: Number of read operations=4
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=3
        Map-Reduce Framework
                Map input records=3
                Map output records=3
                Input split bytes=87
                Spilled Records=0
                Failed Shuffles=0
                Merged Map outputs=0
                GC time elapsed (ms)=15
                Total committed heap usage (bytes)=135266304
        File Input Format Counters
                Bytes Read=0
        File Output Format Counters
                Bytes Written=63
22/12/03 12:15:01 INFO mapreduce.ImportJobBase: Transferred 63 bytes in 4.7521 seconds (13.2573 bytes/sec)
22/12/03 12:15:01 INFO mapreduce.ImportJobBase: Retrieved 3 records.
```

Command: -

hadoop fs -ls Product5

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -ls
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=tr
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentica
hod sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.ha
WARNING: Use --illegal-access=warn to enable warnings of further illegal re
WARNING: All illegal access operations will be denied in a future release
22/12/03 12:15:22 WARN util.NativeCodeLoader: Unable to load native-hadoop
Found 7 items
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 06:54 Persons
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:12 Product
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:28 Product2
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:52 Product3
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 12:09 Product4
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 12:15 Product5
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 07:28 Student
```

Command: - hadoop fs -ls Product5

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -ls  Product5
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.Ke
hod sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.securit
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective acc
WARNING: All illegal access operations will be denied in a future release
22/12/03 12:15:44 WARN util.NativeCodeLoader: Unable to load native-hadoop library for
Found 2 items
-rw-r--r--   1 hadoopusr supergroup          0 2022-12-03 12:15 Product5/_SUCCESS
-rw-r--r--   1 hadoopusr supergroup         63 2022-12-03 12:15 Product5/part-m-00000
```

Command: - hadoop fs -cat Product5/part-m-00000

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -cat Product5/part-m-00000
Picked up _JAVA_OPTIONS: -Dawt.useSystemA
WARNING: An illegal reflective access ope
WARNING: Illegal reflective access by org
hod sun.security.krb5.Config.getInstance(
WARNING: Please consider reporting this t
WARNING: Use --illegal-access=warn to ena
WARNING: All illegal access operations wi
22/12/03 12:16:13 WARN util.NativeCodeLoa
1003,Laptop,20000,2000
1004,Mobile,7000,700
1005,TV,20000,2000
```

6. Incremental Import

Command: - bin/sqoop
import \

--connect jdbc:mysql://localhost/tsest2 \

--username root \

-P \

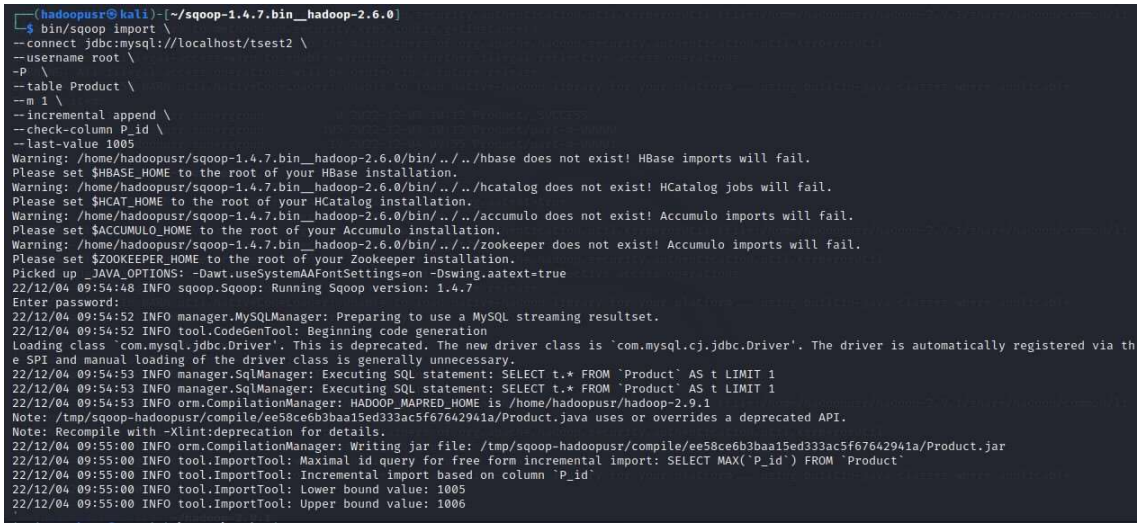
--table Product \

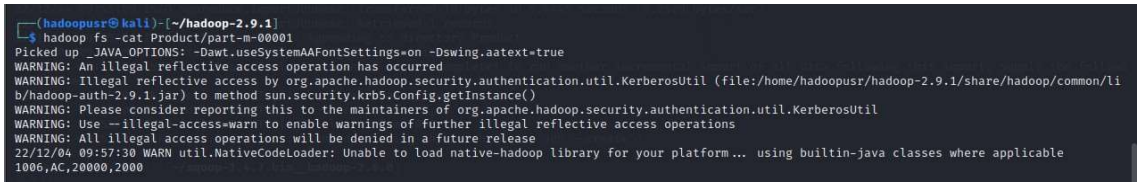
--m 1 \

--incremental append \

--check-column P_id \

--last-value 1005





7. Import all table.

Command: -
bin/sqoop import-all-tables --connect jdbc:mysql://localhost/test2 --username root password kali -m1

```
┌──(hadoopusr㉿kali)-[~/sqoop-1.4.7.bin__hadoop-2.6.0]
└─$ bin/sqoop import-all-tables --connect jdbc:mysql://localhost/test2 --username root -password kali -m1
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hbase does not exist! HBase imports will fail.
Please set $HBASE_HOME to the root of your HBase installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hcatalog does not exist! HCatalog jobs will fail.
Please set $HCAT_HOME to the root of your HCatalog installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../accumulo does not exist! Accumulo imports will fail.
Please set $ACCUMULO_HOME to the root of your Accumulo installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../zookeeper does not exist! Accumulo imports will fail.
Please set $ZOOKEEPER_HOME to the root of your Zookeeper installation.
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
22/12/03 12:55:37 INFO sqoop.Sqoop: Running Sqoop version: 1.4.7
22/12/03 12:55:37 WARN tool.BaseSqoopTool: Setting your password on the command-line is insecure. Consider using -P instead.
22/12/03 12:55:38 INFO manager.MySQLManager: Preparing to use a MySQL streaming resultset.
Loading class `com.mysql.jdbc.Driver'. This is deprecated. The new driver class is `com.mysql.cj.jdbc.Driver'. The driver is automatically registered via the SPI
e driver class is generally unnecessary.
22/12/03 12:55:39 INFO tool.CodeGenTool: Beginning code generation
22/12/03 12:55:39 INFO manager.SqlManager: Executing SQL statement: SELECT t.* FROM `demo2` AS t LIMIT 1
22/12/03 12:55:39 INFO manager.SqlManager: Executing SQL statement: SELECT t.* FROM `demo2` AS t LIMIT 1
22/12/03 12:55:39 INFO orm.CompilationManager: HADOOP_MAPRED_HOME is /home/hadoopusr/hadoop-2.9.1
Note: /tmp/sqoop-hadoopusr/compile/d0063b21171a272eaba1d1645ad6e2e9/demo2.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
22/12/03 12:55:46 INFO orm.CompilationManager: Writing jar file: /tmp/sqoop-hadoopusr/compile/d0063b21171a272eaba1d1645ad6e2e9/demo2.jar
22/12/03 12:55:46 WARN manager.MySQLManager: It looks like you are importing from mysql.
22/12/03 12:55:46 WARN manager.MySQLManager: This transfer can be faster! Use the --direct
22/12/03 12:55:46 WARN manager.MySQLManager: option to exercise a MySQL-specific fast path.
22/12/03 12:55:46 INFO manager.MySQLManager: Setting zero DATETIME behavior to convertToNull (mysql)
22/12/03 12:55:46 INFO mapreduce.ImportJobBase: Beginning import of demo2
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/common/lib/hadd
hod sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
22/12/03 12:55:46 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
22/12/03 12:55:47 INFO Configuration.deprecation: mapred.jar is deprecated. Instead, use mapreduce.job.jar
22/12/03 12:55:49 INFO Configuration.deprecation: mapred.job.tracker is deprecated. Instead, use mapreduce.jobtracker.address
```

hadoop fs -ls

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -ls
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authent
hod sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache
WARNING: Use --illegal-access=warn to enable warnings of further illegal
WARNING: All illegal access operations will be denied in a future releas
22/12/03 14:42:26 WARN util.NativeCodeLoader: Unable to load native-hado
Found 13 items
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 06:54 Persons
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:12 Product
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:28 Product2
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 10:52 Product3
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 12:09 Product4
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 12:15 Product5
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 12:38 Product6
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 12:45 Product7
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 07:28 Student
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 12:55 demo1
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 12:55 demo2
drwxr-xr-x   - hadoopusr supergroup          0 2022-12-03 12:56 demo3
-rw-r--r--   1 hadoopusr supergroup         14 2022-12-03 13:27 export
```

8. Eval –Query

Command: -

bin/sqoop eval --connect jdbc:mysql://localhost/tsest2 --username root -P --query "select * from Product"

```
┌──(hadoopusr㉿kali)-[~/sqoop-1.4.7.bin__hadoop-2.6.0]
└─$ bin/sqoop eval --connect jdbc:mysql://localhost/tsest2 --username root -P
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hbase does n
Please set $HBASE_HOME to the root of your HBase installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hcatalog doe
Please set $HCAT_HOME to the root of your HCatalog installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../accumulo doe
Please set $ACCUMULO_HOME to the root of your Accumulo installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../zookeeper do
Please set $ZOOKEEPER_HOME to the root of your Zookeeper installation.
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
22/12/04 11:12:44 INFO sqoop.Sqoop: Running Sqoop version: 1.4.7
Enter password:
22/12/04 11:12:47 INFO manager.MySQLManager: Preparing to use a MySQL streami
Loading class `com.mysql.jdbc.Driver'. This is deprecated. The new driver cla
he SPI and manual loading of the driver class is generally unnecessary.
```

P_id	P_Name	P_Prices	P_Discount
1001	Table	10000	1000
1002	Chair	2000	200
1003	Laptop	20000	2000
1004	Mobile	7000	700
1005	TV	20000	2000
1006	AC	20000	2000

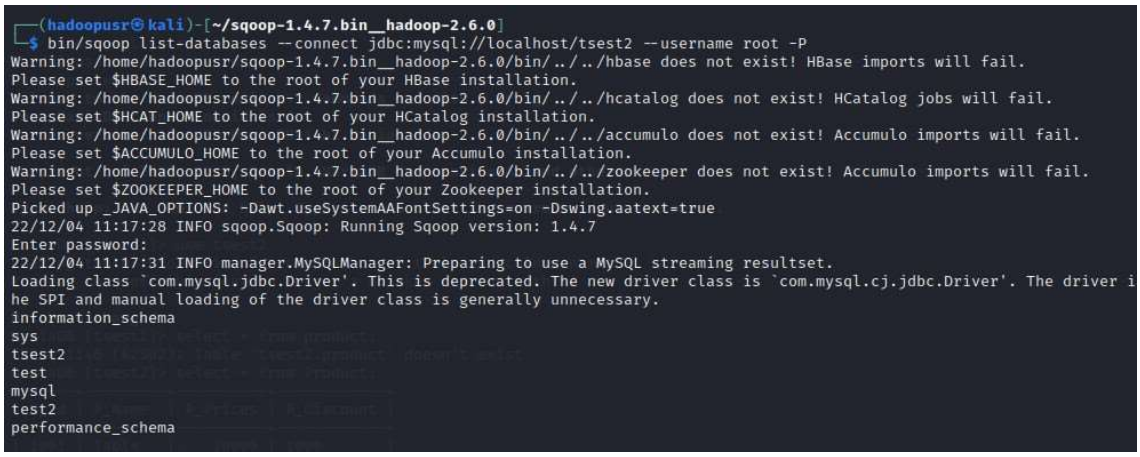
9. EVAL - -Insert

bin/sqoop eval --connect jdbc:mysql://localhost/tsest2 --username root -P -e "INSERT INTO Product VALUES(1009,'Watches',20000,2000);"

```
┌──(hadoopusr㉿kali)-[~/sqoop-1.4.7.bin__hadoop-2.6.0]
└─$ bin/sqoop eval --connect jdbc:mysql://localhost/tsest2 --username root -P -e "INSERT INTO  Product VALUES(1009,'Watches',20000,2000);"
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hbase does not exist! HBase imports will fail.
Please set $HBASE_HOME to the root of your HBase installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hcatalog does not exist! HCatalog jobs will fail.
Please set $HCAT_HOME to the root of your HCatalog installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../accumulo does not exist! Accumulo imports will fail.
Please set $ACCUMULO_HOME to the root of your Accumulo installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../zookeeper does not exist! Accumulo imports will fail.
Please set $ZOOKEEPER_HOME to the root of your Zookeeper installation.
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
22/12/04 11:14:38 INFO sqoop.Sqoop: Running Sqoop version: 1.4.7
Enter password:
22/12/04 11:14:41 INFO manager.MySQLManager: Preparing to use a MySQL streaming resultset.
Loading class `com.mysql.jdbc.Driver'. This is deprecated. The new driver class is `com.mysql.cj.jdbc.Driver'. The driver is automatically regi
he SPI and manual loading of the driver class is generally unnecessary.
22/12/04 11:14:42 INFO tool.EvalSqlTool: 1 row(s) updated.
```

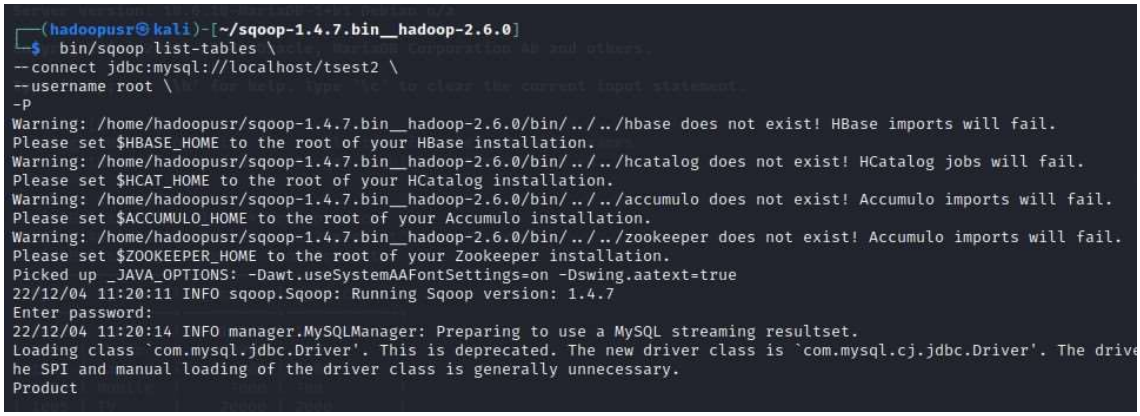
10. List Database

bin/sqoop list-databases --connect jdbc:mysql://localhost/tsest2 --username root -P



11. List table.

bin/sqoop list-
tables \
--connect jdbc:mysql://localhost/tsest2 \
--username root \
-P



12. Export data from HDFS to MySql.

Command: -

bin/sqoop export --connect jdbc:mysql://localhost/test2 --username root -password kali -
table export --export-dir /user/hadoopusr/export

```
┌──(hadoopusr㉿kali)-[~/sqoop-1.4.7.bin__hadoop-2.6.0]
└─$ bin/sqoop export --connect jdbc:mysql://localhost/test2 --username root -password kali --table export --export-dir /user/hadoopusr/export
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hbase does not exist! HBase imports will fail.
Please set $HBASE_HOME to the root of your HBase installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../hcatalog does not exist! HCatalog jobs will fail.
Please set $HCAT_HOME to the root of your HCatalog installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../accumulo does not exist! Accumulo imports will fail.
Please set $ACCUMULO_HOME to the root of your Accumulo installation.
Warning: /home/hadoopusr/sqoop-1.4.7.bin__hadoop-2.6.0/bin/../../zookeeper does not exist! Accumulo imports will fail.
Please set $ZOOKEEPER_HOME to the root of your Zookeeper installation.
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
22/12/03 13:33:02 INFO sqoop.Sqoop: Running Sqoop version: 1.4.7
22/12/03 13:33:02 WARN tool.BaseSqoopTool: Setting your password on the command-line is insecure. Consider using -P instead.
22/12/03 13:33:02 INFO manager.MySQLManager: Preparing to use a MySQL streaming resultset.
22/12/03 13:33:02 INFO tool.CodeGenTool: Beginning code generation
Loading class `com.mysql.jdbc.Driver'. This is deprecated. The new driver class is `com.mysql.cj.jdbc.Driver'. The driver is automatically registered
e driver class is generally unnecessary.
22/12/03 13:33:04 INFO manager.SqlManager: Executing SQL statement: SELECT t.* FROM `export` AS t LIMIT 1
22/12/03 13:33:04 INFO manager.SqlManager: Executing SQL statement: SELECT t.* FROM `export` AS t LIMIT 1
22/12/03 13:33:04 INFO orm.CompilationManager: HADOOP_MAPRED_HOME is /home/hadoopusr/hadoop-2.9.1
Note: /tmp/sqoop-hadoopusr/compile/67b4a49444c0cd5eb7feccfba1a3dd8f/export.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
22/12/03 13:33:13 INFO orm.CompilationManager: Writing jar file: /tmp/sqoop-hadoopusr/compile/67b4a49444c0cd5eb7feccfba1a3dd8f/export.jar
22/12/03 13:33:13 INFO mapreduce.ExportJobBase: Beginning export of export
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/comm
hod sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
22/12/03 13:33:13 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
22/12/03 13:33:14 INFO Configuration.deprecation: mapred.jar is deprecated. Instead, use mapreduce.job.jar
22/12/03 13:33:19 INFO Configuration.deprecation: mapred.reduce.tasks.speculative.execution is deprecated. Instead, use mapreduce.reduce.speculative
22/12/03 13:33:19 INFO Configuration.deprecation: mapred.map.tasks.speculative.execution is deprecated. Instead, use mapreduce.map.speculative
22/12/03 13:33:19 INFO Configuration.deprecation: mapred.job.tracker is deprecated. Instead, use mapreduce.jobtracker.address
22/12/03 13:33:20 INFO Configuration.deprecation: session.id is deprecated. Instead, use dfs.metrics.session-id
22/12/03 13:33:20 INFO jvm.JvmMetrics: Initializing JVM Metrics with processName=JobTracker, sessionId=
```

```
22/12/03 13:34:07 INFO mapred.Task: Task:attempt_local168324352_0001_m_000003_0 is done. And is in the process of committing
22/12/03 13:34:07 INFO mapred.LocalJobRunner: map
22/12/03 13:34:07 INFO mapred.Task: Task 'attempt_local168324352_0001_m_000003_0' done.
22/12/03 13:34:07 INFO mapred.LocalJobRunner: Finishing task: attempt_local168324352_0001_m_000003_0
22/12/03 13:34:07 INFO mapred.LocalJobRunner: map task executor complete.
22/12/03 13:34:08 INFO mapreduce.Job:  map 100% reduce 0%
22/12/03 13:34:08 INFO mapreduce.Job: Job job_local168324352_0001 completed successfully
22/12/03 13:34:08 INFO mapreduce.Job: Counters: 20
        File System Counters
                FILE: Number of bytes read=23744
                FILE: Number of bytes written=2019172
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=158
                HDFS: Number of bytes written=0
                HDFS: Number of read operations=66
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=0
        Map-Reduce Framework
                Map input records=7
                Map output records=7
                Input split bytes=561
                Spilled Records=0
                Failed Shuffles=0
                Merged Map outputs=0
                GC time elapsed (ms)=0
                Total committed heap usage (bytes)=654311424
        File Input Format Counters
                Bytes Read=0
        File Output Format Counters
                Bytes Written=0
22/12/03 13:34:08 INFO mapreduce.ExportJobBase: Transferred 158 bytes in 48.1346 seconds (3.2825 bytes/sec)
22/12/03 13:34:08 INFO mapreduce.ExportJobBase: Exported 7 records.
```

```
MariaDB [test2]> select * from export;
+------+
| e_id |
+------+
|    6 |
|    7 |
|    1 |
|    2 |
|    3 |
|    4 |
|    5 |
+------+
7 rows in set (0.006 sec)
```

Practical 6

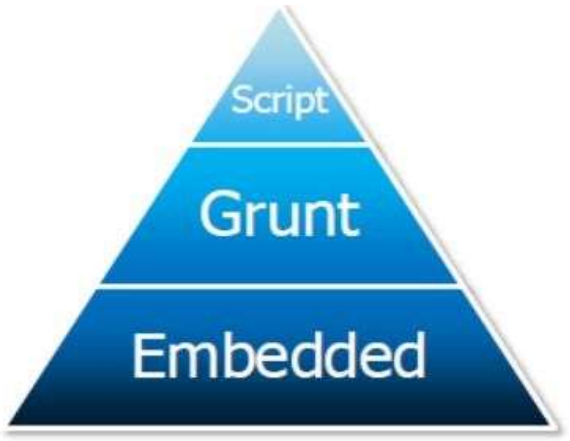
Aim: Write a Pig Script for solving counting problems

What is Apache Pig?

Pig is a high-level programming language useful for analyzing large data sets. Pig was a result of development effort at Yahoo. Apache Pig enables people to focus more on analyzing bulk data sets and to spend less time writing Map-Reduce programs. the Apache Pig programming language is designed to work upon any kind of data.

Pig is important as companies like Yahoo, Google and Microsoft are collecting huge amounts of data sets and is also used in some form of ad-hoc processing and analysis of all the information.

Basic Program Structure of Pig:

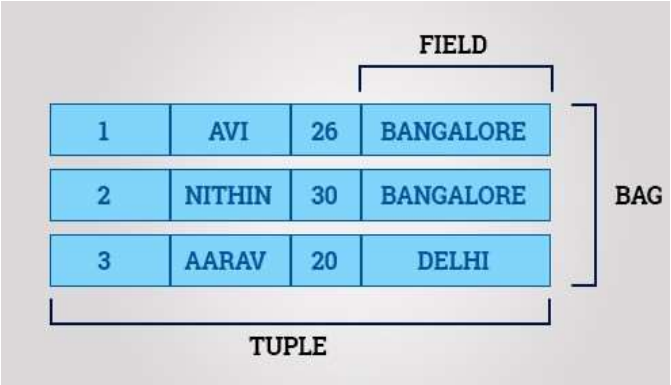


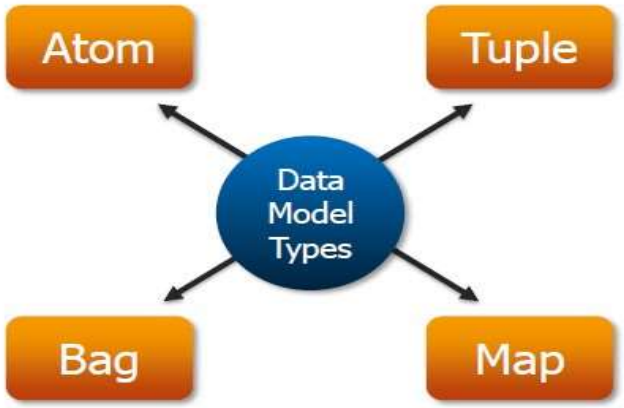
Script – Pig Can run a file script that contains Pig Commands. Eg: pig script .pig runs the command in the local file script.pig.

Grunt – It is an interactive shell for running Pig commands. It is also possible to run pig scripts from within Grunts using run and exec.

Embedded – Can run Pig programs from Java, much like you can use JDBC to run SQL programs from Java.

Basic Types of Data Models in Pig:





Pig comprises of 4 basic types of data models. They are as follows:

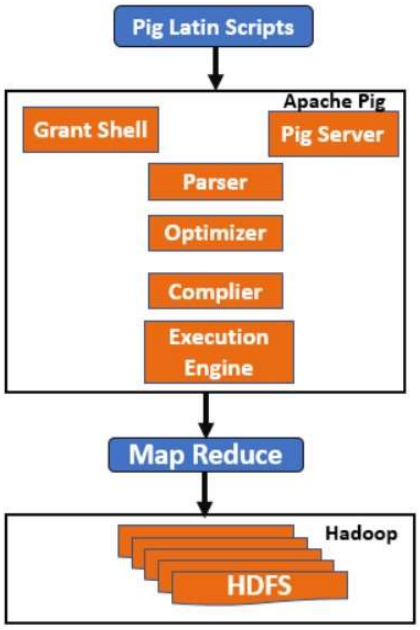
Atom – It is a simple atomic data value. It is stored as a string but can be used as either a string or a number.

Tuple – An ordered set of fields.

Bag – A collection of tuples.

Map – set of key value pairs.

Pig Architecture:



1. **Parser:** When a Pig Latin script is sent to Hadoop Pig, it is first handled by the parser. The parser is responsible for checking the syntax of the script. Parser gives an output in the form of a Directed Acyclic Graph (DAG) that contains Pig Latin statements, together with other logical operators represented as nodes.

2. **Optimizer:** After the output from the parser is retrieved, a logical plan for DAG is passed to a logical optimizer. The optimizer is responsible for carrying out the logical optimizations.
3. **Compiler:** The role of the compiler comes in when the output from the optimizer is received. The compiler compiles the logical plan sent by the optimizing the logical plan is then converted into a series of MapReduce tasks or jobs.
4. **Execution Engine:** After the logical plan is converted to MapReduce jobs, these jobs are sent to Hadoop in a properly sorted order, and these jobs are executed on Hadoop for yielding the desired result.

Hadoop Pig Features:

1. Rich set of operators

One of the major advantages is, in order to perform several operations, there is a huge set of operators offered by Apache Pig, such as join, sort, filer, etc.

2. Ease of programming

Basically, for SQL Programmer, Pig Latin is a boon. It is as similar to SQL. Hence, if you are good at SQL it is easy to write a Pig script.

3. Optimization opportunities

Also, it's a benefit working here because in Apache Pig the tasks optimize their execution automatically. Hence, as a result, programmers only need to focus on the semantics of the language.

Components of Pig

There are two major components of the Pig:

- Pig Latin script language
- A runtime engine

Pig Latin script language

The Pig Latin script is a procedural data flow language. It contains syntax and commands that can be applied to implement business logic. Examples of Pig Latin are LOAD and STORE.

A runtime engine

The runtime engine is a compiler that produces sequences of MapReduce programs. It uses HDFS to store and retrieve data. It is also used to interact with the Hadoop system (HDFS and MapReduce).

The runtime engine parses, validates, and compiles the script operations into a sequence of MapReduce jobs.

Apache Pig Installation:

Pre-Requisite to Install Pig

You must have Hadoop and Java JDK installed on your system.

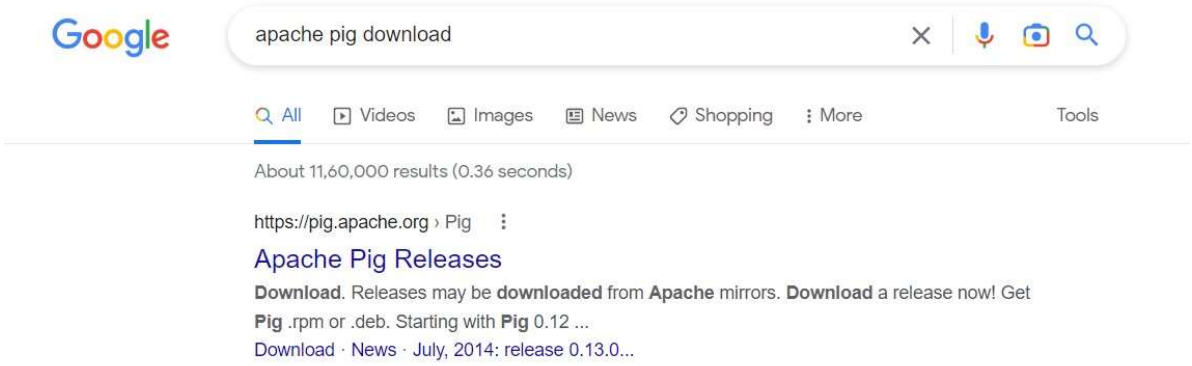
- **java Installation** - Check whether the Java is installed or not using the following command.

$java -version

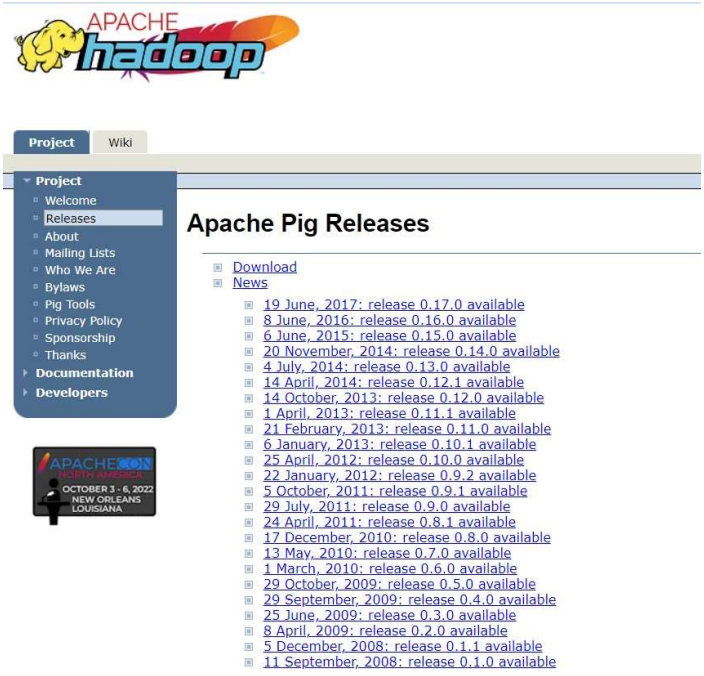
- **Hadoop Installation** - Check whether the Hadoop is installed or not using the following command.

$hadoop version

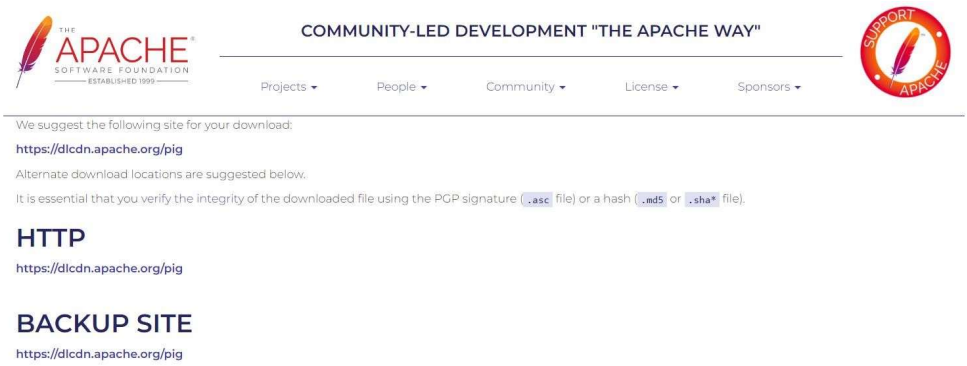
1. To download pig, we need to go on its website- https://pig.apache.org/releases.html



2. Then click on downloads-



3. Now we have to download the required version of pig-



o Download the Apache Pig tar file.

- Unzip the downloaded tar file.

$ tar -xvf pig-0.16.0.tar.gz o Open the bashrc file.

$ sudo nano ~/.bashrc

Now, provide the following PIG_HOME path.

export PIG_HOME=/home/hduser/pig-0.16.0 export PATH=$PATH:$PIG_HOME/bin

- Update the environment variable

$ source ~/.bashrc o Let's test the installation on the command prompt type $ pig -h

```
(hadoopusr㉿kali)-[~/hadoop-2.9.1]
$ pig -h
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true

Apache Pig version 0.16.0 (r1746530)
compiled Jun 01 2016, 23:10:49

USAGE: Pig [options] [-] : Run interactively in grunt shell.
       Pig [options] -e[xecute] cmd [cmd ...] : Run cmd(s).
       Pig [options] [-f[ile]] file : Run cmds found in file.
  options include:
    -4, -log4jconf - Log4j configuration file, overrides log conf
    -b, -brief - Brief logging (no timestamps)
    -c, -check - Syntax check
    -d, -debug - Debug level, INFO is default
    -e, -execute - Commands to execute (within quotes)
    -f, -file - Path to the script to execute
    -g, -embedded - ScriptEngine classname or keyword for the ScriptEngine
    -h, -help - Display this message. You can specify topic to get help for that topic.
        properties is the only topic currently supported: -h properties.
    -i, -version - Display version information
    -l, -logfile - Path to client side log file; default is current working directory.
    -m, -param_file - Path to the parameter file
    -p, -param - Key value pair of the form param=val
    -r, -dryrun - Produces script with substituted parameters. Script is not executed.
    -t, -optimizer_off - Turn optimizations off. The following values are supported:
            ConstantCalculator - Calculate constants at compile time
            SplitFilter - Split filter conditions
            PushUpFilter - Filter as early as possible
            MergeFilter - Merge filter conditions
            PushDownForeachFlatten - Join or explode as late as possible
            LimitOptimizer - Limit as early as possible
```

- Let's start the pig in MapReduce mode. $ pig

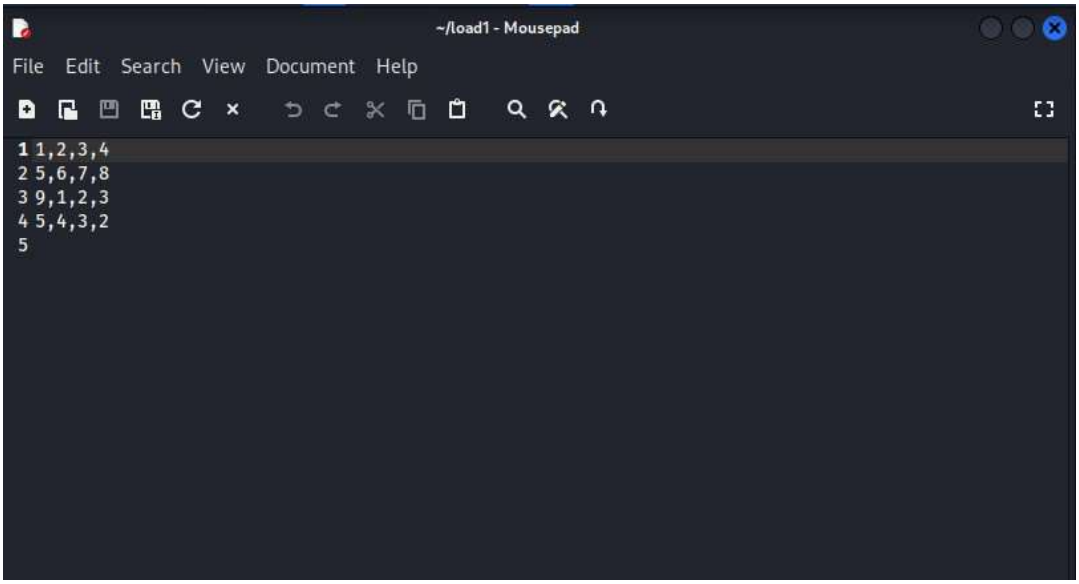
```
(hadoopusr㉿kali)-[~]
$ pig
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
22/12/06 14:10:51 INFO pig.ExecTypeProvider: Trying ExecType : LOCAL
22/12/06 14:10:51 INFO pig.ExecTypeProvider: Trying ExecType : MAPREDUCE
22/12/06 14:10:51 INFO pig.ExecTypeProvider: Picked MAPREDUCE as the ExecType
2022-12-06 14:10:51,869 [main] INFO  org.apache.pig.Main - Apache Pig version 0.16.0 (r1746530) compiled Jun 01 2016, 23:10:49
2022-12-06 14:10:51,869 [main] INFO  org.apache.pig.Main - Logging error messages to: /home/hadoopusr/pig_1670353851863.log
2022-12-06 14:10:51,979 [main] INFO  org.apache.pig.impl.util.Utils - Default bootup file /home/hadoopusr/.pigbootup not found
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/common/lib
/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
2022-12-06 14:10:53,287 [main] WARN  org.apache.hadoop.util.NativeCodeLoader - Unable to load native-hadoop library for your platform... using builtin-java
classes where applicable
2022-12-06 14:10:53,410 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - mapred.job.tracker is deprecated. Instead, use mapreduce.jobtracker.
address
2022-12-06 14:10:53,411 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2022-12-06 14:10:53,411 [main] INFO  org.apache.pig.backend.hadoop.executionengine.HExecutionEngine - Connecting to hadoop file system at: hdfs://localhost:
54310
2022-12-06 14:10:55,295 [main] INFO  org.apache.pig.PigServer - Pig Script ID for the session: PIG-default-46980134-961f-4615-8738-239f4371c4c5
2022-12-06 14:10:55,295 [main] WARN  org.apache.pig.PigServer - ATS is disabled since yarn.timeline-service.enabled set to false
grunt>
```

Implementation:

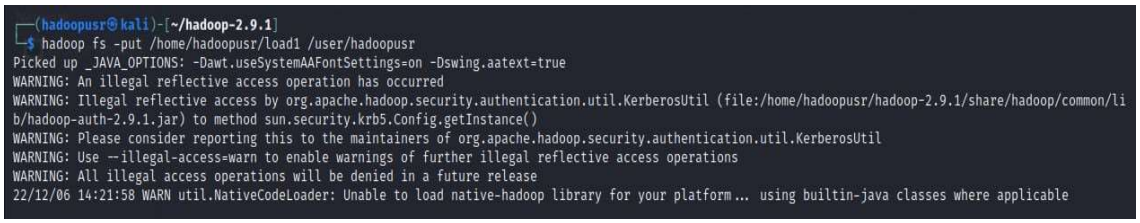
Implementing the pig operators:

1. **Load:**

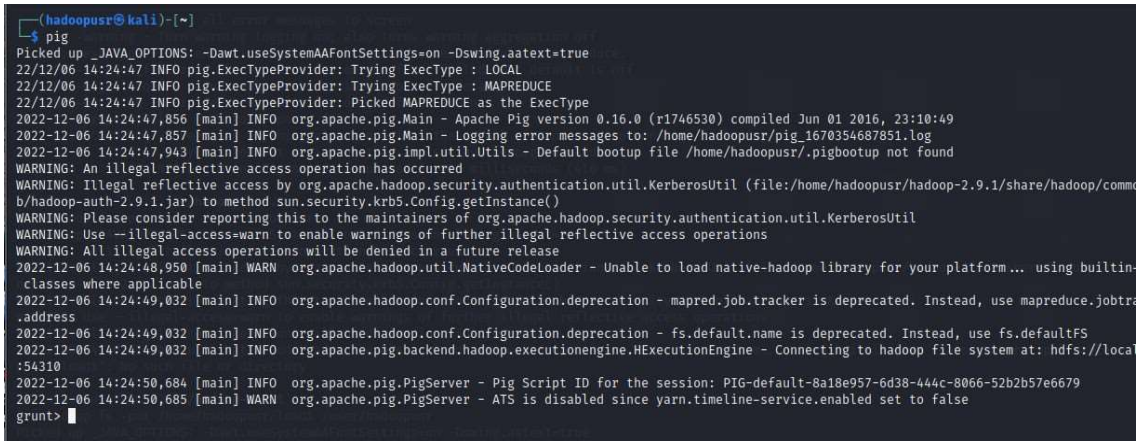
   Create a text file in your local machine and provide some values to it. Check the values written in the text files.



Upload the text files on HDFS in the specific directory.

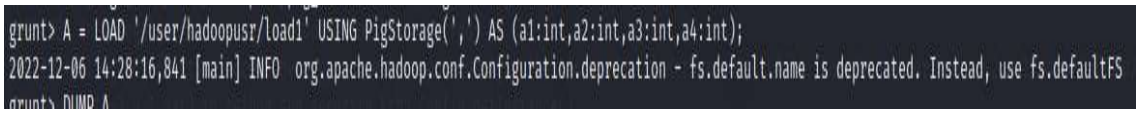


- Open the pig MapReduce run mode.



- Load the file that contains the data.

grunt> A = LOAD '/pigexample/pload.txt' USING PigStorage(',') AS (a1:int,a2:int,a3:int,a4:int) ;



- Now, execute and verify the data. grunt> DUMP A;

```
2022-12-06 14:28:16,841 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt> DUMP A
2022-12-06 14:28:23,514 [main] INFO  org.apache.pig.tools.pigstats.ScriptState - Pig features used in the script: UNKNOWN
2022-12-06 14:28:23,538 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2022-12-06 14:28:23,539 [main] INFO  org.apache.pig.data.SchemaTupleBackend - Key [pig.schematuple] was not set... will not generate code.
2022-12-06 14:28:23,540 [main] INFO  org.apache.pig.newplan.logical.optimizer.LogicalPlanOptimizer - {RULES_ENABLED=[AddForEach, ColumnMapKeyPrune, Constan
tCalculator, GroupByConstParallelSetter, LimitOptimizer, LoadTypeCastInserter, MergeFilter, MergeForEach, PartitionFilterOptimizer, PredicatePushdownOptimi
zer, PushDownForEachFlatten, PushUpFilter, SplitFilter, StreamTypeCastInserter]}
2022-12-06 14:28:23,544 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MRCompiler - File concatenation threshold: 100 optimistic
? false
2022-12-06 14:28:23,546 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MultiQueryOptimizer - MR plan size before optimization: 1
2022-12-06 14:28:23,546 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MultiQueryOptimizer - MR plan size after optimization: 1
2022-12-06 14:28:23,562 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2022-12-06 14:28:23,573 [main] INFO  org.apache.hadoop.metrics.jvm.JvmMetrics - Cannot initialize JVM Metrics with processName=JobTracker, sessionId= - alr
eady initialized
2022-12-06 14:28:23,576 [main] INFO  org.apache.pig.tools.pigstats.mapreduce.MRScriptState - Pig script settings are added to the job
2022-12-06 14:28:23,577 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.JobControlCompiler - mapred.job.reduce.markreset.buffer.p
```

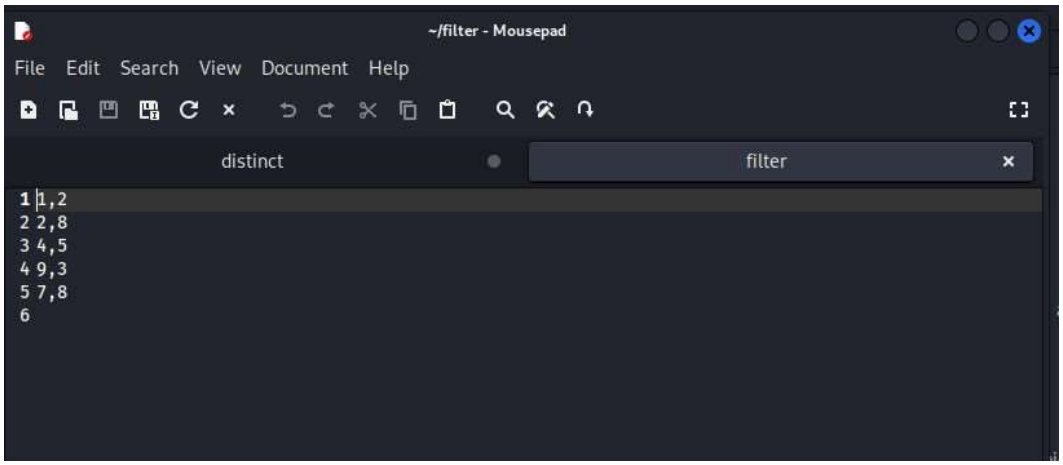
```
2022-12-06 14:28:31,183 [main]
2022-12-06 14:28:31,184 [main]
(1,2,3,4)
(5,6,7,8)
(9,1,2,3)
(5,4,3,2)
```

- Let's check the corresponding schema. grunt> DESCRIBE A;

```
(5,4,3,2)
grunt> DESCRIBE A;
A: {a1: int,a2: int,a3: int,a4: int}
grunt>
```

2. Filter:

Create a text file in your local machine and provide some values to it.



Upload the text files on HDFS in the specific directory.

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ hadoop fs -put /home/hadoopusr/filter /user/hadoopusr
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/common/li
b/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
22/12/06 14:41:44 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
```

Open the pig MapReduce run mode.

$ pig

-

```
┌──(hadoopusr㉿kali)-[~]
└─$ pig
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
22/12/06 14:24:47 INFO pig.ExecTypeProvider: Trying ExecType : LOCAL
22/12/06 14:24:47 INFO pig.ExecTypeProvider: Trying ExecType : MAPREDUCE
22/12/06 14:24:47 INFO pig.ExecTypeProvider: Picked MAPREDUCE as the ExecType
2022-12-06 14:24:47,856 [main] INFO  org.apache.pig.Main - Apache Pig version 0.16.0 (r1746530) compiled Jun 01 2016, 23:10:49
2022-12-06 14:24:47,857 [main] INFO  org.apache.pig.Main - Logging error messages to: /home/hadoopusr/pig_1670354687851.log
2022-12-06 14:24:47,943 [main] INFO  org.apache.pig.impl.util.Utils - Default bootup file /home/hadoopusr/.pigbootup not found
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/commo
b/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
2022-12-06 14:24:48,950 [main] WARN  org.apache.hadoop.util.NativeCodeLoader - Unable to load native-hadoop library for your platform... using builtin-
 classes where applicable
2022-12-06 14:24:49,032 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - mapred.job.tracker is deprecated. Instead, use mapreduce.jobtra
.address
2022-12-06 14:24:49,032 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2022-12-06 14:24:49,032 [main] INFO  org.apache.pig.backend.hadoop.executionengine.HExecutionEngine - Connecting to hadoop file system at: hdfs://local
:54310
2022-12-06 14:24:50,684 [main] INFO  org.apache.pig.PigServer - Pig Script ID for the session: PIG-default-8a18e957-6d38-444c-8066-52b2b57e6679
2022-12-06 14:24:50,685 [main] WARN  org.apache.pig.PigServer - ATS is disabled since yarn.timeline-service.enabled set to false
grunt>
```

- Load the file that contains the data.

grunt> A = LOAD '/pigexample/pfilter.txt' USING PigStorage(',') AS (a1:int,a2:int);

```
grunt> A = LOAD '/user/hadoopusr/filter' USING PigStorage(',') AS (a1:int,a2:int);
2022-12-06 14:47:58,736 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt> Dump A;
2022-12-06 14:48:09,282 [main] INFO  org.apache.pig.tools.pigstats.ScriptState - Pig features used in the script: UNKNOWN
2022-12-06 14:48:09,318 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2022-12-06 14:48:09,318 [main] INFO  org.apache.pig.data.SchemaTupleBackend - Key [pig.schematuple] was not set... will not generate code.
2022-12-06 14:48:09,319 [main] INFO  org.apache.pig.newplan.logical.optimizer.LogicalPlanOptimizer - {RULES_ENABLED=[AddForEach, ColumnMapKeyPrune, Constan
tCalculator, GroupByConstParallelSetter, LimitOptimizer, LoadTypeCastInserter, MergeFilter, MergeForEach, PartitionFilterOptimizer, PredicatePushdownOptimi
zer, PushDownForEachFlatten, PushUpFilter, SplitFilter, StreamTypeCastInserter]}
2022-12-06 14:48:09,324 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MRCompiler - File concatenation threshold: 100 optimistic
? false
2022-12-06 14:48:09,327 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MultiQueryOptimizer - MR plan size before optimization: 1
2022-12-06 14:48:09,327 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MultiQueryOptimizer - MR plan size after optimization: 1
2022-12-06 14:48:09,356 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2022-12-06 14:48:09,360 [main] INFO  org.apache.hadoop.metrics.jvm.JvmMetrics - Cannot initialize JVM Metrics with processName=JobTracker, sessionId= - alr
```

o

Now, execute and verify the data grunt> DUMP A;

```
grunt> A = LOAD '/user/hadoopusr/filter' USING PigStorage(',') AS (a1:int,a2:int);
2022-12-06 14:47:58,736 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt> Dump A;
2022-12-06 14:48:09,282 [main] INFO  org.apache.pig.tools.pigstats.ScriptState - Pig features used in the script: UNKNOWN
2022-12-06 14:48:09,318 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2022-12-06 14:48:09,318 [main] INFO  org.apache.pig.data.SchemaTupleBackend - Key [pig.schematuple] was not set... will not generate code.
2022-12-06 14:48:09,319 [main] INFO  org.apache.pig.newplan.logical.optimizer.LogicalPlanOptimizer - {RULES_ENABLED=[AddForEach, ColumnMapKeyPrune, Constan
tCalculator, GroupByConstParallelSetter, LimitOptimizer, LoadTypeCastInserter, MergeFilter, MergeForEach, PartitionFilterOptimizer, PredicatePushdownOptimi
zer, PushDownForEachFlatten, PushUpFilter, SplitFilter, StreamTypeCastInserter]}
2022-12-06 14:48:09,324 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MRCompiler - File concatenation threshold: 100 optimistic
? false
2022-12-06 14:48:09,327 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MultiQueryOptimizer - MR plan size before optimization: 1
2022-12-06 14:48:09,327 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MultiQueryOptimizer - MR plan size after optimization: 1
2022-12-06 14:48:09,356 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2022-12-06 14:48:09,360 [main] INFO  org.apache.hadoop.metrics.jvm.JvmMetrics - Cannot initialize JVM Metrics with processName=JobTracker, sessionId= - alr
```

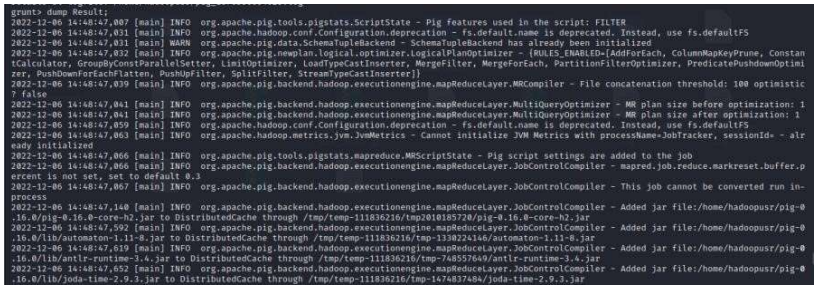
```
2022-12-06 14:48:19,350 [main] INFO  org.apache.hadoop.metrics.jvm.JvmMetrics - Cannot initialize JVM Metrics with processName=JobTracker, sessionId= - alr
eady initialized
2022-12-06 14:48:19,357 [main] INFO  org.apache.hadoop.metrics.jvm.JvmMetrics - Cannot initialize JVM Metrics with processName=JobTracker, sessionId= - alr
eady initialized
2022-12-06 14:48:19,365 [main] INFO  org.apache.hadoop.metrics.jvm.JvmMetrics - Cannot initialize JVM Metrics with processName=JobTracker, sessionId= - alr
eady initialized
2022-12-06 14:48:19,396 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher - Success!
2022-12-06 14:48:19,402 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2022-12-06 14:48:19,402 [main] WARN  org.apache.pig.data.SchemaTupleBackend - SchemaTupleBackend has already been initialized
2022-12-06 14:48:19,424 [main] INFO  org.apache.hadoop.mapreduce.lib.input.FileInputFormat - Total input files to process : 1
2022-12-06 14:48:19,425 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input paths to process : 1
(1,2)
(2,8)
(4,5)
(9,3)
(7,8)
```

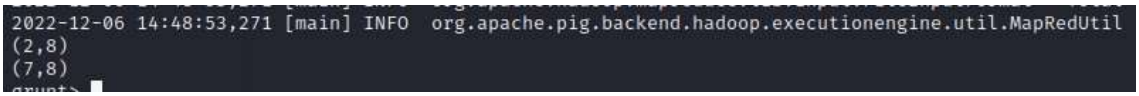
Let's execute FILTER operator to eliminate duplicate tuples.

grunt> Result = FILTER A BY a2==8;

```
grunt> Result = FILTER A BY a2==8;
```

- Now, execute and verify the data. grunt> DUMP Result;

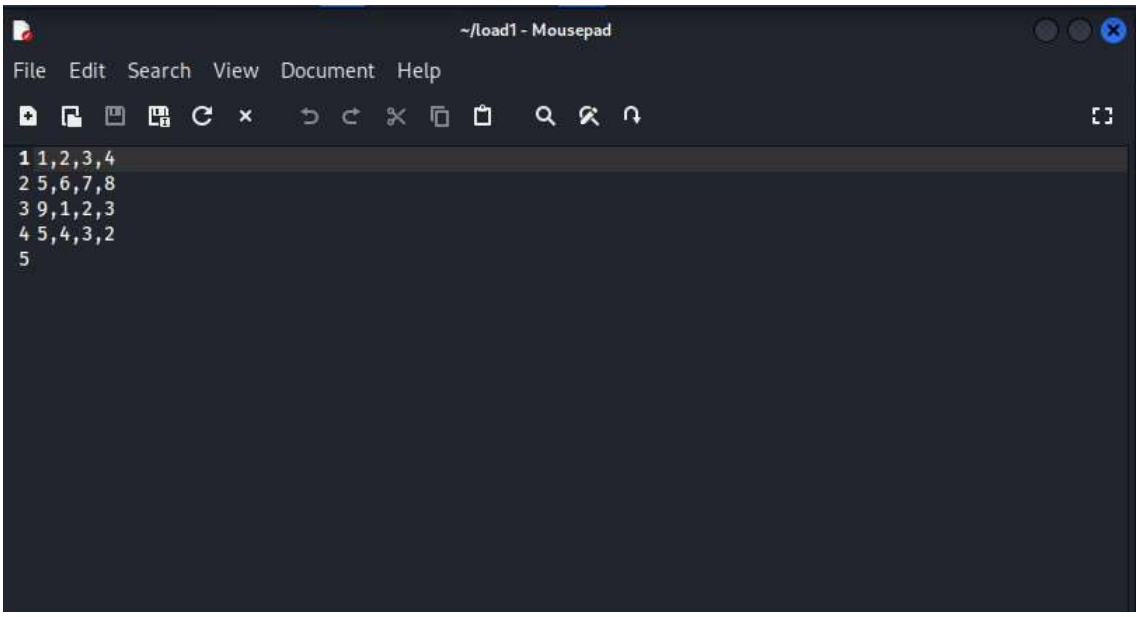




3 **Limit**

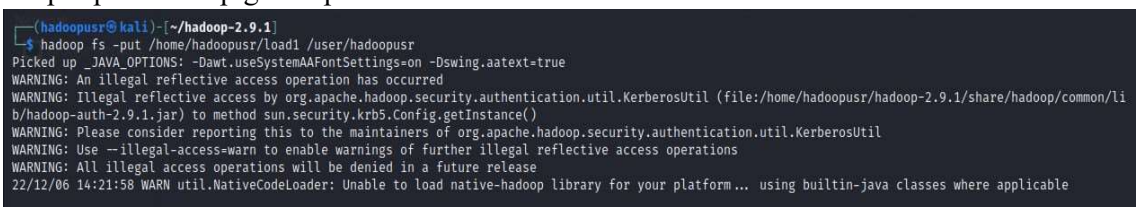
The Apache Pig LIMIT operator is used to limit the number of output tuples. However, if you specify the limit of output tuples equal to or more than the number of tuples exists, all the tuples in the relation are returned.

- Create a text file in your local machine and insert the list of tuples.



pload the text files on HDFS in the specific directory.

$ hdfs dfs -put plimit.txt /pigexample



- Load the file that contains the data.

$ pig

```
┌──(hadoopusr㉿kali)-[~/hadoop-2.9.1]
└─$ pig
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
22/12/06 15:01:20 INFO pig.ExecTypeProvider: Trying ExecType : LOCAL
22/12/06 15:01:20 INFO pig.ExecTypeProvider: Trying ExecType : MAPREDUCE
22/12/06 15:01:20 INFO pig.ExecTypeProvider: Picked MAPREDUCE as the ExecType
2022-12-06 15:01:20,315 [main] INFO  org.apache.pig.Main - Apache Pig version 0.16.0 (r1746530) compiled Jun 01 2016, 23:10:49
2022-12-06 15:01:20,316 [main] INFO  org.apache.pig.Main - Logging error messages to: /home/hadoopusr/hadoop-2.9.1/pig_1670356880312.log
2022-12-06 15:01:20,378 [main] INFO  org.apache.pig.impl.util.Utils - Default bootup file /home/hadoopusr/.pigbootup not found
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/home/hadoopusr/hadoop-2.9.1/share/hadoop/com
b/hadoop-auth-2.9.1.jar) to method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
2022-12-06 15:01:21,323 [main] WARN  org.apache.hadoop.util.NativeCodeLoader - Unable to load native-hadoop library for your platform... using builti
 classes where applicable
```

o Load the file that contains the data.

grunt> A = LOAD '/pigexample/plimit.txt' USING PigStorage(',') AS (a1:int,a2:int,a3:i) ;

```
2022-12-06 15:01:23,036 [main] WARN  org.apache.pig.PigServer - ATS is disabled since yarn.timeline-service.enabled set to false
grunt> A = LOAD '/user/hadoopusr/load1' USING PigStorage(',') AS (a1:int,a2:int,a3:int) ;
2022-12-06 15:02:22,140 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt> Dump A
2022-12-06 15:02:26,523 [main] INFO  org.apache.pig.tools.pigstats.ScriptState - Pig features used in the script: UNKNOWN
2022-12-06 15:02:26,592 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2022-12-06 15:02:26,603 [main] INFO  org.apache.pig.data.SchemaTupleBackend - Key [pig.schematuple] was not set... will not generate code.
2022-12-06 15:02:26,651 [main] INFO  org.apache.pig.newplan.logical.optimizer.LogicalPlanOptimizer - {RULES_ENABLED=[AddForEach, ColumnMapKeyPrune, Constan
tCalculator, GroupByConstParallelSetter, LimitOptimizer, LoadTypeCastInserter, MergeFilter, MergeForEach, PartitionFilterOptimizer, PredicatePushdownOptimi
zer, PushDownForEachFlatten, PushUpFilter, SplitFilter, StreamTypeCastInserter]}
2022-12-06 15:02:26,778 [main] INFO  org.apache.pig.impl.util.SpillableMemoryManager - Selected heap (G1 Old Gen) of size 1048576000 to monitor. collection
UsageThreshold = 734003200, usageThreshold = 734003200
2022-12-06 15:02:26,901 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MRCompiler - File concatenation threshold: 100 optimistic
 2 false
```

o

Now, execute and verify the data. grunt> DUMP A;


```
2022-12-06 15:01:23,036 [main] WARN  org.apache.pig.PigServer - ATS is disabled since yarn.timeline-service.enabled set to false
grunt> A = LOAD '/user/hadoopusr/load1' USING PigStorage(',') AS (a1:int,a2:int,a3:int) ;
2022-12-06 15:02:22,140 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt> Dump A
2022-12-06 15:02:26,523 [main] INFO  org.apache.pig.tools.pigstats.ScriptState - Pig features used in the script: UNKNOWN
2022-12-06 15:02:26,592 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2022-12-06 15:02:26,603 [main] INFO  org.apache.pig.data.SchemaTupleBackend - Key [pig.schematuple] was not set... will not generate code.
2022-12-06 15:02:26,651 [main] INFO  org.apache.pig.newplan.logical.optimizer.LogicalPlanOptimizer - {RULES_ENABLED=[AddForEach, ColumnMapKeyPrune, Constan
tCalculator, GroupByConstParallelSetter, LimitOptimizer, LoadTypeCastInserter, MergeFilter, MergeForEach, PartitionFilterOptimizer, PredicatePushdownOptimi
zer, PushDownForEachFlatten, PushUpFilter, SplitFilter, StreamTypeCastInserter]}
2022-12-06 15:02:26,778 [main] INFO  org.apache.pig.impl.util.SpillableMemoryManager - Selected heap (G1 Old Gen) of size 1048576000 to monitor. collection
UsageThreshold = 734003200, usageThreshold = 734003200
2022-12-06 15:02:26,901 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MRCompiler - File concatenation threshold: 100 optimistic
 2 false
```


```
eady initialized
2022-12-06 15:02:36,008 [main] INFO  org.apache.hadoop.
eady initialized
2022-12-06 15:02:36,019 [main] INFO  org.apache.pig.bac
2022-12-06 15:02:36,025 [main] INFO  org.apache.hadoop.
2022-12-06 15:02:36,025 [main] WARN  org.apache.pig.dat
2022-12-06 15:02:36,037 [main] INFO  org.apache.hadoop.
2022-12-06 15:02:36,037 [main] INFO  org.apache.pig.bac
(1,2,3)
(5,6,7)
(9,1,2)
(5,4,3)
grunt>
```

- Let's return the first two tuples.

grunt> Result = LIMIT A 2; grunt> DUMP Result;

```
(5,4,3)
grunt> Result = LIMIT A 2;
grunt> DUMP Result;
2022-12-06 15:04:45,671 [main] INFO  org.apache.pig.tools.pigstats.ScriptState - Pig features used in the script: LIMIT
2022-12-06 15:04:45,689 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2022-12-06 15:04:45,689 [main] WARN  org.apache.pig.data.SchemaTupleBackend - SchemaTupleBackend has already been initialized
2022-12-06 15:04:45,690 [main] INFO  org.apache.pig.newplan.logical.optimizer.LogicalPlanOptimizer - {RULES_ENABLED=[AddForEach, ColumnMapKeyPrune, C
tCalculator, GroupByConstParallelSetter, LimitOptimizer, LoadTypeCastInserter, MergeFilter, MergeForEach, PartitionFilterOptimizer, PredicatePushdown
zer, PushDownForEachFlatten, PushUpFilter, SplitFilter, StreamTypeCastInserter]}
2022-12-06 15:04:45,746 [main] INFO  org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter - File Output Committer Algorithm version is 1
2022-12-06 15:04:45,746 [main] INFO  org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter - FileOutputCommitter skip cleanup _temporary folders
 output directory:false, ignore cleanup failures: false
2022-12-06 15:04:45,755 [main] INFO  org.apache.pig.data.SchemaTupleBackend - Key [pig.schematuple] was not set... will not generate code.
2022-12-06 15:04:45,782 [main] WARN  org.apache.pig.data.SchemaTupleBackend - SchemaTupleBackend has already been initialized
2022-12-06 15:04:45,785 [main] INFO  org.apache.pig.builtin.PigStorage - Using PigTextInputFormat
2022-12-06 15:04:45,788 [main] INFO  org.apache.hadoop.mapreduce.lib.input.FileInputFormat - Total input files to process : 1
2022-12-06 15:04:45,788 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input paths to process : 1
2022-12-06 15:04:46,235 [main] INFO  org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter - Saved output of task 'attempt__0001_m_000001_1' to
/localhost:54310/tmp/temp-1393259920/tmp-1937660218/_temporary/0/task__0001_m_000001
2022-12-06 15:04:46,256 [main] WARN  org.apache.pig.data.SchemaTupleBackend - SchemaTupleBackend has already been initialized
2022-12-06 15:04:46,268 [main] INFO  org.apache.hadoop.mapreduce.lib.input.FileInputFormat - Total input files to process : 1
2022-12-06 15:04:46,268 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input paths to process : 1
(1,2,3)
(5,6,7)
grunt>
```

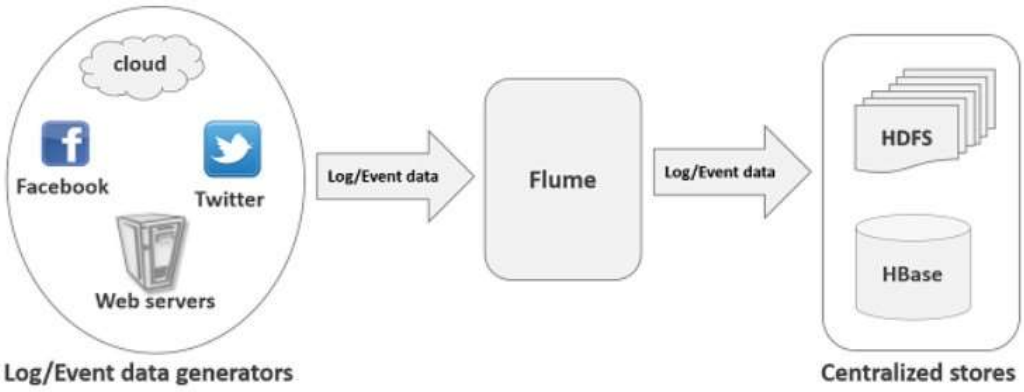
Practical 7

Aim: Use Flume and transport the data from the various sources to a centralized data store.

What is Apache Flume?

Apache Flume is a tool/service/data ingestion mechanism for collecting aggregating and transporting large amounts of streaming data such as log files, events (etc...) from various sources to a centralized data store.

Flume is a highly reliable, distributed, and configurable tool. It is principally designed to copy streaming data (log data) from various web servers to HDFS.



Applications of Flume:

Assume an e-commerce web application wants to analyze the customer behavior from a particular region. To do so, they would need to move the available log data in to Hadoop for analysis. Here, Apache Flume comes to our rescue.

Flume is used to move the log data generated by application servers into HDFS at a higher speed.

Features of Flume:

Some of the notable features of Flume are as follows –

- Flume ingests log data from multiple web servers into a centralized store (HDFS, HBase) efficiently.
- Using Flume, we can get the data from multiple servers immediately into Hadoop.
- Along with the log files, Flume is also used to import huge volumes of event data produced by social networking sites like Facebook and Twitter, and e-commerce websites like Amazon and Flipkart.
- Flume supports a large set of sources and destinations types.
- Flume supports multi-hop flows, fan-in fan-out flows, contextual routing, etc.
- Flume can be scaled horizontally.

Advantages of Flume:

Here are the advantages of using Flume –

- Using Apache Flume, we can store the data in to any of the centralized stores (HBase, HDFS).
- When the rate of incoming data exceeds the rate at which data can be written to the destination, Flume acts as a mediator between data producers and the centralized stores and provides a steady flow of data between them.
- Flume provides the feature of contextual routing.
- The transactions in Flume are channel-based where two transactions (one sender and one receiver) are maintained for each message. It guarantees reliable message delivery.
- Flume is reliable, fault tolerant, scalable, manageable, and customizable.

Implementation:

Pre-requisites:

Check the version of Java.

```
┌──(mohammed㉿Mohammed)-[~]
└─$ java -version
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
openjdk version "11.0.16" 2022-07-19
OpenJDK Runtime Environment (build 11.0.16+8-post-Debian-1)
OpenJDK 64-Bit Server VM (build 11.0.16+8-post-Debian-1, mixed mode, sharing)
```

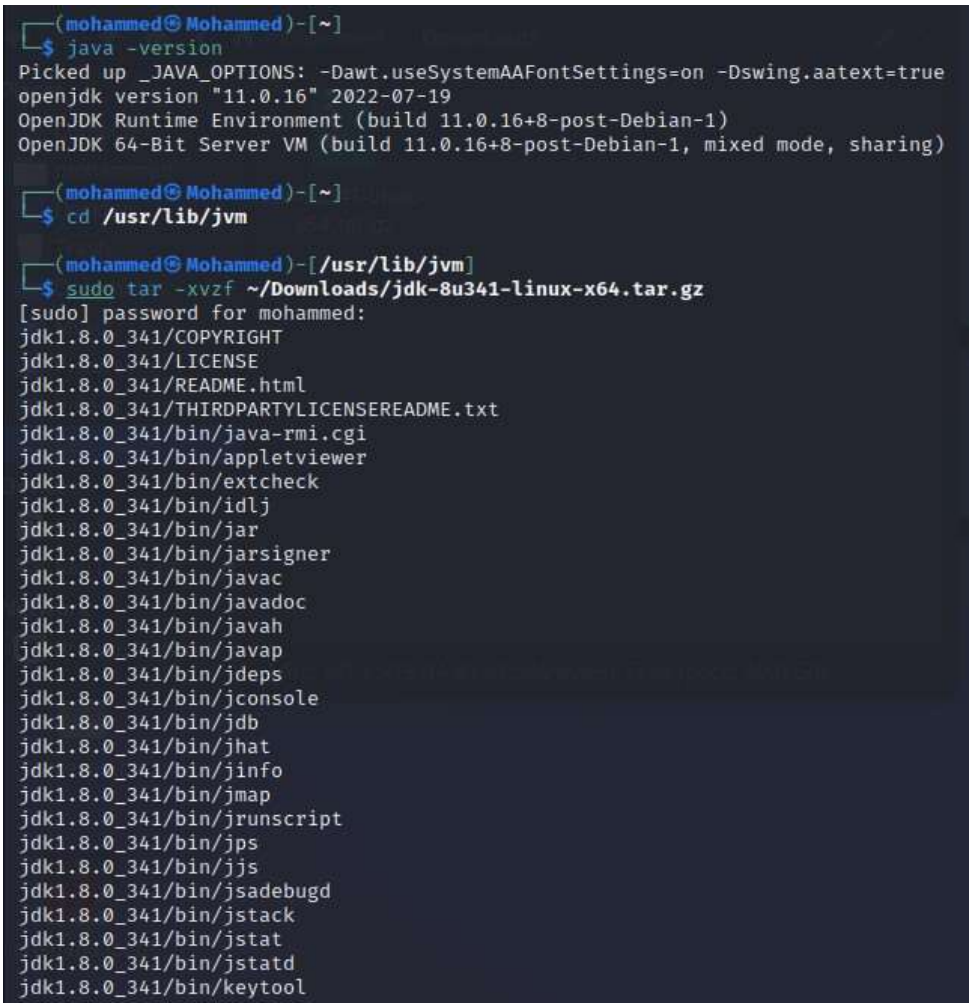
Updating the linux distribution.

```
┌──(mohammed㉿Mohammed)-[~]
└─$ sudo apt-get install update
[sudo] password for mohammed:
Reading package lists ... Done
Building dependency tree ... Done
Reading state information ... Done
E: Unable to locate package update
```

Updating the Java Development Kit (JDK).

```
┌──(mohammed㉿Mohammed)-[~]
└─$ sudo apt-get install default-jdk
Reading package lists ... Done
Building dependency tree ... Done
Reading state information ... Done
The following additional packages will be installed:
  default-jdk-headless libice-dev libpthread-stubs0-dev libsm-dev libx11-6 libx11-data
  libx11-dev libx11-xcb1 libxau-dev libxcb-damage0 libxcb-dri2-0 libxcb-dri3-0 libxcb-glx0
  libxcb-present0 libxcb-randr0 libxcb-render0 libxcb-shape0 libxcb-shm0 libxcb-sync1
  libxcb-xfixes0 libxcb-xinerama0 libxcb-xinput0 libxcb-xkb1 libxcb1 libxcb1-dev libxdmcp-dev
  libxt-dev openjdk-11-jdk openjdk-11-jdk-headless x11proto-dev xorg-sgml-doctools xtrans-dev
Suggested packages:
  libice-doc libsm-doc libx11-doc libxcb-doc libxt-doc openjdk-11-demo openjdk-11-source
  visualvm
The following NEW packages will be installed:
  default-jdk default-jdk-headless libice-dev libpthread-stubs0-dev libsm-dev libx11-dev
  libxau-dev libxcb1-dev libxdmcp-dev libxt-dev openjdk-11-jdk openjdk-11-jdk-headless
  x11proto-dev xorg-sgml-doctools xtrans-dev
The following packages will be upgraded:
  libx11-6 libx11-data libx11-xcb1 libxcb-damage0 libxcb-dri2-0 libxcb-dri3-0 libxcb-glx0
  libxcb-present0 libxcb-randr0 libxcb-render0 libxcb-shape0 libxcb-shm0 libxcb-sync1
  libxcb-xfixes0 libxcb-xinerama0 libxcb-xinput0 libxcb-xkb1 libxcb1
18 upgraded, 15 newly installed, 0 to remove and 1163 not upgraded.
Need to get 227 MB of archives.
After this operation, 239 MB of additional disk space will be used.
```

Then, download jdk1.8.0_341 x64 Linux Distribution from Oracle.



Use the “update-alternatives” command to set the version of “java” and “javac”.

Make sure the versions of both java and javac are set to 1.8.0_341.

```
┌──(mohammed㉿Mohammed)-[/usr/lib/jvm]
└─$ cd jdk1.8.0_341

┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo nano /etc/environment

┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo nano /etc/environment

┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo nano /etc/environment

┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo nano /etc/environment

┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --install "/usr/bin/java""java""/usr/lib/jvm/jdk1.8.0_341/bin/java"
 0
update-alternatives: --install needs <link> <name> <path> <priority>

Use 'update-alternatives --help' for program usage information.

┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --install "/usr/bin/java" "java" "/usr/lib/jvm/jdk1.8.0_341/bin/jav
a" 0

┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --install "/usr/bin/java" "java" "/usr/lib/jvm/jdk1.8.0_341/bin/jav
ac" 0

┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --set java /usr/lib/jvm/jdk1.8.0_341/bin/java
update-alternatives: using /usr/lib/jvm/jdk1.8.0_341/bin/java to provide /usr/bin/java (java) in
 manual mode

┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --set java /usr/lib/jvm/jdk1.8.0_341/bin/javac
update-alternatives: using /usr/lib/jvm/jdk1.8.0_341/bin/javac to provide /usr/bin/java (java) i
n manual mode
```

```
┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --config java
There are 3 choices for the alternative java (providing /usr/bin/java).

  Selection    Path                                          Priority   Status
------------------------------------------------------------
  0            /usr/lib/jvm/java-11-openjdk-amd64/bin/java   1111      auto mode
  1            /usr/lib/jvm/java-11-openjdk-amd64/bin/java   1111      manual mode
  2            /usr/lib/jvm/jdk1.8.0_341/bin/java            0         manual mode
* 3            /usr/lib/jvm/jdk1.8.0_341/bin/javac           0         manual mode

Press <enter> to keep the current choice[*], or type selection number: 2
update-alternatives: using /usr/lib/jvm/jdk1.8.0_341/bin/java to provide /usr/bin/java (java) in
 manual mode

┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ java -version
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
java version "1.8.0_341"
Java(TM) SE Runtime Environment (build 1.8.0_341-b10)
Java HotSpot(TM) 64-Bit Server VM (build 25.341-b10, mixed mode)
```

```
┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --install "/usr/bin/javac" "javac" "/usr/lib/jvm/jdk1.8.0_341/bin/j
avac" 1
update-alternatives: using /usr/lib/jvm/jdk1.8.0_341/bin/javac to provide /usr/bin/javac (javac)
 in auto mode

┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --set javac /usr/lib/jvm/jdk1.8.0_341/bin/javac

┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ sudo update-alternatives --config javac
There is 1 choice for the alternative javac (providing /usr/bin/javac).

  Selection    Path                                  Priority   Status
------------------------------------------------------------
  0            /usr/lib/jvm/jdk1.8.0_341/bin/javac   1          auto mode
* 1            /usr/lib/jvm/jdk1.8.0_341/bin/javac   1          manual mode

Press <enter> to keep the current choice[*], or type selection number: 1
```

Now, check is java is perfectly installed.

```
┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ java -version
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
java version "1.8.0_341"
Java(TM) SE Runtime Environment (build 1.8.0_341-b10)
Java HotSpot(TM) 64-Bit Server VM (build 25.341-b10, mixed mode)

┌──(mohammed㉿Mohammed)-[/usr/lib/jvm/jdk1.8.0_341]
└─$ javac -version
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
javac 1.8.0_341
```

Create a separate user on linux to install Hadoop. We create a user “hadoopusr” in the usergroup “hadoop”.

```
┌──(mohammed㉿Mohammed)-[~]
└─$ sudo addgroup hadoop
[sudo] password for mohammed:
Adding group `hadoop' (GID 1001) ...
Done.

┌──(mohammed㉿Mohammed)-[~]
└─$ sudo adduser --ingroup hadoop hadoopusr
Adding user `hadoopusr' ...
Adding new user `hadoopusr' (1001) with group `hadoop' ...
Creating home directory `/home/hadoopusr' ...
Copying files from `/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for hadoopusr
Enter the new value, or press ENTER for the default
        Full Name []: Apache Flume Project
        Room Number []:
        Work Phone []:
        Home Phone []:
        Other []:
Is the information correct? [Y/n] Y

┌──(mohammed㉿Mohammed)-[~]
└─$ sudo adduser hadoopusr sudo
Adding user `hadoopusr' to group `sudo' ...
Done.

┌──(mohammed㉿Mohammed)-[~]
└─$
```

Now we will install the SSH Server.

```
┌──(mohammed㉿Mohammed)-[~]
└─$ sudo apt-get install openssh-server
Reading package lists ... Done
Building dependency tree ... Done
Reading state information ... Done
The following additional packages will be installed:
  libc-bin libc-dev-bin libc-l10n libc6 libc6-dev libc6-i386 libssl3 locales openssh-client
  openssh-sftp-server openssl runit-helper
Suggested packages:
  glibc-doc libnss-nis libnss-nisplus manpages-dev keychain libpam-ssh monkeysphere
  ssh-askpass molly-guard ufw
Recommended packages:
  manpages-dev libc-devtools
The following packages will be upgraded:
  libc-bin libc-dev-bin libc-l10n libc6 libc6-dev libc6-i386 libssl3 locales openssh-client
  openssh-server openssh-sftp-server openssl runit-helper
13 upgraded, 0 newly installed, 0 to remove and 1168 not upgraded.
Need to get 17.2 MB of archives.
After this operation, 4,006 kB disk space will be freed.
Do you want to continue? [Y/n] Y
```

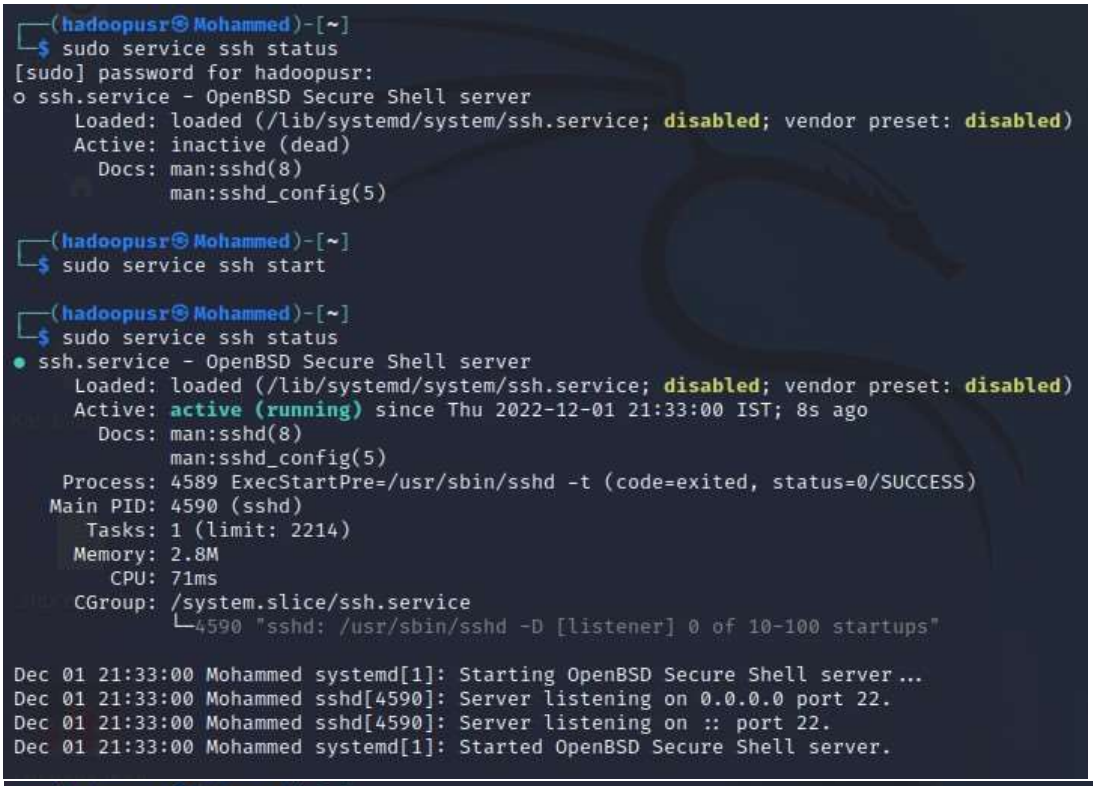
Now we will switch users from “kali” to “hadoopusr”.

```
┌──(mohammed㉿Mohammed)-[~]
└─$ su - hadoopusr
Password:
┌──(hadoopusr㉿Mohammed)-[~]
└─$
```

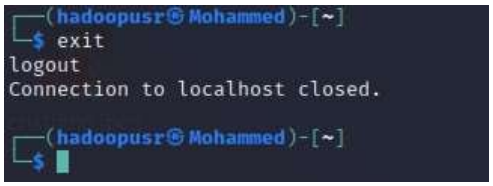
Then we will create and save a SSH key.

```
┌──(hadoopusr㉿Mohammed)-[~]
└─$ ssh-keygen -t rsa -P ""
Generating public/private rsa key pair.
Enter file in which to save the key (/home/hadoopusr/.ssh/id_rsa):
Created directory '/home/hadoopusr/.ssh'.
Your identification has been saved in /home/hadoopusr/.ssh/id_rsa
Your public key has been saved in /home/hadoopusr/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:DVH/6ZIUp7sTlWKtJ4xpm0+/ygv/E5jOupI4pOj5t+A hadoopusr@Mohammed
The key's randomart image is:
+---[RSA 3072]----+
|         ...     |
|          . .    |
|         .   o ... |
|          o  o=+. |
|         S .=o*o  |
|      .   +.B+o  |
|   ..o . o.==+.. |
|  .o..+ o o=++.  |
| .o.E..o .o+B=+o |
+----[SHA256]-----+

┌──(hadoopusr㉿Mohammed)-[~]
└─$ cat $HOME/ .ssh/id_rsa.pub >> $HOME/ .ssh/authorized_keys
-bash: /home/hadoopusr/: Is a directory
```

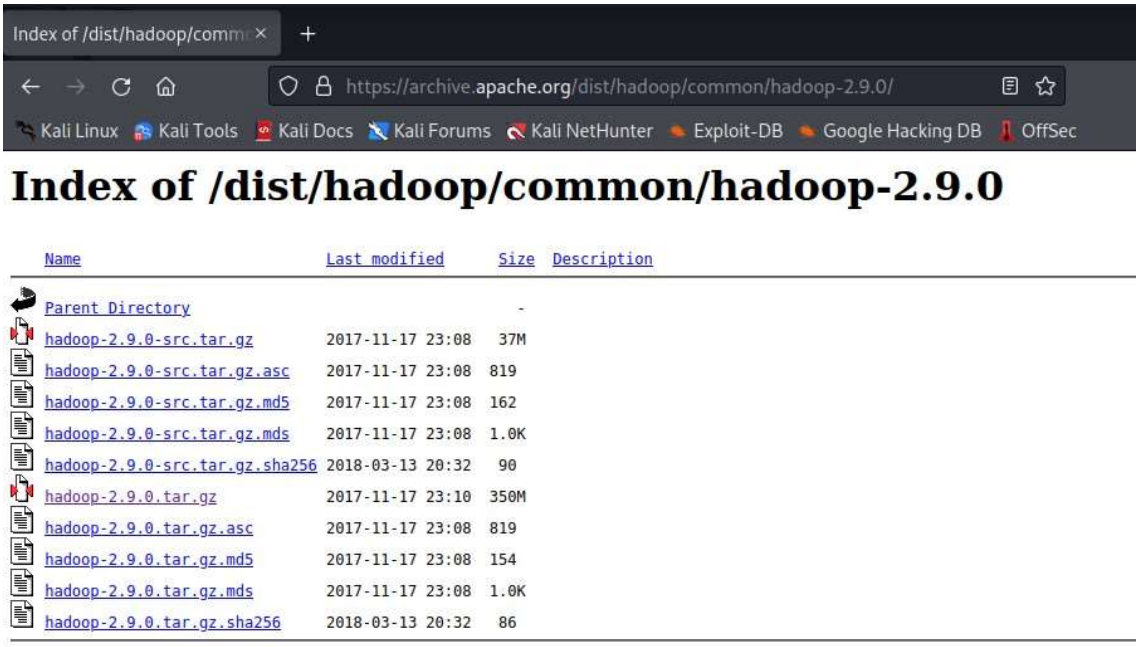
Now, we will start a SSH server on localhost.



Now we will exit the “hadoopusr”.



Now, we will download and install Apache Hadoop 2.9.0.




```
┌──(hadoopusr㉿Mohammed)-[/home/mohammed/Desktop]
└─$ cd /home/mohammed/Downloads

┌──(hadoopusr㉿Mohammed)-[/home/mohammed/Downloads]
└─$ ls
hadoop-2.9.0.tar.gz  jdk-8u341-linux-x64.tar.gz

┌──(hadoopusr㉿Mohammed)-[/home/mohammed/Downloads]
└─$ sudo tar -xvzf hadoop-2.9.0.tar.gz
[sudo] password for hadoopusr:
hadoop-2.9.0/
hadoop-2.9.0/include/
hadoop-2.9.0/include/Pipes.hh
hadoop-2.9.0/include/SerialUtils.hh
hadoop-2.9.0/include/hdfs.h
hadoop-2.9.0/include/StringUtils.hh
hadoop-2.9.0/include/TemplateFactory.hh
hadoop-2.9.0/NOTICE.txt
hadoop-2.9.0/lib/
hadoop-2.9.0/lib/native/
hadoop-2.9.0/lib/native/libhdfs.a
hadoop-2.9.0/lib/native/libhadoop.so
hadoop-2.9.0/lib/native/libhadoop.so.1.0.0
hadoop-2.9.0/lib/native/libhdfs.so.0.0.0
hadoop-2.9.0/lib/native/libhadoop.a
hadoop-2.9.0/lib/native/libhdfs.so
hadoop-2.9.0/lib/native/examples/
hadoop-2.9.0/lib/native/examples/pipes-sort
hadoop-2.9.0/lib/native/examples/wordcount-part
hadoop-2.9.0/lib/native/examples/wordcount-simple
hadoop-2.9.0/lib/native/examples/wordcount-nopipe
hadoop-2.9.0/lib/native/libhadooputils.a
hadoop-2.9.0/lib/native/libhadooppipes.a
hadoop-2.9.0/LICENSE.txt
hadoop-2.9.0/libexec/
hadoop-2.9.0/libexec/kms-config.sh
hadoop-2.9.0/libexec/mapred-config.cmd
hadoop-2.9.0/libexec/mapred-config.sh
hadoop-2.9.0/libexec/hadoop-config.cmd
hadoop-2.9.0/libexec/hadoop-config.sh
```

Now we will move the file to the “hadoopusr” and transfer ownership to the “hadoopusr”.

```
┌──(hadoopusr㉿Mohammed)-[/home/mohammed/Downloads]
└─$ ls
hadoop-2.9.0  hadoop-2.9.0.tar.gz  jdk-8u341-linux-x64.tar.gz

┌──(hadoopusr㉿Mohammed)-[/home/mohammed/Downloads]
└─$ sudo mv hadoop-2.9.0 /usr/local/hadoop

┌──(hadoopusr㉿Mohammed)-[/home/mohammed/Downloads]
└─$ sudo chown -R hadoopusr /usr/local

┌──(hadoopusr㉿Mohammed)-[/home/mohammed/Downloads]
└─$
```

Now make configurations to the “bashrc” file using nano.

```
┌──(hadoopusr㉿Mohammed)-[/home/mohammed/Downloads]
└─$ sudo nano ~/.bashrc
```

```
 GNU nano 6.3                        /home/hadoopusr/.bashrc *

# some more ls aliases
alias ll='ls -l'
alias la='ls -A'
alias l='ls -CF'

# Alias definitions.
# You may want to put all your additions into a separate file like
# ~/.bash_aliases, instead of adding them here directly.
# See /usr/share/doc/bash-doc/examples in the bash-doc package.

if [ -f ~/.bash_aliases ]; then
    . ~/.bash_aliases
fi

# enable programmable completion features (you don't need to enable
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
# sources /etc/bash.bashrc).
if ! shopt -oq posix; then
  if [ -f /usr/share/bash-completion/bash_completion ]; then
    . /usr/share/bash-completion/bash_completion
  elif [ -f /etc/bash_completion ]; then
    . /etc/bash_completion
  fi
fi
export JAVA_HOME=/usr/lib/jvm/jdk1.8.0_341
export JAVA_PATH=$PATH:$JAVA_HOME/bin
export HADOOP_HOME=/usr/local/hadoop
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
export HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_HOME/native
export HADOOP_OPTS="-Djava.library.path=$HADOOP_HOME/native"

^G Help        ^O Write Out   ^W Where Is    ^K Cut         ^T Execute     ^C Location
^X Exit        ^R Read File   ^\ Replace     ^U Paste       ^J Justify     ^/ Go To Line
```

Then we will run “source ~/.bashrc” to enable the changes.

```
┌──(hadoopusr㉿Mohammed)-[/home/mohammed/Downloads]
└─$ source ~/.bashrc
┌──(hadoopusr㉿Mohammed)-[/home/mohammed/Downloads]
└─$
```

Next, we will make some changes to the hadoop environment file.
We will run the command “sudo nano /usr/local/hadoop/etc/hadoop/hadoop-env.sh”.

```
┌──(hadoopusr㉿Mohammed)-[/home/mohammed/Downloads]
└─$ sudo nano /usr/local/hadoop/etc/hadoop/hadoop-env.sh

┌──(hadoopusr㉿Mohammed)-[/home/mohammed/Downloads]
└─$
```

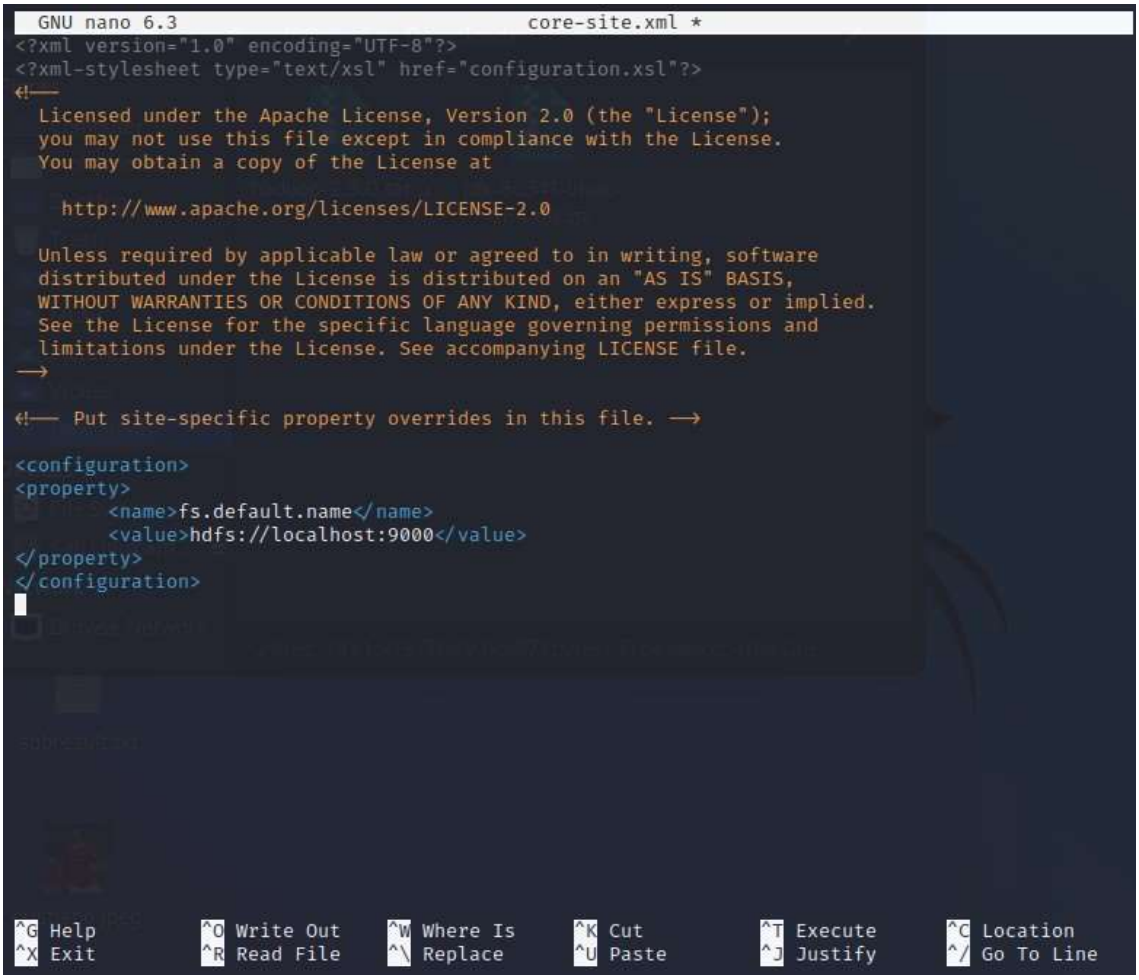
Here we will set the path of JAVA_HOME to “JAVA_HOME=/usr/lib/jvm/jdk1.8.0_341”.

```
  GNU nano 6.3              /usr/local/hadoop/etc/hadoop/hadoop-env.sh *
# WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
# See the License for the specific language governing permissions and
# limitations under the License.

# Set Hadoop-specific environment variables here.

# The only required environment variable is JAVA_HOME.  All others are
# optional.  When running a distributed configuration it is best to
# set JAVA_HOME in this file, so that it is correctly defined on
# remote nodes.

# The java implementation to use.
#export JAVA_HOME=${JAVA_HOME}
export JAVA_HOME=/usr/lib/jvm/jdk1.8.0_341

# The jsvc implementation to use. Jsvc is required to run secure datanodes
# that bind to privileged ports to provide authentication of data transfer
# protocol.  Jsvc is not required if SASL is configured for authentication of
# data transfer protocol using non-privileged ports.
#export JSVC_HOME=${JSVC_HOME}

export HADOOP_CONF_DIR=${HADOOP_CONF_DIR:-"/etc/hadoop"}

# Extra Java CLASSPATH elements.  Automatically insert capacity-scheduler.
for f in $HADOOP_HOME/contrib/capacity-scheduler/*.jar; do
  if [ "$HADOOP_CLASSPATH" ]; then
    export HADOOP_CLASSPATH=$HADOOP_CLASSPATH:$f
  else
    export HADOOP_CLASSPATH=$f
  fi
done

# The maximum amount of heap to use, in MB. Default is 1000.
#export HADOOP_HEAPSIZE=
#export HADOOP_NAMENODE_INIT_HEAPSIZE=""

# Enable extra debugging of Hadoop's JAAS binding, used to set up

^G Help        ^O Write Out   ^W Where Is    ^K Cut         ^T Execute     ^C Location
^X Exit        ^R Read File   ^\ Replace     ^U Paste       ^J Justify     ^/ Go To Line
```

Now we will make the following changes to the configuration of the core-site.xml file.

```
<property>
        <name>fs.default.name</name>
        <value>hdfs://localhost:9000</value>
</property>
```

```
┌──(hadoopusr㉿Mohammed)-[/usr/local/hadoop/etc/hadoop]
└─$ sudo nano core-site.xml
[sudo] password for hadoopusr:
```



Now we will make the following changes to the configuration of the hdfs-site.xml file.

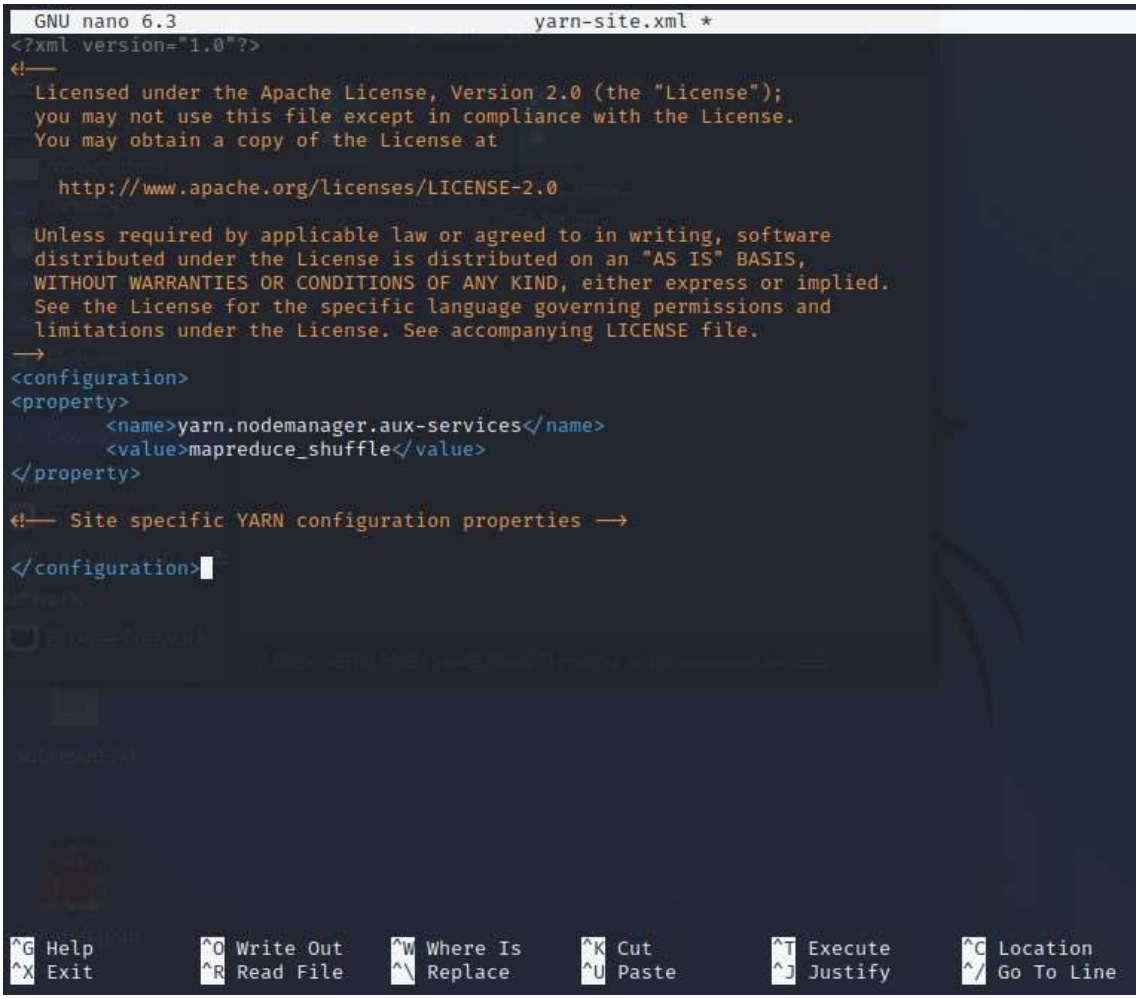
```
<property>
        <name>dfs.replication</name>
        <value>1</value>
</property>
<property>
        <name>dfs.name.name.dir</name>
        <value>file:/usr/local/hadoop_tmp/hdfs/namenode</value>
</property>
<property>
        <name>dfs.data.data.dir</name>
        <value>file:/usr/local/hadoop_tmp/hdfs/datanode</value>
</property>
```

```
  GNU nano 6.3                                hdfs-site.xml *
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="configuration.xsl"?>
<!--
  Licensed under the Apache License, Version 2.0 (the "License");
  you may not use this file except in compliance with the License.
  You may obtain a copy of the License at

    http://www.apache.org/licenses/LICENSE-2.0

  Unless required by applicable law or agreed to in writing, software
  distributed under the License is distributed on an "AS IS" BASIS,
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
  See the License for the specific language governing permissions and
  limitations under the License. See accompanying LICENSE file.
-->

<!-- Put site-specific property overrides in this file. -->

<configuration>
<property>
        <name>dfs.replication</name>
        <value>1</value>
</property>
<property>
        <name>dfs.name.name.dir</name>
        <value>file:/usr/local/hadoop_tmp/hdfs/namenode</value>
</property>
<property>
        <name>dfs.data.data.dir</name>
        <value>file:/usr/local/hadoop_tmp/hdfs/datanode</value>
</property>

</configuration>

^G Help          ^O Write Out     ^W Where Is      ^K Cut           ^T Execute       ^C Location
^X Exit          ^R Read File     ^\ Replace       ^U Paste         ^J Justify       ^/ Go To Line
```

Now we will make the following changes to the configuration of the yarn-site.xml file.

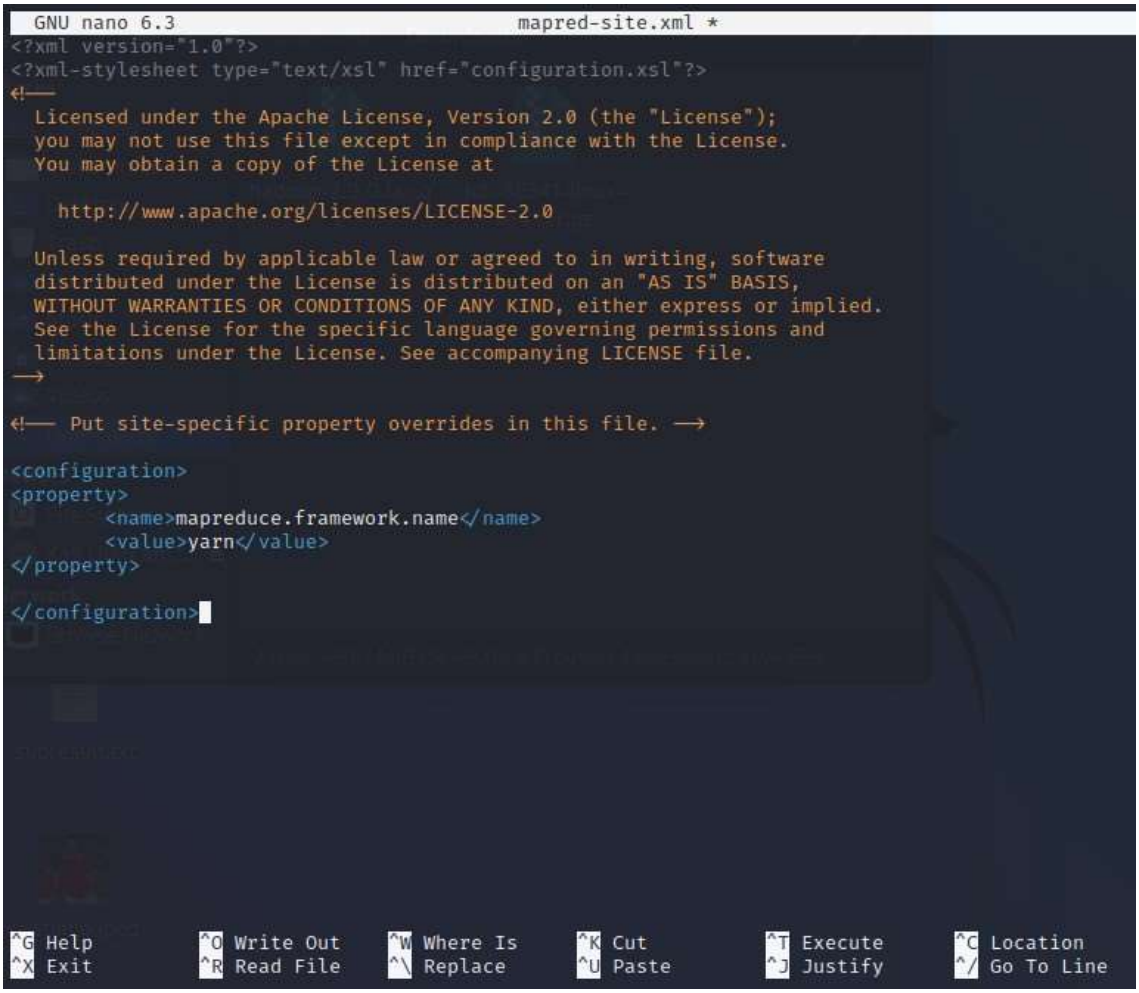
<property>
        <name>yarn.nodemanager.aux-services</name>
        <value>mapreduce_shuffle</value>
</property>

```
┌──(hadoopusr㉿Mohammed)-[/usr/local/hadoop/etc/hadoop]
└─$ sudo nano yarn-site.xml
[sudo] password for hadoopusr:
```



Now we will make the following changes to the configuration of the mapred-site.xml file.

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



Next, we will create the following directories and transfer the ownership to the "hadoopusr". These directories are where hadoop will store data about the namenode and the datanode.

Then we format the namenode in the HDFS file structure.

```
┌──(hadoopusr㉿Mohammed)-[/home/mohammed/Downloads]
└─$ cd

┌──(hadoopusr㉿Mohammed)-[~]
└─$ hdfs namenode -format
22/12/02 17:51:54 INFO namenode.NameNode: STARTUP_MSG:
/************************************************************
STARTUP_MSG: Starting NameNode
STARTUP_MSG:   host = Mohammed/127.0.1.1
STARTUP_MSG:   args = [-format]
STARTUP_MSG:   version = 2.9.0
STARTUP_MSG:   classpath = /usr/local/hadoop/etc/hadoop:/usr/local/hadoop/share/hadoop/common/li
b/stax-api-1.0-2.jar:/usr/local/hadoop/share/hadoop/common/lib/api-asn1-api-1.0.0-M20.jar:/usr/l
ocal/hadoop/share/hadoop/common/lib/avro-1.7.7.jar:/usr/local/hadoop/share/hadoop/common/lib/jac
kson-jaxrs-1.9.13.jar:/usr/local/hadoop/share/hadoop/common/lib/snappy-java-1.0.5.jar:/usr/local
/hadoop/share/hadoop/common/lib/json-smart-1.1.1.jar:/usr/local/hadoop/share/hadoop/common/lib/p
rotobuf-java-2.5.0.jar:/usr/local/hadoop/share/hadoop/common/lib/apacheds-i18n-2.0.0-M15.jar:/us
r/local/hadoop/share/hadoop/common/lib/commons-lang3-3.4.jar:/usr/local/hadoop/share/hadoop/comm
on/lib/jaxb-api-2.2.2.jar:/usr/local/hadoop/share/hadoop/common/lib/servlet-api-2.5.jar:/usr/loc
al/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar:/usr/local/hadoop/share/hadoop/common
/lib/jackson-mapper-asl-1.9.13.jar:/usr/local/hadoop/share/hadoop/common/lib/hadoop-annotations-
2.9.0.jar:/usr/local/hadoop/share/hadoop/common/lib/zookeeper-3.4.6.jar:/usr/local/hadoop/share/
hadoop/common/lib/jetty-util-6.1.26.jar:/usr/local/hadoop/share/hadoop/common/lib/hamcrest-core-
1.3.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-lang-2.6.jar:/usr/local/hadoop/share/h
adoop/common/lib/commons-configuration-1.6.jar:/usr/local/hadoop/share/hadoop/common/lib/gson-2.
2.4.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-beanutils-core-1.8.0.jar:/usr/local/ha
doop/share/hadoop/common/lib/jettison-1.1.jar:/usr/local/hadoop/share/hadoop/common/lib/activati
on-1.1.jar:/usr/local/hadoop/share/hadoop/common/lib/netty-3.6.2.Final.jar:/usr/local/hadoop/sha
re/hadoop/common/lib/xz-1.0.jar:/usr/local/hadoop/share/hadoop/common/lib/guava-11.0.2.jar:/usr/
local/hadoop/share/hadoop/common/lib/curator-framework-2.7.1.jar:/usr/local/hadoop/share/hadoop/
common/lib/httpcore-4.4.4.jar:/usr/local/hadoop/share/hadoop/common/lib/jersey-json-1.9.jar:/usr
/local/hadoop/share/hadoop/common/lib/paranamer-2.3.jar:/usr/local/hadoop/share/hadoop/common/li
b/commons-logging-1.1.3.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-math3-3.1.1.jar:/u
sr/local/hadoop/share/hadoop/common/lib/slf4j-api-1.7.25.jar:/usr/local/hadoop/share/hadoop/comm
on/lib/commons-codec-1.4.jar:/usr/local/hadoop/share/hadoop/common/lib/hadoop-auth-2.9.0.jar:/us
r/local/hadoop/share/hadoop/common/lib/jsr305-3.0.0.jar:/usr/local/hadoop/share/hadoop/common/li
b/jetty-sslengine-6.1.26.jar:/usr/local/hadoop/share/hadoop/common/lib/xmlenc-0.52.jar:/usr/loca
```

Next, we will start the Distributed file system.

```
┌──(hadoopusr㉿Mohammed)-[~]
└─$ start-dfs.sh
22/12/02 17:56:24 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your plat
form ... using builtin-java classes where applicable
Starting namenodes on [localhost]
hadoopusr@localhost's password:
localhost: starting namenode, logging to /usr/local/hadoop/logs/hadoop-hadoopusr-namenode-Mohamm
ed.out
hadoopusr@localhost's password:
localhost: starting datanode, logging to /usr/local/hadoop/logs/hadoop-hadoopusr-datanode-Mohamm
ed.out
Starting secondary namenodes [0.0.0.0]
The authenticity of host '0.0.0.0 (0.0.0.0)' can't be established.
ED25519 key fingerprint is SHA256:UkJN1l6R7QcR05P9w67wvSco3jBtcHPhjJ8EbD2B3Og.
This host key is known by the following other names/addresses:
    ~/.ssh/known_hosts:1: [hashed name]
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
0.0.0.0: Warning: Permanently added '0.0.0.0' (ED25519) to the list of known hosts.
hadoopusr@0.0.0.0's password:
0.0.0.0: starting secondarynamenode, logging to /usr/local/hadoop/logs/hadoop-hadoopusr-secondar
ynamenode-Mohammed.out
22/12/02 17:57:47 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your plat
form ... using builtin-java classes where applicable
```

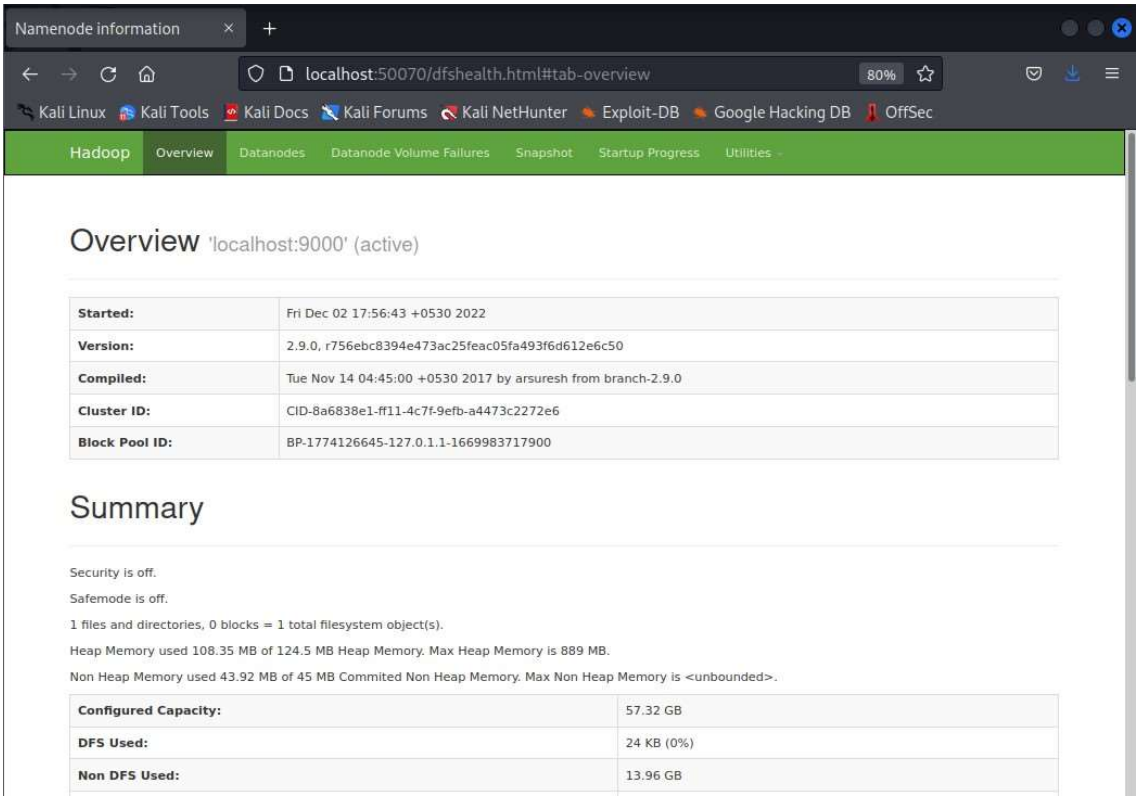
Then the YARN system.

```
┌──(hadoopusr㉿Mohammed)-[~]
└─$ start-yarn.sh
starting yarn daemons
starting resourcemanager, logging to /usr/local/hadoop/logs/yarn-hadoopusr-resourcemanager-Moham
med.out
hadoopusr@localhost's password:
localhost: starting nodemanager, logging to /usr/local/hadoop/logs/yarn-hadoopusr-nodemanager-Mo
hammed.out
```

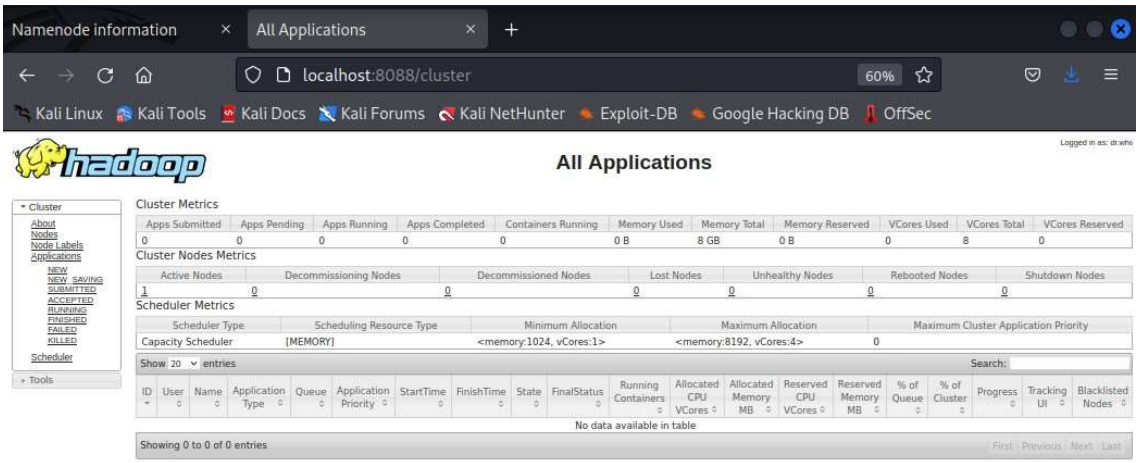
Check if all the systems are running.

```
┌──(hadoopusr㉿Mohammed)-[~]
└─$ start-all.sh
This script is Deprecated. Instead use start-dfs.sh and start-yarn.sh
22/12/02 18:00:12 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your plat
form... using builtin-java classes where applicable
Starting namenodes on [localhost]
hadoopusr@localhost's password:
localhost: namenode running as process 22065. Stop it first.
hadoopusr@localhost's password:
localhost: datanode running as process 22192. Stop it first.
Starting secondary namenodes [0.0.0.0]
hadoopusr@0.0.0.0's password:
0.0.0.0: secondarynamenode running as process 22581. Stop it first.
22/12/02 18:00:48 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your plat
form... using builtin-java classes where applicable
starting yarn daemons
resourcemanager running as process 22984. Stop it first.
hadoopusr@localhost's password:
localhost: nodemanager running as process 23170. Stop it first.
```

Here we can see that hadoop has been successfully installed and activated We have to go the url http://localhost:500070 to access the Hadoop Server page.



We can also see the information of the cluster.



Next, we move on to the process of downloading and installing Apache Flume. I downloaded Apache Flume version 1.11.0 and performed the following:

```
┌──(mohammed㉿Mohammed)-[~]
└─$ cd /home/mohammed/Downloads/

┌──(mohammed㉿Mohammed)-[~/Downloads]
└─$ tar -xzvf apache-flume-1.11.0-bin.tar.gz
apache-flume-1.11.0-bin/LICENSE
apache-flume-1.11.0-bin/NOTICE
apache-flume-1.11.0-bin/bin/
apache-flume-1.11.0-bin/conf/
apache-flume-1.11.0-bin/DEVNOTES
apache-flume-1.11.0-bin/bin/flume-ng.cmd
apache-flume-1.11.0-bin/bin/flume-ng
apache-flume-1.11.0-bin/bin/flume-ng.ps1
apache-flume-1.11.0-bin/CHANGELOG
apache-flume-1.11.0-bin/RELEASE-NOTES
apache-flume-1.11.0-bin/README.md
apache-flume-1.11.0-bin/doap_Flume.rdf
apache-flume-1.11.0-bin/conf/flume-env.ps1.template
apache-flume-1.11.0-bin/conf/log4j2.xml
apache-flume-1.11.0-bin/conf/flume-conf.properties.template
apache-flume-1.11.0-bin/conf/flume-env.sh.template
apache-flume-1.11.0-bin/docs/
apache-flume-1.11.0-bin/docs/css/
apache-flume-1.11.0-bin/docs/images/
apache-flume-1.11.0-bin/docs/images/logos/
apache-flume-1.11.0-bin/docs/apidocs/
apache-flume-1.11.0-bin/docs/apidocs/org/
apache-flume-1.11.0-bin/docs/apidocs/org/apache/
apache-flume-1.11.0-bin/docs/apidocs/org/apache/flume/
apache-flume-1.11.0-bin/docs/apidocs/org/apache/flume/class-use/
apache-flume-1.11.0-bin/docs/apidocs/org/apache/flume/clients/
apache-flume-1.11.0-bin/docs/apidocs/org/apache/flume/clients/log4jappender/
apache-flume-1.11.0-bin/docs/apidocs/org/apache/flume/clients/log4jappender/class-use/
apache-flume-1.11.0-bin/docs/apidocs/org/apache/flume/tools/
apache-flume-1.11.0-bin/docs/apidocs/org/apache/flume/tools/class-use/
apache-flume-1.11.0-bin/docs/apidocs/org/apache/flume/util/
```

Then, we make changes to the ~/.bashrc file.

```
┌──(mohammed㉿Mohammed)-[~]
└─$ su - hadoopusr
Password:
┌──(hadoopusr㉿Mohammed)-[~]
└─$ sudo nano ~/.bashrc
[sudo] password for hadoopusr:
```

```
fi
export JAVA_HOME=/usr/lib/jvm/jdk1.8.0_341
export JAVA_PATH=$PATH:$JAVA_HOME/bin
export HADOOP_HOME=/usr/local/hadoop
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
export HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_HOME/native
export HADOOP_OPTS="-Djava.library.path=$HADOOP_HOME/native"

export FLUME_HOME=/home/mohammed/Downloads/apache-flume-1.11.0-bin/
export PATH=$PATH:$FLUME_HOME/bin/

^G Help        ^O Write Out   ^W Where Is    ^K Cut         ^T Execute     ^C Location
^X Exit        ^R Read File   ^\ Replace     ^U Paste       ^J Justify     ^/ Go To Line
```

Now, we check the version of Flume and hence know it is perfectly installed.

```
┌──(hadoopusr㉿Mohammed)-[~]
└─$ source .bashrc
┌──(hadoopusr㉿Mohammed)-[~]
└─$ flume-ng version
Flume 1.11.0
Source code repository: https://git.apache.org/repos/asf/flume.git
Revision: 1a15927e594fd0d05a59d804b90a9c31ec93f5e1
Compiled by rgoers on Sun Oct 16 14:44:15 MST 2022
From source with checksum bbbca682177262aac3a89defde369a37

┌──(hadoopusr㉿Mohammed)-[~]
└─$
```

Now, we will execute the steps for Netcat Source using Flume

We have to configure the source, the channel, and the sink using the configuration file in the conf folder. Here, we use a NetCat Source, Memory channel, and a logger sink.

For this, we create a file named “netcat.conf” in the conf folder of our Flume.

```
mohammed@mohammed-VirtualBox: $ cd ~/Downloads/apache-flume-1.9.0-bin/conf
mohammed@mohammed-VirtualBox:~/Downloads/apache-flume-1.9.0-bin/conf$ sudo nano
 netcat.conf
```

Then provide the following configuration in the netcat.conf file.
# Naming the components on the current agent
NetcatAgent.sources = Netcat
NetcatAgent.channels = MemChannel

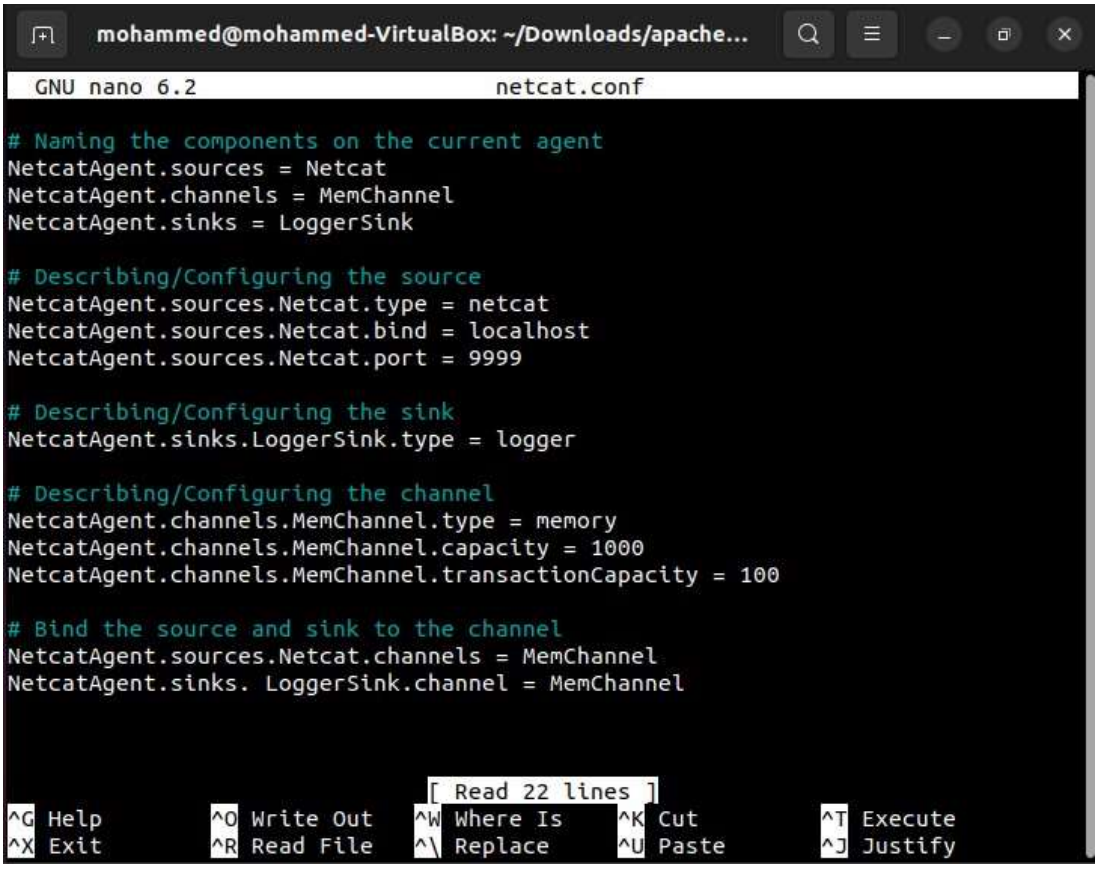
NetcatAgent.sinks = LoggerSink

# Describing/Configuring the source
NetcatAgent.sources.Netcat.type = netcat
NetcatAgent.sources.Netcat.bind = localhost
NetcatAgent.sources.Netcat.port = 56565

# Describing/Configuring the sink
NetcatAgent.sinks.LoggerSink.type = logger

# Describing/Configuring the channel
NetcatAgent.channels.MemChannel.type = memory
NetcatAgent.channels.MemChannel.capacity = 1000
NetcatAgent.channels.MemChannel.transactionCapacity = 100

# Bind the source and sink to the channel
NetcatAgent.sources.Netcat.channels = MemChannel
NetcatAgent.sinks.LoggerSink.channel = MemChannel



Browse through the Flume home directory and execute the application as shown below.

```
mohammed@mohammed-VirtualBox:~/Downloads/apache-flume-1.9.0-bin/conf$ cd $FLUME
_HOME
mohammed@mohammed-VirtualBox:~/Downloads/apache-flume-1.9.0-bin$ flume-ng agent
 -n NetcatAgent -f /home/mohammed/Downloads/apache-flume-1.9.0-bin/conf/netcat.
conf
Warning: No configuration directory set! Use --conf <dir> to override.
Info: Including Hadoop libraries found via (/home/mohammed/hadoop-3.2.3//bin/ha
doop) for HDFS access
/home/mohammed/hadoop-3.2.3//libexec/hadoop-functions.sh: line 2366: HADOOP_ORG
.APACHE.FLUME.TOOLS.GETJAVAPROPERTY_USER: invalid variable name
/home/mohammed/hadoop-3.2.3//libexec/hadoop-functions.sh: line 2461: HADOOP_ORG
.APACHE.FLUME.TOOLS.GETJAVAPROPERTY_OPTS: invalid variable name
Info: Including Hive libraries found via () for Hive access
+ exec /usr/lib/jvm/java-8-openjdk-amd64/bin/java -Xmx20m -cp '/home/mohammed/D
ownloads/apache-flume-1.9.0-bin/lib/*:/home/mohammed/hadoop-3.2.3//etc/hadoop:/
home/mohammed/hadoop-3.2.3//share/hadoop/common/lib/*:/home/mohammed/hadoop-3.2
.3//share/hadoop/common/*:/home/mohammed/hadoop-3.2.3//share/hadoop/hdfs:/home/
mohammed/hadoop-3.2.3//share/hadoop/hdfs/lib/*:/home/mohammed/hadoop-3.2.3//sha
re/hadoop/hdfs/*:/home/mohammed/hadoop-3.2.3//share/hadoop/mapreduce/lib/*:/hom
e/mohammed/hadoop-3.2.3//share/hadoop/mapreduce/*:/home/mohammed/hadoop-3.2.3//
share/hadoop/yarn:/home/mohammed/hadoop-3.2.3//share/hadoop/yarn/lib/*:/home/mo
hammed/hadoop-3.2.3//share/hadoop/yarn/*:/lib/*' -Djava.library.path=:/home/moh
ammed/hadoop-3.2.3//lib/native org.apache.flume.node.Application -n NetcatAgent
 -f /home/mohammed/Downloads/apache-flume-1.9.0-bin/conf/netcat.conf
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/home/mohammed/Downloads/apache-flume-1.9.0-b
```

The following snippet at the end of this execution shows us that the socket connection is successful.

```
2022-12-07 17:03:04,444 INFO instrumentation.MonitoredCounterGroup: Component t
ype: CHANNEL, name: MemChannel started
2022-12-07 17:03:04,445 INFO node.Application: Starting Source Netcat
2022-12-07 17:03:04,483 INFO source.NetcatSource: Source starting
2022-12-07 17:03:04,614 INFO source.NetcatSource: Created serverSocket:sun.nio.
ch.ServerSocketChannelImpl[/127.0.0.1:9999]
```

After this, keep this program running on this terminal and start another terminal and perform the telnet command to write out to our host as follows.

```
mohammed@mohammed-VirtualBox:~$ curl telnet://localhost:9999
```

Once this is executed, we can write any messages or texts we want and it will be delivered to the host and be confirmed to us by the “OK” text after each message is passed. Have a look.

```
mohammed@mohammed-VirtualBox:~$ curl telnet://localhost:9999
unboxing
OK
big
OK
data
OK
```

The texts delivered are displayed on the terminal on which we ran our netcat.conf file.

```
INFO sink.LoggerSink: Event: { headers:{} body: 75 6E 62 6F 78 69 6E 67          unboxing }
INFO sink.LoggerSink: Event: { headers:{} body: 62 69 67                         big }
INFO sink.LoggerSink: Event: { headers:{} body: 64 61 74 61                      data }
```