EXP 3: Map Reduce program to process a weather dataset.

AIM:

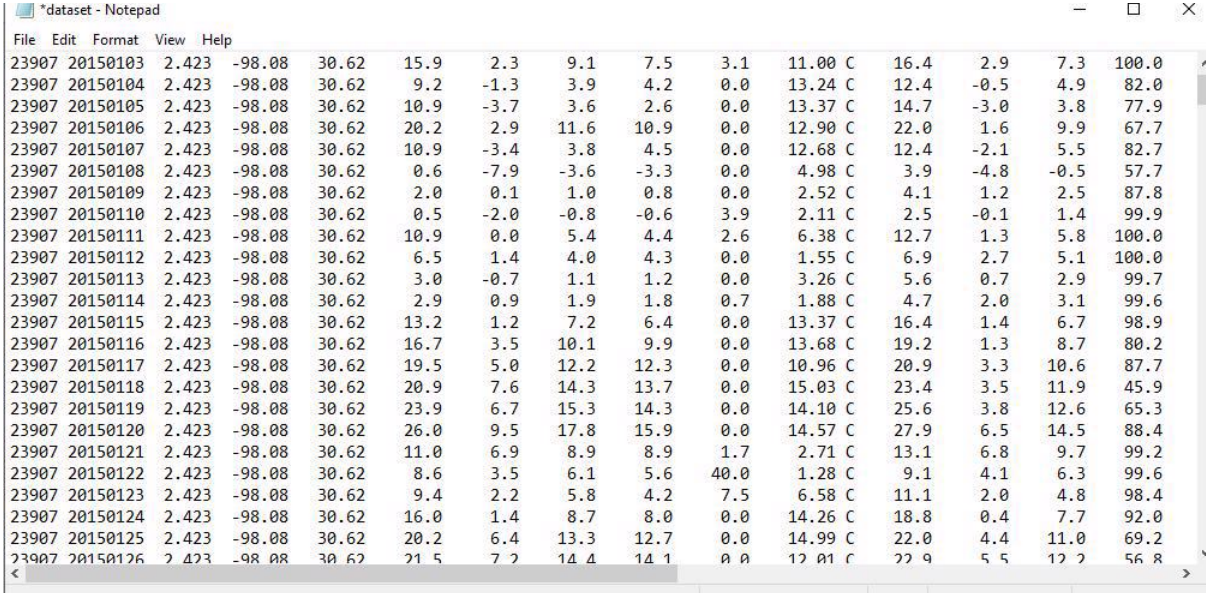
To implement MapReduce program to process a weather dataset.

Procedure:

Step 1: Create Data File:

Create a file named "word_count_data.txt" and populate it with text data that you wish to analyse. Login with your hadoop user.

Output:



*dataset - Notepad

```
23907 20150103  2.423  -98.08   30.62    15.9     2.3     9.1     7.5     3.1    11.00 C    16.4     2.9     7.3   100.0
23907 20150104  2.423  -98.08   30.62     9.2    -1.3     3.9     4.2     0.0    13.24 C    12.4    -0.5     4.9    82.0
23907 20150105  2.423  -98.08   30.62    10.9    -3.7     3.6     2.6     0.0    13.37 C    14.7    -3.0     3.8    77.9
23907 20150106  2.423  -98.08   30.62    20.2     2.9    11.6    10.9     0.0    12.90 C    22.0     1.6     9.9    67.7
23907 20150107  2.423  -98.08   30.62    10.9    -3.4     3.8     4.5     0.0    12.68 C    12.4    -2.1     5.5    82.7
23907 20150108  2.423  -98.08   30.62     0.6    -7.9    -3.6    -3.3     0.0     4.98 C     3.9    -4.8    -0.5    57.7
23907 20150109  2.423  -98.08   30.62     2.0     0.1     1.0     0.8     0.0     2.52 C     4.1     1.2     2.5    87.8
23907 20150110  2.423  -98.08   30.62     0.5    -2.0    -0.8    -0.6     3.9     2.11 C     2.5    -0.1     1.4    99.9
23907 20150111  2.423  -98.08   30.62    10.9     0.0     5.4     4.4     2.6     6.38 C    12.7     1.3     5.8   100.0
23907 20150112  2.423  -98.08   30.62     6.5     1.4     4.0     4.3     0.0     1.55 C     6.9     2.7     5.1   100.0
23907 20150113  2.423  -98.08   30.62     3.0    -0.7     1.1     1.2     0.0     3.26 C     5.6     0.7     2.9    99.7
23907 20150114  2.423  -98.08   30.62     2.9     0.9     1.9     1.8     0.7     1.88 C     4.7     2.0     3.1    99.6
23907 20150115  2.423  -98.08   30.62    13.2     1.2     7.2     6.4     0.0    13.37 C    16.4     1.4     6.7    98.9
23907 20150116  2.423  -98.08   30.62    16.7     3.5    10.1     9.9     0.0    13.68 C    19.2     1.3     8.7    80.2
23907 20150117  2.423  -98.08   30.62    19.5     5.0    12.2    12.3     0.0    10.96 C    20.9     3.3    10.6    87.7
23907 20150118  2.423  -98.08   30.62    20.9     7.6    14.3    13.7     0.0    15.03 C    23.4     3.5    11.9    45.9
23907 20150119  2.423  -98.08   30.62    23.9     6.7    15.3    14.3     0.0    14.10 C    25.6     3.8    12.6    65.3
23907 20150120  2.423  -98.08   30.62    26.0     9.5    17.8    15.9     0.0    14.57 C    27.9     6.5    14.5    88.4
23907 20150121  2.423  -98.08   30.62    11.0     6.9     8.9     8.9     1.7     2.71 C    13.1     6.8     9.7    99.2
23907 20150122  2.423  -98.08   30.62     8.6     3.5     6.1     5.6    40.0     1.28 C     9.1     4.1     6.3    99.6
23907 20150123  2.423  -98.08   30.62     9.4     2.2     5.8     4.2     7.5     6.58 C    11.1     2.0     4.8    98.4
23907 20150124  2.423  -98.08   30.62    16.0     1.4     8.7     8.0     0.0    14.26 C    18.8     0.4     7.7    92.0
23907 20150125  2.423  -98.08   30.62    20.2     6.4    13.3    12.7     0.0    14.99 C    22.0     4.4    11.0    69.2
23907 20150126  2.423  -98.08   30.62    21.5     7.2    14.4    14.1     0.0    12.01 C    22.9     5.5    12.2    56.8
```

Step 2: Mapper Logic - mapper.py:

Create a file named "mapper.py" to implement the logic for the mapper. The mapper will read input data from STDIN, split lines into words, and output each word with its count.

```
#!/usr/bin/env python

import sys

# input comes from STDIN (standard input)
# the mapper will get daily max temperature and group it by month. so output will be
   (month,dailymax_temperature)
```

```
for line in sys.stdin:
    # remove leading and trailing whitespace
    line = line.strip()
    # split the line into words
    words = line.split()
    #See the README hosted on the weather website which help us understand how each
position represents a column
    month = line[10:12] daily_max
    = line[38:45] daily_max =
    daily_max.strip() # increase
    counters
    for word in words:
        # write the results to STDOUT (standard output);
        # what we output here will be go through the shuffle proess and then #
        be the input for the Reduce step, i.e. the input for reducer.py
        #
        # tab-delimited; month and daily max temperature as output print
        ('%s\t%s' % (month ,daily_max))

           .
```

Step 3: Reducer Logic - reducer.py:

Create a file named "reducer.py" to implement the logic for the reducer. The reducer will aggregate the occurrences of each word and generate the final output.

# Copy and paste the reducer.py code

reducer.py

```
#!/usr/bin/env python

from operator import itemgetter
import sys
#reducer will get the input from stdid which will be a collection of key, value(Key=month ,
value= daily max temperature)
#reducer logic: will get all the daily max temperature for a month and find max temperature for
the month
#shuffle will ensure that key are sorted(month)
current_month = None
current_max = 0 month
= None

#input comes from STDIN
for line in sys.stdin:
    # remove leading and trailing whitespace
    line = line.strip()
    # parse the input we got from mapper.py
    month, daily_max = line.split('\t', 1)

    # convert daily_max (currently a string) to float try:
    daily_max = float(daily_max) except ValueError:
        # daily_max was not a number, so silently #
        ignore/discard this line continue

    # this IF-switch only works because Hadoop shuffle process sorts map output #
    by key (here: month) before it is passed to the reducer
    if current_month == month:
        if daily_max > current_max: current_max
            = daily_max
    else:
        if current_month:
            # write result to STDOUT
            print ('%s\t%s' % (current_month, current_max))
        current_max = daily_max
        current_month = month

# output of the last month
if current_month == month:
    print ('%s\t%s' % (current_month, current_max))
```

Step 4: Prepare Hadoop Environment:

Start the Hadoop daemons and create a directory in HDFS to store your data.

```
start-all.sh
```

Step 6: Make Python Files Executable:

Give executable permissions to your mapper.py and reducer.py files.

```
chmod 777 mapper.py reducer.py
```

Step 7: Run the program using Hadoop Streaming:

Download the latest hadoop-streaming jar file and place it in a location you can easily access.

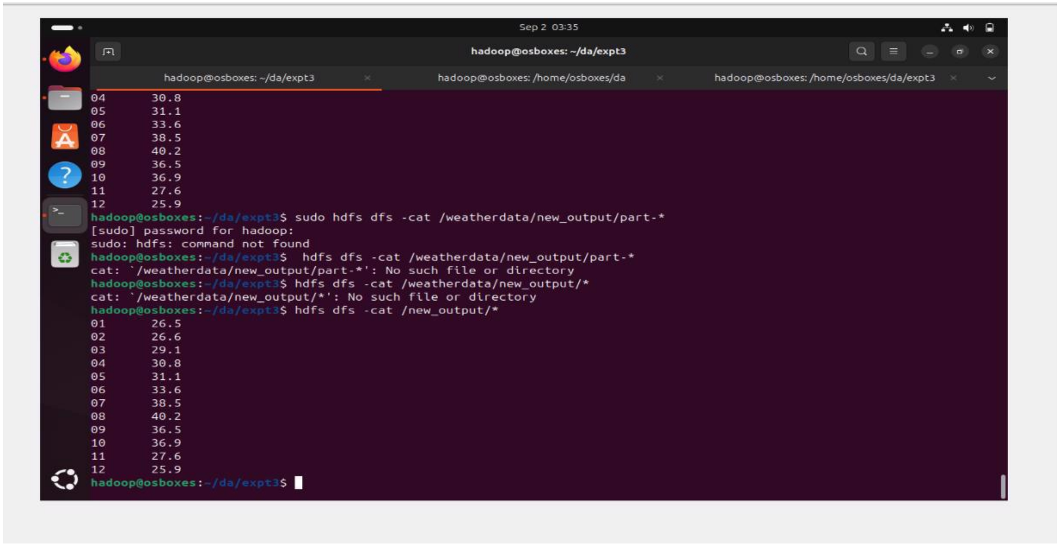
Then run the program using Hadoop Streaming. hadoop

```
fs -mkdir -p /weatherdata

hadoop fs -copyFromLocal /home/sx/Downloads/dataset.txt /weatherdata

hdfs dfs -ls /weatherdata

hadoop jar /home/sx/hadoop-3.2.3/share/hadoop/tools/lib/hadoop-streaming-3.2.3.jar \
  -input /weatherdata/dataset.txt \
  -output /weatherdata/output \
  -file "/home/sx/Downloads/mapper.py" \
  -mapper "python3 mapper.py" \
  -file "/home/sx/Downloads/reducer.py" \
  -reducer "python3 reducer.py"

hdfs dfs -text /weatherdata/output/* > /home/sx/Downloads/outputfile.txt
```

Step 8: Check Output:

Check the output of the program in the specified HDFS output directory.

```
hdfs dfs -text /weatherdata/output/* > /home/sx/Downloads/output/
/part-00000
```



Sep 2 03:35
hadoop@osboxes: ~/da/expt3
hadoop@osboxes: ~/da/expt3
hadoop@osboxes: /home/osboxes/da
hadoop@osboxes: /home/osboxes/da/expt3

```
04      30.8
05      31.1
06      33.6
07      38.5
08      40.2
09      36.5
10      36.9
11      27.6
12      25.9
hadoop@osboxes:~/da/expt3$ sudo hdfs dfs -cat /weatherdata/new_output/part-*
[sudo] password for hadoop:
sudo: hdfs: command not found
hadoop@osboxes:~/da/expt3$  hdfs dfs -cat /weatherdata/new_output/part-*
cat: `/weatherdata/new_output/part-*': No such file or directory
hadoop@osboxes:~/da/expt3$ hdfs dfs -cat /weatherdata/new_output/*
cat: `/weatherdata/new_output/*': No such file or directory
hadoop@osboxes:~/da/expt3$ hdfs dfs -cat /new_output/*
01      26.5
02      26.6
03      29.1
04      30.8
05      31.1
06      33.6
07      38.5
08      40.2
09      36.5
10      36.9
11      27.6
12      25.9
hadoop@osboxes:~/da/expt3$ 
```

Result:

Thus, the program for weather dataset using Map Reduce has been executed successfully.

EXP 4: Create UDF in PIG

Step-by-step installation of Apache Pig on Hadoop cluster on Ubuntu

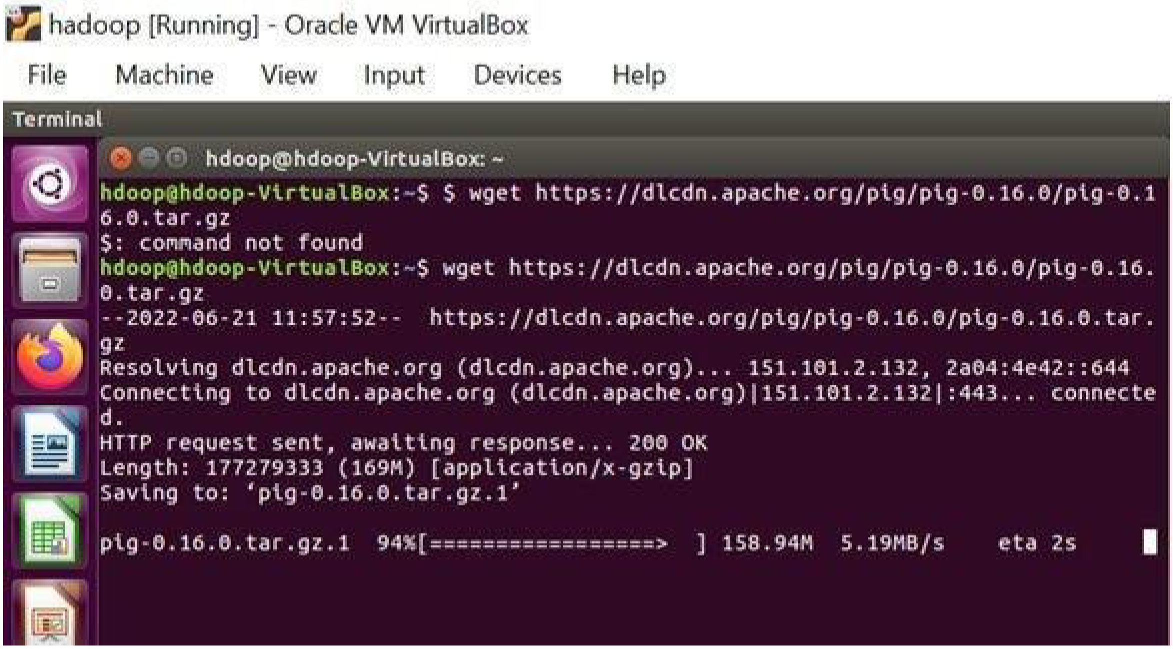
Pre-requisite:

· Ubuntu 16.04 or higher version running (I have installed Ubuntu on Oracle VM (Virtual Machine) VirtualBox),

· Run Hadoop on ubuntu (I have installed Hadoop 3.2.1 on Ubuntu 16.04). You may refer to my blog "How to install Hadoop installation" click here for Hadoop installation).

Pig installation steps Step 1:

Login into Ubuntu


hadoop [Running] - Oracle VM VirtualBox
File
Machine
View
Input
Devices
Help
Terminal
hdoop@hdoop-VirtualBox: ~

```
hdoop@hdoop-VirtualBox:~$ $ wget https://dlcdn.apache.org/pig/pig-0.16.0/pig-0.1
6.0.tar.gz
$: command not found
hdoop@hdoop-VirtualBox:~$ wget https://dlcdn.apache.org/pig/pig-0.16.0/pig-0.16.
0.tar.gz
--2022-06-21 11:57:52--  https://dlcdn.apache.org/pig/pig-0.16.0/pig-0.16.0.tar.
gz
Resolving dlcdn.apache.org (dlcdn.apache.org)... 151.101.2.132, 2a04:4e42::644
Connecting to dlcdn.apache.org (dlcdn.apache.org)|151.101.2.132|:443... connecte
d.
HTTP request sent, awaiting response... 200 OK
Length: 177279333 (169M) [application/x-gzip]
Saving to: ‘pig-0.16.0.tar.gz.1’

pig-0.16.0.tar.gz.1  94%[=================>  ] 158.94M  5.19MB/s    eta 2s
```

Step 2: Go to https://pig.apache.org/releases.html and copy the path of the latest version of pig that you want to install. Run the following comment to download Apache Pig in Ubuntu:

$ wget https://dlcdn.apache.org/pig/pig-0.16.0/pig-0.16.0.tar.gz

Step 3: To untar pig-0.16.0.tar.gz file run the following command:

$ tar xvzf pig-0.16.0.tar.gz

Step 4: To create a pig folder and move pig-0.16.0 to the pig folder, execute the following command:

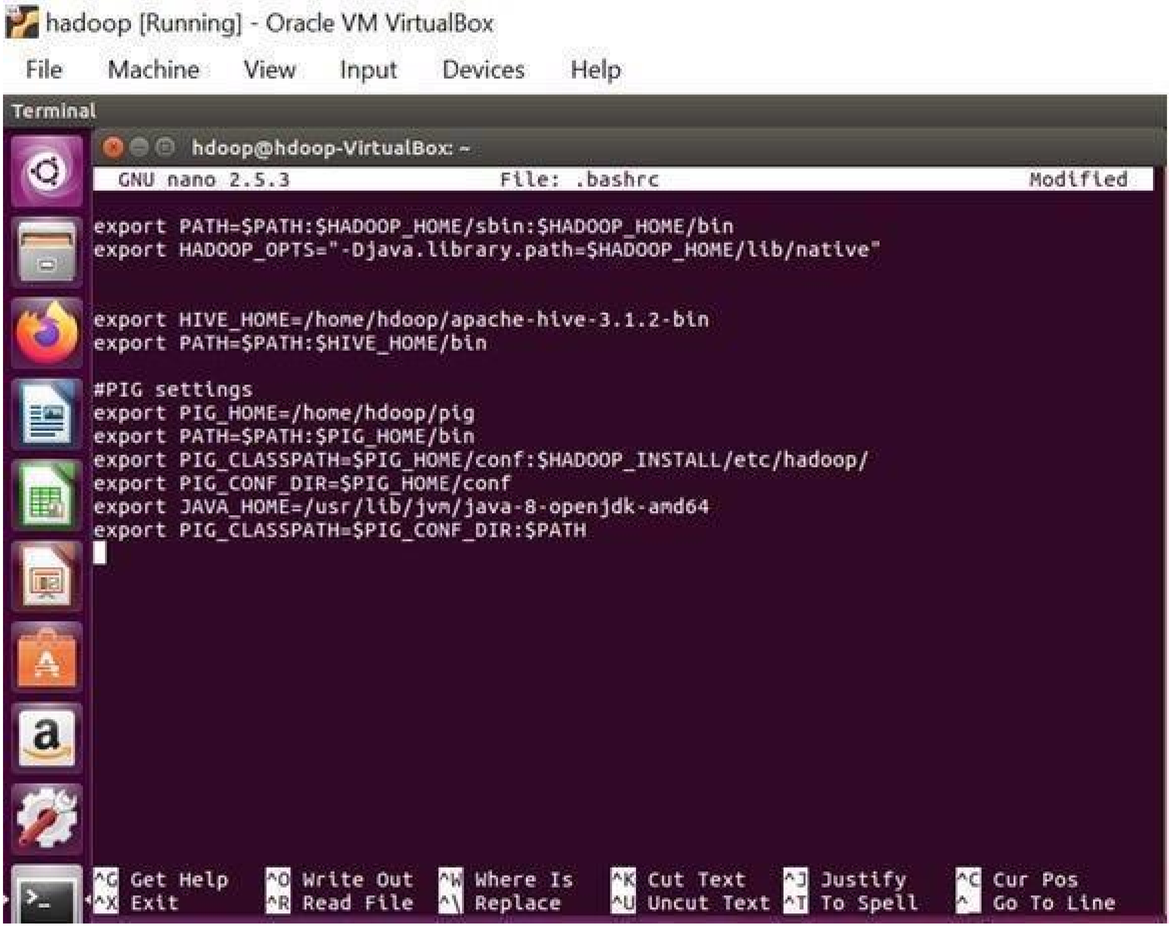
$ sudo mv /home/hdoop/pig-0.16.0 /home/hdoop/pig

Step 5: Now open the .bashrc file to edit the path and variables/settings for pig. Run the following command:

$ sudo nano .bashrc

Add the below given to .bashrc file at the end and save the file.

#PIG settingsexport PIG_HOME=/home/hdoop/pigexport PATH=$PATH:$PIG_HOME/binexport PIG_CLASSPATH=$PIG_HOME/conf:$HADOOP_INSTALL/etc/hadoop/export PIG_CONF_DIR=$PIG_HOME/confexport JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64export PIG_CLASSPATH=$PIG_CONF_DIR:$PATH#PIG setting ends


hadoop [Running] - Oracle VM VirtualBox
File
Machine
View
Input
Devices
Help
Terminal
hdoop@hdoop-VirtualBox: ~

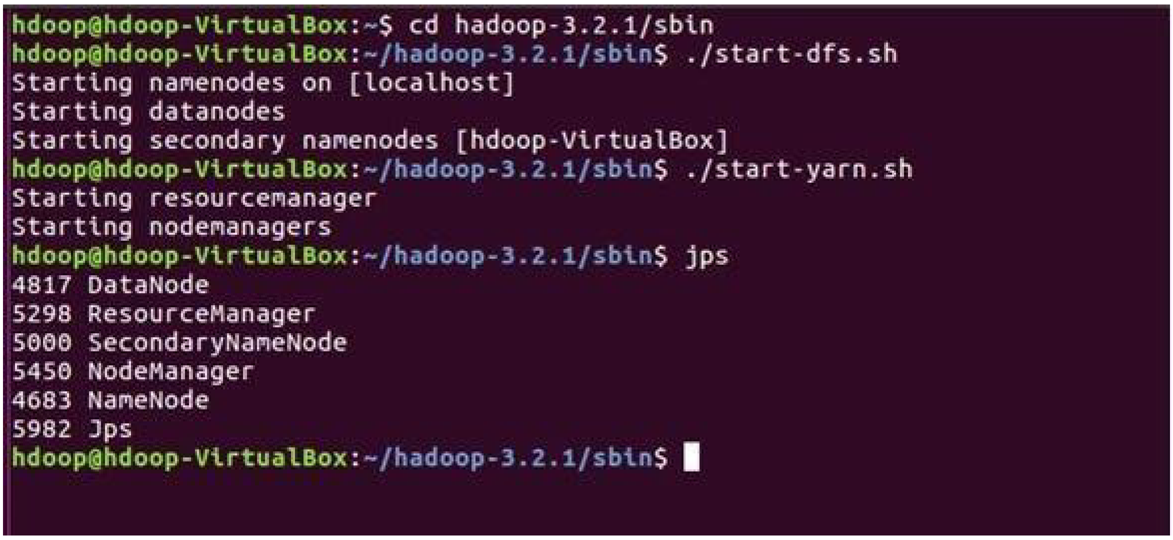
```
  GNU nano 2.5.3                File: .bashrc                            Modified

export PATH=$PATH:$HADOOP_HOME/sbin:$HADOOP_HOME/bin
export HADOOP_OPTS="-Djava.library.path=$HADOOP_HOME/lib/native"


export HIVE_HOME=/home/hdoop/apache-hive-3.1.2-bin
export PATH=$PATH:$HIVE_HOME/bin

#PIG settings
export PIG_HOME=/home/hdoop/pig
export PATH=$PATH:$PIG_HOME/bin
export PIG_CLASSPATH=$PIG_HOME/conf:$HADOOP_INSTALL/etc/hadoop/
export PIG_CONF_DIR=$PIG_HOME/conf
export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64
export PIG_CLASSPATH=$PIG_CONF_DIR:$PATH

^G Get Help   ^O Write Out  ^W Where Is   ^K Cut Text   ^J Justify    ^C Cur Pos
^X Exit       ^R Read File  ^\ Replace    ^U Uncut Text ^T To Spell   ^_ Go To Line
```

Step 6: Run the following command to make the changes effective in the .bashrc file: $

source .bashrc

Step 7: To start all Hadoop daemons, navigate to the hadoop-3.2.1/sbin folder and run the following commands:

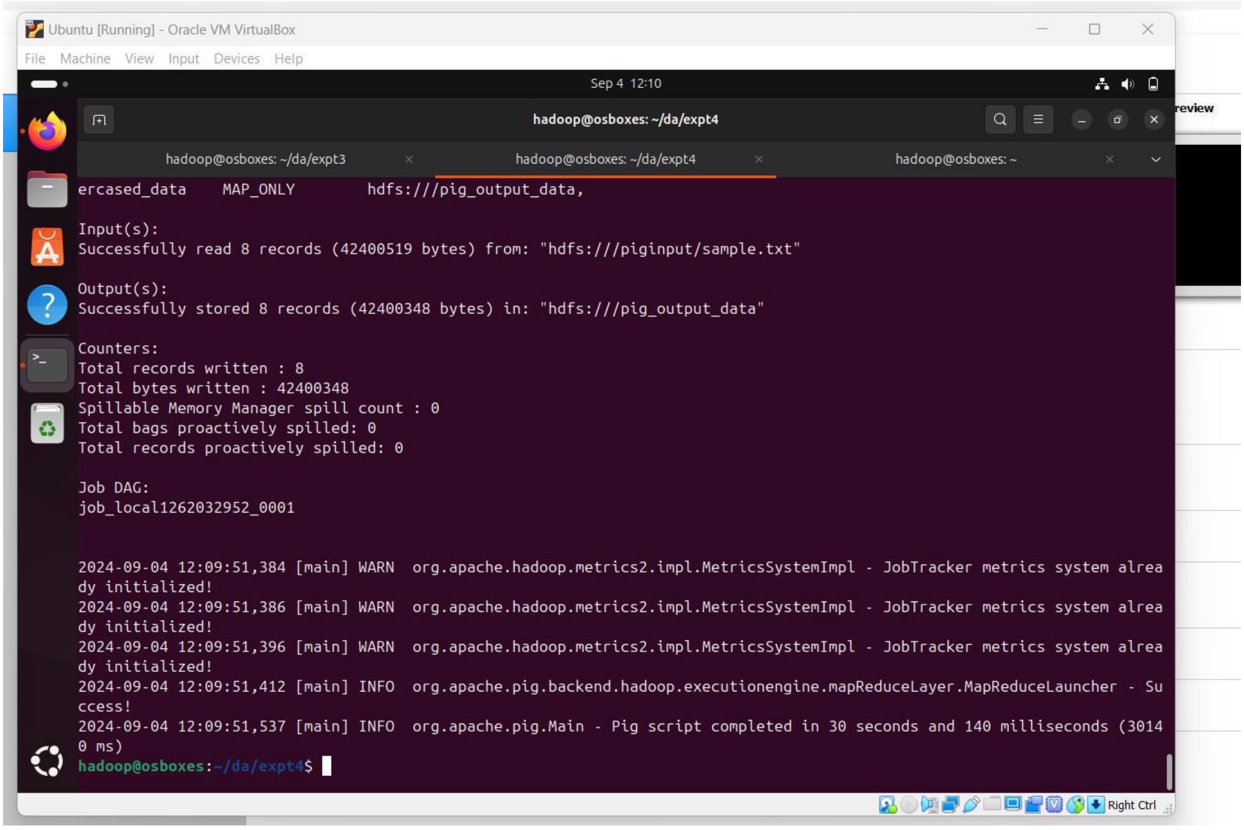
$ ./start-dfs.sh$ ./start-yarn$ jps



```
hdoop@hdoop-VirtualBox:~$ cd hadoop-3.2.1/sbin
hdoop@hdoop-VirtualBox:~/hadoop-3.2.1/sbin$ ./start-dfs.sh
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [hdoop-VirtualBox]
hdoop@hdoop-VirtualBox:~/hadoop-3.2.1/sbin$ ./start-yarn.sh
Starting resourcemanager
Starting nodemanagers
hdoop@hdoop-VirtualBox:~/hadoop-3.2.1/sbin$ jps
4817 DataNode
5298 ResourceManager
5000 SecondaryNameNode
5450 NodeManager
4683 NameNode
5982 Jps
hdoop@hdoop-VirtualBox:~/hadoop-3.2.1/sbin$
```

Step 8: Now you can launch pig by executing the following command: $

pig


Ubuntu [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Sep 4 12:10
hadoop@osboxes: ~/da/expt4
hadoop@osboxes: ~/da/expt3
hadoop@osboxes: ~/da/expt4
hadoop@osboxes: ~
Right Ctrl

```
ercased_data    MAP_ONLY        hdfs:///pig_output_data,

Input(s):
Successfully read 8 records (42400519 bytes) from: "hdfs:///piginput/sample.txt"

Output(s):
Successfully stored 8 records (42400348 bytes) in: "hdfs:///pig_output_data"

Counters:
Total records written : 8
Total bytes written : 42400348
Spillable Memory Manager spill count : 0
Total bags proactively spilled: 0
Total records proactively spilled: 0

Job DAG:
job_local1262032952_0001


2024-09-04 12:09:51,384 [main] WARN  org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system alrea
dy initialized!
2024-09-04 12:09:51,386 [main] WARN  org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system alrea
dy initialized!
2024-09-04 12:09:51,396 [main] WARN  org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system alrea
dy initialized!
2024-09-04 12:09:51,412 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher - Su
ccess!
2024-09-04 12:09:51,537 [main] INFO  org.apache.pig.Main - Pig script completed in 30 seconds and 140 milliseconds (3014
0 ms)
hadoop@osboxes:~/da/expt4$
```

Step 9: Now you are in pig and can perform your desired tasks on pig. You can come out of the pig by the quit command:

> quit;