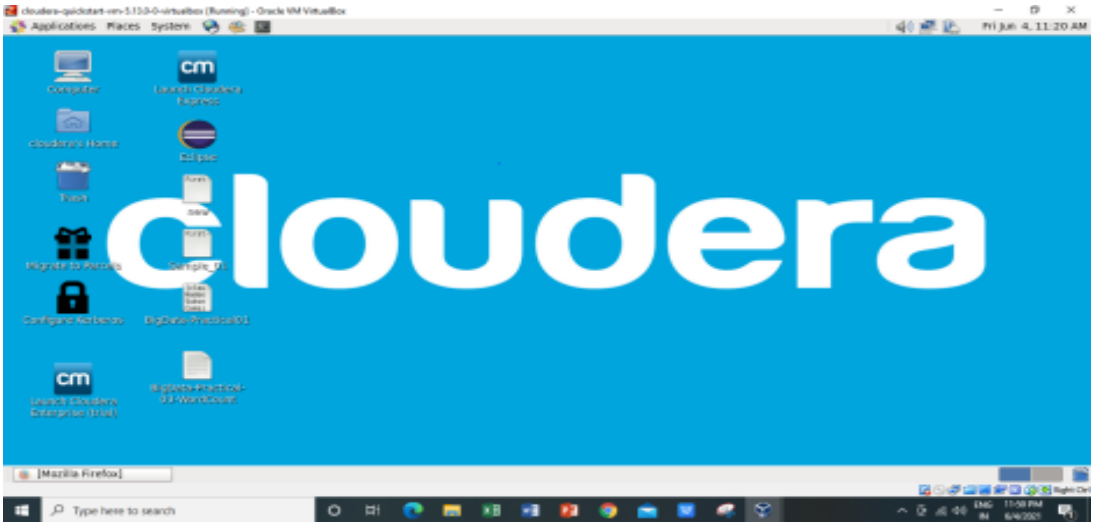
Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47

Steps for Word Count in Cloudera: (Without Combiner)

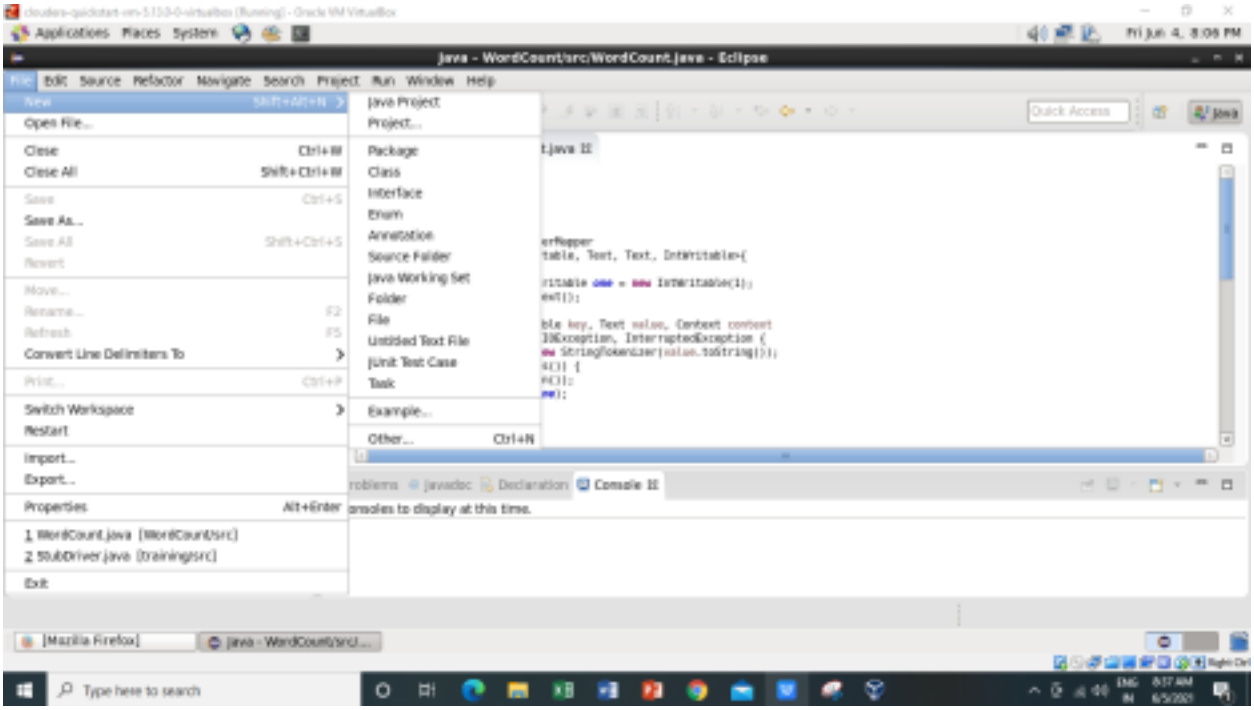
1) Open virtual box and then start cloudera quickstart.



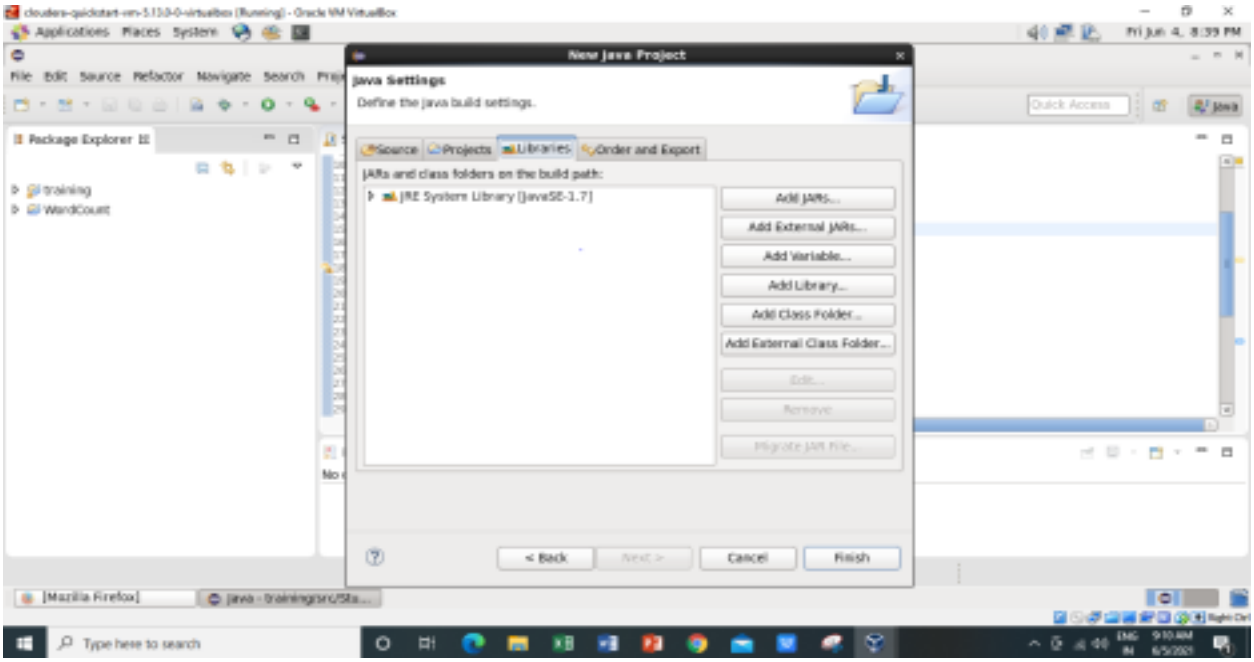
2) Open Eclipse present on the cloudera desktop.

3) Create a new Java project clicking: File -> New -> Project -> Java Project -> Next ("WordCount" is the project name).

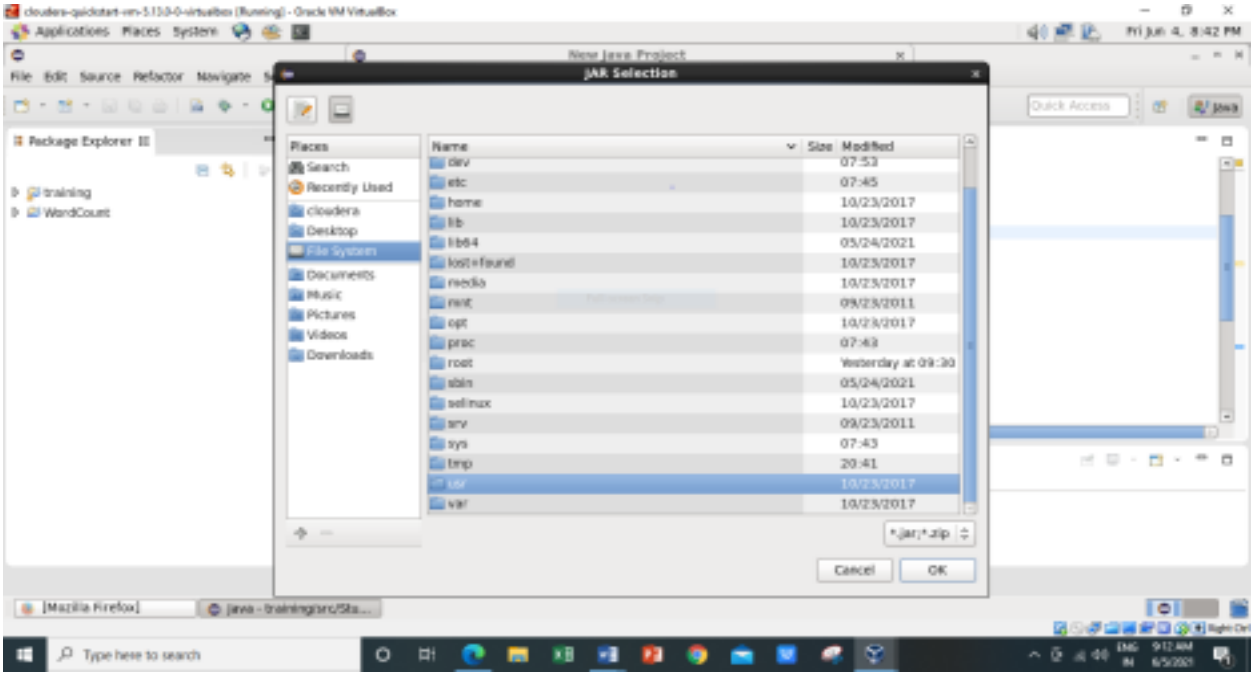
Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47

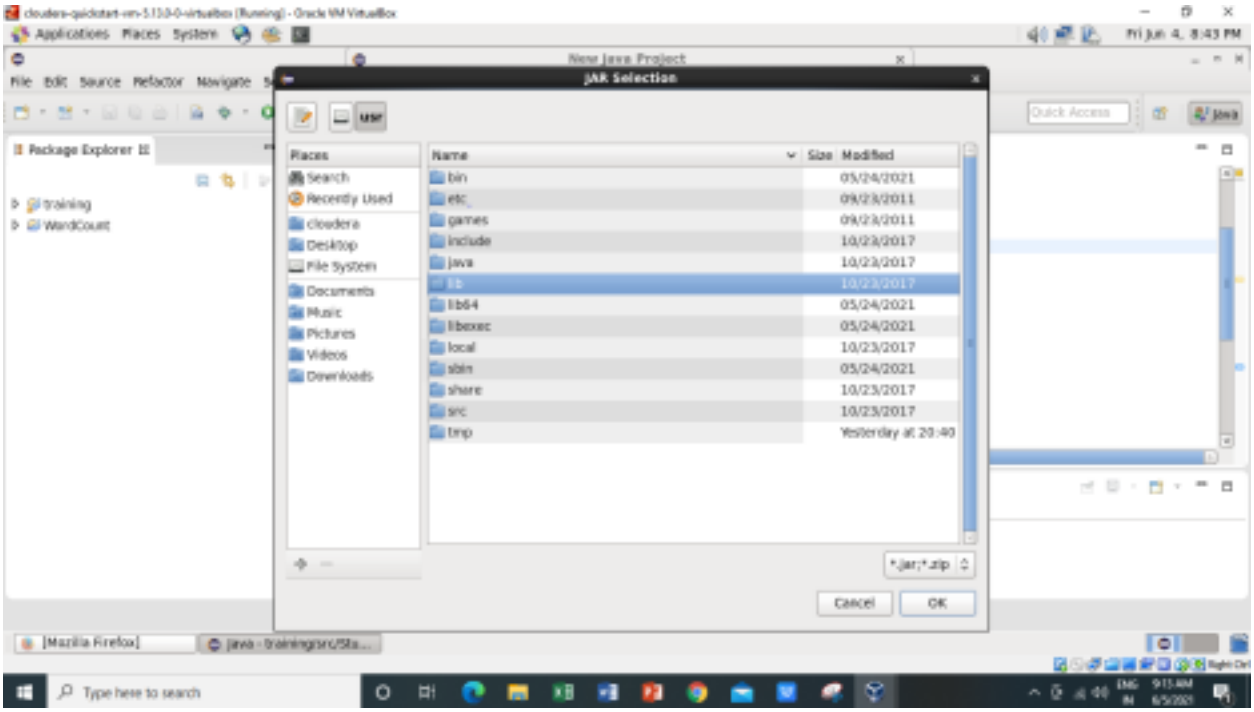


4)Adding the Hadoop libraries to the project Click on Libraries -> Add External JARs Click on File System -> usr -> lib -> hadoop Select all the libraries (JAR Files) -> click OK Click on Add External jars, -> client -> select all jar files -> ok -> Finish

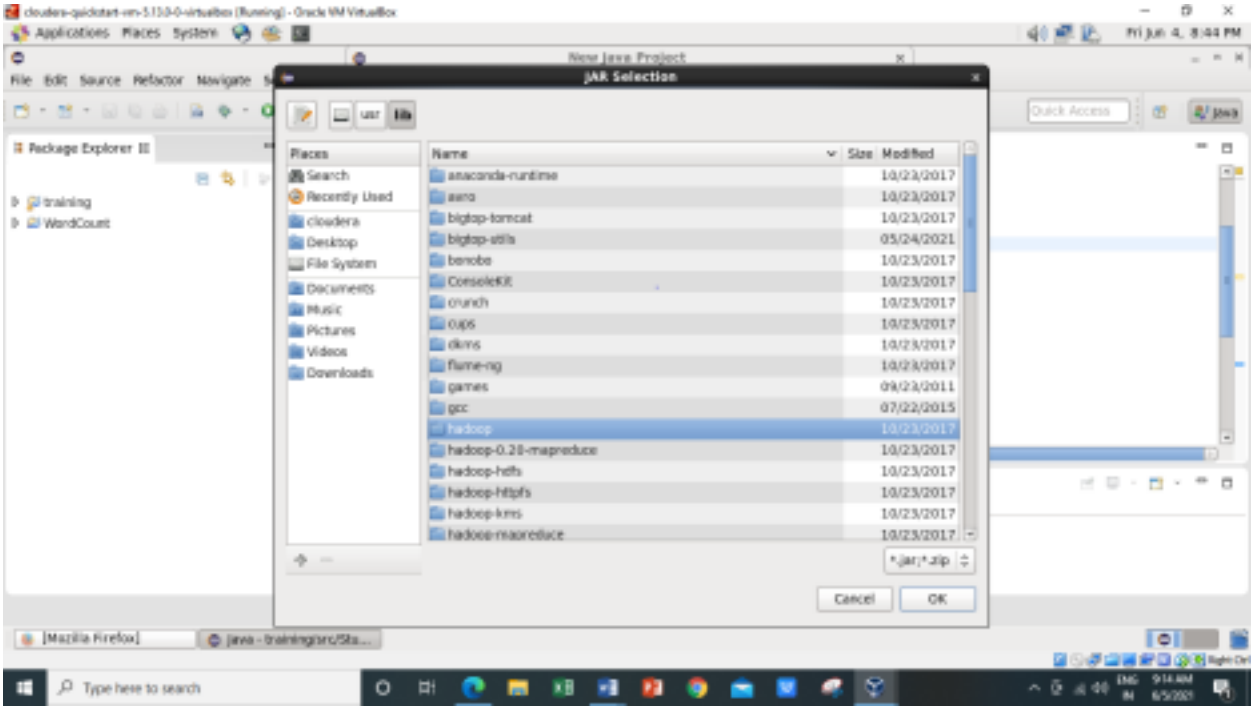


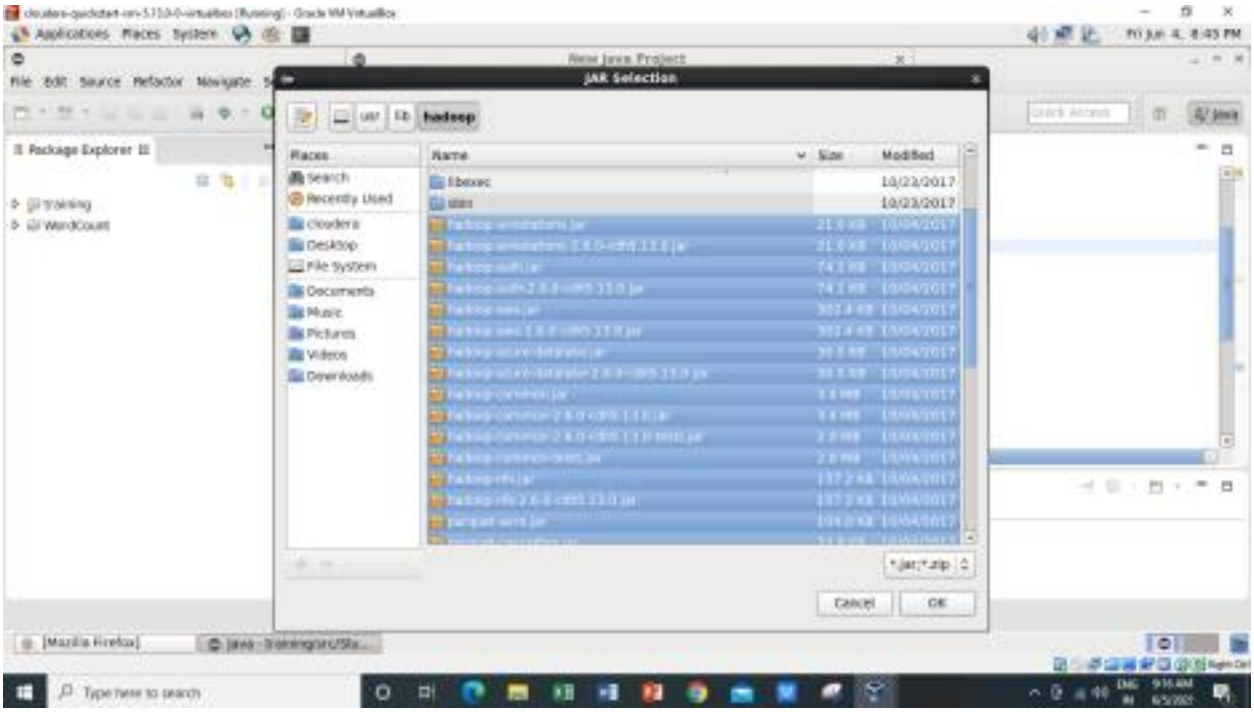
Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47



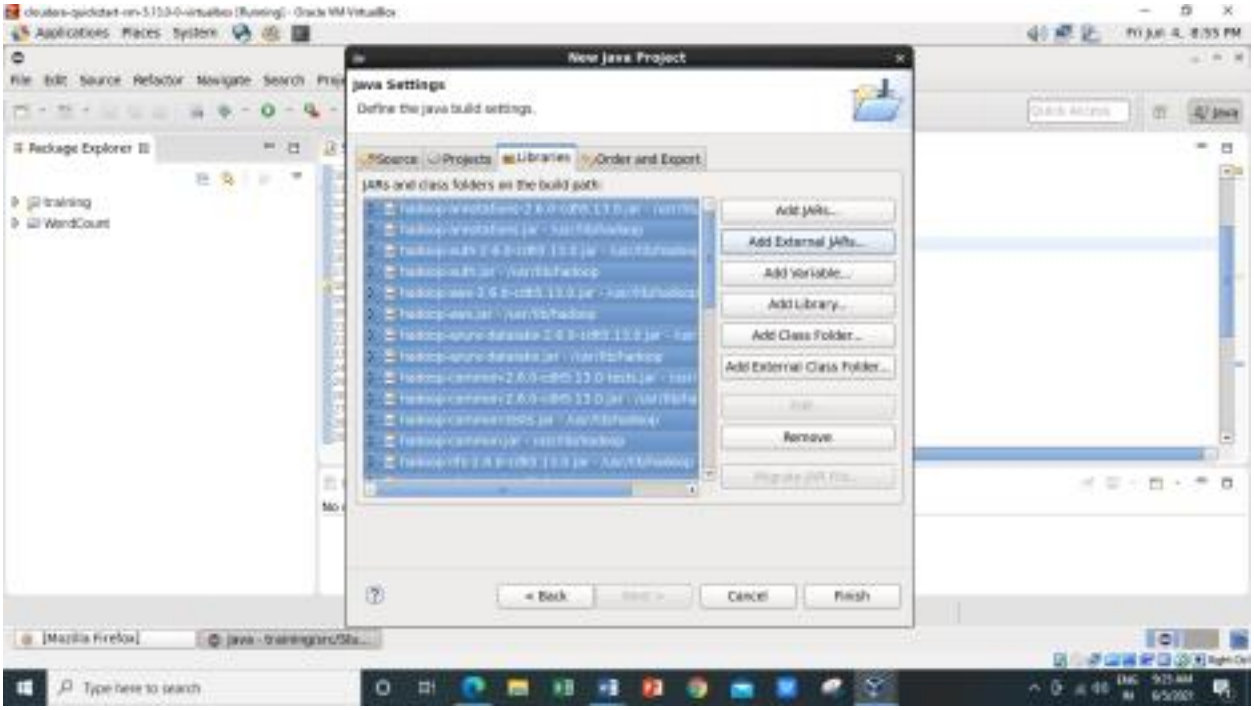


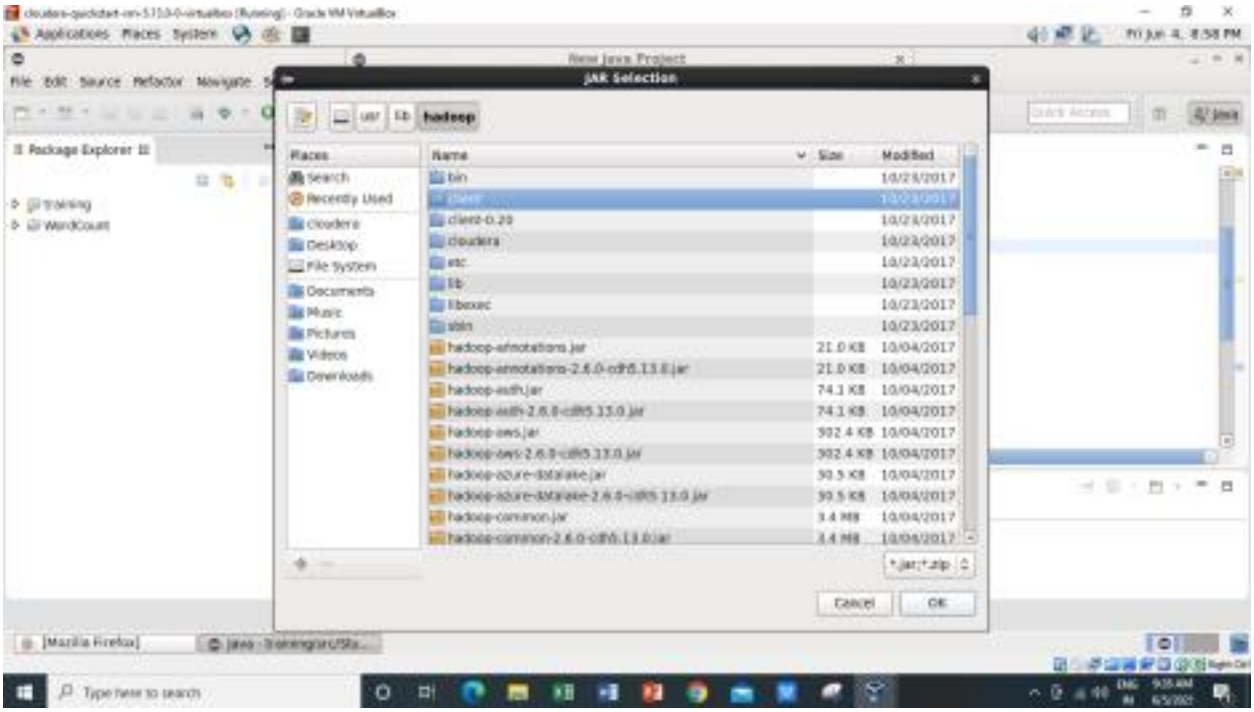
Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47



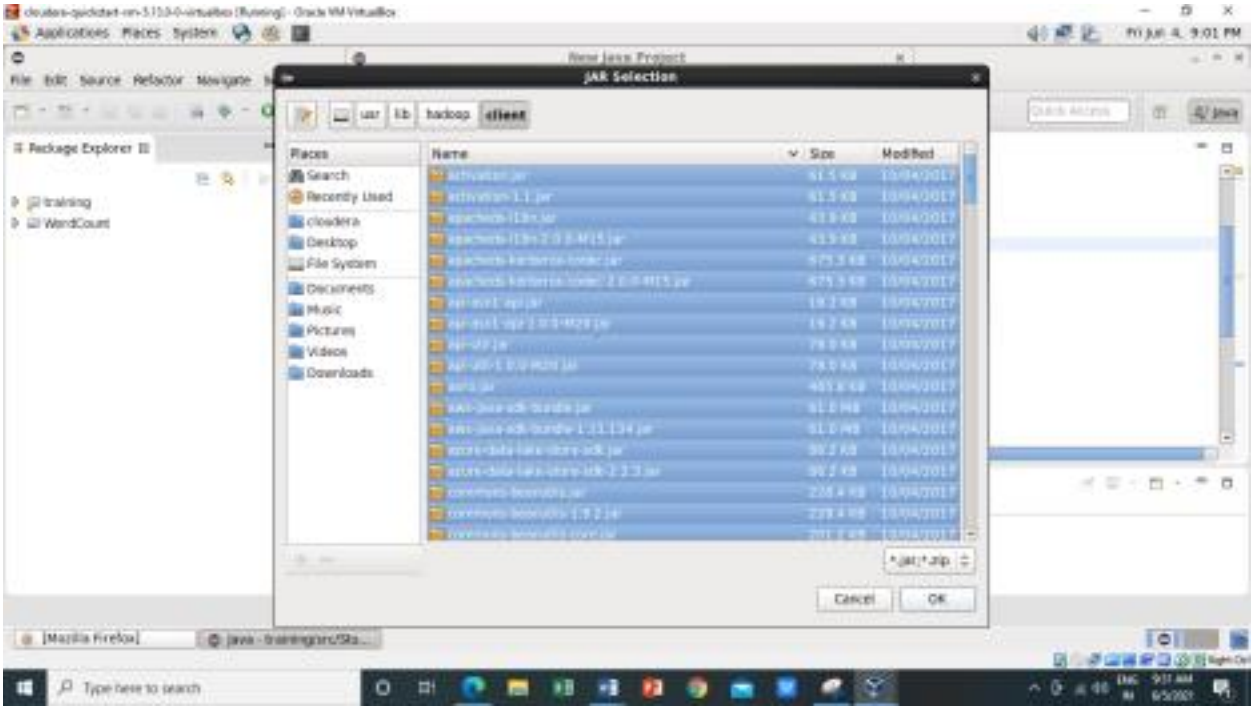


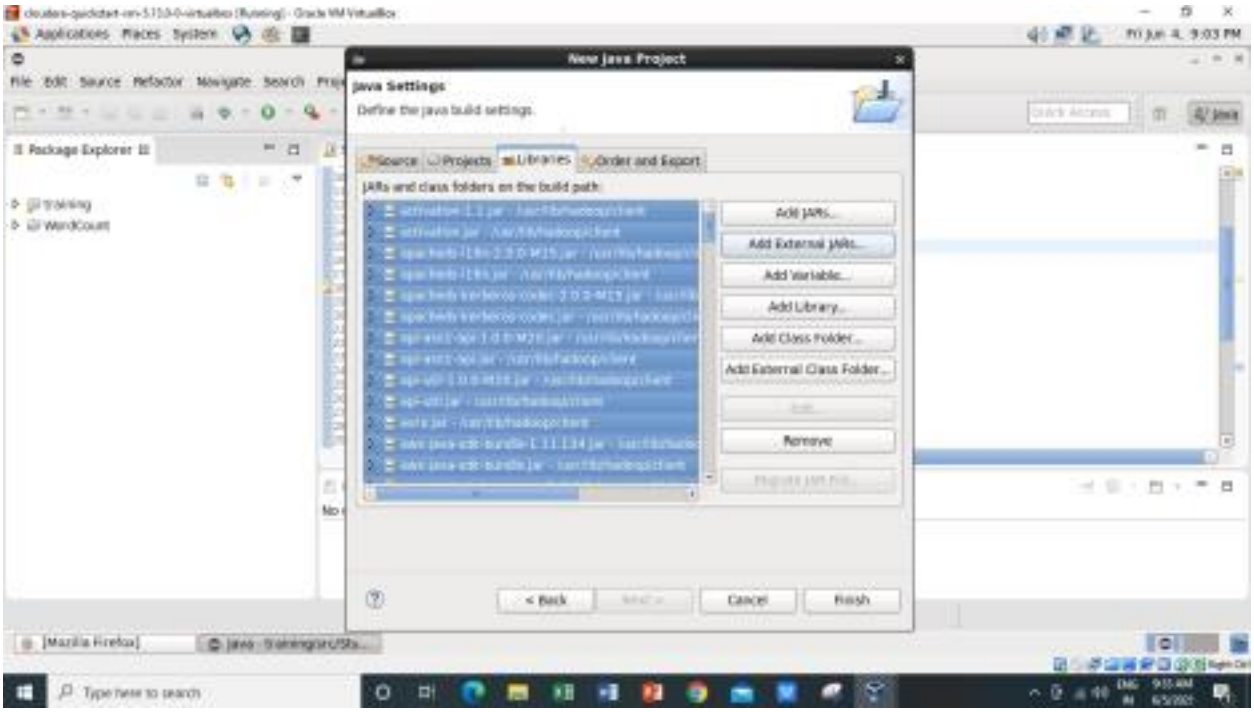
Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47





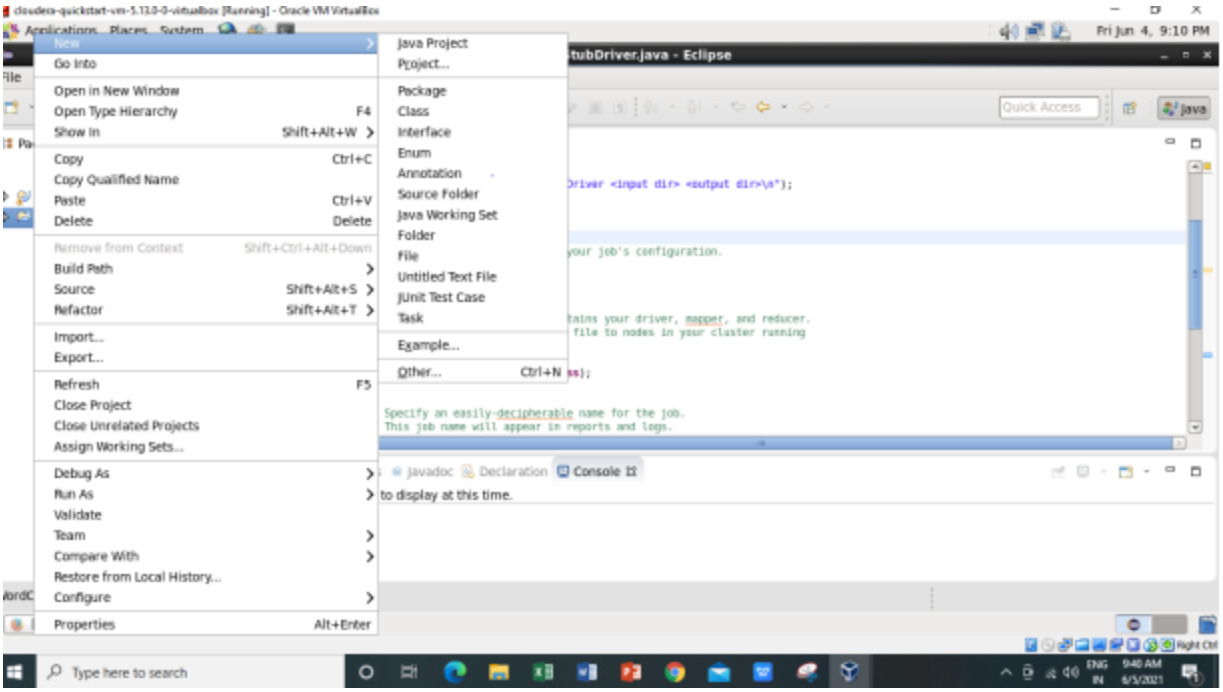
Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47

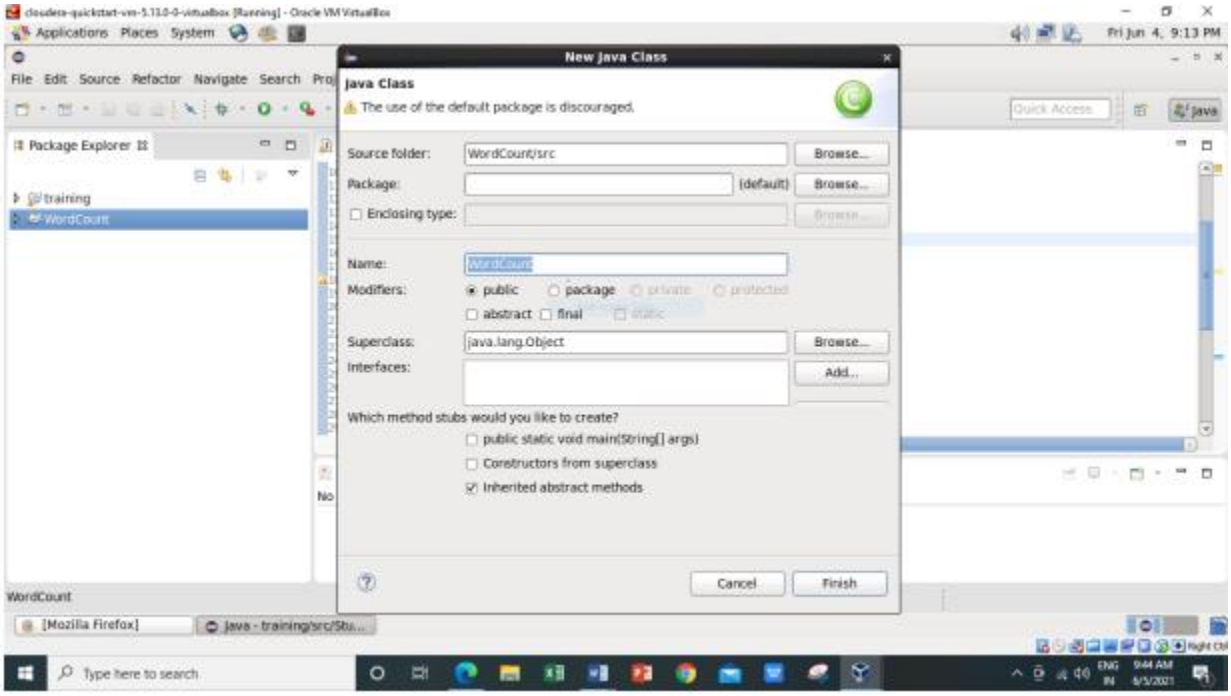




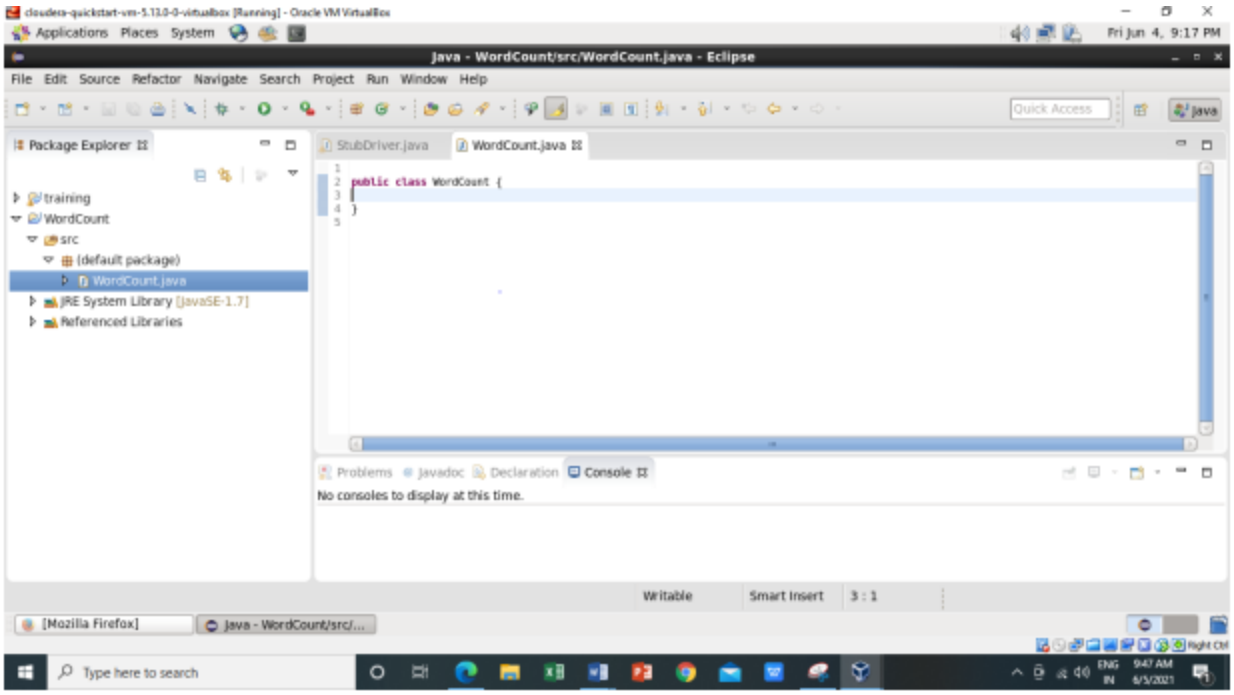
5) Right Click on the name of Project “WordCount” -> New -> class Don’t write anything for package Write Name Textbox write “WordCount” -> Finish Then WordCount.java window will pop up

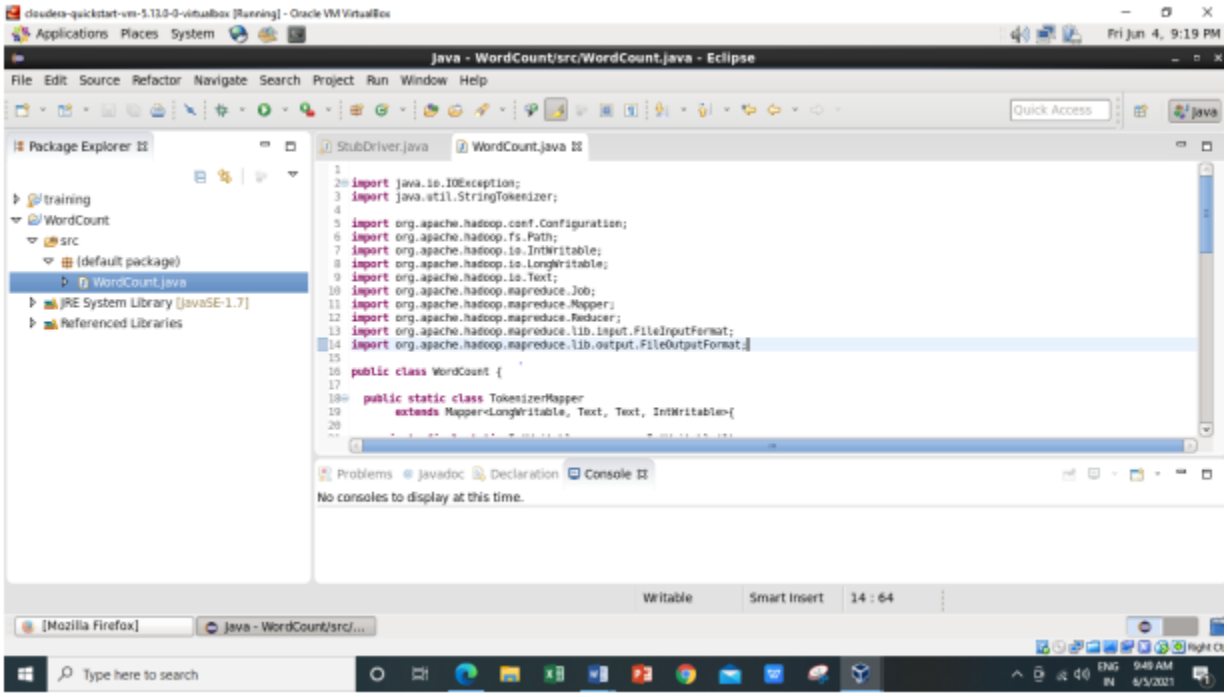
Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47





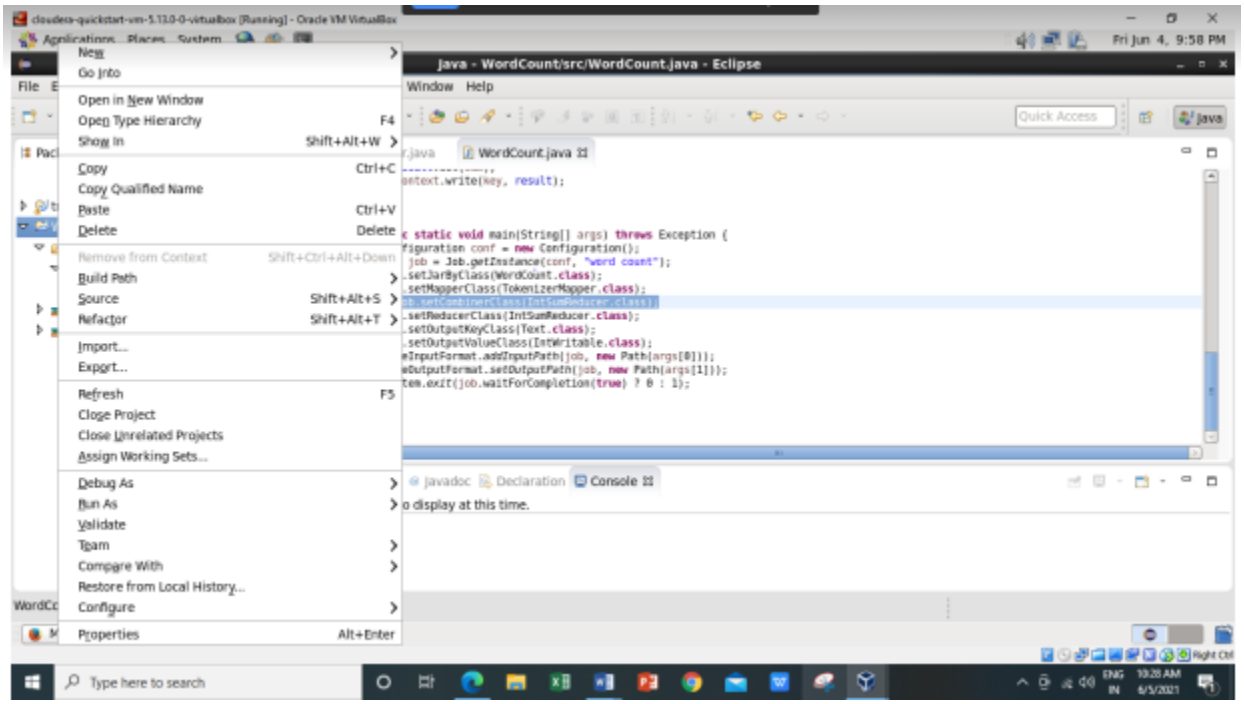
Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47

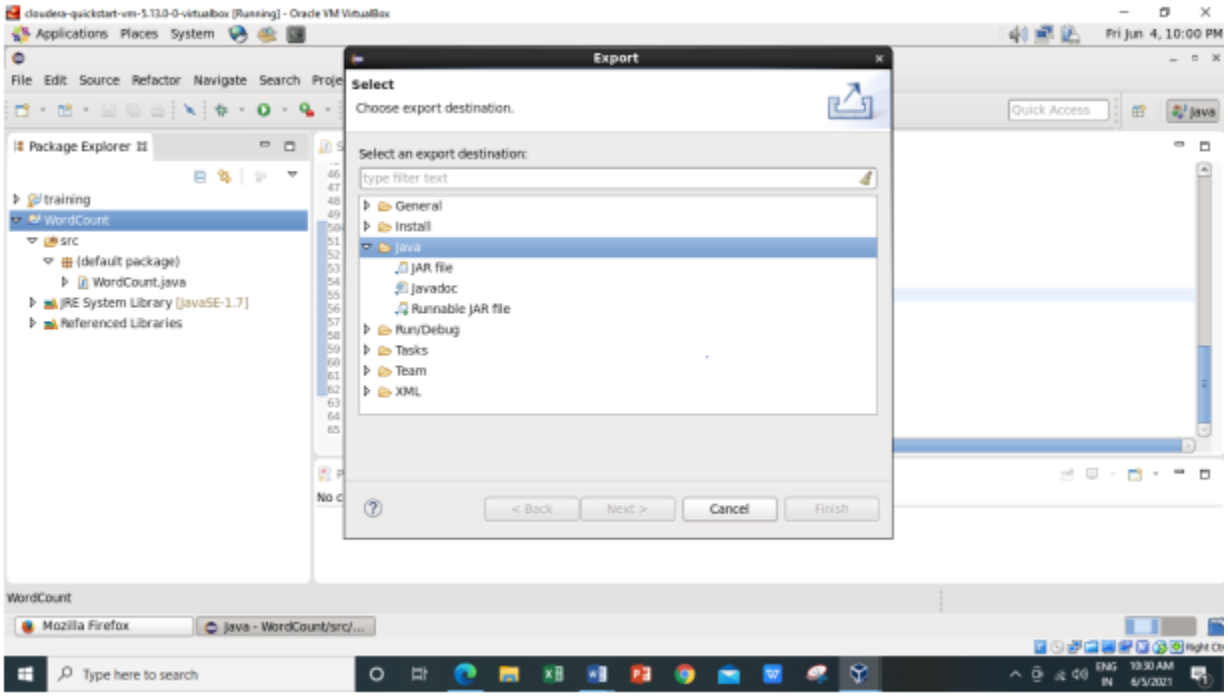




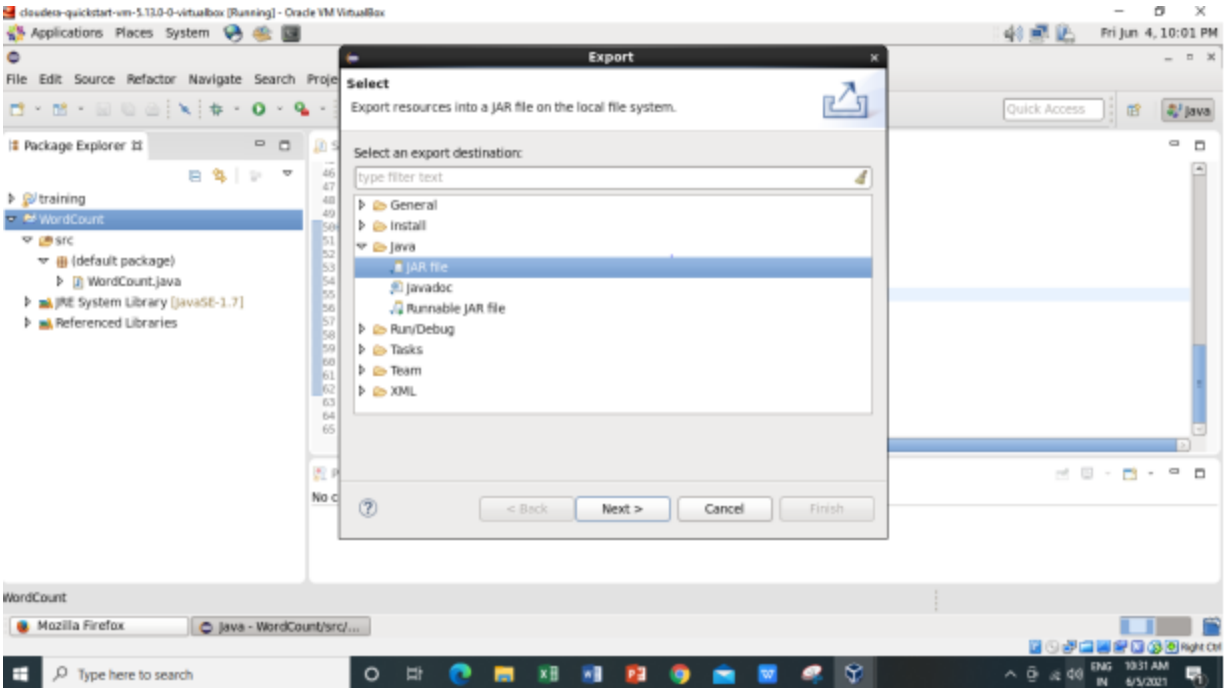
Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47

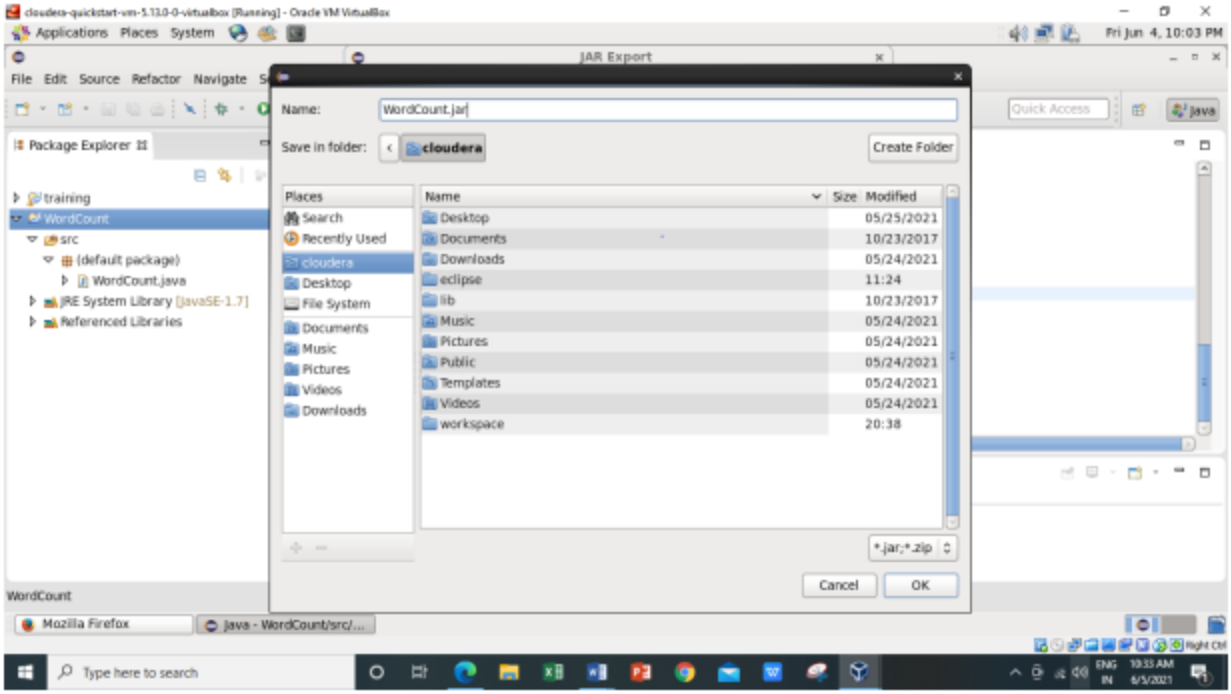
6) Right Click on the project name WordCount -> Export -> Java -> JAR File -> Next -> for select the export destination for JAR file: browse -> Name : WordCount.jar -> save in folder -> cloudera -> Finish -> OK



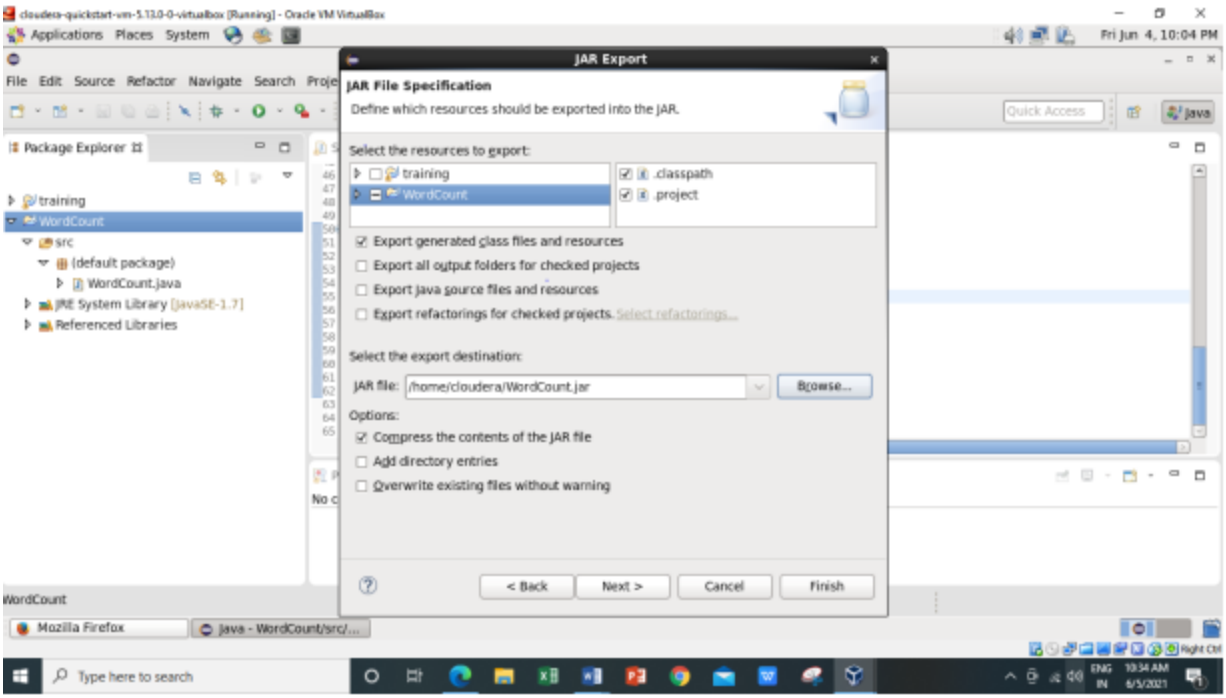


Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47





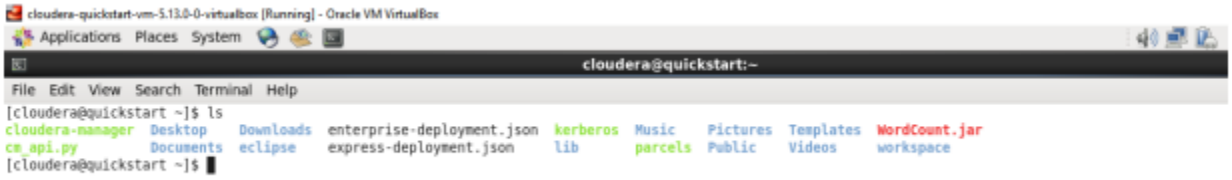
Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47



7) Verify jar file from terminal by using Open terminal & type " ls " There it will show WordCount.jar

Check current working directory ->pwd

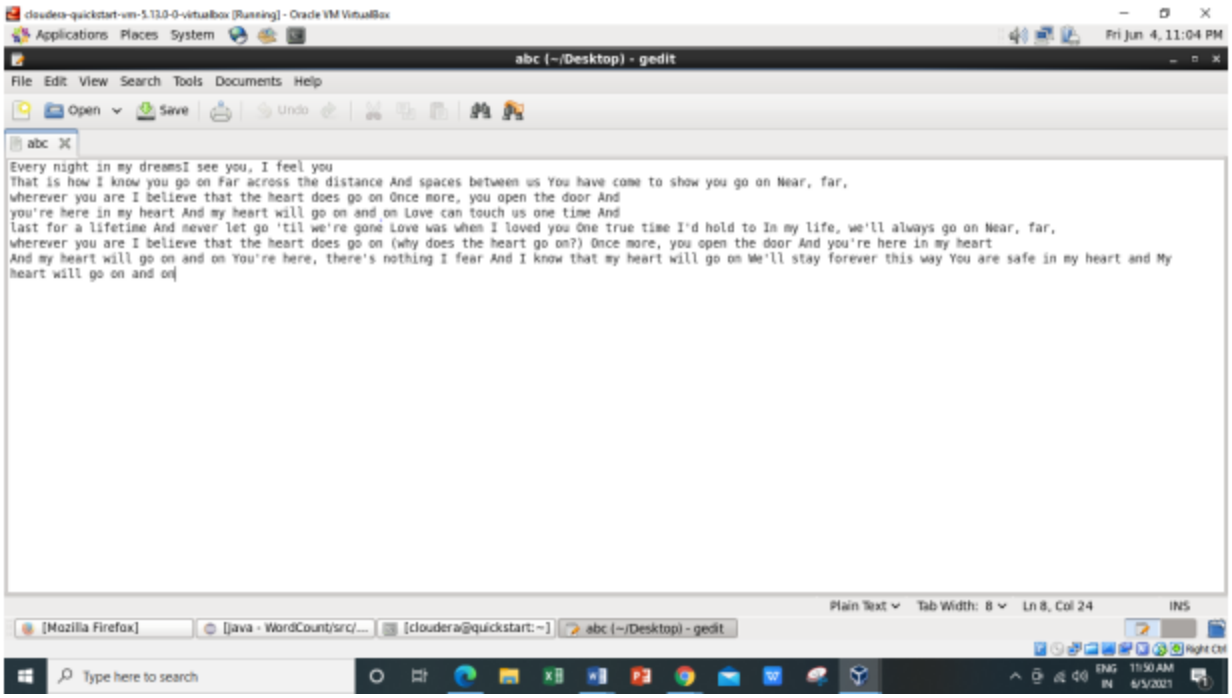
```
[cloudera@quickstart ~]$ pwd
/home/cloudera
[cloudera@quickstart ~]$
```



8) We need to create an input file in local file system

Creating an input file named as "abc".

Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47



Here listing all the directory present in hdfs using hdfs dfs -ls / command

```
[cloudera@quickstart ~]$ hdfs dfs -ls /
Found 10 items
-rw-r--r--   1 cloudera supergroup         27 2021-05-24 12:04 /Sample_01
drwxrwxrwx   - hdfs     supergroup          0 2017-10-23 09:15 /benchmarks
drwxr-xr-x   - cloudera supergroup          0 2021-05-24 13:58 /forcopy
drwxr-xr-x   - hbase    supergroup          0 2021-06-04 07:57 /hbase
drwxr-xr-x   - cloudera supergroup          0 2021-05-24 13:20 /newdir
drwxr-xr-x   - cloudera supergroup          0 2021-05-24 13:36 /rjc
drwxr-xr-x   - cloudera supergroup          0 2021-05-24 13:55 /solr
drwxrwxrwt   - hdfs     supergroup          0 2021-05-24 10:39 /tmp
drwxr-xr-x   - hdfs     supergroup          0 2017-10-23 09:17 /user
drwxr-xr-x   - hdfs     supergroup          0 2017-10-23 09:17 /var
[cloudera@quickstart ~]$
```

9) Now we have to move this input file to hdfs. For this we create a direcory on hdfs using command hdfs dfs -mkdir /inputnew.

```
[cloudera@quickstart ~]$ hdfs dfs -mkdir /inputdir
[cloudera@quickstart ~]$
```

Then we can verify whether this directory is created or not using ls command hdfs dfs -ls /

Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47

```
[cloudera@quickstart ~]$ hdfs dfs -ls /
Found 11 items
-rw-r--r--   1 cloudera supergroup         27 2021-05-24 12:04 /Sample_01
drwxrwxrwx   - hdfs     supergroup          0 2017-10-23 09:15 /benchmarks
drwxr-xr-x   - cloudera supergroup          0 2021-05-24 13:58 /forcopy
drwxr-xr-x   - hbase    supergroup          0 2021-06-04 07:57 /hbase
drwxr-xr-x   - cloudera supergroup          0 2021-06-04 23:34 /inputdir
drwxr-xr-x   - cloudera supergroup          0 2021-05-24 13:20 /newdir
drwxr-xr-x   - cloudera supergroup          0 2021-05-24 13:36 /rjc
drwxr-xr-x   - cloudera supergroup          0 2021-05-24 13:55 /solr
drwxrwxrwt   - hdfs     supergroup          0 2021-05-24 10:39 /tmp
drwxr-xr-x   - hdfs     supergroup          0 2017-10-23 09:17 /user
drwxr-xr-x   - hdfs     supergroup          0 2017-10-23 09:17 /var
[cloudera@quickstart ~]$
```

Move the input file to this directory created in hdfs by using either put command or copyFromLocal command.

```
[cloudera@quickstart ~]$ hdfs dfs -put /home/cloudera/Desktop/abc /inputdir/
[cloudera@quickstart ~]$
```

Now checking whether the “abc” present in /inputdir directory of hdfs or not using hdfs dfs -ls /inputdir command

```
[cloudera@quickstart ~]$ hdfs dfs -ls /inputdir
Found 1 items
-rw-r--r--   1 cloudera supergroup        813 2021-06-05 00:06 /inputdir/abc
[cloudera@quickstart ~]$
```

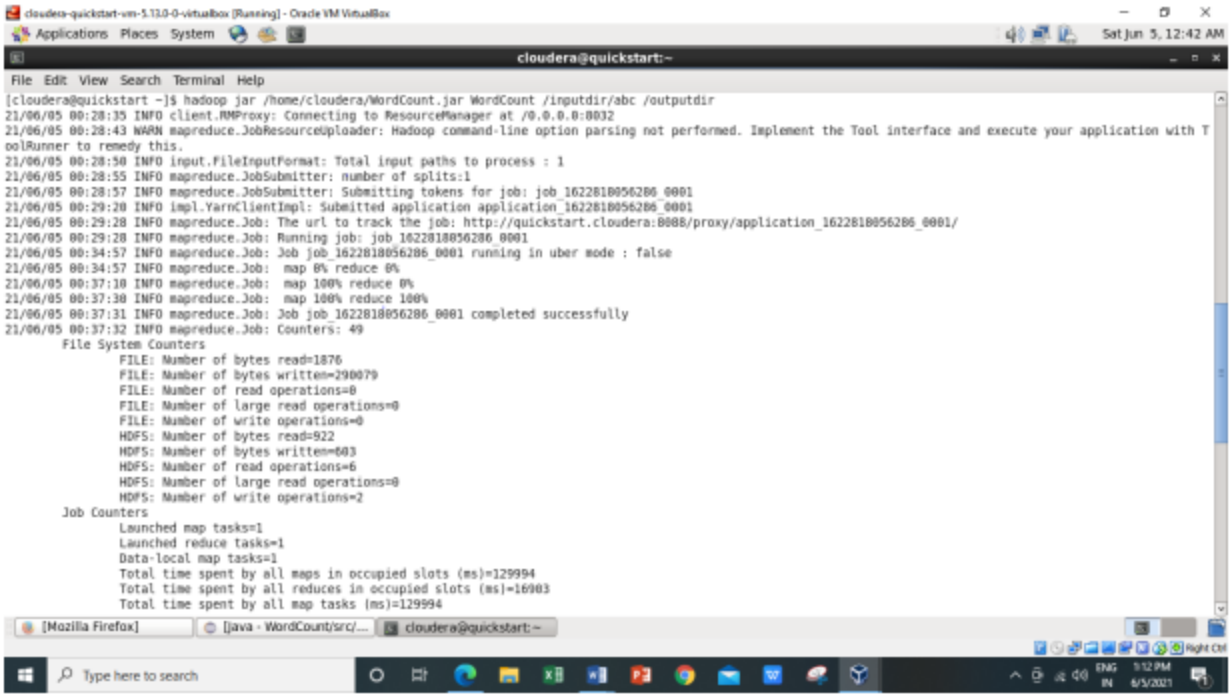
As we can see “abc” file is present in /inputdir directory of hdfs. Now we will see the content of this file using hdfs dfs –cat /inputdir/abc command

```
[cloudera@quickstart ~]$ hdfs dfs -cat /inputdir/abc
Every night in my dreamsI see you, I feel you
That is how I know you go on Far across the distance And spaces between us You have come to show you go on Near, far,
wherever you are I believe that the heart does go on Once more, you open the door And
you're here in my heart And my heart will go on and on Love can touch us one time And
last for a lifetime And never let go 'til we're gone Love was when I loved you One true time I'd hold to In my life, we'll always go on Near, far,
wherever you are I believe that the heart does go on (why does the heart go on?) Once more, you open the door And you're here in my heart
And my heart will go on and on You're here, there's nothing I fear And I know that my heart will go on We'll stay forever this way You are safe in my heart and My
heart will go on and on
[cloudera@quickstart ~]$
```

10) Running Mapreduce Program on Hadoop, syntax is hadoop jar jarFileName.jar ClassName /InputFileAddress /outputdir

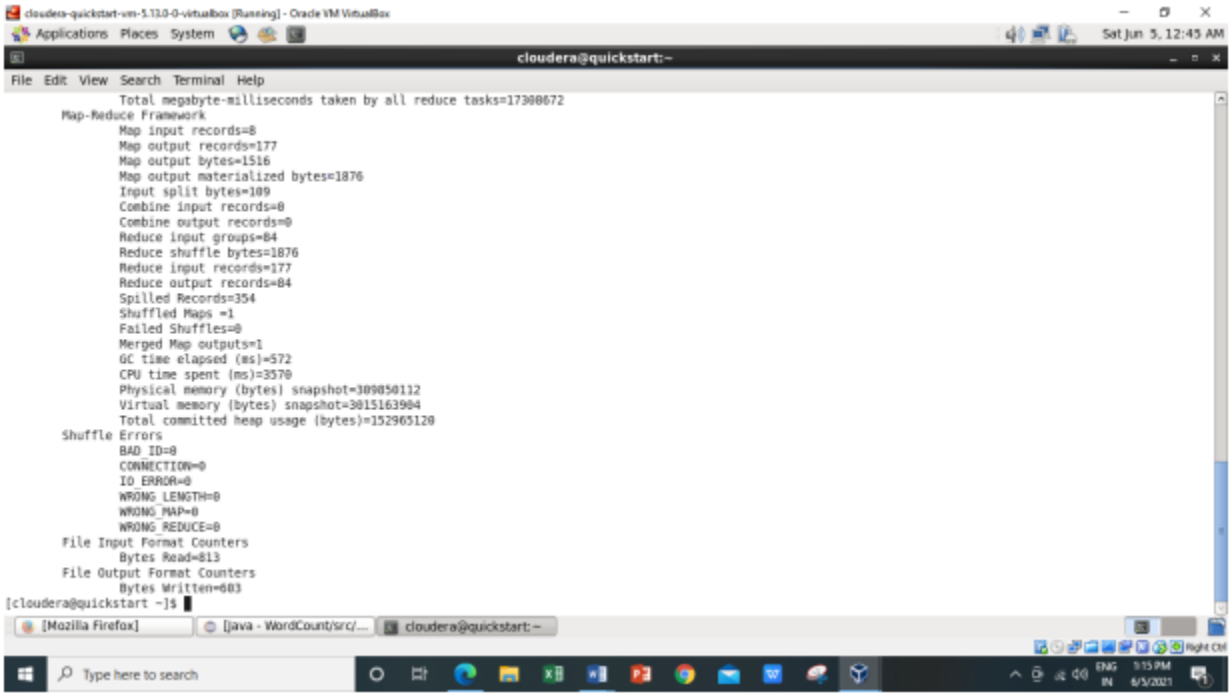
i.e. hadoop jar /home/cloudera/WordCount.jar WordCount /inputdir/abc /outputdir

Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47



```
[cloudera@quickstart ~]$ hadoop jar /home/cloudera/WordCount.jar WordCount /inputdir/abc /outputdir
21/06/05 00:28:35 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0:8032
21/06/05 00:28:43 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with T
oolRunner to remedy this.
21/06/05 00:28:50 INFO input.FileInputFormat: Total input paths to process : 1
21/06/05 00:28:55 INFO mapreduce.JobSubmitter: number of splits:1
21/06/05 00:28:57 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1622818056286_0001
21/06/05 00:29:20 INFO impl.YarnClientImpl: Submitted application application_1622818056286_0001
21/06/05 00:29:28 INFO mapreduce.Job: The url to track the job: http://quickstart.cloudera:8088/proxy/application_1622818056286_0001/
21/06/05 00:29:28 INFO mapreduce.Job: Running job: job_1622818056286_0001
21/06/05 00:34:57 INFO mapreduce.Job: Job job_1622818056286_0001 running in uber mode : false
21/06/05 00:34:57 INFO mapreduce.Job:  map 8% reduce 8%
21/06/05 00:37:10 INFO mapreduce.Job:  map 100% reduce 8%
21/06/05 00:37:30 INFO mapreduce.Job:  map 100% reduce 100%
21/06/05 00:37:31 INFO mapreduce.Job: Job job_1622818056286_0001 completed successfully
21/06/05 00:37:32 INFO mapreduce.Job: Counters: 49
        File System Counters
                FILE: Number of bytes read=1876
                FILE: Number of bytes written=290079
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=922
                HDFS: Number of bytes written=603
                HDFS: Number of read operations=6
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=2
        Job Counters
                Launched map tasks=1
                Launched reduce tasks=1
                Data-local map tasks=1
                Total time spent by all maps in occupied slots (ms)=129994
                Total time spent by all reduces in occupied slots (ms)=16903
                Total time spent by all map tasks (ms)=129994
```

Map-Reduce Framework



```
                Total megabyte-milliseconds taken by all reduce tasks=17308672
        Map-Reduce Framework
                Map input records=8
                Map output records=177
                Map output bytes=1516
                Map output materialized bytes=1876
                Input split bytes=109
                Combine input records=0
                Combine output records=0
                Reduce input groups=84
                Reduce shuffle bytes=1876
                Reduce input records=177
                Reduce output records=84
                Spilled Records=354
                Shuffled Maps =1
                Failed Shuffles=0
                Merged Map outputs=1
                GC time elapsed (ms)=572
                CPU time spent (ms)=3570
                Physical memory (bytes) snapshot=309050112
                Virtual memory (bytes) snapshot=3015163904
                Total committed heap usage (bytes)=152965120
        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=813
        File Output Format Counters
                Bytes Written=603
[cloudera@quickstart ~]$
```

As we can see in the above output,

Combine input records=0

Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47

Combine output records=0

We are getting this because we have commented the Combiner line in main function.

And Reduce shuffle bytes coming as,

Reduce shuffle bytes=1876

So when we are not using combiner 1876 bytes acting as an input for the reducer.

11) Then we can verify the content of outputdir directory and in that part-r file has the actual output by using the command Hdfs dfs -cat /outputdir/part-r-00000 This will give us final output. The same file can also be accessed using a browser. For every execution of this program we need to delete the output directory or give a new name to the output directory every time.

1st we are checking whether the outputdir directory is created in hdfs or not using command

hdfs dfs -ls /

```
[cloudera@quickstart ~]$ hdfs dfs -ls /
Found 12 items
-rw-r--r--   1 cloudera supergroup         27 2021-05-24 12:04 /Sample_01
drwxrwxrwx   - hdfs     supergroup          0 2017-10-23 09:15 /benchmarks
drwxr-xr-x   - cloudera supergroup          0 2021-05-24 13:58 /forcopy
drwxr-xr-x   - hbase    supergroup          0 2021-06-04 07:57 /hbase
drwxr-xr-x   - cloudera supergroup          0 2021-06-05 00:06 /inputdir
drwxr-xr-x   - cloudera supergroup          0 2021-05-24 13:20 /newdir
drwxr-xr-x   - cloudera supergroup          0 2021-06-05 00:37 /outputdir
drwxr-xr-x   - cloudera supergroup          0 2021-05-24 13:36 /rjc
drwxr-xr-x   - cloudera supergroup          0 2021-05-24 13:55 /solr
drwxrwxrwt   - hdfs     supergroup          0 2021-05-24 10:39 /tmp
drwxr-xr-x   - hdfs     supergroup          0 2017-10-23 09:17 /user
drwxr-xr-x   - hdfs     supergroup          0 2017-10-23 09:17 /var
[cloudera@quickstart ~]$
```

Now let's check what we have inside this **outputdir** directory using command as **hdfs dfs -ls /outputdir**

```
[cloudera@quickstart ~]$ hdfs dfs -ls /outputdir
Found 2 items
-rw-r--r--   1 cloudera supergroup          0 2021-06-05 00:37 /outputdir/_SUCCESS
-rw-r--r--   1 cloudera supergroup        603 2021-06-05 00:37 /outputdir/part-r-00000
[cloudera@quickstart ~]$
```

Now we want to read the content of the **part-r-00000 file** which present inside the **outputdir** using command **hdfs dfs -cat /outputdir/part-r-00000**

Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47

```
[cloudera@quickstart ~]$ hdfs dfs -cat /outputdir/part-r-00000
'til    1
(why    1
And     8
Every   1
Far     1
I       7
I'd     1
In      1
Love    2
My      1
Near,   2
Once    2
One     1
That    1
We'll   1
You     2
You're  1
a       1
across  1
always  1
and     4
are     3
believe 2
between 1
can     1
come    1
distance        1
does    3
door    2
dreamsI 1
```

Name: sahil shaikh Mushtaq Ahmed
Roll No: 47

```
more,   2
my      8
never   1
night   1
nothing 1
on      12
on?)    1
one     1
open    2
safe    1
see     1
show    1
spaces  1
stay    1
that    3
the     6
there's 1
this    1
time    2
to      2
touch   1
true    1
us      2
was     1
way     1
we'll   1
we're   1
when    1
wherever        2
will    4
you     8
you're  2
you,    1
[cloudera@quickstart ~]$
```

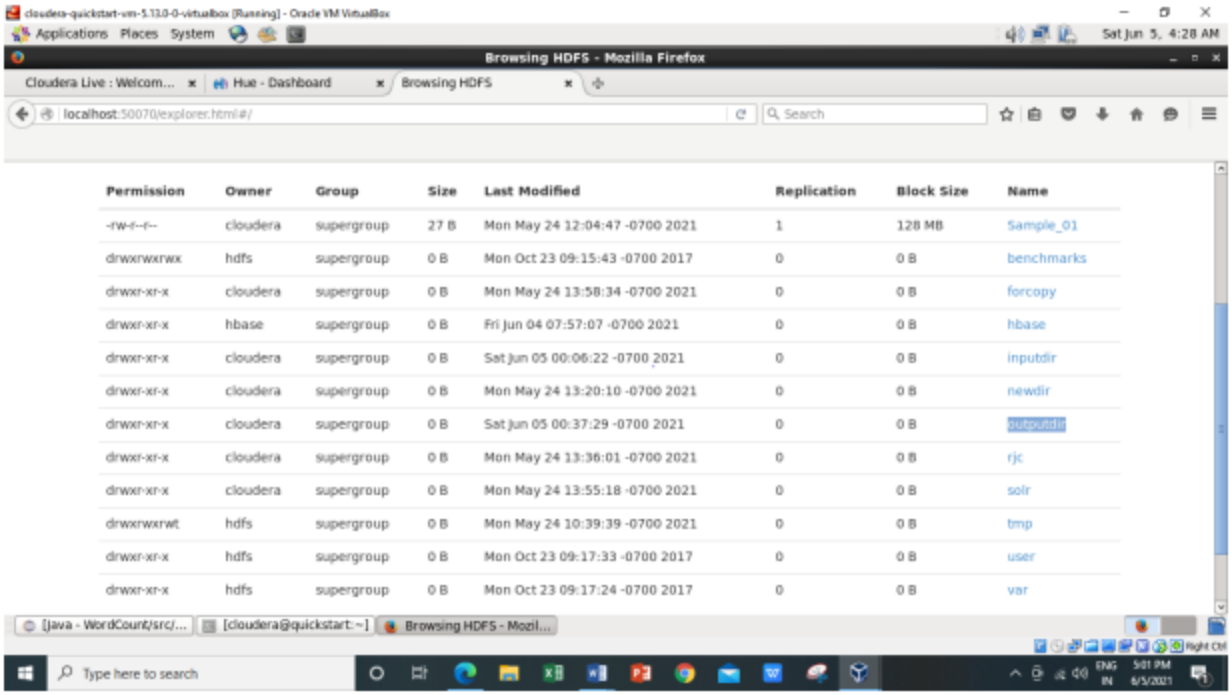
It will give the count of number of times each word has occurred as output.

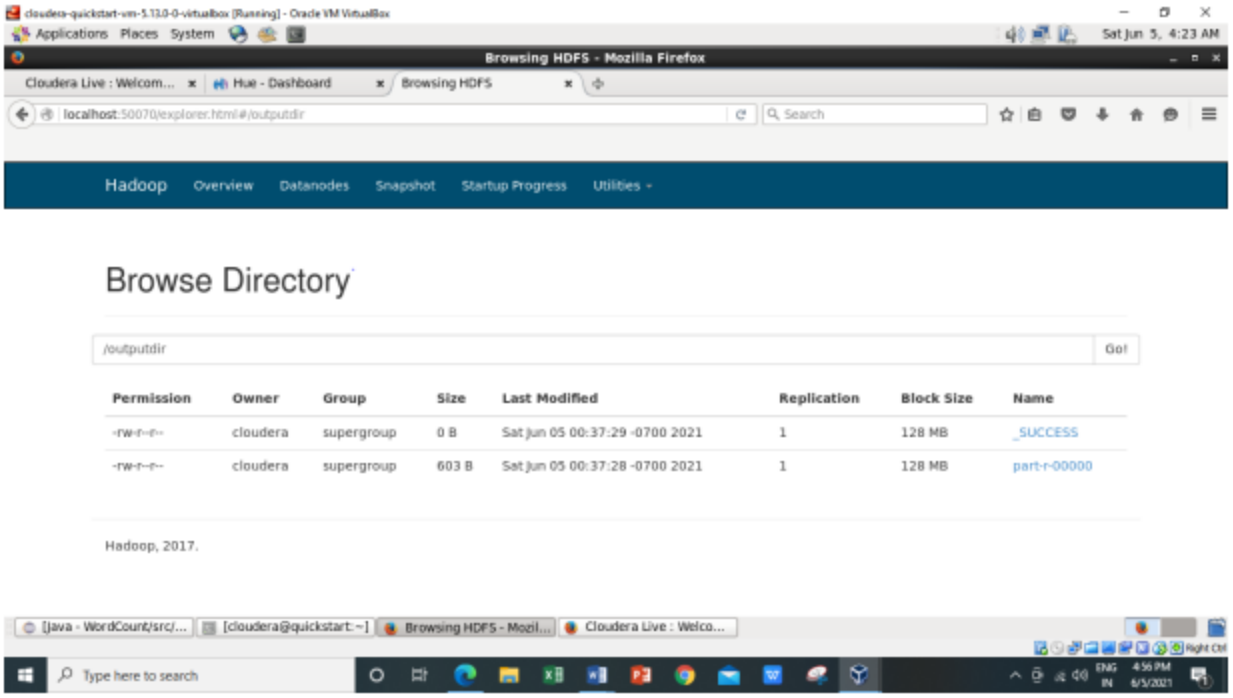
12) The same file can also be accessed using a browser.

Browse the Directory by

Hadoop->HDFS Namenode->Ultilities ->Browse the file system

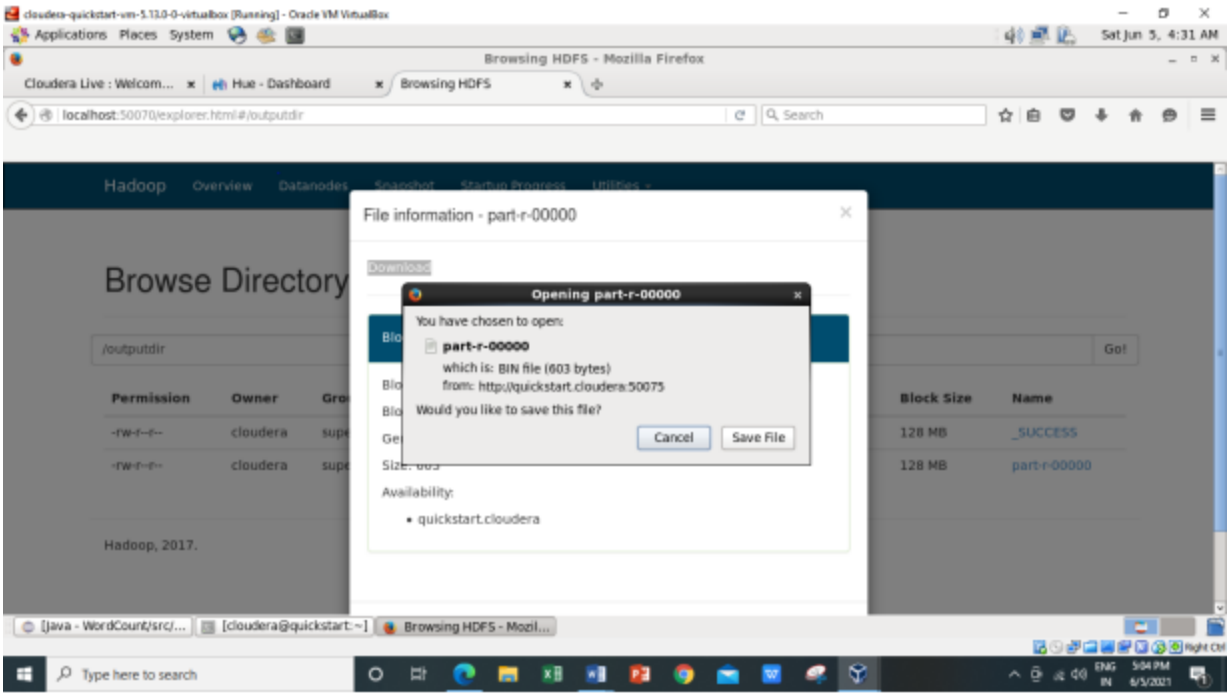
Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47



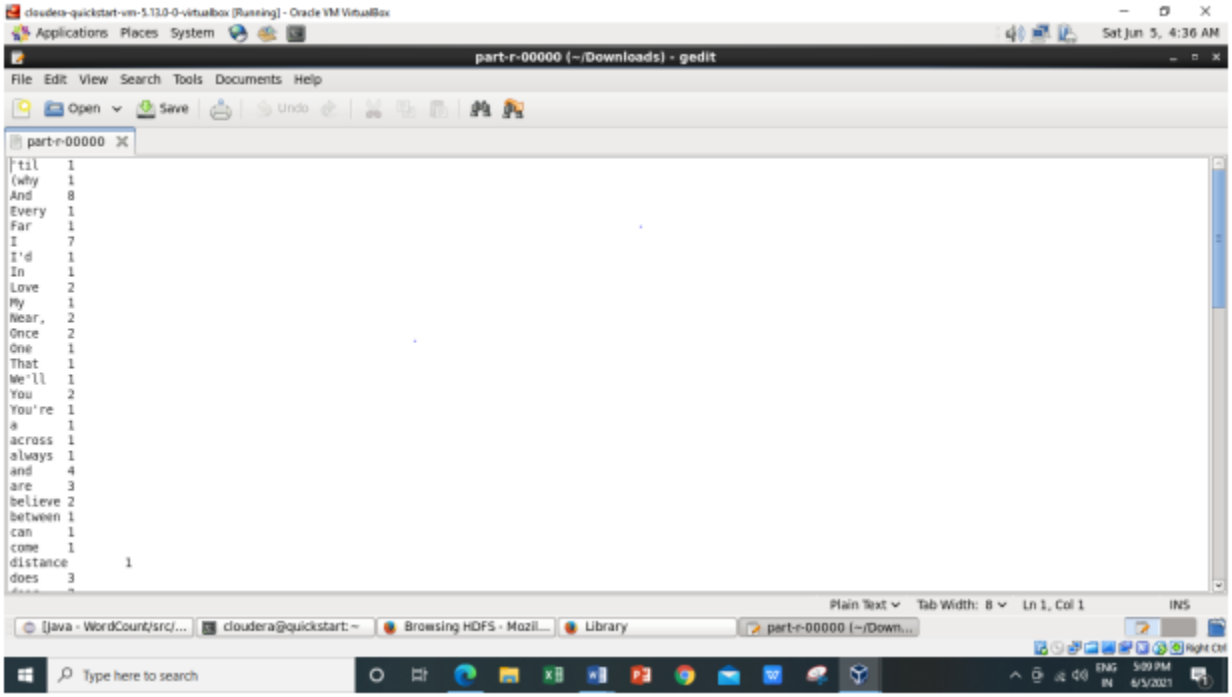


Now downloading the **part-r-00000** file.

Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47



Inside the **part-r-00000** file it will have the same output as we are getting after executing using command **hadoop jar /home/cloudera/WordCount.jar WordCount /inputdir/abc /op1**



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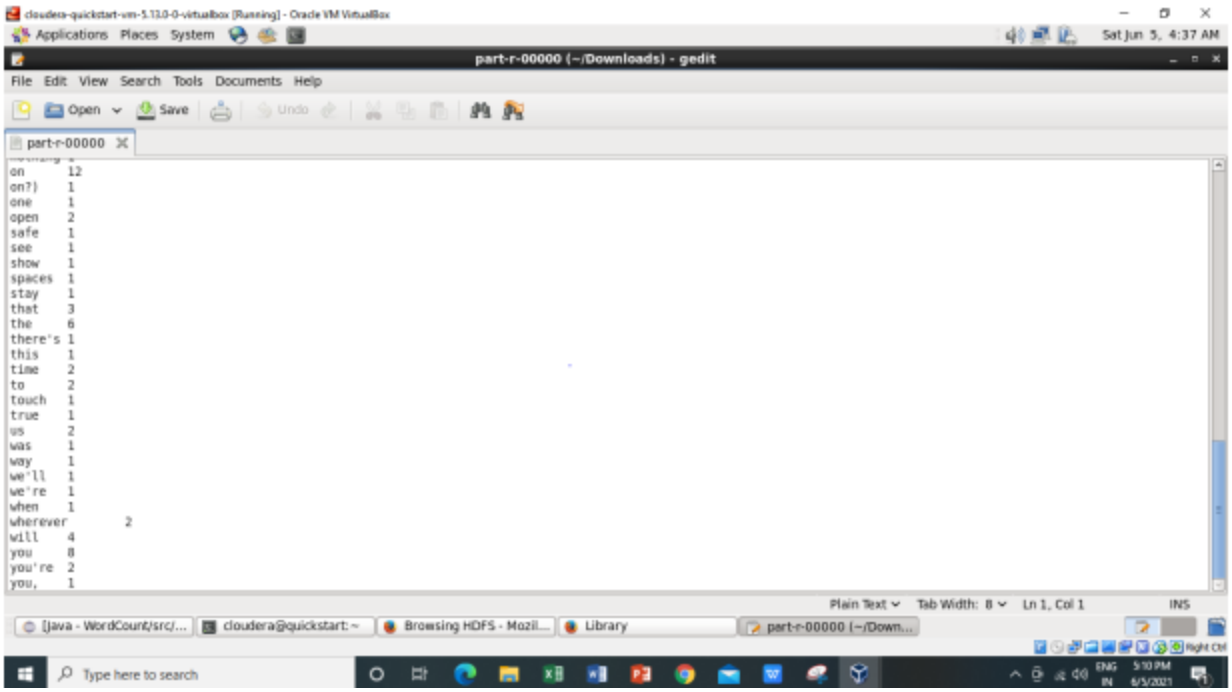
Mushtaq Ahmed
Roll No: 47



For every execution of this program we need to delete the output directory or give a new name to the output directory every time.

Implementation of WordCount problem using Hadoop MapReduce (With Combiner) in Eclipse:

1) We will perform the same steps as we have done above for WordCount (without using combiner) in that we just uncommenting the combiner line in main function**.**

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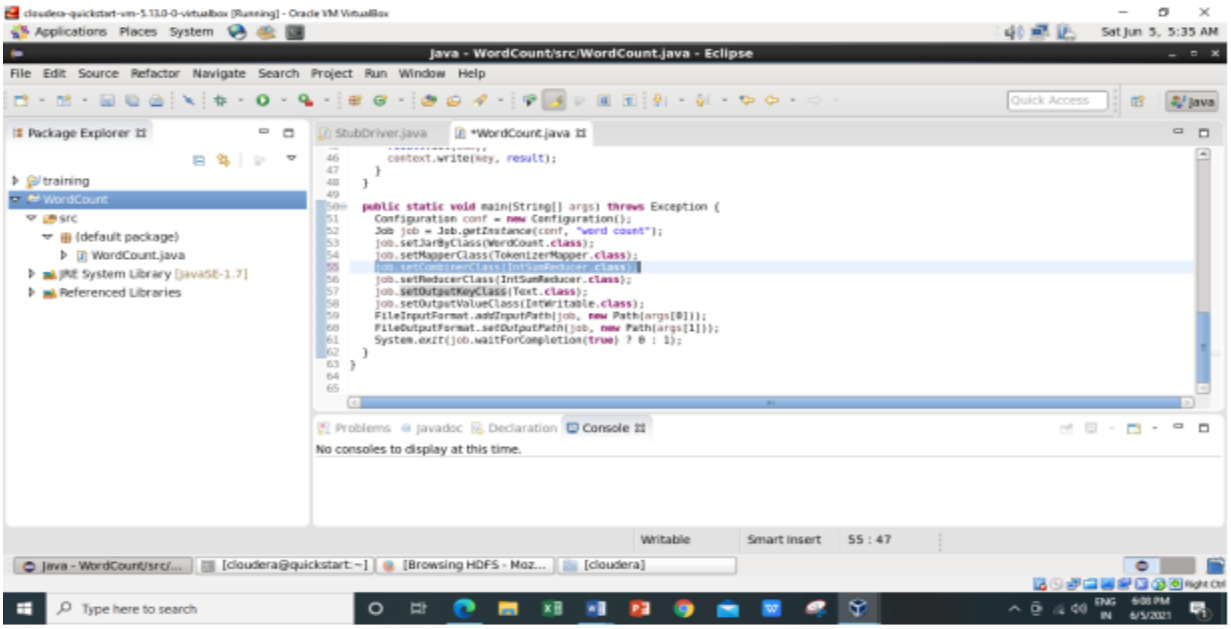
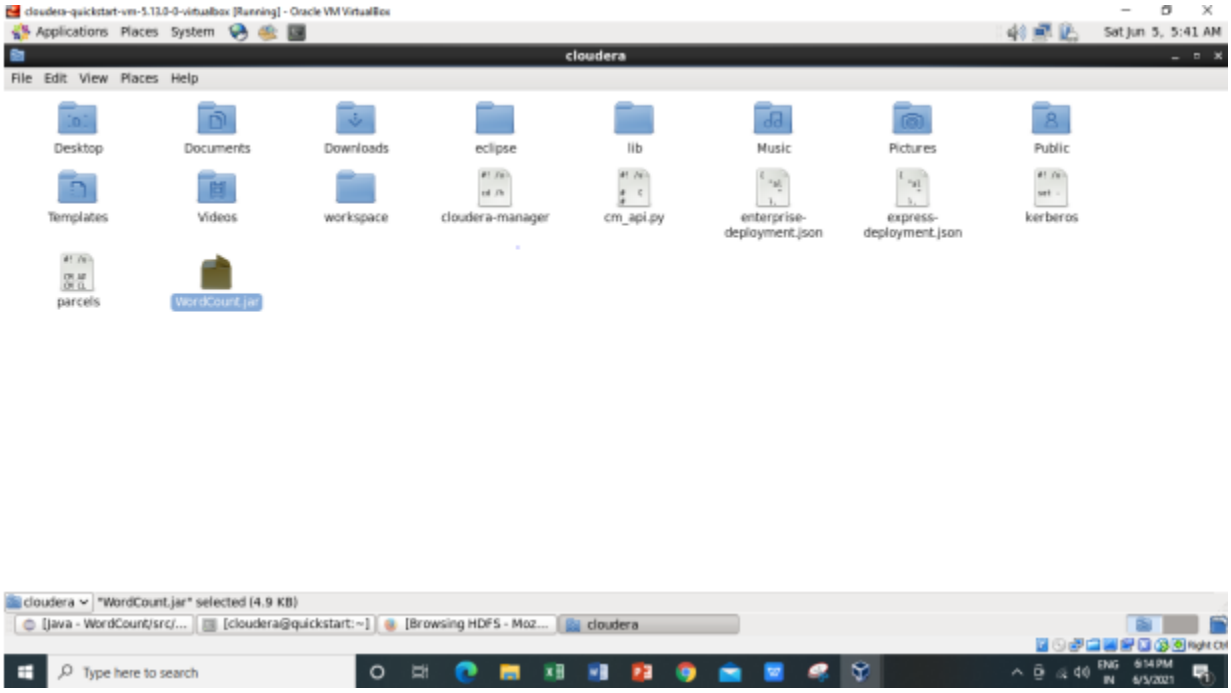
Mushtaq Ahmed
Roll No: 47

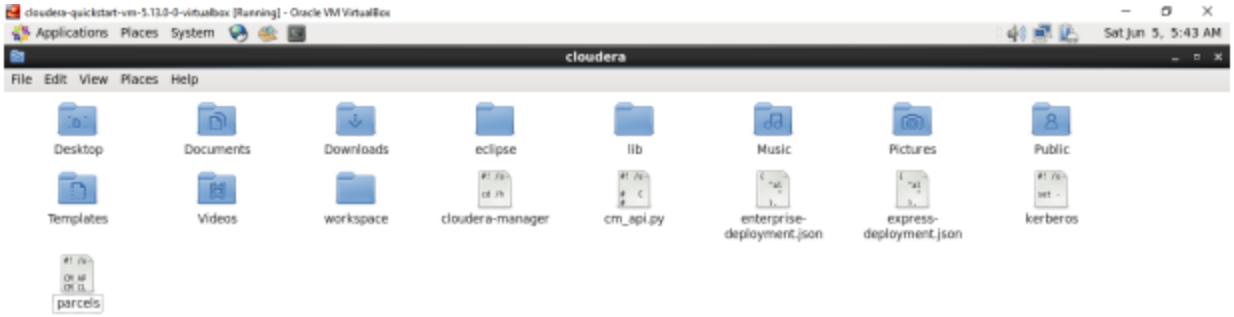


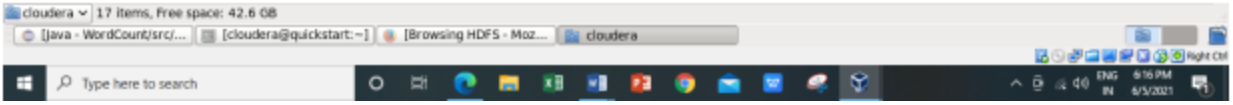
2)And will delete the WordCount.jar file in which all jar files are present from **/home/cloudera.**



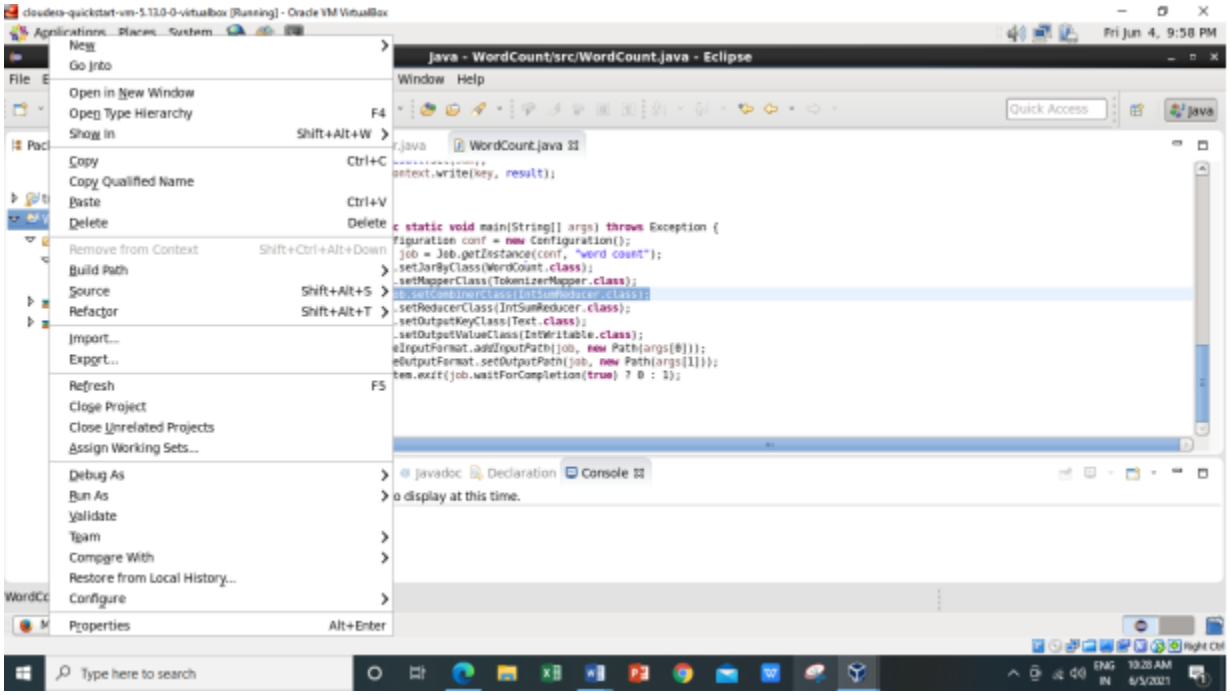
We have successfully deleted the WordCount.jar file.

Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47





3) Now exporting the jar files Right Click on the project name WordCount -> Export -> Java ->JAR File -> Next -> for select the export destination for JAR file: browse -> Name : WordCount.jar -> save in folder -> cloudera -> Finish -> OK



Name: sahil shaikh
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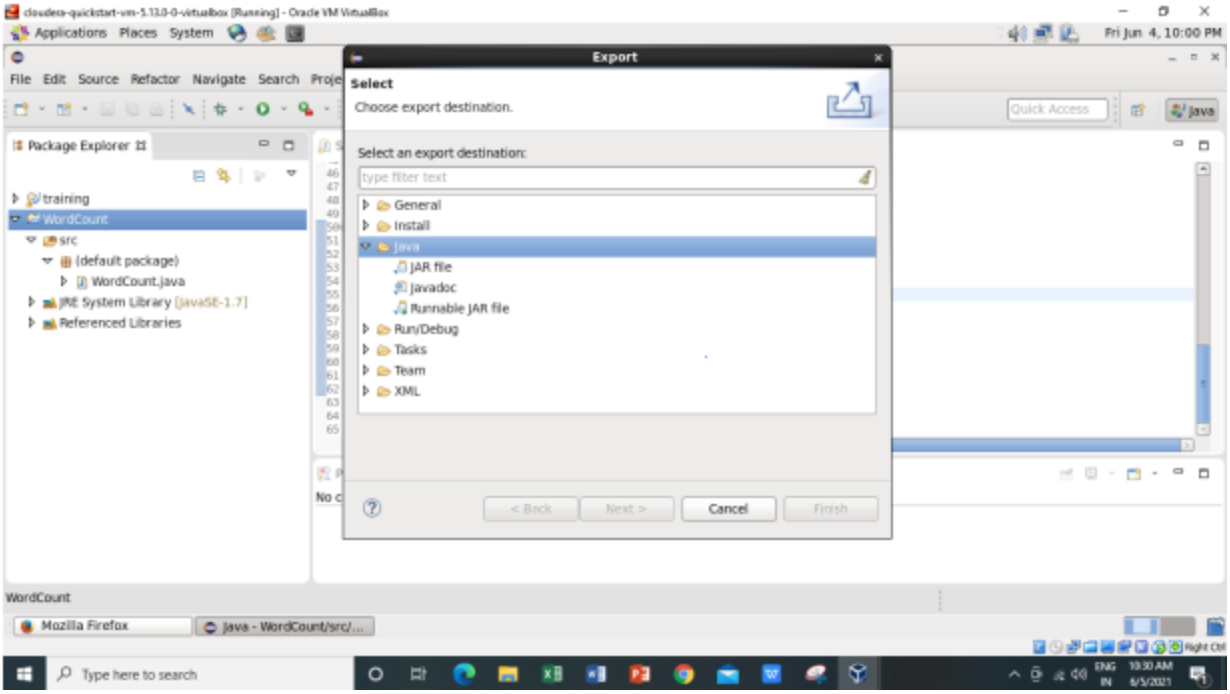
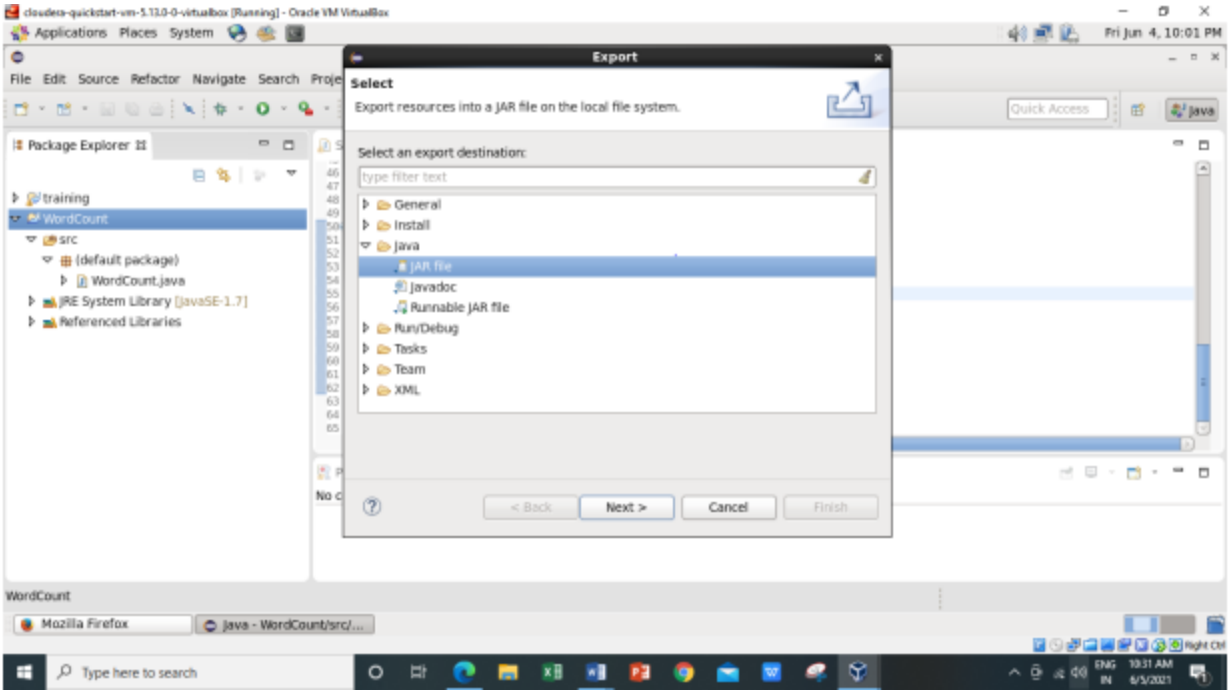
Roll No: 47





Name: sahil shaikh
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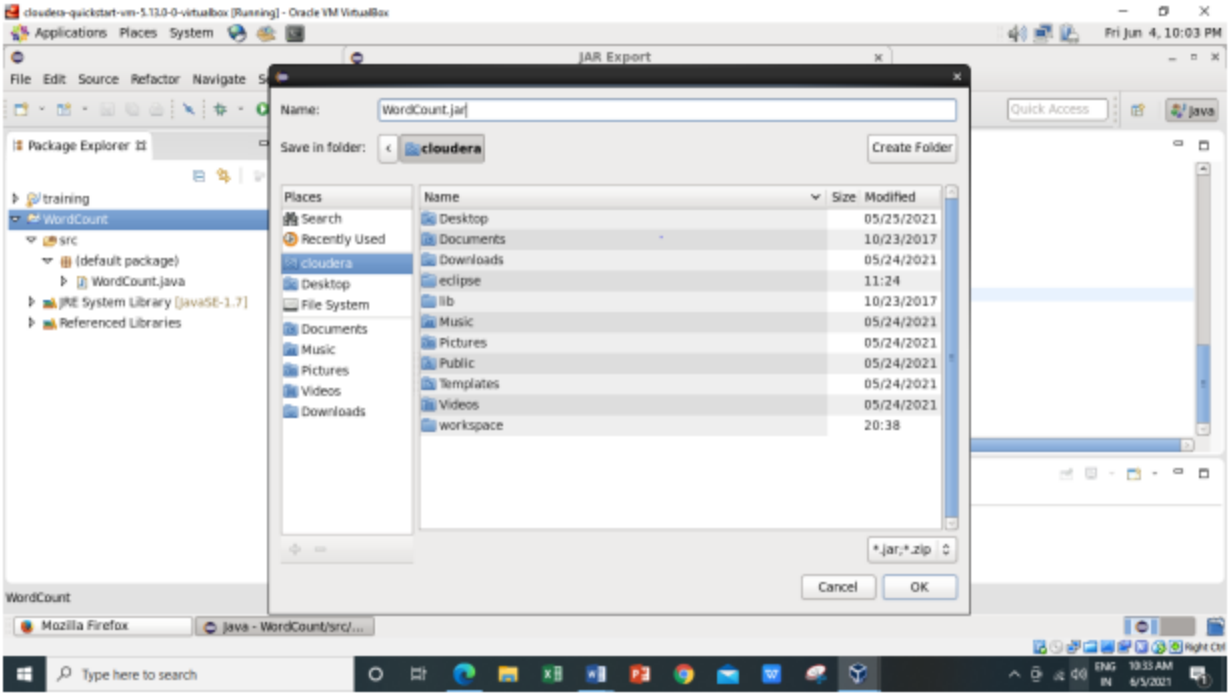
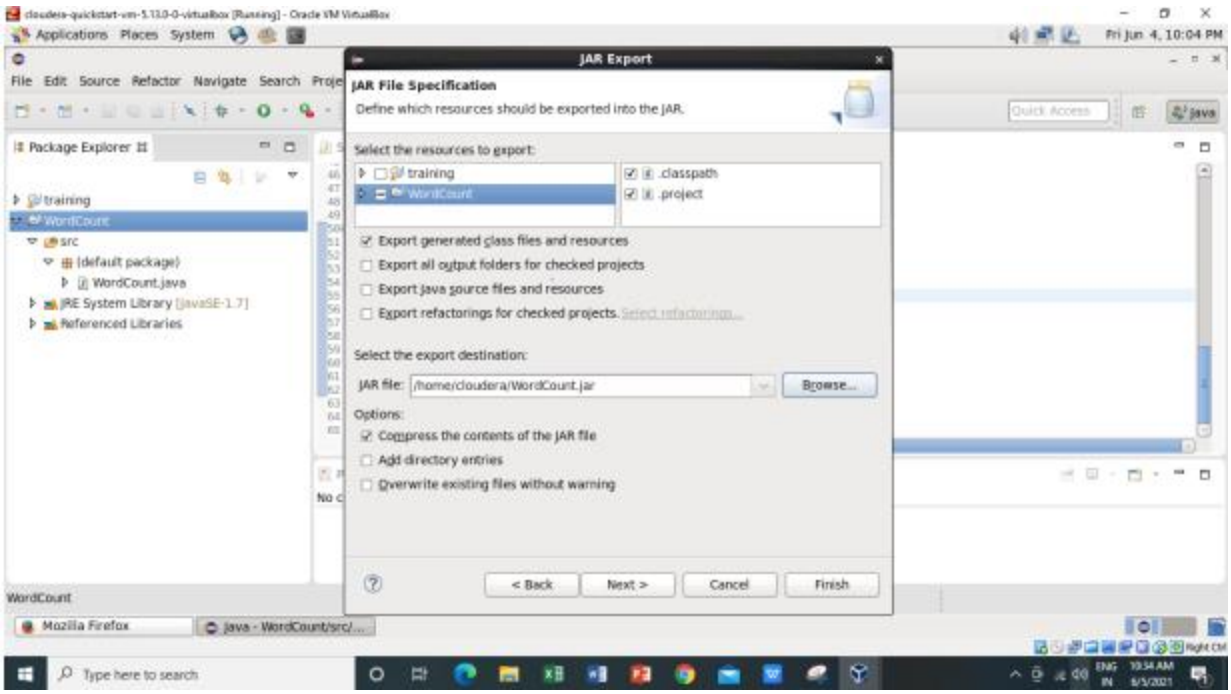
Roll No: 47





4)Now checking the WordCount.jar file is created or not using –ls command

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```
[cloudera@quickstart ~]$ ls
cloudera-manager  Desktop    Downloads  enterprise-deployment.json  kerberos  Music    Pictures  Templates  WordCount.jar
cm_api.py         Documents  eclipse    express-deployment.json     lib       parcels  Public    Videos     workspace
[cloudera@quickstart ~]$
```

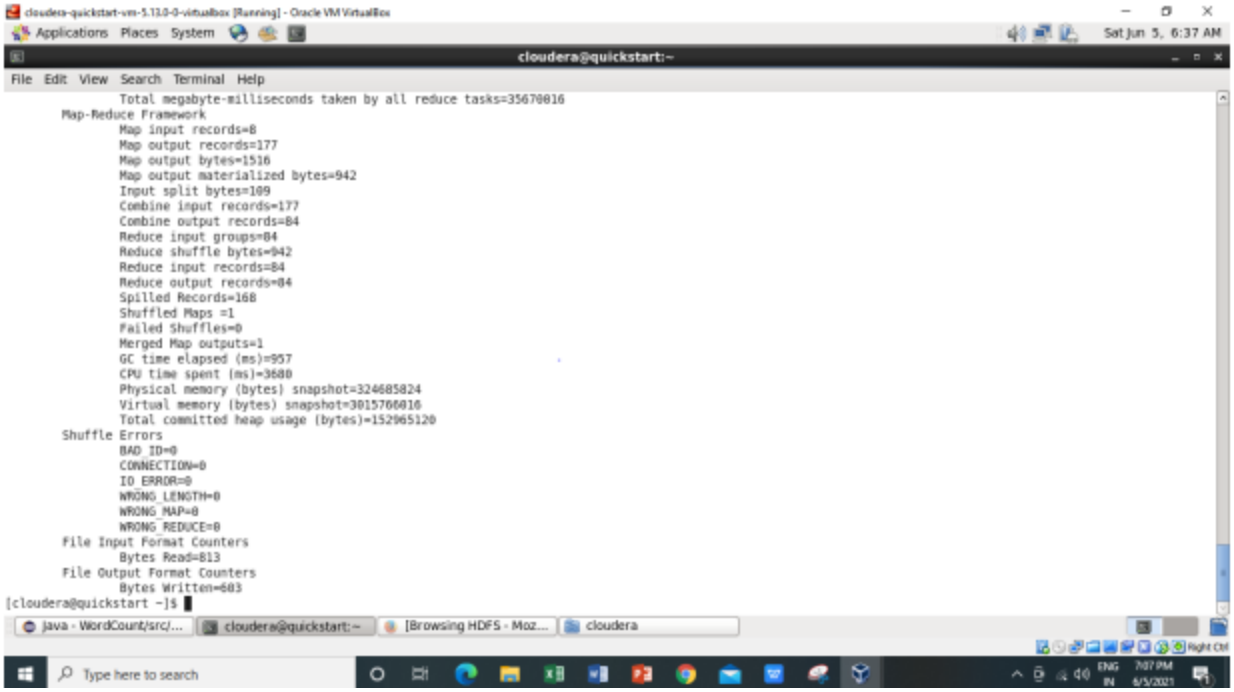
5) Running Mapreduce Program on Hadoop, syntax is hadoop jar jarFileName.jar ClassName /InputFileAddress /outputdir

i.e. hadoop jar /home/cloudera/WordCount.jar WordCount /inputdir/abc /op1

here I am using the same input file 'abc' which I have created earlier for WordCount example (Without Combiner**). For every execution of this program we need to delete the output directory or give a new name to the output directory every time.** So here I am giving the new name to the output directory as **'op1'.**

```
[cloudera@quickstart ~]$ hadoop jar /home/cloudera/WordCount.jar WordCount /inputdir/abc /op1
21/06/05 06:31:13 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0:8032
21/06/05 06:31:22 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with T
oolRunner to remedy this.
21/06/05 06:31:28 INFO input.FileInputFormat: Total input paths to process : 1
21/06/05 06:31:29 INFO mapreduce.JobSubmitter: number of splits:1
21/06/05 06:31:32 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1622818056286_0002
21/06/05 06:31:44 INFO impl.YarnClientImpl: Submitted application application_1622818056286_0002
21/06/05 06:31:50 INFO mapreduce.Job: The url to track the job: http://quickstart.cloudera:8088/proxy/application_1622818056286_0002/
21/06/05 06:31:50 INFO mapreduce.Job: Running job: job_1622818056286_0002
21/06/05 06:33:29 INFO mapreduce.Job: Job job_1622818056286_0002 running in uber mode : false
21/06/05 06:33:29 INFO mapreduce.Job:  map 0% reduce 0%
21/06/05 06:34:12 INFO mapreduce.Job:  map 100% reduce 0%
21/06/05 06:34:49 INFO mapreduce.Job:  map 100% reduce 100%
21/06/05 06:35:38 INFO mapreduce.Job: Job job_1622818056286_0002 completed successfully
21/06/05 06:35:41 INFO mapreduce.Job: Counters: 49
        File System Counters
                FILE: Number of bytes read=942
                FILE: Number of bytes written=288551
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=922
                HDFS: Number of bytes written=603
                HDFS: Number of read operations=6
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=2
        Job Counters
                Launched map tasks=1
                Launched reduce tasks=1
                Data-local map tasks=1
                Total time spent by all maps in occupied slots (ms)=37060
                Total time spent by all reduces in occupied slots (ms)=34834
                Total time spent by all map tasks (ms)=37060
```

Name: sahil shaikh
Mushtaq Ahmed
Roll No: 47



```
cloudera@quickstart:~
File Edit View Search Terminal Help
                Total megabyte-milliseconds taken by all reduce tasks=35670016
        Map-Reduce Framework
                Map input records=8
                Map output records=177
                Map output bytes=1516
                Map output materialized bytes=942
                Input split bytes=109
                Combine input records=177
                Combine output records=84
                Reduce input groups=84
                Reduce shuffle bytes=942
                Reduce input records=84
                Reduce output records=84
                Spilled Records=168
                Shuffled Maps =1
                Failed Shuffles=0
                Merged Map outputs=1
                GC time elapsed (ms)=957
                CPU time spent (ms)=3680
                Physical memory (bytes) snapshot=324685824
                Virtual memory (bytes) snapshot=3015766016
                Total committed heap usage (bytes)=152965120
        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=813
        File Output Format Counters
                Bytes Written=603
[cloudera@quickstart ~]$
```

- As we can see from above image the the combiner input and output records coming out as,

  Combine input records=177

  Combine output records=84

- Earlier it was coming out as "zero" while executing WordCount (without combiner).

  Combine input records=0

  Combine output records=0

- And also here we are getting the Reduce Shuffle bytes as,

  Reduce shuffle bytes=942

  Earlier while executing WordCount (without combiner) it is coming out as,

  Reduce shuffle bytes=1876

- So Combiner is used to save the Network Bandwidth. So for saving the Network bandwidth we make use of combiner. So instead of sending every word over the network what we do is we incorporate the logic of the reducer at the combiner side so that the less amount of information can be transmitted over the network.
- So when we are not using combiner 1876 bytes acting as an input for the reducer. And when we are making use of the combiner so 942 bytes acting as input for the reducer.

6) The same file can also be accessed using a browser.

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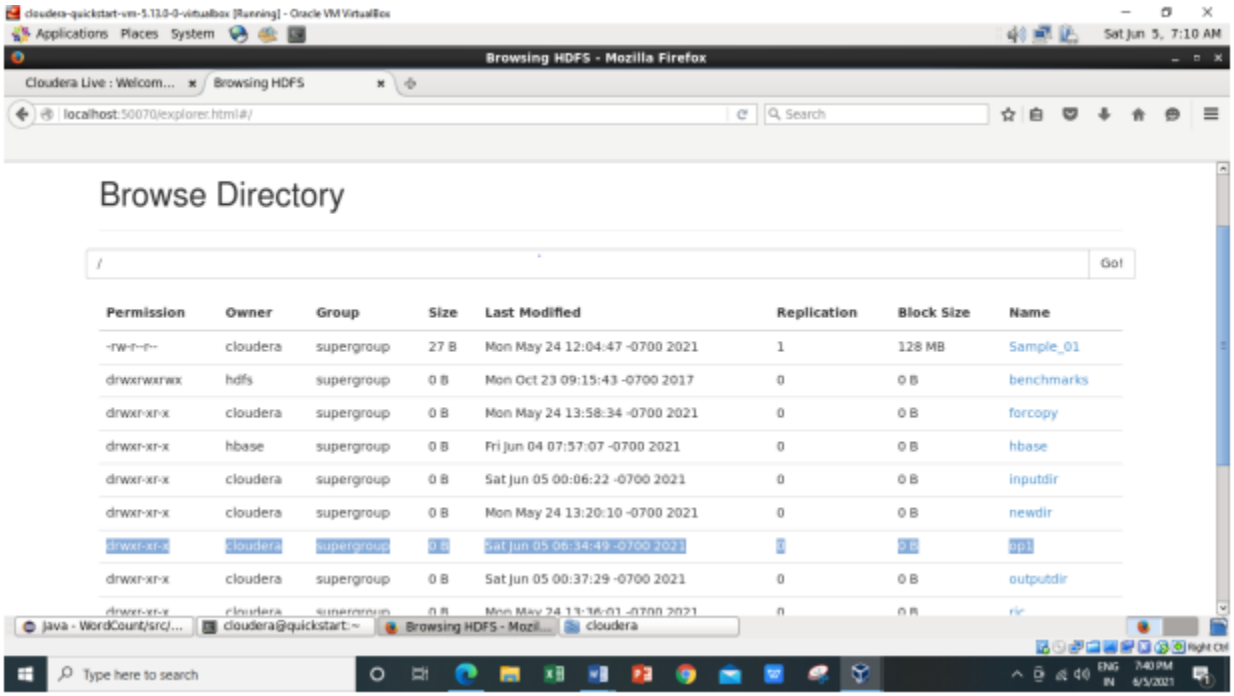
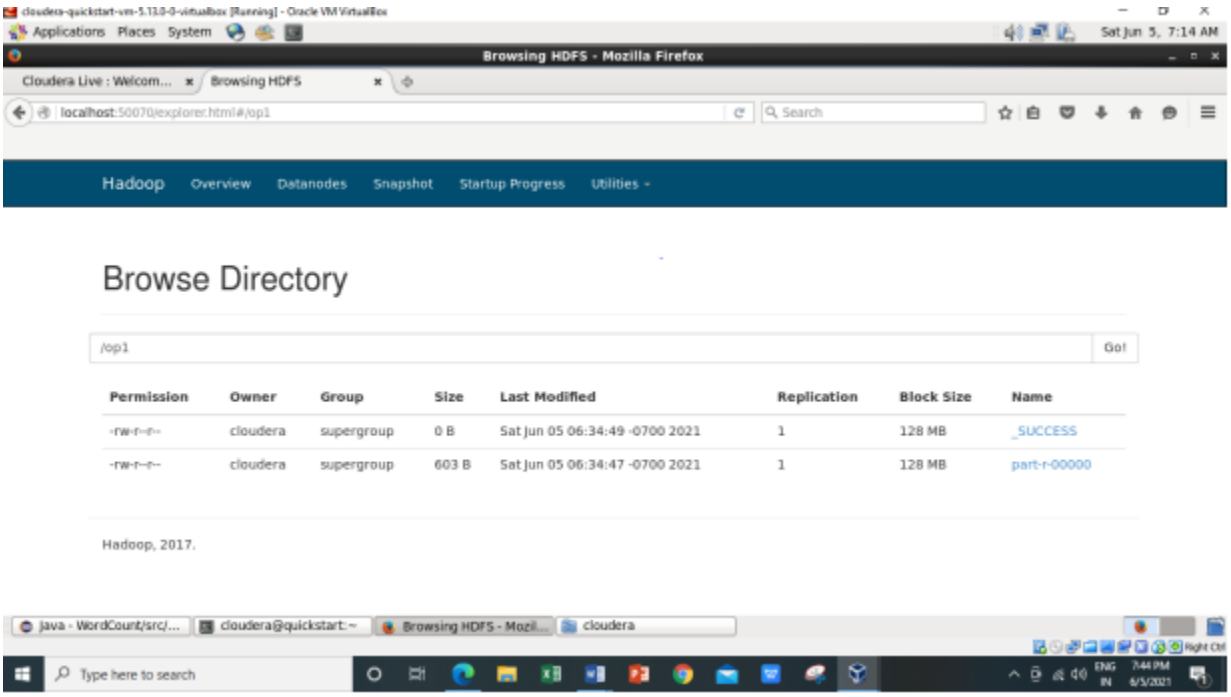
Mushtaq Ahmed
Roll No: 47

Browse the Directory by

Hadoop->HDFS Namenode->Ultilities ->Browse the file system





Now downloading the **part-r-00000** file.

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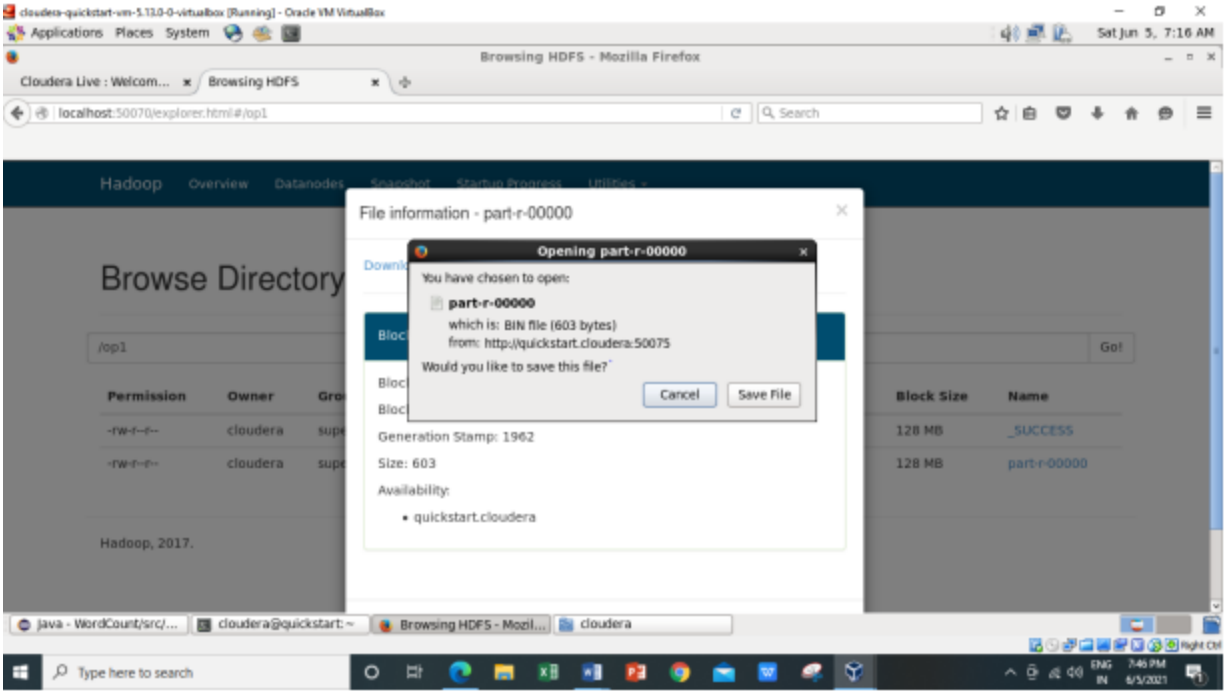
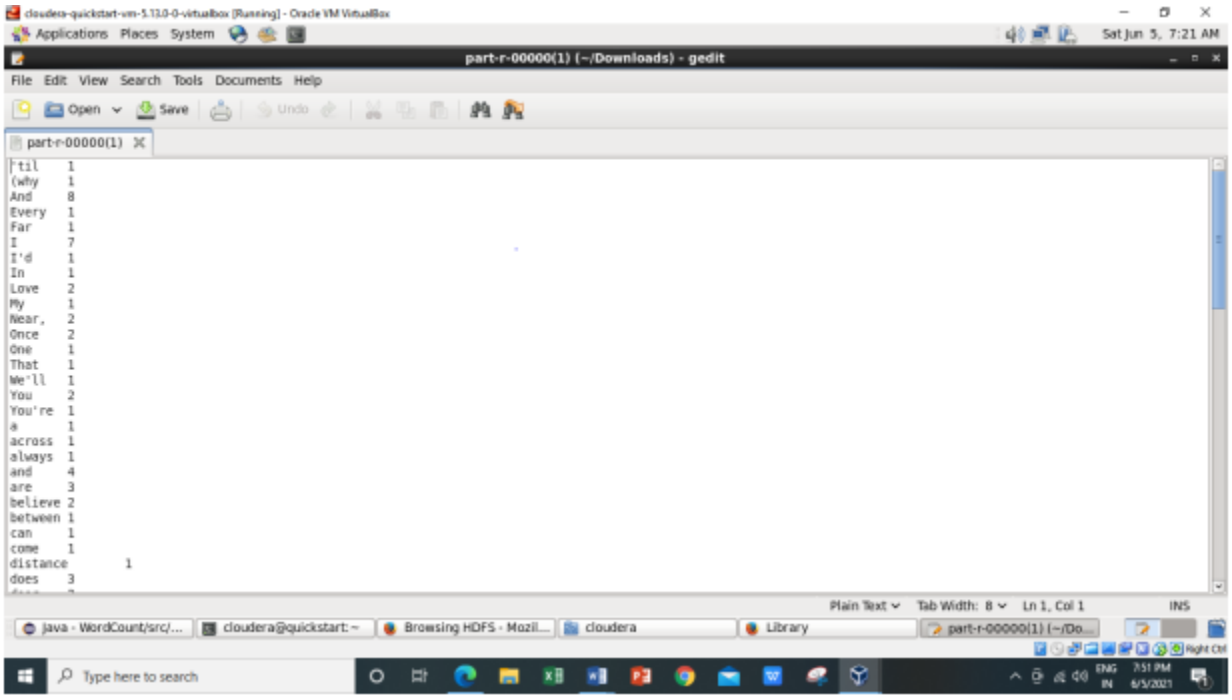
Roll No: 47



Inside the **part-r-00000** file it will have the same output as we are getting after executing using command **hadoop jar /home/cloudera/WordCount.jar WordCount /inputdir/abc /op1**



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