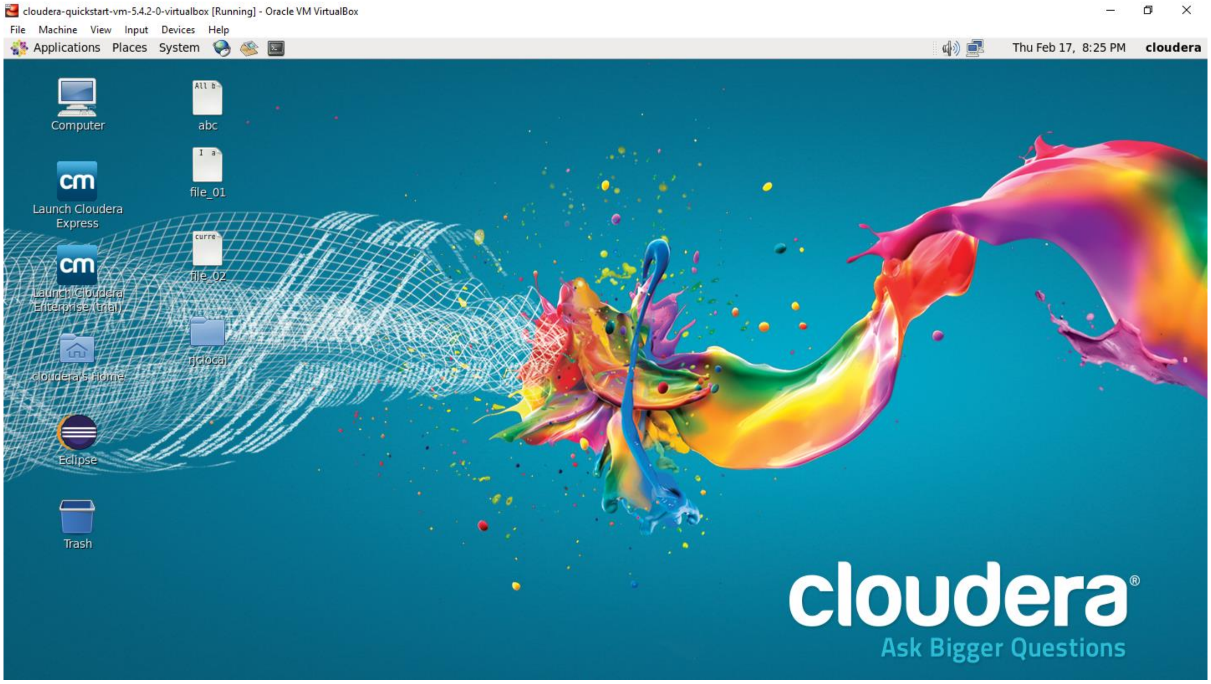
PRACTICAL NO 3

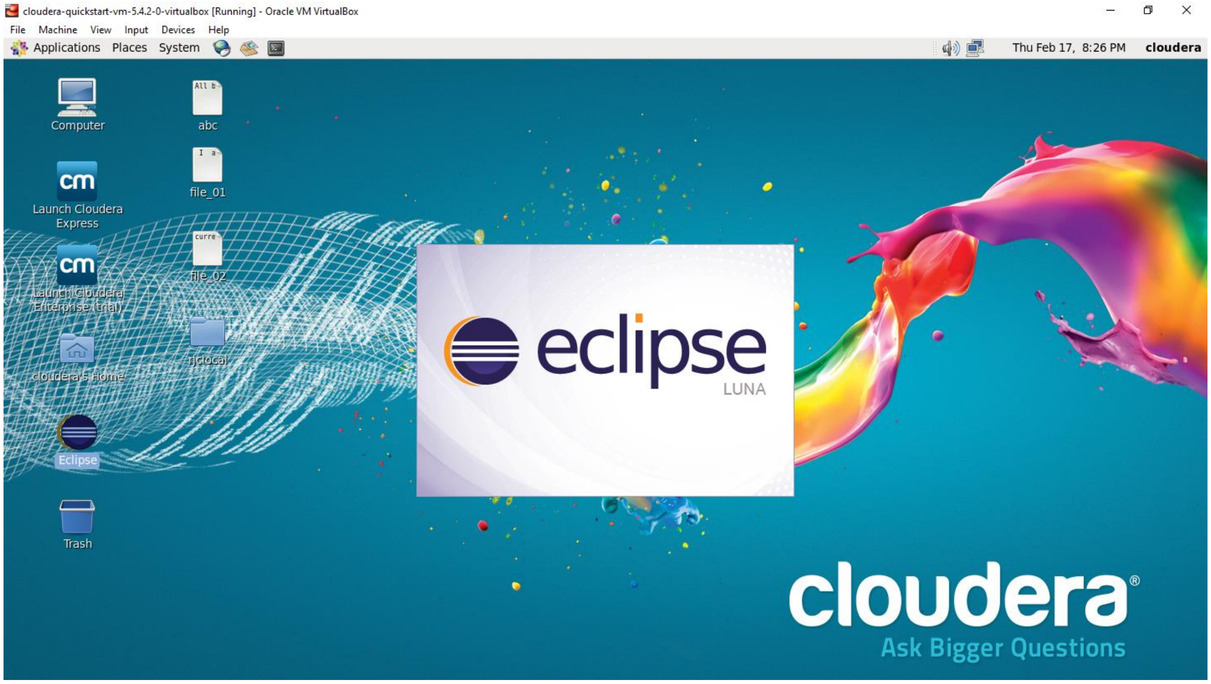
To Implement Wordcount problem using Hadoop MapReduce in Eclipse: (With Combiner & Without Combiner)

- **Steps for Word Count in Cloudera**
  - **With Combiner**

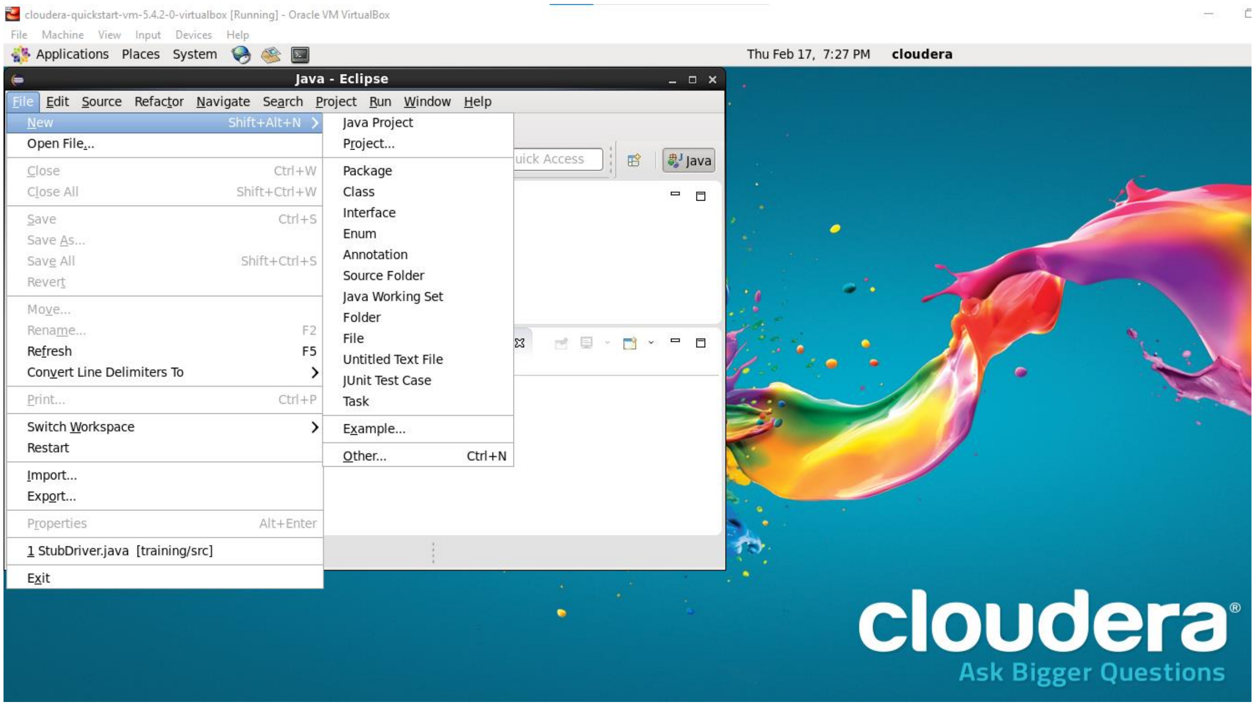
1) Open virtual box and then start cloudera quickstart

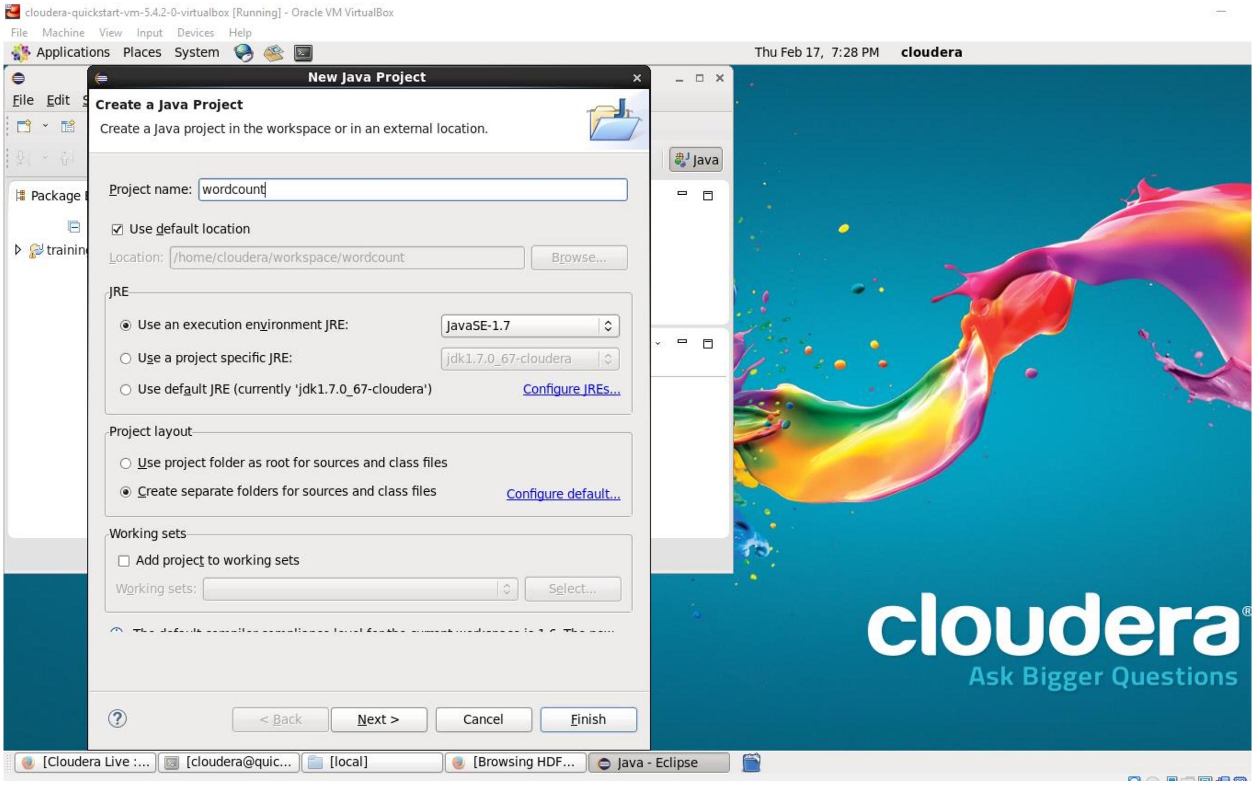

cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 8:25 PM
cloudera
Computer
abc
Launch Cloudera Express
file_01
Launch Cloudera Enterprise (trial)
file_02
cloudera's Home
rjclocal
Eclipse
Trash
cloudera
Ask Bigger Questions

2) Open Eclipse present on the cloudera desktop


cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 8:26 PM cloudera
Computer
abc
file_01
file_02
Launch Cloudera Express
Launch Cloudera Enterprise (trial)
cloudera's Home
Eclipse
Trash
eclipse LUNA
cloudera
Ask Bigger Questions

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




cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 7:28 PM cloudera
File Edit
Package
training
Java
cloudera
Ask Bigger Questions
[Cloudera Live :...
[cloudera@quic...
[local]
[Browsing HDF...
Java - Eclipse

New Java Project

Create a Java Project

Create a Java project in the workspace or in an external location.

Project name: wordcount

☑ Use default location

Location: /home/cloudera/workspace/wordcount Browse...

JRE

● Use an execution environment JRE: JavaSE-1.7

○ Use a project specific JRE: jdk1.7.0_67-cloudera

○ Use default JRE (currently 'jdk1.7.0_67-cloudera') Configure JREs...

Project layout

○ Use project folder as root for sources and class files

● Create separate folders for sources and class files Configure default...

Working sets

☐ Add project to working sets

Working sets: Select...

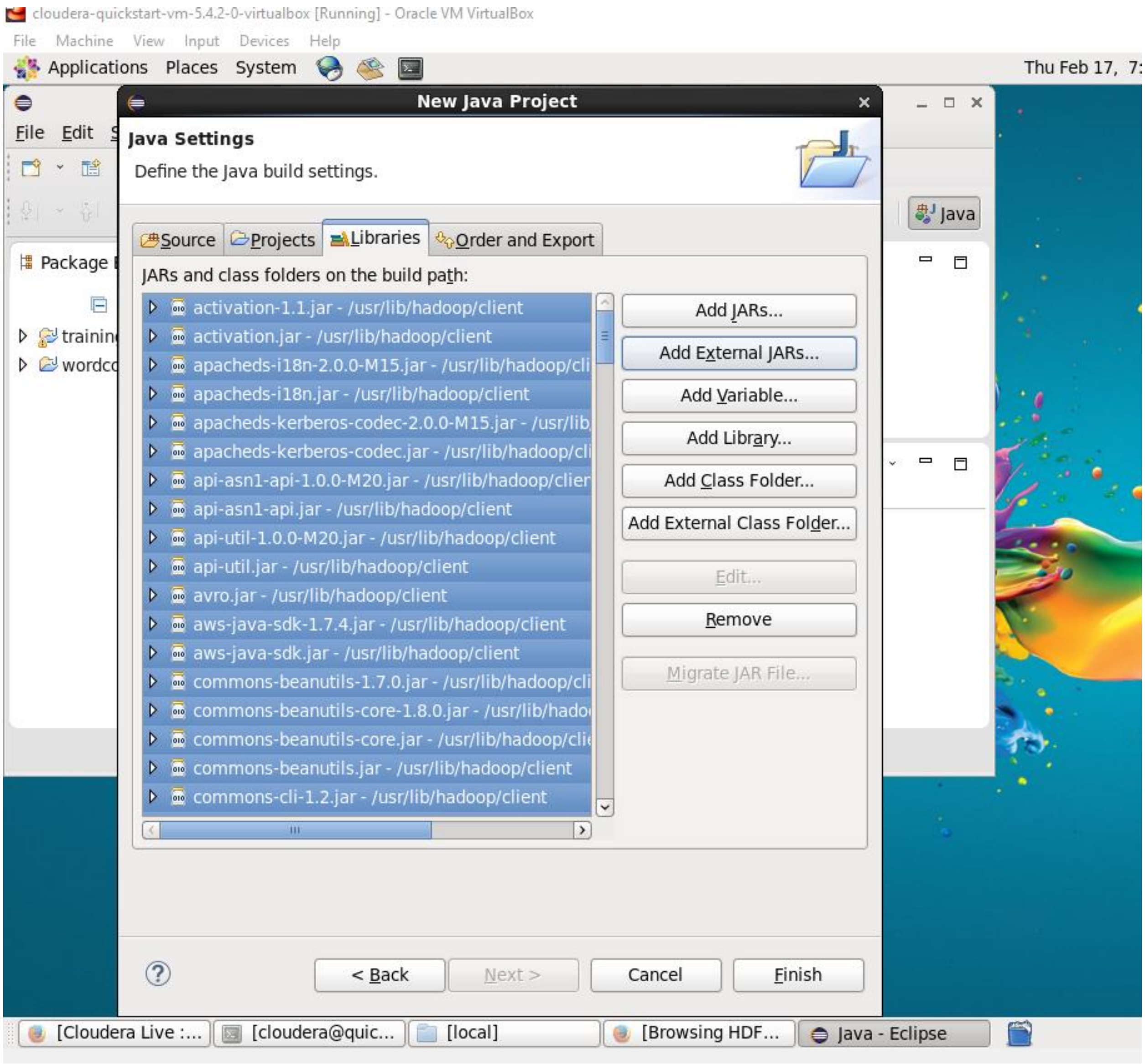
The default compiler compliance level for the current workspace is 1.6. The new...

< Back Next > Cancel Finish

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


cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 7:
File Edit
Package
training
wordco
Java
[Cloudera Live :...
[cloudera@quic...
[local]
[Browsing HDF...
Java - Eclipse

New Java Project

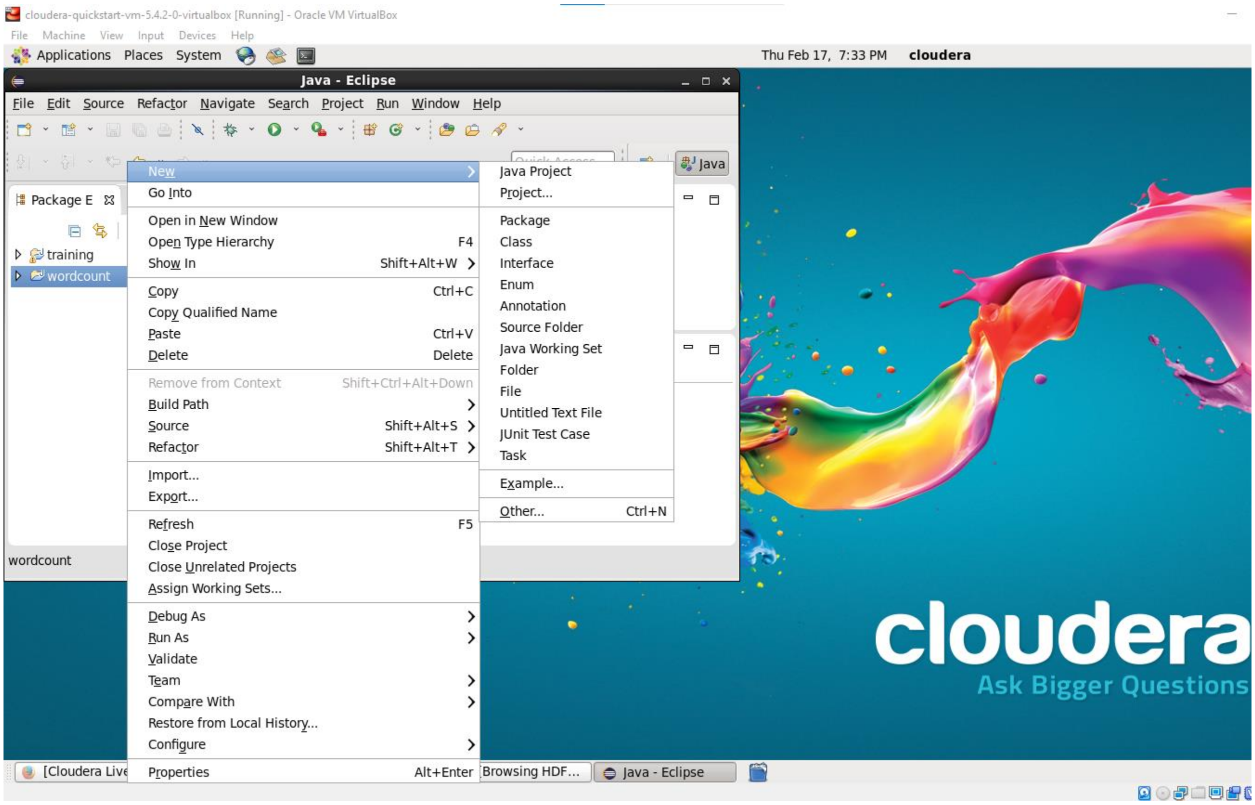
Java Settings

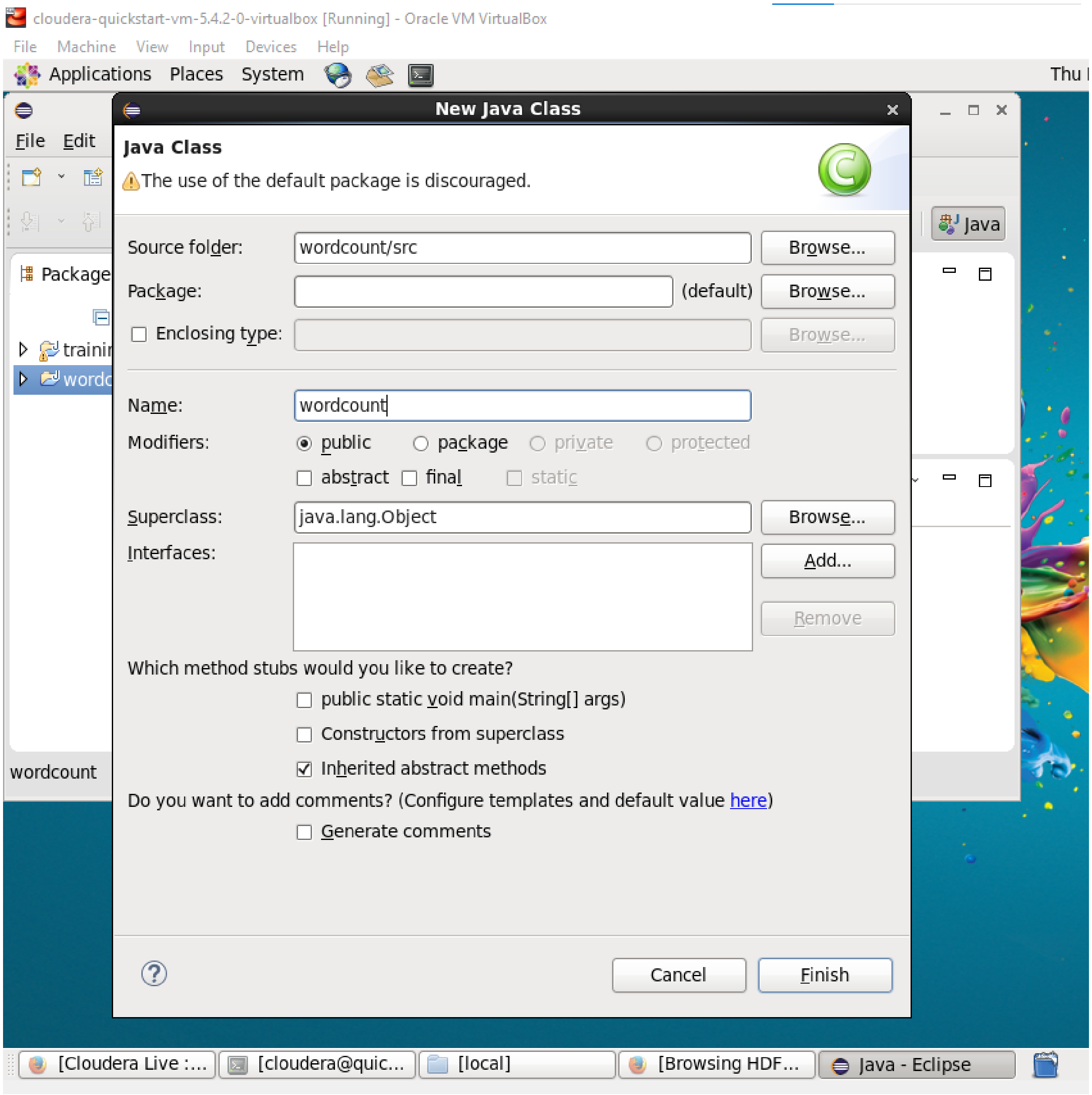
Define the Java build settings.

JARs and class folders on the build path:

```
activation-1.1.jar - /usr/lib/hadoop/client
activation.jar - /usr/lib/hadoop/client
apacheds-i18n-2.0.0-M15.jar - /usr/lib/hadoop/cli
apacheds-i18n.jar - /usr/lib/hadoop/client
apacheds-kerberos-codec-2.0.0-M15.jar - /usr/lib
apacheds-kerberos-codec.jar - /usr/lib/hadoop/cli
api-asn1-api-1.0.0-M20.jar - /usr/lib/hadoop/clien
api-asn1-api.jar - /usr/lib/hadoop/client
api-util-1.0.0-M20.jar - /usr/lib/hadoop/client
api-util.jar - /usr/lib/hadoop/client
avro.jar - /usr/lib/hadoop/client
aws-java-sdk-1.7.4.jar - /usr/lib/hadoop/client
aws-java-sdk.jar - /usr/lib/hadoop/client
commons-beanutils-1.7.0.jar - /usr/lib/hadoop/cli
commons-beanutils-core-1.8.0.jar - /usr/lib/hado
commons-beanutils-core.jar - /usr/lib/hadoop/cli
commons-beanutils.jar - /usr/lib/hadoop/client
commons-cli-1.2.jar - /usr/lib/hadoop/client
```

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


cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 7:33 PM cloudera
Java - Eclipse
File Edit Source Refactor Navigate Search Project Run Window Help
Java
Package E
training
wordcount
New
Go Into
Open in New Window
Open Type Hierarchy F4
Show In Shift+Alt+W
Copy Ctrl+C
Copy Qualified Name
Paste Ctrl+V
Delete Delete
Remove from Context Shift+Ctrl+Alt+Down
Build Path
Source Shift+Alt+S
Refactor Shift+Alt+T
Import...
Export...
Refresh F5
Close Project
Close Unrelated Projects
Assign Working Sets...
Debug As
Run As
Validate
Team
Compare With
Restore from Local History...
Configure
Properties Alt+Enter
Java Project
Project...
Package
Class
Interface
Enum
Annotation
Source Folder
Java Working Set
Folder
File
Untitled Text File
JUnit Test Case
Task
Example...
Other... Ctrl+N
wordcount
cloudera
Ask Bigger Questions
[Cloudera Live
Browsing HDF...
Java - Eclipse



New Java Class

Java Class

The use of the default package is discouraged.

Source folder: wordcount/src

Package: (default)

□ Enclosing type:

Name: wordcount

Modifiers: ● public ○ package ○ private ○ protected

□ abstract □ final □ static

Superclass: java.lang.Object

Interfaces:

Which method stubs would you like to create?

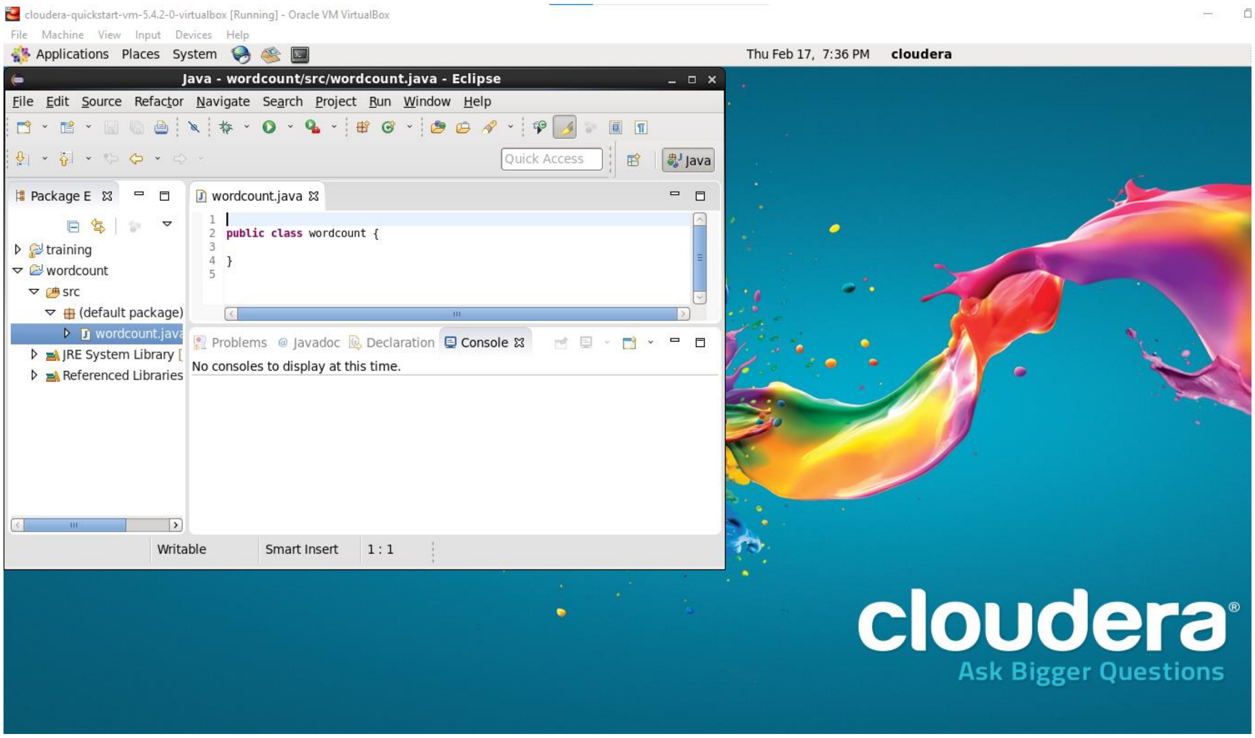
□ public static void main(String[] args)

□ Constructors from superclass

☑ Inherited abstract methods

Do you want to add comments? (Configure templates and default value here)

□ Generate comments



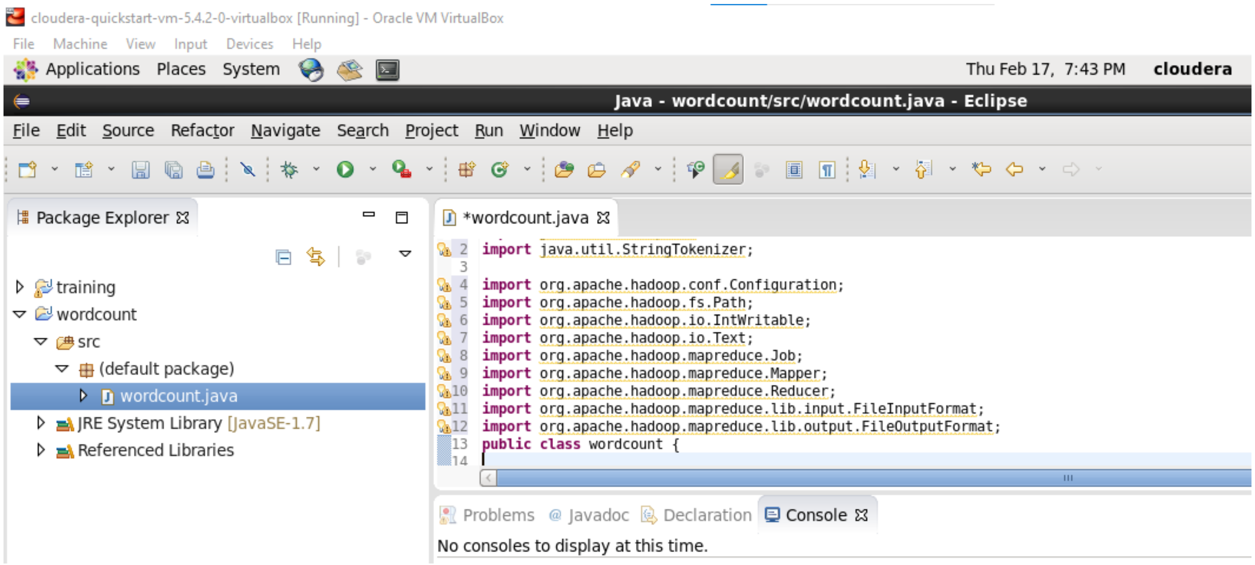
```
public class wordcount {

}
```

No consoles to display at this time.

Source code:

Packages

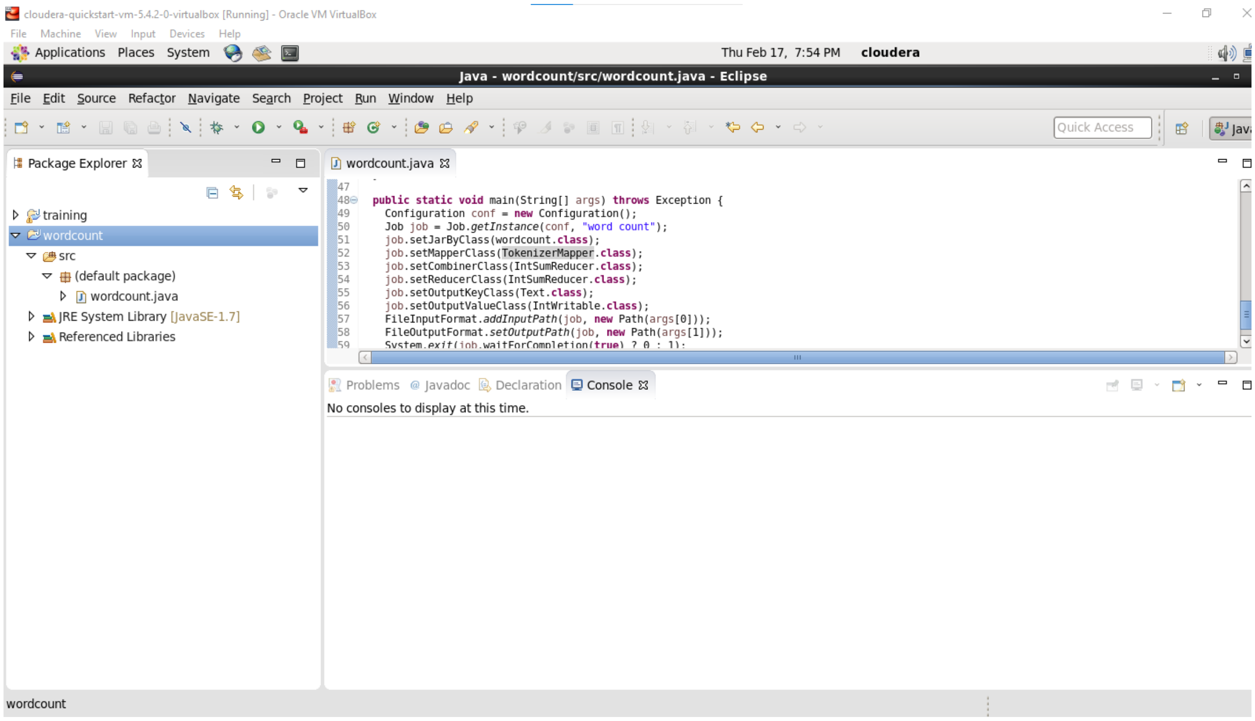


```
import java.util.StringTokenizer;

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 {
```

No consoles to display at this time.

Mapper Logic



```
  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);
```

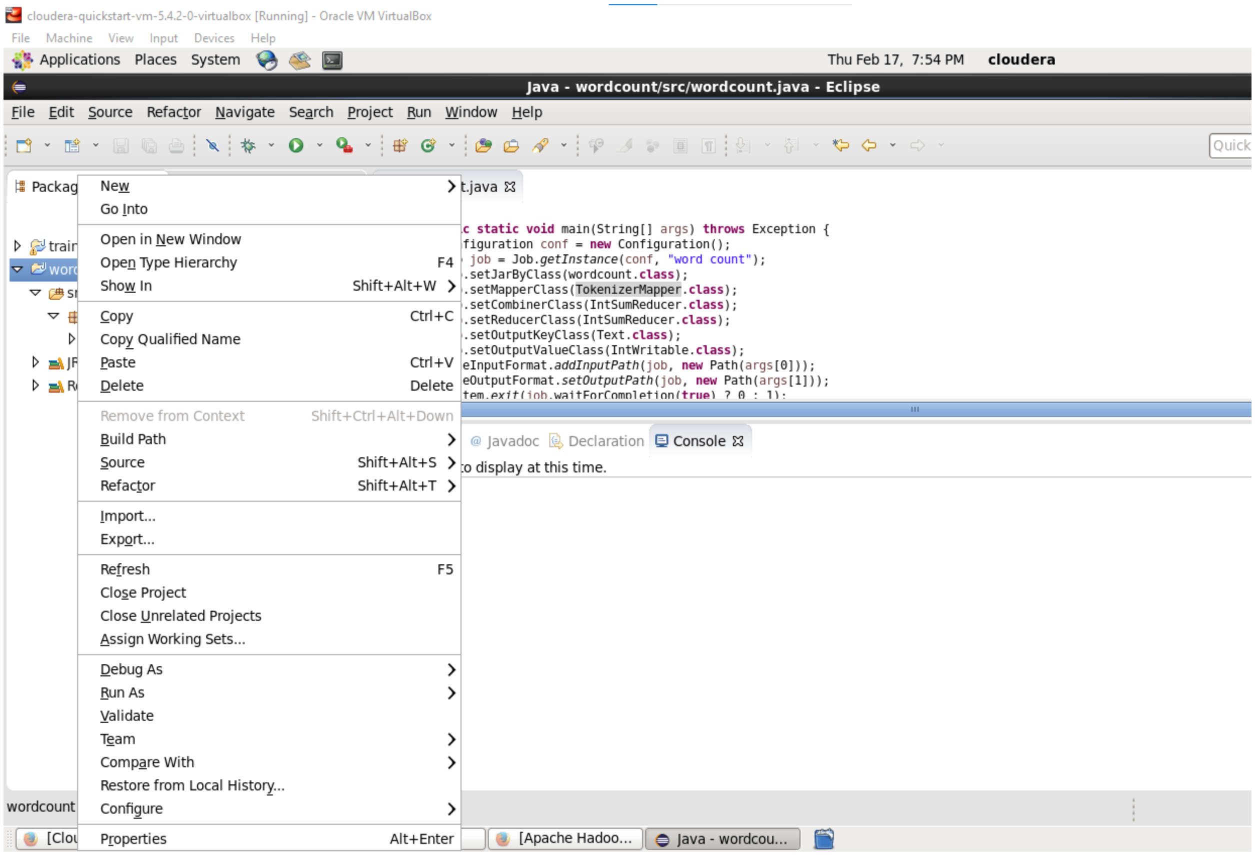
No consoles to display at this time.

cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 7:54 PM cloudera
Java - wordcount/src/wordcount.java - Eclipse
File Edit Source Refactor Navigate Search Project Run Window Help
Quick Access
Java
Package Explorer
training
wordcount
src
(default package)
wordcount.java
JRE System Library [JavaSE-1.7]
Referenced Libraries
wordcount.java
Problems
Javadoc
Declaration
Console
wordcount

6) Right Click on the project name WordCount -> Export -> Java -> JAR File -> Next -> for

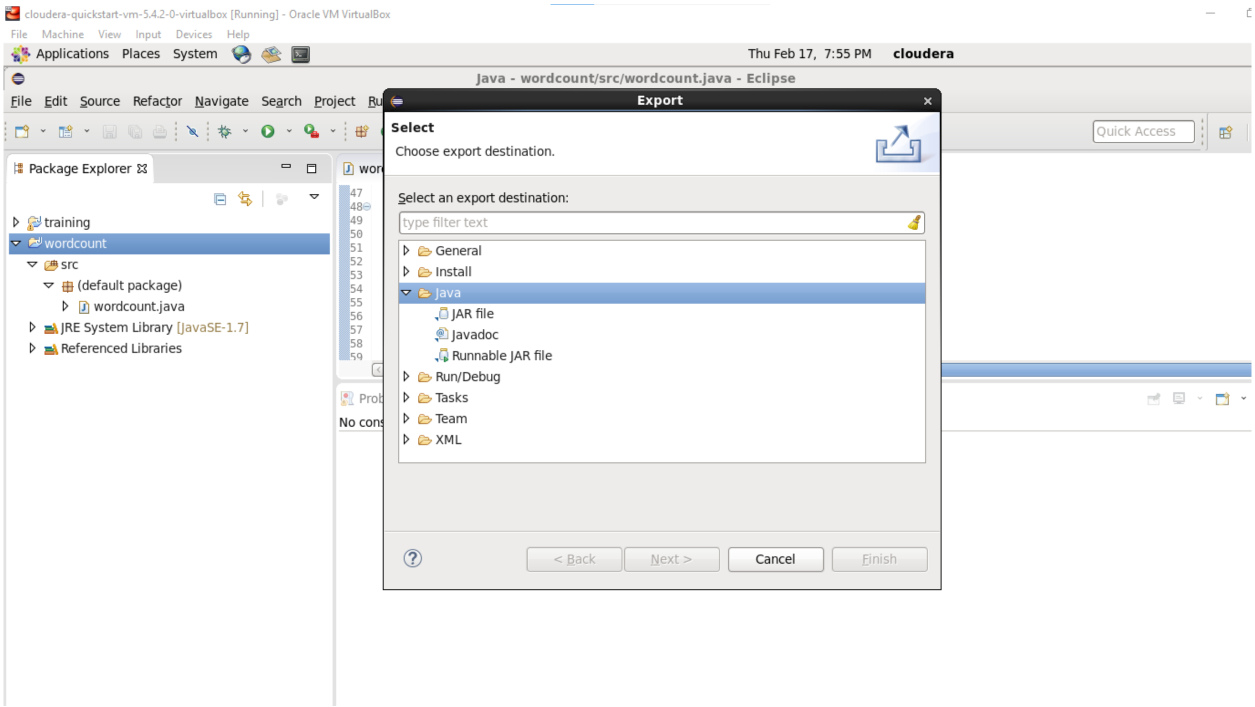
select the export destination for JAR file: browse -> Name : WordCount.jar -> save in folder

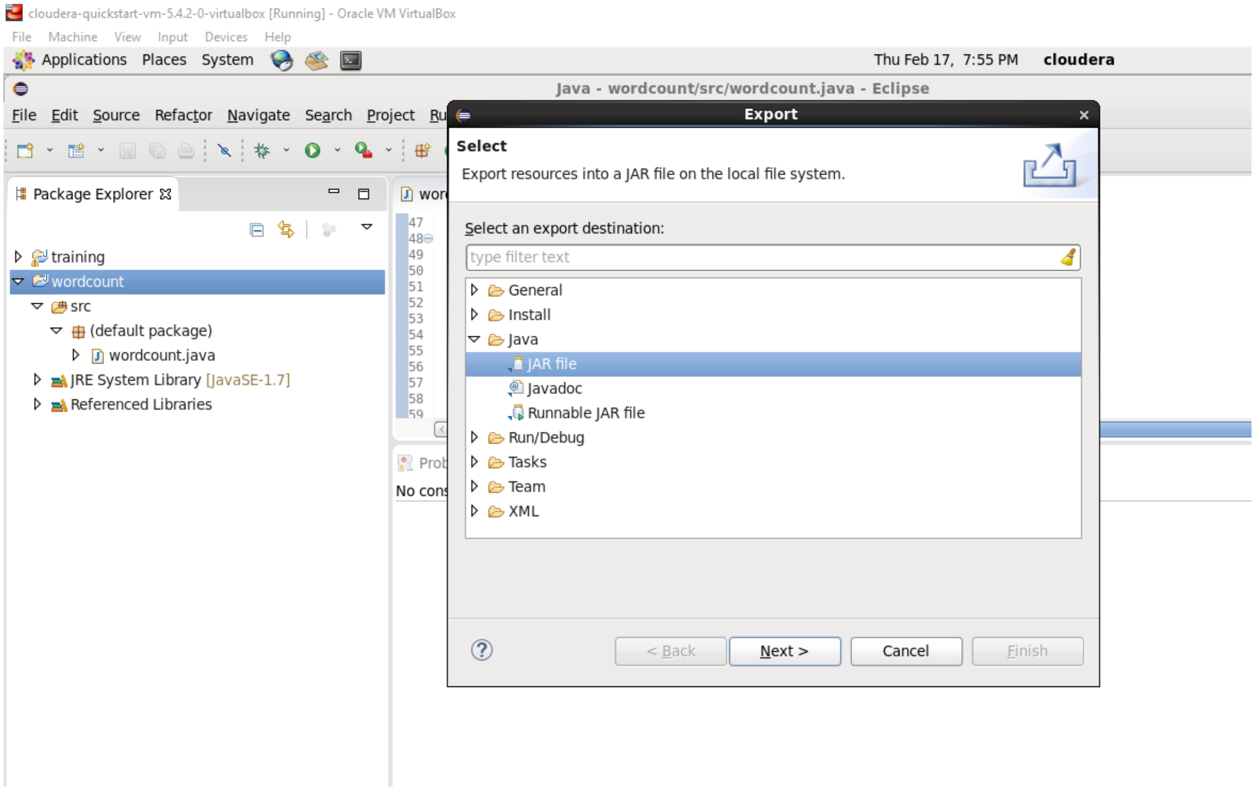
-> cloudera -> Finish -> OK



```
c static void main(String[] args) throws Exception {
figuration conf = new Configuration();
 job = Job.getInstance(conf, "word count");
.setJarByClass(wordcount.class);
.setMapperClass(TokenizerMapper.class);
.setCombinerClass(IntSumReducer.class);
.setReducerClass(IntSumReducer.class);
.setOutputKeyClass(Text.class);
.setOutputValueClass(IntWritable.class);
eInputFormat.addInputPath(job, new Path(args[0]));
eOutputFormat.setOutputPath(job, new Path(args[1]));
tem.exit(job.waitForCompletion(true) ? 0 : 1);
```

o display at this time.


cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 7:55 PM cloudera
Java - wordcount/src/wordcount.java - Eclipse
File Edit Source Refactor Navigate Search Project Ru
Package Explorer
training
wordcount
src
(default package)
wordcount.java
JRE System Library [JavaSE-1.7]
Referenced Libraries
Quick Access
Export
Select
Choose export destination.
Select an export destination:
type filter text
General
Install
Java
JAR file
Javadoc
Runnable JAR file
Run/Debug
Tasks
Team
XML
< Back
Next >
Cancel
Finish


cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 7:55 PM cloudera
Java - wordcount/src/wordcount.java - Eclipse
File Edit Source Refactor Navigate Search Project Ru
Package Explorer
training
wordcount
src
(default package)
wordcount.java
JRE System Library [JavaSE-1.7]
Referenced Libraries
Export
General
Install
Java
JAR file
Javadoc
Runnable JAR file
Run/Debug
Tasks
Team
XML
< Back
Next >
Cancel
Finish

Select

Export resources into a JAR file on the local file system.

Select an export destination:

type filter text

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

Check current working directory

->pwd

->ls

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

Creating an input file named as "abc".

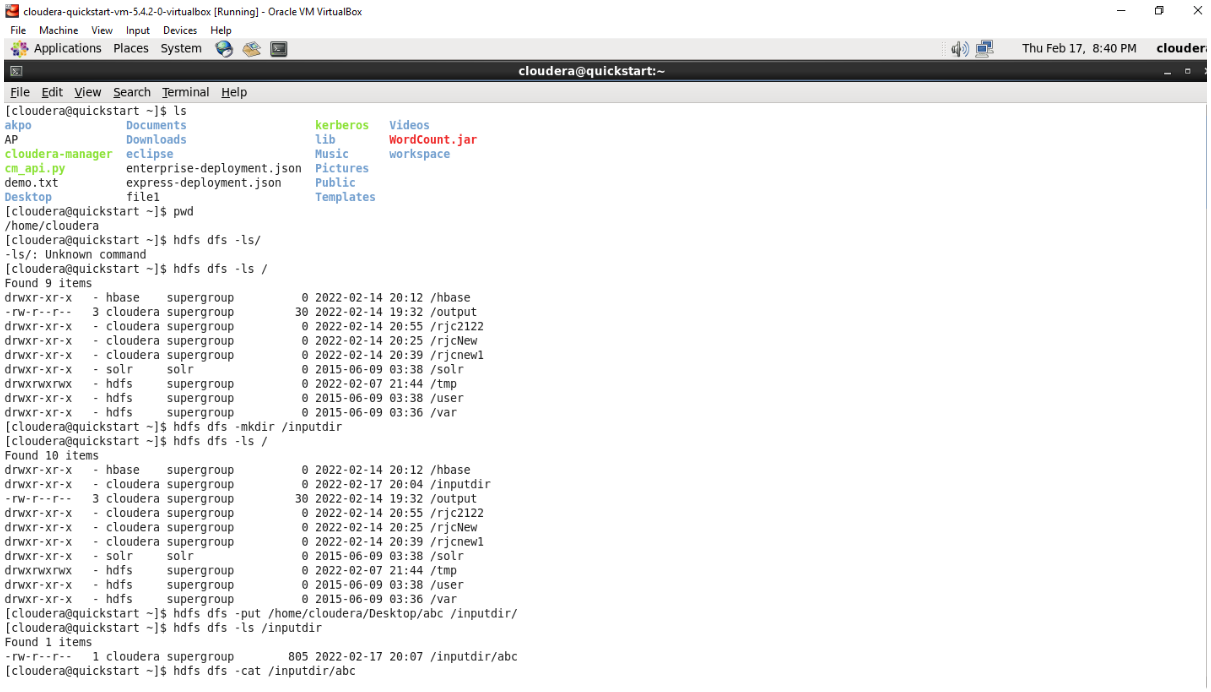
9) Now we have to move this input file to hdfs. For this we create a direcory on hdfs using

command hdfs dfs -mkdir /inputdir.

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

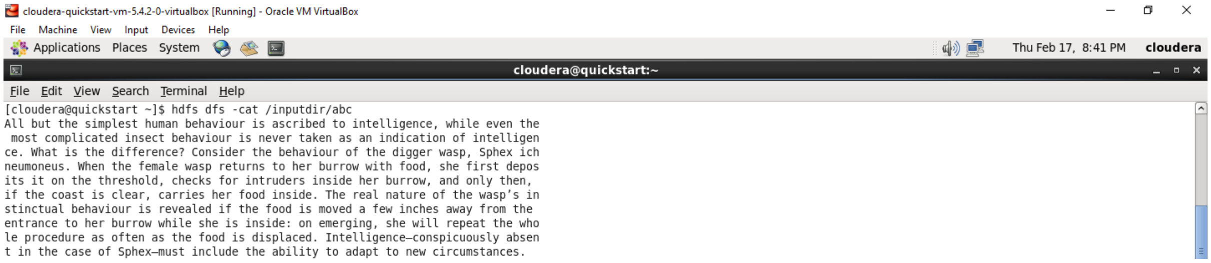
Move the input file to this directory created in hdfs by using either put command or copyFromLocal command.

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


cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 8:40 PM
cloudera
cloudera@quickstart:~
File Edit View Search Terminal Help

```
[cloudera@quickstart ~]$ ls
akpo              Documents                  kerberos  Videos
AP                Downloads                  lib       WordCount.jar
cloudera-manager  eclipse                    Music     workspace
cm_api.py         enterprise-deployment.json Pictures
demo.txt          express-deployment.json    Public
Desktop           file1                      Templates
[cloudera@quickstart ~]$ pwd
/home/cloudera
[cloudera@quickstart ~]$ hdfs dfs -ls/
-ls/: Unknown command
[cloudera@quickstart ~]$ hdfs dfs -ls /
Found 9 items
drwxr-xr-x   - hbase    supergroup          0 2022-02-14 20:12 /hbase
-rw-r--r--   3 cloudera supergroup         30 2022-02-14 19:32 /output
drwxr-xr-x   - cloudera supergroup          0 2022-02-14 20:55 /rjc2122
drwxr-xr-x   - cloudera supergroup          0 2022-02-14 20:25 /rjcNew
drwxr-xr-x   - cloudera supergroup          0 2022-02-14 20:39 /rjcnew1
drwxr-xr-x   - solr     solr                0 2015-06-09 03:38 /solr
drwxrwxrwx   - hdfs     supergroup          0 2022-02-07 21:44 /tmp
drwxr-xr-x   - hdfs     supergroup          0 2015-06-09 03:38 /user
drwxr-xr-x   - hdfs     supergroup          0 2015-06-09 03:36 /var
[cloudera@quickstart ~]$ hdfs dfs -mkdir /inputdir
[cloudera@quickstart ~]$ hdfs dfs -ls /
Found 10 items
drwxr-xr-x   - hbase    supergroup          0 2022-02-14 20:12 /hbase
drwxr-xr-x   - cloudera supergroup          0 2022-02-17 20:04 /inputdir
-rw-r--r--   3 cloudera supergroup         30 2022-02-14 19:32 /output
drwxr-xr-x   - cloudera supergroup          0 2022-02-14 20:55 /rjc2122
drwxr-xr-x   - cloudera supergroup          0 2022-02-14 20:25 /rjcNew
drwxr-xr-x   - cloudera supergroup          0 2022-02-14 20:39 /rjcnew1
drwxr-xr-x   - solr     solr                0 2015-06-09 03:38 /solr
drwxrwxrwx   - hdfs     supergroup          0 2022-02-07 21:44 /tmp
drwxr-xr-x   - hdfs     supergroup          0 2015-06-09 03:38 /user
drwxr-xr-x   - hdfs     supergroup          0 2015-06-09 03:36 /var
[cloudera@quickstart ~]$ hdfs dfs -put /home/cloudera/Desktop/abc /inputdir/
[cloudera@quickstart ~]$ hdfs dfs -ls /inputdir
Found 1 items
-rw-r--r--   1 cloudera supergroup        805 2022-02-17 20:07 /inputdir/abc
[cloudera@quickstart ~]$ hdfs dfs -cat /inputdir/abc
```

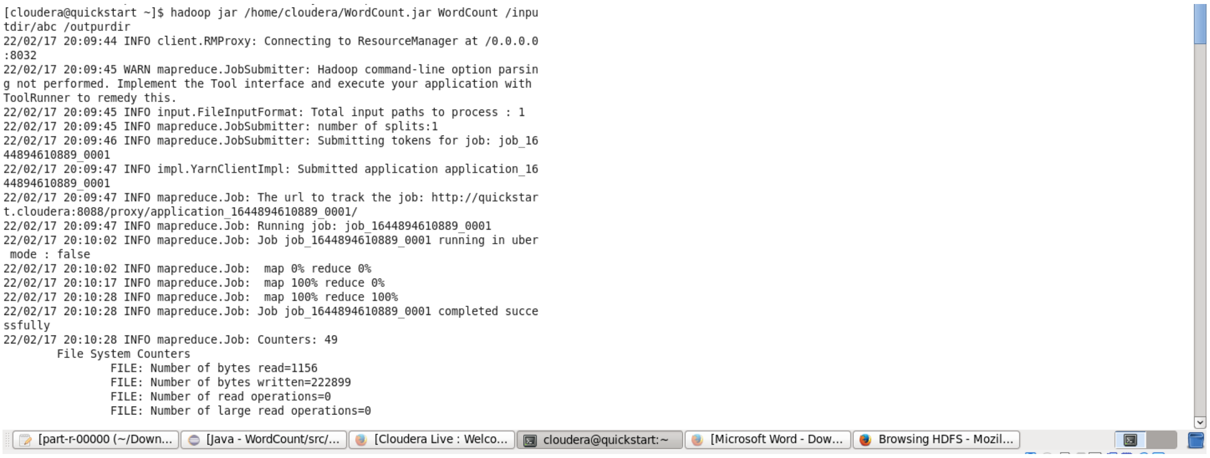
As we can see “abc” file is present in /inputdir directory of hdfs. Now we will see the content of this file using hdfs dfs –cat /inputdir/abc command


cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 8:41 PM
cloudera
cloudera@quickstart:~
File Edit View Search Terminal Help

```
[cloudera@quickstart ~]$ hdfs dfs -cat /inputdir/abc
All but the simplest human behaviour is ascribed to intelligence, while even the
 most complicated insect behaviour is never taken as an indication of intelligen
ce. What is the difference? Consider the behaviour of the digger wasp, Sphex ich
neumoneus. When the female wasp returns to her burrow with food, she first depos
its it on the threshold, checks for intruders inside her burrow, and only then,
if the coast is clear, carries her food inside. The real nature of the wasp’s in
stinctual behaviour is revealed if the food is moved a few inches away from the
entrance to her burrow while she is inside: on emerging, she will repeat the who
le procedure as often as the food is displaced. Intelligence—conspicuously absen
t in the case of Sphex—must include the ability to adapt to new circumstances.
```

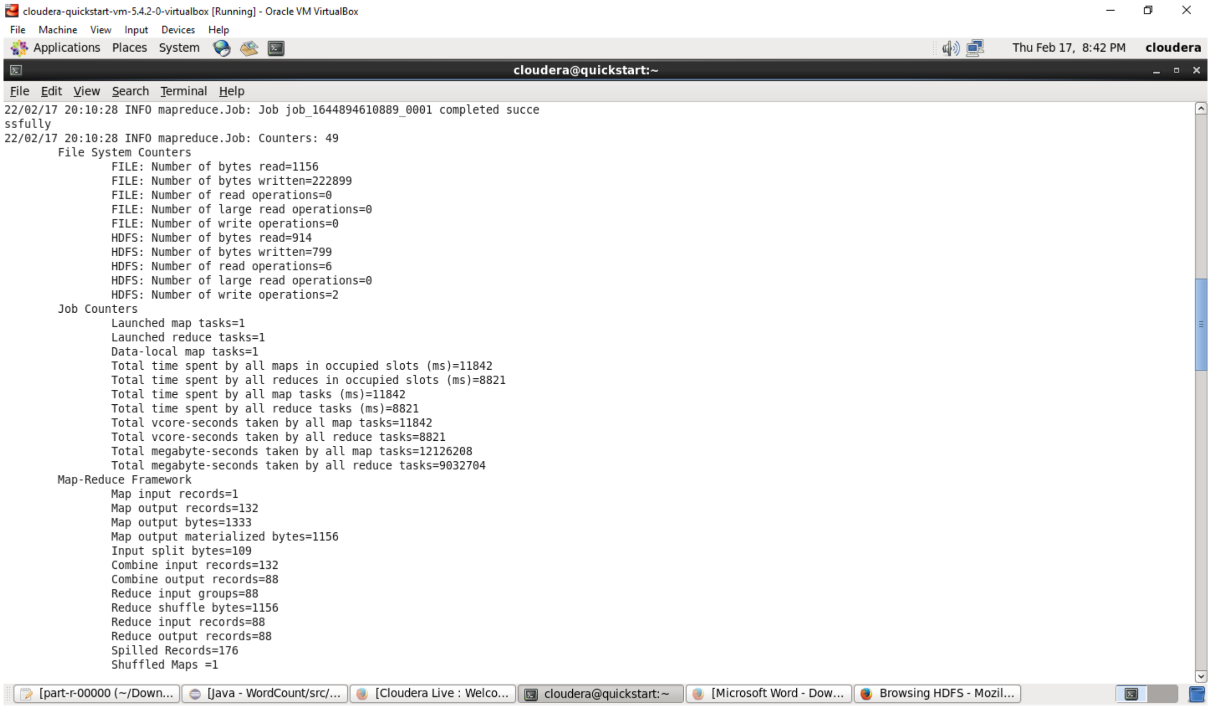
10) Running Mapreduce Program on Hadoop, syntax is hadoop jar jarFileName.jar ClassName /InputFileAddress /outputdir

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



```
[cloudera@quickstart ~]$ hadoop jar /home/cloudera/WordCount.jar WordCount /inpu
tdir/abc /outpurdir
22/02/17 20:09:44 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0
:8032
22/02/17 20:09:45 WARN mapreduce.JobSubmitter: Hadoop command-line option parsin
g not performed. Implement the Tool interface and execute your application with
ToolRunner to remedy this.
22/02/17 20:09:45 INFO input.FileInputFormat: Total input paths to process : 1
22/02/17 20:09:45 INFO mapreduce.JobSubmitter: number of splits:1
22/02/17 20:09:46 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_16
44894610889_0001
22/02/17 20:09:47 INFO impl.YarnClientImpl: Submitted application application_16
44894610889_0001
22/02/17 20:09:47 INFO mapreduce.Job: The url to track the job: http://quickstar
t.cloudera:8088/proxy/application_1644894610889_0001/
22/02/17 20:09:47 INFO mapreduce.Job: Running job: job_1644894610889_0001
22/02/17 20:10:02 INFO mapreduce.Job: Job job_1644894610889_0001 running in uber
 mode : false
22/02/17 20:10:02 INFO mapreduce.Job:  map 0% reduce 0%
22/02/17 20:10:17 INFO mapreduce.Job:  map 100% reduce 0%
22/02/17 20:10:28 INFO mapreduce.Job:  map 100% reduce 100%
22/02/17 20:10:28 INFO mapreduce.Job: Job job_1644894610889_0001 completed succe
ssfully
22/02/17 20:10:28 INFO mapreduce.Job: Counters: 49
        File System Counters
                FILE: Number of bytes read=1156
                FILE: Number of bytes written=222899
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
```

Map-Reduce Framework



cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 8:42 PM cloudera
cloudera@quickstart:~
File Edit View Search Terminal Help

```
22/02/17 20:10:28 INFO mapreduce.Job: Job job_1644894610889_0001 completed succe
ssfully
22/02/17 20:10:28 INFO mapreduce.Job: Counters: 49
        File System Counters
                FILE: Number of bytes read=1156
                FILE: Number of bytes written=222899
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=914
                HDFS: Number of bytes written=799
                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)=11842
                Total time spent by all reduces in occupied slots (ms)=8821
                Total time spent by all map tasks (ms)=11842
                Total time spent by all reduce tasks (ms)=8821
                Total vcore-seconds taken by all map tasks=11842
                Total vcore-seconds taken by all reduce tasks=8821
                Total megabyte-seconds taken by all map tasks=12126208
                Total megabyte-seconds taken by all reduce tasks=9032704
        Map-Reduce Framework
                Map input records=1
                Map output records=132
                Map output bytes=1333
                Map output materialized bytes=1156
                Input split bytes=109
                Combine input records=132
                Combine output records=88
                Reduce input groups=88
                Reduce shuffle bytes=1156
                Reduce input records=88
                Reduce output records=88
                Spilled Records=176
                Shuffled Maps =1
```

As we can see in the above output,

Combine input records=132

Combine output records=88

And Reduce shuffle bytes coming as,

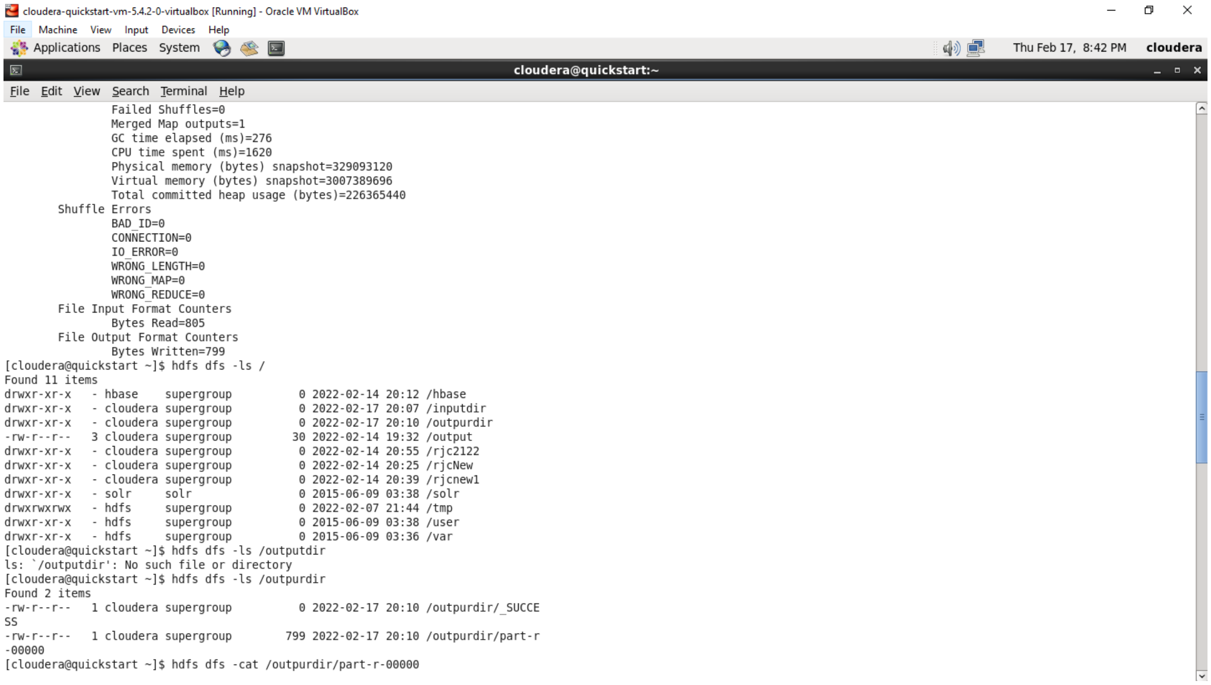
Reduce shuffle bytes=1876

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.

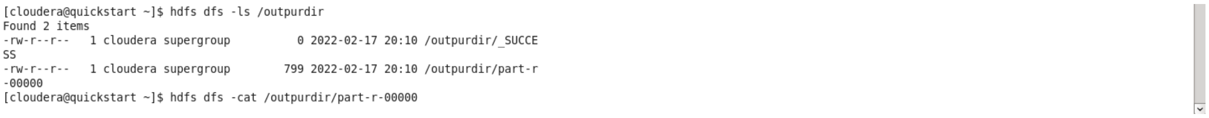
1st we are checking whether the outputdir directory is created in hdfs or not using command

hdfs dfs -ls /


cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 8:42 PM cloudera
cloudera@quickstart:~
File Edit View Search Terminal Help

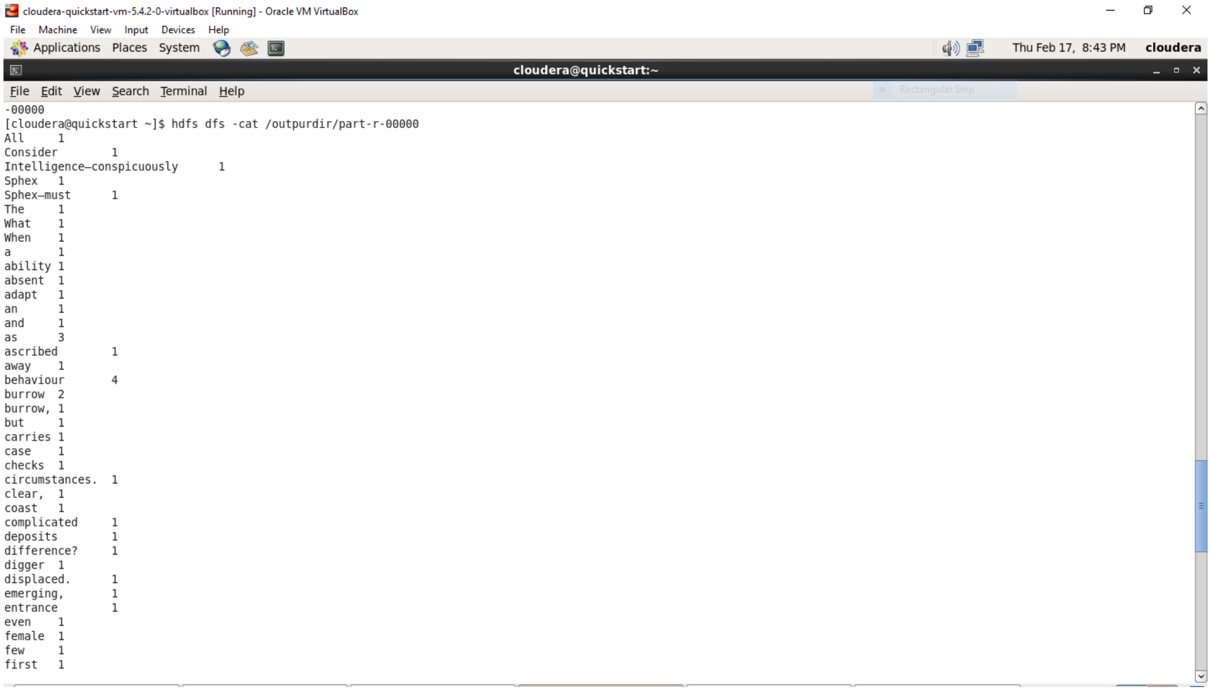
```
                Failed Shuffles=0
                Merged Map outputs=1
                GC time elapsed (ms)=276
                CPU time spent (ms)=1620
                Physical memory (bytes) snapshot=329093120
                Virtual memory (bytes) snapshot=3007389696
                Total committed heap usage (bytes)=226365440
        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=805
        File Output Format Counters
                Bytes Written=799
[cloudera@quickstart ~]$ hdfs dfs -ls /
Found 11 items
drwxr-xr-x   - hbase    supergroup          0 2022-02-14 20:12 /hbase
drwxr-xr-x   - cloudera supergroup          0 2022-02-17 20:07 /inputdir
drwxr-xr-x   - cloudera supergroup          0 2022-02-17 20:10 /outpurdir
-rw-r--r--   3 cloudera supergroup         30 2022-02-14 19:32 /output
drwxr-xr-x   - cloudera supergroup          0 2022-02-14 20:55 /rjc2122
drwxr-xr-x   - cloudera supergroup          0 2022-02-14 20:25 /rjcNew
drwxr-xr-x   - cloudera supergroup          0 2022-02-14 20:39 /rjcnew1
drwxr-xr-x   - solr     solr                0 2015-06-09 03:38 /solr
drwxrwxrwx   - hdfs     supergroup          0 2022-02-07 21:44 /tmp
drwxr-xr-x   - hdfs     supergroup          0 2015-06-09 03:38 /user
drwxr-xr-x   - hdfs     supergroup          0 2015-06-09 03:36 /var
[cloudera@quickstart ~]$ hdfs dfs -ls /outputdir
ls: `/outputdir': No such file or directory
[cloudera@quickstart ~]$ hdfs dfs -ls /outpurdir
Found 2 items
-rw-r--r--   1 cloudera supergroup          0 2022-02-17 20:10 /outpurdir/_SUCCE
SS
-rw-r--r--   1 cloudera supergroup        799 2022-02-17 20:10 /outpurdir/part-r
-00000
[cloudera@quickstart ~]$ hdfs dfs -cat /outpurdir/part-r-00000
```

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



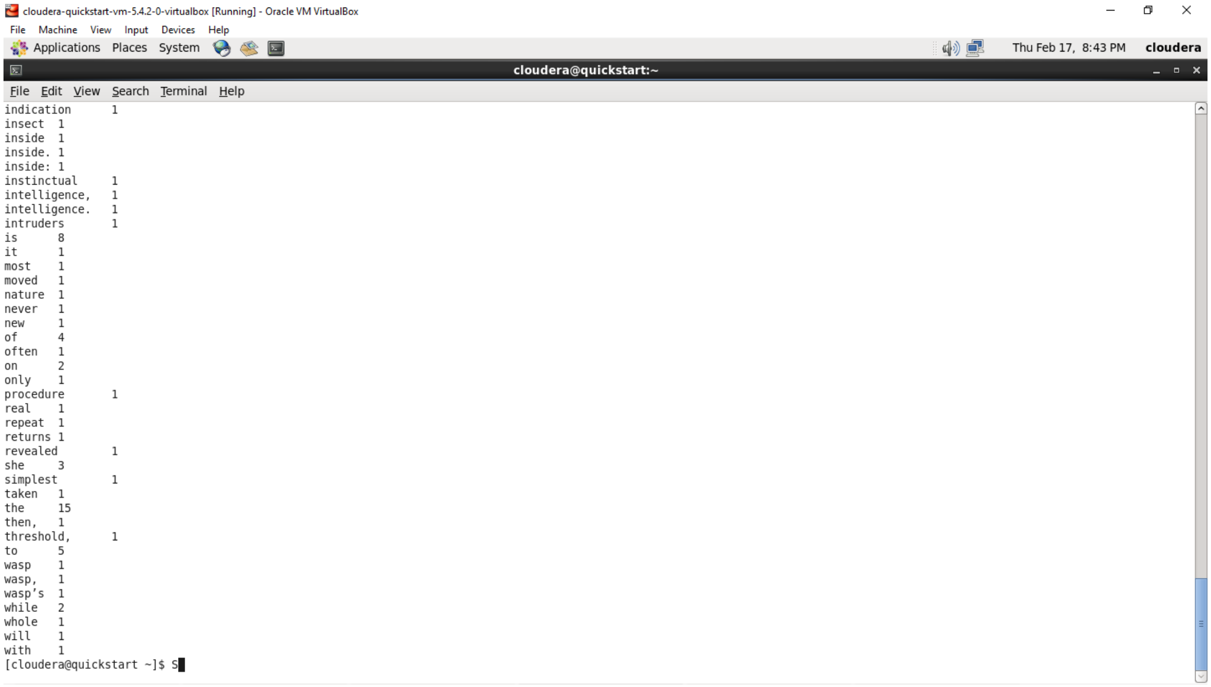
```
[cloudera@quickstart ~]$ hdfs dfs -ls /outpurdir
Found 2 items
-rw-r--r--   1 cloudera supergroup          0 2022-02-17 20:10 /outpurdir/_SUCCE
SS
-rw-r--r--   1 cloudera supergroup        799 2022-02-17 20:10 /outpurdir/part-r
-00000
[cloudera@quickstart ~]$ hdfs dfs -cat /outpurdir/part-r-00000
```

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**



cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 8:43 PM cloudera
cloudera@quickstart:~
File Edit View Search Terminal Help

```
-00000
[cloudera@quickstart ~]$ hdfs dfs -cat /outpurdir/part-r-00000
All     1
Consider        1
Intelligence—conspicuously      1
Sphex   1
Sphex—must      1
The     1
What    1
When    1
a       1
ability 1
absent  1
adapt   1
an      1
and     1
as      3
ascribed        1
away    1
behaviour       4
burrow  2
burrow, 1
but     1
carries 1
case    1
checks  1
circumstances.  1
clear,  1
coast   1
complicated     1
deposits        1
difference?     1
digger  1
displaced.      1
emerging,       1
entrance        1
even    1
female  1
few     1
first   1
```



cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 8:43 PM cloudera
cloudera@quickstart:~
File Edit View Search Terminal Help

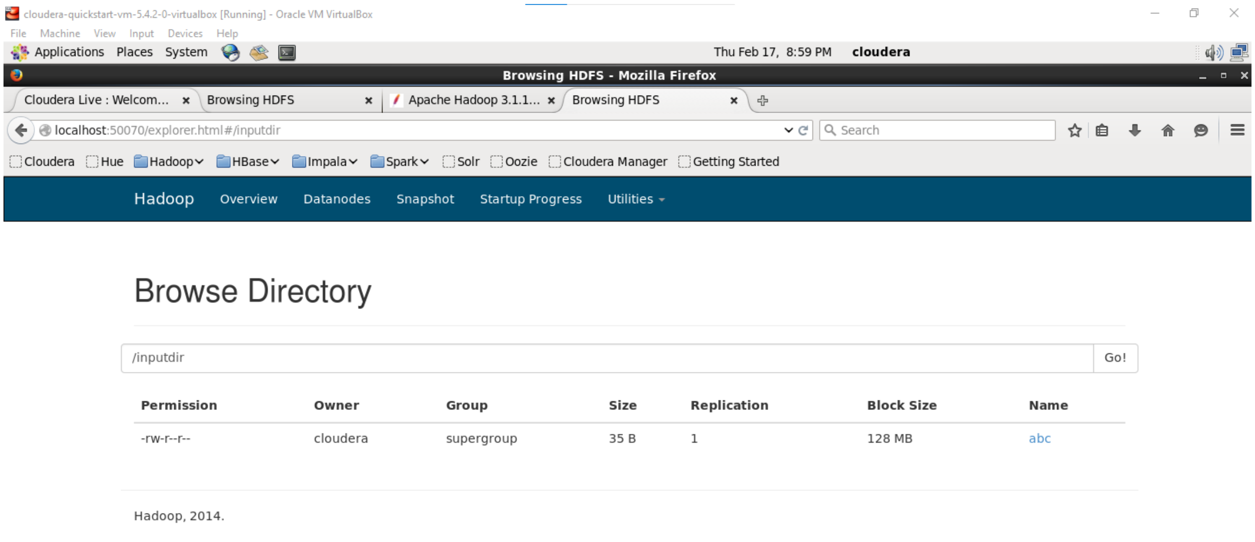
```
indication      1
insect  1
inside  1
inside. 1
inside: 1
instinctual     1
intelligence,   1
intelligence.   1
intruders       1
is      8
it      1
most    1
moved   1
nature  1
never   1
new     1
of      4
often   1
on      2
only    1
procedure       1
real    1
repeat  1
returns 1
revealed        1
she     3
simplest        1
taken   1
the     15
then,   1
threshold,      1
to      5
wasp    1
wasp,   1
wasp’s  1
while   2
whole   1
will    1
with    1
[cloudera@quickstart ~]$ S
```

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


cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 8:59 PM cloudera
Browsing HDFS - Mozilla Firefox
Cloudera Live : Welcom...
Browsing HDFS
Apache Hadoop 3.1.1...
Browsing HDFS
localhost:50070/explorer.html#/inputdir
Search
Cloudera
Hue
Hadoop
HBase
Impala
Spark
Solr
Oozie
Cloudera Manager
Getting Started
Hadoop
Overview
Datanodes
Snapshot
Startup Progress
Utilities

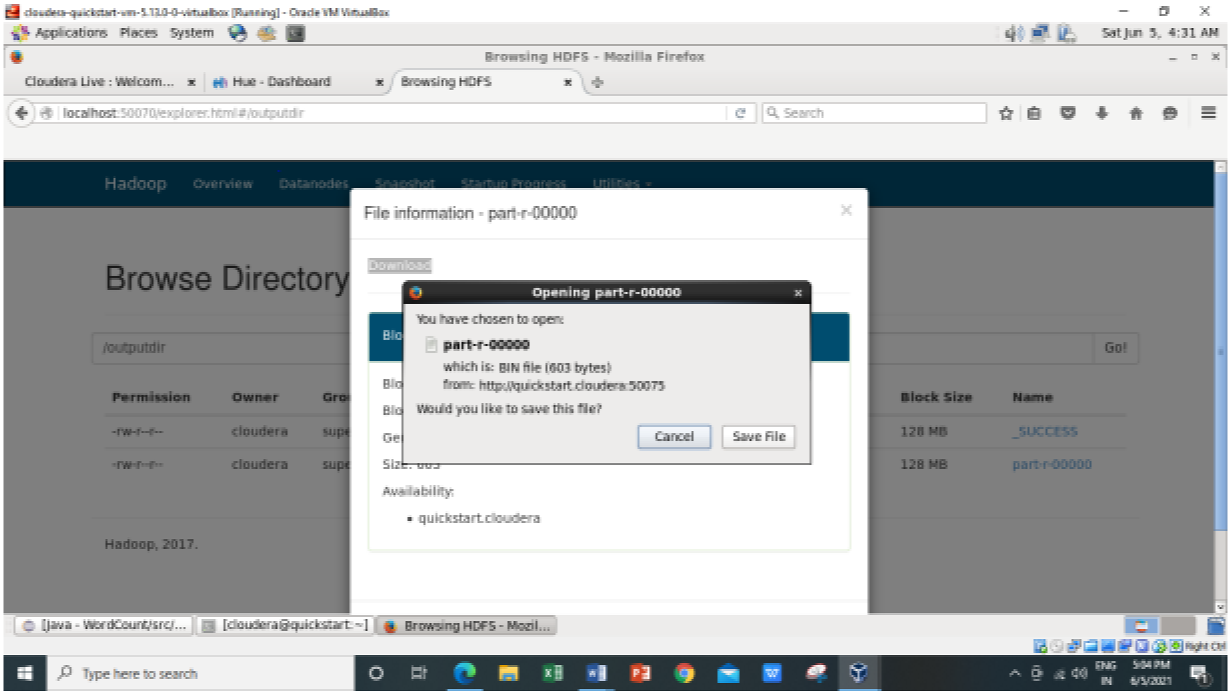
Browse Directory

/inputdir Go!

Permission	Owner	Group	Size	Replication	Block Size	Name
-rw-r--r--	cloudera	supergroup	35 B	1	128 MB	abc

Hadoop, 2014.

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



File information - part-r-00000

Opening part-r-00000

You have chosen to open:

part-r-00000

which is: BIN file (603 bytes)
from: http://quickstart.cloudera:50075

Would you like to save this file?

Cancel Save File

Availability:

- quickstart.cloudera

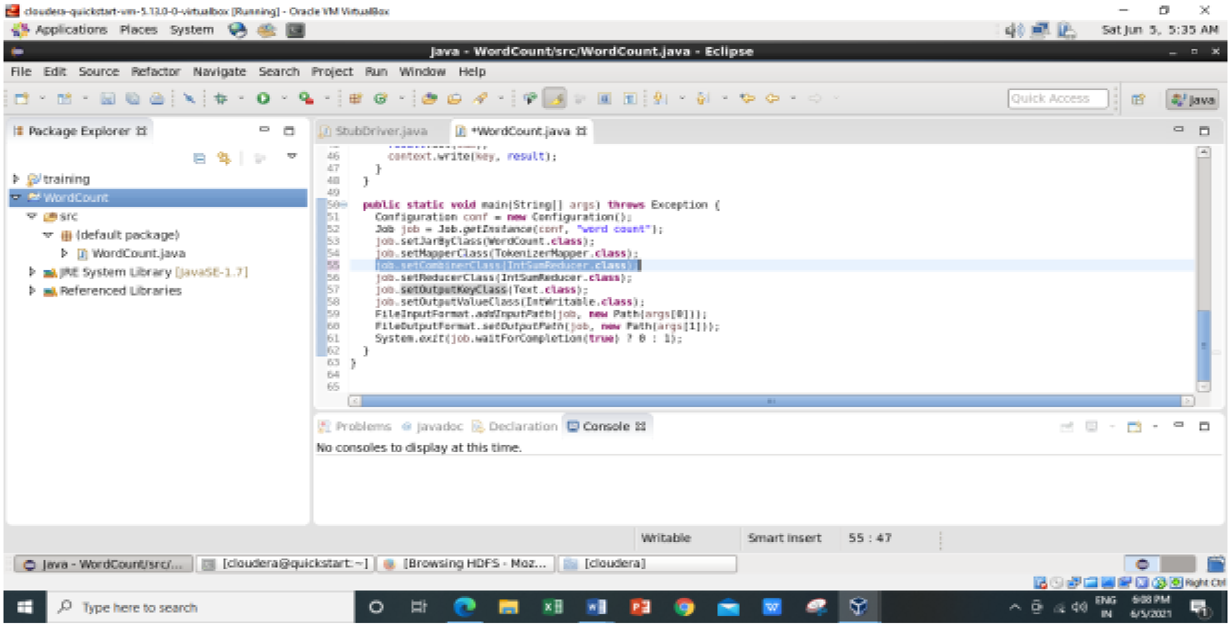
Permission	Owner	Block Size	Name
-rw-r--r--	cloudera	128 MB	_SUCCESS
-rw-r--r--	cloudera	128 MB	part-r-00000

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**

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 (Without Combiner) in Eclipse:

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

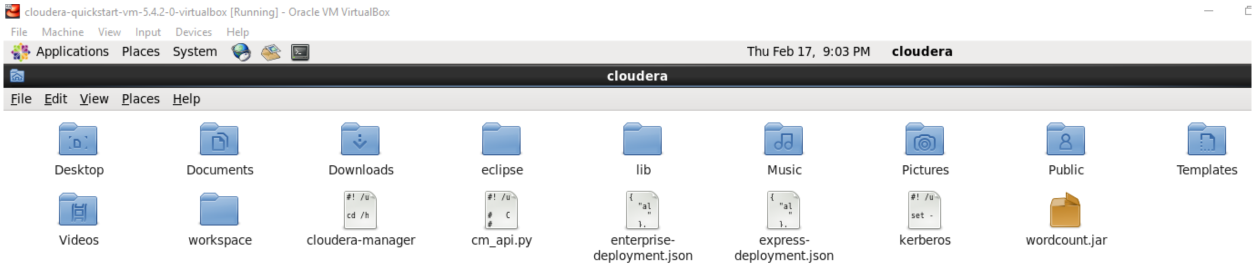


```
        context.write(key, result);
    }
  }

  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);
  }
}
```

```
No consoles to display at this time.
```

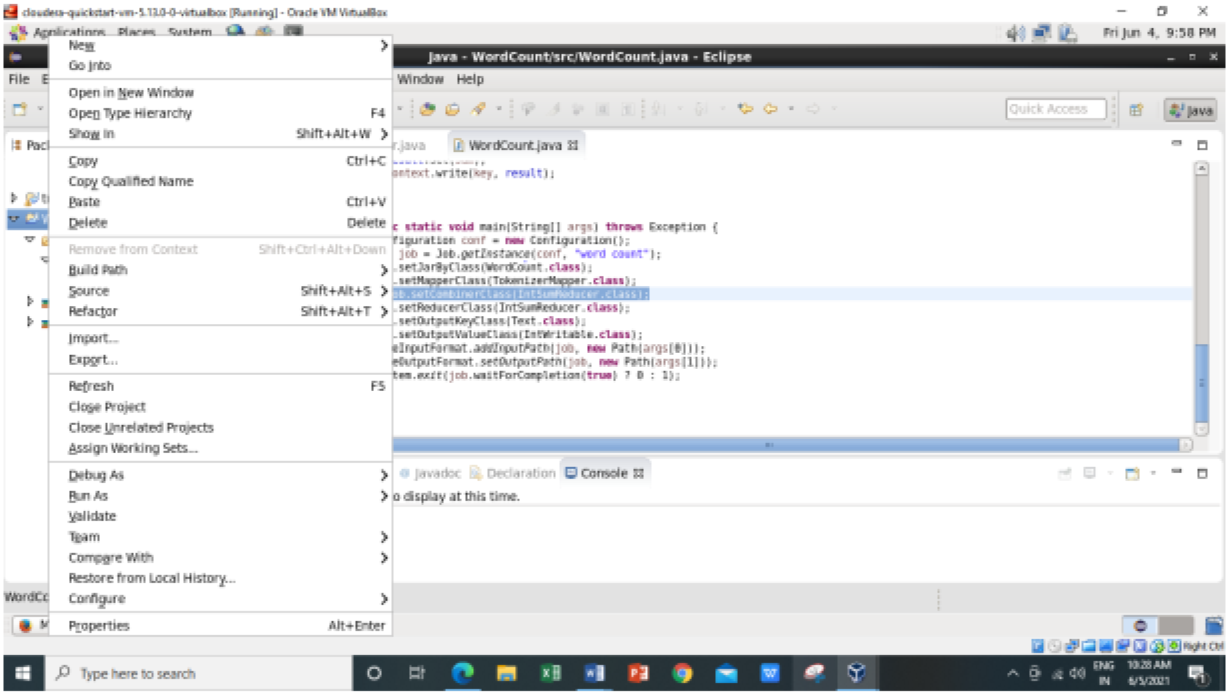
2) And will delete the WordCount.jar file in which all jar files are present from **/home/cloudera.**



cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 9:03 PM
cloudera
cloudera
File Edit View Places Help
Desktop
Documents
Downloads
eclipse
lib
Music
Pictures
Public
Templates
Videos
workspace
cloudera-manager
cm_api.py
enterprise-deployment.json
express-deployment.json
kerberos
wordcount.jar

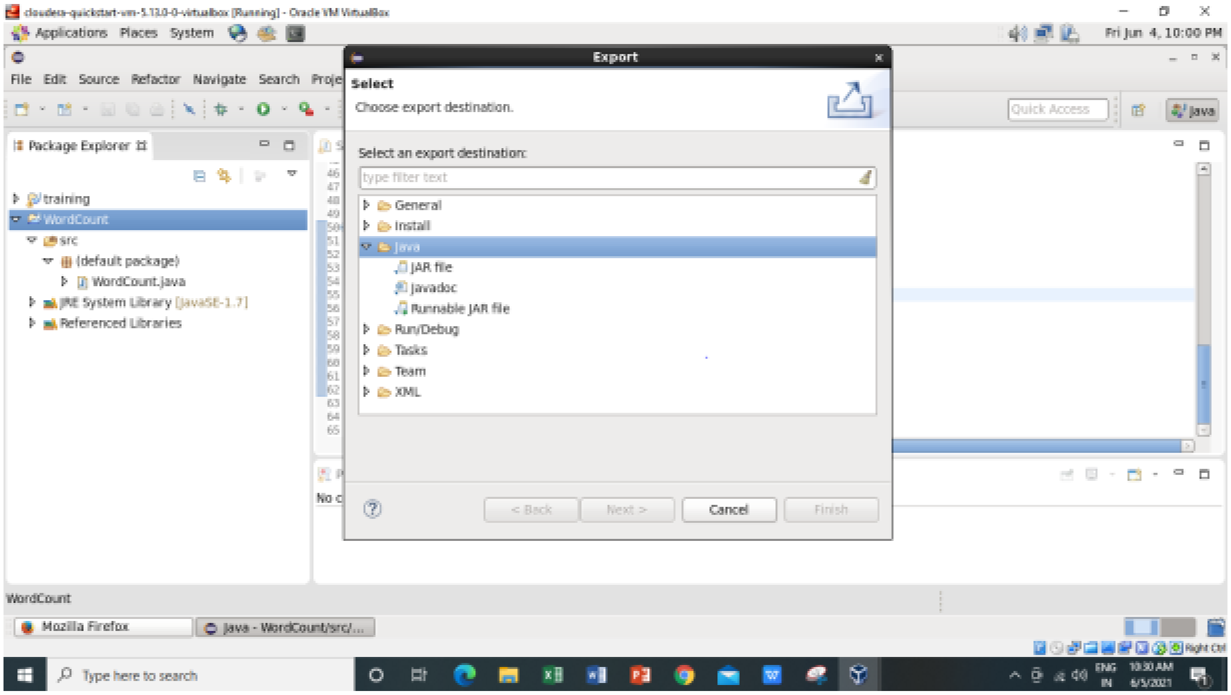
We have successfully deleted the WordCount.jar file.

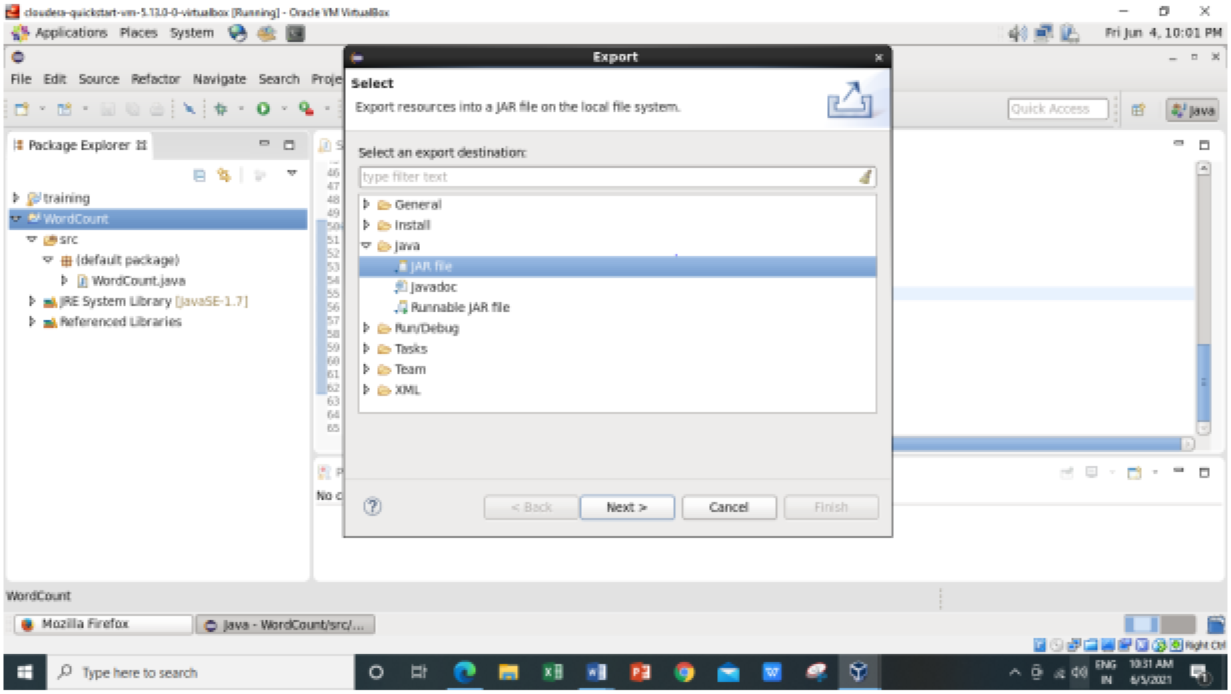
3) Now exporting the jar files Right Click on the project name WordCount -> Export -> Java ->JAR File -> Next -> for select the export destination for JAR file: browse -> Name : WordCount.jar -> save in folder -> cloudera -> Finish -> OK



```
ontext.write(key, result);

c static void main(String[] args) throws Exception {
figuration conf = new Configuration();
 job = Job.getInstance(conf, "word count");
.setJarByClass(WordCount.class);
.setMapperClass(TokenizerMapper.class);
ob.setCombinerClass(IntSumReducer.class);
.setReducerClass(IntSumReducer.class);
.setOutputKeyClass(Text.class);
.setOutputValueClass(IntWritable.class);
eInputFormat.addInputPath(job, new Path(args[0]));
eOutputFormat.setOutputPath(job, new Path(args[1]));
tem.exit(job.waitForCompletion(true) ? 0 : 1);
```





Export

Select

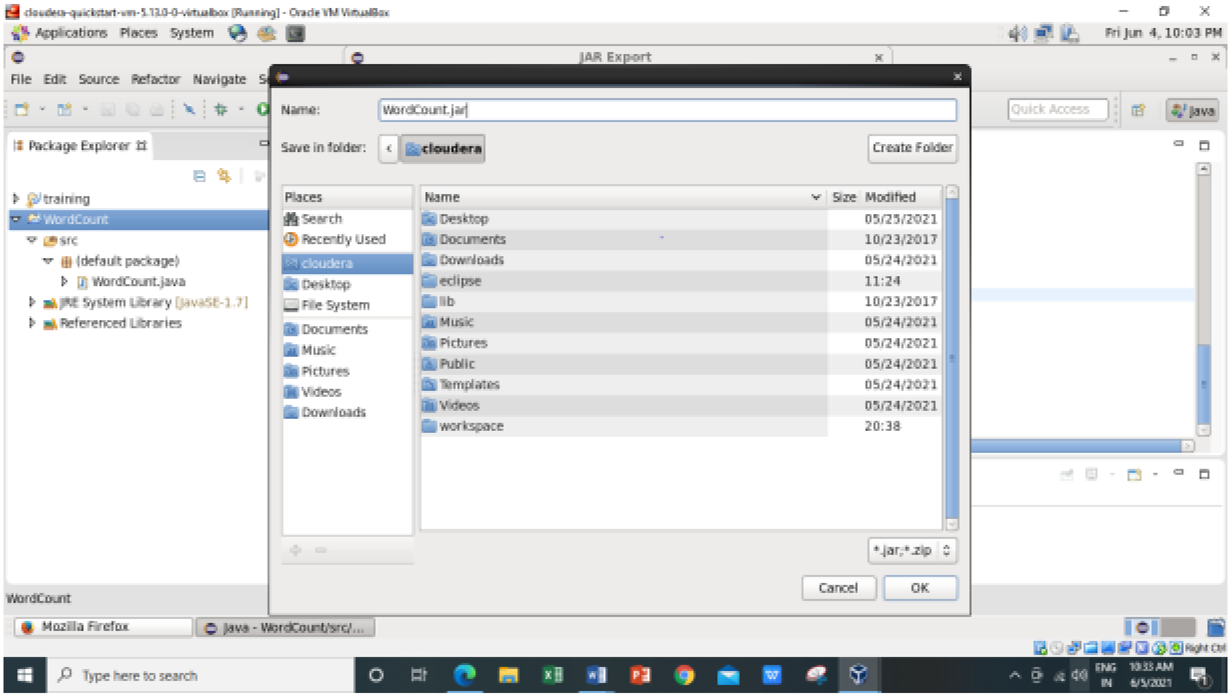
Export resources into a JAR file on the local file system.

Select an export destination:

type filter text

- General
- Install
- Java
  - JAR file
  - Javadoc
  - Runnable JAR file
- Run/Debug
- Tasks
- Team
- XML

< Back | Next > | Cancel | Finish



Name: WordCount.jar

Save in folder: cloudera

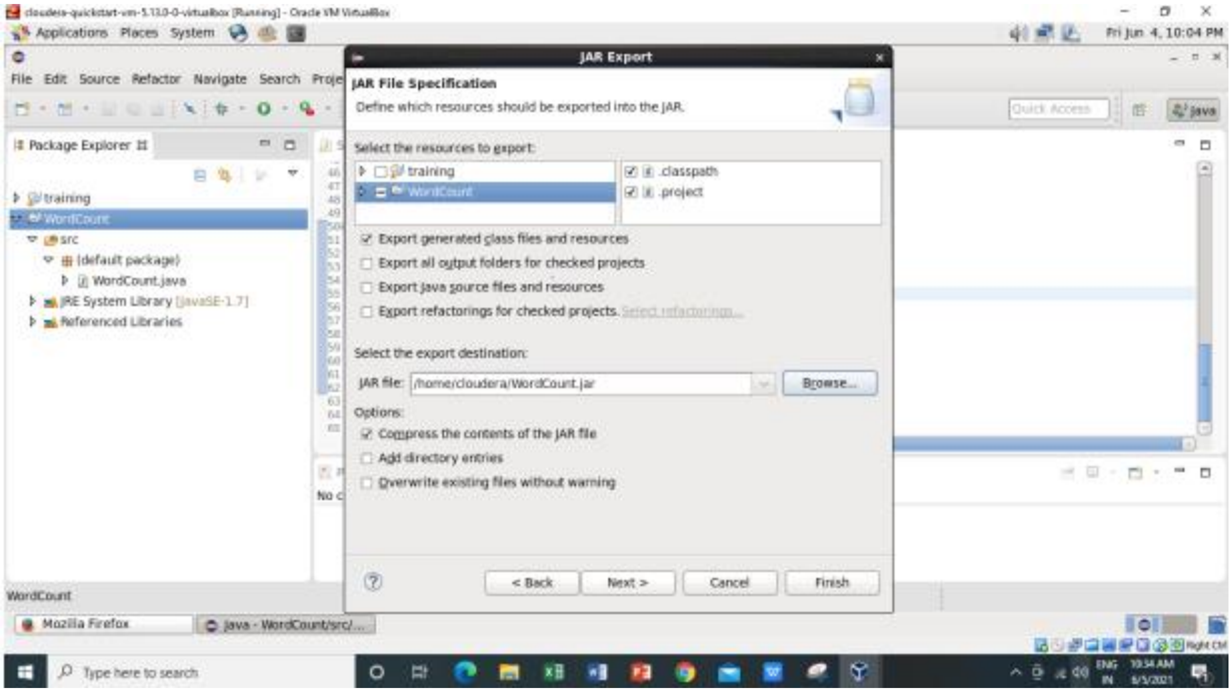
Create Folder

Places
- Search
- Recently Used
- cloudera
- Desktop
- File System
- Documents
- Music
- Pictures
- Videos
- Downloads

Name	Size	Modified
Desktop		05/25/2021
Documents		10/23/2017
Downloads		05/24/2021
eclipse		11:24
lib		10/23/2017
Music		05/24/2021
Pictures		05/24/2021
Public		05/24/2021
Templates		05/24/2021
Videos		05/24/2021
workspace		20:38

.jar;.zip

Cancel | OK



JAR File Specification

Define which resources should be exported into the JAR.

Select the resources to export:

- □ training
- ■ WordCount
- ☑ .classpath
- ☑ .project

☑ Export generated class files and resources

□ Export all output folders for checked projects

□ Export Java source files and resources

□ Export refactorings for checked projects. Select refactorings...

Select the export destination:

JAR file: /home/cloudera/WordCount.jar Browse...

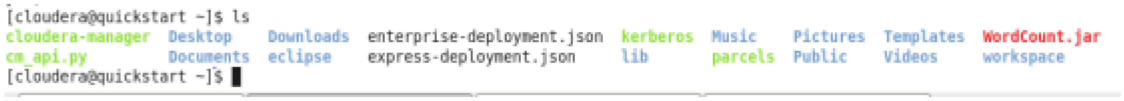
Options:

☑ Compress the contents of the JAR file

□ Add directory entries

□ Overwrite existing files without warning

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

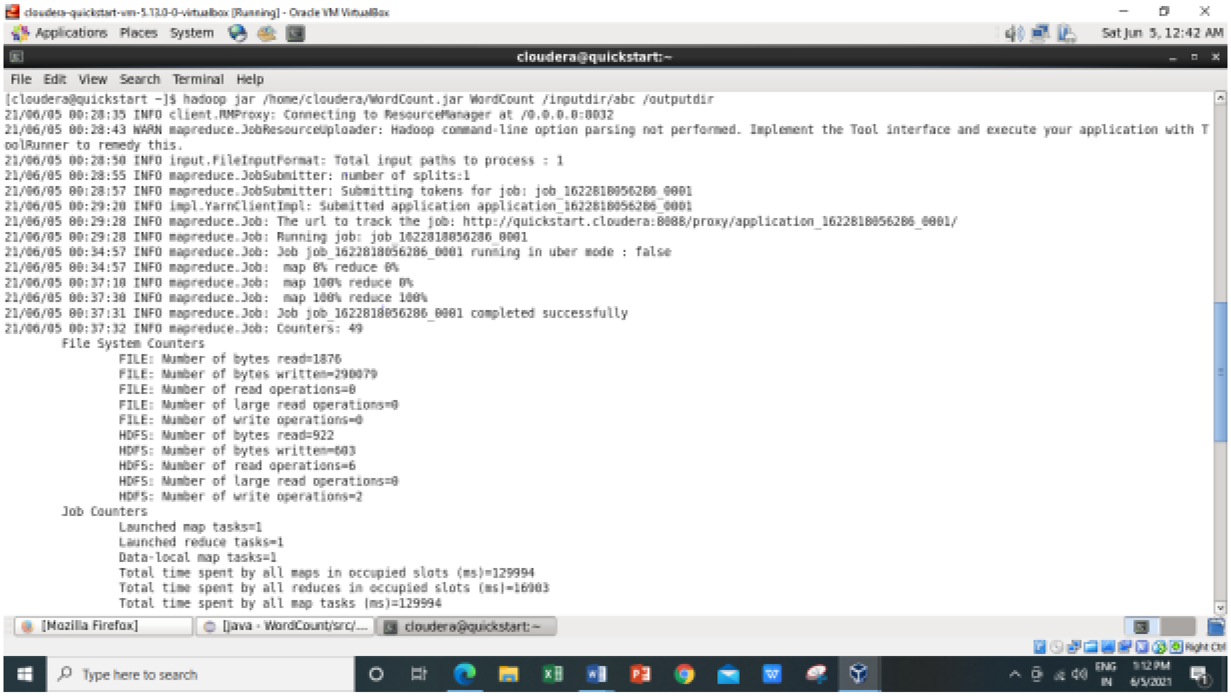


```
[cloudera@quickstart ~]$ ls
cloudera-manager  Desktop    Downloads  enterprise-deployment.json  kerberos  Music    Pictures  Templates  WordCount.jar
cm_api.py         Documents  eclipse    express-deployment.json     lib       parcels  Public    Videos     workspace
[cloudera@quickstart ~]$ █
```

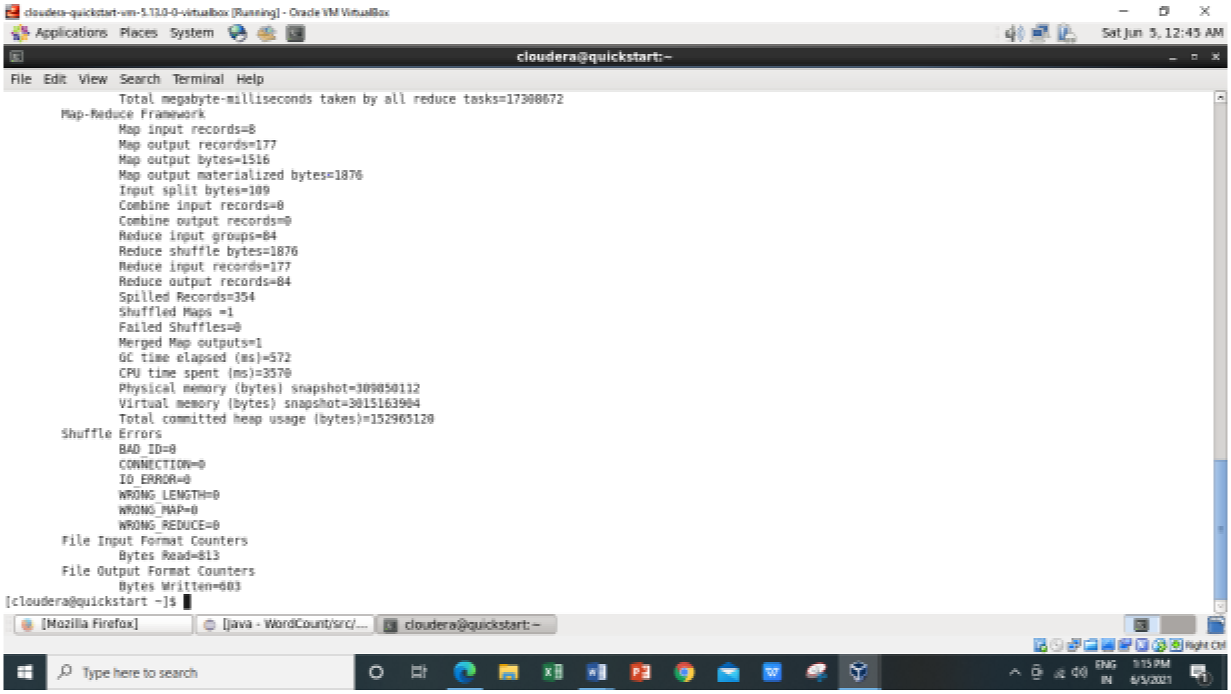
5) Running Mapreduce Program on Hadoop, syntax is hadoop jar jarFileName.jar ClassName /InputFileAddress /outputdir

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-vm-5.13.0-0-virtualbox [Running] - Oracle VM VirtualBox
Applications Places System
Sat Jun 5, 12:42 AM
cloudera@quickstart:~
File Edit View Search Terminal Help
[Mozilla Firefox]
[java - WordCount/src/...
cloudera@quickstart:~
Type here to search
ENG IN
1:12 PM 6/5/2021

```
[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 0% reduce 0%
21/06/05 00:37:10 INFO mapreduce.Job:  map 100% reduce 0%
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
```


cloudera-quickstart-vm-5.13.0-0-virtualbox [Running] - Oracle VM VirtualBox
Applications Places System
Sat Jun 5, 12:45 AM
cloudera@quickstart:~
File Edit View Search Terminal Help
[Mozilla Firefox]
[java - WordCount/src/...
cloudera@quickstart:~
Type here to search
ENG IN
1:15 PM 6/5/2021

```
                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 from above image the the combiner input and output records coming out as,

  Combine input records=0

  Combine output records=0

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

  Combine input records=132

Combine output records=88

- 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,

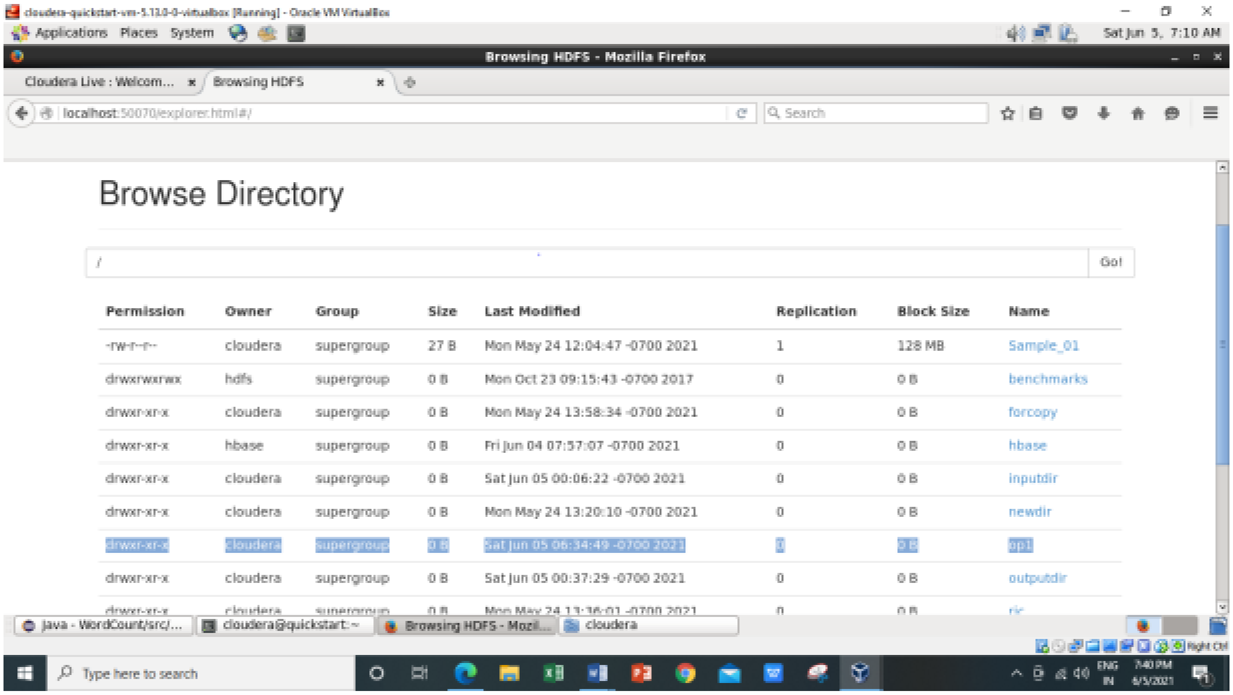
  Reduce shuffle bytes=1876

- 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.

Browse the Directory by

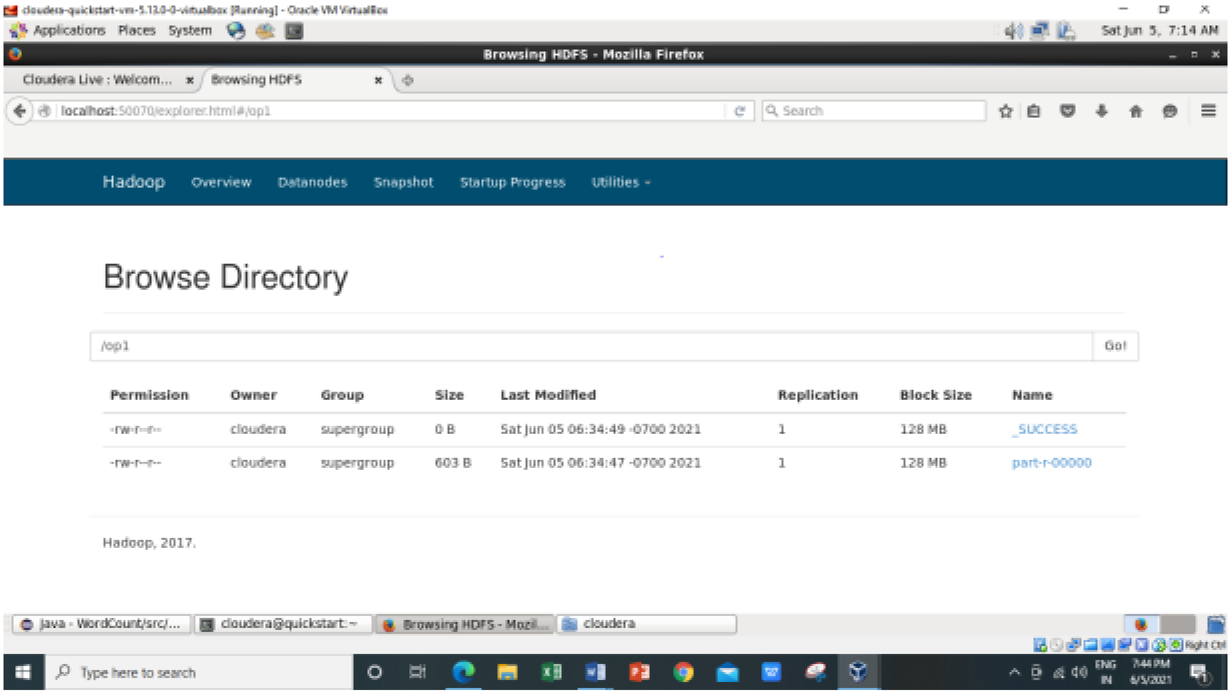
Hadoop->HDFS Namenode->Ultilities ->Browse the file system



Browse Directory

/ Go!

Permission	Owner	Group	Size	Last Modified	Replication	Block Size	Name
-rw-r--r--	cloudera	supergroup	27 B	Mon May 24 12:04:47 -0700 2021	1	128 MB	Sample_01
drwxrwxrwx	hdfs	supergroup	0 B	Mon Oct 23 09:15:43 -0700 2017	0	0 B	benchmarks
drwxr-xr-x	cloudera	supergroup	0 B	Mon May 24 13:58:34 -0700 2021	0	0 B	forcopy
drwxr-xr-x	hbase	supergroup	0 B	Fri Jun 04 07:57:07 -0700 2021	0	0 B	hbase
drwxr-xr-x	cloudera	supergroup	0 B	Sat Jun 05 00:06:22 -0700 2021	0	0 B	inputdir
drwxr-xr-x	cloudera	supergroup	0 B	Mon May 24 13:20:10 -0700 2021	0	0 B	newdir
drwxr-xr-x	cloudera	supergroup	0 B	Sat Jun 05 06:34:49 -0700 2021	0	0 B	op1
drwxr-xr-x	cloudera	supergroup	0 B	Sat Jun 05 00:37:29 -0700 2021	0	0 B	outputdir
drwxr-xr-x	cloudera	supergroup	0 B	Mon May 24 13:36:01 -0700 2021	0	0 B	ric


cloudera-quickstart-vm-5.13.0-0-virtualbox [Running] - Oracle VM VirtualBox
Applications Places System
Sat Jun 5, 7:14 AM
Browsing HDFS - Mozilla Firefox
Cloudera Live : Welcom...
Browsing HDFS
localhost:50070/explorer.html#/op1
Search
Hadoop Overview Datanodes Snapshot Startup Progress Utilities
Java - WordCount/src/...
cloudera@quickstart:~
Browsing HDFS - Mozil...
cloudera
Type here to search

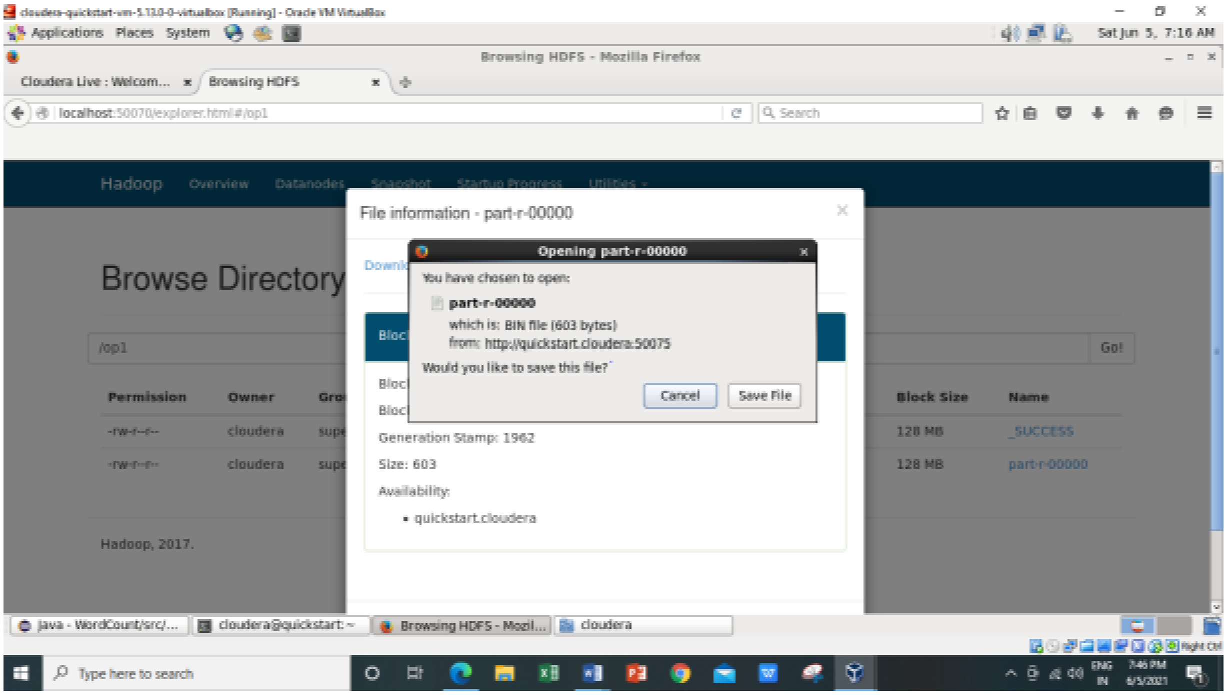
Browse Directory

/op1 Go!

Permission	Owner	Group	Size	Last Modified	Replication	Block Size	Name
-rw-r--r--	cloudera	supergroup	0 B	Sat Jun 05 06:34:49 -0700 2021	1	128 MB	_SUCCESS
-rw-r--r--	cloudera	supergroup	603 B	Sat Jun 05 06:34:47 -0700 2021	1	128 MB	part-r-00000

Hadoop, 2017.

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


cloudera-quickstart-vm-5.13.0-0-virtualbox [Running] - Oracle VM VirtualBox
Applications Places System
Sat Jun 5, 7:16 AM
Browsing HDFS - Mozilla Firefox
Cloudera Live : Welcom...
Browsing HDFS
localhost:50070/explorer.html#/op1
Search
Hadoop Overview Datanodes Snapshot Startup Progress Utilities
Browse Directory
/op1
Go!
Permission Owner Block Size Name
Java - WordCount/src/...
cloudera@quickstart:~
Browsing HDFS - Mozil...
cloudera
Type here to search

File information - part-r-00000

Opening part-r-00000

You have chosen to open:

part-r-00000

which is: BIN file (603 bytes)

from: http://quickstart.cloudera:50075

Would you like to save this file?

Cancel Save File

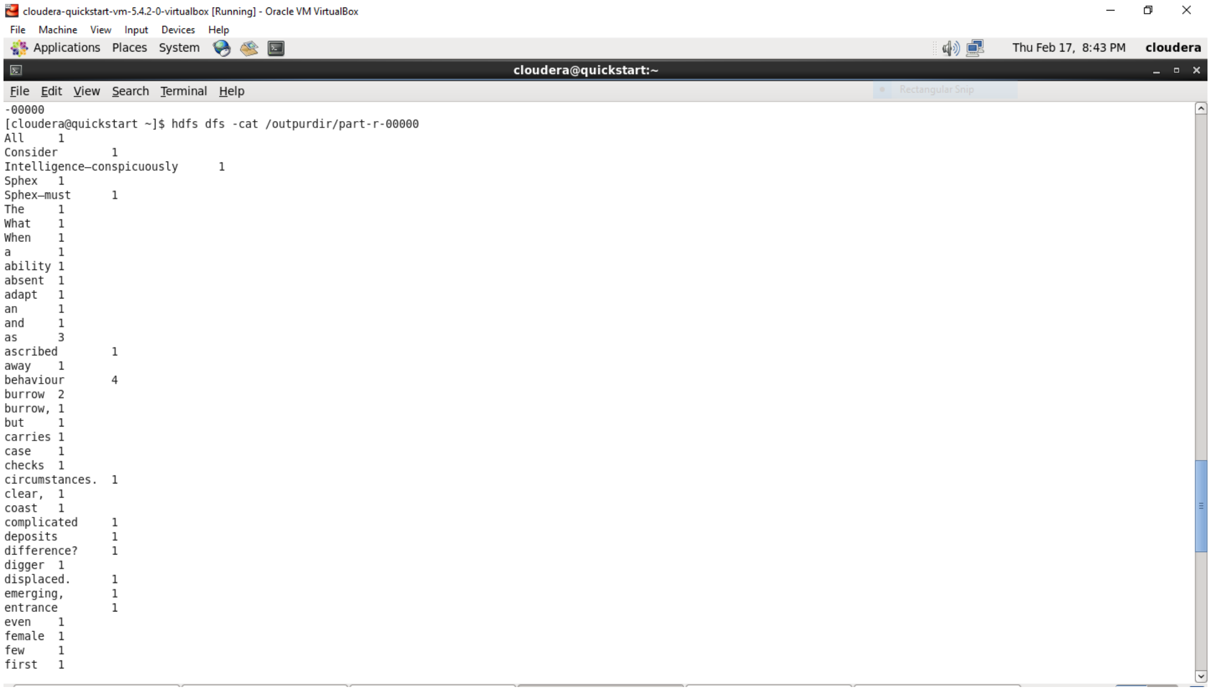
Generation Stamp: 1962

Size: 603

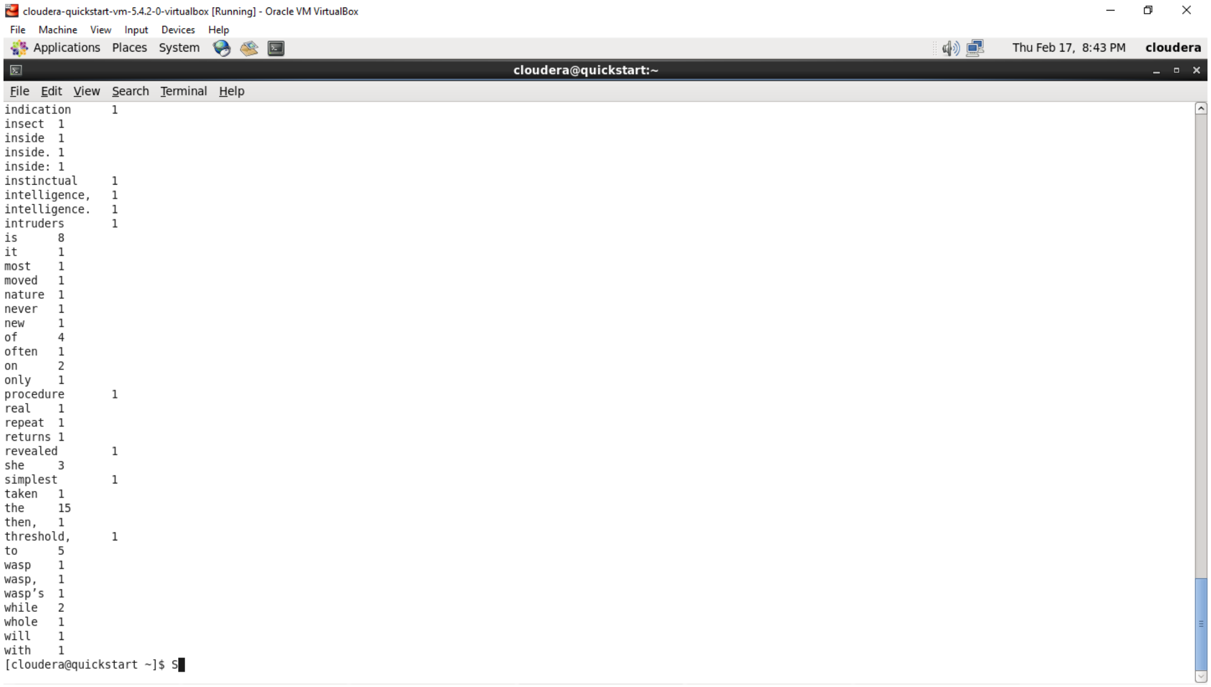
Availability:

- quickstart.cloudera

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**


cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 8:43 PM cloudera
cloudera@quickstart:~
File Edit View Search Terminal Help

```
-00000
[cloudera@quickstart ~]$ hdfs dfs -cat /outpurdir/part-r-00000
All     1
Consider        1
Intelligence—conspicuously      1
Sphex   1
Sphex—must      1
The     1
What    1
When    1
a       1
ability 1
absent  1
adapt   1
an      1
and     1
as      3
ascribed        1
away    1
behaviour       4
burrow  2
burrow, 1
but     1
carries 1
case    1
checks  1
circumstances.  1
clear,  1
coast   1
complicated     1
deposits        1
difference?     1
digger  1
displaced.      1
emerging,       1
entrance        1
even    1
female  1
few     1
first   1
```


cloudera-quickstart-vm-5.4.2-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Thu Feb 17, 8:43 PM cloudera
cloudera@quickstart:~
File Edit View Search Terminal Help

```
indication      1
insect  1
inside  1
inside. 1
inside: 1
instinctual     1
intelligence,   1
intelligence.   1
intruders       1
is      8
it      1
most    1
moved   1
nature  1
never   1
new     1
of      4
often   1
on      2
only    1
procedure       1
real    1
repeat  1
returns 1
revealed        1
she     3
simplest        1
taken   1
the     15
then,   1
threshold,      1
to      5
wasp    1
wasp,   1
wasp’s  1
while   2
whole   1
will    1
with    1
[cloudera@quickstart ~]$ S
```