Ex.No: 8 Install Hadoop single node cluster and run simple applications like wordcount

AIM :-

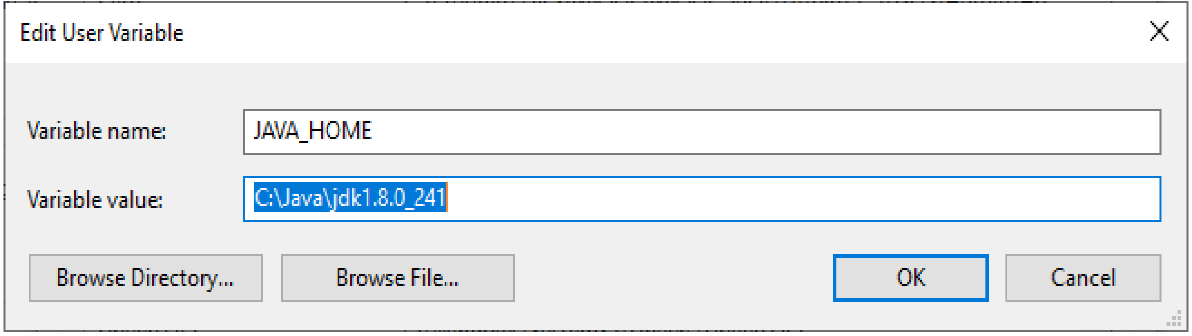
To Install hadoop single node cluster and run simple application like wordcout.

PROCEDURE :-

1. Install Java
2. Configure and install hadoop
3. Test hadoop installation
4. Create wordcount program
5. Input file to mapreduce
6. Display the output

I. JAVA Installation

1. Go to official Java Downloading page https://www.oracle.com/java/technologies/javase-jre8-downloads.html
2. After downloading java, run the **jdk-8u241-windows-x64.exe** file
3. Follow the instructions and click next.
4. After finishing the installation it is need to set Java environment variable
5. Go to Start->Edit the System environment variable->Environment variable
6. Then Click new and enter variable name as “JAVA_HOME”
7. In the value field Enter the java path such as “C:\Java\jdk1.8.0_241”(Consider your installation folder)

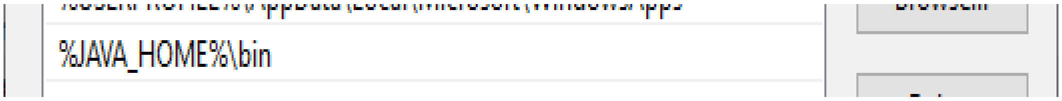


Edit User Variable

Variable name: JAVA_HOME

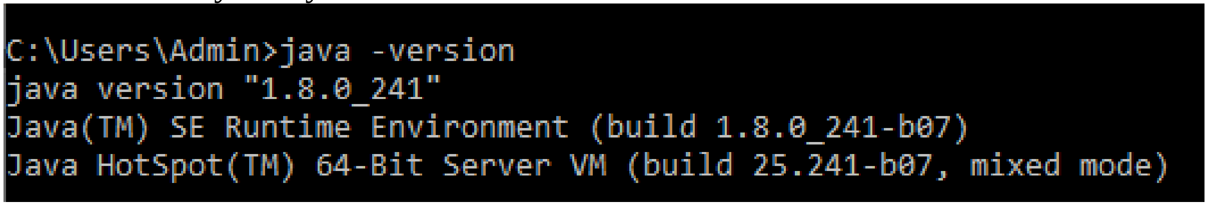
Variable value: C:\Java\jdk1.8.0_241

8. Go to path and click edit then type “%JAVA_HOME%\bin”



%JAVA_HOME%\bin

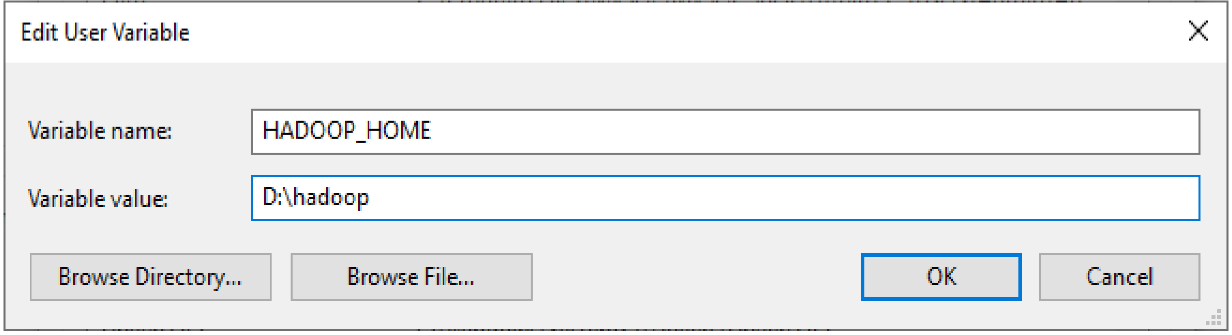
9. Then click Ok and Go to Command Prompt
10. Type “Java -version”. If it prints the installed version of java, now java successfully installed in your System.



```
C:\Users\Admin>java -version
java version "1.8.0_241"
Java(TM) SE Runtime Environment (build 1.8.0_241-b07)
Java HotSpot(TM) 64-Bit Server VM (build 25.241-b07, mixed mode)
```

II. Configuring And Installing Hadoop

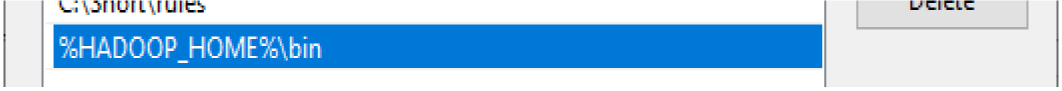
1. Download Hadoop 2.8.0 from http://wwweu.apache.org/dist/hadoop/common/hadoop-2.8.0/hadoop-2.8.0.tar.gz OR http://archive.apache.org/dist/hadoop/core//hadoop-2.8.0/hadoop- 2.8.0.tar.gz)
2. Extract the tar file (in my case I used **7-zip** to extract the file and I stored the extracted file in the **D:\hadoop**)
3. After finishing the extraction it is need to set Hadoop environment variable
4. Go to Start->Edit the System environment variable->Environment variable
5. Then Click new and enter variable name as "HADOOP_HOME"
6. In the value field Enter the java path such as "D:\hadoop"(Consider your installation folder)


Edit User Variable

Variable name: HADOOP_HOME

Variable value: D:\hadoop

7. Go to path and click edit then type "%HADOOP_HOME%\bin"


C:\Short\rules

%HADOOP_HOME%\bin

8. Now we have to configure the hadoop.
9. Go to D:/hadoop/etc/hadoop/.. folder, find the below mentioned files and paste the following.

i. core-site.xml

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

ii. Rename "**mapred-site.xml.template**" to "**mapred-site.xml**" and edit this file D:/Hadoop/etc/hadoop/mapred-site.xml, paste below xml paragraph and save this file.

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

iii. Create folder "**data**" under "D:\Hadoop"
1) Create folder "datanode" under "D:\Hadoop\data"
2) Create folder "namenode" under "D:\Hadoop\data" data

iv. **hdfs-site.xml**

```
<configuration>
<property>
 <name>dfs.replication</name>
 <value>1</value>
 </property>
 <property>
 <name>dfs.namenode.name.dir</name>
 <value>D:\hadoop\data\namenode</value>
 </property>
 <property>
 <name>dfs.datanode.data.dir</name>
 <value>D:\hadoop\data\datanode</value>
 </property>
 </configuration>
```

v. **yarn-site.xml**

```
 <configuration>
 <property>
 <name>yarn.nodemanager.aux-services</name>
 <value>mapreduce_shuffle</value>
 </property>
 <property>
 <name>yarn.nodemanager.auxservices.mapreduce.shuffle.class</name>
 <value>org.apache.hadoop.mapred.ShuffleHandler</value>
 </property>
 </configuration>
```

vi. Edit file D:\Hadoop\etc\hadoop\hadoop-env.cmd by closing the command line "JAVA_HOME=%JAVA_HOME%" instead of set "JAVA_HOME= C:\Java\jdk1.8.0_241"

(if your java file in Program Files the instead of give **Progra~1** otherwise you will get JAVA_HOME incorrectly set error)

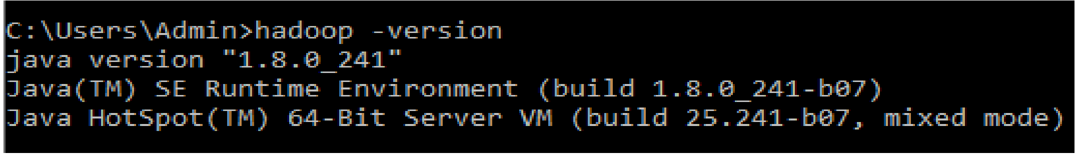
vii. Download file Hadoop Configuration.zip (Link: https://github.com/Prithiviraj2503/hadoop-installation-windows)

viii. Delete file bin on D:\Hadoop\bin, replaced by file bin on file just download (from Hadoop Configuration.zip).

ix. Open cmd and typing command "**hdfs namenode –format**" .You will see hdfs namenode –format

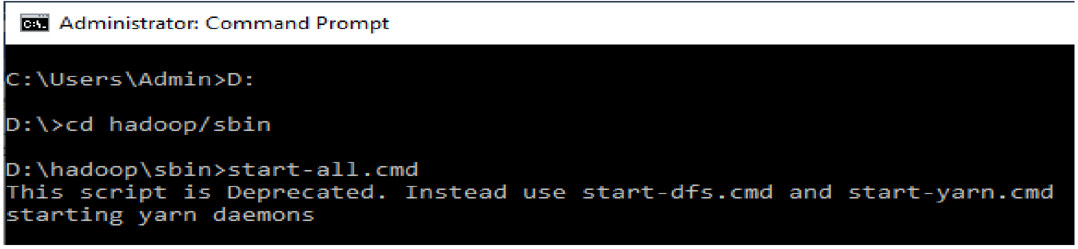
III. Testing Hadoop Installation

1. Open Cmd and type the following “Hadoop -version”



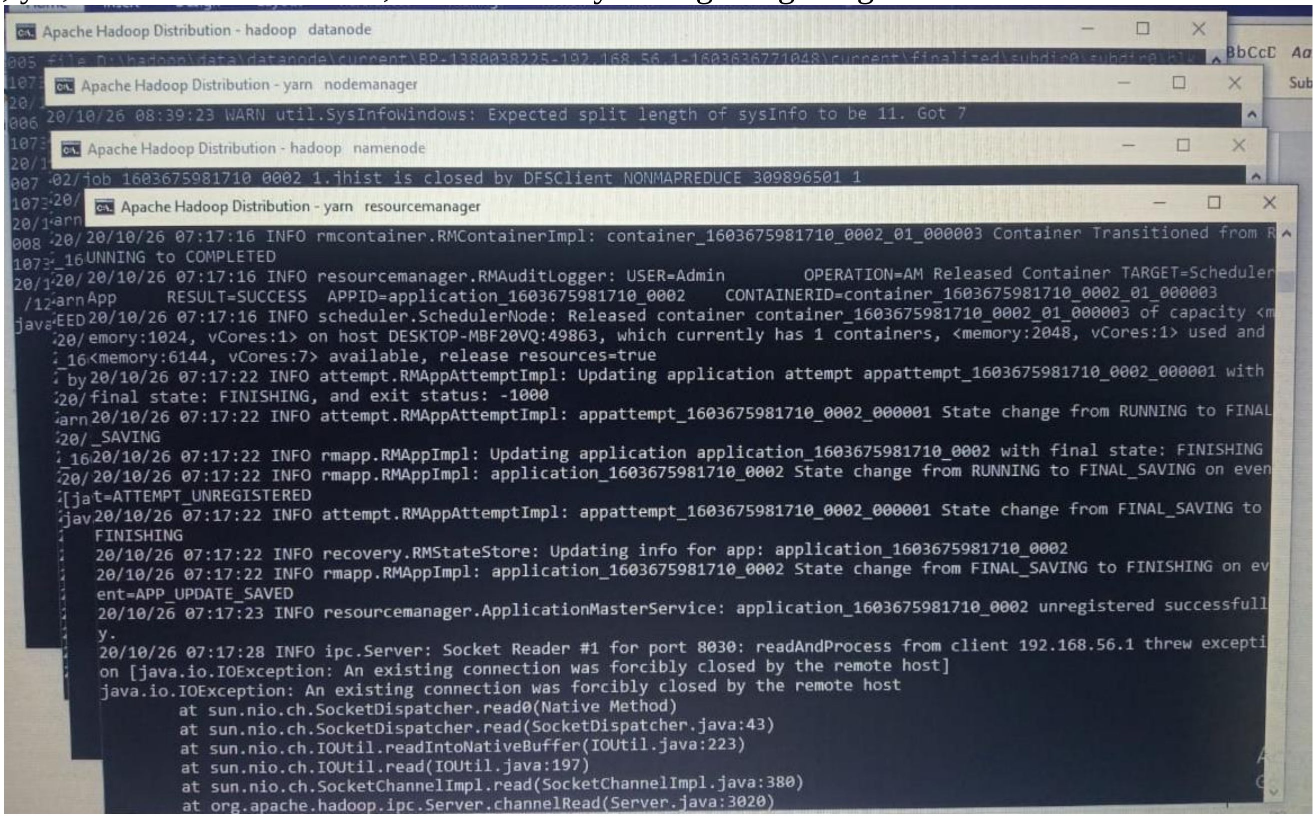
```
C:\Users\Admin>hadoop -version
java version "1.8.0_241"
Java(TM) SE Runtime Environment (build 1.8.0_241-b07)
Java HotSpot(TM) 64-Bit Server VM (build 25.241-b07, mixed mode)
```

2. To start the hadoop locate to “D:\hadoop\sbin” via command prompt and press start-all.cmd



```
C:\Users\Admin>D:

D:\>cd hadoop/sbin

D:\hadoop\sbin>start-all.cmd
This script is Deprecated. Instead use start-dfs.cmd and start-yarn.cmd
starting yarn daemons
```

Now, you can see the namenode, datanode and yarn engines getting start



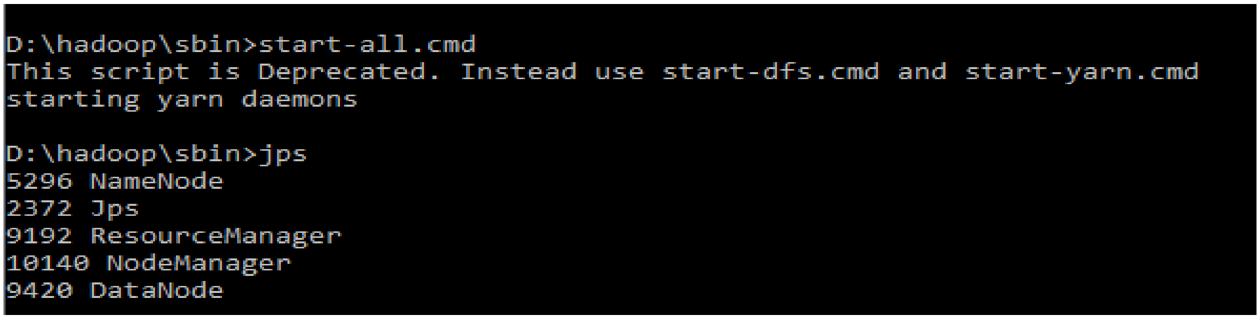
Apache Hadoop Distribution - hadoop datanode
Apache Hadoop Distribution - yarn nodemanager
Apache Hadoop Distribution - hadoop namenode
Apache Hadoop Distribution - yarn resourcemanager

```
20/10/26 08:39:23 WARN util.SysInfoWindows: Expected split length of sysInfo to be 11. Got 7
```

```
02/job_1603675981710_0002_1.jhist is closed by DFSClient_NONMAPREDUCE_309896501_1
```

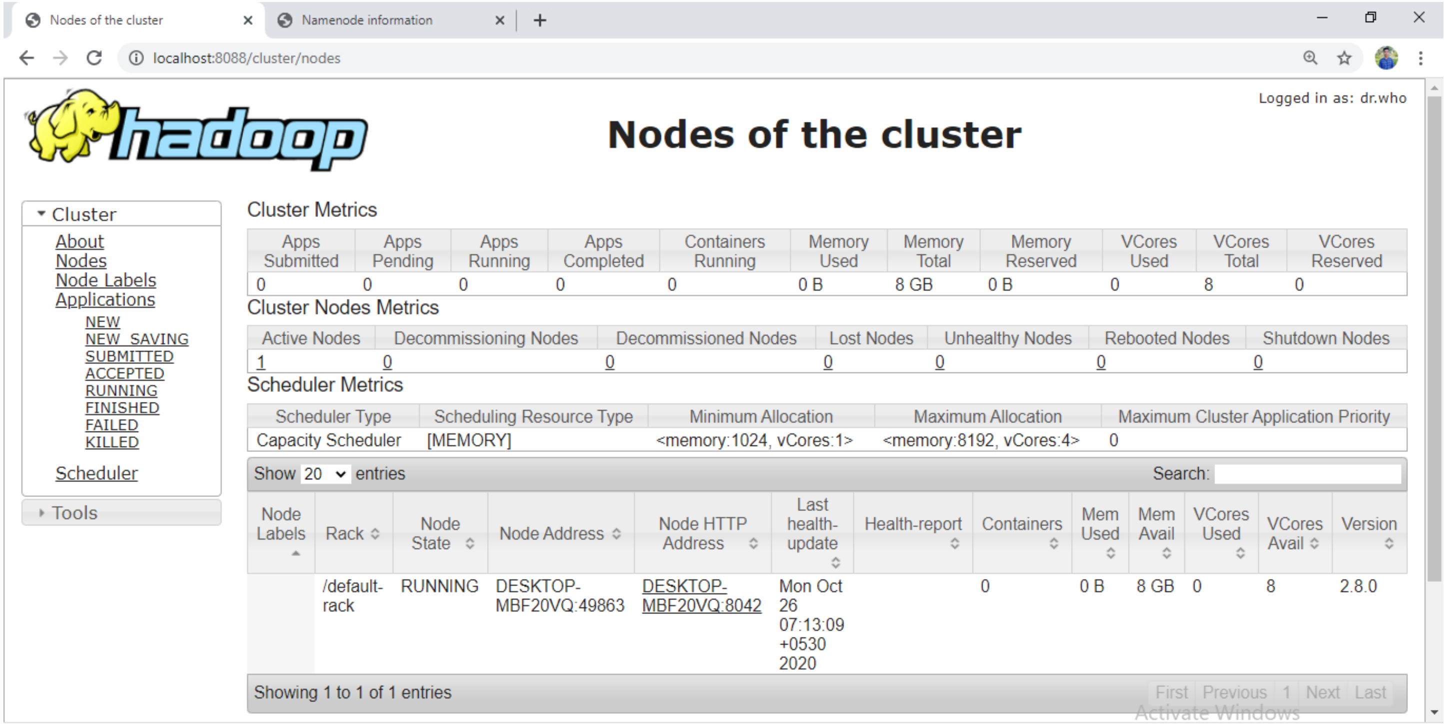
```
20/10/26 07:17:16 INFO rmcontainer.RMContainerImpl: container_1603675981710_0002_01_000003 Container Transitioned from R
UNNING to COMPLETED
20/10/26 07:17:16 INFO resourcemanager.RMAuditLogger: USER=Admin        OPERATION=AM Released Container TARGET=Scheduler
App     RESULT=SUCCESS  APPID=application_1603675981710_0002    CONTAINERID=container_1603675981710_0002_01_000003
20/10/26 07:17:16 INFO scheduler.SchedulerNode: Released container container_1603675981710_0002_01_000003 of capacity <m
emory:1024, vCores:1> on host DESKTOP-MBF20VQ:49863, which currently has 1 containers, <memory:2048, vCores:1> used and
<memory:6144, vCores:7> available, release resources=true
20/10/26 07:17:22 INFO attempt.RMAppAttemptImpl: Updating application attempt appattempt_1603675981710_0002_000001 with
final state: FINISHING, and exit status: -1000
20/10/26 07:17:22 INFO attempt.RMAppAttemptImpl: appattempt_1603675981710_0002_000001 State change from RUNNING to FINAL
_SAVING
20/10/26 07:17:22 INFO rmapp.RMAppImpl: Updating application application_1603675981710_0002 with final state: FINISHING
20/10/26 07:17:22 INFO rmapp.RMAppImpl: application_1603675981710_0002 State change from RUNNING to FINAL_SAVING on even
t=ATTEMPT_UNREGISTERED
20/10/26 07:17:22 INFO attempt.RMAppAttemptImpl: appattempt_1603675981710_0002_000001 State change from FINAL_SAVING to
FINISHING
20/10/26 07:17:22 INFO recovery.RMStateStore: Updating info for app: application_1603675981710_0002
20/10/26 07:17:22 INFO rmapp.RMAppImpl: application_1603675981710_0002 State change from FINAL_SAVING to FINISHING on ev
ent=APP_UPDATE_SAVED
20/10/26 07:17:23 INFO resourcemanager.ApplicationMasterService: application_1603675981710_0002 unregistered successfull
y.
20/10/26 07:17:28 INFO ipc.Server: Socket Reader #1 for port 8030: readAndProcess from client 192.168.56.1 threw excepti
on [java.io.IOException: An existing connection was forcibly closed by the remote host]
java.io.IOException: An existing connection was forcibly closed by the remote host
        at sun.nio.ch.SocketDispatcher.read0(Native Method)
        at sun.nio.ch.SocketDispatcher.read(SocketDispatcher.java:43)
        at sun.nio.ch.IOUtil.readIntoNativeBuffer(IOUtil.java:223)
        at sun.nio.ch.IOUtil.read(IOUtil.java:197)
        at sun.nio.ch.SocketChannelImpl.read(SocketChannelImpl.java:380)
        at org.apache.hadoop.ipc.Server.channelRead(Server.java:3020)
```

3. Now type “**jps**”. **JPS** (Java Virtual Machine Process Status Tool) is a command is used to check all the **Hadoop** daemons like NameNode, DataNode, ResourceManager, NodeManager etc.



```
D:\hadoop\sbin>start-all.cmd
This script is Deprecated. Instead use start-dfs.cmd and start-yarn.cmd
starting yarn daemons

D:\hadoop\sbin>jps
5296 NameNode
2372 Jps
9192 ResourceManager
10140 NodeManager
9420 DataNode
```

4. Open: http://localhost:8088 in any browser



Nodes of the cluster

Cluster Metrics

Apps Submitted	Apps Pending	Apps Running	Apps Completed	Containers Running	Memory Used	Memory Total	Memory Reserved	VCores Used	VCores Total	VCores Reserved
0	0	0	0	0	0 B	8 GB	0 B	0	8	0

Cluster Nodes Metrics

Active Nodes	Decommissioning Nodes	Decommissioned Nodes	Lost Nodes	Unhealthy Nodes	Rebooted Nodes	Shutdown Nodes
1	0	0	0	0	0	0

Scheduler Metrics

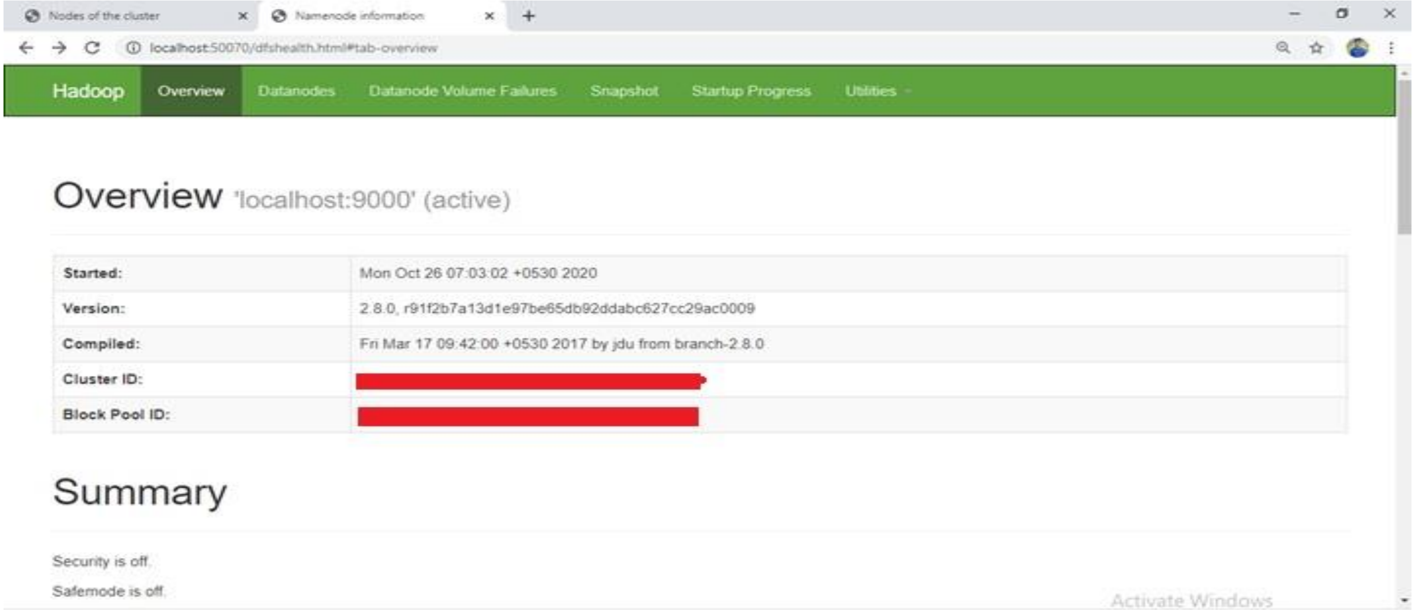
Scheduler Type	Scheduling Resource Type	Minimum Allocation	Maximum Allocation	Maximum Cluster Application Priority
Capacity Scheduler	[MEMORY]	<memory:1024, vCores:1>	<memory:8192, vCores:4>	0

Show 20 entries Search:

Node Labels	Rack	Node State	Node Address	Node HTTP Address	Last health-update	Health-report	Containers	Mem Used	Mem Avail	VCores Used	VCores Avail	Version
	/default-rack	RUNNING	DESKTOP-MBF20VQ:49863	DESKTOP-MBF20VQ:8042	Mon Oct 26 07:13:09 +0530 2020		0	0 B	8 GB	0	8	2.8.0

Showing 1 to 1 of 1 entries

5. Open: http://localhost:50070 in any browser



Overview 'localhost:9000' (active)

Started:	Mon Oct 26 07:03:02 +0530 2020
Version:	2.8.0, r91f2b7a13d1e97be65db92ddabc627cc29ac0009
Compiled:	Fri Mar 17 09:42:00 +0530 2017 by jdu from branch-2.8.0
Cluster ID:	[redacted]
Block Pool ID:	[redacted]

Summary

Security is off.

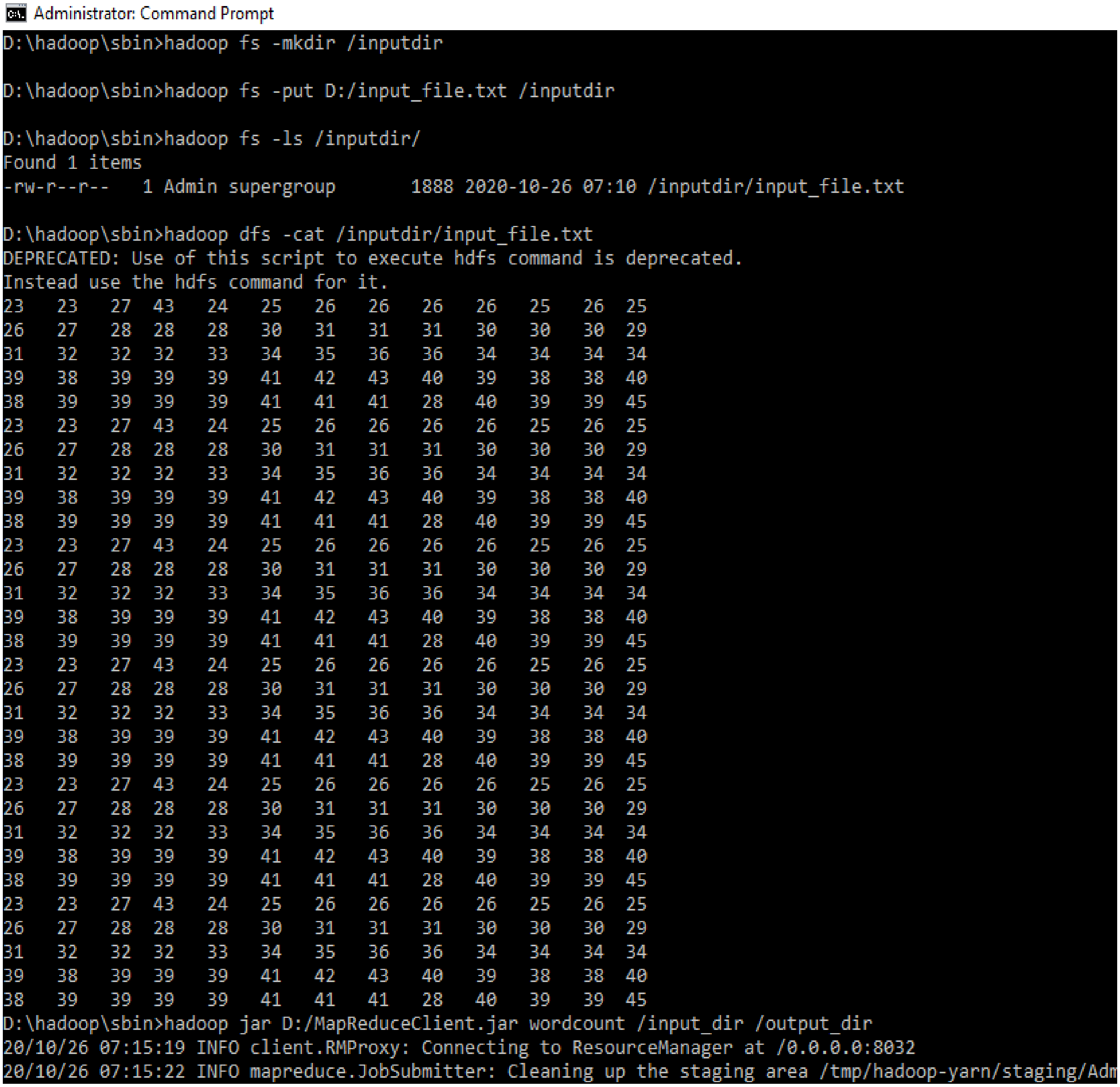
Safemode is off.

Now hadoop succesfully installed in your System.

IV. Simple WordCount Program

1) After successful hadoop installation we need to create an directory in the hadoop file system
2) Start the hadoop via command prompt **$ start-all.cmd**
3) By using **$jps** command Ensure hadoop nodes are running
4) To create a directory, use: **$ hadoop fs –mkdir /inputdir**
5) To input a file within a directory, use: **$ hadoop fs –put D:/input_file.txt/inputdir**
6) To ensure wether your file succesfully imported, use: **$ hadoop fs –ls /inputdir/**
7) To view the content of the file, use: **$ hadoop dfs –cat /inputdir/input_file.txt**

Link for input file : https://github.com/Prithiviraj2503/hadoop-installation-windows

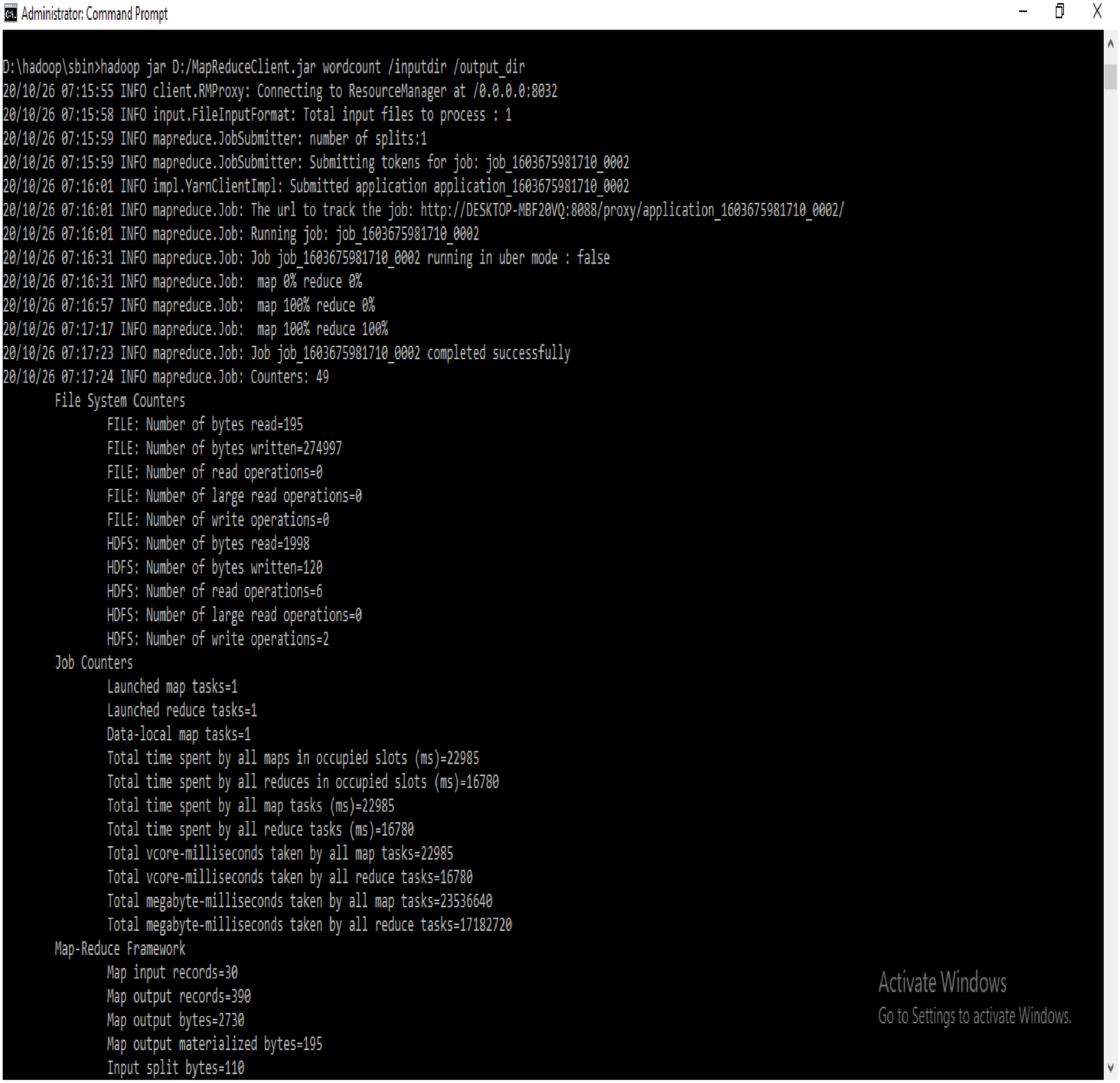


```
D:\hadoop\sbin>hadoop fs -mkdir /inputdir

D:\hadoop\sbin>hadoop fs -put D:/input_file.txt /inputdir

D:\hadoop\sbin>hadoop fs -ls /inputdir/
Found 1 items
-rw-r--r--   1 Admin supergroup       1888 2020-10-26 07:10 /inputdir/input_file.txt

D:\hadoop\sbin>hadoop dfs -cat /inputdir/input_file.txt
DEPRECATED: Use of this script to execute hdfs command is deprecated.
Instead use the hdfs command for it.
23    23  27  43   24   25   26   26   26   26   25   26  25
26    27  28  28   28   30   31   31   31   30   30   30  29
31    32  32  32   33   34   35   36   36   34   34   34  34
39    38  39  39   39   41   42   43   40   39   38   38  40
38    39  39  39   39   41   41   41   28   40   39   39  45
23    23  27  43   24   25   26   26   26   26   25   26  25
26    27  28  28   28   30   31   31   31   30   30   30  29
31    32  32  32   33   34   35   36   36   34   34   34  34
39    38  39  39   39   41   42   43   40   39   38   38  40
38    39  39  39   39   41   41   41   28   40   39   39  45
23    23  27  43   24   25   26   26   26   26   25   26  25
26    27  28  28   28   30   31   31   31   30   30   30  29
31    32  32  32   33   34   35   36   36   34   34   34  34
39    38  39  39   39   41   42   43   40   39   38   38  40
38    39  39  39   39   41   41   41   28   40   39   39  45
23    23  27  43   24   25   26   26   26   26   25   26  25
26    27  28  28   28   30   31   31   31   30   30   30  29
31    32  32  32   33   34   35   36   36   34   34   34  34
39    38  39  39   39   41   42   43   40   39   38   38  40
38    39  39  39   39   41   41   41   28   40   39   39  45
23    23  27  43   24   25   26   26   26   26   25   26  25
26    27  28  28   28   30   31   31   31   30   30   30  29
31    32  32  32   33   34   35   36   36   34   34   34  34
39    38  39  39   39   41   42   43   40   39   38   38  40
38    39  39  39   39   41   41   41   28   40   39   39  45
23    23  27  43   24   25   26   26   26   26   25   26  25
26    27  28  28   28   30   31   31   31   30   30   30  29
31    32  32  32   33   34   35   36   36   34   34   34  34
39    38  39  39   39   41   42   43   40   39   38   38  40
38    39  39  39   39   41   41   41   28   40   39   39  45
D:\hadoop\sbin>hadoop jar D:/MapReduceClient.jar wordcount /input_dir /output_dir
20/10/26 07:15:19 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0:8032
20/10/26 07:15:22 INFO mapreduce.JobSubmitter: Cleaning up the staging area /tmp/hadoop-yarn/staging/Adm
```

8) Now appy mapreduce program to the input file. We have a **mapReduceClient.jar** which contain java mapper and reducer programs.
you can download the .jar from :

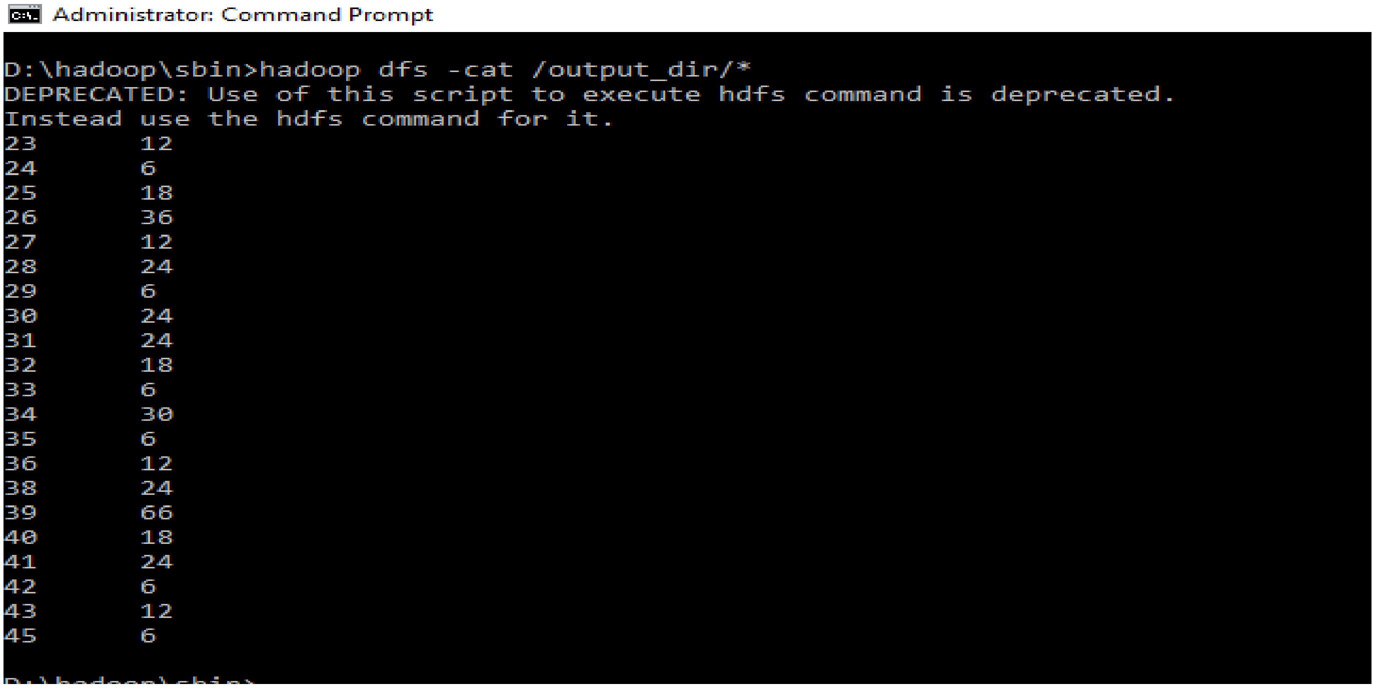
After applying the jar file you can see the task performed in the mapreduce phase.
All the resuts of completed tasks will be printed in the command prompt.

Link for mapReduceClient.jar : https://github.com/Prithiviraj2503/hadoop-installation-windows


Administrator: Command Prompt
Activate Windows
Go to Settings to activate Windows.

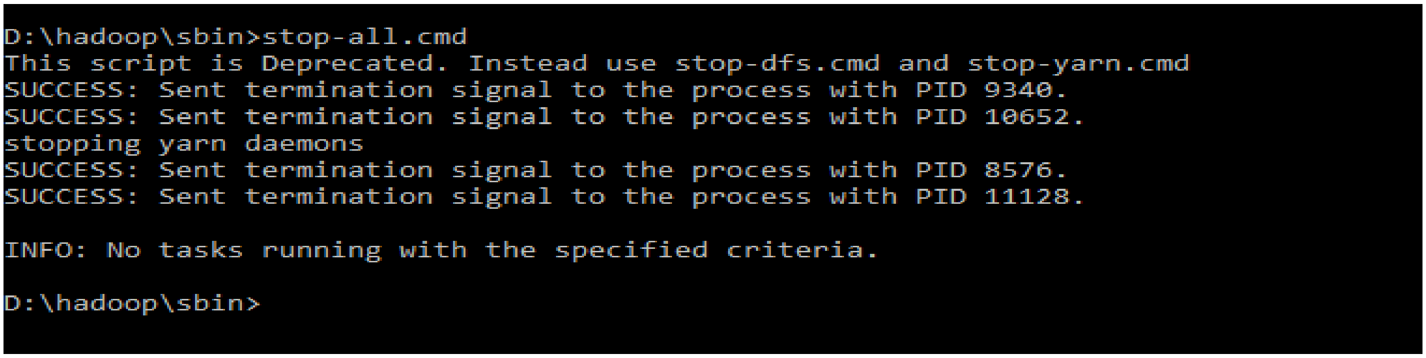
```
D:\hadoop\sbin>hadoop jar D:/MapReduceClient.jar wordcount /inputdir /output_dir
20/10/26 07:15:55 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0:8032
20/10/26 07:15:58 INFO input.FileInputFormat: Total input files to process : 1
20/10/26 07:15:59 INFO mapreduce.JobSubmitter: number of splits:1
20/10/26 07:15:59 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1603675981710_0002
20/10/26 07:16:01 INFO impl.YarnClientImpl: Submitted application application_1603675981710_0002
20/10/26 07:16:01 INFO mapreduce.Job: The url to track the job: http://DESKTOP-MBF20VQ:8088/proxy/application_1603675981710_0002/
20/10/26 07:16:01 INFO mapreduce.Job: Running job: job_1603675981710_0002
20/10/26 07:16:31 INFO mapreduce.Job: Job job_1603675981710_0002 running in uber mode : false
20/10/26 07:16:31 INFO mapreduce.Job:  map 0% reduce 0%
20/10/26 07:16:57 INFO mapreduce.Job:  map 100% reduce 0%
20/10/26 07:17:17 INFO mapreduce.Job:  map 100% reduce 100%
20/10/26 07:17:23 INFO mapreduce.Job: Job job_1603675981710_0002 completed successfully
20/10/26 07:17:24 INFO mapreduce.Job: Counters: 49
        File System Counters
                FILE: Number of bytes read=195
                FILE: Number of bytes written=274997
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=1998
                HDFS: Number of bytes written=120
                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)=22985
                Total time spent by all reduces in occupied slots (ms)=16780
                Total time spent by all map tasks (ms)=22985
                Total time spent by all reduce tasks (ms)=16780
                Total vcore-milliseconds taken by all map tasks=22985
                Total vcore-milliseconds taken by all reduce tasks=16780
                Total megabyte-milliseconds taken by all map tasks=23536640
                Total megabyte-milliseconds taken by all reduce tasks=17182720
        Map-Reduce Framework
                Map input records=30
                Map output records=390
                Map output bytes=2730
                Map output materialized bytes=195
                Input split bytes=110
```

9) After completed the mapreduce tasks the output will be stored in the **output_dir** directory
To see the output, use: **$ hadoop dfs –cat /output_dir**/



```
D:\hadoop\sbin>hadoop dfs -cat /output_dir/*
DEPRECATED: Use of this script to execute hdfs command is deprecated.
Instead use the hdfs command for it.
23      12
24      6
25      18
26      36
27      12
28      24
29      6
30      24
31      24
32      18
33      6
34      30
35      6
36      12
38      24
39      66
40      18
41      24
42      6
43      12
45      6

D:\hadoop\sbin>
```

10) To stop the hadoop type **$stop-all.cmd**



```
D:\hadoop\sbin>stop-all.cmd
This script is Deprecated. Instead use stop-dfs.cmd and stop-yarn.cmd
SUCCESS: Sent termination signal to the process with PID 9340.
SUCCESS: Sent termination signal to the process with PID 10652.
stopping yarn daemons
SUCCESS: Sent termination signal to the process with PID 8576.
SUCCESS: Sent termination signal to the process with PID 11128.

INFO: No tasks running with the specified criteria.

D:\hadoop\sbin>
```

RESULT :-

The hadoop single node cluster was installed succesfully and the simple word count program were executed succesfully and the output is verified.