VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT

on

BIG DATA ANALYTICS

Submitted by

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in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

B.M.S. COLLEGE OF ENGINEERING

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B. M. S. College of Engineering,

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(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "LAB COURSE **BIG DATA ANALYTICS**" carried out by **Gagandeep Kattennanavar (1BM21CS064),** who is bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2024. The Lab report has been approved as it satisfies the academic requirements in respect of a **BIG DATA ANALYTICS - (22CS6PEBDA)** work prescribed for the said degree.

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Index Sheet

8	**For a given Text file, create a Map Reduce program to sort the content in an alphabetic order listing only top 10 maximum occurrences of words.**	**24 - 29**

Course Outcome

CO1	Apply the concepts of NoSQL, Hadoop, Spark for a given task
CO2	Analyse data analytic techniques for a given problem
CO3	Conduct experiments using data analytics mechanisms for a given problem.

Program 1

Perform the following DB operations using Cassandra.

1. Create a keyspace by name Employee

2. Create a column family by name Employee-Info with attributes Emp_Id Primary Key, Emp_Name,

Designation, Date_of_Joining, Salary, Dept_Name

3. Insert the values into the table in batch

4. Update Employee name and Department of Emp-Id 121

5. Sort the details of Employee records based on salary

6. Alter the schema of the table Employee_Info to add a column Projects which stores a set of Projects done by the corresponding Employee.

7. Update the altered table to add project names.

8. Create a TTL of 15 seconds to display the values of Employees.

1. Create a keyspace by name Employee

```
CREATE KEYSPACE Employee WITH replication = {'class': 'SimpleStrategy',
'replication_factor': 1};
```

2. Create a column family by name Employee-Info

```
CREATE TABLE Employee.Employee_Info (
```

```
Emp_Id int PRIMARY KEY,
Emp_Name text,
Designation text,
Date_of_Joining date,
Salary decimal,
Dept_Name text
);
```

3. Insert the values into the table in batch

```
BEGIN BATCH
INSERT INTO Employee.Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name) VALUES (121, 'John Doe', 'Software Engineer', '2022-01-15', 70000.00, 'IT');
```



```
INSERT INTO Employee.Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name) VALUES (122, 'Jane Smith', 'Data Scientist', '2021-05-20', 80000.00, 'Data Science');
INSERT INTO Employee.Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name) VALUES (123, 'Alice Johnson', 'Project Manager', '2020-07-18', 90000.00, 'Management');
APPLY BATCH;
```

4. Update Employee name and Department of Emp-Id 121

```
UPDATE Employee.Employee_Info SET Emp_Name = 'Johnathon Doe', Dept_Name = 'Software Development' WHERE Emp_Id = 121;
```

5. Sort the details of Employee records based on salary

```
CREATE INDEX ON Employee.Employee_Info (Salary);
```

6. Alter the schema of the table Employee_Info to add a column Projects

```
ALTER TABLE Employee.Employee_Info ADD Projects set<text>;
```

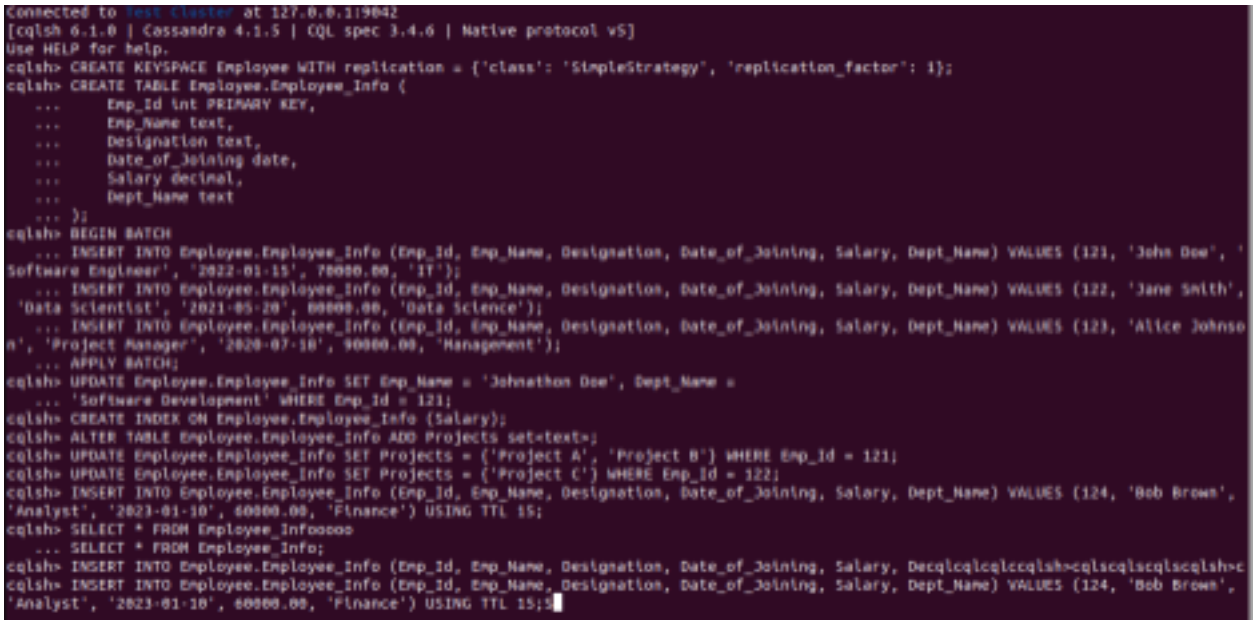
7. Update the altered table to add project names

```
UPDATE Employee.Employee_Info SET Projects = {'Project A', 'Project B'} WHERE Emp_Id = 121;
```

UPDATE Employee.Employee_Info SET Projects = {'Project C'} WHERE Emp_Id = 122; UPDATE Employee.Employee_Info SET Projects = {'Project D', 'Project E'} WHERE Emp_Id = 123;

8. Create a TTL of 15 seconds to display the values of Employeee

INSERT INTO Employee.Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name) VALUES (124, 'Bob Brown', 'Analyst', '2023-01-10', 60000.00, 'Finance') USING TTL 15;



Program 2

Perform the following DB operations using Cassandra.

1. Create a keyspace by name Library

```
CREATE KEYSPACE Library WITH replication = { 'class' :
'SimpleStrategy', 'replication_factor' : 3 };
```

2. Create a column family by name Library-Info with attributes Stud_Id Primary Key, Counter_value of type Counter, Stud_Name, Book-Name, Book-Id, Date_of_issue USE Library;

```
CREATE TABLE Library_Info (
 Stud_Id int PRIMARY KEY,
 Counter_value counter,
 Stud_Name text,
 Book_Name text,
 Book_Id text,
 Date_of_issue timestamp
);
```

3. Insert the values into the table in batch

```
BEGIN BATCH;

INSERT INTO Library_Info (Stud_Id, Counter_value, Stud_Name, Book_Name,
Book_Id, Date_of_issue)
VALUES (1, 101, 'Alice Smith', 'Introduction to Algorithms', 'B001', '2024-05-01');

INSERT INTO Library_Info (Stud_Id, Counter_value, Stud_Name, Book_Name,
Book_Id, Date_of_issue)
VALUES (2, 102, 'Bob Johnson', 'Clean Code', 'B002', '2024-05-02');

INSERT INTO Library_Info (Stud_Id, Counter_value, Stud_Name, Book_Name,
Book_Id, Date_of_issue)

VALUES (3, 103, 'Charlie Brown', 'Design Patterns', 'B003', '2024-05-03');
```

```
INSERT INTO Library_Info (Stud_Id, Counter_value, Stud_Name, Book_Name,
Book_Id, Date_of_issue)
 VALUES (4, 104, 'Diana Prince', 'The Pragmatic Programmer', 'B004', '2024-05-04');

INSERT INTO Library_Info (Stud_Id, Counter_value, Stud_Name, Book_Name,
Book_Id, Date_of_issue)
VALUES (5, 105, 'Ethan Hunt', 'Effective Java', 'B005', '2024-05-05');

APPLY BATCH;
```

4. Display the details of the table created and increase the value of the counter

```
SELECT * FROM Library_Info;

UPDATE Library_Info SET Counter_value = Counter_value + 1 WHERE Stud_Id = 111;
SELECT * FROM Library_Info;
```

5. Write a query to show that a student with id 112 has taken a book “BDA” 2 times.

```
SELECT Stud_Name, Book_Name, Counter_value FROM Library_Info
WHERE Stud_Id = 112 AND Book_Name = 'BDA';
```

6. Export the created column to a csv file

```
COPY Library_Info TO '/path/to/<lib_info>.csv' WITH DELIMITER = ',' QUOTE = ""
HEADER = TRUE;
```

7. Import a given csv dataset from local file system into Cassandra column family COPY

```
Library_Info FROM '/path/to/<filename>.csv' WITH DELIMITER = ',' QUOTE = ""
HEADER = TRUE;
```

```
Connected to Test Cluster at 127.0.0.1:9042
[cqlsh 6.1.0 | Cassandra 4.1.5 | CQL spec 3.4.6 | Native protocol v5]
Use HELP for help.
cqlsh> CREATE KEYSPACE Library WITH replication =  { 'class' : 'SimpleStrategy',
 'replication_factor' : 3 };
AlreadyExists: Keyspace 'library' already exists
cqlsh> use library
   ... ;
cqlsh:library> CREATE TABLE Library_Info (
           ...   Stud_Id int PRIMARY KEY,
           ...   Counter_value counter,
           ...   Stud_Name text,
           ...   Book_Name text,
           ...   Book_Id text,
           ...   Date_of_issue timestamp
           ... );
```


Program 3

MongoDB- CRUD Demonstration

I. Perform the following DB operations using MongoDB.

1. Create a database “Student” with the following attributes Rollno, Age, ContactNo, Email Id. > use StudentDB

2. Insert appropriate values

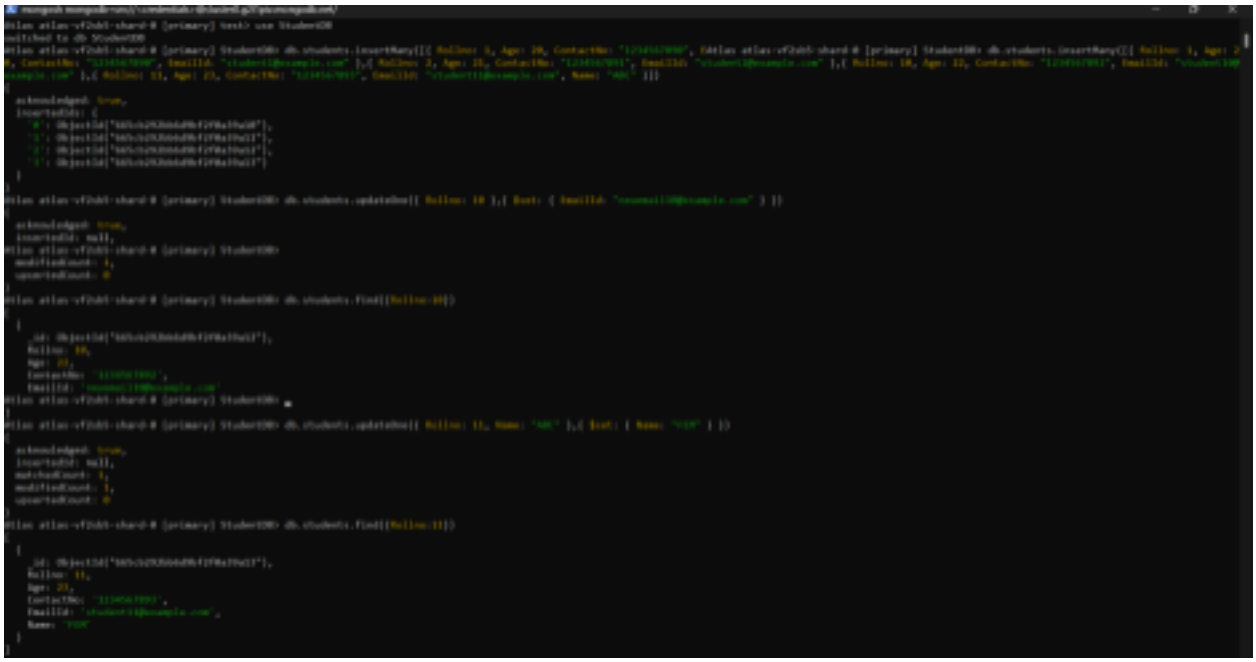
```
> db.students.insertMany([
 { Rollno: 1, Age: 20, ContactNo: "1234567890", EmailId: "student1@example.com" }, { Rollno: 2, Age: 21, ContactNo: "1234567891", EmailId: "student2@example.com" }, { Rollno: 10, Age: 22, ContactNo: "1234567892", EmailId: "student10@example.com" }, { Rollno: 11, Age: 23, ContactNo: "1234567893", EmailId: "student11@example.com", Name: "ABC" } ])
```

3. Write query to update Email-Id of a student with rollno 10.

```
> db.students.updateOne(
 { Rollno: 10 },
 { $set: { EmailId: "newemail10@example.com" } }
)
```

4. Replace the student’s name from “ABC” to “FEM” of rollno 11

```
> db.students.updateOne(
 { Rollno: 11, Name: "ABC" },
 { $set: { Name: "FEM" } }
)
```



II. Perform the following DB operations using MongoDB.

1. Create a collection by name Customers with the following attributes. Cust_id, Acc_Bal, use Bank;

```
db.Customers.insertOne({
 Cust_id: 1,
 Acc_Bal: 1000,
 Acc_Type: "A"
 });
```

2. Insert at least 5 values into the table

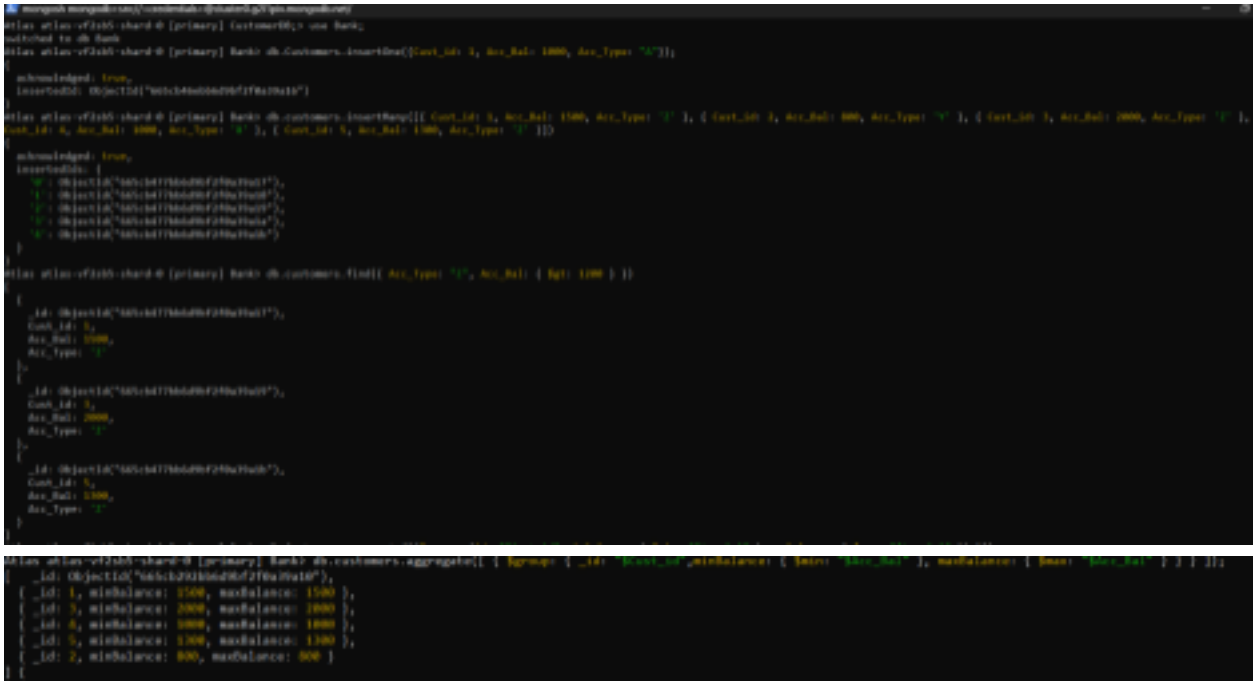
```
> use CustomerDB
db.customers.insertMany([
 { Cust_id: 1, Acc_Bal: 1500, Acc_Type: 'Z' },
 { Cust_id: 2, Acc_Bal: 800, Acc_Type: 'Y' },
 { Cust_id: 3, Acc_Bal: 2000, Acc_Type: 'Z' },
 { Cust_id: 4, Acc_Bal: 1000, Acc_Type: 'X' },
 { Cust_id: 5, Acc_Bal: 1300, Acc_Type: 'Z' }
])
```


3. Write a query to display those records whose total account balance is greater than 1200 of account type ‘Z’ for each customer_id.

```
db.Customers.find({
 Acc_Type: "Z",
 Acc_Bal: { $gt: 1200 }
 });
```

4. Determine Minimum and Maximum account balance for each customer_i

```
db.Customers.aggregate([
 {
 $group: {
 _id: "$Cust_id",
 minBalance: { $min: "$Acc_Bal" },
 maxBalance: { $max: "$Acc_Bal" }
 }
 }
]);
```



Program 4

Screenshot of Hadoop installed

```
Microsoft Windows [Version 10.0.22000.739]
(c) Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>start-all.cmd
This script is Deprecated. Instead use start-dfs.cmd and start-yarn.cmd
starting yarn daemons

C:\WINDOWS\system32>jps
7072 DataNode
13492 Jps
15844 ResourceManager
16196 NameNode
1388 NodeManager

C:\WINDOWS\system32>hdfs dfs -ls -R /
drwxr-xr-x   - khush supergroup          0 2022-06-27 14:09 /input
drwxr-xr-x   - khush supergroup          0 2022-06-21 09:03 /input/inputtest
-rw-r--r--   1 khush supergroup         21 2022-06-21 09:03 /input/inputtest/output.txt
-rw-r--r--   1 khush supergroup         21 2022-06-21 08:19 /input/sample.txt
-rw-r--r--   1 khush supergroup         21 2022-06-27 14:09 /input/sample2.txt
drwxr-xr-x   - khush supergroup          0 2022-06-21 13:30 /test
-rw-r--r--   1 khush supergroup         19 2022-06-21 13:30 /test/sample.txt

C:\WINDOWS\system32>hadoop version
Hadoop 3.3.3
Source code repository https://github.com/apache/hadoop.git -r d37586cbda38c338d9fe481addda5a05fb516f71
Compiled by stevel on 2022-05-09T16:36Z
Compiled with protoc 3.7.1
From source with checksum eb96dd4a797b6989ae0cdb9db6efc6
This command was run using /C:/hadoop-3.3.3/share/hadoop/common/hadoop-common-3.3.3.jar

C:\WINDOWS\system32>
```

Program 5

Execution of HDFS Commands for interaction with Hadoop Environment. (Minimum 10 commands to be executed)

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [bmscecse-HP-Elite-Tower-800-G9-Desktop-PC]
Starting resourcemanager
Starting nodemanagers
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop dfs -mkdir /sadh
WARNING: Use of this script to execute dfs is deprecated.
WARNING: Attempting to execute replacement "hdfs dfs" instead.

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -mkdir /sadh
mkdir: `/sadh': File exists
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /
Found 1 items
drwxr-xr-x - hadoop supergroup 0 2024-05-13 14:27 /sadh

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /sadh

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -put
/home/hadoop/Desktop/example/Welcome.txt /sadh/WC.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -cat /sadh/WC.txt
hiiii
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -get /sadh/WC.txt
/home/hadoop/Desktop/example/WWC.txt
```

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -get /sadh/WC.txt /home/hadoop/Desktop/example/WWC2.txt

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -put /home/hadoop/Desktop/example/Welcome.txt /sadh/WC2.txt

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -getmerge /sadh/WC.txt /sadh/WC2.txt /home/hadoop/Desktop/example/Merge.txt

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -getfacl /sadh/
file: /sadh

owner: hadoop

group: supergroup

user::rwx

group::r-x

other::r-x

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mv /sadh /WC2.txt

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /sadh /WC2.txt

ls: `/sadh': No such file or directory

Found 2 items

-rw-r--r-- 1 hadoop supergroup 6 2024-05-13 14:51 /WC2.txt/WC.txt -rw-r--r-- 1 hadoop supergroup 6 2024-05-13 15:03 /WC2.txt/WC2.txt

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cp /WC2.txt/ /WC.txt

Program 6

Implement WordCount Program on Hadoop framework

Mapper Code:

```
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.MapReduceBase;
import org.apache.hadoop.mapred.Mapper;
import org.apache.hadoop.mapred.OutputCollector;
import org.apache.hadoop.mapred.Reporter;
public class WCMapper extends MapReduceBase implements Mapper<LongWritable,
Text, Text,
IntWritable> {
public void map(LongWritable key, Text value, OutputCollector<Text,
IntWritable> output, Reporter rep) throws IOException
 {
String line = value.toString();
for (String word : line.split(" "))
 {
if (word.length() > 0)
```

```
 {
output.collect(new Text(word), new IntWritable(1));
 } } } }
```

Reducer Code:

```
// Importing libraries
import java.io.IOException;
import java.util.Iterator;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
```



```
import org.apache.hadoop.mapred.MapReduceBase;
import org.apache.hadoop.mapred.OutputCollector;
import org.apache.hadoop.mapred.Reducer;
import org.apache.hadoop.mapred.Reporter;
public class WCReducer extends MapReduceBase implements Reducer<Text,
IntWritable, Text, IntWritable> {
// Reduce function
public void reduce(Text key, Iterator<IntWritable> value,
 OutputCollector<Text, IntWritable> output,
Reporter rep) throws IOException
 {
int count = 0;
// Counting the frequency of each words
while (value.hasNext())
 {
IntWritable i = value.next();
 count += i.get();
 }
 output.collect(key, new IntWritable(count));
```

} }

Driver Code: You have to copy paste this program into the WCDriver Java Class file.

```
// Importing libraries
import java.io.IOException;
import org.apache.hadoop.conf.Configured;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.FileInputFormat;
import org.apache.hadoop.mapred.FileOutputFormat;
import org.apache.hadoop.mapred.JobClient;
import org.apache.hadoop.mapred.JobConf;
```



```
import org.apache.hadoop.util.Tool;
import org.apache.hadoop.util.ToolRunner;
public class WCDriver extends Configured implements Tool {
public int run(String args[]) throws IOException {
if (args.length < 2)
 {
System.out.println("Please give valid inputs");
return -1;
 }
JobConf conf = new JobConf(WCDriver.class);
FileInputFormat.setInputPaths(conf, new Path(args[0]));
FileOutputFormat.setOutputPath(conf, new Path(args[1]));
conf.setMapperClass(WCMapper.class);
conf.setReducerClass(WCReducer.class);
conf.setMapOutputKeyClass(Text.class);
conf.setMapOutputValueClass(IntWritable.class);
conf.setOutputKeyClass(Text.class);
```

```
conf.setOutputValueClass(IntWritable.class);
JobClient.runJob(conf);
return 0;
 }
// Main Method
public static void main(String args[]) throws Exception
 {
int exitCode = ToolRunner.run(new WCDriver(), args);
System.out.println(exitCode);
 }
 }
```


Program 7

From the following link extract the weather data https://github.com/tomwhite/hadoop book/tree/master/input/ncdc/all

Create a Map Reduce program to
a) find average temperature for each year from NCDC data set.

AverageDriver

```
package temp;
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.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
public class AverageDriver {
```

```
public static void main(String[] args) throws Exception {
if (args.length != 2) {
System.err.println("Please Enter the input and output parameters");
System.exit(-1);
}
Job job = new Job();
job.setJarByClass(AverageDriver.class);
job.setJobName("Max temperature");
FileInputFormat.addInputPath(job, new Path(args[0]));
FileOutputFormat.setOutputPath(job, new Path(args[1]));
```



```
job.setMapperClass(AverageMapper.class);
job.setReducerClass(AverageReducer.class);
job.setOutputKeyClass(Text.class);
job.setOutputValueClass(IntWritable.class);
System.exit(job.waitForCompletion(true) ? 0 : 1);
}
}
```

AverageMapper

```
package temp;
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
```

```
import org.apache.hadoop.mapreduce.Mapper;
public class AverageMapper extends Mapper<LongWritable, Text, Text, IntWritable> {
public static final int MISSING = 9999;
public void map(LongWritable key, Text value, Mapper<LongWritable, Text, Text,
IntWritable>.Context context) throws IOException, InterruptedException { int
temperature;
String line = value.toString();
String year = line.substring(15, 19);
if (line.charAt(87) == '+') {
temperature = Integer.parseInt(line.substring(88, 92));
} else {
```

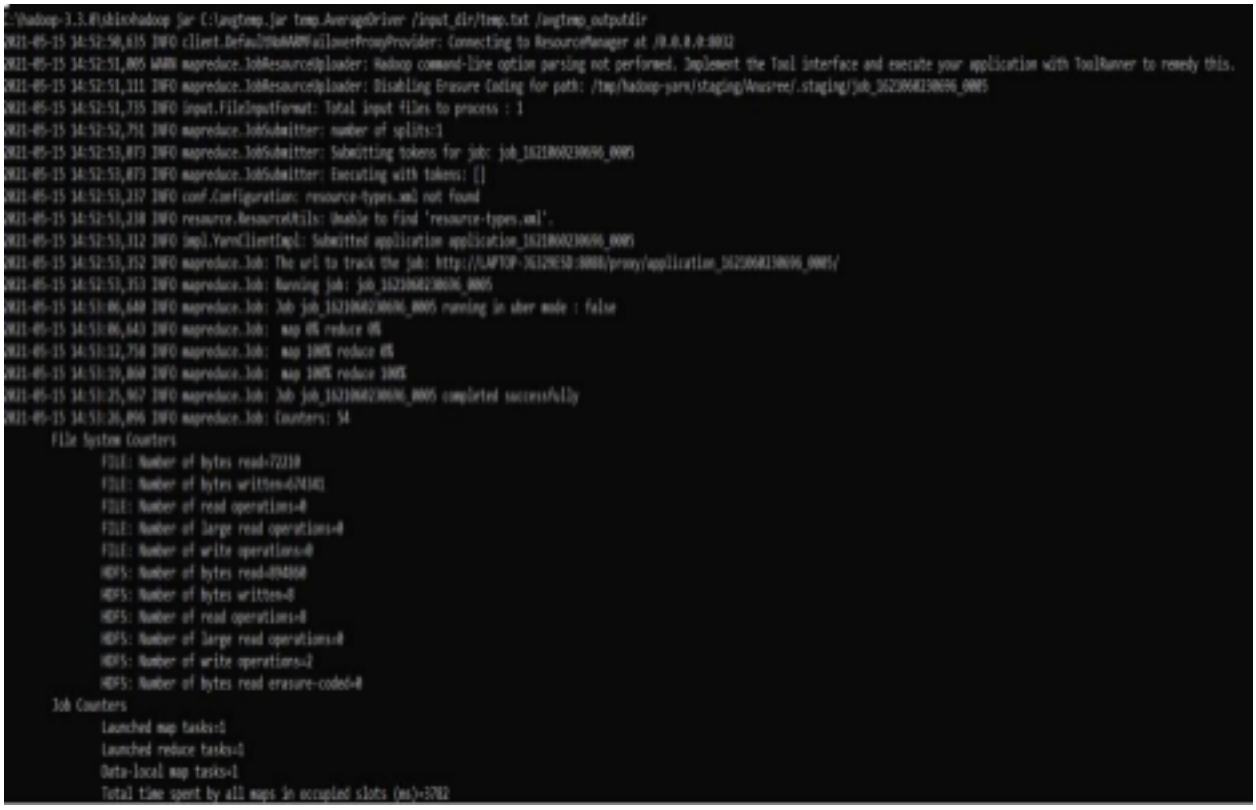


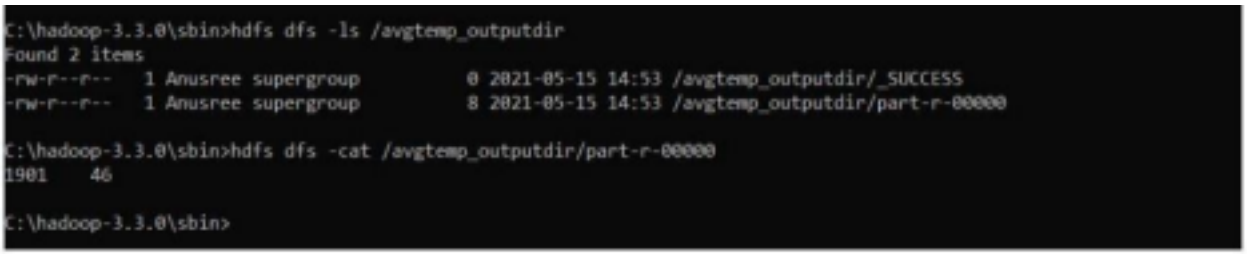
```
temperature = Integer.parseInt(line.substring(87, 92));
}
String quality = line.substring(92, 93);
if (temperature != 9999 && quality.matches("[01459]"))
context.write(new Text(year), new IntWritable(temperature));
}
}
```

AverageReducer

```
package temp;
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
```

```
import org.apache.hadoop.mapreduce.Reducer;
public class AverageReducer extends Reducer<Text, IntWritable, Text, IntWritable> {
public void reduce(Text key, Iterable<IntWritable> values, Reducer<Text, IntWritable,
Text, IntWritable>.Context context) throws IOException, InterruptedException { int
max_temp = 0;
int count = 0;
for (IntWritable value : values) {
max_temp += value.get();
count++;
}
context.write(key, new IntWritable(max_temp / count));
}}
```





b) find the mean max temperature for every month

MeanMaxDriver.class

```
package meanmax;

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.lib.input.FileInputFormat;
```

```
import
org.apache.hadoop.mapreduce.lib.output.FileOutputFormat; public
class MeanMaxDriver {
public static void main(String[] args) throws Exception {
if (args.length != 2) {
System.err.println("Please Enter the input and output parameters");
System.exit(-1);
}
Job job = new Job();
job.setJarByClass(MeanMaxDriver.class);
job.setJobName("Max temperature");
FileInputFormat.addInputPath(job, new Path(args[0]));
FileOutputFormat.setOutputPath(job, new Path(args[1]));
job.setMapperClass(MeanMaxMapper.class);
job.setReducerClass(MeanMaxReducer.class);
job.setOutputKeyClass(Text.class);
job.setOutputValueClass(IntWritable.class);
System.exit(job.waitForCompletion(true) ? 0 : 1);
}
}
```

MeanMaxMapper.class

```
package meanmax;
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
```

```
import org.apache.hadoop.io.LongWritable;
```



```
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;
public class MeanMaxMapper extends Mapper<LongWritable, Text, Text, IntWritable> {
public static final int MISSING = 9999;
public void map(LongWritable key, Text value, Mapper<LongWritable, Text, Text,
IntWritable>.Context context) throws IOException, InterruptedException { int
temperature;
String line = value.toString();
String month = line.substring(19, 21);
if (line.charAt(87) == '+') {
temperature = Integer.parseInt(line.substring(88, 92));
} else {
temperature = Integer.parseInt(line.substring(87, 92));
}
String quality = line.substring(92, 93);
if (temperature != 9999 && quality.matches("[01459]"))
context.write(new Text(month), new IntWritable(temperature));
}
}
```

MeanMaxReducer.class

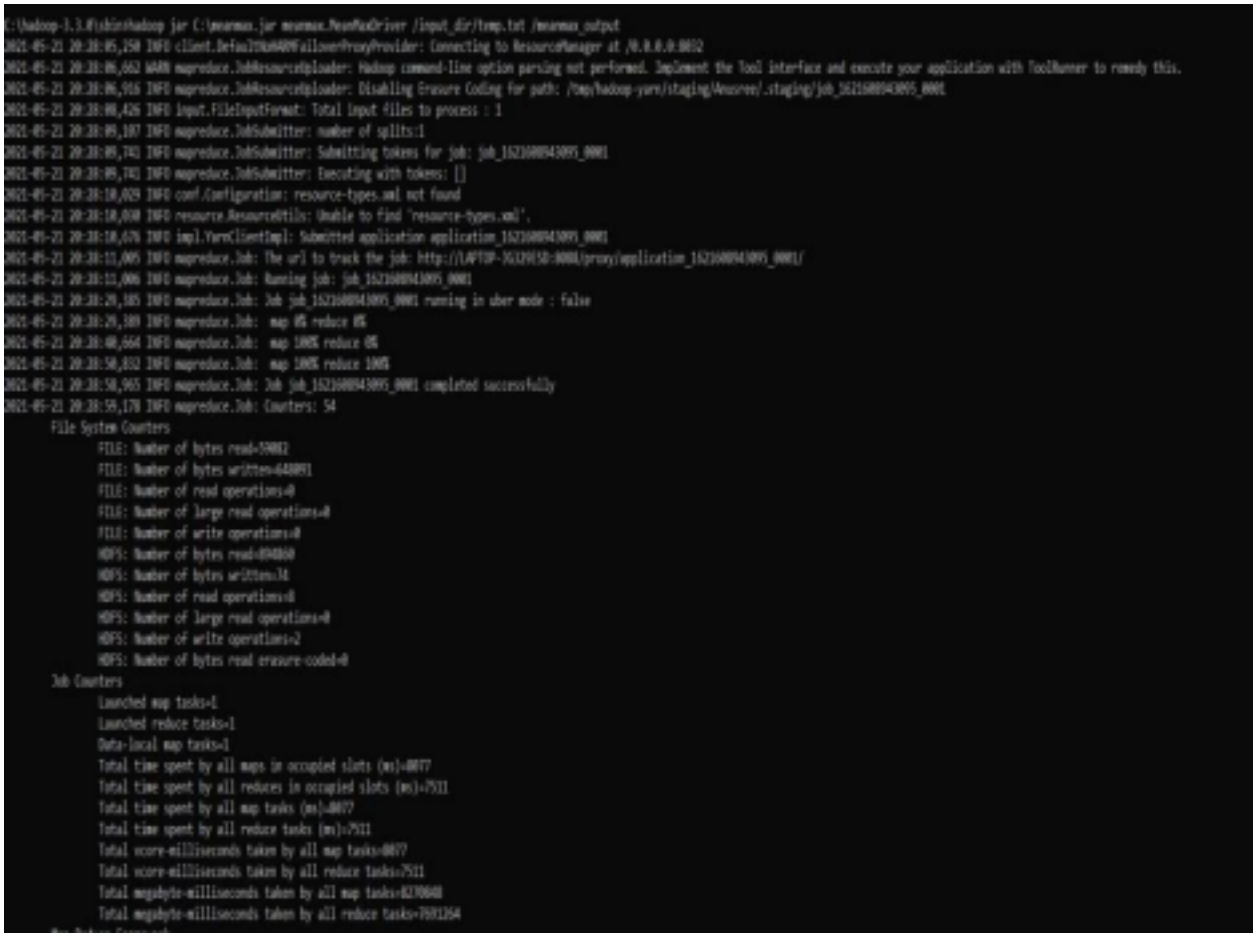
```
package meanmax;
import java.io.IOException;
```

```
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
```



```
import org.apache.hadoop.mapreduce.Reducer;
public class MeanMaxReducer extends Reducer<Text, IntWritable, Text, IntWritable> {
public void reduce(Text key, Iterable<IntWritable> values, Reducer<Text, IntWritable,
Text, IntWritable>.Context context) throws IOException, InterruptedException { int
max_temp = 0;
int total_temp = 0;
int count = 0;
int days = 0;
for (IntWritable value : values) {
int temp = value.get();
if (temp > max_temp)
max_temp = temp;
count++;
if (count == 3) {
total_temp += max_temp;
max_temp = 0;
count = 0;
days++;
}
}
context.write(key, new IntWritable(total_temp / days));
}
```

}


I:\hadoop-3.3.0\sbin\hadoop jar C:\mnarmax.jar mnarmax.MaxMinDriver /input_dir/temp.txt /mnarmax_output
2021-05-21 20:28:05,250 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2021-05-21 20:28:06,662 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2021-05-21 20:28:06,916 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/Amunreo/.staging/job_1621608943095_0001
2021-05-21 20:28:08,426 INFO input.FileInputFormat: Total input files to process : 1
2021-05-21 20:28:09,107 INFO mapreduce.JobSubmitter: number of splits:1
2021-05-21 20:28:09,741 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1621608943095_0001
2021-05-21 20:28:09,741 INFO mapreduce.JobSubmitter: Executing with tokens: []
2021-05-21 20:28:10,029 INFO conf.Configuration: resource-types.xml not found
2021-05-21 20:28:10,030 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2021-05-21 20:28:10,676 INFO impl.YarnClientImpl: Submitted application application_1621608943095_0001
2021-05-21 20:28:11,005 INFO mapreduce.Job: The url to track the job: http://LAPTOP-JG1J9I5D:8088/proxy/application_1621608943095_0001/
2021-05-21 20:28:11,006 INFO mapreduce.Job: Running job: job_1621608943095_0001
2021-05-21 20:28:29,185 INFO mapreduce.Job: Job job_1621608943095_0001 running in uber mode : false
2021-05-21 20:28:29,189 INFO mapreduce.Job: map 0% reduce 0%
2021-05-21 20:28:40,664 INFO mapreduce.Job: map 100% reduce 0%
2021-05-21 20:28:50,832 INFO mapreduce.Job: map 100% reduce 100%
2021-05-21 20:28:50,965 INFO mapreduce.Job: Job job_1621608943095_0001 completed successfully
2021-05-21 20:28:59,178 INFO mapreduce.Job: Counters: 54
File System Counters
FILE: Number of bytes read=59882
FILE: Number of bytes written=648091
FILE: Number of read operations=0
FILE: Number of large read operations=0
FILE: Number of write operations=0
HDFS: Number of bytes read=894860
HDFS: Number of bytes written=34
HDFS: Number of read operations=8
HDFS: Number of large read operations=0
HDFS: Number of write operations=2
HDFS: Number of bytes read erasure-coded=0
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)=8077
Total time spent by all reduces in occupied slots (ms)=7511
Total time spent by all map tasks (ms)=8077
Total time spent by all reduce tasks (ms)=7511
Total vcore-milliseconds taken by all map tasks=8077
Total vcore-milliseconds taken by all reduce tasks=7511
Total megabyte-milliseconds taken by all map tasks=8270848
Total megabyte-milliseconds taken by all reduce tasks=7691264

```
C:\hadoop-3.3.0\sbin>hdfs dfs -cat /meanmax_output/*
01      4
02      0
03      7
04      44
05      100
06      168
07      219
08      198
09      141
10      100
11      19
12      3

C:\hadoop-3.3.0\sbin>
```


Program 8

For a given Text file, create a Map Reduce program to sort the content in an alphabetic order listing only top 10 maximum occurrences of words.

Driver-TopN.class

```
package samples.topn;

import java.io.IOException;

import java.util.StringTokenizer;

import org.apache.hadoop.conf.Configuration;

import org.apache.hadoop.fs.Path;

import org.apache.hadoop.io.IntWritable;

import org.apache.hadoop.io.Text;

import org.apache.hadoop.mapreduce.Job;

import org.apache.hadoop.mapreduce.Mapper;

import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;

import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
```

```
import org.apache.hadoop.util.GenericOptionsParser;
public class TopN {
public static void main(String[] args) throws Exception {
Configuration conf = new Configuration();
String[] otherArgs = (new GenericOptionsParser(conf,
args)).getRemainingArgs(); if (otherArgs.length != 2) {
System.err.println("Usage: TopN <in> <out>");
System.exit(2);
}
```



```
Job job = Job.getInstance(conf);
job.setJobName("Top N");
job.setJarByClass(TopN.class);
job.setMapperClass(TopNMapper.class);
job.setReducerClass(TopNReducer.class);
job.setOutputKeyClass(Text.class);
job.setOutputValueClass(IntWritable.class);
FileInputFormat.addInputPath(job, new Path(otherArgs[0]));
FileOutputFormat.setOutputPath(job, new Path(otherArgs[1]));
System.exit(job.waitForCompletion(true) ? 0 : 1);
}
public static class TopNMapper extends Mapper<Object, Text, Text, IntWritable> {
private static final IntWritable one = new IntWritable(1);
private Text word = new Text();
```

```
private String tokens = "[_|$#<>\\^=\\[\\]\\*/\\\\,;,.\\-:()?!\"']";
public void map(Object key, Text value, Mapper<Object, Text, Text, IntWritable>.Context
 context) throws IOException, InterruptedException {
 String cleanLine = value.toString().toLowerCase().replaceAll(this.tokens, "
"); StringTokenizer itr = new StringTokenizer(cleanLine);
while (itr.hasMoreTokens()) {
this.word.set(itr.nextToken().trim());
 context.write(this.word, one);
 }
 }
```



```
 }
 }
```

TopNCombiner.class

```
package samples.topn;
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;
public class TopNCombiner extends Reducer<Text, IntWritable, Text, IntWritable> {
public void reduce(Text key, Iterable<IntWritable> values, Reducer<Text, IntWritable,
Text, IntWritable>.Context context) throws IOException, InterruptedException { int
sum = 0;
 for (IntWritable val : values)
```

```
sum += val.get();
context.write(key, new IntWritable(sum));

}

}
```

TopNMapper.class

```
package samples.topn;

import java.io.IOException;

import java.util.StringTokenizer;

import org.apache.hadoop.io.IntWritable;

import org.apache.hadoop.io.Text;

import org.apache.hadoop.mapreduce.Mapper;
```



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

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

private Text word = new Text();

private String tokens = "[_|$#<>\\^=\\[\\]\\*/\\\\,;,.\\-:()?!\"']";

public void map(Object key, Text value, Mapper<Object, Text, Text, IntWritable>.Context

context) throws IOException, InterruptedException {

String cleanLine = value.toString().toLowerCase().replaceAll(this.tokens, "

"); StringTokenizer itr = new StringTokenizer(cleanLine);

while (itr.hasMoreTokens()) {

this.word.set(itr.nextToken().trim());

context.write(this.word, one);

}
```

```
}
}
```

TopNReducer.class

```
package samples.topn;

import java.io.IOException;

import java.util.HashMap;

import java.util.Map;

import org.apache.hadoop.io.IntWritable;

import org.apache.hadoop.io.Text;

import org.apache.hadoop.mapreduce.Reducer;

import utils.MiscUtils;

public class TopNReducer extends Reducer<Text, IntWritable, Text, IntWritable> {
```



```
private Map<Text, IntWritable> countMap = new HashMap<>();

public void reduce(Text key, Iterable<IntWritable> values, Reducer<Text, IntWritable,

Text, IntWritable>.Context context) throws IOException, InterruptedException { int

sum = 0;

for (IntWritable val : values)

sum += val.get();

this.countMap.put(new Text(key), new IntWritable(sum));

}

protected void cleanup(Reducer<Text, IntWritable, Text, IntWritable>.Context context)

throws IOException, InterruptedException {
```

```
Map<Text, IntWritable> sortedMap = MiscUtils.sortByValues(this.countMap);
int counter = 0;
for (Text key : sortedMap.keySet()) {
if (counter++ == 20)
break;
context.write(key, sortedMap.get(key));
}
}
}
```

```
C:\hadoop-3.3.0\sbin>jps
11072 DataNode
20528 Jps
5620 ResourceManager
15532 NodeManager
6140 NameNode

C:\hadoop-3.3.0\sbin>hdfs dfs -mkdir /input_dir

C:\hadoop-3.3.0\sbin>hdfs dfs -ls /
Found 1 items
drwxr-xr-x   - Anusree supergroup          0 2021-05-08 19:46 /input_dir

C:\hadoop-3.3.0\sbin>hdfs dfs -copyFromLocal C:\input.txt /input_dir

C:\hadoop-3.3.0\sbin>hdfs dfs -ls /input_dir
Found 1 items
-rw-r--r--   1 Anusree supergroup         36 2021-05-08 19:48 /input_dir/input.txt

C:\hadoop-3.3.0\sbin>hdfs dfs -cat /input_dir/input.txt
hello
world
hello
hadoop
bye
```

```
C:\hadoop-3.3.0\sbin>hadoop jar C:\sort.jar samples.topn.TopN /input_dir/input.txt /output_dir
2021-05-08 19:54:54,582 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2021-05-08 19:54:55,201 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/Anusree/.staging/job_1620483374279_0001
2021-05-08 19:54:55,821 INFO input.FileInputFormat: Total input files to process : 1
2021-05-08 19:54:56,261 INFO mapreduce.JobSubmitter: number of splits:1
2021-05-08 19:54:56,552 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1620483374279_0001
2021-05-08 19:54:56,552 INFO mapreduce.JobSubmitter: Executing with tokens: []
2021-05-08 19:54:56,843 INFO conf.Configuration: resource-types.xml not found
2021-05-08 19:54:56,843 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2021-05-08 19:54:57,387 INFO impl.YarnClientImpl: Submitted application application_1620483374279_0001
2021-05-08 19:54:57,507 INFO mapreduce.Job: The url to track the job: http://LAPTOP-3G329E5D:8088/proxy/application_1620483374279_0001/
2021-05-08 19:54:57,508 INFO mapreduce.Job: Running job: job_1620483374279_0001
2021-05-08 19:55:13,792 INFO mapreduce.Job: Job job_1620483374279_0001 running in uber mode : false
2021-05-08 19:55:13,796 INFO mapreduce.Job:  map 0% reduce 0%
2021-05-08 19:55:20,020 INFO mapreduce.Job:  map 100% reduce 0%
2021-05-08 19:55:27,126 INFO mapreduce.Job:  map 100% reduce 100%
2021-05-08 19:55:33,199 INFO mapreduce.Job: Job job_1620483374279_0001 completed successfully
2021-05-08 19:55:33,334 INFO mapreduce.Job: Counters: 54
        File System Counters
                FILE: Number of bytes read=65
                FILE: Number of bytes written=530397
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=142
                HDFS: Number of bytes written=31
                HDFS: Number of read operations=8
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=2
                HDFS: Number of bytes read erasure-coded=0
```