VISVESVARAYATECHNOLOGICALUNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

BIG DATA ANALYTICS

Submitted by

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(1BM20CS131)

in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
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B.M.S. COLLEGE OF ENGINEERING
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B. M. S. College of Engineering

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "LAB COURSE **BIG DATA ANALYTICS " was carried** out by **ROSHAN (1BM20CS131),** who is a 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 2023. The Lab report has been approved as it satisfies the academic requirements in respect of a **Big Data Analytics - (20CS6PEBDA)** work prescribed for the said degree.

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Program 01: MongoDB commands

To execute create, insert, update, find and count commands of MongoDB

```
$mongosh

test> show dbs; admin
40.00 KiB config 60.00
KiB local 72.00 KiB test>
use database1

database1> db.createCollection("student"); database1>
db.student.insert({_id:1,StudName:"student1",Sem:6});
{ acknowledged: true, insertedIds: { '0': 1 } } database1>
db.student.insert({_id:2,StudName:"student2",Sem:6});
{ acknowledged: true, insertedIds: { '0': 2 } } database1>
db.student.insert({_id:3,StudName:"student3",Sem:6});
{ acknowledged: true, insertedIds: { '0': 3 } } database1>
db.student.insert({_id:4,StudName:"student4",Sem:6});
{ acknowledged: true, insertedIds: { '0': 4 } } database1>
db.student.insert({_id:5,StudName:"student5",Sem:6});
{ acknowledged: true, insertedIds: { '0': 5 } } database1>
db.student.insert({_id:6,StudName:"student6",Sem:6});
{ acknowledged: true, insertedIds: { '0': 6 } }

database1> show collections student

database1> db.student.find()
[
    { _id: 1, StudName: 'student1', Sem: 6 },
    { _id: 2, StudName: 'student2', Sem: 6 },
    { _id: 3, StudName: 'student3', Sem: 6 },
    { _id: 4, StudName: 'student4', Sem: 6 },
    { _id: 5, StudName: 'student5', Sem: 6 },
    { _id: 6, StudName: 'student6', Sem: 6 } ]
```

```
database1> db.student.find({StudName:"student1"}); [ { _id: 1,
StudName: 'student1', Sem: 6 } ]

database1> db.student.count()
6
` database1> db.student.find({Sem:6});
[
    { _id: 1, StudName: 'student1', Sem: 6 },
    { _id: 2, StudName: 'student2', Sem: 6 },
    { _id: 3, StudName: 'student3', Sem: 6 },
    { _id: 4, StudName: 'student4', Sem: 6 },
    { _id: 5, StudName: 'student5', Sem: 6 },
    { _id: 6, StudName: 'student6', Sem: 6 }
]

database1> db.student.update({_id:4,StudName:"student4"},{$set:{Sem:7}},{upsert:
true});
database1> db.student.find()
[
    { _id: 1, StudName: 'student1', Sem: 6 },
    { _id: 2, StudName: 'student2', Sem: 6 },
    { _id: 3, StudName: 'student3', Sem: 6 },
    { _id: 4, StudName: 'student4', Sem: 7 },
    { _id: 5, StudName: 'student5', Sem: 6 },
    { _id: 6, StudName: 'student6', Sem: 6 }
]

database1> db.student.find().pretty()
[
    { _id: 1, StudName: 'student1', Sem: 6 },
    { _id: 2, StudName: 'student2', Sem: 6 },
    { _id: 3, StudName: 'student3', Sem: 6 },
    { _id: 4, StudName: 'student4', Sem: 7 },
    { _id: 5, StudName: 'student5', Sem: 6 },
    { _id: 6, StudName: 'student6', Sem: 6 }
]

database1> db.student.update({_id:5,StudName:"student5"},{$unset:{Sem:6}},{upser
```

```
t:true});
database1> db.student.find().pretty()
[
    { _id: 1, StudName: 'student1', Sem: 6 },
    { _id: 2, StudName: 'student2', Sem: 6 },
    { _id: 3, StudName: 'student3', Sem: 6 },
    { _id: 4, StudName: 'student4', Sem: 7 },
    { _id: 5, StudName: 'student5' },
    { _id: 6, StudName: 'student6', Sem: 6 }
]

database1> db.student.update({_id:6},{$set:{OE:"OR"}},{upsert:true}); database1>
db.student.find()
[
    { _id: 1, StudName: 'student1', Sem: 6 },
    { _id: 2, StudName: 'student2', Sem: 6 },
    { _id: 3, StudName: 'student3', Sem: 6 },
    { _id: 4, StudName: 'student4', Sem: 7 },
    { _id: 5, StudName: 'student5' },
    { _id: 6, StudName: 'student6', Sem: 6, OE: 'OR' }
]

database1> db.student.find({OE:"OR"});
[ { _id: 6, StudName: 'student6', Sem: 6, OE: 'OR' } ]

database1> db.student.count({Sem:6});
4

database1> db.student.find({Sem:6}).limit(4);
[
    { _id: 1, StudName: 'student1', Sem: 6 },
    { _id: 2, StudName: 'student2', Sem: 6 },
    { _id: 3, StudName: 'student3', Sem: 6 },
    { _id: 6, StudName: 'student6', Sem: 6, OE: 'OR' }
] database1> db.student.find({StudName:"student2",Sem:6}); [ { _id: 2,
StudName: 'student2', Sem: 6 } ]

database1> db.student.find().sort({StudName:1}).pretty();
```

```
[
    { _id: 1, StudName: 'student1', Sem: 6 },
    { _id: 2, StudName: 'student2', Sem: 6 },
    { _id: 3, StudName: 'student3', Sem: 6 },
    { _id: 4, StudName: 'student4', Sem: 7 },
    { _id: 5, StudName: 'student5' },
    { _id: 6, StudName: 'student6', Sem: 6, OE: 'OR' }
] database1> db.student.find().sort({StudName:-1}).pretty();
[
    { _id: 6, StudName: 'student6', Sem: 6, OE: 'OR' },
    { _id: 5, StudName: 'student5' },
    { _id: 4, StudName: 'student4', Sem: 7 },
    { _id: 3, StudName: 'student3', Sem: 6 },
    { _id: 2, StudName: 'student2', Sem: 6 },
    { _id: 1, StudName: 'student1', Sem: 6 }
]

database1> db.student.find().skip(3).pretty()
[
    { _id: 4, StudName: 'student4', Sem: 7 },
    { _id: 5, StudName: 'student5' },
    { _id: 6, StudName: 'student6', Sem: 6, OE: 'OR' }
]

database1> db.student.count({Sem:7});
1
```

Program 02: Cassandra Commands

Perform the following DB operations using Cassandra

1. Create a keyspace by name Employee

```
create keyspace Employee with replication = {
    ... 'class':'SimpleStrategy',
    ... 'replication_factor':1 ... }; use
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

```
create table EmployeeInfo (
        ... EmplID int PRIMARY KEY,
        ... EmplName text,
        ... Designation text,
        ... DateOfJoining timestamp,
        ... Salary int,
        ... DeptName text
        ... );
```

3. Insert the values into the table in batch begin

```
batch

insert into EmployeeInfo (EmplID, EmplName, Designation,
DateOfJoining, Salary, DeptName) values (101, 'employee1',
'designation1', '2020-03-29', 40000, 'dept1')

insert into EmployeeInfo (EmplID, EmplName, Designation,
DateOfJoining, Salary, DeptName) values (102, 'employee2',
```

'designation2', '2020-06-04', 60000, 'dept1') insert into EmployeeInfo

(EmplID, EmplName, Designation, DateOfJoining, Salary, DeptName)

values (103,

'employee3',
'designation3', '2020-04-21', 75000, 'dept1')

insert into EmployeeInfo (EmplID, EmplName, Designation, DateOfJoining, Salary, DeptName) values (104, 'employee4', 'designation4', '2020-12-02', 90000, 'dept2')

insert into EmployeeInfo (EmplID, EmplName, Designation, DateOfJoining, Salary, DeptName) values (105, 'employee5', 'designation5', '2020-09-11', 15000, 'dept2') apply batch;

```
emplid | dateofjoining | deptname | designation | emplname | salary
--------+---------------------------------+----------+--------------+-----------+--------
105 | 2020-09-10 18:30:00.000000+0000 | dept2 | designation5 | employee5 | 15000 104 | 2020-12-01
18:30:00.000000+0000 | dept2 | designation4 | employee4 | 90000 102 |
2020-06-03 18:30:00.000000+0000 | dept1 | designation2 | employee2 | 60000 101 |
2020-03-28 18:30:00.000000+0000 | dept1 | designation1 | employee1 | 40000 103 | 2020-04-20
18:30:00.000000+0000 | dept1 | designation3 | employee3 | 75000
```

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

insert into EmployeeInfo (EmplID, EmplName, Designation, DateOfJoining, Salary, DeptName) values (121, 'employee6', 'designation6', '2020-10-18', 45000, 'dept1'); select * from

EmployeeInfo;

```
emplid | dateofjoining | deptname | designation | emplname | salary
--------+---------------------------------+----------+--------------+-----------+--------
105 | 2020-09-10 18:30:00.000000+0000 | dept2 | designation5 | employee5 | 15000 121 | 2020-10-17
18:30:00.000000+0000 | dept1 | designation6 | employee6 | 45000 104 |
2020-12-01 18:30:00.000000+0000 | dept2 | designation4 | employee4 | 90000 102 |
```

2020-06-03 18:30:00.000000+0000 | dept1 | designation2 | employee2 | 60000 101 |
2020-03-28 18:30:00.000000+0000 | dept1 | designation1 | employee1 | 40000 103 | 2020-04-20
18:30:00.000000+0000 | dept1 | designation3 | employee3 | 75000

update EmployeeInfo SET EmplName='employee7', DeptName='dept2' where EmplID=121;

select * from EmployeeInfo;

emplid | dateofjoining | deptname | designation | emplname | salary
--------+----------+----------+----------+----------+--------
105 | 2020-09-10 18:30:00.000000+0000 | dept2 | designation5 | employee5 | 15000 121 | 2020-10-17
18:30:00.000000+0000 | dept2 | designation6 | employee7 | 45000 104 |
2020-12-01 18:30:00.000000+0000 | dept2 | designation4 | employee4 | 90000 102 |
2020-06-03 18:30:00.000000+0000 | dept1 | designation2 | employee2 | 60000 101 |
2020-03-28 18:30:00.000000+0000 | dept1 | designation1 | employee1 | 40000 103 | 2020-04-20
18:30:00.000000+0000 | dept1 | designation3 | employee3 | 75000

5. Sort the details of Employee records based on salary

select * from Employee_info where Emp_id in(101,102,103,104,121,105)
order by salary desc;

emplid | dateofjoining | deptname | designation | emplname | salary
--------+----------+----------+----------+----------+--------
105 | 2020-09-10 18:30:00.000000+0000 | dept2 | designation5 | employee5 | 15000 121 | 2020-10-17
18:30:00.000000+0000 | dept2 | designation6 | employee7 | 45000 104 |
2020-12-01 18:30:00.000000+0000 | dept2 | designation4 | employee4 | 90000 102 |
2020-06-03 18:30:00.000000+0000 | dept1 | designation2 | employee2 | 60000 101 |
2020-03-28 18:30:00.000000+0000 | dept1 | designation1 | employee1 | 40000 103 | 2020-04-20
18:30:00.000000+0000 | dept1 | designation3 | employee3 | 75000

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.

alter table EmployeeInfo add Projects text; select * from

EmployeeInfo;

emplid | dateofjoining | deptname | designation | emplname | projects | salary
--------+----------+----------+----------+----------+----------+----------+--------
105 | 2020-09-10 18:30:00.000000+0000 | dept2 | designation5 | employee5 | null | 15000 121 |
2020-10-17 18:30:00.000000+0000 | dept2 | designation6 | employee7 | null | 45000 104 | 2020-12-01 18:30:00.000000+0000 | dept2 |
designation4 | employee4 | null | 90000 102 | 2020-06-03

18:30:00.000000+0000 | dept1 | designation2 | employee2 | null | 60000 101 | 2020-03-28 18:30:00.000000+0000 | dept1 | designation1 | employee1 | null | 40000 103 | 2020-04-20 18:30:00.000000+0000 | dept1 | designation3 | employee3 | null | 75000

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

```
insert into EmployeeInfo (Emp_id, Emp_name, Designation, DOJ, salary, Dept_name) values (161,'Ryan','Associate professor','2022-05-11',95000,'ISE') using ttl 60;

select ttl(Emp_name) from Employee_info where Emp_id = 161 and salary =
95000;


ttl(emp_name)
---------------
53

(1 rows)

11
```

Program 03: Cassandra Library Database

Perform the following DB operations using Cassandra.

1. Create a keyspace by name Library create keyspace

```
libInfo with replication = {
    ... 'class':'SimpleStrategy',
    ... 'replication_factor':1 ... }; use
libInfo;
```

2. Create a column family by name Library-Info with attributes Stud_Id Primary Key, Counter_value of type Counter create table libInfo (

```
            ... studID int,
            ... studName text, ... bookID
            int,
            ... bookName text,
            ... dateOfIssue timestamp,
            ... counterValue counter,
            ... primary key ((studID, bookID), studName, bookName,
dateOfIssue)
            ... );
```

3. Insert the values into the table in batch update

```
libInfo
            ... set counterValue=counterValue+1
            ... where studID = 001 and studName = 'Raj' and bookID
= 101 and bookName = 'The Midnight Library' and dateOfIssue =
'2023-05-08';

update libInfo
            ... set counterValue=counterValue+1
            ... where studID = 002 and studName = 'Krishna' and bookID = 102 and
bookName = 'The Little Coffee Shop of Kabul' and dateOfIssue = '2023-03-07';
update libInfo
```

```
                ... set counterValue=counterValue+1
                ... where studID = 003 and studName = 'Trupti' and bookID
= 103 and bookName = 'Tokyo Ueno Station' and dateOfIssue =
'2022-12-26';

update libInfo
                ... set counterValue=counterValue+1
                ... where studID = 004 and studName = 'Arya' and bookID =
104  and bookName = 'A Thousand Splendid Suns' and dateOfIssue =
'2022-10-03';

update libInfo
                ... set counterValue=counterValue+1
                ... where studID = 005 and studName = 'Karan' and bookID =
105  and bookName = 'Portrait of an Unknown Woman' and dateOfIssue =
'2023-01-28';
```

4. Display the details of the table created and increase the value of the counter select * from libInfo;

```
studid | bookid | studname | bookname | dateofissue | countervalue
--------+--------+----------+----------------------------------+----------------------------------+-------------
        1 | 101 | Raj | The Midnight Library | 2023-05-07 18:30:00.000000+0000 | 1
        3 | 103 | Trupti | Tokyo Ueno Station | 2022-12-25 18:30:00.000000+0000 | 1
        2 | 102 | Krishna | The Little Coffee Shop of Kabul | 2023-03-06 18:30:00.000000+0000 | 1
        5 | 105 | Karan | Portrait of an Unknown Woman | 2023-01-27 18:30:00.000000+0000 | 1
        4 | 104 | Arya | A Thousand Splendid Suns | 2022-10-02 18:30:00.000000+0000 | 1
```

```
update libInfo
                ... set counterValue=counterValue+1
                ... where studID = 005 and studName = 'Karan' and bookID =
105 and bookName = 'Portrait of an Unknown Woman' and dateOfIssue =
'2023-01-28'; select * from
libInfo;
```

```
studid | bookid | studname | bookname | dateofissue | countervalue --------+--------+----------+----------------------------------+----------------------------------
-----+-------------
```

1 | 101 | Raj | The Midnight Library | 2023-05-07 18:30:00.000000+0000 | 1
3 | 103 | Trupti | Tokyo Ueno Station | 2022-12-25 18:30:00.000000+0000 | 1
2 | 102 | Krishna | The Little Coffee Shop of Kabul | 2023-03-06 18:30:00.000000+0000 | 1
5 | 105 | Karan | Portrait of an Unknown Woman | 2023-01-27 18:30:00.000000+0000 | 2
4 | 104 | Arya | A Thousand Splendid Suns | 2022-10-02 18:30:00.000000+0000 | 1

5. Write a query to show that a student with id 114 has taken a book “UNIX” 2 times.

select studID from libInfo where bookName = 'Portrait of an Unknown Woman' and counterValue = 2 allow filtering;

```
 studid
--------
      5
```

6. Export the created column to a csv file copy libInfo(studID, studName, bookID, bookName, dateOfIssue, counterValue) to 'c:\libInfo.csv'; Using 3 child processes

Starting copy of libinfo.libinfo with columns [studid, studname, bookid, bookname, dateofissue, countervalue].
Processed: 5 rows; Rate: 2 rows/s; Avg. rate: 1 rows/s 5 rows exported to 1 files in 9.163 seconds.

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

truncate library_info;

select * from library_info;

```
studid | bookid | studname | bookname | dateofissue | countervalue
--------+--------+----------+----------+-------------+-------------
(0 rows)
```

copy libInfo(studID, studName, bookID, bookName, dateOfIssue, counterValue) to 'c:\libInfo.csv'; Using 3 child processes

Starting copy of libinfo.libinfo with columns [studid, studname, bookid, bookname, dateofissue, countervalue].
Processed: 5 rows; Rate: 2 rows/s; Avg. rate: 1 rows/s 5 rows exported to 1 files in 9.163 seconds.

Program 04: Hadoop Commands

$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-600-G9-Desktop-PC]
Starting resourcemanager Starting
nodemanagers

#to check all daemons have loaded successfully $jps

9056 Jps
7475 ResourceManager
6709 NameNode
7160 SecondaryNameNode
7659 NodeManager
6875 DataNode

#mkdir command hdfs dfs
-mkdir /bda

ls command hadoop fs -ls / Found 4 items drwxr-xr-x - hadoop supergroup 0 2023-05-08 09:40 /abc drwxr-xr-x - hadoop supergroup 0 2023-05-11 13:57 /bda drwxr-xr-x - hadoop supergroup 0 2023-05-04 12:49 /inputbda
drwxr-xr-x - hadoop supergroup 0 2023-04-27 11:44 /sridevi
to append text in a file in hdfs echo "<Text to append>" | hdfs dfs -appendToFile /user/hduser/myfile.txt OR

hdfs dfs -appendToFile - /user/hduser/myfile.txt and then type the text on the terminal. Once you are done typing then hit 'Ctrl+D'

#cat command echo "hello world bda lab" | hdfs dfs -appendToFile - /bda/hello.txt

hdfs dfs -cat /bda/hello.txt hello world bda
lab

#put & copyFromLocal command hdfs dfs -put Desktop/hadooplocal.txt

/bda/hadoop.txt hdfs dfs -copyFromLocal Desktop/hadooplocal.txt /bda/hadoop.txt

hdfs dfs -cat /bda/hadoop.txt local file created
in the desktop

get command hdfs dfs -touchz
/bda/labfile.txt

echo "copying hdfs file to a local file using get command" | hdfs dfs
-appendToFile - /bda/labfile.txt

hdfs dfs -cat /bda/labfile.txt copying hdfs file to a local file using get
command

hdfs dfs -get /bda/labfile.txt Desktop/getcmd.txt #Contents of getcmd.txt file in
Desktop is:

copying hdfs file to a local file using get command

#copyToLocal command hdfs dfs -touchz

/bda/ghost.txt echo "new hdfs file in hdfs

folder" | hdfs dfs -appendToFile -

/bda/ghost.txt

hdfs dfs -cat /bda/ghost.txt new hdfs file in hdfs folder hdfs dfs -

copyToLocal /bda/ghost.txt Desktop/bigdata.txt

#Contents of bigdata.txt file in desktop is: new hdfs file in hdfs

folder

#mv command hdfs
dfs -ls /bda
Found 4 items
-rw-r--r-- 1 hadoop supergroup 29 2023-05-11 14:39 /bda/ghost.txt
-rw-r--r-- 1 hadoop supergroup 34 2023-05-11 14:26 /bda/hadoop.txt
-rw-r--r-- 1 hadoop supergroup 20 2023-05-11 14:11 /bda/hello.txt
-rw-r--r-- 1 hadoop supergroup 52 2023-05-11 14:32
/bda/labfile.txt hadoop fs -mv /bda/hello.txt

/dir

hdfs dfs -ls /bda
Found 3 items
-rw-r--r-- 1 hadoop supergroup 29 2023-05-11 14:39 /bda/ghost.txt
-rw-r--r-- 1 hadoop supergroup 34 2023-05-11 14:26 /bda/hadoop.txt
-rw-r--r-- 1 hadoop supergroup 52 2023-05-11 14:32
/bda/labfile.txt hdfs dfs -ls

/dir -rw-r--r-- 1 hadoop

supergroup 20 2023-05-11

14:11 /dir

#cp command hadoop fs -cp
/bda /rest

hdfs dfs -ls /bda
Found 3 items
-rw-r--r-- 1 hadoop supergroup 29 2023-05-11 14:39 /bda/ghost.txt
-rw-r--r-- 1 hadoop supergroup 34 2023-05-11 14:26 /bda/hadoop.txt

-rw-r--r-- 1 hadoop supergroup 52 2023-05-11 14:32
/bda/labfile.txt

hdfs dfs -ls /rest
Found 3 items
-rw-r--r-- 1 hadoop supergroup 29 2023-05-11 14:50 /rest/ghost.txt
-rw-r--r-- 1 hadoop supergroup 34 2023-05-11 14:50 /rest/hadoop.txt
-rw-r--r-- 1 hadoop supergroup 52 2023-05-11 14:50
/rest/labfile.txt

Program 05: Word Count Program in Hadoop

WCDriver.java

```
//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);
```

```
        }
}
```

WCMapper.java

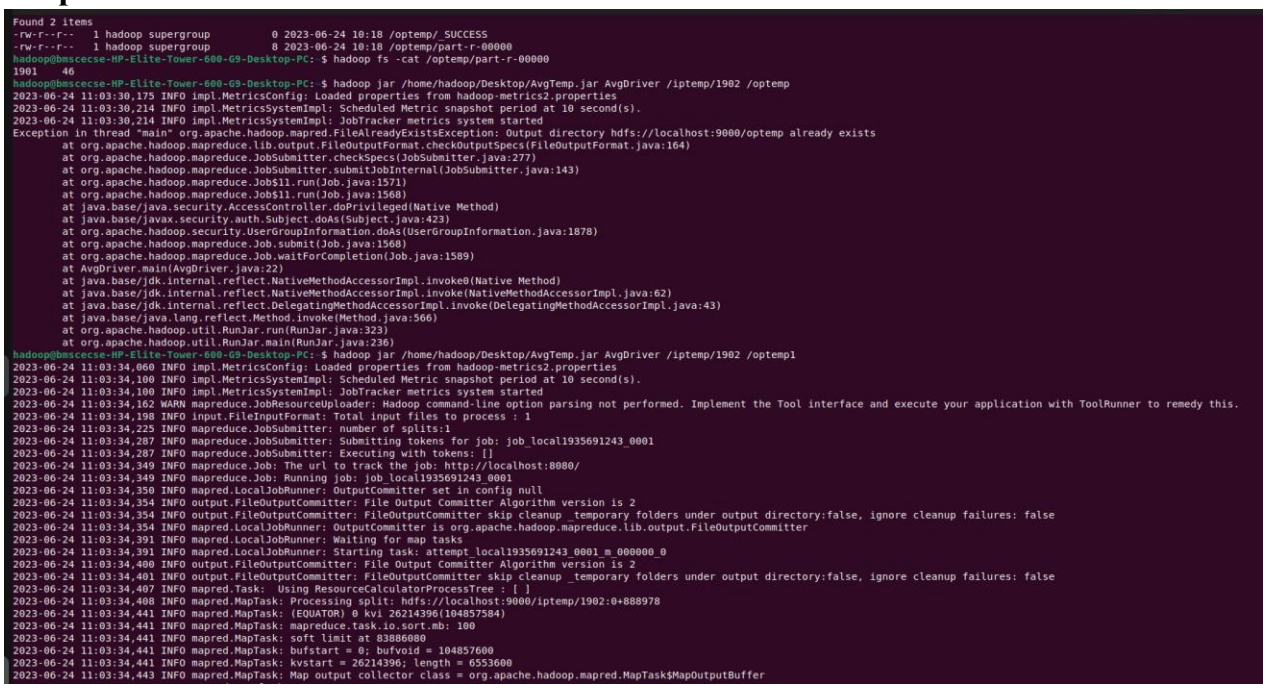
```
// Importing libraries import java.io.IOException; import
org.apache.hadoop.io.IntWritable; import
org.apache.hadoop.io.LongWritable; import
org.apache.hadoop.io.Text; import
org.apache.hadoop.mapred.MapReduceBase; import
org.apache.hadoop.mapred.Mapper; import
org.apache.hadoop.mapred.OutputCollector; import
org.apache.hadoop.mapred.Reporter;

public class WCMapper extends MapReduceBase implements
Mapper<LongWritable,Text, Text, IntWritable> {
// Map function public void map(LongWritable key, Text value,
OutputCollector<Text,
                IntWritable> output, Reporter rep) throws IOException {

                String line = value.toString();
// Splitting the line on spaces for (String word : line.split(""))
                { if (word.length() > 0)
                        { output.collect(new Text(word), new
IntWritable(1));
                        }
                }
        }
}
```

WCReducer.java

```
// 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)); }
}
```

Output:



Program 06: Average Temperature

AverageDriver.java `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.java package temp;

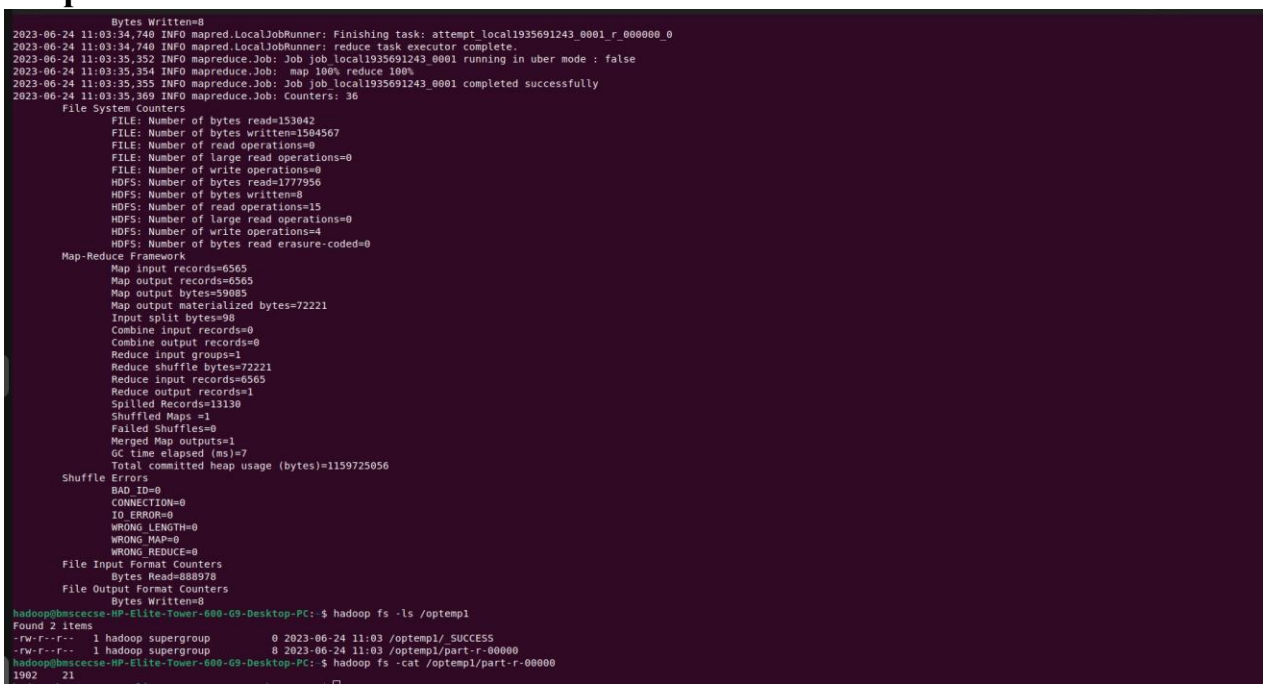
```
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import  org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;
 public class AverageMapper extends Mapper<LongWritable, Text, Text, IntWritable> {
 public static final int 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) ==
    &amp;#39;+&amp;#39;) {
       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.java 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)); }
 }
```

Output:


Bytes Written=8
2023-06-24 11:03:34,740 INFO mapred.LocalJobRunner: Finishing task: attempt_local1935691243_0001_r_000000_0
2023-06-24 11:03:34,740 INFO mapred.LocalJobRunner: reduce task executor complete.
2023-06-24 11:03:35,352 INFO mapreduce.Job: Job job_local1935691243_0001 running in uber mode : false
2023-06-24 11:03:35,354 INFO mapreduce.Job: map 100% reduce 100%
2023-06-24 11:03:35,355 INFO mapreduce.Job: Job job_local1935691243_0001 completed successfully
2023-06-24 11:03:35,369 INFO mapreduce.Job: Counters: 36
File System Counters
FILE: Number of bytes read=153042
FILE: Number of bytes written=1504567
FILE: Number of read operations=0
FILE: Number of large read operations=0
FILE: Number of write operations=0
HDFS: Number of bytes read=1777956
HDFS: Number of bytes written=8
HDFS: Number of read operations=15
HDFS: Number of large read operations=0
HDFS: Number of write operations=4
HDFS: Number of bytes read erasure-coded=0
Map-Reduce Framework
Map input records=6565
Map output records=6565
Map output bytes=59085
Map output materialized bytes=72221
Input split bytes=98
Combine input records=0
Combine output records=0
Reduce input groups=1
Reduce shuffle bytes=72221
Reduce input records=6565
Reduce output records=1
Spilled Records=13130
Shuffled Maps =1
Failed Shuffles=0
Merged Map outputs=1
GC time elapsed (ms)=7
Total committed heap usage (bytes)=1159725056
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=888978
File Output Format Counters
Bytes Written=8
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ hadoop fs -ls /optemp1
Found 2 items
-rw-r--r-- 1 hadoop supergroup 0 2023-06-24 11:03 /optemp1/_SUCCESS
-rw-r--r-- 1 hadoop supergroup 8 2023-06-24 11:03 /optemp1/part-r-00000
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ hadoop fs -cat /optemp1/part-r-00000
1902 21

Program 07: Mean Max Temperature in Hadoop

MeanMaxDriver.java 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); }
 }
```

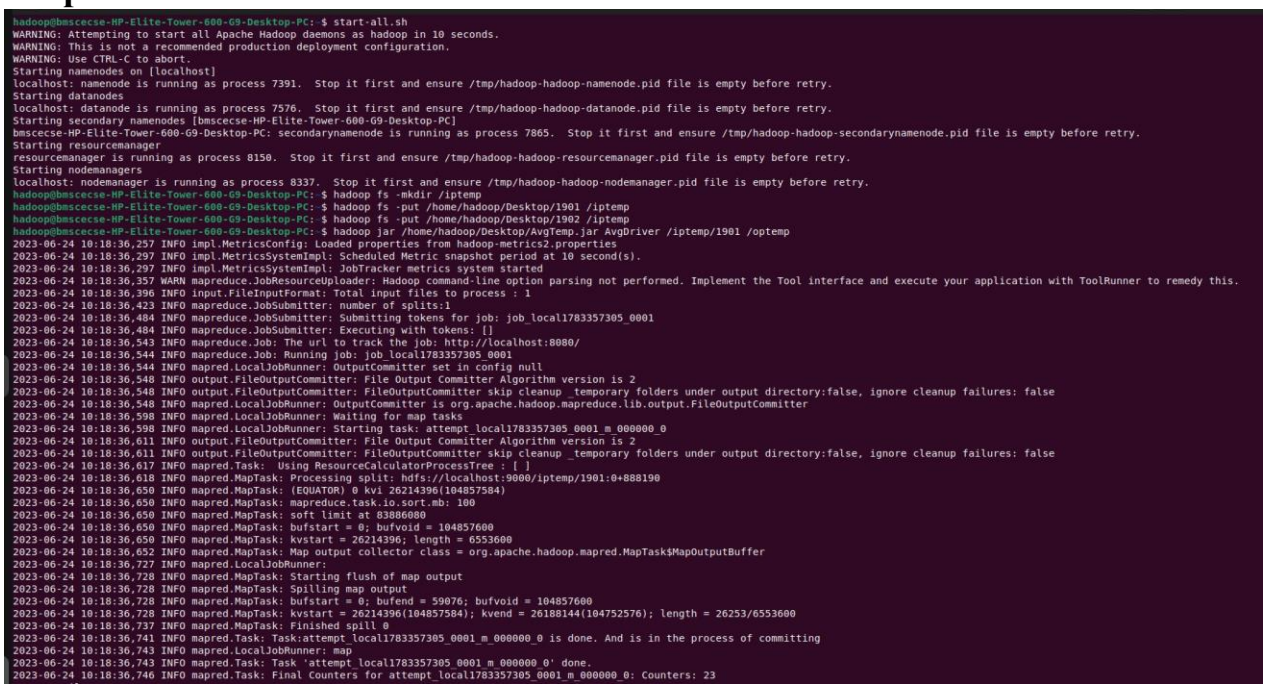
MeanMaxMapper.java

```
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) == &#39;+&#39;)
            {

               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.java 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 <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)); }
}
```

Output:


hadoop@bmscecse-HP-Elite-Tower-600-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]
localhost: namenode is running as process 7391. Stop it first and ensure /tmp/hadoop-hadoop-namenode.pid file is empty before retry.
Starting datanodes
localhost: datanode is running as process 7576. Stop it first and ensure /tmp/hadoop-hadoop-datanode.pid file is empty before retry.
Starting secondary namenodes [bmscecse-HP-Elite-Tower-600-G9-Desktop-PC]
bmscecse-HP-Elite-Tower-600-G9-Desktop-PC: secondarynamenode is running as process 7865. Stop it first and ensure /tmp/hadoop-hadoop-secondarynamenode.pid file is empty before retry.
Starting resourcemanager
resourcemanager is running as process 8150. Stop it first and ensure /tmp/hadoop-hadoop-resourcemanager.pid file is empty before retry.
Starting nodemanagers
localhost: nodemanager is running as process 8337. Stop it first and ensure /tmp/hadoop-hadoop-nodemanager.pid file is empty before retry.
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ hadoop fs -mkdir /iptemp
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ hadoop fs -put /home/hadoop/Desktop/1901 /iptemp
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ hadoop fs -put /home/hadoop/Desktop/1902 /iptemp
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/AvgTemp.jar AvgDriver /iptemp/1901 /optemp
2023-06-24 10:18:36,257 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2023-06-24 10:18:36,297 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2023-06-24 10:18:36,297 INFO impl.MetricsSystemImpl: JobTracker metrics system started
2023-06-24 10:18:36,357 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2023-06-24 10:18:36,396 INFO input.FileInputFormat: Total input files to process : 1
2023-06-24 10:18:36,423 INFO mapreduce.JobSubmitter: number of splits:1
2023-06-24 10:18:36,484 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local1783357305_0001
2023-06-24 10:18:36,484 INFO mapreduce.JobSubmitter: Executing with tokens: []
2023-06-24 10:18:36,543 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2023-06-24 10:18:36,544 INFO mapreduce.Job: Running job: job_local1783357305_0001
2023-06-24 10:18:36,544 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2023-06-24 10:18:36,548 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2023-06-24 10:18:36,548 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2023-06-24 10:18:36,548 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter
2023-06-24 10:18:36,598 INFO mapred.LocalJobRunner: Waiting for map tasks
2023-06-24 10:18:36,598 INFO mapred.LocalJobRunner: Starting task: attempt_local1783357305_0001_m_000000_0
2023-06-24 10:18:36,611 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2023-06-24 10:18:36,611 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2023-06-24 10:18:36,617 INFO mapred.Task: Using ResourceCalculatorProcessTree : [ ]
2023-06-24 10:18:36,618 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/iptemp/1901:0+888190
2023-06-24 10:18:36,650 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)
2023-06-24 10:18:36,650 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
2023-06-24 10:18:36,650 INFO mapred.MapTask: soft limit at 83886080
2023-06-24 10:18:36,650 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
2023-06-24 10:18:36,650 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2023-06-24 10:18:36,652 INFO mapred.MapTask: Map output collector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2023-06-24 10:18:36,727 INFO mapred.LocalJobRunner:
2023-06-24 10:18:36,728 INFO mapred.MapTask: Starting flush of map output
2023-06-24 10:18:36,728 INFO mapred.MapTask: Spilling map output
2023-06-24 10:18:36,728 INFO mapred.MapTask: bufstart = 0; bufend = 59076; bufvoid = 104857600
2023-06-24 10:18:36,728 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26188144(104752576); length = 26253/6553600
2023-06-24 10:18:36,737 INFO mapred.MapTask: Finished spill 0
2023-06-24 10:18:36,741 INFO mapred.Task: Task:attempt_local1783357305_0001_m_000000_0 is done. And is in the process of committing
2023-06-24 10:18:36,743 INFO mapred.LocalJobRunner: map
2023-06-24 10:18:36,743 INFO mapred.Task: Task 'attempt_local1783357305_0001_m_000000_0' done.
2023-06-24 10:18:36,746 INFO mapred.Task: Final Counters for attempt_local1783357305_0001_m_000000_0: Counters: 23

Program 08: Hadoop Map Reduce program to combine information from the users file along with Information from the posts file by using the concept of join and display user_id, Reputation and Score

JoinDriver.java

```
import org.apache.hadoop.conf.Configured;

import org.apache.hadoop.fs.Path;

import org.apache.hadoop.io.Text;

import org.apache.hadoop.mapred.*;

import org.apache.hadoop.mapred.lib.MultipleInputs;

import org.apache.hadoop.util.*;

public class JoinDriver extends Configured implements Tool
{
 public
static class KeyPartitioner implements Partitioner<TextPair, Text>
 {
   @Override

    public void configure(JobConf job) {}
   @Override public int getPartition(TextPair key, Textvalue, int
numPartitions)
 {
 return (key.getFirst().hashCode() & Integer.MAX_VALUE) % numPartitions;
       }
    }

   @Override public int run(String[] args) throws Exception {
      if (args.length != 3) {
                  System.out.println("Usage: <Department Emp Strength input>
<Department Name input> <output>"); return -1;
```

```
    }

  JobConf conf = new JobConf(getConf(), getClass()); conf.setJobName("Join
  &#39;Department Emp Strength input&#39; with
  &#39;Department Name input&#39;");
  Path AInputPath = new Path(args[0]);
  Path BInputPath = new Path(args[1]);
  Path outputPath = new Path(args[2]);

  MultipleInputs.addInputPath(conf, AInputPath, TextInputFormat.class, Posts.class);

  MultipleInputs.addInputPath(conf, BInputPath, TextInputFormat.class, User.class);

  FileOutputFormat.setOutputPath(conf, outputPath);
  conf.setPartitionerClass(KeyPartitioner.class);
  conf.setOutputValueGroupingComparator(TextPair.FirstComparator.class) ;
  conf.setMapOutputKeyClass(TextPair.class); conf.setReducerClass(JoinReducer.class);
  conf.setOutputKeyClass(Text.class);

  JobClient.runJob(conf); return 0; } public static void main(String[] args)
  throws Exception { int exitCode = ToolRunner.run(new JoinDriver(), args);
  System.exit(exitCode);
  }
  }
```

JoinReducer.java

```
  import java.io.IOException;
  import java.util.Iterator; import
  org.apache.hadoop.io.Text; import
  org.apache.hadoop.mapred.*;
  public class JoinReducer extends MapReduceBase implements Reducer<TextPair, Text, Text,
  Text> {

  @Override public void reduce (TextPair key, Iterator<Text> values,
  OutputCollector<Text, Text> output, Reporter reporter) throws
  IOException {
     Text nodeId = new Text(values.next()); while
     (values.hasNext()) { Text node = values.next();
     Text outValue = new Text(nodeId.toString() + "\t\t" + node.toString());
```

```
    output.collect(key.getFirst(), outValue);
    }
  }
  }
```

User.java

```
  import java.io.IOException; import java.util.Iterator; import
  org.apache.hadoop.conf.Configuration; import
  org.apache.hadoop.fs.FSDataInputStream; import
  org.apache.hadoop.fs.FSDataOutputStream; import
  org.apache.hadoop.fs.FileSystem; import
  org.apache.hadoop.fs.Path; import
  org.apache.hadoop.io.LongWritable;

  import org.apache.hadoop.io.Text; import
  org.apache.hadoop.mapred.*; import
  org.apache.hadoop.io.IntWritable;

    public class User extends MapReduceBase implements
  Mapper<LongWritable, Text, TextPair, Text> {
    @Override public void map(LongWritable key, Text value,
  OutputCollector<TextPair, Text> output, Reporter reporter) throws
  IOException {
  String valueString = value.toString();
  String[] SingleNodeData = valueString.split("\t"); output.collect(new
  TextPair(SingleNodeData[0], "1"), new
  Text(SingleNodeData[1]));
  }
  }
```

//Posts.java

```
  import java.io.IOException; import
  org.apache.hadoop.io.*; import
  org.apache.hadoop.mapred.*;
  public class Posts extends MapReduceBase implements
  Mapper<LongWritable, Text, TextPair, Text>{
  @Override public void map(LongWritable key, Text value,
  OutputCollector<TextPair, Text> output, Reporter reporter) throws IOException {
```

```
String valueString = value.toString(); String[] SingleNodeData =
valueString.split("\t"); output.collect(new TextPair(SingleNodeData[3],
"0"), new
Text(SingleNodeData[9]));
}
}
```

// TextPair.java

```
} public Text getFirst() { return
first; }

public Text getSecond() { return second;
}

@Override public void write(DataOutput out) throws IOException {
first.write(out);
second.write(out); }

@Override public void readFields(DataInput in) throws IOException {
first.readFields(in);
second.readFields(in);
}
@Override public int
hashCode() {

return first.hashCode() * 163 + second.hashCode(); }

@Override public boolean equals(Object o)
 {
 if (o instanceof TextPair)
{
 TextPair tp = (TextPair) o; return first.equals(tp.first) &amp;amp;&amp;amp;
second.equals(tp.second);
}
return false;
}
@Override public String toString()
{
```

```
return first + &quot;\t&quot; + second;
}
@Override public int compareTo(TextPair tp) {
int cmp = first.compareTo(tp.first); if (cmp != 0)
{ return cmp; } return
second.compareTo(tp.second);
}
// ^^ TextPair // vv TextPairComparator public static class Comparator extends
WritableComparator {
private static final Text.Comparator TEXT_COMPARATOR = new
Text.Comparator();
public Comparator() { super(TextPair.class);
}
@Override public int compare(byte[] b1, int s1, int l1, byte[]
b2, int s2, int l2) { try {
int firstL1 = WritableUtils.decodeVIntSize(b1[s1]) + readVInt(b1, s1); int firstL2 =
WritableUtils.decodeVIntSize(b2[s2]) + readVInt(b2, s2); int cmp =
TEXT_COMPARATOR.compare(b1, s1, firstL1, b2, s2, firstL2); if (cmp != 0) { return cmp;
} return TEXT_COMPARATOR.compare(b1, s1 + firstL1, l1 - firstL1,

b2, s2 + firstL2, l2 - firstL2); } catch (IOException
e) { throw new IllegalArgumentException(e);
}
} } static {
WritableComparator.define(TextPair.class, new Comparator());
} public static class FirstComparator extends WritableComparator {
private static final Text.Comparator TEXT_COMPARATOR = new
Text.Comparator(); public FirstComparator() { super(TextPair.class); }
@Override public int compare(byte[] b1, int s1, int l1, byte[]
b2, int s2, int l2) {
try { int firstL1 = WritableUtils.decodeVIntSize(b1[s1]) + readVInt(b1, s1); int firstL2 =
WritableUtils.decodeVIntSize(b2[s2]) + readVInt(b2, s2);
return TEXT_COMPARATOR.compare(b1, s1, firstL1, b2, s2, firstL2);
} catch (IOException e)
{
 throw new IllegalArgumentException(e);
}
}
@Override public int compare(WritableComparable a, WritableComparable b)
```

```
 {
 if (a instanceof TextPair &amp;amp;&amp;amp; b instanceof TextPair)
 {
 return ((TextPair) a).first.compareTo(((TextPair) b).first);
}
 return super.compare(a, b);
}
}


 }
```

Output:

```
  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=0
  File Output Format Counters
  Bytes Written=85
hduser@bmsce-Precision-T1700:~/khushil/join/MapReduceJoin$ hdfs dfs -cat /khushil_join/output2/part-
00000
A11     50          Finance
B12     100         HR
C13     250         Manufacturing
Dept_ID Total_Employee          Dept_Name
hduser@bmsce-Precision-T1700:~/khushil/join/MapReduceJoin$
```

Program 09: Word Count in Spark

scala> val data = sc.textFile("sridevi/sparkdata.txt") data: org.apache.spark.rdd.RDD[String] = swati/sparkdata.txt MapPartitionsRDD[1] at textFile at <console>:24

scala> data.collect; res0: Array[String] = Array(hello world, this is BDA spark lab)

scala> val splitdata = data.flatMap(line => line.split(" "));
splitdata: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[2] at flatMap at <console>:25

scala> splitdata.collect;
res1: Array[String] = Array(hello, world,, this, is, BDA, spark, lab)

scala> val mapdata = splitdata.map(word => (word,1));
mapdata: org.apache.spark.rdd.RDD[(String, Int)] = MapPartitionsRDD[3] at map at <console>:25

scala> mapdata.collect; res2: Array[(String, Int)] = Array((hello,1), (world,,1), (this,1), (is,1), (BDA,1), (spark,1), (lab,1))

scala> val reducedata = mapdata.reduceByKey(_+_); reducedata: org.apache.spark.rdd.RDD[(String, Int)] = ShuffledRDD[4] at reduceByKey at <console>:25

scala> reducedata.collect; res3: Array[(String, Int)] = Array((this,1), (is,1), (hello,1), (world,,1), (lab,1), (spark,1), (BDA,1))

Program 10: Using RDD and FlaMap count how many times each word appears in a file and write out a list of words whose count is strictly greater than 4 using Spark.

```
scala> val textFile = sc.textFile("sridevi/word.txt")
textFile: org.apache.spark.rdd.RDD[String] = swati/word.txt MapPartitionsRDD[1] at textFile
at <console>:24

scala> val counts = textFile.flatMap(line => line.split("")).map(word
=> (word, 1)).reduceByKey(_ + _) counts: org.apache.spark.rdd.RDD[(String, Int)] =
ShuffledRDD[4] at reduceByKey at <console>:25

scala> import scala.collection.immutable.ListMap import
scala.collection.immutable.ListMap

scala> val sorted=ListMap(counts.collect.sortWith(_._2 > _._2):_*)// sort in descending order
based
sorted: scala.collection.immutable.ListMap[String,Int] =
ListMap(hello -> 6, world -> 5, this -> 2, is -> 2, lab -> 2, BDA ->
2, word -> 1)

scala> println(sorted)
ListMap(hello -> 6, world -> 5, this -> 2, is -> 2, lab -> 2, BDA ->
2, word -> 1)

scala> for((k,v)<-sorted){
         | if(v>4)
         | {
         | print(k+",")
         | print(v)
         | println()
         | }
         | }
hello,6
```