

# VISVESVARAYATECHNOLOGICALUNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.



**LAB REPORT on**

## **BIG DATA ANALYTICS**

*Submitted by*

**ROSHAN CS  
(1BM20CS132)**

*in partial fulfillment for the award of the degree of*  
**BACHELOR OF ENGINEERING**  
*in*  
**COMPUTER SCIENCE AND ENGINEERING**



**B.M.S. COLLEGE OF ENGINEERING**

(Autonomous Institution under VTU)

**BENGALURU-560019**

**Mar-2023 to July-2023**

**B. M. S. College of Engineering, Bull**

Temple Road, Bangalore 560019 (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** " was **carried** out by **R.DHANUSH (1BM20CS117)**, 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.

**Vikranth BM**  
Assistant Professor

**Dr. Jyothi S Nayak**  
Professor and Head of Department

**Index Sheet**

<b>Sl. No.</b>	<b>Experiment Title</b>
<b>01</b>	<b>MongoDB Commands</b>
<b>02</b>	<b>Cassandra program for Employee details</b>
<b>03</b>	<b>Cassandra Library Database</b>
<b>04</b>	<b>Hadoop Commands</b>
<b>05</b>	<b>Word Count program in Hadoop</b>

<b>06</b>	<b>Average Temperature in Hadoop</b>
<b>07</b>	<b>Mean Max Temperature in Hadoop</b>
<b>08</b>	<b>Map Reduce Program in Hadoop using Joins</b>
<b>09</b>	<b>Spark program for Word Count</b>

### **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}},{upsert: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
	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
```

```
[bmscece-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 /siri # 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:
```

```

Found 2 items
-rw-r--r-- 1 hadoop supergroup 0 2023-06-24 10:18 /optemp/ SUCCESS
-rw-r--r-- 1 hadoop supergroup 8 2023-06-24 10:18 /optemp/part-r-00000
hadoop@hmsccse-HP-Elite-Tower-690-G9-Desktop-PC: $ hadoop fs -cat /optemp/part-r-00000
1901 46
hadoop@hmsccse-HP-Elite-Tower-690-G9-Desktop-PC: $ hadoop jar /home/hadoop/Desktop/AvgTemp.jar AvgDriver /iptemp/1902 /optemp
2023-06-24 11:03:30.175 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2023-06-24 11:03:30.214 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2023-06-24 11:03:30.214 INFO impl.MetricsSystemImpl: JobTracker metrics system started
Exception in thread "main" org.apache.hadoop.mapred.FileAlreadyExistsException: Output directory hdfs://localhost:9000/optemp already exists
    at org.apache.hadoop.mapreduce.lib.output.FileOutputFormat.checkOutputSpecs(FileOutputFormat.java:164)
    at org.apache.hadoop.mapreduce.JobSubmitter.checkSpecs(JobSubmitter.java:277)
    at org.apache.hadoop.mapreduce.JobSubmitter.submit(JobInternal$JobSubmitter.java:143)
    at org.apache.hadoop.mapreduce.Job$11.run(Job.java:1571)
    at org.apache.hadoop.mapreduce.Job$11.run(Job.java:1568)
    at java.base/java.security.AccessController.doPrivileged(Native Method)
    at java.base/javax.security.auth.Subject.doAs(Subject.java:423)
    at org.apache.hadoop.mapreduce.JobSubmitter.doAs(UserGroupInformation.java:1078)
    at org.apache.hadoop.mapreduce.Job.submit(Job.java:1568)
    at org.apache.hadoop.mapreduce.Job.waitForCompletion(Job.java:1589)
    at AvgDriver.main(AvgDriver.java:22)
    at java.base/jdk.internal.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
    at java.base/jdk.internal.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:62)
    at java.base/jdk.internal.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:43)
    at java.base/java.lang.reflect.Method.invoke(Method.java:566)
    at org.apache.hadoop.util.RunJar.run(RunJar.java:323)
    at org.apache.hadoop.util.RunJar.main(RunJar.java:226)
hadoop@hmsccse-HP-Elite-Tower-690-G9-Desktop-PC: $ hadoop jar /home/hadoop/Desktop/AvgTemp.jar AvgDriver /iptemp/1902 /optemp1
2023-06-24 11:03:34.060 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2023-06-24 11:03:34.100 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2023-06-24 11:03:34.162 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 11:03:34.198 INFO input.FileInputFormat: Total input files to process : 1
2023-06-24 11:03:34.225 INFO mapreduce.JobSubmitter: number of splits:1
2023-06-24 11:03:34.287 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local1935691243_0001
2023-06-24 11:03:34.287 INFO mapreduce.JobSubmitter: Executing with tokens: {}
2023-06-24 11:03:34.349 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2023-06-24 11:03:34.349 INFO mapreduce.Job: Running job: job_local1935691243_0001
2023-06-24 11:03:34.350 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2023-06-24 11:03:34.354 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2023-06-24 11:03:34.354 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup temporary folders under output directory:false, ignore cleanup failures: false
2023-06-24 11:03:34.354 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter
2023-06-24 11:03:34.391 INFO mapred.LocalJobRunner: Waiting for map tasks
2023-06-24 11:03:34.391 INFO mapred.LocalJobRunner: Starting task: attempt local1935691243_0001_r_000000_0
2023-06-24 11:03:34.400 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2023-06-24 11:03:34.401 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup temporary folders under output directory:false, ignore cleanup failures: false
2023-06-24 11:03:34.407 INFO mapred.Task: Using ResourceCalculatorProcessFree: [ ]
2023-06-24 11:03:34.408 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/iptemp/1902:0+888978
2023-06-24 11:03:34.441 INFO mapred.MapTask: (EQUATOR) # vci 26214396(104857564)
2023-06-24 11:03:34.441 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
2023-06-24 11:03:34.441 INFO mapred.MapTask: soft limit at 83886080
2023-06-24 11:03:34.441 INFO mapred.MapTask: bufstart = 0, bufvoid = 104857600
2023-06-24 11:03:34.441 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2023-06-24 11:03:34.443 INFO mapred.MapTask: Map output collector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer

```

## 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) == '&#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(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=177956
  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_REUCE=0
File Input Format Counters
  Bytes Read=888978
File Output Format Counters
  Bytes Written=8
hadoop@bmsccscs-HP-Elite-Tower-680-G9-Desktop-PC: $ hadoop fs -ls /optempl
Found 2 items
-rw-r--r-- 1 hadoop supergroup          0 2023-06-24 11:03 /optempl/ SUCCESS
-rw-r--r-- 1 hadoop supergroup          8 2023-06-24 11:03 /optempl/part-r_00000
hadoop@bmsccscs-HP-Elite-Tower-680-G9-Desktop-PC: $ hadoop fs -cat /optempl/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@bscscce-HP-Elite-Tower-680-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 [bscscce-HP-Elite-Tower-680-G9-Desktop-PC]
bscscce-HP-Elite-Tower-680-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 resource manager
resource manager is running as process 8150. Stop it first and ensure /tmp/hadoop-hadoop-resource manager.pid file is empty before retry.
Starting node managers
localhost: nodemanager is running as process 8337. Stop it first and ensure /tmp/hadoop-hadoop-nodemanager.pid file is empty before retry.
hadoop@bscscce-HP-Elite-Tower-680-G9-Desktop-PC: ~$ hadoop fs -mkdir /iptemp
hadoop@bscscce-HP-Elite-Tower-680-G9-Desktop-PC: ~$ hadoop fs -put /home/hadoop/Desktop/1901 /iptemp
hadoop@bscscce-HP-Elite-Tower-680-G9-Desktop-PC: ~$ hadoop fs -put /home/hadoop/Desktop/1902 /iptemp
hadoop@bscscce-HP-Elite-Tower-680-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 = 59876; 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.Configuration; 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 Configuration implements Tool { public
static class KeyPartitioner implements Partitioner<TextPair, Text> {
@Override

public void configure(JobConf job) {}
@Override public int getPartition(TextPair key, Text value,
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; 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 && 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("swati/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 FlamaMap 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("swati/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
```