VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

BIG DATA ANALYTICS
(20CS6PEBDA)

Submitted by

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

B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
BENGALURU-560019
May-2022 to July-2022

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 "**BIG DATA ANALYTICS**" carried out by **Rahul Suresh (1BM19CS204),** 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 2022. 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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Index Sheet

Course Outcome

CO 1	Apply the concept of NoSQL, Hadoop or Spark for a given task
CO 2	Analyze the Big Data and obtain insight using data analytics mechanisms.
CO 3	Design and implement big data applications by applying NoSQL, Hadoop or Spark

1 Perform the following DB operations using Cassandra.

1. Create a keyspace by name Employee

2. Create a column family by

name Employee-Info with

attributes Emp_Id Primary

Key, Emp_Name,

Designation, Date_of_Joining, Salary, Dept_Name

3. Insert the values into the table in batch

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

5. Sort the details of Employee records based on salary

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

Projects done by the corresponding Employee.

7. Update the altered table to add project names.

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

```
cqlsh:employee> CREATE KEYSPACE employee WITH REPLICATION={ 'class' :
'SimpleStrategy', 'replication_factor' : 1};

cqlsh:employee> USE employee;

cqlsh:employee> create table employee_info(emp_id int PRIMARY KEY, emp_name text,
    ... designation text, date_of_joining timestamp, salary double PRIMARY KEY, dept_name text);

cqlsh:employee> CREATE TABLE employee_info(emp_id int, emp_name text, designation text,
date_of_joining timestamp, salary double, dept_name text, PRIMARY KEY(emp_id, salary));

cqlsh:employee> BEGIN BATCH INSERT INTO
    ... employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name)
    ... VALUES(100,'John','MANAGER','2021-09-11',30000,'TESTING');
    ... INSERT INTO
```

```
        ... employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name)
        ... VALUES(111,'Tom','ASSOCIATE','2021-06-22',25000,'DEVELOPING');
        ... INSERT INTO
        ... employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name)
        ... VALUES(121,'Elsa','MANAGER','2021-03-30',35000,'HR');
        ... INSERT INTO
        ... employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name)
        ... VALUES(115,'Chris','ASSISTANT','2021-12-30',20000,'DEVELOPING');
        ... INSERT INTO
        ... employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name)
        ... VALUES(105,'Sarah','ASSOCIATE','2021-06-25',25000,'TESTING');
        ... APPLY BATCH;
cqlsh:employee> SELECT * FROM employee_info
        ... ;

 emp_id | salary | date_of_joining           | dept_name | designation | emp_name
--------+--------+---------------------------+-----------+-------------+----------
    105 |  25000 | 2021-06-24 18:30:00.000000+0000 |   TESTING |   ASSOCIATE |    Sarah
    111 |  25000 | 2021-06-21 18:30:00.000000+0000 |DEVELOPING |   ASSOCIATE |      Tom
    121 |  35000 | 2021-03-29 18:30:00.000000+0000 |        HR |    MANAGER |     Elsa
    115 |  20000 | 2021-12-29 18:30:00.000000+0000 |DEVELOPING |   ASSISTANT |    Chris
    100 |  30000 | 2021-09-10 18:30:00.000000+0000 |   TESTING |     MANAGER |     John

(5 rows)
cqlsh:employee> UPDATE employee_info SET emp_name = 'Jessica', dept_name =
'DEVELOPING' WHERE emp_id = 121;
cqlsh:employee> UPDATE employee_info SET emp_name = 'Jessica', dept_name =
'DEVELOPING' WHERE emp_id = 121 AND salary = 35000;
cqlsh:employee> SELECT * FROM employee_info ;
```

```
 emp_id | salary | date_of_joining           | dept_name | designation | emp_name
--------+--------+---------------------------+-----------+-------------+----------
    105 |  25000 | 2021-06-24 18:30:00.000000+0000 |                         TESTING |   ASSOCIATE
|                                                 Sarah
    111 |  25000 | 2021-06-21 18:30:00.000000+0000 | DEVELOPING |   ASSOCIATE |  Tom
    121 |  35000 | 2021-03-29 18:30:00.000000+0000 | DEVELOPING |      MANAGER |  Jessica
    115 |  20000 | 2021-12-29 18:30:00.000000+0000 | DEVELOPING |   ASSISTANT |   Chris
    100 |  30000 | 2021-09-10 18:30:00.000000+0000 |                TESTING |     MANAGER |     John

(5 rows)
```

cqlsh:employee> SELECT * FROM employee_info WHERE emp_id in (105, 111, 121, 115, 100) order by salary; cqlsh:employee> paging off

Disabled Query paging.

cqlsh:employee> SELECT * FROM employee_info WHERE emp_id in (105, 111, 121, 115, 100) order by salary;

```
 emp_id | salary | date_of_joining           | dept_name | designation | emp_name
--------+--------+---------------------------+-----------+-------------+----------
    115 |  20000 | 2021-12-29 18:30:00.000000+0000 | DEVELOPING |   ASSISTANT |   Chris
    105 |  25000 | 2021-06-24 18:30:00.000000+0000 |                         TESTING |   ASSOCIATE
|                                                 Sarah
    111 |  25000 | 2021-06-21 18:30:00.000000+0000 | DEVELOPING |   ASSOCIATE |  Tom
    100 |  30000 | 2021-09-10 18:30:00.000000+0000 |                TESTING |     MANAGER |     John
    121 |  35000 | 2021-03-29 18:30:00.000000+0000 | DEVELOPING |      MANAGER |  Jessica

(5 rows)
```

cqlsh:employee> ALTER TABLE employee_info ADD projects text;

cqlsh:employee> UPDATE employee_info SET projects = 'Chat App' WHERE emp_id = 111;

cqlsh:employee> UPDATE employee_info SET projects = 'Chat App' WHERE emp_id = 111 and salary = 25000;

cqlsh:employee> UPDATE employee_info SET projects = 'Discord Bot' WHERE emp_id = 115 and salary = 20000;

cqlsh:employee> UPDATE employee_info SET projects = 'Campus Portal' WHERE emp_id = 105 and salary = 25000;

cqlsh:employee> UPDATE employee_info SET projects = 'YouTube Downloader' WHERE emp_id = 100 and salary = 30000;

cqlsh:employee> UPDATE employee_info SET projects = 'Library Management System ' WHERE emp_id = 121 and salary = 35000;

cqlsh:employee> SELECT * FROM employee_infor

... ;

cqlsh:employee> SELECT * FROM employee_info ;

emp_id	salary	date_of_joining	dept_name	designation	emp_name	projects
105	25000	2021-06-24 18:30:00.000000+0000	TESTING	ASSOCIATE	Sarah	Campus Portal
111	25000	2021-06-21 18:30:00.000000+0000	DEVELOPING	ASSOCIATE	Tom	Chat App
121	35000	2021-03-29 18:30:00.000000+0000	DEVELOPING	MANAGER	Jessica	Library Management System
115	20000	2021-12-29 18:30:00.000000+0000	DEVELOPING	ASSISTANT	Chris	Discord Bot
100	30000	2021-09-10 18:30:00.000000+0000	TESTING	MANAGER	John	YouTube Downloader

(5 rows)

cqlsh:employee> INSERT INTO

... employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name)

...

... ;

cqlsh:employee> INSERT INTO

```
        ... employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name)
        ... VALUES(110,'SAM','ASSOCIATE','2021-01-11',28000,'TESTING') USING TTL 15;
cqlsh:employee> SELECT TTL(emp_name) from employee_info WHERE emp_id = 110;

 ttl(emp_name)
----------------
          3

(1 rows)
cqlsh:employee> SELECT * FROM employee_info;

 emp_id | salary | date_of_joining           | dept_name | designation | emp_name | projects
--------+--------+---------------------------+-----------+-------------+----------+-----------------------
   105 |  25000 | 2021-06-24 18:30:00.000000+0000 |                 TESTING |   ASSOCIATE |                Sarah |                 Campus Portal
   111 |  25000 | 2021-06-21 18:30:00.000000+0000 | DEVELOPING |   ASSOCIATE |                  Tom |                      Chat App
   121 |  35000 | 2021-03-29 18:30:00.000000+0000 | DEVELOPING |      MANAGER |              Jessica |  Library Management System
   115 |  20000 | 2021-12-29 18:30:00.000000+0000 | DEVELOPING |   ASSISTANT |                Chris |                   Discord Bot
   100 |  30000 | 2021-09-10 18:30:00.000000+0000 |                 TESTING |      MANAGER |                 John |                 YouTube Downloader

(5 rows)
```

2.Perform the following DB operations using Cassandra.

1.Create a keyspace by name Library

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

3. Insert the values into the table in batch

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

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

6. Export the created column to a csv file

7. Import a given csv dataset from local file system into Cassandra column family cqlsh:library> CREATE KEYSPACE library WITH replication = {'class':

'SimpleStrategy','replication_factor':1}; cqlsh:library> USE library ;

cqlsh:library> CREATE TABLE Library_info(stud_id int, stud_name text, book_name text, book_id text, date_of_issue timestamp, counter_value counter, PRIMARY KEY(stud_id,stud_name, book_name, book_id, date_of_issue));

cqlsh:library> BEGIN COUNTER BATCH

... UPDATE library_info set counter_value +=1 where stud_id = 111 and stud_name = 'Manoj' and book_name = 'Operations Research' and book_id = '56TXT' and date_of_issue = '2021-09-12';

... UPDATE library_info set counter_value +=1 where stud_id = 112 and stud_name = 'Kamal' and book_name = 'Engineering Mathematics-3' and book_id = '5ERW4' and date_of_issue = '2021-04-10';

... UPDATE library_info set counter_value +=1 where stud_id = 113 and stud_name = 'Mahesh' and book_name = 'Robinson Crusoe' and book_id = '34EDC' and date_of_issue = '2021-02-01';

... UPDATE library_info set counter_value +=1 where stud_id = 114 and stud_name = 'Raj' and book_name = 'Engineering Drawing' and book_id = '123ER' and date_of_issue = '2021-04-03';

... APPLY BATCH;

cqlsh:library> SELECT * FROM library_info ;

stud_id | stud_name | book_name | book_id | date_of_issue | counter_value

+ + + + +

114 | Raj | Engineering Drawing | 123ER | 2021-04-02 18:30:00.000000+0000 | 1

111 | Manoj | Operations Research | 56TXT | 2021-09-11 18:30:00.000000+0000 | 1

```
 113 |   Mahesh |        Robinson Crusoe | 34EDC | 2021-01-31 18:30:00.000000+0000 |   1
 112 |    Kamal | Engineering Mathematics-3 | 5ERW4 | 2021-04-09 18:30:00.000000+0000 |  1

(4 rows)
```

```
cqlsh:library> UPDATE library_info set counter_value += 1 where stud_id = 112 and stud_name =
'Kamal' and book_name = 'Engineering Mathematics-3' and book_id = '5ERW4' and date_of_issue =
'2021-04-09';
cqlsh:library> SELECT * FROM library_info ;

 stud_id | stud_name | book_name           | book_id | date_of_issue              | counter_value
---------+-----------+---------------------+---------+----------------------------+---------------
     114 |       Raj |      Engineering Drawing | 123ER | 2021-04-02 18:30:00.000000+0000 |    1
     111 |     Manoj |                          Operations Research | 56TXT | 2021-09-11          1
                                                                                 18:30:00.000000+0000 |
     113 |   Mahesh |   Robinson Crusoe | 34EDC | 2021-01-31 18:30:00.000000+0000          1
                                                                                                     |
     112 |    Kamal | Engineering Mathematics-3 |   5ERW4 | 2021-04-09 18:30:00.000000+0000 |2
```

```
cqlsh:library> copy library_info(stud_id,stud_name, book_name, book_id,
date_of_issue,counter_value) to 'library_info.csv' ;
Using 11 child processes

Starting copy of library.library_info with columns [stud_id, stud_name, book_name, book_id,
date_of_issue, counter_value].
Processed: 6 rows; Rate:  39 rows/s; Avg. rate:   39
rows/s 6 rows exported to 1 files in 0.165 seconds.
```

```
cqlsh:library> copy library_info(stud_id,stud_name, book_name, book_id,
date_of_issue,counter_value) from 'library_info.csv' ;
Using 11 child processes
```

Starting copy of library.library_info with columns [stud_id, stud_name, book_name, book_id, date_of_issue, counter_value].

Processed: 6 rows; Rate: 10 rows/s; Avg. rate: 15

rows/s 6 rows imported from 1 files in 0.392 seconds (0

skipped).

3.MongoDB- CRUD Demonstration

bmsce@bmsce-Precision-T1700:~$

mongo MongoDB shell version v3.6.8

connecting to: mongodb://127.0.0.1:27017

Implicit session: session { "id" : UUID("d66acdb3-8482-417d-8b75-

d65dae4b53ee") } MongoDB server version: 3.6.8

> use Student

switched to db

Student

> db.createCollection("student");

{ "ok" : 1 }

> db.Student.insert({_id:1,StudName:"Megha",Grade:"vii",Hobbies:"InternetSurfi

ng"}); WriteResult({ "nInserted" : 1 })

> db.Student.update({_id:3,StudName:"Ayan",Grade:"vii"},{$set:{Hobbies:"skating"}},{upsert:t

rue}); WriteResult({ "nMatched" : 0, "nUpserted" : 1, "nModified" : 0, "_id" : 3 })

> db.Student.find({StudName:"Ayan"});

```
{ "_id" : 3, "Grade" : "vii", "StudName" : "Ayan", "Hobbies" : "skating" }
> db.Student.find({},{StudName:1,Grade:1,_id:0});
{ "StudName" : "Megha", "Grade" : "vii" }
{ "Grade" : "vii", "StudName" : "Ayan" }

> db.Student.find({Grade:{$eq:'vii'}}).pretty();
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
{ "_id" : 3, "Grade" : "vii", "StudName" : "Ayan", "Hobbies" : "skating" }
> db.Student.find({Grade:{$eq:'vii'}});
{ "_id" : 1, "StudName" : "Megha", "Grade" : "vii", "Hobbies" : "InternetSurfing" }
{ "_id" : 3, "Grade" : "vii", "StudName" : "Ayan", "Hobbies" : "skating" }
> db.Student.find({Grade:{$eq:'vii'}}).pretty();
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
{ "_id" : 3, "Grade" : "vii", "StudName" : "Ayan", "Hobbies" : "skating" }
> db.Student.find({Hobbies:{$in:['Chess','Skating']}}).pretty();
> db.Student.find({Hobbies:{$in:['Skating']}}).pretty();
> db.Student.find({Hobbies:{$in:['skating']}}).pretty();
{ "_id" : 3, "Grade" : "vii", "StudName" : "Ayan", "Hobbies" : "skating" }
```

```
> db.Student.find({StudName:/^M/}).pretty();
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
> db.Student.find({StudName:/e/}).pretty();
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
> db.Student.count(
); 2
> db.Student.find().sort({StudName:-1}).pretty();
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
{ "_id" : 3, "Grade" : "vii", "StudName" : "Ayan", "Hobbies" : "skating" }
> db.Student.save({StudName:"Vamsi",Greade:"
vi"}) WriteResult({ "nInserted" : 1 })
> db.Students.update({_id:4},{$set:{Location:"Network"}})
WriteResult({ "nMatched" : 0, "nUpserted" : 0, "nModified" :
0 })
```

```
> db.Students.update({_id:4},{$unset:{Location:"Network"}}
) WriteResult({ "nMatched" : 0, "nUpserted" : 0, "nModified"
: 0 })
> db.Student.find({_id:1},{StudName:1,Grade:1,_id:0});
{ "StudName" : "Megha", "Grade" : "vii" }
> db.Student.find({Grade:{$ne:'VII'}}).pretty();
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
{ "_id" : 3, "Grade" : "vii", "StudName" : "Ayan", "Hobbies" : "skating" }
{
        "_id" : ObjectId("6253f413e88b8c9e787b194e"),
        "StudName" : "Vamsi",
        "Grade" : "vi"
}
> db.Student.find({StudName:/s$/}).pretty();
> db.Students.update({_id:3},{$set:{Location:null}})
WriteResult({ "nMatched" : 0, "nUpserted" : 0, "nModified" :
0 })
> db.Students.count
() 0
> db.Students.count({Grade:"VII
"}) 0
> db.Student.find({Grade:"VII"}).limit(3).pretty();
> db.Student.update({_id:3},{$set:{Location:null}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.Student.count({Grade:"VII"})
```

```
0
> db.Students.count({Grade:"vii
"}) 0
> db.Student.count
() 3
> db.Student.count({Grade:"vii
"}) 2
> db.Student.find({Grade:"vii"}).limit(3).pretty();
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
{
        "_id" : 3,
        "Grade" :
        "vii",
        "StudName"          :
        "Ayan",  "Hobbies"  :
        "skating", "Location"
        : null
}
> db.Student.find().sort({StudName:1}).pretty();
{
        "_id"    :    3,
        "Grade"       :
        "vii",
        "StudName"          :
        "Ayan",  "Hobbies"  :
```

"skating", "Location"

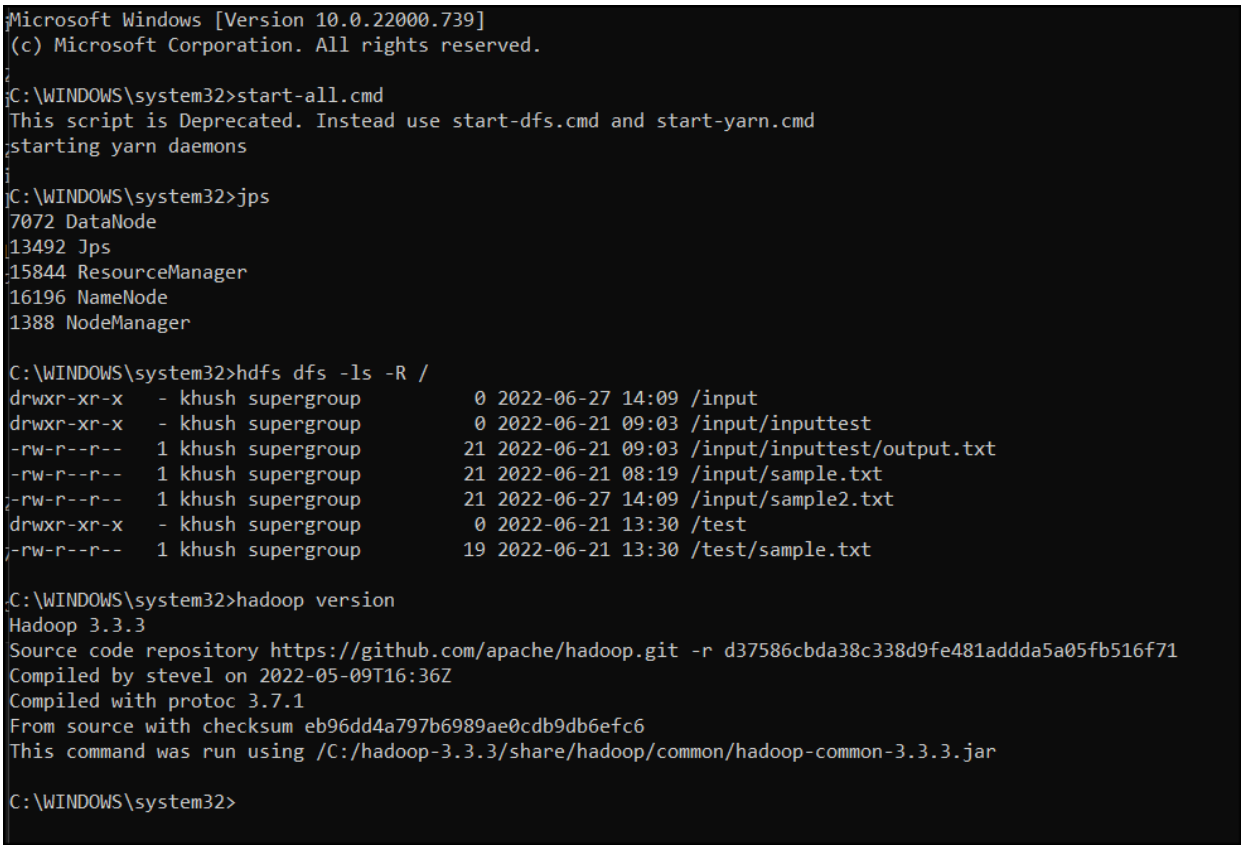
: null

```
}
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
{
        "_id" : ObjectId("6253f413e88b8c9e787b194e"),
        "StudName" : "Vamsi",
        "Grade" : "vi"
}
> db.Student.find().skip(2).pretty()
{
        "_id" : ObjectId("6253f413e88b8c9e787b194e"),
        "StudName" : "Vamsi",
        "Grade" : "vi"
}
> db.food.insert( { _id:1, fruits:['grapes','mango','apple';] } )
2022-04-11T15:05:51.894+0530 E QUERY    [thread1] SyntaxError: missing ] after element list @(shell):1:57
> db.food.insert({_id:1,fruits:['grapes','mango','apple
']}) WriteResult({ "nInserted" : 1 })
> db.food.insert({_id:2,fruits:['grapes','mango','cherry
']}) WriteResult({ "nInserted" : 1 })
> db.food.insert({_id:3,fruits:['banana','mango'
]}) WriteResult({ "nInserted" : 1 })
> db.food.find({fruits:['grapes','mango','apple']}).pretty();
{ "_id" : 1, "fruits" : [ "grapes", "mango", "apple" ] }
```

```
> db.food.find({'fruits.1':'grapes'})
> db.food.find({"fruits":{$size:2}})
{ "_id" : 3, "fruits" : [ "banana", "mango" ] }
> db.food.find({_id:1},{"fruits":{$slice:2}})
{ "_id" : 1, "fruits" : [ "grapes", "mango" ] }
> db.food.find({fruits:{$all:["mango","grapes"]}})
{ "_id" : 1, "fruits" : [ "grapes", "mango", "apple" ] }
{ "_id" : 2, "fruits" : [ "grapes", "mango", "cherry" ] }
> db.food.update({_id:3},{$set:{"fruits.1":"apple"}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" :
1 })
> db.food.update({_id:2},{$push:{price:{grapes:80,mango:200,cherry:1
00}}}) WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })

>db.Customers.insert({_custID:1,AcctBal:'100000',AcctType:"sav
ing"}); WriteResult({ "nInserted" : 1 })
> db.Customers.aggregate({$group:{_id:"$custID",TotAccBal:{$sum:"$AccBal"}}});
{ "_id" : null, "TotAccBal" : 0 }
db.Customers.aggregate({$match:{AcctType:"saving"}},{$group:{_id:"$custID",TotAccBal:{$sum:"$A
ccBal"}}});
{ "_id" : null, "TotAccBal" : 0 }
db.Customers.aggregate({$match:{AcctType:"saving"}},{$group:{_id:"$custID",TotAccBal:{$sum:"$Acc
Bal"}}},{$ match:{TotAccBal:{$gt:1200}}});
```

4. Screenshot of Hadoop installed



5.Execution of HDFS Commands for interaction with Hadoop Environment.

hduser@bmsce-Precision-T1700:~$ start-all.sh

hduser@bmsce-Precision-

T1700:~$ jps 7184 NodeManager

6851 ResourceManager

6692 SecondaryNameNode

6313 NameNode

7306 Jps

6479 DataNode

hduser@bmsce-Precision-T1700:~$ hdfs dfs -mkdir /1BM19CS204

hduser@bmsce-Precision-T1700:~$ hadoop

fs -ls / Found 5 items

drwxr-xr-x - hduser supergroup 0 2022-06-01 09:30 /1BM19CS204

drwxr-xr-x - hduser supergroup 0 2022-05-31 09:58 /abcde

drwxr-xr-x - hduser supergroup 0 2022-05-31 10:04 /abcdef

drwxrwxr-x - hduser supergroup 0 2019-08-01 16:19 /tmp

drwxr-xr-x - hduser supergroup 0 2019-08-01 16:03 /user

hduser@bmsce-Precision-T1700:~$ hdfs dfs -put /home/hduser/Desktop/Welcome.txt /1BM19CS167/WC.txt

hduser@bmsce-Precision-T1700:~$ hdfs dfs -cat

/1BM19CS204/WC.txt Science in our Daily Lives

As I have mentioned earlier Science has got many changes in our lives. First of all, transportation is easier now. With the help of Science it now easier to travel long distances. Moreover, the time of traveling is also reduced. Various high-speed vehicles are available these days. These vehicles have totally changed. The phase of our society. Science upgraded steam engines to electric engines. In earlier times people were traveling with cycles. But now everybody travels on motorcycles and cars. This saves time and effort. And this is all possible with the help of Science.

hduser@bmsce-Precision-T1700:~$ hdfs dfs -get /1BM19CS204/WC.txt /home/hduser/Desktop/WWC.txt

hduser@bmsce-Precision-T1700:~$ hdfs dfs -put /home/hduser/Desktop/Welcome.txt /1BM19CS204/WC2.txt

hduser@bmsce-Precision-T1700:~$ hdfs dfs -getmerge /1BM19CS167/WC.txt /1BM19CS204/WC2.txt /home/hduser/Desktop/Merge.txt

hduser@bmsce-Precision-T1700:~$ hadoop fs -getfacl

/1BM19CS204/ # file: /1BM19CS204

owner: hduser

group:

supergroup

user::rwx

group::r-

x

other::r-x

hduser@bmsce-Precision-T1700:~$ hdfs dfs -copyToLocal /1BM19CS204WC.txt /home/hduser/Desktop

hduser@bmsce-Precision-T1700:~$ hdfs dfs -mv /1BM19CS204/1bm19cs167

hduser@bmsce-Precision-T1700:~$ hadoop

fs -ls / Found 5 items

```
drwxr-xr-x   - hduser supergroup     0 2022-06-01 10:03 /1bm19cs167
drwxr-xr-x   - hduser supergroup     0 2022-05-31 09:58 /abcde
```

drwxr-xr-x - hduser supergroup 0 2022-05-31 10:04 /abcdef

drwxrwxr-x - hduser supergroup 0 2019-08-01 16:19 /tmp

drwxr-xr-x - hduser supergroup 0 2019-08-01 16:03 /user

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls

/1bm19cs204

Found 2 items

-rw-r--r-- 1 hduser supergroup 1812 2022-06-01 09:39 /1bm19cs204/WC.txt

-rw-r--r-- 1 hduser supergroup 607 2022-06-01 10:03 /1bm19cs204/WC2.txt

hduser@bmsce-Precision-T1700:~$ hdfs dfs -cp /1bm19cs204 /1BM19CS204

hduser@bmsce-Precision-T1700:~$ hadoop

fs -ls / Found 6 items

drwxr-xr-x - hduser supergroup 0 2022-06-01 10:15 /1BM19CS204

drwxr-xr-x - hduser supergroup 0 2022-06-01 10:03 /1bm19cs204

drwxr-xr-x - hduser supergroup 0 2022-05-31 09:58 /abcde

drwxr-xr-x - hduser supergroup 0 2022-05-31 10:04 /abcdef

drwxrwxr-x - hduser supergroup 0 2019-08-01 16:19 /tmp

drwxr-xr-x - hduser supergroup 0 2019-08-01 16:03 /user

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls

/1BM19CS204

Found 2 items

-rw-r--r-- 1 hduser supergroup 1812 2022-06-01 10:15 /1BM19CS204/WC.txt

-rw-r--r-- 1 hduser supergroup 607 2022-06-01 10:15 /1BM19CS204/WC2.txt

6. Create a Map Reduce program to

a) find average temperature for each year from the NCDC data set.

b) find the mean max temperature for every month

AverageDriver

```
package temp;
import org.apache.hadoop.fs.Path;
import
org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import
org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
public class AverageDriver {
 public static void main(String[] args) throws
 Exception { if (args.length != 2) {
 System.err.println("Please Enter the input and output
 parameters"); System.exit(-1);
 }
 Job job = new Job();
 job.setJarByClass(AverageDriver.class);
 job.setJobName("Max temperature");
 FileInputFormat.addInputPath(job, new
 Path(args[0])); FileOutputFormat.setOutputPath(job,
 new Path(args[1]));
 job.setMapperClass(AverageMapper.class);
```

```
job.setReducerClass(AverageReducer.class);
```

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

AverageMapper

```
package temp;
import java.io.IOException;
import
org.apache.hadoop.io.IntWritable;
import
org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;
public class AverageMapper extends Mapper<LongWritable, Text, Text,
 IntWritable> { public static final int MISSING = 9999;

public void map(LongWritable key, Text value, Mapper<LongWritable,
Text, Text, IntWritable>.Context context) throws IOException,
InterruptedException {
 int temperature;
 String line = value.toString();
 String year = line.substring(15,
 19); if (line.charAt(87) == '+') {
 temperature = Integer.parseInt(line.substring(88, 92));
 } else {
 temperature = Integer.parseInt(line.substring(87, 92));
```

```
}
String quality = line.substring(92, 93);
```

```
 if (temperature != 9999 && quality.matches("[01459]"))
 context.write(new Text(year), new
 IntWritable(temperature));
 }
}
```

AverageReducer

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

```
c:\hadoop_new\sbin>hdfs dfs -cat /tempAverageOutput/part-r-00000
1901    46
1949    94
1950    3
```

MeanMaxDriver.class

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

MeanMaxMapper.class

```
package meanmax;
import java.io.IOException;
import
org.apache.hadoop.io.IntWritable;
import
org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;
public class MeanMaxMapper extends Mapper<LongWritable, Text, Text,
 IntWritable> { public static final int MISSING = 9999;

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

MeanMaxReducer.class

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

```
 }
 context.write(key, new IntWritable(total_temp / days));
 }
}
```

```
c:\hadoop_new\sbin>hdfs dfs -cat /tempMaxOutput/part-r-00000
01      44
02      17
03      111
04      194
05      256
06      278
07      317
08      283
09      211
10      156
11      89
12      117
```

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

```
//Driver Code
package
wordCount;
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);
        }
}

//Mapper Code
package
wordCount;
```

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

```
}

//Reducer Code
```

```
package wordCount;


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));
```

```
        }
}
```

//Hadoop Commands

hduser@bmsce-Precision-T1700:~$ start-all.sh
This script is Deprecated. Instead use start-dfs.sh and start-
yarn.sh Starting namenodes on [localhost]
hduser@localhost's password:
localhost: namenode running as process 10473. Stop it
first. hduser@localhost's password:
localhost: datanode running as process 10644. Stop it
first. Starting secondary namenodes [0.0.0.0]
hduser@0.0.0.0's password:
0.0.0.0: secondarynamenode running as process 10857. Stop
it first. starting yarn daemons
resourcemanager running as process 9796. Stop it first.
hduser@localhost's password:
localhost: nodemanager running as process 10160. Stop
it first. hduser@bmsce-Precision-T1700:~$ jps
10160 NodeManager
7441 org.eclipse.equinox.launcher_1.5.600.v20191014-2022.jar
9796 ResourceManager
12692 org.eclipse.equinox.launcher_1.5.600.v20191014-2022.jar
10644 DataNode
10857 SecondaryNameNode
10473 NameNode
15100 Jps

hduser@bmsce-Precision-T1700:~$ hadoop
fs -ls / Found 10 items

drwxr-xr-x - hduser supergroup 0 2019-10-23 09:52 /gou

drwxr-xr-x - hduser supergroup 0 2019-10-23 10:33 /har

drwxr-xr-x - hduser supergroup 0 2022-06-14 10:50 /input

drwxr-xr-x - hduser supergroup 0 2019-10-23 09:58 /output1

drwxr-xr-x - hduser supergroup 0 2019-10-23 15:57 /output2

drwxr-xr-x - hduser supergroup 0 2022-06-15 10:27 /rgs

drwxr-xr-x - hduser supergroup 0 2019-10-23 11:09 /stud

drwxr-xr-x - hduser supergroup 0 2019-10-23 15:50 /testing

drwxrwxr-x - hduser supergroup 0 2019-10-23 11:24 /tmp

drwxr-xr-x - hduser supergroup 0 2019-08-01 16:03 /user

hduser@bmsce-Precision-T1700:~$ hadoop fs -mkdir /1BM19CS167

hduser@bmsce-Precision-T1700:~$ hadoop fs -copyFromLocal /home/hduser/Desktop/sample.txt /1BM19CS167/test.txt

hduser@bmsce-Precision-T1700:~$ hdfs dfs -cat

/1BM19CS167/test.txt hi how are you

how is your job

how is your family

how is your

brother how is

your sister

hduser@bmsce-Precision-T1700:~$ hadoop jar /home/hduser/Documents/wordCount.jar wordCount.WCDriver /1BM19CS167/test.txt /1BM19CS167/output

22/06/15 10:27:53 INFO Configuration.deprecation: session.id is deprecated. Instead, use dfs.metrics.session- id

22/06/15 10:27:53 INFO jvm.JvmMetrics: Initializing JVM Metrics with processName=JobTracker, sessionId=

22/06/15 10:27:53 INFO jvm.JvmMetrics: Cannot initialize JVM Metrics with processName=JobTracker, sessionId= - already initialized

22/06/15 10:27:53 WARN mapreduce.JobSubmitter: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.

22/06/15 10:27:53 INFO mapred.FileInputFormat: Total input paths to process

: 1 22/06/15 10:27:53 INFO mapreduce.JobSubmitter: number of splits:1

22/06/15 10:27:53 INFO mapreduce.JobSubmitter: Submitting tokens for job:

job_local1115189753_0001 22/06/15 10:27:53 INFO mapreduce.Job: The url to track the job:

http://localhost:8080/

22/06/15 10:27:53 INFO mapred.LocalJobRunner: OutputCommitter set in config null

22/06/15 10:27:53 INFO mapreduce.Job: Running job: job_local1115189753_0001

22/06/15 10:27:53 INFO mapred.LocalJobRunner:
OutputCommitter is
org.apache.hadoop.mapred.FileOutputCommitter

22/06/15 10:27:53 INFO mapred.LocalJobRunner: Waiting for map tasks

22/06/15 10:27:53 INFO mapred.LocalJobRunner:
Starting task:
attempt_local1115189753_0001_m_000000_0

22/06/15 10:27:53 INFO mapred.Task: Using ResourceCalculatorProcessTree : [ ]

22/06/15 10:27:53 INFO mapred.MapTask: Processing split:

hdfs://localhost:54310/rgs/test.txt:0+89 22/06/15 10:27:53 INFO mapred.MapTask:

numReduceTasks: 1

22/06/15 10:27:54 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)

22/06/15 10:27:54 INFO mapred.MapTask:

mapreduce.task.io.sort.mb: 100 22/06/15 10:27:54 INFO

mapred.MapTask: soft limit at 83886080

22/06/15 10:27:54 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600

22/06/15 10:27:54 INFO mapred.MapTask: kvstart = 26214396; length =

6553600

22/06/15 10:27:54 INFO mapred.MapTask: Map output collector
class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer

22/06/15 10:27:54 INFO mapred.LocalJobRunner:

22/06/15 10:27:54 INFO mapred.MapTask: Starting flush of map

output 22/06/15 10:27:54 INFO mapred.MapTask: Spilling map

output

22/06/15 10:27:54 INFO mapred.MapTask: bufstart = 0; bufend = 169; bufvoid = 104857600

22/06/15 10:27:54 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26214320(104857280);
length = 77/6553600

22/06/15 10:27:54 INFO mapred.MapTask: Finished spill 0

22/06/15 10:27:54 INFO mapred.Task: Task:attempt_local1115189753_0001_m_000000_0 is done. And is in the process of committing

22/06/15 10:27:54 INFO mapred.LocalJobRunner: hdfs://localhost:54310/rgs/test.txt:0+89

22/06/15 10:27:54 INFO mapred.Task: Task

'attempt_local1115189753_0001_m_000000_0' done.

22/06/15 10:27:54 INFO mapred.LocalJobRunner: Finishing task: attempt_local1115189753_0001_m_000000_0

22/06/15 10:27:54 INFO mapred.LocalJobRunner: map task executor

complete. 22/06/15 10:27:54 INFO mapred.LocalJobRunner: Waiting for

reduce tasks

22/06/15 10:27:54 INFO mapred.LocalJobRunner: Starting task:

attempt_local1115189753_0001_r_000000_0 22/06/15 10:27:54 INFO mapred.Task: Using

ResourceCalculatorProcessTree : [ ]

22/06/15 10:27:54 INFO mapred.ReduceTask: Using ShuffleConsumerPlugin: org.apache.hadoop.mapreduce.task.reduce.Shuffle@1bc68cd5

22/06/15 10:27:54 INFO reduce.MergeManagerImpl: MergerManager: memoryLimit=334338464, maxSingleShuffleLimit=83584616, mergeThreshold=220663392, ioSortFactor=10, memToMemMergeOutputsThreshold=10

22/06/15 10:27:54 INFO reduce.EventFetcher: attempt_local1115189753_0001_r_000000_0 Thread started: EventFetcher for fetching Map Completion Events

22/06/15 10:27:54 INFO reduce.LocalFetcher: localfetcher#1 about to shuffle output of map attempt_local1115189753_0001_m_000000_0 decomp: 211 len: 215 to MEMORY

22/06/15 10:27:54 INFO reduce.InMemoryMapOutput: Read 211 bytes from map-output for attempt_local1115189753_0001_m_000000_0

22/06/15 10:27:54 INFO reduce.MergeManagerImpl: closeInMemoryFile -> map-output of size: 211, inMemoryMapOutputs.size() -> 1, commitMemory -> 0, usedMemory ->211

22/06/15 10:27:54 INFO reduce.EventFetcher: EventFetcher is interrupted..

Returning 22/06/15 10:27:54 INFO mapred.LocalJobRunner: 1 / 1 copied.

22/06/15 10:27:54 INFO reduce.MergeManagerImpl: finalMerge called with 1 in-memory map-

outputs and 0 on-disk map-outputs

22/06/15 10:27:54 INFO mapred.Merger: Merging 1 sorted segments

22/06/15 10:27:54 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 205 bytes

22/06/15 10:27:54 INFO reduce.MergeManagerImpl: Merged 1 segments, 211 bytes to disk to satisfy reduce memory limit

22/06/15 10:27:54 INFO reduce.MergeManagerImpl: Merging 1 files, 215 bytes from disk

22/06/15 10:27:54 INFO reduce.MergeManagerImpl: Merging 0 segments, 0 bytes from memory into

reduce 22/06/15 10:27:54 INFO mapred.Merger: Merging 1 sorted segments

22/06/15 10:27:54 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 205 bytes

22/06/15 10:27:54 INFO mapred.LocalJobRunner: 1 / 1 copied.

22/06/15 10:27:54 INFO mapred.Task: Task:attempt_local1115189753_0001_r_000000_0 is done. And is in the process of committing

22/06/15 10:27:54 INFO mapred.LocalJobRunner: 1 / 1 copied.

22/06/15 10:27:54 INFO mapred.Task: Task attempt_local1115189753_0001_r_000000_0 is allowed to commit now

22/06/15 10:27:54 INFO output.FileOutputCommitter: Saved output of task 'attempt_local1115189753_0001_r_000000_0' to hdfs://localhost:54310/rgs/output/_temporary/0/task_local1115189753_0001_r_000000

22/06/15 10:27:54 INFO mapred.LocalJobRunner: reduce > reduce

22/06/15 10:27:54 INFO mapred.Task: Task 'attempt_local1115189753_0001_r_000000_0' done.

22/06/15 10:27:54 INFO mapred.LocalJobRunner: Finishing task: attempt_local1115189753_0001_r_000000_0

22/06/15 10:27:54 INFO mapred.LocalJobRunner: reduce task executor complete.

22/06/15 10:27:54 INFO mapreduce.Job: Job job_local1115189753_0001 running in uber

mode : false 22/06/15 10:27:54 INFO mapreduce.Job: map 100% reduce 100%

22/06/15 10:27:54 INFO mapreduce.Job: Job job_local1115189753_0001 completed

successfully 22/06/15 10:27:54 INFO mapreduce.Job: Counters: 38

File System Counters

FILE: Number of bytes read=8614

FILE: Number of bytes

written=510599 FILE: Number of read

operations=0

FILE: Number of large read
operations=0 FILE: Number of write
operations=0 HDFS: Number of
bytes read=178
HDFS: Number of bytes
written=69 HDFS: Number of read
operations=13
HDFS: Number of large read
operations=0 HDFS: Number of write
operations=4

Map-Reduce Framework

Map input
records=5
Map output
records=20 Map
output bytes=169
Map output materialized bytes=215
Input split bytes=87
Combine input
records=0 Combine
output records=0
Reduce input groups=10
Reduce shuffle
bytes=215 Reduce input
records=20 Reduce
output records=10
Spilled Records=40
Shuffled Maps =1
Failed Shuffles=0
Merged Map

outputs=1 GC time

elapsed (ms)=1 CPU

time spent (ms)=0

Physical memory (bytes) snapshot=0

Virtual memory (bytes) snapshot=0

Total committed heap usage (bytes)=471859200

```
        Shuffle Errors
                BAD_ID=0
                CONNECTION=0
                IO_ERROR=0
                WRONG_LENGT
                H=0
                WRONG_MAP=0
                WRONG_REDUC
                E=0
        File Input Format Counters
                Bytes Read=89
        File Output Format Counters
                Bytes Written=69
0


hduser@bmsce-Precision-T1700:~$ hdfs dfs -cat /1BM19CS167/output/part-00000
are     1
brother 1
family  1
hi      1
how     5
is      4
job     1
sister  1
you     1
your    4
```

8. Create a Map Reduce program to demonstrating join operation

```
// 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, 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 'Department Emp Strength input' with 'Department
Nameinput'"); 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(con
f); 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> {
@Overrid
e
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> {
@Overrid
e
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> {
@Overrid
e
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
import
java.io.*;
import org.apache.hadoop.io.*;
public class TextPair implements
WritableComparable<TextPair> { private Text first;
private Text
second; public
TextPair() {
set(new Text(), new Text());
}
public TextPair(String first, String
second) { set(new Text(first), new
Text(second));
}
public TextPair(Text first, Text
second) { set(first, second);
}
public void set(Text first, Text
second) { this.first = first;
this.second = second;
}
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) && second.equals(tp.second);
}
return false;
}
@Override
public String toString() {
```

```
return first + "\t" + 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);

}

} }

```
hduser@bmsce-Precision-T1700:/home/bmsce$ hdfs dfs -cat /join/output/*
A11     Finance         50
B12     HR              100
C13     Manufacturing           250
Dept_ID Dept_Name               Total_Employee
```

9. Program to print word count on scala shell and print “Hello world” on scala

IDE

val

data=sc.textFile("sparkdata.txt")

data.collect;

val splitdata = data.flatMap(line => line.split("

")); splitdata.collect;

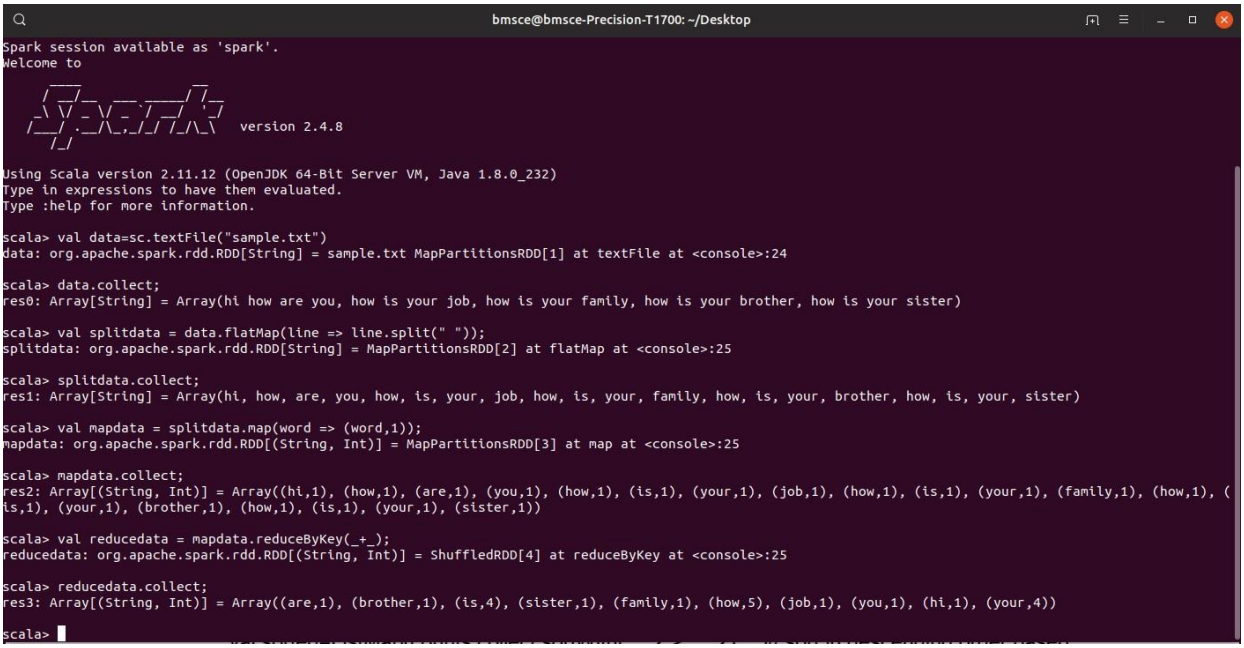
val mapdata = splitdata.map(word =>

(word,1)); mapdata.collect;

val reducedata =

mapdata.reduceByKey(_+_);

reducedata.collect;



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

val textFile = sc.textFile("/home/bhoom/Desktop/wc.txt")

val counts = textFile.flatMap(line => line.split(" ")).map(word => (word,

1)).reduceByKey(_ + _) import scala.collection.immutable.ListMap

val sorted=ListMap(counts.collect.sortWith(_._2 > _._2):_*)// sort in descending order

based on values

println(sorted)

for((k,v)<-

sorted)

{

if(v>4)

{

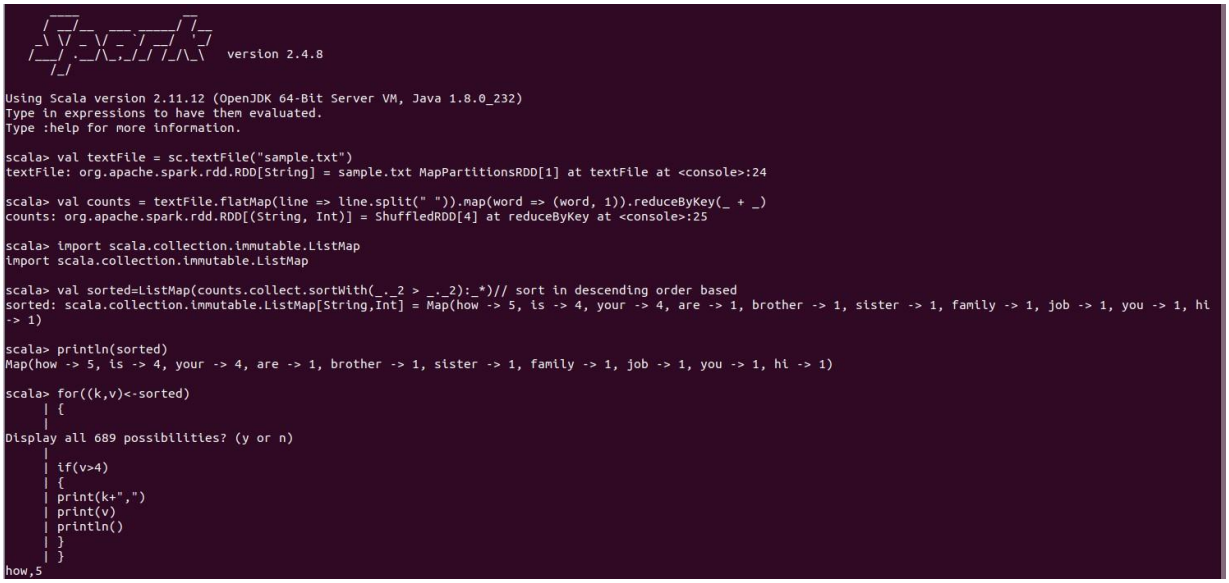
print(k+","

) print(v)

println()

}

}



```
      ____              __
     / __/__  ___ _____/ /__
    _\ \/ _ \/ _ `/ __/  '_/
   /___/ .__/\_,_/_/ /_/\_\   version 2.4.8
      /_/

Using Scala version 2.11.12 (OpenJDK 64-Bit Server VM, Java 1.8.0_232)
Type in expressions to have them evaluated.
Type :help for more information.

scala> val textFile = sc.textFile("sample.txt")
textFile: org.apache.spark.rdd.RDD[String] = sample.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] = Map(how -> 5, is -> 4, your -> 4, are -> 1, brother -> 1, sister -> 1, family -> 1, job -> 1, you -> 1, hi
-> 1)

scala> println(sorted)
Map(how -> 5, is -> 4, your -> 4, are -> 1, brother -> 1, sister -> 1, family -> 1, job -> 1, you -> 1, hi -> 1)

scala> for((k,v)<-sorted)
     | {
     |
Display all 689 possibilities? (y or n)
     |
     | if(v>4)
     | {
     | print(k+",")
     | print(v)
     | println()
     | }
     | }
how,5
```