VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.

LAB REPORT
on

BIG DATA ANALYTICS

Submitted by

S Sanjith

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-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 “**BIG DATA ANALYTICS**” carried out by **S Sanjith (1BM20CS135),** who is bonafide student of **B. M. S. College of Engineering.** Itis 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

CO1	Apply the concept of NoSQL, Hadoop or Spark for a given task
CO2	Analyze the Big Data and obtain insight using data analytics mechanisms.
CO3	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.

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

};


use Employee;
```

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

```
3. 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;
```

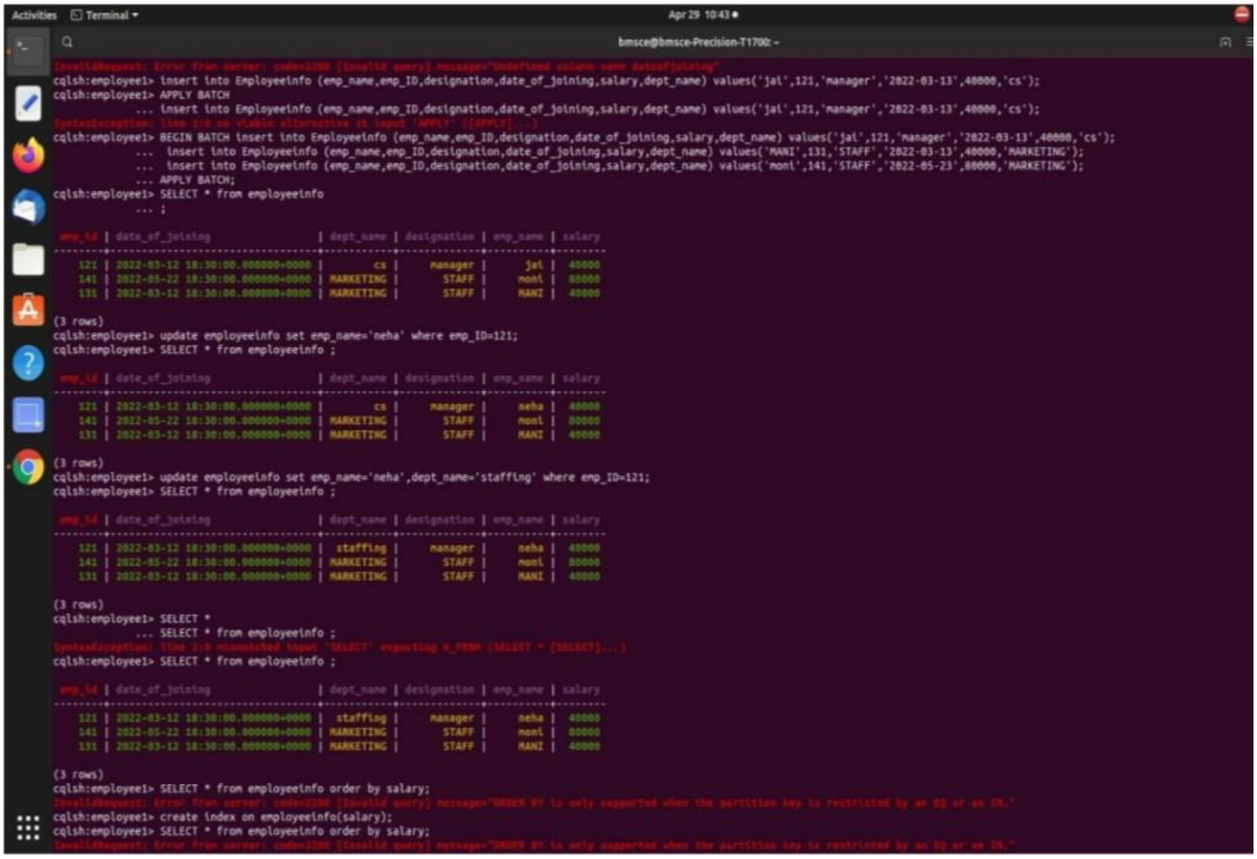
4.
   ```
   insert into EmployeeInfo (EmplID, EmplName, Designation,
   DateOfJoining, Salary, DeptName) values (121, 'employee6',
   'designation6', '2020-10-18', 45000, 'dept1'); select *
   from EmployeeInfo;

   update EmployeeInfo SET EmplName='employee7', DeptName='dept2' where

   EmplID=121; select * from EmployeeInfo;
   ```

5.
   ```
   select * from Employee_info where Emp_id in(101,102,103,104,121,105)
   order by salary desc;
   ```

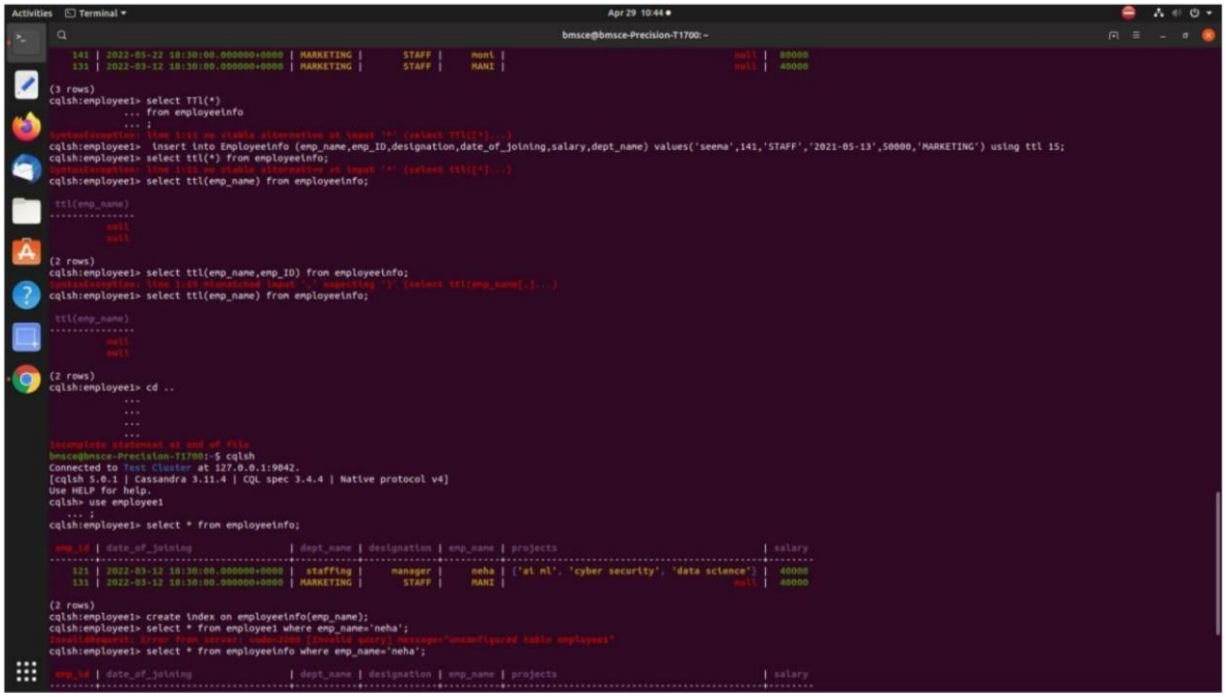
6.
   ```
   alter table EmployeeInfo add Projects text; select *
   from EmployeeInfo;
   ```

7.
   ```
   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;
   ```

Output:



```
InvalidRequest: Error from server: code=2200 [Invalid query] message="Undefined column name dateofjoining"
cqlsh:employee1> insert into Employeeinfo (emp_name,emp_ID,designation,date_of_joining,salary,dept_name) values('jal',121,'manager','2022-03-13',40000,'cs');
cqlsh:employee1> APPLY BATCH
             ... insert into Employeeinfo (emp_name,emp_ID,designation,date_of_joining,salary,dept_name) values('jal',121,'manager','2022-03-13',40000,'cs');
SyntaxException: line 1:0 no viable alternative at input 'APPLY' ([APPLY]...)
cqlsh:employee1> BEGIN BATCH insert into Employeeinfo (emp_name,emp_ID,designation,date_of_joining,salary,dept_name) values('jal',121,'manager','2022-03-13',40000,'cs');
             ...  insert into Employeeinfo (emp_name,emp_ID,designation,date_of_joining,salary,dept_name) values('MANI',131,'STAFF','2022-03-13',40000,'MARKETING');
             ...  insert into Employeeinfo (emp_name,emp_ID,designation,date_of_joining,salary,dept_name) values('moni',141,'STAFF','2022-05-23',80000,'MARKETING');
             ... APPLY BATCH;
cqlsh:employee1> SELECT * from employeeinfo
             ... ;

 emp_id | date_of_joining                 | dept_name | designation | emp_name | salary
--------+---------------------------------+-----------+-------------+----------+--------
    121 | 2022-03-12 18:30:00.000000+0000 |        cs |     manager |      jal |  40000
    141 | 2022-05-22 18:30:00.000000+0000 | MARKETING |       STAFF |     moni |  80000
    131 | 2022-03-12 18:30:00.000000+0000 | MARKETING |       STAFF |     MANI |  40000

(3 rows)
cqlsh:employee1> update employeeinfo set emp_name='neha' where emp_ID=121;
cqlsh:employee1> SELECT * from employeeinfo ;

 emp_id | date_of_joining                 | dept_name | designation | emp_name | salary
--------+---------------------------------+-----------+-------------+----------+--------
    121 | 2022-03-12 18:30:00.000000+0000 |        cs |     manager |     neha |  40000
    141 | 2022-05-22 18:30:00.000000+0000 | MARKETING |       STAFF |     moni |  80000
    131 | 2022-03-12 18:30:00.000000+0000 | MARKETING |       STAFF |     MANI |  40000

(3 rows)
cqlsh:employee1> update employeeinfo set emp_name='neha',dept_name='staffing' where emp_ID=121;
cqlsh:employee1> SELECT * from employeeinfo ;

 emp_id | date_of_joining                 | dept_name | designation | emp_name | salary
--------+---------------------------------+-----------+-------------+----------+--------
    121 | 2022-03-12 18:30:00.000000+0000 |  staffing |     manager |     neha |  40000
    141 | 2022-05-22 18:30:00.000000+0000 | MARKETING |       STAFF |     moni |  80000
    131 | 2022-03-12 18:30:00.000000+0000 | MARKETING |       STAFF |     MANI |  40000

(3 rows)
cqlsh:employee1> SELECT *
             ... SELECT * from employeeinfo ;
SyntaxException: line 2:0 mismatched input 'SELECT' expecting K_FROM (SELECT * [SELECT]...)
cqlsh:employee1> SELECT * from employeeinfo ;

 emp_id | date_of_joining                 | dept_name | designation | emp_name | salary
--------+---------------------------------+-----------+-------------+----------+--------
    121 | 2022-03-12 18:30:00.000000+0000 |  staffing |     manager |     neha |  40000
    141 | 2022-05-22 18:30:00.000000+0000 | MARKETING |       STAFF |     moni |  80000
    131 | 2022-03-12 18:30:00.000000+0000 | MARKETING |       STAFF |     MANI |  40000

(3 rows)
cqlsh:employee1> SELECT * from employeeinfo order by salary;
InvalidRequest: Error from server: code=2200 [Invalid query] message="ORDER BY is only supported when the partition key is restricted by an EQ or an IN."
cqlsh:employee1> create index on employeeinfo(salary);
cqlsh:employee1> SELECT * from employeeinfo order by salary;
InvalidRequest: Error from server: code=2200 [Invalid query] message="ORDER BY is only supported when the partition key is restricted by an EQ or an IN."
```



```
    141 | 2022-05-22 18:30:00.000000+0000 | MARKETING |       STAFF |     moni |                                                  null |  80000
    131 | 2022-03-12 18:30:00.000000+0000 | MARKETING |       STAFF |     MANI |                                                  null |  40000

(3 rows)
cqlsh:employee1> select TTl(*)
             ... from employeeinfo
             ... ;
SyntaxException: line 1:11 no viable alternative at input '*' (select TTl([*]...)
cqlsh:employee1>  insert into Employeeinfo (emp_name,emp_ID,designation,date_of_joining,salary,dept_name) values('seema',141,'STAFF','2021-05-13',50000,'MARKETING') using ttl 15;
cqlsh:employee1> select ttl(*) from employeeinfo;
SyntaxException: line 1:11 no viable alternative at input '*' (select ttl([*]...)
cqlsh:employee1> select ttl(emp_name) from employeeinfo;

 ttl(emp_name)
---------------
          null
          null

(2 rows)
cqlsh:employee1> select ttl(emp_name,emp_ID) from employeeinfo;
SyntaxException: line 1:19 mismatched input ',' expecting ')' (select ttl(emp_name[,]...)
cqlsh:employee1> select ttl(emp_name) from employeeinfo;

 ttl(emp_name)
---------------
          null
          null

(2 rows)
cqlsh:employee1> cd ..
             ...
             ...
             ...
             ...
Incomplete statement at end of file
bmsce@bmsce-Precision-T1700:~$ cqlsh
Connected to Test Cluster at 127.0.0.1:9042.
[cqlsh 5.0.1 | Cassandra 3.11.4 | CQL spec 3.4.4 | Native protocol v4]
Use HELP for help.
cqlsh> use employee1
   ... ;
cqlsh:employee1> select * from employeeinfo;

 emp_id | date_of_joining                 | dept_name | designation | emp_name | projects                                          | salary
--------+---------------------------------+-----------+-------------+----------+---------------------------------------------------+--------
    121 | 2022-03-12 18:30:00.000000+0000 |  staffing |     manager |     neha | {'ai ml', 'cyber security', 'data science'} |  40000
    131 | 2022-03-12 18:30:00.000000+0000 | MARKETING |       STAFF |     MANI |                                              null |  40000

(2 rows)
cqlsh:employee1> create index on employeeinfo(emp_name);
cqlsh:employee1> select * from employee1 where emp_name='neha';
InvalidRequest: Error from server: code=2200 [Invalid query] message="unconfigured table employee1"
cqlsh:employee1> select * from employeeinfo where emp_name='neha';

 emp_id | date_of_joining                 | dept_name | designation | emp_name | projects                                          | salary
--------+---------------------------------+-----------+-------------+----------+---------------------------------------------------+--------
```

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

8. 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';

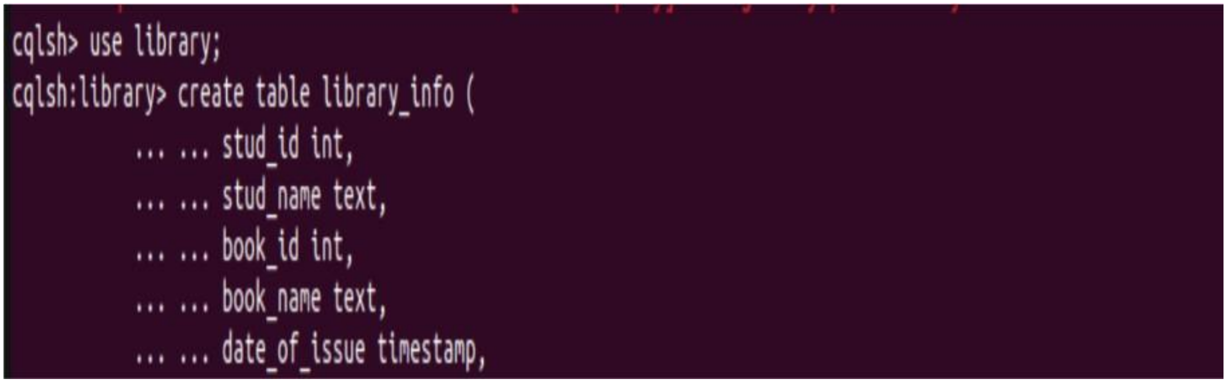
... UPDATE library_info set counter_value +=1 where stud_id = 114 and stud_name = 'Raj' and book_name = 'Engineering Drawing' and book_id = '123ER' and date_of_issue = '2021-04-03';

... APPLY BATCH;

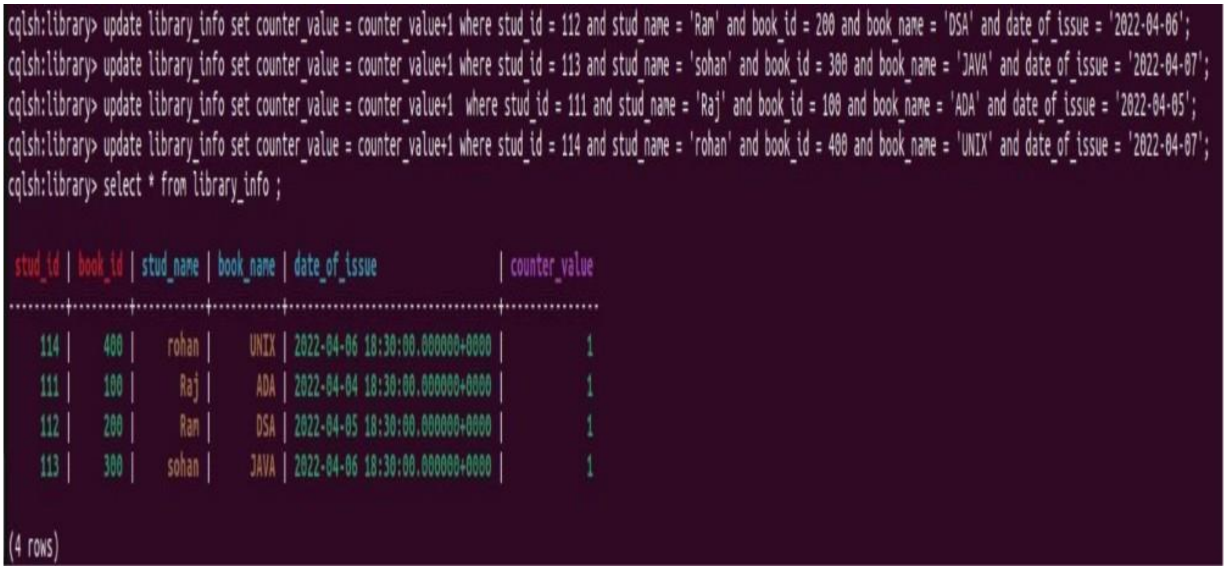
cqlsh:library> SELECT * FROM library_info ;

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';

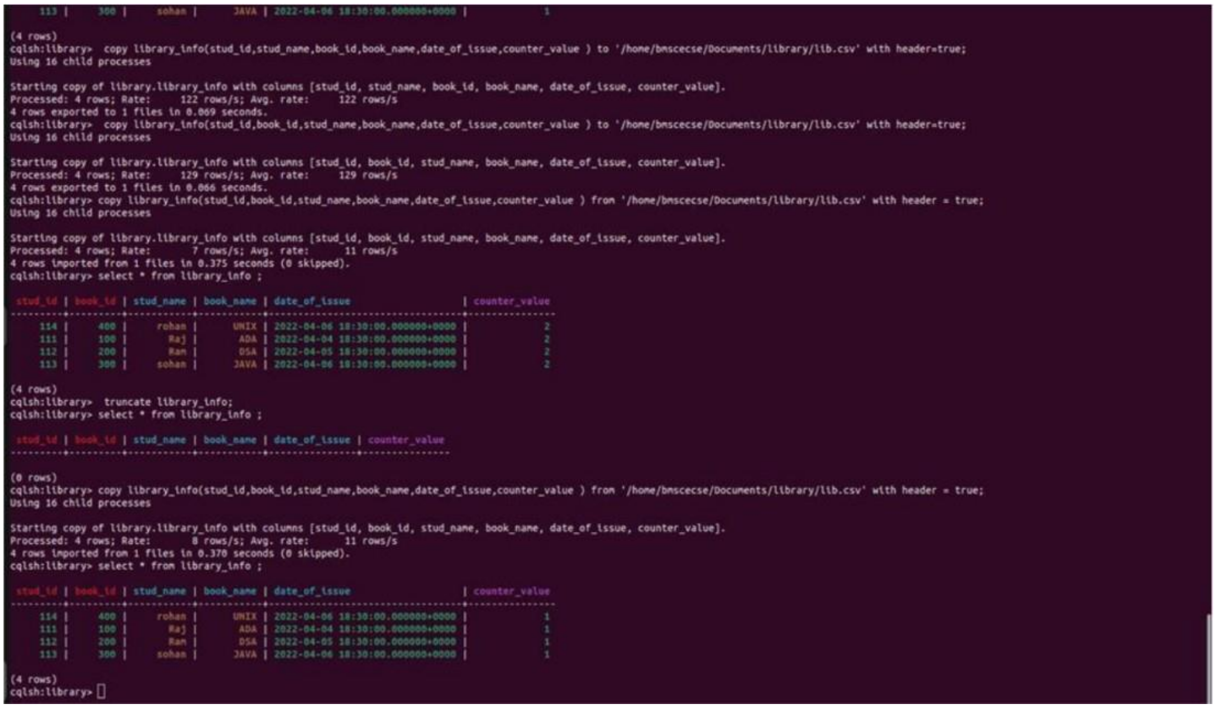
cqlsh:library> SELECT * FROM library_info ;



```
cqlsh> use library;
cqlsh:library> create table library_info (
         ... ... stud_id int,
         ... ... stud_name text,
         ... ... book_id int,
         ... ... book_name text,
         ... ... date_of_issue timestamp,
```



```
cqlsh:library> update library_info set counter_value = counter_value+1 where stud_id = 112 and stud_name = 'Ram' and book_id = 200 and book_name = 'DSA' and date_of_issue = '2022-04-06';
cqlsh:library> update library_info set counter_value = counter_value+1 where stud_id = 113 and stud_name = 'sohan' and book_id = 300 and book_name = 'JAVA' and date_of_issue = '2022-04-07';
cqlsh:library> update library_info set counter_value = counter_value+1  where stud_id = 111 and stud_name = 'Raj' and book_id = 100 and book_name = 'ADA' and date_of_issue = '2022-04-05';
cqlsh:library> update library_info set counter_value = counter_value+1 where stud_id = 114 and stud_name = 'rohan' and book_id = 400 and book_name = 'UNIX' and date_of_issue = '2022-04-07';
cqlsh:library> select * from library_info ;

 stud_id | book_id | stud_name | book_name | date_of_issue                   | counter_value
---------+---------+-----------+-----------+---------------------------------+---------------
     114 |     400 |     rohan |      UNIX | 2022-04-06 18:30:00.000000+0000 |             1
     111 |     100 |       Raj |       ADA | 2022-04-04 18:30:00.000000+0000 |             1
     112 |     200 |       Ram |       DSA | 2022-04-05 18:30:00.000000+0000 |             1
     113 |     300 |     sohan |      JAVA | 2022-04-06 18:30:00.000000+0000 |             1

(4 rows)
```



```
     113 |     300 |     sohan |      JAVA | 2022-04-06 18:30:00.000000+0000 |             1

(4 rows)
cqlsh:library>  copy library_info(stud_id,stud_name,book_id,book_name,date_of_issue,counter_value ) to '/home/bmscecse/Documents/library/lib.csv' with header=true;
Using 16 child processes

Starting copy of library.library_info with columns [stud_id, stud_name, book_id, book_name, date_of_issue, counter_value].
Processed: 4 rows; Rate:     122 rows/s; Avg. rate:     122 rows/s
4 rows exported to 1 files in 0.069 seconds.
cqlsh:library>  copy library_info(stud_id,book_id,stud_name,book_name,date_of_issue,counter_value ) to '/home/bmscecse/Documents/library/lib.csv' with header=true;
Using 16 child processes

Starting copy of library.library_info with columns [stud_id, book_id, stud_name, book_name, date_of_issue, counter_value].
Processed: 4 rows; Rate:     129 rows/s; Avg. rate:     129 rows/s
4 rows exported to 1 files in 0.066 seconds.
cqlsh:library> copy library_info(stud_id,book_id,stud_name,book_name,date_of_issue,counter_value ) from '/home/bmscecse/Documents/library/lib.csv' with header = true;
Using 16 child processes

Starting copy of library.library_info with columns [stud_id, book_id, stud_name, book_name, date_of_issue, counter_value].
Processed: 4 rows; Rate:       7 rows/s; Avg. rate:      11 rows/s
4 rows imported from 1 files in 0.375 seconds (0 skipped).
cqlsh:library> select * from library_info ;

 stud_id | book_id | stud_name | book_name | date_of_issue                   | counter_value
---------+---------+-----------+-----------+---------------------------------+---------------
     114 |     400 |     rohan |      UNIX | 2022-04-06 18:30:00.000000+0000 |             2
     111 |     100 |       Raj |       ADA | 2022-04-04 18:30:00.000000+0000 |             2
     112 |     200 |       Ram |       DSA | 2022-04-05 18:30:00.000000+0000 |             2
     113 |     300 |     sohan |      JAVA | 2022-04-06 18:30:00.000000+0000 |             2

(4 rows)
cqlsh:library>  truncate library_info;
cqlsh:library> select * from library_info ;

 stud_id | book_id | stud_name | book_name | date_of_issue | counter_value
---------+---------+-----------+-----------+---------------+---------------

(0 rows)
cqlsh:library> copy library_info(stud_id,book_id,stud_name,book_name,date_of_issue,counter_value ) from '/home/bmscecse/Documents/library/lib.csv' with header = true;
Using 16 child processes

Starting copy of library.library_info with columns [stud_id, book_id, stud_name, book_name, date_of_issue, counter_value].
Processed: 4 rows; Rate:       8 rows/s; Avg. rate:      11 rows/s
4 rows imported from 1 files in 0.370 seconds (0 skipped).
cqlsh:library> select * from library_info ;

 stud_id | book_id | stud_name | book_name | date_of_issue                   | counter_value
---------+---------+-----------+-----------+---------------------------------+---------------
     114 |     400 |     rohan |      UNIX | 2022-04-06 18:30:00.000000+0000 |             1
     111 |     100 |       Raj |       ADA | 2022-04-04 18:30:00.000000+0000 |             1
     112 |     200 |       Ram |       DSA | 2022-04-05 18:30:00.000000+0000 |             1
     113 |     300 |     sohan |      JAVA | 2022-04-06 18:30:00.000000+0000 |             1

(4 rows)
cqlsh:library> 
```

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:"Int

ernetSurfi 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']}}).pret

ty();

> 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.c
ount();

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.c

ount()

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','ap
ple']}) WriteResult({ "nInserted" : 1 })
> db.food.insert({_id:2,fruits:['grapes','mango','che
rry']}) WriteResult({ "nInserted" : 1 })
> db.food.insert({_id:3,fruits:['banana','ma
ngo']}) 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:"saving"});
```

WriteResult({ "nInserted" : 1 })

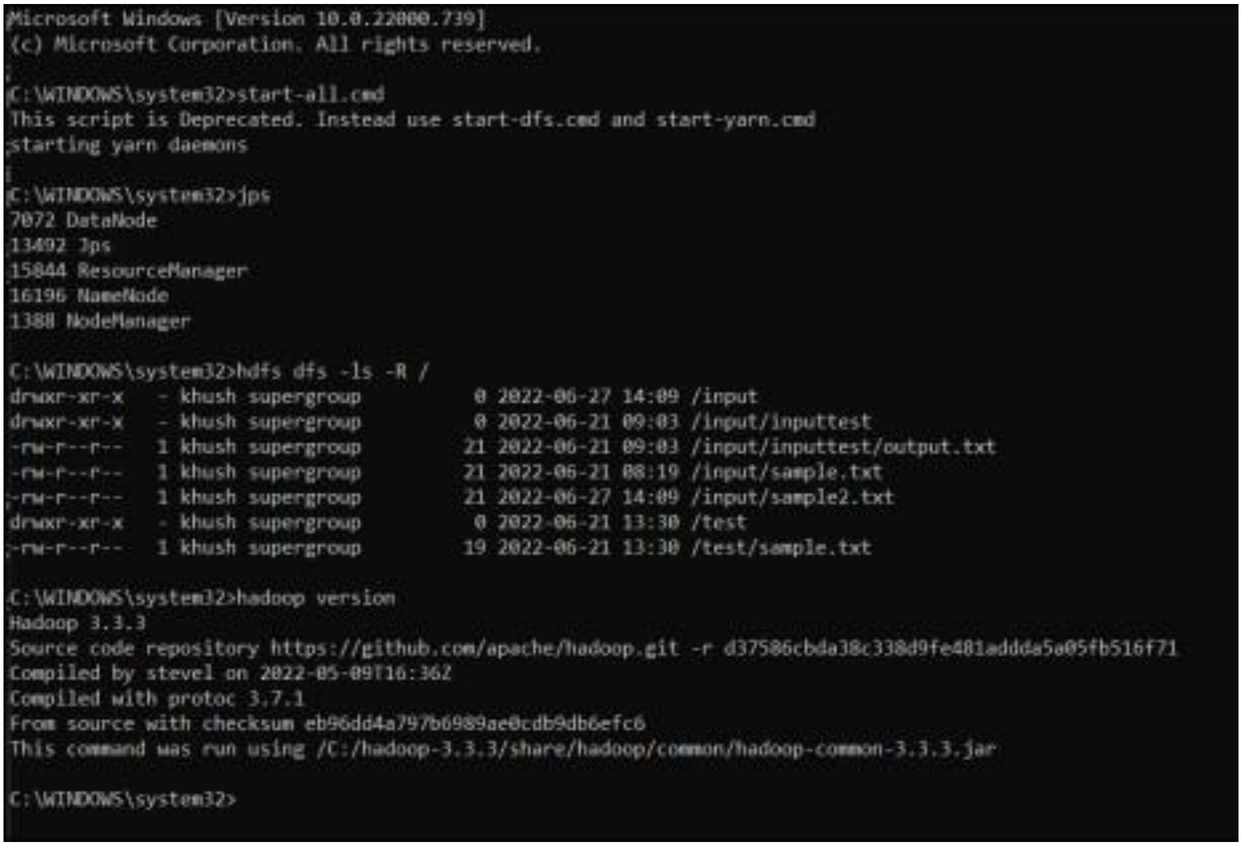
> db.Customers.aggregate({$group:{_id:"$custID",TotAccBal:{$sum:"$AccBal"}}});

{ "_id" : null, "TotAccBal" : 0 }

db.Customers.aggregate({$match:{AcctType:"saving"}},{$group:{_id:"$custID",TotAccBal:{$sum:"$AccBal"}}}); { "_id" : null, "TotAccBal" : 0 }

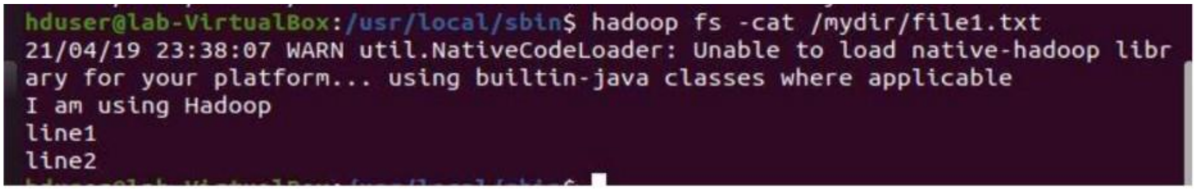
db.Customers.aggregate({$match:{AcctType:"saving"}},{$group:{_id:"$custID",TotAccBal:{$sum:"$AccBal"}}},{$ match:{TotAccBal:{$gt:1200}}

4. Screenshot of Hadoop installed

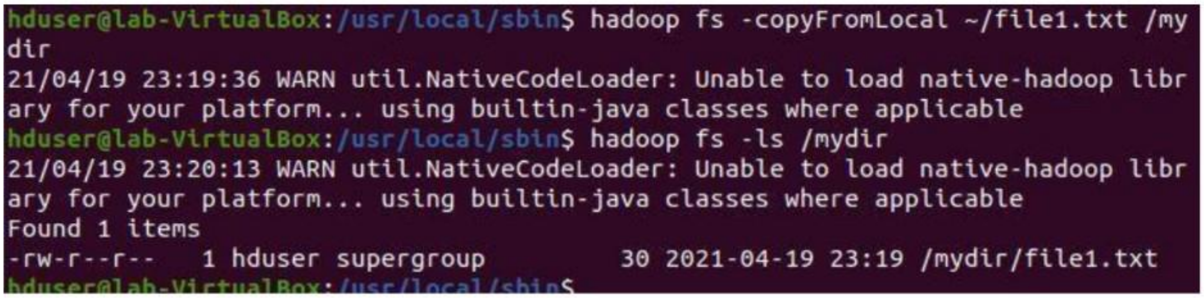


```
Microsoft Windows [Version 10.0.22000.739]
(c) Microsoft Corporation. All rights reserved.

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

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

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

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

C:\WINDOWS\system32>
```

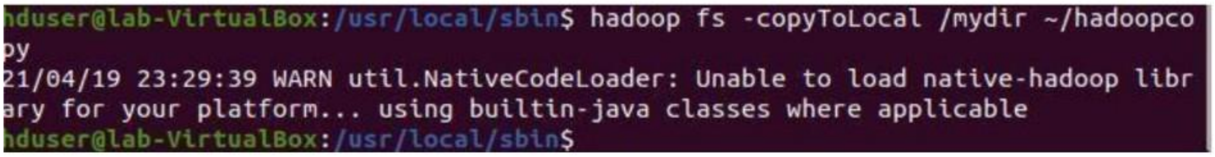
5. Execution of HDFS Commands for interaction with Hadoop Environment.



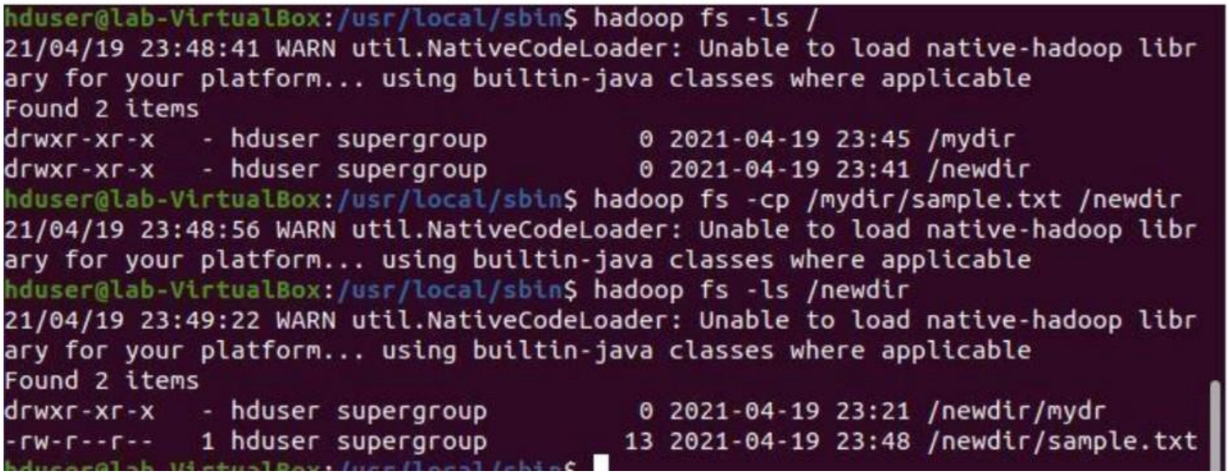
```
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -cat /mydir/file1.txt
21/04/19 23:38:07 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
I am using Hadoop
line1
line2
hduser@lab-VirtualBox:/usr/local/sbin$
```



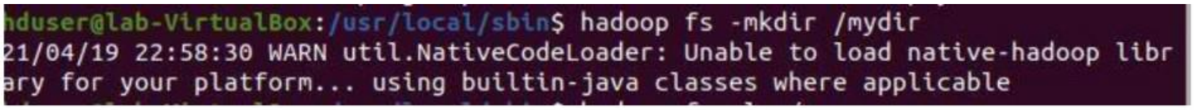
```
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -copyFromLocal ~/file1.txt /my
dir
21/04/19 23:19:36 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -ls /mydir
21/04/19 23:20:13 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
Found 1 items
-rw-r--r--   1 hduser supergroup         30 2021-04-19 23:19 /mydir/file1.txt
hduser@lab-VirtualBox:/usr/local/sbin$
```



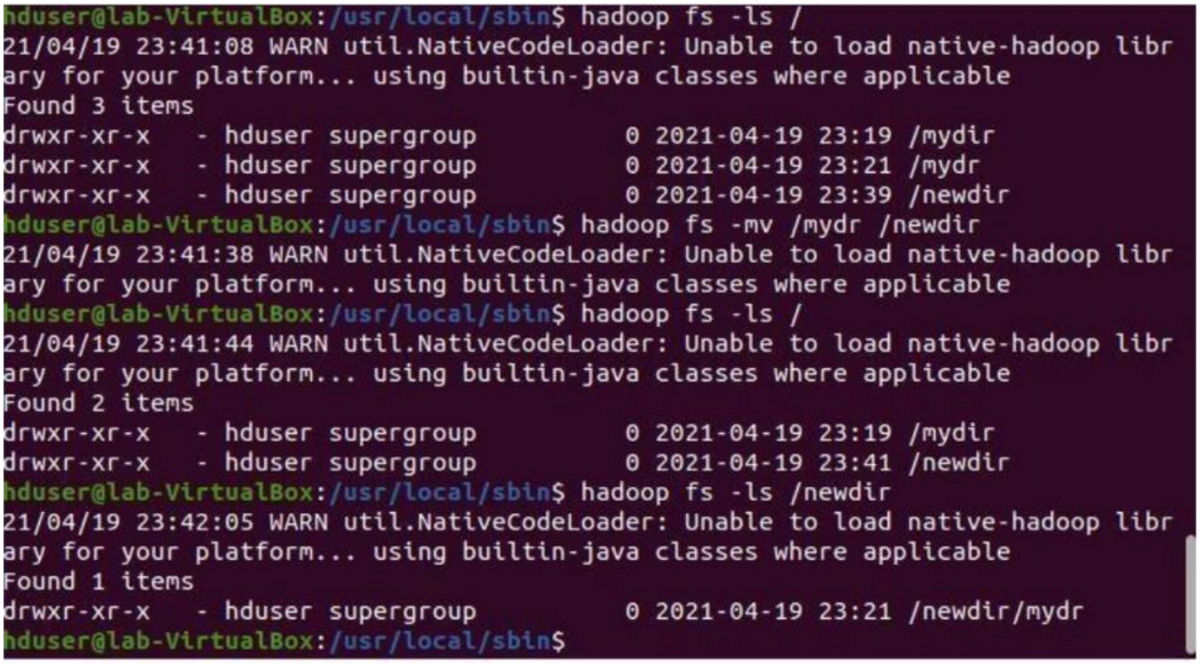
```
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -copyToLocal /mydir ~/hadoopco
py
21/04/19 23:29:39 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
hduser@lab-VirtualBox:/usr/local/sbin$
```



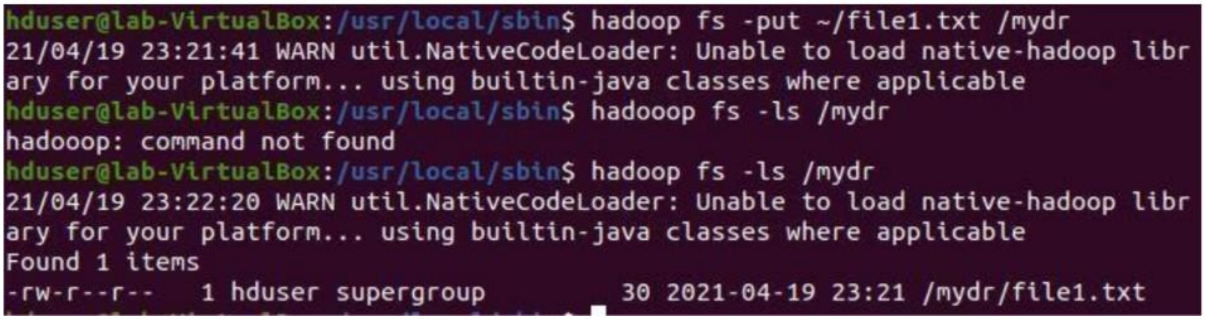
```
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -ls /
21/04/19 23:48:41 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
Found 2 items
drwxr-xr-x   - hduser supergroup          0 2021-04-19 23:45 /mydir
drwxr-xr-x   - hduser supergroup          0 2021-04-19 23:41 /newdir
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -cp /mydir/sample.txt /newdir
21/04/19 23:48:56 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -ls /newdir
21/04/19 23:49:22 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
Found 2 items
drwxr-xr-x   - hduser supergroup          0 2021-04-19 23:21 /newdir/mydr
-rw-r--r--   1 hduser supergroup         13 2021-04-19 23:48 /newdir/sample.txt
hduser@lab-VirtualBox:/usr/local/sbin$
```



```
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -mkdir /mydir
21/04/19 22:58:30 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
```



```
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -ls /
21/04/19 23:41:08 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
Found 3 items
drwxr-xr-x   - hduser supergroup          0 2021-04-19 23:19 /mydir
drwxr-xr-x   - hduser supergroup          0 2021-04-19 23:21 /mydr
drwxr-xr-x   - hduser supergroup          0 2021-04-19 23:39 /newdir
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -mv /mydr /newdir
21/04/19 23:41:38 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -ls /
21/04/19 23:41:44 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
Found 2 items
drwxr-xr-x   - hduser supergroup          0 2021-04-19 23:19 /mydir
drwxr-xr-x   - hduser supergroup          0 2021-04-19 23:41 /newdir
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -ls /newdir
21/04/19 23:42:05 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
Found 1 items
drwxr-xr-x   - hduser supergroup          0 2021-04-19 23:21 /newdir/mydr
hduser@lab-VirtualBox:/usr/local/sbin$
```



```
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -put ~/file1.txt /mydr
21/04/19 23:21:41 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
hduser@lab-VirtualBox:/usr/local/sbin$ hadooop fs -ls /mydr
hadooop: command not found
hduser@lab-VirtualBox:/usr/local/sbin$ hadoop fs -ls /mydr
21/04/19 23:22:20 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
Found 1 items
-rw-r--r--   1 hduser supergroup         30 2021-04-19 23:21 /mydr/file1.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.FileOutp
utFormat; 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);

}

}
```

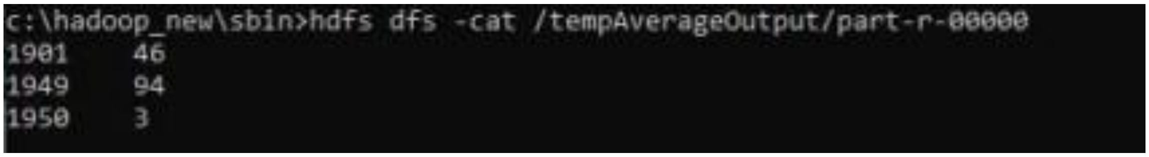
AverageMapper

```
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
```

b) MeanMaxDriver.class

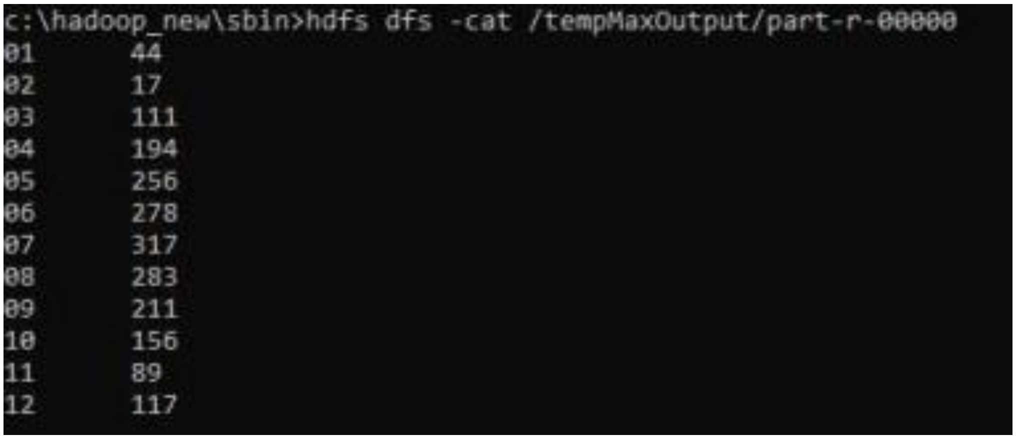
```
package meanmax;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import
org.apache.hadoop.mapreduce.lib.input.FileInputF
ormat; import
org.apache.hadoop.mapreduce.lib.output.FileOutp
utFormat; public 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.c
 lass);
 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

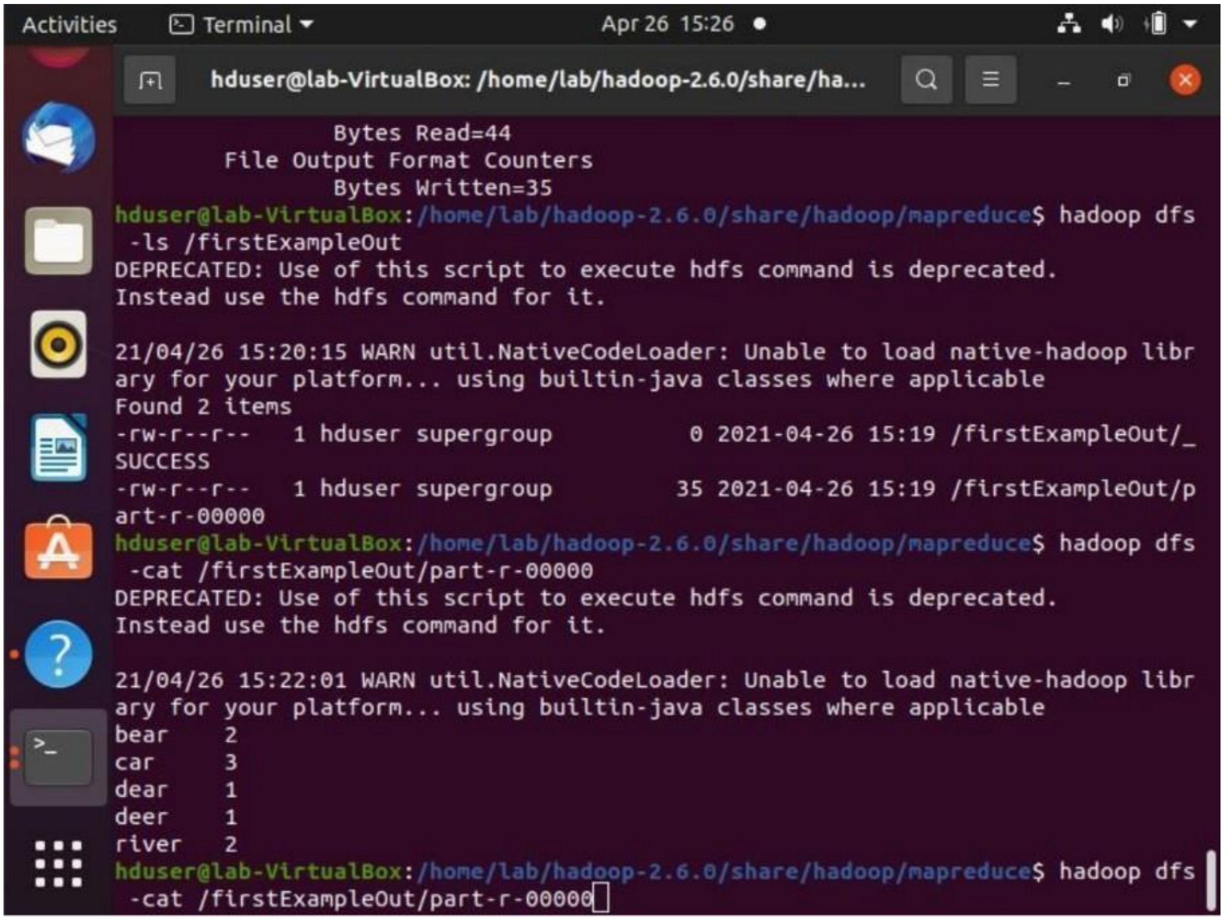
```
package meanmax;
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;
public class MeanMaxReducer extends Reducer<Text, IntWritable, Text, IntWritable> {
public void reduce(Text key, Iterable<IntWritable> 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));

        }

}
```



```
                Bytes Read=44
        File Output Format Counters
                Bytes Written=35
hduser@lab-VirtualBox:/home/lab/hadoop-2.6.0/share/hadoop/mapreduce$ hadoop dfs
 -ls /firstExampleOut
DEPRECATED: Use of this script to execute hdfs command is deprecated.
Instead use the hdfs command for it.

21/04/26 15:20:15 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
Found 2 items
-rw-r--r--   1 hduser supergroup          0 2021-04-26 15:19 /firstExampleOut/_
SUCCESS
-rw-r--r--   1 hduser supergroup         35 2021-04-26 15:19 /firstExampleOut/p
art-r-00000
hduser@lab-VirtualBox:/home/lab/hadoop-2.6.0/share/hadoop/mapreduce$ hadoop dfs
 -cat /firstExampleOut/part-r-00000
DEPRECATED: Use of this script to execute hdfs command is deprecated.
Instead use the hdfs command for it.

21/04/26 15:22:01 WARN util.NativeCodeLoader: Unable to load native-hadoop libr
ary for your platform... using builtin-java classes where applicable
bear    2
car     3
dear    1
deer    1
river   2
hduser@lab-VirtualBox:/home/lab/hadoop-2.6.0/share/hadoop/mapreduce$ hadoop dfs
 -cat /firstExampleOut/part-r-00000
```

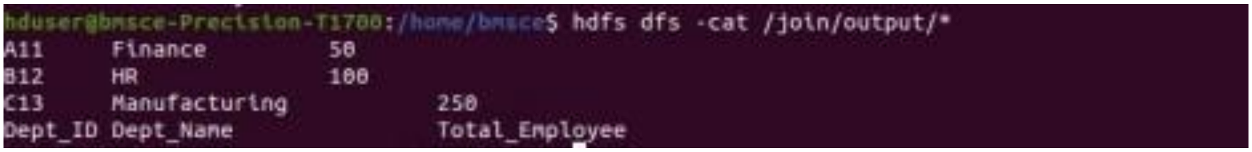
8. Create a Map Reduce program to demonstrating join operation

```
// 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(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

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);
```

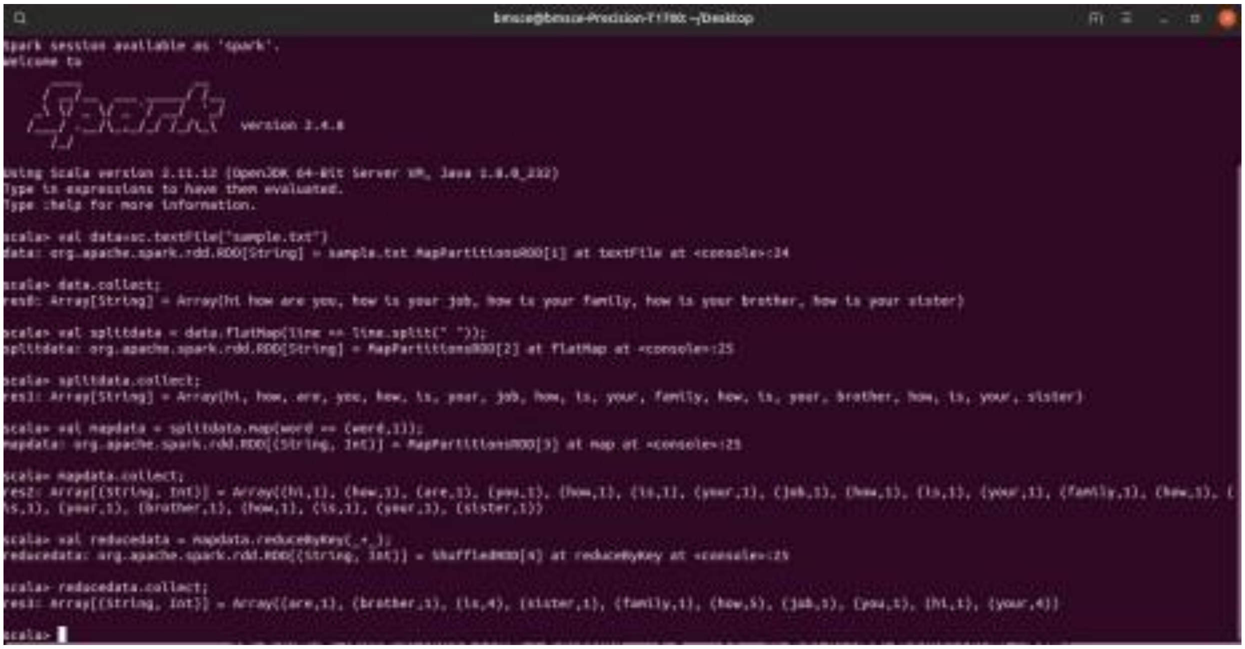
```
} catch (IOException e) {
throw new IllegalArgumentException(e);
}
}
@Override
public int compare(WritableComparable a, WritableComparable b) {
if (a instanceof TextPair && b instanceof TextPair) {
return ((TextPair) a).first.compareTo(((TextPair) b).first);
}
return super.compare(a, b);
}
} }
```



```
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

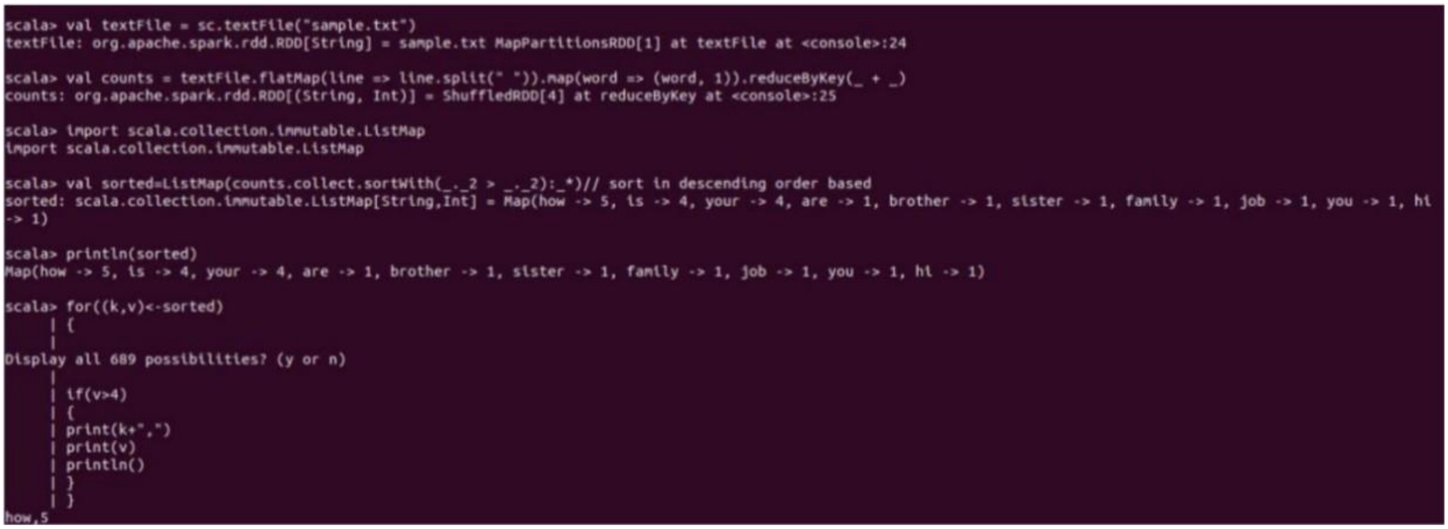
```
val data=sc.textFile("sparkdata.txt")

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;
```



```
Spark session available as 'spark'.
Welcome to
      ____              __
     / __/__  ___ _____/ /__
    _\ \/ _ \/ _ `/ __/  '_/
   /___/ .__/\_,_/_/ /_/\_\   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 data=sc.textFile("sample.txt")
data: org.apache.spark.rdd.RDD[String] = sample.txt MapPartitionsRDD[1] at textFile at <console>:24

scala> data.collect;
res0: Array[String] = Array(hi how are you, how is your job, how is your family, how is your brother, how is your sister)

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(hi, how, are, you, how, is, your, job, how, is, your, family, how, is, your, brother, how, is, your, sister)

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((hi,1), (how,1), (are,1), (you,1), (how,1), (is,1), (your,1), (job,1), (how,1), (is,1), (your,1), (family,1), (how,1), (
is,1), (your,1), (brother,1), (how,1), (is,1), (your,1), (sister,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((are,1), (brother,1), (is,4), (sister,1), (family,1), (how,5), (job,1), (you,1), (hi,1), (your,4))

scala> 
```

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()

}

}
```



```
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
```