# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

**"JnanaSangama", Belgaum -590014, Karnataka.**

**LAB REPORT**
**on**

# BIG DATA ANALYTICS
# (20CS6PEBDA)

***Submitted by***

**NISHCHAL NANDAGOPAL(1BM19CS105)**

***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 **NISHCHAL NANDAGOPAL(1BM19CS105),** who is bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 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 |

# Lab 1

```
cqlsh> create keyspace mployee_space WITH REPLICATION = {'class' : 'SimpleStrategy','replication_factor':2};

CREATE TABLE employee_space.employee_info (emp_id int PRIMARY KEY,emp_name text,designation text,date_of_joining timestamp,salary float,dept_name text);

cqlsh> begin batch INSERT INTO employee_space.employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name) VALUES(1,'Damodar','Manager','2022-01-24',100000,'Mar
   ... apply batch;
cqlsh> begin batch INSERT INTO employee_space.employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name) VALUES(2,'Mahalaxmi','Accountant','2021-01-24',200000
   ... INSERT INTO employee_space.employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name) VALUES(3,'Mahesh','Manager','2021-03-24',500000,'Marketing');
   ... INSERT INTO employee_space.employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name) VALUES(4,'Nidhi','Administrator','2021-05-24',500000,'Administrat
   ... INSERT INTO employee_space.employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name) VALUES(5,'Rahul','Administrator','2009-05-24',2000000,'Administra
   ... apply batch;

cqlsh> use employee_space;

cqlsh:employee_space> select * from employee_info;

 emp_id | date_of_joining                 | dept_name      | designation    | emp_name  | salary
--------+---------------------------------+----------------+----------------+-----------+--------
      5 | 2009-05-23 18:30:00.000000+0000 | Administration | Administrator |     Rahul |  2e+06
      1 | 2022-01-23 18:30:00.000000+0000 |      Marketing |       Manager |   Damodar |  1e+05
      2 | 2021-01-23 18:30:00.000000+0000 |       Accounts |    Accountant | Mahalaxmi |  2e+05
      4 | 2021-05-23 18:30:00.000000+0000 | Administration | Administrator |     Nidhi |  5e+05
      3 | 2021-03-23 18:30:00.000000+0000 |      Marketing |       Manager |    Mahesh |  5e+05

(5 rows)


cqlsh:employee_space> update employee_info set emp_name='Radha' where emp_id=1;

cqlsh:employee_space> update employee_info set dept_name='Development' where emp_id=1;

cqlsh:employee_space> select * from employee_info;
```

```
cqlsh:employee_space> select * from employee_info;

 emp_id | date_of_joining                 | dept_name      | designation    | emp_name  | salary
--------+---------------------------------+----------------+----------------+-----------+--------
      5 | 2009-05-23 18:30:00.000000+0000 | Administration | Administrator |     Rahul |  2e+06
      1 | 2022-01-23 18:30:00.000000+0000 |    Development |       Manager |     Radha |  1e+05
      2 | 2021-01-23 18:30:00.000000+0000 |       Accounts |    Accountant | Mahalaxmi |  2e+05
      4 | 2021-05-23 18:30:00.000000+0000 | Administration | Administrator |     Nidhi |  5e+05
      3 | 2021-03-23 18:30:00.000000+0000 |      Marketing |       Manager |    Mahesh |  5e+05

(5 rows)

cqlsh:employee_space> alter table employee_info add projects set<text>;

cqlsh:employee_space> update employee_info set projects=projects+{'Web development','machine learning'} where emp_id=2;

cqlsh:employee_space> select * from employee_info;

 emp_id | date_of_joining                 | dept_name      | designation    | emp_name  | projects                                | salary
--------+---------------------------------+----------------+----------------+-----------+-----------------------------------------+--------
      5 | 2009-05-23 18:30:00.000000+0000 | Administration | Administrator |     Rahul |                                    null |  2e+06
      1 | 2022-01-23 18:30:00.000000+0000 |    Development |       Manager |     Radha |                                    null |  1e+05
      2 | 2021-01-23 18:30:00.000000+0000 |       Accounts |    Accountant | Mahalaxmi | {'Web development', 'machine learning'} |  2e+05
      4 | 2021-05-23 18:30:00.000000+0000 | Administration | Administrator |     Nidhi |                                    null |  5e+05
      3 | 2021-03-23 18:30:00.000000+0000 |      Marketing |       Manager |    Mahesh |                                    null |  5e+05

(5 rows)
cqlsh:employee_space> update employee_info set projects=projects+{'Web development','machine learning','cybersecurity'} where emp_id=5;

cqlsh:employee_space> select * from employee_info;
```

```
 emp_id | date_of_joining                 | dept_name      | designation   | emp_name  | projects                                                          | salary
--------+---------------------------------+----------------+---------------+-----------+-------------------------------------------------------------------+--------
      5 | 2009-05-23 18:30:00.000000+0000 | Administration | Administrator |     Rahul | {'Web development', 'cybersecurity', 'machine learning'} |  2e+06
      1 | 2022-01-23 18:30:00.000000+0000 |    Development |       Manager |     Radha |                                                              null |  1e+05
      2 | 2021-01-23 18:30:00.000000+0000 |       Accounts |    Accountant | Mahalaxmi |                 {'Web development', 'machine learning'} |  2e+05
      4 | 2021-05-23 18:30:00.000000+0000 | Administration | Administrator |     Nidhi |                                                              null |  5e+05
      3 | 2021-03-23 18:30:00.000000+0000 |      Marketing |       Manager |    Mahesh |                                                              null |  5e+05

(5 rows)

cqlsh:employee_space> INSERT INTO employee_space.employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name) VALUES(6,'Harshitha','Manager','2022-01-24',100000

cqlsh:employee_space> select * from employee_info;

 emp_id | date_of_joining                 | dept_name      | designation   | emp_name  | projects                                                          | salary
--------+---------------------------------+----------------+---------------+-----------+-------------------------------------------------------------------+--------
      5 | 2009-05-23 18:30:00.000000+0000 | Administration | Administrator |     Rahul | {'Web development', 'cybersecurity', 'machine learning'} |  2e+06
      1 | 2022-01-23 18:30:00.000000+0000 |    Development |       Manager |     Radha |                                                              null |  1e+05
      2 | 2021-01-23 18:30:00.000000+0000 |       Accounts |    Accountant | Mahalaxmi |                 {'Web development', 'machine learning'} |  2e+05
      4 | 2021-05-23 18:30:00.000000+0000 | Administration | Administrator |     Nidhi |                                                              null |  5e+05
      6 | 2022-01-23 18:30:00.000000+0000 |      Marketing |       Manager | Harshitha |                                                              null |  1e+05
      3 | 2021-03-23 18:30:00.000000+0000 |      Marketing |       Manager |    Mahesh |                                                              null |  5e+05

(6 rows)

cqlsh:employee_space> select * from employee_info;

 emp_id | date_of_joining                 | dept_name      | designation   | emp_name  | projects                                                          | salary
--------+---------------------------------+----------------+---------------+-----------+-------------------------------------------------------------------+--------
      5 | 2009-05-23 18:30:00.000000+0000 | Administration | Administrator |     Rahul | {'Web development', 'cybersecurity', 'machine learning'} |  2e+06
      1 | 2022-01-23 18:30:00.000000+0000 |    Development |       Manager |     Radha |                                                              null |  1e+05
      2 | 2021-01-23 18:30:00.000000+0000 |       Accounts |    Accountant | Mahalaxmi |                 {'Web development', 'machine learning'} |  2e+05
      4 | 2021-05-23 18:30:00.000000+0000 | Administration | Administrator |     Nidhi |                                                              null |  5e+05
      3 | 2021-03-23 18:30:00.000000+0000 |      Marketing |       Manager |    Mahesh |                                                              null |  5e+05
```

# LAB 2

```
cqlsh> create keyspace library_space WITH REPLICATION={'class':'SimpleStrategy','replication_factor':2};

cqlsh> use library_space;

cqlsh:library_space> create table library_info(stud_id int,counter_value counter,stud_name text,book_name text,book_id int,date_of_issue timestamp,PRIMARY KEY(stud_id,stud_nam

cqlsh:library_space> update library_info set counter_value=counter_value+1 where stud_id=1 and stud_name='abc' and book_name='book1' and book_id=11 and date_of_issue='2022-01-

cqlsh:library_space> update library_info set counter_value=counter_value+1 where stud_id=2 and stud_name='def' and book_name='book2' and book_id=12 and date_of_issue='2022-03-

cqlsh:library_space> update library_info set counter_value=counter_value+1 where stud_id=3 and stud_name='ghi' and book_name='book3' and book_id=13 and date_of_issue='2022-05-

cqlsh:library_space> update library_info set counter_value=counter_value+1 where stud_id=4 and stud_name='jkl' and book_name='book4' and book_id=14 and date_of_issue='2022-07-

cqlsh:library_space> update library_info set counter_value=counter_value+1 where stud_id=5 and stud_name='mno' and book_name='book5' and book_id=15 and date_of_issue='2022-09-

cqlsh:library_space> select * from library_info;

 stud_id | stud_name | book_name | book_id | date_of_issue                   | counter_value
---------+-----------+-----------+---------+---------------------------------+---------------
       5 |       mno |     book5 |      15 | 2022-09-29 18:30:00.000000+0000 |             1
       1 |       abc |     book1 |      11 | 2022-01-29 18:30:00.000000+0000 |             1
       2 |       def |     book2 |      12 | 2022-03-29 18:30:00.000000+0000 |             1
       4 |       jkl |     book4 |      14 | 2022-07-29 18:30:00.000000+0000 |             1
       3 |       ghi |     book3 |      13 | 2022-05-29 18:30:00.000000+0000 |             1

(5 rows)

cqlsh:library_space> update library_info set counter_value=counter_value+1 where stud_id=5 and stud_name='mno' and book_name='book5' and book_id=15 and date_of_issue='2022-09-

cqlsh:library_space> select * from library_info;

 stud_id | stud_name | book_name | book_id | date_of_issue                   | counter_value
---------+-----------+-----------+---------+---------------------------------+---------------
       5 |       mno |     book5 |      15 | 2022-09-29 18:30:00.000000+0000 |             2
       1 |       abc |     book1 |      11 | 2022-01-29 18:30:00.000000+0000 |             1
       2 |       def |     book2 |      12 | 2022-03-29 18:30:00.000000+0000 |             1
       4 |       jkl |     book4 |      14 | 2022-07-29 18:30:00.000000+0000 |             1
       3 |       ghi |     book3 |      13 | 2022-05-29 18:30:00.000000+0000 |             1

(5 rows)

cqlsh:library_space> copy library_info(stud_id,stud_name,book_name,book_id,date_of_issue,counter_value) to '/home/bmscecse/Desktop/bda.csv';

Using 11 child processes

Starting copy of library_space.library_info with columns [stud_id, stud_name, book_name, book_id, date_of_issue, counter_value].
Processed: 5 rows; Rate:      45 rows/s; Avg. rate:      45 rows/s
5 rows exported to 1 files in 0.121 seconds.

cqlsh:library_space> create table library_info_copy(stud_id int,counter_value counter,stud_name text,book_name text,book_id int,date_of_issue timestamp,PRIMARY KEY(stud_id,stu

cqlsh:library_space> copy library_info_copy(stud_id,stud_name,book_name,book_id,date_of_issue,counter_value) from '/home/bmscecse/Desktop/new.csv';

Using 11 child processes

Starting copy of library_space.library_info_copy with columns [stud_id, stud_name, book_name, book_id, date_of_issue, counter_value].
Processed: 5 rows; Rate:       8 rows/s; Avg. rate:      12 rows/s
5 rows imported from 1 files in 0.406 seconds (0 skipped).

cqlsh:library_space> select * from library_info where counter_value=2 allow filtering;

 stud_id | stud_name | book_name | book_id | date_of_issue                   | counter_value
---------+-----------+-----------+---------+---------------------------------+---------------
       5 |       mno |     book5 |      15 | 2022-09-29 18:30:00.000000+0000 |             2
```

# Lab3

use studentdb switched

to db studentdb

```
db.createCollection("student_details")
{ "ok" : 1 }

db.student_details.insert({'name':'abc','rollno':1,'age':19,'contactno':9090909090,'email':'abc@lab.
com'})
WriteResult({ "nInserted" : 1 })

db.student_details.insert({'name':'mno','rollno':2,'age':20,'contactno':9999900000,'email':'mno@lab.com'})
WriteResult({ "nInserted" : 1 })

db.student_details.insert({'name':'xyz','rollno':3,'age':21,'contactno':9999911111,'email':'xyz@lab .com'})
WriteResult({ "nInserted" : 1 })

db.student_details.find({})
{ "_id" : ObjectId("60a88f32ffecf7c8abe76775"), "name" : "abc", "rollno" : 1, "age" : 19,
"contactno" : 9090909090, "email" : "abc@lab.com" }
{ "_id" : ObjectId("60a88f7effecf7c8abe76776"), "name" : "mno", "rollno" : 2, "age" : 20,
"contactno" : 9999900000, "email" : "mno@lab.com" }
{ "_id" : ObjectId("60a88f8fffecf7c8abe76777"), "name" : "xyz", "rollno" : 3, "age" : 21,
"contactno" : 9999911111, "email" : "xyz@lab.com" }

db.student_details.update({'rollno':3},{$set:{'email':'update@lab.com'}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })

db.student_details.find({'rollno':3})
{ "_id" : ObjectId("60a88f8fffecf7c8abe76777"), "name" : "xyz", "rollno" : 3, "age" : 21,
"contactno" : 9999911111, "email" : "update@lab.com" }
```

```
db.student_details.update({'name':'xyz'},{$set:{'name':'pqr'}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
db.student_details.find({'name':'pqr'})
{ "_id" : ObjectId("60a88f8fffecf7c8abe76777"), "name" : "pqr", "rollno" : 3, "age" : 21,
"contactno" : 9999911111, "email" : "update@lab.com" }

mongoexport --db studentdb --collection student_details --out E:\Desktop\sample.json
2021-05-22T10:43:30.687+0530    connected to: mongodb://localhost/
2021-05-22T10:43:31.026+0530    exported 3 records

db.getCollection('student_details').drop()
true

mongoimport --db studentdb --collection student_details --type=json --file=
E:\Desktop\sample.json
2021-05-22T10:46:49.898+0530    connected to: mongodb://localhost/
2021-05-22T10:46:50.044+0530    3 document(s) imported successfully. 0 document(s) failed to
import.

db.student_details.find({})
{ "_id" : ObjectId("60a88f8fffecf7c8abe76777"), "name" : "pqr", "rollno" : 3, "age" : 21,
"contactno" : 9999911111, "email" : "update@lab.com" }
{ "_id" : ObjectId("60a88f32ffecf7c8abe76775"), "name" : "abc", "rollno" : 1, "age" : 19,
"contactno" : 9090909090, "email" : "abc@lab.com" }
{ "_id" : ObjectId("60a88f7effecf7c8abe76776"), "name" : "mno", "rollno" : 2, "age" : 20,
"contactno" : 9999900000, "email" : "mno@lab.com" }

db.student_details.remove({age:{$gt:20}})
```

WriteResult({ "nRemoved" : 1 })

db.student_details.find({})

{ "_id" : ObjectId("60a88f32ffecf7c8abe76775"), "name" : "abc", "rollno" : 1, "age" : 19, "contactno" : 9090909090, "email" : "abc@lab.com" }

{ "_id" : ObjectId("60a88f7effecf7c8abe76776"), "name" : "mno", "rollno" : 2, "age" : 20, "contactno" : 9999900000, "email" : "mno@lab.com" }

db.student_details.find({})

{ "_id" : ObjectId("60a88f32ffecf7c8abe76775"), "name" : "abc", "rollno" : 1, "age" : 19, "contactno" : 9090909090, "email" : "abc@lab.com" }

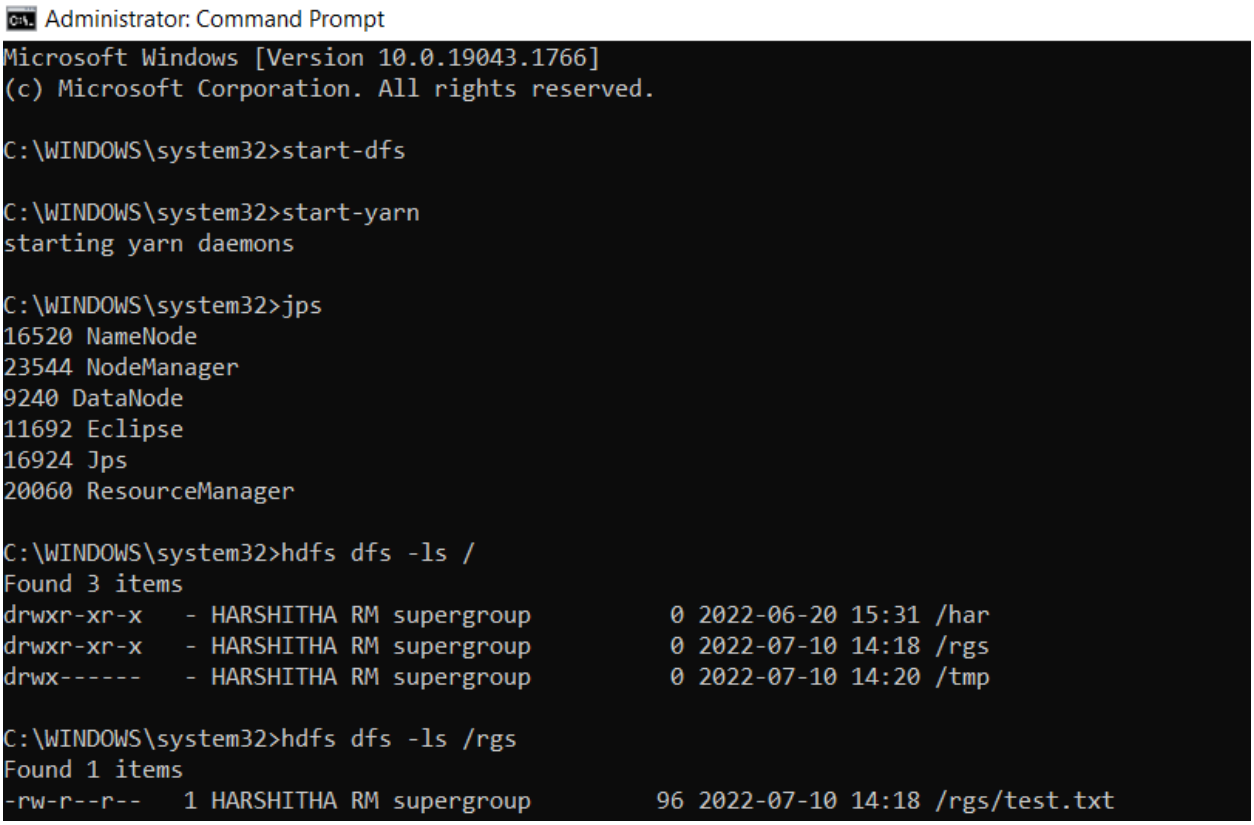
{ "_id" : ObjectId("60a88f7effecf7c8abe76776"), "name" : "mno", "rollno" : 2, "age" : 20, "contactno" : 9999900000, "email" : "mno@lab.com" }

```
> use studentdb
switched to db studentdb
> db.createCollection("student_details")
{ "ok" : 1 }
> db.student_details.insert({'name':'abc','rollno':1,'age':19,'contactno':9090909090,'email':'abc@lab.com'})
WriteResult({ "nInserted" : 1 })
> db.student_details.insert({'name':'mno','rollno':2,'age':20,'contactno':9999900000,'email':'mno@lab.com'})
WriteResult({ "nInserted" : 1 })
> db.student_details.insert({'name':'xyz','rollno':3,'age':21,'contactno':9999911111,'email':'xyz@lab.com'})
WriteResult({ "nInserted" : 1 })
> db.student_details.find({})
{ "_id" : ObjectId("60a88f32ffecf7c8abe76775"), "name" : "abc", "rollno" : 1, "age" : 19, "contactno" : 9090909090, "email" : "abc@lab.com" }
{ "_id" : ObjectId("60a88f7effecf7c8abe76776"), "name" : "mno", "rollno" : 2, "age" : 20, "contactno" : 9999900000, "email" : "mno@lab.com" }
{ "_id" : ObjectId("60a88f8fffecf7c8abe76777"), "name" : "xyz", "rollno" : 3, "age" : 21, "contactno" : 9999911111, "email" : "xyz@lab.com" }
> db.student_details.update({'rollno':3},{$set:{'email':'update@lab.com'}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.student_details.find({'rollno':3})
{ "_id" : ObjectId("60a88f8fffecf7c8abe76777"), "name" : "xyz", "rollno" : 3, "age" : 21, "contactno" : 9999911111, "email" : "update@lab.com" }
> db.student_details.update({'name':'xyz'},{$set:{'name':'pqr'}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.student_details.find({'name':'pqr'})
{ "_id" : ObjectId("60a88f8fffecf7c8abe76777"), "name" : "pqr", "rollno" : 3, "age" : 21, "contactno" : 9999911111, "email" : "update@lab.com" }
```

```
> db.student_details.find({})
{ "_id" : ObjectId("60a88f8fffecf7c8abe76777"), "name" : "pqr", "rollno" : 3, "age" : 21, "contactno" : 9999911111, "email" : "update@lab.com" }
{ "_id" : ObjectId("60a88f32ffecf7c8abe76775"), "name" : "abc", "rollno" : 1, "age" : 19, "contactno" : 9090909090, "email" : "abc@lab.com" }
{ "_id" : ObjectId("60a88f7effecf7c8abe76776"), "name" : "mno", "rollno" : 2, "age" : 20, "contactno" : 9999900000, "email" : "mno@lab.com" }
> db.student_details.remove({age:{$gt:20}})
WriteResult({ "nRemoved" : 1 })
> db.student_details.find({})
{ "_id" : ObjectId("60a88f32ffecf7c8abe76775"), "name" : "abc", "rollno" : 1, "age" : 19, "contactno" : 9090909090, "email" : "abc@lab.com" }
{ "_id" : ObjectId("60a88f7effecf7c8abe76776"), "name" : "mno", "rollno" : 2, "age" : 20, "contactno" : 9999900000, "email" : "mno@lab.com" }
```

# LAB4

SCREENSHOT OF HADOOP INSTALLATION



# LAB 5

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

c:\hadoop_new\sbin>hdfs dfs -mkdir /temp

c:\hadoop_new\sbin>hdfs dfs -copyFromLocal E:\Desktop\sample.txt \temp

c:\hadoop_new\sbin>hdfs dfs -ls \temp

Found 1 items

-rw-r--r-- 1 Admin supergroup 11 2021-06-11 21:12 /temp/sample.txt

c:\hadoop_new\sbin>hdfs dfs -cat \temp\sample.txt hello
world

c:\hadoop_new\sbin>hdfs dfs -get \temp\sample.txt E:\Desktop\temp

c:\hadoop_new\sbin>hdfs dfs -put E:\Desktop\temp \temp

c:\hadoop_new\sbin>hdfs dfs -ls \temp

Found 2 items

-rw-r--r-- 1 Admin supergroup 11 2021-06-11 21:12 /temp/sample.txt drwxr-xr-x -
Admin supergroup 0 2021-06-11 21:15 /temp/temp

c:\hadoop_new\sbin>hdfs dfs -mv \lab1 \temp

c:\hadoop_new\sbin>hdfs dfs -ls \temp Found 3 items drwxr-xr-x - Admin
supergroup 0 2021-04-19 15:07 /temp/lab1 -rw-r--r-- 1 Admin
supergroup 11 2021-06-11 21:12 /temp/sample.txt drwxr-xr-x -
Admin supergroup 0 2021-06-11 21:15 /temp/temp

```
c:\hadoop_new\sbin>hdfs dfs -rm /temp/sample.txt
Deleted /temp/sample.txt

c:\hadoop_new\sbin>hdfs dfs -ls \temp Found 2 items drwxr-xr-x   - Admin
supergroup          0 2021-04-19 15:07 /temp/lab1 drwxr-xr-x   - Admin
supergroup          0 2021-06-11 21:15 /temp/temp

c:\hadoop_new\sbin>hdfs dfs -copyFromLocal E:\Desktop\sample.txt \temp

c:\hadoop_new\sbin>hdfs dfs -ls \temp Found 3 items drwxr-xr-x   - Admin
supergroup          0 2021-04-19 15:07 /temp/lab1 -rw-r--r--   1 Admin supergroup
11 2021-06-11 21:17 /temp/sample.txt drwxr-xr-x   - Admin supergroup          0
2021-06-11 21:15 /temp/temp

c:\hadoop_new\sbin>hdfs dfs -copyToLocal \temp\sample.txt E:\Desktop\sample.txt
```

```
c:\hadoop_new\sbin>hdfs dfs -mkdir /temp

c:\hadoop_new\sbin>hdfs dfs -copyFromLocal E:\Desktop\sample.txt \temp

c:\hadoop_new\sbin>hdfs dfs -ls \temp
Found 1 items
-rw-r--r--   1 Admin supergroup         11 2021-06-11 21:12 /temp/sample.txt

c:\hadoop_new\sbin>hdfs dfs -cat \temp\sample.txt
hello world
c:\hadoop_new\sbin>hdfs dfs -get \temp\sample.txt E:\Desktop\temp

c:\hadoop_new\sbin>hdfs dfs -put E:\Desktop\temp \temp

c:\hadoop_new\sbin>hdfs dfs -ls \temp
Found 2 items
-rw-r--r--   1 Admin supergroup         11 2021-06-11 21:12 /temp/sample.txt
drwxr-xr-x   - Admin supergroup          0 2021-06-11 21:15 /temp/temp
```

```
c:\hadoop_new\sbin>hdfs dfs -mv \lab1 \temp

c:\hadoop_new\sbin>hdfs dfs -ls \temp
Found 3 items
drwxr-xr-x   - Admin supergroup          0 2021-04-19 15:07 /temp/lab1
-rw-r--r--   1 Admin supergroup         11 2021-06-11 21:12 /temp/sample.txt
drwxr-xr-x   - Admin supergroup          0 2021-06-11 21:15 /temp/temp

c:\hadoop_new\sbin>hdfs dfs -rm /temp/sample.txt
Deleted /temp/sample.txt

c:\hadoop_new\sbin>hdfs dfs -ls \temp
Found 2 items
drwxr-xr-x   - Admin supergroup          0 2021-04-19 15:07 /temp/lab1
drwxr-xr-x   - Admin supergroup          0 2021-06-11 21:15 /temp/temp

c:\hadoop_new\sbin>hdfs dfs -copyFromLocal E:\Desktop\sample.txt \temp

c:\hadoop_new\sbin>hdfs dfs -ls \temp
Found 3 items
drwxr-xr-x   - Admin supergroup          0 2021-04-19 15:07 /temp/lab1
-rw-r--r--   1 Admin supergroup         11 2021-06-11 21:17 /temp/sample.txt
drwxr-xr-x   - Admin supergroup          0 2021-06-11 21:15 /temp/temp

c:\hadoop_new\sbin>hdfs dfs -copyToLocal \temp\sample.txt E:\Desktop\sample.txt
```

# LAB 6

**For the given file, Create a Map Reduce program to**
**a) Find the average temperature for each year from the NCDC data set.**

```
// AverageDriver.java package temperature;

import org.apache.hadoop.io.*; import org.apache.hadoop.fs.*; import
org.apache.hadoop.mapreduce.*; import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;

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

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

//AverageMapper.java package temperature;

import org.apache.hadoop.io.*; import org.apache.hadoop.mapreduce.*; import java.io.IOException;

public class AverageMapper extends Mapper <LongWritable, Text, Text, IntWritable>
{ public static final int MISSING = 9999;

public void map(LongWritable key, Text value, Context context) throws IOException,
InterruptedException
{
        String line = value.toString();     String year = line.substring(15,19);       int temperature;
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 != MISSING && quality.matches("[01459]"))
context.write(new Text(year),new IntWritable(temperature)); }
}
```

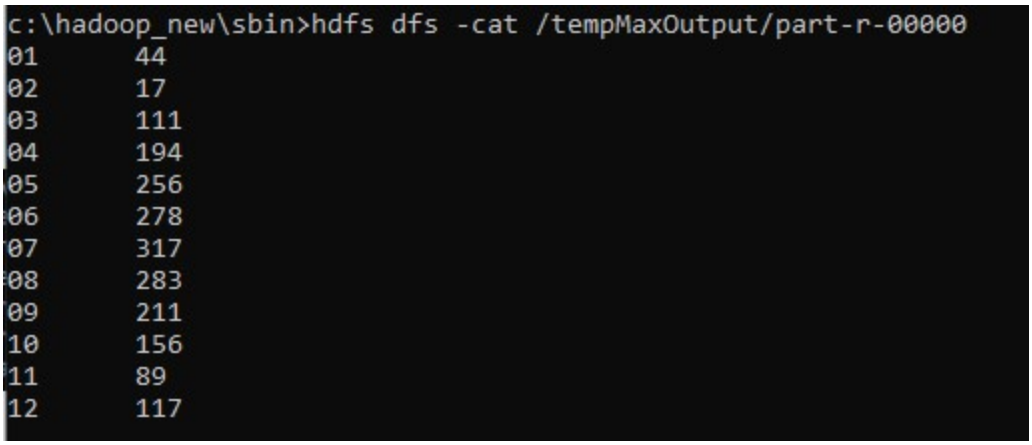
```
//AverageReducer.java package temperature;

import org.apache.hadoop.io.IntWritable; import org.apache.hadoop.io.Text; import
org.apache.hadoop.mapreduce.*; import java.io.IOException;

public class AverageReducer extends Reducer <Text, IntWritable,Text, IntWritable>
{
        public void reduce(Text key, Iterable<IntWritable> values, Context context) throws
IOException,InterruptedException
        {
                int max_temp = 0;                int count = 0;
                for (IntWritable value : values)
                {
                        max_temp += value.get();
                        count+=1;
                }
                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
```

```
//TempDriver.java package
temperatureMax;

import org.apache.hadoop.io.*; import org.apache.hadoop.fs.*; import
org.apache.hadoop.mapreduce.*; import
org.apache.hadoop.mapreduce.lib.input.FileInputFormat; import
org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;

public class TempDriver
{       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(TempDriver.class);          job.setJobName("Max
temperature");
              FileInputFormat.addInputPath(job,new Path(args[0]));
              FileOutputFormat.setOutputPath(job,new Path (args[1]));

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

//TempMapper.java package
temperatureMax;

import org.apache.hadoop.io.*; import
org.apache.hadoop.mapreduce.*; import
java.io.IOException;

public class TempMapper extends Mapper <LongWritable, Text, Text, IntWritable>
{ public static final int MISSING = 9999;

public void map(LongWritable key, Text value, Context context) throws IOException,
InterruptedException
{
        String line = value.toString();     String month = line.substring(19,21);
int temperature;          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 != MISSING &&
quality.matches("[01459]"))                context.write(new Text(month),new
IntWritable(temperature)); }

}

//TempReducer.java package
temperatureMax;

import org.apache.hadoop.io.*; import
org.apache.hadoop.mapreduce.*; import
java.io.IOException;

public class TempMapper extends Mapper <LongWritable, Text, Text, IntWritable>
{ public static final int MISSING = 9999;

public void map(LongWritable key, Text value, Context context) throws IOException,
InterruptedException
{
        String line = value.toString();      String month = line.substring(19,21);
int temperature;          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 != MISSING &&
quality.matches("[01459]"))                context.write(new Text(month),new
IntWritable(temperature));
        }
}
```


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

# LAB 7

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

```
// TopN.java package sortWords;

import org.apache.hadoop.conf.Configuration; import org.apache.hadoop.fs.Path; import
org.apache.hadoop.io.IntWritable; import org.apache.hadoop.io.Text; import
org.apache.hadoop.mapreduce.Job; import org.apache.hadoop.mapreduce.Mapper; import
org.apache.hadoop.mapreduce.Reducer; import
org.apache.hadoop.mapreduce.lib.input.FileInputFormat; import
org.apache.hadoop.mapreduce.lib.output.FileOutputFormat; import
org.apache.hadoop.util.GenericOptionsParser; import utils.MiscUtils;

import java.io.IOException; import java.util.*;

public class TopN {

   public static void main(String[] args) throws Exception {
      Configuration conf = new Configuration();
      String[] otherArgs = new GenericOptionsParser(conf, args).getRemainingArgs();        if
(otherArgs.length != 2) {
         System.err.println("Usage: TopN <in> <out>");
         System.exit(2);
      }
      Job job = Job.getInstance(conf);        job.setJobName("Top N");        job.setJarByClass(TopN.class);
job.setMapperClass(TopNMapper.class);        //job.setCombinerClass(TopNReducer.class);
job.setReducerClass(TopNReducer.class);        job.setOutputKeyClass(Text.class);
job.setOutputValueClass(IntWritable.class);
      FileInputFormat.addInputPath(job, new Path(otherArgs[0]));
      FileOutputFormat.setOutputPath(job, new Path(otherArgs[1]));
      System.exit(job.waitForCompletion(true) ? 0 : 1);
   }

   /**
    * The mapper reads one line at the time, splits it into an array of single words and emits every      *
word to the reducers with the value of 1.
    */
   public static class TopNMapper extends Mapper<Object, Text, Text, IntWritable> {

      private final static IntWritable one = new IntWritable(1);        private Text word = new Text();
      private String tokens = "[_|$#<>\\^=\\[\\]\\*/\\\\,;,.\\-:()?!\"']";

      @Override
      public void map(Object key, Text value, Context context) throws IOException,
InterruptedException {
         String cleanLine = value.toString().toLowerCase().replaceAll(tokens, " ");           StringTokenizer itr
= new StringTokenizer(cleanLine);           while (itr.hasMoreTokens()) {
            word.set(itr.nextToken().trim());              context.write(word, one);
         }
      }
```

```
  }

  /**
   * The reducer retrieves every word and puts it into a Map: if the word already exists in the      * map,
increments its value, otherwise sets it to 1.
   */
  public static class TopNReducer extends Reducer<Text, IntWritable, Text, IntWritable> {

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

    @Override
    public void reduce(Text key, Iterable<IntWritable> values, Context context) throws IOException,
InterruptedException {

      // computes the number of occurrences of a single word          int sum = 0;          for (IntWritable
val : values) {              sum += val.get();
      }
      // puts the number of occurrences of this word into the map.
      // We need to create another Text object because the Text instance
      // we receive is the same for all the words          countMap.put(new Text(key), new
IntWritable(sum));
    }
@Override
    protected void cleanup(Context context) throws IOException, InterruptedException {

      Map<Text, IntWritable> sortedMap = MiscUtils.sortByValues(countMap);

      int counter = 0;          for (Text key : sortedMap.keySet()) {              if (counter++ == 3) {
break;
        }
        context.write(key, sortedMap.get(key));
      }
    }
  }

  /**
   * The combiner retrieves every word and puts it into a Map: if the word already exists in the      * map,
increments its value, otherwise sets it to 1.
   */
  public static class TopNCombiner extends Reducer<Text, IntWritable, Text, IntWritable> {

    @Override
    public void reduce(Text key, Iterable<IntWritable> values, Context context) throws IOException,
InterruptedException {

      // computes the number of occurrences of a single word          int sum = 0;          for (IntWritable
val : values) {              sum += val.get();
      }
      context.write(key, new IntWritable(sum));
}
```

```
   }
}

// MiscUtils.java package utils;

import java.util.*;

public class MiscUtils {

   /**
sorts the map by values. Taken from:
http://javarevisited.blogspot.it/2012/12/how-to-sort-hashmap-java-by-key-and-value.html
    */
   public static <K extends Comparable, V extends Comparable> Map<K, V> sortByValues(Map<K, V>
map) {
      List<Map.Entry<K, V>> entries = new LinkedList<Map.Entry<K, V>>(map.entrySet());

      Collections.sort(entries, new Comparator<Map.Entry<K, V>>() {

         @Override          public int compare(Map.Entry<K, V> o1, Map.Entry<K, V> o2) {          return
o2.getValue().compareTo(o1.getValue());
         }
      });

      //LinkedHashMap will keep the keys in the order they are inserted
      //which is currently sorted on natural ordering
      Map<K, V> sortedMap = new LinkedHashMap<K, V>();
for (Map.Entry<K, V> entry : entries) {
         sortedMap.put(entry.getKey(), entry.getValue());
      }

      return sortedMap;
   }
}
```

```
C:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -cat \sortwordsOutput\part-r-00000
car     7
deer    6
bear    3
```

# LAB 8

**Create a Hadoop Map Reduce program to combine information from the users file along with Information from the posts file by using the concept of join and display user_id, Reputation and Score.**

// JoinDriver.java import org.apache.hadoop.conf.Configured; import org.apache.hadoop.fs.Path; import org.apache.hadoop.io.Text; import org.apache.hadoop.mapred.*; import org.apache.hadoop.mapred.lib.MultipleInputs; import org.apache.hadoop.util.*;

```
public class JoinDriver extends Configured implements Tool {

	public static class KeyPartitioner implements Partitioner<TextPair, Text> {
		@Override
		public void configure(JobConf job) {}

		@Override
    public int getPartition(TextPair key, 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 Name input'");

		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);
   }
  }
}
```

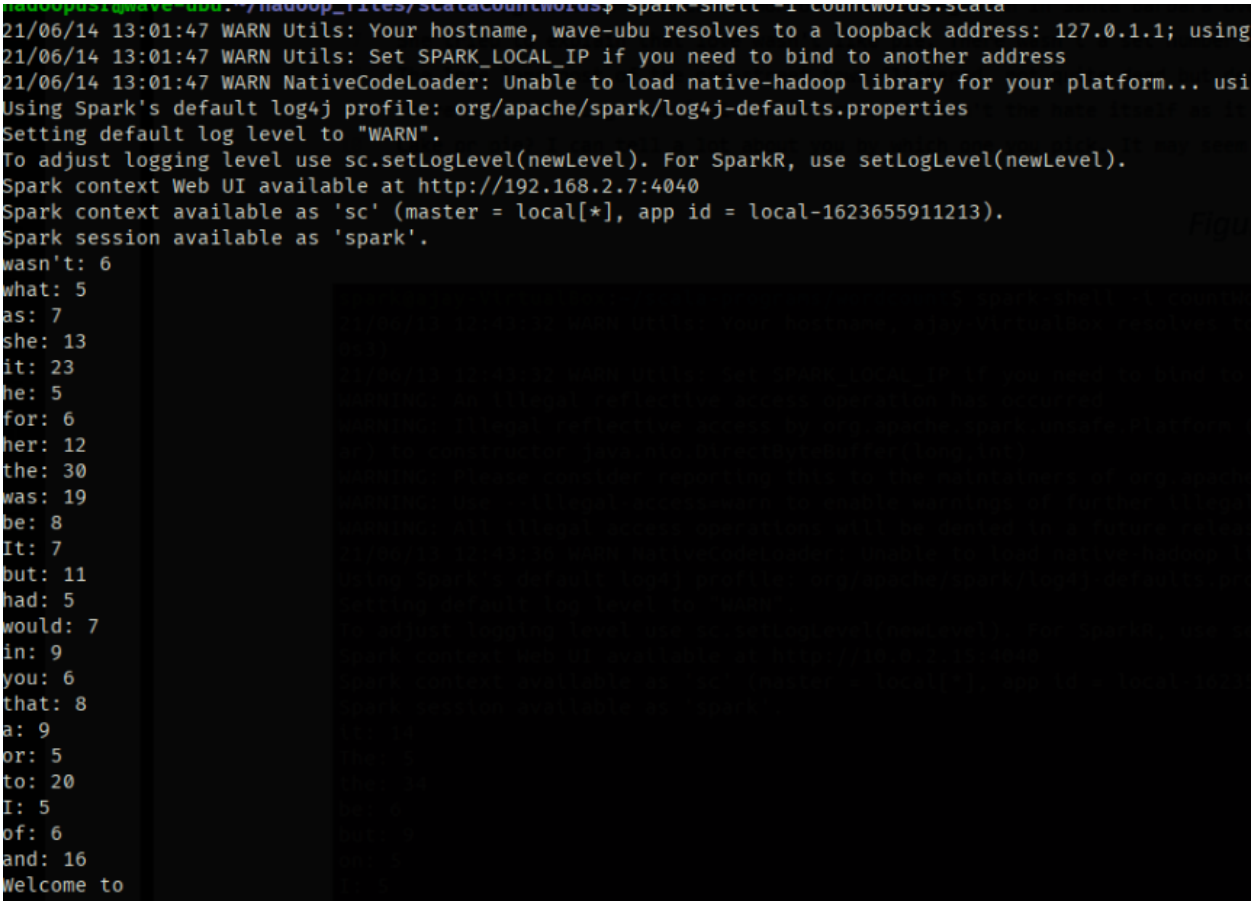
```
c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -cat \joinOutput\part-00000
"100005361"     "2"             "36134"
"100018705"     "2"             "76"
"100022094"     "0"             "6354"
```

## LAB 9

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

```
scala> println("Hello World!");
Hello World!
```

```
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;
```




# LAB 10

**Using RDD and Flat Map count how many times each word appears in a file and write out a list of**
**words whose count is strictly greater than 4 using Spark**

```
scala> val textfile = sc.textFile("/home/sam/Desktop/abc.txt")
textfile: org.apache.spark.rdd.RDD[String] = /home/sam/Desktop/abc.txt MapPartitionsRDD[8] at textFile at <conso
le>:25

scala> val counts = textfile.flatMap(line => line.split(" ")).map(word => (word,1)).reduceByKey(_+_)
counts: org.apache.spark.rdd.RDD[(String, Int)] = ShuffledRDD[11] at reduceByKey at <console>:26

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

scala> val sorted = ListMap(counts.collect.sortWith(_._2>_._2):_*)
sorted: scala.collection.immutable.ListMap[String,Int] = ListMap(hello -> 3, apple -> 2, unicorn -> 1, world ->
1)

scala> println(sorted)
ListMap(hello -> 3, apple -> 2, unicorn -> 1, world -> 1)
```