VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.

LAB REPORT
on

BIG DATA ANALYTICS (20CS6PEBDA)

Submitted by

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

B.M.S. COLLEGE OF ENGINEERING
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B. M. S. College of Engineering,

Bull Temple Road, Bangalore 560019
(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering

<u>CERTIFICATE</u>

This is to certify that the Lab work entitled **“BIG DATA ANALYTICS”** carried out by **ANITEJ PRASAD (1BM19CS194),** 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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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

LAB1:

Using MongoDB create a database for students.

```
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
Server has startup warnings:
2022-04-11T18:49:15.627+0530 I STORAGE [initandlisten]
2022-04-11T18:49:15.627+0530 I STORAGE [initandlisten] ** WARNING: Using the XFS filesystem is strongly recommended with the WiredTiger storage engine
2022-04-11T18:49:15.627+0530 I STORAGE [initandlisten] ** See http://dochub.mongodb.org/core/prodnotes-filesystem
2022-04-11T18:49:18.771+0530 I CONTROL [initandlisten]
2022-04-11T18:49:18.771+0530 I CONTROL [initandlisten] ** WARNING: Access control is not enabled for the database.
2022-04-11T18:49:18.771+0530 I CONTROL [initandlisten] ** Read and write access to data and configuration is unrestricted.
2022-04-11T18:49:18.771+0530 I CONTROL [initandlisten]
```

```
> use Student

switched to db Student

> db.createCollection("student");

{ "ok" : 1 }

>
db.Student.insert({_id:1,StudName:"Megha",Grade:"vii",Hobbies:"Inter
netSurfing"});

WriteResult({ "nInserted" : 1 })

>
db.Student.update({_id:3,StudName:"Ayan",Grade:"vii"},{$set:{Hobbie
s:"skating"}},{upsert:true});

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

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

{ "_id" : 3, "Grade" : "vii", "StudName" : "Ayan", "Hobbies" : "skating"
}

> db.Student.find({},{StudName:1,Grade:1,_id:0});

{ "StudName" : "Megha", "Grade" : "vii" }

{ "Grade" : "vii", "StudName" : "Ayan" }


> db.Student.find({Grade:{$eq:'vii'}}).pretty();

{

        "_id" : 1,

        "StudName" : "Megha",

        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
{ "_id" : 3, "Grade" : "vii", "StudName" : "Ayan", "Hobbies" : "skating"
}
> db.Student.find({Grade:{$eq:'vii'}});
{ "_id" : 1, "StudName" : "Megha", "Grade" : "vii", "Hobbies" :
"InternetSurfing" }
{ "_id" : 3, "Grade" : "vii", "StudName" : "Ayan", "Hobbies" : "skating"
}
> db.Student.find({Grade:{$eq:'vii'}}).pretty();
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
{ "_id" : 3, "Grade" : "vii", "StudName" : "Ayan", "Hobbies" : "skating"
}
> db.Student.find({Hobbies:{$in:['Chess','Skating']}}).pretty();
> db.Student.find({Hobbies:{$in:['Skating']}}).pretty();
> db.Student.find({Hobbies:{$in:['skating']}}).pretty();
{ "_id" : 3, "Grade" : "vii", "StudName" : "Ayan", "Hobbies" : "skating"
}
> db.Student.find({StudName:/^M/}).pretty();
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
> db.Student.find({StudName:/e/}).pretty();
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
> db.Student.count();
2
> db.Student.find().sort({StudName:-1}).pretty();
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
{ "_id" : 3, "Grade" : "vii", "StudName" : "Ayan", "Hobbies" : "skating"
}
> db.Student.save({StudName:"Vamsi",Greade:"vi"})
```

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

```
> db.Students.count()
0
> db.Students.count({Grade:"VII"})
0
> db.Student.find({Grade:"VII"}).limit(3).pretty();
> db.Student.update({_id:3},{$set:{Location:null}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.Student.count({Grade:"VII"})
0
> db.Students.count({Grade:"vii"})
0
> db.Student.count()
3
> db.Student.count({Grade:"vii"})
2
> db.Student.find({Grade:"vii"}).limit(3).pretty();
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
{
        "_id" : 3,
        "Grade" : "vii",
        "StudName" : "Ayan",
        "Hobbies" : "skating",
        "Location" : null
}
> db.Student.find().sort({StudName:1}).pretty();
{
        "_id" : 3,
        "Grade" : "vii",
        "StudName" : "Ayan",
        "Hobbies" : "skating",
        "Location" : null
}
{
        "_id" : 1,
        "StudName" : "Megha",
        "Grade" : "vii",
        "Hobbies" : "InternetSurfing"
}
{
        "_id" : ObjectId("6253f413e88b8c9e787b194e"),
        "StudName" : "Vamsi",
        "Greade" : "vi"
}
> db.Student.find().skip(2).pretty()
{
        "_id" : ObjectId("6253f413e88b8c9e787b194e"),
        "StudName" : "Vamsi",
        "Greade" : "vi"
}
> db.food.insert( { _id:1, fruits:['grapes','mango','apple';] } )
2022-04-11T15:05:51.894+0530 E QUERY    [thread1] SyntaxError:
missing ] after element list @(shell):1:57
> db.food.insert({_id:1,fruits:['grapes','mango','apple']})
WriteResult({ "nInserted" : 1 })
> db.food.insert({_id:2,fruits:['grapes','mango','cherry']})
WriteResult({ "nInserted" : 1 })
> db.food.insert({_id:3,fruits:['banana','mango']})
WriteResult({ "nInserted" : 1 })
> db.food.find({fruits:['grapes','mango','apple']}).pretty();
{ "_id" : 1, "fruits" : [ "grapes", "mango", "apple" ] }
> db.food.find({'fruits.1':'grapes'})
> db.food.find({"fruits":{$size:2}})
{ "_id" : 3, "fruits" : [ "banana", "mango" ] }
> db.food.find({_id:1},{"fruits":{$slice:2}})
{ "_id" : 1, "fruits" : [ "grapes", "mango" ] }
```

```
> db.food.find({fruits:{$all:["mango","grapes"]}})

{ "_id" : 1, "fruits" : [ "grapes", "mango", "apple" ] }

{ "_id" : 2, "fruits" : [ "grapes", "mango", "cherry" ] }

> db.food.update({_id:3},{$set:{"fruits.1":"apple"}})

WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })

>
db.food.update({_id:2},{$push:{price:{grapes:80,mango:200,cherry:100
}}}})

WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })

>

> db.createCollection("Customers");

{

        "ok" : 0,

        "errmsg" : "a collection 'bhuvana.Customers' already exists",

        "code" : 48,

        "codeName" : "NamespaceExists"

}

db.Customers.insert({_custID:1,AcctBal:'100000',AcctType:"saving"});

WriteResult({ "nInserted" : 1 })

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

{ "_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}}});
```

LAB 2:

Using Cassandra create a database for Employees

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

cqlsh:employee> USE employee;

cqlsh:employee> create table employee_info(emp_id int PRIMARY
KEY, emp_name text,

        ... designation text, date_of_joining timestamp, salary double
PRIMARY KEY, dept_name text);

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

cqlsh:employee> BEGIN BATCH INSERT INTO

        ...
employee_info(emp_id,emp_name,designation,date_of_joining,salary,de
pt_name)

        ... VALUES(100,'Jogesh','MANAGER','2021-09-
11',30000,'TESTING');

        ... INSERT INTO

        ...
employee_info(emp_id,emp_name,designation,date_of_joining,salary,de
pt_name)

        ... VALUES(111,'Tamara','ASSOCIATE','2021-06-
22',25000,'DEVELOPING');
```

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

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

```
   105 |  25000 | 2021-06-24 18:30:00.000000+0000 |    TESTING |
ASSOCIATE |    Santosh

   111 |  25000 | 2021-06-21 18:30:00.000000+0000 | DEVELOPING |
ASSOCIATE |    Tamara

   121 |  35000 | 2021-03-29 18:30:00.000000+0000 |         HR |
MANAGER |    Elenor

   115 |  20000 | 2021-12-29 18:30:00.000000+0000 | DEVELOPING |
ASSISTANT |    Charu

   100 |  30000 | 2021-09-10 18:30:00.000000+0000 |    TESTING |
MANAGER |    Jogesh


(5 rows)

cqlsh:employee> UPDATE employee_info SET emp_name = 'Jayesh',
dept_name = 'DEVELOPING' WHERE emp_id = 121;

cqlsh:employee> UPDATE employee_info SET emp_name = 'Jayesh',
dept_name = 'DEVELOPING' WHERE emp_id = 121 AND salary =
35000;

cqlsh:employee> SELECT * FROM employee_info ;


 emp_id | salary | date_of_joining                 | dept_name  | designation |
emp_name

--------+--------+---------------------------------+------------+-------------+-----
-----

   105 |  25000 | 2021-06-24 18:30:00.000000+0000 |    TESTING |
ASSOCIATE |    Santosh

   111 |  25000 | 2021-06-21 18:30:00.000000+0000 | DEVELOPING |
ASSOCIATE |    Tamara
```

```
    121 |  35000 | 2021-03-29 18:30:00.000000+0000 | DEVELOPING |
MANAGER |    Jayesh

    115 |  20000 | 2021-12-29 18:30:00.000000+0000 | DEVELOPING |
ASSISTANT |    Charu

    100 |  30000 | 2021-09-10 18:30:00.000000+0000 |    TESTING |
MANAGER |    Jogesh


(5 rows)

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

cqlsh:employee> paging off

Disabled Query paging.

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


 emp_id | salary | date_of_joining                 | dept_name  | designation |
emp_name

--------+--------+---------------------------------+------------+-------------+-----
-----

    115 |  20000 | 2021-12-29 18:30:00.000000+0000 | DEVELOPING |
ASSISTANT |    Charu

    105 |  25000 | 2021-06-24 18:30:00.000000+0000 |    TESTING |
ASSOCIATE |    Santosh

    111 |  25000 | 2021-06-21 18:30:00.000000+0000 | DEVELOPING |
ASSOCIATE |    Tamara
```

```
   100 |  30000 | 2021-09-10 18:30:00.000000+0000 |    TESTING |
MANAGER |    Jogesh

   121 |  35000 | 2021-03-29 18:30:00.000000+0000 | DEVELOPING |
MANAGER |    Jayesh


(5 rows)

cqlsh:employee> ALTER TABLE employee_info ADD projects text;

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

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

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

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

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

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

cqlsh:employee> SELECT * FROM employee_infor

            ... ;

cqlsh:employee> SELECT * FROM employee_info ;


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

```
--------+--------+---------------------------------+------------+-------------+-----
-----+----------------------------

    105 |  25000 | 2021-06-24 18:30:00.000000+0000 |    TESTING |
ASSOCIATE |  Santosh |            Campus Portal

    111 |  25000 | 2021-06-21 18:30:00.000000+0000 | DEVELOPING |
ASSOCIATE |  Tamara  |                 Chat App

    121 |  35000 | 2021-03-29 18:30:00.000000+0000 | DEVELOPING |
MANAGER |  Jayesh  |  Library Management System

    115 |  20000 | 2021-12-29 18:30:00.000000+0000 | DEVELOPING |
ASSISTANT |  Charu   |              Discord Bot

    100 |  30000 | 2021-09-10 18:30:00.000000+0000 |    TESTING |
MANAGER |  Jogesh  |        YouTube Downloader


(5 rows)

cqlsh:employee> INSERT INTO

            ...
employee_info(emp_id,emp_name,designation,date_of_joining,salary,de
pt_name)

            ...

            ... ;

cqlsh:employee> INSERT INTO

            ...
employee_info(emp_id,emp_name,designation,date_of_joining,salary,de
pt_name)

            ... VALUES(110,'SAM','ASSOCIATE','2021-01-
11',28000,'TESTING') USING TTL 15;
```

```
cqlsh:employee> SELECT TTL(emp_name) from employee_info
WHERE emp_id = 110;


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


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


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


(5 rows)
```

LAB3:

Using Cassandra create a Library database

```
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 = 'Manju' and book_name = 'Human Behaviour' and
book_id = '52e43' and date_of_issue = '2021-09-12';

        ... UPDATE library_info set counter_value +=1 where stud_id =
112 and stud_name = 'Kishore' and book_name = 'Engineering
Mathematics-1' and book_id = '52e44' and date_of_issue = '2021-04-10';

        ... UPDATE library_info set counter_value +=1 where stud_id =
113 and stud_name = 'Maitri' and book_name = 'Dan Brown and
book_id = '52e45' and date_of_issue = '2021-02-01';

        ... UPDATE library_info set counter_value +=1 where stud_id =
114 and stud_name = 'Ramesh' and book_name = 'EME' and book_id =
'52e46' and date_of_issue = '2021-04-03';

        ... APPLY BATCH;

cqlsh:library> SELECT * FROM library_info ;
```

```
 stud_id | stud_name | book_name                | book_id | date_of_issue
| counter_value

---------+-----------+-------------------------+---------+------------------------
--------+--------------

     114 |  Ramesh |   EME                     |   52e46 | 2021-04-02
18:30:00.000000+0000 |           1

     111 |  Manju  |   Human Behaviour          |   52e43 | 2021-09-11
18:30:00.000000+0000 |           1

     113 |  Maitri |   Dan Brown                |   52e45 | 2021-01-31
18:30:00.000000+0000 |           1

     112 |  Kishore|   Engineering Mathematics-1 |   52e44 | 2021-04-09
18:30:00.000000+0000 |           1


(4 rows)


cqlsh:library> UPDATE library_info set counter_value += 1 where
stud_id = 112 and stud_name = 'Kishore' and book_name = 'Engineering
Mathematics-1' and book_id = '52e44' and date_of_issue = '2021-04-09';
cqlsh:library> SELECT * FROM library_info ;


 stud_id | stud_name | book_name                | book_id | date_of_issue
| counter_value

---------+-----------+-------------------------+---------+------------------------
--------+--------------

     114 |  Ramesh |   EME                     |   52e46 | 2021-04-02
18:30:00.000000+0000 |           1
```

```
    111 |  Manoj  |   Human Behaviour          |   52e43 | 2021-09-11
18:30:00.000000+0000 |           1

    113 |  Maitri |   Dan Brown                |   52e45 | 2021-01-31
18:30:00.000000+0000 |           1

    112 |  Kishore|   Engineering Mathematics-1 |   52e44 | 2021-04-09
18:30:00.000000+0000 |           2


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

Using 11 child processes


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


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

Using 11 child processes


Starting copy of library.library_info with columns [stud_id, stud_name,
book_name, book_id, date_of_issue, counter_value]. Processed: 6 rows;
Rate:      10 rows/s; Avg. rate:      15 rows/s 6 rows imported from 1 files
in 0.392 seconds (0 skipped).
```

LAB4:

Wordcount Program for a given text file using Hadoop

```
hduser@bmsce-Precision-T1700:~$ start-all.sh
This script is Deprecated. Instead use start-dfs.sh and start-yarn.sh
Starting namenodes on [localhost]
hduser@localhost's password:
localhost: starting namenode, logging to /usr/local/hadoop/logs/hadoop-hduser-namenode-bmsce-Precision-T1700.out
hduser@localhost's password:
localhost: starting datanode, logging to /usr/local/hadoop/logs/hadoop-hduser-datanode-bmsce-Precision-T1700.out
Starting secondary namenodes [0.0.0.0]
hduser@0.0.0.0's password:
0.0.0.0: starting secondarynamenode, logging to /usr/local/hadoop/logs/hadoop-hduser-secondarynamenode-bmsce-Precision-T1700.out
starting yarn daemons
starting resourcemanager, logging to /usr/local/hadoop/logs/yarn-hduser-resourcemanager-bmsce-Precision-T1700.out
hduser@localhost's password:
localhost: starting nodemanager, logging to /usr/local/hadoop/logs/yarn-hduser-nodemanager-bmsce-Precision-T1700.out
hduser@bmsce-Precision-T1700:~$ jps
7747 NodeManager
```

```
7045 DataNode
7416 ResourceManager
7257 SecondaryNameNode
6874 NameNode
7886 Jps
hduser@bmsce-Precision-T1700:~$ mkdir
mkdir: missing operand
Try 'mkdir --help' for more information.
hduser@bmsce-Precision-T1700:~$ hdfs dfs -mkdir/hadoop
-mkdir/hadoop: Unknown command
hduser@bmsce-Precision-T1700:~$ hdfs dfs -mkdir/lab6
-mkdir/lab6: Unknown command
hduser@bmsce-Precision-T1700:~$ hdfs dfs -mkdir /lab6
hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /
Found 6 items
drwxr-xr-x   - hduser supergroup          0 2022-05-31 09:45 /ff
drwxr-xr-x   - hduser supergroup          0 2022-05-31 09:16 /j
drwxr-xr-x   - hduser supergroup          0 2022-06-01 09:31 /lab6
drwxr-xr-x   - hduser supergroup          0 2022-05-31 09:57 /ss
drwxrwxr-x   - hduser supergroup          0 2019-08-01 16:19 /tmp
drwxr-xr-x   - hduser supergroup          0 2019-08-01 16:03 /user
hduser@bmsce-Precision-T1700:~$ hdfs dfs -put
/home/hduser/Desktop/Welcome.txt/abc/WC.txt
put: `.': No such file or directory
```

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

put: `.': No such file or directory

hduser@bmsce-Precision-T1700:~$ hdfs dfs -put
/home/hduser/Desktop/Welcome.txt /lab6/WC.txt

hduser@bmsce-Precision-T1700:~$ sudo nano xyz.txt

[sudo] password for hduser:

hduser@bmsce-Precision-T1700:~$ sudo nano xyz.txt

hduser@bmsce-Precision-T1700:~$ hadoop fs -copyFromlocal xyz.txt
/lab6

-copyFromlocal: Unknown command

hduser@bmsce-Precision-T1700:~$ hadoop fs -copyFromLocal xyz.txt
/lab6

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls/lab6

-ls/lab6: Unknown command

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /lab6

Found 2 items

-rw-r--r--   1 hduser supergroup          0 2022-06-01 09:40 /lab6/WC.txt

-rw-r--r--   1 hduser supergroup         24 2022-06-01 09:45 /lab6/xyz.txt

hduser@bmsce-Precision-T1700:~$ hadoop fs -cat /lab6/xyz.txt

Hello My name is Anitej

hduser@bmsce-Precision-T1700:~$ hdfs dfs -get /lab6/xyz.txt
/home/hduser/Downloads/WWC.txt

get: `/home/hduser/Downloads/WWC.txt': File exists
```

```
hduser@bmsce-Precision-T1700:~$ hdfs dfs -get /lab6/WC.txt
/home/hduser/Downloads/WWC.txt

get: `/home/hduser/Downloads/WWC.txt': File exists

hduser@bmsce-Precision-T1700:~$ hdfs dfs -get /lab6/xyz.txt
/home/hduser/Downloads/WWC.txt

get: `/home/hduser/Downloads/WWC.txt': File exists

hduser@bmsce-Precision-T1700:~$ hdfs dfs -copyToLocal /lab6/xyz.xt
/home/hduser/Desktop

copyToLocal: `/lab6/xyz.xt': No such file or directory

hduser@bmsce-Precision-T1700:~$ hdfs dfs -copyToLocal /lab6/xyz.txt
/home/hduser/Desktop

hduser@bmsce-Precision-T1700:~$ hdfs dfs -cat /lab6/xyz.txt

Hello My name is Anitej

hduser@bmsce-Precision-T1700:~$ hdfs dfs -copyToLocal /lab6/xyz.txt
/home/hduser/Desktop

copyToLocal: `/home/hduser/Desktop/xyz.txt': File exists

hduser@bmsce-Precision-T1700:~$ hdoop fs -mv /lab6 /FFF

hdoop: command not found

hduser@bmsce-Precision-T1700:~$ hadoop fs -mv /lab6 /FFF

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

Found 2 items

-rw-r--r--   1 hduser supergroup          0 2022-06-01 09:40 /FFF/WC.txt

-rw-r--r--   1 hduser supergroup         24 2022-06-01 09:45 /FFF/xyz.txt

hduser@bmsce-Precision-T1700:~$ hadoop fs -cp /lab6/  /LLL

cp: `/lab6/': No such file or directory
```

```
hduser@bmsce-Precision-T1700:~$ hadoop fs -cp /CSE/  /LLL
cp: `/CSE/': No such file or directory
hduser@bmsce-Precision-T1700:~$ hadoop fs -cp /lab6/  /LLL
cp: `/lab6/': No such file or directory
hduser@bmsce-Precision-T1700:~$ hadoop fs -cp /lab6/ LLL
cp: `LLL': No such file or directory
```

LAB5:

Wordcount Program for a given text file using Map Reduce

Mapper Code: You have to copy paste this program into the WCMapper Java Class file.

```
// Importing libraries
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.MapReduceBase;
import org.apache.hadoop.mapred.Mapper;
import org.apache.hadoop.mapred.OutputCollector;
import org.apache.hadoop.mapred.Reporter;
public class WCMapper extends MapReduceBase implements
Mapper&lt;LongWritable,
Text, Text,

IntWritable&gt; {
// Map function
public void map(LongWritable key, Text value,
OutputCollector&lt;Text,
IntWritable&gt; output, Reporter rep) throws IOException
{
String line = value.toString();
// Splitting the line on spaces
for (String word : line.split(&quot; &quot;))
{
if (word.length() &gt; 0)
{
output.collect(new Text(word), new IntWritable(1));
} } } }
```

Reducer Code: You have to copy paste this program into the WCReducer Java Class file

```
// Importing libraries
import java.io.IOException;
import java.util.Iterator;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.MapReduceBase;
import org.apache.hadoop.mapred.OutputCollector;
import org.apache.hadoop.mapred.Reducer;
import org.apache.hadoop.mapred.Reporter;
public class WCReducer extends MapReduceBase implements
Reducer&lt;Text,
IntWritable, Text, IntWritable&gt; {

// Reduce function
public void reduce(Text key, Iterator&lt;IntWritable&gt; value,

OutputCollector&lt;Text, IntWritable&gt; 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));
} }
```

Driver Code: You have to copy paste this program into the WCDriver Java Class file.

```
// Importing libraries
import java.io.IOException;
import org.apache.hadoop.conf.Configured;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.FileInputFormat;
import org.apache.hadoop.mapred.FileOutputFormat;
import org.apache.hadoop.mapred.JobClient;
import org.apache.hadoop.mapred.JobConf;
import org.apache.hadoop.util.Tool;
import org.apache.hadoop.util.ToolRunner;
public class WCDriver extends Configured implements Tool {
public int run(String args[]) throws IOException
{
if (args.length &lt; 2)
{
System.out.println(&quot;Please give valid inputs&quot;);
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);
}
```

HDFS EXECUTION:

```
hduser@bmsce-Precision-T1700:~$ start-all.sh
This script is Deprecated. Instead use start-dfs.sh and start-yarn.sh
Starting namenodes on [localhost]
hduser@localhost's password:
localhost: namenode running as process 10473. Stop it first.
hduser@localhost's password:
```

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

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /
Found 10 items
drwxr-xr-x   - hduser supergroup          0 2019-10-23 09:52 /sample
drwxr-xr-x   - hduser supergroup          0 2019-10-23 10:33 /test
drwxr-xr-x   - hduser supergroup          0 2022-06-14 10:50 /tmp1
```

```
drwxr-xr-x   - hduser supergroup          0 2019-10-23 09:58 /output
drwxr-xr-x   - hduser supergroup          0 2022-06-15 10:27 /rgs
drwxr-xr-x   - hduser supergroup          0 2019-10-23 11:09 /stud
drwxr-xr-x   - hduser supergroup          0 2019-10-23 15:50 /testing
drwxrwxr-x   - hduser supergroup          0 2019-10-23 11:24 /tmp
drwxr-xr-x   - hduser supergroup          0 2019-08-01 16:03 /user

hduser@bmsce-Precision-T1700:~$ hadoop fs -mkdir /1BM19CS194


hduser@bmsce-Precision-T1700:~$ hadoop fs -copyFromLocal
/home/hduser/Desktop/sample1.txt /1BM19CS194/test.txt


hduser@bmsce-Precision-T1700:~$ hdfs dfs -cat /1BM19CS194/test.txt
hi my name is anitej
my age is twenty one
my country is india
my surname is prasad


hduser@bmsce-Precision-T1700:~$ hadoop jar
/home/hduser/Documents/wordCount.jar wordCount.WCDriver
/1BM19CS194/test.txt /1BM19CS194/output
22/06/15 10:27:53 INFO Configuration.deprecation: session.id is
deprecated. Instead, use dfs.metrics.session-id
22/06/15 10:27:53 INFO jvm.JvmMetrics: Initializing JVM Metrics with
processName=JobTracker, sessionId=
22/06/15 10:27:53 INFO jvm.JvmMetrics: Cannot initialize JVM
Metrics with processName=JobTracker, sessionId= - already initialized

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

22/06/15 10:27:53 INFO mapred.FileInputFormat: Total input paths to
process : 1

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

22/06/15 10:27:53 INFO mapreduce.JobSubmitter: Submitting tokens
for job: job_local1115189753_0001

22/06/15 10:27:53 INFO mapreduce.Job: The url to track the job:
http://localhost:8080/

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

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

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

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

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

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

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

22/06/15 10:27:53 INFO mapred.MapTask: numReduceTasks: 1
```

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

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

22/06/15 10:27:54 INFO mapred.MapTask: soft limit at 83886080

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

22/06/15 10:27:54 INFO mapred.MapTask: kvstart = 26214396; length
= 6553600

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

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

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

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

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

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

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

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

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

22/06/15 10:27:54 INFO mapred.Task: Task
'attempt_local1115189753_0001_m_000000_0' done.
```

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

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

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

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

22/06/15 10:27:54 INFO mapred.Task:  Using
ResourceCalculatorProcessTree : [ ]

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

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

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

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

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

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

```
22/06/15 10:27:54 INFO reduce.EventFetcher: EventFetcher is interrupted.. Returning
22/06/15 10:27:54 INFO mapred.LocalJobRunner: 1 / 1 copied.
22/06/15 10:27:54 INFO reduce.MergeManagerImpl: finalMerge called with 1 in-memory map-outputs and 0 on-disk map-outputs
22/06/15 10:27:54 INFO mapred.Merger: Merging 1 sorted segments
22/06/15 10:27:54 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 205 bytes
22/06/15 10:27:54 INFO reduce.MergeManagerImpl: Merged 1 segments, 211 bytes to disk to satisfy reduce memory limit
22/06/15 10:27:54 INFO reduce.MergeManagerImpl: Merging 1 files, 215 bytes from disk
22/06/15 10:27:54 INFO reduce.MergeManagerImpl: Merging 0 segments, 0 bytes from memory into reduce
22/06/15 10:27:54 INFO mapred.Merger: Merging 1 sorted segments
22/06/15 10:27:54 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 205 bytes
22/06/15 10:27:54 INFO mapred.LocalJobRunner: 1 / 1 copied.
22/06/15 10:27:54 INFO mapred.Task: Task:attempt_local1115189753_0001_r_000000_0 is done. And is in the process of committing
22/06/15 10:27:54 INFO mapred.LocalJobRunner: 1 / 1 copied.
22/06/15 10:27:54 INFO mapred.Task: Task attempt_local1115189753_0001_r_000000_0 is allowed to commit now
22/06/15 10:27:54 INFO output.FileOutputCommitter: Saved output of task 'attempt_local1115189753_0001_r_000000_0' to
```

```
hdfs://localhost:54310/rgs/output/_temporary/0/task_local1115189753_
0001_r_000000

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

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

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

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

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

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

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

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

        File System Counters

                FILE: Number of bytes read=8614

                FILE: Number of bytes written=510599

                FILE: Number of read operations=0

                FILE: Number of large read operations=0

                FILE: Number of write operations=0

                HDFS: Number of bytes read=178

                HDFS: Number of bytes written=69

                HDFS: Number of read operations=13

                HDFS: Number of large read operations=0
                HDFS: Number of write operations=4
        Map-Reduce Framework
                Map input records=5
                Map output records=20
                Map output bytes=169
                Map output materialized bytes=215
                Input split bytes=87
                Combine input records=0
                Combine output records=0
                Reduce input groups=10
                Reduce shuffle bytes=215
                Reduce input records=20
                Reduce output records=10
                Spilled Records=40
                Shuffled Maps =1
                Failed Shuffles=0
                Merged Map outputs=1
                GC time elapsed (ms)=1
                CPU time spent (ms)=0
                Physical memory (bytes) snapshot=0
                Virtual memory (bytes) snapshot=0
                Total committed heap usage (bytes)=471859200
        Shuffle Errors
```

```
                BAD_ID=0
                CONNECTION=0
                IO_ERROR=0
                WRONG_LENGTH=0
                WRONG_MAP=0
                WRONG_REDUCE=0
        File Input Format Counters
                Bytes Read=89
        File Output Format Counters
                Bytes Written=69
0
hduser@bmsce-Precision-T1700:~$ hdfs dfs -cat
/1BM19CS194/output/part-00000
age     1
anitej  1
country         1
india   1
is      4
my      4
name    1
one     1
prasad          1
surname         1
twenty 1
```

LAB6:

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.

Driver-TopN.class

```
package samples.topn;
import java.io.IOException;
import java.util.StringTokenizer;
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.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
import org.apache.hadoop.util.GenericOptionsParser;
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(&quot;Usage: TopN &lt;in&gt; &lt;out&gt;&quot;);
System.exit(2);
}
Job job = Job.getInstance(conf);
job.setJobName(&quot;Top N&quot;);
job.setJarByClass(TopN.class);
job.setMapperClass(TopNMapper.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);
}
public static class TopNMapper extends Mapper&lt;Object, Text, Text,
IntWritable&gt; {
private static final IntWritable one = new IntWritable(1);
private Text word = new Text();
private String tokens = &quot;[_|$#&lt;&gt;\\^=\\[\\]\\*/\\\\,;,.\\-
:()?!\&quot;&#39;]&quot;;
```

```
public void map(Object key, Text value, Mapper&lt;Object, Text, Text,
IntWritable&gt;.Context
context) throws IOException, InterruptedException {
String cleanLine =
value.toString().toLowerCase().replaceAll(this.tokens, &quot; &quot;);
StringTokenizer itr = new StringTokenizer(cleanLine);
while (itr.hasMoreTokens()) {
this.word.set(itr.nextToken().trim());
context.write(this.word, one);
}
}
}
}
```

TopNCombiner.class

```
package samples.topn;
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;
public class TopNCombiner extends Reducer&lt;Text, IntWritable,
Text, IntWritable&gt; {
```

```
public void reduce(Text key, Iterable&lt;IntWritable&gt; values,
Reducer&lt;Text, IntWritable,

Text, IntWritable&gt;.Context context) throws IOException,
InterruptedException {

int sum = 0;

for (IntWritable val : values)

sum += val.get();

context.write(key, new IntWritable(sum));

}

}
```

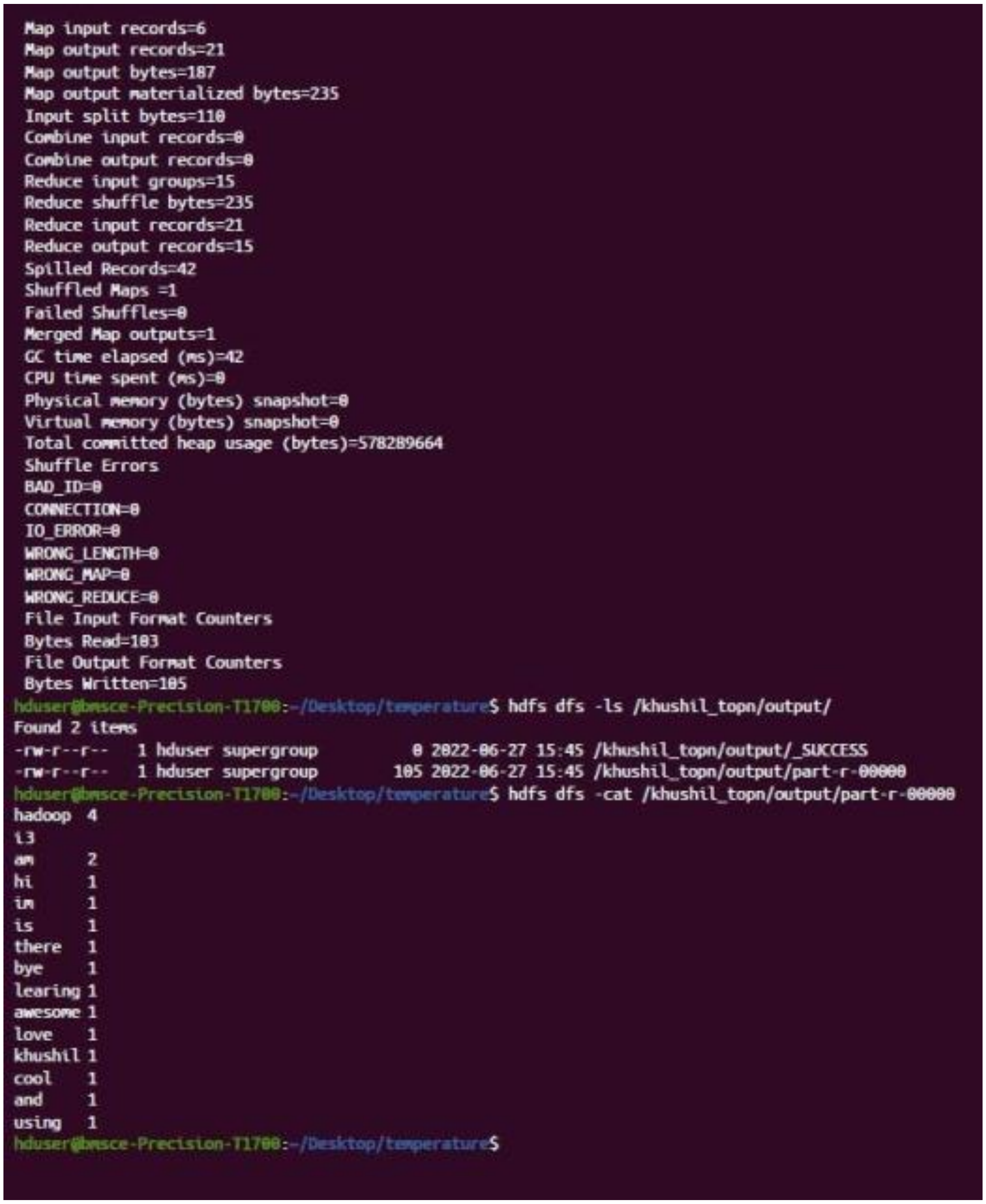
TopNMapper.class

```
package samples.topn;

import java.io.IOException;

import java.util.StringTokenizer;

import org.apache.hadoop.io.IntWritable;

import org.apache.hadoop.io.Text;

import org.apache.hadoop.mapreduce.Mapper;

public class TopNMapper extends Mapper&lt;Object, Text, Text,
IntWritable&gt; {

private static final IntWritable one = new IntWritable(1);

private Text word = new Text();

private String tokens = &quot;[_|$#&lt;&gt;\\^=\\[\\]\\*/\\\\,;,.\\-
:()?!\&quot;&#39;]&quot;;

public void map(Object key, Text value, Mapper&lt;Object, Text, Text,
IntWritable&gt;.Context
context) throws IOException, InterruptedException {
String cleanLine =
value.toString().toLowerCase().replaceAll(this.tokens, &quot; &quot;);
StringTokenizer itr = new StringTokenizer(cleanLine);
while (itr.hasMoreTokens()) {
this.word.set(itr.nextToken().trim());
context.write(this.word, one);
}
}
}
```

TopNReducer.class

```
package samples.topn;
import java.io.IOException;
import java.util.HashMap;
import java.util.Map;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;
import utils.MiscUtils;
public class TopNReducer extends Reducer&lt;Text, IntWritable, Text,
IntWritable&gt; {
private Map&lt;Text, IntWritable&gt; countMap = new
HashMap&lt;&gt;();
public void reduce(Text key, Iterable&lt;IntWritable&gt; values,
Reducer&lt;Text, IntWritable,

Text, IntWritable&gt;.Context context) throws IOException,
InterruptedException {

int sum = 0;

for (IntWritable val : values)

sum += val.get();

this.countMap.put(new Text(key), new IntWritable(sum));

}

protected void cleanup(Reducer&lt;Text, IntWritable, Text,
IntWritable&gt;.Context context)

throws IOException, InterruptedException {

Map&lt;Text, IntWritable&gt; sortedMap =
MiscUtils.sortByValues(this.countMap);

int counter = 0;

for (Text key : sortedMap.keySet()) {

if (counter++ == 20)

break;

context.write(key, sortedMap.get(key));

}

}

}
```

HDFS EXECTUION:



```
 Map input records=6
 Map output records=21
 Map output bytes=187
 Map output materialized bytes=235
 Input split bytes=110
 Combine input records=0
 Combine output records=0
 Reduce input groups=15
 Reduce shuffle bytes=235
 Reduce input records=21
 Reduce output records=15
 Spilled Records=42
 Shuffled Maps =1
 Failed Shuffles=0
 Merged Map outputs=1
 GC time elapsed (ms)=42
 CPU time spent (ms)=0
 Physical memory (bytes) snapshot=0
 Virtual memory (bytes) snapshot=0
 Total committed heap usage (bytes)=578289664
 Shuffle Errors
 BAD_ID=0
 CONNECTION=0
 IO_ERROR=0
 WRONG_LENGTH=0
 WRONG_MAP=0
 WRONG_REDUCE=0
 File Input Format Counters
 Bytes Read=103
 File Output Format Counters
 Bytes Written=105
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -ls /khushil_topn/output/
Found 2 items
-rw-r--r--   1 hduser supergroup          0 2022-06-27 15:45 /khushil_topn/output/_SUCCESS
-rw-r--r--   1 hduser supergroup        105 2022-06-27 15:45 /khushil_topn/output/part-r-00000
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -cat /khushil_topn/output/part-r-00000
hadoop  4
i3
am      2
hi      1
im      1
is      1
there   1
bye     1
learing 1
awesome 1
love    1
khushil 1
cool    1
and     1
using   1
hduser@bmsce-Precision-T1700:~/Desktop/temperature$
```

LAB7:

From the following link extract the weather data

https://github.com/tomwhite/hadoop-book/tree/master/input/ncdc/all

Create a Map Reduce program to

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

AverageDriver

```
package temp;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
public class AverageDriver {
public static void main(String[] args) throws Exception {
if (args.length != 2) {

System.err.println(&quot;Please Enter the input and output parameters&quot;);
System.exit(-1);
}
Job job = new Job();
job.setJarByClass(AverageDriver.class);
job.setJobName(&quot;Max temperature&quot;);
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&lt;LongWritable, Text,
Text, IntWritable&gt; {
public static final int MISSING = 9999;
public void map(LongWritable key, Text value,
Mapper&lt;LongWritable, Text, Text,
IntWritable&gt;.Context context) throws IOException,
InterruptedException {
int temperature;
String line = value.toString();
String year = line.substring(15, 19);
if (line.charAt(87) == &#39;+&#39;) {
temperature = Integer.parseInt(line.substring(88, 92));
} else {
temperature = Integer.parseInt(line.substring(87, 92));
}
String quality = line.substring(92, 93);
if (temperature != 9999 &amp;&amp;
quality.matches(&quot;[01459]&quot;))
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&lt;Text, IntWritable,
Text, IntWritable&gt; {

public void reduce(Text key, Iterable&lt;IntWritable&gt; values,
Reducer&lt;Text, IntWritable,

Text, IntWritable&gt;.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));

}

}
```

HDFS EXECUTION:

```
C:\WINDOWS\system32>cd c:\hadoop_new\sbin

c:\hadoop_new\sbin>start-all.cmd

This script is Deprecated. Instead use start-dfs.cmd and start-yarn.cmd
starting yarn daemons

c:\hadoop_new\sbin>cd c:\hadoop_new\share\hadoop\mapreduce
```

```
c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -mkdir /tempAverage

c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -put

E:\Desktop\temp1.txt \tempAverage

c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -put

E:\Desktop\temp2.txt \tempAverage

c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -cat
\tempAverage\temp1.txt

0067011990999991950051507004+68750+023550FM-
12+038299999V0203301N0067
1220001CN9999999N9+00001+99999999999

0043011990999991950051512004+68750+023550FM-
12+038299999V0203201N0067
1220001CN9999999N9+00221+99999999999

0043011990999991950051518004+68750+023550FM-
12+038299999V0203201N0026

1220001CN9999999N9-00111+99999999999

0043012650999991949032412004+62300+010750FM-
12+048599999V0202701N0046
1220001CN0500001N9+01111+99999999999

0043012650999991949032418004+62300+010750FM-
12+048599999V0202701N0046

1220001CN0500001N9+00781+99999999999
c:\hadoop_new\share\hadoop\mapreduce>hadoop jar

E:\Desktop\temperatureAverage.jar temperature.AverageDriver
\tempAverage

\tempAverageOutput
```

```
2022-06-22 14:31:05,036 INFO client.RMProxy: Connecting to
ResourceManager at

/0.0.0.0:8032

2022-06-22 14:31:07,049 WARN mapreduce.JobResourceUploader:
Hadoop command-line option parsing not performed. Implement the
Tool interface and execute your application with ToolRunner to remedy
this.

2022-06-22 14:31:07,159 INFO mapreduce.JobResourceUploader:
Disabling Erasure

Coding for path: /tmp/hadoop-
yarn/staging/Admin/.staging/job_1620636818881_0001 2021-05-10
14:31:08,149 INFO input.FileInputFormat: Total input files to process :
2 2021-05-10 14:31:08,697 INFO mapreduce.JobSubmitter: number of
splits:2 2021-05-10 14:31:09,122 INFO Configuration.deprecation:
yarn.resourcemanager.system-metrics-publisher.enabled is deprecated.
Instead, use yarn.system-metrics-publisher.enabled

2022-06-22 14:31:10,026 INFO mapreduce.JobSubmitter: Submitting
tokens for job: job_1620636818881_0001

2022-06-22 14:31:10,031 INFO mapreduce.JobSubmitter: Executing
with tokens: []

2022-06-22 14:31:10,923 INFO conf.Configuration: resource-types.xml
not found 2022-06-22 14:31:10,924 INFO resource.ResourceUtils:
Unable to find 'resource-types.xml'.

2022-06-22 14:31:11,755 INFO impl.YarnClientImpl: Submitted
application application_1620636818881_0001

2022-06-22 14:31:12,063 INFO mapreduce.Job: The url to track the job:
http://DESKTOP-
CK14PFH:8088/proxy/application_1620636818881_0001/ 2021-05-10
```

```
14:31:12,068 INFO mapreduce.Job: Running job:
job_1620636818881_0001

2022-06-22 14:31:43,855 INFO mapreduce.Job: Job
job_1620636818881_0001 running in uber mode : false

2022-06-22 14:31:43,876 INFO mapreduce.Job:  map 0% reduce 0%

2022-06-22 14:32:25,710 INFO mapreduce.Job:  map 50% reduce 0%

2022-06-22 14:32:26,732 INFO mapreduce.Job:  map 100% reduce 0%

2022-06-22 14:32:56,193 INFO mapreduce.Job:  map 100% reduce
100% 2022-06-22 14:33:04,369 INFO mapreduce.Job: Job
job_1620636818881_0001 completed successfully

2022-06-22 14:33:04,843 INFO mapreduce.Job: Counters: 53

File System Counters

FILE: Number of bytes read=72265

FILE: Number of bytes written=784759

FILE: Number of read operations=0

FILE: Number of large read operations=0

FILE: Number of write operations=0

HDFS: Number of bytes read=895504 HDFS: Number of bytes
written=23

HDFS: Number of read operations=11

HDFS: Number of large read operations=0

HDFS: Number of write operations=2

Job Counters

Launched map tasks=2

Launched reduce tasks=1
```

```
Data-local map tasks=2
Total time spent by all maps in occupied slots (ms)=79302
Total time spent by all reduces in occupied slots (ms)=27416
Total time spent by all map tasks (ms)=79302
Total time spent by all reduce tasks (ms)=27416
Total vcore-milliseconds taken by all map tasks=79302
Total vcore-milliseconds taken by all reduce tasks=27416
Total megabyte-milliseconds taken by all map tasks=81205248
Total megabyte-milliseconds taken by all reduce tasks=28073984
Map-Reduce Framework
Map input records=6570
Map output records=6569
Map output bytes=59121
Map output materialized bytes=72271
Input split bytes=216
Combine input records=0
Combine output records=0
Reduce input groups=3
Reduce shuffle bytes=72271
Reduce input records=6569
Reduce output records=3
Spilled Records=13138
Shuffled Maps =2
```

```
Failed Shuffles=0
Merged Map outputs=2
GC time elapsed (ms)=350
CPU time spent (ms)=7667
Physical memory (bytes) snapshot=689139712
Virtual memory (bytes) snapshot=854798336
Total committed heap usage (bytes)=381157376
Peak Map Physical memory (bytes)=250327040
Peak Map Virtual memory (bytes)=309706752
Peak Reduce Physical memory (bytes)=190980096
Peak Reduce Virtual memory (bytes)=244252672
Shuffle Errors
BAD_ID=0
CONNECTION=0
IO_ERROR=0
WRONG_LENGTH=0
WRONG_MAP=0
WRONG_REDUCE=0
File Input Format Counters
Bytes Read=895288
File Output Format Counters
Bytes Written=23
c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -ls
\tempAverageOutput
```

```
Found 2 items
-rw-r--r--   1 Admin supergroup          0 2022-06-22 14:32
/tempAverageOutput/_SUCCESS
-rw-r--r--   1 Admin supergroup         23 2022-06-22 14:32
/tempAverageOutput/part-r-00000
c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -cat
\tempAverageOutput\part-r-00000
1901	46
1949 94
1950 3
```

LAB8:

Find the mean max temperature for every month

MeanMax

MeanMaxDriver.class

```
package meanmax;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;

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

MeanMaxMapper.class

```
package meanmax;
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;
public class MeanMaxMapper extends Mapper&lt;LongWritable, Text,
Text, IntWritable&gt; {
public static final int MISSING = 9999;
public void map(LongWritable key, Text value,
Mapper&lt;LongWritable, Text, Text,
IntWritable&gt;.Context context) throws IOException,
InterruptedException {
int temperature;
String line = value.toString();
String month = line.substring(19, 21);
if (line.charAt(87) == &#39;+&#39;) {
temperature = Integer.parseInt(line.substring(88, 92));
} else {
temperature = Integer.parseInt(line.substring(87, 92));
}
String quality = line.substring(92, 93);
if (temperature != 9999 &amp;&amp;
quality.matches(&quot;[01459]&quot;))
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&lt;Text, IntWritable,
Text, IntWritable&gt; {
public void reduce(Text key, Iterable&lt;IntWritable&gt; values,
Reducer&lt;Text, IntWritable,
Text, IntWritable&gt;.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 &gt; 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));
}
}
```

HDFS EXECUTION:

```
c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -mkdir /tempMax
c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -put
E:\Desktop\temp1.txt \tempMax
c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -put
E:\Desktop\temp2.txt \tempMax
c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -cat
\tempMax\temp1.txt
0067011990999991950051507004+68750+023550FM-
12+038299999V0203301N0067
1220001CN9999999N9+00001+99999999999
0043011990999991950051512004+68750+023550FM-
12+038299999V0203201N0067
1220001CN9999999N9+00221+99999999999
0043011990999991950051518004+68750+023550FM-
12+038299999V0203201N0026
1220001CN9999999N9-00111+99999999999
0043012650999991949032412004+62300+010750FM-
12+048599999V0202701N0046
1220001CN0500001N9+01111+99999999999
0043012650999991949032418004+62300+010750FM-
12+048599999V0202701N0046
1220001CN0500001N9+00781+99999999999
c:\hadoop_new\share\hadoop\mapreduce>hadoop jar
```

```
E:\Desktop\temperatureMax.jar temperatureMax.TempDriver \tempMax
\tempMaxOutput

2022-06-22 15:19:31,366 INFO client.RMProxy: Connecting to
ResourceManager at

/0.0.0.0:8032

2022-06-22 15:19:33,482 WARN mapreduce.JobResourceUploader:
Hadoop command-line option parsing not performed. Implement the
Tool interface and execute your application with ToolRunner to remedy
this.

2022-06-22 15:19:33,591 INFO mapreduce.JobResourceUploader:
Disabling Erasure

Coding for path: /tmp/hadoop-
yarn/staging/Admin/.staging/job_1620636818881_0003

2022-06-22 15:19:34,660 INFO input.FileInputFormat: Total input files
to process : 2 2022-06-22 15:19:35,250 INFO mapreduce.JobSubmitter:
number of splits:2 2022-06-22 15:19:35,729 INFO
Configuration.deprecation: yarn.resourcemanager.system-metrics-
publisher.enabled is deprecated. Instead, use yarn.system-metrics-
publisher.enabled

2022-06-22 15:19:36,334 INFO mapreduce.JobSubmitter: Submitting
tokens for job: job_1620636818881_0003

2022-06-22 15:19:36,337 INFO mapreduce.JobSubmitter: Executing
with tokens: []

2022-06-22 15:19:36,859 INFO conf.Configuration: resource-types.xml
not found 2022-06-22 15:19:36,863 INFO resource.ResourceUtils:
Unable to find 'resource-types.xml'.

2022-06-22 15:19:37,153 INFO impl.YarnClientImpl: Submitted
application application_1620636818881_0003
```

```
2022-06-22 15:19:37,287 INFO mapreduce.Job: The url to track the job:
http://DESKTOP-
CK14PFH:8088/proxy/application_1620636818881_0003/ 2022-06-22
15:19:37,290 INFO mapreduce.Job: Running job:
job_1620636818881_0003

2022-06-22 15:20:03,295 INFO mapreduce.Job: Job
job_1620636818881_0003 running in uber mode : false

2022-06-22 15:20:03,327 INFO mapreduce.Job:  map 0% reduce 0%

2022-06-22 15:20:26,140 INFO mapreduce.Job:  map 100% reduce 0%

2022-06-22 15:20:55,633 INFO mapreduce.Job:  map 100% reduce
100% 2021-05-2022-06-22,752 INFO mapreduce.Job: Job
job_1620636818881_0003 completed successfully

2022-06-22 15:21:03,029 INFO mapreduce.Job: Counters: 53

File System Counters

FILE: Number of bytes read=59127

FILE: Number of bytes written=758459

FILE: Number of read operations=0

FILE: Number of large read operations=0

FILE: Number of write operations=0

HDFS: Number of bytes read=895496 HDFS: Number of bytes
written=81

HDFS: Number of read operations=11

HDFS: Number of large read operations=0

HDFS: Number of write operations=2

Job Counters

Launched map tasks=2
Launched reduce tasks=1
Data-local map tasks=2
Total time spent by all maps in occupied slots (ms)=40099
Total time spent by all reduces in occupied slots (ms)=26572
Total time spent by all map tasks (ms)=40099
Total time spent by all reduce tasks (ms)=26572
Total vcore-milliseconds taken by all map tasks=40099
Total vcore-milliseconds taken by all reduce tasks=26572
Total megabyte-milliseconds taken by all map tasks=41061376
Total megabyte-milliseconds taken by all reduce tasks=27209728
Map-Reduce Framework
Map input records=6570
Map output records=6569
Map output bytes=45983
Map output materialized bytes=59133
Input split bytes=208
Combine input records=0
Combine output records=0
Reduce input groups=12
Reduce shuffle bytes=59133
Reduce input records=6569
Reduce output records=12
Spilled Records=13138
```

```
Shuffled Maps =2
Failed Shuffles=0
Merged Map outputs=2
GC time elapsed (ms)=368
CPU time spent (ms)=14277
Physical memory (bytes) snapshot=654815232
Virtual memory (bytes) snapshot=1096699904
Total committed heap usage (bytes)=554696704
Peak Map Physical memory (bytes)=245723136
Peak Map Virtual memory (bytes)=432418816
Peak Reduce Physical memory (bytes)=186056704
Peak Reduce Virtual memory (bytes)=232816640
Shuffle Errors
BAD_ID=0
CONNECTION=0
IO_ERROR=0
WRONG_LENGTH=0
WRONG_MAP=0
WRONG_REDUCE=0
File Input Format Counters
Bytes Read=895288
File Output Format Counters
Bytes Written=81
```

```
c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -ls \tempMaxOutput

Found 2 items

-rw-r--r--   1 Admin supergroup          0 2022-06-22 15:20
/tempMaxOutput/_SUCCESS

-rw-r--r--   1 Admin supergroup         81 2022-06-22 15:20
/tempMaxOutput/part-r-00000
c:\hadoop_new\share\hadoop\mapreduce>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
```

LAB9:

Join Operation using MapReduce

```
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);
    }
}
```

```
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);
        }
    }
}
```

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());
}
// ^^ TextPairComparator

// vv TextPairFirstComparator
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);
  }
}
// ^^ TextPairFirstComparator

// vv TextPair
}
```

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]));
    }
}
```

HDFS EXECUTION:

```
c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -mkdir /posts

c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -put

E:\Desktop\sampleposts.tsv \posts

c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -mkdir /users

c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -put

E:\Desktop\sampleusers.tsv \users

c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -cat
\posts\sampleposts.tsv

"2312" "Feedback on Audio Quality" "cs101 production audio"

"100005361" "<p>We are looking for feedback on the audio in our
videos. Tell

us what you think and try to be as <em>specific</em> as possible.</p>"

"question"

"\N" "\N" "2012-02-23 00:28:02.321344+00" "2" "" "\N"

"201398145" "2014-01-14 17:18:35.613939+00" "2960" "\N" "\N"
"524"

"f"

"2014856" "" "cs101 " "100022094" "<p>I also would like to know

the answer to this question. An 'open exam' sounds great, but on the
other hand

it also seems pretty easy to cheat now: solutions have been posted and
anybody

only interested in a certificate wouldn't have much of a problem getting
the

highest distinction. So where is the catch??</p>" "answer" "2014706"
```

```
"2014706" "2012-07-01 10:32:36.302782+00" "0" "" "\N"
"100022094" "2012-07-01 10:32:36.302782+00" "2020501" "\N" "\N"
"0" "f"
"2004004" "" "cs101 " "100018705" "<p>But then why even the
new variable q? Why not just modify the variable p?</p>" "comment"
"2003997" "2003993" "2012-05-03 21:07:52.028935+00" "2" ""
"\N" "100018705" "2012-05-03 21:07:52.028935+00" "2005150" "\N"
"\N" "0" "f"
c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -cat
\users\sampleusers.tsv
"100006402" "18" "0" "0" "0"
"100022094" "6354" "4" "12" "50"
"100018705" "76" "0" "3" "4"
"100005361" "36134" "73" "220" "333"
c:\hadoop_new\share\hadoop\mapreduce>hadoop jar E:\Desktop\Join.jar
JoinDriver \join \users \joinOutput
2022-06-12 12:28:44,441 INFO client.RMProxy: Connecting to
ResourceManager at /0.0.0.0:8032
2022-07-03 12:28:45,518 INFO client.RMProxy: Connecting to
ResourceManager at /0.0.0.0:8032
2022-07-03 12:28:46,975 INFO mapreduce.JobResourceUploader:
Disabling
Erasure Coding for path:
```

```
/tmp/hadoop-yarn/staging/Admin/.staging/job_1623480742672_0001
2022-07-
03 12:28:47,543 INFO mapred.FileInputFormat: Total input files to
process : 1
2022-07-03 12:28:47,635 INFO mapred.FileInputFormat: Total input
files to
process : 1
2022-07-03 12:28:48,092 INFO mapreduce.JobSubmitter: number of
splits:4
2022-07-03 12:28:53,031 INFO Configuration.deprecation:
yarn.resourcemanager.system-metrics-publisher.enabled is deprecated.
Instead,
use yarn.system-metrics-publisher.enabled
2022-07-03 12:28:53,944 INFO mapreduce.JobSubmitter: Submitting
tokens for
job: job_1623480742672_0001
2022-07-03 12:28:53,947 INFO mapreduce.JobSubmitter: Executing
with tokens:
[]
2022-07-03 12:28:54,424 INFO conf.Configuration: resource-types.xml
not found
2022-07-03 12:28:54,426 INFO resource.ResourceUtils: Unable to find
'resource-types.xml'.
2022-07-03 12:28:55,154 INFO impl.YarnClientImpl: Submitted
application
application_1623480742672_0001
```

```
2022-07-03 12:28:55,293 INFO mapreduce.Job: The url to track the job:

http://DESKTOP-
CK14PFH:8088/proxy/application_1623480742672_0001/

2022-07-03 12:28:55,295 INFO mapreduce.Job: Running job:

job_1623480742672_0001

2022-07-03 12:29:19,847 INFO mapreduce.Job: Job
job_1623480742672_0001

running in uber mode : false

2022-07-03 12:29:19,874 INFO mapreduce.Job: map 0% reduce 0%

2022-07-03 12:31:53,514 INFO mapreduce.Job: map 67% reduce 0%
2022-07-

03 12:31:59,518 INFO mapreduce.Job: map 83% reduce 0%

2022-07-03 12:32:00,667 INFO mapreduce.Job: map 100% reduce 0%

2022-07-03 12:33:23,194 INFO mapreduce.Job: map 100% reduce
100% 2022-

07-03 12:33:32,307 INFO mapreduce.Job: Job
job_1623480742672_0001

completed successfully

2022-07-03 12:33:32,532 INFO mapreduce.Job: Counters: 53

File System Counters

FILE: Number of bytes read=155

FILE: Number of bytes written=1071678

FILE: Number of read operations=0

FILE: Number of large read operations=0

FILE: Number of write operations=0
```

```
HDFS: Number of bytes read=2595
HDFS: Number of bytes written=71
HDFS: Number of read operations=17
HDFS: Number of large read operations=0
HDFS: Number of write operations=2
Job Counters
Launched map tasks=4
Launched reduce tasks=1
Data-local map tasks=4
Total time spent by all maps in occupied slots (ms)=630042
Total time spent by all reduces in occupied slots (ms)=80087
Total time spent by all map tasks (ms)=630042
Total time spent by all reduce tasks (ms)=80087
Total vcore-milliseconds taken by all map tasks=630042
Total vcore-milliseconds taken by all reduce tasks=80087
Total megabyte-milliseconds taken by all map tasks=645163008
Total megabyte-milliseconds taken by all reduce tasks=82009088
Map-Reduce Framework
Map input records=7
Map output records=7
Map output bytes=135
Map output materialized bytes=173
Input split bytes=750
```

```
Combine input records=0
Combine output records=0
Reduce input groups=4
Reduce shuffle bytes=173
Reduce input records=7
Reduce output records=3
Spilled Records=14
Shuffled Maps =4
Failed Shuffles=0
Merged Map outputs=4
GC time elapsed (ms)=903
CPU time spent (ms)=15864
Physical memory (bytes) snapshot=990265344
Virtual memory (bytes) snapshot=1415651328
Total committed heap usage (bytes)=663224320
Peak Map Physical memory (bytes)=219955200
Peak Map Virtual memory (bytes)=296644608
Peak Reduce Physical memory (bytes)=204709888
Peak Reduce Virtual memory (bytes)=246579200
Shuffle Errors
BAD_ID=0
CONNECTION=0
IO_ERROR=0
```

```
WRONG_LENGTH=0
WRONG_MAP=0
WRONG_REDUCE=0
File Input Format Counters
Bytes Read=0
File Output Format Counters
Bytes Written=71
c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -ls \joinOutput
Found 2 items
-rw-r--r-- 1 Admin supergroup 0 2022-07-03 12:33 /joinOutput/_SUCCESS
-rw-r--r-- 1 Admin supergroup 71 2022-07-03 12:33 /joinOutput/part-00000
c:\hadoop_new\share\hadoop\mapreduce>hdfs dfs -cat \joinOutput\part-00000
"100005361" "2" "36134"
"100018705" "2" "76"
"100022094" "0" "6354"
```

LAB10:

Scala Program for word count

```
object WordCount {

def main(args: Array[String]): Unit = {

val map = ReadFile.readFile()
ReadFile.printContent(map)

}

}
```

Output:

```
scala> result.foreach(println)
(working,1)
(BigData,2)
(is,1)
(Technologies,1)
(Anish,2)
(on,1)
(Hello,1)
```

LAB11:

Wordcount greater than 4 using Scala

```
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()
}}
```

Output:

```
In,
5
I,
6
```