VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

BIG DATA ANALYTICS
(20CS6PEBDA)

Submitted by

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

B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
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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

CERTIFICATE

This is to certify that the Lab work entitled "**BIG DATA ANALYTICS**" carried out by **ANAGHA ACHARYA(1BM19CS224),** who is bonafde student of **B. M. S. College of Engineering.** It is in partialfulfillment 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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1	Employee Database
2	Library
3	Mongo (CRUD)
4	Hadoop installation
5	HDFS Commands
6	Create a Map Reduce program to a) find average temperature for each yearfrom NCDC data set. b) find the mean max temperature for every month
7	For a given Text file, create a Map Reduce program to sort the content in an alphabeticorder listing only top 10 maximum occurrences of words.
8	Create a Map Reduce program to demonstrating join operation
9	Program to print word count on scala shell and print “Hello world” on scala IDE
10	Using RDD and FlatMap count how many times each word appears in a file and writeout a list of words whose count is strictly greater than 4 using Spark

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

Perform the following DB operations using Cassandra.
1. Create a keyspace by name Employee
2. Create a column family by name
Employee-Info with attributes
Emp_Id Primary Key, Emp_Name,
Designation, Date_of_Joining, Salary, Dept_Name
3. Insert the values into the table in batch
4. Update Employee name and Department of Emp-Id 121
5. Sort the details of Employee records based on salary
6. Alter the schema of the table Employee_Info to add a column Projects which stores a set of
Projects done by the corresponding Employee.
7. Update the altered table to add project names.
8.Create a TTL of 15 seconds to display the values of Employees.

```
bmsce@bmsce-not-so-precised-animo-succker:~$ cqlsh
Connected to Test Cluster at 127.0.0.1:9042.
[cqlsh 5.0.1 | Cassandra 3.11.4 | CQL spec 3.4.4 | Native protocol v4]
Use HELP for help.
cqlsh> create keyspace employee_224 with replication={'class':'SimpleStrategy','replication_factor':1};
cqlsh> use employee_224;
cqlsh:employee_224> create table empinfo(emp_id int, emp_name text, designation text,doj date,salary double,dept_name
text, primary key(emp_id,salary));
cqlsh:employee_224> describe empinfo;

CREATE TABLE employee_224.empinfo (
    emp_id int,
    salary double,
    dept_name text,
    designation text,
    doj date,
    emp_name text,
    PRIMARY KEY (emp_id, salary)
) WITH CLUSTERING ORDER BY (salary ASC)
    AND bloom_filter_fp_chance = 0.01
    AND caching = {'keys': 'ALL', 'rows_per_partition': 'NONE'}
    AND comment = ''
    AND compaction = {'class': 'org.apache.cassandra.db.compaction.SizeTieredCompactionStrategy', 'max_threshold': '32',
'min_threshold': '4'}
    AND compression = {'chunk_length_in_kb': '64', 'class': 'org.apache.cassandra.io.compress.LZ4Compressor'}
    AND crc_check_chance = 1.0
    AND dclocal_read_repair_chance = 0.1
    AND default_time_to_live = 0
    AND gc_grace_seconds = 864000
    AND max_index_interval = 2048
    AND memtable_flush_period_in_ms = 0
    AND min_index_interval = 128
    AND read_repair_chance = 0.0
```

```
   AND speculative_retry = '99PERCENTILE';

cqlsh:employee_224> begin batch
            ... insert into empinfo(emp_id,emp_name,designation,doj,salary,dept_name) values(1,'Abhinav','Director','2010-
08-28',5000000,'Business')
            ... apply batch;
cqlsh:employee_224> begin batch
            ... insert into empinfo(emp_id,emp_name,designation,doj,salary,dept_name) values(2,'Saurabh','Manager','2020-
05-20',800000,'Sales')
            ... insert into empinfo(emp_id,emp_name,designation,doj,salary,dept_name) values(3,'Rythm','HR','2021-10-
10',1000000,'HR')
            ... insert into empinfo(emp_id,emp_name,designation,doj,salary,dept_name) values(4,'Anagha','Executive
Director','2016-03-27',3000000,'R&D')
            ... apply batch;
cqlsh:employee_224> select * from empinfo;

 emp_id | salary | dept_name | designation        | doj        | emp_name
--------+--------+-----------+--------------------+------------+----------
      1 |  5e+06 |  Business |           Director | 2010-08-28 |  Abhinav
      2 |  8e+05 |     Sales |            Manager | 2020-05-20 |  Saurabh
      4 |  3e+06 |       R&D | Executive Director | 2016-03-27 |   Anagha
      3 |  1e+06 |        HR |                 HR | 2021-10-10 |    Rythm

(4 rows)
cqlsh:employee_224> update empinfo set emp_name='Manu' where emp_id=3 and salary=1000000;
cqlsh:employee_224> select * from empinfo;

 emp_id | salary | dept_name | designation        | doj        | emp_name
--------+--------+-----------+--------------------+------------+----------
      1 |  5e+06 |  Business |           Director | 2010-08-28 |  Abhinav
      2 |  8e+05 |     Sales |            Manager | 2020-05-20 |  Saurabh
      4 |  3e+06 |       R&D | Executive Director | 2016-03-27 |   Anagha
      3 |  1e+06 |        HR |                 HR | 2021-10-10 |     Manu
cqlsh:employee_224> alter table empinfo add projects set<text>;
cqlsh:employee_224> update empinfo set projects=projects+{'Psychology of body','Strength and conditioning'} where
emp_id=4 and salary=3000000;
cqlsh:employee_224> update empinfo set projects=projects+{'Analytics','Risk assesment'} where emp_id=2 and
salary=800000;
qlsh:employee_224> update empinfo set projects=projects+{'Diversity management'} where emp_id=3 and
salary=1000000;
cqlsh:employee_224> update empinfo set projects=projects+{'Role of motivation in improving organisational performance'}
where emp_id=1 and salary=5000000;
cqlsh:employee_224> select * from empinfo;

 emp_id | salary | dept_name | designation        | doj        | emp_name | projects
--------+--------+-----------+--------------------+------------+----------+-----------------------------------------------------------------
      1 |  5e+06 |  Business |           Director | 2010-08-28 |  Abhinav | {'Role of motivation in improving organisational
performance'}
      2 |  8e+05 |     Sales |            Manager | 2020-05-20 |  Saurabh |                          {'Analytics', 'Risk assesment'}
      4 |  3e+06 |       R&D | Executive Director | 2016-03-27 |   Anagha |          {'Psychology of body', 'Strength and
```

```
conditioning'}
     3 |  1e+06 |       HR |               HR | 2021-10-10 |     Manu |                                {'Diversity management'}
cqlsh:employee_224> insert into empinfo(emp_id,emp_name,designation,doj,salary,dept_name,projects)
values(5,'Rakesh','Lawyer','2012-05-07',1200000,'Legal',{'Doping crime in international law'}) using ttl 15;
cqlsh:employee_224> select * from empinfo;

 emp_id | salary  | dept_name | designation        | doj        | emp_name | projects
--------+---------+-----------+--------------------+------------+----------+-----------------------------------------------------------------
     5 | 1.2e+06 |     Legal |            Lawyer | 2012-05-07 |   Rakesh |                    {'Doping crime in international law'}
     1 |   5e+06 |  Business |           Director | 2010-08-28 |  Abhinav | {'Role of motivation in improving organisational
performance'}
     2 |   8e+05 |     Sales |            Manager | 2020-05-20 |  Saurabh |                      {'Analytics', 'Risk assesment'}
     4 |   3e+06 |       R&D | Executive Director | 2016-03-27 |   Anagha |           {'Psychology of body', 'Strength and
conditioning'}
     3 |   1e+06 |       HR |               HR | 2021-10-10 |     Manu |                      {'Diversity management'}

(5 rows)
cqlsh:employee_224> select ttl(emp_name) from empinfo where emp_id=5;

 ttl(emp_name)
---------------
             8
cqlsh:employee_224> select * from empinfo;

 emp_id | salary | dept_name | designation        | doj        | emp_name | projects
--------+--------+-----------+--------------------+------------+----------+-----------------------------------------------------------------
     1 |  5e+06 |  Business |           Director | 2010-08-28 |  Abhinav | {'Role of motivation in improving organisational
performance'}
     2 |  8e+05 |     Sales |            Manager | 2020-05-20 |  Saurabh |                      {'Analytics', 'Risk assesment'}
     4 |  3e+06 |       R&D | Executive Director | 2016-03-27 |   Anagha |           {'Psychology of body', 'Strength and
conditioning'}
     3 |  1e+06 |       HR |               HR | 2021-10-10 |     Manu |                      {'Diversity management'}

(4 rows)
```

Lab2

Perform the following DB operations using Cassandra.
1.Create a keyspace by name Library
2. Create a column family by name Library-Info with attributes
Stud_Id Primary Key, Counter_value of type Counter,
Stud_Name, Book-Name, Book-Id, Date_of_issue
3. Insert the values into the table in batch
4. Display the details of the table created and increase the value of the counter
5. Write a query to show that a student with id 112 has taken a book “BDA” 2 times.
6. Export the created column to a csv file
7. Import a given csv dataset from local file system into Cassandra column family

```
Connected to Test Cluster at 127.0.0.1:9042.
[cqlsh 5.0.1 | Cassandra 3.11.8 | CQL spec 3.4.4 | Native protocol v4]
  cqlsh:library> create table library_info(stud_id int,
            ... counter_value counter,
            ... stud_name text,
            ... book_name text,
            ... book_id int,
            ... date_of_issue date,
            ... primary key(stud_id,stud_name,book_name,book_id,date_of_issue));
  cqlsh:library> describe table library_info;

  CREATE TABLE library.library_info (
      stud_id int,
      stud_name text,
      book_name text,
      book_id int,
      date_of_issue date,
      counter_value counter,
      PRIMARY KEY (stud_id, stud_name, book_name, book_id, date_of_issue)
  ) WITH CLUSTERING ORDER BY (stud_name ASC, book_name ASC, book_id ASC, date_of_issue ASC)
      AND bloom_filter_fp_chance = 0.01
      AND caching = {'keys': 'ALL', 'rows_per_partition': 'NONE'}
      AND comment = ''
      AND compaction = {'class': 'org.apache.cassandra.db.compaction.SizeTieredCompactionStrategy', 'max_threshold': '32'
  'min_threshold': '4'}
      AND compression = {'chunk_length_in_kb': '64', 'class': 'org.apache.cassandra.io.compress.LZ4Compressor'}
      AND crc_check_chance = 1.0
      AND dclocal_read_repair_chance = 0.1
      AND default_time_to_live = 0
      AND gc_grace_seconds = 864000
      AND max_index_interval = 2048
      AND memtable_flush_period_in_ms = 0
      AND min_index_interval = 128
      AND read_repair_chance = 0.0
      AND speculative_retry = '99PERCENTILE';
      cqlsh:library> update library_info set counter_value=counter_value+1 where stud_id=1 and stud_name='Anagha' and
```

```
book_name='BDA' and book_id=10 and date_of_issue='2022-06-10';
cqlsh:library> update library_info set counter_value=counter_value+1 where stud_id=2 and stud_name='Trisha' and
book_name='OOMD' and book_id=11 and date_of_issue='2022-05-10';
cqlsh:library> update library_info set counter_value=counter_value+1 where stud_id=3 and stud_name='Ramya' and
book_name='ML' and book_id=15 and date_of_issue='2022-05-15';
cqlsh:library> update library_info set counter_value=counter_value+1 where stud_id=4 and stud_name='Tasmiya' and
book_name='Management' and book_id=18 and date_of_issue='2022-05-12';
cqlsh:library> select * from library_info;

 stud_id | stud_name | book_name  | book_id | date_of_issue | counter_value
---------+-----------+------------+---------+---------------+---------------
       1 |    Anagha |        BDA |      10 |    2022-06-10 |             1
       2 |    Trisha |       OOMD |      11 |    2022-05-10 |             1
       4 |   Tasmiya | Management |      18 |    2022-05-12 |             1
       3 |     Ramya |         ML |      15 |    2022-05-15 |             1

(4 rows)
cqlsh:library> update library_info set counter_value=counter_value+1 where stud_id=1 and stud_name='Anagha' and
book_name='BDA' and book_id=10 and date_of_issue='2022-06-10';
cqlsh:library> select * from library_info;

 stud_id | stud_name | book_name  | book_id | date_of_issue | counter_value
---------+-----------+------------+---------+---------------+---------------
       1 |    Anagha |        BDA |      10 |    2022-06-10 |             2
       2 |    Trisha |       OOMD |      11 |    2022-05-10 |             1
       4 |   Tasmiya | Management |      18 |    2022-05-12 |             1
       3 |     Ramya |         ML |      15 |    2022-05-15 |             1

(4 rows)
cqlsh:library> select * from library_info where counter_value=2 allow filtering;

 stud_id | stud_name | book_name | book_id | date_of_issue | counter_value
---------+-----------+-----------+---------+---------------+---------------
       1 |    Anagha |       BDA |      10 |    2022-06-10 |             2

(1 rows)
cqlsh:library> copy library_info(stud_id,stud_name,book_id,book_name,date_of_issue,counter_value) to
'Desktop/library_info.csv';
Using 7 child processes

Starting copy of library.library_info with columns [stud_id, stud_name, book_id, book_name, date_of_issue,
counter_value].
Processed: 4 rows; Rate:       7 rows/s; Avg. rate:       2 rows/s
4 rows exported to 1 files in 2.441 seconds.
cqlsh:library> truncate library_info;
cqlsh:library> select * from library_info;

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

(0 rows)
cqlsh:library> copy library_info(stud_id,stud_name,book_id,book_name,date_of_issue,counter_value) from 'Desktop/library_info.csv';
Using 7 child processes
Starting copy of library.library_info with columns [stud_id, stud_name, book_id, book_name, date_of_issue, counter_value].
Process ImportProcess-8:   2 rows/s; Avg. rate: 2 rows/s
Processed: 4 rows; Rate: 1 rows/s; Avg. rate: 2 rows/s
4 rows imported from 1 files in 2.507 seconds (0 skipped).
cqlsh:library> select * from library_info;

 stud_id | stud_name | book_name | book_id | date_of_issue | counter_value
---------+-----------+------------+---------+---------------+---------------
       1 | Anagha | BDA | 10 | 2022-06-10 | 2
       2 | Trisha | OOMD | 11 | 2022-05-10 | 1
       4 | Tasmiya | Management | 18 | 2022-05-12 | 1
       3 | Ramya | ML | 15 | 2022-05-15 | 1

(4 rows)

Lab 3

MongoDB- CRUD Demonstration

```
use studentdb switchedto db
studentdb

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

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

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

db.student_details.insert({'name':'xyz','rollno':3,'age':21,'contactno':9999911111,'email':'xyz@la b
.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({})

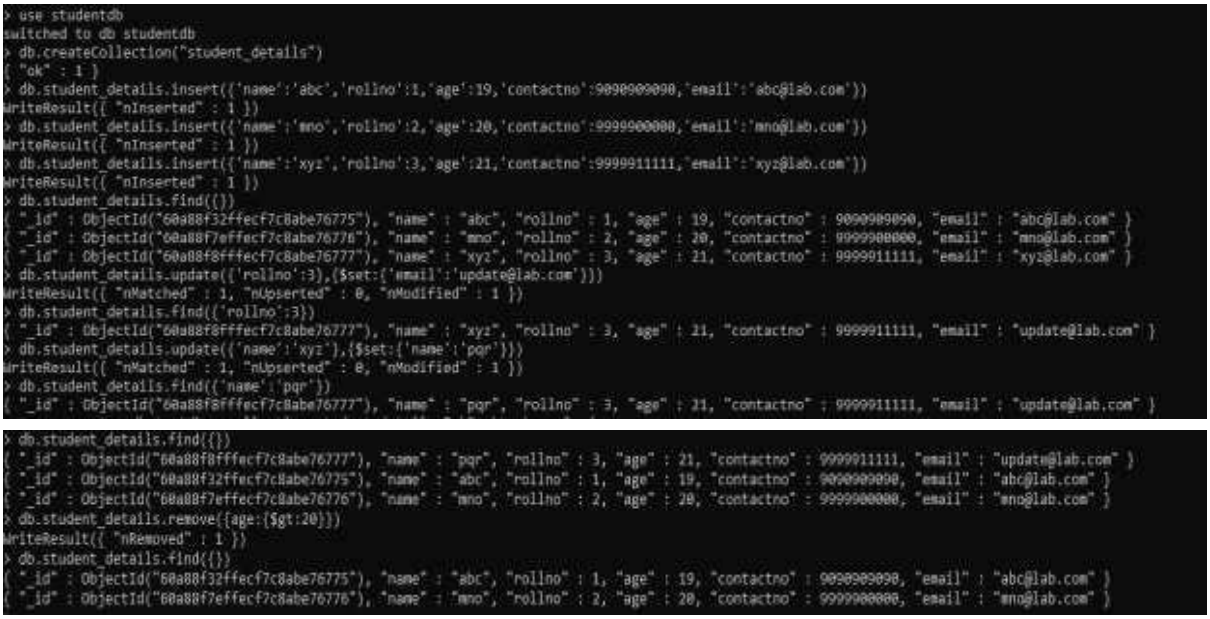
{ "_id" : ObjectId("60a88f32ffecf7c8abe76775"), "name" : "abc", "rollno" : 1, "age" : 19, "contactno" : 9090909090, "email" : "abc@lab.com" }

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

db.student_details.find({})

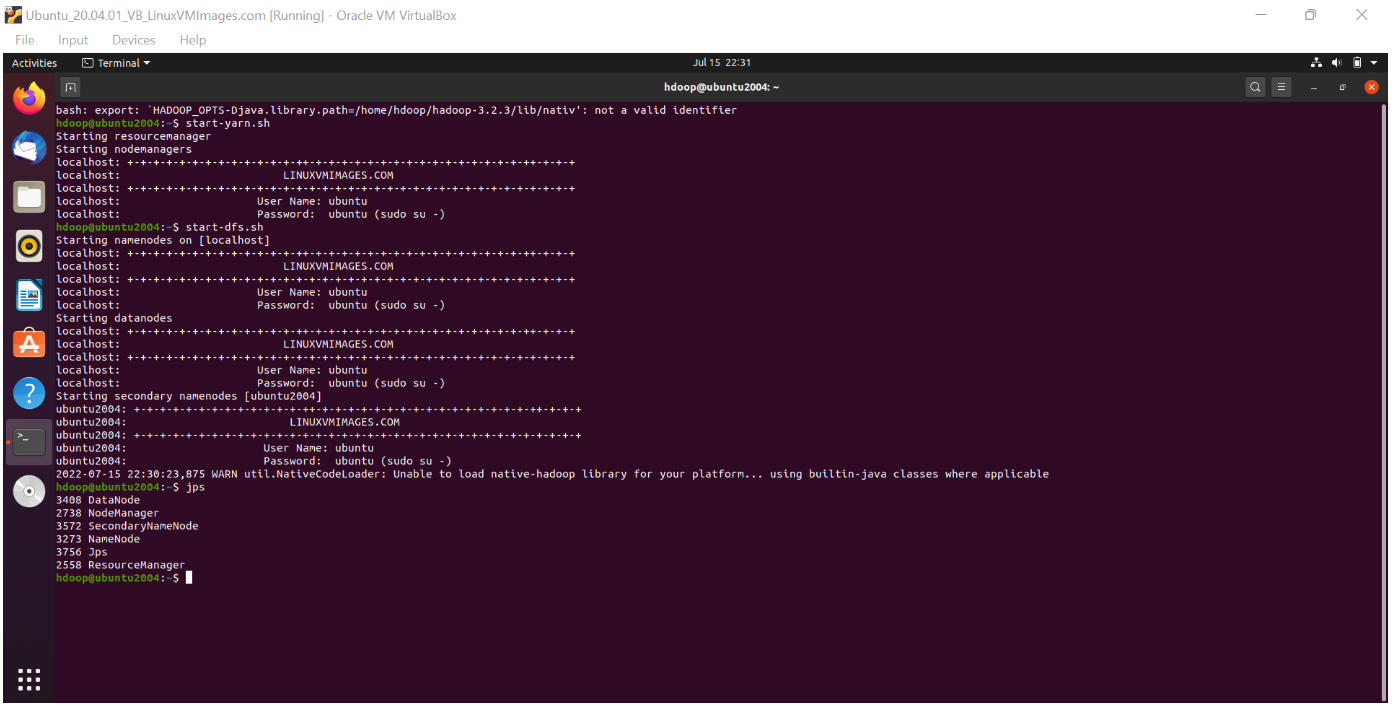
{ "_id" : ObjectId("60a88f32ffecf7c8abe76775"), "name" : "abc", "rollno" : 1, "age" : 19, "contactno" : 9090909090, "email" : "abc@lab.com" }

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



Lab 4

Screenshot of Hadoop installation



Lab 5

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

```
hduser@bmsce-Precision-T1700:~$ start-all.sh
This script is Deprecated. Instead use start-dfs.sh and start-yarn.sh
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by
org.apache.hadoop.security.authentication.util.KerberosUtil
(file:/usr/local/hadoop/share/hadoop/common/lib/hadoop-auth-2.6.0.jar) to
method sun.security.krb5.Config.getInstance()
WARNING: Please consider reporting this to the maintainers of
org.apache.hadoop.security.authentication.util.KerberosUtil
WARNING: Use --illegal-access=warn to enable warnings of further illegal
reflective access operations
WARNING: All illegal access operations will be denied in a future release
Starting namenodes on [localhost]
hduser@localhost's password:
localhost: starting namenode, logging to /usr/local/hadoop/logs/hadoop-hduser-
namenode-bmsce-Precision-T1700.out
localhost: WARNING: An illegal reflective access operation has occurred
localhost: WARNING: Illegal reflective access by
org.apache.hadoop.security.authentication.util.KerberosUtil
(file:/usr/local/hadoop/share/hadoop/common/lib/hadoop-auth-2.6.0.jar) to
method sun.security.krb5.Config.getInstance()
localhost: WARNING: Please consider reporting this to the maintainers of
org.apache.hadoop.security.authentication.util.KerberosUtil
localhost: WARNING: Use --illegal-access=warn to enable warnings of further
illegal reflective access operations
localhost: WARNING: All illegal access operations will be denied in a future
release
```

hduser@localhost's password:

localhost: starting datanode, logging to /usr/local/hadoop/logs/hadoop-hduser-datanode-bmsce-Precision-T1700.out

localhost: WARNING: An illegal reflective access operation has occurred

localhost: WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/usr/local/hadoop/share/hadoop/common/lib/hadoop-auth-2.6.0.jar) to method sun.security.krb5.Config.getInstance()

localhost: WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil

localhost: WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations

localhost: WARNING: All illegal access operations will be denied in a future release

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

0.0.0.0: WARNING: An illegal reflective access operation has occurred

0.0.0.0: WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/usr/local/hadoop/share/hadoop/common/lib/hadoop-auth-2.6.0.jar) to method sun.security.krb5.Config.getInstance()

0.0.0.0: WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil

0.0.0.0: WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations

0.0.0.0: WARNING: All illegal access operations will be denied in a future release

WARNING: An illegal reflective access operation has occurred

WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil

(file:/usr/local/hadoop/share/hadoop/common/lib/hadoop-auth-2.6.0.jar) to method sun.security.krb5.Config.getInstance()

WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil

WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations

WARNING: All illegal access operations will be denied in a future release

starting yarn daemons

starting resourcemanager, logging to /usr/local/hadoop/logs/yarn-hduser-resourcemanager-bmsce-Precision-T1700.out

WARNING: An illegal reflective access operation has occurred

WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/usr/local/hadoop/share/hadoop/common/lib/hadoop-auth-2.6.0.jar) to method sun.security.krb5.Config.getInstance()

WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil

WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations

WARNING: All illegal access operations will be denied in a future release

hduser@localhost's password:

localhost: starting nodemanager, logging to /usr/local/hadoop/logs/yarn-hduser-nodemanager-bmsce-Precision-T1700.out

localhost: WARNING: An illegal reflective access operation has occurred

localhost: WARNING: Illegal reflective access by org.apache.hadoop.security.authentication.util.KerberosUtil (file:/usr/local/hadoop/share/hadoop/common/lib/hadoop-auth-2.6.0.jar) to method sun.security.krb5.Config.getInstance()

localhost: WARNING: Please consider reporting this to the maintainers of org.apache.hadoop.security.authentication.util.KerberosUtil

localhost: WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations

```
localhost: WARNING: All illegal access operations will be denied in a future
release

hduser@bmsce-Precision-T1700:~$ jps
8386 NodeManager
7654 DataNode
7879 SecondaryNameNode
7463 NameNode
9143 Jps
8044 ResourceManager

hduser@bmsce-Precision-T1700:~$ hdfs dfs -mkdir /227new

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /
Found 11 items
drwxr-xr-x   - hduser supergroup          0 2022-06-01 10:12 /1bm19cs186
drwxr-xr-x   - hduser supergroup          0 2022-06-04 09:27 /227new
drwxr-xr-x   - hduser supergroup          0 2022-06-03 12:20 /Copy-Secure
drwxr-xr-x   - hduser supergroup          0 2022-06-03 12:06 /Sharan
drwxr-xr-x   - hduser supergroup          0 2022-06-03 14:57 /bda
drwxr-xr-x   - hduser supergroup          0 2022-06-01 09:32 /firstlab
drwxr-xr-x   - hduser supergroup          0 2022-06-01 09:32 /lab
drwxr-xr-x   - hduser supergroup          0 2022-06-01 14:59 /nothing
drwxr-xr-x   - hduser supergroup          0 2022-06-01 15:27 /something
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 /227new/WC.txt
```

```
hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /227new
Found 1 items
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:33 /227new/WC.txt

hduser@bmsce-Precision-T1700:~$ hdfs dfs -cat /227new/WC.txt
Hello! Welcome

hduser@bmsce-Precision-T1700:~$ hdfs dfs -copyFromLocal
/home/hduser/Desktop/Welcome.txt /227new/WC1.txt

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /227new
Found 2 items
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:33 /227new/WC.txt
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:37 /227new/WC1.txt

hduser@bmsce-Precision-T1700:~$ hdfs dfs -cat /227new/WC1.txt
Hello! Welcome

hduser@bmsce-Precision-T1700:~$ hdfs dfs -get /227new/WC.txt
/home/hduser/Downloads/WWC.txt

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /
Found 11 items
drwxr-xr-x   - hduser supergroup          0 2022-06-01 10:12 /1bm19cs186
drwxr-xr-x   - hduser supergroup          0 2022-06-04 09:37 /227new
drwxr-xr-x   - hduser supergroup          0 2022-06-03 12:20 /Copy-Secure
drwxr-xr-x   - hduser supergroup          0 2022-06-03 12:06 /Sharan
drwxr-xr-x   - hduser supergroup          0 2022-06-03 14:57 /bda
drwxr-xr-x   - hduser supergroup          0 2022-06-01 09:32 /firstlab
drwxr-xr-x   - hduser supergroup          0 2022-06-01 09:32 /lab
```

```
drwxr-xr-x   - hduser supergroup          0 2022-06-01 14:59 /nothing
drwxr-xr-x   - hduser supergroup          0 2022-06-01 15:27 /something
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 -getmerge /227new/WC.txt
/227new/WC1.txt /home/hduser/Desktop/Merge.txt

hduser@bmsce-Precision-T1700:~$ hadoop fs -getfacl /227new/
# file: /227new
# owner: hduser
# group: supergroup
user::rwx
group::r-x
other::r-x

hduser@bmsce-Precision-T1700:~$ sudo nano abc.txt
[sudo] password for hduser:

hduser@bmsce-Precision-T1700:~$ hdfs dfs -put /home/hduser/abc.txt
/227new/name.txt

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /227new
Found 3 items
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:33 /227new/WC.txt
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:37 /227new/WC1.txt
-rw-r--r--   1 hduser supergroup         20 2022-06-04 09:51 /227new/name.txt

hduser@bmsce-Precision-T1700:~$ hdfs dfs -cat /227new/name.txt
This is Ramya here!
```

```
hduser@bmsce-Precision-T1700:~$ hdfs dfs -copyToLocal /227new/name.txt
/home/hduser/Desktop

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /
Found 11 items
drwxr-xr-x   - hduser supergroup          0 2022-06-01 10:12 /1bm19cs186
drwxr-xr-x   - hduser supergroup          0 2022-06-04 09:51 /227new
drwxr-xr-x   - hduser supergroup          0 2022-06-03 12:20 /Copy-Secure
drwxr-xr-x   - hduser supergroup          0 2022-06-03 12:06 /Sharan
drwxr-xr-x   - hduser supergroup          0 2022-06-03 14:57 /bda
drwxr-xr-x   - hduser supergroup          0 2022-06-01 09:32 /firstlab
drwxr-xr-x   - hduser supergroup          0 2022-06-01 09:32 /lab
drwxr-xr-x   - hduser supergroup          0 2022-06-01 14:59 /nothing
drwxr-xr-x   - hduser supergroup          0 2022-06-01 15:27 /something
drwxrwxr-x   - hduser supergroup          0 2019-08-01 16:19 /tmp
drwxr-xr-x   - hduser supergroup          0 2019-08-01 16:03 /user

hduser@bmsce-Precision-T1700:~$ hadoop fs -mv /227new /227newer

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /227newer
Found 3 items
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:33 /227newer/WC.txt
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:37 /227newer/WC1.txt
-rw-r--r--   1 hduser supergroup         20 2022-06-04 09:51 /227newer/name.txt

hduser@bmsce-Precision-T1700:~$ hadoop fs -cp /227newer/  /227new

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /227new
Found 3 items
```

```
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:58 /227new/WC.txt
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:58 /227new/WC1.txt
-rw-r--r--   1 hduser supergroup         20 2022-06-04 09:58 /227new/name.txt

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /227newer
Found 3 items
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:33 /227newer/WC.txt
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:37 /227newer/WC1.txt
-rw-r--r--   1 hduser supergroup         20 2022-06-04 09:51 /227newer/name.txt

hduser@bmsce-Precision-T1700:~$ hadoop fs -cp /227newer/name.txt
/227new
cp: `/227new/name.txt': File exists

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

hduser@bmsce-Precision-T1700:~$ hdfs dfs -put /home/hduser/hello.txt
/227newer/hello.txt

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /227newer
Found 4 items
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:33 /227newer/WC.txt
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:37 /227newer/WC1.txt
-rw-r--r--   1 hduser supergroup         13 2022-06-04 10:02 /227newer/hello.txt
-rw-r--r--   1 hduser supergroup         20 2022-06-04 09:51 /227newer/name.txt

hduser@bmsce-Precision-T1700:~$ hdfs dfs -cat /227newer/hello.txt
hi hello bye

hduser@bmsce-Precision-T1700:~$ hadoop fs -cp /227newer/hello.txt  /227new
```

```
hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /227newer
Found 4 items
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:33 /227newer/WC.txt
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:37 /227newer/WC1.txt
-rw-r--r--   1 hduser supergroup         13 2022-06-04 10:02 /227newer/hello.txt
-rw-r--r--   1 hduser supergroup         20 2022-06-04 09:51 /227newer/name.txt

hduser@bmsce-Precision-T1700:~$ hadoop fs -ls /227new
Found 4 items
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:58 /227new/WC.txt
-rw-r--r--   1 hduser supergroup         15 2022-06-04 09:58 /227new/WC1.txt
-rw-r--r--   1 hduser supergroup         13 2022-06-04 10:03 /227new/hello.txt
-rw-r--r--   1 hduser supergroup         20 2022-06-04 09:58 /227new/name.txt

hduser@bmsce-Precision-T1700:~$
```

Lab 6

```
// 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;

importorg.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
    {
            intmax_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;

importorg.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;

importjava.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, " ");          StringTokenizeritr = 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 (IntWritableval : 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 (IntWritableval : 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 intcompare(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
publicintgetPartition(TextPair key, Text value, intnumPartitions) {          return (key.getFirst().hashCode()
&Integer.MAX_VALUE) % numPartitions;
            }
    }

@Override public intrun(String[] args) throws Exception {              if (args.length != 3) {
                    System.out.println("Usage: <Department Emp Strength input>
<Department Name input><output>");
                    return -1;
            }

            JobConfconf = 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 {

            intexitCode = ToolRunner.run(new JoinDriver(), args);
            System.exit(exitCode);
    }
}

// JoinReducer.java import java.io.IOException; import java.util.Iterator;

importorg.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.*;

importorg.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;

publicTextPair() {     set(new Text(), new Text());
  }

publicTextPair(String first, String second) {     set(new Text(first), new Text(second));
  }

publicTextPair(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 inthashCode() {     return first.hashCode() * 163 + second.hashCode();
  }

  @Override   public booleanequals(Object o) {     if (o instanceofTextPair) {       TextPairtp = (TextPair) o;       return
first.equals(tp.first) &&second.equals(tp.second);
    }     return false;
  }

  @Override   public String toString() {     return first + "\t" + second;
  }

  @Override
publicintcompareTo(TextPairtp) {     intcmp = first.compareTo(tp.first);     if (cmp != 0) {       return cmp;
    }
returnsecond.compareTo(tp.second);
  }
  // ^^ TextPair

  // vvTextPairComparator   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);        intcmp = 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();

publicFirstComparator() {       super(TextPair.class);
    }
```

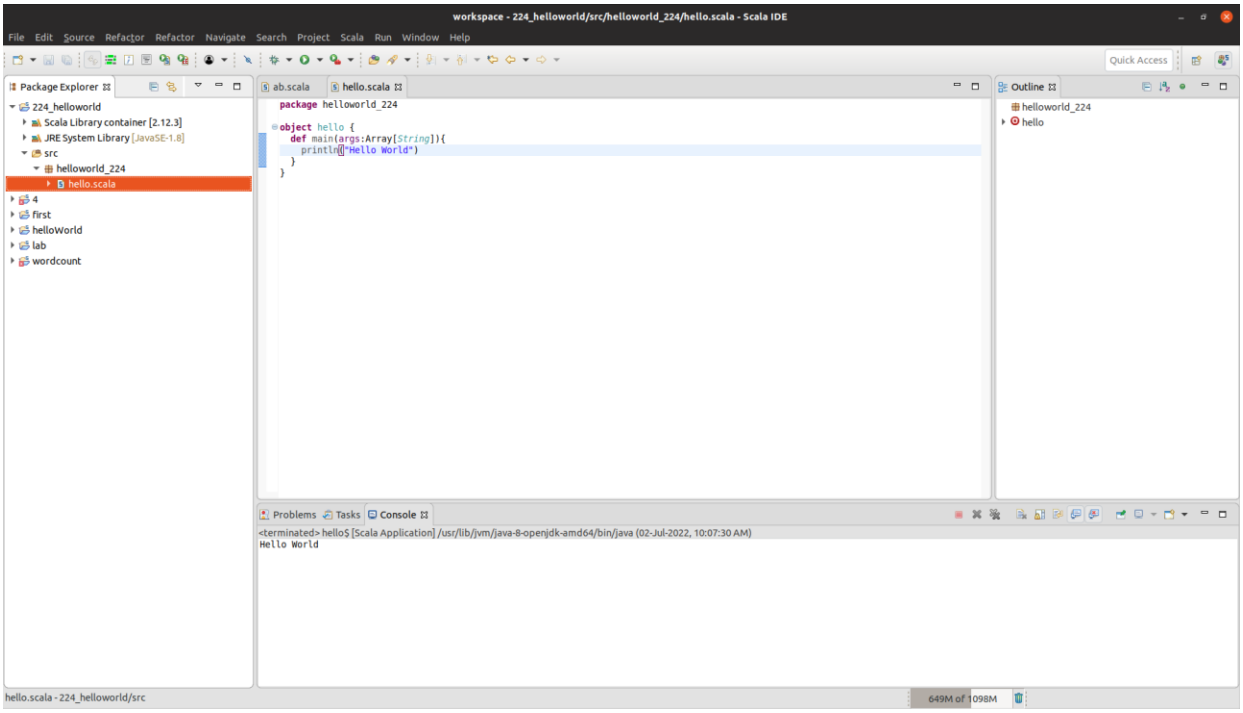
```
   @Override     public int compare(byte[] b1, int s1, int l1,                     byte[] b2, int s2, int l2) {
          try {
int firstL1 = WritableUtils.decodeVIntSize(b1[s1]) + readVInt(b1, s1);        int firstL2 =
WritableUtils.decodeVIntSize(b2[s2]) + readVInt(b2, s2);        return TEXT_COMPARATOR.compare(b1, s1, firstL1,
b2, s2, firstL2);
     } catch (IOException e) {        throw new IllegalArgumentException(e);
     }
   }

   @Override
publicint compare(WritableComparable a, WritableComparable b) {       if (a instanceofTextPair&& b instanceofTextPair)
{        return ((TextPair) a).first.compareTo(((TextPair) b).first);
     }
returnsuper.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!
```



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/bmsce/Desktop/sparkdata.txt")
textFile: org.apache.spark.rdd.RDD[String] = /home/bmsce/Desktop/sparkdata.txt MapPartitionsRDD[6] at textFile at <console>:24

scala> val counts=textFile.flatMap(line=>line.split(" ")).map(word=>(word,1)).reduceByKey(_+_);
counts: org.apache.spark.rdd.RDD[(String, Int)] = ShuffledRDD[9] at reduceByKey at <console>:25

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

scala> val sorted=ListMap(counts.collect.sortWith(_._2>_._2):_*)
sorted: scala.collection.immutable.ListMap[String,Int] = Map(bms -> 5, college -> 4, of -> 2, university -> 1, evening -> 1, women's -> 1, technological -> 1, engineering -> 1, architecture -> 1, id -> 1, visweswariah -> 1)

scala> println(sorted)
Map(bms -> 5, college -> 4, of -> 2, university -> 1, evening -> 1, women's -> 1, technological -> 1, engineering -> 1, architecture -> 1, id -> 1, visweswariah -> 1)

scala> for((k,v)<-sorted)
     | {
     | if(v>4)
     | {
     | print(k+",")
     | print(v)
     | println()
     | }
     | }
bms,5

scala>
```