

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.



LAB REPORT on

Big Data Analytics(23CS6PCBDA)

Submitted by

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



B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
BENGALURU-560019
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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(23CS6PCBDA)**” carried out by **Kavana Patil (1BM22CS124)**, 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 2024. The Lab report has been approved as it satisfies the academic requirements in respect of a **Big Data Analytics - (23CS6PCBDA)** 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	Analyse big data analytics mechanisms that can be applied to obtain solution for a given problem.
CO3	Design and implement solutions using data analytics mechanisms for a given problem.

Lab 1: MongoDB- CRUD Demonstration

Question: Perform basic CRUD (Create, Read, Update, Delete) operations in MongoDB.

Code with Output:

```
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.createCollection('Customers')
{ ok: 1 }

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.createCollection('Student')
{ ok: 1 }

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.createCollection('Student')
{ ok: 1 }

Atlas atlas-ws5rct-shard-0 [primary] test> use mydb
switched to db mydb

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.deleteMany({Grade:'VII'})
{ acknowledged: true, deletedCount: 3 }

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.deleteOne({StudName:'JacobAdam'})
{ acknowledged: true, deletedCount: 0 }

[Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.drop()]
true

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.dropDatabase()
{ ok: 1, dropped: 'mydb' }

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.remove({StudName:'JacobAdam'})
)
DeprecationWarning: Collection.remove() is deprecated. Use deleteOne, deleteMany, findOneAndDelete, or bulkWrite.
{ acknowledged: true, deletedCount: 0 }
```

```
[Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Customers.find()]
[  {
      _id: ObjectId('67c6c71f812483cc27dd4a64'),
      cust_id: 1,
      balance: 200,
      type: 'S'
    },
    {
      _id: ObjectId('67c6c739812483cc27dd4a65'),
      cust_id: 1,
      balance: 1000,
      type: 'Z'
    },
    {
      _id: ObjectId('67c6c74d812483cc27dd4a66'),
      cust_id: 2,
      balance: 100,
      type: 'Z'
    },
    {
      _id: ObjectId('67c6c75e812483cc27dd4a67'),
      cust_id: 2,
      balance: 1000,
      type: 'C'
    },
    {
      _id: ObjectId('67c6c76e812483cc27dd4a68'),
      cust_id: 2,
      balance: 500,
      type: 'C'
    },
    {
      _id: ObjectId('67c6c781812483cc27dd4a69'),
      cust_id: 2,
      balance: 50,
      type: 'S'
    },
    {
      _id: ObjectId('67c6c795812483cc27dd4a6a'),
      cust_id: 3,
      balance: 500,
      type: 'Z'
    }
]
```

Google Classroom

```
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.find()
[
  {
    _id: ObjectId('67c6c3c3812483cc27dd4a5d'),
    RollNo: 1,
    Age: 21,
    Cont: 9876,
    email: 'antara.de9@gmail.com'
  },
  {
    _id: ObjectId('67c6c3d8812483cc27dd4a5e'),
    RollNo: 1,
    Age: 21,
    Cont: 9876,
    email: 'antara.de9@gmail.com'
  },
  {
    _id: ObjectId('67c6c458812483cc27dd4a5f'),
    RollNo: 2,
    Age: 22,
    Cont: 9976,
    email: 'anushka.de@gmail.com'
  },
  {
    _id: ObjectId('67c6c47f812483cc27dd4a60'),
    RollNo: 3,
    Age: 21,
    Cont: 5576,
    email: 'anubhav.de@gmail.com'
  },
  {
    _id: ObjectId('67c6c4a2812483cc27dd4a61'),
    RollNo: 4,
    Age: 20,
    Cont: 4476,
    email: 'pani.de9@gmail.com'
  },
  {
    _id: ObjectId('67c6c4db812483cc27dd4a62'),
    RollNo: 10,
    Age: 23,
    Cont: 2276,
    email: 'rekha.de9@gmail.com'
  }
]
```

```
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.find()
[[{"_id": ObjectId('67c6c3c3812483cc27dd4a5d'), "RollNo": 1, "Age": 21, "Cont": 9876, "email": "antara.de9@gmail.com"}, {"_id": ObjectId('67c6c3d8812483cc27dd4a5e'), "RollNo": 1, "Age": 21, "Cont": 9876, "email": "antara.de9@gmail.com"}, {"_id": ObjectId('67c6c458812483cc27dd4a5f'), "RollNo": 2, "Age": 22, "Cont": 9976, "email": "anushka.de@gmail.com"}, {"_id": ObjectId('67c6c47f812483cc27dd4a60'), "RollNo": 3, "Age": 21, "Cont": 5576, "email": "anubhav.de@gmail.com"}, {"_id": ObjectId('67c6c4a2812483cc27dd4a61'), "RollNo": 4, "Age": 20, "Cont": 4476, "email": "pani.de9@gmail.com"}, {"_id": ObjectId('67c6c4db812483cc27dd4a62'), "RollNo": 10, "Age": 23, "Cont": 2276, "email": "abhinav@gmail.com"}]]
```

```
{  
  _id: ObjectId('67c6c616812483cc27dd4a63'),  
  RollNo: 11,  
  Age: 22,  
  Name: 'FEM',  
  cont: 2276,  
  email: 'rea.de9@gmail.com'  
},  
{  
  _id: 1,  
  StudName: 'Michelle Jacintha',  
  Grade: 'VII',  
  Hobbies: 'InternetSurfing'  
},  
{ _id: 2, StudName: 'Jannie', Grade: 'VIII', Hobbies: 'Music' },  
{ _id: 3, StudName: 'Jacob Adam', Grade: 'VII', Hobbies: 'Swimming' },  
{  
  _id: 4,  
  StudName: 'Amy Jacks',  
  Grade: 'X',  
  Hobbies: 'Dancing',  
  Location: 'Network'  
},  
{ _id: 6, StudName: 'Aryan David', Grade: 'VII', Hobbies: 'Skating' }  
]
```

```

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Customers.insert({cust_id:1,balance:2
00,type:'S'})
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c71f812483cc27dd4a64') }
}
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Customers.insert({cust_id:1,balance:1
000,type:'Z'})
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c739812483cc27dd4a65') }
}
[Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Customers.insert({cust_id:2,balance:1]
00,type:'Z'])
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c74d812483cc27dd4a66') }
}
[Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Customers.insert({cust_id:2,balance:1]
000,type:'C'])
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c75e812483cc27dd4a67') }
}
[Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Customers.insert({cust_id:2,balance:5]
00,type:'C'])
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c76e812483cc27dd4a68') }
}
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Customers.insert({cust_id:2,balance:5
0,type:'S'})
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c781812483cc27dd4a69') }
}
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Customers.insert({cust_id:3,balance:5]
00,type:'Z'})
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c795812483cc27dd4a6a') }
}

```

```

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.insert({RollNo:1, Age:21, Cont:t:9876, email:'antara.de9@gmail.com'});
DeprecationWarning: Collection.insert() is deprecated. Use insertOne, insertMany, or bulkWrite.
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c3c3812483cc27dd4a5d') }
}
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.insertOne({RollNo:1, Age:21, Cont:t:9876, email:'antara.de9@gmail.com'});
{
  acknowledged: true,
  insertedId: ObjectId('67c6c3d8812483cc27dd4a5e')
}
Atlas atlas-ws5rct-shard-0 [primary] mydb> show mydb
MongoshInvalidInputError: [COMMON-10001] 'mydb' is not a valid argument for "show".
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.insert({RollNo:2, Age:22, Cont:t:9976, email:'anushka.de@gmail.com'});
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c458812483cc27dd4a5f') }
}
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.insert({RollNo:3, Age:21, Cont:t:5576, email:'anubhav.de@gmail.com'});
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c47f812483cc27dd4a60') }
}
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.insert({RollNo:4, Age:20, Cont:t:4476, email:'pani.de9@gmail.com'});
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c4a2812483cc27dd4a61') }
}
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.insert({RollNo:10, Age:23, Cont:t:2276, email:'rekha.de9@gmail.com'});
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c4db812483cc27dd4a62') }
}

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.insertMany([{_id:3, StudName:'Jacob Adam', Grade:'VII', Hobbies:'Swimming'}, {_id:4, StudName:'Amy Jacks', Grade:'X', Hobbies:'Dancing'}])
{ acknowledged: true, insertedIds: { '0': 3, '1': 4 } }

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.insert({_id:1, StudName:'Michelle Jacintha', Grade:'VII', Hobbies:'InternetSurfing'})
{ acknowledged: true, insertedIds: { '0': 1 } }
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.insertOne({_id:2, StudName:'Janie', Grade:'VIII', Hobbies:'Music'})
{ acknowledged: true, insertedId: 2 }

```

```
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.find().pretty()
[
  {
    _id: ObjectId('67c6c3c3812483cc27dd4a5d'),
    RollNo: 1,
    Age: 21,
    Cont: 9876,
    email: 'antara.de9@gmail.com'
  },
  {
    _id: ObjectId('67c6c3d8812483cc27dd4a5e'),
    RollNo: 1,
    Age: 21,
    Cont: 9876,
    email: 'antara.de9@gmail.com'
  },
  {
    _id: ObjectId('67c6c458812483cc27dd4a5f'),
    RollNo: 2,
    Age: 22,
    Cont: 9976,
    email: 'anushka.de@gmail.com'
  },
  {
    _id: ObjectId('67c6c47f812483cc27dd4a60'),
    RollNo: 3,
    Age: 21,
    Cont: 5576,
    email: 'anubhav.de@gmail.com'
  },
  {
    _id: ObjectId('67c6c4a2812483cc27dd4a61'),
    RollNo: 4,
    Age: 20,
    Cont: 4476,
    email: 'pani.de9@gmail.com'
  },
  {
    _id: ObjectId('67c6c4db812483cc27dd4a62'),
    RollNo: 10,
    Age: 23,
    Cont: 2276,
    email: 'rekha.de9@gmail.com'
  }
]
```

```

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.save({StudName:'Vamsi',Grade:'VI'})
[{"_id": 5, "StudName": "Vamsi", "Grade": "VI", "Hobbies": "Skating", "Age": 11, "RollNo": 11, "Name": "Vamsi", "Email": "rea.de9@gmail.com", "Contact": 2276, "Status": "Active"}, {"_id": 6, "StudName": "Aryan David", "Grade": "VII", "Hobbies": "Skating", "Age": 12, "RollNo": 12, "Name": "Aryan David", "Email": "rea.de9@gmail.com", "Contact": 2277, "Status": "Active"}]

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.updateOne({_id:6,StudName:'Aryan David',Grade:'VII'},{$set:{Hobbies:'Skating'}},{upsert:true})
{
  acknowledged: true,
  insertedId: 6,
  matchedCount: 0,
  modifiedCount: 0,
  upsertedCount: 1
}

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.insert({RollNo:11, Age:22, Name : "ABC", cont:2276, email:"rea.de9@gmail.com"})
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c616812483cc27dd4a63') }
}

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.update({RollNo:11, Name:"ABC"},{$set:{Name:"FEM"}})
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.updateMany({Grade:'VII'},{$set:{status:'Active'}})
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 3,
  modifiedCount: 2,
  upsertedCount: 0
}

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.updateOne({Grade:'VII'},{$set:{status:'Active'}})
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}

```

```
Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.update({_id:4}, {$set:{Location:'Network'}})
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.update({_id:4}, {$unset:{Location:'Network'}})
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}

Atlas atlas-ws5rct-shard-0 [primary] mydb> db.Student.update({RollNo:10}, {$set:{email:'abhinav@gmail.com'}})
DeprecationWarning: Collection.update() is deprecated. Use updateOne, updateMany, or bulkWrite.
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
```

Lab 2: Cassandra

Question: 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.

Code with Output:

```
cqlsh> CREATE KEYSPACE Employee WITH REPLICATION = { 'class' : 'SimpleStrategy', 'replication_factor' : 1 };
cqlsh> CREATE TABLE Employee.Employee_Info (
...     Emp_Id int,
...     Salary decimal,
...     Emp_Name text,
...     Designation text,
...     Date_of_Joining date,
...     Dept_Name text,
...     PRIMARY KEY (Emp_Id, Salary)
... ) WITH CLUSTERING ORDER BY (Salary ASC);
cqlsh> BEGIN BATCH
...     INSERT INTO Employee.Employee_Info (Emp_Id, Salary, Emp_Name, Designation, Date_of_Joining, Dept_Name) VALUES (121, 60000, 'John Doe', 'Developer', '2023-01-15', 'IT');
...     INSERT INTO Employee.Employee_Info (Emp_Id, Salary, Emp_Name, Designation, Date_of_Joining, Dept_Name) VALUES (122, 80000, 'Jane Smith', 'Manager', '2022-05-20', 'HR');
...     INSERT INTO Employee.Employee_Info (Emp_Id, Salary, Emp_Name, Designation, Date_of_Joining, Dept_Name) VALUES (123, 55000, 'Alice Johnson', 'Analyst', '2021-11-10', 'Finance');
...     APPLY BATCH;
cqlsh> UPDATE Employee.Employee_Info SET Emp_Name = 'Johnathan Doe', Dept_Name = 'Engineering' WHERE Emp_Id = 121 AND Salary = 60000;
cqlsh> SELECT * FROM Employee.Employee_Info WHERE Emp_Id = 121 ORDER BY Salary;
emp_id | salary | date_of_joining | dept_name | designation | emp_name
-----+-----+-----+-----+-----+-----+
  121 |   60000 | 2023-01-15 | Engineering | Developer | Johnathan Doe
(1 rows)

cqlsh> ALTER TABLE Employee.Employee_Info ADD Projects set<text>;
cqlsh> UPDATE Employee.Employee_Info SET Projects = ['Project A', 'Project B'] WHERE Emp_Id = 121 AND Salary = 60000;
cqlsh> INSERT INTO Employee.Employee_Info (Emp_Id, Salary, Emp_Name, Designation, Date_of_Joining, Dept_Name) VALUES (124, 30000, 'Temp Employee', 'Intern', '2023-10-01', 'Temp Dept') USING TTL 15;
cqlsh> SELECT * FROM Employee.Employee_Info;
emp_id | salary | date_of_joining | dept_name | designation | emp_name | projects
-----+-----+-----+-----+-----+-----+-----+
  123 | 55000 | 2021-11-10 | Finance | Analyst | Alice Johnson | null
  122 | 80000 | 2022-05-20 | HR | Manager | Jane Smith | null
  121 | 60000 | 2023-01-15 | Engineering | Developer | Johnathan Doe | {'Project A', 'Project B'}
(3 rows)
cqlsh> 
```

Lab 3: Cassandra

Question: 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

Code with Output:

```

cqlsh> CREATE KEYSPACE Library WITH REPLICATION = { 'class' : 'SimpleStrategy', 'replication_factor' : 1 };
cqlsh> CREATE TABLE Library.Library_Info (
    ...     Stud_Id int,
    ...     Book_Name TEXT,
    ...     Book_Id int,
    ...     Date_of_issue DATE,
    ...     PRIMARY KEY (Stud_Id, Book_Name, Date_of_issue)
    ... );
cqlsh> BEGIN BATCH
    ... INSERT INTO Library.Library_Info (Stud_Id, Book_Name, Book_Id, Date_of_issue) VALUES (112, 'BDA', 1, '2023-09-01');
    ... INSERT INTO Library.Library_Info (Stud_Id, Book_Name, Book_Id, Date_of_issue) VALUES (112, 'BDA', 1, '2023-09-05');
    ... INSERT INTO Library.Library_Info (Stud_Id, Book_Name, Book_Id, Date_of_issue) VALUES (113, 'ML', 2, '2023-09-02');
    ... INSERT INTO Library.Library_Info (Stud_Id, Book_Name, Book_Id, Date_of_issue) VALUES (114, 'AI', 3, '2023-09-03');
    ... INSERT INTO Library.Library_Info (Stud_Id, Book_Name, Book_Id, Date_of_issue) VALUES (115, 'DBMS', 4, '2023-09-04');
    ... APPLY BATCH;
cqlsh> SELECT * FROM Library.Library_Info;

stud_id | book_name | date_of_issue | book_id
-----+-----+-----+-----+
  114 |      AI | 2023-09-03 |      3
  113 |      ML | 2023-09-02 |      2
  112 |      BDA | 2023-09-01 |      1
  112 |      BDA | 2023-09-05 |      1
  115 |      DBMS | 2023-09-04 |      4

(5 rows)
cqlsh> SELECT COUNT(*) FROM Library.Library_Info WHERE Stud_Id = 112 AND Book_Name = 'BDA';

  count
-----
  2

(1 rows)

```

```

cqlsh> COPY Library.Library_Info TO 'library_info.csv' WITH HEADER = TRUE;
Using 16 child processes

Starting copy of library.library_info with columns [stud_id, book_name, date_of_issue, book_id].
Processed: 5 rows; Rate:      96 rows/s; Avg. rate:      96 rows/s
5 rows exported to 1 files in 0.089 seconds.
cqlsh> COPY Library.Library_Info FROM 'library_info.csv' WITH HEADER = TRUE;
Using 16 child processes

Starting copy of library.library_info with columns [stud_id, book_name, date_of_issue, book_id].
Processed: 5 rows; Rate:      9 rows/s; Avg. rate:      13 rows/s
5 rows imported from 1 files in 0.375 seconds (0 skipped).
cqlsh> 

```

Lab 4: Cassandra

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

Code with Output:

```

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ cd ./Desktop/
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [bmscecse-HP-Elite-Tower-800-G9-Desktop-PC]
Starting resourcemanager
Starting nodemanagers
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -mkdir /Lab05

```

```

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Hadoop
ls: `/Hadoop': No such file or directory
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Lab05

```

```

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ touch test.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ nano text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -put ./text.txt /Lab05/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Lab05
Found 1 items
-rw-r--r-- 1 hadoop supergroup 19 2024-05-13 14:33 /Lab05/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -cat /Lab05/text.txt
Hello
How are you?

```

```

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Lab05
Found 2 items
-rw-r--r-- 1 hadoop supergroup 15 2024-05-13 14:40 /Lab05/test.txt
-rw-r--r-- 1 hadoop supergroup 19 2024-05-13 14:33 /Lab05/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -getmerge /Lab05 /text.txt /Lab05 /test.txt ..
Downloads/Merged.txt
getmerge: '/text.txt': No such file or directory
getmerge: '/test.txt': No such file or directory
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -getmerge /Lab05/text.txt /Lab05/test.txt ..//Do
wnloads/Merged.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -getfacl /Lab05
# file: /Lab05
# owner: hadoop
# group: supergroup
user::rwx
group::r-x
other::r-x

```

```

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -copyToLocal /Lab05/text.txt ..//Documents
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -copyToLocal /Lab05/test.txt ..//Documents

```

```

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -cat /Lab05/text.txt
Hello
How are you?
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -mv /Lab05 /test_Lab05

```

```

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -ls /test_Lab05
Found 2 items
-rw-r--r-- 1 hadoop supergroup 15 2024-05-13 14:40 /test_Lab05/test.txt
-rw-r--r-- 1 hadoop supergroup 19 2024-05-13 14:33 /test_Lab05/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -cp /test_Lab05/ /Lab05
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -ls /Lab05
Found 2 items
-rw-r--r-- 1 hadoop supergroup 15 2024-05-13 14:51 /Lab05/test.txt
-rw-r--r-- 1 hadoop supergroup 19 2024-05-13 14:51 /Lab05/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -ls /test_Lab05
Found 2 items
-rw-r--r-- 1 hadoop supergroup 15 2024-05-13 14:40 /test_Lab05/test.txt
-rw-r--r-- 1 hadoop supergroup 19 2024-05-13 14:33 /test_Lab05/text.txt

```

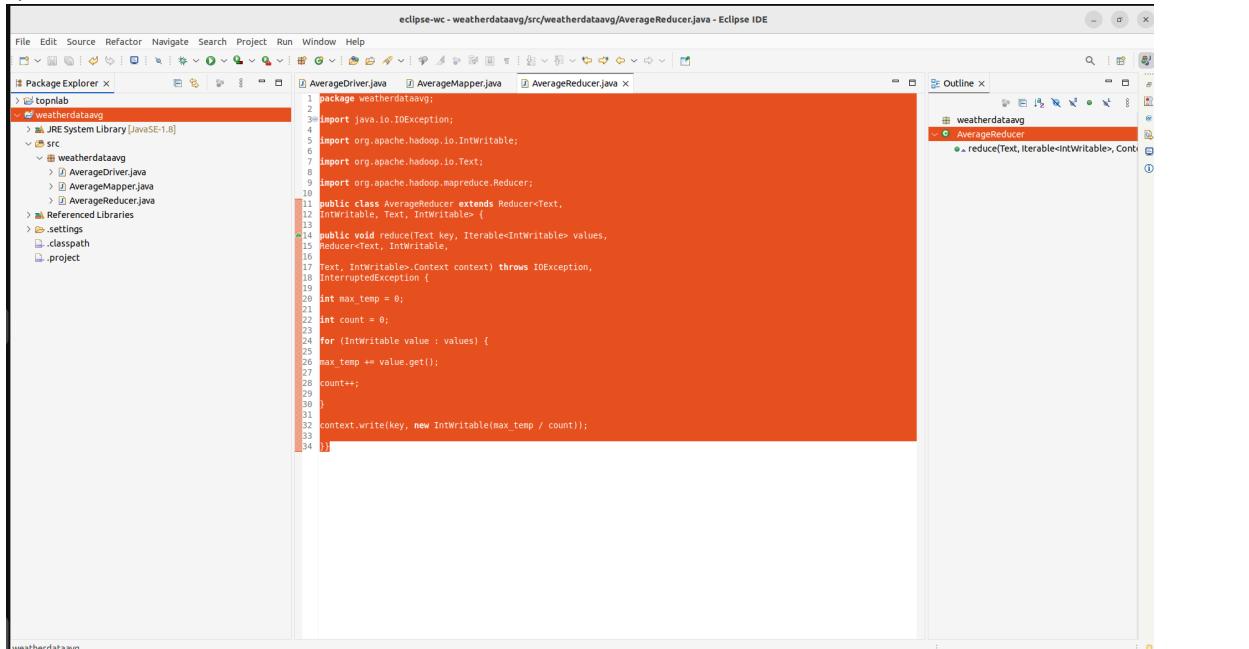
Lab 5: Hadoop

Question: 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.
b) find the mean max temperature for every month

Code with Output:

a)



```

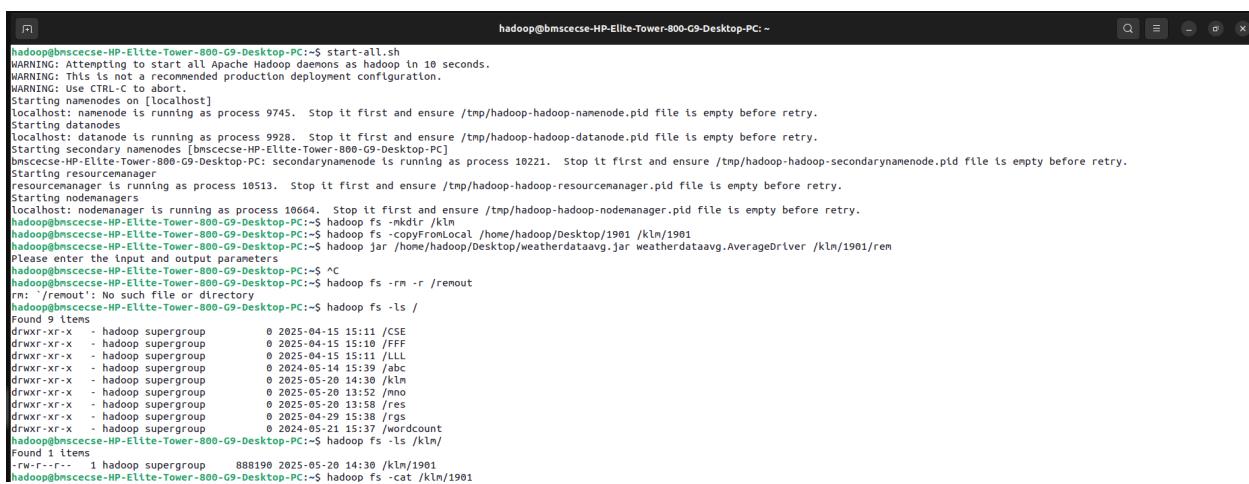
eclipse-wc - weatherdataavg/src/weatherdataavg/AverageReducer.java - Eclipse IDE

File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer X
src
  weatherdataavg
    AverageDriver.java
    AverageMapper.java
    AverageReducer.java
Referenced Libraries
settings
.classpath
.project

weatherdataavg

1 package weatherdataavg;
2 import java.io.IOException;
3 import org.apache.hadoop.io.IntWritable;
4 import org.apache.hadoop.mapreduce.Reducer;
5 import org.apache.hadoop.mapreduce.Text;
6 import org.apache.hadoop.mapreduce.Mapper;
7 import org.apache.hadoop.io.Text;
8 import org.apache.hadoop.mapreduce.Reducer;
9 import org.apache.hadoop.mapreduce.Mapper;
10 public class AverageReducer extends Reducer<Text, IntWritable, Text, IntWritable> {
11     public void reduce(Text key, Iterable<IntWritable> values,
12                        Context context) throws IOException,
13                        InterruptedException {
14         int max_temp = 0;
15         int count = 0;
16         for (IntWritable value : values) {
17             max_temp += value.get();
18             count++;
19         }
20         context.write(key, new IntWritable(max_temp / count));
21     }
22 }

```



```

hadoop@bmsccse-HP-Elite-Tower-800-G9-Desktop-PC:~ start-all.sh
WARNING: This is not a recommended production deployment configuration.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
localhost: namenode is running as process 9745. Stop it first and ensure /tmp/hadoop-hadoop-namenode.pid file is empty before retry.
Starting datanodes
localhost: datanode is running as process 9928. Stop it first and ensure /tmp/hadoop-hadoop-datanode.pid file is empty before retry.
Starting secondary namenodes [bmsccse-HP-Elite-Tower-800-G9-Desktop-PC]
hadoop@bmsccse-HP-Elite-Tower-800-G9-Desktop-PC:~ hadoop jar /home/hadoop/Desktop/weatherdataavg.jar weatherdataavg.AverageDriver /klm/1901/rem
Please enter the input and output parameters:
hadoop@bmsccse-HP-Elite-Tower-800-G9-Desktop-PC:~ hadoop fs -rm -r /remout
rm: '/remout': such file or directory
hadoop@bmsccse-HP-Elite-Tower-800-G9-Desktop-PC:~ hadoop fs -ls /
Found 9 items
drwxr-xr-x 1 hadoop supergroup 0 2025-04-15 15:11 /CSE
drwxr-xr-x 1 hadoop supergroup 0 2025-04-15 15:10 /FFF
drwxr-xr-x 1 hadoop supergroup 0 2025-04-15 15:11 /LLL
drwxr-xr-x 1 hadoop supergroup 0 2024-05-14 15:39 /abc
drwxr-xr-x 1 hadoop supergroup 0 2025-05-20 14:30 /klm
drwxr-xr-x 1 hadoop supergroup 0 2025-05-20 13:52 /mno
drwxr-xr-x 1 hadoop supergroup 0 2025-05-20 13:58 /res
drwxr-xr-x 1 hadoop supergroup 0 2025-04-29 15:38 /rgs
drwxr-xr-x 1 hadoop supergroup 0 2024-05-21 15:37 /wordcount
hadoop@bmsccse-HP-Elite-Tower-800-G9-Desktop-PC:~ hadoop fs -ls /klm/
Found 1 items
-rw-r--r-- 1 hadoop supergroup 888196 2025-05-20 14:30 /klm/1901
hadoop@bmsccse-HP-Elite-Tower-800-G9-Desktop-PC:~ hadoop fs -cat /klm/1901

```

```

hadoop@bnsccse-HP-Elite-Tower-800-09-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/weatherdataavg.jar weatherdataavg.AverageDriver /klm/1901 /rem
2025-05-20 14:34:21.074 INFO impl.MetricConfig: Loaded properties from hadoop-metrics2.properties
2025-05-20 14:34:21.116 INFO impl.MetricSystemImpl: JobTracker metrics system started
2025-05-20 14:34:21.176 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2025-05-20 14:34:21.233 INFO input.FileInputFormat: Total input files to process : 1
2025-05-20 14:34:21.262 INFO mapreduce.JobSubmitter: number of splits:1
2025-05-20 14:34:21.332 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local261815800_0001
2025-05-20 14:34:21.404 INFO mapreduce.Job: Job tracking url: [http://localhost:8080/jobs/1]
2025-05-20 14:34:21.408 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-05-20 14:34:21.401 INFO mapreduce.Job: Running job: job_local261815800_0001
2025-05-20 14:34:21.402 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-05-20 14:34:21.233 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 14:34:21.405 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 14:34:21.406 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:34:21.407 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _attempt folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:34:21.446 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-05-20 14:34:21.447 INFO mapred.LocalJobRunner: Starting task: attempt_local261815800_0001_m_000000_0
2025-05-20 14:34:21.459 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 14:34:21.460 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 14:34:21.460 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:34:21.465 INFO mapred.Tasks: Using ResourceCalculatorProcessTree : []
2025-05-20 14:34:21.501 INFO mapred.Task: (REDATOR) kvnd=26188144(104857584)
2025-05-20 14:34:21.511 INFO mapred.MapTask: (REDATOR) kvnd=26188144(104857584)
2025-05-20 14:34:21.511 INFO mapred.MapTask: napreded.task.io.sort.mbo_100
2025-05-20 14:34:21.511 INFO mapred.MapTask: soft limit at 83884080
2025-05-20 14:34:21.511 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
2025-05-20 14:34:21.511 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2025-05-20 14:34:21.511 INFO mapred.MapTask: Map output collector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-05-20 14:34:21.584 INFO mapred.LocalJobRunner: map task attempt_local261815800_0001_m_000000_0 finished
2025-05-20 14:34:21.587 INFO mapred.MapTask: Spilling map output
2025-05-20 14:34:21.587 INFO mapred.MapTask: bufstart = 0; bufend = 59076; bufvoid = 104857600
2025-05-20 14:34:21.595 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26188144(104752576); length = 26253/6553600
2025-05-20 14:34:21.595 INFO mapred.MapTask: Finished spill 0
2025-05-20 14:34:21.602 INFO mapred.LocalJobRunner: map task attempt_local261815800_0001_m_000000_0 is done. And is in the process of committing
2025-05-20 14:34:21.605 INFO mapred.Task: Task attempt_local261815800_0001_m_000000_0 done.
2025-05-20 14:34:21.605 INFO mapred.Task: Final Counters for attempt_local261815800_0001_m_000000_0: Counters: 23
  File System Counters
    FILE: Number of bytes read=4430
    FILE: Number of bytes written=713998
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=8808198
    HDFS: Number of bytes written=0
    HDFS: Number of read operations=5
    HDFS: Number of write operations=1
    HDFS: Number of bytes read erasure-coded=0
    HDFS: Number of bytes read erasure-coded=0
  Map-Reduce Framework
    Map input records=6565
    Map output records=6564
    HDFS: Number of bytes written=8
    HDFS: Number of read operations=10
    HDFS: Number of large read operations=1
    HDFS: Number of write operations=1
    HDFS: Number of bytes read erasure-coded=0
  Map-Reduce Framework
    Combine input records=0
    Combine output records=0
    Reduce input groups=1
    Reduce shuffle bytes=2220
    Reduce input records=6564
    Reduce output records=1
    Spilled Records=6564
    Shuffled Maps =1
    Failed Shuffles=0
    Merged Map outputs=1
    GC time elapsed (ms)=0
    Total committed heap usage (bytes)=633339904
  Shuffle Errors
    BAD_ID=0
    CONNECTION=0
    IO_ERROR=0
    WRONG_LENGTH=0
    WRONG_MAP=0
    WRONG_REDUCE=0
  File Output Format Counters
    Bytes Written=8
2025-05-20 14:34:21.803 INFO mapred.LocalJobRunner: Finishing task: attempt_local261815800_0001_r_000000_0
2025-05-20 14:34:21.803 INFO mapred.LocalJobRunner: reduce task executor complete.
2025-05-20 14:34:22.404 INFO mapred.Job: Job job_local261815800_0001 running in uber mode : false
2025-05-20 14:34:22.405 INFO mapred.Job: map 100% reduce 100%
2025-05-20 14:34:22.405 INFO mapred.Job: Job job_local261815800_0001 completed successfully
2025-05-20 14:34:22.414 INFO mapred.Job: Counters: 36
  File System Counters
    FILE: Number of bytes read=153312
    FILE: Number of bytes written=1508206
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=1776380
    HDFS: Number of bytes written=8
    HDFS: Number of read operations=15
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=4
    HDFS: Number of bytes read erasure-coded=0
  Map-Reduce Framework
    Map input records=6565
    Map output records=6564
    Map output bytes=59076
    Map output materialized bytes=72210
    Input split bytes=95
    Combine input records=0
    Combine output records=0
    Reduce input groups=1
    Reduce shuffle bytes=72210
    Reduce input records=6564

```

```

Map input records=6565
Map output records=5564
Map output bytes=59876
Map output materialized bytes=72210
Input split bytes=95
Combiner Input records=0
Spilled Records=6564
Failed Shuffles=0
Merged Map outputs=0
GC time elapsed (ms)=0
Total committed heap usage (bytes)=633339904
File Input Format Counters
  Bytes Read=888190
2025-05-20 14:34:21.605 INFO mapred.LocalJobRunner: Flushing task: attempt_local261815800_0001_m_000000
2025-05-20 14:34:21.607 INFO mapred.LocalJobRunner: map task is done.
2025-05-20 14:34:21.607 INFO mapred.LocalJobRunner: Waiting for reduce tasks.
2025-05-20 14:34:21.608 INFO mapred.LocalJobRunner: Starting task: attempt_local261815800_0001_r_000000
2025-05-20 14:34:21.608 INFO PathOutputCommitterFactory: No output Committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 14:34:21.612 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 14:34:21.612 INFO output.FileOutputCommitter: skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:34:21.612 INFO mapred.Tasks: Using ResourceCalculatorProcessTree: []
2025-05-20 14:34:21.614 WARN impl.MetricsSystemImpl: Used org.apache.hadoop.mapreduce.task.reduce.Shuffle@cd4d107
2025-05-20 14:34:21.622 INFO reduce.MergeManagerImpl: JobTracker metrics system is alive and initialized!
2025-05-20 14:34:21.622 INFO reduce.MergeManagerImpl: MergerManager: memoryLimit=5829453312, maxSinglesShuffleLimit=1457363328, mergeThreshold=3847439360, ioSortFactor=10, memToMemMergeOutputsThreshold=10
2025-05-20 14:34:21.623 INFO reduce.InMemoryFetcher: attempt_local261815800_0001_r_000000 Thread started: EventFetcher for fetching Map Completion Events
2025-05-20 14:34:21.635 INFO reduce.LocalFetcher: localfetcher#1 about to shuffle output of map attempt_local261815800_0001_m_000000_0
2025-05-20 14:34:21.637 INFO reduce.InMemoryFetcher: Read 72206 bytes from map-output for attempt_local261815800_0001_m_000000_0 decomp: 72206 len: 72210 to MEMORY
2025-05-20 14:34:21.637 INFO reduce.MergeManagerImpl: closeInMemoryFile -> map-output of size: 72206, InMemoryMapOutputs.size() -> 1, commitMemory -> 0, usedMemory -> 72206
2025-05-20 14:34:21.638 INFO reduce.LocalFetcher: EventFetcher is interrupted.. Returning
2025-05-20 14:34:21.638 INFO mapred.LocalJobRunner: EventFetcher is interrupted.. Returning
2025-05-20 14:34:21.638 INFO reduce.MergeManagerImpl: findMerge called with 1 in-memory map-outputs and 0 on-disk map-outputs
2025-05-20 14:34:21.641 INFO mapred.Merger: Merging 1 sorted segments
2025-05-20 14:34:21.641 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 72199 bytes
2025-05-20 14:34:21.645 INFO reduce.MergeManagerImpl: Merged 1 segments, 72206 bytes to disk to satisfy reduce memory limit
2025-05-20 14:34:21.645 INFO reduce.MergeManagerImpl: Merging 1 files, 72199 bytes from disk
2025-05-20 14:34:21.645 INFO reduce.MergeManagerImpl: Merging 1 segments, 0 bytes from memory into reduce
2025-05-20 14:34:21.645 INFO reduce.MergeManagerImpl: Merged 1 segments left of total size: 72199 bytes
2025-05-20 14:34:21.645 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 72199 bytes
2025-05-20 14:34:21.679 INFO Configuration.deprecation: mapred.skip.on is deprecated. Instead, use mapreduce.job.skiprecords
2025-05-20 14:34:21.707 INFO mapred.Task: Task:attempt_local261815800_0001_r_000000_0 is done. And is in the process of committing
2025-05-20 14:34:21.771 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-20 14:34:21.771 INFO mapred.Task: Task attempt_local261815800_0001_r_000000_0 is allowed to commit now
2025-05-20 14:34:21.800 INFO mapred.Task: Saved report of task 'attempt_local261815800_0001_r_000000_0' to hdfs://localhost:9000/re
2025-05-20 14:34:21.802 INFO mapred.Task: reduce done
2025-05-20 14:34:21.803 INFO mapred.Task: Task 'attempt_local261815800_0001_r_000000_0' done.
2025-05-20 14:34:21.803 INFO mapred.Task: Final Counters for attempt_local261815800_0001_r_000000_0: Counters: 30
  File System Counters
    FILE: Number of bytes read=148882
    FILE: Number of bytes written=786208
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=888190
    HDFS: Number of bytes written=8
    HDFS: Number of read operations=10

    Reduce shuffle bytes=72210
    Reduce input records=5564
    Reduce output records=0
    Spilled Records=13128
    Shuffled Maps =1
    Failed Shuffles=0
    Merged Map outputs=1
    GC time elapsed (ms)=0
    Total committed heap usage (bytes)=1266679808
  Shuffle Errors
    BAD_ID=0
    CONNECTION=0
    IO_ERROR=0
    WRONG_LENGTH=0
    WRONG_MAP=0
    WRONG_PARTITION=0
    WRONG_REDUCE=0
  File Input Format Counters
    Bytes Read=888190
  File Output Format Counters
    Bytes Written=8
hadoop@bnsccece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /rem/part-00000
cat : /rem/part-00000: No such file or directory
hadoop@bnsccece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /rem/part-r-00000
190 46
hadoop@bnsccece-HP-Elite-Tower-800-G9-Desktop-PC:~$ package weatherdataavg;

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

```

b)

The screenshot shows the Eclipse IDE interface with the following details:

- Eclipse IDE Title Bar:** eclipse-wc - weatherdatameanmax/src/weatherdatameanmax/MeanMaxReducer.java - Eclipse IDE
- Package Explorer:** Shows the project structure under "weatherdatameanmax".
- MeanMaxReducer.java Content:** The code implements a Reducer for a MapReduce job. It processes temperature data, calculates the mean, and outputs it. The code uses Java's Iterator API and the IntWritable class from the Apache Hadoop library.
- Outline View:** Shows the class structure, including the reduce method.
- Terminal Window:** Shows the command-line output of starting the Hadoop daemon. It includes logs for namenodes, datanodes, secondary namenodes, and resource manager.

```
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
Hadoop is running. To abort,
Starting namenodes on [localhost]
localhost: namenode is running as process 9745. Stop it first and ensure /tmp/hadoop-hadoop-namenode.pid file is empty before retry.
Starting datanodes
localhost: datanode is running as process 9928. Stop it first and ensure /tmp/hadoop-hadoop-datanode.pid file is empty before retry.
Starting secondary namenodes [bmscsece-HP-Elite-Tower-800-G9-Desktop-PC]
bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: secondarynamenode is running as process 10221. Stop it first and ensure /tmp/hadoop-hadoop-secondarynamenode.pid file is empty before retry.
Starting resourcemanager
resourcemanager is running as process 10513. Stop it first and ensure /tmp/hadoop-hadoop-resourcemanager.pid file is empty before retry.
Starting nodemanagers
nodemanager is running as process 10664. Stop it first and ensure /tmp/hadoop-hadoop-nodemanager.pid file is empty before retry.
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mkdir /omn
ERROR: ls is not COMMAND nor fully qualified CLASSNAME.
Usage: hadoop [OPTIONS] SUBCOMMAND [SUBCOMMAND OPTIONS]
or hadoop [OPTIONS] CLASSNAME [CLASSNAME OPTIONS]
where CLASSNAME is a user-provided Java class

OPTIONS is none or any of:
buildpaths          attempt to add class files from build tree
--config dir        Hadoop config directory
--debug             turn on script debug mode
--help              usage information
hostnames list[,of,host,names] hosts to use in worker mode
hosts filename      list of hosts to use in worker mode
loglevel level     set the log4j level for this command
workers            turn on worker mode

SUBCOMMAND is one of:

Admin Commands:
daemonlog          get/set the log level for each daemon

Client Commands:
archive             create a Hadoop archive
checknative         check native Hadoop and compression libraries availability
classpath           prints the class path needed to get the Hadoop jar and the required libraries
conftest            validate configuration XML files
credential          interact with credential providers
distcp              distribute files
distcp              copy file or directories recursively
dutil               operations related to delegation tokens
envvars             display computed Hadoop environment variables
fs                 run a generic filesystem user client
gridmix             submit a mix of synthetic job, modeling a profiled from production load
jar <jar>           run a jar file. NOTE: please use "yarn jar" to launch YARN applications, not this command.
tninath             create the java libharu path
```

```

hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~

  applications, not this command.
jnpipath  prints the java.library.path
kdtag   Diagnose Kerberos Problems
kername  show auth_to_local principal conversion
key    manage keys via the KeyProvider
rumenfolder scale a runen input trace
runentrace convert tracings into a runen trace
sguard   S3 Commands
trace    view and modify Hadoop tracing settings
version   print the version

  Daemon Commands:

kns      run KMS, the Key Management Server
registrydns run the registry DNS server

SUBCOMMAND may print help when invoked w/o parameters or with -h.
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mkdir /omn
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -copyFromLocal /home/hadoop/Desktop/1901 /omn/1901
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/weatherdatameanmax.jar weatherdatameanmax.MeanMaxDriver /omn/1901 /ren
2025-05-20 14:53:15.615 INFO org.apache.hadoop.mapreduce.lib.input.FileInputFormat: Input paths from /omn/1901/metrics2.properties
2025-05-20 14:53:15.615 INFO org.apache.hadoop.metrics2.impl.MetricsSystemImpl: Scheduled metrics snapshot period 10 second(s).
2025-05-20 14:53:15.615 INFO org.apache.hadoop.metrics2.impl.MetricsSystemImpl: JobTracker metrics system started
2025-05-20 14:53:15.674 WARN mapred.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2025-05-20 14:53:15.737 INFO input.FileInputFormat: Total input files to process : 1
2025-05-20 14:53:15.833 INFO mapred.JobSubmitter: number of splits:1
2025-05-20 14:53:15.833 INFO mapred.JobSubmitter: Submitting tokens for job: job_local2143084439_0001
2025-05-20 14:53:15.886 INFO mapred.JobSubmitter: The job is executing at: http://localhost:8080/
2025-05-20 14:53:15.891 INFO mapred.Job: Running job: job_local2143084439_0001
2025-05-20 14:53:15.895 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 14:53:15.895 INFO output.FileOutputCommitter: File Output Committer Algorith version is 2
2025-05-20 14:53:15.895 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:53:15.895 INFO mapred.LocalJobunner: FileOutputCommitter is org.apache.hadoop.mapred.lib.output.FileOutputCommitter
2025-05-20 14:53:15.895 INFO mapred.LocalJobunner: Waiting for map tasks
2025-05-20 14:53:15.982 INFO mapred.LocalJobunner: Starting task attempt local2143084439_0001_m_000000_0
2025-05-20 14:53:15.996 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 14:53:15.996 INFO output.FileOutputCommitter: File Output Committer Algorith version is 2
2025-05-20 14:53:15.996 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:53:16.008 INFO mapred.Tasks: Using ResourceCalculatorForProcessTree: [ ]
2025-05-20 14:53:16.084 INFO mapred.MapTask: Processing split: hdfs://localhost:9080/omn/1901:0+888190
2025-05-20 14:53:16.084 INFO mapred.MapTask: (Equation) kvend=26188144(104857584)
2025-05-20 14:53:16.084 INFO mapred.MapTask: (Equation) mbi=100
2025-05-20 14:53:16.084 INFO mapred.MapTask: soft limit at 83884800
2025-05-20 14:53:16.084 INFO mapred.MapTask: bufstart = 0; bufvold = 104857600
2025-05-20 14:53:16.084 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2025-05-20 14:53:16.118 INFO mapred.LocalJobunner: Map output collector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-05-20 14:53:16.118 INFO mapred.MapTask: Map output collector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-05-20 14:53:16.119 INFO mapred.MapTask: Spilling map output
2025-05-20 14:53:16.119 INFO mapred.MapTask: bufstart = 0; bufvold = 104857600
2025-05-20 14:53:16.119 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26188144(104752576); length = 26253/6553600
2025-05-20 14:53:16.133 INFO mapred.Task: Task@attempt_local2143084439_0001_m_000000_0 is done. And ls in the process of committing
2025-05-20 14:53:16.135 INFO mapred.Task: attempt_local2143084439_0001_m_000000_0 Thread started: EventFetcher for fetching Map Completion Events
2025-05-20 14:53:16.145 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:53:16.145 INFO output.FileOutputCommitter: Using ResourceCalculatorForProcessTree: [ ]
2025-05-20 14:53:16.145 INFO mapred.ReduceTask: Using ResourceCalculatorForProcessTree: [ ]
2025-05-20 14:53:16.147 WARN org.apache.hadoop.mapred.Task.reduce.Shuffle@0b4ffe0: JobManagerImpl: JobTracker metrics system already initialized!
2025-05-20 14:53:16.155 INFO reduce.MergeManagerImpl: MergerManager: memoryLimit=5829453312, maxSingleShuffleLimit=1457363328, mergeThreshold=3847439360, toSortFactor=10, memToMemMergeOutputsThreshold=10
2025-05-20 14:53:16.155 INFO reduce.MergeManagerImpl: MergerManager: memoryLimit=5829453312, maxSingleShuffleLimit=1457363328, mergeThreshold=3847439360, toSortFactor=10, memToMemMergeOutputsThreshold=10
2025-05-20 14:53:16.157 INFO reduce.EventFetcher: attempt_local2143084439_0001_r_000000_0 Thread started: EventFetcher for fetching Map Completion Events
2025-05-20 14:53:16.172 INFO reduce.LocalFetcher: localfetcher#1 about to shuffle output of map attempt_local2143084439_0001_m_000000_0 decomp: 59078 len: 59082 to MEMORY
2025-05-20 14:53:16.172 INFO reduce.MergeManagerImpl: closeInMemoryFile -> map-output of size: 59078, inMemoryMapOutputs.size() -> 1, commitMemory -> 0, usedMemory -> 59078
2025-05-20 14:53:16.172 INFO reduce.EventFetcher: EventFetcher is interrupted.. Returning
2025-05-20 14:53:16.174 INFO mapred.LocalJobunner: 1 / 1 copied
2025-05-20 14:53:16.174 INFO reduce.MergeManagerImpl: finalMerge called with 1 in-memory map-outputs and 0 on-disk map-outputs
2025-05-20 14:53:16.176 INFO mapred.Merger: Merging 1 sorted segments
2025-05-20 14:53:16.176 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 59073 bytes
2025-05-20 14:53:16.181 INFO reduce.MergeManagerImpl: Merged 1 segments, 59078 bytes to disk to satisfy reduce memory limit
2025-05-20 14:53:16.181 INFO reduce.MergeManagerImpl: Merging 1 files, 59082 bytes from disk
2025-05-20 14:53:16.181 INFO reduce.MergeManagerImpl: Merged 1 segments, 0 bytes from memory into reduce
2025-05-20 14:53:16.182 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 59073 bytes
2025-05-20 14:53:16.182 INFO mapred.LocalJobunner: 1 / 1 copied.
2025-05-20 14:53:16.212 INFO Configuration.deprecation: mapred.skip.on is deprecated. Instead, use mapreduce.job.skiprecords
2025-05-20 14:53:16.275 INFO mapred.LocalJobunner: 1 / 1 copied.
2025-05-20 14:53:16.275 INFO mapred.Task: Task@attempt_local2143084439_0001_m_000000_0 is allowed to commit now
2025-05-20 14:53:16.299 INFO mapred.Task: Task attempt_local2143084439_0001_m_000000_0 saved output to 'attempt_local2143084439_0001_r_000000_0' to hdfs://localhost:9000/ren
2025-05-20 14:53:16.299 INFO mapred.Task: reduce -> reduce
2025-05-20 14:53:16.299 INFO mapred.Task: Task 'attempt_local2143084439_0001_m_000000_0' done.
2025-05-20 14:53:16.299 INFO mapred.Task: Final Counters for attempt_local2143084439_0001_r_000000_0: Counters: 30
  File System Counters
    FILE: Number of bytes read=122769
    FILE: Number of bytes written=763193
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=888190
    HDFS: Number of bytes written=81
    HDFS: Number of read operations=10
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=3
    HDFS: Number of bytes read erasure-coded=0
  Map-Reduce Framework
    Combine input records=0
    Combine output records=0
    Reduce input groups=12
    Reduce shuffle bytes=59082
    Reduce time records=5644
    Reduce output records=12
    Spilled Records=664
    Shuffled Maps =1
    Failed Shuffles=0
    Merged Map outputs=1
    GC time elapsed (ms)=0
    Total committed heap usage (bytes)=526385152
  Shuffle Errors
    BAD_ID=0
    RACKER=0
  
```

Screenshot captured You can paste the image from the clipboard.

```

2025-05-20 14:53:15,982 INFO mapred.LocalJobRunner: Starting task: attempt_12345678901234567890_0001_m_000000_0
2025-05-20 14:53:15,996 INFO output.PathOutputCommitterFactory: No output Committer
2025-05-20 14:53:15,996 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 14:53:15,996 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:53:16,004 INFO mapred.Task: Using ResourceCalculatorProcessTree : []
2025-05-20 14:53:16,004 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/omn/1901:0+888190
2025-05-20 14:53:16,004 INFO mapred.MapTask: (Equivocation ID: 12345678901234567890)
2025-05-20 14:53:16,044 INFO mapred.MapTask: source.task.io.sort.mbo: 100
2025-05-20 14:53:16,044 INFO mapred.MapTask: soft limit at 83884960
2025-05-20 14:53:16,044 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
2025-05-20 14:53:16,044 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2025-05-20 14:53:16,118 INFO mapred.LocalJobRunner: Map output collector flush
2025-05-20 14:53:16,118 INFO mapred.LocalJobRunner: Map output collector flush of map output
2025-05-20 14:53:16,119 INFO mapred.MapTask: Spilling map output
2025-05-20 14:53:16,119 INFO mapred.MapTask: bufstart = 0; bufend = 45948; bufvoid = 104857600
2025-05-20 14:53:16,119 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26188144(104752576); length = 26253/6553600
2025-05-20 14:53:16,124 INFO mapred.MapTask: Finished spill 0
2025-05-20 14:53:16,133 INFO mapred.Task: Task:attempt_local2143084439_0001_m_000000_0 is done. And is in the process of committing
2025-05-20 14:53:16,135 INFO mapred.LocalJobRunner: map
2025-05-20 14:53:16,135 INFO mapred.Task: Task 'attempt_local2143084439_0001_m_000000_0' done.
2025-05-20 14:53:16,136 INFO mapred.Task: Final Counters for attempt_local2143084439_0001_m_000000_0: Counters: 23
  File System Counters
    FILE: Number of bytes read=4573
    FILE: Number of bytes written=704111
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=888190
    HDFS: Number of bytes written=0
    HDFS: Number of read operations=5
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=1
    HDFS: Number of bytes read erasure-coded=0
  Map-Reduce Framework
    Map input records=6565
    Map output records=6564
    Map output bytes=45948
    Map output materialized bytes=59082
    Input split bytes=95
    Combine input records=0
    Spilled Records=6564
    Failed Shuffles=0
    Merged Map outputs=0
    GC time elapsed (ns)=0
    Total committed heap usage (bytes)=526385152
  File Input Format Counters
    Bytes Read=888190
2025-05-20 14:53:16,138 INFO mapred.LocalJobRunner: Flushing task: attempt_local2143084439_0001_m_000000_0
2025-05-20 14:53:16,140 INFO mapred.LocalJobRunner: map task executor complete.
2025-05-20 14:53:16,140 INFO mapred.LocalJobRunner: Waiting for reduce tasks
2025-05-20 14:53:16,140 INFO mapred.LocalJobRunner: Starting task: attempt_local2143084439_0001_r_000000_0
2025-05-20 14:53:16,145 INFO output.PathOutputCommitterFactory: No output Committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 14:53:16,145 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 14:53:16,145 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:53:16,145 INFO mapred.Task: Using ResourceCalculatorProcessTree : []

```

Screenshot captured
You can paste the image from the clipboard.

```

FILE: Number of bytes written=763193
FILE: Number of read operations=0
FILE: Number of large read operations=0
FILE: Number of write operations=0
HDFS: Number of bytes read=888198
HDFS: Number of bytes written=81
HDFS: Number of large read operations=10
HDFS: Number of large read operations=0
HDFS: Number of write operations=3
HDFS: Number of bytes read erasure-coded=0

Map-Reduce Framework
  Combine input records=0
  Combine output records=0
  Reduce input records=0
  Reduce shuffle bytes=59082
  Reduce input records=6564
  Reduce output records=12
  Spilled Records=6564
  Shuffled Maps =1
  Failed Shuffles=0
  Merged Map outputs=1
  GC time elapsed (ns)=0
  Total committed heap usage (bytes)=526385152

Shuffle Errors
  BAD_ID=0
  CONNECTION=0
  IO_ERROR=0
  NETWORK_LENGTH=0
  WRONG_MAP=0
  WRONG_REDUCE=0

File Output Format Counters
  Bytes Written=81
2025-05-20 14:53:16,290 INFO mapred.LocalJobRunner: Finishing task: attempt_local2143084439_0001_r_000000_0
2025-05-20 14:53:16,291 INFO mapred.LocalJobRunner: reduce task executor complete.
2025-05-20 14:53:16,295 INFO mapreduce.Job: Job job_local2143084439_0001 running in uber mode : false
2025-05-20 14:53:16,897 INFO mapreduce.Job: map 100% reduce 100%
2025-05-20 14:53:16,899 INFO mapreduce.Job: Job job_local2143084439_0001 completed successfully
2025-05-20 14:53:16,902 INFO mapreduce.Job: Counters
  File System Counters
    FILE: Number of bytes read=127342
    FILE: Number of bytes written=1467304
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=1776388
    HDFS: Number of bytes written=81
    HDFS: Number of read operations=15
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=4
    HDFS: Number of bytes read erasure-coded=0

Map-Reduce Framework
  Map input records=6565
  Map output records=6564
  Map output bytes=45948
  Map output materialized bytes=59082
  Total committed heap usage (bytes)=36

FILE: Number of bytes written=1467304
FILE: Number of read operations=0
FILE: Number of large read operations=0
FILE: Number of write operations=0
HDFS: Number of bytes read=1776388
HDFS: Number of bytes written=81
HDFS: Number of read operations=15
HDFS: Number of large read operations=0
HDFS: Number of write operations=4
HDFS: Number of bytes read erasure-coded=0

Map-Reduce Framework
  Map input records=6565
  Map output records=6564
  Map output bytes=45948
  Map output materialized bytes=59082
  Input split bytes=95
  Combine input records=0
  Combine output records=0
  Reduce input groups=12
  Reduce shuffle bytes=59082
  Reduce input records=6564
  Reduce output records=12
  Spilled Records=13128
  Shuffled Maps =1
  Failed Shuffles=0
  Merged Map outputs=1
  GC time elapsed (ns)=0
  Total committed heap usage (bytes)=1052770304

Shuffle Errors
  BAD_ID=0
  CONNECTION=0
  IO_ERROR=0
  NETWORK_LENGTH=0
  WRONG_MAP=0
  WRONG_REDUCE=0

File Input Format Counters
  Bytes Read=888198
File Output Format Counters
  Bytes Written=81

hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /omn/part-r-00000
cat: /omn/part-r-00000: No such file or directory
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /ren/part-r-00000
01      -13
02      -66
03      -15
04      -43
05      108
06      168
07      219
08      198
09      141
10      100
11      1
12      -61
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ 
```

Lab 6: Hadoop

Question: Implement Wordcount program on Hadoop framework

Code with Output:

eclipse-workspace - wordcount/src/WCDriver.java - Eclipse IDE

File Edit Source Refactor Navigate Search Project Run Window Help

Package Explorer X WCDriver.java X WCMapper.java X WCReducer.java Task List X

word_count wordcount JRE System Library [JavaSE-1.8] SRC (default package) WCDriver.java WCMapper.java WCReducer.java wordcount Referenced Libraries

```

1 import java.io.IOException;
2 import org.apache.hadoop.conf.Configured;
3 import org.apache.hadoop.fs.Path;
4 import org.apache.hadoop.io.IntWritable;
5 import org.apache.hadoop.io.Text;
6 import org.apache.hadoop.mapred.FileInputFormat;
7 import org.apache.hadoop.mapred.FileOutputFormat;
8 import org.apache.hadoop.mapred.JobClient;
9 import org.apache.hadoop.mapred.JobConf;
10 import org.apache.hadoop.util.Tool;
11 import org.apache.hadoop.util.ToolRunner;
12
13 public class WCDriver extends Configured implements Tool {
14
15     public int run(String[] args) throws IOException {
16         if (args.length < 2) {
17             System.out.println("Please provide input and output paths");
18             return -1;
19         }
20
21         JobConf conf = new JobConf(WCDriver.class);
22         conf.setJobName("WordCount");
23         conf.setJarByClass(WCDriver.class); // Ensures job runs from correct JAR
24
25         FileInputFormat.setInputPaths(conf, new Path(args[0]));
26         FileOutputFormat.setOutputPath(conf, new Path(args[1]));
27
28         conf.setMapperClass(WCMapper.class);
29         conf.setReducerClass(WCReducer.class);
30
31         conf.setMapOutputKeyClass(Text.class);
32         conf.setMapOutputValueClass(IntWritable.class);

```

Find All Activate... Outline X WCDriver

Problems @ Javadoc Declaration Console Install Java 24 Support X

Java 24 has been released.

Would you like to install Eclipse Java Development Tools support for Java 24 into your IDE?

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[Download Temurin JDK 24](#) [Download OpenJDK 24](#)

wordcount

```

hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mkdir /rsg
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -copyFromLocal /home/hadoop/Desktop/sample.txt /rsg/sample.txt
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/wordcount.jar WCDriver /rsg/sample.txt /result
2025-05-06 15:05:01,260 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2025-05-06 15:05:01,299 INFO impl.MetricssystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-06 15:05:01,299 INFO impl.MetricssystemImpl: JobTracker metrics system started
2025-05-06 15:05:01,305 WARN impl.MetricsSystemImpl: JobTracker metrics system already initialized!
2025-05-06 15:05:01,365 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2025-05-06 15:05:01,414 INFO mapred.FileInputFormat: Total input files to process : 1
2025-05-06 15:05:01,445 INFO mapreduce.JobSubmitter: number of splits:1
2025-05-06 15:05:01,511 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local90897529_0001
2025-05-06 15:05:01,511 INFO mapreduce.JobSubmitter: Executing with tokens: []
2025-05-06 15:05:01,565 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-05-06 15:05:01,566 INFO mapreduce.Job: Running job: job_local90897529_0001
2025-05-06 15:05:01,566 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-05-06 15:05:01,567 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapred.FileOutputCommitter
2025-05-06 15:05:01,569 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2

```

```

hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~

2025-05-06 15:05:01,299 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-06 15:05:01,299 INFO impl.MetricsSystemImpl: JobTracker metrics system started
2025-05-06 15:05:01,305 WARN impl.MetricsSystemImpl: JobTracker metrics system already initialized!
2025-05-06 15:05:01,365 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2025-05-06 15:05:01,414 INFO mapred.FileInputFormat: Total input files to process : 1
2025-05-06 15:05:01,445 INFO mapreduce.JobSubmitter: number of splits:1
2025-05-06 15:05:01,511 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local90897529_0001
2025-05-06 15:05:01,511 INFO mapreduce.JobSubmitter: Executing with tokens: []
2025-05-06 15:05:01,565 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-05-06 15:05:01,566 INFO mapreduce.Job: Running job: job_local90897529_0001
2025-05-06 15:05:01,566 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-05-06 15:05:01,567 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapred.FileOutputCommitter
2025-05-06 15:05:01,569 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 15:05:01,569 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false , ignore cleanup failures: false
2025-05-06 15:05:01,606 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-05-06 15:05:01,607 INFO mapred.LocalJobRunner: Starting task: attempt_local90897529_0001_m_000000_0
2025-05-06 15:05:01,618 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 15:05:01,618 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false , ignore cleanup failures: false
2025-05-06 15:05:01,624 INFO mapred.Task: Using ResourceCalculatorProcessTree : []
2025-05-06 15:05:01,631 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/rsg/sample.txt:0+89
2025-05-06 15:05:01,640 INFO mapred.MapTask: numReduceTasks: 1
2025-05-06 15:05:01,671 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)
2025-05-06 15:05:01,671 INFO mapred.MapTask: mapreduce.task.io.sort.nb: 100
2025-05-06 15:05:01,671 INFO mapred.MapTask: soft limit at 83886080
2025-05-06 15:05:01,671 INFO mapred.MapTask: bufstart = 0; bufend = 104857600
2025-05-06 15:05:01,671 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2025-05-06 15:05:01,673 INFO mapred.MapTask: Map output collector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-05-06 15:05:01,742 INFO mapred.LocalJobRunner:
2025-05-06 15:05:01,742 INFO mapred.MapTask: Starting flush of map output
2025-05-06 15:05:01,742 INFO mapred.MapTask: Spilling map output
2025-05-06 15:05:01,742 INFO mapred.MapTask: bufstart = 0; bufend = 169; bufvoid = 104857600
2025-05-06 15:05:01,742 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26214320(104857280); length = 77/6553600
2025-05-06 15:05:01,745 INFO mapred.MapTask: Finished spill 0
2025-05-06 15:05:01,751 INFO mapred.Task: Task:attempt_local90897529_0001_m_000000_0 is done. And is in the process of committing
2025-05-06 15:05:01,753 INFO mapred.LocalJobRunner: hdfs://localhost:9000/rsg/sample.txt:0+89
2025-05-06 15:05:01,753 INFO mapred.Task: Task 'attempt_local90897529_0001_m_000000_0' done.
2025-05-06 15:05:01,756 INFO mapred.Task: Final Counters for attempt_local90897529_0001_m_000000_0: Counters: 23
File System Counters
    FILE: Number of bytes read=4273
    FILE: Number of bytes written=639534
    FILE: Number of read operations=0

```

```

hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~

BAD_ID=0
CONNECTION=0
IO_ERROR=0
WRONG_LENGTH=0
WRONG_MAP=0
WRONG_REDUCE=0
File Output Format Counters
    Bytes Written=69
2025-05-06 15:05:01,897 INFO mapred.LocalJobRunner: Finishing task: attempt_local90897529_0001_r_000000_0
2025-05-06 15:05:01,897 INFO mapred.LocalJobRunner: reduce task executor complete.
2025-05-06 15:05:02,569 INFO mapreduce.Job: Job job_local90897529_0001 running in uber mode : false
2025-05-06 15:05:02,572 INFO mapreduce.Job: map 100% reduce 100%
2025-05-06 15:05:02,574 INFO mapreduce.Job: Job job_local90897529_0001 completed successfully
2025-05-06 15:05:02,584 INFO mapreduce.Job: Counters: 36
File System Counters
    FILE: Number of bytes read=9008
    FILE: Number of bytes written=1279283
    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=15
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=4
    HDFS: Number of bytes read erasure-coded=0
Map-Reduce Framework
    Map input records=5
    Map output records=20
    Map output bytes=169
    Map output materialized bytes=215
    Input split bytes=88
    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)=0
    Total committed heap usage (bytes)=1052770304

```

```
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~
FILE: Number of write operations=0
HDFS: Number of bytes read=89
HDFS: Number of bytes written=0
HDFS: Number of read operations=5
HDFS: Number of large read operations=0
HDFS: Number of write operations=1
HDFS: Number of bytes read erasure-coded=0
Map-Reduce Framework
  Map input records=5
  Map output records=20
  Map output bytes=169
  Map output materialized bytes=215
  Input split bytes=88
  Combine input records=0
  Spilled Records=20
  Failed Shuffles=0
  Merged Map outputs=0
  GC time elapsed (ms)=0
  Total committed heap usage (bytes)=526385152
File Input Format Counters
  Bytes Read=89
2025-05-06 15:05:01,756 INFO mapred.LocalJobRunner: Finishing task: attempt_local90897529_0001_m_000000_0
2025-05-06 15:05:01,757 INFO mapred.LocalJobRunner: map task executor complete.
2025-05-06 15:05:01,758 INFO mapred.LocalJobRunner: Waiting for reduce tasks
2025-05-06 15:05:01,758 INFO mapred.LocalJobRunner: Starting task: attempt_local90897529_0001_r_000000_0
2025-05-06 15:05:01,762 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 15:05:01,762 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false , ignore cleanup failures: false
2025-05-06 15:05:01,762 INFO mapred.Task: Using ResourceCalculatorProcessTree : [ ]
2025-05-06 15:05:01,763 INFO mapred.ReduceTask: Using ShuffleConsumerPlugin: org.apache.hadoop.mapreduce.task.reduce.Shuffle@636a90e9
2025-05-06 15:05:01,764 WARN impl.MetricsSystemImpl: JobTracker metrics system already initialized!
2025-05-06 15:05:01,771 INFO reduce.MergeManagerImpl: MergerManager: memoryLimit=5827985408, maxSingleShuffleLimit=1456996352, mergeThreshold=3846470400, ioSortFactor=10, memToMemMergeOutputsThreshold=10
2025-05-06 15:05:01,772 INFO reduce.EventFetcher: attempt_local90897529_0001_r_000000_0 Thread started: EventFetcher for fetching Map Completion Events
2025-05-06 15:05:01,785 INFO reduce.LocalFetcher: localfetcher#1 about to shuffle output of map attempt_local90897529_0001_m_000000_0 dec
omp: 211 len: 215 to MEMORY
2025-05-06 15:05:01,787 INFO reduce.InMemoryMapOutput: Read 211 bytes from map-output for attempt_local90897529_0001_m_000000_0
2025-05-06 15:05:01,788 INFO reduce.MergeManagerImpl: closeInMemoryFile -> map-output of size: 211, inMemoryMapOutputs.size() -> 1, committedMemory -> 0, usedMemory ->211
2025-05-06 15:05:01,788 INFO reduce.EventFetcher: EventFetcher is interrupted.. Returning
2025-05-06 15:05:01,789 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-06 15:05:01,789 INFO reduce.MergeManagerImpl: finalMerge called with 1 in-memory map-outputs and 0 on-disk map-outputs
2025-05-06 15:05:01,792 INFO mapred.Merger: Merging 1 sorted segments
```

```
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC: ~
2025-05-06 15:05:01,792 INFO reduce.MergeManagerImpl: Merged 1 segments, 211 bytes to disk to satisfy reduce memory limit
2025-05-06 15:05:01,793 INFO reduce.MergeManagerImpl: Merging 1 files, 215 bytes from disk
2025-05-06 15:05:01,793 INFO reduce.MergeManagerImpl: Merging 0 segments, 0 bytes from memory into reduce
2025-05-06 15:05:01,793 INFO mapred.Merger: Merging 1 sorted segments
2025-05-06 15:05:01,793 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 205 bytes
2025-05-06 15:05:01,793 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-06 15:05:01,867 INFO mapred.Task: Task@attempt_local90897529_0001_r_000000_0 is done. And is in the process of committing
2025-05-06 15:05:01,869 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-06 15:05:01,869 INFO mapred.Task: Task attempt_local90897529_0001_r_000000_0 is allowed to commit now
2025-05-06 15:05:01,894 INFO output.FileOutputCommitter: Saved output of task 'attempt_local90897529_0001_r_000000_0' to hdfs://localhost:9000/result
2025-05-06 15:05:01,896 INFO mapred.LocalJobRunner: reduce > reduce
2025-05-06 15:05:01,896 INFO mapred.Task: Task 'attempt_local90897529_0001_r_000000_0' done.
2025-05-06 15:05:01,897 INFO mapred.Task: Final Counters for attempt_local90897529_0001_r_000000_0: Counters: 30
File System Counters
    FILE: Number of bytes read=4735
    FILE: Number of bytes written=639749
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=89
    HDFS: Number of bytes written=69
    HDFS: Number of read operations=10
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=3
    HDFS: Number of bytes read erasure-coded=0
Map-Reduce Framework
    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=20
    Shuffled Maps =1
    Failed Shuffles=0
    Merged Map outputs=1
    GC time elapsed (ms)=0
    Total committed heap usage (bytes)=526385152
Shuffle Errors
    BAD_ID=0
    CONNECTION=0
    IO_ERROR=0
    WRONG_LENGTH=0
```

```
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC: ~
HDFS: Number of write operations=4
HDFS: Number of bytes read erasure-coded=0
Map-Reduce Framework
    Map input records=5
    Map output records=20
    Map output bytes=169
    Map output materialized bytes=215
    Input split bytes=88
    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)=0
    Total committed heap usage (bytes)=1052770304
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
Exit Code: 0
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC: ~$ hadoop fs -cat /result/part-00000
are      1
brother  1
family   1
hi       1
how      5
is       4
job      1
sister   1
you      1
your     4
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC: ~$
```

Lab 7: Hadoop

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

Code with Output:

The screenshot shows the Eclipse IDE interface with the following details:

- File Bar:** File, Edit, Source, Refactor, Navigate, Search, Project, Run, Window, Help.
- Package Explorer:** Shows the project structure: topnlab (JRE System Library [JavaSE-1.8]), src (TopN.java, TopNReducer.java, TopNMapper.java, TopNCombiner.java).
- Editor:** Displays the code for `TopNMapper.java`. The code implements the `Mapper` interface, performing word counting and emitting words with their counts. A specific line of code is highlighted in blue: `this.context.write(this.word, one);`.
- Outline View:** Shows the class structure: `TopNMapper` with fields `one`, `word`, and `tokens`, and a method `map(Object, Text, Context)`.

```

hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ start -all.sh
Command 'start' not found, did you mean:
  command 'stars' from snap stars (2.7jrc3)
  command 'rstart' from deb x11-session-utils (7.7+4build2)
  command 'kstart' from deb kde-cli-tools (4:5.24.4-0ubuntu1)
  command 'startx' from deb xinit (1.4.1-0ubuntu4)
  command 'stat' from deb coreutils (8.32-4.1ubuntu1.2)
  command 'tart' from deb tart (3.10-1build1)
See 'snap info <snapname>' for additional versions.
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [bmscsece-HP-Elite-Tower-800-G9-Desktop-PC]
Starting resourcemanager
Starting nodemanagers
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mkdir /mno
mkdir: Cannot create directory /mno. Name node is in safe mode.
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ ^C
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfsadmin -safemode get
Safe mode is OFF
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mkdir /mno
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -copyFromLocal /home/hadoop/Desktop/sample.txt /mno/sample.txt
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/topn.jar TopN /mno/sample.txt /res
Exception in thread "main" java.lang.ClassNotFoundException: TopN
        at java.base/java.net.URLClassLoader.findClass(URLClassLoader.java:476)
        at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:594)
        at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:527)
        at java.base/java.lang.Class.forName0(Native Method)
        at java.base/java.lang.Class.forName(Class.java:398)
        at org.apache.hadoop.util.RunJar.run(RunJar.java:321)
        at org.apache.hadoop.util.RunJar.main(RunJar.java:241)
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/topn.jar topnlab /mno/sample.txt /res
Exception in thread "main" java.lang.ClassNotFoundException: topnlab
        at java.base/java.net.URLClassLoader.findClass(URLClassLoader.java:476)
        at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:594)
        at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:527)
        at java.base/java.lang.Class.forName0(Native Method)
        at java.base/java.lang.Class.forName(Class.java:398)
        at org.apache.hadoop.util.RunJar.run(RunJar.java:321)
        at org.apache.hadoop.util.RunJar.main(RunJar.java:241)
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/topn.jar TopN /mno/sample.txt /res
Exception in thread "main" java.lang.NoClassDefFoundError: topnlab/TopN (wrong name: TopN)
        at java.base/java.lang.ClassLoader.defineClass1(Native Method)

```

```

hadoop@bmscscse-HP-Elite-Tower-800-G9-Desktop-PC: ~
at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:594)
at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:527)
at java.base/java.lang.Class.forName0(Native Method)
at java.base/java.lang.Class.forName(Class.java:398)
at org.apache.hadoop.util.RunJar.run(RunJar.java:321)
at org.apache.hadoop.util.RunJar.main(RunJar.java:241)
hadoop@bmscscse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/topn.jar topnlab /mno/sample.txt /res
Exception in thread "main" java.lang.ClassNotFoundException: topnlab
at java.base/java.net.URLClassLoader.findClass(URLClassLoader.java:476)
at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:594)
at java.base/java.lang.Class.forName0(Native Method)
at java.base/java.lang.Class.forName(Class.java:398)
at org.apache.hadoop.util.RunJar.run(RunJar.java:321)
at org.apache.hadoop.util.RunJar.main(RunJar.java:241)
hadoop@bmscscse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/topn.jar TopN /mno/sample.txt /res
Exception in thread "main" java.lang.NoClassDefFoundError: topnlab/TopN (wrong name: TopN)
at java.base/java.lang.ClassLoader.defineClass1(Native Method)
at java.base/java.lang.ClassLoader.defineClass(ClassLoader.java:1022)
at java.base/java.security.SecureClassLoader.defineClass(SecureClassLoader.java:174)
at java.base/java.net.URLClassLoader.defineClass(URLClassLoader.java:555)
at java.base/java.net.URLClassLoader$1.run(URLClassLoader.java:458)
at java.base/java.net.URLClassLoader$1.run(URLClassLoader.java:452)
at java.base/java.security.AccessController.doPrivileged(Native Method)
at java.base/java.net.URLClassLoader.findClass(URLClassLoader.java:451)
at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:594)
at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:527)
at java.base/java.lang.Class.forName0(Native Method)
at java.base/java.lang.Class.forName(Class.java:398)
at org.apache.hadoop.util.RunJar.run(RunJar.java:321)
at org.apache.hadoop.util.RunJar.main(RunJar.java:241)
hadoop@bmscscse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/topn.jar topnlab.TopN /mno/sample.txt /res
2025-05-20 13:58:09,506 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2025-05-20 13:58:09,545 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-20 13:58:09,545 INFO impl.MetricssystemImpl: JobTracker metrics system started
2025-05-20 13:58:09,658 INFO input.FileInputFormat: Total input files to process : 1
2025-05-20 13:58:09,709 INFO mapreduce.JobSubmitter: number of splits:1
2025-05-20 13:58:09,777 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local408680812_0001
2025-05-20 13:58:09,778 INFO mapreduce.JobSubmitter: Executing with tokens: []
2025-05-20 13:58:09,836 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-05-20 13:58:09,837 INFO mapreduce.Job: Running job: job_local408680812_0001
2025-05-20 13:58:09,838 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-05-20 13:58:09,841 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 13:58:09,842 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 13:58:09,842 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false

```

```
hadoop@bmscscse-HP-Elite-Tower-800-G9-Desktop-PC: ~
2025-05-20 13:58:09,842 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 13:58:09,842 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 13:58:09,842 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter
2025-05-20 13:58:09,884 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-05-20 13:58:09,885 INFO mapred.LocalJobRunner: Starting task: attempt_local408680812_0001_m_000000_0
2025-05-20 13:58:09,895 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 13:58:09,895 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 13:58:09,895 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 13:58:09,903 INFO mapred.Task: Using ResourceCalculatorProcessTree : []
2025-05-20 13:58:09,906 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/mno/sample.txt:0+75
2025-05-20 13:58:09,945 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)
2025-05-20 13:58:09,945 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
2025-05-20 13:58:09,945 INFO mapred.MapTask: soft limit at 83886080
2025-05-20 13:58:09,945 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
2025-05-20 13:58:09,945 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2025-05-20 13:58:09,947 INFO mapred.MapTask: Map output collector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-05-20 13:58:10,006 INFO mapred.LocalJobRunner:
2025-05-20 13:58:10,007 INFO mapred.MapTask: Starting flush of map output
2025-05-20 13:58:10,007 INFO mapred.MapTask: Spilling map output
2025-05-20 13:58:10,007 INFO mapred.MapTask: bufstart = 0; bufend = 135; bufvoid = 104857600
2025-05-20 13:58:10,007 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26214340(104857360); length = 57/6553600
0
2025-05-20 13:58:10,010 INFO mapred.MapTask: Finished spill 0
2025-05-20 13:58:10,014 INFO mapred.Task: Task:attempt_local408680812_0001_m_000000_0 is done. And is in the process of committing
2025-05-20 13:58:10,016 INFO mapred.LocalJobRunner: map
2025-05-20 13:58:10,017 INFO mapred.Task: Task 'attempt_local408680812_0001_m_000000_0' done.
2025-05-20 13:58:10,020 INFO mapred.Task: Final Counters for attempt_local408680812_0001_m_000000_0: Counters: 23
    File System Counters
        FILE: Number of bytes read=751
        FILE: Number of bytes written=645435
        FILE: Number of read operations=0
        FILE: Number of large read operations=0
        FILE: Number of write operations=0
        HDFS: Number of bytes read=75
        HDFS: Number of bytes written=0
        HDFS: Number of read operations=5
        HDFS: Number of large read operations=0
        HDFS: Number of write operations=1
        HDFS: Number of bytes read erasure-coded=0
    Map-Reduce Framework
        Map input records=2
        Map output records=15
        Map output bytes=135
```

```
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC: ~
2025-05-20 13:58:10,168 INFO mapred.Task: Task:attempt_local408680812_0001_r_000000_0 is done. And is in the process of committing.
2025-05-20 13:58:10,169 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-20 13:58:10,169 INFO mapred.Task: Task attempt_local408680812_0001_r_000000_0 is allowed to commit now
2025-05-20 13:58:10,194 INFO output.FileOutputCommitter: Saved output of task 'attempt_local408680812_0001_r_000000_0' to hdfs://localhost:9000/res
2025-05-20 13:58:10,195 INFO mapred.LocalJobRunner: reduce > reduce
2025-05-20 13:58:10,196 INFO mapred.Task: Task 'attempt_local408680812_0001_r_000000_0' done.
2025-05-20 13:58:10,197 INFO mapred.Task: Final Counters for attempt_local408680812_0001_r_000000_0: Counters: 30
  File System Counters
    FILE: Number of bytes read=7887
    FILE: Number of bytes written=645606
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=75
    HDFS: Number of bytes written=105
    HDFS: Number of read operations=10
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=3
    HDFS: Number of bytes read erasure-coded=0
  Map-Reduce Framework
    Combine input records=0
    Combine output records=0
    Reduce input groups=15
    Reduce shuffle bytes=171
    Reduce input records=15
    Reduce output records=15
    Spilled Records=15
    Shuffled Maps =1
    Failed Shuffles=0
    Merged Map outputs=1
    GC time elapsed (ms)=0
    Total committed heap usage (bytes)=526385152
  Shuffle Errors
    BAD_ID=0
    CONNECTION=0
    IO_ERROR=0
    WRONG_LENGTH=0
    WRONG_MAP=0
    WRONG_REDUCE=0
  File Output Format Counters
    Bytes Written=105
2025-05-20 13:58:10,197 INFO mapred.LocalJobRunner: Finishing task: attempt_local408680812_0001_r_000000_0
2025-05-20 13:58:10,197 INFO mapred.LocalJobRunner: reduce task executor complete.
2025-05-20 13:58:10,840 INFO mapreduce.Job: Job job_local408680812_0001 running in uber mode : false
2025-05-20 13:58:10,842 INFO mapreduce.Job: map 100% reduce 100%
2025-05-20 13:58:10,843 INFO mapreduce.Job: Job job_local408680812_0001 completed successfully
```

```
hadoop@bmscse-HP-Elite-Tower-800-G9-Desktop-PC: ~
2025-05-20 13:58:10,168 INFO mapred.Task: Task:attempt_local408680812_0001_r_000000_0 is done. And is in the process of committing.
2025-05-20 13:58:10,169 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-20 13:58:10,169 INFO mapred.Task: Task attempt_local408680812_0001_r_000000_0 is allowed to commit now
2025-05-20 13:58:10,194 INFO output.FileOutputCommitter: Saved output of task 'attempt_local408680812_0001_r_000000_0' to hdfs://localhost:9000/res
2025-05-20 13:58:10,195 INFO mapred.LocalJobRunner: reduce > reduce
2025-05-20 13:58:10,196 INFO mapred.Task: Task 'attempt_local408680812_0001_r_000000_0' done.
2025-05-20 13:58:10,197 INFO mapred.Task: Final Counters for attempt_local408680812_0001_r_000000_0: Counters: 30
  File System Counters
    FILE: Number of bytes read=7887
    FILE: Number of bytes written=645606
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=75
    HDFS: Number of bytes written=105
    HDFS: Number of read operations=10
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=3
    HDFS: Number of bytes read erasure-coded=0
  Map-Reduce Framework
    Combine input records=0
    Combine output records=0
    Reduce input groups=15
    Reduce shuffle bytes=171
    Reduce input records=15
    Reduce output records=15
    Spilled Records=15
    Shuffled Maps =1
    Failed Shuffles=0
    Merged Map outputs=1
    GC time elapsed (ms)=0
    Total committed heap usage (bytes)=526385152
  Shuffle Errors
    BAD_ID=0
    CONNECTION=0
    IO_ERROR=0
    WRONG_LENGTH=0
    WRONG_MAP=0
    WRONG_REDUCE=0
  File Output Format Counters
    Bytes Written=105
2025-05-20 13:58:10,197 INFO mapred.LocalJobRunner: Finishing task: attempt_local408680812_0001_r_000000_0
2025-05-20 13:58:10,197 INFO mapred.LocalJobRunner: reduce task executor complete.
2025-05-20 13:58:10,840 INFO mapreduce.Job: Job job_local408680812_0001 running in uber mode : false
2025-05-20 13:58:10,842 INFO mapreduce.Job: map 100% reduce 100%
2025-05-20 13:58:10,843 INFO mapreduce.Job: Job job_local408680812_0001 completed successfully
```

```
+ hadoop@bmscscse-HP-Elite-Tower-800-G9-Desktop-PC: ~
Map input records=2
Map output records=15
Map output bytes=135
Map output materialized bytes=171
Input split bytes=101
Combine input records=0
Spilled Records=15
Failed Shuffles=0
Merged Map outputs=0
GC time elapsed (ms)=0
Total committed heap usage (bytes)=526385152
File Input Format Counters
    Bytes Read=75
2025-05-20 13:58:10,020 INFO mapred.LocalJobRunner: Finishing task: attempt_local408680812_0001_m_000000_0
2025-05-20 13:58:10,020 INFO mapred.LocalJobRunner: map task executor complete.
2025-05-20 13:58:10,021 INFO mapred.LocalJobRunner: Waiting for reduce tasks
2025-05-20 13:58:10,022 INFO mapred.LocalJobRunner: Starting task: attempt_local408680812_0001_r_000000_0
2025-05-20 13:58:10,027 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 13:58:10,027 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 13:58:10,027 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 13:58:10,027 INFO mapred.Task: Using ResourceCalculatorProcessTree : []
2025-05-20 13:58:10,028 INFO mapred.ReduceTask: Using ShuffleConsumerPlugin: org.apache.hadoop.mapreduce.task.reduce.Shuffle@6622090a
2025-05-20 13:58:10,029 WARN impl.MetricsSystemImpl: JobTracker metrics system already initialized!
2025-05-20 13:58:10,037 INFO reduce.MergeManagerImpl: MergerManager: memoryLimit=5829453312, maxSingleShuffleLimit=1457363328, mergeThreshold=3847439360, ioSortFactor=10, memToMemMergeOutputsThreshold=10
2025-05-20 13:58:10,038 INFO reduce.EventFetcher: attempt_local408680812_0001_r_000000_0 Thread started: EventFetcher for fetching Map Completion Events
2025-05-20 13:58:10,053 INFO reduce.LocalFetcher: localfetcher#1 about to shuffle output of map attempt_local408680812_0001_m_000000_0 decomp: 167 len: 171 to MEMORY
2025-05-20 13:58:10,054 INFO reduce.InMemoryMapOutput: Read 167 bytes from map-output for attempt_local408680812_0001_m_000000_0
2025-05-20 13:58:10,055 INFO reduce.MergeManagerImpl: closeInMemoryFile -> map-output of size: 167, inMemoryMapOutputs.size() -> 1, commitMemory -> 0, usedMemory ->167
2025-05-20 13:58:10,056 INFO reduce.EventFetcher: EventFetcher is interrupted.. Returning
2025-05-20 13:58:10,056 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-20 13:58:10,056 INFO reduce.MergeManagerImpl: finalMerge called with 1 in-memory map-outputs and 0 on-disk map-outputs
2025-05-20 13:58:10,059 INFO mapred.Merger: Merging 1 sorted segments
2025-05-20 13:58:10,059 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 162 bytes
2025-05-20 13:58:10,060 INFO reduce.MergeManagerImpl: Merged 1 segments, 167 bytes to disk to satisfy reduce memory limit
2025-05-20 13:58:10,060 INFO reduce.MergeManagerImpl: Merging 1 files, 171 bytes from disk
2025-05-20 13:58:10,060 INFO reduce.MergeManagerImpl: Merging 0 segments, 0 bytes from memory into reduce
2025-05-20 13:58:10,060 INFO mapred.Merger: Merging 1 sorted segments
2025-05-20 13:58:10,061 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 162 bytes
2025-05-20 13:58:10,061 INFO mapred.LocalJobRunner: 1 / 1 copied.
```

```
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~
2025-05-20 13:58:10,840 INFO mapreduce.Job: Job job_local408680812_0001 running in uber mode : false
2025-05-20 13:58:10,842 INFO mapreduce.Job: map 100% reduce 100%
2025-05-20 13:58:10,843 INFO mapreduce.Job: Job job_local408680812_0001 completed successfully
2025-05-20 13:58:10,854 INFO mapreduce.Job: Counters: 36
    File System Counters
        FILE: Number of bytes read=15400
        FILE: Number of bytes written=1291041
        FILE: Number of read operations=0
        FILE: Number of large read operations=0
        FILE: Number of write operations=0
        HDFS: Number of bytes read=150
        HDFS: Number of bytes written=105
        HDFS: Number of read operations=15
        HDFS: Number of large read operations=0
        HDFS: Number of write operations=4
        HDFS: Number of bytes read erasure-coded=0
    Map-Reduce Framework
        Map input records=2
        Map output records=15
        Map output bytes=135
        Map output materialized bytes=171
        Input split bytes=101
        Combine input records=0
        Combine output records=0
        Reduce input groups=15
        Reduce shuffle bytes=171
        Reduce input records=15
        Reduce output records=15
        Spilled Records=30
        Shuffled Maps =1
        Failed Shuffles=0
        Merged Map outputs=1
        GC time elapsed (ms)=0
        Total committed heap usage (bytes)=1052770304
    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=75
    File Output Format Counters
        Bytes Written=105
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /res/part-00000
cat: `/res/part-00000': No such file or directory
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /res
```

```
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~
Input split bytes=101
Combine input records=0
Combine output records=0
Reduce input groups=15
Reduce shuffle bytes=171
Reduce input records=15
Reduce output records=15
Spilled Records=30
Shuffled Maps =1
Failed Shuffles=0
Merged Map outputs=1
GC time elapsed (ms)=0
Total committed heap usage (bytes)=1052770304
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=75
File Output Format Counters
Bytes Written=105
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /res/part-00000
cat: '/res/part-00000': No such file or directory
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /res
Found 2 items
-rw-r--r-- 1 hadoop supergroup 0 2025-05-20 13:58 /res/_SUCCESS
-rw-r--r-- 1 hadoop supergroup 105 2025-05-20 13:58 /res/part-r-00000
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ ^
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /res/part-r-00000
college 1
in 1
bms 1
hi 1
i 1
inna 1
am 1
m 1
bhuvana 1
how 1
are 1
avyukth 1
of 1
you 1
engineering 1
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ 
```

Lab 8: Scala

Question: Write a Scala program to print numbers from 1 to 100 using for loop.

Code with Output:

```
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ nano pi.scala
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ scalac pi.scala
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ scala pi
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 5
7 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83
84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
```

The screenshot shows a terminal window titled "GNU nano 6.2" with the file name "pi.scala" in the title bar. The window contains the following Scala code:

```
object pi {
  def main(args: Array[String]): Unit = {
    for(counter <- 1 to 100)
      print(counter + " ")
    println()
  }
}
```

At the bottom of the terminal window, there is a menu bar with various keyboard shortcuts for file operations like Help, Exit, Write Out, Read File, Where Is, Replace, Cut, Paste, Execute, Justify, Location, and Go To Line. A status bar at the bottom indicates "[Read 7 lines]".

Lab 9: Spark

Question: Using RDD and FlatMap 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.

Code with Output:

```
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ spark-shell
25/05/20 15:32:38 WARN Utils: Your hostname, bmscecse-HP-Elite-Tower-800-G9-Desktop-PC resolves to a loopback address: 127.0.1.1
; using 10.124.2.8 instead (on interface eno1)
25/05/20 15:32:38 WARN Utils: Set SPARK_LOCAL_IP if you need to bind to another address
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.spark.unsafe.Platform (file:/opt/spark/jars/spark-unsafe_2.12-3.0.3.jar) to constructor java.nio.DirectByteBuffer(long,int)
WARNING: Please consider reporting this to the maintainers of org.apache.spark.unsafe.Platform
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
25/05/20 15:32:38 WARN NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Using Spark's default log4j profile: org/apache/spark/log4j-defaults.properties
Setting default log level to "WARN".
To adjust logging level use sc.setLogLevel(newLevel). For SparkR, use setLogLevel(newLevel).
Spark context Web UI available at http://10.124.2.8:4040
Spark context available as 'sc' (master = local[*], app id = local-1747735361481).
Spark session available as 'spark'.
Welcome to

    / \ / \
   / \ \ - \ \ . \ \ / \ / \
  / \ / . \ \ / \ / \ / \ \ \
 / \ / \ / \ / \ / \ / \ / \ \ \
                                     version 3.0.3

Using Scala version 2.12.10 (OpenJDK 64-Bit Server VM, Java 11.0.26)
Type in expressions to have them evaluated.
Type :help for more information.

scala> val textFile = sc.textFile("/home/bmscecse/Desktop/sparkdata.txt")
textFile: org.apache.spark.rdd.RDD[String] = /home/bmscecse/Desktop/sparkdata.txt MapPartitionsRDD[1] at textFile at <console>:2
4

scala>

scala> val counts = textFile
counts: org.apache.spark.rdd.RDD[String] = /home/bmscecse/Desktop/sparkdata.txt MapPartitionsRDD[1] at textFile at <console>:24

scala> .flatMap(line => line.split(" "))
res0: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[2] at flatMap at <console>:26

scala> .map(word => (word, 1))

scala> val data = sc.textFile("sparkdata.txt")
data: org.apache.spark.rdd.RDD[String] = sparkdata.txt MapPartitionsRDD[1] at textFile at <console>:25

scala> val splitedata = data.flatMap(line => line.split(" "))
splitedata: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[2] at flatMap at <console>:26

scala> val mapdata = splitedata.map(word => (word, 1))
mapdata: org.apache.spark.rdd.RDD[(String, Int)] = MapPartitionsRDD[3] at map at <console>:26

scala> val reducedata = mapdata.reduceByKey(_ + _)
reducedata: org.apache.spark.rdd.RDD[(String, Int)] = ShuffledRDD[4] at reduceByKey at <console>:26

scala> reducedata.collect.foreach(println)
(,1)
(hello,2)
(world,1)
(spark,1)
```

```
scala> val textFile = sc.textFile("/home/bmscecse/Desktop/WC.txt")
textFile: org.apache.spark.rdd.RDD[String] = /home/bmscecse/Desktop/WC.txt MapPartitionsRDD[31] at textFile at <console>:31

scala> val words = textFile.flatMap(line => line.split(" "))
words: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[32] at flatMap at <console>:32

scala>

scala> val pairs = words.map(word => (word, 1))
pairs: org.apache.spark.rdd.RDD[(String, Int)] = MapPartitionsRDD[33] at map at <console>:32

scala>

scala> val counts = pairs.reduceByKey(_ + _)
counts: org.apache.spark.rdd.RDD[(String, Int)] = ShuffledRDD[34] at reduceByKey at <console>:32

scala> val countsArray = counts.collect() // This is Array[(String, Int)]
countsArray: Array[(String, Int)] = Array((",",1), (hello,6), (world,1), (spark,1))

scala> val sorted = ListMap(countsArray.sortWith(_.value > _.value): _*)
sorted: scala.collection.immutable.ListMap[String,Int] = ListMap(hello -> 6, "" -> 1, world -> 1, spark -> 1)

scala> for ((k, v) <- sorted) {
|   if (v > 4) println(s"$k, $v")
| }
hello, 6

scala> █
```