Assignment No. 1

Use Hadoop File System (HDFS) commands to perform basic operations like creating directories, uploading files, listing files, and deleting files in HDFS.

#Linux Command

1.Create File in Linux

```
vi firstfile.txt
```

2.Show File Contain in Linux

```
cat firstfile.txt
```

#Hadoop Command

1. Create a Directory in HDFS

```
hdfs dfs –mkdir firstdir
```

2. List Files in a Directory in HDFS

```
hdfs dfs –ls
```

3. Upload Files from Local File System to HDFS

Use the `-put` command to upload files from your local file system to HDFS.

```
hdfs dfs –put firstfile.txt /user/cloudera/firstdir
```

4. List Files in a Directory

Use the `-ls` command to list the files in an HDFS directory.

```
hdfs dfs –ls  /user/cloudera/firstdir/
```

5. Display the Contents of a File

Use the `-cat` command to display the contents of a file in HDFS.

```
hdfs dfs -cat  /user/cloudera/firstdir/firstfile.txt
```

6. Delete a File in HDFS

Use the `-rm` command to remove a file from HDFS.

```
hdfs dfs -rm  /user/cloudera/firstdir/firstfile1.txt
```

Assignment No. 2

Implement a Java program to interact with HDFS (reading and writing files).

```
import java.io.File;
public  class filehand  {
  public static void main(String []args) throws IOException
  {
      File obj1=new File("/home/cloudera/Desktop/Firstfile.txt");
      if (obj1.createNewFile())
          System.out.print("File is Created");
      else
          System.out.print("File is Already exist");
      FileWrite w1=new FileWriter("/home/cloudera/Desktop/Firstfile.txt");
      w1.write("Welcome my first file is write");
      w1.close();
      Scanner r1=new Scanner(obj1);
      while(r1.hasNextLine())
      {
             String data=r1.nextLine();
             System.out.println(data);
      }
   }
}
```

Assignment No. 3

Use Hadoop's built-in commands to manage files and directories.

1. Create Directories in HDFS.

```
hdfs dfs –mkdir firstdir
```

2. Upload Files from Local File System to HDFS

Use the `-put` command to upload files from your local file system to HDFS.

```
hdfs dfs –put firstfile.txt /user/cloudera/firstdir
```

3. List Files in a Directory

Use the `-ls` command to list the files in an HDFS directory.

```
hdfs dfs –ls  /user/cloudera/firstdir/
```

5. Display the Contents of a File

Use the `-cat` command to display the contents of a file in HDFS.

```
hdfs dfs -cat  /user/cloudera/firstfile.txt
```

6. Copy Files from HDFS to Local File System

Use the `-get` command to copy files from HDFS to your local file system.

```
hdfs dfs -get  /user/cloudera/firstdir/firstfile.txt /home/cloudera/lindir
```

7. Delete a File in HDFS

Use the `-rm` command to remove a file from HDFS.

```
hdfs dfs -rm  /user/cloudera/firstdir/firstfile1.txt
```

8. Delete a Directory in HDFS

Use the `-rm -r` command to delete a directory and its contents from HDFS.

```
hdfs dfs -rm -r /user/cloudera/firstdir  (For Non Empty Directory

hdfs dfs -rmdir  /user/cloudera/firstdir     (For Empty Directory )
```

Assignment No. 4

Implement Map Side Join and Reduce Side Join.

(Write hadoop code to implement Map Reduce application count number of word in file)

```
import java.io.IOException;
import java.util.StringTokenizer;
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.Reducer;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;

public class WordCount {

  public static class TokenizerMapper
       extends Mapper<Object, Text, Text, IntWritable>{

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

    public void map(Object key, Text value, Context context
                    ) throws IOException, InterruptedException {
      StringTokenizer itr = new StringTokenizer(value.toString());
      while (itr.hasMoreTokens()) {
        word.set(itr.nextToken());
        context.write(word, one);
      }
    }
  }
  public static class IntSumReducer
       extends Reducer<Text,IntWritable,Text,IntWritable> {
    private IntWritable result = new IntWritable();

    public void reduce(Text key, Iterable<IntWritable> values,
                       Context context
                       ) throws IOException, InterruptedException {
      int sum = 0;
      for (IntWritable val : values) {
        sum += val.get();
      }
      result.set(sum);
      context.write(key, result);
    }
  }
  public static void main(String[] args) throws Exception {
    Configuration conf = new Configuration();
    Job job = Job.getInstance(conf, "word count");
    job.setJarByClass(WordCount.class);
    job.setMapperClass(TokenizerMapper.class);
    job.setCombinerClass(IntSumReducer.class);
    job.setReducerClass(IntSumReducer.class);
    job.setOutputKeyClass(Text.class);
    job.setOutputValueClass(IntWritable.class);
    FileInputFormat.addInputPath(job, new Path(args[0]));
    FileOutputFormat.setOutputPath(job, new Path(args[1]));
    System.exit(job.waitForCompletion(true) ? 0 : 1);
  }
}
```

File Link
https://hadoop.apache.org/docs/current/hadoop-mapreduce-client/hadoop-mapreduce-client-core/MapReduceTutorial.html#Source_Code

Step 1: Export Java Eclipse Project Jar File to Cloudera
Step 2. Make firstfile.txt file vi editor ->Write data
Step 3: Perform Below commands on terminal

Command Map Reduce Code

1) Transfer all local file to hadoop

```
Hdfs dfs -put firstfile.txt /user/cloudera

Hdfs dfs -put WordCount.jar /user/cloudera
```

2) Run Java Jar File for Map Reduce Operation

```
hadoop jar WordCount.jar WordCount firstfile.txt outputfile
```

3) List outputfile

```
hdfs dfs -ls /user/cloudera/outputfile
```

4) Show outputfile

```
hdfs dfs -cat /user/cloudera/outputfile/part-r-00000
```

Assignment No. 5

Implement Secondary Sorting. (Write hadoop code to implement Item Sort Program)

```
       ----------Main class------------------------
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
import org.apache.hadoop.mapreduce.Job;

public class testdriver {
    public static void main(String[] args) throws Exception {
       if (args.length != 2) {
          System.out.printf("Usage: WordCount <input dir> <output 
dir>\n");
          System.exit(-1);
                }
                Job job = new Job();

                job.setJarByClass(testdriver.class);
                job.setJobName("Word Count");
                FileInputFormat.setInputPaths(job, new Path(args[0]));
                FileOutputFormat.setOutputPath(job, new Path(args[1]));

                job.setMapperClass(testmap.class);
                job.setReducerClass(testreduce.class);

                job.setMapOutputKeyClass(IntWritable.class);
                job.setMapOutputValueClass(IntWritable.class);

                job.setOutputKeyClass(IntWritable.class);
                job.setOutputValueClass(IntWritable.class);

                boolean success = job.waitForCompletion(true);
                System.exit(success ? 0 : 1);

        }
}




----------Mapper class------------------------

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

public class testmap extends Mapper<LongWritable, Text, IntWritable, 
IntWritable> {
@Override
     public void map(LongWritable key, Text value, Context context) 
throws IOException, InterruptedException {
         String line = value.toString();
           String[] tokens = line.split(","); // This is the delimiter 
between
           int keypart = Integer.parseInt(tokens[0]);
           int valuePart = Integer.parseInt(tokens[1]);
           context.write(new IntWritable(valuePart), new 
IntWritable(keypart));
```

```
        }
}



----------Reducer class------------------------

import java.io.IOException;
import org.apache.hadoop.io.IntWritable;

import org.apache.hadoop.mapreduce.Reducer;

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

        for (IntWritable value : values) {

            context.write(value,key);

           }

}
}
```

Step 1: Export Java Eclipse Project Jar File to Cloudera
Step 2. Make Sort.txt file vi editor ->Write data
Step 3: Perform Below commands on terminal

<u>Command Map Reduce Code</u>

1) **Transfer all local file to hadoop**

```
Hdfs dfs –put sort.txt /user/cloudera

Hdfs dfs –put Sorting.jar /user/cloudera
```

2) **Run Java Jar File for Map Reduce Operation**

```
hadoop jar Sorting.jar testdriver sort.txt outputsort
```

3) **List outputfile**

```
hdfs dfs –ls /user/cloudera/outputsort
```

4) **Show outputfile**

```
hdfs dfs –cat /user/cloudera/outputsort /part-r-00000
```

Assignment No. 6

Pipeline multiple Map Reduce jobs

Job 1 (WordCount) counts the frequency of each word in the input data, while Job 2 (FilterWords) filters out words with a count greater than 2.

Job 1: Word Count (Word frequency count)

This first job counts the occurrences of each word in the input text files.

```
import java.io.IOException;
import java.util.StringTokenizer;
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.Reducer;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;

public class WordCount {
    public static class TokenizerMapper extends Mapper<Object, Text, Text,
IntWritable> {
        private final static IntWritable one = new IntWritable(1);
        private Text word = new Text();

        public void map(Object key, Text value, Context context) throws
IOException, InterruptedException {
            String[] words = value.toString().split("\\s+");
            for (String wordStr : words) {
                word.set(wordStr);
                context.write(word, one);
            }
        }
    }

    public static class IntSumReducer extends Reducer<Text, IntWritable,
Text, IntWritable> {
        private IntWritable result = new IntWritable();

        public void reduce(Text key, Iterable<IntWritable> values, Context
context) throws IOException, InterruptedException {
            int sum = 0;
            for (IntWritable val : values) {
                sum += val.get();
            }
            result.set(sum);
            context.write(key, result);
        }
    }
    public static void main(String[] args) throws Exception {
        Configuration conf = new Configuration();
        Job job = Job.getInstance(conf, "word count");
        job.setJarByClass(WordCount.class);
        job.setMapperClass(TokenizerMapper.class);
        job.setCombinerClass(IntSumReducer.class);
        job.setReducerClass(IntSumReducer.class);
        job.setOutputKeyClass(Text.class);
        job.setOutputValueClass(IntWritable.class);
        FileInputFormat.addInputPath(job, new Path(args[0]));
        FileOutputFormat.setOutputPath(job, new Path(args[1]));
        System.exit(job.waitForCompletion(true) ? 0 : 1);
    }
}
```

Job 2: Filter Words with Frequency Greater Than 2

The second job processes the output of the first job to filter and only output words that have a frequency greater than 2

```
import java.io.IOException;
import java.util.StringTokenizer;
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.Reducer;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;

public class FilterWords {
    public static class FilterMapper extends Mapper<Object, Text, Text,
IntWritable> {
        private IntWritable count = new IntWritable();

        public void map(Object key, Text value, Context context) throws
IOException, InterruptedException {
            String[] fields = value.toString().split("\t");
            String word = fields[0];
            int wordCount = Integer.parseInt(fields[1]);

            // Output only words with count greater than 2
            if (wordCount > 2) {
                count.set(wordCount);
                context.write(new Text(word), count);
            }
        }
    }

    public static void main(String[] args) throws Exception {
        Configuration conf = new Configuration();
        Job job = Job.getInstance(conf, "filter words");
        job.setJarByClass(FilterWords.class);
        job.setMapperClass(FilterMapper.class);
        job.setOutputKeyClass(Text.class);
        job.setOutputValueClass(IntWritable.class);

        FileInputFormat.addInputPath(job, new Path(args[0]));  // Input
path from the first job's output
        FileOutputFormat.setOutputPath(job, new Path(args[1]));  // Output
path

        System.exit(job.waitForCompletion(true) ? 0 : 1);
    }
}
```

Step 1: Export Java Eclipse Project Jar File to Cloudera
Step 2. Make firstfile.txt file vi editor ->Write data
Step 3: Perform Below commands on terminal

Command Map Reduce Code

1) Transfer all local file to hadoop

```
Hdfs dfs -put firstfile.txt /user/cloudera

Hdfs dfs -put PipLine1.jar /user/cloudera
```

2) Run First job of Java Jar File for Map Reduce Operation

```
hadoop jar PipLine1.jar wordcount firstfile.txt outpip1
```

3) Run Second job of Java Jar File for Map Reduce Operation

```
hadoop jar PipLine1.jar FilterWords outpip1 outpip2
```

4） List outputfile

```
hdfs dfs –ls /user/cloudera/outpip2
```

5） Show outputfile

```
hdfs dfs –cat /user/cloudera/outpip2/part-r-00000
```

Assignment No. 7

Create and use UDFs in Pig Latin scripts (Write hadoop code to convert username in uppercase)

Step 1: Open Java Eclipse -> Make New Project->(PigAss7) Add External Libarary->pig , hadoop ,hadoop 0.20_map_reduce->finish

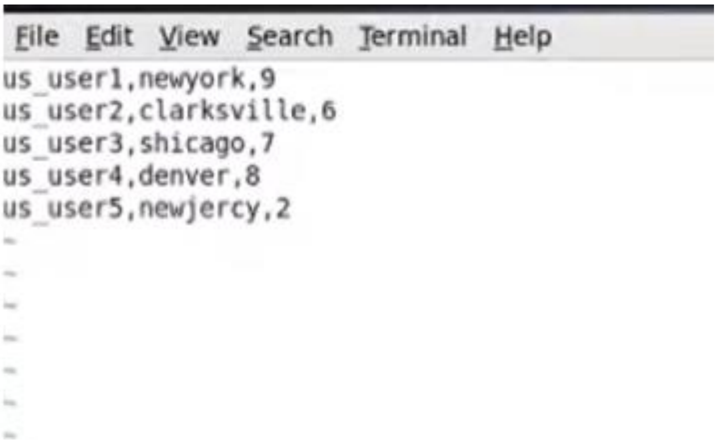
Step 2: Add class in project -> PigUDF -> Write below code (Create the UDF)

```
import  org.apache.pig.EvalFunc;
import org.apache.pig.data.Tuple;
public class PigUDF extends EvalFun<String> {
public String exec(Tuple tuple)throws IOException {
   if(tuple ==null) {
        return null;
   }
   String user=(String)tuple.get(0);
   String city=(String)tuple.get(1);
   int score=(Integer)tuple.get(2);
   return user+”,”+city.toUpperCase()+”,”+score;
 }
}
```

Step 3: Export java project in to jar file ->PigAss7.jar

Step 4: Open terminal create cust_us.txt file using following command

```
vi cust_us
```



```
us_user1,newyork,9
us_user2,clarksville,6
us_user3,shicago,7
us_user4,denver,8
us_user5,newjercy,2
~
~
~
~
~
~
~
```

Step 5: Open terminal to create pig file using following command.

```
vi toupper.pig
```

Write following code in file

```
REGISTER /home/cloudera/PigAss7.jar
DEFINE toupper PigUDF();
```

```
usa=LOAD  '/home/cloudera/cust_us.txt' Using PigStorage(',')
as (user:chararray,city:chararray,score:int);

usa_upper = FOREACH usa GENERATE toupper(user,city,score);

DUMP usa_upper;
```

Step 6: Run Pig script

```
pig –x  local toupper.pig
```

Assignment No. 8

Integrate UDFs to enhance the functionality of Pig scripts. (Write hadoop code to concatenation two string)

Step 1: Open Java Eclipse -> Make New Project->(PigAss7) Add External Libarary->pig , hadoop ,hadoop 0.20_map_reduce->finish

Step 2: Add class in project -> (Ass8Demo) -> Write below code (Create the UDF)

```
import org.apache.pig.EvalFunc;
import org.apache.pig.data.Tuple;
import org.apache.pig.data.DataByteArray;

public class ConcatStrings extends EvalFunc<DataByteArray> {
    @Override
    public DataByteArray exec(Tuple input) {
        if (input == null || input.size() < 2)
            return null;
        try {
            String str1 = (String) input.get(0);
            String str2 = (String) input.get(1);
            return new DataByteArray((str1 + str2).getBytes());
        } catch (Exception e) {
            return null;
        }
    }
}
```

Step 3: Export java project in to jar file ->Ass8Demo.jar

Step 4: Open terminal create strdata.txt file using following command

```
vi strdata.txt
```

```
hi,hello
good,morning
welcome,RCPET’s IMRD
```

Step 5: Open terminal to create pig file using following command.

```
vi strcat.pig
```

Write following code in file

```
REGISTER /home/cloudera/Ass8Demo.jar
DEFINE ConcatStrings ConcatStrings();
data=LOAD  ‘/home/cloudera/strdata.txt’ Using PigStorage(‘,’)
as (str1:chararray,str2:chararray);
result = FOREACH data GENERATE ConcatStrings(str1,str2);
DUMP result;
```

Step 6: Run Pig script

```
pig –x  local strcat.pig
```

Assignment No 9

Implement and execute HiveQL queries to perform data retrieval and manipulation.

1. **Setting up Hive**
   Hive

2. **Creating a Hive Table**
   ```
   CREATE TABLE employees (
      emp_id INT,
      emp_name STRING,
      emp_salary DOUBLE,
      emp_department STRING
   ) ROW FORMAT DELIMITED
   FIELDS TERMINATED BY ','
   STORED AS TEXTFILE;
   ```

3. **Data Manipulation**
   a. **Inserting Data into the Table:**
   ```
   INSERT INTO TABLE employees VALUES (1001, 'John Doe', 60000.00,'Engineering');
   ```
   b. **Updating Data:**
   ```
   INSERT OVERWRITE TABLE employees
   SELECT emp_id, emp_name, CASE
                     WHEN emp_salary < 50000 THEN emp_salary * 1.1
                     ELSE emp_salary
                   END AS emp_salary,
                   emp_department
   FROM employees;
   ```
   c. **Deleting Data:**
   ```
   INSERT OVERWRITE TABLE employees
   SELECT * FROM employees WHERE emp_id != 1001;
   ```

4. **Basic Data Retrieval Queries**
   a. **Select all records:**
   ```
   SELECT * FROM employees;
   ```
   b. **Select specific columns:**
   ```
   SELECT emp_name, emp_salary FROM employees;
   ```
   c. **Select with a WHERE clause:**
   ```
   SELECT * FROM employees WHERE emp_salary > 50000;
   ```

Assignment No 10

Perform operations like joins, group by, and aggregations in Hive.

1. **Creating a Hive Table**

```
CREATE TABLE employees (
   emp_id INT,
   emp_name STRING,
   emp_salary DOUBLE,
   emp_department STRING
) ROW FORMAT DELIMITED
FIELDS TERMINATED BY ','
STORED AS TEXTFILE;

CREATE TABLE departments (
   dept_id INT,
   dept_name STRING,
) ROW FORMAT DELIMITED
FIELDS TERMINATED BY ','
STORED AS TEXTFILE;
```

Insert 5 record on each table by using insert command

2. **Joins**

```
SELECT e.emp_name, d.dept_name
FROM employees e
JOIN departments d
ON e.emp_department = d.dept_id;
```

3. **Aggregate Functions**

a. **Count the number of employees:**

```
SELECT COUNT(*) FROM employees;
```

b. **Find the average salary:**

```
SELECT AVG(emp_salary) FROM employees;
```

c. **Find the highest salary:**

```
SELECT MAX(emp_salary) FROM employees;
```

4. Group By

Group by department and get average salary per department:

```
SELECT emp_department, AVG(emp_salary) FROM employees GROUP BY emp_department;
```