LAB EXERCISE 3

Aim: Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

- Find the number of occurrences of each word appearing in the input file(s)
- Performing a MapReduce Job for word search count (look for specific keywords in a file)

Theory:

MapReduce is a processing technique and a program model for distributed computing based on java. The MapReduce algorithm contains two important tasks, namely Map and Reduce. Map takes a set of data and converts it into another set of data, where individual elements are broken down into tuples (key/value pairs). Reduce task, which takes the output from a map as an input and combines those data tuples into a smaller set of tuples. As the sequence of the name MapReduce implies, the reduce task is always performed after the map job.

The major advantage of MapReduce is that it is easy to scale data processing over multiple computing nodes. Under the MapReduce model, the data processing primitives are called mappers and reducers. Decomposing a data processing application into mappers and reducers is sometimes nontrivial. But, once we write an application in the MapReduce form, scaling the application to run over hundreds, thousands, or even tens of thousands of machines in a cluster are merely a configuration change. This simple scalability is what has attracted many programmers to use the MapReduce model.

Procedure:

Step1) Upload input.txt file on hdfs which contain some sentences with repeated words

>>> hadoop fs -put "Input.txt file path" /input

Step 2) Open IntelliJ and add required dependencies in "pom.xml" file.

```
<dependencies>
    <dependency>
        <groupId>org.apache.hadoop</groupId>
        <artifactId>hadoop-common</artifactId>
        <version>3.3.3</version>
    </dependency>
    <dependency>
        <groupId>org.apache.hadoop</groupId>
        <artifactId>hadoop-mapreduce-client-core</artifactId>
        <version>3.3.3</version>
    </dependency>
</dependencies>
```

Step 3) After adding dependencies add 3 java file in org.example folder named

1. WC_Runner
2. WC_Reducer
3. WC_Mapper

Step 4) Open IntelliJ terminal and write the below command,

>>>hadoop jar target/wordcount-1.0-SNAPSHOT.jar org.ankit.WC_Runner "hdfs input.txt file path" /output

For WC_Mapper.java:

```
package org.priyanshu;

import java.io.IOException;
import
java.util.StringTokenizer;
import org.apache.hadoop.io.IntWritable;
import
org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import
org.apache.hadoop.mapred.MapReduceBase;
import org.apache.hadoop.mapred.Mapper;
import
org.apache.hadoop.mapred.OutputCollector;
import org.apache.hadoop.mapred.Reporter;
public class WC_Mapper extends MapReduceBase implements
Mapper<LongWritable,Text,Text,IntWritable>{
    private final static IntWritable one = new IntWritable(1);
    private Text word = new Text();
    public void map(LongWritable key, Text value,OutputCollector<Text,IntWritable>
                    output, Reporter reporter) throws IOException{
        String line = value.toString();
        StringTokenizer  tokenizer = new
        StringTokenizer(line); while
        (tokenizer.hasMoreTokens()){
            word.set(tokenizer.nextToken(
            )); output.collect(word, one);
        }

    }
}
```

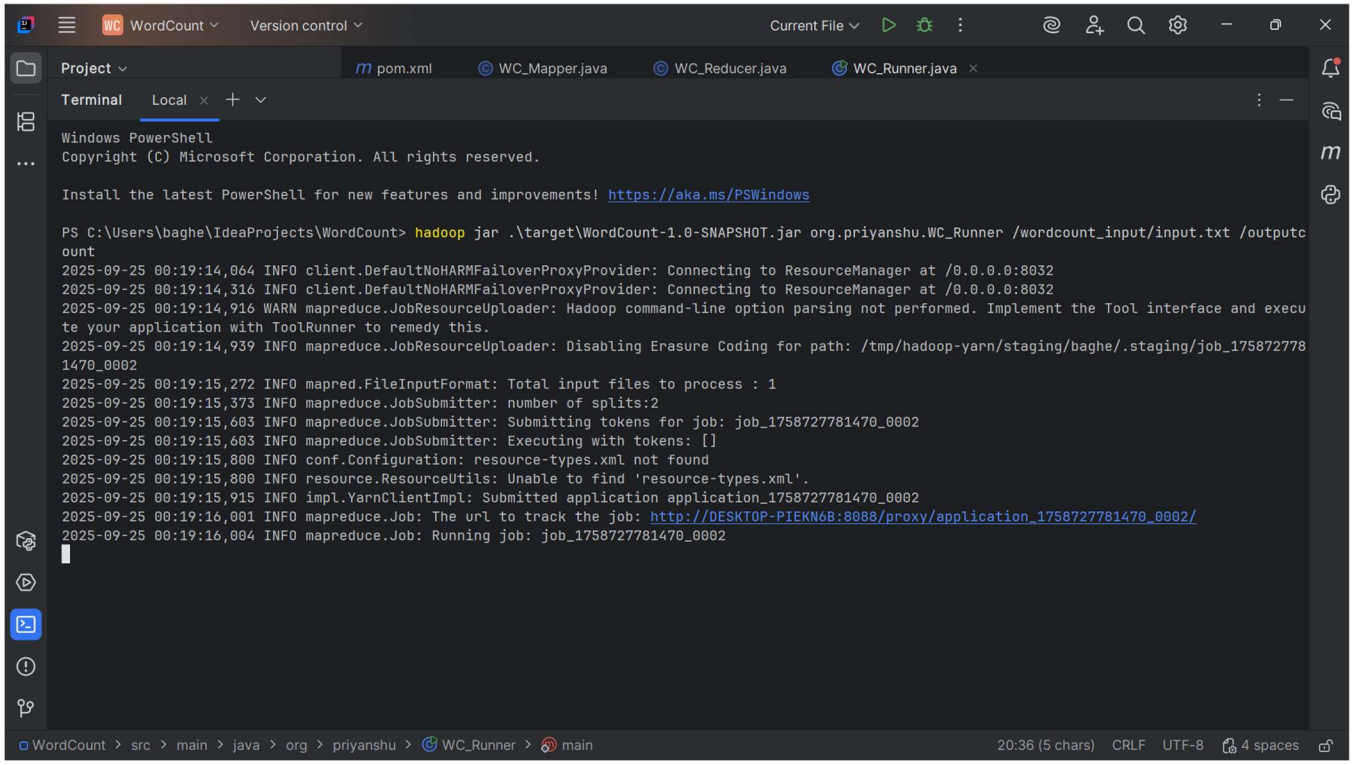
For WC_Reducer.java:

```
package org.priyanshu;

import java.io.IOException;
import java.util.Iterator;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import
org.apache.hadoop.mapred.MapReduceBase;
import
org.apache.hadoop.mapred.OutputCollector;
import org.apache.hadoop.mapred.Reducer;
import org.apache.hadoop.mapred.Reporter;

public class WC_Reducer  extends MapReduceBase implements
Reducer<Text,IntWritable,Text,IntWritable> {
    public void reduce(Text key, Iterator<IntWritable>
values,OutputCollector<Text,IntWritable> output, Reporter reporter) throws IOException
{
        int sum=0;
        while (values.hasNext()) {
            sum+=values.next().get();
        }

        output.collect(key,new IntWritable(sum));
    }

}
```

For WC_Runner.java:

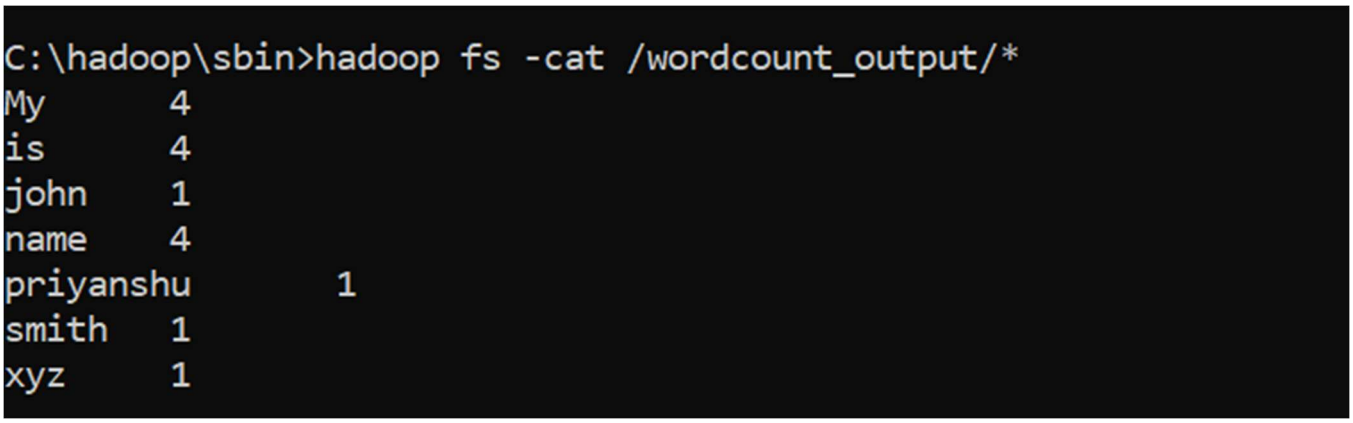
```
package org.priyanshu;

import java.io.IOException;
import
org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import
org.apache.hadoop.mapred.FileInputFormat;
import
org.apache.hadoop.mapred.FileOutputFormat
; import
org.apache.hadoop.mapred.JobClient;  import
org.apache.hadoop.mapred.JobConf;
import
org.apache.hadoop.mapred.TextInputFormat;
import
org.apache.hadoop.mapred.TextOutputFormat;
public class WC_Runner {
    public static void main(String[] args) throws IOException{
        JobConf conf = new JobConf(WC_Runner.class);
        conf.setJobName("WordCount");
        conf.setOutputKeyClass(Text.class);
        conf.setOutputValueClass(IntWritable.class);
        conf.setMapperClass(WC_Mapper.class);
        conf.setCombinerClass(WC_Reducer.class);
        conf.setReducerClass(WC_Reducer.class);
        conf.setInputFormat(TextInputFormat.class);
        conf.setOutputFormat(TextOutputFormat.class);
        FileInputFormat.setInputPaths(conf,new Path(args[0]));
        FileOutputFormat.setOutputPath(conf,new
        Path(args[1])); JobClient.runJob(conf);
    }
}
```

Running WC_Runner**:**



Snapshot No. 6 (Running of WordCount Code)

Output:



Snapshot No. 7 (Output of WordCount Code)

Conclusion:

In this, we learnt about the map-reduce and its function in Hadoop and how map breaks the data and reduce combine the generated output.