Lab 7

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.

Driver Code (TopNDriver.java)

```
package samples.topn;

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.lib.input.FileInputFor
mat; import
org.apache.hadoop.mapreduce.lib.output.FileOutputF
ormat;

public class TopNDriver {

   public static void main(String[] args) throws
Exception {        if (args.length != 3) {
           System.err.println("Usage: TopNDriver <in> <temp-
out> <final-out>");            System.exit(2);
       }

       Configuration conf = new Configuration();

       // === Job 1: Word Count ===
       Job wcJob = Job.getInstance(conf, "word count");
wcJob.setJarByClass(TopNDriver.class);
wcJob.setMapperClass(WordCountMapper.class);
wcJob.setCombinerClass(WordCountReducer.class);
wcJob.setReducerClass(WordCountReducer.class);
wcJob.setOutputKeyClass(Text.class);
       wcJob.setOutputValueClass(IntWritable.class);

       FileInputFormat.addInputPath(wcJob, new Path(args[0]));
       Path tempDir = new Path(args[1]);
       FileOutputFormat.setOutputPath(wcJob, tempDir);

       if (!wcJob.waitForCompletion(true)) {
          System.exit(1);
       }

       // === Job 2: Top N ===
        Job topJob = Job.getInstance(conf, "top 10 words");
topJob.setJarByClass(TopNDriver.class);
topJob.setMapperClass(TopNMapper.class);
topJob.setReducerClass(TopNReducer.class);
topJob.setMapOutputKeyClass(IntWritable.class);
topJob.setMapOutputValueClass(Text.class);
topJob.setOutputKeyClass(Text.class);
        topJob.setOutputValueClass(IntWritable.class);

        FileInputFormat.addInputPath(topJob, tempDir);
        FileOutputFormat.setOutputPath(topJob, new
Path(args[2]));

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

Mapper Code (TopNMapper.java)

```
package samples.topn;

import java.io.IOException;

import
org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;

public class TopNMapper     extends
Mapper<Object, Text, IntWritable, Text> {

    private IntWritable count = new
IntWritable();     private Text word = new
Text();

    @Override
    protected void map(Object key, Text value, Context
context)         throws IOException, InterruptedException
{

        // input line: word \t count
        String[] parts =
value.toString().split("\\t");         if
(parts.length == 2) {
word.set(parts[0]);
            count.set(Integer.parseInt(parts[1]));
// emit count → word, so Hadoop sorts by
count
            context.write(count, word);
        }
    } }
```

Reducer Code (TopNReducer.java)

```
package samples.topn;

import java.io.IOException; import
java.util.ArrayList; import
java.util.Collections; import
java.util.List; import java.util.Map;
import java.util.TreeMap;

import org.apache.hadoop.io.IntWritable; import
org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;

public class TopNReducer
    extends Reducer<IntWritable, Text, Text, IntWritable> {

    // TreeMap with descending order of keys (counts)     private
TreeMap<Integer, List<String>> countMap =
        new TreeMap<>(Collections.reverseOrder());

    @Override
    protected void reduce(IntWritable key, Iterable<Text> values, Context context)
throws IOException, InterruptedException {

        int cnt = key.get();
        List<String> words = countMap.getOrDefault(cnt, new ArrayList<>());         for
(Text w : values) {
            words.add(w.toString());
        }
        countMap.put(cnt, words);
    }

    @Override
    protected void cleanup(Context context)
        throws IOException, InterruptedException {

        // collect top 10 word→count pairs
        List<WordCount> topList = new ArrayList<>();         int seen = 0;         for
(Map.Entry<Integer, List<String>> entry : countMap.entrySet()) {             int cnt =
entry.getKey();             for (String w : entry.getValue()) {
                topList.add(new WordCount(w, cnt));
                seen++;                 if (seen ==
10) break;
            }
            if (seen == 10) break;
        }

        // sort these 10 entries alphabetically by word
        Collections.sort(topList, (a, b) -> a.word.compareTo(b.word));

        // emit final top 10 in alphabetical order         for (WordCount wc : topList)
{             context.write(new Text(wc.word), new IntWritable(wc.count));
        }
    }

    // helper class     private static class
WordCount {
        String word;
        int count;
        WordCount(String w, int c) { word = w; count = c; }
    }
}
```

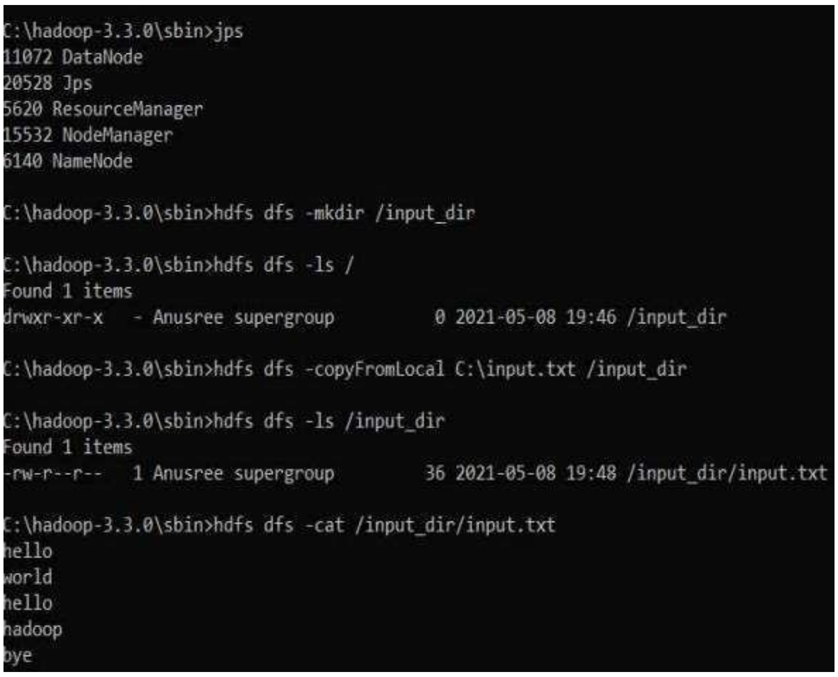
Mapper Code (WordCountMapper.java)

```
package samples.topn;

import java.io.IOException;
import java.util.StringTokenizer;

import
org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;

public class WordCountMapper     extends
Mapper<Object, Text, Text, IntWritable> {

   private final static IntWritable ONE = new
IntWritable(1);     private Text word = new
Text();     // characters to normalize into spaces
   private String tokens = "[_|$#<>\\^=\\[\\]\\*/\\\\,;,.\\-:()?!\""]";

   @Override     protected void map(Object key,
Text value, Context context)         throws
IOException, InterruptedException {

       // clean & tokenize
       String clean = value.toString()
                      .toLowerCase()
                      .replaceAll(tokens, " ");
       StringTokenizer itr = new
StringTokenizer(clean);         while
(itr.hasMoreTokens()) {
word.set(itr.nextToken().trim());
           context.write(word, ONE);
       }
   }
}
```

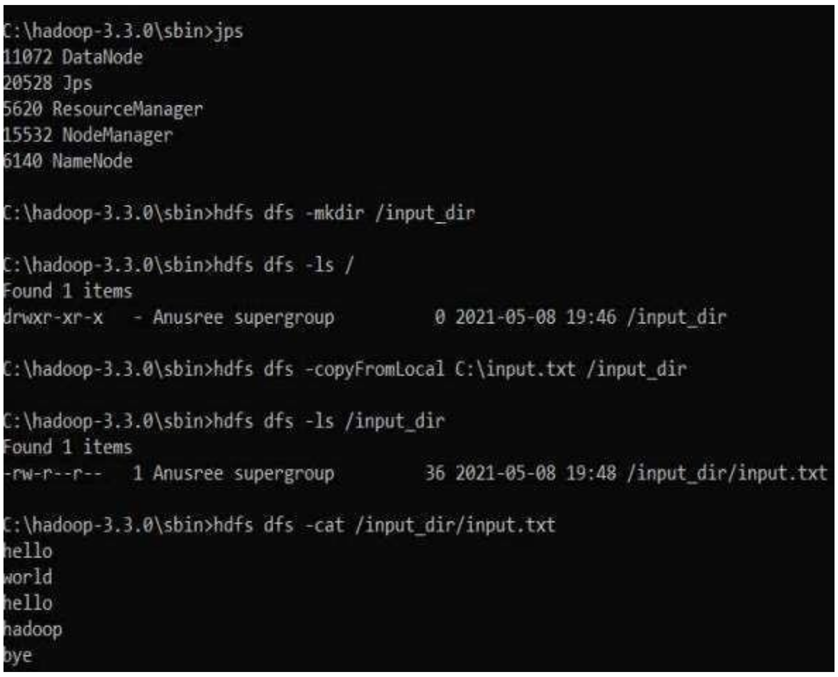
Reducer Code (WordCountReducer.java)

```
package samples.topn;

import java.io.IOException;

import
org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;
```

```
public class WordCountReducer     extends
Reducer<Text, IntWritable, Text, IntWritable> {

   @Override     protected void reduce(Text key,
Iterable<IntWritable> values, Context context)         throws
IOException, InterruptedException {

        int sum = 0;          for
(IntWritable val : values) {
            sum += val.get();
        }
        context.write(key, new IntWritable(sum));
    }
}
```



```
C:\hadoop-3.3.0\sbin>jps
11072 DataNode
20528 Jps
5620 ResourceManager
15532 NodeManager
6140 NameNode

C:\hadoop-3.3.0\sbin>hdfs dfs -mkdir /input_dir

C:\hadoop-3.3.0\sbin>hdfs dfs -ls /
Found 1 items
drwxr-xr-x   - Anusree supergroup          0 2021-05-08 19:46 /input_dir

C:\hadoop-3.3.0\sbin>hdfs dfs -copyFromLocal C:\input.txt /input_dir

C:\hadoop-3.3.0\sbin>hdfs dfs -ls /input_dir
Found 1 items
-rw-r--r--   1 Anusree supergroup         36 2021-05-08 19:48 /input_dir/input.txt

C:\hadoop-3.3.0\sbin>hdfs dfs -cat /input_dir/input.txt
hello
world
hello
hadoop
bye
```



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