Music Data

Data Set

111115|222|0|1|0
111113|225|1|0|0
111117|223|0|1|1
111115|225|1|0|0

Dataset is sample data of songs heard by users on an online streaming platform. The Description of data set attached in musicdata.txt as follows:

1st column – User Id
2nd Column – Track Id
3rd Column – Songs Share status (1 for shared, 0 for not shared)
4th Column – Listening Platform (Radio or Web – 0 for radio, 1 for web)
5th Column – Song Listening Status (0 for skipped, 1 for fully heard)

We will process the above Music Data from Hadoop Map Reduce.

1. First start hadoop daemons in Virtual Machine. The command to start daemons are as follows:
   $start-all.sh

```
[acadgild@localhost ~]$ start-all.sh
This script is Deprecated. Instead use start-dfs.sh and start-yarn.sh
18/09/07 11:06:10 WARN util.NativeCodeLoader: Unable to load native-hadoop libra
ry for your platform... using builtin-java classes where applicable
Starting namenodes on [localhost]
localhost: starting namenode, logging to /home/acadgild/install/hadoop/hadoop-2.
6.5/logs/hadoop-acadgild-namenode-localhost.localdomain.out
localhost: starting datanode, logging to /home/acadgild/install/hadoop/hadoop-2.
6.5/logs/hadoop-acadgild-datanode-localhost.localdomain.out
Starting secondary namenodes [0.0.0.0]
0.0.0.0: starting secondarynamenode, logging to /home/acadgild/install/hadoop/hadoop-2.6.5/logs/hadoop-acadgild-secondaryname
node-localhost.localdomain.out
18/09/07 11:06:32 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java cl
asses where applicable
starting yarn daemons
starting resourcemanager, logging to /home/acadgild/install/hadoop/hadoop-2.6.5/logs/yarn-acadgild-resourcemanager-localhost.
localdomain.out
localhost: starting nodemanager, logging to /home/acadgild/install/hadoop/hadoop-2.6.5/logs/yarn-acadgild-nodemanager-localho
st.localdomain.out
You have new mail in /var/spool/mail/acadgild
[acadgild@localhost ~]$
```

2. We can verify the started daemons with **jps** command, as follows:
   $jps

```
Hadoop 2.6_1_1_1 [Running] - Oracle VM VirtualBox
Applications  Places  System                                   Fri Sep 7, 11:10 AM  Acadgild
acadgild@localhost:~
File  Edit  View  Search  Terminal  Help
You have new mail in /var/spool/mail/acadgild
[acadgild@localhost ~]$ jps
8050 ResourceManager
7606 NameNode
7734 DataNode
8154 NodeManager
4090 org.eclipse.equinox.launcher_1.4.0.v20161219-1356.jar
8555 Jps
7901 SecondaryNameNode
[acadgild@localhost ~]$
```

Task 1: Find the number of unique listeners in the data set.

1. For this task to do, we need to write three Java source files, ***MusicData.java, MusicDataMapper.java*** and ***MusicDataReducer.java.***
2. Here ***MusicData.java*** is a Driver class which reads the input and calls the ***MusicDataMapper.java*** methods and ***MusicDataReducer.java*** methods.
3. ***MusicDataMapper.java*** implements the Mapper functions of the Map Reduce process.
4. ***MusicDataReducer.java*** implements the Reducer functions of the Map Reduce process

1. The Source code of the ***MusicData.java*** is as follows:

```
package MusicData;
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.lib.output.TextOutputFormat;
import org.apache.hadoop.mapreduce.lib.input.TextInputFormat;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;

public class MusicData {

  public static void main(String[] args) throws Exception {
   if (args.length != 2) {
     System.err.println("Usage: TVsales <input path> <output path>");
     System.exit(-1);
   }

        //Job Related Configurations
        Configuration conf = new Configuration();
        //Job job = new Job.getInstance(conf, "My Word Count with combiner");
        Job job = Job.getInstance(conf, "My Word Count with combiner");
        job.setJarByClass(MusicData.class);


   // Specify the number of reducer to 1
        job.setNumReduceTasks(1);

   //Provide paths to pick the input file for the job
   FileInputFormat.setInputPaths(job, new Path(args[0]));


   //Provide paths to pick the output file for the job, and delete it if already present
        Path outputPath = new Path(args[1]);
        FileOutputFormat.setOutputPath(job, outputPath);
        outputPath.getFileSystem(conf).delete(outputPath, true);


   //To set the mapper and reducer of this job
   job.setMapperClass(MusicDataMapper.class);
   job.setReducerClass(MusicDataReducer.class);

   //Set the combiner
   job.setCombinerClass(MusicDataReducer.class);
```

```
    //set the input and output format class
    job.setInputFormatClass(TextInputFormat.class);
    job.setOutputFormatClass(TextOutputFormat.class);

    //set up the output key and value classes
    job.setOutputKeyClass(Text.class);
    job.setOutputValueClass(IntWritable.class);

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

2. The source code of the ***MusicDataMapper.java*** is as follows:

```
package MusicData;
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;
import java.util.*;

public class MusicDataMapper
  extends Mapper<LongWritable, Text, Text, IntWritable> {

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


  @Override
  public void map(LongWritable key, Text value, Context context)
     throws IOException, InterruptedException {
          String line = value.toString();
          StringTokenizer tokenizer = new StringTokenizer(line);
          word.set(tokenizer.nextToken("|"));
          context.write(word, one);
  }
}
```

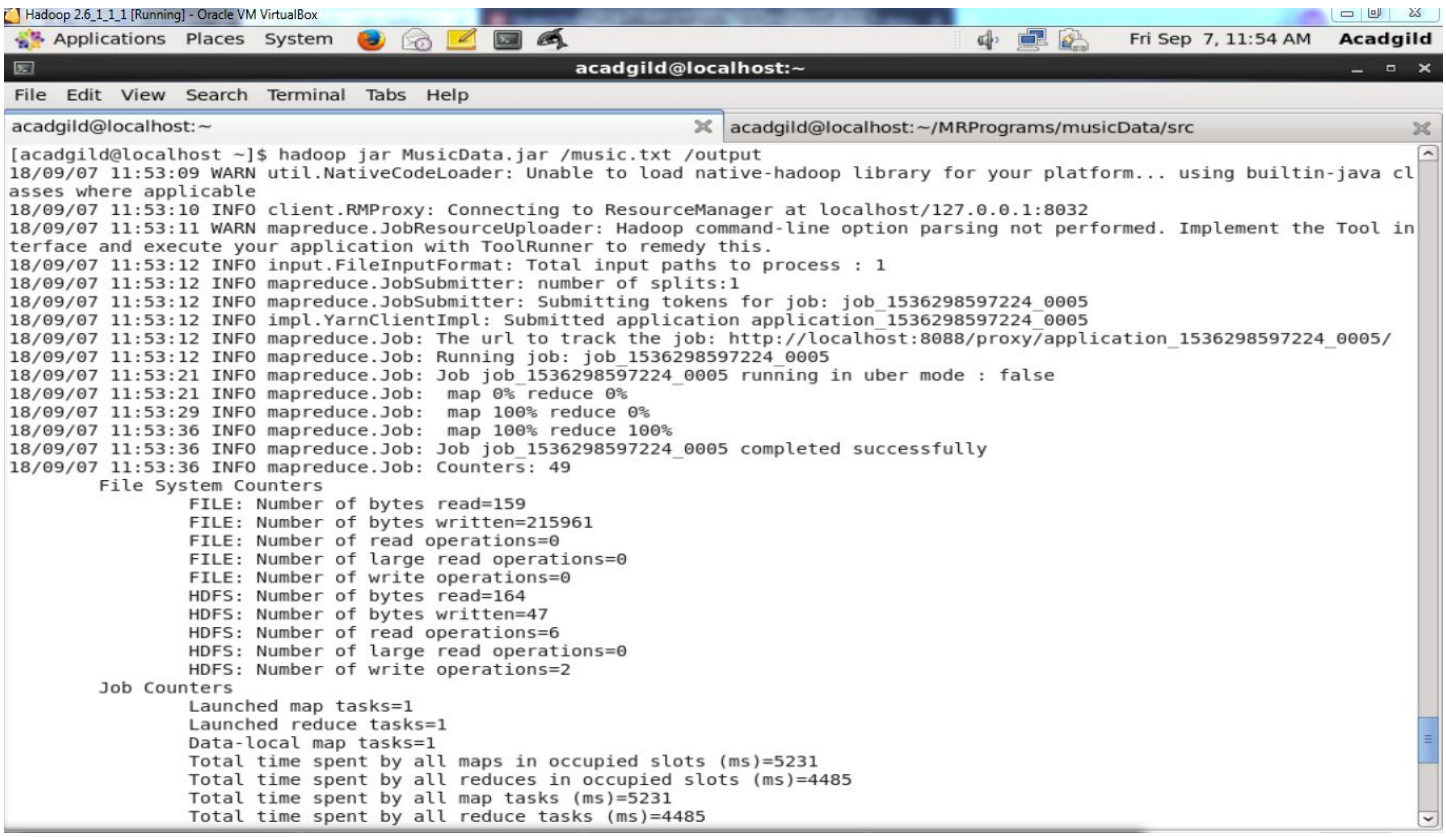
3. The ***MusicDataReducer.java*** source code is as follows:

```
package MusicData;
import java.io.IOException;

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


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

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

```
        System.out.println("From The Reducer=>"+key) ;

        int sum = 0;
        int unique = 0;

        for (IntWritable value : values) {
           sum+=value.get();
          unique  += 1;
       }
      key.set("Number of unique listeners in the data set: ");
      context.write(key, new IntWritable(unique));
     }
}
```

4. Create a jar file ***MusicData.jar*** with the above source files ***MusicData.java, MusicDataMapper.java*** and ***MusicDataReducer.java***.
5. Run the jar file with the input data as ***/music.txt*** and output will be present in the ***/output*** directory.

$hadoop jar MusicData.jar /music.txt /output



```
Hadoop 2.6_1_1_1 [Running] - Oracle VM VirtualBox
Applications Places System                                   Fri Sep 7, 11:56 AM  Acadgild
acadgild@localhost:~
File Edit View Search Terminal Tabs Help
acadgild@localhost:~   acadgild@localhost:~/MRPrograms/musicData/src
                Total vcore-milliseconds taken by all map tasks=5231
                Total vcore-milliseconds taken by all reduce tasks=4485
                Total megabyte-milliseconds taken by all map tasks=5356544
                Total megabyte-milliseconds taken by all reduce tasks=4592640
        Map-Reduce Framework
                Map input records=4
                Map output records=4
                Map output bytes=44
                Map output materialized bytes=159
                Input split bytes=96
                Combine input records=4
                Combine output records=3
                Reduce input groups=1
                Reduce shuffle bytes=159
                Reduce input records=3
                Reduce output records=1
                Spilled Records=6
                Shuffled Maps =1
                Failed Shuffles=0
                Merged Map outputs=1
                GC time elapsed (ms)=187
                CPU time spent (ms)=2180
                Physical memory (bytes) snapshot=424574976
                Virtual memory (bytes) snapshot=4165435392
                Total committed heap usage (bytes)=302514176
        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=68
        File Output Format Counters
                Bytes Written=47
[acadgild@localhost ~]$
```

6. Now we will verify the ***/output*** directory for Map Reduce process status and output.
   $hadoop fs –ls /ouput

```
Hadoop 2.6_1_1_1 [Running] - Oracle VM VirtualBox
Applications Places System                                   Fri Sep 7, 2:06 PM  Acadgild
acadgild@localhost:~
File Edit View Search Terminal Tabs Help
acadgild@localhost:~   acadgild@localhost:~/MRPrograms/musicData/src
You have new mail in /var/spool/mail/acadgild
[acadgild@localhost ~]$ hadoop fs -ls /output
18/09/07 11:59:58 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java cl
asses where applicable
Found 2 items
-rw-r--r--   1 acadgild supergroup          0 2018-09-07 11:53 /output/_SUCCESS
-rw-r--r--   1 acadgild supergroup         47 2018-09-07 11:53 /output/part-r-00000
[acadgild@localhost ~]$
```

7. From the _SUCCESS flag we can understand that the process is success. And the output is present in the ***part-r-00000*** file.
8. Open the file ***part-r-00000*** as: ***$hadoop fs –cat /output/part-r-00000***

```
Hadoop 2.6_1_1_1 [Running] - Oracle VM VirtualBox
Applications Places System                                   Fri Sep 7, 2:08 PM  Acadgild
acadgild@localhost:~
File Edit View Search Terminal Tabs Help
acadgild@localhost:~   acadgild@localhost:~/MRPrograms/musicData/src
You have new mail in /var/spool/mail/acadgild
[acadgild@localhost ~]$ hadoop fs -cat /output/part-r-00000
18/09/07 14:08:14 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java cl
asses where applicable
Number of unique listeners in the data set:     3
[acadgild@localhost ~]$
```

9. We can observe that the message **"Number of unique listeners in the data set: 3"** represents the number of listeners in the given Musig data set.

Task 2: What are the number of times a song was heard fully.

1. For the task 2, we no need to change the **MusicData.java** driver source code.
2. But we need to change the source code of the **MusicDataMapper.java** source code. The changes are as follows:

```
for(int i = 0; i < 4; i++) {
   tokenizer.nextToken("|");
}
String str = tokenizer.nextToken( );

if(str.equals("1")) {
   word.set(str);
   context.write(word, one);
}
```

3. Other wise we can use the following ***MusicDataMapper.java*** with above changes.

```
package MusicData;
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;
import java.util.*;

public class MusicDataMapper
  extends Mapper<LongWritable, Text, Text, IntWritable> {

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


  @Override
  public void map(LongWritable key, Text value, Context context)
     throws IOException, InterruptedException {
          String line = value.toString();
          StringTokenizer tokenizer = new StringTokenizer(line);

           for(int i = 0; i < 4; i++) {
              tokenizer.nextToken("|");
           }
           String str = tokenizer.nextToken();

           if(str.equals("1")) {
              word.set(str);
              context.write(word, one);
           }
     }
}
```

4. The ***MusicDataReducer.java*** also requires some changes. The changes are as follows:

```
key.set("Number of times a song was heard fully: ");
```

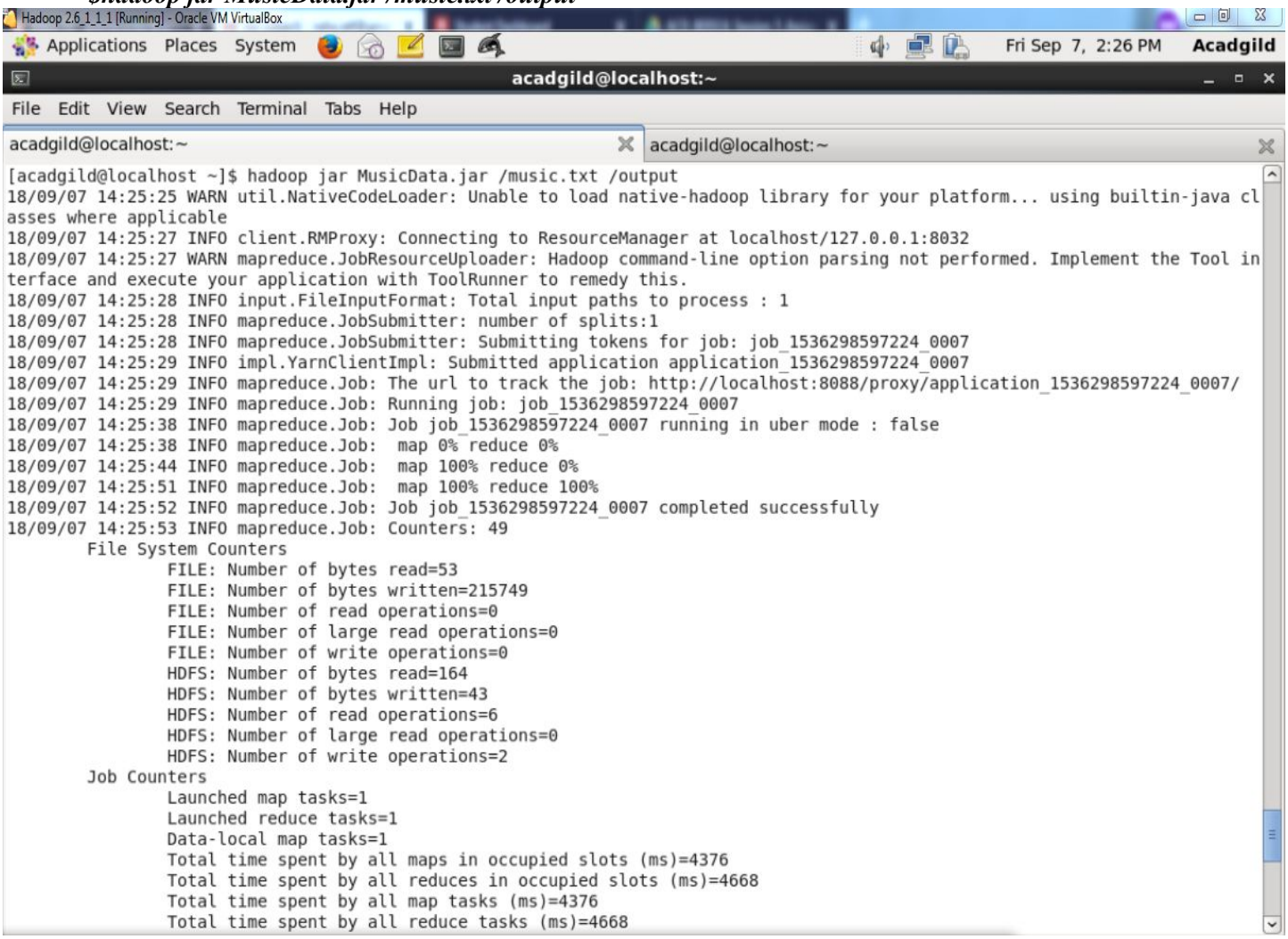
5. Other wise we can use the following ***MusicDataReducer.java*** with the above changes:

```
package MusicData;
import java.io.IOException;

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

```
import org.apache.hadoop.mapreduce.Reducer;


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

  @Override
  public void reduce(Text key, Iterable<IntWritable> values,
      Context context)
      throws IOException, InterruptedException {
      System.out.println("From The Reducer=>"+key) ;

      int sum = 0;

      for (IntWritable value : values) {
                    sum+=value.get();
        }
      key.set("Number of times a song was heard fully: ");
      context.write(key, new IntWritable(sum));
  }
}
```

6. Now create a jar file ***MusicData.jar*** with the above three source files, ***MusicData.java, MusicDataMapper.java*** and ***MusicDataReducer.java.***

7. Run the jar file ***MusicData.jar*** as follows:
   $hadoop jar MusicData.jar /music.txt /output



```
Hadoop 2.6_1_1_1 [Running] - Oracle VM VirtualBox
Applications Places System                                  Fri Sep 7, 2:28 PM  Acadgild
acadgild@localhost:~
File Edit View Search Terminal Tabs Help
acadgild@localhost:~   acadgild@localhost:~
                Total vcore-milliseconds taken by all map tasks=4376
                Total vcore-milliseconds taken by all reduce tasks=4668
                Total megabyte-milliseconds taken by all map tasks=4481024
                Total megabyte-milliseconds taken by all reduce tasks=4780032
        Map-Reduce Framework
                Map input records=4
                Map output records=1
                Map output bytes=6
                Map output materialized bytes=53
                Input split bytes=96
                Combine input records=1
                Combine output records=1
                Reduce input groups=1
                Reduce shuffle bytes=53
                Reduce input records=1
                Reduce output records=1
                Spilled Records=2
                Shuffled Maps =1
                Failed Shuffles=0
                Merged Map outputs=1
                GC time elapsed (ms)=162
                CPU time spent (ms)=2220
                Physical memory (bytes) snapshot=423776256
                Virtual memory (bytes) snapshot=4160446464
                Total committed heap usage (bytes)=290979840
        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=68
        File Output Format Counters
                Bytes Written=43
[acadgild@localhost ~]$
```

8. We can observe that the MR process is done.
9. Now lets open the ***/output*** folder to check the status of the process and output of the process.
10. Open the ***/output*** folder for status:
    $hadoop fs –ls /output

```
Hadoop 2.6_1_1_1 [Running] - Oracle VM VirtualBox
Applications Places System                                  Fri Sep 7, 2:31 PM  Acadgild
acadgild@localhost:~
File Edit View Search Terminal Tabs Help
acadgild@localhost:~   acadgild@localhost:~
You have new mail in /var/spool/mail/acadgild
[acadgild@localhost ~]$ hadoop fs -ls /output
18/09/07 14:26:08 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java cl
asses where applicable
Found 2 items
-rw-r--r--   1 acadgild supergroup          0 2018-09-07 14:25 /output/_SUCCESS
-rw-r--r--   1 acadgild supergroup         43 2018-09-07 14:25 /output/part-r-00000
[acadgild@localhost ~]$
```

11. We can observe that the output is ***_SUCCESS*** indicates that the process executed successfully.
12. Now open the file ***/output/part-r-00000*** for final output.
    $hadoop fs –cat /output/part-r-00000

```
[acadgild@localhost ~]$ hadoop fs -cat /output/part-r-00000
18/09/07 14:26:14 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java cl
asses where applicable
Number of times a song was heard fully:         1
You have new mail in /var/spool/mail/acadgild
[acadgild@localhost ~]$
```

13. We can observe that the message ***Number of times a song was heard fully:*** *1* indicates that only one song was fully listened by the user.

Task 3: What are the number of times a song was shared.

1. For this task there is nothing to be changed for the ***MusicData.java*** driver program.
2. But for the ***MusicDataMapper.java*** program the following changes are required:

```
for(int i = 0; i < 2; i++) {
   tokenizer.nextToken("|");
}
String str = tokenizer.nextToken("|");

if(str.equals("1")) {
   word.set(str);
   context.write(word, one);
}
```

3. Other wise the following ***MusicDataMapper.java*** can be used with the above changes:

```
package MusicData;
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;
import java.util.*;

public class MusicDataMapper
  extends Mapper<LongWritable, Text, Text, IntWritable> {

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


  @Override
  public void map(LongWritable key, Text value, Context context)
     throws IOException, InterruptedException {
          String line = value.toString();
          StringTokenizer tokenizer = new StringTokenizer(line);
           for(int i = 0; i < 2; i++) {
              tokenizer.nextToken("|");
           }
           String str = tokenizer.nextToken("|");
           if(str.equals("1")) {
              word.set(str);
              context.write(word, one);
           }
     }
}
```

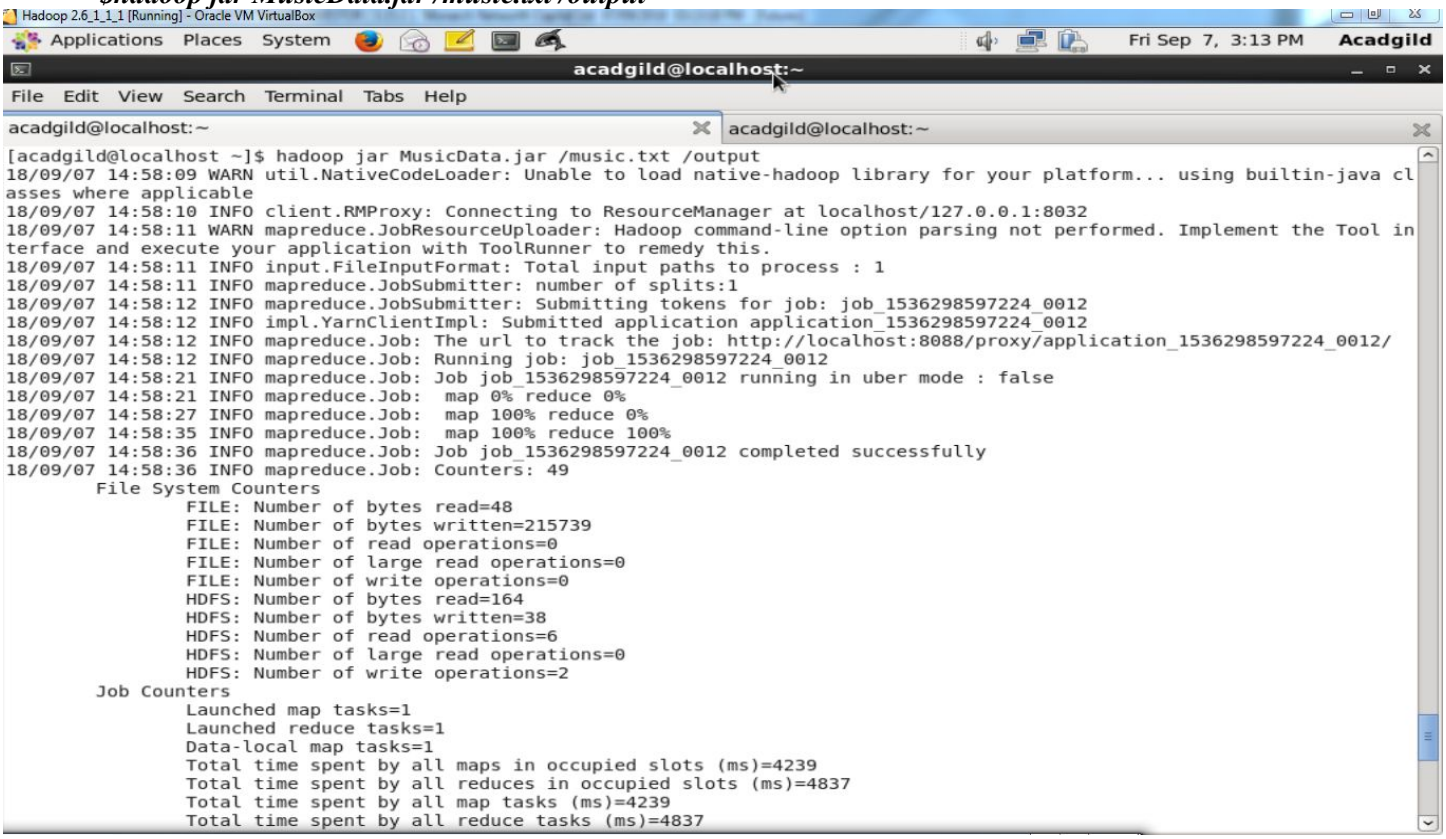
4. And the ***MusicDataReducer.java*** source code needs to be changed with the following changes:

```
int  sum = 0;

for(IntWritable value : values) {
   sum += value.get();
}
key.set("Number of times a song was shared: ");
context.write(key, new IntWritable(sum));
```

5. Otherwise, use the following ***MusicDataReducer.java*** source code with the above changes:

```
package MusicData;
import java.io.IOException;

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


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

  @Override
  public void reduce(Text key, Iterable<IntWritable> values,
      Context context)
      throws IOException, InterruptedException {
      System.out.println("From The Reducer=>"+key) ;

      int sum = 0;

      for (IntWritable value : values) {
            sum+=value.get();
       }
      key.set("Number of times a song was shared: ");
      context.write(key, new IntWritable(sum));
  }
}
```

6. Now create a jar ***MusicData.jar*** with the above three source files: **MusicData.java, MusicDataMapper.java** and ***MusicDataReducer.java***.
7. Now run the jar file ***MusicData.jar*** as follows:
   $hadoop jar MusicData.jar /music.txt /output



```
                Total vcore-milliseconds taken by all map tasks=4239
                Total vcore-milliseconds taken by all reduce tasks=4837
                Total megabyte-milliseconds taken by all map tasks=4340736
                Total megabyte-milliseconds taken by all reduce tasks=4953088
        Map-Reduce Framework
                Map input records=4
                Map output records=2
                Map output bytes=12
                Map output materialized bytes=48
                Input split bytes=96
                Combine input records=2
                Combine output records=1
                Reduce input groups=1
                Reduce shuffle bytes=48
                Reduce input records=1
                Reduce output records=1
                Spilled Records=2
                Shuffled Maps =1
                Failed Shuffles=0
                Merged Map outputs=1
                GC time elapsed (ms)=171
                CPU time spent (ms)=2130
                Physical memory (bytes) snapshot=421109760
                Virtual memory (bytes) snapshot=4163706880
                Total committed heap usage (bytes)=289406976
        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=68
        File Output Format Counters
                Bytes Written=38
You have new mail in /var/spool/mail/acadgild
```

8. Now the Map Reduce process is successfully completed.
9. Open the /***output*** folder to check the success of the process and final output of the process.
10. Open the ***/output*** folder:
    $hadoop fs –ls /output

```
Hadoop 2.6_1_1_1 [Running] - Oracle VM VirtualBox
Applications Places System                                   Fri Sep 7, 3:18 PM  Acadgild
acadgild@localhost:~
File Edit View Search Terminal Tabs Help
acadgild@localhost:~    acadgild@localhost:~
You have new mail in /var/spool/mail/acadgild
[acadgild@localhost ~]$ hadoop fs -ls /output
18/09/07 15:13:01 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java cl
asses where applicable
Found 2 items
-rw-r--r--   1 acadgild supergroup          0 2018-09-07 14:58 /output/_SUCCESS
-rw-r--r--   1 acadgild supergroup         38 2018-09-07 14:58 /output/part-r-00000
[acadgild@localhost ~]$
```

11. Open the ***/output/part-r-00000*** file for the final output.
    $hadoop fs –cat /output/part-r-00000

```
Hadoop 2.6_1_1_1 [Running] - Oracle VM VirtualBox
Applications Places System                                   Fri Sep 7, 3:19 PM  Acadgild
acadgild@localhost:~
File Edit View Search Terminal Tabs Help
acadgild@localhost:~    acadgild@localhost:~
You have new mail in /var/spool/mail/acadgild
[acadgild@localhost ~]$ hadoop fs -cat /output/part-r-00000
18/09/07 15:19:33 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java cl
asses where applicable
Number of times a song was shared:      2
[acadgild@localhost ~]$
```

12. We can observer with the message "**Number of times a song was share: 2",** indicates that the song was shared 2 times.