Large Scale Data Processing CSE3025

Prof. Ramesh Ragala

August 17, 2019

Hadoop Map Reduce Word Count Exam

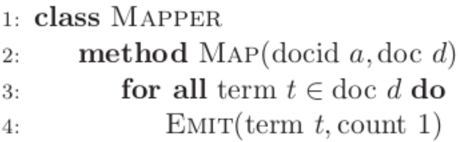
- **Problem**
  - For a given a set of text documents, the program has to counts the number of occurrences of each word.
- Word Count is a simple and easy to understand algorithm which can be implemented as a Map Reduce application easily.
- The algorithm consists of three main sections
  - Driver Program (Main Program) → Configurations
  - Mapper → Produce key - value pairs form data
  - Reduce → Produce Results in the form of key-value pair

Hadoop Map Reduce Word Count Exam

- **Writing Mapper Class**
  - It is created by extending the org.apache.hadoop.mapreduce.Mapper Class.
  - The map() is implemented by overriding the map method in the Mapper Class
  - The Mapper() will take four arguments.
  - The input key-value pair and output key-value pair need not be of same type
  - Input parameters: Key → Byteoffset of the input file(line number). Value → Line of text in the corresponding byteoffset position
  - Output Parameters: (word,1) for each word it reads in the line

Hadoop Map Reduce Word Count Exam

- **Pseudo Code for Mapper in Hadoop Map Reduce**



```
class Mapper
    method Map(docid $a$, doc $d$)
        for all term $t \in$ doc $d$ do
            Emit(term $t$, count 1)
```

Hadoop MapReduce Word Count Examp

Mapper Code in Java

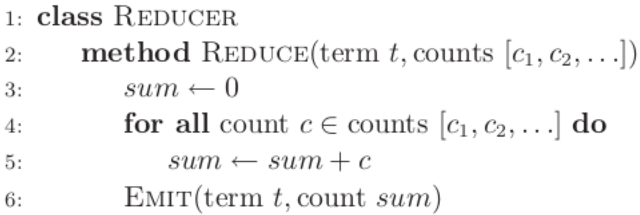
```java
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;
import java.io.*;
import java.util.StringTokenizer;
public class WordCountMapper extends Mapper<LongWritable,Text,Text,IntWritable> {
        private static final IntWritable one = new IntWritable(1);
        private Text word = new Text();

        public void map(LongWritable key, Text value, Context context) throws
        IOException, InterruptedException
        {
                String line = value.toString();
                StringTokenizer itr = new StringTokenizer(line);
                while(itr.hasMoreTokens())
                {
                        word.set(itr.nextToken());
                        context.write(word,one);
                }
        }

}
```

Hadoop Map Reduce Word Count Exam

- **Writing Mapper Class**
  - It is created by extending the org.apache.hadoop.mapreduce.Reducer Class.
  - The reduce() is implemented by overriding the reduce method in the Reducer Class
  - It collects all the intermediate key-value pairs generated by the multiple map functions.
  - After this, it will sum up all the occurrences of each word and output a key-value pair for each word in the text documents as.

Hadoop Map Reduce Word Count Exam

- **Pseudo Code for Reducer in Hadoop Map Reduce**



```
class Reducer
    method Reduce(term $t$, counts $[c_1, c_2, \ldots]$)
        $sum \leftarrow 0$
        for all count $c \in$ counts $[c_1, c_2, \ldots]$ do
            $sum \leftarrow sum + c$
        Emit(term $t$, count $sum$)
```

Hadoop MapReduce Word Count Examp

Reducer Code in Java

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

Hadoop Map Reduce Word Count Exam

- **Writing Driver Program - Steps**
  - Job Name : name of this Job
  - Executable (Jar) Class: the main executable class.
  - Mapper Class: class which overrides the "map" function.
  - Reducer: class which override the "reduce" function.
  - Output Key: type of output key.
  - Output Value: type of output value.
  - File Input Path
  - File Output Path

Hadoop MapReduce Word Count Examp

Driver Code in Java

```java
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.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
public class WordCountDriver {
        public static void main(String[] args) throws Exception
        {
                Configuration conf = new Configuration();
                Job job = Job.getInstance(conf, "WordCount");
                //Job job = new Job(new Configuration(), "WordCount");
                job.setJarByClass(WordCountDriver.class);
                job.setMapperClass(WordCountMapper.class);
                job.setReducerClass(WordCountReducer.class);
                FileInputFormat.addInputPath(job, new Path(args[0]));
                FileOutputFormat.setOutputPath(job, new Path(args[1]));
                job.setOutputKeyClass(Text.class);
                job.setOutputValueClass(IntWritable.class);
                job.waitForCompletion(true);
                //System.exit(job.waitForCompletion(true) ? 0 : 1);
        }

}
```