

Exp No: 11

Date:

HADOOP
IMPLEMENT THE MAX TEMPERATURE MAPREDUCE PROGRAM TO
IDENTIFY THE YEAR WISE MAXIMUM TEMPERATURE FROM
SENSOR DATA

AIM

To implement the Max temperature MapReduce program to identify the year-wise maximum temperature from the sensor data.

Description

Sensors sense weather data in big text format containing station ID, year, date, time, temperature, quality etc. from each sensor and store it in a single line. Suppose thousands of data sensors are there, then we have thousands of records with no particular order. We require only a year and maximum temperature of particular quality in that year.

For example:

Input string from sensor:

0029029070999991902010720004+64333+023450

FM-12+

000599999V0202501N0278199999999N0000001N9-00331+

99999098351ADDGF102991999999999999999999

Here: 1902 is year

0033 is temperature

1 is measurement quality (Range between 0 or 1 or 4 or 5 or 9)

Here each mapper takes the input **key** as "byte offset of line" and **value** as "one weather sensor read i.e one line". and parse each line and produce an intermediate **key** "year" and **intermediate value** as "temperature of certain measurement qualities" for that year.

The combiner will form set values of temperature. Year and set of values of temperatures is given as input <key, value> to reducer and Reducer will produce year and maximum temperature for that year from the set of temperature values.

PROGRAM

*/

```

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;
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 org.apache.hadoop.mapreduce.Reducer;

//Mapper class

class MaxTemperatureMapper
extends Mapper<LongWritable, Text, Text, IntWritable> { private static final int MISSING
= 9999;

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

String line = value.toString(); String year = line.substring(15, 19); int airTemperature;
if (line.charAt(87) == '+') { // parseInt doesn't like leading plus signs airTemperature =
Integer.parseInt(line.substring(88, 92));
} else {
airTemperature = Integer.parseInt(line.substring(87, 92));
}
String quality = line.substring(92, 93);
if (airTemperature != MISSING && quality.matches("[01459]")) { context.write(new
Text(year), new IntWritable(airTemperature));
}
}
}

//Reducer class
class MaxTemperatureReducer
extends Reducer<Text, IntWritable, Text, IntWritable> {

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

```

```

int maxValue = Integer.MIN_VALUE; for (IntWritable value : values) {
maxValue = Math.max(maxValue, value.get());
}
context.write(key, new IntWritable(maxValue));
}
}
//Driver Class

public class MaxTemperature {

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

Job job = Job.getInstance(new Configuration()); job.setJarByClass(MaxTemperature.class);
job.setJobName("Max temperature");

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

job.setMapperClass(MaxTemperatureMapper.class);
job.setReducerClass(MaxTemperatureReducer.class);

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

job.submit();
}
}

```

OUTPUT:

Input for String :

0029029070999991902010720004+64333+023450FM-12+
000599999V0202501N0278199999999N0000001N9-00331+
99999098351ADDGF102991999999999999999'

```

(hadoop@kali)~$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [kali]
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
2024-09-11 04:59:16,429 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Starting resourcemanager
Starting nodemanagers

```

```
(hadoop@kali)~$ jps
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
14436 NodeManager
16772 Jps
13830 SecondaryNameNode
14311 ResourceManager
13597 DataNode
13471 NameNode
```

```
(hadoop@kali)~/hadoop/bin$ ./hdfs dfs -ls /exp3
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
2024-09-21 00:11:13,818 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform...
Found 3 items
-rw-r--r-- 1 hadoop supergroup 79205 2024-08-29 10:50 /exp3/dataset.txt
drwxr-xr-x - hadoop supergroup 0 2024-08-29 10:52 /exp3/new_output
drwxr-xr-x - hadoop supergroup 0 2024-09-13 01:00 /exp3/output
```

```
(hadoop@kali)~/hadoop/bin$ hadoop jar $HADOOP_STREAMING -input /exp3/dataset.txt -output /exp3/output -mapper ~/DA-Lab/exp3/mapper.py -reducer ~/DA-Lab/exp3/reducer.py
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
2024-09-21 00:13:19,993 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
packageJobJar: [/tmp/hadoop-unjar3838594044787382099/] [] /tmp/streamjob2158010624070613243.jar tmpDir=null
2024-09-21 00:13:20,918 INFO client.DefaultHohARMFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2024-09-21 00:13:21,223 INFO client.DefaultHohARMFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2024-09-21 00:13:27,216 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/hadoop/.staging/job_1726891437845_0001
2024-09-21 00:13:28,262 INFO mapred.FileInputFormat: Total input files to process : 1
2024-09-21 00:13:28,365 INFO mapreduce.JobSubmitter: number of splits:2
2024-09-21 00:13:28,613 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1726891437845_0001
2024-09-21 00:13:28,613 INFO mapreduce.JobSubmitter: Executing with tokens: []
2024-09-21 00:13:29,230 INFO conf.Configuration: resource-types.xml not found
2024-09-21 00:13:29,230 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2024-09-21 00:13:29,895 INFO impl.YarnClientImpl: Submitted application application_1726891437845_0001
2024-09-21 00:13:29,993 INFO mapreduce.Job: The url to track the job: http://kali:8088/proxy/application_1726891437845_0001/
2024-09-21 00:13:29,998 INFO mapreduce.Job: Running job: job_1726891437845_0001
2024-09-21 00:13:43,554 INFO mapreduce.Job: Job job_1726891437845_0001 running in uber mode : false
2024-09-21 00:13:43,560 INFO mapreduce.Job: map 0% reduce 0%
2024-09-21 00:13:52,918 INFO mapreduce.Job: map 100% reduce 0%
2024-09-21 00:14:00,992 INFO mapreduce.Job: map 100% reduce 100%
2024-09-21 00:14:01,012 INFO mapreduce.Job: Job job_1726891437845_0001 completed successfully
2024-09-21 00:14:01,169 INFO mapreduce.Job: Counters: 54
File System Counters
FILE: Number of bytes read=102094
FILE: Number of bytes written=1138411
FILE: Number of read operations=0
FILE: Number of large read operations=0
FILE: Number of write operations=0
HDFS: Number of bytes read=83481
HDFS: Number of bytes written=96
HDFS: Number of read operations=11
HDFS: Number of large read operations=0
HDFS: Number of write operations=2
HDFS: Number of bytes read erasure-coded=0
Job Counters
Launched map tasks=2
Launched reduce tasks=1
Data-local map tasks=2
Total time spent by all maps in occupied slots (ms)=14691
Total time spent by all reduces in occupied slots (ms)=4696
Total time spent by all map tasks (ms)=14691
Total time spent by all reduce tasks (ms)=4696
Total vcore-milliseconds taken by all map tasks=14691
Total vcore-milliseconds taken by all reduce tasks=4696
Total megabyte-milliseconds taken by all map tasks=15043584
Total megabyte-milliseconds taken by all reduce tasks=4808704
Map-Reduce Framework
Map input records=365
Map output records=10220
Map output bytes=81648
Map output materialized bytes=102100
Input split bytes=180
```

```
(hadoop@kali)~/hadoop/bin$ ./hdfs dfs -cat /exp3/output/*
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
2024-09-21 00:15:38,966 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform...
01 26.5
02 26.6
03 29.1
04 30.8
05 31.1
06 33.6
07 38.5
08 40.2
09 36.5
10 36.9
11 27.6
12 25.9
```

RESULT

Thus a java program has been implemented to identify the year-wise maximum temperature from the sensor data.