EXP 3: Map Reduce program to process a weather dataset.

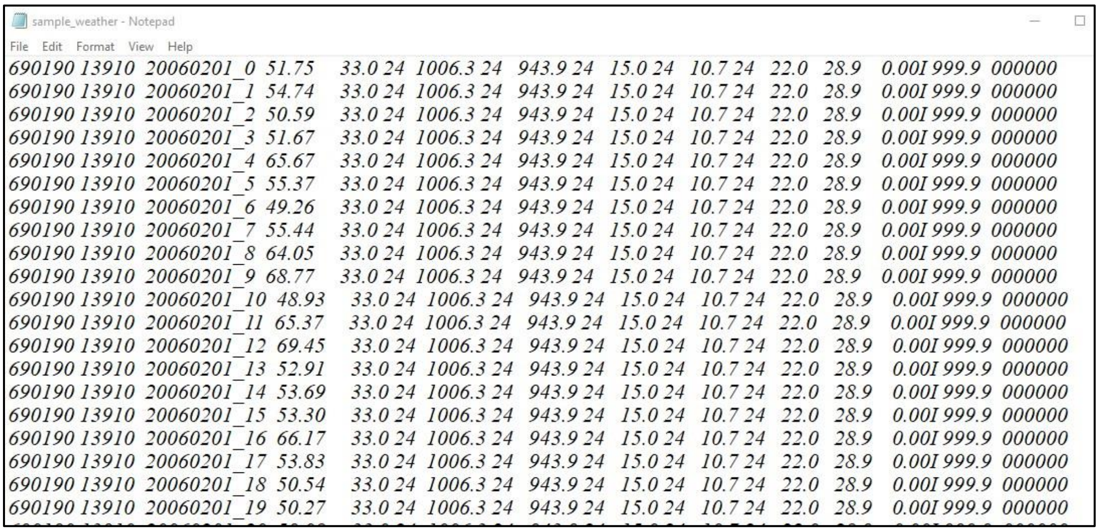
AIM:

To implement MapReduce program to process a weather dataset.

PROCEDURE:

Step 1: Create Data File:

Create a file named "sample_weather.txt" and populate it with text data that you wish to analyse.



```
690190 13910  20060201_0  51.75   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_1  54.74   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_2  50.59   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_3  51.67   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_4  65.67   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_5  55.37   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_6  49.26   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_7  55.44   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_8  64.05   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_9  68.77   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_10  48.93   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_11  65.37   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_12  69.45   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_13  52.91   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_14  53.69   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_15  53.30   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_16  66.17   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_17  53.83   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_18  50.54   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
690190 13910  20060201_19  50.27   33.0 24  1006.3 24  943.9 24  15.0 24  10.7 24  22.0  28.9  0.00I 999.9  000000
```

Step 2: Mapper Logic - mapper.py:

Create a file named "mapper.py" to implement the logic for the mapper. The mapper will read input data from STDIN, split lines into words, and output each word with its count.

mapper.py:

```
#!/usr/bin/python3
import sys def
map1():     for line in
sys.stdin:
        tokens = line.strip().split()          if len(tokens) < 13:
continue          station = tokens[0]          if "STN" in station:
continue          date_hour = tokens[2]          temp = tokens[3]
dew = tokens[4]          wind = tokens[12]          if temp == "9999.9"
or dew == "9999.9" or wind == "999.9":              continue
        hour = int(date_hour.split("_")[-1])
date = date_hour[:date_hour.rfind("_")-2]
if 4 < hour <= 10:
            section = "section1"
elif 10 < hour <= 16:
section = "section2"          elif
```

```
16 < hour <= 22:
section = "section3"         else:
            section = "section4"
        key_out = f"{station}_{date}_{section}"
value_out = f"{temp} {dew} {wind}"
print(f"{key_out}\t{value_out}") if
__name__ == "__main__":     map1()
```

Step 3: Reducer Logic - reducer.py:
Create a file named "reducer.py" to implement the logic for the reducer. The reducer will aggregate the occurrences of each word and generate the final output.

reducer.py: #!/usr/bin/python3 import sys

```
def reduce1():     current_key = None
sum_temp, sum_dew, sum_wind = 0, 0, 0
count = 0     for line in sys.stdin:
        key, value = line.strip().split("\t")
temp, dew, wind = map(float, value.split())
if current_key is None:             current_key =
key         if key == current_key:
sum_temp += temp             sum_dew += dew
sum_wind += wind             count += 1
else:
            avg_temp = sum_temp / count             avg_dew = sum_dew /
count             avg_wind = sum_wind / count
print(f"{current_key}\t{avg_temp} {avg_dew} {avg_wind}")

            current_key = key             sum_temp, sum_dew,
sum_wind = temp, dew, wind             count = 1
    if current_key is not None:
        avg_temp = sum_temp / count         avg_dew = sum_dew /
count         avg_wind = sum_wind / count
print(f"{current_key}\t{avg_temp} {avg_dew} {avg_wind}") if
__name__ == "__main__":
    reduce1()
```

Step 4: Prepare Hadoop Environment:
Start the Hadoop daemons and create a directory in HDFS to store your data. Run the following commands to store the data in the WeatherData Directory.

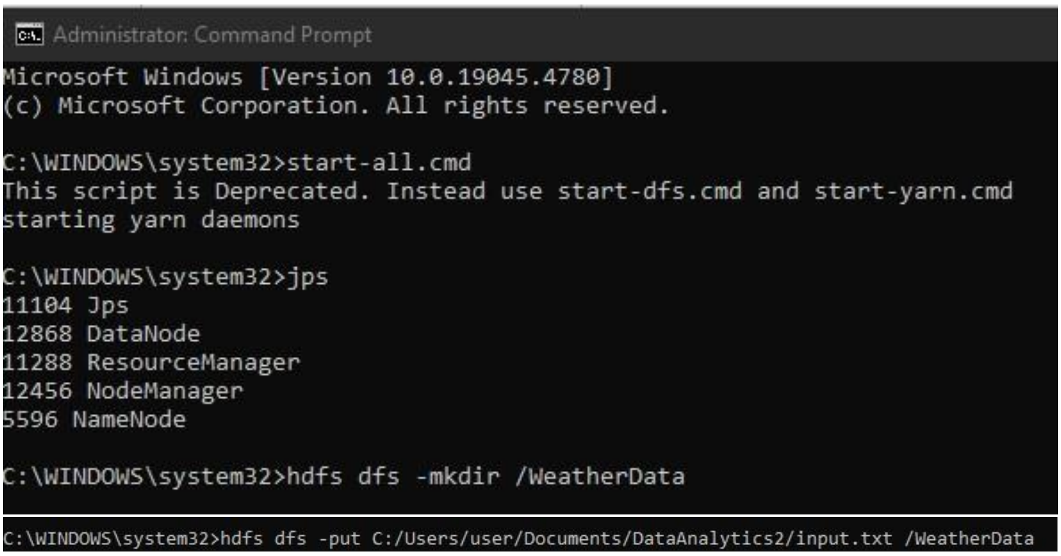
```
start-all.cmd cd C:/Hadoop/sbin hdfs dfs -mkdir /WeatherData hdfs dfs -put
C:/Users/user/Documents/DataAnalytics2/input.txt /WeatherData hadoop jar
C:\hadoop\share\hadoop\tools\lib\hadoop-streaming-3.3.6.jar ^
-input /user/input/sample_weather.txt ^
-output /user/output ^
-mapper "python C:/ Users/user/Documents/DataAnalytics2/mapper.py" ^ -reducer
"python C:/ Users/user/Documents/DataAnalytics2/reducer.py"
```

Step 5: Check Output:

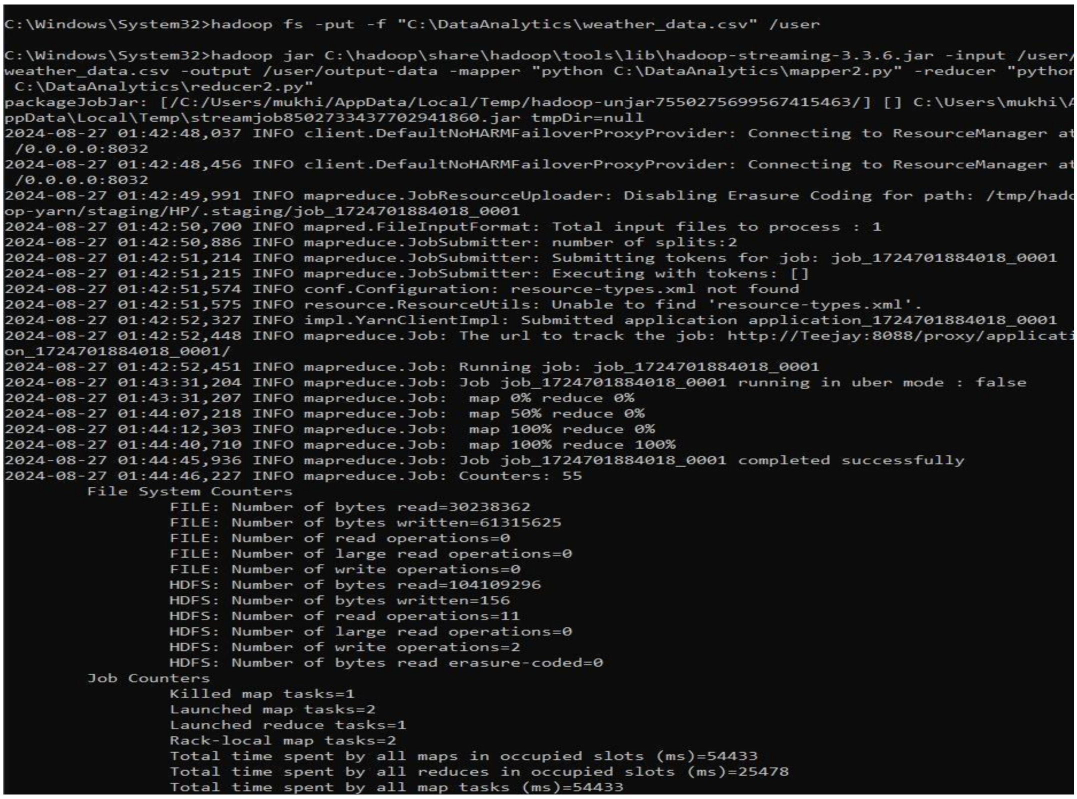
Check the output of the Word Count program in the specified HDFS output directory.

```
hdfs dfs -cat /WeatherData/output/part-00000
```

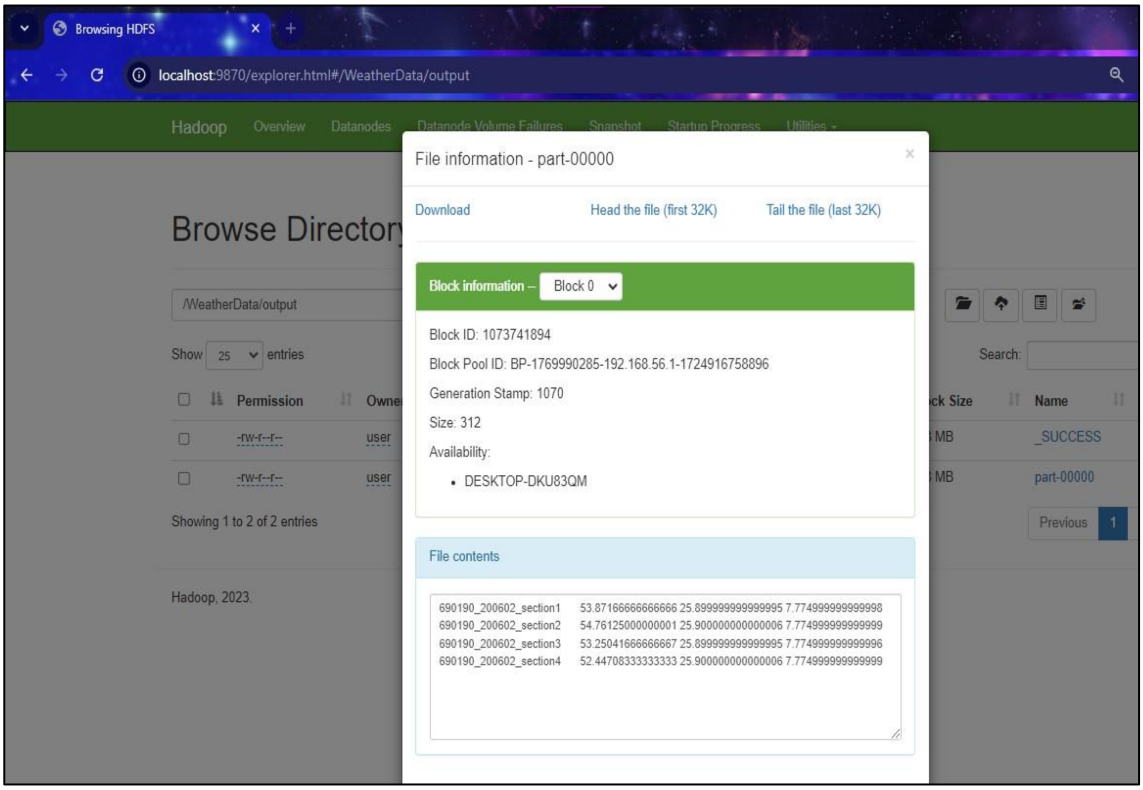
OUTPUT:



```
Microsoft Windows [Version 10.0.19045.4780]
(c) Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>start-all.cmd
This script is Deprecated. Instead use start-dfs.cmd and start-yarn.cmd
starting yarn daemons

C:\WINDOWS\system32>jps
11104 Jps
12868 DataNode
11288 ResourceManager
12456 NodeManager
5596 NameNode

C:\WINDOWS\system32>hdfs dfs -mkdir /WeatherData

C:\WINDOWS\system32>hdfs dfs -put C:/Users/user/Documents/DataAnalytics2/input.txt /WeatherData
```



```
C:\Windows\System32>hadoop fs -put -f "C:\DataAnalytics\weather_data.csv" /user

C:\Windows\System32>hadoop jar C:\hadoop\share\hadoop\tools\lib\hadoop-streaming-3.3.6.jar -input /user/
weather_data.csv -output /user/output-data -mapper "python C:\DataAnalytics\mapper2.py" -reducer "pythor
 C:\DataAnalytics\reducer2.py"
packageJobJar: [/C:/Users/mukhi/AppData/Local/Temp/hadoop-unjar7550275699567415463/] [] C:\Users\mukhi\A
ppData\Local\Temp\streamjob8502733437702941860.jar tmpDir=null
2024-08-27 01:42:48,037 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at
 /0.0.0.0:8032
2024-08-27 01:42:48,456 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at
 /0.0.0.0:8032
2024-08-27 01:42:49,991 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hado
op-yarn/staging/HP/.staging/job_1724701884018_0001
2024-08-27 01:42:50,700 INFO mapred.FileInputFormat: Total input files to process : 1
2024-08-27 01:42:50,886 INFO mapreduce.JobSubmitter: number of splits:2
2024-08-27 01:42:51,214 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1724701884018_0001
2024-08-27 01:42:51,215 INFO mapreduce.JobSubmitter: Executing with tokens: []
2024-08-27 01:42:51,574 INFO conf.Configuration: resource-types.xml not found
2024-08-27 01:42:51,575 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2024-08-27 01:42:52,327 INFO impl.YarnClientImpl: Submitted application application_1724701884018_0001
2024-08-27 01:42:52,448 INFO mapreduce.Job: The url to track the job: http://Teejay:8088/proxy/applicati
on_1724701884018_0001/
2024-08-27 01:42:52,451 INFO mapreduce.Job: Running job: job_1724701884018_0001
2024-08-27 01:43:31,204 INFO mapreduce.Job: Job job_1724701884018_0001 running in uber mode : false
2024-08-27 01:43:31,207 INFO mapreduce.Job:  map 0% reduce 0%
2024-08-27 01:44:07,218 INFO mapreduce.Job:  map 50% reduce 0%
2024-08-27 01:44:12,303 INFO mapreduce.Job:  map 100% reduce 0%
2024-08-27 01:44:40,710 INFO mapreduce.Job:  map 100% reduce 100%
2024-08-27 01:44:45,936 INFO mapreduce.Job: Job job_1724701884018_0001 completed successfully
2024-08-27 01:44:46,227 INFO mapreduce.Job: Counters: 55
        File System Counters
                FILE: Number of bytes read=30238362
                FILE: Number of bytes written=61315625
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=104109296
                HDFS: Number of bytes written=156
                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
                Killed map tasks=1
                Launched map tasks=2
                Launched reduce tasks=1
                Rack-local map tasks=2
                Total time spent by all maps in occupied slots (ms)=54433
                Total time spent by all reduces in occupied slots (ms)=25478
                Total time spent by all map tasks (ms)=54433
```



/WeatherData/output

Show 25 entries

Permission	Owner	...ck Size	Name
-rw-r--r--	user	... MB	_SUCCESS
-rw-r--r--	user	... MB	part-00000

Showing 1 to 2 of 2 entries

Hadoop, 2023.

File information - part-00000

Block information -- Block 0

Block ID: 1073741894

Block Pool ID: BP-1769990285-192.168.56.1-1724916758896

Generation Stamp: 1070

Size: 312

Availability:

- DESKTOP-DKU83QM

File contents

```
690190_200602_section1	53.87166666666666 25.899999999999995 7.774999999999998
690190_200602_section2	54.76125000000001 25.900000000000006 7.774999999999999
690190_200602_section3	53.25041666666667 25.899999999999995 7.774999999999996
690190_200602_section4	52.44708333333333 25.900000000000006 7.774999999999999
```

RESULT:

Thus, the program for weather dataset using Map Reduce has been executed successfully.