

Ex.No.10

## **IMPLEMENT THE MAPREDUCE PROGRAM TO PERFORM PROCESSING ON TEMPERATURE DATA COLLECTED FROM SENSORS**

### **AIM:**

To implement a Map Reduce program to perform processing on the temperature data collected from sensors

### **PROCEDURE:**

Open command prompt and run as administrator

Start Hadoop services by typing in the following commands:

- start-dfs.cmd
- start-yarn.cmd

```
C:\Windows\System32>jps
14212 Jps

C:\Windows\System32>start-dfs.cmd

C:\Windows\System32>jps
12000 DataNode
16488 Jps
24904 NameNode

C:\Windows\System32>start-yarn.cmd
starting yarn daemons

C:\Windows\System32>jps
12000 DataNode
6384 NodeManager
31300 Jps
24904 NameNode
29036 ResourceManager

C:\Windows\System32>
```

Open the browser and go to the URL localhost:9870

Hadoop

Overview

Datanodes

Datanode Volume Failures

Snapshot

Startup Progress

Utilities

Overview 'localhost:9000' (✓active)

Started:	Tue Sep 10 15:34:26 +0530 2024
Version:	3.3.6, r1be78238728da9266a4f88195058f08fd012bf9c
Compiled:	Sun Jun 18 13:52:00 +0530 2023 by ubuntu from (HEAD detached at release-3.3.6-RC1)
Cluster ID:	CID-84c31ef0-3f5d-4043-8d92-f6f88dc15d51
Block Pool ID:	BP-1561018181-192.168.1.46-1724075006684

Summary

Security is off.

Safemode is off.

5 files and directories, 1 blocks (1 replicated blocks, 0 erasure coded block groups) = 6 total filesystem object(s).

Heap Memory used 123 MB of 339 MB Heap Memory. Max Heap Memory is 889 MB.

Non Heap Memory used 51.75 MB of 54.05 MB Committed Non Heap Memory. Max Non Heap Memory is <unbounded>.

Confined Memory

156.75 MB

Create a directory in HDFS using the command:

```
hdfs dfs -mkdir -p /weather/hadoop/input
```

```
C:\hadoop-3.3.6\sbin>hdfs dfs -mkdir -p /weather/hadoop/input
C:\hadoop-3.3.6\sbin>_
```

## Browse Directory

/weather/hadoop/Go!

Show 25 entriesSearch:

	Permission	Owner	Group	Size	Last Modified	Replication	Block Size	Name	
<input type="checkbox"/>	drwxr-xr-x	prath	supergroup	0 B	Sep 10 17:54	0	0 B	input	

Showing 1 to 1 of 1 entries

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Copy the input file to HDFS using the command:

```
hdfs dfs -put C:/Semester7/DataAnalytics/Lab/Ex3/sample_weather.txt
/weather/hadoop/input
```

```
C:\hadoop-3.3.6\sbin>hdfs dfs -put C:/Semester7/DataAnalytics/Lab/Ex3/sample_weather.txt /weather/hadoop/input
```

Display the contents of the file using this command:

`hdfs dfs -cat /weather/hadoop/input/sample_weather.txt`

```
C:\hadoop-3.3.6\sbin>hdfs dfs -cat /weather/hadoop/input/sample_weather.txt
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
```

Create mapper.py and reducer.py files

mapper.py

```
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()
```

## reducer.py

```
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()
```

Run the Hadoop Streaming Job and give the file paths to the input, mapper and reducer using the following command:

```
hadoop jar %HADOOP_HOME%\share\hadoop\tools\lib\hadoop-streaming-*.jar^
```

```
-mapper "python C:\Semester7\DataAnalytics\Lab\Ex3\mapper.py" -reducer  
"python C:\Semester7\DataAnalytics\Lab\Ex3\reducer.py"^
```

```
-input/weather/hadoop/input/sample_weather.txt -output /weather/hadoop/output
```

```

C:\hadoop-3.3.6\sbin>hadoop jar %HADOOP_HOME%\share/hadoop/tools/lib/hadoop-streaming-*.jar ^ -mapper "python C:/Semester7/DataAnalytics/Lab/Ex3/mapper.py" ^ -reducer "python C:/Semester7/DataAnalytics/Lab/Ex3/reducer.py" ^ -input /weather/hadoop/input/sample_weather.txt -output /weather/hadoop/output
packageJobJar: [/C:/Users/prath/AppData/Local/Temp/hadoop-unjar5827120770609893550/] [] C:\Users\prath\AppData\Local\Temp\streamjob7774243408206235166.jar tmpDir=null
2024-09-11 13:02:03,113 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2024-09-11 13:02:03,274 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2024-09-11 13:02:08,930 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/prath/.staging/job_1726037706825_0002
2024-09-11 13:02:09,188 INFO mapred.FileInputFormat: Total input files to process : 1
2024-09-11 13:02:09,269 INFO mapreduce.JobSubmitter: number of splits:2
2024-09-11 13:02:09,391 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1726037706825_0002
2024-09-11 13:02:09,391 INFO mapreduce.JobSubmitter: Executing with tokens: []
2024-09-11 13:02:09,551 INFO conf.Configuration: resource-types.xml not found
2024-09-11 13:02:09,551 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2024-09-11 13:02:09,615 INFO Impl.YarnClientImpl: Submitted application application_1726037706825_0002
2024-09-11 13:02:09,651 INFO mapreduce.Job: The url to track the job: http://ANURAJ:8088/proxy/application_1726037706825_0002/
2024-09-11 13:02:09,654 INFO mapreduce.Job: Running job: job_1726037706825_0002
2024-09-11 13:02:22,062 INFO mapreduce.Job: Job job_1726037706825_0002 running in uber mode : false
2024-09-11 13:02:22,065 INFO mapreduce.Job: map 100% reduce 0%
2024-09-11 13:02:29,095 INFO mapreduce.Job: map 100% reduce 100%
2024-09-11 13:02:29,113 INFO mapreduce.Job: Job job_1726037706825_0002 completed successfully
2024-09-11 13:02:29,199 INFO mapreduce.Job: Counters: 54

File System Counters
  FILE: Number of bytes read=3870
  FILE: Number of bytes written=846968
  FILE: Number of read operations=0
  FILE: Number of large read operations=0
  FILE: Number of write operations=0
  HDFS: Number of bytes read=16375
  HDFS: Number of bytes written=312
  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)=7175
  Total time spent by all reduces in occupied slots (ms)=3274
  Total time spent by all map tasks (ms)=7175
  Total time spent by all reduce tasks (ms)=3274
  Total vcore-milliseconds taken by all map tasks=7175
  Total vcore-milliseconds taken by all reduce tasks=3274
  Total megabyte-milliseconds taken by all map tasks=7347200
  Total megabyte-milliseconds taken by all reduce tasks=3352576

```

```

Total megabyte-milliseconds taken by all reduce tasks=3352576
Map-Reduce Framework
  Map input records=96
  Map output records=96
  Map output bytes=3672
  Map output materialized bytes=3876
  Input split bytes=226
  Combine input records=0
  Combine output records=0
  Reduce input groups=4
  Reduce shuffle bytes=3876
  Reduce input records=96
  Reduce output records=4
  Spilled Records=192
  Shuffled Maps =2
  Failed Shuffles=0
  Merged Map outputs=2
  GC time elapsed (ms)=182
  CPU time spent (ms)=451
  Physical memory (bytes) snapshot=940191744
  Virtual memory (bytes) snapshot=1579802624
  Total committed heap usage (bytes)=877658112
  Peak Map Physical memory (bytes)=352460800
  Peak Map Virtual memory (bytes)=559587328
  Peak Reduce Physical memory (bytes)=274481152
  Peak Reduce Virtual memory (bytes)=492412928

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=16149
File Output Format Counters
  Bytes Written=312
2024-09-11 13:02:29,199 INFO streaming.StreamJob: Output directory: /weather/hadoop/output

```

View the output using the command:

`hdfs dfs -cat /weather/hadoop/output/part-00000`

```

C:\hadoop-3.3.6\sbin>hdfs dfs -cat /weather/hadoop/output/part-00000
690190_200602_section1 53.87166666666666 25.899999999999995 7.774999999999999
690190_200602_section2 54.761250000000001 25.900000000000006 7.774999999999999
690190_200602_section3 53.25041666666667 25.899999999999995 7.774999999999996
690190_200602_section4 52.44708333333333 25.900000000000006 7.774999999999999

```

View the output on the file system in browser

Hadoop

Overview

Datanodes

Datanode Volume Failures

Snapshot

Startup Progress

Utilities

Browse Directory

/weather/hadoop/output

Go!

Show

25

entries

Search:

<input type="checkbox"/>	Permission	Owner	Group	Size	Last Modified	Replication	Block Size	Name	
<input type="checkbox"/>	-rw-r--r--	prath	supergroup	0 B	Sep 11 13:02	1	128 MB	_SUCCESS	
<input type="checkbox"/>	-rw-r--r--	prath	supergroup	312 B	Sep 11 13:02	1	128 MB	part-00000	

Showing 1 to 2 of 2 entries

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File contents

690190\_200602\_section1

53.87166666666666 25.899999999999995 7.774999999999998

690190\_200602\_section2

54.761250000000001 25.900000000000006 7.774999999999999

690190\_200602\_section3

53.25041666666667 25.899999999999995 7.774999999999996

690190\_200602\_section4

52.44708333333333 25.900000000000006 7.774999999999999

RESULT:

Thus, to implement the Map Reduce program to perform processing on the temperature data collected from sensors was completed successfully.