Processing a weather dataset using MapReduce

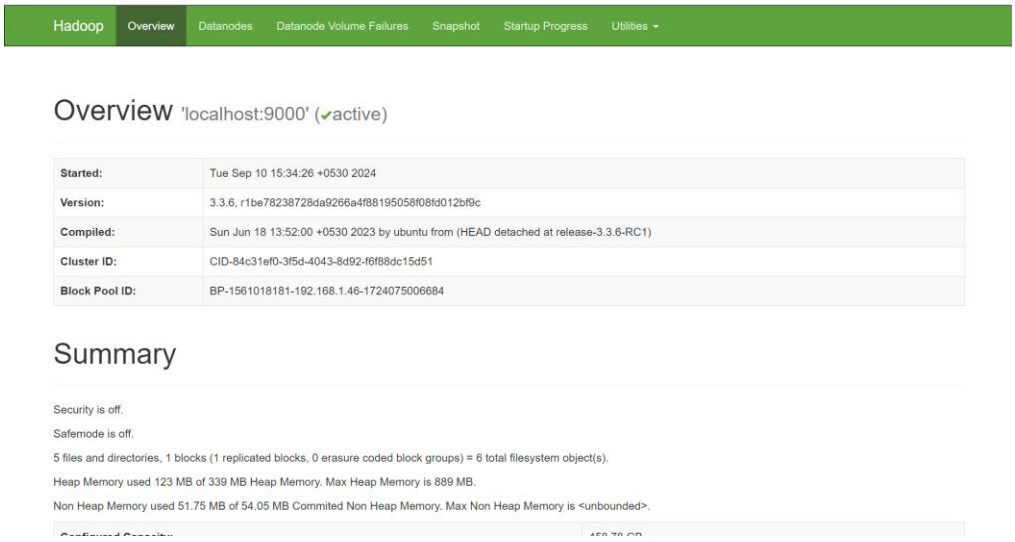
Open command prompt and run as administrator

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>
```

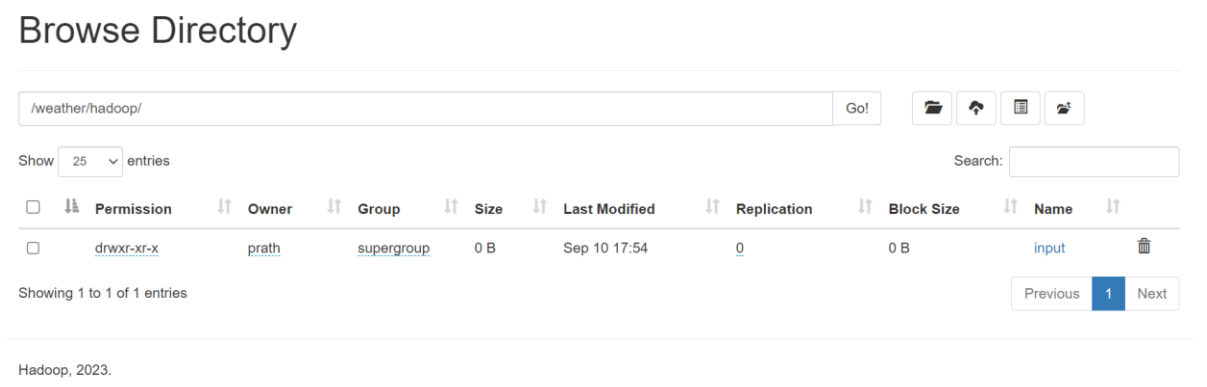
Open the browser and go to the URL localhost:9870



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>_
```



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 "pyth
on 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 13:02:22,962 INFO mapreduce.Job: Job job_1726037706825_0002 running in uber mode : false
2024-09-11 13:02:22,965 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 7.774999999999998
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
```

View the output on the file system in browser