Ex No 3

Map Reduce program to process a weather dataset.

AIM:

To implement MapReduce program to process a weather dataset.

PROCEDURE:

1. Start Hadoop Services

Make sure you are in the `sbin` folder of Hadoop. Start the Hadoop services by running the following commands:

```
cd /usr/local/Cellar/hadoop/3.4.0/libexec/sbin
./start-dfs.sh
./start-yarn.sh
```

2. Prepare Your Files

Create the necessary files (`mapper.py`, `reducer.py`, and `sample_weather.txt`) on your local machine or the server where Hadoop is installed.

Create `sample_weather.txt`:

You can create this file in the current directory:

```
nano sample_weather.txt
```

Example data for `sample_weather.txt`:

```
STN001 2023-09-10_04 15.0 12.0 5.0
STN001 2023-09-10_10 25.0 20.0 8.0
STN002 2023-09-10_16 30.0 25.0 10.0
STN002 2023-09-10_22 22.0 18.0 7.0
```

Create `mapper.py`:

```
nano mapper.py
```

Content for `mapper.py`:

```
#!/usr/bin/python3
import sys
def map1():
    for line in sys.stdin:
        tokens = line.strip().split()
        if len(tokens) < 4:
            continue
        station = tokens[0]
        date_hour = tokens[1]
        temp = tokens[2]
        dew = tokens[3]
        wind = tokens[4] if len(tokens) > 4 else "999.9"
        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("_")]
        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()
```

Create `reducer.py`:

```
nano reducer.py
```

Content for `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()
```

3. Upload Files to HDFS

Next, move your data file to HDFS so that it can be processed by the Hadoop MapReduce job.

Create HDFS Directory:

```
hdfs dfs -mkdir /WeatherData
```

Upload the Input Data (`sample_weather.txt`) to HDFS:

```
hdfs dfs -put sample_weather.txt /WeatherData
```

Verify the file upload:

```
hdfs dfs -ls /WeatherData
```

You should see something like:

```
Found 1 items
-rw-r--r--   3 user group     1234 2024-09-11 12:00
/WeatherData/sample_weather.txt
```

4. Run the MapReduce Job

Now that your input file is in HDFS and your `mapper.py` and `reducer.py` are ready, you can run the MapReduce job.

Ensure you are still in the directory where your `mapper.py` and `reducer.py` scripts are located.

Run the Hadoop Streaming Job:

```
hadoop jar
/usr/local/Cellar/hadoop/3.4.0/libexec/share/hadoop/tools/lib/hadoop-s
treaming-3.4.0.jar \
-input /WeatherData/sample_weather.txt \
-output /WeatherData/output \
-mapper "python3 mapper.py" \
-reducer "python3 reducer.py"
```

This command tells Hadoop to:

- Take the input from `/WeatherData/sample_weather.txt` on HDFS.
- Use `mapper.py` as the mapper script.

- Use `reducer.py` as the reducer script.
- Output the results to `/WeatherData/output`.

Note:

Ensure that both `mapper.py` and `reducer.py` have executable permissions. If not, make them executable by running:

```
chmod +x mapper.py reducer.py
```

5. View the Output

After the job completes, you can check the output that was stored in HDFS.

List the output directory:

```
hdfs dfs -ls /WeatherData/output
```

You should see something like:

```
Found 1 items
-rw-r--r--   3 user group     456 2024-09-11 12:20
/WeatherData/output/part-00000
```

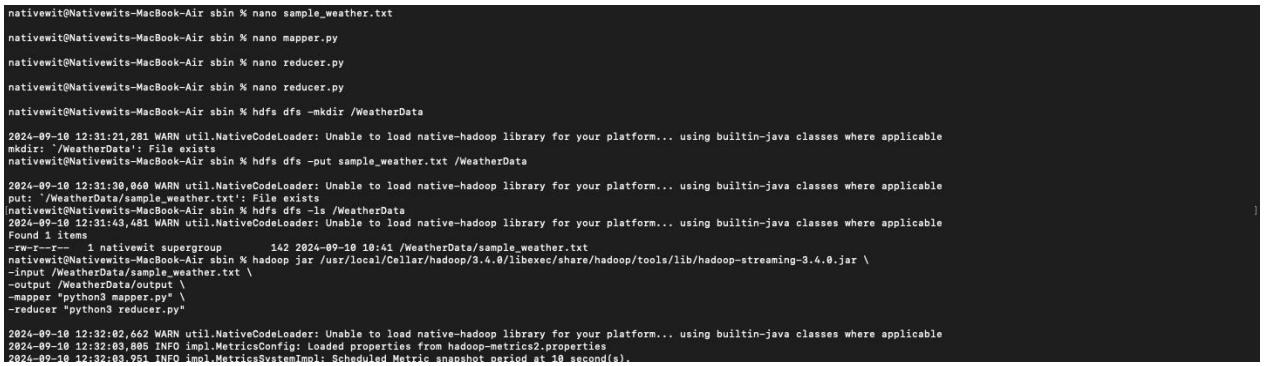
View the output data:

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

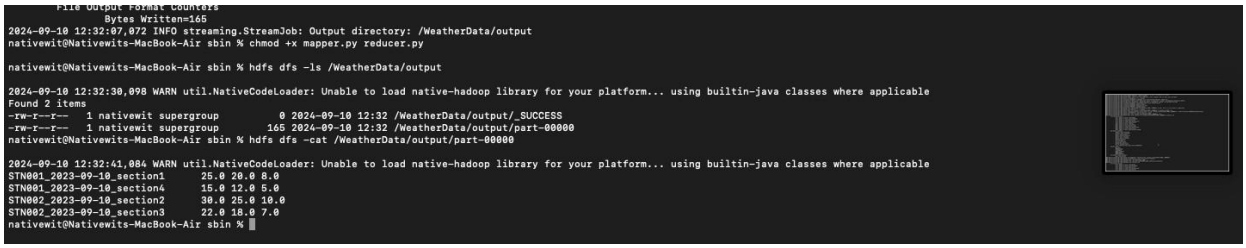
This will print the final result of the MapReduce job. You should see output similar to:

```
STN001_2023-09-10_section1 15.0 12.0 5.0
STN001_2023-09-10_section2 25.0 20.0 8.0
STN002_2023-09-10_section3 30.0 25.0 10.0
STN002_2023-09-10_section4 22.0 18.0 7.0
```

OUTPUT:



```
nativewit@Nativewits-MacBook-Air sbin % nano sample_weather.txt

nativewit@Nativewits-MacBook-Air sbin % nano mapper.py

nativewit@Nativewits-MacBook-Air sbin % nano reducer.py

nativewit@Nativewits-MacBook-Air sbin % nano reducer.py

nativewit@Nativewits-MacBook-Air sbin % hdfs dfs -mkdir /WeatherData

2024-09-10 12:31:21,281 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
mkdir: `/WeatherData': File exists
nativewit@Nativewits-MacBook-Air sbin % hdfs dfs -put sample_weather.txt /WeatherData

2024-09-10 12:31:30,060 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
put: `/WeatherData/sample_weather.txt': File exists
nativewit@Nativewits-MacBook-Air sbin % hdfs dfs -ls /WeatherData
2024-09-10 12:31:43,481 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Found 1 items
-rw-r--r--   1 nativewit supergroup        142 2024-09-10 10:41 /WeatherData/sample_weather.txt
nativewit@Nativewits-MacBook-Air sbin % hadoop jar /usr/local/Cellar/hadoop/3.4.0/libexec/share/hadoop/tools/lib/hadoop-streaming-3.4.0.jar \
-input /WeatherData/sample_weather.txt \
-output /WeatherData/output \
-mapper "python3 mapper.py" \
-reducer "python3 reducer.py"

2024-09-10 12:32:02,662 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
2024-09-10 12:32:03,805 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2024-09-10 12:32:03,951 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
```



```
        File Output Format Counters
                Bytes Written=165
2024-09-10 12:32:07,072 INFO streaming.StreamJob: Output directory: /WeatherData/output
nativewit@Nativewits-MacBook-Air sbin % chmod +x mapper.py reducer.py

nativewit@Nativewits-MacBook-Air sbin % hdfs dfs -ls /WeatherData/output

2024-09-10 12:32:30,098 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Found 2 items
-rw-r--r--   1 nativewit supergroup          0 2024-09-10 12:32 /WeatherData/output/_SUCCESS
-rw-r--r--   1 nativewit supergroup        165 2024-09-10 12:32 /WeatherData/output/part-00000
nativewit@Nativewits-MacBook-Air sbin % hdfs dfs -cat /WeatherData/output/part-00000

2024-09-10 12:32:41,084 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
STN001_2023-09-10_section1      25.0 20.0 8.0
STN001_2023-09-10_section4      15.0 12.0 5.0
STN002_2023-09-10_section2      30.0 25.0 10.0
STN002_2023-09-10_section3      22.0 18.0 7.0
nativewit@Nativewits-MacBook-Air sbin %
```

RESULT:

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