

**Exp.No: 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 "word\_count\_data.txt" and populate it with text data that you wish to analyse. Login with your hadoop user.

**Output:**

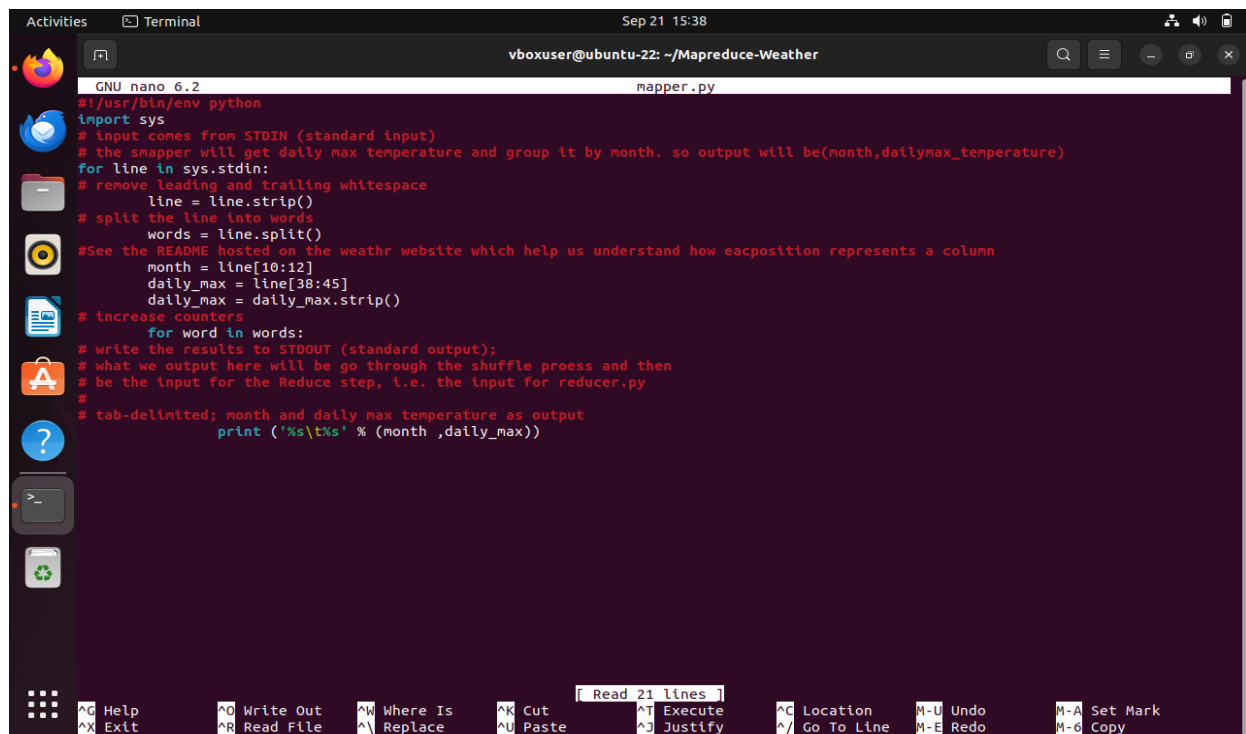
```

GNU nano 6.2 dataset.txt
26494 20240101 2.424 -147.51 64.97 -8.6 -15.7 -12.2 -13.5 0.0 0.00 C -13.2 -22.0 -19.5 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240102 2.424 -147.51 64.97 -6.9 -10.1 -8.5 -8.3 0.0 0.01 C -10.9 -16.6 -12.8 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240103 2.424 -147.51 64.97 -10.0 -15.7 -12.9 -13.5 0.0 0.00 C -14.4 -20.1 -17.4 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240104 2.424 -147.51 64.97 -13.6 -16.4 -15.0 -15.6 0.2 0.03 C -14.7 -19.5 -16.4 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240105 2.424 -147.51 64.97 -13.5 -20.5 -17.0 -17.3 0.0 0.00 C -16.7 -25.2 -22.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240106 2.424 -147.51 64.97 -10.4 -21.7 -16.0 -17.7 0.0 0.00 C -16.1 -25.7 -22.9 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240107 2.424 -147.51 64.97 -2.9 -10.7 -6.8 -5.8 0.0 0.01 C -6.2 -17.8 -9.2 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240108 2.424 -147.51 64.97 -4.8 -12.5 -8.6 -8.0 5.5 0.00 C -6.2 -12.0 -8.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240109 2.424 -147.51 64.97 -12.5 -20.0 -16.2 -15.8 0.2 0.00 C -12.0 -27.6 -16.9 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240110 2.424 -147.51 64.97 -15.2 -20.9 -18.1 -17.6 0.0 0.00 C -16.6 -31.2 -22.3 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240111 2.424 -147.51 64.97 -10.2 -17.1 -13.7 -13.6 0.0 0.04 C -15.7 -25.2 -19.9 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240112 2.424 -147.51 64.97 -14.5 -19.3 -16.9 -17.2 0.0 0.00 C -18.4 -23.9 -21.8 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240113 2.424 -147.51 64.97 -15.9 -20.9 -18.4 -18.5 0.0 0.01 C -16.5 -28.2 -23.4 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240114 2.424 -147.51 64.97 -14.9 -18.8 -16.8 -17.2 3.1 0.02 C -14.3 -19.5 -16.1 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240115 2.424 -147.51 64.97 -7.6 -15.2 -11.4 -11.8 2.6 0.02 C -7.8 -18.4 -12.2 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240116 2.424 -147.51 64.97 -3.8 -9.8 -6.8 -7.4 1.8 0.00 C -4.9 -16.3 -8.2 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240117 2.424 -147.51 64.97 -8.7 -16.2 -12.5 -12.5 0.0 0.13 C -14.0 -24.4 -17.5 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240118 2.424 -147.51 64.97 -12.2 -17.3 -14.7 -14.7 0.0 0.18 C -11.8 -25.9 -19.4 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240119 2.424 -147.51 64.97 -11.6 -17.4 -14.5 -15.3 0.0 0.01 C -11.7 -24.7 -20.5 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240120 2.424 -147.51 64.97 -14.0 -21.1 -17.5 -18.6 0.0 0.03 C -18.4 -26.8 -23.4 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240121 2.424 -147.51 64.97 -19.1 -27.0 -23.1 -22.2 0.0 0.05 C -22.8 -34.6 -27.2 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240122 2.424 -147.51 64.97 -23.5 -29.0 -26.3 -26.4 0.0 0.05 C -30.6 -35.8 -33.5 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240123 2.424 -147.51 64.97 -23.5 -31.7 -27.6 -26.9 0.0 0.22 C -28.1 -36.6 -31.7 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240124 2.424 -147.51 64.97 -23.9 -33.6 -28.7 -28.1 0.0 0.23 C -24.4 -37.4 -30.8 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240125 2.424 -147.51 64.97 -25.9 -31.0 -28.5 -28.7 0.0 0.07 C -30.8 -37.6 -34.8 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240126 2.424 -147.51 64.97 -28.0 -36.9 -32.4 -33.2 0.0 0.03 C -34.7 -42.2 -39.2 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240127 2.424 -147.51 64.97 -36.2 -40.4 -38.3 -38.5 0.0 0.26 C -38.7 -43.7 -41.9 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240128 2.424 -147.51 64.97 -31.7 -38.3 -35.0 -34.9 1.4 0.12 C -28.5 -43.3 -34.4 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240129 2.424 -147.51 64.97 -29.8 -33.7 -31.7 -31.9 0.7 0.00 C -26.9 -32.5 -28.9 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240130 2.424 -147.51 64.97 -27.6 -32.6 -30.1 -29.5 0.0 0.08 C -25.4 -37.5 -30.6 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240131 2.424 -147.51 64.97 -27.7 -32.6 -30.1 -30.2 0.0 0.15 C -29.2 -40.1 -37.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240201 2.424 -147.51 64.97 -31.4 -36.6 -34.0 -34.1 0.0 0.24 C -36.4 -41.8 -39.8 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240202 2.424 -147.51 64.97 -33.8 -38.8 -36.3 -36.1 0.0 0.33 C -36.9 -45.1 -42.2 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240203 2.424 -147.51 64.97 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 0.00 U -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240204 2.424 -147.51 64.97 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 0.00 U -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0
26494 20240205 2.424 -147.51 64.97 -16.1 -20.2 -18.1 -17.9 0.0 0.65 C -18.2 -25.1 -22.2 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0 -9999.0

```

**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.

**nano mapper.py**

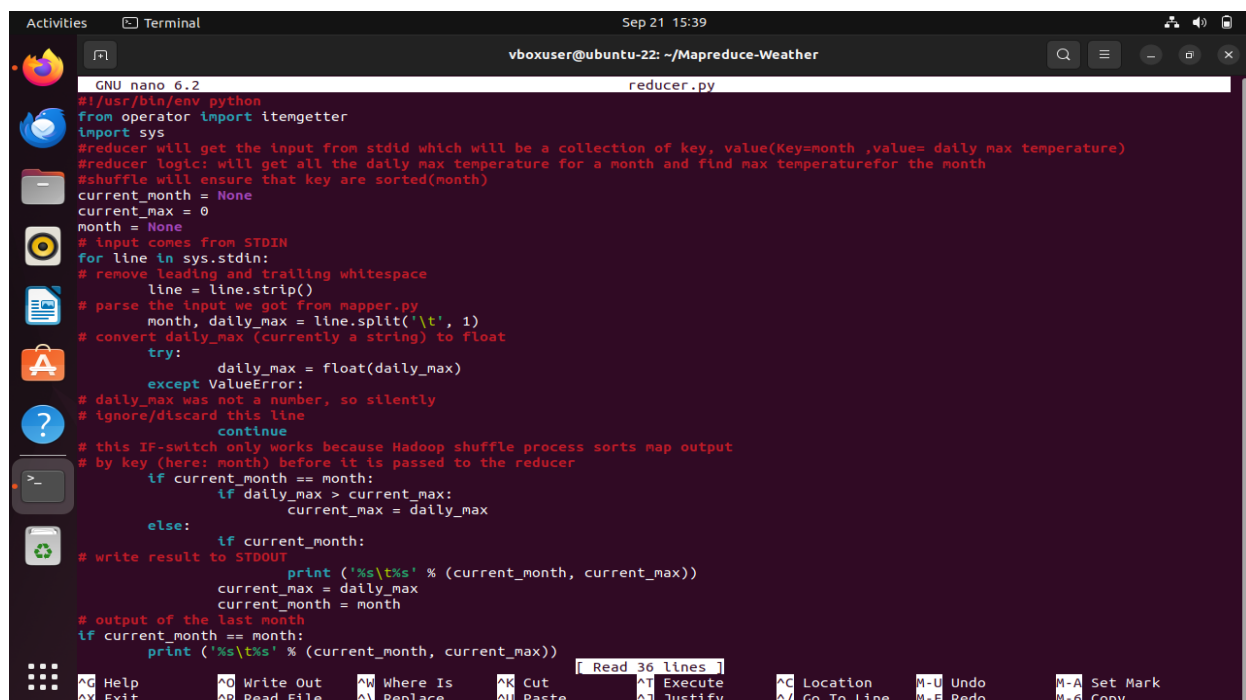


```

GNU nano 6.2 mapper.py
#!/usr/bin/env python
import sys
# input comes from STDIN (standard input)
# the mapper will get daily max temperature and group it by month. so output will be(month,daily_max_temperature)
for line in sys.stdin:
    # remove leading and trailing whitespace
    line = line.strip()
    # split the line into words
    words = line.split()
    # See the README hosted on the weathr website which help us understand how each position represents a column
    month = line[10:12]
    daily_max = line[38:45]
    daily_max = daily_max.strip()
    # increase counters
    for word in words:
        # write the results to STDOUT (standard output);
        # what we output here will be go through the shuffle process and then
        # be the input for the Reduce step, i.e. the input for reducer.py
        #
        # tab-delimited; month and daily max temperature as output
        print('%s\t%s' % (month, daily_max))
  
```

**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.

### nano reducer.py



```

GNU nano 6.2 reducer.py
#!/usr/bin/env python
from operator import itemgetter
import sys
# reducer will get the input from stdid which will be a collection of key, value(Key=month, value= daily max temperature)
# reducer logic: will get all the daily max temperature for a month and find max temperature for the month
# shuffle will ensure that key are sorted(month)
current_month = None
current_max = 0
month = None
# input comes from STDIN
for line in sys.stdin:
    # remove leading and trailing whitespace
    line = line.strip()
    # parse the input we got from mapper.py
    month, daily_max = line.split('\t', 1)
    # convert daily_max (currently a string) to float
    try:
        daily_max = float(daily_max)
    except ValueError:
        # daily_max was not a number, so silently
        # ignore/discard this line
        continue
    # this IF-switch only works because Hadoop shuffle process sorts map output
    # by key (here: month) before it is passed to the reducer
    if current_month == month:
        if daily_max > current_max:
            current_max = daily_max
    else:
        if current_month:
            # write result to STDOUT
            print('%s\t%s' % (current_month, current_max))
            current_max = daily_max
            current_month = month
        # output of the last month
        if current_month == month:
            print('%s\t%s' % (current_month, current_max))
  
```

**Step 4: Prepare Hadoop Environment:** Start the Hadoop daemons and create a directory in HDFS to store your data.

**start-all.sh**

**Step 6: Make Python Files Executable:** Give executable permissions to your mapper.py and reducer.py files.

**chmod 777 mapper.py reducer.py**

**Step 7: Run the program using Hadoop Streaming:** Download the latest hadoop-streaming jar file and place it in a location you can easily access.

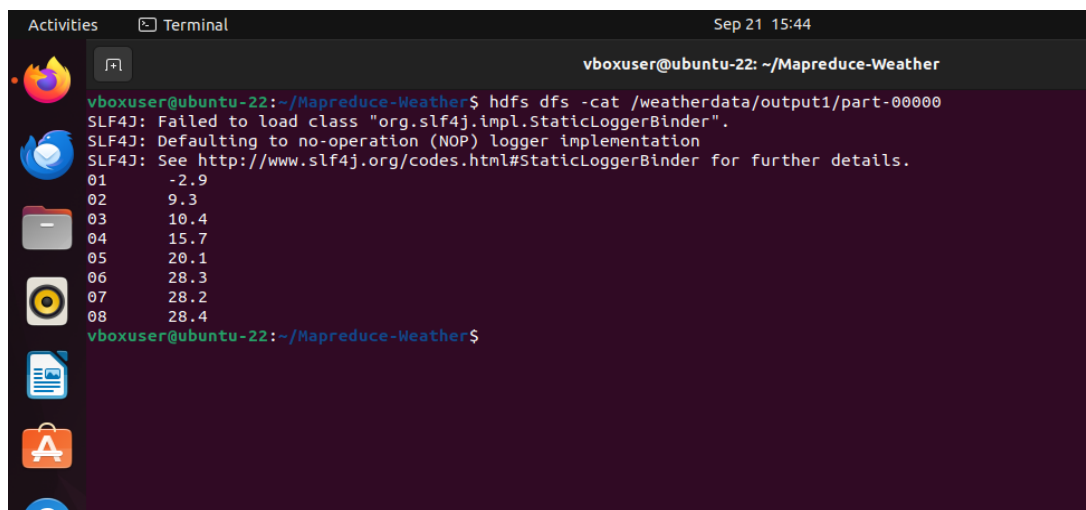
Then run the program using Hadoop Streaming.

```
hadoop fs -mkdir -p /weatherdata hadoop fs -copyFromLocal  
/home/sx/Downloads/dataset.txt /weatherdata
```

```
hdfs dfs -ls /weatherdata hadoop jar /home/sx/hadoop-  
3.2.3/share/hadoop/tools/lib/hadoop-streaming-3.2.3.jar \ -input  
/weatherdata/dataset.txt \ -output /weatherdata/output \ -file  
"/home/sx/Downloads/mapper.py" \ -mapper "python3 mapper.py" \ -file  
"/home/sx/Downloads/reducer.py" \ -reducer "python3 reducer.py"
```

```
hdfs dfs -text /weatherdata/output/* > /home/vboxuser/Downloads/outputfile.txt
```

**Step 8: Check Output:** Check the output of the program in the specified HDFS output directory.

A screenshot of a terminal window titled 'Terminal' with a timestamp of 'Sep 21 15:44'. The user is 'vboxuser@ubuntu-22: ~/Mapreduce-Weather'. The terminal shows the command 'hdfs dfs -cat /weatherdata/output1/part-00000' being executed. The output displays a list of numbers: 01 -2.9, 02 9.3, 03 10.4, 04 15.7, 05 20.1, 06 28.3, 07 28.2, and 08 28.4. There are also SLF4J warning messages at the top of the output.

```
Activities  Terminal  Sep 21 15:44  
vboxuser@ubuntu-22: ~/Mapreduce-Weather  
vboxuser@ubuntu-22:~/Mapreduce-Weather$ hdfs dfs -cat /weatherdata/output1/part-00000  
SLF4J: Failed to load class "org.slf4j.impl.StaticLoggerBinder".  
SLF4J: Defaulting to no-operation (NOP) logger implementation  
SLF4J: See http://www.slf4j.org/codes.html#StaticLoggerBinder for further details.  
01      -2.9  
02       9.3  
03      10.4  
04      15.7  
05      20.1  
06      28.3  
07      28.2  
08      28.4  
vboxuser@ubuntu-22:~/Mapreduce-Weather$
```

**Step 9:** The result in the browser is as follows:

The screenshot shows a web browser window with the address bar displaying 'localhost:9870/explorer.html#/weatherdata/output1'. The main content area is titled 'File information - part-00000'. It features a green header bar with 'Block information --' and a dropdown menu showing 'Block 0'. Below this, the following details are listed:

- Block ID: 1073741917
- Block Pool ID: BP-305058674-127.0.1.1-1726117174333
- Generation Stamp: 1093
- Size: 63
- Availability:
  - ubuntu-22.4.myguest.virtualbox.org

Below the block information, there is a section titled 'File contents' with a light blue background. It contains a list of data points:

01	-2.9
02	9.3
03	10.4
04	15.7
05	20.1
06	28.3
07	28.2
08	28.4

## RESULT:

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