

Exp. No : 3

## Map Reduce program to process Weather dataset

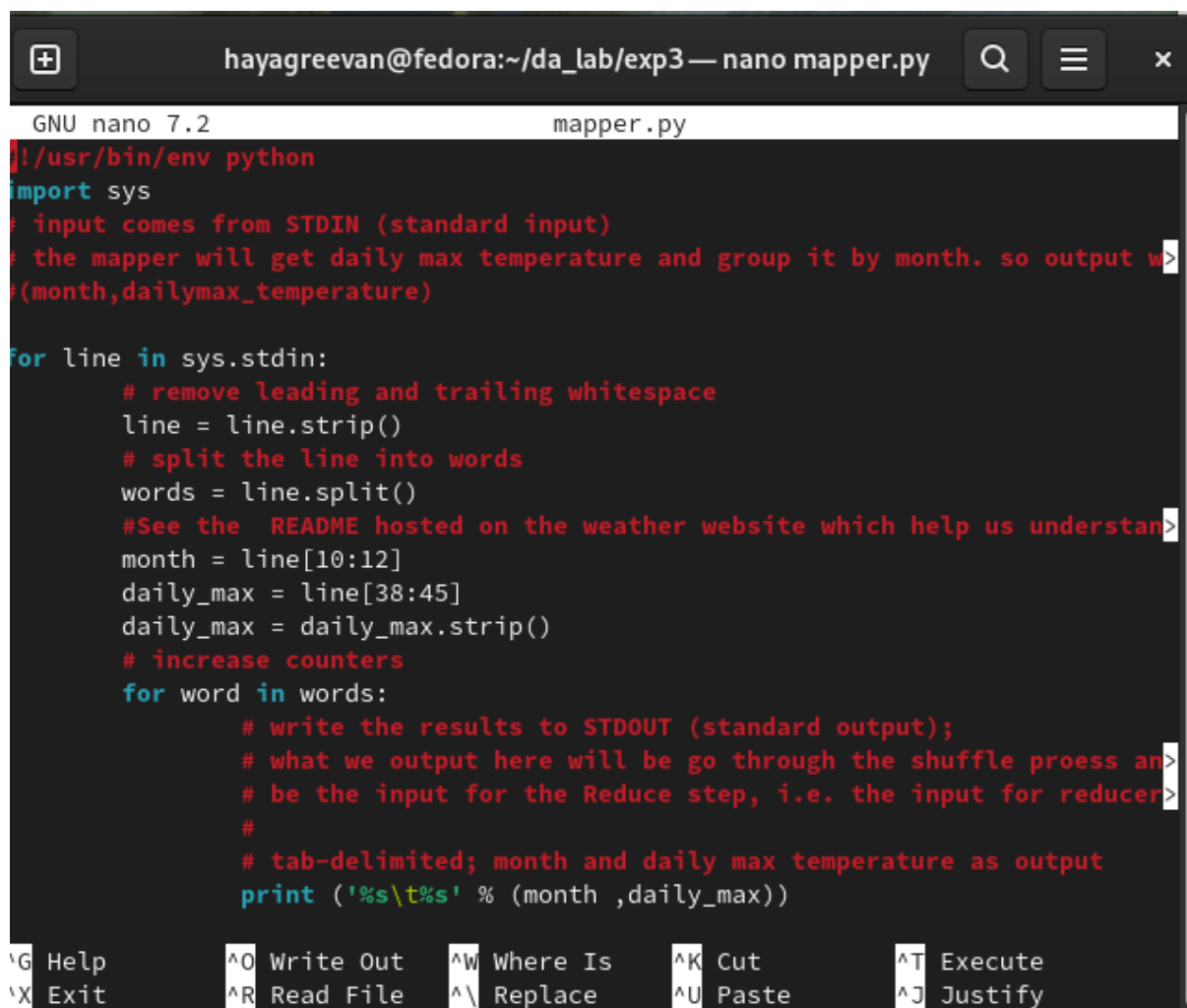
### 1. Download Weather dataset.

hayagreenan@fedora:~/da\_lab/exp3

GNU nano 2.2	dataset.txt																													
23007 20150101	2.423	-98.08	30.62	2.2	-0.6	0.8	0.9	7.0	1.47 C	3.7	1.1	2.5	99.9	85.4	97.2	0.369	0.388	-99.000	-99.000	-99.000	7.0	8.1	-9999.0	-9999.0	-9999.0					
23007 20150102	2.423	-98.08	30.62	3.5	1.3	2.4	2.2	10.2	1.42 C	4.0	2.3	3.1	100.0	98.8	99.8	0.391	0.327	-99.000	-99.000	-99.000	7.1	7.9	-9999.0	-9999.0	-9999.0					
23007 20150103	2.423	-98.08	30.62	15.9	1.3	9.1	7.5	3.1	11.00 C	16.4	2.9	7.3	100.0	34.8	73.7	0.450	0.397	-99.000	-99.000	-99.000	7.6	7.9	-9999.0	-9999.0	-9999.0					
23007 20150104	2.423	-98.08	30.62	9.2	-1.3	3.9	4.2	0.0	13.24 C	12.4	-0.5	4.0	82.0	40.6	61.7	0.413	0.352	-99.000	-99.000	-99.000	7.3	7.9	-9999.0	-9999.0	-9999.0					
23007 20150105	2.423	-98.08	30.62	10.9	-1.7	3.6	2.6	0.0	13.37 C	14.7	-1.0	3.8	77.9	33.3	57.4	0.399	0.340	-99.000	-99.000	-99.000	6.8	7.0	-9999.0	-9999.0	-9999.0					
23007 20150106	2.423	-98.08	30.62	20.2	2.9	11.6	19.9	0.0	12.90 C	22.8	1.6	9.9	87.7	39.2	49.3	0.395	0.335	-99.000	-99.000	-99.000	8.0	8.0	-9999.0	-9999.0	-9999.0					
23007 20150107	2.423	-98.08	30.62	10.9	-1.4	3.8	4.5	0.0	12.68 C	12.4	-2.1	5.5	82.7	36.5	55.7	0.387	0.328	-99.000	-99.000	-99.000	7.6	8.3	-9999.0	-9999.0	-9999.0					
23007 20150108	2.423	-98.08	30.62	0.6	-7.9	-3.6	-1.3	0.0	4.98 C	3.9	-4.8	-0.5	57.7	37.6	48.1	0.372	0.310	-99.000	-99.000	-99.000	4.7	6.1	-9999.0	-9999.0	-9999.0					
23007 20150109	2.423	-98.08	30.62	2.0	-0.1	1.0	-0.8	0.0	2.52 C	4.1	1.2	2.5	87.8	48.9	64.4	0.368	0.312	-99.000	-99.000	-99.000	5.4	6.2	-9999.0	-9999.0	-9999.0					
23007 20150110	2.423	-98.08	30.62	0.5	-2.0	-0.8	-0.6	3.9	2.11 C	2.5	-0.1	1.4	99.9	47.7	85.8	0.373	0.314	-99.000	-99.000	-99.000	5.1	6.0	-9999.0	-9999.0	-9999.0					
23007 20150111	2.423	-98.08	30.62	10.9	8.0	5.4	4.4	2.6	6.38 C	12.7	1.3	5.8	100.0	77.8	97.1	0.420	0.362	-99.000	-99.000	-99.000	6.5	6.7	-9999.0	-9999.0	-9999.0					
23007 20150112	2.423	-98.08	30.62	6.5	1.4	4.0	4.3	0.0	1.55 C	6.9	2.7	5.1	100.0	89.4	97.8	0.412	0.350	-99.000	-99.000	-99.000	7.3	7.5	-9999.0	-9999.0	-9999.0					
23007 20150113	2.423	-98.08	30.62	3.0	-0.7	1.1	1.2	0.0	1.26 C	5.6	0.7	2.9	99.7	80.7	90.7	0.401	0.337	-99.000	-99.000	-99.000	6.1	6.8	-9999.0	-9999.0	-9999.0					
23007 20150114	2.423	-98.08	30.62	2.9	0.9	1.9	1.8	0.7	1.88 C	4.7	2.0	3.1	99.6	90.8	97.9	0.395	0.331	-99.000	-99.000	-99.000	6.1	6.7	-9999.0	-9999.0	-9999.0					
23007 20150115	2.423	-98.08	30.62	13.2	1.2	7.2	6.4	0.0	13.37 C	16.8	1.4	6.7	98.9	46.7	73.4	0.395	0.333	-99.000	-99.000	-99.000	6.7	7.0	-9999.0	-9999.0	-9999.0					
23007 20150116	2.423	-98.08	30.62	16.7	3.5	10.1	9.9	0.0	13.68 C	19.2	1.3	8.7	80.2	38.1	58.2	0.391	0.330	-99.000	-99.000	-99.000	7.3	7.4	-9999.0	-9999.0	-9999.0					
23007 20150117	2.423	-98.08	30.62	19.5	5.0	12.2	12.3	0.0	10.96 C	20.9	3.3	10.6	87.7	30.4	55.7	0.388	0.327	-99.000	-99.000	-99.000	8.7	8.4	-9999.0	-9999.0	-9999.0					
23007 20150118	2.423	-98.08	30.62	20.9	7.6	14.3	13.7	0.0	15.03 C	23.4	3.5	11.9	45.9	14.6	31.4	0.383	0.325	-99.000	-99.000	-99.000	9.5	9.2	-9999.0	-9999.0	-9999.0					
23007 20150119	2.423	-98.08	30.62	23.9	0.7	15.3	14.3	0.0	14.18 C	23.6	3.8	12.6	65.3	26.8	45.0	0.376	0.321	-99.000	-99.000	-99.000	9.9	9.5	-9999.0	-9999.0	-9999.0					
23007 20150120	2.423	-98.08	30.62	26.0	9.5	17.8	15.9	0.0	14.57 C	27.9	6.5	14.5	88.4	16.1	50.2	0.373	0.320	-99.000	-99.000	-99.000	10.9	10.4	-9999.0	-9999.0	-9999.0					
23007 20150121	2.423	-98.08	30.62	11.0	6.9	8.9	8.9	1.7	2.71 C	13.1	6.8	9.7	99.2	68.0	88.1	0.369	0.317	-99.000	-99.000	-99.000	10.7	10.6	-9999.0	-9999.0	-9999.0					
23007 20150122	2.423	-98.08	30.62	8.6	1.5	6.1	5.6	40.0	1.28 C	9.1	4.1	6.3	99.6	95.2	98.0	0.546	0.410	-99.000	-99.000	-99.000	9.0	9.3	-9999.0	-9999.0	-9999.0					
23007 20150123	2.423	-98.08	30.62	9.4	2.2	5.8	4.2	7.5	6.58 C	11.1	2.8	4.8	98.4	58.8	86.3	0.554	0.400	-99.000	-99.000	-99.000	7.6	8.1	-9999.0	-9999.0	-9999.0					
23007 20150124	2.423	-98.08	30.62	16.0	1.4	8.7	8.0	0.0	14.26 C	18.8	0.4	7.7	92.0	33.0	63.0	0.494	0.381	-99.000	-99.000	-99.000	7.7	7.9	-9999.0	-9999.0	-9999.0					
23007 20150125	2.423	-98.08	30.62	20.2	6.4	13.3	12.7	0.0	14.99 C	22.0	4.4	11.0	69.2	18.9	43.8	0.456	0.357	-99.000	-99.000	-99.000	9.1	8.9	-9999.0	-9999.0	-9999.0					
23007 20150126	2.423	-98.08	30.62	21.5	7.2	14.4	14.1	0.0	12.01 C	22.9	5.5	12.1	56.4	21.7	40.6	0.413	0.340	-99.000	-99.000	-99.000	10.0	9.7	-9999.0	-9999.0	-9999.0					
23007 20150127	2.423	-98.08	30.62	26.5	10.7	18.6	17.5	0.0	15.18 C	28.9	8.1	15.5	52.2	21.4	38.8	0.420	0.344	-99.000	-99.000	-99.000	11.4	10.8	-9999.0	-9999.0	-9999.0					
23007 20150128	2.423	-98.08	30.62	26.3	13.3	19.8	19.1	0.0	15.11 C	28.1	7.9	16.3	54.9	19.4	35.3	0.410	0.339	-99.000	-99.000	-99.000	12.1	11.5	-9999.0	-9999.0	-9999.0					
23007 20150129	2.423	-98.08	30.62	23.1	9.8	16.5	16.4	0.0	13.78 C	27.4	9.7	16.4	87.0	34.2	55.0	0.402	0.328	-99.000	-99.000	-99.000	13.1	12.4	-9999.0	-9999.0	-9999.0					
23007 20150130	2.423	-98.08	30.62	13.0	6.9	10.0	9.0	0.2	7.19 C	19.2	8.3	11.0	67.6	48.4	58.8	0.389	0.320	-99.000	-99.000	-99.000	11.6	11.8	-9999.0	-9999.0	-9999.0					
23007 20150131	2.423	-98.08	30.62	15.1	7.4	11.3	10.2	8.5	1.18 C	14.5	8.4	10.7	100.0	63.1	90.3	0.401	0.337	-99.000	-99.000	-99.000	11.2	11.3	-9999.0	-9999.0	-9999.0					
23007 20150201	2.423	-98.08	30.62	18.3	1.9	11.1	13.3	0.0	8.69 C	22.1	4.1	13.8	98.8	53.6	79.1	0.450	0.380	-99.000	-99.000	-99.000	12.9	12.6	-9999.0	-9999.0	-9999.0					
23007 20150202	2.423	-98.08	30.62	8.0	-1.0	3.1	1.3	0.0	12.48 C	15.2	-0.4	5.8	69.4	34.6	54.2	0.420	0.354	-99.000	-99.000	-99.000	9.3	10.1	-9999.0	-9999.0	-9999.0					
23007 20150203	2.423	-98.08	30.62	5.3	2.3	3.8	3.8	0.8	2.09 C	8.3	3.9	5.7	100.0	65.1	82.6	0.409	0.343	-99.000	-99.000	-99.000	8.7	9.3	-9999.0	-9999.0	-9999.0					
23007 20150204	2.423	-98.08	30.62	11.8	4.3	8.1	7.9	0.3	4.41 C	13.8	5.5	8.8	100.0	80.6	94.1	0.410	0.344	-99.000	-99.000	-99.000	9.6	9.8	-9999.0	-9999.0	-9999.0					
23007 20150205	2.423	-98.08	30.62	9.4	0.7	5.0	2.1	0.0	4.90 C	9.3	2.8	5.6	97.3	68.8	81.4	0.402	0.330	-99.000	-99.000	-99.000	8.6	9.3	-9999.0	-9999.0	-9999.0					
23007 20150206	2.423	-98.08	30.62	15.3	0.8	8.0	7.4	0.0	14.67 C	20.9	1.8	9.3	95.9	50.7	75.9	0.396	0.331	-99.000	-99.000	-99.000	9.1	9.2	-9999.0	-9999.0	-9999.0					
23007 20150207	2.423	-98.08	30.62	19.8	5.9	12.8	12.0	0.0	16.75 C	23.8	4.8	12.0	96.8	48.6	76.2	0.393	0.329	-99.000	-99.000	-99.000	10.5	10.2	-9999.0	-9999.0	-9999.0					
23007 20150208	2.423	-98.08	30.62	26.3	12.3	19.3	17.7	0.0	16.54 C	29.8	10.8	17.3	96.6	25.4	65.2	0.393	0.332	-99.000	-99.000	-99.000	13.0	12.2	-9999.0	-9999.0	-9999.0					
23007 20150209	2.423	-98.08	30.62	26.6	13.6	20.1	19.3	0.0	16.90 C	31.1	10.3	17.8	64.6	19.7	40.8	0.388	0.320	-99.000	-99.000	-99.000	13.5	12.9	-9999.0	-9999.0	-9999.0					
23007 20150210	2.423	-98.08	30.62	26.0	12.7	19.4	18.7	0.0	17.09 C	30.3	9.5	17.6	61.3	26.5	49.1	0.381	0.325	-99.000	-99.000	-99.000	13.6	13.0	-9999.0	-9999.0	-9999.0					
23007 20150211	2.423	-98.08	30.62	23.0	10.6	16.8	16.3	0.0	16.50 C	29.2	8.1	16.8	77.6	29.9	55.8	0.375	0.323	-99.000	-99.000	-99.000	14.0	13.5	-9999.0	-9999.0	-9999.0					
23007 20150212	2.423	-98.08	30.62	14.0	5.6	10.2	9.4	0.0	12.60 C	22.8	6.8	11.9	71.2	32.3	52.2	0.363	0.317	-99.000	-99.000	-99.000	12.3	12.7	-9999.0	-9999.0	-9999.0					
23007 20150213	2.423	-98.08	30.62	18.9	4.7	11.8	11.5	0.0	12.25 C	26.3	4.5	12.3	65.6	37.7	50.7	0.355	0.310	-99.000	-99.000	-99.000	11.4	11.7	-9999.0	-9999.0	-9999.0					

Help Write Out Where Is Replace Paste Execute Justify Location Go To Line Undo Redo Set Mark To Bracket Previous Next Back Forward Prev Word Next Word Home End

## 2. Create mapper.py program

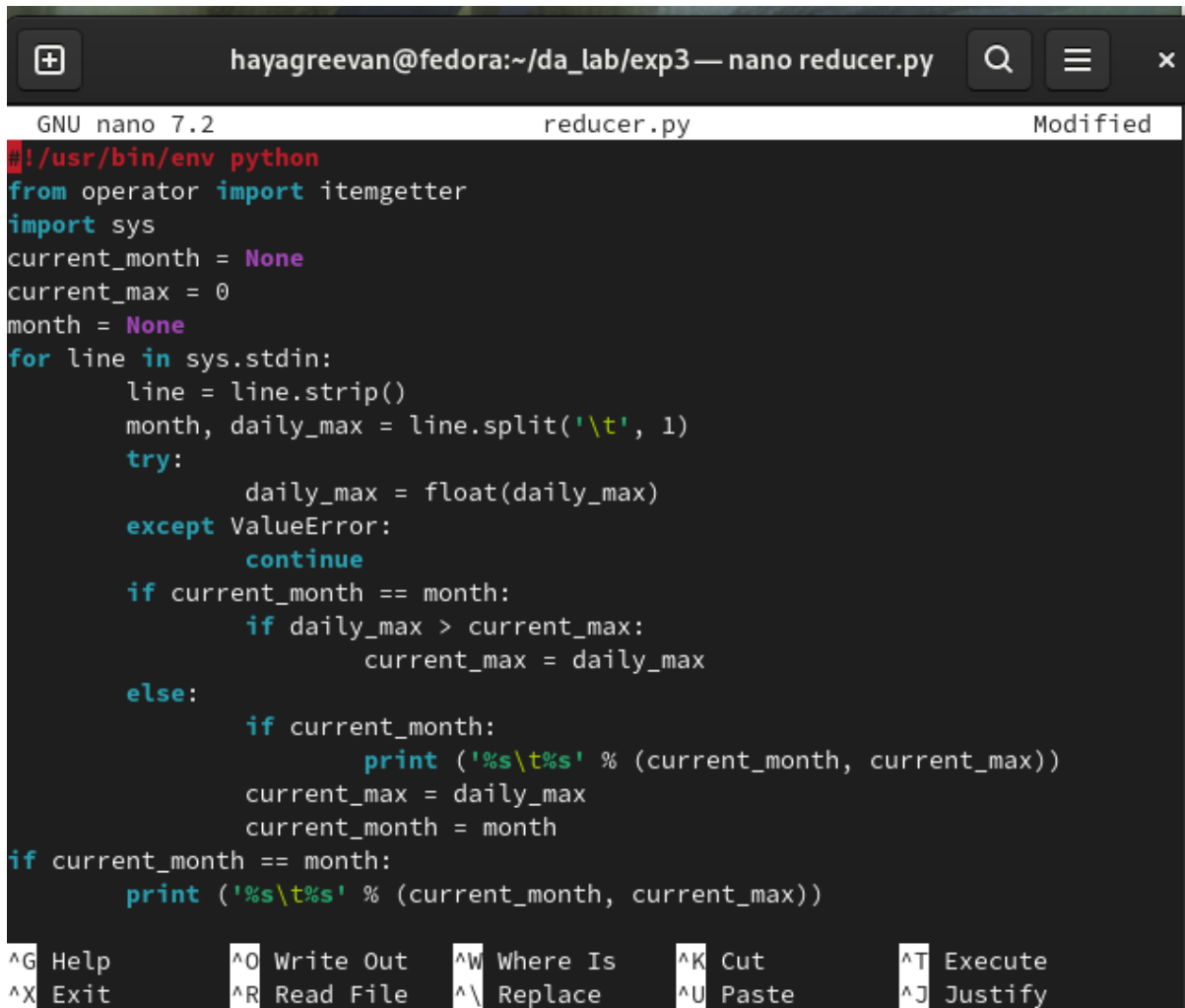


```
GNU nano 7.2 mapper.py
#!/usr/bin/env python
import sys
# input comes from STDIN (standard input)
# the mapper will get daily max temperature and group it by month. so output will be
# (month,daily_max_temperature)

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 weather website which help us understand the data
    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
        # be the input for the Reduce step, i.e. the input for reducer
        #
        # tab-delimited; month and daily max temperature as output
        print ('%s\t%s' % (month ,daily_max))

^G Help      ^O Write Out  ^W Where Is   ^K Cut        ^T Execute
^X Exit      ^R Read File  ^\ Replace    ^U Paste      ^J Justify
```

## 3. Create reducer.py



```
hayagreevan@fedora:~/da_lab/exp3 — nano reducer.py
GNU nano 7.2 reducer.py Modified
#!/usr/bin/env python
from operator import itemgetter
import sys
current_month = None
current_max = 0
month = None
for line in sys.stdin:
    line = line.strip()
    month, daily_max = line.split('\t', 1)
    try:
        daily_max = float(daily_max)
    except ValueError:
        continue
    if current_month == month:
        if daily_max > current_max:
            current_max = daily_max
    else:
        if current_month:
            print('%s\t%s' % (current_month, current_max))
            current_max = daily_max
            current_month = month
if current_month == month:
    print('%s\t%s' % (current_month, current_max))

^G Help      ^O Write Out  ^W Where Is   ^K Cut        ^T Execute
^X Exit      ^R Read File  ^\ Replace    ^U Paste      ^J Justify
```

## 4. Start Hadoop services.

```
hayagreevan@fedora:~/da_lab/exp3$ service sshd start
Redirecting to /bin/systemctl start sshd.service
hayagreevan@fedora:~/da_lab/exp3$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hayagreevan in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [fedora]
Starting resourcemanager
Starting nodemanagers
hayagreevan@fedora:~/da_lab/exp3$ jps
4355 ResourceManager
4899 Jps
3814 DataNode
4058 SecondaryNameNode
4494 NodeManager
3631 NameNode
hayagreevan@fedora:~/da_lab/exp3$
```

## 5. Upload Weather dataset into HDFS Storage.

```
hayagreevan@fedora:~/da_lab/exp3$ hdfs dfs -mkdir /exp3/
hayagreevan@fedora:~/da_lab/exp3$ hdfs dfs -copyFromLocal dataset.txt /exp3/
hayagreevan@fedora:~/da_lab/exp3$ hdfs dfs -ls /exp3/
Found 1 items
-rw-r--r--  1 hayagreevan supergroup      79568 2024-08-28 12:27 /exp3/dataset.txt
hayagreevan@fedora:~/da_lab/exp3$
```

## 6. Run the Map reduce program using Hadoop Streaming.

```

hayagreevan@fedora:~/da_lab/exp3$ hadoop jar ~/da_lab/exp3/hadoop-streaming-3.3
6.jar -input /exp3/dataset.txt -output /exp3/output -mapper ~/da_lab/exp3/mapp
er.py -reducer ~/da_lab/exp3/reducer.py
packageJobJar: [/tmp/hadoop-unjar514626091708043449/] [] /tmp/streamjob81084674
87130491776.jar tmpDir=null
2024-08-28 12:29:06,156 INFO client.DefaultNoHARMFailoverProxyProvider: Connect
ing to ResourceManager at /0.0.0.0:8032
2024-08-28 12:29:06,878 INFO client.DefaultNoHARMFailoverProxyProvider: Connect
ing to ResourceManager at /0.0.0.0:8032
2024-08-28 12:29:08,553 INFO mapreduce.JobResourceUploader: Disabling Erasure C
oding for path: /tmp/hadoop-yarn/staging/hayagreevan/.staging/job_1724828139433
_0001
2024-08-28 12:29:09,732 INFO mapred.FileInputFormat: Total input files to proce
ss : 1
2024-08-28 12:29:10,083 INFO mapreduce.JobSubmitter: number of splits:2
2024-08-28 12:29:11,063 INFO mapreduce.JobSubmitter: Submitting tokens for job:
job_1724828139433_0001
2024-08-28 12:29:11,063 INFO mapreduce.JobSubmitter: Executing with tokens: []
2024-08-28 12:29:11,464 INFO conf.Configuration: resource-types.xml not found
2024-08-28 12:29:11,465 INFO resource.ResourceUtils: Unable to find 'resource-t
ypes.xml'.
2024-08-28 12:29:12,414 INFO impl.YarnClientImpl: Submitted application applica
tion_1724828139433_0001
2024-08-28 12:29:12,514 INFO mapreduce.Job: The url to track the job: http://fe
dora:8088/proxy/application_1724828139433_0001/
2024-08-28 12:29:12,517 INFO mapreduce.Job: Running job: job_1724828139433_0001
2024-08-28 12:29:30,610 INFO mapreduce.Job: Job job_1724828139433_0001 running

```

```

in uber mode : false
2024-08-28 12:29:30,617 INFO mapreduce.Job: map 0% reduce 0%
2024-08-28 12:29:43,801 INFO mapreduce.Job: map 100% reduce 0%
2024-08-28 12:29:53,121 INFO mapreduce.Job: map 100% reduce 100%
2024-08-28 12:29:55,350 INFO mapreduce.Job: Job job_1724828139433_0001 completed successfully
2024-08-28 12:29:55,534 INFO mapreduce.Job: Counters: 54
    File System Counters
        FILE: Number of bytes read=102094
        FILE: Number of bytes written=1041193
        FILE: Number of read operations=0
        FILE: Number of large read operations=0
        FILE: Number of write operations=0
        HDFS: Number of bytes read=83844
        HDFS: Number of bytes written=96
        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)=20327
        Total time spent by all reduces in occupied slots (ms)=5986
        Total time spent by all map tasks (ms)=20327
        Total time spent by all reduce tasks (ms)=5986

```

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        Total time spent by all map tasks (ms)=20327
        Total time spent by all reduce tasks (ms)=5986
        Total vcore-milliseconds taken by all map tasks=20327
        Total vcore-milliseconds taken by all reduce tasks=5986
        Total megabyte-milliseconds taken by all map tasks=20814848
        Total megabyte-milliseconds taken by all reduce tasks=6129664
    Map-Reduce Framework
        Map input records=365
        Map output records=10220
        Map output bytes=81648
        Map output materialized bytes=102100
        Input split bytes=180
        Combine input records=0
        Combine output records=0
        Reduce input groups=12
        Reduce shuffle bytes=102100
        Reduce input records=10220
        Reduce output records=12
        Spilled Records=20440
        Shuffled Maps =2
        Failed Shuffles=0
        Merged Map outputs=2
        GC time elapsed (ms)=581
        CPU time spent (ms)=7020
        Physical memory (bytes) snapshot=896544768
        Virtual memory (bytes) snapshot=7764856832
        Total committed heap usage (bytes)=698875904

```

```

        Spilled Records=20440
        Shuffled Maps =2
        Failed Shuffles=0
        Merged Map outputs=2
        GC time elapsed (ms)=581
        CPU time spent (ms)=7020
        Physical memory (bytes) snapshot=896544768
        Virtual memory (bytes) snapshot=7764856832
        Total committed heap usage (bytes)=698875904
        Peak Map Physical memory (bytes)=331964416
        Peak Map Virtual memory (bytes)=2587738112
        Peak Reduce Physical memory (bytes)=235270144
        Peak Reduce Virtual memory (bytes)=2591649792
    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=83664
    File Output Format Counters
        Bytes Written=96
2024-08-28 12:29:55,534 INFO streaming.StreamJob: Output directory: /exp3/output
hayagreevan@fedora:~/da_lab/exp3$

```

### Output :

```

hayagreevan@fedora:~/da_lab/exp3$ hdfs dfs -cat /exp3/output/*
01      26.5
02      26.6
03      29.1
04      30.8
05      31.1
06      33.6
07      38.5
08      40.2
09      36.5
10      36.9
11      27.6
12      25.9
hayagreevan@fedora:~/da_lab/exp3$

```