Program 2: Run a basic word count Map Reduce program to understand Map Reduce Paradigm:

Login into Hadoop user you used while installing Hadoop , here we use hdoop user

```
hdoop@NuvobookV1:~$
```

$ su – hdoop

-start the Hadoop server

$ cd hadoop-3.4.0/sbin/

$ ./start-dfs.sh

$ ./start-yarn

$ jps

```
hdoop@hdoop-VirtualBox:~$ cd hadoop-3.2.1/sbin
hdoop@hdoop-VirtualBox:~/hadoop-3.2.1/sbin$ ./start-dfs.sh
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [hdoop-VirtualBox]
hdoop@hdoop-VirtualBox:~/hadoop-3.2.1/sbin$ ./start-yarn.sh
Starting resourcemanager
Starting nodemanagers
hdoop@hdoop-VirtualBox:~/hadoop-3.2.1/sbin$ jps
4817 DataNode
5298 ResourceManager
5000 SecondaryNameNode
5450 NodeManager
4683 NameNode
5982 Jps
hdoop@hdoop-VirtualBox:~/hadoop-3.2.1/sbin$
```

$ sudo mkdir p2/

$ cd p2/

$ start-all.sh

$sudo nano mapper.py

-inside it paste this program:

```
#!/usr/bin/env python3

# import sys because we need to read and write data to STDIN and STDOUT
import sys

# reading entire line from STDIN (standard input)
for line in sys.stdin:
    # to remove leading and trailing whitespace
    line = line.strip()
    # split the line into words
    words = line.split()

    # we are looping over the words array and printing the word
    # with the count of 1 to the STDOUT
    for word in words:
        # write the results to STDOUT (standard output);
        # what we output here will be the input for the
        # Reduce step, i.e. the input for reducer.py
        print ('%s\t%s' % (word, 1))
```

-click Ctrl+s and Ctrl+x to close it

$ nano reducer.py

-insert this program inside it:

```
#!/usr/bin/env python3

from operator import itemgetter
import sys

current_word = None
current_count = 0
word = None

# read the entire line from STDIN
for line in sys.stdin:
    # remove leading and trailing whitespace
    line = line.strip()
    # splitting the data on the basis of tab we have provided in mapper.py
    word, count = line.split('\t', 1)
    # convert count (currently a string) to int
    try:
        count = int(count)
    except ValueError:
        # count was not a number, so silently
        # ignore/discard this line
        continue
```

```
    # this IF-switch only works because Hadoop sorts map output
    # by key (here: word) before it is passed to the reducer
    if current_word == word:
        current_count += count
    else:
        if current_word:
            # write result to STDOUT
            print ('%s\t%s' % (current_word, current_count))
        current_count = count
        current_word = word

# do not forget to output the last word if needed!
if current_word == word:
    print ('%s\t%s' % (current_word, current_count))
```

-click Ctrl+s and Ctrl+x to close it

$ sudo sample.txt

-insert this program inside it:

The server processes data, repeating tasks to repeat actions efficiently. Users rely on it, repeating operations to repeat access to critical data

-click Ctrl+s and Ctrl+x to close it

$ sudo chmod 777 reducer.py

$sudo chmod 777 mapper.py

$ hdfs dfs -mkdir /p2/

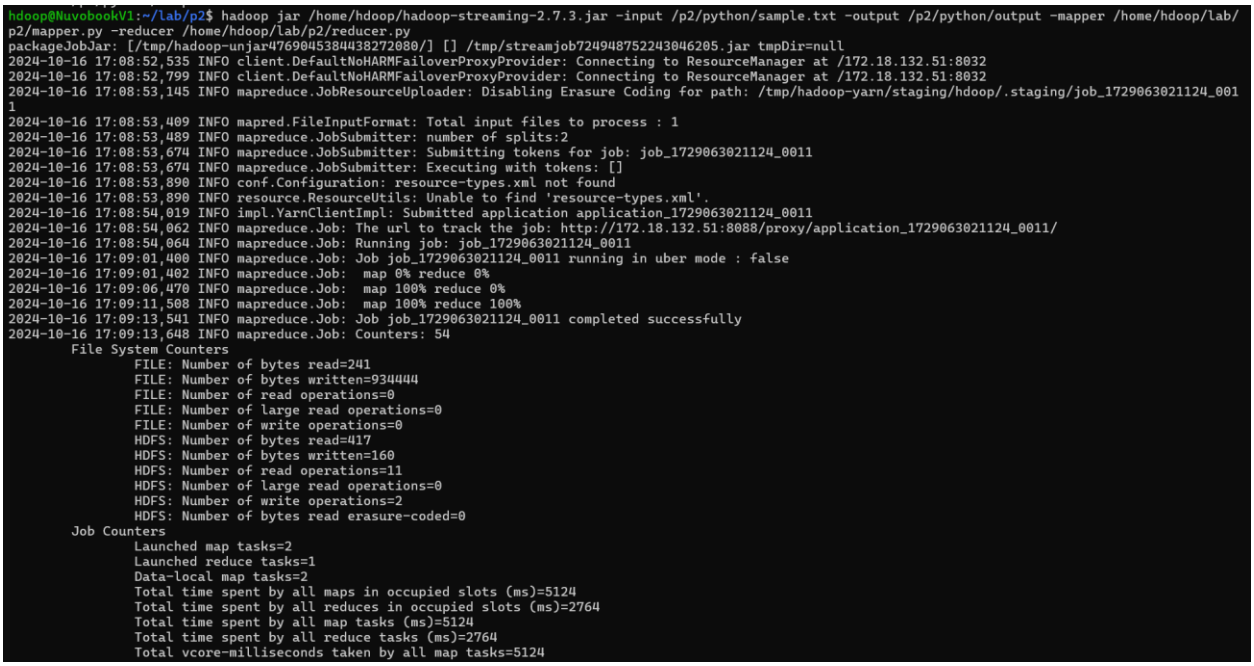
$ hdfs dfs -copyFromLocal sample.txt /p2/

$ cd

$ wget https://repo1.maven.org/maven2/org/apache/hadoop/hadoop-streaming/2.7.3/hadoop-streaming-2.7.3.jar

$ hadoop jar /home/hdoop/hadoop-streaming-2.7.3.jar -input /p2/sample.txt -output /p2/output -mapper /home/hdoop/p2/mapper.py -reducer /home/hdoop/p2/reducer.py

Output:



```
                Total time spent by all reduce tasks (ms)=2764
                Total vcore-milliseconds taken by all map tasks=5124
                Total vcore-milliseconds taken by all reduce tasks=2764
                Total megabyte-milliseconds taken by all map tasks=5246976
                Total megabyte-milliseconds taken by all reduce tasks=2830336
        Map-Reduce Framework
                Map input records=1
                Map output records=22
                Map output bytes=191
                Map output materialized bytes=247
                Input split bytes=196
                Combine input records=0
                Combine output records=0
                Reduce input groups=18
                Reduce shuffle bytes=247
                Reduce input records=22
                Reduce output records=18
                Spilled Records=44
                Shuffled Maps =2
                Failed Shuffles=0
                Merged Map outputs=2
                GC time elapsed (ms)=162
                CPU time spent (ms)=2180
                Physical memory (bytes) snapshot=885735424
                Virtual memory (bytes) snapshot=7685988352
                Total committed heap usage (bytes)=678952960
                Peak Map Physical memory (bytes)=323989504
                Peak Map Virtual memory (bytes)=2561187840
                Peak Reduce Physical memory (bytes)=240586752
                Peak Reduce Virtual memory (bytes)=2564431872
        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=221
        File Output Format Counters
                Bytes Written=160
2024-10-16 17:09:13,649 INFO streaming.StreamJob: Output directory: /p2/python/output
hdoop@NuvobookV1:~/lab/p2$
```