Practical 4

Aim: Write an Hadoop MapReduce Program in Python

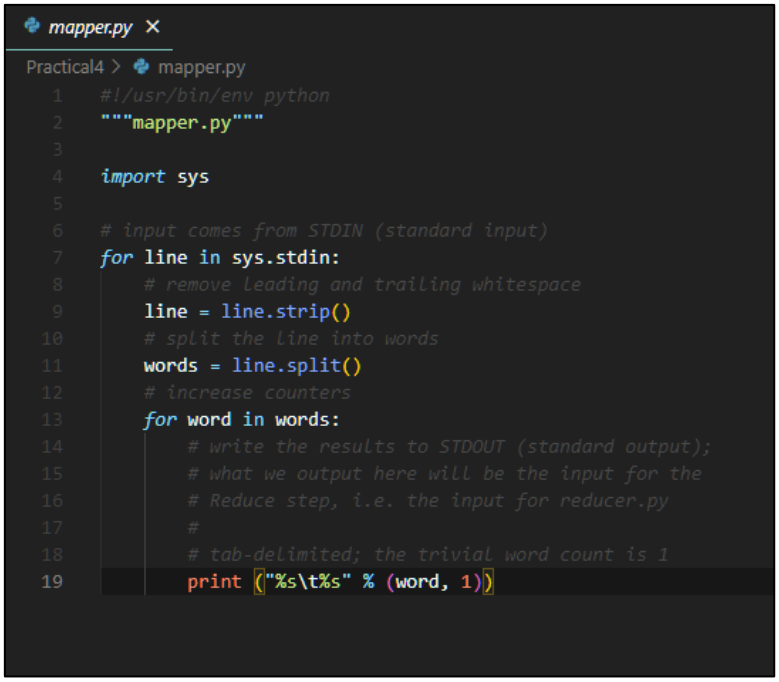
→

Create the mapper.py

```
#!/usr/bin/env python
"""mapper.py"""

import sys

# input comes from STDIN (standard input)
for line in sys.stdin:
    # remove leading and trailing whitespace
    line = line.strip()
    # split the line into words
    words = line.split()
    # increase counters
    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
        #
        # tab-delimited; the trivial word count is 1
        print ("%s\t%s" % (word, 1))
```



Create the reducer.py

```
#!/usr/bin/env python
"""reducer.py"""

from operator import itemgetter
import sys

current_word = None
current_count = 0
word = 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
    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))
```

reducer.py

```python
#!/usr/bin/env python
"""reducer.py"""

from operator import itemgetter
import sys

current_word = None
current_count = 0
word = 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
    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))
```

Running mapper and reducer without Hadoop HDFS

Step 1: Open **Command Prompt** where the mapper.py and reducer.py is located

```
PROBLEMS  OUTPUT  TERMINAL  JUPYTER  COMMENTS  DEBUG CONSOLE

Microsoft Windows [Version 10.0.19044.1826]
(c) Microsoft Corporation. All rights reserved.

F:\Practicals\BigData>cd Practical4

F:\Practicals\BigData\Practical4>
```

Step 2: To Execute the program create one file in the same location with name sample.txt

sample.txt

```
foo foo quux labs foo bar quux
```

Step 3: Now run the following command to get the output

```
type .\sample.txt | python .\mapper.py | sort |python .\reducer.py
```

Running the Python Code on Hadoop

Step 1: Download example input data

We will use three eBooks from Project Gutenberg for this example:

- The Outline of Science, Vol. 1 (of 4) by J. Arthur Thomson
- The Notebooks of Leonardo Da Vinci
- Ulysses by James Joyce

Download each eBook as text files in `Plain Text UTF-8` encoding and store the files in a local temporary directory of choice.

Copy local example data to HDFS

Before we run the actual MapReduce job, we must first copy the files from our local file system to Hadoop's HDFS.

Step 1: Open Command Prompt in Administration Mode and change the present working directory to the C:\Hadoop\hadoop-3.3.3\sbin

Step 2: Now run the command .\start-all.cmd

Step3: Now change the present working directory to C:\Hadoop\hadoop-3.3.3\bin and run the command

hadoop dfs –copyFromLocal 'path of the downloaded sample file' 'path to store on the hdfs'

```
hadoop dfs -copyFromLocal
"F:\Practicals\BigData\Practical4\Data"  hdfs://localhost:9000/Harsh
```

```
hadoop dfs -ls /Harsh
```

Step 4: To check the files are uploaded to the Hadoop HDFS the visit http://localhost:9870/dfshealth.html#tab-overview → go to utilities in the navigation bar and click on the Browse the file system

Step 5: Run the MapReduce job

```
hadoop jar C:\Hadoop\hadoop-3.3.3\share\hadoop\tools\lib\hadoop-streaming-
3.3.3.jar -file F:\Practicals\BigData\Practical4\mapper.py -mapper "python
mapper.py" -file F:\Practicals\BigData\Practical4\reducer.py -reducer "python
reducer.py" -input hdfs://localhost:9000/Harsh/sample.txt -output /output
```

Step 6: Check if the result is successfully stored in HDFS directory `/output`

```
hadoop dfs -ls /output
```

Step 7: To check the output is generated to the Hadoop HDFS the visit http://localhost:9870/dfshealth.html#tab-overview → go to utilities in the navigation bar and click on the Browse the file system

Step 8: You can then inspect the contents of the file with the `dfs -cat` command:

```
hadoop fs -cat /output/part-00000
```