Exercise 03: Stop Word Elimination using Map Reduce

Previous exercise described how to count repeated words in the input file. This exercise practice the students to do MapReduce process using word counting application with elimination words.

Prerequisites

Ensure that Hadoop is installed, configured and is running. More details:

Single Node Setup for first-time users.

Cluster Setup for large, distributed clusters.

Inputs and Outputs

i. **Input file should be in : /wcsw/in00/**

data.txt

Copy the content text from Shakespeare.txt, Which is attached in Google classroom.

sw.txt

Add following elimination words into sw.txt file.

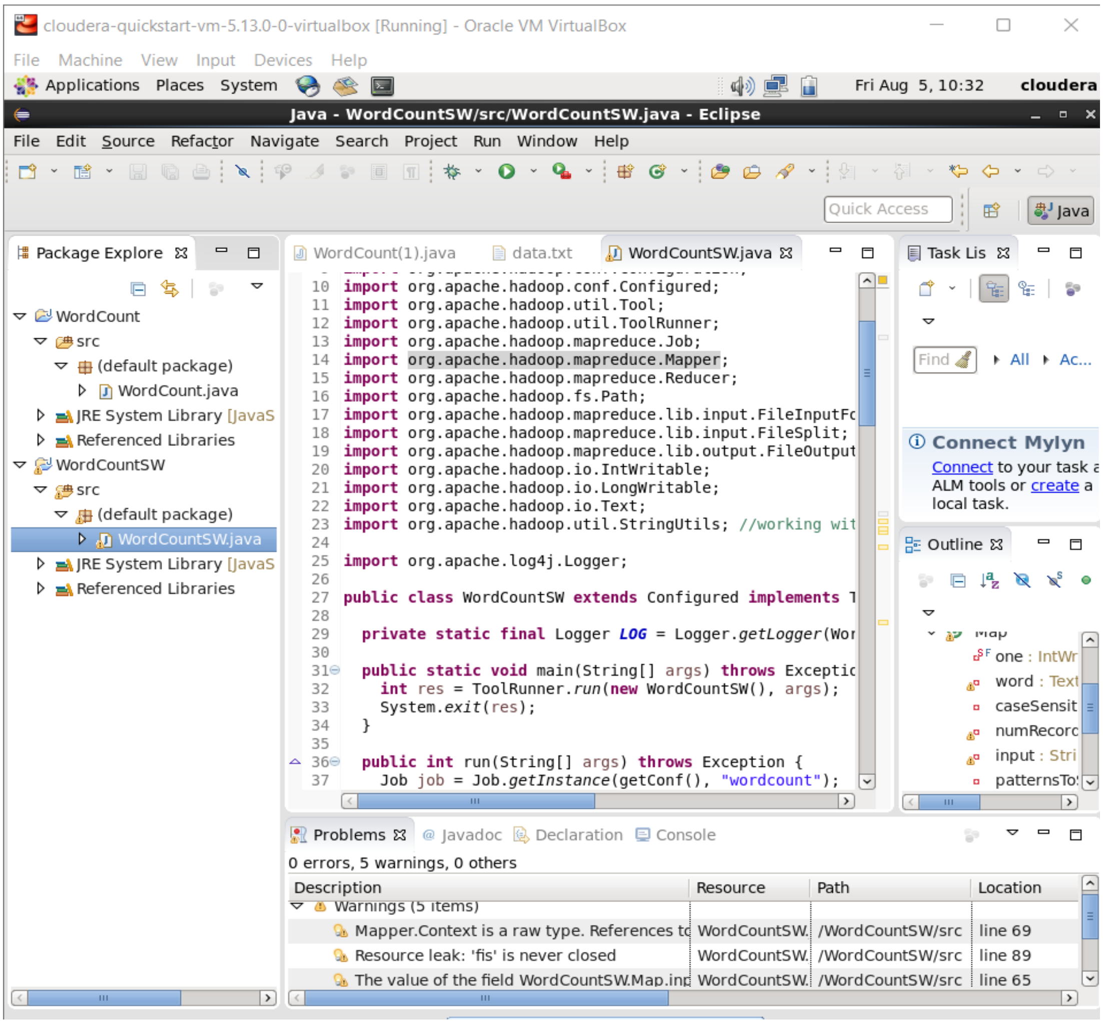
all
is
the
our
I
It

ii. **Output file should be in /wcsw/out00/**

Step 1

Compile `WordCountSW.java` and create a WordCountSW.jar:

(i) Create WordCountSW.java project.

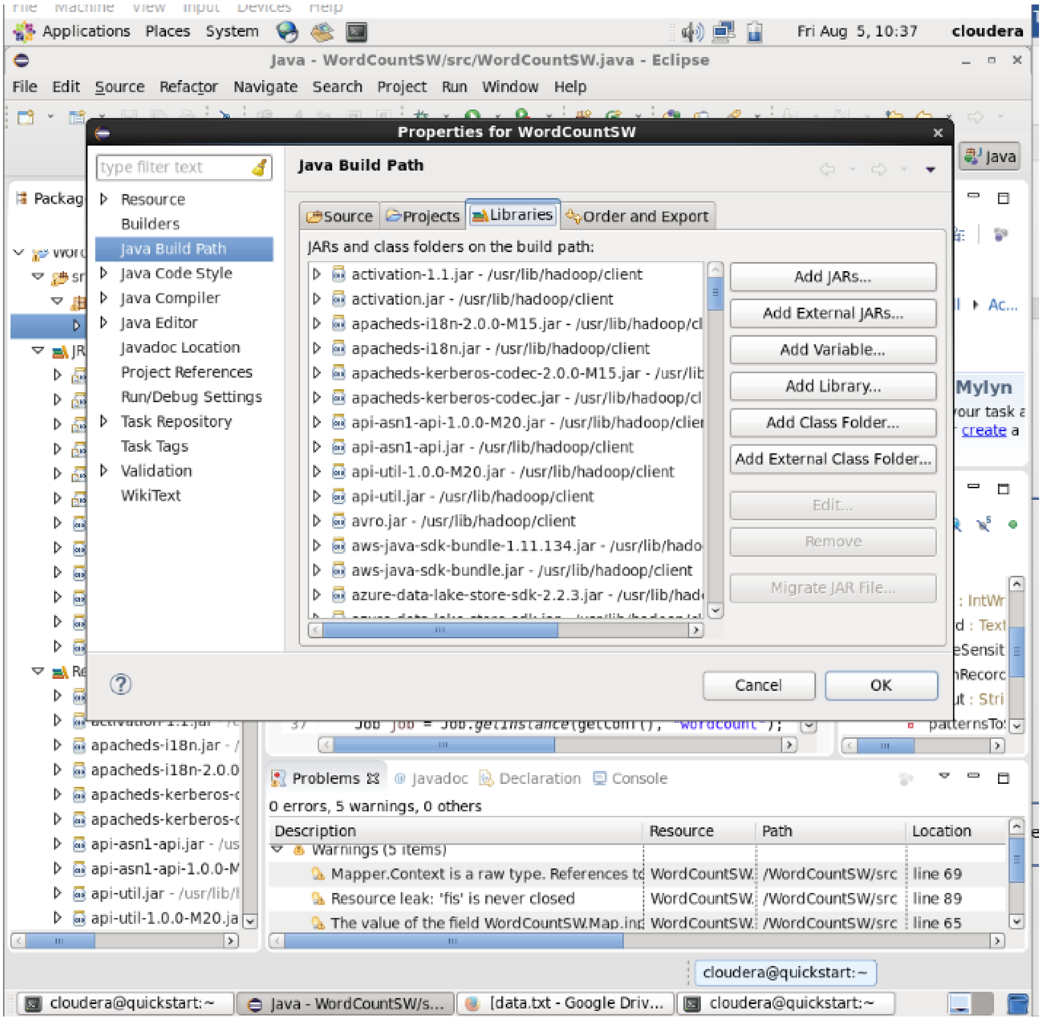


```
import org.apache.hadoop.conf.Configured;
import org.apache.hadoop.util.Tool;
import org.apache.hadoop.util.ToolRunner;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.Reducer;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.mapreduce.lib.input.FileInputFc
import org.apache.hadoop.mapreduce.lib.input.FileSplit;
import org.apache.hadoop.mapreduce.lib.output.FileOutput
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.util.StringUtils; //working wit

import org.apache.log4j.Logger;

public class WordCountSW extends Configured implements T

  private static final Logger LOG = Logger.getLogger(Wor

  public static void main(String[] args) throws Exceptic
    int res = ToolRunner.run(new WordCountSW(), args);
    System.exit(res);
  }

  public int run(String[] args) throws Exception {
    Job job = Job.getInstance(getConf(), "wordcount");
```

0 errors, 5 warnings, 0 others

Description	Resource	Path	Location
Warnings (5 items)			
Mapper.Context is a raw type. References to	WordCountSW.	/WordCountSW/src	line 69
Resource leak: 'fis' is never closed	WordCountSW.	/WordCountSW/src	line 89
The value of the field WordCountSW.Map.inp	WordCountSW.	/WordCountSW/src	line 65

(ii) Import external .jar files


Properties for WordCountSW

Java Build Path

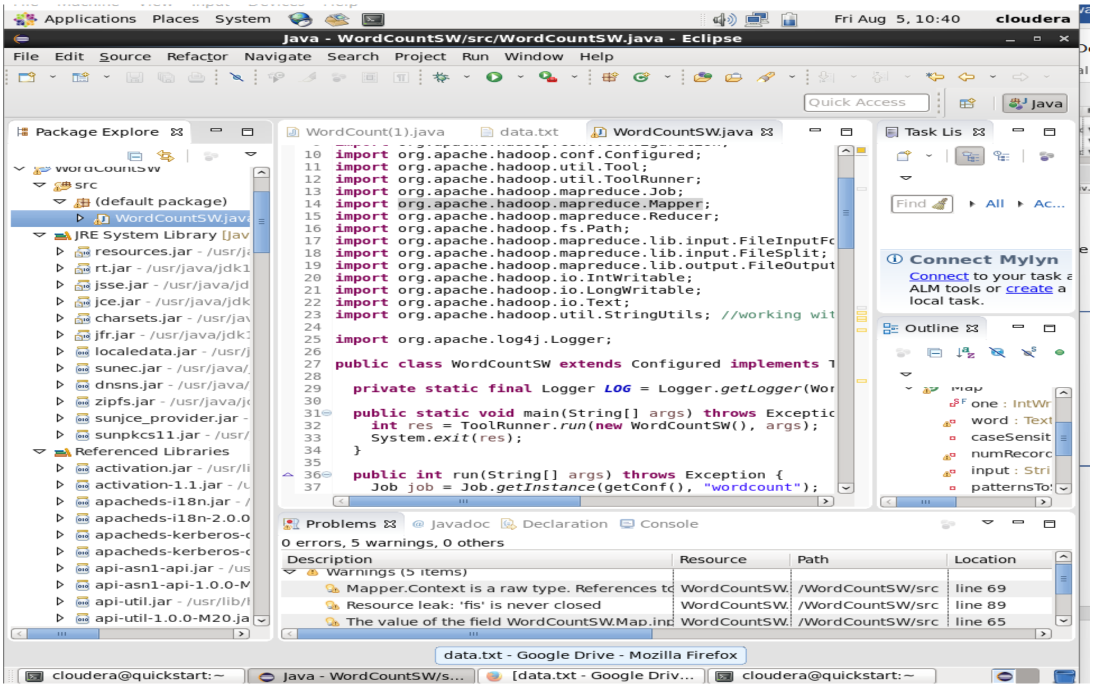
JARs and class folders on the build path:

- activation-1.1.jar - /usr/lib/hadoop/client
- activation.jar - /usr/lib/hadoop/client
- apacheds-i18n-2.0.0-M15.jar - /usr/lib/hadoop/cl
- apacheds-i18n.jar - /usr/lib/hadoop/client
- apacheds-kerberos-codec-2.0.0-M15.jar - /usr/lib
- apacheds-kerberos-codec.jar - /usr/lib/hadoop/cl
- api-asn1-api-1.0.0-M20.jar - /usr/lib/hadoop/clier
- api-asn1-api.jar - /usr/lib/hadoop/client
- api-util-1.0.0-M20.jar - /usr/lib/hadoop/client
- api-util.jar - /usr/lib/hadoop/client
- avro.jar - /usr/lib/hadoop/client
- aws-java-sdk-bundle-1.11.134.jar - /usr/lib/hado
- aws-java-sdk-bundle.jar - /usr/lib/hadoop/client
- azure-data-lake-store-sdk-2.2.3.jar - /usr/lib/had

0 errors, 5 warnings, 0 others

Description	Resource	Path	Location
Warnings (5 items)			
Mapper.Context is a raw type. References tc	WordCountSW.	/WordCountSW/src	line 69
Resource leak: 'fis' is never closed	WordCountSW.	/WordCountSW/src	line 89
The value of the field WordCountSW.Map.inc	WordCountSW.	/WordCountSW/src	line 65

(iii) Create WordCount class file using Google classroom attached WordCount.java file.


```
import org.apache.hadoop.conf.Configured;
import org.apache.hadoop.util.Tool;
import org.apache.hadoop.util.ToolRunner;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.Reducer;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.mapreduce.lib.input.FileInputFc
import org.apache.hadoop.mapreduce.lib.input.FileSplit;
import org.apache.hadoop.mapreduce.lib.output.FileOutput
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.util.StringUtils; //working wit

import org.apache.log4j.Logger;

public class WordCountSW extends Configured implements T

  private static final Logger LOG = Logger.getLogger(Wor

  public static void main(String[] args) throws Exceptic
    int res = ToolRunner.run(new WordCountSW(), args);
    System.exit(res);
  }

  public int run(String[] args) throws Exception {
    Job job = Job.getInstance(getConf(), "wordcount");
```

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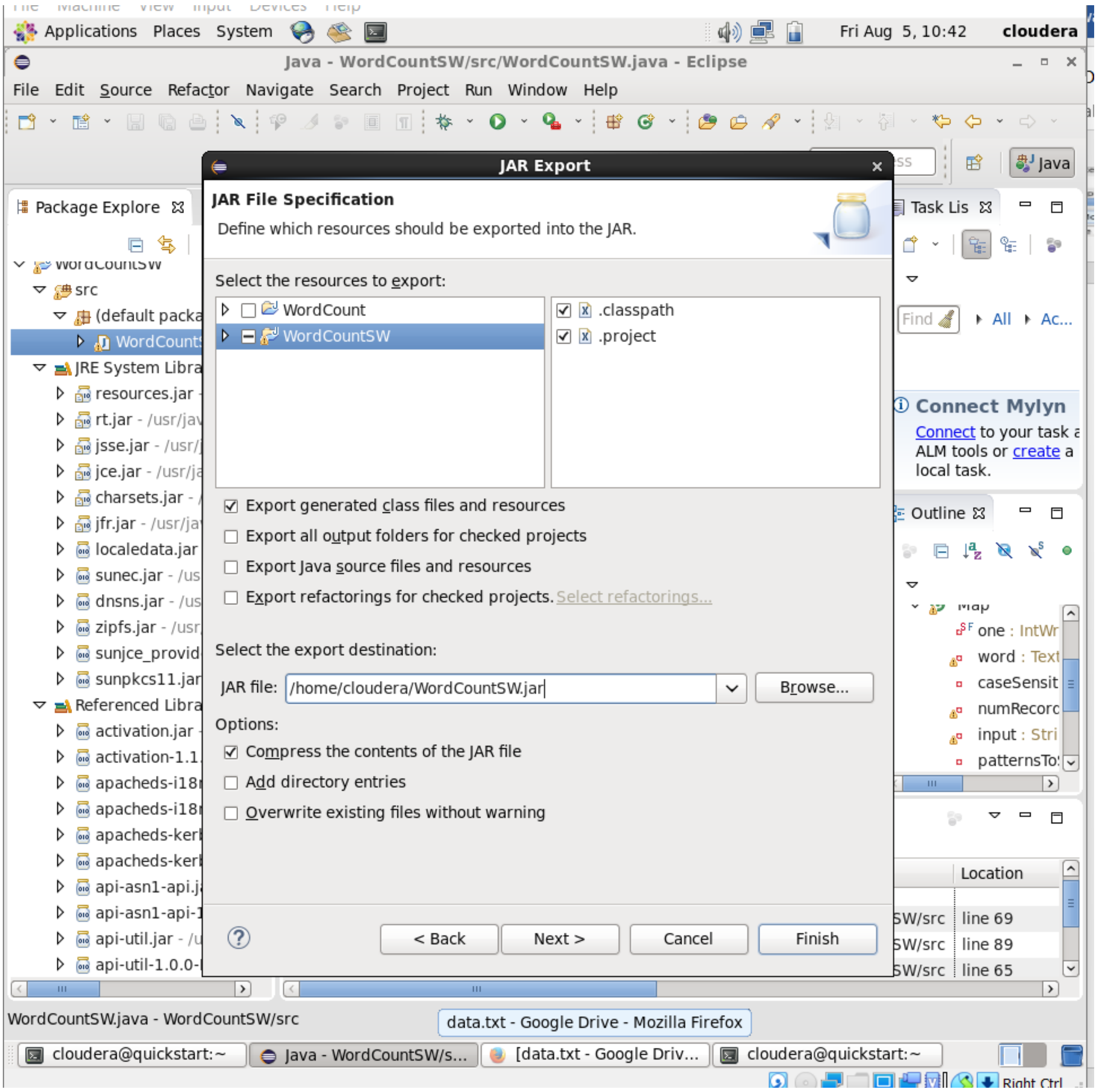
Description	Resource	Path	Location
Warnings (5 items)			
Mapper.Context is a raw type. References tc	WordCountSW.	/WordCountSW/src	line 69
Resource leak: 'fis' is never closed	WordCountSW.	/WordCountSW/src	line 89
The value of the field WordCountSW.Map.inc	WordCountSW.	/WordCountSW/src	line 65

(iv) Create WordCountSW.jar file



JAR Export

JAR File Specification

Define which resources should be exported into the JAR.

Select the resources to export:

☐ WordCount
▬ WordCountSW

☑ .classpath
☑ .project

☑ Export generated class files and resources
☐ Export all output folders for checked projects
☐ Export Java source files and resources
☐ Export refactorings for checked projects. Select refactorings...

Select the export destination:

JAR file: /home/cloudera/WordCountSW.jar

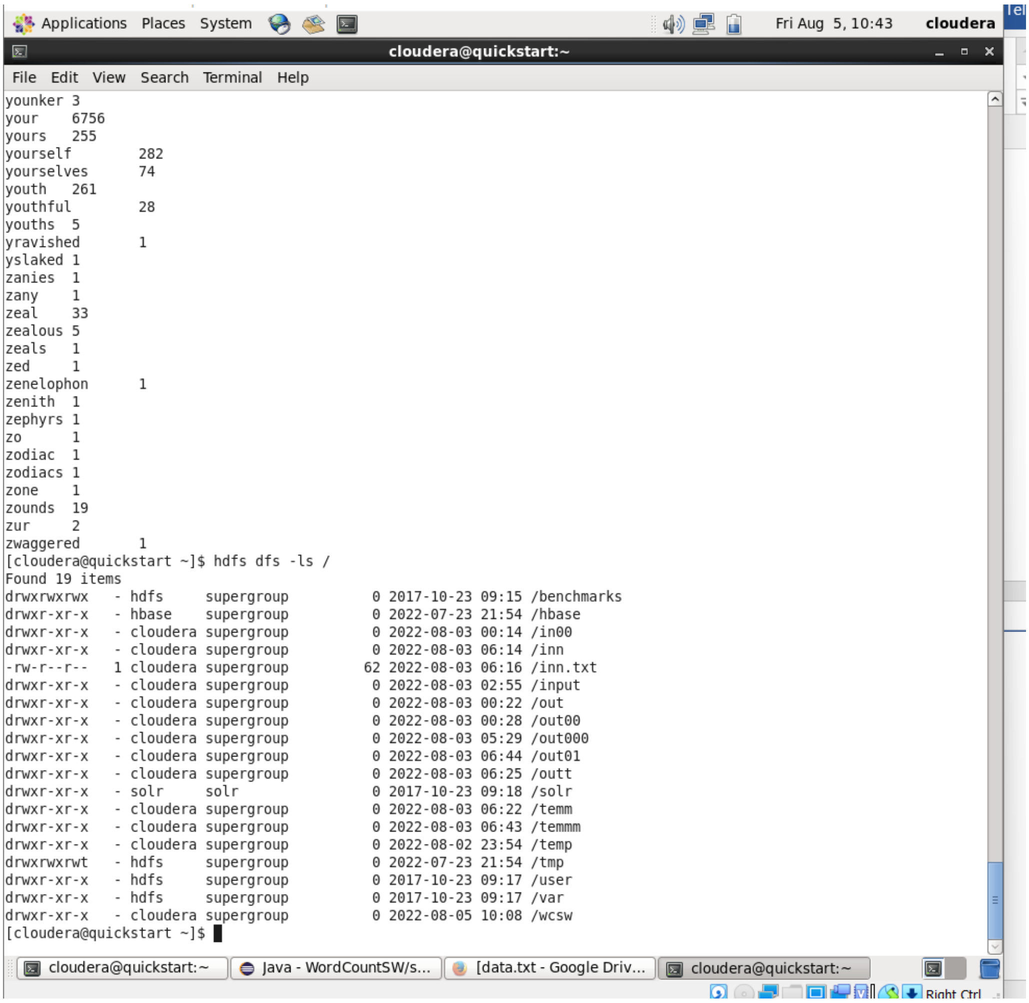
Options:

☑ Compress the contents of the JAR file
☐ Add directory entries
☐ Overwrite existing files without warning

Step 2

Create following folders in HDFS:

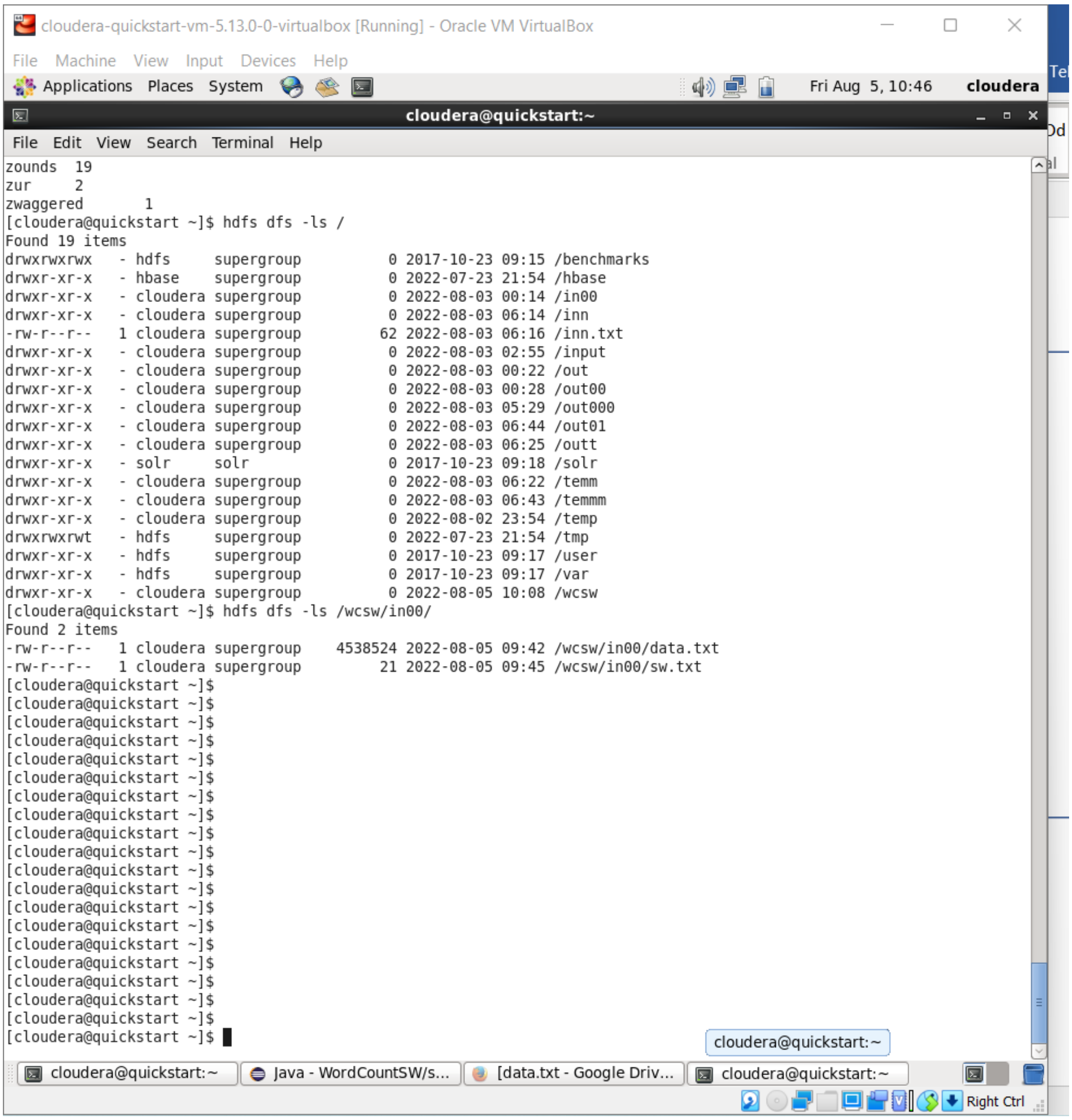
- `/wcsw/in00` - input directory in HDFS
- `/wcsw/out00` - output directory in HDFS



```
younker 3
your    6756
yours   255
yourself        282
yourselves      74
youth   261
youthful        28
youths  5
yravished       1
yslaked 1
zanies  1
zany    1
zeal    33
zealous 5
zeals   1
zed     1
zenelophon      1
zenith  1
zephyrs 1
zo      1
zodiac  1
zodiacs 1
zone    1
zounds  19
zur     2
zwaggered       1
[cloudera@quickstart ~]$ hdfs dfs -ls /
Found 19 items
drwxrwxrwx   - hdfs     supergroup          0 2017-10-23 09:15 /benchmarks
drwxr-xr-x   - hbase    supergroup          0 2022-07-23 21:54 /hbase
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 00:14 /in00
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 06:14 /inn
-rw-r--r--   1 cloudera supergroup         62 2022-08-03 06:16 /inn.txt
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 02:55 /input
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 00:22 /out
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 00:28 /out00
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 05:29 /out000
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 06:44 /out01
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 06:25 /outt
drwxr-xr-x   - solr     solr                0 2017-10-23 09:18 /solr
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 06:22 /temm
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 06:43 /temmm
drwxr-xr-x   - cloudera supergroup          0 2022-08-02 23:54 /temp
drwxrwxrwt   - hdfs     supergroup          0 2022-07-23 21:54 /tmp
drwxr-xr-x   - hdfs     supergroup          0 2017-10-23 09:17 /user
drwxr-xr-x   - hdfs     supergroup          0 2017-10-23 09:17 /var
drwxr-xr-x   - cloudera supergroup          0 2022-08-05 10:08 /wcsw
[cloudera@quickstart ~]$
```

Step 3

Create and copy data text-files into input folder:


cloudera-quickstart-vm-5.13.0-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Applications Places System
Fri Aug 5, 10:46
cloudera
cloudera@quickstart:~
File Edit View Search Terminal Help
cloudera@quickstart:~
Java - WordCountSW/s...
[data.txt - Google Driv...
Right Ctrl

```
zounds  19
zur     2
zwaggered       1
[cloudera@quickstart ~]$ hdfs dfs -ls /
Found 19 items
drwxrwxrwx   - hdfs     supergroup          0 2017-10-23 09:15 /benchmarks
drwxr-xr-x   - hbase    supergroup          0 2022-07-23 21:54 /hbase
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 00:14 /in00
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 06:14 /inn
-rw-r--r--   1 cloudera supergroup         62 2022-08-03 06:16 /inn.txt
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 02:55 /input
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 00:22 /out
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 00:28 /out00
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 05:29 /out000
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 06:44 /out01
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 06:25 /outt
drwxr-xr-x   - solr     solr                0 2017-10-23 09:18 /solr
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 06:22 /temm
drwxr-xr-x   - cloudera supergroup          0 2022-08-03 06:43 /temmm
drwxr-xr-x   - cloudera supergroup          0 2022-08-02 23:54 /temp
drwxrwxrwt   - hdfs     supergroup          0 2022-07-23 21:54 /tmp
drwxr-xr-x   - hdfs     supergroup          0 2017-10-23 09:17 /user
drwxr-xr-x   - hdfs     supergroup          0 2017-10-23 09:17 /var
drwxr-xr-x   - cloudera supergroup          0 2022-08-05 10:08 /wcsw
[cloudera@quickstart ~]$ hdfs dfs -ls /wcsw/in00/
Found 2 items
-rw-r--r--   1 cloudera supergroup    4538524 2022-08-05 09:42 /wcsw/in00/data.txt
-rw-r--r--   1 cloudera supergroup         21 2022-08-05 09:45 /wcsw/in00/sw.txt
[cloudera@quickstart ~]$
[cloudera@quickstart ~]$
[cloudera@quickstart ~]$
[cloudera@quickstart ~]$
[cloudera@quickstart ~]$
[cloudera@quickstart ~]$
[cloudera@quickstart ~]$
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[cloudera@quickstart ~]$
[cloudera@quickstart ~]$
[cloudera@quickstart ~]$
[cloudera@quickstart ~]$
[cloudera@quickstart ~]$
[cloudera@quickstart ~]$
```
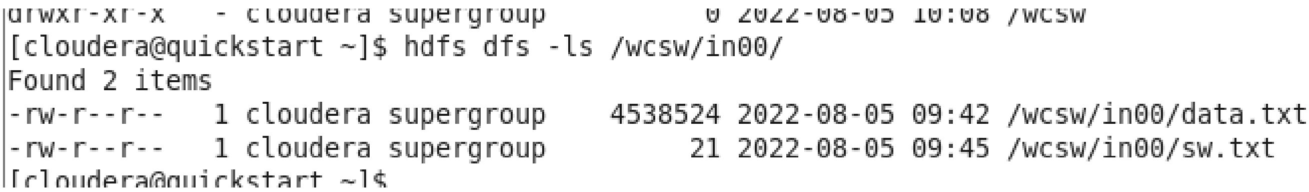

Step-4

Create and copy sw text-files into input folder:



```
drwxr-xr-x   - cloudera supergroup          0 2022-08-05 10:08 /wcsw
[cloudera@quickstart ~]$ hdfs dfs -ls /wcsw/in00/
Found 2 items
-rw-r--r--   1 cloudera supergroup    4538524 2022-08-05 09:42 /wcsw/in00/data.txt
-rw-r--r--   1 cloudera supergroup         21 2022-08-05 09:45 /wcsw/in00/sw.txt
[cloudera@quickstart ~]$
```

[cloudera@quickstart ~]$ hdfs dfs -ls /wcsw/in00/

Found 2 items

-rw-r--r-- 1 cloudera supergroup 3309 2021-08-24 07:00 /wcsw/in00/data.txt

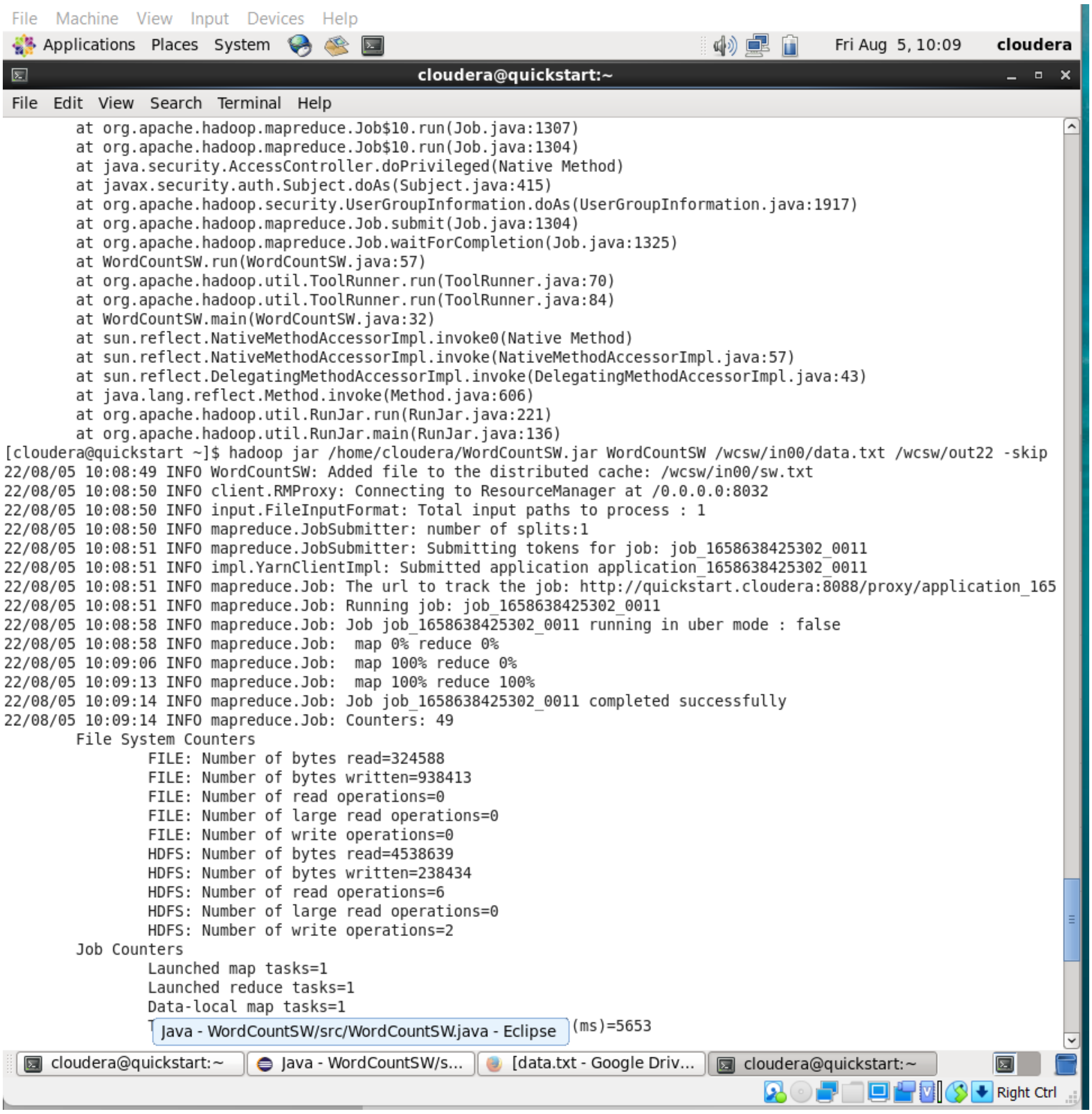
-rw-r--r--   1 cloudera supergroup   15 2021-08-24 07:02 /wcsw/in00/sw.txt

Step 5

Run the MapReduce application with skip option:

[cloudera@quickstart ~]$ hadoop jar /home/cloudera/WordCountSW.jar /wcsw/in00/data.txt /wcsw/out00/ -skip /wcsw/in00/sw.txt

Show MapReduce Framework

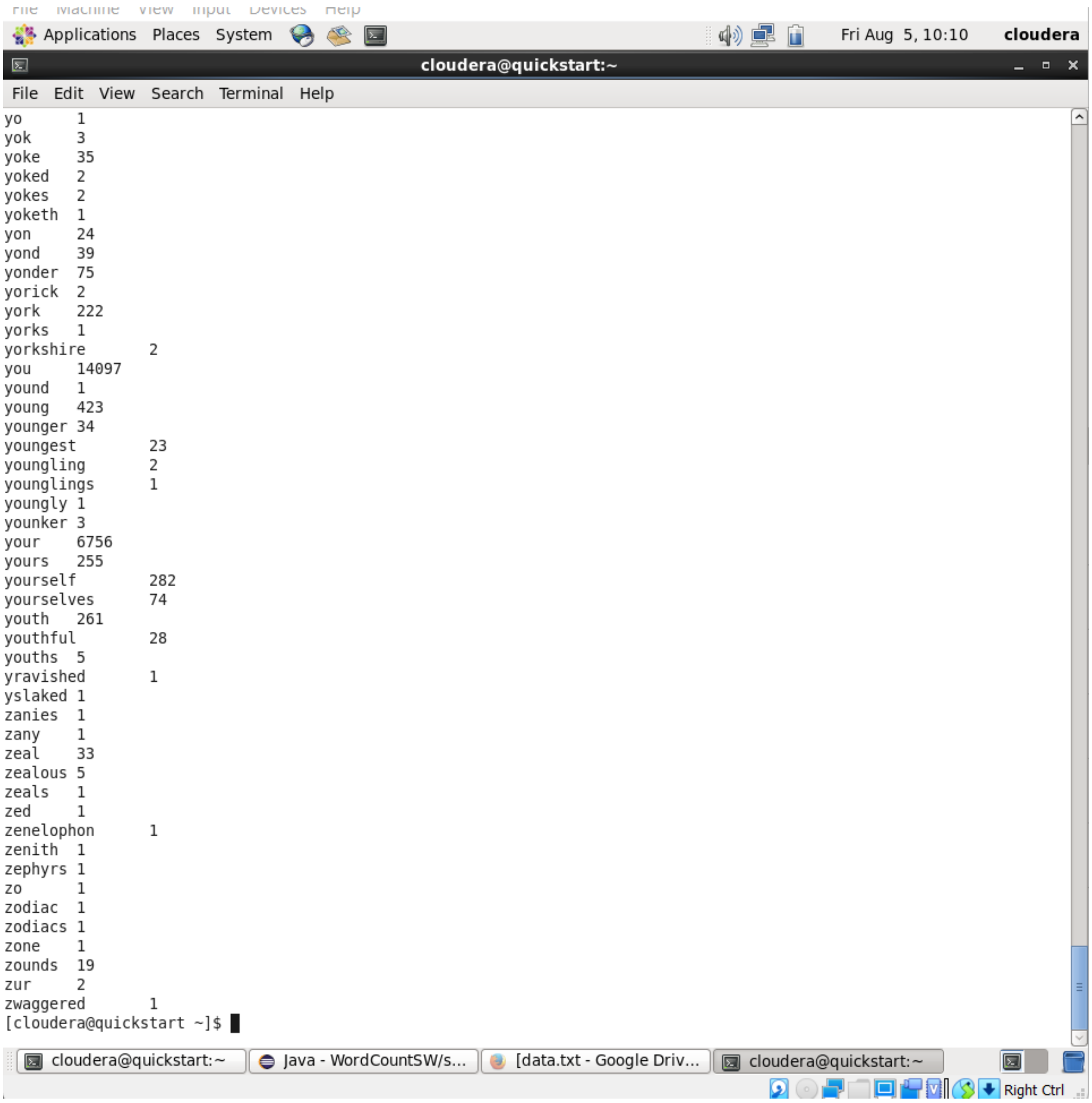

File Machine View Input Devices Help
Applications Places System
Fri Aug 5, 10:09
cloudera
cloudera@quickstart:~
File Edit View Search Terminal Help
Java - WordCountSW/src/WordCountSW.java - Eclipse
cloudera@quickstart:~
Java - WordCountSW/s...
[data.txt - Google Driv...
cloudera@quickstart:~
Right Ctrl

```
        at org.apache.hadoop.mapreduce.Job$10.run(Job.java:1307)
        at org.apache.hadoop.mapreduce.Job$10.run(Job.java:1304)
        at java.security.AccessController.doPrivileged(Native Method)
        at javax.security.auth.Subject.doAs(Subject.java:415)
        at org.apache.hadoop.security.UserGroupInformation.doAs(UserGroupInformation.java:1917)
        at org.apache.hadoop.mapreduce.Job.submit(Job.java:1304)
        at org.apache.hadoop.mapreduce.Job.waitForCompletion(Job.java:1325)
        at WordCountSW.run(WordCountSW.java:57)
        at org.apache.hadoop.util.ToolRunner.run(ToolRunner.java:70)
        at org.apache.hadoop.util.ToolRunner.run(ToolRunner.java:84)
        at WordCountSW.main(WordCountSW.java:32)
        at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
        at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:57)
        at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:43)
        at java.lang.reflect.Method.invoke(Method.java:606)
        at org.apache.hadoop.util.RunJar.run(RunJar.java:221)
        at org.apache.hadoop.util.RunJar.main(RunJar.java:136)
[cloudera@quickstart ~]$ hadoop jar /home/cloudera/WordCountSW.jar WordCountSW /wcsw/in00/data.txt /wcsw/out22 -skip
22/08/05 10:08:49 INFO WordCountSW: Added file to the distributed cache: /wcsw/in00/sw.txt
22/08/05 10:08:50 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0:8032
22/08/05 10:08:50 INFO input.FileInputFormat: Total input paths to process : 1
22/08/05 10:08:50 INFO mapreduce.JobSubmitter: number of splits:1
22/08/05 10:08:51 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1658638425302_0011
22/08/05 10:08:51 INFO impl.YarnClientImpl: Submitted application application_1658638425302_0011
22/08/05 10:08:51 INFO mapreduce.Job: The url to track the job: http://quickstart.cloudera:8088/proxy/application_165
22/08/05 10:08:51 INFO mapreduce.Job: Running job: job_1658638425302_0011
22/08/05 10:08:58 INFO mapreduce.Job: Job job_1658638425302_0011 running in uber mode : false
22/08/05 10:08:58 INFO mapreduce.Job:  map 0% reduce 0%
22/08/05 10:09:06 INFO mapreduce.Job:  map 100% reduce 0%
22/08/05 10:09:13 INFO mapreduce.Job:  map 100% reduce 100%
22/08/05 10:09:14 INFO mapreduce.Job: Job job_1658638425302_0011 completed successfully
22/08/05 10:09:14 INFO mapreduce.Job: Counters: 49
        File System Counters
                FILE: Number of bytes read=324588
                FILE: Number of bytes written=938413
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=4538639
                HDFS: Number of bytes written=238434
                HDFS: Number of read operations=6
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=2
        Job Counters
                Launched map tasks=1
                Launched reduce tasks=1
                Data-local map tasks=1
                T                                              (ms)=5653
```

Step 6

Output:

```
[cloudera@quickstart ~]$ hdfs dfs -ls /wcsw/out00/

Found 2 items

-rw-r--r--   1 cloudera supergroup          0 2021-08-24 07:05  /wcsw/out00/_SUCCESS

-rw-r--r--   1 cloudera supergroup       2384 2021-08-24 07:05 /wcsw/out00/part-r-00000

[cloudera@quickstart ~]$ hdfs dfs -cat /wcsw/out00/part-r-00000
```


File Machine View Input Devices Help
Applications Places System
Fri Aug 5, 10:10
cloudera
cloudera@quickstart:~
File Edit View Search Terminal Help
cloudera@quickstart:~
Java - WordCountSW/s...
[data.txt - Google Driv...
cloudera@quickstart:~
Right Ctrl

```
yo      1
yok     3
yoke    35
yoked   2
yokes   2
yoketh  1
yon     24
yond    39
yonder  75
yorick  2
york    222
yorks   1
yorkshire       2
you     14097
yound   1
young   423
younger 34
youngest        23
youngling       2
younglings      1
youngly 1
younker 3
your    6756
yours   255
yourself        282
yourselves      74
youth   261
youthful        28
youths  5
yravished       1
yslaked 1
zanies  1
zany    1
zeal    33
zealous 5
zeals   1
zed     1
zenelophon      1
zenith  1
zephyrs 1
zo      1
zodiac  1
zodiacs 1
zone    1
zounds  19
zur     2
zwaggered       1
[cloudera@quickstart ~]$ 
```