PROBLEM1 :-

- **IMPLEMENT A WORD COUNT PROGRAM THAT NOT ONLY COUNTS WORDS BUT ALSO FILTERS OUT STOP WORDS (LIKE "THE," "AND," "A") AND OUTPUTS THE TOP N MOST FREQUENT WORDS.**
- **OBJECTIVE: PRACTICE WITH BASIC TEXT PROCESSING, FILTERING, AND SORTING**

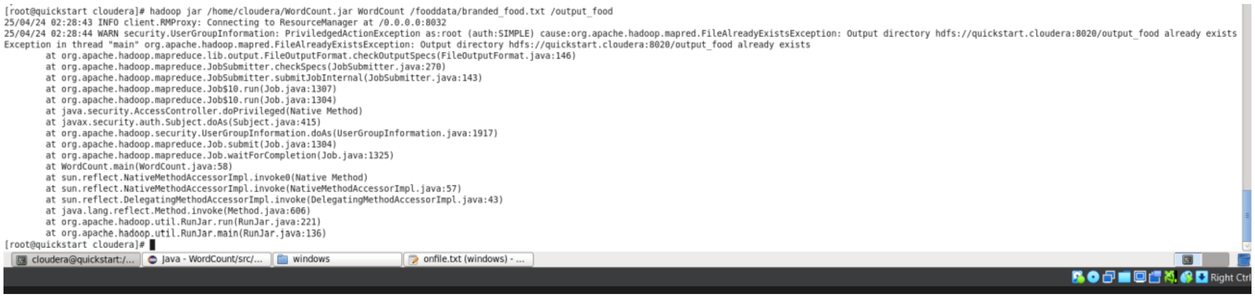
USING PARALLEL AND DISTRIBUTED COMPUTING CONCEPT IN HADOOP, WRITE A PROGRAM TO COUNT HOW MANY TIMES EACH WORD IN THE DATASETS OCCURS AND SHOW HOW PARALLEL COMPUTING CONCEPTS IS APPLIED HERE. HOW MANY BLOCKS IS CREATED IN THIS DATASET EXPLAIN BLOCK CONCEPTS AND SHOW WITH SNAP THE NUMBER BLOCKS CREATED, SUBMIT THE LAB REPORT WITH PROPER PROOF OF EXECUTION (SNAP).

Solution:

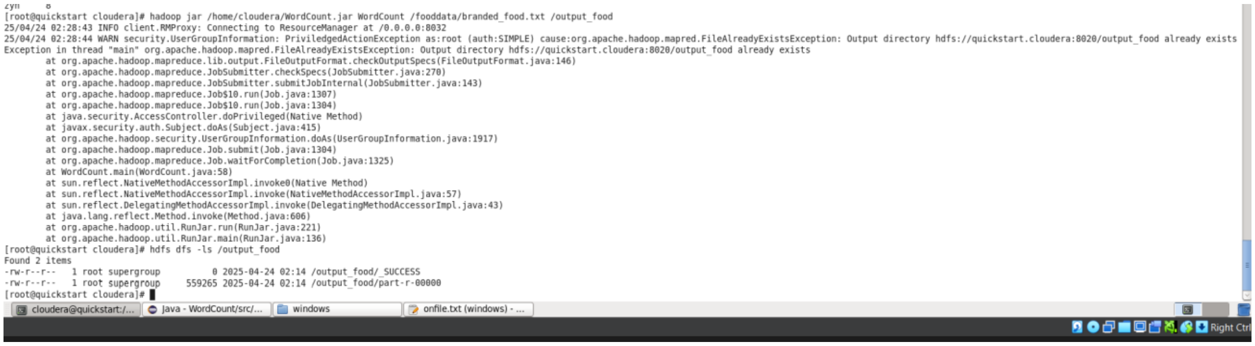
The Code:

```
import java.io.IOException;
import java.util.Arrays;
import java.util.HashSet;
import java.util.Set;
import java.util.StringTokenizer;

import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.Mapper;

import org.apache.hadoop.mapreduce.Reducer;

import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;

import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;


public class WordCount {


  public static class TokenMapper extends Mapper<Object, Text, Text, IntWritable> {

    private final static IntWritable counter = new IntWritable(1);

    private final Text currentWord = new Text();


    private static final Set<String> filterWords = new HashSet<>(Arrays.asList(

      "the", "and", "a", "an", "of", "is", "to", "in", "on", "for", "with", "as", "by"

    ));


    @Override

    protected void map(Object key, Text line, Context context) throws IOException,
InterruptedException {

      StringTokenizer tokenizer = new StringTokenizer(line.toString().toLowerCase());

      while (tokenizer.hasMoreTokens()) {

        String rawWord = tokenizer.nextToken().replaceAll("[^a-z]", "");

        if (!rawWord.isEmpty() && !filterWords.contains(rawWord)) {

          currentWord.set(rawWord);

          context.write(currentWord, counter);

        }

      }
    }
  }

  public static class FrequencyReducer extends Reducer<Text, IntWritable, Text, IntWritable> {
    private final IntWritable total = new IntWritable();

    @Override
    protected void reduce(Text word, Iterable<IntWritable> values, Context context)
        throws IOException, InterruptedException {
      int count = 0;
      for (IntWritable freq : values) {
        count += freq.get();
      }
      total.set(count);
      context.write(word, total);
    }
  }

  public static void main(String[] args) throws Exception {
    Configuration conf = new Configuration();
    Job wordCountJob = Job.getInstance(conf, "word count");

    wordCountJob.setJarByClass(WordCount.class);
    wordCountJob.setMapperClass(TokenMapper.class);
    wordCountJob.setCombinerClass(FrequencyReducer.class);
```

```java
        wordCountJob.setReducerClass(FrequencyReducer.class);


        wordCountJob.setOutputKeyClass(Text.class);

        wordCountJob.setOutputValueClass(IntWritable.class);


        FileInputFormat.addInputPath(wordCountJob, new Path(args[0]));

        FileOutputFormat.setOutputPath(wordCountJob, new Path(args[1]));


        System.exit(wordCountJob.waitForCompletion(true) ? 0 : 1);

    }

}
```



```
[root@quickstart cloudera]# hadoop jar /home/cloudera/WordCount.jar WordCount /fooddata/branded_food.txt /output_food
25/04/24 02:28:43 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0:8032
25/04/24 02:28:44 WARN security.UserGroupInformation: PriviledgedActionException as:root (auth:SIMPLE) cause:org.apache.hadoop.mapred.FileAlreadyExistsException: Output directory hdfs://quickstart.cloudera:8020/output_food already exists
Exception in thread "main" org.apache.hadoop.mapred.FileAlreadyExistsException: Output directory hdfs://quickstart.cloudera:8020/output_food already exists
        at org.apache.hadoop.mapreduce.lib.output.FileOutputFormat.checkOutputSpecs(FileOutputFormat.java:146)
        at org.apache.hadoop.mapreduce.JobSubmitter.checkSpecs(JobSubmitter.java:270)
        at org.apache.hadoop.mapreduce.JobSubmitter.submitJobInternal(JobSubmitter.java:143)
        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 WordCount.main(WordCount.java:58)
        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)
[root@quickstart cloudera]# 
```



```
zyn     8
[root@quickstart cloudera]# hadoop jar /home/cloudera/WordCount.jar WordCount /fooddata/branded_food.txt /output_food
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25/04/24 02:28:44 WARN security.UserGroupInformation: PriviledgedActionException as:root (auth:SIMPLE) cause:org.apache.hadoop.mapred.FileAlreadyExistsException: Output directory hdfs://quickstart.cloudera:8020/output_food already exists
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        at org.apache.hadoop.util.RunJar.run(RunJar.java:221)
        at org.apache.hadoop.util.RunJar.main(RunJar.java:136)
[root@quickstart cloudera]# hdfs dfs -ls /output_food
Found 2 items
-rw-r--r--   1 root supergroup          0 2025-04-24 02:14 /output_food/_SUCCESS
-rw-r--r--   1 root supergroup     559265 2025-04-24 02:14 /output_food/part-r-00000
[root@quickstart cloudera]# 
```
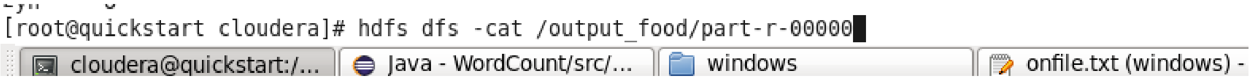
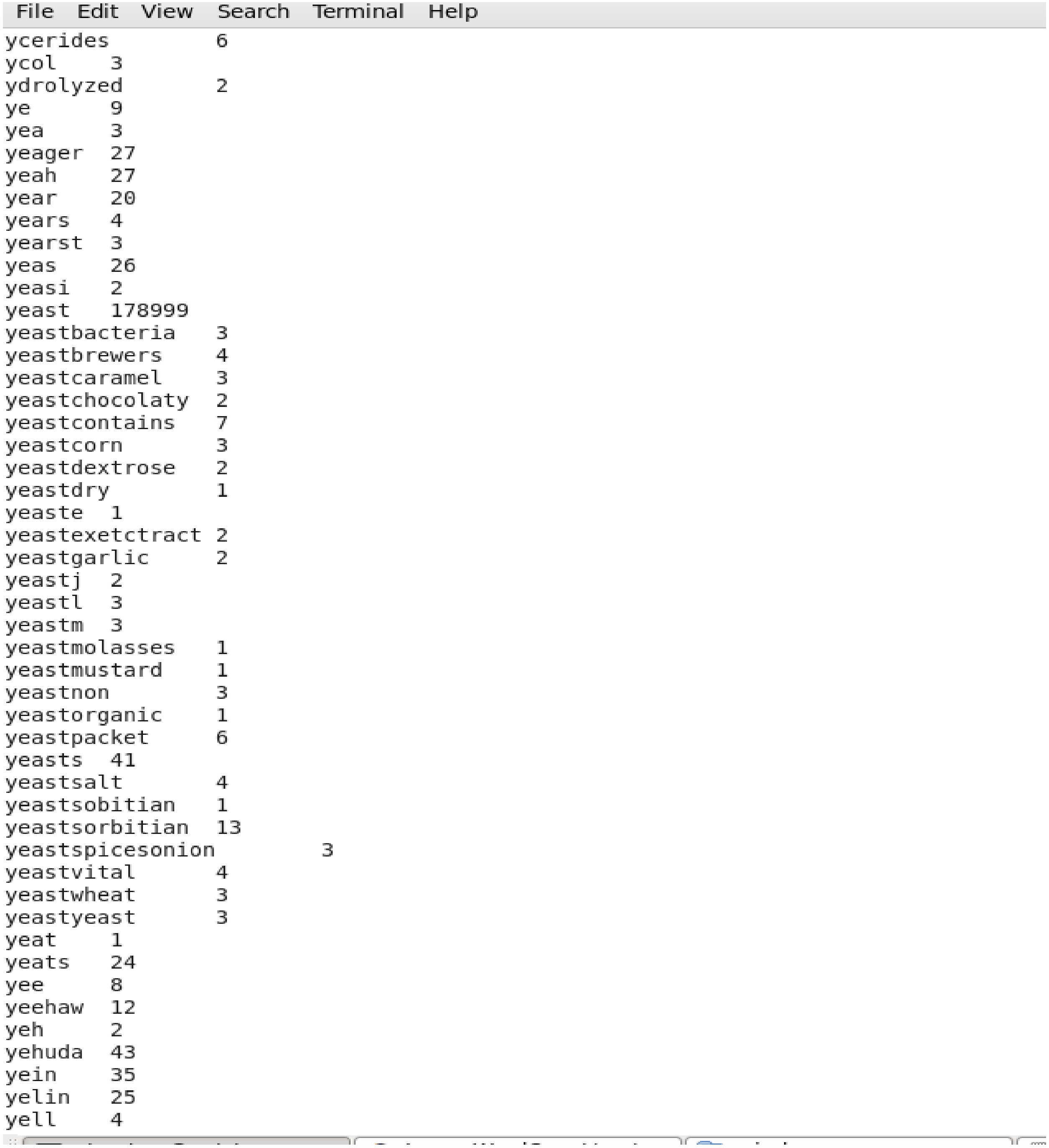
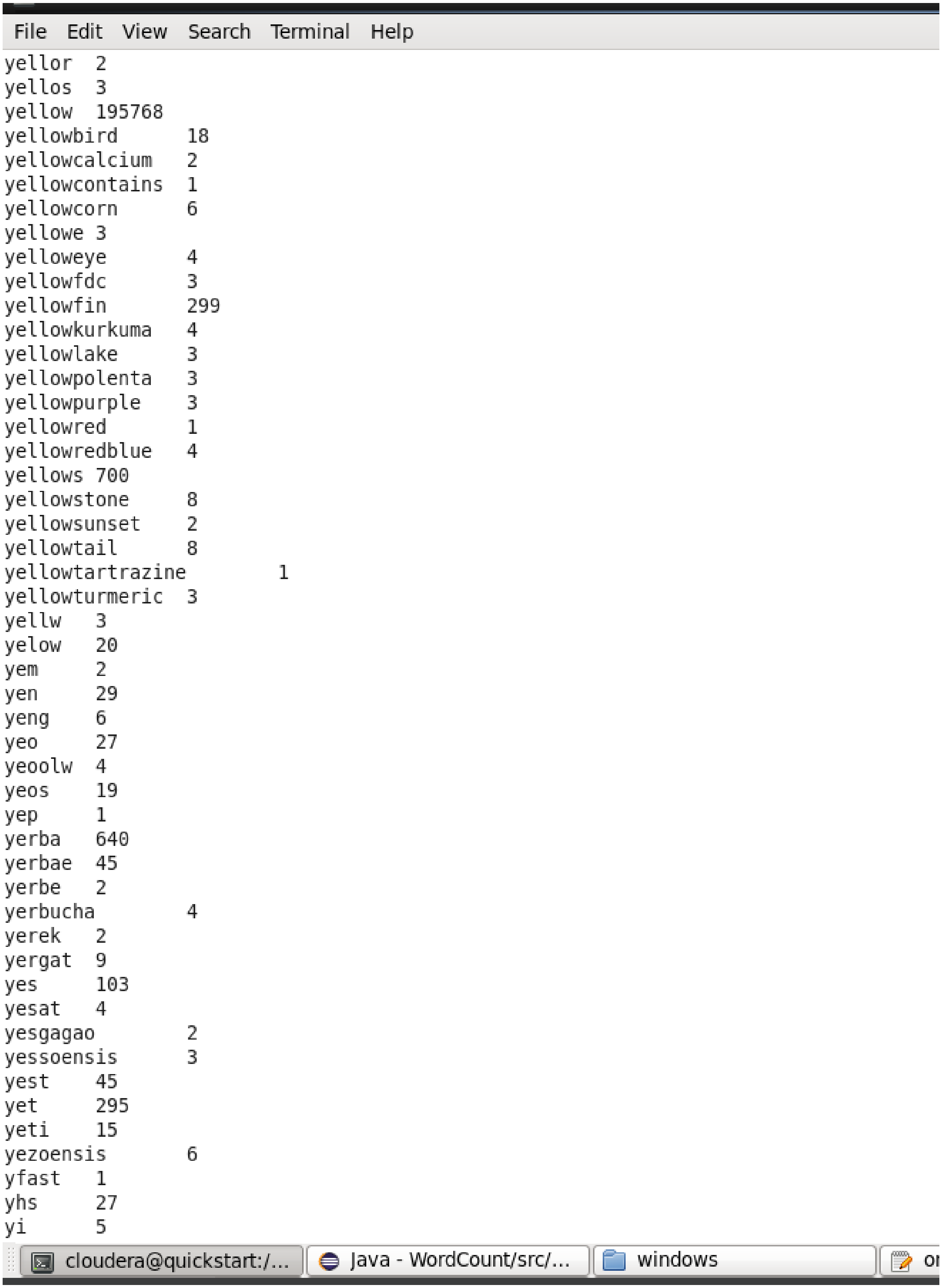



```
[root@quickstart cloudera]# hdfs dfs -cat /output_food/part-r-00000
```

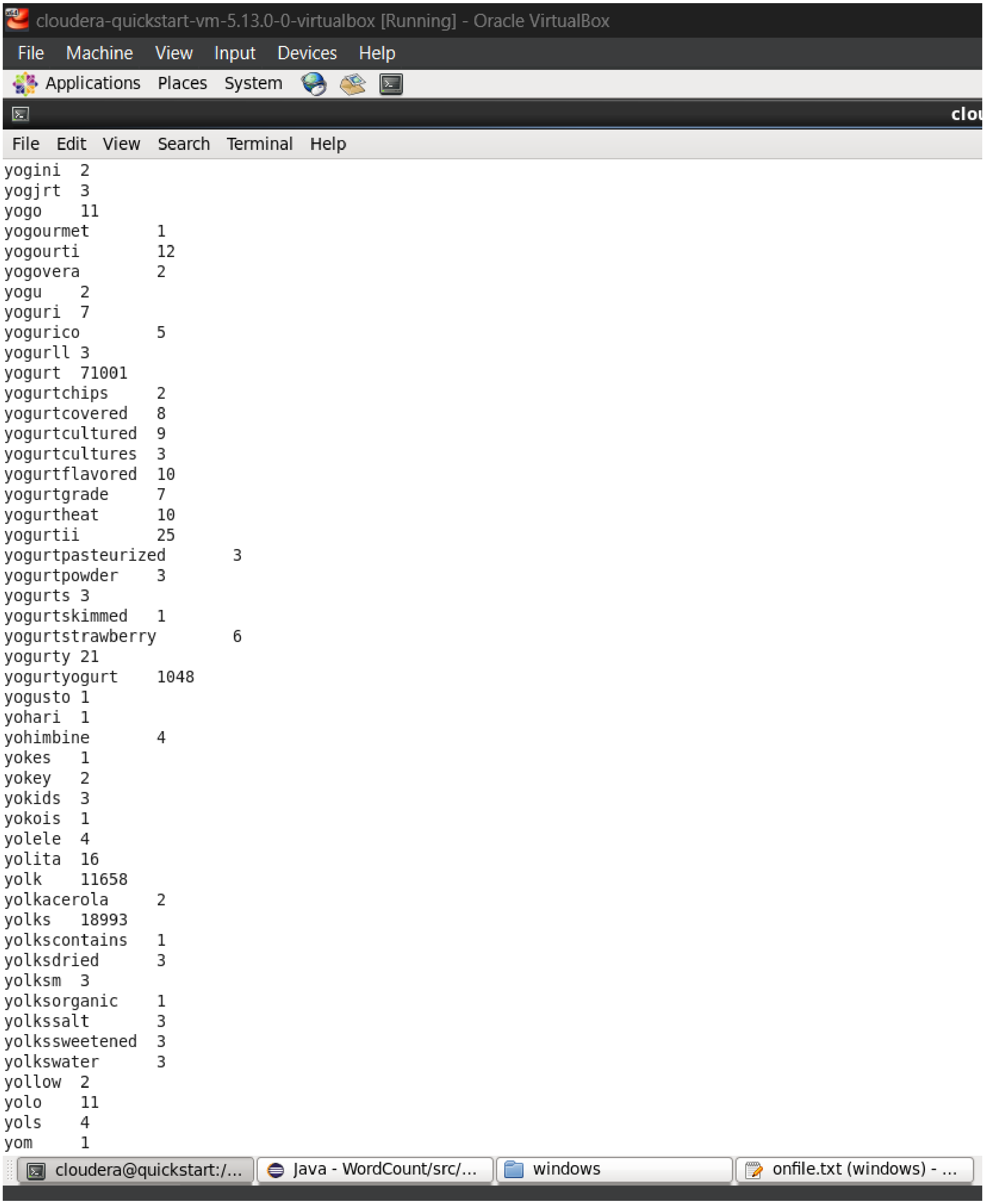
The Word Count Results:



```
ycerides        6
ycol    3
ydrolyzed       2
ye      9
yea     3
yeager  27
yeah    27
year    20
years   4
yearst  3
yeas    26
yeasi   2
yeast   178999
yeastbacteria   3
yeastbrewers    4
yeastcaramel    3
yeastchocolaty  2
yeastcontains   7
yeastcorn       3
yeastdextrose   2
yeastdry        1
yeaste  1
yeastexetctract 2
yeastgarlic     2
yeastj  2
yeastl  3
yeastm  3
yeastmolasses   1
yeastmustard    1
yeastnon        3
yeastorganic    1
yeastpacket     6
yeasts  41
yeastsalt       4
yeastsobitian   1
yeastsorbitian  13
yeastspicesonion        3
yeastvital      4
yeastwheat      3
yeastyeast      3
yeat    1
yeats   24
yee     8
yeehaw  12
yeh     2
yehuda  43
yein    35
yelin   25
yell    4
```

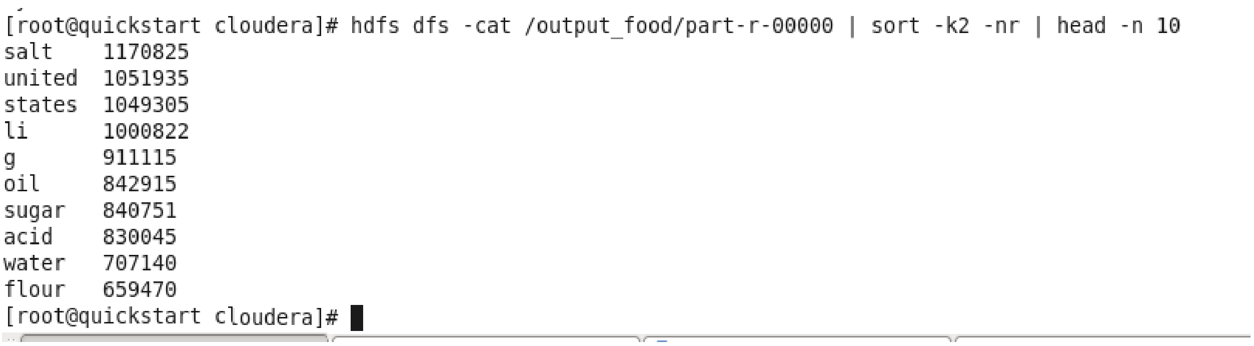


```
yellor  2
yellos  3
yellow  195768
yellowbird      18
yellowcalcium   2
yellowcontains  1
yellowcorn      6
yellowe 3
yelloweye       4
yellowfdc       3
yellowfin       299
yellowkurkuma   4
yellowlake      3
yellowpolenta   3
yellowpurple    3
yellowred       1
yellowredblue   4
yellows 700
yellowstone     8
yellowsunset    2
yellowtail      8
yellowtartrazine        1
yellowturmeric  3
yellw   3
yelow   20
yem     2
yen     29
yeng    6
yeo     27
yeoolw  4
yeos    19
yep     1
yerba   640
yerbae  45
yerbe   2
yerbucha        4
yerek   2
yergat  9
yes     103
yesat   4
yesgagao        2
yessoensis      3
yest    45
yet     295
yeti    15
yezoensis       6
yfast   1
yhs     27
yi      5
```


cloudera-quickstart-vm-5.13.0-0-virtualbox [Running] - Oracle VirtualBox
File Machine View Input Devices Help
Applications Places System
clou
File Edit View Search Terminal Help
cloudera@quickstart:/...
Java - WordCount/src/...
windows
onfile.txt (windows) - ...

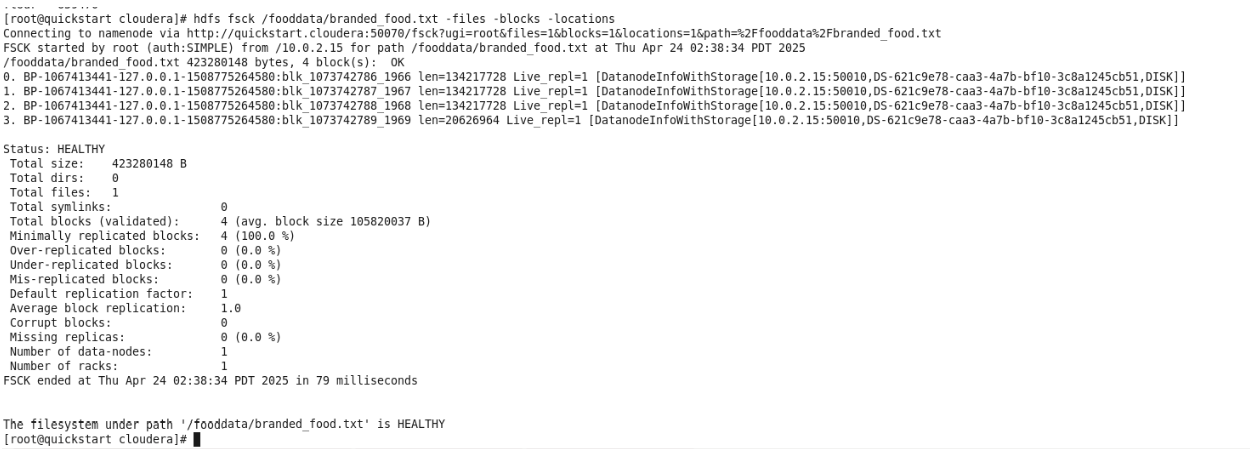
```
yogini  2
yogjrt  3
yogo    11
yogourmet       1
yogourti        12
yogovera        2
yogu    2
yoguri  7
yogurico        5
yogurll 3
yogurt  71001
yogurtchips     2
yogurtcovered   8
yogurtcultured  9
yogurtcultures  3
yogurtflavored  10
yogurtgrade     7
yogurtheat      10
yogurtii        25
yogurtpasteurized       3
yogurtpowder    3
yogurts 3
yogurtskimmed   1
yogurtstrawberry        6
yogurty 21
yogurtyogurt    1048
yogusto 1
yohari  1
yohimbine       4
yokes   1
yokey   2
yokids  3
yokois  1
yolele  4
yolita  16
yolk    11658
yolkacerola     2
yolks   18993
yolkscontains   1
yolksdried      3
yolksm  3
yolksorganic    1
yolkssalt       3
yolkssweetened  3
yolkswater      3
yollow  2
yolo    11
yols    4
yom     1
```

Top 10:



```
[root@quickstart cloudera]# hdfs dfs -cat /output_food/part-r-00000 | sort -k2 -nr | head -n 10
salt    1170825
united  1051935
states  1049305
li      1000822
g       911115
oil     842915
sugar   840751
acid    830045
water   707140
flour   659470
[root@quickstart cloudera]# 
```

Block Info for branded_food.txt:



```
[root@quickstart cloudera]# hdfs fsck /fooddata/branded_food.txt -files -blocks -locations
Connecting to namenode via http://quickstart.cloudera:50070/fsck?ugi=root&files=1&blocks=1&locations=1&path=%2Ffooddata%2Fbranded_food.txt
FSCK started by root (auth:SIMPLE) from /10.0.2.15 for path /fooddata/branded_food.txt at Thu Apr 24 02:38:34 PDT 2025
/fooddata/branded_food.txt 423280148 bytes, 4 block(s):  OK
0. BP-1067413441-127.0.0.1-1508775264580:blk_1073742786_1966 len=134217728 Live_repl=1 [DatanodeInfoWithStorage[10.0.2.15:50010,DS-621c9e78-caa3-4a7b-bf10-3c8a1245cb51,DISK]]
1. BP-1067413441-127.0.0.1-1508775264580:blk_1073742787_1967 len=134217728 Live_repl=1 [DatanodeInfoWithStorage[10.0.2.15:50010,DS-621c9e78-caa3-4a7b-bf10-3c8a1245cb51,DISK]]
2. BP-1067413441-127.0.0.1-1508775264580:blk_1073742788_1968 len=134217728 Live_repl=1 [DatanodeInfoWithStorage[10.0.2.15:50010,DS-621c9e78-caa3-4a7b-bf10-3c8a1245cb51,DISK]]
3. BP-1067413441-127.0.0.1-1508775264580:blk_1073742789_1969 len=20626964 Live_repl=1 [DatanodeInfoWithStorage[10.0.2.15:50010,DS-621c9e78-caa3-4a7b-bf10-3c8a1245cb51,DISK]]

Status: HEALTHY
 Total size:    423280148 B
 Total dirs:    0
 Total files:   1
 Total symlinks:                0
 Total blocks (validated):      4 (avg. block size 105820037 B)
 Minimally replicated blocks:   4 (100.0 %)
 Over-replicated blocks:        0 (0.0 %)
 Under-replicated blocks:       0 (0.0 %)
 Mis-replicated blocks:         0 (0.0 %)
 Default replication factor:    1
 Average block replication:     1.0
 Corrupt blocks:                0
 Missing replicas:              0 (0.0 %)
 Number of data-nodes:          1
 Number of racks:               1
FSCK ended at Thu Apr 24 02:38:34 PDT 2025 in 79 milliseconds


The filesystem under path '/fooddata/branded_food.txt' is HEALTHY
[root@quickstart cloudera]# 
```