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Introduction

This assignment teaches us some practical problem which include the concept of MapReduce, Hive queries and Apache solr.

Objective

To learn and implement the problems provided in the assignment which improves our logical thinking and get familiar with the Big Data Programming Concepts.

Features

We have used the following features:

1. Eclipse

2. cloudera Terminal

3. Apache solr

Datasets used

1. Zomato Dataset
2. SuperHero Dataset

Questions

1. Hadoop MapReduce Algorithm

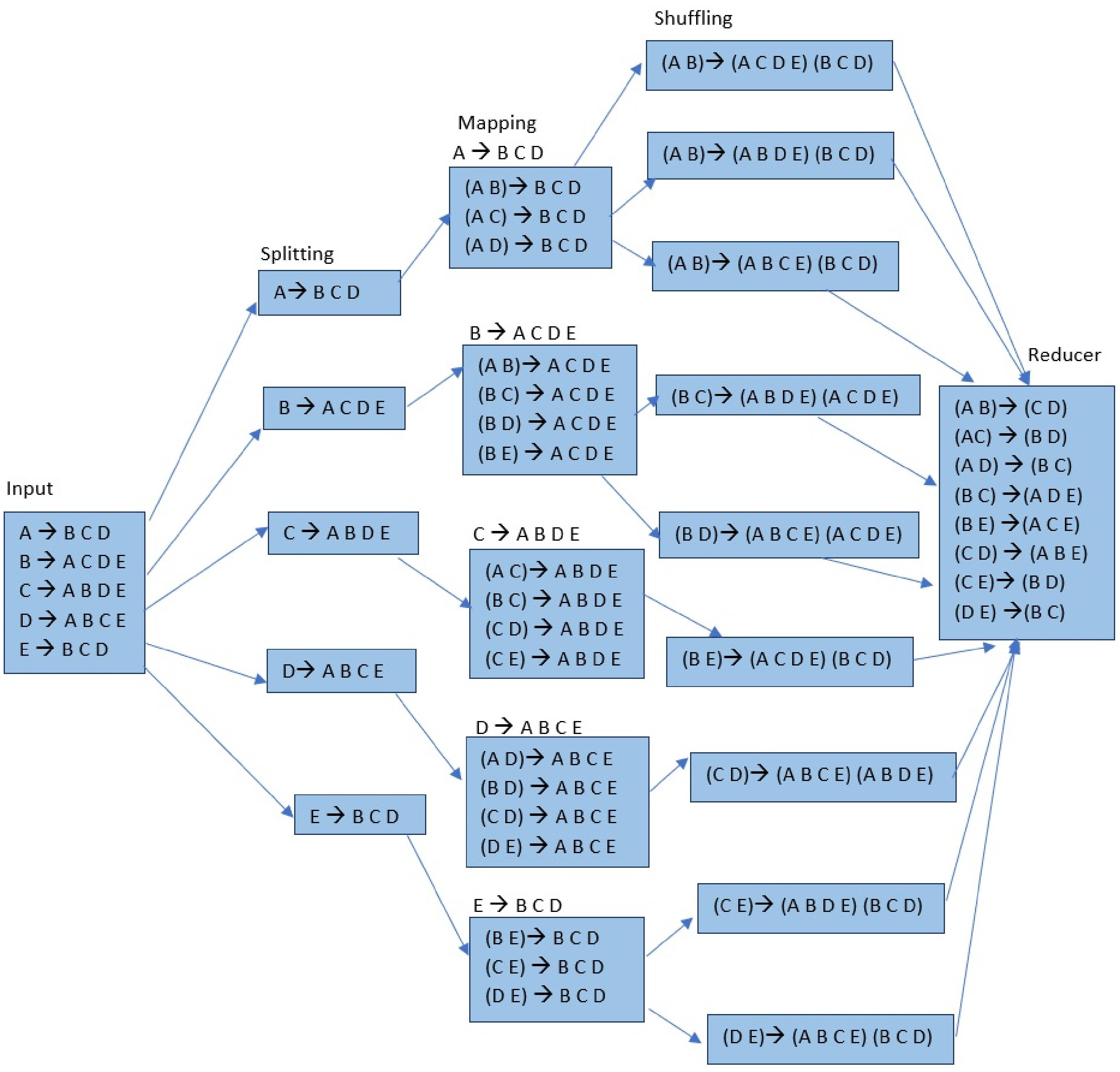
Implement MapReduce algorithm for finding Facebook common friends problem and run the MapReduce job on Apache Hadoop. Show your implementation through map-reduce diagram as shown in Lesson Plan 2:

https://umkc.box.com/s/jhpgd8yeerlkurqwjtgp5ej5izpt47lk

Write a report including your algorithm and result screenshots.

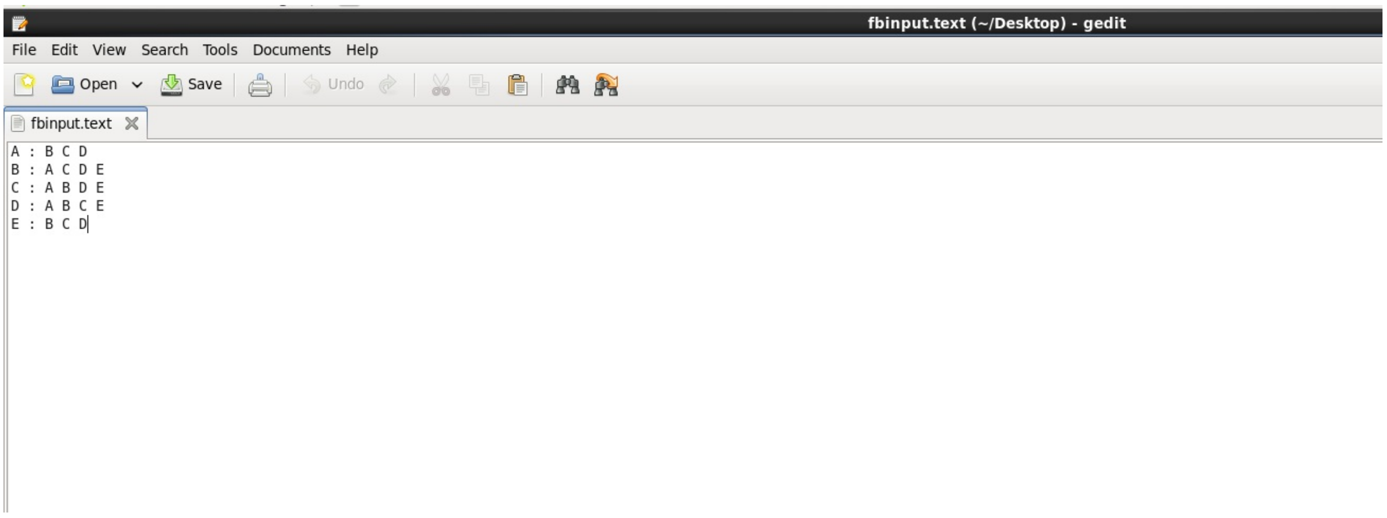
Solution-1

Workflow diagram



Shuffling
Mapping
Splitting
Input
Reducer
A → B C D
B → A C D E
C → A B D E
D → A B C E
E → B C D
A → B C D
(A B)→ B C D
(A C) → B C D
(A D) → B C D
B → A C D E
(A B)→ A C D E
(B C) → A C D E
(B D) → A C D E
(B E) → A C D E
C → A B D E
(A C)→ A B D E
(B C) → A B D E
(C D) → A B D E
(C E) → A B D E
D → A B C E
(A D)→ A B C E
(B D) → A B C E
(C D) → A B C E
(D E) → A B C E
E → B C D
(B E)→ B C D
(C E) → B C D
(D E) → B C D
(A B)→ (A C D E) (B C D)
(A B)→ (A B D E) (B C D)
(A B)→ (A B C E) (B C D)
(B C)→ (A B D E) (A C D E)
(B D)→ (A B C E) (A C D E)
(B E)→ (A C D E) (B C D)
(C D)→ (A B C E) (A B D E)
(C E)→ (A B D E) (B C D)
(D E)→ (A B C E) (B C D)
(A B)→ (C D)
(AC) → (B D)
(A D) → (B C)
(B C) →(A D E)
(B E) →(A C E)
(C D) → (A B E)
(C E)→ (B D)
(D E) →(B C)

Input

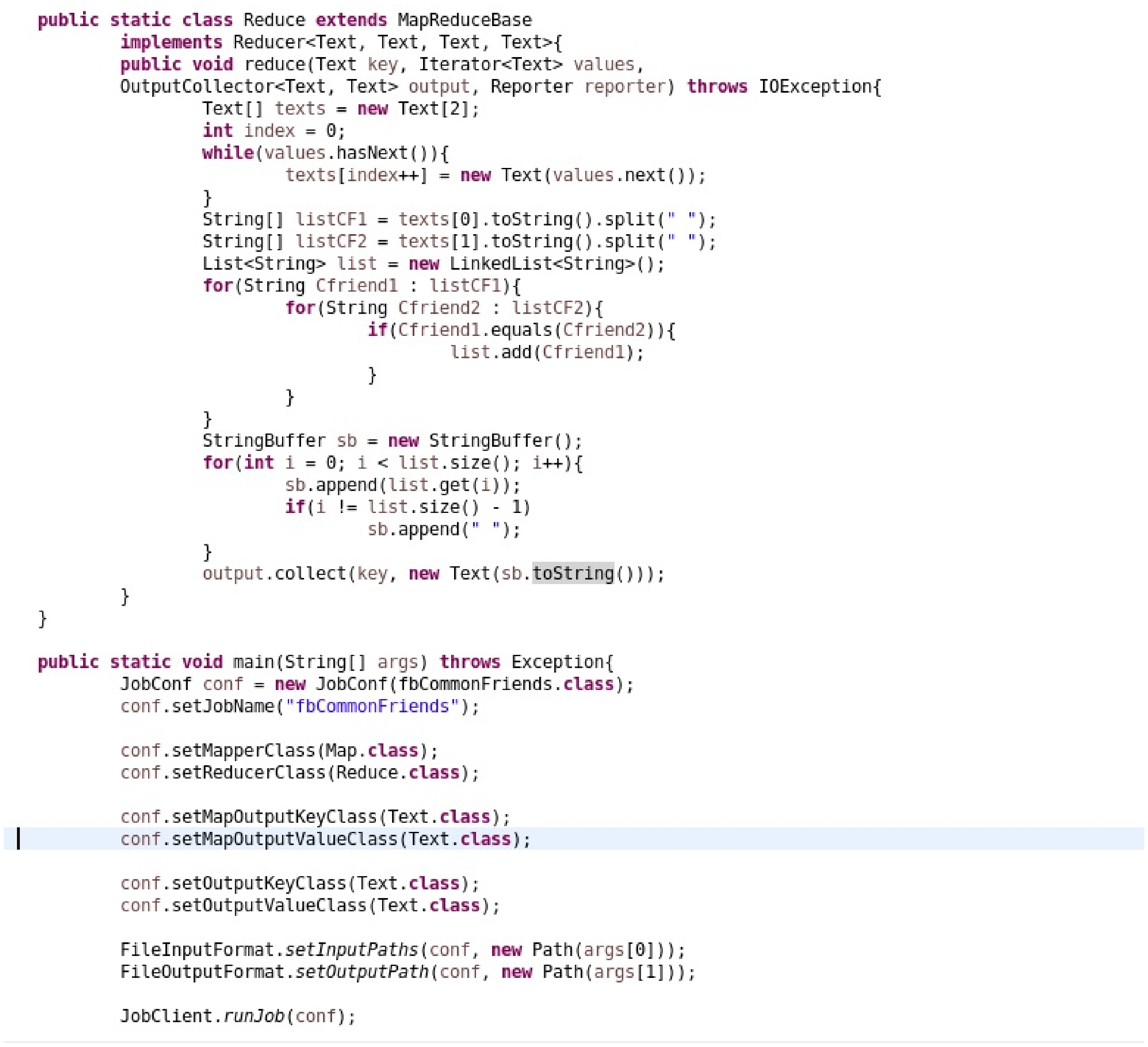

fbinput.text (~/Desktop) - gedit
File Edit View Search Tools Documents Help
Open Save Undo
fbinput.text

```
A : B C D
B : A C D E
C : A B D E
D : A B C E
E : B C D
```

Map Algorithm

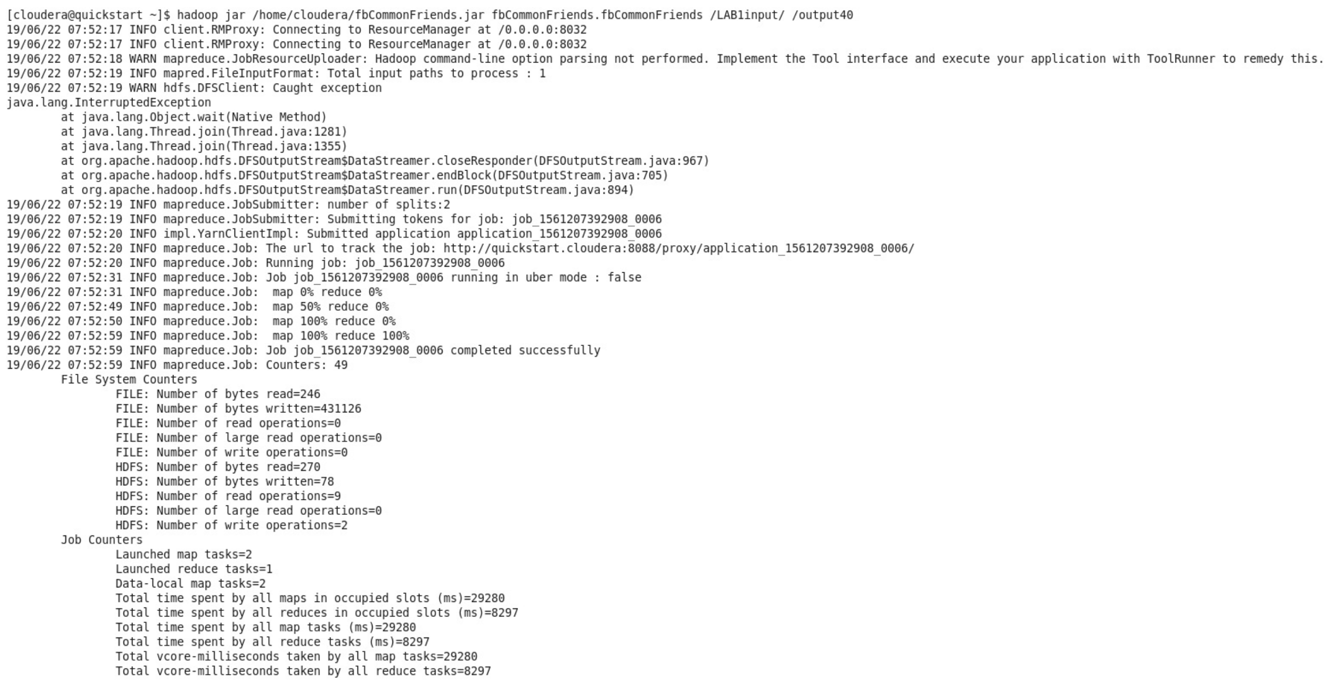
```
public static class Map extends MapReduceBase
        implements Mapper<LongWritable, Text, Text, Text>{
        public void map(LongWritable key, Text value, OutputCollector<Text, Text> output, Reporter reporter)
                throws IOException{
                StringTokenizer tokenizer = new StringTokenizer(value.toString(), "\n");
                String line = null;
                String[] splitArray = null;
                String[] CfriendArray = null;
                String[] tempArray = null;
                while(tokenizer.hasMoreTokens()){
                        line = tokenizer.nextToken();
                        splitArray = line.split(" : ");
                        CfriendArray = splitArray[1].split(" ");
                        tempArray = new String[2];
                        for(int i = 0; i < CfriendArray.length; i++){
                                tempArray[0] = CfriendArray[i];
                                tempArray[1] = splitArray[0];
                                Arrays.sort(tempArray);
                                output.collect(new Text(tempArray[0] + " " + tempArray[1]), new Text(splitArray[1]));
                        }
                }
        }
}
```

Reduce Algorithm



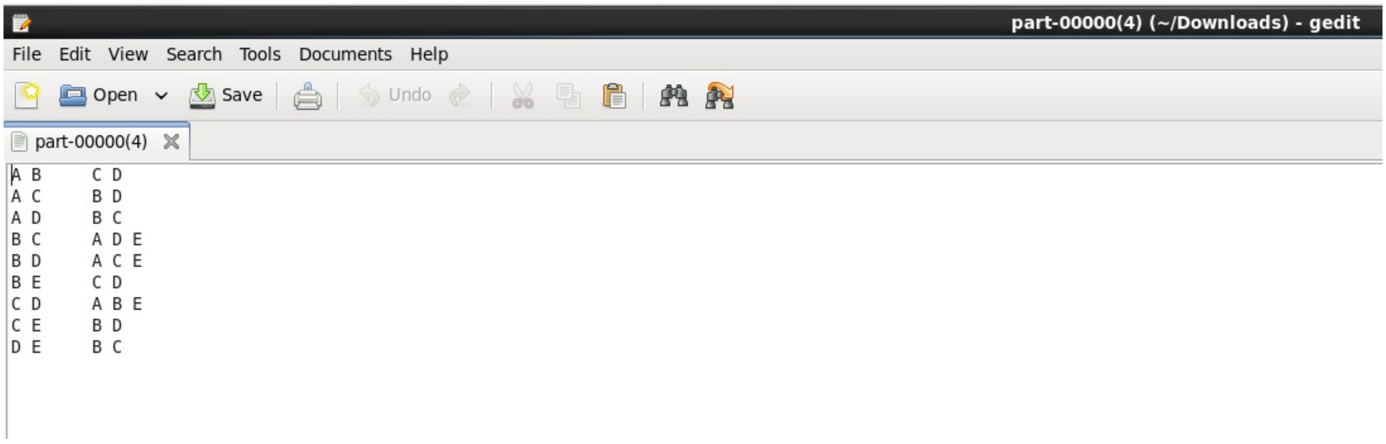
```
public static class Reduce extends MapReduceBase
        implements Reducer<Text, Text, Text, Text>{
        public void reduce(Text key, Iterator<Text> values,
        OutputCollector<Text, Text> output, Reporter reporter) throws IOException{
                Text[] texts = new Text[2];
                int index = 0;
                while(values.hasNext()){
                        texts[index++] = new Text(values.next());
                }
                String[] listCF1 = texts[0].toString().split(" ");
                String[] listCF2 = texts[1].toString().split(" ");
                List<String> list = new LinkedList<String>();
                for(String Cfriend1 : listCF1){
                        for(String Cfriend2 : listCF2){
                                if(Cfriend1.equals(Cfriend2)){
                                        list.add(Cfriend1);
                                }
                        }
                }
                StringBuffer sb = new StringBuffer();
                for(int i = 0; i < list.size(); i++){
                        sb.append(list.get(i));
                        if(i != list.size() - 1)
                                sb.append(" ");
                }
                output.collect(key, new Text(sb.toString()));
        }
}

public static void main(String[] args) throws Exception{
        JobConf conf = new JobConf(fbCommonFriends.class);
        conf.setJobName("fbCommonFriends");

        conf.setMapperClass(Map.class);
        conf.setReducerClass(Reduce.class);

        conf.setMapOutputKeyClass(Text.class);
        conf.setMapOutputValueClass(Text.class);

        conf.setOutputKeyClass(Text.class);
        conf.setOutputValueClass(Text.class);

        FileInputFormat.setInputPaths(conf, new Path(args[0]));
        FileOutputFormat.setOutputPath(conf, new Path(args[1]));

        JobClient.runJob(conf);
```

Running the Program



```
[cloudera@quickstart ~]$ hadoop jar /home/cloudera/fbCommonFriends.jar fbCommonFriends.fbCommonFriends /LAB1input/ /output40
19/06/22 07:52:17 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0:8032
19/06/22 07:52:17 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0:8032
19/06/22 07:52:18 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
19/06/22 07:52:19 INFO mapred.FileInputFormat: Total input paths to process : 1
19/06/22 07:52:19 WARN hdfs.DFSClient: Caught exception
java.lang.InterruptedException
        at java.lang.Object.wait(Native Method)
        at java.lang.Thread.join(Thread.java:1281)
        at java.lang.Thread.join(Thread.java:1355)
        at org.apache.hadoop.hdfs.DFSOutputStream$DataStreamer.closeResponder(DFSOutputStream.java:967)
        at org.apache.hadoop.hdfs.DFSOutputStream$DataStreamer.endBlock(DFSOutputStream.java:705)
        at org.apache.hadoop.hdfs.DFSOutputStream$DataStreamer.run(DFSOutputStream.java:894)
19/06/22 07:52:19 INFO mapreduce.JobSubmitter: number of splits:2
19/06/22 07:52:19 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1561207392908_0006
19/06/22 07:52:20 INFO impl.YarnClientImpl: Submitted application application_1561207392908_0006
19/06/22 07:52:20 INFO mapreduce.Job: The url to track the job: http://quickstart.cloudera:8088/proxy/application_1561207392908_0006/
19/06/22 07:52:20 INFO mapreduce.Job: Running job: job_1561207392908_0006
19/06/22 07:52:31 INFO mapreduce.Job: Job job_1561207392908_0006 running in uber mode : false
19/06/22 07:52:31 INFO mapreduce.Job:  map 0% reduce 0%
19/06/22 07:52:49 INFO mapreduce.Job:  map 50% reduce 0%
19/06/22 07:52:50 INFO mapreduce.Job:  map 100% reduce 0%
19/06/22 07:52:59 INFO mapreduce.Job:  map 100% reduce 100%
19/06/22 07:52:59 INFO mapreduce.Job: Job job_1561207392908_0006 completed successfully
19/06/22 07:52:59 INFO mapreduce.Job: Counters: 49
        File System Counters
                FILE: Number of bytes read=246
                FILE: Number of bytes written=431126
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=270
                HDFS: Number of bytes written=78
                HDFS: Number of read operations=9
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=2
        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)=29280
                Total time spent by all reduces in occupied slots (ms)=8297
                Total time spent by all map tasks (ms)=29280
                Total time spent by all reduce tasks (ms)=8297
                Total vcore-milliseconds taken by all map tasks=29280
                Total vcore-milliseconds taken by all reduce tasks=8297
```

Output

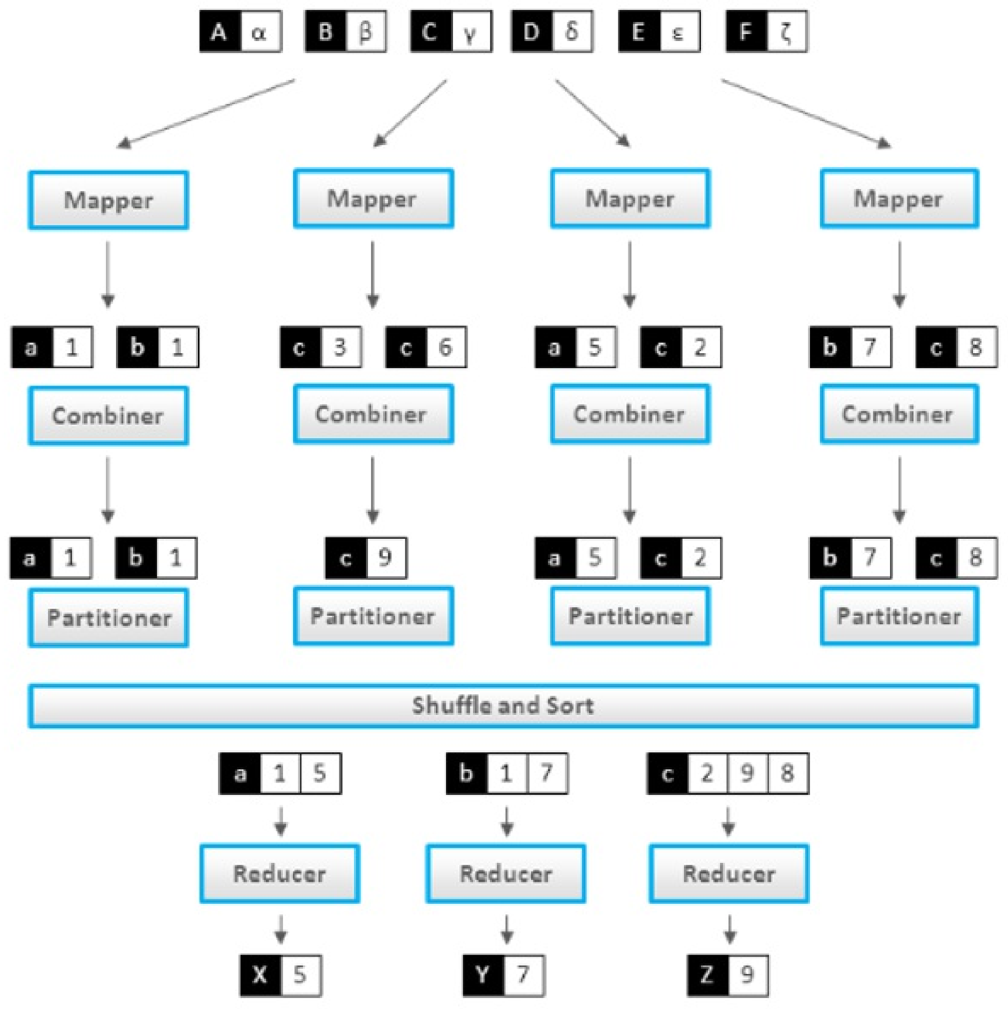

part-00000(4) (~/Downloads) - gedit
File Edit View Search Tools Documents Help
Open
Save
Undo
part-00000(4)

```
A B     C D
A C     B D
A D     B C
B C     A D E
B D     A C E
B E     C D
C D     A B E
C E     B D
D E     B C
```

2.Use Case: Counting and Summing

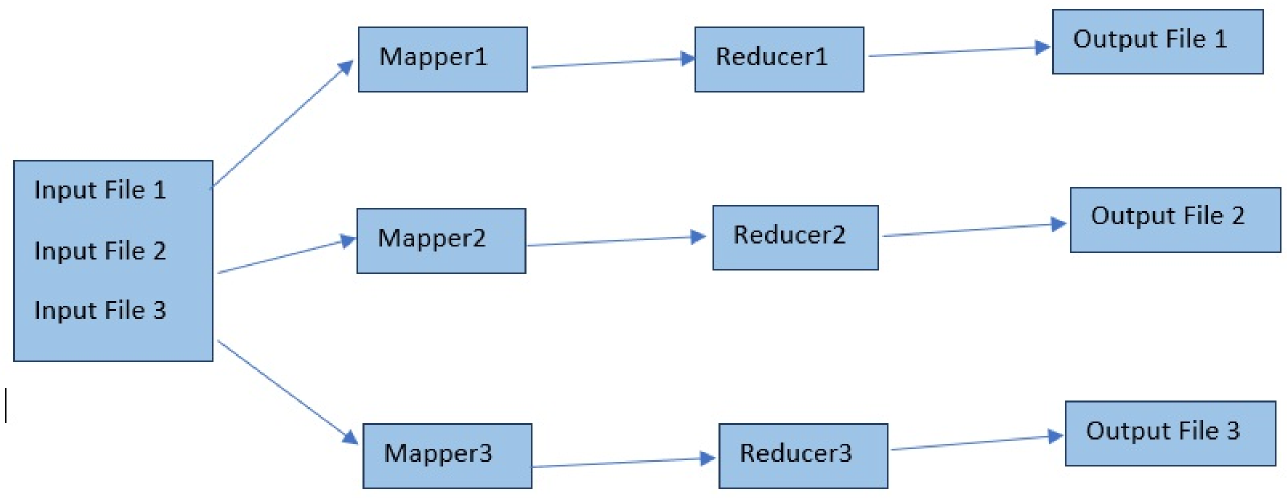
There is a number of documents where each document is a set of terms. It is required to calculate a total number of occurrences of each term in all documents. Alternatively, it can be an arbitrary function of the terms. For instance, there is a log file where each record contains a response time and it is required to calculate an average response time.

For reference, use the image above and show your implementation through map-reduce diagram as shown in Lesson Plan 2: https://umkc.box.com/s/jhpgd8yeerlkurqwjtgp5ej5izpt47lk

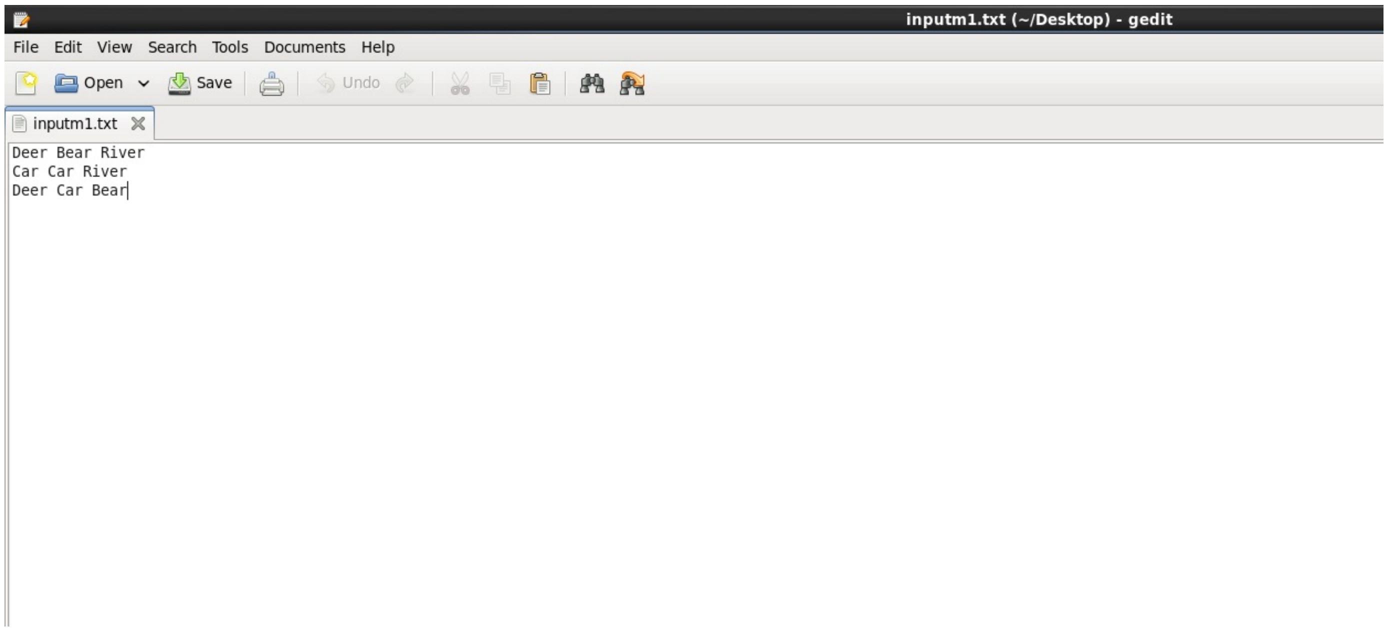


Solution-2

Workflow Diagram

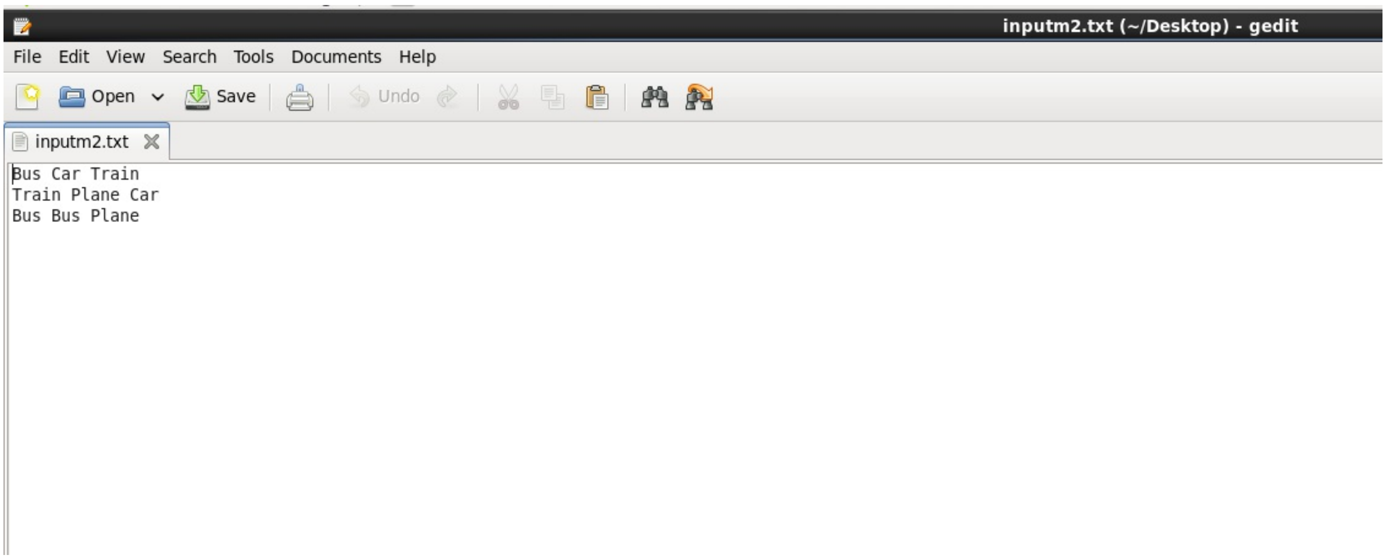


Input File-1


inputm1.txt (~/Desktop) - gedit
File Edit View Search Tools Documents Help
Open Save Undo
inputm1.txt

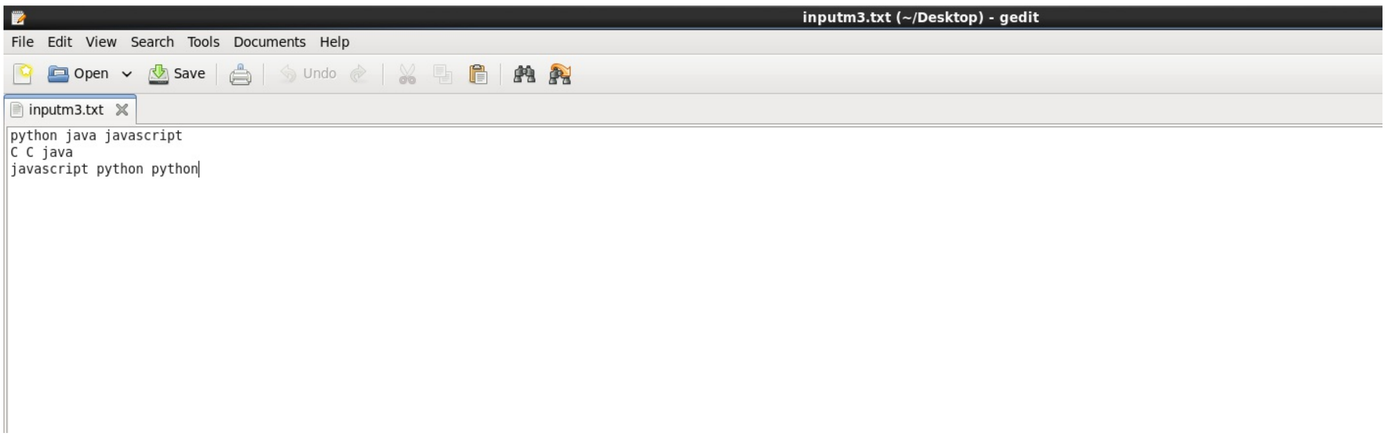
```
Deer Bear River
Car Car River
Deer Car Bear
```

Input File-2


inputm2.txt (~/Desktop) - gedit
File Edit View Search Tools Documents Help
Open Save Undo
inputm2.txt

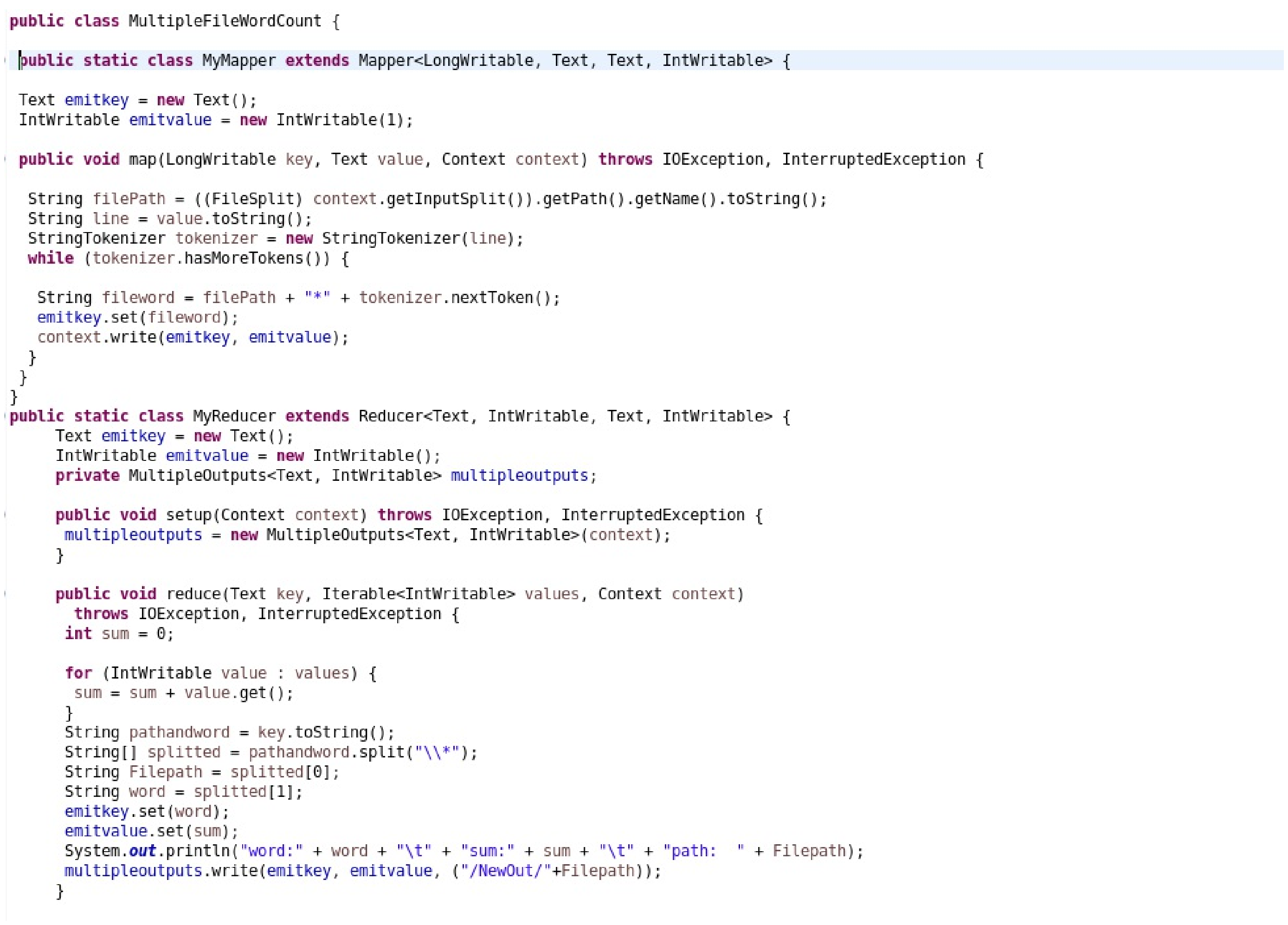
```
Bus Car Train
Train Plane Car
Bus Bus Plane
```

Input File -3


inputm3.txt (~/Desktop) - gedit
File Edit View Search Tools Documents Help
Open Save Undo
inputm3.txt

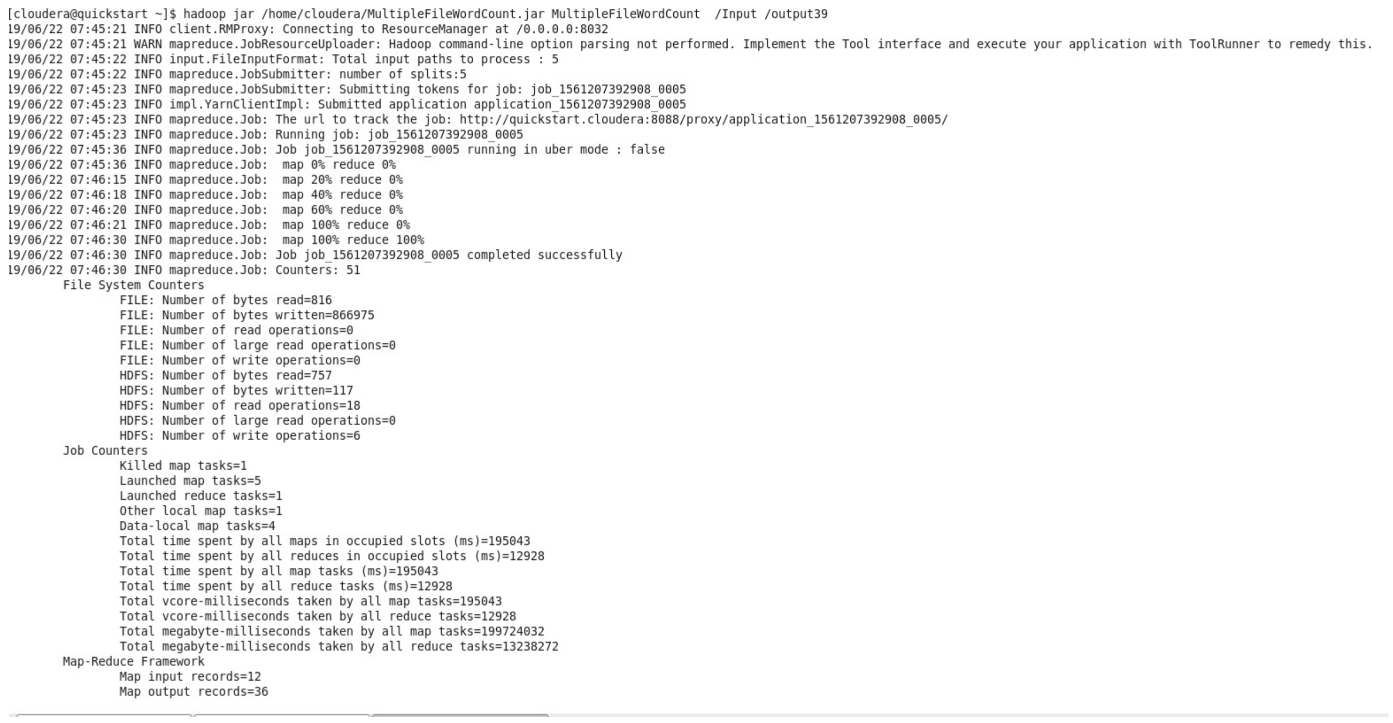
```
python java javascript
C C java
javascript python python
```

Mapper and Reducer Algorithm



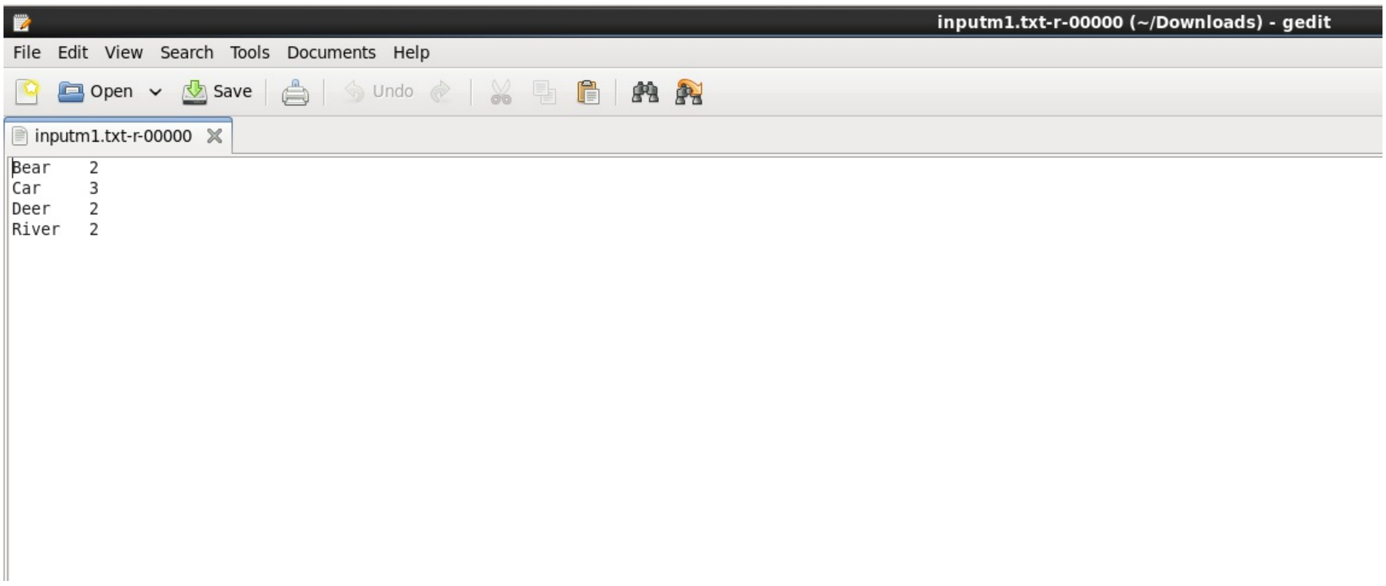
```java
public class MultipleFileWordCount {

 public static class MyMapper extends Mapper<LongWritable, Text, Text, IntWritable> {

 Text emitkey = new Text();
 IntWritable emitvalue = new IntWritable(1);

 public void map(LongWritable key, Text value, Context context) throws IOException, InterruptedException {

  String filePath = ((FileSplit) context.getInputSplit()).getPath().getName().toString();
  String line = value.toString();
  StringTokenizer tokenizer = new StringTokenizer(line);
  while (tokenizer.hasMoreTokens()) {

   String fileword = filePath + "*" + tokenizer.nextToken();
   emitkey.set(fileword);
   context.write(emitkey, emitvalue);
  }
 }
}
public static class MyReducer extends Reducer<Text, IntWritable, Text, IntWritable> {
     Text emitkey = new Text();
     IntWritable emitvalue = new IntWritable();
     private MultipleOutputs<Text, IntWritable> multipleoutputs;

     public void setup(Context context) throws IOException, InterruptedException {
      multipleoutputs = new MultipleOutputs<Text, IntWritable>(context);
     }

     public void reduce(Text key, Iterable<IntWritable> values, Context context)
       throws IOException, InterruptedException {
      int sum = 0;

      for (IntWritable value : values) {
       sum = sum + value.get();
      }
      String pathandword = key.toString();
      String[] splitted = pathandword.split("\\*");
      String Filepath = splitted[0];
      String word = splitted[1];
      emitkey.set(word);
      emitvalue.set(sum);
      System.out.println("word:" + word + "\t" + "sum:" + sum + "\t" + "path:  " + Filepath);
      multipleoutputs.write(emitkey, emitvalue, ("/NewOut/"+Filepath));
     }
```

Running the Program

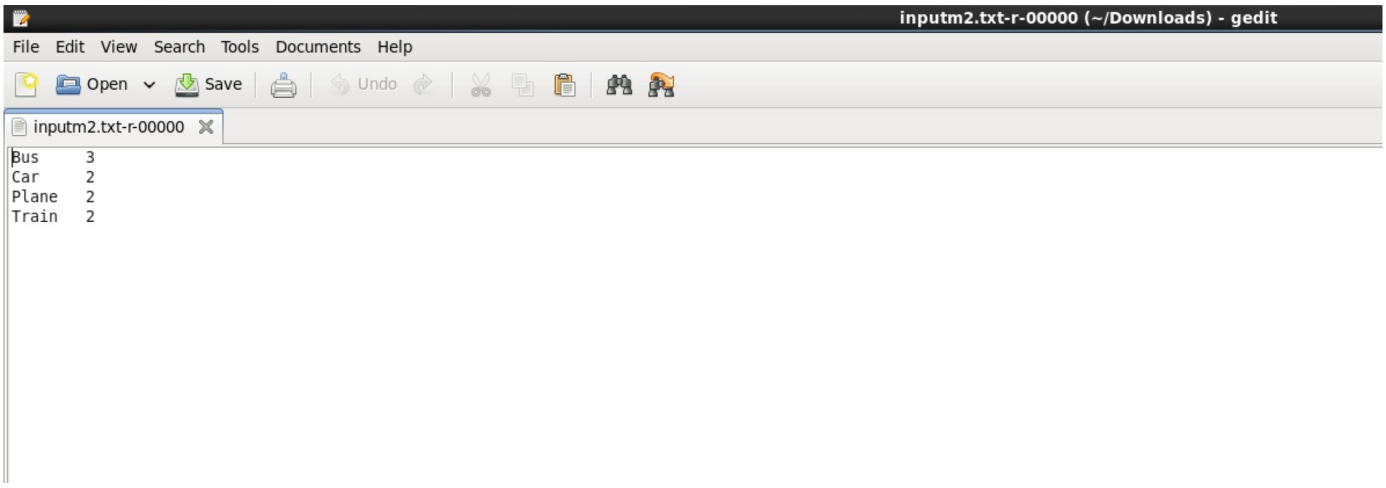


```
[cloudera@quickstart ~]$ hadoop jar /home/cloudera/MultipleFileWordCount.jar MultipleFileWordCount  /Input /output39
19/06/22 07:45:21 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0:8032
19/06/22 07:45:21 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
19/06/22 07:45:22 INFO input.FileInputFormat: Total input paths to process : 5
19/06/22 07:45:22 INFO mapreduce.JobSubmitter: number of splits:5
19/06/22 07:45:23 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1561207392908_0005
19/06/22 07:45:23 INFO impl.YarnClientImpl: Submitted application application_1561207392908_0005
19/06/22 07:45:23 INFO mapreduce.Job: The url to track the job: http://quickstart.cloudera:8088/proxy/application_1561207392908_0005/
19/06/22 07:45:23 INFO mapreduce.Job: Running job: job_1561207392908_0005
19/06/22 07:45:36 INFO mapreduce.Job: Job job_1561207392908_0005 running in uber mode : false
19/06/22 07:45:36 INFO mapreduce.Job:  map 0% reduce 0%
19/06/22 07:46:15 INFO mapreduce.Job:  map 20% reduce 0%
19/06/22 07:46:18 INFO mapreduce.Job:  map 40% reduce 0%
19/06/22 07:46:20 INFO mapreduce.Job:  map 60% reduce 0%
19/06/22 07:46:21 INFO mapreduce.Job:  map 100% reduce 0%
19/06/22 07:46:30 INFO mapreduce.Job:  map 100% reduce 100%
19/06/22 07:46:30 INFO mapreduce.Job: Job job_1561207392908_0005 completed successfully
19/06/22 07:46:30 INFO mapreduce.Job: Counters: 51
        File System Counters
                FILE: Number of bytes read=816
                FILE: Number of bytes written=866975
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=757
                HDFS: Number of bytes written=117
                HDFS: Number of read operations=18
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=6
        Job Counters
                Killed map tasks=1
                Launched map tasks=5
                Launched reduce tasks=1
                Other local map tasks=1
                Data-local map tasks=4
                Total time spent by all maps in occupied slots (ms)=195043
                Total time spent by all reduces in occupied slots (ms)=12928
                Total time spent by all map tasks (ms)=195043
                Total time spent by all reduce tasks (ms)=12928
                Total vcore-milliseconds taken by all map tasks=195043
                Total vcore-milliseconds taken by all reduce tasks=12928
                Total megabyte-milliseconds taken by all map tasks=199724032
                Total megabyte-milliseconds taken by all reduce tasks=13238272
        Map-Reduce Framework
                Map input records=12
                Map output records=36
```

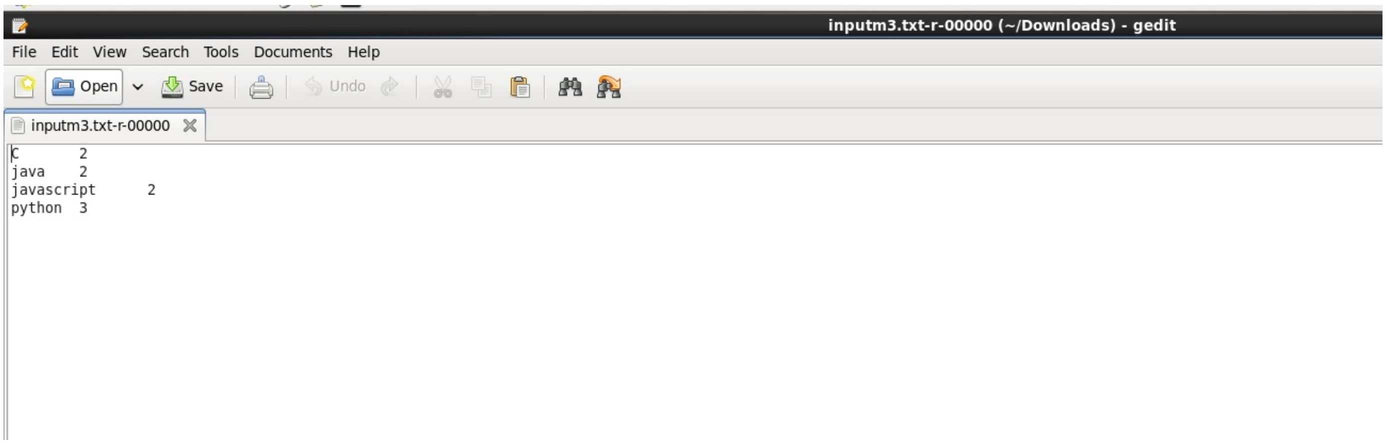
Ouptut Files


inputm1.txt-r-00000 (~/Downloads) - gedit
File Edit View Search Tools Documents Help
Open Save Undo
inputm1.txt-r-00000

```
Bear	2
Car	3
Deer	2
River	2
```


inputm2.txt-r-00000 (~/Downloads) - gedit
File Edit View Search Tools Documents Help
Open Save Undo
inputm2.txt-r-00000

```
Bus	3
Car	2
Plane	2
Train	2
```


inputm3.txt-r-00000 (~/Downloads) - gedit
File Edit View Search Tools Documents Help
Open Save Undo
inputm3.txt-r-00000

```
C	2
java	2
javascript	2
python	3
```

Hive Queries

Q3 Consider one of the following use cases,

A. Zomato Restaurants Data

https://www.kaggle.com/shrutimehta/zomato-restaurants-data

B. Super Heros Dataset

https://www.kaggle.com/claudiodavi/superhero-set/data

C. Google Job Skills Dataset

https://www.kaggle.com/niyamatalmass/google-job-skills/data

D. Seinfeld Chronicles Dataset

https://www.kaggle.com/thec03u5/seinfeld-chronicles/data

** HIVE USECASE**

a. Create a Hive Table including Complex Data Types

b. Use built-in functions in your queries

c. Perform 10 intuitive questions in Dataset (e.g.: pattern recognition, topic discussion, most important terms, etc.). Use your innovation to think out of box

Solution-3

We have used a zomato restaurant data

Query -1 Display 6 recorde for online booking with resturant id and address

<img width=“802” alt=“Query 1 - Display 6 records for has online booking with restaurant id and address” src="https://user-images.githubusercontent.com/47010164/59978425-b0344680-95a1-11e9-8ef6-0195f669ead0.PNG">

Query-2 Display country code 14 resturant id and name sort it by ascending order

<img width=“504” alt=“Query 2 - for country code 14 display restaurant id and name n order by restaurant id” src="https://user-images.githubusercontent.com/47010164/59978426-b1657380-95a1-11e9-93a9-02de4f0ead20.PNG">

Query-3 Display Country code for value Davenport

<img width=“393” alt=“Query 3-For Davenport show country code” src="https://user-images.githubusercontent.com/47010164/59978429-b4606400-95a1-11e9-90c6-fb4004d7a887.PNG">

Query-4 To display the address for city Des moines

<img width=“508” alt=“Query 4- Addresses for city Des moines” src="https://user-images.githubusercontent.com/47010164/59978432-b75b5480-95a1-11e9-9680-5f9166addd3c.PNG">

Query -5 Display table information for country code 14

<img width=“957” alt=“Query 5 updated- Display table info for country code 14” src="https://user-images.githubusercontent.com/47010164/59978433-b9251800-95a1-11e9-9ea1-039fb77f689a.PNG">

Query-6 Display all records for restaurant Shirley Display

<img width=“928” alt=“Query 6 - for restaurant Shirley Display all records” src="https://user-images.githubusercontent.com/47010164/59978436-bb877200-95a1-11e9-90ca-69c2013c1665.PNG">

Query-7 Show 5 records for price range greater than 3.

<img width=“953” alt=“Query 7 - Show 5 records for price range greater than 3” src="https://user-images.githubusercontent.com/47010164/59978437-bde9cc00-95a1-11e9-80ad-f307be781c12.PNG">

Query-8 New table

<img width=“612” alt=“Query 8 1 - New table” src="https://user-images.githubusercontent.com/47010164/59978438-bfb38f80-95a1-11e9-9775-d8d2b81d7f95.PNG">

Query-8.1 Join operation

<img width=“960” alt=“Query 8 2 - Join Operation output” src="https://user-images.githubusercontent.com/47010164/60020781-52ae0180-9656-11e9-877d-5456bdeb41fd.PNG">

Query-9 Show restaurant name in city Boise

<img width=“366” alt=“Query 10 - Show restautant names in city Boise” src="https://user-images.githubusercontent.com/47010164/59978445-cb9f5180-95a1-11e9-873e-c8fd9fba49ac.PNG">

Query-10 Display records where

average cost for 2 is more than 25 and limit the output to 2

<img width=“960” alt=“Query 9 - Display records where average cost for 2 is more than 25 and limit the output to 2 records” src="https://user-images.githubusercontent.com/47010164/59978442-c3dfad00-95a1-11e9-8c81-b3e864a1a56d.PNG">

Q4 SOLR USECASE

a. Create a Solr Collection including our own Field Types

b. Perform 10 intuitive questions in Dataset (e.g.: pattern recognition, topic discussion, most important terms,
etc.). Use your innovation to think out of box. Implement at least 5 nested queries among the 10.

c. Record the time execution for the queries.

Write a report including your algorithm and result screenshots.

Solution-4

Configs:

Modify films schema:

1. gedit /tmp/films/conf/schema.xml

2. add these lines:

```
<field name=“Gender” type=“string” indexed=“true” stored=“true” />

<field name=“Eye color” type=“string” indexed=“true” stored=“true” />

<field name=“Race” type=“string” indexed=“true” stored=“true” />

<field name=“Hair color” type=“string” indexed=“true” stored=“true” />

<field name=“Height” type=“double” indexed=“true” stored=“true” />

<field name=“Publisher” type=“string” indexed=“true” stored=“true” />

<field name=“Skin color” type=“string” indexed=“true” stored=“true” />

<field name=“Alignment” type=“string” indexed=“true” stored=“true” />

<field name=“Weight” type=“double” indexed=“true” stored=“true” />
```

3. Delete any fields which duplicate these names

4. Create instancedir:

   solr instancedir --create superheros /tmp/films

5. Create collection:
   solr collection --create superheros

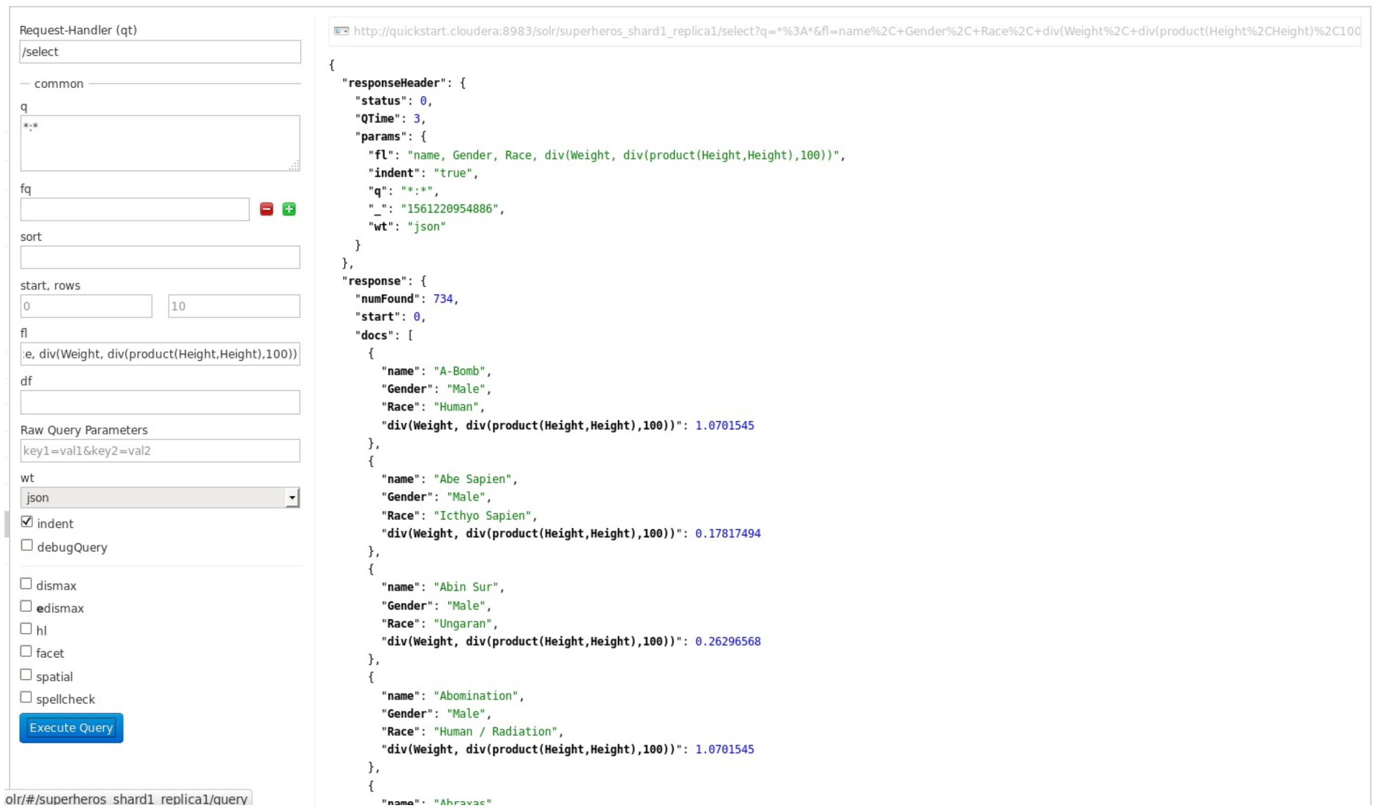
6. Copy/Paste CSV in Solr UI

7. Query away

We have used superhero dataset

Non-nested Queries

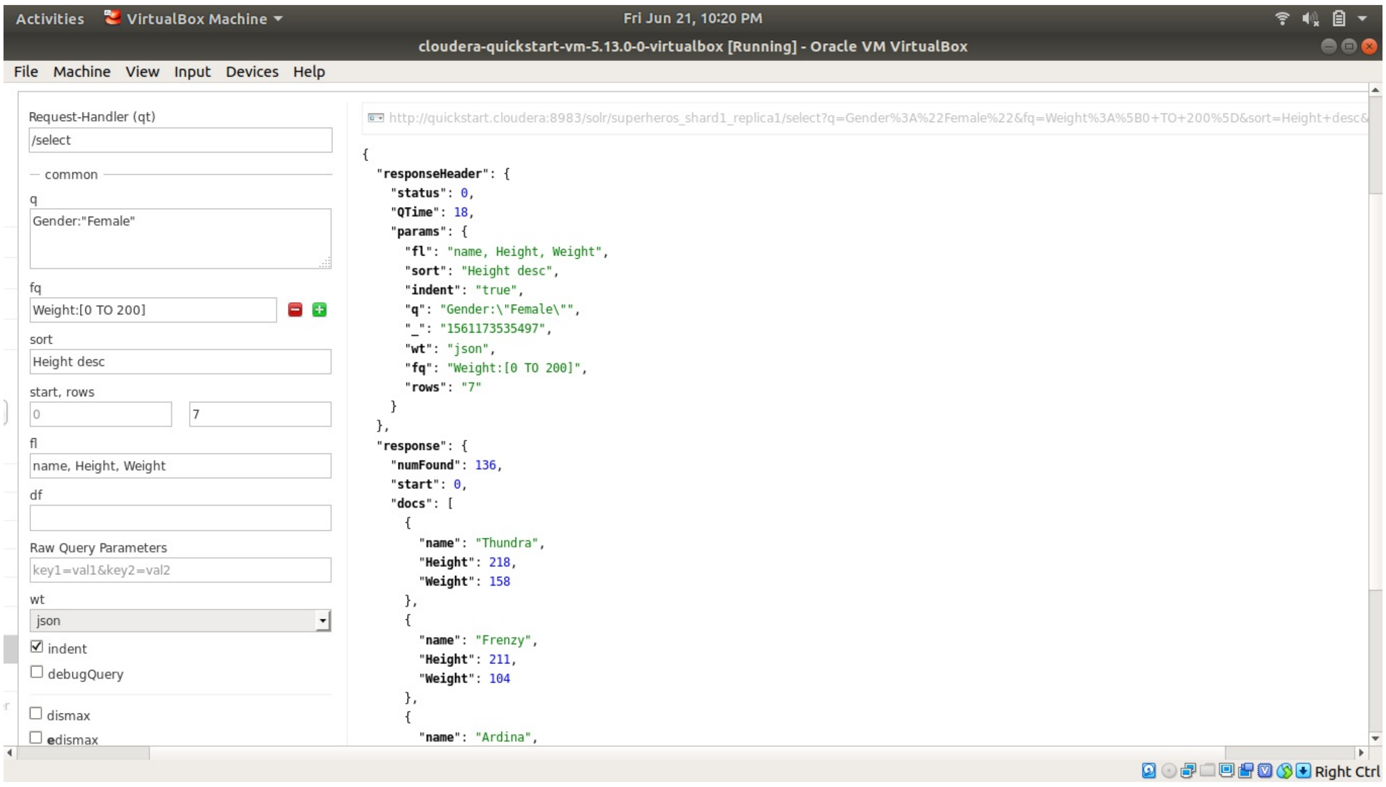
Solr1 - returns name, Gender, Race and BMI (Body Mass Index) for each character. BMI is calculated as weight/height2 for metric. The 4th param of fl computes that function.



```
http://quickstart.cloudera:8983/solr/superheros_shard1_replica1/select?q=*%3A*&fl=name%2C+Gender%2C+Race%2C+div(Weight%2C+div(product(Height%2CHeight)%2C100
```

```
{
  "responseHeader": {
    "status": 0,
    "QTime": 3,
    "params": {
      "fl": "name, Gender, Race, div(Weight, div(product(Height,Height),100))",
      "indent": "true",
      "q": "*:*",
      "_": "1561220954886",
      "wt": "json"
    }
  },
  "response": {
    "numFound": 734,
    "start": 0,
    "docs": [
      {
        "name": "A-Bomb",
        "Gender": "Male",
        "Race": "Human",
        "div(Weight, div(product(Height,Height),100))": 1.0701545
      },
      {
        "name": "Abe Sapien",
        "Gender": "Male",
        "Race": "Icthyo Sapien",
        "div(Weight, div(product(Height,Height),100))": 0.17817494
      },
      {
        "name": "Abin Sur",
        "Gender": "Male",
        "Race": "Ungaran",
        "div(Weight, div(product(Height,Height),100))": 0.26296568
      },
      {
        "name": "Abomination",
        "Gender": "Male",
        "Race": "Human / Radiation",
        "div(Weight, div(product(Height,Height),100))": 1.0701545
      },
      {
        "name": "Abraxas"
```

Solr2 - returns name, Height and Weight for all Female characters filtered by 0<weight<200 (there are some negative heights and weights in the data). Could be thought of as making a Basketball team.


Activities
VirtualBox Machine
Fri Jun 21, 10:20 PM
cloudera-quickstart-vm-5.13.0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Right Ctrl

Request-Handler (qt): /select

common

q: Gender:"Female"

fq: Weight:[0 TO 200]

sort: Height desc

start, rows: 0 7

fl: name, Height, Weight

df:

Raw Query Parameters: key1=val1&key2=val2

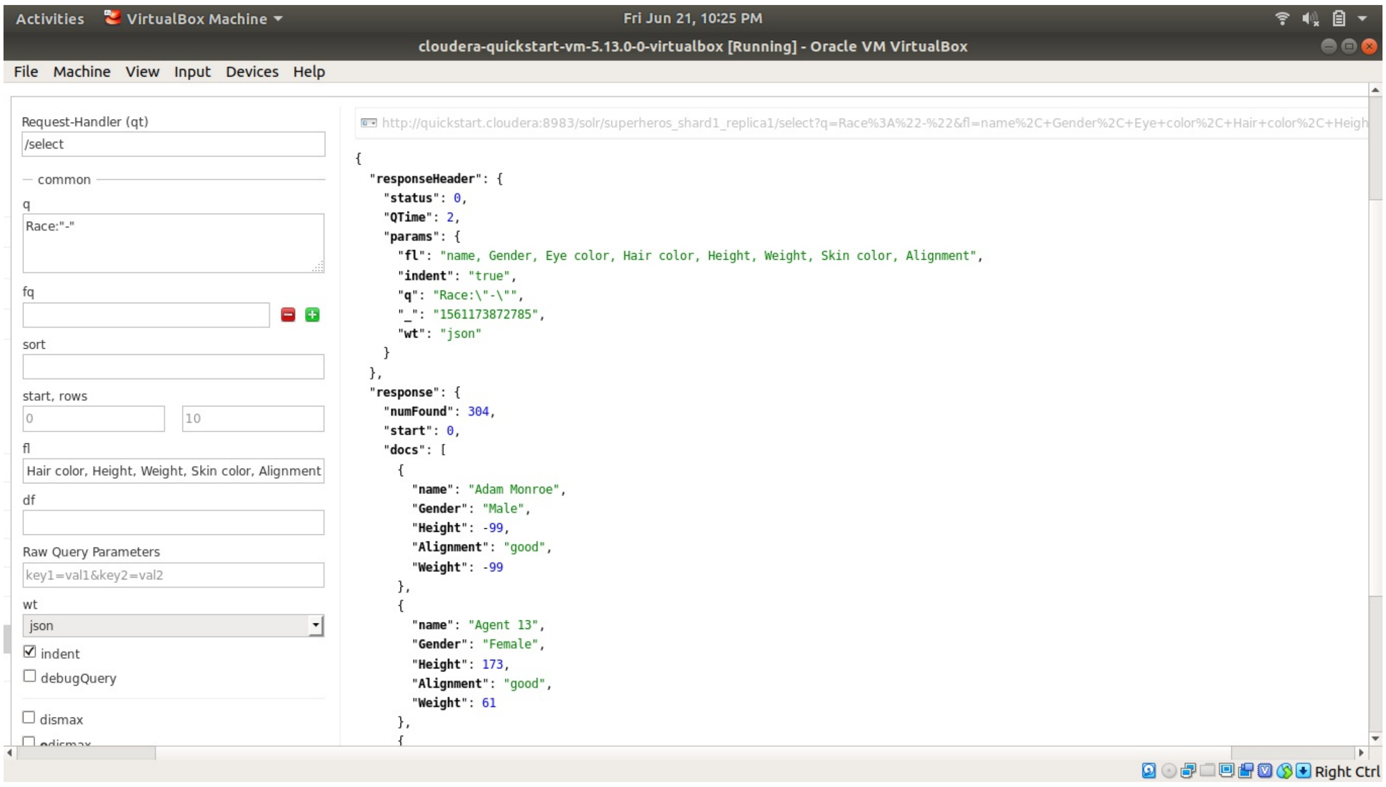
wt: json

☑ indent
☐ debugQuery
☐ dismax
☐ edismax

http://quickstart.cloudera:8983/solr/superheros_shard1_replica1/select?q=Gender%3A%22Female%22&fq=Weight%3A%5B0+TO+200%5D&sort=Height+desc&

```
{
  "responseHeader": {
    "status": 0,
    "QTime": 18,
    "params": {
      "fl": "name, Height, Weight",
      "sort": "Height desc",
      "indent": "true",
      "q": "Gender:\"Female\"",
      "_": "1561173535497",
      "wt": "json",
      "fq": "Weight:[0 TO 200]",
      "rows": "7"
    }
  },
  "response": {
    "numFound": 136,
    "start": 0,
    "docs": [
      {
        "name": "Thundra",
        "Height": 218,
        "Weight": 158
      },
      {
        "name": "Frenzy",
        "Height": 211,
        "Weight": 104
      },
      {
        "name": "Ardina",
```

Solr3 - returns name, Gender, Height, Weight and Alignment for all characters of unknown race. A list of species for research.


Activities
VirtualBox Machine
Fri Jun 21, 10:25 PM
cloudera-quickstart-vm-5.13.0-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Right Ctrl

Request-Handler (qt)
/select

common

q
Race:"-"

fq

sort

start, rows
0 10

fl
Hair color, Height, Weight, Skin color, Alignment

df

Raw Query Parameters
key1=val1&key2=val2

wt
json

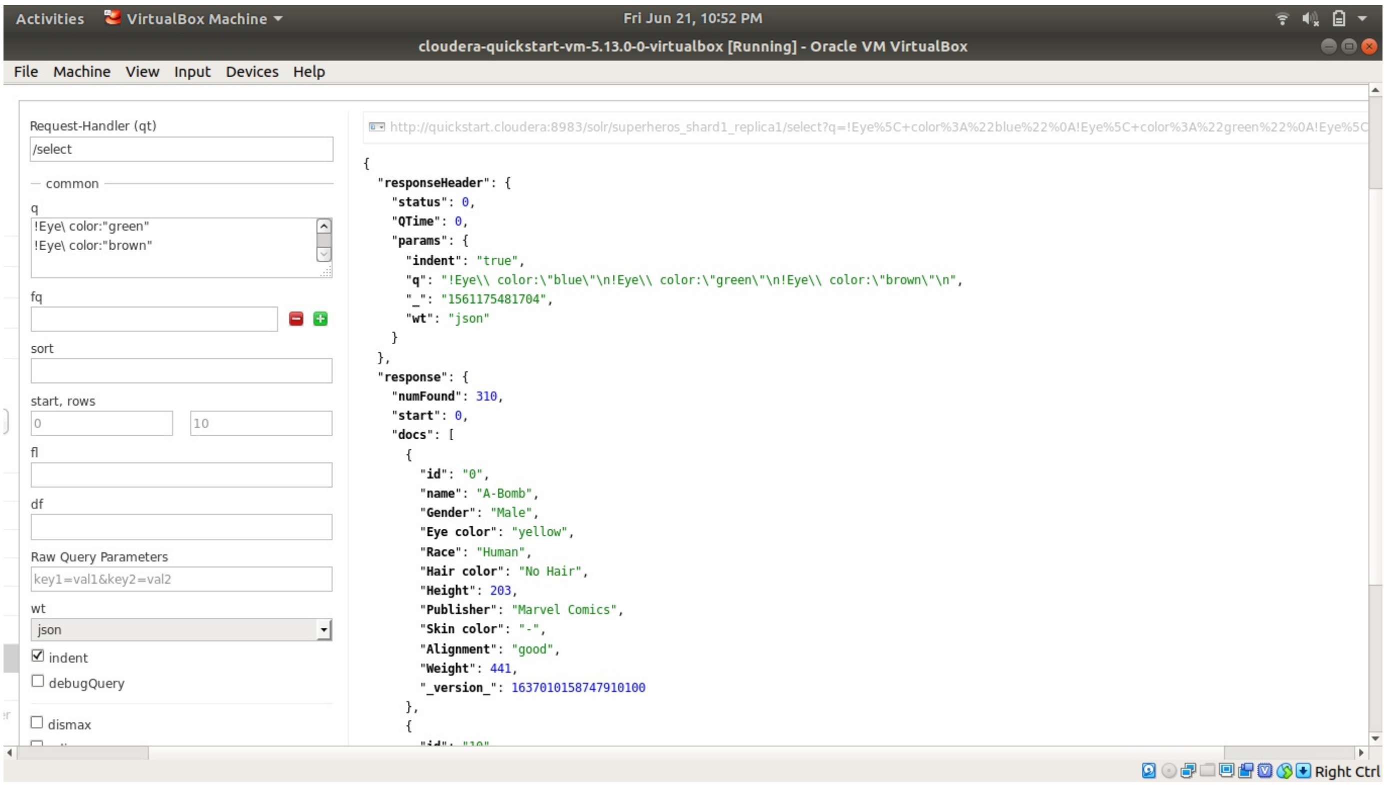
☑ indent
☐ debugQuery

☐ dismax
☐ edismax

http://quickstart.cloudera:8983/solr/superheros_shard1_replica1/select?q=Race%3A%22-%22&fl=name%2C+Gender%2C+Eye+color%2C+Hair+color%2C+Heigh

```
{
  "responseHeader": {
    "status": 0,
    "QTime": 2,
    "params": {
      "fl": "name, Gender, Eye color, Hair color, Height, Weight, Skin color, Alignment",
      "indent": "true",
      "q": "Race:\"-\"",
      "_": "1561173872785",
      "wt": "json"
    }
  },
  "response": {
    "numFound": 304,
    "start": 0,
    "docs": [
      {
        "name": "Adam Monroe",
        "Gender": "Male",
        "Height": -99,
        "Alignment": "good",
        "Weight": -99
      },
      {
        "name": "Agent 13",
        "Gender": "Female",
        "Height": 173,
        "Alignment": "good",
        "Weight": 61
      },
      {
```

Solr4 - return all fields for all characters whose Eye color is not blue, green or brown. Basically a list of all characters with abnormal Eye color.


Activities
VirtualBox Machine
Fri Jun 21, 10:52 PM
cloudera-quickstart-vm-5.13.0-0-virtualbox [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Right Ctrl

Request-Handler (qt): /select

common

q:
!Eye\ color:"green"
!Eye\ color:"brown"

fq:

sort:

start, rows: 0 10

fl:

df:

Raw Query Parameters: key1=val1&key2=val2

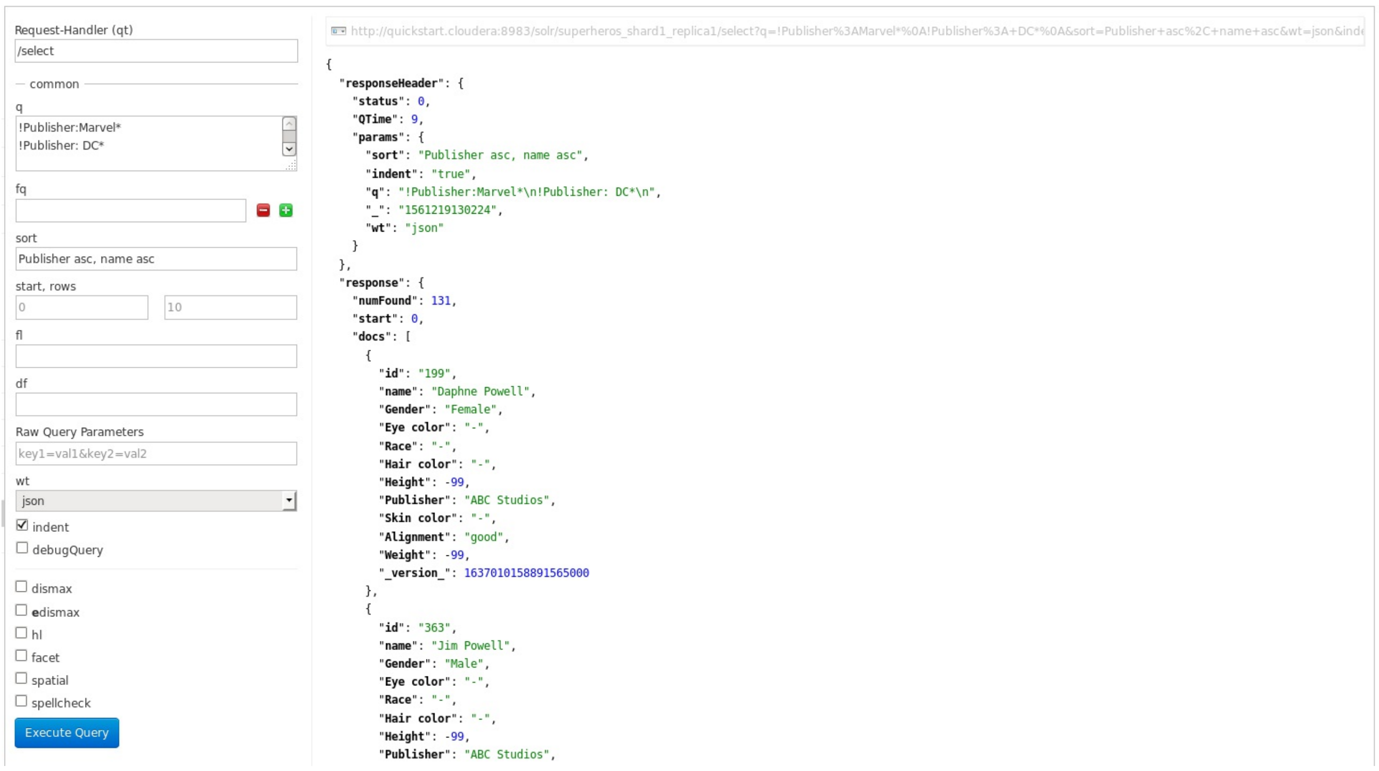
wt: json

[✓] indent
☐ debugQuery
☐ dismax

http://quickstart.cloudera:8983/solr/superheros_shard1_replica1/select?q=!Eye%5C+color%3A%22blue%22%0A!Eye%5C+color%3A%22green%22%0A!Eye%5C

```
{
  "responseHeader": {
    "status": 0,
    "QTime": 0,
    "params": {
      "indent": "true",
      "q": "!Eye\\ color:\"blue\"\n!Eye\\ color:\"green\"\n!Eye\\ color:\"brown\"\n",
      "_": "1561175481704",
      "wt": "json"
    }
  },
  "response": {
    "numFound": 310,
    "start": 0,
    "docs": [
      {
        "id": "0",
        "name": "A-Bomb",
        "Gender": "Male",
        "Eye color": "yellow",
        "Race": "Human",
        "Hair color": "No Hair",
        "Height": 203,
        "Publisher": "Marvel Comics",
        "Skin color": "-",
        "Alignment": "good",
        "Weight": 441,
        "_version_": 1637010158747910100
      },
      {
```

Solr5 - return all fields for all characters whose Publisher is not Marvel or DC, sorted by publisher and then sorted by name. So basically a list of characters from the small studios.

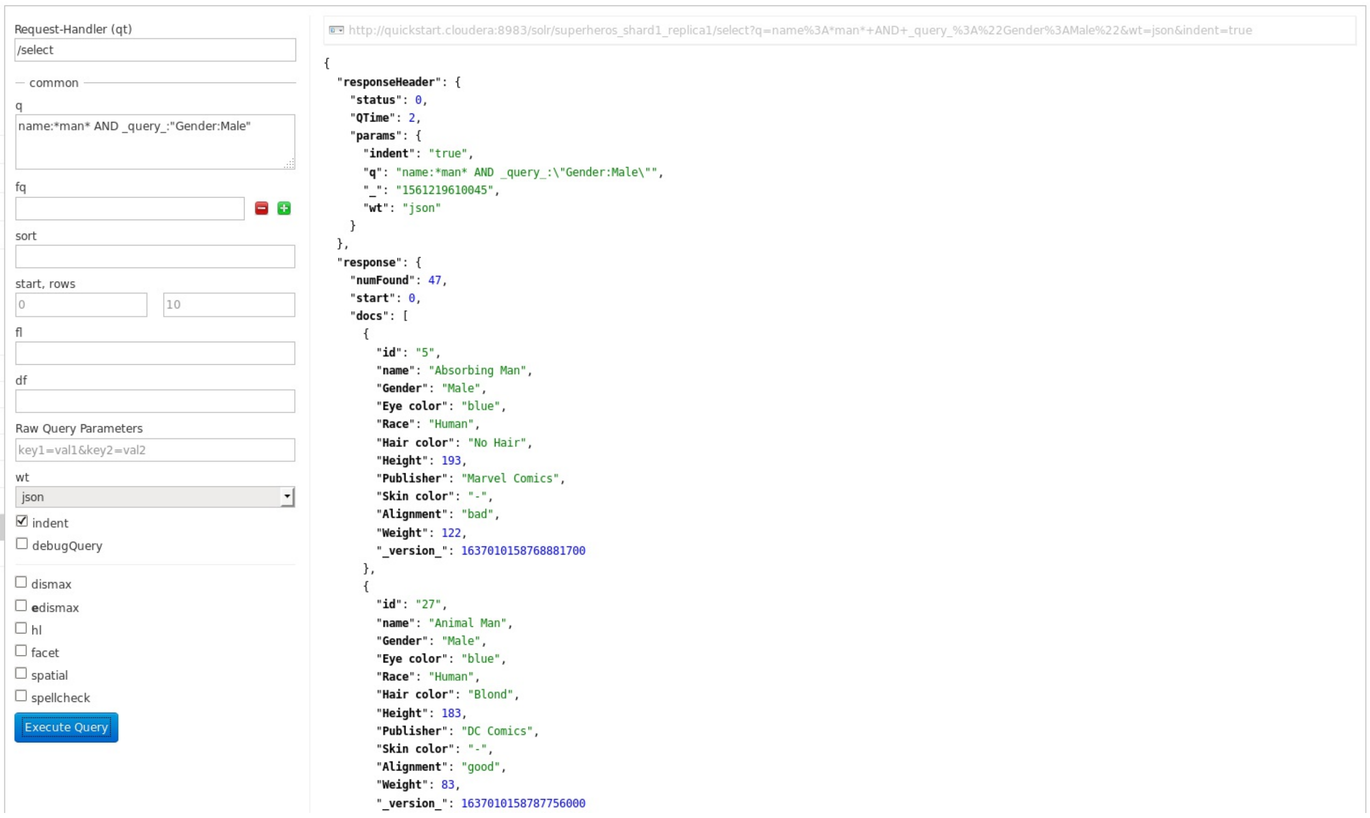


```
{
  "responseHeader": {
    "status": 0,
    "QTime": 9,
    "params": {
      "sort": "Publisher asc, name asc",
      "indent": "true",
      "q": "!Publisher:Marvel*\n!Publisher: DC*\n",
      "_": "1561219130224",
      "wt": "json"
    }
  },
  "response": {
    "numFound": 131,
    "start": 0,
    "docs": [
      {
        "id": "199",
        "name": "Daphne Powell",
        "Gender": "Female",
        "Eye color": "-",
        "Race": "-",
        "Hair color": "-",
        "Height": -99,
        "Publisher": "ABC Studios",
        "Skin color": "-",
        "Alignment": "good",
        "Weight": -99,
        "_version_": 1637010158891565000
      },
      {
        "id": "363",
        "name": "Jim Powell",
        "Gender": "Male",
        "Eye color": "-",
        "Race": "-",
        "Hair color": "-",
        "Height": -99,
        "Publisher": "ABC Studios",
```

Nested Queries

*NOTE - the <AND *query*:“someField:someValue”> syntax denotes the nested query.

Solr6 - return all fields for all characters whose name contains “man” (outer) from all characters whose Gender is Male (inner). So it’s a list of characters with uncreative names.


Request-Handler (qt): /select

q: name:*man* AND _query_:"Gender:Male"

start, rows: 0, 10

Raw Query Parameters: key1=val1&key2=val2

wt: json

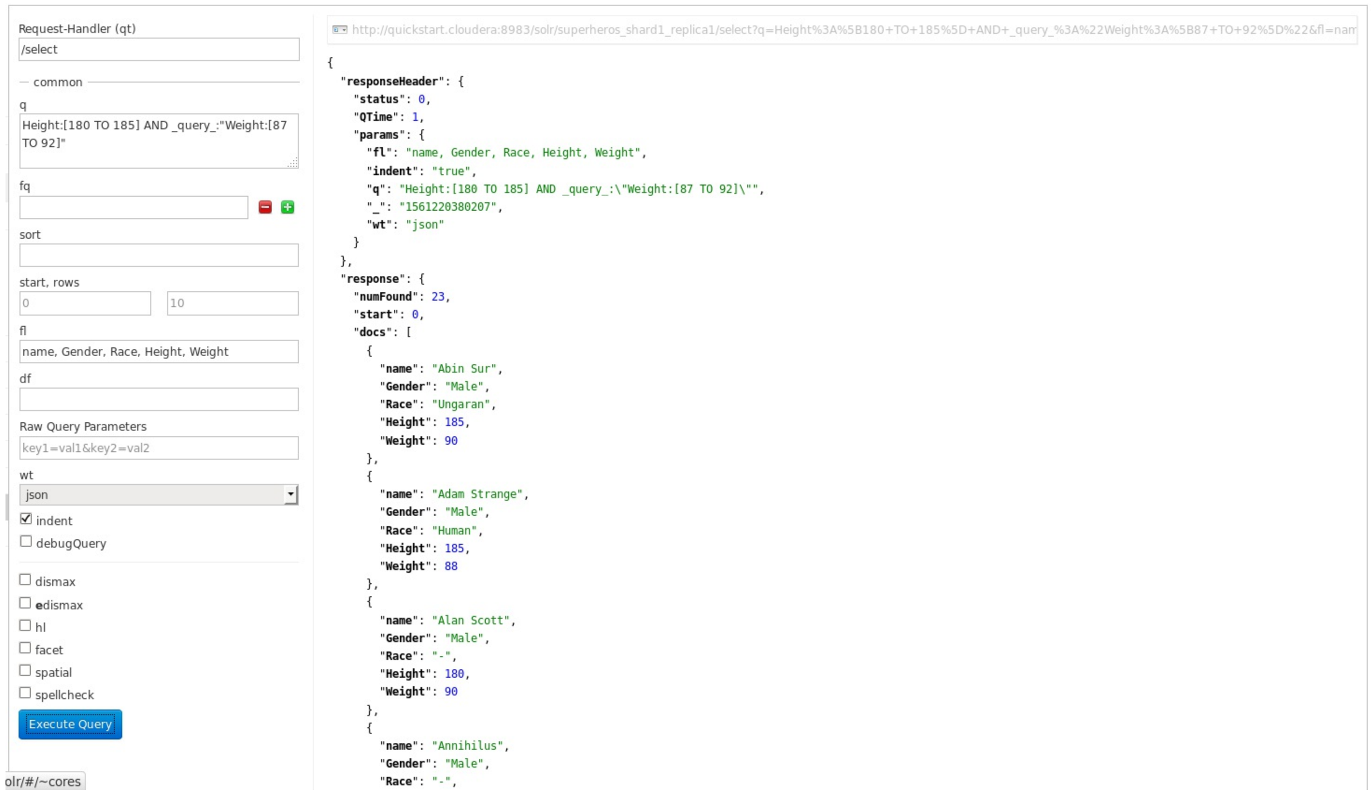
[✓ indent] debugQuery

dismax, edismax, hl, facet, spatial, spellcheck

```
http://quickstart.cloudera:8983/solr/superheros_shard1_replica1/select?q=name%3A*man*+AND+_query_%3A%22Gender%3AMale%22&wt=json&indent=true
```

```
{
  "responseHeader": {
    "status": 0,
    "QTime": 2,
    "params": {
      "indent": "true",
      "q": "name:*man* AND _query_:\"Gender:Male\"",
      "_": "1561219610045",
      "wt": "json"
    }
  },
  "response": {
    "numFound": 47,
    "start": 0,
    "docs": [
      {
        "id": "5",
        "name": "Absorbing Man",
        "Gender": "Male",
        "Eye color": "blue",
        "Race": "Human",
        "Hair color": "No Hair",
        "Height": 193,
        "Publisher": "Marvel Comics",
        "Skin color": "-",
        "Alignment": "bad",
        "Weight": 122,
        "_version_": 1637010158768881700
      },
      {
        "id": "27",
        "name": "Animal Man",
        "Gender": "Male",
        "Eye color": "blue",
        "Race": "Human",
        "Hair color": "Blond",
        "Height": 183,
        "Publisher": "DC Comics",
        "Skin color": "-",
        "Alignment": "good",
        "Weight": 83,
        "_version_": 1637010158787756000
```

Solr7 - return name, Gender, Race, Height and Weight of all characters who are approximately my size (yes, I fall in those ranges). Weight is inner query and Height is outer.


Request-Handler (qt)
/select

common

q
Height:[180 TO 185] AND _query_:"Weight:[87 TO 92]"

fq

sort

start, rows
0 10

fl
name, Gender, Race, Height, Weight

df

Raw Query Parameters
key1=val1&key2=val2

wt
json

☑ indent
☐ debugQuery

☐ dismax
☐ edismax
☐ hl
☐ facet
☐ spatial
☐ spellcheck

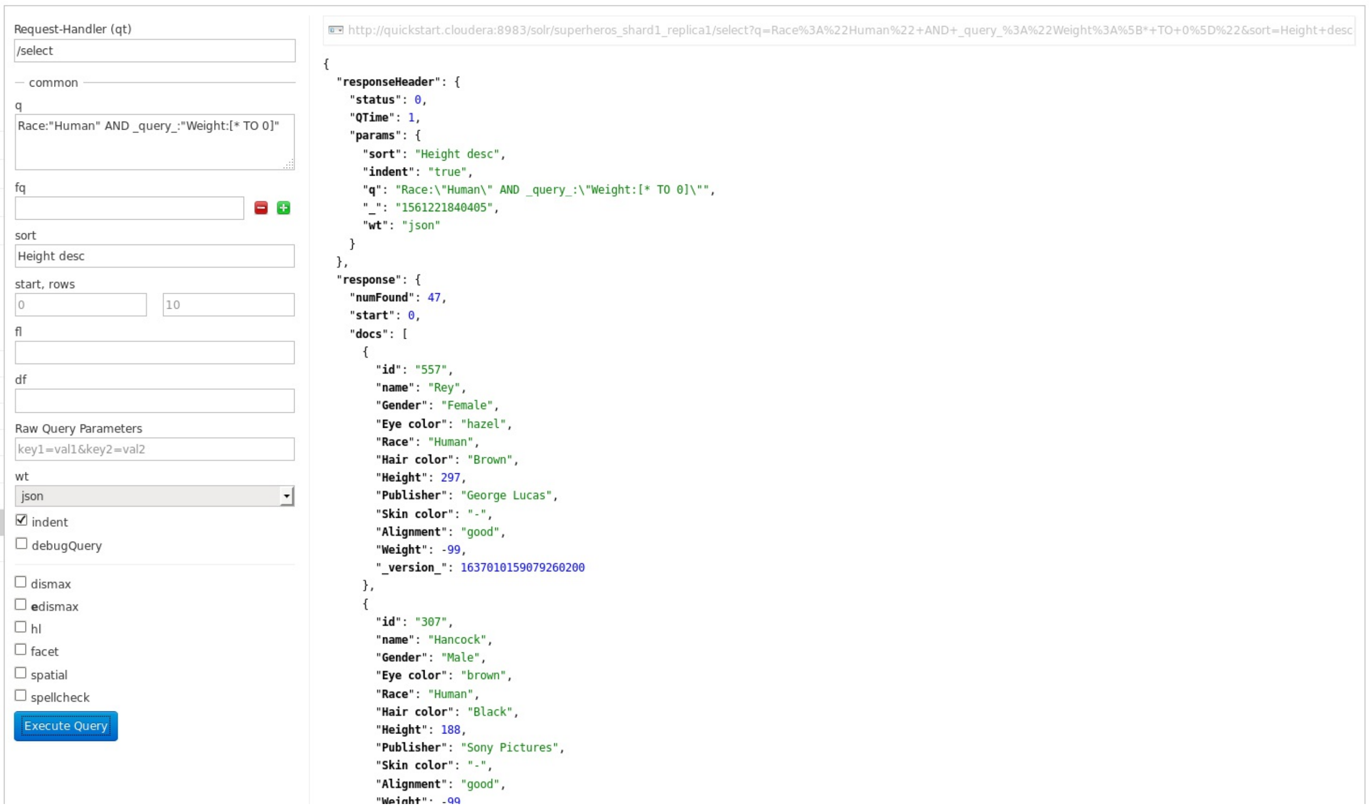
Execute Query

olr/#/~cores

http://quickstart.cloudera:8983/solr/superheros_shard1_replica1/select?q=Height%3A%5B180+TO+185%5D+AND+_query_%3A%22Weight%3A%5B87+TO+92%5D%22&fl=nam

```
{
  "responseHeader": {
    "status": 0,
    "QTime": 1,
    "params": {
      "fl": "name, Gender, Race, Height, Weight",
      "indent": "true",
      "q": "Height:[180 TO 185] AND _query_:\"Weight:[87 TO 92]\"",
      "_": "1561220380207",
      "wt": "json"
    }
  },
  "response": {
    "numFound": 23,
    "start": 0,
    "docs": [
      {
        "name": "Abin Sur",
        "Gender": "Male",
        "Race": "Ungaran",
        "Height": 185,
        "Weight": 90
      },
      {
        "name": "Adam Strange",
        "Gender": "Male",
        "Race": "Human",
        "Height": 185,
        "Weight": 88
      },
      {
        "name": "Alan Scott",
        "Gender": "Male",
        "Race": "-",
        "Height": 180,
        "Weight": 90
      },
      {
        "name": "Annihilus",
        "Gender": "Male",
        "Race": "-",
```

Solr8 - return all fields for all characters whose Race is Human (outer) and whose Weight is less than 0 (inner) in descending order by Height. So essentially a list of humans with unknown weight.


Request-Handler (qt)
/select

common

q
Race:"Human" AND _query_:"Weight:[* TO 0]"

fq

sort
Height desc

start, rows
0 10

fl

df

Raw Query Parameters
key1=val1&key2=val2

wt
json

☑ indent
☐ debugQuery

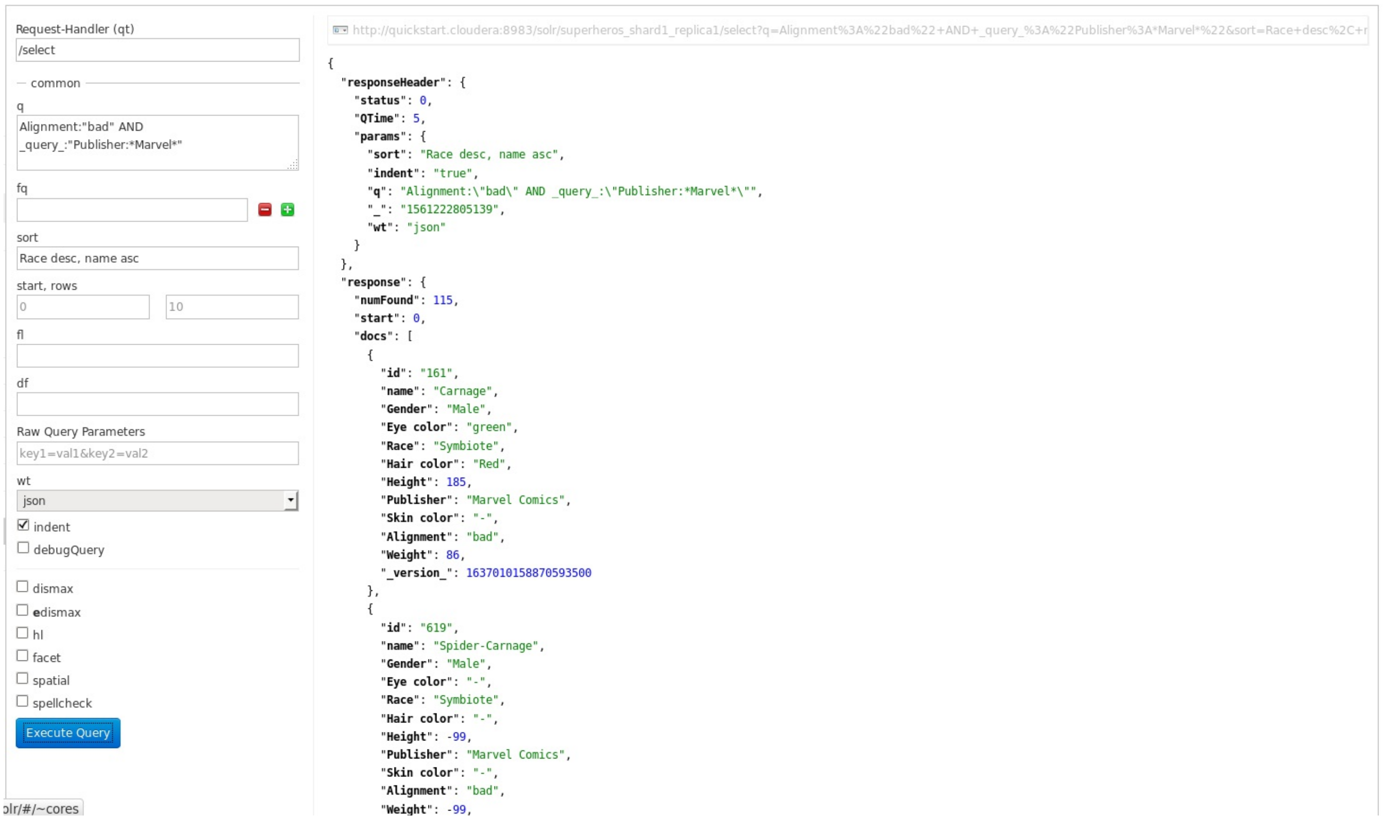
☐ dismax
☐ edismax
☐ hl
☐ facet
☐ spatial
☐ spellcheck

Execute Query

http://quickstart.cloudera:8983/solr/superheros_shard1_replica1/select?q=Race%3A%22Human%22+AND+_query_%3A%22Weight%3A%5B*+TO+0%5D%22&sort=Height+desc

```
{
  "responseHeader": {
    "status": 0,
    "QTime": 1,
    "params": {
      "sort": "Height desc",
      "indent": "true",
      "q": "Race:\"Human\" AND _query_:\"Weight:[* TO 0]\"",
      "_": "1561221840405",
      "wt": "json"
    }
  },
  "response": {
    "numFound": 47,
    "start": 0,
    "docs": [
      {
        "id": "557",
        "name": "Rey",
        "Gender": "Female",
        "Eye color": "hazel",
        "Race": "Human",
        "Hair color": "Brown",
        "Height": 297,
        "Publisher": "George Lucas",
        "Skin color": "-",
        "Alignment": "good",
        "Weight": -99,
        "_version_": 1637010159079260200
      },
      {
        "id": "307",
        "name": "Hancock",
        "Gender": "Male",
        "Eye color": "brown",
        "Race": "Human",
        "Hair color": "Black",
        "Height": 188,
        "Publisher": "Sony Pictures",
        "Skin color": "-",
        "Alignment": "good",
```

Solr9 - return all fields for all characters whose publisher is Marvel (inner) and whose Alignment is bad (outer) sorted by Race descending and then sorted by name ascending. Basically a list of all the Marvel bad guys.



Request-Handler (qt)
/select

common

q
Alignment:"bad" AND
query:"Publisher:*Marvel*"

fq

sort
Race desc, name asc

start, rows
0 10

fl

df

Raw Query Parameters
key1=val1&key2=val2

wt
json

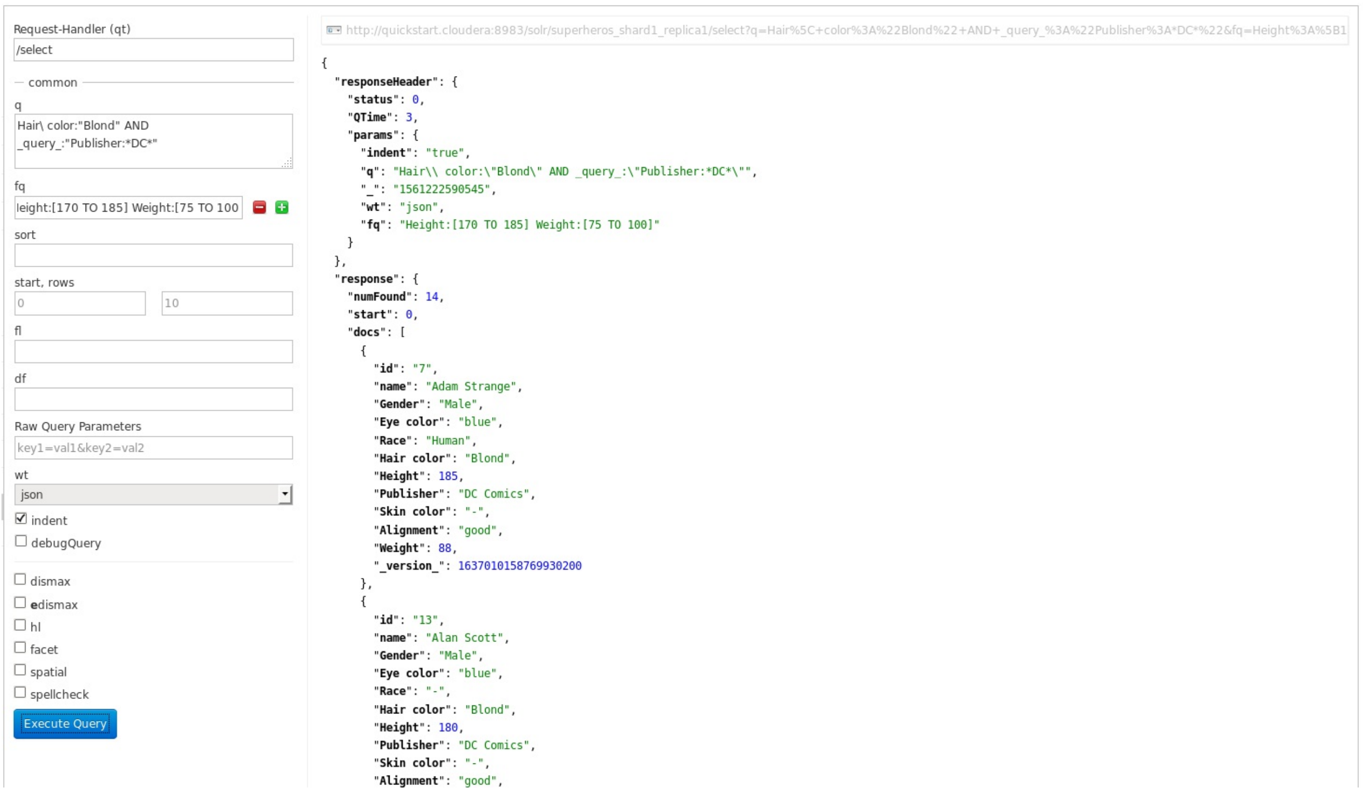
[✓] indent
☐ debugQuery

☐ dismax
☐ edismax
☐ hl
☐ facet
☐ spatial
☐ spellcheck

http://quickstart.cloudera:8983/solr/superheros_shard1_replica1/select?q=Alignment%3A%22bad%22+AND+_query_%3A%22Publisher%3A*Marvel*%22&sort=Race+desc%2C+r

```
{
  "responseHeader": {
    "status": 0,
    "QTime": 5,
    "params": {
      "sort": "Race desc, name asc",
      "indent": "true",
      "q": "Alignment:\"bad\" AND _query_:\"Publisher:*Marvel*\"",
      "_": "1561222805139",
      "wt": "json"
    }
  },
  "response": {
    "numFound": 115,
    "start": 0,
    "docs": [
      {
        "id": "161",
        "name": "Carnage",
        "Gender": "Male",
        "Eye color": "green",
        "Race": "Symbiote",
        "Hair color": "Red",
        "Height": 185,
        "Publisher": "Marvel Comics",
        "Skin color": "-",
        "Alignment": "bad",
        "Weight": 86,
        "_version_": 1637010158870593500
      },
      {
        "id": "619",
        "name": "Spider-Carnage",
        "Gender": "Male",
        "Eye color": "-",
        "Race": "Symbiote",
        "Hair color": "-",
        "Height": -99,
        "Publisher": "Marvel Comics",
        "Skin color": "-",
        "Alignment": "bad",
        "Weight": -99,
```

Solr10 - return all fields for all characters whose Publisher is DC (inner) and whose Hair color is Blond (outer) filtered by Height and Weight in the range of classical attractiveness. So it’s a list of the Blond DC heartthrobs.


Request-Handler (qt): /select

common

q: Hair\ color:"Blond" AND _query_:"Publisher:*DC*"

fq: leight:[170 TO 185] Weight:[75 TO 100

sort:

start, rows: 0 10

fl:

df:

Raw Query Parameters: key1=val1&key2=val2

wt: json

[✓] indent

☐ debugQuery

☐ dismax

☐ edismax

☐ hl

☐ facet

☐ spatial

☐ spellcheck

Execute Query

http://quickstart.cloudera:8983/solr/superheros_shard1_replica1/select?q=Hair%5C+color%3A%22Blond%22+AND+_query_%3A%22Publisher%3A*DC*%22&fq=Height%3A%5B1

```
{
  "responseHeader": {
    "status": 0,
    "QTime": 3,
    "params": {
      "indent": "true",
      "q": "Hair\\ color:\"Blond\" AND _query_:\"Publisher:*DC*\"",
      "_": "1561222590545",
      "wt": "json",
      "fq": "Height:[170 TO 185] Weight:[75 TO 100]"
    }
  },
  "response": {
    "numFound": 14,
    "start": 0,
    "docs": [
      {
        "id": "7",
        "name": "Adam Strange",
        "Gender": "Male",
        "Eye color": "blue",
        "Race": "Human",
        "Hair color": "Blond",
        "Height": 185,
        "Publisher": "DC Comics",
        "Skin color": "-",
        "Alignment": "good",
        "Weight": 88,
        "_version_": 1637010158769930200
      },
      {
        "id": "13",
        "name": "Alan Scott",
        "Gender": "Male",
        "Eye color": "blue",
        "Race": "-",
        "Hair color": "Blond",
        "Height": 180,
        "Publisher": "DC Comics",
        "Skin color": "-",
        "Alignment": "good",
```

Limitation

1. We were not able to run MapReduce on Intellij. There were a lot of errors. We shifted to the Eclipse and we perform the logic for the MapReduce Problems.
2. Eclipse configuration also took some time to understand.

Conclusion

We have learnt some advanced concepts of Mapreduce, Hive and Apache Solr.

References

http://stevekrenzel.com/finding-friends-with-mapreduce

https://acadgild.com/blog/hive-complex-data-types-with-examples

https://lucene.apache.org/solr/guide/6_6/introduction-to-solr-indexing.html

Contribution

Mapreduce Problem:

Usecase-1

1. Mapper algorithm: Eric chadwick
2. Reducer Algorithm: Maseerah Muradabadi, Nikita Goyal

Usecase-2

1. Mapper and Input: Nikita Goyal
2. Reducer: Eric Chadwick and Maseerah Muradabadi

Hive Usecase:

1. 4 queries -Maseeerah Muradabadi
2. 3 queries -Nikita Goyal
3. 3 Queries- Eric chadwick

Solr Usecase:

1. 4 Nested queries: Eric Chadwick
2. 3 Queries: Nikita Goyal
3. 3 queries : Maseerah Muradabadi

Percentage of contribution:

70% of map-reduce- Nikita goyal

30% of map-reduce- Maeerah and Eric

70% of hive - Maseerah

30% of hive- Eric and Nikita

70% of solar- Eric Chadwick

30% of solar- Nikita and Maseerah

Masserah and Eric send me the screenshots and write up about solar and Hive and nikita made the wiki