PRACTICAL NO: 1

TO UNDERSTAND THE HDFS COMMANDS

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TO UNDERSTAND THE HDFS COMMANDS

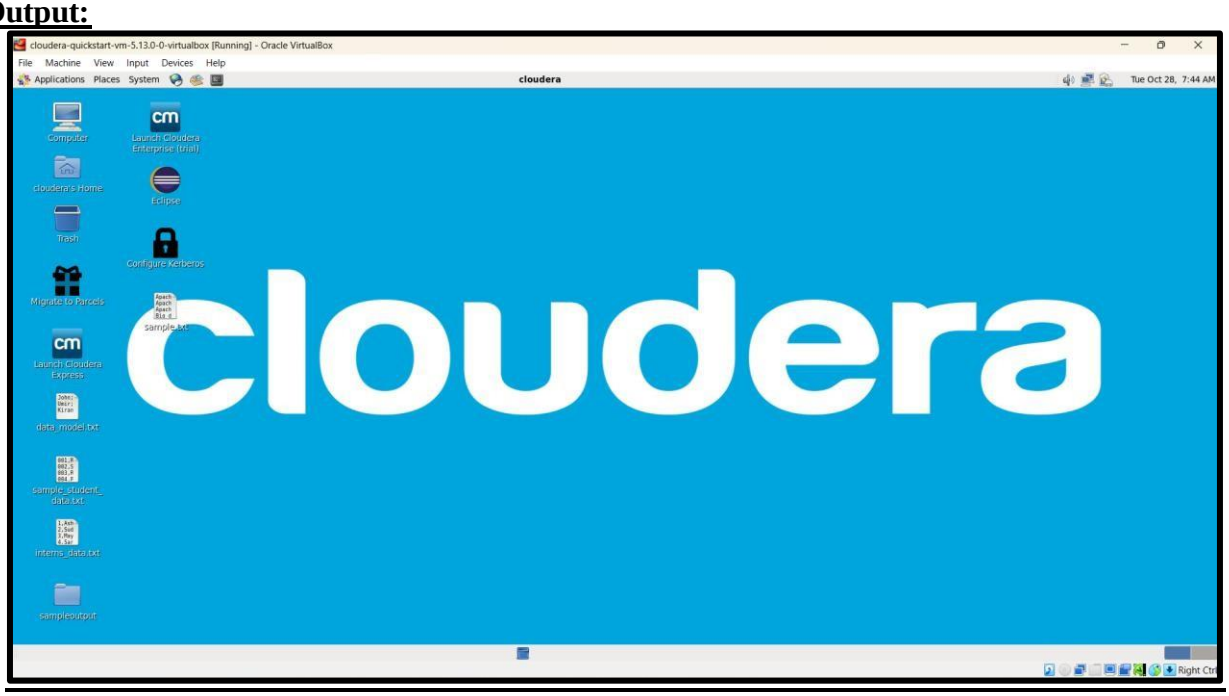
Question 1: HDFS: List of Commands (ls, mkdir, touchz, copy from local/put, copy to local/get, move from local, viewing file content(cat, head, tail),cp, rmr, du, dus, stat)

Code :-

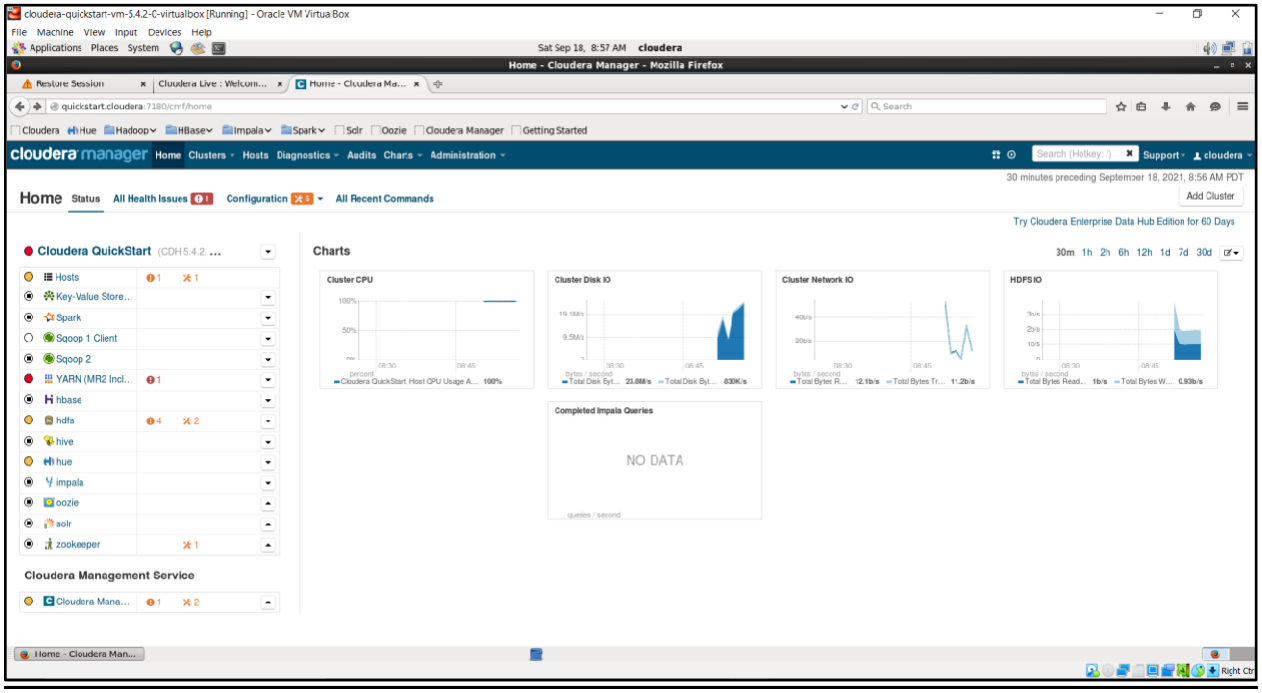
Steps:

Step 1: Download oracle virtual machine and install it as run as administrator
Step 2: Download Cloudera-quickstart-vm-5.4.2-0-Virtualbox and unzip it use 7 zip.
Step 3: Import Cloudera-quickstart-vm-5.4.2-0-Virtualbox.ovf in oracle Virtual Machine.
Step 4: Provide the Memory and processor to machine. It requires minimum 4 gb ram and 2 processor.
Step 5: Enable Network Adapter and attach it to NAT.
Step 6: Start the Machine.
Step 7: Launch Cloudera express. After launch we get command i.e sudo /home/cloudera-manager - -force We have to run this command by adding - - express command.
Step 8: we have to login the cloudera manager and after that we have to start the services of Hadoop system.

Output:



```
cloudera@quickstart:~
File  Edit  View  Search  Terminal  Help
[cloudera@quickstart ~]$  sudo /home/cloudera/cloudera-manager --force
You must specify --express or --enterprise
[cloudera@quickstart ~]$  sudo /home/cloudera/cloudera-manager --force --express
[QuickStart] Shutting down CDH services via init scripts...
JMX enabled by default
Using config: /etc/zookeeper/conf/zoo.cfg
[QuickStart] Disabling CDH services on boot...
[QuickStart] Starting Cloudera Manager daemons...
[QuickStart] Waiting for Cloudera Manager API...
[QuickStart] Configuring deployment...
[QuickStart] Deploying client configuration...
[QuickStart] Starting Cloudera Management Service...
[QuickStart] Enabling Cloudera Manager daemons on boot...

Success! You can now log into Cloudera Manager from the QuickStart VM's browser:

    http://quickstart.cloudera:7180

    Username: cloudera
    Password: cloudera

[cloudera@quickstart ~]$ d
```



1. Perform the following task on HDFS cluster using HDFS commands

a. Check Linux login detail and list of all files available in the current directory their size and date

The command for login detail:

>Whoami

Output:

```
[cloudera@quickstart ~]$ whoami
cloudera
[cloudera@quickstart ~]$
```

The command for available files in the current directory their size and date:

>ls -la

Output:

cloudera@quickstart:~

File Edit View Search Terminal Help

```
[cloudera@quickstart ~]$ ls -la
total 292
drwxrwxr-x  26 cloudera cloudera  4096 Sep 16 21:46 .
drwxrwxr-x.  3 root     root      4096 Jun  9  2015 ..
-rw-------   1 cloudera cloudera     0 Sep 16 12:30 .bash_history
-rw-r--r--   1 cloudera cloudera    18 Jun  9  2015 .bash_logout
-rw-r--r--   1 cloudera cloudera   176 Jun  9  2015 .bash_profile
-rw-r--r--   1 cloudera cloudera   176 Jun  9  2015 .bashrc
drwxr-xr-x   3 cloudera cloudera  4096 Sep 16 09:36 .cache
-rwxrwxr-x   1 cloudera cloudera  5141 Jun  9  2015 cloudera-manager
-rwxrwxr-x   1 cloudera cloudera  9922 Jun  9  2015 cm_api.py
drwxrwxr-x   4 cloudera cloudera  4096 Sep 16 09:36 .config
drwx------   3 cloudera cloudera  4096 Sep 16 09:36 .dbus
drwxrwxr-x   2 cloudera cloudera  4096 Jun  9  2015 Desktop
drwxrwxr-x   4 cloudera cloudera  4096 Jun  9  2015 Documents
drwxr-xr-x   2 cloudera cloudera  4096 Sep 16 09:36 Downloads
drwxrwsr-x   9 cloudera cloudera  4096 Feb 19  2015 eclipse
-rw-rw-r--   1 cloudera cloudera 53819 Jun  9  2015 enterprise-deployment.json
```

b. List all files of HDFS default directory

Command

hdfs dfs -ls /user/cloudera

After create some file and directory

```
[cloudera@quickstart ~]$ hdfs dfs -cat /user/cloudera/FirstDir/Firstfile1.txt
cat: Permission denied: user=cloudera, access=EXECUTE, inode="/user/cloudera/Fir
stDir":cloudera:cloudera:-rw-r--r-- (Ancestor /user/cloudera/FirstDir is not a d
irectory).
[cloudera@quickstart ~]$ hdfs dfs -rm /user/cloudera/FirstDir
25/09/06 07:12:07 INFO fs.TrashPolicyDefault: Moved: 'hdfs://quickstart.cloudera
:8020/user/cloudera/FirstDir' to trash at: hdfs://quickstart.cloudera:8020/user/
cloudera/.Trash/Current/user/cloudera/FirstDir
[cloudera@quickstart ~]$ hdfs dfs -mkdir /user/cloudera/FirstDir
[cloudera@quickstart ~]$ hdfs dfs -put Firstfile1.txt /user/cloudera/FirstDir
[cloudera@quickstart ~]$ hdfs dfs -ls /user/cloudera/FirstDir
Found 1 items
```

c. Create new directory

Command:

hdfs dfs -mkdir FirstDir

Output:

```
[cloudera@quickstart ~]$ hdfs dfs -cat /user/cloudera/FirstDir/Firstfile1.txt
cat: Permission denied: user=cloudera, access=EXECUTE, inode="/user/cloudera/Fir
stDir":cloudera:cloudera:-rw-r--r-- (Ancestor /user/cloudera/FirstDir is not a d
irectory).
[cloudera@quickstart ~]$ hdfs dfs -rm /user/cloudera/FirstDir
25/09/06 07:12:07 INFO fs.TrashPolicyDefault: Moved: 'hdfs://quickstart.cloudera
:8020/user/cloudera/FirstDir' to trash at: hdfs://quickstart.cloudera:8020/user/
cloudera/.Trash/Current/user/cloudera/FirstDir
[cloudera@quickstart ~]$ hdfs dfs -mkdir /user/cloudera/FirstDir
[cloudera@quickstart ~]$ hdfs dfs -put Firstfile1.txt /user/cloudera/FirstDir
[cloudera@quickstart ~]$ hdfs dfs -ls /user/cloudera/FirstDir
Found 1 items
```

d. Create file

Command:

File created in Hadoop:

hdfs dfs -touchz /user/cloudera/FirstDir/Firstfile.txt

Output:

```
[cloudera@quickstart ~]$ hdfs dfs -ls /user/cloudera
[cloudera@quickstart ~]$ nano Firstfile1.txt
[cloudera@quickstart ~]$ cat Firstfile1.txt
This is my first HDFS practical file.
Stored from Linux to HDFS.
```

e. Copy data from Linux to HDFS

Command:

hdfs dfs -put Firstfile1.txt /user/cloudera/FirstDir

Output:

```
[cloudera@quickstart ~]$ hdfs dfs -put Firstfile1.txt /user/cloudera/FirstDir
[cloudera@quickstart ~]$ hdfs dfs -ls /user/cloudera/FirstDir
-rw-r--r--   1 cloudera cloudera         66 2025-09-06 07:10 /user/cloudera/Firs
tDir
```

f. Copy HDFS file in Linux default directory

Command:

hdfs dfs -get /user/cloudera/FirstDir/Firstfile1.txt /home/cloudera/FirstDir

Output:

```
[cloudera@quickstart ~]$ hdfs dfs -get /user/cloudera/FirstDir/Firstfile2.txt /home/cl
oudera/
get: `/home/cloudera/Firstfile2.txt': File exists
```

g. Move Linux data in HDFS default folder

Command:

hdfs dfs -moveFromLocal /home/cloudera/Firstfile.txt /user/cloudera

Output:

```
[cloudera@quickstart ~]$ ls
cloudera-manager  Desktop    Downloads  enterprise-deployment.json  FirstDir       Firstfile.txt  kerberos  Music    Public     Videos
cm_api.py         Documents  eclipse    express-deployment.json     Firstfile1.txt  FirstFir       lib       Pictures  Templates  workspace
[cloudera@quickstart ~]$
```

```
[cloudera@quickstart ~]$ hdfs dfs -moveFromLocal /home/cloudera/Firstfile2.txt /user/c
loudera
[cloudera@quickstart ~]$ hdfs dfs -ls
Found 4 items
drwxr-xr-x   - cloudera cloudera          0 2021-11-18 07:19 FirstDir
-rw-r--r--   1 cloudera cloudera          0 2021-11-18 07:30 Firstfile.txt
-rw-r--r--   1 cloudera cloudera         13 2021-11-18 07:30 Firstfile2.txt
-rw-r--r--   1 cloudera cloudera          0 2021-11-18 06:49 jagrit
[cloudera@quickstart ~]$
```

h. Remove created file from Linux and HDFS cluster too

Command:

Remove file from Hadoop:

hdfs dfs -rm /user/cloudera/FirstDir/Firstfile1.txt

Remove file from hdfs:

```
[cloudera@quickstart ~]$ hdfs dfs -rm -skipTrash /user/cloudera/FirstDir/Fi
le1.txt
Deleted /user/cloudera/FirstDir/Firstfile1.txt
```

i. Remove Directory from HDFS cluster which is having at least one file.

Command:

hdfs dfs -rmr FirstDir

Output:

```
[cloudera@quickstart ~]$ hdfs dfs -rmr FirstDir
rmr: DEPRECATED: Please use 'rm -r' instead.
21/09/20 14:28:30 INFO fs.TrashPolicyDefault: Namenode trash configuration: Deletion interval = 1440 minutes, Emptier interval = 0 minutes.
Moved: 'hdfs://quickstart.cloudera:8020/user/cloudera/FirstDir' to trash at: hdfs://quickstart.cloudera:8020/user/cloudera/.Trash/Current
```

j. Check the size of each file in directory of HDFS

Command:

hdfs dfs -du /user/cloudera

Output:

```
[cloudera@quickstart ~]$ hdfs dfs -du /user/cloudera
66  66  /user/cloudera/.Trash
0   0   /user/cloudera/FirstDir
38  38  /user/cloudera/Firstfile.txt
```

k. Check the last modified time of current directory

Command:

hdfs dfs -stat /user

Output:

```
[cloudera@quickstart ~]$ hdfs dfs -stat /user
2017-10-23 16:17:33
```

l. HDFS Command to know the usage of any command on HDFS

Command:

hdfs dfs -usage put

Output:

```
[cloudera@quickstart ~]$ hdfs dfs -usage put
Usage: hadoop fs [generic options] -put [-f] [-p] [-l] <localsrc> ... <dst>
[cloudera@quickstart ~]$
```

m. HDFS Command to get help for any command on HDFS

Command:

hdfs dfs -help put

Output:

```
[cloudera@quickstart ~]$ hdfs dfs -help put
-put [-f] [-p] [-l] <localsrc> ... <dst> :
  Copy files from the local file system into fs. Copying fails if the file already
  exists, unless the -f flag is given.
  Flags:

  -p  Preserves access and modification times, ownership and the mode.
  -f  Overwrites the destination if it already exists.
  -l  Allow DataNode to lazily persist the file to disk. Forces
         replication factor of 1. This flag will result in reduced
         durability. Use with care.
[cloudera@quickstart ~]$
```

PRACTICAL NO: 2

TO UNDERSTAND THE USE OF MAPREDUCE FOR WORDCOUNT AND UNION OPERATIONS

PRACTICAL NO: 2

TO UNDERSTAND THE USE OF MAPREDUCE FOR WORDCOUNT AND UNION OPERATIONS

Question a) To implement a Date Time Server using RPC concept. (Make use of Server Socket).

Objective:
To write and execute a Hadoop MapReduce program in Java for counting the occurrences of each word in a text file.

Software Used:
- Cloudera VM 5.13.0
- Eclipse Luna (pre-installed)
- Hadoop 2.6.0 (CDH 5.13.0)

Algorithm / Procedure:
Step 1 – Open Eclipse Luna
Double-click the **Eclipse** icon on the Cloudera desktop.
When prompted for workspace, keep the default:
/home/cloudera/workspace
Click **OK**.

Step 2 – Create New Java Project
File → New → Java Project
Project Name: WordCount
Finish

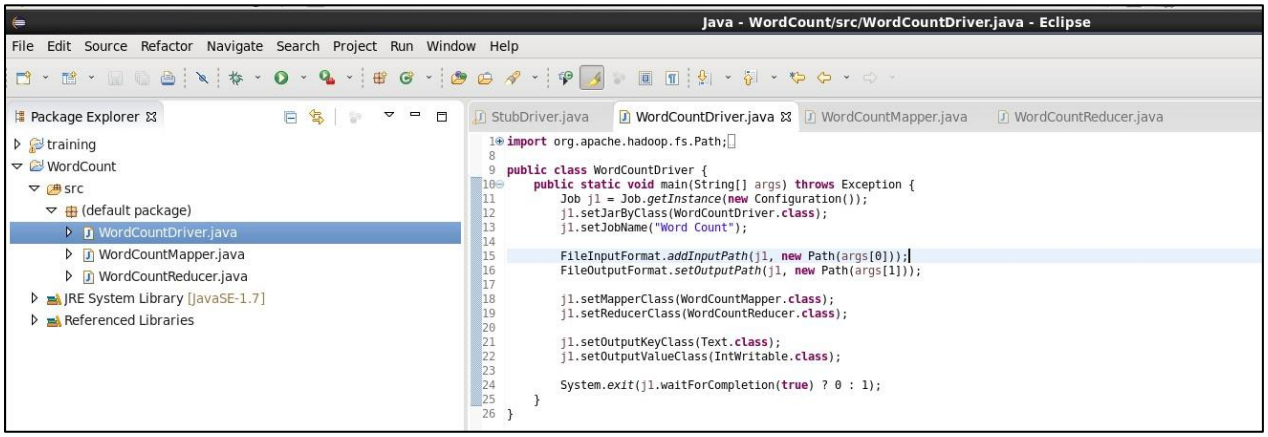
Step 3 – Add Hadoop JAR Libraries
Right-click WordCount → Properties
Java Build Path → Libraries tab → Add External JARs…

Add all JARs from the following folders:
/usr/lib/hadoop/*.jar
/usr/lib/hadoop-mapreduce/*.jar
/usr/lib/hadoop/common/*.jar
/usr/lib/hadoop/hdfs/*.jar
/usr/lib/hadoop/yarn/*.jar
Click **Apply and Close**.

Step 4 – Create 3 Java Files inside src folder

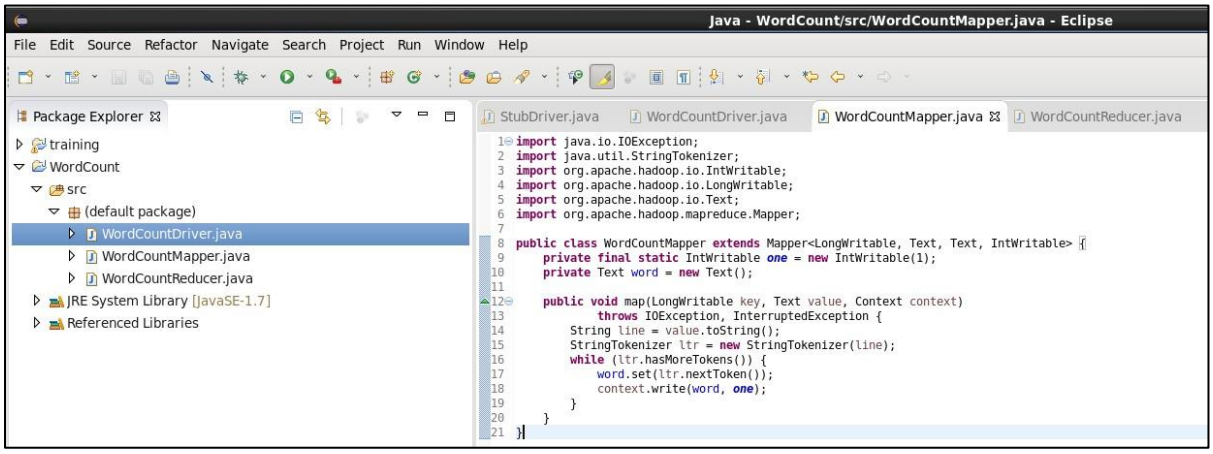
WordCountDriver.java

```
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
import org.apache.hadoop.conf.Configuration;

public class WordCountDriver {
   public static void main(String[] args) throws Exception {
      Job j1 = Job.getInstance(new Configuration());
      j1.setJarByClass(WordCountDriver.class);
      j1.setJobName("Word Count");

      FileInputFormat.addInputPath(j1, new Path(args[0]));
      FileOutputFormat.setOutputPath(j1, new Path(args[1]));

      j1.setMapperClass(WordCountMapper.class);
      j1.setReducerClass(WordCountReducer.class);

      j1.setOutputKeyClass(Text.class);
      j1.setOutputValueClass(IntWritable.class);

      System.exit(j1.waitForCompletion(true) ? 0 : 1);
   }
}
```



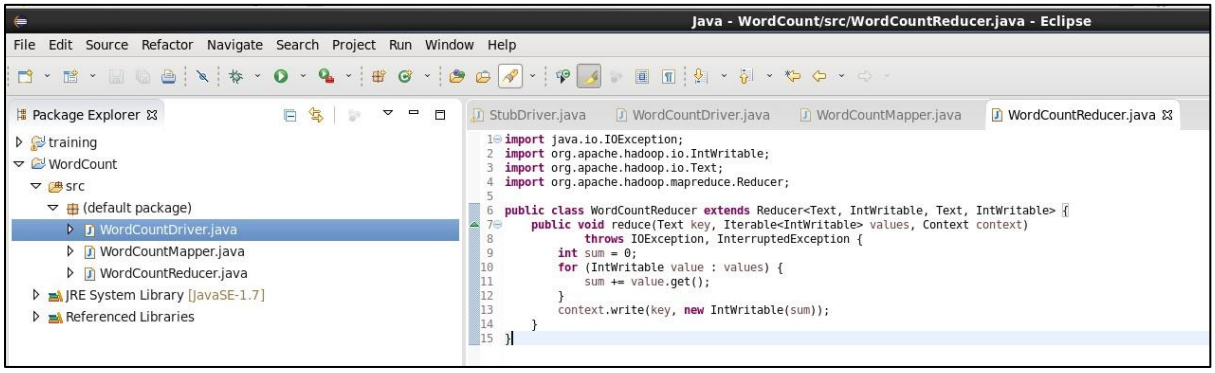
WordCountMapper.java

```
import java.io.IOException;
import java.util.StringTokenizer;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;

public class WordCountMapper extends Mapper<LongWritable, Text, Text, IntWritable>
 {
   private final static IntWritable one = new IntWritable(1);
   private Text word = new Text();

   public void map(LongWritable key, Text value, Context context)
         throws IOException, InterruptedException {
      String line = value.toString();
      StringTokenizer ltr = new StringTokenizer(line);
      while (ltr.hasMoreTokens()) {
         word.set(ltr.nextToken());
         context.write(word, one);
      }
   }
}
```



WordCountReducer.java

```
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;

public class WordCountReducer extends Reducer<Text, IntWritable, Text, IntWritable>
 {
   public void reduce(Text key, Iterable<IntWritable> values, Context context)
         throws IOException, InterruptedException {
      int sum = 0;
      for (IntWritable value : values) {
         sum += value.get();
      }
      context.write(key, new IntWritable(sum));
   }
}
```

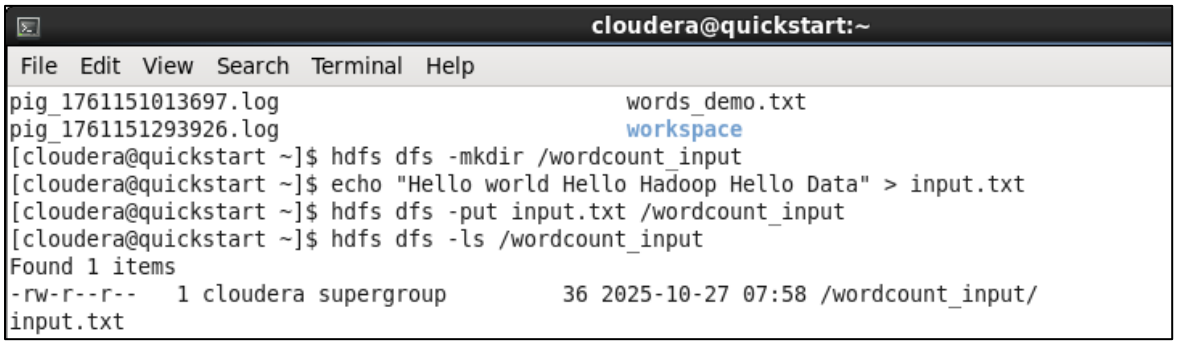


Step 5 – Export Project as JAR

Right-click project → Export → JAR file
JAR file path: /home/cloudera/wordcount.jar
Finish

Step 6 – Create Input in HDFS

```
hdfs dfs -mkdir /wordcount_input
echo "Hello world Hello Hadoop Hello Data" > input.txt
hdfs dfs -put input.txt /wordcount_input
```



Step 7 – Run the MapReduce Job

hadoop jar /home/cloudera/wordcount.jar WordCountDriver /wordcount_input /wordcount_output

```
[cloudera@quickstart ~]$ hadoop jar /home/cloudera/wordcount.jar WordCountDriver
 /wordcount_input /wordcount_output
25/10/27 07:58:47 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0
:8032
25/10/27 07:58:48 WARN mapreduce.JobResourceUploader: Hadoop command-line option
 parsing not performed. Implement the Tool interface and execute your applicatio
n with ToolRunner to remedy this.
25/10/27 07:58:48 INFO input.FileInputFormat: Total input paths to process : 1
25/10/27 07:58:48 INFO mapreduce.JobSubmitter: number of splits:1
25/10/27 07:58:49 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_17
61571560830_0001
25/10/27 07:58:49 INFO impl.YarnClientImpl: Submitted application application_17
61571560830_0001
25/10/27 07:58:49 INFO mapreduce.Job: The url to track the job: http://quickstar
t.cloudera:8088/proxy/application_1761571560830_0001/
25/10/27 07:58:49 INFO mapreduce.Job: Running job: job_1761571560830_0001
25/10/27 07:59:15 INFO mapreduce.Job: Job job_1761571560830_0001 running in uber
 mode : false
25/10/27 07:59:15 INFO mapreduce.Job:  map 0% reduce 0%
25/10/27 07:59:29 INFO mapreduce.Job:  map 100% reduce 0%
25/10/27 07:59:37 INFO mapreduce.Job:  map 100% reduce 100%
25/10/27 07:59:38 INFO mapreduce.Job: Job job_1761571560830_0001 completed succe
ssfully
25/10/27 07:59:38 INFO mapreduce.Job: Counters: 49
        File System Counters
                FILE: Number of bytes read=78
                FILE: Number of bytes written=286469
```

Step 8 – View the Output

hdfs dfs -cat /wordcount_output/part-r-00000

```
[cloudera@quickstart ~]$ hdfs dfs -cat /wordcount_output/part-r-00000
Data    1
Hadoop  1
Hello   3
world   1
[cloudera@quickstart ~]$
```

Question b) Write a program in Map Reduce for Union operation.

Objective:
To write and execute a Hadoop MapReduce program in Java to perform a **Union operation** on two datasets and output all unique records.

Software Used:
- Cloudera VM 5.13.0
- Eclipse Luna (pre-installed)
- Hadoop 2.6.0 (CDH 5.13.0)

Algorithm / Procedure:

Step 1 – Create New Java Project
Open Eclipse Luna → File → New → Java Project
Project Name: UnionOperation
Finish

Step 2 – Add Hadoop JAR Libraries
Add the following libraries just like in WordCount:

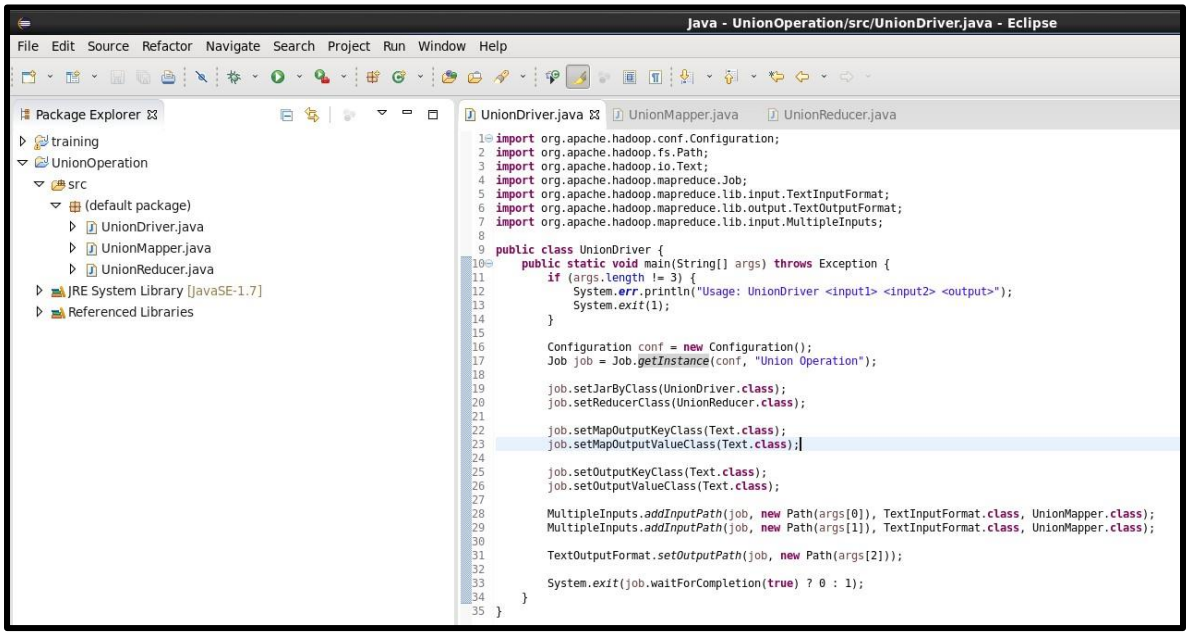
```
/usr/lib/hadoop/*.jar
/usr/lib/hadoop-mapreduce/*.jar
/usr/lib/hadoop-hdfs/*.jar
/usr/lib/hadoop-yarn/*.jar
/usr/lib/hadoop/common/*.jar
```

Then click **Apply and Close** ✓

Step 3 – Create 3 Java Files inside src
UnionDriver.java

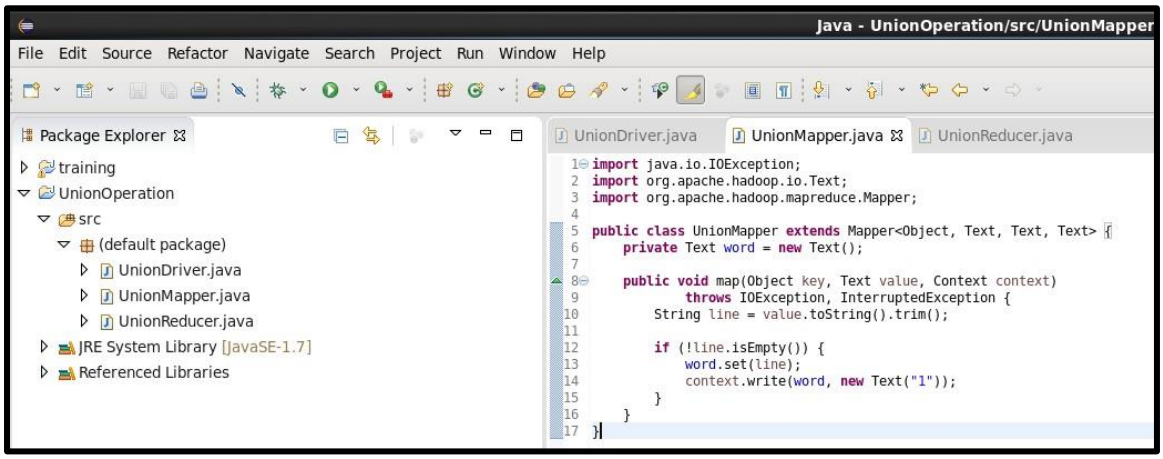
```
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.TextInputFormat;
import org.apache.hadoop.mapreduce.lib.output.TextOutputFormat;
import org.apache.hadoop.mapreduce.lib.input.MultipleInputs;

public class UnionDriver {
   public static void main(String[] args) throws Exception {
      if (args.length != 3) {
         System.err.println("Usage: UnionDriver <input1> <input2> <output>");
         System.exit(1);
      }

      Configuration conf = new Configuration();
      Job job = Job.getInstance(conf, "Union Operation");

      job.setJarByClass(UnionDriver.class);
```

```
        job.setReducerClass(UnionReducer.class);

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

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

        MultipleInputs.addInputPath(job, new Path(args[0]), TextInputFormat.class,
UnionMapper.class);
        MultipleInputs.addInputPath(job, new Path(args[1]), TextInputFormat.class,
UnionMapper.class);

        TextOutputFormat.setOutputPath(job, new Path(args[2]));

        System.exit(job.waitForCompletion(true) ? 0 : 1);
    }
}
```



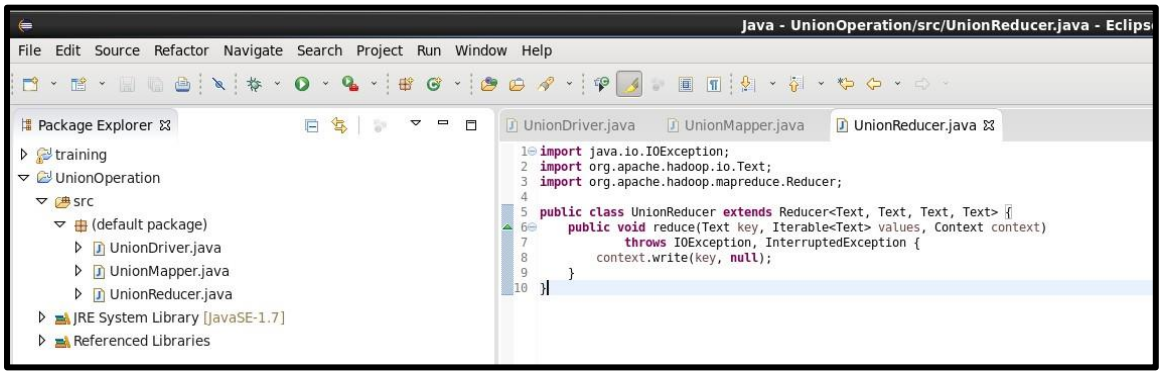
UnionMapper.java

```
import java.io.IOException;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;

public class UnionMapper extends Mapper<Object, Text, Text, Text> {
   private Text word = new Text();

   public void map(Object key, Text value, Context context)
         throws IOException, InterruptedException {
      String line = value.toString().trim();

      if (!line.isEmpty()) {
         word.set(line);
         context.write(word, new Text("1"));
      }
   }
}
```



UnionReducer.java

```
import java.io.IOException;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;

public class UnionReducer extends Reducer<Text, Text, Text, Text> {
   public void reduce(Text key, Iterable<Text> values, Context context)
         throws IOException, InterruptedException {
      context.write(key, null);
   }
}
```



Step 4 – Export Project as JAR

Right-click project → Export → JAR file
JAR file path: /home/cloudera/union.jar
Finish ✓

Step 5 – Create Input Files and Upload to HDFS

```
echo "nginx
CopyEdit
apple
banana
cherry" > file1.txt

echo "bash
CopyEdit
banana
date
apple" > file2.txt
```

Now create HDFS directories and upload:
hdfs dfs -mkdir /union_input1
hdfs dfs -mkdir /union_input2
hdfs dfs -put file1.txt /union_input1
hdfs dfs -put file2.txt /union_input2

```
[cloudera@quickstart Desktop]$ mkdir -p union_classes
[cloudera@quickstart Desktop]$ javac -classpath `hadoop classpath` -d union_clas
ses UnionMapper.java UnionReducer.java UnionDriver.java
[cloudera@quickstart Desktop]$ ls union_classes
UnionDriver.class  UnionMapper.class  UnionReducer.class
[cloudera@quickstart Desktop]$ jar -cvf union.jar -C union_classes/ .
added manifest
adding: UnionMapper.class(in = 1474) (out= 637)(deflated 56%)
adding: UnionDriver.class(in = 1737) (out= 887)(deflated 48%)
adding: UnionReducer.class(in = 1263) (out= 488)(deflated 61%)
[cloudera@quickstart Desktop]$ jar tf union.jar
META-INF/
META-INF/MANIFEST.MF
UnionMapper.class
UnionDriver.class
UnionReducer.class
[cloudera@quickstart Desktop]$ hadoop jar union.jar UnionDriver /union_input/ufi
le1.txt /union_input/ufile2.txt /union_output
25/09/06 05:19:55 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0
:8032
```

Step 6 – Run MapReduce Job

hadoop jar /home/cloudera/union.jar UnionDriver /union_input1 /union_input2 /union_output

If output folder already exists:

hdfs dfs -rm -r /union_output

then re-run the job.

```
[cloudera@quickstart Desktop]$ hadoop jar union.jar UnionDriver /union_input/ufi
le1.txt /union_input/ufile2.txt /union_output
25/09/06 05:19:55 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0
:8032
25/09/06 05:19:58 WARN mapreduce.JobResourceUploader: Hadoop command-line option
 parsing not performed. Implement the Tool interface and execute your applicatio
n with ToolRunner to remedy this.
25/09/06 05:19:59 INFO input.FileInputFormat: Total input paths to process : 2
25/09/06 05:19:59 INFO mapreduce.JobSubmitter: number of splits:2
25/09/06 05:20:00 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_17
57159799958_0001
```

Step 7 – View Output

hdfs dfs -cat /union_output/part-r-00000

Expected Output:

```
[cloudera@quickstart Desktop]$ hdfs dfs -cat /union_output/part-r-00000
CopyEdit
apple
banana
bash
cherry
date
nginx
[cloudera@quickstart Desktop]$ s
```

PRACTICAL NO: 3

TO UNDERSTAND THE USE OF MAPREDUCE FOR INTERACTION AND MATRIX OPERATIONS

PRACTICAL NO: 3

TO UNDERSTAND THE USE OF MAPREDUCE FOR INTERACTION AND MATRIX OPERATIONS

Question a) Write a program in Map Reduce for Intersection operation.

Objective:
To write and execute a Hadoop MapReduce program in Java to perform an **Intersection operation** on two datasets and display common records.

Software Used:

- Cloudera VM 5.13.0
- Eclipse Luna (pre-installed)
- Hadoop 2.6.0 (CDH 5.13.0)

Algorithm / Procedure:

Step 1 – Create New Java Project
Open Eclipse Luna
File → New → Java Project
Project Name: Intersection
Finish

Step 2 – Add Hadoop JAR Libraries
Add the following libraries (same as before):

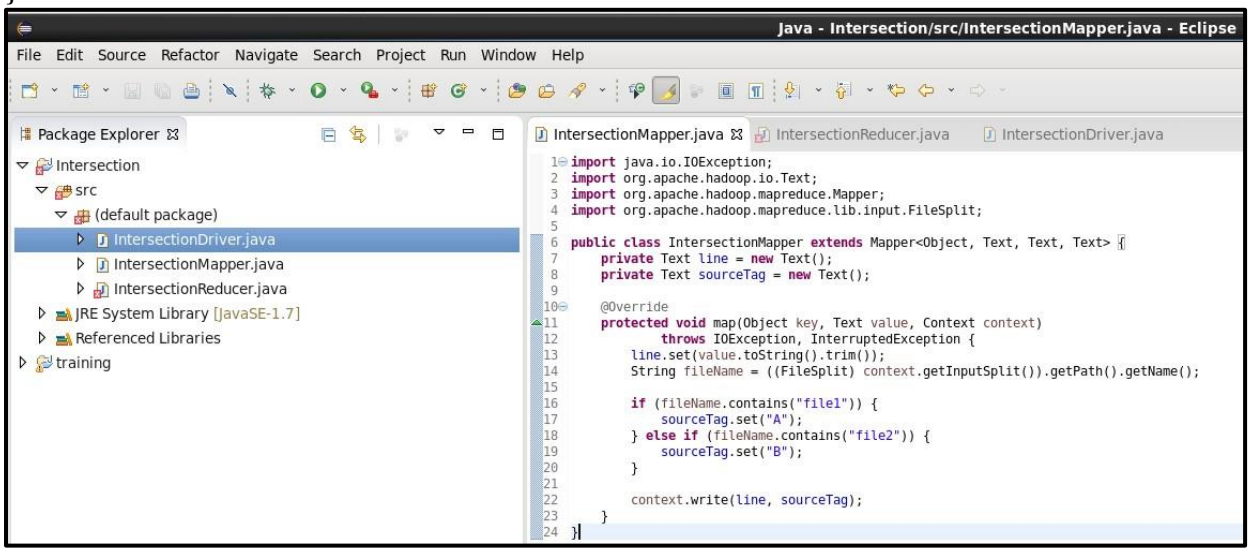
```
/usr/lib/hadoop/*.jar
/usr/lib/hadoop-mapreduce/*.jar
/usr/lib/hadoop-hdfs/*.jar
/usr/lib/hadoop-yarn/*.jar
/usr/lib/hadoop/common/*.jar
```

Then click **Apply and Close.**

Step 3 – Create 3 Java Files inside src folder

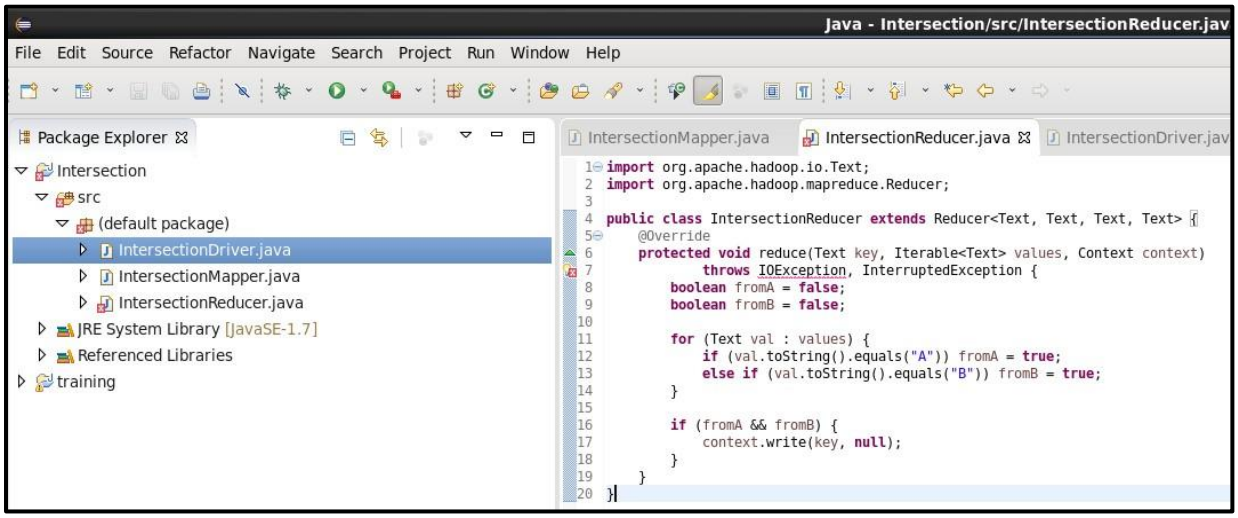
IntersectionMapper.java

```
import java.io.IOException;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.lib.input.FileSplit;

public class IntersectionMapper extends Mapper<Object, Text, Text, Text> {
   private Text line = new Text();
   private Text sourceTag = new Text();

   @Override
   protected void map(Object key, Text value, Context context)
         throws IOException, InterruptedException {
      line.set(value.toString().trim());
      String fileName = ((FileSplit) context.getInputSplit()).getPath().getName();

      if (fileName.contains("file1")) {
         sourceTag.set("A");
      } else if (fileName.contains("file2")) {
         sourceTag.set("B");
      }

      context.write(line, sourceTag);
   }
}
```



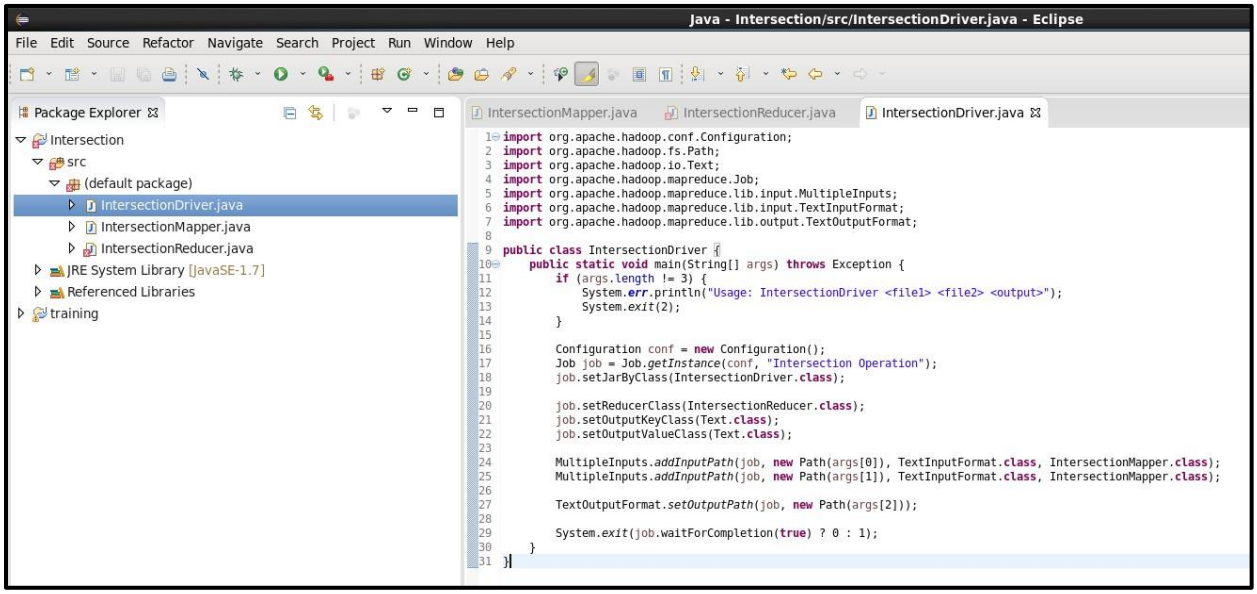
IntersectionReducer.java

```
import java.io.IOException;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;

public class IntersectionReducer extends Reducer<Text, Text, Text, Text> {
   @Override
   protected void reduce(Text key, Iterable<Text> values, Context context)
         throws IOException, InterruptedException {
      boolean fromA = false;
      boolean fromB = false;

      for (Text val : values) {
         if (val.toString().equals("A")) fromA = true;
         else if (val.toString().equals("B")) fromB = true;
      }

      if (fromA && fromB) {
         context.write(key, null);
      }
   }
}
```



IntersectionDriver.java

```
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.MultipleInputs;
import org.apache.hadoop.mapreduce.lib.input.TextInputFormat;
import org.apache.hadoop.mapreduce.lib.output.TextOutputFormat;

public class IntersectionDriver {
   public static void main(String[] args) throws Exception {
      if (args.length != 3) {
         System.err.println("Usage: IntersectionDriver <file1> <file2> <output>");
         System.exit(2);
      }

      Configuration conf = new Configuration();
      Job job = Job.getInstance(conf, "Intersection Operation");
      job.setJarByClass(IntersectionDriver.class);

      job.setReducerClass(IntersectionReducer.class);
      job.setOutputKeyClass(Text.class);
      job.setOutputValueClass(Text.class);

      MultipleInputs.addInputPath(job, new Path(args[0]), TextInputFormat.class,
IntersectionMapper.class);
      MultipleInputs.addInputPath(job, new Path(args[1]), TextInputFormat.class,
IntersectionMapper.class);

      TextOutputFormat.setOutputPath(job, new Path(args[2]));

      System.exit(job.waitForCompletion(true) ? 0 : 1);
   }
}
```



Step 4 – Export Project as JAR
Right-click project → Export → JAR file
Save as: /home/cloudera/intersection.jar
Finish ✓

Step 5 – Create Input Files and Upload to HDFS

```
echo "apple
banana
orange
mango" > file1.txt

echo "banana
mango
grape" > file2.txt
```

Now create HDFS directories and upload:
hdfs dfs -mkdir /inter_input1
hdfs dfs -mkdir /inter_input2
hdfs dfs -put file1.txt /inter_input1
hdfs dfs -put file2.txt /inter_input2

Step 6 – Run MapReduce Job
hadoop jar /home/cloudera/intersection.jar IntersectionDriver /inter_input1 /inter_input2 /inter_output

Step 7 – View Output
hdfs dfs -cat /inter_output/part-r-00000

Expected Output:

```
[cloudera@quickstart Desktop]$ hdfs dfs -cat /inter_output/part-r-00000

banana
mango
[cloudera@quickstart Desktop]$
```

Question b) Write a program in Map Reduce for Matrix Multiplication

Objective:
To write and execute a Hadoop MapReduce program in Java to perform **Matrix Multiplication (C = A × B)** where:

- Matrix A has dimensions $m \times n$
- Matrix B has dimensions $n \times p$
- The resultant Matrix C has dimensions $m \times p$

Software Used:

- Cloudera VM 5.13.0
- Eclipse Luna (pre-installed)
- Hadoop 2.6.0 (CDH 5.13.0)

Algorithm / Logic
Input Format:
Each line of input represents one matrix element.
A,i,k,value
B,k,j,value
A/B → Matrix identifier
i, k, j → Indices
value → Numeric value

Mapper Logic:

- For every element in **A**, emit (i,j) for all possible columns j of **B** → (A,k,value)
- For every element in **B**, emit (i,j) for all possible rows i of **A** → (B,k,value)

Reducer Logic:

- Joins A and B records on same k (column of A = row of B)
- Computes
- C[i][j] = Σ (A[i][k] × B[k][j])

Driver Logic:

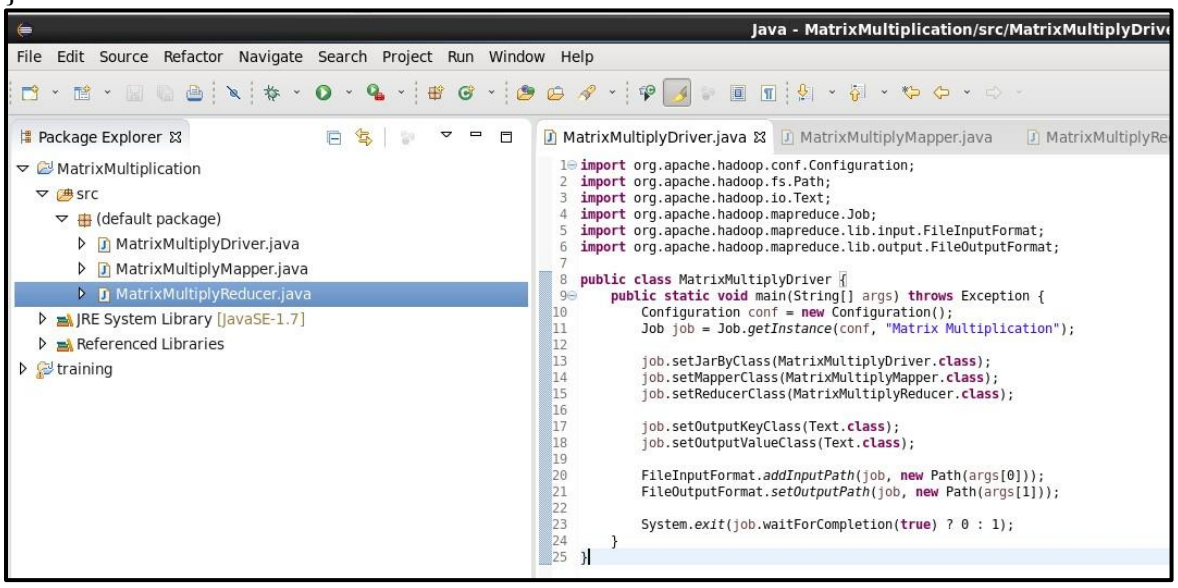
- Configures Mapper and Reducer
- Sets input and output paths
- Submits and executes the job

Step 1 – Create Eclipse Project
Open Eclipse Luna →
File → New → Java Project → Name it: MatrixMultiplication → Finish ✓

Step 2 – Create 3 Java Files inside src folder

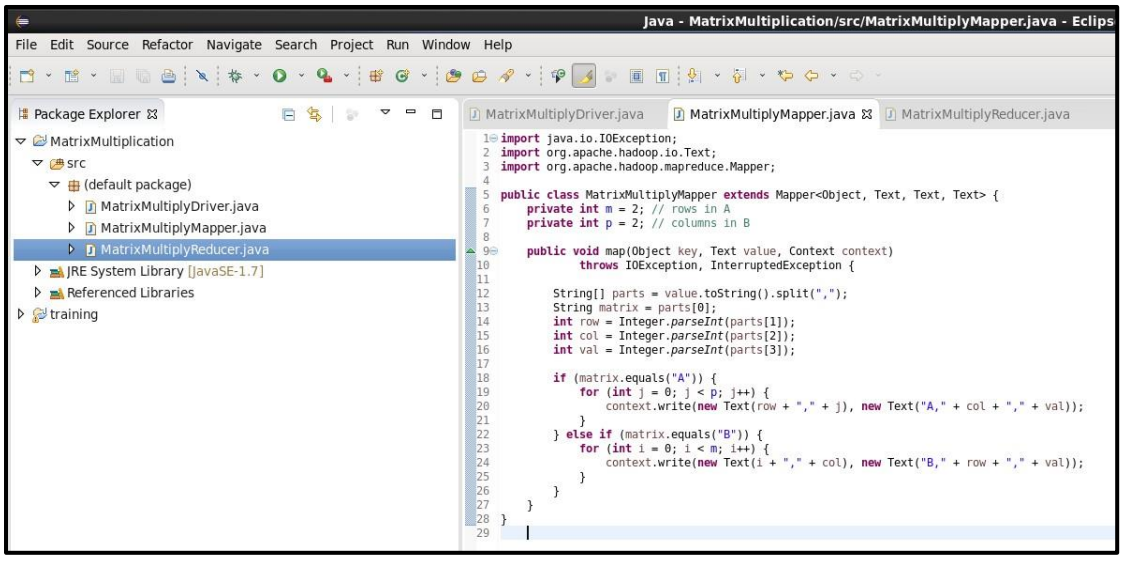
MatrixMultiplyDriver.java

```
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;

public class MatrixMultiplyDriver {
   public static void main(String[] args) throws Exception {
      Configuration conf = new Configuration();
      Job job = Job.getInstance(conf, "Matrix Multiplication");

      job.setJarByClass(MatrixMultiplyDriver.class);
      job.setMapperClass(MatrixMultiplyMapper.class);
      job.setReducerClass(MatrixMultiplyReducer.class);

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

      FileInputFormat.addInputPath(job, new Path(args[0]));
      FileOutputFormat.setOutputPath(job, new Path(args[1]));

      System.exit(job.waitForCompletion(true) ? 0 : 1);
   }
}
```



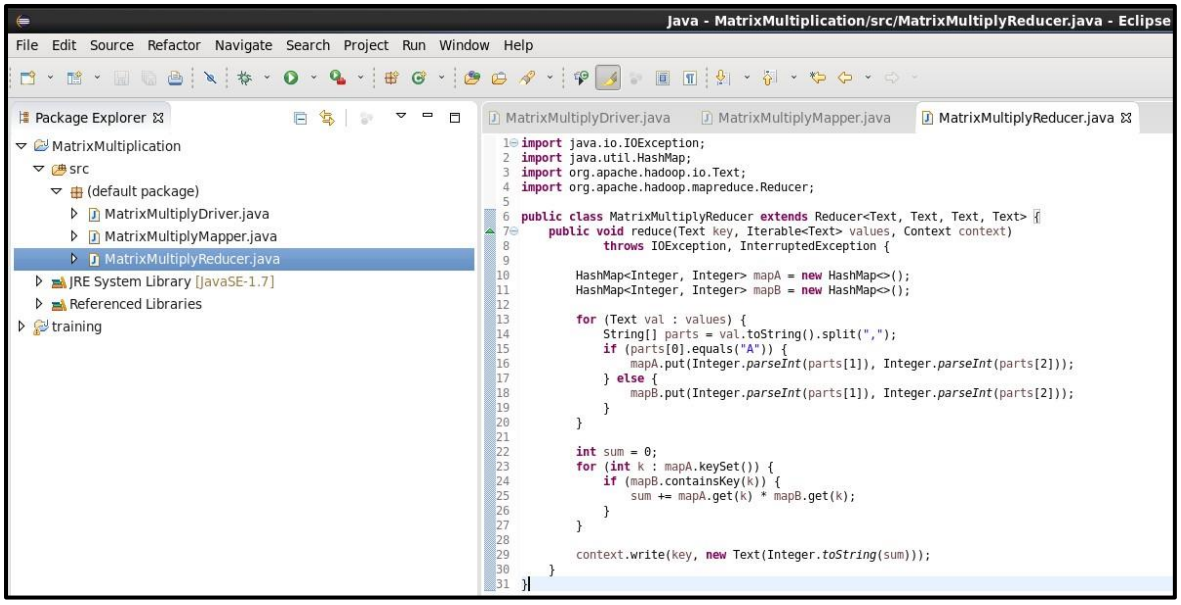
MatrixMultiplyMapper.java

```
import java.io.IOException;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;

public class MatrixMultiplyMapper extends Mapper<Object, Text, Text, Text> {
   private int m = 2; // rows in A
   private int p = 2; // columns in B
   public void map(Object key, Text value, Context context)
         throws IOException, InterruptedException {

      String[] parts = value.toString().split(",");
      String matrix = parts[0];
      int row = Integer.parseInt(parts[1]);
      int col = Integer.parseInt(parts[2]);
      int val = Integer.parseInt(parts[3]);
      if (matrix.equals("A")) {
         for (int j = 0; j < p; j++) {
            context.write(new Text(row + "," + j), new Text("A," + col + "," + val));
         }
      } else if (matrix.equals("B")) {
         for (int i = 0; i < m; i++) {
            context.write(new Text(i + "," + col), new Text("B," + row + "," + val));
         }
      }
   }}
```



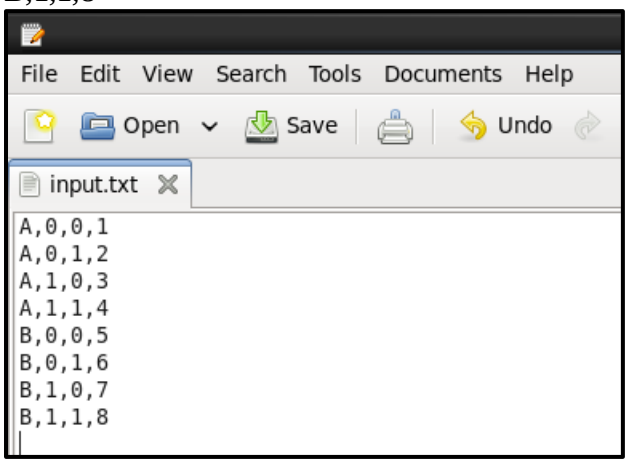
MatrixMultiplyReducer.java

```
import java.io.IOException;
import java.util.HashMap;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;

public class MatrixMultiplyReducer extends Reducer<Text, Text, Text, Text> {
   public void reduce(Text key, Iterable<Text> values, Context context)
         throws IOException, InterruptedException {

      HashMap<Integer, Integer> mapA = new HashMap<>();
      HashMap<Integer, Integer> mapB = new HashMap<>();

      for (Text val : values) {
         String[] parts = val.toString().split(",");
         if (parts[0].equals("A")) {
            mapA.put(Integer.parseInt(parts[1]), Integer.parseInt(parts[2]));
         } else {
            mapB.put(Integer.parseInt(parts[1]), Integer.parseInt(parts[2]));
         }
      }

      int sum = 0;
      for (int k : mapA.keySet()) {
         if (mapB.containsKey(k)) {
            sum += mapA.get(k) * mapB.get(k);
         }
      }

      context.write(key, new Text(Integer.toString(sum)));
   }
}
```



Step 3 – Export as JAR
Right-click project → Export → JAR file
Save as: /home/cloudera/matrixmul.jar
Finish ✅

Step 4 – Prepare Input Data
Create input.txt:
A,0,0,1
A,0,1,2
A,1,0,3
A,1,1,4
B,0,0,5
B,0,1,6
B,1,0,7
B,1,1,8



Upload to HDFS:
hdfs dfs -mkdir /matrix_input
hdfs dfs -put input.txt /matrix_input

Step 5 – Run the MapReduce Job
hadoop jar /home/cloudera/matrixmul.jar MatrixMultiplyDriver /matrix_input /matrix_output
then re-run the job.

Step 6 – View Output
hdfs dfs -cat /matrix_output/part-r-00000
Expected Output:

```
[cloudera@quickstart Desktop]$ hdfs dfs -cat /matrix_output/part-r-00000
0,0     19
0,1     22
1,0     43
1,1     50
[cloudera@quickstart Desktop]$
```

PRACTICAL NO: 4

TO GET FAMILIAR WITH MONGODB

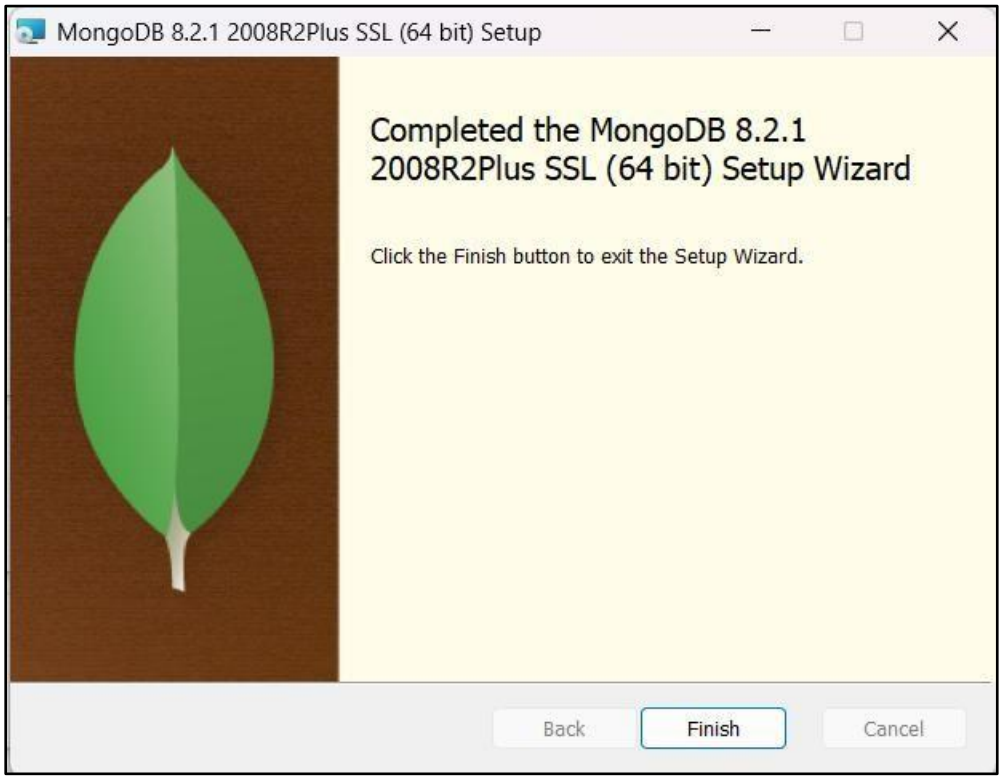
PRACTICAL NO: 4
TO GET FAMILIAR WITH MONGODB

Question a) Installation

1. Installation of MongoDB

Steps:

1. Download and install **MongoDB Server** from the official website.
2. Install **MongoDB Shell (mongosh)** for command-line interaction.
3. Start the MongoDB service and open mongosh from CMD or PowerShell.



Command:

mongosh

```
C:\Windows\System32>mongosh
Current Mongosh Log ID: 69015d850bff9ca894cebea3
Connecting to:          mongodb://127.0.0.1:27017/?directConnection=true&serverSelectionTimeoutMS=2000&appName=mongosh+2.5.8
Using MongoDB:          8.2.1
Using Mongosh:          2.5.8

For mongosh info see: https://www.mongodb.com/docs/mongodb-shell/

------
   The server generated these startup warnings when booting
   2025-10-29T05:38:25.686+05:30: Access control is not enabled for the database. Read and write access to data and configuration is unrestricted
------
```

Question b) Sample Database Creation

Commands:
use sampleDB
This command creates and switches to a new database named sampleDB.
db.createCollection("students")
Creates a new collection named students.

```
test> use sampleDB
switched to db sampleDB
sampleDB> db.createCollection("students")
{ ok: 1 }
```

Insert Sample Data into Collection
Commands:
db.students.insertMany([
{ name: "Lathika", age: 23, course: "MCA", city: "Navi Mumbai" },
{ name: "Priya", age: 22, course: "BCA", city: "Mumbai" },
{ name: "Rohan", age: 24, course: "MSc", city: "Thane" }
])

```
sampleDB> db.students.insertMany([
...   { name: "Lathika", age: 23, course: "MCA", city: "Navi Mumbai" },
...   { name: "Priya", age: 22, course: "BCA", city: "Mumbai" },
...   { name: "Rohan", age: 24, course: "MSc", city: "Thane" }
... ])
{
  acknowledged: true,
  insertedIds: {
    '0': ObjectId('69015dd60bff9ca894cebea4'),
    '1': ObjectId('69015dd60bff9ca894cebea5'),
    '2': ObjectId('69015dd60bff9ca894cebea6')
  }
}
```

Question c) Query the Sample Database using MongoDB querying commands

Display All Documents:
db.students.find()

```
sampleDB> db.students.find()
[
  {
    _id: ObjectId('69015dd60bff9ca894cebea4'),
    name: 'Lathika',
    age: 23,
    course: 'MCA',
    city: 'Navi Mumbai'
  },
  {
    _id: ObjectId('69015dd60bff9ca894cebea5'),
    name: 'Priya',
    age: 22,
    course: 'BCA',
    city: 'Mumbai'
  },
  {
    _id: ObjectId('69015dd60bff9ca894cebea6'),
    name: 'Rohan',
    age: 24,
    course: 'MSc',
    city: 'Thane'
  }
]
```

Filter Query (Example):
db.students.find({ city: "Mumbai" })

```
sampleDB> db.students.find({ city: "Mumbai" })
[
  {
    _id: ObjectId('69015dd60bff9ca894cebea5'),
    name: 'Priya',
    age: 22,
    course: 'BCA',
    city: 'Mumbai'
  }
]
```

Sorting (Ascending by Age):
db.students.find().sort({ age: 1 })

```
sampleDB> db.students.find().sort({ age: 1 })
[
  {
    _id: ObjectId('69015dd60bff9ca894cebea5'),
    name: 'Priya',
    age: 22,
    course: 'BCA',
    city: 'Mumbai'
  },
  {
    _id: ObjectId('69015dd60bff9ca894cebea4'),
    name: 'Lathika',
    age: 23,
    course: 'MCA',
    city: 'Navi Mumbai'
  },
  {
    _id: ObjectId('69015dd60bff9ca894cebea6'),
    name: 'Rohan',
    age: 24,
    course: 'MSc',
    city: 'Thane'
  }
]
```

5. Update a Document
Command:
db.students.updateOne(
{ name: "Lathika" },
{ $set: { city: "Panvel" } }
)

```
sampleDB> db.students.updateOne(
...   { name: "Lathika" },
...   { $set: { city: "Panvel" } }
... )
...
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
```

6. Delete a Document
Command:
db.students.deleteOne({ name: "Rohan" })

```
sampleDB> db.students.deleteOne({ name: "Rohan" })
{ acknowledged: true, deletedCount: 1 }
sampleDB>
```

7. Display Total Number of Documents
Command:
db.students.countDocuments()

```
sampleDB> db.students.deleteOne({ name: "Rohan" })
{ acknowledged: true, deletedCount: 1 }
sampleDB> db.students.countDocuments()
2
```

8. Drop the Collection (Optional)
Command:
db.students.drop()

```
sampleDB> db.students.drop()
true
```

PRACTICAL NO: 5

TO WORK WITH THE VARIOUS CRUD OPERATIONS USING MONGODB

PRACTICAL NO: 5
TO WORK WITH THE VARIOUS CRUD OPERATIONS USING MONGODB

Question a) Create Collection

1. create a database named salesdb and switch to salesdb
2. We have two collections namely sales and sales_profile. Let us populate them. First run a query to insert data in sales_profile.

```
test> use salesdb;
switched to db salesdb
salesdb> db.sales_profile.insertMany([
... { id:1,invoice_no:"750-67-8428", card:"Member", gender:"Female"} ,
... { id:2,invoice_no:"226-31-3081", card:"Normal", gender:"Female"} ,
... { id:3,invoice_no:"631-41-3108", card:"Normal", gender:"Male"} ,
... { id:4,invoice_no:"123-19-1176", card:"Member", gender:"Male"} ,
... { id:5,invoice_no:"373-73-7910", card:"Normal", gender:"Male"} ])
{
  acknowledged: true,
  insertedIds: {
    '0': ObjectId("633896ee748becd9a0a5da6c"),
    '1': ObjectId("633896ee748becd9a0a5da6d"),
    '2': ObjectId("633896ee748becd9a0a5da6e"),
    '3': ObjectId("633896ee748becd9a0a5da6f"),
    '4': ObjectId("633896ee748becd9a0a5da70")
  }
```

Question b) Insert Document

```
test> use salesdb;
switched to db salesdb
salesdb> db.sales_profile.insertMany([
... { id:1,invoice_no:"750-67-8428", card:"Member", gender:"Female"} ,
... { id:2,invoice_no:"226-31-3081", card:"Normal", gender:"Female"} ,
... { id:3,invoice_no:"631-41-3108", card:"Normal", gender:"Male"} ,
... { id:4,invoice_no:"123-19-1176", card:"Member", gender:"Male"} ,
... { id:5,invoice_no:"373-73-7910", card:"Normal", gender:"Male"} ])
{
  acknowledged: true,
  insertedIds: {
    '0': ObjectId("633896ee748becd9a0a5da6c"),
    '1': ObjectId("633896ee748becd9a0a5da6d"),
    '2': ObjectId("633896ee748becd9a0a5da6e"),
    '3': ObjectId("633896ee748becd9a0a5da6f"),
    '4': ObjectId("633896ee748becd9a0a5da70")
  }
```

Question c) Query Document

```
Select C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19044.2130]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Lab1-89\Downloads\mongodb-database-tools-windows-x86_64-100.6.1\bin>mongoimport --db=salesdb --collection=sales --type=csv --headerline --file=sales_profile.csv
2022-11-14T11:52:07.541+0530    connected to: mongodb://localhost/
2022-11-14T11:52:07.892+0530    2823 document(s) imported successfully. 0 document(s) failed to import.

C:\Users\Lab1-89\Downloads\mongodb-database-tools-windows-x86_64-100.6.1\bin>
```

Find data query
Query : db.sales.find()

```
mongosh mongodb://localhost:27017/?directConnection=true&serverSelectionTimeoutMS=2000

salesdb> db.sales.find()
[
  {
    _id: ObjectId("6371de8f8976cbf6d0144748"),
    ORDERNUMBER: 10107,
    QUANTITYORDERED: 30,
    PRICEEACH: 95.7,
    ORDERLINENUMBER: 2,
    SALES: 2871,
    ORDERDATE: '2/24/2003 0:00',
    STATUS: 'Shipped',
    QTR_ID: 1,
    MONTH_ID: 2,
    YEAR_ID: 2003,
    PRODUCTLINE: 'Motorcycles',
    MSRP: 95,
    PRODUCTCODE: 'S10_1678',
    CUSTOMERNAME: 'Land of Toys Inc.',
    PHONE: 2125557818,
    ADDRESSLINE1: '897 Long Airport Avenue',
    ADDRESSLINE2: '',
    CITY: 'NYC',
    STATE: 'NY',
    POSTALCODE: 10022,
    COUNTRY: 'USA',
    TERRITORY: 'NA',
    CONTACTLASTNAME: 'Yu',
    CONTACTFIRSTNAME: 'Kwai',
    DEALSIZE: 'Small'
```

db.sales.find({ CITY : "Salzburg" , STATUS :"Shipped"}).limit(5)

```
mongosh mongodb://localhost:27017/?directConnection=true&serverSelectionTimeoutMS=2000
salesdb> db.sales.find( { CITY : "Salzburg"  , STATUS :"Shipped"}).limit(5)
[
  {
    _id: ObjectId("6371de8f8976cbf6d014475b"),
    ORDERNUMBER: 10341,
    QUANTITYORDERED: 41,
    PRICEEACH: 100,
    ORDERLINENUMBER: 9,
    SALES: 7737.93,
    ORDERDATE: '11/24/2004 0:00',
    STATUS: 'Shipped',
    QTR_ID: 4,
    MONTH_ID: 11,
    YEAR_ID: 2004,
    PRODUCTLINE: 'Motorcycles',
    MSRP: 95,
    PRODUCTCODE: 'S10_1678',
    CUSTOMERNAME: 'Salzburg Collectables',
    PHONE: '6562-9555',
    ADDRESSLINE1: 'Geislweg 14',
    ADDRESSLINE2: '',
    CITY: 'Salzburg',
    STATE: '',
    POSTALCODE: 5020,
    COUNTRY: 'Austria',
    TERRITORY: 'EMEA',
    CONTACTLASTNAME: 'Pipps',
    CONTACTFIRSTNAME: 'Georg',
    DEALSIZE: 'Large'
  },
```

Find data using greater than condition
db.sales.find({QUANTITYORDERED: { $gt:33 }, PRICEEACH: { $gt:33 }}, { CITY : "Salzburg" , STATUS :"Shipped"}).limit(5)

```
mongosh mongodb://localhost:27017/?directConnection=true&serverSelectionTimeoutMS=2000
salesdb> db.sales.find( {QUANTITYORDERED: { $gt:33 }, PRICEEACH: { $gt:33 }}, { CITY : "Salzburg" , STATUS :"Shipped"}).limit(5)
[
  {
    _id: ObjectId("6371de8f8976cbf6d0144749"),
    STATUS: 'Shipped',
    CITY: 'Reims'
  },
  {
    _id: ObjectId("6371de8f8976cbf6d014474a"),
    STATUS: 'Shipped',
    CITY: 'Paris'
  },
  {
    _id: ObjectId("6371de8f8976cbf6d014474b"),
    STATUS: 'Shipped',
    CITY: 'Pasadena'
  },
```

Question d) Delete Document

Update document
db.sales.updateMany({ CITY : “Salzburg”}, { $set :{ CITY:”MUMBAI” }})

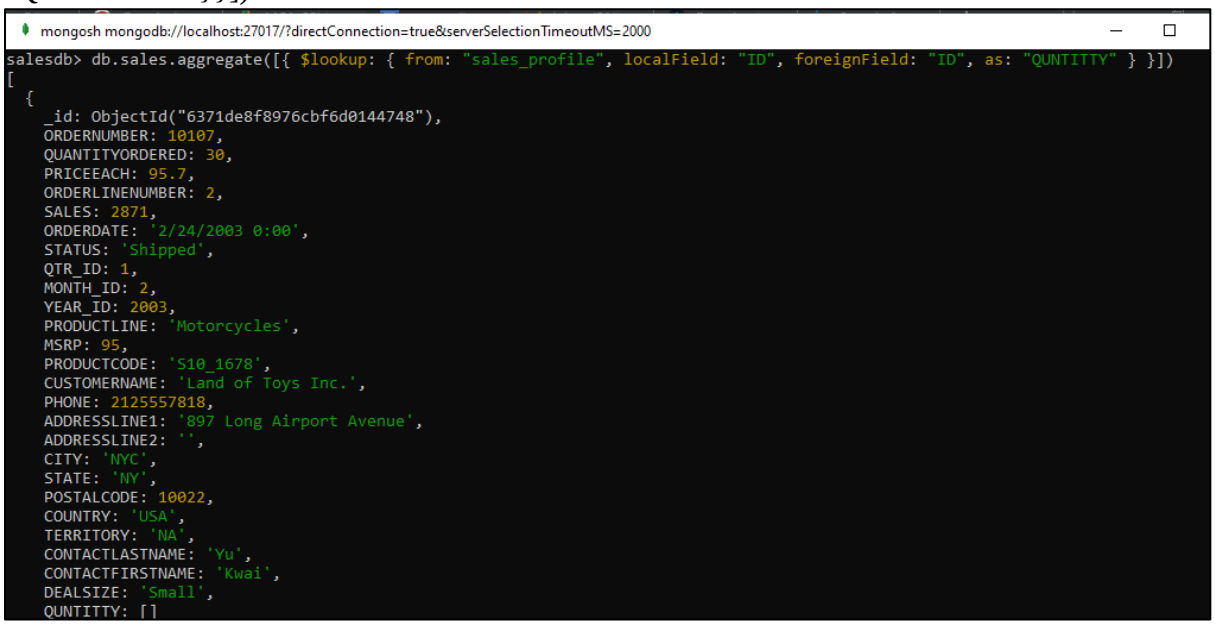
```
salesdb> db.sales.updateMany( { CITY : "Salzburg"},
...   { $set :{ CITY:"MUMBAI"}})
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 40,
  modifiedCount: 40,
  upsertedCount: 0
}
salesdb>
```

Delete document
db.sales.deleteOne({CITY : “MUMBAI” })

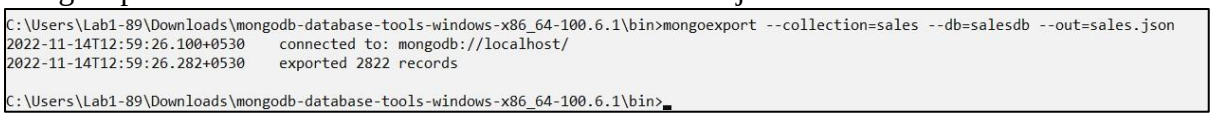
```
salesdb> db.sales.deleteOne({CITY: "MUMBAI"})
{ acknowledged: true, deletedCount: 1 }
salesdb>
```

Question e) Indexing

Aggregate function
db.sales.aggregate([{ $lookup: {from: "sales_profile",localField: "ID", foreignField: "ID", as: "QUNTITTY" }}])



9. Extract the salesdb database in json
mongoexport --collection=sales --db=salesdb --out=sales.json



PRACTICAL NO: 6

TO UNDERTAND THE CONCEPTS OF HIVEQL

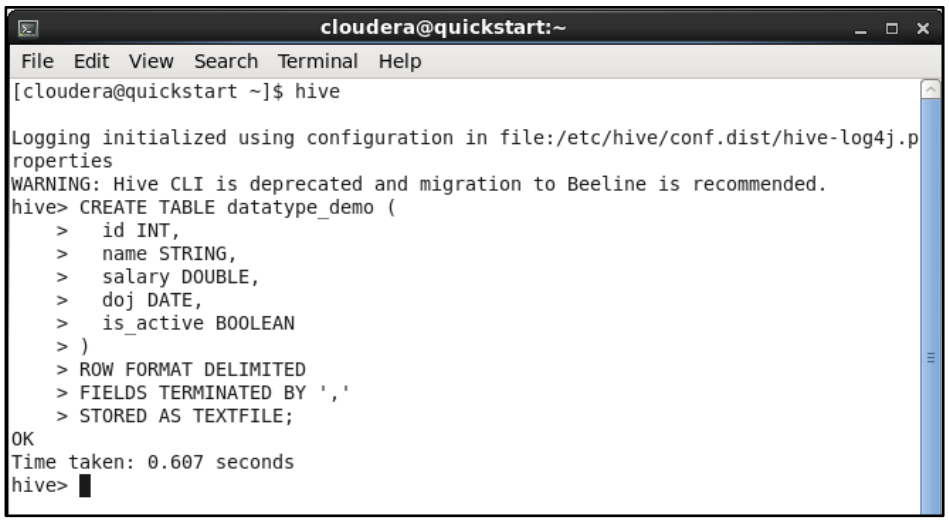
PRACTICAL NO: 6
TO UNDERTAND THE CONCEPTS OF HIVEQL

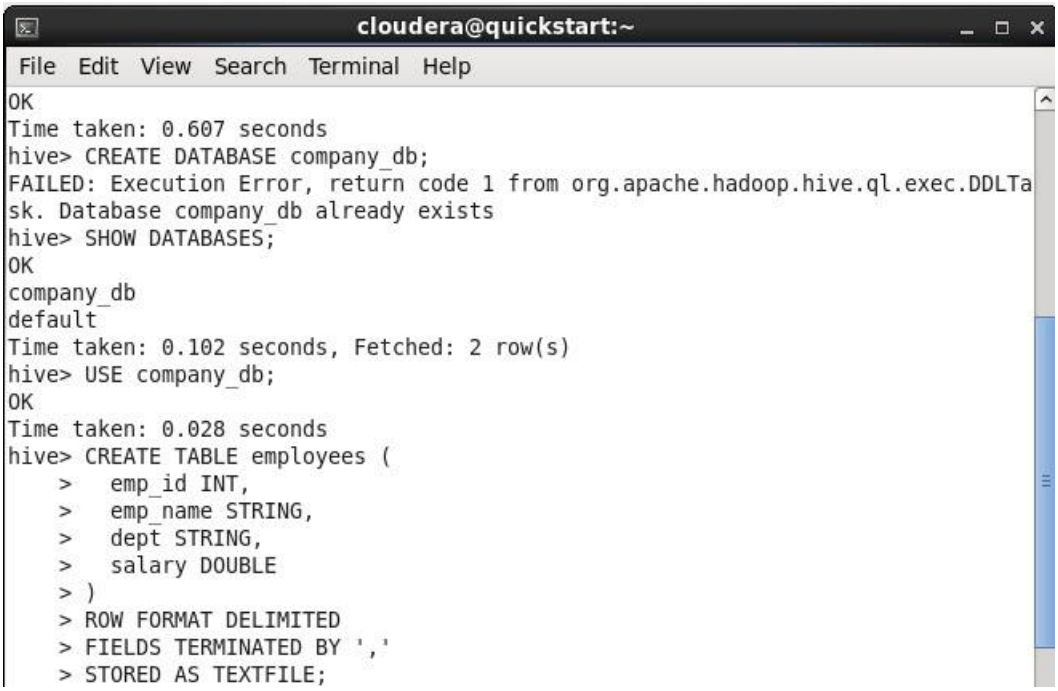
Question a) Hive Data Types

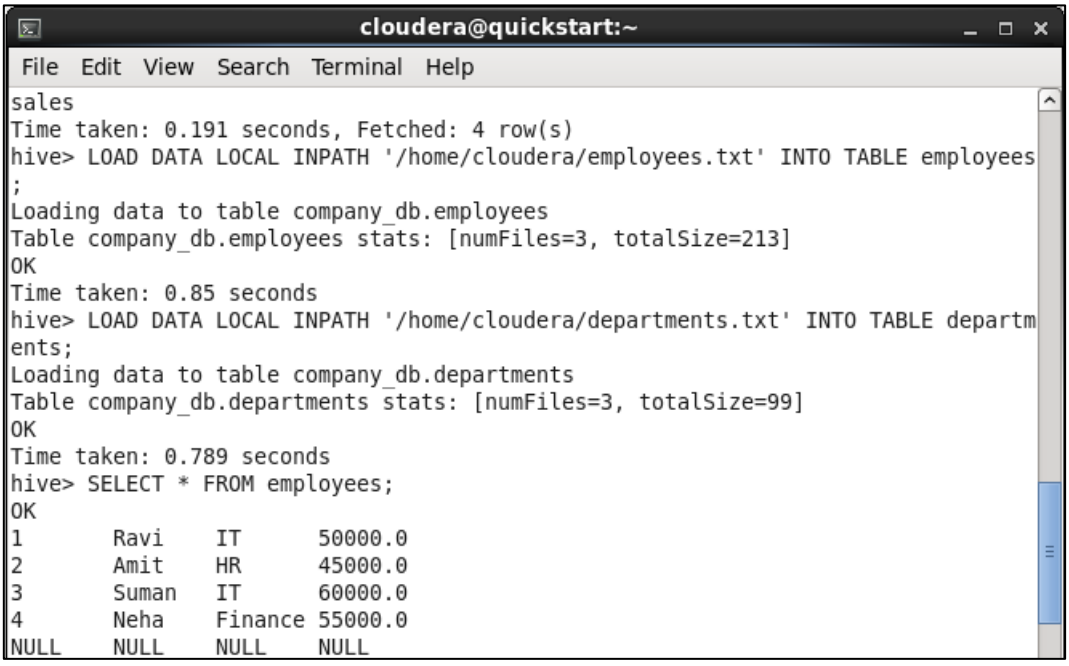
Apache Hive Practical Journal
Environment: Cloudera 5.13.0 (VMware)
Tool: Apache Hive

Setup: Opening Hive Shell
1. Start your Cloudera VM in VMware.
2. Open the terminal on the Cloudera desktop and type:
hiv
This command opens the Hive shell. The prompt will look like this: hive>
1. Hive Data Types
Common Hive Data Types:
• Numeric: TINYINT, INT, BIGINT, FLOAT, DOUBLE
• String: STRING, VARCHAR(n), CHAR(n)
• Date/Time: DATE, TIMESTAMP
• Misc: BOOLEAN, ARRAY, MAP, STRUCT

Example:
```
>CREATE TABLE datatype_demo (
>  id INT,
>  name STRING,
>  salary DOUBLE,
>  doj DATE,
>  is_active BOOLEAN
>)
>ROW FORMAT DELIMITED
>FIELDS TERMINATED BY ','
>STORED AS TEXTFILE;
```

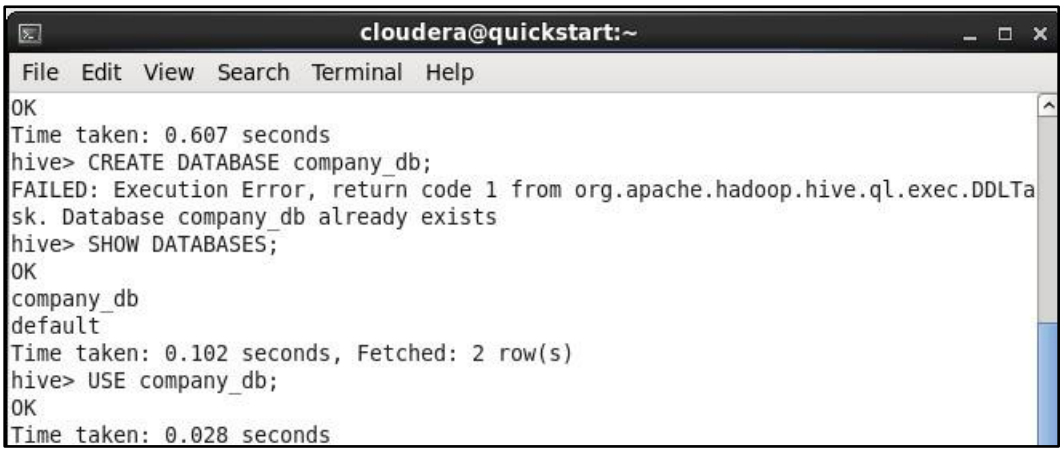



cloudera@quickstart:~
File Edit View Search Terminal Help
OK
Time taken: 0.607 seconds
hive> CREATE DATABASE company_db;
FAILED: Execution Error, return code 1 from org.apache.hadoop.hive.ql.exec.DDLTa
sk. Database company_db already exists
hive> SHOW DATABASES;
OK
company_db
default
Time taken: 0.102 seconds, Fetched: 2 row(s)
hive> USE company_db;
OK
Time taken: 0.028 seconds
hive> CREATE TABLE employees (
> emp_id INT,
> emp_name STRING,
> dept STRING,
> salary DOUBLE
>)
> ROW FORMAT DELIMITED
> FIELDS TERMINATED BY ','
> STORED AS TEXTFILE;


cloudera@quickstart:~
File Edit View Search Terminal Help
sales
Time taken: 0.191 seconds, Fetched: 4 row(s)
hive> LOAD DATA LOCAL INPATH '/home/cloudera/employees.txt' INTO TABLE employees
;
Loading data to table company_db.employees
Table company_db.employees stats: [numFiles=3, totalSize=213]
OK
Time taken: 0.85 seconds
hive> LOAD DATA LOCAL INPATH '/home/cloudera/departments.txt' INTO TABLE departm
ents;
Loading data to table company_db.departments
Table company_db.departments stats: [numFiles=3, totalSize=99]
OK
Time taken: 0.789 seconds
hive> SELECT * FROM employees;
OK
1 Ravi IT 50000.0
2 Amit HR 45000.0
3 Suman IT 60000.0
4 Neha Finance 55000.0
NULL NULL NULL NULL

Question b) Create Database & Table in Hive

2. Create Database and Table
Create Database:
>CREATE DATABASE company_db;
>SHOW DATABASES;
>USE company_db;



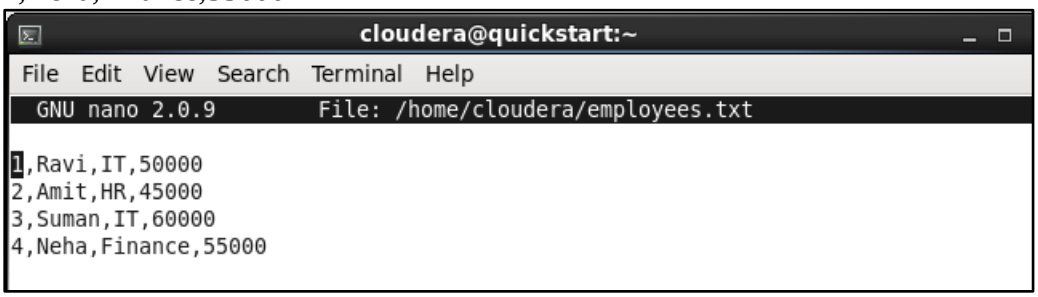
Create Table:

```
CREATE TABLE employees (
  emp_id INT,
  emp_name STRING,
  dept STRING,
  salary DOUBLE
)
ROW FORMAT DELIMITED
FIELDS TERMINATED BY ','
STORED AS TEXTFILE;
```

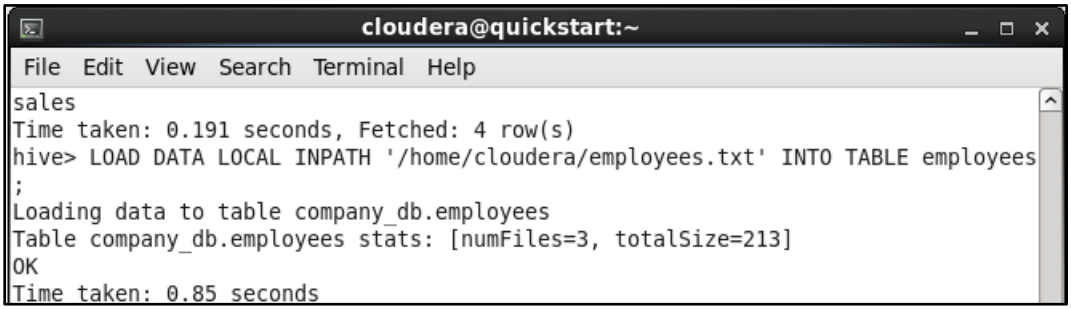
```
Time taken: 0.028 seconds
hive> CREATE TABLE employees (
    >   emp_id INT,
    >   emp_name STRING,
    >   dept STRING,
    >   salary DOUBLE
    > )
    > ROW FORMAT DELIMITED
    > FIELDS TERMINATED BY ','
    > STORED AS TEXTFILE;
```

Load Data:
Create a local file in terminal:
nano /home/cloudera/employees.txt

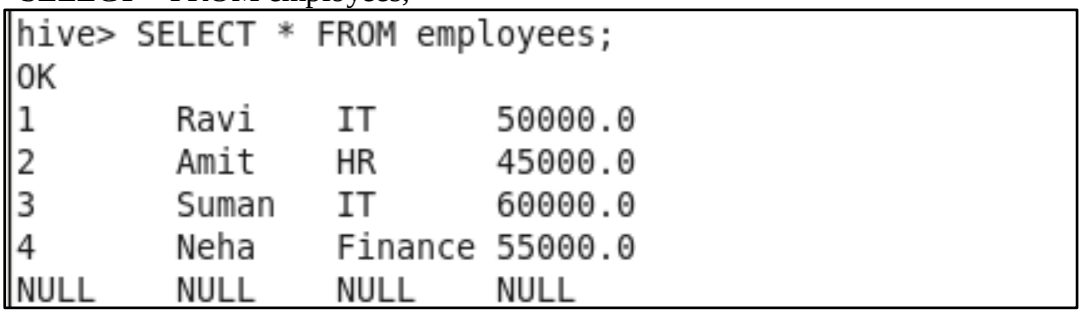
Add the following data:
1,Ravi,IT,50000
2,Amit,HR,45000
3,Suman,IT,60000
4,Neha,Finance,55000



Then execute in Hive:
>LOAD DATA LOCAL INPATH '/home/cloudera/employees.txt' INTO TABLE employees;



>SELECT * FROM employees;



Question c) Hive Partitioning

3. Hive Partitioning
Partitioning helps improve query performance.

Example:

```
CREATE TABLE sales (
  id INT,
  item STRING,
  amount DOUBLE
)
>PARTITIONED BY (year INT, month INT)
>ROW FORMAT DELIMITED
>FIELDS TERMINATED BY ',';
```

```
hive> CREATE TABLE sales (
    >   id INT,
    >   item STRING,
    >   amount DOUBLE
    > )
    > PARTITIONED BY (year INT, month INT)
    > ROW FORMAT DELIMITED
    > FIELDS TERMINATED BY ',';
OK
Time taken: 1.07 seconds
```

>LOAD DATA LOCAL INPATH '/home/cloudera/sales_jan.txt' INTO TABLE sales PARTITION (year=2024, month=1);

```
cloudera@quickstart:~
File  Edit  View  Search  Terminal  Help
    > FIELDS TERMINATED BY ',';
OK
Time taken: 1.07 seconds
hive> LOAD DATA LOCAL INPATH '/home/cloudera/sales_jan.txt' INTO TABLE sales PAR
TITION (year=2024, month=1);
Loading data to table default.sales partition (year=2024, month=1)
Partition default.sales{year=2024, month=1} stats: [numFiles=1, numRows=0, total
Size=38, rawDataSize=0]
OK
Time taken: 1.675 seconds
```

>LOAD DATA LOCAL INPATH '/home/cloudera/sales_feb.txt' INTO TABLE sales PARTITION (year=2024, month=2);

```
hive> LOAD DATA LOCAL INPATH '/home/cloudera/sales_feb.txt' INTO TABLE sales PAR
TITION (year=2024, month=2);
Loading data to table default.sales partition (year=2024, month=2)
Partition default.sales{year=2024, month=2} stats: [numFiles=1, numRows=0, total
Size=32, rawDataSize=0]
OK
Time taken: 0.686 seconds
```

>SHOW PARTITIONS sales;

```
hive>
    > SHOW PARTITIONS sales;
OK
year=2024/month=1
year=2024/month=2
Time taken: 0.248 seconds, Fetched: 2 row(s)
hive>
```

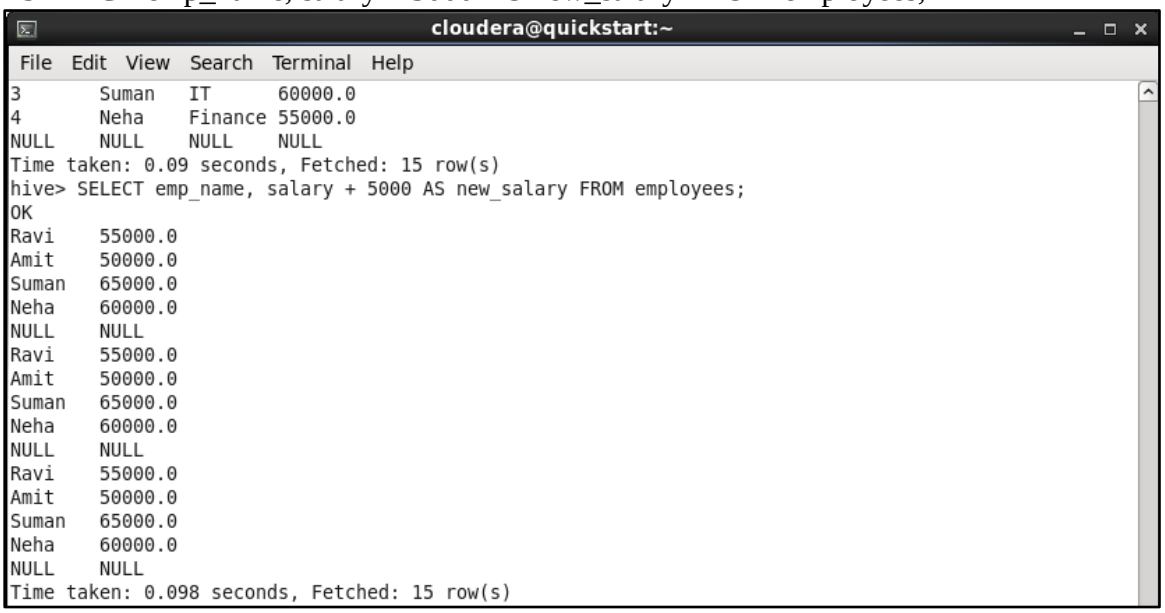
PRACTICAL NO: 7

TO UNDERTAND THE USE OF OPERATORS, FUNCTIONS, VIEWS ETC USING HIVEQL

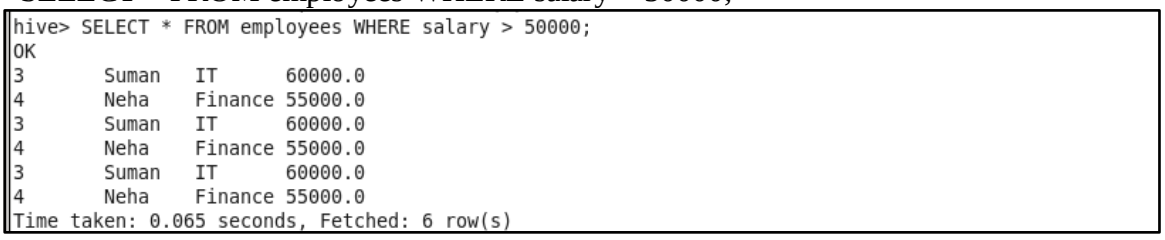
PRACTICAL NO: 7
TO UNDERTAND THE USE OF OPERATORS, FUNCTIONS, VIEWS ETC USING HIVEQL

Question a) Hive Built-In Operators

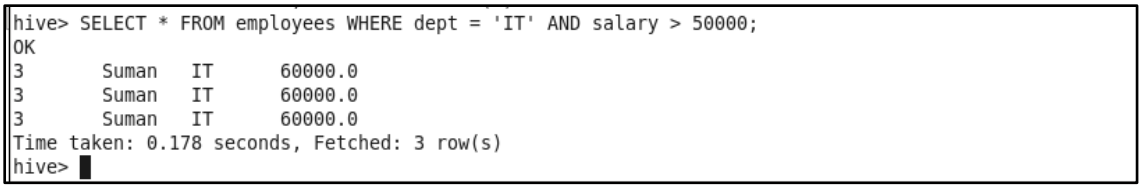
>SELECT emp_name, salary + 5000 AS new_salary FROM employees;



>SELECT * FROM employees WHERE salary > 50000;



>SELECT * FROM employees WHERE dept = 'IT' AND salary > 55000;



Question b) Hive Built-In Functions

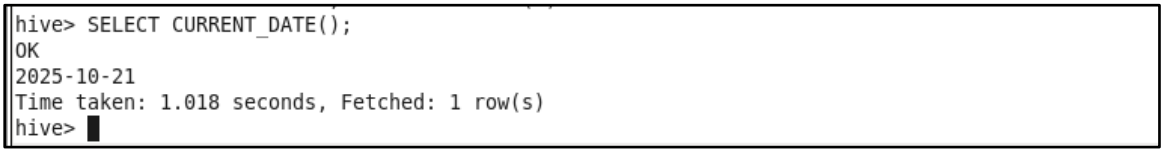
5. Hive Built-in Functions
-- String Functions
>SELECT UPPER(emp_name), LENGTH(emp_name) FROM employees;

```
hive> SELECT UPPER(emp_name), LENGTH(emp_name) FROM employees;
OK
RAVI    4
AMIT    4
SUMAN   5
NEHA    4
NULL    NULL
RAVI    4
AMIT    4
SUMAN   5
NEHA    4
NULL    NULL
RAVI    4
AMIT    4
SUMAN   5
NEHA    4
NULL    NULL
Time taken: 0.878 seconds, Fetched: 15 row(s)
hive>
```

-- Numeric Functions
>SELECT MAX(salary), MIN(salary), AVG(salary) FROM employees;

```
cloudera@quickstart:~
File  Edit  View  Search  Terminal  Help
NULL    NULL
Time taken: 0.878 seconds, Fetched: 15 row(s)
hive> SELECT MAX(salary), MIN(salary), AVG(salary) FROM employees;
Query ID = cloudera_20251021004040_2d5b0599-9633-435e-b6dd-3e1a887306ae
Total jobs = 1
Launching Job 1 out of 1
Number of reduce tasks determined at compile time: 1
In order to change the average load for a reducer (in bytes):
  set hive.exec.reducers.bytes.per.reducer=<number>
In order to limit the maximum number of reducers:
  set hive.exec.reducers.max=<number>
In order to set a constant number of reducers:
  set mapreduce.job.reduces=<number>
Starting Job = job_1761030184232_0001, Tracking URL = http://quickstart.cloudera:8088/proxy/applicati
on_1761030184232_0001/
Kill Command = /usr/lib/hadoop/bin/hadoop job  -kill job_1761030184232_0001
Hadoop job information for Stage-1: number of mappers: 1; number of reducers: 1
2025-10-21 00:40:53,169 Stage-1 map = 0%,  reduce = 0%
2025-10-21 00:41:06,411 Stage-1 map = 100%,  reduce = 0%, Cumulative CPU 3.57 sec
2025-10-21 00:41:15,725 Stage-1 map = 100%,  reduce = 100%, Cumulative CPU 4.79 sec
MapReduce Total cumulative CPU time: 4 seconds 790 msec
Ended Job = job_1761030184232_0001
MapReduce Jobs Launched:
Stage-Stage-1: Map: 1  Reduce: 1   Cumulative CPU: 4.79 sec   HDFS Read: 9656 HDFS Write: 24 SUCCESS
Total MapReduce CPU Time Spent: 4 seconds 790 msec
OK
60000.0 45000.0 52500.0
Time taken: 37.582 seconds, Fetched: 1 row(s)
hive>
```

-- Date Function
>SELECT CURRENT_DATE();



Question c) Hive Views

6. Hive Views
Views are virtual tables created from queries.

CREATE VIEW high_salary AS
SELECT emp_name, dept, salary
FROM employees
WHERE salary > 50000;

>SELECT * FROM high_salary;

```
hive> CREATE VIEW high_salary AS
    > SELECT emp_name, dept, salary
    > FROM employees
    > WHERE salary > 50000;
FAILED: Execution Error, return code 1 from org.apache.hadoop.hive.ql.exec.DDLTask. AlreadyExistsExce
ption(message:Table high_salary already exists)
hive>
    > SELECT * FROM high_salary;
OK
Suman   IT      60000.0
Neha    Finance 55000.0
Suman   IT      60000.0
Neha    Finance 55000.0
Suman   IT      60000.0
Neha    Finance 55000.0
Time taken: 0.362 seconds, Fetched: 6 row(s)
hive>
```

Question d) HiveQL : Select Where, Select OrderBy, Select GroupBy, Select Joins

-- Select + Where Clause
>SELECT * FROM employees WHERE dept = 'IT';

```
hive> SELECT * FROM employees WHERE dept = 'IT';
OK
1       Ravi    IT      50000.0
3       Suman   IT      60000.0
1       Ravi    IT      50000.0
3       Suman   IT      60000.0
1       Ravi    IT      50000.0
3       Suman   IT      60000.0
Time taken: 0.087 seconds, Fetched: 6 row(s)
hive>
```

-- Order By Clause
>SELECT * FROM employees ORDER BY salary DESC;

```
Total MapReduce CPU Time Spent: 3 seconds 930 msec
OK
3       Suman   IT      60000.0
3       Suman   IT      60000.0
3       Suman   IT      60000.0
4       Neha    Finance 55000.0
4       Neha    Finance 55000.0
4       Neha    Finance 55000.0
1       Ravi    IT      50000.0
1       Ravi    IT      50000.0
1       Ravi    IT      50000.0
2       Amit    HR      45000.0
2       Amit    HR      45000.0
2       Amit    HR      45000.0
NULL    NULL    NULL    NULL
NULL    NULL    NULL    NULL
NULL    NULL    NULL    NULL
Time taken: 26.908 seconds, Fetched: 15 row(s)
hive>
```

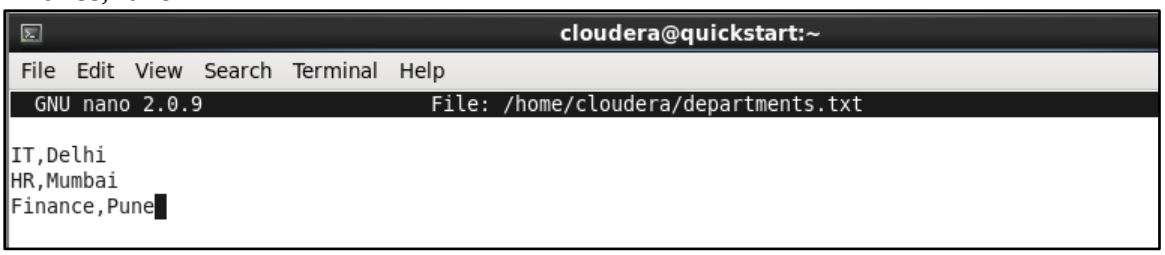
-- Group By Clause
>SELECT dept, AVG(salary) AS avg_sal FROM employees GROUP BY dept;

```
Total MapReduce CPU Time Spent: 3 seconds 120 msec
OK
NULL    NULL
Finance 55000.0
HR      45000.0
IT      55000.0
Time taken: 21.36 seconds, Fetched: 4 row(s)
hive>
```

-- Create and Load Departments Table
CREATE TABLE departments (
  dept STRING,
  location STRING
)
ROW FORMAT DELIMITED
FIELDS TERMINATED BY ','
STORED AS TEXTFILE;

Create local file:
nano /home/cloudera/departments.txt

Add data:
IT,Delhi
HR,Mumbai
Finance,Pune

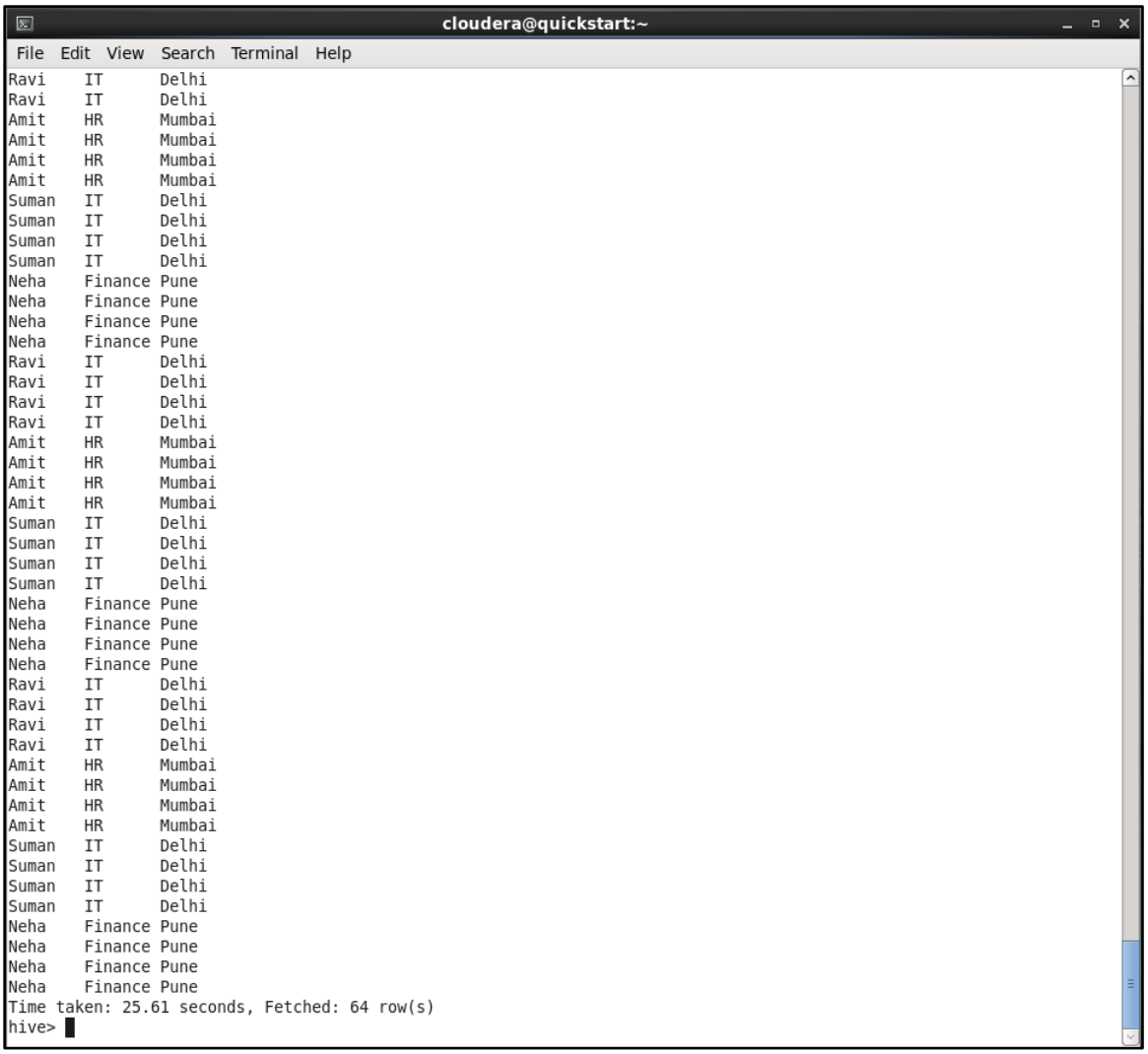


Load data:
>LOAD DATA LOCAL INPATH '/home/cloudera/departments.txt' INTO TABLE departments;

```
hive> LOAD DATA LOCAL INPATH '/home/cloudera/departments.txt' INTO TABLE departments;
Loading data to table company_db.departments
Table company_db.departments stats: [numFiles=4, totalSize=132]
OK
Time taken: 0.912 seconds
```

-- Join Query
SELECT e.emp_name, e.dept, d.location
FROM employees e
JOIN departments d
ON (e.dept = d.dept);

```
hive> SELECT e.emp_name, e.dept, d.location
    > FROM employees e
    > JOIN departments d
    > ON (e.dept = d.dept);
Query ID = cloudera_20251021010000_082f3c80-2686-4e42-8922-9b4540bfbe35
Total jobs = 1
Execution log at: /tmp/cloudera/cloudera_20251021010000_082f3c80-2686-4e42-8922-9b4540bfbe35.log
2025-10-21 01:00:15     Starting to launch local task to process map join;      maximum memory = 932184064
2025-10-21 01:00:16     Dump the side-table for tag: 1 with group count: 4 into file: file:/tmp/cloudera/aaf38c19-185
d-4f36-8bed-2dba0b973353/hive_2025-10-21_01-00-11_682_2040883646967824857-1/-local-10003/HashTable-Stage-3/MapJoin-ma
pfile01--.hashtable
2025-10-21 01:00:16     Uploaded 1 File to: file:/tmp/cloudera/aaf38c19-185d-4f36-8bed-2dba0b973353/hive_2025-10-21_0
1-00-11_682_2040883646967824857-1/-local-10003/HashTable-Stage-3/MapJoin-mapfile01--.hashtable (479 bytes)
2025-10-21 01:00:16     End of local task; Time Taken: 1.063 sec.
Execution completed successfully
MapredLocal task succeeded
Launching Job 1 out of 1
Number of reduce tasks is set to 0 since there's no reduce operator
Starting Job = job_1761030184232_0004, Tracking URL = http://quickstart.cloudera:8088/proxy/application_1761030184232
_0004/
Kill Command = /usr/lib/hadoop/bin/hadoop job  -kill job_1761030184232_0004
Hadoop job information for Stage-3: number of mappers: 1; number of reducers: 0
2025-10-21 01:00:23,917 Stage-3 map = 0%,  reduce = 0%
2025-10-21 01:00:35,084 Stage-3 map = 100%,  reduce = 0%, Cumulative CPU 2.56 sec
MapReduce Total cumulative CPU time: 2 seconds 560 msec
Ended Job = job_1761030184232_0004
MapReduce Jobs Launched:
Stage-Stage-3: Map: 1   Cumulative CPU: 2.56 sec   HDFS Read: 7212 HDFS Write: 992 SUCCESS
Total MapReduce CPU Time Spent: 2 seconds 560 msec
OK
Ravi    IT      Delhi
Ravi    IT      Delhi
Ravi    IT      Delhi
Ravi    IT      Delhi
Amit    HR      Mumbai
Amit    HR      Mumbai
Amit    HR      Mumbai
Amit    HR      Mumbai
Suman   IT      Delhi
Suman   IT      Delhi
Suman   IT      Delhi
Suman   IT      Delhi
Neha    Finance Pune
Neha    Finance Pune
Neha    Finance Pune
Neha    Finance Pune
```


cloudera@quickstart:~
File Edit View Search Terminal Help
Ravi IT Delhi
Ravi IT Delhi
Amit HR Mumbai
Amit HR Mumbai
Amit HR Mumbai
Amit HR Mumbai
Suman IT Delhi
Suman IT Delhi
Suman IT Delhi
Suman IT Delhi
Neha Finance Pune
Neha Finance Pune
Neha Finance Pune
Neha Finance Pune
Ravi IT Delhi
Ravi IT Delhi
Ravi IT Delhi
Ravi IT Delhi
Amit HR Mumbai
Amit HR Mumbai
Amit HR Mumbai
Amit HR Mumbai
Suman IT Delhi
Suman IT Delhi
Suman IT Delhi
Suman IT Delhi
Neha Finance Pune
Neha Finance Pune
Neha Finance Pune
Neha Finance Pune
Ravi IT Delhi
Ravi IT Delhi
Ravi IT Delhi
Ravi IT Delhi
Amit HR Mumbai
Amit HR Mumbai
Amit HR Mumbai
Amit HR Mumbai
Suman IT Delhi
Suman IT Delhi
Suman IT Delhi
Suman IT Delhi
Neha Finance Pune
Neha Finance Pune
Neha Finance Pune
Neha Finance Pune
Time taken: 25.61 seconds, Fetched: 64 row(s)
hive>

PRACTICAL NO: 8

TO GET HANDSON EXPERIENCE ON PIG LATIN

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TO GET HANDSON EXPERIENCE ON PIG LATIN

Question a) Pig Latin Basic

Step 1 – Start Hadoop and Pig
Start all Hadoop services:
>start-all.sh
Now open the Pig shell:
>pig
Expected Output:
You are now inside the Pig shell.

```
2025-10-28 11:56:31,249 [main] INFO  org.apache.hadoop.conf.Configuration.deprec
ation - fs.default.name is deprecated. Instead, use fs.defaultFS
2025-10-28 11:56:31,249 [main] INFO  org.apache.hadoop.conf.Configuration.deprec
ation - mapred.job.tracker is deprecated. Instead, use mapreduce.jobtracker.addr
ess
grunt>
```

Question b) Pig Data Types

Step 2 – Pig Data Types
Pig supports various data types, as listed below:

Type	Description	Example
int	Integer number	5
long	Large integer	
	123456789 floatDecimal number	
	10.5	
double	Larger decimal number	999.99
chararray	String	'Lathika'
bytearray	Raw bytes	Binary data
tuple	Row of fields	(1,'Lathika',99)
bag	Collection of tuples	{ (1,'Lathika'), (2,'Sunny') }
map	Key-value pairs	['name'#'Lathika','marks'#99]

Example: Load and Display Data
grunt> a = LOAD 'student_data.txt' USING PigStorage(',') AS (id:int, name:chararray, marks:int);

```
grunt> a = LOAD 'student_data.txt' USING PigStorage(',') AS (id:int, name:chararray, marks:int);
grunt>
```

grunt> DUMP a;

Question c) Download the data

Step 3 – Download the Data File

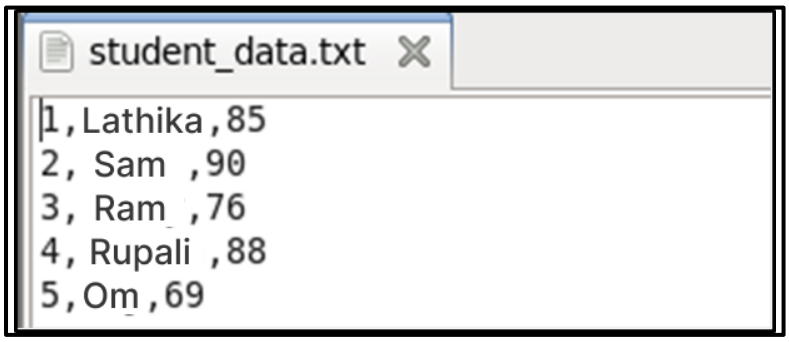
Step 1: Go to your home directory:

cd /home/cloudera

Step 2: Create a new file:

gedit student_data.txt

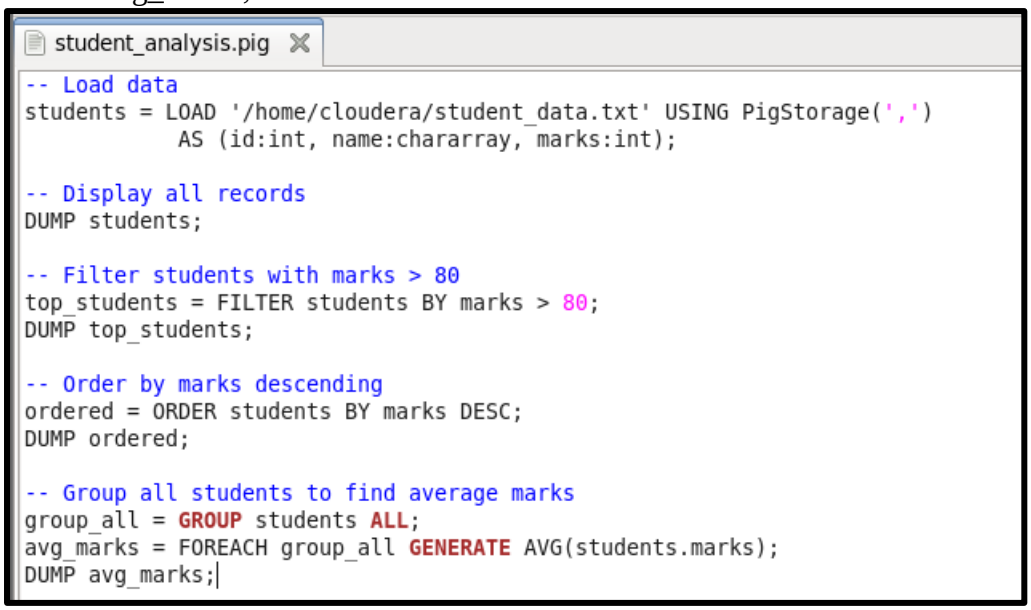
Step 3: Paste the following data and save:



Question d) Create your Script

Step 4 – Create a Pig Script
Step 1: Create a new Pig script file:
gedit student_analysis.pig
Step 2: Paste the following code:

```
-- Load data
students = LOAD '/home/cloudera/student_data.txt' USING PigStorage(',')
        AS (id:int, name:chararray, marks:int);

-- Display all records
DUMP students;

-- Filter students with marks > 80
top_students = FILTER students BY marks > 80;
DUMP top_students;

-- Order students by marks descending
ordered = ORDER students BY marks DESC;
DUMP ordered;

-- Group all students to find average marks
group_all = GROUP students ALL;
avg_marks = FOREACH group_all GENERATE AVG(students.marks);
DUMP avg_marks;
```



Question e) Save and Execute the Script

Step 5 – Execute the Pig Script

Run Pig in local mode:

pig -x local student_analysis.pig

Expected Output:

```
s to process : 1
(1,Lathika,85)
(2, Sam ,90)
(3, Ram ,76)
(4,Rupali ,88)
(5,Om,69)
```

```
Success!

Job Stats (time in seconds):
JobId   Alias   Feature Outputs
job_local852736765_0006 avg_marks,group_all,students    GROUP_BY,COMBINER       file:/tmp/temp637870975/tmp1160779770
,

Input(s):
Successfully read records from: "/home/cloudera/student_data.txt"

Output(s):
Successfully stored records in: "file:/tmp/temp637870975/tmp1160779770"

Job DAG:
job_local852736765_0006


2025-10-28 12:05:15,296 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher -
 Success!
2025-10-28 12:05:15,296 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated
. Instead, use fs.defaultFS
2025-10-28 12:05:15,296 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - mapred.job.tracker is depreca
ted. Instead, use mapreduce.jobtracker.address
2025-10-28 12:05:15,297 [main] WARN  org.apache.pig.data.SchemaTupleBackend - SchemaTupleBackend has already been ini
tialized
2025-10-28 12:05:15,366 [main] INFO  org.apache.hadoop.mapreduce.lib.input.FileInputFormat - Total input paths to pro
cess : 1
2025-10-28 12:05:15,366 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(81.6)
[cloudera@quickstart ~]$
```

PRACTICAL NO: 9

TO WORK WITH VARIOUS OPERATIONS IN PIG LATIN

PRACTICAL NO: 9
TO WORK WITH VARIOUS OPERATIONS IN PIG LATIN

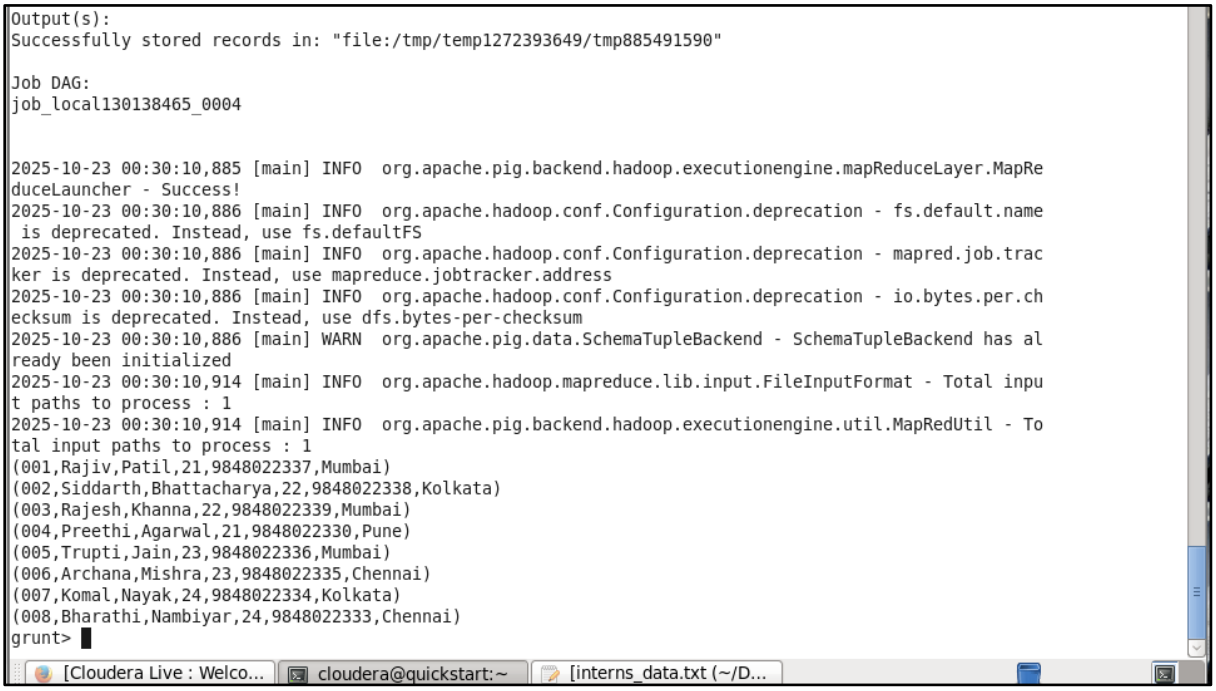
Question a) Pig Operations : Diagnostic Operators, Grouping and Joining, Combining & Splitting, Filtering, Sorting

Load the data:

>student_info = LOAD '/home/cloudera/Desktop/interns_data.txt' USING PigStorage(',') AS (id:chararray, fname:chararray, age:int, city:chararray);

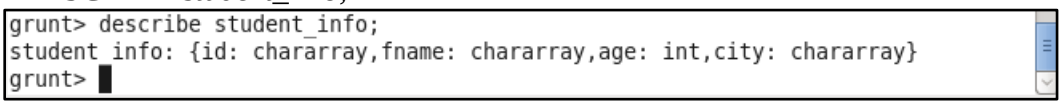
--Check loaded data

>DUMP student_info;



-- Describe schema

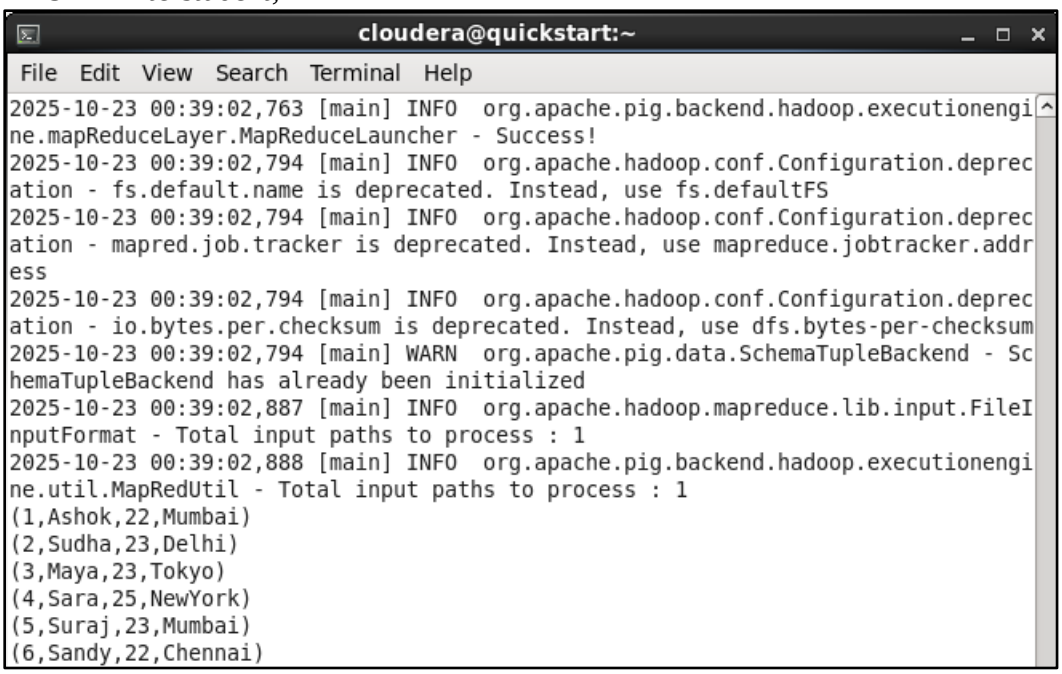
>DESCRIBE student_info;



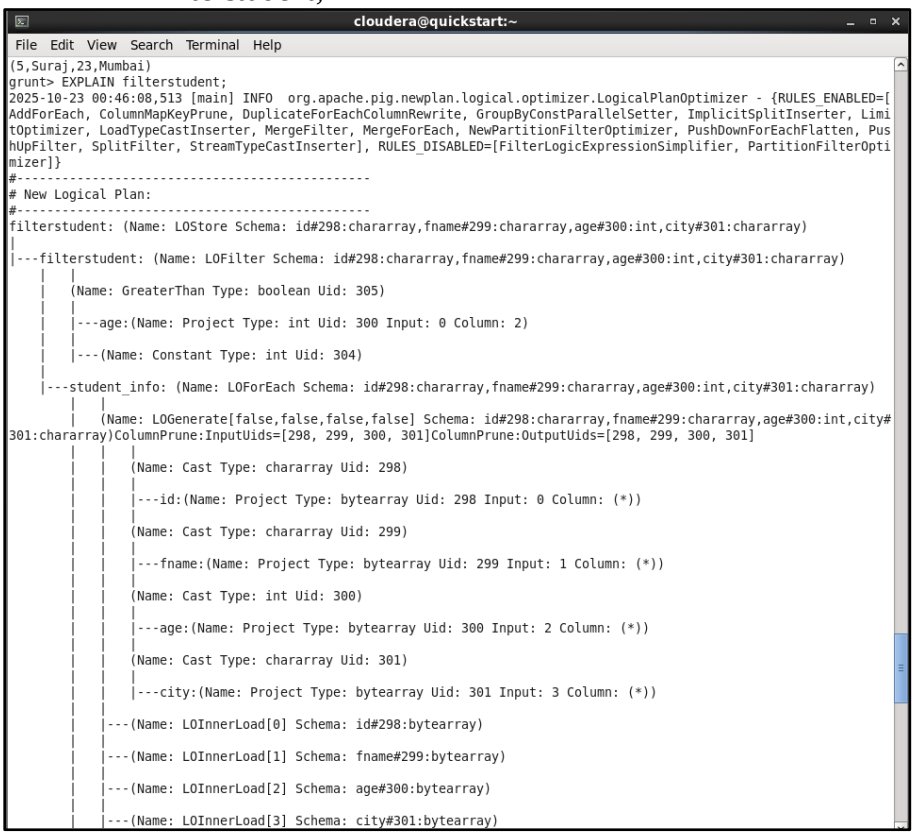
Filter data

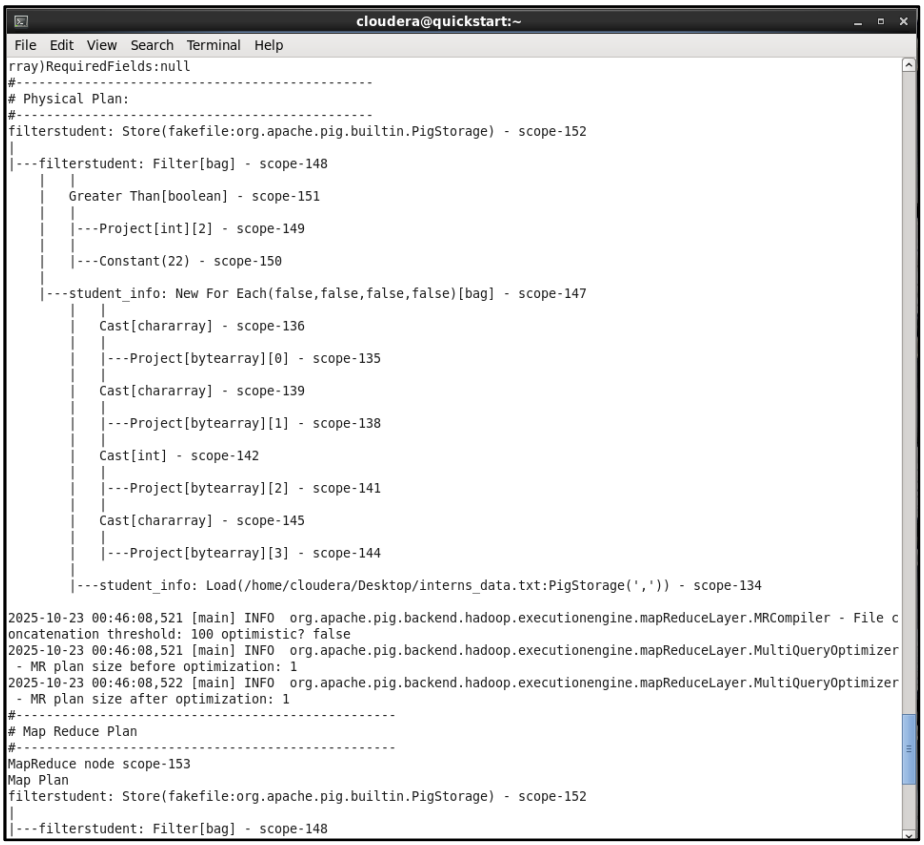
>filterstudent = FILTER student_info BY age > 22;

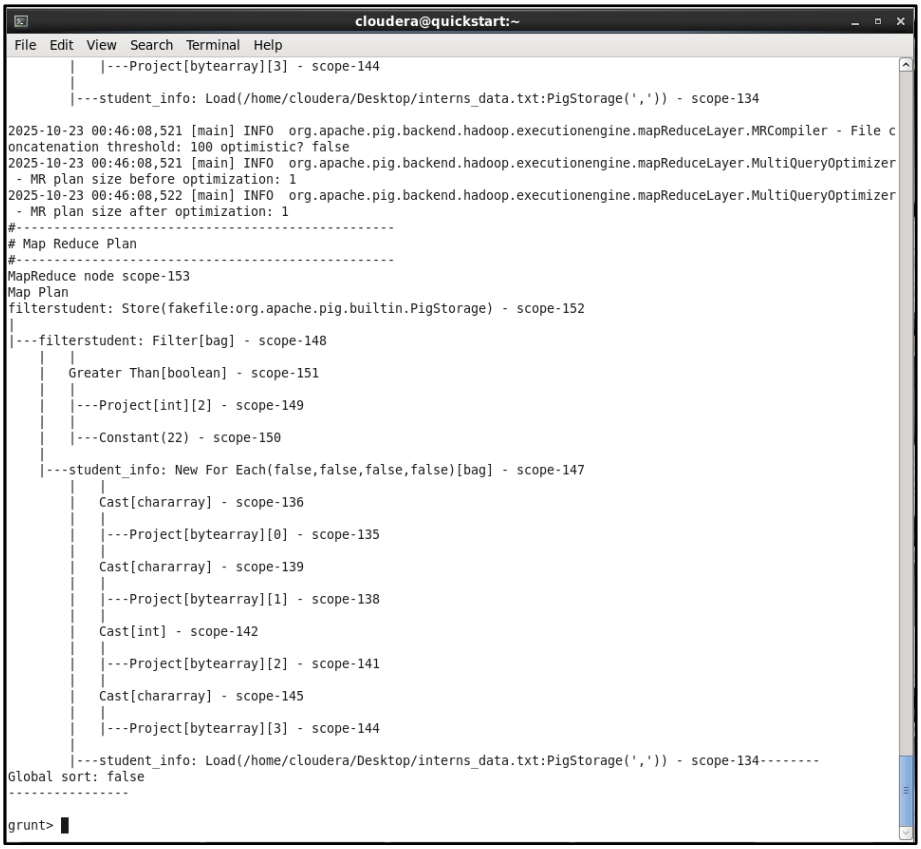
>DUMP filterstudent;



>EXPLAIN filterstudent;




cloudera@quickstart:~
File Edit View Search Terminal Help
rray)RequiredFields:null
#---
Physical Plan:
#---
filterstudent: Store(fakefile:org.apache.pig.builtin.PigStorage) - scope-152
|
|---filterstudent: Filter[bag] - scope-148
| | |
| | Greater Than[boolean] - scope-151
| | |
| | |---Project[int][2] - scope-149
| | |
| | |---Constant(22) - scope-150
| |
| |---student_info: New For Each(false,false,false,false)[bag] - scope-147
| | |
| | Cast[chararray] - scope-136
| | |
| | |---Project[bytearray][0] - scope-135
| | |
| | Cast[chararray] - scope-139
| | |
| | |---Project[bytearray][1] - scope-138
| | |
| | Cast[int] - scope-142
| | |
| | |---Project[bytearray][2] - scope-141
| | |
| | Cast[chararray] - scope-145
| | |
| | |---Project[bytearray][3] - scope-144
| |
| |---student_info: Load(/home/cloudera/Desktop/interns_data.txt:PigStorage(',')) - scope-134
2025-10-23 00:46:08,521 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MRCompiler - File c
oncatenation threshold: 100 optimistic? false
2025-10-23 00:46:08,521 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MultiQueryOptimizer
- MR plan size before optimization: 1
2025-10-23 00:46:08,522 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MultiQueryOptimizer
- MR plan size after optimization: 1
#---
Map Reduce Plan
#---
MapReduce node scope-153
Map Plan
filterstudent: Store(fakefile:org.apache.pig.builtin.PigStorage) - scope-152
|
|---filterstudent: Filter[bag] - scope-148


cloudera@quickstart:~
File Edit View Search Terminal Help
| |---Project[bytearray][3] - scope-144
| |
|---student_info: Load(/home/cloudera/Desktop/interns_data.txt:PigStorage(',')) - scope-134
2025-10-23 00:46:08,521 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MRCompiler - File c
oncatenation threshold: 100 optimistic? false
2025-10-23 00:46:08,521 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MultiQueryOptimizer
- MR plan size before optimization: 1
2025-10-23 00:46:08,522 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MultiQueryOptimizer
- MR plan size after optimization: 1
#---
Map Reduce Plan
#---
MapReduce node scope-153
Map Plan
filterstudent: Store(fakefile:org.apache.pig.builtin.PigStorage) - scope-152
|
|---filterstudent: Filter[bag] - scope-148
| | |
| | Greater Than[boolean] - scope-151
| | |
| | |---Project[int][2] - scope-149
| | |
| | |---Constant(22) - scope-150
| |
| |---student_info: New For Each(false,false,false,false)[bag] - scope-147
| | |
| | Cast[chararray] - scope-136
| | |
| | |---Project[bytearray][0] - scope-135
| | |
| | Cast[chararray] - scope-139
| | |
| | |---Project[bytearray][1] - scope-138
| | |
| | Cast[int] - scope-142
| | |
| | |---Project[bytearray][2] - scope-141
| | |
| | Cast[chararray] - scope-145
| | |
| | |---Project[bytearray][3] - scope-144
| |
| |---student_info: Load(/home/cloudera/Desktop/interns_data.txt:PigStorage(',')) - scope-134--------
Global sort: false
----
grunt>

Foreach (select columns)

>foreachstudent = FOREACH filterstudent GENERATE id, fname, age, city;
>DUMP foreachstudent;

```
2025-10-23 00:49:29,765 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(2,Sudha,23,Delhi)
(3,Maya,23,Tokyo)
(4,Sara,25,NewYork)
(5,Suraj,23,Mumbai)
grunt>
```

-- Illustrate data flow
>ILLUSTRATE foreachstudent;

```
-------------------------------------------------------------------------------------------
| student_info     | id:chararray     | fname:chararray     | age:int     | city:chararray     |
-------------------------------------------------------------------------------------------
|                  | 3                | Maya                | 23          | Tokyo              |
|                  | 1                | Ashok               | 22          | Mumbai             |
-------------------------------------------------------------------------------------------
-------------------------------------------------------------------------------------------
| filterstudent    | id:chararray     | fname:chararray     | age:int     | city:chararray     |
-------------------------------------------------------------------------------------------
|                  | 3                | Maya                | 23          | Tokyo              |
-------------------------------------------------------------------------------------------
-------------------------------------------------------------------------------------------
| foreachstudent   | id:chararray     | fname:chararray     | age:int     | city:chararray     |
-------------------------------------------------------------------------------------------
|                  | 3                | Maya                | 23          | Tokyo              |
-------------------------------------------------------------------------------------------

grunt>
```

Grouping

-- Group by city
>DESCRIBE groupstudent;

```
groupstudent: {group: chararray,student_info: {(id: chararray,fname: chararray,age: int,city: chararray)}}
grunt>
```

-- Group by city and age
>groupstudent2 = GROUP student_info BY (city, age);
>DUMP groupstudent2;

```
2025-10-23 00:53:44,529 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
((Delhi,23),{(2,Sudha,23,Delhi)})
((Tokyo,23),{(3,Maya,23,Tokyo)})
((Mumbai,22),{(1,Ashok,22,Mumbai)})
((Mumbai,23),{(5,Suraj,23,Mumbai)})
((Chennai,22),{(6,Sandy,22,Chennai)})
((NewYork,25),{(4,Sara,25,NewYork)})
grunt>
```

-- Group all
>groupstudent3 = GROUP student_info ALL;
>DUMP groupstudent3;

```
2025-10-23 00:54:48,164 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(all,{(6,Sandy,22,Chennai),(5,Suraj,23,Mumbai),(4,Sara,25,NewYork),(3,Maya,23,Tokyo),(2,Sudha,23,Delhi),(1,Ashok,22,M
umbai)})
grunt>
```

Store output

>STORE student_info INTO '/home/cloudera/Desktop/sampleoutput' USING PigStorage('|');

```
Success!

Job Stats (time in seconds):
JobId   Alias   Feature Outputs
job_local1724561446_0012        student_info    MAP_ONLY        /home/cloudera/Desktop/sampleoutput,

Input(s):
Successfully read records from: "/home/cloudera/Desktop/interns_data.txt"

Output(s):
Successfully stored records in: "/home/cloudera/Desktop/sampleoutput"

Job DAG:
job_local1724561446_0012


2025-10-23 00:58:08,196 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher -
 Success!
grunt>
```

Load data again into another alias for COGROUP

>I = LOAD '/home/cloudera/Desktop/interns_data.txt'
USING PigStorage(',')
AS (id:chararray, fname:chararray, age:int, city:chararray);

>DUMP I;

```
2025-10-23 01:00:05,043 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(1,Ashok,22,Mumbai)
(2,Sudha,23,Delhi)
(3,Maya,23,Tokyo)
(4,Sara,25,NewYork)
(5,Suraj,23,Mumbai)
(6,Sandy,22,Chennai)
grunt>
```

COGROUP

>CG = COGROUP student_info BY age, I BY age;
>DUMP CG;

```
2025-10-23 01:01:08,713 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(22,{(6,Sandy,22,Chennai),(1,Ashok,22,Mumbai)},{(6,Sandy,22,Chennai),(1,Ashok,22,Mumbai)})
(23,{(5,Suraj,23,Mumbai),(3,Maya,23,Tokyo),(2,Sudha,23,Delhi)},{(5,Suraj,23,Mumbai),(3,Maya,23,Tokyo),(2,Sudha,23,Del
hi)})
(25,{(4,Sara,25,NewYork)},{(4,Sara,25,NewYork)})
grunt>
```

Self Join

>student_infoB = LOAD '/home/cloudera/student_data.txt'
>USING PigStorage(',') AS
(id:chararray,fname:chararray,lname:chararray,age:int,phone:chararray,city:chararray);
>SelfJoin = JOIN student_info BY age, student_infoB BY age;
>DUMP SelfJoin;

```
2025-10-22 10:07:32,645 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(2,Neha,Sharma,21,9988776655,Pune,2,Neha,Sharma,21,9988776655,Pune)
(4,Kiran,Doe,22,7766554433,Nashik,4,Kiran,Doe,22,7766554433,Nashik)
(1,Aakash,Patil,23,9876543210,Mumbai,1,Aakash,Patil,23,9876543210,Mumbai)
(3,Raj,Verma,24,8877665544,Mumbai,3,Raj,Verma,24,8877665544,Mumbai)
(5,Sneha,Naik,25,6655443322,Pune,5,Sneha,Naik,25,6655443322,Pune)
grunt>
```

Inner Join

>InnerJoin = JOIN student_info BY city, I BY city;
>DUMP InnerJoin;

```
Output(s):
Successfully stored 0 records in: "hdfs://quickstart.cloudera:8020/tmp/temp-1826155470/tmp255345062"

Counters:
Total records written : 0
Total bytes written : 0
Spillable Memory Manager spill count : 0
Total bags proactively spilled: 0
Total records proactively spilled: 0

Job DAG:
job_1761126620207_0019


2025-10-22 10:13:27,171 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher -
 Success!
2025-10-22 10:13:27,176 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated
. Instead, use fs.defaultFS
2025-10-22 10:13:27,176 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - mapred.job.tracker is depreca
ted. Instead, use mapreduce.jobtracker.address
2025-10-22 10:13:27,177 [main] INFO  org.apache.pig.data.SchemaTupleBackend - Key [pig.schematuple] was not set... wi
ll not generate code.
2025-10-22 10:13:27,217 [main] INFO  org.apache.hadoop.mapreduce.lib.input.FileInputFormat - Total input paths to pro
cess : 1
2025-10-22 10:13:27,224 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
grunt>
```

Left Join

>LeftJoin = JOIN student_info BY city LEFT OUTER, I BY city;
>DUMP LeftJoin;

```
2025-10-22 10:19:30,371 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(5,Sneha,Naik,25,6655443322,Pune,,,,)
(2,Neha,Sharma,21,9988776655,Pune,,,,)
(3,Raj,Verma,24,8877665544,Mumbai,,,,)
(1,Aakash,Patil,23,9876543210,Mumbai,,,,)
(4,Kiran,Doe,22,7766554433,Nashik,,,,)
grunt>
```

Right Join

>RightJoin = JOIN student_info BY city RIGHT OUTER, I BY city;
>DUMP RightJoin;

```
2025-10-22 11:01:58,383 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(,,,,,,11,Neha,21,)
(,,,,,,13,Aakash,23,)
(,,,,,,10,Ravi,23,)
(,,,,,,14,Raj,24,)
(,,,,,,12,Pratik,25,)
grunt>
grunt> d
```

Full Join

>FullJoin = JOIN student_info BY city FULL OUTER, I BY city;
>DUMP FullJoin;

```
2025-10-22 11:04:23,604 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(,,,,,,11,Neha,21,)
(,,,,,,13,Aakash,23,)
(,,,,,,10,Ravi,23,)
(,,,,,,14,Raj,24,)
(,,,,,,12,Pratik,25,)
(5,Sneha,Naik,25,6655443322,Pune,,,,)
(2,Neha,Sharma,21,9988776655,Pune,,,,)
(3,Raj,Verma,24,8877665544,Mumbai,,,,)
(1,Aakash,Patil,23,9876543210,Mumbai,,,,)
(4,Kiran,Doe,22,7766554433,Nashik,,,,)
grunt>
```

Split Data

>SPLIT student_info INTO younger_students IF age < 23, older_students IF age >= 23;
>DUMP younger_students;

```
2025-10-22 11:07:01,674 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(2,Neha,Sharma,21,9988776655,Pune)
(4,Kiran,Doe,22,7766554433,Nashik)
grunt>
```

>DUMP older_students;

```
2025-10-22 11:08:21,251 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(1,Aakash,Patil,23,9876543210,Mumbai)
(3,Raj,Verma,24,8877665544,Mumbai)
(5,Sneha,Naik,25,6655443322,Pune)
grunt>
```

Filter by City

>filter_city = FILTER student_info BY city == 'Mumbai';
>DUMP filter_city;

```
2025-10-22 11:09:43,653 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(1,Aakash,Patil,23,9876543210,Mumbai)
(3,Raj,Verma,24,8877665544,Mumbai)
grunt>
```

Distinct Cities

>all_city = FOREACH student_info GENERATE city;
>distinct_cities = DISTINCT all_city;

```
2025-10-22 11:10:58,042 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(Mumbai)
(Pune)
(Mumbai)
(Nashik)
(Pune)
grunt>
```

>DUMP distinct_cities;

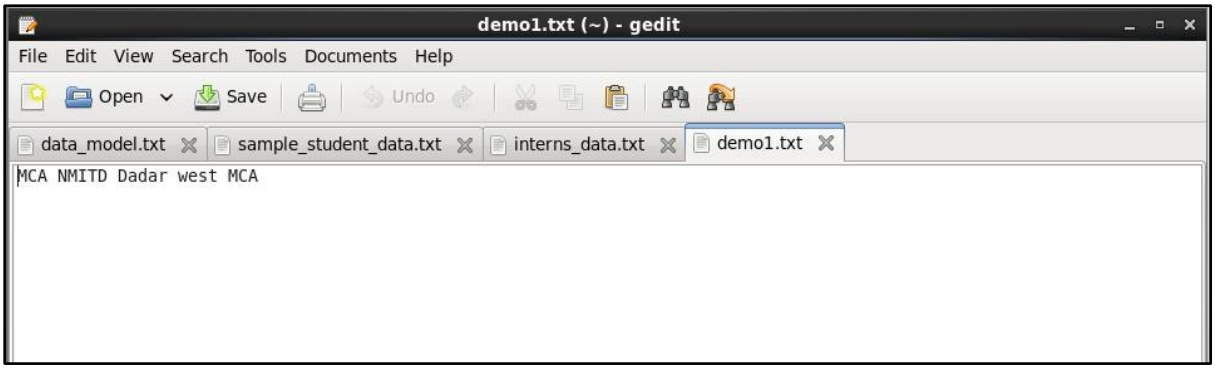
```
2025-10-22 11:12:06,474 [main] INFO  org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input path
s to process : 1
(Pune)
(Mumbai)
(Nashik)
grunt>
```

Write a Pig Latin Script to get the count of each word of a text file, save it in WordCount.pig and execute script to get the required output.(Use any text file as input file. It should have a few statements).

Create files demo1.txt and wordcount.pig in /home/cloudera

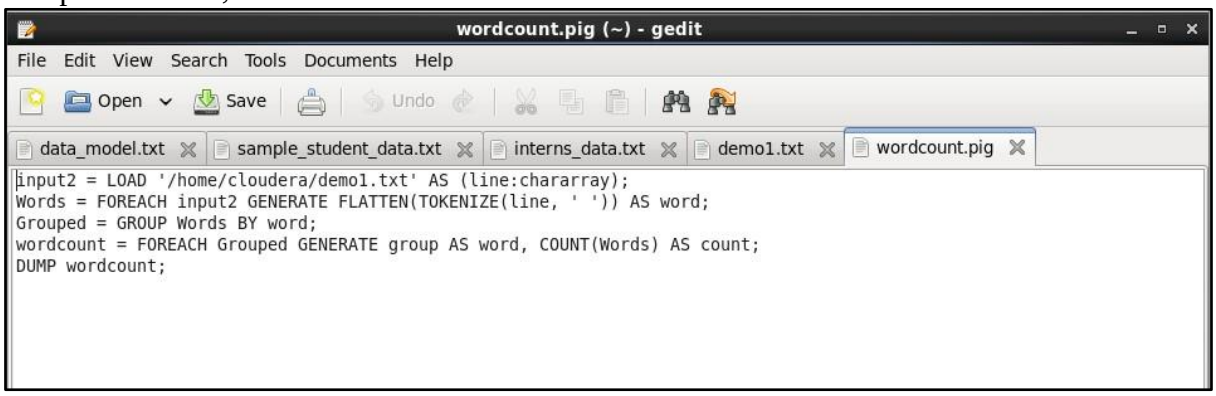
demo1.txt

MCA NMITD Dadar west MCA

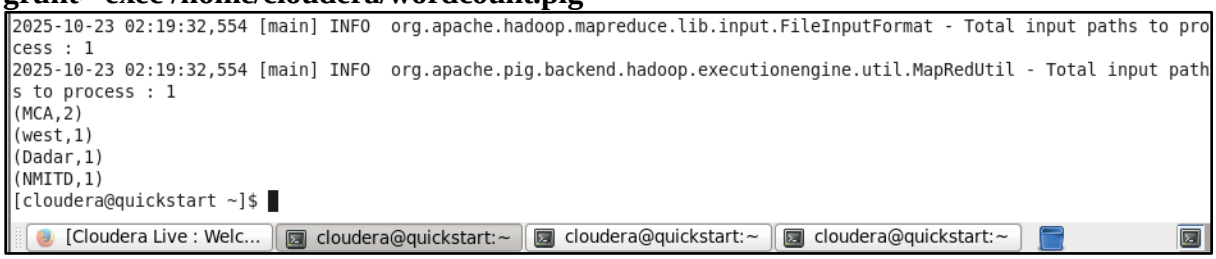


wordcount.pig

```
input2 = LOAD '/home/cloudera/demo1.txt' AS (line:Chararray) ;
Words = FOREACH input2 GENERATE
FLATTEN(TOKENIZE(line,' ')) AS word;
 Grouped = GROUP Words BY word;
wordcount = FOREACH Grouped GENERATE COUNT(Words), group;
dump wordcount;
```



grunt> exec /home/cloudera/wordcount.pig



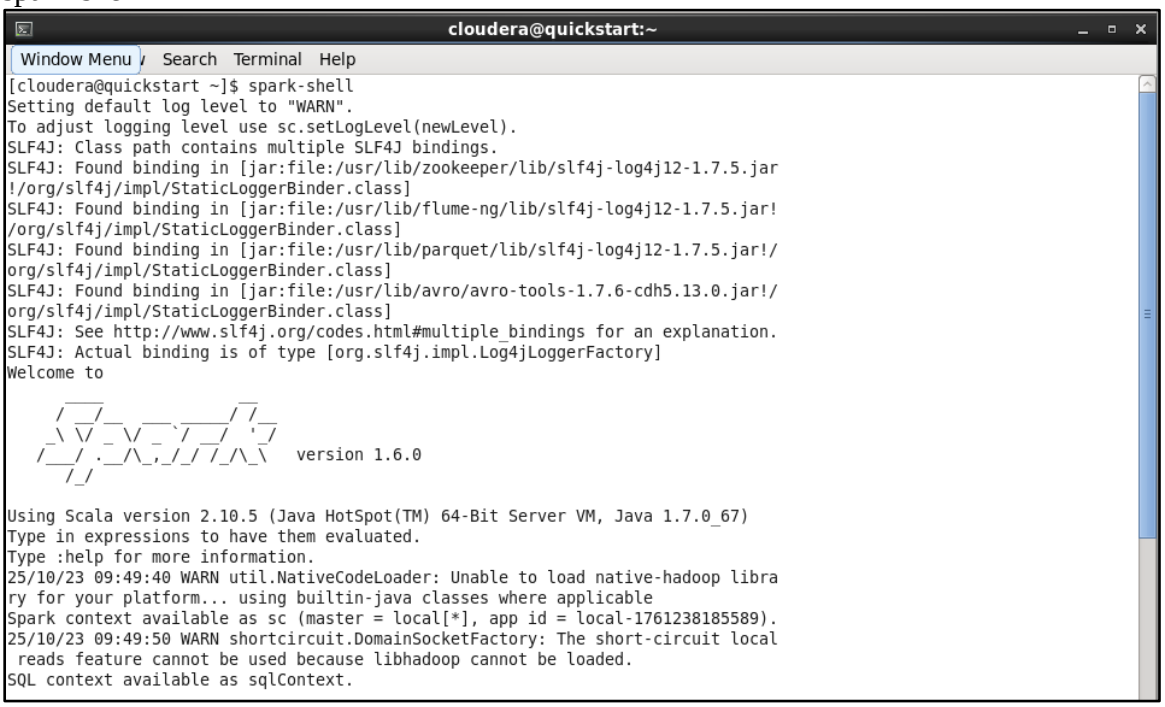
PRACTICAL NO:10

WORKING WITH SPARK

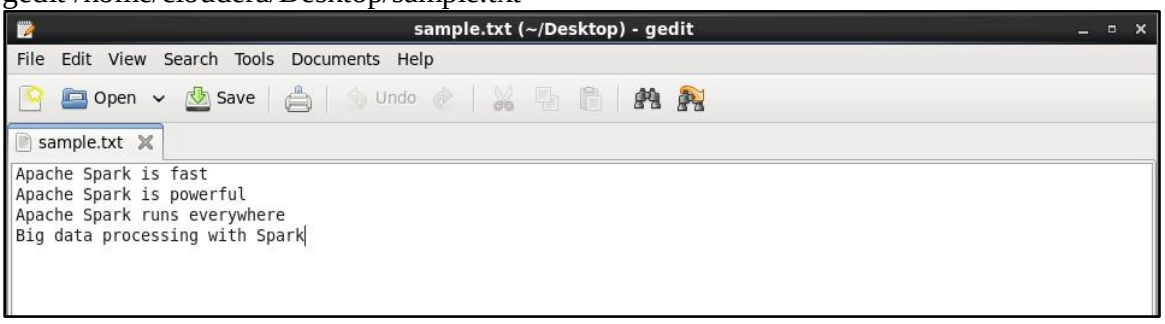
PRACTICAL NO: 10
WORKING WITH SPARK

Question a) Downloading Data Set and Processing it Spark

Downloading Data Set and Processing it in Spark
Word Count in Apache Spark
Aim:
To download a dataset and perform word count processing using Apache Spark (Scala).
Software Requirement:
Cloudera 5.13.0 with Apache Spark pre-installed.
Procedure:
Step 1: Check Spark Installation
Command:
spark-shell



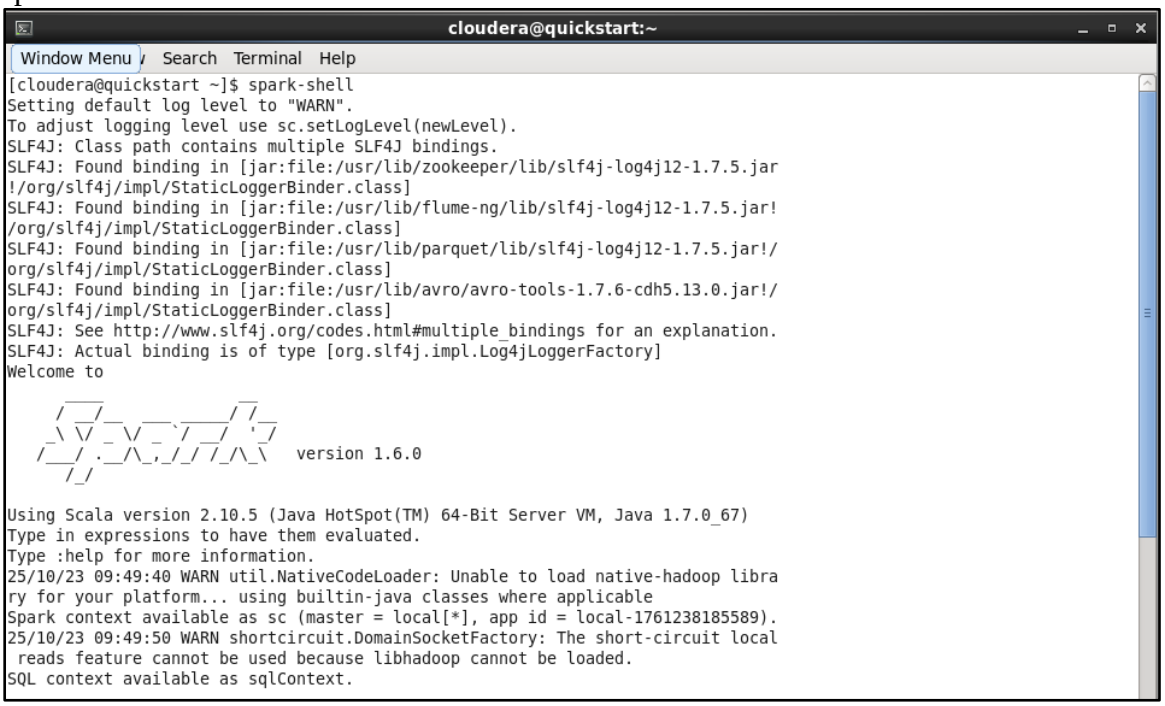
Step 2: Create Dataset File
Command:
gedit /home/cloudera/Desktop/sample.txt



Step 3: Open Spark Shell

Command:

spark-shell



Step 4: Load the Dataset in Spark

Command:

val textFile = sc.textFile("file:///home/cloudera/Desktop/sample.txt")

```
scala> val textFile = sc.textFile("file:///home/cloudera/Desktop/sample.txt")
textFile: org.apache.spark.rdd.RDD[String] = file:///home/cloudera/Desktop/sample.txt MapPartitionsRDD[1] at textFile at <console>:27
```

Step 4a: Verify Dataset Loaded

Command:

textFile.collect()

```
scala> textFile.collect()
res0: Array[String] = Array(Apache Spark is fast, Apache Spark is powerful, Apache Spark runs everywhere, Big data processing with Spark)
```

Step 5: Split Lines into Words

Command:

val words = textFile.flatMap(line => line.split(" "))

```
scala> val words = textFile.flatMap(line => line.split(" "))
words: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[2] at flatMap at <console>:29
```

Question b) Word Count in Apache Spark.

Command:
words.collect()

```
scala> words.collect()
res1: Array[String] = Array(Apache, Spark, is, fast, Apache, Spark, is, powerful
, Apache, Spark, runs, everywhere, Big, data, processing, with, Spark)
```

Step 6: Create (word, 1) Pair
Command:
val wordPairs = words.map(word => (word, 1))

```
scala> val wordPairs = words.map(word => (word, 1))
wordPairs: org.apache.spark.rdd.RDD[(String, Int)] = MapPartitionsRDD[3] at map
at <console>:31
```

Step 7: Reduce to Count Words
Command:
val wordCounts = wordPairs.reduceByKey(_ + _)

```
scala> val wordCounts = wordPairs.reduceByKey(_ + _)
wordCounts: org.apache.spark.rdd.RDD[(String, Int)] = ShuffledRDD[4] at reduceBy
Key at <console>:33
```

Step 8: Show the Final Output
Command:
wordCounts.collect().foreach(println)

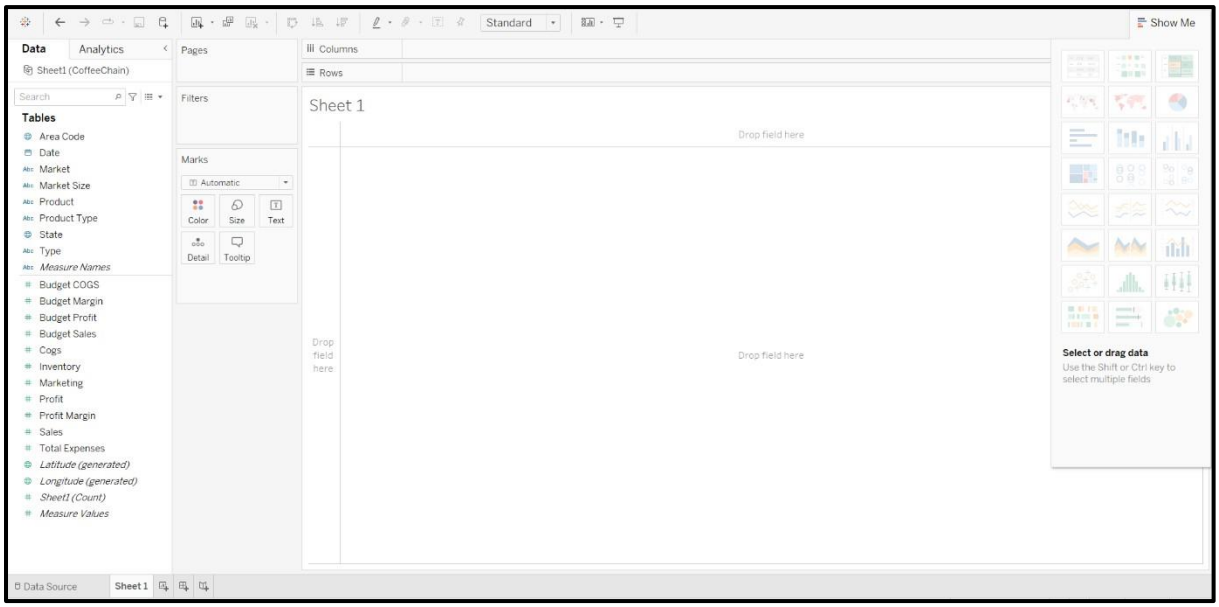
```
scala> wordCounts.collect().foreach(println)
(is,2)
(runs,1)
(Big,1)
(fast,1)
(Apache,3)
(with,1)
(data,1)
(everywhere,1)
(powerful,1)
(Spark,4)
(processing,1)

scala>
```

PRACTICAL NO: 11
TO UNDERTAND WORKING OF TABLEAU TOOL FOR VISUALISATION

PRACTICAL NO: 11
TO UNDERTAND WORKING OF TABLEAU TOOL FOR VISUALISATION

Question a) Tool Overview

Tool Overview:



This screenshot shows the **Tableau Start Page**, which is the first screen you see when you open the application. It acts as the main hub or "home base" for all your projects. It is organized into three main sections:

The "Connect" Pane (The Start)

On the **left** side is the **Connect** pane. This is the starting point for any analysis. It's where you tell Tableau where your data lives.

The "Open" Pane (Your Projects)

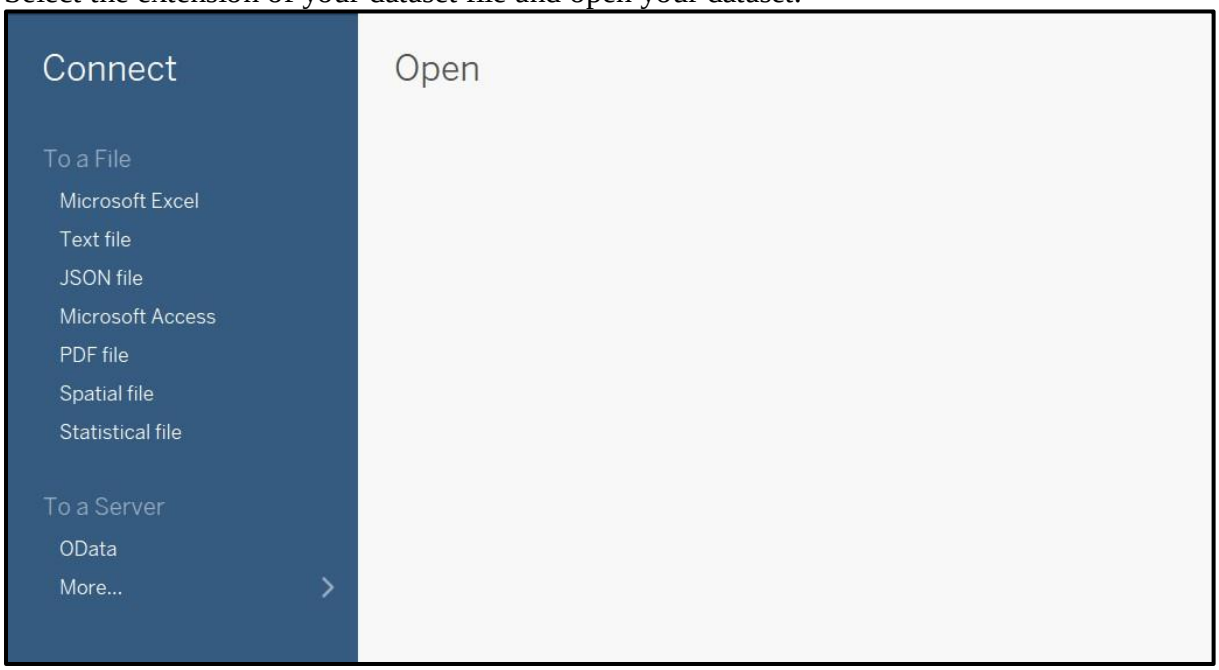
In the **center** is the **Open** pane. This area shows all the recent workbooks

The "Discover" Pane (Learning & Inspiration)

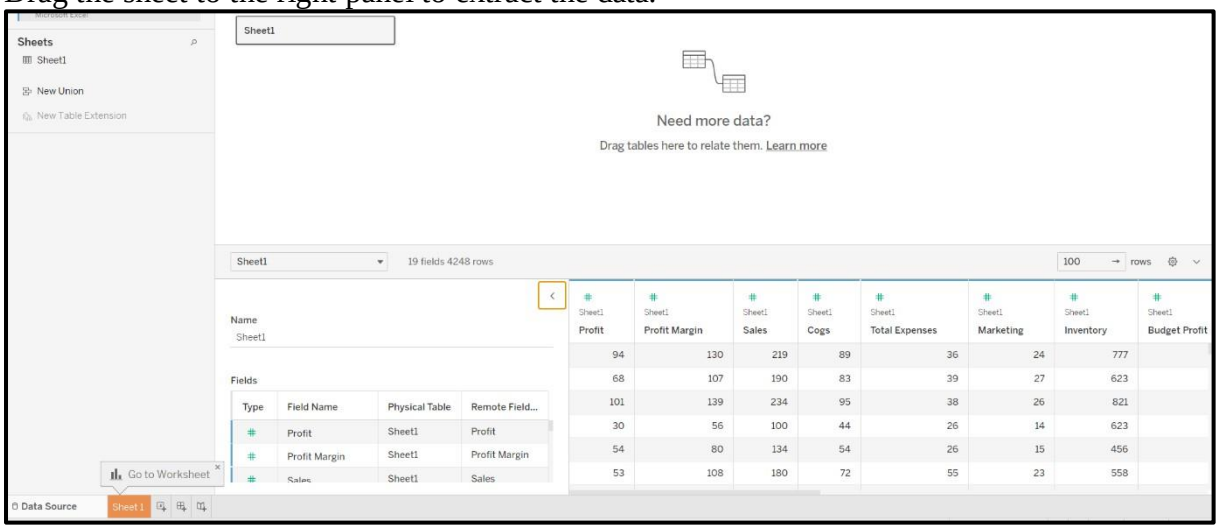
On the **right** side is the **Discover** pane. This is a great resource for learning. It provides training videos, sample workbooks, and links to the "Viz of the Week," which shows amazing dashboards created by other users. It's a perfect place to get inspiration for new chart ideas.

Question b) Importing Data

Importing Data:
Select the extension of your dataset file and open your dataset:



Drag the sheet to the right panel to extract the data:



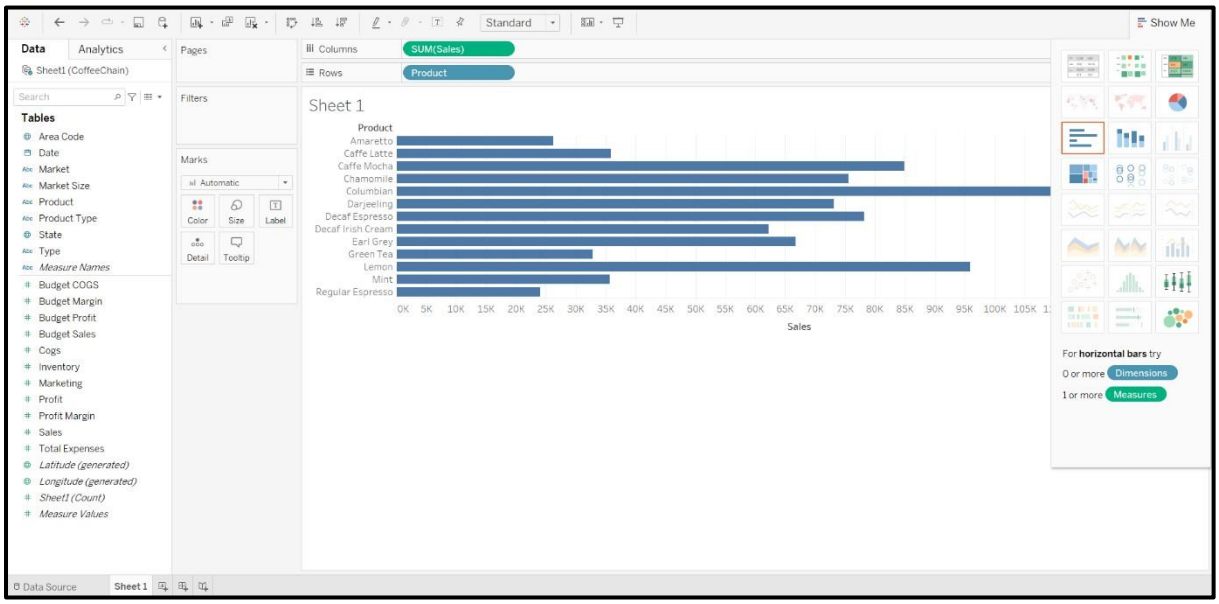
Question c) Analyzing with Charts

Analyzing with Charts:

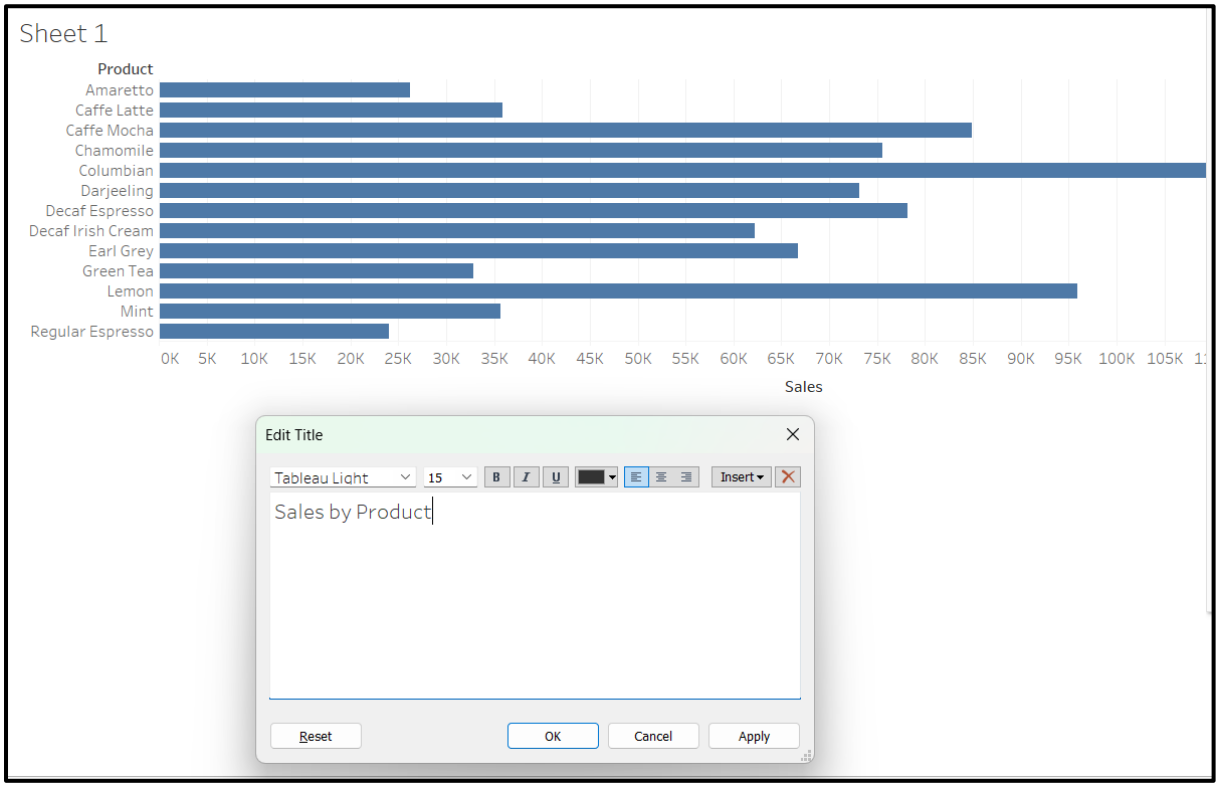
Analysis is done by dragging and dropping data fields from the **Data pane** (on the left) onto the **shelves** (at the top).

- **Dimensions** (categories, like Product or Market) are usually dragged to **Columns**.
- **Measures** (numbers, like Sales or Profit) are usually dragged to **Rows**.

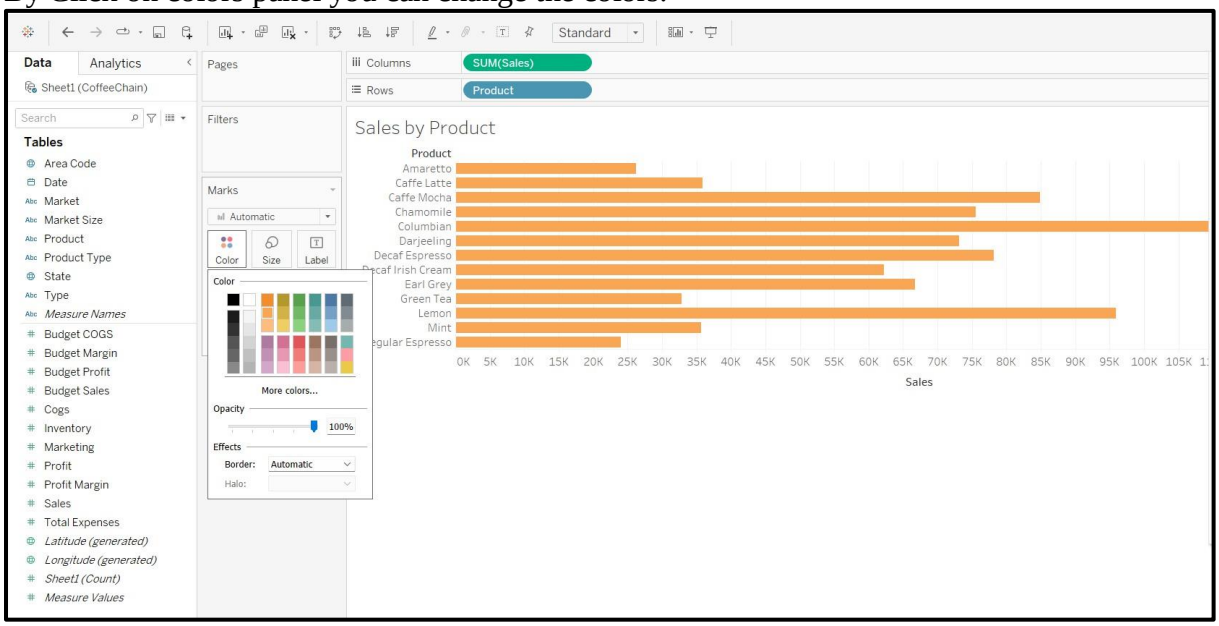
1. Bar Chart:



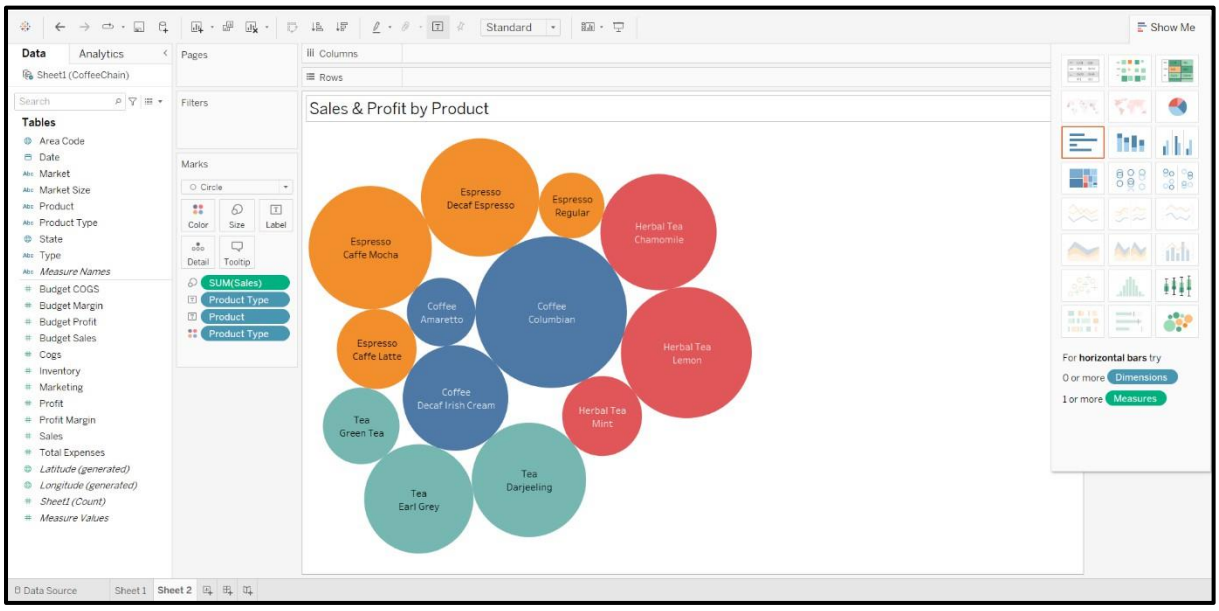
By clicking on sheet name, you can change the sheet name to your desired name:



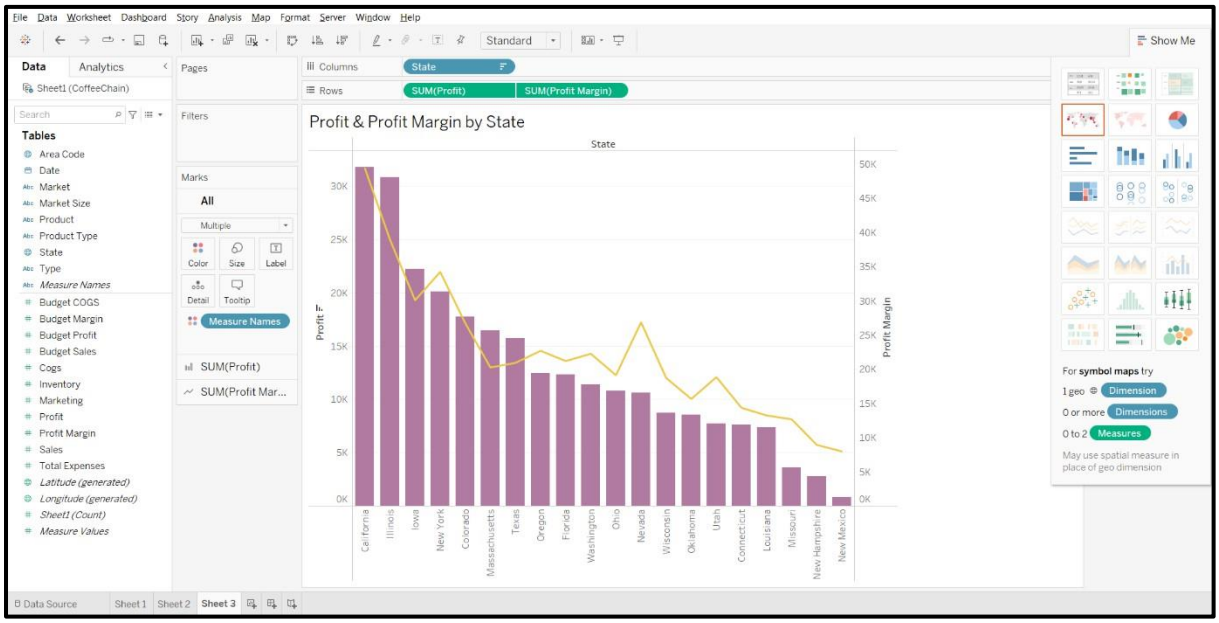
By Click on colors panel you can change the colors:



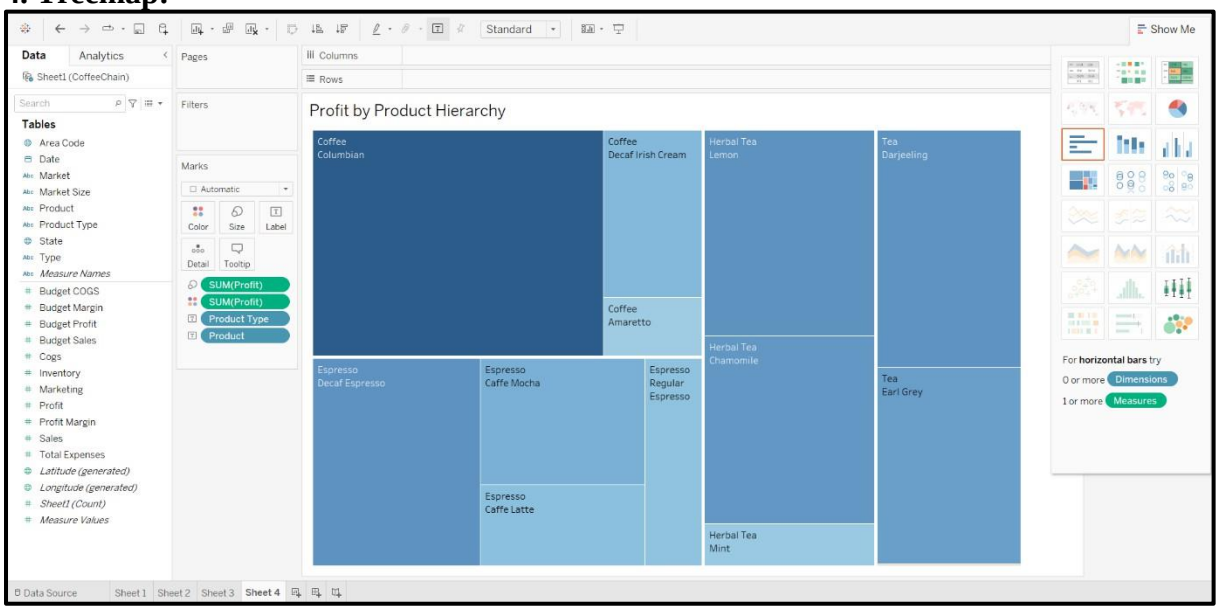
2. Packed Bubble Chart:



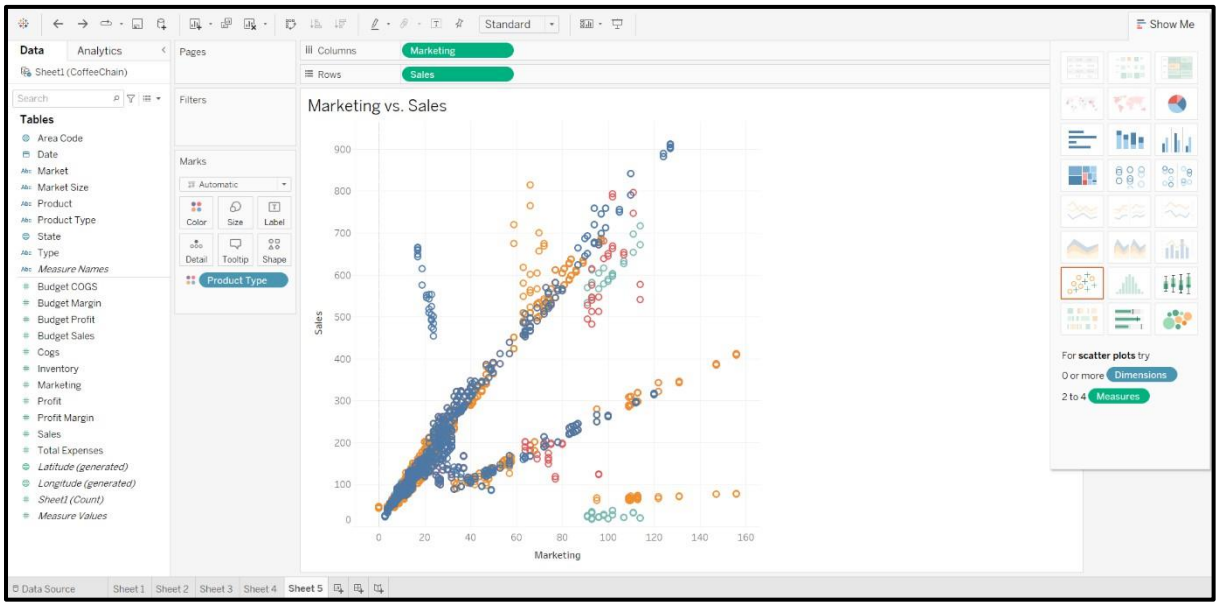
3. Dual-Combination Chart:



4. Treemap:



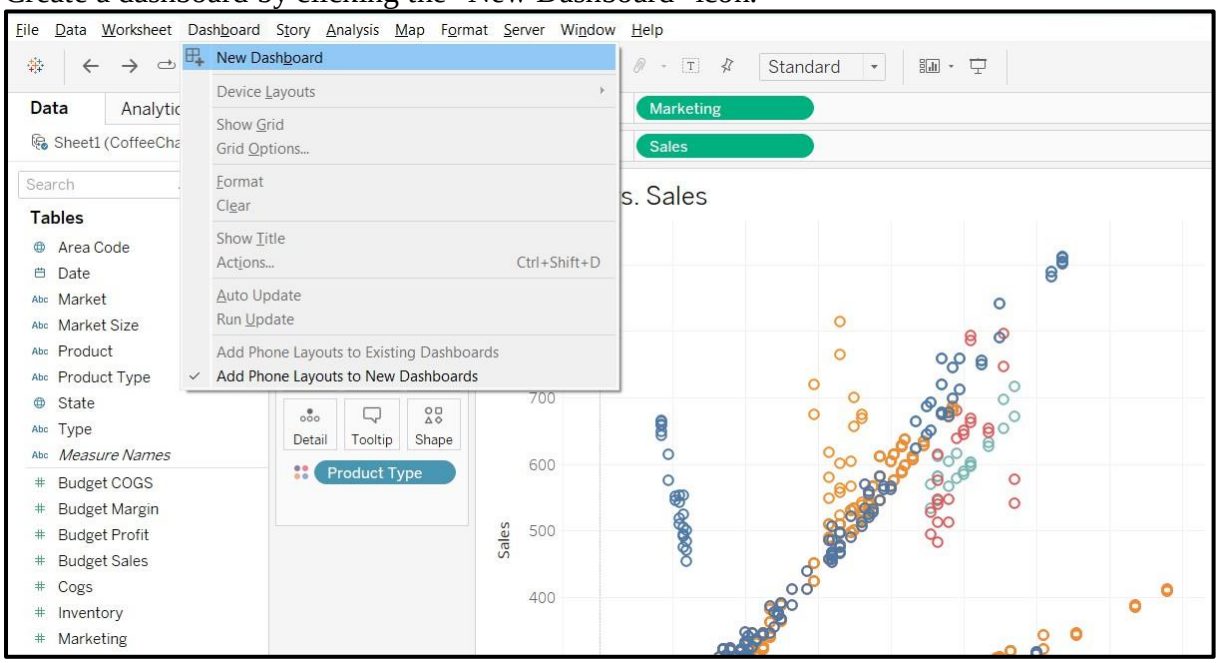
5. ScatterPlot:



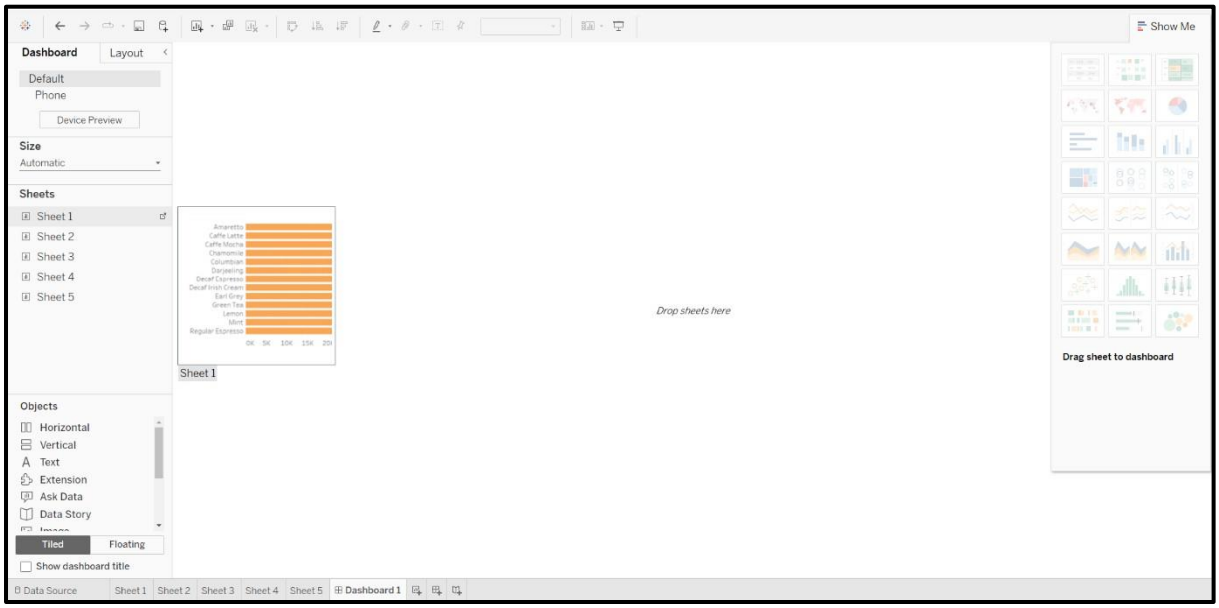
Question d) Creating Dashboards

Creating Dashboards:

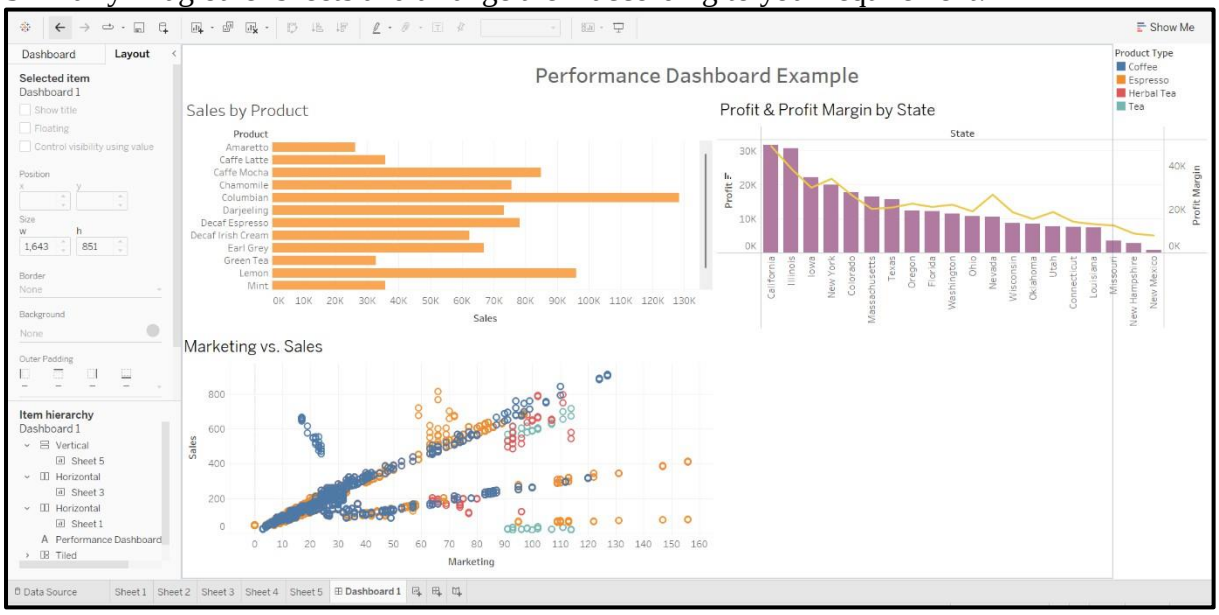
Create a dashboard by clicking the "New Dashboard" icon.



On the left, you see a list of all your completed charts. You simply **drag and drop** your worksheets from this list onto the main dashboard canvas.

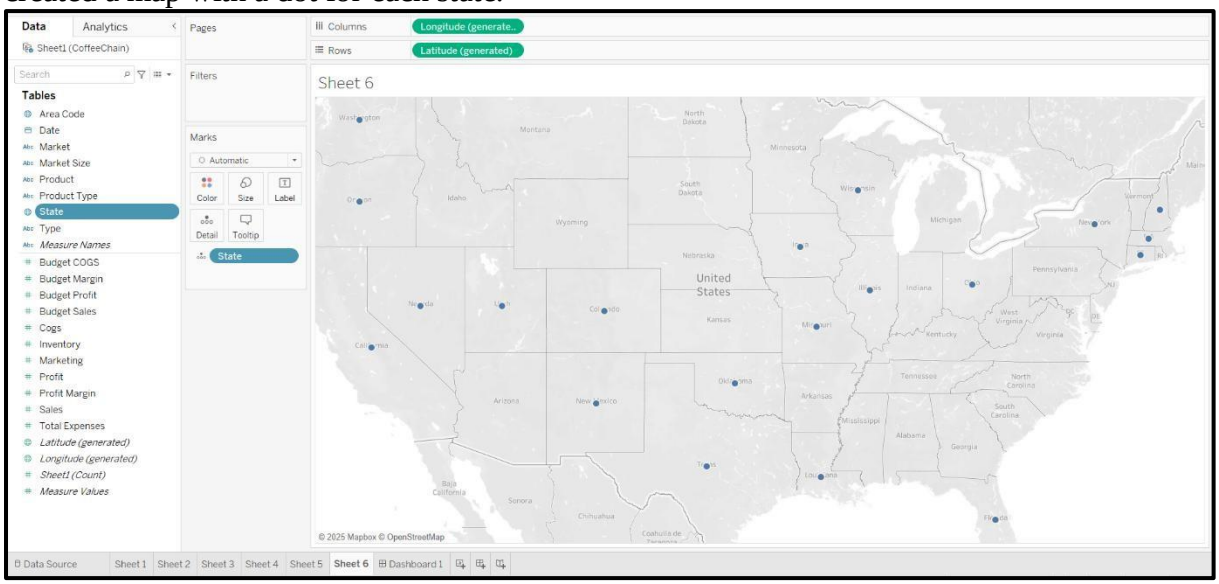


Similarly Drag other sheets and arrange them according to your requirement:

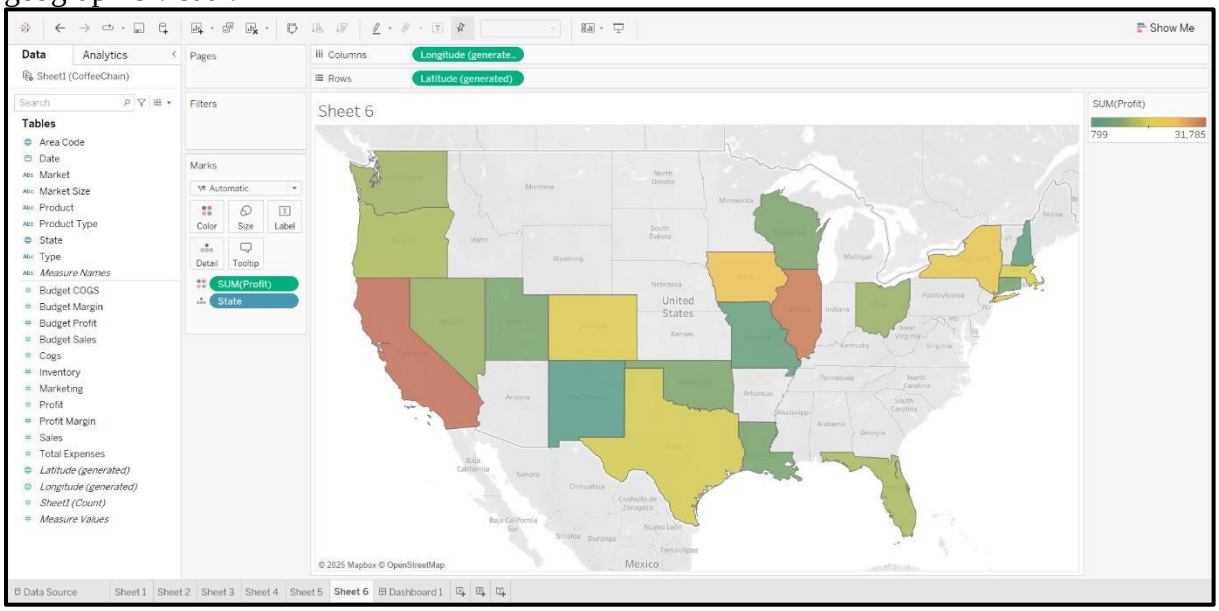


Question e) Working with maps

Working with maps:
Tableau makes it easy to create maps because it automatically recognizes geographic data. The State field had a small globe icon next to it. By simply **double-clicking State**, Tableau created a map with a dot for each state.



We then dragged the Profit measure onto the **Color** card. This instantly colored each state based on its profitability (as seen in the screenshot), turning our data into a powerful geographic visual.

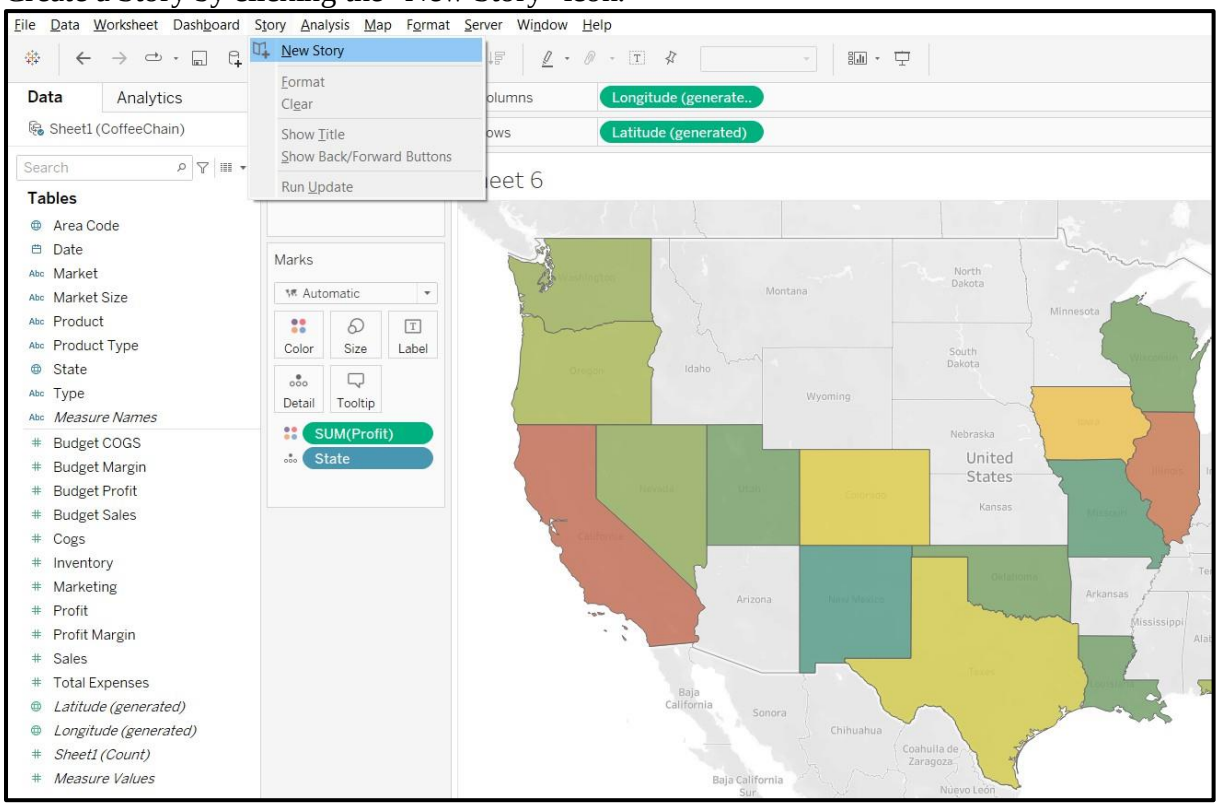


Question e) Telling Stories with tableau

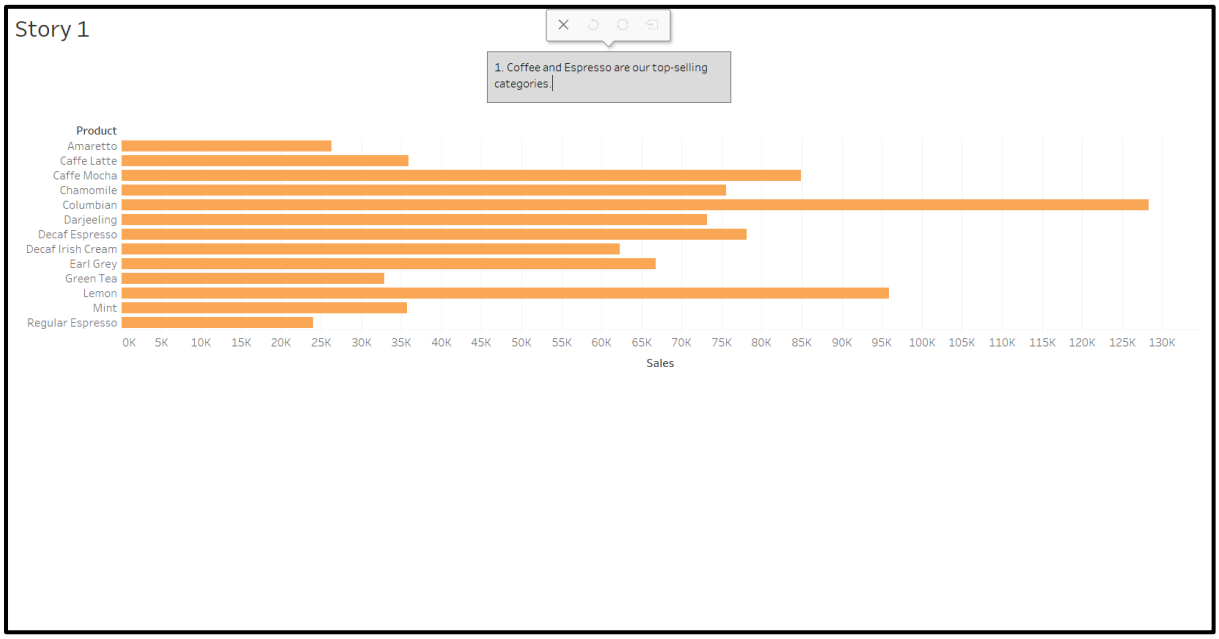
Telling Stories with tableau:

The **Story** feature is like creating a PowerPoint presentation directly inside Tableau. It lets you guide an audience through your findings step-by-step.

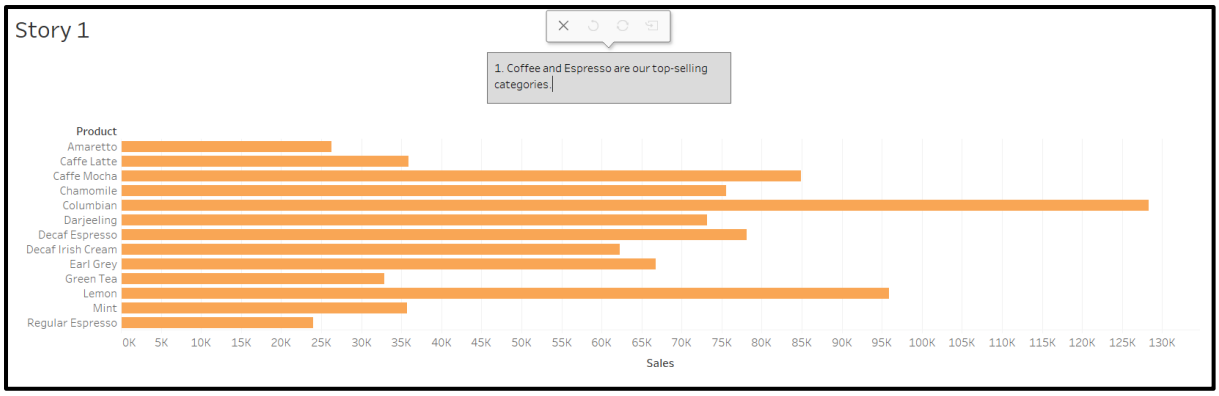
Create a Story by clicking the "New Story" icon.

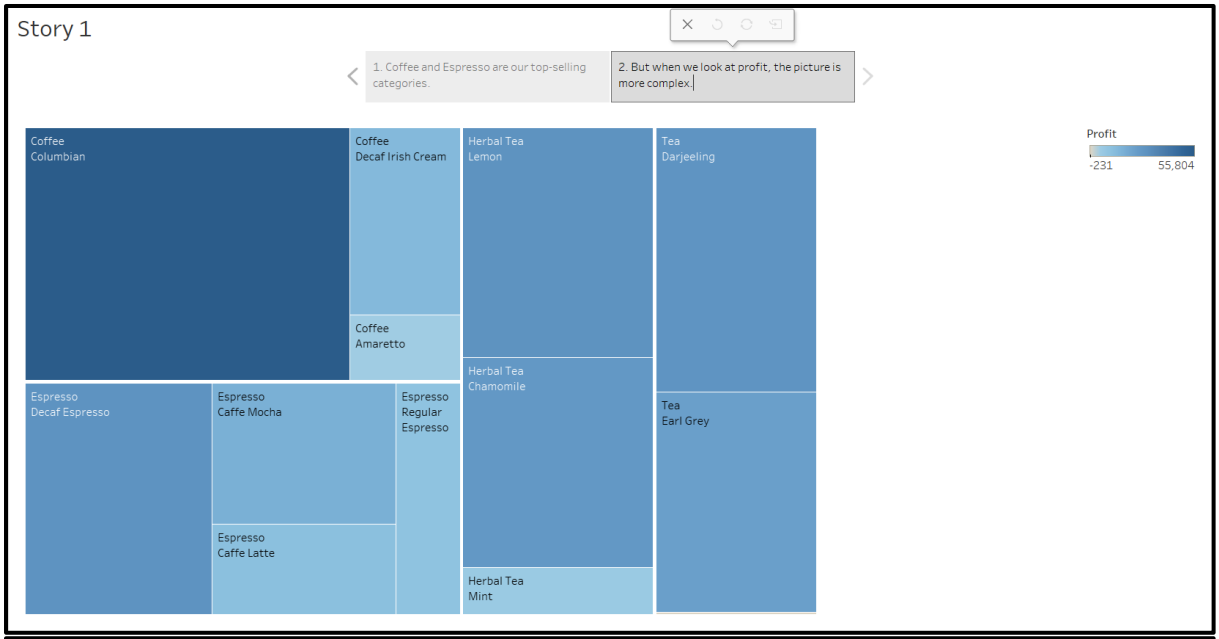


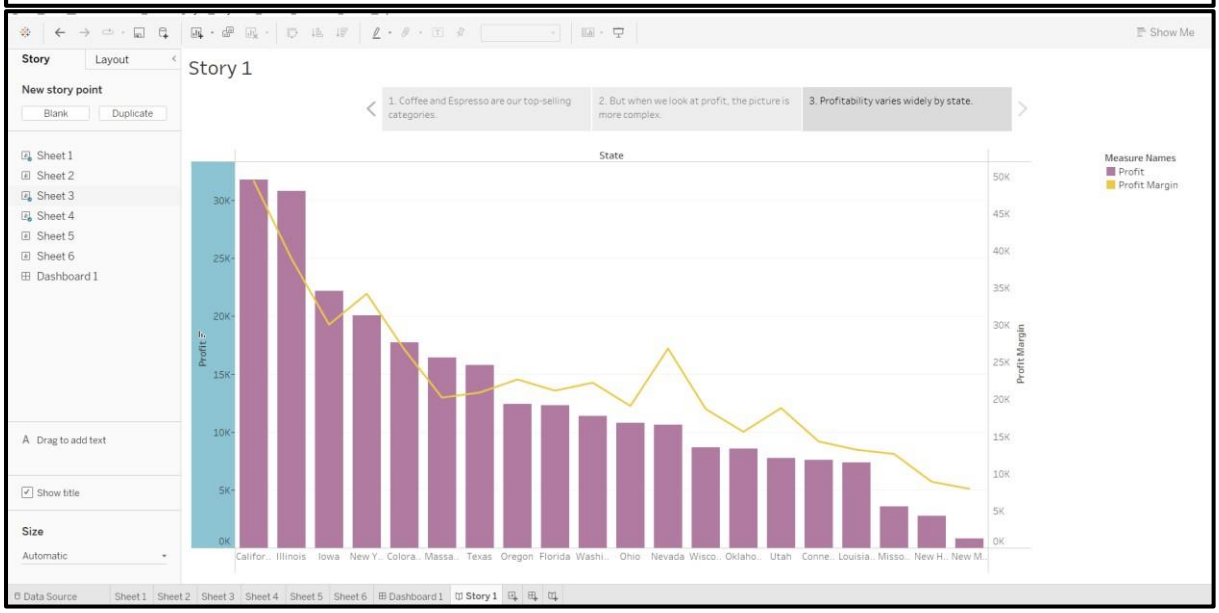
You create a "Story" by adding **"Story Points"** (which are like slides). Each story point can contain one worksheet or one dashboard.



You then write a **caption** for each point to explain what the audience should see. This is a powerful way to present your analysis and "tell a story" with your data.


Story 1
1. Coffee and Espresso are our top-selling categories.
Product
Amaretto
Caffe Latte
Caffe Mocha
Chamomile
Columbian
Darjeeling
Decaf Espresso
Decaf Irish Cream
Earl Grey
Green Tea
Lemon
Mint
Regular Espresso
0K 5K 10K 15K 20K 25K 30K 35K 40K 45K 50K 55K 60K 65K 70K 75K 80K 85K 90K 95K 100K 105K 110K 115K 120K 125K 130K
Sales


Story 1
1. Coffee and Espresso are our top-selling categories.
2. But when we look at profit, the picture is more complex.
Coffee
Columbian
Coffee
Decaf Irish Cream
Coffee
Amaretto
Herbal Tea
Lemon
Herbal Tea
Chamomile
Herbal Tea
Mint
Tea
Darjeeling
Tea
Earl Grey
Espresso
Decaf Espresso
Espresso
Caffe Mocha
Espresso
Caffe Latte
Espresso
Regular Espresso
Profit
-231
55,804


Show Me
Story
Layout
New story point
Blank
Duplicate
Sheet 1
Sheet 2
Sheet 3
Sheet 4
Sheet 5
Sheet 6
Dashboard 1
Drag to add text
Show title
Size
Automatic
Story 1
1. Coffee and Espresso are our top-selling categories.
2. But when we look at profit, the picture is more complex.
3. Profitability varies widely by state.
State
Measure Names
Profit
Profit Margin
Profit
Profit Margin
Califor..
Illinois
Iowa
New Y..
Colora..
Massa..
Texas
Oregon
Florida
Washi..
Ohio
Nevada
Wisco..
Oklaho..
Utah
Conne..
Louisia..
Misso..
New H..
New M..
Data Source
Sheet 1
Sheet 2
Sheet 3
Sheet 4
Sheet 5
Sheet 6
Dashboard 1
Story 1