Project 2 : State-Wise Development Analysis In India

To develop the System to analyze the log data (In XML format) of government progress of various development activities.

Purpose and Scope of this Specification

The purpose of this project is to capture the data for analyzing the progress of various activities In scope

The following requirement will be addressed in phase 1 of Project:

- Developing system to handle the incoming log feed and store the information in Hadoop Cluster (Flume)
- Analyze the data and understand the progress
- Store the results in Hbase/RDBMS

Out of scope

We can use this data and visualization and get more insights

2. Product/Service Description

2.1 Assumptions

Log will be generated in XML format and stored in a server

2.2 Constraints

Describe any item that will constrain the design options, including

- This system may not be used for searching for now. But it will be used for analysis and saving the relevant information as of now
- System will be using Hbase as a database

3. Requirements

- The FLUME job which will format the data and place the data to HDFS
- Pig/MapReduce job for parsing the XML data.
- Create Pig scripts/MapReduce jobs to analyze the data
- Create the Sqoop job to store the data in database

- Priority Definitions

The following definitions are intended as a guideline to prioritize requirements.

- Priority 1 – Create FLUME job for fetching log files from spool directory the data
- Priority 2 – MapReduce/pig job to preprocess

Solution

For this assignment, I've used Acadgild VM and used Flume,Pig, MySQl, and HDFS.

The input log file is in the XML format. I've used Apache flume to copy the data set from local file system to HDFS.

Step 1 : Copy dataset from local file system to HDFS using flume

Apache Flume is a tool/service/data ingestion mechanism for collecting aggregating and transporting large amounts of streaming data such as log data, events (etc...) from various webserves to a centralized data store.

1) First copied flume config file 'filecopy.conf' in the path . /home/acadgild/flume/
2) Configured the flume agent details, channel, source and sink in the config file as below.

```
#Specify source, channel and sink
agent1.sinks =  hdfs-sink1_1
agent1.sources = source1_1
agent1.channels = fileChannel1_1

#Flume Configuration Starts
# Define a file channel called fileChannel on agent1
agent1.channels.fileChannel1_1.type = memory

# on linux FS
agent1.channels.fileChannel1_1.capacity = 200000
agent1.channels.fileChannel1_1.transactionCapacity = 1000

# Define a source for agent1
agent1.sources.source1_1.type = spooldir

# on linux FS
#Spooldir in my case is /home/acadgild/project2_flume_input
agent1.sources.source1_1.spoolDir = /home/acadgild/project2_flume_input
agent1.sources.source1_1.fileHeader = false
agent1.sources.source1_1.fileSuffix = .COMPLETED
agent1.sinks.hdfs-sink1_1.type = hdfs
```

```
#Sink is /flume_import under hdfs
agent1.sinks.hdfs-sink1_1.hdfs.path = hdfs://localhost.localdomain:9000/flume_import
agent1.sinks.hdfs-sink1_1.hdfs.batchSize = 1000
agent1.sinks.hdfs-sink1_1.hdfs.rollSize = 268435456
agent1.sinks.hdfs-sink1_1.hdfs.rollInterval = 0
agent1.sinks.hdfs-sink1_1.hdfs.rollCount = 0
agent1.sinks.hdfs-sink1_1.hdfs.writeFormat=Text

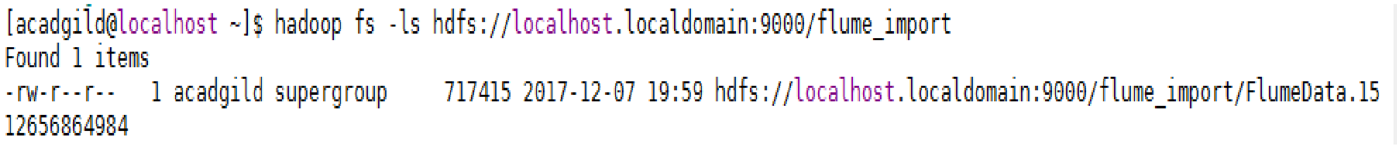
agent1.sinks.hdfs-sink1_1.hdfs.fileType = DataStream
agent1.sources.source1_1.channels = fileChannel1_1
agent1.sinks.hdfs-sink1_1.channel = fileChannel1_1
```

3) Source directory is the location, where the xml file is stored its in /home/acadgild/project2_flume_input

4) Then started the flume agent by running the command flume-ng agent -n agent1 -f filecopy.conf

5) After running the flume agent, the xml file is transferred to HDFS within the location hdfs://localhost.localdomain:9000/flume_import . The content of the folder is as below.

Screenshot of Mobaxterm: Content of flume_import



```
[acadgild@localhost ~]$ hadoop fs -ls hdfs://localhost.localdomain:9000/flume_import
Found 1 items
-rw-r--r--   1 acadgild supergroup     717415 2017-12-07 19:59 hdfs://localhost.localdomain:9000/flume_import/FlumeData.15
12656864984
```

Step 2 : Parsing the data in pig

Then parsed the xml data in Pig to find the solution for the below problem statements

Started the pig shell using pig –x local

Problem statement 1: Find out the districts who achieved 100 percent objective in BPL cards

- **In line 1**: We are registering piggybank jar in order to use XMLLoader to parse XML file.
- **In Line 2**: we are defining org.apache.pig.piggybank.evaluation.xml.XPath() as XPath
- **In relation A**, we are loading the dataset using XMLLoader because of its effective technique to handle XML File and specify the row
- **In relation B**, we are using Xpath, as XPath uses path expressions to select nodes or node-sets in an XML document and specifying name for each node in pig and assigning the value taken from XML file
- **In relation C,** we are generating the columns which are required for processing and explicitly type-casting each of them. To find the districts who achieved 100 percent

objective in BPL, we are calculating the (perform_BPL/Obj_BPL) * 100, which will calculate the achieved vs targeted and storing as BPL_Percentage.

- **In relation D**, we are filtering the district name which has achieved the BPL_Percentage 100,.
- **In relation E**, we are only taking the district names from relation D.
- Finally storing the result **STORE E INTO HDFS** using pigstorage.

Pig Scripts:

```
A = load 'hdfs://localhost.localdomain:9000/flume_import/FlumeData.1512656864984'
using org.apache.pig.piggybank.storage.XMLLoader('row') as (row);
```

```
B = foreach A generate XPath(row,'row/State_Name') AS
State_Name,XPath(row,'row/District_Name') AS
District_Name,XPath(row,'row/Project_Objectives_IHHL_BPL') AS
Obj_BPL,XPath(row,'row/Project_Objectives_IHHL_APL') AS
Obj_APL,XPath(row,'row/Project_Objectives_IHHL_TOTAL') AS Obj_TOTAL,
XPath(row,'row/Project_Objectives_IHHL_SCW') AS
Obj_SCW,XPath(row,'row/Project_Objectives_School_Toilets') AS Obj_School_Toilets,
XPath(row,'row/Project_Objectives_Anganwadi_Toilets') AS
Obj_Anganwadi_Toilets,XPath(row,'row/Project_Objectives_RSM') AS Obj_RSM,
XPath(row,'row/Project_Objectives_PC') AS Obj_PC,XPath(row,'row/Project_Performance-
IHHL_BPL') AS perform_BPL,XPath(row,'row/Project_Performance-IHHL_APL') AS
perform_APL,XPath(row,'row/Project_Performance-IHHL_TOTAL') AS
perform_TOTAL,XPath(row,'row/Project_Performance-SCW') AS perform_SCW,
XPath(row,'row/Project_Performance-School_Toilets') AS
perform_School_Toilets,XPath(row,'row/Project_Performance-Anganwadi_Toilets') AS
perform_Anganwadi_Toilets,XPath(row,'row/Project_Performance-RSM') AS
perform_RSM,XPath(row,'row/Project_Performance-PC') AS perform_PC;
```

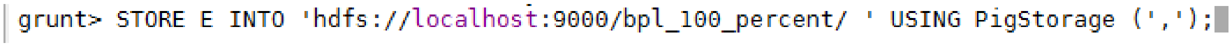
```
C = FOREACH B GENERATE District_Name, ((double)perform_BPL/(double)Obj_BPL)*100
AS BPL_Percentage;
```

```
D = FILTER C BY BPL_Percentage==100.0;
```

```
E = FOREACH D GENERATE District_Name;
```

```
STORE E INTO 'hdfs://localhost:9000/bpl_100_percent/ ' USING PigStorage (',');
```

Screenshot of Mobaxterm: Storing the Pig output in HDFS



```
grunt> STORE E INTO 'hdfs://localhost:9000/bpl_100_percent/ ' USING PigStorage (',');
```

Problem statement 2: Write a Pig UDF to filter the districts which have reached 80% of objectives of BPL cards.

Pig UDF program:

- Firstly we are writing a UDF program, which takes a tuple input as argument, The tuple input will have 3 fields, 1st field is the district name, second is the perfom_BPL value and 3rd is Obj_BPL value.

- As per the above logic, we are casting the string input as double and calculating percentage achieved using (perfom_BPL/Obj_BPL) * 100;

- Then finding if the the percentage achieved is atleast 80. If its atleast 80, then returning the district name as output, else returning “”

- Finally packaging it as jar file to be deployed in pig grunt shell.

- The UDF file is uploaded in the local file of acadgild VM in the location, /home/acadgild/pig/pig_udf_project2.jar'

UDF Source Code

```
package pigudf;

import java.io.IOException;

import org.apache.pig.EvalFunc;
import org.apache.pig.data.Tuple;

public class District_Filter extends EvalFunc<String> {

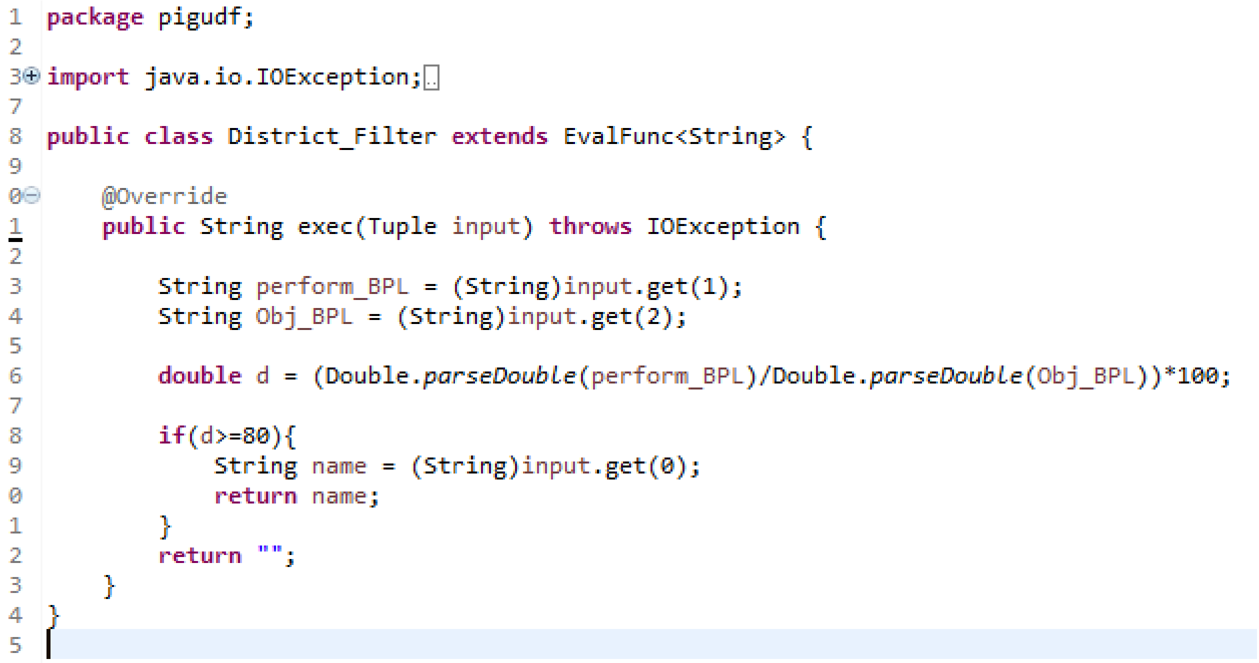
	@Override
	public String exec(Tuple input) throws IOException {

		String perform_BPL = (String)input.get(1);
		String Obj_BPL = (String)input.get(2);

		double d =
(Double.parseDouble(perform_BPL)/Double.parseDouble(Obj_BPL))*100;

		if(d>=80){
			String name = (String)input.get(0);
			return name;
		}
		return "";
	}
}
```

Screenshot of Pig UDF java program



```
package pigudf;

import java.io.IOException;

public class District_Filter extends EvalFunc<String> {

    @Override
    public String exec(Tuple input) throws IOException {

        String perform_BPL = (String)input.get(1);
        String Obj_BPL = (String)input.get(2);

        double d = (Double.parseDouble(perform_BPL)/Double.parseDouble(Obj_BPL))*100;

        if(d>=80){
            String name = (String)input.get(0);
            return name;
        }
        return "";
    }
}

```

Running the Pig UDF program in Mobaxterm:

- **In line 1**: We are registering piggybank jar in order to use XMLLoader to parse XML file.
- **In Line 2**: we are defining org.apache.pig.piggybank.evaluation.xml.XPath() as XPath
- **In relation A**, we are loading the dataset using XMLLoader because of its effective technique to handle XML File and specify the row
- **In relation B**, we are using Xpath, as XPath uses path expressions to select nodes or node-sets in an XML document and specifying name for each node in pig and assigning the value taken from XML file
- Next, we are registering the UDF program jar file using   REGISTER '/home/acadgild/pig/pig_udf_project2.jar'
- Defining pigudf.District_Filter as filterbpl for ease of use.
- **In relation F**, we are passing the input arguments to filterbpl , which are required for processing, we are passing district_name, perform_bpl & obj_bpl. The UDF function will run and return the district names as ouput, for the inputs which has achieved more than 80% in BPL, else it will return empty tuple as output
- **In relation G,** we are filtering the district names which are not null.
- Finally storing the result **STORE G INTO HDFS** using pigstorage

Pig Scripts:

A = load 'hdfs://localhost.localdomain:9000/flume_import/FlumeData.1512656864984' using org.apache.pig.piggybank.storage.XMLLoader('row') as (row);

```
B = foreach A generate XPath(row,'row/State_Name') AS
State_Name,XPath(row,'row/District_Name') AS
District_Name,XPath(row,'row/Project_Objectives_IHHL_BPL') AS
Obj_BPL,XPath(row,'row/Project_Objectives_IHHL_APL') AS
Obj_APL,XPath(row,'row/Project_Objectives_IHHL_TOTAL') AS Obj_TOTAL,
XPath(row,'row/Project_Objectives_IHHL_SCW') AS
Obj_SCW,XPath(row,'row/Project_Objectives_School_Toilets') AS Obj_School_Toilets,
XPath(row,'row/Project_Objectives_Anganwadi_Toilets') AS
Obj_Anganwadi_Toilets,XPath(row,'row/Project_Objectives_RSM') AS Obj_RSM,
XPath(row,'row/Project_Objectives_PC') AS Obj_PC,XPath(row,'row/Project_Performance-
IHHL_BPL') AS perform_BPL,XPath(row,'row/Project_Performance-IHHL_APL') AS
perform_APL,XPath(row,'row/Project_Performance-IHHL_TOTAL') AS
perform_TOTAL,XPath(row,'row/Project_Performance-SCW') AS perform_SCW,
XPath(row,'row/Project_Performance-School_Toilets') AS
perform_School_Toilets,XPath(row,'row/Project_Performance-Anganwadi_Toilets') AS
perform_Anganwadi_Toilets,XPath(row,'row/Project_Performance-RSM') AS
perform_RSM,XPath(row,'row/Project_Performance-PC') AS perform_PC;
```

```
REGISTER '/home/acadgild/pig/pig_udf_project2.jar'

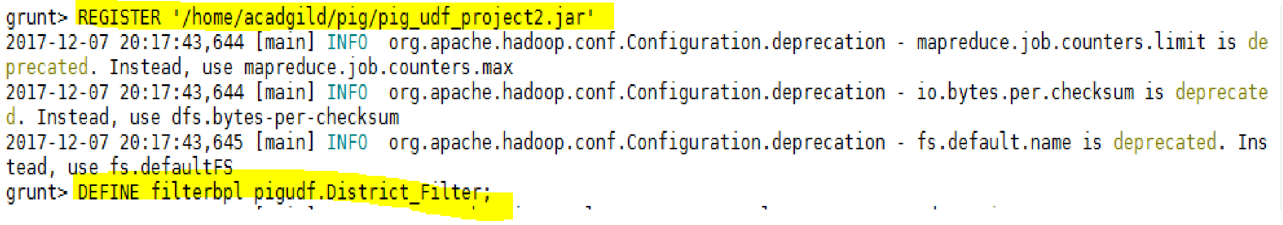
DEFINE filterbpl pigudf.District_Filter;

F= FOREACH B GENERATE filterbpl(District_Name,perform_BPL,Obj_BPL) as district_name;

G = FILTER F by ( district_name is not null and TRIM(district_name) != '' );

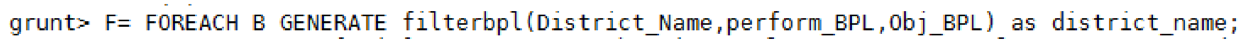
STORE G INTO 'hdfs://localhost:9000/bpl_80_percent/ ' USING PigStorage (',');
```

Screenshot of Mobaxterm: Registering the Pig UDF



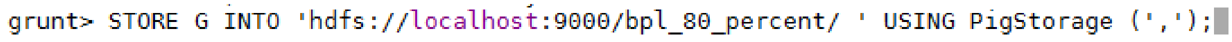
```
grunt> REGISTER '/home/acadgild/pig/pig_udf_project2.jar'
2017-12-07 20:17:43,644 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - mapreduce.job.counters.limit is de
precated. Instead, use mapreduce.job.counters.max
2017-12-07 20:17:43,644 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - io.bytes.per.checksum is deprecate
d. Instead, use dfs.bytes-per-checksum
2017-12-07 20:17:43,645 [main] INFO  org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Ins
tead, use fs.defaultFS
grunt> DEFINE filterbpl pigudf.District_Filter;
```

Screenshot of Mobaxterm: Passing the arguments for the Pig UDF



```
grunt> F= FOREACH B GENERATE filterbpl(District_Name,perform_BPL,Obj_BPL) as district_name;
```

Screenshot of Mobaxterm: Storing the Pig UDF output in HDFS

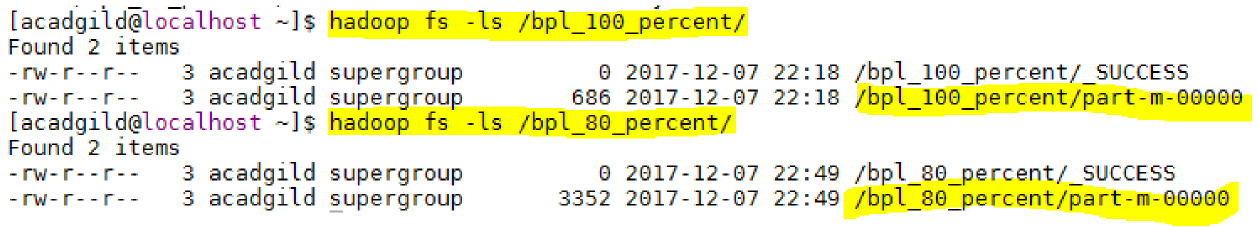


```
grunt> STORE G INTO 'hdfs://localhost:9000/bpl_80_percent/ ' USING PigStorage (',');
```

Step 3: Export the results to mysql using sqoop

First we verify if the Pig outputs are stored in in HDFS using the below command.

Screenshot of Mobaxterm: Verifying Pig outputs stored in HDFS



```
[acadgild@localhost ~]$ hadoop fs -ls /bpl_100_percent/
Found 2 items
-rw-r--r--   3 acadgild supergroup          0 2017-12-07 22:18 /bpl_100_percent/_SUCCESS
-rw-r--r--   3 acadgild supergroup        686 2017-12-07 22:18 /bpl_100_percent/part-m-00000
[acadgild@localhost ~]$ hadoop fs -ls /bpl_80_percent/
Found 2 items
-rw-r--r--   3 acadgild supergroup          0 2017-12-07 22:49 /bpl_80_percent/_SUCCESS
-rw-r--r--   3 acadgild supergroup       3352 2017-12-07 22:49 /bpl_80_percent/part-m-00000
```

Now creating tables in MYSQL

MYSQL

1) Starting the mySql using below syntax

   sudo service mysqld start

2) Logging into mysql command line as user ‘root’

   mysql -u root

3) Created a database ‘project2’.

   create database project2;

   use project2;

4) Granting previliges to user ‘root’

   grant all on *.* to 'root'@'localhost' with grant option;

Exporting the data from HDFS to MySql:

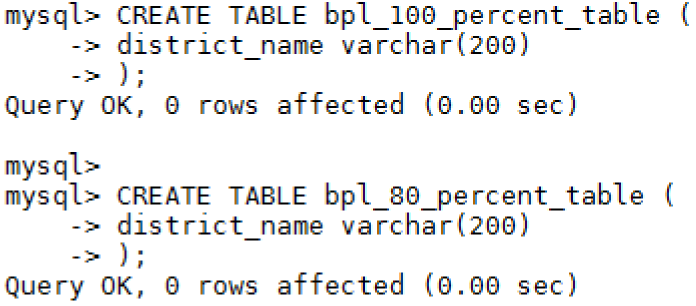
For exporting bpl_100_percent and bpl_80_percent data from HDFS to MySql, I’ve created 2 tables as “bpl_100_percent_table ” and “bpl_80_percent_table” using the below syntax in MySql.

MySQL create table Query

CREATE TABLE bpl_100_percent_table (
district_name varchar(200)
);

CREATE TABLE bpl_80_percent_table (
district_name varchar(200)
);

Screenshot for creating tables in mySql



```
mysql> CREATE TABLE bpl_100_percent_table (
    -> district_name varchar(200)
    -> );
Query OK, 0 rows affected (0.00 sec)

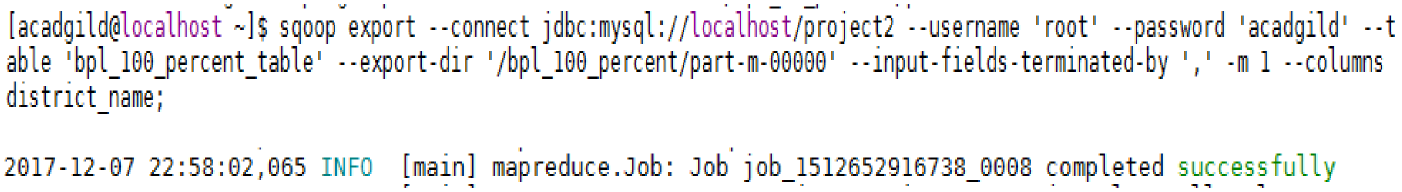
mysql>
mysql> CREATE TABLE bpl_80_percent_table (
    -> district_name varchar(200)
    -> );
Query OK, 0 rows affected (0.00 sec)
```

Exporting data into bpl_100_percent_table

Then on the command line, executed following command to run Sqoop to export content of bpl_100_percent from HDFS to "bpl_100_percent_table"

sqoop export --connect jdbc:mysql://localhost/project2 --username 'root' --password 'acadgild' --table 'bpl_100_percent_table' --export-dir '/bpl_100_percent/part-m-00000' --input-fields-terminated-by ',' -m 1 --columns district_name;

Screenshot of Mobaxterm for exporting bpl_100_percent data from HDFS to MySql:

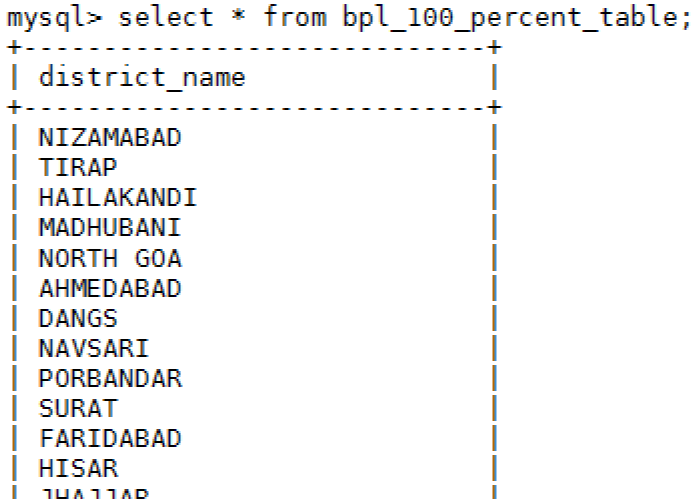


```
[acadgild@localhost ~]$ sqoop export --connect jdbc:mysql://localhost/project2 --username 'root' --password 'acadgild' --t
able 'bpl_100_percent_table' --export-dir '/bpl_100_percent/part-m-00000' --input-fields-terminated-by ',' -m 1 --columns
district_name;

2017-12-07 22:58:02,065 INFO  [main] mapreduce.Job: Job job_1512652916738_0008 completed successfully
```

Data is exported. As shown in the below screen, verified the contents bpl_100_percent_table

Screenshot of Mobaxterm "bpl_100_percent_table"



```
mysql> select * from bpl_100_percent_table;
+-----------------------------+
| district_name               |
+-----------------------------+
| NIZAMABAD                   |
| TIRAP                       |
| HAILAKANDI                  |
| MADHUBANI                   |
| NORTH GOA                   |
| AHMEDABAD                   |
| DANGS                       |
| NAVSARI                     |
| PORBANDAR                   |
| SURAT                       |
| FARIDABAD                   |
| HISAR                       |
| JHAJJAR                     |
```

Contents of bpl_100_percent_table is as below:

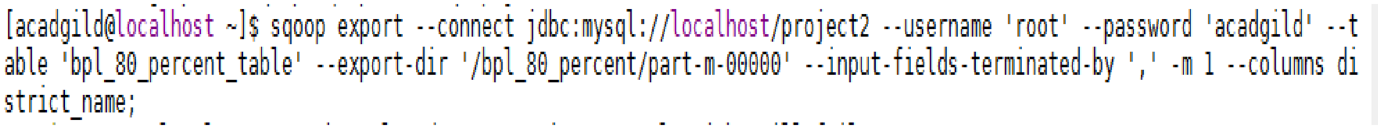
```
mysql> select * from bpl_100_percent_table;
+-----------------------------+
| district_name               |
+-----------------------------+
| NIZAMABAD                   |
| TIRAP                       |
| HAILAKANDI                  |
| MADHUBANI                   |
| NORTH GOA                   |
| AHMEDABAD                   |
| DANGS                       |
| NAVSARI                     |
| PORBANDAR                   |
| SURAT                       |
| FARIDABAD                   |
| HISAR                       |
| JHAJJAR                     |
| MAHENDRAGARH                |
| PANCHKULA                   |
| PANIPAT                     |
| ROHTAK                      |
| SIRSA                       |
| HAMIRPUR                    |
| KINNAUR                     |
| KULLU                       |
| LAHAUL & SPITI              |
| SHIMLA                      |
| SOLAN                       |
| UNA                         |
| DEOGHAR                     |
| LOHARDAGA                   |
| HASSAN                      |
| MANGALORE(DAKSHINA KANNADA) |
| UDUPI                       |
| ALAPPUZHA                   |
| KOLLAM                      |
| KOTTAYAM                    |
| KOZHIKODE                   |
| PALAKKAD                    |
| PATHANAMTHITTA              |
| WAYANAD                     |
| GADCHIROLI                  |
| SINDHUDURG                  |
| WEST GARO HILLS             |
| CHAMPHAI                    |
| LAWNGTLAI                  |
| HANUMANGARH                |
| ERODE                      |
| KARUR                      |
| NAMAKKAL                   |
| TIRUCHIRAPPALLI            |
| TIRUVANNAMALAI             |
| DHALAI                     |
| SOUTH TRIPURA              |
| WEST TRIPURA               |
| AMBEDKAR NAGAR             |
| BALRAMPUR                  |
| BAREILLY                   |
| BIJNOR                     |
| BUDAUN                     |
| ETAWAH                     |
| FARRUKHABAD                |
| FIROZABAD                  |
| GHAZIABAD                  |
| HARDOI                     |
| JYOTIBA PHULE NAGAR        |
| LUCKNOW                    |
| MAHARAJGANJ                |
| MAHOBA                     |
| MORADABAD                  |
| MUZAFFARNAGAR              |
| PILIBHIT                   |
| SONBHADRA                  |
| SULTANPUR                  |
+----------------------------+
70 rows in set (0.00 sec)
```

Exporting data into bpl_80_percent_table

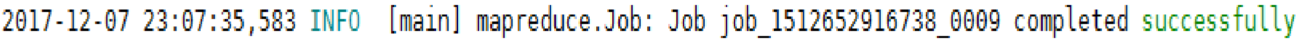
Then on the command line, executed following command to run Sqoop to export content of bpl_80_percent from HDFS to “bpl_80_percent_table”

```
sqoop export --connect jdbc:mysql://localhost/project2 --username 'root' --password 'acadgild' --table 'bpl_80_percent_table' --export-dir '/bpl_80_percent/part-m-00000' --input-fields-terminated-by ',' -m 1 --columns district_name;
```

Screenshot of Mobaxterm for exporting bpl_80_percent data from HDFS to MySql:



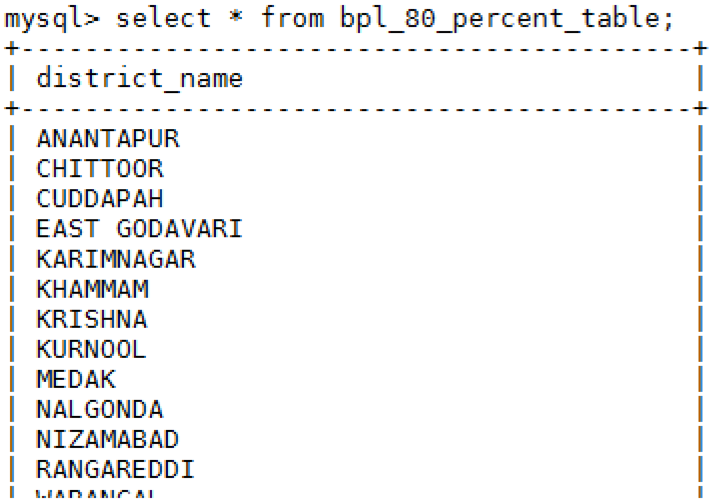
```
[acadgild@localhost ~]$ sqoop export --connect jdbc:mysql://localhost/project2 --username 'root' --password 'acadgild' --t
able 'bpl_80_percent_table' --export-dir '/bpl_80_percent/part-m-00000' --input-fields-terminated-by ',' -m 1 --columns di
strict_name;
```



```
2017-12-07 23:07:35,583 INFO  [main] mapreduce.Job: Job job_1512652916738_0009 completed successfully
```

Data is exported. As shown in the below screen, verified the contents bpl_80_percent_table

Screenshot of Mobaxterm "bpl_80_percent_table"



```
mysql> select * from bpl_80_percent_table;
+------------------------------------------+
| district_name                            |
+------------------------------------------+
| ANANTAPUR                                |
| CHITTOOR                                 |
| CUDDAPAH                                 |
| EAST GODAVARI                            |
| KARIMNAGAR                               |
| KHAMMAM                                  |
| KRISHNA                                  |
| KURNOOL                                  |
| MEDAK                                    |
| NALGONDA                                 |
| NIZAMABAD                                |
| RANGAREDDI                               |
| WARANGAL                                 |
```

Contents of bpl_80_percent_table is as below:

```
mysql> select * from bpl_80_percent_table;
+------------------------------------------+
| district_name                    |
+------------------------------------------+
| ANANTAPUR                         |
| CHITTOOR                        |
| CUDDAPAH                         |
| EAST GODAVARI                     |
| KARIMNAGAR                       |
| KHAMMAM                          |
| KRISHNA                         |
| KURNOOL                          |
| MEDAK                          |
| NALGONDA                          |
| NIZAMABAD                        |
| RANGAREDDI                       |
| WARANGAL                         |
| WEST GODAVARI                    |
| DIBANG VALLEY                    |
| LOHIT                            |
| TIRAP                            |
| BAGSHA                           |
| CACHAR                           |
| DIBRUGARH                        |
| GOALPARA                         |
| GOLAGHAT                         |
| HAILAKANDI                       |
| JORHAT                           |
| KAMRUP                           |
| KARIMGANJ                        |
| KOKRAJHAR                        |
| LAKHIMPUR                        |
| MARIGAON                         |
| NAGAON                           |
| SIBSAGAR                         |
| SONITPUR                         |
| TINSUKIA                         |
| BEGUSARAI                        |
| MADHUBANI                        |
| MUZAFFARPUR                      |
| SAHARSA                          |
| VAISHALI                         |
| DHAMTARI                         |
| JASHPUR                          |
| KANKER                           |
| KORBA                            |
| KORIYA                           |
| SURGUJA                          |
| NORTH GOA                        |
| AHMEDABAD                        |
| AMRELI                           |
| ANAND                            |
| BANAS KANTHA                     |
| BHARUCH                          |
| BHAVNAGAR                        |
| DAHOD                            |
| DANGS                            |
| GANDHINAGAR                      |
| JAMNAGAR                         |
| JUNAGADH                         |
| KACHCHH                        |
| KHEDA                          |
| MAHESANA                       |
| NARMADA                        |
| NAVSARI                        |
| PANCH MAHALS                   |
| PATAN                          |
| PORBANDAR                      |
| RAJKOT                         |
| SABAR KANTHA                   |
| SURAT                          |
| SURENDRANAGAR                  |
| VADODARA                       |
| VALSAD                         |
| AMBALA                         |
| BHIWANI                        |
| FARIDABAD                      |
| FATEHABAD                      |
| GURGAON                        |
| HISAR                          |
| JHAJJAR                        |
| JIND                           |
| KAITHAL                        |
| KARNAL                         |
| KURUKSHETRA                    |
| MAHENDRAGARH                   |
| MEWAT                          |
| PANCHKULA                      |
| PANIPAT                        |
| REWARI                         |
| ROHTAK                         |
| SIRSA                          |
| SONIPAT                        |
| YAMUNANAGAR                    |
| BILASPUR                       |
| CHAMBA                         |
| HAMIRPUR                       |
| KANGRA                         |
| KINNAUR                        |
| KULLU                          |
| LAHAUL & SPITI                 |
| MANDI                          |
| SHIMLA                         |
| SIRMAUR                        |
| SOLAN                          |
| UNA                            |
| ANANTNAG                          |
| LEH (LADAKH)                      |
| DEOGHAR                           |
| DUMKA                             |
| LATEHAR                           |
| LOHARDAGA                         |
| PAKUR                             |
| PURBI SINGHBHUM                   |
| BAGALKOT                          |
| BANGALORE RURAL                   |
| CHICKMAGALUR                      |
| CHITRADURGA                       |
| DHARWAD                           |
| GADAG                             |
| HASSAN                            |
| KODAGU                            |
| KOLAR                             |
| KOPPAL                            |
| MANDYA                            |
| MANGALORE(DAKSHINA KANNADA)       |
| RAMANAGARA                        |
| SHIMOGA                           |
| UDUPI                             |
| ALAPPUZHA                         |
| ERNAKULAM                         |
| IDUKKI                            |
| KANNUR                            |
| KASARGOD                          |
| KOLLAM                            |
| KOTTAYAM                          |
| KOZHIKODE                         |
| MALAPPURAM                        |
| PALAKKAD                          |
| PATHANAMTHITTA                    |
| THIRUVANANTHAPURAM                |
| THRISSUR                          |
| WAYANAD                           |
| ALIRAJPUR                         |
| ANUPPUR                           |
| BARWANI                           |
| BETUL                             |
| BHOPAL                            |
| BURHANPUR                         |
| DATIA                             |
| DEWAS                             |
| DHAR                              |
| DINDORI                |
| GUNA                   |
| GWALIOR                |
| HARDA                  |
| HOSHANGABAD            |
| INDORE                 |
| JABALPUR               |
| JHABUA                 |
| KATNI                  |
| KHANDWA(EAST NIMAR)    |
| KHARGONE               |
| MANDLA                 |
| MANDSAUR               |
| MORENA                 |
| NARSINGHPUR            |
| NEEMUCH                |
| RAISEN                 |
| RAJGARH                |
| RATLAM                 |
| REWA                   |
| SEHORE                 |
| SEONI                  |
| SHAHDOL                |
| SHAJAPUR               |
| SHEOPUR                |
| SINGRAULI              |
| UJJAIN                 |
| UMARIA                 |
| VIDISHA                |
| AHMEDNAGAR             |
| BHANDARA               |
| DHULE                  |
| GADCHIROLI             |
| GONDIA                 |
| HINGOLI                |
| JALNA                  |
| KOLHAPUR               |
| NAGPUR                 |
| OSMANABAD              |
| PARBHANI               |
| PUNE                   |
| RATNAGIRI              |
| SANGLI                 |
| SATARA                 |
| SINDHUDURG             |
| THANE                  |
| WARDHA                         |
| BISHNUPUR                      |
| IMPHAL EAST                    |
| TAMENGLONG                     |
| RI BHOI                        |
| SOUTH GARO HILLS               |
| WEST GARO HILLS                |
| CHAMPHAI                       |
| KOLASIB                        |
| LAWNGTLAI                      |
| LUNGLEI                        |
| MAMIT                          |
| SAIHA                          |
| SERCHHIP                       |
| KOHIMA                         |
| MOKOKCHUNG                     |
| PHEK                           |
| BALESWAR                       |
| JAGATSINGHAPUR                 |
| BARNALA                        |
| FATEHGARH SAHIB                |
| HOSHIARPUR                     |
| JALANDHAR                      |
| KAPURTHALA                     |
| LUDHIANA                       |
| MANSA                          |
| NAWANSHAHR                     |
| S.A.S Nagar                    |
| AJMER                          |
| CHURU                          |
| DUNGARPUR                      |
| GANGANAGAR                     |
| HANUMANGARH                    |
| JAISALMER                      |
| NAGAUR                         |
| SIKAR                          |
| EAST SIKKIM                    |
| NORTH SIKKIM                   |
| SOUTH SIKKIM                   |
| WEST SIKKIM                    |
| COIMBATORE                     |
| CUDDALORE                      |
| DHARMAPURI                     |
| DINDIGUL                       |
| ERODE                          |
| KANCHIPURAM                    |
| KANYAKUMARI(NAGERCOIL)                  |
| KARUR                                   |
| MADURAI                                 |
| NAMAKKAL                                |
| NILGIRIS(UDHAGAMANDALAM)                |
| PERAMBALUR                              |
| PUDUKKOTTAI                             |
| RAMANATHAPURAM                          |
| SALEM                                   |
| SIVAGANGA                               |
| THENI                                   |
| THOOTHUKUDI                             |
| TIRUCHIRAPPALLI                         |
| TIRUNELVELI                             |
| TIRUVANNAMALAI                          |
| TIRUVARUR                               |
| VELLORE                                 |
| VIRUDHUNAGAR                            |
| DHALAI                                  |
| NORTH TRIPURA                           |
| SOUTH TRIPURA                           |
| WEST TRIPURA                            |
| AGRA                                    |
| ALIGARH                                 |
| ALLAHABAD                               |
| AMBEDKAR NAGAR                          |
| AZAMGARH                                |
| BAGPAT                                  |
| BALLIA                                  |
| BALRAMPUR                               |
| BANDA                                   |
| BARABANKI                               |
| BAREILLY                                |
| BASTI                                   |
| BIJNOR                                  |
| BUDAUN                                  |
| BULANDSHAHR                             |
| CHANDAULI                               |
| CHITRAKOOT                              |
| DEORIA                                  |
| ETAH                                    |
| ETAWAH                                  |
| FAIZABAD                                |
| FARRUKHABAD                             |
| FATEHPUR                                |
| FIROZABAD                               |
| GAUTAM BUDDHA NAGAR                    |
| GHAZIABAD                              |
| GHAZIPUR                               |
| GONDA                                  |
| GORAKHPUR                              |
| HAMIRPUR                               |
| HARDOI                                 |
| JALAUN                                 |
| JAUNPUR                                |
| JHANSI                                 |
| JYOTIBA PHULE NAGAR                    |
| KANNAUJ                                |
| KANPUR DEHAT                           |
| KANPUR NAGAR                           |
| KAUSHAMBI                              |
| KUSHINAGAR                             |
| LAKHIMPUR KHERI                        |
| LALITPUR                               |
| LUCKNOW                                |
| MAHAMAYA NAGAR(HATHRAS)                |
| MAHARAJGANJ                            |
| MAHOBA                                 |
| MAINPURI                               |
| MATHURA                                |
| MAU                                    |
| MEERUT                                 |
| MIRZAPUR                               |
| MORADABAD                              |
| MUZAFFARNAGAR                          |
| PILIBHIT                               |
| PRATAPGARH                             |
| RAE BARELI                             |
| RAMPUR                                 |
| SAHARANPUR                             |
| SANT RAVIDAS NAGAR( BHADOHI)           |
| SHAHJAHANPUR                           |
| SHRAVASTI                              |
| SIDDHARTHNAGAR                         |
| SITAPUR                                |
| SONBHADRA                              |
| SULTANPUR                              |
| UNNAO                                  |
| VARANASI                               |
| BAGESHWAR                              |
| CHAMOLI                                |
| DEHRADUN                               |
| HARIDWAR                               |
| NAINITAL                               |
| PITHORAGARH                            |
| RUDRAPRAYAG                            |
| TEHRI GARHWAL                          |
| UDHAM SINGH NAGAR                      |
| UTTARKASHI                             |
| BARDHAMAN                              |
| DAKSHIN DINAJPUR                       |
| HOOGHLY                                |
| HOWRAH                                 |
| JALPAIGURI                             |
| MIDNAPUR EAST                          |
| MIDNAPUR WEST                          |
| NADIA                                  |
| NORTH 24 PARAGANAS                     |
| SOUTH 24 PARAGANAS                     |
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