Big Data Analytics Lab

Exp 1:

Implement the following Data structures in java

a) Linked List

```
 import java.util.*;

class  llist{

public static void main(String args[])

 {

   int n,i,j,k,num,a,z=0;

   LinkedList l=new LinkedList ();

   Scanner S=new Scanner(System.in);

  do{System.out.println("Enter your Choice"+"\n1:insertion\n2:deletion\n3:display\n4:exit");

   n=S.nextInt();

   switch(n)

   {

  case 1:   System.out.println("Enter your Choice"+"\n1:insertion at first\n2 :insertion at last\n
other numbers:insertion after a number");

  k=S.nextInt();

  if(k==1)

  {    System.out.println("enter number");

   num=S.nextInt();

   l.addFirst(num);

  }

   else if(k==2)

  {

   System.out.println("enter number");
   num=S.nextInt();

   l.addLast(num);

                      }

                  else

                      {  System.out.println("enter number after which u want to insert");

                          a=S.nextInt();

                        ListIterator iter =l.listIterator();

                         while(iter.hasNext())

                      {

                             if(a==iter.next())

                                 {

                                  System.out.println("enter number");

                                   num=S.nextInt();

                                    iter.add(num);

                                      z=1;

                               }

                              }

                             if(z==0)

                            System.out.println("number not in list");

                                  z=0;

                      }

                 break;


        case 2:     System.out.println("Enter your Choice"+"\n1:DELETION at first\n2:DELETION  at
last\nOTHER DELETION at middle");

                 k=S.nextInt();

                  if(k==1)

                    {    l.removeFirst();
                  }
              else if(k==2)
                {

                   l.removeLast();
                  }
                else
                   {  System.out.println("enter number after which u want to delete");
                       a=S.nextInt();
                     ListIterator it =l.listIterator();
                      while(it.hasNext())
                   {
                          if(a==it.next())
                              { it.remove();
                                   z=1;
                             }
                            }
                          if(z==0)
                         System.out.println("number not in list");
                              z=0;
                  }


                break;
case 3:  System.out.println(l);
                break;
case 4:  n=0; break;
```

```
   }
     }while(n!=0);

    }

 }
```

b) Stacks

```
import java.util.*;
 class Stk {
  public static void main(String args[])
   {
    int n,i=-1,size,k;
    Stack c= new Stack ();
    Scanner S= new Scanner(System.in);
System.out.println(" enter Stack size");
  size=S.nextInt();
    do {
      System.out.println("enter your choice"+"\n 1:insertion "+"\n 2:deletion "+"\n 3:display"+ "0 for exit");
      n=S.nextInt();
       switch(n)
         {
             case 1:  if(i>=size-1)
                          {System.out.println("cannot insert");}
```

```
            else {
              System.out.println("insert element");
                k=S.nextInt();
              c.push(k);


              i++;
              }
              break;


  case 2:  if(i<0)
              {System.out.println("cannot delete");}
            else {
              c.pop();
              i--;
               }
              break;


  case 3:  if(i<=5 && i>=0)
              {
                   System.out.println(c);
                }
            else {
              System.out.println("cannot display");
               }
              break;


}
```

```
     }while(n!=0);

   }

}
```

c) Queues

```
import java.util.*;

 class  queue {

  public static void main(String args[])

   {

    int n,i=-1,sz,k;

    Queue c= new LinkedList ();

    Scanner S= new Scanner(System.in);

System.out.println("enter queue size");

   sz=S.nextInt();

    do {

      System.out.println("enter your choice"+"\n 1:insertion "+"\n 2:deletion "+"\n 3:display"+ "0
for exit");

      n=S.nextInt();

       switch(n)

         {

             case 1:  if(i>=sz-1)

                           {System.out.println("cannot insert");}

                        else {

                           System.out.println("insert element");

                             k=S.nextInt();

                          c.add(k);



                           i++;
```

```
                 }
                 break;

         case 2:  if(i<0)
                  {System.out.println("cannot delete");}
                else {
                 c.remove();
                  i--;
                  }
                 break;

        case 3:  if(i<=5 && i>=0)
                  {
                     System.out.println(c);
                   }
                else {
                 System.out.println("cannot display");
                  }
                 break;

       }
   }while(n!=0);
  }
}
```

d)Set

```
import java.util.*;

import java.io.*;
```

```
public class set
{
  public static void main(String args[]) throws FileNotFoundException
   {
     Set<String> dictionaryWords=readWords("words");
     Set<String> documentWords=readWords("alice30.txt");
   for(String word: documentWords)
    {
       if(!dictionaryWords.contains(word))
         {
            System.out.println(word);
          }
     }
}

public static Set<String> readWords(String filename) throws FileNotFoundException
{
 Set <String> words= new TreeSet<String>();
 Scanner in = new Scanner(new File(filename));
 in.useDelimiter("[^a-zA-Z]+");
   while(in.hasNext())
{
words.add(in.next().toLowerCase());
}
return words;
}
 }
```

e)Map

```
import java.awt.*;

import java.util.*;

public class MapaDemo

{

 public static void main(String args[])

  {

    Map<String, Color> fav= new HashMap<String,Color>();

    fav.put("Romeo",Color.BLUE);

    fav.put("juliet",Color.RED);

    fav.put("adam",Color.BLACK);

    fav.put("Eve",Color.GREEN);

  Set <String> keyset= fav.keySet();

   for(String key: keyset)

    {

      Color value=fav.get(key);

      System.out.println(key+" "+value);

    }

}

}
```

Exp 2:

Perform setting up and installing hadoop in standalone mode.

INSTALL APACHE HADOOP 2.6.0 IN UBUNTU (SINGLE NODE SETUP)

1)Installing Oracle Java 8

Apache Hadoop is java framework, we need java installed on our machine to get it run over operating system. Hadoop supports all java version greater than 5 (i.e. `Java 1.5`). So, Here you can also try Java 6, 7 instead of Java 8.

```
$ sudo add-apt-repository ppa:webupd8team/java

$  sudo apt-get update

$  sudo apt-get install oracle-java8-installer
```

It will install java source in your machine at `/usr/lib/jvm/java-8-oracle`

To verify your java installation, you have to fire the following command like,

```
$  java –version
```

2) Creating a Hadoop user for accessing HDFS and MapReduce

To avoid security issues, we recommend to setup new Hadoop user group and user account to deal with all Hadoop related activities.

We will create hadoop as system group and hduser as system user by,

```
$ sudo addgroup hadoop

$ sudo adduser --ingroup hadoop hduser
```

3) Installing SSH

SSH ("Secure SHell") is a protocol for securely accessing one machine from another. Hadoop uses SSH for accessing another slaves nodes to start and manage all HDFS and MapReduce daemons.

```
$ sudo apt-get install openssh-server
$ sudo apt-get install ssh
$ sudo adduser hduser sudo
```

Now, we have installed SSH over Ubuntu machine so we will be able to connect with this machine as well as from this machine remotely.

```
$ cd Downloads

$sudo mv hadoop-2.6.0.tar.gz /usr/local/

$cd

$sudo su hduser

$cd
```

Configuring SSH

Once you installed SSH on your machine, you can connect to other machine or allow other machines to connect with this machine. However we have this single machine, we can try connecting with this same machine by SSH. To do this, we need to copy generated RSA key (i.e. id_rsa.pub) pairs to authorized_keys folder of SSH installation of this machine by the following command,

```
$ ssh-keygen -t rsa -P ""

$ cat $HOME/.ssh/id_rsa.pub >> $HOME/.ssh/authorized_keys
```

In case you are configuring SSH for another machine (i.e. from master node to slave node), you have to update the above command by adding the hostname of slave machine.

4) Disabling IPv6

Since Hadoop doesn’t work on IPv6, we should disable it. One of another reason is also that it has been developed and tested on IPv4 stacks. Hadoop nodes will be able to communicate if we are having IPv4 cluster. (Once you have disabled IPV6 on your machine, you need to reboot your machine in order to check its effect. In case if you don’t know how to reboot with command use sudo reboot)

For getting your IPv6 disable in your Linux machine, you need to update */etc/sysctl.conf* by adding following line of codes at end of the file,

```
$sudo gedit /etc/sysctl.conf
```

```
# disable ipv6
```

```
net.ipv6.conf.all.disable_ipv6 = 1

net.ipv6.conf.default.disable_ipv6 = 1

net.ipv6.conf.lo.disable_ipv6 = 1
```

Tip:- You can use nano, gedit, and Vi editor for updating all text files for this configuration purpose.

```
$ sudo reboot
```

Installation Steps

1)Download latest Apache Hadoop source from Apache mirrors
First you need to download Apache Hadoop 2.6.0 (i.e. *hadoop-2.6.0.tar.gz*)or latest version source from Apache download Mirrors. You can also try stable hadoop to get all latest features as well as recent bugs solved with Hadoop source. Choose location where you want to place all your hadoop installation, I have chosen */usr/local/hadoop*

```
$sudo su hduser
```

```
## Locate to hadoop installation parent dir

$ cd /usr/local/

## Extract Hadoop source

$ sudo tar -xzvf hadoop-2.6.0.tar.gz

## Move hadoop-2.6.0 to hadoop folder

$ sudo mv hadoop-2.6.0 /usr/local/hadoop

## Assign ownership of this folder to Hadoop user

$ sudo chown hduser:hadoop -R /usr/local/hadoop

## Create Hadoop temp directories for Namenode and Datanode

$ sudo mkdir -p /usr/local/hadoop_tmp/hdfs/namenode

$sudo mkdir -p /usr/local/hadoop_tmp/hdfs/datanode
```

```
## Again assign ownership of this Hadoop temp folder to Hadoop user

$ sudo chown hduser:hadoop -R /usr/local/hadoop_tmp/
```

2)Update Hadoop configuration files

```
$cd
$ sudo gedit .bashrc
```

```
## Update hduser configuration file by appending the

## following environment variables at the end of this file.
```

```
# -- HADOOP ENVIRONMENT VARIABLES START -- #

export JAVA_HOME=/usr/lib/jvm/java-8-oracle

export HADOOP_HOME=/usr/local/hadoop

export PATH=$PATH:$HADOOP_HOME/bin

export PATH=$PATH:$HADOOP_HOME/sbin

export HADOOP_MAPRED_HOME=$HADOOP_HOME

export HADOOP_COMMON_HOME=$HADOOP_HOME

export HADOOP_HDFS_HOME=$HADOOP_HOME

export YARN_HOME=$HADOOP_HOME

export HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_HOME/lib/native

export HADOOP_OPTS="-Djava.library.path=$HADOOP_HOME/lib"

# -- HADOOP ENVIRONMENT VARIABLES END -- #
```

Configuration file : hadoop-env.sh

```
$cd /usr/local/hadoop/etc/hadoop

$ sudo gedit hadoop-env.sh
```

```
## Update JAVA_HOME variable,
```

```
JAVA_HOME=/usr/lib/jvm/java-8-oracle
```

Configuration file : core-site.xml

```
$ sudo gedit core-site.xml
```

```
## Paste these lines into <configuration> tag
```

```
<property>

<name>fs.default.name</name>

<value>hdfs://localhost:9000</value>

</property>
```

Configuration file : hdfs-site.xml

```
$ sudo gedit hdfs-site.xml
```

```
## Paste these lines into <configuration> tag
```

```
<property>

      <name>dfs.replication</name>

      <value>1</value>

 </property>

 <property>

      <name>dfs.namenode.name.dir</name>
```

```
     <value>file:/usr/local/hadoop_tmp/hdfs/namenode</value>

 </property>

 <property>

     <name>dfs.datanode.data.dir</name>

     <value>file:/usr/local/hadoop_tmp/hdfs/datanode</value>

 </property>
```

Configuration file : yarn-site.xml

```
$ sudo gedit yarn-site.xml
```

```
## Paste these lines into <configuration> tag
```

```
<property>

     <name>yarn.nodemanager.aux-services</name>

     <value>mapreduce_shuffle</value>

</property>

<property>

     <name>yarn.nodemanager.aux-
services.mapreduce.shuffle.class</name>

     <value>org.apache.hadoop.mapred.ShuffleHandler</value>

</property>
```

Configuration file : mapred-site.xml

```
$ cp /usr/local/hadoop/etc/hadoop/mapred-site.xml.template
/usr/local/hadoop/etc/hadoop/mapred-site.xml
```

```
$ sudo gedit mapred-site.xml
```

```
## Paste these lines into <configuration> tag
```

```
<property>

   <name>mapreduce.framework.name</name>

   <value>yarn</value>

</property>
```

```
$ sudo reboot
```

3)Format Namenode

```
$sudo su hduser

$hdfs namenode –format
```

4)Start all Hadoop daemons

```
$ cd /usr/local/hadoop
```

Start hdfs daemons

```
$ start-dfs.sh
```

Start MapReduce daemons:

```
$ start-yarn.sh
```

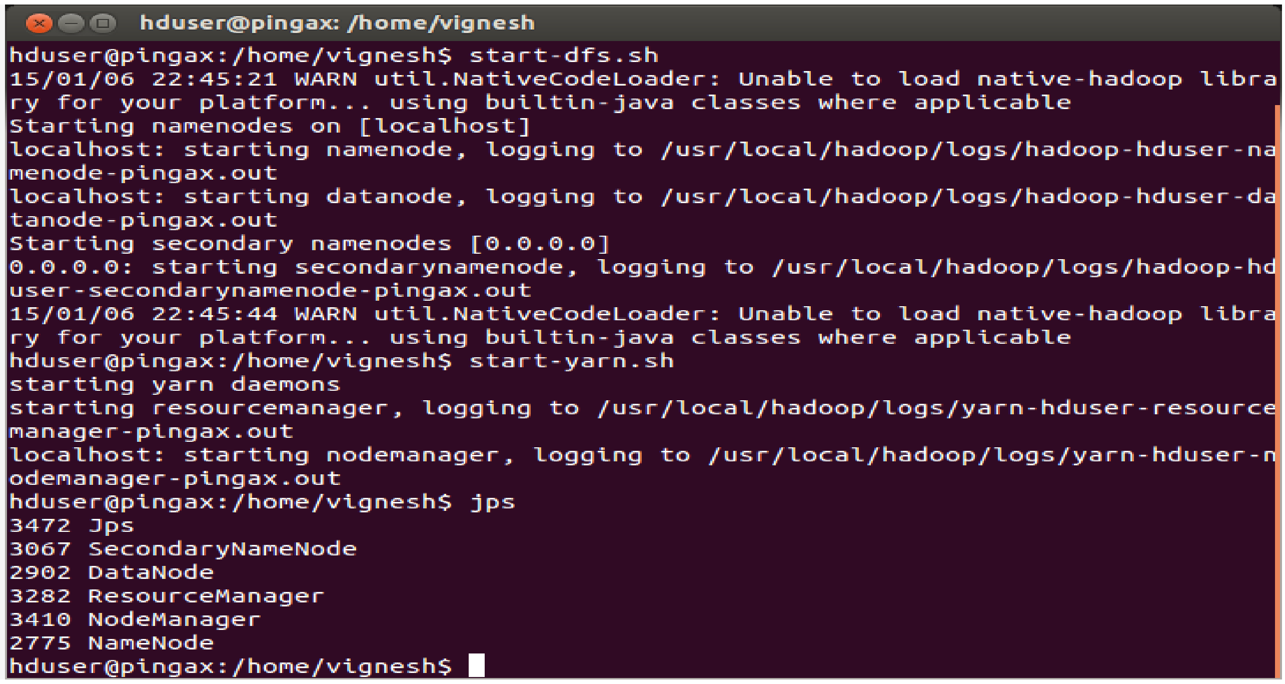
Instead both of these above command you can also use *start-all.sh*, but its now deprecated so its not recommended to be used for better Hadoop operations.

5) **Track/Monitor/Verify**

```
$cd
```

Verify Hadoop daemons:

```
$ jps
```

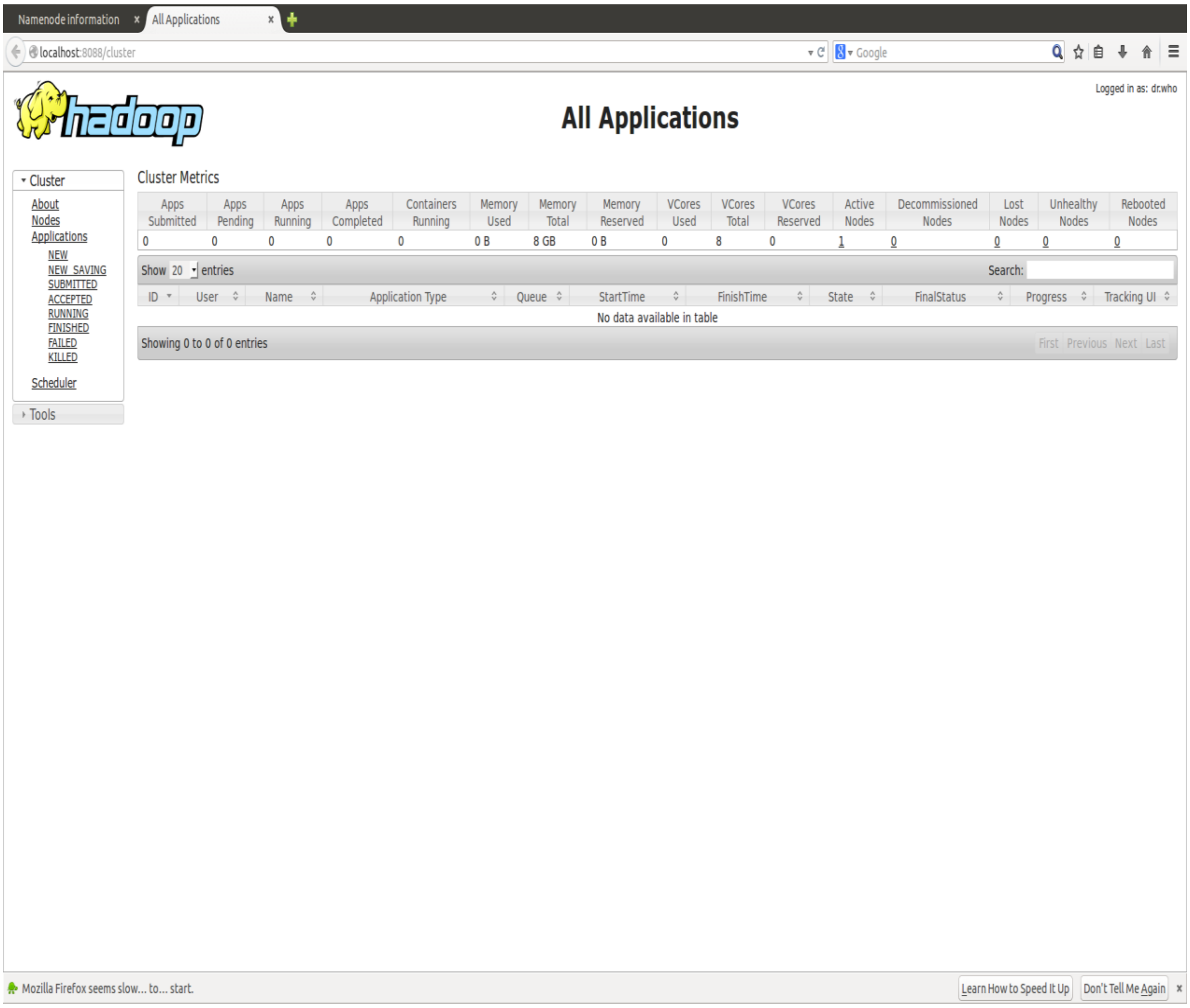


```
hduser@pingax:/home/vignesh$ start-dfs.sh
15/01/06 22:45:21 WARN util.NativeCodeLoader: Unable to load native-hadoop libra
ry for your platform... using builtin-java classes where applicable
Starting namenodes on [localhost]
localhost: starting namenode, logging to /usr/local/hadoop/logs/hadoop-hduser-na
menode-pingax.out
localhost: starting datanode, logging to /usr/local/hadoop/logs/hadoop-hduser-da
tanode-pingax.out
Starting secondary namenodes [0.0.0.0]
0.0.0.0: starting secondarynamenode, logging to /usr/local/hadoop/logs/hadoop-hd
user-secondarynamenode-pingax.out
15/01/06 22:45:44 WARN util.NativeCodeLoader: Unable to load native-hadoop libra
ry for your platform... using builtin-java classes where applicable
hduser@pingax:/home/vignesh$ start-yarn.sh
starting yarn daemons
starting resourcemanager, logging to /usr/local/hadoop/logs/yarn-hduser-resource
manager-pingax.out
localhost: starting nodemanager, logging to /usr/local/hadoop/logs/yarn-hduser-n
odemanager-pingax.out
hduser@pingax:/home/vignesh$ jps
3472 Jps
3067 SecondaryNameNode
2902 DataNode
3282 ResourceManager
3410 NodeManager
2775 NameNode
hduser@pingax:/home/vignesh$
```

Monitor Hadoop ResourseManage and Hadoop NameNode

If you wish to track Hadoop MapReduce as well as HDFS, you can try exploring Hadoop web view of ResourceManager and NameNode which are usually used by hadoop administrators. Open your default browser and visit to the following links.

For ResourceManager – http://localhost:8088



All Applications

Cluster Metrics

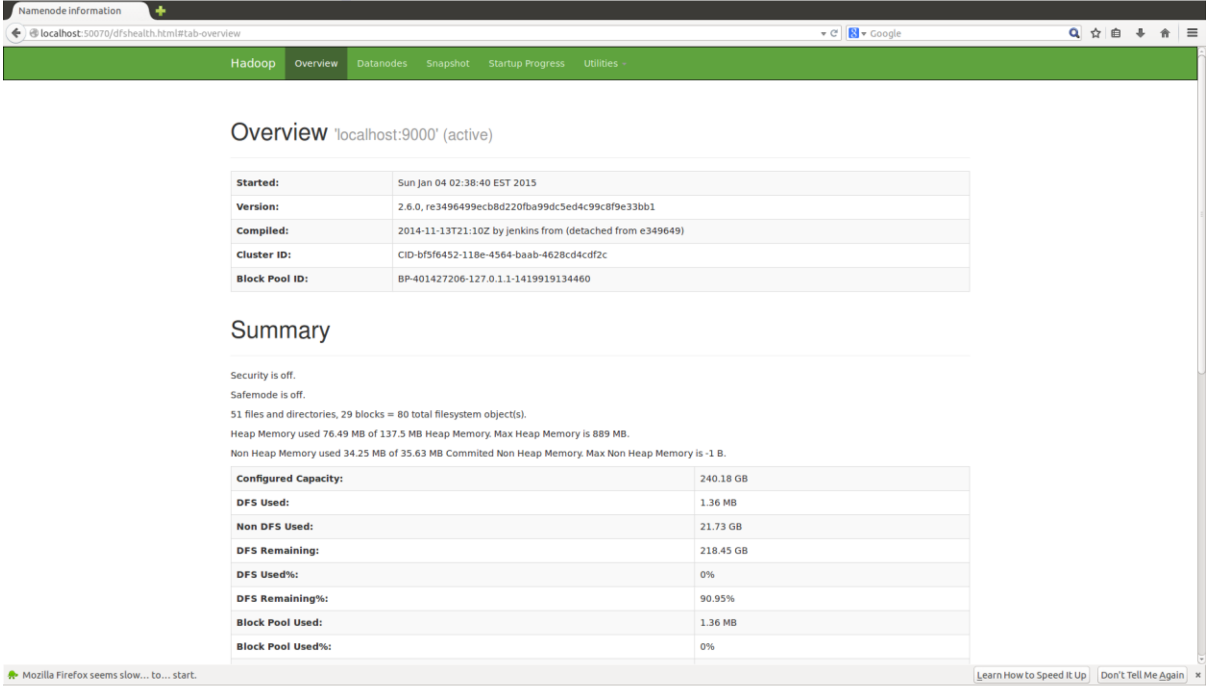
Apps Submitted	Apps Pending	Apps Running	Apps Completed	Containers Running	Memory Used	Memory Total	Memory Reserved	VCores Used	VCores Total	VCores Reserved	Active Nodes	Decommissioned Nodes	Lost Nodes	Unhealthy Nodes	Rebooted Nodes
0	0	0	0	0	0 B	8 GB	0 B	0	8	0	1	0	0	0	0

Show 20 entries   Search:

ID	User	Name	Application Type	Queue	StartTime	FinishTime	State	FinalStatus	Progress	Tracking UI
No data available in table										

Showing 0 to 0 of 0 entries   First Previous Next Last

For NameNode –http://localhost:50070



Overview 'localhost:9000' (active)

Started:	Sun Jan 04 02:38:40 EST 2015
Version:	2.6.0, re3496499ecb8d220fba99dc5ed4c99c8f9e33bb1
Compiled:	2014-11-13T21:10Z by jenkins from (detached from e349649)
Cluster ID:	CID-bf5f6452-118e-4564-baab-4628cd4cdf2c
Block Pool ID:	BP-401427206-127.0.1.1-1419919134460

Summary

Security is off.

Safemode is off.

51 files and directories, 29 blocks = 80 total filesystem object(s).

Heap Memory used 76.49 MB of 137.5 MB Heap Memory. Max Heap Memory is 889 MB.

Non Heap Memory used 34.25 MB of 35.63 MB Commited Non Heap Memory. Max Non Heap Memory is -1 B.

Configured Capacity:	240.18 GB
DFS Used:	1.36 MB
Non DFS Used:	21.73 GB
DFS Remaining:	218.45 GB
DFS Used%:	0%
DFS Remaining%:	90.95%
Block Pool Used:	1.36 MB
Block Pool Used%:	0%

Exp 3:

Implementing the following file management tasks in hadoop:

1. *Adding Files and Directories to HDFS*

Before you can run Hadoop programs on data stored in HDFS, you'll need to put the data into HDFS first. Let's create a directory and put a file in it. HDFS has a default working directory of /user/$USER, where $USER is your login user name. This directory isn't automatically created for you, though, so let's create it with the mkdir command. For the purpose of illustration, we use chuck. You should substitute your user name in the example commands.

```
hadoop fs –mkdir /user/chuck
```

Hadoop's mkdir command automatically creates parent directories if they don't already exist. Now that we have a working directory, we can put a file into it. Create some text file on your local filesystem called example.txt. The Hadoop command put is used to copy files from the local system into HDFS.

```
hadoop fs –put example.txt
```

Note the period (.) as the last argument in the command above. It means that we're putting the file into the default working directory. The command above is equivalent to:

hadoop fs –put example.txt /user/chuck

2. **Retrieving Files from HDFS**

The Hadoop command get copies files from HDFS back to the local filesystem. To retrieve example.txt, we can run the following command:

hadoop fs –get example.txt

Another way to access the data is to display it. The Hadoop cat command allows us to do that:

hadoop fs –cat example.txt

3. **Deleting Files from HDFS**

You shouldn't be too surprised by now that the Hadoop command for removing files is rm:

hadoop fs –rm example.txt

The rm command can also be used to delete empty directories.

Exp 4:

Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

```
import java.io.IOException;
import java.util.StringTokenizer;

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

public class WordCount {

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

    private final static IntWritable one = new IntWritable(1);
    private Text word = new Text();

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

  public static class IntSumReducer
       extends Reducer<Text,IntWritable,Text,IntWritable> {
    private IntWritable result = new IntWritable();

    public void reduce(Text key, Iterable<IntWritable> values,
                       Context context
                       ) throws IOException, InterruptedException {
      int sum = 0;
      for (IntWritable val : values) {
        sum += val.get();
      }
      result.set(sum);
      context.write(key, result);
    }
  }

  public static void main(String[] args) throws Exception {
    Configuration conf = new Configuration();
    Job job = Job.getInstance(conf, "word count");
    job.setJarByClass(WordCount.class);
    job.setMapperClass(TokenizerMapper.class);
    job.setCombinerClass(IntSumReducer.class);
    job.setReducerClass(IntSumReducer.class);
    job.setOutputKeyClass(Text.class);
    job.setOutputValueClass(IntWritable.class);
    FileInputFormat.addInputPath(job, new Path(args[0]));
    FileOutputFormat.setOutputPath(job, new Path(args[1]));
    System.exit(job.waitForCompletion(true) ? 0 : 1);
  }
}
```

Create a folder on desktop as inputdata and place data in test.txt as a file.

Create a folder on desktop as wordcountf and palce a program with WordCount.java

open terminal :

these commandsmust run after starting haddoop nodes..

```
cd /usr/local/hadoop
```

```
bin/hdfs dfs -put '/home/oslab/Desktop/inputdata' /user
```

```
cd '/home/oslab/Desktop/wordcountf'
```

compiling :

```
sudo javac -classpath /usr/local/hadoop/share/hadoop/common/hadoop-common-2.6.0.jar:/usr/local/hadoop/share/hadoop/common/lib/hadoop-annotations-2.6.0.jar:/usr/local/hadoop/share/hadoop/mapreduce/hadoop-mapreduce-client-core-2.6.0.jar -d /home/oslab/Desktop/wordcountf *.java
```

create a folder in wordcountf as wordcountc, and move all class files to worccountc folder

running :

open terminal :

```
sudo jar -cvf wordcountj.jar -C /home/oslab/Desktop/wordcountf/wordcountc .
```

```
 cd /usr/local/hadoop
```

```
bin/hadoop jar /home/oslab/Desktop/wordcountf/wordcountj.jar WordCount /user/inputdata/ outputwc
```

open browser :

http://localhost:50070/explorer.html#/

goto utilities tab on that page, and select the browse the file system

and type /user/hduser/outputwc in search bar .

Select part-r-00000 and download it ,you will get output of a program.

Exp 5:

Write a Map Reduce program that mines weather data.

```
{
     int maxValue = Integer.MIN_VALUE;
    for (IntWritable value : values) {
      maxValue = Math.max(maxValue, value.get());import
org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.Reducer;
//Mapper class
 class MaxTemperatureMapper
  extends Mapper<LongWritable, Text, Text, IntWritable> {
   private static final int MISSING = 9999;
  @Override
  public void map(LongWritable key, Text value, Context context)
      throws IOException, InterruptedException {
     String line = value.toString();
    String year = line.substring(15, 19);
    int airTemperature;
    if (line.charAt(87) == '+') { // parseInt doesn't like leading plus
signs
      airTemperature = Integer.parseInt(line.substring(88, 92));
    } else {
      airTemperature = Integer.parseInt(line.substring(87, 92));
    }
    String quality = line.substring(92, 93);
    if (airTemperature != MISSING && quality.matches("[01459]")) {
      context.write(new Text(year), new IntWritable(airTemperature));
    }
  }
}
 //Reducer class
 class MaxTemperatureReducer
  extends Reducer<Text, IntWritable, Text, IntWritable> {
   @Override
  public void reduce(Text key, Iterable<IntWritable> values,
      Context context)
      throws IOException, InterruptedException
    }
    context.write(key, new IntWritable(maxValue));
  }
}
//Driver Class
public class MaxTemperature {
  public static void main(String[] args) throws Exception {
    if (args.length != 2) {
      System.err.println("Usage: MaxTemperature <input path=""> <output
path>");
      System.exit(-1);
    }
    Job job = Job.getInstance(new Configuration());
    job.setJarByClass(MaxTemperature.class);
    job.setJobName("Max temperature");
    FileInputFormat.addInputPath(job, new Path(args[0]));
    FileOutputFormat.setOutputPath(job, new Path(args[1]));
    job.setMapperClass(MaxTemperatureMapper.class);
    job.setReducerClass(MaxTemperatureReducer.class);
    job.setOutputKeyClass(Text.class);
    job.setOutputValueClass(IntWritable.class);
   job.submit();
  }
}
```

WEEK-8

PIG LATIN LANGUAGE - PIG

8.1 OBJECTIVE:

1. Installation of PIG.

8.2 RESOURCES:

VMWare, Web browser, 4 GB RAM, Hard Disk 80 GB.

8.3 PROGRAM LOGIC:

STEPS FOR INSTALLING APACHE PIG

1) Extract the pig-0.15.0.tar.gz and move to home directory

2) Set the environment of PIG in bashrc file.

3) Pig can run in two modes

Local Mode and Hadoop Mode

Pig –x local and pig

4) Grunt Shell

Grunt >

5) LOADING Data into Grunt Shell

DATA = LOAD <CLASSPATH> USING PigStorage(DELIMITER) as (ATTRIBUTE : DataType1, ATTRIBUTE : DataType2…..)

6) Describe Data

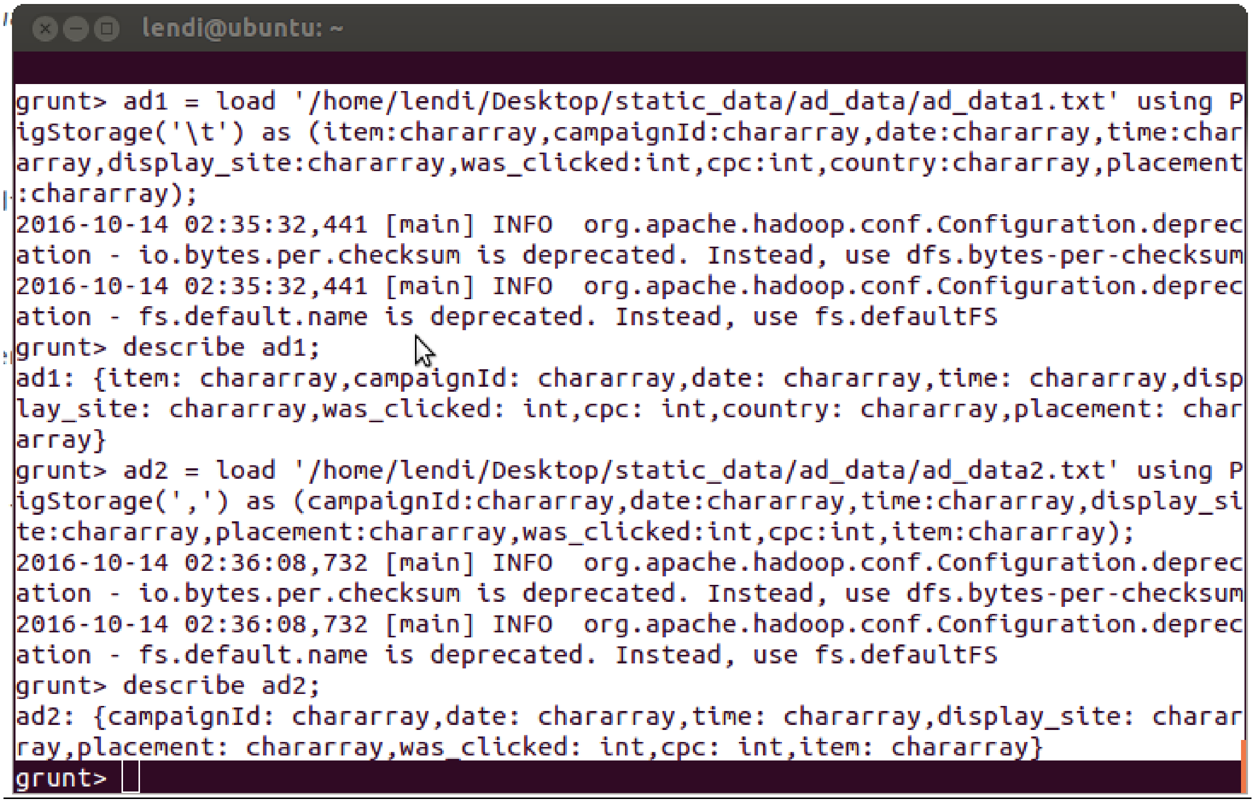
Describe DATA;

7) DUMP Data

Dump DATA;

8.4 INPUT/OUTPUT:

Input as Website Click Count Data



```
grunt> ad1 = load '/home/lendi/Desktop/static_data/ad_data/ad_data1.txt' using P
igStorage('\t') as (item:chararray,campaignId:chararray,date:chararray,time:char
array,display_site:chararray,was_clicked:int,cpc:int,country:chararray,placement
:chararray);
2016-10-14 02:35:32,441 [main] INFO  org.apache.hadoop.conf.Configuration.deprec
ation - io.bytes.per.checksum is deprecated. Instead, use dfs.bytes-per-checksum
2016-10-14 02:35:32,441 [main] INFO  org.apache.hadoop.conf.Configuration.deprec
ation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt> describe ad1;
ad1: {item: chararray,campaignId: chararray,date: chararray,time: chararray,disp
lay_site: chararray,was_clicked: int,cpc: int,country: chararray,placement: char
array}
grunt> ad2 = load '/home/lendi/Desktop/static_data/ad_data/ad_data2.txt' using P
igStorage(',') as (campaignId:chararray,date:chararray,time:chararray,display_si
te:chararray,placement:chararray,was_clicked:int,cpc:int,item:chararray);
2016-10-14 02:36:08,732 [main] INFO  org.apache.hadoop.conf.Configuration.deprec
ation - io.bytes.per.checksum is deprecated. Instead, use dfs.bytes-per-checksum
2016-10-14 02:36:08,732 [main] INFO  org.apache.hadoop.conf.Configuration.deprec
ation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt> describe ad2;
ad2: {campaignId: chararray,date: chararray,time: chararray,display_site: charar
ray,placement: chararray,was_clicked: int,cpc: int,item: chararray}
grunt>
```

8.5 PRE-LAB VIVA QUESTIONS:

1) What do you mean by a bag in Pig?
2) Differentiate between PigLatin and HiveQL
3) How will you merge the contents of two or more relations and divide a single relation into two or more relations?

8.6 LAB ASSIGNMENT:

1. Process baseball data using Apache Pig.

8.7 POST-LAB VIVA QUESTIONS:

1. What is the usage of foreach operation in Pig scripts?
2. What does Flatten do in Pig

WEEK-9

PIG COMMANDS

9.1 OBJECTIVE:

Write Pig Latin scripts sort, group, join, project, and filter your data.

9.2 RESOURCES:

VMWare, Web browser, 4 GB RAM, Hard Disk 80 GB.

9.3 PROGRAM LOGIC:

FILTER Data

FDATA = FILTER DATA by ATTRIBUTE = VALUE;

GROUP Data

GDATA = GROUP DATA by ATTRIBUTE;

Iterating Data

FOR_DATA = FOREACH DATA GENERATE GROUP AS GROUP_FUN,

ATTRIBUTE = <VALUE>

Sorting Data

SORT_DATA = ORDER DATA BY ATTRIBUTE WITH CONDITION;

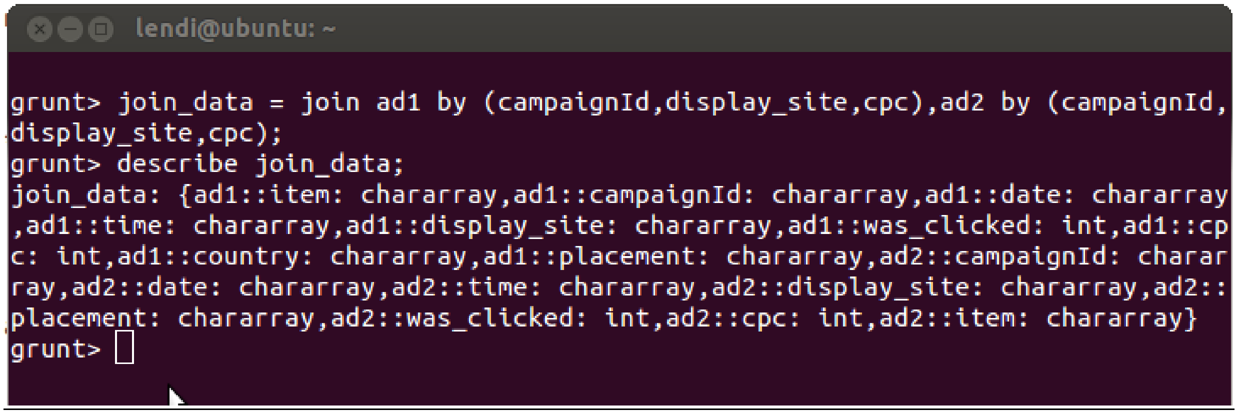
LIMIT Data

LIMIT_DATA = LIMIT DATA COUNT;

JOIN Data

JOIN DATA1 BY (ATTRIBUTE1,ATTRIBUTE2….) , DATA2 BY (ATTRIBUTE3,ATTRIBUTE….N)

9.4 INPUT / OUTPUT :



```
grunt> join_data = join ad1 by (campaignId,display_site,cpc),ad2 by (campaignId,
display_site,cpc);
grunt> describe join_data;
join_data: {ad1::item: chararray,ad1::campaignId: chararray,ad1::date: chararray
,ad1::time: chararray,ad1::display_site: chararray,ad1::was_clicked: int,ad1::cp
c: int,ad1::country: chararray,ad1::placement: chararray,ad2::campaignId: charar
ray,ad2::date: chararray,ad2::time: chararray,ad2::display_site: chararray,ad2::
placement: chararray,ad2::was_clicked: int,ad2::cpc: int,ad2::item: chararray}
grunt> 
```

9.5 PRE-LAB VIVA QUESTIONS:

1. How will you merge the contents of two or more relations and divide a single relation into two or more relations?
2. What is the usage of foreach operation in Pig scripts?
3. What does Flatten do in Pig?

9.6 LAB ASSIGNMENT:

1. Using Apache Pig to develop User Defined Functions for student data.

9.7 PRE-LAB VIVA QUESTIONS:

1. What do you mean by a bag in Pig?
2. Differentiate between PigLatin and HiveQL

WEEK-10

PIG LATIN MODES, PROGRAMS

10.1 OBJECTIVE:

a. Run the Pig Latin Scripts to find Word Count.
b. Run the Pig Latin Scripts to find a max temp for each and every year.

10.2 RESOURCES:

VMWare, Web Browser, 4 GB RAM, 80 GB Hard Disk.

10.3 PROGRAM LOGIC:

Run the Pig Latin Scripts to find Word Count.

```
lines = LOAD '/user/hadoop/HDFS_File.txt' AS (line:chararray);
words = FOREACH lines GENERATE FLATTEN(TOKENIZE(line)) as word;
grouped = GROUP words BY word;
wordcount = FOREACH grouped GENERATE group, COUNT(words);
DUMP wordcount;
```

Run the Pig Latin Scripts to find a max temp for each and every year

```
-- max_temp.pig: Finds the maximum temperature by year
records = LOAD 'input/ncdc/micro-tab/sample.txt'
AS (year:chararray, temperature:int, quality:int);
filtered_records = FILTER records BY temperature != 9999 AND
(quality == 0 OR quality == 1 OR quality == 4 OR quality == 5 OR quality == 9);
grouped_records = GROUP filtered_records BY year;
max_temp = FOREACH grouped_records GENERATE group,
MAX(filtered_records.temperature);
DUMP max_temp;
```

10.4 INPUT / OUTPUT:

```
(1950,0,1)
(1950,22,1)
(1950,-11,1)
(1949,111,1)
(1949,78,1)
```

10.5 PRE-LAB VIVA QUESTIONS:

1. List out the benefits of Pig?
2. Classify Pig Latin commands in Pig?

10.6 LAB ASSIGNMENT:

1. Analyzing average stock price from the stock data using Apache Pig

10.7 POST-LAB VIVA QUESTIONS:

1. Discuss the modes of Pig scripts?
2. Explain the Pig Latin application flow?

WEEK-11

HIVE

11.1 OBJECTIVE:

Installation of HIVE.

11.2 RESOURCES:

VMWare, Web Browser, 1GB RAM, Hard Disk 80 GB.

11.3 PROGRAM LOGIC:

Install MySQL-Server

1) Sudo apt-get install mysql-server
2) Configuring MySQL UserName and Password
3) Creating User and granting all Privileges

```
Mysql –uroot –proot
Create user <USER_NAME> identified by <PASSWORD>
```

4) Extract and Configure Apache Hive

```
tar xvfz apache-hive-1.0.1.bin.tar.gz
```

5) Move Apache Hive from Local directory to Home directory
6) Set CLASSPATH in bashrc

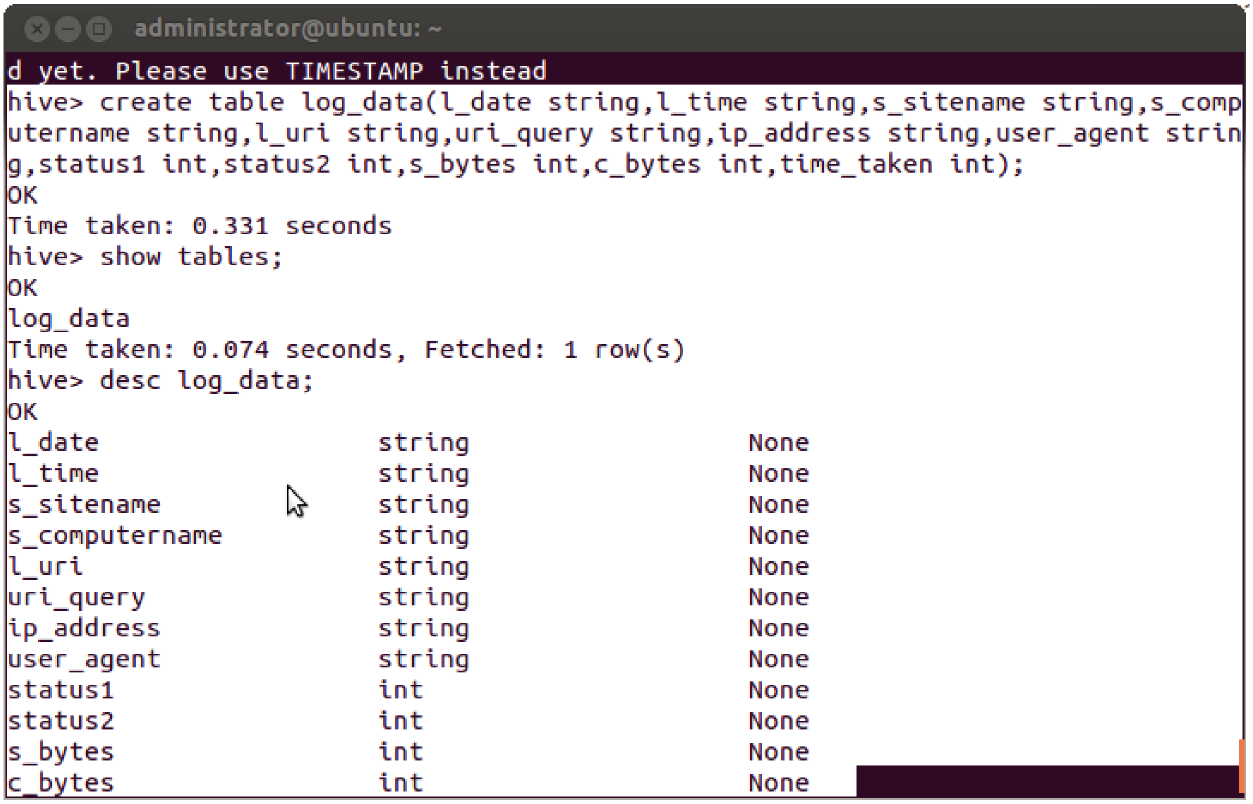
```
Export HIVE_HOME = /home/apache-hive
Export PATH = $PATH:$HIVE_HOME/bin
```

7) Configuring hive-default.xml by adding My SQL Server Credentials

```
<property>
<name>javax.jdo.option.ConnectionURL</name>
<value>
jdbc:mysql://localhost:3306/hive?createDatabaseIfNotExist=true
</value>
</property>
<property>
<name>javax.jdo.option.ConnectionDriverName</name>
<value>com.mysql.jdbc.Driver</value>
</property>
<property>
<name>javax.jdo.option.ConnectionUserName</name>
<value>hadoop</value>
</property>
<property>
<name>javax.jdo.option.ConnectionPassword</name>
<value>hadoop</value>
</property>
```

8) Copying mysql-java-connector.jar to hive/lib directory.

11.4 INPUT/OUTPUT:



```
d yet. Please use TIMESTAMP instead
hive> create table log_data(l_date string,l_time string,s_sitename string,s_comp
utername string,l_uri string,uri_query string,ip_address string,user_agent strin
g,status1 int,status2 int,s_bytes int,c_bytes int,time_taken int);
OK
Time taken: 0.331 seconds
hive> show tables;
OK
log_data
Time taken: 0.074 seconds, Fetched: 1 row(s)
hive> desc log_data;
OK
l_date                  string                  None
l_time                  string                  None
s_sitename              string                  None
s_computername          string                  None
l_uri                   string                  None
uri_query               string                  None
ip_address              string                  None
user_agent              string                  None
status1                 int                     None
status2                 int                     None
s_bytes                 int                     None
c_bytes                 int                     None
```

11.5 PRE-LAB VIVA QUESTIONS:

1. In Hive, explain the term ‘aggregation’ and its uses?
2. List out the Data types in Hive?

11.6 LAB ASSIGNMENT:

1. Analyze twitter data using Apache Hive.

11.7 POST-LAB VIVA QUESTIONS:

1. Explain the Built-in Functions in Hive?
2. Describe the various Hive Data types?

WEEK-12

HIVE OPERATIONS

12.1 OBJECTIVE:

Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

12.2 RESOURCES:

VMWare, XAMPP Server, Web Browser, 1GB RAM, Hard Disk 80 GB.

12.3 PROGRAM LOGIC:

SYNTAX for HIVE Database Operations

DATABASE Creation

CREATE DATABASE|SCHEMA [IF NOT EXISTS] <database name>

Drop Database Statement

DROP DATABASE StatementDROP (DATABASE|SCHEMA) [IF EXISTS] database_name [RESTRICT|CASCADE];

Creating and Dropping Table in HIVE

CREATE [TEMPORARY] [EXTERNAL] TABLE [IF NOT EXISTS] [db_name.] table_name
[(col_name data_type [COMMENT col_comment], ...)]
[COMMENT table_comment] [ROW FORMAT row_format] [STORED AS file_format]

Loading Data into table log_data

Syntax:

LOAD DATA LOCAL INPATH '<path>/u.data' OVERWRITE INTO TABLE u_data;

Alter Table in HIVE

Syntax

ALTER TABLE name RENAME TO new_name
ALTER TABLE name ADD COLUMNS (col_spec[, col_spec ...])
ALTER TABLE name DROP [COLUMN] column_name
ALTER TABLE name CHANGE column_name new_name new_type
ALTER TABLE name REPLACE COLUMNS (col_spec[, col_spec ...])

Creating and Dropping View

CREATE VIEW [IF NOT EXISTS] view_name [(column_name [COMMENT column_comment], ...)] [COMMENT table_comment] AS SELECT ...

Dropping View

Syntax:

DROP VIEW view_name

Functions in HIVE

String Functions:- round(), ceil(), substr(), upper(), reg_exp() etc
Date and Time Functions:- year(), month(), day(), to_date() etc
Aggregate Functions :- sum(), min(), max(), count(), avg() etc

INDEXES

```
CREATE INDEX index_name ON TABLE base_table_name (col_name, ...)
AS 'index.handler.class.name'
[WITH DEFERRED REBUILD]
[IDXPROPERTIES (property_name=property_value, ...)]
[IN TABLE index_table_name]
[PARTITIONED BY (col_name, ...)]
[
[ ROW FORMAT ...] STORED AS ...
| STORED BY ...
]
[LOCATION hdfs_path]
[TBLPROPERTIES (...)]
```

Creating Index

```
CREATE INDEX index_ip ON TABLE log_data(ip_address) AS
'org.apache.hadoop.hive.ql.index.compact.CompactIndexHandler' WITH DEFERRED
REBUILD;
```

Altering and Inserting Index

```
ALTER INDEX index_ip_address ON log_data REBUILD;
```

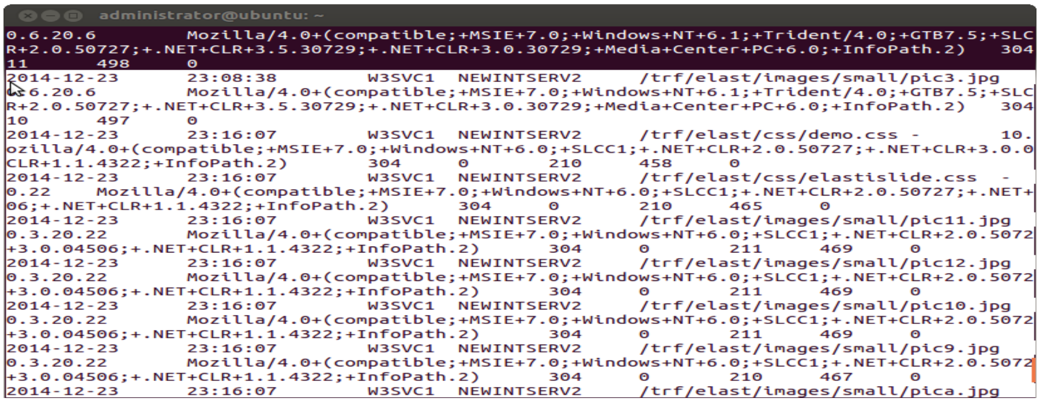
Storing Index Data in Metastore

```
SET
hive.index.compact.file=/home/administrator/Desktop/big/metastore_db/tmp/index_ipaddress_result;
SET
hive.input.format=org.apache.hadoop.hive.ql.index.compact.HiveCompactIndexInputFormat;
```

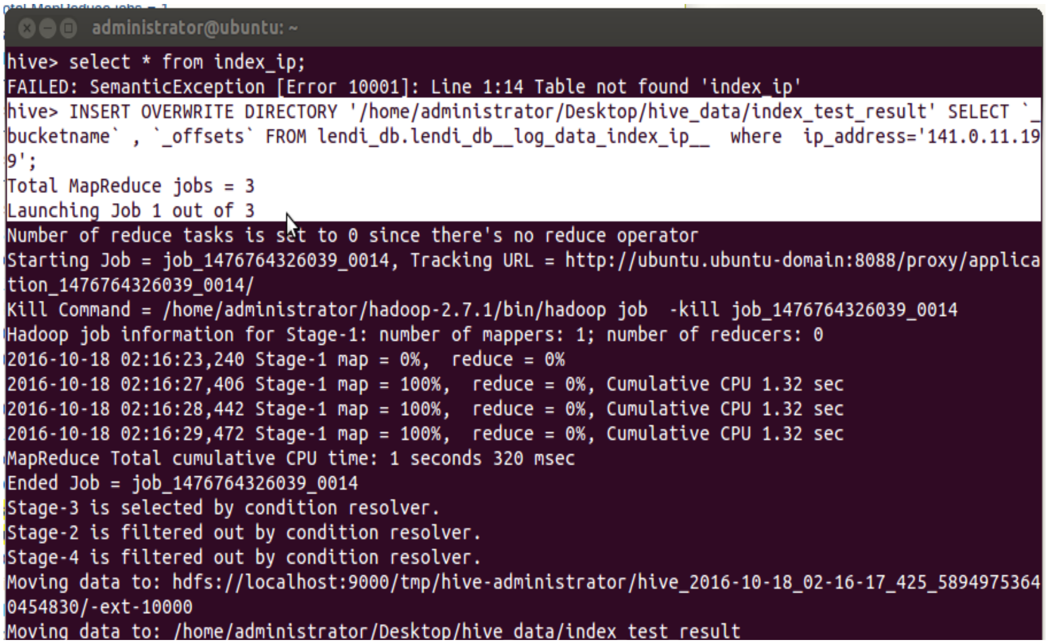
Dropping Index

```
DROP INDEX INDEX_NAME on TABLE_NAME;
```

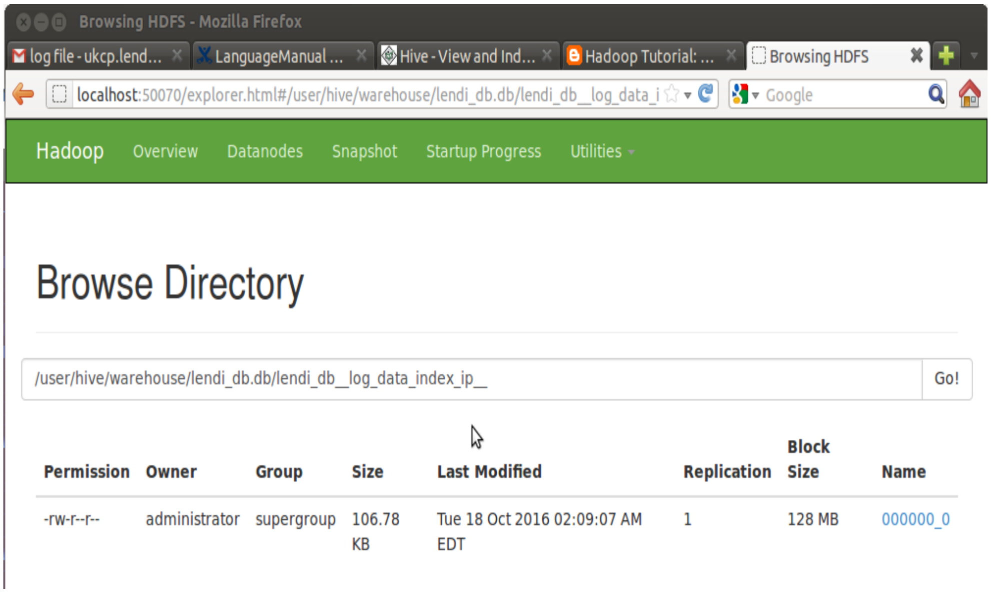
12.4 INPUT/OUTPUT:



```
0.6.20.6        Mozilla/4.0+(compatible;+MSIE+7.0;+Windows+NT+6.1;+Trident/4.0;+GTB7.5;+SLC
R+2.0.50727;+.NET+CLR+3.5.30729;+.NET+CLR+3.0.30729;+Media+Center+PC+6.0;+InfoPath.2)   304
11      498     0
2014-12-23      23:08:38        W3SVC1  NEWINTSERV2     /trf/elast/images/small/pic3.jpg
0.6.20.6        Mozilla/4.0+(compatible;+MSIE+7.0;+Windows+NT+6.1;+Trident/4.0;+GTB7.5;+SLC
R+2.0.50727;+.NET+CLR+3.5.30729;+.NET+CLR+3.0.30729;+Media+Center+PC+6.0;+InfoPath.2)   304
10      497     0
2014-12-23      23:16:07        W3SVC1  NEWINTSERV2     /trf/elast/css/demo.css -       10.
ozilla/4.0+(compatible;+MSIE+7.0;+Windows+NT+6.0;+SLCC1;+.NET+CLR+2.0.50727;+.NET+CLR+3.0.0
CLR+1.1.4322;+InfoPath.2)       304     0       210     458     0
2014-12-23      23:16:07        W3SVC1  NEWINTSERV2     /trf/elast/css/elastislide.css  -
0.22    Mozilla/4.0+(compatible;+MSIE+7.0;+Windows+NT+6.0;+SLCC1;+.NET+CLR+2.0.50727;+.NET+
06;+.NET+CLR+1.1.4322;+InfoPath.2)      304     0       210     465     0
2014-12-23      23:16:07        W3SVC1  NEWINTSERV2     /trf/elast/images/small/pic11.jpg
0.3.20.22       Mozilla/4.0+(compatible;+MSIE+7.0;+Windows+NT+6.0;+SLCC1;+.NET+CLR+2.0.5072
+3.0.04506;+.NET+CLR+1.1.4322;+InfoPath.2)      304     0       211     469     0
2014-12-23      23:16:07        W3SVC1  NEWINTSERV2     /trf/elast/images/small/pic12.jpg
0.3.20.22       Mozilla/4.0+(compatible;+MSIE+7.0;+Windows+NT+6.0;+SLCC1;+.NET+CLR+2.0.5072
+3.0.04506;+.NET+CLR+1.1.4322;+InfoPath.2)      304     0       211     469     0
2014-12-23      23:16:07        W3SVC1  NEWINTSERV2     /trf/elast/images/small/pic10.jpg
0.3.20.22       Mozilla/4.0+(compatible;+MSIE+7.0;+Windows+NT+6.0;+SLCC1;+.NET+CLR+2.0.5072
+3.0.04506;+.NET+CLR+1.1.4322;+InfoPath.2)      304     0       211     469     0
2014-12-23      23:16:07        W3SVC1  NEWINTSERV2     /trf/elast/images/small/pic9.jpg
0.3.20.22       Mozilla/4.0+(compatible;+MSIE+7.0;+Windows+NT+6.0;+SLCC1;+.NET+CLR+2.0.5072
+3.0.04506;+.NET+CLR+1.1.4322;+InfoPath.2)      304     0       210     467     0
2014-12-23      23:16:07        W3SVC1  NEWINTSERV2     /trf/elast/images/small/pica.jpg
```



```
hive> select * from index_ip;
FAILED: SemanticException [Error 10001]: Line 1:14 Table not found 'index_ip'
hive> INSERT OVERWRITE DIRECTORY '/home/administrator/Desktop/hive_data/index_test_result' SELECT `_
bucketname` , `_offsets` FROM lendi_db.lendi_db__log_data_index_ip__  where  ip_address='141.0.11.19
9';
Total MapReduce jobs = 3
Launching Job 1 out of 3
Number of reduce tasks is set to 0 since there's no reduce operator
Starting Job = job_1476764326039_0014, Tracking URL = http://ubuntu.ubuntu-domain:8088/proxy/applica
tion_1476764326039_0014/
Kill Command = /home/administrator/hadoop-2.7.1/bin/hadoop job  -kill job_1476764326039_0014
Hadoop job information for Stage-1: number of mappers: 1; number of reducers: 0
2016-10-18 02:16:23,240 Stage-1 map = 0%,  reduce = 0%
2016-10-18 02:16:27,406 Stage-1 map = 100%,  reduce = 0%, Cumulative CPU 1.32 sec
2016-10-18 02:16:28,442 Stage-1 map = 100%,  reduce = 0%, Cumulative CPU 1.32 sec
2016-10-18 02:16:29,472 Stage-1 map = 100%,  reduce = 0%, Cumulative CPU 1.32 sec
MapReduce Total cumulative CPU time: 1 seconds 320 msec
Ended Job = job_1476764326039_0014
Stage-3 is selected by condition resolver.
Stage-2 is filtered out by condition resolver.
Stage-4 is filtered out by condition resolver.
Moving data to: hdfs://localhost:9000/tmp/hive-administrator/hive_2016-10-18_02-16-17_425_5894975364
0454830/-ext-10000
Moving data to: /home/administrator/Desktop/hive_data/index_test_result
```



Browse Directory

/user/hive/warehouse/lendi_db.db/lendi_db__log_data_index_ip__

Permission	Owner	Group	Size	Last Modified	Replication	Block Size	Name
-rw-r--r--	administrator	supergroup	106.78 KB	Tue 18 Oct 2016 02:09:07 AM EDT	1	128 MB	000000_0

12.5 PRE-LAB VIVA QUESTIONS:

1. How many types of joins are there in Pig Latin with an examples?
2. Write the Hive command to create a table with four columns: First name, last name, age, and income?

12.6 LAB ASSIGNMENT:

1. Analyze stock data using Apache Hive.

12.7 POST-LAB VIVA QUESTIONS:

1. Write a shell command in Hive to list all the files in the current directory?
2. List the collection types provided by Hive for the purpose a start-up company want to use Hive for storing its data.