CS 553 Cloud Computing

Programming Assignment 2

Project Report

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The following are the most important aspects in this assignment:

- Creating a Virtual Cluster using AMAZON WEB SERVICES(AWS)
- Implementing Word count in JAVA
- Implementing Word count in HADOOP
- Implementing Word count in SWIFT
- Implementing Word count using MPI
- Implementing Sorting across 4 approaches (JAVA, HADOOP, SWIFT, MPI)
- Measuring the performance of the above

Creating a Virtual Cluster using AMAZON WEB SERVICES(AWS):

First we log in into the Amazon AWS service website (http://aws.amazon.com/) and we select EC2 from the network and services section. We select launch instance here. Then we configure our service to meet our requirements. We choose the AMI we need. Then we choose the instance type which can be micro, small, medium, large Xlarge, 2Xlarge, 4Xlarge or 8Xlarge. Then we configure the instance i.e we can choose the instance to be either spot instance or on Demand instance. We then add storage to our selected instance and configure the security group. We add TCP, UDP and ICMP protocols from the security group. We then create the instance. We access the instance by connecting to the instance by suing the public IP address of it and later on we can configure the settings of the AMI that we are using.

Implementing Word count in JAVA:

We implement a java program to count the occurrence of each word in a given input file of size 1MB and 1GB. We print the output into a file in the increasing order of the frequency of the word.

Implementing Word count in HADOOP:

After downloading and installing HADOOP and extracting its components and adding the library paths to the bash we connect to the AWS instance using ssh –i key (IP address). The word count application is implemented using HADOOP for 1MB on a single node and 10GB dataset on 16 nodes.

Implementing Word count in SWIFT:

The same word count application is implemented using SWIFT programming language for a 10GB dataset on 16 nodes.

WORD COUNT IN MPI:

The same word count application is implemented using MPI (Message Passing Interface) for a 10GB dataset on 16 nodes.

PERFORMANCE CALCULATION:

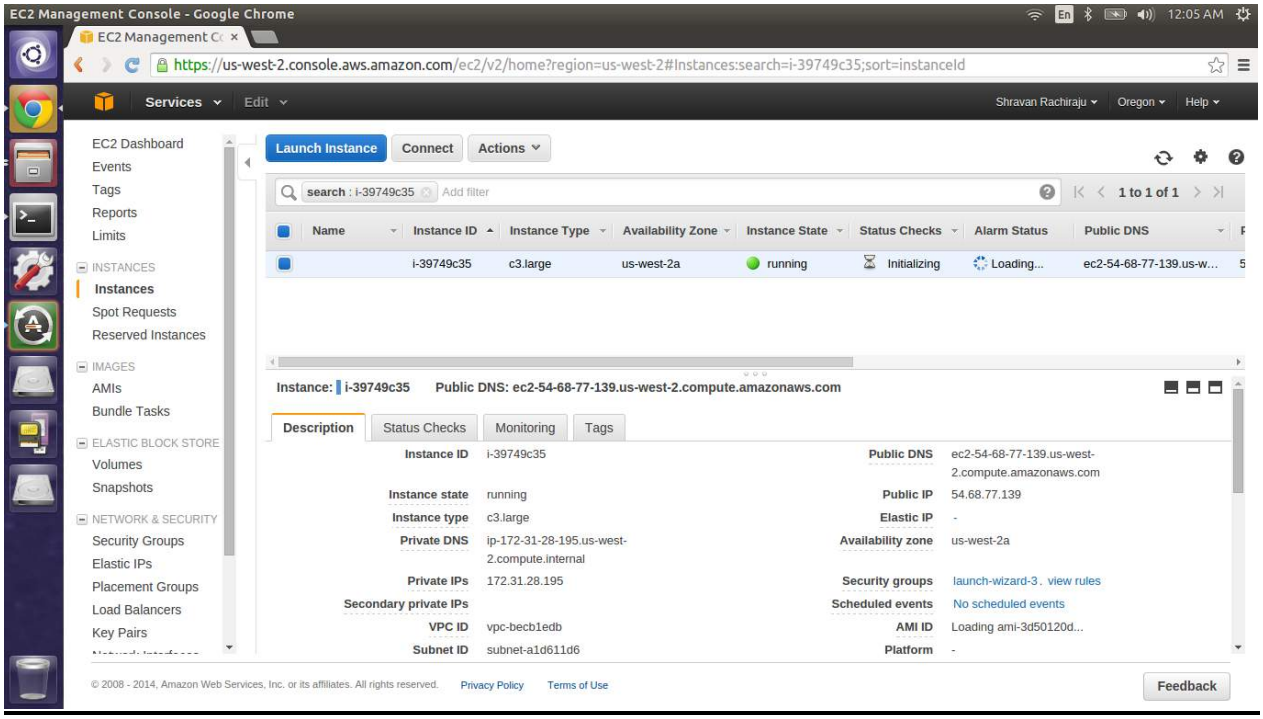
From the given data sets, all the three version of word count i.e. JAVA, HADOOP and SWIFT their performances are obtained on 1 node and 16 nodes. These are compared and performance graphs are drawn for them. The performance result of shared memory Word count is compared with the performance of swift word count and Hadoop word count which are implemented on 16 nodes. For each of the above separate graphs are drawn to show their performance.

SORTING:

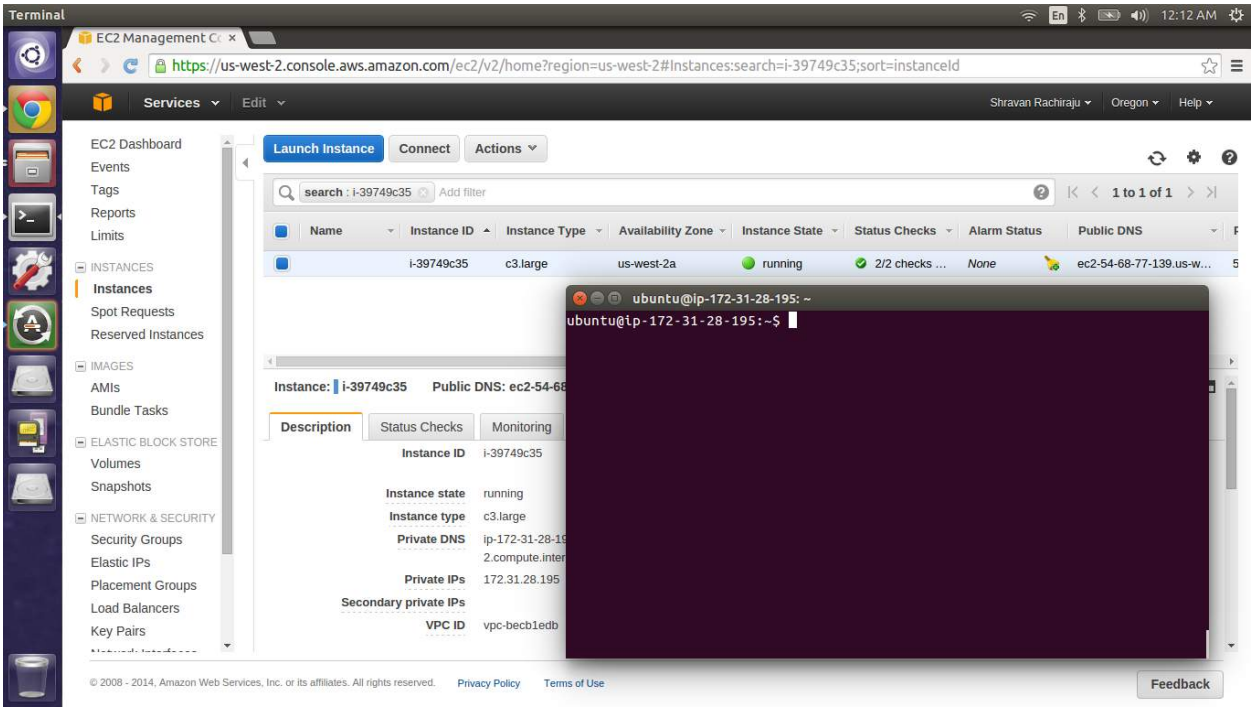
Implementation and evaluation the performance of sorting for all the 4 versions of word count i.e. for JAVA, HADOOP, SWIFT, MPI on a 10GB dataset is done. This sorting performance includes reading, sorting and writing data to disks.

Creating an instance in Amazon(AWS):

- Log in into the Amazon AWS service website (http://aws.amazon.com/).
- Select EC2 from the network and services section.
- Select launch instance. Then configure the service and chose the best AMI to meet the requirements.
- Then choose the instance type which can be micro, small, medium, large Xlarge, 2Xlarge, 4Xlarge or 8Xlarge. For our assignment it is c3.large
- Then we configure the instance i.e we can choose the instance to be either spot instance or on Demand instance.
- Add storage to our selected instance.
- Configure the security group. We add TCP, UDP and ICMP protocols from the security group. We then create the instance. We access the instance by connecting to the instance by suing the public IP address of it and later on we can configure the settings of the AMI that we are using.



The above screen shot is of a c3.large instance.



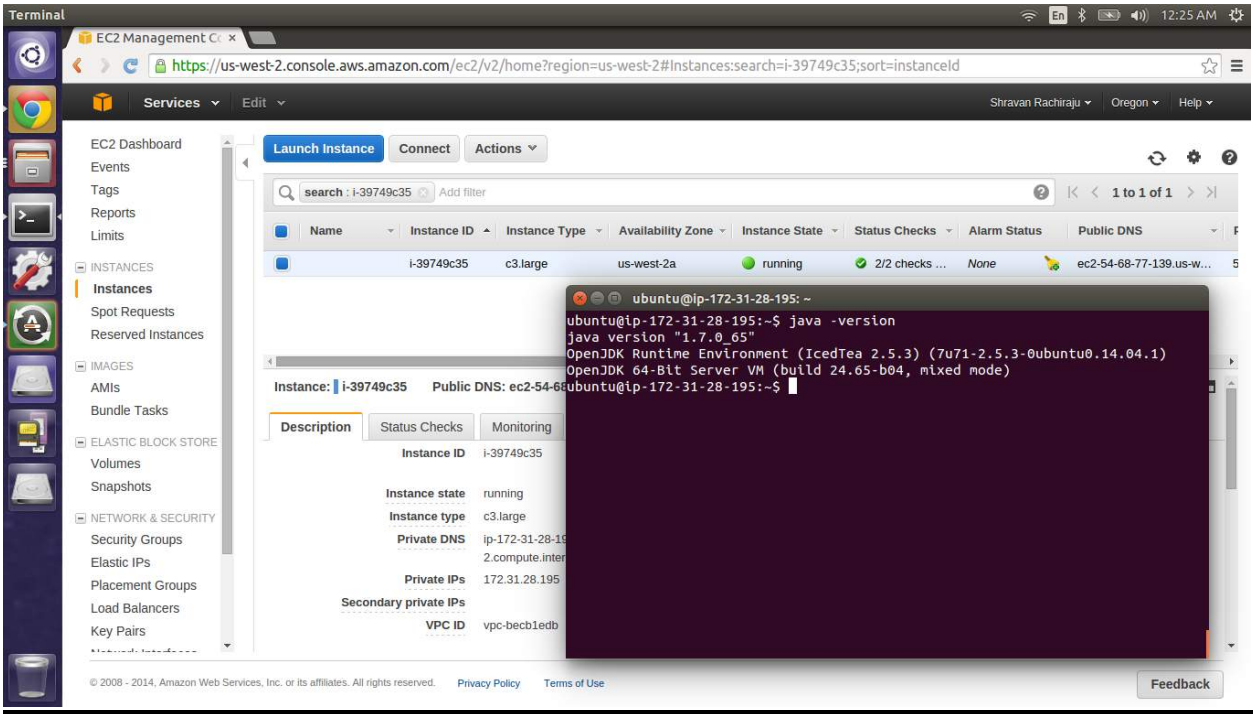
The above screen shot is of a connected instance via the Ubuntu terminal using the below commands:

chmod 400 keygiven(This is to change the permission to be read by owner.)

ssh –i key IP address

In our case we use ssh –i newkey.pem Ubuntu@54.68.77.139

- After getting connected to the AMI we now have to install java on the virtual node.
- Install java by using sudo apt-get install openjdk-7-jreheadless.
- Install javac by using sudo apt-get install openjdk-7-jdk.
- Now update all the installed applications by using sudo apt-get update
- Now check the java version by using java –version.



java –version is shown in the above screen shot

WORD COUNT IN JAVA:

Configuration:

VERSION	: JAVA 1.7
INSTANCE TYPE	: c3. Large UBUNTU
RAM	: 3.75 GB
NO. OF CORES	: 2 virtual cores
STORAGE	: 32 GB

METHODOLOGY:

We take input of total size 10 gigabyte and count the number of lines in the file.

- On the basis of number of lines, we further split the data into equal no. of chunks.
- The file name of each chunk is fetched using a user defined function called *fileGeneration ()*. The *fileGeneration ()* has a dual functionality of fetching the file name and removing from the list once it is processed.
- In the function *count()*, each chunk is opened in the read mode and every line of chunk is read and every line is tokenized and then regular that it reads is stored into the map and it is tokenized into words with delimiters as " ".
- A pattern match is run on each of these tokens to find the leading and trailing special symbols. Once these special symbols are determined the word is stored into the map *(m1)*. If the word has occurred for first time 1 is assigned as key for that particular word. The value of this key is incremented with subsequent occurrence of the token.
- The above mentioned point c and d, are executed under function called *run()*. The threads are started and execute one file per thread. Numbers of threads are dependent on the number of chunks of a file.
- The point d is executed within the semaphore block to achieve the synchronization and hence avoid deadlocks in threads.
- Finally, we execute sorting. In sorting the hash map is converted into array list and this list is sorted using inbuilt sort function.
- The value of map is stored in the text file name *output.txt*.

Outputs:

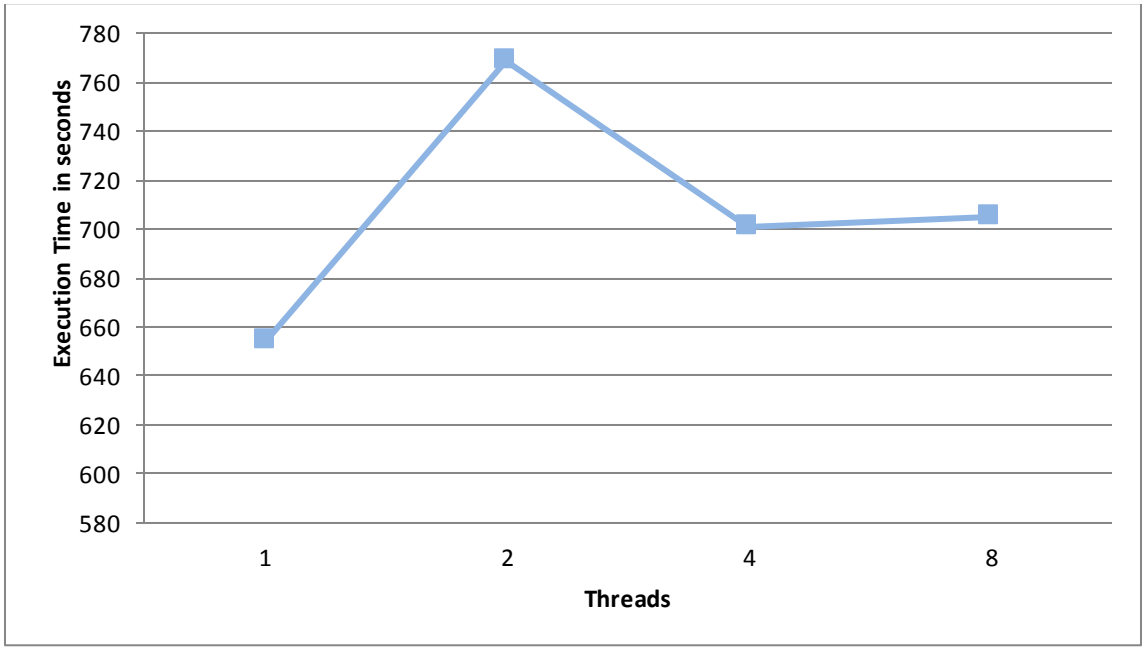
10 GB DATASET ON c3.large instance (Only Word Count with Frequency no sorting):

Number of threads	Execution Time in Seconds
1	654.552
2	768.757
4	700.781
8	704.746

EXPLANATION:

Every thread is responsible for reading a file and processing it achieves the word count functionality

- Best performance was at thread 1



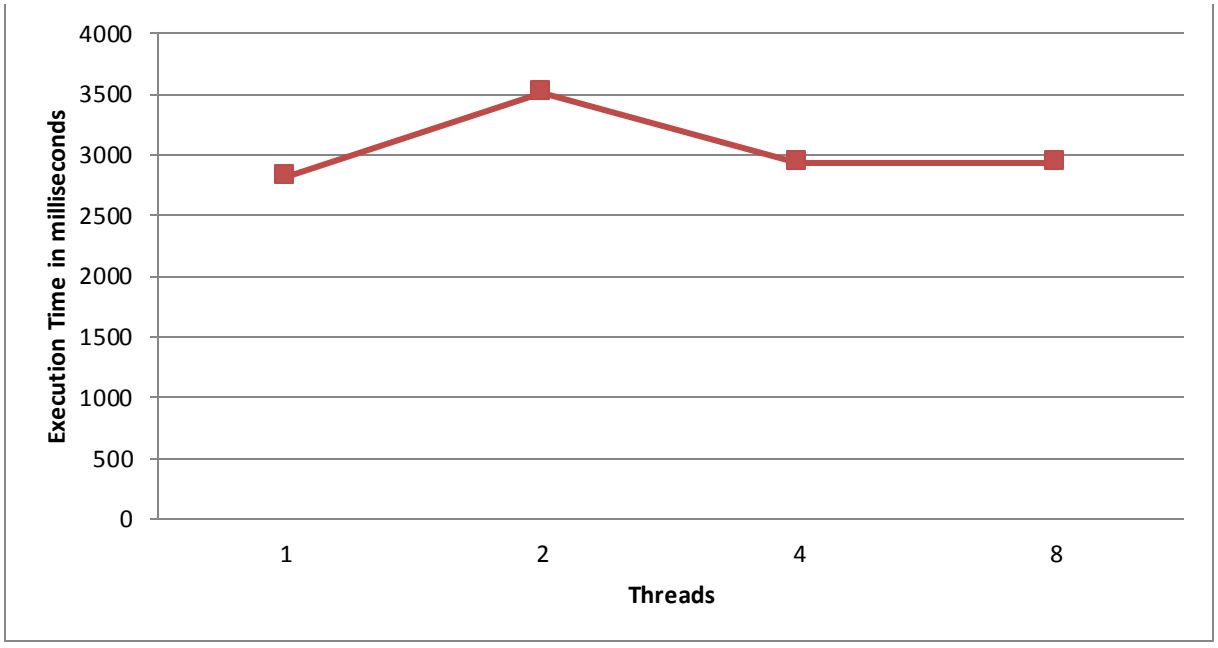
10GB DATASET ON c3.large instance(Sorted word count without frequency based on the ASCII) :

Number of threads	Execution Time in Seconds
1	2819.673
2	3503.585
4	2935.958
8	2927.552

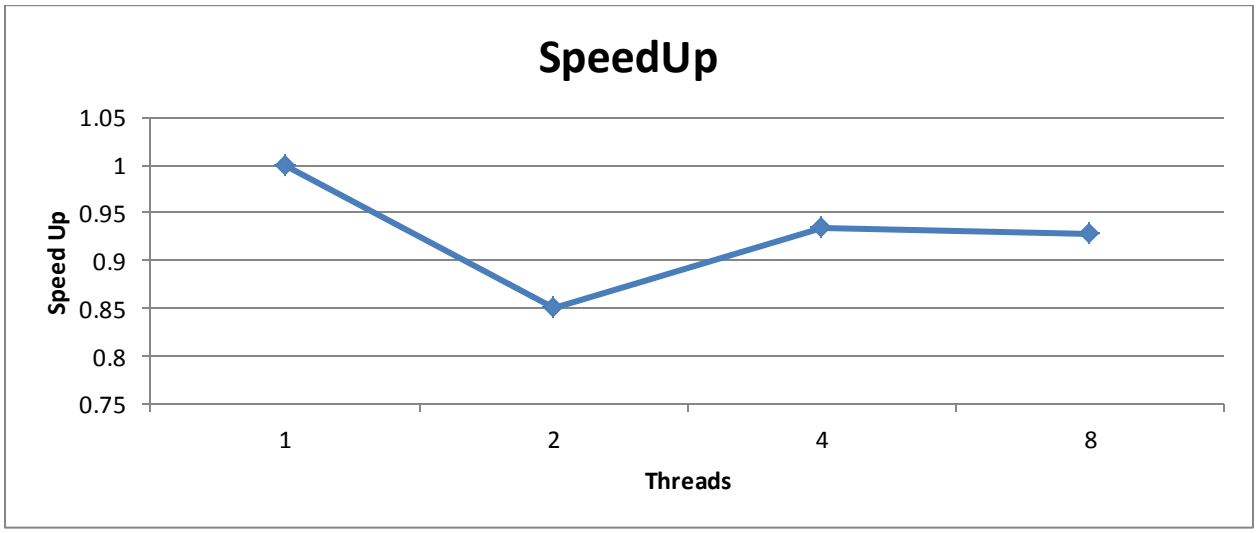
EXPLANATION:

In a multithreaded process on a single processor, the processor can switch execution resources between threads, resulting in concurrent execution .

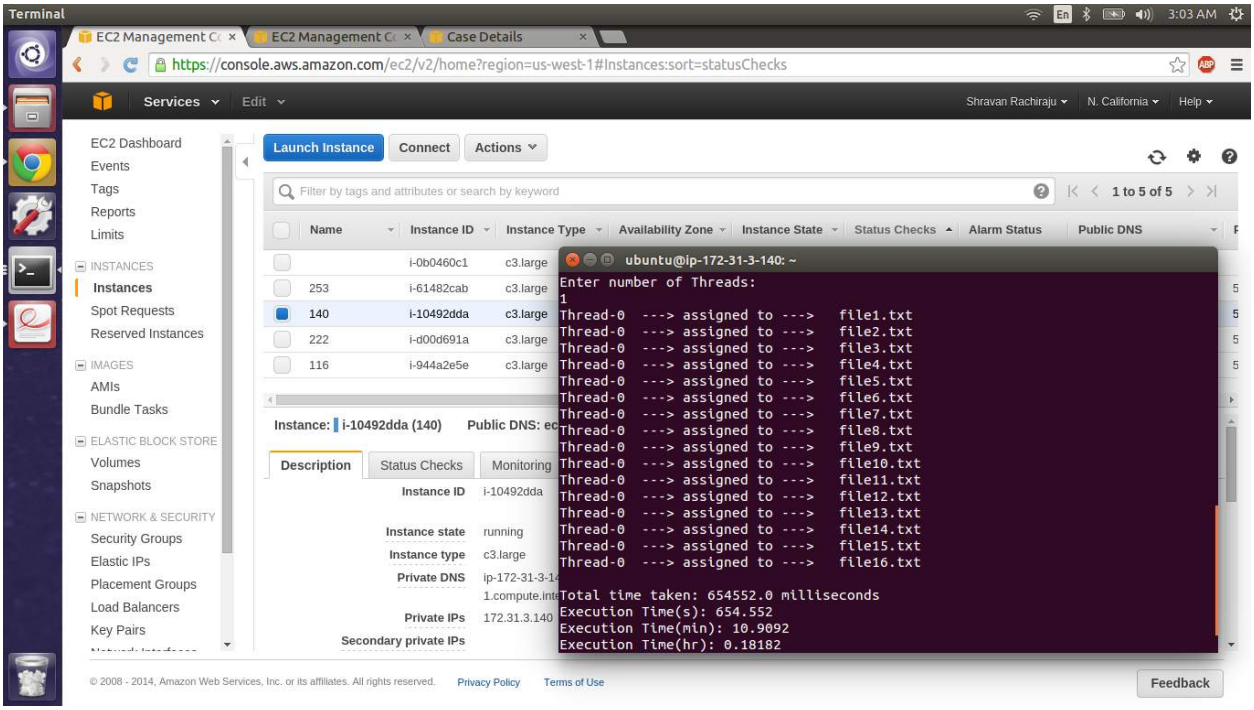
- Best performance was at thread 1. Thread 4 and 8 were very close in terms of execution time.

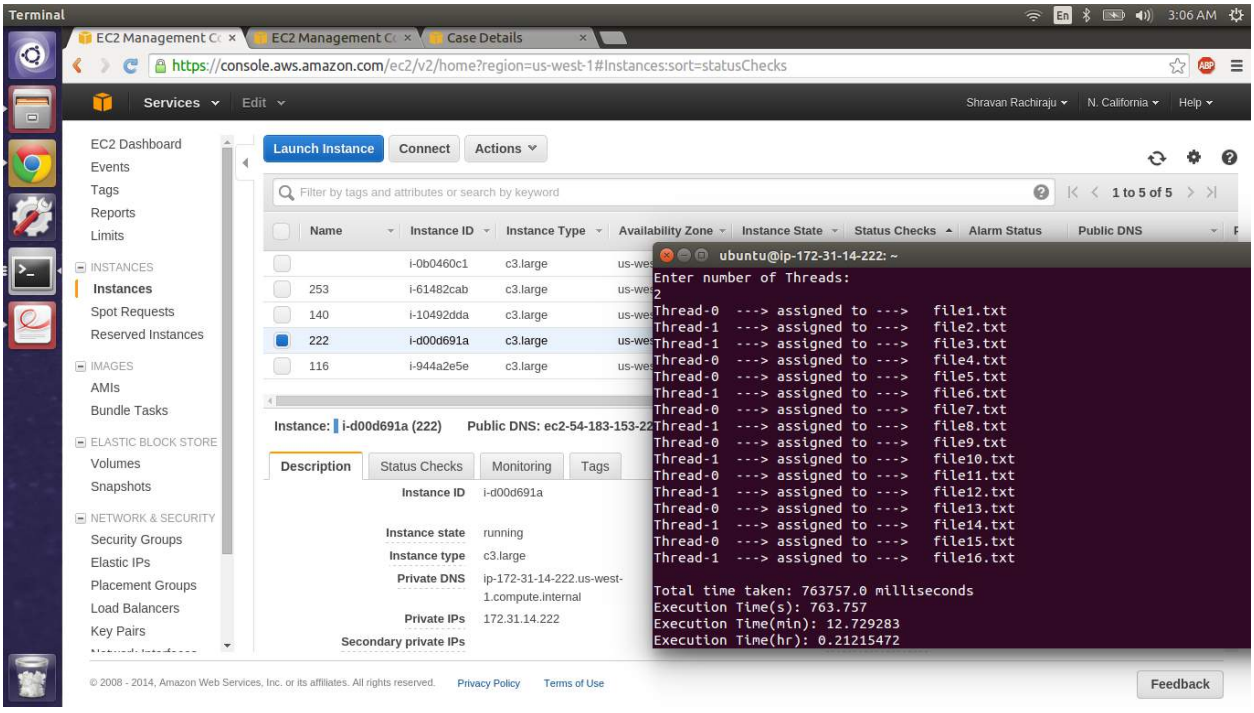


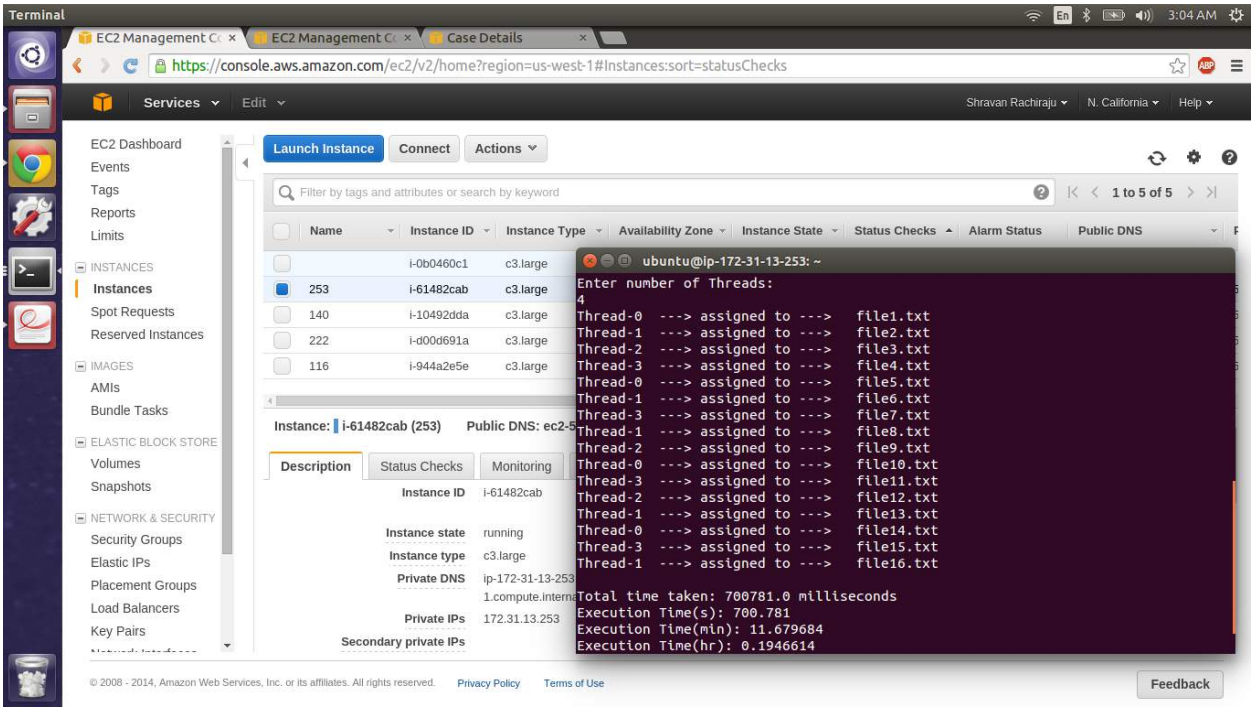
Number of threads	Execution Time in Seconds	Execution Time in Seconds for 1 Node	Speed Up
1	654.552	654.552	1
2	768.757	654.552	0.851442003
4	700.781	654.552	0.934032173
8	704.746	654.552	0.928777176



Screens Shots Word Count with Frequency no sorting :






Terminal
3:04 AM
EC2 Management Co
EC2 Management Co
Case Details
https://console.aws.amazon.com/ec2/v2/home?region=us-west-1#Instances:sort=statusChecks
Services
Edit
Shravan Rachiraju
N. California
Help
EC2 Dashboard
Events
Tags
Reports
Limits
INSTANCES
Instances
Spot Requests
Reserved Instances
IMAGES
AMIs
Bundle Tasks
ELASTIC BLOCK STORE
Volumes
Snapshots
NETWORK & SECURITY
Security Groups
Elastic IPs
Placement Groups
Load Balancers
Key Pairs
Launch Instance
Connect
Actions
Filter by tags and attributes or search by keyword
1 to 5 of 5
Name
Instance ID
Instance Type
Availability Zone
Instance State
Status Checks
Alarm Status
Public DNS
i-0b0460c1 c3.large
253 i-61482cab c3.large
140 i-10492dda c3.large
222 i-d00d691a c3.large
116 i-944a2e5e c3.large
Instance: i-61482cab (253)
Public DNS: ec2-5
Description
Status Checks
Monitoring
Instance ID i-61482cab
Instance state running
Instance type c3.large
Private DNS ip-172-31-13-253
1.compute.interna
Private IPs 172.31.13.253
Secondary private IPs
ubuntu@ip-172-31-13-253: ~
Enter number of Threads:
4
Thread-0 ---> assigned to ---> file1.txt
Thread-1 ---> assigned to ---> file2.txt
Thread-2 ---> assigned to ---> file3.txt
Thread-3 ---> assigned to ---> file4.txt
Thread-0 ---> assigned to ---> file5.txt
Thread-1 ---> assigned to ---> file6.txt
Thread-3 ---> assigned to ---> file7.txt
Thread-1 ---> assigned to ---> file8.txt
Thread-2 ---> assigned to ---> file9.txt
Thread-0 ---> assigned to ---> file10.txt
Thread-3 ---> assigned to ---> file11.txt
Thread-2 ---> assigned to ---> file12.txt
Thread-1 ---> assigned to ---> file13.txt
Thread-0 ---> assigned to ---> file14.txt
Thread-3 ---> assigned to ---> file15.txt
Thread-1 ---> assigned to ---> file16.txt
Total time taken: 700781.0 milliseconds
Execution Time(s): 700.781
Execution Time(min): 11.679684
Execution Time(hr): 0.1946614
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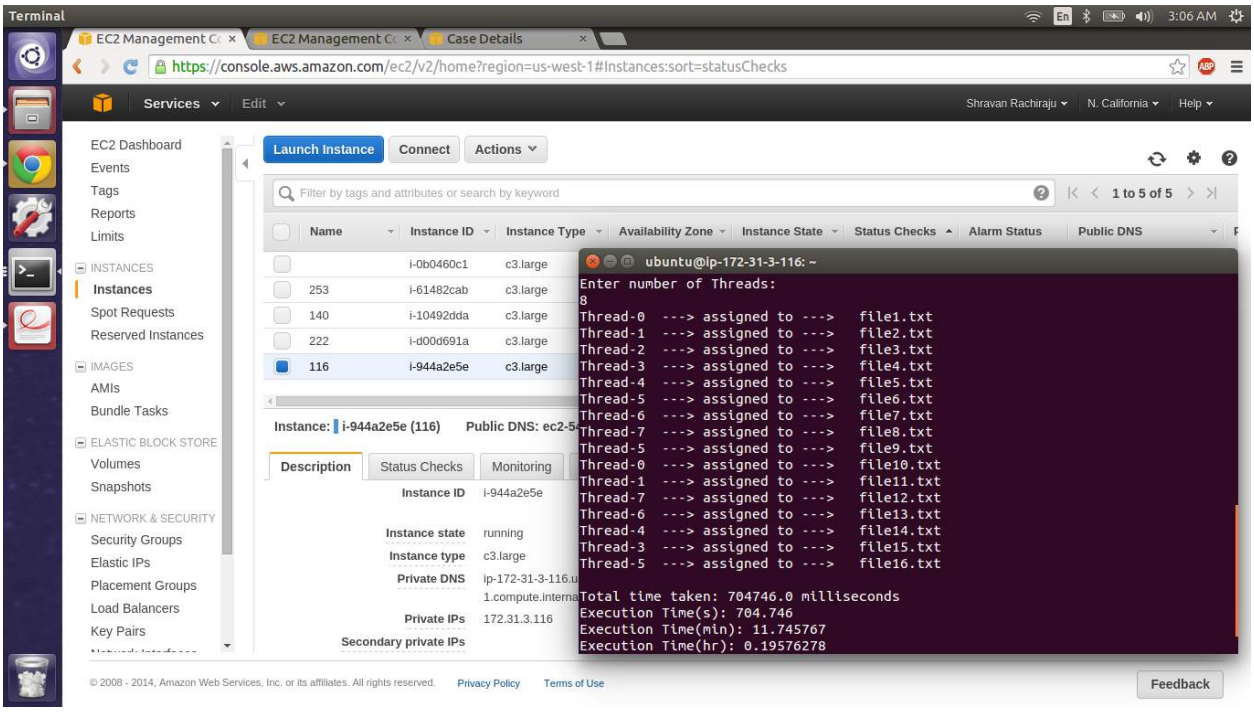
Terminal
3:06 AM
EC2 Management Co
EC2 Management Co
Case Details
https://console.aws.amazon.com/ec2/v2/home?region=us-west-1#Instances:sort=statusChecks
Services
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Instance ID
Instance Type
Availability Zone
Instance State
Status Checks
Alarm Status
Public DNS
i-0b0460c1 c3.large
253 i-61482cab c3.large
140 i-10492dda c3.large
222 i-d00d691a c3.large
116 i-944a2e5e c3.large
Instance: i-944a2e5e (116)
Public DNS: ec2-5
Description
Status Checks
Monitoring
Instance ID i-944a2e5e
Instance state running
Instance type c3.large
Private DNS ip-172-31-3-116.u
1.compute.interna
Private IPs 172.31.3.116
Secondary private IPs
ubuntu@ip-172-31-3-116: ~
Enter number of Threads:
8
Thread-0 ---> assigned to ---> file1.txt
Thread-1 ---> assigned to ---> file2.txt
Thread-2 ---> assigned to ---> file3.txt
Thread-3 ---> assigned to ---> file4.txt
Thread-4 ---> assigned to ---> file5.txt
Thread-5 ---> assigned to ---> file6.txt
Thread-6 ---> assigned to ---> file7.txt
Thread-7 ---> assigned to ---> file8.txt
Thread-5 ---> assigned to ---> file9.txt
Thread-0 ---> assigned to ---> file10.txt
Thread-1 ---> assigned to ---> file11.txt
Thread-7 ---> assigned to ---> file12.txt
Thread-6 ---> assigned to ---> file13.txt
Thread-4 ---> assigned to ---> file14.txt
Thread-3 ---> assigned to ---> file15.txt
Thread-5 ---> assigned to ---> file16.txt
Total time taken: 704746.0 milliseconds
Execution Time(s): 704.746
Execution Time(min): 11.745767
Execution Time(hr): 0.19576278
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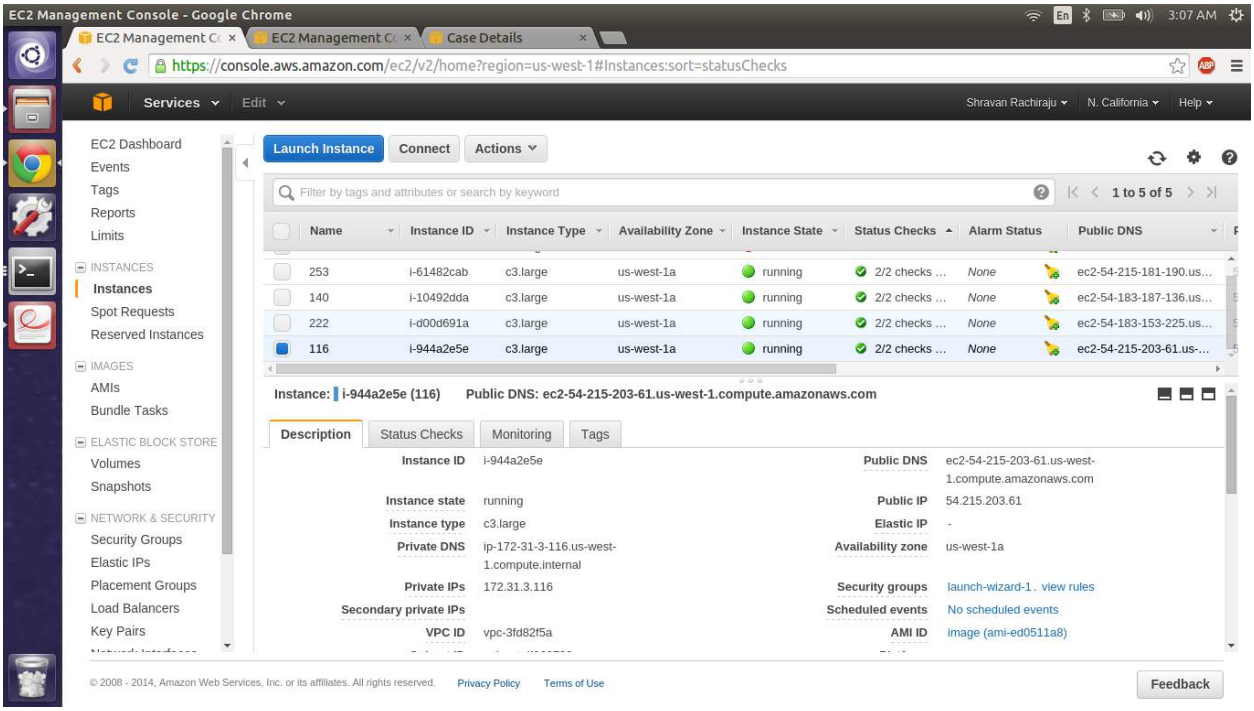
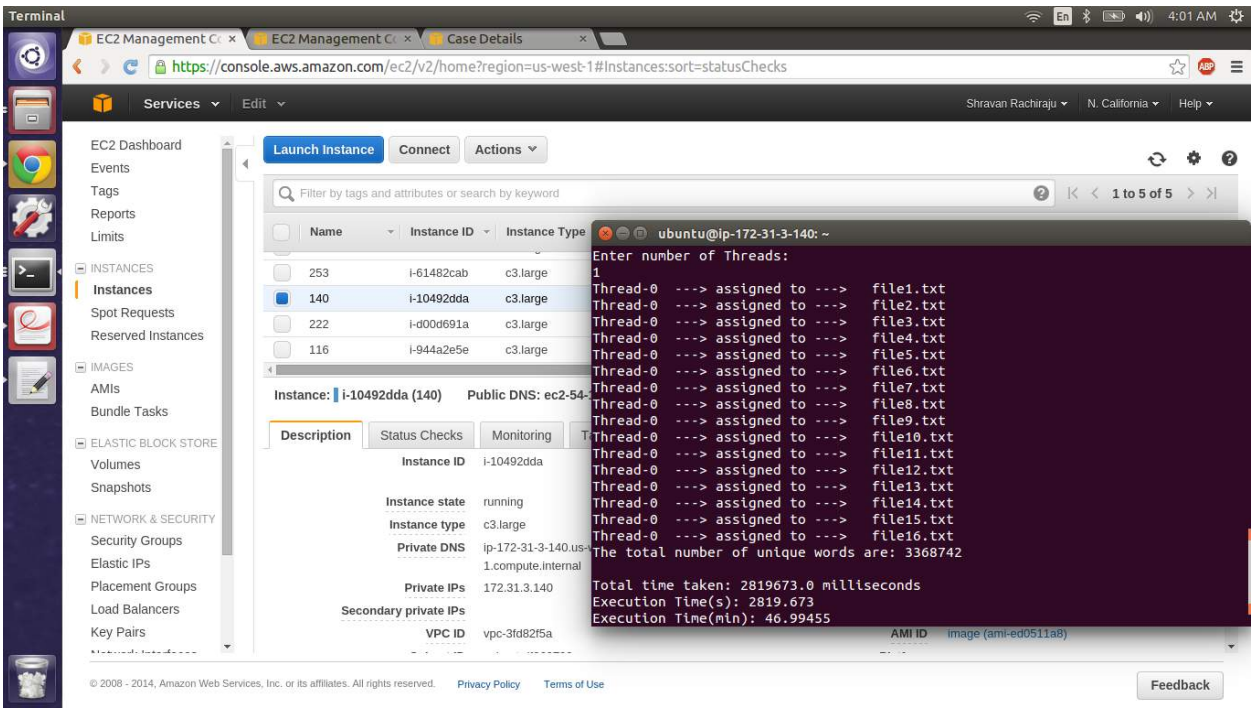
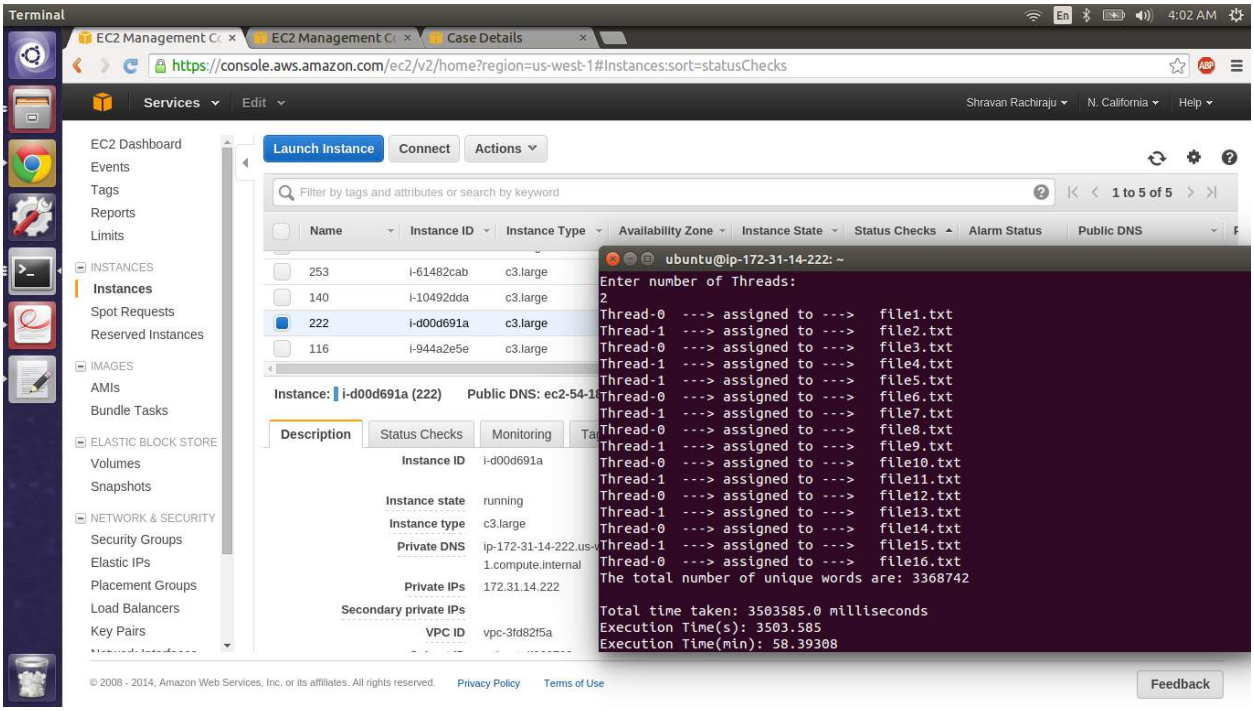
Running Instance:



Screen Shots Sorted word_count without_frequency_based on the ASCII:

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4:02 AM
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Actions
Filter by tags and attributes or search by keyword
1 to 5 of 5
Name
Instance ID
Instance Type
Availability Zone
Instance State
Status Checks
Alarm Status
Public DNS
253 i-61482cab c3.large
140 i-10492dda c3.large
222 i-d00d691a c3.large
116 i-944a2e5e c3.large
Instance: i-d00d691a (222)
Public DNS: ec2-54-1
Description
Status Checks
Monitoring
Instance ID i-d00d691a
Instance state running
Instance type c3.large
Private DNS ip-172-31-14-222.us-
1.compute.internal
Private IPs 172.31.14.222
Secondary private IPs
VPC ID vpc-3fd82f5a
ubuntu@ip-172-31-14-222: ~
Enter number of Threads:
2
Thread-0 ---> assigned to ---> file1.txt
Thread-1 ---> assigned to ---> file2.txt
Thread-0 ---> assigned to ---> file3.txt
Thread-1 ---> assigned to ---> file4.txt
Thread-1 ---> assigned to ---> file5.txt
Thread-0 ---> assigned to ---> file6.txt
Thread-1 ---> assigned to ---> file7.txt
Thread-0 ---> assigned to ---> file8.txt
Thread-1 ---> assigned to ---> file9.txt
Thread-0 ---> assigned to ---> file10.txt
Thread-1 ---> assigned to ---> file11.txt
Thread-0 ---> assigned to ---> file12.txt
Thread-1 ---> assigned to ---> file13.txt
Thread-0 ---> assigned to ---> file14.txt
Thread-1 ---> assigned to ---> file15.txt
Thread-0 ---> assigned to ---> file16.txt
The total number of unique words are: 3368742
Total time taken: 3503585.0 milliseconds
Execution Time(s): 3503.585
Execution Time(min): 58.39308
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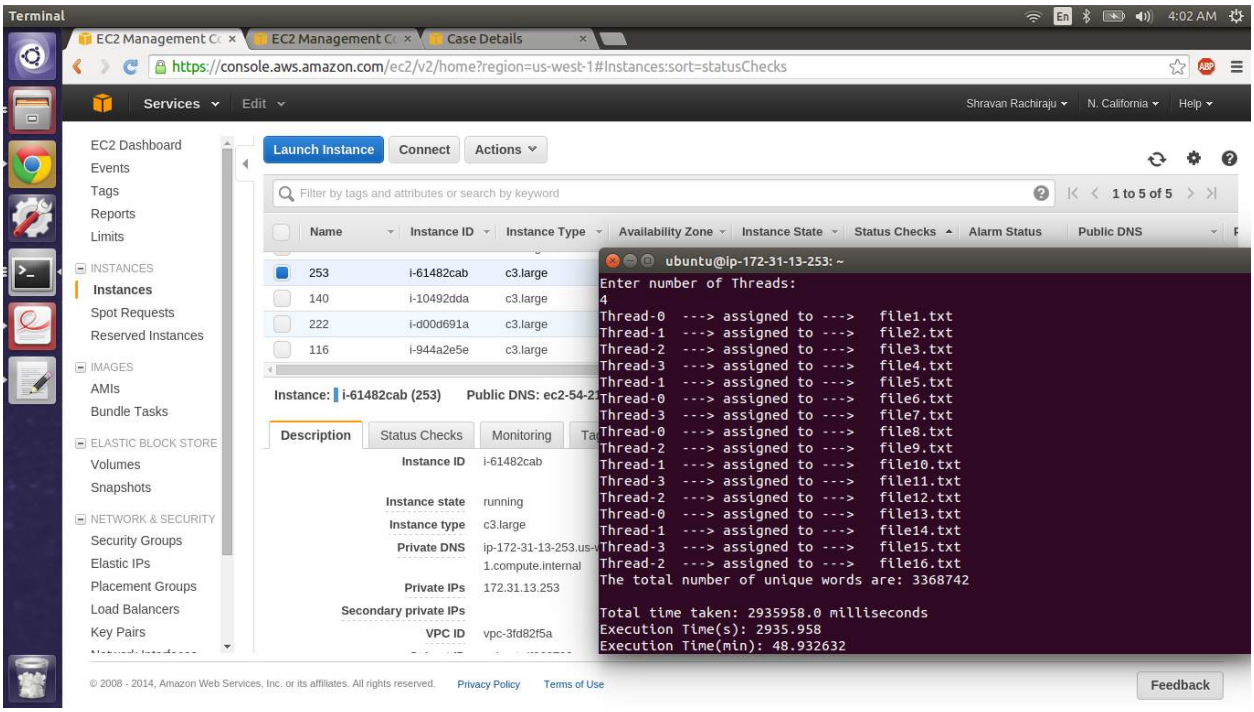
Terminal
4:02 AM
EC2 Management Co
EC2 Management Co
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Connect
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Filter by tags and attributes or search by keyword
1 to 5 of 5
Name
Instance ID
Instance Type
Availability Zone
Instance State
Status Checks
Alarm Status
Public DNS
253 i-61482cab c3.large
140 i-10492dda c3.large
222 i-d00d691a c3.large
116 i-944a2e5e c3.large
Instance: i-61482cab (253)
Public DNS: ec2-54-2
Description
Status Checks
Monitoring
Instance ID i-61482cab
Instance state running
Instance type c3.large
Private DNS ip-172-31-13-253.us-
1.compute.internal
Private IPs 172.31.13.253
Secondary private IPs
VPC ID vpc-3fd82f5a
ubuntu@ip-172-31-13-253: ~
Enter number of Threads:
4
Thread-0 ---> assigned to ---> file1.txt
Thread-1 ---> assigned to ---> file2.txt
Thread-2 ---> assigned to ---> file3.txt
Thread-3 ---> assigned to ---> file4.txt
Thread-1 ---> assigned to ---> file5.txt
Thread-0 ---> assigned to ---> file6.txt
Thread-3 ---> assigned to ---> file7.txt
Thread-0 ---> assigned to ---> file8.txt
Thread-2 ---> assigned to ---> file9.txt
Thread-1 ---> assigned to ---> file10.txt
Thread-3 ---> assigned to ---> file11.txt
Thread-2 ---> assigned to ---> file12.txt
Thread-0 ---> assigned to ---> file13.txt
Thread-1 ---> assigned to ---> file14.txt
Thread-3 ---> assigned to ---> file15.txt
Thread-2 ---> assigned to ---> file16.txt
The total number of unique words are: 3368742
Total time taken: 2935958.0 milliseconds
Execution Time(s): 2935.958
Execution Time(min): 48.932632
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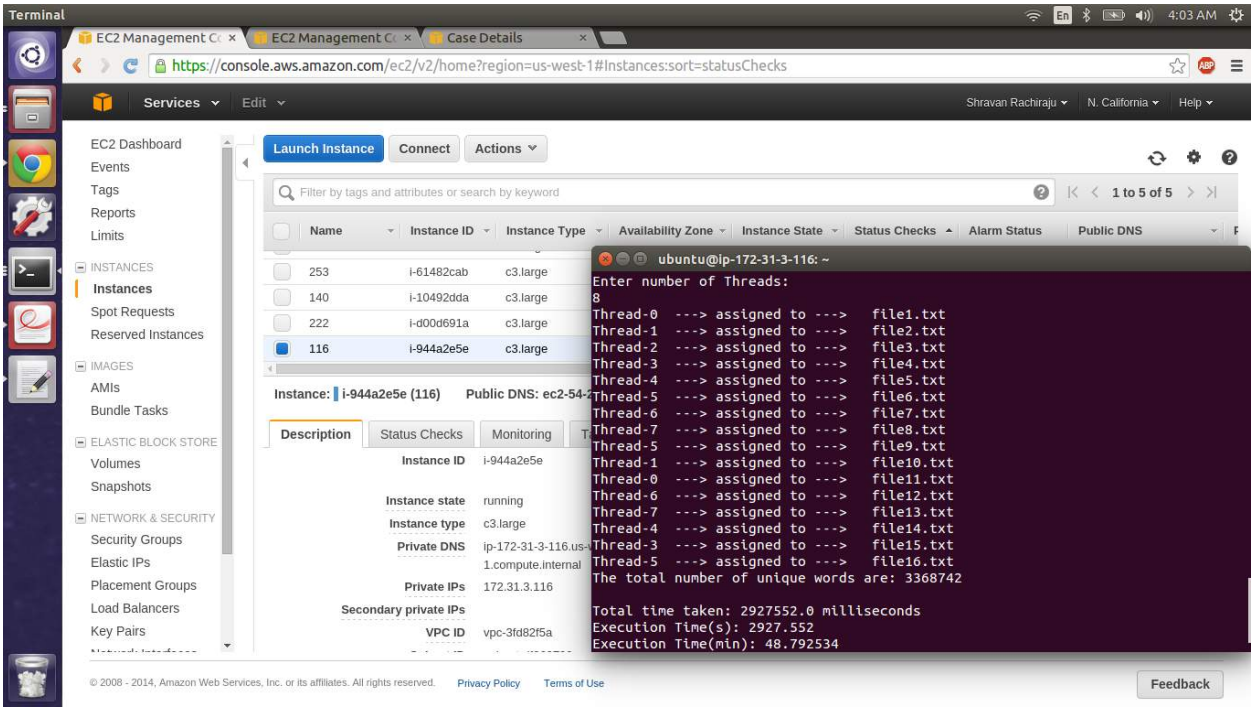


Best Performance:

Normal Word Count with Frequency no sorting: 1 Thread

Sorting Sorted word count without frequency based on the ASCII: 1 Thread

Setting Up a Virtual Cluster of 16 Nodes + 1 Master:

Creating an instance in Amazon(AWS):

- Log in into the Amazon AWS service website (http://aws.amazon.com/).
- Select EC2 from the network and services section.
- Select launch instance. Then configure the service and chose the best AMI to meet the requirements.
- Then choose the instance type which can be micro, small, medium, large Xlarge, 2Xlarge, 4Xlarge or 8Xlarge. For our assignment it is c3.large
- Then we configure the instance i.e we can choose the instance to be either spot instance or on Demand instance.
- Add storage to our selected instance.
- Configure the security group. We add TCP, UDP and ICMP protocols from the security group. We then create the instance. We access the instance by connecting to the instance by suing the public IP address of it and later on we can configure the settings of the AMI that we are using.

To Connect to the Node:

chmod 400 keygiven(This is to change the permission to be read by owner.)

ssh –i key IP address

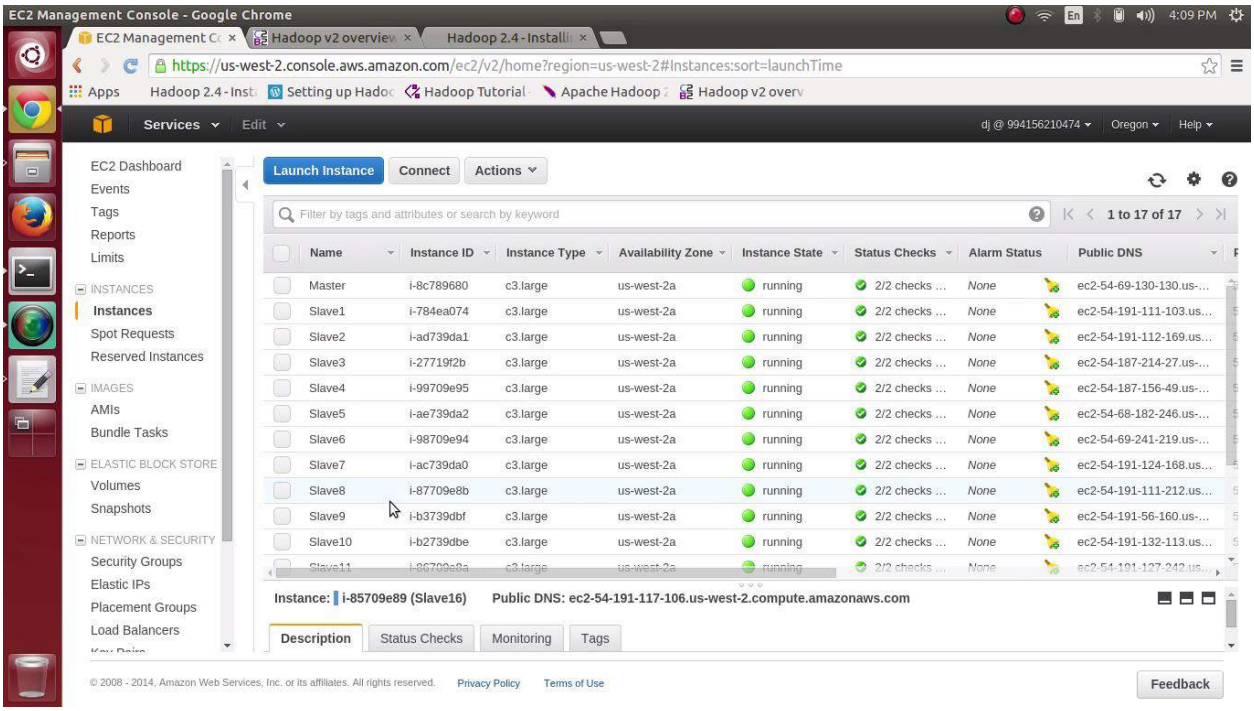
In our case we use:

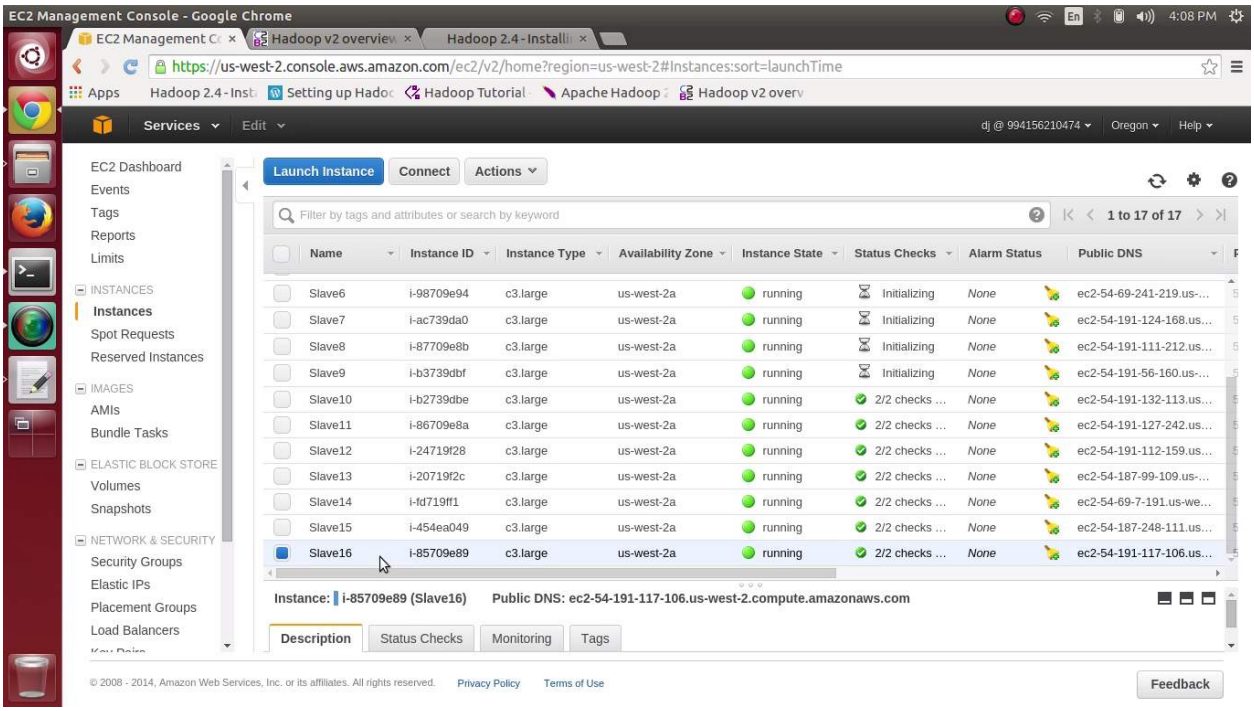
1. chmod 400 newkey.pem
2. ssh –i newkey.pem Ubuntu@54.69.130.130

After the connection is established:

- After getting connected to the AMI we now have to install java on the virtual node.
- Install java by using sudo apt-get install openjdk-7-jreheadless.
- Install javac by using sudo apt-get install openjdk-7-jdk.
- Now update all the installed applications by using sudo apt-get update
- Now check the java version by using java –version.
- Now right click the instance we created and select "create image" option. This will create an image for what all we did till now and reflect the same in the other instances.
- Go to the images tab in the left panel of the AWS webpage and select AMI images. You will see the name of the image we just created. Select that and launch the other 16 nodes.

Screen Shots of 17 nodes (1 Master and the other 16 are slaves):





Hadoop:

Installation:

Creating an instance in Amazon(AWS):

- Log in into the Amazon AWS service website (http://aws.amazon.com/).
- Select EC2 from the network and services section.
- Select launch instance. Then configure the service and chose the best AMI to meet the requirements.
- Then choose the instance type which can be micro, small, medium, large Xlarge, 2Xlarge, 4Xlarge or 8Xlarge. For our assignment it is c3.large
- Then we configure the instance i.e we can choose the instance to be either spot instance or on Demand instance.
- Add storage to our selected instance.
- Configure the security group. We add TCP, UDP and ICMP protocols from the security group. We then create the instance. We access the instance by connecting to the instance by suing the public IP address of it and later on we can configure the settings of the AMI that we are using.

To Connect to the Node:

chmod 400 keygiven(This is to change the permission to be read by owner.)

ssh –i key IP address

In our case we use:

3. chmod 400 dj_key.pem
4. ssh –i dj_key.pem Ubuntu@54.69.130.130

After the connection is established:

- After getting connected to the AMI we now have to install java on the virtual node.
- Hadoop Frame Work is written in java, so we need to install java on all the nodes.
- Install java by using sudo apt-get install openjdk-7-jreheadless.
- Install javac by using sudo apt-get install openjdk-7-jdk.
- Now update all the installed applications by using sudo apt-get update
- Now check the java version by using java –version.

To Install Hadoop:

- In the terminal do a wget http://mirrors.sonic.net/apache/hadoop/common/hadoop-2.4.1/hadoop-2.4.1.tar.gz
- Unzip it Using "tar xvzf hadoop-2.5.1.tar.gz"
- Create a folder installs in hadoop and then move the contents into this folder.

The following files will have to be modified to complete the Hadoop setup:

- ~/.bashrc
- / conf /hadoop-env.sh
- / conf /core-site.xml
- / conf /yarn-site.xml
- / conf /hdfs-site.xml
- / conf /mapred-site.xml.template

1. ~/.bashrc:

```
#HADOOP VARIABLES START
export JAVA_HOME=/usr/lib/jvm/java-7-openjdk-amd64
export HADOOP_INSTALL=/usr/ubuntu/installs/hadoop
export PATH=$PATH:$HADOOP_INSTALL/bin
export PATH=$PATH:$HADOOP_INSTALL/sbin
export HADOOP_MAPRED_HOME=$HADOOP_INSTALL
export HADOOP_COMMON_HOME=$HADOOP_INSTALL
export HADOOP_HDFS_HOME=$HADOOP_INSTALL
export YARN_HOME=$HADOOP_INSTALL
export HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_INSTALL/lib/native
export HADOOP_OPTS="-Djava.library.path=$HADOOP_INSTALL/lib"
eval ($ssh-agent);
ssh-add/home/ubuntu/dj_key.pem
#HADOOP VARIABLES END
```

   Reboot the connection now for the changes to be reflected.

2. / conf /hadoop-env.sh:

   This is to set the JAVA Path by modifying **hadoop-env.sh** file

```
export JAVA_HOME=/usr/lib/jvm/java-7-openjdk-amd64
```

3. / conf /core-site.xml:

The **/usr/local/hadoop/etc/hadoop/core-site.xml** file contains configuration properties that Hadoop uses when starting up. This file can be used to override the default settings that Hadoop starts with.

```
<configuration>
<property>
<name>fs.default.name</name>
 <value>hdfs://<172.31.22.90>:9000</value>
</property>
<property>
<name>hadoop.tmp.dir</name>
<value>/home/ubuntu/installs/hadoop/hadoop_tmp/tmp</value>
</property>
</configuration>
```

4. / conf /yarn-site.xml:

```
<configuration>
<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>
<property>
<name>yarn.resourcemanager.resource-tracker.address</name>
<value><172.31.22.90>:8025</value>
</property>
<property>
<name>yarn.resourcemanager.scheduler.address</name>
<value><172.31.22.90>:8030</value>
</property>
<property>
<name>yarn.resourcemanager.address</name>
<value><172.31.22.90>:8040</value>
</property>
</configuration>
```

5. / conf /hdfs-site.xml:

```
<configuration>
<property>
<name>dfs.replication</name>
 <value>16</value>
</property>
<property>
 <name>dfs.permissions</name>
 <value>false</value>
 </property>
</configuration>
```

6. /conf /mapred-site.xml:

By default, the /usr/local/hadoop/etc/hadoop/ contains the /usr/local/hadoop/etc/hadoop/mapred-site.xml.template file which has to be renamed/copied with the name mapred-site.xml:

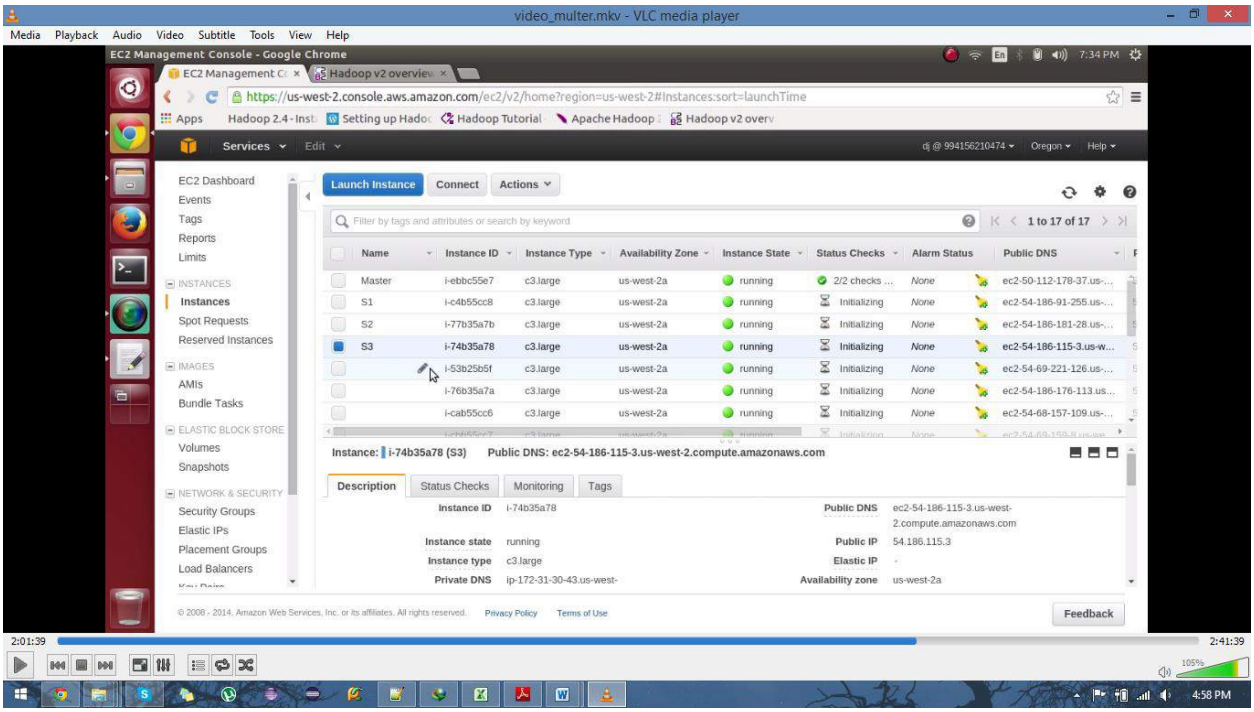
"cp /usr/local/hadoop/etc/hadoop/mapred-site.xml.template/usr/local/hadoop/etc/hadoop/mapred-site.xml"

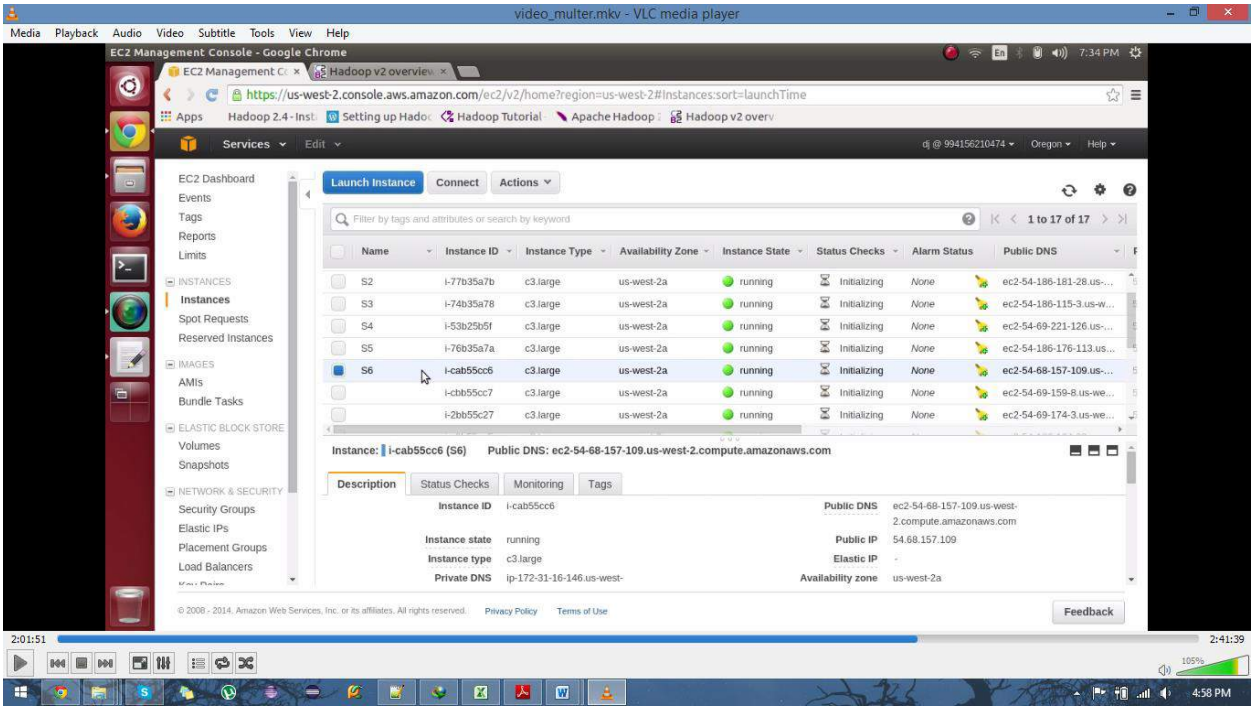
The **mapred-site.xml** file is used to specify which framework is being used for MapReduce. We need to enter the following content in between the <configuration></configuration> tag:

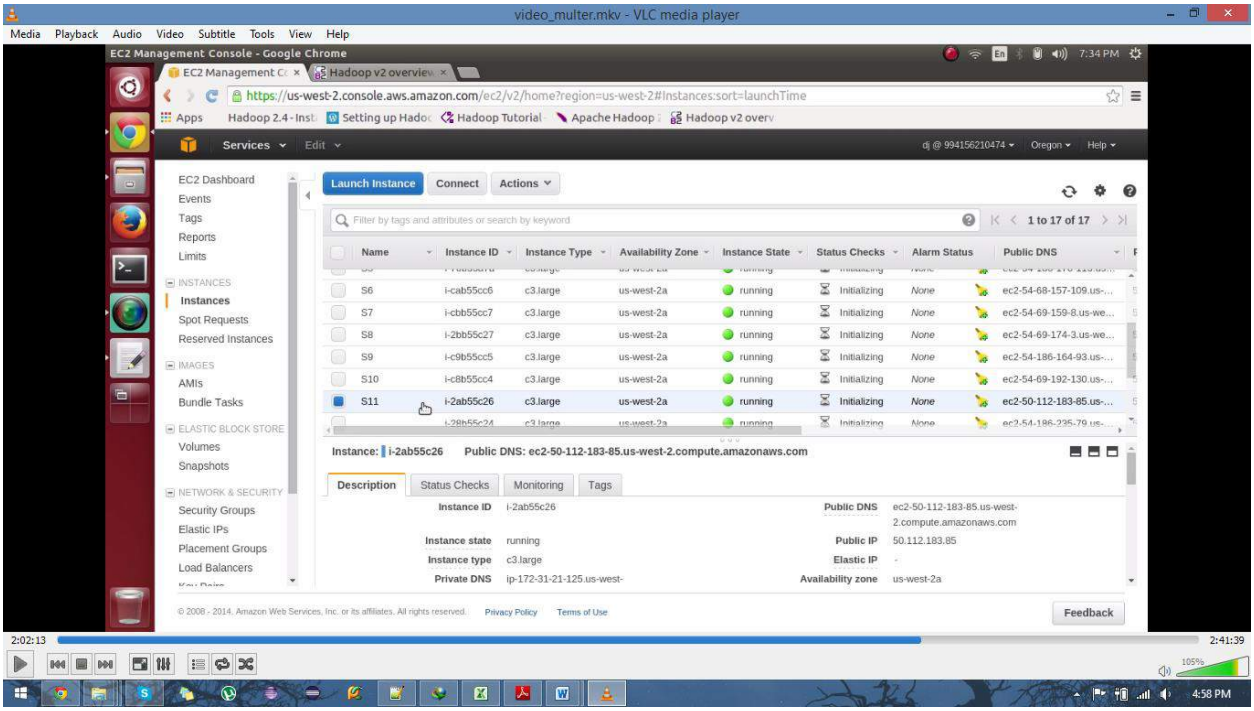
```
<configuration>
<property>
 <name>mapreduce.framework.name</name>
<value>yarn</value>
 </property>
</configuration>
```

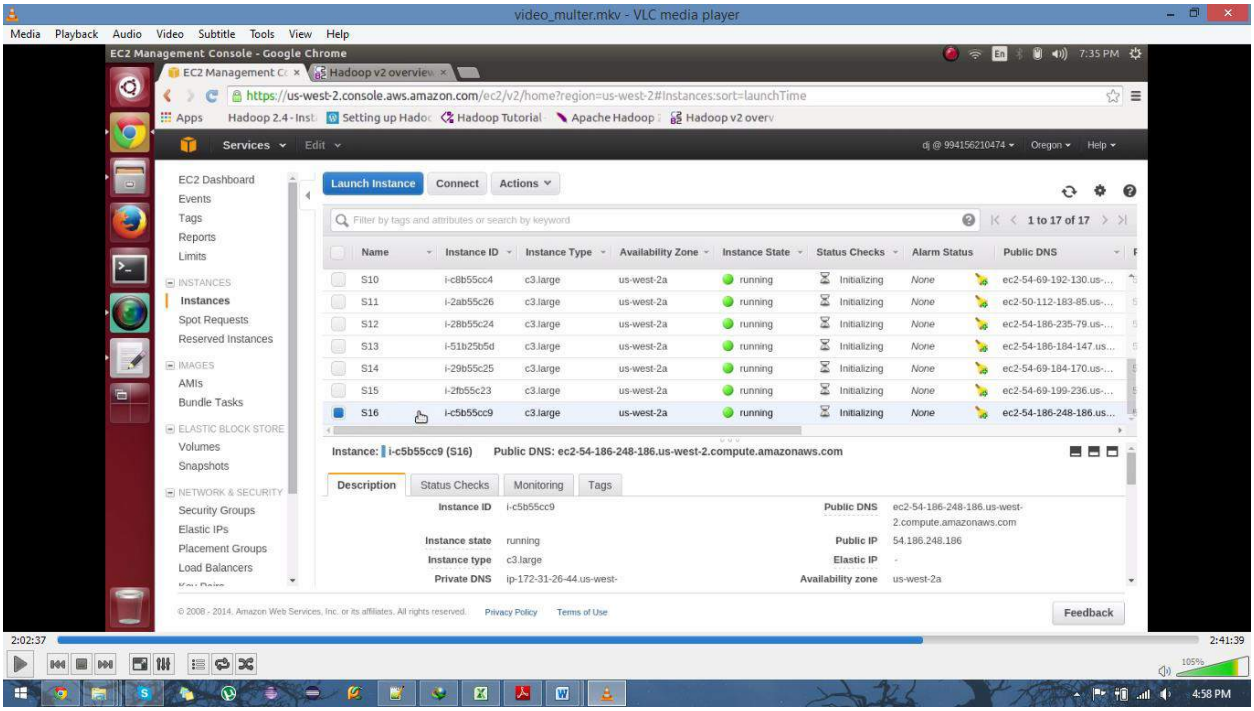
Create an IMAGE for all this so that it can be reflected in all the nodes. This would be the basic configuration for hadoop for 1 node setup. For 16 node setup we have to edit 2 more configuration files the conf/hosts, conf/slaves on the **MASTER NODE ONLY**.

Master and Slave Nodes Connected:



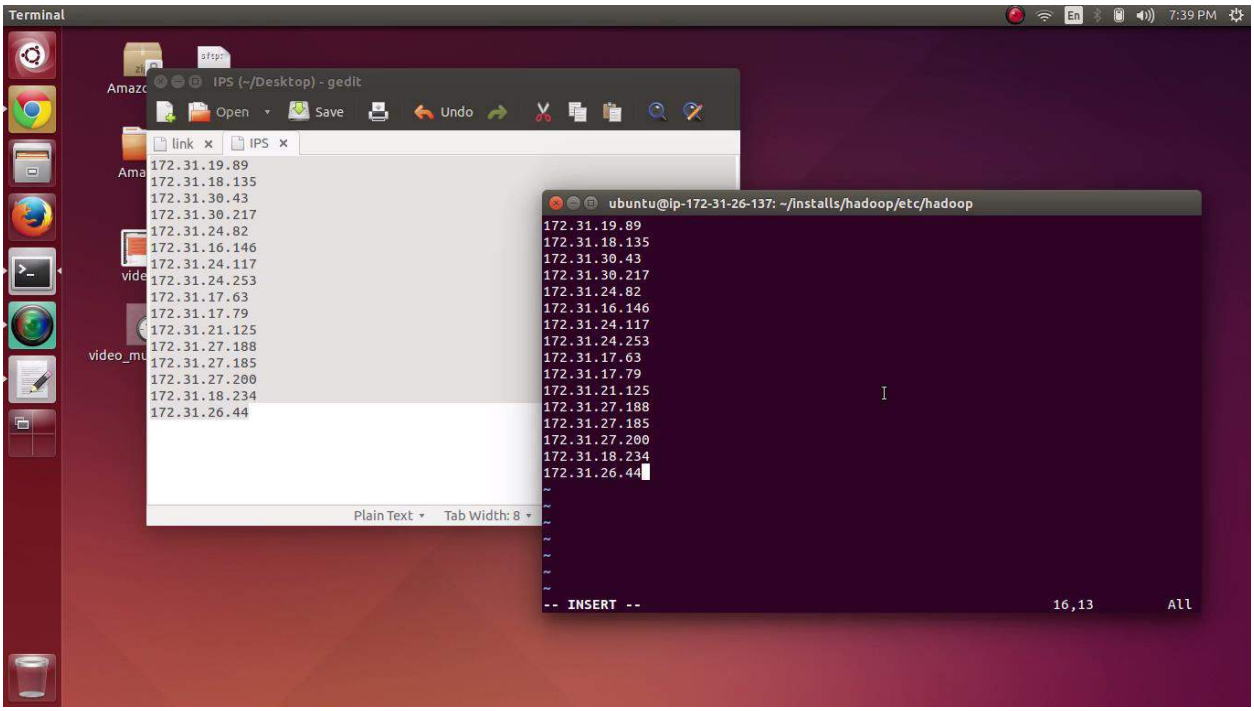



video_multer.mkv - VLC media player
Media Playback Audio Video Subtitle Tools View Help
EC2 Management Console - Google Chrome
https://us-west-2.console.aws.amazon.com/ec2/v2/home?region=us-west-2#Instances:sort=launchTime
Launch Instance
Connect
Actions
Instance: i-2ab55c26 Public DNS: ec2-50-112-183-85.us-west-2.compute.amazonaws.com
Description
Status Checks
Monitoring
Tags
Feedback
2:02:13
2:41:39


video_multer.mkv - VLC media player
Media Playback Audio Video Subtitle Tools View Help
EC2 Management Console - Google Chrome
https://us-west-2.console.aws.amazon.com/ec2/v2/home?region=us-west-2#Instances:sort=launchTime
Launch Instance
Connect
Actions
Instance: i-c5b55cc9 (S16) Public DNS: ec2-54-186-248-186.us-west-2.compute.amazonaws.com
Description
Status Checks
Monitoring
Tags
Feedback
2:02:37
2:41:39

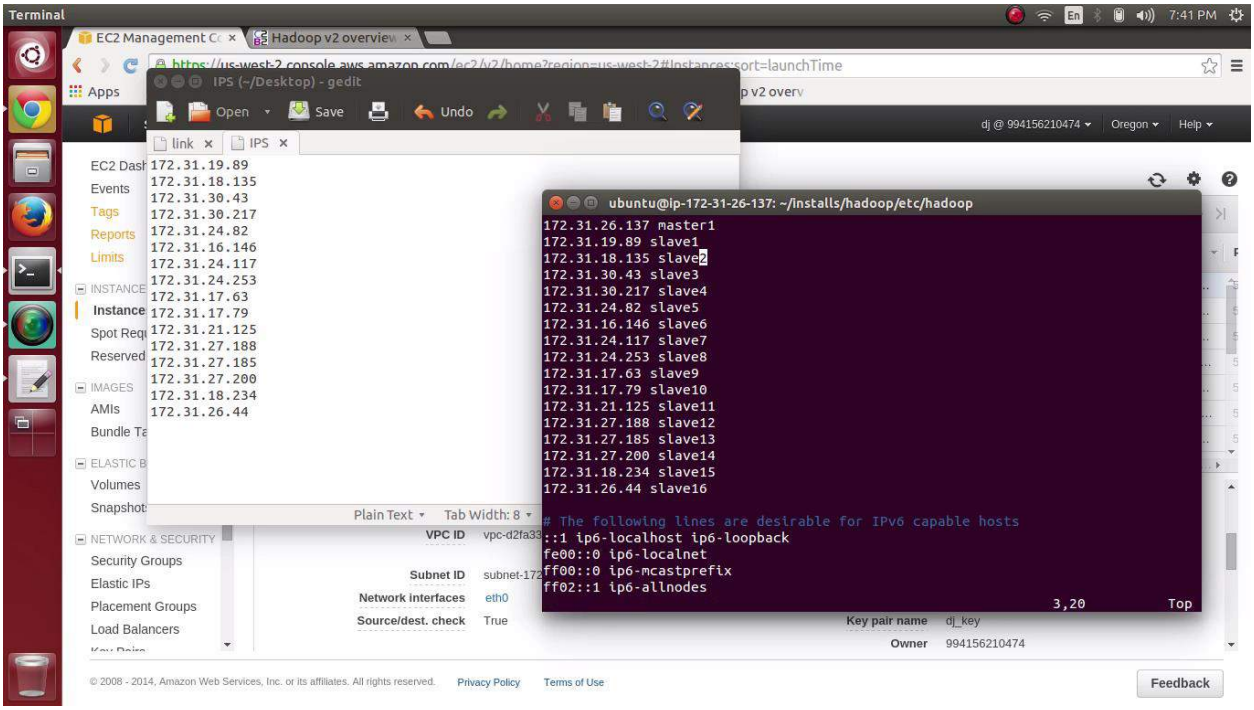
7. / conf /slaves:

Add all the IP address to the slaves file



8. conf/hosts:

Add all the IP's of the the slaves in the file including the master IP.



1. The namenode will run only on the master in our test setup and is started by executing the following command:

    - $<HADOOP_HOME>/sbin/hadoop-daemon.sh start namenode

2. Start the datanodes which will run on both the slave nodes:

    - $<HADOOP_HOME>/hadoop-daemons.sh start datanode

3. The resource manager process will run only on the master and is started using the following command:

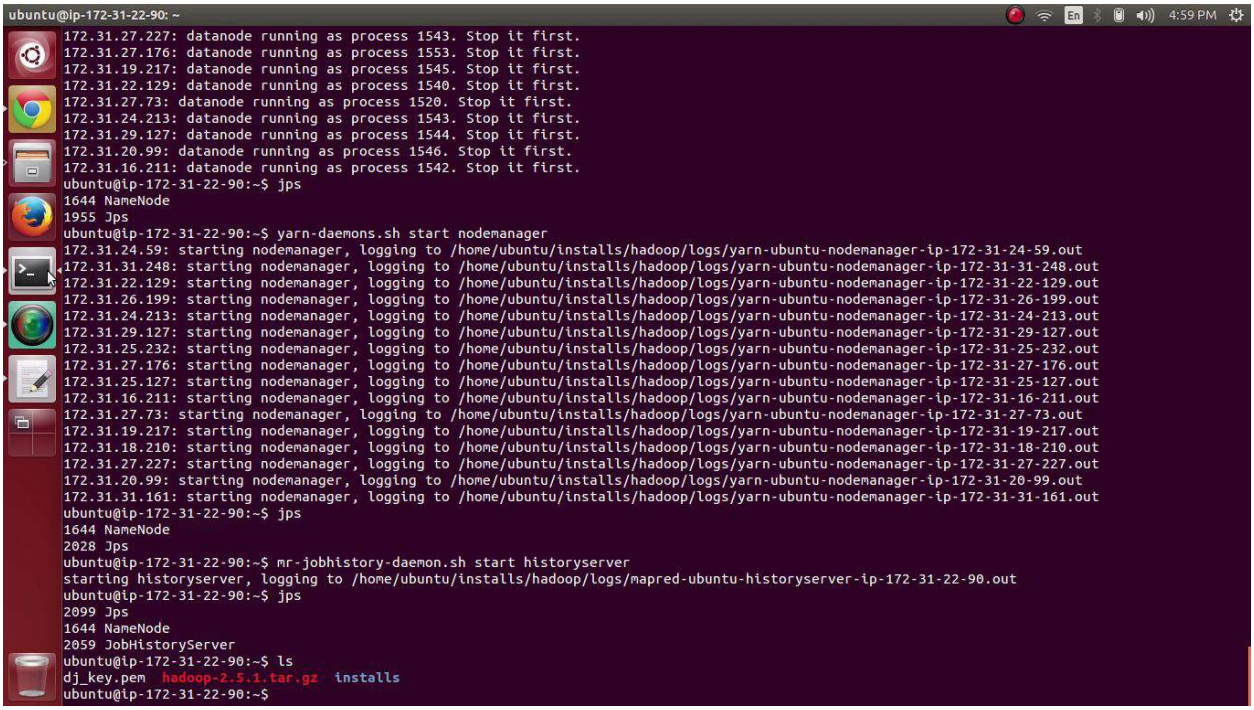
    - $<HADOOP_HOME>/yarn-daemon.sh start resourcemanager

4. The node manager process runs on each of the slave nodes and is started using this command.:

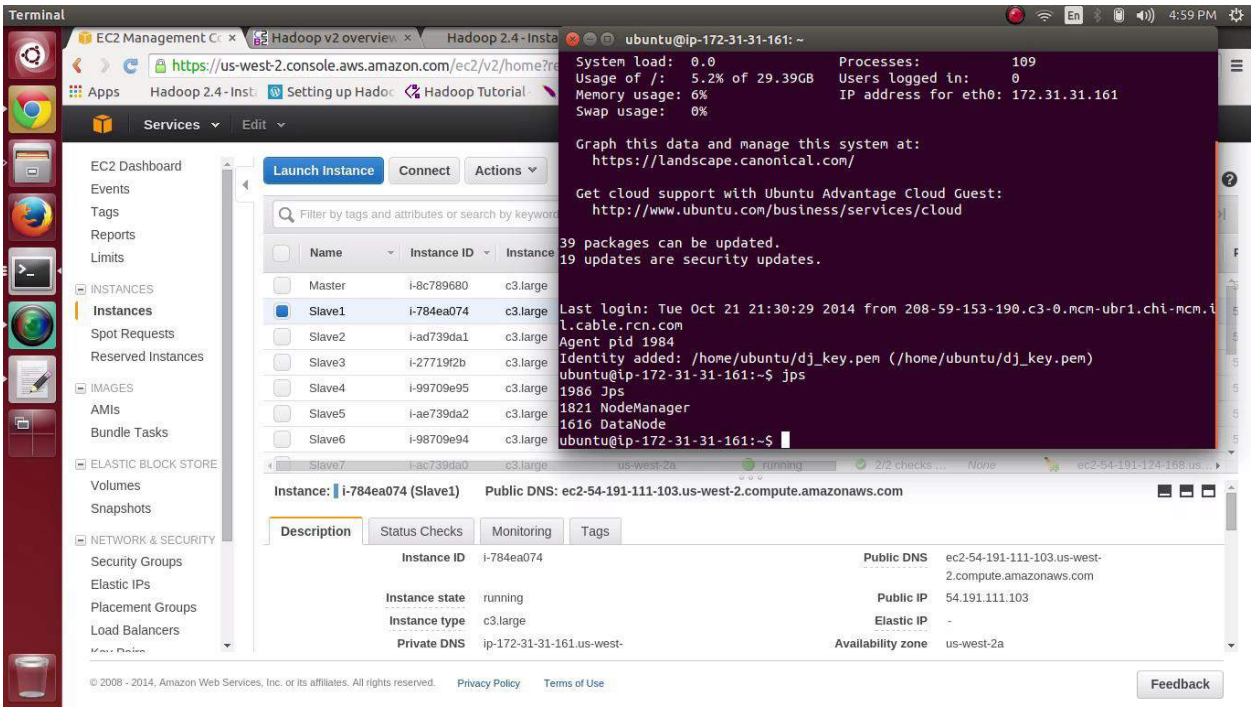
    - $<HADOOP_HOME>/yarn-daemons.sh start nodemanager

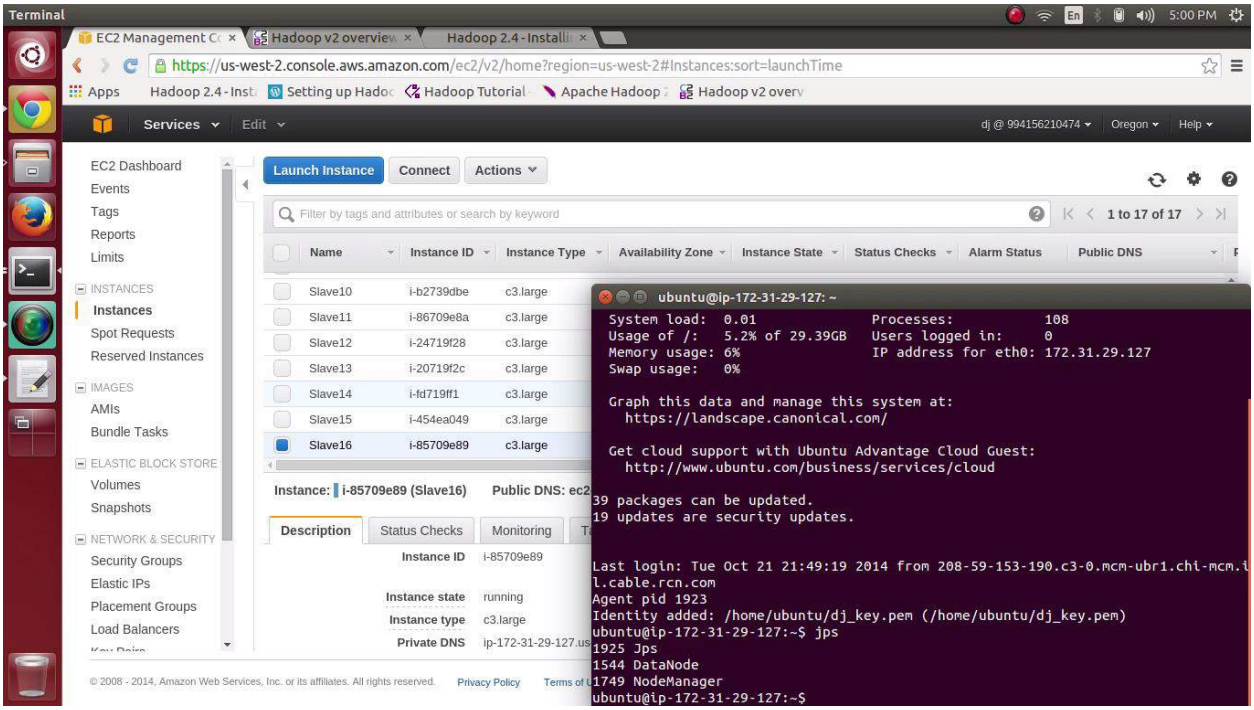
5. The job history server process runs on the master node and is started using the following command:

    - $<HADOOP_HOME>/mr-jobhistory-daemon.sh start historyserver

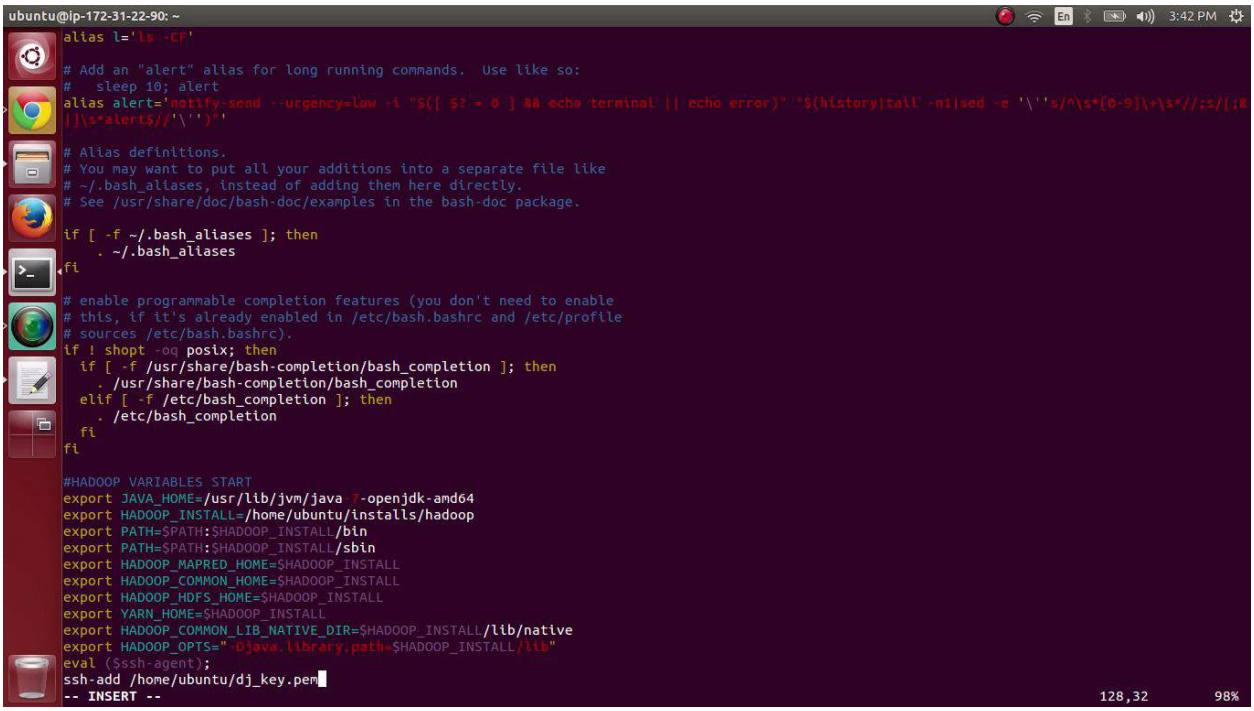


To Check if the nodes are connected we login into another node and do jps:

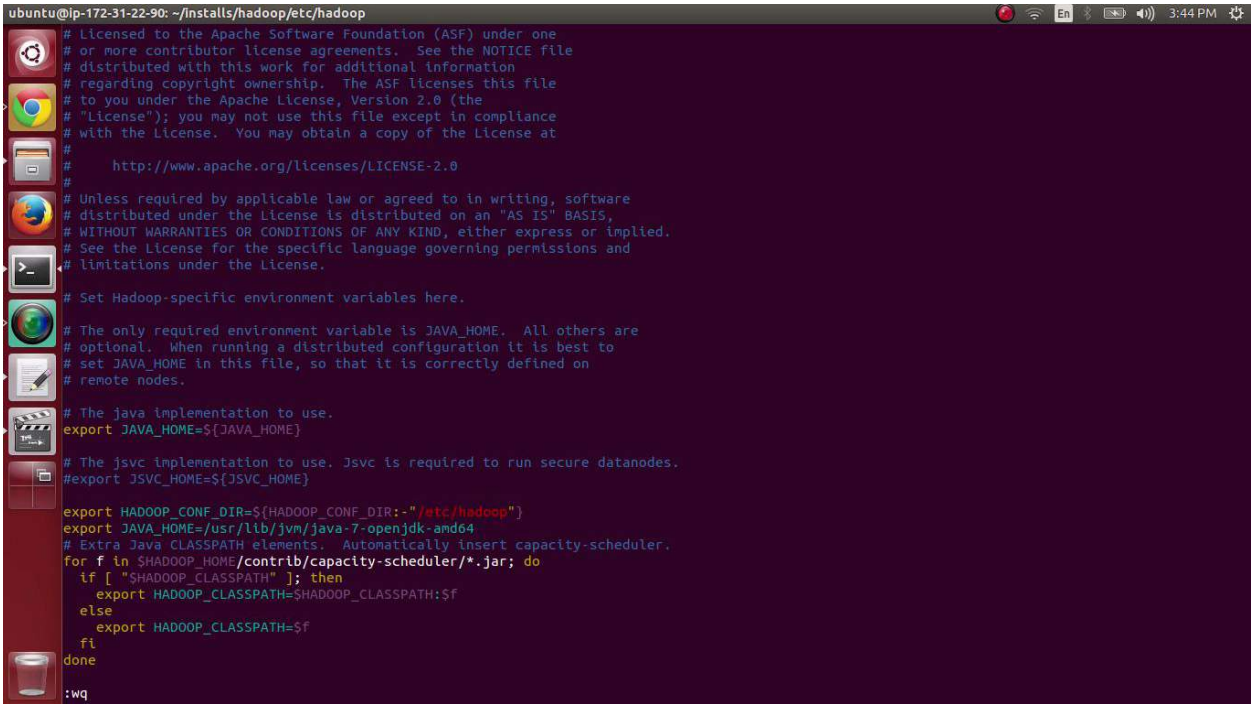




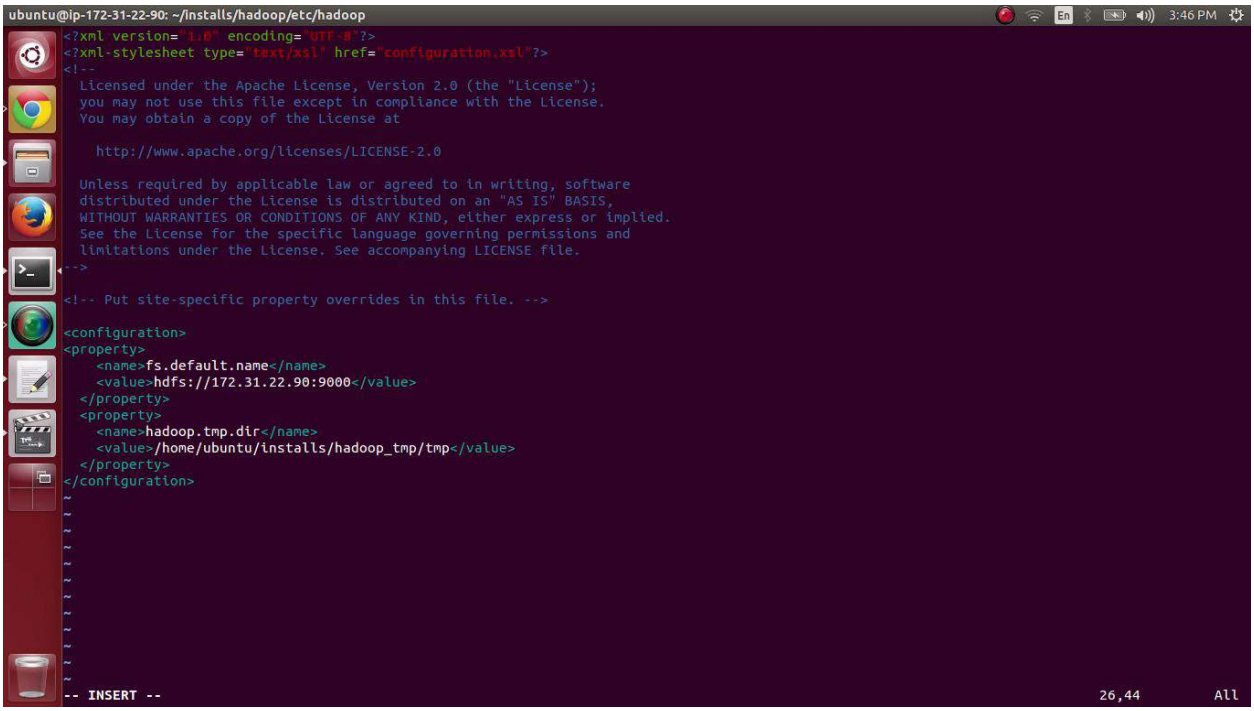
Screen Shots of the Configuration FILES:
~/.bashrc:



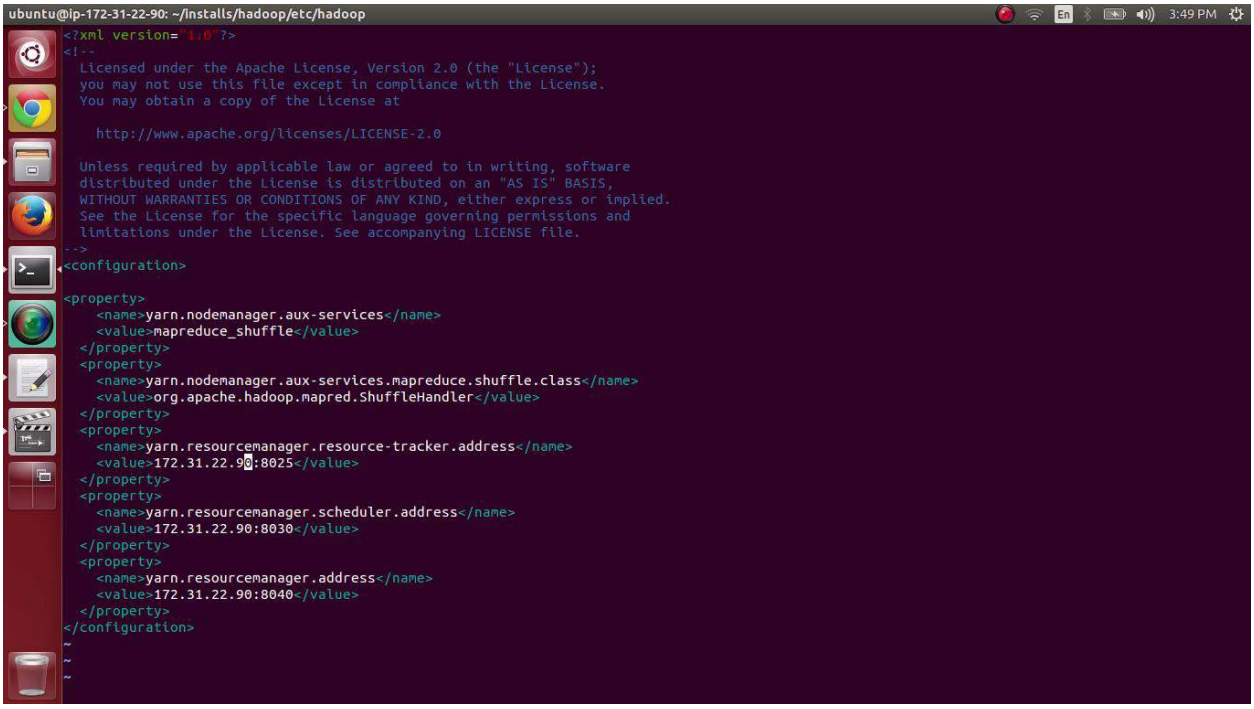
conf /hadoop-env.sh



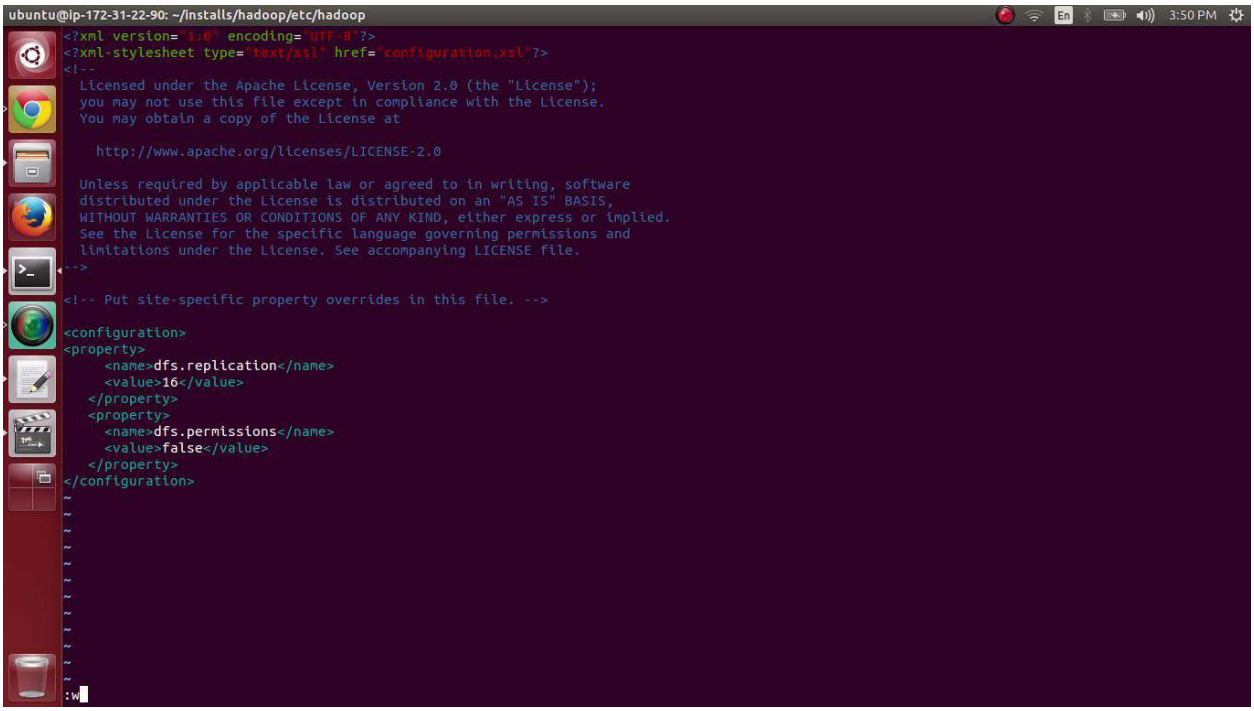
/ conf /core-site.xml:



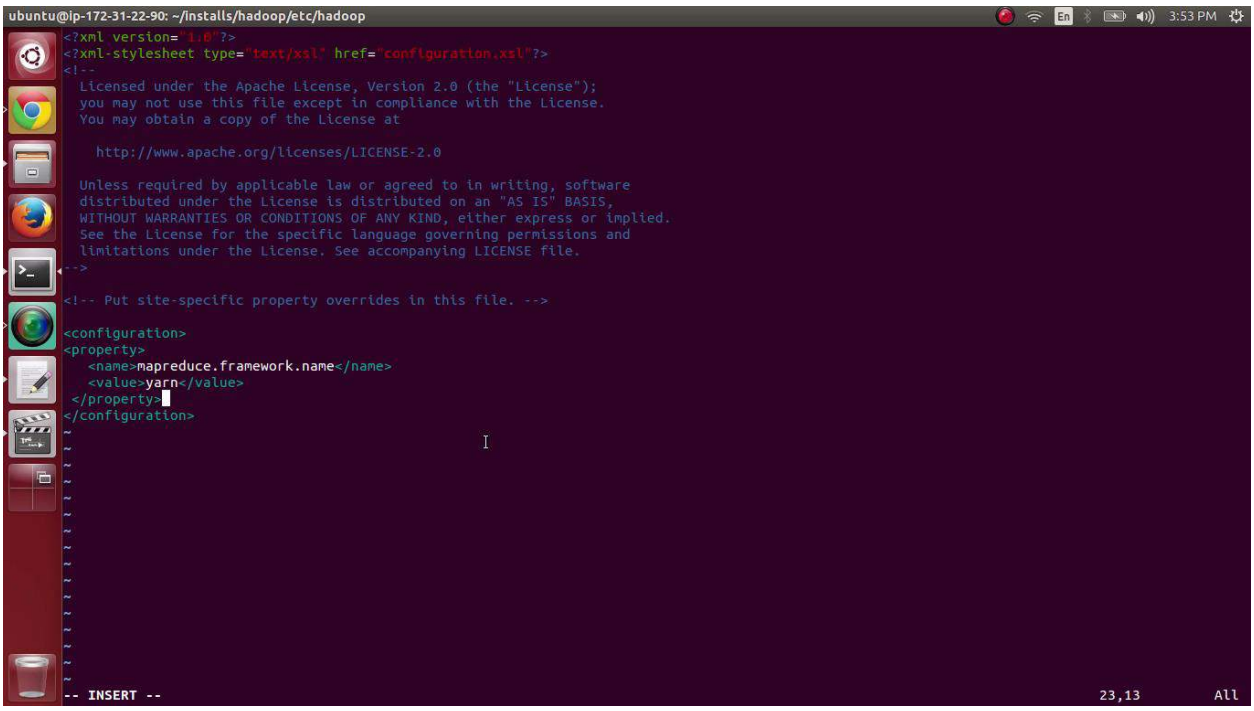
/ conf /yarn-site.xml:



/ conf /hdfs-site.xml:

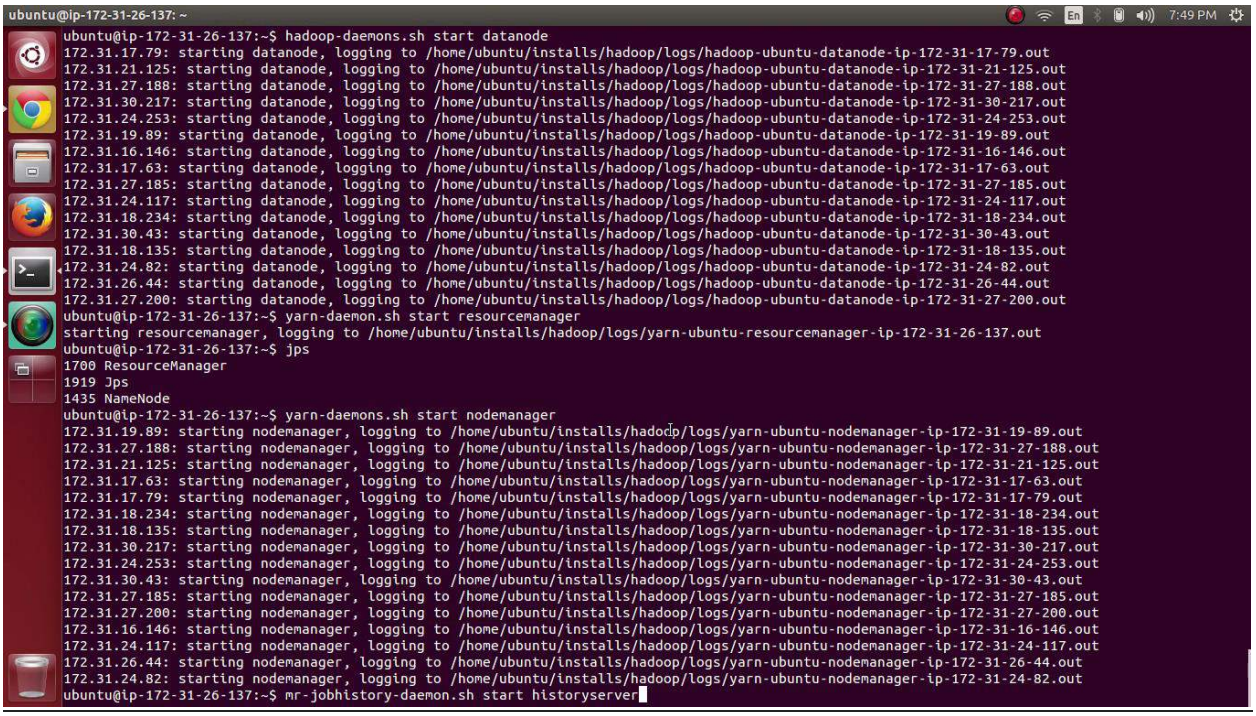


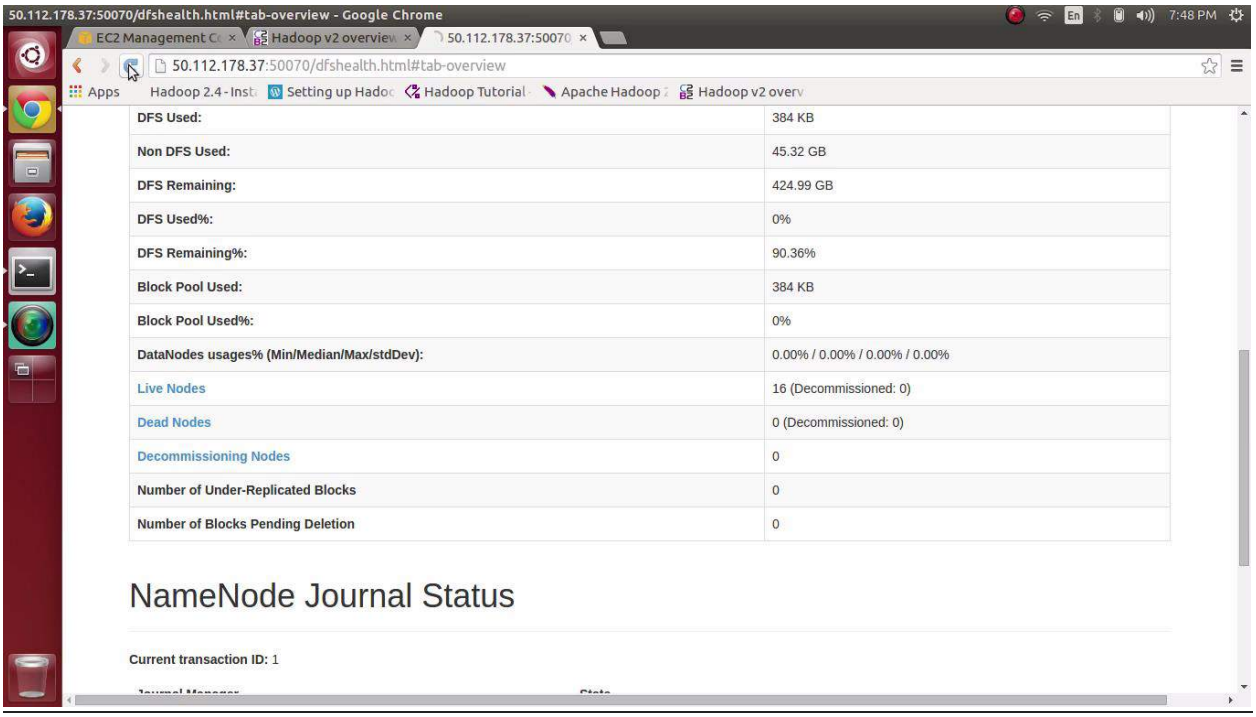
/conf /mapred-site.xml :

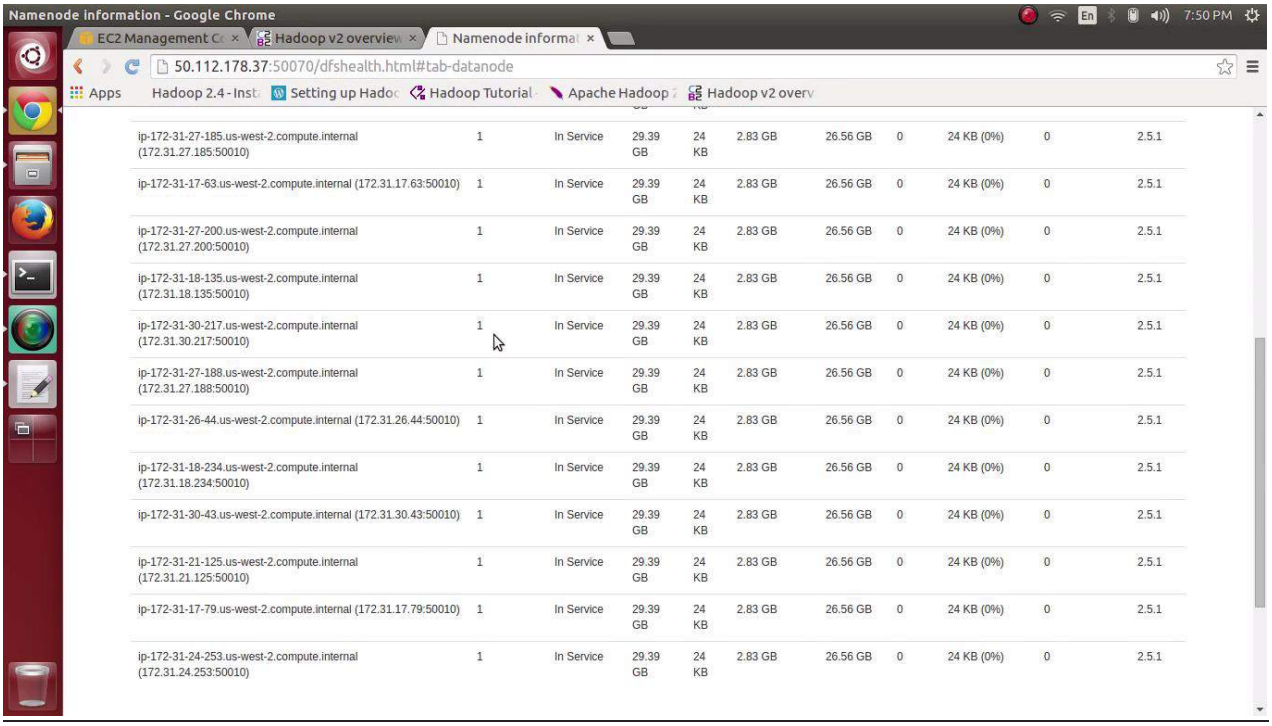


Connecting to Data Nodes:

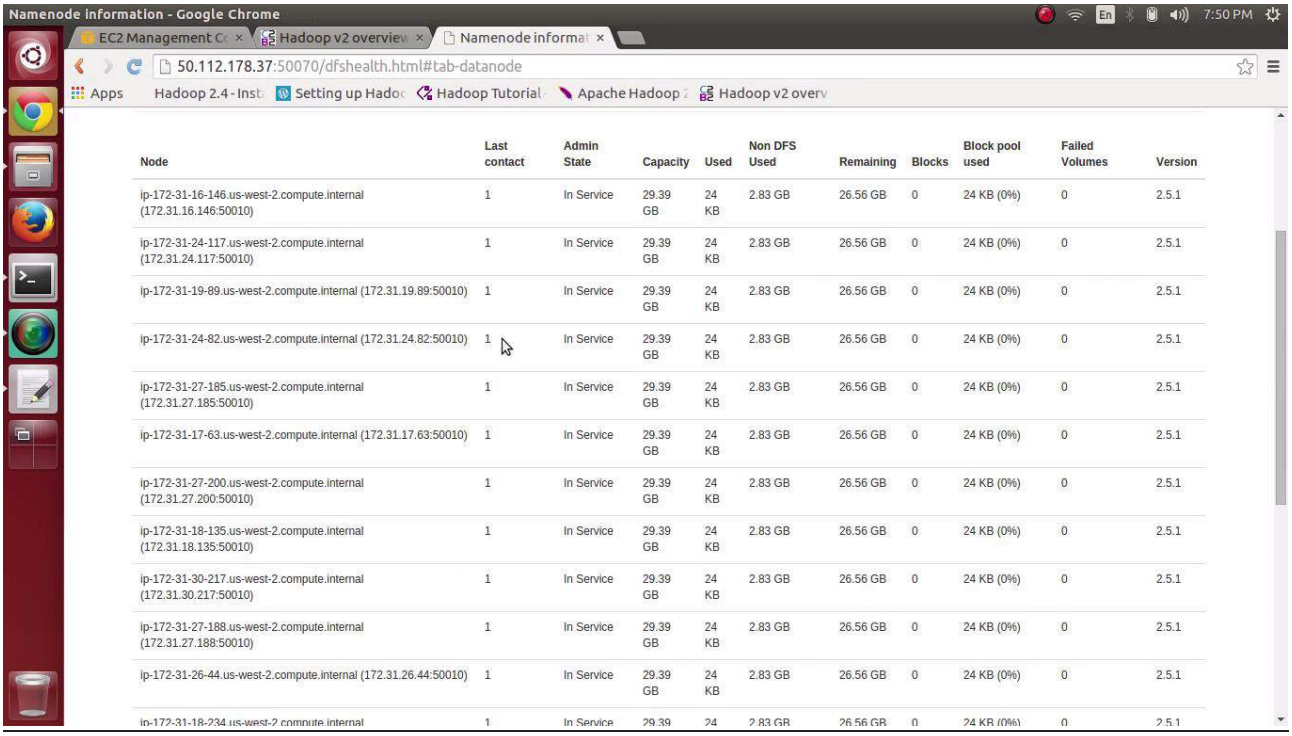
Screen Shots:



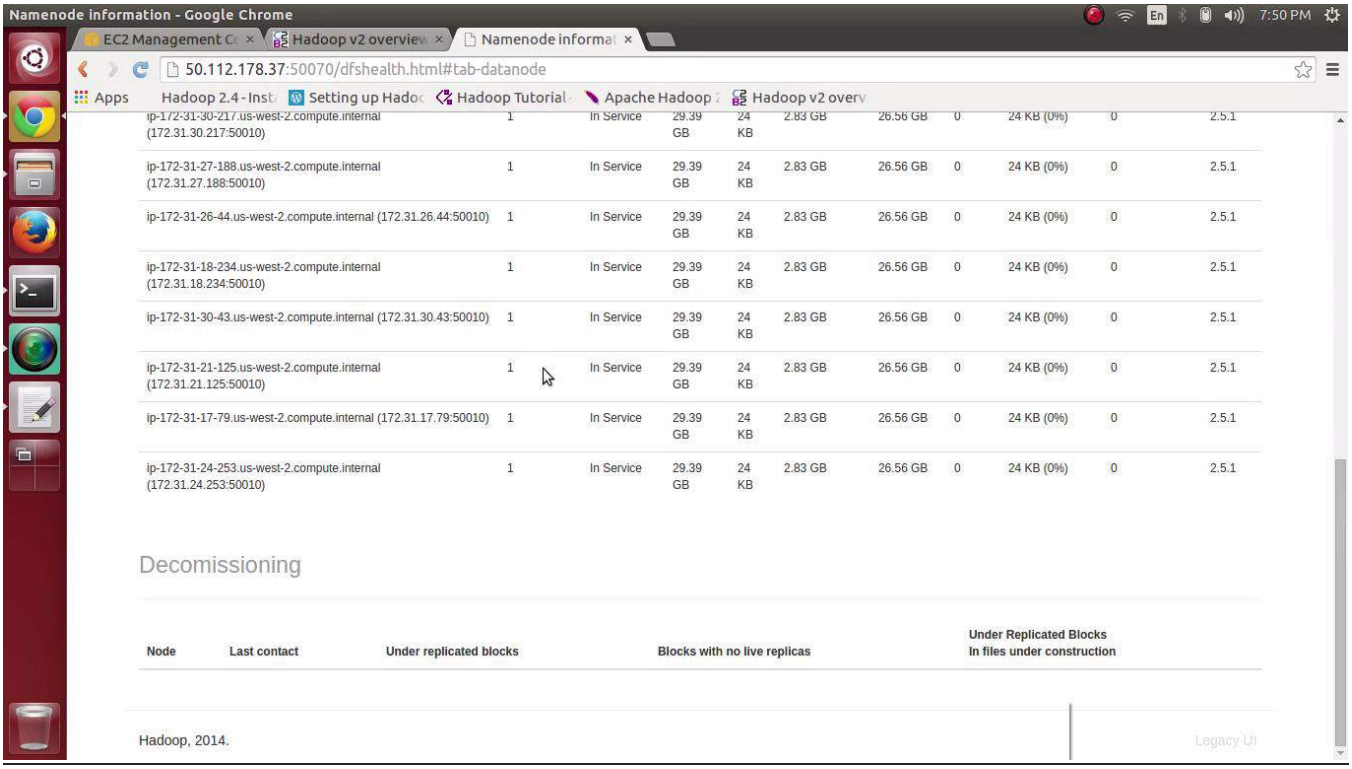




Node	Last contact	Admin State	Capacity	Used	Non DFS Used	Remaining	Blocks	Block pool used	Failed Volumes	Version
ip-172-31-27-185.us-west-2.compute.internal (172.31.27.185:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-17-63.us-west-2.compute.internal (172.31.17.63:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-27-200.us-west-2.compute.internal (172.31.27.200:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-18-135.us-west-2.compute.internal (172.31.18.135:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-30-217.us-west-2.compute.internal (172.31.30.217:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-27-188.us-west-2.compute.internal (172.31.27.188:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-26-44.us-west-2.compute.internal (172.31.26.44:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-18-234.us-west-2.compute.internal (172.31.18.234:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-30-43.us-west-2.compute.internal (172.31.30.43:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-21-125.us-west-2.compute.internal (172.31.21.125:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-17-79.us-west-2.compute.internal (172.31.17.79:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-24-253.us-west-2.compute.internal (172.31.24.253:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1



Node	Last contact	Admin State	Capacity	Used	Non DFS Used	Remaining	Blocks	Block pool used	Failed Volumes	Version
ip-172-31-16-146.us-west-2.compute.internal (172.31.16.146:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-24-117.us-west-2.compute.internal (172.31.24.117:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-19-89.us-west-2.compute.internal (172.31.19.89:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-24-82.us-west-2.compute.internal (172.31.24.82:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-27-185.us-west-2.compute.internal (172.31.27.185:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-17-63.us-west-2.compute.internal (172.31.17.63:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-27-200.us-west-2.compute.internal (172.31.27.200:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-18-135.us-west-2.compute.internal (172.31.18.135:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-30-217.us-west-2.compute.internal (172.31.30.217:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-27-188.us-west-2.compute.internal (172.31.27.188:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-26-44.us-west-2.compute.internal (172.31.26.44:50010)	1	In Service	29.39 GB	24 KB	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1
ip-172-31-18-234.us-west-2.compute.internal	1	In Service	29.39	24	2.83 GB	26.56 GB	0	24 KB (0%)	0	2.5.1


Namenode information - Google Chrome
7:50 PM
EC2 Management C
Hadoop v2 overvie
Namenode informat
50.112.178.37:50070/dfshealth.html#tab-datanode
Apps
Hadoop 2.4 - Inst
Setting up Hadoc
Hadoop Tutorial
Apache Hadoop
Hadoop v2 overv
ip-172-31-30-217.us-west-2.compute.internal (172.31.30.217:50010) 1 In Service 29.39 GB 24 KB 2.83 GB 26.56 GB 0 24 KB (0%) 0 2.5.1
ip-172-31-27-188.us-west-2.compute.internal (172.31.27.188:50010) 1 In Service 29.39 GB 24 KB 2.83 GB 26.56 GB 0 24 KB (0%) 0 2.5.1
ip-172-31-26-44.us-west-2.compute.internal (172.31.26.44:50010) 1 In Service 29.39 GB 24 KB 2.83 GB 26.56 GB 0 24 KB (0%) 0 2.5.1
ip-172-31-18-234.us-west-2.compute.internal (172.31.18.234:50010) 1 In Service 29.39 GB 24 KB 2.83 GB 26.56 GB 0 24 KB (0%) 0 2.5.1
ip-172-31-30-43.us-west-2.compute.internal (172.31.30.43:50010) 1 In Service 29.39 GB 24 KB 2.83 GB 26.56 GB 0 24 KB (0%) 0 2.5.1
ip-172-31-21-125.us-west-2.compute.internal (172.31.21.125:50010) 1 In Service 29.39 GB 24 KB 2.83 GB 26.56 GB 0 24 KB (0%) 0 2.5.1
ip-172-31-17-79.us-west-2.compute.internal (172.31.17.79:50010) 1 In Service 29.39 GB 24 KB 2.83 GB 26.56 GB 0 24 KB (0%) 0 2.5.1
ip-172-31-24-253.us-west-2.compute.internal (172.31.24.253:50010) 1 In Service 29.39 GB 24 KB 2.83 GB 26.56 GB 0 24 KB (0%) 0 2.5.1
Decomissioning
Node
Last contact
Under replicated blocks
Blocks with no live replicas
Under Replicated Blocks In files under construction
Hadoop, 2014.
Legacy UI

Word Count in Hadoop:

SYSTEM CONFIGURATION:

VERSION	: Hadoop 1.2.1
INSTANCE TYPE	: c3. Large UBUNTU
RAM	: 3.75 GB
NO. OF CORES	: 2 virtual cores
STORAGE	: 32 GB

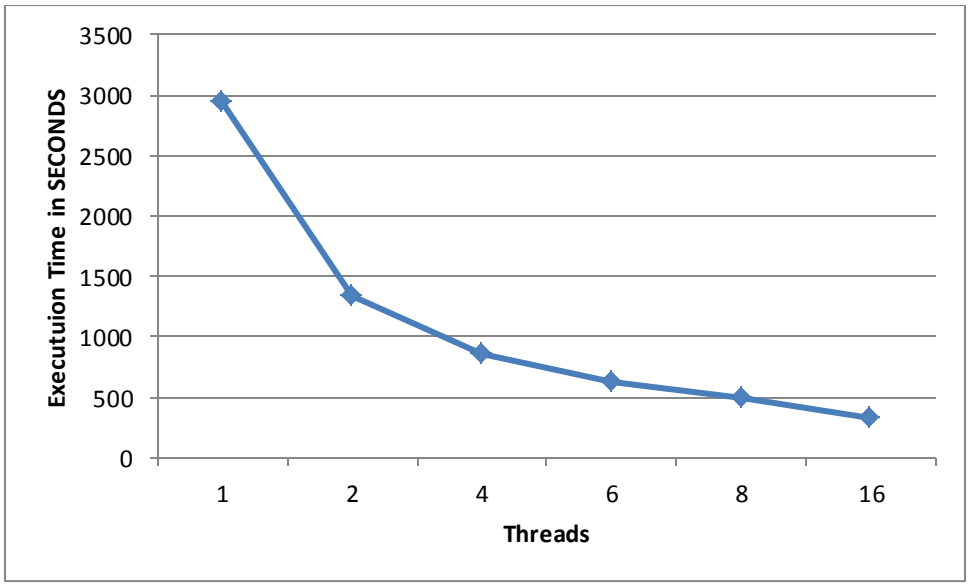
Methodology:

1. HADOOP framework is written in java.
2. Install java latest version (1.7) and check version by using java –version command.
3. Next is to create and to setup SSH certificates and install HADOOP.
4. Hadoop WordCount Map Reduce: MapReduce programs are designed to compute large volumes of data in a parallel fashion i.e. 10GB input. This requires dividing the workload across a two or single nodes.
5. List Processing: MapReduce programs transform lists of input data elements into lists of output data elements. A MapReduce program will do this twice, using two different list processing idioms: map, and reduce.
6. Mapping List: In the first phase called mapping, a list of data elements are provided, one at a time, to a function called the Mapper, which transforms each element individually to an output data element. As an example of the utility of map: We have a code to remove all the special characters (symbols) form the beginning and end of the word. We are not modifying the input string here: we are returning a new string that will form part of a new output list.
7. Reducing List: Reducing aggregate values together. A reducer function receives an iterator of input values from an input list. It then combines these values together, returning a single output value.
8. Now set up the configuration files and format the HADOOP file system and start HADOOP.
9. We have to access the output from the HDFS. This can be done using get command.
10. The output files stored are titled as wordcount-HADOOP.txt

Outputs:

10 GB DATASET ON c3.large instance (Only Word Count with Frequency no sorting):

Nodes	Execution time in seconds
1	2950
2	1338
4	850.8
6	625.8
8	498
16	327.6

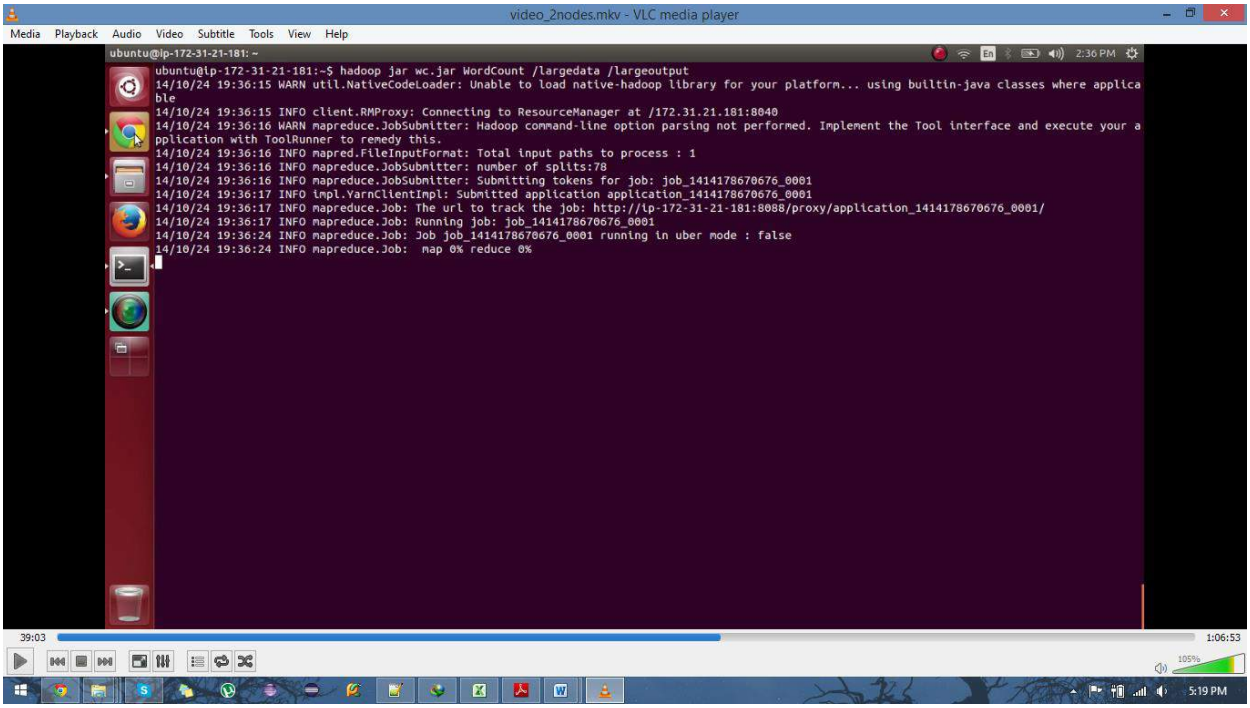


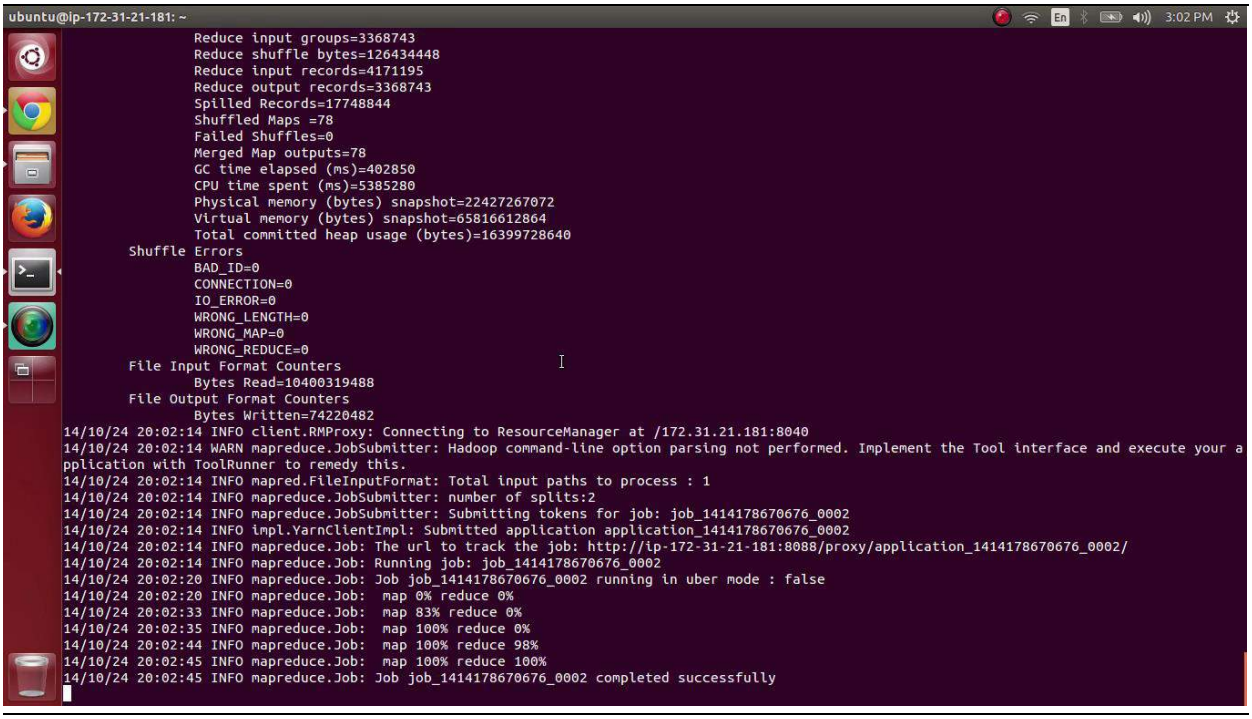
EXPLANATION:

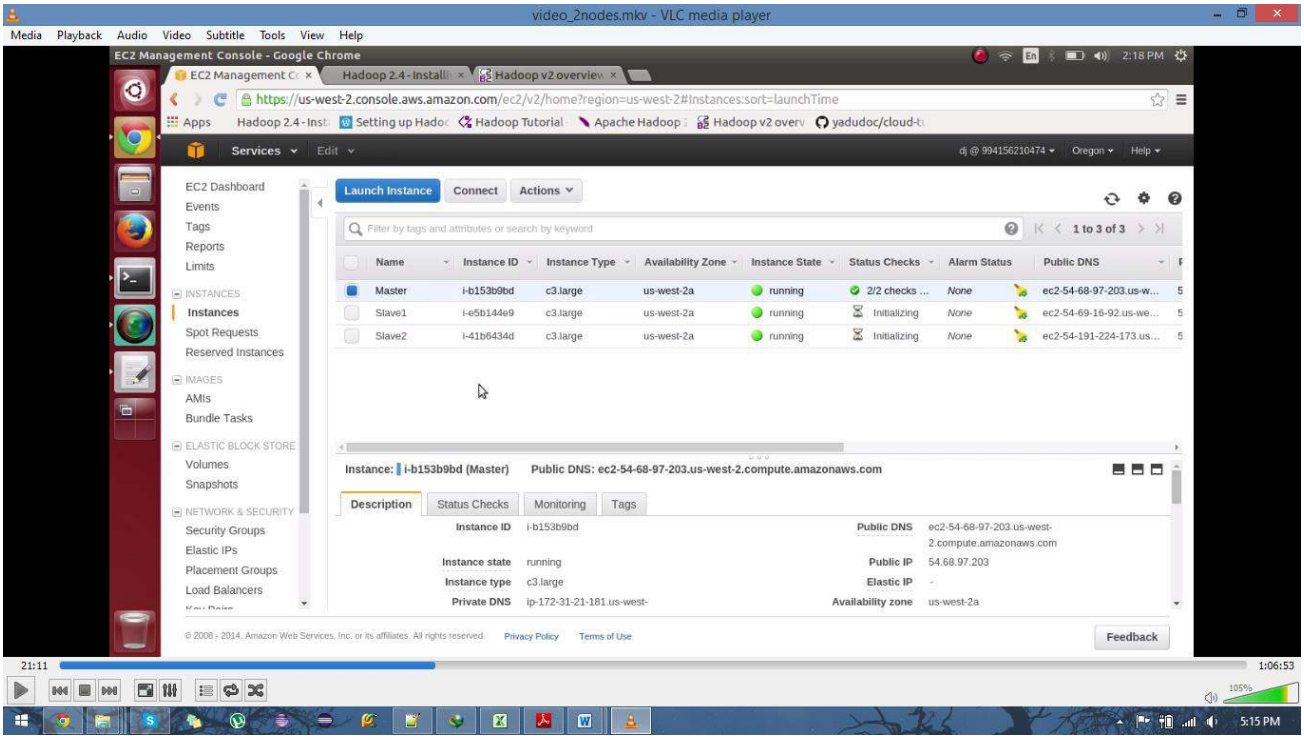
1. The above graph is clearly shows that as number of nodes increases the execution time decreases.

Screen Shots for setting up and running 2,4,6, 8 and 16 nodes:

2 Nodes:






video_2nodes.mkv - VLC media player
Media Playback Audio Video Subtitle Tools View Help
EC2 Management Console - Google Chrome
https://us-west-2.console.aws.amazon.com/ec2/v2/home?region=us-west-2#Instances:sort=launchTime
Services Edit
EC2 Dashboard
Events
Tags
Reports
Limits
INSTANCES
Instances
Spot Requests
Reserved Instances
IMAGES
AMIs
Bundle Tasks
ELASTIC BLOCK STORE
Volumes
Snapshots
NETWORK & SECURITY
Security Groups
Elastic IPs
Placement Groups
Load Balancers
Launch Instance
Connect
Actions
Filter by tags and attributes or search by keyword
1 to 3 of 3
Name
Instance ID
Instance Type
Availability Zone
Instance State
Status Checks
Alarm Status
Public DNS
Master i-b153b9bd c3.large us-west-2a running 2/2 checks ... None ec2-54-68-97-203.us-w...
Slave1 i-e5b144e9 c3.large us-west-2a running Initializing None ec2-54-69-16-92.us-we...
Slave2 i-41b6434d c3.large us-west-2a running Initializing None ec2-54-191-224-173.us...
Instance: i-b153b9bd (Master) Public DNS: ec2-54-68-97-203.us-west-2.compute.amazonaws.com
Description
Status Checks
Monitoring
Tags
Instance ID i-b153b9bd
Instance state running
Instance type c3.large
Private DNS ip-172-31-21-181.us-west-
Public DNS ec2-54-68-97-203.us-west-2.compute.amazonaws.com
Public IP 54.68.97.203
Elastic IP -
Availability zone us-west-2a
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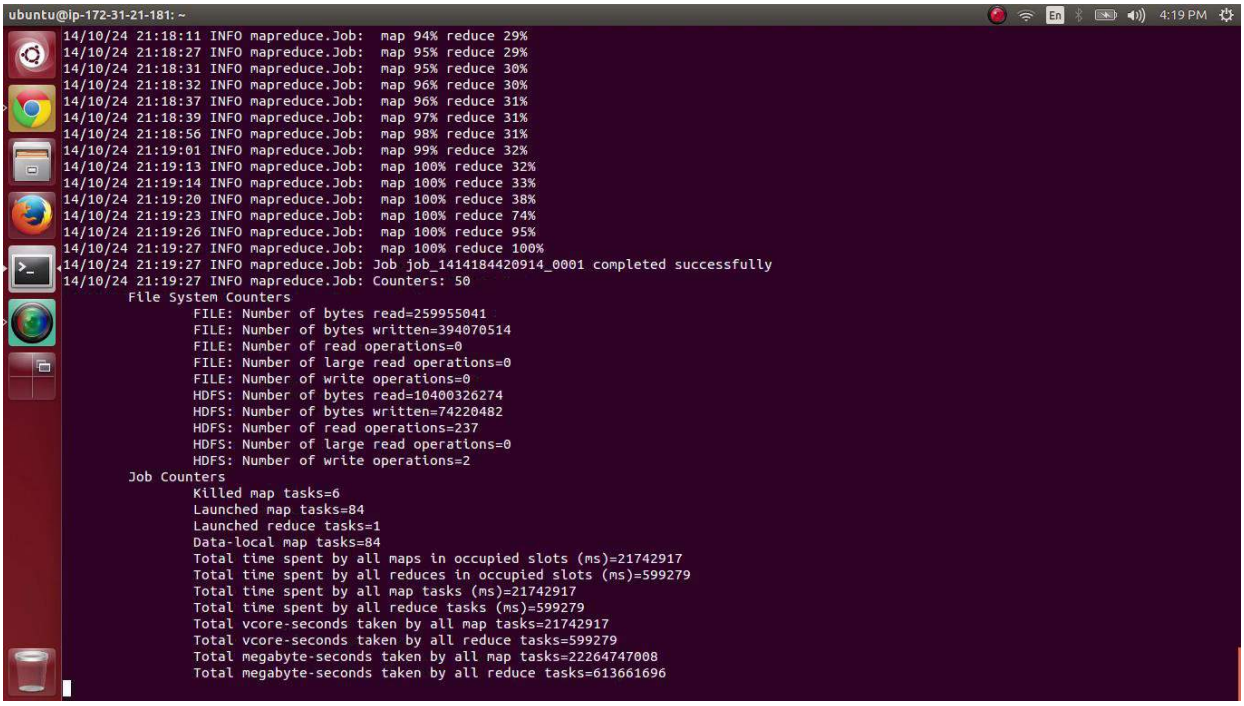
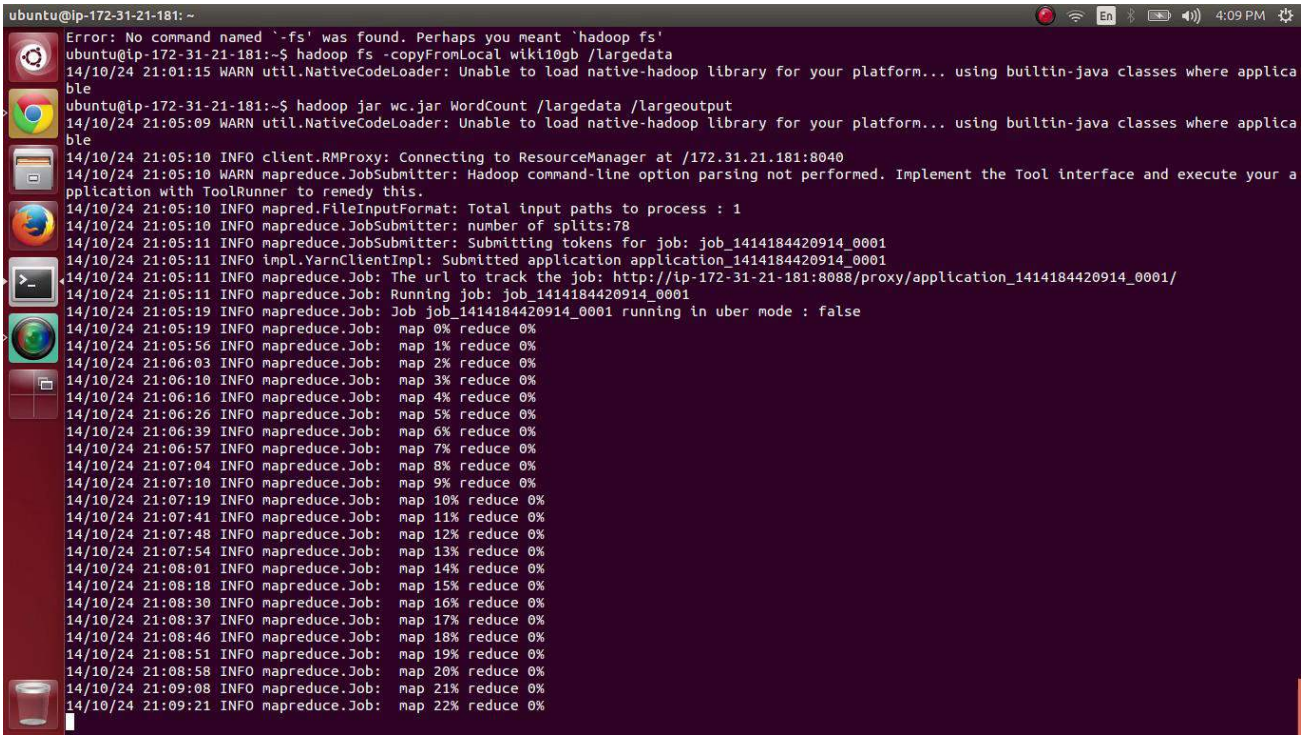
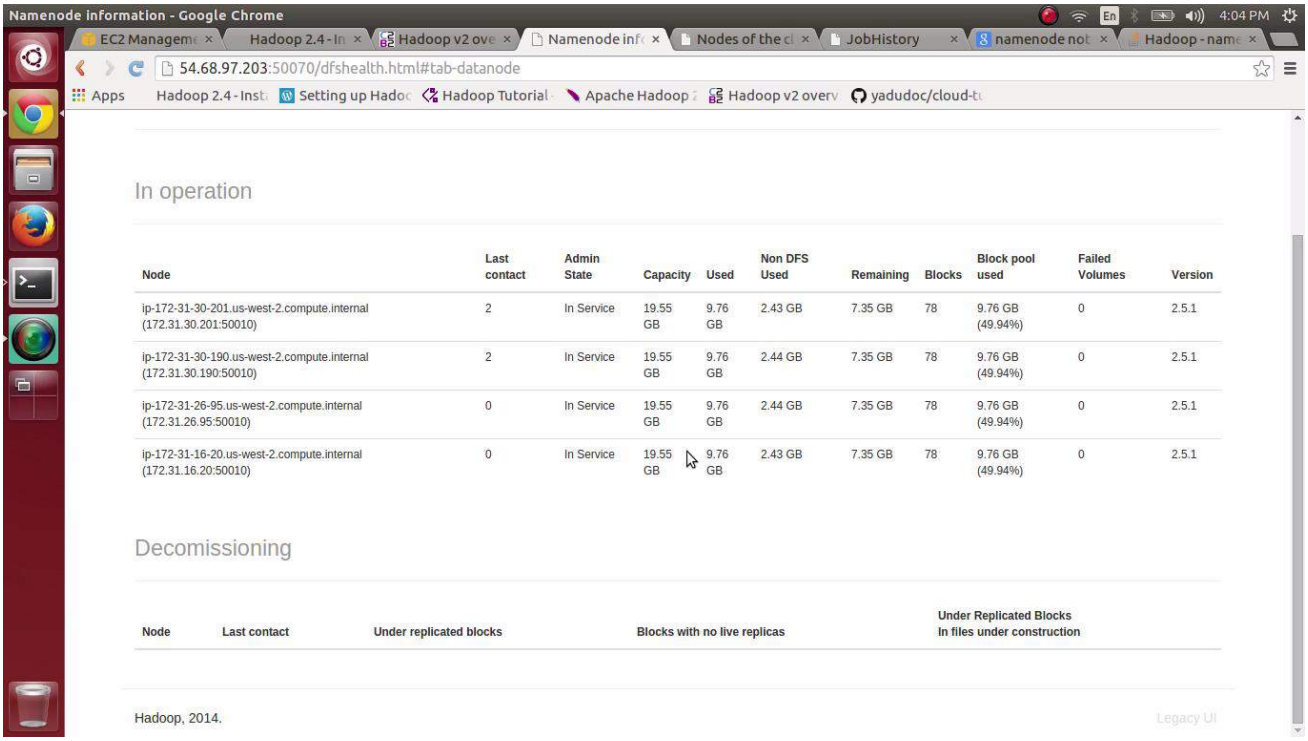
Privacy Policy
Terms of Use
Feedback
21:11
1:06:53
105%
5:15 PM

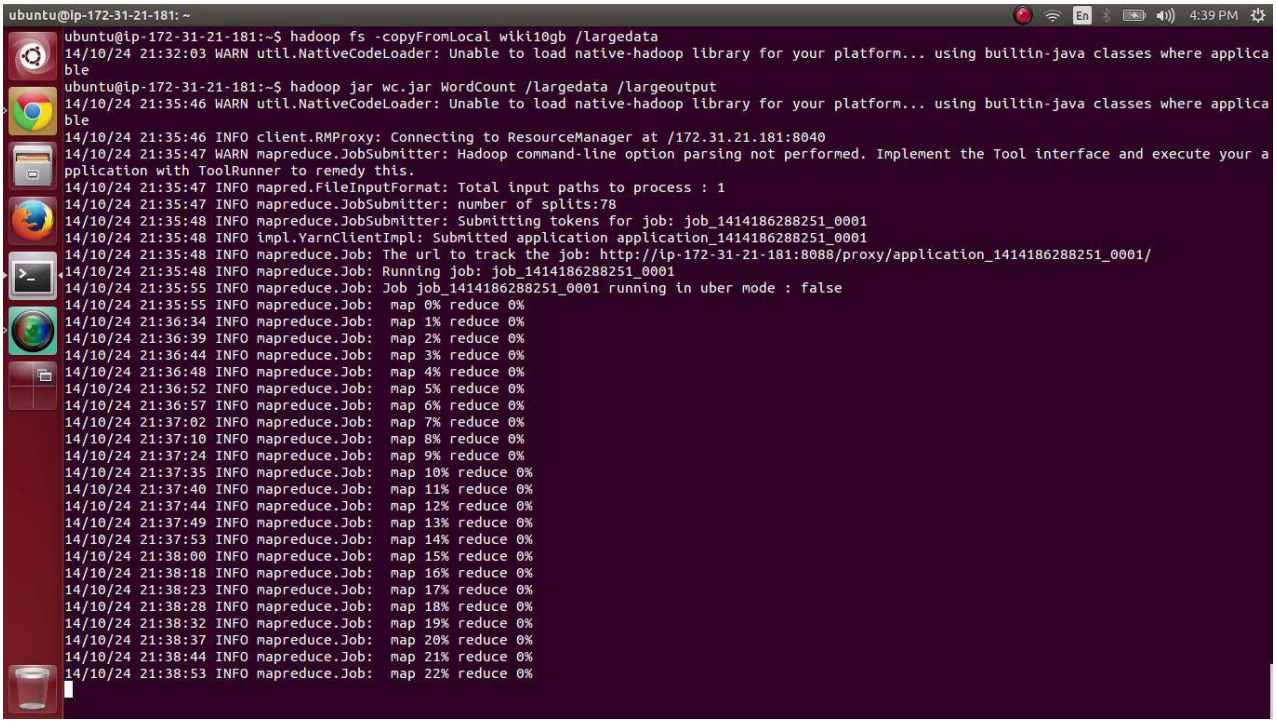
4 Nodes:

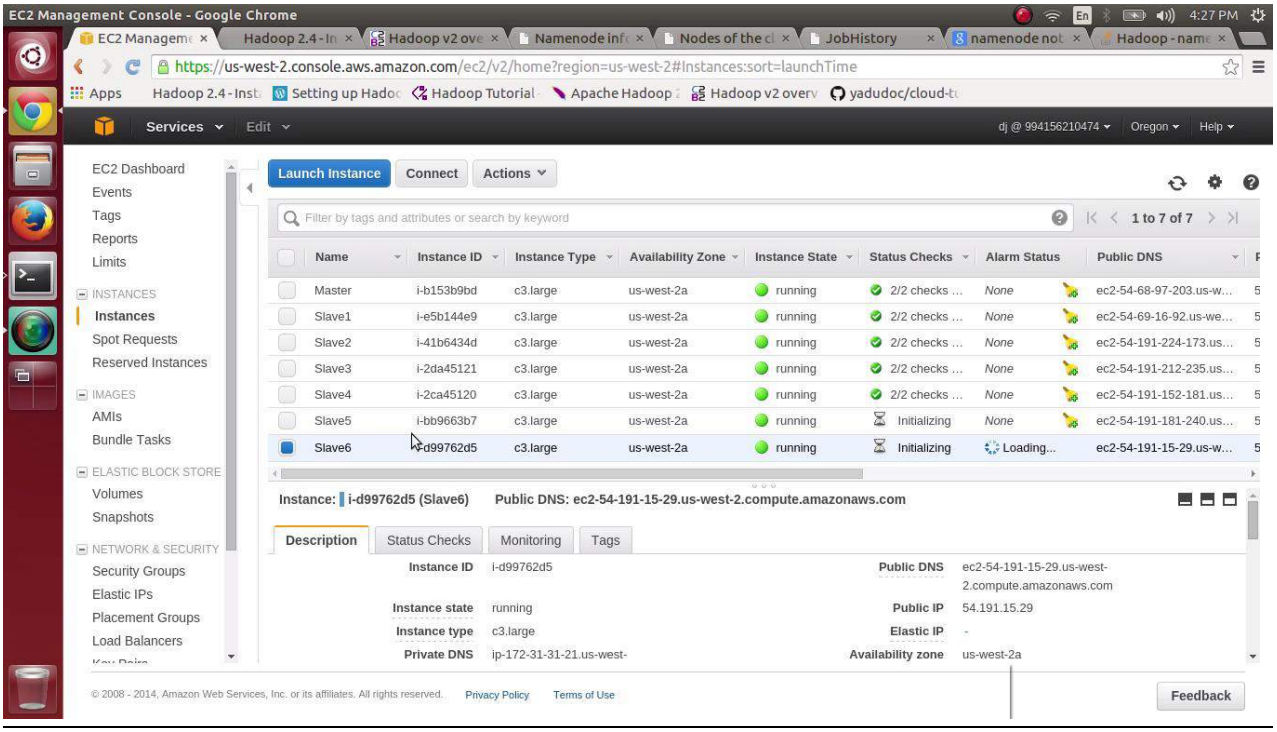

ubuntu@ip-172-31-21-181: ~
4:19 PM
14/10/24 21:18:11 INFO mapreduce.Job: map 94% reduce 29%
14/10/24 21:18:27 INFO mapreduce.Job: map 95% reduce 29%
14/10/24 21:18:31 INFO mapreduce.Job: map 95% reduce 30%
14/10/24 21:18:32 INFO mapreduce.Job: map 96% reduce 30%
14/10/24 21:18:37 INFO mapreduce.Job: map 96% reduce 31%
14/10/24 21:18:39 INFO mapreduce.Job: map 97% reduce 31%
14/10/24 21:18:56 INFO mapreduce.Job: map 98% reduce 31%
14/10/24 21:19:01 INFO mapreduce.Job: map 99% reduce 32%
14/10/24 21:19:13 INFO mapreduce.Job: map 100% reduce 32%
14/10/24 21:19:14 INFO mapreduce.Job: map 100% reduce 33%
14/10/24 21:19:20 INFO mapreduce.Job: map 100% reduce 38%
14/10/24 21:19:23 INFO mapreduce.Job: map 100% reduce 74%
14/10/24 21:19:26 INFO mapreduce.Job: map 100% reduce 95%
14/10/24 21:19:27 INFO mapreduce.Job: map 100% reduce 100%
14/10/24 21:19:27 INFO mapreduce.Job: Job job_1414184420914_0001 completed successfully
14/10/24 21:19:27 INFO mapreduce.Job: Counters: 50
File System Counters
FILE: Number of bytes read=259955041
FILE: Number of bytes written=394070514
FILE: Number of read operations=0
FILE: Number of large read operations=0
FILE: Number of write operations=0
HDFS: Number of bytes read=10400326274
HDFS: Number of bytes written=74220482
HDFS: Number of read operations=237
HDFS: Number of large read operations=0
HDFS: Number of write operations=2
Job Counters
Killed map tasks=6
Launched map tasks=84
Launched reduce tasks=1
Data-local map tasks=84
Total time spent by all maps in occupied slots (ms)=21742917
Total time spent by all reduces in occupied slots (ms)=599279
Total time spent by all map tasks (ms)=21742917
Total time spent by all reduce tasks (ms)=599279
Total vcore-seconds taken by all map tasks=21742917
Total vcore-seconds taken by all reduce tasks=599279
Total megabyte-seconds taken by all map tasks=22264747008
Total megabyte-seconds taken by all reduce tasks=613661696


ubuntu@ip-172-31-21-181: ~
4:09 PM
Error: No command named `-fs' was found. Perhaps you meant `hadoop fs'
ubuntu@ip-172-31-21-181:~$ hadoop fs -copyFromLocal wiki10gb /largedata
14/10/24 21:01:15 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
ubuntu@ip-172-31-21-181:~$ hadoop jar wc.jar WordCount /largedata /largeoutput
14/10/24 21:05:09 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
14/10/24 21:05:10 INFO client.RMProxy: Connecting to ResourceManager at /172.31.21.181:8040
14/10/24 21:05:10 WARN mapreduce.JobSubmitter: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
14/10/24 21:05:10 INFO mapred.FileInputFormat: Total input paths to process : 1
14/10/24 21:05:10 INFO mapreduce.JobSubmitter: number of splits:78
14/10/24 21:05:11 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1414184420914_0001
14/10/24 21:05:11 INFO impl.YarnClientImpl: Submitted application application_1414184420914_0001
14/10/24 21:05:11 INFO mapreduce.Job: The url to track the job: http://ip-172-31-21-181:8088/proxy/application_1414184420914_0001/
14/10/24 21:05:11 INFO mapreduce.Job: Running job: job_1414184420914_0001
14/10/24 21:05:19 INFO mapreduce.Job: Job job_1414184420914_0001 running in uber mode : false
14/10/24 21:05:19 INFO mapreduce.Job: map 0% reduce 0%
14/10/24 21:05:56 INFO mapreduce.Job: map 1% reduce 0%
14/10/24 21:06:03 INFO mapreduce.Job: map 2% reduce 0%
14/10/24 21:06:10 INFO mapreduce.Job: map 3% reduce 0%
14/10/24 21:06:16 INFO mapreduce.Job: map 4% reduce 0%
14/10/24 21:06:26 INFO mapreduce.Job: map 5% reduce 0%
14/10/24 21:06:39 INFO mapreduce.Job: map 6% reduce 0%
14/10/24 21:06:57 INFO mapreduce.Job: map 7% reduce 0%
14/10/24 21:07:04 INFO mapreduce.Job: map 8% reduce 0%
14/10/24 21:07:10 INFO mapreduce.Job: map 9% reduce 0%
14/10/24 21:07:19 INFO mapreduce.Job: map 10% reduce 0%
14/10/24 21:07:41 INFO mapreduce.Job: map 11% reduce 0%
14/10/24 21:07:48 INFO mapreduce.Job: map 12% reduce 0%
14/10/24 21:07:54 INFO mapreduce.Job: map 13% reduce 0%
14/10/24 21:08:01 INFO mapreduce.Job: map 14% reduce 0%
14/10/24 21:08:18 INFO mapreduce.Job: map 15% reduce 0%
14/10/24 21:08:30 INFO mapreduce.Job: map 16% reduce 0%
14/10/24 21:08:37 INFO mapreduce.Job: map 17% reduce 0%
14/10/24 21:08:46 INFO mapreduce.Job: map 18% reduce 0%
14/10/24 21:08:51 INFO mapreduce.Job: map 19% reduce 0%
14/10/24 21:08:58 INFO mapreduce.Job: map 20% reduce 0%
14/10/24 21:09:08 INFO mapreduce.Job: map 21% reduce 0%
14/10/24 21:09:21 INFO mapreduce.Job: map 22% reduce 0%


Namenode information - Google Chrome
4:04 PM
54.68.97.203:50070/dfshealth.html#tab-datanode
Apps
In operation
Node
Last contact
Admin State
Capacity
Used
Non DFS Used
Remaining
Blocks
Block pool used
Failed Volumes
Version
ip-172-31-30-201.us-west-2.compute.internal (172.31.30.201:50010)
2
In Service
19.55 GB
9.76 GB
2.43 GB
7.35 GB
78
9.76 GB (49.94%)
0
2.5.1
ip-172-31-30-190.us-west-2.compute.internal (172.31.30.190:50010)
2
In Service
19.55 GB
9.76 GB
2.44 GB
7.35 GB
78
9.76 GB (49.94%)
0
2.5.1
ip-172-31-26-95.us-west-2.compute.internal (172.31.26.95:50010)
0
In Service
19.55 GB
9.76 GB
2.44 GB
7.35 GB
78
9.76 GB (49.94%)
0
2.5.1
ip-172-31-16-20.us-west-2.compute.internal (172.31.16.20:50010)
0
In Service
19.55 GB
9.76 GB
2.43 GB
7.35 GB
78
9.76 GB (49.94%)
0
2.5.1
Decomissioning
Node
Last contact
Under replicated blocks
Blocks with no live replicas
Under Replicated Blocks In files under construction
Hadoop, 2014.
Legacy UI

6 nodes:


ubuntu@ip-172-31-21-181: ~
4:39 PM
ubuntu@ip-172-31-21-181:~$ hadoop fs -copyFromLocal wiki10gb /largedata
14/10/24 21:32:03 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
ubuntu@ip-172-31-21-181:~$ hadoop jar wc.jar WordCount /largedata /largeoutput
14/10/24 21:35:46 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
14/10/24 21:35:46 INFO client.RMProxy: Connecting to ResourceManager at /172.31.21.181:8040
14/10/24 21:35:47 WARN mapreduce.JobSubmitter: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
14/10/24 21:35:47 INFO mapred.FileInputFormat: Total input paths to process : 1
14/10/24 21:35:47 INFO mapreduce.JobSubmitter: number of splits:78
14/10/24 21:35:48 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1414186288251_0001
14/10/24 21:35:48 INFO impl.YarnClientImpl: Submitted application application_1414186288251_0001
14/10/24 21:35:48 INFO mapreduce.Job: The url to track the job: http://ip-172-31-21-181:8088/proxy/application_1414186288251_0001/
14/10/24 21:35:48 INFO mapreduce.Job: Running job: job_1414186288251_0001
14/10/24 21:35:55 INFO mapreduce.Job: Job job_1414186288251_0001 running in uber mode : false
14/10/24 21:35:55 INFO mapreduce.Job: map 0% reduce 0%
14/10/24 21:36:34 INFO mapreduce.Job: map 1% reduce 0%
14/10/24 21:36:39 INFO mapreduce.Job: map 2% reduce 0%
14/10/24 21:36:44 INFO mapreduce.Job: map 3% reduce 0%
14/10/24 21:36:48 INFO mapreduce.Job: map 4% reduce 0%
14/10/24 21:36:52 INFO mapreduce.Job: map 5% reduce 0%
14/10/24 21:36:57 INFO mapreduce.Job: map 6% reduce 0%
14/10/24 21:37:02 INFO mapreduce.Job: map 7% reduce 0%
14/10/24 21:37:10 INFO mapreduce.Job: map 8% reduce 0%
14/10/24 21:37:24 INFO mapreduce.Job: map 9% reduce 0%
14/10/24 21:37:35 INFO mapreduce.Job: map 10% reduce 0%
14/10/24 21:37:40 INFO mapreduce.Job: map 11% reduce 0%
14/10/24 21:37:44 INFO mapreduce.Job: map 12% reduce 0%
14/10/24 21:37:49 INFO mapreduce.Job: map 13% reduce 0%
14/10/24 21:37:53 INFO mapreduce.Job: map 14% reduce 0%
14/10/24 21:38:00 INFO mapreduce.Job: map 15% reduce 0%
14/10/24 21:38:18 INFO mapreduce.Job: map 16% reduce 0%
14/10/24 21:38:23 INFO mapreduce.Job: map 17% reduce 0%
14/10/24 21:38:28 INFO mapreduce.Job: map 18% reduce 0%
14/10/24 21:38:32 INFO mapreduce.Job: map 19% reduce 0%
14/10/24 21:38:37 INFO mapreduce.Job: map 20% reduce 0%
14/10/24 21:38:44 INFO mapreduce.Job: map 21% reduce 0%
14/10/24 21:38:53 INFO mapreduce.Job: map 22% reduce 0%


EC2 Management Console - Google Chrome
4:27 PM
https://us-west-2.console.aws.amazon.com/ec2/v2/home?region=us-west-2#Instances:sort=launchTime
Services
Edit
Launch Instance
Connect
Actions
1 to 7 of 7
Name
Instance ID
Instance Type
Availability Zone
Instance State
Status Checks
Alarm Status
Public DNS
Master i-b153b9bd c3.large us-west-2a running 2/2 checks ... None ec2-54-68-97-203.us-w...
Slave1 i-e5b144e9 c3.large us-west-2a running 2/2 checks ... None ec2-54-69-16-92.us-we...
Slave2 i-41b6434d c3.large us-west-2a running 2/2 checks ... None ec2-54-191-224-173.us...
Slave3 i-2da45121 c3.large us-west-2a running 2/2 checks ... None ec2-54-191-212-235.us...
Slave4 i-2ca45120 c3.large us-west-2a running 2/2 checks ... None ec2-54-191-152-181.us...
Slave5 i-bb9663b7 c3.large us-west-2a running Initializing None ec2-54-191-181-240.us...
Slave6 i-d99762d5 c3.large us-west-2a running Initializing Loading... ec2-54-191-15-29.us-w...
Instance: i-d99762d5 (Slave6) Public DNS: ec2-54-191-15-29.us-west-2.compute.amazonaws.com
Description
Status Checks
Monitoring
Tags
Instance ID i-d99762d5
Instance state running
Instance type c3.large
Private DNS ip-172-31-31-21.us-west-
Public DNS ec2-54-191-15-29.us-west-2.compute.amazonaws.com
Public IP 54.191.15.29
Elastic IP -
Availability zone us-west-2a
EC2 Dashboard
Events
Tags
Reports
Limits
INSTANCES
Instances
Spot Requests
Reserved Instances
IMAGES
AMIs
Bundle Tasks
ELASTIC BLOCK STORE
Volumes
Snapshots
NETWORK & SECURITY
Security Groups
Elastic IPs
Placement Groups
Load Balancers
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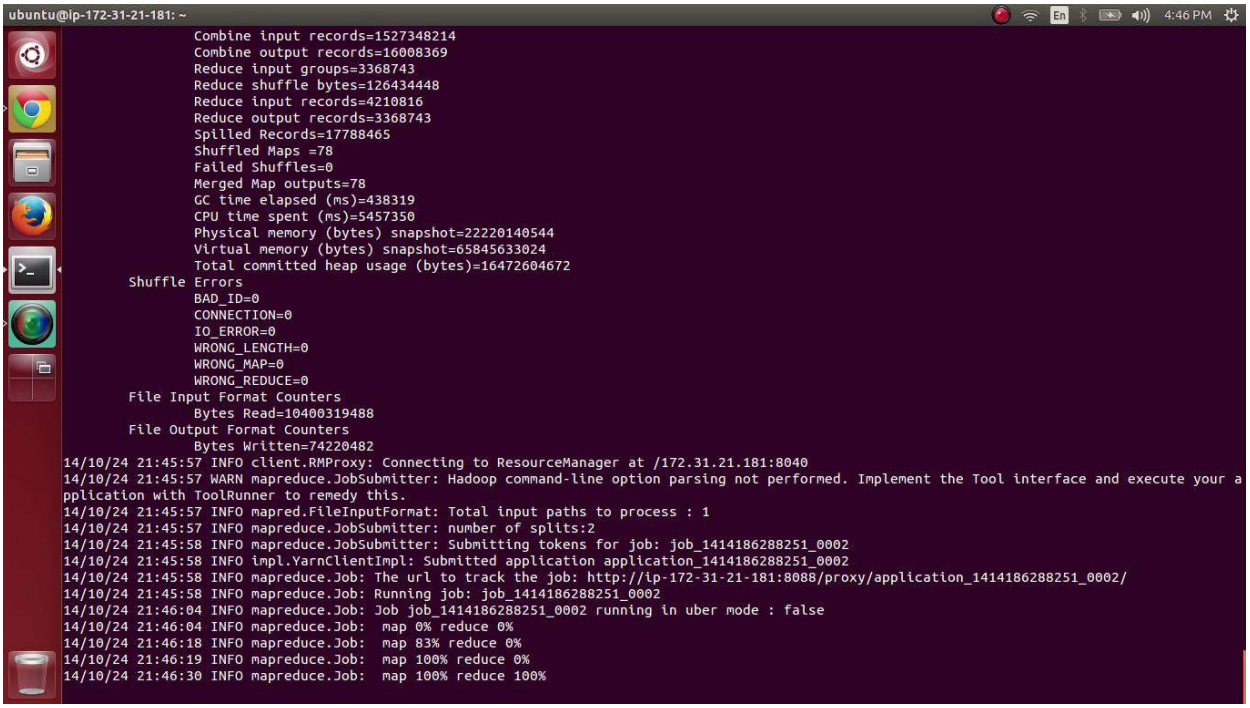
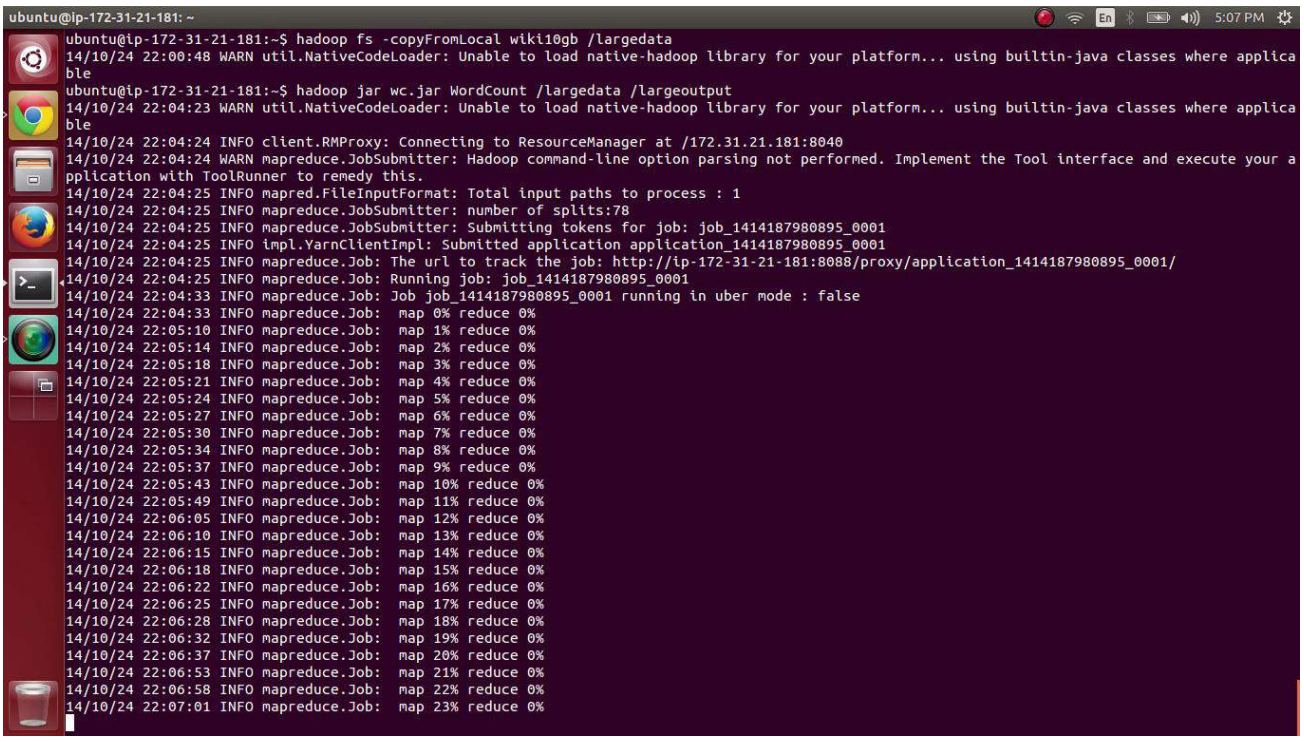
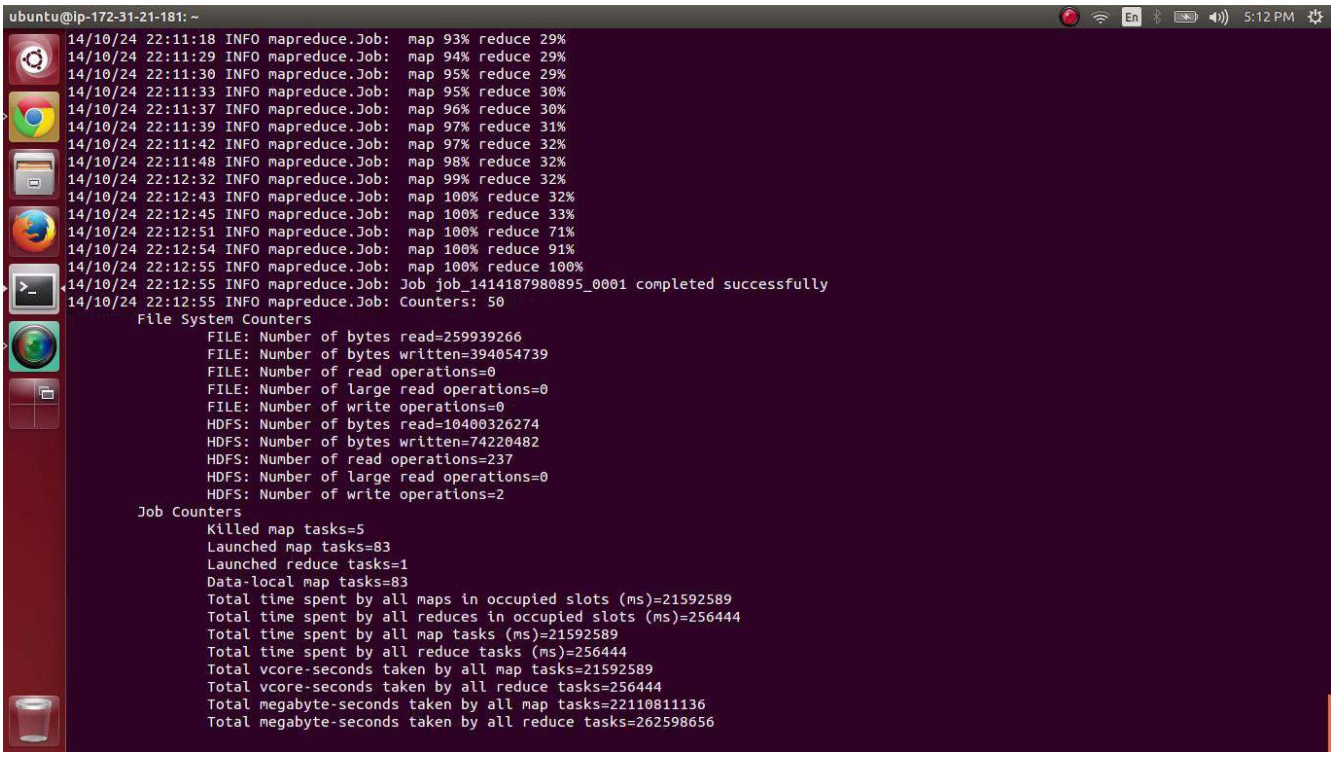
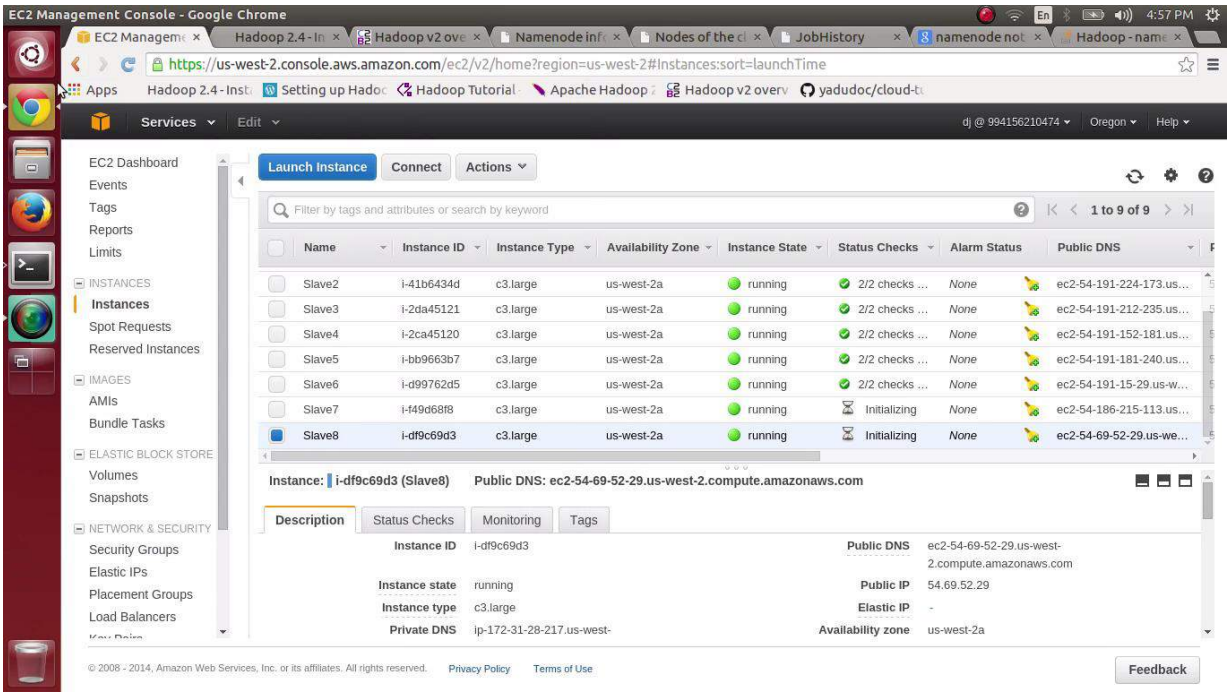
Privacy Policy
Terms of Use
Feedback


ubuntu@ip-172-31-21-181: ~
4:46 PM
Combine input records=1527348214
Combine output records=16008369
Reduce input groups=3368743
Reduce shuffle bytes=126434448
Reduce input records=4210816
Reduce output records=3368743
Spilled Records=17788465
Shuffled Maps =78
Failed Shuffles=0
Merged Map outputs=78
GC time elapsed (ms)=438319
CPU time spent (ms)=5457350
Physical memory (bytes) snapshot=22220140544
Virtual memory (bytes) snapshot=65845633024
Total committed heap usage (bytes)=16472604672
Shuffle Errors
BAD_ID=0
CONNECTION=0
IO_ERROR=0
WRONG_LENGTH=0
WRONG_MAP=0
WRONG_REDUCE=0
File Input Format Counters
Bytes Read=10400319488
File Output Format Counters
Bytes Written=74220482
14/10/24 21:45:57 INFO client.RMProxy: Connecting to ResourceManager at /172.31.21.181:8040
14/10/24 21:45:57 WARN mapreduce.JobSubmitter: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
14/10/24 21:45:57 INFO mapred.FileInputFormat: Total input paths to process : 1
14/10/24 21:45:57 INFO mapreduce.JobSubmitter: number of splits:2
14/10/24 21:45:58 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1414186288251_0002
14/10/24 21:45:58 INFO impl.YarnClientImpl: Submitted application application_1414186288251_0002
14/10/24 21:45:58 INFO mapreduce.Job: The url to track the job: http://ip-172-31-21-181:8088/proxy/application_1414186288251_0002/
14/10/24 21:45:58 INFO mapreduce.Job: Running job: job_1414186288251_0002
14/10/24 21:46:04 INFO mapreduce.Job: Job job_1414186288251_0002 running in uber mode : false
14/10/24 21:46:04 INFO mapreduce.Job: map 0% reduce 0%
14/10/24 21:46:18 INFO mapreduce.Job: map 83% reduce 0%
14/10/24 21:46:19 INFO mapreduce.Job: map 100% reduce 0%
14/10/24 21:46:30 INFO mapreduce.Job: map 100% reduce 100%

8 Nodes:


ubuntu@ip-172-31-21-181: ~
5:07 PM
ubuntu@ip-172-31-21-181:~$ hadoop fs -copyFromLocal wiki10gb /largedata
14/10/24 22:00:48 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
ubuntu@ip-172-31-21-181:~$ hadoop jar wc.jar WordCount /largedata /largeoutput
14/10/24 22:04:23 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
14/10/24 22:04:24 INFO client.RMProxy: Connecting to ResourceManager at /172.31.21.181:8040
14/10/24 22:04:24 WARN mapreduce.JobSubmitter: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
14/10/24 22:04:25 INFO mapred.FileInputFormat: Total input paths to process : 1
14/10/24 22:04:25 INFO mapreduce.JobSubmitter: number of splits:78
14/10/24 22:04:25 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1414187980895_0001
14/10/24 22:04:25 INFO impl.YarnClientImpl: Submitted application application_1414187980895_0001
14/10/24 22:04:25 INFO mapreduce.Job: The url to track the job: http://ip-172-31-21-181:8088/proxy/application_1414187980895_0001/
14/10/24 22:04:25 INFO mapreduce.Job: Running job: job_1414187980895_0001
14/10/24 22:04:33 INFO mapreduce.Job: Job job_1414187980895_0001 running in uber mode : false
14/10/24 22:04:33 INFO mapreduce.Job: map 0% reduce 0%
14/10/24 22:05:10 INFO mapreduce.Job: map 1% reduce 0%
14/10/24 22:05:14 INFO mapreduce.Job: map 2% reduce 0%
14/10/24 22:05:18 INFO mapreduce.Job: map 3% reduce 0%
14/10/24 22:05:21 INFO mapreduce.Job: map 4% reduce 0%
14/10/24 22:05:24 INFO mapreduce.Job: map 5% reduce 0%
14/10/24 22:05:27 INFO mapreduce.Job: map 6% reduce 0%
14/10/24 22:05:30 INFO mapreduce.Job: map 7% reduce 0%
14/10/24 22:05:34 INFO mapreduce.Job: map 8% reduce 0%
14/10/24 22:05:37 INFO mapreduce.Job: map 9% reduce 0%
14/10/24 22:05:43 INFO mapreduce.Job: map 10% reduce 0%
14/10/24 22:05:49 INFO mapreduce.Job: map 11% reduce 0%
14/10/24 22:06:05 INFO mapreduce.Job: map 12% reduce 0%
14/10/24 22:06:10 INFO mapreduce.Job: map 13% reduce 0%
14/10/24 22:06:15 INFO mapreduce.Job: map 14% reduce 0%
14/10/24 22:06:18 INFO mapreduce.Job: map 15% reduce 0%
14/10/24 22:06:22 INFO mapreduce.Job: map 16% reduce 0%
14/10/24 22:06:25 INFO mapreduce.Job: map 17% reduce 0%
14/10/24 22:06:28 INFO mapreduce.Job: map 18% reduce 0%
14/10/24 22:06:32 INFO mapreduce.Job: map 19% reduce 0%
14/10/24 22:06:37 INFO mapreduce.Job: map 20% reduce 0%
14/10/24 22:06:53 INFO mapreduce.Job: map 21% reduce 0%
14/10/24 22:06:58 INFO mapreduce.Job: map 22% reduce 0%
14/10/24 22:07:01 INFO mapreduce.Job: map 23% reduce 0%


ubuntu@ip-172-31-21-181: ~
5:12 PM
14/10/24 22:11:18 INFO mapreduce.Job: map 93% reduce 29%
14/10/24 22:11:29 INFO mapreduce.Job: map 94% reduce 29%
14/10/24 22:11:30 INFO mapreduce.Job: map 95% reduce 29%
14/10/24 22:11:33 INFO mapreduce.Job: map 95% reduce 30%
14/10/24 22:11:37 INFO mapreduce.Job: map 96% reduce 30%
14/10/24 22:11:39 INFO mapreduce.Job: map 97% reduce 31%
14/10/24 22:11:42 INFO mapreduce.Job: map 97% reduce 32%
14/10/24 22:11:48 INFO mapreduce.Job: map 98% reduce 32%
14/10/24 22:12:32 INFO mapreduce.Job: map 99% reduce 32%
14/10/24 22:12:43 INFO mapreduce.Job: map 100% reduce 32%
14/10/24 22:12:45 INFO mapreduce.Job: map 100% reduce 33%
14/10/24 22:12:51 INFO mapreduce.Job: map 100% reduce 71%
14/10/24 22:12:54 INFO mapreduce.Job: map 100% reduce 91%
14/10/24 22:12:55 INFO mapreduce.Job: map 100% reduce 100%
14/10/24 22:12:55 INFO mapreduce.Job: Job job_1414187980895_0001 completed successfully
14/10/24 22:12:55 INFO mapreduce.Job: Counters: 50
File System Counters
FILE: Number of bytes read=259939266
FILE: Number of bytes written=394054739
FILE: Number of read operations=0
FILE: Number of large read operations=0
FILE: Number of write operations=0
HDFS: Number of bytes read=10400326274
HDFS: Number of bytes written=74220482
HDFS: Number of read operations=237
HDFS: Number of large read operations=0
HDFS: Number of write operations=2
Job Counters
Killed map tasks=5
Launched map tasks=83
Launched reduce tasks=1
Data-local map tasks=83
Total time spent by all maps in occupied slots (ms)=21592589
Total time spent by all reduces in occupied slots (ms)=256444
Total time spent by all map tasks (ms)=21592589
Total time spent by all reduce tasks (ms)=256444
Total vcore-seconds taken by all map tasks=21592589
Total vcore-seconds taken by all reduce tasks=256444
Total megabyte-seconds taken by all map tasks=22110811136
Total megabyte-seconds taken by all reduce tasks=262598656


EC2 Management Console - Google Chrome
4:57 PM
https://us-west-2.console.aws.amazon.com/ec2/v2/home?region=us-west-2#Instances:sort=launchTime
Services
Edit
dj @ 994156210474
Oregon
Help
EC2 Dashboard
Events
Tags
Reports
Limits
INSTANCES
Instances
Spot Requests
Reserved Instances
IMAGES
AMIs
Bundle Tasks
ELASTIC BLOCK STORE
Volumes
Snapshots
NETWORK & SECURITY
Security Groups
Elastic IPs
Placement Groups
Load Balancers
Launch Instance
Connect
Actions
1 to 9 of 9
Name
Instance ID
Instance Type
Availability Zone
Instance State
Status Checks
Alarm Status
Public DNS
Slave2 i-41b6434d c3.large us-west-2a running 2/2 checks ... None ec2-54-191-224-173.us...
Slave3 i-2da45121 c3.large us-west-2a running 2/2 checks ... None ec2-54-191-212-235.us...
Slave4 i-2ca45120 c3.large us-west-2a running 2/2 checks ... None ec2-54-191-152-181.us...
Slave5 i-bb9663b7 c3.large us-west-2a running 2/2 checks ... None ec2-54-191-181-240.us...
Slave6 i-d99762d5 c3.large us-west-2a running 2/2 checks ... None ec2-54-191-15-29.us-w...
Slave7 i-f49d68f8 c3.large us-west-2a running Initializing None ec2-54-186-215-113.us...
Slave8 i-df9c69d3 c3.large us-west-2a running Initializing None ec2-54-69-52-29.us-we...
Instance: i-df9c69d3 (Slave8) Public DNS: ec2-54-69-52-29.us-west-2.compute.amazonaws.com
Description
Status Checks
Monitoring
Tags
Instance ID i-df9c69d3
Instance state running
Instance type c3.large
Private DNS ip-172-31-28-217.us-west-
Public DNS ec2-54-69-52-29.us-west-2.compute.amazonaws.com
Public IP 54.69.52.29
Elastic IP -
Availability zone us-west-2a
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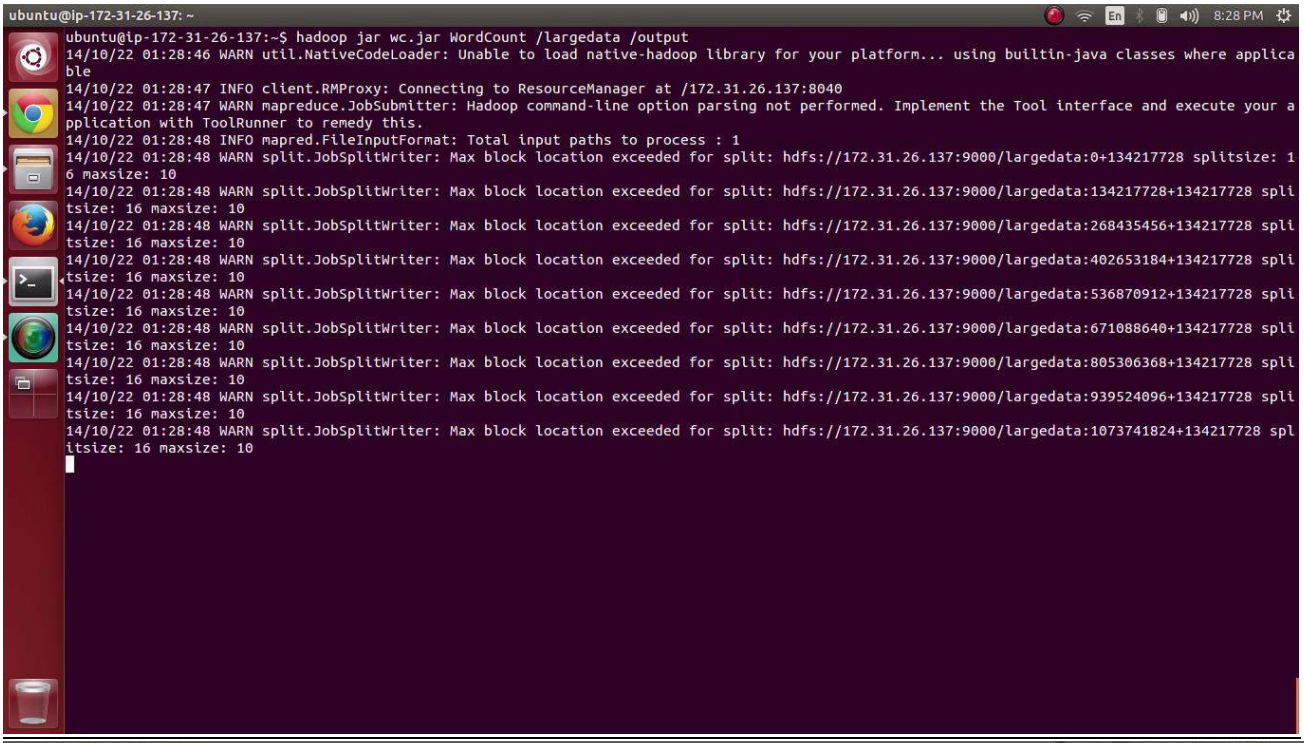
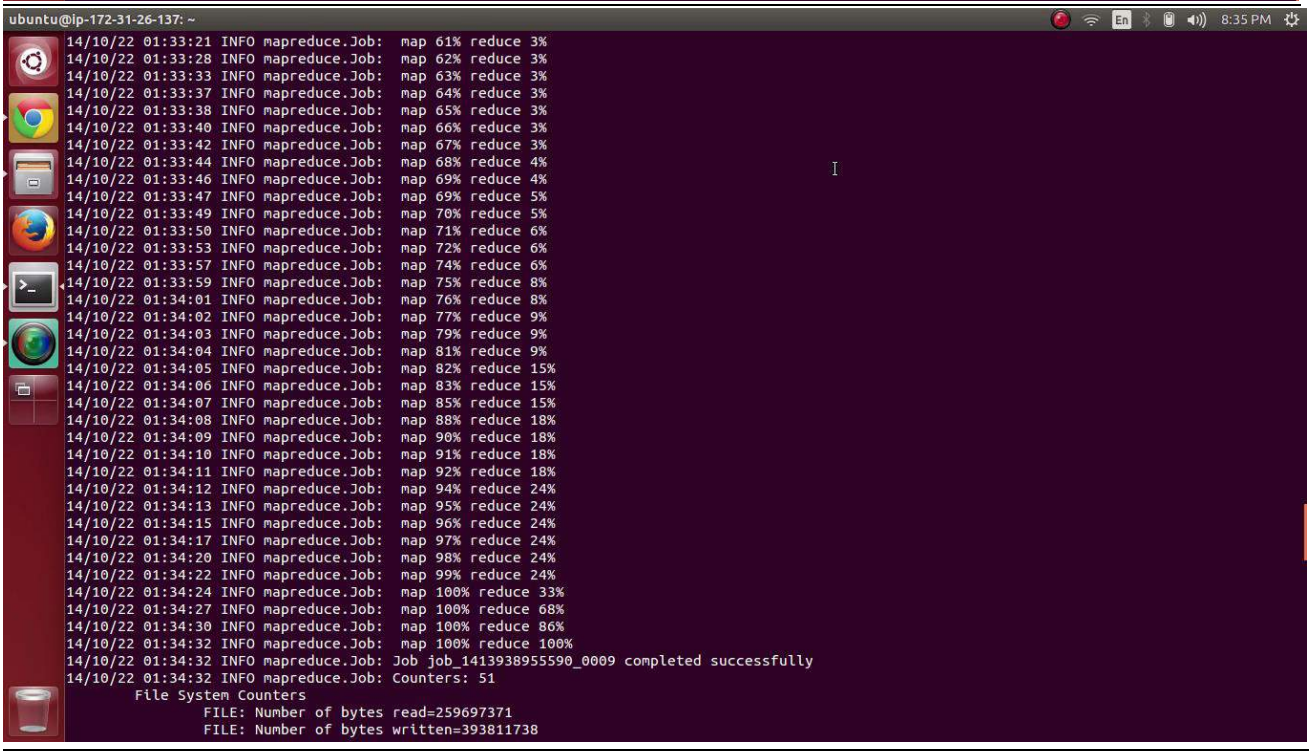
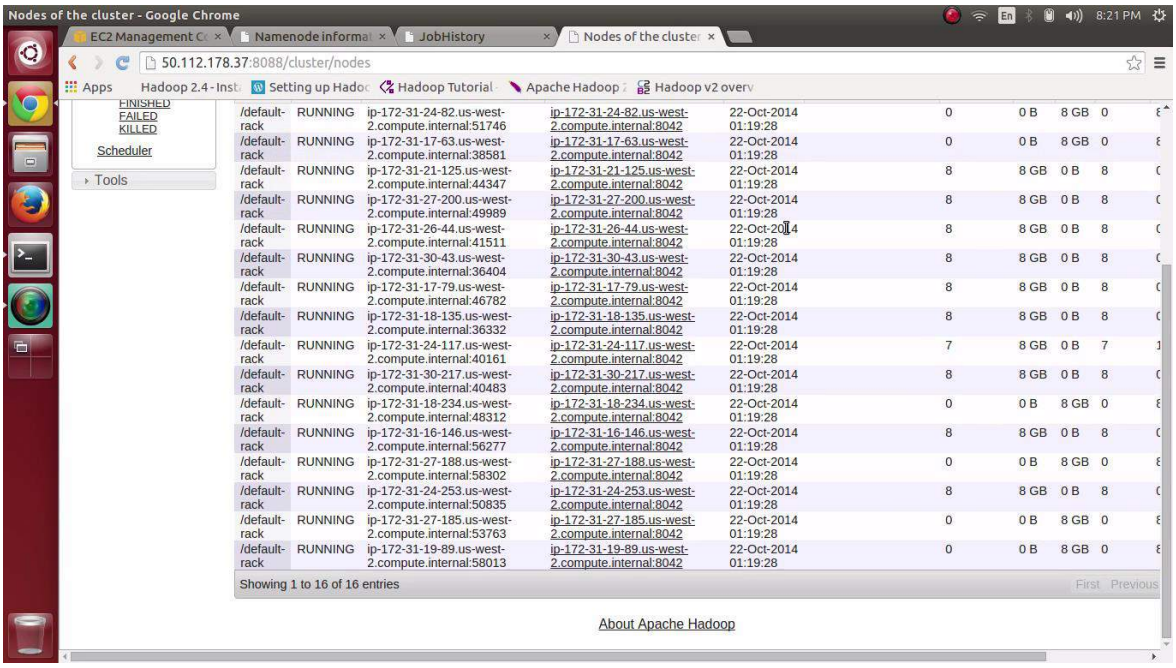
Terms of Use
Feedback

16 nodes:


ubuntu@ip-172-31-26-137: ~
8:28 PM
ubuntu@ip-172-31-26-137:~$ hadoop jar wc.jar WordCount /largedata /output
14/10/22 01:28:46 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
14/10/22 01:28:47 INFO client.RMProxy: Connecting to ResourceManager at /172.31.26.137:8040
14/10/22 01:28:47 WARN mapreduce.JobSubmitter: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
14/10/22 01:28:48 INFO mapred.FileInputFormat: Total input paths to process : 1
14/10/22 01:28:48 WARN split.JobSplitWriter: Max block location exceeded for split: hdfs://172.31.26.137:9000/largedata:0+134217728 splitsize: 16 maxsize: 10
14/10/22 01:28:48 WARN split.JobSplitWriter: Max block location exceeded for split: hdfs://172.31.26.137:9000/largedata:134217728+134217728 splitsize: 16 maxsize: 10
14/10/22 01:28:48 WARN split.JobSplitWriter: Max block location exceeded for split: hdfs://172.31.26.137:9000/largedata:268435456+134217728 splitsize: 16 maxsize: 10
14/10/22 01:28:48 WARN split.JobSplitWriter: Max block location exceeded for split: hdfs://172.31.26.137:9000/largedata:402653184+134217728 splitsize: 16 maxsize: 10
14/10/22 01:28:48 WARN split.JobSplitWriter: Max block location exceeded for split: hdfs://172.31.26.137:9000/largedata:536870912+134217728 splitsize: 16 maxsize: 10
14/10/22 01:28:48 WARN split.JobSplitWriter: Max block location exceeded for split: hdfs://172.31.26.137:9000/largedata:671088640+134217728 splitsize: 16 maxsize: 10
14/10/22 01:28:48 WARN split.JobSplitWriter: Max block location exceeded for split: hdfs://172.31.26.137:9000/largedata:805306368+134217728 splitsize: 16 maxsize: 10
14/10/22 01:28:48 WARN split.JobSplitWriter: Max block location exceeded for split: hdfs://172.31.26.137:9000/largedata:939524096+134217728 splitsize: 16 maxsize: 10
14/10/22 01:28:48 WARN split.JobSplitWriter: Max block location exceeded for split: hdfs://172.31.26.137:9000/largedata:1073741824+134217728 splitsize: 16 maxsize: 10

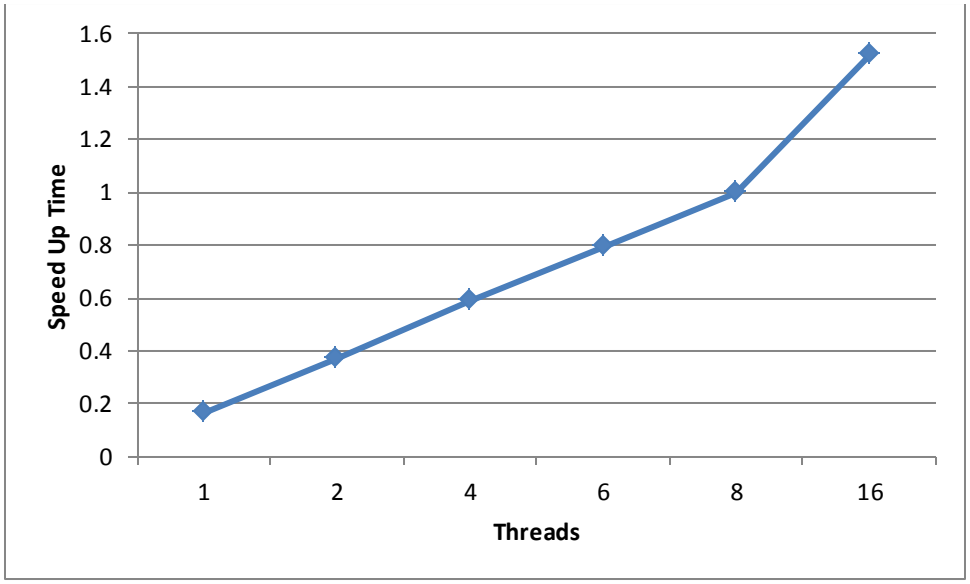

ubuntu@ip-172-31-26-137: ~
8:35 PM
14/10/22 01:33:21 INFO mapreduce.Job: map 61% reduce 3%
14/10/22 01:33:28 INFO mapreduce.Job: map 62% reduce 3%
14/10/22 01:33:33 INFO mapreduce.Job: map 63% reduce 3%
14/10/22 01:33:37 INFO mapreduce.Job: map 64% reduce 3%
14/10/22 01:33:38 INFO mapreduce.Job: map 65% reduce 3%
14/10/22 01:33:40 INFO mapreduce.Job: map 66% reduce 3%
14/10/22 01:33:42 INFO mapreduce.Job: map 67% reduce 3%
14/10/22 01:33:44 INFO mapreduce.Job: map 68% reduce 4%
14/10/22 01:33:46 INFO mapreduce.Job: map 69% reduce 4%
14/10/22 01:33:47 INFO mapreduce.Job: map 69% reduce 5%
14/10/22 01:33:49 INFO mapreduce.Job: map 70% reduce 5%
14/10/22 01:33:50 INFO mapreduce.Job: map 71% reduce 6%
14/10/22 01:33:53 INFO mapreduce.Job: map 72% reduce 6%
14/10/22 01:33:57 INFO mapreduce.Job: map 74% reduce 6%
14/10/22 01:33:59 INFO mapreduce.Job: map 75% reduce 8%
14/10/22 01:34:01 INFO mapreduce.Job: map 76% reduce 8%
14/10/22 01:34:02 INFO mapreduce.Job: map 77% reduce 9%
14/10/22 01:34:03 INFO mapreduce.Job: map 79% reduce 9%
14/10/22 01:34:04 INFO mapreduce.Job: map 81% reduce 9%
14/10/22 01:34:05 INFO mapreduce.Job: map 82% reduce 15%
14/10/22 01:34:06 INFO mapreduce.Job: map 83% reduce 15%
14/10/22 01:34:07 INFO mapreduce.Job: map 85% reduce 15%
14/10/22 01:34:08 INFO mapreduce.Job: map 88% reduce 18%
14/10/22 01:34:09 INFO mapreduce.Job: map 90% reduce 18%
14/10/22 01:34:10 INFO mapreduce.Job: map 91% reduce 18%
14/10/22 01:34:11 INFO mapreduce.Job: map 92% reduce 18%
14/10/22 01:34:12 INFO mapreduce.Job: map 94% reduce 24%
14/10/22 01:34:13 INFO mapreduce.Job: map 95% reduce 24%
14/10/22 01:34:15 INFO mapreduce.Job: map 96% reduce 24%
14/10/22 01:34:17 INFO mapreduce.Job: map 97% reduce 24%
14/10/22 01:34:20 INFO mapreduce.Job: map 98% reduce 24%
14/10/22 01:34:22 INFO mapreduce.Job: map 99% reduce 24%
14/10/22 01:34:24 INFO mapreduce.Job: map 100% reduce 33%
14/10/22 01:34:27 INFO mapreduce.Job: map 100% reduce 68%
14/10/22 01:34:30 INFO mapreduce.Job: map 100% reduce 86%
14/10/22 01:34:32 INFO mapreduce.Job: map 100% reduce 100%
14/10/22 01:34:32 INFO mapreduce.Job: Job job_1413938955590_0009 completed successfully
14/10/22 01:34:32 INFO mapreduce.Job: Counters: 51
File System Counters
FILE: Number of bytes read=259697371
FILE: Number of bytes written=393811738


Nodes of the cluster - Google Chrome
8:21 PM
EC2 Management C
Namenode informa
JobHistory
Nodes of the cluste
50.112.178.37:8088/cluster/nodes
Apps
Hadoop 2.4 - Inst
Setting up Hadoo
Hadoop Tutorial
Apache Hadoop
Hadoop v2 overv
FINISHED
FAILED
KILLED
Scheduler
Tools
/default-rack RUNNING ip-172-31-24-82.us-west-2.compute.internal:51746 ip-172-31-24-82.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 0 0 B 8 GB 0
/default-rack RUNNING ip-172-31-17-63.us-west-2.compute.internal:38581 ip-172-31-17-63.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 0 0 B 8 GB 0
/default-rack RUNNING ip-172-31-21-125.us-west-2.compute.internal:44347 ip-172-31-21-125.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 8 8 GB 0 B 8
/default-rack RUNNING ip-172-31-27-200.us-west-2.compute.internal:49989 ip-172-31-27-200.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 8 8 GB 0 B 8
/default-rack RUNNING ip-172-31-26-44.us-west-2.compute.internal:41511 ip-172-31-26-44.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 8 8 GB 0 B 8
/default-rack RUNNING ip-172-31-30-43.us-west-2.compute.internal:36404 ip-172-31-30-43.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 8 8 GB 0 B 8
/default-rack RUNNING ip-172-31-17-79.us-west-2.compute.internal:46782 ip-172-31-17-79.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 8 8 GB 0 B 8
/default-rack RUNNING ip-172-31-18-135.us-west-2.compute.internal:36332 ip-172-31-18-135.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 8 8 GB 0 B 8
/default-rack RUNNING ip-172-31-24-117.us-west-2.compute.internal:40161 ip-172-31-24-117.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 7 8 GB 0 B 7
/default-rack RUNNING ip-172-31-30-217.us-west-2.compute.internal:40483 ip-172-31-30-217.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 8 8 GB 0 B 8
/default-rack RUNNING ip-172-31-18-234.us-west-2.compute.internal:48312 ip-172-31-18-234.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 0 0 B 8 GB 0
/default-rack RUNNING ip-172-31-16-146.us-west-2.compute.internal:56277 ip-172-31-16-146.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 8 8 GB 0 B 8
/default-rack RUNNING ip-172-31-27-188.us-west-2.compute.internal:58302 ip-172-31-27-188.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 0 0 B 8 GB 0
/default-rack RUNNING ip-172-31-24-253.us-west-2.compute.internal:50835 ip-172-31-24-253.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 8 8 GB 0 B 8
/default-rack RUNNING ip-172-31-27-185.us-west-2.compute.internal:53763 ip-172-31-27-185.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 0 0 B 8 GB 0
/default-rack RUNNING ip-172-31-19-89.us-west-2.compute.internal:58013 ip-172-31-19-89.us-west-2.compute.internal:8042 22-Oct-2014 01:19:28 0 0 B 8 GB 0
Showing 1 to 16 of 16 entries
First Previous
About Apache Hadoop

Number of nodes and the speed up time:

Base :1 Node

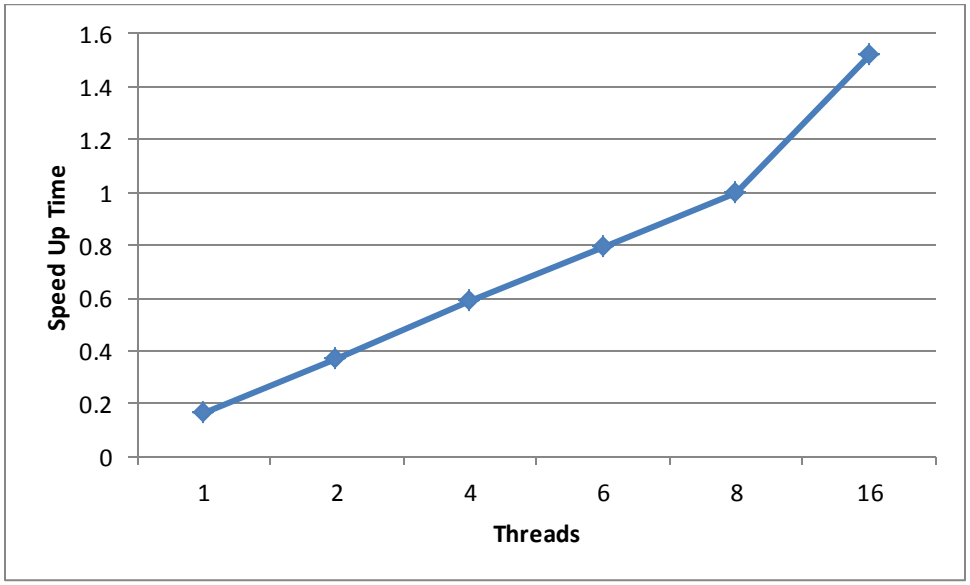
Nodes	Execution time in seconds	Execution time for 1 Node	Speed Up
1	2950	2950	1
2	1338	2950	2.204783259
4	850.8	2950	3.467324871
6	625.8	2950	4.713966123
8	498	2950	5.923694779
16	327.6	2950	9.004884005



Number of nodes and the speed up time:

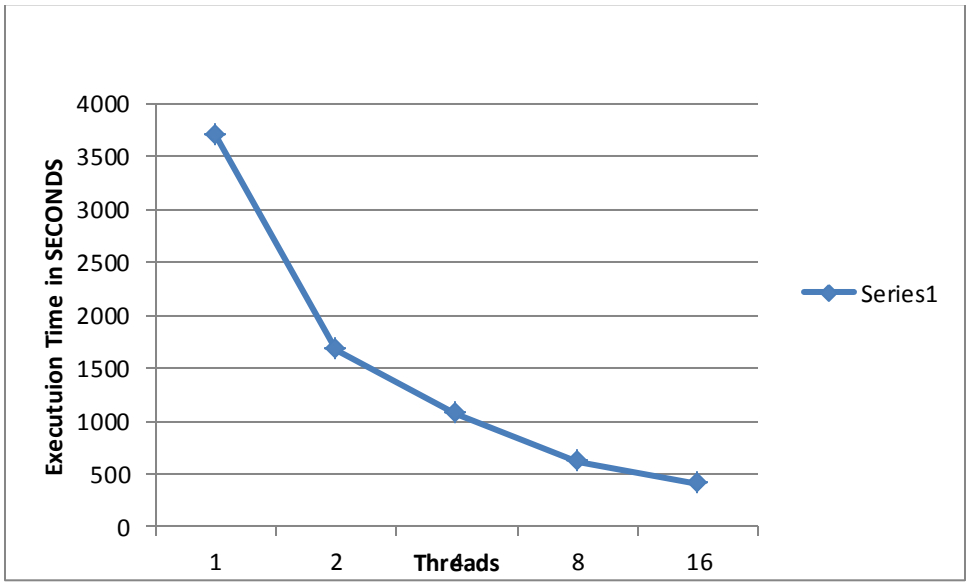
Base : 8 Node

Nodes	Execution time in seconds	Execution time for 8 Node	Speed Up
1	2950	498	0.168813559
2	1338	498	0.372197309
4	850.8	498	0.585331453
6	625.8	498	0.7957814
8	498	498	1
16	327.6	498	1.52014652



Java 1 Thread Baseline:

Nodes	Execution time in seconds	Execution time for 1 Thread java	Speed Up
1	2950	654.552	0.221882034
2	1338	654.552	0.489201794
4	850.8	654.552	0.769337094
8	625.8	654.552	1.045944391
16	498	654.552	1.314361446



10GB DATASET ON c3.large instance(Sorted word count without frequency based on the ASCII) :

Word Count	Execution time in seconds
1	2841
16	396

Best Performance is achieved at 16 nodes for both types .

SWIFT INSTALLATION:

Steps to get you IAM access keys:

1. Go to the IAM console.
2. From the navigation menu, click Users.
3. Select your IAM user name, or create a new one.
4. Click User Actions, and then click Manage Access Keys.
5. Click Create Access Key.
6. Click Download Credentials, and store the keys (a .csv file) in a secure location.

Create a Keypair to ssh to the ec2 instances:

1. Open the Amazon EC2 console .
2. In the top navigation bar, in the region selector, click **US West (Oregon)**.
3. In the left navigation pane, under Network and Security, click Key Pairs.
4. Click Create Key Pair. Type mykeypair in the new Key pair name box.
5. Download the private key file, which is named mykeypair.pem, and keep it in a safe place. You will need it to access any instances that you launch with this key pair.

Launch an EC2 instance with AMI as Ubuntu Server 14.04 LTS (HVM).

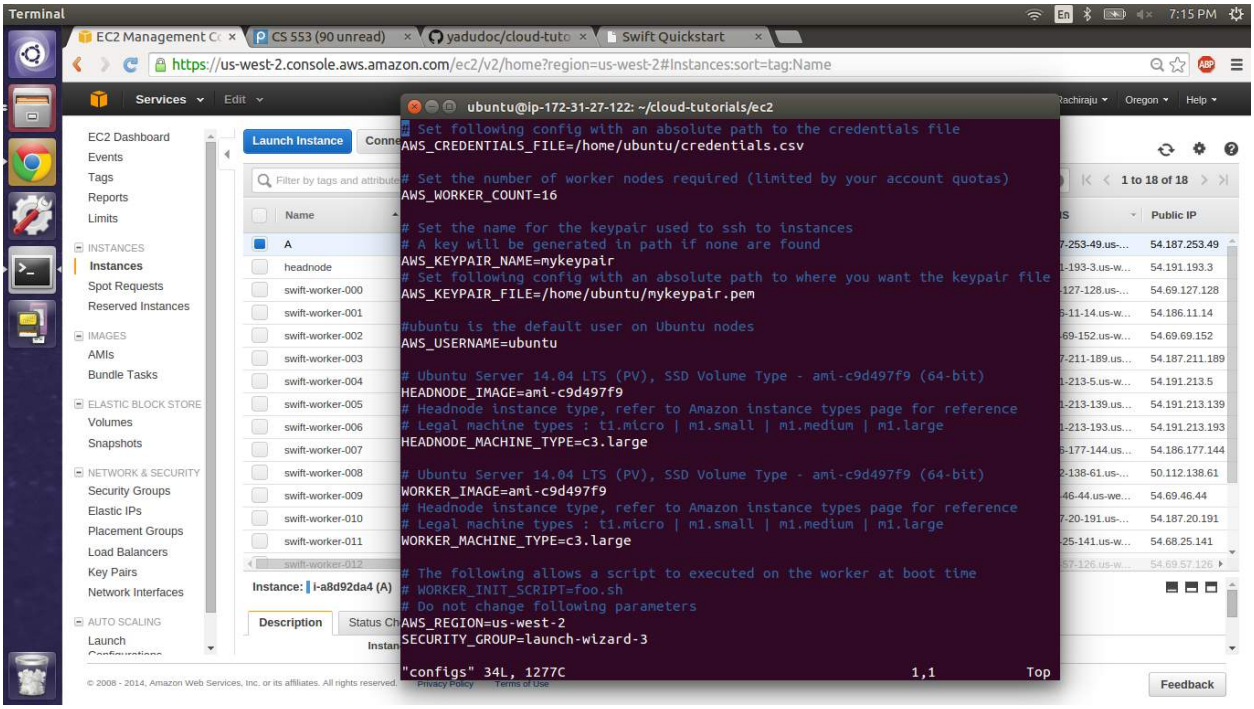
Do shh-add mykey.pem. Then connect to the instance by using ssh –i @ubuntu:ipaddress

Then do a scp to send mykeypair.pem and credentials to the instance location.

Install the following:

1. sudo apt-get install -y python python-pip git
2. sudo pip install apache-libcloud
3. sudo apt-get install default-java
4. git clone https://github.com/yadudoc/cloud-tutorials.git
5. cd cloud-tutorials/ec2

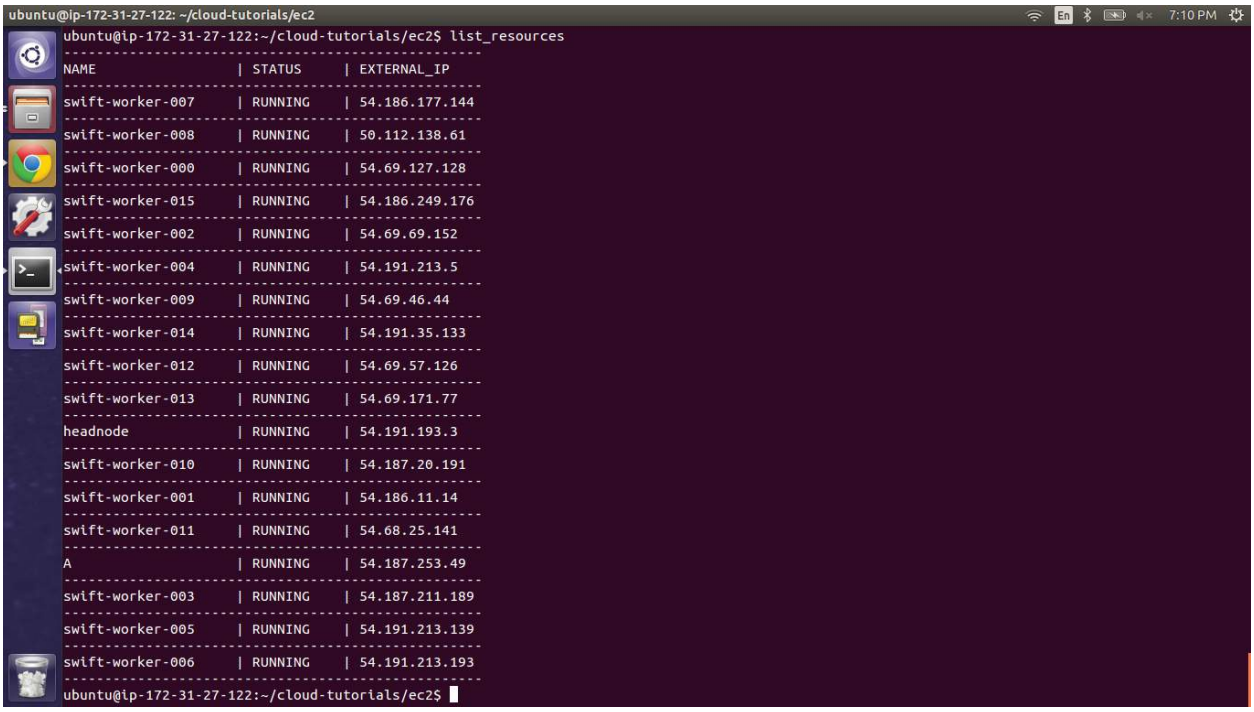
Now configure the configs file to the following shown in the screen shot:



Now navigate to ec2 directory and do a source setup.sh.

To see if all the 16 workers are launched check by using list_resources.

This will give the following:

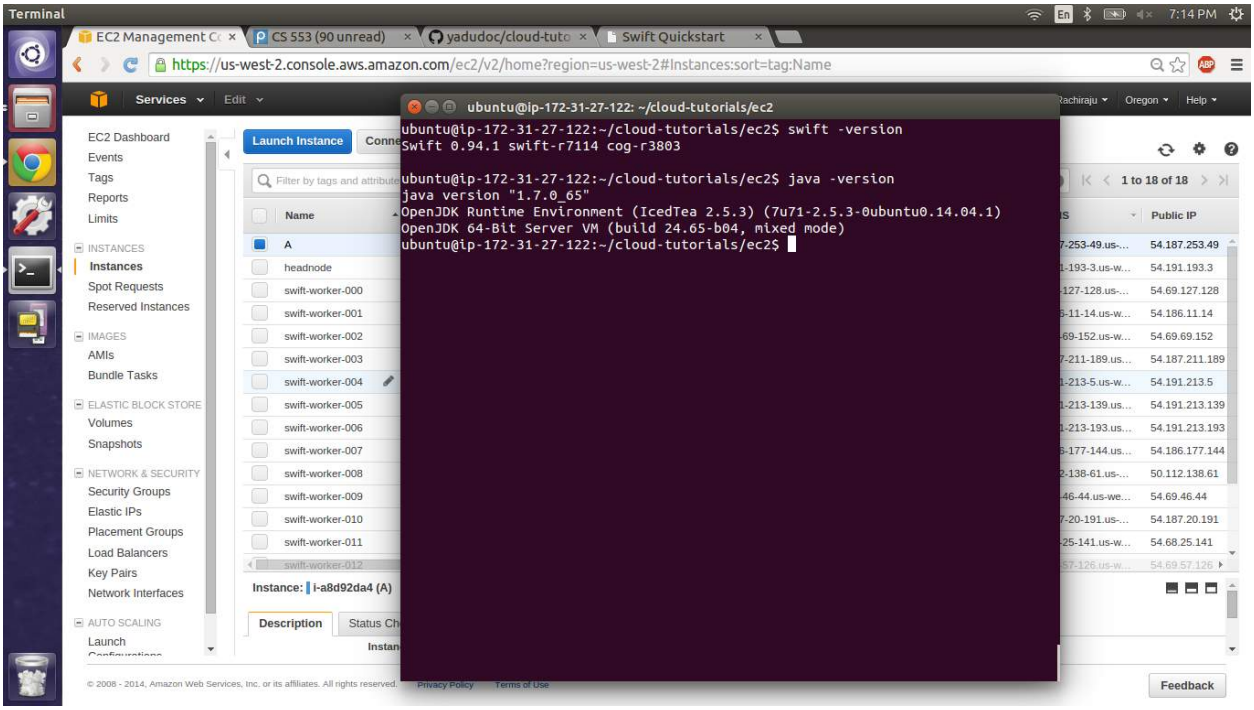


Connect to the headnode by using the “connect headnode” command.

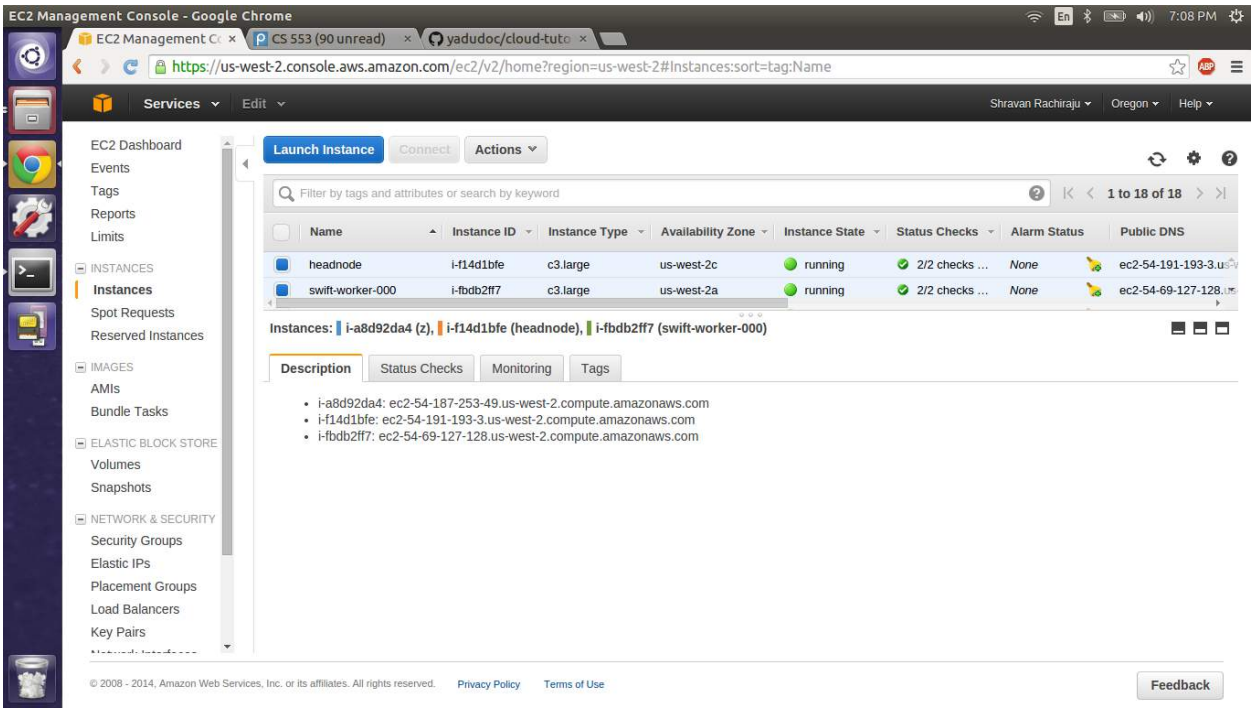
Java and Swift Version:

To see the java version: java –version

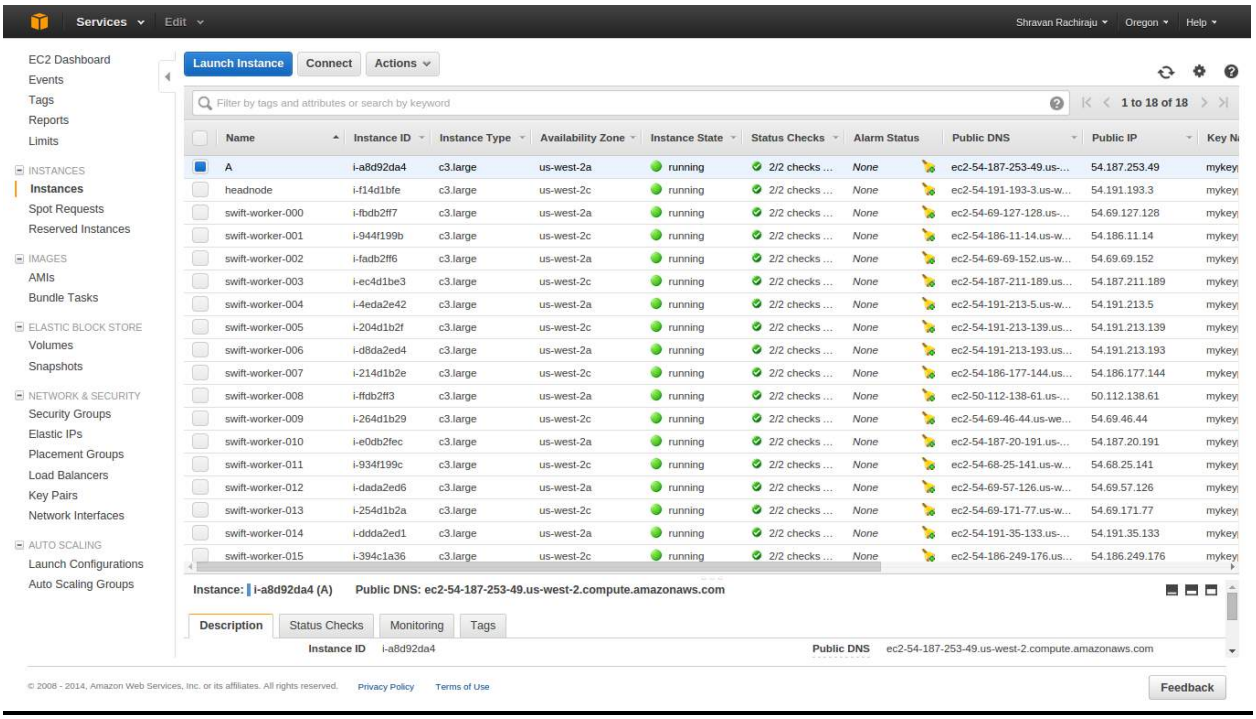
To see the swift version: swift –version



Head node and 1 Worker:



Head Node and 16 Workers:



Swift Word Count:

SYSTEM CONFIGURATION:

VERSION	: Swift 0.94.1
INSTANCE TYPE	: c3. Large UBUNTU
RAM	: 3.75 GB
NO. OF CORES	: 2 virtual cores
STORAGE	: 32 GB

Methodology:

1. Install Swift on 17 nodes (including the POSIX layer over S3 via FUSE, as Swift expects a shared POSIX filesystem between all the compute nodes)
2. Install the following in the node:
    - Install python-pip, apache-libcloud
    - git clone cloud-tutorials
    - Configure and start the cluster
3. Create an Access key credentials.csv and store it in an secure location.
4. Connect to instance by ssh and save the credentials and key file in it.
5. Update the configs file.
6. Navigate to ec2 and do a source setup.sh
7. Connect to headnode.
8. Now run the program using swift wordCount.swift.
9. Make sure we have the config file present to run the main swift file.

Change the following in the configs file:

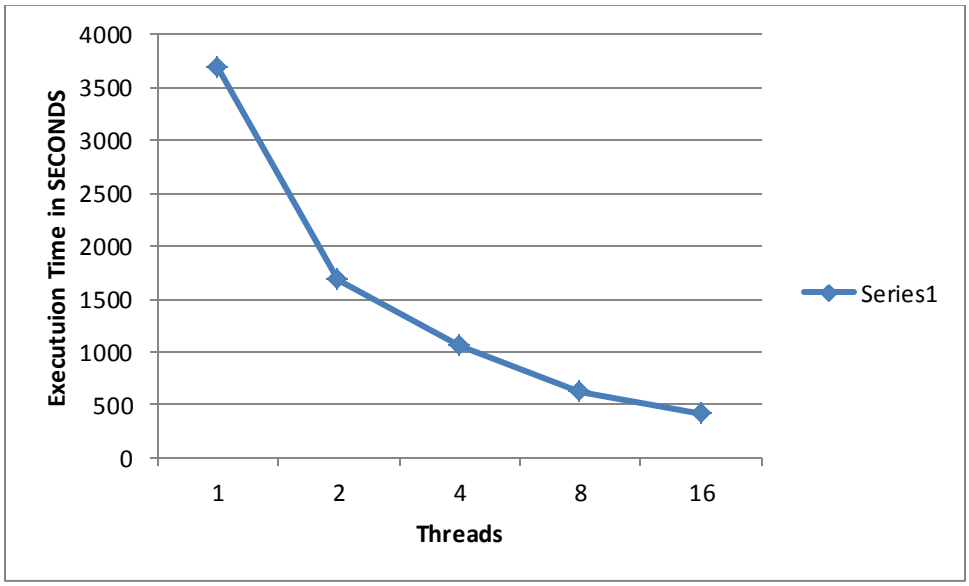
AWS_CREDENTIALS_FILE	/home/Ubuntu/credentials.csv
AWS_WORKER_COUNT	Worker count is 17
AWS_KEYPAIR_NAME	mykeypair.pem
AWS_KEYPAIR_FILE	/home/Ubuntu/cs553w.pem
HEADNODE_MACHINE_TYPE	c3.large
WORKER_MACHINE_TYPE	c3.large

Execution results:

Nodes	Execution time in seconds	Execution time for 1 Node	Speed Up
1	3687.5	3687.5	1
2	1672	3687.5	2.205442584
4	1061	3687.5	3.475494816
8	622.5	3687.5	5.923694779
16	409.2	3687.5	9.011485826

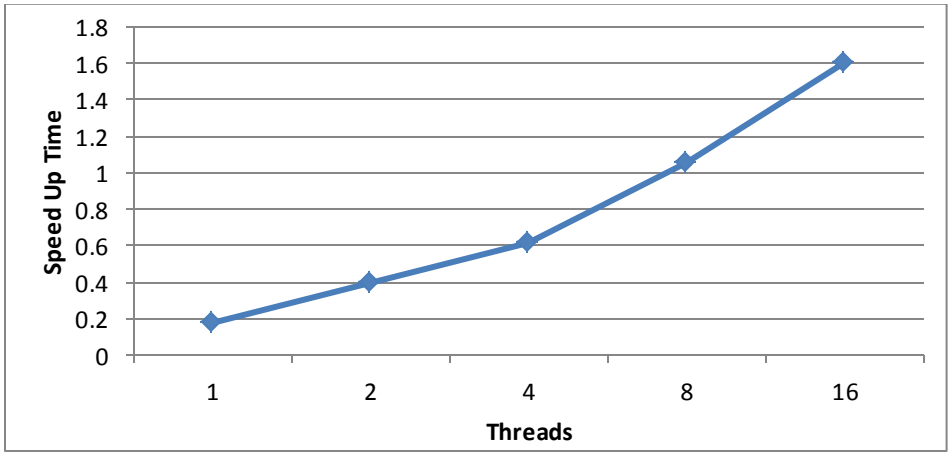
GRAPH

From the data available in the above table, a graph is plotted between number of nodes and execution time.



GRAPH :

Using the information from the table above a graph is plotted between number of nodes and speed up time. The baseline of this graph is value obtained at node 1.

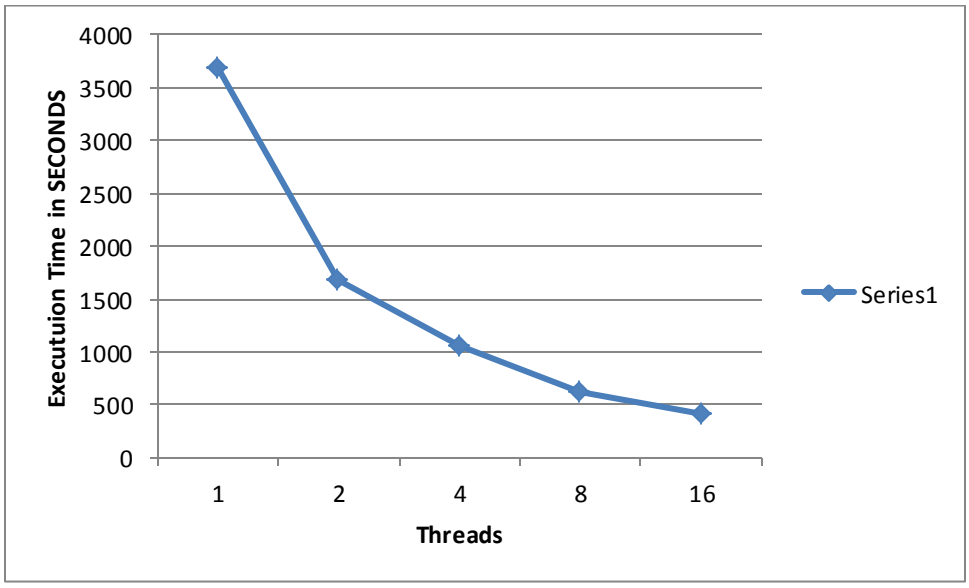


Best Performance is obtained at 16 nodes.

Java 1 Thread baseline:

Nodes	Execution time in seconds	Execution time for 1 Thread java	Speed Up
1	3687.5	654.552	0.177505627
2	1672	654.552	0.391478469
4	1061	654.552	0.616919887
8	622.5	654.552	1.051489157
16	409.2	654.552	1.599589443

Graph:



Sorting in SWIFT:

Word Count	Execution time in seconds
1	2131
16	372

Best Performance is obtained at 16 nodes

Performance:

PLATFORM	NUMBER OF NODES	EXECUTION TIME in seconds Word Count
JAVA	1	654.552
HADOOP	1	2950
SWIFT	1	3687
JAVA	1	654.552
HADOOP	16	327.6
SWIFT	16	409

Out of all the three **HADOOP** is said to give the best performance.

From the above table we can say that best performance at 16 nodes is offered by HADOOP and at 1 node is offered by JAVA. Compared to 1 node execution time of JAVA execution time of 16 nodes of SWIFT and HADOOP is faster. Let it be 100 nodes or 1000 nodes it doesn't make any difference as you scale from 16 nodes to higher because the execution time stays constant as there is resource saturation.

While Considering sorting we can see that swift gives the best performance. It gives almost $1/4^{th}$ times that of hadoop. So while considering sorting we can say that SWIFT has the best performance.

MPI Sort:

Configuration:

VERSION	: MPI 3.1.3
INSTANCE TYPE	: c3. Large UBUNTU
RAM	: 3.75 GB
NO. OF CORES	: 2 virtual cores
STORAGE	: 32 GB

Methodology:

MPI INSTALL VERSION: mpich3.1.3

1.install mpich3.1.3 and configure it with command ./configure disable --fortran
2. build $make

after the installation of mpich3.1.3 on the local node

3. run MPIsort.cpp using

mpicc MPIsort.cpp -o MPITsort

after compilation the resulting file is an executable file MPIsort

4. mpirun -np 2 /home/ubuntu/MPIsort wiki10gb.txt

mpirun executes the executable file with 2 processes sorting the wiki10gb.txt file.

Running MPI ON AMAZON EC2

run the below commands

sudo apt-get install pythonsetuptools
sudo apt-get install python-pip
sudo apt-get update
sudo easy_install -upgrade pip
sudo easy_install StarCluster0.95.5
and install pycrypto-2.6.1

after installing Starcluster0.95.5
configure starcluster in
./starcluster/config

and after configuring the start cluster is installed
now start the cluster on 16 nodes.