CS22612 – CLOUD COMPUTING LABORATORY

EXP NO: 1 **DEVELOP A NEW WEB SERVICE FOR A CALCULATOR**

DATE:

AIM:

To develop a new Web Service for Calculator using SOAP Protocol

PROCEDURE:

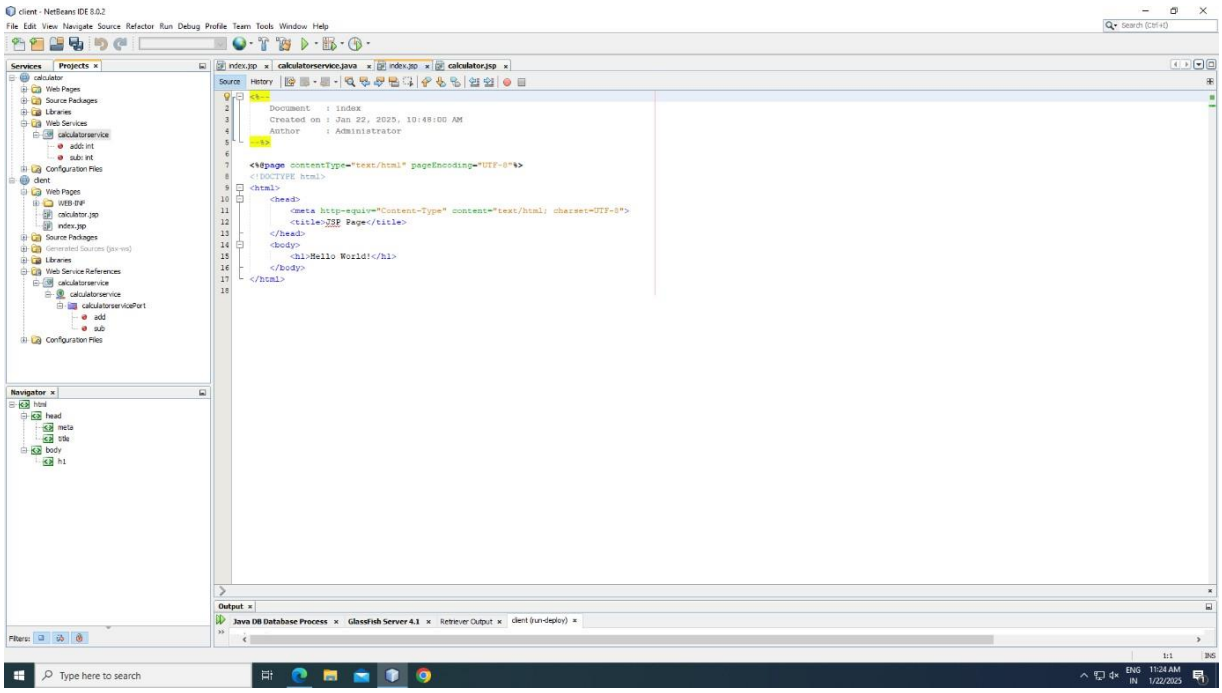
1. Open NetBeans IDE 8.1

2. Click File -> New Project

3. Give project name as calcws application and click next.

4. In new web application dialog box, ensure that glassfish v2 server and Java EE5 are selected and click next and then finish

5. Right click calcws application and select New -> Web Service. Give web service name as calwebservice and package name as calculator and click Finish



6. Expand web service folder. Right click calwebservice and click Add Operation, Give operation name as add and return type as int

7. Click add button and give parameter as a and datatype as int. Again, Click add button and give parameter name as b and its datatype as b and Click OK

8. Instead of return 0, change it as return a+b

9. Similarly, add operations for subtraction (sub), multiplication (mul), division (div)

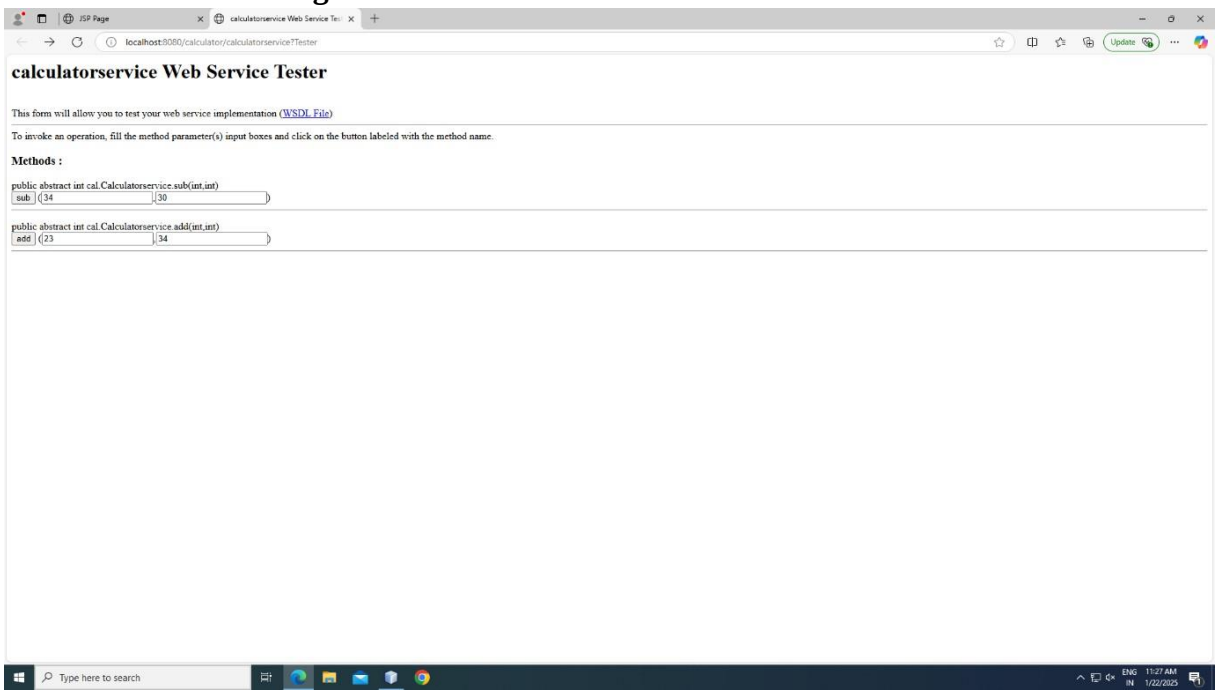
10. Right Click calcws application and click clean and build. It will show BUILD SUCCESSFUL.

11. Again, right Click calcws application and click deploy. It will show BUILD SUCCESSFUL.

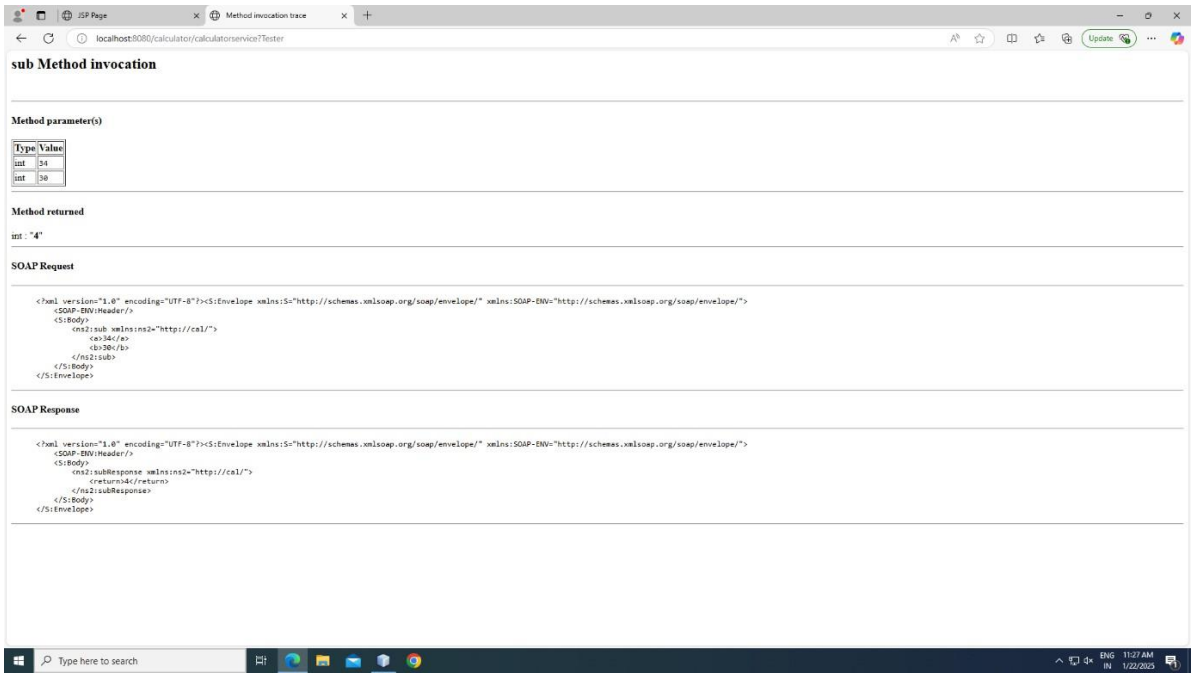
12. Select calcws application -> Web Services -> calculatorws. Right click and select Test Web Service

13. Give input values and click add button to check output. Go to back and click WSDL to open it. Now, Server is running...

Web Service Tester Page:



Output:



Invoking Web Service Client:

1. Click File -> New Project. Select web application from java web category

2. Give filename as calcwsclient. Click next and then finish.

3. Right Click calcwsclient and Select New -> Web Service client

4. Select Project and click browse. Browse the web service that we did in the previous step.

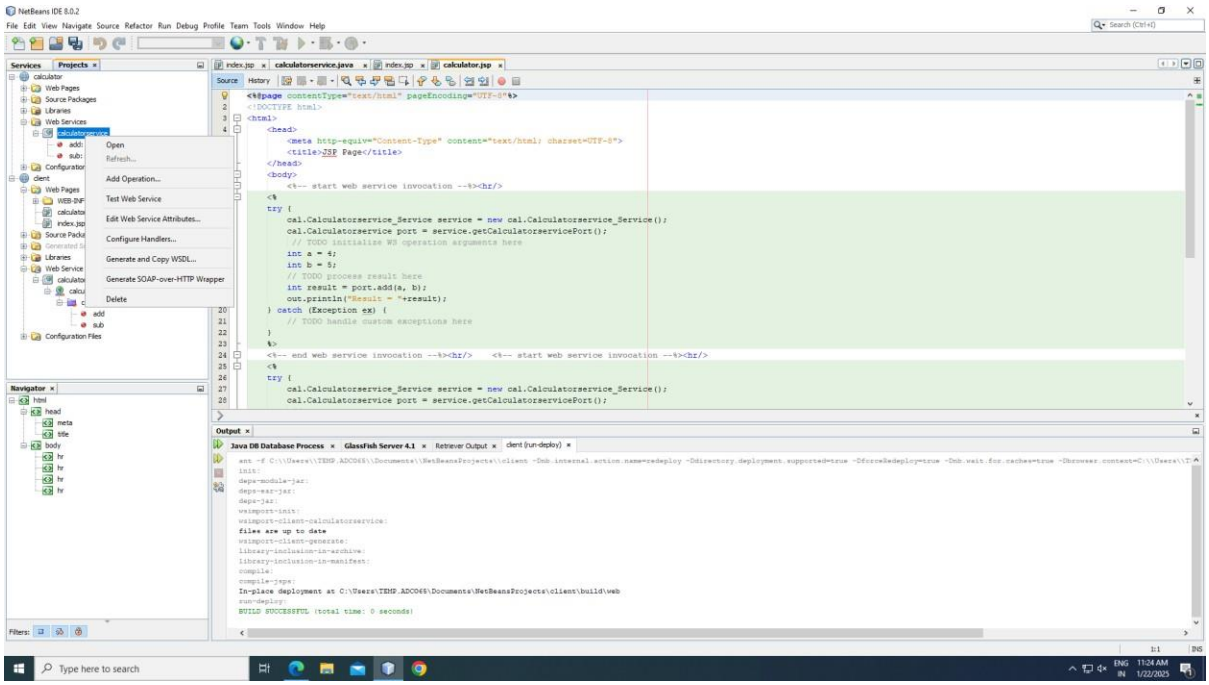
5. Click Finish. Code will appear and it will show some error

6. Click on error. At end of line add: xendorsed="true" and save it.

7. Right Click calcwsclient -> Web Pages and select new -> JSP

8. Give filename as client and click finish.

9. In client.jsp page, inside the body tag, remove h1 tag and drag and drop the add operation from web_service_references from calcwsclient



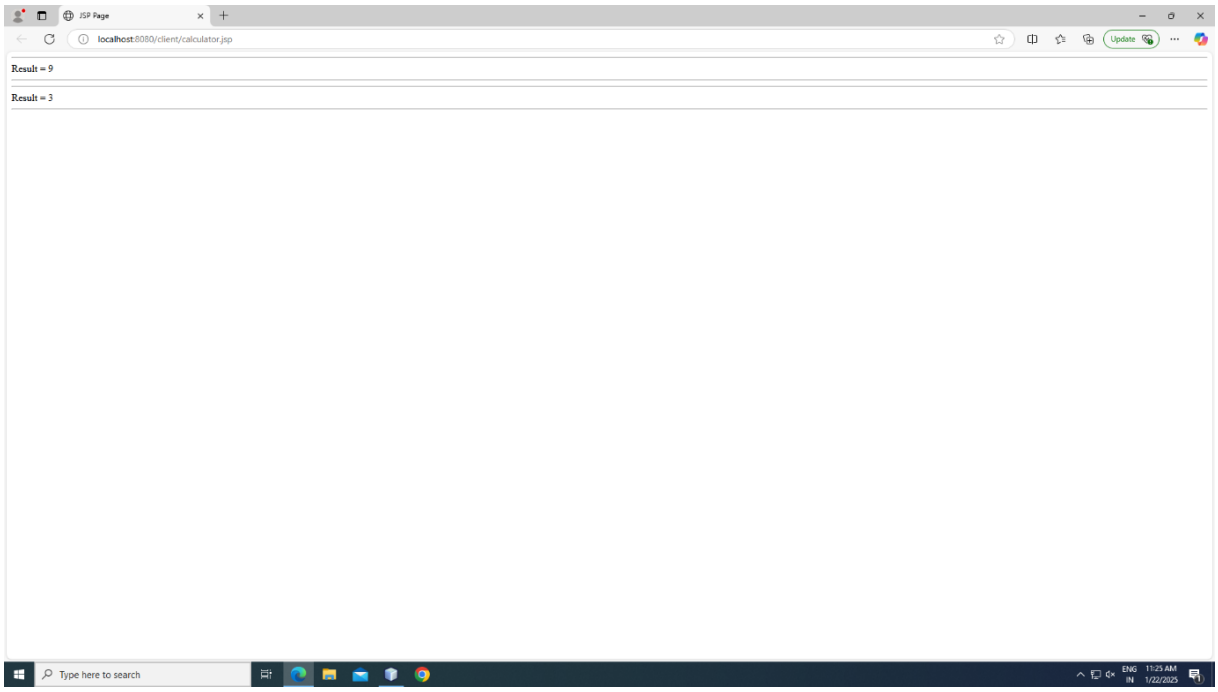
10. In the code appeared, change the values. (For instance, a=5, b=13)

11. Right Click calcwsclient and click Clean and build

12. Again Right click calcwsclient and click deploy. It will show BUILD SUCCESSFUL.

13. Right Click Client.jsp and click Run file

14. It will show the output as follows:



15. Similarly create jsp files for subtraction, multiplication and division.

RESULT:

Thus, calculator is implemented as a web service using SOAP protocol.

CS22612 – CLOUD COMPUTING LABORATORY

EXP NO: 2 **DEVELOP A CLOUD ENVIRONMENT USING CLOUDSIM SIMULATOR**

DATE:

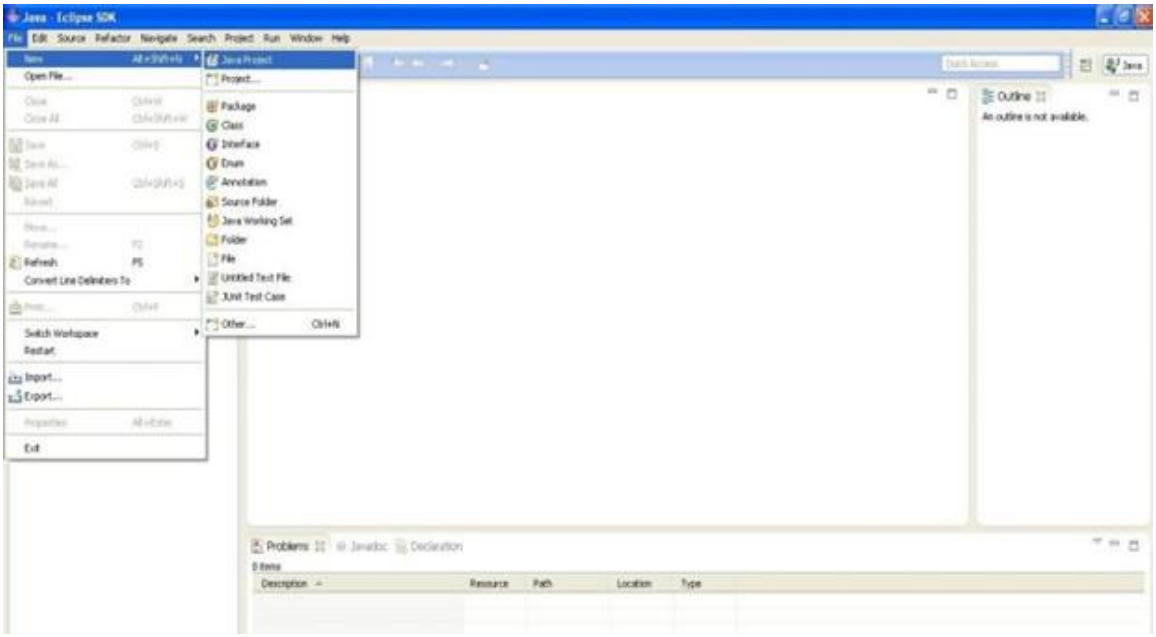
AIM:

To install CloudSim and implement the Java code to create cloudlets and execute the cloudlets in data centers.

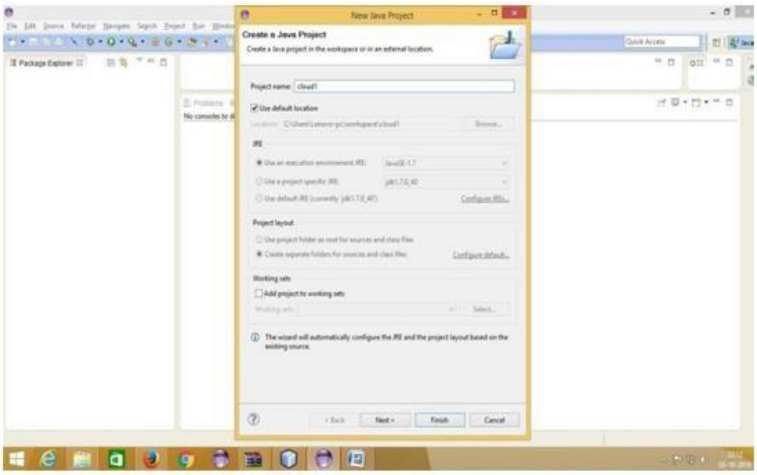
PROCEDURE:

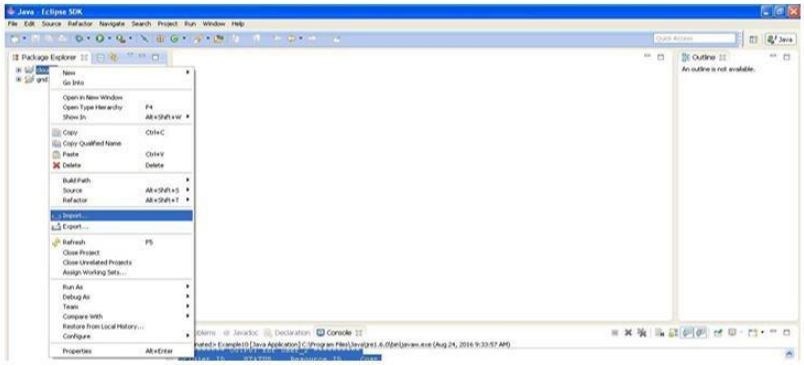
1. Open the Eclipse tool using the path E:\cloudgrid\eclipse-SDK-4.2.2-win32x86_64\eclipse\eclipse.exe.

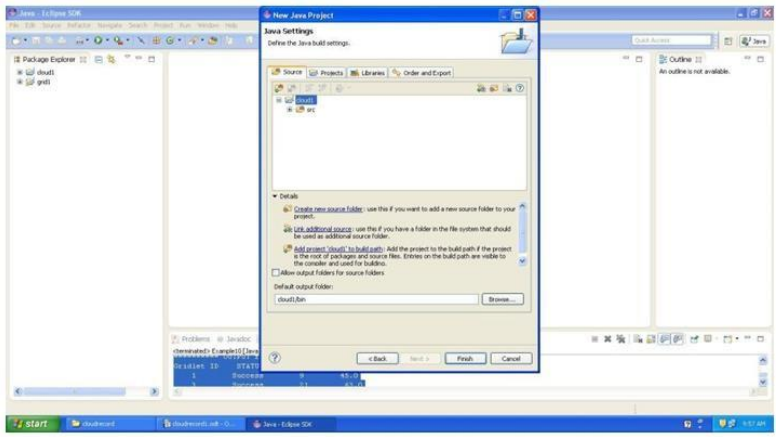
2. Click on File Menu □ New □ Java Project.



3. Give a name to the project (for instance, cloud1) and click on Next Button.





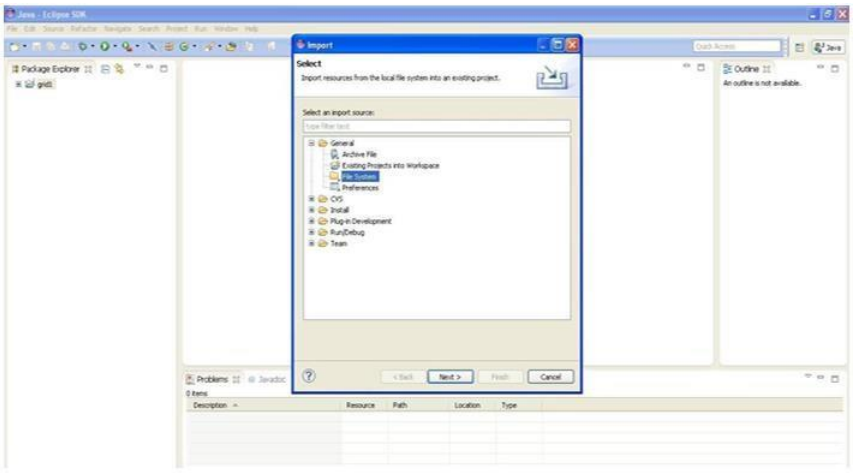


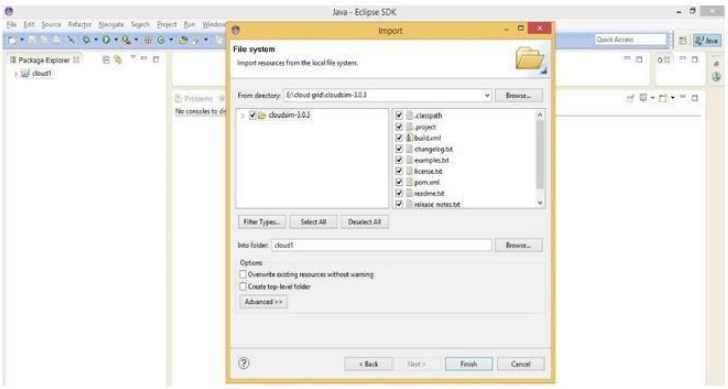
4. Click Finish Button.

5. Right-click on the project in the project explorer and click Import.

6. Select General File System and click Next.

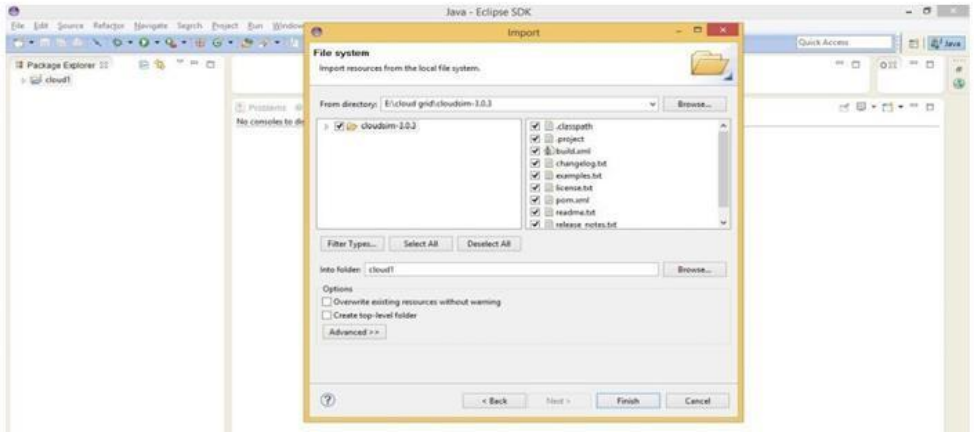
7. Click Browse and browse the CloudSim-3.0.3 folder and select the folder.



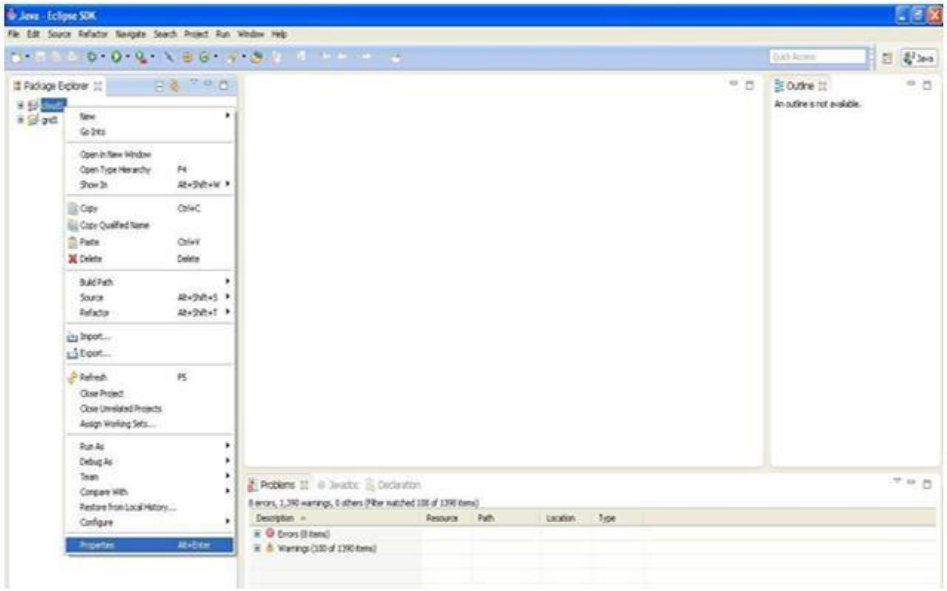


8. Click OK.

9. Select the CloudSim folder.



10. Click Finish Button.

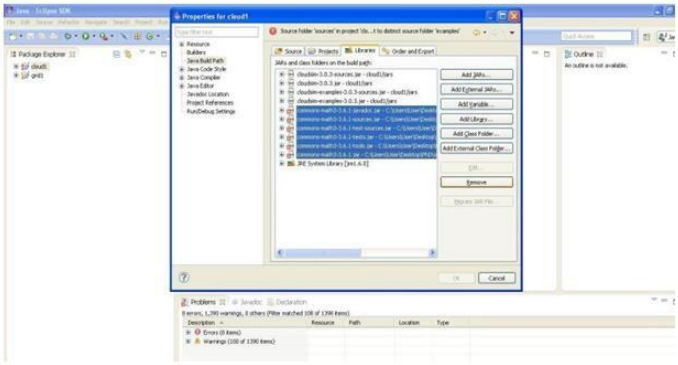


11. Click "Yes to All" to import.

12. Right-click the project in the project explorer and click Properties.

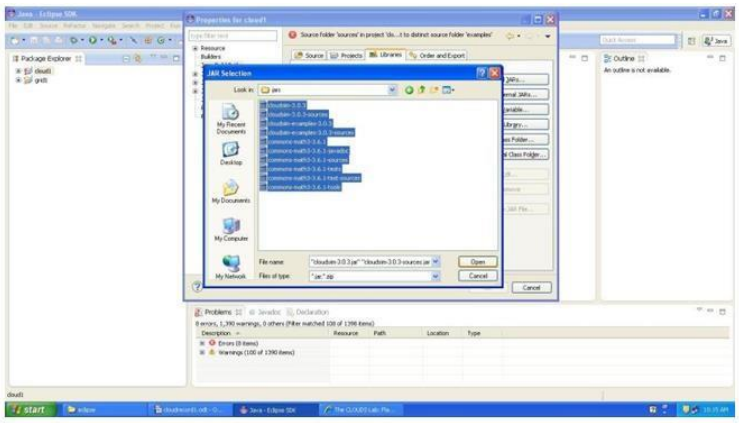
13. Click on Java Build Path and then the Libraries tab.

14. Remove Error showing Jar files.

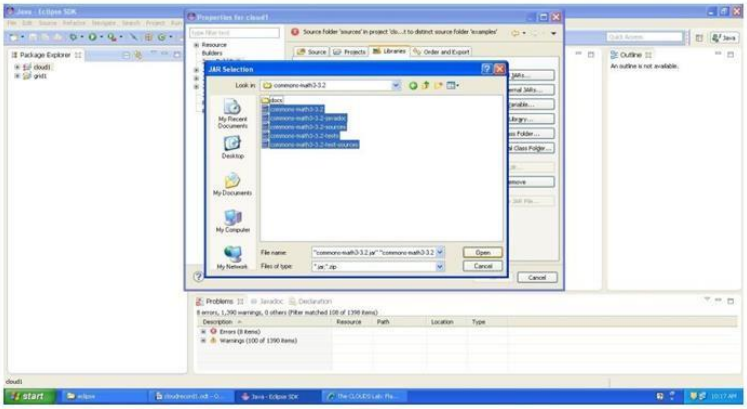


15. Click on Add External Jars.

16. Browse and select all the jar files within the CloudSim folder -> jars.



17. Click Add External Jars again to include common math jars.



18. If it shows an error, click on the Source tab and then the Browse button.

19. Click on Create New Folder.

20. Give the folder a name (for instance, output).

21. Click OK, and again click OK.

22. Expand the project and navigate into cloud1 □ examples □ org.cloudbus.cloudSim.examples □ CloudSimExample1.java.

23. Open the source code by double-clicking the CloudSimExample1.java file.

Output:

Starting CloudSimExample3... Initialising...

Starting CloudSim version 3.0

Datacenter_0 is starting...

Broker is starting...

Entities started.

:Broker: CloudResourceList received with 1 resource(s)

:Broker: Trying to Create VM #0 in Datacenter_0

:Broker: Trying to Create VM #1 in Datacenter_0

:Broker: VM #0 has been created in Datacenter #2, Host #0

:Broker: VM #1 has been created in Datacenter #2, Host #1

:Broker: Sending cloudlet 0 to VM #0

:Broker: Sending cloudlet 1 to VM #1

80.1: Broker: Cloudlet 1 received

160.1: Broker: Cloudlet 0 received

160.1: Broker: All Cloudlets executed. Finishing...

160.1: Broker: Destroying VM #0

160.1: Broker: Destroying VM #1

Broker is shutting down...

Simulation: No more future events

Cloud Information Service: Notify all CloudSim entities for shutting down.

Datacenter_0 is shutting down...

Broker is shutting down...

Simulation completed.

Cloudlet ID | STATUS | Datacenter ID | VM ID | Time | Start Time | Finish Time

1 | SUCCESS| 2 | 0 | 80.1 | 0.1 | 160.1

0 | SUCCESS| 2 | 0 | 160.1| 0.1 | 160.1

CloudSimExample3 finished!

RESULT:

Thus, calculator is implemented as a web service using SOAP protocol.

CS22612 - CLOUD COMPUTING LABORATORY

EXP.NO: 3 DEVELOP A CLOUD ENVIRONMENT WITH FASTSTART EUCALYPTUS

DATE:

AIM:

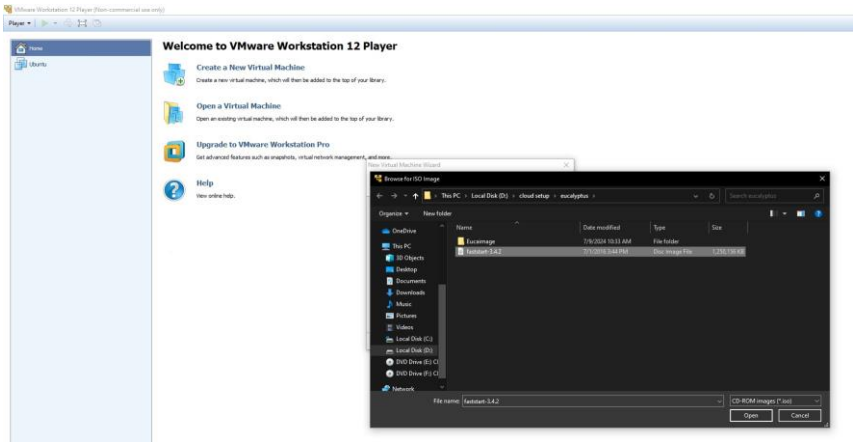
To develop a cloud environment using faststart eucalyptus in a virtual machine using vmware workstation.

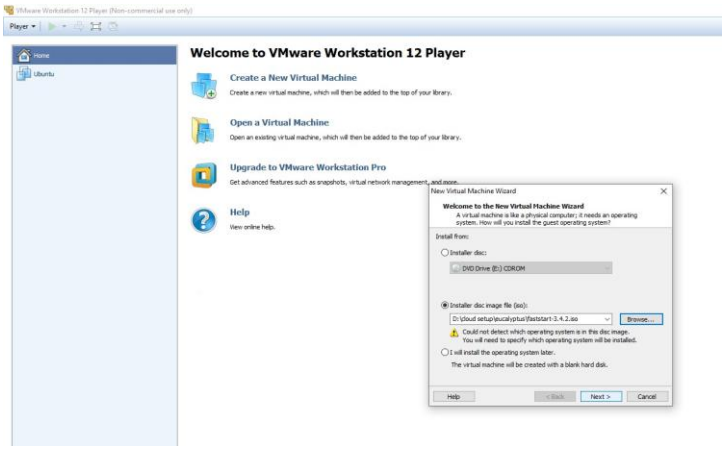
PROCEDURE:

STEP 1:

- Install the virtual machine (vmware workstation12)
- Click **Create New Virtual Machine.**

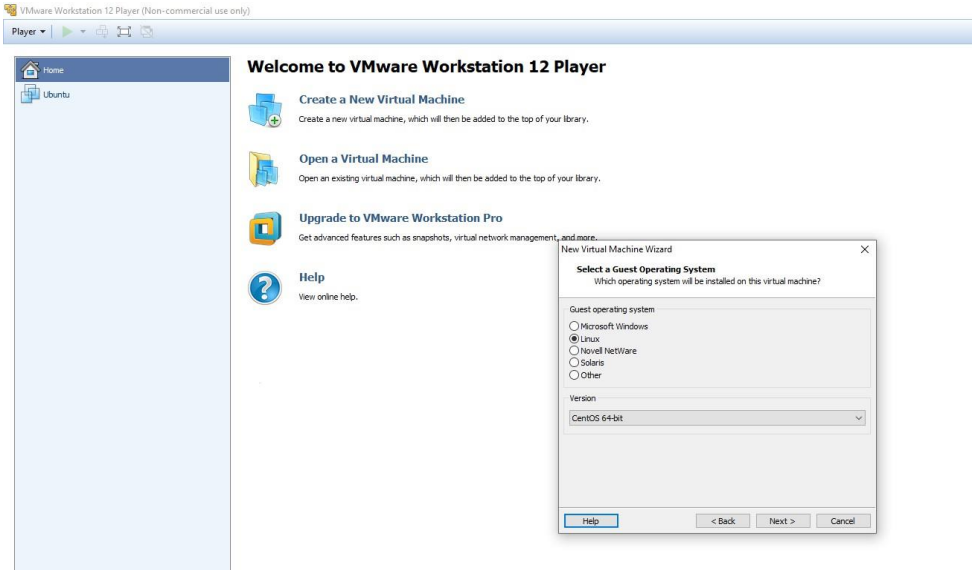
- New virtual machine wizard dialog box appears,check the installer disk image file(iso).Browse the faststart.3.4.2.iso file from the path **E:\Cloud Grid\faststart.3.4.2.iso.**Click **Next.**





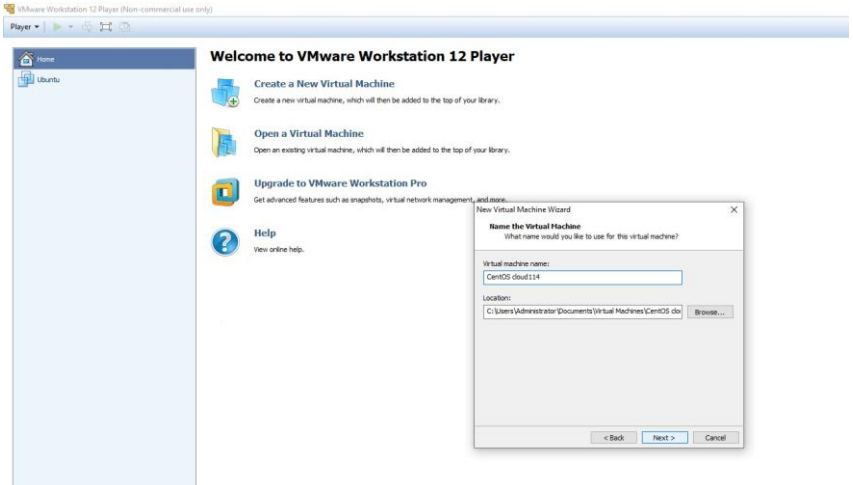
STEP 2:

- Select the **LINUX** operating system.
- Version:**CENTOS 64-bit.**
- Click **Next.**



STEP 3:

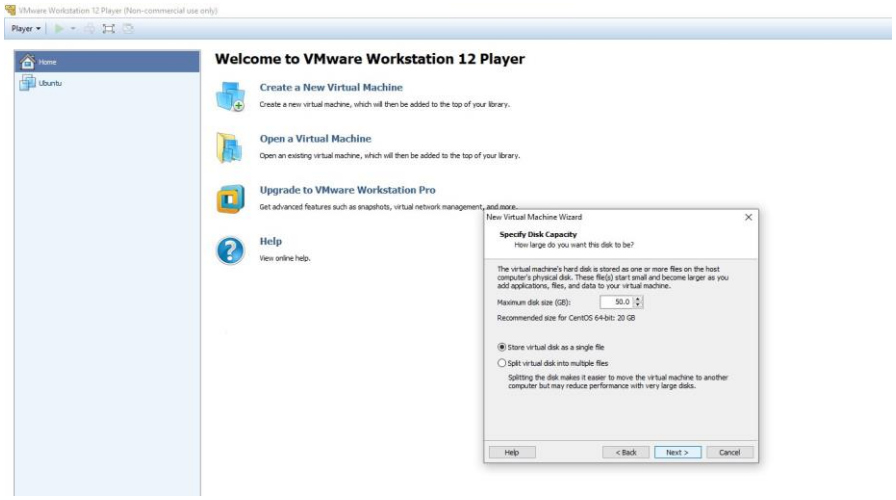
- Create a virtual machine name as **cloud**(anyname)



- Browse the location for the virtual machine **E:\cloudgrid**
- Then Click **make new folder** and give the name for the folder.

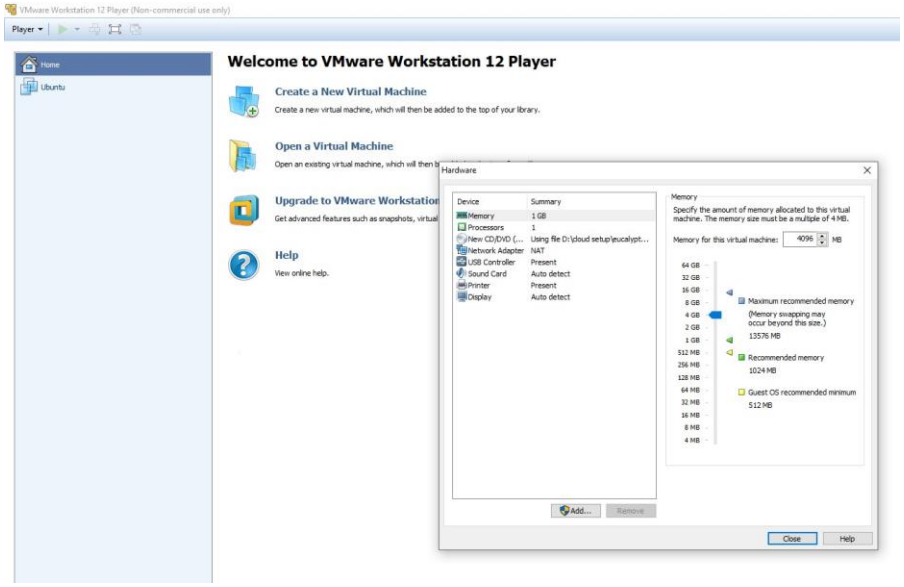
STEP 4:

- Set the maximum disk size as **40GB or more.**
- Select the**"Store virtual disk as single file"**option.
- Click **next.**

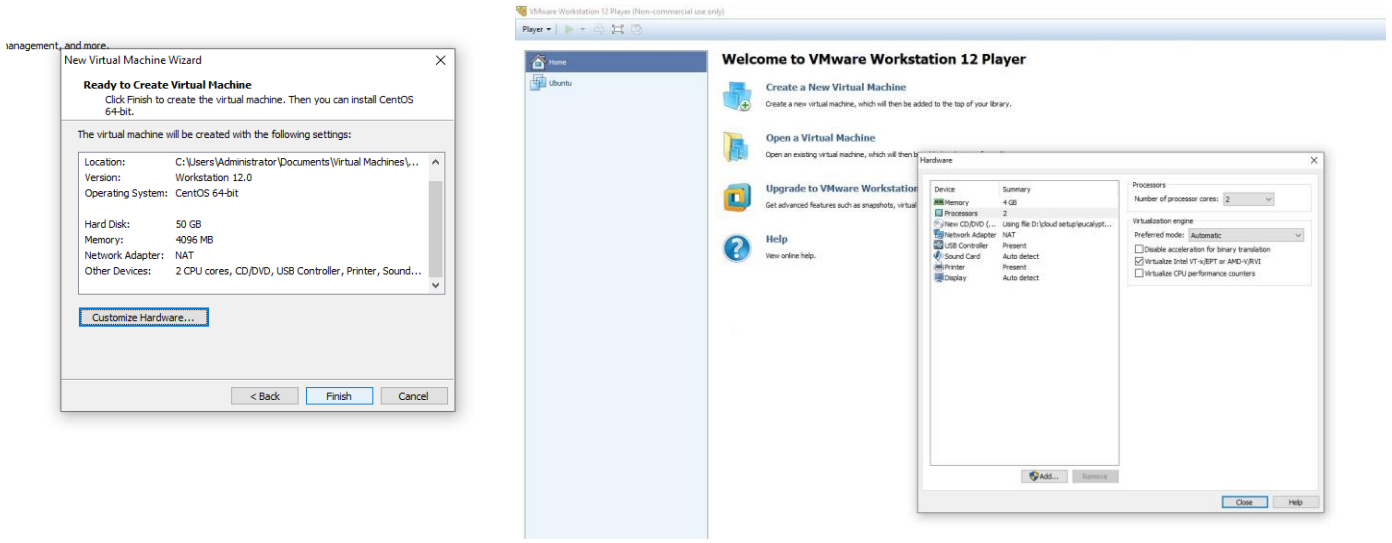


STEP 5:

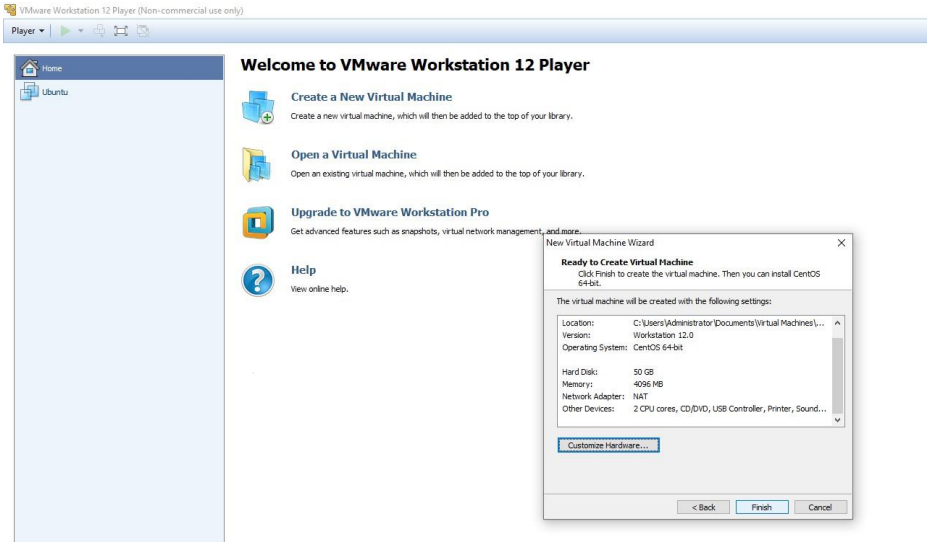
- Select the**"customize hardware option".**
- Select Memory as **4GB.**



- Select the number of processors as 2 and select the two options **"Virtualize Intel" and "Virtualize CPU".**
- Click **close** when all changes are done.

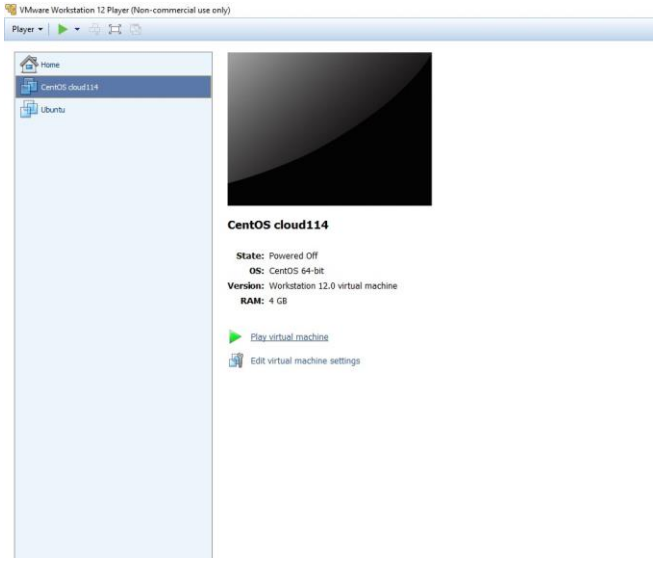


- Click **"Finish"** on the next screen.



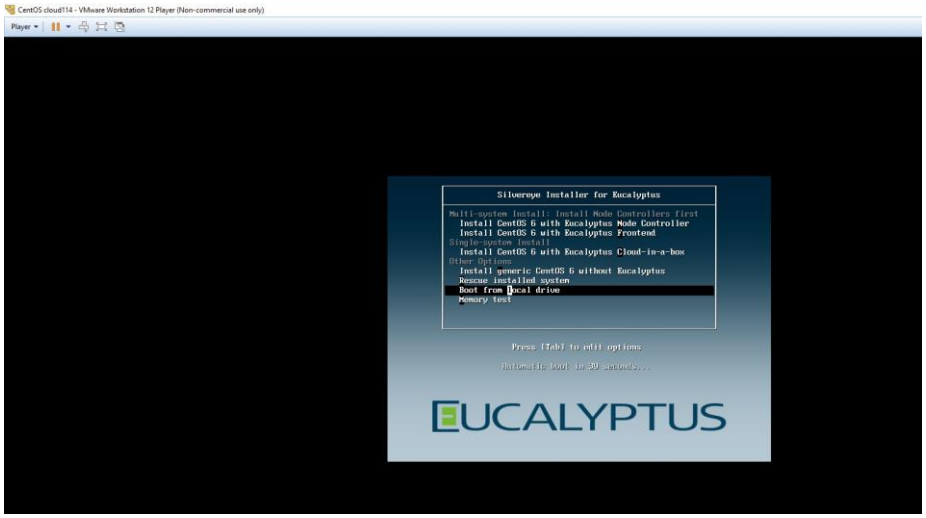
STEP 6:

- Select The Recently Created Virtual Image And Click on**"Play Virtual Machine".**

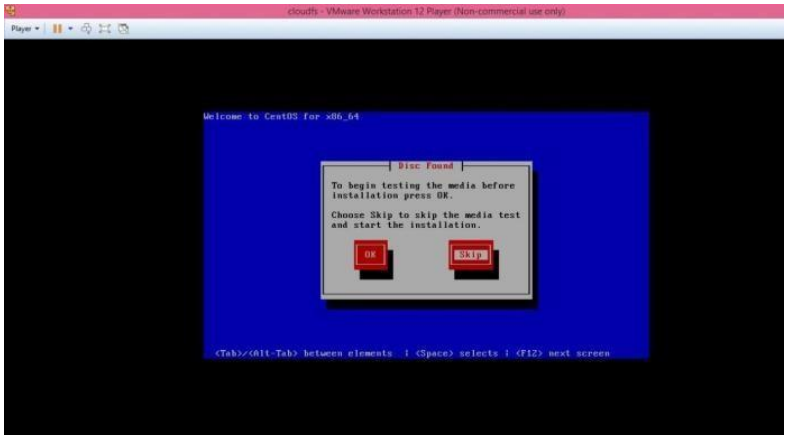


STEP 7:

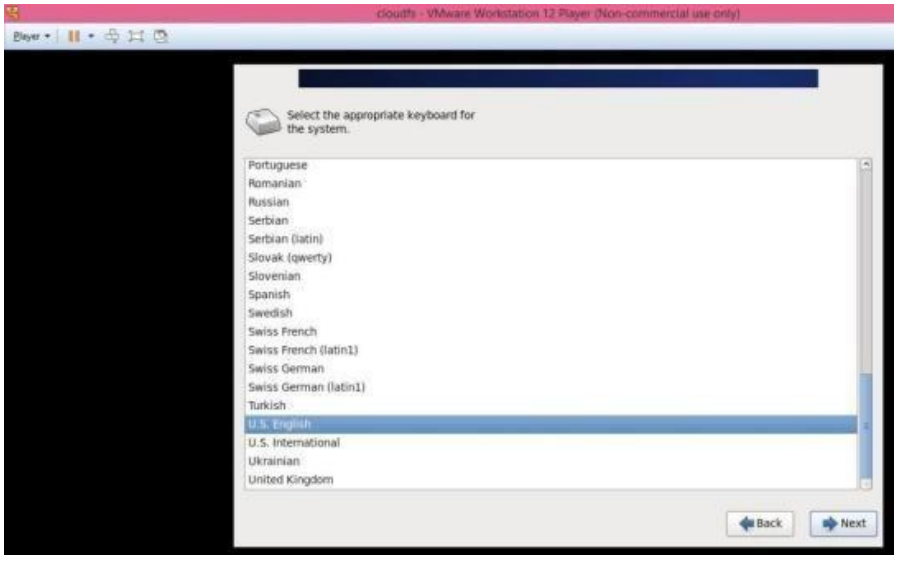
- Click on **"Install CentOS 6 with EucalyptusCloud-in-a-box".**



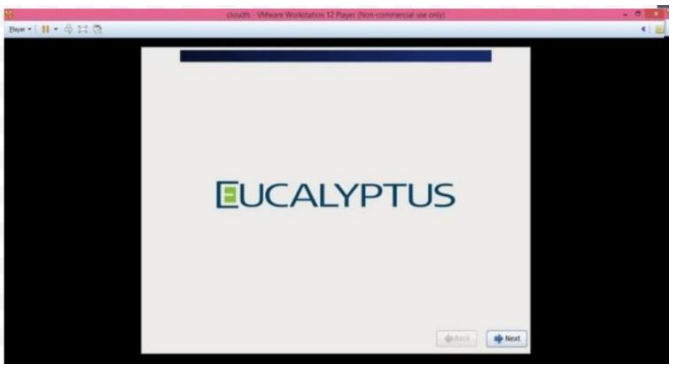
- Click on **"Skip"** on the screen when it asks for the media test.

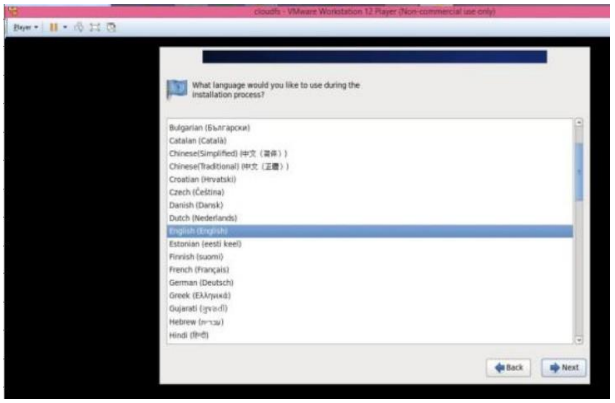


- Select the appropriate keyboard for the system.



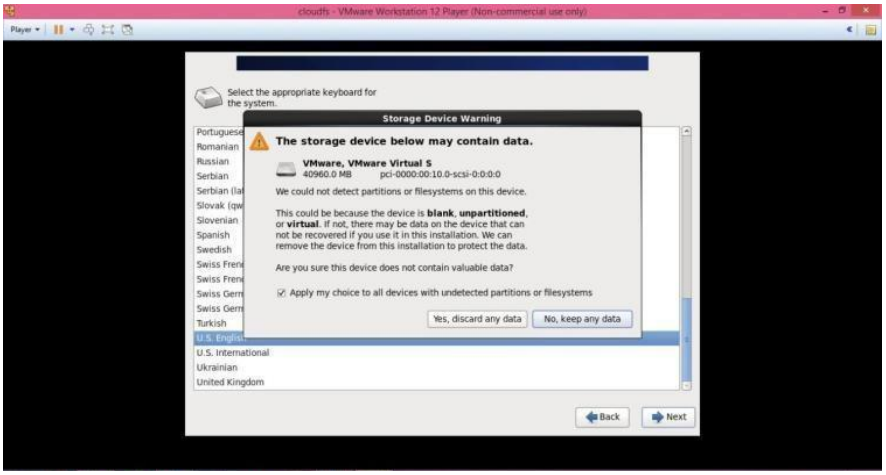
- You will get the EUCALYPTUS Page and select the language for the installation process.





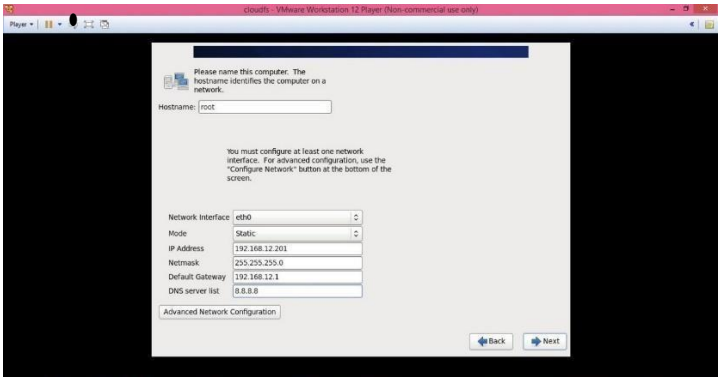
STEP 8:

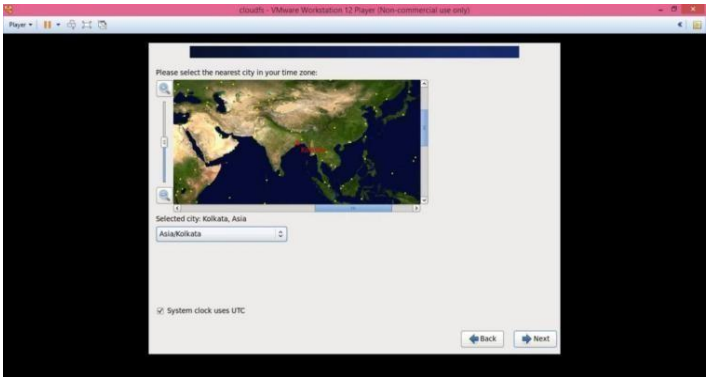
- Click On **"Next"** in the previous screen still you arrive **at a "Data Storage Device Warning".**
- Click on **"Yes,Discard Any Data".**



STEP 9:

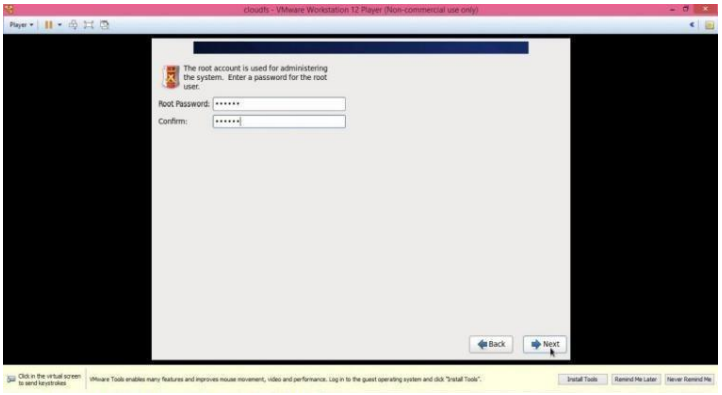
- Select Hostname As**"root"** and Select Network Interface as **"eth0"** and mode as **"Static".**
- Enter the IPAddress as **"192.168.12.201"** and Netmask **"255.255.255.0".**
- Default Gateway as **"192.168.12.1"** and DNS Server list "**8.8.8.8**"**.**
- Click **Next.**
- You will get a world Map to choose a city. In which city you select **"Kolkata/Asia".**

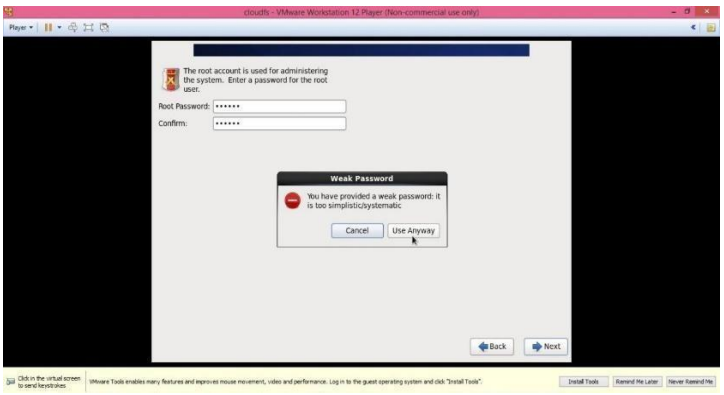




STEP 10:

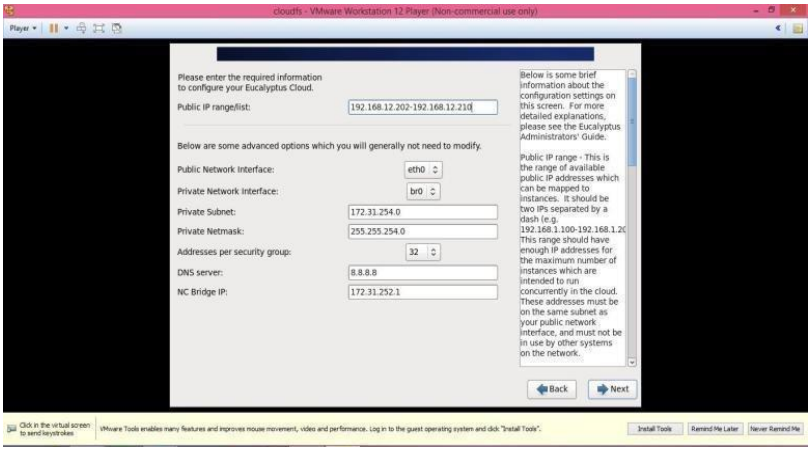
- Enter Your Root Password:**123456** and click **Next.**
- Click on **"UseAnyway".**





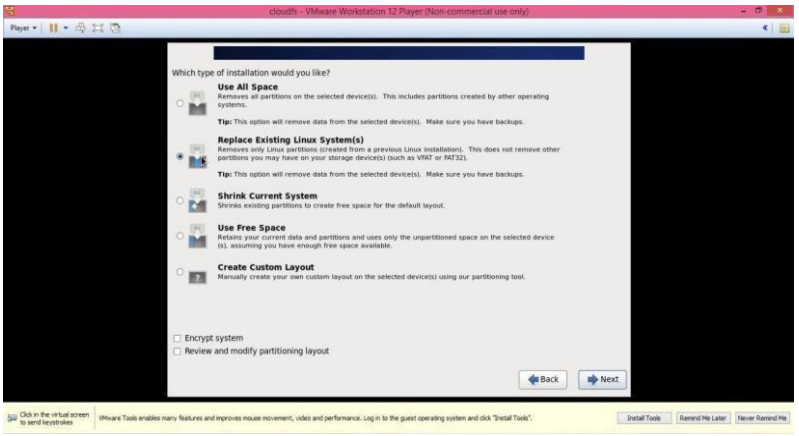
STEP 11:

- Enter the Public IPrange as **"192.168.12.202-192.168.12.210" .**
- Click on **Next.**



STEP 12:

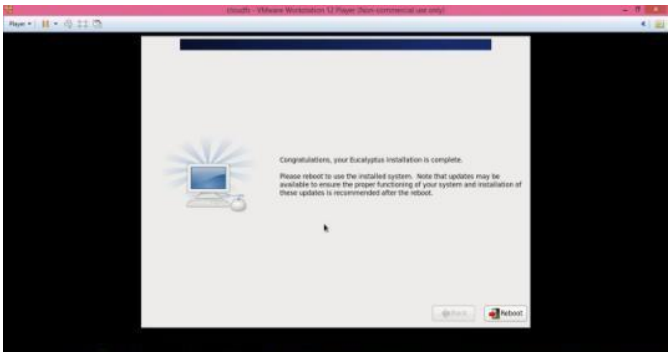
- Select **Replace Existing Linux Systems** and click on**Next.**

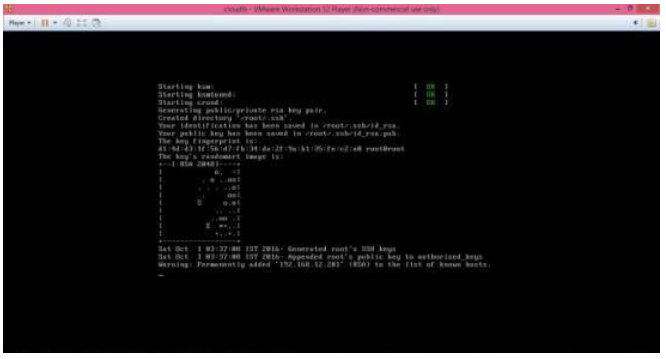


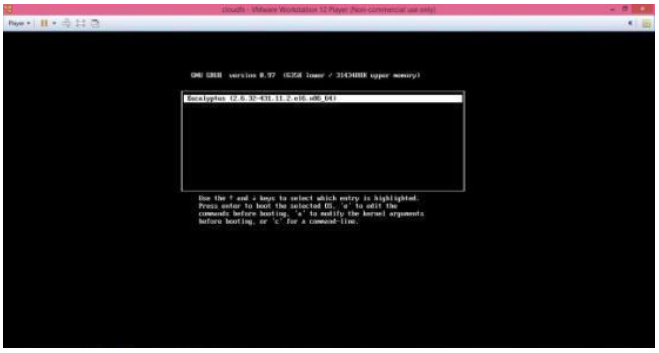
STEP 13:

- Click on "**Write Changes to Disk".**

- Wait for installation to complete.
- Click on "**Reboot ".**
- Wait for CentOS boot up.

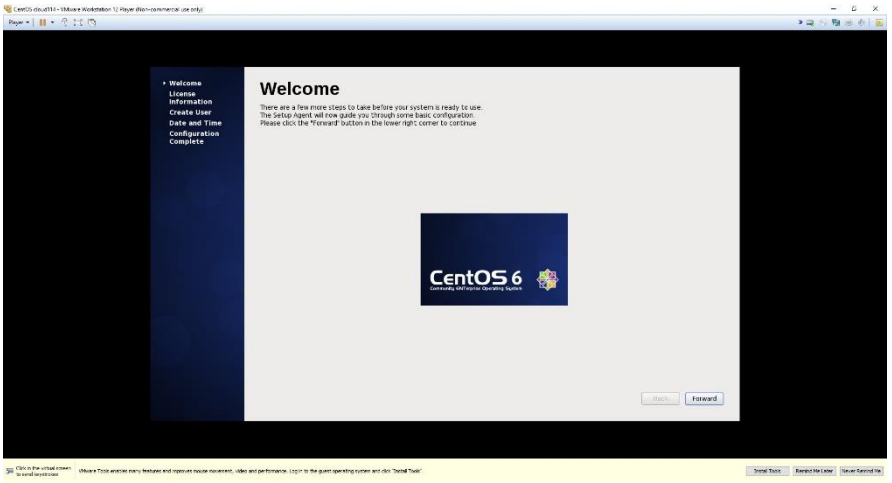






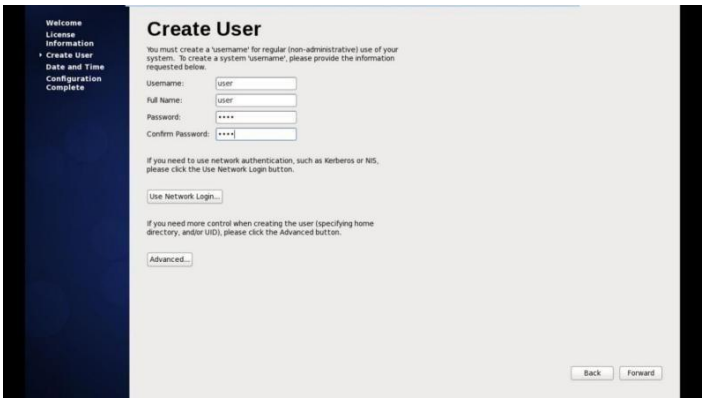
STEP 14:

- Click on "**Forward**".



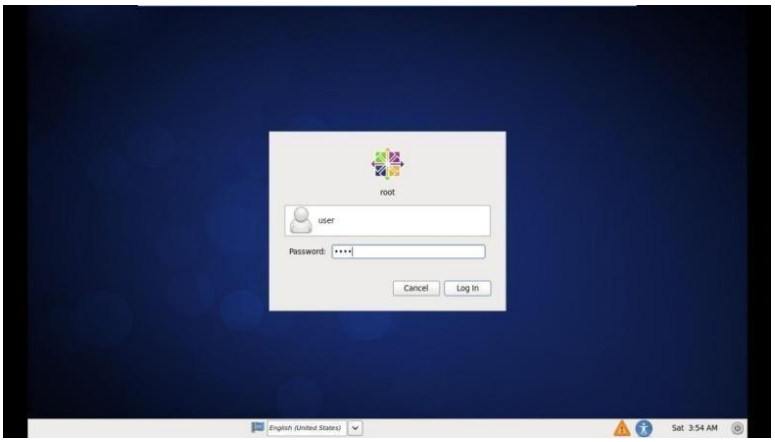
STEP 15:

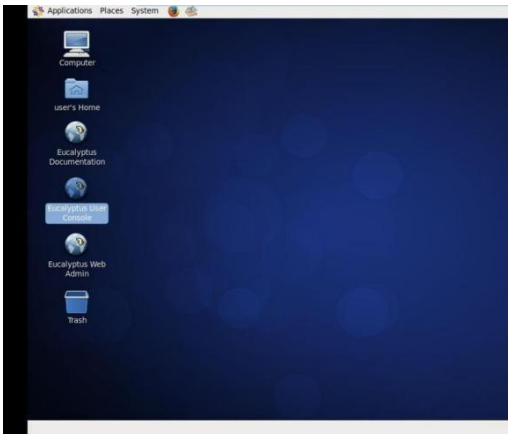
- Type your Username**:user;** Full Name**:user;** Password**:user;** Confirm Password**:user**
- Click on **Forward** when you are done.
- Select**"Yes"**if the dialog box appears.
- Click **Forward** and **Finish** when Configuration Complete Window appears.



- Enter your password and Login into the system.An Application will be opened.

SAMPLE INPUT AND OUTPUT:





RESULT:

Thus the Cloud environment is developed using FastStart Eucalyptus is executed successfully.

CS22612 - CLOUD COMPUTING LABORATORY

EXP.NO: 4 VIRTUAL MACHINE CREATION WITH DIFFERENT CONFIGURATION

DATE:

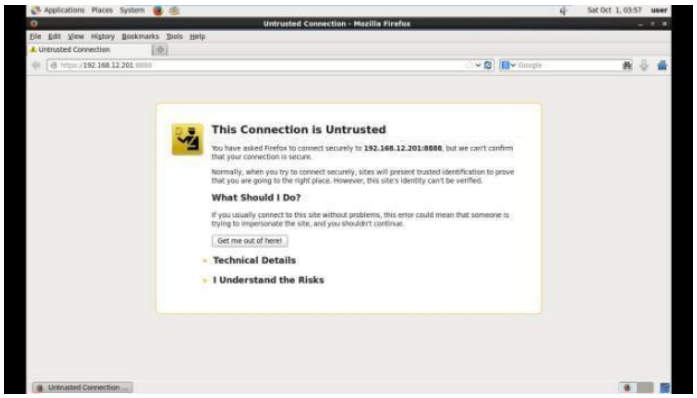
AIM:

To create a virtual machine with different configurations in the cloud environment created using Fastart Eucalyptus.

PROCEDURE:

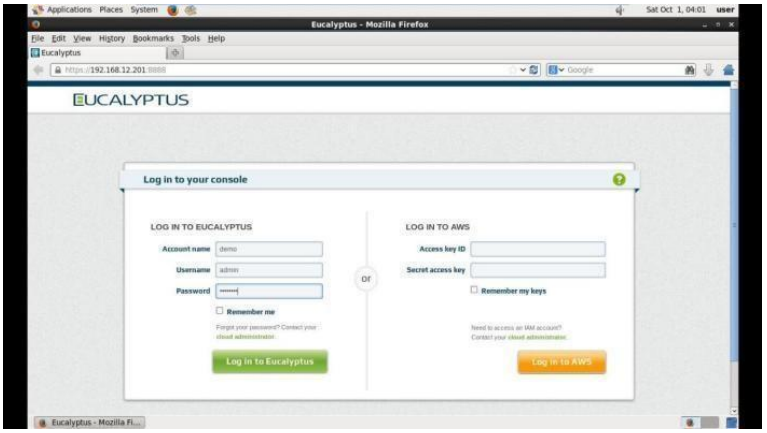
STEP 1:

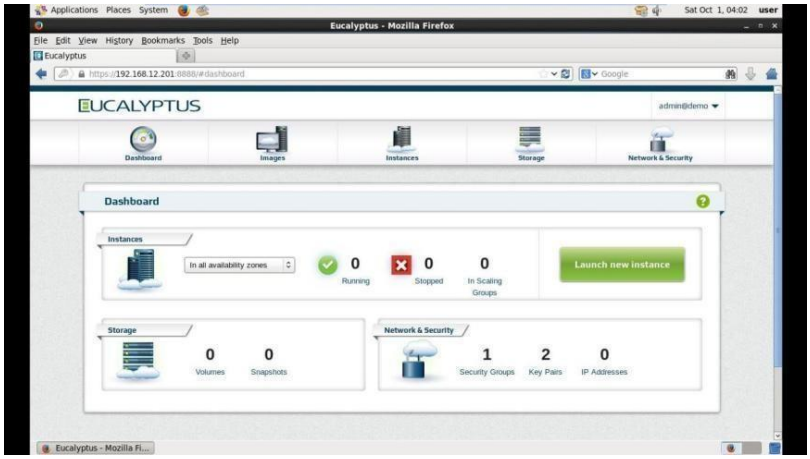
- Open Firefox and go to the URL-**"192.168.12.201:8888"**(Or) click the eucalyptus user console
- Click on **"I Understand the Risks"** and then click on **"AddException".**
- Click on **"Confirm SecurityException".**



STEP 2:

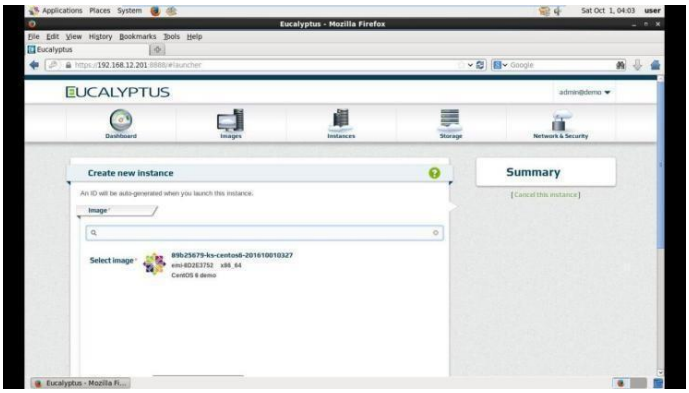
- Log into the Eucalyptus.
- Account name:demo; username: admin; password:password.
- Click on **"Launch new Instance.**

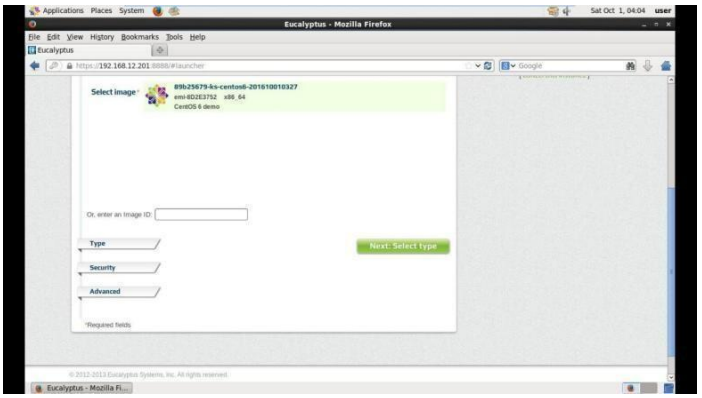




STEP 3:

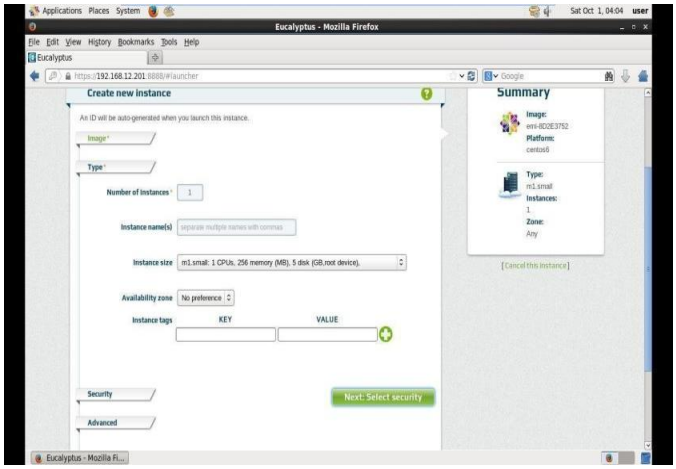
- Select the **"Image"** to be used.
- Click the "**Select Type**".

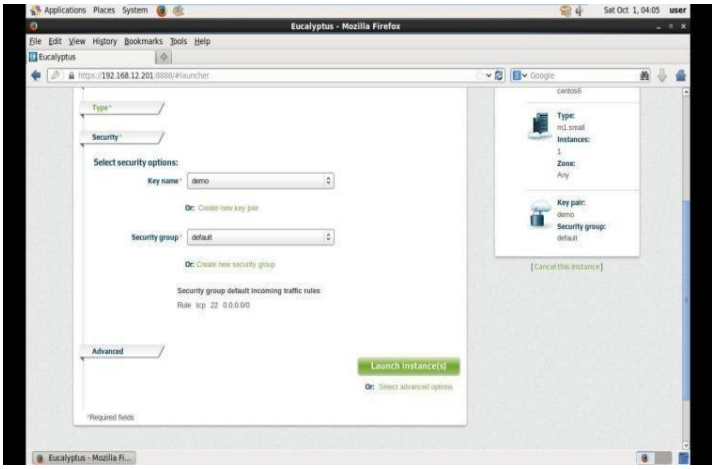




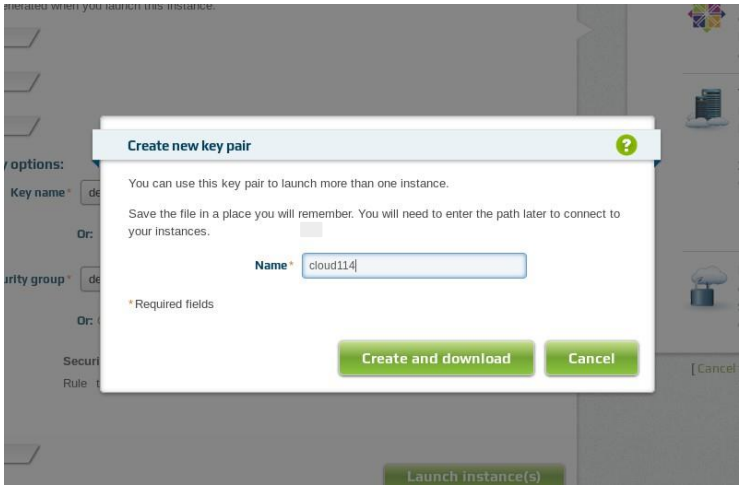
STEP 4:

- A New Window will be opened then click the "**Select Security**".

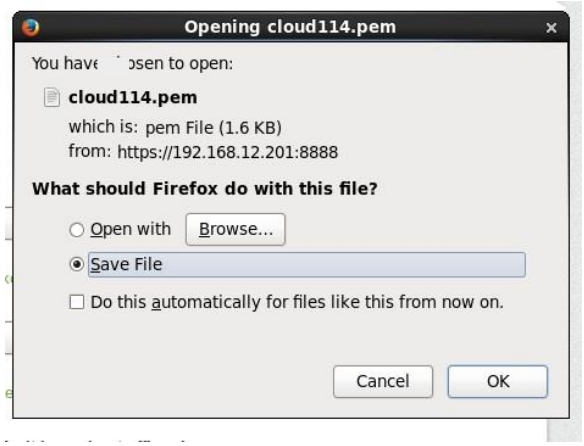


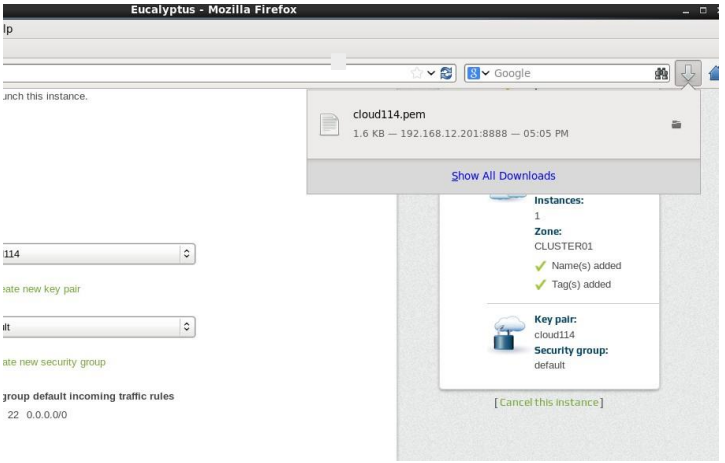


- Select the**"Create New Key Pair".**
- Give a **name** for your key pair and click on create and download and then on**"Save file".**



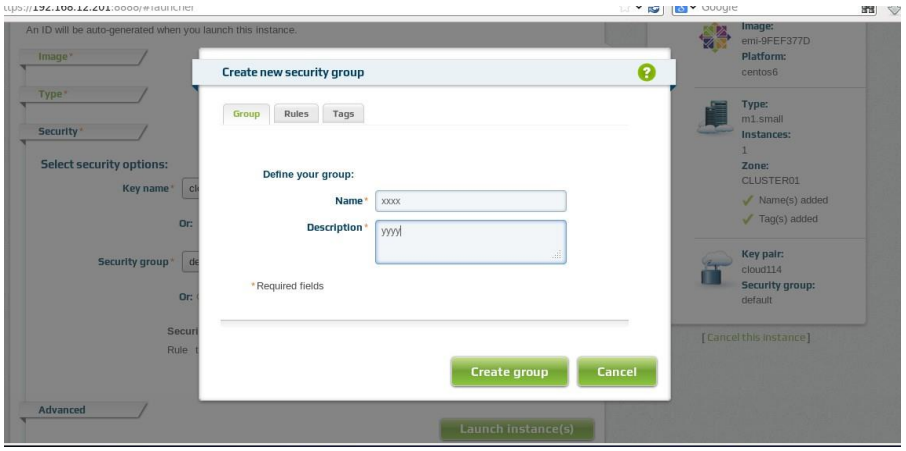
- **".pem File"** will appear on the window that appears.



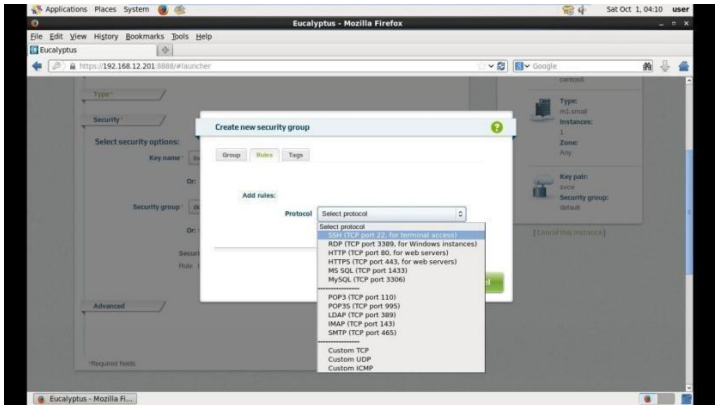


STEP 5:

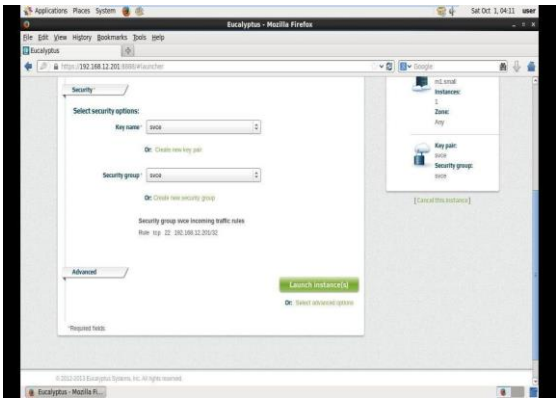
- Select the **"Create new Security Group".**
- Enter name as "**xxxx"** and description as **"yyyy".**

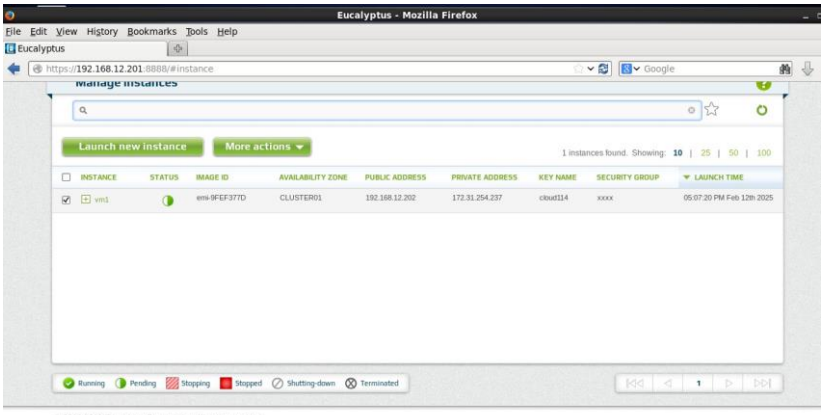


- Select "**Rules Tab"** and create a rule for the "**SSH protocol".**
- Enter IP address as **"192.168.12.202/32"(or)** click use **"my ip"** and click on **"CreateGroup".**



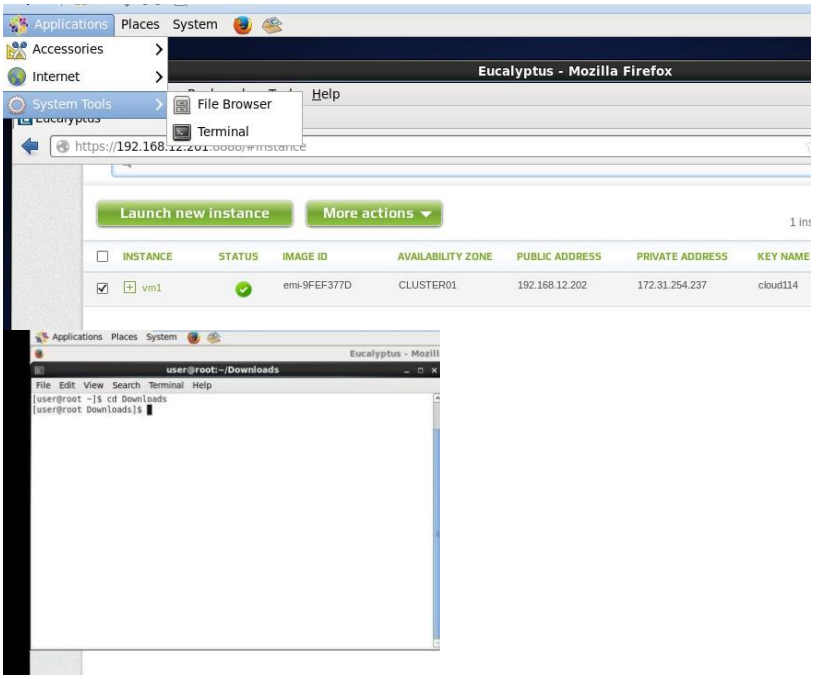
- Click on **"Launch Instance"** and wait for the instance for launching.





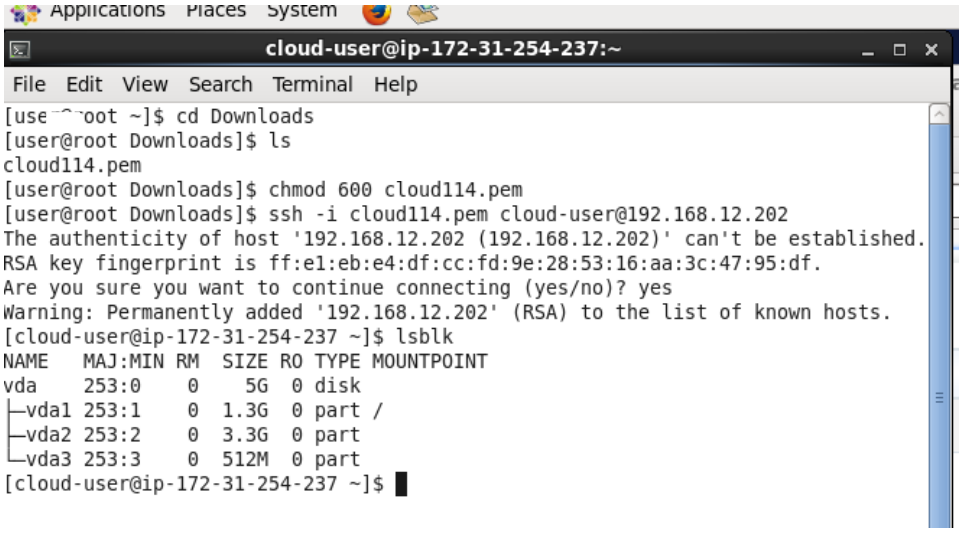
STEP 6:

- Open a new Terminal.



- Type the following:
    1. **cd Downloads.**
    2. **ls** (This list all the files from the downloads).
    3. **chmod 400 svce.pem.**
    4. **ssh -i svce.pemcloud-user@192.168.12.202**
    5. **lsblk**

SAMPLE INPUT AND OUTPUT:



RESULT:

Thus the virtual machine is created using different configurations in the cloud environment is executed and the output is verified successfully

CS22612 - CLOUD COMPUTING LABORATORY

EXP.NO: 5

DATE:

ATTACH A VIRTUAL BLOCK TO THE CREATED VIRTUAL MACHINE

AIM:

To attach a virtual block to the created virtual machine in the developed cloud environment.

PROCEDURE:

STEP-1:

- To create and attach the volume in the instance,go to **"Instance"** in the Eucalyptus**.**
- There will be two options in **"Instance"."Launch new instance"** and **"More actions"**.
- If you click **"More actions"**,it will show multiple options.
- Choose the **"Attach volume"** option.

STEP-2:

- It will open a new page to **"attach the new volume to instance"**.
- It will have two options: **"Launch Instance"** and **"Create volume"**.
- Choose the **"Create Volume"** option.

STEP-3:

- A New dialog box will appear in the Eucalyptus to create a new volume.
- In the General option, Name the volume as **"vm1".**
- Choose for **"Create from Snapshot?"** option as **"None"**.
- Give the volume size for the virtual block as **"2"**.The volume size will be taken in GB.
- Choose **"CLUSTER01"** from the Availability zone options.
- Click **"create volume"** to create a new volume in storage in the instance.

STEP-4:

- There is also another way to create and attach a virtual block. In this way,go to **"Storage".**
- The virtual blocks are created and stored as **"volume".**
- create a virtual block by clicking **"Create new volume"**

STEP-5:

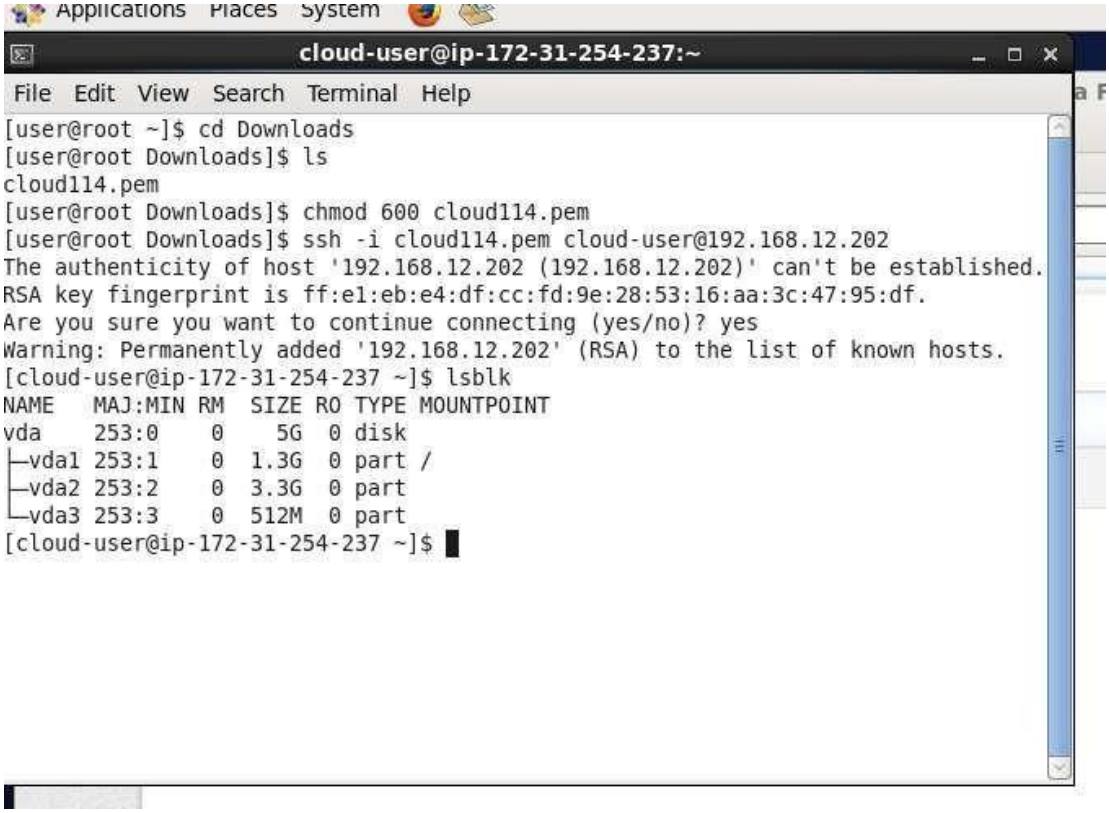
- A New dialog box will appear in the Eucalyptus to create a new volume.
- In the General option, Name the volume as **"vol1".**
- Choose for **"Create from Snapshot?"** option as **"None"**.
- Give the volume size for the virtual block as **"2"**.The volume size will be taken in GB.
- Choose **"CLUSTER01"** from the Availability zone options.
- Click **"create volume"** to create a new volume in storage.

- A new virtual block will be created as volume in the storage

STEP-6:

- Open a new Terminal.

- Type the following:
  1. **cd Downloads.**
  2. **ls** (This lists all the files from the downloads).
  3. **chmod 400 svce.pem.**
  4. **ssh -i svce.pemcloud-user@192.168.12.202**
  5. **lsblk**



RESULT:

The new virtual block is created and attached in the created virtual machine the cloud environment is executed and the output is verified successfully.

CS22612 - CLOUD COMPUTING LABORATORY

EXP.NO: 6

DATE:

SETUP AND CONFIGURATION OF SINGLE NODE HADOOP CLUSTER

AIM:

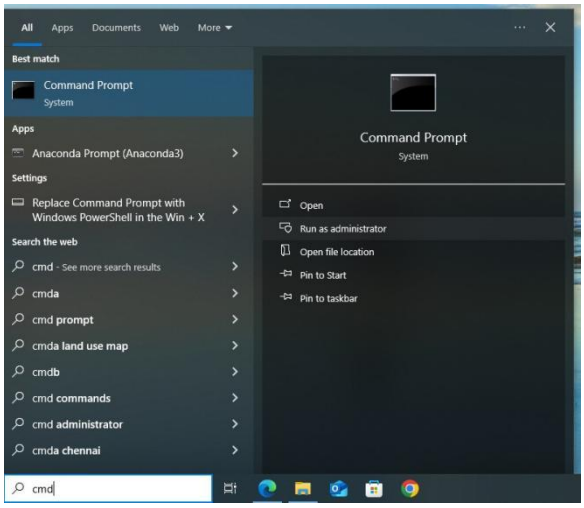
To create a setup and configuration of a single node hadoop cluster in the system environment.

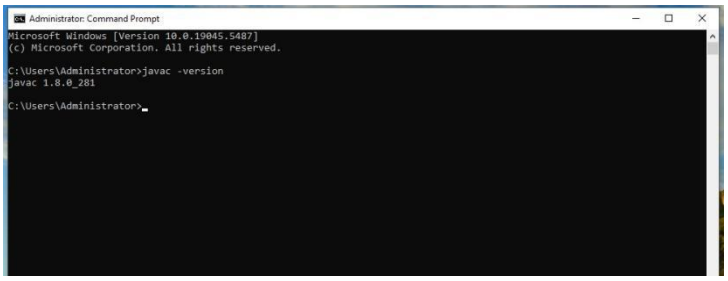
PROCEDURE:

SETUP:

STEP 1:

Check whether the java 1.8.0 version is already installed in the system or not by using **"javac -version"** command in the windows command prompt by running it as administrator.



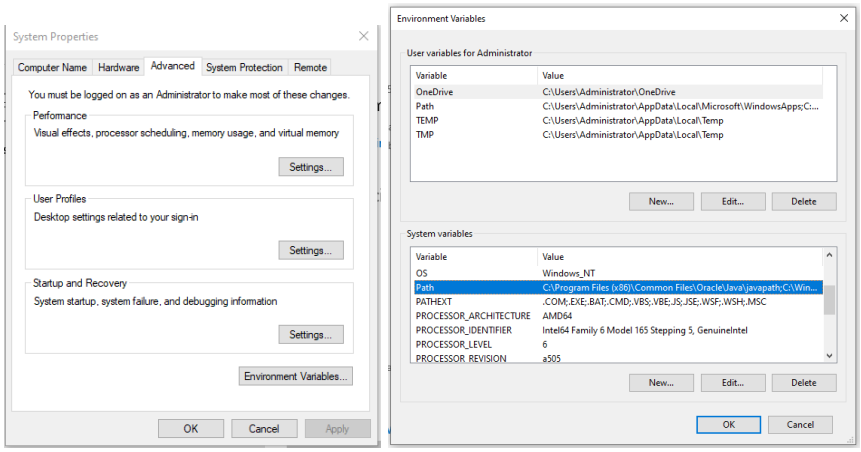


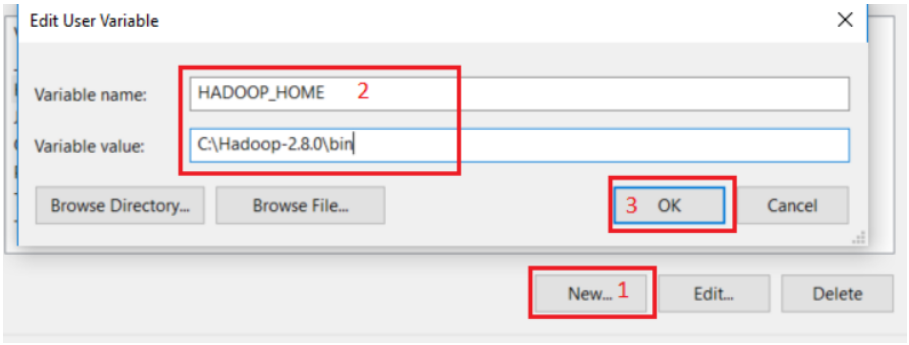
STEP 2:

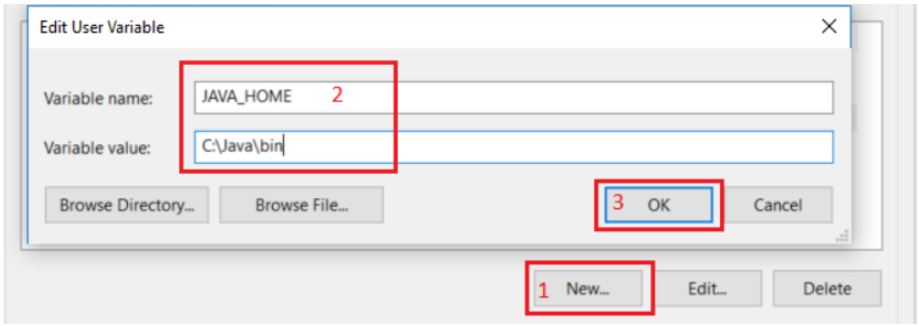
Then check Hadoop 2.8.0 is already installed in the system or not.If not install hadoop 2.8.0 version,you will get neither Hadoop 2.8.0.tar.gz or Hadoop-2.8.0.zip file in the system.Extract the file and place under **"C:\Hadoop-2.8.0"** path.

STEP 3:

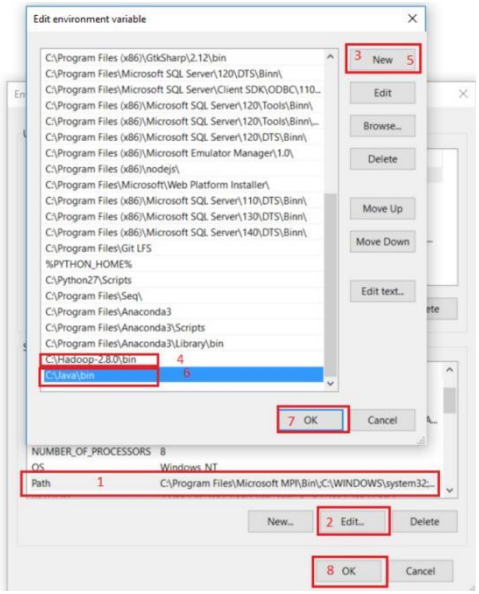
- Setup the path for HADOOP_HOME environment variable on the system from the hadoop bin directory path in the system variables.
- Setup the path for the JAVA_HOME environment variable on the system from the java bin directory path in the system variables.







- In the system variable, set up the new path for the hadoop bin directory path and java bin directory path in the system variables.

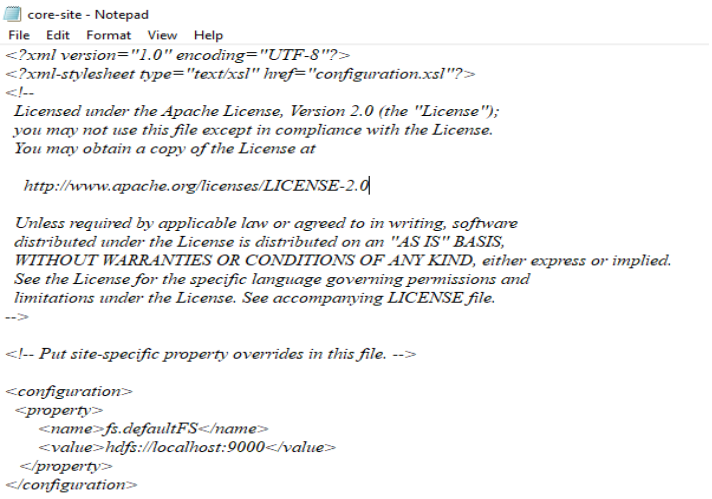


CONFIGURATION:

STEP 1:

Edit the **"core-site.xml"** file from the hadoop folder by adding the given xml paragraph and save the file.

```
<configuration>
        <property>
                <name>fs.defaultFS</name>
                <value>hdfs://localhost:9000</value>
        </property>
</configuration>
```



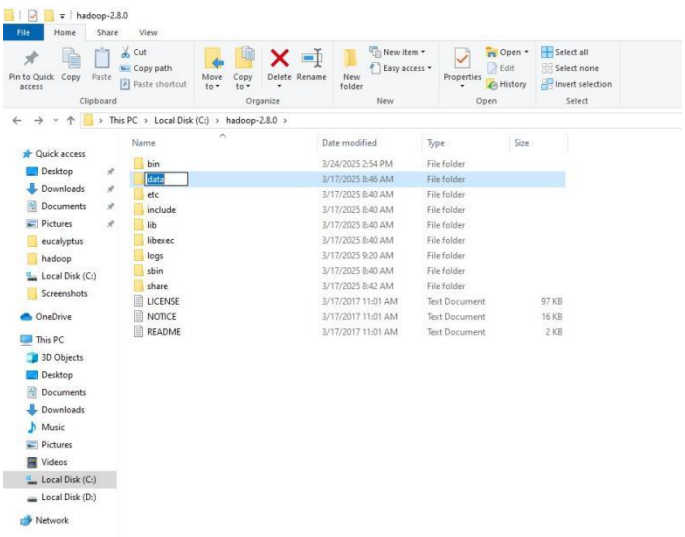
STEP 2:

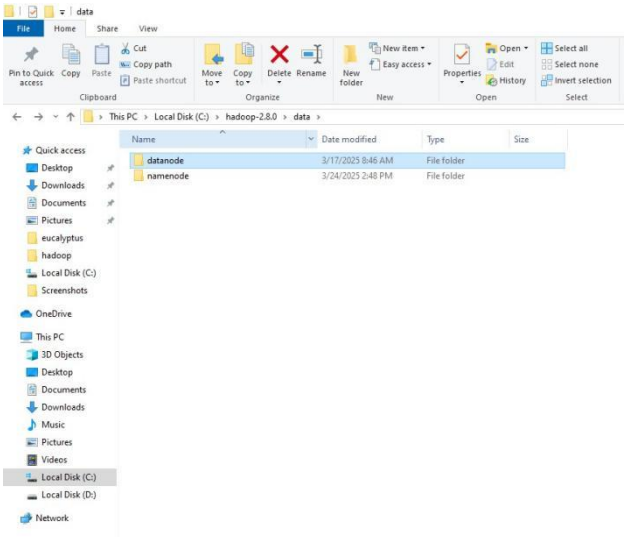
Rename **"mapred-site.xml.template"** to **"mapred-site.xml"** file from the hadoop folder and edit the file by adding the given xml paragraph and save the file.

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

STEP 3:

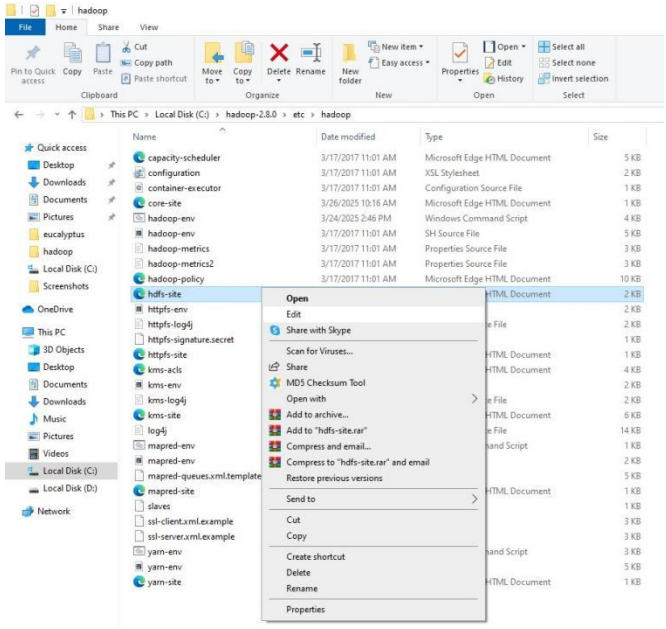
- Create folder **"data"** under **"C:\Hadoop-2.8.0".**
- Create folder **"datanode"** under **"C:\Hadoop-2.8.0\data"**
- Create folder **"namenode"** under **"C:\Hadoop-2.8.0\data"**





STEP 4:

Edit the **"hdfs-site.xml"** file from the hadoop folder by adding the given xml paragraph and save the file.

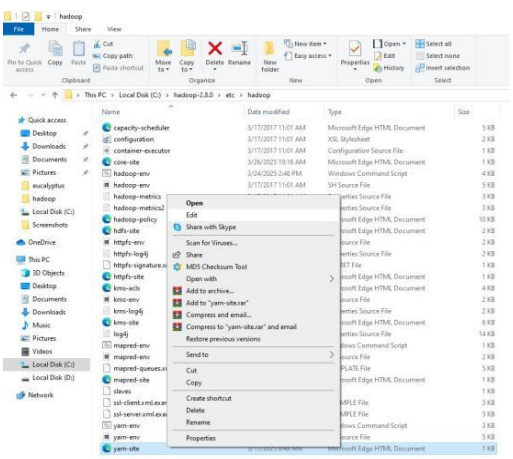


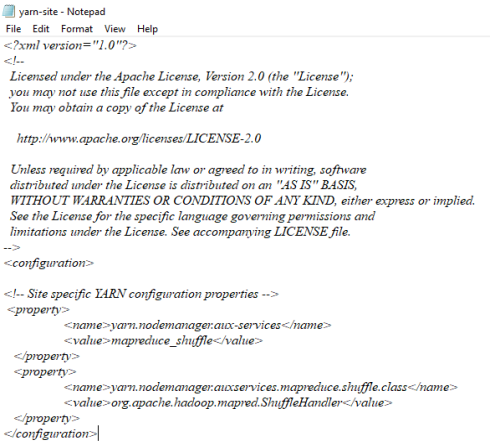

```
<configuration>
        <property>
                <name>dfs.replication</name>
                <value>1</value>
        </property>
        <property>
                <name>dfs.namenode.name.dir</name>
                <value>/hadoop-2.8.0/data/namenode</value>
        </property>
        <property>
                <name>dfs.datanode.data.dir</name>
                <value>/hadoop-2.8.0/data/datanode</value>
        </property>
</configuration>
```

STEP 5:

Edit the **"yarn-site.xml"** file from the hadoop folder by adding the given xml paragraph and save the file.

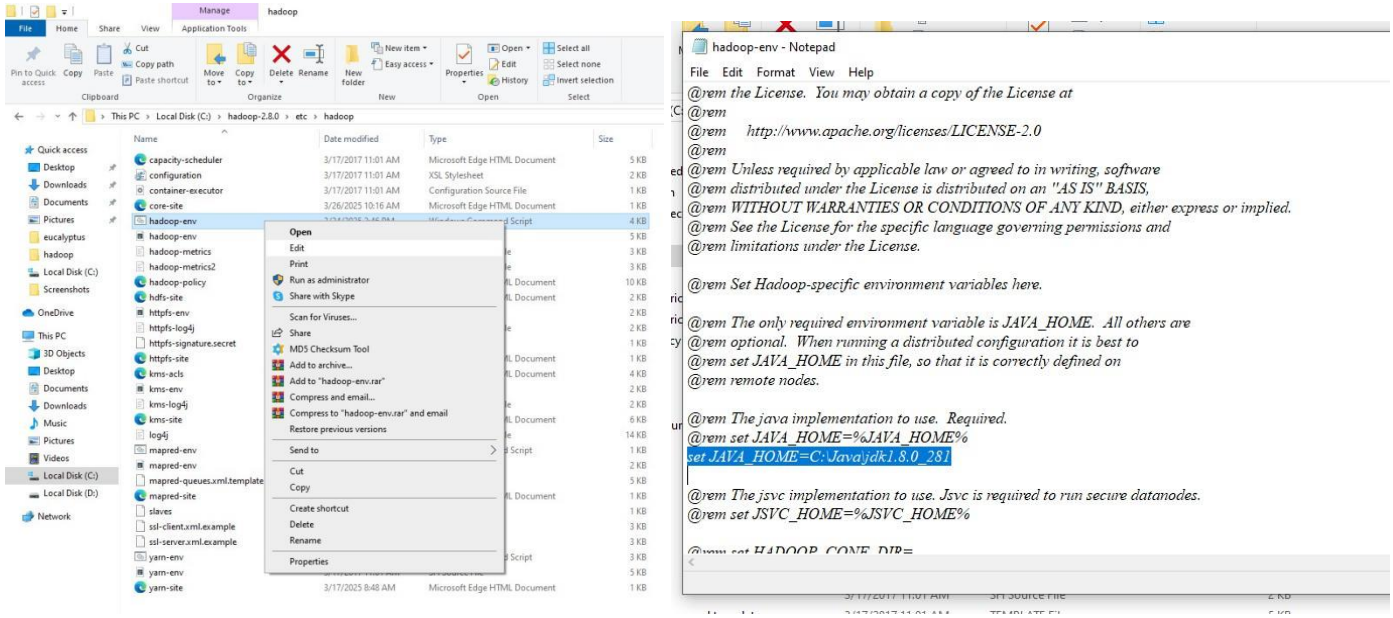
```
<configuration>
  <property>
        <name>yarn.nodemanager.aux-services</name>
        <value>mapreduce_shuffle</value>
  </property>
  <property>
        <name>yarn.nodemanager.auxservices.mapreduce.shuffle.class</name>
        <value>org.apache.hadoop.mapred.ShuffleHandler</value>
  </property>
</configuration>
```





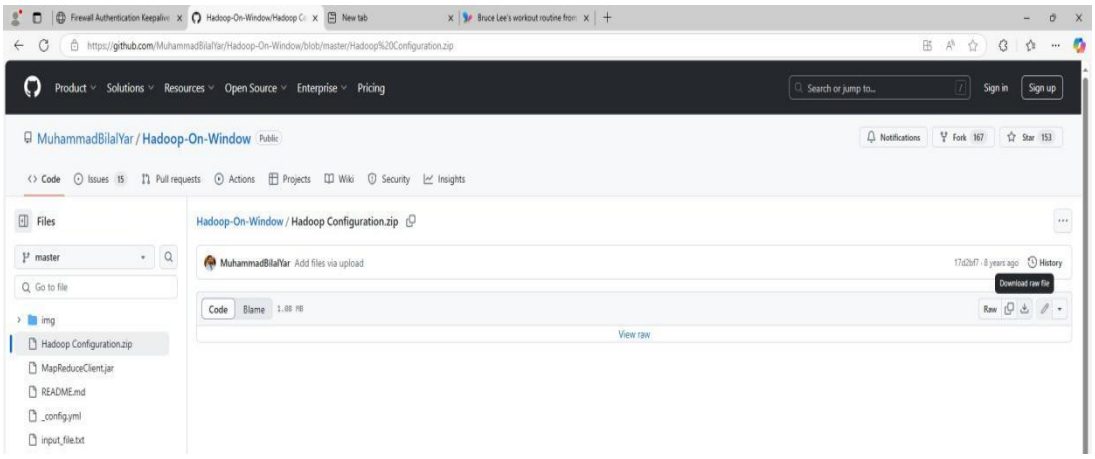
STEP 6:

- Edit the file **"hadoop-env.cmd"** by closing the command line **"JAVA_HOME=%JAVA_HOME%"** instead of set **"JAVA_HOME=C:\Java\jdk1.8.0_281".**

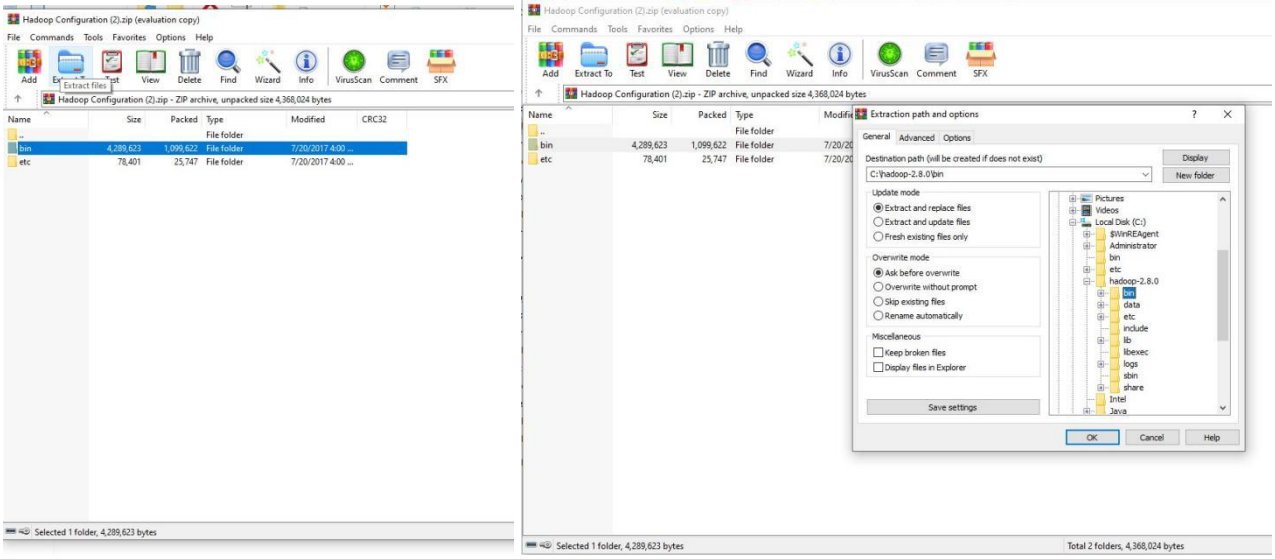


STEP 7:

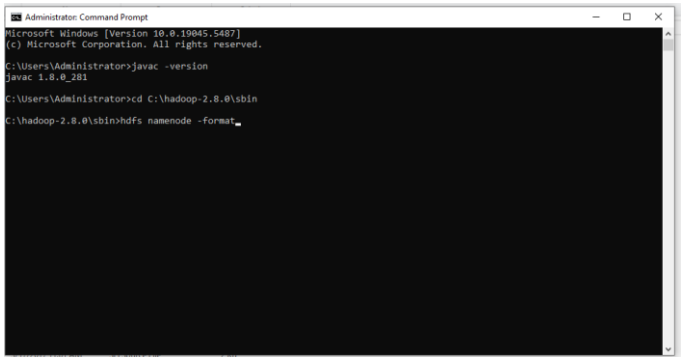
- For hadoop configuration,Download file Hadoop Configuration.zip.

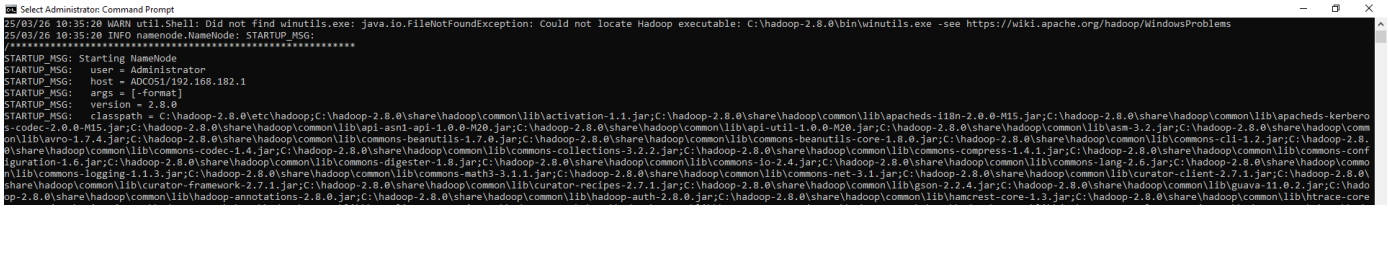


- Delete the file bin from Hadoop-2.8.0 folder then replace it by bin on file by downloading it and extracting it from Hadoop Configuration.zip.

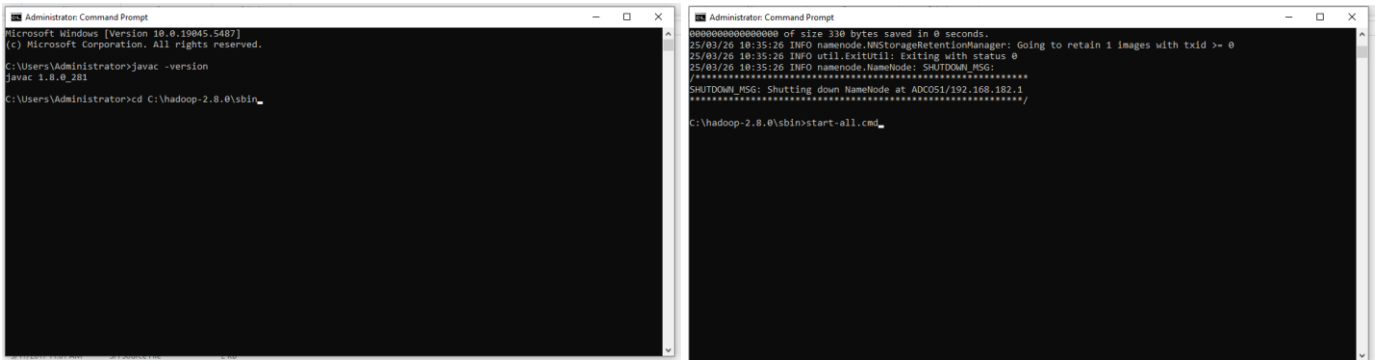


- Open cmd from the sbin folder from hadoop 2.8.0 folder and type the command **"hdfs namenode –format"** .

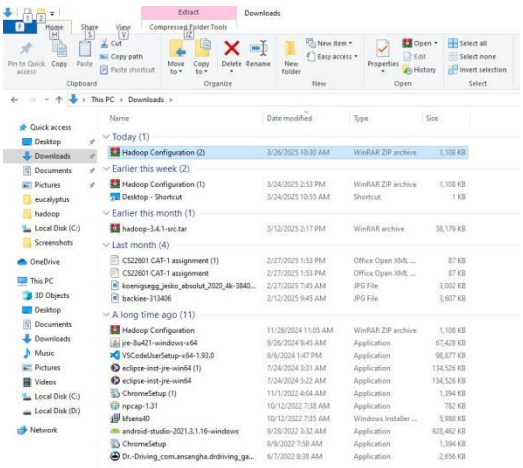


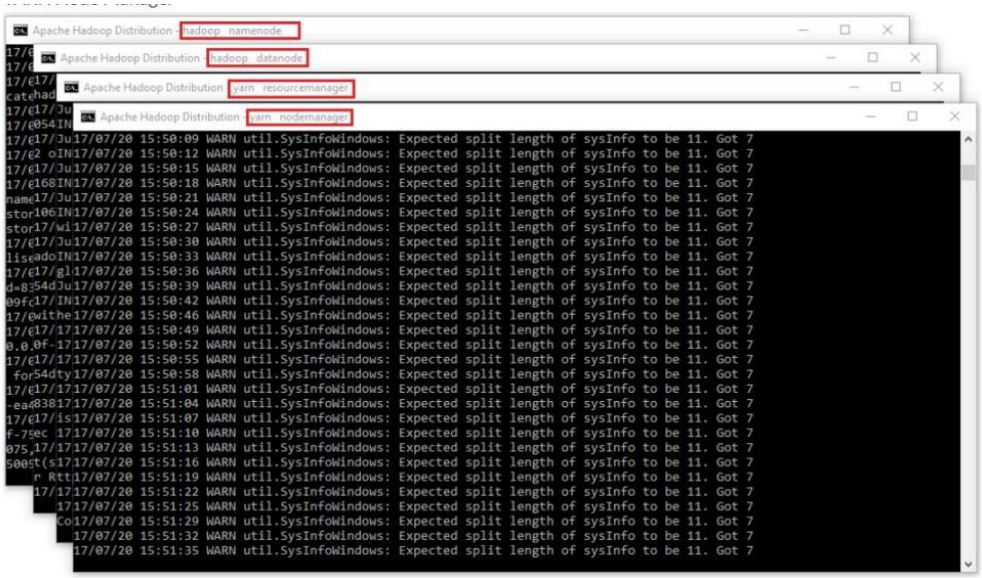


- Open cmd and change directory to "C:\Hadoop-2.8.0\sbin" and type **"start-all.cmd"** to start apache.



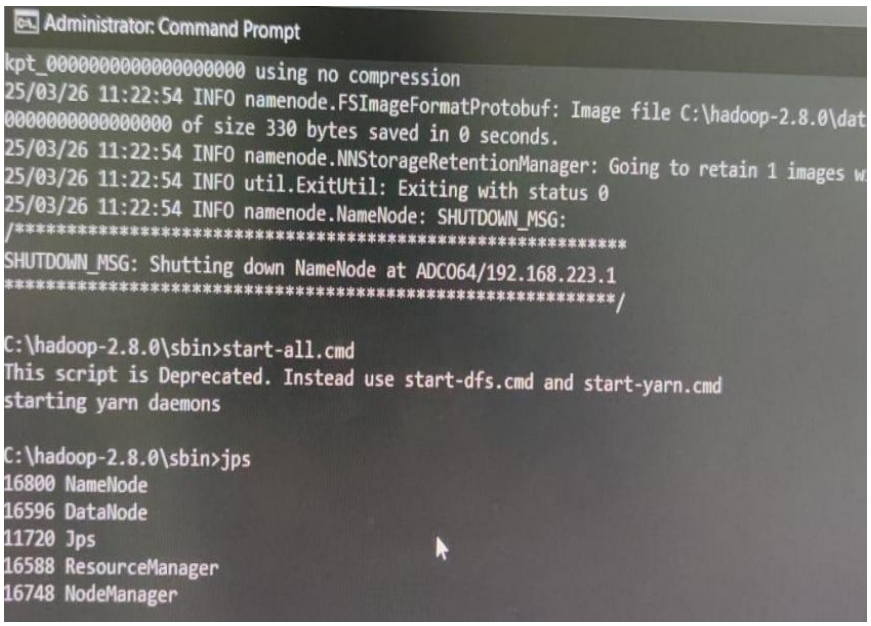
- Make sure these apps are running
  - Hadoop NameNode
  - Hadoop DataNode
  - YARN Resource Manager
  - YARN Node Manager





SAMPLE INPUT AND OUTPUT:

Give the **"jps"** in the administrator command prompt.you will get the output for every apps in the apache



RESULT:

The creation, setup and configuration of a single node hadoop cluster in the system environment was executed successfully.

CS22612 - CLOUD COMPUTING LABORATORY

EXP.NO: 7

DATE:

API'S OF HADOOP AND DISPLAY THE CONTENT OF FILE

AIM:

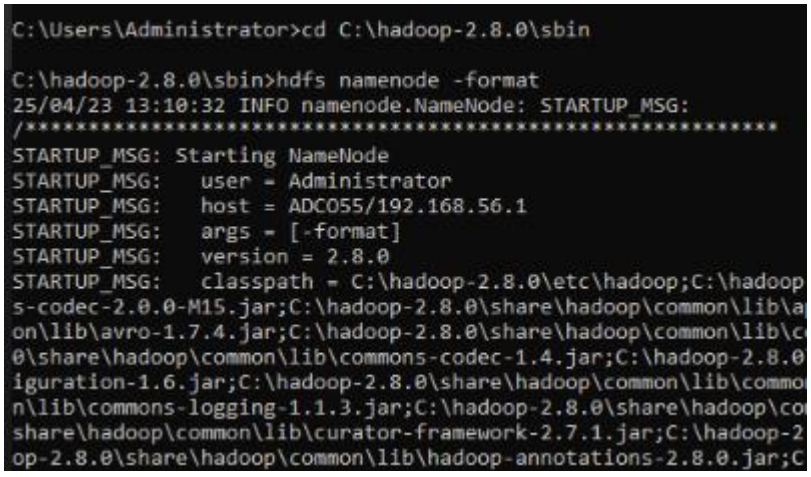
To create Api's of hadoop and display the content of file

ALGORITHM:

1. Import necessary Hadoop libraries.
2. Create a Hadoop Configuration object.
3. Connect to HDFS using a FileSystem object.
4. Specify the HDFS file path you want to read.
5. Open the file from HDFS.
6. Read the content line by line.
7. Display the content to the user.
8. Close the opened file and connection properly.

PROCEDURE:

1. Ensure that Hadoop and Java are properly installed and configured



2. Start all Hadoop services using start-all.cmd and verify with jps that services are running (NameNode, DataNode, ResourceManager, NodeManager).

```
C:\hadoop-2.8.0\sbin>start-all.cmd
This script is Deprecated. Instead use start-dfs.cmd and start-yarn.cmd
starting yarn daemons

C:\hadoop-2.8.0\sbin>jps
11396 NameNode
2596 NodeManager
9252 ResourceManager
10712 Jps
9608 DataNode
```

3. Create a new Java project and add Hadoop libraries (hadoop-common, hadoop-hdfs) to the build path

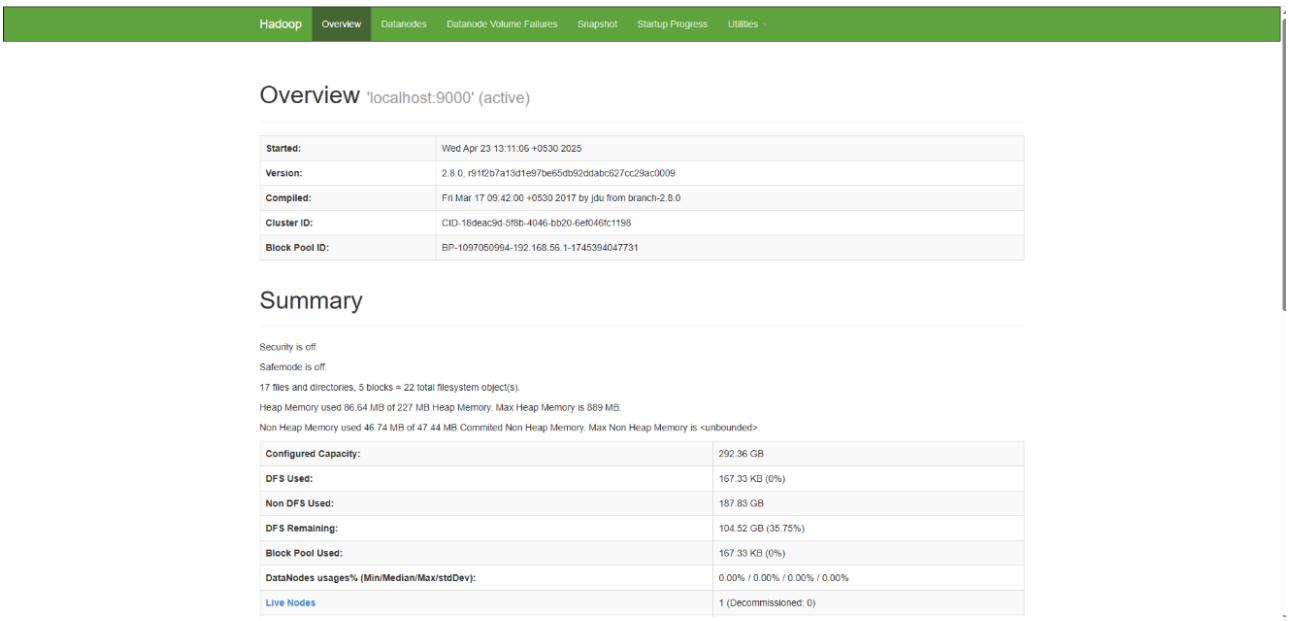
```
C:\hadoop-2.8.0\sbin>hadoop fs -mkdir /input20

C:\hadoop-2.8.0\sbin>hadoop fs -put C:\new.txt /input20
```

.

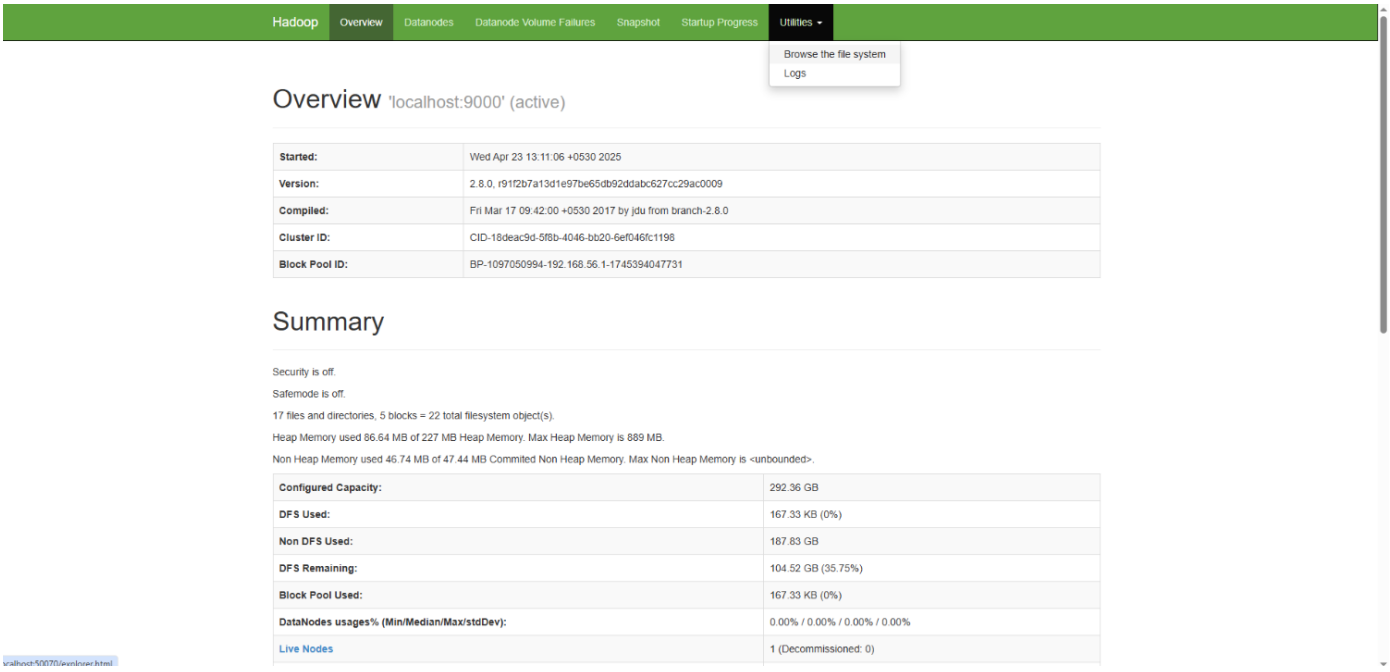
4. Initialize a Hadoop Configuration object with the HDFS URI (e.g., hdfs://localhost:9000).

```
C:\hadoop-2.8.0\sbin>hdfs dfs -cat /input20/new.txt
CSE
SVCE
CSE
EEE
```

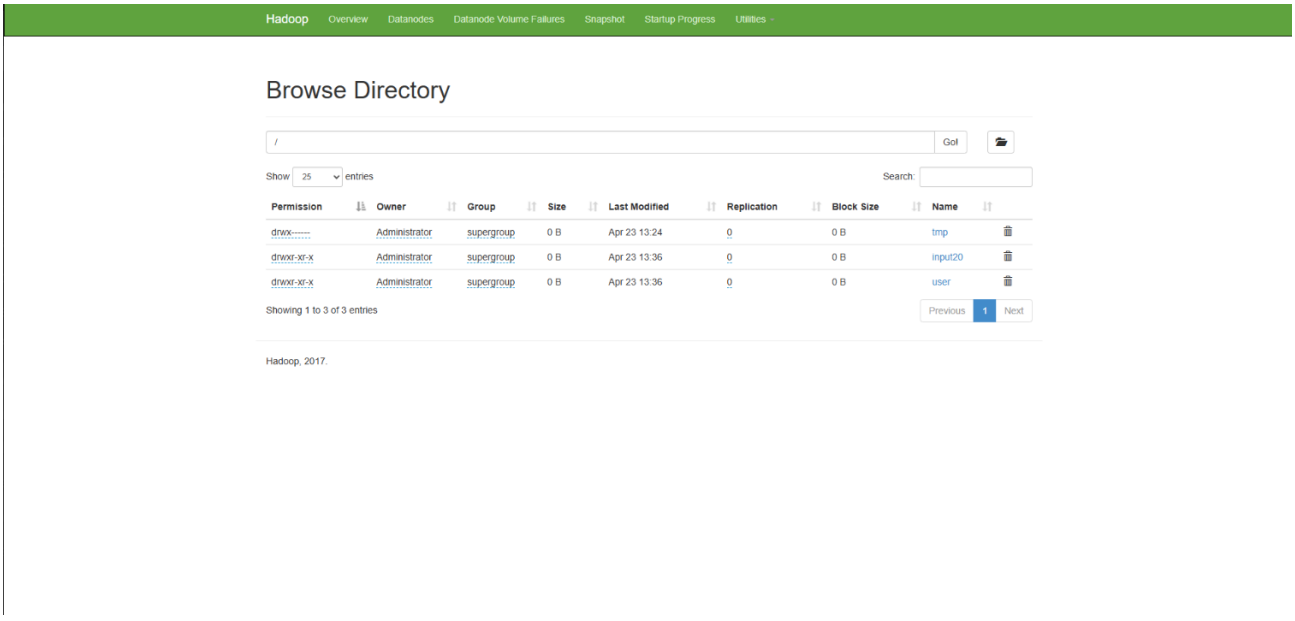
5. Use the FileSystem class to connect to the Hadoop Distributed File System (HDFS).

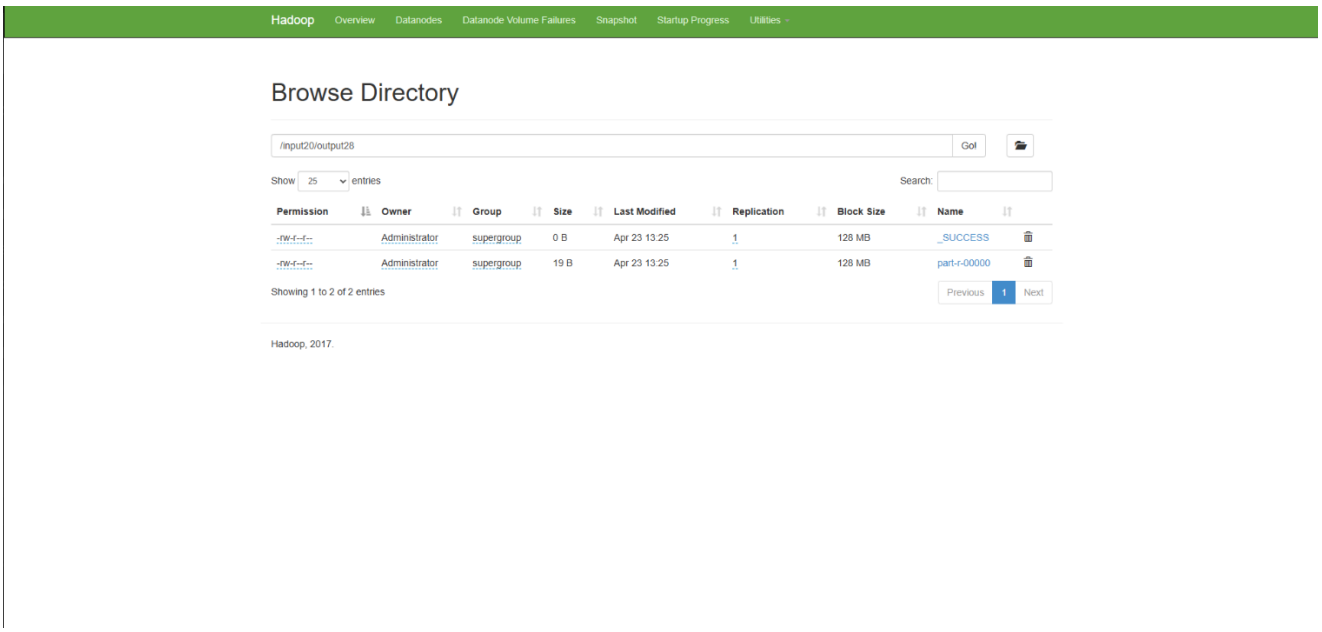


6. Specify the file path in HDFS that you want to access.

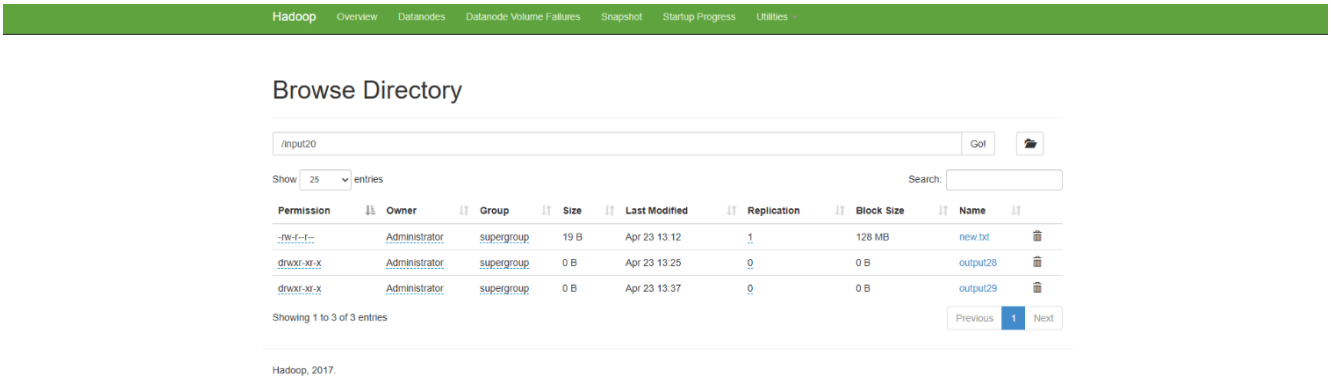


7. Open an input stream to the specified file from HDFS.

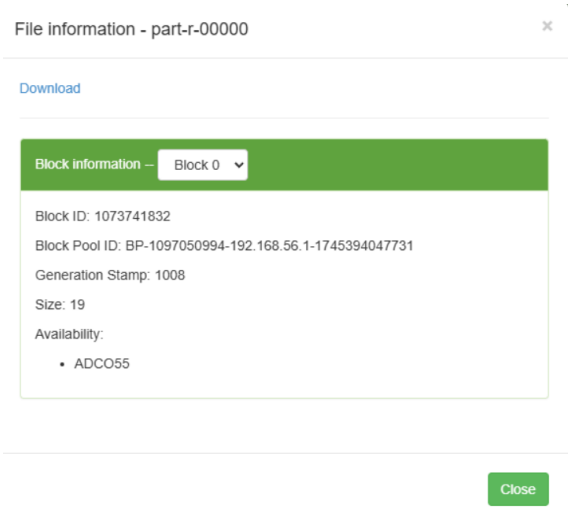


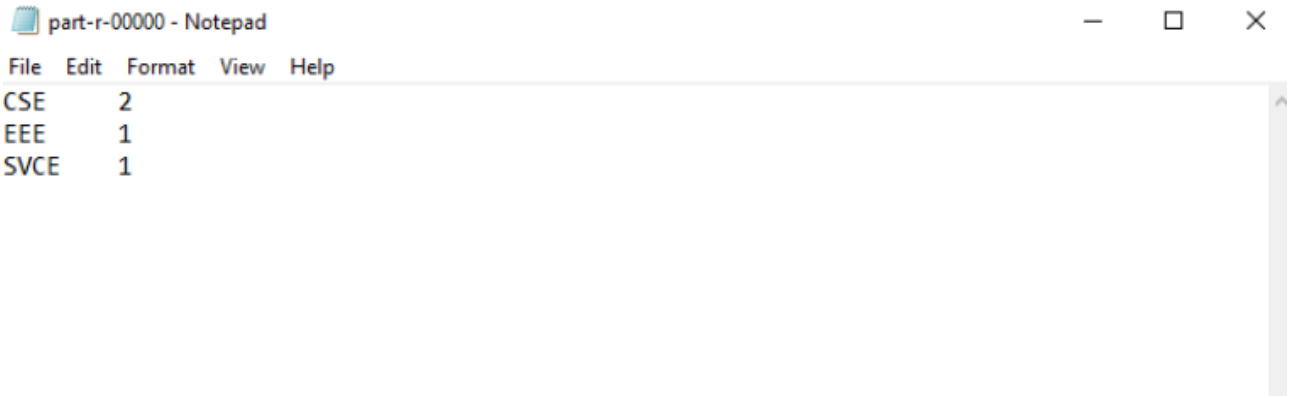


8. Read the file's contents line by line using a reader.



9. Display each line to the console or output screen.





10. After reading, close the input stream and the file system connection.

RESULT:

The creation of api's of hadoop and print the content of file was implemented successfully.

CS22612 - CLOUD COMPUTING LABORATORY

EXP.NO: 8

DATE:

WORDCOUNT PROGRAM TO DEMONSTRATE THE USE OF MAP AND REDUCE TASKS

AIM:

To create wordcount program to demonstrate the use of map and reduce tasks

ALGORITHM:

1. Import the required Hadoop libraries for MapReduce.
2. Create a Mapper class:
    - Read the input data line by line.
    - Split each line into words.
    - For each word, output (word, 1) as key-value pair.
3. Create a Reducer class:
    - Take all values associated with the same key (word).
    - Sum all the counts for each word.
    - Output (word, total_count) as the final key-value pair.
4. Create a Driver class:
    - Configure the job with the Mapper, Reducer, and input/output file paths.
    - Submit the job to the Hadoop cluster.
5. View the output file in HDFS where each word and its count are listed.

PROCEDURE:

1. Ensure Hadoop is properly installed and configured on your system.
2. Start all the Hadoop services using start-all.cmd and verify they are running using the jps command.

```
C:\hadoop-2.8.0\sbin>start-all.cmd
This script is Deprecated. Instead use start-dfs.cmd and start-yarn.cmd
starting yarn daemons

C:\hadoop-2.8.0\sbin>jps
11396 NameNode
2596 NodeManager
9252 ResourceManager
10712 Jps
9608 DataNode
```

3. Create a new Java project and add necessary Hadoop libraries (hadoop-common, hadoop-mapreduce-client-core, hadoop-hdfs) to the build path.

```
C:\hadoop-2.8.0\sbin>hadoop fs -mkdir /input20
```

4. Define a Mapper class that processes each line of input and emits words with count 1.
5. Define a Reducer class that aggregates the counts for each word.
6. Define a Driver class to set up the job:
    - Set input and output formats.
    - Specify Mapper and Reducer classes.
    - Define input and output paths in HDFS.
7. Compile the Java classes into a .jar file.

```
C:\hadoop-2.8.0\sbin>hadoop jar "C:\hadoop-2.8.0\share\hadoop\mapreduce\hadoop-mapreduce-examples-2.8.0.jar" wordcount /input20/new.txt /input20
25/04/23 13:24:48 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0:8032
25/04/23 13:24:48 INFO input.FileInputFormat: Total input files to process : 1
25/04/23 13:24:49 INFO mapreduce.JobSubmitter: number of splits:1
25/04/23 13:24:49 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1745394057461_0001
25/04/23 13:24:49 INFO impl.YarnClientImpl: Submitted application application_1745394057461_0001
25/04/23 13:24:50 INFO mapreduce.Job: The url to track the job: http://ADCO55:8088/proxy/application_1745394057461_0001/
25/04/23 13:24:50 INFO mapreduce.Job: Running job: job_1745394057461_0001
25/04/23 13:24:56 INFO mapreduce.Job: Job job_1745394057461_0001 running in uber mode : false
25/04/23 13:24:56 INFO mapreduce.Job:  map 0% reduce 0%
25/04/23 13:25:05 INFO mapreduce.Job:  map 100% reduce 0%
25/04/23 13:25:14 INFO mapreduce.Job:  map 100% reduce 100%
25/04/23 13:25:15 INFO mapreduce.Job: Job job_1745394057461_0001 completed successfully
25/04/23 13:25:15 INFO mapreduce.Job: Counters: 49
        File System Counters
```

8. Upload the input file to HDFS using the hdfs dfs -put command.

```
C:\hadoop-2.8.0\sbin>hadoop fs -put C:\new.txt /input20
```

9. Execute the MapReduce job using hadoop jar command.

10. After the job completes, check the output folder in HDFS to see the word counts.

SAMPLE INPUT AND OUTPUT:

```
C:\hadoop-2.8.0\sbin>hdfs dfs -cat /input20/output28/*
CSE     2
EEE     1
SVCE    1
```

RESULT:

The wordcount program to demonstrate the use of map and reduce tasks is implemented successfully.

CS22612 - CLOUD COMPUTING LABORATORY

EXP.NO: 9

DATE:

GREP PROGRAM TO DEMONSTRATE THE USE OF MAP AND REDUCE TASKS

AIM:

To create a grep program to demonstrate the use of Map and Reduce tasks.

ALGORITHM

1. Import required Hadoop libraries for MapReduce.
2. Create a Mapper class:
   - Read input data line by line.
   - Search for a specific pattern (word or text) in each line.
   - If the pattern matches, output the matching line or relevant part with a count value.
3. Create a Reducer class:
   - Collect all matched outputs.
   - Aggregate or simply pass them forward (optional depending on the requirement).
4. Create a Driver class:
   - Set up the configuration for the Mapper and Reducer.
   - Specify the input file path and output directory in HDFS.
   - Submit the job to the Hadoop cluster.
5. Check the output directory for lines that match the search pattern.

PROCEDURE:

1. Make sure Hadoop and Java are installed and configured properly in your system.
2. Start all Hadoop services (start-all.cmd) and verify with jps that NameNode, DataNode, ResourceManager, and NodeManager are running.

```
C:\hadoop-2.8.0\sbin>start-all.cmd
This script is Deprecated. Instead use start-dfs.cmd and start-yarn.cmd
starting yarn daemons
```

3. Create a new Java project and add Hadoop libraries (hadoop-common, hadoop-mapreduce-client-core, hadoop-hdfs) to the project build path.

```
C:\hadoop-2.8.0\sbin>jps
11396 NameNode
2596 NodeManager
9252 ResourceManager
10712 Jps
9608 DataNode
```

4. Define a Mapper class that:
   - Reads each line from the input.
   - Searches for the specified pattern.
   - Emits the line or part of the line if the pattern is found.
5. Define a Reducer class (optional) to aggregate the matched lines if necessary. Define a Driver class to configure:
   - Input and output formats.
   - Mapper and Reducer classes.
   - Set the input and output paths in HDFS.
6. Compile the Java program into a .jar file.

```
C:\hadoop-2.8.0\sbin>hadoop jar "C:\hadoop-2.8.0\share\hadoop\mapreduce\hadoop-mapreduce-examples-2.8.0.jar" grep /input20/new.txt /input20/output29 [SVCE]
25/04/23 13:36:20 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0:8032
25/04/23 13:36:21 INFO input.FileInputFormat: Total input files to process : 1
25/04/23 13:36:21 INFO mapreduce.JobSubmitter: number of splits:1
25/04/23 13:36:21 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1745394057461_0002
25/04/23 13:36:22 INFO impl.YarnClientImpl: Submitted application application_1745394057461_0002
25/04/23 13:36:22 INFO mapreduce.Job: The url to track the job: http://ADCO55:8088/proxy/application_1745394057461_0002/
25/04/23 13:36:22 INFO mapreduce.Job: Running job: job_1745394057461_0002
25/04/23 13:36:27 INFO mapreduce.Job: Job job_1745394057461_0002 running in uber mode : false
25/04/23 13:36:27 INFO mapreduce.Job:  map 0% reduce 0%
25/04/23 13:36:36 INFO mapreduce.Job:  map 100% reduce 0%
25/04/23 13:36:46 INFO mapreduce.Job:  map 100% reduce 100%
25/04/23 13:36:46 INFO mapreduce.Job: Job job_1745394057461_0002 completed successfully
25/04/23 13:36:46 INFO mapreduce.Job: Counters: 49
        File System Counters
```

7. Upload the input text file into HDFS using hdfs dfs -put command.

```
C:\hadoop-2.8.0\sbin>hadoop fs -mkdir /input20

C:\hadoop-2.8.0\sbin>hadoop fs -put C:\new.txt /input20

C:\hadoop-2.8.0\sbin>hdfs dfs -cat /input20/new.txt
CSE
SVCE
CSE
EEE
```

8. Run the MapReduce Grep job using the hadoop jar command.

9. After successful execution, view the output folder in HDFS to see the matched lines.

SAMPLE INPUT AND OUTPUT:

```
C:\hadoop-2.8.0\sbin>hdfs dfs -cat /input20/output29/
6       E
3       S
3       C
1       V
```

RESULT:

The grep program to demonstrate the use of Map and Reduce tasks is implemented successfully

CS22612-CLOUD COMPUTING LABORATORY

EXP.NO: 10 **VIRTUAL MACHINE MIGRATION BETWEEN NODES IN A VIRTUALIZED ENVIRONMENT**

DATE:

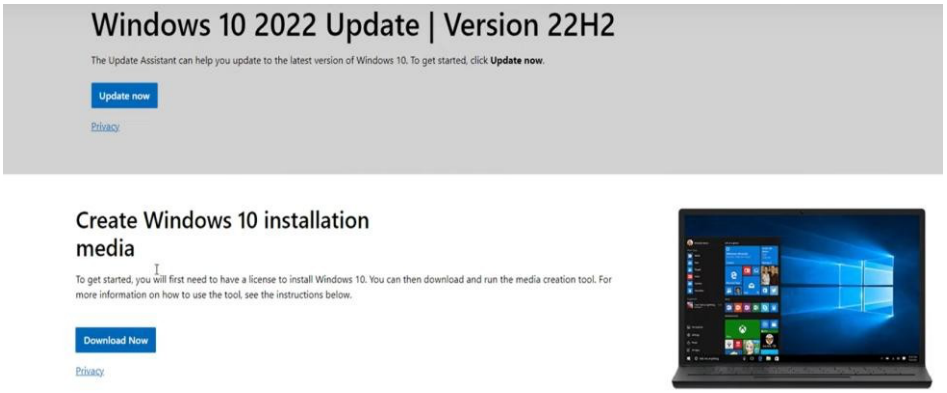
AIM:

To implement virtual machine migration between nodes in a virtualized environment.

PROCEDURE:

1) Download and install VirtualBox and its extension packages on the system.

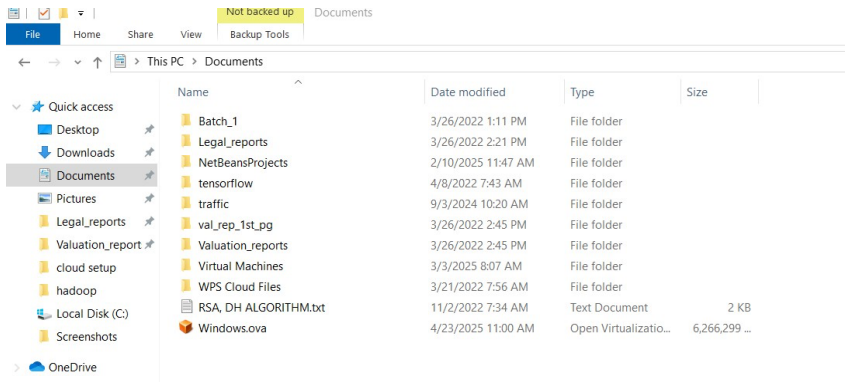
2) Download the Windows iso image to the system.



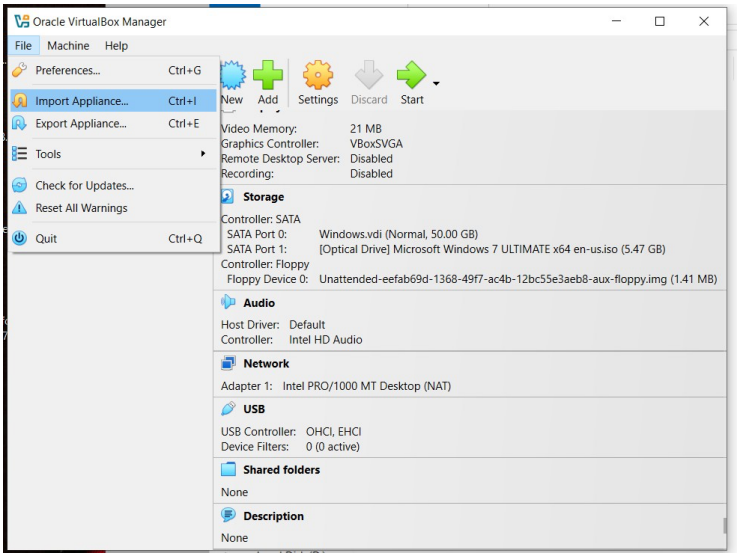
3) Create a new virtual machine for Windows in VirtualBox by fixing disk size, memory and processors for the virtual machine.

4) After the virtual machine for Windows is created, power off the virtual machine.

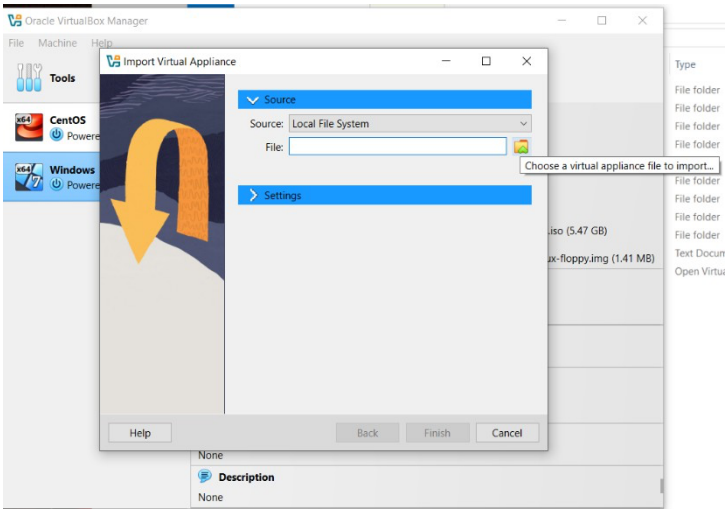
5) Click **Windows** virtual machine in VirtualBox, then click the file option in VirtualBox, it will show multiple options, click "**Export Application**" to export the virtual machine in VirtualBox to the system as a **".ova"** file.



6) Click the file option in Virtual Box, and it will show multiple options. Click "**Import Application**" to import a virtual machine from the system to VirtualBox.



7) It will open a new page to import a virtual application. On that page, goto "**Source**" and choose the file of the virtual machine for VirtualBox, which will be stored as **".ova"** file.



8) After choosing the file, click **"Finish"** to import the virtual application from the system toVirtualBox.The virtual application will be migrated from the system to a VirtualBox environment.

RESULT:

Thus the implementation of virtual machine migration between nodes in a virtualized environment

is executed, and the output is verified successfully.

CS22612-CLOUD COMPUTING LABORATORY

EXP.NO: 11 **PROCEDURES FOR INSTALLING AND INTERACTING WITH A STORAGE CONTROLLER IN VIRTUAL BOX**

DATE:

AIM:

To implement the procedures for installing and interfacing with a storage controller in VirtualBox.

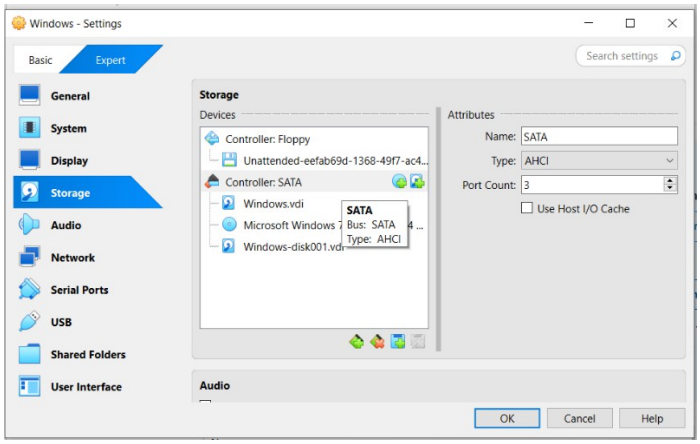
PROCEDURE:

1) Check whether VirtualBoxand its extension packages then the Windows iso image is downloaded and installed on the system.

2) Create a virtual machine for Windows in VirtualBox. In VirtualBox,select the **Windows virtual machine**, then go to **File > Export Appliance**, and export it to your system as a **".ova" file**.

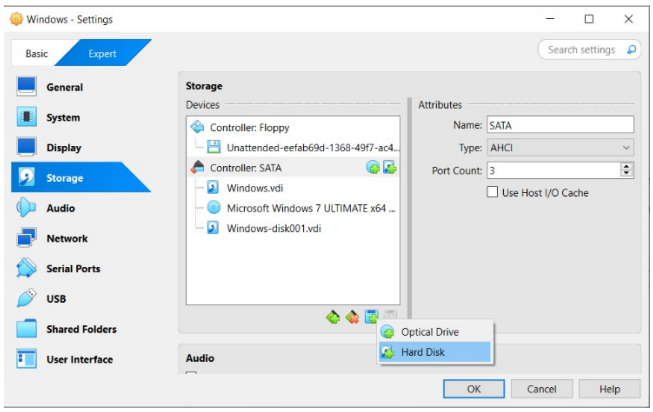
3) InVirtualBox, goto **File>ImportAppliance**,then select the **".ova" file** from your system to import the virtual machine.

4) Interact with the storage controller of the virtual machine by going to the settings then selected virtual machine, then going to the storage option.

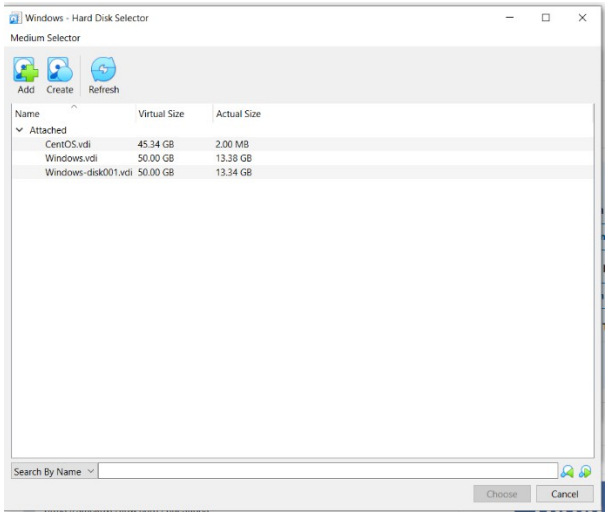


5) The storage controller used in this system is **SATA** with bus type **AHCI** then 3 ports are connected with the storage controller.

6) The type of storage used for the virtual machine can be altered using the storage controller by clicking the disk icon in the storage settings. It will give two options: **Optical drive** and **Hard disk.** If the user need to use system memory for the virtual machine, the user can choose **Hard Disk**.



7) By clicking the hard disk option, it will open a new page named **Hard Disk Selector.** This page will show the media available in the system that can be used for storage for the virtual machine. The user can add, create and refresh the medium for storage(The medium is stored as **".vdi"** files)



RESULT:

Thus, the implementation of the procedures for installing and interfacing with a storage controller in VirtualBox is executed, and the output is verified successfully.

CS22612 - CLOUD COMPUTING LABORATORY

EXP.NO: 12 **INSTALLATION AND EXECUTION OF A SAMPLE PROGRAM IN A C COMPILER IN A VIRTUAL MACHINE**

DATE:

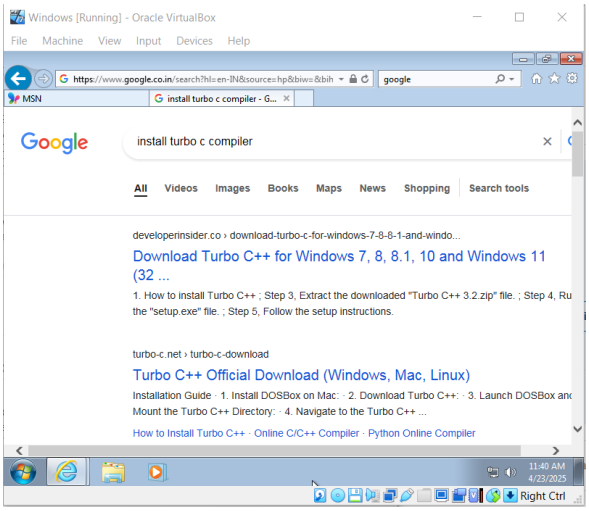
AIM:

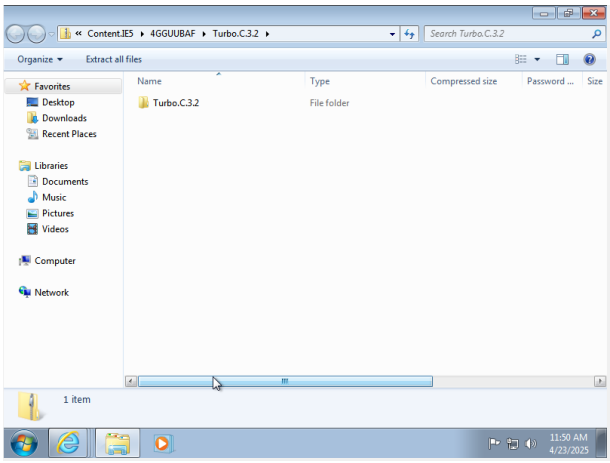
To implement the installation and execution of a sample program of a C compiler in a virtual machine.

PROCEDURE:

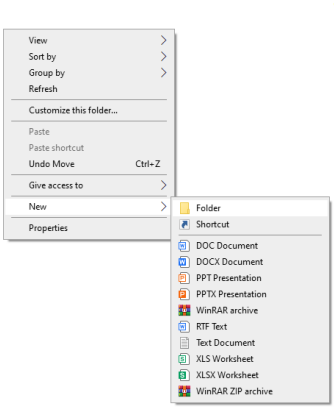
1) Check whether VirtualBox and its extension packages are installed, and then the Windows iso image is downloaded and installed on the system. Create a virtual machine for Windows in VirtualBox.

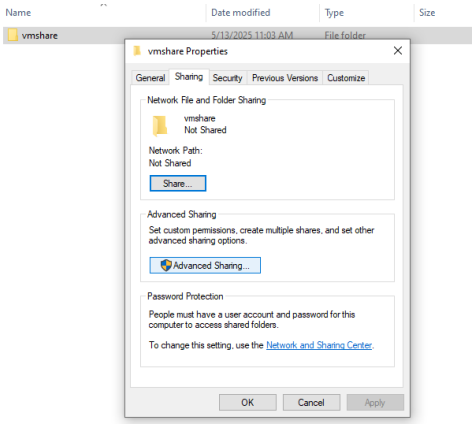
2) Power on the Windows virtual machine in VirtualBox. Download the Turbo C compiler on the system.



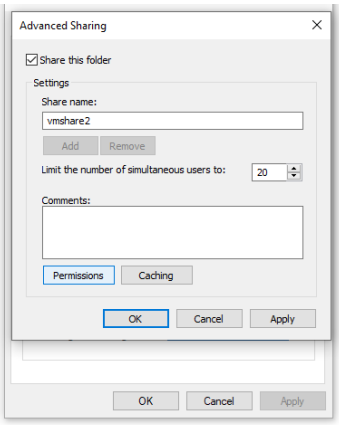


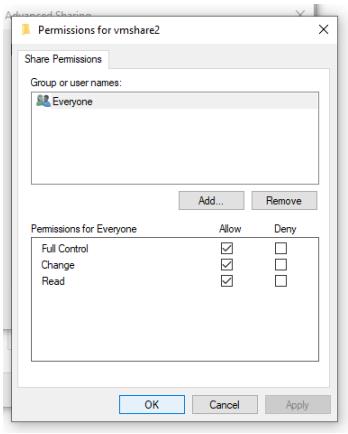
3) In order to transfer the Turbo C compiler folder in the virtual machine, create a new folder named "**vmshare".** Select properties by left-clicking on the folder, and go to the **sharing** option and then select **advanced sharing** options.



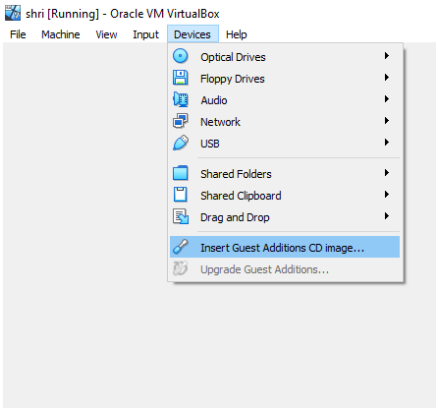


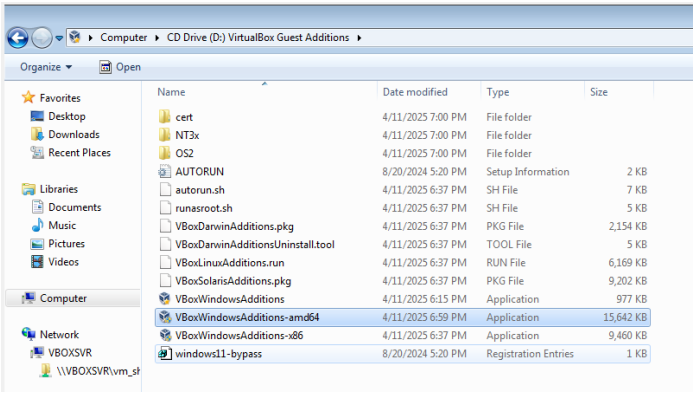
4) After clicking the "**Advanced sharing option**", a new page will be opened. On that page, click the "**Share this folder**" option. Click the "**permissions**" option, which will open a new page to share the folder, then click the "**full control**" option to permit everyone. Apply this option to the folder.

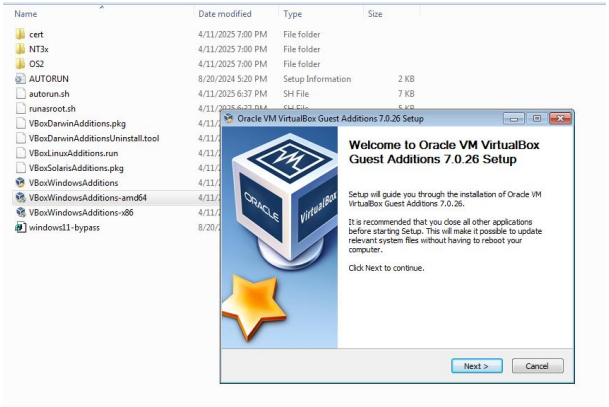




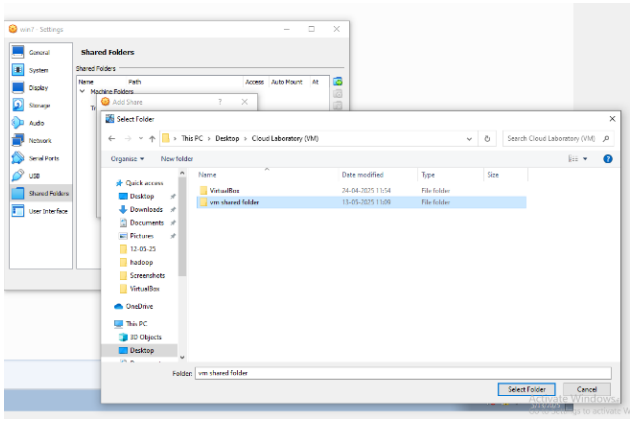
5) In VirtualBox, while running the Windows virtual machine, go to the "**Devices"** option, then click the "**Insert guest additions CD image**" option. Within the Windows virtual machine, go to the "**VirtualBox Guest Additions**" and run the "**VBoxWindowsAdditions – amd64**" file. It will reboot the virtual machine.

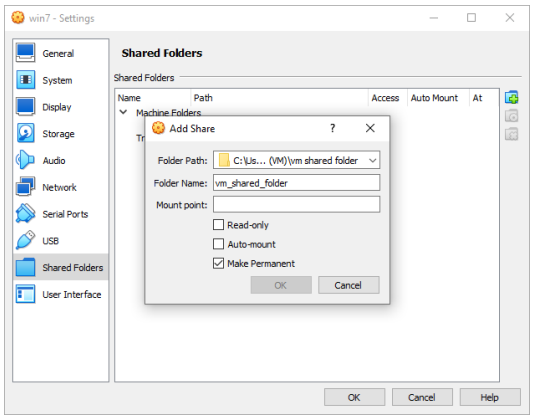




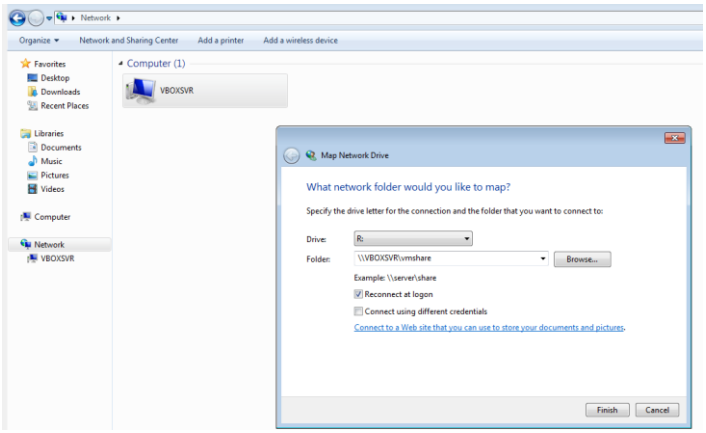


6) It will create a "**VBOXSVR\vm_shared_folder**" in the network page of the Windows virtual machine. Open the folder, it will open a new page where create a new folder by setting a path from the "**vmshare**" folder in the system to the virtual machine. It will transfer the folder to the virtual machine.

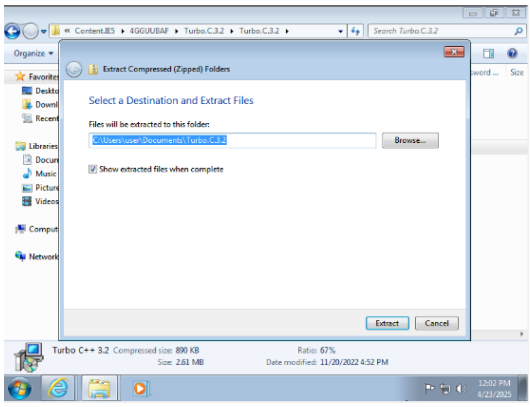


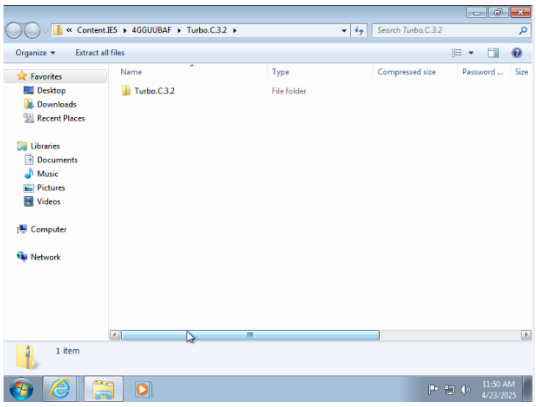


7) Otherwise, the user can map the network drive in the virtual machine by choosing the drive and setting the path for the folder "**vmshare**" in the system to the virtual machine.

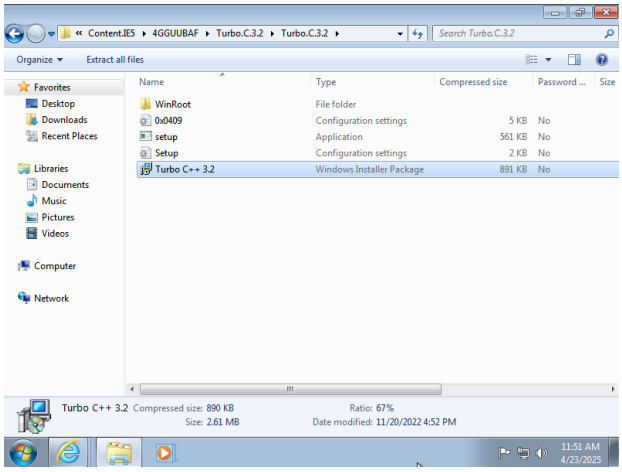


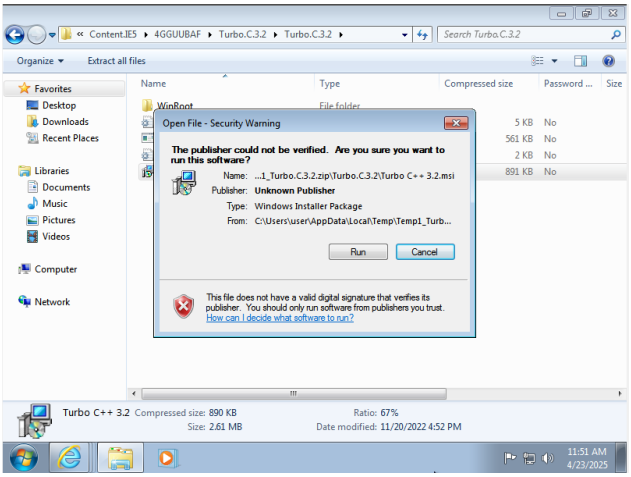
8) After the download is completed, the Turbo C 3.2 zip folder is created in the system. Extract the files in the zip folder by creating a path for the folder.

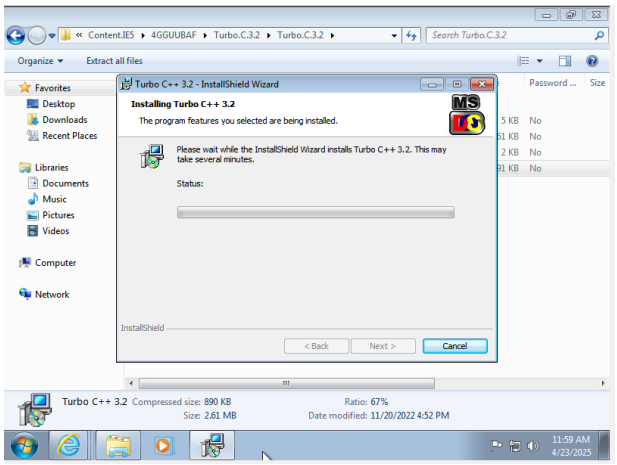


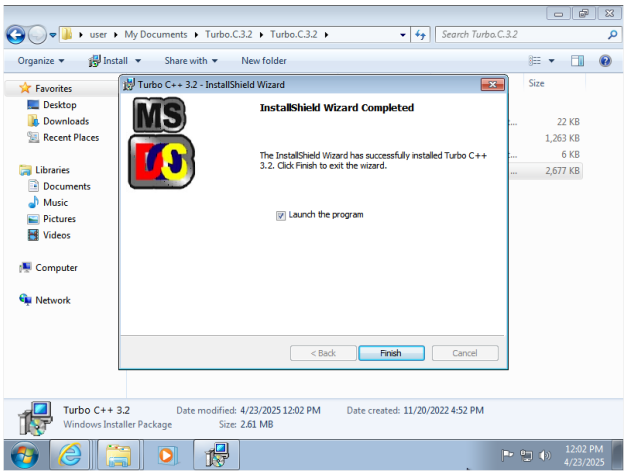


9) Within the folder, there will be the Installer package named **Turbo C++ 3.2.** Run the installer package and install the Turbo C Compiler.

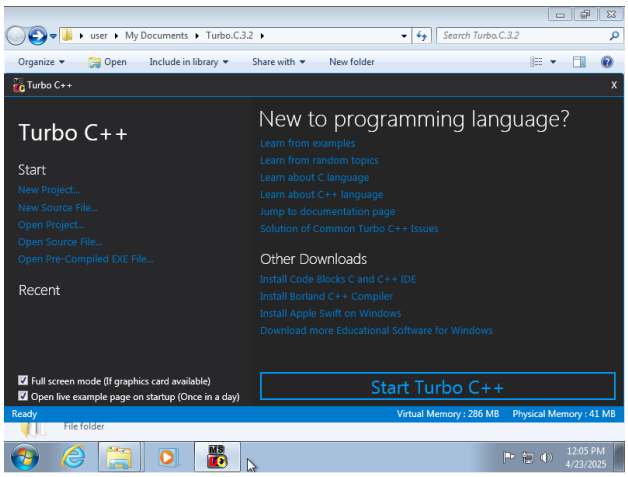


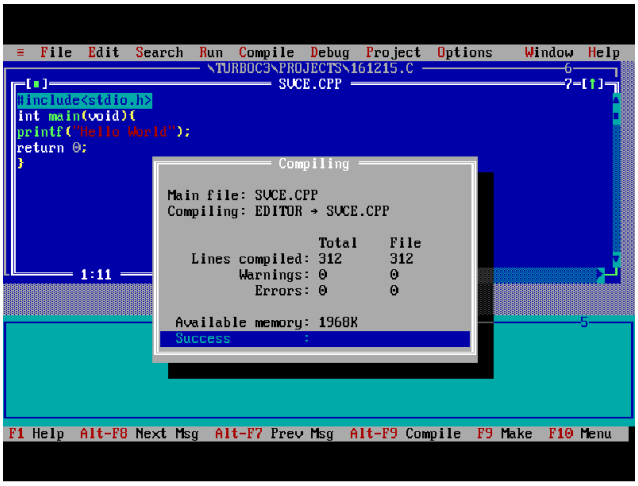






10) Open the Turbo C compiler and click **Start Turbo C++.** Write a sample program in C, then compile the program and run the program.





SAMPLE INPUT AND OUTPUT:

RESULT:

Thus, the implementation of Installation and execution of a sample program of a C compiler in a virtual machine is executed, and the output is verified successfully.