Cloud Computing Lab

B. Tech (COMPUTER ENGINEERING)
Semester - VII

Laboratory Manual

Department of Computer Engineering
R. C. Patel Institute of Technology, Shirpur

VISION&MISSION

Institute

Vision:

- To achieve excellence in engineering education with strong ethical values.

Mission:

To impart high quality Technical Education through:

- Innovative and Interactive learning process and high quality instructional programs.
- Fostering a scientific temper among students by means of a liaison with the Academia, Industries and Government.
- Preparing students from diverse backgrounds to have attitude for research and spirit of Professionalism.
- Inculcating in students a respect for fellow human beings and responsibility towards the society.

Computer Engineering Department

Vision:

- To provide prominent computer engineering education with socio-moral values.

Mission:

- To groom students to become professionally and ethically sound computer engineers to meet the growing needs of industry and society.

The Shirpur Education Society's

R. C. Patel Institute of Technology, Shirpur

CERTIFICATE

This is to certify that Mr. / Miss. _____of Third Year Computer Engineering, Roll No. _____has performed practical work satisfactorily in the subject Computer Networks Lab, in the Department of Computer Engineering during the academic year 2019-2020.

Date: / / 2020 *Subject Incharge*

Place: Shirpur

Principal *Head of Department*

CONTENTS

Laboratory Report

Experiment No - 1

Batch -

Date of Experiment: _____ Date of Submission: _____

Title: Demonstrate the use of map and reduce tasks

Evaluation

1) Attendance [2] ----------

2) Lab Performance [2] ----------

3) Oral [1] ----------

Overall Marks [5] ----------

Subject Incharge

Experiment No. 1

TITLE: Sketch out and analyze architecture of Moodle cloud portal and Moodle cloud site and create different entities dynamically

PREREQUISITE: Operating Systems

THEORY:

Introduction

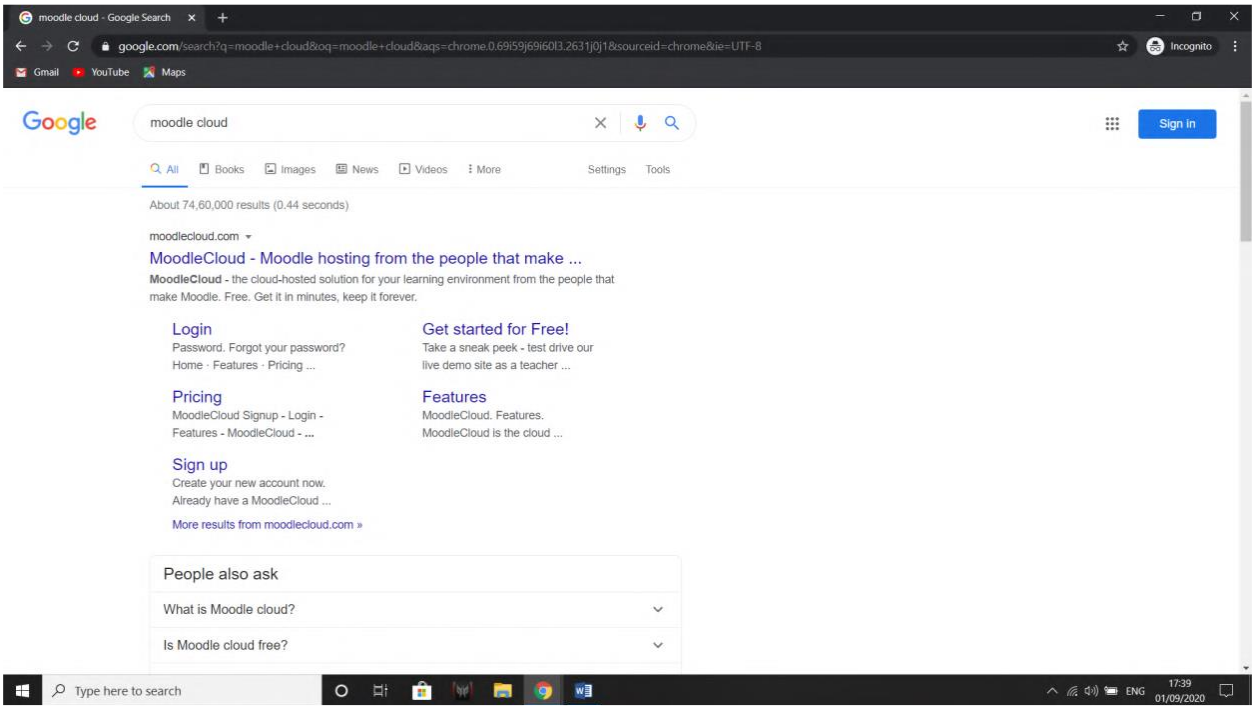
Moodle recently announced a new, free Learning Management System (LMS) that offers easy setup. It's a great introduction to their open source LMS software.

The Free Moodle Cloud Overview:

- Not everyone is tech savvy and wants and easy way to create an LMS
- While many pieces of Moodle are easy, installing software on a server, managing it, upgrades and maintenance aren't for everyone
- This is geared towards small schools, companies or entrepreneurs that have small courses with a small audience with no budget
- They update the software for you to the latest version which allows all the safety security patches, features and flexibility available
- It's responsive out of the box
- It includes a free version of BigBlueButton their solution for full online conferencing, including video, audio, whiteboards and desktop sharing.

What Moodle Cloud Includes:

- 50 users maximum
- 200Mb disk space
- But, you can host your large files with Dropbox, Google Drive, iCloud or others
- You can host your videos with Youtube and it will automatically embed
- Core themes and plugins only
- One site per phone number
- In MoodleCloud the free BigBlueButton sessions are limited to 6 people, with no recordings, but we hope you'll find this perfect for small classes and even study groups. You can add a conferencing session to your course just like any other class activity.
- There are ads in the footer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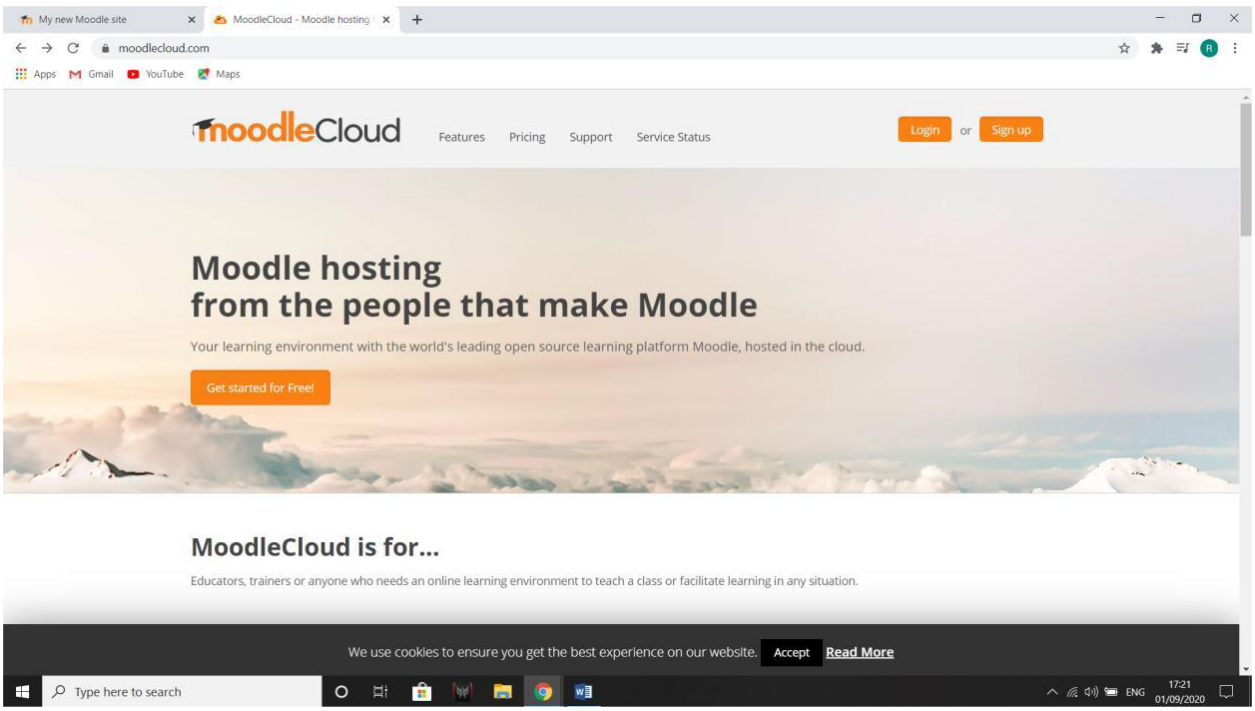
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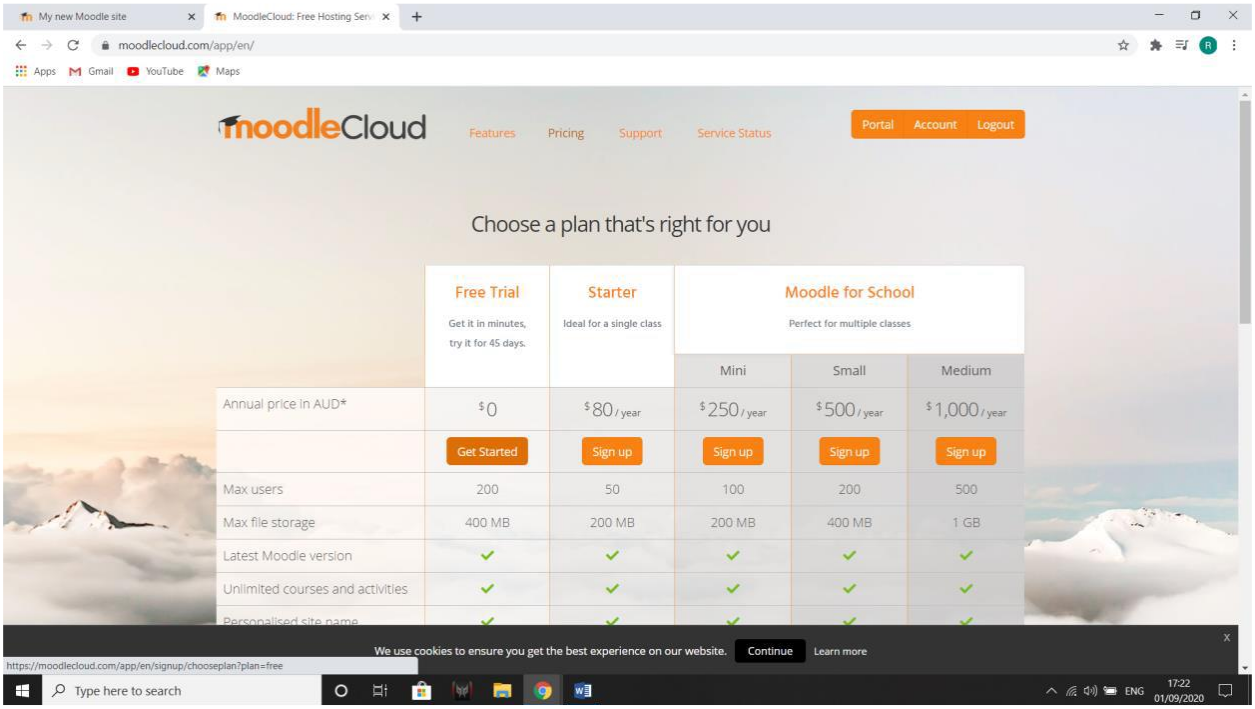
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Features
Pricing
Support
Service Status
Portal
Account
Logout
Choose a plan that's right for you
Free Trial
Get it in minutes, try it for 45 days.
Starter
Ideal for a single class
Moodle for School
Perfect for multiple classes
Mini
Small
Medium
Annual price in AUD*
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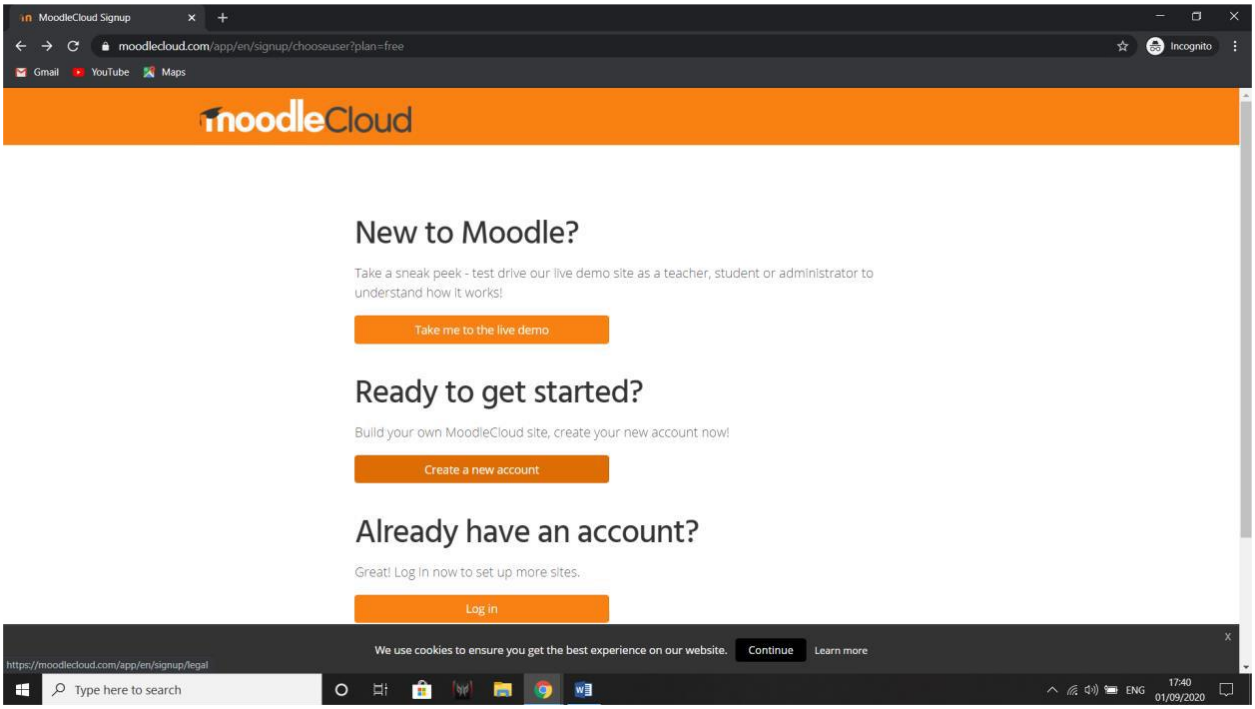
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New to Moodle?
Take a sneak peek - test drive our live demo site as a teacher, student or administrator to understand how it works!
Take me to the live demo
Ready to get started?
Build your own MoodleCloud site, create your new account now!
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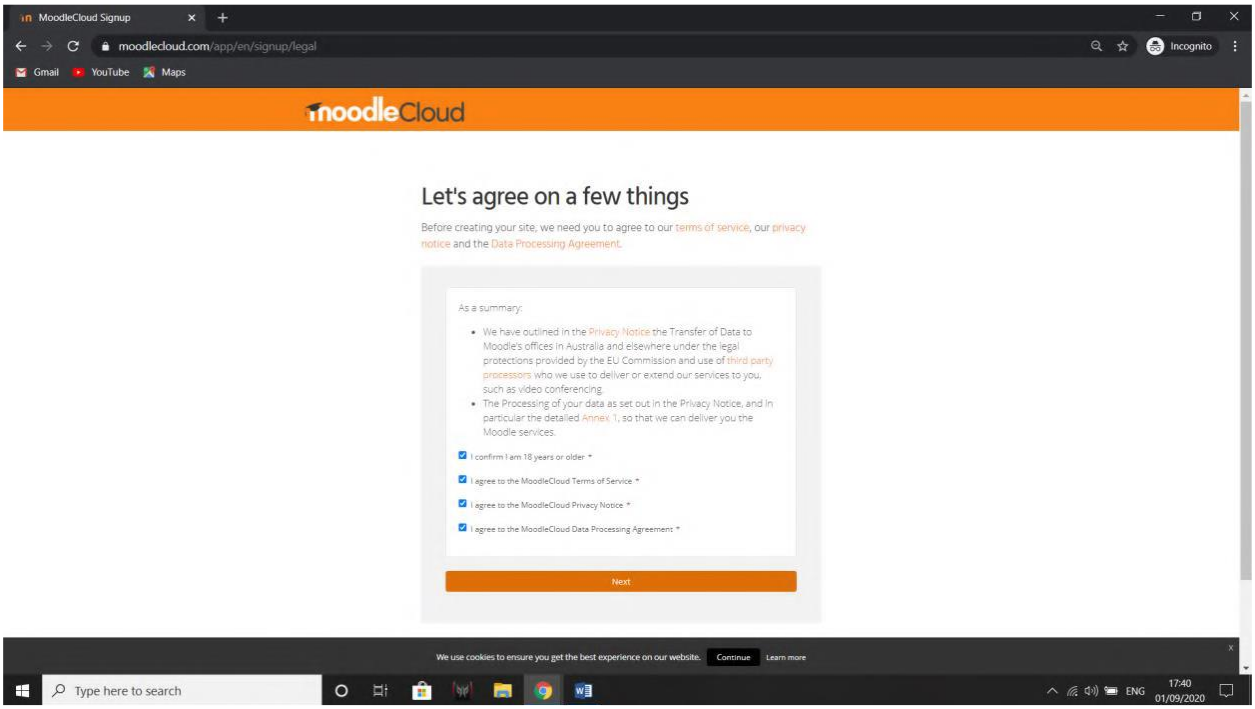
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Before creating your site, we need you to agree to our terms of service, our privacy notice and the Data Processing Agreement.
As a summary:
We have outlined in the Privacy Notice the Transfer of Data to Moodle's offices in Australia and elsewhere under the legal protections provided by the EU Commission and use of third party processors who we use to deliver or extend our services to you, such as video conferencing.
The Processing of your data as set out in the Privacy Notice, and in particular the detailed Annex 1, so that we can deliver you the Moodle services.
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I agree to the MoodleCloud Privacy Notice *
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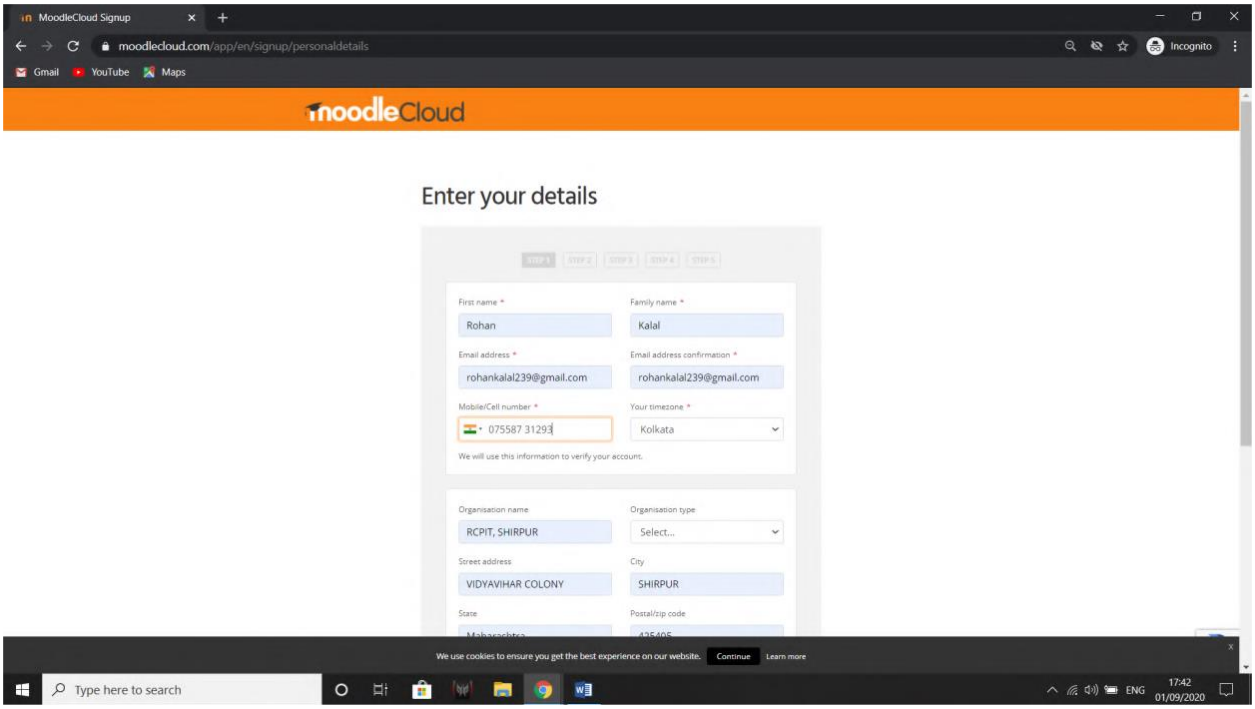
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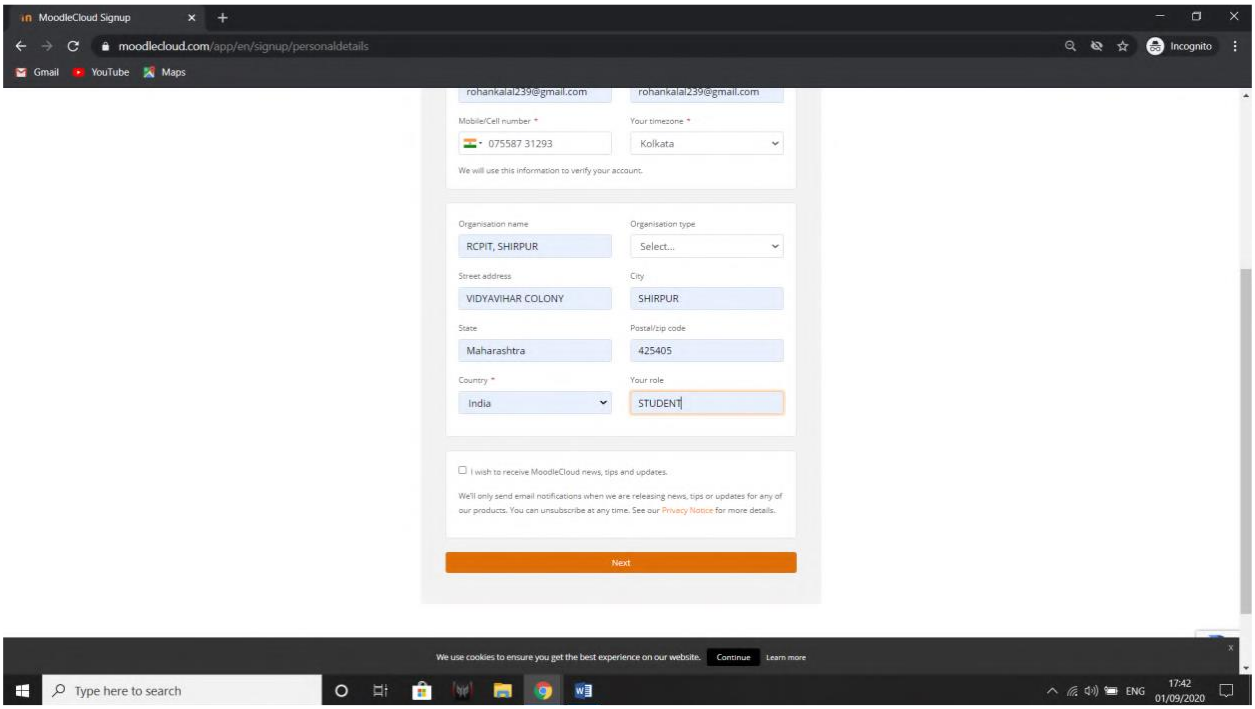
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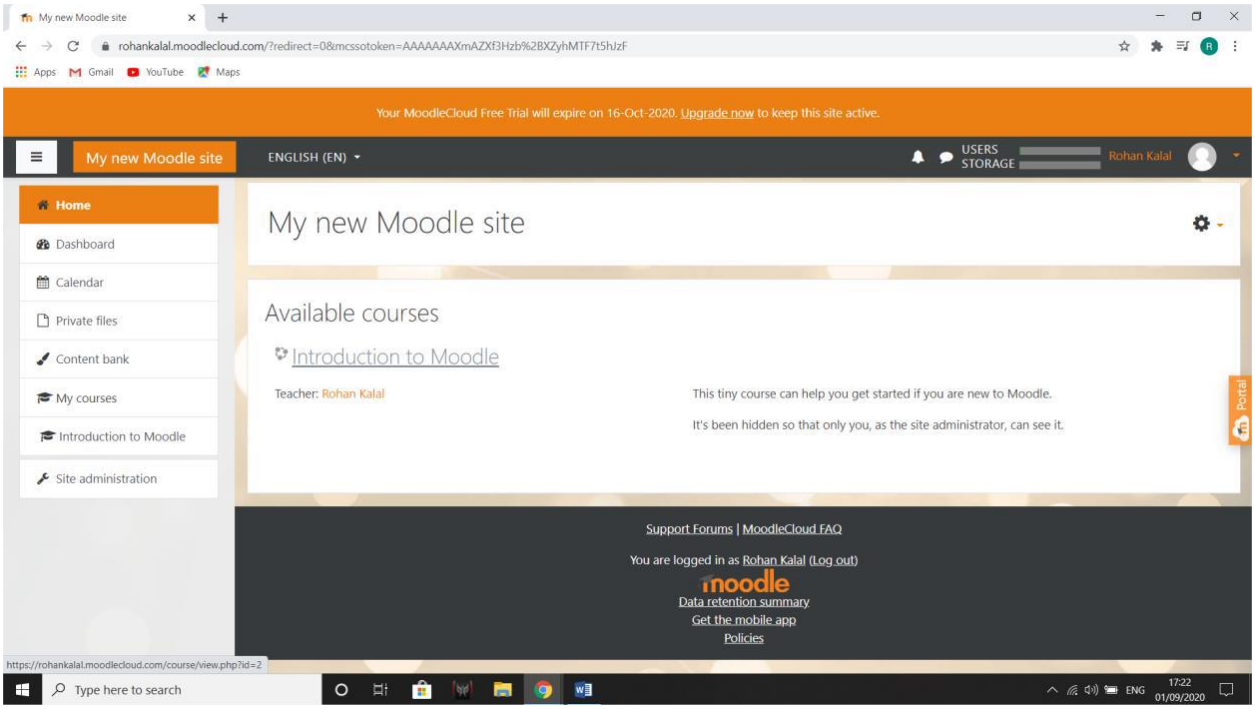
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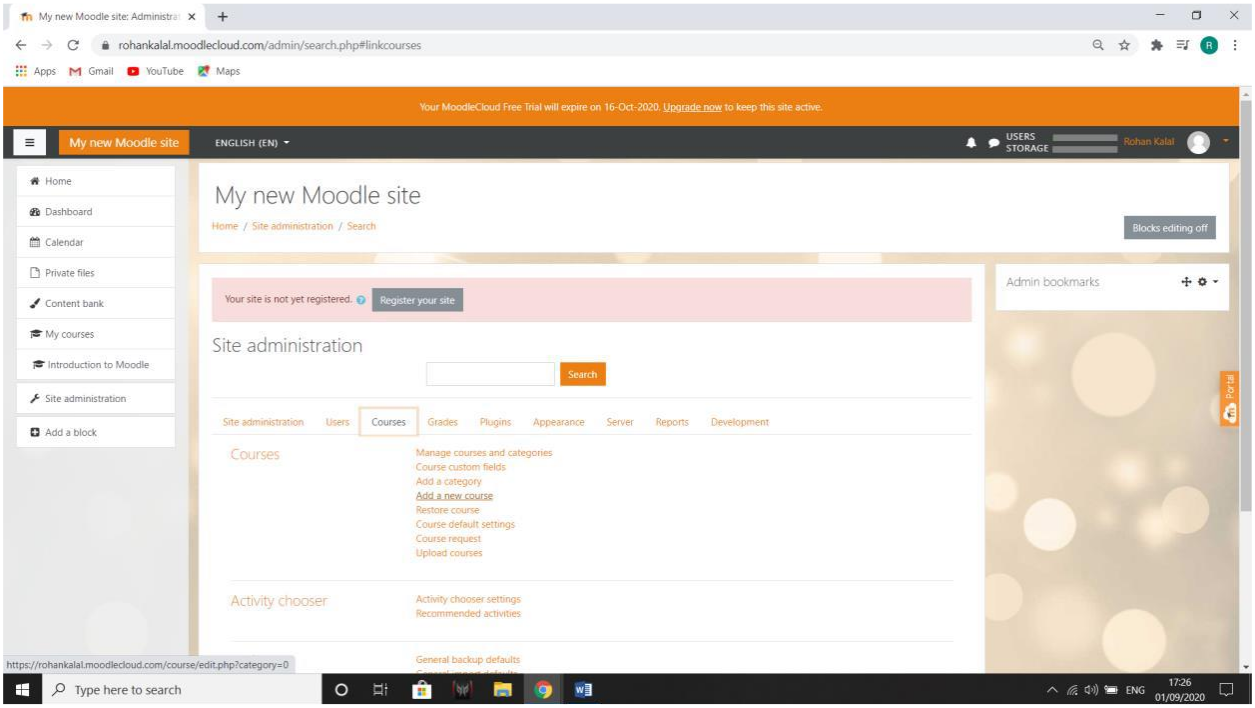
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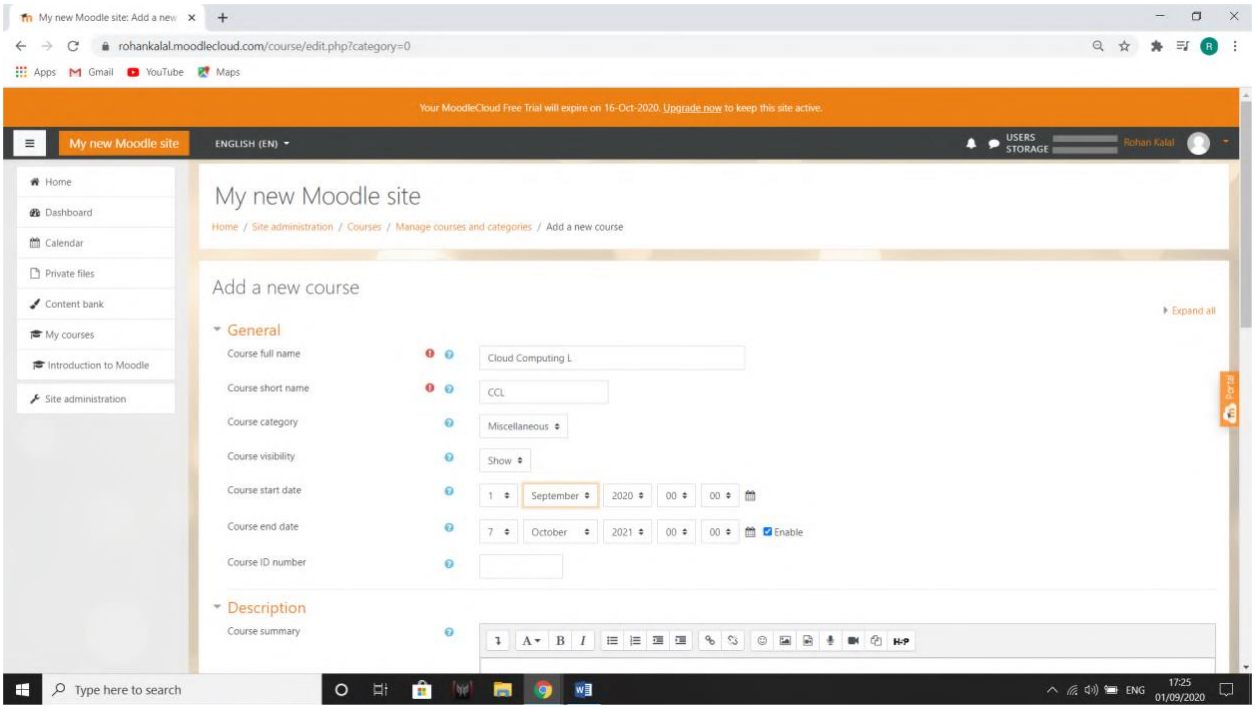
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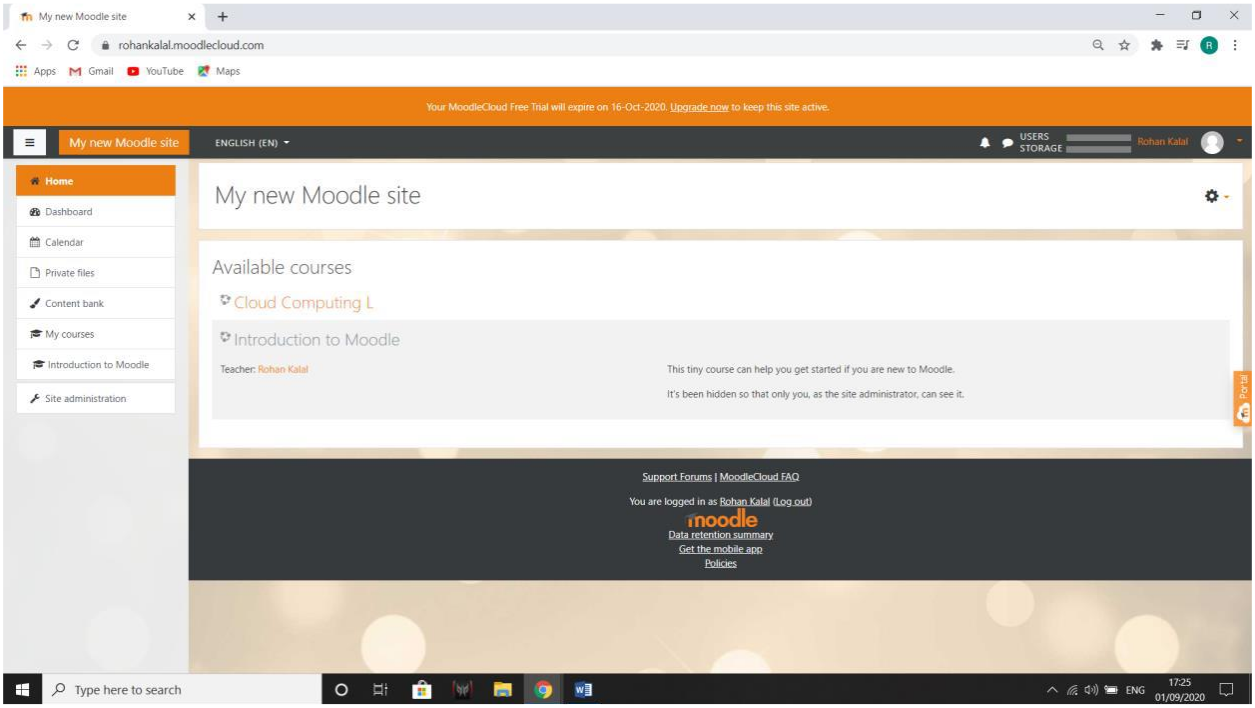
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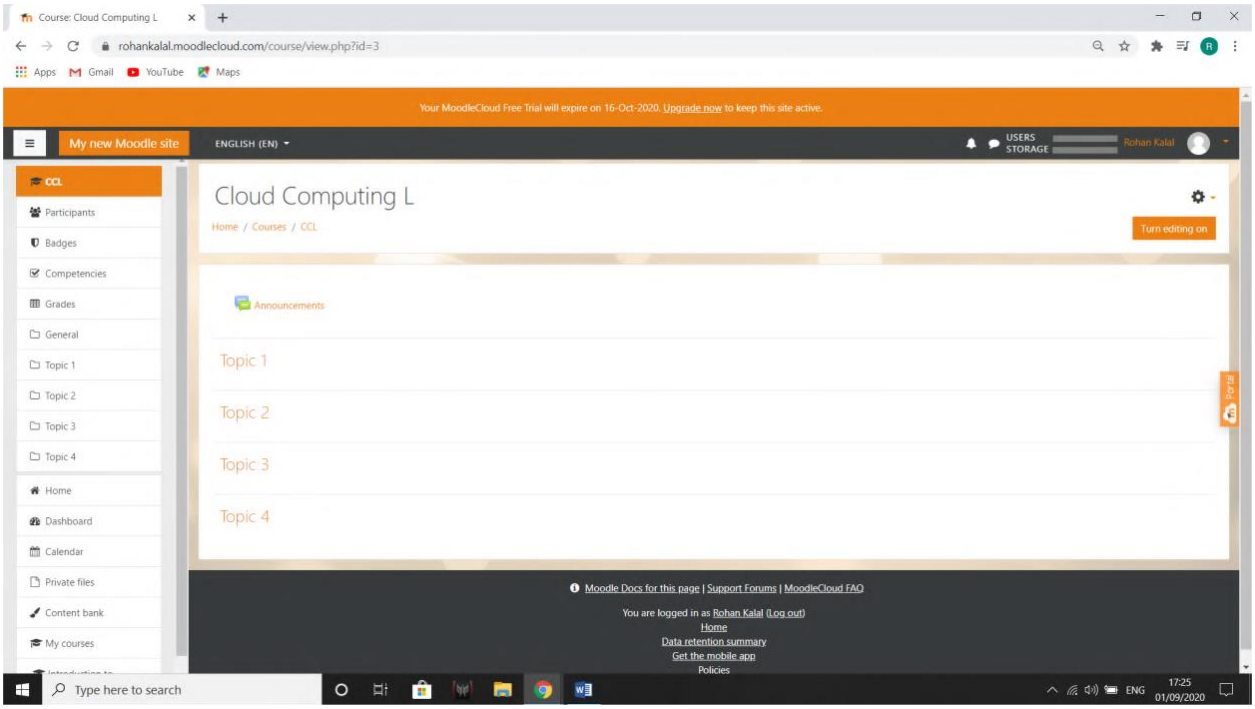
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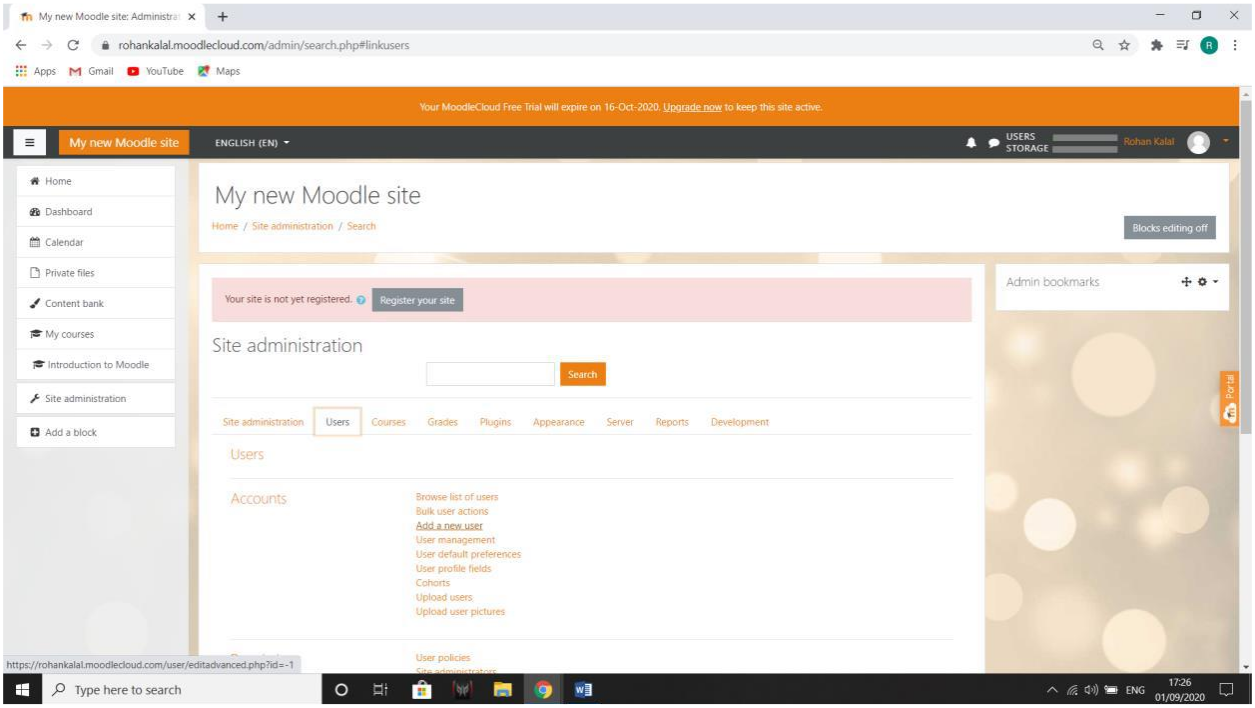
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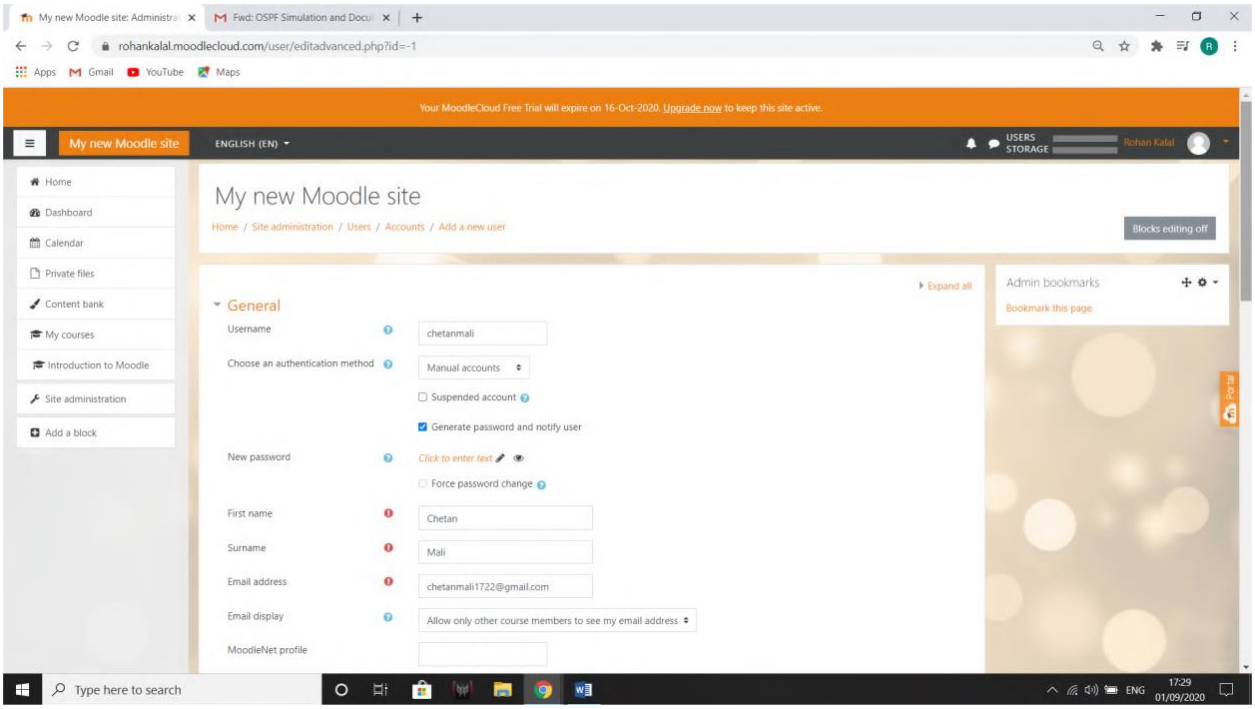
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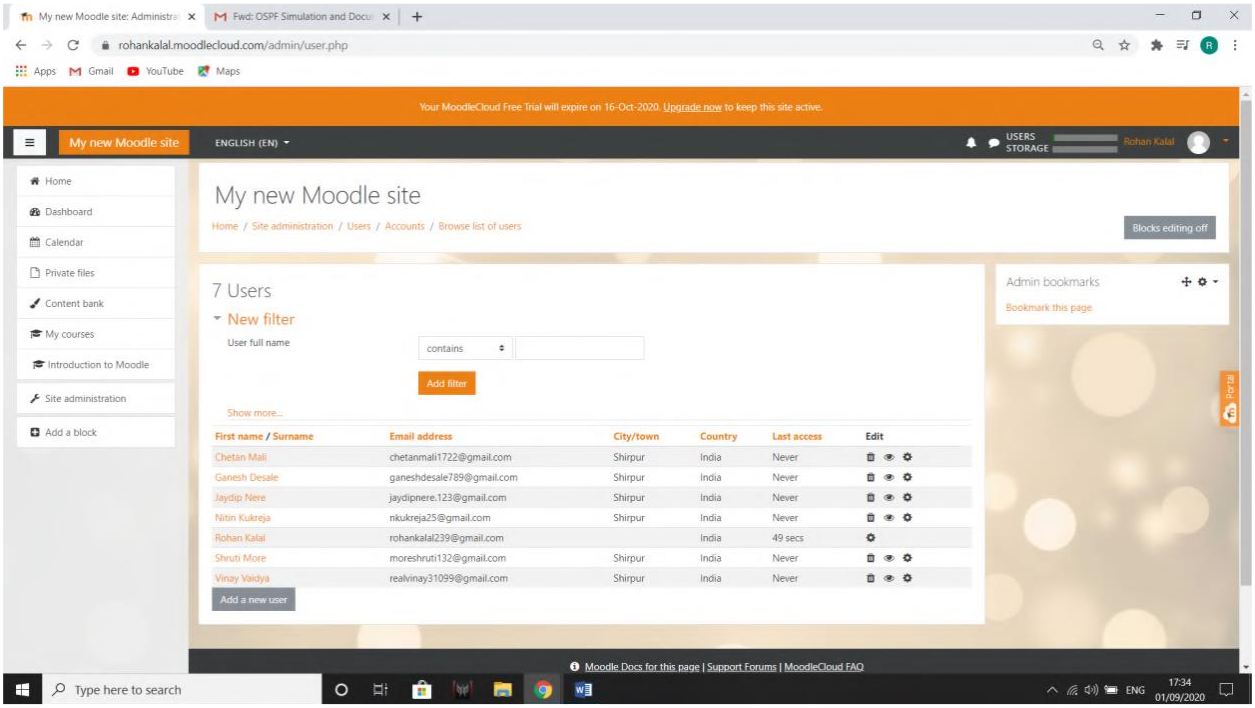
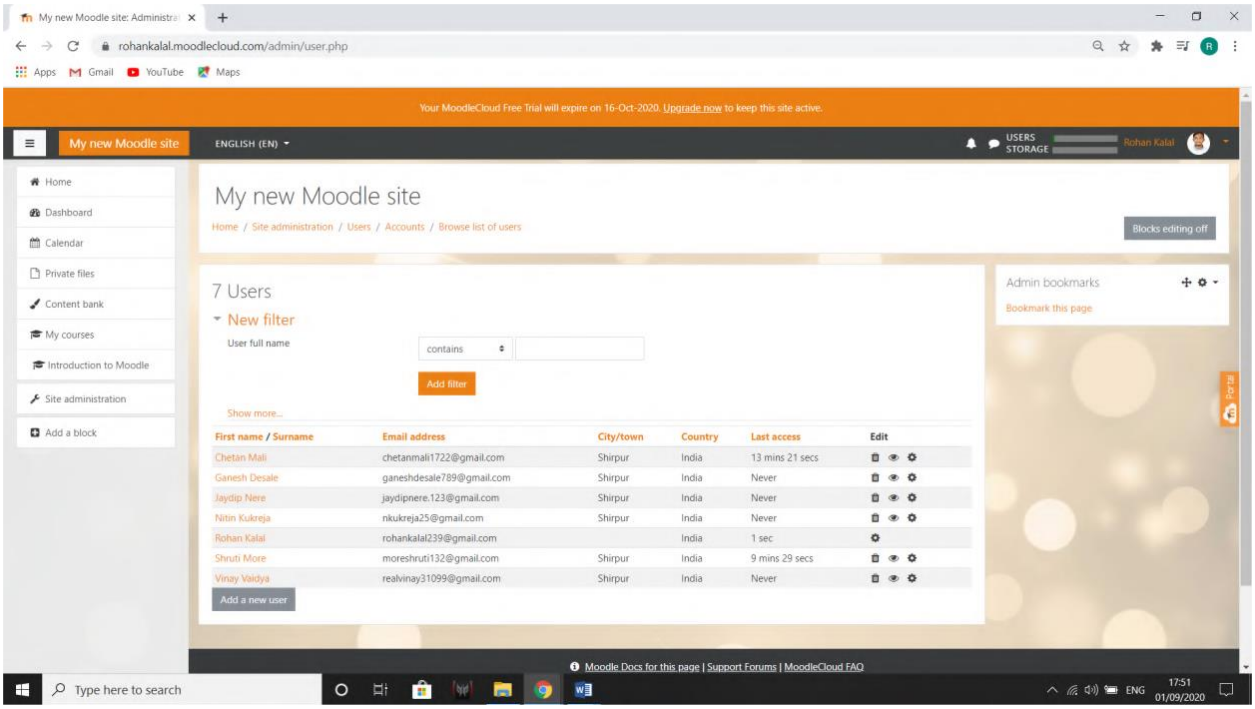




CONCLUSION / RESULT:

In this Experiment, we created Moodle cloud site and create different entities dynamically.

Laboratory Report

Experiment No - 2

Batch -

Date of Experiment: _____ Date of Submission: _____

Title: Create a scenario in wordpress for Social Marketing, Search engine and Sharing Tools.

Evaluation

1) Attendance [2] ----------

2) Lab Performance [2] ----------

3) Oral [1] ----------

Overall Marks [5] ----------

Subject Incharge

Experiment No. 2

TITLE: Create a scenario in wordpress for Social Marketing, Search engine and Sharing Tools.

PREREQUISITE: Operating Systems, Computer Nertworks

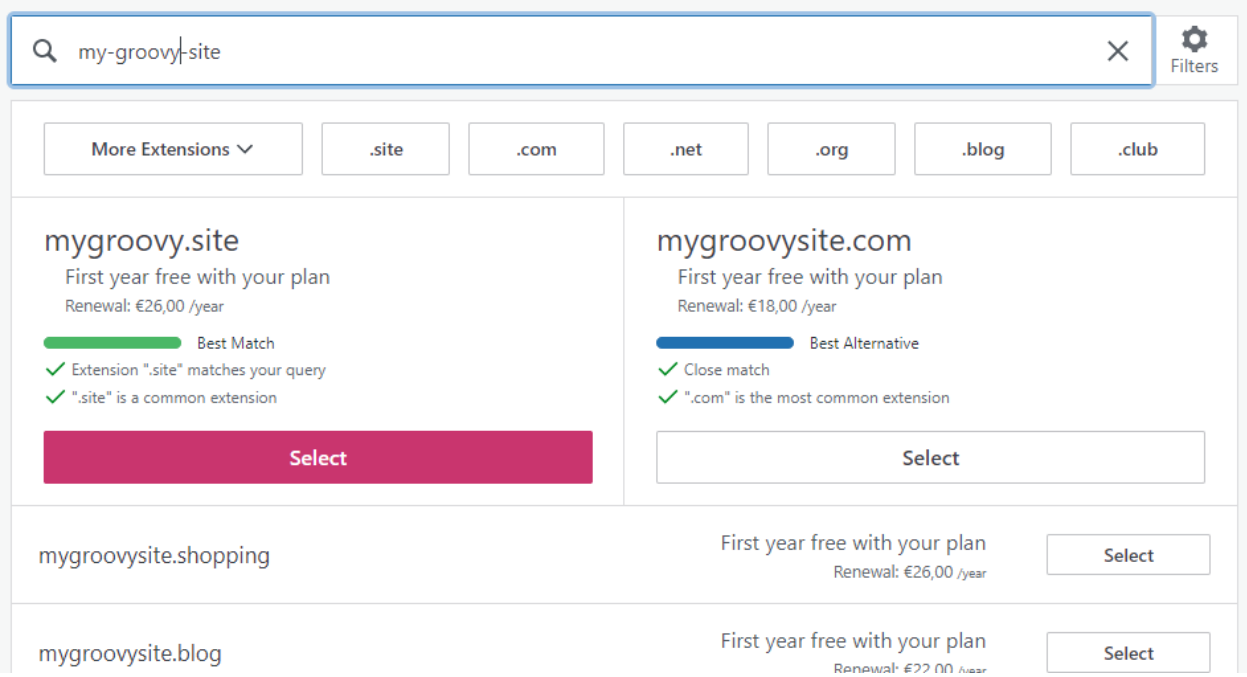
THEORY:

Whether you want to share your ideas, start a business, or run a store, you can do it all on WordPress.com.

Step 1: Choose Your Identity

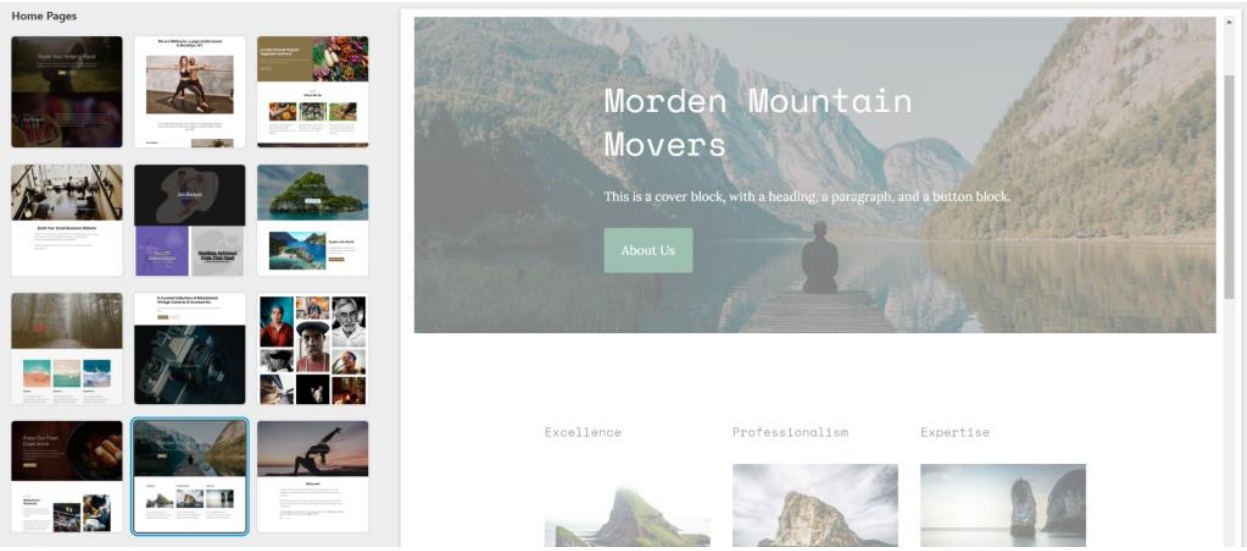
Choosing a name for your site is an important decision because it immediately tells visitors what your site is about. Once you decide on the perfect name, make it your Site Title by going to My Site → Manage → Settings.

By signing up, you already have a site address like yourgroovysite.wordpress.com but you can register your very own domain like yourgroovydomain.com. Your domain is free for the first year with any WordPress.com plan.



Step 2: Design Your Homepage

To make a great first impression, think about the most important elements you want people to see when they first visit your site. You can start with a blank page, or you can use one of our pre-built page layouts to create a beautiful homepage in seconds. You can load any of these gorgeous designs and then change, add, or remove any elements to make it your own.



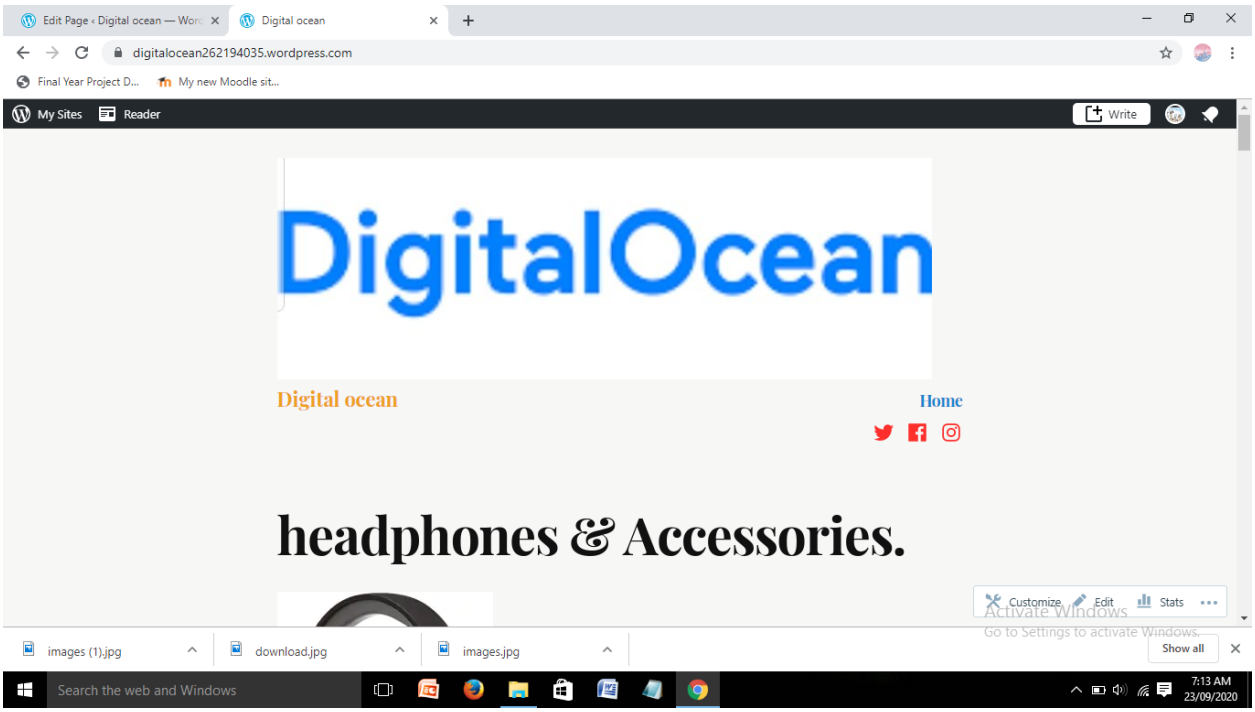
Step 3: Create More Pages

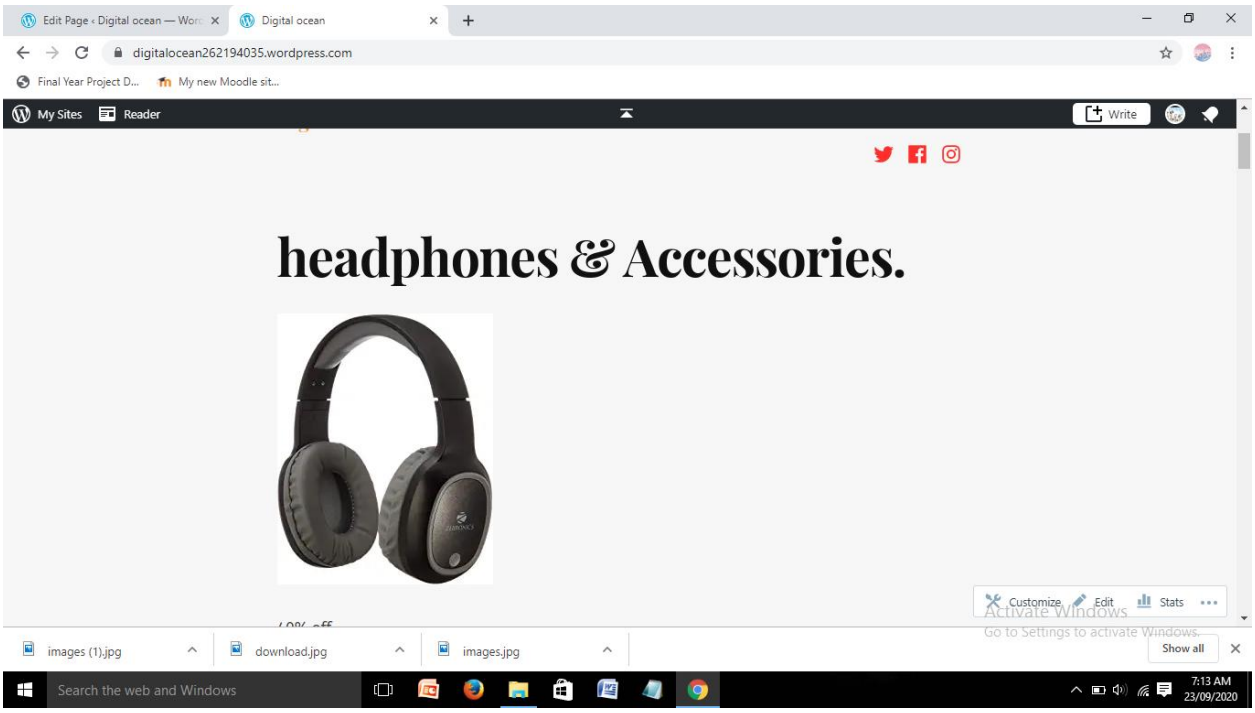
Now it's time to add more pages. The most common pages you'll find on a website are an About page and a Contact page. Go to My Site → Site → Pages → Add New Page to get started. When you created your homepage in Step Two, you had your first introduction to "blocks" — these are the building blocks of your website. You can use blocks to add virtually anything to your pages: images, galleries, columns, videos, payment buttons, and much more.

Step 4: Add Your Social Media Presence

If you have a social media presence, your website is the perfect place to promote it. It's common to see social media icons similar to this:

You can add these icons to your site's menu using the Social Links menu or to the content of any page using the Social Links block. All major social media services are supported.

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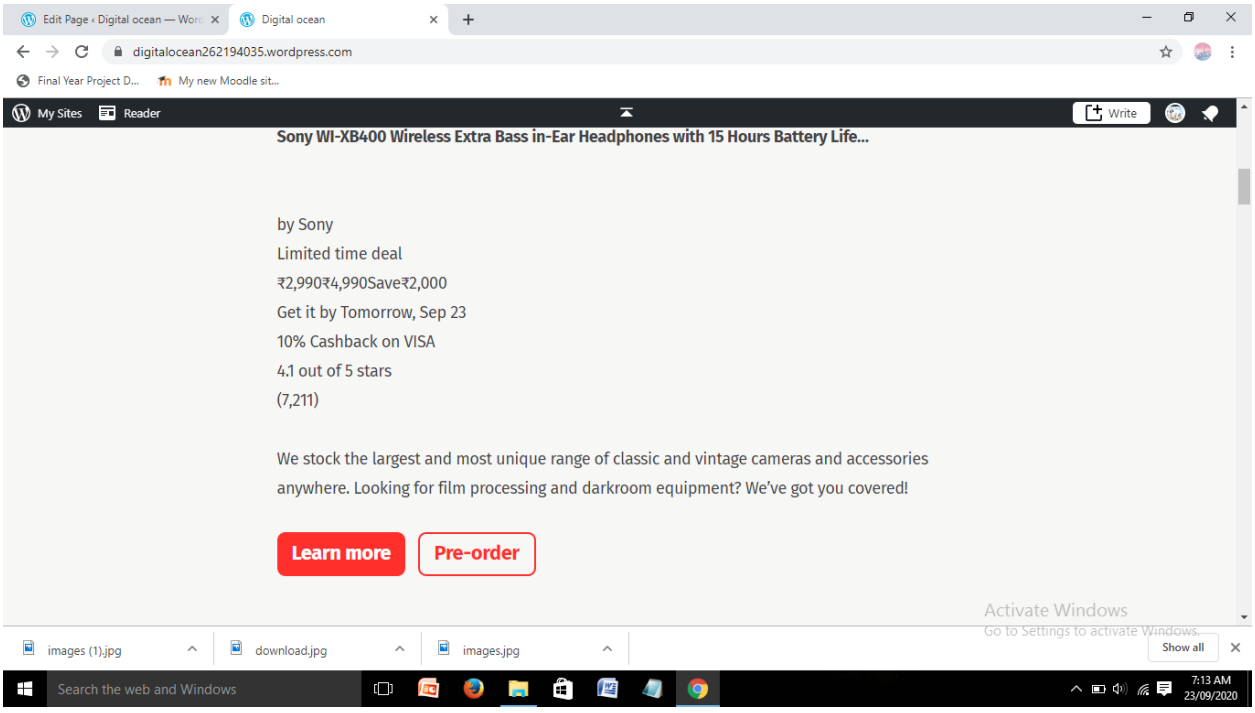
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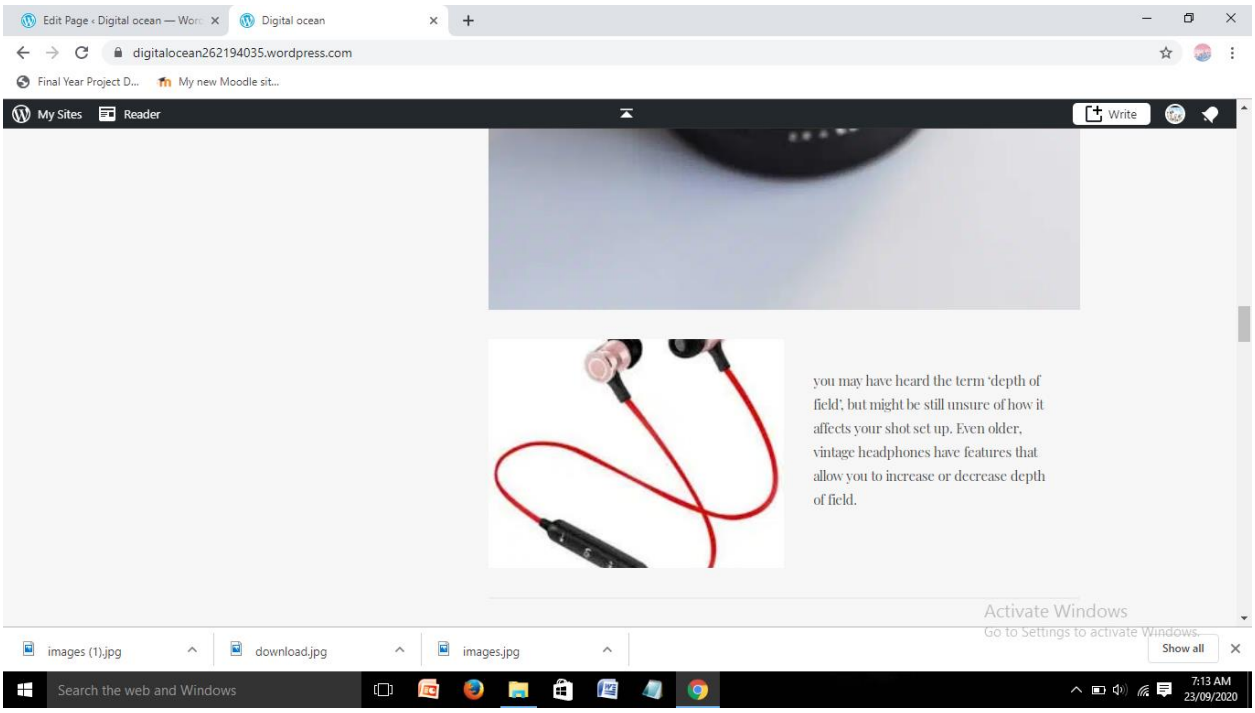
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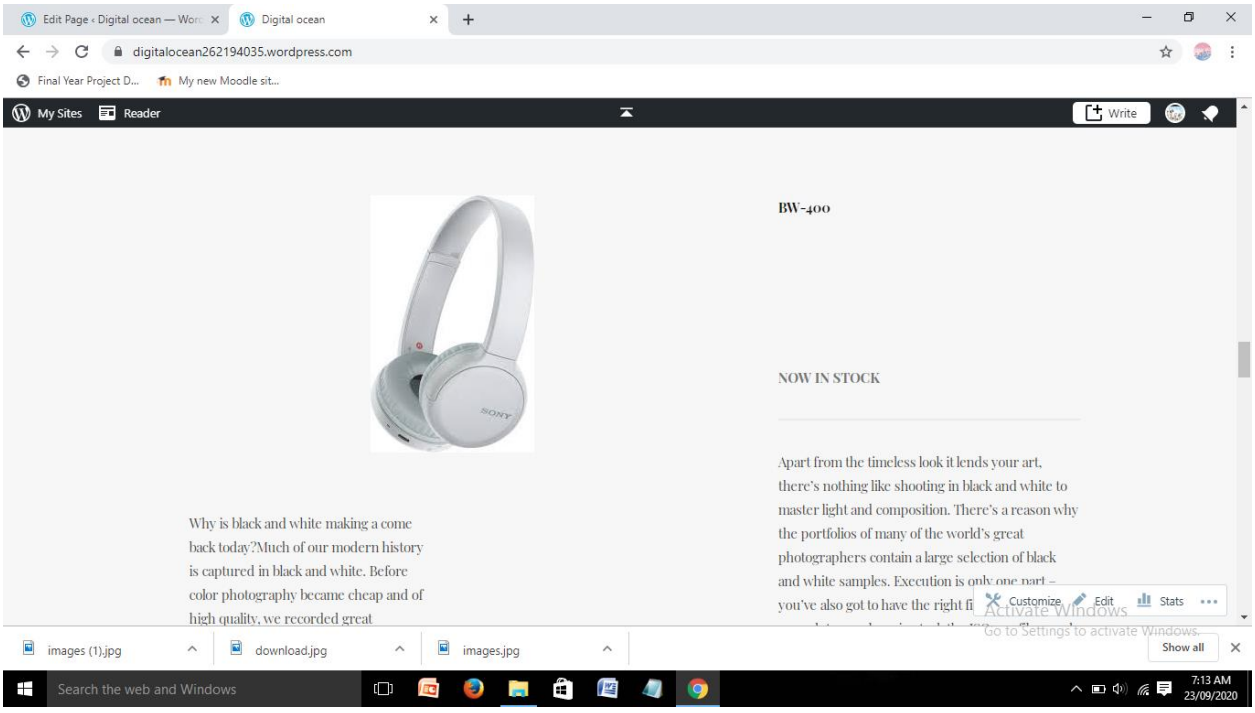
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Apart from the timeless look it lends your art, there's nothing like shooting in black and white to master light and composition. There's a reason why the portfolios of many of the world's great photographers contain a large selection of black and white samples. Execution is only one part –
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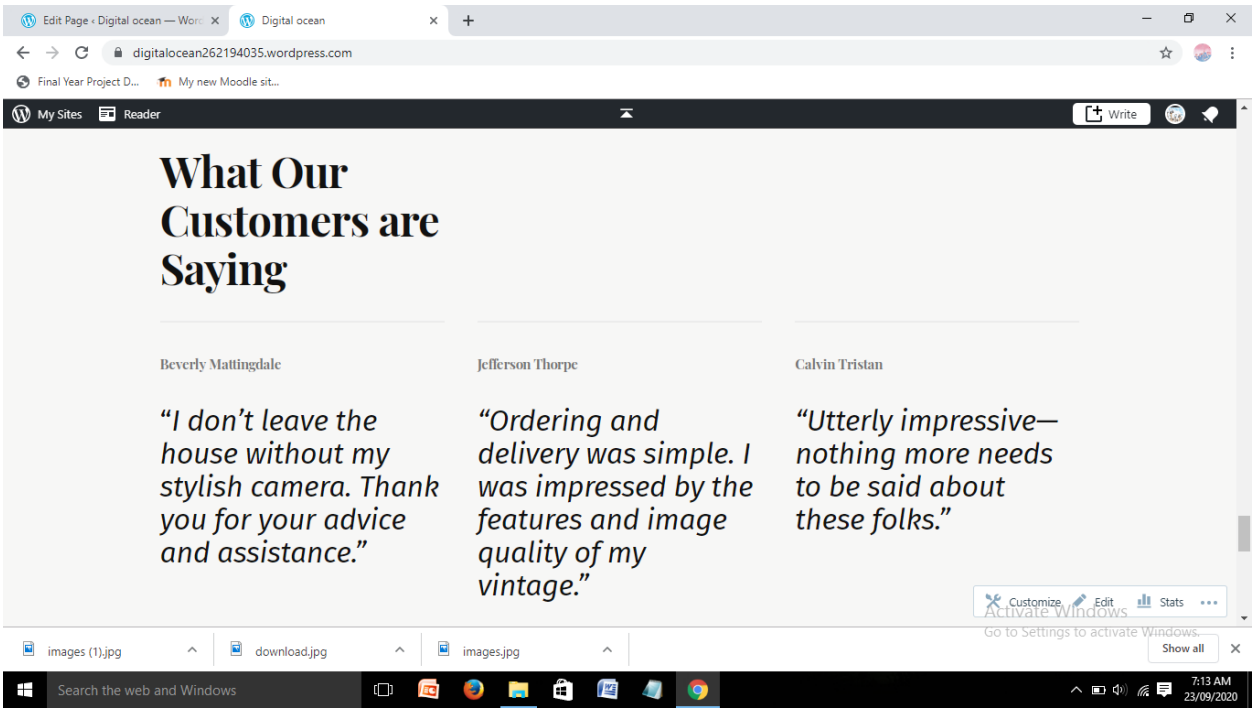
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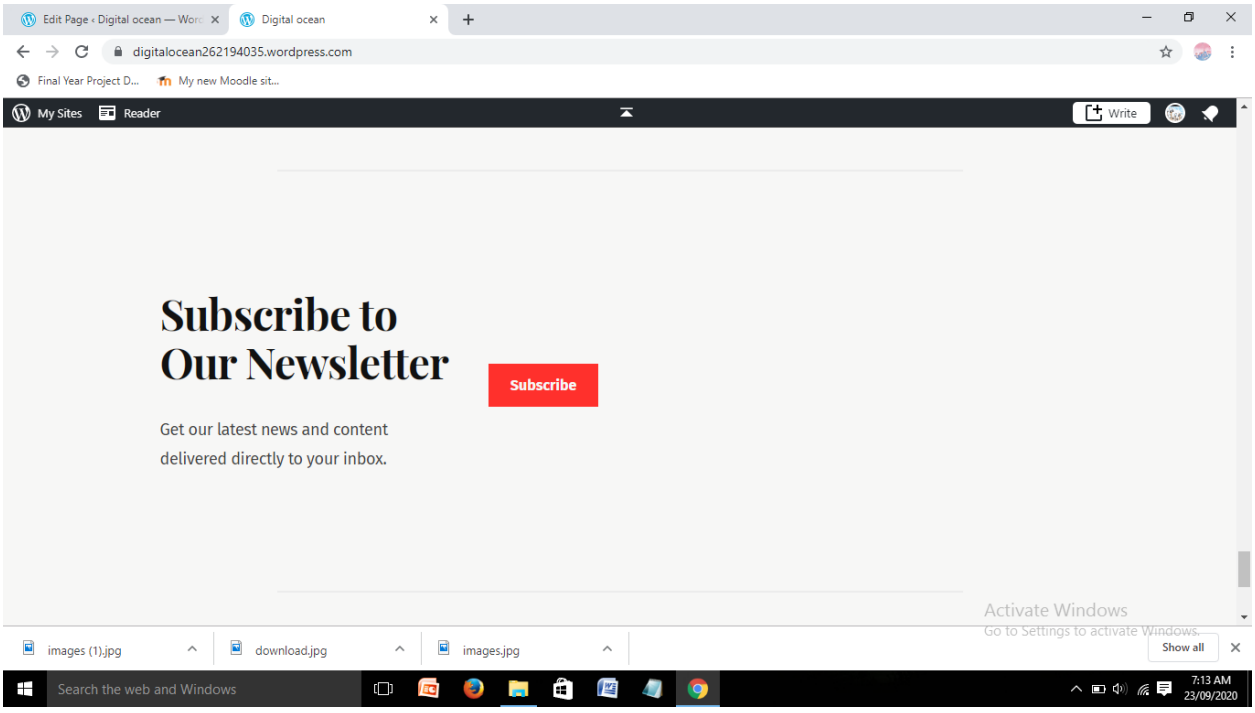
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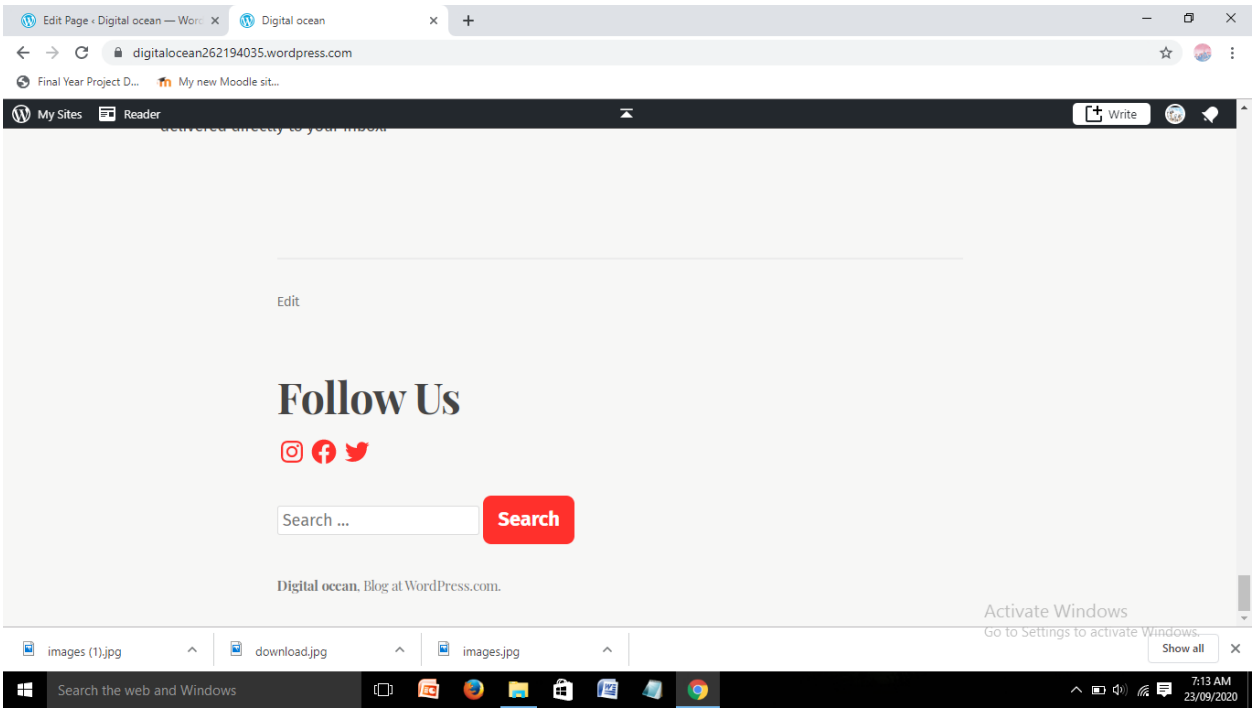


CONCLUSION / RESULT:

In this Experiment, we have created a scenario in wordpress for Social Marketing, Search engine and Sharing Tools.

Laboratory Report

Experiment No - 3

Batch -

Date of Experiment: _____ Date of Submission: _____

Title: Working in Cloud9/Codenvy to demonstrate different language Evaluation

1) Attendance [2] ----------

2) Lab Performance [2] ----------

3) Oral [1] ----------

Overall Marks [5] ----------

Subject Incharge

Experiment No. 3

TITLE: Working in Cloud9/Codenvy to demonstrate different language Evaluation

PREREQUISITE: Operating Systems

THEORY:

Introduction

Codenvy's power comes from the unique Eclipse Che workspaces which are portable and shareable because they are composed of projects (source files) and environments (runtimes).

Workspace Activation

1. Create a workspace with a production runtime

- A Docker image or a "recipe", for example a Dockerfile / Composefile
- Runtimes can inherit from other kinds of "machines" such as SSH
- Images are built, if necessary, and run with additional run + volume mount parameters
- We provide numerous "stacks" with pre-defined Docker compose and image runtimes.

2. "Dev Mode" The Workspace

- Agents ⇒ ZIP package of bash software to be installed + started in the runtime (sshd, intellisense, sync)
- Agents ⇒ Can be added during workspace boot, or after it has started triggered by a developer activity
- Agents ⇒ Added through either a volume mount or HTTP download from the Che server - depending upon config
- Terminal Agent ⇒ Special purpose agent to provide web-based terminal
- WS Agent ⇒ Special purpose agent that must exist in one container providing Che APIs for Che server & browser clients
- Debuggers ⇒ Processes with special ports to be exposed, which allow debugger clients to connect

3. Import Projects From Version Control

- Clone ⇒ Users can clone repos from remote locations

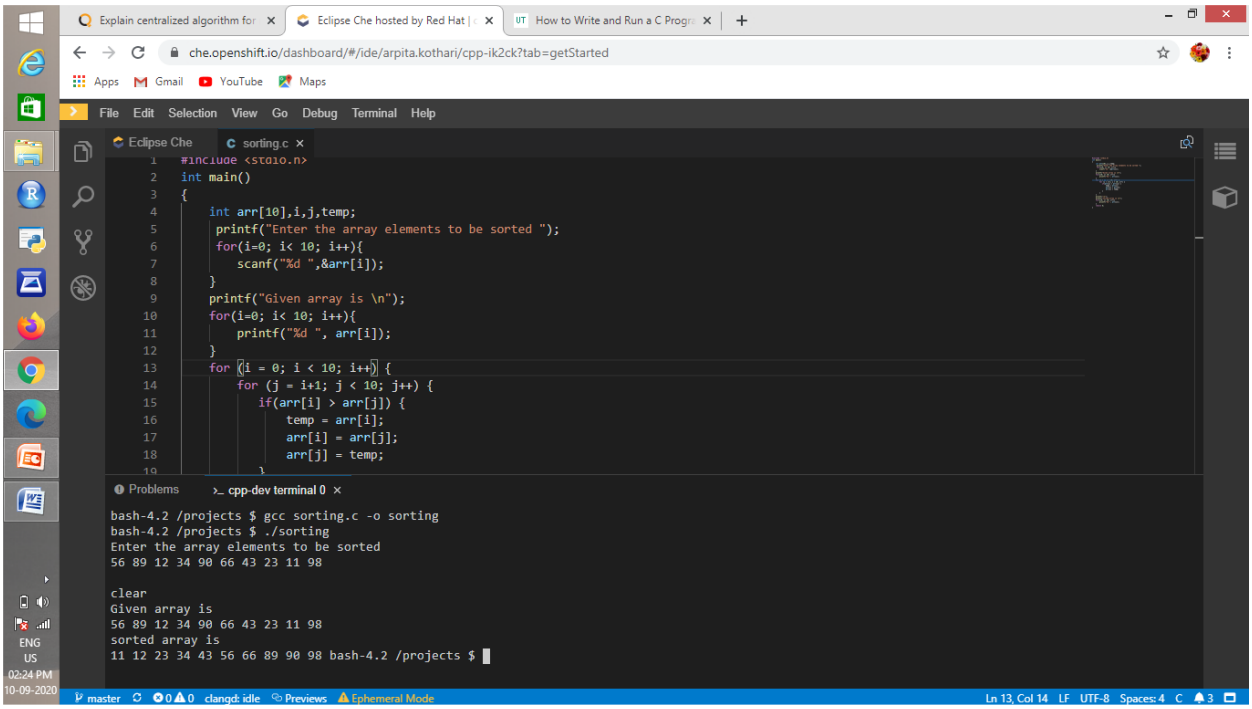
- Mount ⇒ Source code is volume mounted to the local server host for long term storage
- Rsync ⇒ Distributed workspaces with Codenvy rsync project code from long term storage to a workspace runtime during boot

4. IDEs Connect To Workspace Endpoint

- Use our cloud IDE or your desktop IDE
- Sync ⇒ Users can use a che-sync docker container to unison sync workspace files to localhost

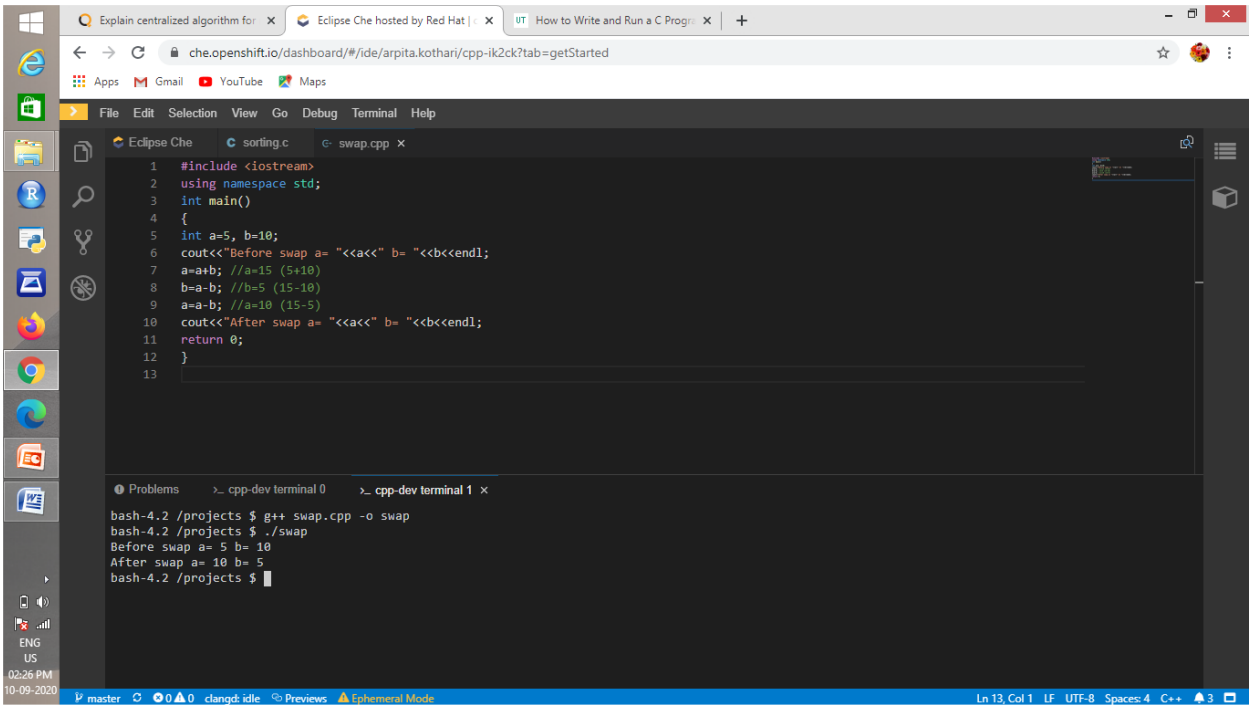
1. C PROGRAM (Sorting array) :

```
#include <stdio.h>
int main()
{
int arr[10],i,j,temp;
printf("Enter the array elements to be sorted ");
for(i=0; i< 10; i++){
scanf("%d ",&arr[i]);
}
printf("Given array is \n");
for(i=0; i< 10; i++){
printf("%d ", arr[i]);
}
for ( i = 0; i < 10; i++) {
for ( j = i+1; j < 10; j++) {
if(arr[i] > arr[j]) {
temp = arr[i];
arr[i] = arr[j];
arr[j] = temp;
}
}
}
printf("\n");
printf("sorted array is \n");
for(i=0; i< 10; i++){
printf("%d ", arr[i]);
}
return 0;
}
```



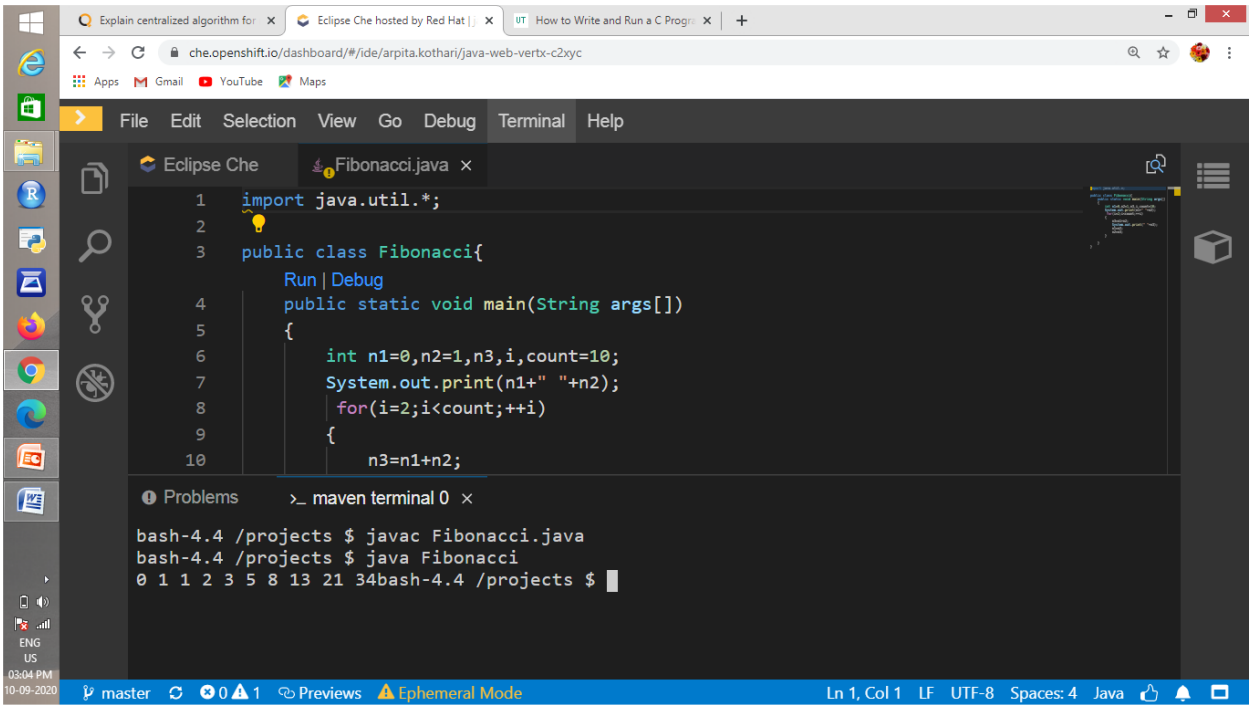
2. CPP PROGRAM (Swapping without 3rd variable) :

```
#include <iostream>
using namespace std;
int main()
{
int a=5, b=10;
cout<<"Before swap a= "<<a<<" b= "<<b<<endl;
a=a+b; //a=15 (5+10)
b=a-b; //b=5 (15-10)
a=a-b; //a=10 (15-5)
cout<<"After swap a= "<<a<<" b= "<<b<<endl;
return 0;
}
```



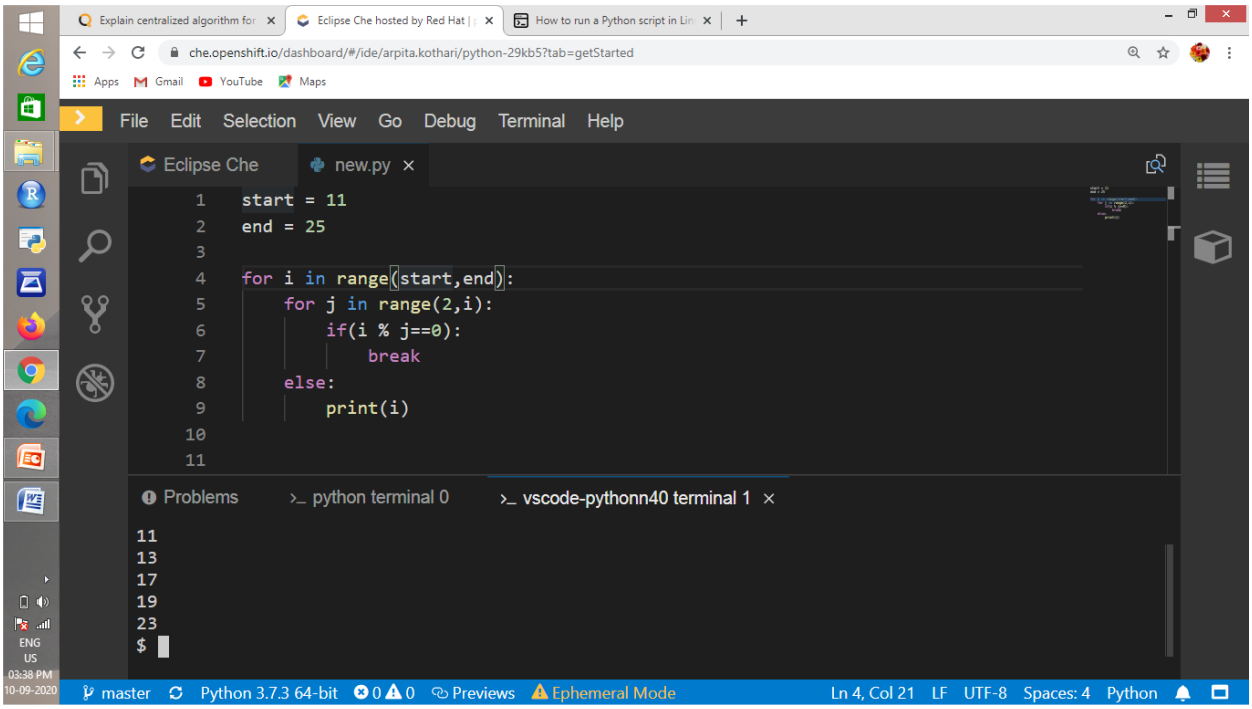
3. JAVA PROGRAM (Fibonacci Series) :

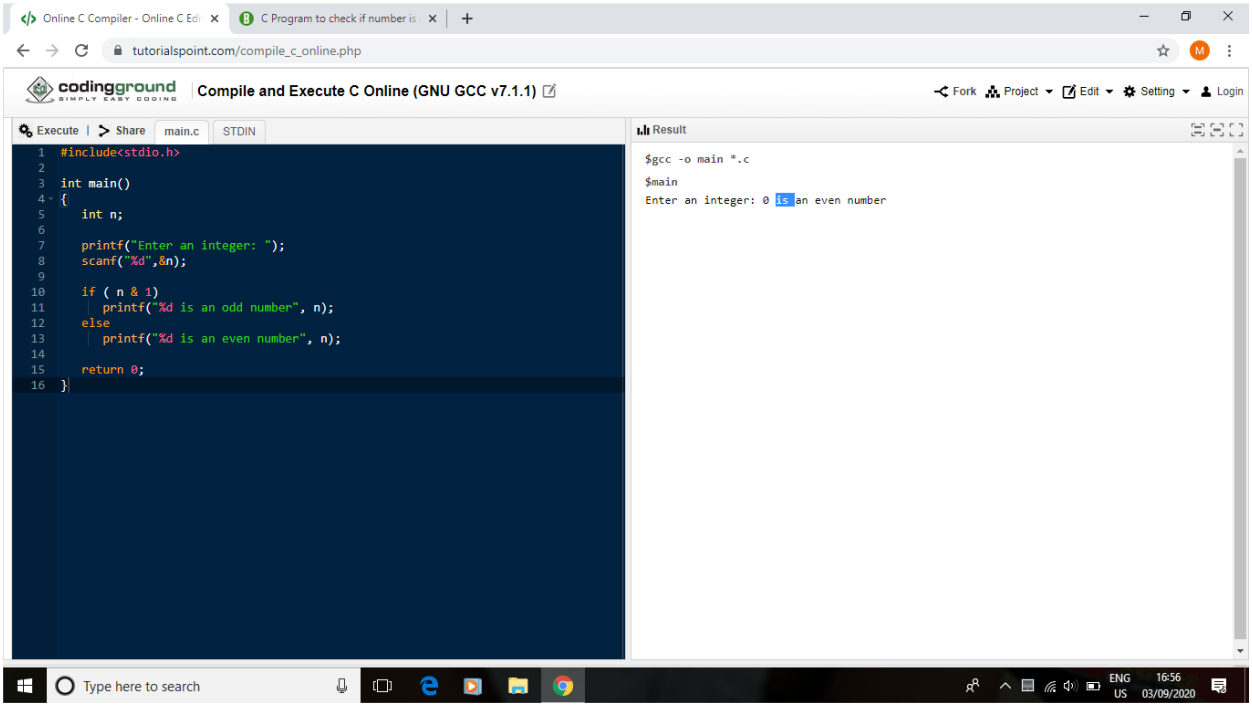
```
public class Fibonacci{
public static void main(String args[])
{
int n1=0,n2=1,n3,i,count=10;
System.out.print(n1+" "+n2);
for(i=2;i<count;++i)
{
n3=n1+n2;
System.out.print(" "+n3);
n1=n2;
n2=n3;
}
}
}
```



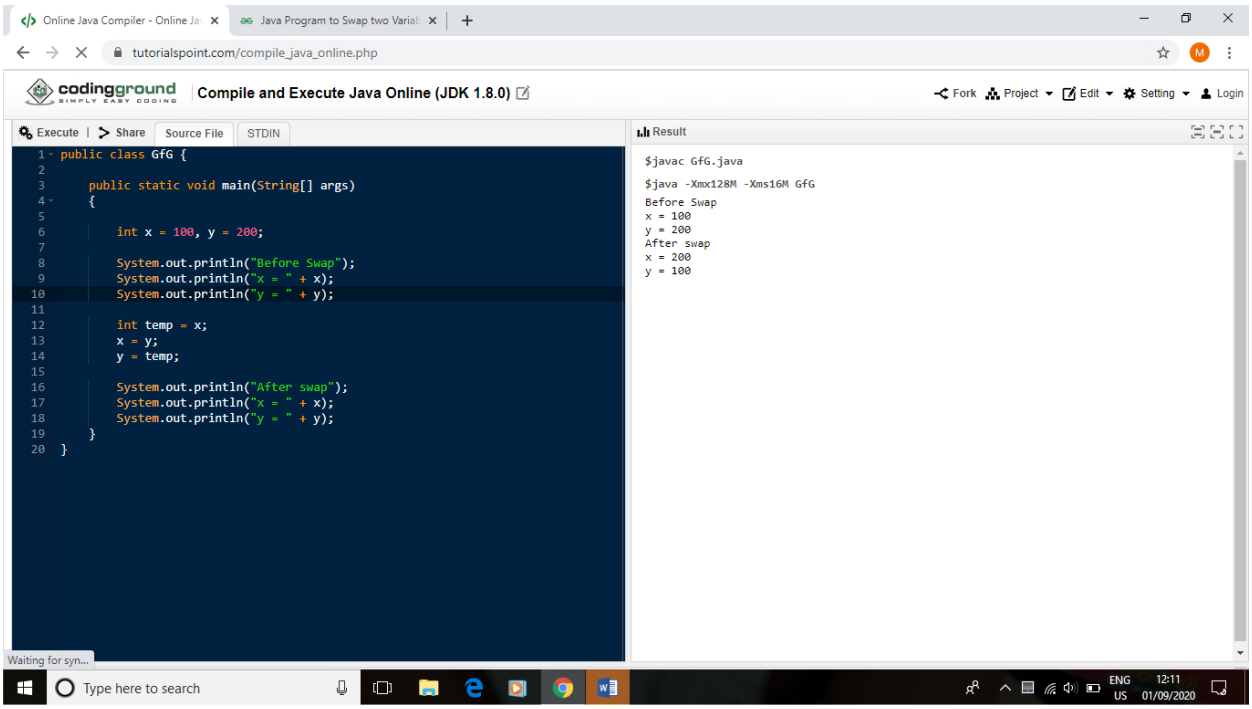
4. Python (Prime Number in Given Range) :

```
start = 11
end = 25
for i in range(start,end):
for j in range(2,i):
if(i % j==0):
break
else:
print(i)
```

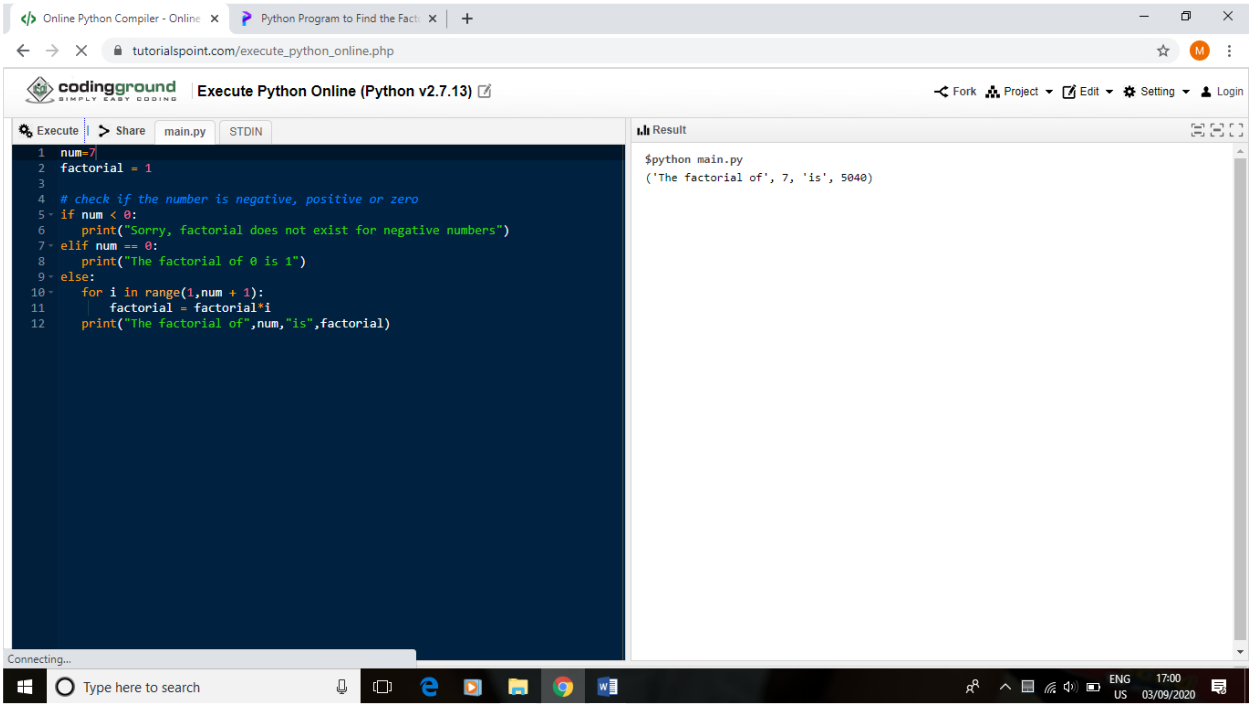




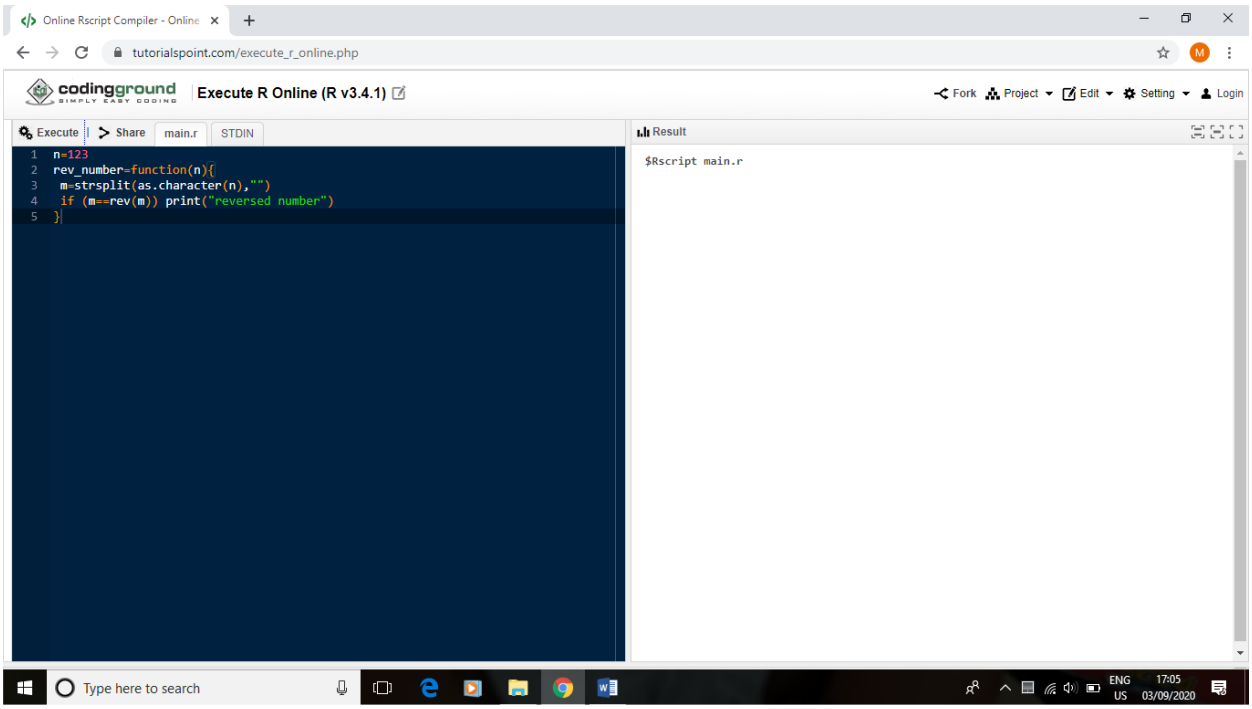
2. Java Program example



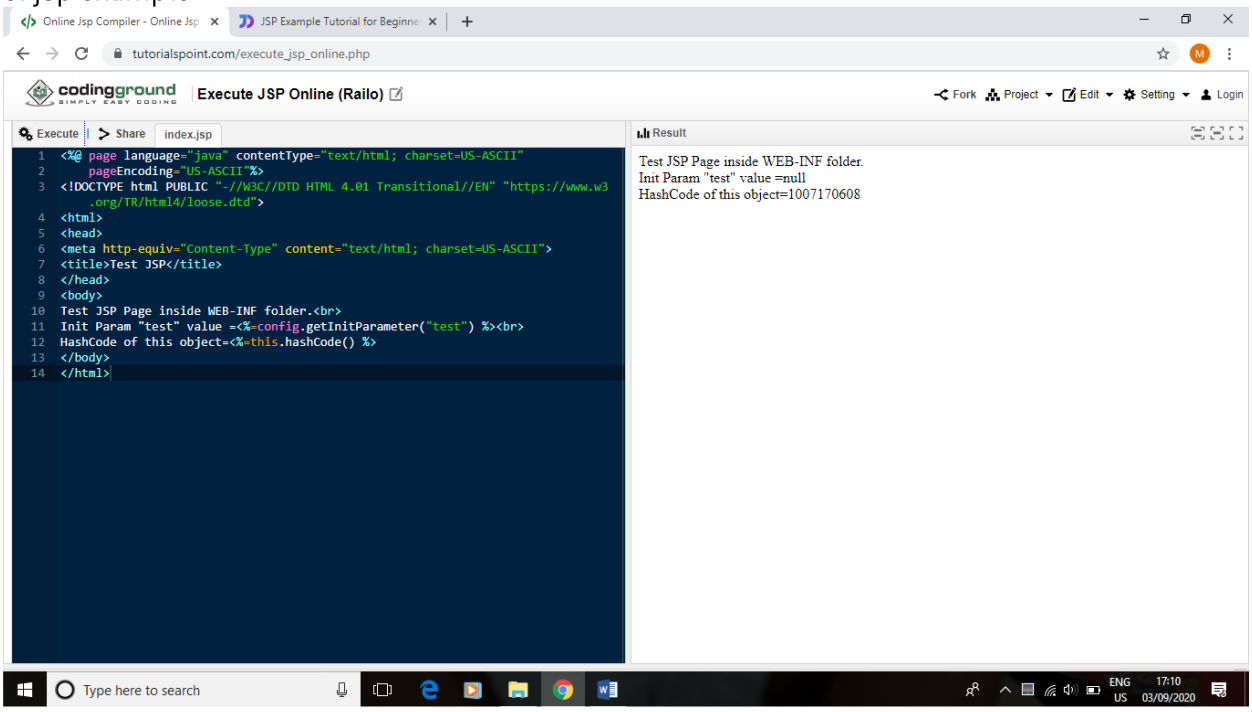
3.Python program



4. R program example



5. jsp example



CONCLUSION / RESULT:

In this Experiment, we demonstrate Cloud9/Codenvy for different language Evaluation.

Laboratory Report

Experiment No - 4

Batch -

Date of Experiment: _____ Date of Submission: _____

Title: Installation and configuration of virtual machine with guest OS

1) Attendance [2] ----------

2) Lab Performance [2] ----------

3) Oral [1] ----------

Overall Marks [5] ----------

Subject Incharge

Experiment No. 4

TITLE: Installation and configuration of virtual machine with guest OS

PREREQUISITE: Operating Systems

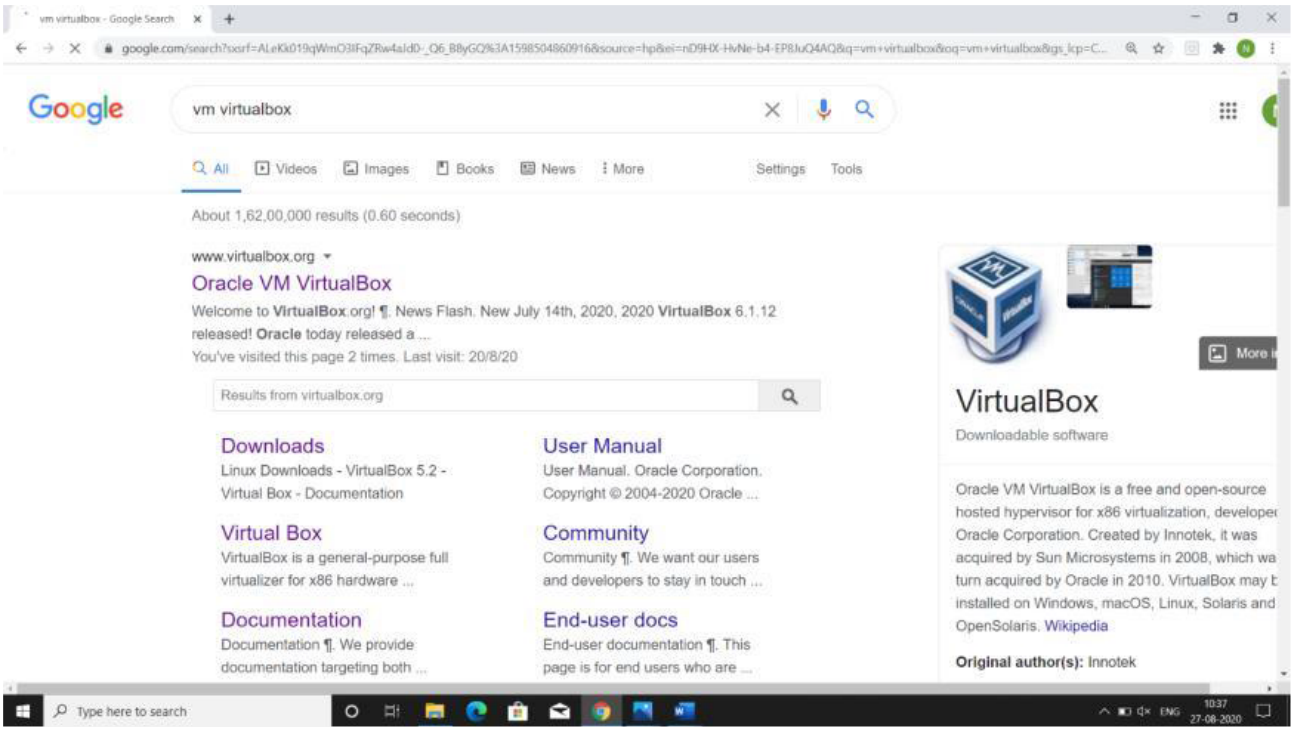
THEORY:

Introduction

In computing, a **virtual machine** (**VM**) is an emulation of a computer system. Virtual machines are based on computer architectures and provide functionality of a physical computer. Their implementations may involve specialized hardware, software, or a combination.

There are different kinds of virtual machines, each with different functions:

- **System virtual machines** (also termed full virtualization VMs) provide a substitute for a real machine. They provide functionality needed to execute entire operating systems. A hypervisor uses native execution to share and manage hardware, allowing for multiple environments, which are isolated from one another, yet exist on the same physical machine. Modern hypervisors use hardware-assisted virtualization, virtualization-specific hardware, primarily from the host CPUs.
- **Process virtual machines** are designed to execute computer programs in a platform-independent environment.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Oracle VM VirtualBox is a free and open-source hosted hypervisor for x86 virtualization, developed Oracle Corporation. Created by Innotek, it was acquired by Sun Microsystems in 2008, which wa turn acquired by Oracle in 2010. VirtualBox may b installed on Windows, macOS, Linux, Solaris and OpenSolaris. Wikipedia
Original author(s): Innotek
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VirtualBox is a powerful x86 and AMD64/Intel64 virtualization product for enterprise as well as home use. Not only is VirtualBox an extremely feature rich, high performance product for enterprise customers, it is also the only professional solution that is freely available as Open Source Software under the terms of the GNU General Public License (GPL) version 2. See "About VirtualBox" for an introduction.
Presently, VirtualBox runs on Windows, Linux, Macintosh, and Solaris hosts and supports a large number of guest operating systems including but not limited to Windows (NT 4.0, 2000, XP, Server 2003, Vista, Windows 7, Windows 8, Windows 10), DOS/Windows 3.x, Linux (2.4, 2.6, 3.x and 4.x), Solaris and OpenSolaris, OS/2, and OpenBSD.
VirtualBox is being actively developed with frequent releases and has an ever growing list of features, supported guest operating systems and platforms it runs on. VirtualBox is a community effort backed by a dedicated company: everyone is encouraged to contribute while Oracle ensures the product always meets professional quality criteria.
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If you're looking for the latest VirtualBox 6.0 packages, see VirtualBox 6.0 builds. Please also use version 6.0 if you need to run VMs with software virtualization, as this has been discontinued in 6.1. Version 6.0 will remain supported until July 2020.
If you're looking for the latest VirtualBox 5.2 packages, see VirtualBox 5.2 builds. Please also use version 5.2 if you still need support for 32-bit hosts, as this has been discontinued in 6.0. Version 5.2 will remain supported until July 2020.
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Solaris hosts
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SHA256 checksums, MD5 checksums
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VirtualBox 6.1.12 Oracle VM VirtualBox Extension Pack
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VirtualBox Bridge
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VirtualBox Python 2.x S
Oracle VM VirtualBox 6.1.12 application.
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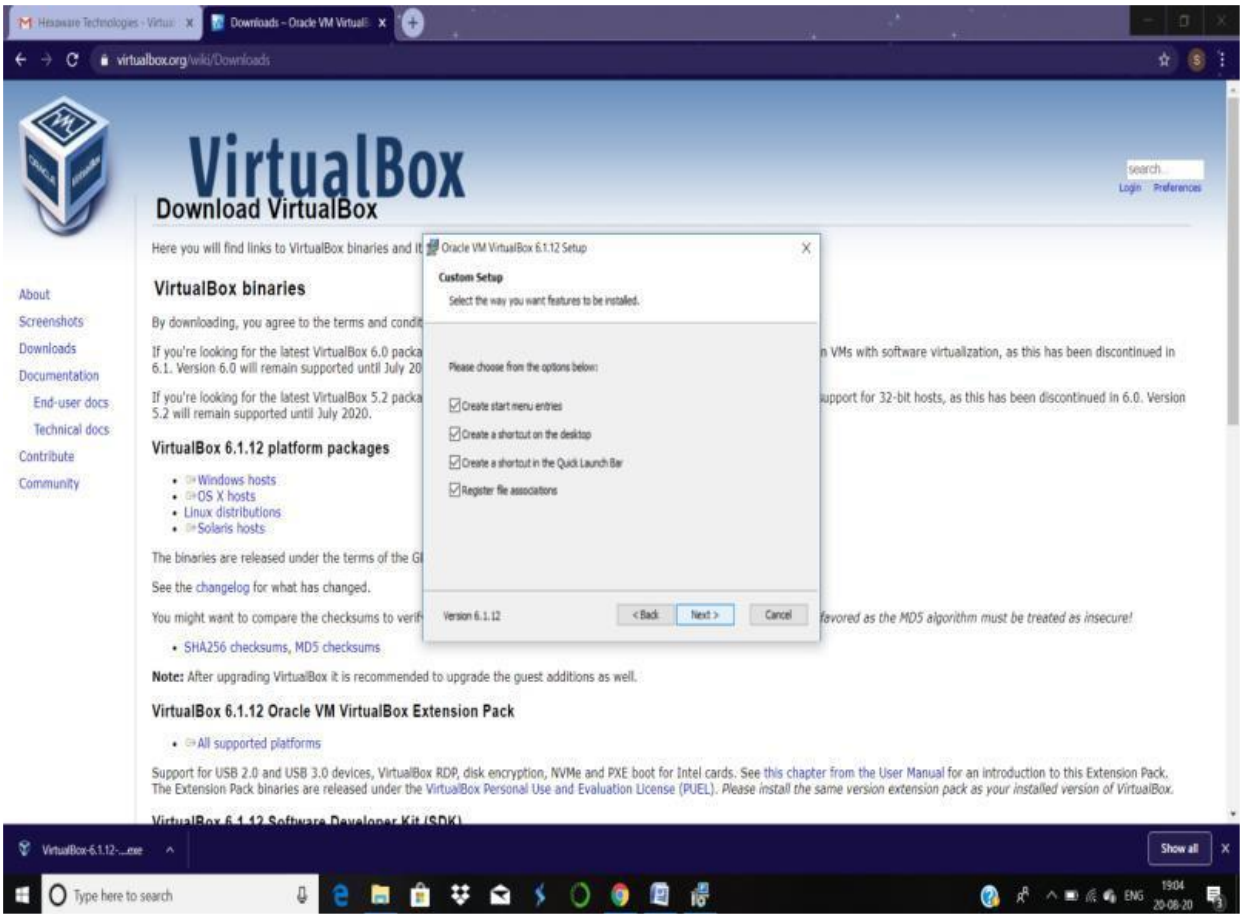
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SHA256 checksums, MD5 checksums
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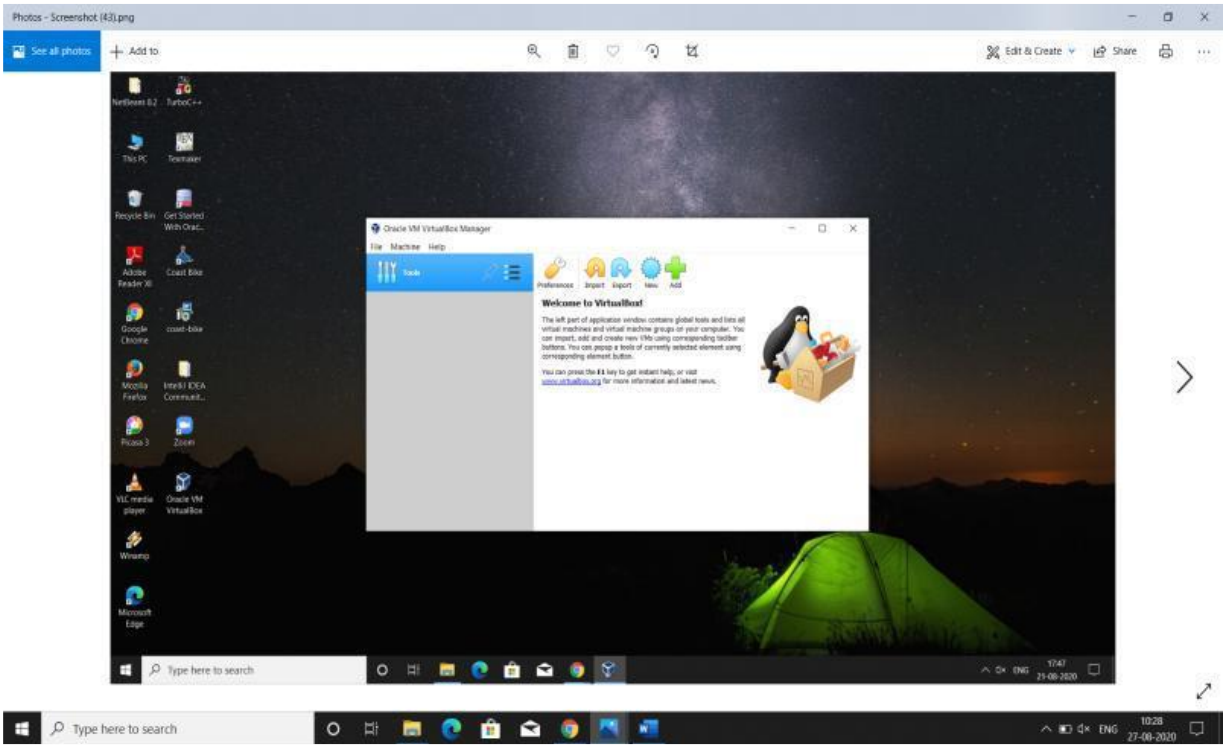
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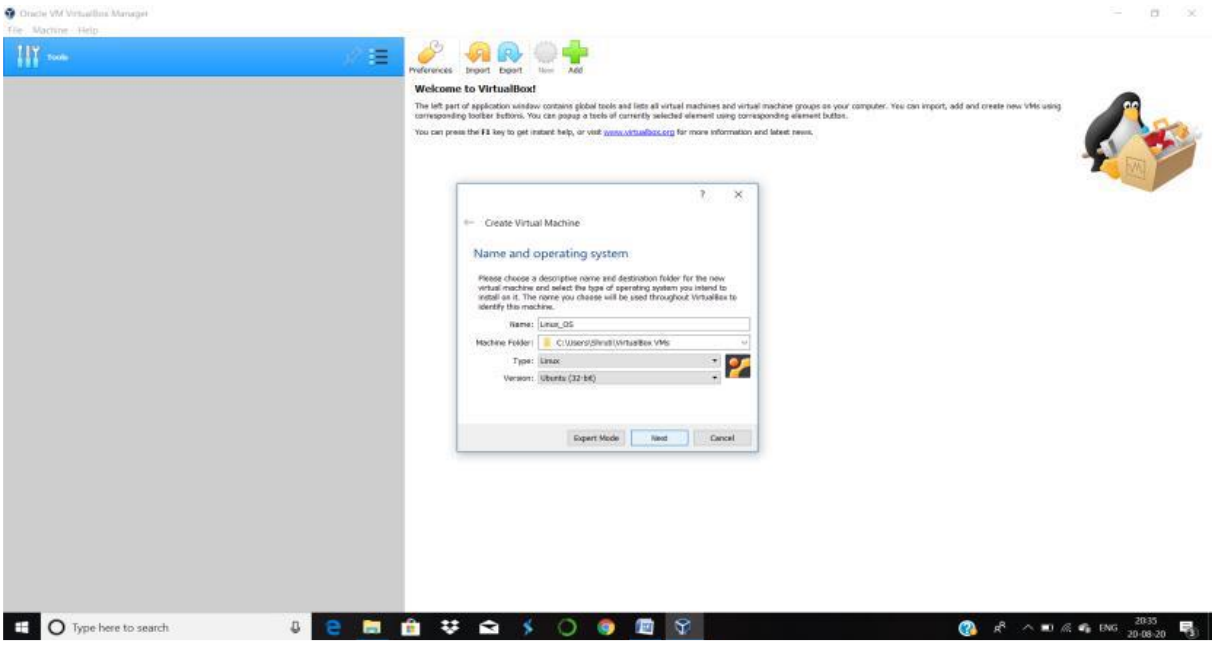
Oracle VM VirtualBox Manager
File Machine Help
Tools
Preferences
Import
Export
New
Add
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The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new VMs using corresponding toolbar buttons. You can popup a tools of currently selected element using corresponding element buttons.
You can press the F1 key to get instant help, or visit www.virtualbox.org for more information and latest news.
Create Virtual Machine
Name and operating system
Please choose a descriptive name and destination folder for the new virtual machine and select the type of operating system you intend to install on it. The name you choose will be used throughout VirtualBox to identify this machine.
Name: Linux_OS
Machine Folder: C:\Users\Shirvi\VirtualBox VMs
Type: Linux
Version: Ubuntu (32-bit)
Expert Mode
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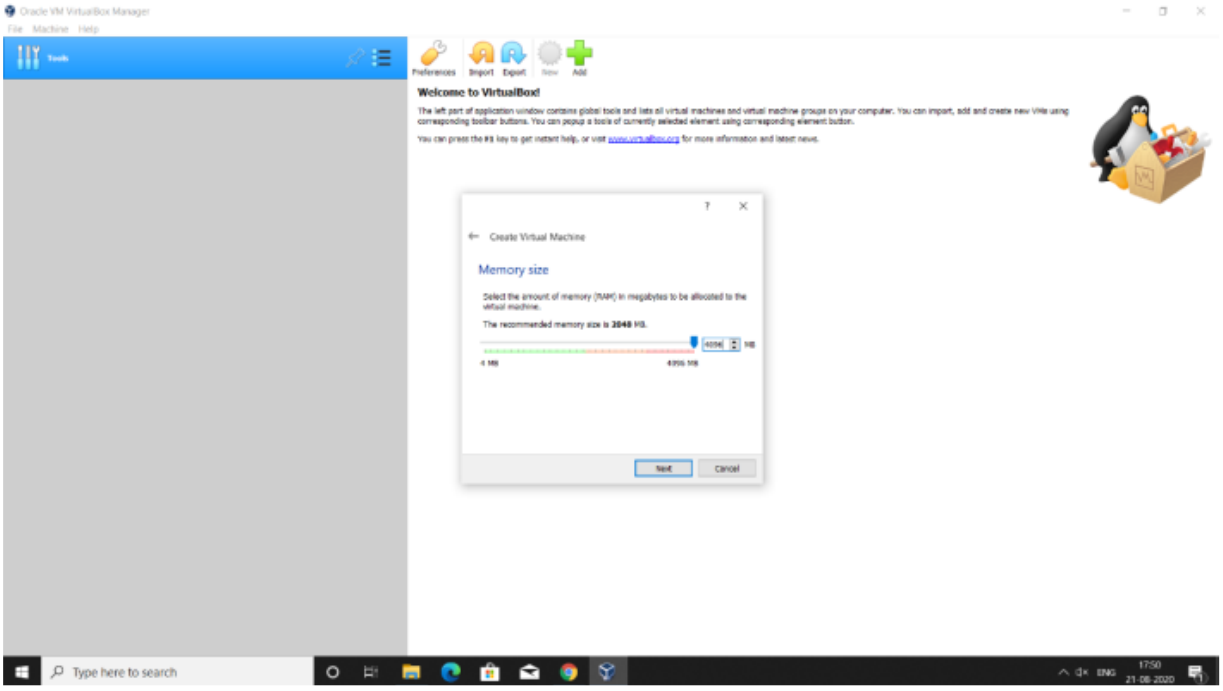
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You can press the F1 key to get instant help, or visit www.virtualbox.org for more information and latest news.
Create Virtual Machine
Memory size
Select the amount of memory (RAM) in megabytes to be allocated to the virtual machine.
The recommended memory size is 2048 MB.
4 MB
4096 MB
Next
Cancel
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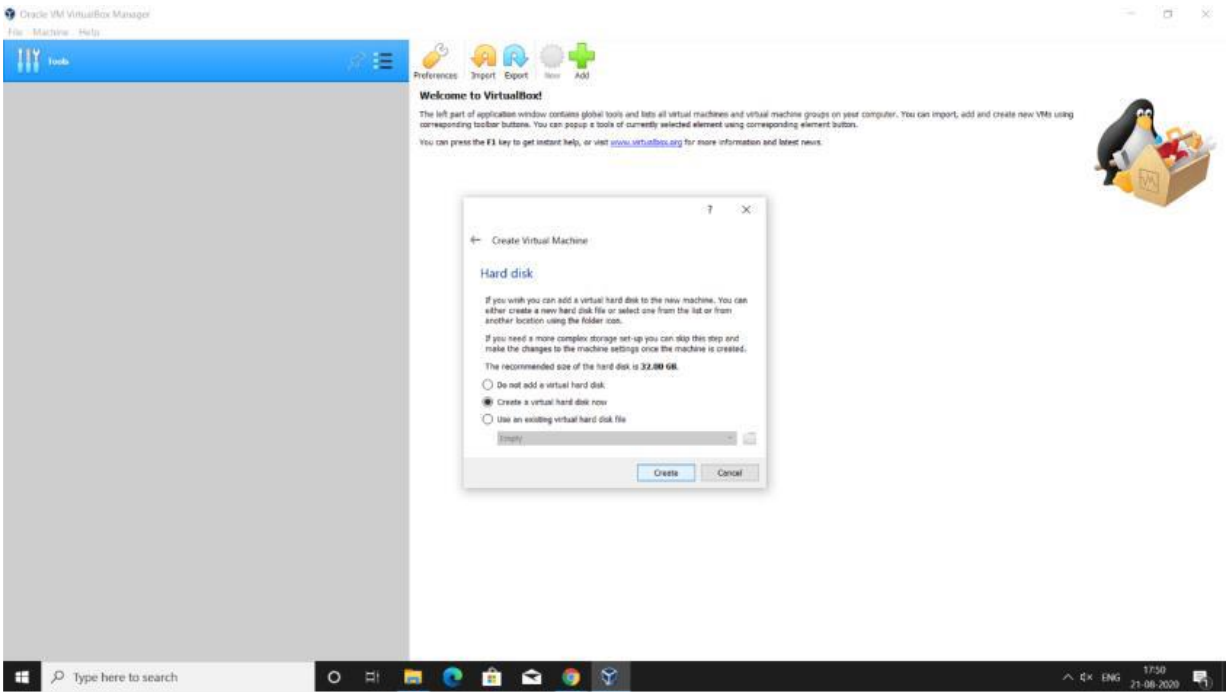
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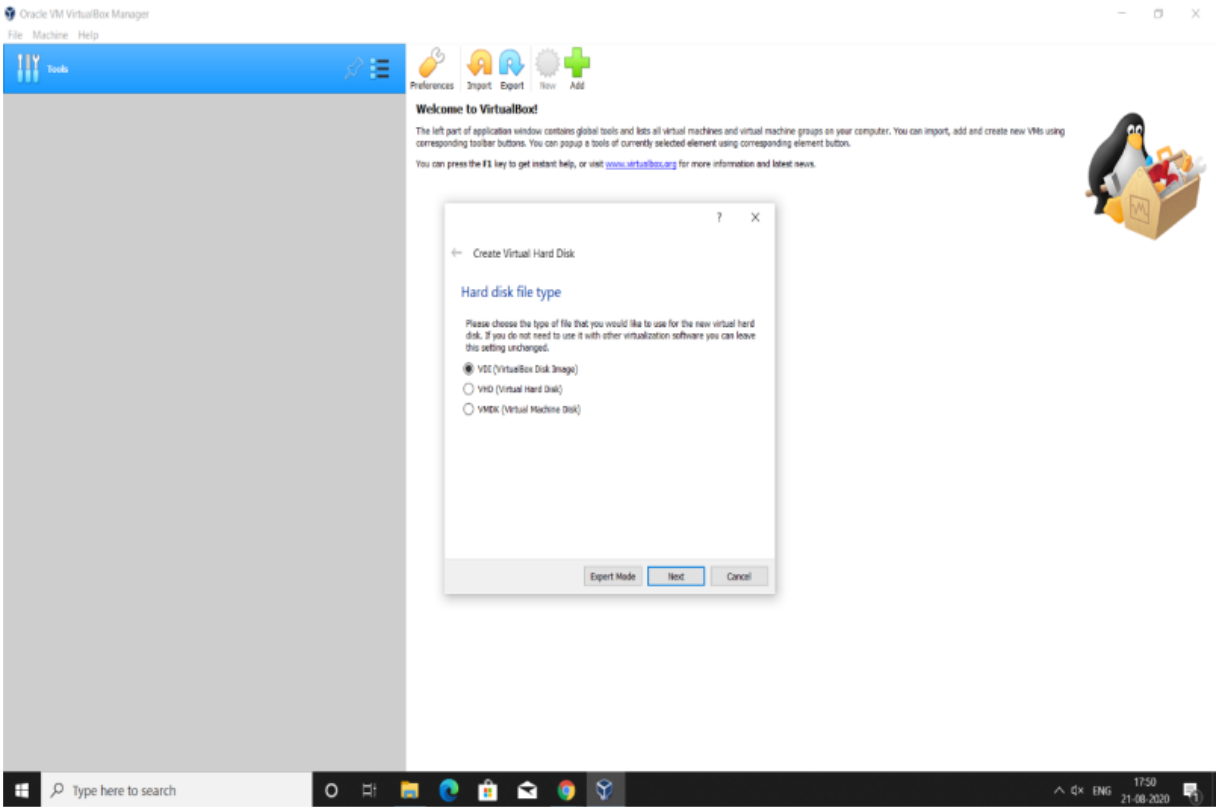
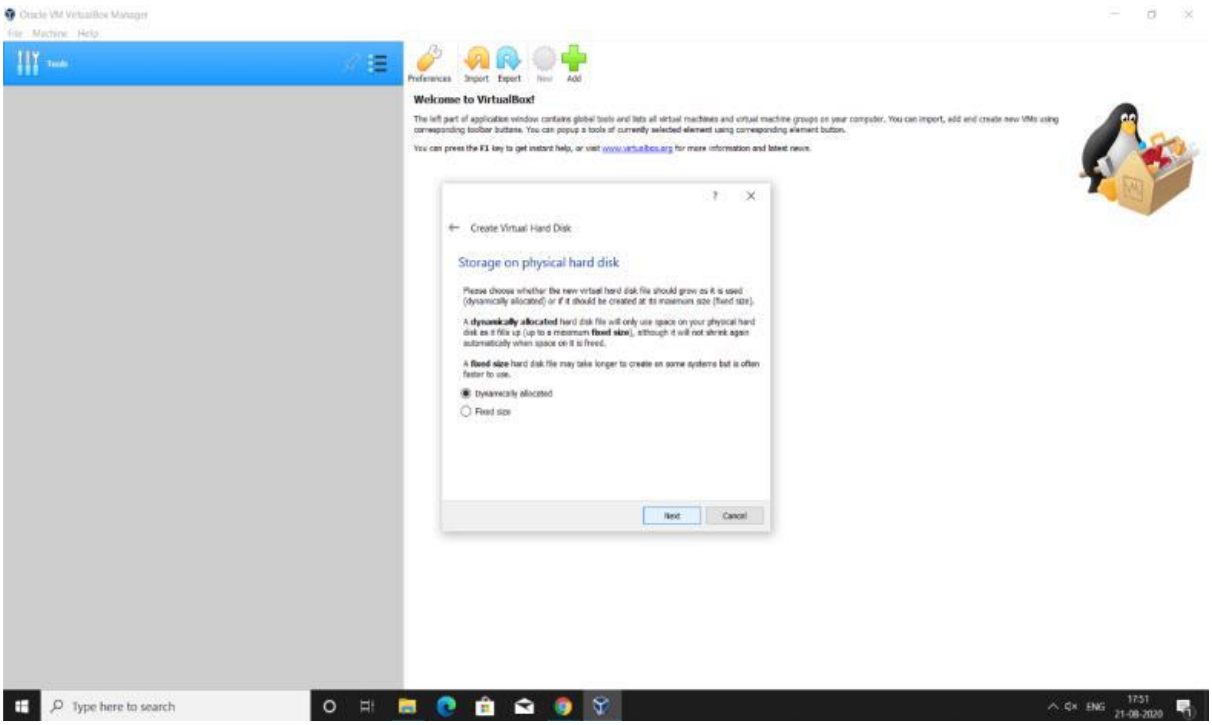
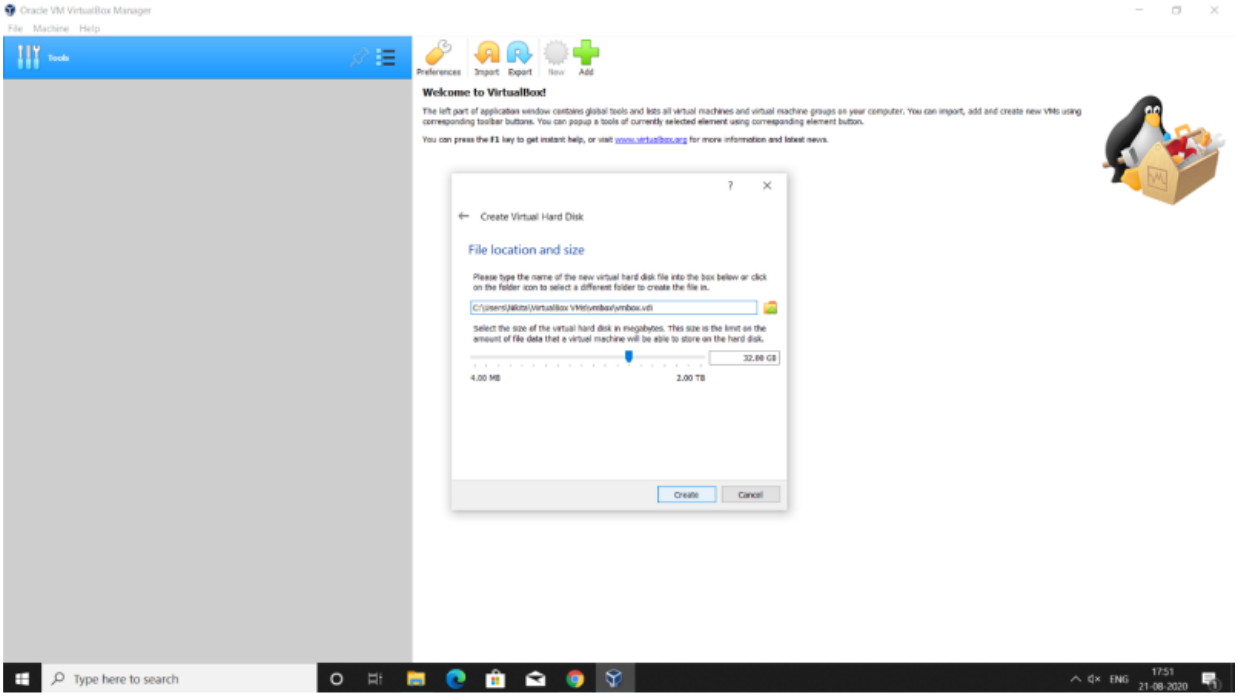
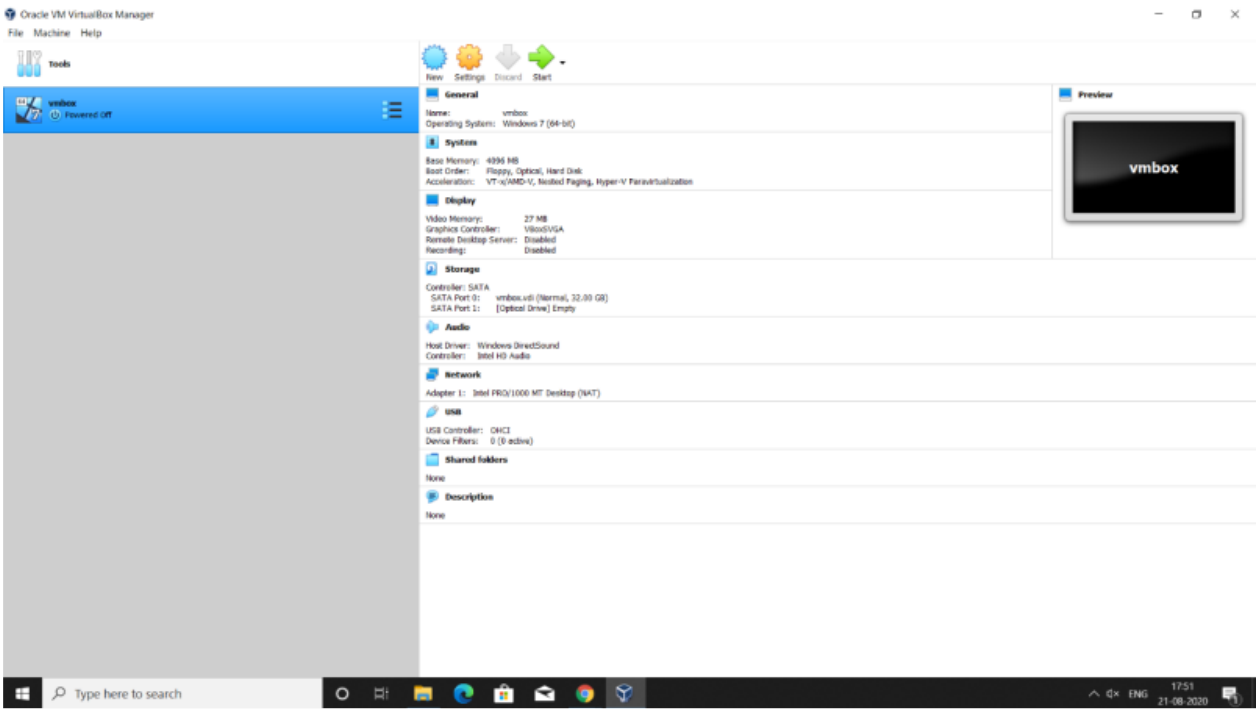
Welcome to VirtualBox!
The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new VMs using corresponding toolbar buttons. You can popup a tools of currently selected element using corresponding element buttons.
You can press the F1 key to get instant help, or visit www.virtualbox.org for more information and latest news.
Create Virtual Machine
Hard disk
If you wish you can add a virtual hard disk to the new machine. You can either create a new hard disk file or select one from the list or from another location using the folder icon.
If you need a more complex storage set-up you can skip this step and make the changes to the machine settings once the machine is created.
The recommended size of the hard disk is 32.00 GB.
Do not add a virtual hard disk
Create a virtual hard disk now
Use an existing virtual hard disk file
Empty
Create
Cancel
Type here to search
ENG
17:50
21-08-2020


Oracle VM VirtualBox Manager
File Machine Help
Tools
Preferences
Import
Export
New
Add
Welcome to VirtualBox!
The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new VMs using corresponding toolbar buttons. You can popup a tools of currently selected element using corresponding element button.
You can press the F1 key to get instant help, or visit www.virtualbox.org for more information and latest news.
Create Virtual Hard Disk
Hard disk file type
Please choose the type of file that you would like to use for the new virtual hard disk. If you do not need to use it with other virtualization software you can leave this setting unchanged.
VDI (VirtualBox Disk Image)
VHD (Virtual Hard Disk)
VMDK (Virtual Machine Disk)
Expert Mode
Next
Cancel
Type here to search
ENG
17:50
21-08-2020


Oracle VM VirtualBox Manager
File Machine Help
Tools
Preferences Import Export New Add
Welcome to VirtualBox!
The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new VMs using corresponding toolbar buttons. You can popup a tools of currently selected element using corresponding element button.
You can press the F1 key to get instant help, or visit www.virtualbox.org for more information and latest news.
Create Virtual Hard Disk
Storage on physical hard disk
Please choose whether the new virtual hard disk file should grow as it is used (dynamically allocated) or if it should be created at its maximum size (fixed size).
A dynamically allocated hard disk file will only use space on your physical hard disk as it fills up (up to a maximum fixed size), although it will not shrink again automatically when space on it is freed.
A fixed size hard disk file may take longer to create on some systems but is often faster to use.
Dynamically allocated
Fixed size
Next
Cancel
Type here to search
ENG
17:51
21-08-2020


Oracle VM VirtualBox Manager
File Machine Help
Tools
Preferences Import Export New Add
Welcome to VirtualBox!
The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new VMs using corresponding toolbar buttons. You can popup a tools of currently selected element using corresponding element button.
You can press the F1 key to get instant help, or visit www.virtualbox.org for more information and latest news.
Create Virtual Hard Disk
File location and size
Please type the name of the new virtual hard disk file into the box below or click on the folder icon to select a different folder to create the file in.
Select the size of the virtual hard disk in megabytes. This size is the limit on the amount of file data that a virtual machine will be able to store on the hard disk.
4.00 MB
2.00 TB
Create
Cancel
Type here to search
ENG
17:51
21-08-2020



CONCLUSION / RESULT:

In this Experiment, we studied installation and configuration of virtual machine with guest OS

Laboratory Report

Experiment No - 5

Batch -

Date of Experiment: _____ Date of Submission: _____

Title: Demonstrate the use of map and reduce tasks

Evaluation

1) Attendance [2] ----------

2) Lab Performance [2] ----------

3) Oral [1] ----------

Overall Marks [5] ----------

Subject Incharge

Experiment No. 5

TITLE: Demonstrate the use of map and reduce tasks.

PREREQUISITE: Operating Systems, Computer Networks, Java

THEORY:

Introduction

Hadoop is a Java-based programming framework that supports the processing and storage of extremely large datasets on a cluster of inexpensive machines. It was the first major open source project in the big data playing field and is sponsored by the Apache Software Foundation. Hadoop 2.7 is comprised of four main layers: Hadoop Common is the collection of utilities and libraries that support other Hadoop modules.

- HDFS, which stands for Hadoop Distributed File System, is responsible for persisting data to disk.
- YARN, short for Yet Another Resource Negotiator, is the "operating system" for HDFS.
- MapReduce is the original processing model for Hadoop clusters. It distributes work within the cluster or map, then organizes and reduces the results from the nodes into a response to a query. Many other processing models are available for the 2.x version of Hadoop.

Step 1 — Installing Java

To get started, we'll update our package list:

sudo apt-get update

Next, we'll install OpenJDK, the default Java Development Kit on Ubuntu 16.04.

sudo apt-get install default-jdk

Once the installation is complete, let's check the version.

java -version

Output

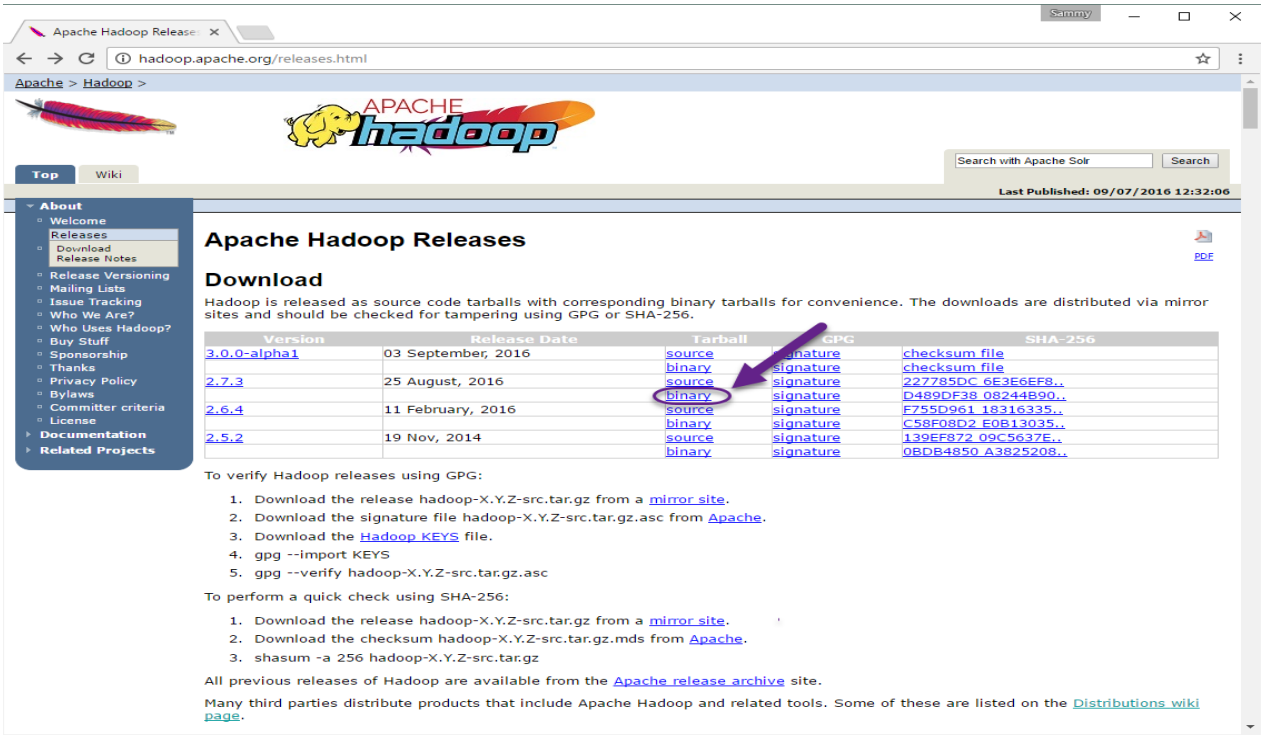
openjdk version "1.8.0_91"

OpenJDK Runtime Environment (build 1.8.0_91-8u91-b14-3ubuntu1~16.04.1-b14)

OpenJDK 64-Bit Server VM (build 25.91-b14, mixed mode)

Step 2 — Installing Hadoop

With Java in place, we'll visit the Apache Hadoop Releases page to find the most recent stable release. Follow the binary for the current release:



Step 3 — Configuring Hadoop's Java Home

Hadoop requires that you set the path to Java, either as an environment variable or in the Hadoop configuration file. The path to Java, /usr/bin/java is a symlink to /etc/alternatives/java, which is in turn a symlink to default Java binary. We will use readlink with the -f flag to follow every symlink in every part of the path, recursively. Then, we'll use sed to trim bin/java from the output to give us the correct value for JAVA_HOME. To find the default Java path

readlink -f /usr/bin/java | sed "s:bin/java::"

Output

/usr/lib/jvm/java-8-openjdk-amd64/jre/

You can copy this output to set Hadoop's Java home to this specific version, which ensures that if the default Java changes, this value will not. Alternatively, you can use

the readlink command dynamically in the file so that Hadoop will automatically use whatever Java version is set as the system default.

To begin, open hadoop-env.sh:

sudo nano /usr/local/hadoop/etc/hadoop/hadoop-env.sh

Then, choose one of the following options:

Option 1: Set a Static Value

/usr/local/hadoop/etc/hadoop/hadoop-env.sh

```
...
#export JAVA_HOME=${JAVA_HOME}
export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64/jre/
...
```

Copy

Option 2: Use Readlink to Set the Value Dynamically

/usr/local/hadoop/etc/hadoop/hadoop-env.sh

```
...
#export JAVA_HOME=${JAVA_HOME}
export JAVA_HOME=$(readlink -f /usr/bin/java | sed "s:bin/java::")
```

Step 4 — Running Hadoop

Now we should be able to run Hadoop:

```
/usr/local/hadoop/bin/hadoop
```

Output

```
Usage: hadoop [--config confdir] [COMMAND | CLASSNAME]
 CLASSNAME           run the class named CLASSNAME
or
 where COMMAND is one of:
 fs                  run a generic filesystem user client
 version             print the version
 jar <jar>           run a jar file
                     note: please use "yarn jar" to launch
```

```
                    YARN applications, not this command.
checknative [-a|-h]  check native hadoop and compression libraries availability
distcp <srcurl> <desturl> copy file or directories recursively
archive -archiveName NAME -p <parent path> <src>* <dest> create a hadoop archive
classpath           prints the class path needed to get the
credential          interact with credential providers
                Hadoop jar and the required libraries
daemonlog           get/set the log level for each daemon
```

The help means we've successfully configured Hadoop to run in stand-alone mode. We'll ensure that it is functioning properly by running the example MapReduce program it ships with. To do so, create a directory called input in our home directory and copy Hadoop's configuration files into it to use those files as our data.

```
mkdir ~/input
cp /usr/local/hadoop/etc/hadoop/*.xml ~/input
```

Next, we can use the following command to run the MapReduce hadoop-mapreduce-examples program, a Java archive with several options. We'll invoke its grep program, one of many examples included in hadoop-mapreduce-examples, followed by the input directory, input and the output directory grep_example. The MapReduce grep program will count the matches of a literal word or regular expression. Finally, we'll supply a regular expression to find occurrences of the word principal within or at the end of a declarative sentence. The expression is case-sensitive, so we wouldn't find the word if it were capitalized at the beginning of a sentence:

```
/usr/local/hadoop/bin/hadoop jar /usr/local/hadoop/share/hadoop/mapreduce/hadoop-mapreduce-examples-2.7.3.jar grep ~/input ~/grep_example 'principal[.]*'
```

When the task completes, it provides a summary of what has been processed and errors it has encountered, but this doesn't contain the actual results.

STANDARD INPUT AND OUTPUT:

```
Output
. . .
    File System Counters
        FILE: Number of bytes read=1247674
        FILE: Number of bytes written=2324248
        FILE: Number of read operations=0
        FILE: Number of large read operations=0
        FILE: Number of write operations=0
    Map-Reduce Framework
        Map input records=2
        Map output records=2
        Map output bytes=37
        Map output materialized bytes=47
        Input split bytes=114
        Combine input records=0
        Combine output records=0
        Reduce input groups=2
        Reduce shuffle bytes=47
        Reduce input records=2
        Reduce output records=2
        Spilled Records=4
        Shuffled Maps =1
        Failed Shuffles=0
        Merged Map outputs=1
        GC time elapsed (ms)=61
        Total committed heap usage (bytes)=263520256
    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=151
    File Output Format Counters
        Bytes Written=37
```

CONCLUSION / RESULT:

In this Experiment, we have demonstrated the use of map and reduce tasks using Hadoop.

Laboratory Report

Experiment No - 6

Batch -

Date of Experiment: _____ Date of Submission: _____

Title: Design and analyze architecture of Aneka identify different entities to understand the structure

---

Evaluation

1) Attendance [2] ----------

2) Lab Performance [2] ----------

3) Oral [1] ----------

Overall Marks [5] ----------

Subject Incharge

Experiment No. 6

TITLE: Design and analyze architecture of Aneka identify different entities to understand the structure of it

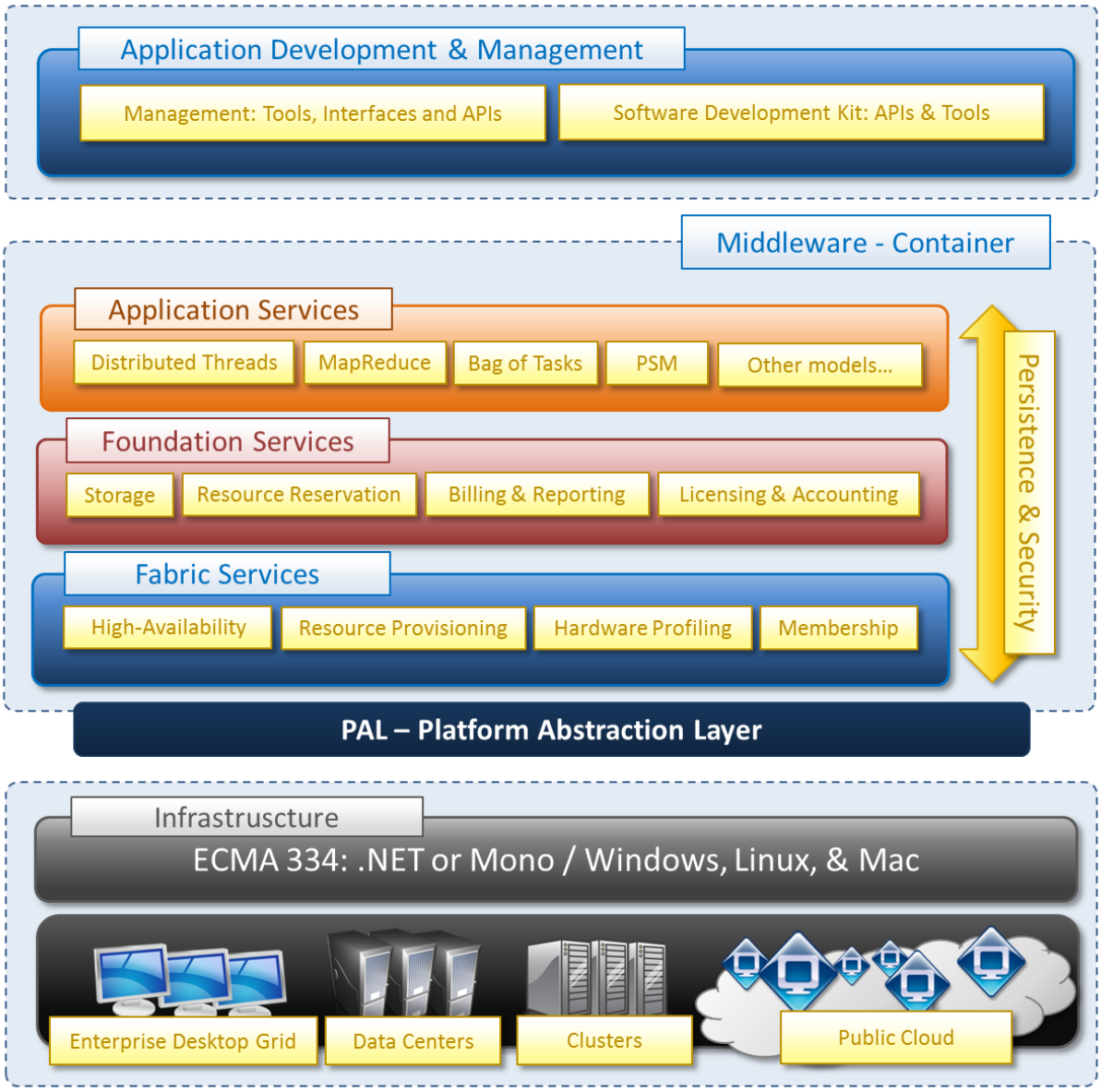
PREREQUISITE: Operating Systems, Computer networks

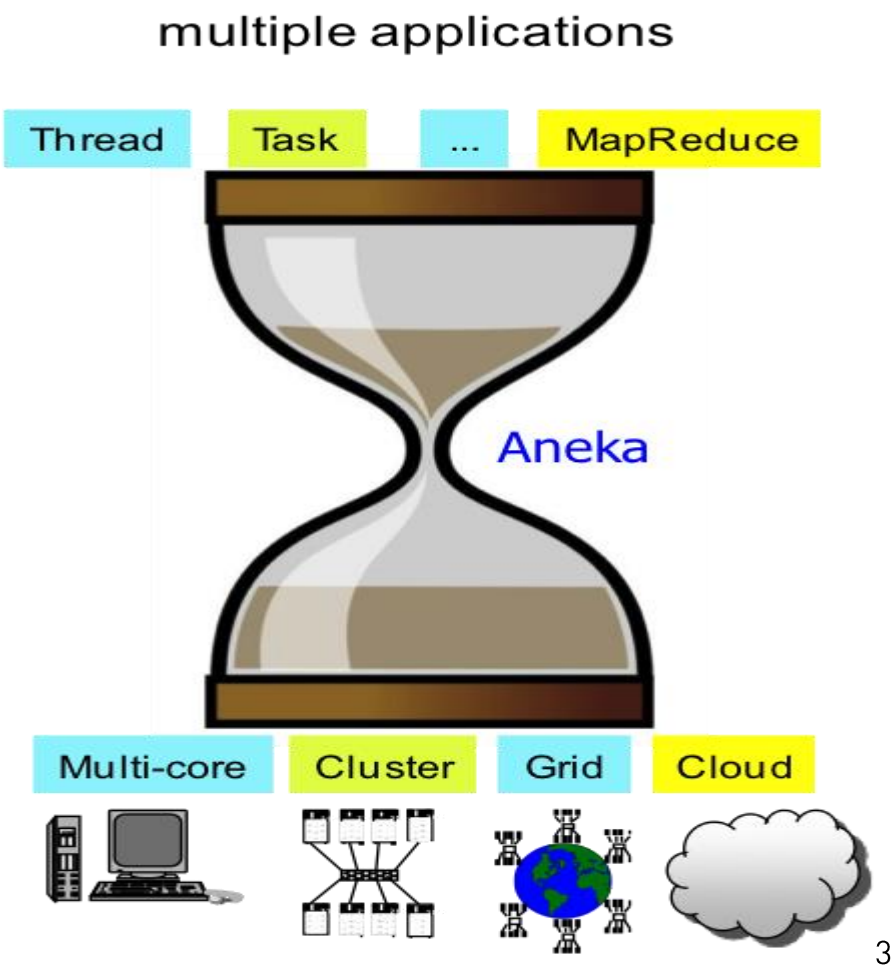
THEORY:

Aneka Architecture

Aneka is a platform and a framework for developing distributed applications on the Cloud. It harnesses the spare CPU cycles of a heterogeneous network of desktop PCs and servers or datacenters on demand. Aneka provides developers with a rich set of APIs for transparently exploiting such resources and expressing the business logic of applications by using the preferred programming abstractions. System administrators can leverage on a collection of tools to monitor and control the deployed infrastructure. This can be a public cloud available to anyone through the Internet, or a private cloud constituted by a set of nodes with restricted access.

The Aneka based computing cloud is a collection of physical and virtualized resources connected through a network, which are either the Internet or a private intranet. Each of these resources hosts an instance of the Aneka Container representing the runtime environment where the distributed applications are executed. The container provides the basic management features of the single node and leverages all the other operations on the services that it is hosting. The services are broken up into fabric, foundation, and execution services. Fabric services directly interact with the node through the Platform Abstraction Layer (PAL) and perform hardware profiling and dynamic resource provisioning. Foundation services identify the core system of the Aneka middleware, providing a set of basic features to enable Aneka containers to perform specialized and specific sets of tasks. Execution services directly deal with the scheduling and execution of applications in the Cloud.


Application Development & Management
Management: Tools, Interfaces and APIs
Software Development Kit: APIs & Tools
Middleware - Container
Application Services
Distributed Threads
MapReduce
Bag of Tasks
PSM
Other models...
Foundation Services
Storage
Resource Reservation
Billing & Reporting
Licensing & Accounting
Fabric Services
High-Availability
Resource Provisioning
Hardware Profiling
Membership
Persistence & Security
PAL – Platform Abstraction Layer
Infrastruscture
ECMA 334: .NET or Mono / Windows, Linux, & Mac
Enterprise Desktop Grid
Data Centers
Clusters
Public Cloud



3

One of the key features of Aneka is the ability of providing different ways for expressing distributed applications by offering different programming models; execution services are mostly concerned with providing the middleware with an implementation for these models. Additional services such as persistence and security are transversal to the entire stack of services that are hosted by the Container. At the application level, a set of different components and tools are provided to:

1) simplify the development of applications (SDK);

2) porting existing applications to the Cloud; and

3) monitoring and managing the Aneka Cloud.

A common deployment of Aneka is presented at the side. An Aneka based Cloud is constituted by a set of interconnected resources that are dynamically modified according to the user needs by using resource virtualization or by harnessing the spare

CPU cycles of desktop machines. If the deployment identifies a private Cloud all the resources are in house, for example within the enterprise. This deployment is extended by adding publicly available resources on demand or by interacting with other Aneka public clouds providing computing resources connected over the Internet.

CONCLUSION / RESULT:

In this Experiment, we have analyzed the architecture of Aneka and identified different entities to understand the structure of it

Laboratory Report

Experiment No - 7

Batch -

Date of Experiment: _____ Date of Submission: _____

Title: Installation and configuration of Aneka master node and execution of Convolution imaging application

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Evaluation

1) Attendance [2] ----------

2) Lab Performance [2] ----------

3) Oral [1] ----------

Overall Marks [5] ----------

Subject Incharge

Experiment No. 7

TITLE: Installation and configuration of Aneka master node and execution of Convolution imaging application

PREREQUISITE: Operating Systems, Computer Nertworks

THEORY:

Aneka is a Cloud Application Development Platform for developing and running compute and data intensive applications. As a platform it provides users with both a runtime environment for executing applications developed using any of the three supported programming models, and a set of APIs and tools that allow you to build new applications or run existing legacy code. The purpose of this document is to help you through the process of installing and setting up an Aneka Cloud environment. This document will cover everything from helping you to understand your existing infrastructure, different deployment options, installing the Management Studio, configuring Aneka Daemons and Containers, and finally running some of the samples to test your environment.

An Aneka Cloud is composed of a collection of services deployed on top of an infrastructure. This infrastructure can include both physical and virtual machines located in your local area network or Data Centre. Aneka services are hosted on Aneka Containers which are managed by Aneka Daemons. An Aneka Daemon is a background service that runs on a machine and helps you to install, start, stop, update and reconfigure Containers.

A key component of the Aneka platform is the Aneka Management Studio, a portal for managing your infrastructure and clouds. Administrators use the Aneka Management Studio to define their infrastructure, deploy Aneka Daemons, and install and configure Aneka Containers. The figure below shows a high-level representation of an Aneka Cloud, composed of a Master Container that is responsible for scheduling jobs to Workers, and a group of Worker Containers that execute the jobs. Each machine is typically configured with a single instance of the Aneka Daemon and a single instance

of the Aneka Container.

Installation

This section assumes that you have a copy of the Aneka distribution with you. If you do not have a copy already, you can download the latest version from Manjrasoft's Website.

Installing Aneka Cloud Management Studio

Aneka installation begins with installing Aneka Cloud Management Studio. The Cloud Management Studio is your portal for creating, configuring and managing Aneka Clouds. Installing Aneka using the distributed Microsoft Installer Package (MSI) is a quick process involving three steps as described below.

Step 1 – Run the installer package to start the Setup Wizard

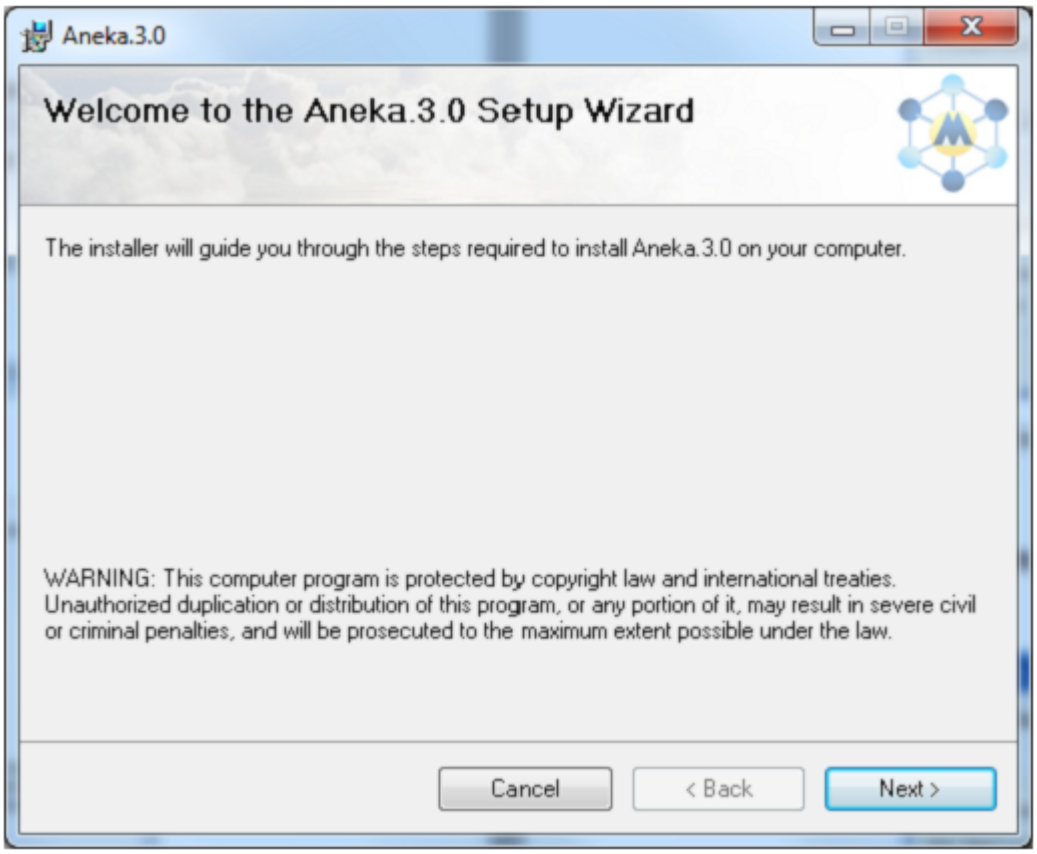


Figure - Welcome Page

The Welcome Page is self-explanatory and you can proceed by clicking next.

Step 2 – Specifying the installation folder

In Step 2 you specify the installation folder. By default Aneka is installed in C:\Program Files\Manjrasoft\Aneka.3.0.

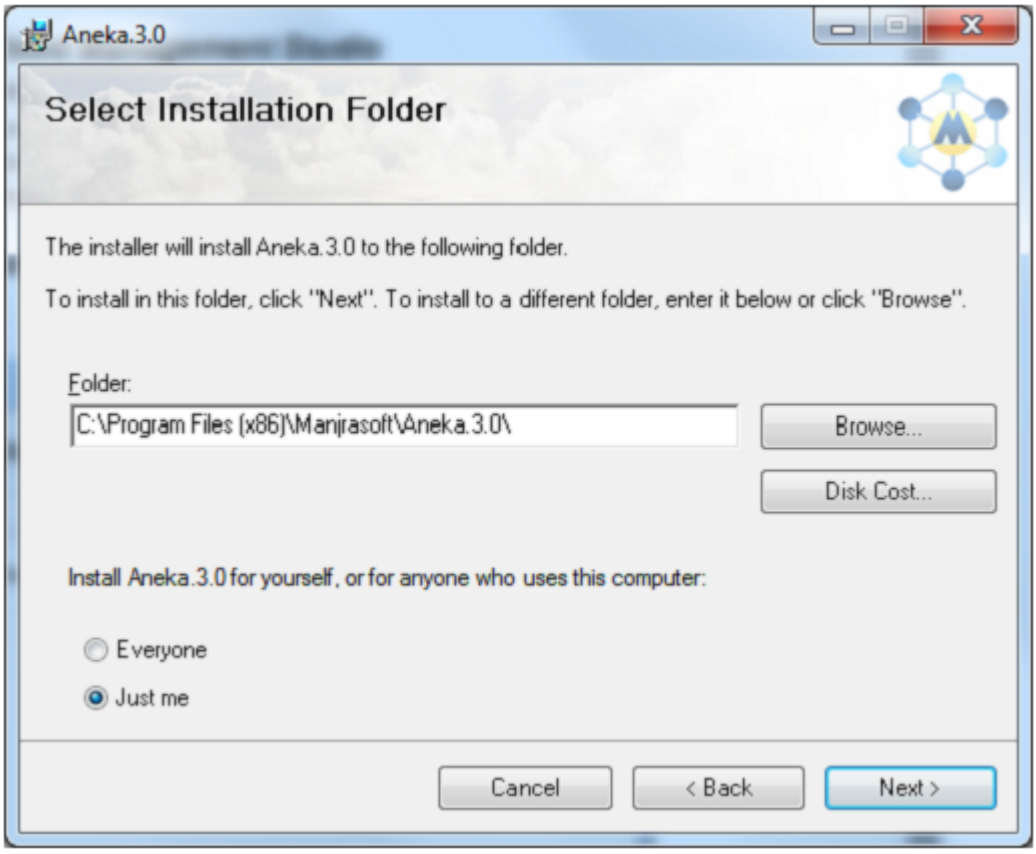


Figure - Specifying the installation folder

Step 3 – Confirm and start the installation

At this point you are ready to begin the installation. Click —"Next" to start the installation or —"Back" to change your installation folder.

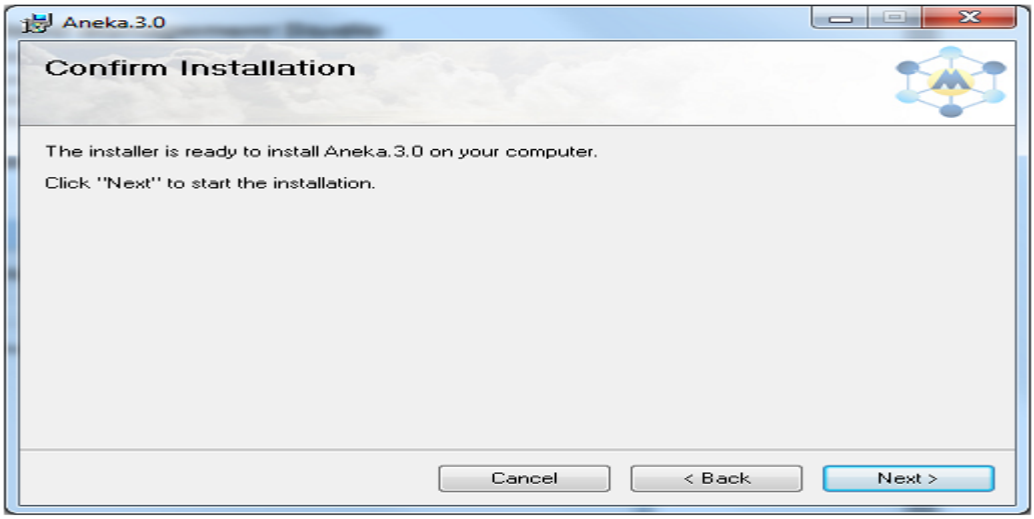


Figure - Confirm Installation

Once the installation is complete, close the wizard and launch Aneka Management Studio from the start menu.

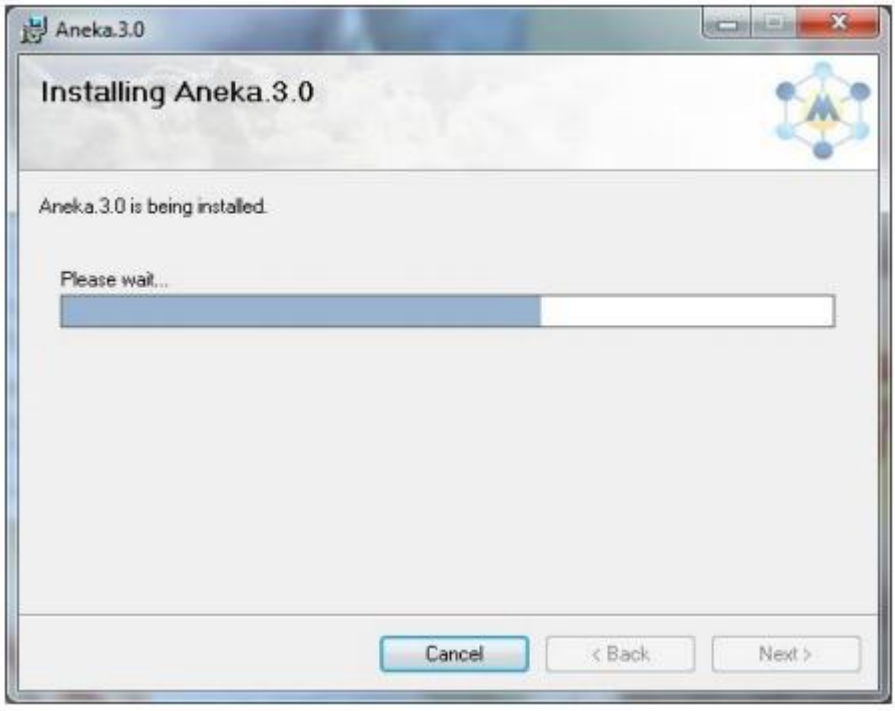


Figure - Installation Progress

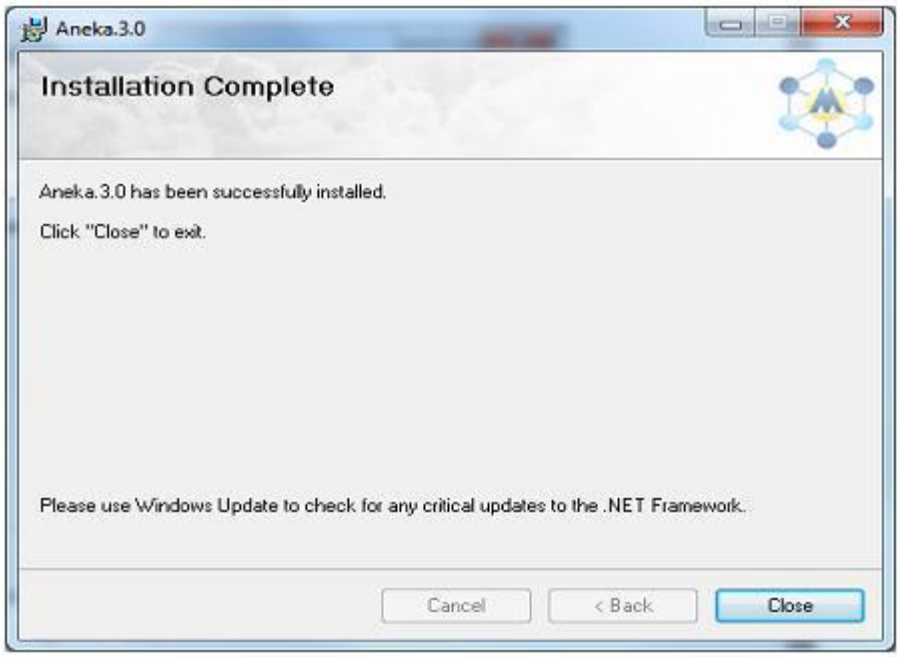


Figure - Installation Complete

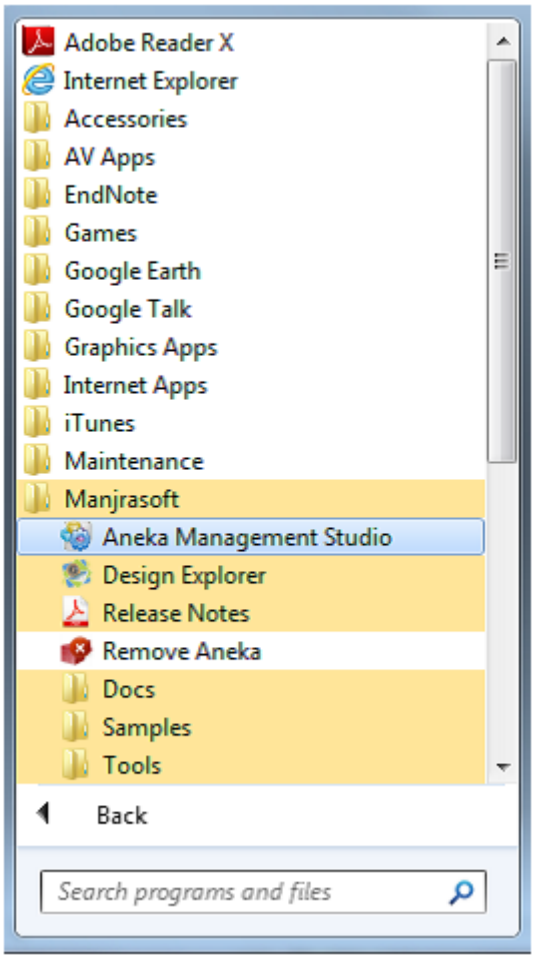


Figure - Start Menu

Aneka Cloud Management Studio

The Aneka Cloud Management Studio is your portal for managing your infrastructure and clouds. It provides facilities for defining your underlying cloud infrastructure and creating one or more Aneka Clouds on top. It lets you create and manage Aneka user accounts, monitor the overall performance of your Cloud, obtain detailed reporting information on resource usage, data transfers, billing and application (job) execution. It also provides facilities for troubleshooting your deployments by allowing you to access and examine remote logs.

Starting up Management Studio

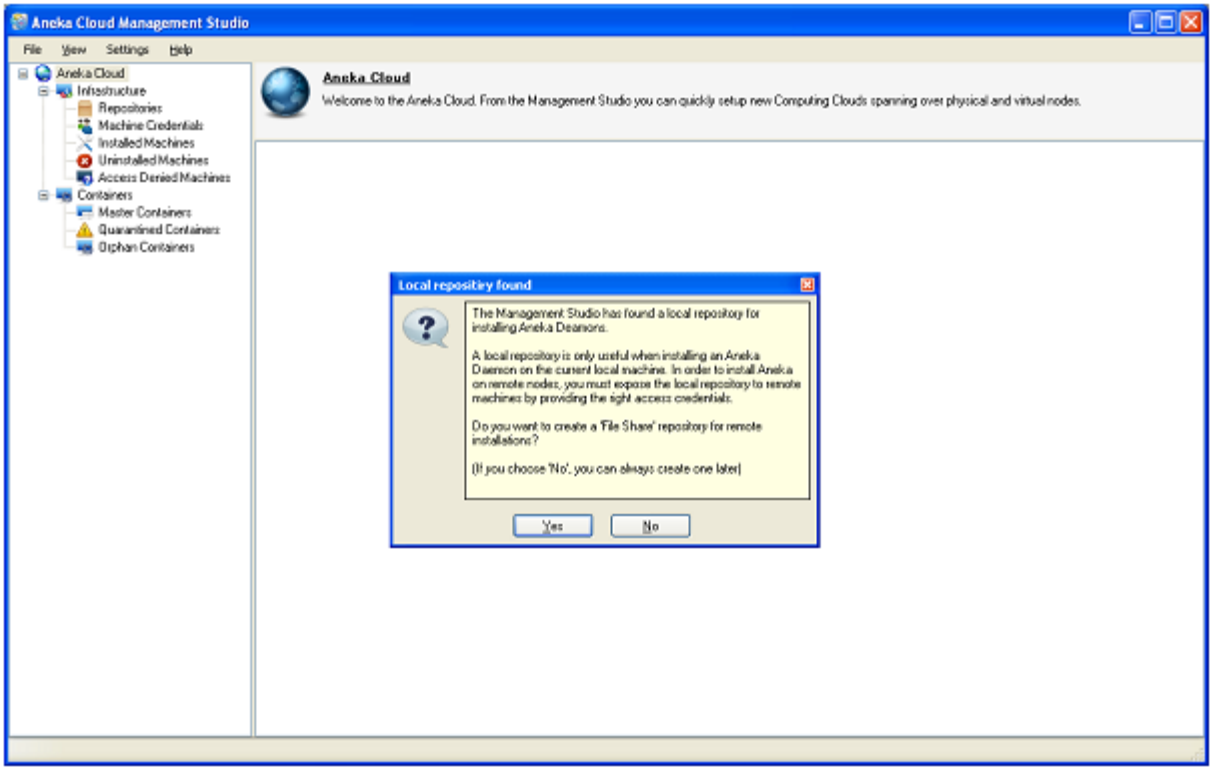


Figure - Starting Aneka Cloud Management Studio for the first time.

When Aneka Cloud Management Studio is started up for the first time you'll be asked to create a Remote Repository for performing remote installations. Setting up a Remote Repository requires selecting a suitable repository type and supplying valid credentials which remote machines can use to connect and download required files. You may however choose to create this repository at a late time before making remote installations. If no repository is defined, you will be restricted to making local installations only.

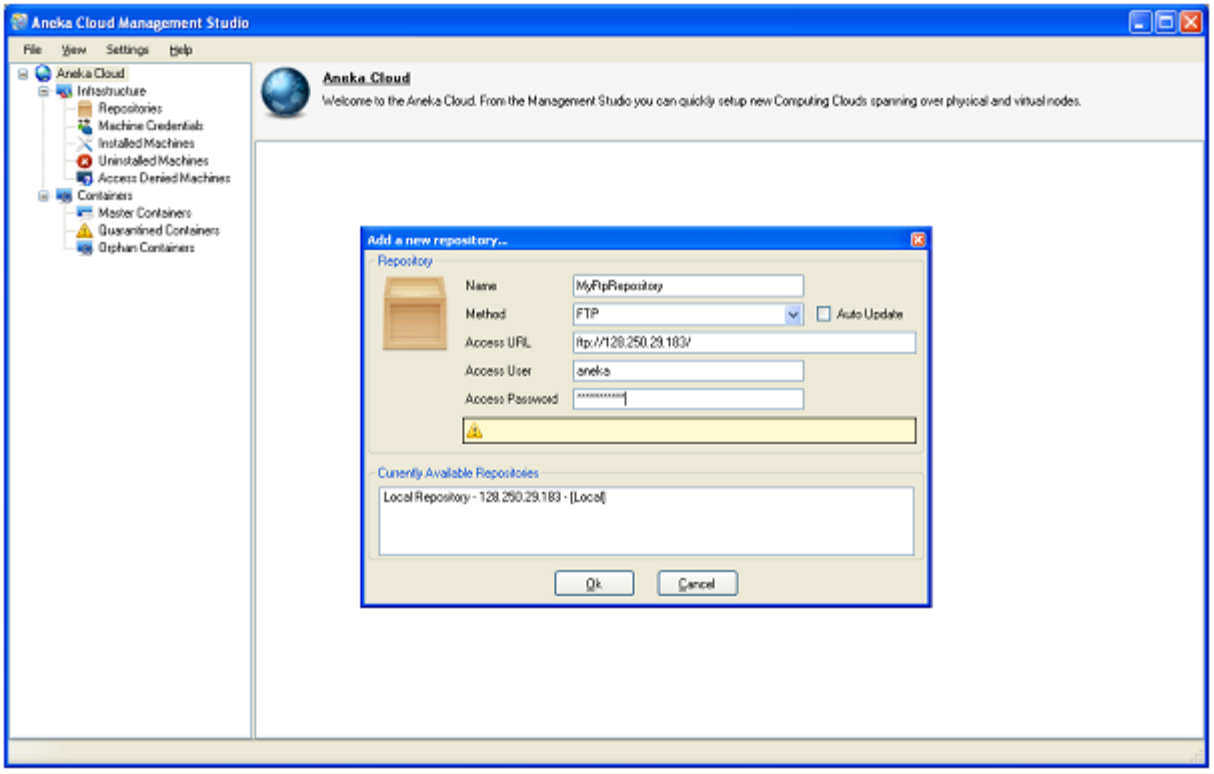


Figure - Creating a repository for remote installations

Shutting down Aneka Management Studio

When attempting to shut down Aneka Management Studio, you will be given the choice of saving all configuration data from the current session. It is highly recommended that you save this information and restore it the next time you start using the Management Studio.

The Configuration File

The configuration file, ManagementStudio.config, contains all information that describes your infrastructure, your Clouds, the machine credentials, repositories and authentication keys (see section on installing the Master Container) that you defined when using Aneka Management Studio. It is recommended that you save this information when you exit Management Studio so that you can restore it at a later session, and get up-to-speed with your Cloud management without having to redefine all settings again. Some configuration information, such as authentication keys, must be maintained safely if you are to add new Containers to your existing Cloud. Losing an authentication key however, is not detrimental as you will be able to reconfigure your

clouds with a new key.

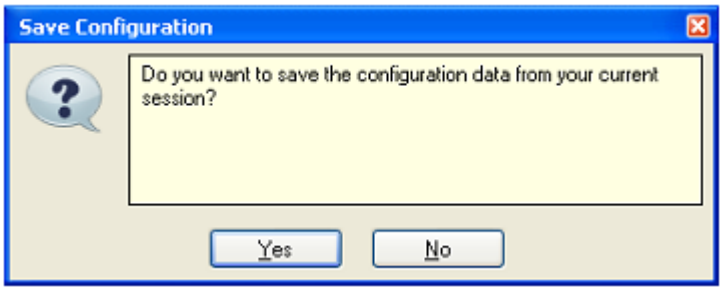


Figure - Request to save configuration data when closing Management Studio

The configuration file is always encrypted before being written to disk for security reasons. When saving configuration data you will be required to specify a password as show in Figure.

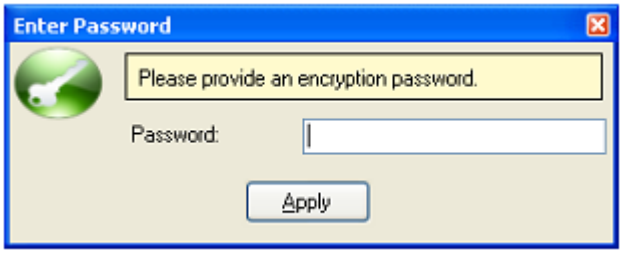


Figure - Password to encrypt configuration data

When starting up Aneka Management Studio at a later session, you will be given the choice of restoring your configuration data. If you choose to do so, you must re-enter the same password you used when saving.

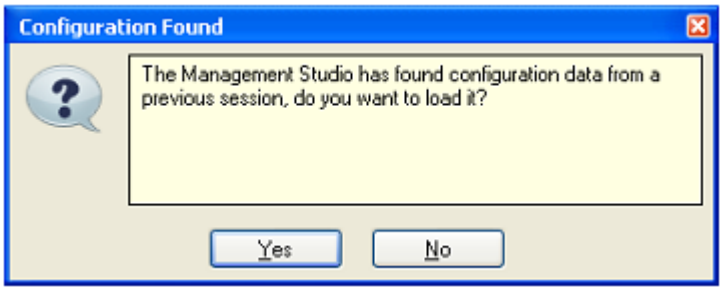


Figure - Request to restore configuration data

CONCLUSION / RESULT:

In this Experiment, we have Installed and configured Aneka master node and executed Convolution imaging application.

Laboratory Report

Experiment No - 8

Batch -

Date of Experiment: _____ Date of Submission: _____

Title: Implementation of matrix multiplication using python in Google Colab

1) Attendance [2] ----------

2) Lab Performance [2] ----------

3) Oral [1] ----------

Overall Marks [5] ----------

Subject Incharge

Experiment No. 8

TITLE: Implementation of matrix multiplication using python in Google Colab

PREREQUISITE: Operating Systems

THEORY:

Introduction

Colaboratory, or "Colab" for short, allows you to write and execute Python in your browser, with

- Zero configuration required
- Free access to GPUs
- Easy sharing

Whether you're a **student**, a **data scientist** or an **AI researcher**, Colab can make your work easier. Watch Introduction to Colab to learn more, or just get started below!

Getting started

The document you are reading is not a static web page, but an interactive environment called a **Colab notebook** that lets you write and execute code.

For example, here is a **code cell** with a short Python script that computes a value, stores it in a variable, and prints the result:

```
seconds_in_a_day = 24 * 60 * 60
seconds_in_a_day
```

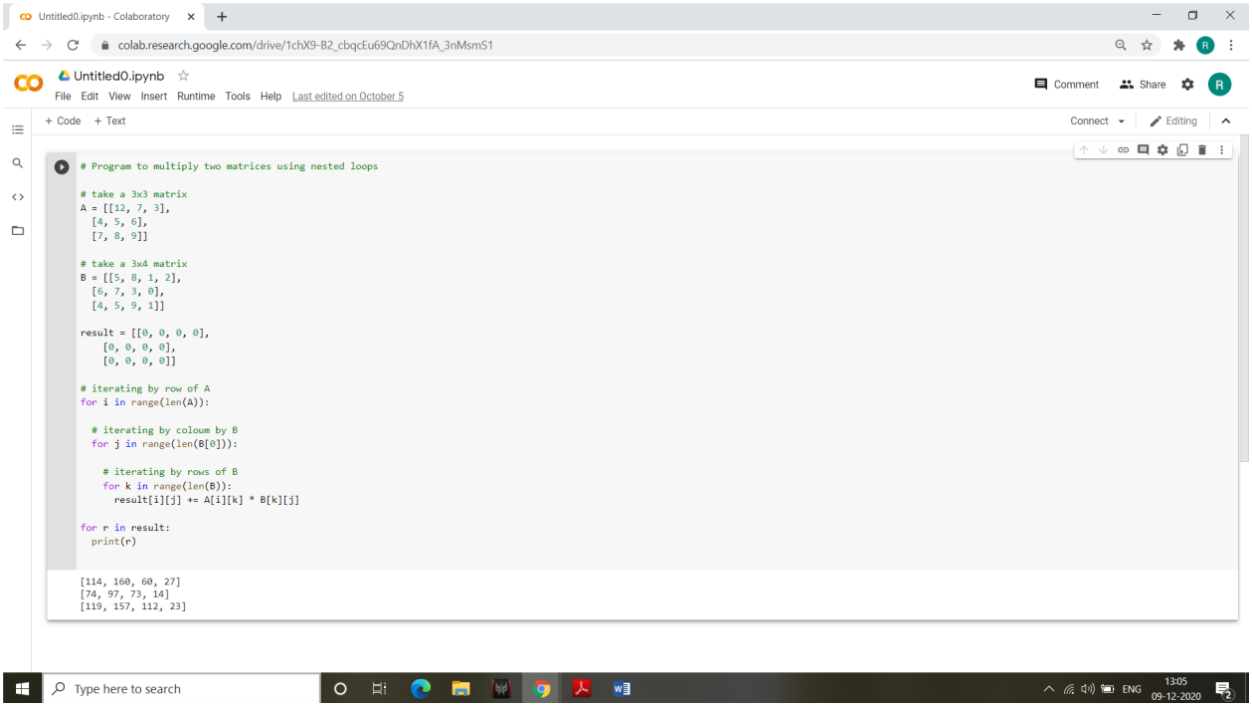
```
86400
```

Colab notebooks allow you to combine **executable code** and **rich text** in a single document, along with **images**, **HTML**, **LaTeX** and more. When you create your own Colab notebooks, they are stored in your Google Drive account. You can easily share your Colab notebooks with co-workers or friends, allowing them to comment on your notebooks or even edit them. To learn more, see Overview of Colab. To create a new Colab notebook you can use the File menu above, or use the following link: create a new Colab notebook.

Colab notebooks are Jupyter notebooks that are hosted by Colab. To learn more about the Jupyter project, see jupyter.org.

Program:

```
X = [[12,7,3],
[4 ,5,6],
[7 ,8,9]]
Y = [[5,8,1,2],
[6,7,3,0],
[4,5,9,1]]
result = [[0,0,0,0],
[0,0,0,0],
[0,0,0,0]]
for i in range(len(X)):
# iterate through columns of Y
for j in range(len(Y[0])):
# iterate through rows of Y
for k in range(len(Y)):
result[i][j] += X[i][k] * Y[k][j]
for r in result:
print(r)
```



CONCLUSION / RESULT:

In this Experiment, we demonstrate matrix multiplication using python in Google Colab.

Laboratory Report

Experiment No - 9

Batch -

Date of Experiment: _____ Date of Submission: _____

Title: Implementation of machine learning application using Google Colab.

1) Attendance [2] ----------

2) Lab Performance [2] ----------

3) Oral [1] ----------

Overall Marks [5] ----------

Subject Incharge

Experiment No. 9

TITLE: Implementation of machine learning application using Google Colab.

PREREQUISITE: Operating Systems

THEORY:

Introduction

Colaboratory, or "Colab" for short, allows you to write and execute Python in your browser, with

- Zero configuration required
- Free access to GPUs
- Easy sharing

Whether you're a **student**, a **data scientist** or an **AI researcher**, Colab can make your work easier. Watch Introduction to Colab to learn more, or just get started below!

Getting started

The document you are reading is not a static web page, but an interactive environment called a **Colab notebook** that lets you write and execute code.

For example, here is a **code cell** with a short Python script that computes a value, stores it in a variable, and prints the result:

```
seconds_in_a_day = 24 * 60 * 60
seconds_in_a_day
```

```
86400
```

Colab notebooks allow you to combine **executable code** and **rich text** in a single document, along with **images**, **HTML**, **LaTeX** and more. When you create your own Colab notebooks, they are stored in your Google Drive account. You can easily share your Colab notebooks with co-workers or friends, allowing them to comment on your notebooks or even edit them. To learn more, see Overview of Colab. To create a new Colab notebook you can use the File menu above, or use the following link: create a new Colab notebook.

Colab notebooks are Jupyter notebooks that are hosted by Colab. To learn more about the Jupyter project, see jupyter.org.

Program:

```
%matplotlib inline
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
plt.rcParams['figure.figsize'] = (20.0, 10.0)

# Reading Data
data = pd.read_csv('headbrain.csv')
data.head()

# Collecting X and Y
X = data['Head Size(cm^3)'].values
Y = data['Brain Weight(grams)'].values

# Calculating coefficient
# Mean X and Y
mean_x = np.mean(X)
mean_y = np.mean(Y)
print(mean_x)
print(mean_y)

# Total number of values
n = len(X)
print(n)

# Using the formula to calculate b1 and b0
numer = 0
denom = 0
for i in range(n):
numer += (X[i] - mean_x) * (Y[i] - mean_y)
denom += (X[i] - mean_x) ** 2
b1 = numer / denom #slope
b0 = mean_y - (b1 * mean_x) #intercept
# Printing coefficients
print(b1, b0)

# Ploting Scatter Points
plt.scatter(X, Y, c='#ef5423', label='Scatter Plot')
plt.xlabel('Head Size in cm3')
plt.ylabel('Brain Weight in grams')
plt.legend()
plt.show()


max_x = np.max(X)+100
min_x = np.min(X)-100

# Calculating line values x and y
x = np.linspace(min_x,max_x,1000)
y = b0 + b1 * x

# Plotting Values and Regression Line
plt.scatter(X, Y, c='#ef5423', label='Scatter Plot')
```

```
# Ploting Line
plt.plot(x, y, color='#58b970', label='Regression Line')

# Calculating Root Mean Squares Error
rmse = 0
for i in range(n):
y_pred = b0 + b1 * X[i]
rmse += (Y[i] - y_pred) ** 2
rmse = np.sqrt(rmse/n)
print(rmse)

# Calculating R2 Score
ss_tot = 0
ss_res = 0
for i in range(n):
y_pred = b0 + b1 * X[i]
ss_tot += (Y[i] - mean_y) ** 2
ss_res += (Y[i] - y_pred) ** 2
r2 = 1 - (ss_res/ss_tot)
print(r2)
```

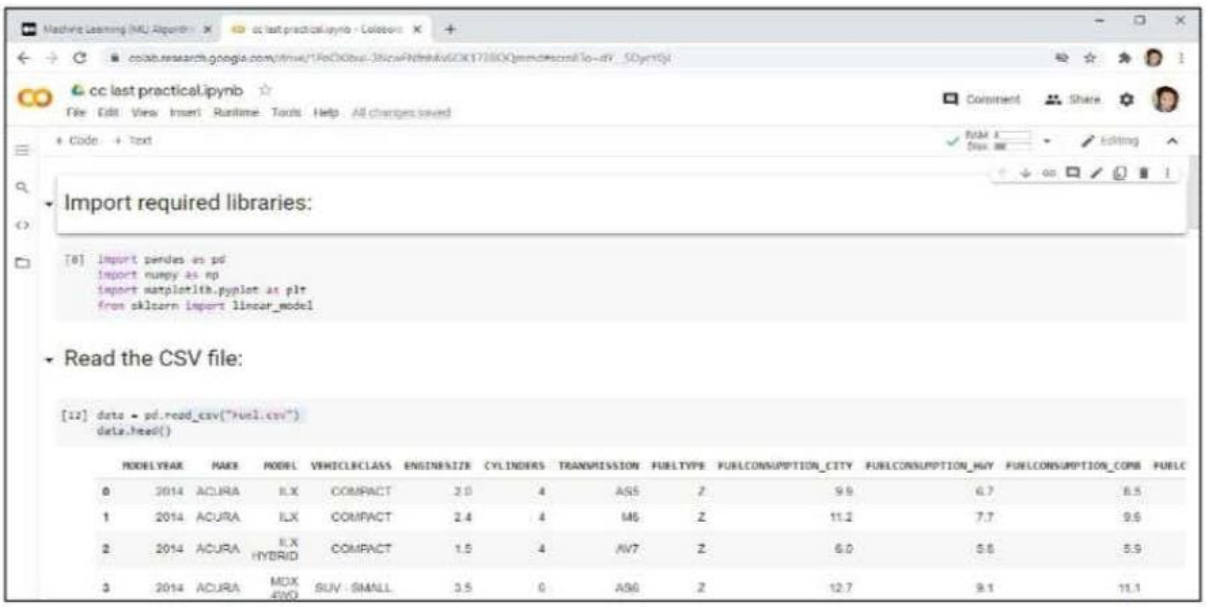


Figure 1: -Import libraries and Read CSV

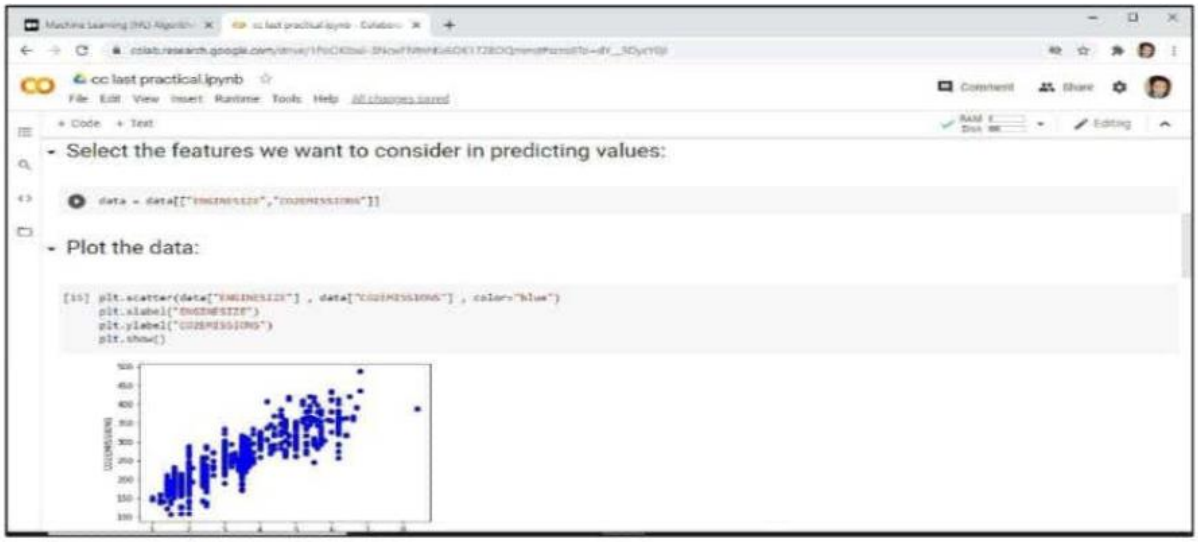


Figure 2: - Select the features and Plot the data

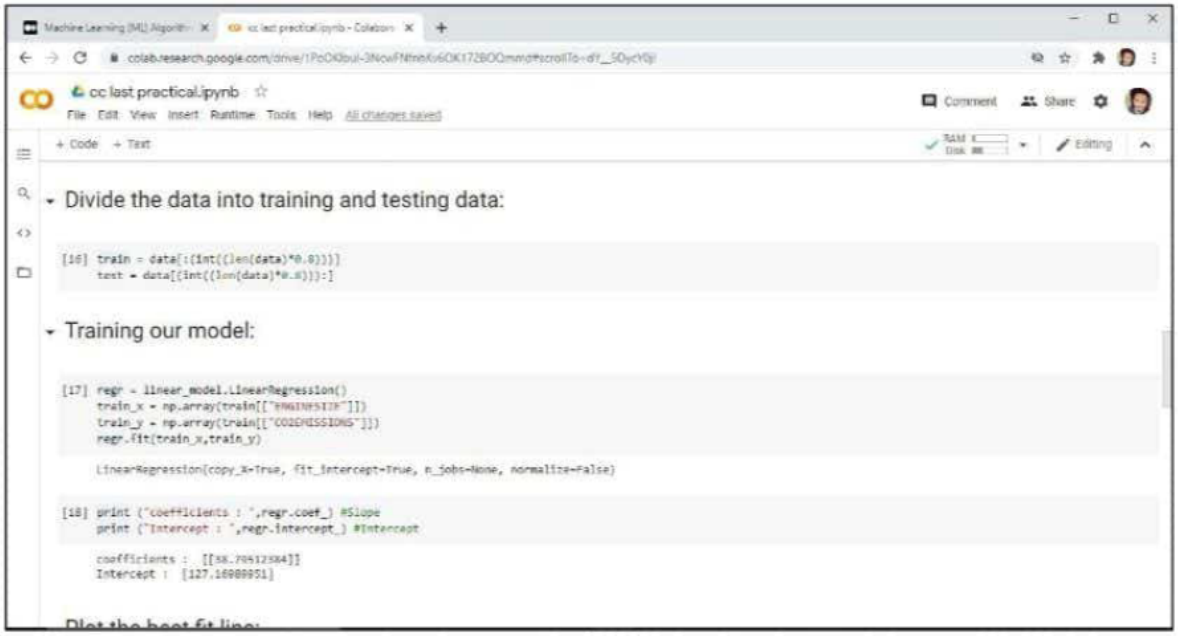


Figure 3: -Divide data and Training data

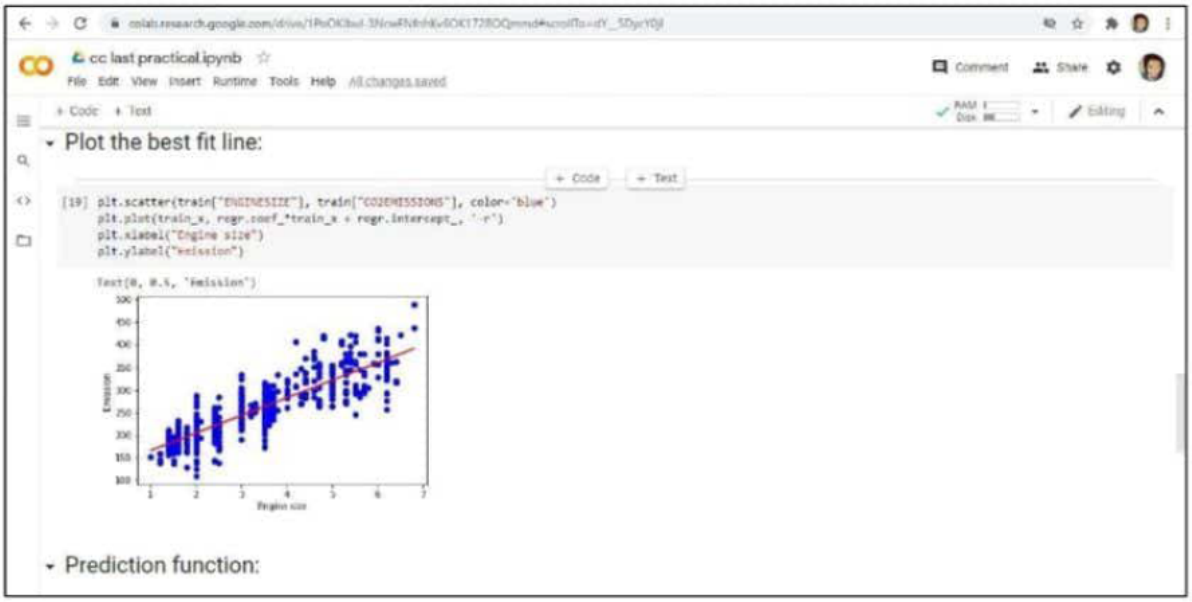


Figure 4: - Plot Best fit line

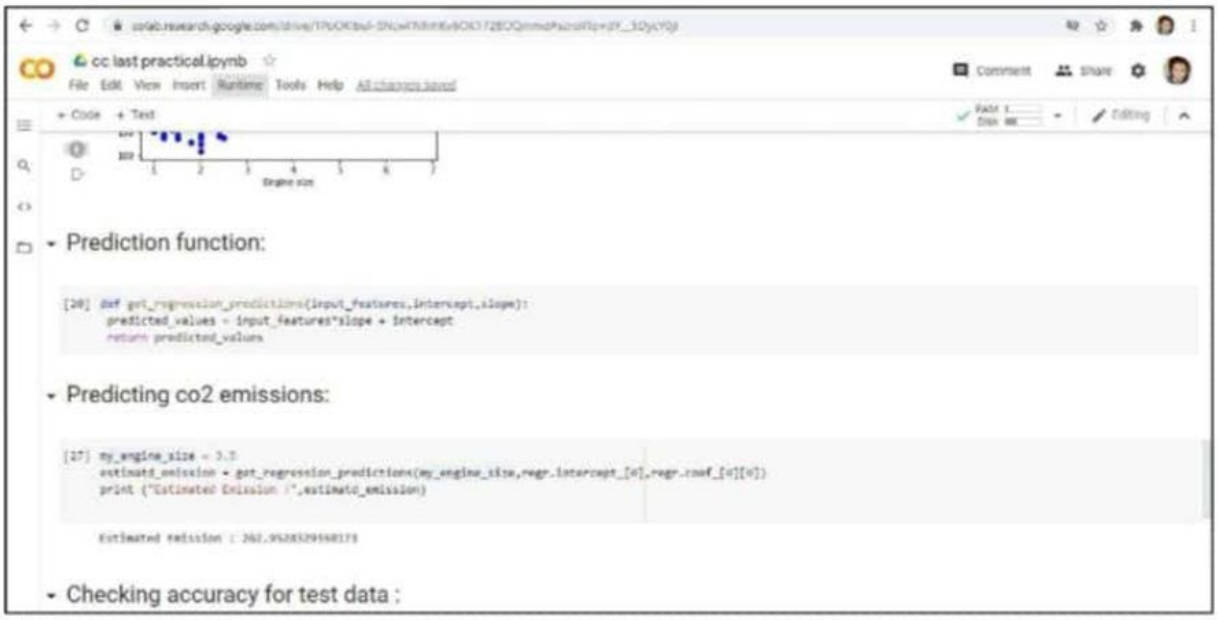


Figure 5: - Prediction Function

Figure 6: -Accuracy test for data

CONCLUSION / RESULT:

In this Experiment, we demonstrate Machine Learning Application using python in Google Colab.