



MALAD KANDIVALI EDUCATION SOCIETY'S
NAGINDAS KHANDWALA COLLEGE OF COMMERCE, ARTS &
MANAGEMENT STUDIES & SHANTABEN NAGINDAS KHANDWALA
COLLEGE OF SCIENCE
MALAD [W], MUMBAI – 64
AUTONOMOUS INSTITUTION
(Affiliated To University Of Mumbai)
Reaccredited 'A' Grade by NAAC | ISO 9001:2015 Certified

CERTIFICATE

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Roll No: 578

Programme: BSc IT

Semester: V

This is certified to be a bonafide record of practical works done by the above student in the college laboratory for the course **CLOUD COMPUTING (Course Code:2154UITCCPR)** for the partial fulfilment of Fifth Semester of BSc IT during the academic year 2021-22.

The journal work is the original study work that has been duly approved in the year 2021-22 by the undersigned.

External Examiner

Mrs. Niramaye Deshpande
(Subject-In-Charge)

Date of Examination: (College Stamp)

Name: Zeenat Hafeez Fazale Rab

Class: T.Y. B.Sc. IT Sem- V

Roll No: 578

Subject: CLOUD COMPUTING (Course Code: 2154UITCCPR)

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Practical 1

Aim: Creating and running virtual machines on Hosted Hypervisors Type 1 – KVM

NOTE: The Practical is not implemented because Laptop is not supporting it.

Theory:

Kernel-based Virtual Machine (KVM) is open source software that is a full virtualization solution for Linux on x86 hardware containing virtualization extensions (Intel VT or AMD-V). KVM consists of a kernel module, kvm.ko, which provides the core virtualization infrastructure, and a processor-specific module, kvm-intel.ko or kvm-amd.ko, depending on the CPU manufacturer (Intel or AMD). Multiple virtual machines running unmodified Linux or Windows images can be run using KVM.

A wide variety of guest operating systems work with KVM, including many versions of Linux, BSD, Solaris, Windows, Haiku, ReactOS, and the AROS Research Operating System. Each virtual machine has private virtualized hardware: a network card, disk, graphics adapter, etc. The kernel component of KVM is included in Linux, as of the 2.6.20 kernel version.

KVM's performance is good, but not as good as that of some of the more mature products, such as VMware or VirtualBox. For example, network and graphics speeds are noticeably slower with KVM. In general, KVM performance can offer near-native speed, thanks to its use of Intel VT or AMD-V extensions. As an open source product, it is being very actively developed and is constantly improving

Step 1: Verifying Hardware Support

```
$ egrep -c '(svm|vmx)' /proc/cpuinfo
```

Step 2: Installing the KVM Package

```
$ sudo apt-get install qemu-kvm libvirt-bin bridge-utils virt-manager
```

Step 3: Adding Your User Account to KVM

```
$ sudo adduser [username] libvirtd
```

Step 4: Verifying Successful Installation

```
$ virsh -c qemu:///system list
```

Step 5: After the successful installation of KVM, you can start working with it**Step 6: Now create a sample virtual machine through the manager**

Step 7: You can create a new virtual machine through the File Menu, Create a new virtual Machine icon on the toolbar, or through the right-click menu at QEMU/KVM entry under the 'Name' column.

Step 8: Select your installation option from the four available options and click the Forward button. selecting the Local install Media option as the ISO file is already downloaded on my system.

Step 9: Choose the location for installing media. You can wish to install it through a CD ROM or DVD, use an ISO image of the installation package.

Step 10: For 64 bit systems, you can even choose more than 2 GB from the memory available on the host computer. Through this dialog, you can also select the CPU number from the available processors of your system.

Step 11: Click the Forward button after enabling storage.

Step12: Click the Finish button. The installation of your new VM will begin depending on your choices and the installation options you provided.

Practical 2

Aim: Creating and running virtual machines on Hypervisors Type 1 – ESXI

Theory:

A hypervisor is a form of virtualization software used in Cloud hosting to divide and allocate the resources on various pieces of hardware. The program which provides partitioning, isolation or abstraction is called virtualization hypervisor. The hypervisor is a hardware virtualization technique that allows multiple guest operating systems (OS) to run on a single host system at the same time. A hypervisor is sometimes also called a virtual machine manager(VMM).

The hypervisor runs directly on the underlying host system. It is also known as “Native Hypervisor” or “Bare metal hypervisor”. It does not require any base server operating system. It has direct access to hardware resources Examples of Type 1 hypervisors include VMware ESXi, Citrix XenServer and Microsoft Hyper-V hypervisor.

1. ESXI Host is bare metal Type 1 Hypervisor.
2. It is directly install on Physical Server
3. Use to assing Virtual Resources(Cpu, RAM, NIC,Disk) to the Virtual Enviroment.
4. Provide high-speed performance
5. Occupies less than 150 MB of space for installation of ESXI Hostin the system
6. Reduces data center space, power and IT administrative requirements.
7. Consolidate multiple servers onto fewer physical devices

Step 1: Install VMware

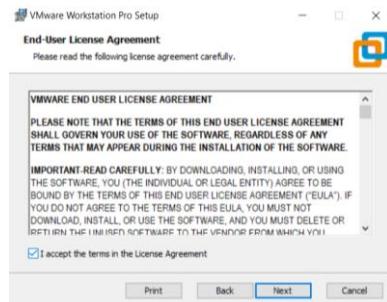


Step 2: agree the T&C and click on next

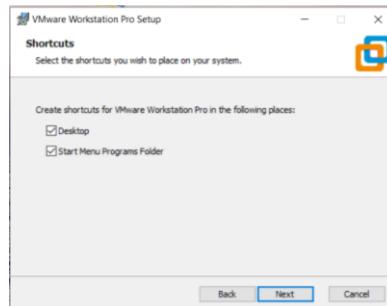
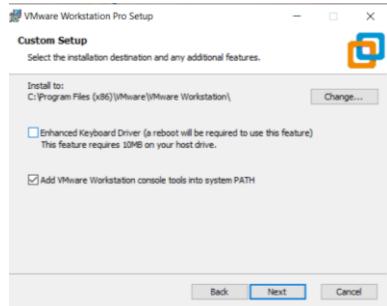
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Step 3: select location for installation



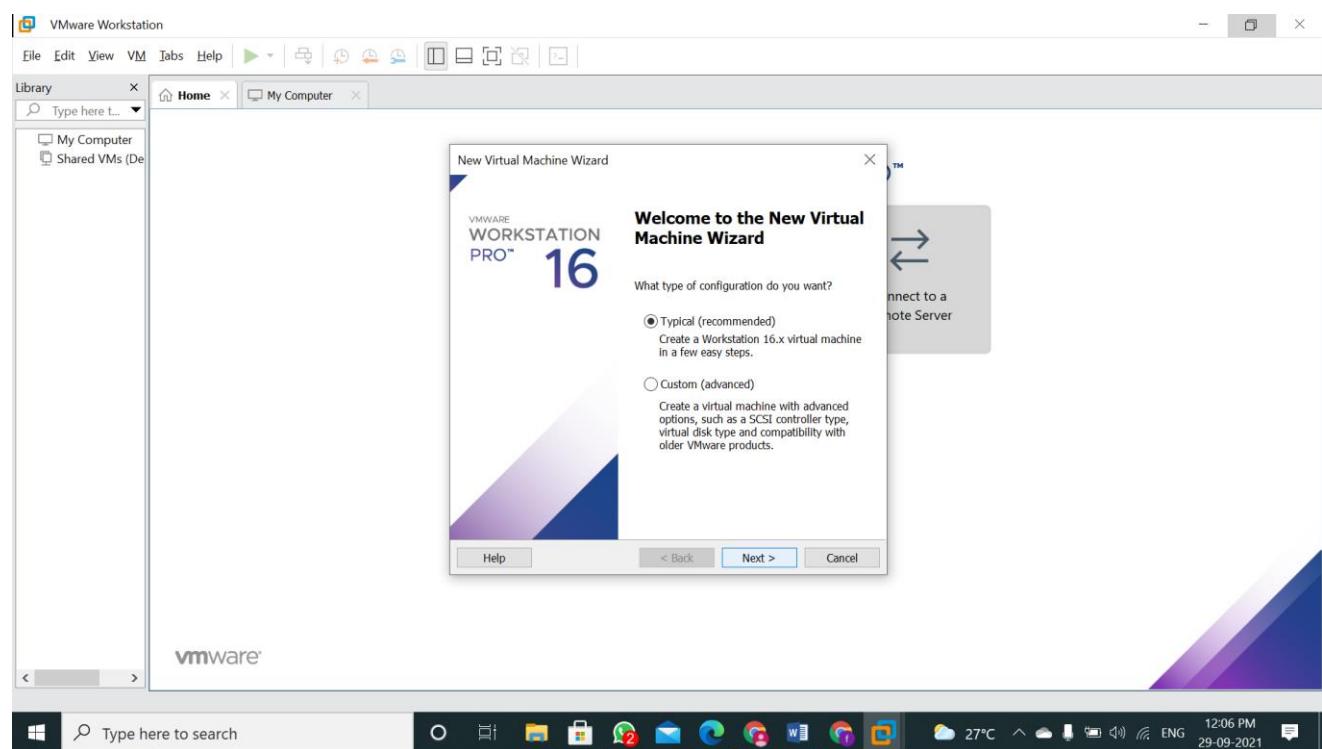
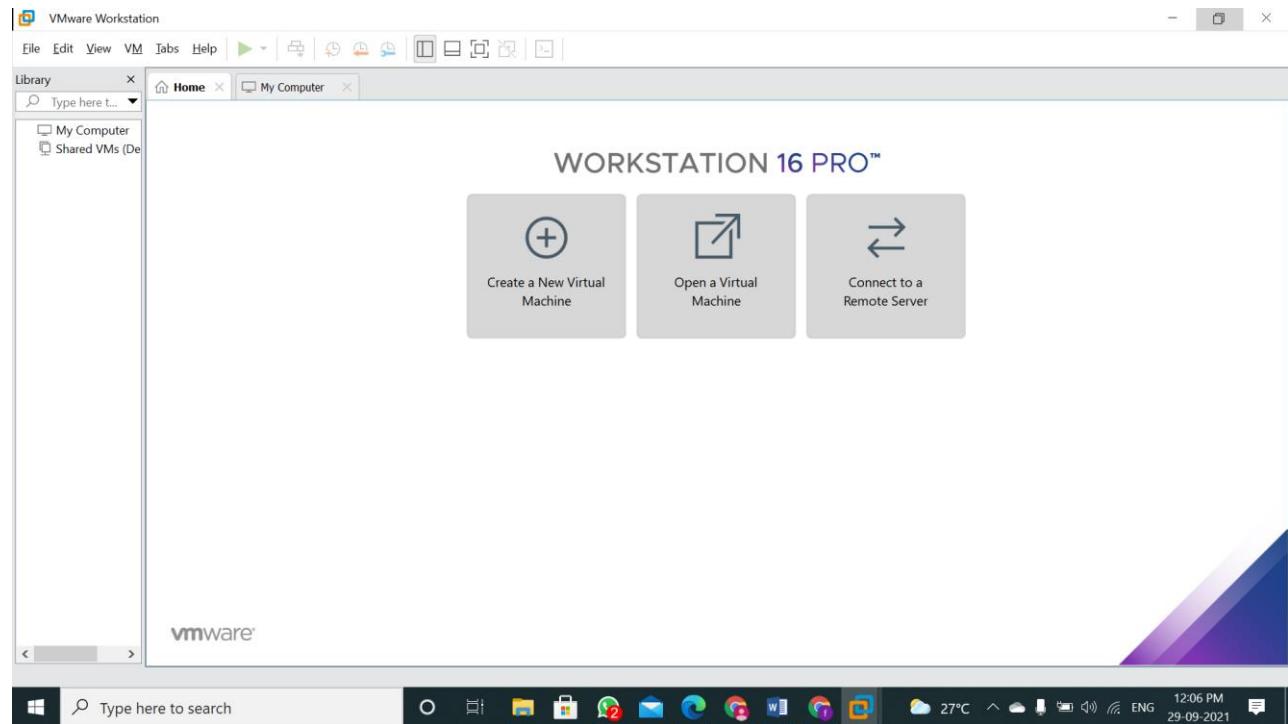
Step 4: After Installing VMware click finish button

Step 5: Create new virtual machine wizard

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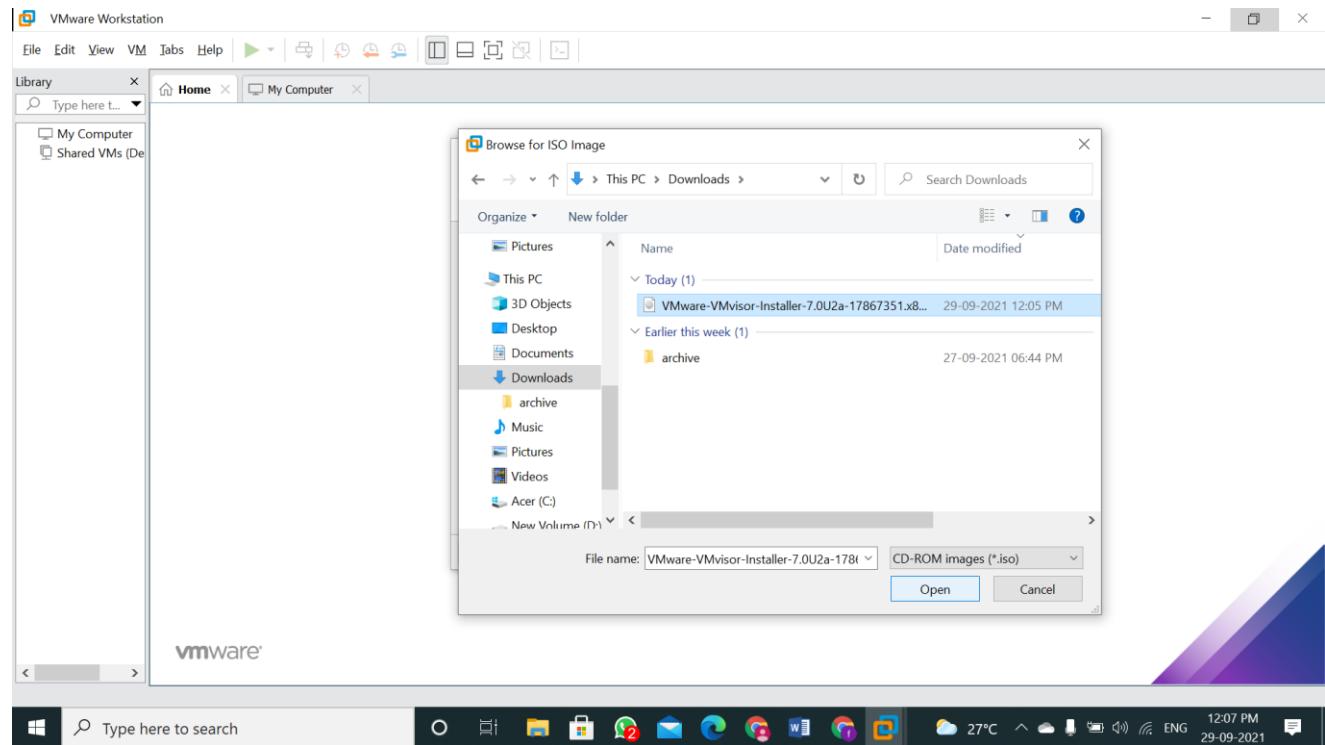


Step 6: choose your ISO image file

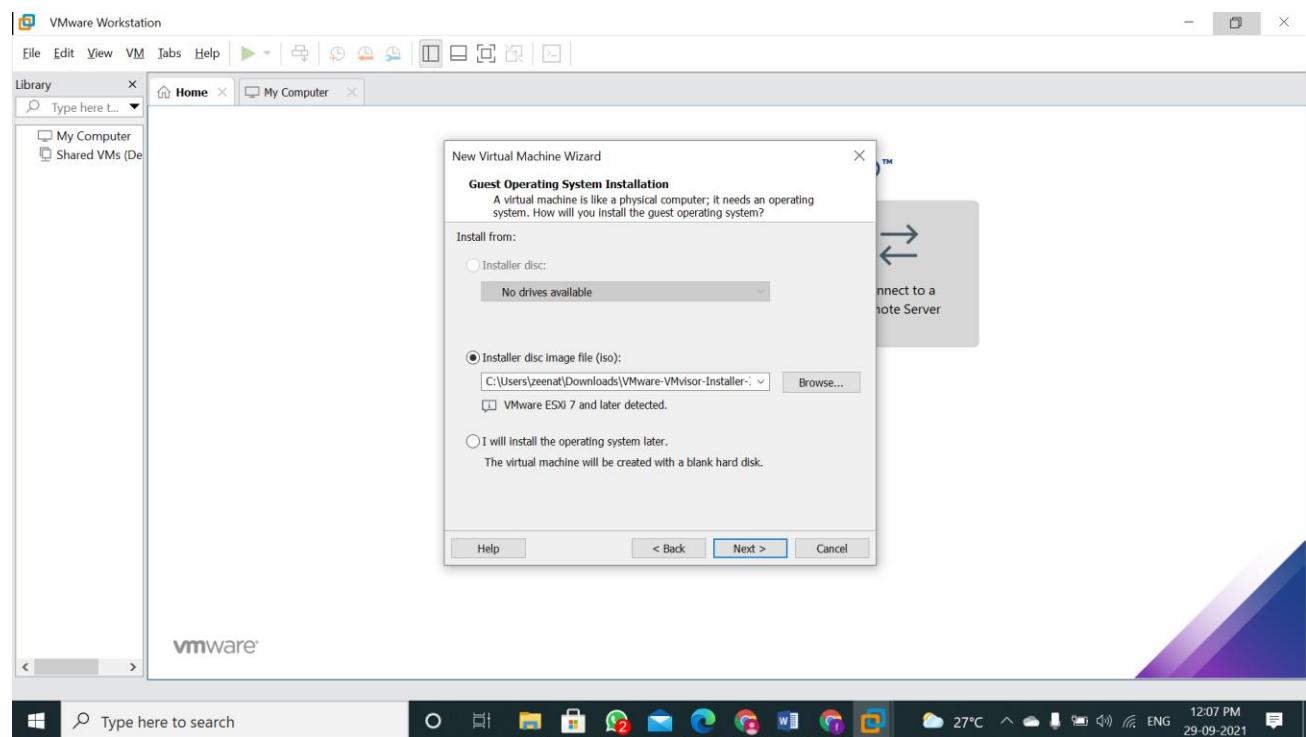
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Step 7: choose option I will install operating system later

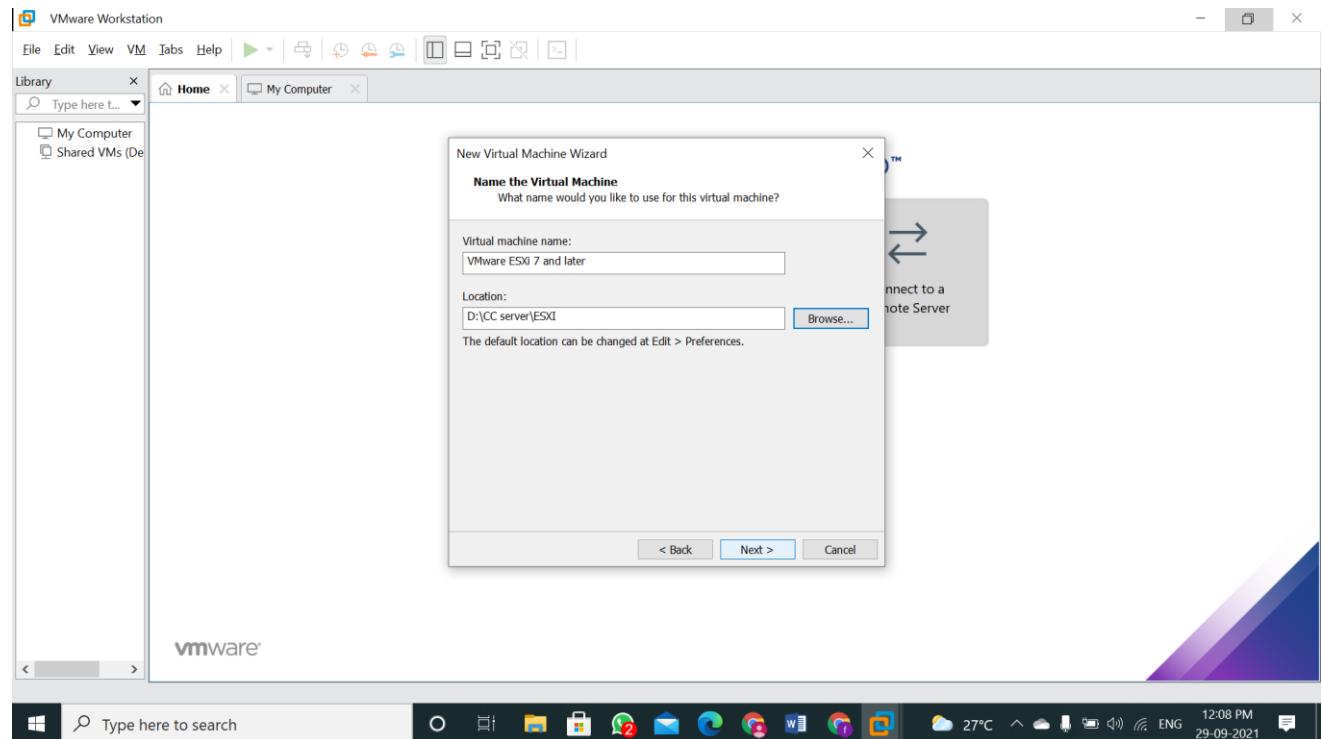


Step 8: Name the Virtual Machine.

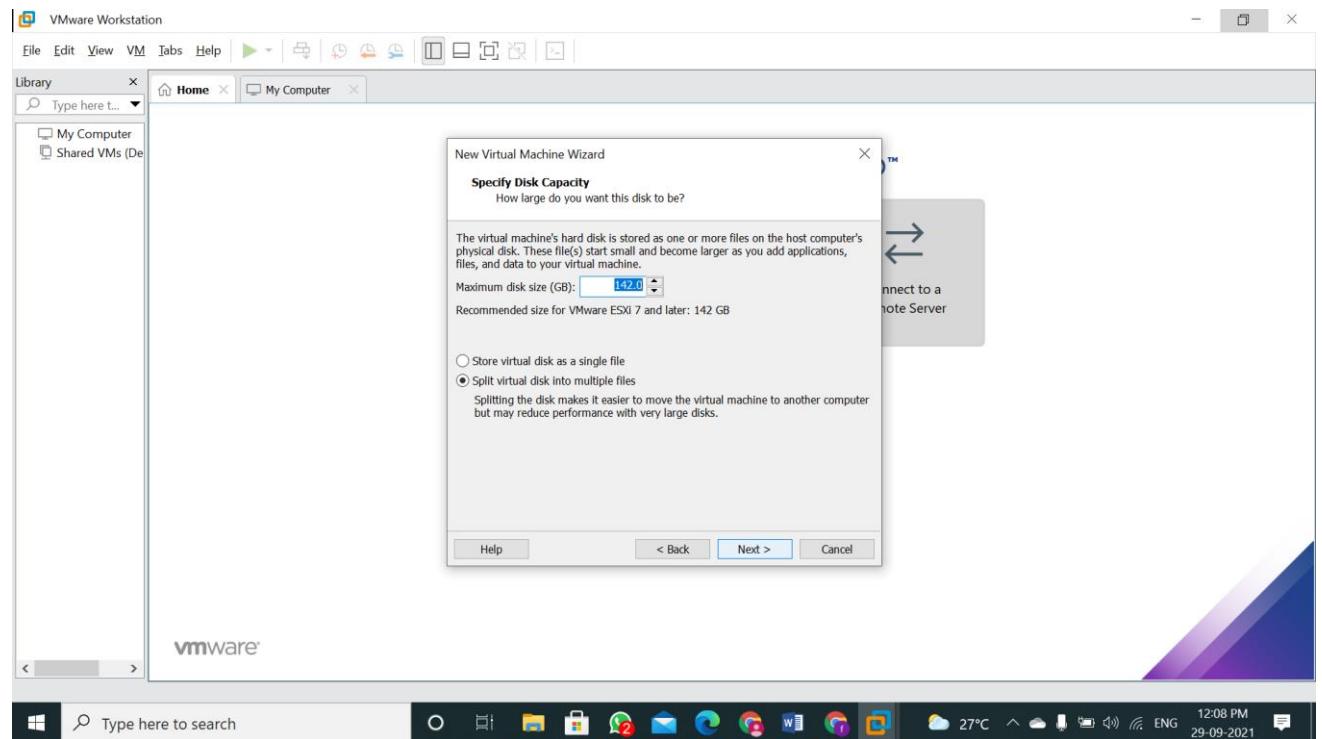
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Step 9: Specify the amount of memory and click next

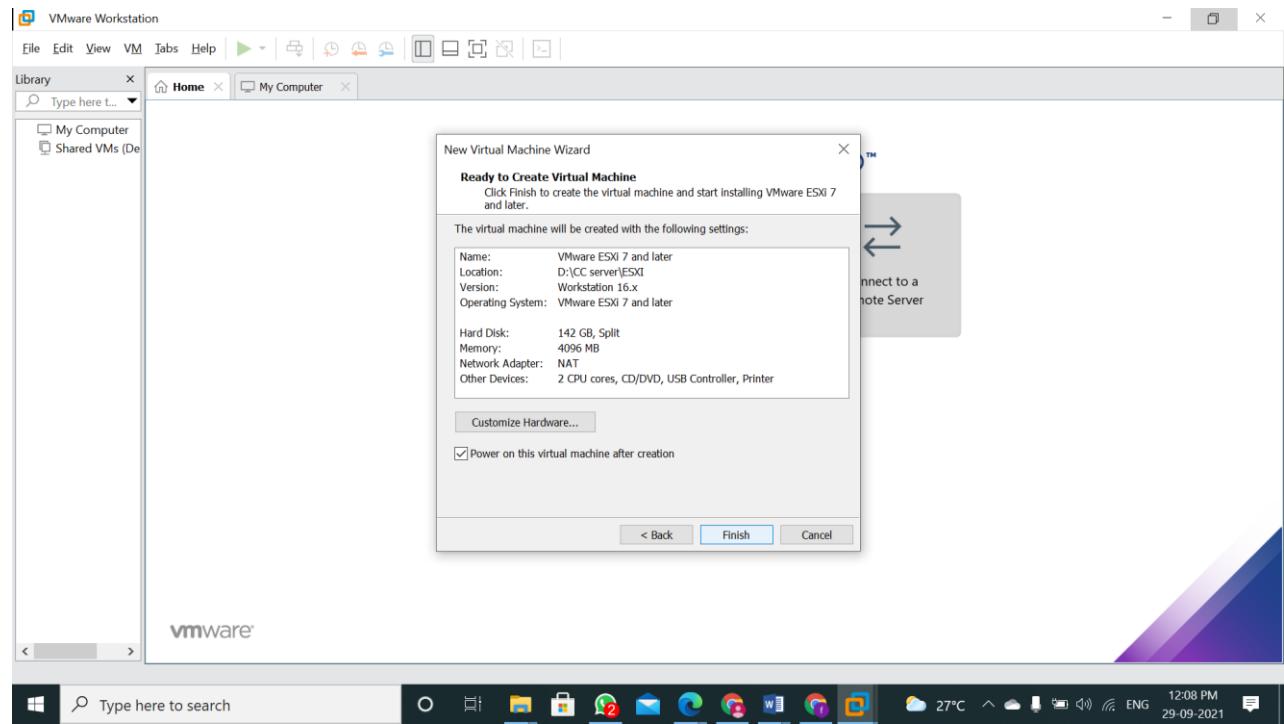


Step 10: Click on finish

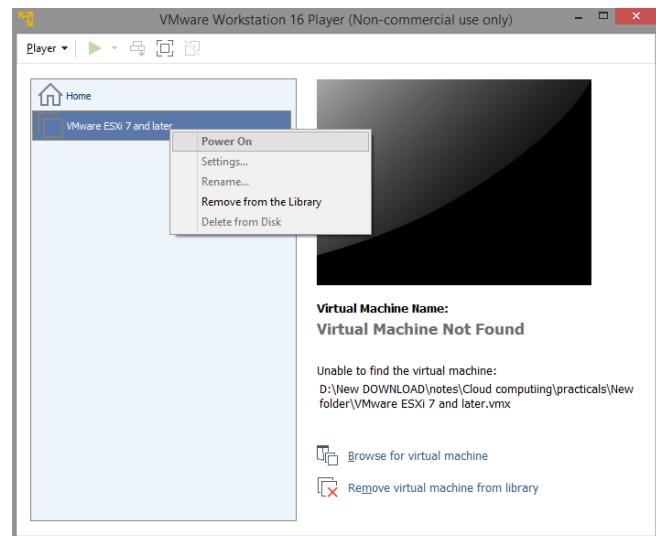
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Step 11: Start VMware 16 with ESXI server

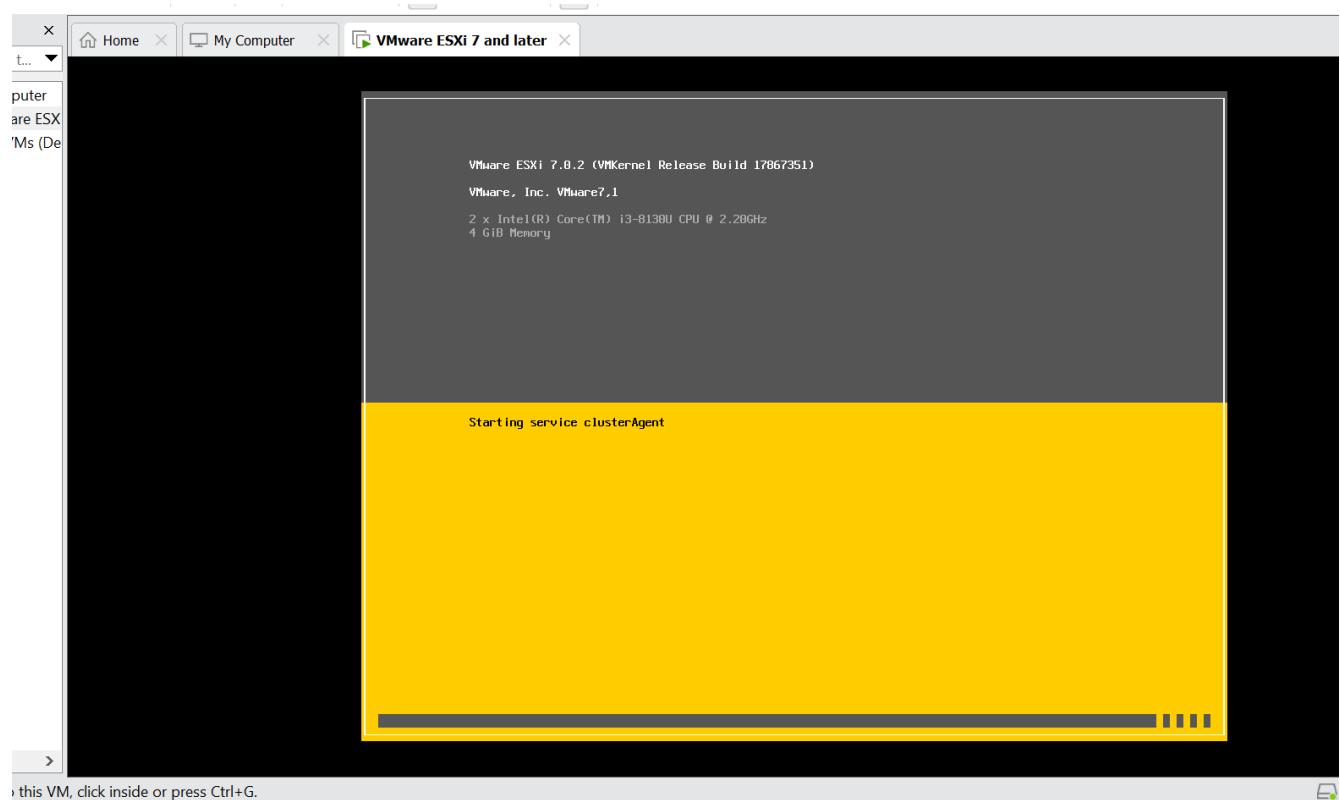
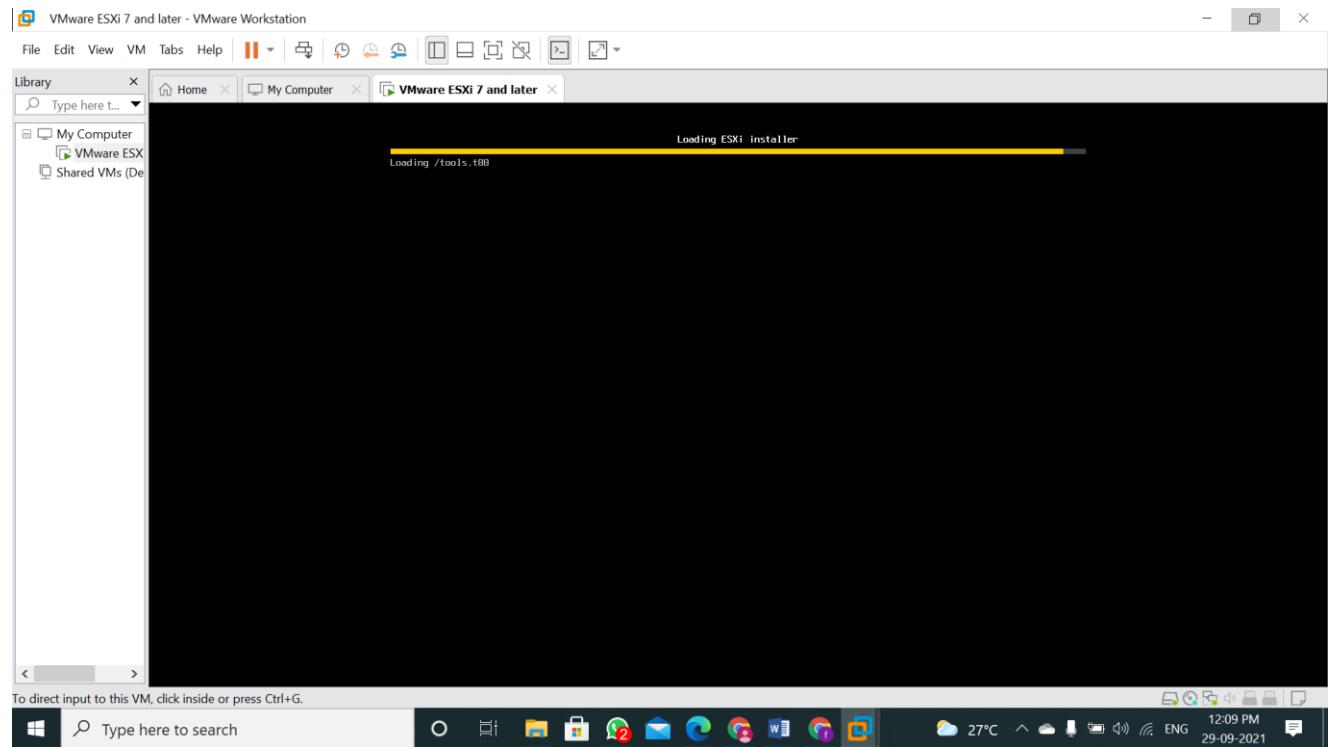


Step 12: Loading process of ESXI server.

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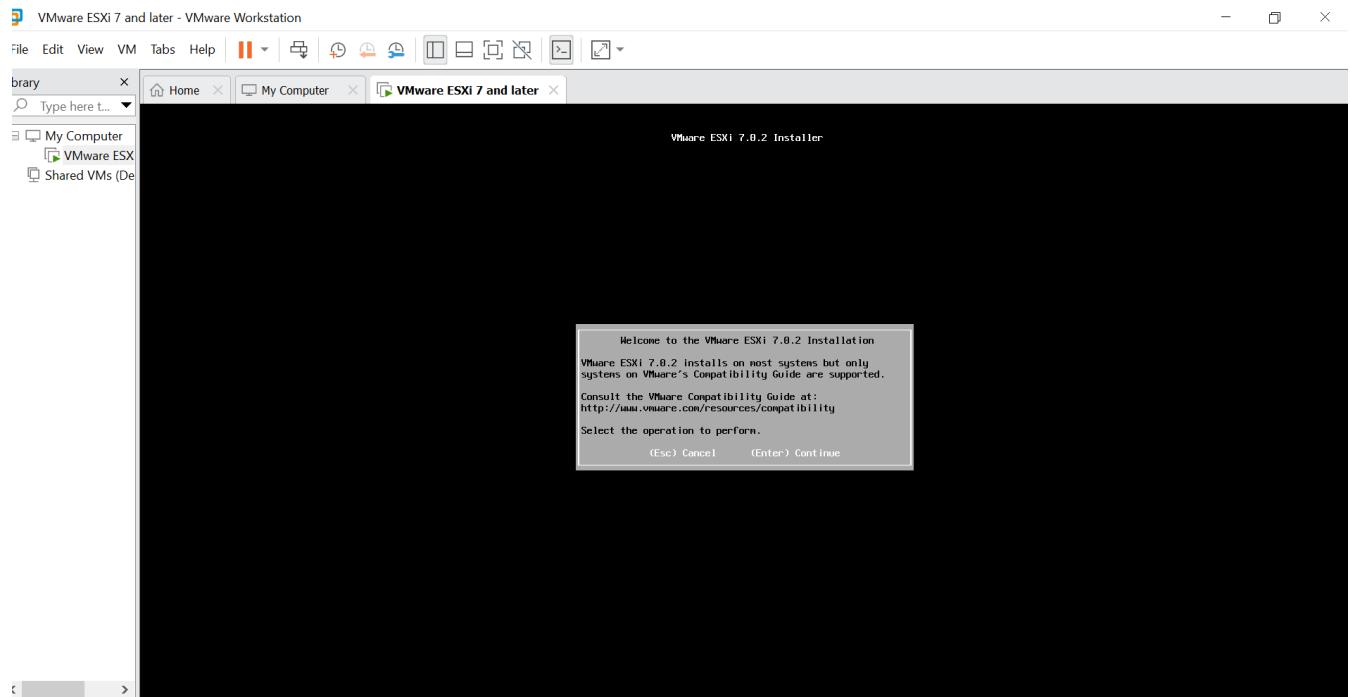


Step 13: Welcome to the Installation

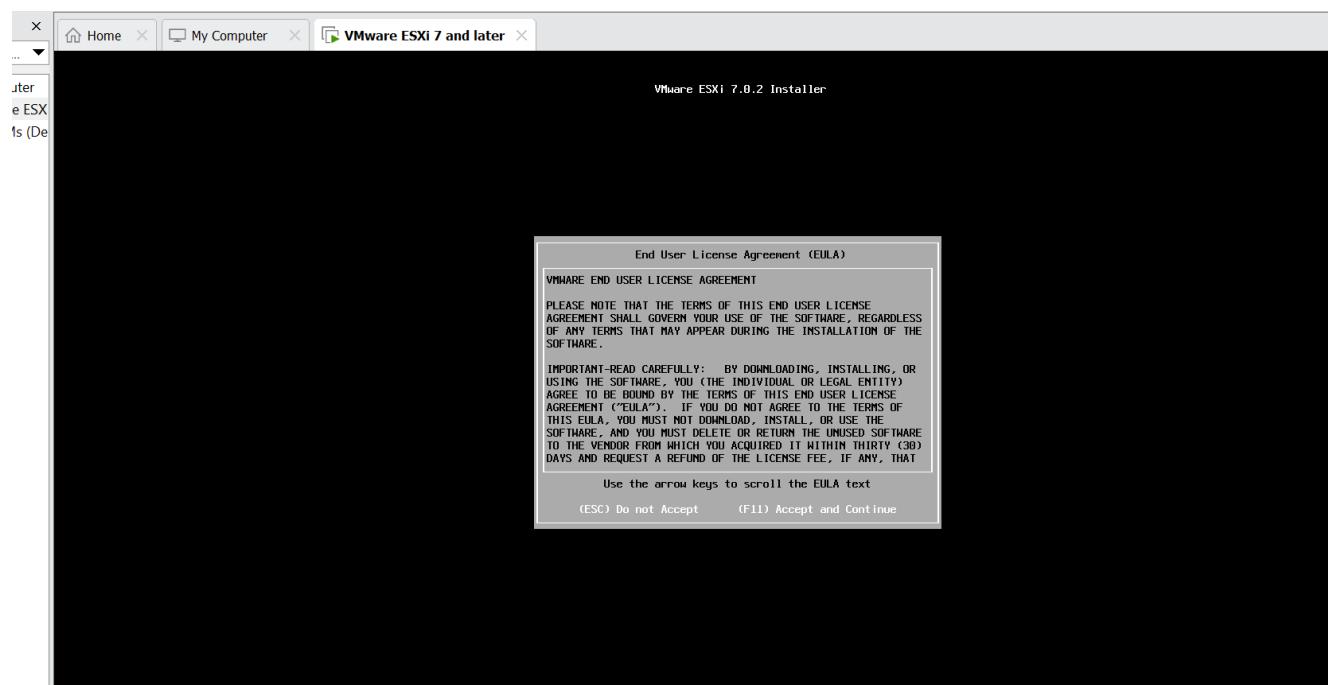
Name: Zeenat

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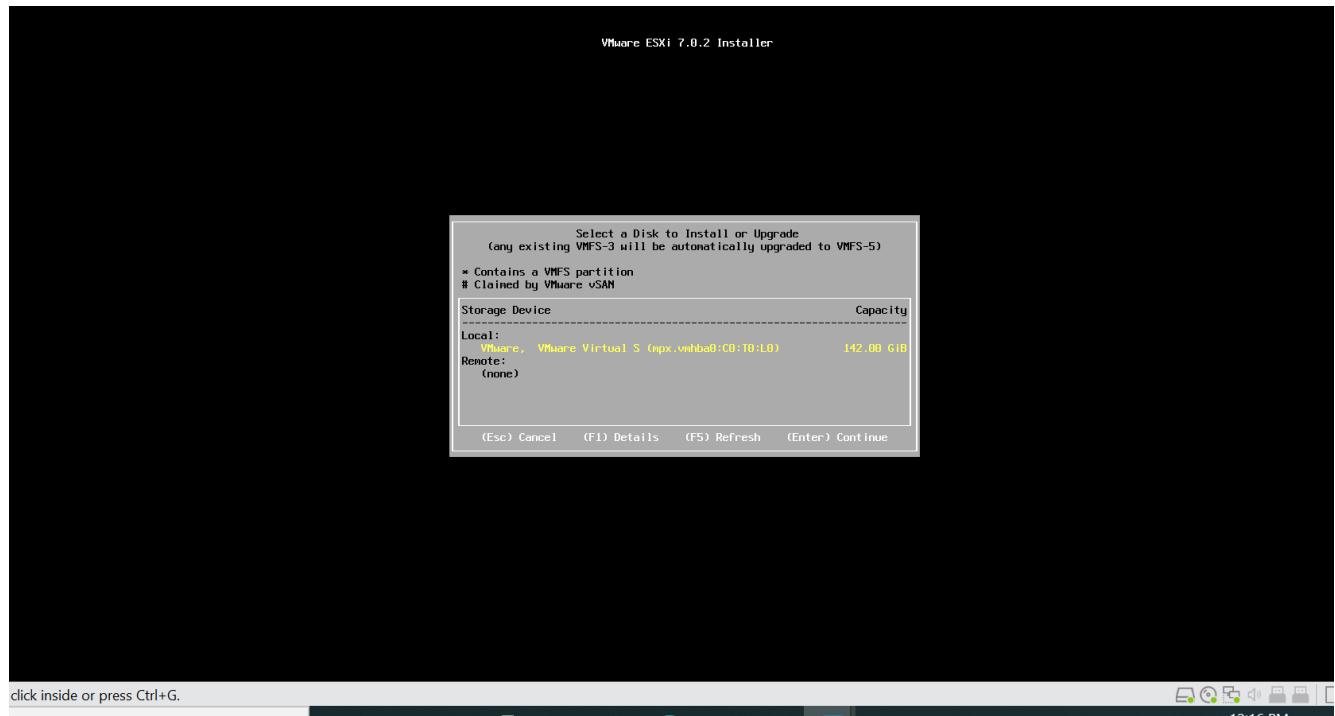
Step 14: Accept End User License Agreement (EULA)



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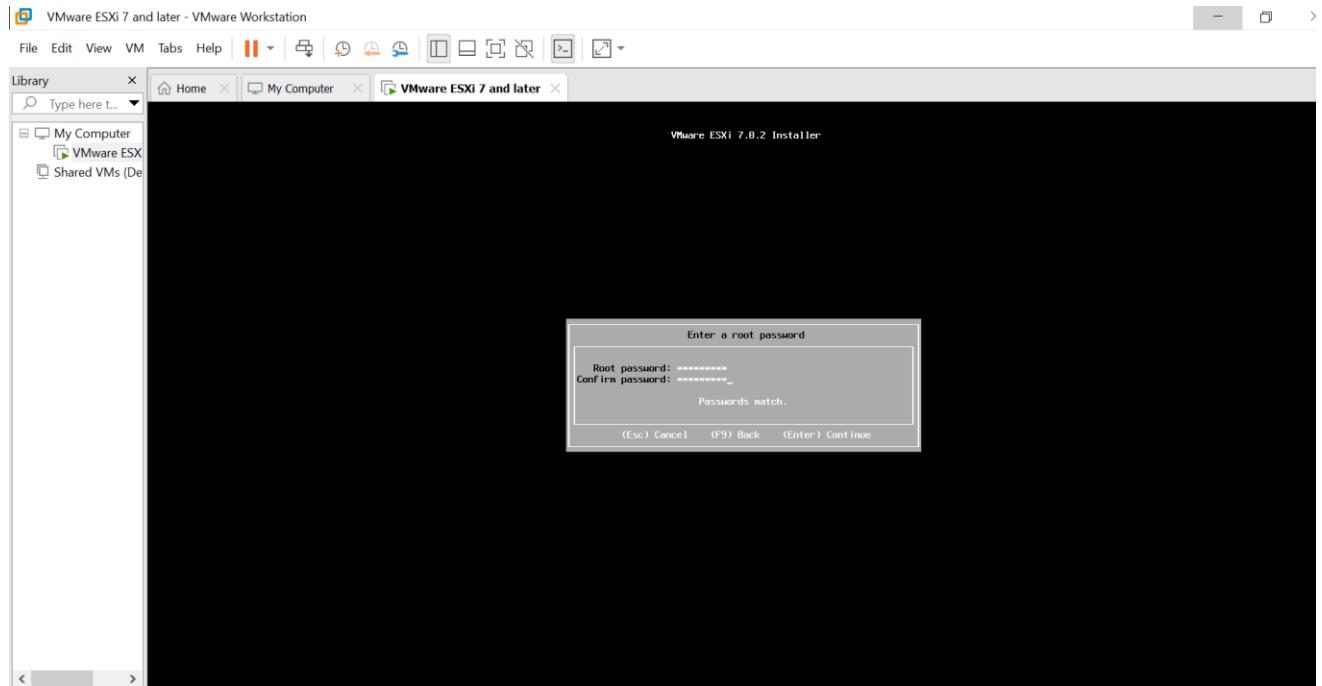


Step 15: Provide Password for Root User

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Step 16: Scanning System

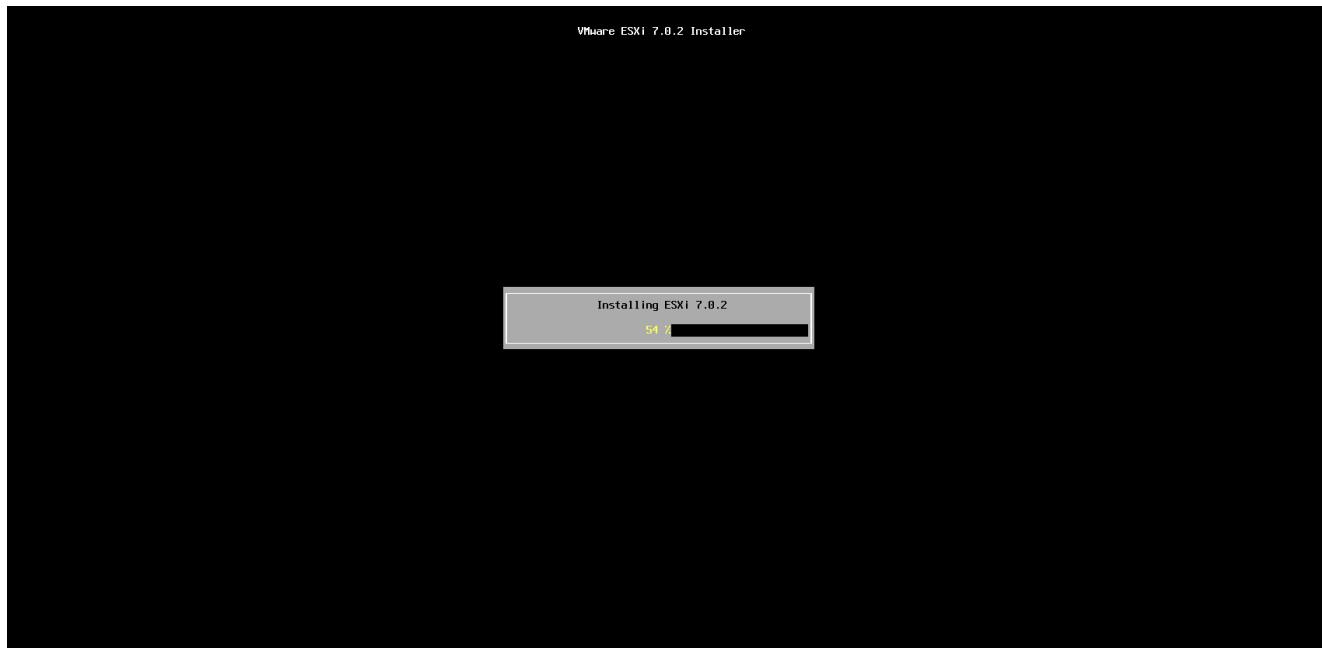


Step 17: Confirm installation

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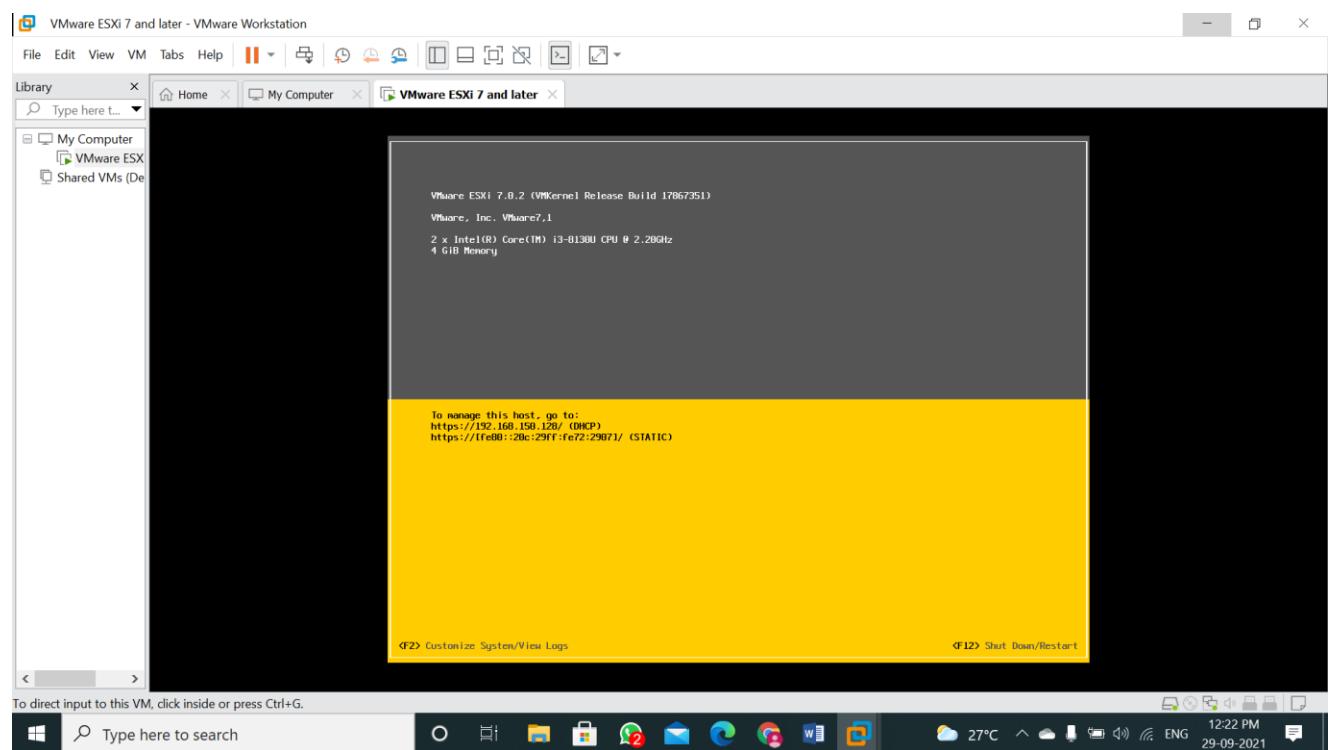
Step 18: Press Enter.



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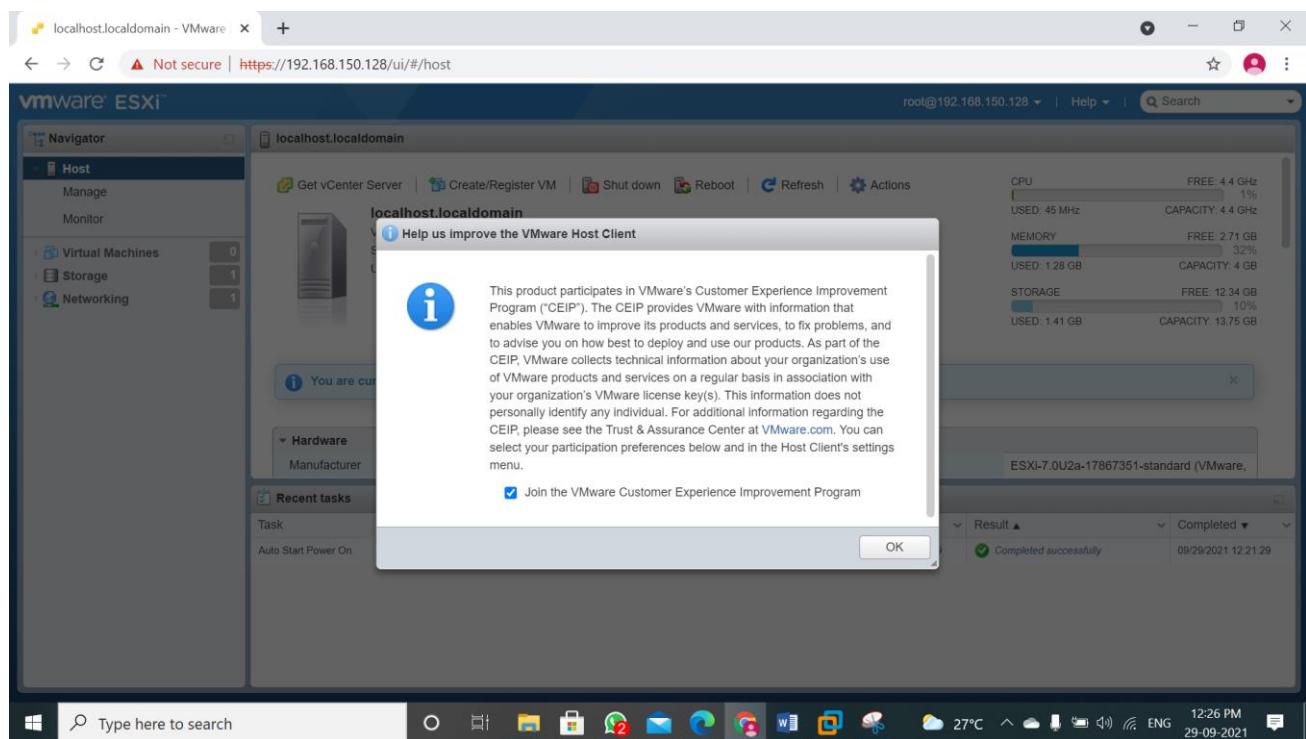
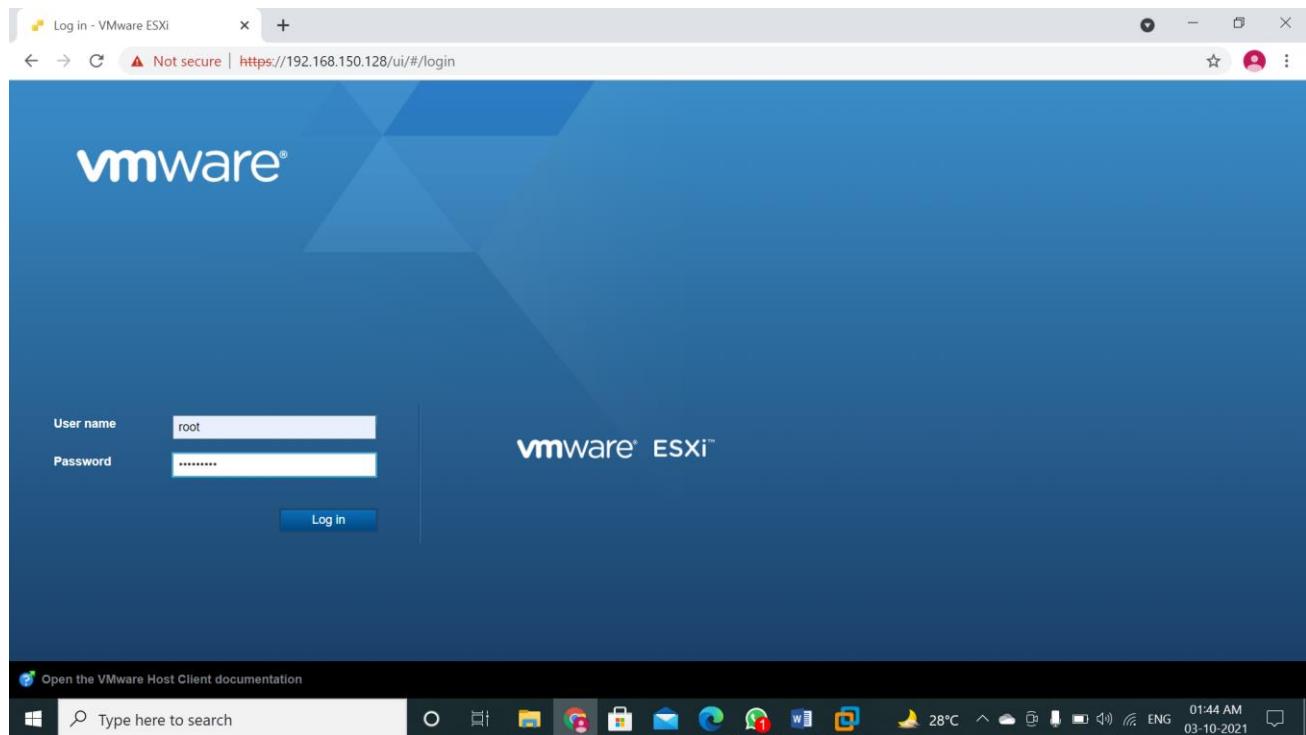


Step 19: Open the VMware vsphere Client and enter the following IP address.

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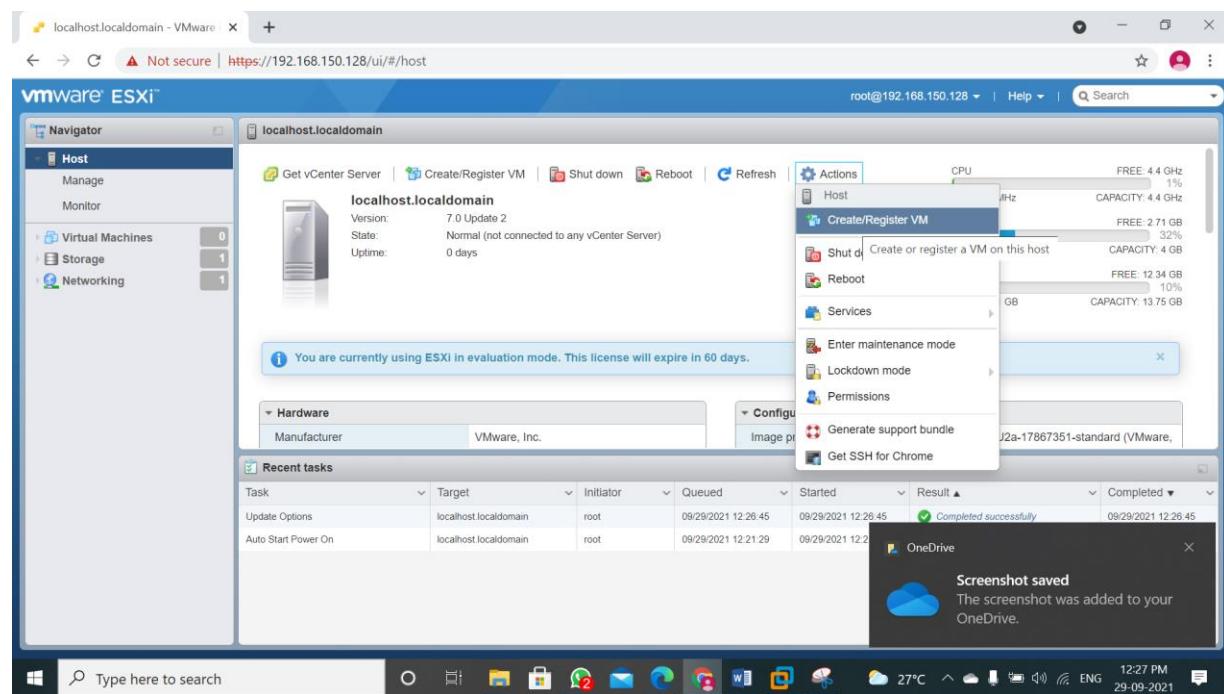
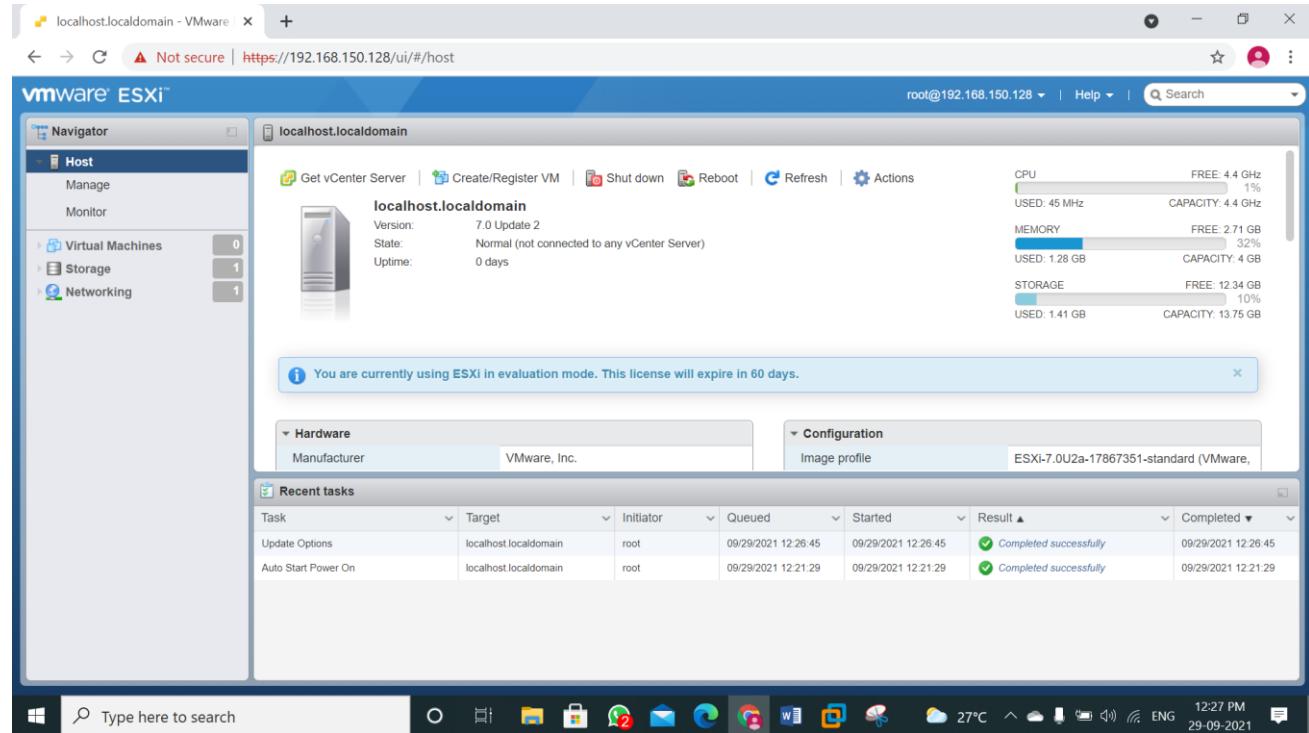


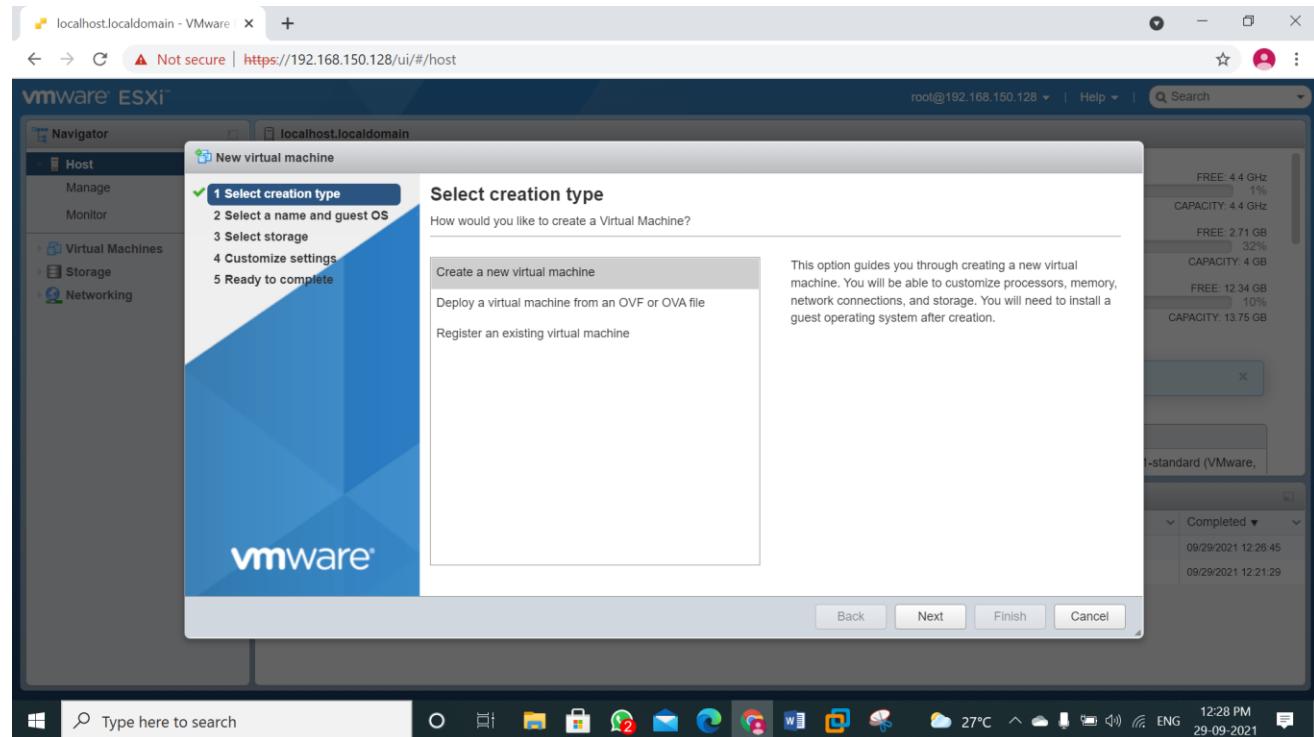
Step 20: Click on Action > create new virtual machine

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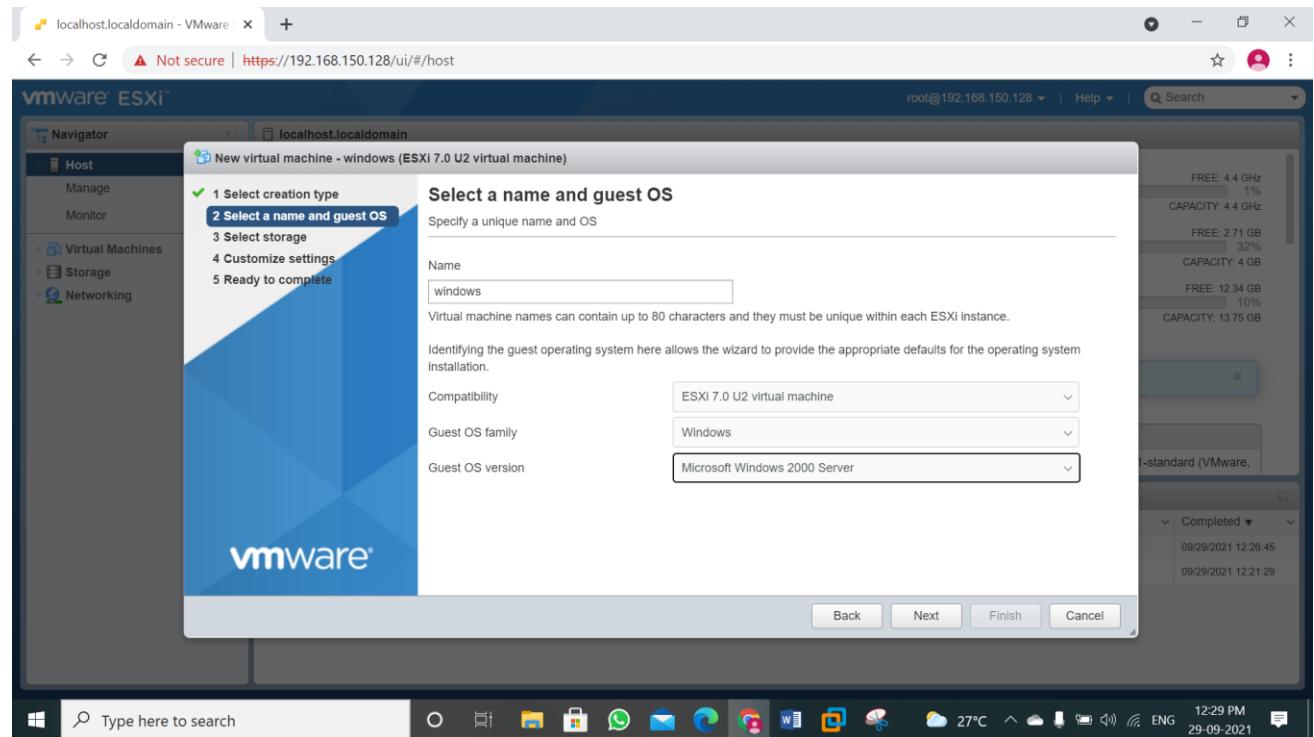
Class: TYIT

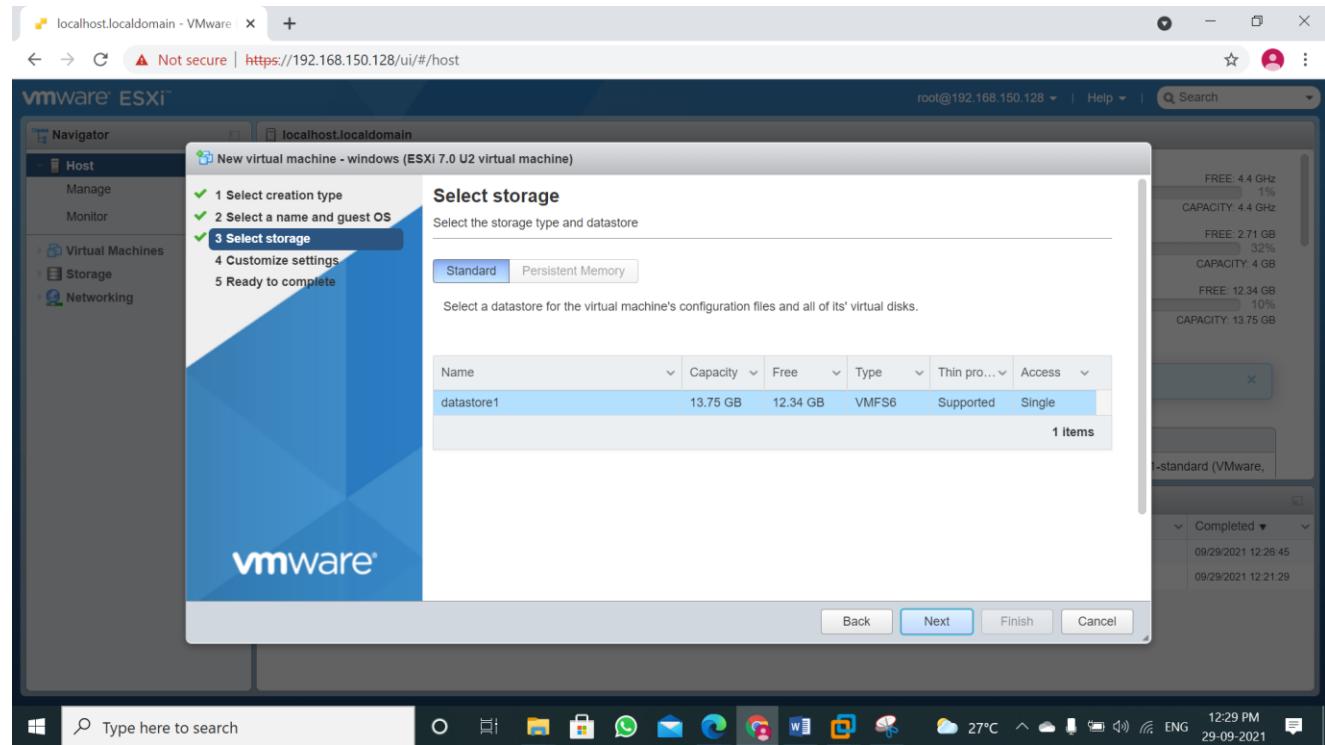
Roll no: 578



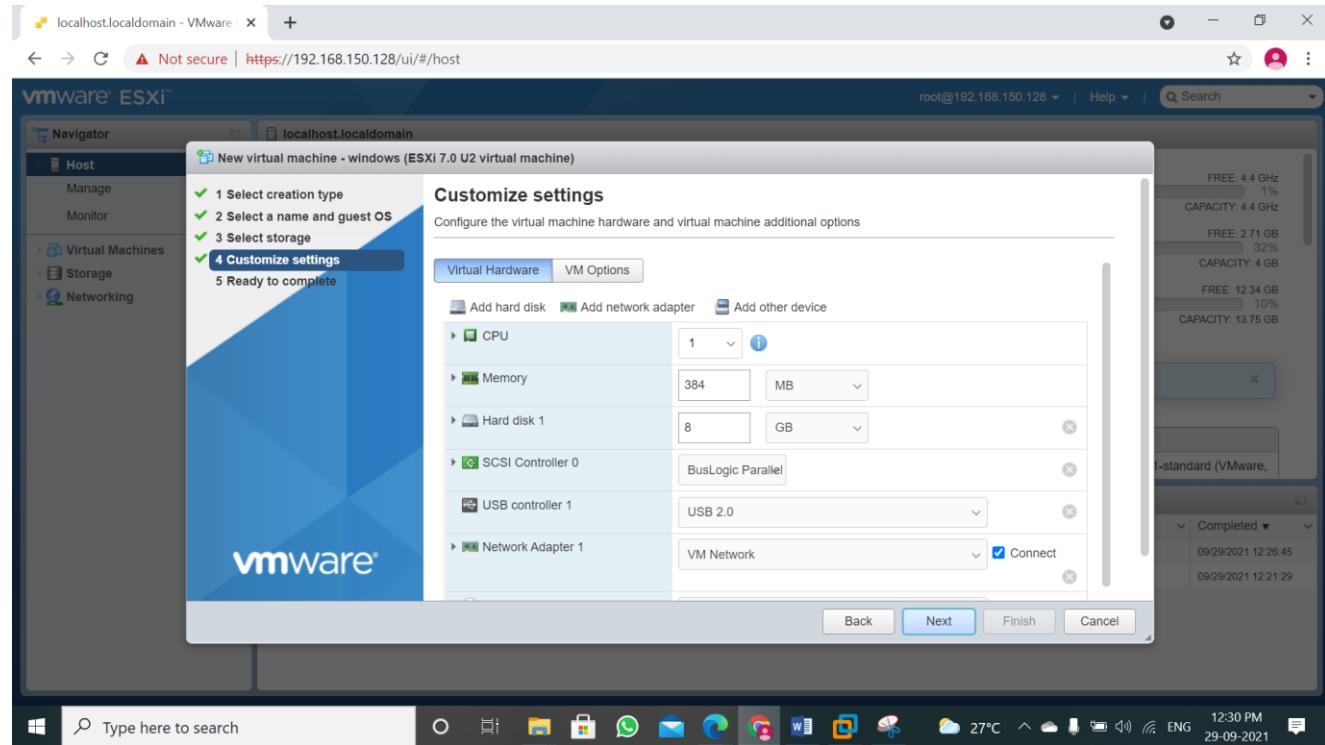


Step 21: Name window and keep os version Microsoft windows 2000





Step 22: Confirm the configuration

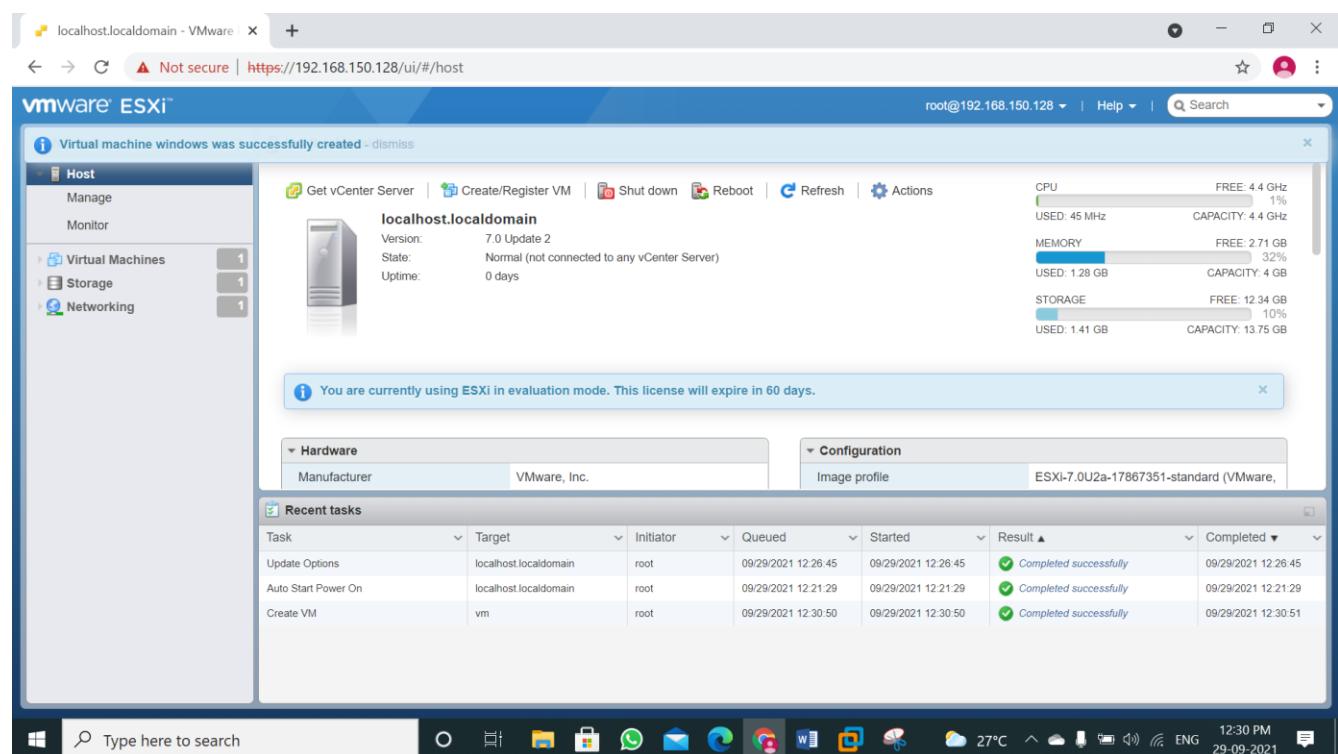
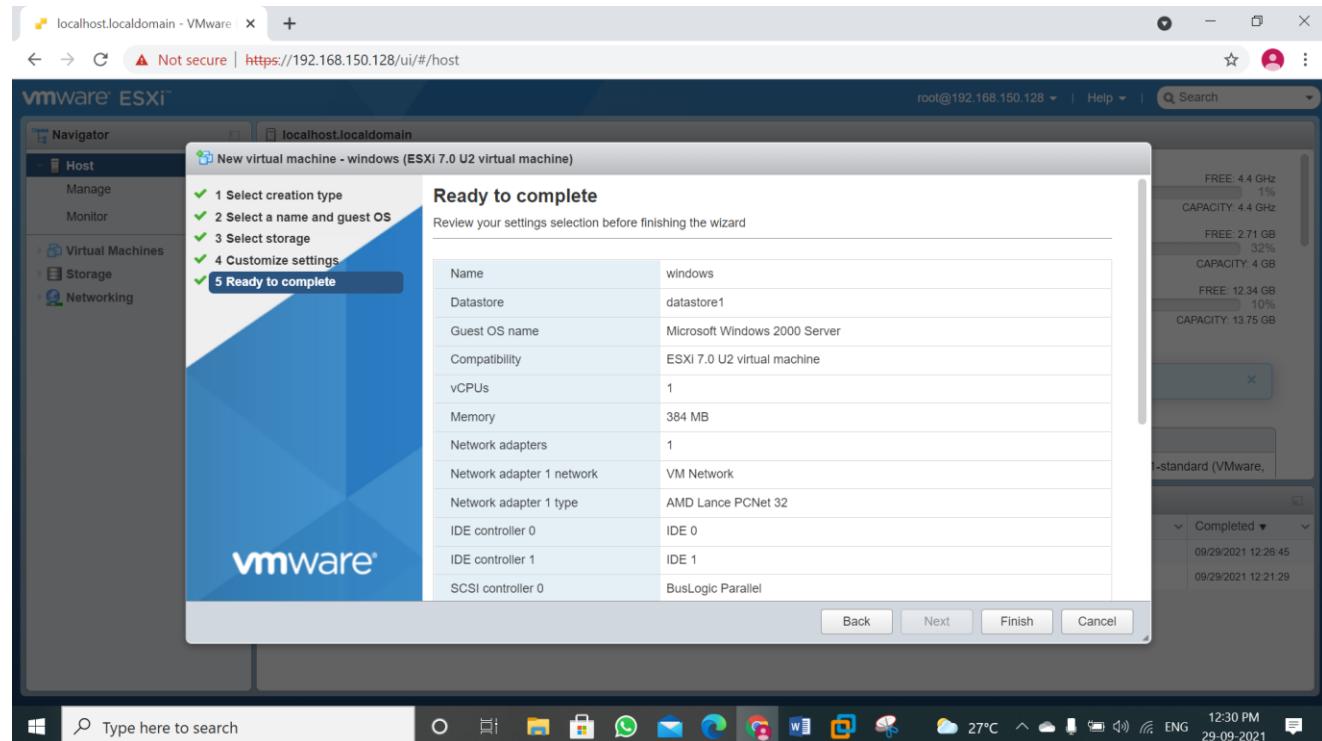


Step 23: Finish the installation

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Practical 3

Aim: Study and Implement Software as a service.

Collaborating on Presentations:

The components of the traditional office suite to move into the cloud is the presentation application. Microsoft PowerPoint has ruled the desktop forever, and it's proven difficult to offer competitive functionality in a web-based application; if nothing else, slides with large graphics are slow to upload and download in an efficient manner. The Presentation is actually a collaboration on a specific novel, either on the first day that we work on the novel or the last day that we finish it up. First day presentations will cover an introduction; last day presentations will present a game that represents our discussions about this text.

Collaborating on Word Processing:

A word processor is software or a device that allows users to create, edit, and print documents. It enables you to write text, store it electronically, display it on a screen, modify it by entering commands and characters from the keyboard, and print it. Of all computer applications, word processing is the most common. Today, most word processors are delivered either as a cloud service or as software that users can install on a PC or mobile device.

Google Docs:

Google Docs is a free Web-based application in which documents and spreadsheets can be created, edited and stored online. Files can be accessed from any computer with an Internet connection and a full-featured Web browser. Google Docs is a part of a comprehensive package of online applications offered by and associated with Google.

Google Presentations:

Google first offered a presentation program for Google Docs in 2007. Google's free presentation software has been named Google Slides since 2012.

PROCEDURE:

Step 1: Sign into Google Drive website using Google account. If you don't have any account create a account. Google Drive will allow you to store your files in the cloud, as well as create documents and forms through the Google Drive web Interface.

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The screenshot shows the Google Drive interface. On the left, there's a sidebar with links to 'My Drive' (which is selected), 'Computers', 'Shared with me', 'Recent', 'Starred', and 'Trash'. Below this is a storage status bar showing 'Storage (75% full)' and '11.25 GB of 15 GB used'. A 'Buy storage' button is also present. The main area displays a 'Suggested' section with cards for 'Untitled document' (edited yesterday) and 'Exam' (edited in the past week). To the right is a list of files and folders:

Name	Owner	Last modified	File size
Zee	me	Sep 8, 2019	me
Colab Notebooks	me	Jan 9, 2021	me
Classroom	me	Jul 27, 2019	me
zeenat42.docx	me	Sep 26, 2019	257 KB

At the bottom, there's a search bar and a taskbar with various icons.

Step 2: Add files to your drive. There are 2 ways to add files - You can create or you can upload from your computer. To create new file click NEW button, to upload click file upload or folder upload.

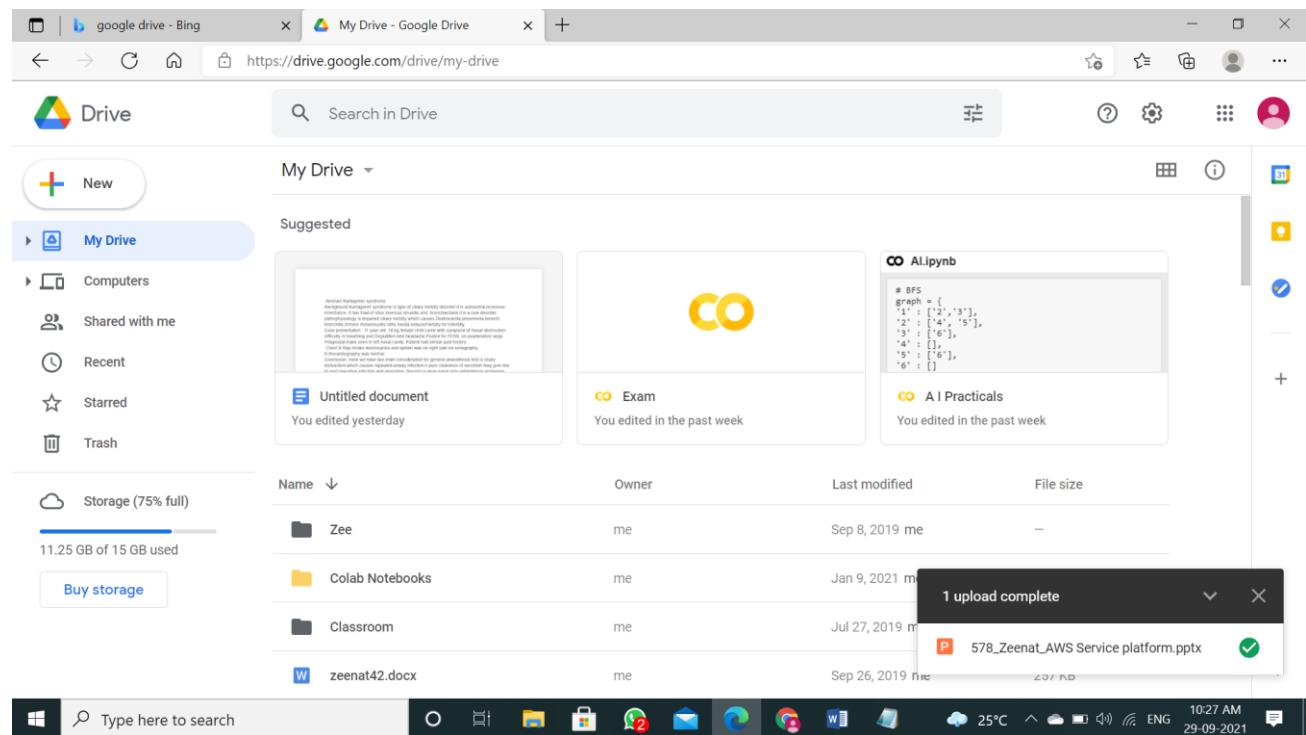
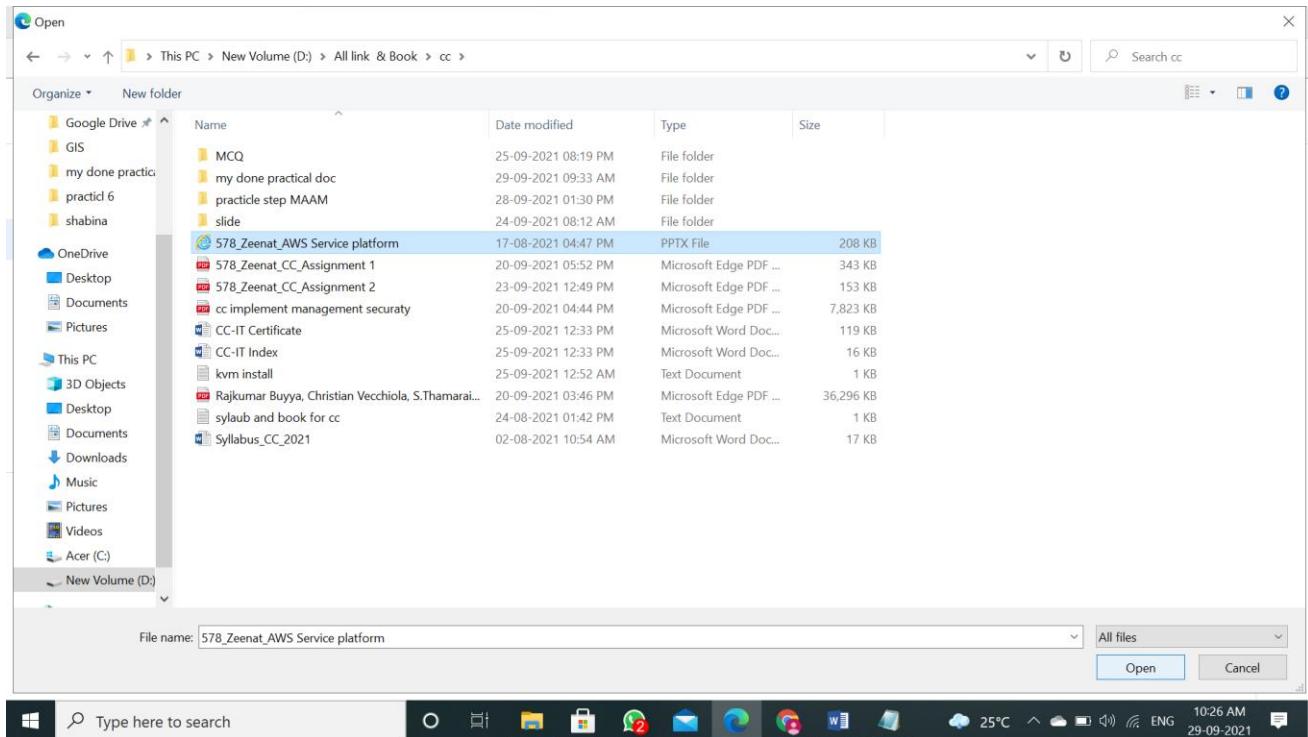
This screenshot is similar to the previous one but shows the 'File upload' option selected in the sidebar. The sidebar also includes 'Folder', 'Folder upload', and 'More' options. The main area shows the same list of files and folders as before, with the 'File upload' option highlighted.

Step 3: You can now Upload a File after clicking on the Button.

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Step 4: File successfully uploaded on Google Drive.

The screenshot shows the Google Drive interface. On the left, there's a sidebar with options like 'New', 'My Drive' (which is selected), 'Computers', 'Shared with me', 'Recent', 'Starred', and 'Trash'. Below that is a storage status: 'Storage (75% full)' with '11.25 GB of 15 GB used' and a 'Buy storage' button. The main area is titled 'My Drive' and lists files with columns for 'Name', 'Owner', 'Last modified', and 'File size'. A file named '578_Zeenat_AWS Service platform.pptx' is highlighted, and a progress bar at the bottom right indicates '1 upload complete' for this file. The file details show it was uploaded by 'me' on Aug 17, 2021, with a size of 207 KB. The taskbar at the bottom shows various icons and the date/time: 25°C, ENG, 10:29 AM, 29-09-2021.

Step 5: Uploading File on Google Slides:

Step 6: In a web browser (Chrome, Safari, etc), open Google Drive or click on this link:
<https://www.google.com/intl/en/drive/>

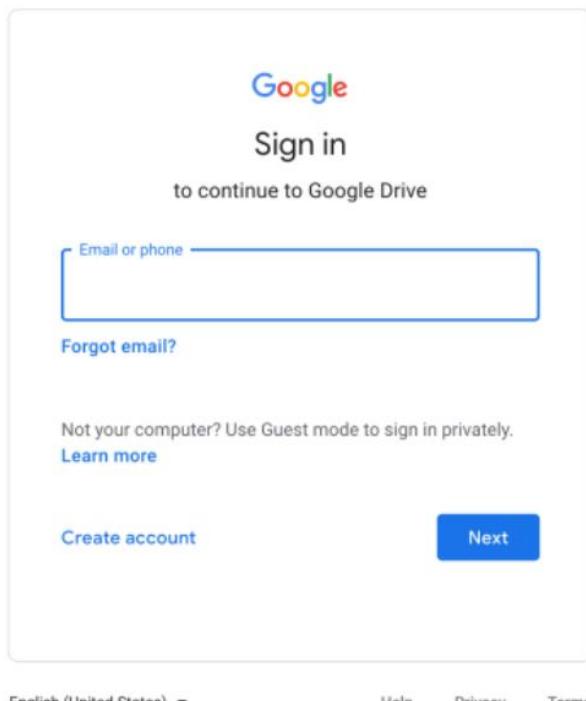
The screenshot shows the Google Drive landing page in a browser. The address bar shows the URL 'https://www.google.com/intl/en/drive/'. The page features a large central image of a laptop and a smartphone displaying the Google Drive interface. To the left of the devices, the text 'Easy and secure access to all of your content' is displayed, along with a subtext: 'Store, share, and collaborate on files and folders from any mobile device, tablet, or computer'. At the bottom left are two buttons: 'Go to Drive' and 'Try Drive for your team'. The taskbar at the bottom shows various icons and the date/time: 25°C, ENG, 10:34 AM, 29-09-2021.

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Step 7: Click on GO TO DRIVE and Log in with your Gmail Credentials (your gmail email address and password)

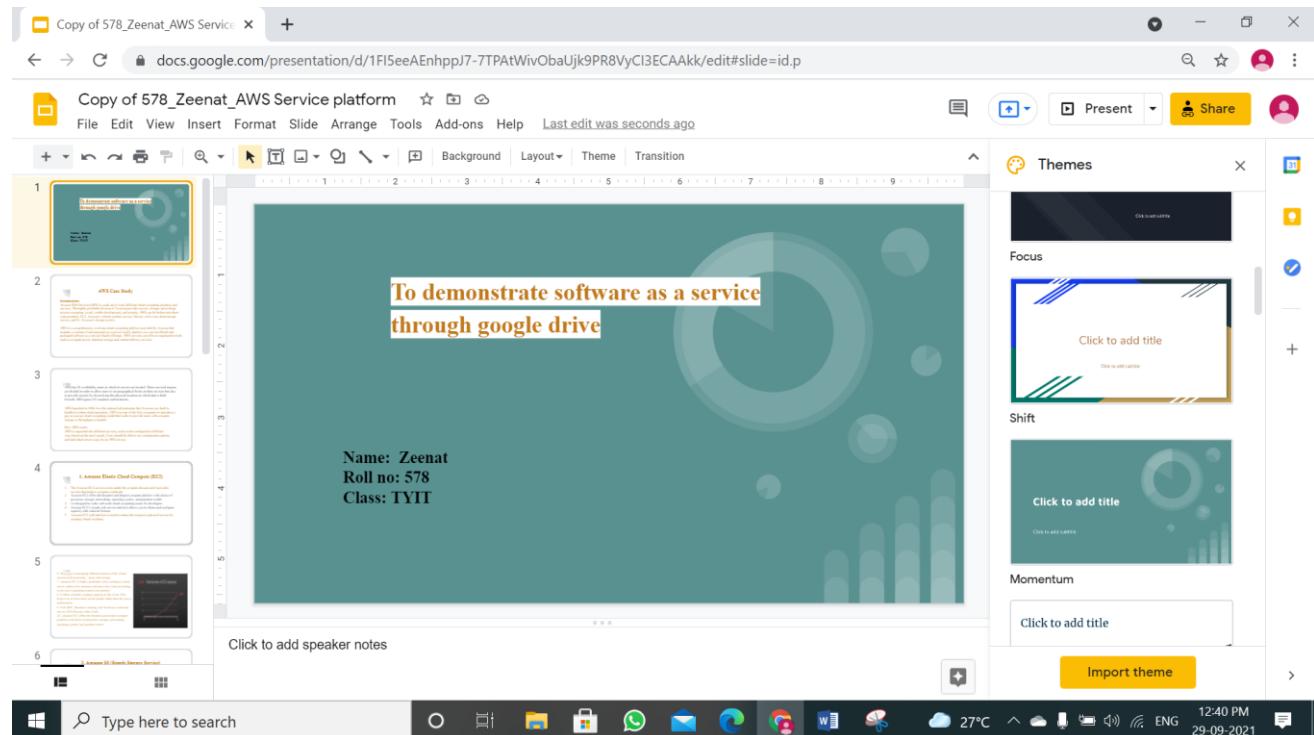


Step 8: Select “New” in the upper left-hand corner of the screen

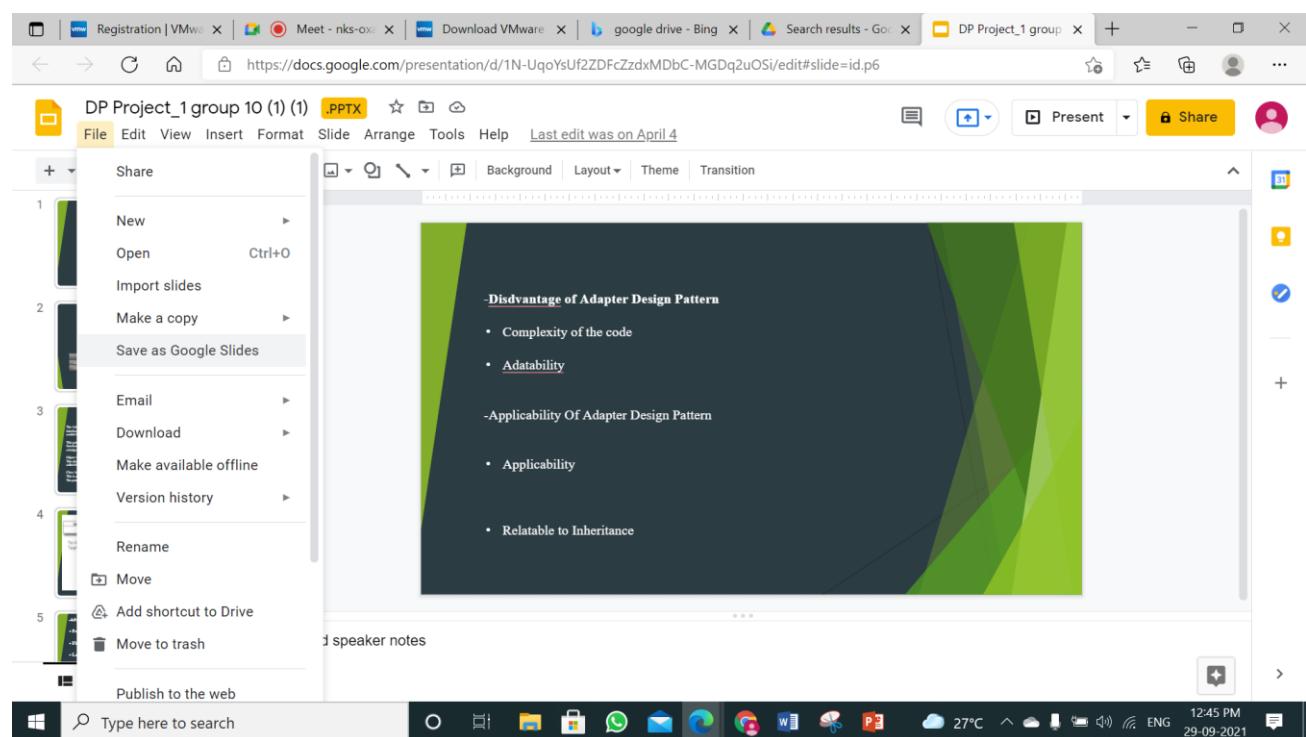
A screenshot of the Google Drive interface. On the left, there's a sidebar with options like "My Drive" (which is selected and highlighted in blue), "Computers", "Shared with me", "Recent", "Starred", and "Trash". Below that is "Storage (75% full)" and a "Buy storage" button. The main area shows "Suggested" files: "Untitled document", "Exam", and "AI.ipynb". Below these is a table of files with columns for "Name", "Owner", "Last modified", and "File size". The table includes entries for "Zee", "Colab Notebooks", "Classroom", and "zeenat42.docx". At the bottom, there's a search bar and a taskbar with various icons.

Step 9: Select the desired PowerPoint presentation that you downloaded from Etsy (it has to be a file ending in .PPTX) and select OPEN

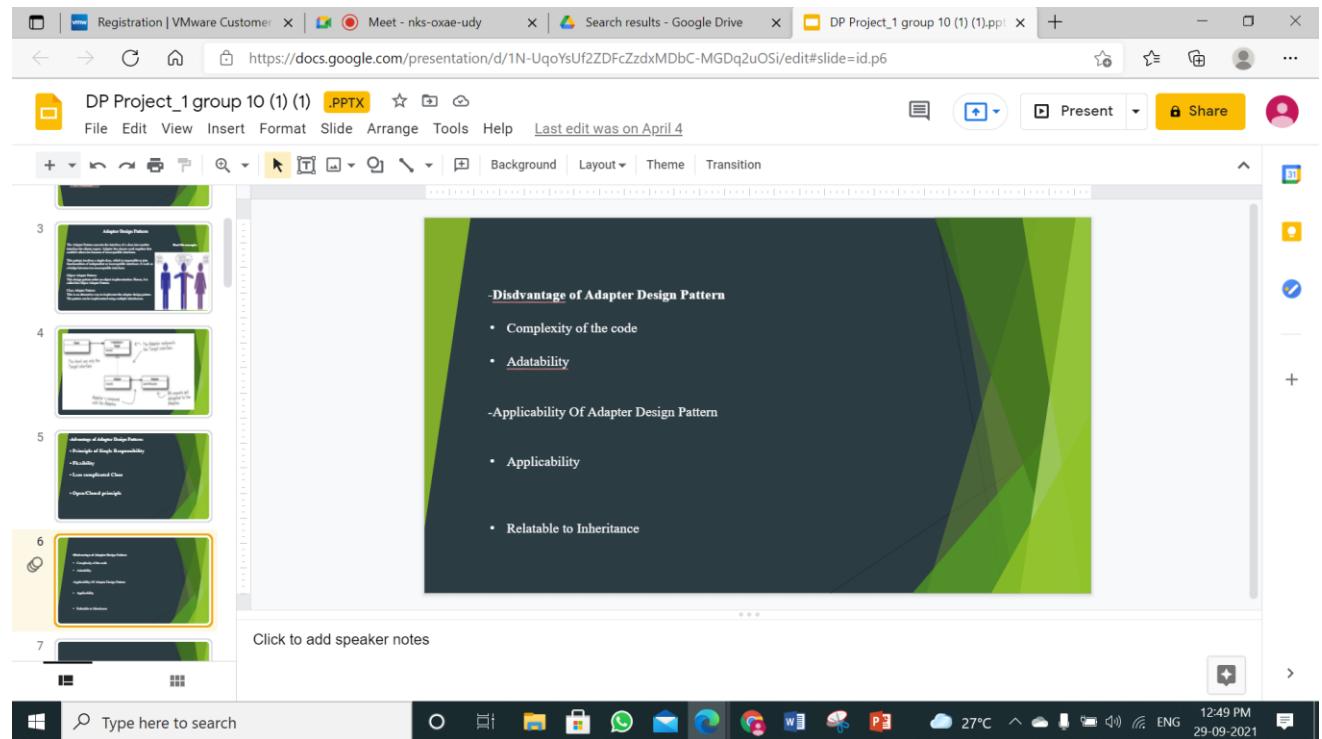
Step 10: After uploading the PPTX file, right-click the file image and select “Open With,” then select “Google Slides.” ...



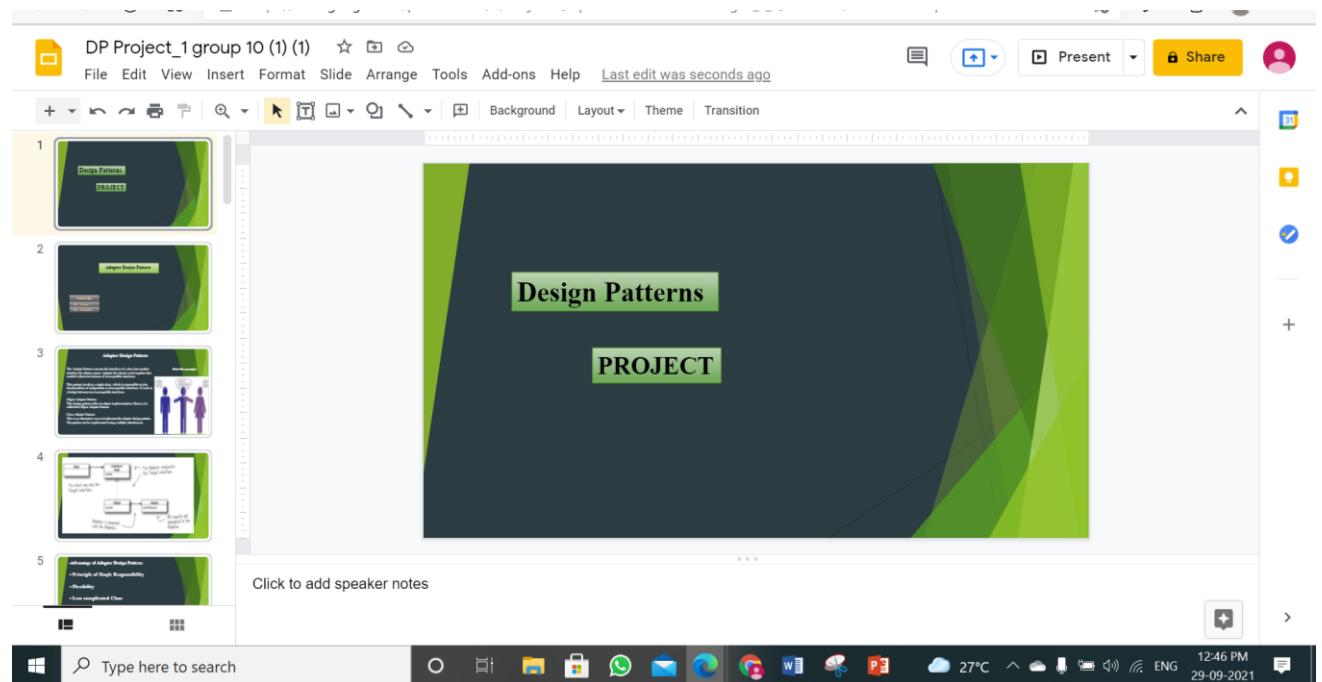
Step 11: Select “File.” at the top of the page on the left... Select “Save as Google Slides.



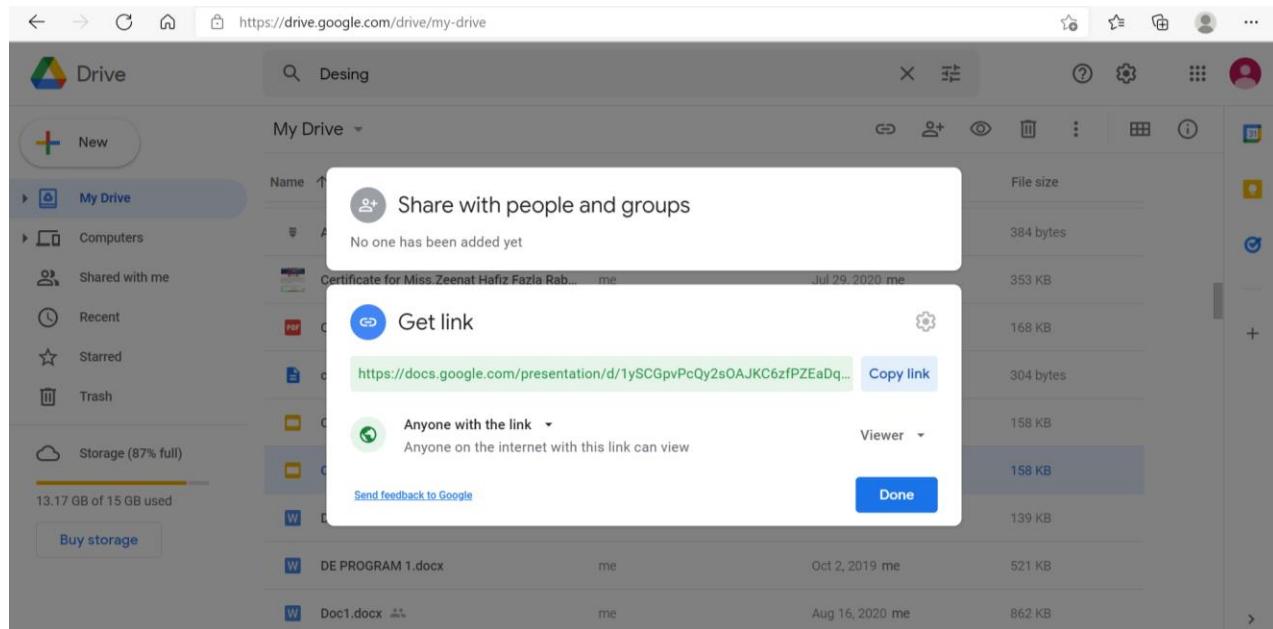
Step 12: The file will open in a new tab and will no longer have the PPTX label at the top.



Step 13: Close the tab of the original PPTX file and start editing your NEW file in Google Slides



Step 14: To Share Document link with anyone



CONCLUSION:

Google Docs provide an efficient way for storage of data. It fits well in storage as a service(SaaS).

It has varied options to create documents, PPT's and also spreadsheets. It saves document automatically after few seconds and can be shared anywhere on the Internet at a click of a button.

Practical 4

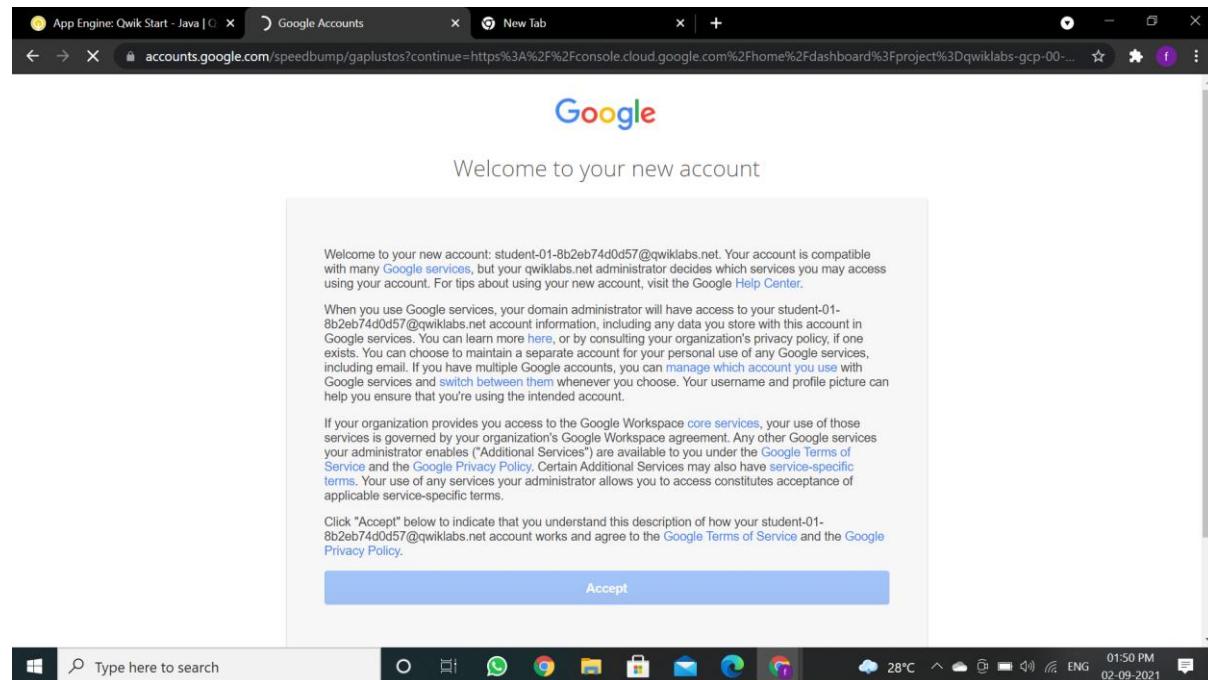
Aim: To demonstrate PaaS with Google App Engine.

Theory:

Google App Engine is a Paas(Platform as a service) service model for cloud computing. Google App Engine makes it easy to build an application that runs reliably, even under heavy load and with large amounts of data. The Google App Engine environment includes the following features

1. Dynamic web serving, with full support for common web technologies
2. Persistent storage with queries, sorting, and transactions
3. Automatic scaling and load balancing
4. APIs for authenticating users and sending email using Google Accounts
5. A fully featured local development environment that simulates Google App Engine on your computer.

Step 1: Create account



Step 2: Click the **Start Lab** button. If you need to pay for the lab, a pop-up opens for you to select your payment method. On the left is a panel populated with the temporary credentials that you must use for this lab.

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[Open Google Console](#)

Caution: When you are in the console, do not deviate from the lab instructions. Doing so may cause your account to be blocked. [Learn more.](#)

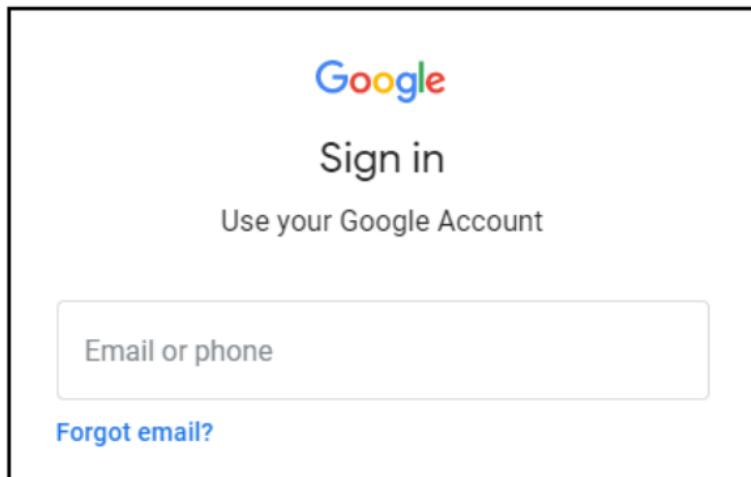
Username
google2727032_student@qwiklabs.n 

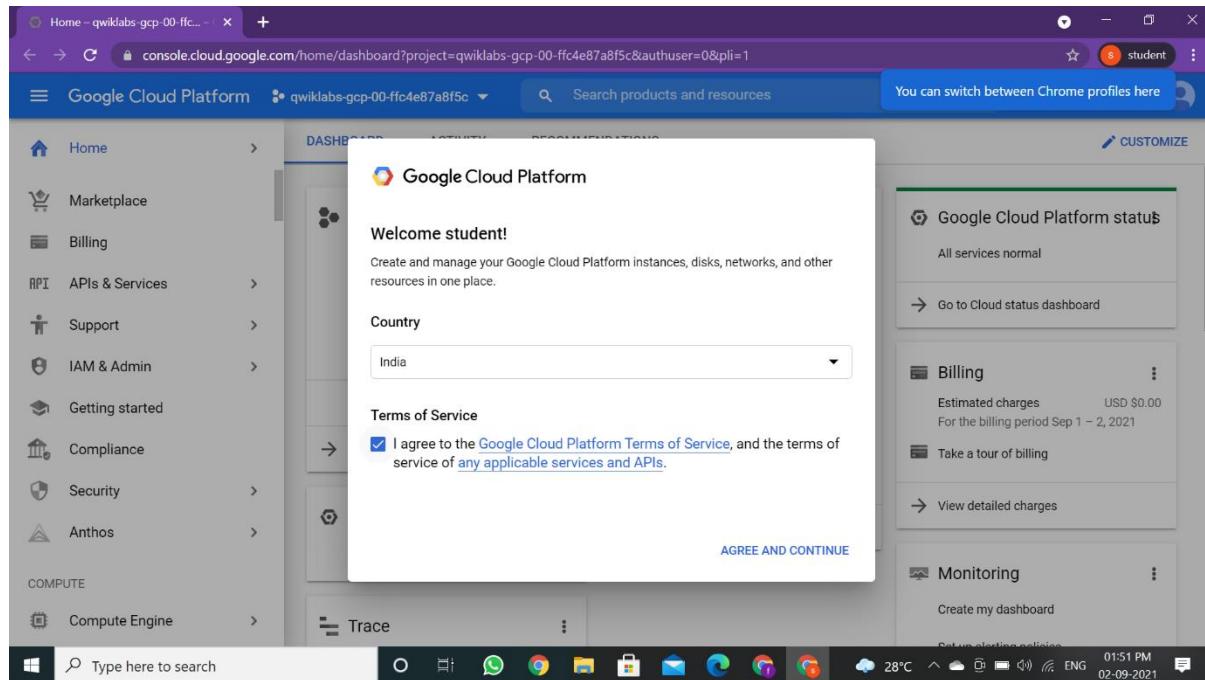
Password
k68CZXsxMZ 

GCP Project ID
qwiklabs-gcp-4fbfecac8667e457 

[New to labs? View our introductory video!](#)

Step 3: Copy the username, and then click **Open Google Console**. The lab spins up resources, and then opens another tab that shows the **Sign in** page.



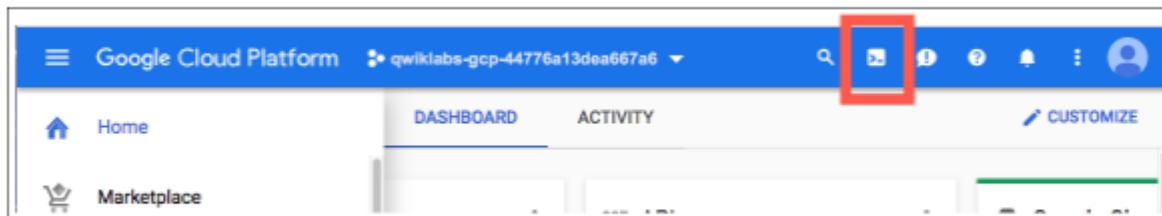


Step 4: In the **Sign in** page, paste the username that you copied from the Connection Details panel. Then copy and paste the password.

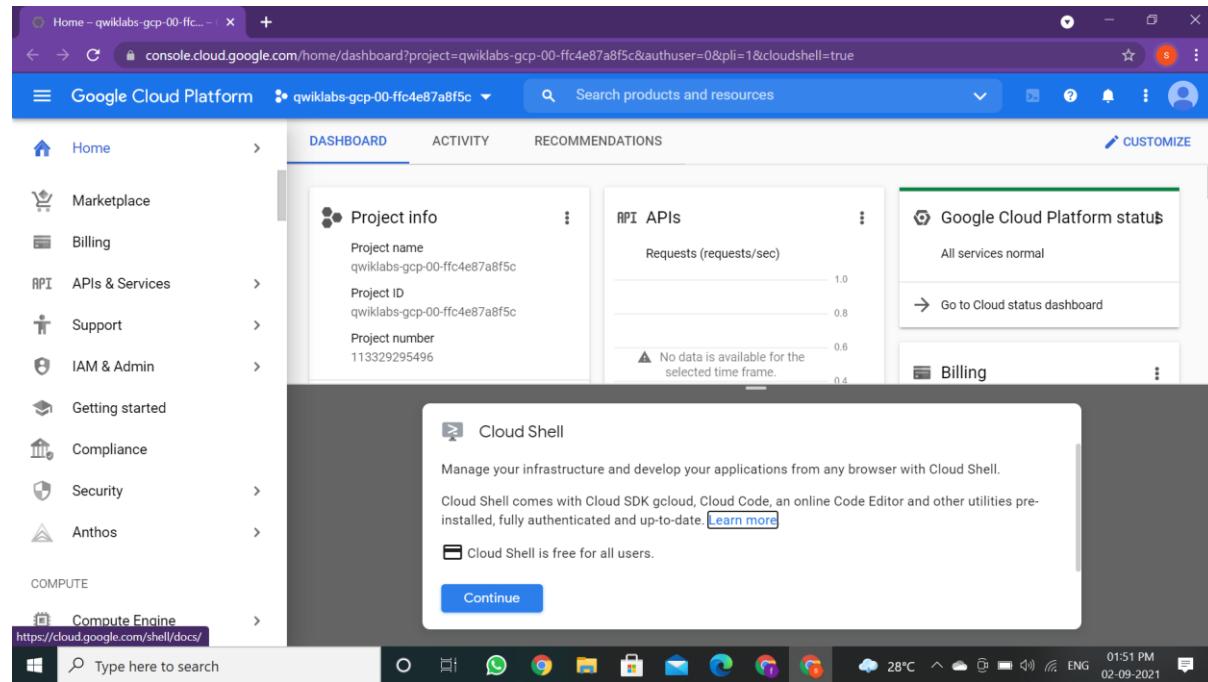
Activate Cloud Shell

Step 5: Cloud Shell is a virtual machine that is loaded with development tools. It offers a persistent 5GB home directory and runs on the Google Cloud. Cloud Shell provides command-line access to your Google Cloud resources.

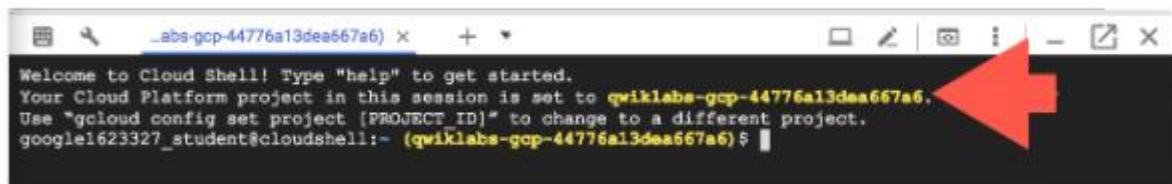
In the Cloud Console, in the top right toolbar, click the **Activate Cloud Shell** button.



Click **Continue**.



Step 6: It takes a few moments to provision and connect to the environment. When you are connected, you are already authenticated, and the project is set to your *PROJECT_ID*. For example:



gcloud is the command-line tool for Google Cloud. It comes pre-installed on Cloud Shell and supports tab-completion.

Step 7: You can list the active account name with this command:

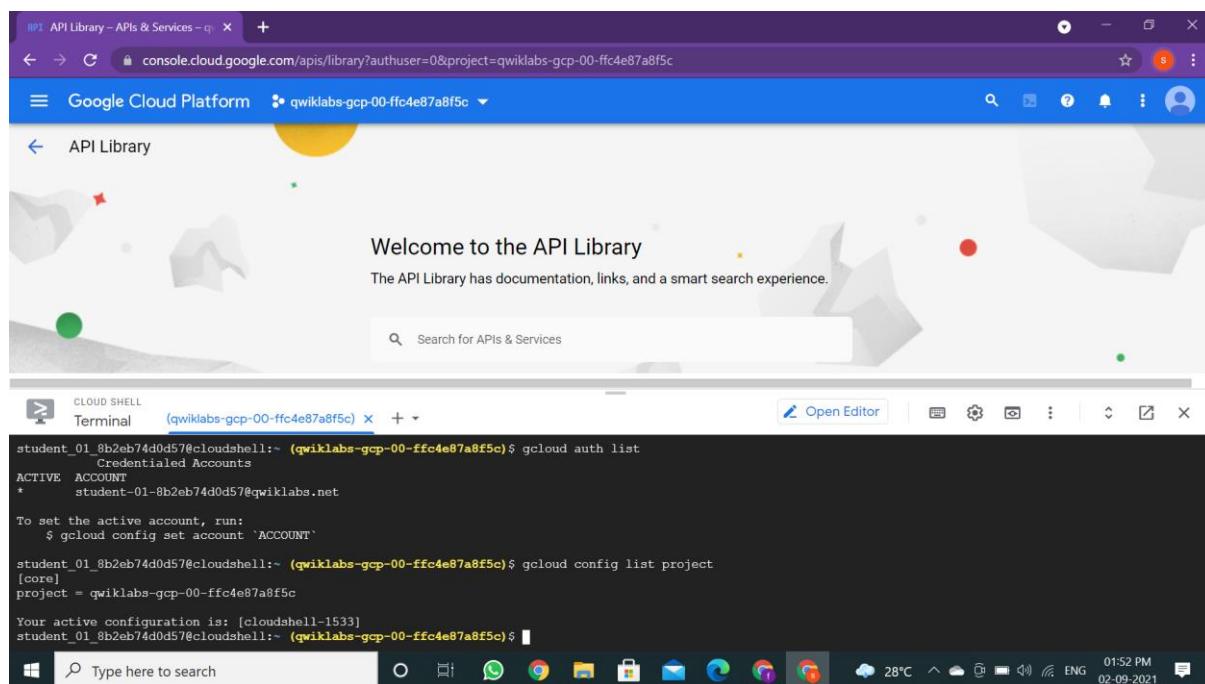
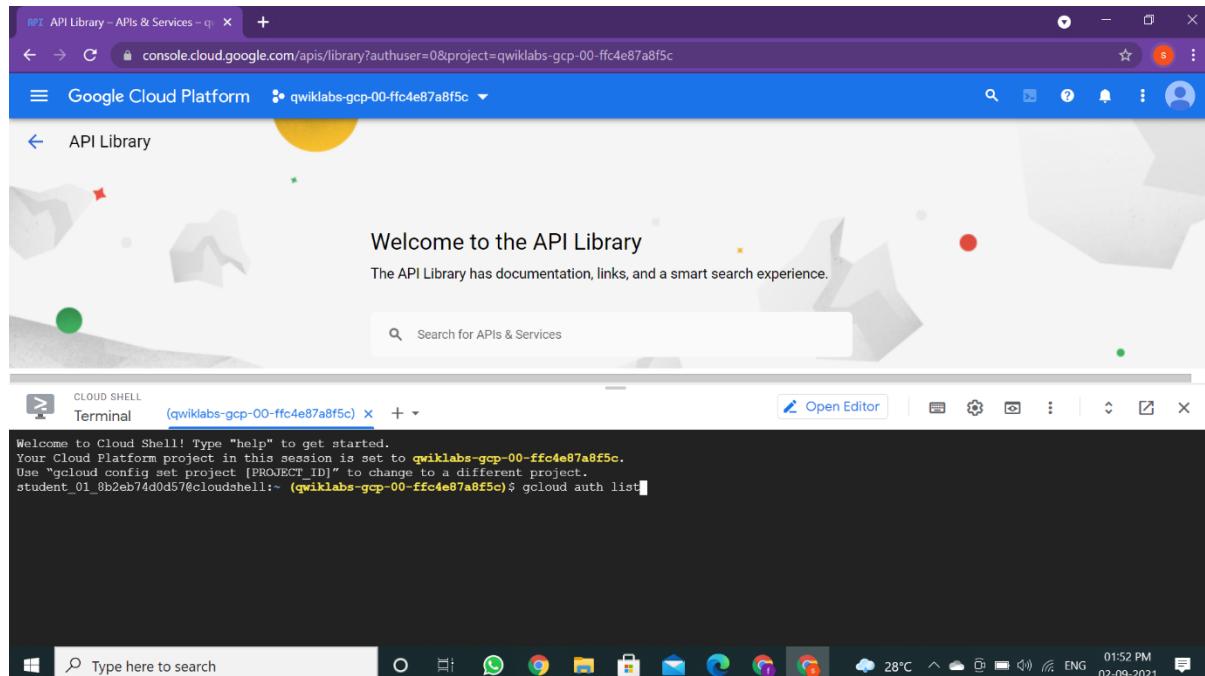
gcloud auth list

gcloud config list project

Name: Zeenat

Class: TYIT

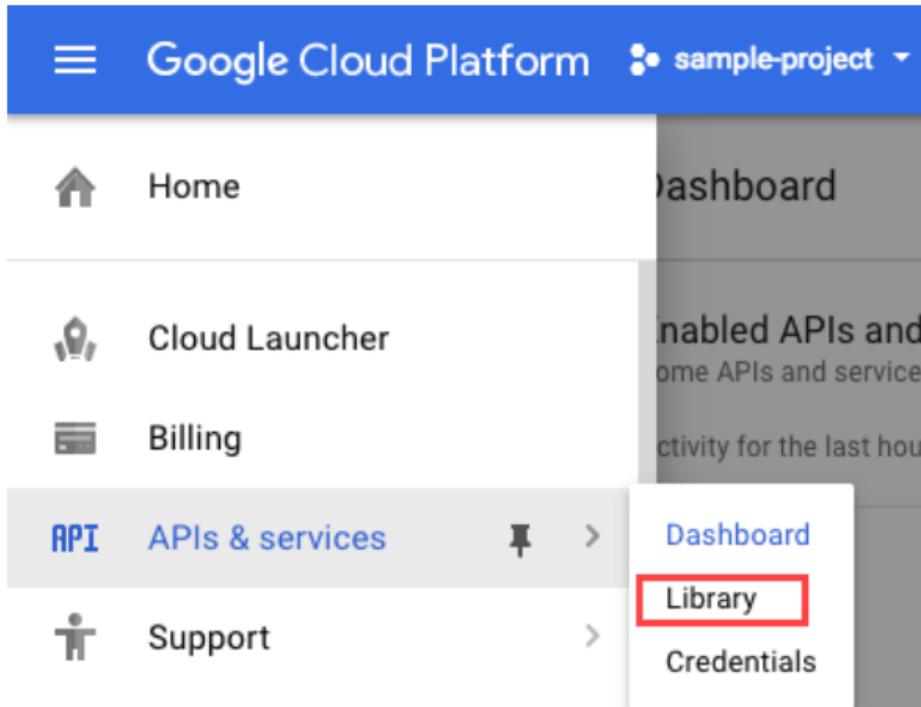
Roll no: 578



Step 8: Enable Google App Engine Admin API

The App Engine Admin API enables developers to provision and manage their App Engine Applications.

1. In the left-hand menu click on **APIs & Services > Library**.

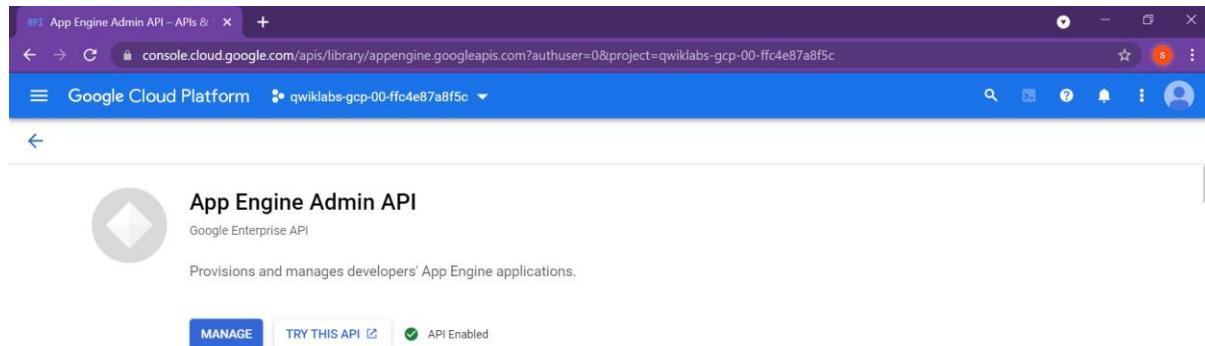


Step9 : Type "App Engine Admin API" in the search box.

2. Click **App Engine Admin API**.

A screenshot of a web browser showing the Google Cloud API Library. The search bar at the top contains 'App Engine Admin API'. The results list shows one result: 'App Engine Admin API' under 'Google Enterprise APIs'. Below the search bar, there are filters for 'Compute (1)', 'Google Enterprise APIs (1)', 'PRICE', 'Free (1)', and 'Paid (1)'. On the right side of the search results, there is a brief description: 'Provisions and manages developers' App Engine applications.' At the bottom of the page, there is a terminal window titled 'CLOUD SHELL' showing command-line output related to Google Cloud auth and config.

3. Click **Enable** if it isn't already set. Your page should now resemble the following:



The screenshot shows the Google Cloud Platform API Library interface. The top navigation bar has tabs for 'APIs & Services' and 'Compute'. The URL in the address bar is `console.cloud.google.com/apis/library/appengine.googleapis.com?authuser=0&project=qwiklabs-gcp-00-ffc4e87a8f5c`. Below the address bar, the title 'Google Cloud Platform' and project name 'qwiklabs-gcp-00-ffc4e87a8f5c' are displayed. The main content area is titled 'App Engine Admin API' with a subtitle 'Google Enterprise API'. It describes the API as 'Provisions and manages developers' App Engine applications.' There are two buttons at the bottom: 'MANAGE' and 'TRY THIS API'. A green checkmark indicates 'API Enabled'.

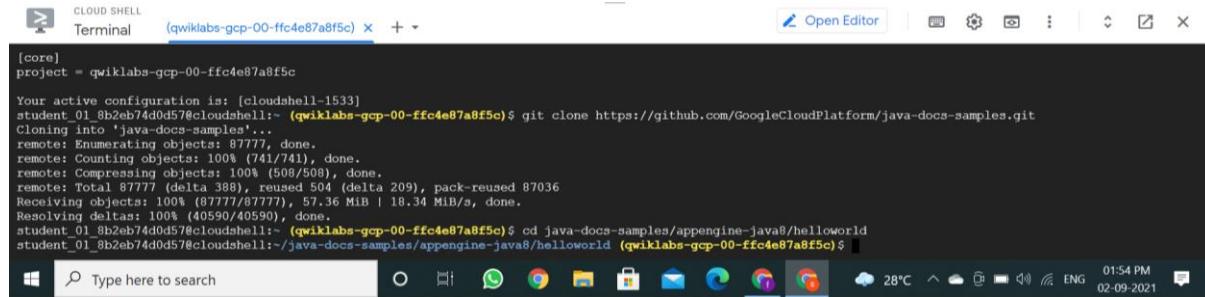
Download the Hello World app

1. Open a Cloud Shell session and run the following command to clone the Hello World sample app repository:

```
git clone https://github.com/GoogleCloudPlatform/java-docs-samples.git
```

2. Then go to the directory that contains the sample code:

```
cd java-docs-samples/appengine-java8/helloworld
```



The screenshot shows a Windows Cloud Shell terminal window. The title bar says 'CLOUD SHELL Terminal (qwiklabs-gcp-00-ffc4e87a8f5c)'. The terminal output shows the command `git clone https://github.com/GoogleCloudPlatform/java-docs-samples.git` being run. The progress of the cloning process is shown, including object enumeration, counting, compressing, and receiving data. The status message 'done.' appears at the end. The system tray at the bottom right shows the date as 02-09-2021 and the time as 01:54 PM.

Test the application using the development server

To get the development server running, you'll download Maven to manage compiling your app and starting the development server.

1. Run the following commands to configure your Maven environment:

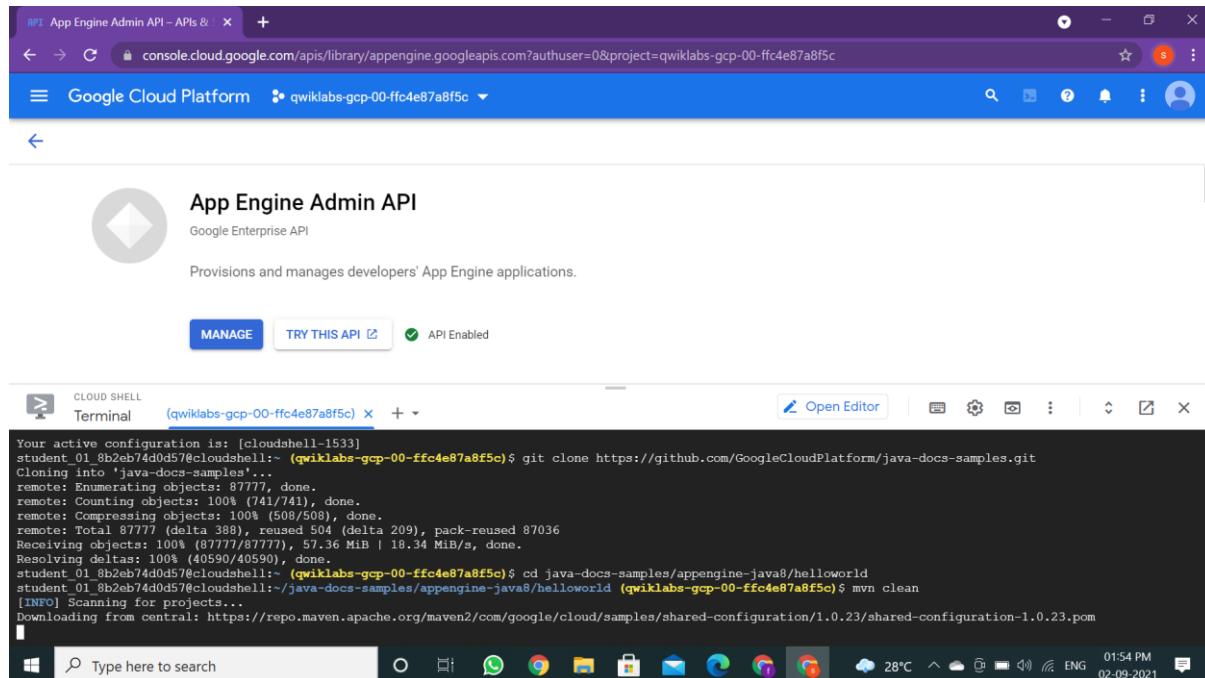
```
mvn clean
```

```
mvn package
```

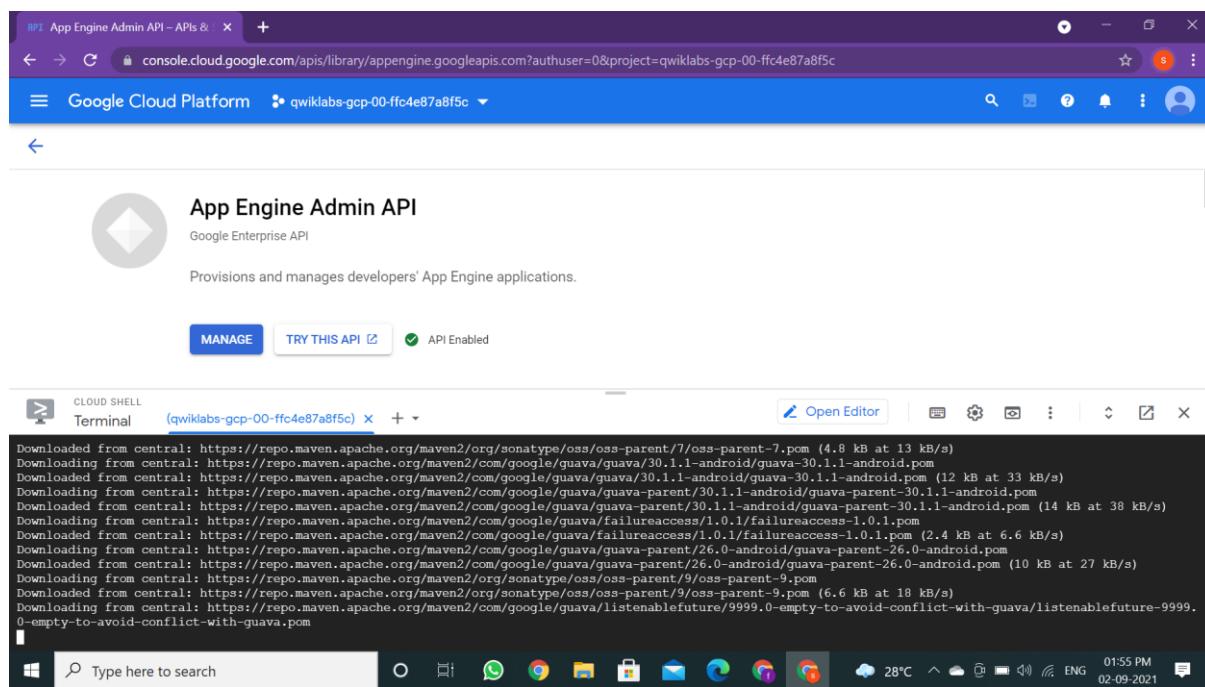
Name: Zeenat

Class: TYIT

Roll no: 578



The screenshot shows the Google Cloud Platform App Engine Admin API interface. At the top, there's a navigation bar with 'Google Cloud Platform' and 'qwiklabs-gcp-00-ffc4e87a8f5c'. Below it, a section titled 'App Engine Admin API' (Google Enterprise API) shows a message: 'Provisions and manages developers' App Engine applications.' There are two buttons: 'MANAGE' and 'TRY THIS API'. A status indicator shows 'API Enabled'. The main area is a terminal window titled 'CLOUD SHELL Terminal (qwiklabs-gcp-00-ffc4e87a8f5c)'. It displays a command-line session where a developer clones a GitHub repository, navigates to the directory, runs 'mvn clean', and then 'mvn appengine:run'. The terminal output shows the Maven build process, including dependency download logs and the application running message: 'Starting local server at http://localhost:8888'. The bottom of the screen shows a Windows taskbar with various icons and system status.



This screenshot is similar to the first one but shows a failed Maven build. The terminal output indicates that several dependencies could not be found in the central repository, such as 'guava-parent-30.1.1-android.pom' and 'failureaccess-1.0.1.pom'. The error message 'Failure: Could not find artifact com.google.guava:guava-parent:30.1.1-android:pom' is repeated multiple times. The rest of the interface and taskbar are identical to the first screenshot.

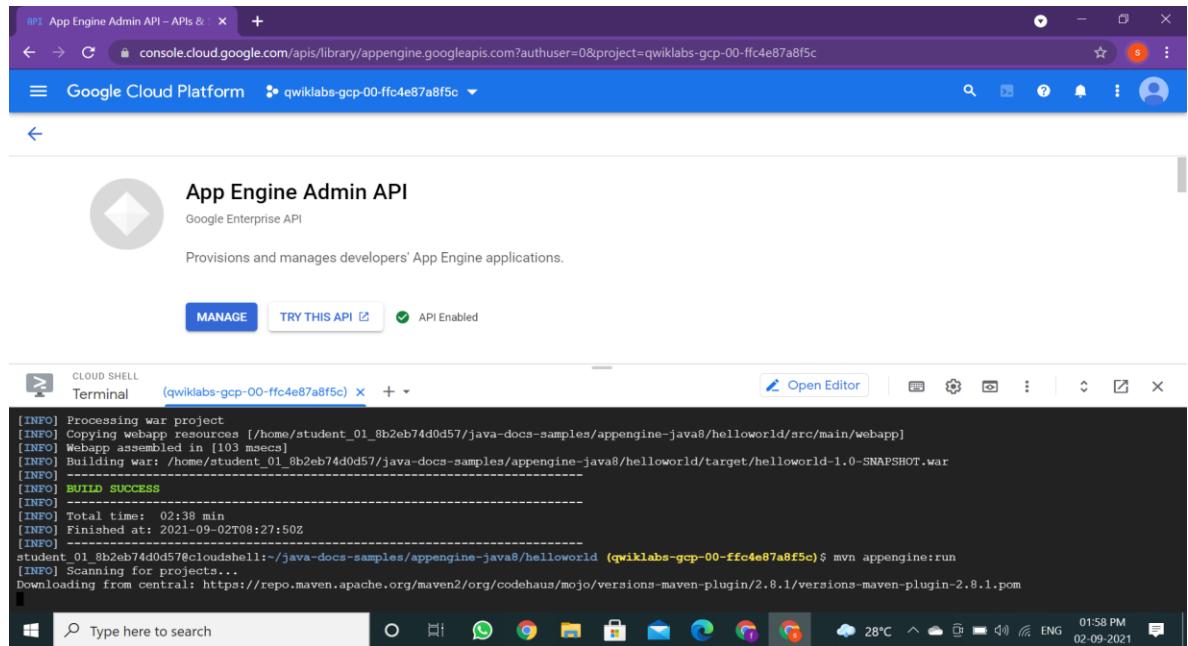
- Enter the following Maven command to download and install Maven and run the app:

mvn appengine:run

Name: Zeenat

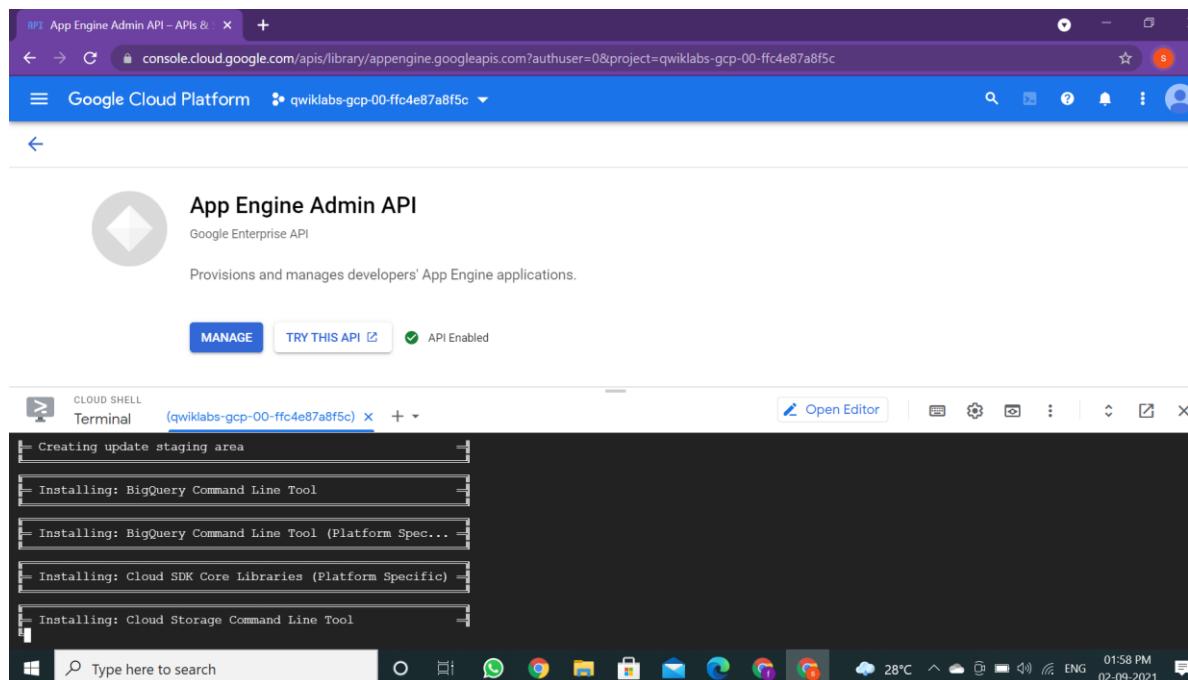
Class: TYIT

Roll no: 578



The screenshot shows the Google Cloud Platform App Engine Admin API interface. A terminal window is open under the 'CLOUD SHELL' tab, showing the command 'mvn appengine:run' being executed. The output indicates a successful build ('BUILD SUCCESS') and deployment ('Deployment successful!'). The status bar at the bottom right shows the date and time as 02-09-2021 01:58 PM.

```
[INFO] Processing war project
[INFO] Copying webapp resources [/home/student_01_8b2eb74d0d57/java-docs-samples/appengine-java8/helloworld/src/main/webapp]
[INFO] Webapp assembled in [103 msecs]
[INFO] Building war: /home/student_01_8b2eb74d0d57/java-docs-samples/appengine-java8/helloworld/target/helloworld-1.0-SNAPSHOT.war
[INFO] 
[INFO] BUILD SUCCESS
[INFO] Total time: 02:38 min
[INFO] Finished at: 2021-09-02T08:27:50Z
[INFO] 
student_01_8b2eb74d0d57@cloudshell:~/java-docs-samples/appengine-java8/helloworld (qwiklabs-gcp-00-ffc4e87a8f5c)$ mvn appengine:run
[INFO] Scanning for projects...
Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/mojo/versions-maven-plugin/2.8.1/versions-maven-plugin-2.8.1.pom
```

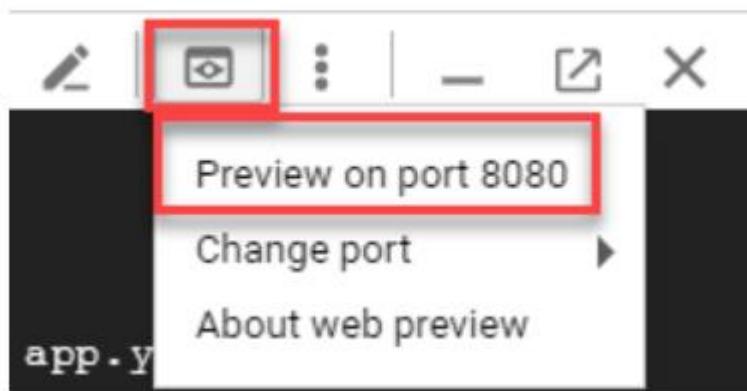


The screenshot shows the Google Cloud Platform App Engine Admin API interface. A terminal window is open under the 'CLOUD SHELL' tab, showing the command 'mvn appengine:run' being executed. The output shows the deployment process starting, with multiple parallel tasks installing various command-line tools like BigQuery, Cloud Storage, and Cloud SDK Core Libraries. The status bar at the bottom right shows the date and time as 02-09-2021 01:58 PM.

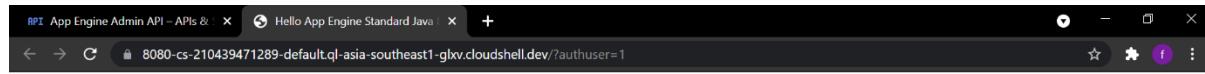
```
[INFO] Creating update staging area
[INFO] Installing: BigQuery Command Line Tool
[INFO] Installing: BigQuery Command Line Tool (Platform Specific)
[INFO] Installing: Cloud SDK Core Libraries (Platform Specific)
[INFO] Installing: Cloud Storage Command Line Tool
```

The development server is listening for requests on port 8080 when you see the following last line of output:

3. View the app by clicking the **Web preview** button > **Preview on port 8080**:



page should resemble the following:



Hello App Engine -- Java 8!

This is Version: 11.0.12 OS: Linux User: student_01_8b2eb74d0d57.

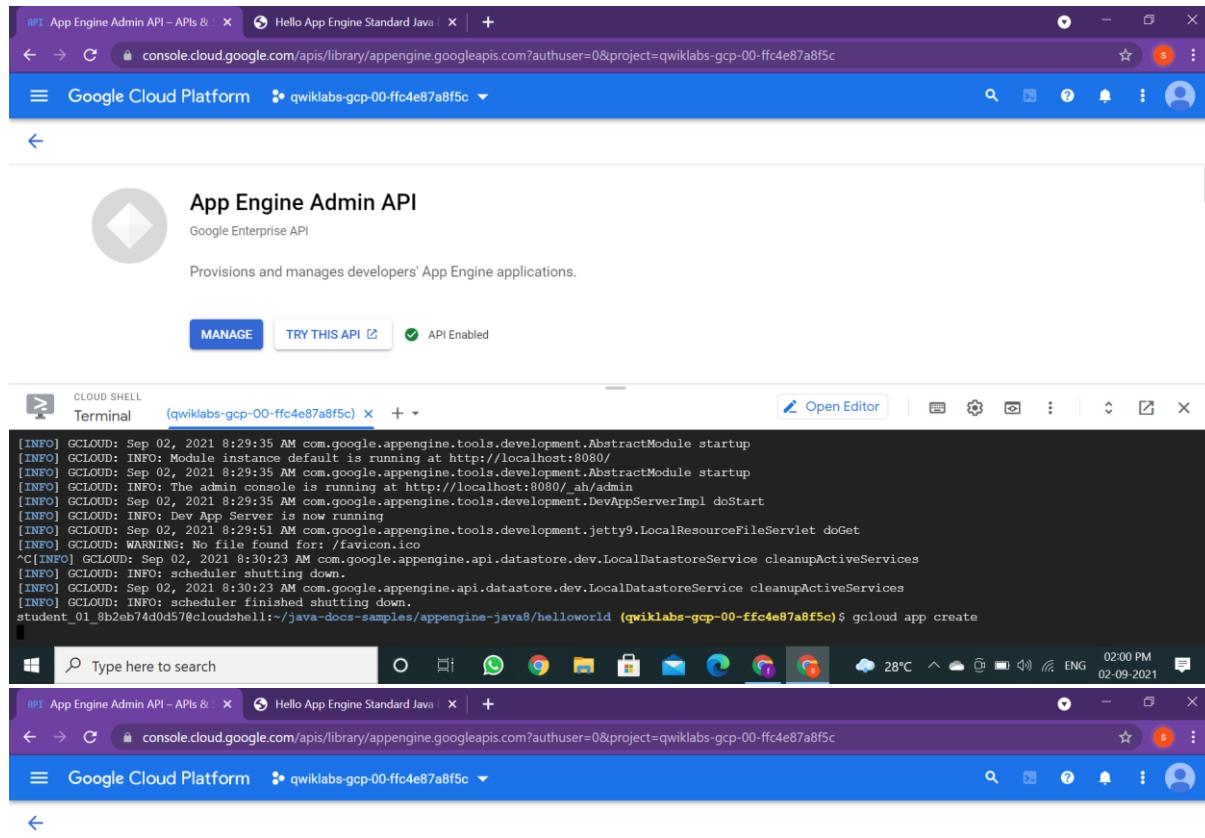
Available Servlets:
[Hello App Engine](#)



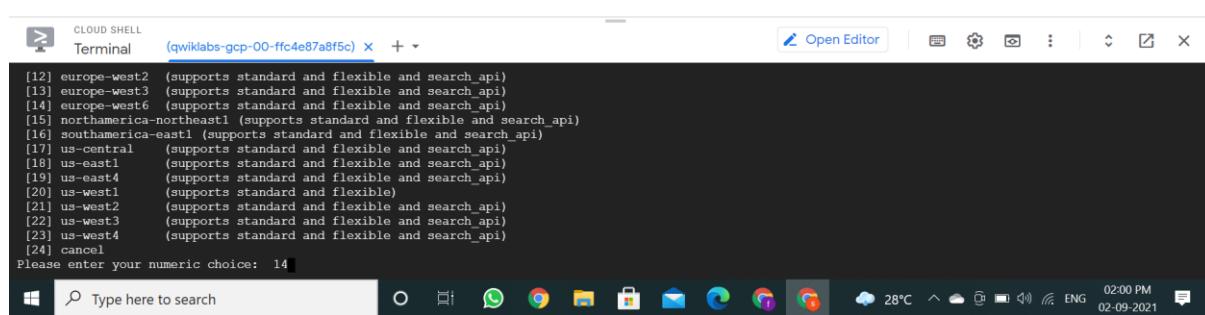
Deploy your app

Now you'll create an application on an App Engine with the following command

gcloud app create



The screenshot shows the Google Cloud Platform App Engine Admin API interface. A terminal window is open in the Cloud Shell, showing the command `gcloud app create` being run. The output of the command shows various log entries from the GCloud logs, including startup messages for AbstractModule and the admin console, and scheduler shutdown messages.



The screenshot shows the Google Cloud Platform App Engine Admin API interface. A terminal window is open in the Cloud Shell, showing a list of regions and their supported APIs. The user is prompted to enter a numeric choice between 12 and 24. The regions listed include europe-west2, europe-west3, europe-west6, northamerica-northeast1, southamerica-east1, us-central, us-east1, us-east4, us-west1, us-west2, us-west3, and us-west4.

2. Open the pom.xml file with the following command:

nano pom.xml

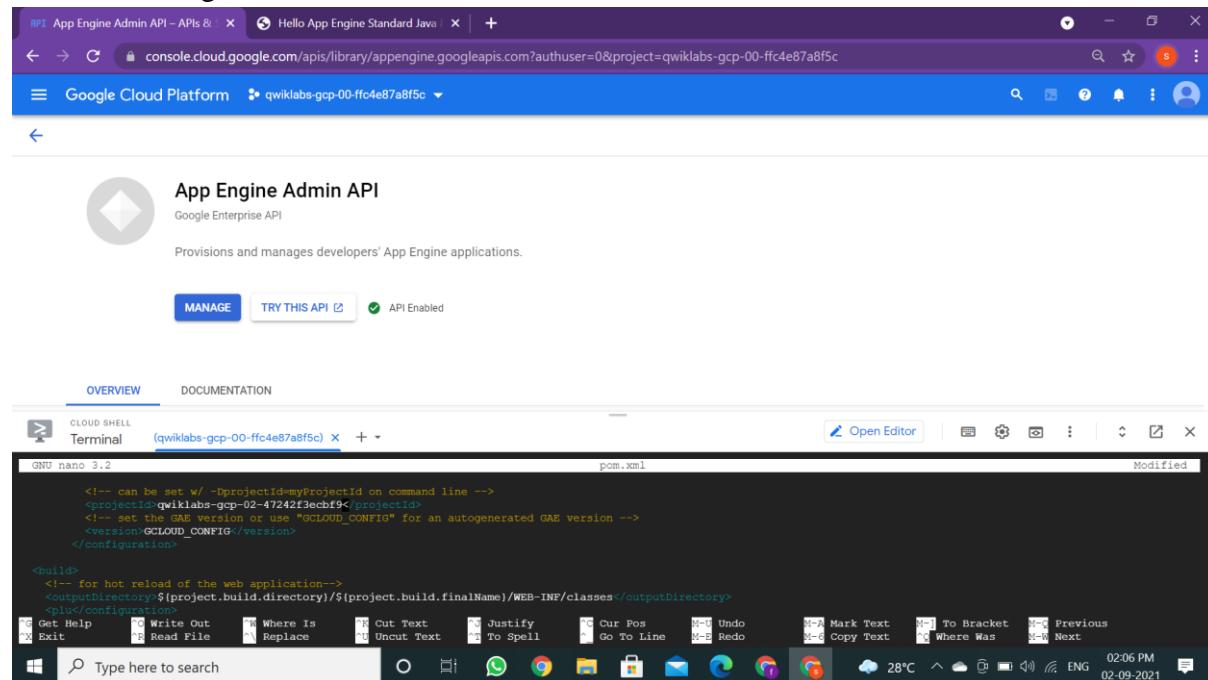
3. Key down towards the bottom of the page until you find this section:

<version>2.2.0</version>

```
<configuration>
    <!-- can be set w/ -DprojectId=myProjectId on command line -->
    <projectId>myProjectId</projectId>
    <!-- set the GAE version or use "GCLOUD_CONFIG" for an autogenerated GAE version -->
    <version>GCLOUD_CONFIG</version>
</configuration>
```

4. Change myProjectId to your Qwiklabs Project ID. Ensure this section resembles the following before moving on:

```
<configuration>
    <!-- can be set w/ -DprojectId=myProjectId on command line -->
    <projectId>qwiklabs-gcp-02-47242f3ecbf9</projectId>
    <!-- set the GAE version or use "GCLOUD_CONFIG" for an autogenerated GAE version -->
    <version>GCLOUD_CONFIG</version>
</configuration>
```



5. Now exit nano and save the file with **CTRL + X** --> **Y** --> **Enter**.
6. **DO NOT** use the gcloud app deploy command as stated in the output to deploy your app. Instead, run the following command to deploy your application:

mvn package appengine:deploy

Name: Zeenat

Class: TYIT

Roll no: 578

The screenshot shows the Google Cloud Platform App Engine Admin API interface. At the top, there are tabs for 'OVERVIEW' and 'DOCUMENTATION'. Below this is a terminal window titled '(qwiklabs-gcp-00-ffc4e87a8f5c)'. The terminal displays the following deployment logs:

```
[18] us-east1      (supports standard and flexible and search_api)
[19] us-east4      (supports standard and flexible and search_api)
[20] us-west1      (supports standard and flexible)
[21] us-west2      (supports standard and flexible and search_api)
[22] us-west3      (supports standard and flexible and search_api)
[23] us-west4      (supports standard and flexible and search_api)
[24] cancel

Please enter your numeric choice: 14

Creating App Engine application in project [qwiklabs-gcp-00-ffc4e87a8f5c] and region [europe-west6]....done.
Success! The app is now created. Please use 'gcloud app deploy' to deploy your first app.
student_01 8b2eb74d0d57@cloudshell:~/java-docs-samples/appengine-java8/helloworld (qwiklabs-gcp-00-ffc4e87a8f5c)$ nano pom.xml
student_01 8b2eb74d0d57@cloudshell:~/java-docs-samples/appengine-java8/helloworld (qwiklabs-gcp-00-ffc4e87a8f5c)$ nano pom.xml
student_01 8b2eb74d0d57@cloudshell:~/java-docs-samples/appengine-java8/helloworld (qwiklabs-gcp-00-ffc4e87a8f5c)$ mvn package appengine:deploy
```

Below the terminal, there is a search bar and a taskbar with various icons.

The second part of the screenshot shows a similar interface for a different project, '(qwiklabs-gcp-04-4c6c0578cb26)'. The terminal output shows the deployment process for this project.

To launch your browser, enter the following command then click on the link it provides.

gcloud app browse

Example output; your link will be different:

Name: Zeenat

Class: TYIT

Roll no: 578

The screenshot shows the Google Cloud Platform interface for the App Engine Admin API. At the top, there are tabs for 'APIs & Services' and 'Hello App Engine Standard Java'. The main content area is titled 'App Engine Admin API' and describes it as a 'Google Enterprise API' for provisioning and managing App Engine applications. Below this, a 'TRY THIS API' button and a 'MANAGE' button are visible, along with a status indicator 'API Enabled'. A terminal window titled '(qwiklabs-gcp-04-4c6c0578cb26)' shows deployment logs:

```
[INFO] GCloud: target version: [20210906t103448]
[INFO] GCloud: target url: [https://qwiklabs-gcp-04-4c6c0578cb26.oe.r.appspot.com]
[INFO] GCloud: target service account: [App Engine default service account]
[INFO] GCloud:
[INFO] GCloud: Beginning deployment of service [default]...
[INFO] GCloud: Uploading 0 files to Google Cloud Storage
[INFO] GCloud: File upload done.
^Cstudent_01_8b2eb74d0d57ecloudshell:~/java-docs-samples/appengine-java8/helloworld (qwiklabs-gcp-04-4c6c0578cb26)$ gcloud app browse
Did not detect your browser. Go to this link to view your app:
https://qwiklabs-gcp-04-4c6c0578cb26.oe.r.appspot.com
student_01_8b2eb74d0d57ecloudshell:~/java-docs-samples/appengine-java8/helloworld (qwiklabs-gcp-04-4c6c0578cb26)$
```

The taskbar at the bottom shows various application icons and system status.

Your application is deployed and you can read the short message in your browser:

The screenshot shows a web browser window with three tabs: 'APIs & Services', 'Hello App Engine Standard Java', and 'Hello App Engine Standard Java'. The active tab displays the message 'Hello App Engine -- Java 8!'. Below the message, it says 'This is Version: 1.8.0_181-google-v7 OS: Linux User: appengine.' and lists 'Available Servlets: Hello App Engine'.

Hello App Engine -- Java 8!

This is Version: 1.8.0_181-google-v7 OS: Linux User: appengine.

Available Servlets:
[Hello App Engine](#)

The screenshot shows a Windows taskbar with the application icon for 'Hello App Engine -- Java 8!' visible among other pinned and running applications.

Click **Check my progress** to verify the objective.

Name: Zeenat

Class: TYIT

Roll no: 578

The screenshot shows a browser window for 'App Engine: Qwik Start - Java' at google.qwiklabs.com/focuses/951?catalog_rank=%7B%22rank%22%3A1%2C%22num_filters%22%3A0%2C%22has_search%22%3Atrue%7D&parent=catalog&search_id=12767701. The page displays a 'Checkpoints' summary with a yellow background. It shows 'Deploy your app' status as 'Assessment Completed!' with a green checkmark icon. A progress bar indicates '100 / 100'. On the left, there's a sidebar with 'Available Servlets: Hello App Engine'. The main area also includes sections for 'End Lab', 'Open Google Console', and 'Student Resources' (with a link to 'Build Apps at Scale with Google App Engine'). The taskbar at the bottom shows various icons and system status.

Practical 5

Aim: To implement Infrastructure as a service using OwnCloud.

Theory:

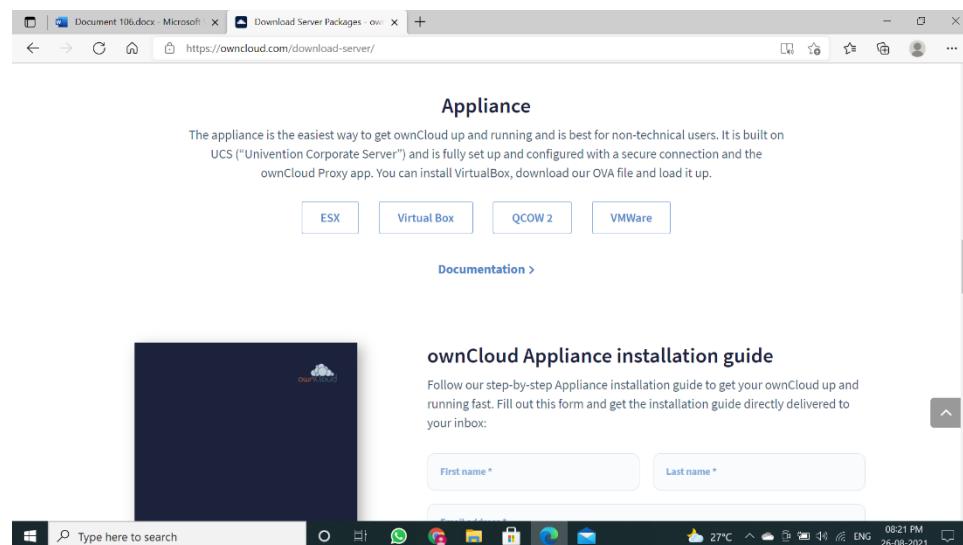
OwnCloud is a self-hosted, open source file syncing and sharing server. Like Dropbox, Google Drive, Box and more for the "big guys", ownCloud gives you access to your files, calendar, contacts, and other data. You can sync all (or part of it) between your devices and share files with others.

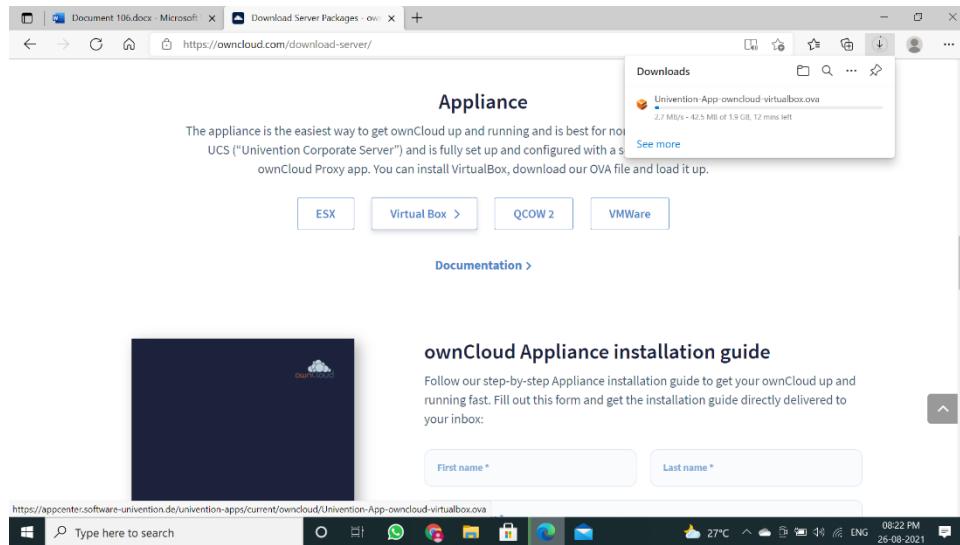
OwnCloud supports extensions that allow it to function like Google Drive, with online document editing, calendar and contacts syncing, and more. Its opening avoids the quotas imposed on the storage space or the number of connected clients, instead of having strict limits (for example in the storage space or the number of users), the limits are determined by the physical capacities of the server.

Step1: Download the OwnCloud X Server from the link (It only works with 64bit system).

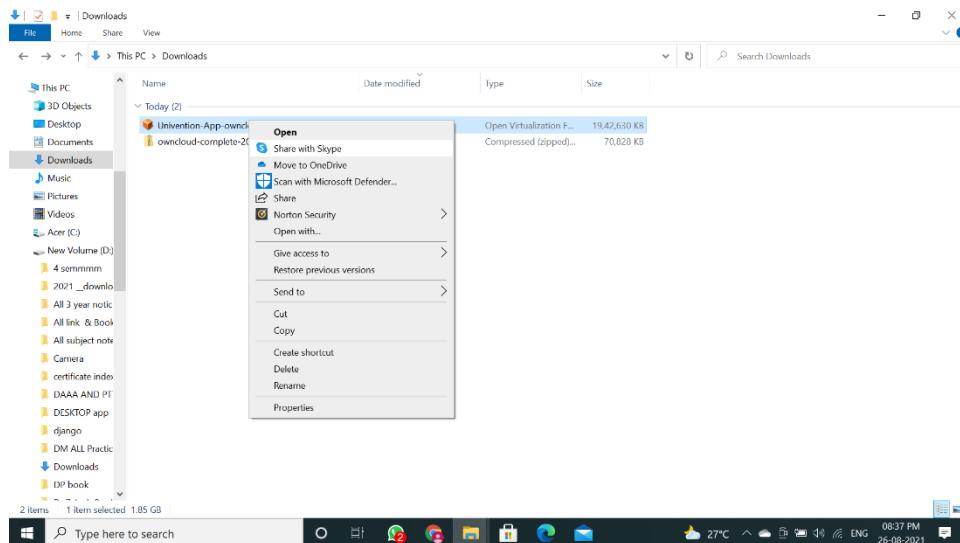
<https://owncloud.com/download/>

Here I've demonstrated for VirtualBox. So click the Virtual Box button.

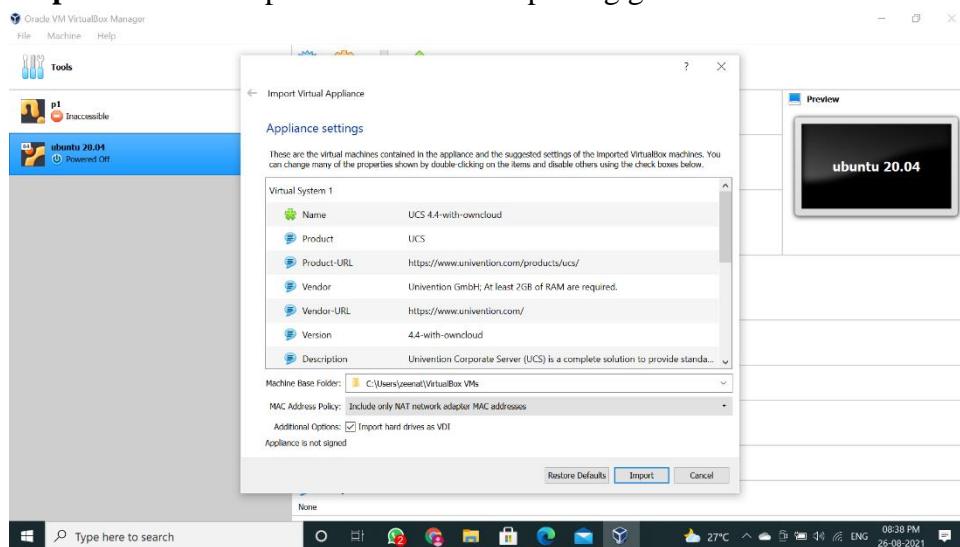


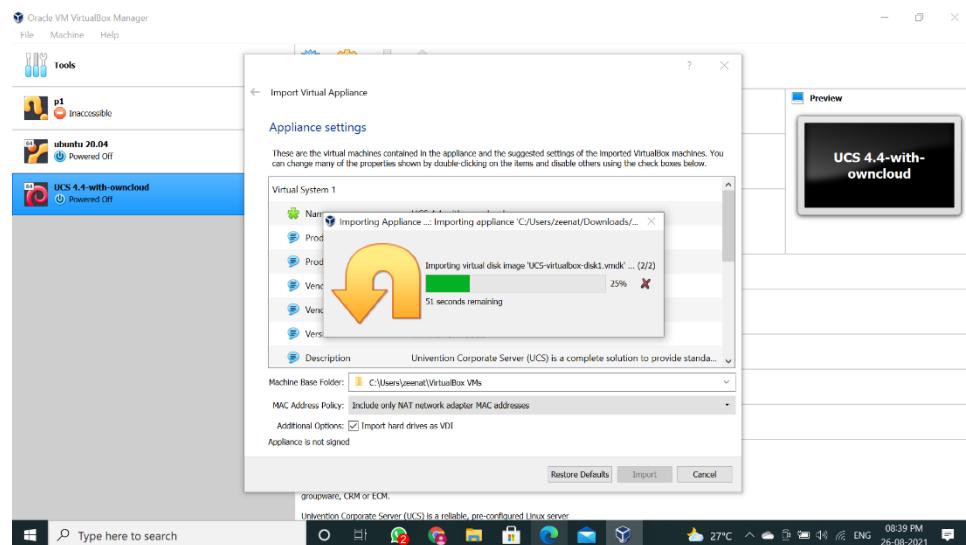
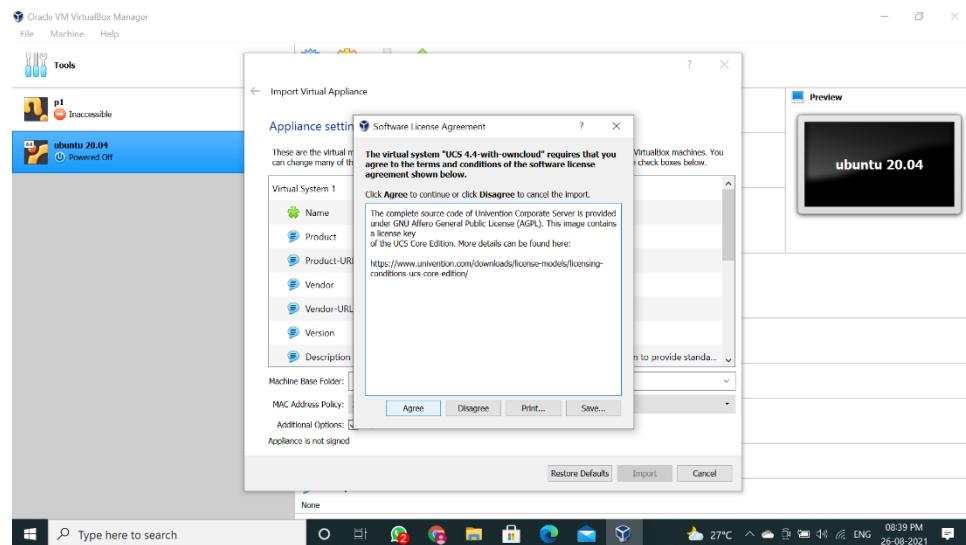


Step 2: Now Double click the application. It will directly take you to the VirtualBox

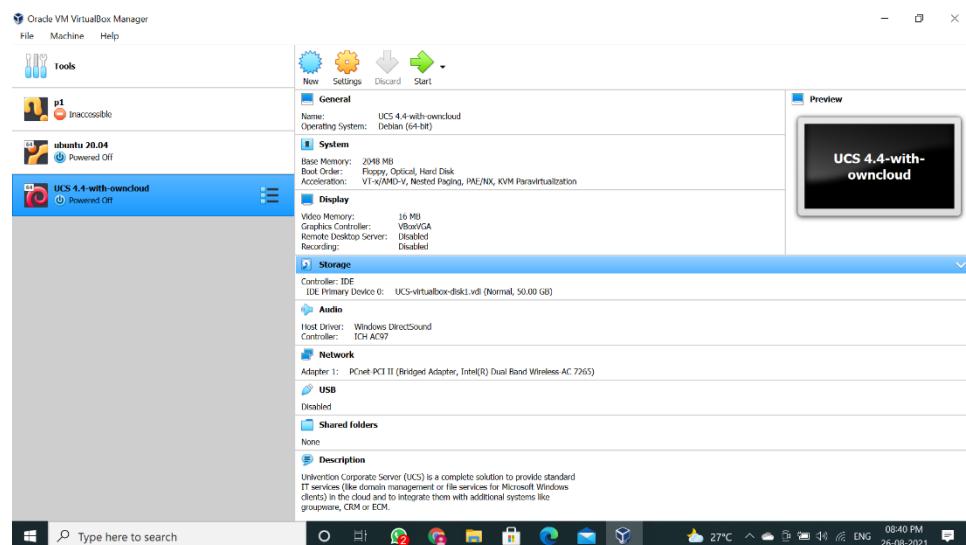


Step 3: Click on Import. Wait till the importing gets finished.





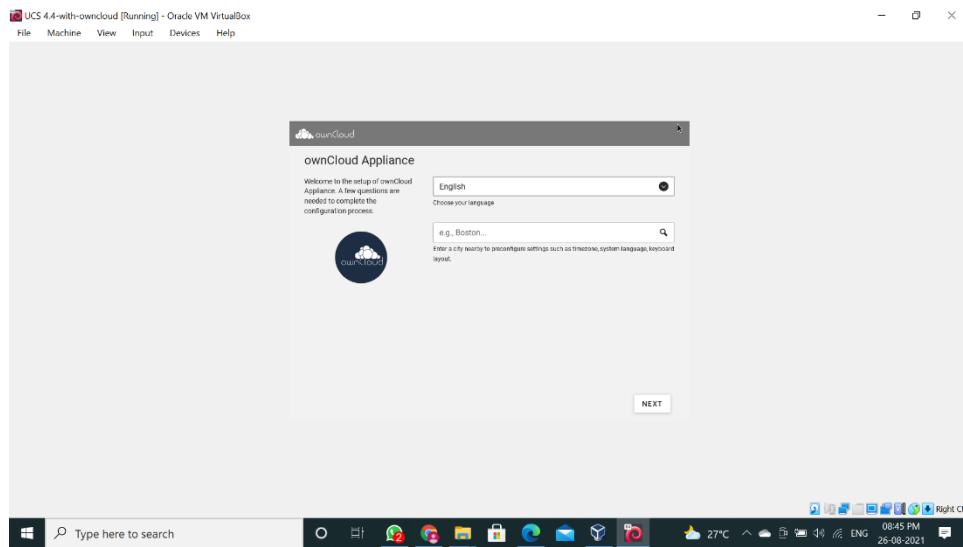
Step 4: Once import is done agree T&C.



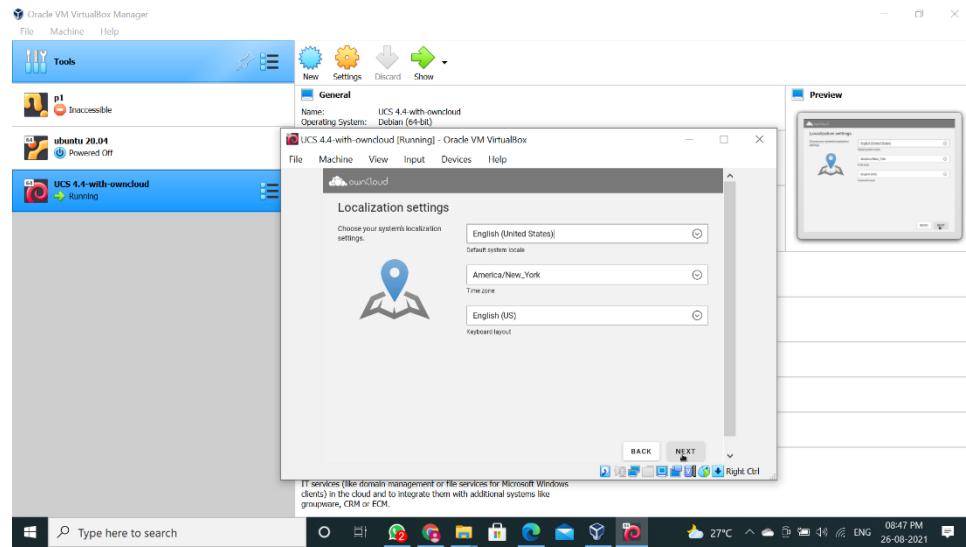
Step 5: Click on "Power on this virtual machine" and following window will appear.



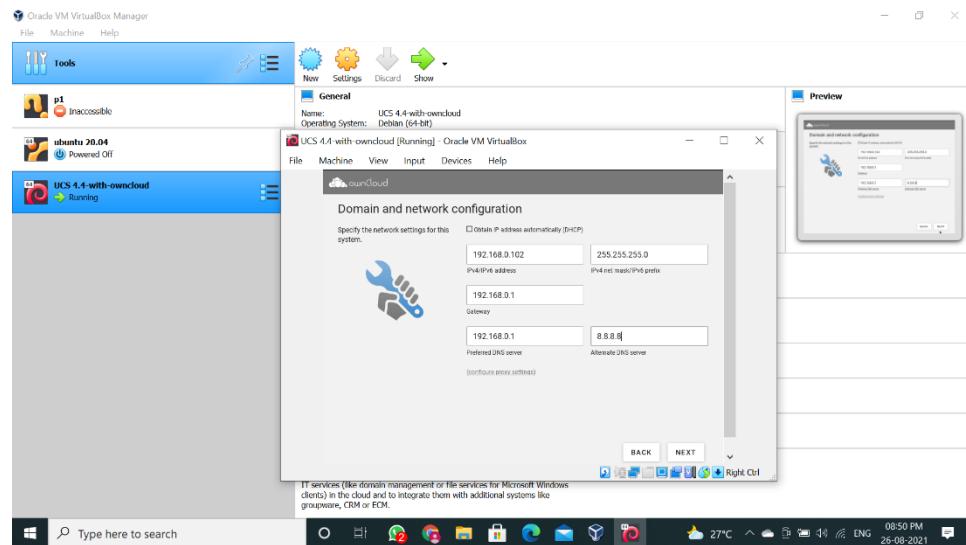
Step 6: On next window it will ask you for your “city”, don’t enter any city name in it and just click “NEXT” (Most important step please don’t enter any city name in it otherwise it will not read keyboard entries).



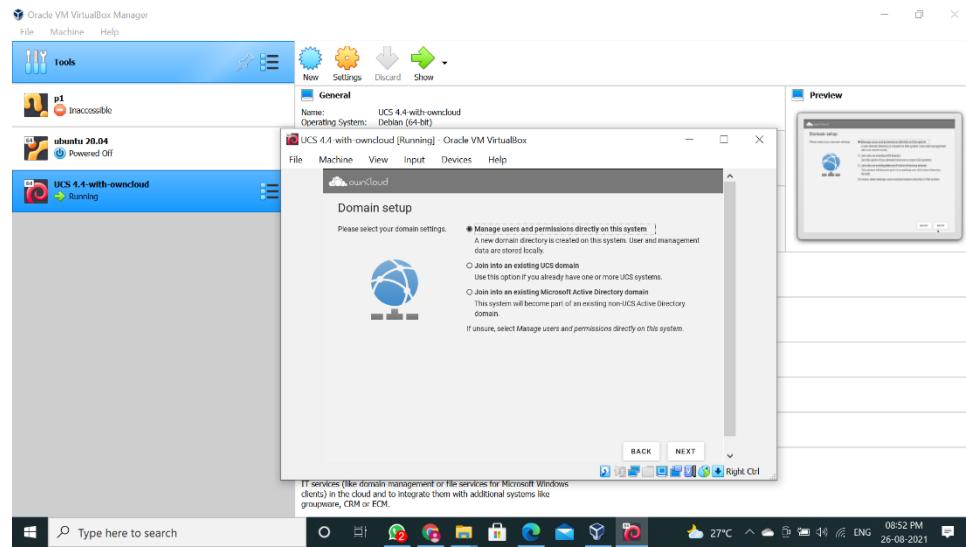
Step 7: Just click “NEXT” on “Localization settings” window.



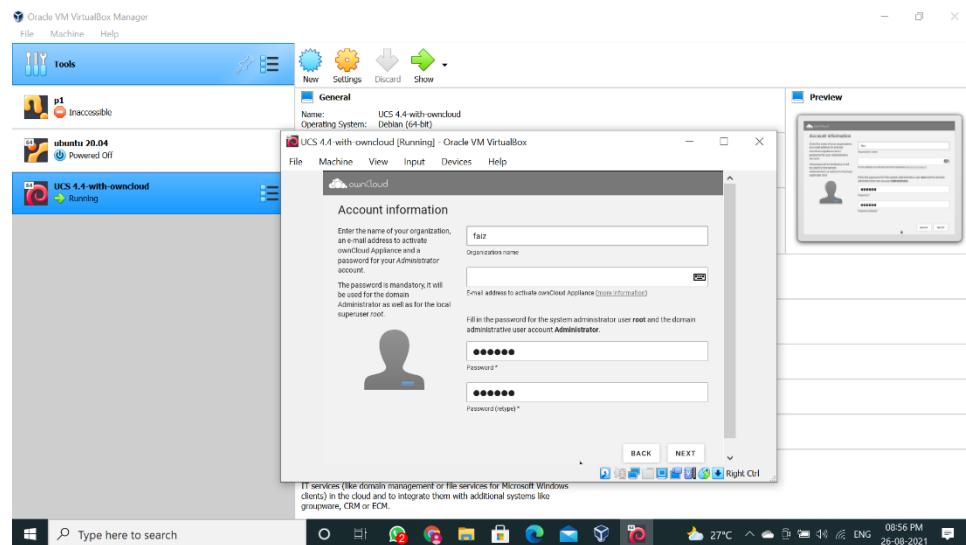
Step 8: It will fetch IP Address, Net Mask and Gateway from DHCP, don't change anything, also uncheck "Obtain IP address automatically (DHCP)", mention an "Alternate DNS Server" and just click "NEXT".



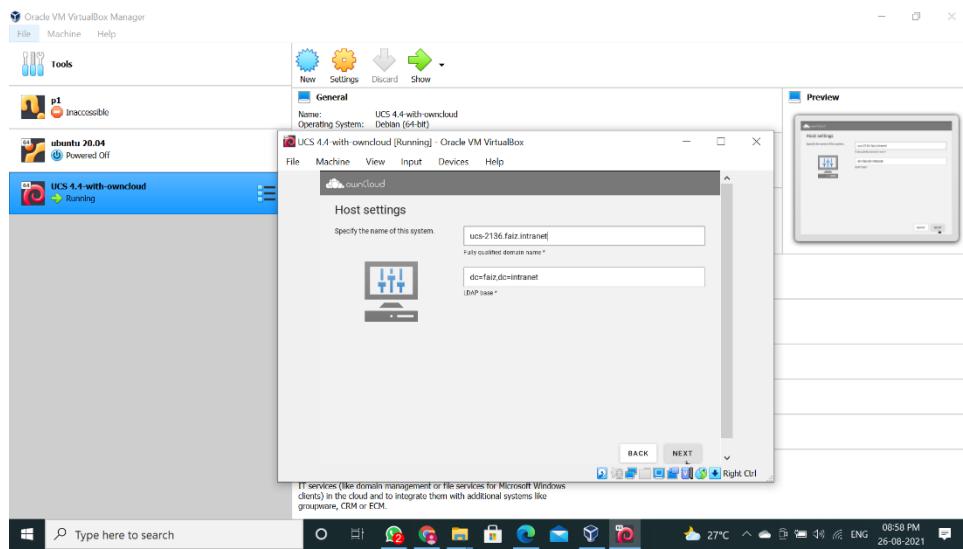
Step 9: In Domain setup click "NEXT"



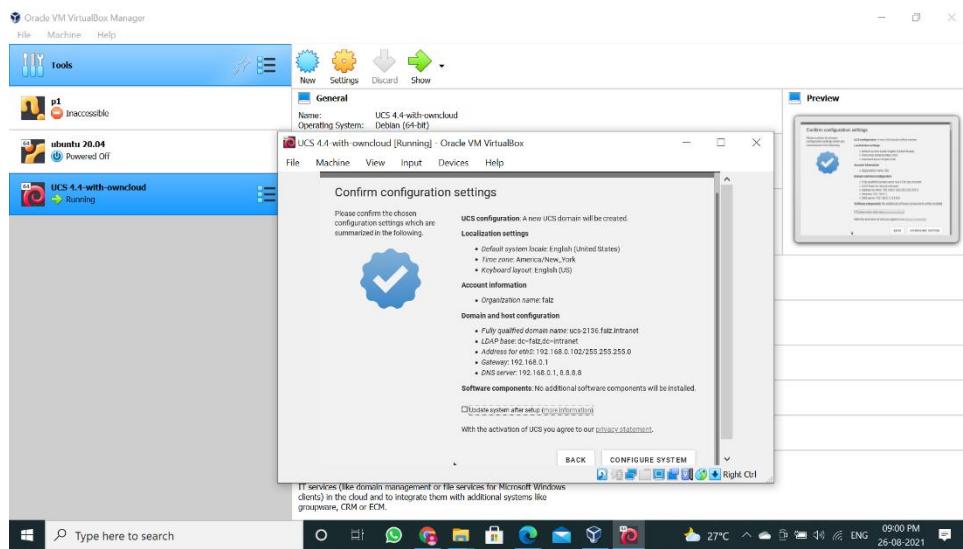
Step 10: Now Account information window will appear, enter details in it. Remember that password we are setting is for “root” and “Administrator”, click on “NEXT”



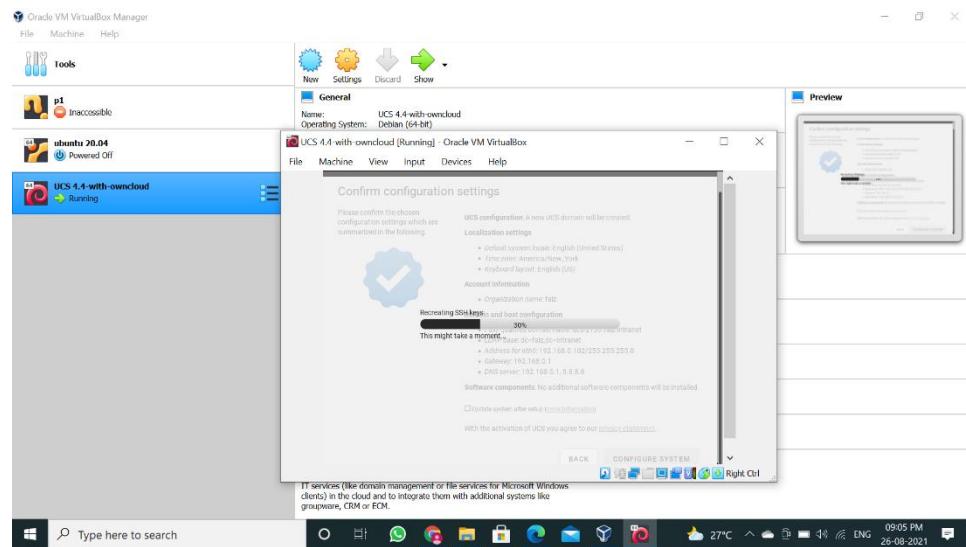
Step 11: On next window it will show you Fully Qualified domain name and LDAP base, click on “NEXT”.



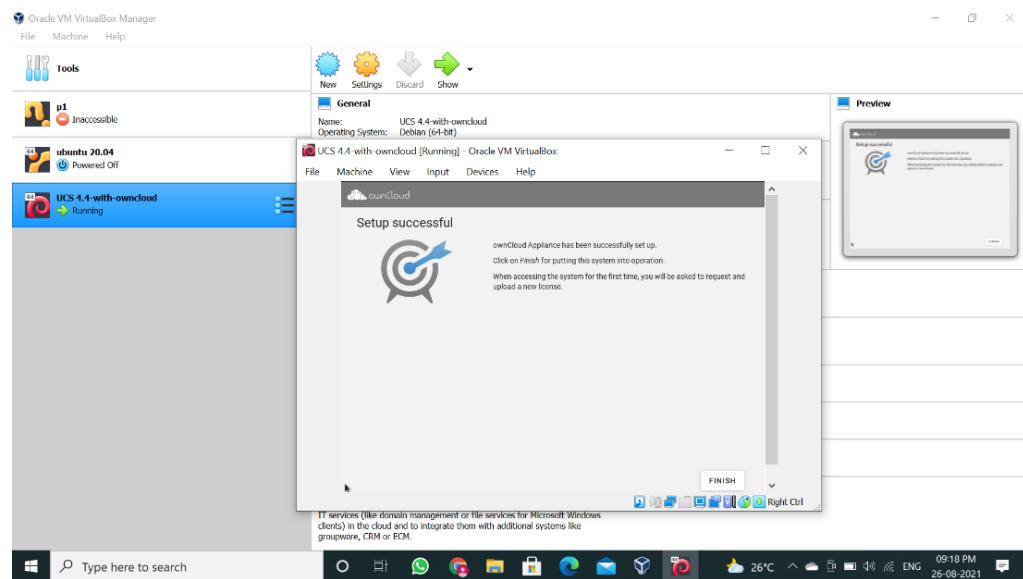
Step 12: It will show the configuration settings for ownCloud scroll down a little and click on "CONFIGURE SYSTEM"



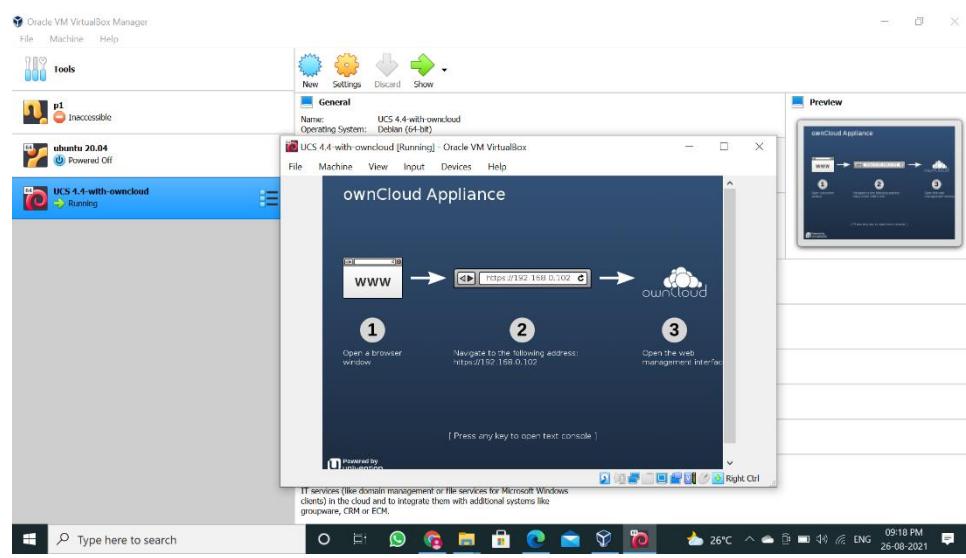
Step 13: It will take time to setup.



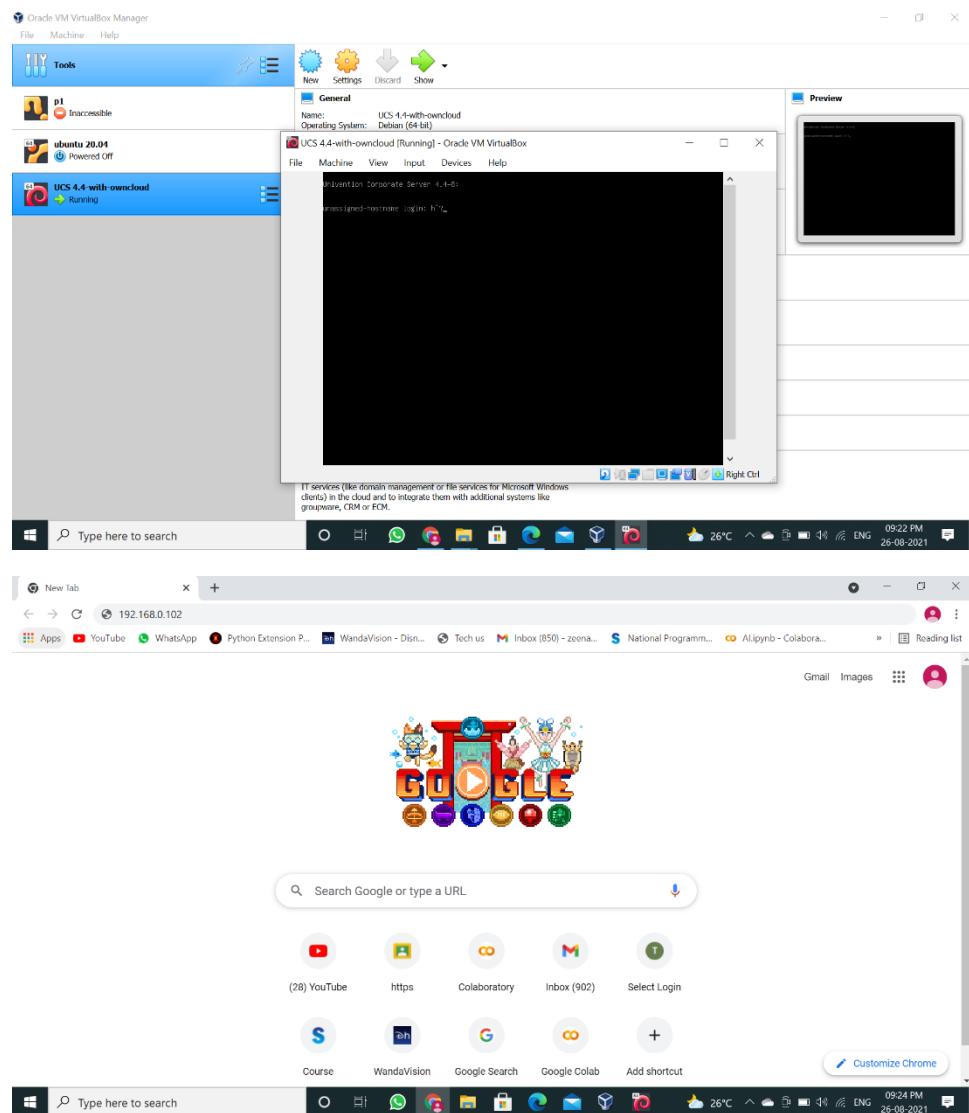
Step 14: The setup is done now click on “FINISH”.



Step 15: Now on next window press any button.



Step 16: Now you can see the IP address on top right-hand side, open the browser and enter system's IP address in URL bar and press enter.

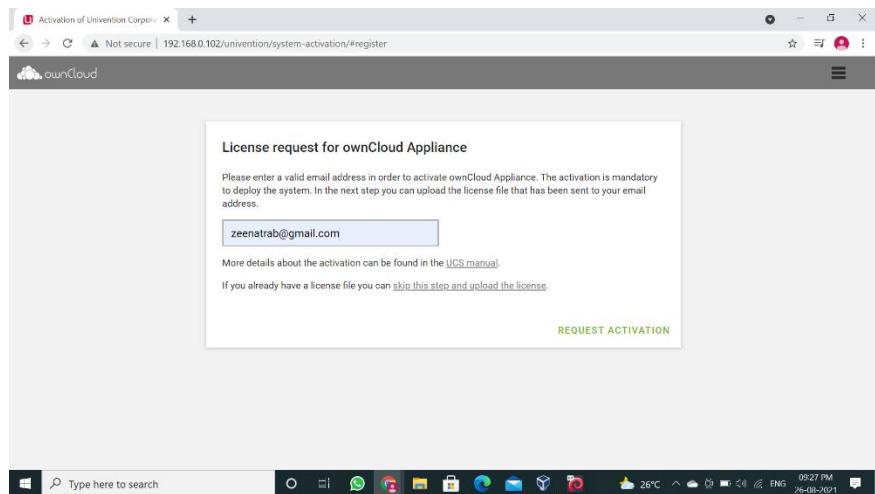


Step 17: It will ask you for Email ID to send license, enter your Email ID and click “REQUEST ACTIVATION”.

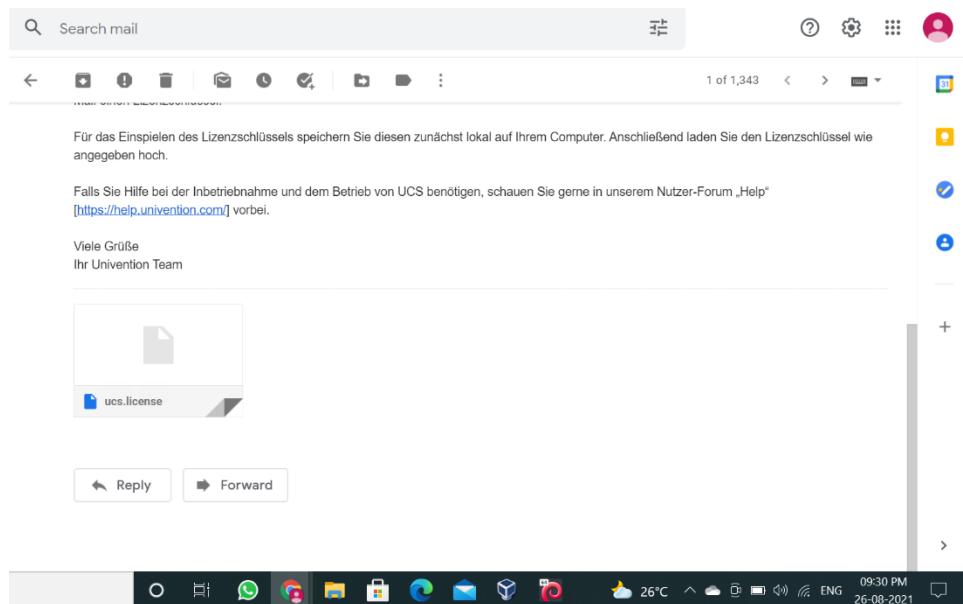
Name: Zeenat

Class: TYIT

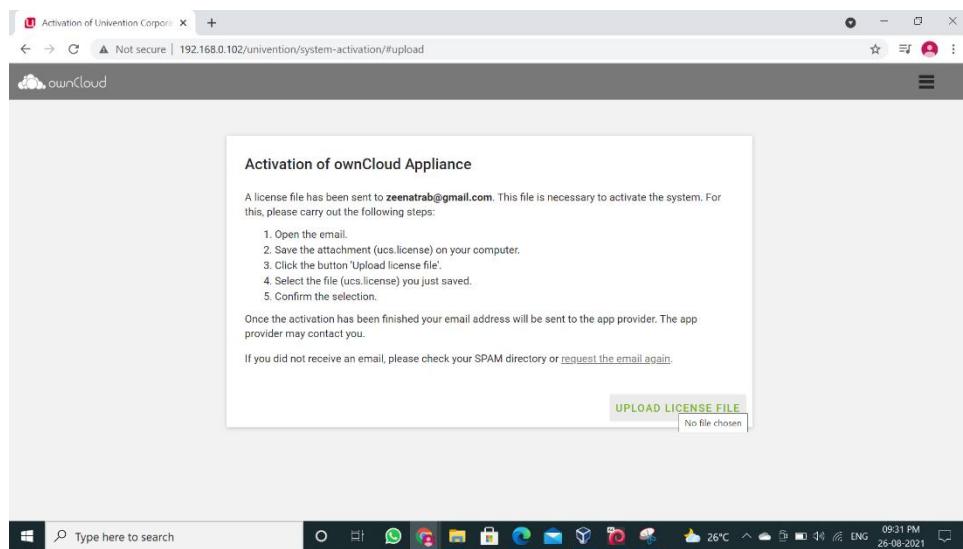
Roll no: 578



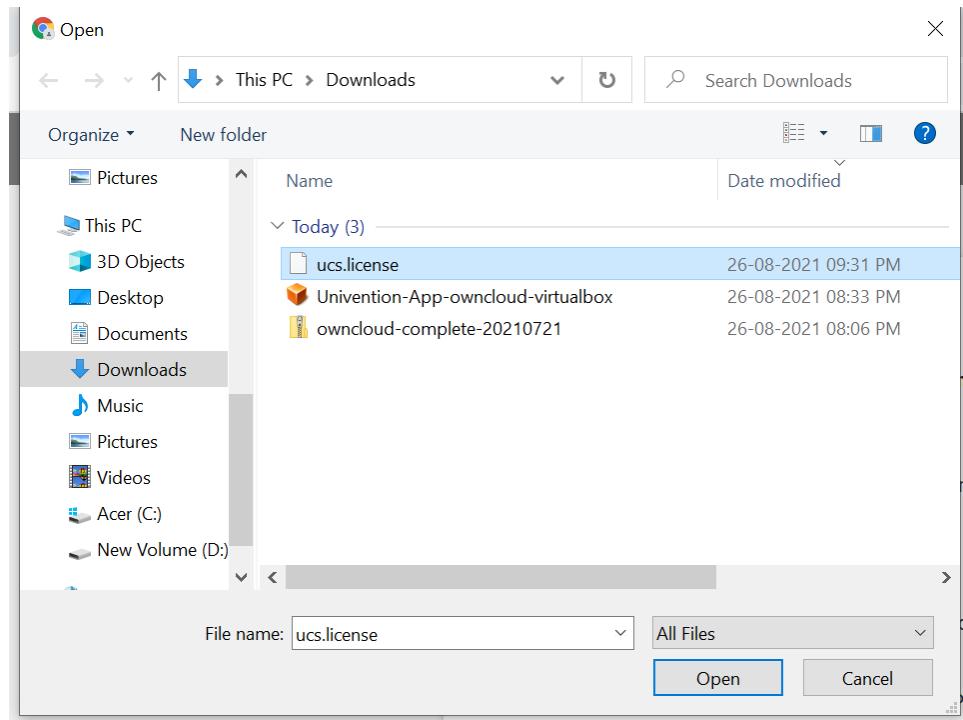
Step 18: Check your mailbox you will receive the license from OwnCloud, download it



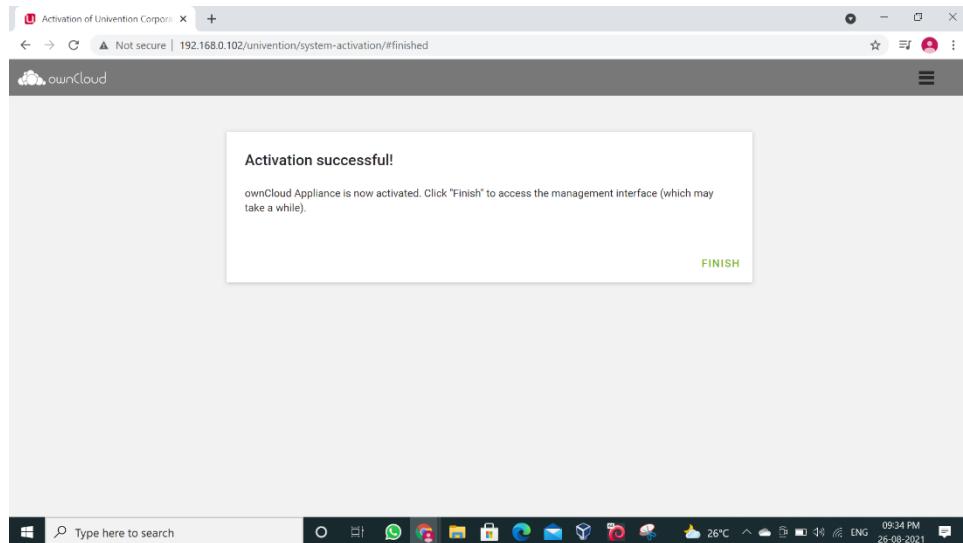
Step 19: Get back to OwnCloud and click on “UPLOAD LICENSE FILE”



Step 20: Now select the license file and click “Open”.



Step 21: On next page click on “FINISH”.

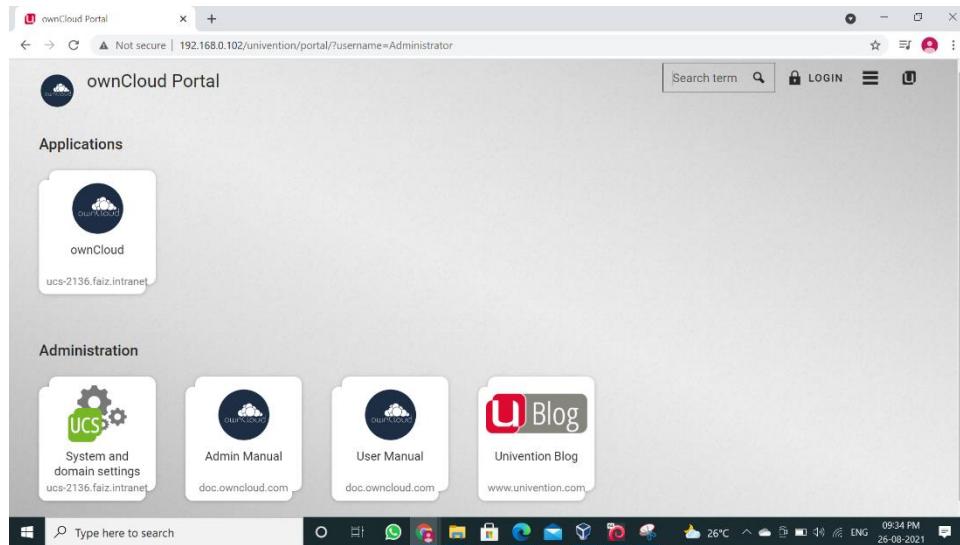


Step 22: We have installed OwnCloud, now just try logging in with “Administrator” as userfor that click on “LOGIN” button.

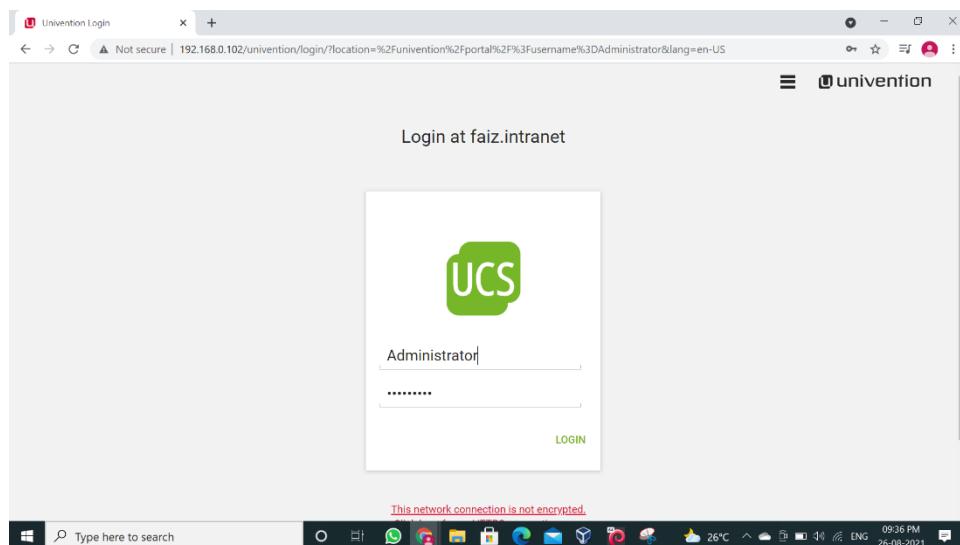
Name: Zeenat

Class: TYIT

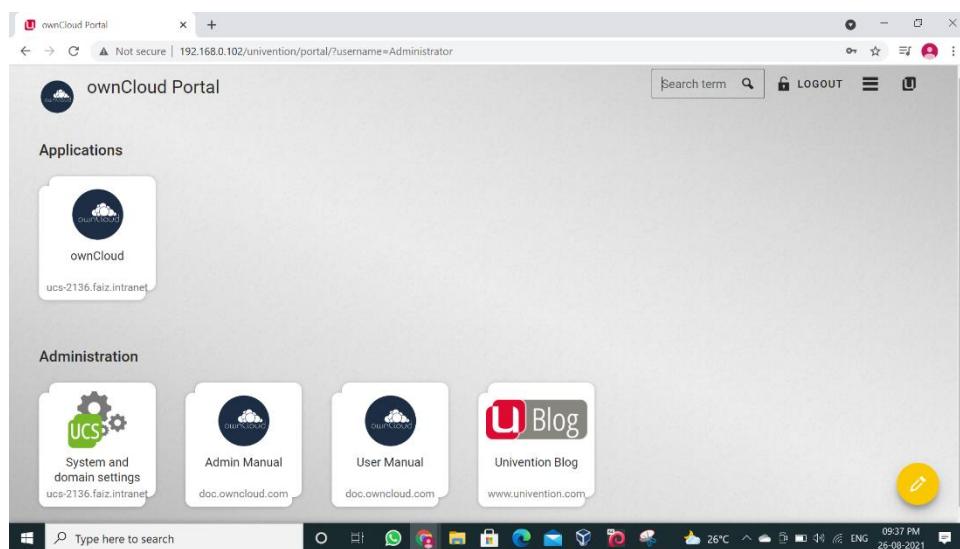
Roll no: 578



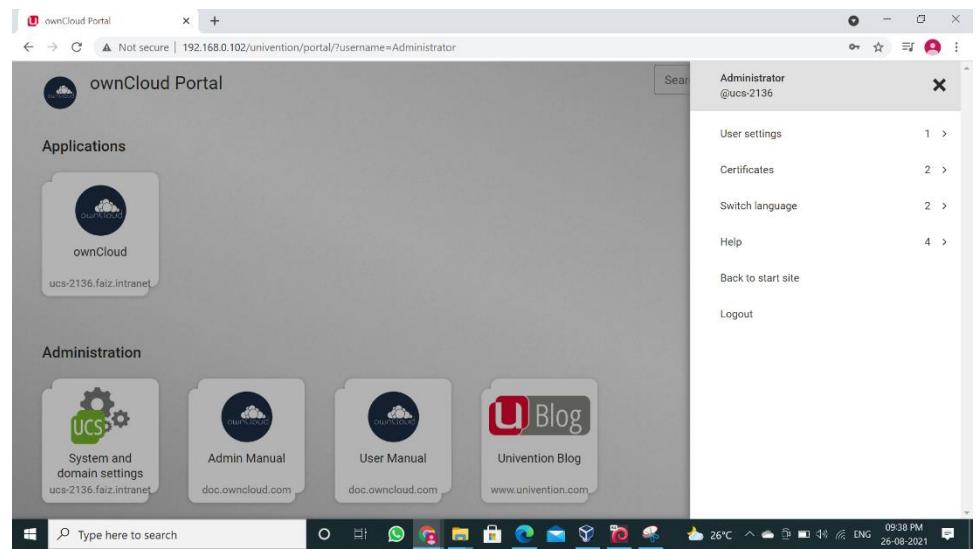
Step 23: Enter “Administrator” as user name and the password which you set during setting up process and click on “LOGIN”.



Step 24: After we have logged in successfully, now click on hamburger menu button.



Step 25: Now we successfully completed OwnCloud installation.



CONCLUSION:

We have installed OwnCloud as bare metal hypervisor and implemented it. It provides access to computing resources in a virtual environment. With the help of Infrastructure as a service we can build our own IT platform.

Practical 6**Aim: Understanding Infrastructure as a Service in Open-nebula and Eucalyptus**

1. Eucalyptus & OpenNebula are major Open-Source Cloud-Computing Software Platforms
2. Manage the provisioning of virtual machines for a cloud providing IaaS
3. Commercial cloud services charge, by the hour, for CPU time
4. It might be more cost effective for the organization to purchase hardware to create its own private cloud.
5. These software products are designed to allow an organization to set up a private group of machines as their own cloud.
6. These two frameworks represent two different points of interest in the design space of this particular type of opensource cloud.

Eucalyptus:

- EUCLYPTUS stands for Elastic Utility Computing Architecture for Linking Your Program To Useful System.
- It is open source software that was developed by University of California-Santa Barbara for Cloud Computing to implement Infrastructure as a Service.
- Eucalyptus provide an EC2 -compatible cloud Computing Platform and S3- compatible Cloud Storage thus its services are available through EC2/S3 compatible APIs.
- The Eucalyptus system is composed of a 5 main components interacting together; Client, Cloud Controller, Storage Controller (Walrus), Cluster Controller and a Node Controller.

Node Controller

- Is installed in each compute node to control VM activities, including the execution, inspection and termination of VM instances.

Cluster Controller

- Runs on 1 machine per cluster & works as an intermediary between the cloud & node controller.

Storage Controller

- Warlus is a component that provides storage services for storing virtual machine images and user's data.

Cloud Controller

- It is the user's entry point into the Eucalyptus system and only one instance is run on the system. It provides users with a way managing the system.
- The cloud controller is built using the Enterprise service bus providing decoupling from the services' implementation.

Client

- The client component provides the user with a way to access the Eucalyptus system (cloud controller).
- Eucalyptus provides two interfaces;
- One is a WDSL which is a SOAP client interface similar to AWS EC2 interface called euca2ools.
- Another interface is a HTTP query based interface.

Constructing a Virtual Machine:

1. A user uses the euca2ools front-end to request a VM.
2. The VM template disk image is pushed to a compute node
3. This disk image is padded to the correct size and packaged for use by the hypervisor on the compute node.
4. The compute node sets up network bridging to provide a virtual NIC with a virtual MAC.
5. On the head node the dhcp is set up with the MAC/IP pair
6. VM is spawned on the VMM.
7. The user can now SSH directly into the VM.

OpenNebula

- OpenNebula tends to a greater level of centralization and customizability (especially for end-users).
- The idea of OpenNebula is a pure private cloud, in which users actually log into the head node to access cloud functions.
- OpenNebula, by default, uses a shared file system, typically NFS, for all disk images files and all files for actually running the OpenNebula functions.
- In order to spawn a VM, the user provides a configuration file containing parameters which would be fed into the VMM command line. This allows for memory, processor, network and disk resources to be requested for essentially any configuration.

- OpenNebula is also very centralized, especially in its default configuration with an NFS filesystem.

Constructing A Virtual Machine

1. A user uses ssh to login to the head node.
2. The user uses the onevm command to request a VM.
3. The VM template disk image is copied and a copy is padded to the correct size and configuration within the NFS directory on the head node.
4. The one process on the head node uses ssh to log into a compute node.
5. The compute node sets up network bridging to provide a virtual NIC with a virtual MAC.
6. Files needed by the VMM on the compute node will be pulled to the compute node via the NFS.
7. VM is spawned on the VMM.
8. The user can now SSH directly into the VM.

Practical 7

Aim: Study and Implementation User Management inCloud

OBJECTIVE: From this experiment the student will be able,

- Is to understand how to create user's accounts.
- Manage user and group of user's accounts.
- To explore OwnCloud.

OUTCOME: The learner will be able to,

- Installing and using Administrative features of ownCloud Technology
- User Management
- Access same with 2 different credentials

THEORY:

- OwnCloud is a suite of client–server software for creating and using file hosting services. OwnCloud functionally has similarities to the widely used Dropbox.
- The primary functional difference between ownCloud and Dropbox is that ownCloud does not offer data centre capacity to host stored files.
- The Server Edition of ownCloud is free and open-source, thereby allowing anyone to install and operate it without charge on their own private server.
- OwnCloud supports extensions that allow it to work like Google Drive, with online document editing, calendar and contact synchronization, and more.
- Its openness avoids enforced quotas on storage space or the number of connected clients, instead of having hard limits (for example on storage space or number of users) limits are determined by the physical capabilities of the server.
- On the User management page of your ownCloud Web UI you can:
 1. Create new users
 2. View all of your users in a single scrolling window
 3. Filter users by group
 4. See what groups they belong to
 5. Edit their full names and passwords
 6. See their data storage locations
 7. View and set quotas
 8. Create and edit their email addresses
 9. Send an automatic email notification to new users
 10. Delete them with a single click

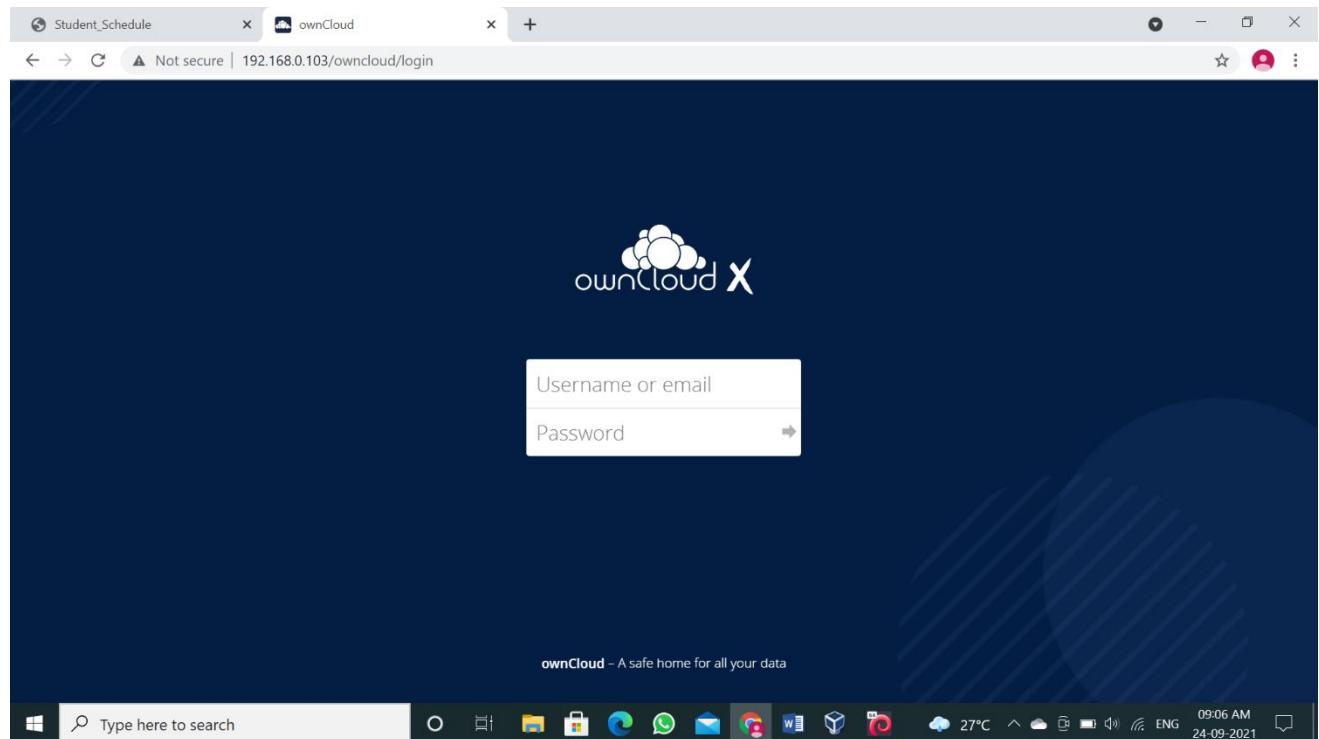
➤ Granting Administrator Privileges to a User – OwnCloud has two types of administrators:

1. **Group administrators** – It has the rights to create, edit and delete users in their assigned groups. Group administrators cannot access system settings, or add or modify users in the groups that they are not Group Administrators for. Use the dropdown menus in the Group Admin column to assign group admin privileges.
2. **Super Administrators** – It has full rights on your ownCloud server, and can access and modify all settings. To assign the Super Administrators role to a user, simply add them to the admin group.

PROCEDURE:

Step 1: Open browser and type “localhost/owncloud/” in URL bar and press “enter”.

Note: If the user is doing it for first time, it will ask the user for SignUp. Provide the username and password and finish the setup.

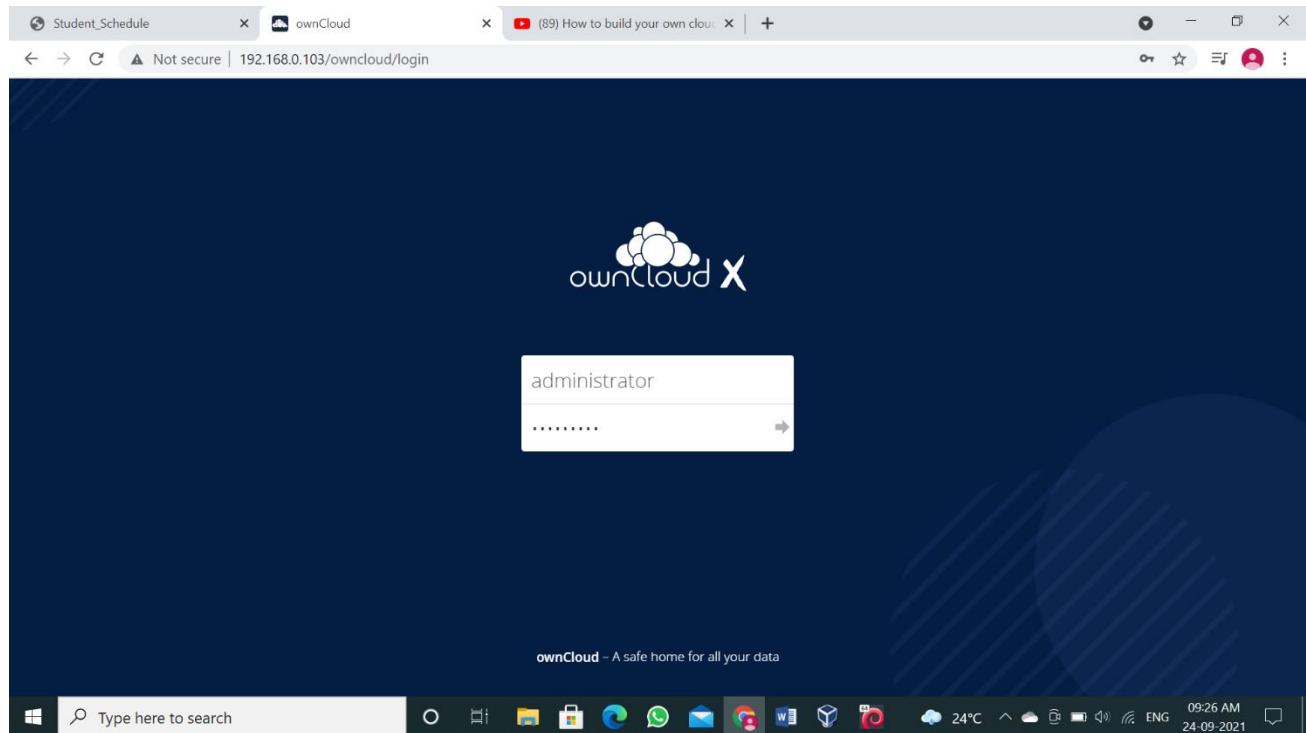


Step 3: Enter admin name and password which you have set while creating account and click on “Log in”.

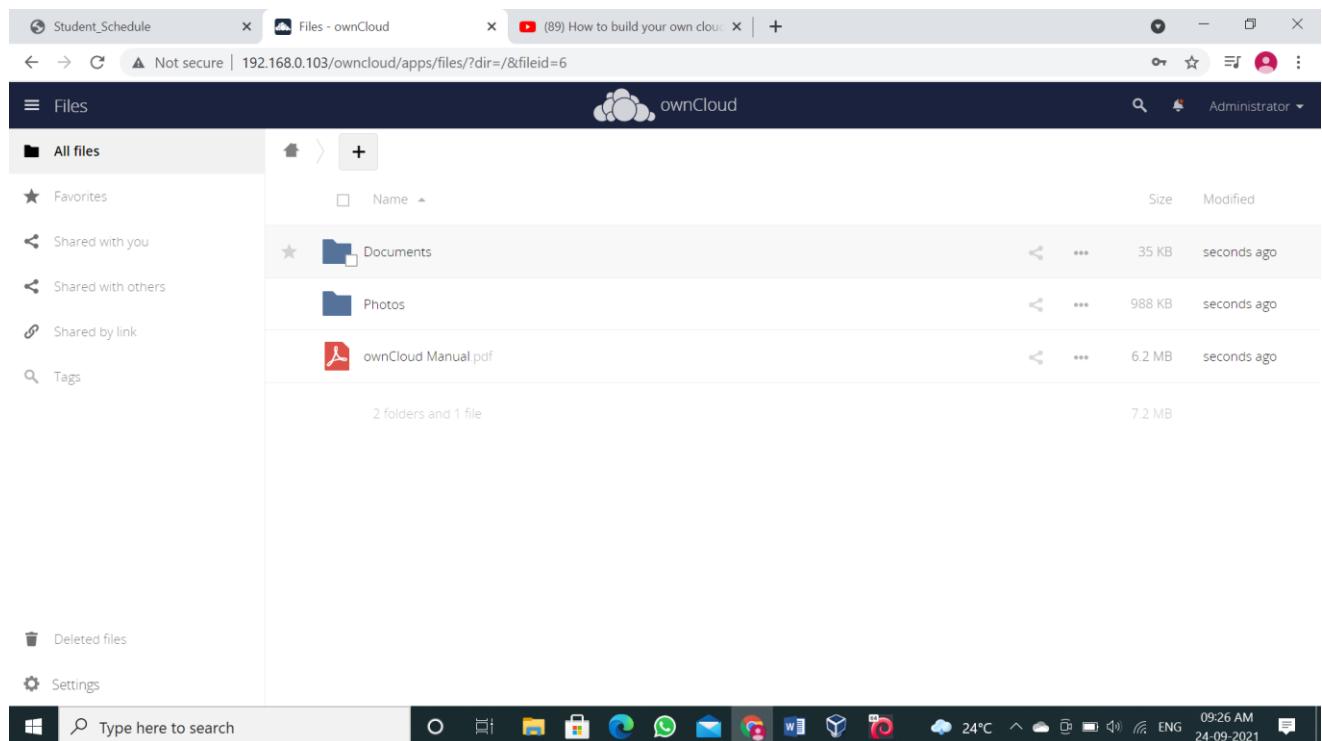
Name: Zeenat

Class: TYIT

Roll no: 578



Step 4: Following dashboard will get load.



Step 5: Now go to “Users”.

Name: Zeenat

Class: TYIT

Roll no: 578

The screenshot shows the ownCloud web interface. At the top, there are three tabs: 'Student_Schedule', 'Files - ownCloud', and '(89) How to build your own cloud...'. The 'Files' tab is active. The main area displays a list of files and folders. On the left, a sidebar shows 'All files' with categories like Favorites, Shared with you, Shared with others, Shared by link, and Tags. Below this is a section for 'Deleted files'. The main list includes 'Documents' (35 KB), 'Photos' (988 KB, updated 'seconds ago'), and 'ownCloud Manual.pdf' (6.2 MB, updated 'seconds ago'). A summary at the bottom indicates '2 folders and 1 file' with a total size of '7.2 MB'. In the top right corner, there is a user menu with options for 'Settings', 'Users', and 'Log out'. The status bar at the bottom shows the URL '192.168.0.103/owncloud/settings/users', the Windows taskbar with various pinned icons, and system information like temperature (24°C), battery level, and date/time (24-09-2021, 09:29 AM).

Step 6: You can see that there is only user which is admin, which is in Group admin

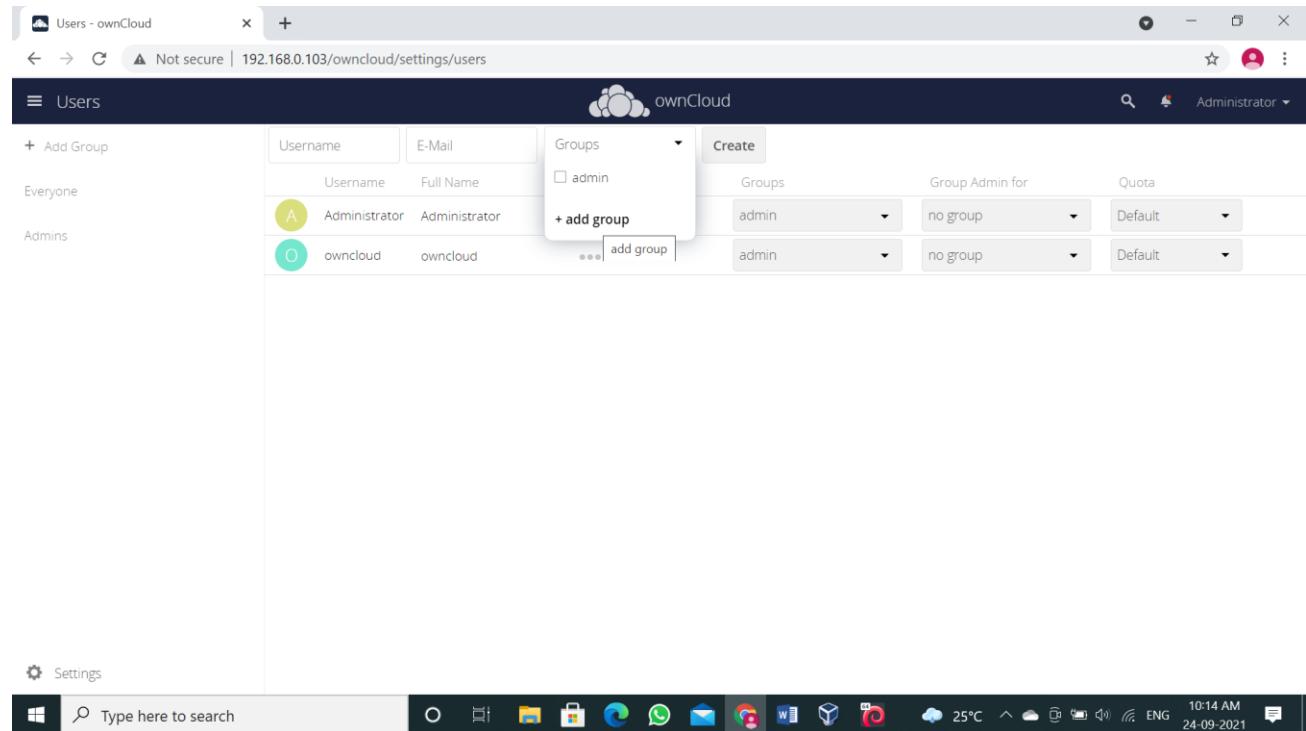
The screenshot shows the ownCloud web interface on the 'Users' page. The top navigation bar has tabs for 'Student_Schedule', 'Users - ownCloud', and '(89) How to build your own cloud...'. The 'Users' tab is active. The main content area displays a table of users. The columns are 'Username', 'E-Mail', 'Groups', 'Create', 'Username', 'Full Name', 'Password', 'Groups', 'Group Admin for', and 'Quota'. There are two entries: 'Everyone' (Admins) and 'Admins'. The 'Everyone' entry has a yellow circle icon with 'A' and the 'Administrator' account has a green circle icon with 'O'. Both entries have 'ownCloud' as the username and 'ownCloud' as the full name. The password is masked with '*****'. The 'Groups' dropdown for both is set to 'admin'. The 'Group Admin for' dropdown is set to 'no group'. The 'Quota' dropdown is set to 'Default'. The status bar at the bottom shows the URL '192.168.0.103/owncloud/settings/users', the Windows taskbar with various pinned icons, and system information like temperature (24°C), battery level, and date/time (24-09-2021, 09:30 AM).

Step 7: Now let's add group, for that go to "Group" > "add group".

Name: Zeenat

Class: TYIT

Roll no: 578



The screenshot shows the 'Users' settings page in the ownCloud web interface. A context menu is open over the 'admin' group entry, with the 'add group' option highlighted. The menu also includes options like 'Groups' and 'Create'. The main table lists users and groups. At the bottom, there's a search bar and a taskbar with various icons.

Step 8: Enter group name and press “enter”.



The screenshot shows the 'Users' settings page in the ownCloud web interface. A new group named 'messanger' has been added and is listed in the Groups column for the user 'shibu'. The main table lists users and groups. At the bottom, there's a search bar and a taskbar with various icons.

Step 9: Our group has been added, now select it.

Name: Zeenat

Class: TYIT

Roll no: 578

Users - ownCloud

Not secure | 192.168.0.103/owncloud/settings/users

Administrator

Users

Create

Username	E-Mail	Groups	Group Admin for	Quota
admin		admin	no group	Default
messenger		+ add group	admin	no group
owncloud	owncloud			Default

Add Group

Everyone

Admins

messenger

Settings

Type here to search

25°C 10:15 AM ENG 24-09-2021

Step 10: Now enter “Username” and “E-mail” for the user and click on “Create”.

Users - ownCloud

Not secure | 192.168.0.103/owncloud/settings/users

Administrator

Users

Username	Full Name	Password	Groups	Group Admin for	Quota
admin		*****	admin	no group	Default
zeenat	zeenatrab@gmail.com	*****	messenger	no group	Default
A	Administrator	*****			
O	owncloud	*****	admin	no group	Default

Add Group

Everyone

Admins

messenger

Settings

Type here to search

25°C 10:16 AM ENG 24-09-2021

Name: Zeenat

Class: TYIT

Roll no: 578

The screenshot shows the 'Users' section of the ownCloud control panel. The 'messenger' group is currently selected. A new user, 'zeenat', has been added with a quota of 'Default'. The Windows taskbar at the bottom shows various pinned icons and the date/time as 24-09-2021 10:17 AM.

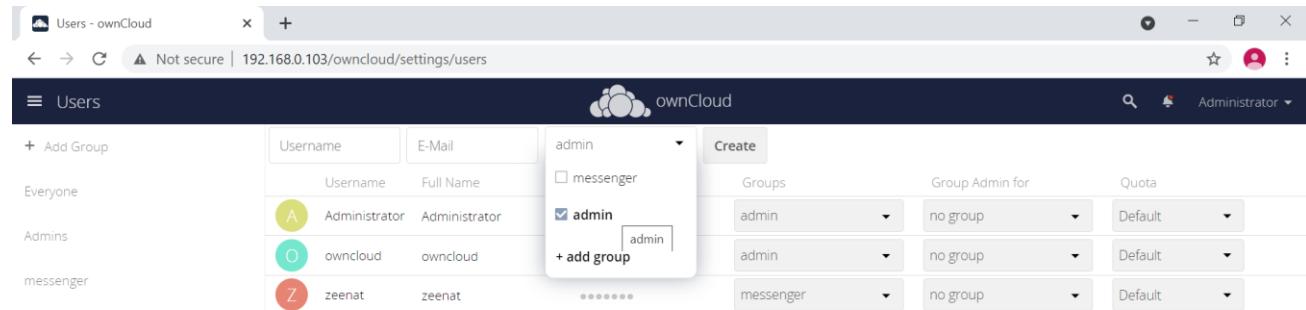
	Username	E-Mail	Groups	Group Admin for	Quota
Administrator	Administrator	*****	admin	no group	Default
owncloud	owncloud	*****	admin	no group	Default
zeenat	zeenat	*****	messenger	no group	Default

Step 11: Our user is been added we can change the storage limit for the new user.

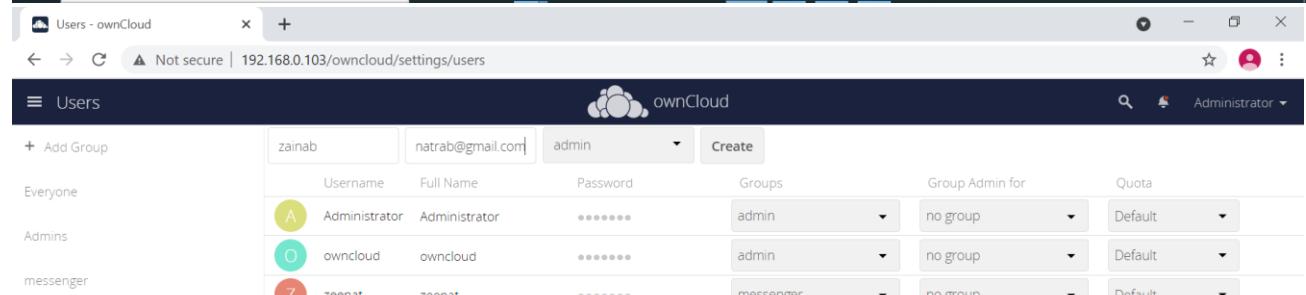
The screenshot shows the 'Users' section of the ownCloud control panel. The 'messenger' group is currently selected. A new user, 'zeenat', has been added with a quota of '1 GB'. A context menu is open over the 'messenger' group, showing options like 'Default', 'Unlimited', '1 GB', '5 GB', '10 GB', and 'Other ...'. The Windows taskbar at the bottom shows various pinned icons and the date/time as 24-09-2021 10:17 AM.

	Username	E-Mail	Groups	Group Admin for	Quota
Administrator	Administrator	*****	admin	no group	Default
owncloud	owncloud	*****	admin	no group	Default
zeenat	zeenat	*****	messenger	no group	1 GB

Step 12: Let's add another user but this time in "admin" group



	Username	E-Mail	Groups	Group Admin for	Quota
admin	admin		admin	no group	Default
messenger	messenger		messenger	no group	Default



	Username	Full Name	Password	Groups	Group Admin for	Quota
zainab	zainab	Administrator	*****	admin	no group	Default
owncloud	owncloud	owncloud	*****	admin	no group	Default
zeenat	zeenat	zeenat	*****	messenger	no group	Default

Step 13: If it shows “admin, admin” in group just click on it and uncheck one “admin”.

Name: Zeenat

Class: TYIT

Roll no: 578

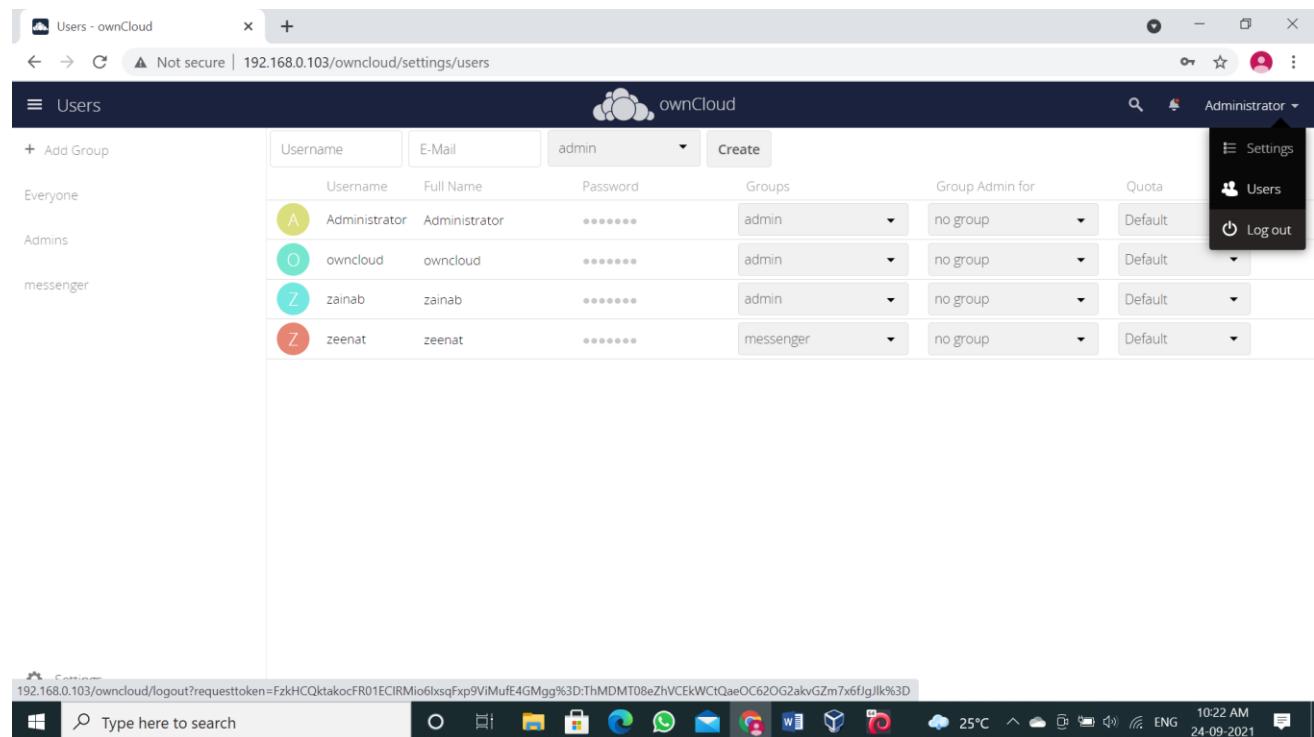
	Username	E-Mail	Groups	Group Admin for	Quota
Everyone	Administrator	Administrator	admin	no group	Default
Admins	owncloud	owncloud	admin	no group	Default
messenger	zainab	zainab	admin	no group	Default
	zeenat	zeenat	messenger	no group	Default

Note: Sometimes it fails to register user in “admin” group so please check before logging out.
You can check by refreshing the page.

Step 14: Before Logging out from admin account, set new password in the password field.

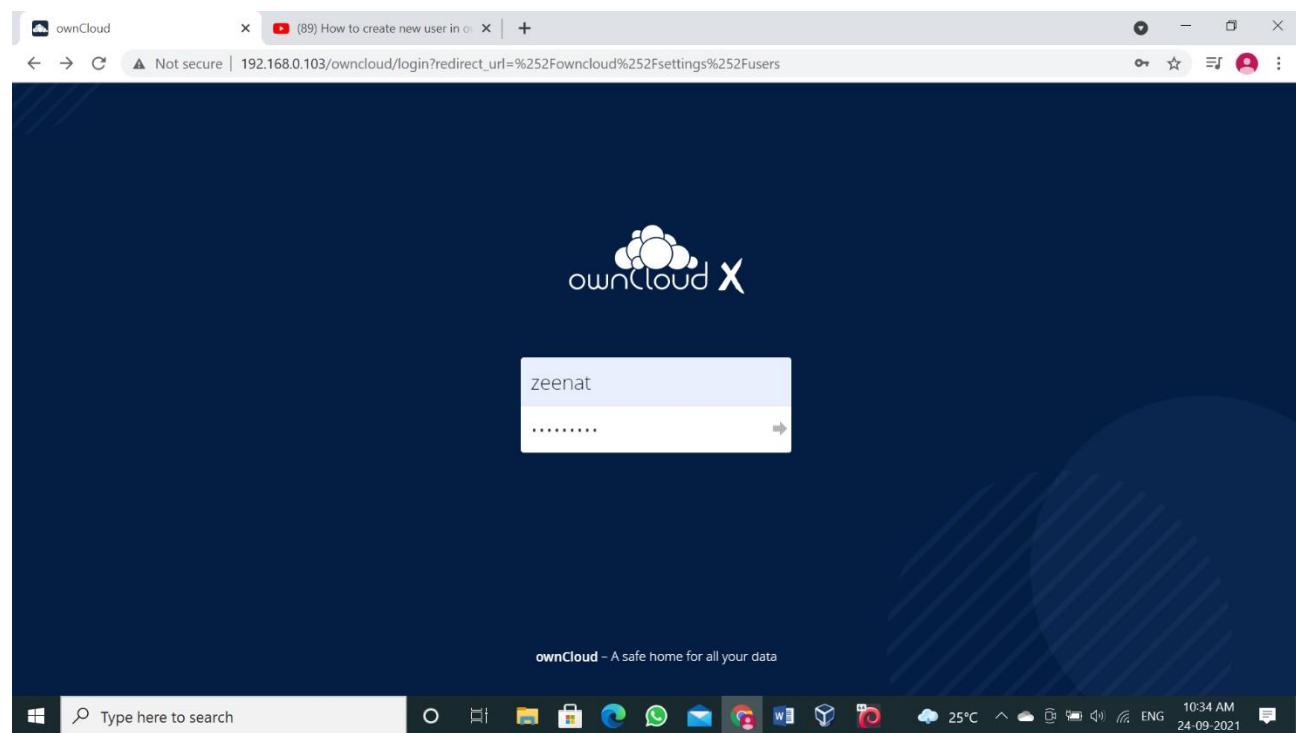
	Username	E-Mail	Groups	Group Admin for	Quota
Everyone	Administrator	Administrator	admin	no group	Default
Admins	owncloud	owncloud	admin	no group	Default
messenger	zainab	zainab	admin	no group	Default
	zeenat	zeenat	[Pencil Icon]	no group	Default

Step 15: Now “Log out” from the admin account.

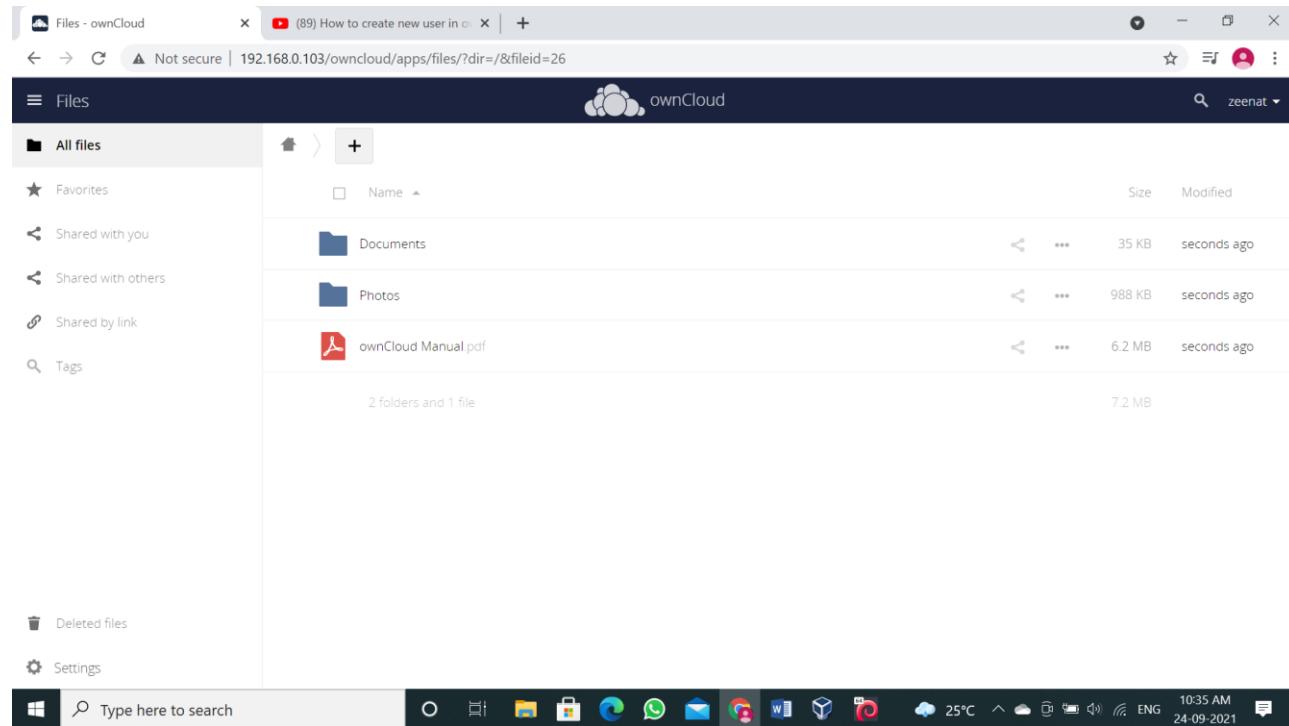


The screenshot shows the 'Users' page of the ownCloud web interface. The URL is 192.168.0.103/owncloud/settings/users. The page lists four users: 'Administrator' (admin), 'owncloud' (owncloud), 'zainab' (zainab), and 'zeenat' (zeenat). The 'zeenat' row is selected. In the top right corner, there is a dropdown menu for the user 'Administrator'. The 'Log out' option is highlighted with a red box. The taskbar at the bottom shows the Windows Start button, a search bar with 'Type here to search', and various pinned icons.

Step 16: Try log in with user you just created.

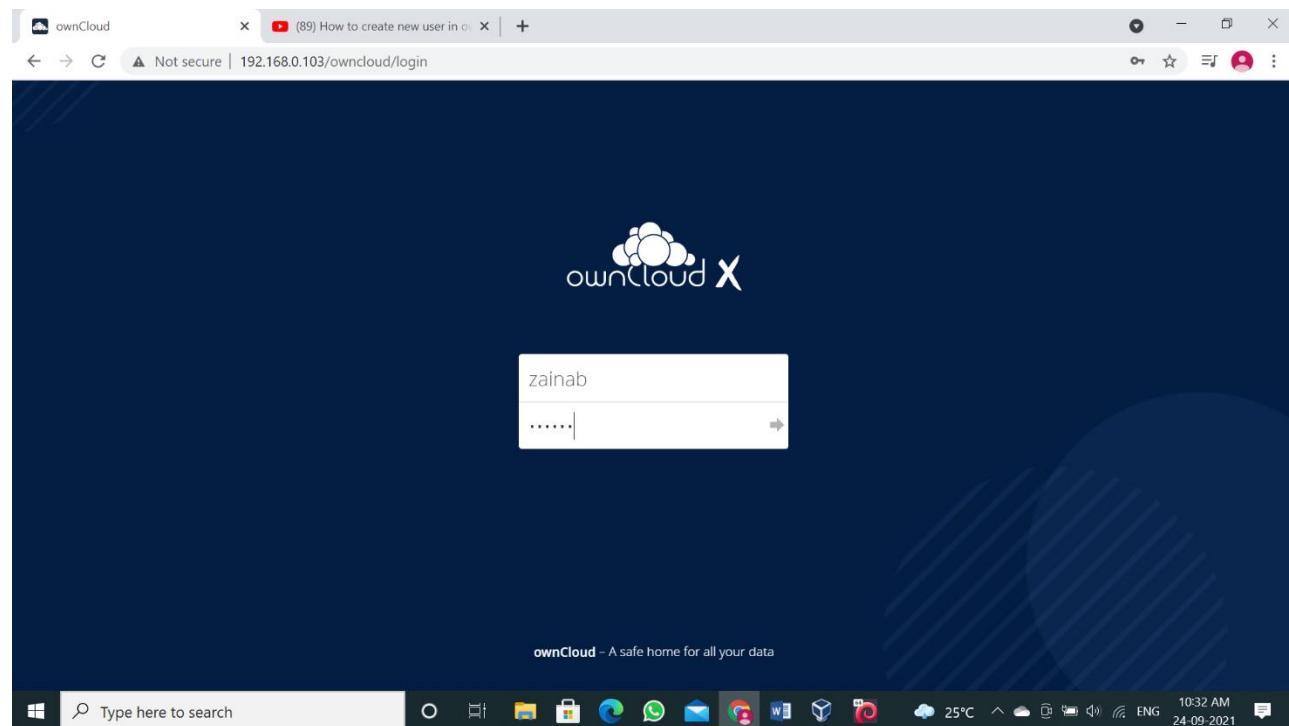


The screenshot shows the ownCloud login screen. The URL is 192.168.0.103/owncloud/login?redirect_url=%252Fowncloud%252Fsettings%252Fusers. The page features the ownCloud logo and a large input field for the username 'zeenat', which is highlighted with a red box. Below the input field is a password field with several dots. At the bottom of the screen, the text 'ownCloud – A safe home for all your data' is visible. The taskbar at the bottom shows the Windows Start button, a search bar with 'Type here to search', and various pinned icons.



Yes, it has successfully logged in. As you can see this user don't have any privilege link adding users and creating group because it's not in "admin" group, now "log out" from the account.

Step 17: Now let's try to log in from the user account who is in "admin" group.



Step 18: Enter login details and click on “Log in”.

The screenshot shows the OwnCloud web interface. On the left, there's a sidebar with links for 'All files', 'Favorites', 'Shared with you', 'Shared with others', 'Shared by link', and 'Tags'. The main area displays a file list with three items: 'Documents' (35 KB), 'Photos' (988 KB), and 'ownCloud Manual.pdf' (6.2 MB). A search bar at the top right contains 'zainab'. On the far right, a user menu shows 'Settings', 'Users' (with a count of 2), and a 'Logout' button. Below the main area, it says '2 folders and 1 file' and '7.2 MB'. At the bottom, there's a 'Deleted files' section with a trash can icon. The taskbar at the bottom of the browser window shows various pinned icons and the system tray with the date and time (24-09-2021).

As you can see this user has the privileges of admin because he is in “admin” group.

Note: If it doesn't show the privilege then go to admin account and check if this user group is “admin” group.

This user has all the rights that admin possess like adding or deleting user

The screenshot shows the 'Users' settings page in OwnCloud. On the left, there's a sidebar with 'Add Group' and a list of existing groups: 'Everyone', 'Admins', and 'messenger'. The main area is a table with columns for 'Username', 'E-Mail', 'Groups', 'Create', 'Username', 'Full Name', 'Password', 'Groups', 'Group Admin for', and 'Quota'. There are four users listed: 'Administrator' (username 'Administrator', full name 'Administrator', password '*****', groups 'admin', 'no group', 'Default'), 'owncloud' (username 'owncloud', full name 'owncloud', password '*****', groups 'admin', 'no group', 'Default'), 'zainab' (username 'zainab', full name 'zainab', password '*****', groups 'admin', 'no group', '1 GB'), and 'zeenat' (username 'zeenat', full name 'zeenat', password '*****', groups 'messenger', 'no group', '1 GB'). The 'Groups' column dropdowns are currently set to 'admin' for the first two users and 'messenger' for the last two. The 'Group Admin for' dropdowns are set to 'no group' for all users. The 'Quota' dropdowns are set to 'Default' for the first two and '1 GB' for the last two.

CONCLUSION:

OwnCloud only stands to grow in popularity as people and enterprises become more concerned about the true security of their data, given the recent leaks we have seen from the NSA and the co-operation of companies such as Google or Apple in sharing user data. With OwnCloud you maintain control of your data and no-one else will be able to access it.

Practical 8

Aim: Study Cloud Security Management.

OBJECTIVE: From this experiment the student will be able,

- To understand the security features of Cloud.
- To learn the technique of application security management and its complexity
- To understand the importance of cloud security management from application point of view

OUTCOME: The learner will be able to

- Student can study and implement single-sign-on.
- To use current techniques, skills, and tools necessary for computing practice.
- To match the industry requirements in the domains of Database management, Programming and Networking with the required management skills.

THEORY:

Multi-Factor Authentication (MFA) – Multi Factor Authentication (MFA) is an authentication method that requires the user to provide two or more verification factors to gain access to a resource such as an application, online account, or a VPN. MFA is a core component of a strong identity and access management (IAM) policy.

Rather than just asking for a username and password, MFA requires one or more additional verification factors, which decreases the likelihood of a successful cyber-attack.

Importance – The main benefit of MFA is it will enhance your organization's security by requiring your users to identify themselves by more than a username and password. While important, usernames and passwords are vulnerable to brute force attacks and can be stolen by third parties.

Enforcing the use of an MFA factor like a thumbprint or physical hardware key means increased confidence that your organization will stay safe from cyber criminals.

Working of MFA – MFA works by requiring additional verification information (factors). One of the most common MFA factors that users encounter are one-time passwords (OTP). OTPs are those 4–8 digits codes that you often receive via email, SMS or some sort of mobile app.

With OTPs a new code is generated periodically or each time an authentication request is submitted.

The code is generated based upon a seed value that is assigned to the user when they first register and some other factor which could simply be a counter that is incremented or a time value.

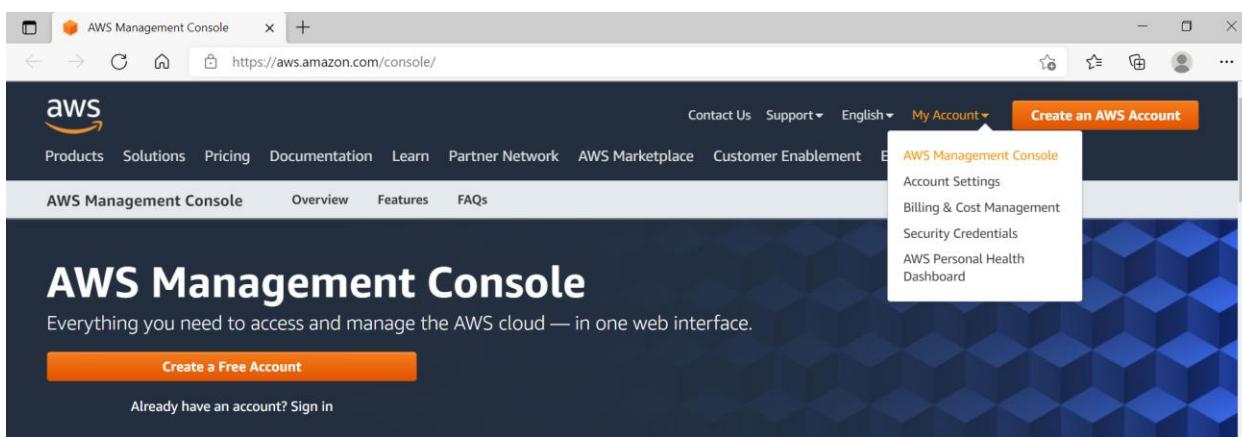
Three Main Types of MFA Authentication Methods

- Things you know (knowledge), such as a password or PIN
- Things you have (possession), such as a badge or smartphone
- Things you are (inherence), such as a biometric like fingerprints or voice recognition

PROCEDURE:

Click on the link: <https://aws.amazon.com/console/>

Step 1: Go to “My Account” > “AWS Management Console”.



The AWS Management Console brings the unmatched breadth and depth of AWS right to your computer or mobile phone with a secure, easy-to-access, web-based portal. Discover new services, manage your entire account, build new applications, and learn how to do even more with AWS.

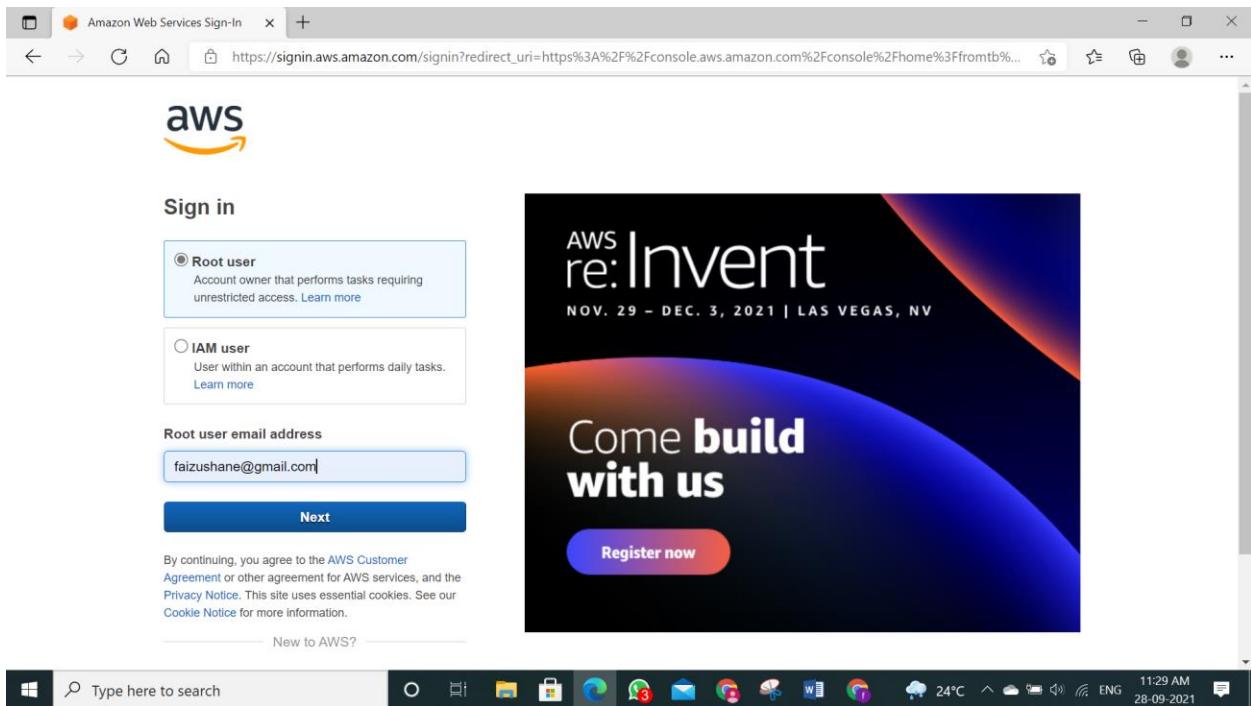


Step 2: Just login to your user's account.

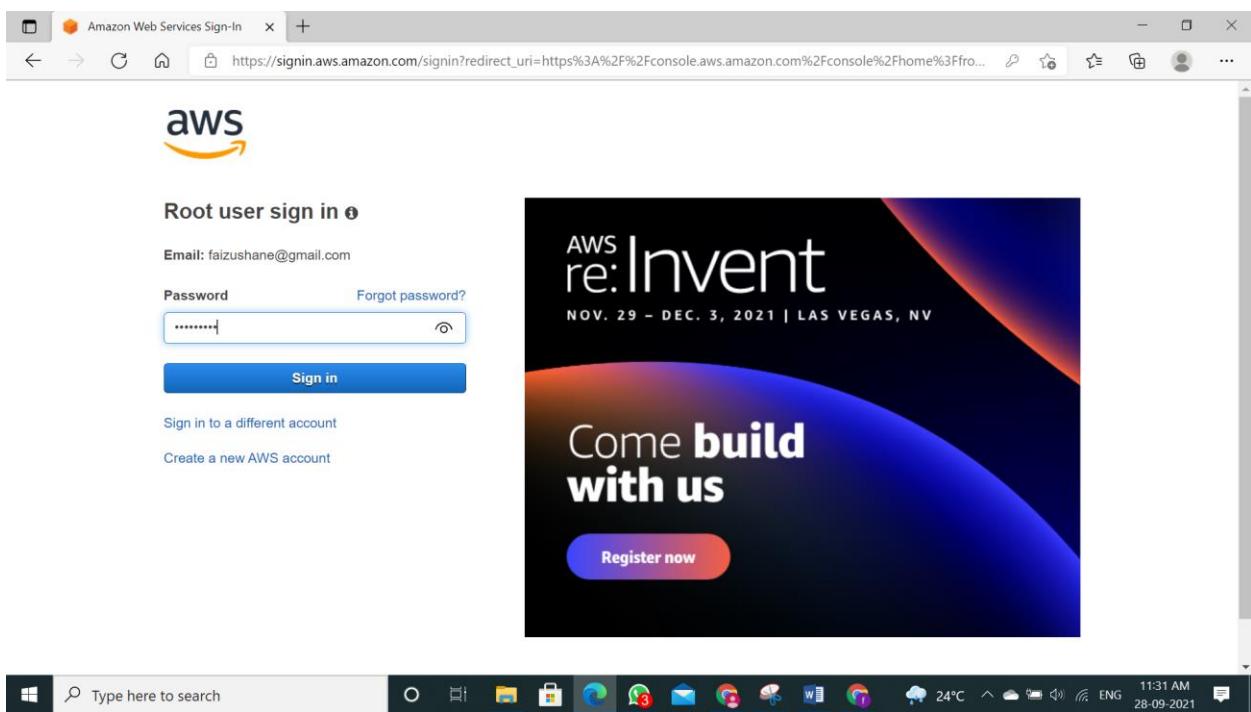
Name: Zeenat

Class: TYIT

Roll no: 578



Step 3: Click on “Sign In”.



Name: Zeenat

Class: TYIT

Roll no: 578

The screenshot shows the AWS Management Console homepage. At the top, there's a navigation bar with the AWS logo, a search bar, and account information for 'my_account' in 'Ohio'. Below the header, the title 'AWS Management Console' is displayed. On the left, there's a sidebar titled 'AWS services' with sections for 'Recently visited services' and 'All services'. To the right, there are several promotional boxes: one for the 'AWS Console Mobile App' supporting four additional regions, another for 'Explore AWS' featuring the 'Amazon Location Service', and a third for 'My Security Credentials'. At the bottom, there's a Windows taskbar with various pinned icons.

Step 4: Once you logged in go to "My security credentials".

This screenshot is similar to the previous one, showing the AWS Management Console homepage. However, the navigation menu on the right has been expanded, and the 'My Security Credentials' option is highlighted with a yellow box. The rest of the interface is identical to the first screenshot, including the sidebar, promotional boxes, and taskbar at the bottom.

Step 5: Scroll down you will find “Multi-factor authentication (MFA)”. Click on “Assign MFA device”

Name: Zeenat

Class: TYIT

Roll no: 578

The screenshot shows the AWS IAM Management Console with the URL https://console.aws.amazon.com/iam/home?region=us-east-2#/security_credentials. The left sidebar lists various IAM management options like Dashboard, Access management, Policies, and Access reports. The main content area is titled 'Your Security Credentials' and contains sections for Password, Multi-factor authentication (MFA), Access keys, CloudFront key pairs, X.509 certificate, and Account identifiers. A prominent blue button labeled 'Activate MFA' is visible. The status bar at the bottom shows the date and time as 28-09-2021 11:34 AM.

Step 6: We will select first option “Virtual MFA device” and click on “Continue”

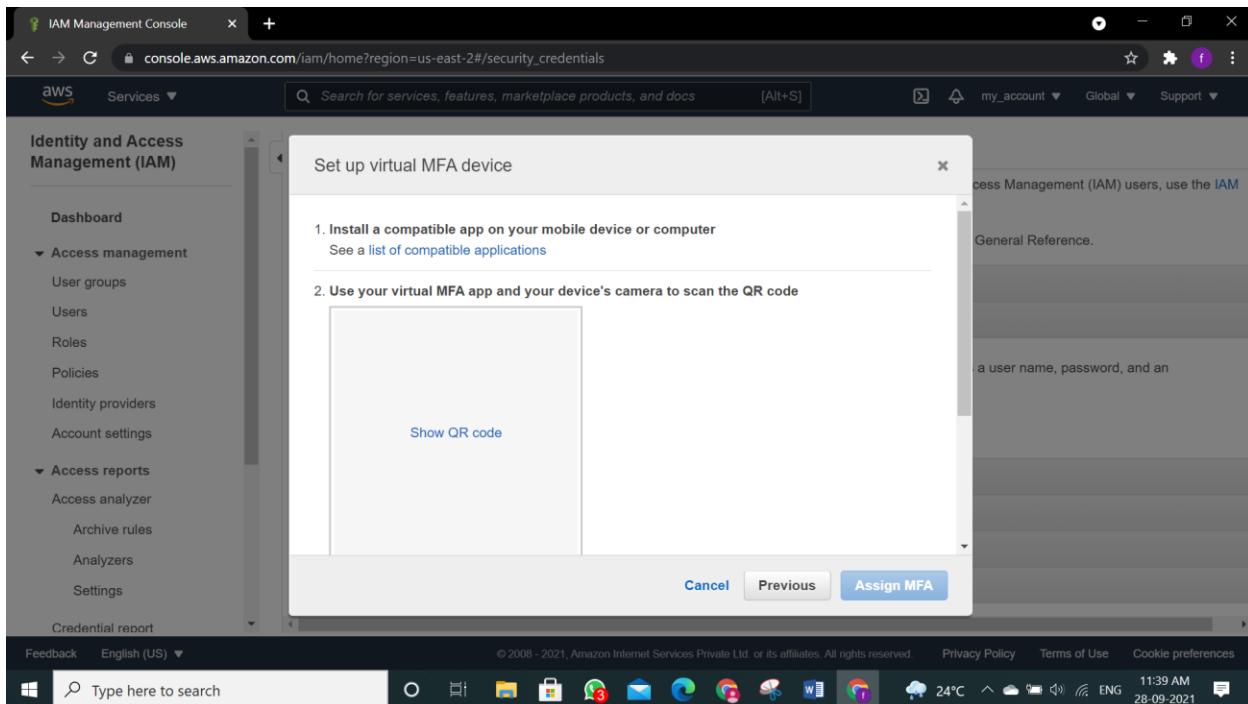
The screenshot shows the 'Manage MFA device' dialog box overlaid on the IAM console. The dialog asks to choose the type of MFA device, with three options: 'Virtual MFA device' (selected), 'U2F security key', and 'Other hardware MFA device'. Below the options is a note about supported MFA devices. At the bottom right of the dialog are 'Cancel' and 'Continue' buttons. The background shows the same IAM interface as the previous screenshot.

Step 7: So, concept is we will use third party app to generate OTP which will help us to authenticate ourselves during logging in. It will add a security layer to our account. Now we have to download “2FA Authenticator (2FAS)” app on our mobile.

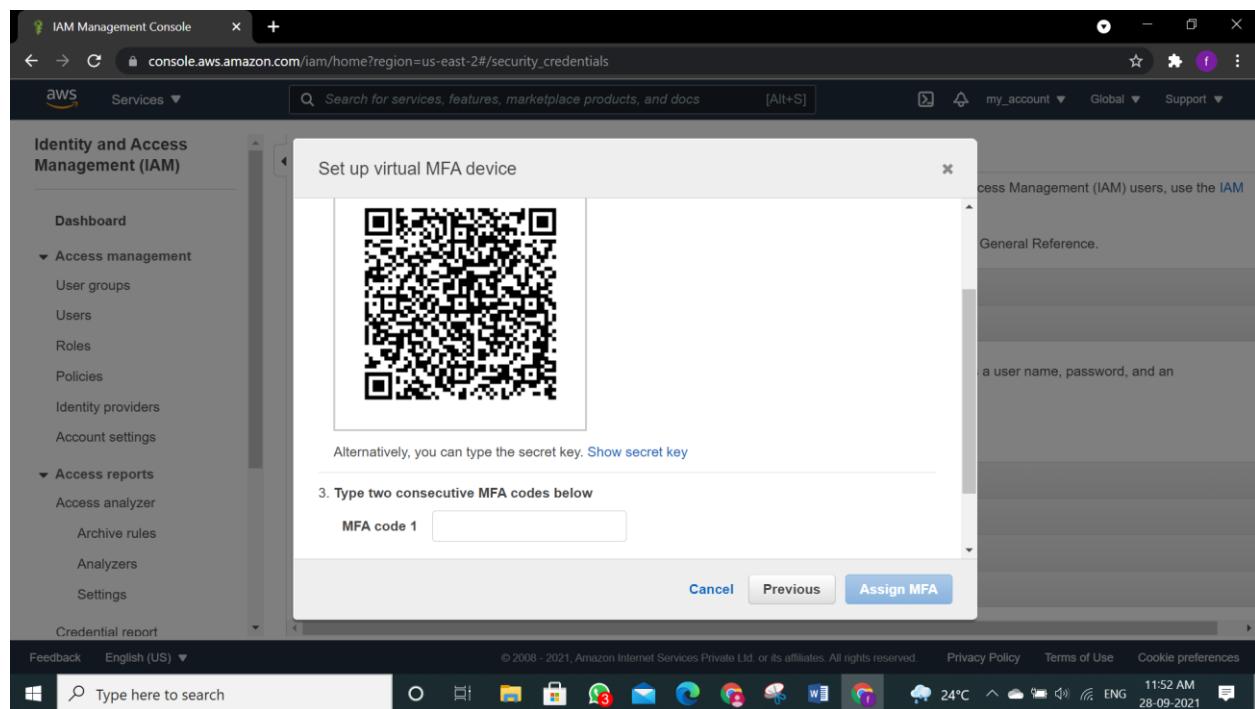
Name: Zeenat

Class: TYIT

Roll no: 578



Step 8: Click on “Show QR code” to display QR code.



Name: Zeenat

Class: TYIT

Roll no: 578

The screenshot shows the AWS IAM Management Console with the URL console.aws.amazon.com/iam/home?region=us-east-2#/security_credentials. The left sidebar lists various IAM management options like User groups, Users, Roles, Policies, Identity providers, Account settings, Access reports, Access analyzer, Archive rules, Analyzers, and Settings. The main content area is titled "Your Security Credentials" and contains a section about Multi-factor authentication (MFA). A table lists one MFA device:

Device type	Serial number	Actions
Virtual	arn:aws:iam::739537979389:mfa/root-account-mfa-device	Manage

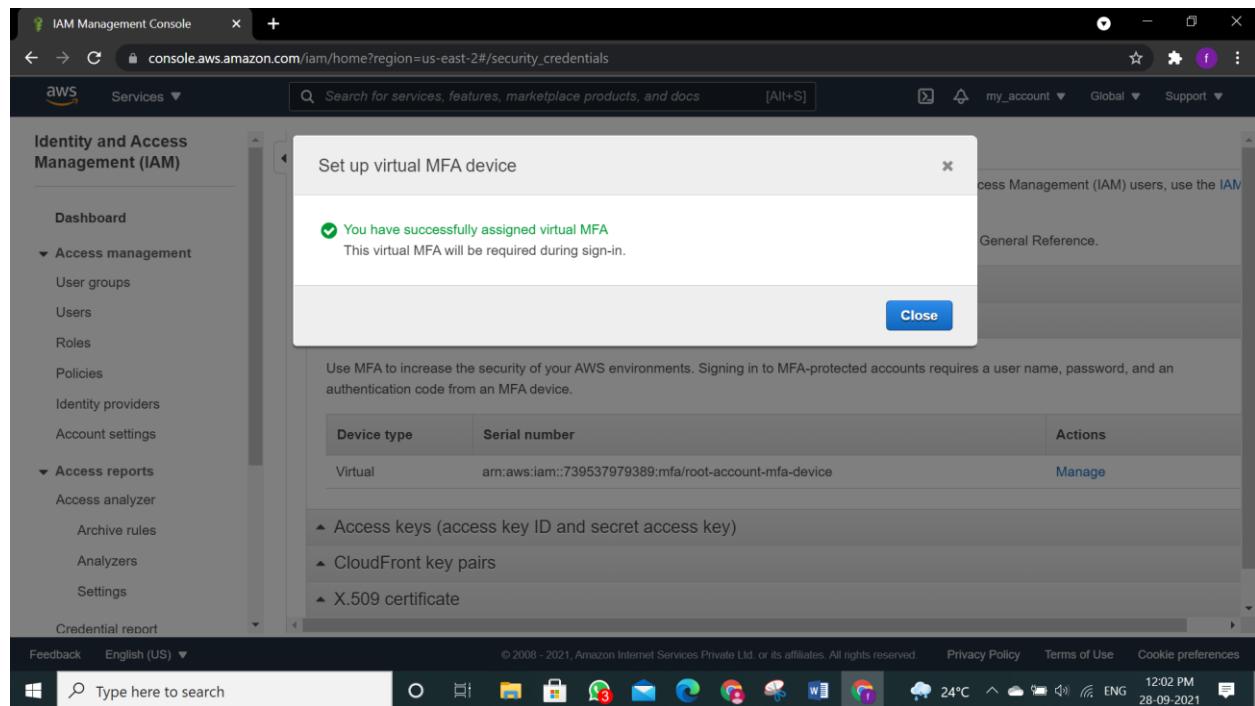
Below the table are links to "Access keys (access key ID and secret access key)", "CloudFront key pairs", and "X.509 certificate".

Step 9: Open the 2FA Authenticator (2FAS) app click on continue.

Step 10: And click on “Scan QR code”.

Step 11: First, we have to enter 2 OTP which we will receive on app and click “Assign MFA”.

The screenshot shows the "Set up virtual MFA device" dialog box overlaid on the IAM Management Console. The dialog has a title "Set up virtual MFA device" and a QR code for scanning. Below the QR code, it says "Alternatively, you can type the secret key. [Show secret key](#)". There are two input fields labeled "MFA code 1" and "MFA code 2", each containing a 6-digit OTP. At the bottom right of the dialog are "Cancel", "Previous", and "Assign MFA" buttons.

Step 12: Click on "Close"**Step 13:** Log out from the account.

A screenshot of the IAM Management Console showing the 'Your Security Credentials' page. The left sidebar includes options like Policies, Identity providers, Account settings, and Access reports. A vertical navigation bar on the right lists links such as My Account (344753536617), My Organization, My Service Quotas, My Billing Dashboard, and My Security Credentials. The 'My Security Credentials' link is currently selected and highlighted in blue. A 'Sign Out' button is visible at the bottom of this menu. The main content area displays information about MFA and a table of credentials, identical to the one in Step 12.

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The screenshot shows the AWS sign-in interface. On the left, there are two radio button options: 'Root user' (unchecked) and 'IAM user' (checked). Below these is a text input field containing 'faizushane@gmail.com'. Underneath the input field is a checkbox for 'Remember this account'. A large blue 'Next' button is centered at the bottom. To the right of the sign-in form is a promotional banner for 'Amazon Lightsail' with the text 'Lightsail is the easiest way to get started on AWS' and a small cartoon robot icon.

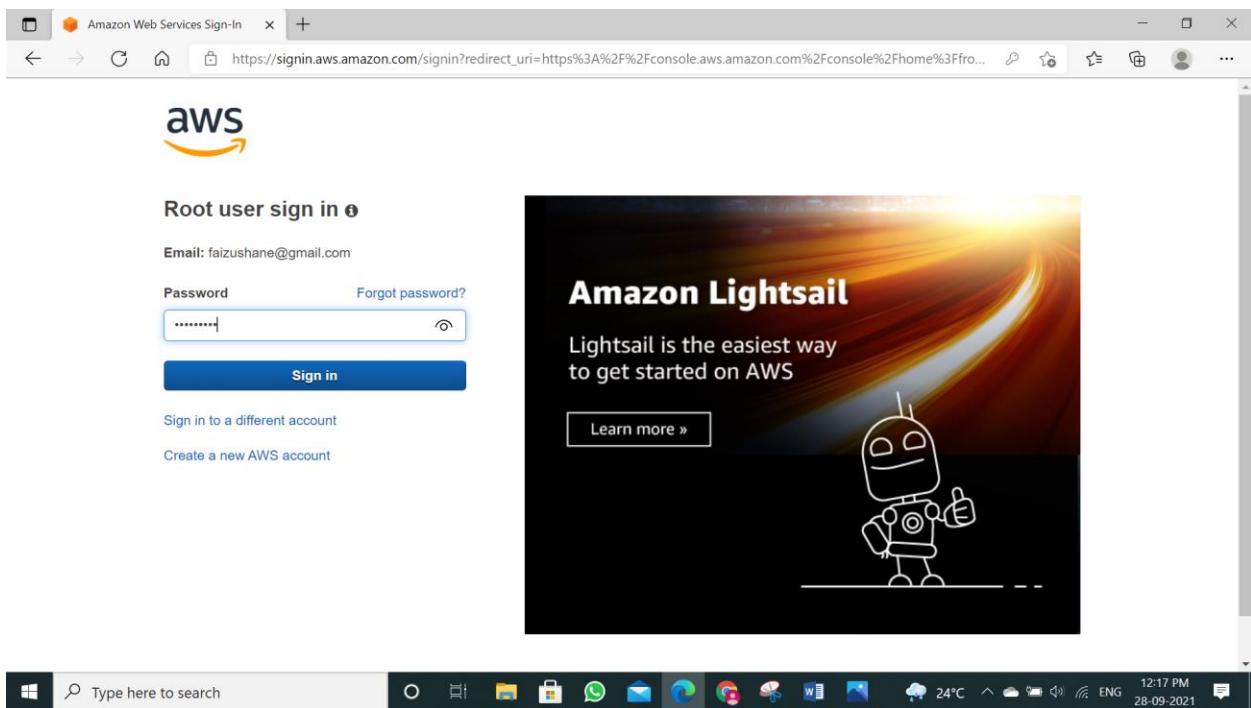
The screenshot shows the AWS sign-in interface again, but this time it's on the 'Security check' step. It features a CAPTCHA image with the text 'pmdxhd' and a text input field where 'pmdxhd' is typed. Below the input field is a blue 'Submit' button. To the right of the security check is the same 'Amazon Lightsail' promotional banner.

Step 14: Now again try to log in to your account

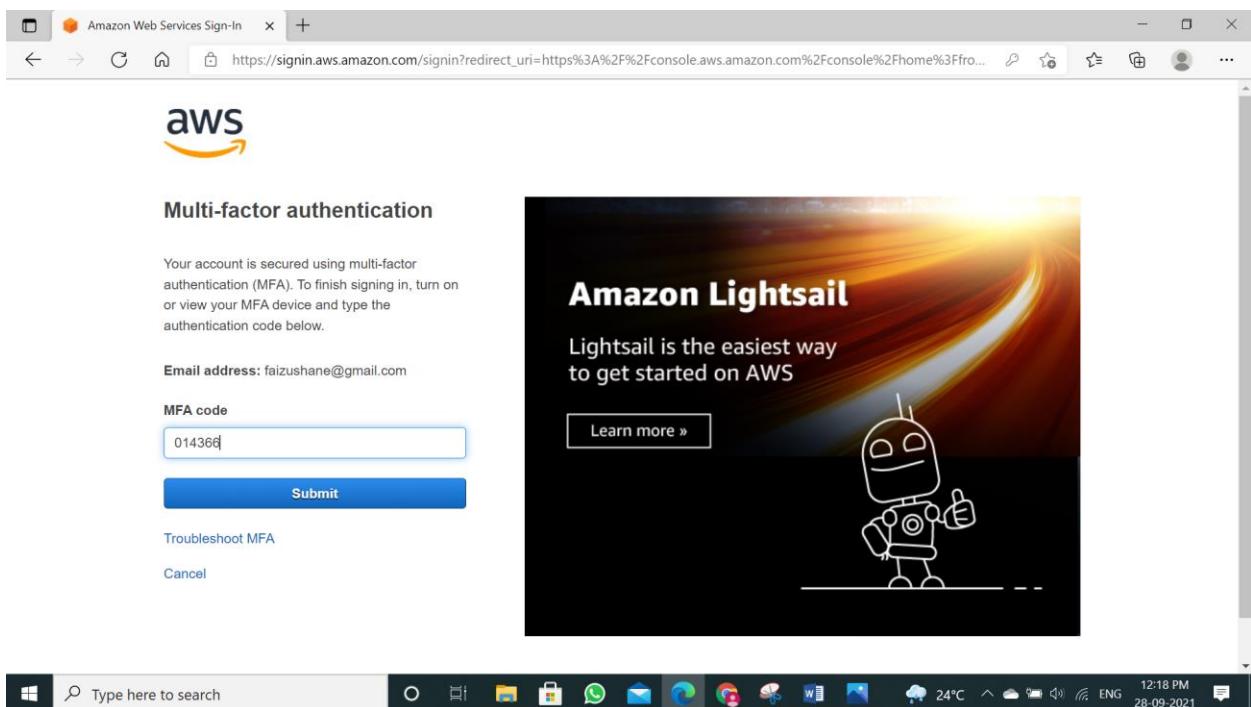
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Step 15: It will ask for MFA code. You get new code after every 30 seconds, just enter the valid MFA code and click on “Submit” to login.



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The screenshot shows the AWS Management Console homepage. At the top, there's a navigation bar with the AWS logo, a search bar, and links for 'my_account', 'Ohio', and 'Support'. Below the header, the title 'AWS Management Console' is displayed. On the left, a sidebar titled 'AWS services' shows 'Recently visited services' with 'IAM' listed and 'All services' as an option. In the center, there's a section titled 'Build a solution' with two options: 'Launch a virtual machine' (With EC2, 2-3 minutes) and 'Build a web app' (With Elastic Beanstalk, 6 minutes). To the right, there's a box titled 'Stay connected to your AWS resources on-the-go' featuring the AWS mobile app icon and text about supporting four additional regions. Another box titled 'Explore AWS' highlights 'Amazon FSx File Gateway' with a brief description and a 'Learn more' link. At the bottom, there's a taskbar with various icons and a system status bar showing the date and time.

CONCLUSION:

We have studied how to secure the cloud and its data. Amazon AWS provides the best security with its extended facilities and services like MFA device. It also gives you the ability to add your own permissions and policies for securing data more encrypted.