

# National University of Computer and Emerging Sciences



## Operating System Lab

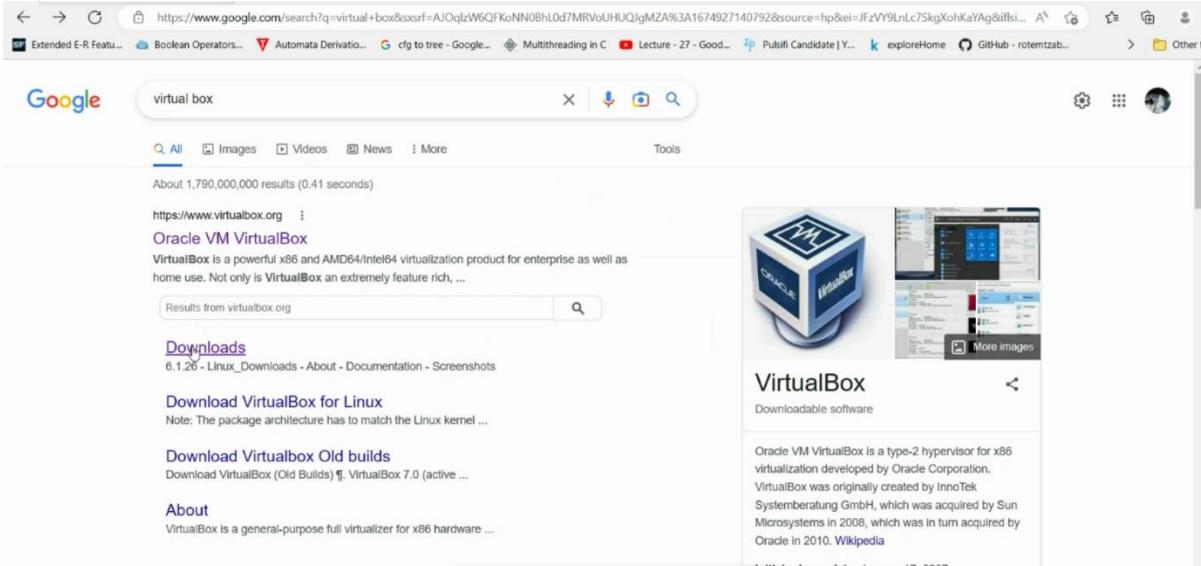
Course Instructor	Sir Mubashar Hussain
Lab Instructor (s)	Muhammad Hassan Raza
Section	BSE-5B
Semester	Fall 2024

Department of Computer Science  
FAST-NU, Lahore, Pakistan

## Activity 1: Ubuntu Installation

You can either use virtualbox or VMWare workstation in order to install Ubuntu on your windows operating system. Virtualbox or VMware are open source tools which enable us to run different operating systems virtually on your windows system.

### Process of installing ubuntu on virtual box:



The screenshot shows a Google search results page for the query "virtual box". The search bar at the top contains "virtual box". Below the search bar, there are tabs for "All", "Images", "Videos", "News", and "More". The main search results area displays several links related to Oracle VM VirtualBox, including "Oracle VM VirtualBox", "Download VirtualBox for Linux", "Download Virtualbox Old builds", and "About". To the right of the search results, there is a large image of the VirtualBox logo (a blue cube with "ORACLE" and "VirtualBox" on it) and a screenshot of the VirtualBox interface showing multiple virtual machines. Below this image, there is a brief description of VirtualBox as a type-2 hypervisor for x86 virtualization developed by Oracle Corporation.


The screenshot shows the "Downloads" page of the VirtualBox website. The page features the VirtualBox logo and the title "VirtualBox Download VirtualBox". A sidebar on the left lists links for "About", "Screenshots", "Downloads", "Documentation", "End-user docs", "Technical docs", "Contribute", and "Community". The main content area contains sections for "VirtualBox binaries" (with a note about agreeing to terms and conditions), "VirtualBox 7.0.6 platform packages" (listing various host platforms like Windows, macOS, Linux, Solaris, and Solaris 11), and "VirtualBox 7.0.6 Oracle VM VirtualBox Extension Pack" (with a note about upgrading guest additions). There is also a note about SHA256 checksums and MD5 checksums, and a "Note" about upgrading VirtualBox.

https://www.virtualbox.org/wiki/Downloads

**VirtualBox**  
Download VirtualBox

Here you will find links to VirtualBox binaries and its source code.

### VirtualBox binaries

By downloading, you agree to the terms and conditions of the respective license.

If you're looking for the latest VirtualBox 6.1 packages, see [VirtualBox 6.1 builds](#). Version 6.1 will remain supported until December 2023.

#### VirtualBox 7.0.6 platform packages

- Windows hosts
- macOS / Intel hosts
- Developer preview for macOS / Arm64 (M1/M2) hosts
- Linux distributions
- Solaris hosts
- Solaris 11 IPS hosts

The binaries are released under the terms of the GPL version 3.

See the [changelog](#) for what has changed.

You might want to compare the checksums to verify the integrity of downloaded packages. *The SHA256 checksums should be favored as the MD5 algorithm must be treated as insecure!*

- SHA256 checksums, MD5 checksums

Note: After upgrading VirtualBox it is recommended to upgrade the guest additions as well.

#### VirtualBox 7.0.6 Oracle VM VirtualBox Extension Pack

- All supported platforms

Support VirtualBox RDP, disk encryption, NVMe and PXE ...

https://www.google.com/search?q=ubuntu&ssrf=AJOqlzXj4tp0icV-BfOrjUCqq4\_F\_KgLw%3A1674927245537&source=hp&ei=VzVY9u6HsUlwxXt0LzwCg&ilisig=AK50M... A

**Google**

ubuntu

All News Images Videos More Tools

About 514,000,000 results (0.40 seconds)

This search may be relevant to recent activity Your Search activity | Feedback

**ubuntu vm**

<https://ubuntu.com> Ubuntu: Enterprise Open Source and Linux

Ubuntu is the modern, open source operating system on Linux for the enterprise server, desktop, cloud, and IoT.

Results from ubuntu.com

**Download Ubuntu Desktop**  
Ubuntu is an open source software operating system that runs from ...

**Download**  
Download Ubuntu desktop, Ubuntu Server, Ubuntu for ...

**Get Ubuntu Server**  
Option 1: Manual server installation - Download Ubuntu ...

**Ubuntu** Software

Ubuntu is a Linux distribution based on Debian and composed mostly of free and open-source software. Ubuntu is officially released in three editions: Desktop, Server, and Core for Internet of things devices and robots. All of the editions can run on the computer alone, or in a virtual machine. [Wikipedia](#)

https://ubuntu.com

CANONICAL

ubuntu® Enterprise Developer Community Download

We are hiring Products

Search Sign in

Open source security: best practices for early detection and risk mitigation

Join us on February 9, 2023 at 11 AM EST / 4 PM GMT

Don't miss this webinar!

Lech Sandecki  
Senior Product Manager

The screenshot shows the Canonical Ubuntu download page. At the top, there are four main sections: "Ubuntu Desktop", "Ubuntu Server", "Ubuntu for IoT", and "Ubuntu Cloud".

- Ubuntu Desktop:** Describes it as the most popular server Linux in the cloud and data centre, with guaranteed free upgrades. It offers "22.04 LTS" and "22.10" versions.
- Ubuntu Server:** Describes it as the most popular server Linux in the cloud and data centre, with guaranteed free upgrades. It offers "Get Ubuntu Server" and links for "Mac and Windows", "ARM", "IBM Power", and "s390x".
- Ubuntu for IoT:** Describes it as for developers who want to try snappy Ubuntu Core or classic Ubuntu on an IoT board. It lists platforms like "Raspberry Pi", "Intel IoT platforms", "Intel NUC", "KVM", "Qualcomm Dragonboard 410c", "Intel iBT TANIC 870", "AMD-Xilinx Evaluation kits & SOMs", and "RISC-V platforms".
- Ubuntu Cloud:** Describes it as using Ubuntu optimised and certified server images on major clouds. It links to "Amazon AWS", "Microsoft Azure", "Google Cloud Platform", and "more...". It also links to "Download cloud images for local development and testing".

Below these sections are "TUTORIALS", "READ THE DOCS", "OTHER WAYS TO DOWNLOAD", and "UBUNTU FLAVOURS" sections.

The screenshot shows the Ubuntu download page with a progress bar for the download of "ubuntu-22.10-desktop-amd64.iso". The progress is at 96.0 kB/h, 96.0 kB of 3.8 GB, with 12 hours left.

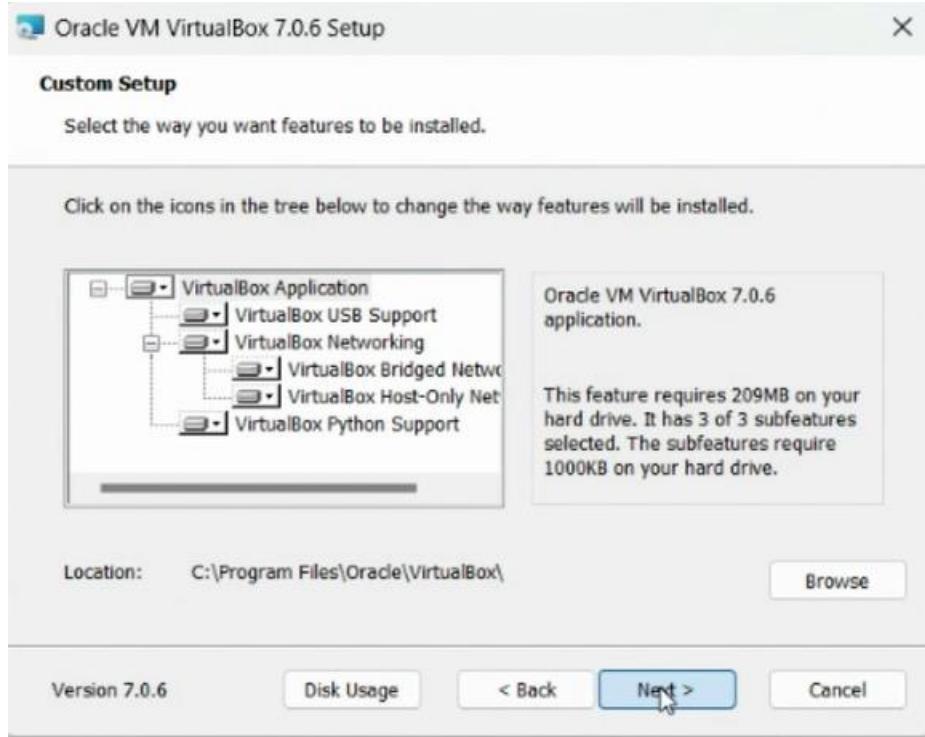
## Thank you for downloading Ubuntu Desktop

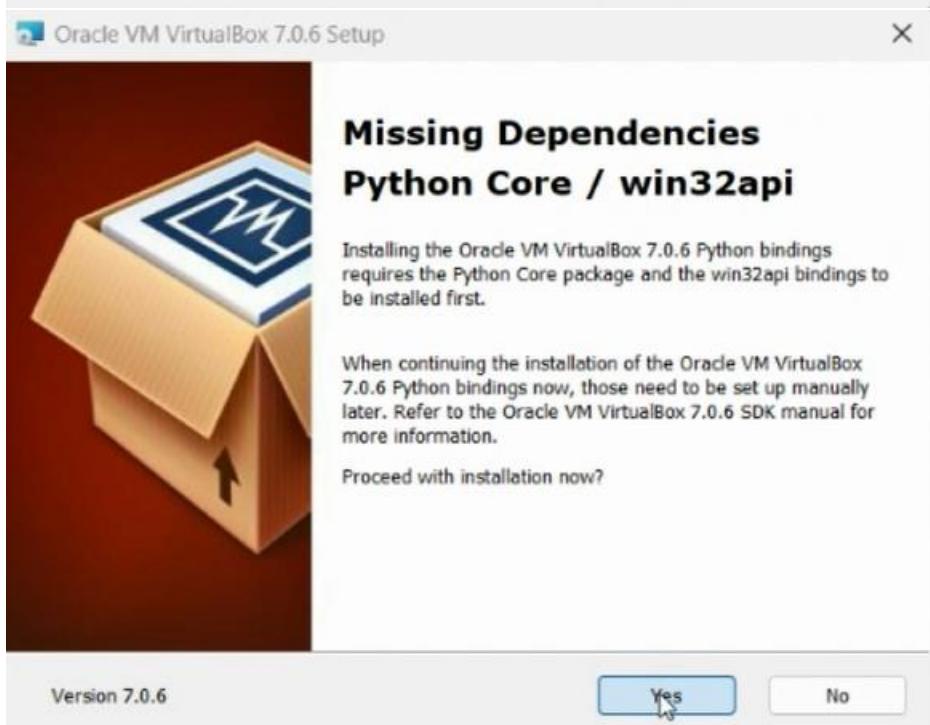
Your download should start automatically. If it doesn't, [download now](#).

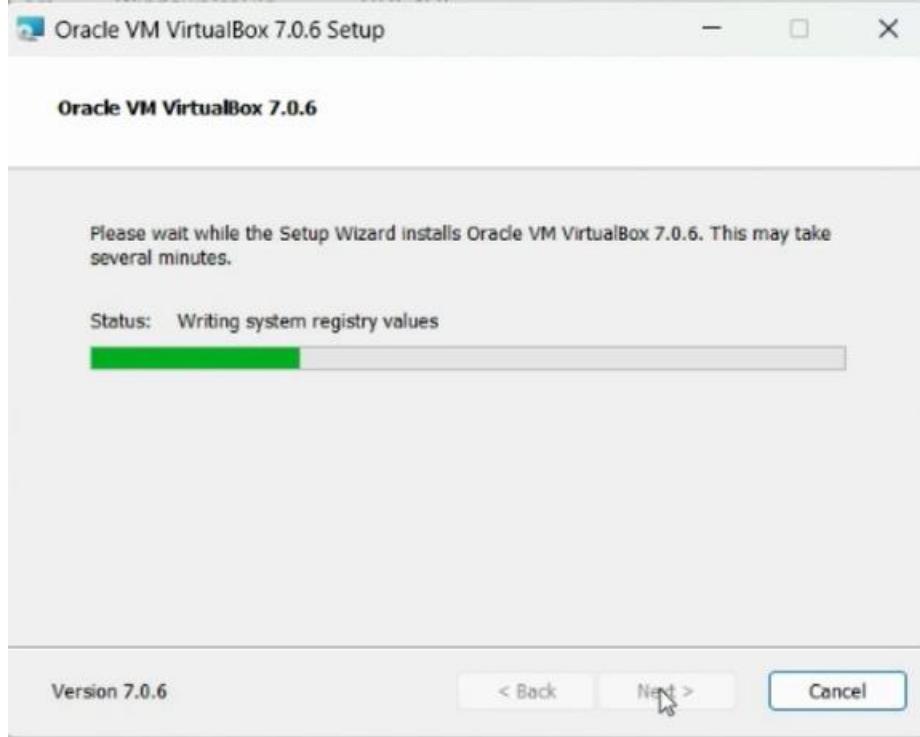
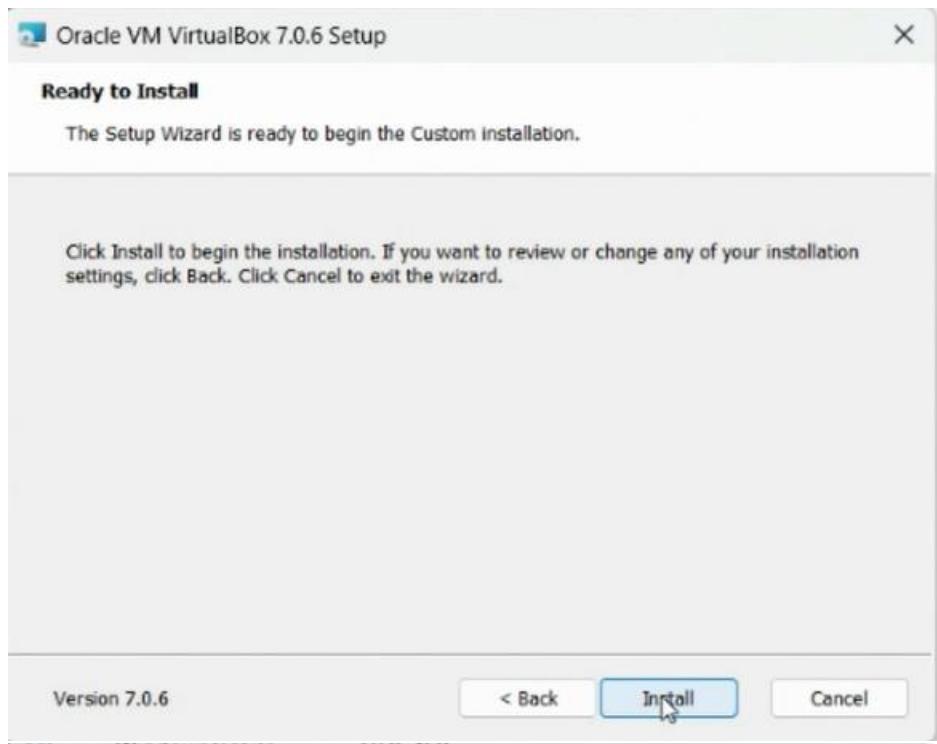
You can [verify your download](#), or [get help on installing](#).

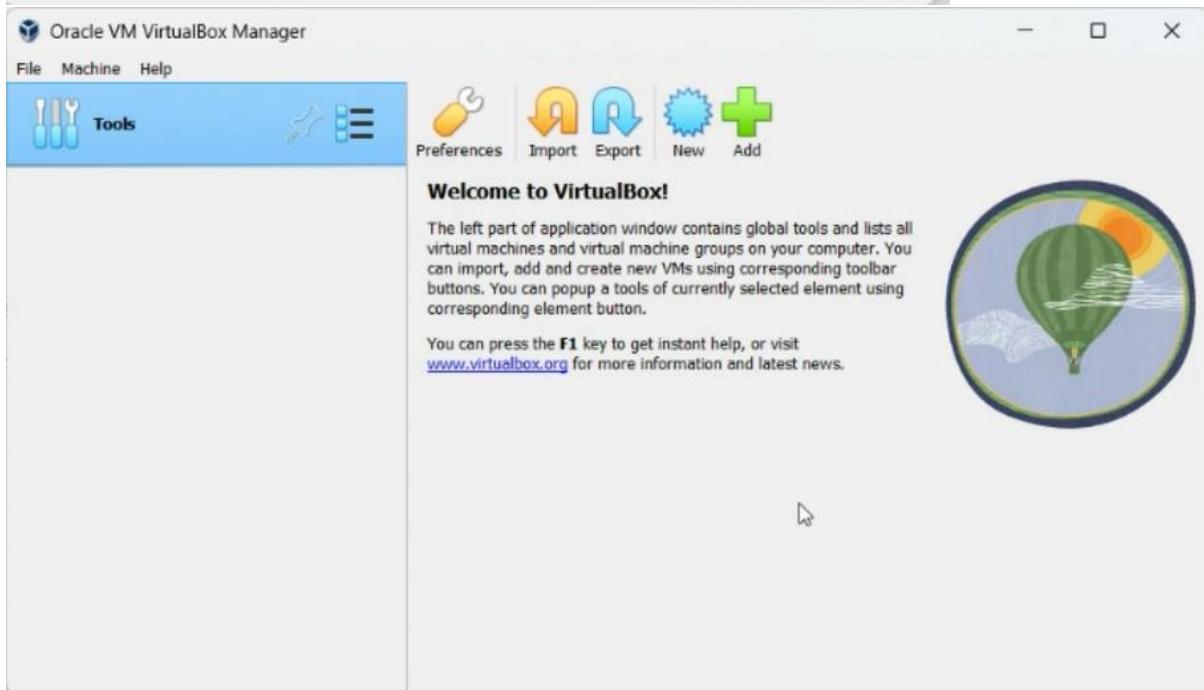
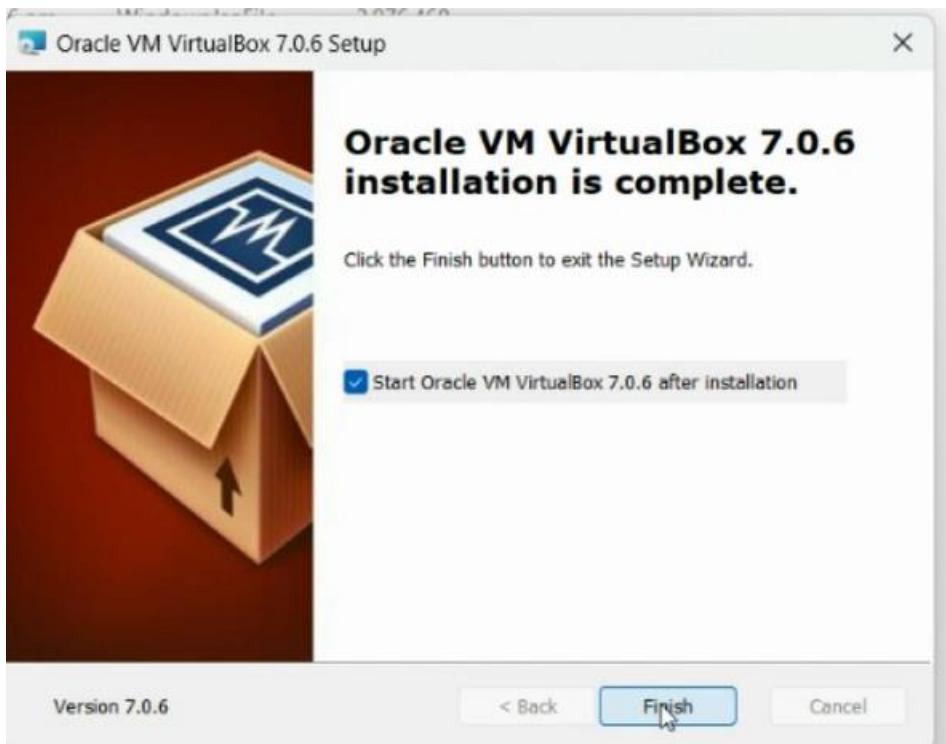
The screenshot shows the Windows File Explorer interface with two windows open:

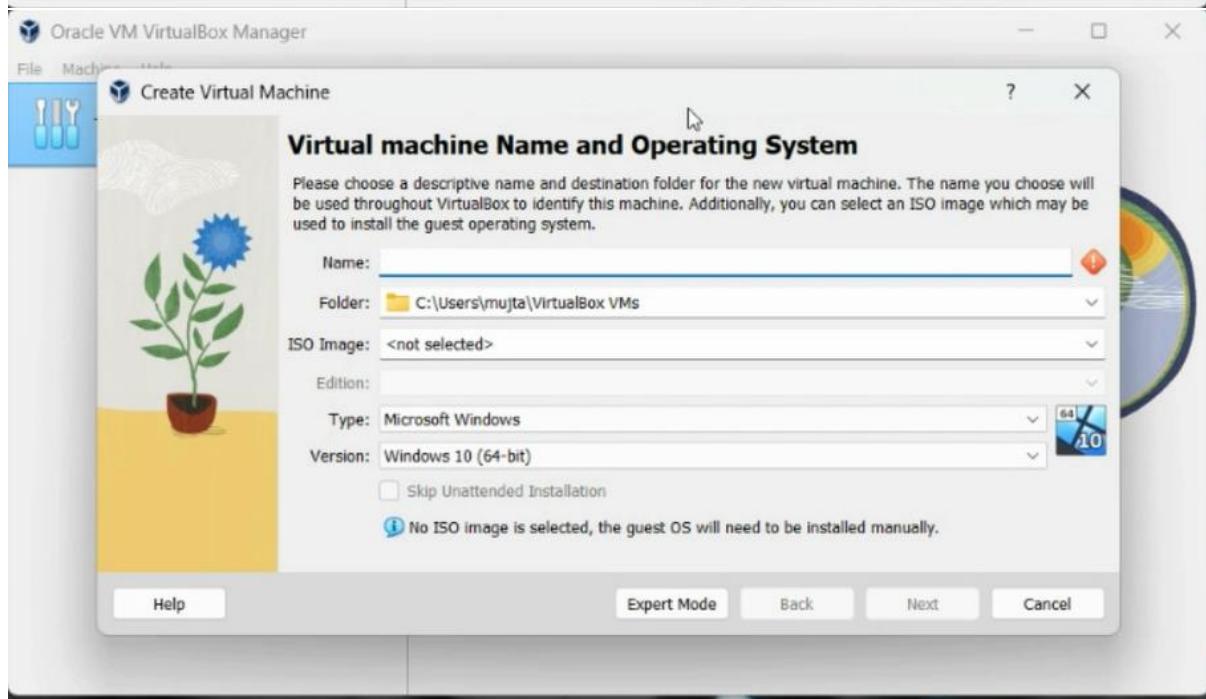
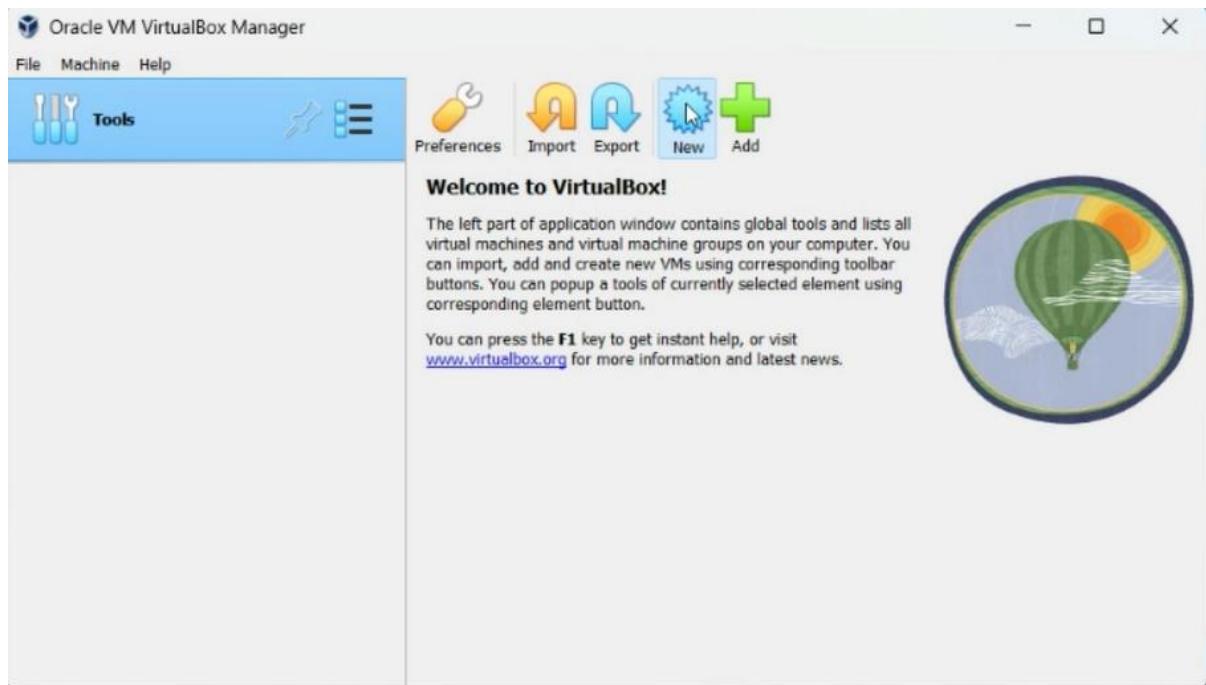
- Downloads:** Shows the ISO file "ubuntu-22.10-desktop-amd64.iso" (3.976.468 KB) and a VirtualBox image ("VirtualBox-7.0.6-155176-Win").
- This PC > OS (C) > Users > mujta > Downloads:** Shows the same ISO file and the VirtualBox image. A context menu is open over the VirtualBox image, with options: "Open", "Enter", "Run as administrator", and "Pin to Start".

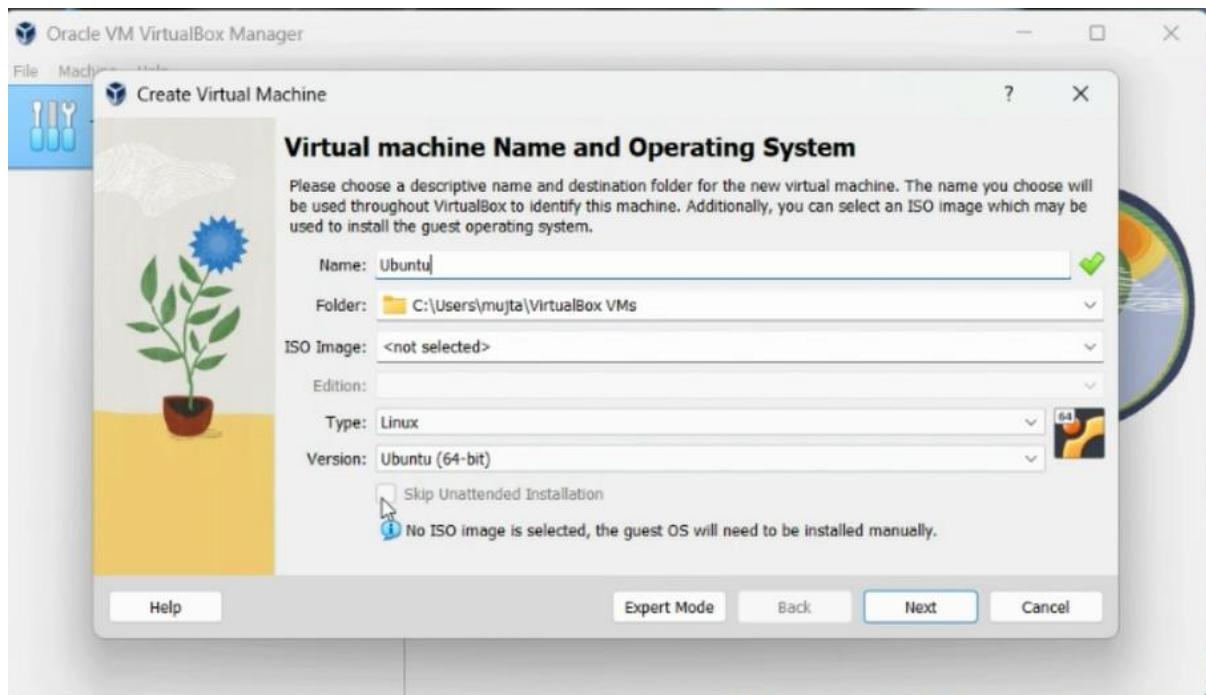


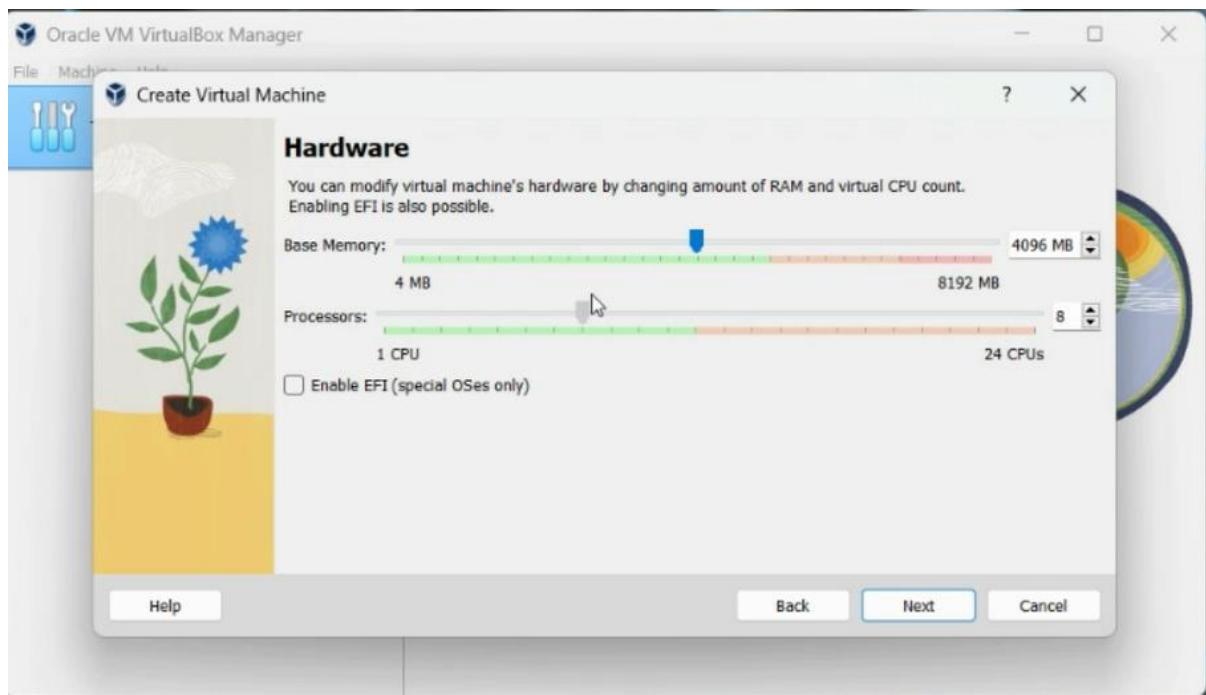


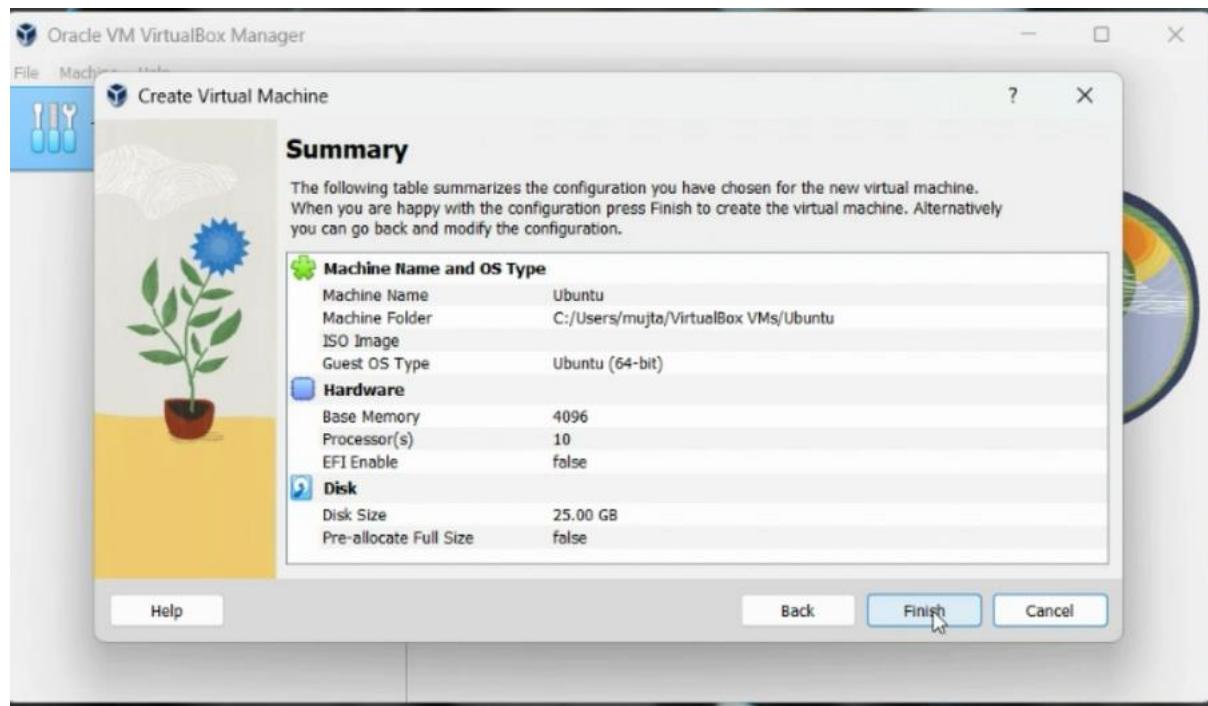


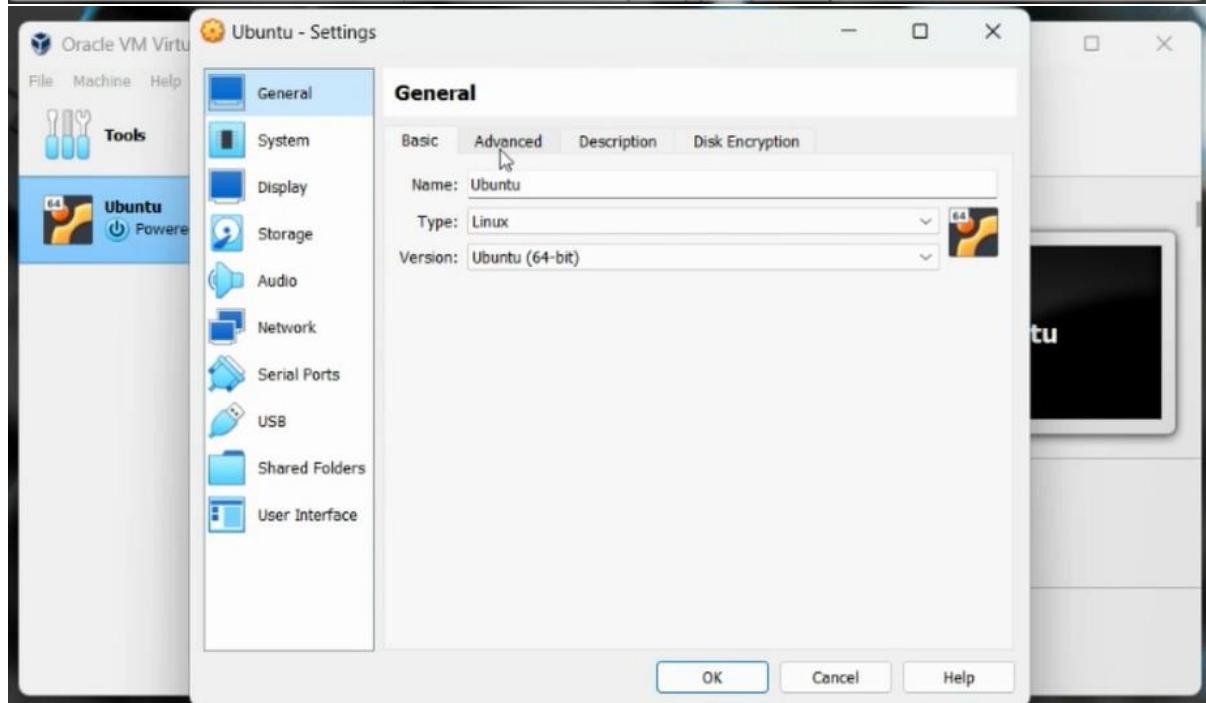


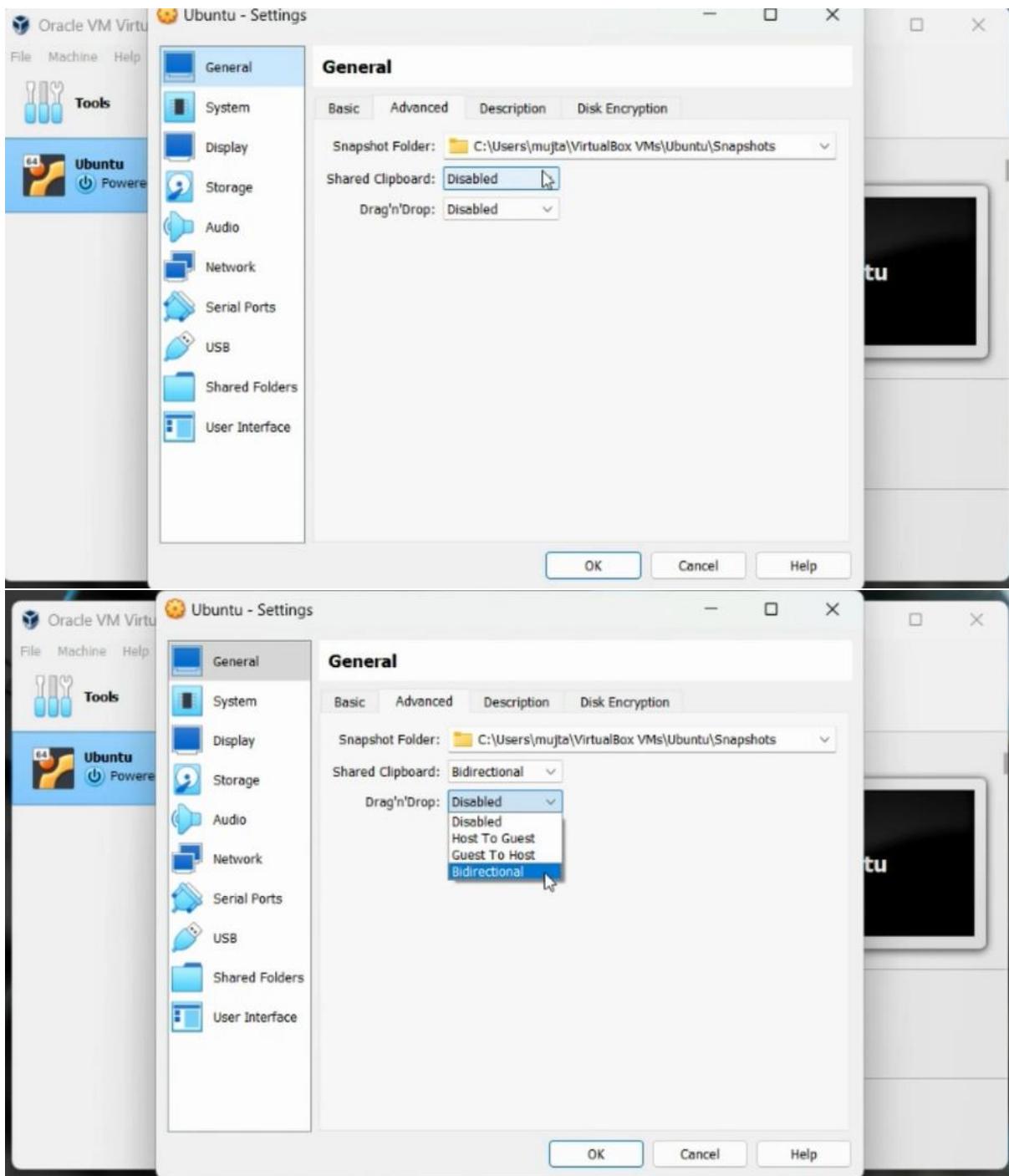


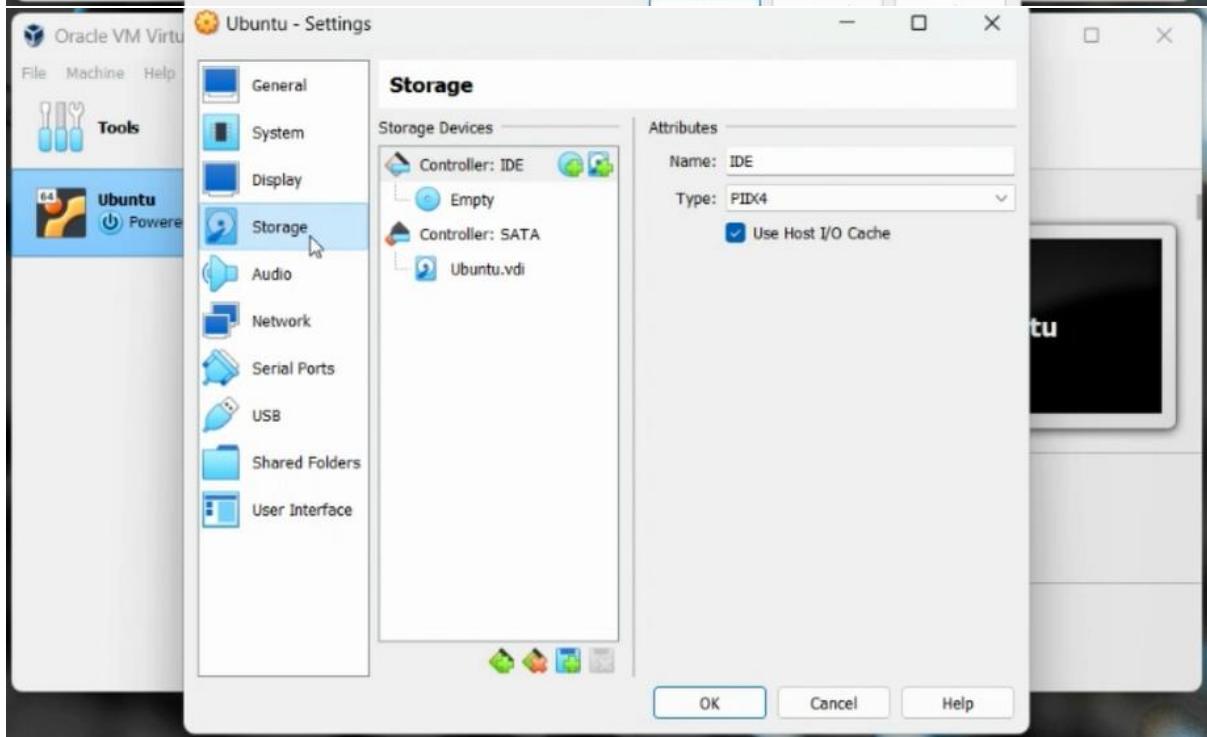
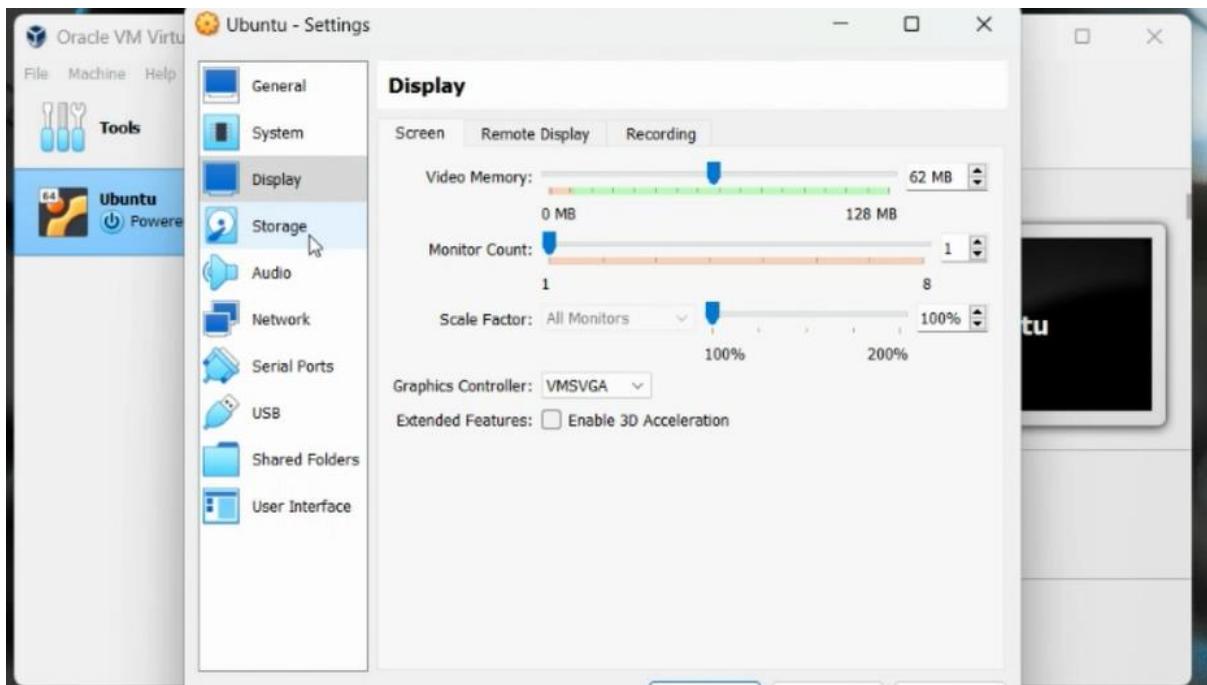


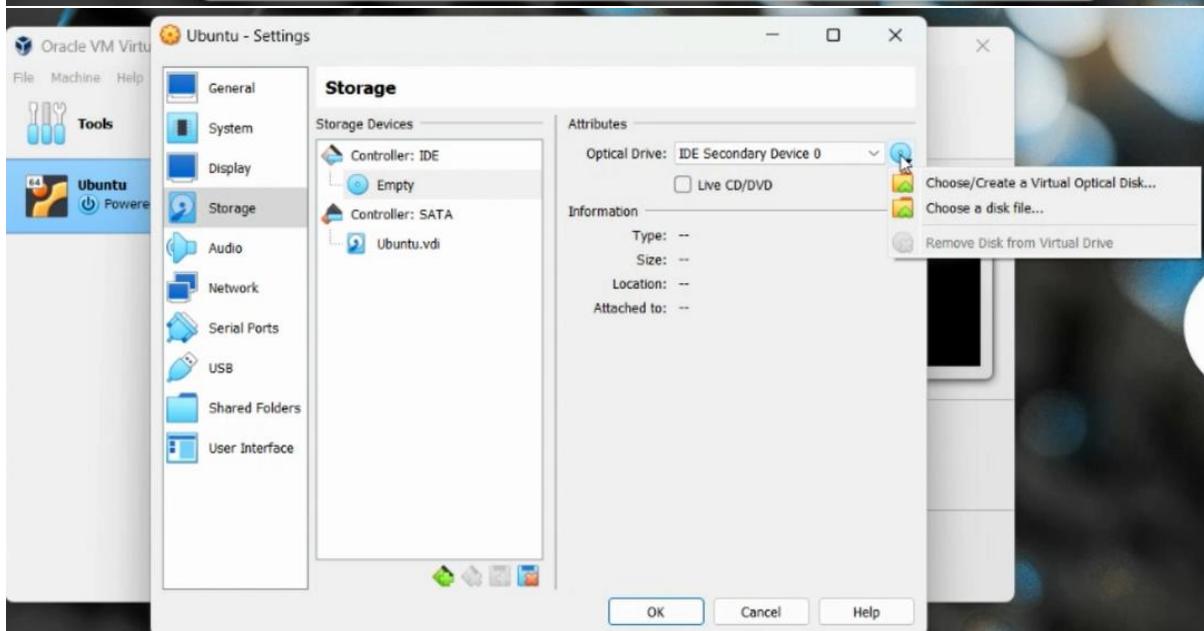
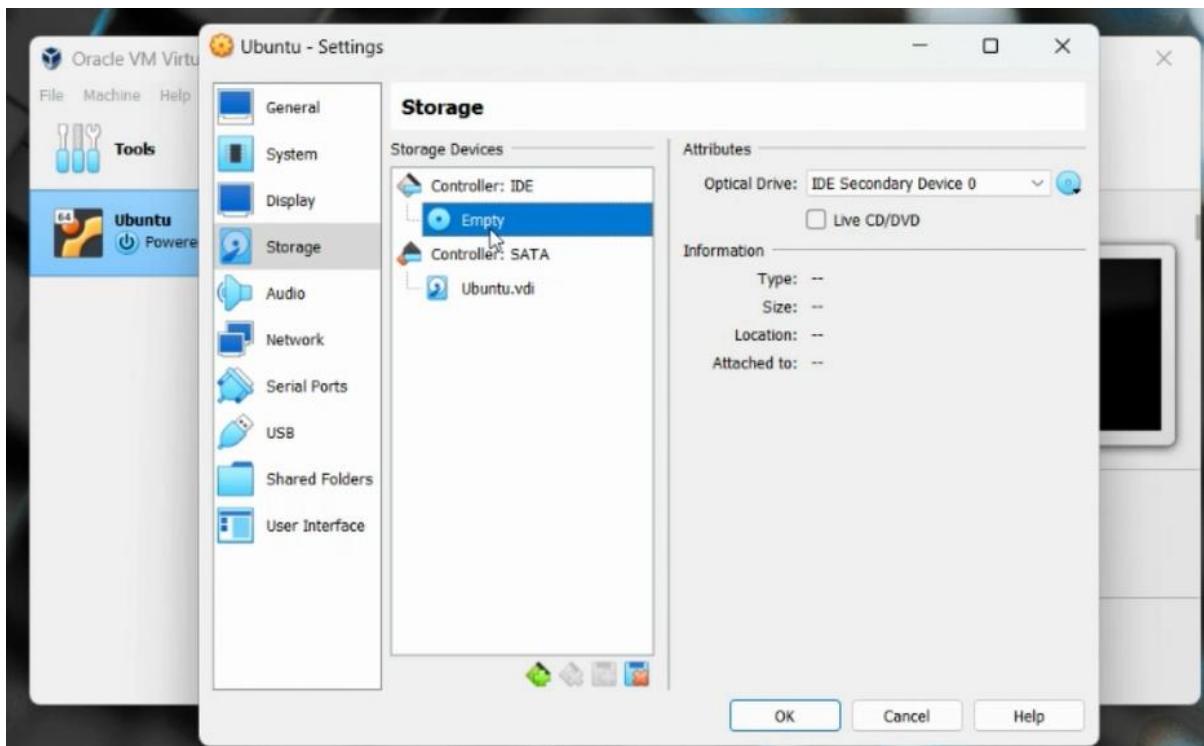




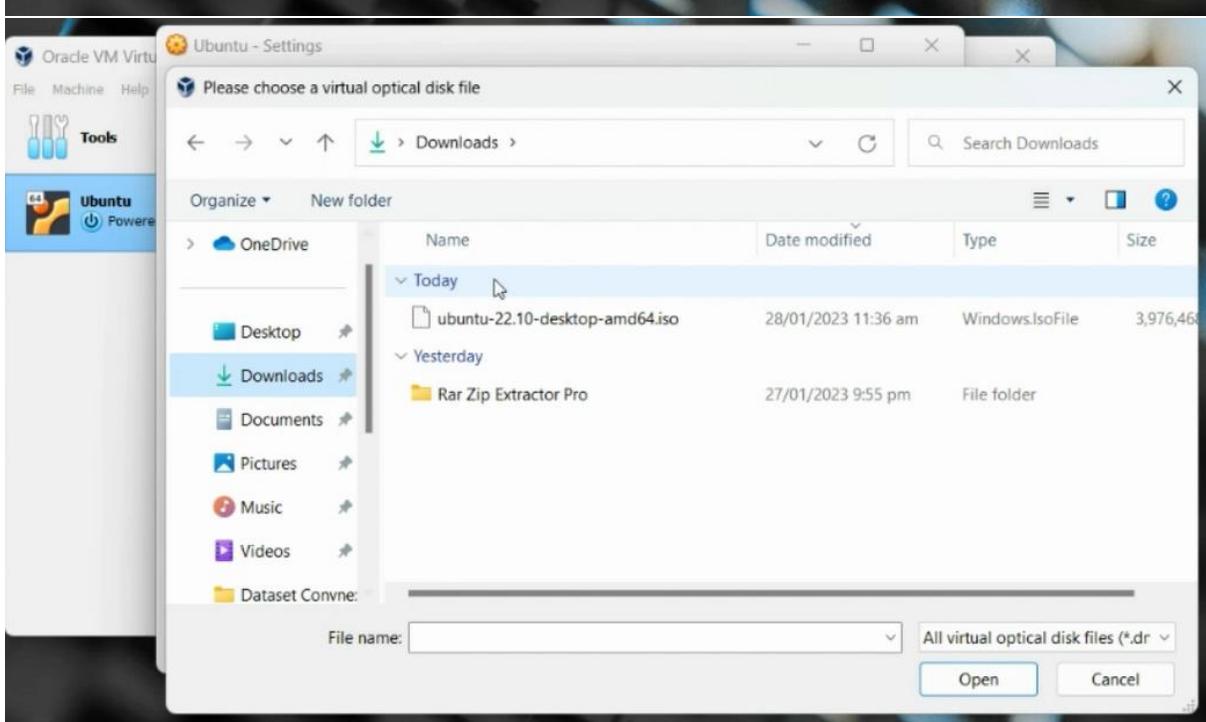
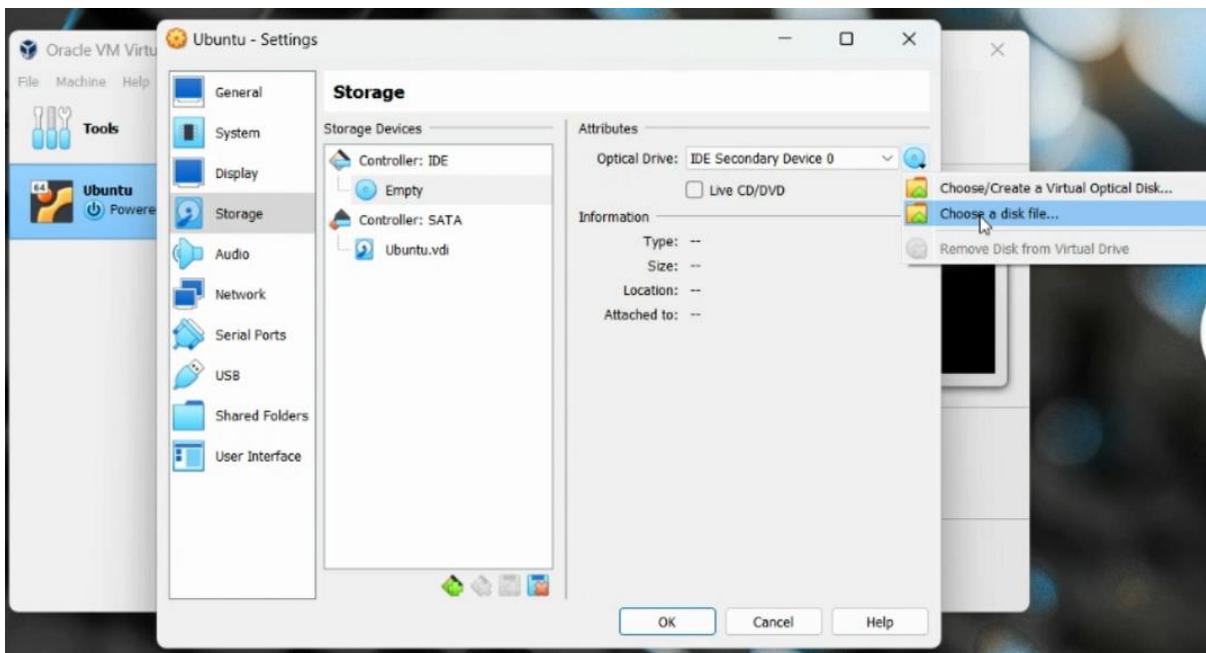


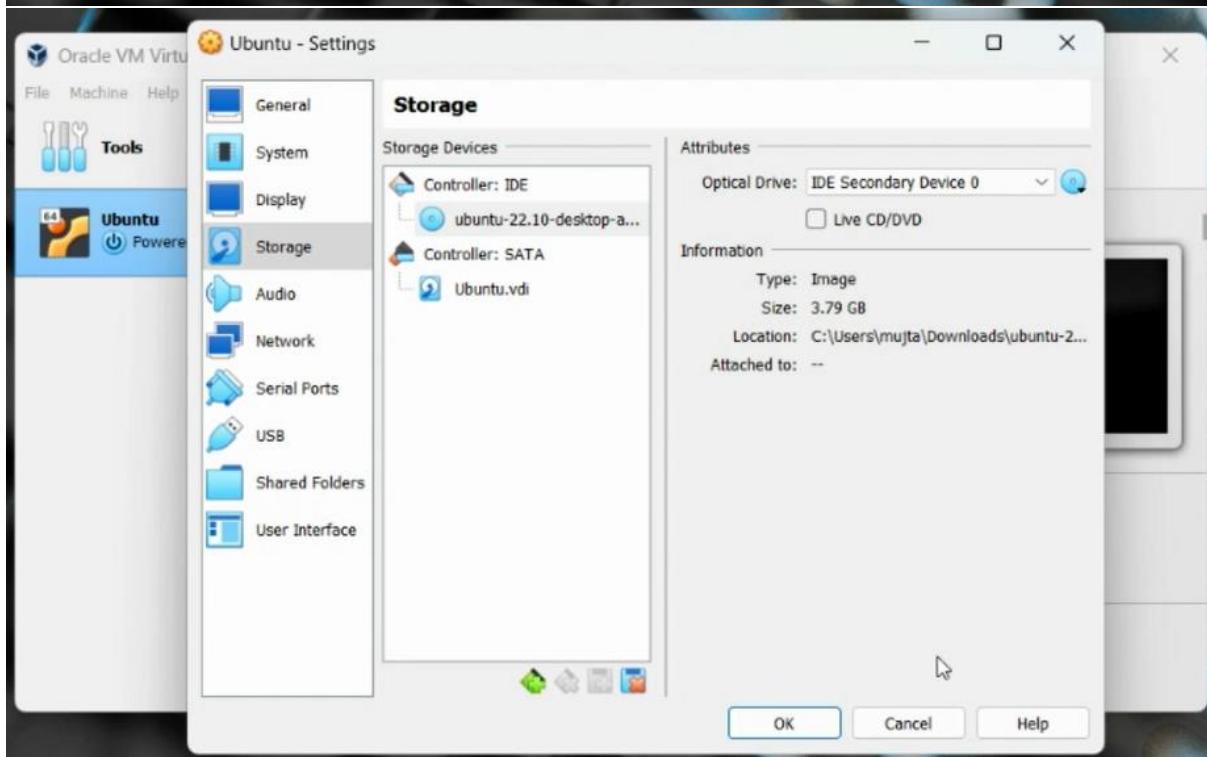
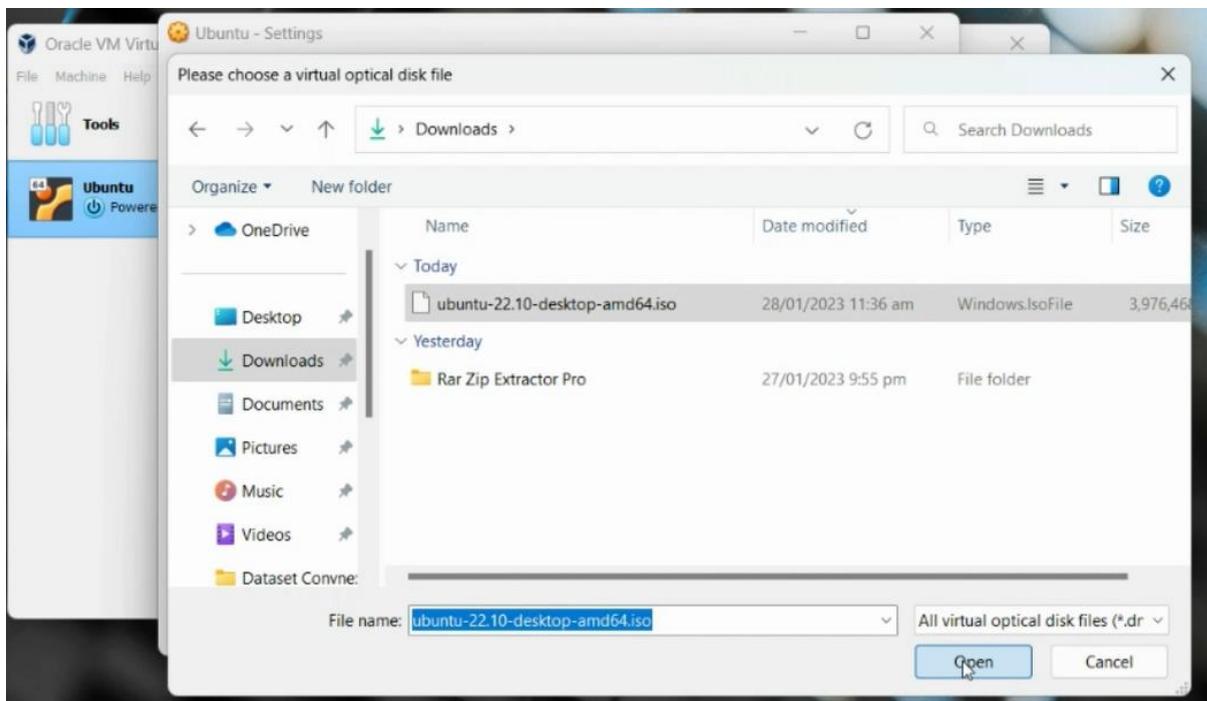


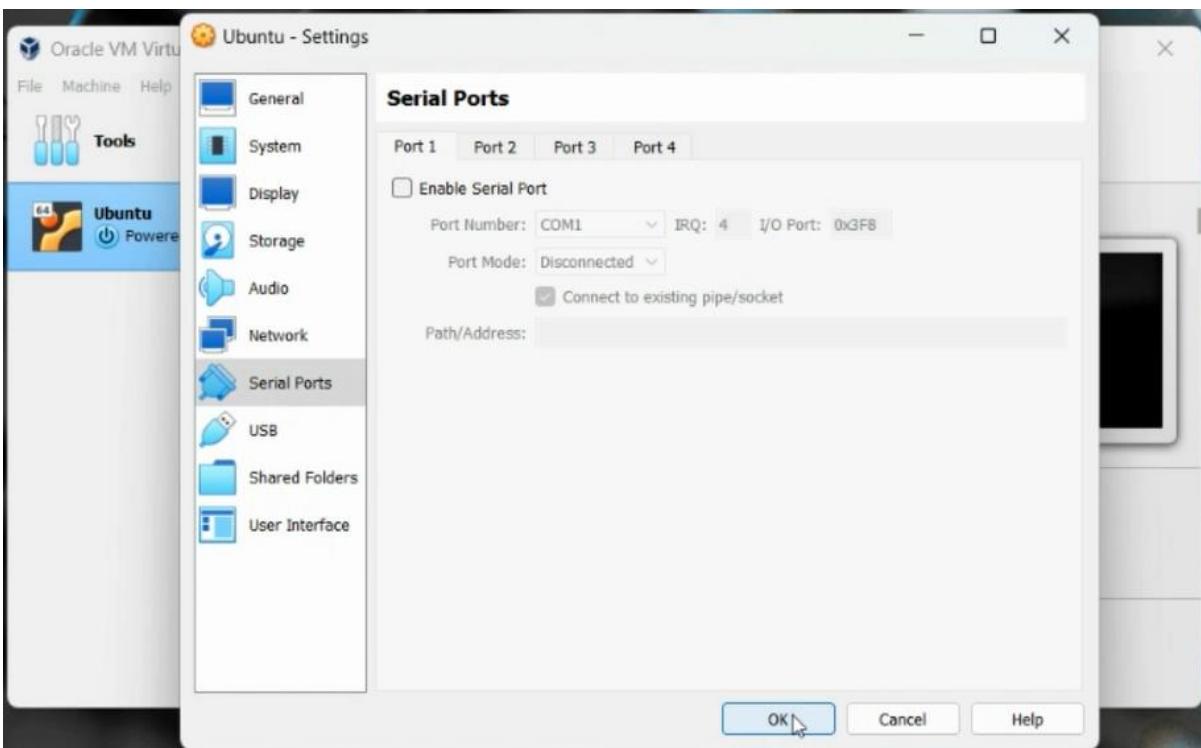


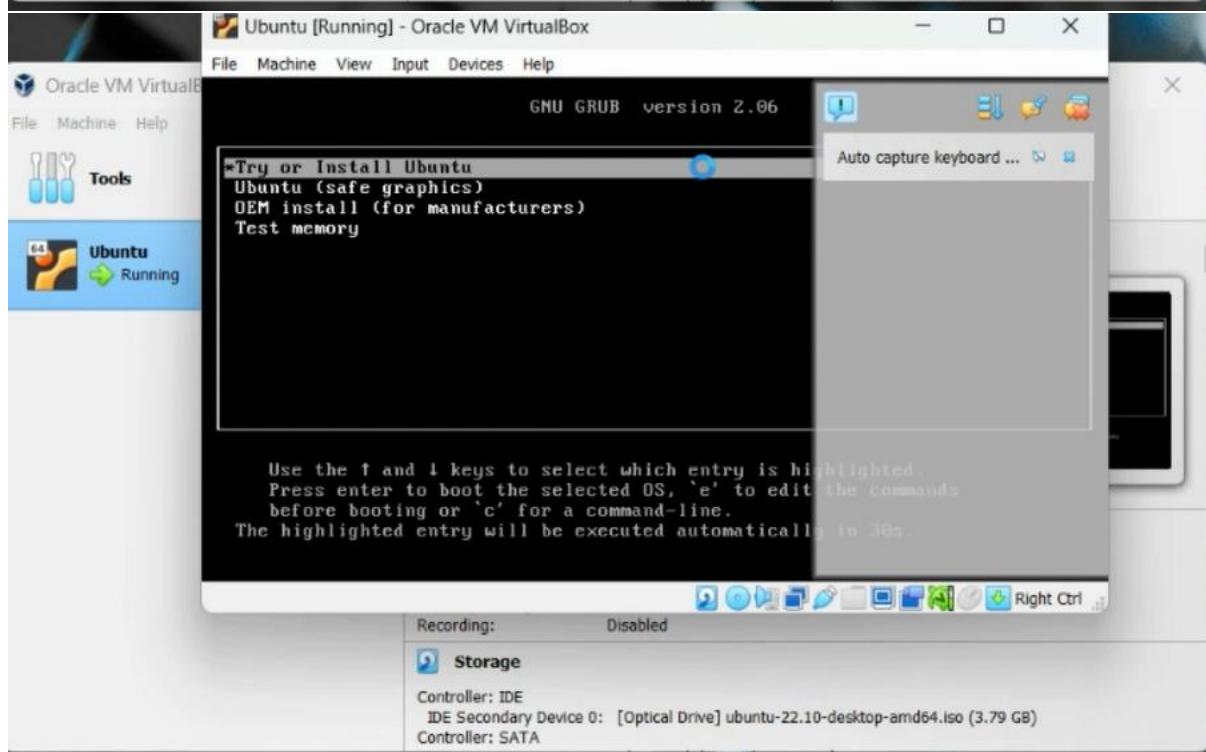


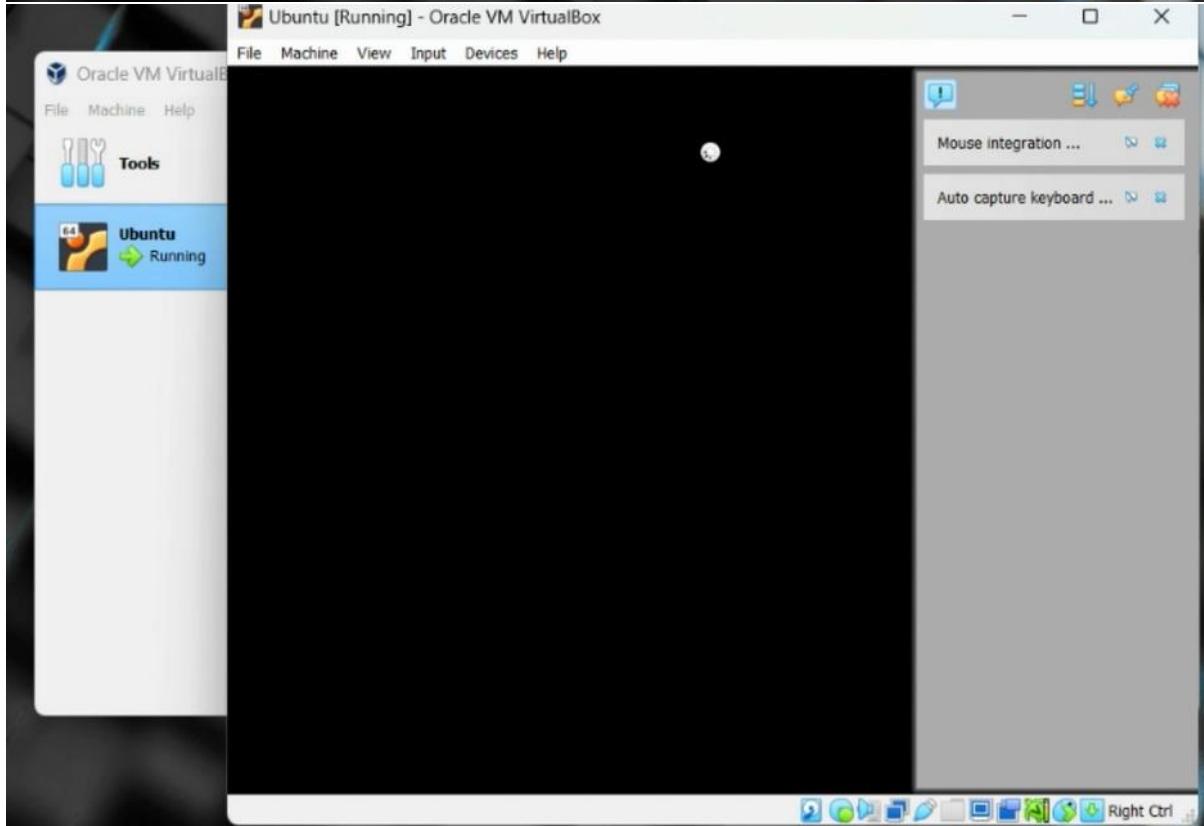
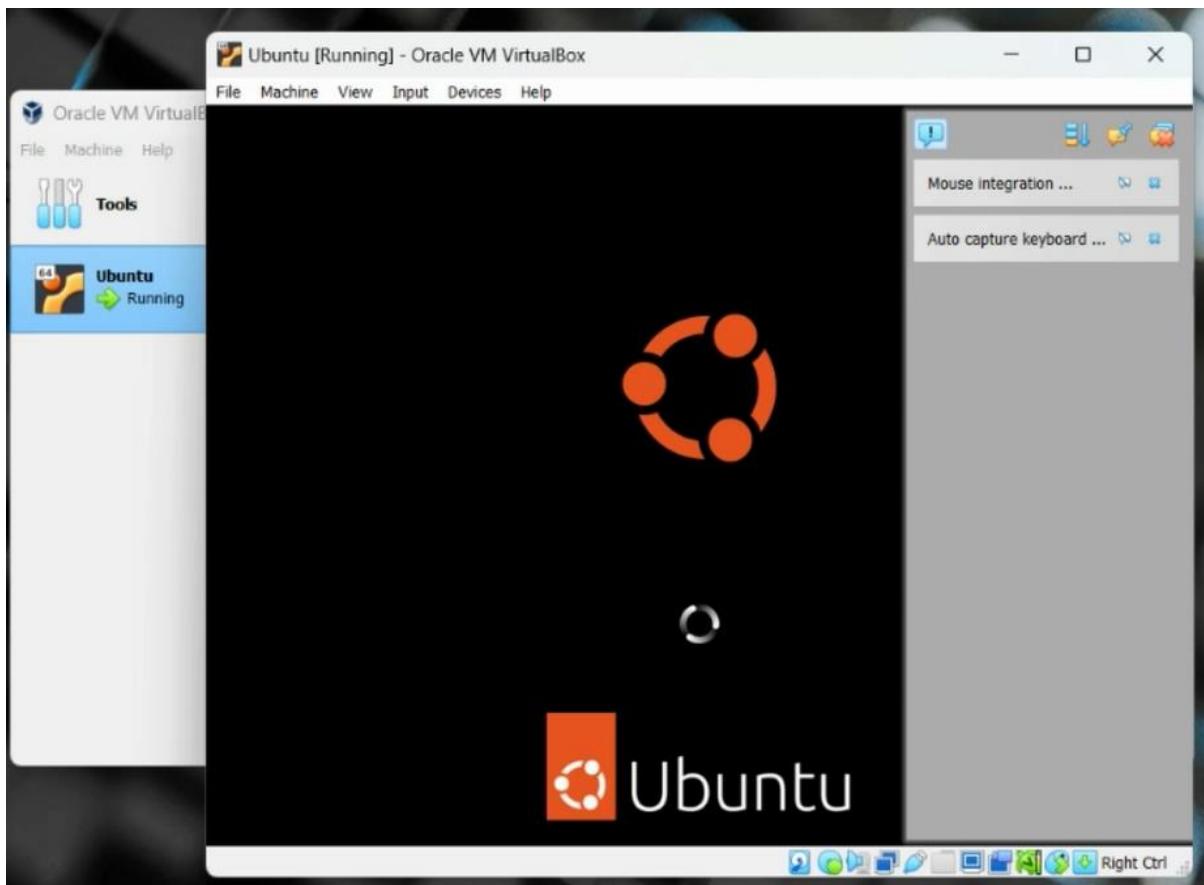
Now click browse and give path to your ubuntu iso file. After that click ok.

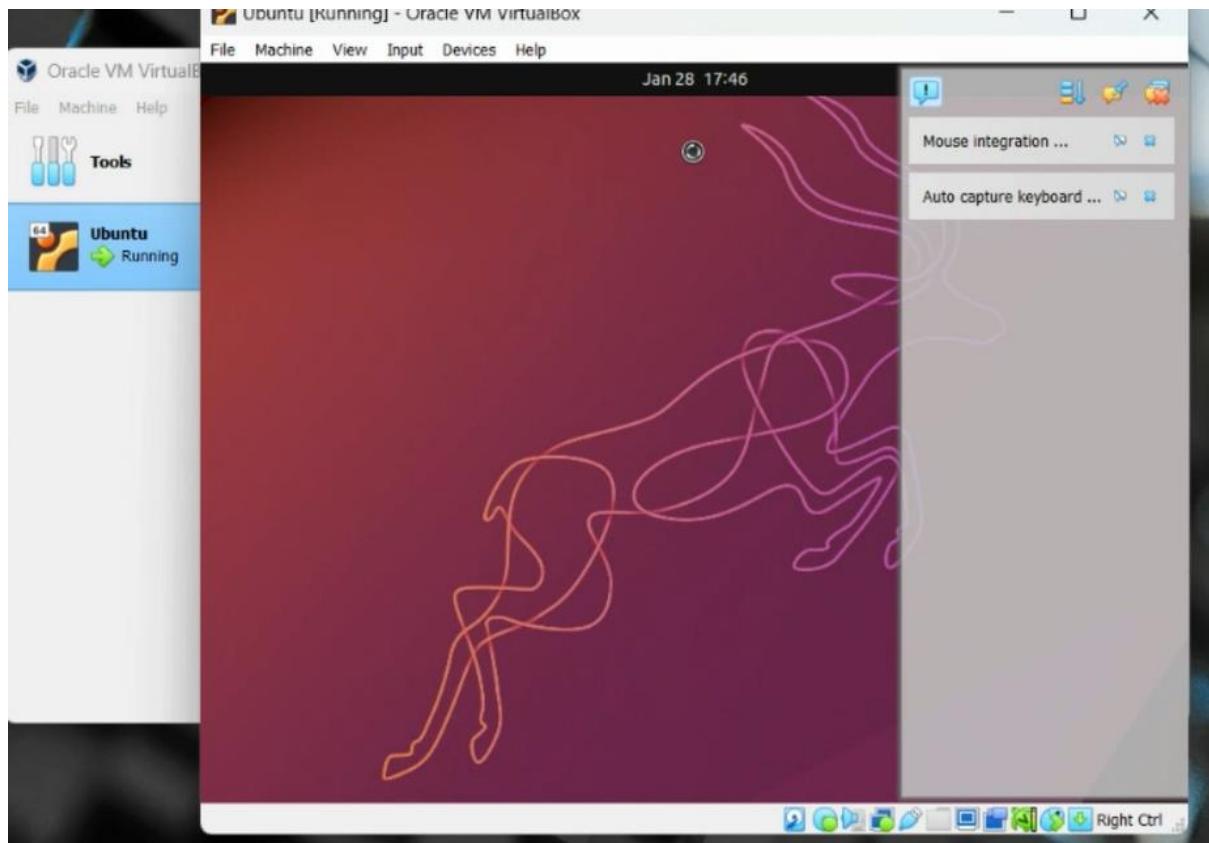












Jan 28 17:47

Install

X



Jan 28 17:47

Install

X

## Welcome

English

Español

Esperanto

Euskara

Français

Gaeilge

Galego

Hrvatski

Íslenska

Italiano

Kurdî

Latviski

Lietuviškai

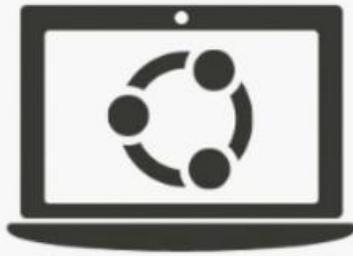
Magyar

Nederlands

No localization (UTF-8)

Norsk bokmål

Norsk nynorsk



Try Ubuntu

Install Ubuntu

You can try Ubuntu without making any changes to your computer, directly from this CD.

Or if you're ready, you can install Ubuntu alongside (or instead of) your current operating system. This shouldn't take too long.

You may wish to read the [release notes](#).

Jan 28 17:47

Install X

## Keyboard layout

Choose your keyboard layout:

DE (Germany)

- English (Australian)
- English (Cameroon)
- English (Ghana)
- English (Nigeria)
- English (South Africa)
- English (UK)
- English (US)**
- Esperanto
- Estonian
- Faroese
- Filipino
- Finnish
- French

**English (US)**

- English (US) - Cherokee
- English (US) - English (Colemak)
- English (US) - English (Colemak-DH ISO)
- English (US) - English (Colemak-DH)
- English (US) - English (Dvorak)
- English (US) - English (Dvorak, Macintosh)
- English (US) - English (Dvorak, alt. intl.)
- English (US) - English (Dvorak, intl., with dead keys)
- English (US) - English (Dvorak, left-handed)
- English (US) - English (Dvorak, right-handed)
- English (US) - English (Macintosh)
- English (US) - English (Norman)
- English (US) - English (US, Canadian)

Type here to test your keyboard

Detect Keyboard Layout

Quit

Back

Continue

Jan 28 17:47

Install



## Updates and other software

### What apps would you like to install to start with?

Normal installation

Web browser, utilities, office software, games, and media players.

Minimal installation

Web browser and basic utilities.

### Other options

Download updates while installing Ubuntu

This saves time after installation.

Install third-party software for graphics and Wi-Fi hardware and additional media formats

This software is subject to license terms included with its documentation. Some is proprietary.

Quit

Back

Continue



Jan 28 17:47

Install



## Installation type

This computer currently has no detected operating systems. What would you like to do?

- Erase disk and install Ubuntu

Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems.

Advanced features... None selected

- Something else

You can create or resize partitions yourself, or choose multiple partitions for Ubuntu.

Quit

Back

Install Now

Jan 28 17:48

Install

Where are you?



Karachi

Back

Continue

Jan 28 22:49

Install

## Who are you?

Your name:  

Your computer's name:  

The name it uses when it talks to other computers.

Pick a username:  

Choose a password:  

Confirm your password:

Log in automatically

Require my password to log in

Use Active Directory

You'll enter domain and other details in the next step.

[Back](#)

[Continue](#)

Jan 28 22:49

Install

## Who are you?

Your name:  ✓

Your computer's name:  ✓

The name it uses when it talks to other computers.

Pick a username:  ✓

Choose a password:  ⓘ Fair password

Confirm your password:  ✓

Log in automatically

Require my password to log in

Use Active Directory

You'll enter domain and other details in the next step.

Back

Continue

Jan 28 22:49

Install

> Copying files...

Skip

Jan 28 23:06

Install

## Help and support

The official documentation covers many of the most common areas about Ubuntu. It's available both [online](#) and via the Help icon in the Dock.

At [Ask Ubuntu](#) you can ask questions and search an impressive collection of already answered questions. Support in your own language may be provided by your [Local Community Team](#).

For pointers to other useful resources, please visit [Community support](#) or [Commercial support](#).



› Copying installation logs...

Skip

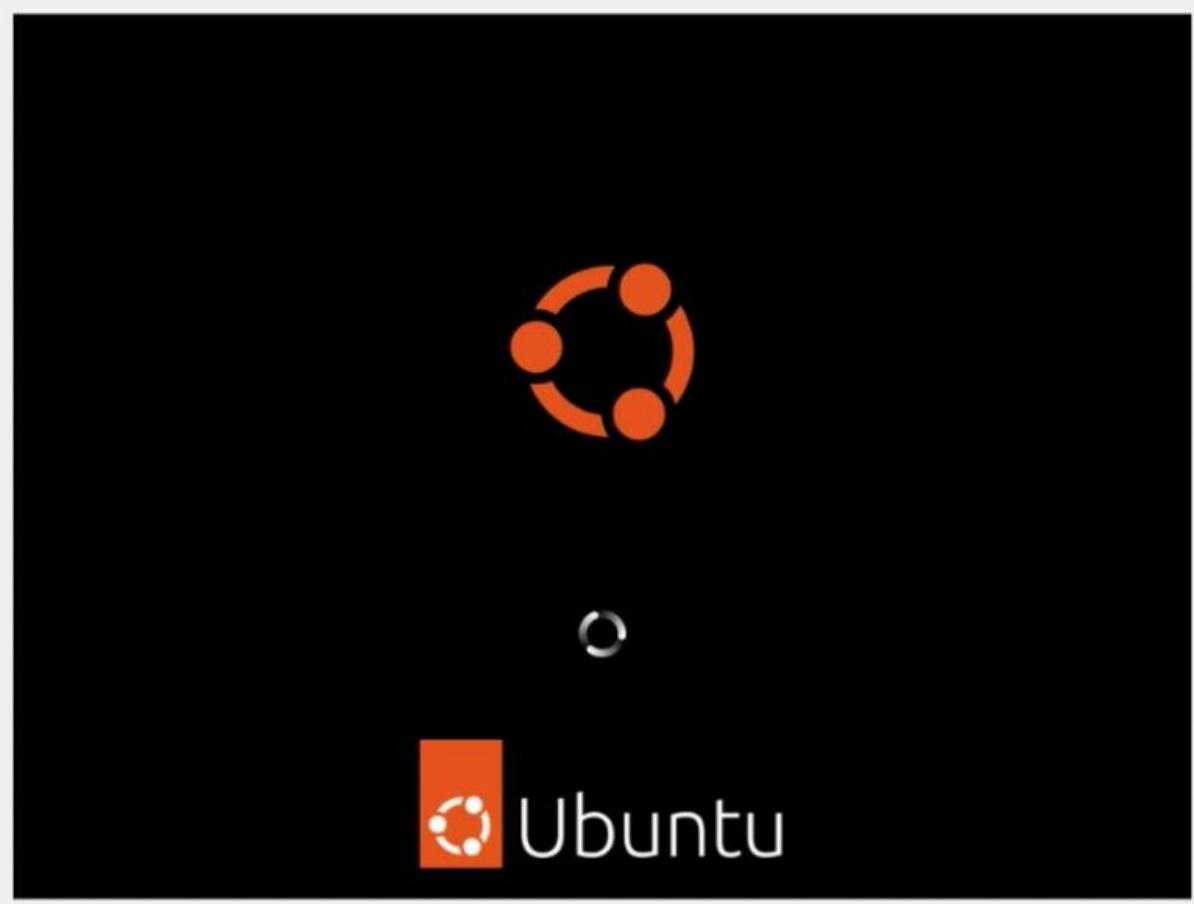
Jan 28 23:07

Installation Complete



Installation is complete. You need to restart the computer  
in order to use the new installation.

[Restart Now](#)



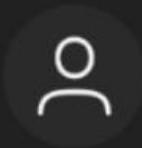
جنوری 28 23:09



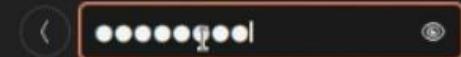
Not listed?

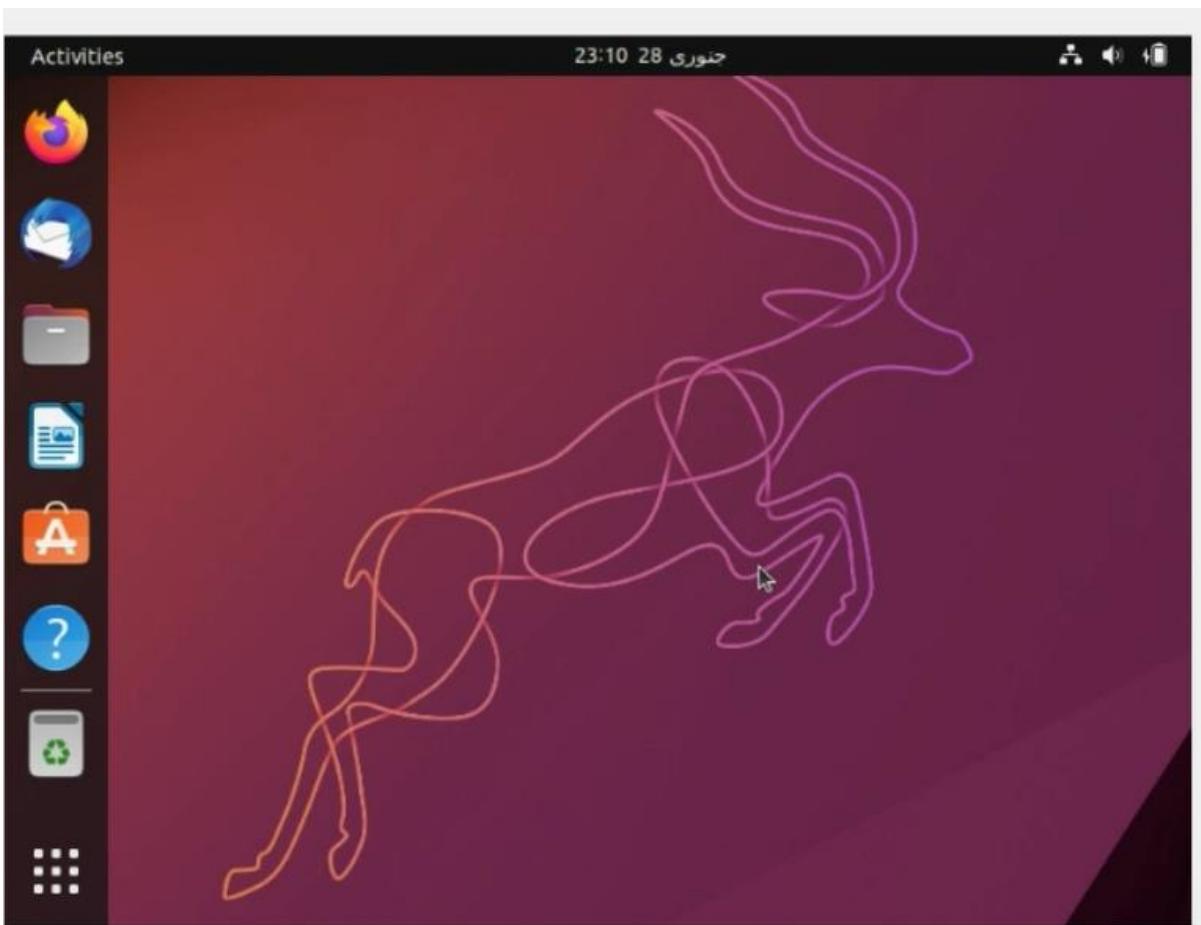


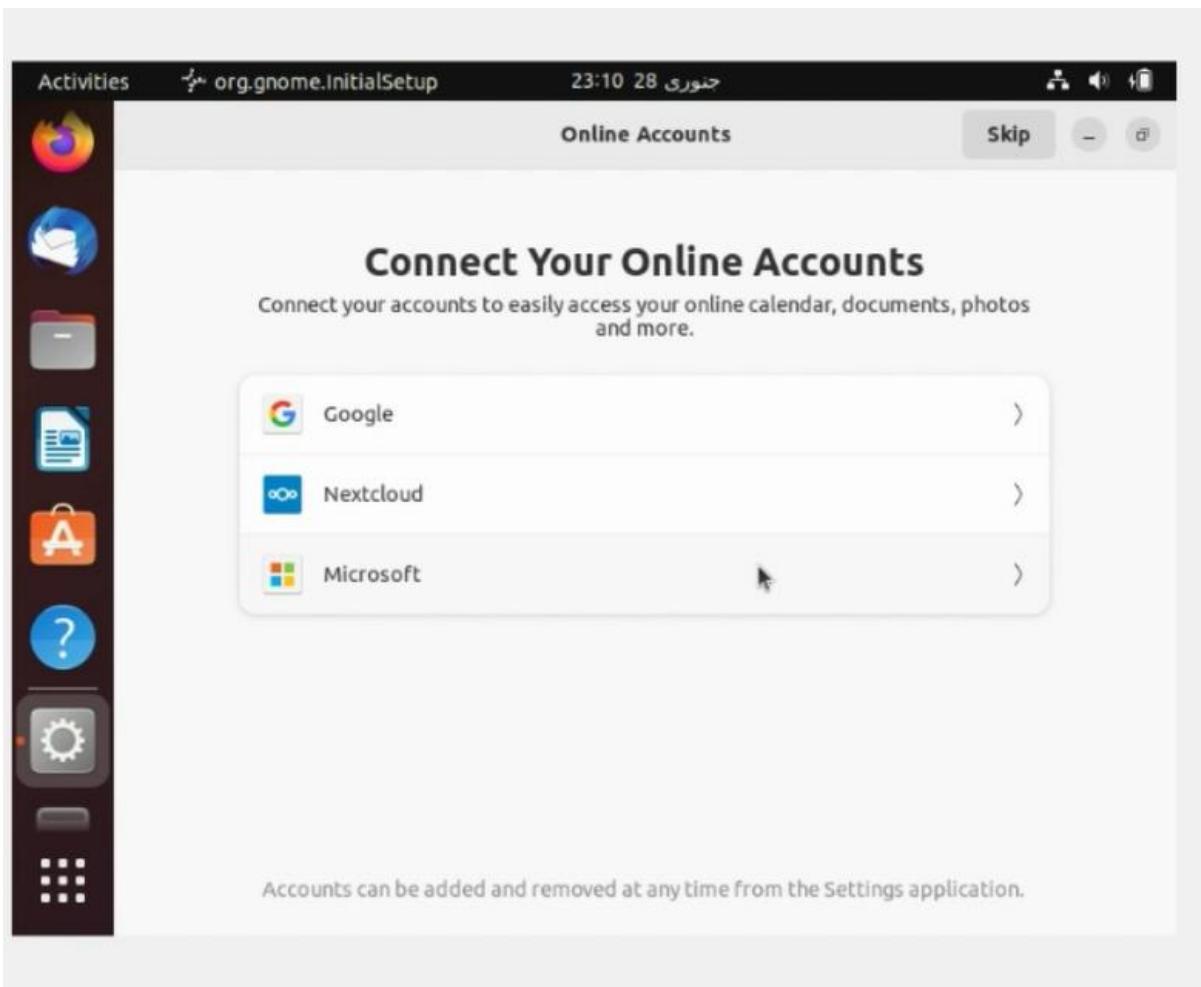
23:10 28 جنوری

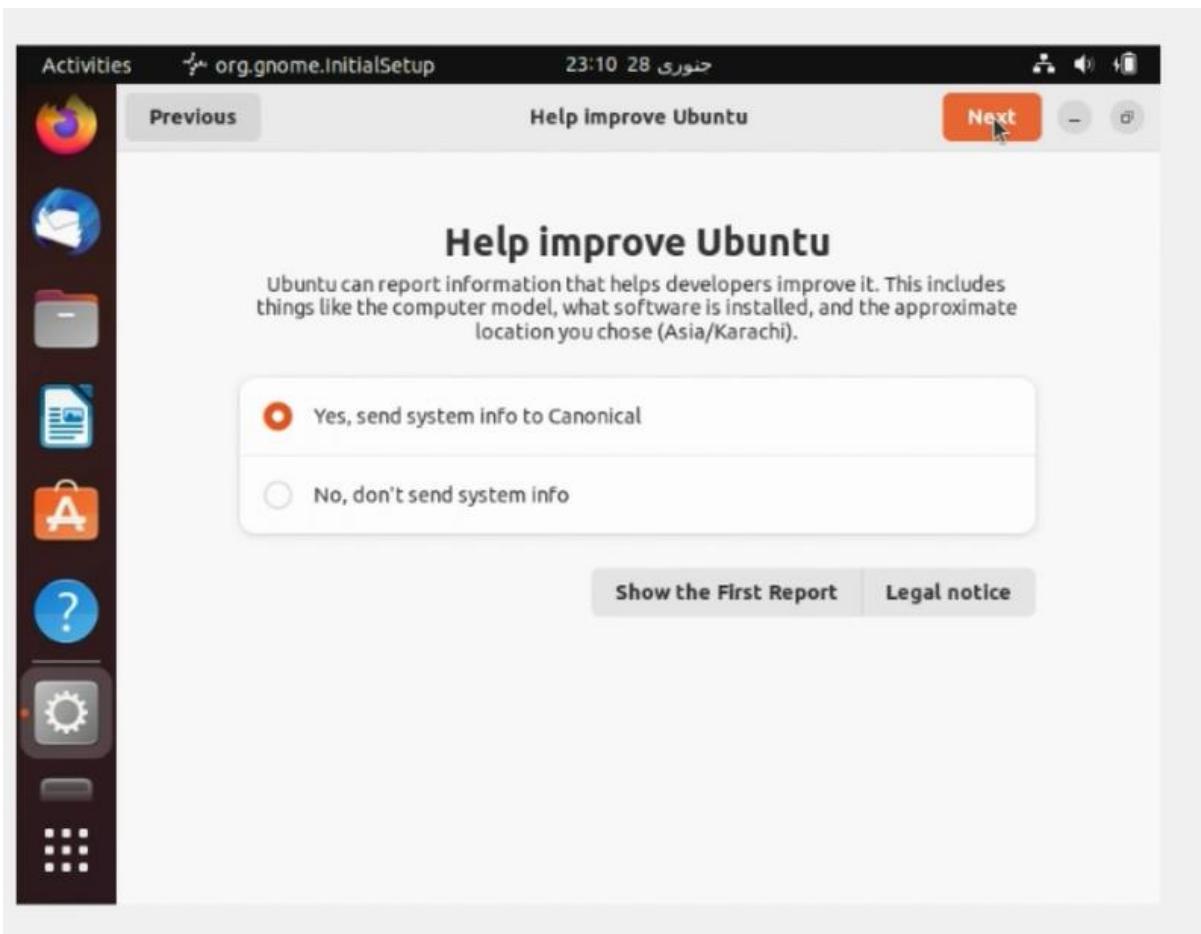


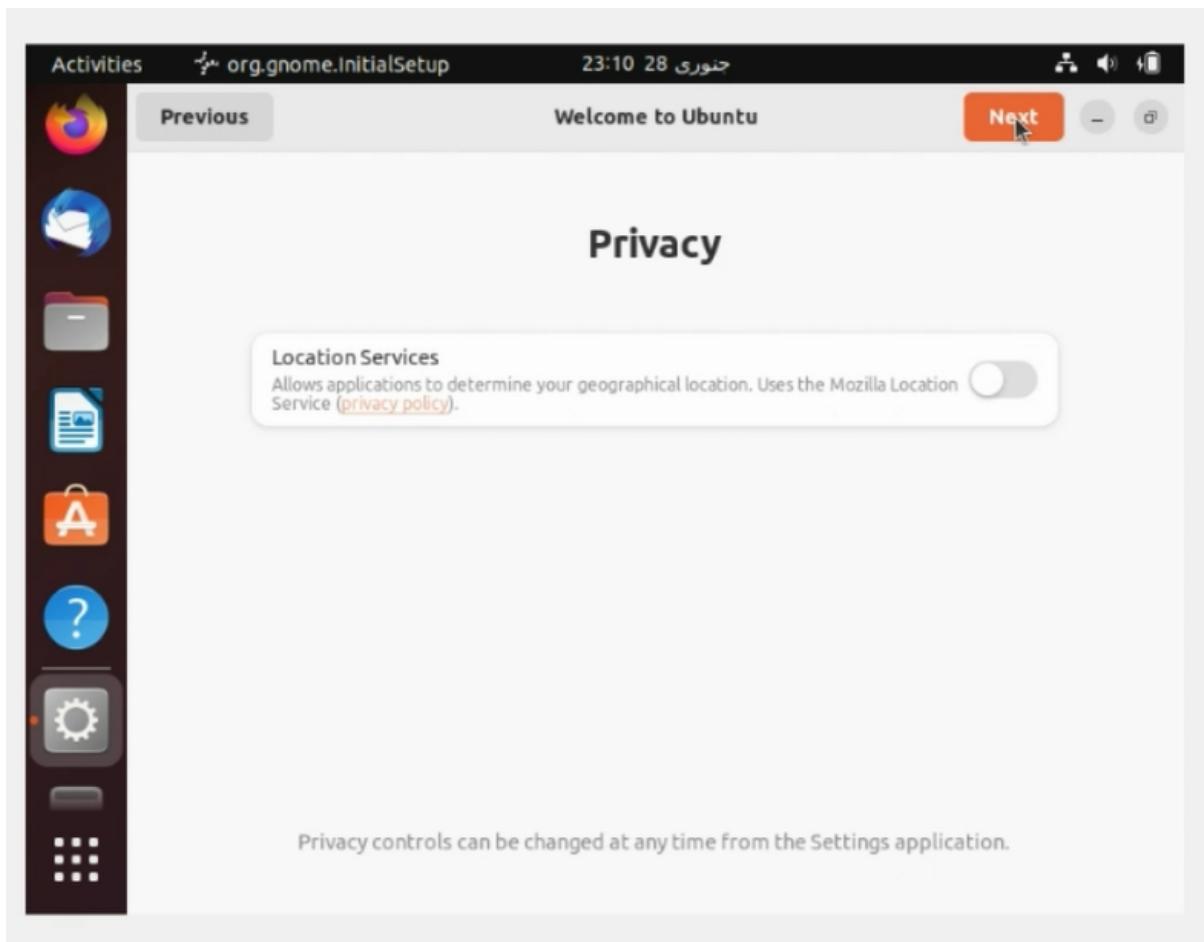
Mujtaba

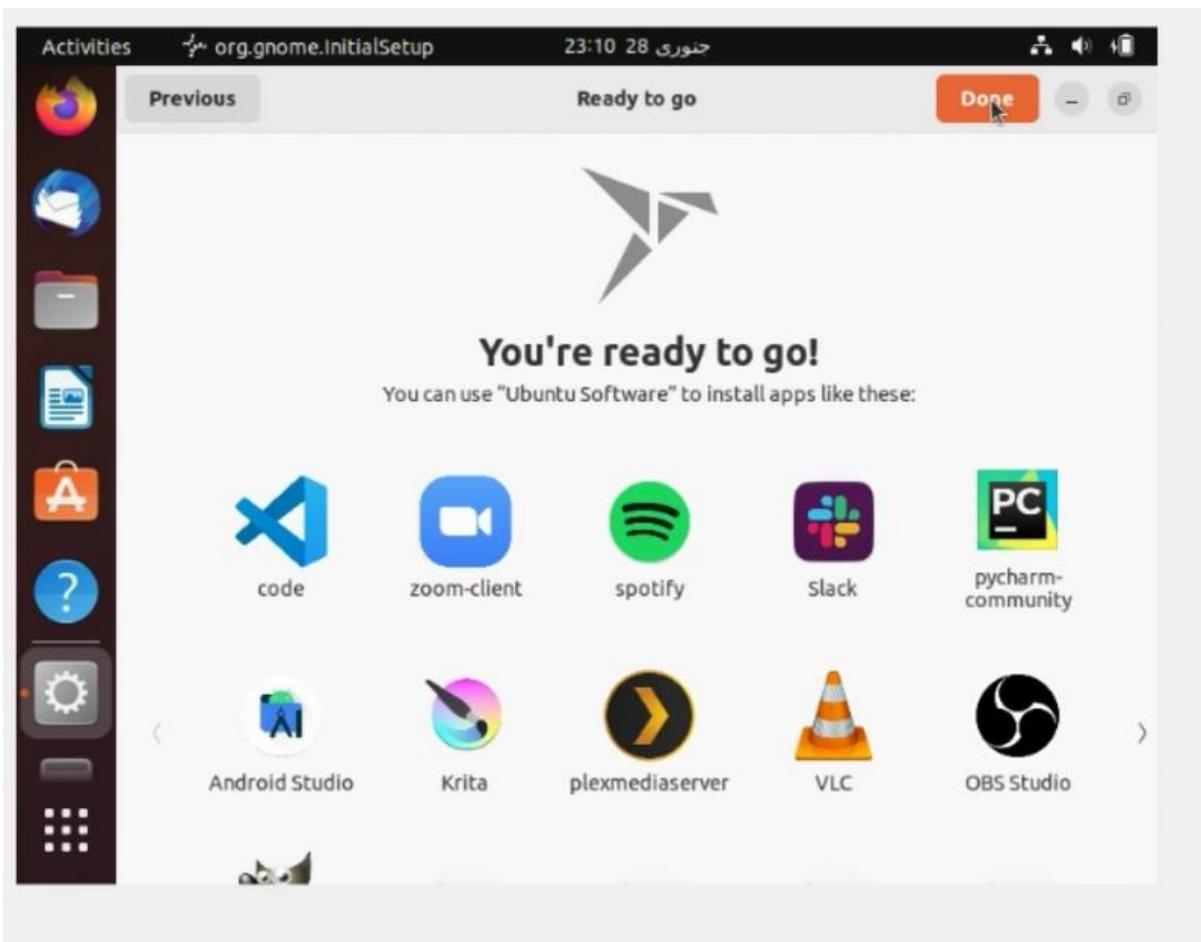


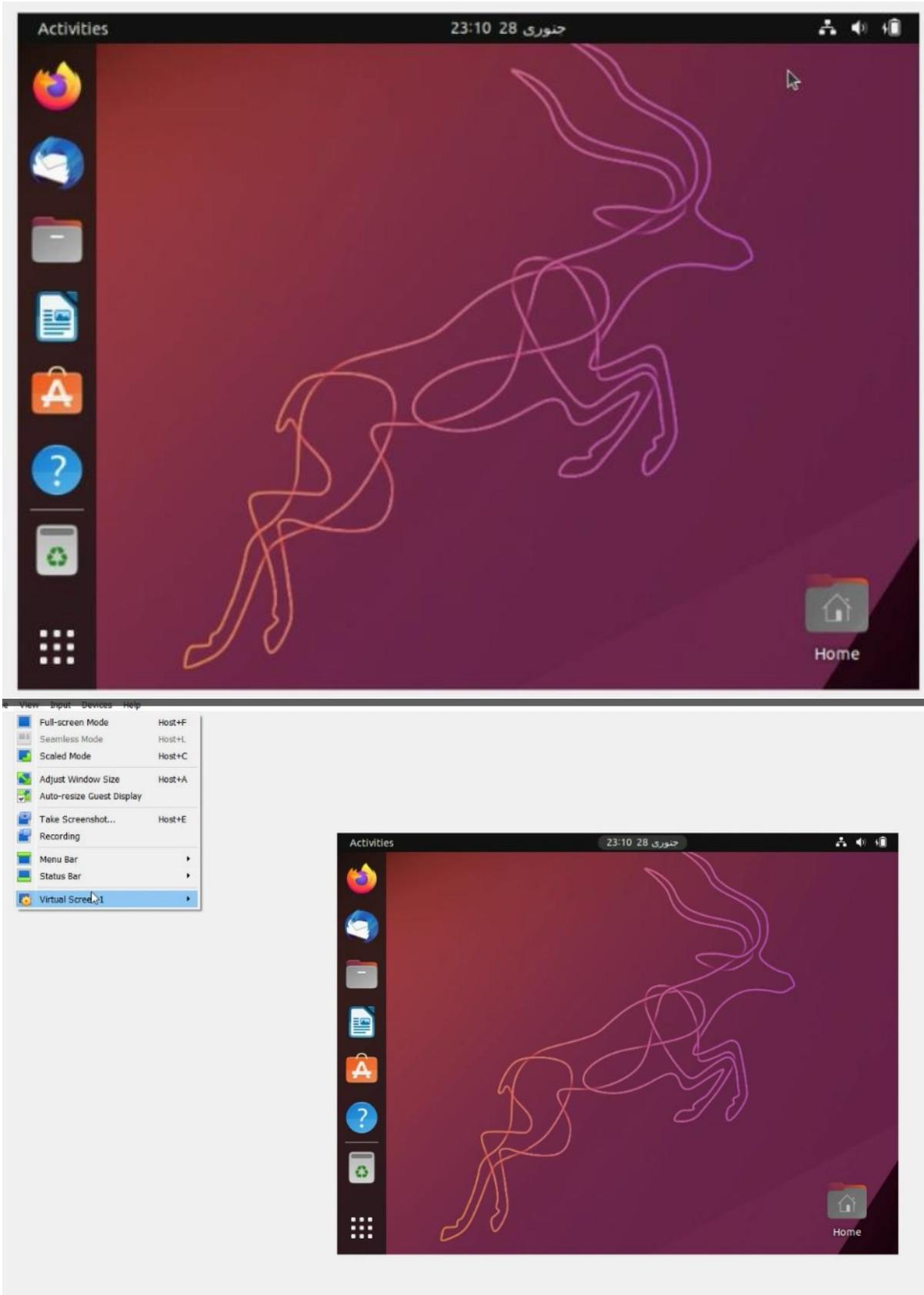


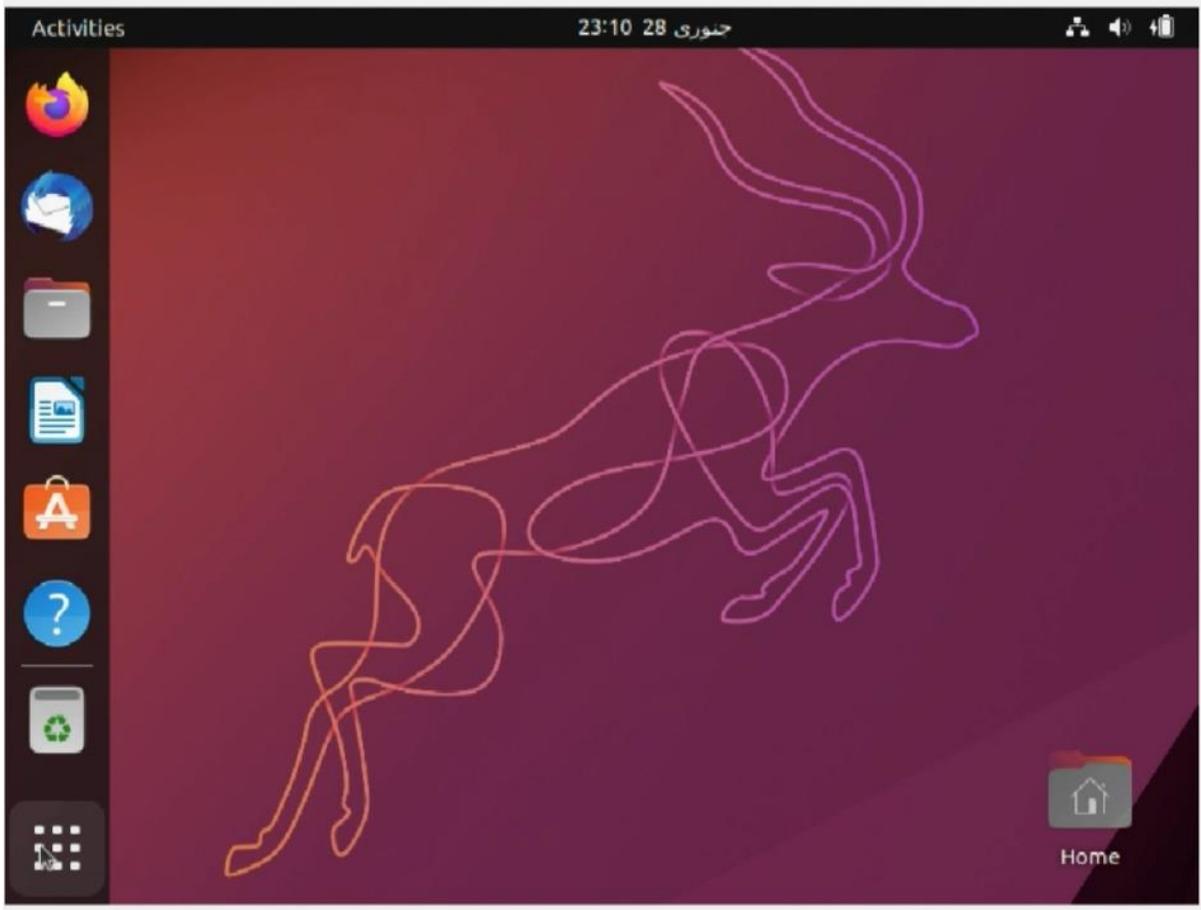
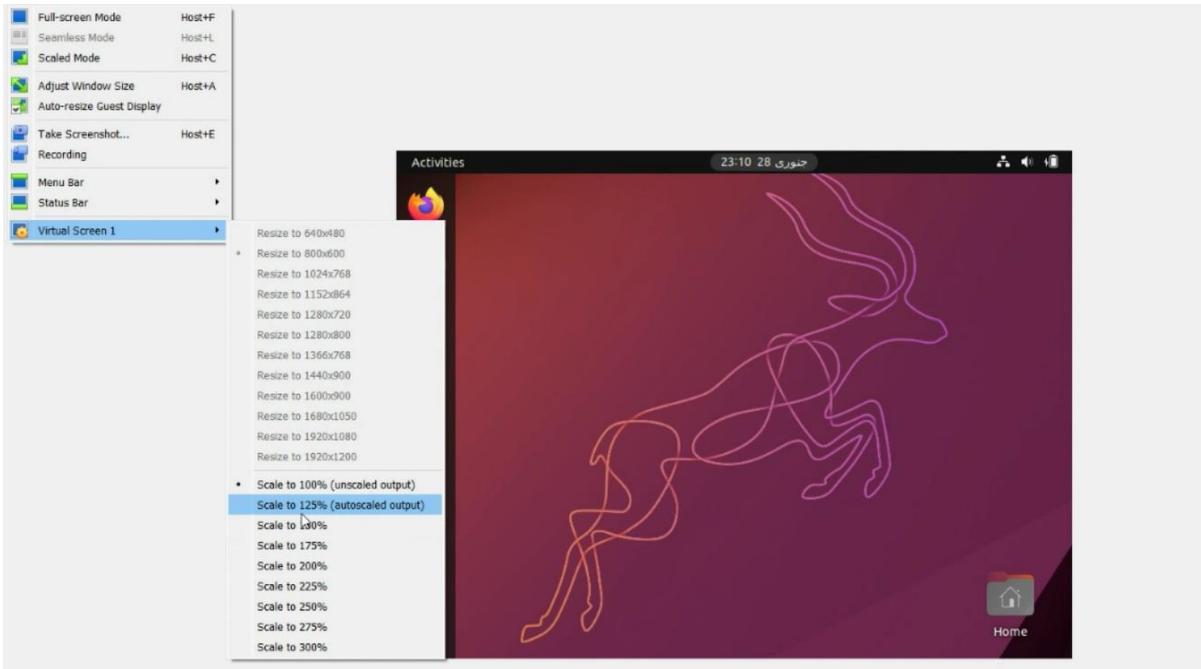


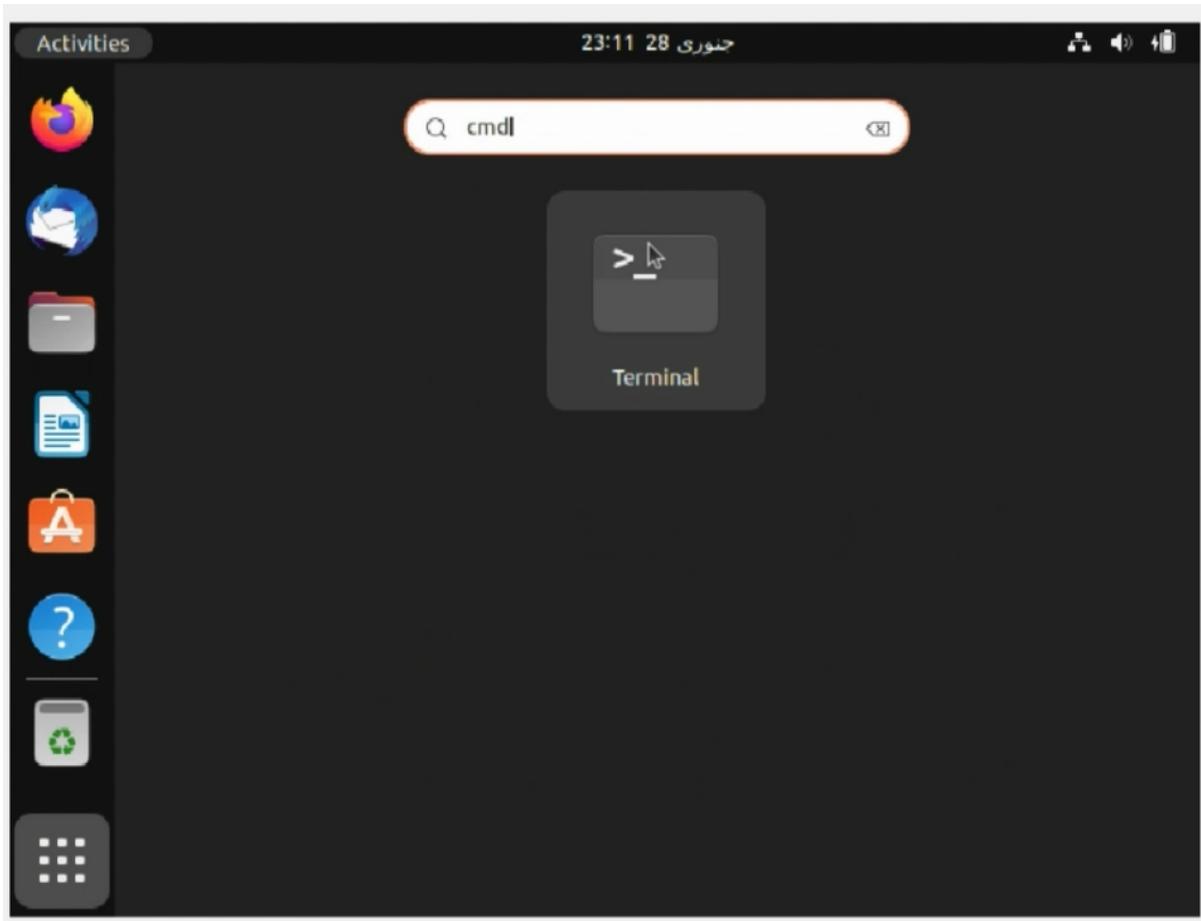


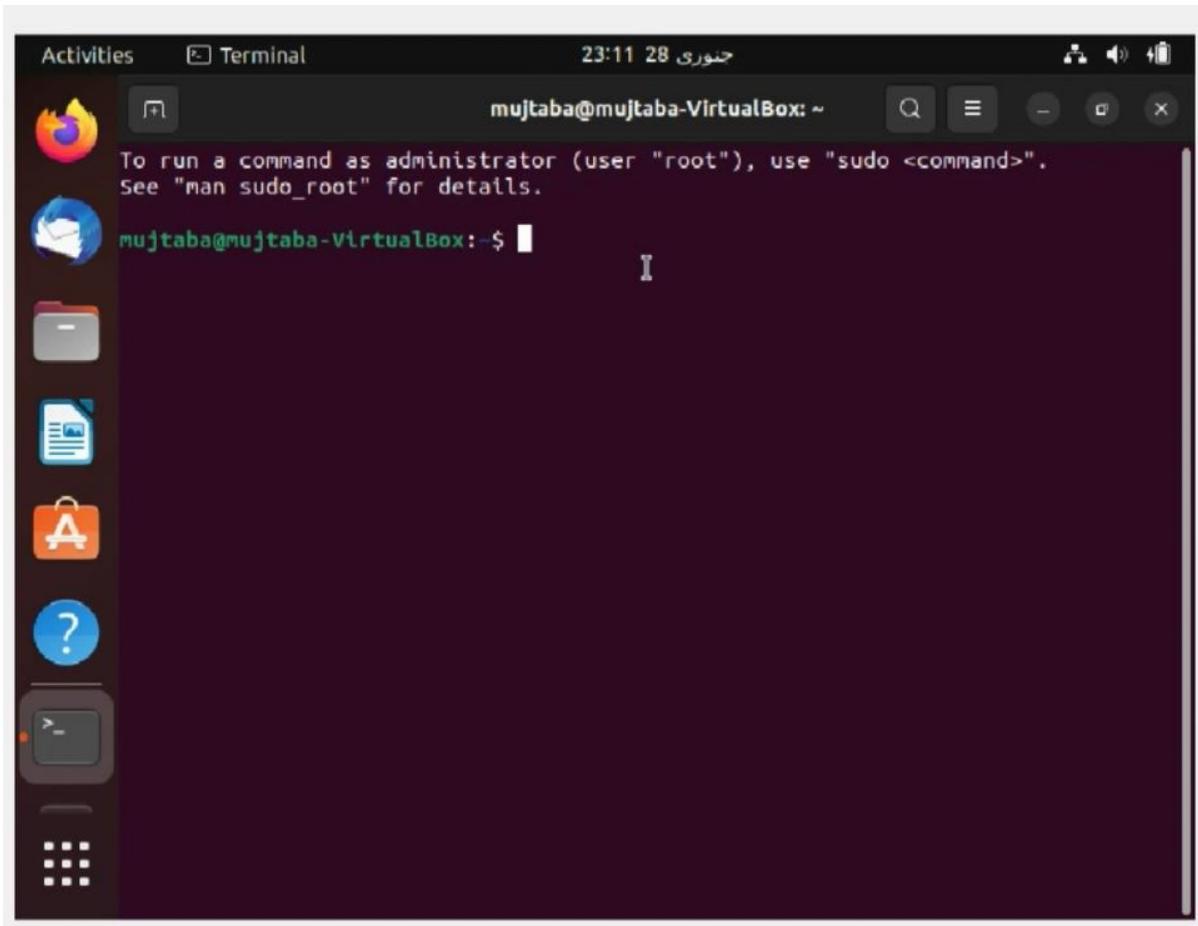












#### VMware workstation:

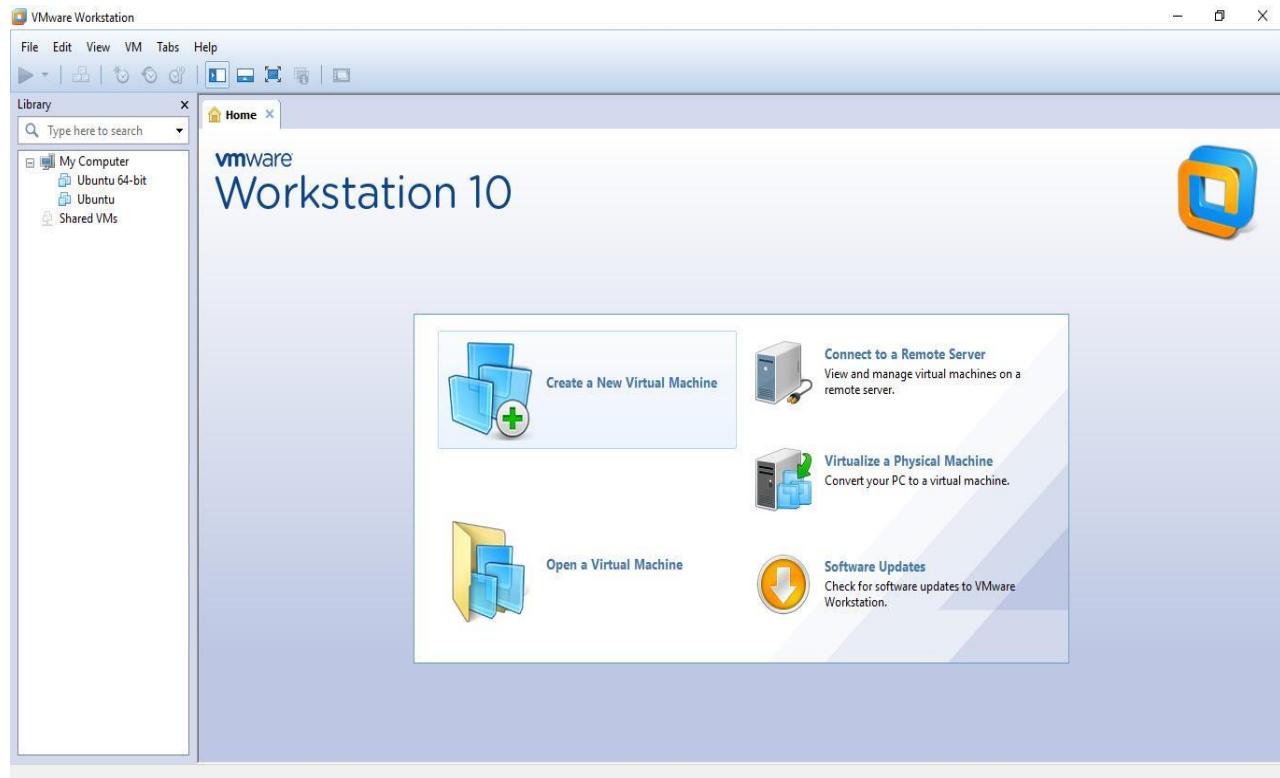
You can use the below mentioned links to install WMware.

<https://www.youtube.com/watch?v=9QXXyG0hKtI>

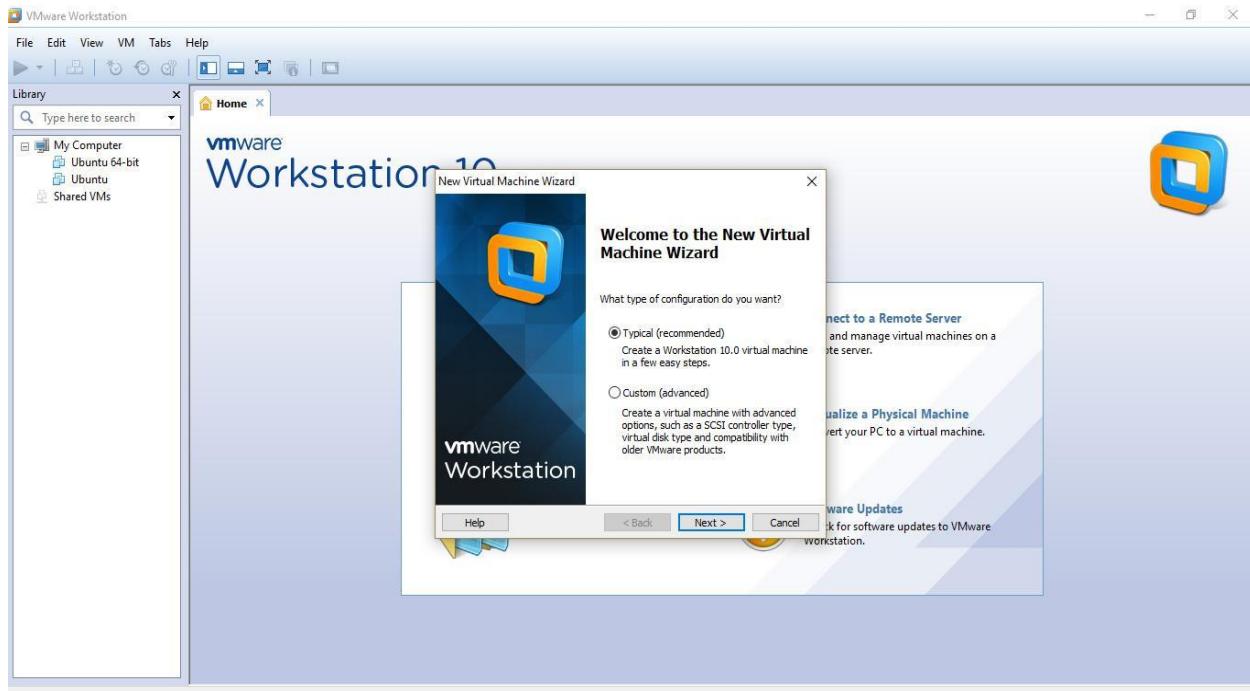
After installing VMware install Ubuntu

<https://www.youtube.com/watch?v=9QXXyG0hKtI>

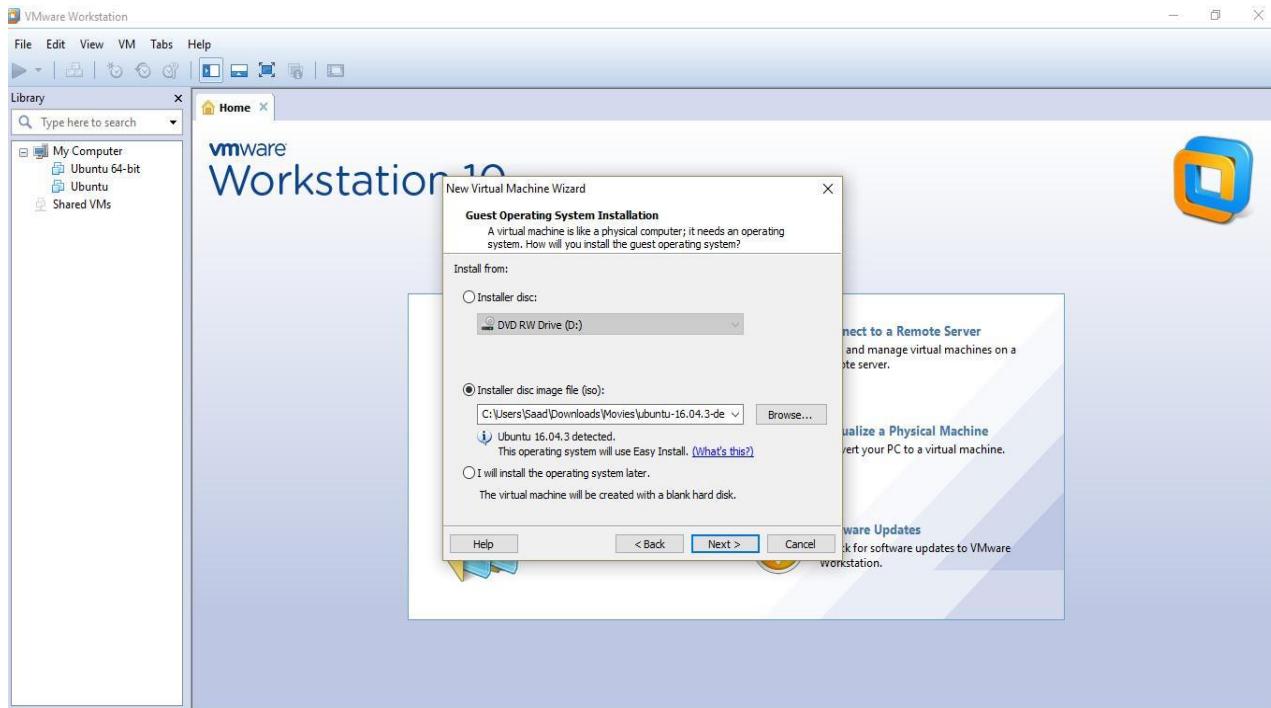
Open Vmware and select “Create a New Virtual Machine”.



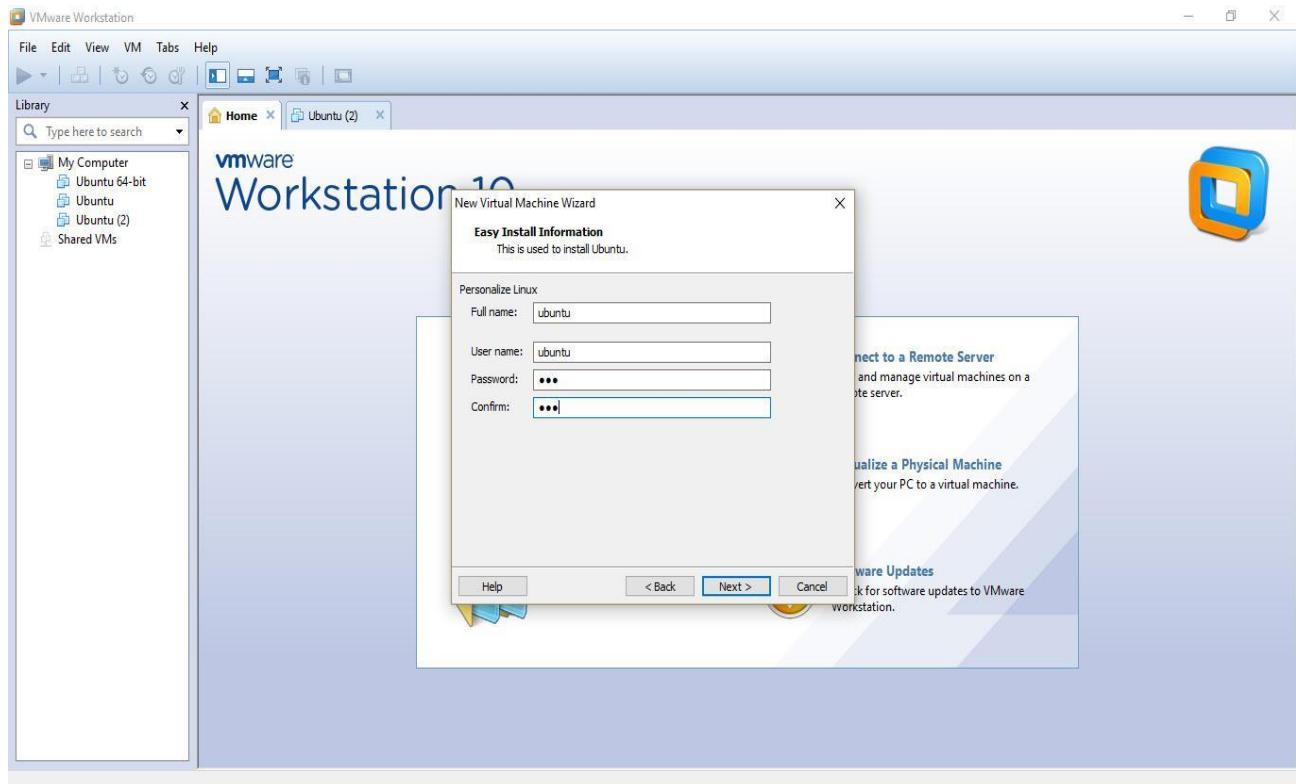
Click Next



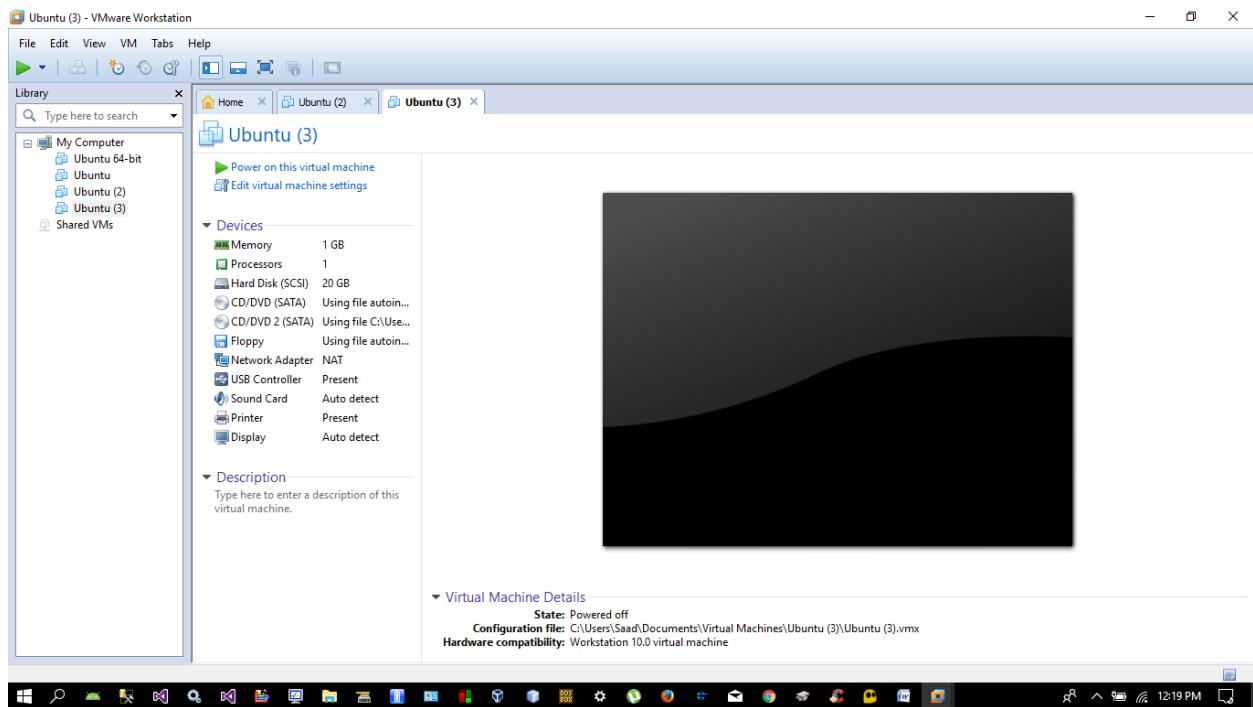
Now click browse and give path to your ubuntu iso file. After that click next.



Now enter a new username and password for ubuntu, and click next.

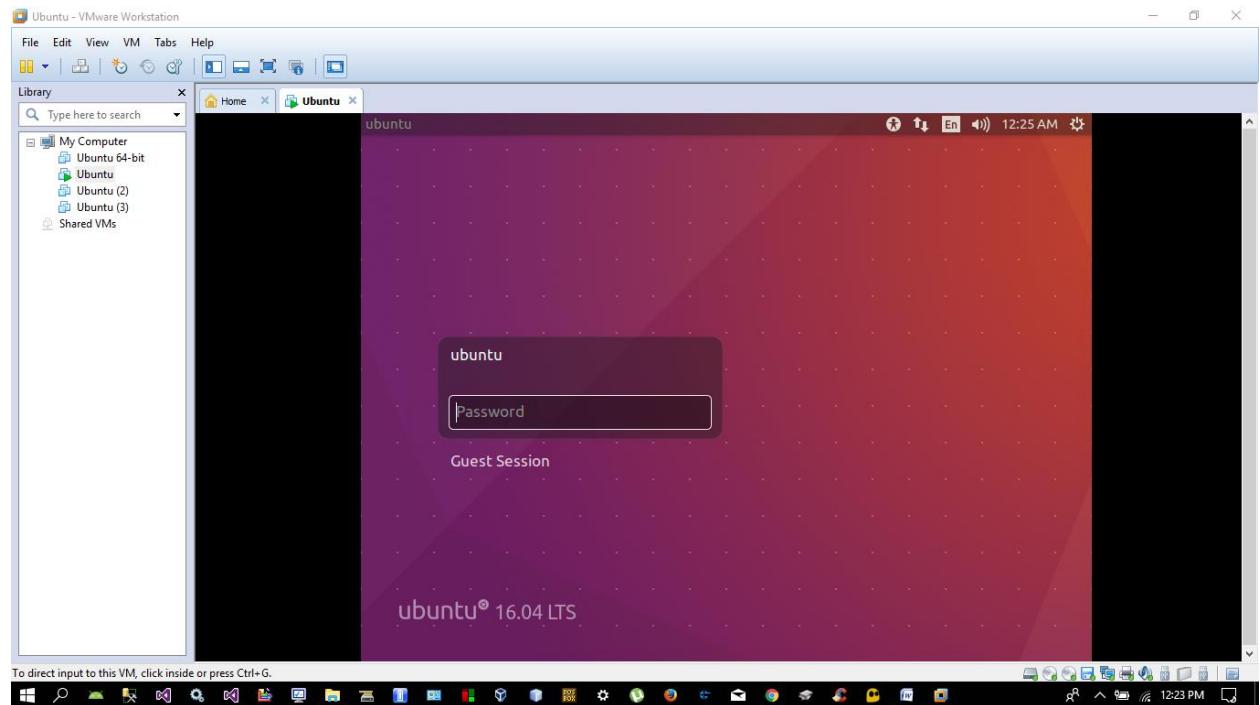


Then keep clicking next. After the wizard has finished, the following screen will appear

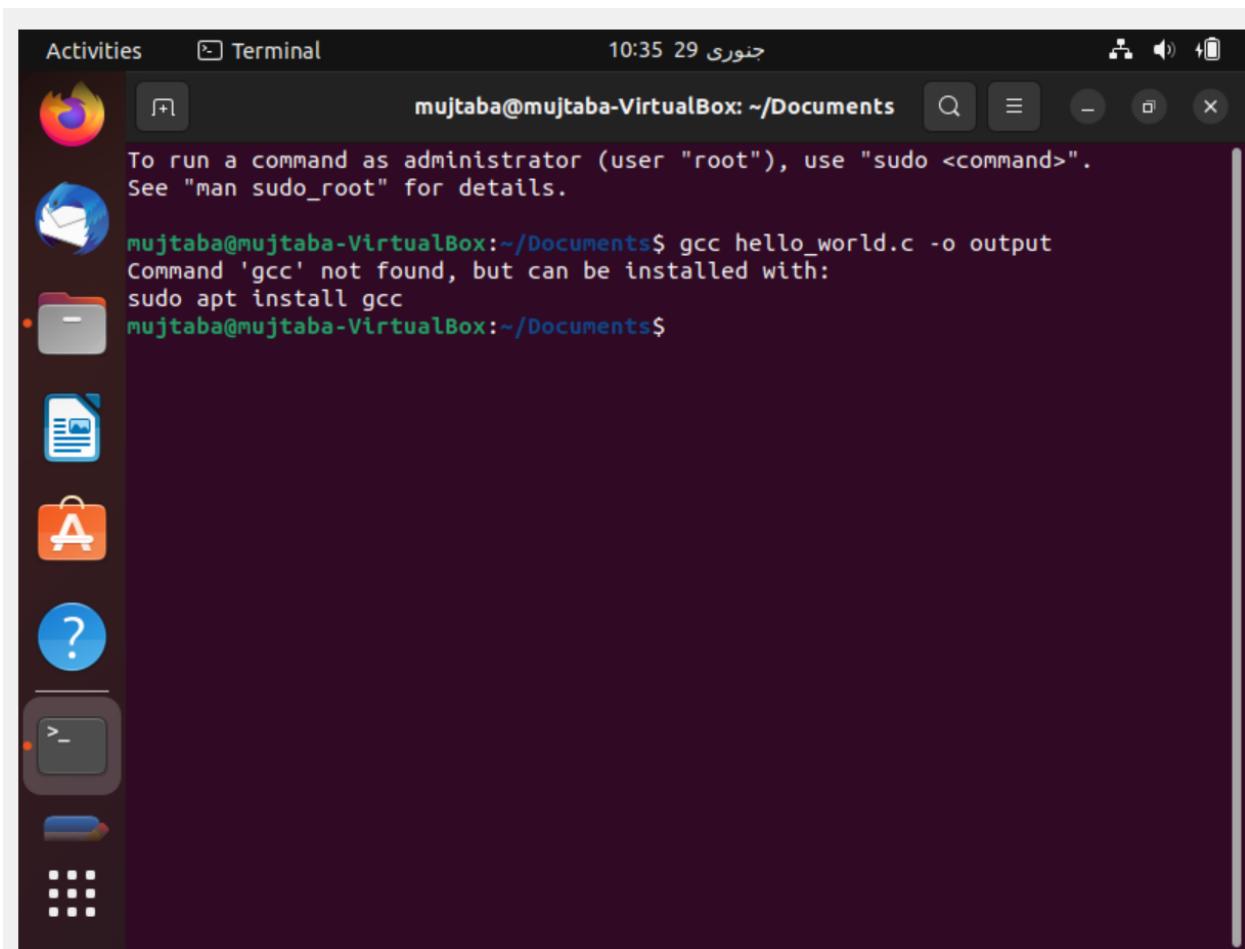


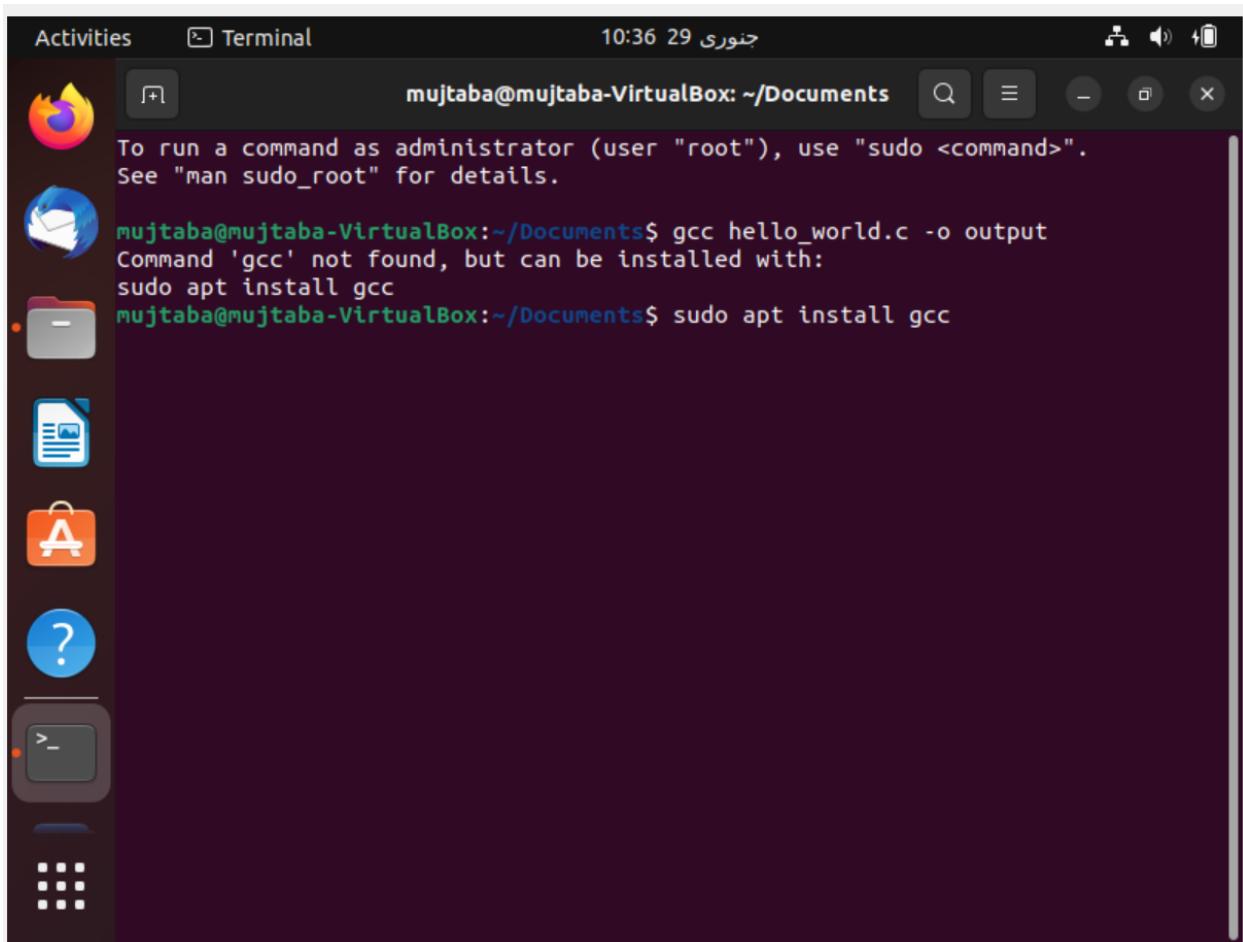
Now “Click Power on This Virtual Machine”. The system will now perform installation of ubuntu. This may take 10-15 minutes.

If ubuntu asks you for username and password, you will have to enter the user name and password that you had chosen earlier during installation wizard.



### Activity 2 Installation of GCC compiler:





Activities Terminal 10:36 29 جنوری mujtaba@mujtaba-VirtualBox: ~/Documents

```
See "man sudo_root" for details.

mujtaba@mujtaba-VirtualBox:~/Documents$ gcc hello_world.c -o output
Command 'gcc' not found, but can be installed with:
sudo apt install gcc
[mujtaba@mujtaba-VirtualBox:~/Documents$ sudo apt install gcc
[sudo] password for mujtaba:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  binutils binutils-common binutils-x86_64-linux-gnu gcc-12 libasan8
  libbinutils libc-dev-bin libc-devtools libc6-dev libcc1-0 libcrypt-dev
  libctf-nobfd0 libctf0 libgcc-12-dev libgprofng0 libitm1 liblsan0 libnsl-dev
  libquadmath0 libtirpc-dev libtsan2 libubsan1 linux-libc-dev manpages-dev
  rpcsvc-proto
Suggested packages:
  binutils-doc gcc-multilib make autoconf automake libtool flex bison gcc-doc
  gcc-12-multilib gcc-12-doc gcc-12-locales glibc-doc
The following NEW packages will be installed:
  binutils binutils-common binutils-x86_64-linux-gnu gcc gcc-12 libasan8
  libbinutils libc-dev-bin libc-devtools libc6-dev libcc1-0 libcrypt-dev
  libctf-nobfd0 libctf0 libgcc-12-dev libgprofng0 libitm1 liblsan0 libnsl-dev
  libquadmath0 libtirpc-dev libtsan2 libubsan1 linux-libc-dev manpages-dev
  rpcsvc-proto
0 upgraded, 26 newly installed, 0 to remove and 115 not upgraded.
Need to get 41.7 MB of archives.
After this operation, 155 MB of additional disk space will be used.
Do you want to continue? [Y/n] █
```

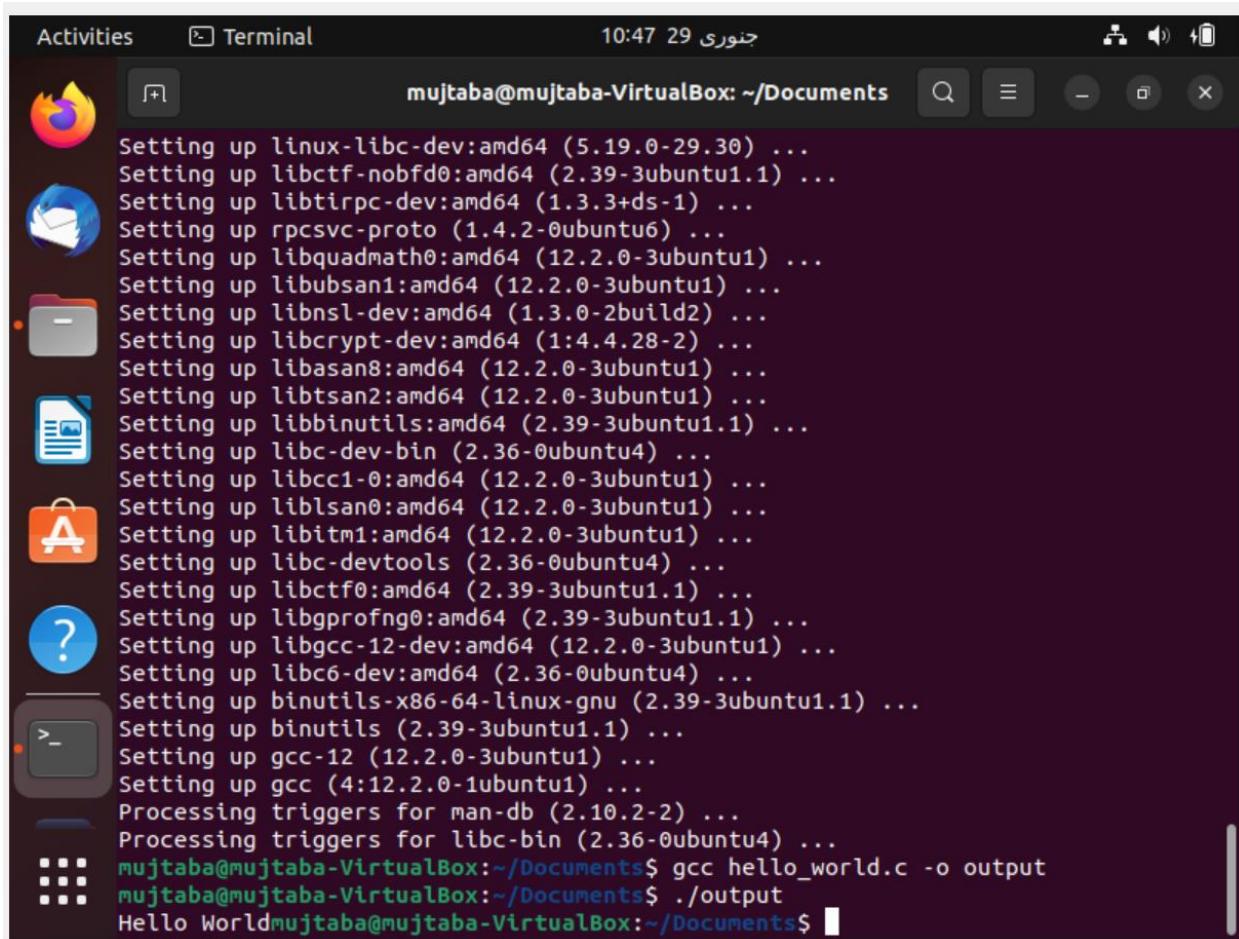
Activities Terminal 10:37 29 جنوری mujtaba@mujtaba-VirtualBox: ~/Documents

```
mujtaba@mujtaba-VirtualBox:~/Documents$ sudo apt install gcc
[sudo] password for mujtaba:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  binutils binutils-common binutils-x86_64-linux-gnu gcc-12 libasan8
  libbinutils libc-dev-bin libc-devtools libc6-dev libcc1-0 libcrypt-dev
  libctf-nobfd0 libctf0 libgcc-12-dev libgprofng0 libitm1 liblsan0 libnsl-dev
  libquadmath0 libtirpc-dev libtsan2 libubsan1 linux-libc-dev manpages-dev
  rpcsvc-proto
Suggested packages:
  binutils-doc gcc-multilib make autoconf automake libtool flex bison gcc-doc
  gcc-12-multilib gcc-12-doc gcc-12-locales glibc-doc
The following NEW packages will be installed:
  binutils binutils-common binutils-x86_64-linux-gnu gcc gcc-12 libasan8
  libbinutils libc-dev-bin libc-devtools libc6-dev libcc1-0 libcrypt-dev
  libctf-nobfd0 libctf0 libgcc-12-dev libgprofng0 libitm1 liblsan0 libnsl-dev
  libquadmath0 libtirpc-dev libtsan2 libubsan1 linux-libc-dev manpages-dev
  rpcsvc-proto
0 upgraded, 26 newly installed, 0 to remove and 115 not upgraded.
Need to get 41.7 MB of archives.
After this operation, 155 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://pk.archive.ubuntu.com/ubuntu kinetic-updates/main amd64 binutils-common amd64 2.39-3ubuntu1.1 [225 kB]
Get:2 http://pk.archive.ubuntu.com/ubuntu kinetic-updates/main amd64 libbinutils amd64 2.39-3ubuntu1.1 [610 kB]
1% [2 libbinutils 131 kB/610 kB 22%] 23.6 kB/s 29min 14s
```

Activities Terminal 10:43 29 جنوری mujtaba@mujtaba-VirtualBox: ~/Documents

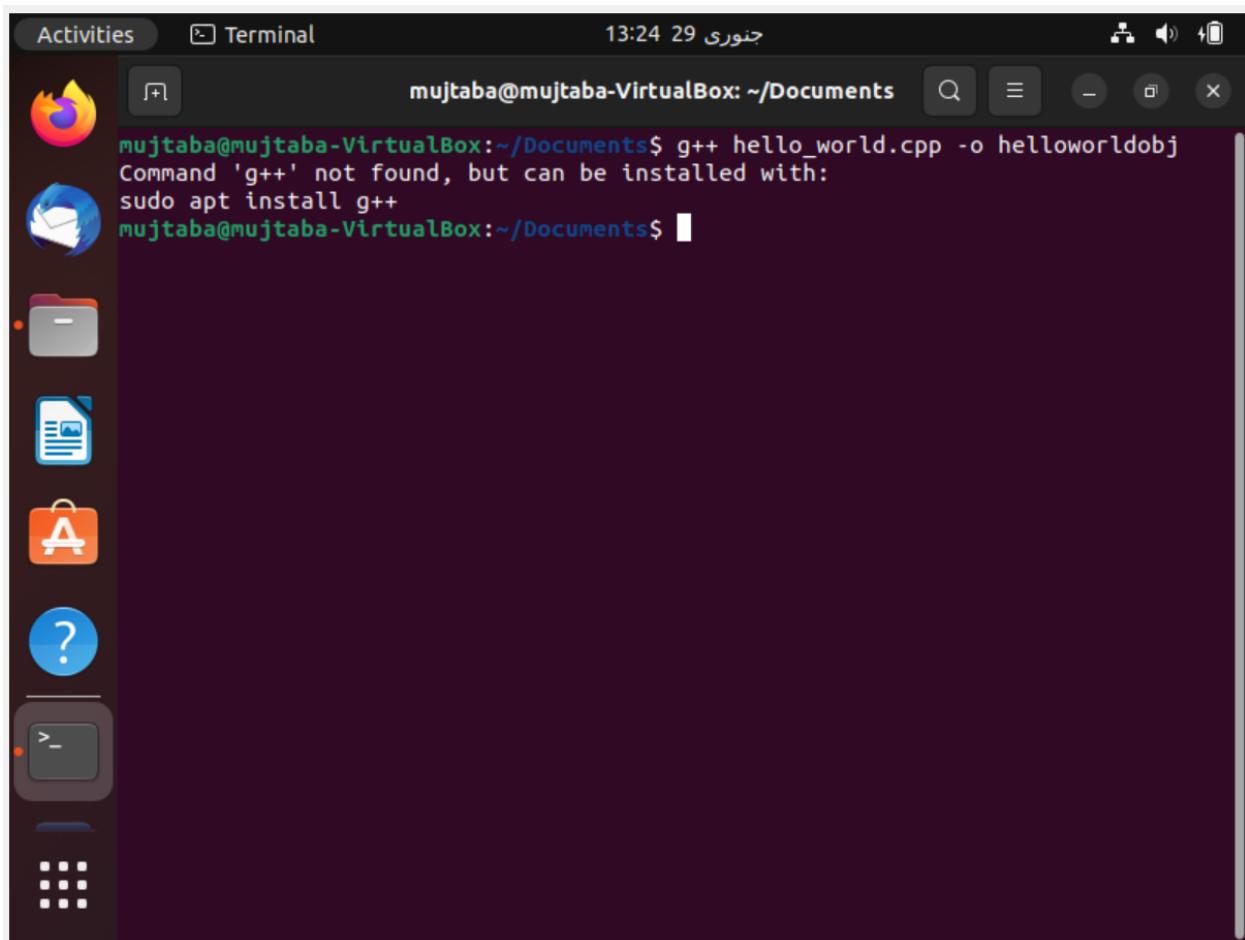
```
Setting up linux-libc-dev:amd64 (5.19.0-29.30) ...
Setting up libctf-nobfd0:amd64 (2.39-3ubuntu1.1) ...
Setting up libtirpc-dev:amd64 (1.3.3+ds-1) ...
Setting up rpcsvc-proto (1.4.2-0ubuntu6) ...
Setting up libquadmath0:amd64 (12.2.0-3ubuntu1) ...
Setting up libubsan1:amd64 (12.2.0-3ubuntu1) ...
Setting up libnsl-dev:amd64 (1.3.0-2build2) ...
Setting up libcrypt-dev:amd64 (1:4.4.28-2) ...
Setting up libasan8:amd64 (12.2.0-3ubuntu1) ...
Setting up libtsan2:amd64 (12.2.0-3ubuntu1) ...
Setting up libbinutils:amd64 (2.39-3ubuntu1.1) ...
Setting up libc-dev-bin (2.36-0ubuntu4) ...
Setting up libcc1-0:amd64 (12.2.0-3ubuntu1) ...
Setting up liblsan0:amd64 (12.2.0-3ubuntu1) ...
Setting up libitm1:amd64 (12.2.0-3ubuntu1) ...
Setting up libc-devtools (2.36-0ubuntu4) ...
Setting up libctf0:amd64 (2.39-3ubuntu1.1) ...
Setting up libgprofng0:amd64 (2.39-3ubuntu1.1) ...
Setting up libgcc-12-dev:amd64 (12.2.0-3ubuntu1) ...
Setting up libc6-dev:amd64 (2.36-0ubuntu4) ...
Setting up binutils-x86-64-linux-gnu (2.39-3ubuntu1.1) ...
Setting up binutils (2.39-3ubuntu1.1) ...
Setting up gcc-12 (12.2.0-3ubuntu1) ...
Setting up gcc (4:12.2.0-1ubuntu1) ...
Processing triggers for man-db (2.10.2-2) ...
Processing triggers for libc-bin (2.36-0ubuntu4) ...
mujtaba@mujtaba-VirtualBox:~/Documents$ gcc hello_world.c -o output
mujtaba@mujtaba-VirtualBox:~/Documents$
```

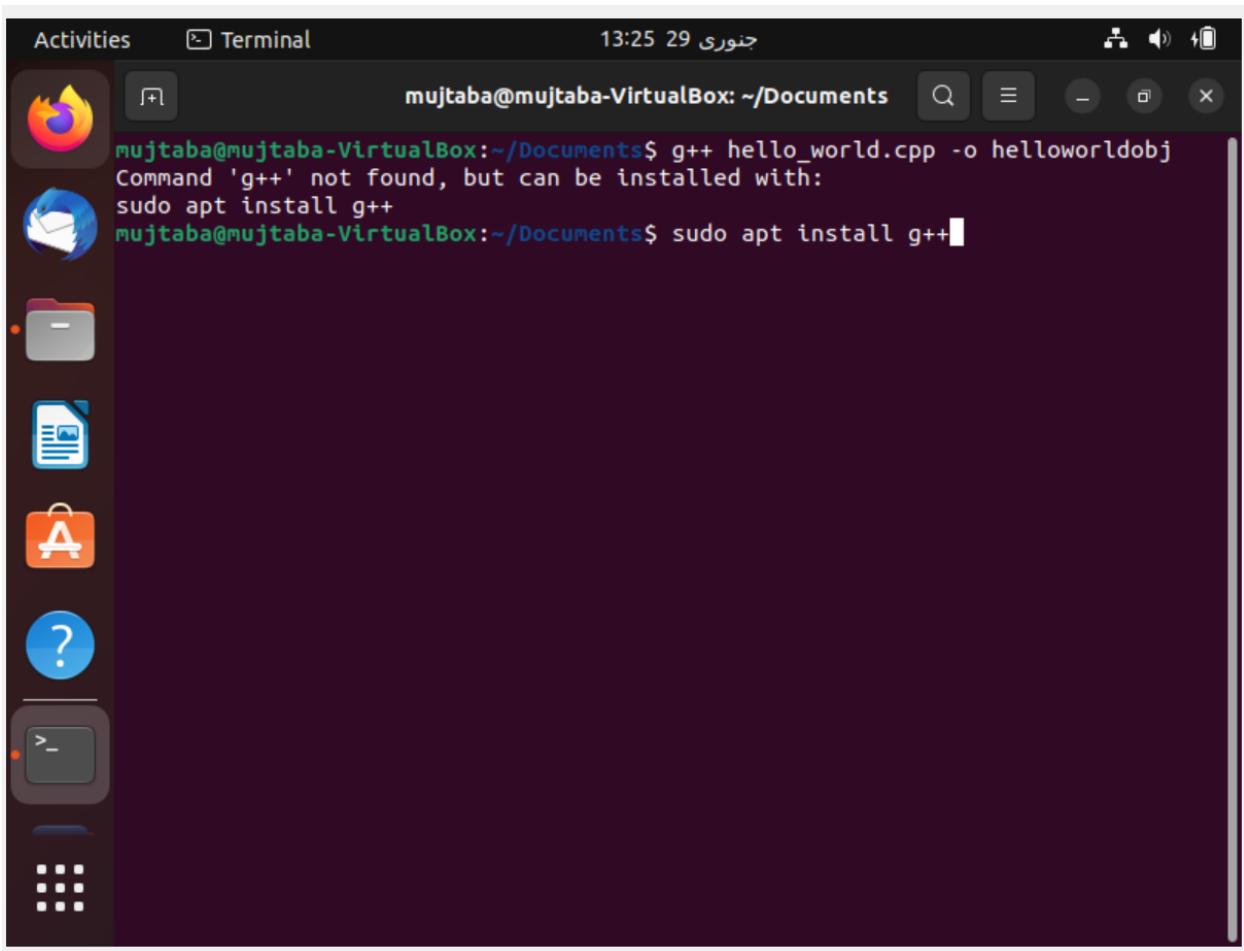
Activities Terminal 10:47 29 جنوری mujtaba@mujtaba-VirtualBox: ~/Documents



```
Setting up linux-libc-dev:amd64 (5.19.0-29.30) ...
Setting up libctf-nobfd0:amd64 (2.39-3ubuntu1.1) ...
Setting up libtirpc-dev:amd64 (1.3.3+ds-1) ...
Setting up rpcsvc-proto (1.4.2-0ubuntu6) ...
Setting up libquadmath0:amd64 (12.2.0-3ubuntu1) ...
Setting up libubsan1:amd64 (12.2.0-3ubuntu1) ...
Setting up libnsl-dev:amd64 (1.3.0-2build2) ...
Setting up libcrypt-dev:amd64 (1:4.4.28-2) ...
Setting up libasan8:amd64 (12.2.0-3ubuntu1) ...
Setting up libtsan2:amd64 (12.2.0-3ubuntu1) ...
Setting up libbinutils:amd64 (2.39-3ubuntu1.1) ...
Setting up libc-dev-bin (2.36-0ubuntu4) ...
Setting up libcc1-0:amd64 (12.2.0-3ubuntu1) ...
Setting up liblsan0:amd64 (12.2.0-3ubuntu1) ...
Setting up libitm1:amd64 (12.2.0-3ubuntu1) ...
Setting up libc-devtools (2.36-0ubuntu4) ...
Setting up libctf0:amd64 (2.39-3ubuntu1.1) ...
Setting up libgprofng0:amd64 (2.39-3ubuntu1.1) ...
Setting up libgcc-12-dev:amd64 (12.2.0-3ubuntu1) ...
Setting up libc6-dev:amd64 (2.36-0ubuntu4) ...
Setting up binutils-x86-64-linux-gnu (2.39-3ubuntu1.1) ...
Setting up binutils (2.39-3ubuntu1.1) ...
Setting up gcc-12 (12.2.0-3ubuntu1) ...
Setting up gcc (4:12.2.0-1ubuntu1) ...
Processing triggers for man-db (2.10.2-2) ...
Processing triggers for libc-bin (2.36-0ubuntu4) ...
mujtaba@mujtaba-VirtualBox:~/Documents$ gcc hello_world.c -o output
mujtaba@mujtaba-VirtualBox:~/Documents$ ./output
Hello Worldmujtaba@mujtaba-VirtualBox:~/Documents$
```

Activity 3 Installation of G++ compiler:





Activities Terminal 13:27 جنوری 29 mujtaba@mujtaba-VirtualBox: ~/Documents

```
mujtaba@mujtaba-VirtualBox:~/Documents$ g++ hello_world.cpp -o helloworldobj
Command 'g++' not found, but can be installed with:
sudo apt install g++
mujtaba@mujtaba-VirtualBox:~/Documents$ sudo apt install g++
[sudo] password for mujtaba:
Sorry, try again.
[sudo] password for mujtaba:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  g++-12 libstdc++-12-dev
Suggested packages:
  g++-multilib g++-12-multilib gcc-12-doc libstdc++-12-doc
The following NEW packages will be installed:
  g++ g++-12 libstdc++-12-dev
0 upgraded, 3 newly installed, 0 to remove and 115 not upgraded.
Need to get 14.1 MB of archives.
After this operation, 57.8 MB of additional disk space will be used.
Do you want to continue? [Y/n] █
```

Activities Terminal 13:27 29 جنوری

```
mujtaba@mujtaba-VirtualBox:~/Documents$ g++ hello_world.cpp -o helloworldobj
Command 'g++' not found, but can be installed with:
sudo apt install g++
mujtaba@mujtaba-VirtualBox:~/Documents$ sudo apt install g++
[sudo] password for mujtaba:
Sorry, try again.
[sudo] password for mujtaba:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  g++-12 libstdc++-12-dev
Suggested packages:
  g++-multilib g++-12-multilib gcc-12-doc libstdc++-12-doc
The following NEW packages will be installed:
  g++ g++-12 libstdc++-12-dev
0 upgraded, 3 newly installed, 0 to remove and 115 not upgraded.
Need to get 14.1 MB of archives.
After this operation, 57.8 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://pk.archive.ubuntu.com/ubuntu kinetic/main amd64 libstdc++-12-dev a
md64 12.2.0-3ubuntu1 [2,158 kB]
1% [1 libstdc++-12-dev 135 kB/2,158 kB 6%]
```

Activities Terminal ١٣:٤٦ ٢٩ حنوری

```
mujtaba@mujtaba-VirtualBox: ~/Documents
```

Get:1 http://pk.archive.ubuntu.com/ubuntu kinetic/main amd64 libstdc++-12-dev amd64 12.2.0-3ubuntu1 [2,158 kB]

Get:2 http://pk.archive.ubuntu.com/ubuntu kinetic/main amd64 g++-12 amd64 12.2.0-3ubuntu1 [12.0 MB]

Get:3 http://pk.archive.ubuntu.com/ubuntu kinetic/main amd64 g++ amd64 4:12.2.0-1ubuntu1 [1,406 B]

Fetched 14.1 MB in 4min 31s (52.3 kB/s)

Selecting previously unselected package libstdc++-12-dev:amd64.

(Reading database ... 201078 files and directories currently installed.)

Preparing to unpack .../libstdc++-12-dev\_12.2.0-3ubuntu1\_amd64.deb ...

Unpacking libstdc++-12-dev:amd64 (12.2.0-3ubuntu1) ...

Selecting previously unselected package g++-12.

Preparing to unpack .../g++-12\_12.2.0-3ubuntu1\_amd64.deb ...

Unpacking g++-12 (12.2.0-3ubuntu1) ...

Selecting previously unselected package g++.

Preparing to unpack .../g++-4%3a12.2.0-1ubuntu1\_amd64.deb ...

Unpacking g++ (4:12.2.0-1ubuntu1) ...

Setting up libstdc++-12-dev:amd64 (12.2.0-3ubuntu1) ...

Setting up g++-12 (12.2.0-3ubuntu1) ...

Setting up g++ (4:12.2.0-1ubuntu1) ...

update-alternatives: using /usr/bin/g++ to provide /usr/bin/c++ (c++) in auto mode

Processing triggers for man-db (2.10.2-2) ...

```
mujtaba@mujtaba-VirtualBox:~/Documents$ g++ hello_world.cpp -o hello_worldobj
```

```
mujtaba@mujtaba-VirtualBox:~/Documents$ ls
```

```
hello_world.c    hello_worldobj  Makefile      message.h
```

```
hello_world.cpp  main.cpp       message.cpp  output
```

```
mujtaba@mujtaba-VirtualBox:~/Documents$ ./hello_worldobj
```

```
hello worldmujtaba@mujtaba-VirtualBox:~/Documents$
```