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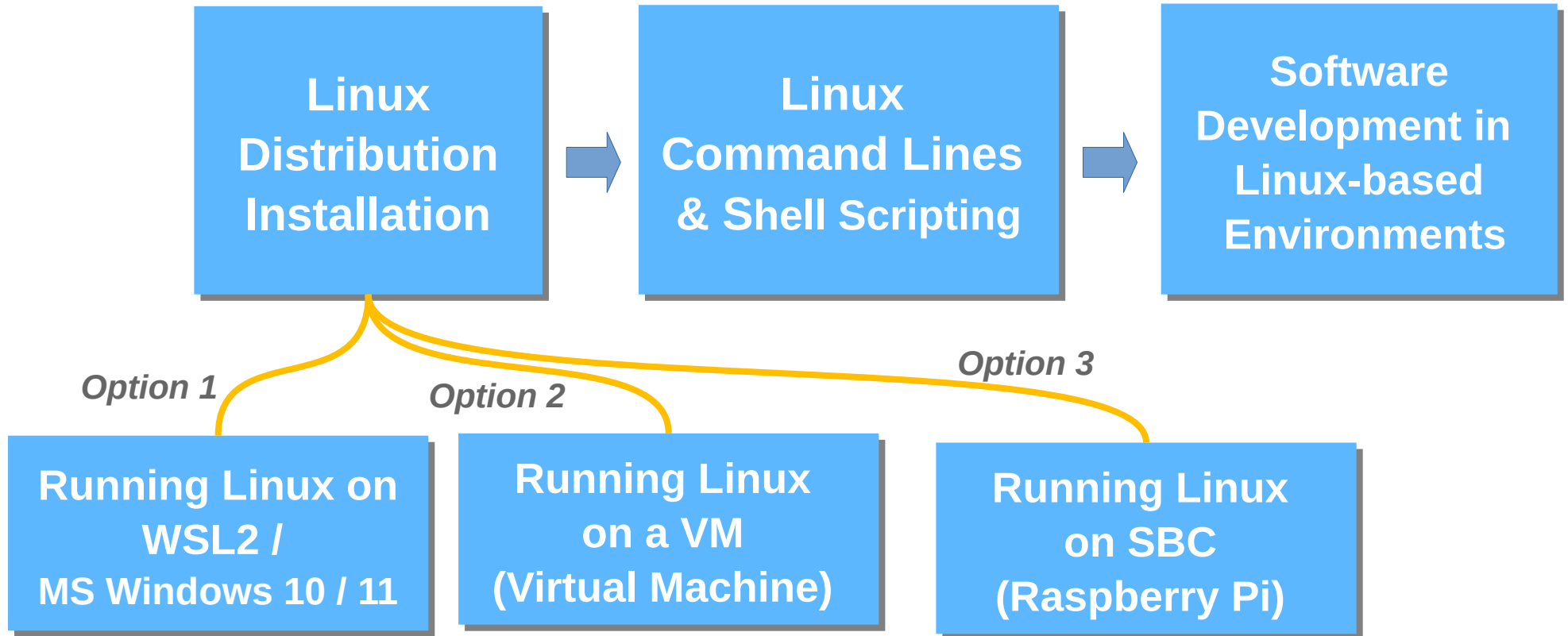
# Software Development Practice I

## Handout #2

<rawat.s@eng.kmutnb.ac.th>

Last Update: 2024-06-29

# Linux-based Environment for Software Development



*for Windows users*

# Practical & Lab Work (1)

- Explore different environments for **open-source Linux-based software development**.
- Setup and use **Linux-based machines** (local or remote).
- Get familiar with some common commands in Linux.
- Use **VS Code IDE** on a remote machine.
- Write **basic C/C++ programs** and compile the source code files to build executable files.

# Practical & Lab Work (2)

- Install **WSL2** on Windows 10 or 11 (for Windows users).
- Install **Ubuntu on WSL2** (for Windows users).
- Install **Oracle VirtualBox** and create VMs for some selected **Linux distributions** such as
  - Ubuntu 22.04 LTS, Raspbian OS for x86\_64, Kali Linux, etc.
- Install **VMWare Workstation Player** and create Linux VMs.

🔍 Filter by title

WSL Documentation

> Overview

▾ Install

**Install WSL**

Manual install steps for older versions

Install on Windows Server

> Tutorials

> Concepts

> How-to

Frequently Asked Questions

Troubleshooting

> Release Notes

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⋮ / Windows / Development environment / WSL /

⊕ ✎ ⋮

# Install Linux on Windows with WSL

Article • 01/12/2023 • 8 contributors

👍 Feedback

Developers can access the power of both Windows and Linux at the same time on a Windows machine. The Windows Subsystem for Linux (WSL) lets developers install a Linux distribution (such as Ubuntu, OpenSUSE, Kali, Debian, Arch Linux, etc) and use Linux applications, utilities, and Bash command-line tools directly on Windows, unmodified, without the overhead of a traditional virtual machine or dualboot setup.

## Prerequisites

You must be running Windows 10 version 2004 and higher (Build 19041 and higher) or Windows 11 to use the commands below. If you are on earlier versions please see [the manual install page](#).

## Install WSL command

You can now install everything you need to run WSL with a single command. Open PowerShell or Windows Command Prompt in

☰ In this article

Prerequisites

Install WSL command

Change the default Linux distribution installed

Set up your Linux user info

Show more ▾

<https://docs.microsoft.com/en-us/windows/wsl/install>

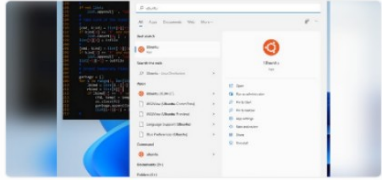
# "wsl ubuntu"

Filters

- All departments
- Apps
- Games

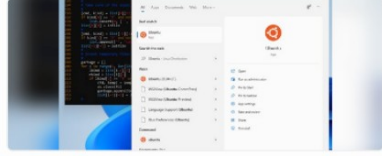
**Ubuntu** Free  
4.2 ★ Apps Deve...

Install a complete Ubuntu terminal environment in minutes with Windo...



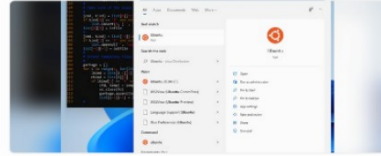
**Ubuntu 22.04.2 LTS** Installed  
5.0 ★ Apps ...

Install a complete Ubuntu terminal environment in minutes with Windo...



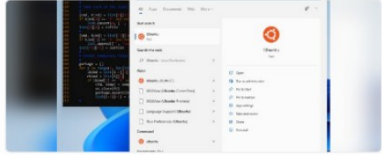
**Ubuntu 20.04.6 LTS** Free  
4.3 ★ Apps Deve...

Install a complete Ubuntu terminal environment in minutes with Windo...




**Ubuntu 18.04.6 LTS** Free  
4.0 ★ Apps Deve...

Install a complete Ubuntu terminal environment in minutes with Windo...




**Windows Subsystem...** Installed  
5.0 ★ Apps ...

Windows Subsystem for Linux (WSL) lets developers run a GNU/Linux...



**Ubuntu (Preview)** Free  
Apps Developer t...

Install a complete Ubuntu terminal environment in minutes with Windo...



# Check List for WSL2

- Which **Linux distributions and release versions** are available for use with **WSL2** or downloadable from the **Microsoft Store**? Additionally, which distribution is set as the default for **WSL2**?"
- Is it necessary to enable the **Microsoft Hyper-V feature** in order to use **WSL2** for Windows 10 or 11 users?
- Did you enable the **hardware virtualization setting** (Intel/AMD Virtualization Technology) in BIOS settings for your computer?

# Check List for WSL2

- Please explain the function of the following **WSL commands** when they are executed in **Windows PowerShell Prompt (Administrator)**.

```
wsl --status
```

```
wsl --list --online
```

```
wsl --install
```

```
wsl --install "kali-linux"
```

```
wsl --update
```

```
wsl --shutdown
```

```
wsl --list --running
```

```
wsl --unregister "kali-linux"
```



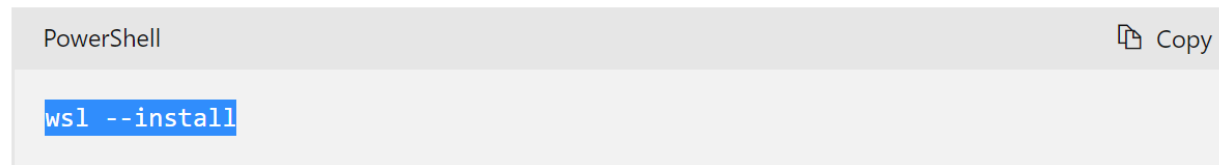
# WSL 2 Installation for Windows 10 or 11

## Prerequisites

You must be running Windows 10 version 2004 and higher (Build 19041 and higher) or Windows 11 to use the commands below. If you are on earlier versions please see [the manual install page](#).

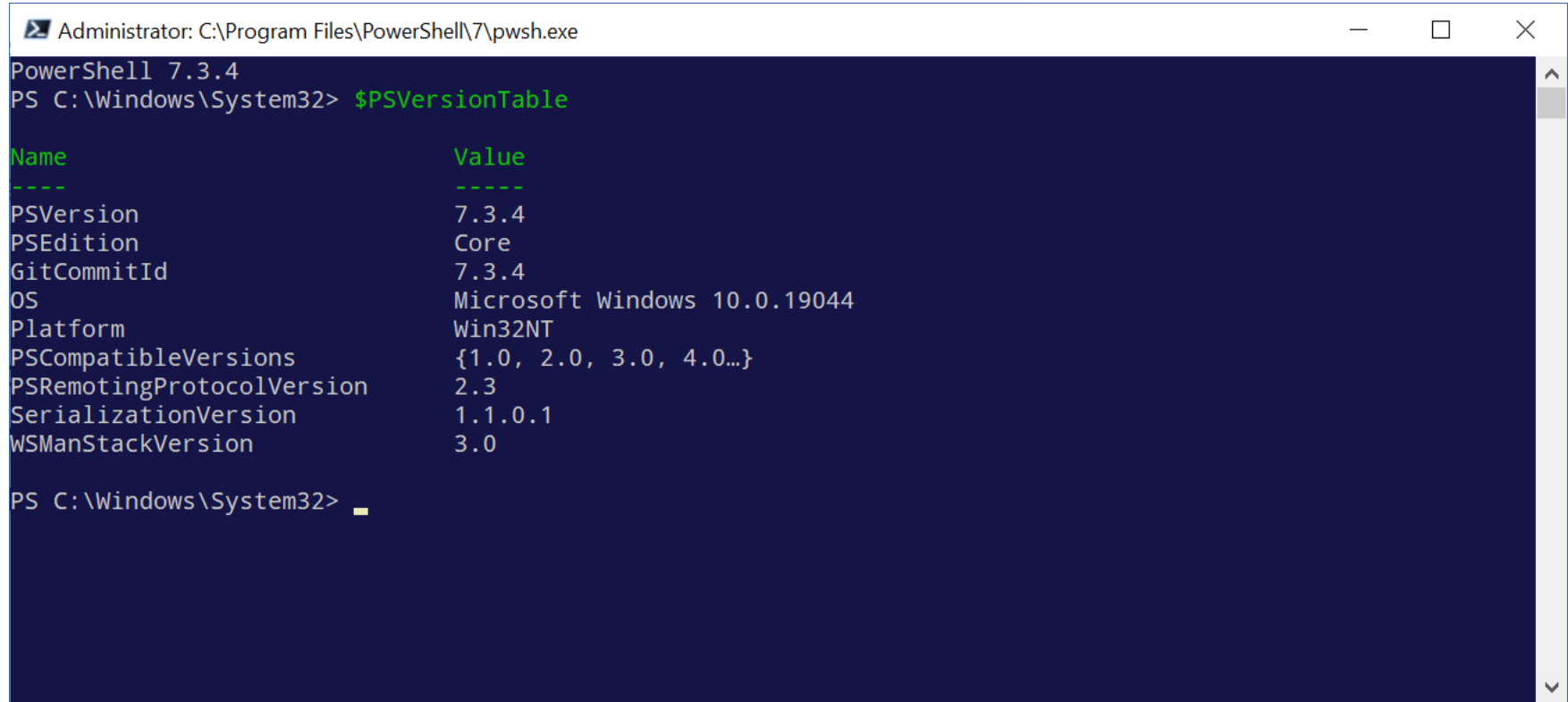
## Install WSL command

You can now install everything you need to run WSL with a single command. Open PowerShell or Windows Command Prompt in **administrator** mode by right-clicking and selecting "Run as administrator", enter the `wsl --install` command, then restart your machine.

A screenshot of a PowerShell terminal window. The title bar at the top reads "PowerShell" and has a "Copy" button on the right. The command prompt shows the text `wsl --install` entered, with the text highlighted in blue.

This command will enable the features necessary to run WSL and install the Ubuntu distribution of Linux. ([This default distribution can be changed](#)).

# Open Windows Powershell



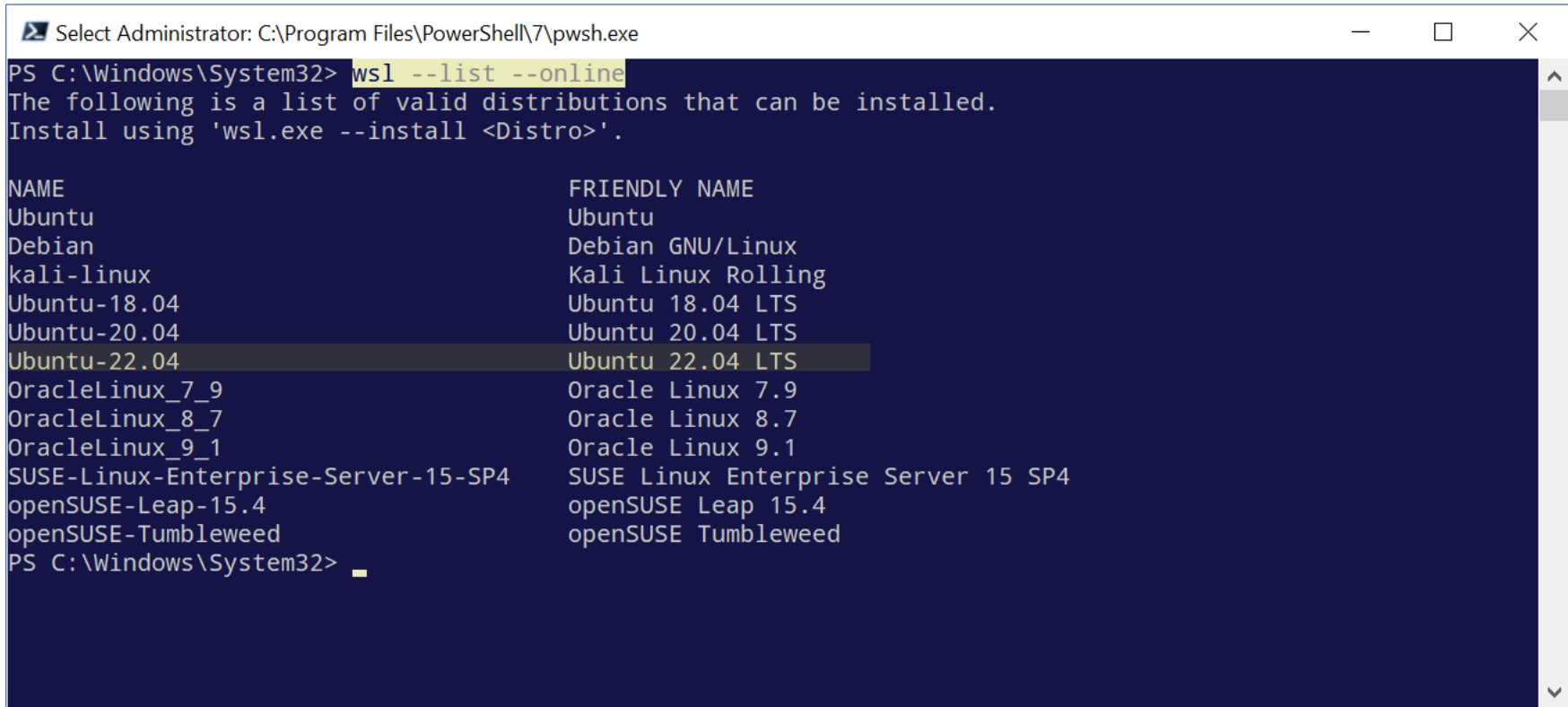
The screenshot shows a Windows PowerShell window titled "Administrator: C:\Program Files\PowerShell\7\pwsh.exe". The prompt is "PS C:\Windows\System32>". The command "\$PSVersionTable" has been entered and executed, resulting in a table of version information. The table has two columns: "Name" and "Value". The rows are: PSVersion (7.3.4), PSEdition (Core), GitCommitId (7.3.4), OS (Microsoft Windows 10.0.19044), Platform (Win32NT), PSCompatibleVersions ({1.0, 2.0, 3.0, 4.0...}), PSRemotingProtocolVersion (2.3), SerializationVersion (1.1.0.1), and WSManStackVersion (3.0). The prompt "PS C:\Windows\System32> \_" is visible at the bottom.

```
PowerShell 7.3.4
PS C:\Windows\System32> $PSVersionTable

Name                Value
----                -
PSVersion           7.3.4
PSEdition            Core
GitCommitId         7.3.4
OS                  Microsoft Windows 10.0.19044
Platform            Win32NT
PSCompatibleVersions {1.0, 2.0, 3.0, 4.0...}
PSRemotingProtocolVersion 2.3
SerializationVersion 1.1.0.1
WSManStackVersion   3.0

PS C:\Windows\System32> _
```

# List available Linux distributions for WSL2



```
Select Administrator: C:\Program Files\PowerShell\7\pwsh.exe
PS C:\Windows\System32> wsl --list --online
The following is a list of valid distributions that can be installed.
Install using 'wsl.exe --install <Distro>'.

NAME                                FRIENDLY NAME
-----                                -
Ubuntu                                Ubuntu
Debian                                Debian GNU/Linux
kali-linux                            Kali Linux Rolling
Ubuntu-18.04                          Ubuntu 18.04 LTS
Ubuntu-20.04                          Ubuntu 20.04 LTS
Ubuntu-22.04                          Ubuntu 22.04 LTS
OracleLinux_7_9                       Oracle Linux 7.9
OracleLinux_8_7                       Oracle Linux 8.7
OracleLinux_9_1                       Oracle Linux 9.1
SUSE-Linux-Enterprise-Server-15-SP4   SUSE Linux Enterprise Server 15 SP4
openSUSE-Leap-15.4                    openSUSE Leap 15.4
openSUSE-Tumbleweed                   openSUSE Tumbleweed
PS C:\Windows\System32>
```

Microsoft Store

wsl ubuntu

# "wsl ubuntu"

All departments Apps Games

Ubuntu

Apps • Developer tools

★★★★☆ 4

Free

Ubuntu (Preview)

Apps • Developer tools

Free

Ubuntu 22.04 LTS

Apps • Developer tools

★★★★★ 3

Free

Ubuntu 18.04.5 LTS

Apps • Developer tools

Free

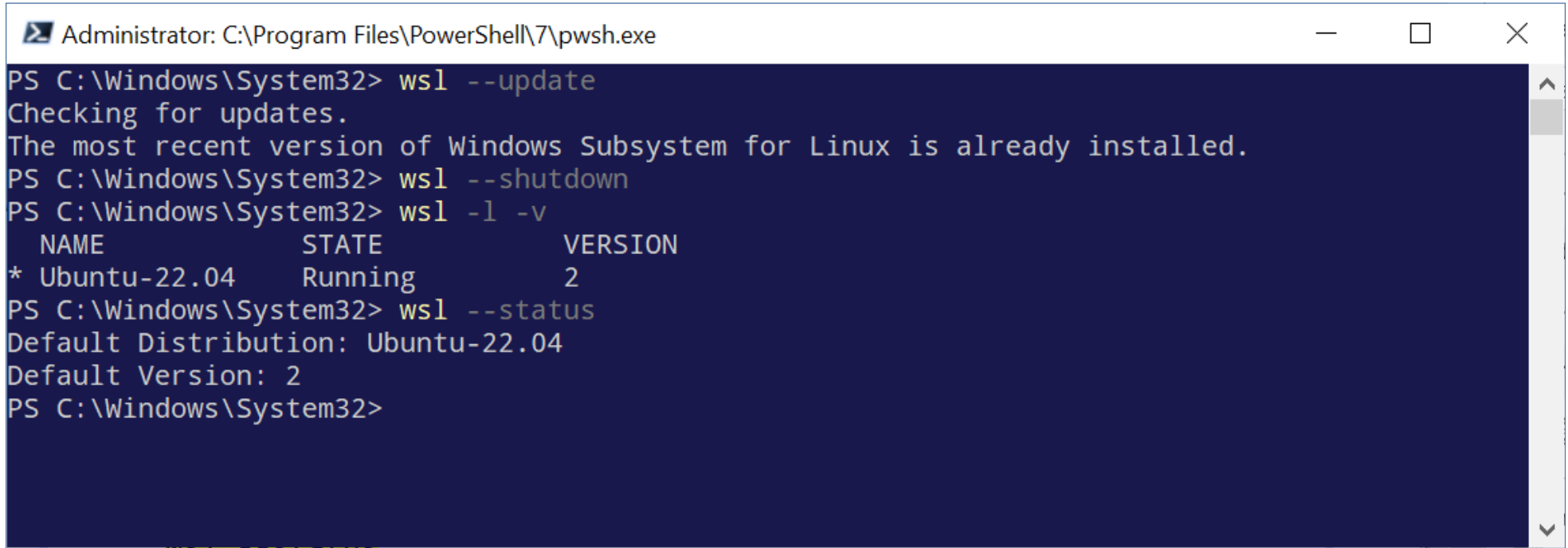
Library

Help

1) Install WSL2 on Windows 10 or 11  
2) Go to Microsoft Store and install Ubuntu OS for WSL2.



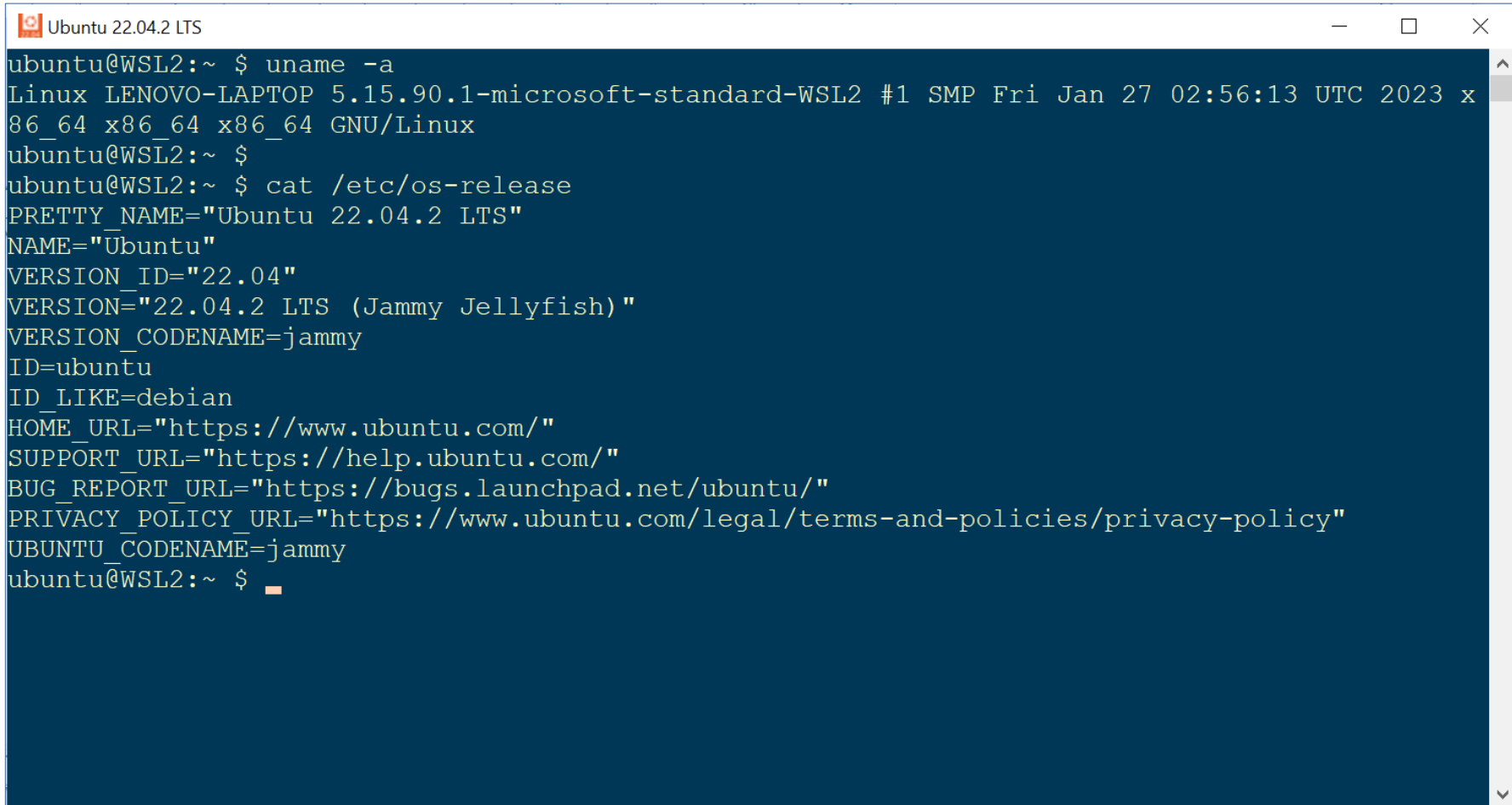
# Update and restart WSL2



The screenshot shows a PowerShell terminal window titled "Administrator: C:\Program Files\PowerShell\7\pwsh.exe". The terminal output is as follows:

```
PS C:\Windows\System32> wsl --update
Checking for updates.
The most recent version of Windows Subsystem for Linux is already installed.
PS C:\Windows\System32> wsl --shutdown
PS C:\Windows\System32> wsl -l -v
  NAME          STATE      VERSION
* Ubuntu-22.04  Running    2
PS C:\Windows\System32> wsl --status
Default Distribution: Ubuntu-22.04
Default Version: 2
PS C:\Windows\System32>
```

# Open WSL2-Ubuntu Terminal and Show System Info

A screenshot of a terminal window titled "Ubuntu 22.04.2 LTS". The terminal shows the output of the command 'uname -a' and 'cat /etc/os-release'. The output of 'uname -a' is: "Linux LENOVO-LAPTOP 5.15.90.1-microsoft-standard-WSL2 #1 SMP Fri Jan 27 02:56:13 UTC 2023 x86\_64 x86\_64 x86\_64 GNU/Linux". The output of 'cat /etc/os-release' is: "PRETTY\_NAME='Ubuntu 22.04.2 LTS'", "NAME='Ubuntu'", "VERSION\_ID='22.04'", "VERSION='22.04.2 LTS (Jammy Jellyfish)'", "VERSION\_CODENAME=jammy", "ID=ubuntu", "ID\_LIKE=debian", "HOME\_URL='https://www.ubuntu.com/'", "SUPPORT\_URL='https://help.ubuntu.com/'", "BUG\_REPORT\_URL='https://bugs.launchpad.net/ubuntu/'", "PRIVACY\_POLICY\_URL='https://www.ubuntu.com/legal/terms-and-policies/privacy-policy'", "UBUNTU\_CODENAME=jammy". The terminal prompt is 'ubuntu@WSL2:~ \$' and there is a cursor at the end of the last line.

```
ubuntu@WSL2:~ $ uname -a
Linux LENOVO-LAPTOP 5.15.90.1-microsoft-standard-WSL2 #1 SMP Fri Jan 27 02:56:13 UTC 2023 x
86_64 x86_64 x86_64 GNU/Linux
ubuntu@WSL2:~ $
ubuntu@WSL2:~ $ cat /etc/os-release
PRETTY_NAME="Ubuntu 22.04.2 LTS"
NAME="Ubuntu"
VERSION_ID="22.04"
VERSION="22.04.2 LTS (Jammy Jellyfish)"
VERSION_CODENAME=jammy
ID=ubuntu
ID_LIKE=debian
HOME_URL="https://www.ubuntu.com/"
SUPPORT_URL="https://help.ubuntu.com/"
BUG_REPORT_URL="https://bugs.launchpad.net/ubuntu/"
PRIVACY_POLICY_URL="https://www.ubuntu.com/legal/terms-and-policies/privacy-policy"
UBUNTU_CODENAME=jammy
ubuntu@WSL2:~ $
```

# Update Ubuntu software packages

```
Select Ubuntu 22.04.2 LTS
ubuntu@WSL2:~ $ sudo apt update && sudo apt upgrade -y
[sudo] password for ubuntu:
Get:1 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Hit:2 https://deb.nodesource.com/node_16.x jammy InRelease
Get:3 https://packages.microsoft.com/repos/code stable InRelease [3,569 B]
Get:4 https://packages.microsoft.com/repos/code stable/main amd64 Packages [67.8 kB]
Get:5 https://packages.microsoft.com/repos/code stable/main arm64 Packages [68.2 kB]
Get:6 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [362 kB]
Get:7 https://packages.microsoft.com/repos/code stable/main armhf Packages [68.4 kB]
Get:8 https://ppa.launchpadcontent.net/mozillateam/ppa/ubuntu jammy InRelease [23.8 kB]
Hit:9 http://archive.ubuntu.com/ubuntu jammy InRelease
Get:10 http://archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Get:11 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [107 kB]
Get:12 http://security.ubuntu.com/ubuntu jammy-security/main amd64 DEP-11 Metadata [41.4 kB]
Get:13 http://security.ubuntu.com/ubuntu jammy-security/main amd64 c-n-f Metadata [9,716 B]Get:14 h
http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [225 kB]
Get:15 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-en [33.3 kB]Get:16 h
http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [709 kB]
Get:17 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en [122 kB]
Get:18 https://ppa.launchpadcontent.net/mozillateam/ppa/ubuntu jammy/main amd64 Packages [33.9 kB]
Get:19 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 DEP-11 Metadata [18.5 kB]
Get:20 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Metadata [14.3 kB]
Get:21 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [30.2 kB]Get:22 h
```



# VMware Workstation Player Installation for 64-bit Windows

The screenshot shows the VMware Customer Connect website. The browser address bar displays the URL: [customerconnect.vmware.com/en/downloads/details?downloadGroup=WKST-P...](https://customerconnect.vmware.com/en/downloads/details?downloadGroup=WKST-P...). The page header includes the VMware logo, "CUSTOMER CONNECT", and navigation links for "Products and Accounts", "Knowledge", and "More". There are also search, globe, "Register", and "Login" icons.

The main content area shows the breadcrumb "Home / VMware Workstation Player" and a "Download Product" section. A "Select Version" dropdown menu is set to "16.2.3". Below this, there are details for the product: "Documentation" with a link to "Release Notes", "Release Date" as "2022-03-10", and "Type" as "Product Binaries".

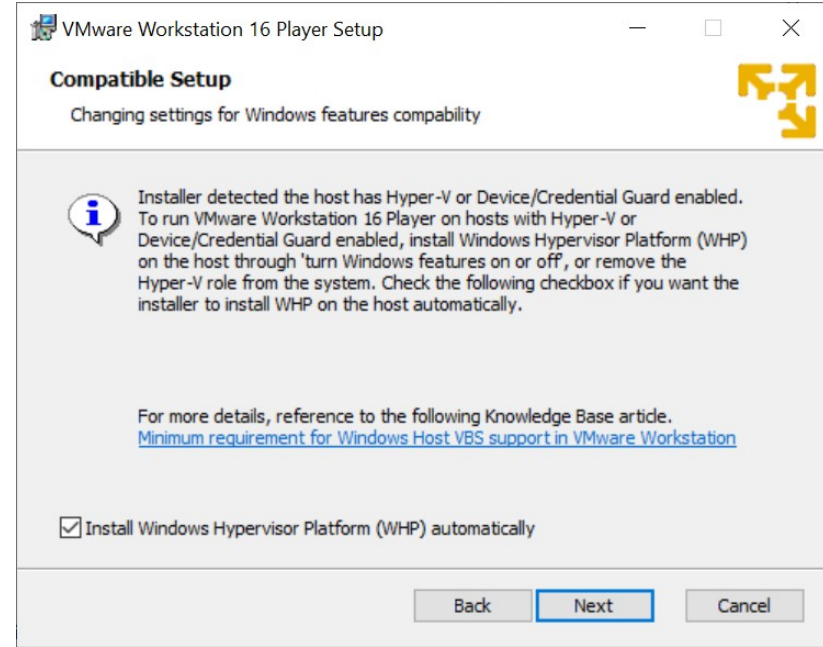
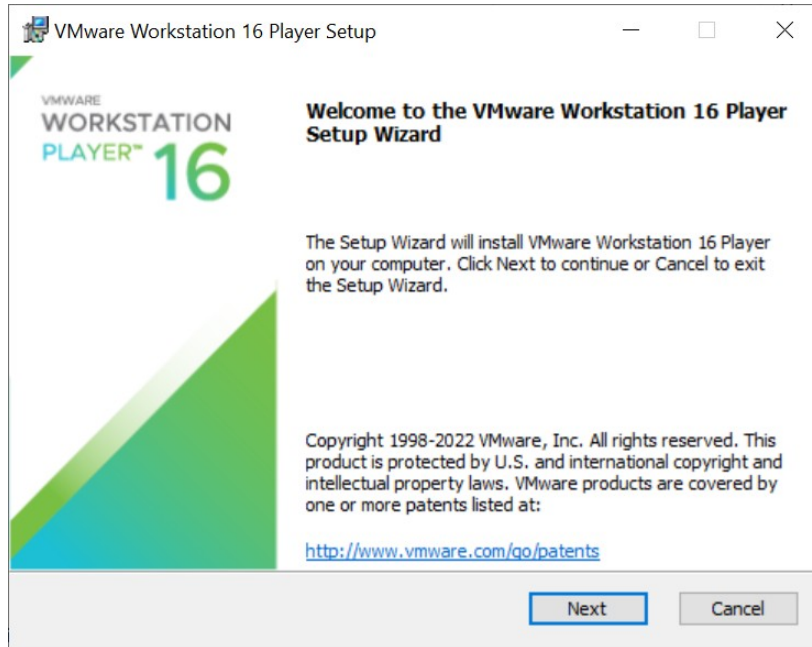
On the right side, there is a "Product Resources" sidebar with links: "View My Download History", "Product Info", "Documentation", "Knowledge Base", "Community", "Self-Help Support", "Support Policies", and "Workstation Player Upgrade".

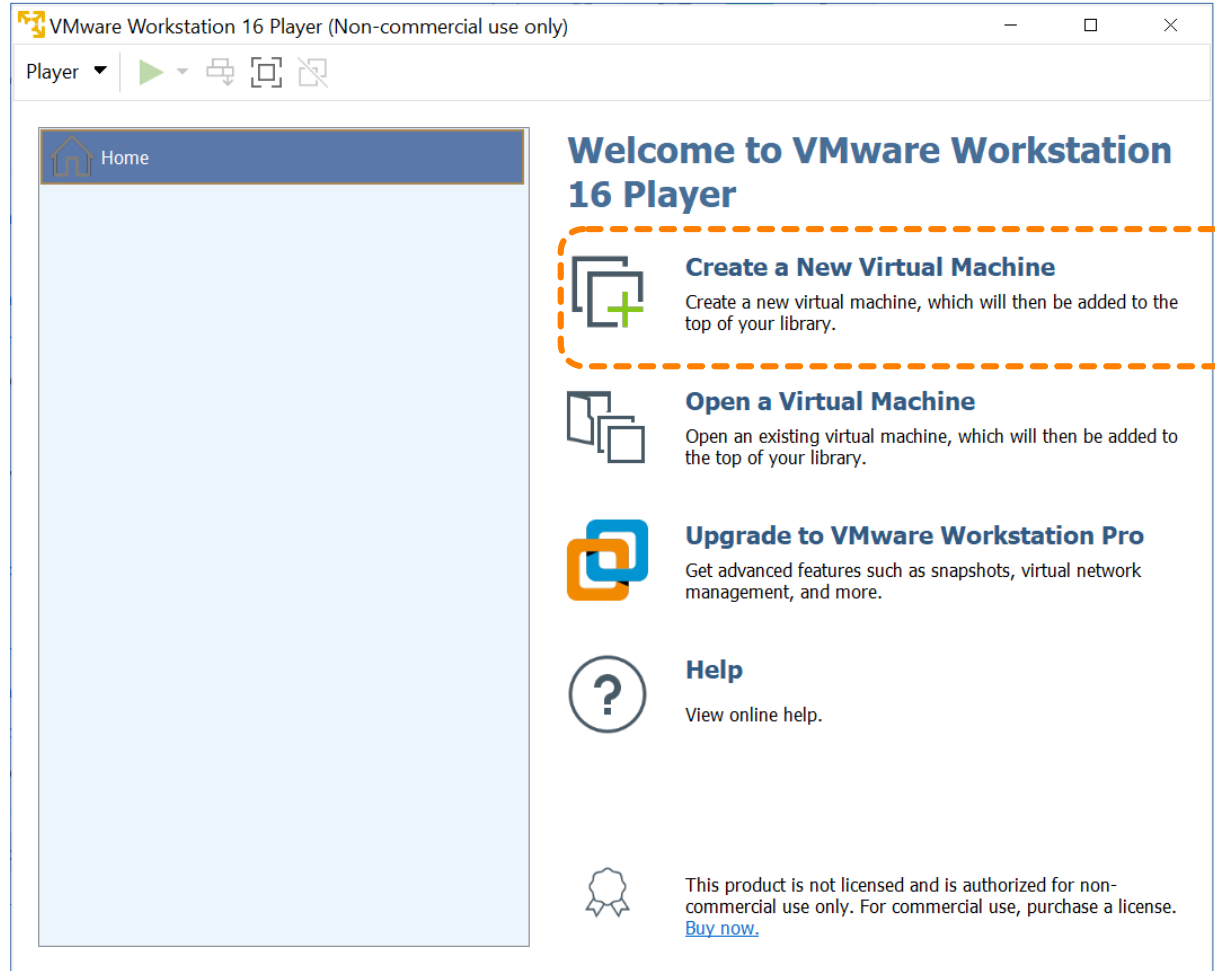
At the bottom, there is a navigation bar with tabs: "Product Downloads" (selected), "Drivers & Tools", "Open Source", "Custom ISOs", and "OEM Addons".

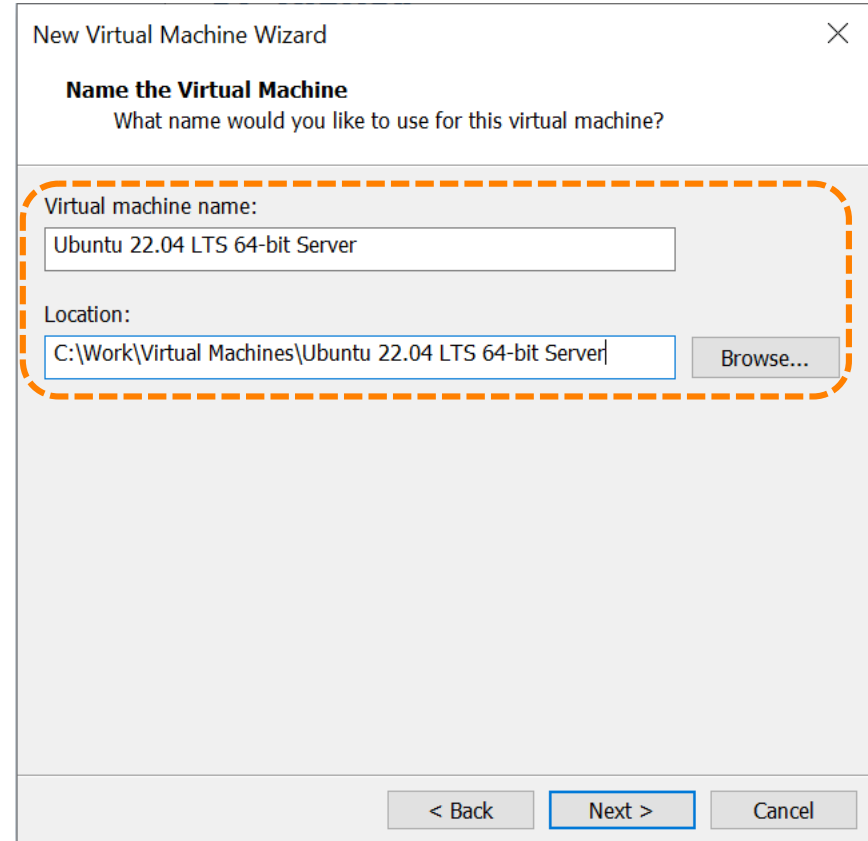
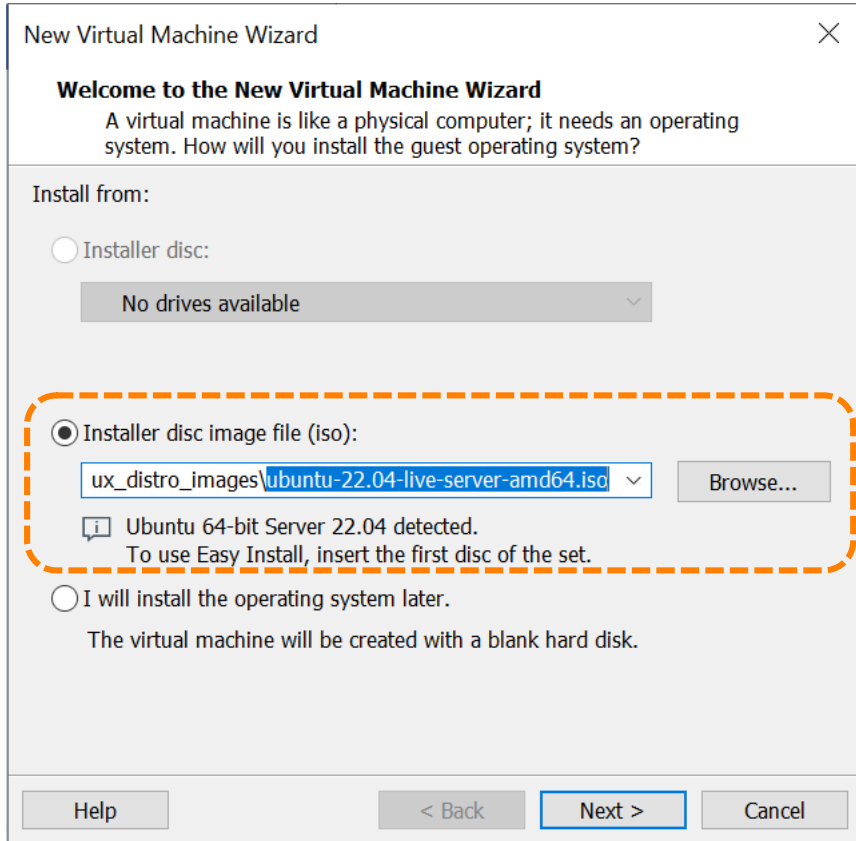
The main download table has two columns: "File" and "Information". The first row is highlighted in yellow and contains the following information:

File	Information
VMware Workstation 16.2.3 Player for Windows 64-bit Operating Systems	<a href="#">DOWNLOAD NOW</a>
File size: 584.21 MB File type: exe	
<a href="#">Read More</a>	

# VMware Workstation Player Installation for 64-bit Windows







**Specify the location or path of the Linux Ubuntu image file (.iso) downloaded previously from the Internet.**

New Virtual Machine Wizard ✕

### Specify Disk Capacity

How large do you want this disk to be?

The virtual machine's hard disk is stored as one or more files on the host computer's physical disk. These file(s) start small and become larger as you add applications, files, and data to your virtual machine.

Maximum disk size (GB):  ▲▼

Recommended size for Ubuntu 64-bit: 20 GB

Store virtual disk as a single file

Split virtual disk into multiple files

Splitting the disk makes it easier to move the virtual machine to another computer but may reduce performance with very large disks.

New Virtual Machine Wizard ✕

### Ready to Create Virtual Machine

Click Finish to create the virtual machine and start installing Ubuntu 64-bit.

The virtual machine will be created with the following settings:

Name:	Ubuntu 22.04 LTS 64-bit Server
Location:	C:\Work\Virtual Machines\Ubuntu 22.04 LTS 64-bit Server
Version:	Workstation 16.2.x
Operating System:	Ubuntu 64-bit
Hard Disk:	8 GB, Split
Memory:	4096 MB
Network Adapter:	NAT
Other Devices:	2 CPU cores, CD/DVD, USB Controller, Printer, Sound Card

Power on this virtual machine after creation

### New Virtual Machine Wizard

**Ready to Create Virtual Machine**  
Click Finish to create the virtual machine and start installing Ubuntu 64-bit.

The virtual machine will be created with the following settings:

Name:	Ubuntu 22.04 LTS 64-bit Server
Location:	C:\Work\Virtual Machines\Ubuntu 22.04 LTS 64-bit Server
Version:	Workstation 16.2.x
Operating System:	Ubuntu 64-bit
Hard Disk:	8 GB, Split
Memory:	4096 MB
Network Adapter:	NAT
Other Devices:	2 CPU cores, CD/DVD, USB Controller, Printer, Sound Card

**Customize Hardware...**

Power on this virtual machine after creation

< Back   Finish   Cancel

### Hardware

Device	Summary
Memory	2 GB
Processors	2
New CD/DVD (SATA)	Using file C:\Work\Linux_distr...
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Printer	Present
Display	Auto detect

Memory

Specify the amount of memory allocated to this virtual machine. The memory size must be a multiple of 4 MB.

Memory for this virtual machine:  MB

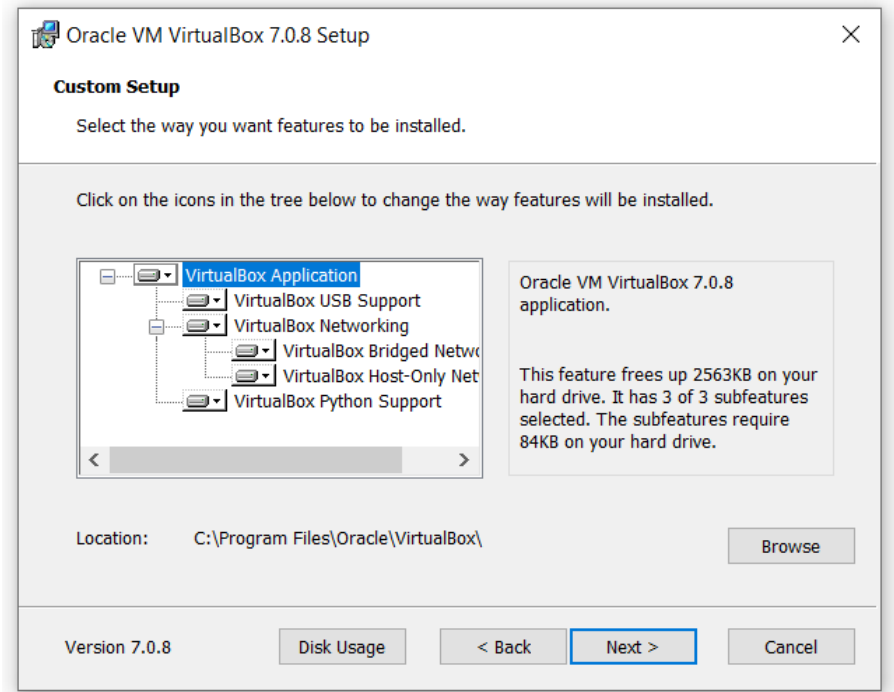
128 GB -  
64 GB -  
32 GB -  
16 GB -  
8 GB -  
4 GB -  
2 GB -  
1 GB -  
512 MB -  
256 MB -  
128 MB -  
64 MB -  
32 MB -  
16 MB -  
8 MB -  
4 MB -

- Maximum recommended memory (Memory swapping may occur beyond this size.) 13.3 GB
- Recommended memory 4 GB
- Guest OS recommended minimum 2 GB

Add...   Remove

Close   Help

# VirtualBox Installation for 64-bit Windows



# VirtualBox Extension Pack Installation

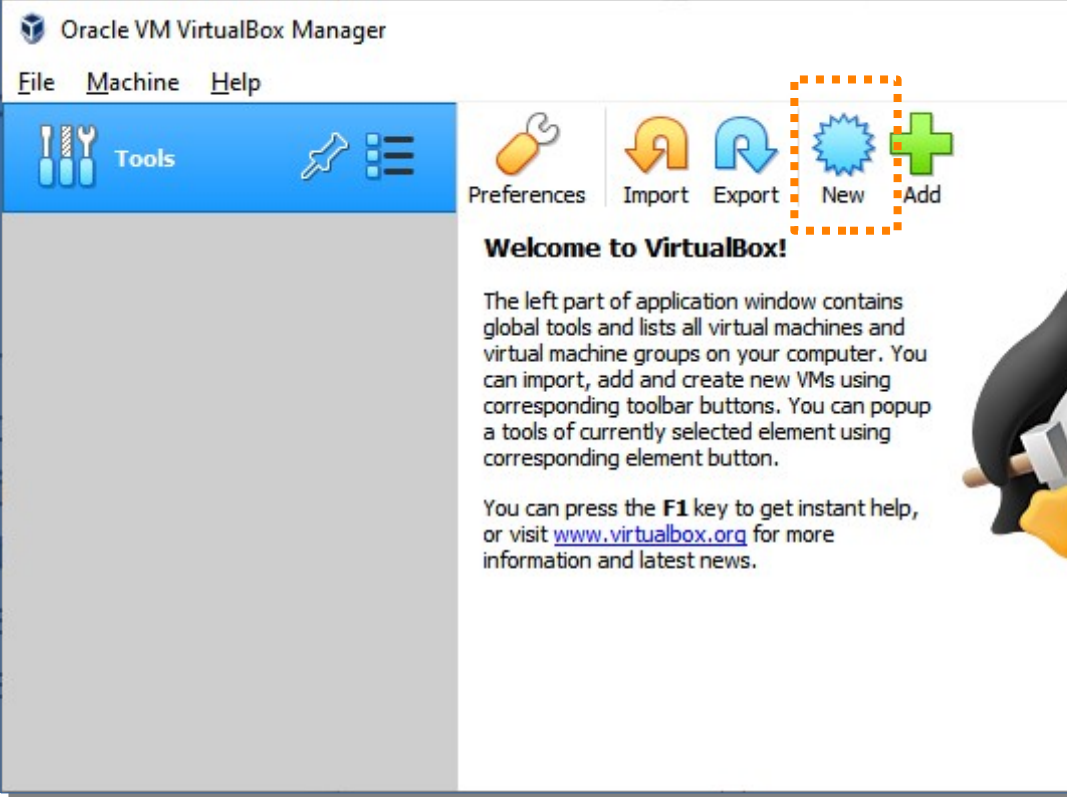
The screenshot displays the Oracle VM VirtualBox Manager interface. The main window is titled "Oracle VM VirtualBox Manager" and features a menu bar with "File", "Machine", "Extension", and "Help". Below the menu bar is a toolbar with icons for "Tools", "Install", and "Uninstall". The "Install" button is highlighted with a green plus sign, and the "Uninstall" button is highlighted with a red minus sign. The main area of the window shows a table with the following data:

Active	Name	Version
<input checked="" type="checkbox"/>	Oracle VM VirtualBox Extension Pack	7.0.8r156879

In the foreground, there is a smaller window titled "VirtualBox - About". This window displays the Oracle VM logo, the text "ORACLE VM", and "VirtualBox 7.0". At the bottom of the window, it reads: "VirtualBox Graphical User Interface Version 7.0.8 r156879 (Q15.15.2) Copyright © 2023 Oracle and/or its affiliates." and includes a "Close" button.



# Create a new Ubuntu VM in VirtualBox



The screenshot shows the Oracle VM VirtualBox Manager application window. The title bar reads "Oracle VM VirtualBox Manager". Below the title bar is a menu bar with "File", "Machine", and "Help". A blue toolbar contains icons for "Tools" (wrench and screwdriver), a search icon, and a list icon. To the right of the toolbar is a secondary toolbar with icons for "Preferences" (wrench), "Import" (curved arrow), "Export" (curved arrow), "New" (starburst), and "Add" (plus sign). The "New" button is highlighted with a dashed orange box. Below the toolbars, the text "Welcome to VirtualBox!" is displayed, followed by a paragraph explaining the interface and a link to the VirtualBox website.

Oracle VM VirtualBox Manager

File Machine Help

Tools

Preferences Import Export New Add

**Welcome to VirtualBox!**

The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new VMs using corresponding toolbar buttons. You can popup a tools of currently selected element using corresponding element button.

You can press the **F1** key to get instant help, or visit [www.virtualbox.org](http://www.virtualbox.org) for more information and latest news.

Create a Linux VM using the Oracle VM VirtualBox Manager



# Create a Ubuntu Desktop 22.04 VM

**Virtual machine Name and Operating System**

Please choose a descriptive name and destination folder for the new virtual machine. The name you choose will be used throughout VirtualBox to identify this machine. Additionally, you can select an ISO image which may be used to install the guest operating system.

Name:  ✓

Folder:

ISO Image:

Edition:

Type:  64

Version:

Skip Unattended Installation

**i** Detected OS type: Ubuntu (64-bit). This OS type can be installed unattendedly. The install will start after this wizard is closed.

Help Expert Mode Back Next Cancel

- Specify the VM name.
- Specify the folder to store the Ubuntu VM file.
- Specify the location or path to the Ubuntu image file (.iso) previously downloaded from the Ubuntu archive server.

Create Virtual Machine

## Unattended Guest OS Install Setup

You can configure the unattended guest OS install by modifying username, password, and hostname. Additionally you can enable guest additions install. For Microsoft Windows guests it is possible to provide a product key.

**Username and Password**

Username:  ✓

Password:

Repeat Password:

**Additional Options**

Product Key:

Hostname:  ✓

Domain Name:

Install in Background

Guest Additions

Guest Additions ISO:

When running **Ubuntu Desktop** in a **VirtualBox VM**, it is recommended to install **VirtualBox Guest Additions** to support features such as **Copy & Paste**, **Drag & Drop**, etc.

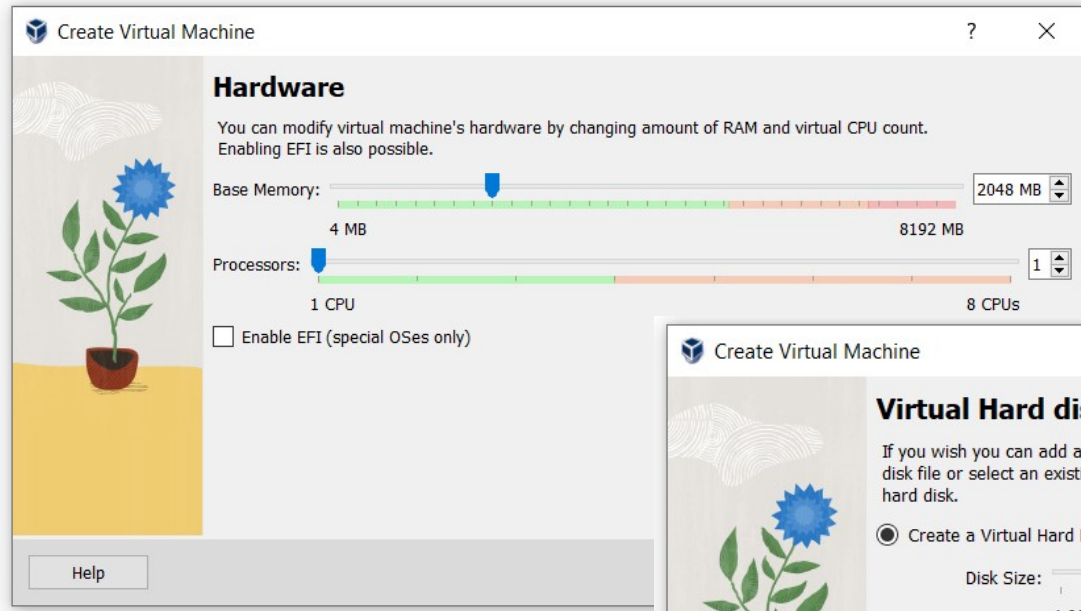
Help Back Next Cancel

- Specify the user name and password.
- Specify the host name and domain name.
- Check “Guest Additions” for installation.

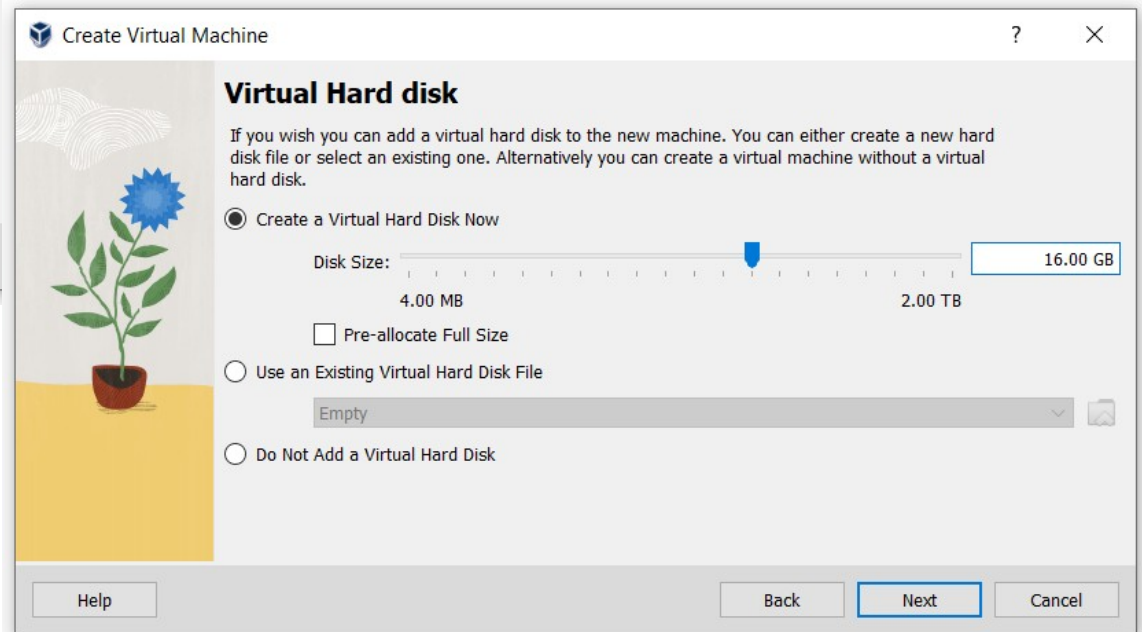
# Unattended Installation Method

- An unattended installation is a method of installing a Guest OS for the VM without requiring the user to select options or click “Next” at the end of each step.
- Using this method, VirtualBox can install a guest OS automatically and this makes the installation process faster.

# Create a Ubuntu Desktop 22.04 VM



- Specify the number of CPUs and memory size to be allocated to the VM.
- Specify the virtual disk size for the VM.



# Start the Ubuntu Desktop 22.04 VM

Oracle VM VirtualBox Manager

File Machine Help

Tools

**64** Ubuntu Desktop 2...  
Powered Off

**Start**

- Normal Start
- Headless Start
- Detachable Start

**General**

Name: Ubuntu Desktop  
22.04 LTS

Operating System: Ubuntu (64-bit)

**System**

Base Memory: 2048 MB  
Boot Order: Floppy, Optical, Hard Disk  
Acceleration: Nested Paging, KVM  
Paravirtualization

**Display**

Video Memory: 16 MB  
Graphics Controller: VMSVGA  
Remote Desktop Server: Disabled  
Recording: Disabled

**Storage**

VirtualBox - Information

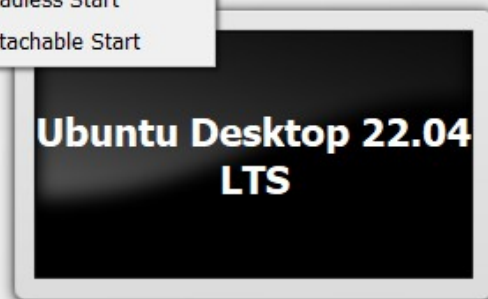
The virtual machine window will be now switched to **full-screen** mode. You can go back to windowed mode at any time by pressing **Host+F**.

Note that the *Host* key is currently defined as **Right Ctrl**.

Note that the main menu bar is hidden in full-screen mode. You can access it by pressing **Host+Home**.

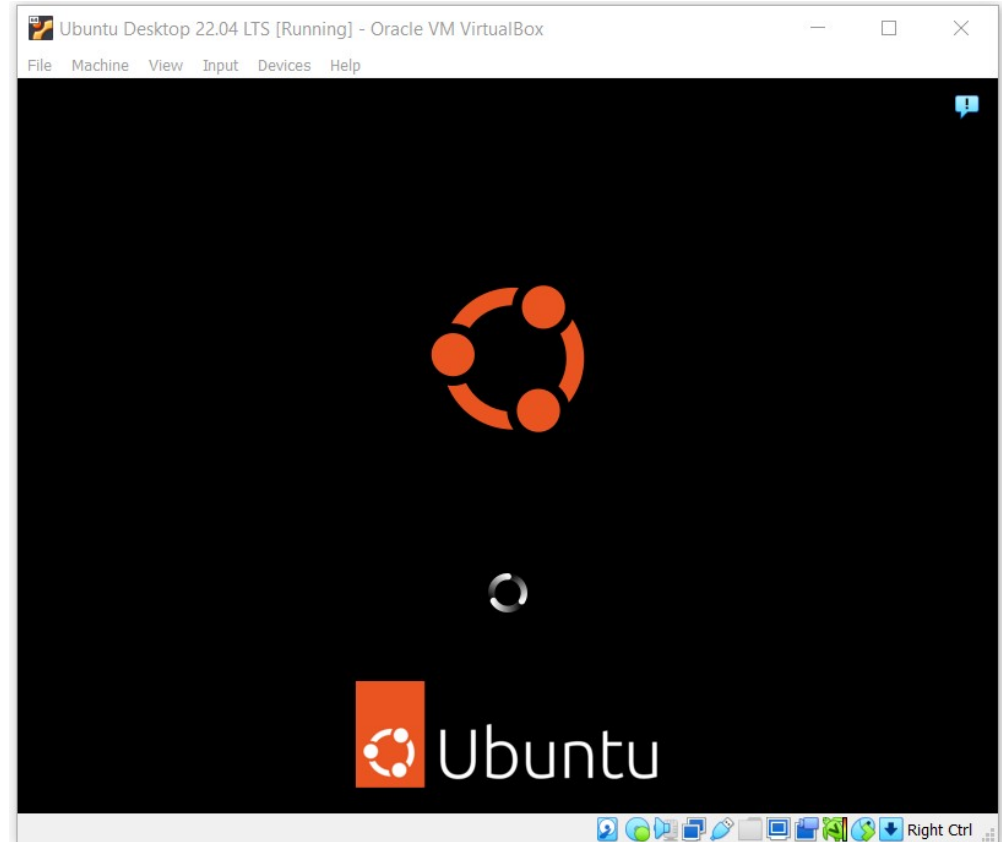
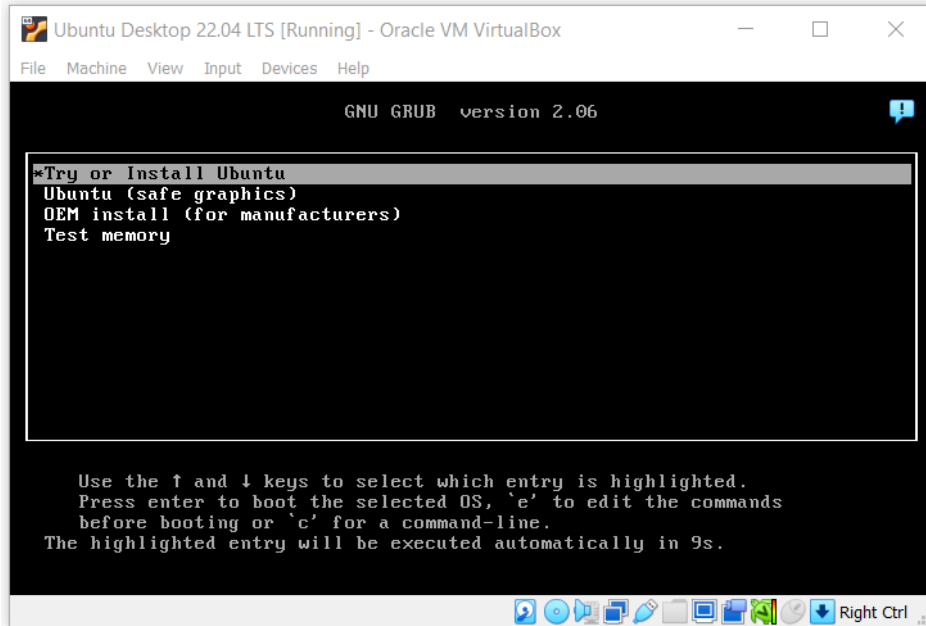
Do not show this message again

Switch Cancel

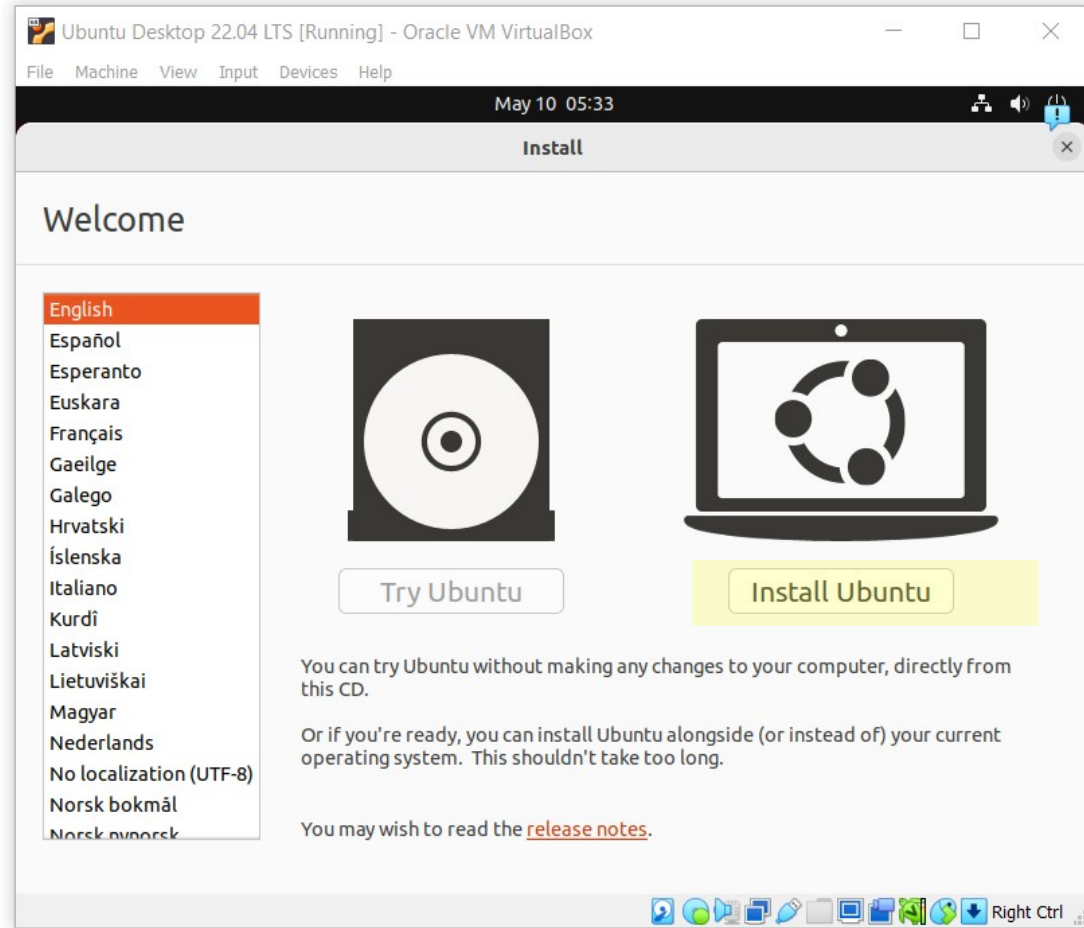


# Ubuntu Installation Process

The Ubuntu installation process remains largely the same, whether installing on a virtual machine (VM) or physical hardware.

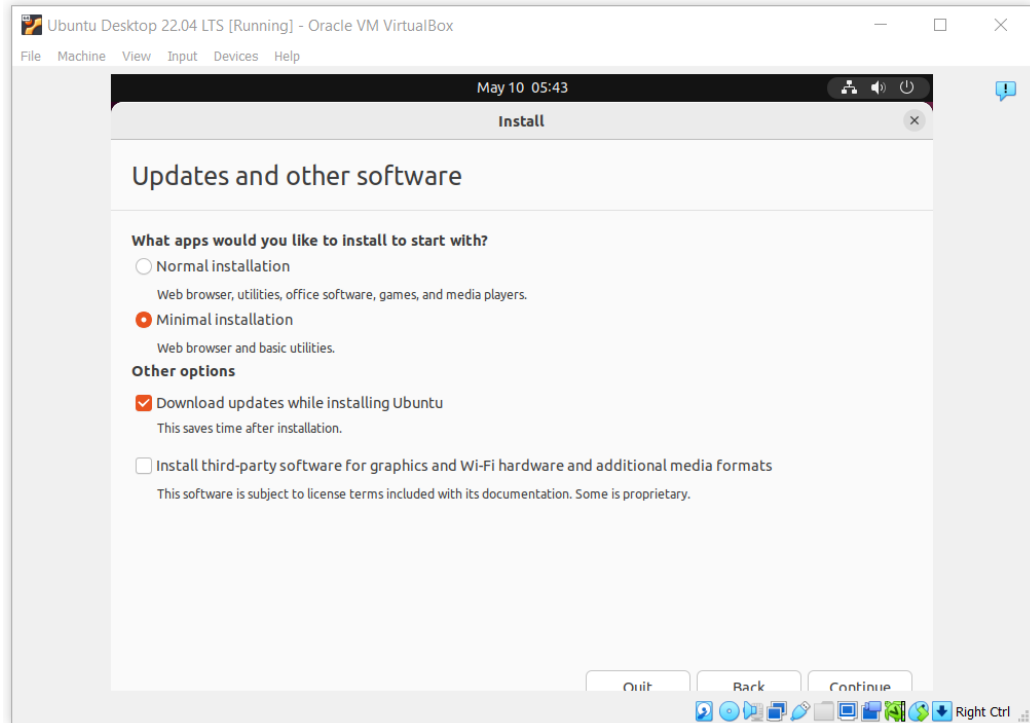
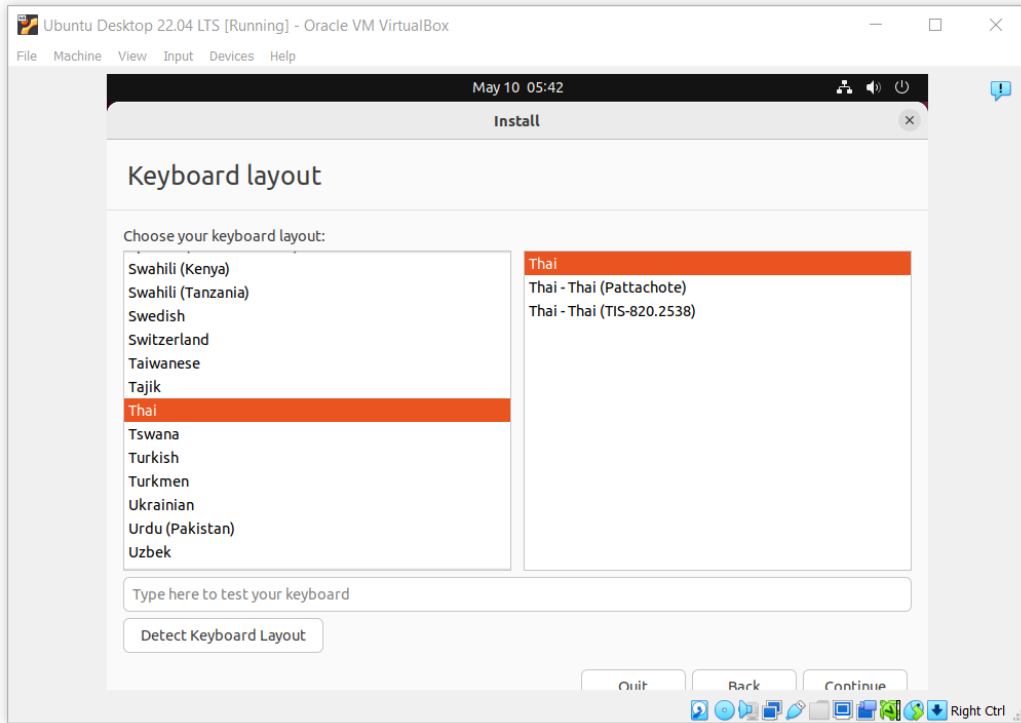


# Ubuntu Desktop Installation

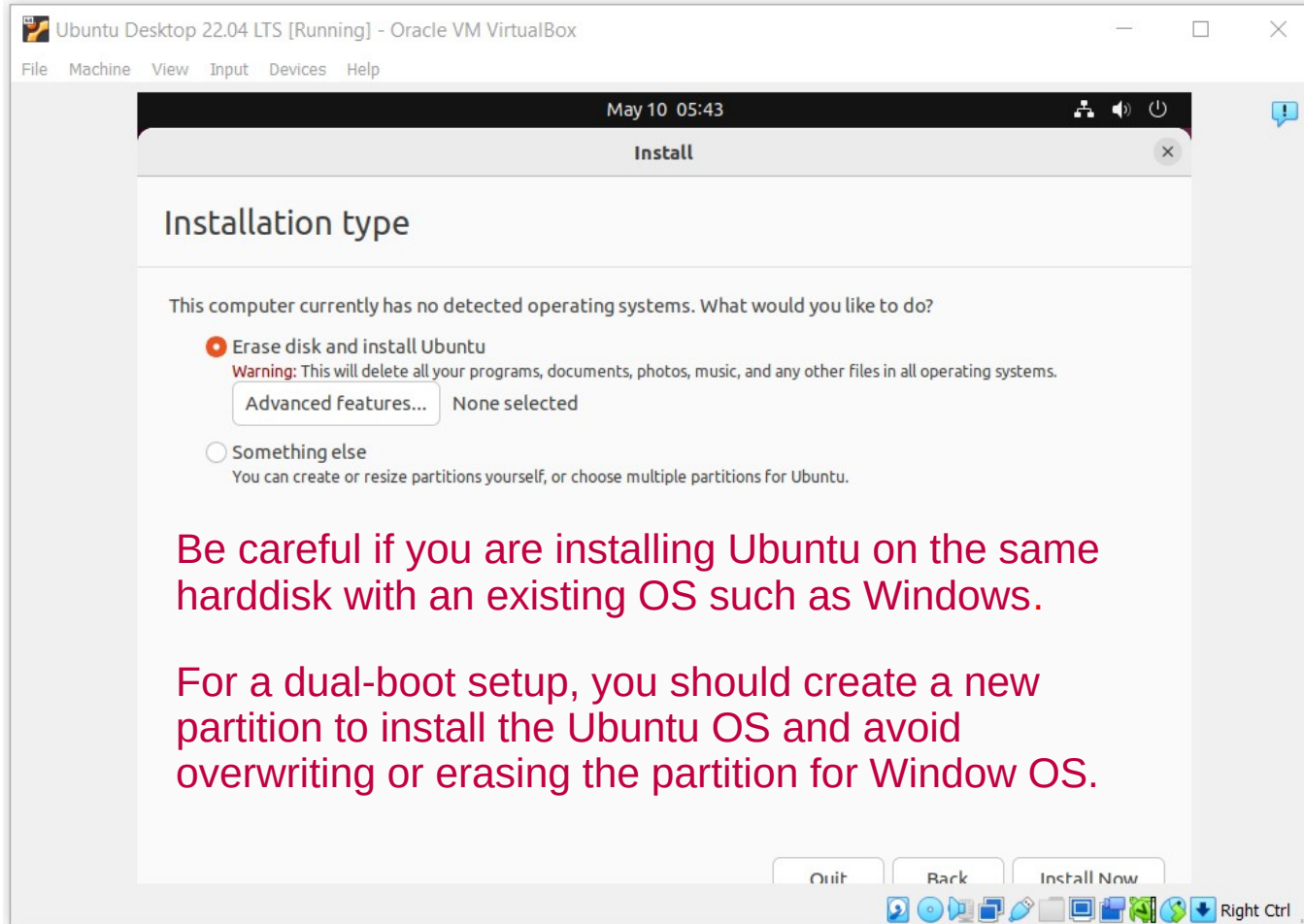




# Ubuntu Desktop Installation



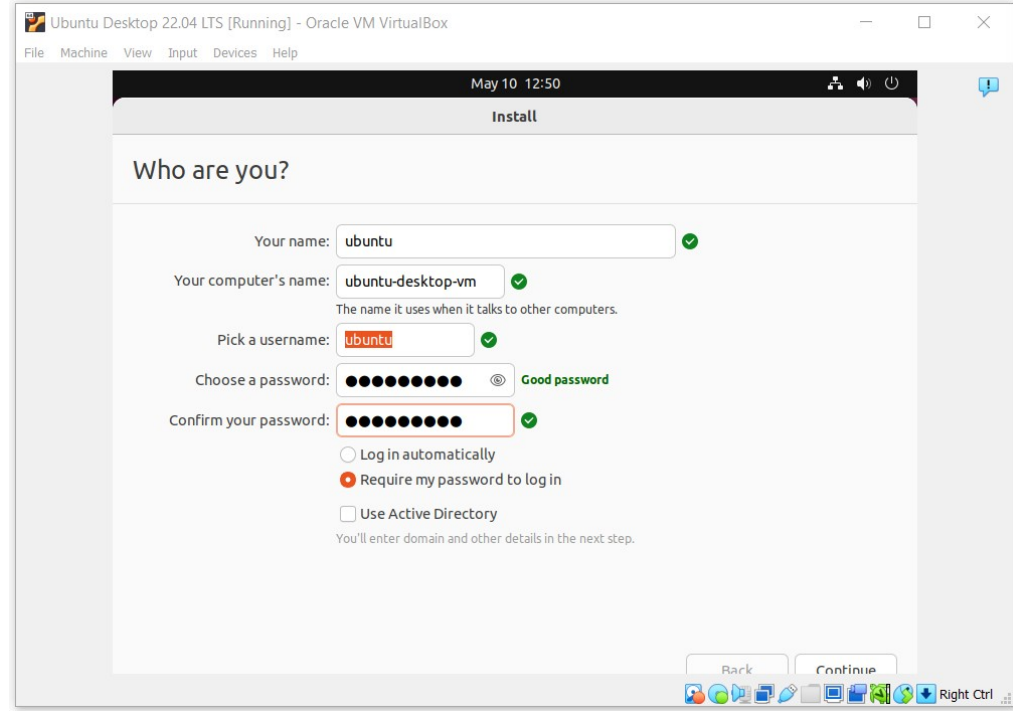
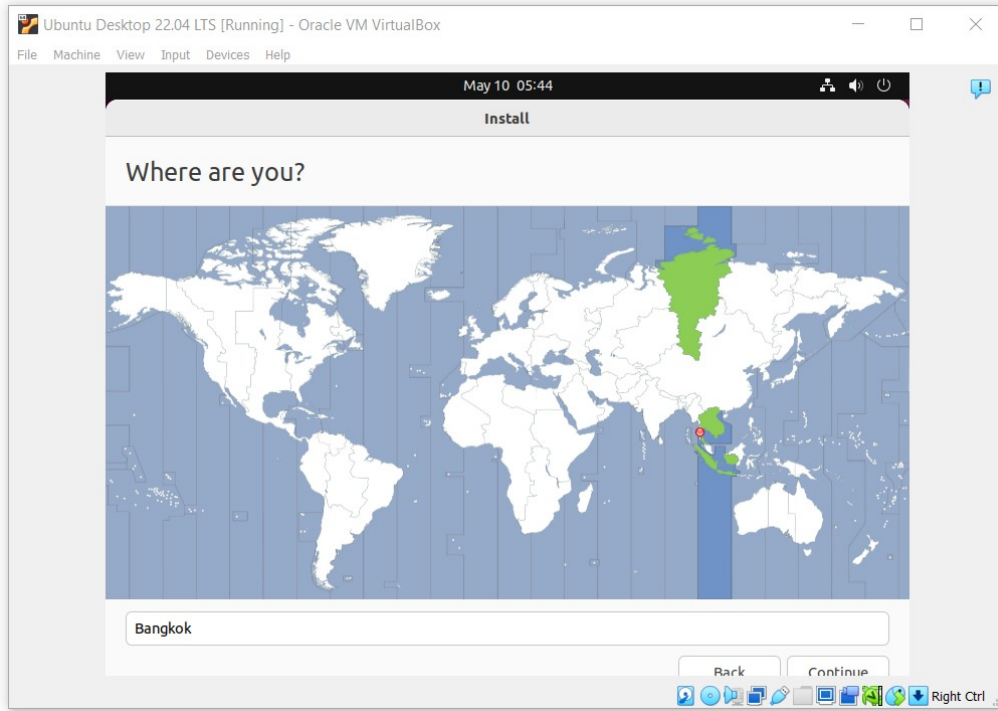
# Ubuntu Desktop Installation



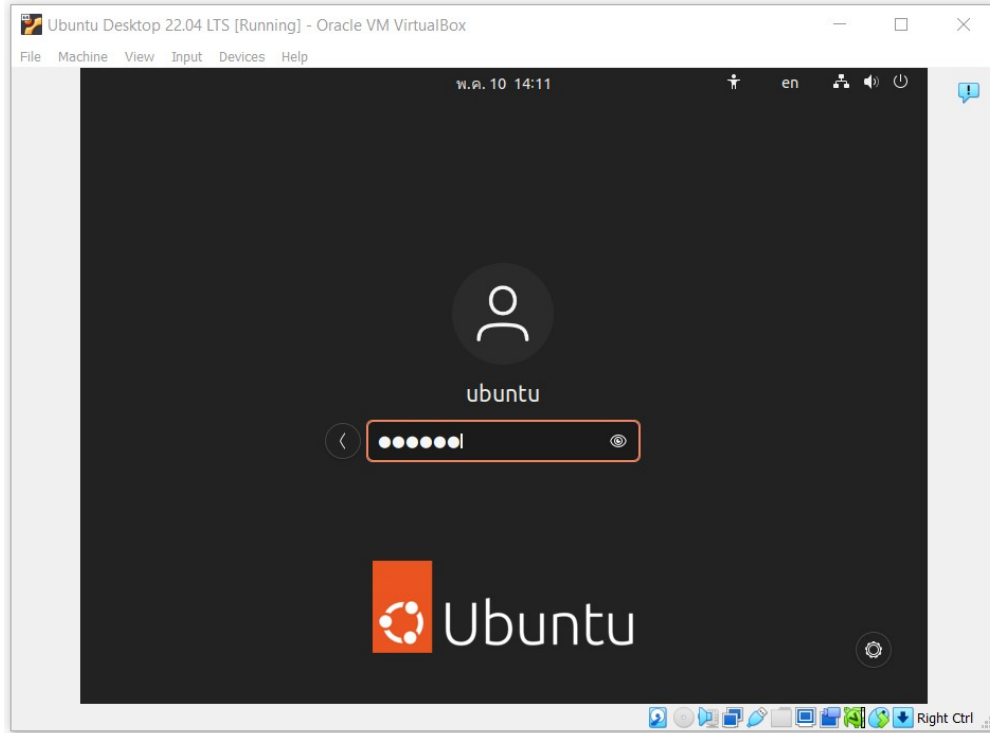
Be careful if you are installing Ubuntu on the same harddisk with an existing OS such as Windows.

For a dual-boot setup, you should create a new partition to install the Ubuntu OS and avoid overwriting or erasing the partition for Window OS.

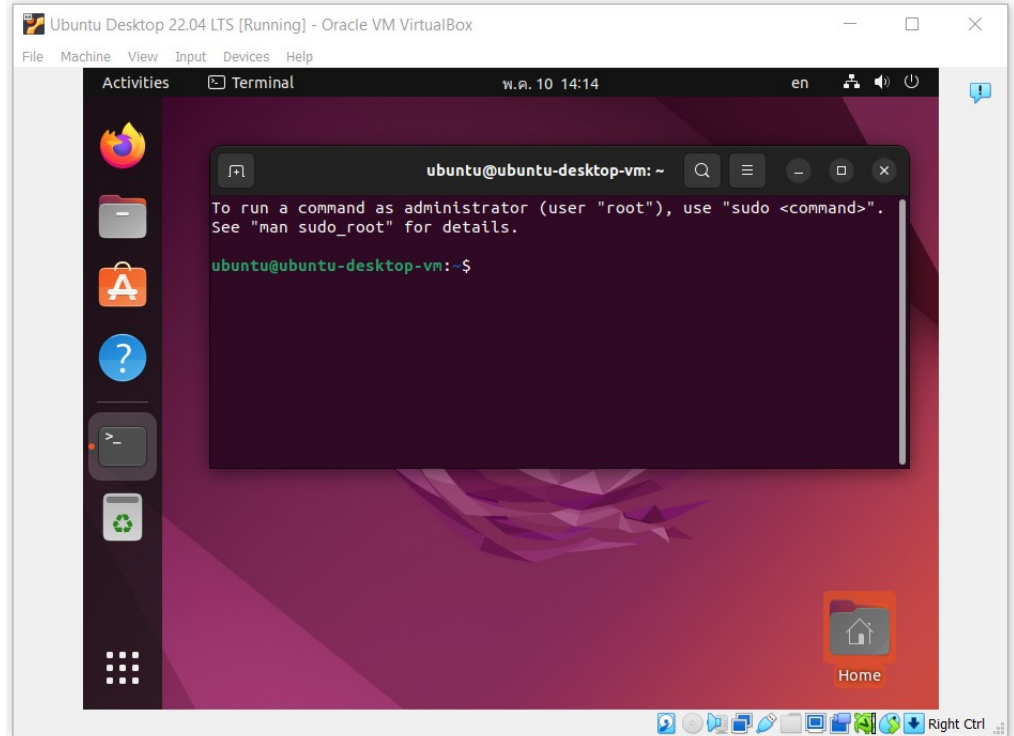
# Ubuntu Desktop Installation



# Ubuntu Desktop Login



# Linux Terminal



To open a Linux terminal, press: **Ctrl+Alt+T**

```
ubuntu@ubuntu-desktop-vm: ~  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
ubuntu@ubuntu-desktop-vm:~$ sudo apt update  
[sudo] password for ubuntu:  
Hit:1 http://th.archive.ubuntu.com/ubuntu jammy InRelease  
Hit:2 http://th.archive.ubuntu.com/ubuntu jammy-updates InRelease  
Hit:3 http://th.archive.ubuntu.com/ubuntu jammy-backports InRelease  
Get:4 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]  
Get:5 http://security.ubuntu.com/ubuntu jammy-security/main amd64 DEP-11 Met  
adata [41.5 kB]  
34% [Waiting for headers]
```

**\$ sudo apt update**

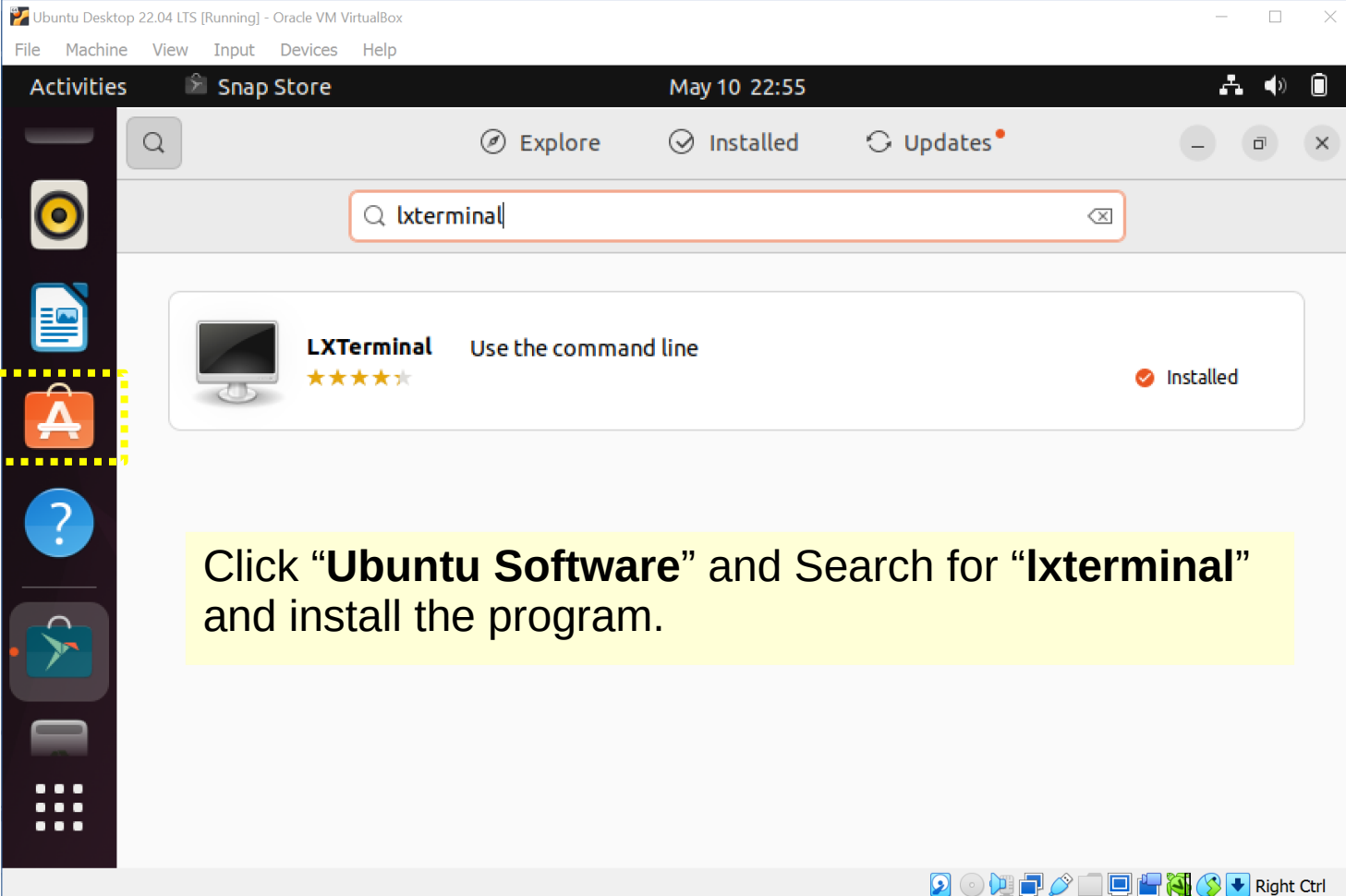
```
ubuntu@ubuntu-desktop-vm:~$ sudo apt upgrade -y  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
Calculating upgrade... Done  
The following packages will be upgraded:  
  also-ucm-conf apparmor apport apport-gtk apt apt-utils bind9-dnswtills  
  bind9-host bind9-libs distro-info-data dnsmasq-base evince evince-common  
  fonts-opensymbol gdm3 ghostscript ghostscript-x gir1.2-gdm-1.0  
  gir1.2-javascriptcoregtk-4.0 gir1.2-pango-1.0 gir1.2-webkit2-4.0  
  gnome-settings-daemon gnome-settings-daemon-common im-config  
  intel-microcode ipp-usb isc-dhcp-client isc-dhcp-common libapparmor1  
  libapt-pkg6.0 libcurl3-gnutls libcurl4 libevdocument3-4 libevview3-3  
  libfprint-2-2 libfreetype6 libgdm1 libglib2.0-0 libglib2.0-bin  
  libglib2.0-data libgnutls30 libgs9 libgs9-common  
  libjavascriptcoregtk-4.0-18 libldap-2.5-0 libldap-common libldb2  
  libllvm15 liblouis-data liblouis20 libmbim-glib4 libmbim-proxy
```

**\$ sudo apt upgrade -y**

```
ubuntu@ubuntu-desktop-vm: ~  
ubuntu@ubuntu-desktop-vm:~$ df -h  
Filesystem      Size  Used Avail Use% Mounted on  
tmpfs           198M  1.5M  197M   1% /run  
/dev/sda3       16G   9.8G  4.6G  68% /  
tmpfs           988M   0    988M   0% /dev/shm  
tmpfs           5.0M  4.0K  5.0M   1% /run/lock  
/dev/sda2       512M  6.1M  506M   2% /boot/efi  
tmpfs           198M  2.4M  196M   2% /run/user/1000  
ubuntu@ubuntu-desktop-vm:~$
```

```
ubuntu@ubuntu-desktop-vm: ~  
ubuntu@ubuntu-desktop-vm:~$ ping 8.8.8.8 -c 3  
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.  
64 bytes from 8.8.8.8: icmp_seq=1 ttl=112 time=31.8 ms  
64 bytes from 8.8.8.8: icmp_seq=2 ttl=112 time=33.3 ms  
64 bytes from 8.8.8.8: icmp_seq=3 ttl=112 time=32.8 ms  
  
--- 8.8.8.8 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 2003ms  
rtt min/avg/max/mdev = 31.829/32.658/33.311/0.617 ms  
ubuntu@ubuntu-desktop-vm:~$
```

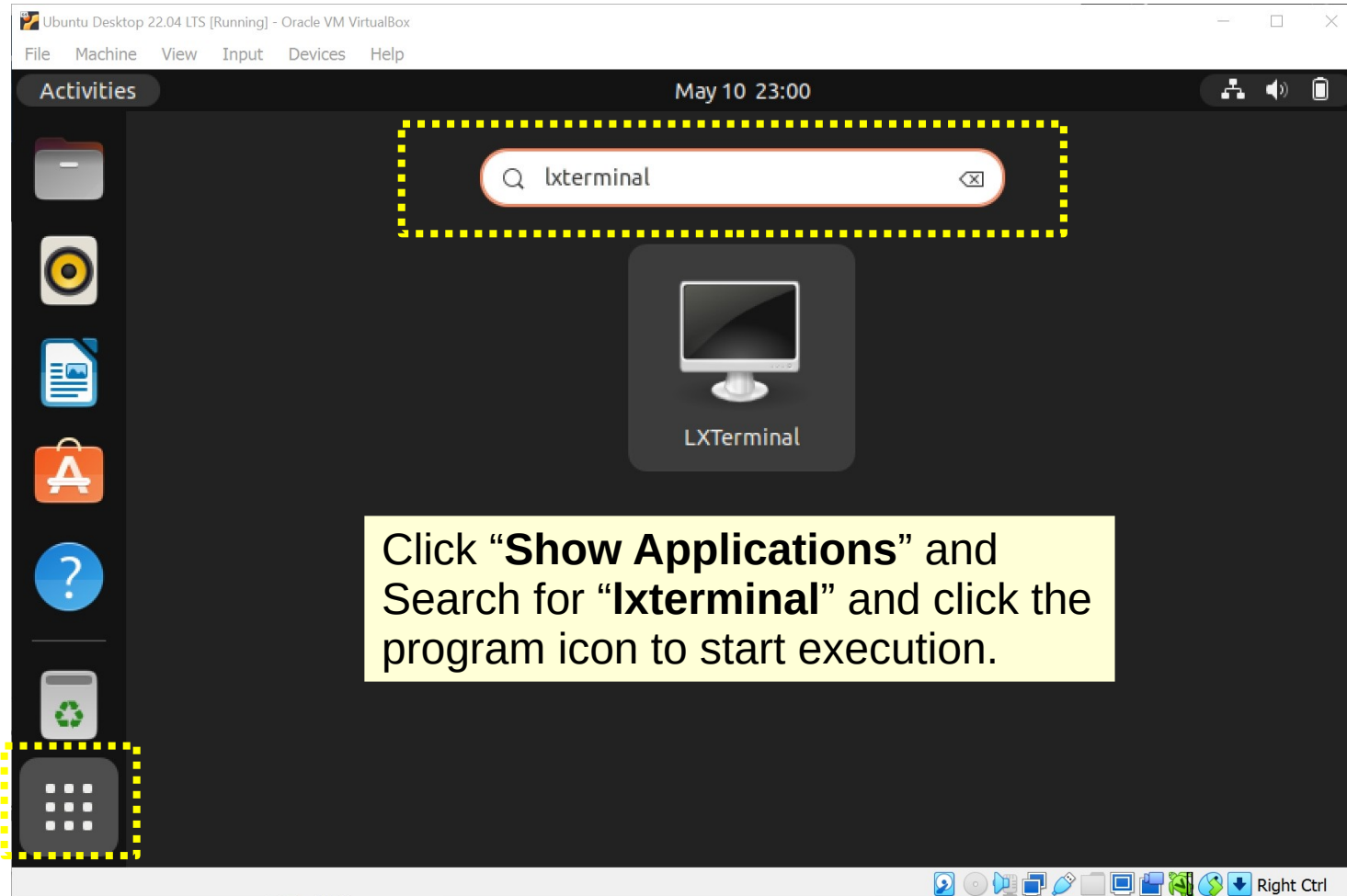
# Ubuntu App Installation: LXTerminal



The screenshot shows the Ubuntu Snap Store interface. The search bar at the top contains the text "lxterminal". Below the search bar, the results for "LXTerminal" are displayed. The application is described as "Use the command line" and has a rating of five stars. A red checkmark and the word "Installed" are visible next to the application name. The Ubuntu Software icon in the left sidebar is highlighted with a yellow dashed box. A yellow text box at the bottom of the screen contains the instruction: "Click 'Ubuntu Software' and Search for 'lxterminal' and install the program."

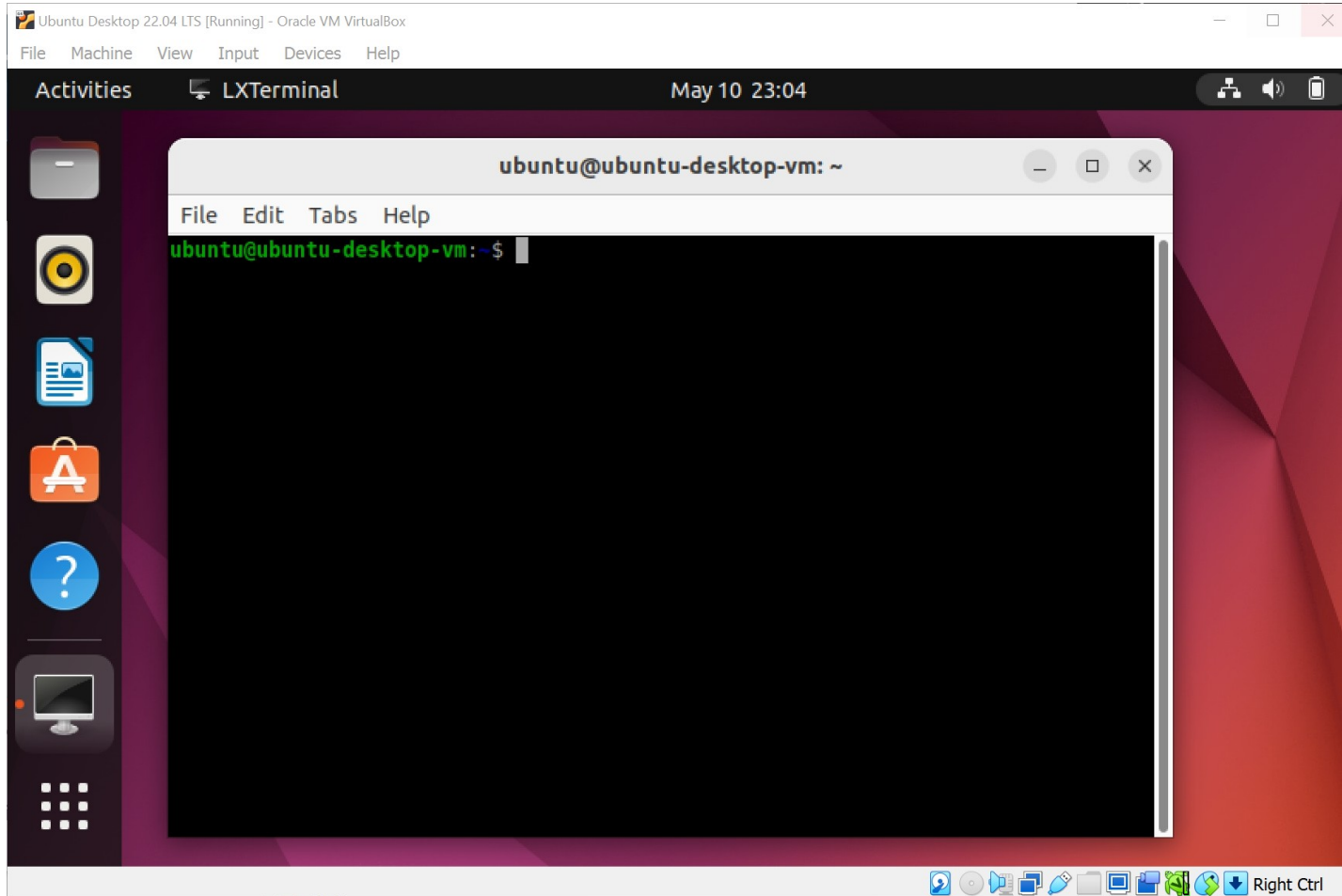
Click **“Ubuntu Software”** and Search for **“lxterminal”** and install the program.

# Start LXTerminal





# LXTerminal



# Conclusions

- We have learned how to setup Linux system, using Linux distributions such as Ubuntu, in virtual machines managed by VirtualBox or VMware Workstation Player.
- Additionally, we have learned how to setup a Linux environment for a Windows machine using WSL2.