

OPERATING SYSTEM INDIVIDUAL ASSIGNMENT



BAHIR DAR UNIVERSITY

BAHIR DAR INSTITUTE OF TECHNOLOGY

FACULTY OF COMPUTING

Department: Software Engineering

Year: 2nd Year, 2017 E.C

NAME

ID

GATWECH DENG KUN.....1510065

SUBMITTED TO: Mr. WONDIMU BAYE

Submission Date: 16/07/2017 E.C.

OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

OPERATING SYSTEM ASSIGNED: WINDOWS 11

VIRTUALIZATION TOOL: VMWARE WORKSTATION



WORLD-VIEW

OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

PROJECT-WORK

OPERATING SYSTEM AND SYSTEM PROGRAMMING

1. Installation of operating system in virtual environment tools (VMware workstation, oracle vm virtual box, and etc...). Installation may not necessary if the technology tool is outdated, has no long term support (LTS), and no hardware support only. Which OS you are going to install refer on the attached document. Your name list as well as OS list is incorporated. Contents to cover when you prepare documentation:

- a. Introduction (background, motivation)
- b. Objectives
- c. Requirements i. Hardware ii. Software
- d. Installation steps: i. Include snipped images ii. When you create an account, you should name by your full-name
- e. Issues (problem faced): when you face problems, list or snip the problem/s.
- f. Solution: i. if you have the solution for the problem listed in above (e), list the solution
- g. File system support.
- h. Which file system support(NTFS, FAT32, exFAT, ext4, Btrfs, ZFS, HFS+, APFS) and why
- i. Advantage and disadvantage.
- j. Conclusion. j. Future outlook /recommendation.

2. Briefly explain the what, why, and how virtualization in modern operating system.

4. Implement system calls.

OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

a. Introduction to windows 11 OS

Windows 11 is the latest major release of the Windows operating system developed by Microsoft. It was officially announced on June 24, 2021, and became available for general use starting October 5, 2021. As the successor to Windows 10, Windows 11 introduces a more streamlined, modern interface, improved performance, and enhanced features designed to cater to the evolving needs of both personal and business users.

Historical background of windows 11 OS

Windows 11 comes as part of Microsoft's ongoing effort to enhance user experience across various devices, from desktops to laptops and tablets. It builds on the foundation laid by Windows 10 but introduces significant changes in aesthetics, functionality, and security. Windows 11 is designed to provide users with a more refined and cohesive experience, making it easier to multitask, work, and entertain.

Motivation behind windows 11 OS

The motivation behind Windows 11 is to create an OS that is more intuitive, secure, and efficient. With the increase in remote work, gaming, and advanced computing needs, Windows 11 aims to provide a platform that supports a variety of workloads, from everyday tasks to high-performance applications. It also seeks to integrate a more unified experience across multiple types of devices, including those with ARM processors, and improve support for modern hardware standards such as TPM 2.0 and Secure Boot for enhanced security.

Objectives of Windows 11 OS

The primary objectives of Windows 11 are to provide a modern, secure, and efficient computing environment while enhancing the user experience for both individuals and organizations. Some key objectives of Windows 11 include:

1. Enhanced User Interface and Experience

Windows 11 aims to provide a more aesthetically pleasing and intuitive user interface. With features like a centered Start menu, rounded corners, and new taskbar layouts, the design focuses on simplicity, clarity, and ease of use. The objective is to make navigation more fluid and visually appealing while promoting multitasking.

2. Improved Performance and Speed

Windows 11 is optimized for better performance. The OS prioritizes faster boot times, smoother animations, and more efficient memory management. This allows for a quicker and more responsive experience, especially on newer hardware that supports features like DirectStorage and Auto HDR.

OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

3. Strengthened Security Features

One of the core objectives of Windows 11 is to enhance security. With mandatory TPM 2.0 (Trusted Platform Module) and Secure Boot, the OS improves data protection and ensures that the operating system is booted only from trusted sources. Windows 11 also introduces additional protections for malware, ransomware, and cyber threats, focusing on providing a secure environment for personal and enterprise use.

4. Optimized for Hybrid Work and Productivity

As hybrid work becomes more common, Windows 11 offers tools to enhance productivity, including Snap Layouts, Snap Groups, and Desktops. These features allow users to organize their workspace efficiently, manage multiple open apps, and streamline tasks across different virtual desktops. Collaboration is also improved with tighter integration of Microsoft Teams.

5. Support for Modern Hardware and Software

Windows 11 is designed to take full advantage of the latest hardware innovations, such as faster processors, improved graphics, and new input devices. It also introduces better support for ARM-based processors, offering a more consistent experience across different device types.

6. Gaming Advancements

Windows 11 includes several advancements for gaming, such as DirectStorage for faster load times and Auto HDR for enhanced visual quality. The OS also integrates Xbox Game Pass and Xbox Live more tightly, bringing better gaming experiences to PC users.

7. Compatibility and Ecosystem Integration

Windows 11 strives to maintain compatibility with a wide range of applications and peripherals while offering a more unified ecosystem across devices, such as PCs, tablets, and Xbox. Microsoft Store improvements also make it easier to find and install apps that work across all Windows-based devices

c. Requirements

i. Hardware

- Processor: Intel Core i5 or higher
- RAM: Minimum 8 GB
- Storage: Minimum 60 GB free disk space
- Virtualization support (Enabled in BIOS)

OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

ii. Software

- VMware Workstation (Pro or Player)
- Windows 11 ISO file
- VMware Tools (for drivers and enhanced performance)

d. Installation Steps

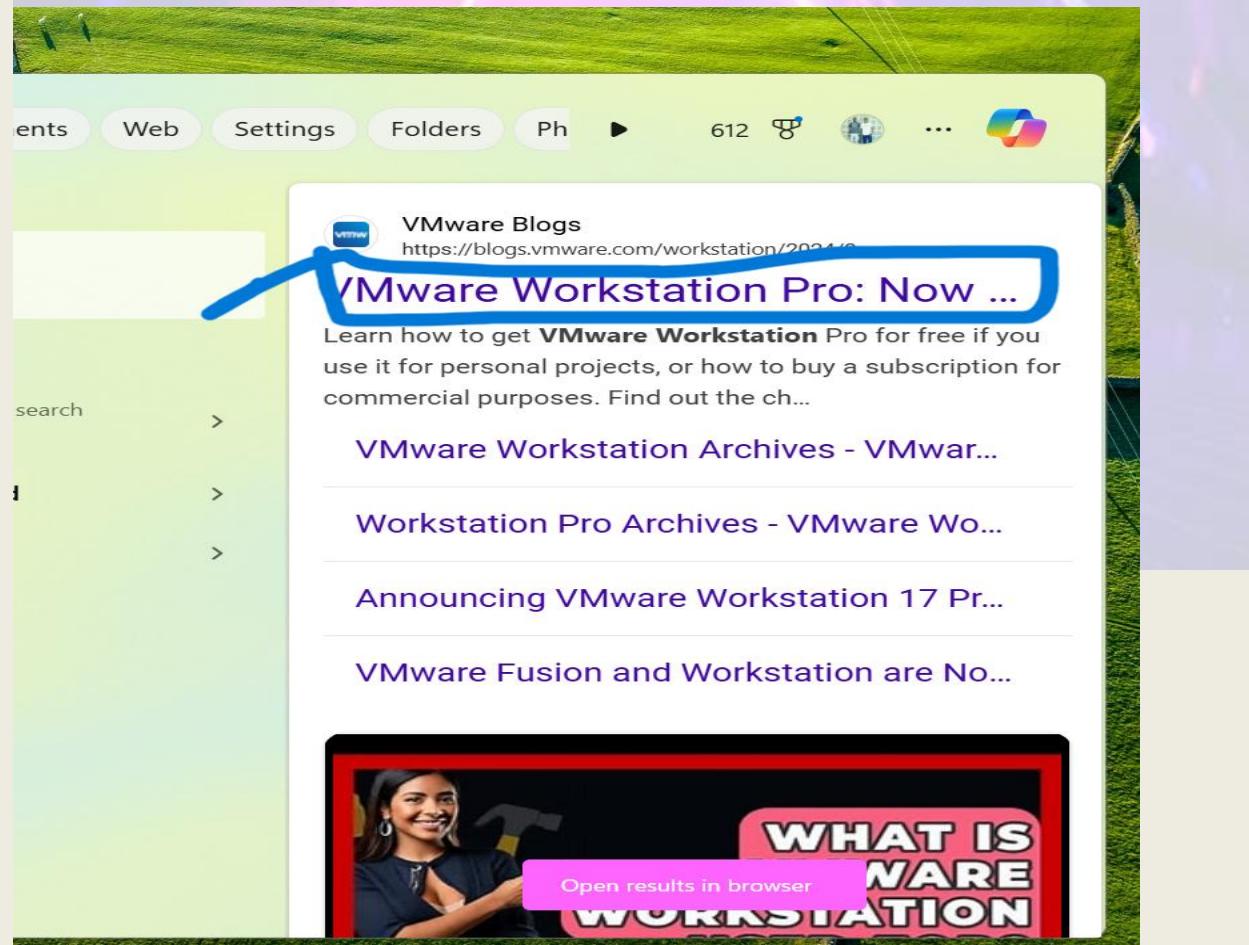
INSTALLATION IT COULD BE DIVIDED INTO TWO:

1. Virtual box downloading and installation

2. Windows 11 OS downloading and installation

Downloading Virtual box

Go to any browser and search for “Virtual Box”. Click the link encircled in blue color.



OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

Now you will find all the websites where you can click one website

vmware workstation - Search

Microsoft Bing

ALL SEARCH COPilot SCHOOL IMAGES VIDEOS MAPS NEWS MORE TOOLS

About 7,720,000 results

Vmware Workstation
https://www.vmware.com/products/workstation-pro/workstation-pr...
Software · Vmware Inc.

Vmware Workstation is a desktop hypervisor that enables you to run multiple operating systems as virtual machines on your Windows or Linux PC. The industry standard for running vir...

Download

VMware Blogs
https://blogs.vmware.com › workstation › vmware-workstation-pro-n... ▾

VMware Workstation Pro: Now Available for Personal Use
13 May 2024 · Learn how to get VMware Workstation Pro for free if you use it for personal projects, or how to buy a subscription for commercial purposes. Find out the changes in ...

VMware Workstation Archive...
VMware Workstation Pro: Now Available
Free for Personal Use. Michael Roy. May ...

Announcing VMware Workst...
After much anticipation, we're proud to be announcing the general availability of ...

VMware Workstation
Hosted hypervisor

VMware Workstation Pro is a hosted hypervisor that runs on x64 versions of Windows and Linux operating systems. It enables users to set up virtual machines on a single physical machine and use them si...

W Wikipedia

Developer(s) VMware
Initial release 15 May 1999
Stable release 17.6.3 / 4 March 2025
Written in C, C++

Many os will come where you will have option to decide which os is already in your computer.

Because am running window in my pc then I have to click on window workstation with red circle.

VMware Workstation Pro Download - 17.6.3 | TechSpot

TECHSPOT

TRENDING FEATURES REVIEWS DOWNLOADS THE BEST PRODUCT FINDER FORUMS

Build, test and demo software across an array of different devices, platforms and clouds. IT professionals, developers and businesses rely on Workstation Pro every day to support their projects and customers. Workstation Pro makes it easy to run complex local virtual environments to simulate operating systems, platforms and clouds, all from the same desktop PC.

What are the different editions of VMware Workstation?

The VMware Workstation product line consists of two products: Workstation Pro and Workstation Player. Collectively they are referred to as 'VMware Workstation,' and when there are differences, they are called out.

What are the differences between Workstation Pro and Workstation Player?

Download options:

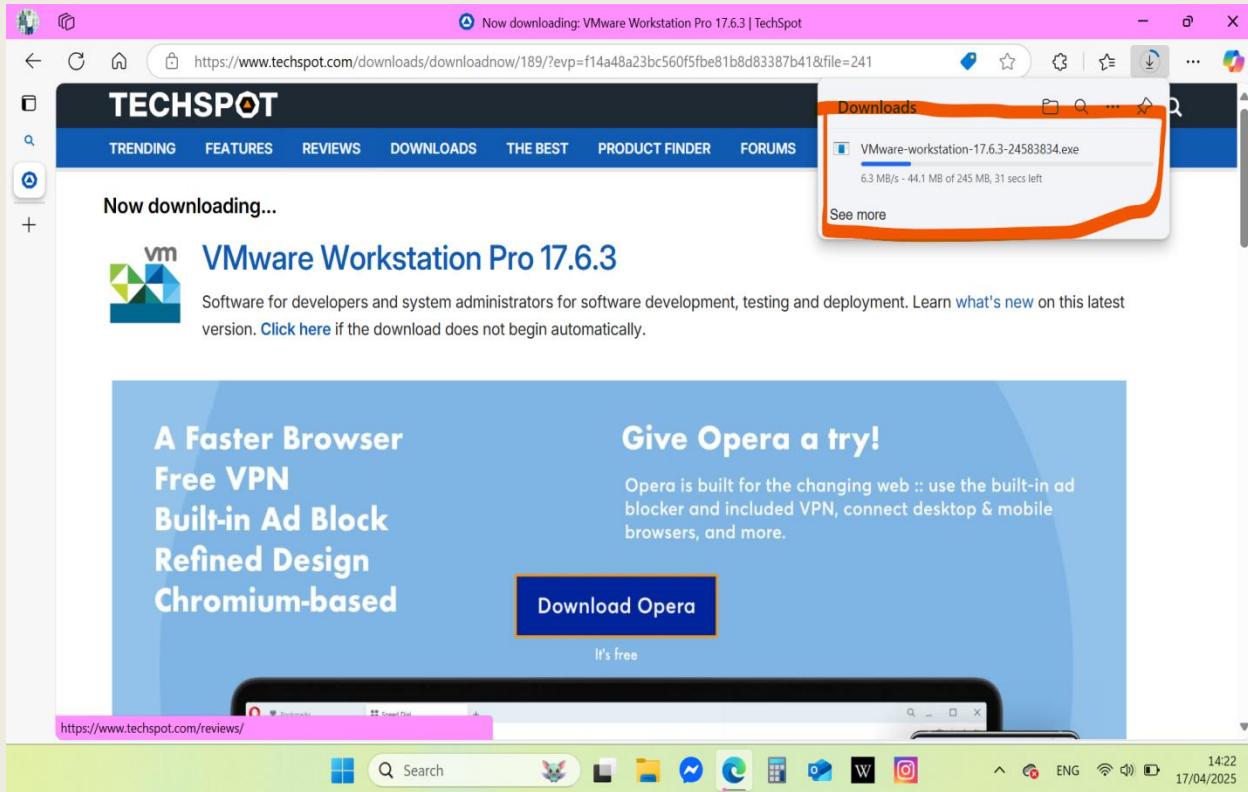
- Workstation Windows
- VMware Player Windows
- Workstation Linux
- VMware Player Linux
- Workstation Windows 17.6.2
- Workstation Windows 17.6.1
- Workstation Windows 17.5.2
- Workstation Linux 17.6.1

DOWNLOADS

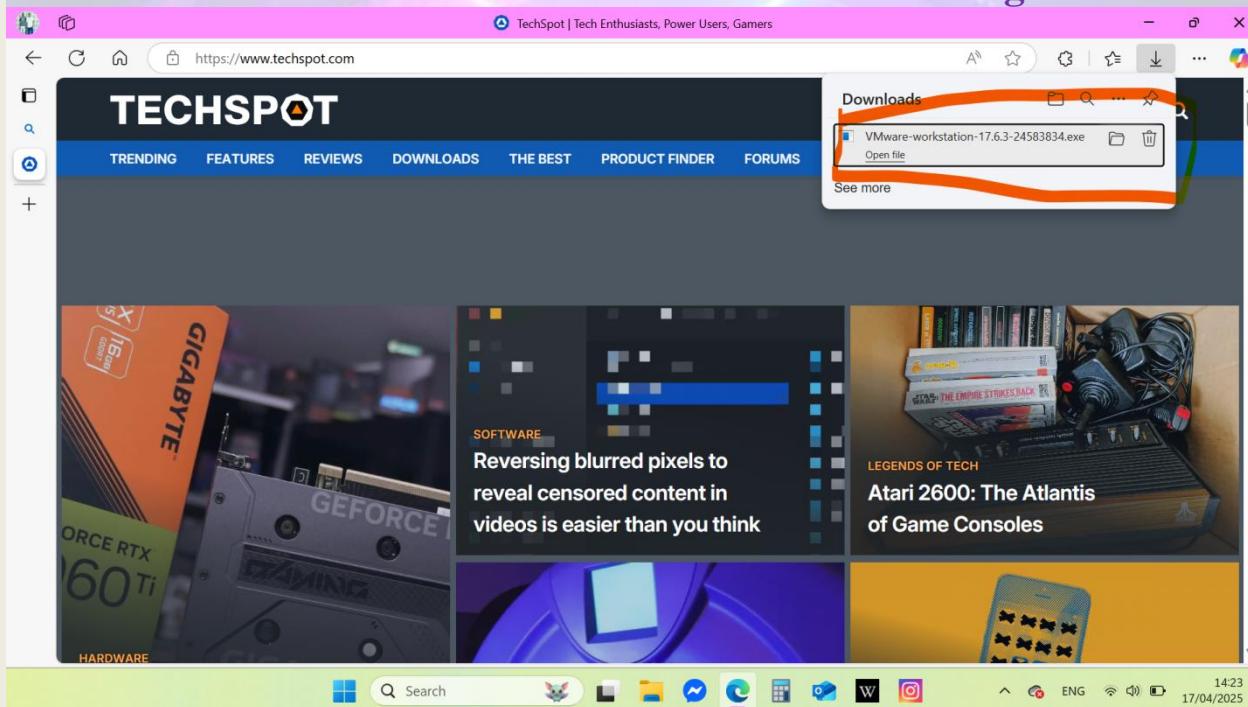
Tor Browser for Android 14.5.6
9 similar apps in Browsers

OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

Now my download will start; it's labeled with red rectangle.



Now our download has finish encircled with red rectangle.



OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

Windows 11 OS downloading steps.

Go to any browser again and search for windows 11 OS and click the link that encircled with red color

windows 11 operating system - Search

https://www.bing.com/search?qs=MT&pq=windows+11+op&sk=CSYN1LT1&sc=16-13&pglt=931&q=windows+11+operating+...

Microsoft Bing

windows 11 operating system

Copilot Answer

Microsoft https://www.microsoft.com › en-us › software-download

Download Windows 11 - microsoft.com

Learn how to install or create Windows 11 media for x64 or Arm-based PCs. Check the release information status, upgrade FAQ, and download options before you begin.

Introducing Windows 11 | Windows Experience Blog

Windows 11 is designed to bring you closer to what you love, with a redesigned user experience, integrated chat, gaming

Getting ready for the Windows 11 upgrade - Microsoft Support

Windows 11 is a new Windows experience, bringing you closer to what you love. Learn how to check if your device can run

Windows 11 - Wikipedia

Windows 11 is the latest major release of Microsoft's Windows operating system, released on October 5, 2021 as a successor to Windows 10 (2015). It is provided for free for an

W Wikipedia

Development Features

At the 2015 Ignite conference, Microsoft employees announced that Windows 10 would be the "last version of Windows considered to be a service, with new builds and updates coming over time. PC World argued that the widely reported claim was "out of context", noting that the official event transcript did not mention Windows 11 as a core part of the talk. It argues that

Click downloads now

Download Windows 11 Disk Image (ISO) for x64 devices

This option is for users that want to create a bootable installation media (USB flash drive, DVD) or create a virtual machine (.ISO file) to install Windows 11. This download is a multi-edition ISO which uses your product key to unlock the correct edition.

Windows 11 ISOs for Arm64 devices are available [here](#).

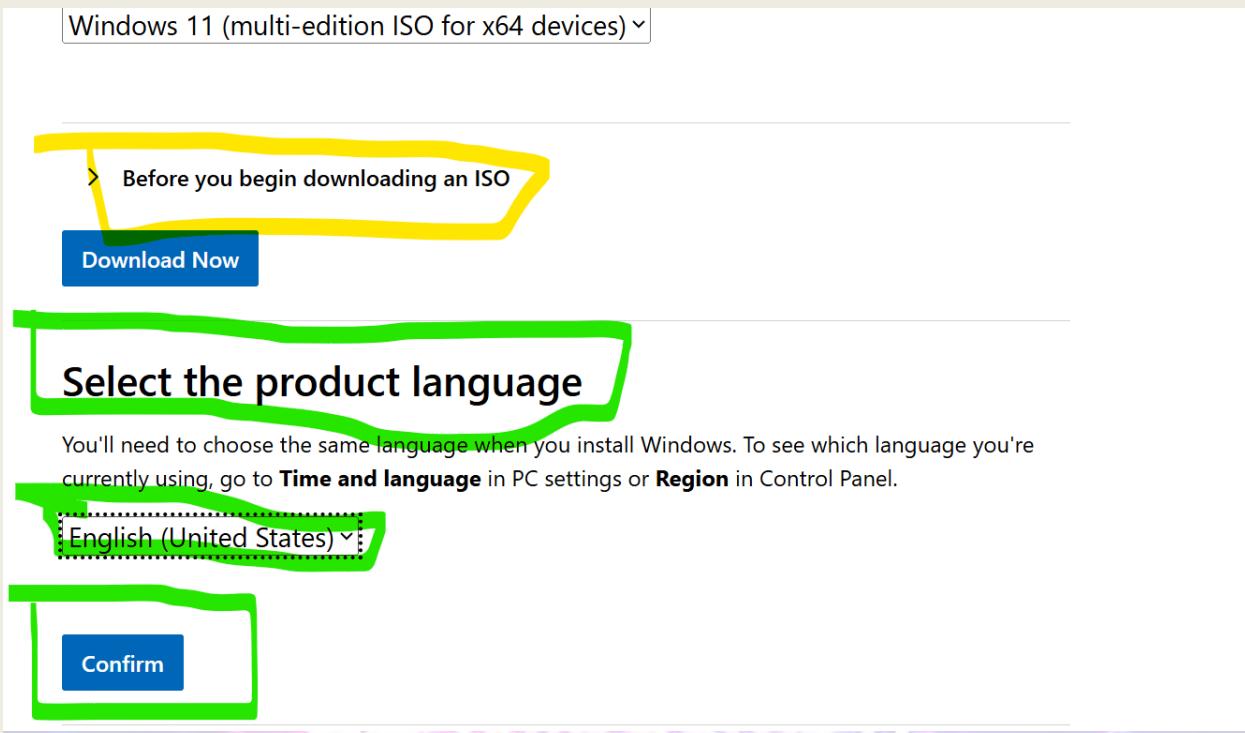
Select Download

Before you begin downloading an ISO

Download Now

OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

It will prompt you to confirm and click confirm



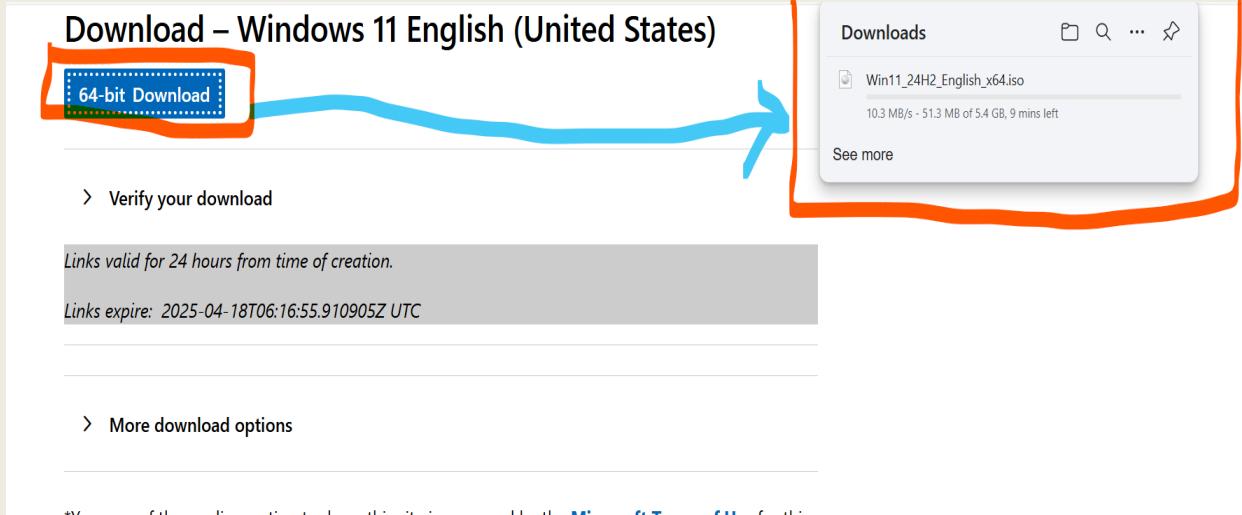
Click 64-bit Download

The screenshot shows the 'Download – Windows 11 English (United States)' page. A blue button labeled '64-bit Download' is highlighted with a pink box. Below it, a red box highlights the link 'Verify your download'. A note states that links are valid for 24 hours from creation and expire on April 18, 2025. A blue box highlights the link 'More download options' at the bottom.

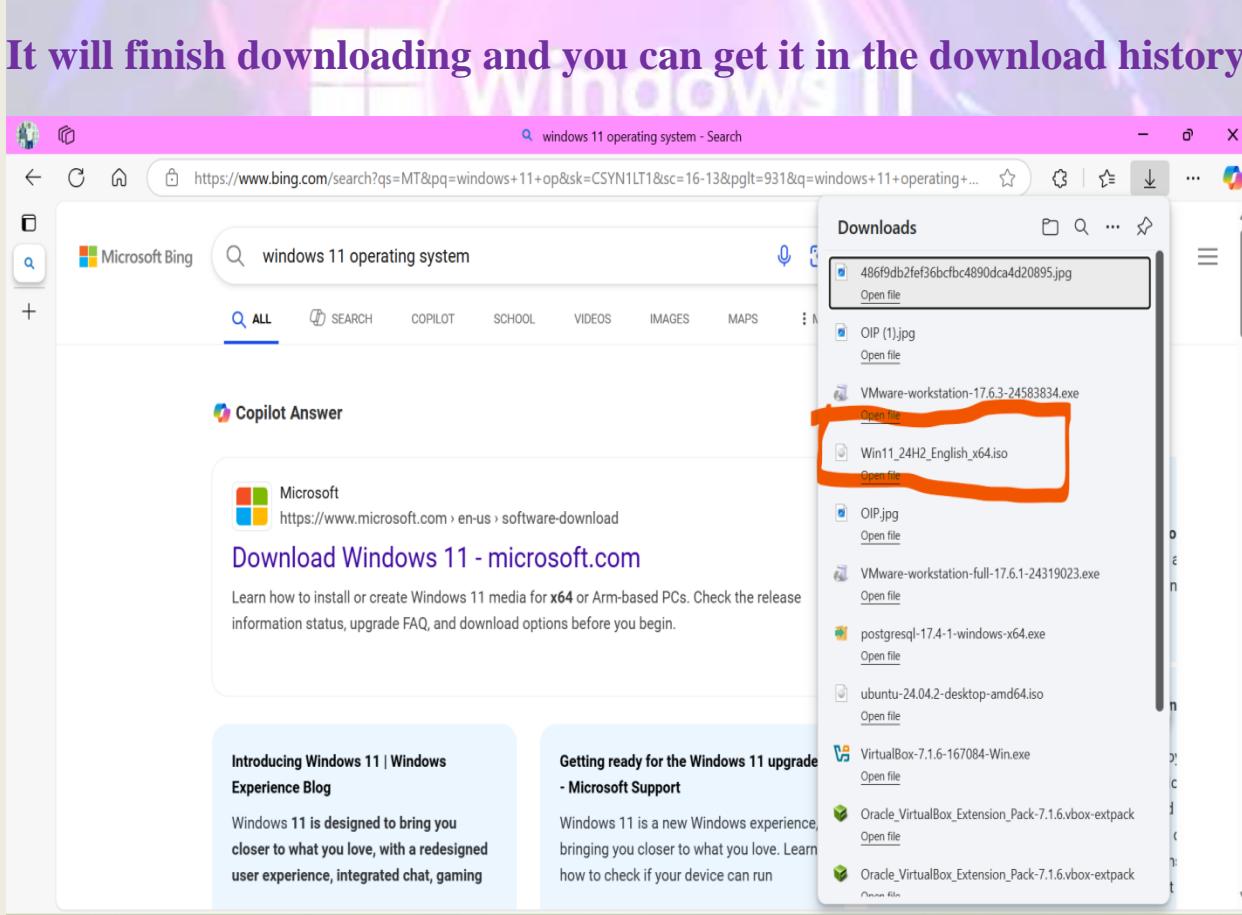
*Your use of the media creation tools on this site is governed by the [Microsoft Terms of Use](#) for this website.

OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

It will start downloading



It will finish downloading and you can get it in the download history

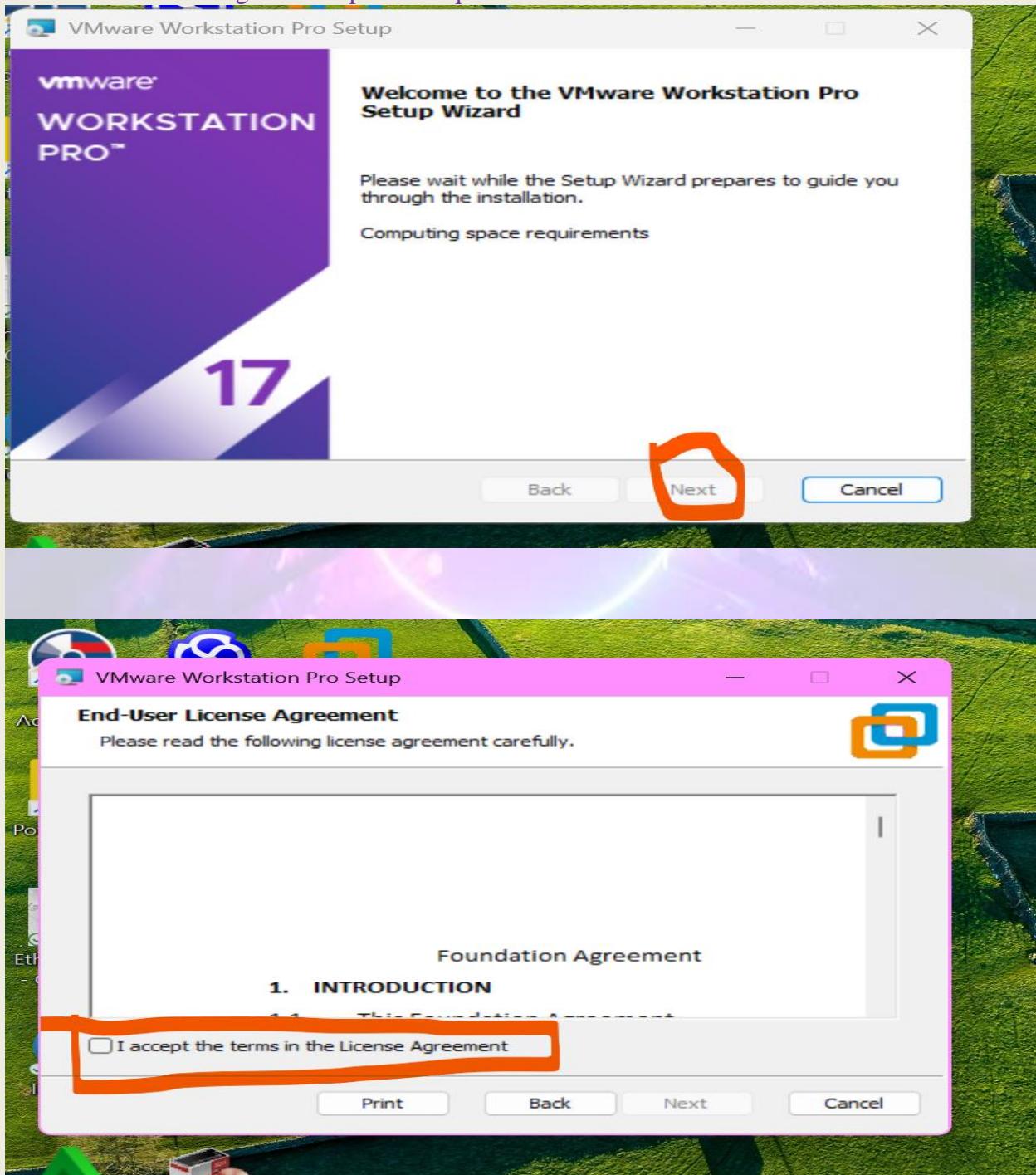


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

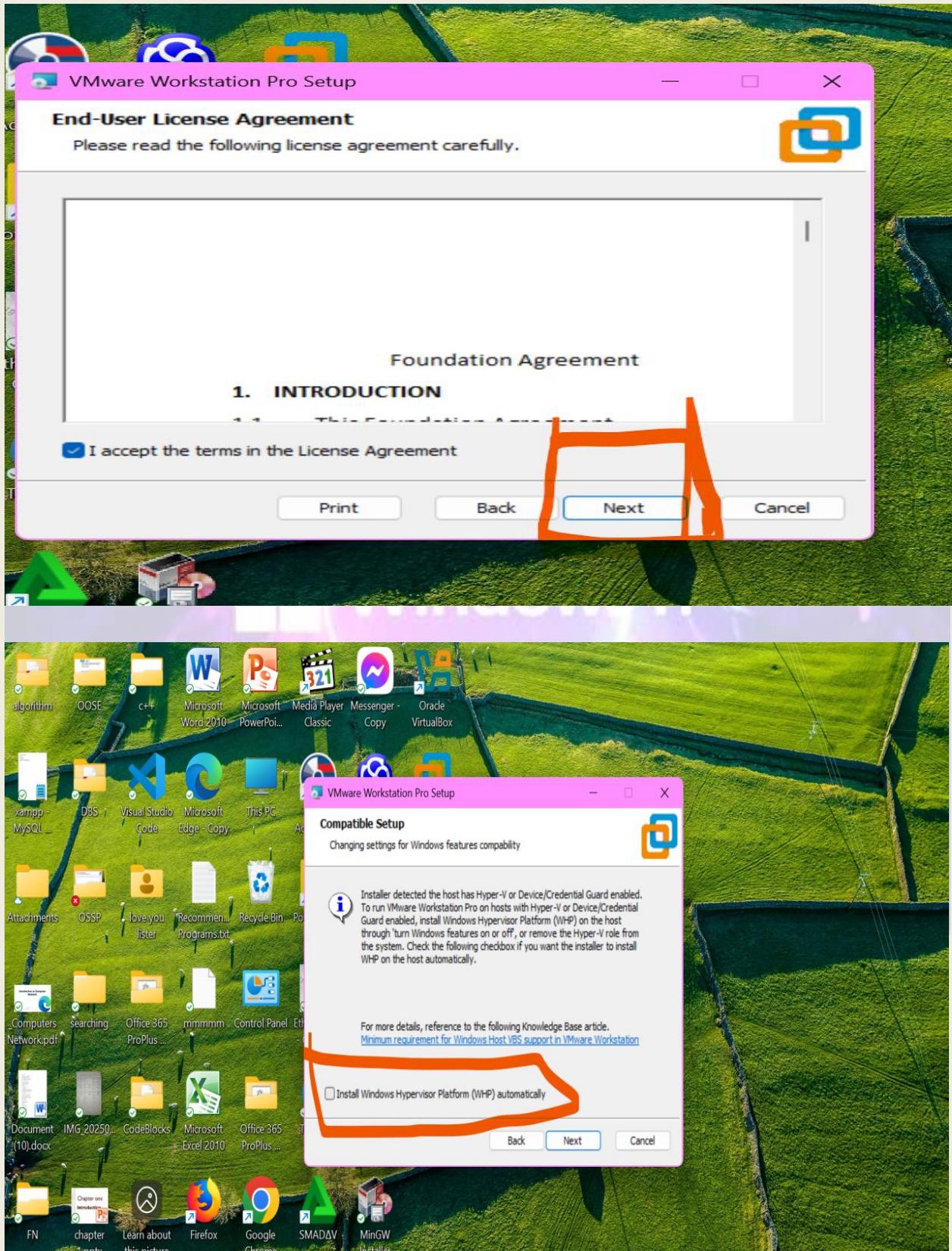
Installation of virtual Box

Run the installer:

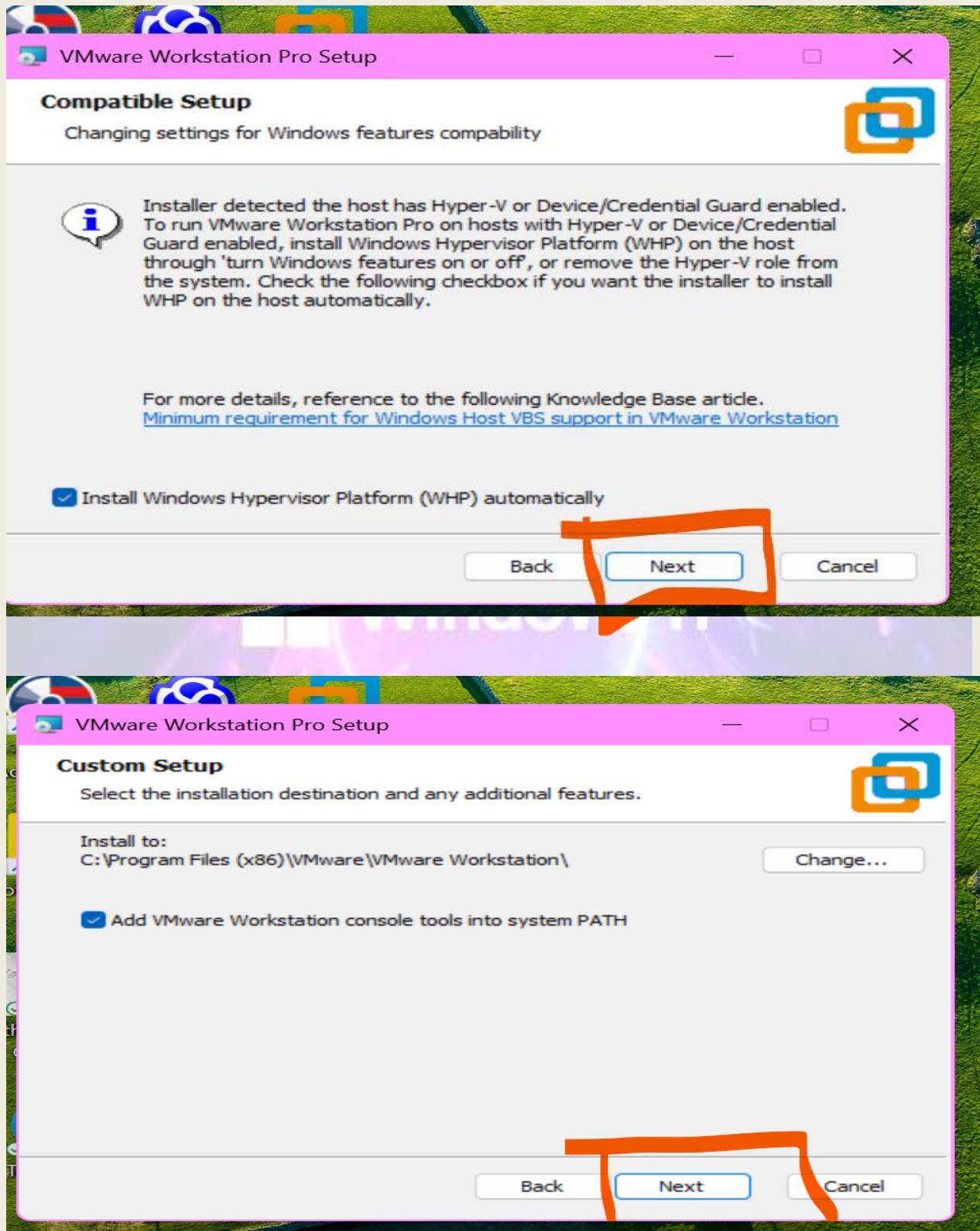
Once downloaded, run the installer. In windows, this involves clicking through a series of prompts. The installer will ask where to install virtual box and whether to create shortcuts. Stick with the default settings unless specific requirements.



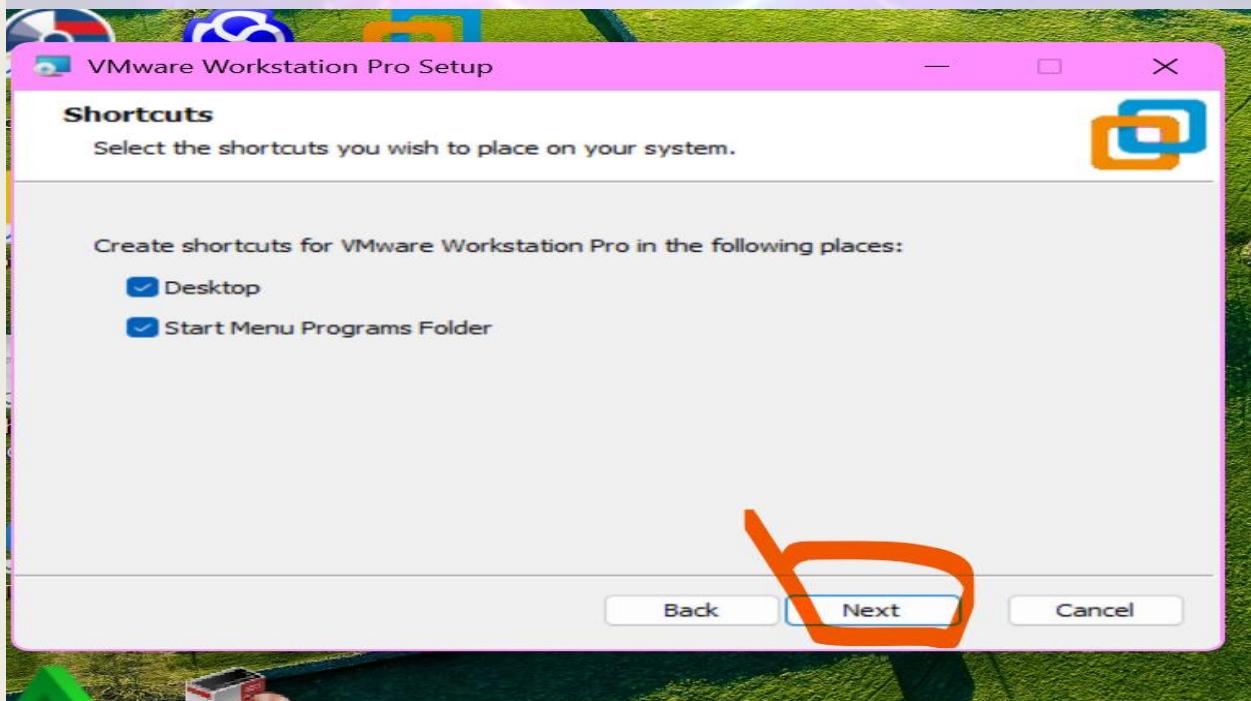
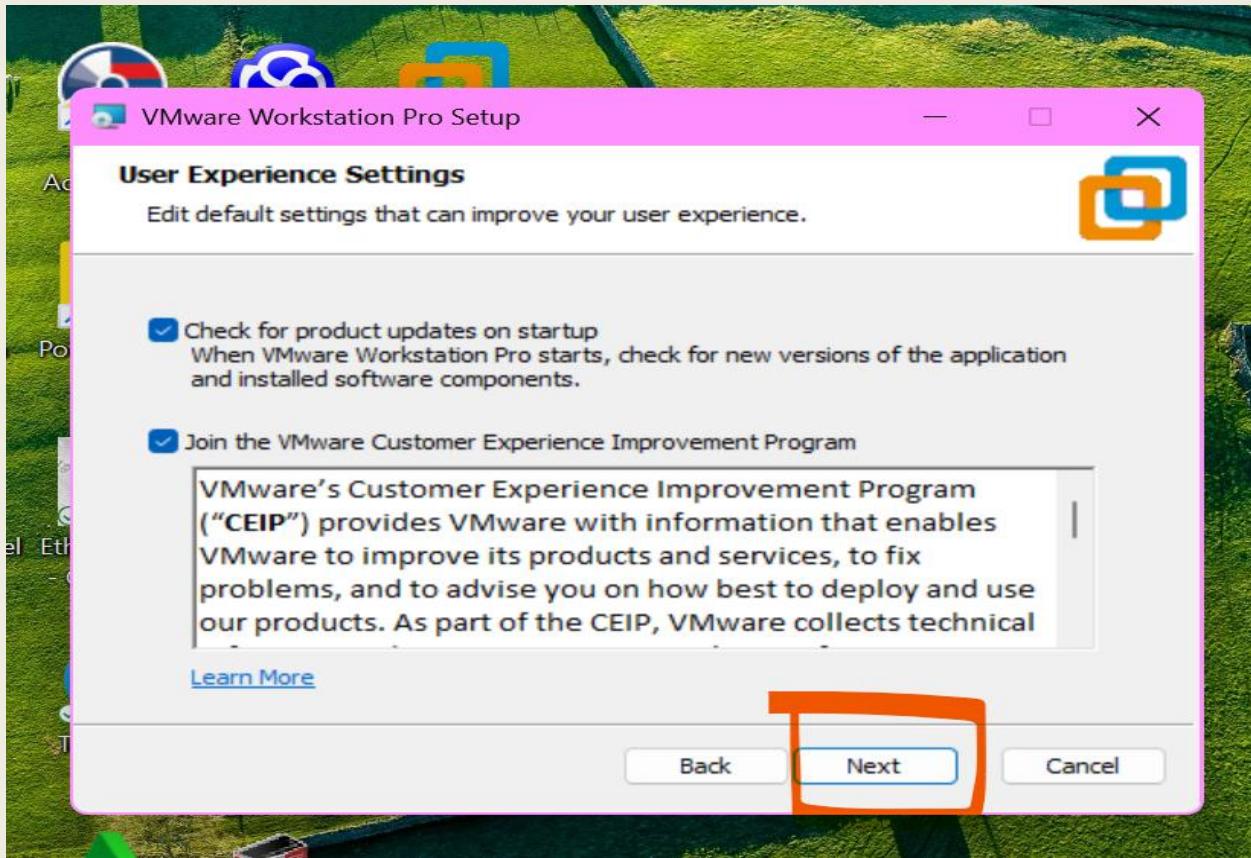
OPERATING SYSTEM INDIVIDUAL ASSIGNMENT



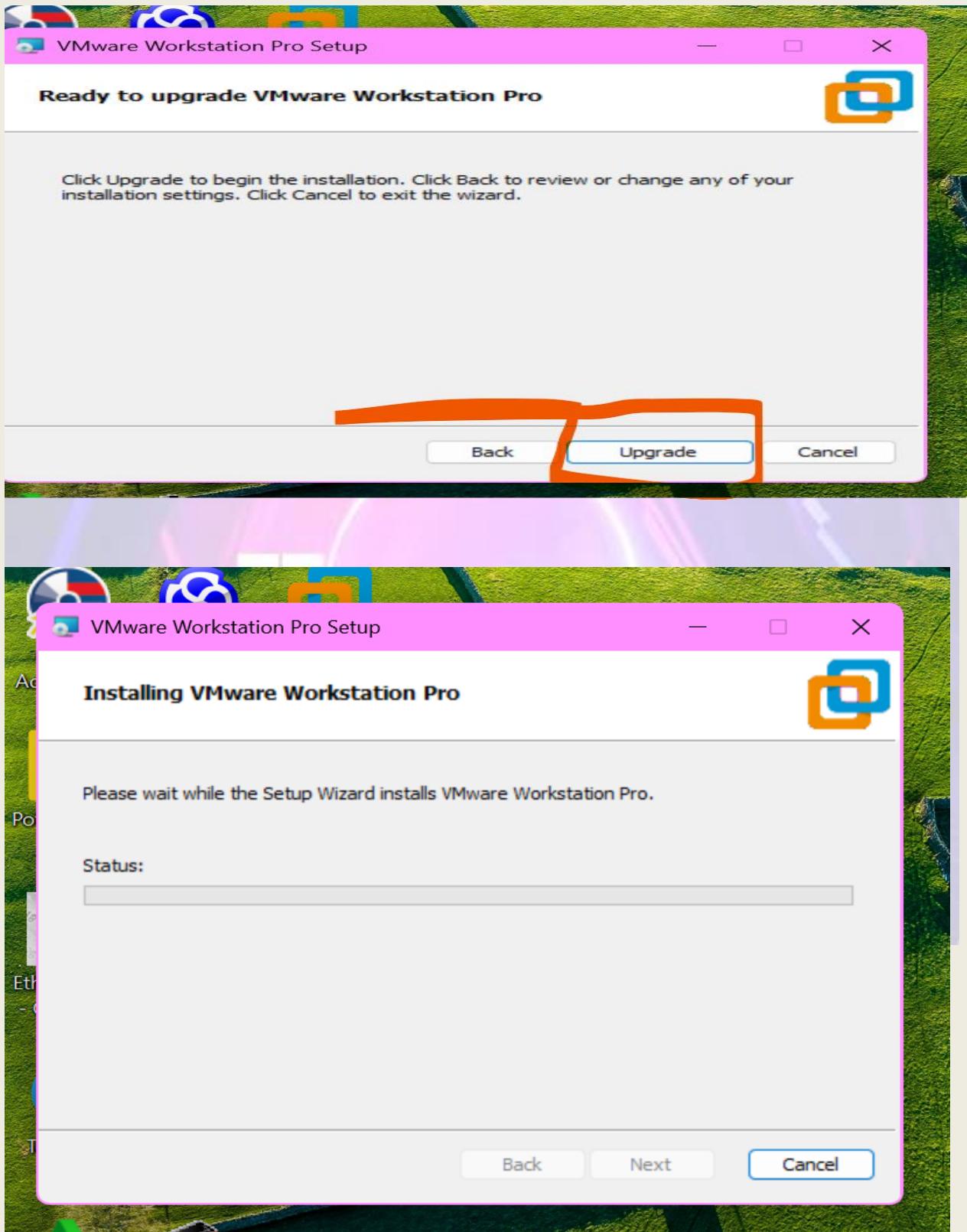
OPERATING SYSTEM INDIVIDUAL ASSIGNMENT



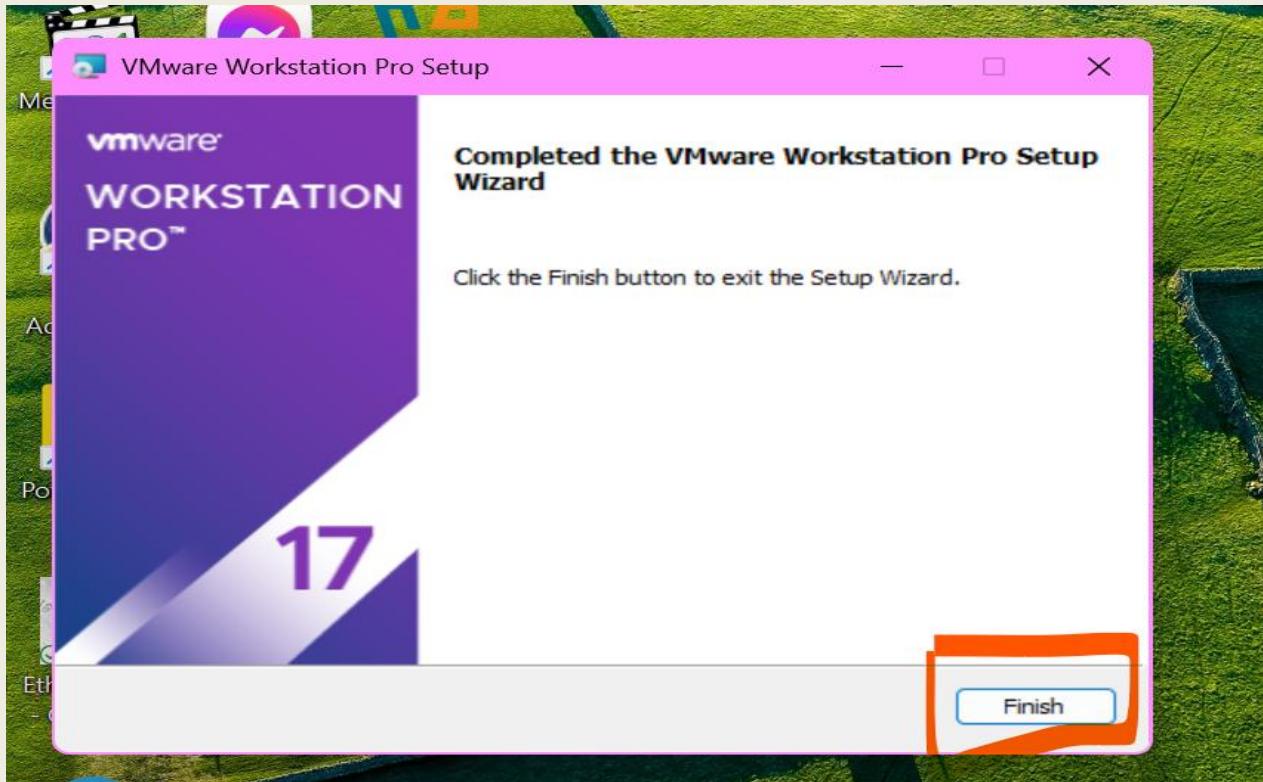
OPERATING SYSTEM INDIVIDUAL ASSIGNMENT



OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

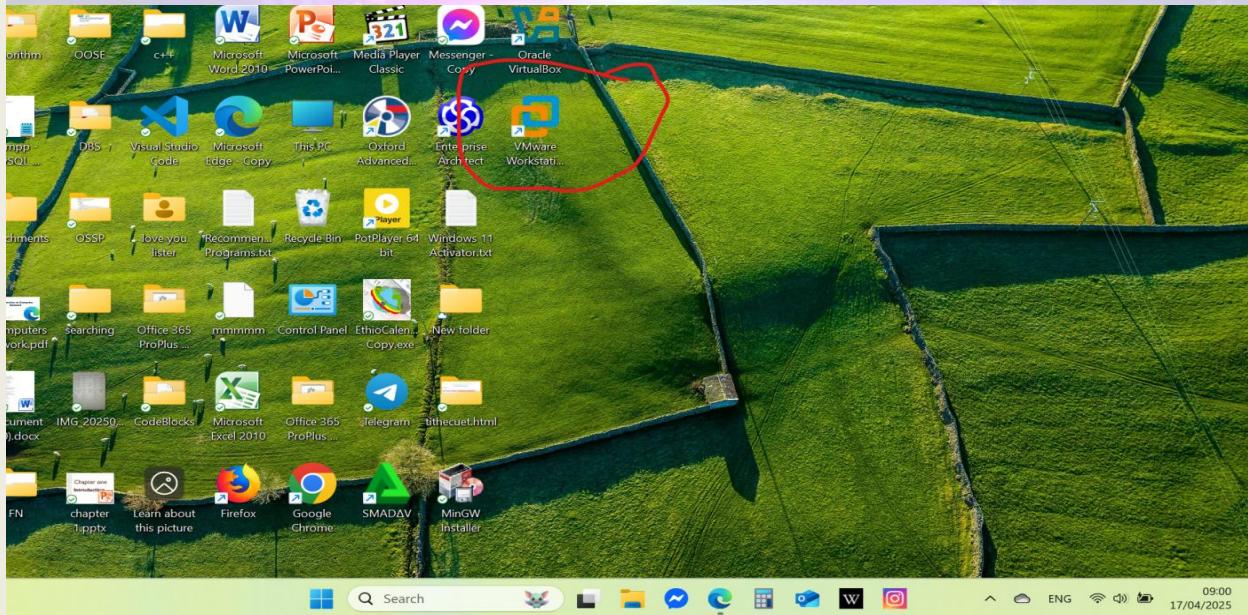


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

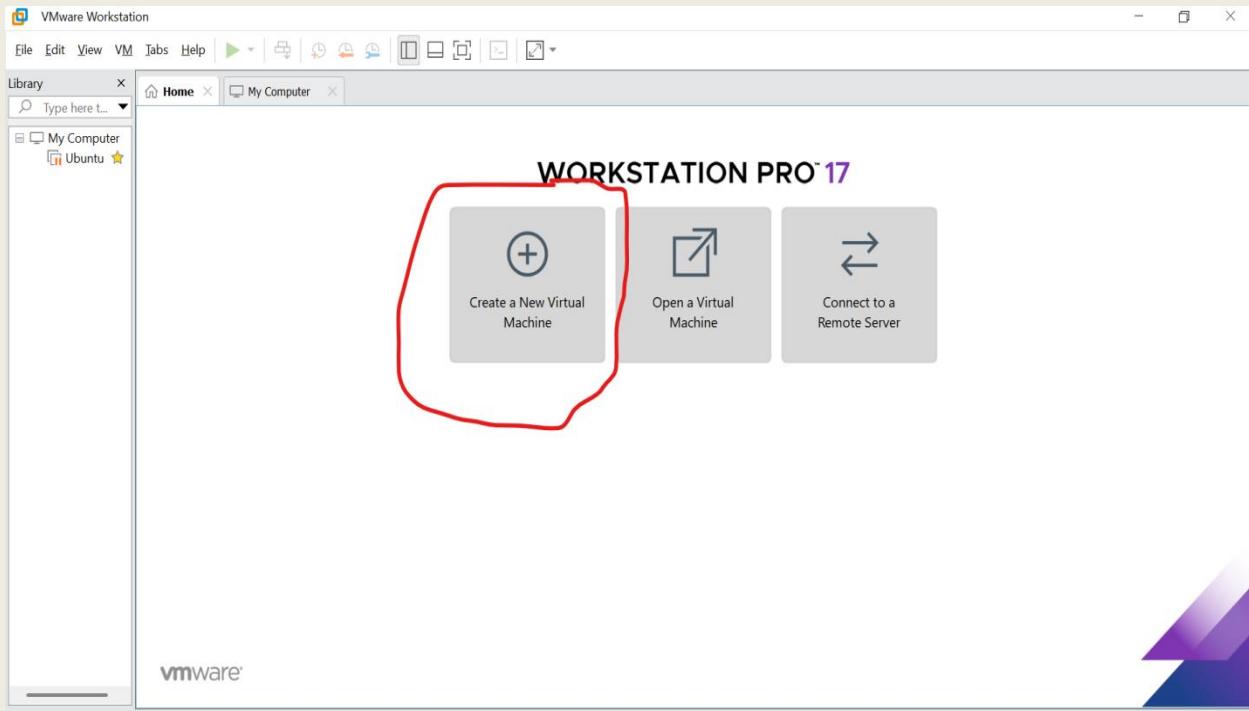


I. SNIPPED IMAGES PLACEHOLDER

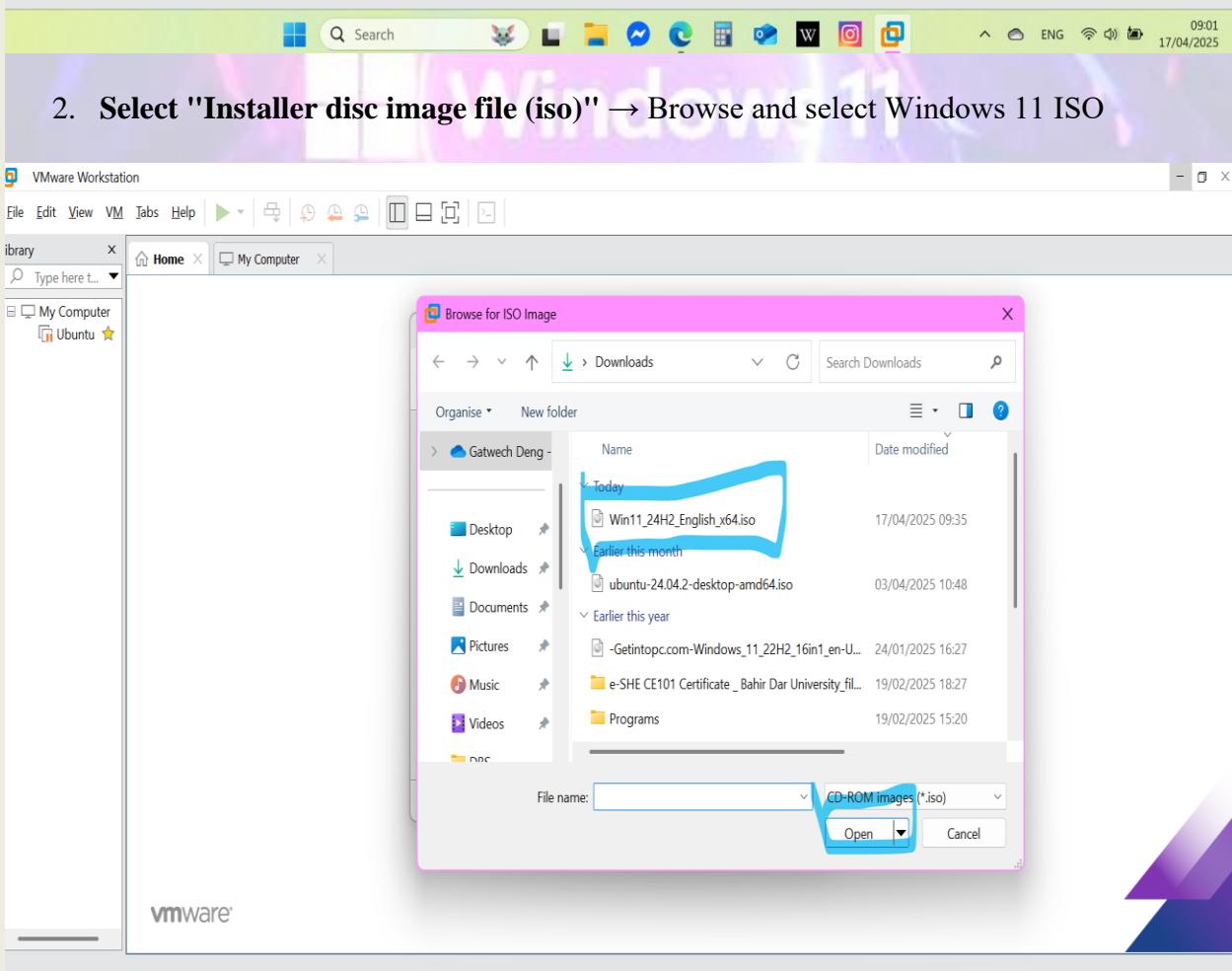
1. Open VMware Workstation → New Virtual Machine



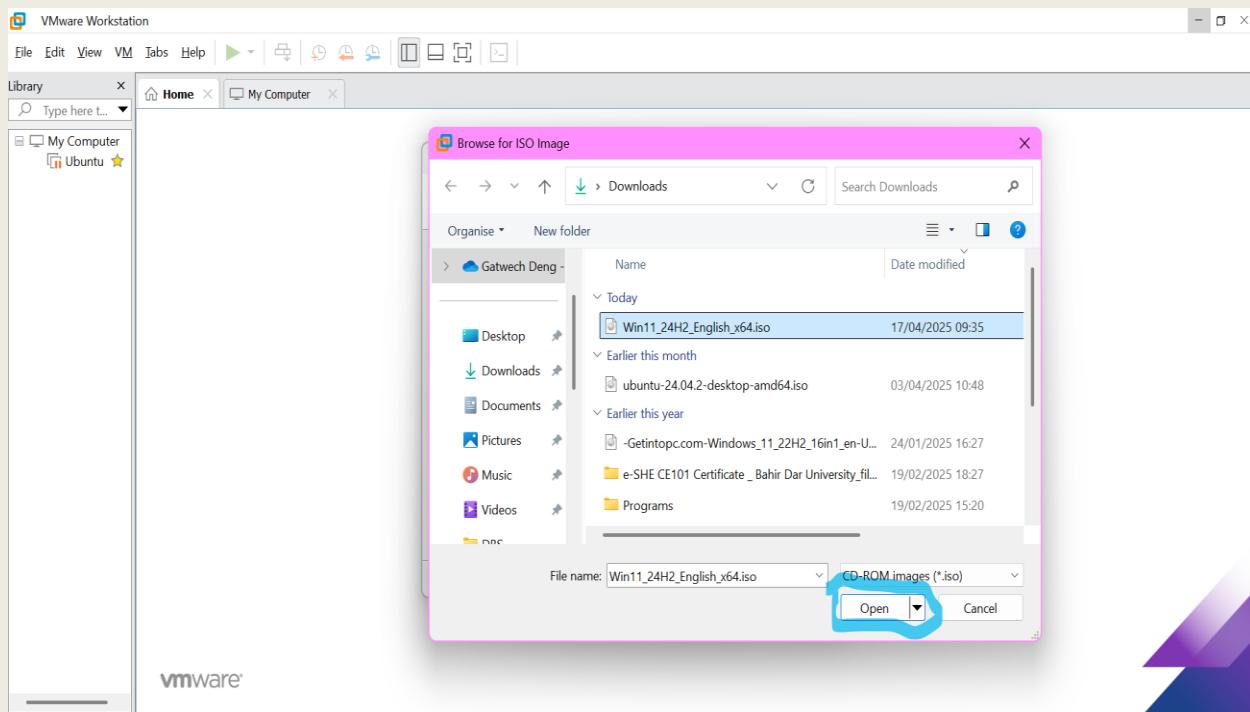
OPERATING SYSTEM INDIVIDUAL ASSIGNMENT



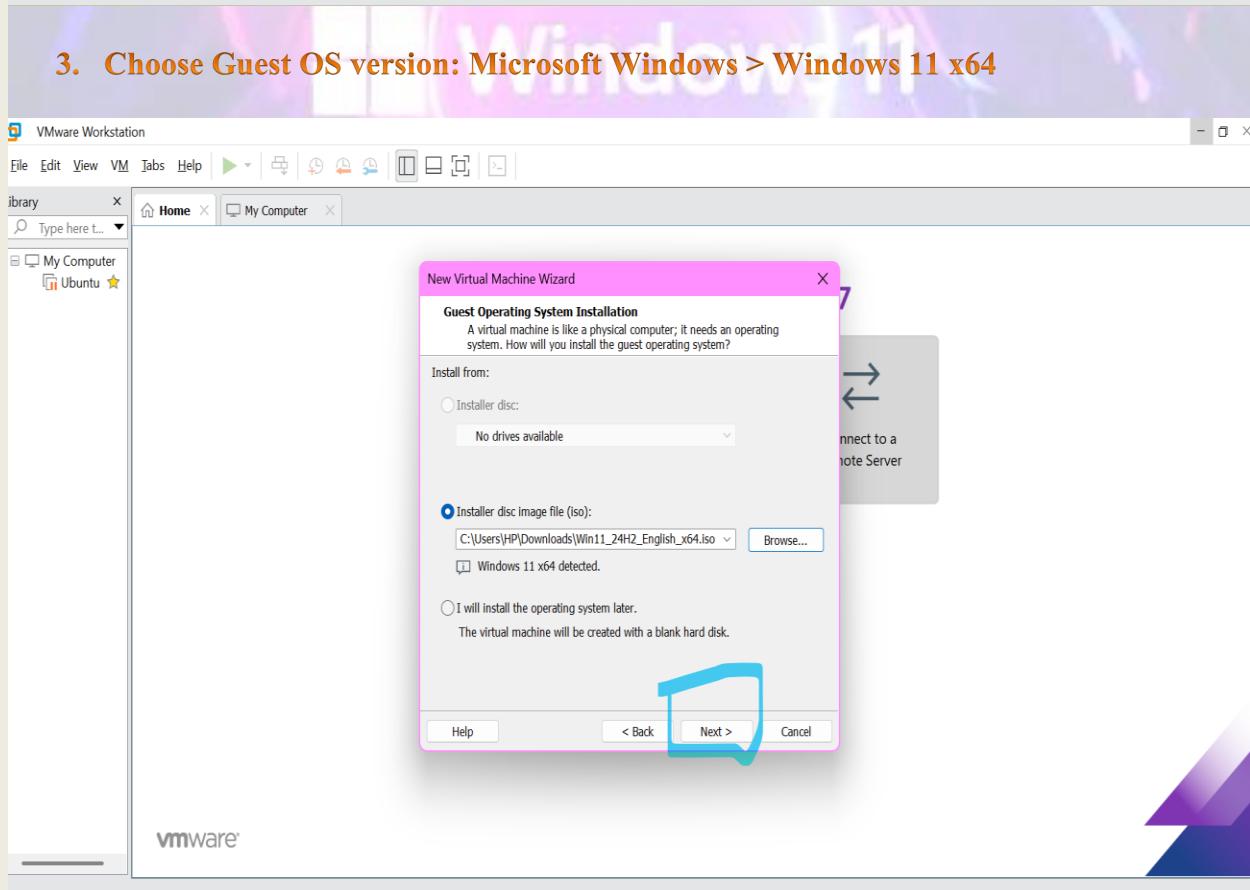
2. Select "Installer disc image file (iso)" → Browse and select Windows 11 ISO



OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

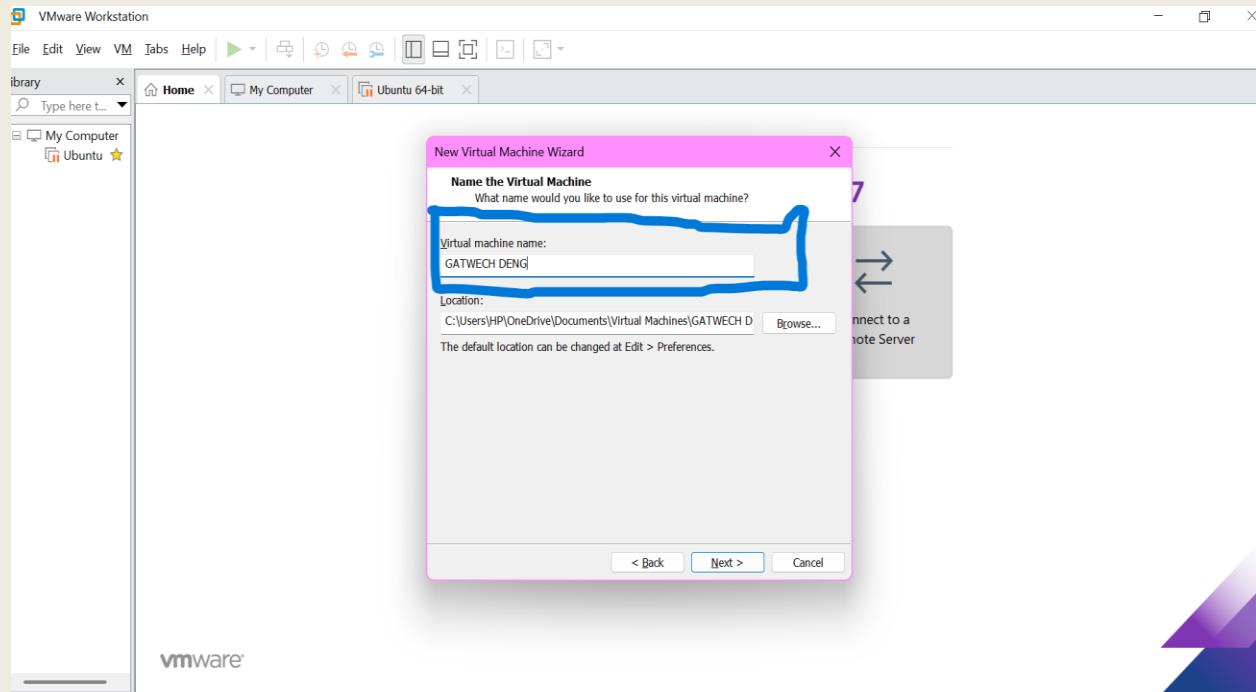


3. Choose Guest OS version: Microsoft Windows > Windows 11 x64

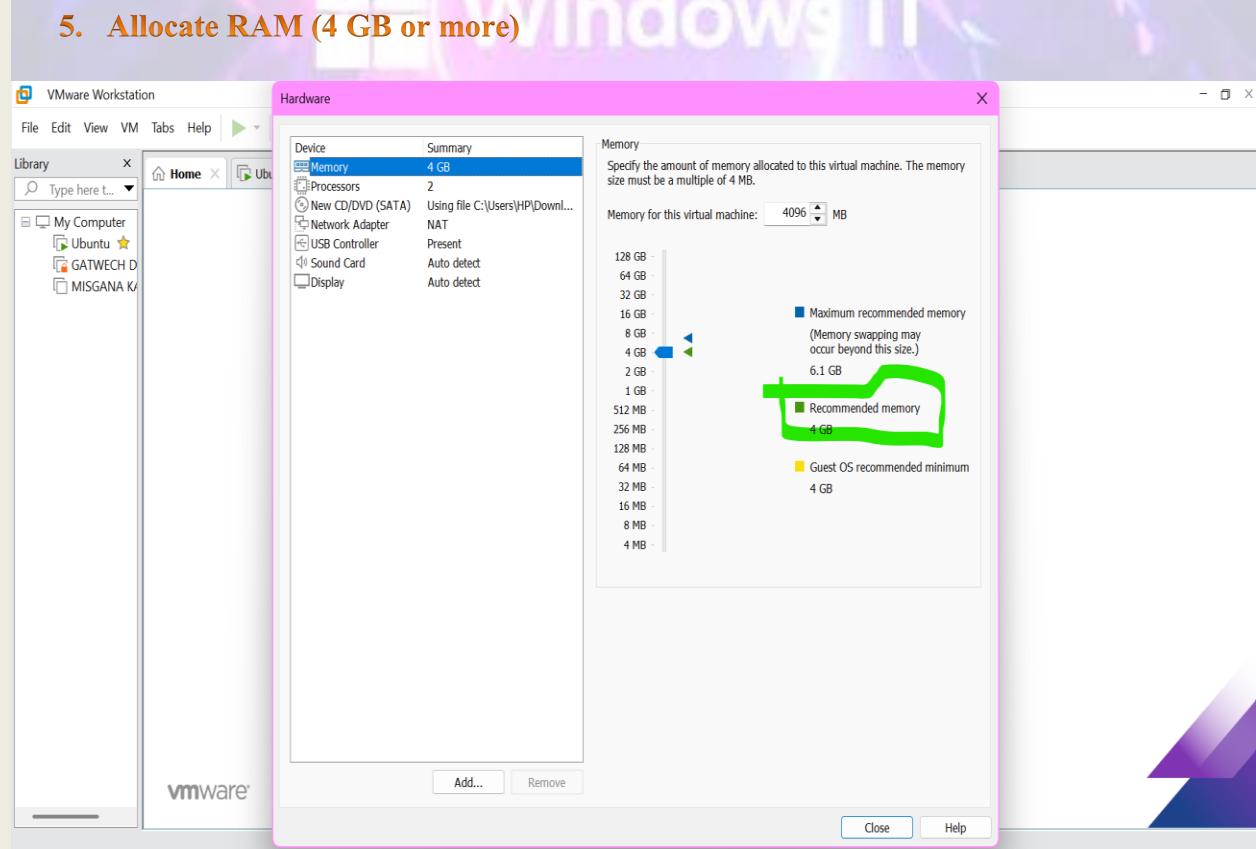


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

4. Set VM name (GATWECH DENG)

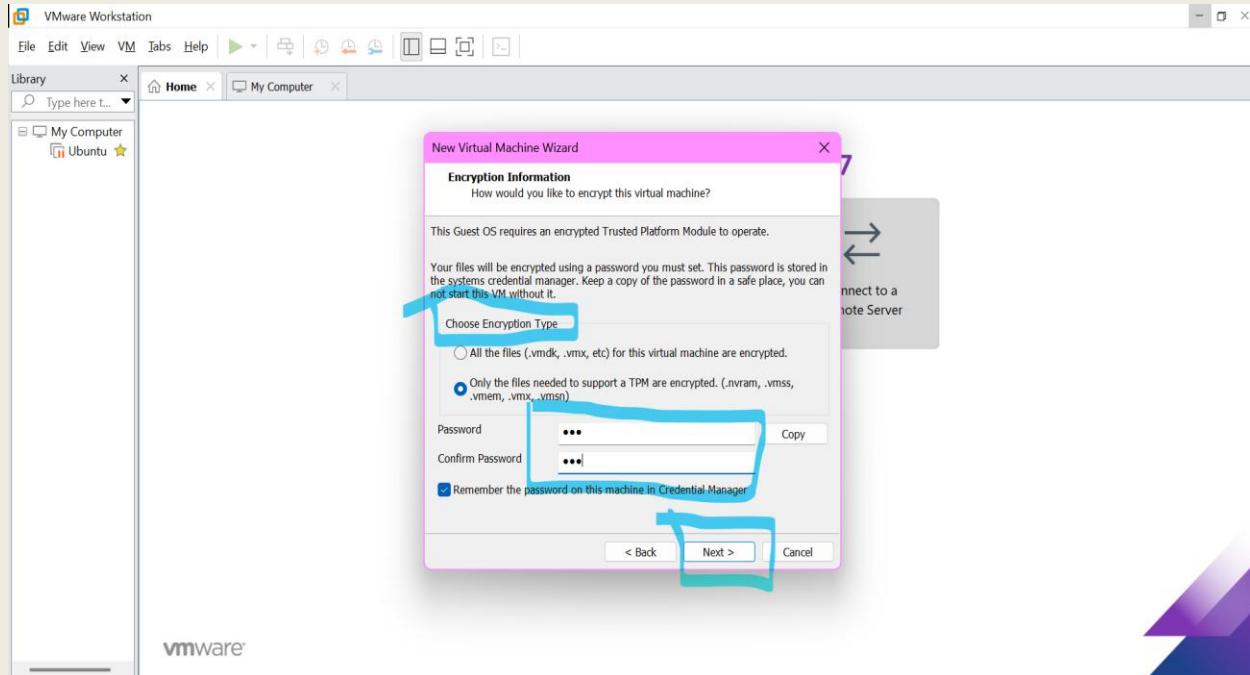


5. Allocate RAM (4 GB or more)

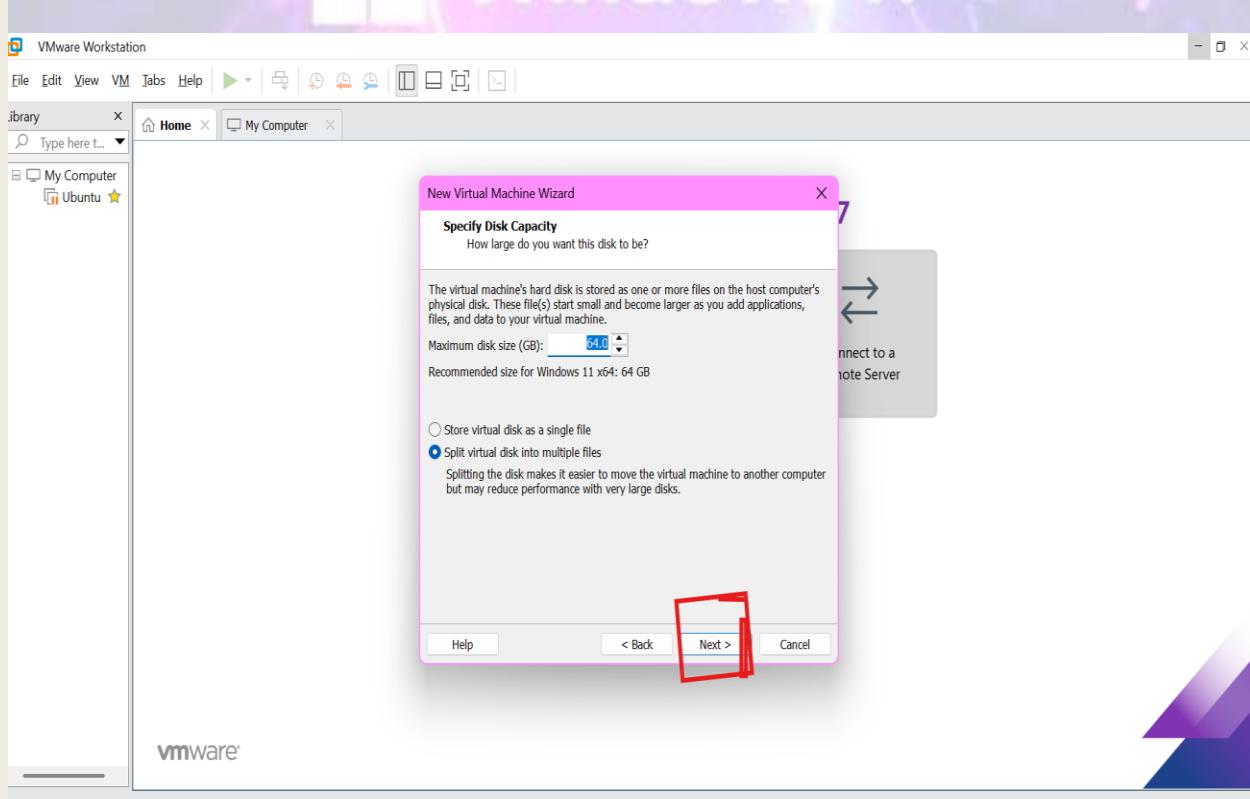


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

6. Input password

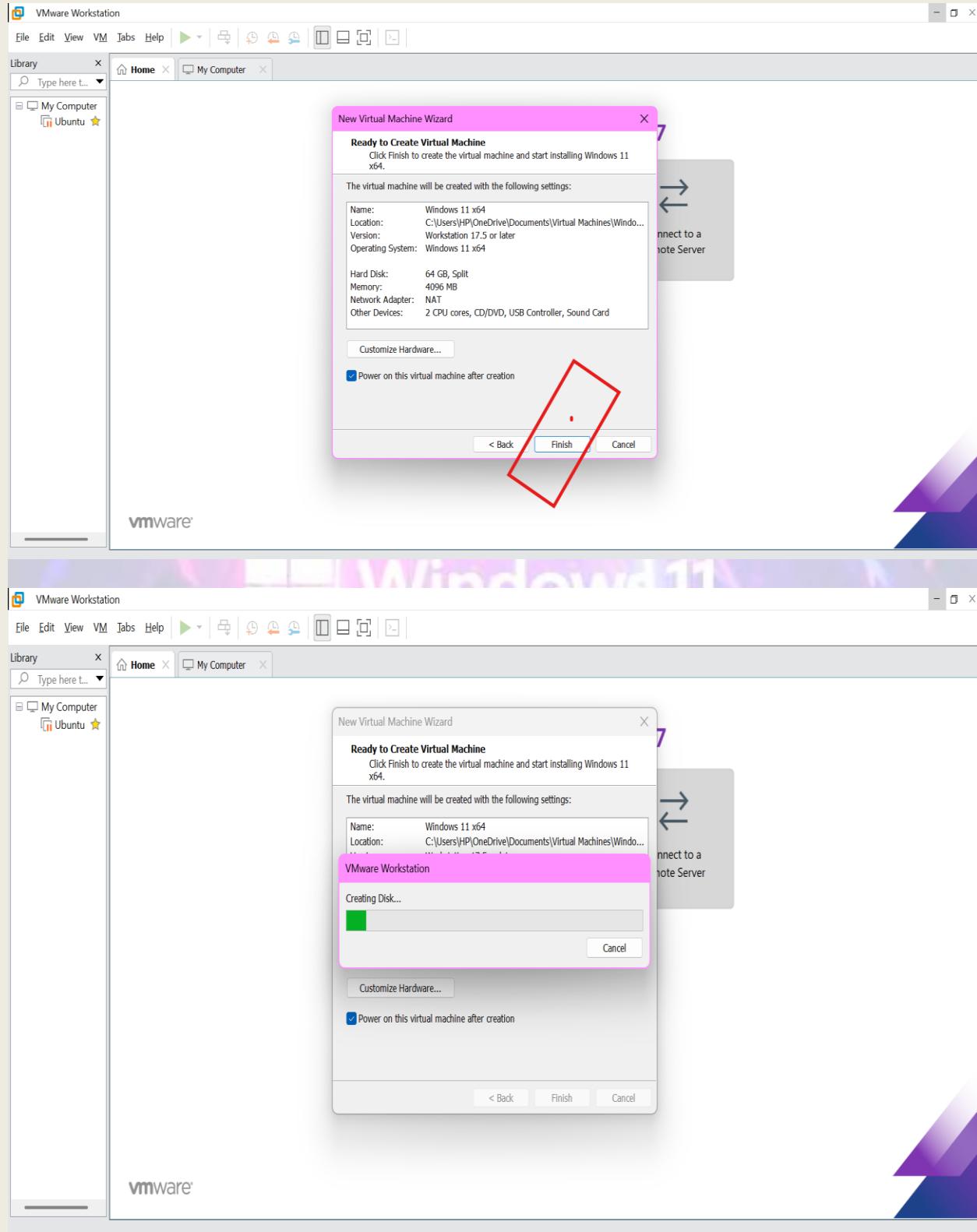


7. Create a new virtual disk → 60 GB recommended



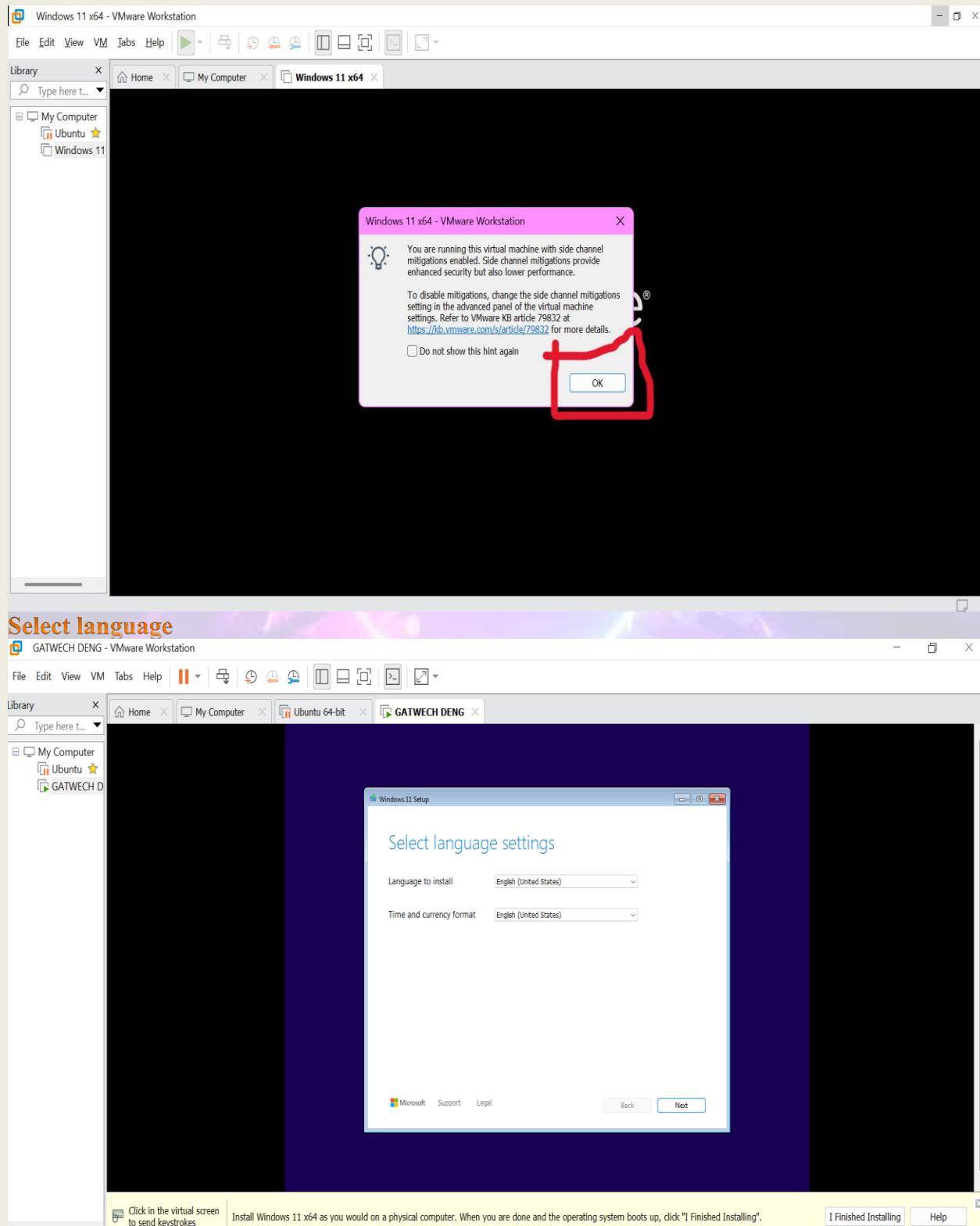
OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

8. Finish Setup and power on VM



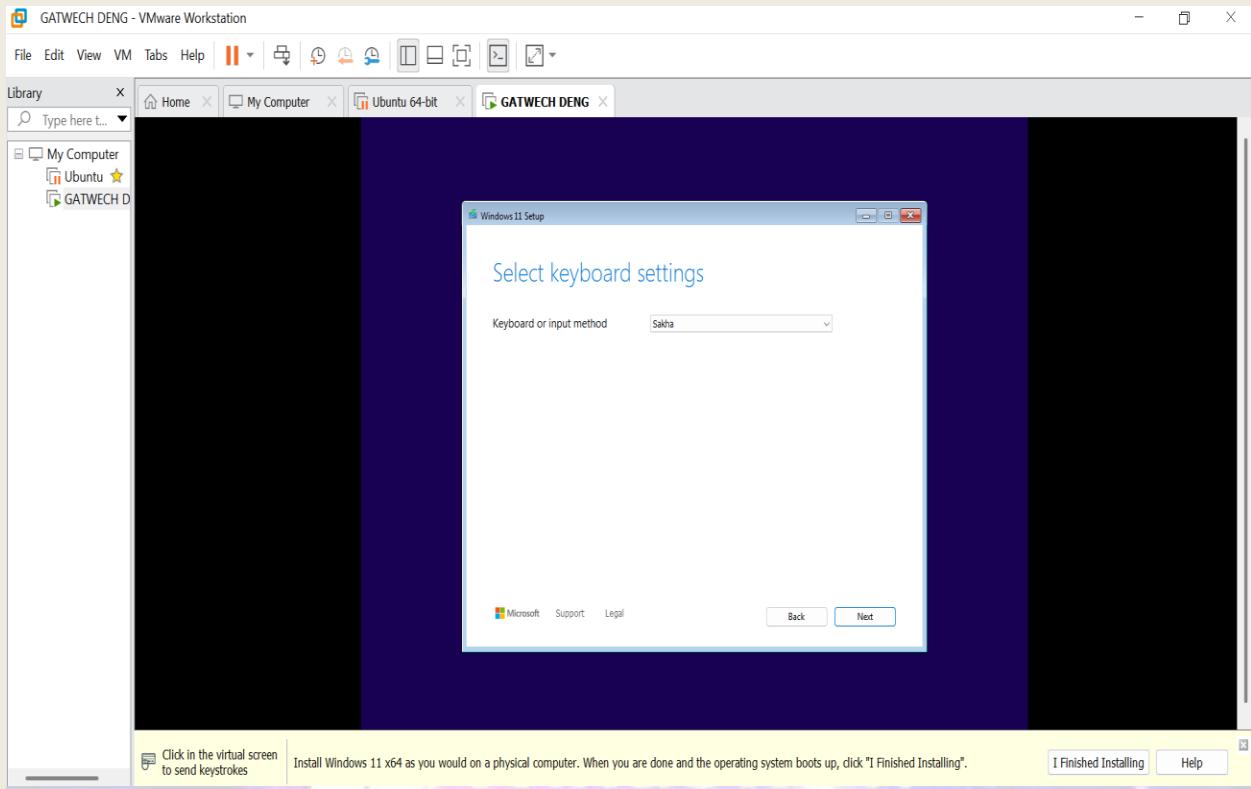
OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

9. Follow Windows installation steps:

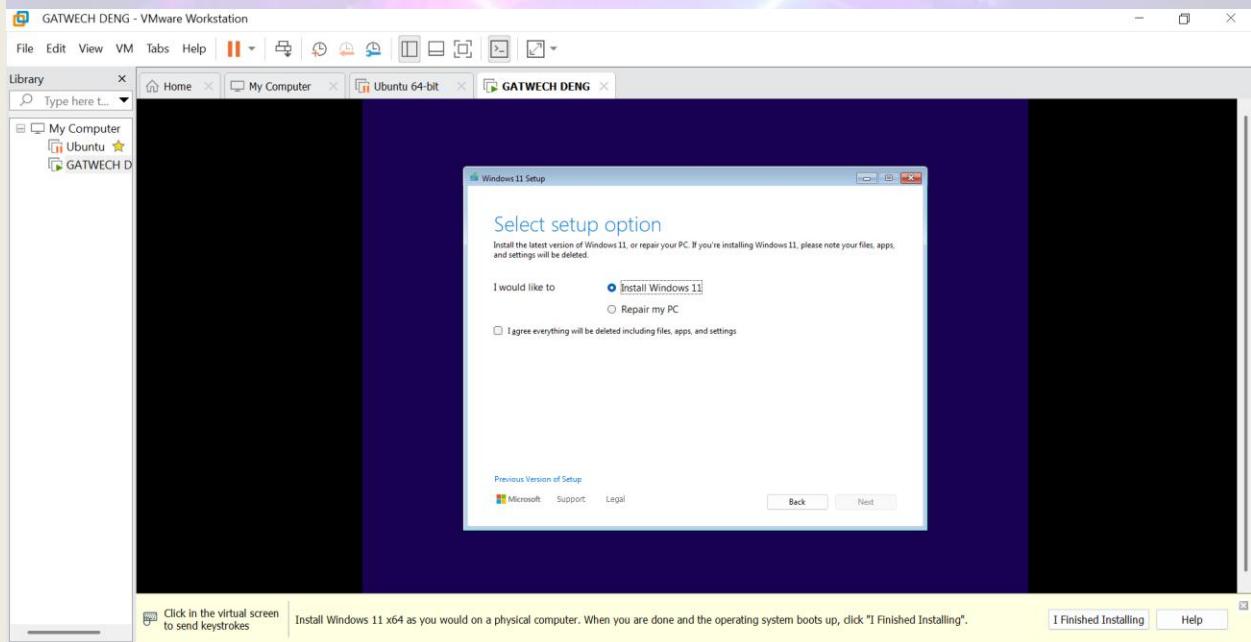


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

o keyboard layout

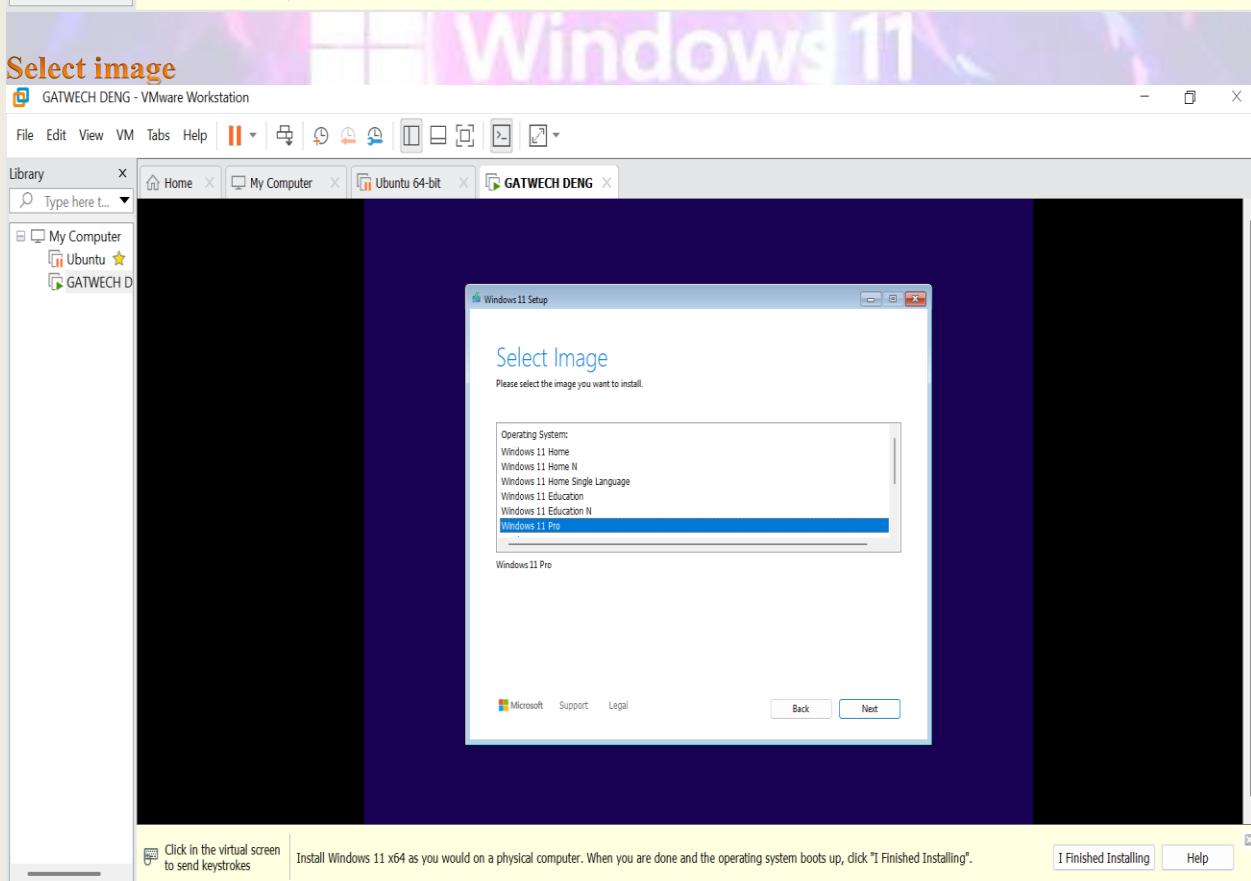
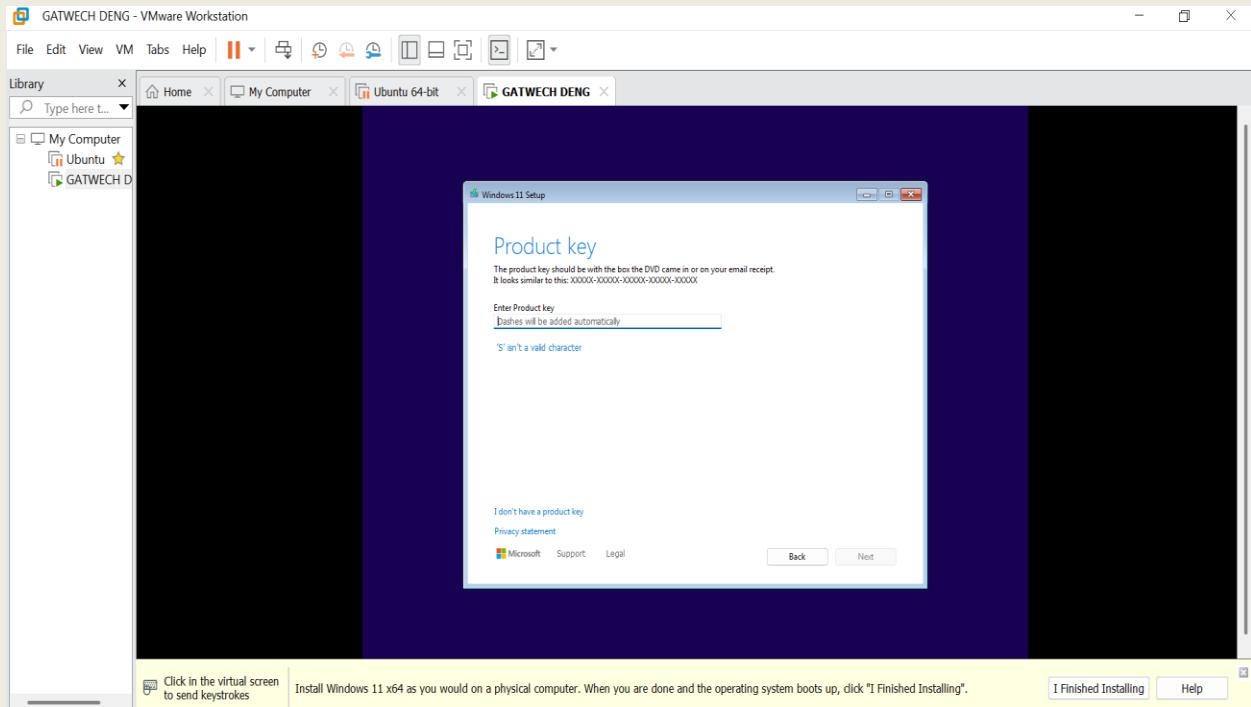


Select setup option



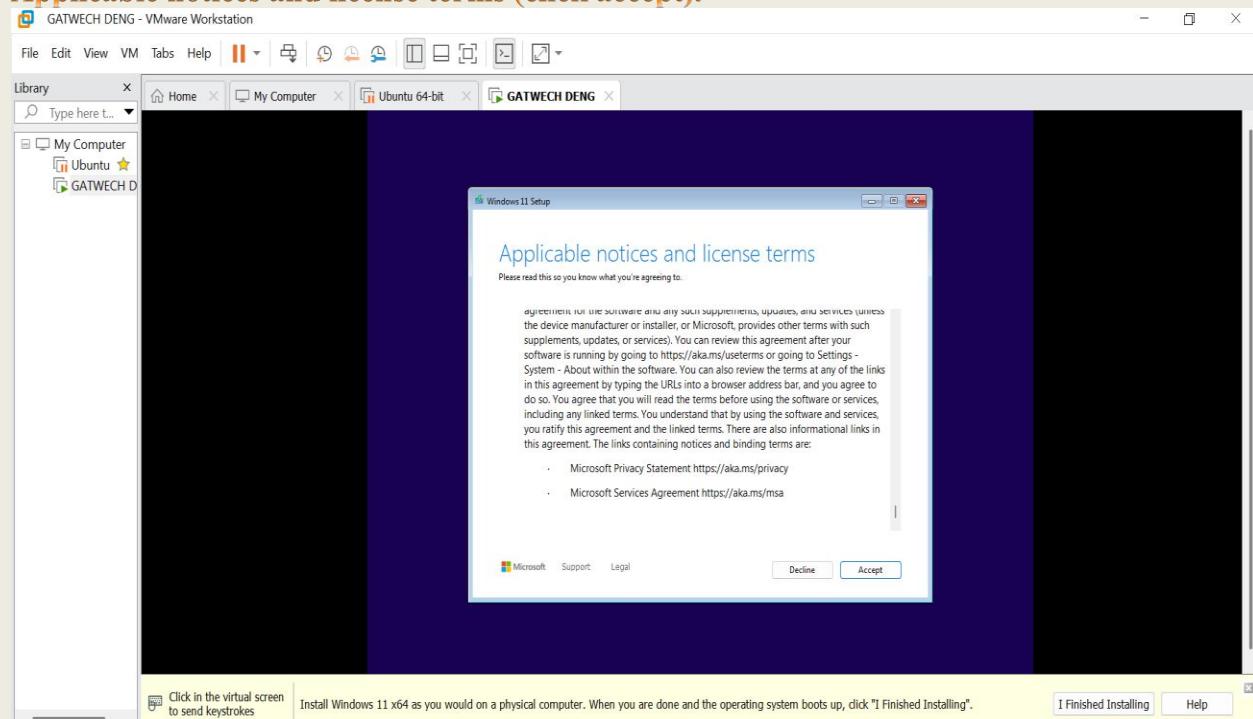
OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

o Product key (Skip if not available)

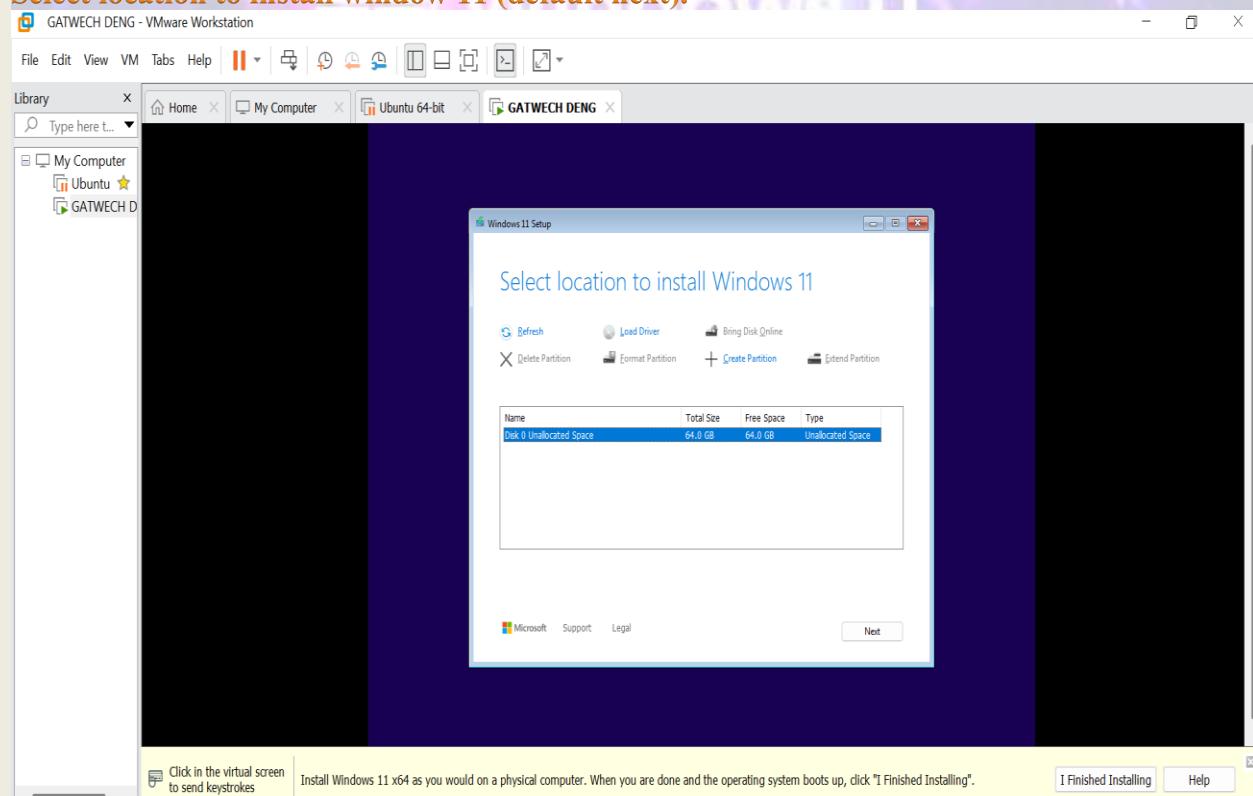


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

Applicable notices and license terms (click accept).

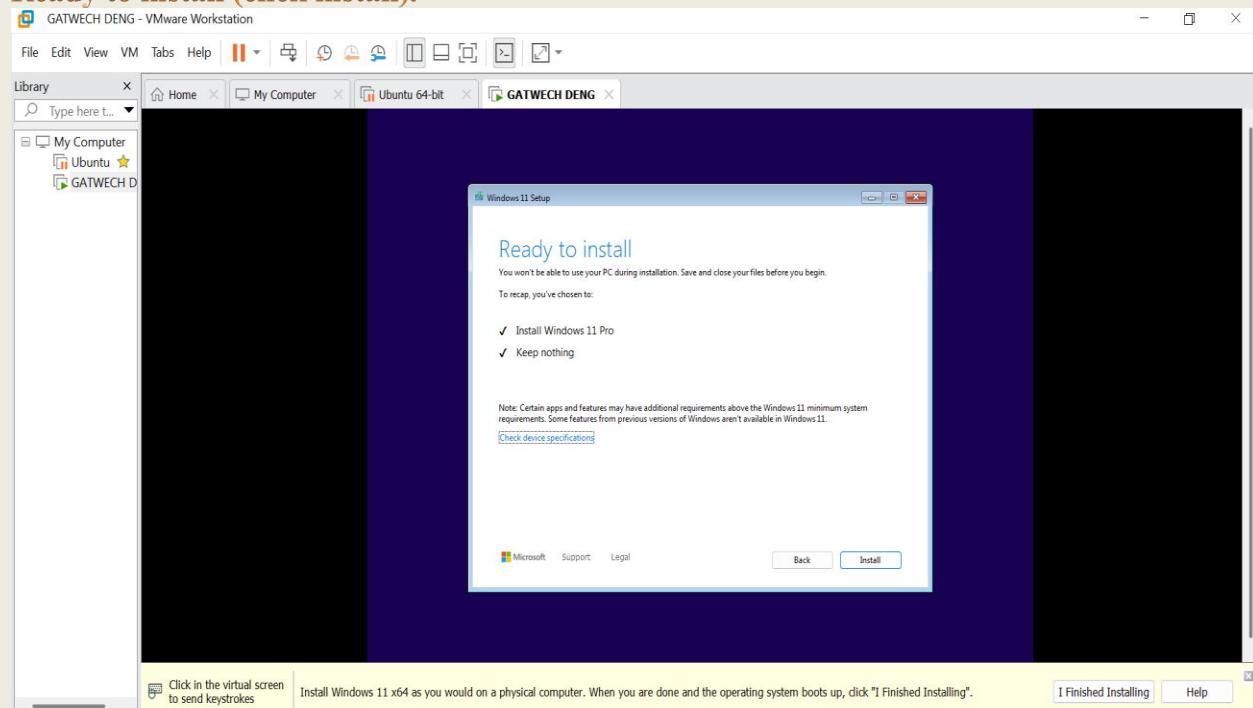


Select location to install window 11 (default next).

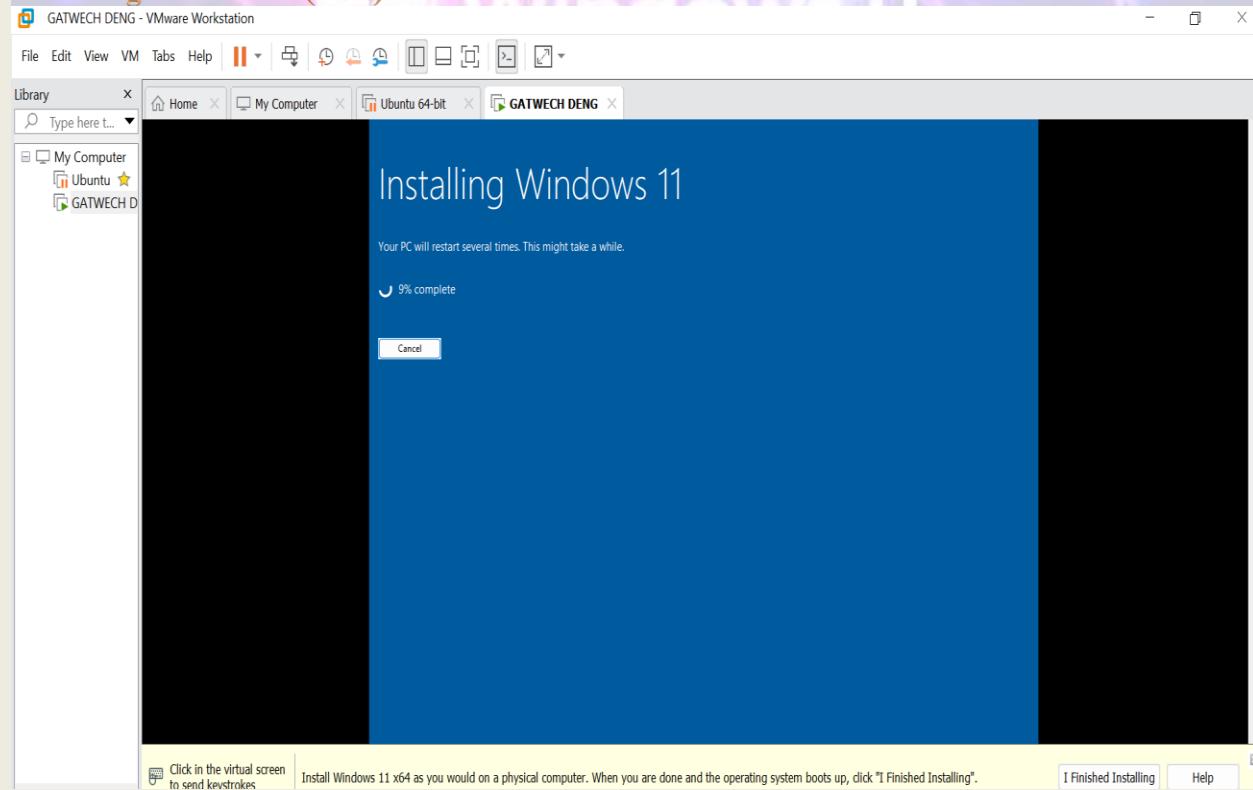


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

Ready to install (click install).

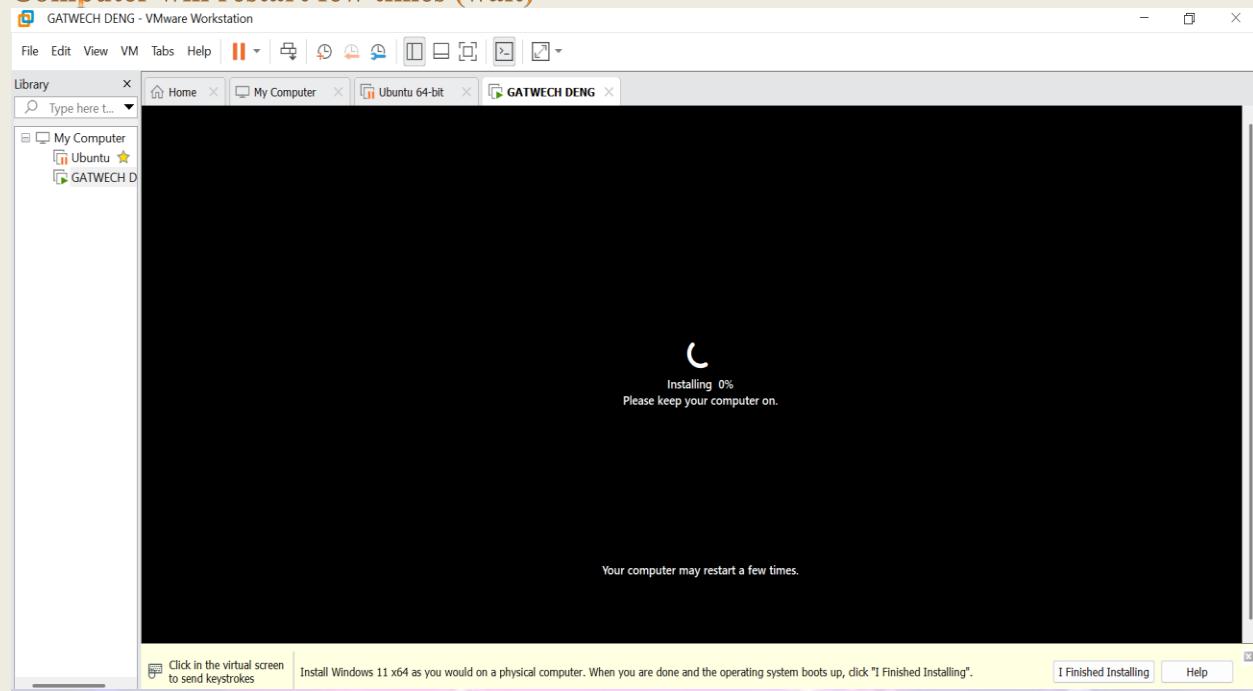


Installing window 11 (wait).

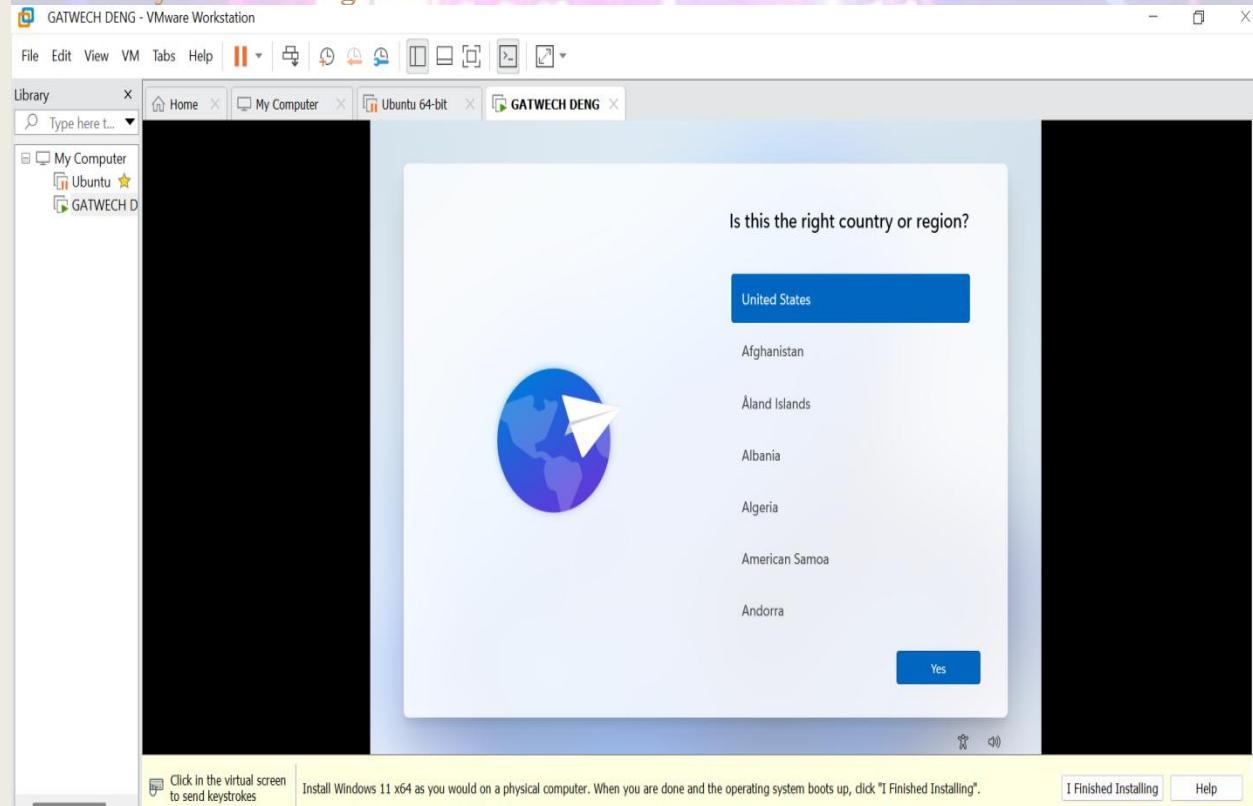


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

Computer will restart few times (wait)

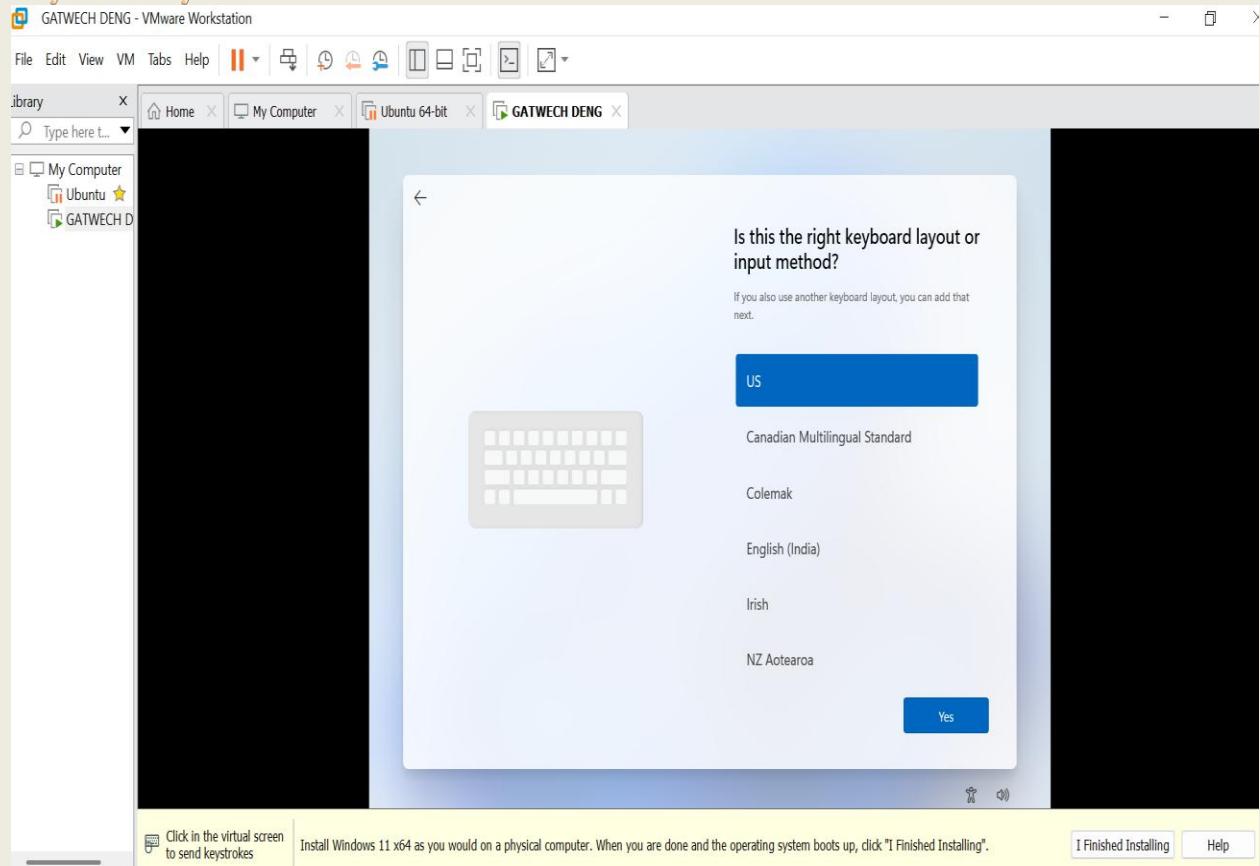


It will ask you for the region but continue for the default

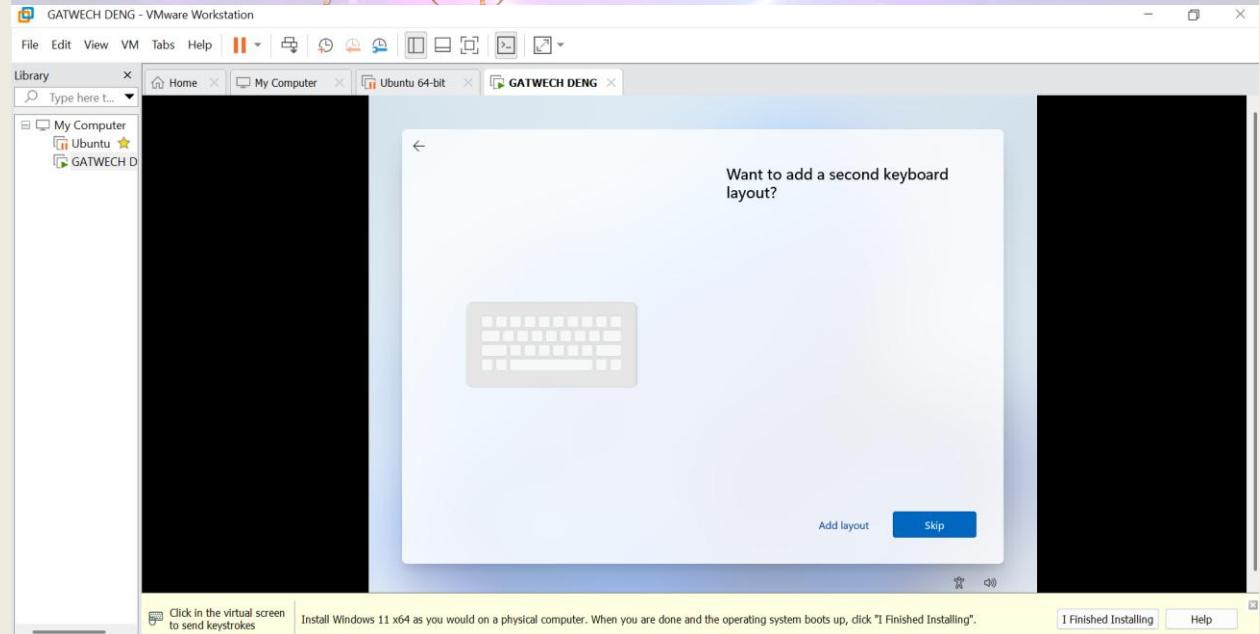


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

Keyboard layout

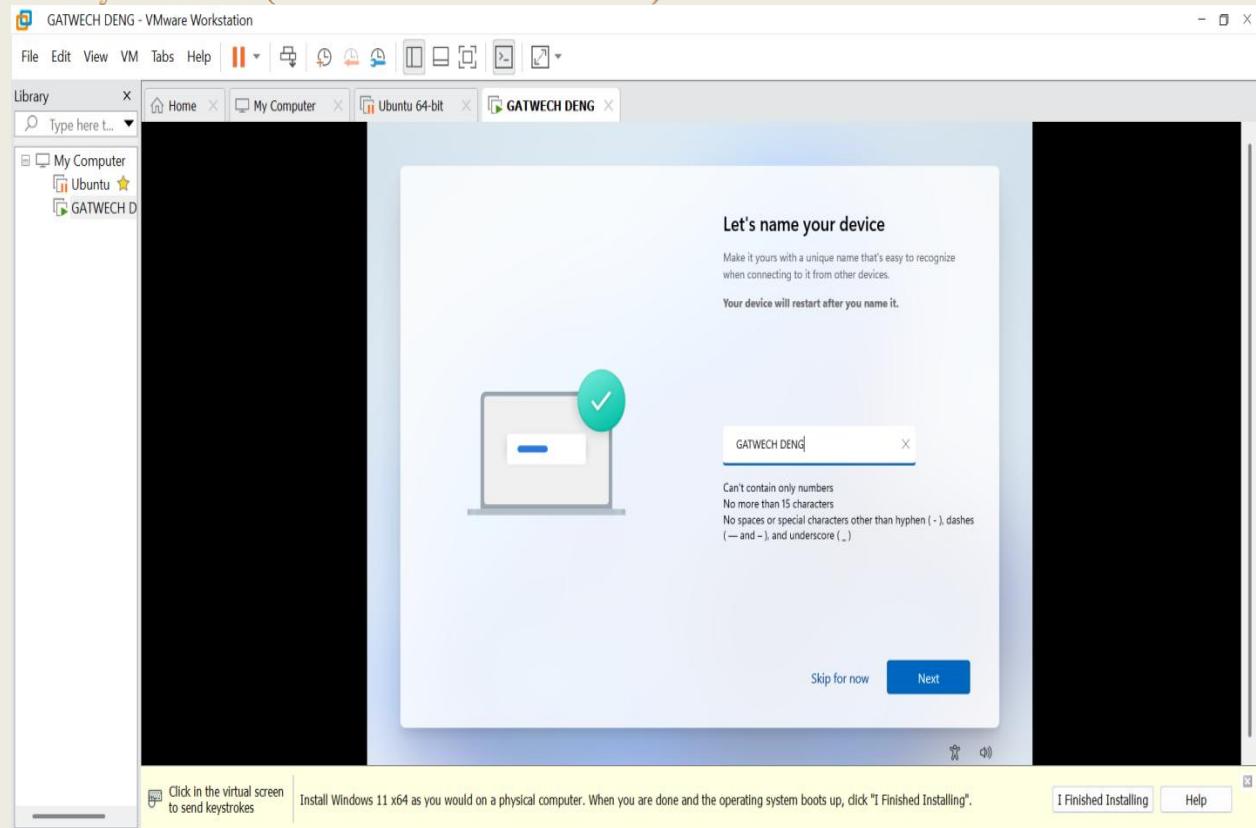


Want to add second keyboard (skip).

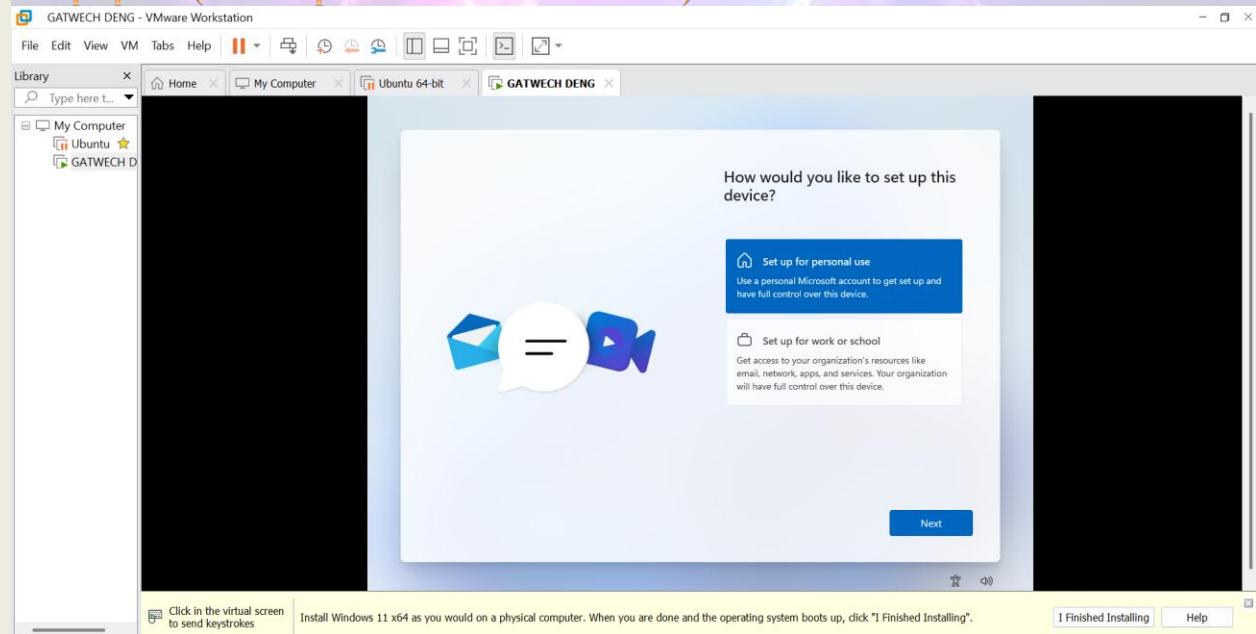


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

Name your device (mine is GATWECH DENG).

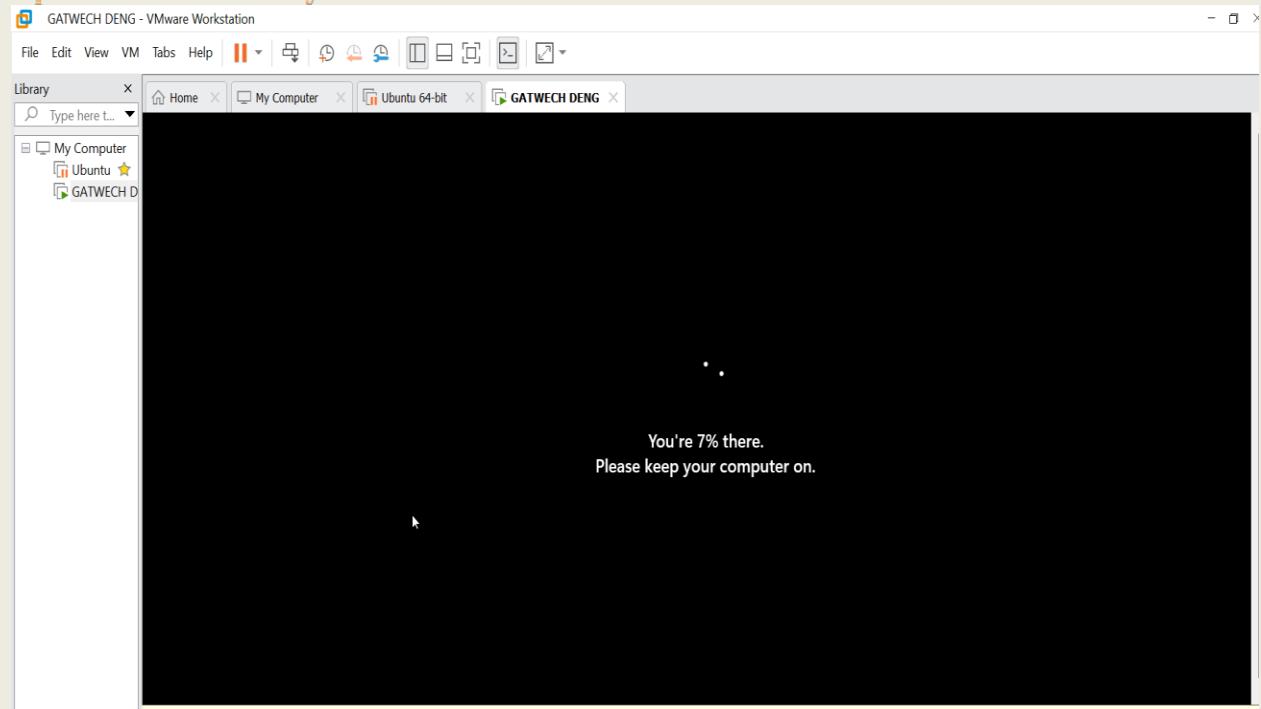


Setup option (chooses personal use and click next)

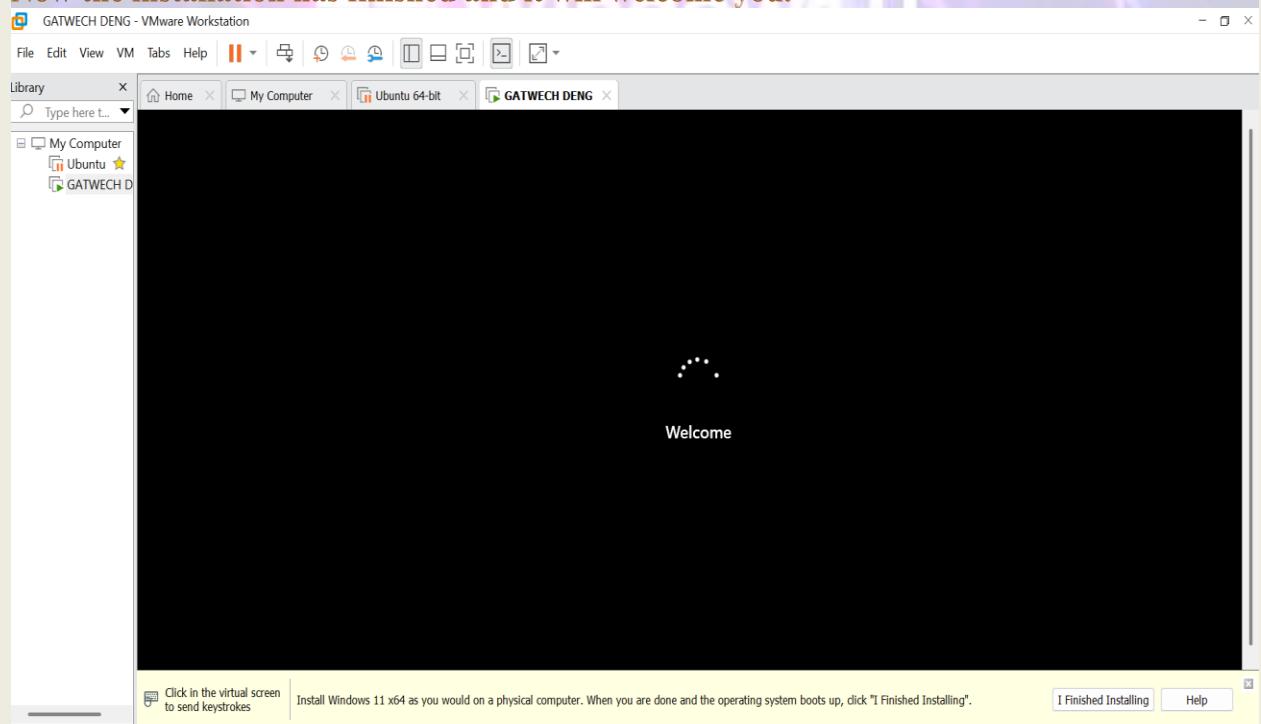


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

Updates are underway

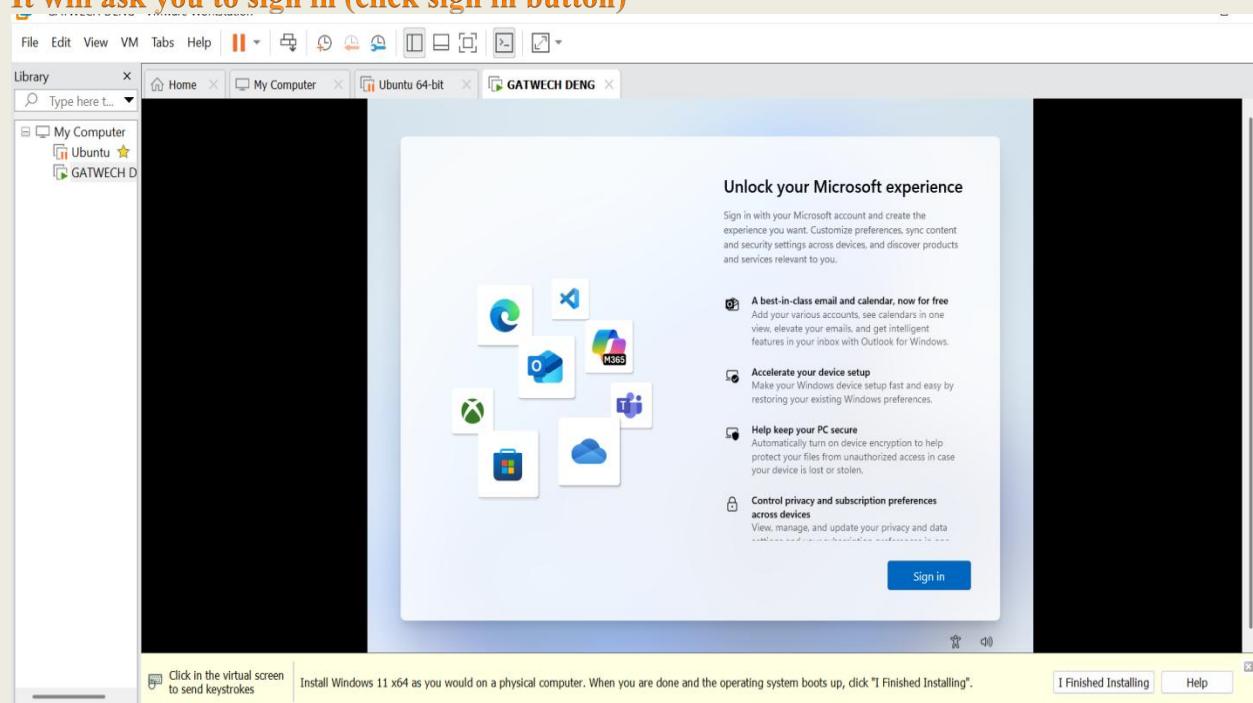


Now the installation has finished and it will welcome you.

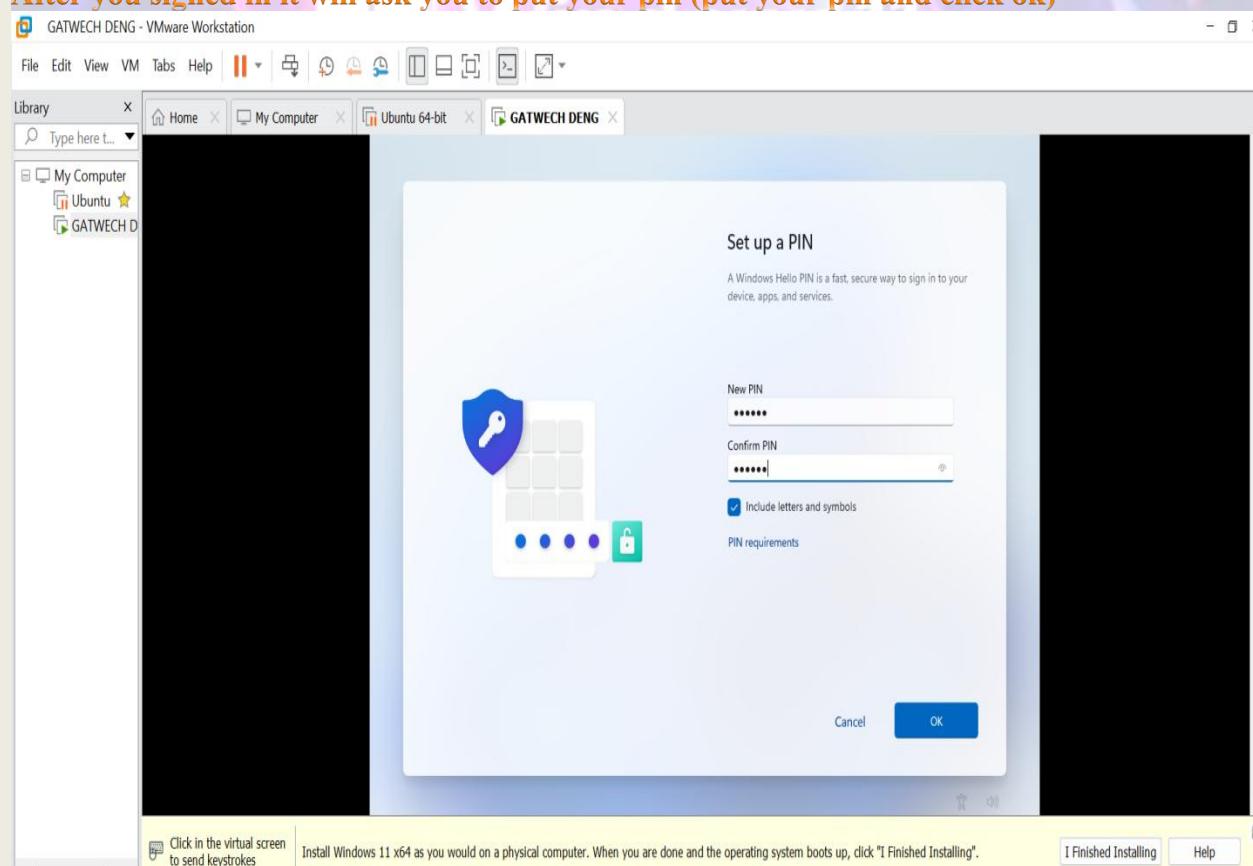


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

It will ask you to sign in (click sign in button)

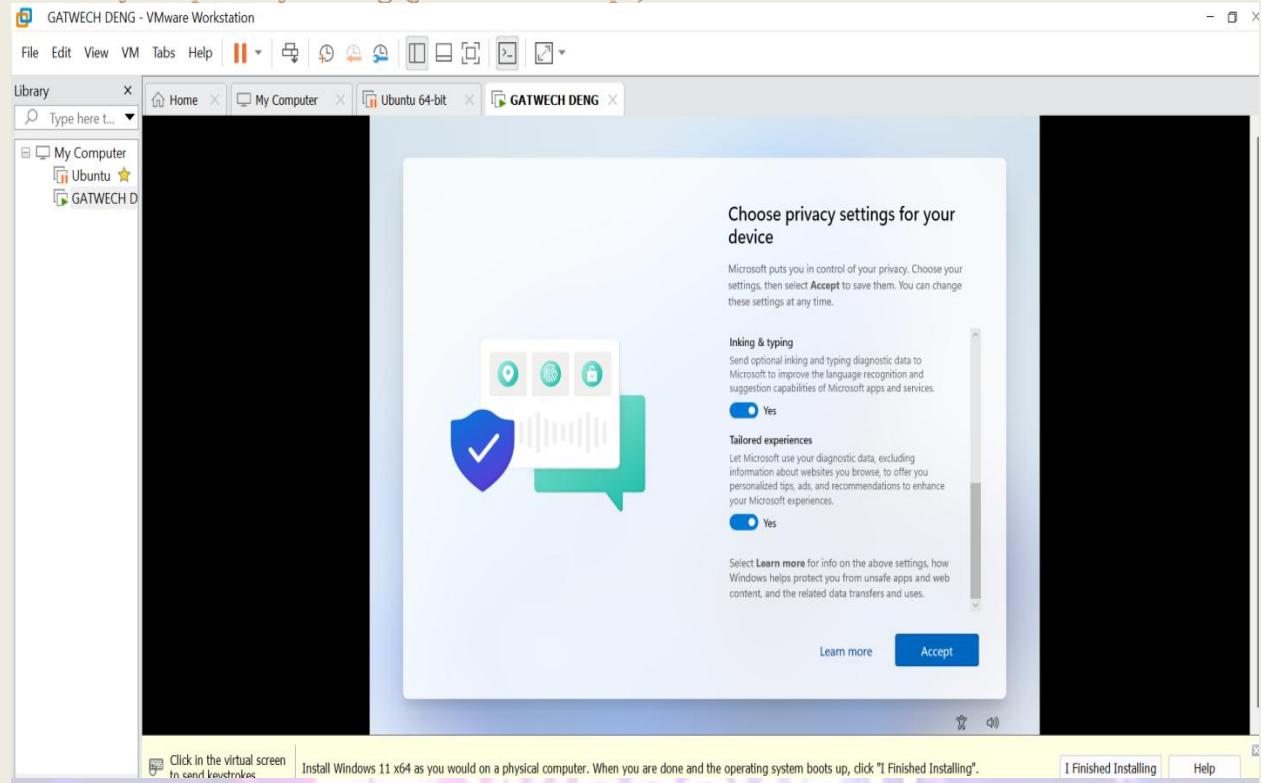


After you signed in it will ask you to put your pin (put your pin and click ok)

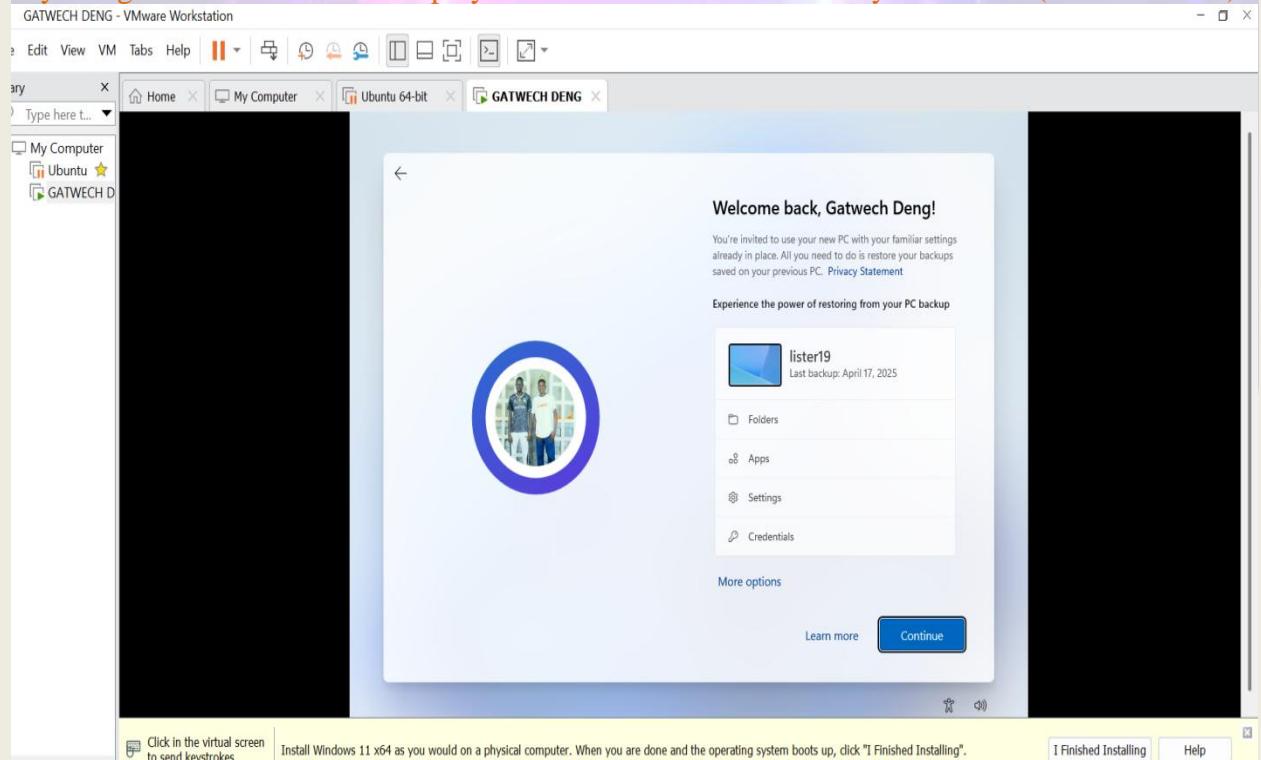


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

Choose your privacy setting (just click Accept)

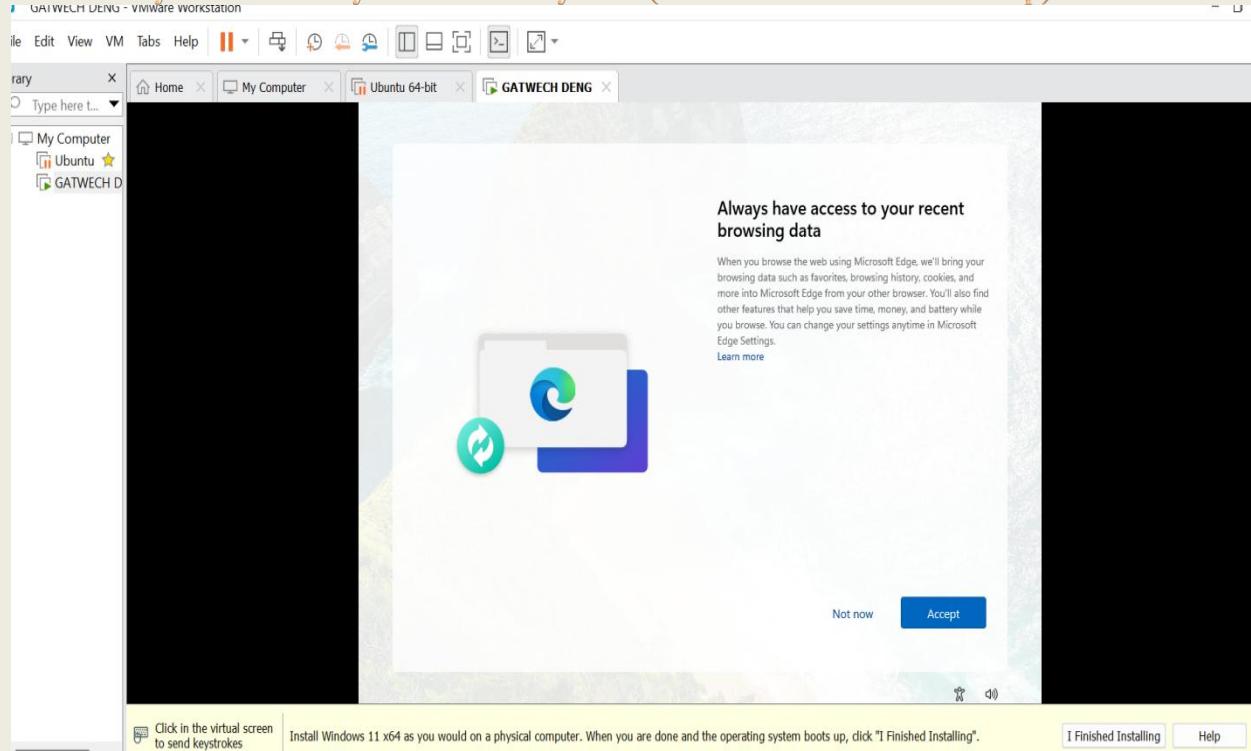


If you signed in before it will display welcome back or welcome if you are new (click continue)

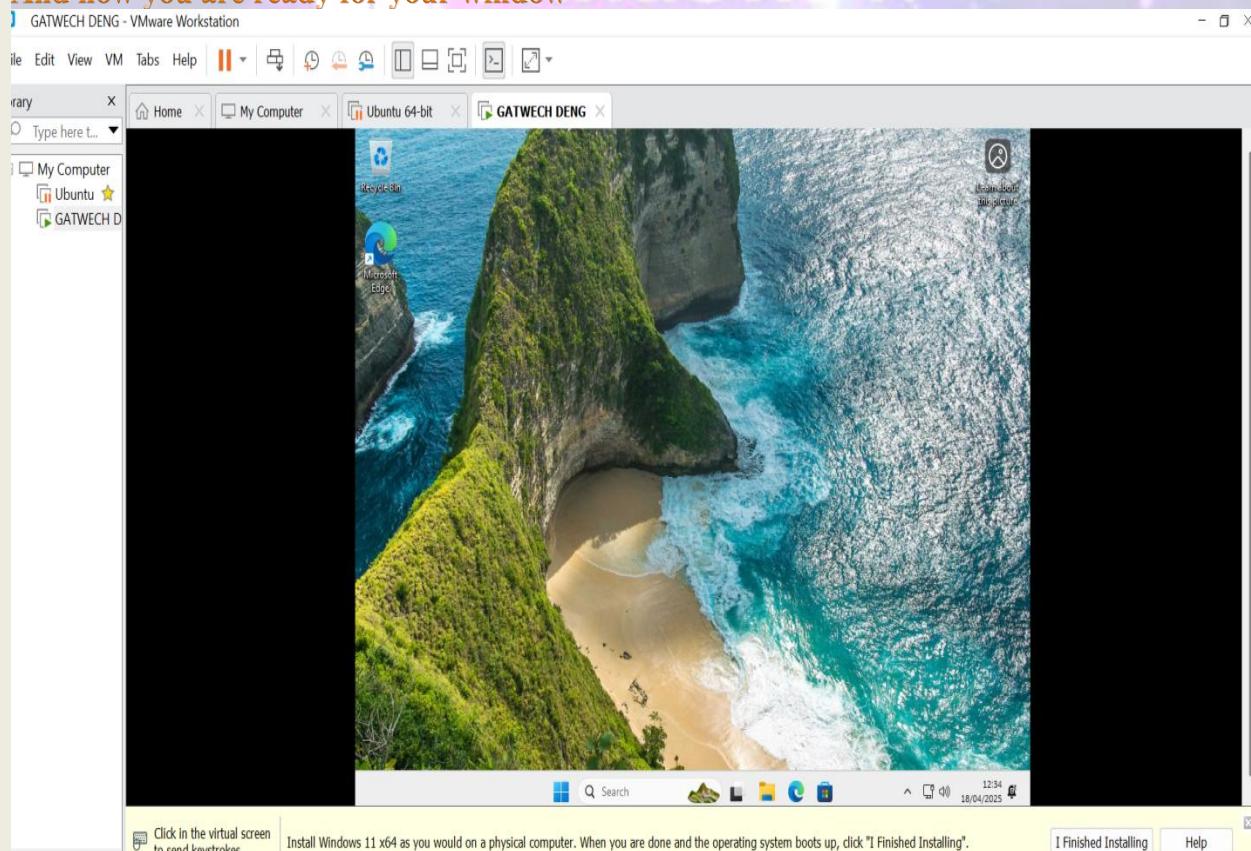


OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

It will ask you to browse your data always but (click not now for later setup)



And now you are ready for your window



OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

E. ISSUES FACED

- Windows 11 installation stuck during setup
- TPM 2.0 and Secure Boot not detected

F. SOLUTIONS

- Modified VM settings to enable "Virtualize Intel VT-x/EPT" and added TPM support in VMware.
- I Used custom .vmx file settings:

```
managedvms.autoAddVTPM = "software"  
uefi.secureBoot.enabled = "TRUE"
```

G. FILE SYSTEM SUPPORT

Windows 11 uses NTFS (New Technology File System) as the default file system.

H. FILE SYSTEM COMPARISON

| File System | Supported OS | Features | Why NTFS? |
|------------------|---------------|------------------------------|--|
| NTFS | Windows | Journaling, encryption, ACLs | Stable, secure, and supports large files |
| FAT32 | Windows/Linux | Older, widely compatible | Max file size: 4 GB |
| exFAT | Windows/macOS | Optimized for flash drives | Not as robust |
| ext4, Btrfs, ZFS | Linux | Linux-specific | Not supported natively in Windows |

Why NTFS?

- Offers file compression, encryption, and detailed permission handling.
- Reliable and supports modern storage requirements.

I. ADVANTAGES AND DISADVANTAGES

Advantages of Windows 11 on VMware:

- No dual-booting required
- Safe testing environment
- Snapshots for easy rollback

OPERATING SYSTEM INDIVIDUAL ASSIGNMENT

Disadvantages:

- Requires strong hardware resources
- Some performance overhead

J. CONCLUSION

The virtualization of Windows 11 using VMware demonstrates how operating systems can be deployed in isolated, flexible environments. The project enhanced understanding of installation procedures, file systems, and virtualization principles.

K. FUTURE OUTLOOK / RECOMMENDATION

As virtualization becomes more integrated with cloud computing and containerization, future efforts could explore container-based virtualization using tools like Docker or experiment with Linux-based OS installs for cross-platform testing.

2. Virtualization – What, Why, and How

What is Virtualization?

Virtualization is the creation of a virtual instance of hardware or software, allowing one physical system to run multiple isolated OS environments.

Why Use Virtualization?

- Testing without altering host system
- Efficient use of hardware
- Quick recovery and snapshotting
- Run different OS on one machine

How It Works:

A **hypervisor** (like VMware) abstracts physical resources and provides virtual hardware to guest OS. There are:

- **Type 1 hypervisors** (bare metal, like Hyper-V)
- **Type 2 hypervisors** (hosted, like VMware Workstation)

3. System Call Implementation

Problem: System Call Implementation on Windows 11 OS

ISSUE:

I attempted to implement a custom system call named mloc() on Windows 11 OS running inside VMware.

Problem I Faced:

Windows 11 uses completely different kernel architecture and does not support Linux system calls. System calls like mloc() can only be implemented and tested within a Linux kernel environment, because:

Windows does not provide access to the Linux kernel source code.

The syscall mechanism and structure in Windows are not compatible with Linux syscall development.

LINUX SYSTEM CALL DEVELOPMENT REQUIRES MODIFYING AND RECOMPILING THE LINUX KERNEL.

Conclusion:

System call mloc() cannot be implemented in Windows 11. To implement and test a Linux system call like mloc(), I need to use a Linux OS (e.g., Slackware, Ubuntu) as the guest operating system in VMware.