WINDOWS
11 OS

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1.Introduction

Windows 11 is the newest operating system Microsoft company has released to the public and it was announced and made available to all users worldwide who possess the required system requirements It is the successor of Windows 10 and it brings numerous different changes and improvements that make the system stronger and more attractive Windows 11 is a major upgrade not only in looks but also in performance and the way the users interact with the computer It is showing how Microsoft see the future of computing and digital world in the next few years With a new and enhanced user interface new performance features. Windows 11 has much stronger features than before This piece of writing paper will explain the reasons why Windows 11 come why it was required and what new features does it bring in to the past one which is Windows 10

2.Background

Windows operating system is most used and most popular computer system in the world especially in Ethiopia and other African countries and Microsoft company was ruling operating system market for decades starting from long time Windows 10 was released and at that time Microsoft announced it will be last version of Windows and from then on it will get only updates and not new versions in total However after some years that idea changed because of some reasons and now we have Windows 11 which is completely new version

One of the primary reasons is the evolution of hardware technologies like central processing units known as CPU graphic cards or GPU and solid state drives which is referred to as SSD All these new technologies are becoming stronger and faster and they offer the chance to make more powerful and advanced computers so the operating system must also be strong enough to use all of the power from hardware devices Also humans now demand more features and a better look from their computers because other operating systems like macOS and Linux are becoming very advanced and they offer better user experience and better security So Windows must also update not to lag behind in the market and make users happy That's why Microsoft chose to create Windows 11 with new changes and developments that accompany the present era and demand

3.Motivation

As technologies continue to develop fast information technology students and even professionals working in the tech industry must keep themselves in pace with new software and system updates Windows 11 is Microsoft's newest system and it offers plenty of new requirements and features that is required to learn and know how to utilize For example it has completely redesigned a better security feature more cloud connectivity noted above along with stringent installation requirements like the necessity of TPM 20 and Secure Boot enabled These new requirements are tough sometimes especially for those who want to install Windows 11 on virtual machine platforms

Acquiring installation and usage of operating systems in virtual environments is very crucial and key skill for any IT student and worker because virtualization is used in system administration software testing network security and other computing duties Virtual machine enabled us to run many systems on a single machine so it saves money and allow for safe testing without affecting the host machine VMware is one of the widely used software for that purpose and many students utilize it for practice

But it is not always simple and easy to install Windows 11 on VMware It have different kinds of errors and problems such as software drivers incompatible These problems make the installation process difficult but it is also a good learning experience for students who are trying to learn how operating system works and how to fix system problems in real-world scenario.

So the main aim of this paper is to discover and learn what are the main issues come into play while trying to install Windows 11 in VMware and how can we find the optimal solution to solve those issues Whenever we do this task we are not just learning how to install but we are also gaining long-term experience in real system management with virtualization software which help us in future IT jobs and careers It also help us to understand Windows system deeply especially how the inner parts of operating system work.

Completing this assignment also help us to improve critical thinking and logical problem-solving skills as we face unexpected issues and we need to search solutions online employ different tricks So, this assignment is not just technical but it foster our independent learning and confidence to address modern IT challenges

4.New Features of Windows 11

Windows 11 has lots of new features that are aimed at improving productivity performance as well as creativity for the users The new features simplify work and make it more enjoyable

The Start Menu and Taskbar now have new looks They are now, by default, aligned to the middle of the screen which is more and cleaner-looking The Start Menu is where pinned programs and suggested files from the cloud reside that help the user quickly and easily open files

Another gigantic feature is Snap Layouts and Snap Groups These features enable to arrange open windows in an organized way so user can work with many apps at a time and will not get confused It saves time and make multitasking easier especially for those who work on many things at a time

Microsoft Teams is now integrated with Windows 11 and can be accessed directly from the taskbar This allow users to call and chat easily whether for school work or personal use This also improve the idea of hybrid work and communication

Windows 11 also allows Android apps to run natively on PC by supporting Windows Subsystem for Android and using Amazon Appstore This is a very useful feature because it integrate mobile and desktop applications and provide more choice for users

Another new feature is the widgets that show weather calendar to do list news and other useful information instantly without having to open big apps Either way touch screen users will enjoy better performance with large touch targets gestures and smoother experience

5.Objectives

To understand and practice the installation process of Windows 11 in a virtual environment and understand how to configure the virtual machine settings such as processor memory disk and TPM option

To identify and solve the general installation issues that may arise while installing Windows 11 in VMware such as TPM error secure boot black screen missing drivers and other compatibility issues

To keep records and jot down the solutions and steps that we used to fix installation problems so that we can reuse it or help others to fix similar problems

To get hands on experience with VMware software features like mounting ISO images virtual hardware setup snapshots and installing VMware tools which is of utmost use to computer science and IT students

To actually learn the Windows 11 system architecture and why new features like TPM 20 and Secure Boot are necessary and included and how we can circumvent or activate them within virtual machines

To improve our solo troubleshooting and research skills by browsing on internet read forum threads Microsoft documentation and testing various ways of fixing real issues

To determine how Windows 11 handles itself in a virtual machine compared to real physical install and see how performance and use change in both environments

6.Windows 11 Software and Hardware Requirements

Windows 11 demands higher system requirements than the past versions like Windows 10 or Windows 8 because it contains more features that need more hardware to function effectively This integrates minimum requirements that must be followed in order to install the OS properly

Minimum hardware requirement is processor of 1 GHz or higher with two or more cores and it should be 64 bit type also computer should have minimum 4 GB RAM and at least 64 GB free space for storage System firmware should support UEFI and Secure Boot A screen of minimum 9 inch with resolution of 720p is also required Additionally internet connection is required to do updates and also to configure Microsoft account which is mandatory for Home Edition

Processor compatibility is limited too Windows 11 is not compatible with every CPU For example only 8th Generation Intel Core and above are supported along with some AMD models too

Storage must be SSD especially NVMe SSD as Windows 11 have DirectStorage feature which give faster loading times for games and heavy programs This feature came from Xbox console now adopted in PC

For cloud and online capabilities user must possess functional internet connectivity since OneDrive Microsoft Teams and other capabilities demand it Windows 11 also accepts newer connectivity options like Wi-Fi 6 Bluetooth 50 and newer ethernet solutions

The operating system also demand latest drivers in UWD or WDM type Older drivers can be dysfunctional Programs and antivirus solutions must also be latest version to ensure maximum functionality and security

Windows 11 is also virtualization friendly with features like nested virtualization and Windows Subsystem for Linux In order to utilize these features the computer must have processor with Second Level Address Translation support and virtualization support enabled via BIOS Also it needs 4 GB RAM or more for best performance

These requirements may exclude some older devices from running Windows 11 but they also make good foundation for greater computing security and future software needs

7.Installation Steps

#First we need to download the Vmware Workstation player
->Go to the web browser and search for Vmware worksation download

->Under the listed websites choose the first one

->we choose workstation player version

->selecting our operating systems(hosting os)

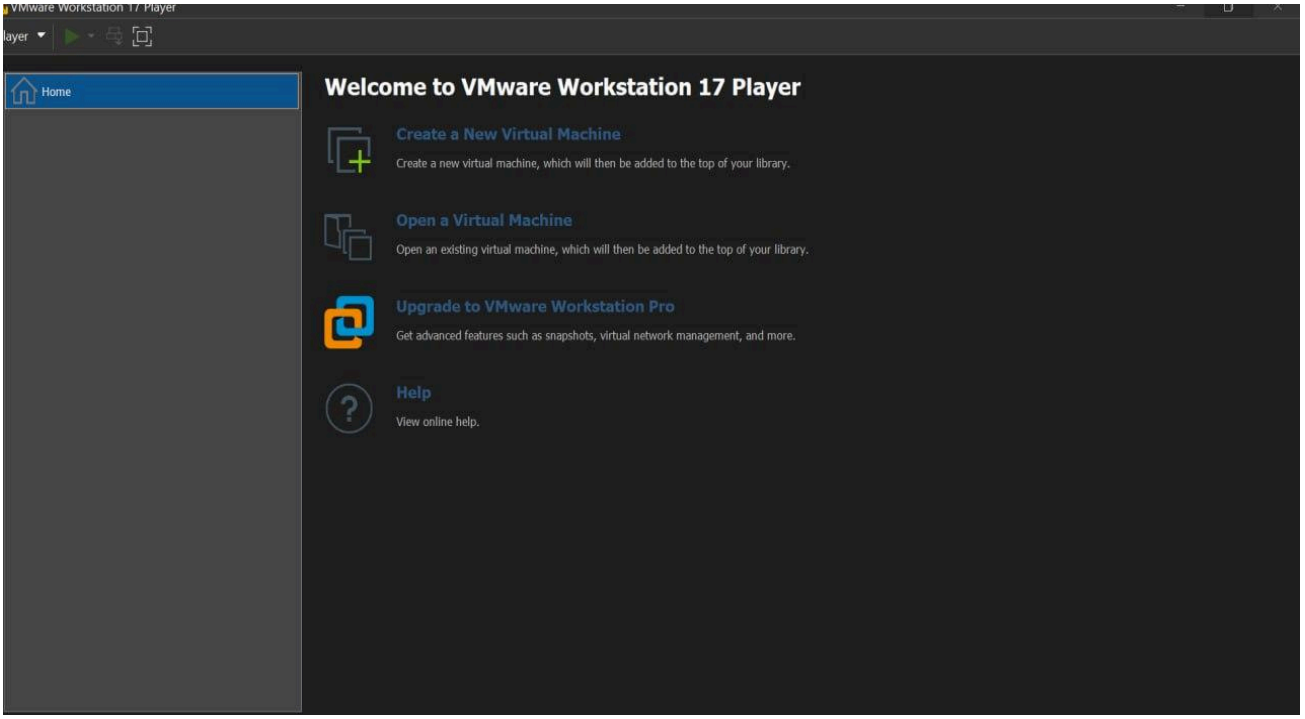
->finally executing the installer file

Also we need to download the window 11 operating system installer
To download it

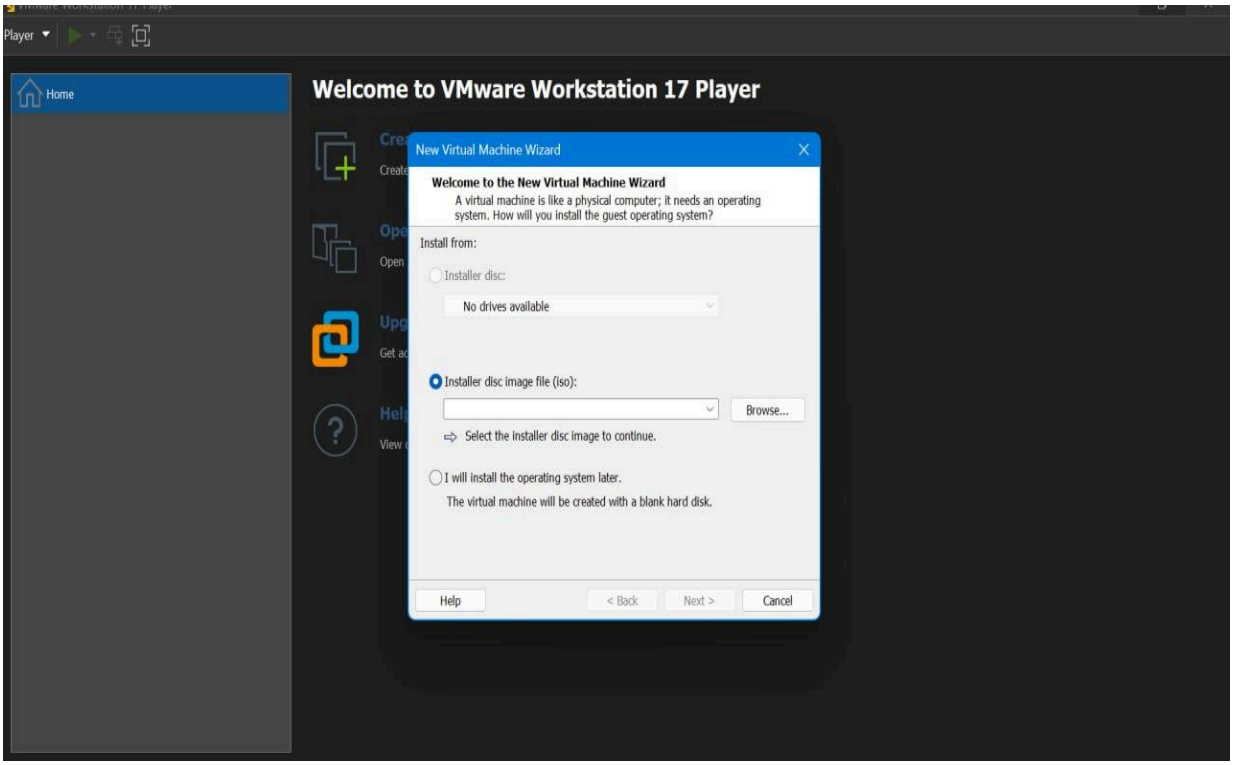
->we need to go to the official microsoft website
-> then from software download we select windows 11
->Download windows 11 disk Image (ISO)
-> select windows 11 multiedition
->choose language
->we select 64-bit Download

Now we continue the installation of windows 11 on virtual machine using the installed apps

1-First we open the Vmware and below will be displayed

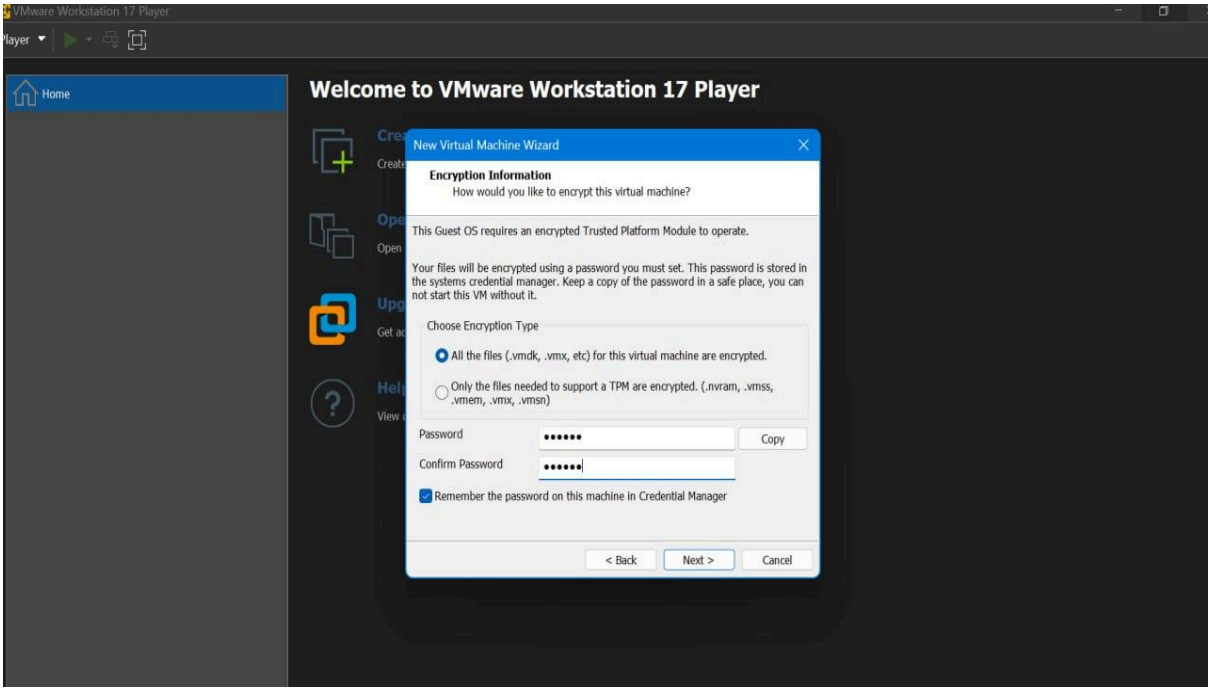


2-from the above we select create new virtual machine and following will be displayed

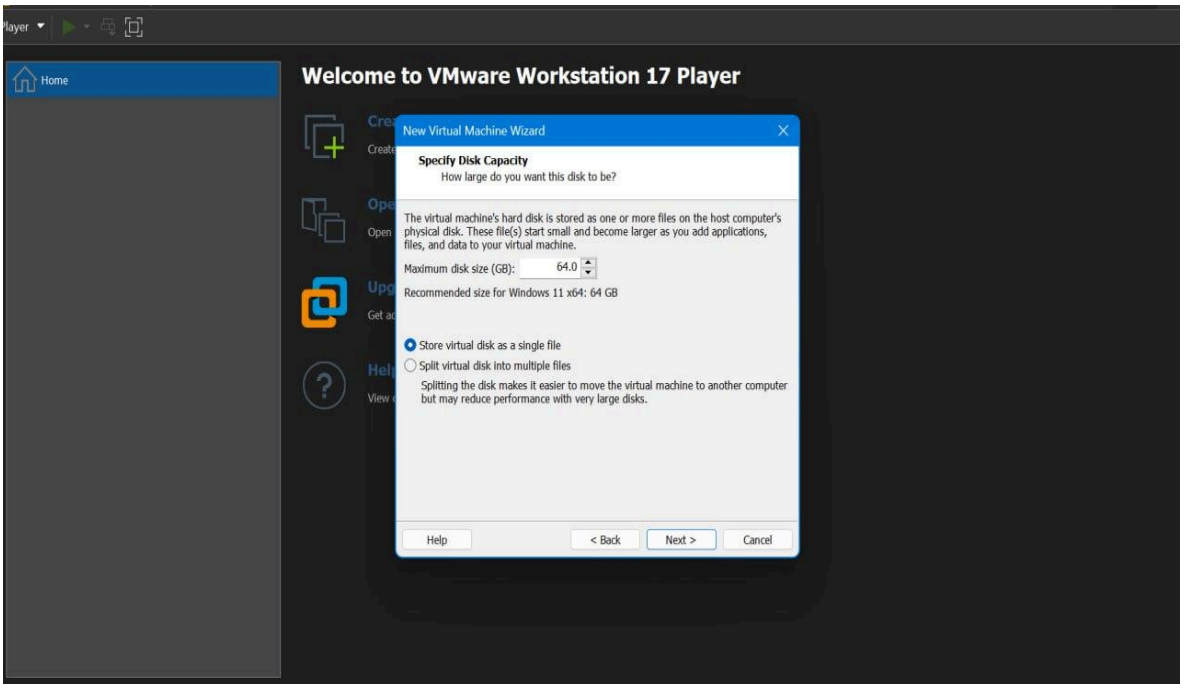


2- now we go to browse section and select the window iso file that is going to be installed then we select next

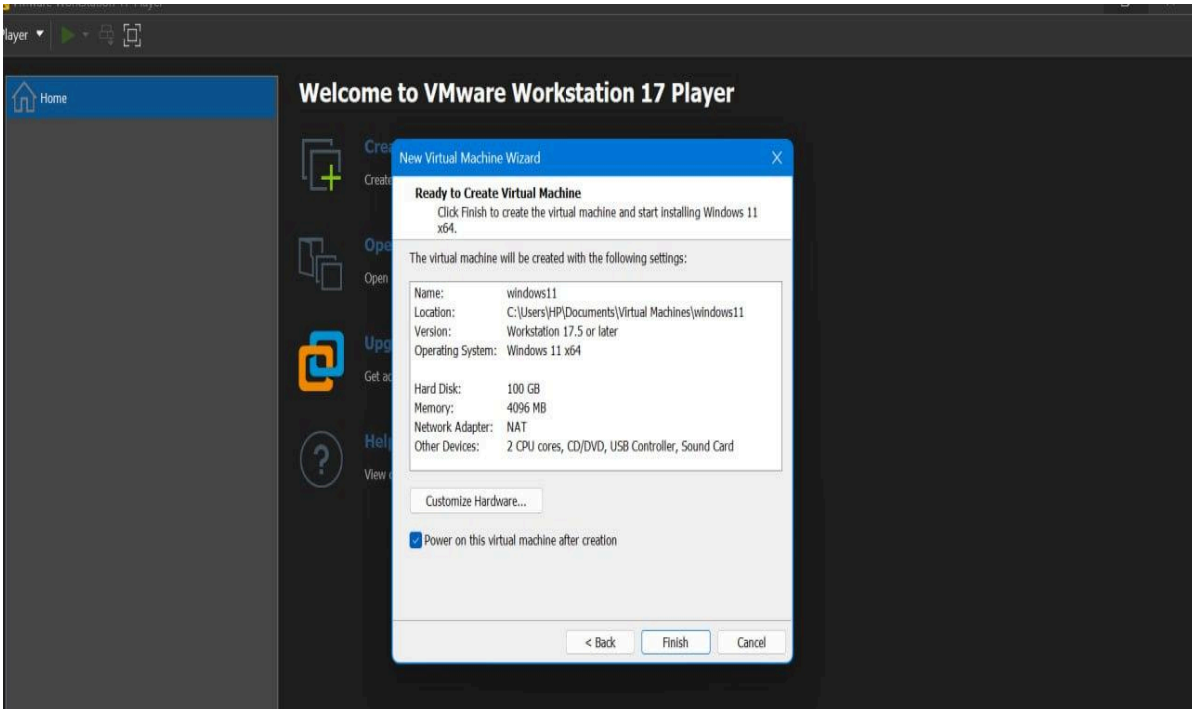
The next display is the confirmation of installed file and we give name for our virtual machine after that below will be displayed



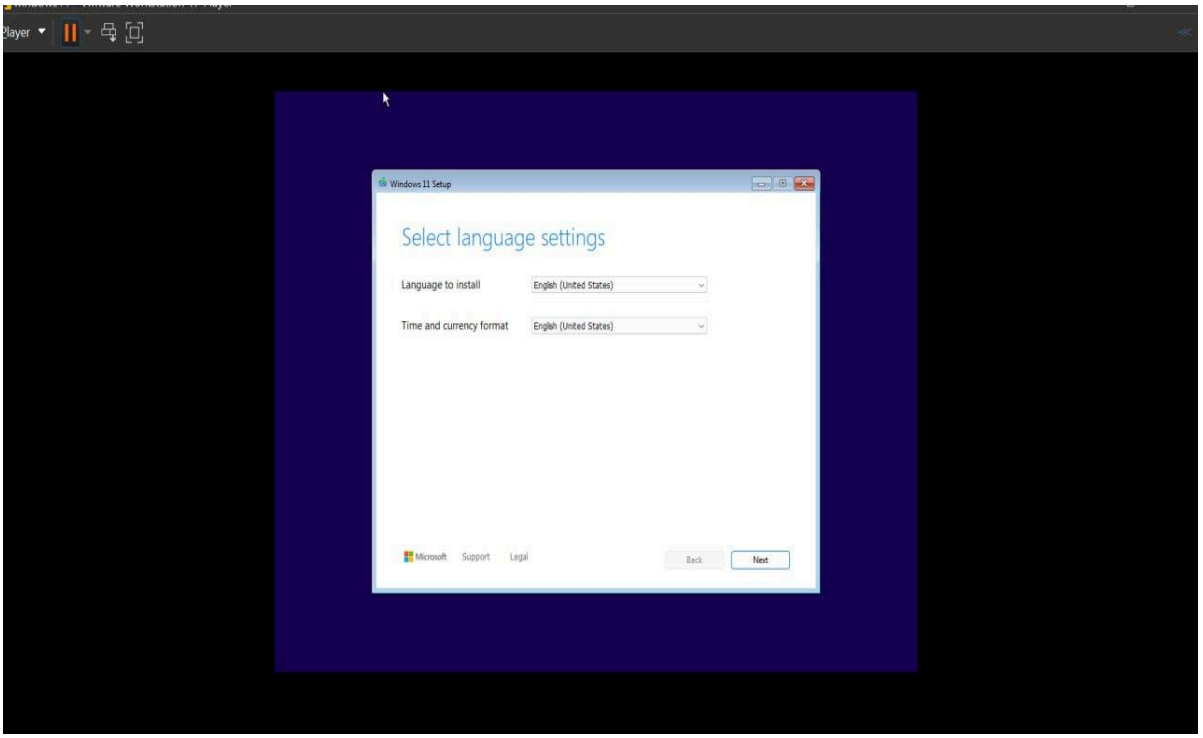
3- We select which files going to be encrypted on guest os(win 11) and after creating password elect next then the following will be displayed



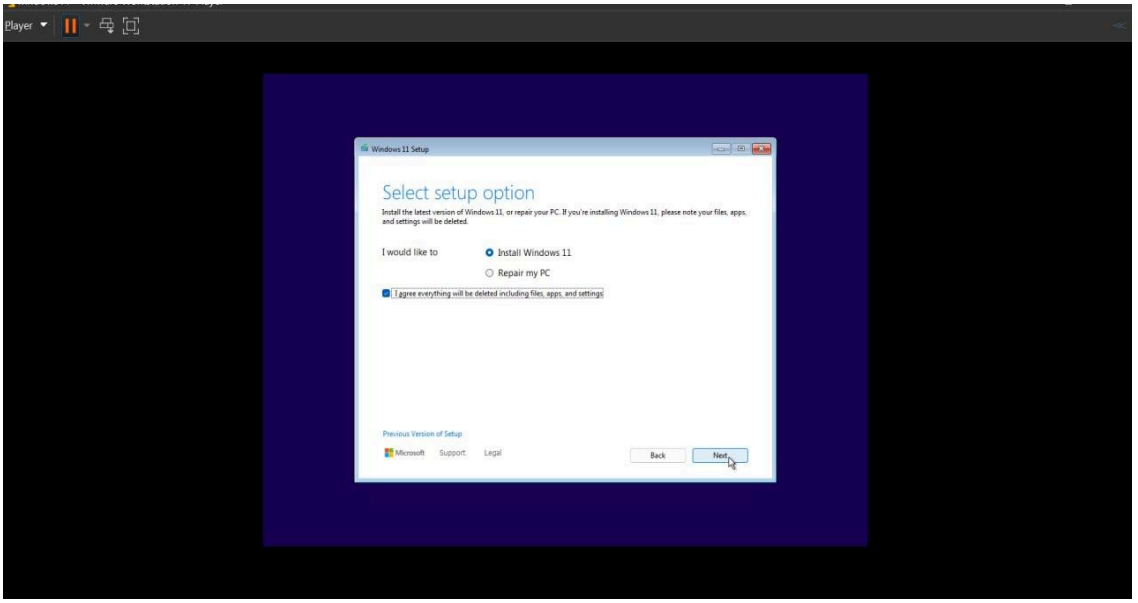
4- In this display we limit the resources for our guest os, the default storage is 64GB but we can change it also we select disk management as splitted or as single file and we have selected single file and next the display will be as follows



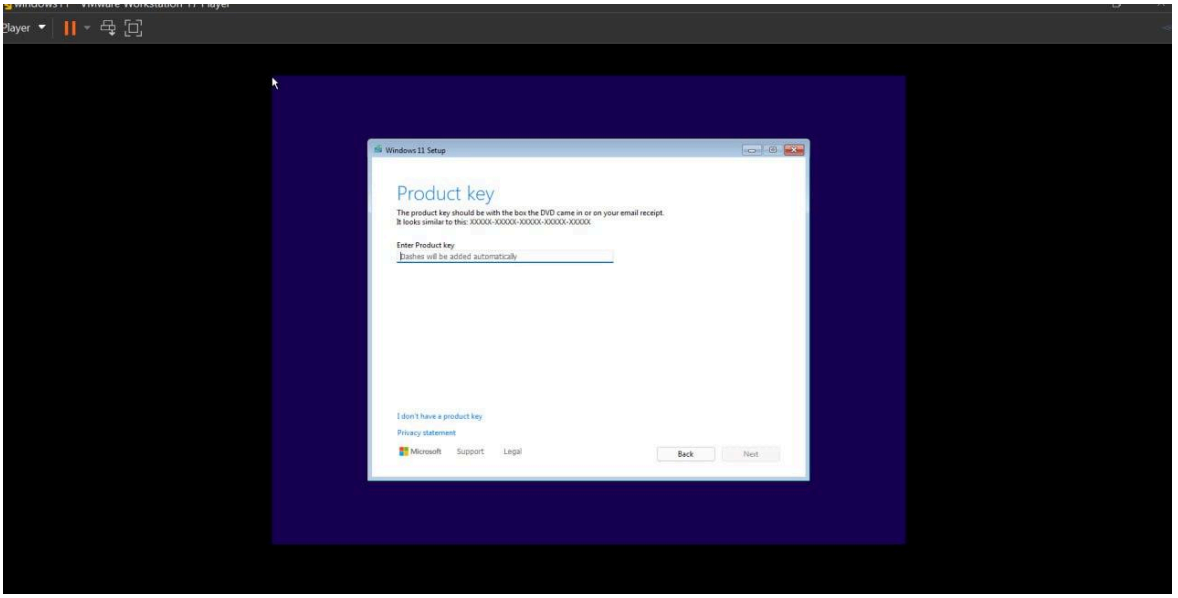
5- which is the confirmation of our used resources and when we select of finish the installation will start and after while it asks to press any key to continue below image will be displayed



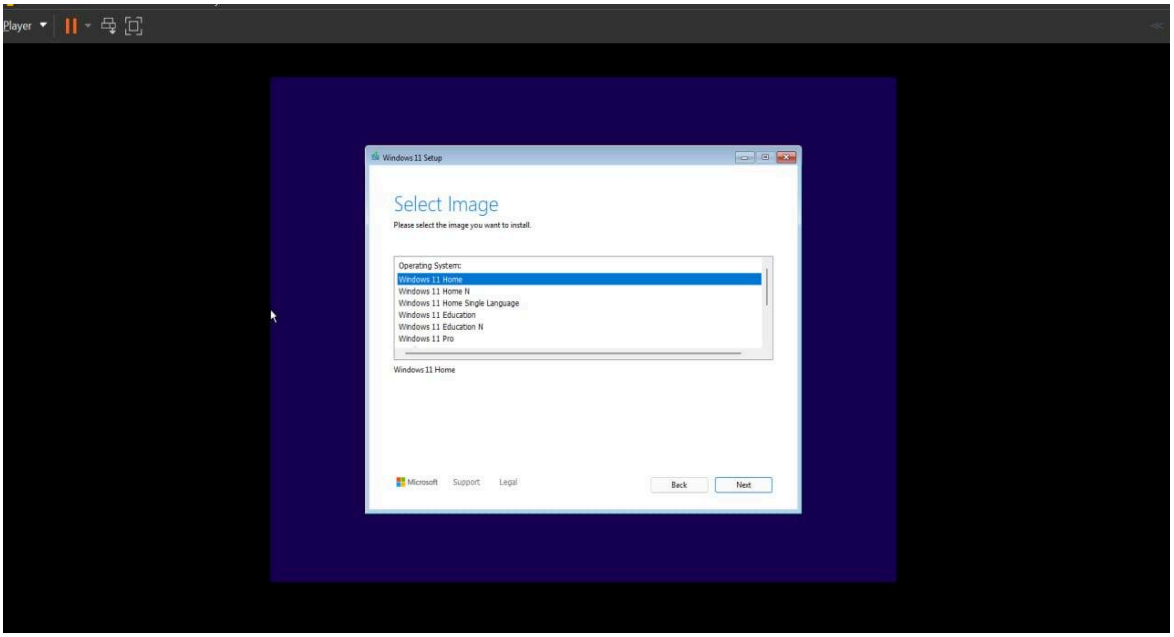
6- in this display we have selected the language used to install, time and currency format and also keyboard /input method and press next the following will be displayed



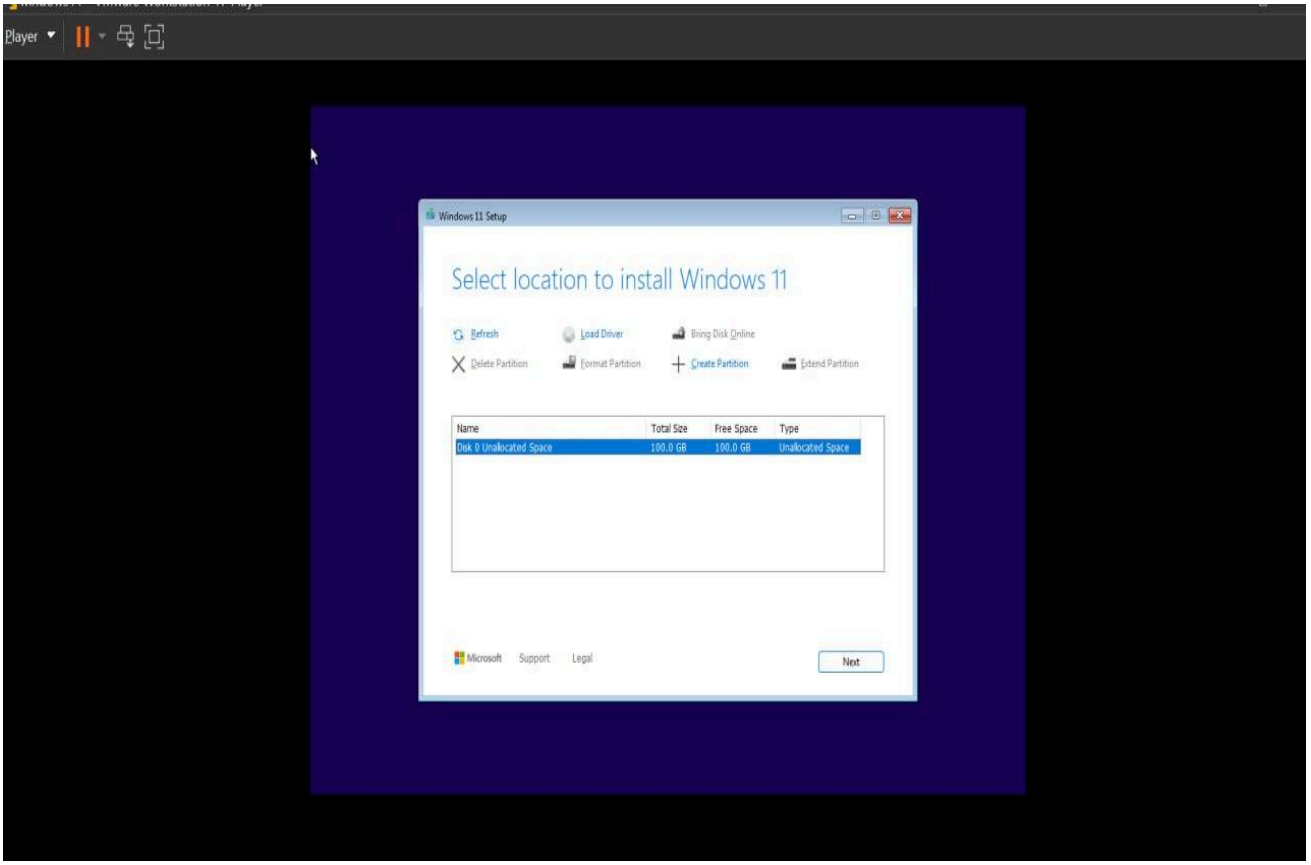
7- in this step we have selected the setup option which is install windows 11 the next display will be



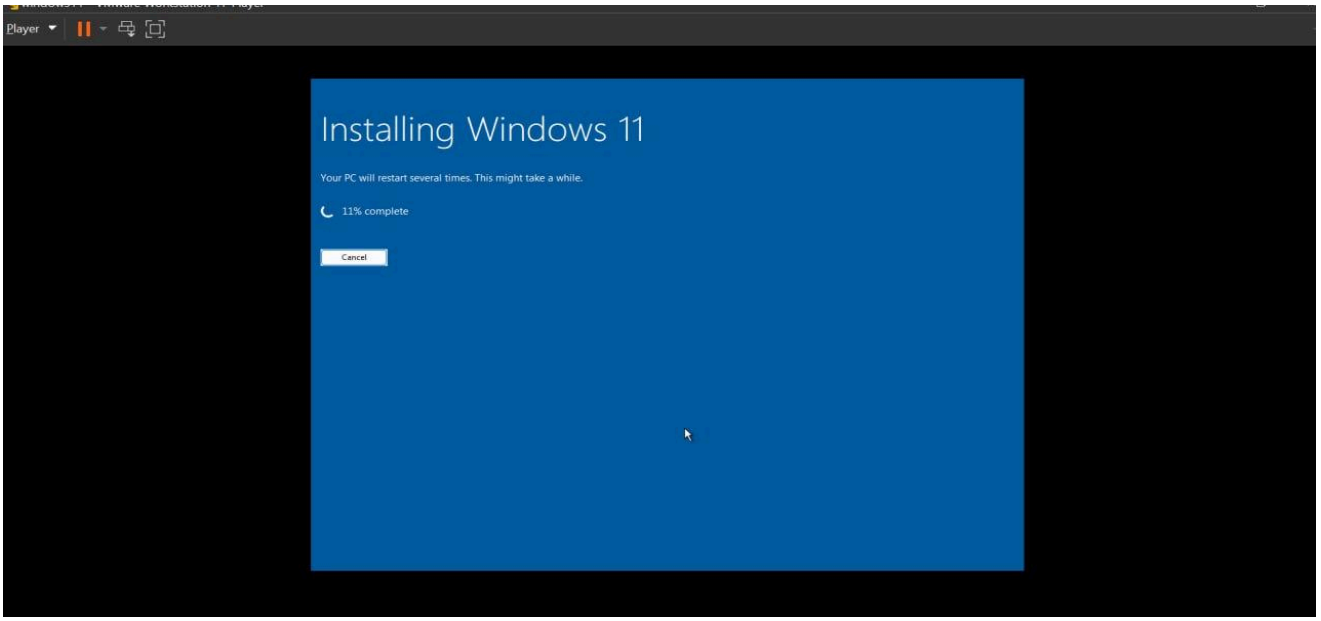
8- in this step as we don't have product key we press i don't have product key



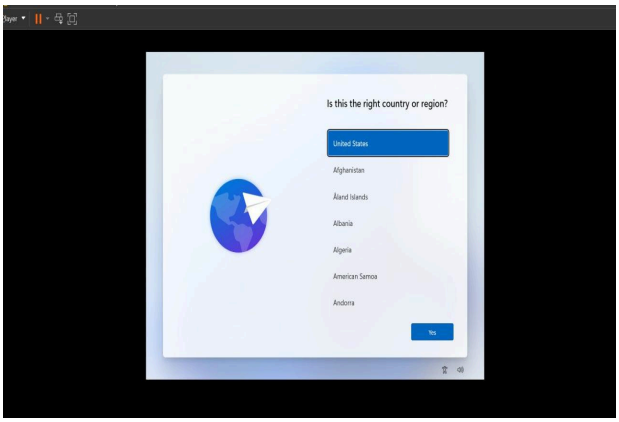
9-Select the image which is home one that we are going to install the windows 11 so the next display is below

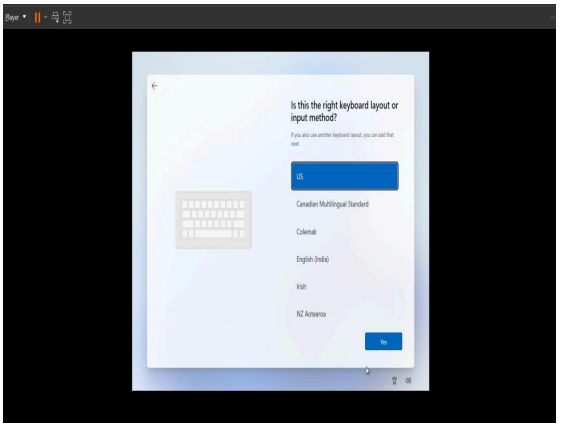


10-at this level we can add partition to our resources or leave it as it is and when we press next the installation will start automatically as shown below

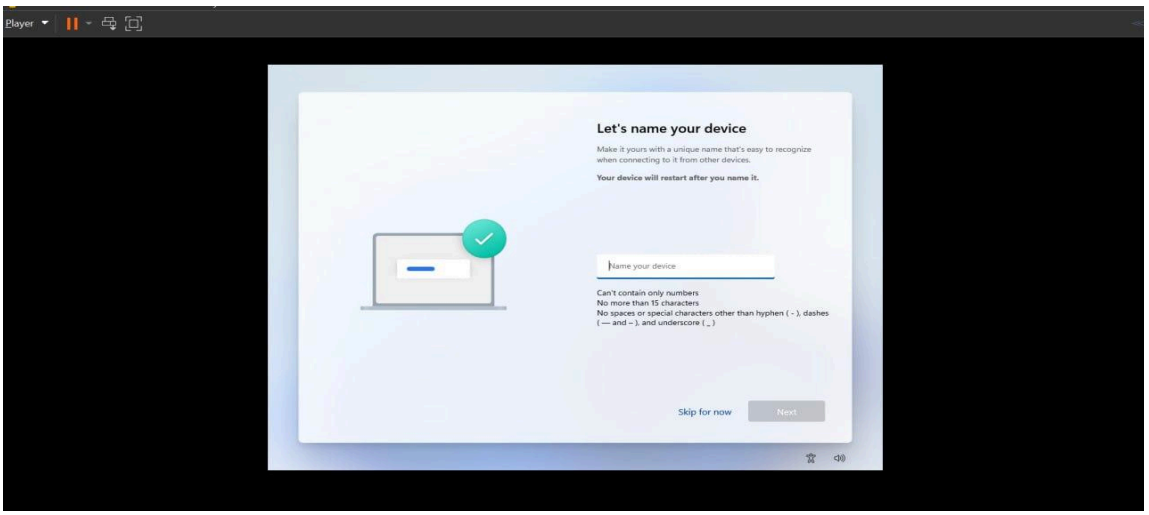


11-after the installing is done the display in which we can choose country of origin and keyboard or input format will be displayed as follows

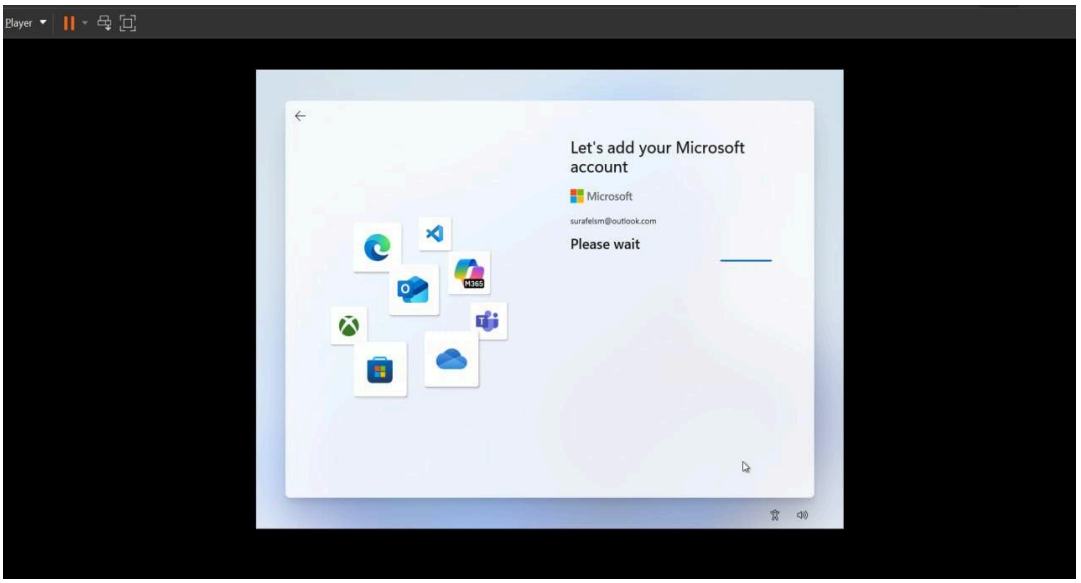




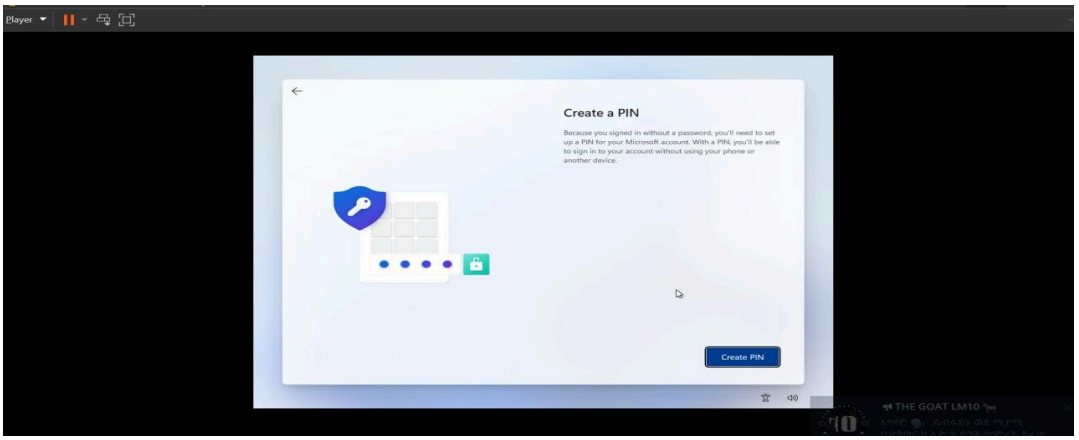
12-After that it asks as to name the device to make sure its easily recognizability when connected with other devices



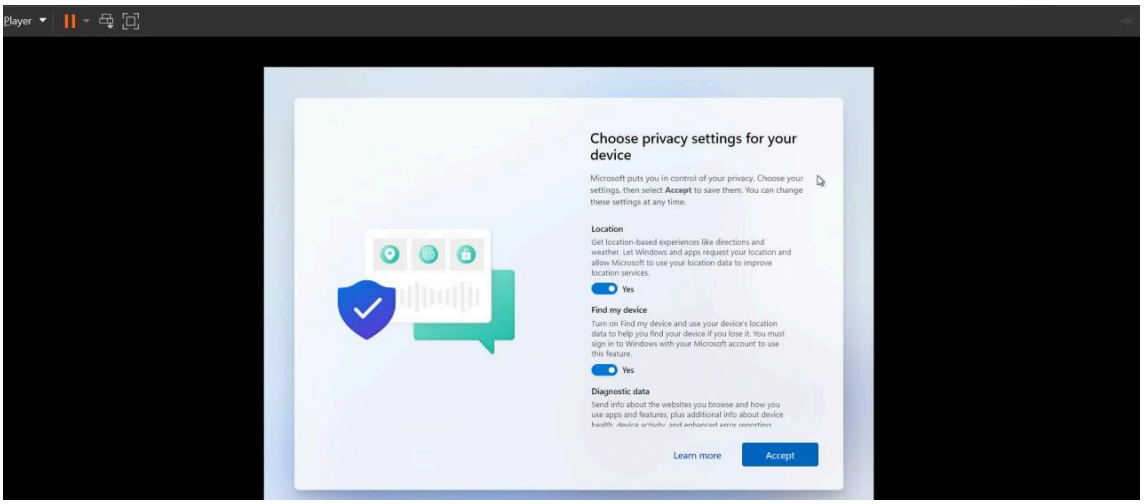
13- After this we are asked to add microsoft account and we have added as follows



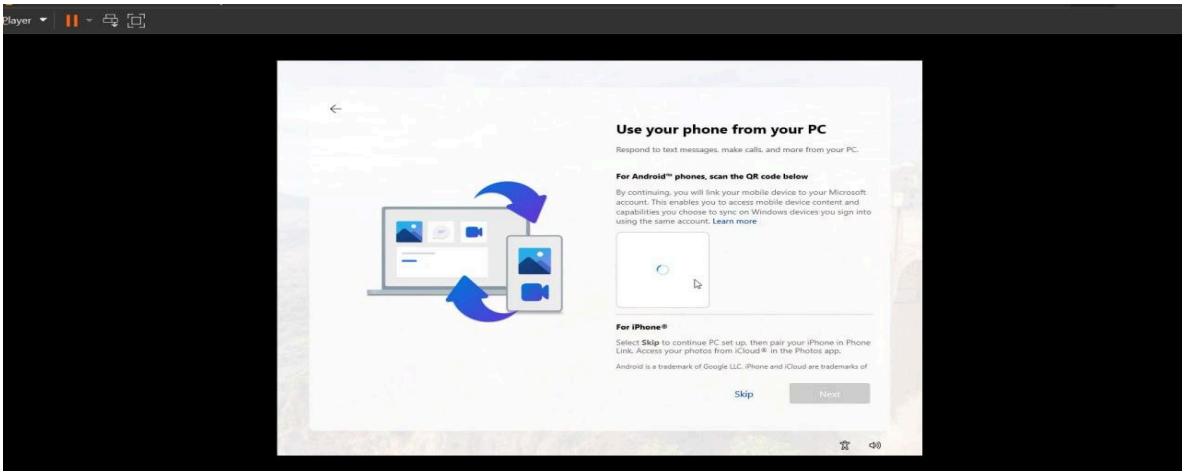
13-going after the naming we are required to sign in in microsoft accout to create one or to log in with the created one and select next or we can skip the account sign in for now

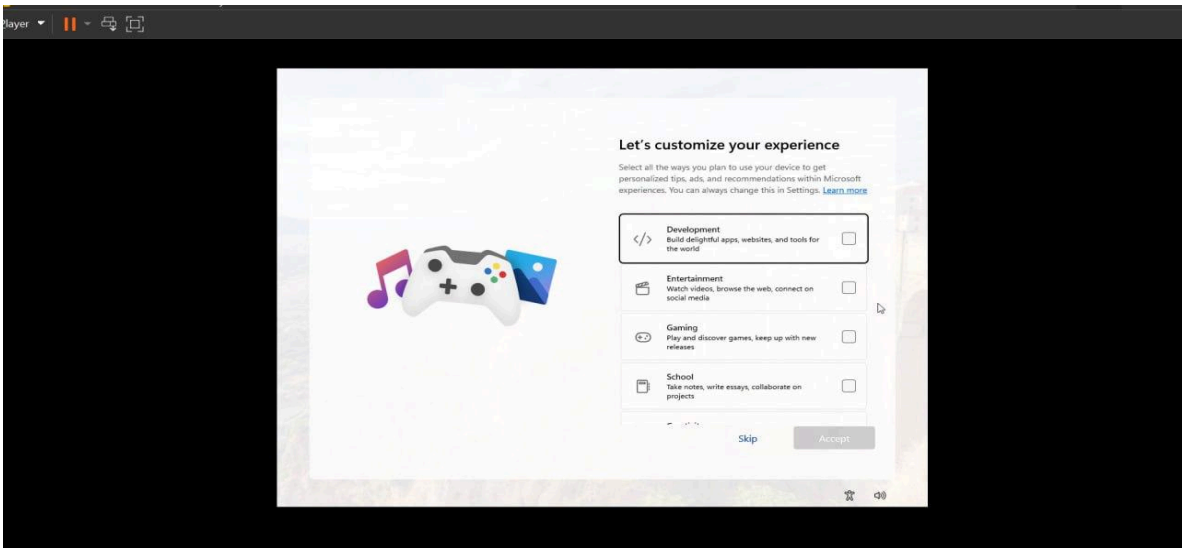


14-Creating a pin as we created our microsoft account using recovery email and after that select next



15-step is choosing privacy settings for device we leave it as it is and press next





16-In both display we select skip and the installation works its majic in background and gets ready itself and after we will get our window 11 installed and looks like below

8-The problems faced in Installation respectively with their solutions

#Low Performance or Lag

Problem: Windows 11 VM is slow or laggy.

Solutions : Allocate at least 4 GB RAM and 2 processors.

#No Internet Connection

Problem: VM has no internet.

Solution:Ensure network adapter is connected has good flow

#Window activation

Problem: Windows 11 is not activated.

Solution:Enter a valid license key.In this level we skip it because we can use and install without it and having has limited customization

#Input device malfunctioning

Problem:keyboard and mouse doesnt work properly

Solution:use ctrl+alt to exchange working space between virtual machine and the host

operating system

9.File Support Systems

Windows 11 supports the following file systems:

* NTFS (New Technology File System): It is the primary and default file system for Windows.
Because: It offers a robust feature set, including security descriptors, encryption, disk quotas, and rich metadata. It supports large files and volumes, and provides reliability through journaling, which helps to recover data in case of system crashes.

* FAT32 (File Allocation Table 32): An older file system with good compatibility.
Because: While it has some restrictions such as a 4GB maximum file size and 2TB maximum partition size, it is compatible with nearly all operating systems (Windows, macOS, Linux) and most other hardware. It is hence suitable for USB drives and memory cards where cross-platform compatibility is paramount for smaller files.

* exFAT (Extended File Allocation Table): A new alternative to FAT32 that is optimized for portability.
Because: It does away with FAT32's file and partition size limitations, supporting very large files and storage devices. It is well-supported cross-platform with Windows, macOS, and many other devices, so it's used extensively on external hard drives and large USB drives.

10.Advantages and Disadvantages of Windows 11

Advantages of Windows 11

I. Modern User Interface and Design
Windows 11 introduces a refreshed and more modern design with a centered Start menu, rounded corners, new animations, and improved consistency across the system. The interface is more streamlined and aesthetically pleasing, aligning with current UI trends.

II. Improved Multitasking with Snap Layouts and Snap Groups
Snap Layouts and Snap Groups allow users to quickly organize multiple windows, making multitasking easier and more efficient—ideal for professionals and multitaskers.

III. Performance Improvements and Efficiency
The system has been optimized for modern hardware, leading to faster boot times, better battery performance on laptops, and overall improved responsiveness.

IV. Enhanced Gaming Features
Windows 11 supports DirectStorage and Auto HDR, offering faster loading times and richer graphics for gamers with compatible hardware.

V. Integration of Microsoft Teams
With Microsoft Teams integrated into the taskbar, users can easily connect with others via chat or video—perfect for remote work and virtual collaboration.

VI. Better Virtual Desktop Support
The ability to create multiple customized desktops for different uses—like work, school, or personal—adds flexibility to the user experience.

Disadvantages of Windows 11

I. Higher System Requirements
Windows 11 requires TPM 2.0, Secure Boot, and newer processors, meaning many older PCs are ineligible for the upgrade despite being fully functional.

II. Learning Curve and UI Changes
The repositioned Start menu and changed layouts might be confusing for users familiar with older versions of Windows, requiring time to adapt.

III. Incomplete Legacy Support
While modern in design, Windows 11 still contains elements from previous versions like the old Control Panel, leading to inconsistency in user experience.

IV. Reduced Taskbar Functionality
Windows 11's taskbar lacks some useful features present in Windows 10—like moving the taskbar or dragging files to open apps—which might frustrate some users.

V. Limited App Compatibility at Launch
Certain older or niche applications may not work properly or require updates, which can be problematic for businesses relying on legacy software.

VI. Frequent Updates and Potential Bugs
Like many new operating systems, Windows 11 has experienced bugs and stability issues early on. Users seeking a more stable platform may prefer to wait or stick with Windows 10.

11.Conclusion

Windows 11 represents a significant leap forward for Microsoft's operating system family, offering an all-new, clean experience centered on productivity, security, and a strong adoption of the cloud and artificial intelligence. With its fresh new look, improved multitasking capabilities like Snap Layouts, and tighter integration with applications like Microsoft Teams and Copilot, Windows 11 is targeted not just at everyday consumers but also professionals, students, and business-class users.

Technically, Windows 11 features an even safer and performance-improved system structure. The need for up-to-date hardware requirements such as TPM 2.0 and Secure Boot indicates that Microsoft is on its way toward a zero-trust security solution, aiming to actively prevent compromises and malware infiltration. This puts Windows 11 among the securest consumer operating systems to date.

Way out in front, Windows 11 is explicitly engineered to endure. With ongoing commitment to AI-fueled integration, cloud technology, and multi-platform compatibility, it should remain a contender for years to come in a future that continues to seek remote connections, hybrid workplaces, and wiser technology. The incorporation of innovations like Microsoft Copilot marks a leap into user experience grandeur, with computer use now more intuitive, automated, and personalized.

However, Windows 11 adoption must be strategic. The end users should be sure that their devices are system requirement-compliant and capable of embracing new workflows and the new user interface. Organisations will need thoughtful planning, user training, and software testing to ensure compatibility before migration.

12.Future Outlook and Suggestions for Windows 11

Windows 11 represents a new direction in Microsoft's strategy toward a more connected, secure, and user-centered operating system. Its future is guided by significant breakthroughs in AI, cloud computing, security, and user productivity.

✓ Incorporation of Artificial Intelligence (AI)

Microsoft is also embedding AI utilities like Copilot in Windows 11 itself. Copilot uses natural language to help users write, summarize documents, and automate tasks. Future versions will likely bring AI integration to system settings, productivity apps, and third-party software.

✓ Cloud-Based Features and Virtual Desktops

Windows 11 supports Windows 365 and other virtualization platforms, allowing users to stream their desktop directly from the cloud. This is the gateway to a future with cloud PCs as a more prevalent, less hardware-dependent option.

✓ Security Focus with Zero Trust Architecture

The OS relies on TPM 2.0, Secure Boot, and newer processors, creating the basis for a Zero Trust model of security. Upcoming versions are set to include stronger encryption, secure login, and real-time threat detection.

✓ Enhanced Gaming Capabilities

DirectStorage, Auto HDR, and better GPU usage are already installed with Windows 11. With time, as gaming evolves, Microsoft will include more innovations such as cloud gaming, ray tracing, AR/VR integration, and reduced latency rendering.

✓ Regular Feature Updates and Extended Support

As Microsoft makes its promise of yearly feature updates and monthly security patches, customers can look forward to a continuously improving platform. The updates will improve stability, add new tools, and address user input.

✓ Enhanced Accessibility and Inclusivity

Windows 11 is adding more support for people with disabilities through features like voice access, live captions, and adaptive accessories. Personalization and inclusion for all user groups will be further enhanced through future updates.

*Recommendations

✓ Upgrade Only If Your PC Meets System Requirements

Check TPM 2.0, UEFI/Secure Boot, and supported CPUs prior to upgrading. Unsupported hardware may have performance issues or lack essential features.

✓ Keep the System Updated

Let automatic updates or periodically review feature and security updates so that you can appreciate the latest improvements and patches.

✓ Provide Training on New Features

Companies should provide users with training in Snap Layouts, Virtual Desktops, Microsoft Teams, and Copilot to maximize productivity and ease the switch from older versions of Windows.

✓ Test App Compatibility Before Migrating

Firms should ensure that key software and drivers are Windows 11 compatible. If issues arise, resort to compatibility modes, updates, or virtual machines.

✓ Secure Device and Data

Enforce technologies like BitLocker, Windows Hello, and Microsoft Defender to additionally secure. For corporations, enforce Zero Trust principles for network and identity management.

✓ Embrace AI and Cloud-Based Workflows

Use AI solutions such as Microsoft Copilot, cloud storage via OneDrive, and collaboration tools such as Teams. These are the future of hybrid work and productivity.

13.Virtualization in Modern Operating Systems

1.. What is Virtualization?
Virtualization allows multiple virtual machines (VMs) or containers to share a single physical machine by hiding hardware resources.

1.1 Key Components
- Hypervisor (VMM)
    - Type 1: Executes directly on hardware (e.g., VMware ESXi).
    - Type 2: Executes on top of a host OS (e.g., VirtualBox).
- Guest OS: OS running inside a VM.
- Virtual Hardware: Emulated CPU, memory, disk, and network.

1.2 Types of Virtualization
A. Hardware Virtualization: Full hardware emulation (e.g., VMware).
B. Para-Virtualization: Modified guest OS for performance.
C. OS-Level Virtualization: Shared kernel (e.g., Docker).

2. Why Use Virtualization?
A. Resource Efficiency
- Maximizes hardware utilization (multiple VMs per host).
- Reduces physical infrastructure costs.

B. Security & Isolation
- Fault containment (VM crashes don't affect others).
- Malware isolation (sandboxing).

C. Cloud & Scalability
- Enables dynamic resource allocation.
- Supports microservices (Kubernetes/Docker).

D. Legacy Support
- Runs outdated OS versions securely.

E.Disaster Recovery
- Instant VM snapshots/cloning.

3. How Virtualization Works
A. CPU Virtualization
- Trap-and-Emulate: Slow, software-based emulation.
- Hardware-Assisted: Direct execution in guest mode.

B. Memory Virtualization
- Shadow Page Tables: Software-managed memory mapping.
- Extended Page Tables): Hardware-accelerated translation.

C. I/O Virtualization
Emulated Devices: Compatibility-focused (slow).
- PCI Passthrough: Near-native performance (e.g., gaming VMs).

D. Containerization
- Lightweight alternative to VMs (shared OS kernel).
- Used in Docker/Kubernetes for microservices.

4.Emerging Trends
- Serverless Computing: Event-driven execution (AWS Lambda).
- Nested Virtualization:VMs within VMs.
- Edge Virtualization: Support for edge/IoT devices.

So, Virtualization enables cloud computing, resource efficiency, and secure isolation using hypervisors and hardware acceleration.