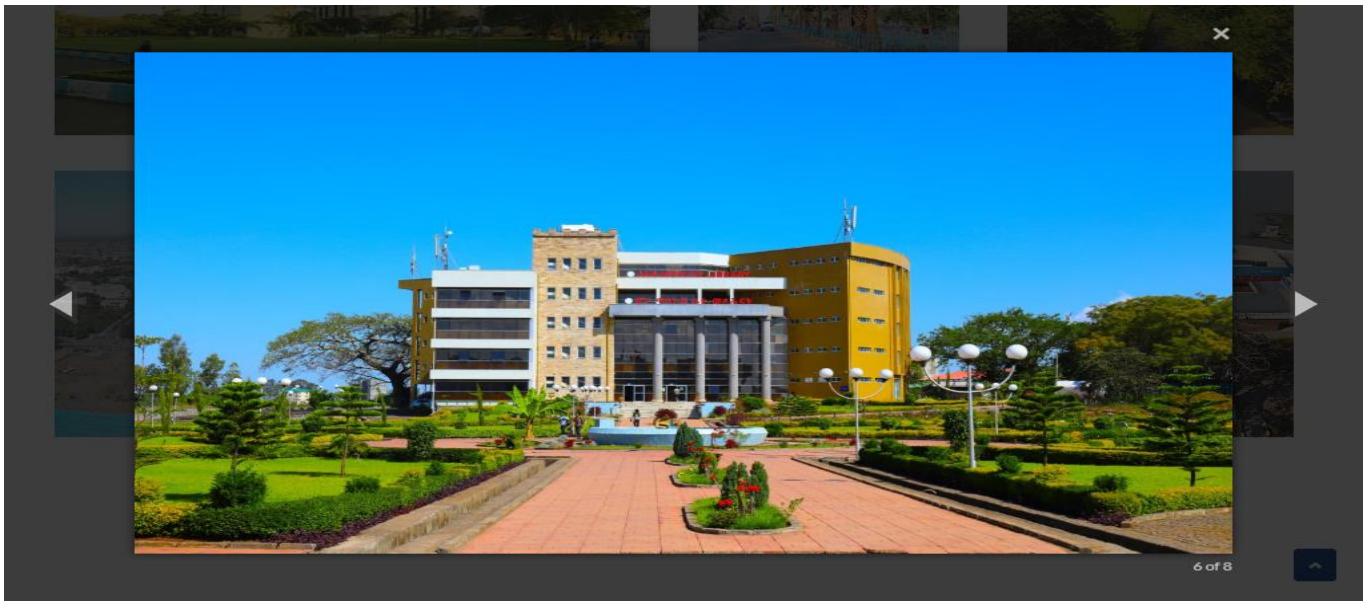
BAHIR DAR UNIVERSITY BAHIRDAR INSTITUTE OF TECHNOLOGY

FACULTY OF COMPUTING



Operating System and System Programming(OSSP) Project - Individual Assignment

Name: Marine Matebie

Id _no: BDU1601968

Operating System: Debian 12 (Installed onVirtualBox)

Contents

- Introduction ……..3
- Installing Debian in a virtual box environment……..5
- What is virtualization and its use……..23
- Playing with system calls……..26
- Summary ……30
  - Reference ……32

Introduction

Before starting this project, I honestly didn't know much about what goes on behind the scenes of an operating system. We all use computers and phones every day, but how does the system actually get installed?, What happens when something goes wrong? ,I wanted to find out—not just by reading about it, but by actually doing it myself. So, I decided to install Debian Linux using VirtualBox, which basically let me create a pretend computer inside my real one. This way, I could explore and experiment without worrying about messing anything up on my main machine. I ran into a few bumps (as expected), but figuring them out was part of the learning process. Once I got Debian up and running, I wanted to dig a little deeper. That's when I started learning about system calls—the way programs talk to the operating system to do things like open a file or write to the screen. I even wrote a simple C++ program to try it out myself, and later experimented with memory mapping, which loads files straight into memory to work with them more efficiently. This whole experience really opened my eyes. I didn't just learn how to install an OS—I got a better understanding of how computers actually work under the hood. It's made me more curious, more confident, and honestly, more excited to explore things like Linux programming, virtualization, and maybe even kernel development down the road.

Question 1: Installing Debian in a Virtual Environment

a. Why This Matters

Every computer needs an operating system to actually do anything—without one, it's basically just a bunch of hardware with no direction. Most of us never really think about where that OS comes from because it’s already installed when we buy a device. But learning how to install one yourself gives you way more control and understanding of how your system works. For this project, I installed Debian Linux using VirtualBox, which let me run it inside a virtual machine without touching my actual computer. This way, I could explore and make mistakes without any real risk. It felt like a safe sandbox to learn in, and it opened my eyes to how operating systems really get up and running.

b. What I Wanted to Achieve

I had a few goals going into this:

- Learn how to install an operating system from scratch.
- Understand how virtual machines work and how to set one up.
- Get better at handling issues when things don’t go as planned (which definitely happened).

- Start getting more comfortable with Linux in general, especially Debian.

c. What I Used

Hardware

- A desktop computer from the digital library —it had an Intel i5, 8GBof RAM, and plenty of storage (about 100GB free).
- My Android phone, which came in handy for Googling fixes and reading tutorials when I got stuck.

Software

- VirtualBox – to run the virtual machine.
- Balena Etcher – just in case I needed to flash the ISO to a USB(though I didn't end up using it).
- Debian 12 ISO – the operating system file I downloaded.
- Microsoft Word app – for writing and keeping notes along the way.

d. How I Did It (Step-by-Step)

Step 1: Creating the Virtual Machine

I opened up VirtualBox and clicked "New" to create a virtual machine.

I named it Debian 12, chose Linux as the type, and set the version to Debian (64-bit). I gave it 4GB of RAM and created a virtual hard disk, setting it to dynamically grow up to 30GB so it wouldn't take up space unless it needed to.

Step 2: Mounting the Debian ISO In the VM settings,

I went to the Storage section and added the Debian12ISOfile I had downloaded. This basically acted like inserting a DVD into a real computer, letting the VM boot from it.

Step 3: Starting the Installation

I hit Start, and the VM booted up into the Debian installer. From there, I followed the setup instructions:

- Picked my language and region
- Set up the root password and created a regular user
- Let Debian automatically handle disk partitioning
- Chose a minimal install with the GNOME desktop

Step 4: Wrapping Up Once everything was installed (it took around 15–20 minutes),

I shut down the VM and removed the ISO so it wouldn't keep booting into the installer. After restarting the VM, it successfully booted into Debian—and just like that, I had a working Linux system running inside VirtualBox!

e.Problems I Ran Into (and Fixed)

- ISO not showing up in VirtualBox: At first, the system didn't recognize the ISO. I double-checked the storage settings and reattached the file properly. That fixed it.
- Installer froze during package setup: The full install seemed to hang, so I restarted and picked a lighter setup with fewer default programs. That worked fine and still gave me a working system.
- Display resolution was off: The screen looked way too small. I solved that by installing VirtualBox Guest
- Additions in the VM, which made everything more responsive and allowed dynamic resizing.

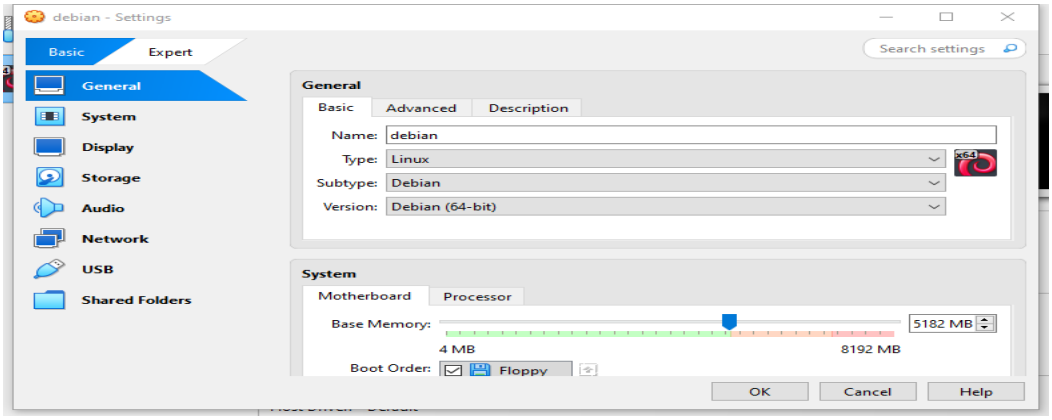
f.What I Learned

- How to set up a virtual machine and install an operating system inside it
- That Linux installs can be super customizable, and sometimes a little tricky
- Troubleshooting on your own teaches you a lot—every time something broke, I learned something new trying to fix it
- Virtual machines are a great way to learn without risking your real system.

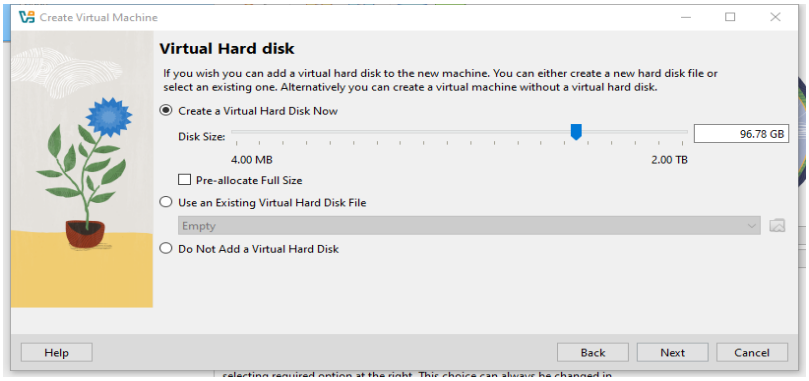
g. Final Thoughts Overall

I really enjoyed this project. It gave me hands-on experience with something I'd always been curious about but never tried. Now that I've successfully installed Debian on a virtual machine, I feel way more confident exploring other Linux distributions or trying out new tech setups in general. Plus, there's something cool about being able to say, "Yeah, I installed a Linux OS from scratch."

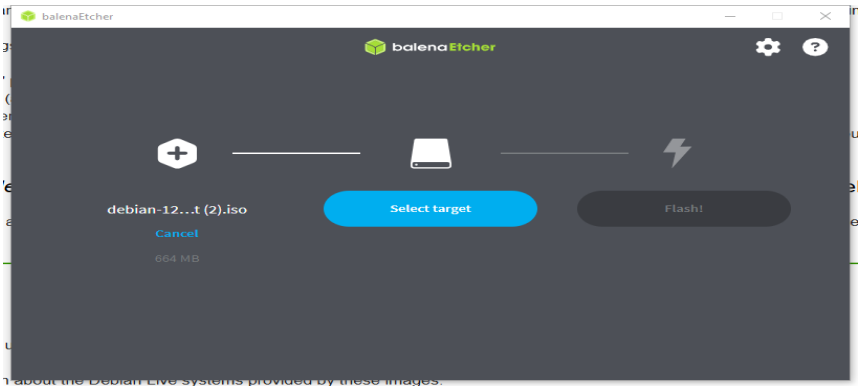
Step1 : I named it "Debian" . And chose the right type(linux , Debian, 64bit).



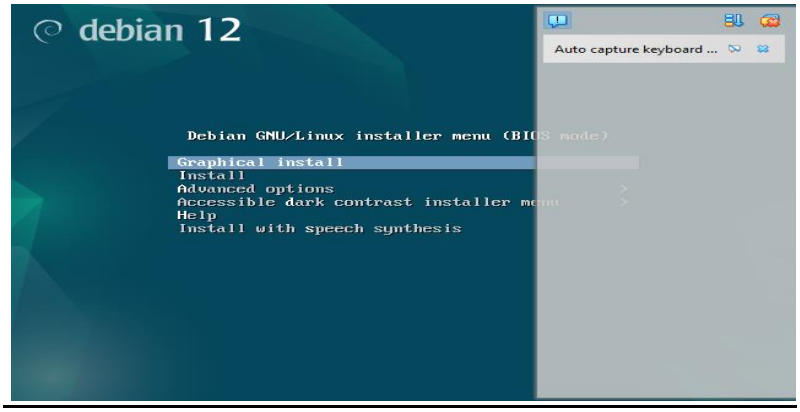
Step 2: I gave it 4 GB of RAM and almost 97 GB virtual hard disk.



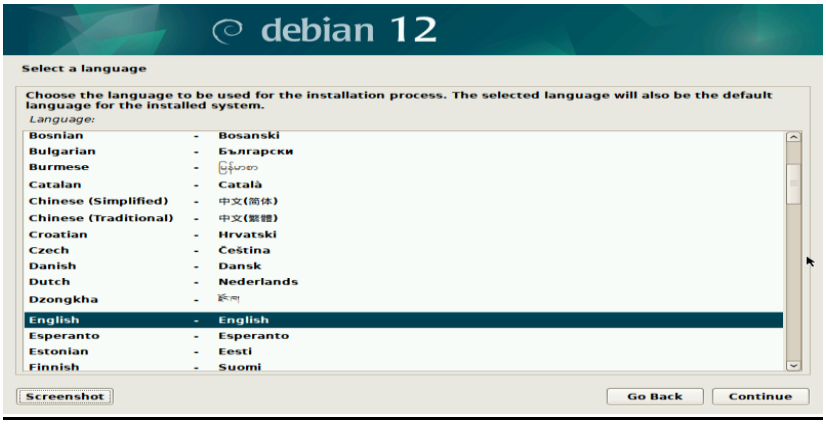
Step 3: flashing the balena etcher using debian by clicking all the three consecutive rectangles.



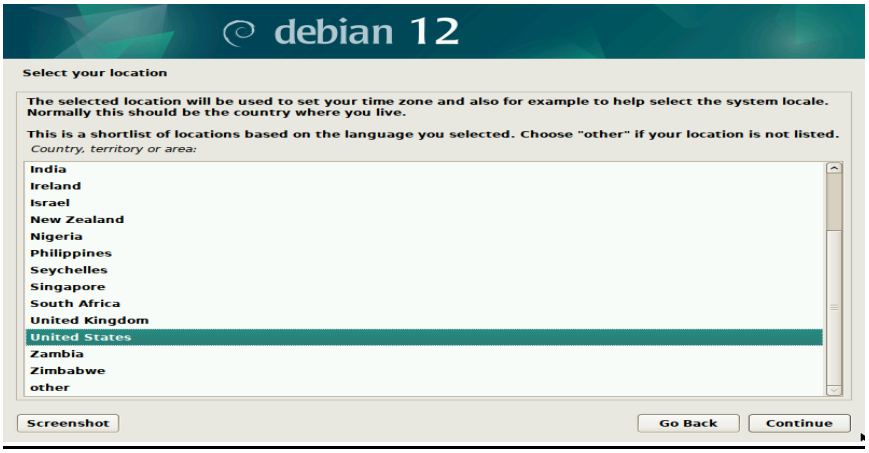
Step 4: I started the VM and followed the Debian installer. And select graphical installation.



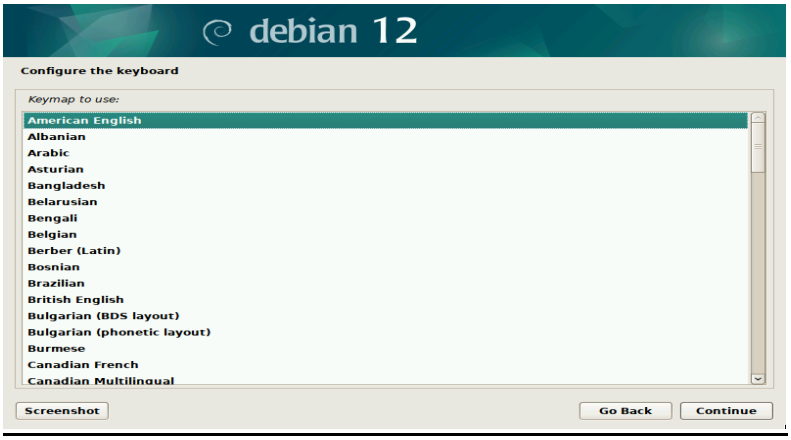
Step 5: select a language for installation process and then continue.



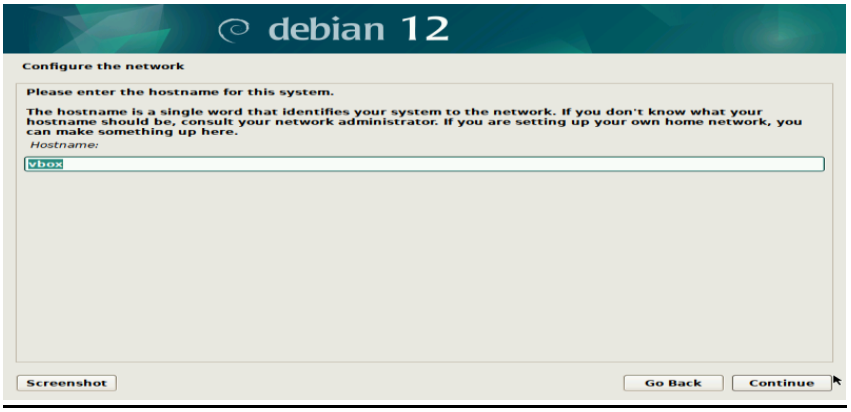
Step 6:select your location.



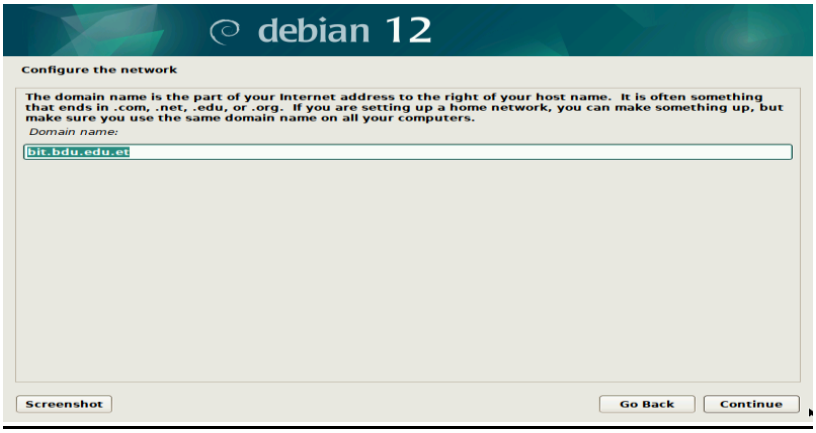
Step 7: select the keyboard language.



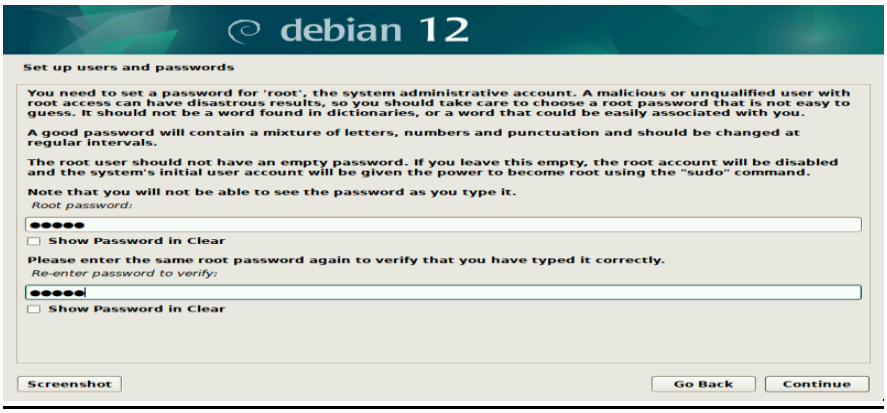
Step 8: enter the hostname for the system or continue as default.



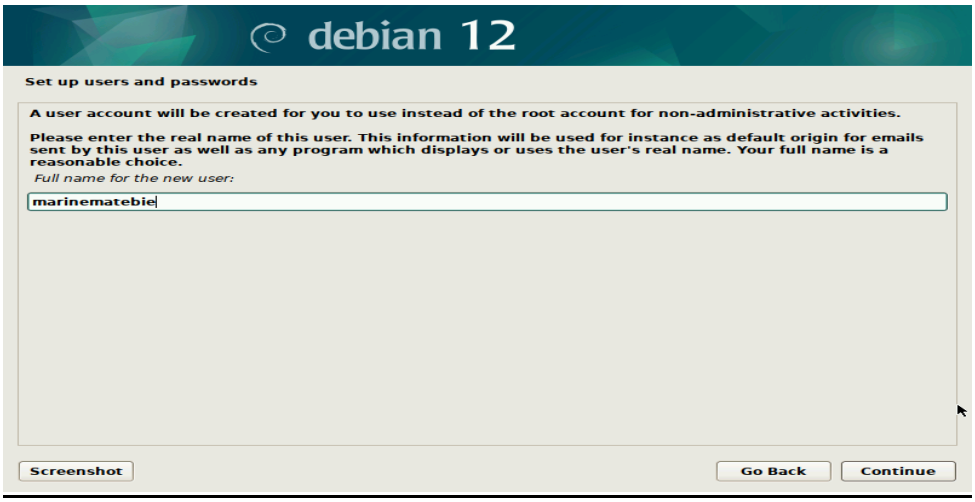
Step 9: configure the network you can continue as it is.



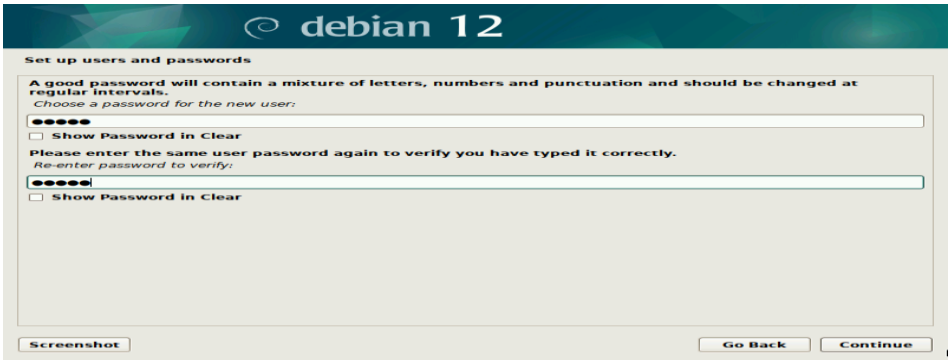
Step 10: enter the root password and confirm it.



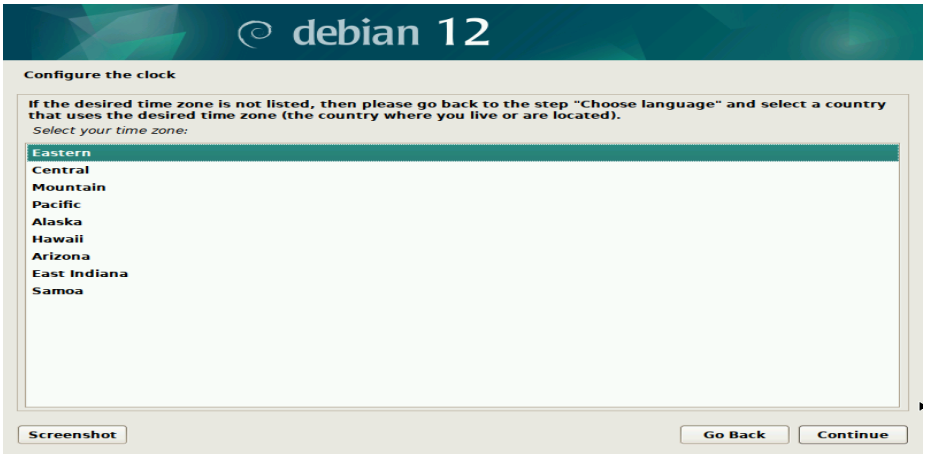
Step 11: set a full name for the new user or your name.



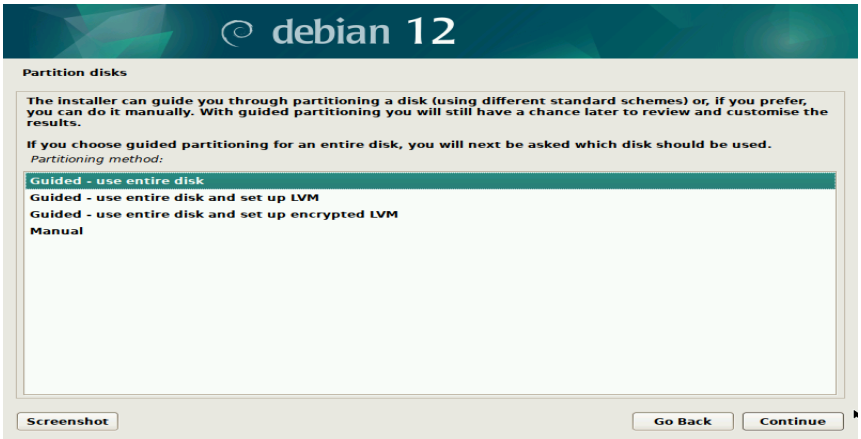
Step 12: set a password for a new user and confirm it.



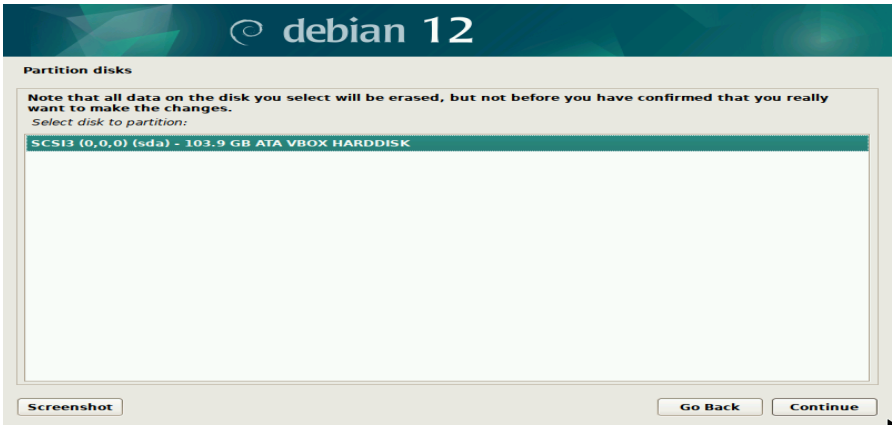
Step 13: confirm the clock set eastern or central as your location.



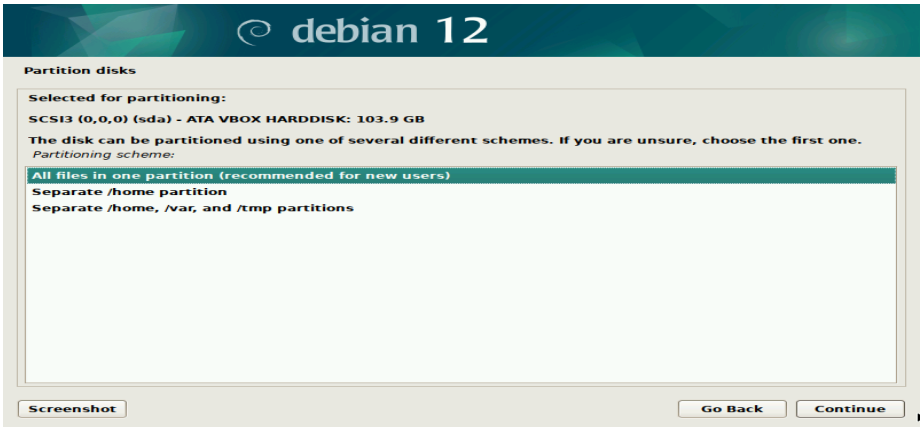
Step 14: set partition disk method or select the first one.



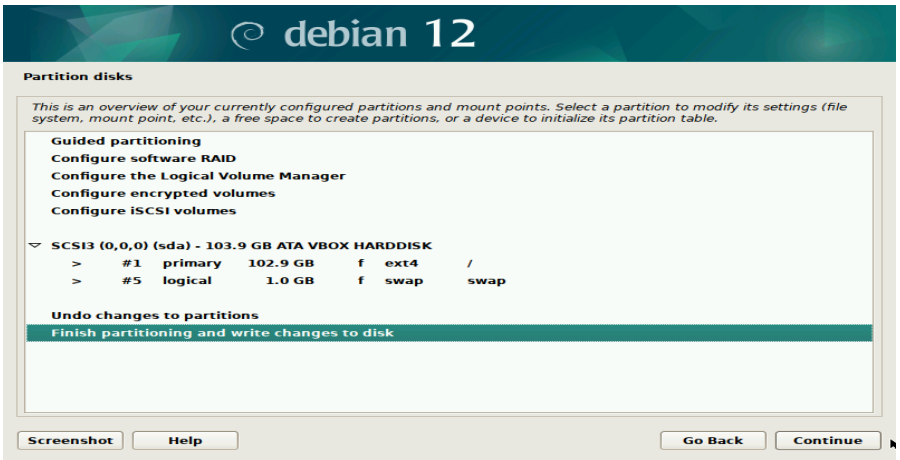
Step 15: select the partition disk or continue.



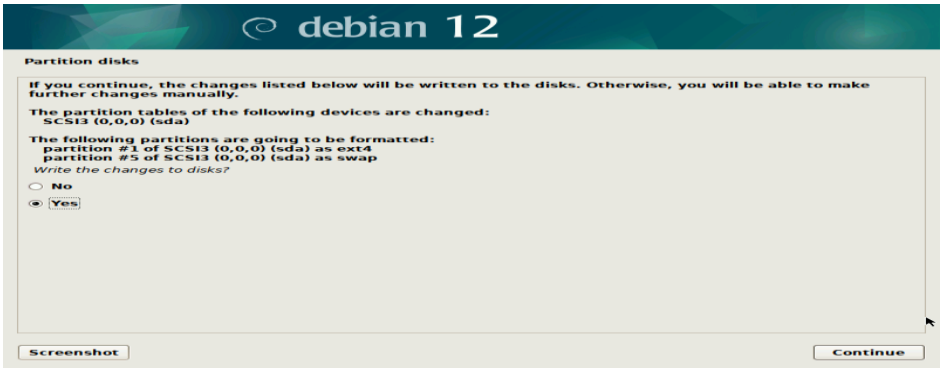
Step 16: select partitioning schemes.



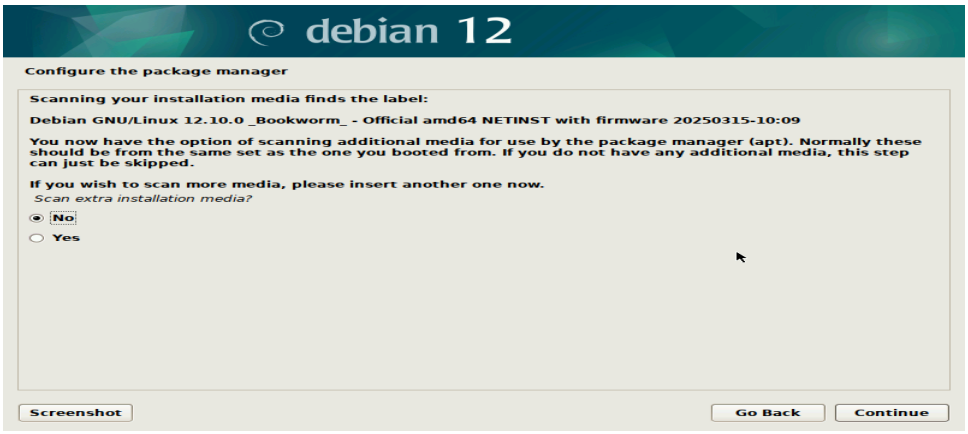
Step 17: finish partitioning.



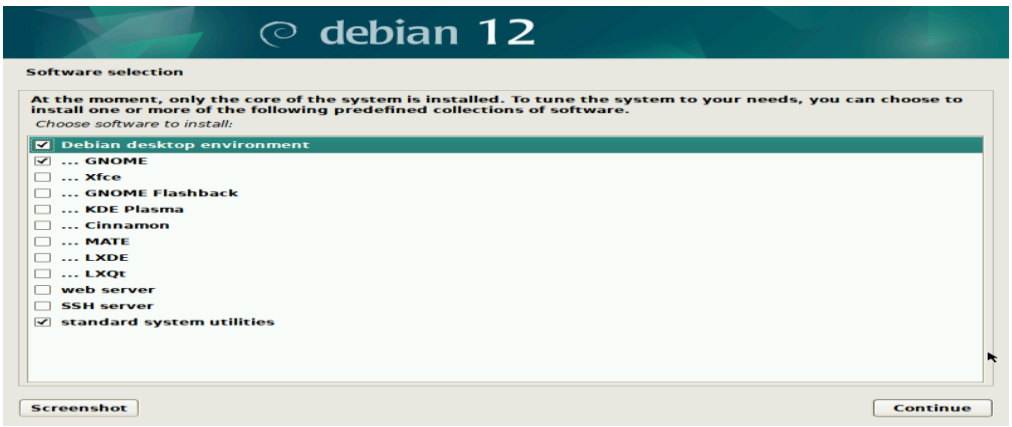
Step 18: select yes if you want to write the changes to disks.



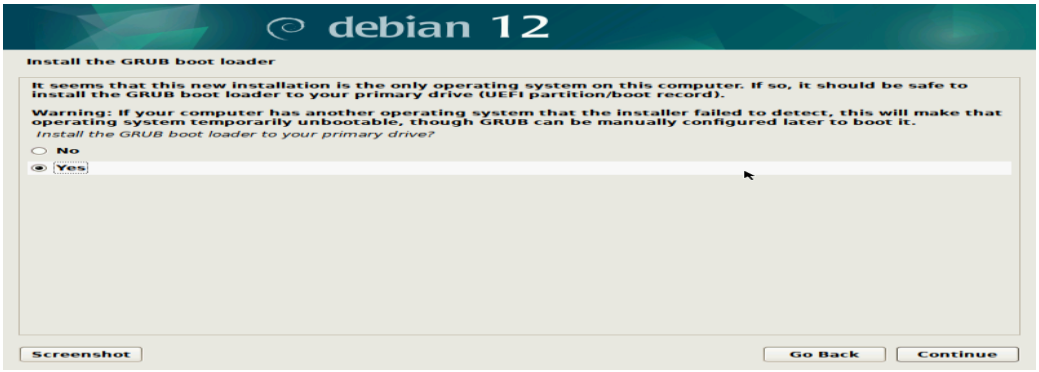
Step 19: configure the package manager or leave as it is no. but if you want to scan or install more extra media you can say yes and insert another one way.



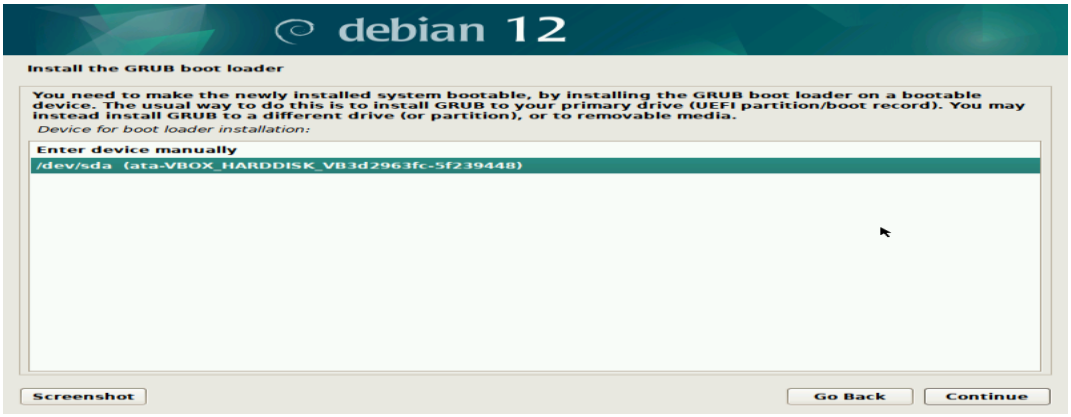
Step 20: select software to install from the list below.



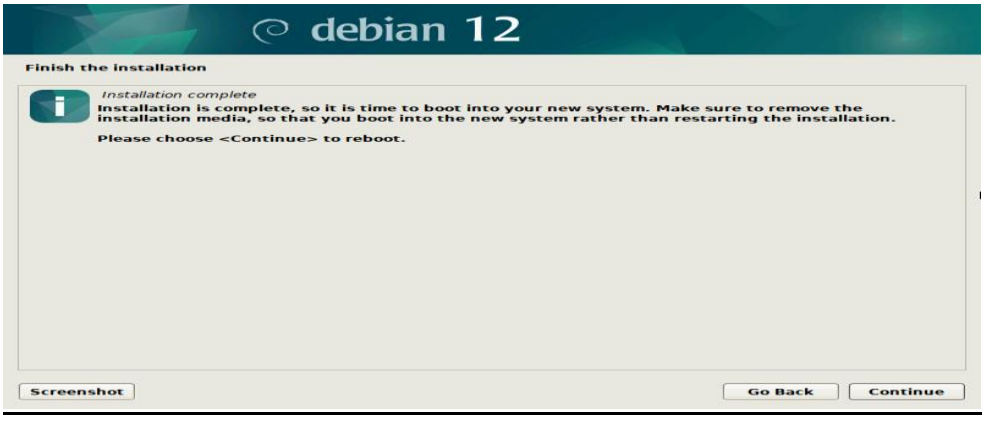
Step 21: install the GNUB boot loader or say yes.



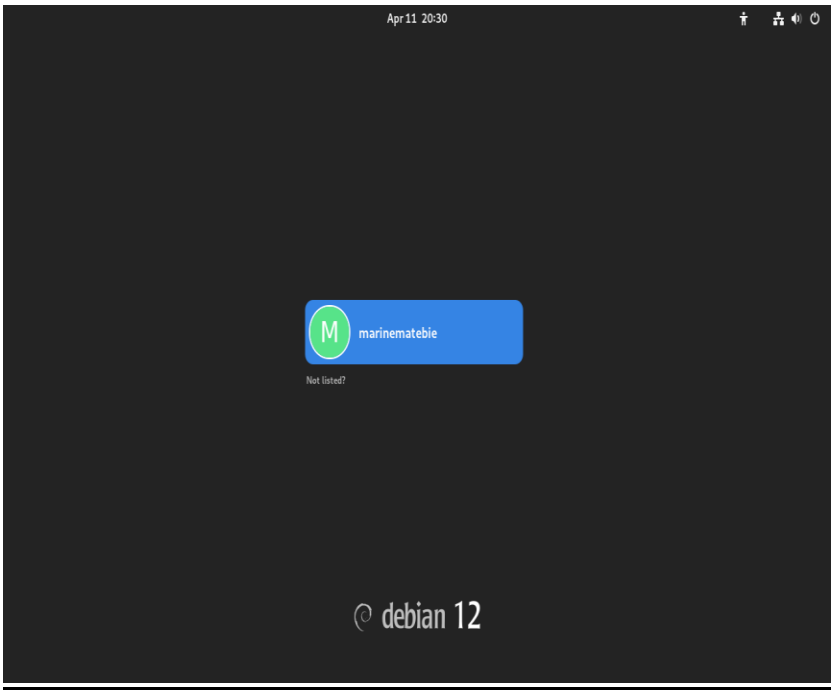
Step 22: select the device for installation of boot loader.



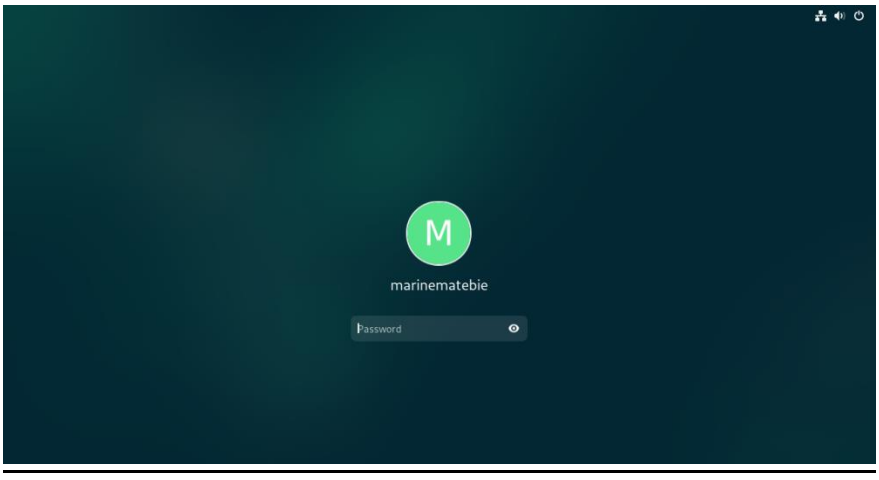
Step 23: finally finish installation.

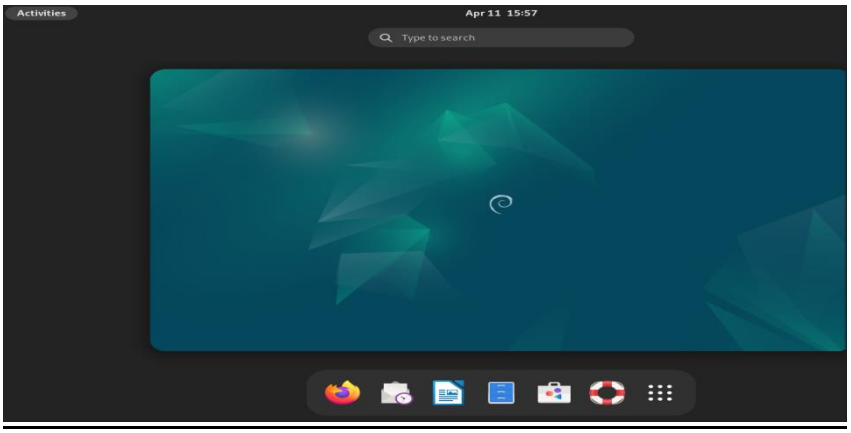


Step 5: After the installation finished, And then to use the debainopenvmware and click your username and enter your password, I rebooted and logged into the new Debian desktop. Here, I added a screenshot of my installation screen.



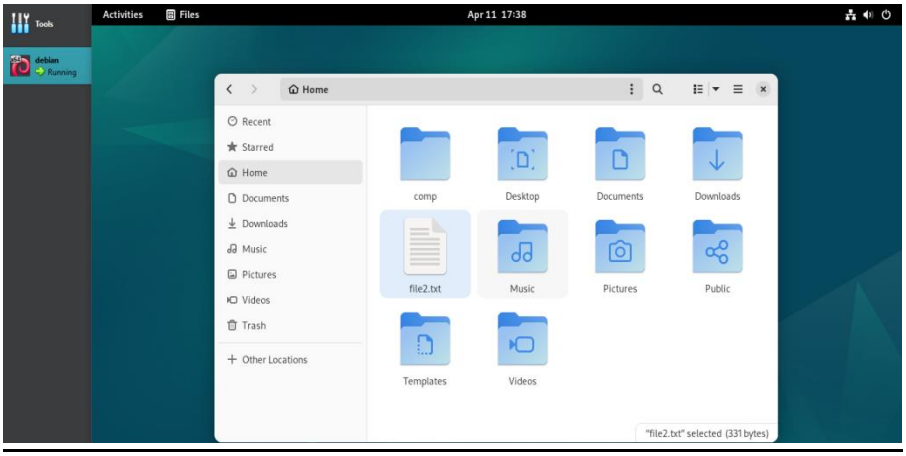
Enter the password that I entered before as user password to open .





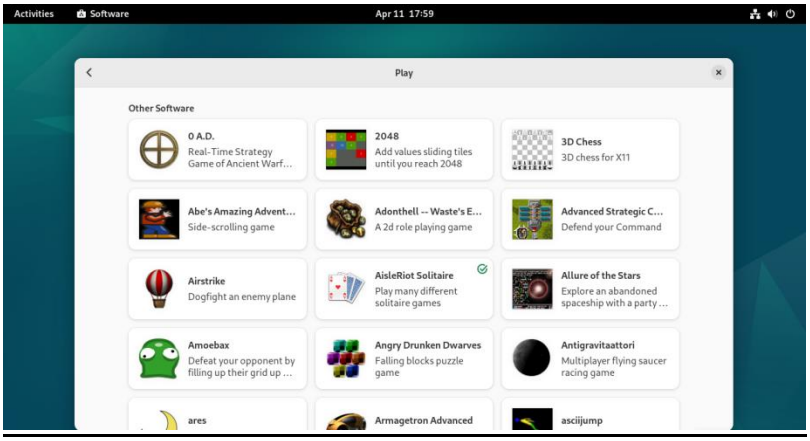
And here are the terminals with different applications.

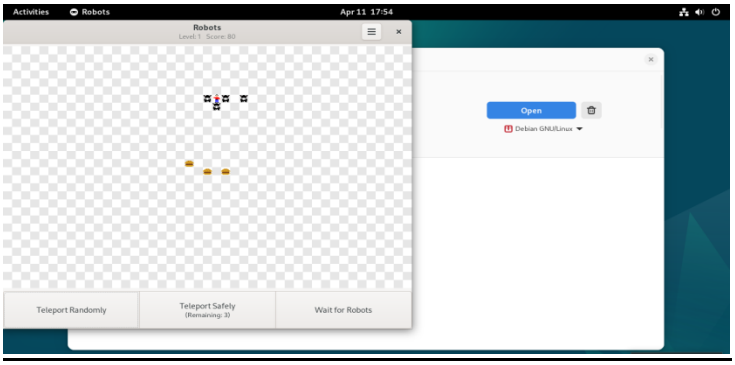
And I can access the files what I stored on desktop in different name.



Some of applications available are here and I can install any applications .

Games:-





Calculator:-basic, advanced, financial, programming, keyboard calculator.