ECE 3401 Digital Systems Design – Spring 2025

Setting up the VHDL Toolchain

We will use GHDL open-source simulator for the VHDL language. More details on GHDL can be found at https://ghdl.github.io/ghdl/. We will use the GTK+ based wave form viewer, GTKWave to view the VCD output of the designs. Three widely applicable methods to install these tools on your personal computers are discussed next. Once installed, run "ghdl –version" and "gtkwave –version" commands to confirm installation of the toolchain.

Method 1: Windows 10/11

You will leverage the Windows Subsystem for Linux (WSL). WSL is a lightweight Linux Virtual Machine (VM) that runs as a native Windows application.
The following instructions describe how to install WSL, Ubuntu Linux, and the required developer tools:
- Follow the **Manual Installation Steps** on the following webpage to install WSL:
  - https://learn.microsoft.com/en-us/windows/wsl/install
- Open the Ubuntu Application by searching Ubuntu in start menu
- Install GHDL and GTKWave using the following commands in a terminal
  - sudo apt update
  - sudo apt install make ghdl gtkwave

Method 2: Linux

- Install GHDL and GTKWave using the following commands in a terminal
 - sudo apt update
  - sudo apt install make ghdl gtkwave

Method 3: MacOS

- Install Homebrew by running this command in a terminal:
  - /bin/bash -c "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh)"
- Install GHDL using this command
  - brew install --cask ghdl
- Now GTKWave can be installed using with brew install --cask gtkwave. For newer Macs, there is an issue with this gtkwave install. So, here is what needs to be done to install GTKWave on newer Mac machines.
  - brew uninstall gtkwave
  - brew untap randomplum/gtkwave
 - brew install --HEAD randomplum/gtkwave/gtkwave

VirtualBox Installation

1. Download Virtual box and Ubuntu 20.04.06 ISO. Create a Linux virtual machine w/ 20GB of drive space and at least 4GB of RAM. You will run Method 2 once VM is installed.
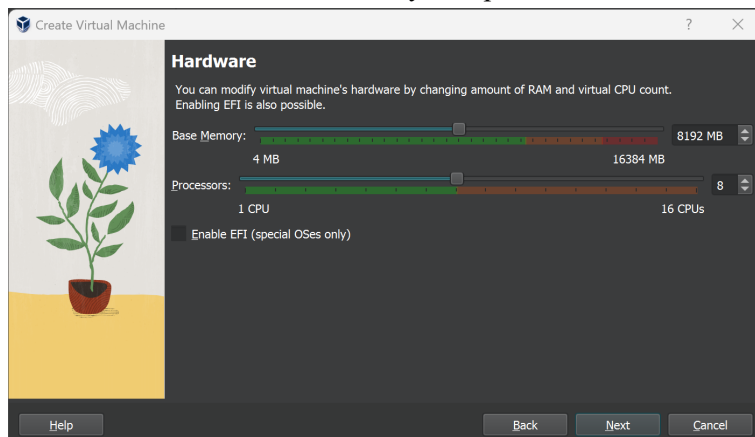2. Open Virtual Box and click on New

3. Give the name to your virtual machine and select the ISO image and click Next
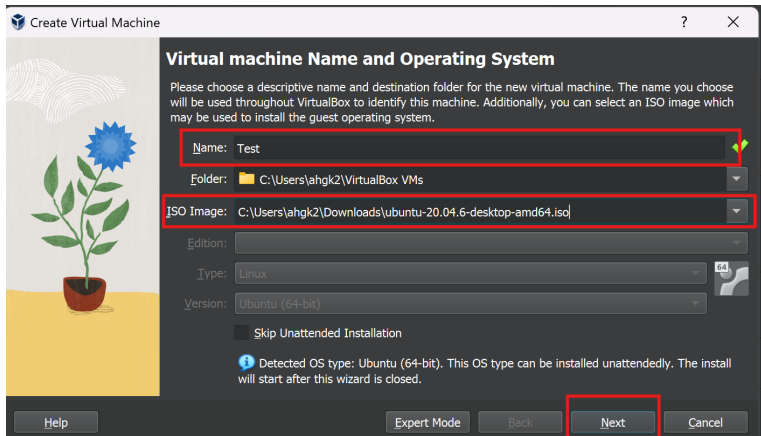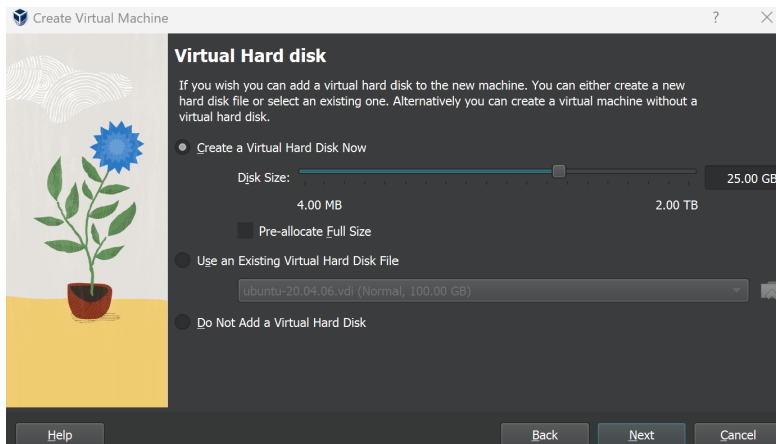

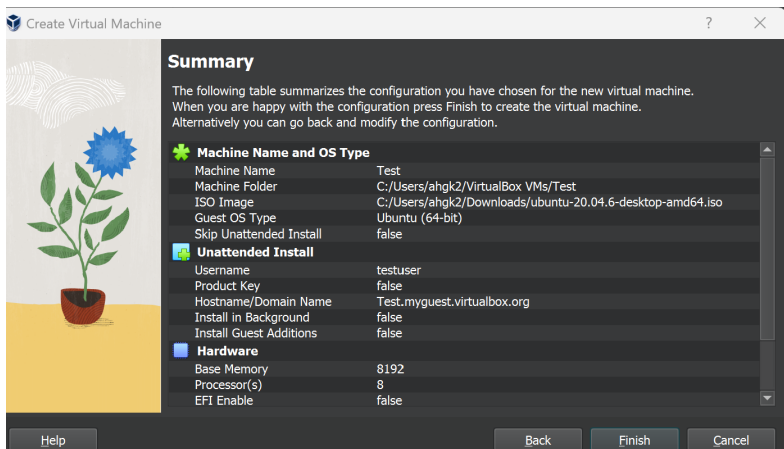4. Update the username and password to your liking and click Next
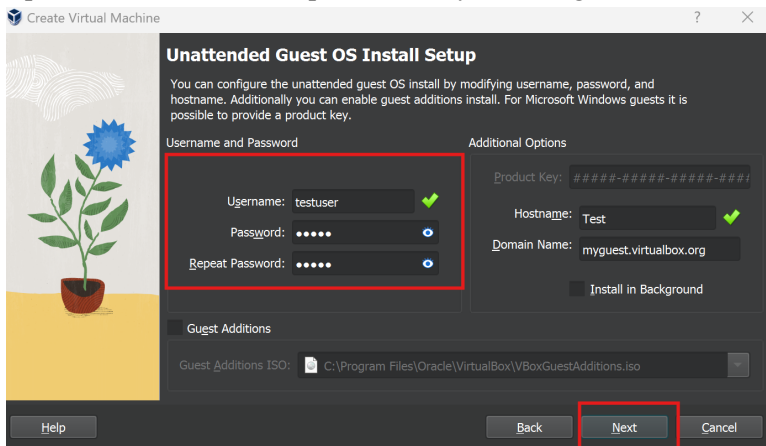
5. Select 8GB or 4GB of base memory. For processors move the cursor to middle. And click Next
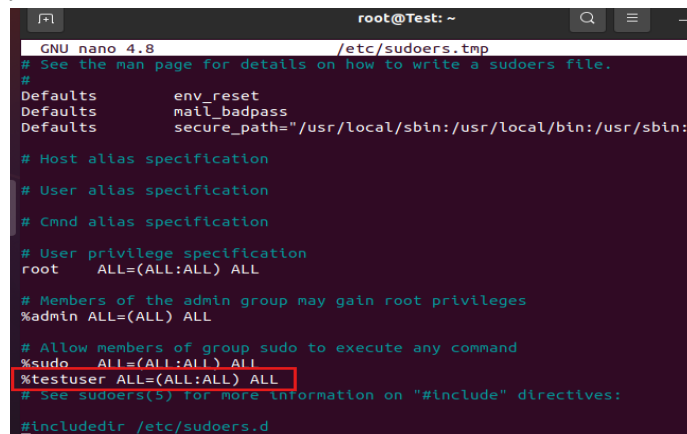
6. Create a Disk size of 25GB. And click Next

7. Click Finish

8. Open your terminal
9. Make sure you have sudo access. If not follow these steps
    a. Run "su -"
    b. Run "visudio"
    c. Add the highlighted line in the file under the sudo as shown. Instead of testuser write your own username

    d. Save it and Run "exit"