Technitute_

Advanced Kalman Filtering and Sensor Fusion

Setting up the C++ Development Environment

Ubuntu 64-bit 20.04.2.0 LTS Virtual Machine

Setting up the C++ Development Environment

Overview

The simulation code and exercises that go with this course are all developed in C++ and tested on Linux Ubuntu 64-bit 20.04.2.0 LTS. Linux and C++ were selected as they are very commonly used in industry for this type of development and implementation. So to follow along with the exercises in this course, you will need to be running Ubuntu Linux.

The simulation code for this course is able to be cross-compiled to other operating systems (such as Windows and Mac), so you are free to do this if you have the expertise, however this course will not cover those details.

If you already have a copy of Linux installed and running, you're welcome to use that. So that everyone else can follow along, you have the option of using a Virtual Machine.

Virtual Machine Setup

A virtual machine is a bit like a mini computer running inside of your own computer, whatever you do in the VM, stays in the VM. Any mistakes that happen in the VM, will not affect your main computer. The VM can also run a different version of the operating system, so you can run the VM on Windows and inside the VM install Ubuntu! This is the easiest option and most recommended option for anyone not familiar with the Linux operating system.

We recommend that you use VMWare to run the VM. There is a free version for Windows and Linux operating systems called Workstation Player. You can also use a different VM software such as VirtualBox.

The instructions for the setup are very similar no matter what virtual machine software you use::

1. Download and install your VM software (such as VMware Player or VirtualBox)
2. Download the Linux Ubuntu ISO (Ubuntu 20.04.2.0 LTS)
3. Using your VM software, create a new Virtual Machine and Install Ubuntu on it

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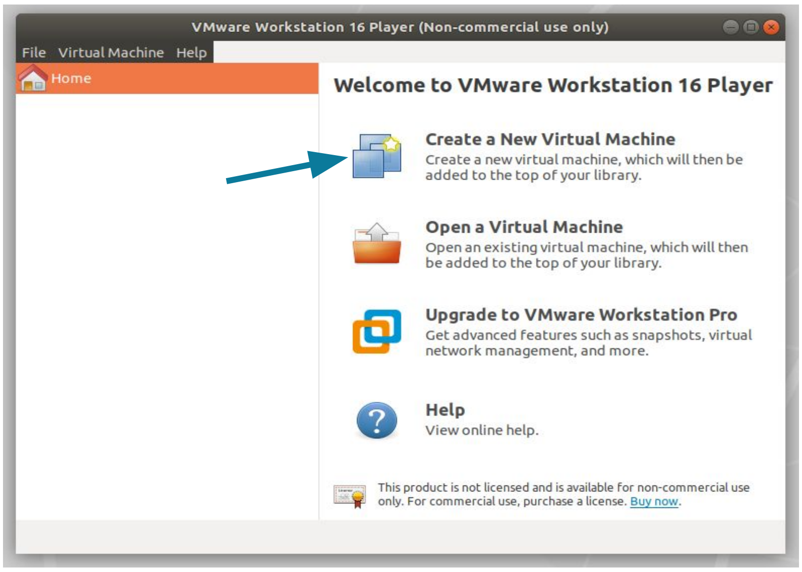
Windows/Linux (WMware Player) Setup

1. Download and install VMware Player (http://www.vmware.com/products/player/playerpro-evaluation.html)
2. Download Linux Ubuntu ISO (Ubuntu 20.04.2.0 LTS) (https://ubuntu.com/download/desktop)
3. Run VMware Player
4. Click Create a New Virtual Machine


VMware Workstation 16 Player (Non-commercial use only)
File Virtual Machine Help
Home

Welcome to VMware Workstation 16 Player

Create a New Virtual Machine
Create a new virtual machine, which will then be added to the top of your library.

Open a Virtual Machine
Open an existing virtual machine, which will then be added to the top of your library.

Upgrade to VMware Workstation Pro
Get advanced features such as snapshots, virtual network management, and more.

Help
View online help.

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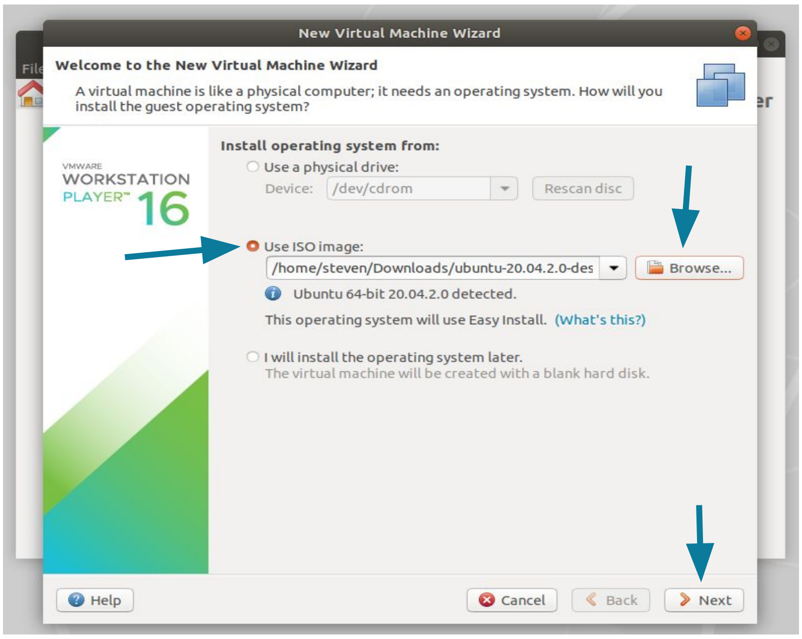
5. Select "Use ISO image" and browse to the path where you downloaded the Ubuntu ISO image
6. Click Next



Welcome to the New Virtual Machine Wizard

A virtual machine is like a physical computer; it needs an operating system. How will you install the guest operating system?

Install operating system from:

○ Use a physical drive:
Device: /dev/cdrom Rescan disc

● Use ISO image:
/home/steven/Downloads/ubuntu-20.04.2.0-des Browse...
Ubuntu 64-bit 20.04.2.0 detected.
This operating system will use Easy Install. (What's this?)

○ I will install the operating system later.
The virtual machine will be created with a blank hard disk.

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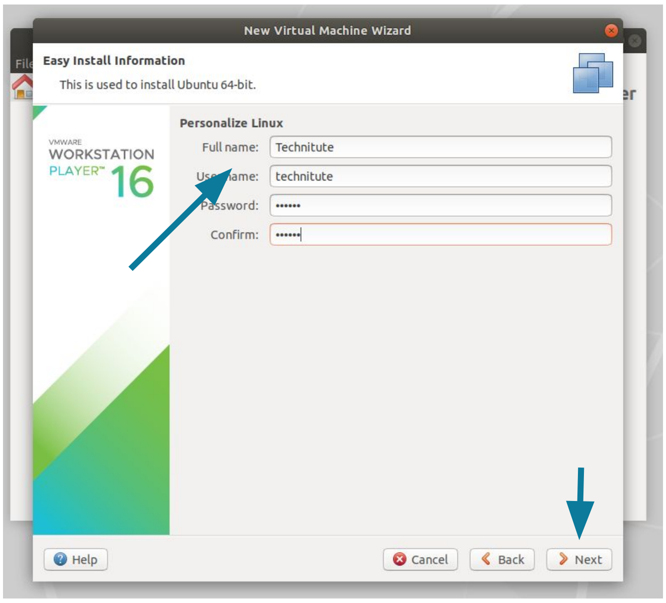
7. Enter username and password for your account that you want to create on the Ubuntu VM
8. Click Next



Easy Install Information

This is used to install Ubuntu 64-bit.

Personalize Linux

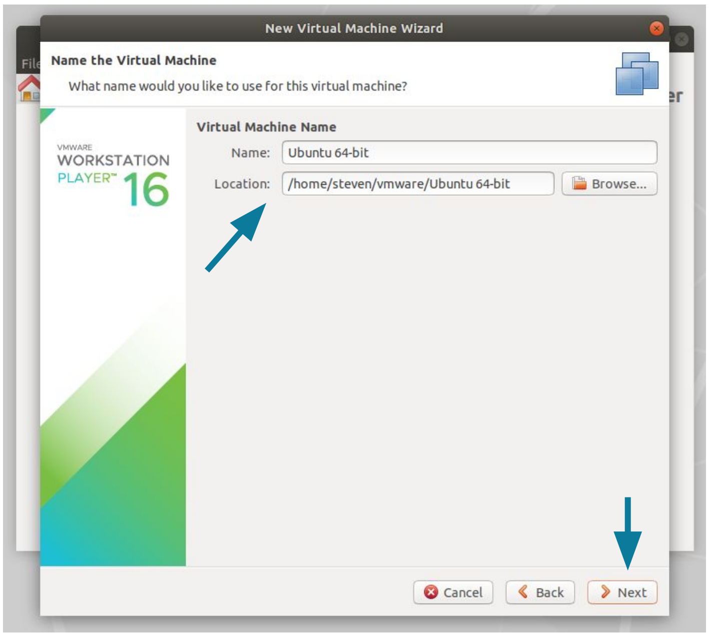
Full name: Technitute

User name: technitute

Password: ••••••

Confirm: ••••••

9. Enter the name that you want to call the VM and where you would like to save the VM file (i.e the virtual hard drive of the VM)
10. Click Next



Name the Virtual Machine

What name would you like to use for this virtual machine?

Virtual Machine Name

Name: Ubuntu 64-bit

Location: /home/steven/vmware/Ubuntu 64-bit

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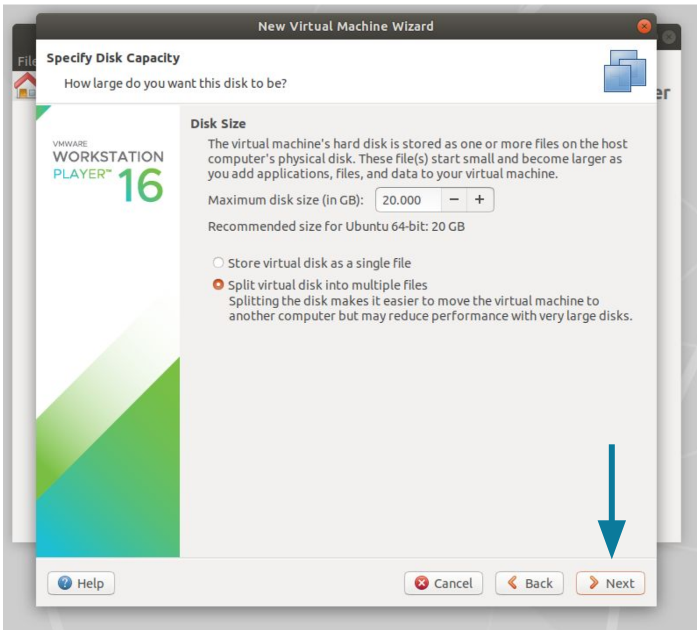
11. Enter the Disk Size you want to create
12. Click Next



Specify Disk Capacity

How large do you want this disk to be?

Disk Size

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.

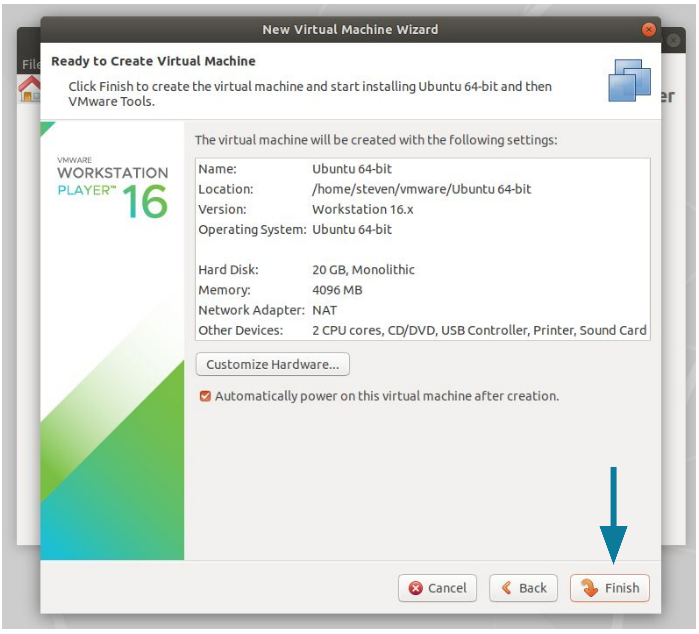
Maximum disk size (in GB): 20.000

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.

13. Review the details and Click Finish



Ready to Create Virtual Machine

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

The virtual machine will be created with the following settings:

```
Name:               Ubuntu 64-bit
Location:           /home/steven/vmware/Ubuntu 64-bit
Version:            Workstation 16.x
Operating System:   Ubuntu 64-bit

Hard Disk:          20 GB, Monolithic
Memory:             4096 MB
Network Adapter:    NAT
Other Devices:      2 CPU cores, CD/DVD, USB Controller, Printer, Sound Card
```

☑ Automatically power on this virtual machine after creation.

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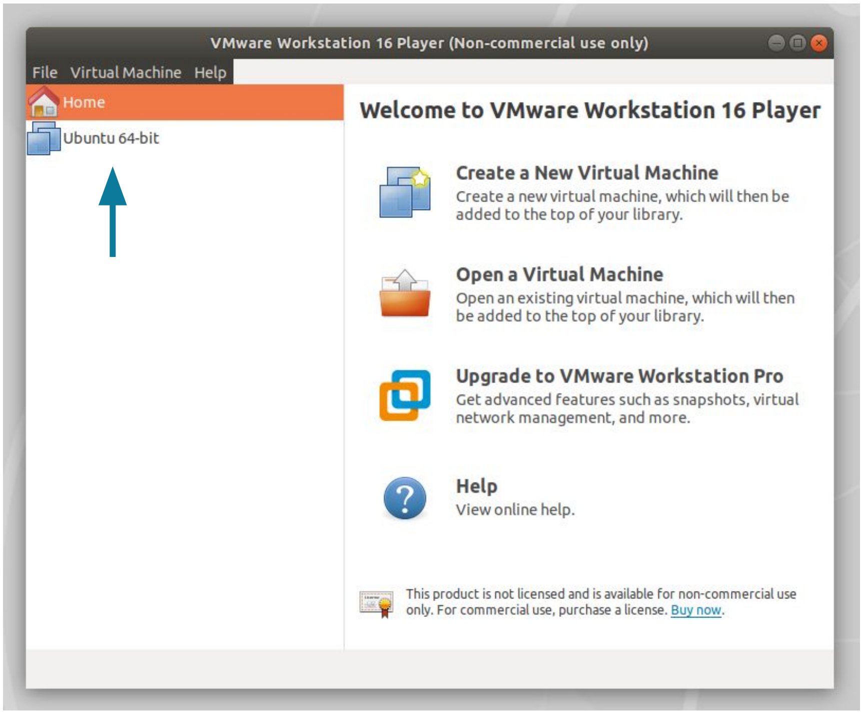
14. Click on your new Virtual Machine



Welcome to VMware Workstation 16 Player

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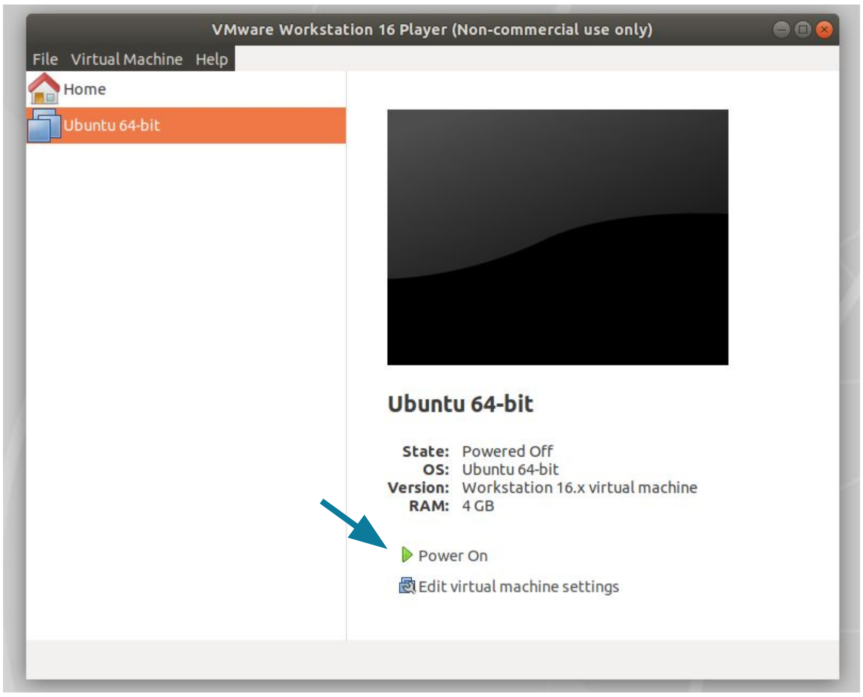
15. Click Power On to start the VM


VMware Workstation 16 Player (Non-commercial use only)
File
Virtual Machine
Help
Home
Ubuntu 64-bit
Power On
Edit virtual machine settings

Ubuntu 64-bit

State: Powered Off
OS: Ubuntu 64-bit
Version: Workstation 16.x virtual machine
RAM: 4 GB

16. Install Ubuntu (should be mostly automatic)

17. Use your account details to log into your new Ubuntu Account!

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Ubuntu C++ Development Setup

Once you have your Ubuntu VM setup, we need to install a few applications so that you can compile C++ code that we will be using in this course. You can also install an IDE (such as VSCode) or text editor to help make programming easier.

1. Open a new Terminal Window in your VM (Ctrl-Alt-t)
2. Install the c++ compiler and other software:
    a. sudo apt install build-essential git cmake
    b. (Enter your password as needed to run as sudo)
3. (Optional) Install VSCode
    a. sudo snap install --classic code
    b. (Enter your password as needed to run as sudo)
4. Done! That should be all you need to start developing and compiling C++ with Ubuntu linux on this VM.