Virtual Machine (VM) and Robotic Operating System (ROS) Setup

For Windows computers/OS

For ECE 417 Spring 2022 by Sarah Meyer-Waldo

Estimated Time:

Total download time: 2 hours

Total setup time: 1 hour

Total estimated time: 3 hours

What you need:

Download the VM VirtualBox Installer based on your current operating system from here: https://www.oracle.com/virtualization/technologies/vm/downloads/virtualbox-downloads.html

Note: a virtual machine allows us to run a 'window' of a different computer operating system without changing the settings or OS on our own computer. Essentially, a mini computer on our base computer.

Download the Ubuntu Operating System desktop image file from here: <u>https://releases.ubuntu.com/20.04/</u>

Note: Ubuntu is a 'flavor' of linux based OS. There are over 600 flavors, including CentOS, Fedora, and others. Linux refers to a family of open-source Unix-like OS based on the linux kernel (the lowest level of an OS, in control of hardware)

This Guide:

The download instructions for ROS on an ubuntu VM on a Windows base OS are made from a combination of the following two links: If you are using Windows this will be needed after Ubuntu VM installation.

- 1. http://wiki.ros.org/Installation/Ubuntu
- 2. <u>https://varhowto.com/install-ros-noetic-ubuntu-20-04/</u>

Helpful Links:

The ROS wiki page with instructions for different base OS: We recommend only install ROS on ubuntu.

http://wiki.ros.org/ROS/Installation

- 1. Begin the download of the Ubuntu iso file. This could take over an hour.
- 2. Download VirtualBox and launch installer, accept all default preferences



3. To setup a virtual machine from the VirtualBox Manager, click the green Add button



4. Create a virtual machine. The Type refers to the Operating System of your computer, most likely Windows

The default location is in your user folder. Feel free to change the location to your class folder:

?	×	? ×
← Create Virtual Machine		← Create Virtual Machine
Name and operating system		Name and operating system
Please choose a descriptive name and destination folder for the new virtual machine and select the type of operating system you intend t install on it. The name you choose will be used throughout VirtualBo identify this machine.	w to ox to	Please choose a descriptive name and destination folder for the new virtual machine and select the type of operating system you intend to install on it. The name you choose will be used throughout VirtualBox to identify this machine.
Name: ECE 417 VM 2022		Name: ECE 417 VM 2022
Machine Folder: 📜 C:\Users\sarah\VirtualBox VMs	\sim	Machine Folder: arah\Documents\2022 Spring\ECE 417\Vitural Machine $ \smallsetminus $
Version: Windows 7 (64 bit)	64	Type: Microsoft Windows Version: Windows 7 (64-bit)
Uburt u bit)		
Expert Mode Next Can	ncel	Expert Mode Next Cancel

5. Memory size default is okay:



6. Create a new virtual hard disk



7. Since we downloaded a desktop image file for Ubuntu, verify that the VDI disk file type is selected:



Expert Mode	Next	Cancel

8. Select Fixed Size for the hard disk



9. Leave the file location and size defaults and click Create

			?	×
← Create Virtual Hard	Disk			
File location and s	size			
Please type the name of t on the folder icon to selec	he new virtual hard d t a different folder to	isk file into the box b create the file in.	elow or	click
2022 Spring\ECE 417\Vitur	al Machine\ECE 417 \	/M 2022\ECE 417 VM	1 2022.v	di 🔼
Select the size of the virte amount of file data that a	ial hard disk in megal virtual machine will b	bytes. This size is the be able to store on th	e limit or ie hard (n the disk.
			3	2.00 GB
4.00 MB		2.00 TB		
	32-8	ohb		
	If you have sp We are going in Ubuntu.	ace, l recomm to install a lot	end 8 of pac	30 GB. ckages
		Create	Ca	ncel

10. This may take a while. Estimates are 3 minutes.

💱 Create Virtual Hard Disk: Creating fixed medium storage unit 'C:\Users\sarah\Documents\2022 Spring\ECE 417\Vitural Machine\ECE ... 🔅



- 11. On your base machine, move the downloaded iso file into your class folder or wherever you saved the VM's virtual hard drive
- 12. From VirtualBox Manager, start the VM by double clicking it in the left-hand toolbar.



13. Select the Ubuntu iso file for the start-up disk



Ubuntu OS will begin startup. This may take a few minutes.

- 14. Verify your preferred language is selected
- 15. Click Install Ubuntu



16. Verify your preferred language and dialect are selected and click continue



17. Select Minimal Installation and Download Updates while installing



18. Select Erase disk and install Ubuntu. Since we created a new virtual hard disk, it is blank and there is nothing that will be lost.

😿 ECE 417 VM 2022 [Running] - Oracle VM VirtualBox	_		\times
File Machine View Input Devices Help			
Jan 10 17:14		. ()	• •
Install			8
Installation type			
This computer currently has no detected operating systems. What would you like to do?			
Erase disk and install Ubuntu Warning: This will delete all your programs, documents, photos, music, and any other files in all operal	ting syste	ms.	
Advanced features None selected			
 Something else You can create or resize partitions yourself, or choose multiple partitions for Ubuntu. 		Install M	
		🚫 🔸 Rig	ht Ctrl 🔡

19. Press continue.



20. Select the correct time zone:

ECE 417 VM 2022 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Install
Where are you?

Image: Continue

New York

Back

Continue

Image: Continue

Image: Continue

21. Create an account for the new OS. Make it easy to remember, and a password that is short and easy to input (you will have to input the password regularly for ROS setup commands). Select "Log in Automatically". All other defaults are okay.

ど VM for ECE 417 Spring 22 [Ri	unning] - Oracle VM Virtua	IBox		_		\times
File Machine View Input D	Devices Help					
	Jan 4	14:16			. ()	Î •
	Ins	tall				
Who are you?						
Your name:	ece417		0			
Your computer's name:	ece417-VirtualBox	0				
	The name it uses when it talks t	o other computers.				
Pick a username:	ece417					
Choose a password:	••••	Short password				
Confirm your password:	••••	•				
	Log in automatically	, 				
	 Require my password t 	o log in				
	Use Active Directory					
	You'll enter domain and other d	letails in the next step.				
			Ra		Contin	IIP
		2 🕝 🖳 📩			🍼 🛃 Rig	ht Ctrl 🔡

22. Wait for VirtualBox to finish setting up Ubuntu! This may take several minutes. Estimate: 17 minutes.

ile Machine View I	Input Devices Help Jan 10 12:	17	A 🐠 🔒
	Install		
Welcome to	o Ubuntu		
Fast and full d version of Ub than ever. He to look out fo	f new features, the latest untu makes computing easier re are just a few cool new things r		
Copying files			Skip

23. Restart

File Machine View Input Devices Help Jan 10 12:35	7	A •)	• •
Jan 10 12:35		A •	. -
e p 7			
Installation Complete	8		
Installation is complete. You need to restart the computer in order to use the new installation.			
	/		
Click inside the window and proce enter:			jne etri



25. Skip in the upper right hand corner of Online Accounts



26. Click next



27. Click next again



28. Leave location off

🌃 ECE 41	7 VM 2022 [R	unning] - Oracle VM VirtualBox	-		\times
File Mac	hine View I	nput Devices Help			
Activities	@ Welco	me to Ubuntu 👻 🛛 Jan 10-13:05		A 4	•
6	Previous	Welcome to Ubuntu			Next
		Privacy			
Â		Location Services			
		Allows applications to determine your geographical location. A indication is shown when location services are in use.	n		
?		Uses Mozilla Location Service: Privacy Policy			
· 🧿					
A					
		Privacy controls can be changed at any time from the Settings a	pplication.		
		🔼 🔿 Mr. 🔳 📣 -==			

29. Press done to close



30. Feel free to update ubuntu. However you must let the update finish before downloading ROS to ensure all tools are available for the ROS download. Estimated time: 20 minutes



31. Open app explorer in the bottom left (9 dots) of the screen



32. Search and open up Software & Updates

a. Make sure all repositories are enabled, and Source code is marked

Ubuntu Software Other Software Updates Authentication Additional Driver community-maintained free and open-source software (main) Community-maintained free and open-source software (universe) Proprietary drivers for devices (restricted) Software restricted by copyright or legal issues (multiverse) Software restricted by copyright or legal issues (multiverse) Source code Source code Download from: Server for United States statlable from CD-ROM/DVD Cdrom with Ubuntu 20.04 'Focal Fossa' Officially supported Restricted copyright -					
Ownloadable from the Internet Canonical-supported free and open-source software (universe) Proprietary drivers for devices (restricted) Software restricted by copyright or legal issues (multiverse) Source code Download from: Server for United States Installable from CD-ROM/DVD Cdrom with Ubuntu 20.04 'Focal Fossa' Officially supported Restricted copyright	Ubuntu Software	Other Software	Updates	Authentication	Additional Driver
Canonical-supported free and open-source software (main) Community-maintained free and open-source software (universe) Proprietary drivers for devices (restricted) Software restricted by copyright or legal issues (multiverse) Source code Download from: Server for United States statlable from CD-ROM/DVD Cdrom with ubuntu 20.04 'Focal Fossa' Officially supported Restricted copyright	Oownloadable from	the Internet			
Community-maintained free and open-source software (universe) Proprietary drivers for devices (restricted) Software restricted by copyright or legal issues (multiverse) Source code Download from: Server for United States statlable from CD-ROM/DVD Cdrom with Ubuntu 20.04 'Focal Fossa' Officially supported Restricted copyright	Canonical-supp	orted free and open-s	ource softwar	e (main)	
Proprietary drivers for devices (restricted) Software restricted by copyright or legal issues (multiverse) Source code Download from: Server for United States Installable from CD-ROM/DVD Cdrom with Ubuntu 20.04 'Focal Fossa' Officially supported Restricted copyright 417 VM 2020 (Running) - Oracle VM Vinueltor: Software & Updates Software & Updates Ubuntu Software Qudates Ubuntu Software Qudates Updates Authentication Additional Drivers Software packaged by Canonical for their partners: Software packaged by Canonical for their partners Software packaged by	🗹 Community-ma	intained free and ope	n-source softw	are (universe)	
Software restricted by copyright or legal issues (multiverse) Source code Download from: Server for United States statlable from CD-ROM/DVD Cdrom with Ubuntu 20.04 'Focal Fossa' Officially supported Restricted copyright 417 VM 2022 (Running) - Oracle VM Virusition: For Ostare VM Virusition: Software & Updates Ubuntu Software Qudates Ubuntu Software @ Updates Ubuntu Software Other Software Updates Ubuntu Software packaged by Canonical for their partners Software packaged by Canonical for their partners Software packaged by Canonical for their partners Control Partners Code Software packaged by Canonical for their partners Control Partners Code Software packaged by Canonical for their partners Extension Control Partners C	🔽 Proprietary driv	vers for devices (restr	icted)		
Source code Download from: Server for United States statllable from CD-ROM/DVD Cdrom with Ubuntu 20.04 'Focal Fossa' Officially supported Restricted copyright 417 VM 2022 (Running) - Oracle VM Virusition: 417 VM 2022 (Running) - Oracle VM Virusition: 50 Software & Updates Central Devices Help' Software & Updates Ubuntu Software Other Software Updates Authentication Additional Drivers Ubuntu Software packaged by Canonical for their partners Software packaged by Canonical for their partners Software packaged by Canonical for their partners Estiware Packaged by Canonical for their Packaged	🔽 Software restri	cted by copyright or le	gal issues (mu	ltiverse)	
Download from: Server for United States stallable from CD-ROM/DVD Cdrom with Ubuntu 20.04 'Focal Fossa' Officially supported Restricted copyright 417 VM 2022 (fluwing) - Oncle VM Virtualitox 417 VM 202 (fluming) - Oncle	🚍 Source code				
stallable from CD-ROM/DVD Cdrom with Ubuntu 20.04 'Focal Fossa' Officially supported Restricted copyright	Download from:	Server for United Sta	tes		
Cdrom with Ubuntu 20.04 'Focal Fossa' Cdrom with Ubuntu 20.04 'Focal Fossa' Restricted copyright	stallable from CD	-ROM/DVD			
417 VM 2022 [Running] - Oracle VM VirtualBox – – – × achine View Input Devices Help es I Software & Updates × Jan 10 13:10 Software & Updates × Jan 10 13:10 Software & Updates × Jan 10 13:10 Canonical Portners Ubiuntu Software Other Software Updates Authentication Additional Drivers I Ubiuntu Software packaged by Canonical for their partners: Canonical Portners Codel Software packaged by Canonical for their partners	Cdrom with Ul Officially supp Restricted cop	buntu 20.04 'Focal Fo orted yright	issa'		
Et 17 VM 2022 (Rumning) - Oracle VM VirtualBox: bachine View lepid ses Software & Updates - Jan 10 13:10 Software & Updates - Jan 10 13:10 Conception - Software & Updates - Authentication Additional Drivers Ubuntu Software Dotter Software Updates Authentication Additional Drivers Telep Software packaged by Canonical for their partners. Software packaged by Canonical for their partners Software packaged by Canonical for their partners Software packaged by Canonical for their partners Software packaged by Canonical for their partners Add					
Add Edit Remove	E 417 VM 2022 [Running] - Orac	le VM VirtualBox		- 0 ×	
Software & Updates Software & Updates Ubuntu Software Other Software Updates Authentication Additional Drivers Canonical Pertners Canonical Pertners Software packaged by Canonical for their partners Software packaged by Canonical for their partners Add Edit Remove	Anabian Minus Innut Davies				
Connel Perners Connel Perners	ies Software & Update:	Jan 10 13:10		A # 8 *	
Software & Updates Ubuntu Software Other Software Updates Authentication Additional Drivers Canonical Partners Canonical Fortheir partners Canonical Partners Software packaged by Canonical for their partners Software packaged by Canonical for their partners Add Edit Remove	ies 🚯 Software & Update:	s		A € 8 +	
Ubuntu Software Other Software Updates Authentication Additional Drivers Canonical Partners Canonical For their partners Canonical Partners Software packaged by Canonical for their partners	ece417	s - Jan 10 13:10		A # 8 -	
Connected partners Addemical for their partners Connected partners Connected partners	ece417	Jan 10, 13:10		A # 8 *	
Canonical Partners Canonical For their partners Canonical Partners Source Code) Software packaged by Canonical for their partners Add Edit Remove	es Software & Update: ece417	Jan 10 13:10	Software & Updates	A 4 9 +	
Add Edit Remove	es O Software & Updater	Jan 10 13:10	Software & Updates Authentication A	dditional Drivers	
Add Edit Remove	es Software & Update	Jan 10 13:10 Other Software Updates by Canonical for their partners (Source Code) ye Canonical for their partners	Software & Updates Authentication A	dditional Drivers	
Add Edit Remove	des Software & Updates eccest7 Ubuntu Software Velo Software packaged	Jan 10 13:10 Dther Software Updates by Canonical for their partners Source Code) by Canonical for their partners	Software & Updates Authentication A	dditional Drivers	
Add Edit Remove	des	Jan 10 13:10 Dther Software Updates by Canonical for their partners Source Code) by Canonical for their partners	Software & Updates	dditional Drivers	
Add Edit Remove	des	Jan 10 13:10 Other Software Updates by Canonical for their partners Source Code) by Canonical for their partners	Software & Updates Authentication	ddRional Drivers	
	des Software & Updates ecci37 Ubuntu Software Help software packaged	Jan 10 13:10 Other Software Updates by Canonical for their partners Source Code) by Canonical for their partners	Software & Updates Authentication	dditional Drivers	
	des O Software & Updates cest7 Ubuntu Software Canoncal Patters Software packaged Add Esit	Jan 10 13:10 Dther Software Updates by Canonical for their partners Source Code by Canonical for their partners Remove Remove	Software & Updates	ddRional Drivers	

- 33. Close and reload if prompted. Note: Ubuntu must be finished updating for this to be successful
- 34. Open the terminal (search in apps, recommend right click to Add to favorites)
- 35. Enter in the following commands, in order:

Learn about these commands. sudo: https://man7.org/linux/man-pages/man8/sudo.8.html

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu focal main" > /etc/apt/sources.lis
t.d/ros-focal.list'
sh: https://www.man7.org/linux/man-pages/man1/sh.1p.html
sudo apt install curl # enter Y when prompted
https://manpages.ubuntu.com/manpages/xenial/man8/apt.8.html
curl -s https://raw.githubusercontent.com/ros/rosdistro/master/ros.asc | sudo
apt-key add -
https://www.man7.org/linux/man-pages/man1/curl.1.html
sudo apt update
sudo apt install ros-noetic-desktop-full
```

- 36. Wait for ROS to finish installing! Estimated time: 1 hour
- 37. When ROS finished installing, run the following commands:



Verify you have the last line spelled correctly.

38. Run the following commands

```
sudo apt install python3-rosdep python3-rosinstall python3-rosinstall-g
enerator python3-wstool build-essential
```

https://docs.ros.org/en/independent/api/rosdep/html/commands.html

sudo rosdep init

rosdep update