

Linux Tutorials

Programming Environment Setup Installing VirtualBox and Ubuntu

For more tutorials:

<http://cs.uwlax.edu/~jjhursey/teaching/tutorial/linux/>

Professor J. Hursey

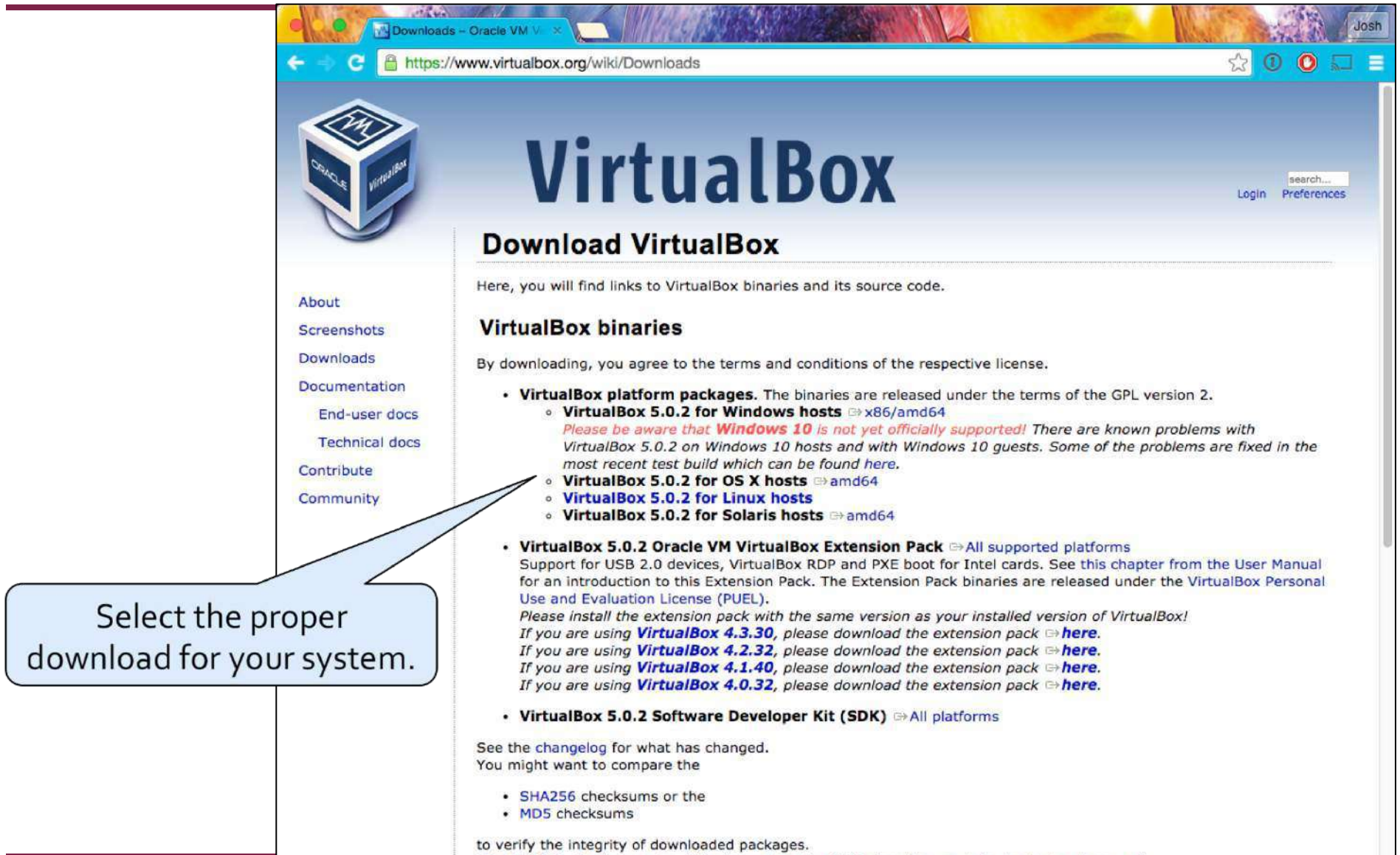
Download Oracle VirtualBox

- Download Website: (download may take a while ~100MB)
<https://www.virtualbox.org/>



The screenshot shows the Oracle VM VirtualBox website homepage. The browser address bar displays "https://www.virtualbox.org". The page features the VirtualBox logo, a search bar, and navigation links for "Login" and "Preferences". A sidebar on the left contains links for "About", "Screenshots", "Downloads" (highlighted with a red dashed box), "Documentation", "End-user docs", "Technical docs", "Contribute", and "Community". The main content area includes a "Welcome to VirtualBox.org!" message, a paragraph describing the product, and a large blue button labeled "Download VirtualBox 5.0". A "News Flash" section on the right lists recent updates, including "New August 13th, 2015 VirtualBox 5.0.2 released!" and "New July 9th, 2015 VirtualBox 5.0 released!".

Download Oracle VirtualBox



The screenshot shows the Oracle VirtualBox website's download page. The browser address bar displays <https://www.virtualbox.org/wiki/Downloads>. The page features the VirtualBox logo and a navigation menu on the left with links for About, Screenshots, Downloads, Documentation, End-user docs, Technical docs, Contribute, and Community. The main content area is titled "Download VirtualBox" and includes a sub-section "VirtualBox binaries". A callout box with a pointer to the "VirtualBox binaries" section contains the text: "Select the proper download for your system."

VirtualBox

Download VirtualBox

Here, you will find links to VirtualBox binaries and its source code.

VirtualBox binaries

By downloading, you agree to the terms and conditions of the respective license.

- **VirtualBox platform packages.** The binaries are released under the terms of the GPL version 2.
 - **VirtualBox 5.0.2 for Windows hosts** ⇨ x86/amd64
*Please be aware that **Windows 10** is not yet officially supported! There are known problems with VirtualBox 5.0.2 on Windows 10 hosts and with Windows 10 guests. Some of the problems are fixed in the most recent test build which can be found [here](#).*
 - **VirtualBox 5.0.2 for OS X hosts** ⇨ amd64
 - **VirtualBox 5.0.2 for Linux hosts**
 - **VirtualBox 5.0.2 for Solaris hosts** ⇨ amd64
- **VirtualBox 5.0.2 Oracle VM VirtualBox Extension Pack** ⇨ All supported platforms
Support for USB 2.0 devices, VirtualBox RDP and PXE boot for Intel cards. See [this chapter](#) from the User Manual for an introduction to this Extension Pack. The Extension Pack binaries are released under the VirtualBox Personal Use and Evaluation License (PUEL).
Please install the extension pack with the same version as your installed version of VirtualBox!
If you are using **VirtualBox 4.3.30**, please download the extension pack ⇨ [here](#).
If you are using **VirtualBox 4.2.32**, please download the extension pack ⇨ [here](#).
If you are using **VirtualBox 4.1.40**, please download the extension pack ⇨ [here](#).
If you are using **VirtualBox 4.0.32**, please download the extension pack ⇨ [here](#).
- **VirtualBox 5.0.2 Software Developer Kit (SDK)** ⇨ All platforms

See the [changelog](#) for what has changed.
You might want to compare the

- [SHA256](#) checksums or the
- [MD5](#) checksums

to verify the integrity of downloaded packages.

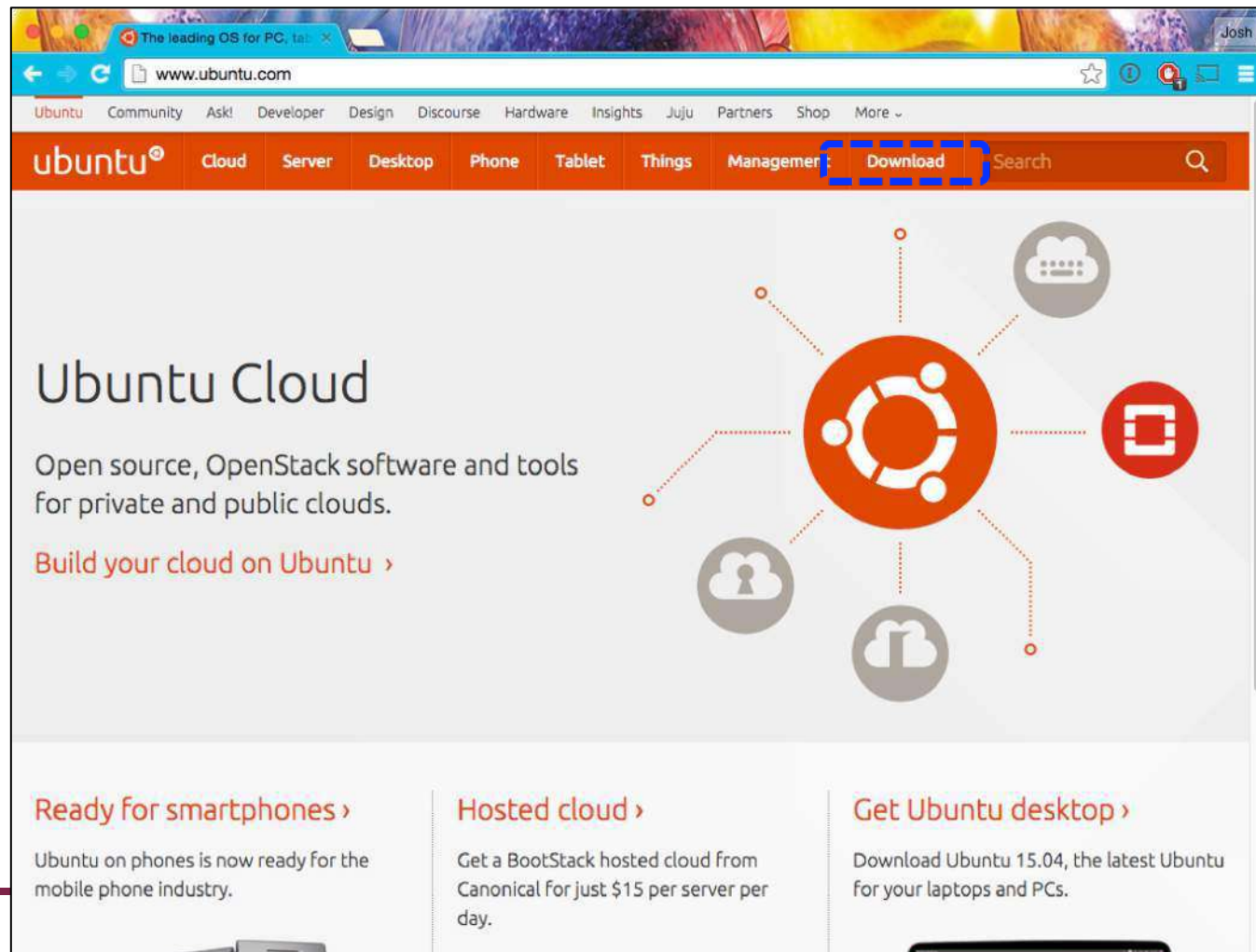
Install VirtualBox

- The download (~100MB) may take a while.
- Once it is finished, follow the instructions to install it on your system.



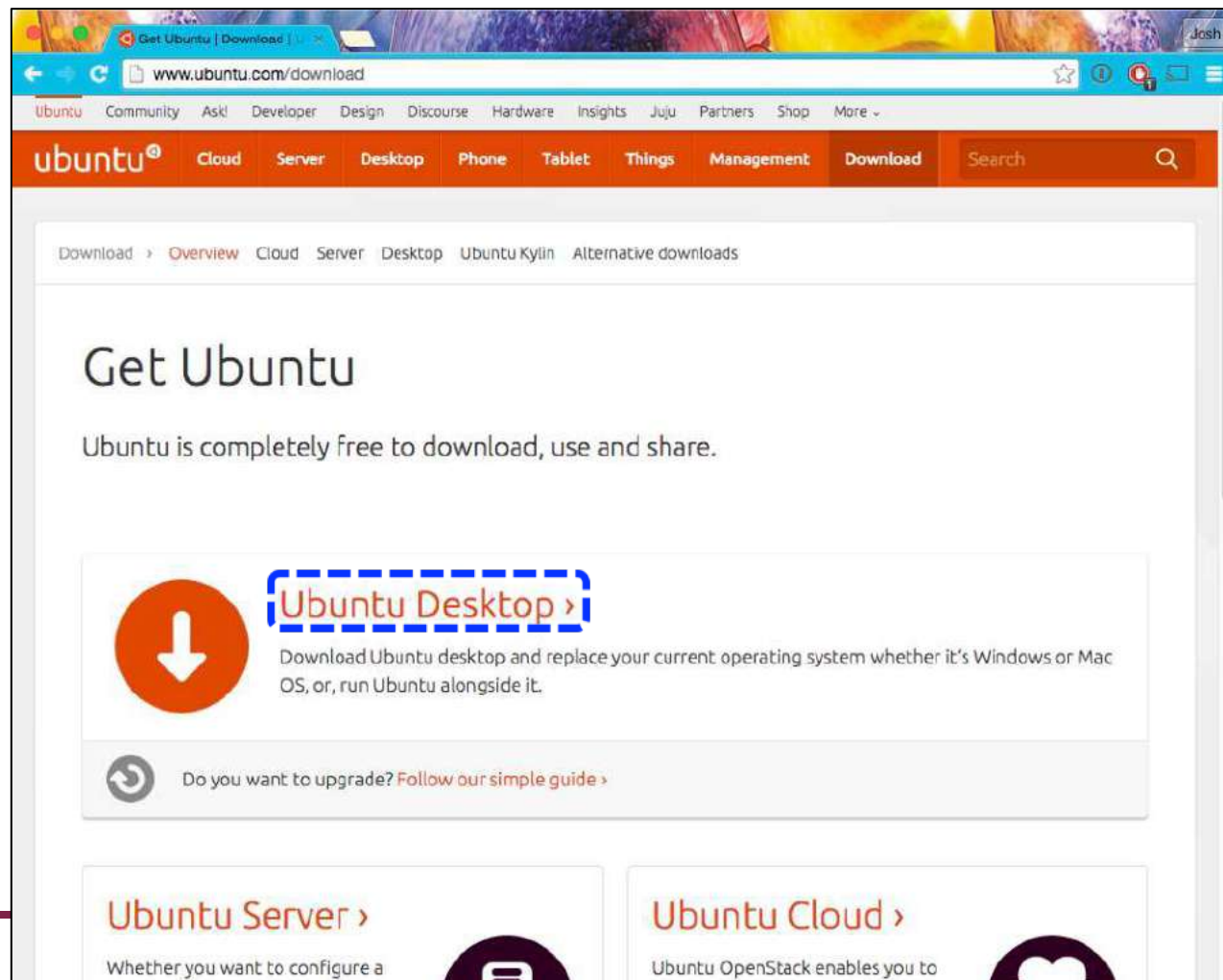
Download Ubuntu Linux

- Download website: (download may take a while >700MB)
<http://www.ubuntu.com/>



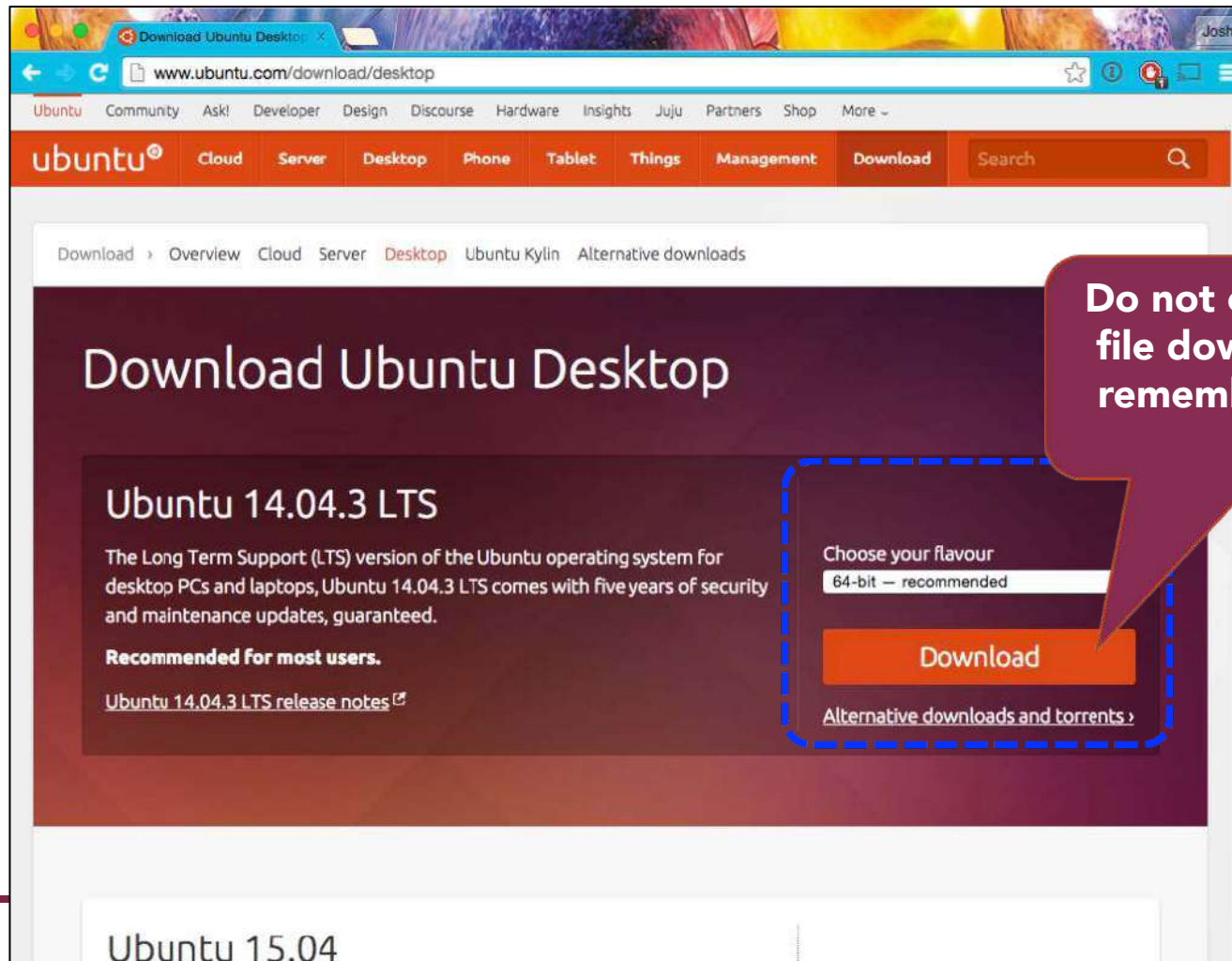
Download Ubuntu Linux

- Download website: (download may take a while ~1 GB)
<http://www.ubuntu.com/>



Download Ubuntu Linux

- Download website: (download may take a while ~1 GB)
<http://www.ubuntu.com/> (Make sure you get the LTS version)



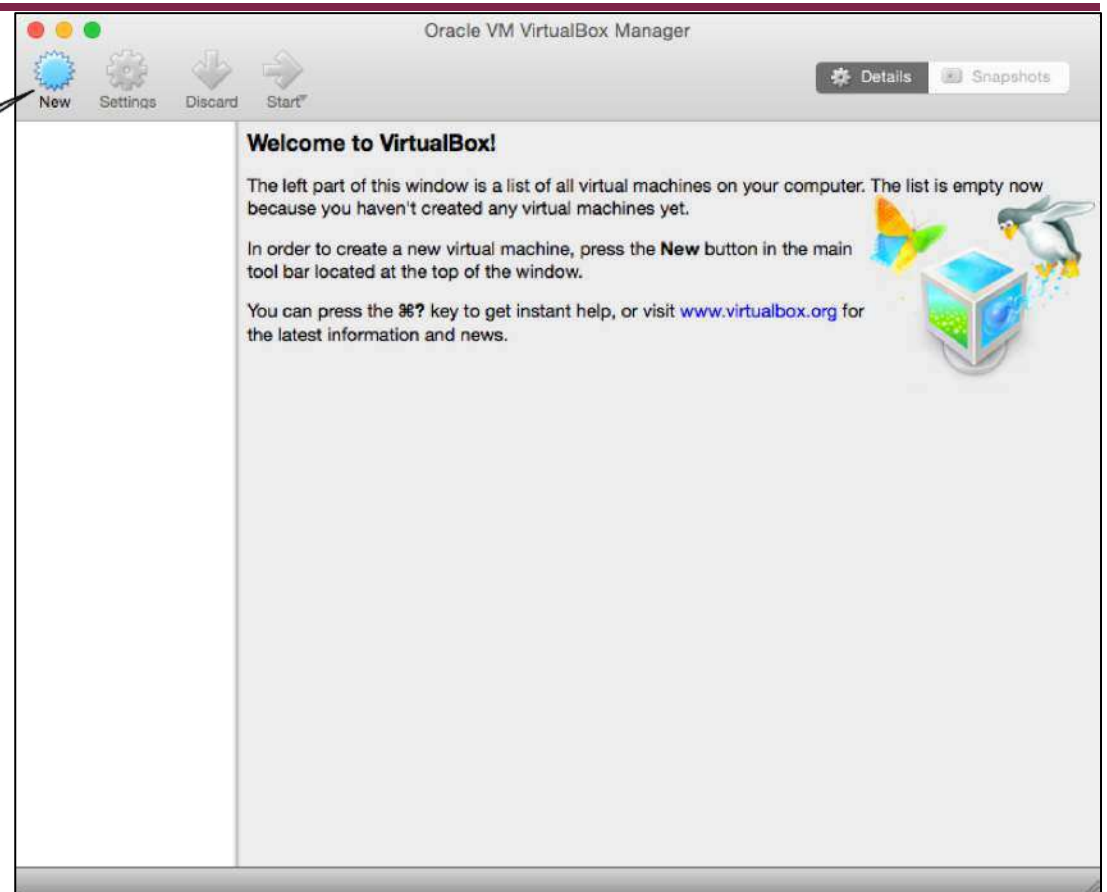


ubuntu[®]

Installing Ubuntu in VirtualBox

1) Launch VirtualBox

Click on the **New** button to setup a new VM



- Note: If you add more VMs you will see them all listed on the left-hand side.


2) Enter a name for your new VM

The name can be anything you like

Name and operating system

Please choose a descriptive name 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:

Type: 

Version:

When finished click **Continue**

3) VM Memory Limit

The image shows a 'Memory size' configuration window for a virtual machine. The window contains a slider and a text input field. The slider is set to 2048 MB, with a minimum of 4 MB and a maximum of 16384 MB. A callout points to the slider with the text 'Set the memory size limit for the VM'. Another callout points to the 'Continue' button with the text 'When finished click Continue'. A third callout points to the slider with the text 'Minimum of 512 MB. Recommended 1Gb to 2GB'. The dialog also includes 'Back', 'Continue', and 'Cancel' buttons.

Memory size

Select the amount of memory (RAM) in megabytes to be allocated to the virtual machine.

The recommended memory size is 768 MB.

4 MB 16384 MB 2048 MB

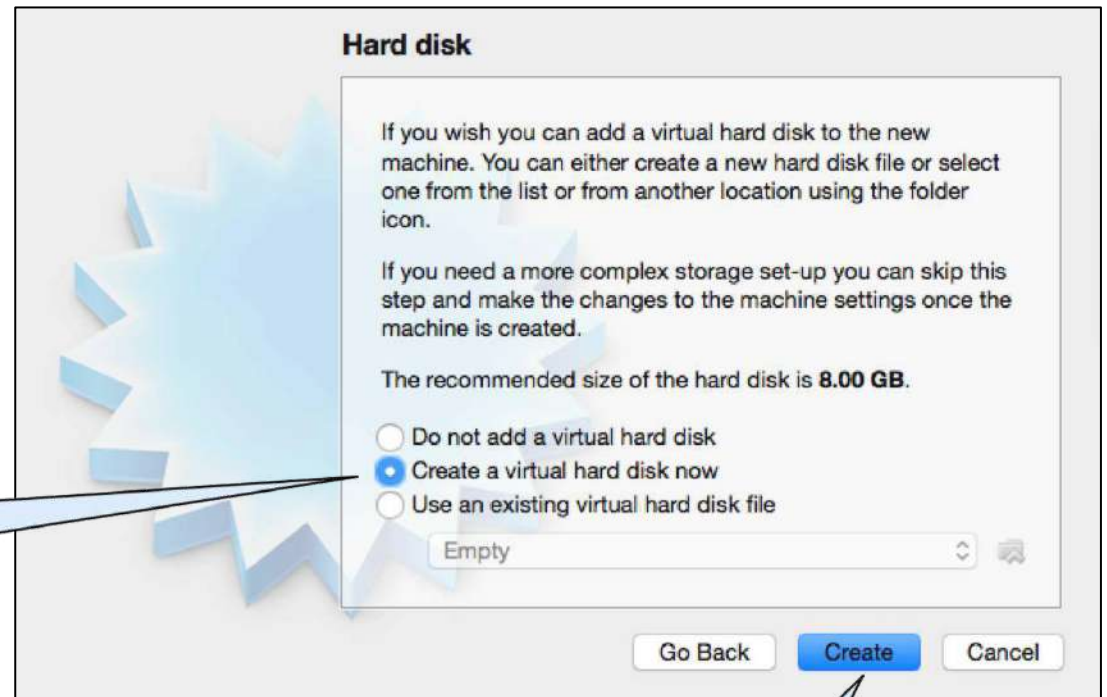
Back Continue Cancel

Set the memory size limit for the VM

Minimum of 512 MB. Recommended 1Gb to 2GB

When finished click **Continue**

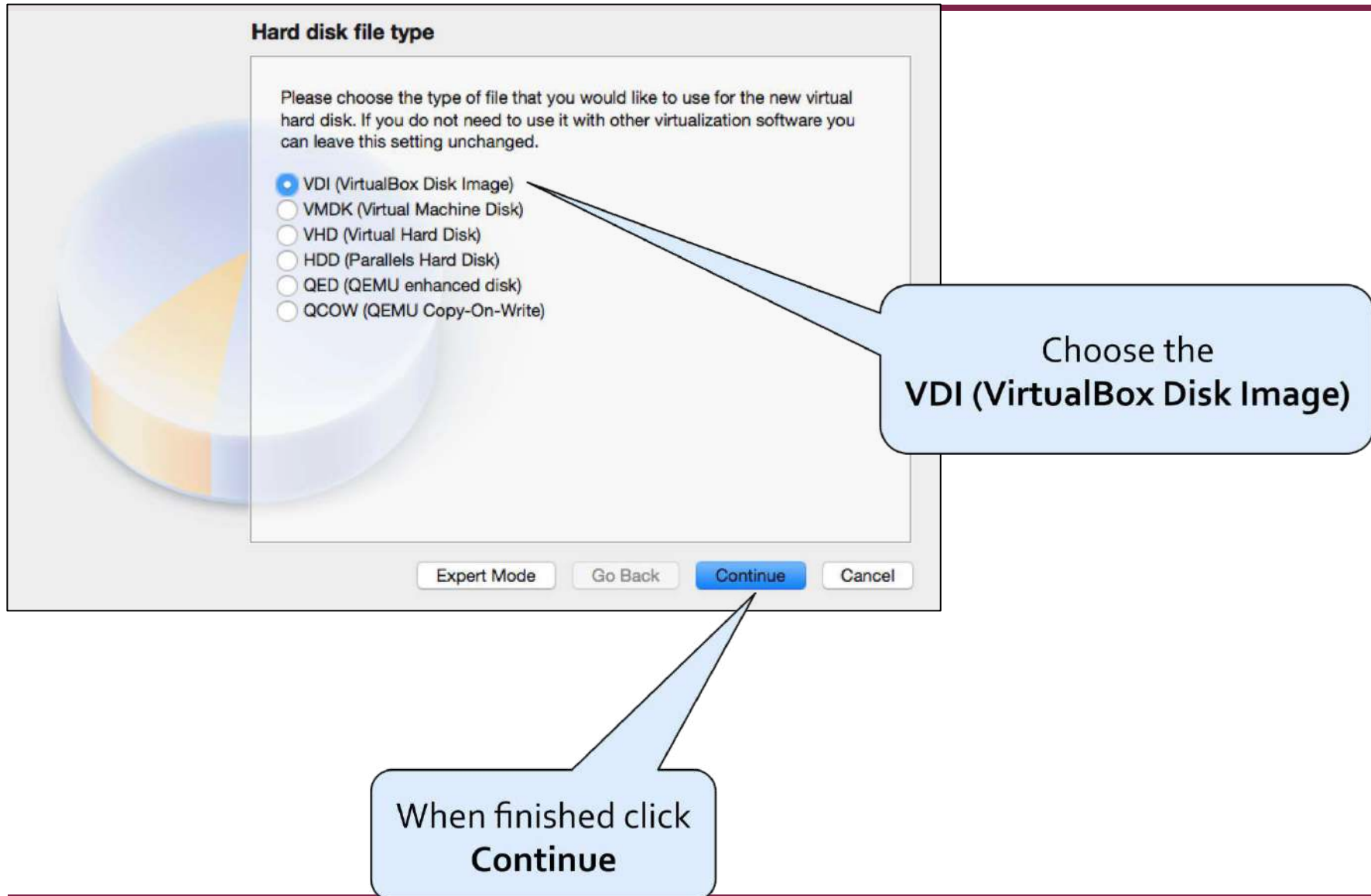
4) Virtual Hard Drive Setup



Create a new
virtual hard drive

When finished click
Create

4) Virtual Hard Drive Setup



The image shows a screenshot of a 'Hard disk file type' dialog box. The dialog box has a title bar and a main content area. The main content area contains the following text: 'Please choose the type of file that you would like to use for the new virtual hard disk. If you do not need to use it with other virtualization software you can leave this setting unchanged.' Below this text is a list of radio button options: 'VDI (VirtualBox Disk Image)', 'VMDK (Virtual Machine Disk)', 'VHD (Virtual Hard Disk)', 'HDD (Parallels Hard Disk)', 'QED (QEMU enhanced disk)', and 'QCOW (QEMU Copy-On-Write)'. The 'VDI (VirtualBox Disk Image)' option is selected. At the bottom of the dialog box are four buttons: 'Expert Mode', 'Go Back', 'Continue', and 'Cancel'. The 'Continue' button is highlighted in blue. There are two callout boxes: one pointing to the 'VDI (VirtualBox Disk Image)' option with the text 'Choose the VDI (VirtualBox Disk Image)', and another pointing to the 'Continue' button with the text 'When finished click Continue'.

Hard disk file type

Please choose the type of file that you would like to use for the new virtual hard disk. If you do not need to use it with other virtualization software you can leave this setting unchanged.

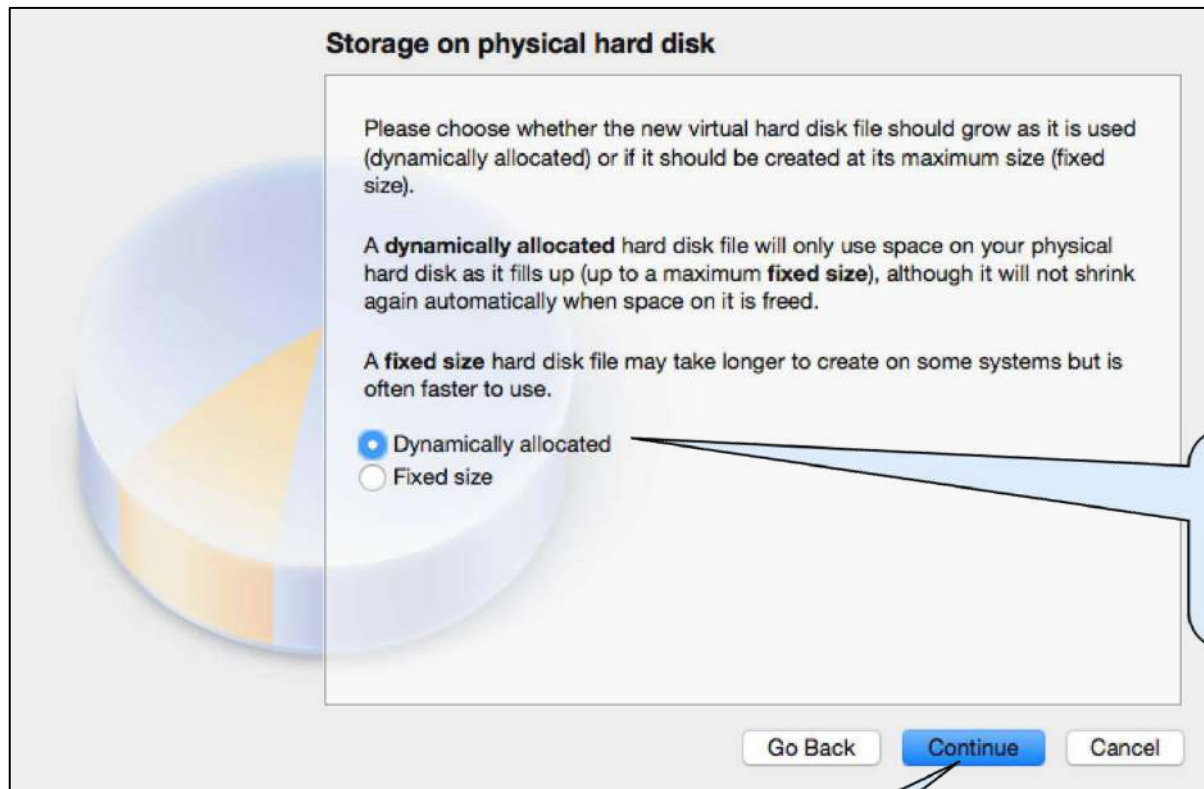
- VDI (VirtualBox Disk Image)
- VMDK (Virtual Machine Disk)
- VHD (Virtual Hard Disk)
- HDD (Parallels Hard Disk)
- QED (QEMU enhanced disk)
- QCOW (QEMU Copy-On-Write)

Expert Mode Go Back **Continue** Cancel

Choose the VDI (VirtualBox Disk Image)

When finished click **Continue**

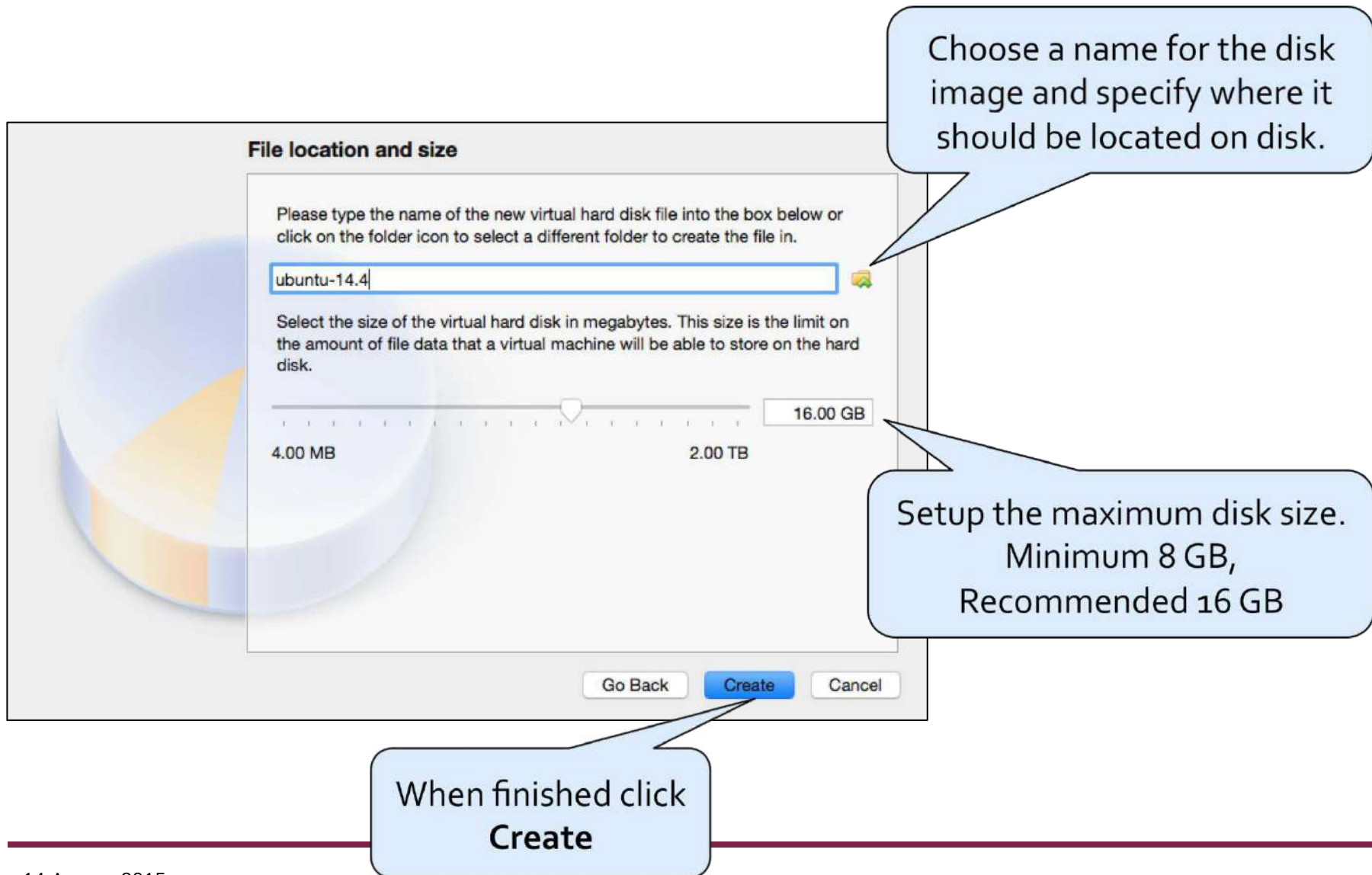
4) Virtual Hard Drive Setup



Choose a **Dynamically allocated** image

When finished click **Continue**

4) Virtual Hard Drive Setup



The screenshot shows a dialog box titled "File location and size" for creating a virtual hard disk. The dialog has a text input field containing "ubuntu-14.4" and a slider for disk size set to "16.00 GB". The slider ranges from "4.00 MB" to "2.00 TB". At the bottom are "Go Back", "Create", and "Cancel" buttons. Three callout boxes provide instructions: one for naming and location, one for disk size (8 GB minimum, 16 GB recommended), and one pointing to the "Create" button.

File location and size

Please type the name of the new virtual hard disk file into the box below or click on the folder icon to select a different folder to create the file in.

ubuntu-14.4

Select the size of the virtual hard disk in megabytes. This size is the limit on the amount of file data that a virtual machine will be able to store on the hard disk.

4.00 MB 16.00 GB 2.00 TB

Go Back Create Cancel

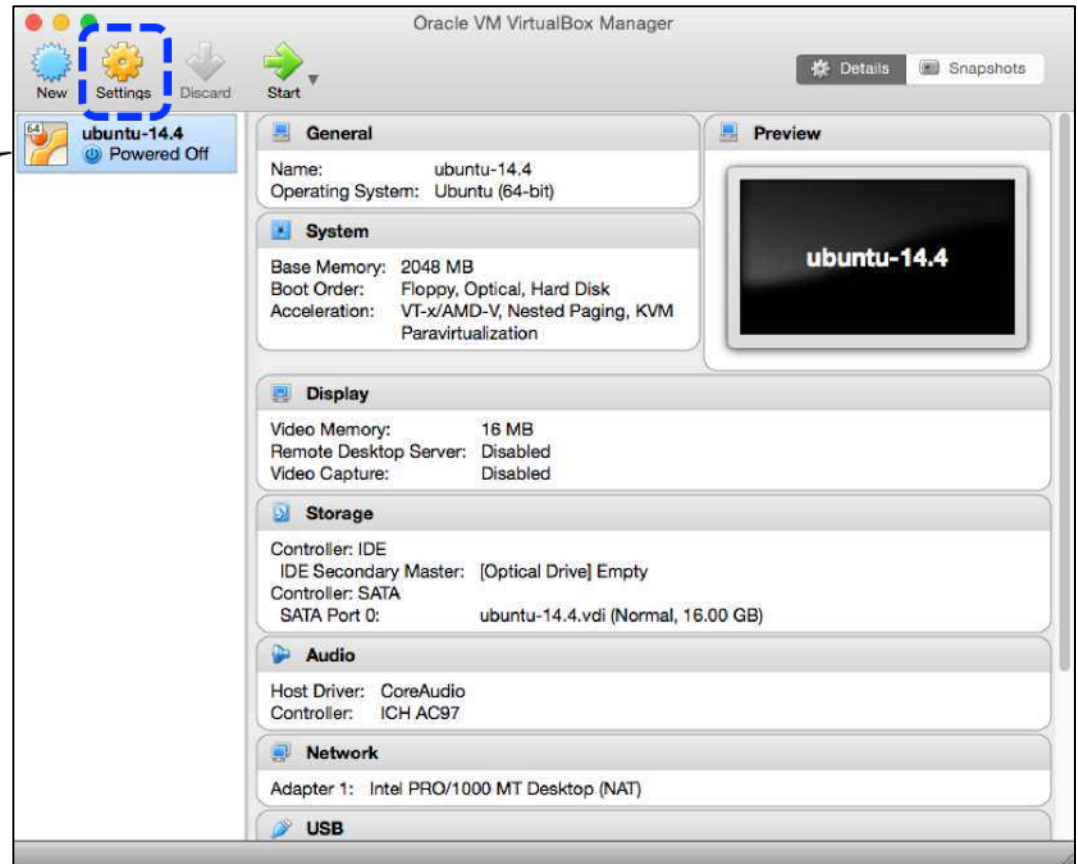
Choose a name for the disk image and specify where it should be located on disk.

Setup the maximum disk size. Minimum 8 GB, Recommended 16 GB

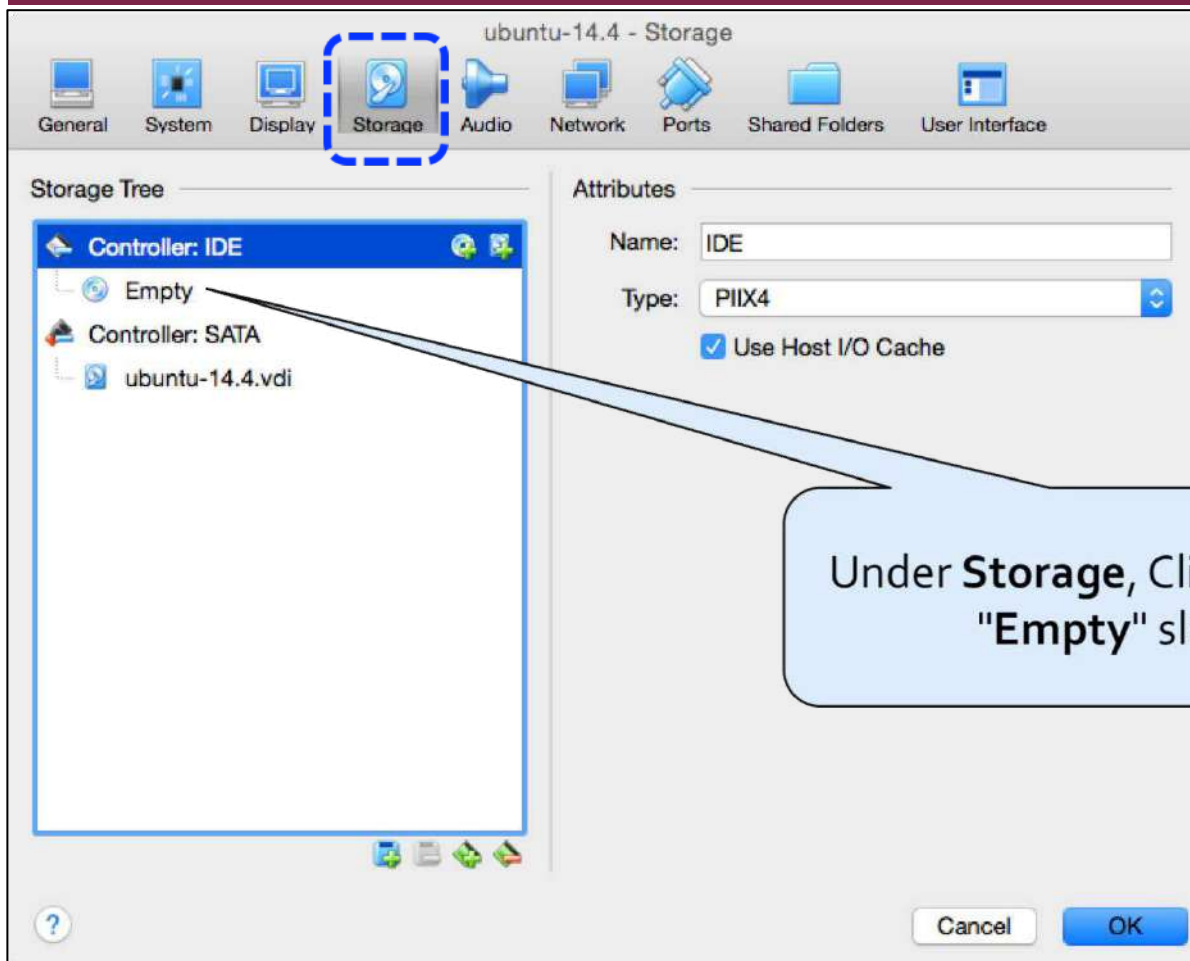
When finished click **Create**

5) Setup the new VM to boot from the Ubuntu iso image you downloaded

Choose your new VM, then click on **Settings**



5) Setup the new VM to boot from the Ubuntu iso image you downloaded



5) Setup the new VM to boot from the Ubuntu iso image you downloaded

Oracle VM VirtualBox Manager

ubuntu-14.4 - Storage

Storage Tree

- Controller: IDE
 - Empty
- Controller: SATA
 - ubuntu-14.4.vdi

Attributes

Optical Drive: IDE Secondary Master

Live CD/DVD

Information

Type: --

Size: --

Location: --

Attached to: --

Choose Virtual Optical Disk File...

Remove Disk from Virtual Drive

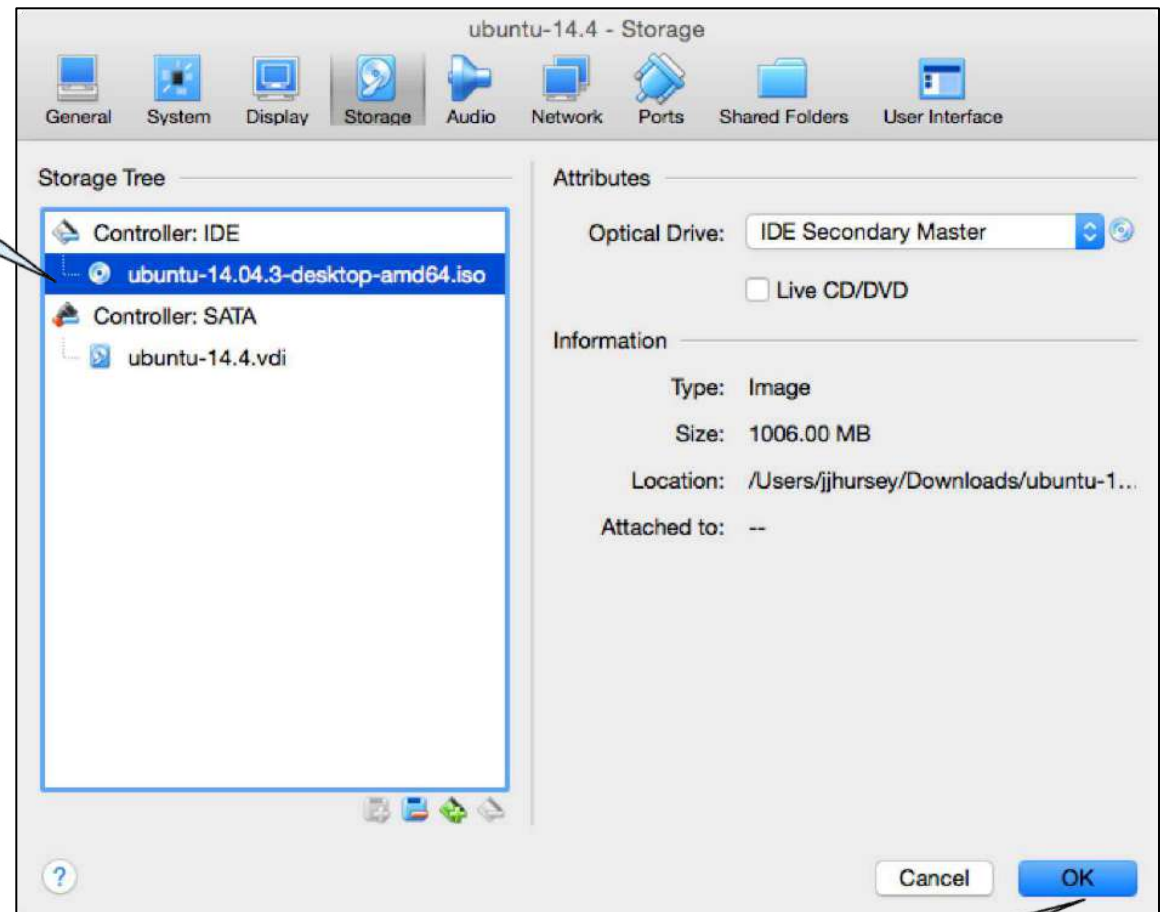
Cancel OK

Click on the "CD" icon, and select "Choose a virtual CD/ DVD disk file..."

When the file selector opens up find the ubuntu .iso file that you downloaded earlier.

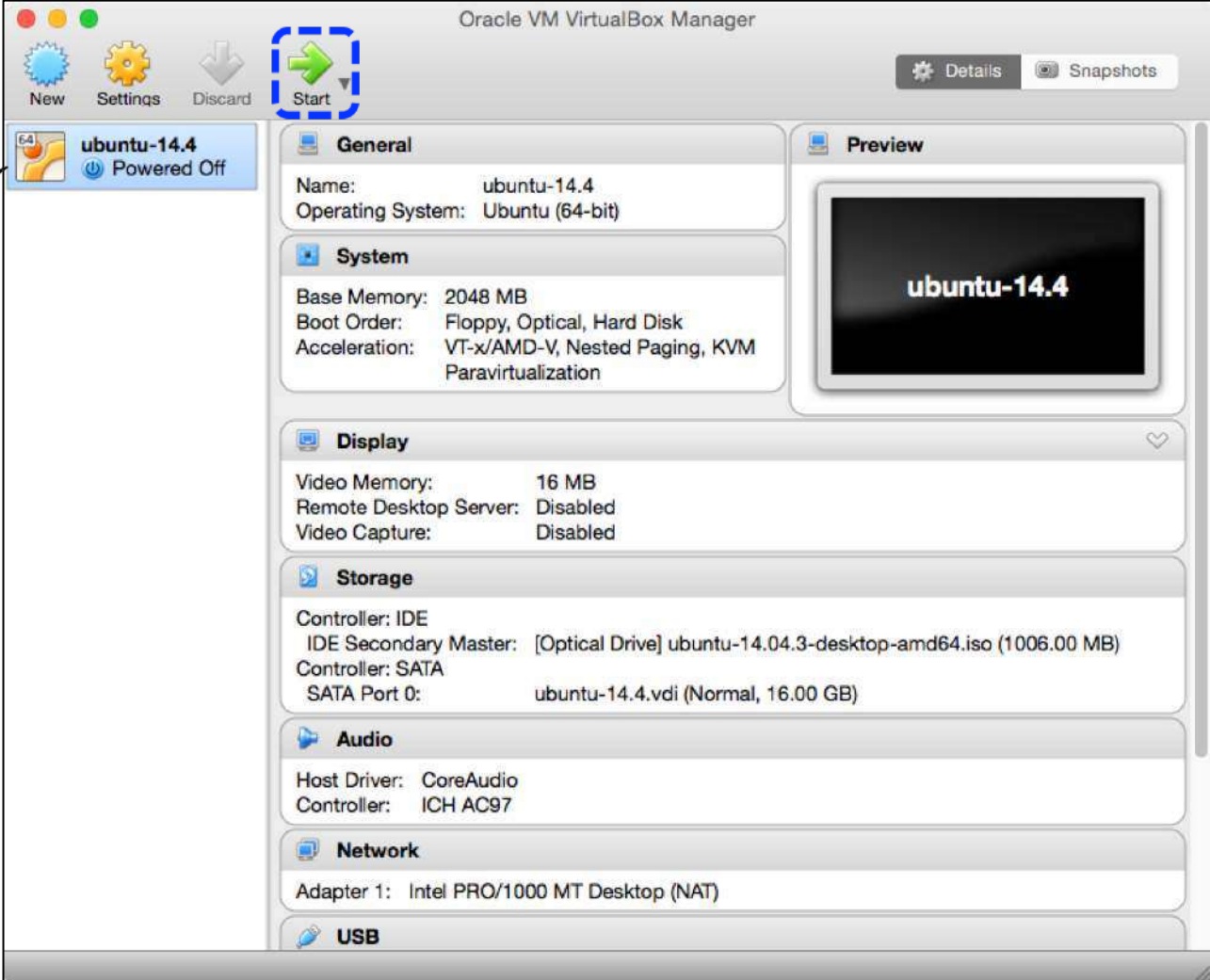
5) Setup the new VM to boot from the Ubuntu iso image you downloaded

You should see the .iso loaded in the drive.



Click **OK** to close the window

6) Startup your new VM



The screenshot shows the Oracle VM VirtualBox Manager interface. The 'Start' button is highlighted with a blue dashed border. A callout box on the left contains the text: 'Choose your new VM, then click on **Start**'. The VM 'ubuntu-14.4' is selected and its status is 'Powered Off'. The 'Details' tab is active, showing the following configuration:

- General**
 - Name: ubuntu-14.4
 - Operating System: Ubuntu (64-bit)
- System**
 - Base Memory: 2048 MB
 - Boot Order: Floppy, Optical, Hard Disk
 - Acceleration: VT-x/AMD-V, Nested Paging, KVM Paravirtualization
- Display**
 - Video Memory: 16 MB
 - Remote Desktop Server: Disabled
 - Video Capture: Disabled
- Storage**
 - Controller: IDE
 - IDE Secondary Master: [Optical Drive] ubuntu-14.04.3-desktop-amd64.iso (1006.00 MB)
 - Controller: SATA
 - SATA Port 0: ubuntu-14.4.vdi (Normal, 16.00 GB)
- Audio**
 - Host Driver: CoreAudio
 - Controller: ICH AC97
- Network**
 - Adapter 1: Intel PRO/1000 MT Desktop (NAT)
- USB**

The 'Preview' window shows a black screen with the text 'ubuntu-14.4' in white.

Troubleshooting

- **Problem:**

After pressing Start I get a message like:

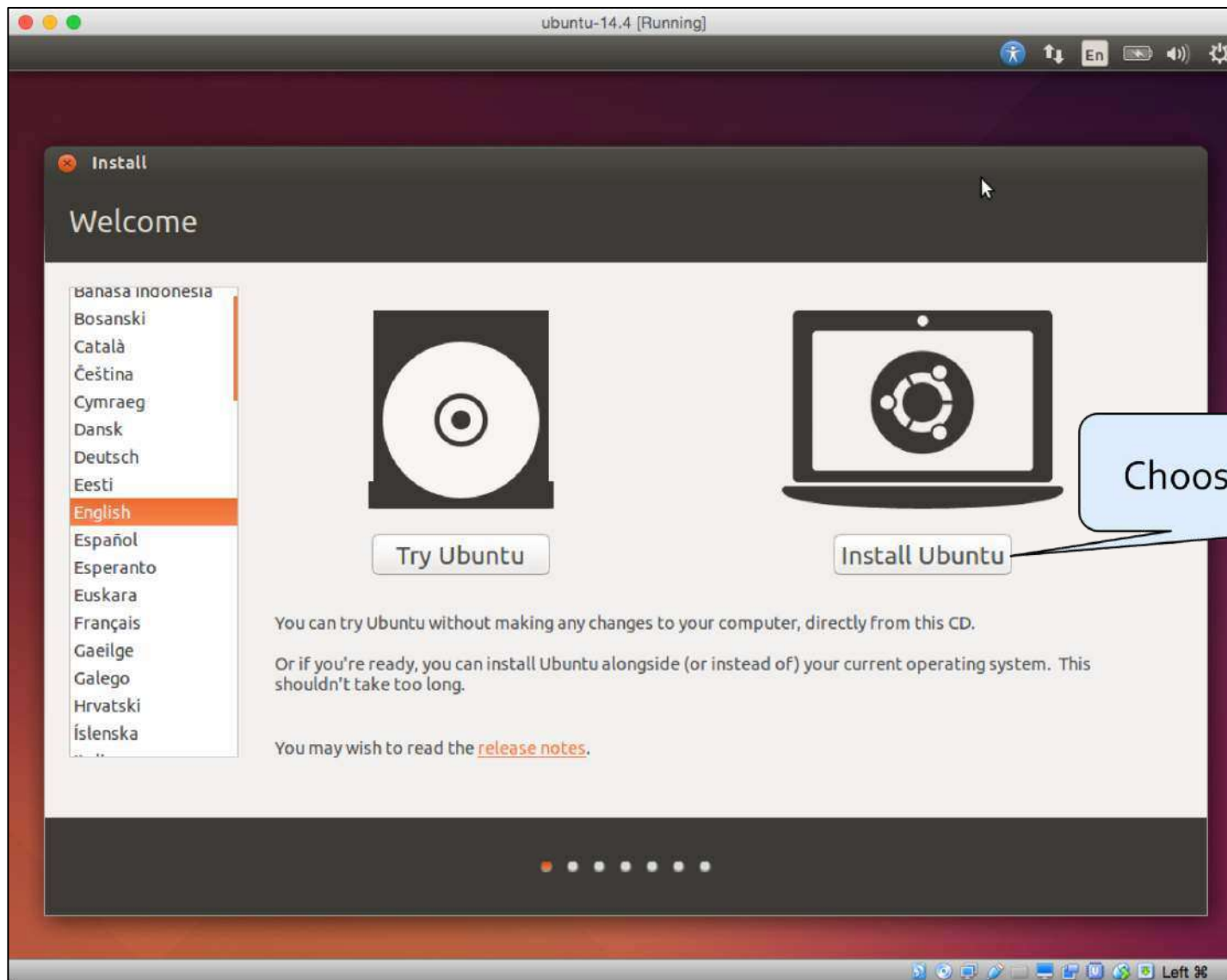
This kernel requires an x86-64 CPU, but only detected an i686 CPU. Unable to boot - please use a kernel appropriate for your CPU.

- **Solution:**

You can either:

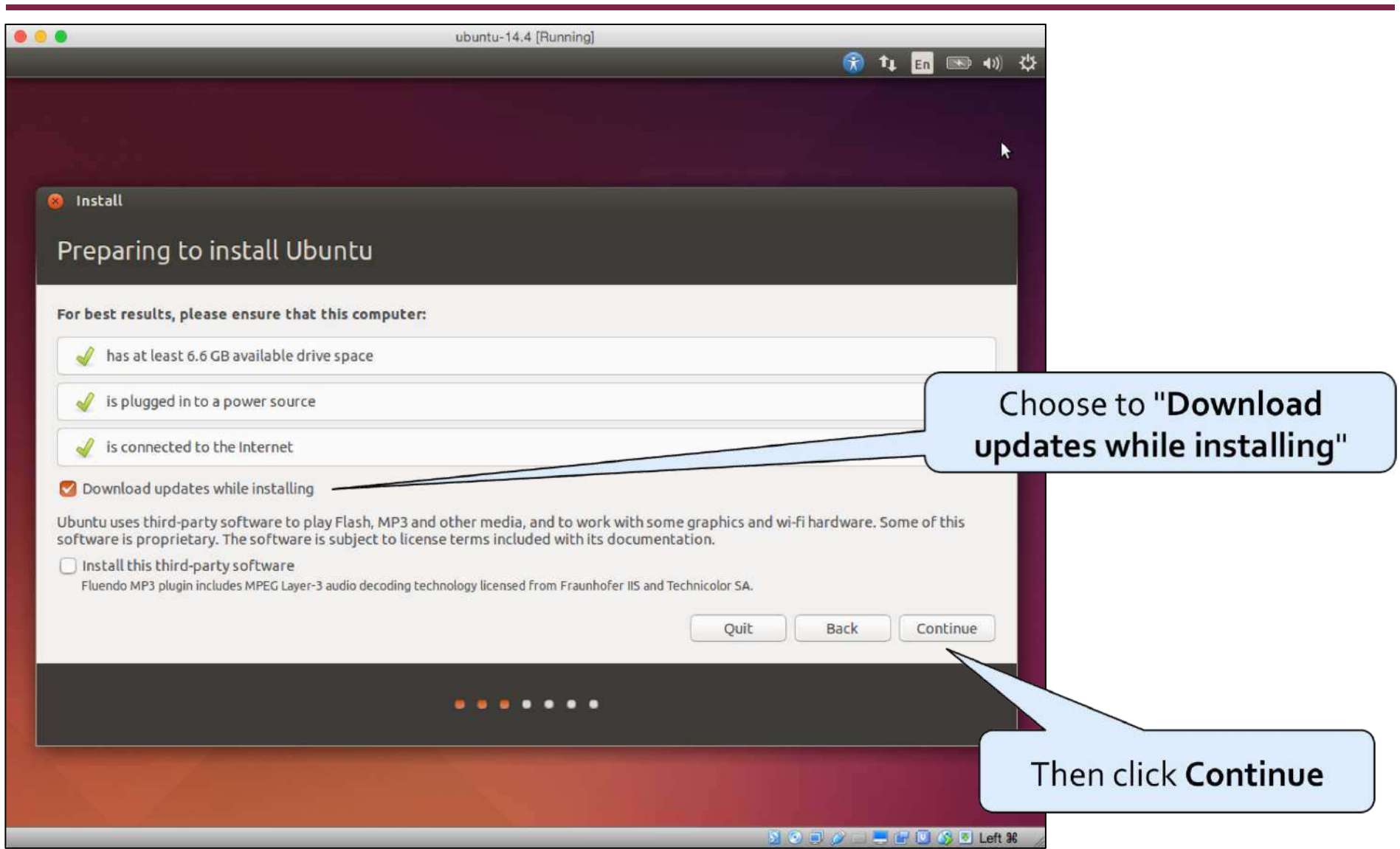
- Download and install the 32bit version of Ubuntu, or
- Make sure you have setup the virtual machine in 64bit mode
 - <http://askubuntu.com/a/309007>

7) Installing Ubuntu on the virtual hard drive

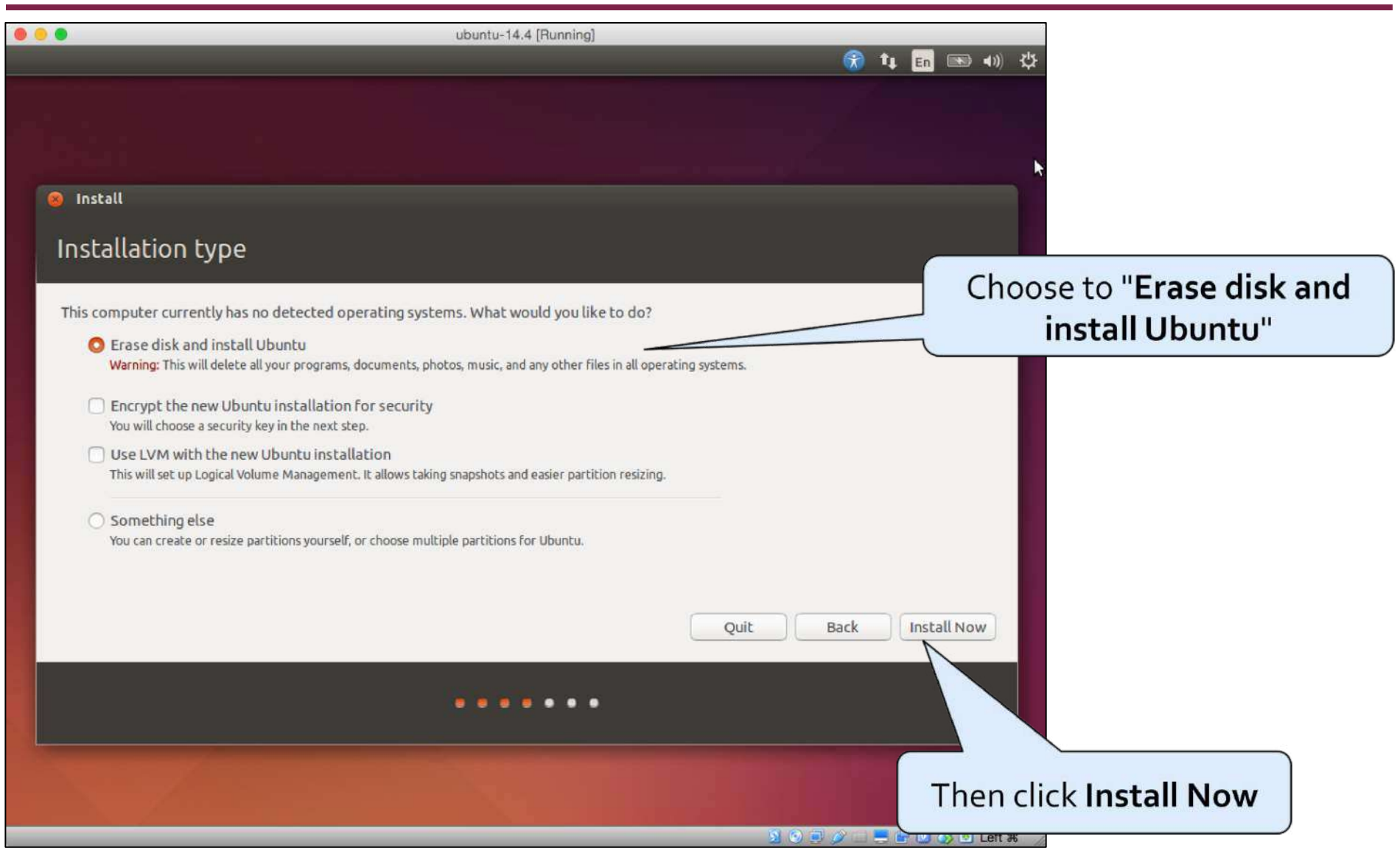


Choose to "Install Ubuntu"

7) Installing Ubuntu on the virtual hard drive



7) Installing Ubuntu on the virtual hard drive



7) Installing Ubuntu on the virtual hard drive

The screenshot shows the Ubuntu 14.4 installation window. The 'Installation type' screen is visible, with the option 'Erase disk and install Ubuntu' selected. A warning message states: 'Warning: This will delete all your programs, documents, photos, music, and any other files in the existing system.' A dialog box titled 'Write the changes to disks?' is open, displaying the following information:

Write the changes to disks?

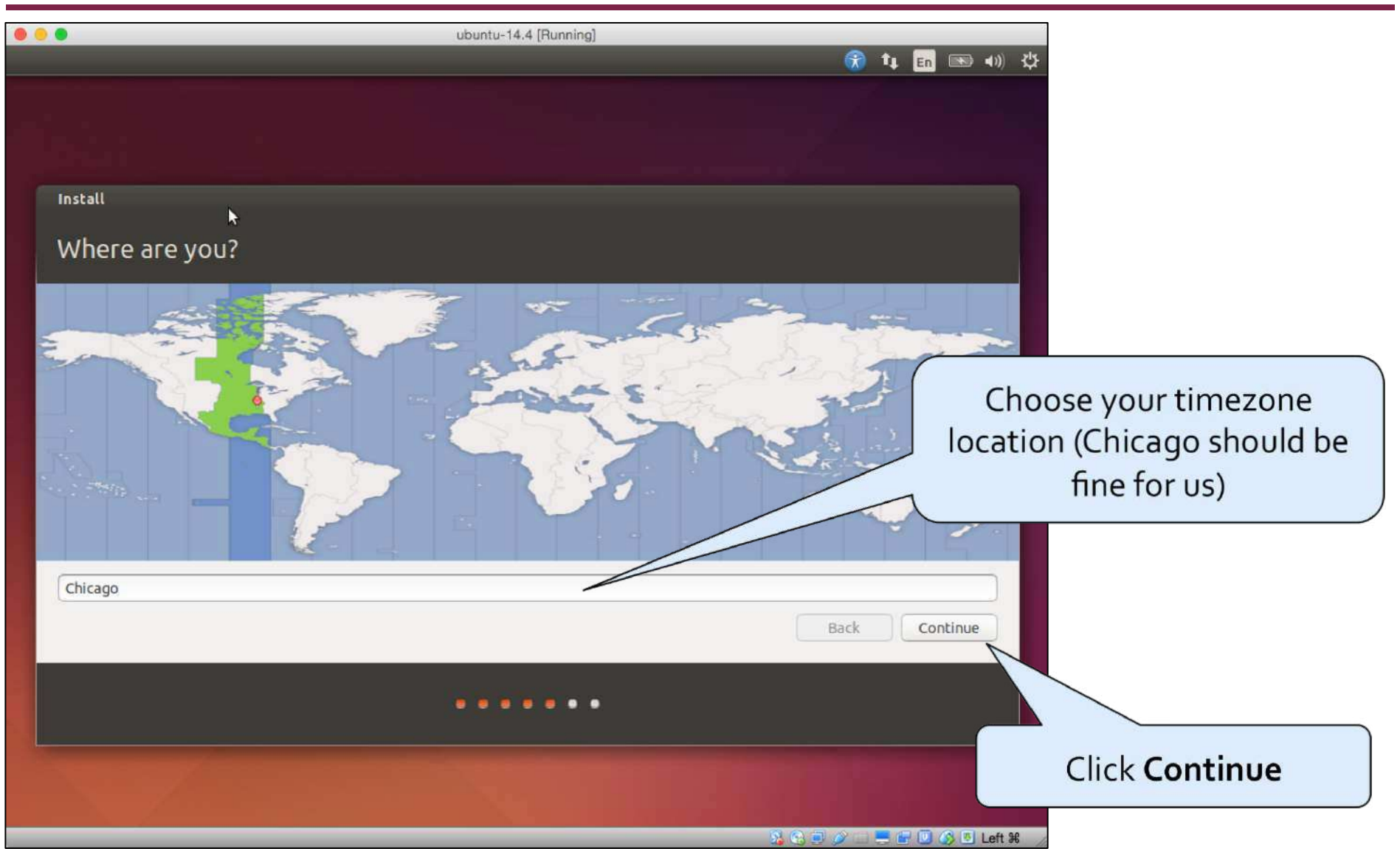
If you continue, the changes listed below will be written to the disks. Otherwise, you will be able to make further changes manually.

The partition tables of the following devices are changed:
SCSI3 (0,0,0) (sda)

The following partitions are going to be formatted:
partition #1 of SCSI3 (0,0,0) (sda) as ext4
partition #5 of SCSI3 (0,0,0) (sda) as swap

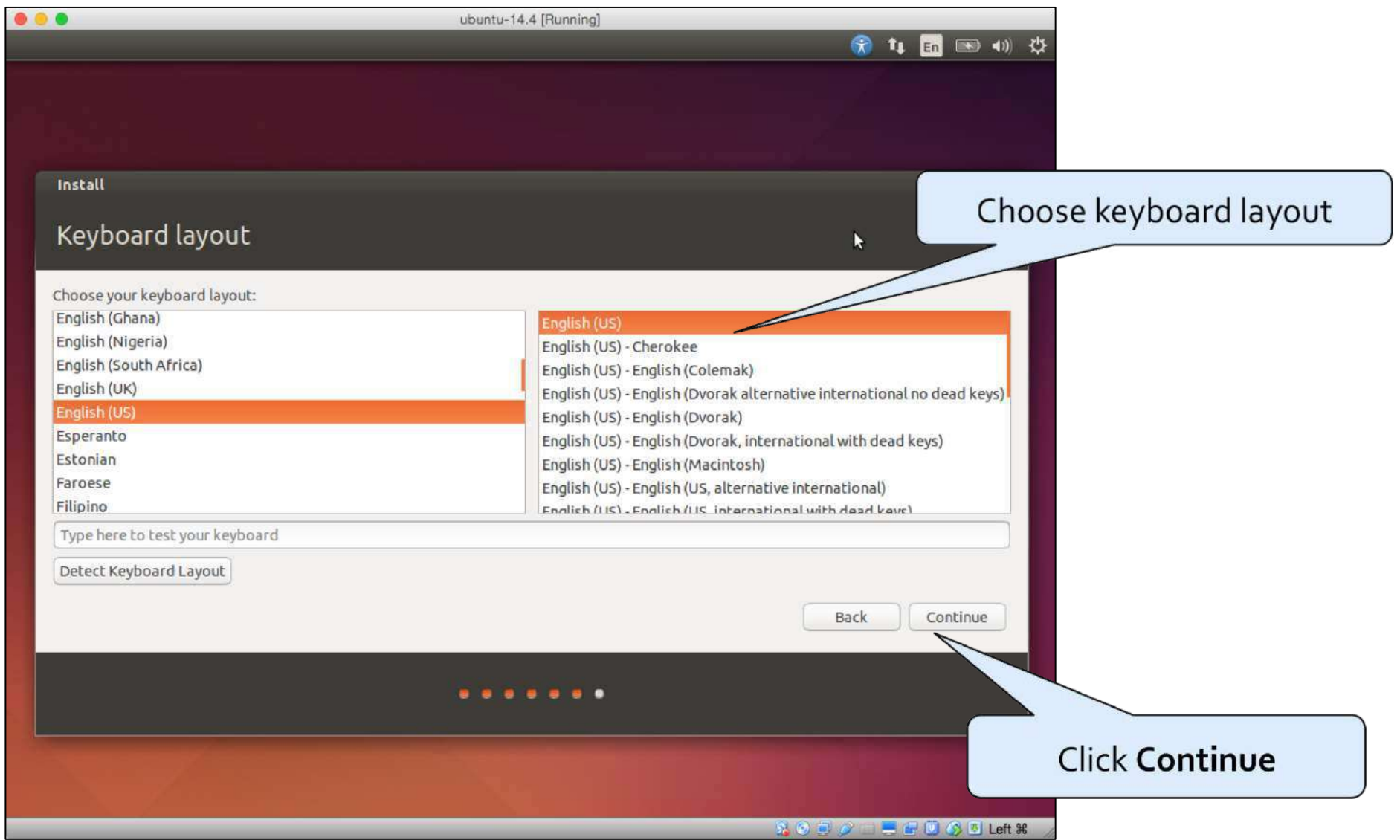
Buttons for 'Go Back' and 'Continue' are visible at the bottom of the dialog box. A callout bubble points to the 'Continue' button with the text 'Click Continue'. Another callout bubble points to the 'Write the changes to disks?' dialog box with the text: 'Note that we are erasing the "VBOX HARDDISK" so everything else on your hard drive should be protected.'

7) Installing Ubuntu on the virtual hard drive



The image shows a screenshot of the Ubuntu 14.4 installer window titled "Install". The main question is "Where are you?". Below the question is a world map with a green highlighted area over North America and a red pin indicating the location of Chicago. Below the map is a text input field containing "Chicago". At the bottom right of the input area are "Back" and "Continue" buttons. A progress indicator at the bottom shows five dots, with the first four being orange and the fifth being white. Two callout boxes are present: one pointing to the "Chicago" text field with the text "Choose your timezone location (Chicago should be fine for us)", and another pointing to the "Continue" button with the text "Click Continue". The window title bar shows "ubuntu-14.4 [Running]" and standard system icons.

7) Installing Ubuntu on the virtual hard drive



7) Installing Ubuntu on the virtual hard drive

The screenshot shows the Ubuntu 14.4 installer window titled "Install" with the sub-header "Who are you?". The form contains the following fields and options:

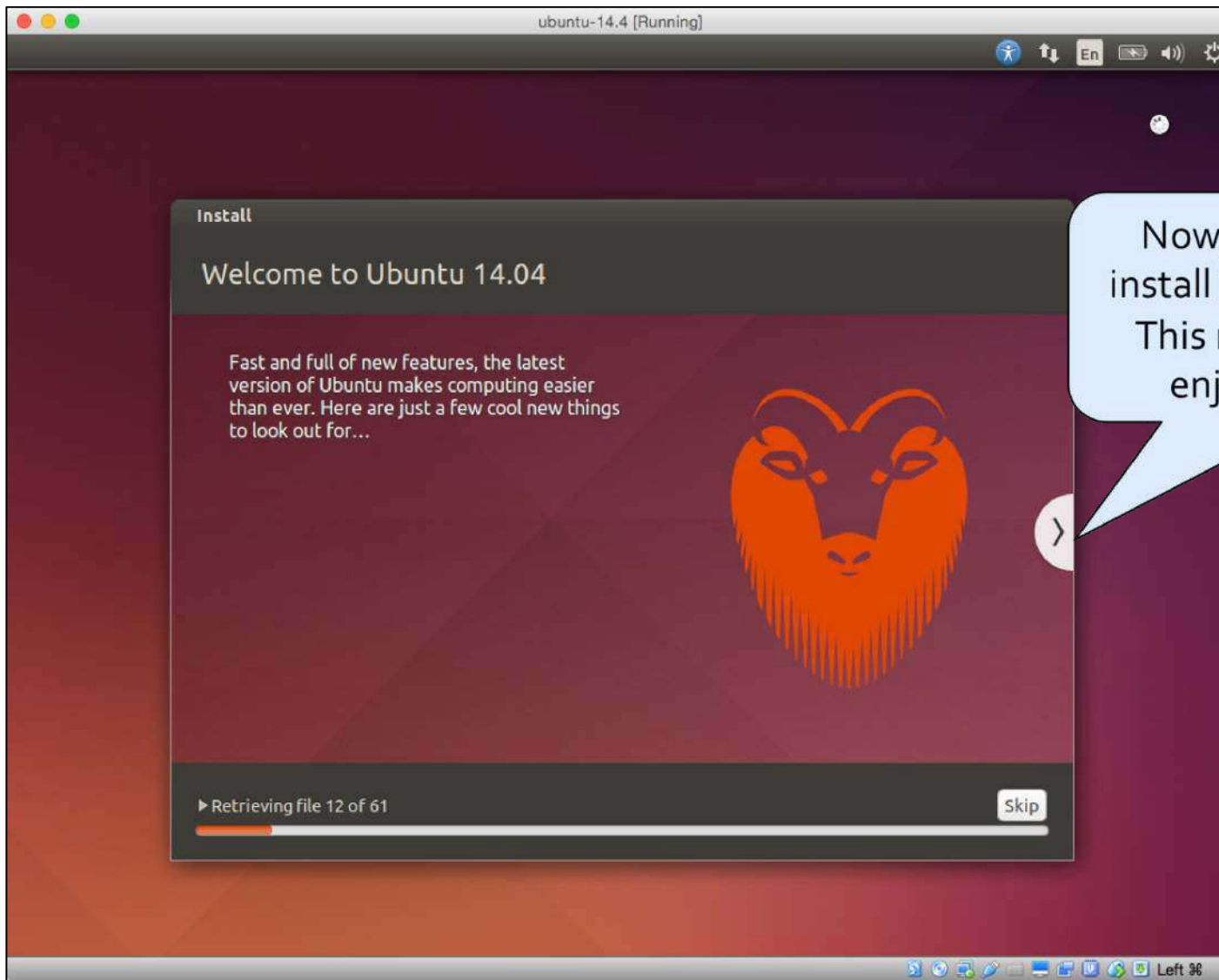
- Your name: Josh Hursey ✓
- Your computer's name: ubuntu-cs441 ✓
The name it uses when it talks to other computers.
- Pick a username: jjhursey ✓
- Choose a password: [masked] Weak password
- Confirm your password: [masked] ✓
- Log in automatically (selected)
- Require my password to log in
- Encrypt my home folder

Buttons: Back, Continue

Callout boxes:

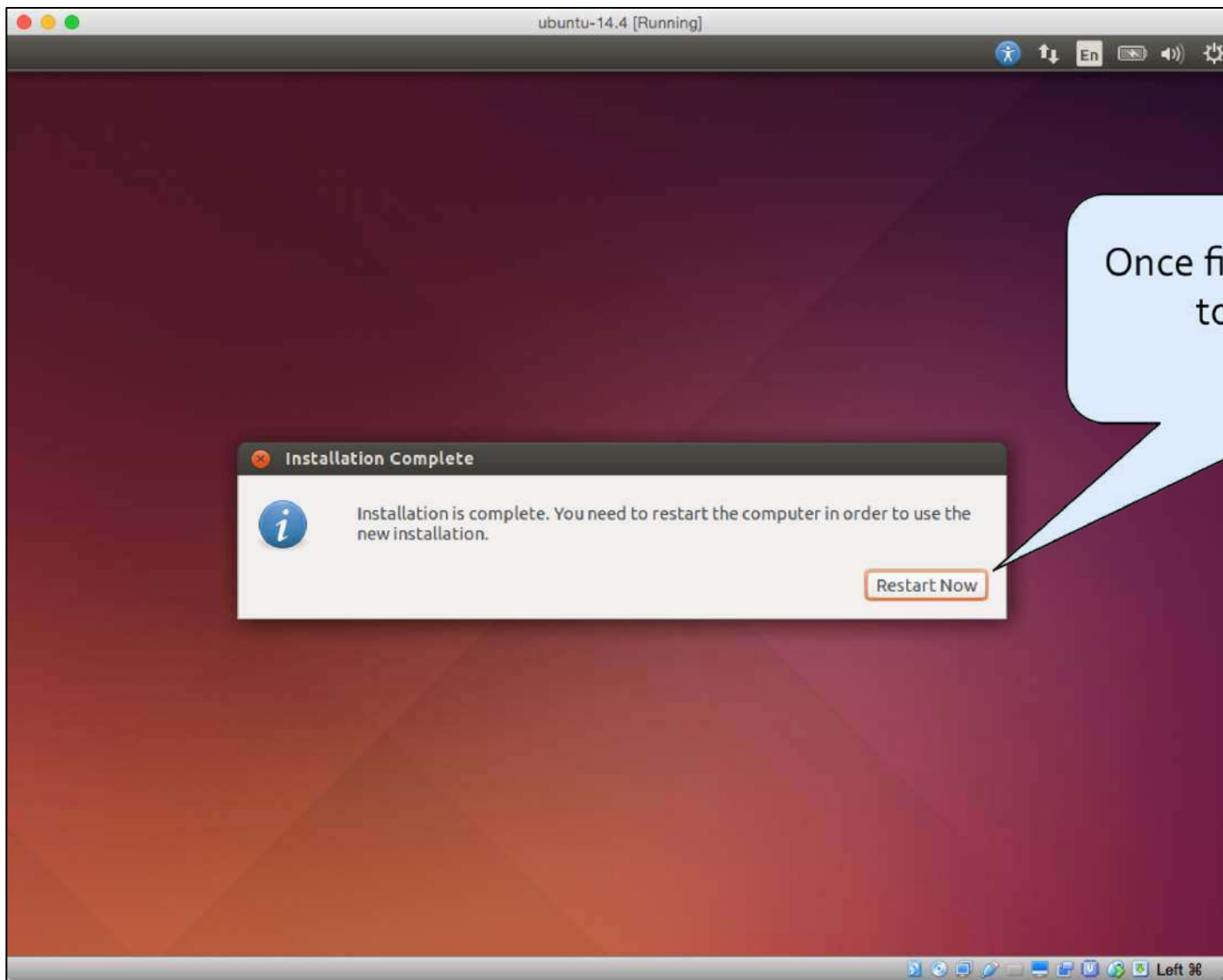
- Top right: "Setup your login information. It can be whatever you want." (points to the name and computer name fields)
- Middle right: "Do not forget your username/password. **The only way to fix a lost password is to delete the entire hard drive!**" (points to the password fields)
- Bottom left: "Since we only have one user, I like to have it 'Log in automatically'" (points to the radio button)
- Bottom right: "Click **Continue**" (points to the Continue button)

7) Installing Ubuntu on the virtual hard drive



Now, Ubuntu is going to install itself on your system. This may take a while, so enjoy the slide show.

7) Installing Ubuntu on the virtual hard drive



Once finished, it will ask you to "Restart Now" Go for it!

Troubleshooting

- **Problem:**

After installing Ubuntu and restarting either

- Ubuntu tries to install itself again, or
- VirtualBox/Ubuntu crashes

- **Solution:**

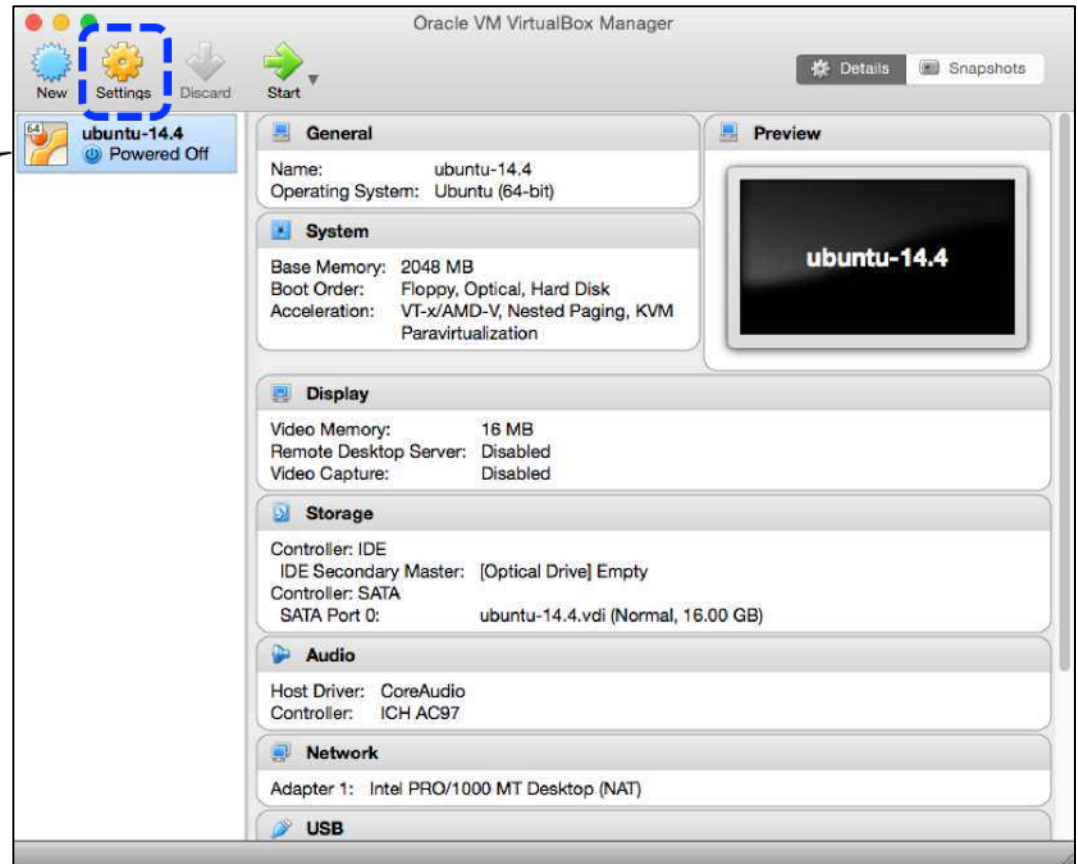
You may need to eject the installation media (i.e., iso)

- See the next few slides for more details.

Ejecting the Installation Media

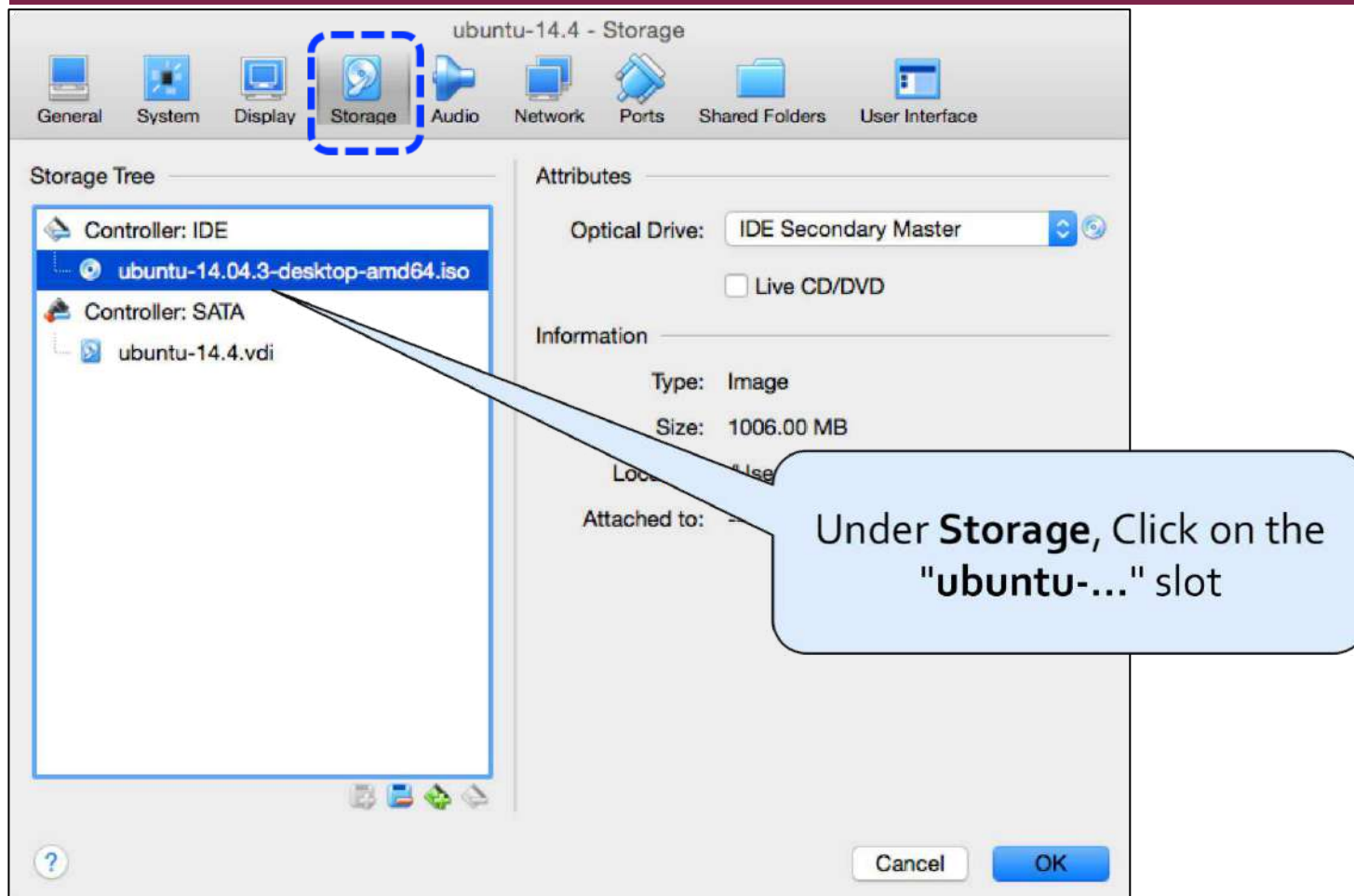
1) Open Settings for your VM

Choose your new VM, then click on **Settings**



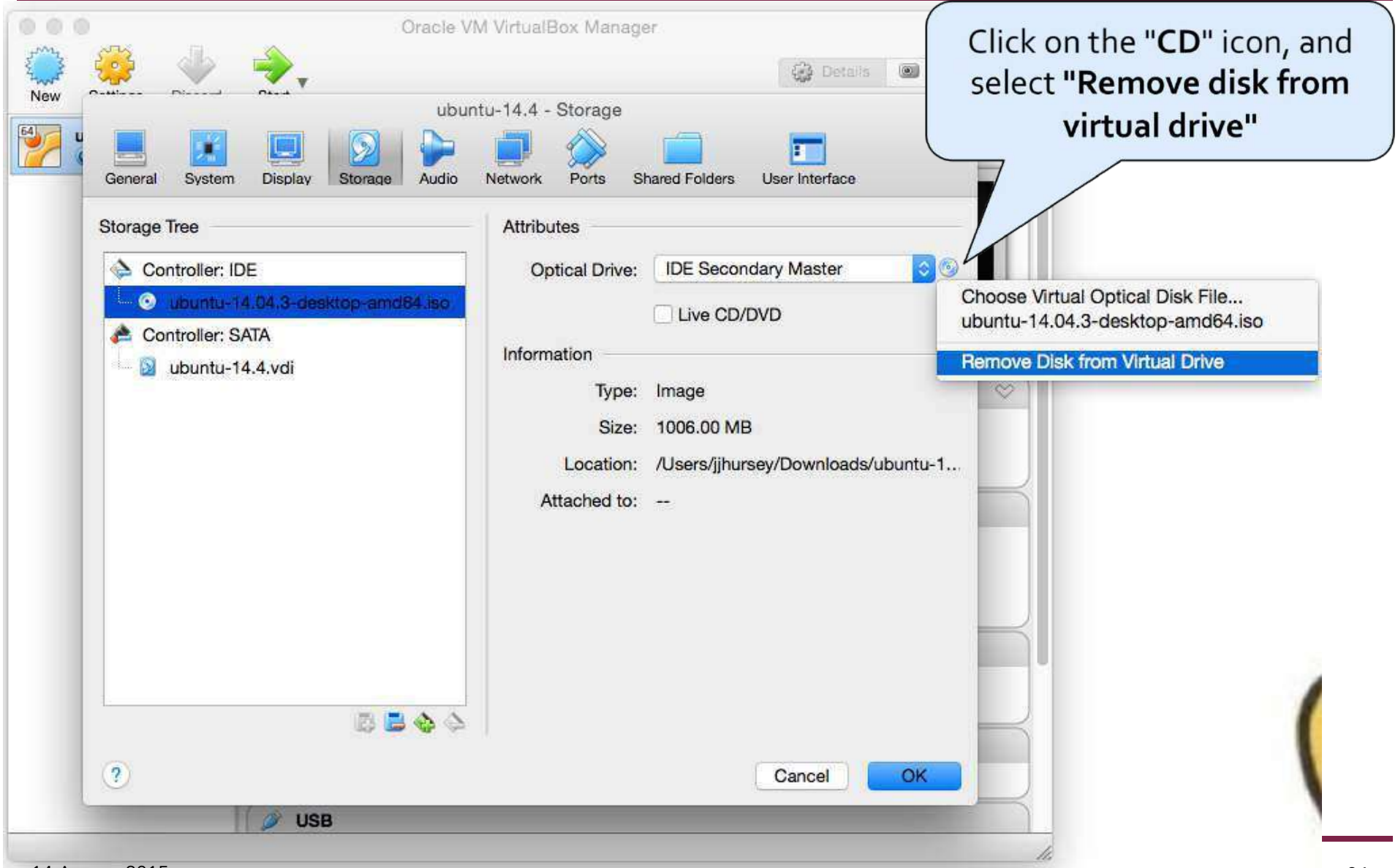
Ejecting the Installation Media

2) Find the installation .iso



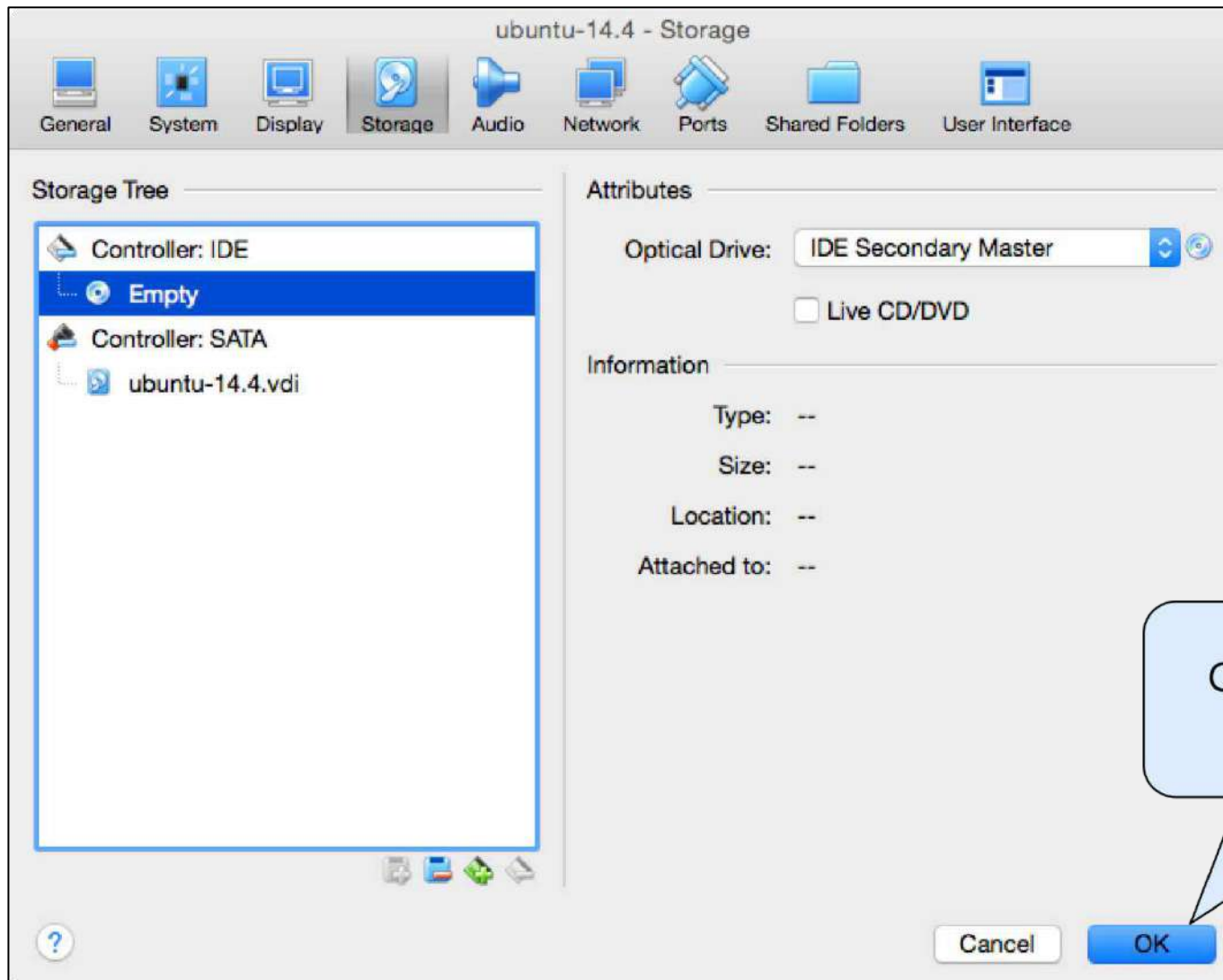
Ejecting the Installation Media

3) Remove the disk from the drive



Ejecting the Installation Media

4) All done





Setting up Guest Additions - Ubuntu

Tiny Window

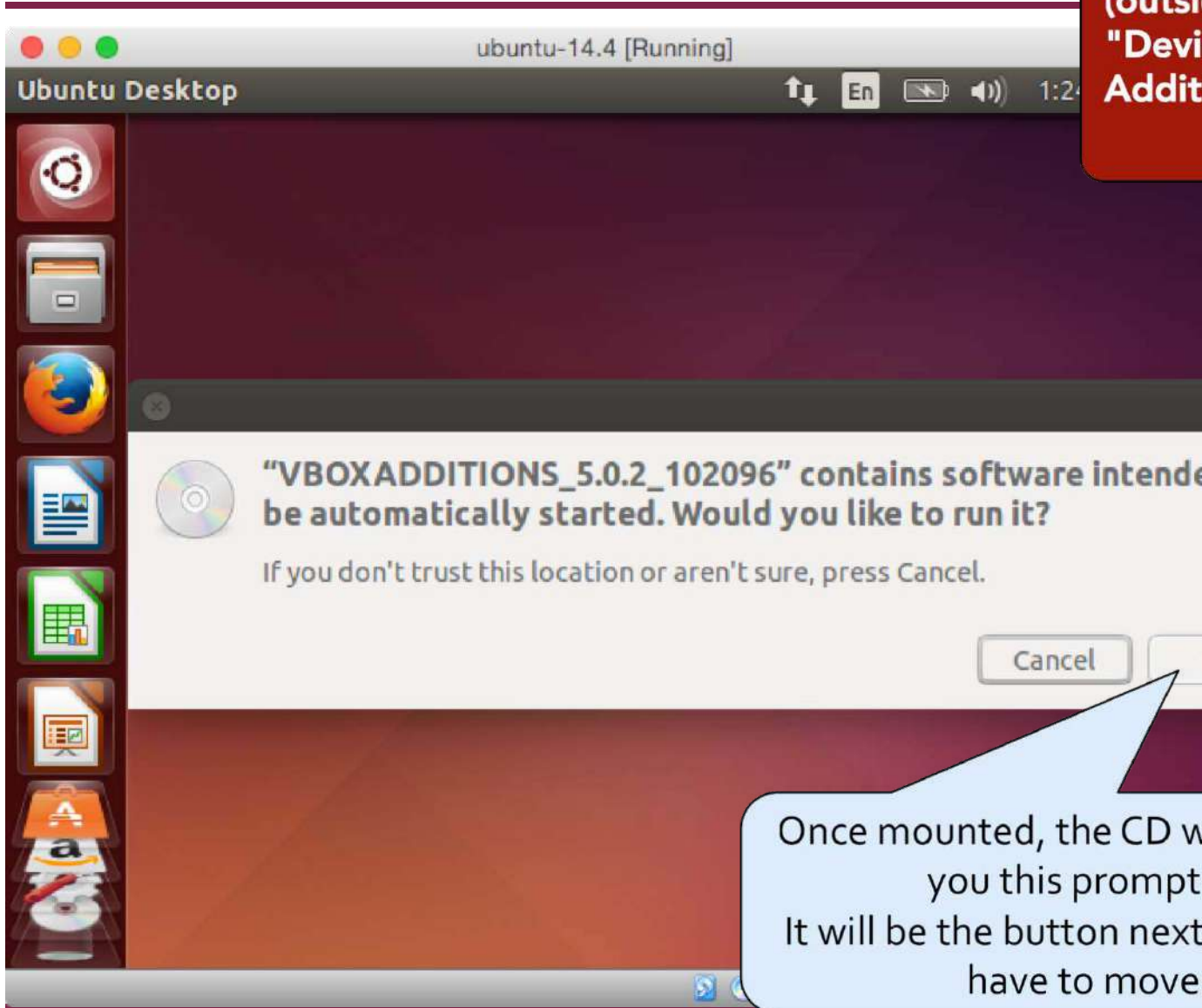
Often when Ubuntu starts up for the first time it does so in a small window that is difficult to use.

You need to install the "Guest Additions" to allow the Ubuntu virtual machine to notice when the VirtualBox window is resized.

Once installed you can expand the window as you would any other application on your system.



1) Install VirtualBox Guest Additions

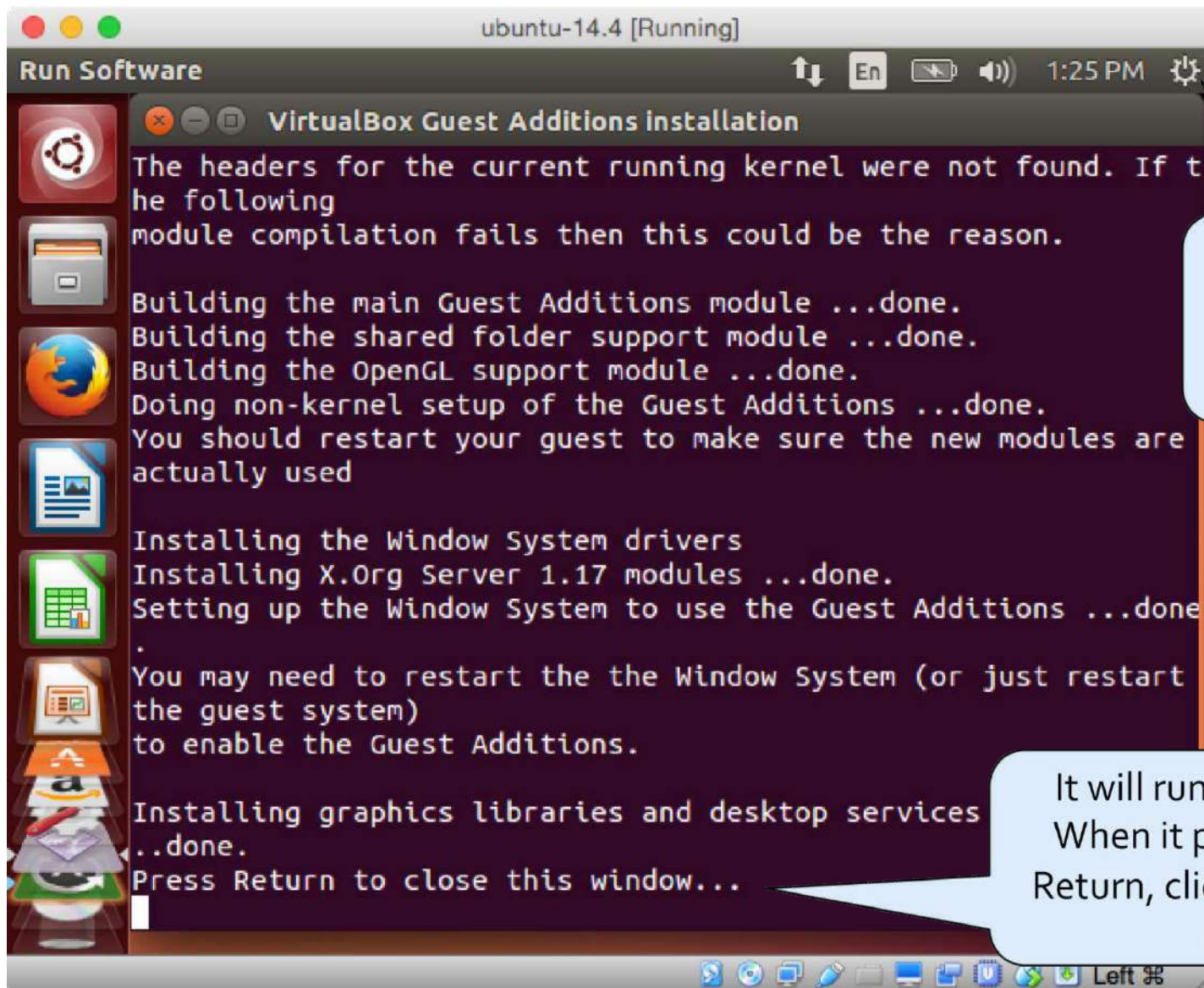


The screenshot shows a window titled "ubuntu-14.4 [Running]" with the "Ubuntu Desktop" title bar. A dialog box is open in the center, displaying a CD icon and the text: "VBOXADDITIONS_5.0.2_102096" contains software intended to be automatically started. Would you like to run it? If you don't trust this location or aren't sure, press Cancel. There are two buttons at the bottom right: "Cancel" and a partially visible "Run" button. A red callout box in the top right corner contains the text: "From the VirtualBox menu (outside of Ubuntu). Choose 'Devices' -> 'Insert Guest Additions CD Image'". A blue callout box in the bottom right corner contains the text: "Once mounted, the CD will cause Ubuntu to give you this prompt. Choose 'Run' It will be the button next to 'Cancel', you might have to move the window."

From the VirtualBox menu (outside of Ubuntu). Choose "Devices" -> "Insert Guest Additions CD Image"

Once mounted, the CD will cause Ubuntu to give you this prompt. Choose "Run" It will be the button next to "Cancel", you might have to move the window.

2) Install VirtualBox Guest Additions



```
ubuntu-14.4 [Running]
Run Software
VirtualBox Guest Additions installation
The headers for the current running kernel were not found. If the following
module compilation fails then this could be the reason.
Building the main Guest Additions module ...done.
Building the shared folder support module ...done.
Building the OpenGL support module ...done.
Doing non-kernel setup of the Guest Additions ...done.
You should restart your guest to make sure the new modules are
actually used
Installing the Window System drivers
Installing X.Org Server 1.17 modules ...done.
Setting up the Window System to use the Guest Additions ...done
.
You may need to restart the the Window System (or just restart
the guest system)
to enable the Guest Additions.
Installing graphics libraries and desktop services
..done.
Press Return to close this window...
```

You will now need to restart the OS. Click on this icon, then choose "Shut Down"

It will run for a few moments. When it prompts you to press Return, click in the Terminal and press enter.

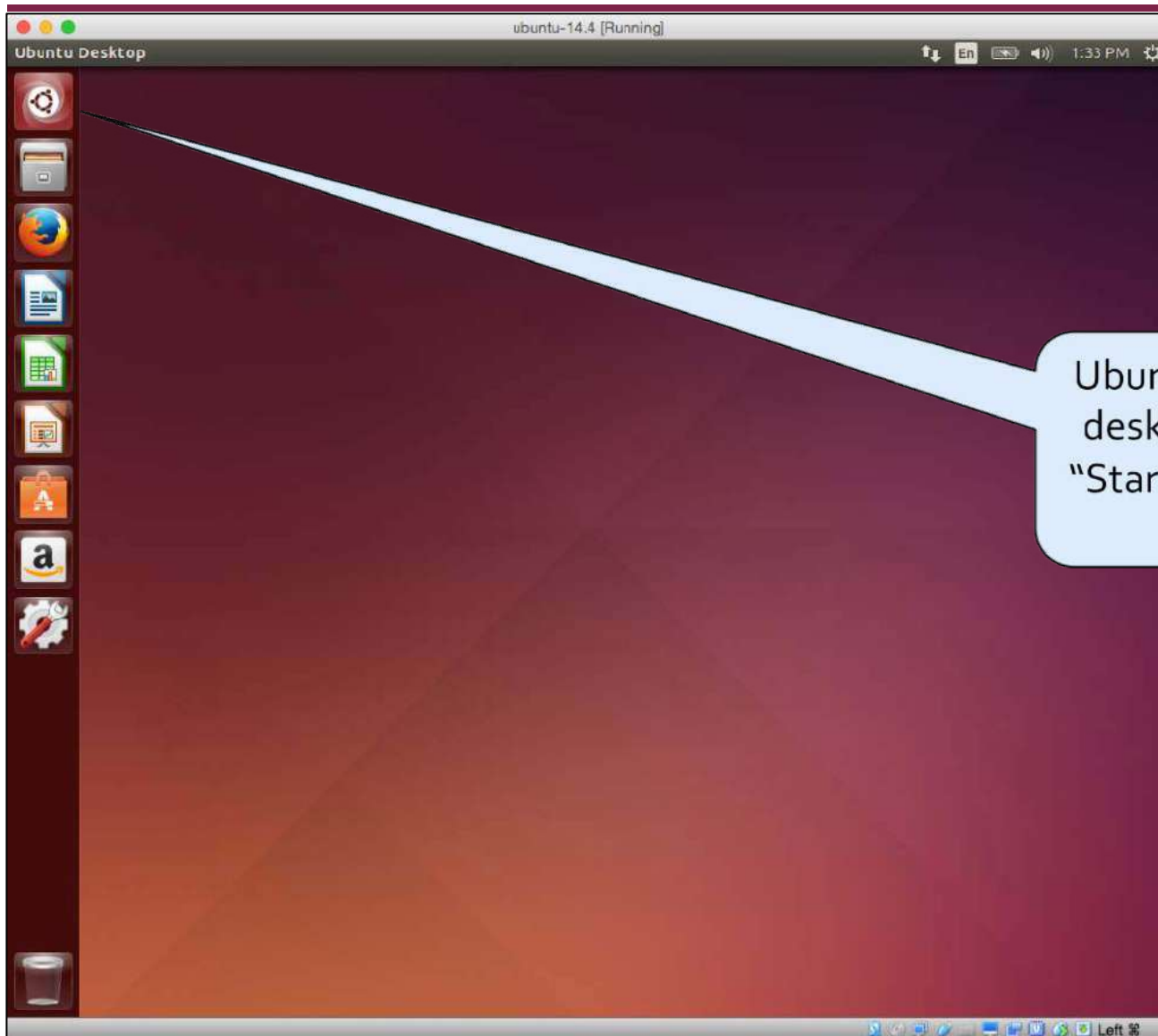
Other Useful Links

- VirtualBox Guest Additions Manual
 - <https://www.virtualbox.org/manual/ch04.html>
 - In particular take a look at the “Shared Folders” capability for an easy way to share files between the host machine and the virtual machine.



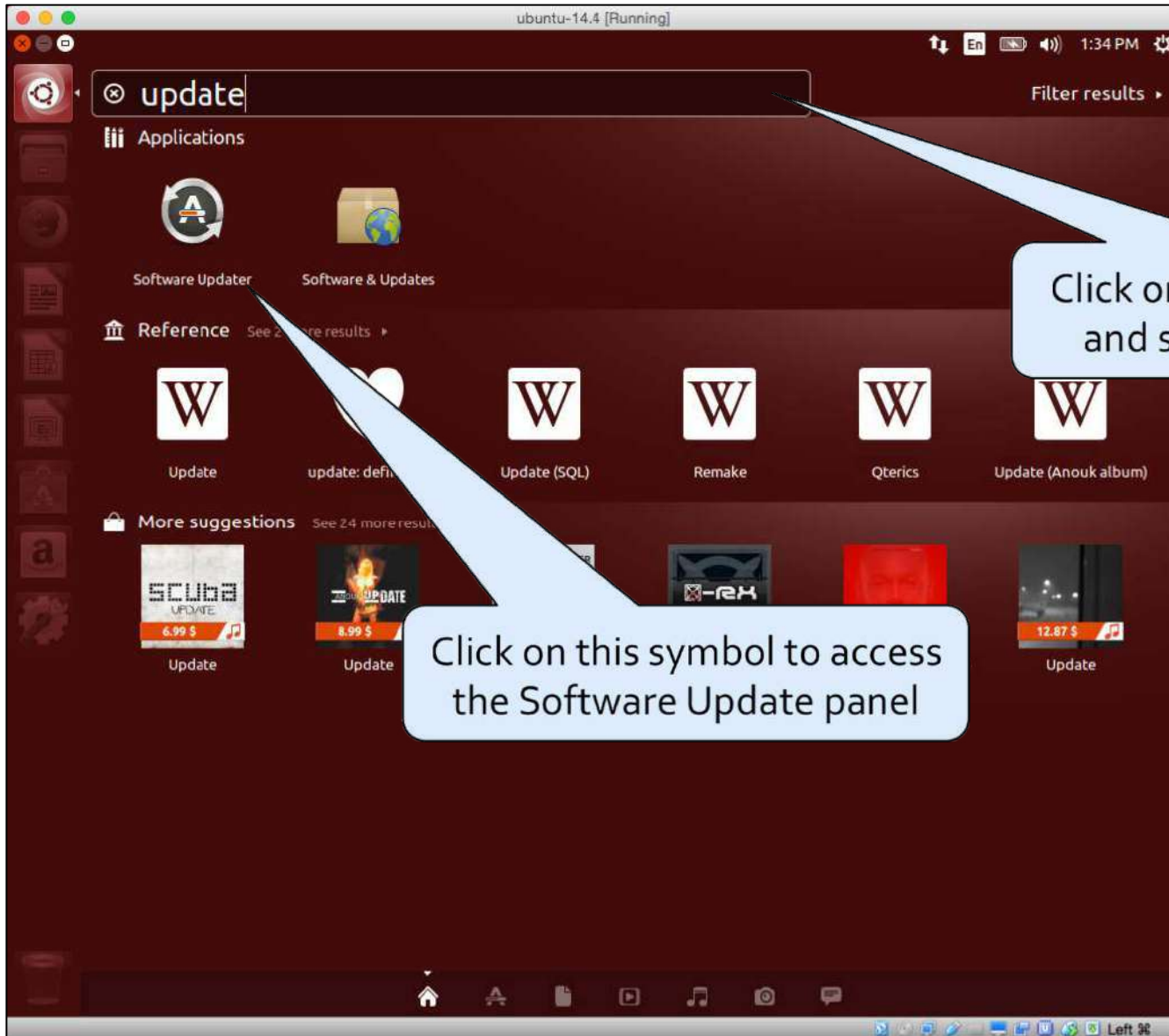
Setting up Ubuntu

1) Welcome!

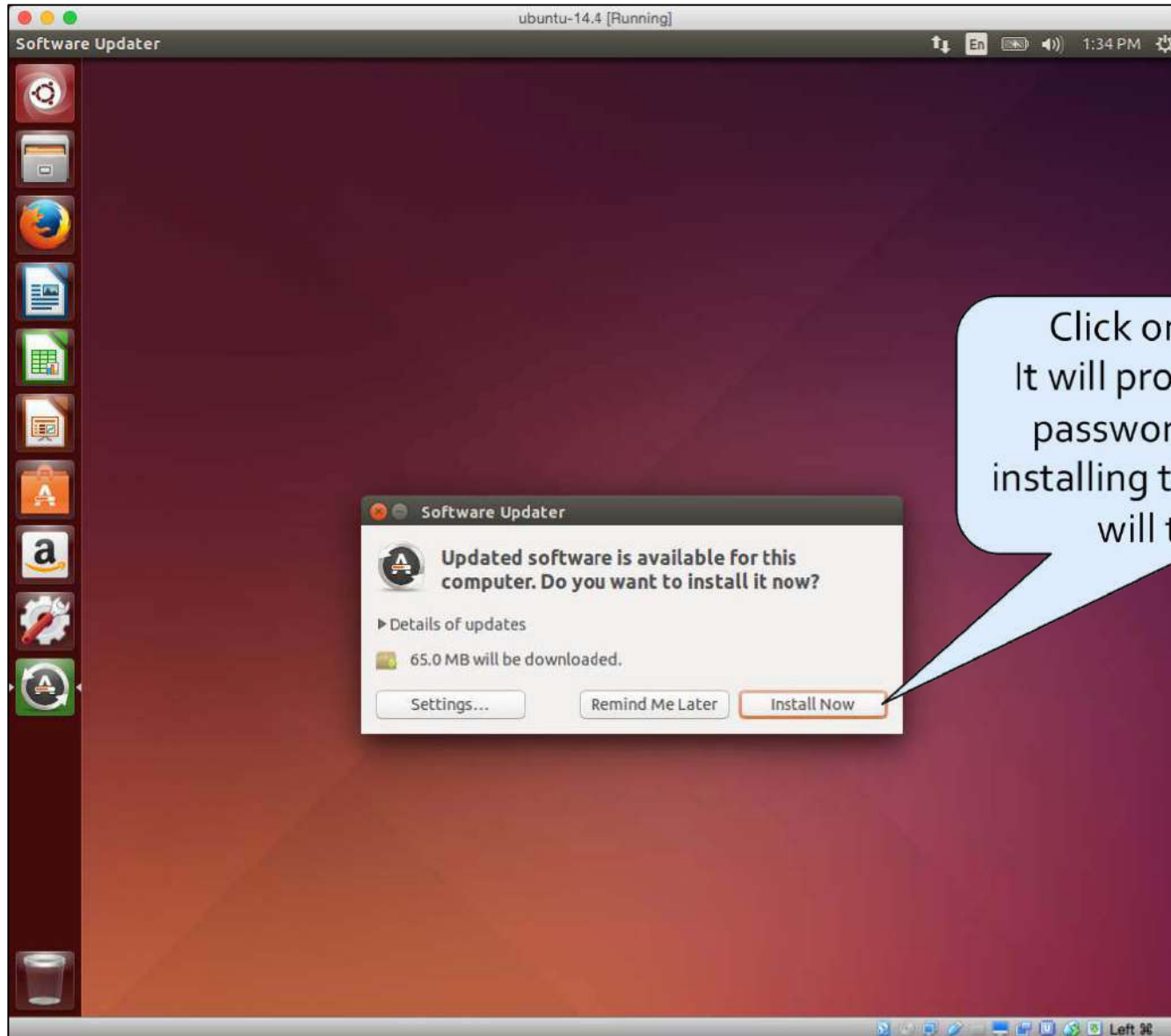


Ubuntu Boots into a familiar desktop type setting with a "Start"-like button at the top of the sidebar.

2) Software Update

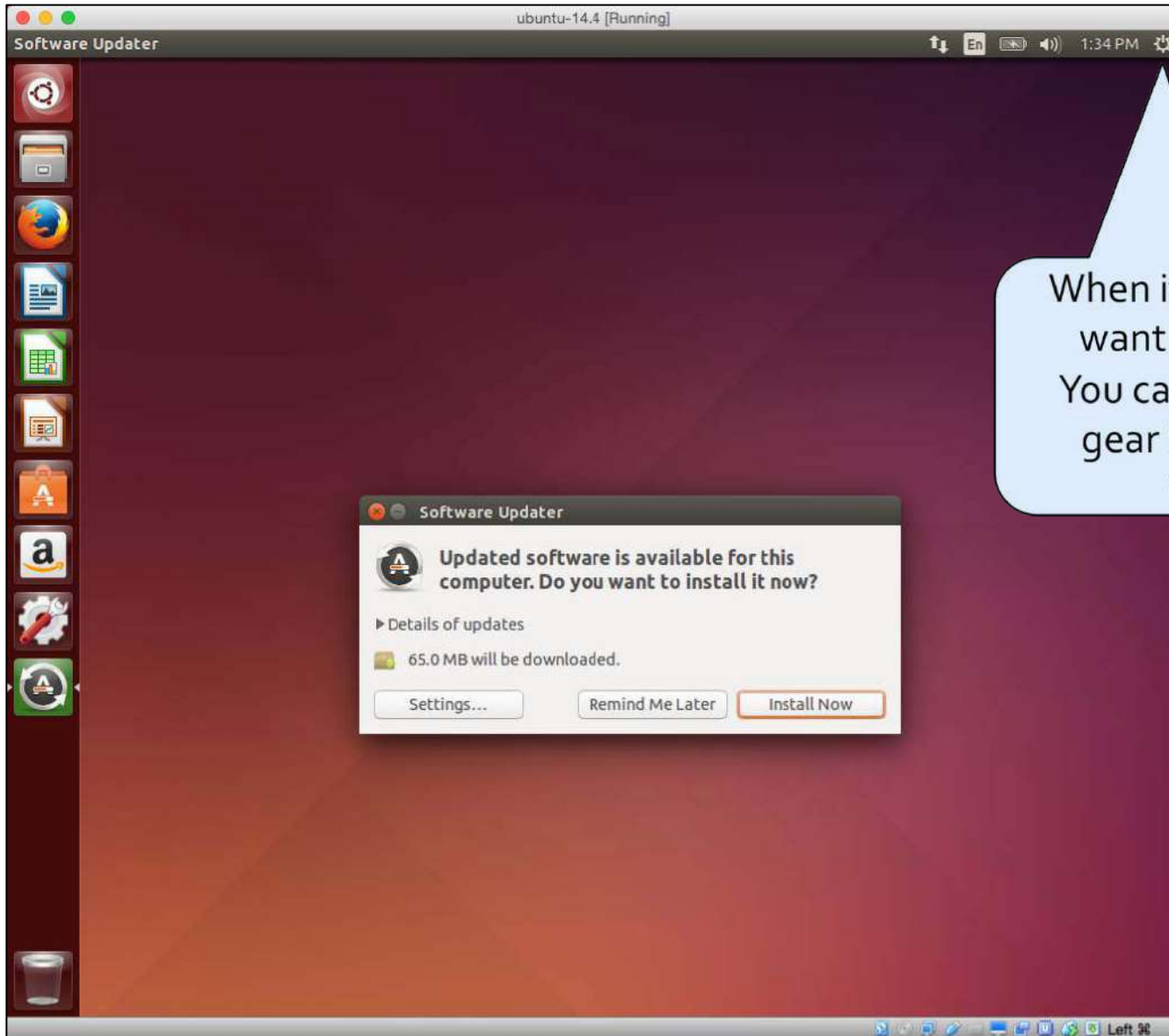


2) Software Update



Click on "Install Now"
It will prompt you for your
password, then work on
installing the updates, which
will take a while.

2) Software Update



When it is finished you will want to restart the OS. You can do that using the gear icon the choosing "Shut Down"

Troubleshooting

- **Problem:**

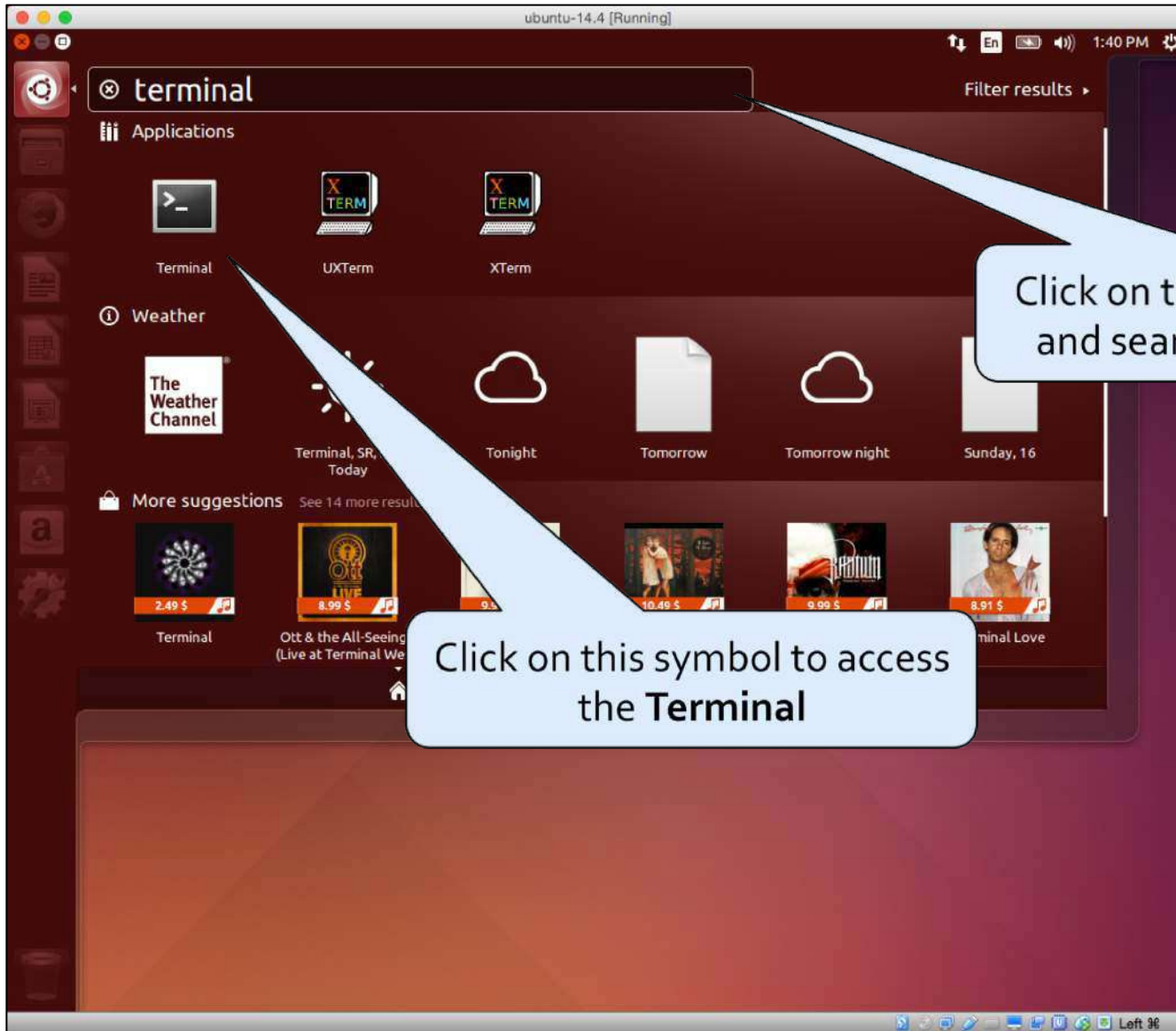
After installing updates in Ubuntu and restarting the screen does not resize any longer.

- **Solution:**

Try reinstalling the Guest Additions then rebooting.

- See the previous slides for more details.

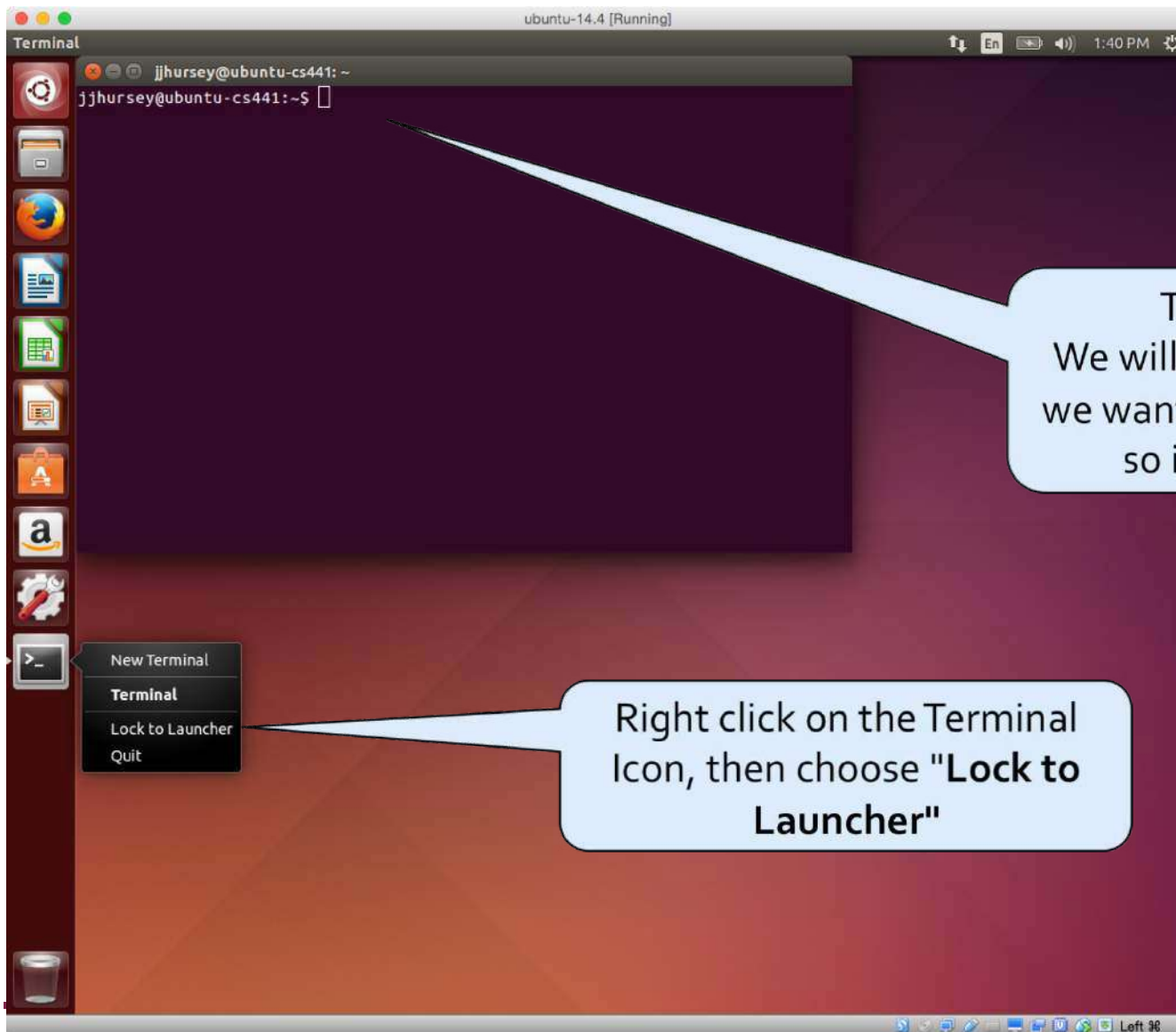
3) Find the Terminal



Click on the Ubuntu symbol,
and search for "Terminal"

Click on this symbol to access
the Terminal

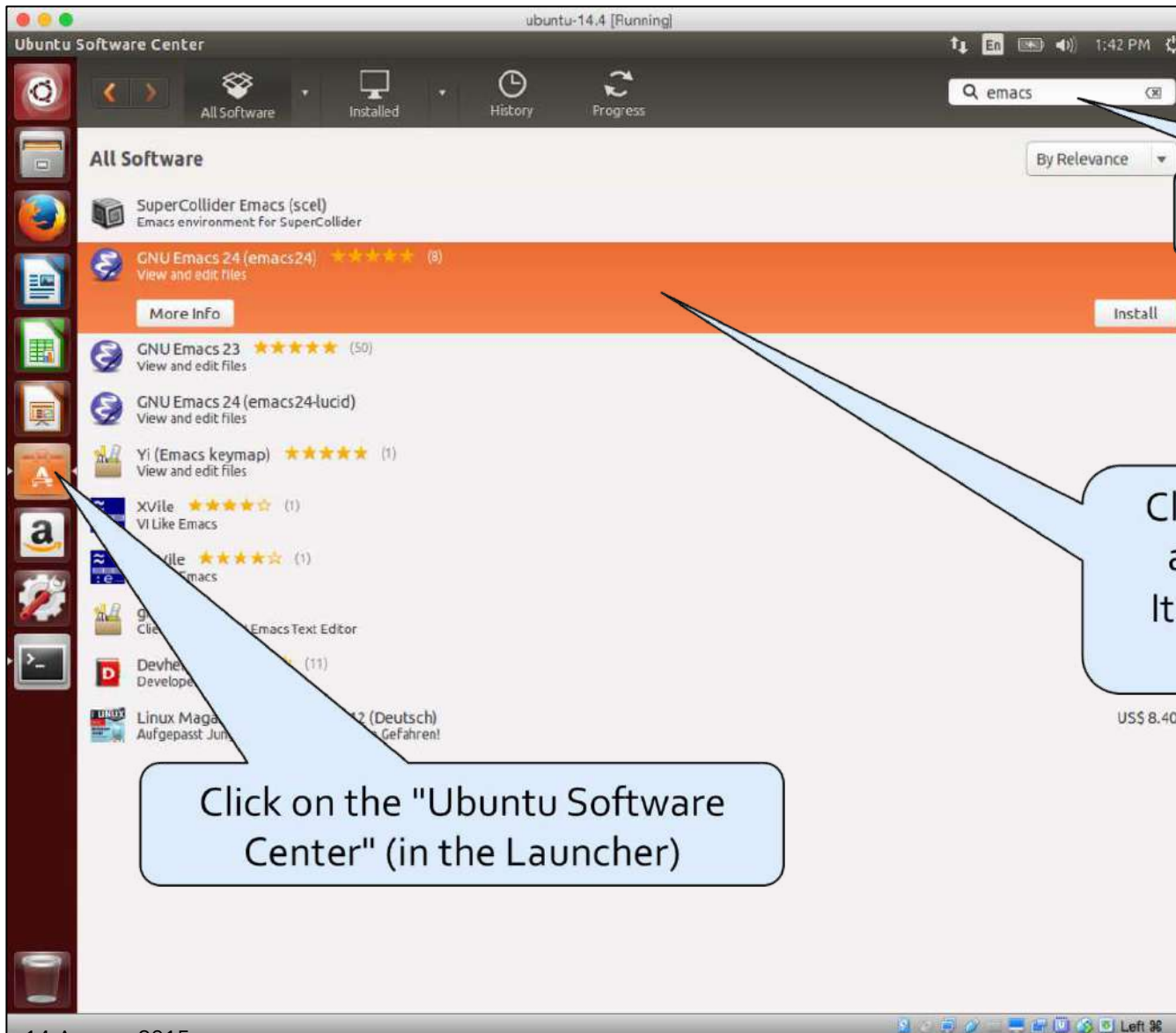
3) Find the Terminal



This is the terminal!
We will be using it quite a lot, so we want to **pin** it to the Launcher so it is easy to find later.

Right click on the Terminal icon, then choose "**Lock to Launcher**"

4) Install Emacs (your new favorite editor)

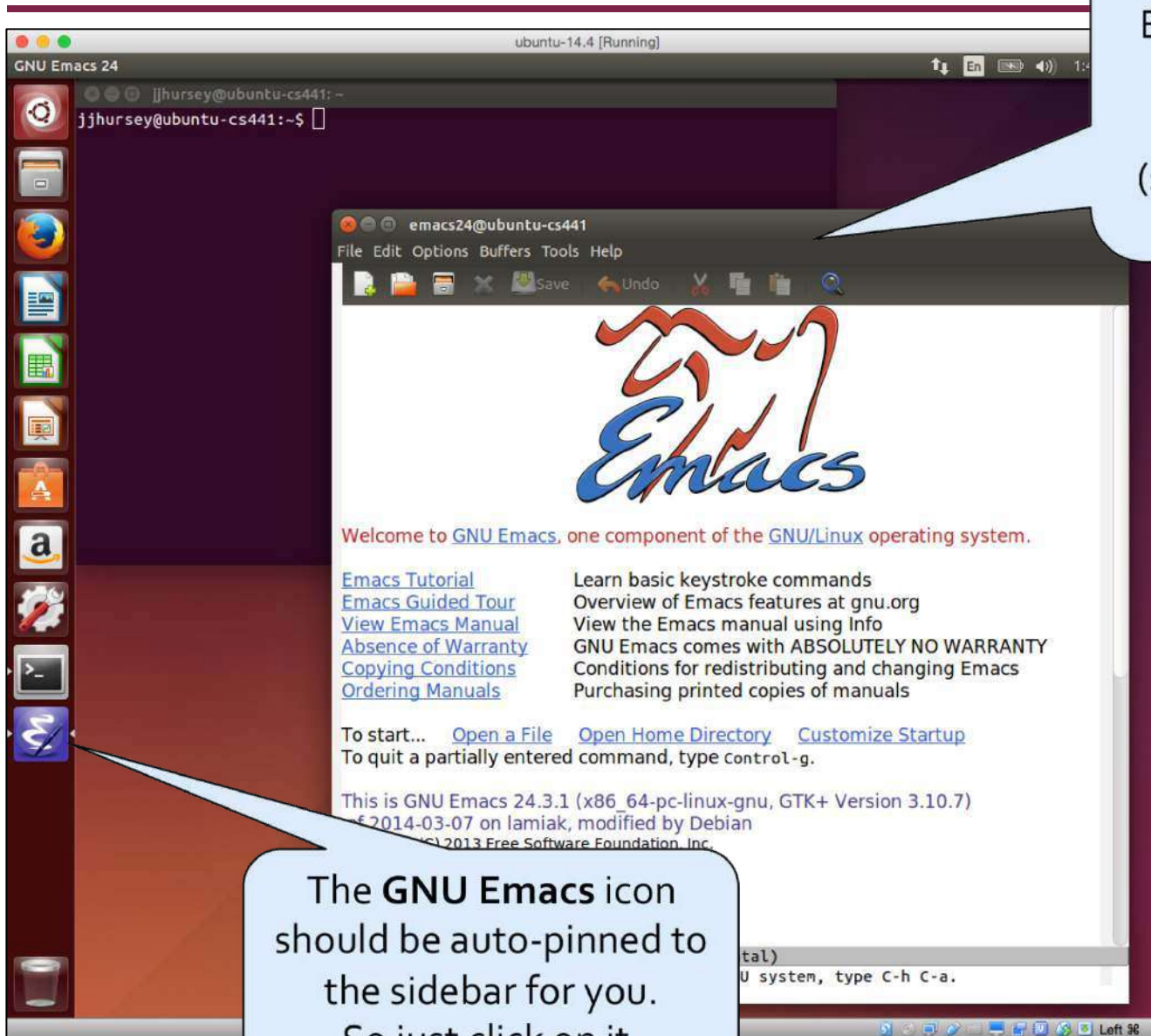


Search for "emacs"

Click on this package,
and choose **Install**.
It will prompt you for
your password.

Click on the "Ubuntu Software
Center" (in the Launcher)

5) Launch Emacs



This is Emacs!
Emacs is a widely used and versatile IDE. It just takes some getting used to. (see additional Tutorials for more information)

The **GNU Emacs** icon should be auto-pinned to the sidebar for you. So just click on it.

6) Install git & valgrind

These tools are not easily installed from the Software Center, so we will use the terminal to access the backend installed called apt-get

Terminal

```
jjhursey@ubuntu-cs441:~$ sudo apt-get -y install git valgrind
```

Run the following commands in the terminal. One at a time. They may prompt you for your password (note that nothing will appear as you type your password).

```
sudo apt-get update
sudo apt-get -y upgrade
sudo apt-get -y install git valgrind
```

Launch the Terminal.



All Done

This one time setup is finished!

Other Useful Links

- Desktop Ubuntu manual
 - <https://help.ubuntu.com/14.04/ubuntu-help/index.html>