

Lecture 4

408/508 Computational Techniques for Linguists


Today's Topic

- We're gonna need the Terminal
 - but we don't want our mistakes to kill the machine
 - can run stuff inside a guest **Operating System**, or be very careful
 - Example: `rm -rf *`
- Homework 2:
 - for Windows 10/11 users, install [Microsoft WSL2](#)
 - for Apple Intel users, install [VirtualBox](#) (or use existing Terminal)
 - for Apple Silicon users, install [Multipass](#) (or use existing Terminal)
 - for Linux users, do nothing

WSL2

- Windows Subsystem for Linux
 - <https://docs.microsoft.com/en-us/windows/wsl/>

Windows Subsystem for Linux Documentation

07/22/2020 • 2 minutes to read • 

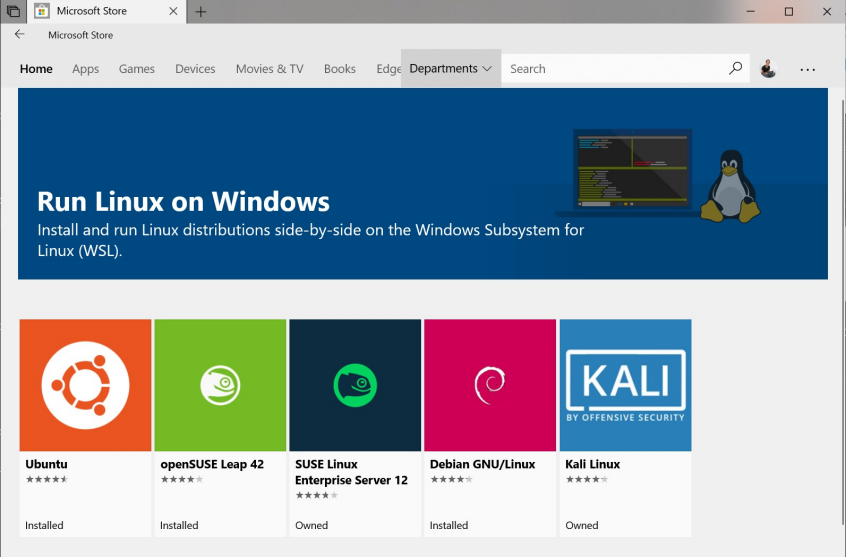
The Windows Subsystem for Linux lets developers run a GNU/Linux environment -- including most command-line tools, utilities, and applications -- directly on Windows, unmodified, without the overhead of a traditional virtual machine or dualboot setup.

Learn more here

- [What is the Windows Subsystem for Linux?](#)
- [What's new with WSL 2?](#)
- [Compare WSL 2 and WSL 1](#)
- [Read frequently asked questions](#)

Get started

- [Install WSL1](#)
- [Update to WSL2](#)



The screenshot shows the Microsoft Store interface with a search for Linux distributions. The main banner reads "Run Linux on Windows" and "Install and run Linux distributions side-by-side on the Windows Subsystem for Linux (WSL)". Below the banner, five Linux distributions are listed with their logos, names, ratings, and installation status:

Distribution	Rating	Status
Ubuntu	★★★★★	Installed
openSUSE Leap 42	★★★★☆	Installed
SUSE Linux Enterprise Server 12	★★★★☆	Owned
Debian GNU/Linux	★★★★☆	Installed
Kali Linux	★★★★★	Owned

WSL2

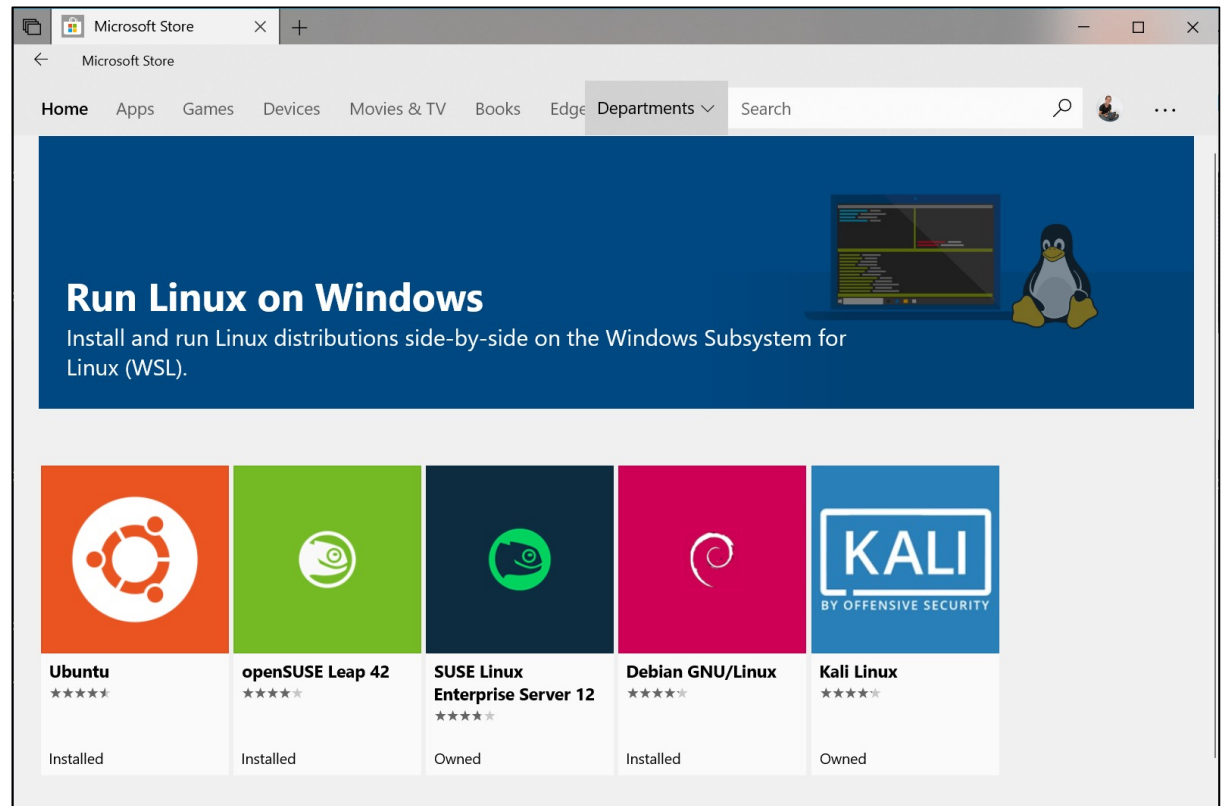
- Consider installing WSL2 (Windows Subsystem for Linux 2)
 - <https://learn.microsoft.com/en-us/windows/wsl/>
- Why?
 - gives you a Bash shell (*with quoting consistent with the lecture slides*)
 - (*simultaneously*) use Linux under Windows 10/11 (not dual-booting)
 - can access your Windows C: drive via directory /mnt/c

Get started

- Install WSL
- Install Linux on Windows Server
- Manual install steps
- Best practices for setting up a WSL development environment

WSL2

*I installed
Ubuntu*



Ubuntu

Installing, this may take a few minutes...

Please create a default UNIX user account. The username does not need to match your Windows username.

For more information visit: <https://aka.ms/wslusers>

Enter new UNIX username:

WSL2

sandiway@DESKTOP-VEPP64Q: ~

Retype new password:

passwd: password updated successfully

Installation successful!

To run a command as administrator (user "root"), use "sudo <command>".

See "man sudo_root" for details.

Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.10.16.3-microsoft-standard-WSL2 x86_64)

- * Documentation: <https://help.ubuntu.com>
- * Management: <https://landscape.canonical.com>
- * Support: <https://ubuntu.com/advantage>

System information as of Fri Sep 10 10:01:52 MST 2021

System load:	0.13	Processes:	8
Usage of /:	0.5% of 250.98GB	Users logged in:	0
Memory usage:	0%	IPv4 address for eth0:	172.24.13.136
Swap usage:	0%		

1 update can be applied immediately.

To see these additional updates run: apt list --upgradable

The list of available updates is more than a week old.

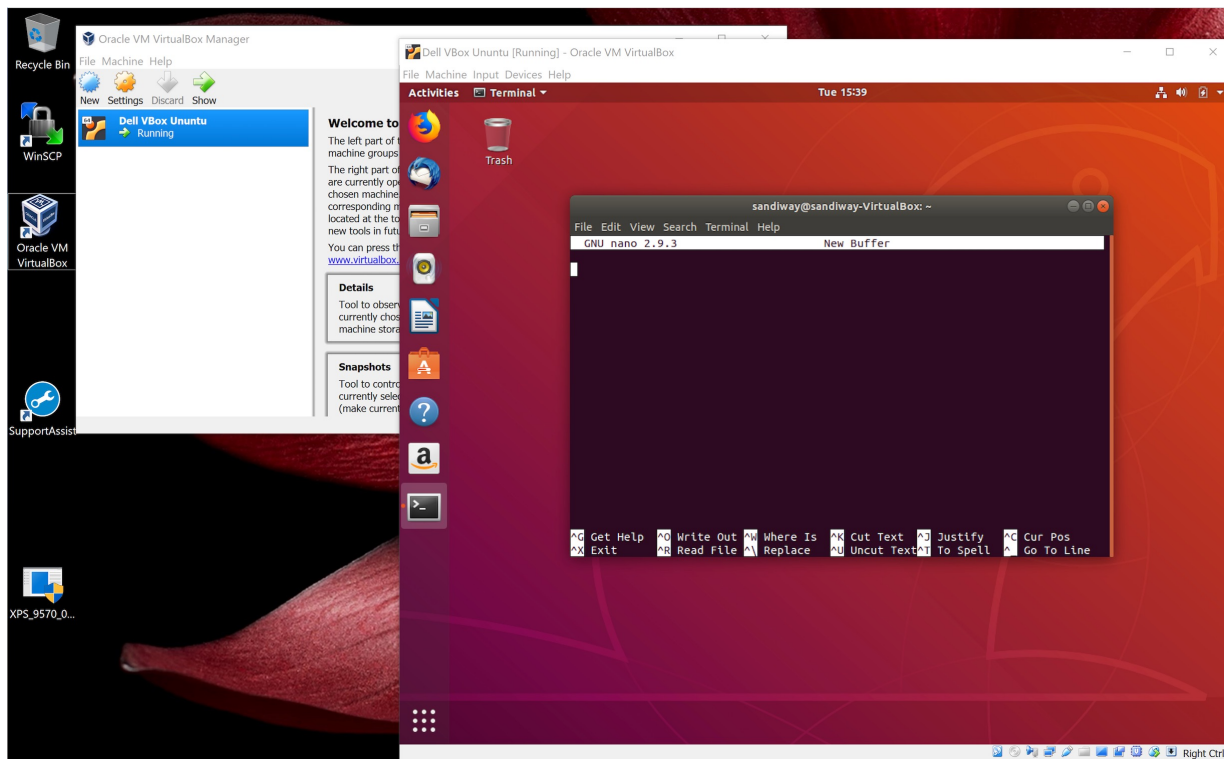
To check for new updates run: sudo apt update

This message is shown once a day. To disable it please create the
/home/sandiway/.hushlogin file.

sandiway@DESKTOP-VEPP64Q:~\$

WSL2

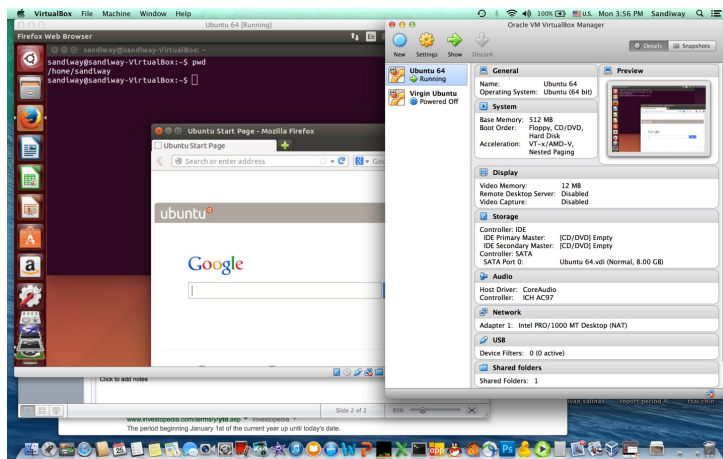
Ubuntu Text Editor: nano



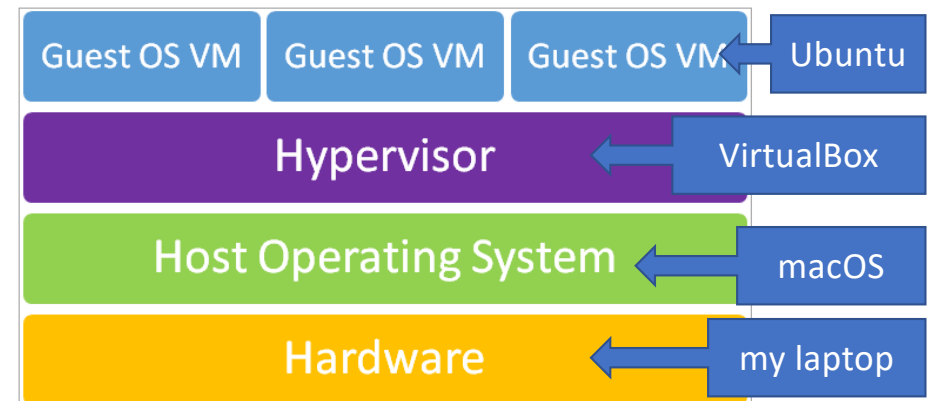
- **Text editor (built in)**
 - nano is a decent one for (use inside Terminal)
 - You might prefer it, but I can't stand vi
 - can install others via
 - `sudo apt-get install`
- or
 - `sudo apt install`

VirtualBox

- permits the use of Guest Operating Systems (OS) in your computer
 - for x86 Intel/AMD **only**: virtual x86 machine(s)
 - they're *sandboxed*
 - install an OS running inside a window, we'll install Ubuntu (Linux) as a Guest OS



Type 2 Hypervisor



VirtualBox

- Free application at <https://www.virtualbox.org>
- Install VirtualBox on your x86 laptop:

Welcome to VirtualBox.org!

VirtualBox is a powerful x86 and AMD64/Intel64 [virtualization](#) product for enterprise as well as home use. Not only is VirtualBox an extremely feature rich, high performance product for enterprise customers, it is also the only professional solution that is freely available as Open Source Software under the terms of the GNU General Public License (GPL) version 3. See "[About VirtualBox](#)" for an introduction.

Presently, VirtualBox runs on Windows, Linux, macOS, and Solaris hosts and supports a large number of [guest operating systems](#) including but not limited to Windows (NT 4.0, 2000, XP, Server 2003, Vista, Windows 7, Windows 8, Windows 10), DOS/Windows 3.x, Linux (2.4, 2.6, 3.x and 4.x), Solaris and OpenSolaris, OS/2, and OpenBSD.

VirtualBox is being actively developed with frequent releases and has an ever growing list of features, supported guest operating systems and platforms it runs on. VirtualBox is a community effort backed by a dedicated company: everyone is encouraged to contribute while Oracle ensures the product always meets professional quality criteria.



VirtualBox 7.0.10 platform packages

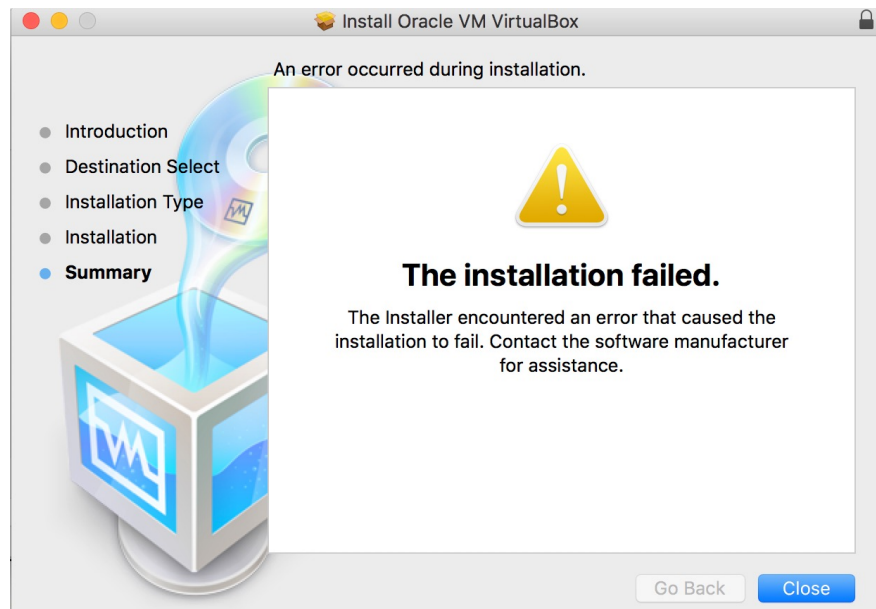
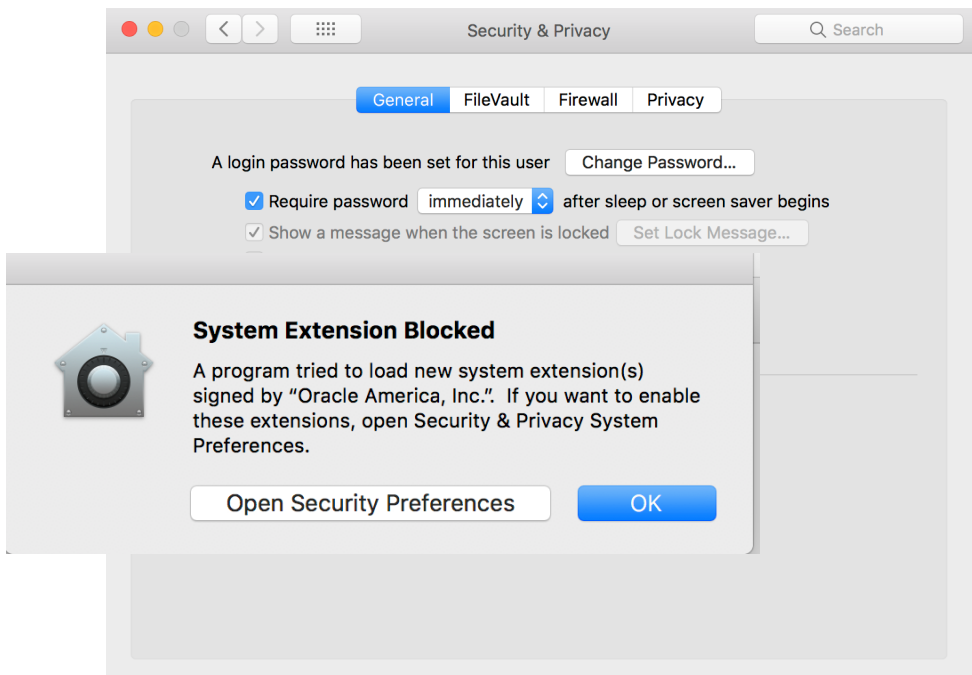
- [Windows hosts](#)
- [macOS / Intel hosts](#)
- [Linux distributions](#)
- [Solaris hosts](#)
- [Solaris 11 IPS hosts](#)

The binaries are released under the terms of the GPL version 3.

Installing VirtualBox

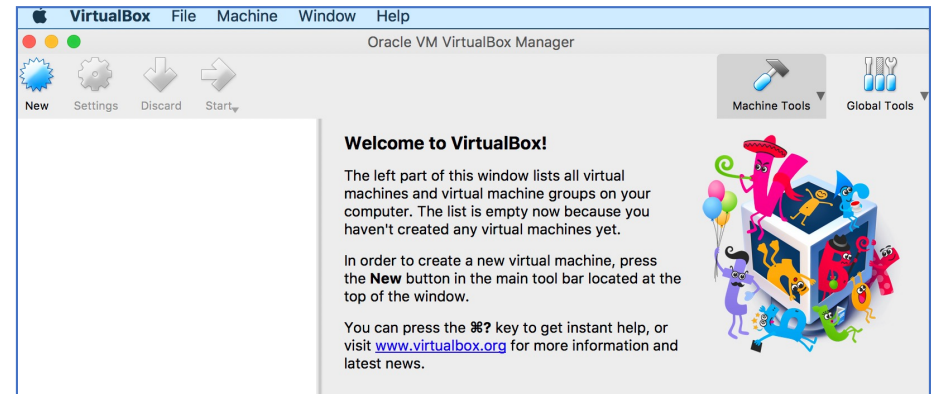
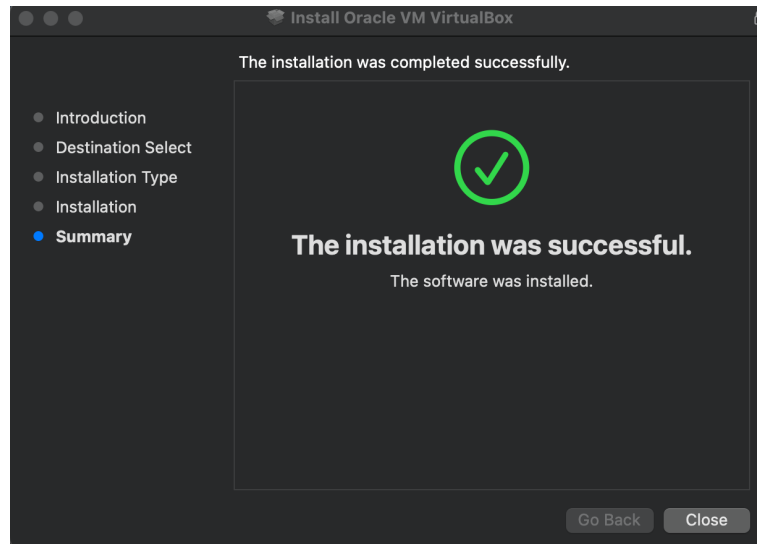


Installing VirtualBox



Installing VirtualBox

- Re-run installer after giving Oracle Computer permission

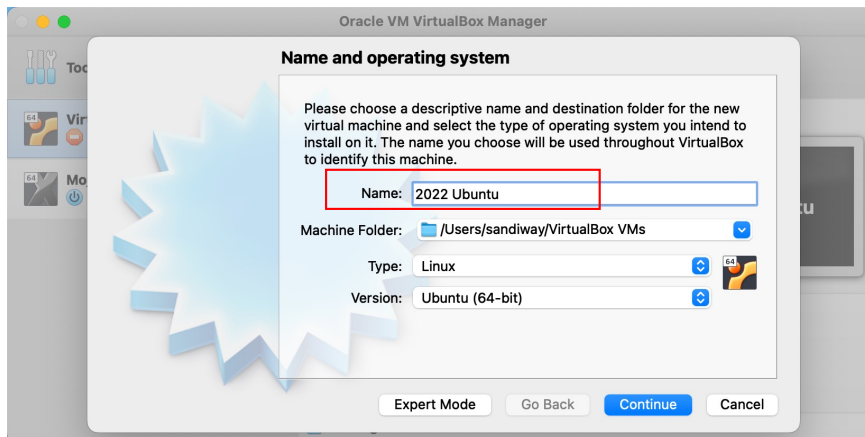


Read

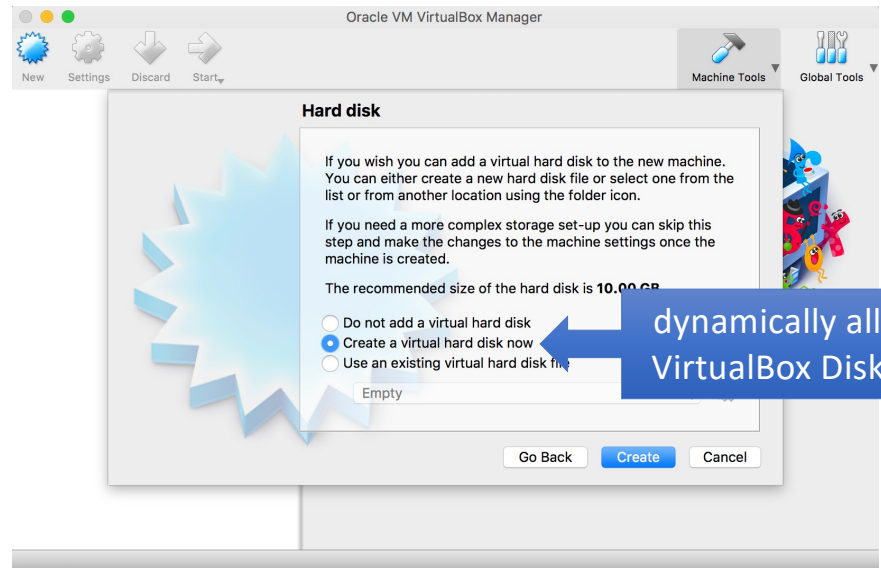
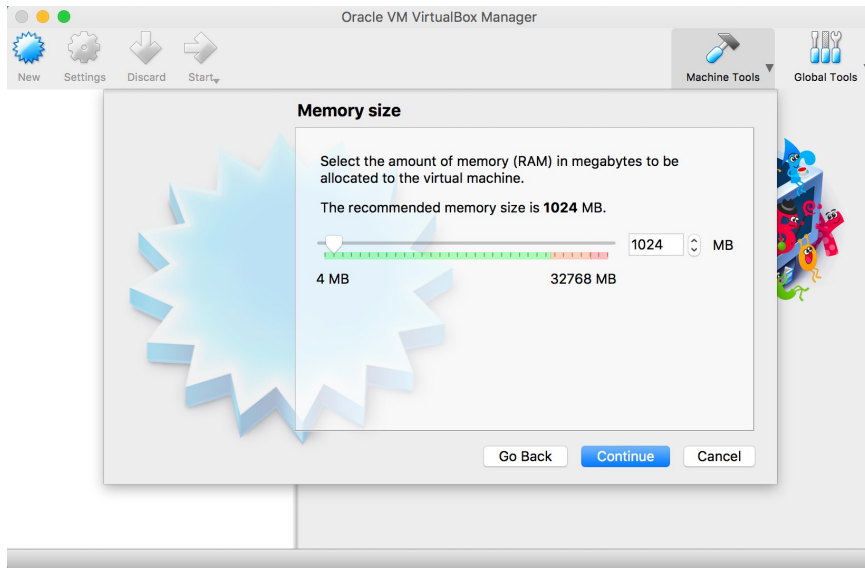
<https://www.virtualbox.org/manual/ch01.html#idm272>

Start VirtualBox, select New

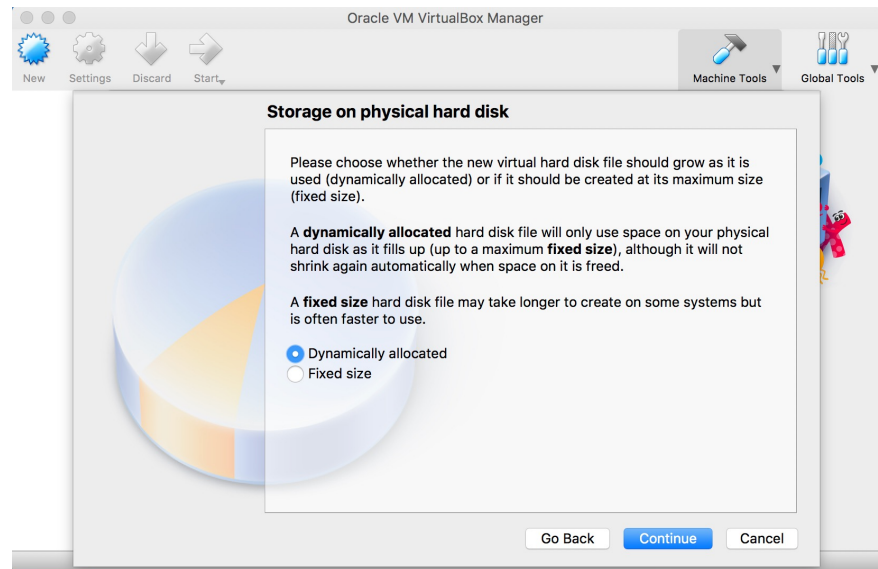
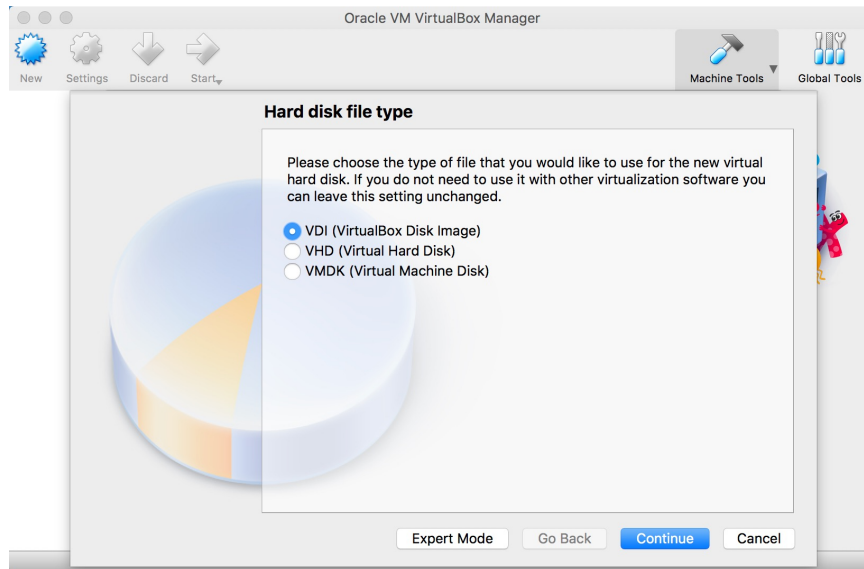
- Note:
 - choosing the name with Ubuntu in it auto-fills the Type/Version



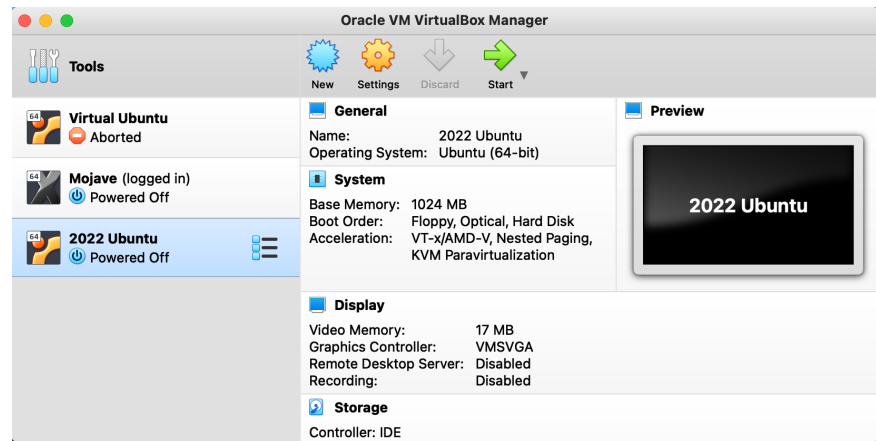
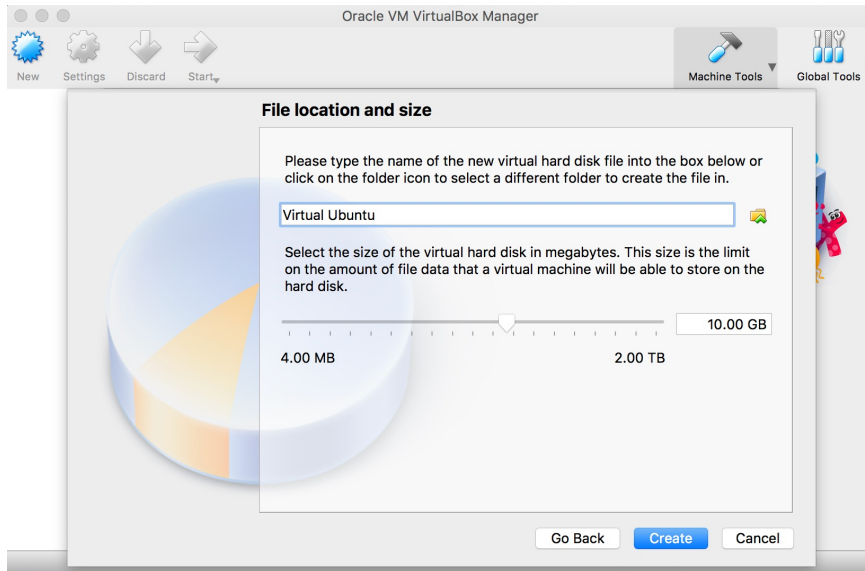
Virtual Machine Parameters



Virtual Machine Parameters

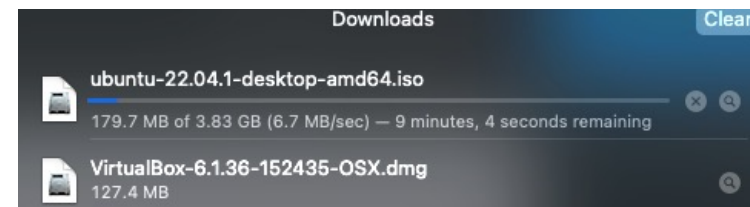


Virtual Machine Parameters



Ubuntu ISO Image

- Now we need a guest operating system: we'll use the latest version of Ubuntu (Linux) LTS (*Long Term Support*).
- <https://ubuntu.com/download>



The .iso file is a BIG download!
It's a special file that is a virtual cd
ISO images:

- Macs can mount ISO images.
- Macs can't boot off a multitrack ISO image
- some versions of Windows can't mount an ISO image
- (without extra software).
- Install Microsoft's Virtual CD-ROM Control Panel.

VirtualBox

Oracle VM VirtualBox Manager

Start your virtual machine (double-click or Start)

Tools

New Settings Discard Start

Mojave (logged in) Powered Off

2022 Ubuntu Powered

General

Name: 2022 Ubuntu
Operating System: Ubuntu (64-bit)

Display

Video Memory: 17 MB
Graphics Controller: VMSVGA
Remote Desktop Server: Disabled
Recording: Disabled

Storage

Controller: IDE

Creating process for virtual machine "2022 Ubuntu" (GUI/Qt) ...

Add Create Refresh

Name	Virtual Size
APFS EFI Boot Image.iso	1.00 MB
darwin.iso	3.25 MB
Mojave.iso	--
ubuntu-22.04.1-desktop-amd64.iso	3.56 GB
VBoxGuestAdditions.iso	60.85 MB

Search By Name

Leave Empty Cancel Choose

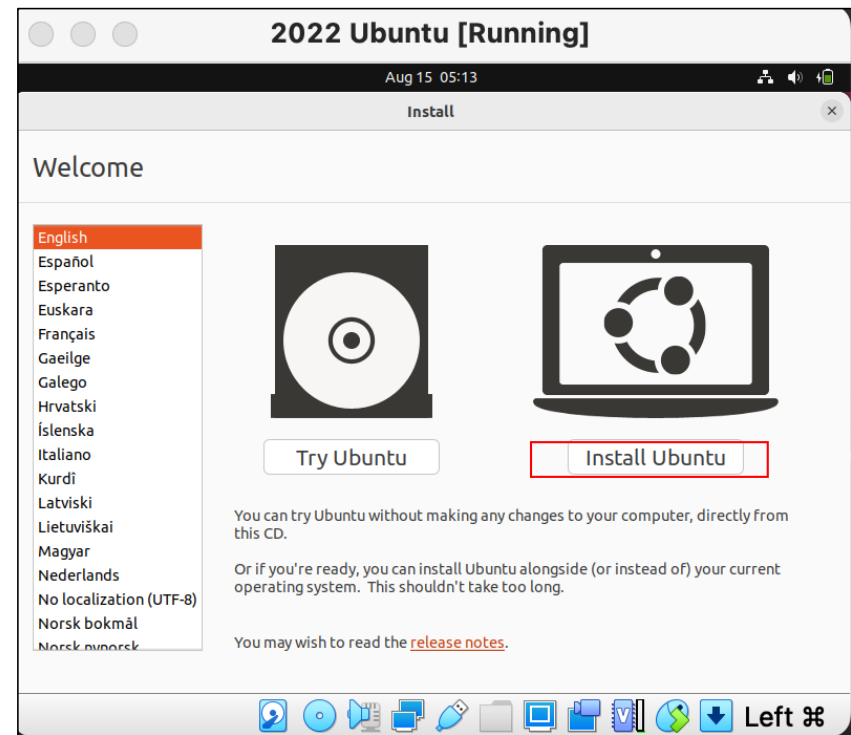
Please select a virtual optical disk file or a physical optical drive containing a disk to start your new virtual machine from.

The disk should be suitable for starting a computer from and should contain the operating system you wish to install on the virtual machine if you want to do that now. The disk will be ejected from the virtual drive automatically next time you switch the virtual machine off, but you can also do this yourself if needed using the Devices menu.

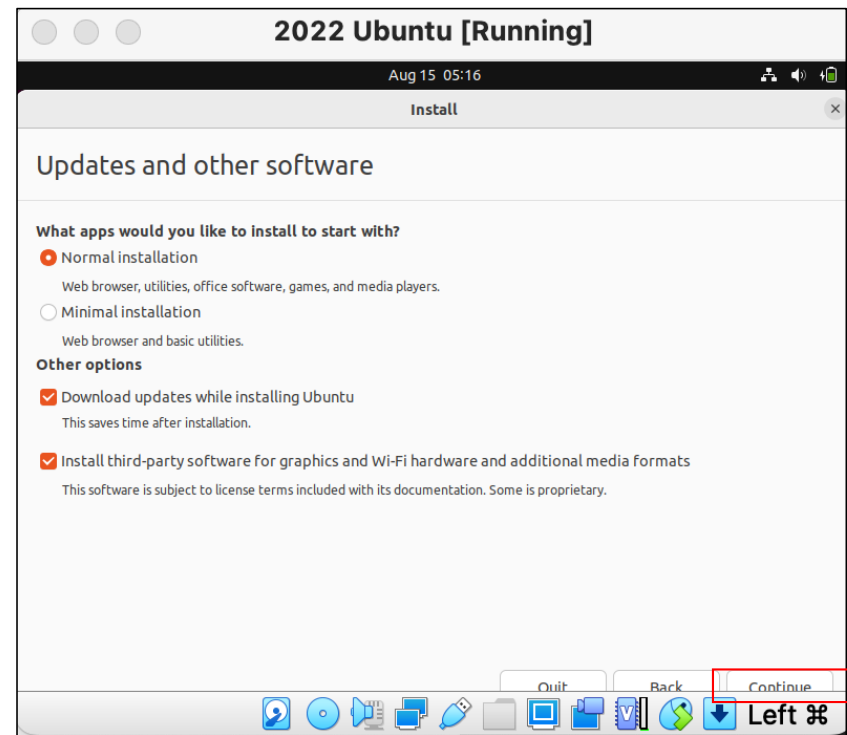
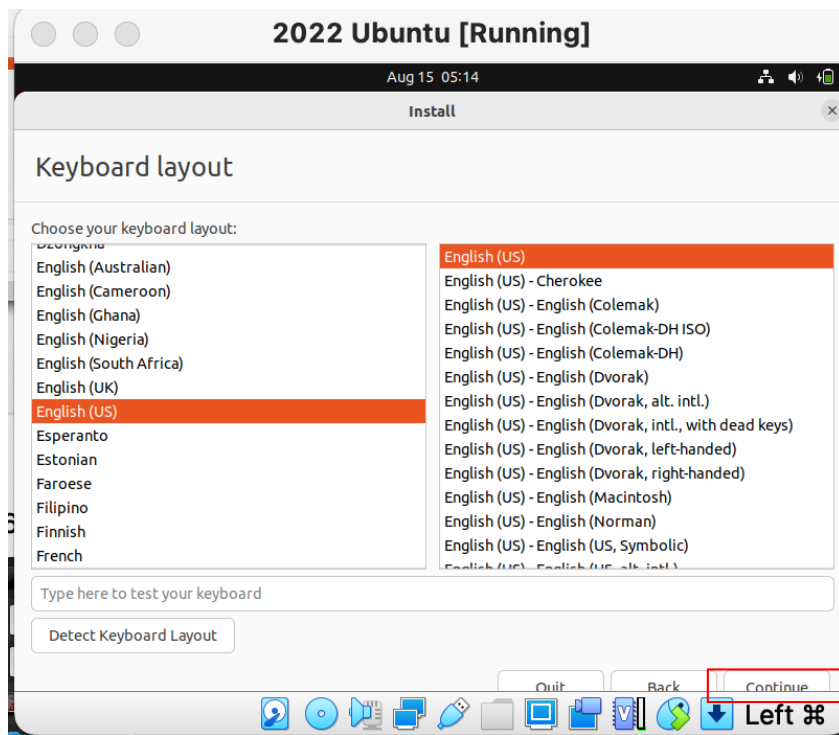
Mojave.iso (Inaccessible)

Go Back Start Cancel

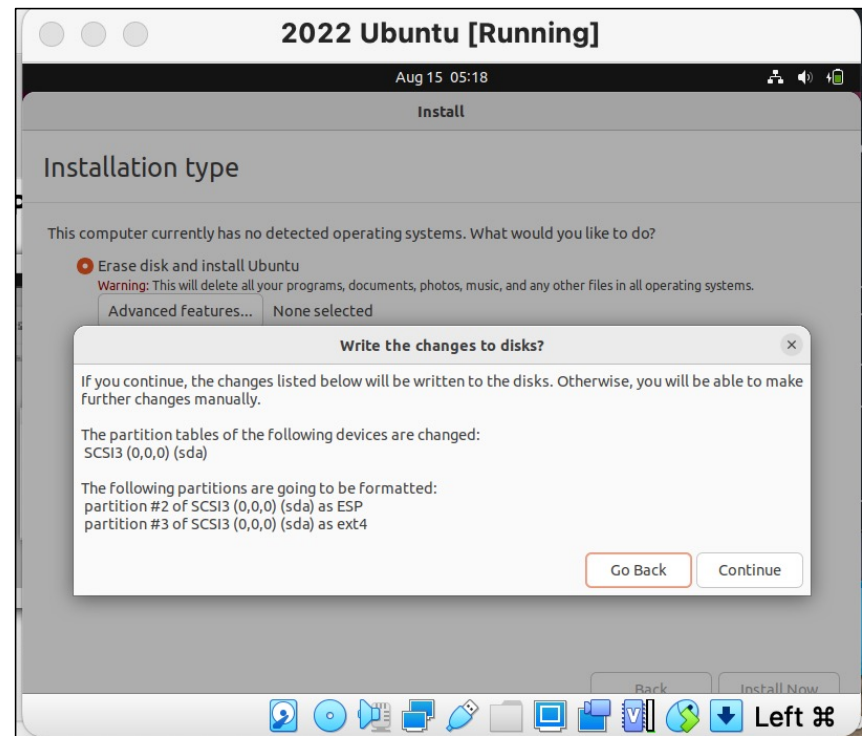
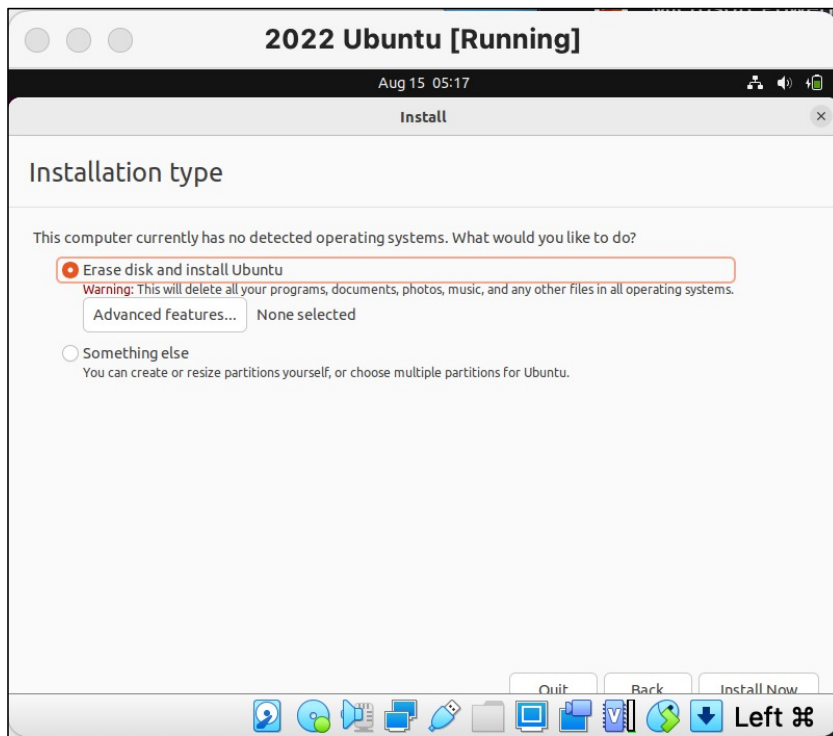
VirtualBox: installing Ubuntu



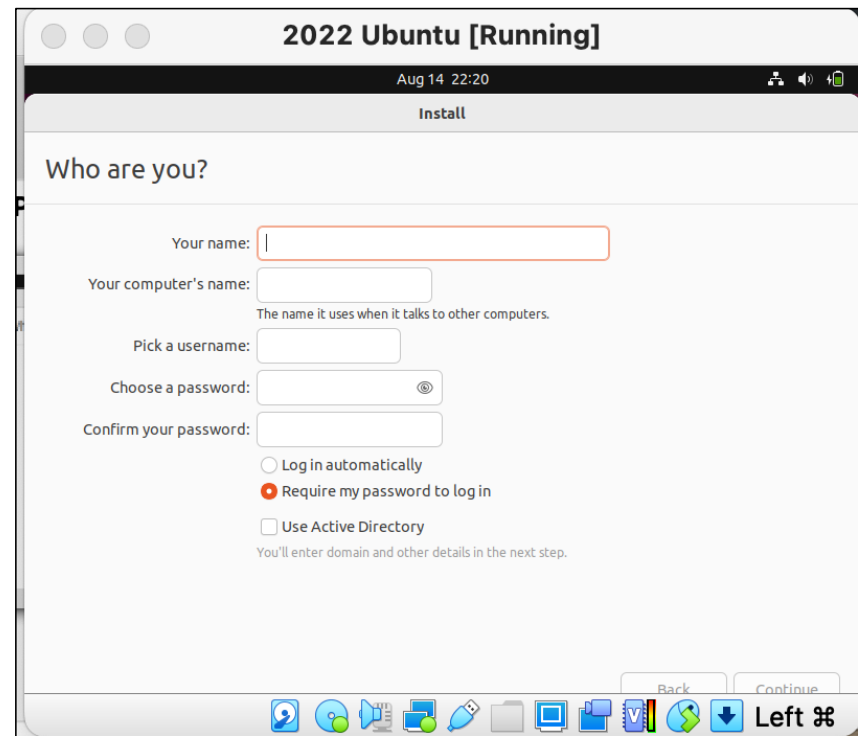
VirtualBox: installing Ubuntu



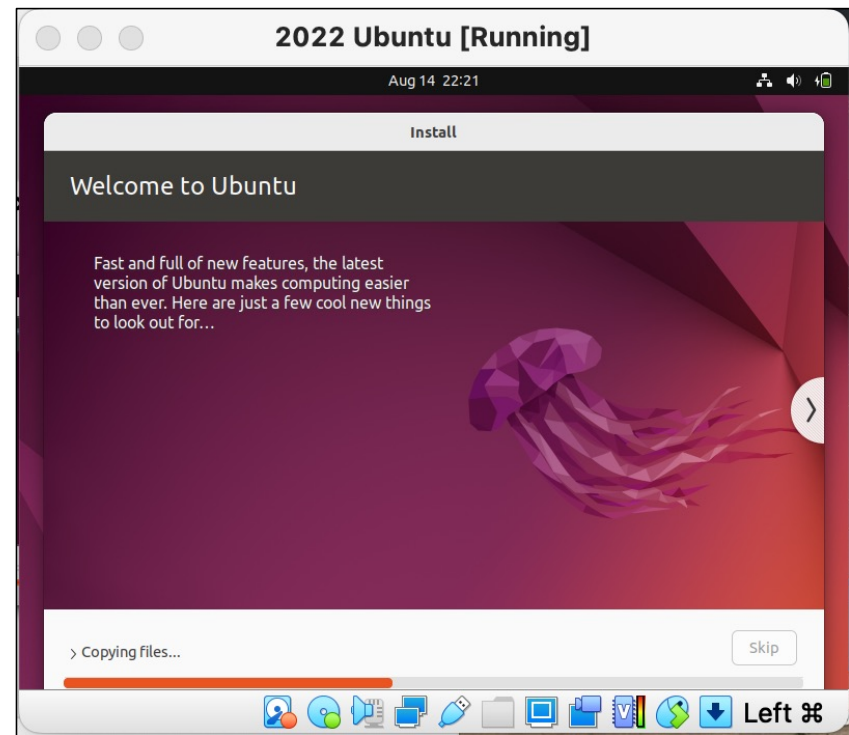
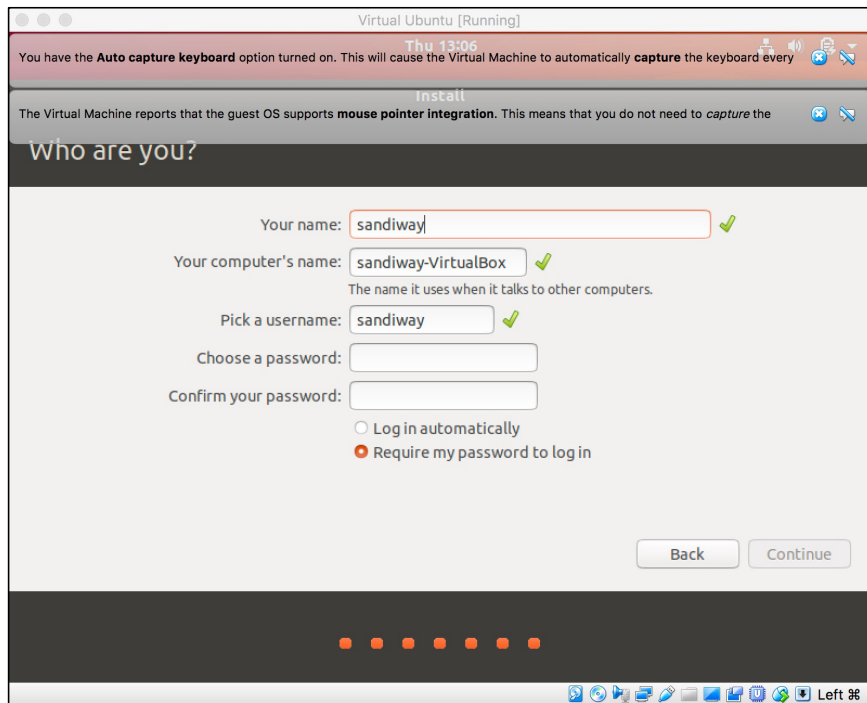
VirtualBox: installing Ubuntu



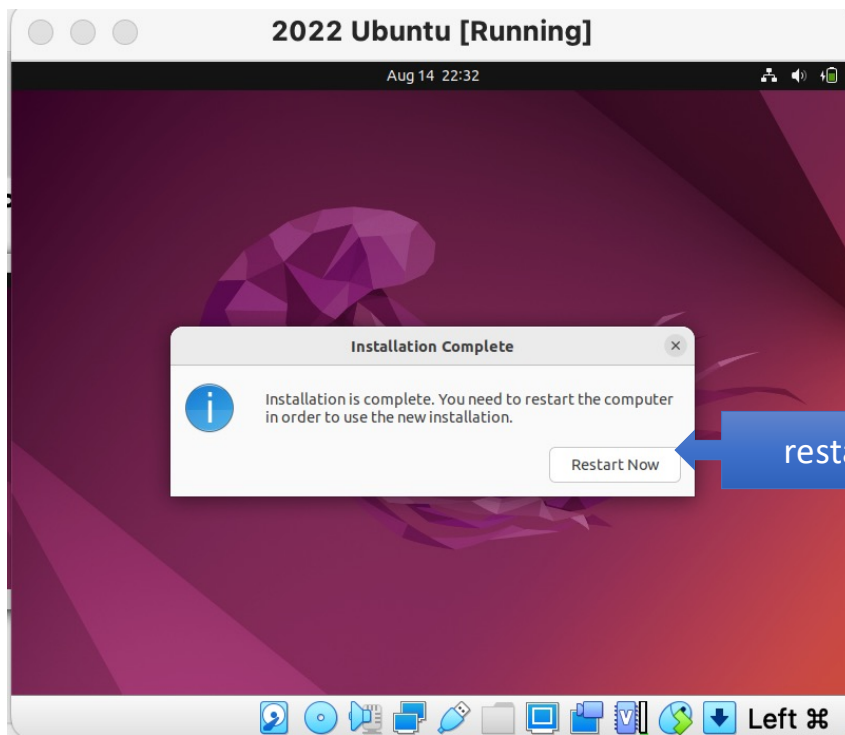
VirtualBox: installing Ubuntu



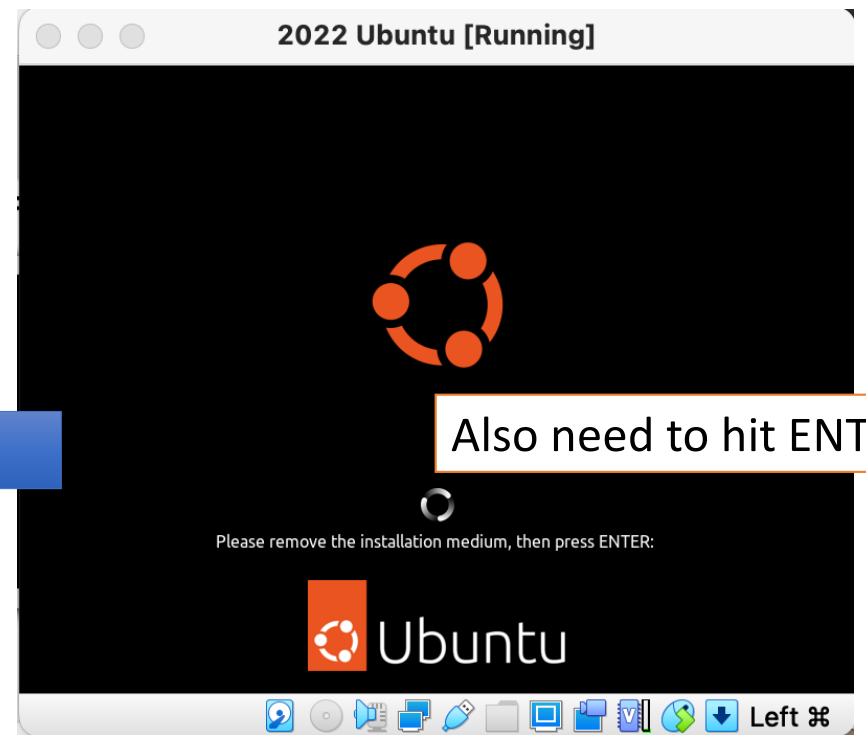
VirtualBox: installing Ubuntu



VirtualBox: installing Ubuntu

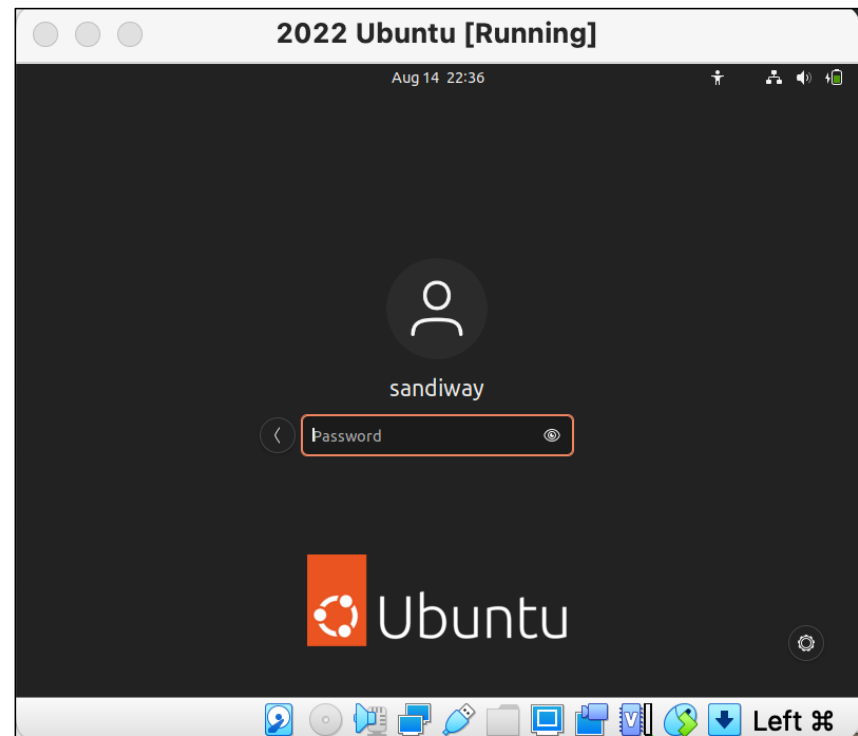
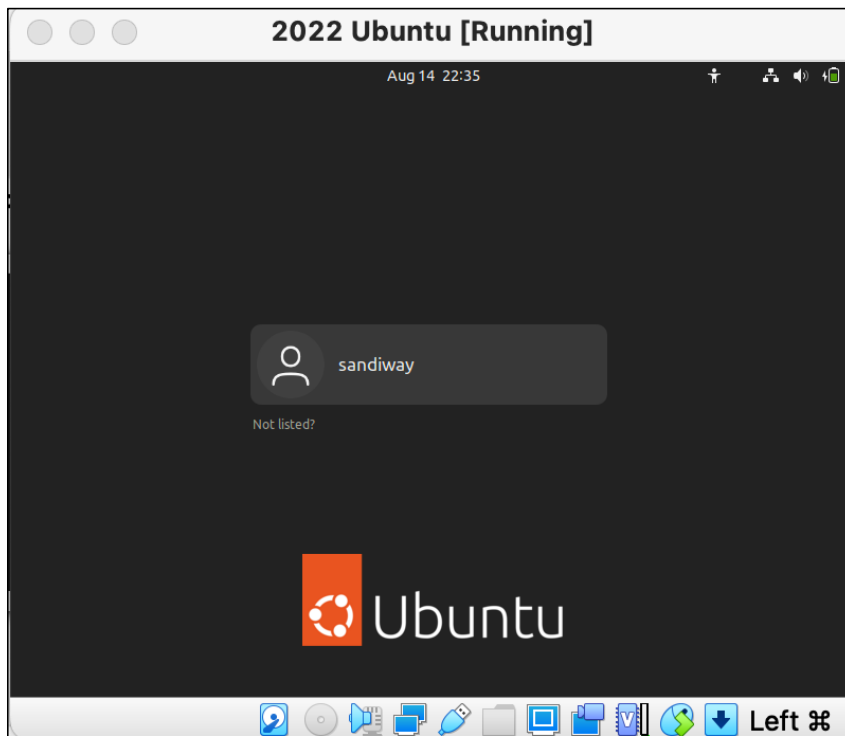


restart

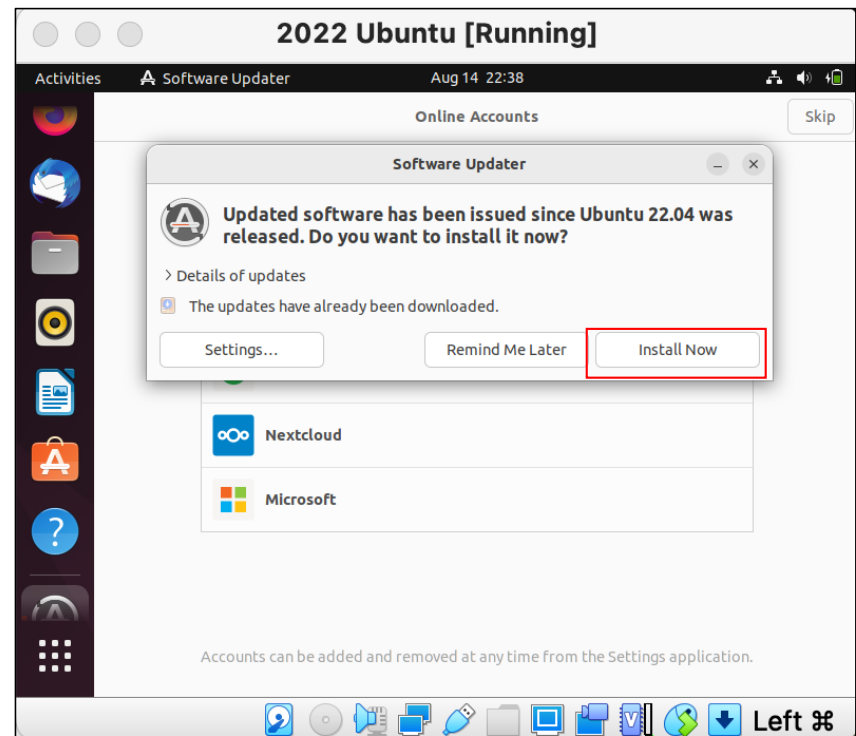
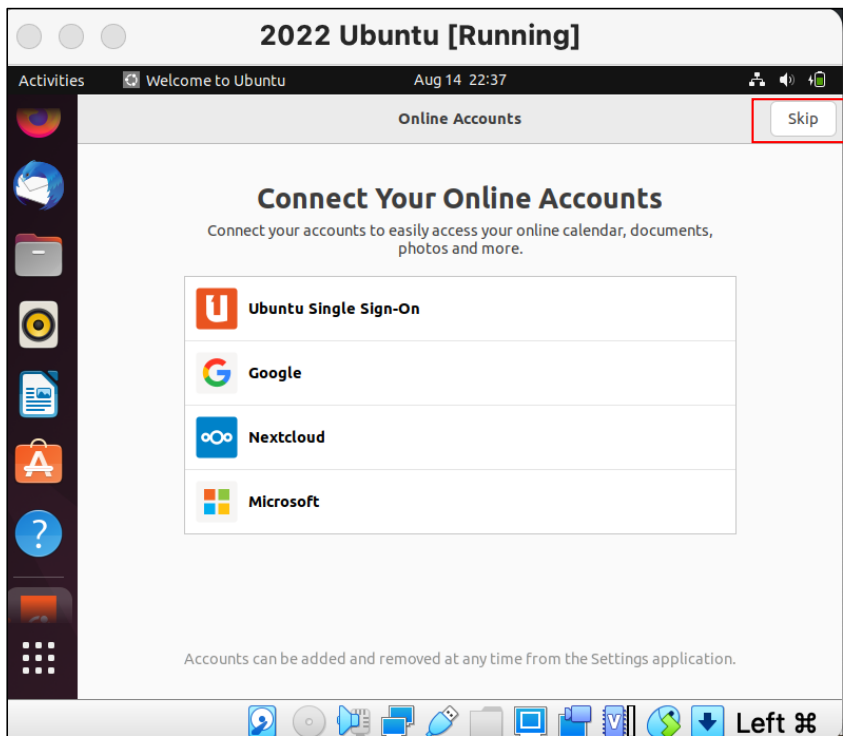


Also need to hit ENTER

VirtualBox: running Ubuntu

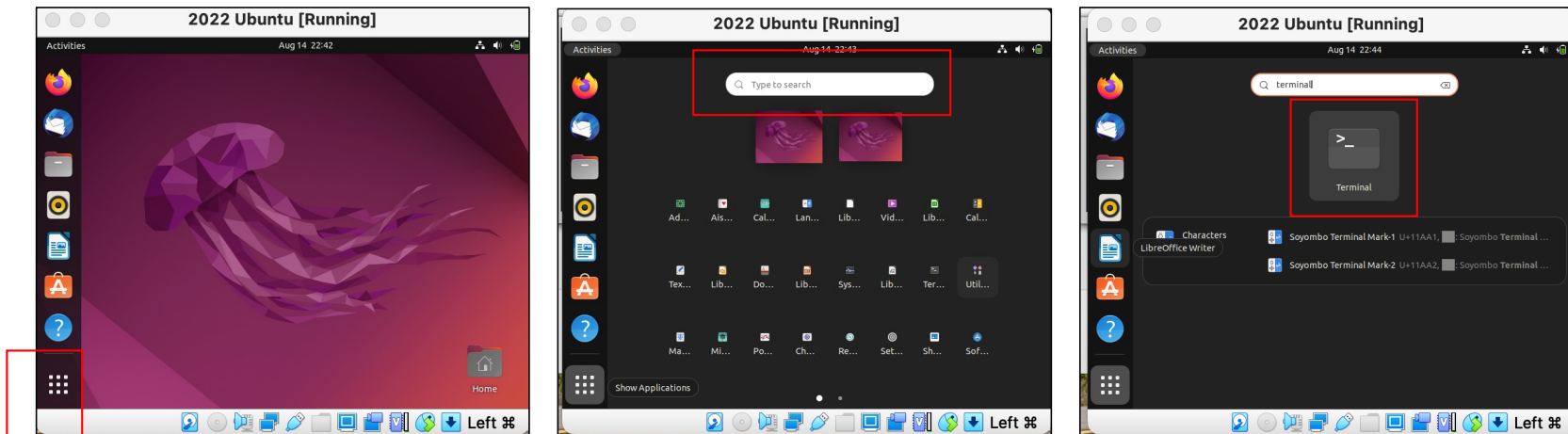


VirtualBox: running Ubuntu



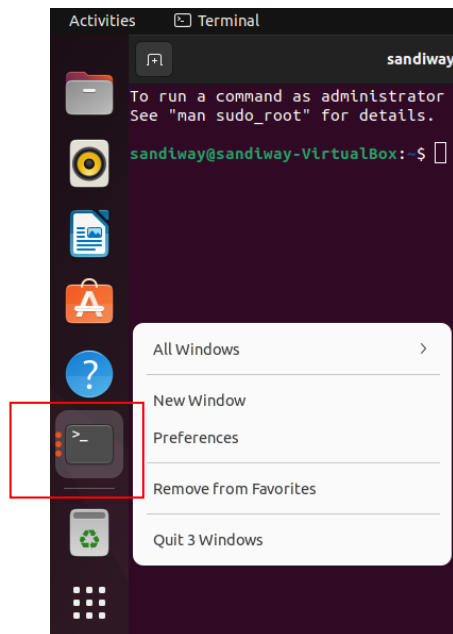
VirtualBox: running Ubuntu

- Software packages
 - Terminal: **sudo** apt-get install <pkg-name>
 - **sudo** prefix: means execute the apt-get command with superuser privileges (typically needed for packages)
- How to find Terminal: use search via the *app menu* (9 squares icon)

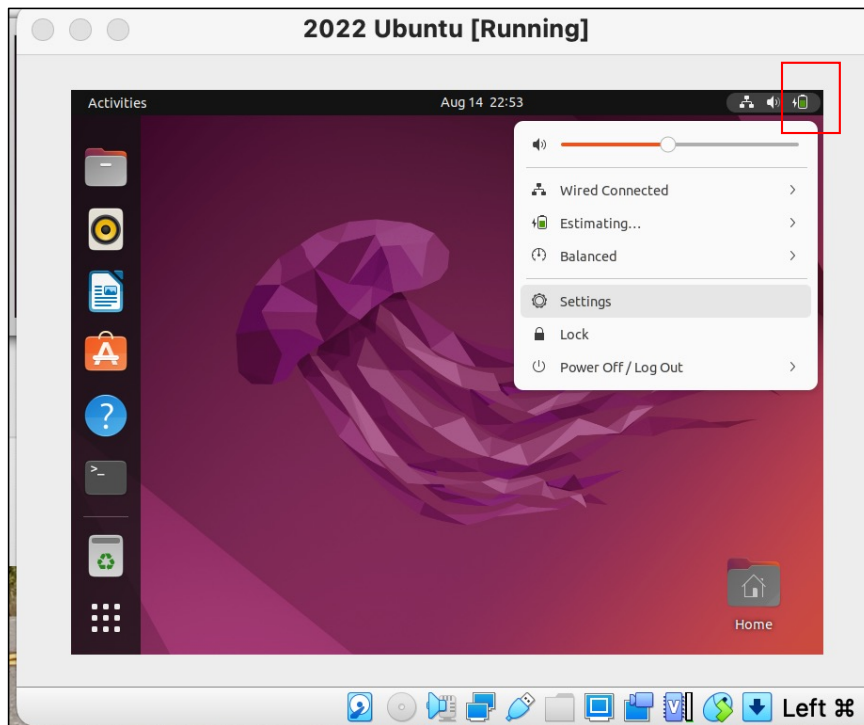


VirtualBox: running Ubuntu

- Add Terminal to favorites:
 - Control-Click Terminal icon: add/remove from Favorites

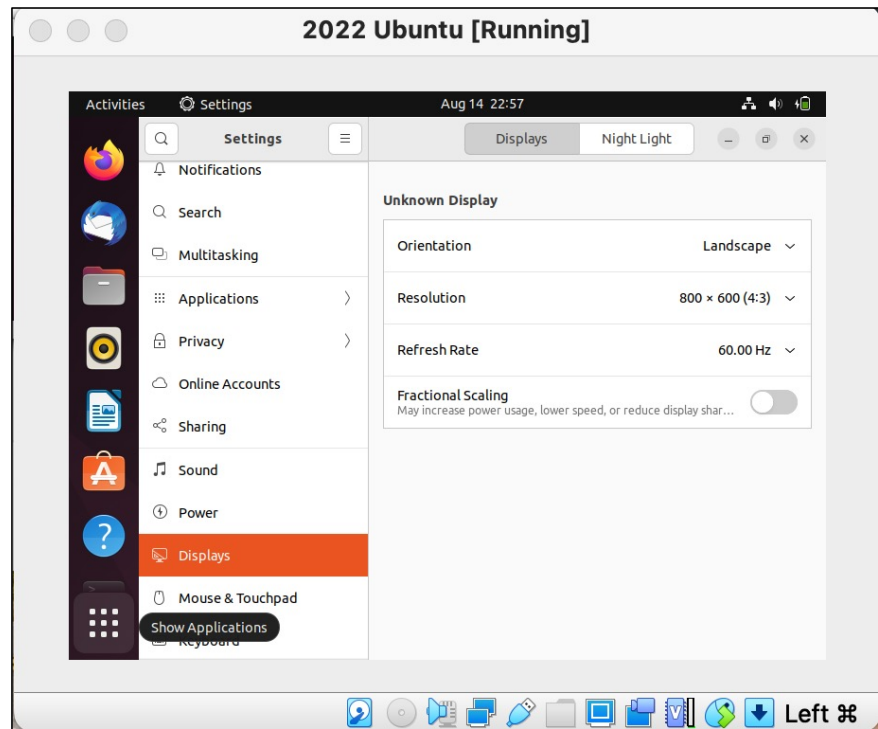
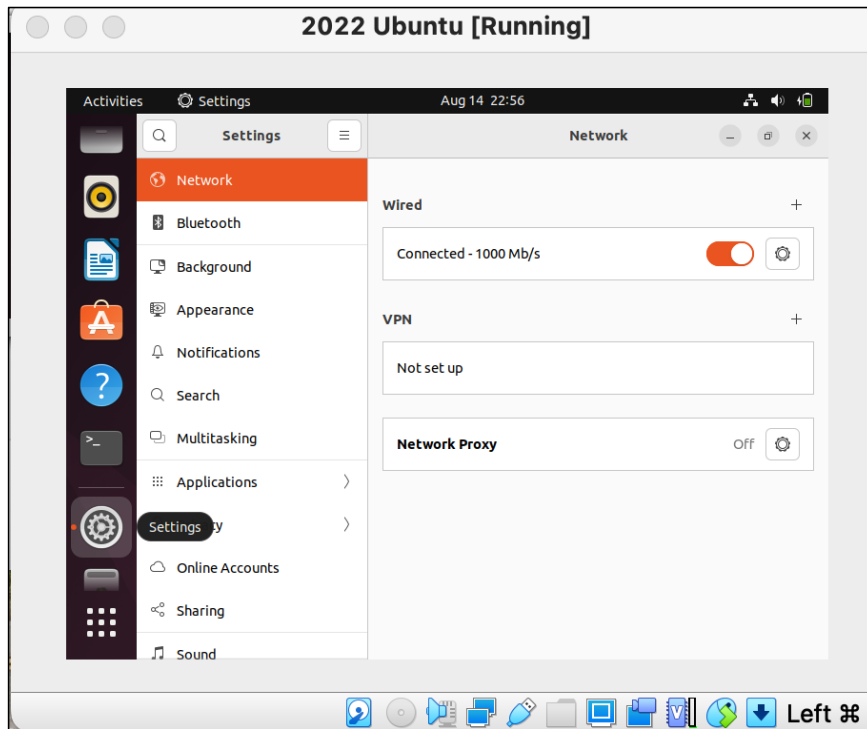


VirtualBox: running Ubuntu

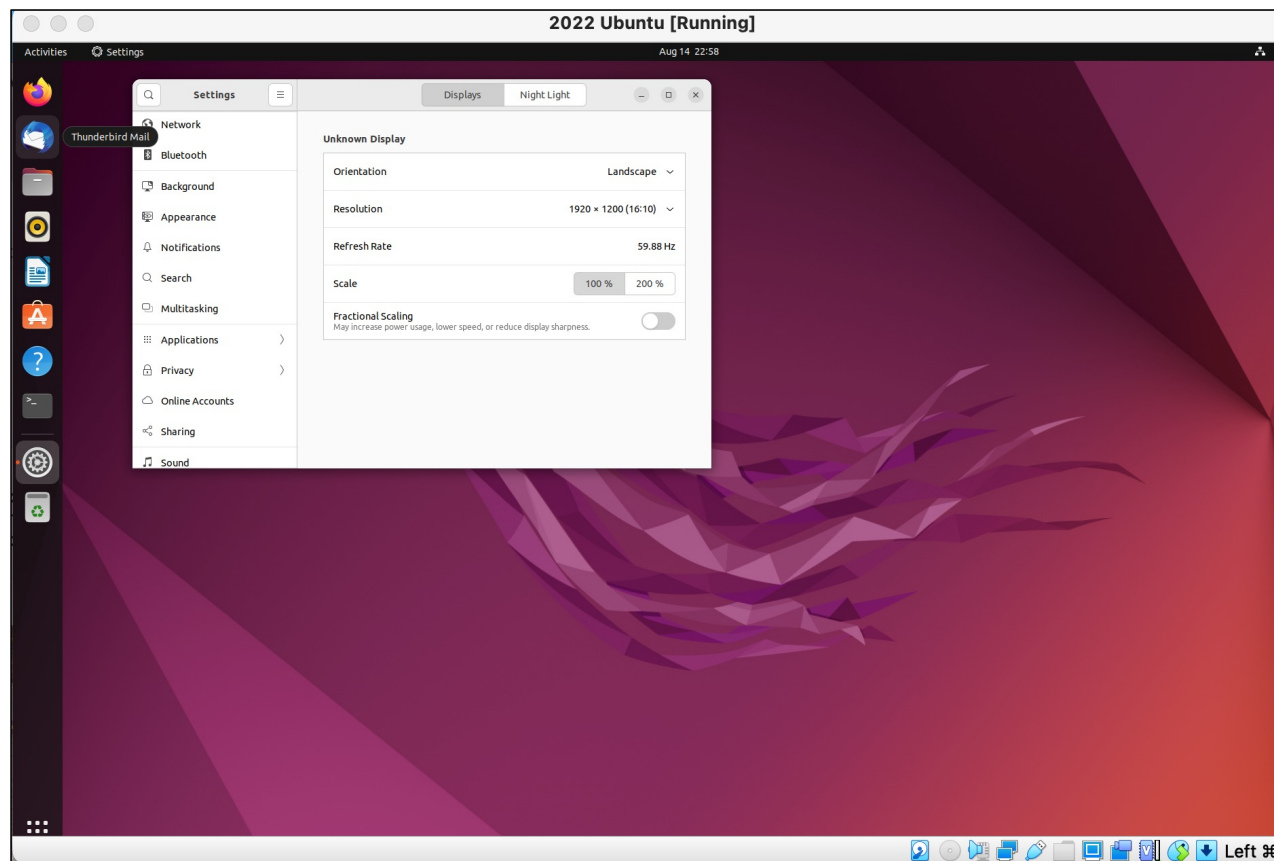


- Click top-right icon to bring up Power Off etc.
- In Settings, you can also change the screen resolution from the default 800 x 600

VirtualBox: running Ubuntu

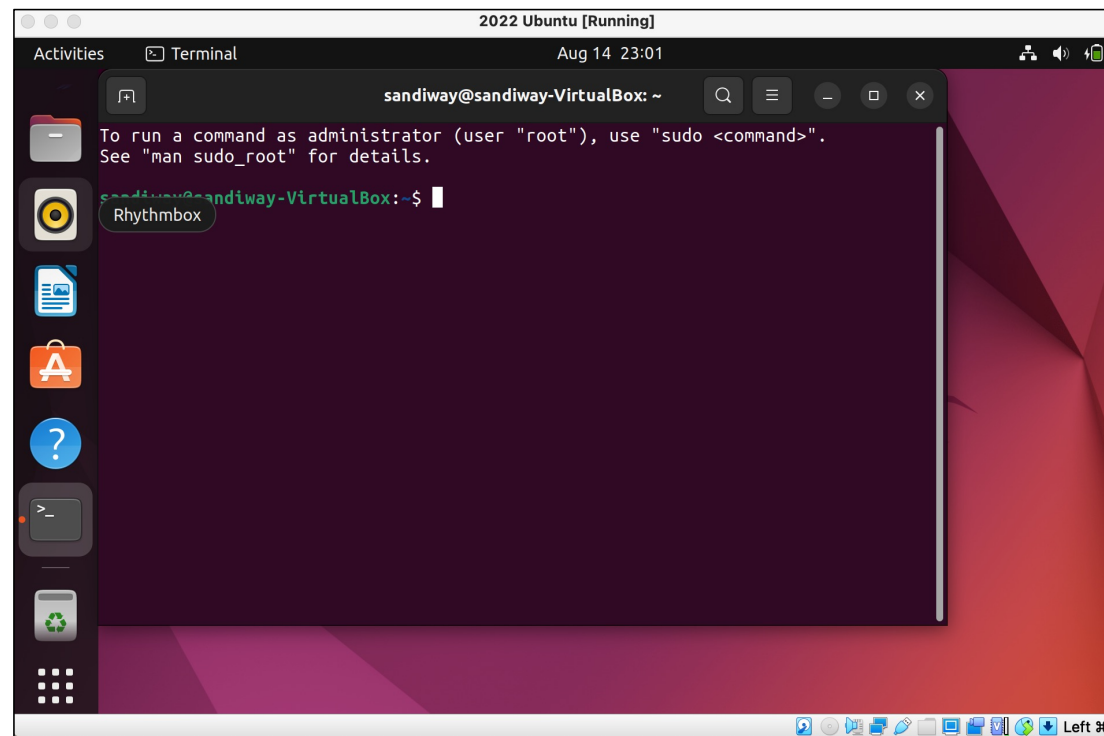


VirtualBox: running Ubuntu



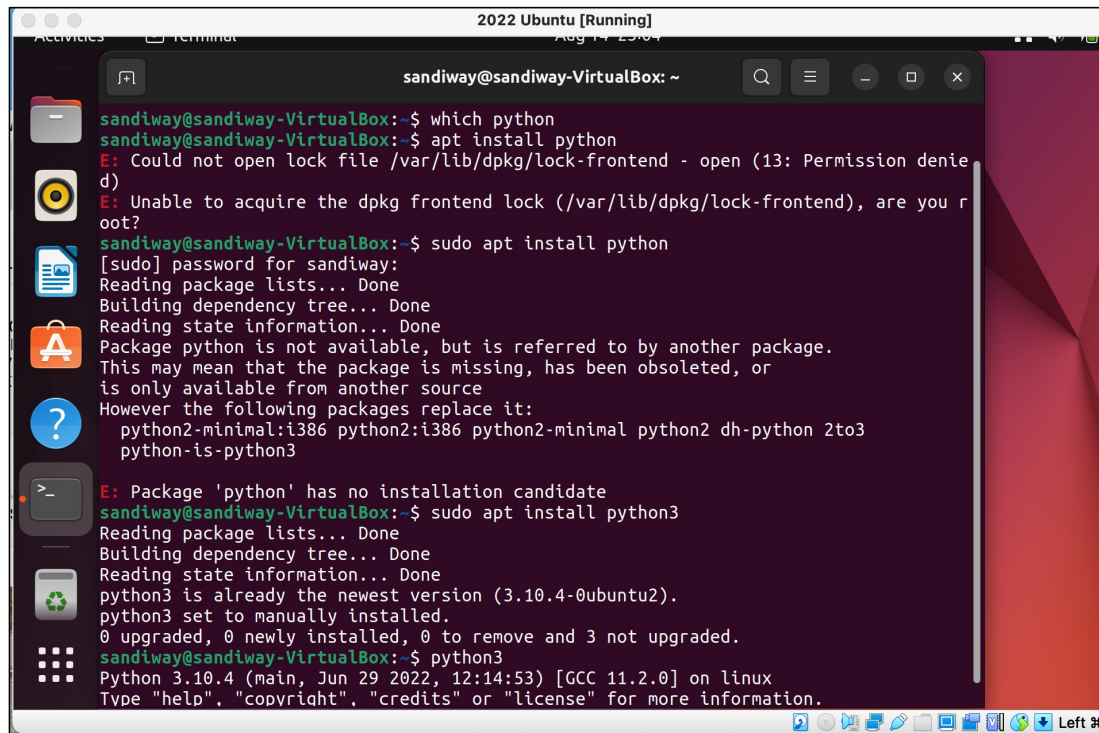
1920 x 1200
resolution

VirtualBox: running Ubuntu



Magnification:
200%

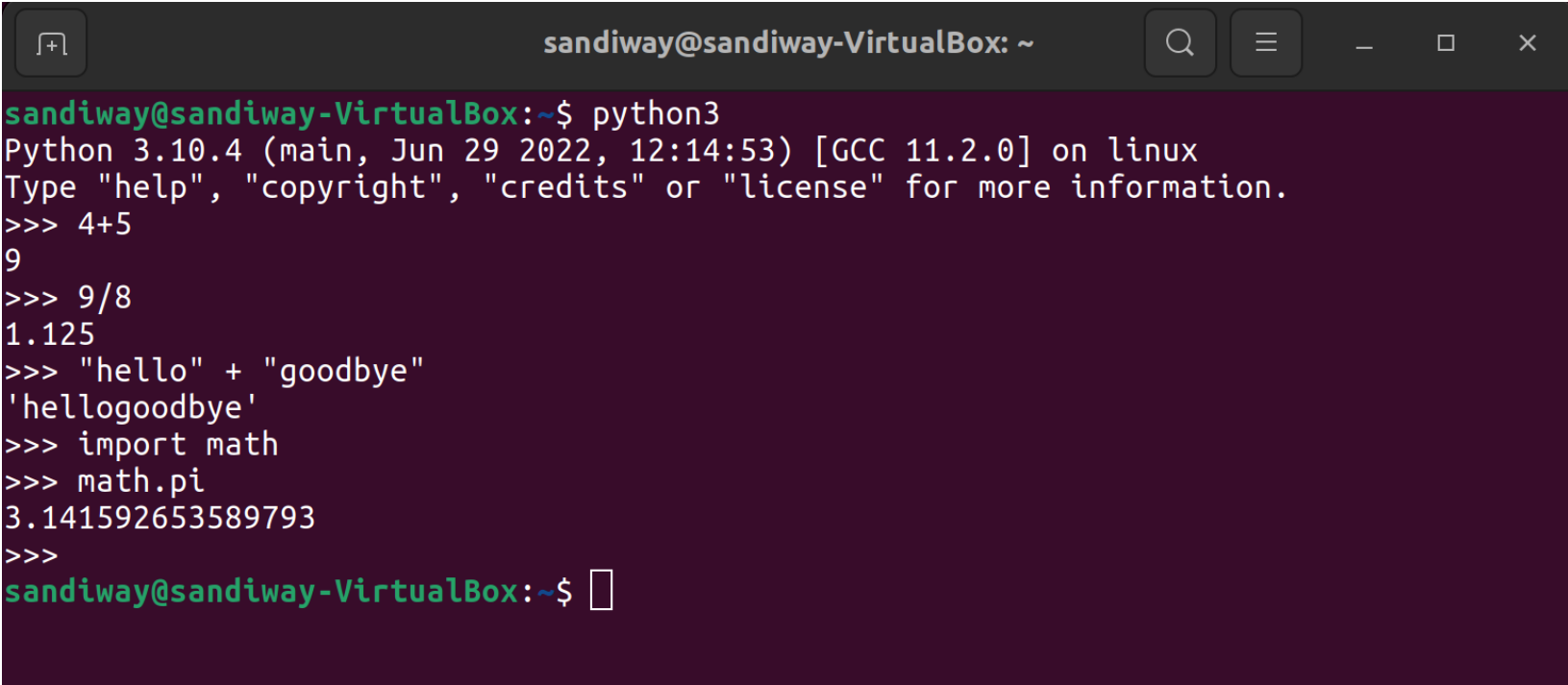
Ubuntu: python3 is already installed!



```
sandiway@sandiway-VirtualBox: ~  
sandiway@sandiway-VirtualBox:~$ which python  
sandiway@sandiway-VirtualBox:~$ apt install python  
E: Could not open lock file /var/lib/dpkg/lock-frontent - open (13: Permission denied)  
E: Unable to acquire the dpkg frontend lock (/var/lib/dpkg/lock-frontent), are you root?  
sandiway@sandiway-VirtualBox:~$ sudo apt install python  
[sudo] password for sandiway:  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
Package python is not available, but is referred to by another package.  
This may mean that the package is missing, has been obsoleted, or  
is only available from another source  
However the following packages replace it:  
python2-minimal:i386 python2:i386 python2-minimal python2 dh-python 2to3  
python-is-python3  
E: Package 'python' has no installation candidate  
sandiway@sandiway-VirtualBox:~$ sudo apt install python3  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
python3 is already the newest version (3.10.4-0ubuntu2).  
python3 set to manually installed.  
0 upgraded, 0 newly installed, 0 to remove and 3 not upgraded.  
sandiway@sandiway-VirtualBox:~$ python3  
Python 3.10.4 (main, Jun 29 2022, 12:14:53) [GCC 11.2.0] on linux  
Type "help", "copyright", "credits" or "license" for more information.
```

- which python returns nothing
- apt install python doesn't work: 1) not administrator, and 2) there's no such package!
- sudo apt install python3 says it's already there
- python3 places you in the interpreter at the prompt >>>
- <Control>-D quits Python

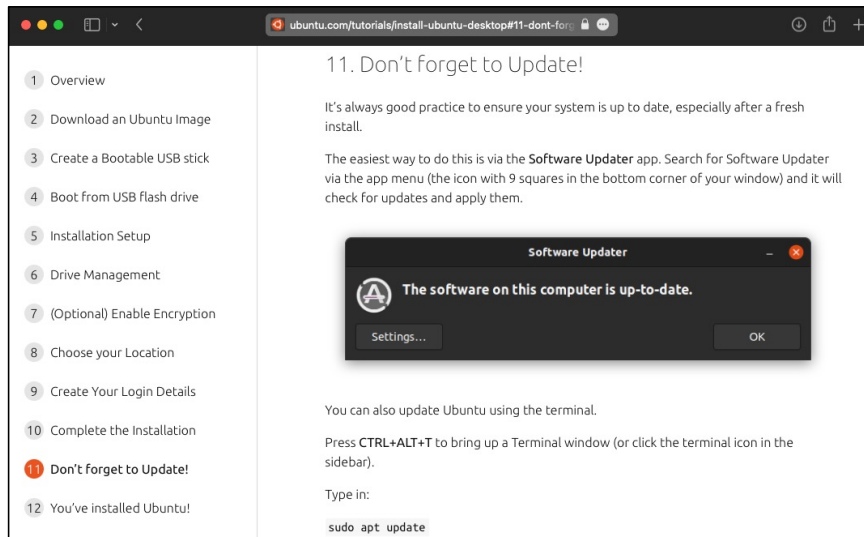
Ubuntu: python3 is already installed!



```
sandiway@sandiway-VirtualBox: ~  
sandiway@sandiway-VirtualBox:~$ python3  
Python 3.10.4 (main, Jun 29 2022, 12:14:53) [GCC 11.2.0] on linux  
Type "help", "copyright", "credits" or "license" for more information.  
>>> 4+5  
9  
>>> 9/8  
1.125  
>>> "hello" + "goodbye"  
'hellogoodbye'  
>>> import math  
>>> math.pi  
3.141592653589793  
>>>  
sandiway@sandiway-VirtualBox:~$
```

Keep Ubuntu up to date

<https://ubuntu.com/tutorials/install-ubuntu-desktop#1-overview>

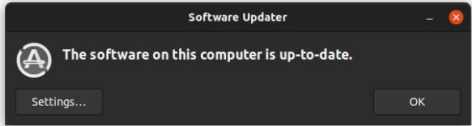


The screenshot shows a web browser window with the URL `ubuntu.com/tutorials/install-ubuntu-desktop#11-dont-for-`. The page content is as follows:

11. Don't forget to Update!

It's always good practice to ensure your system is up to date, especially after a fresh install.

The easiest way to do this is via the **Software Updater** app. Search for Software Updater via the app menu (the icon with 9 squares in the bottom corner of your window) and it will check for updates and apply them.



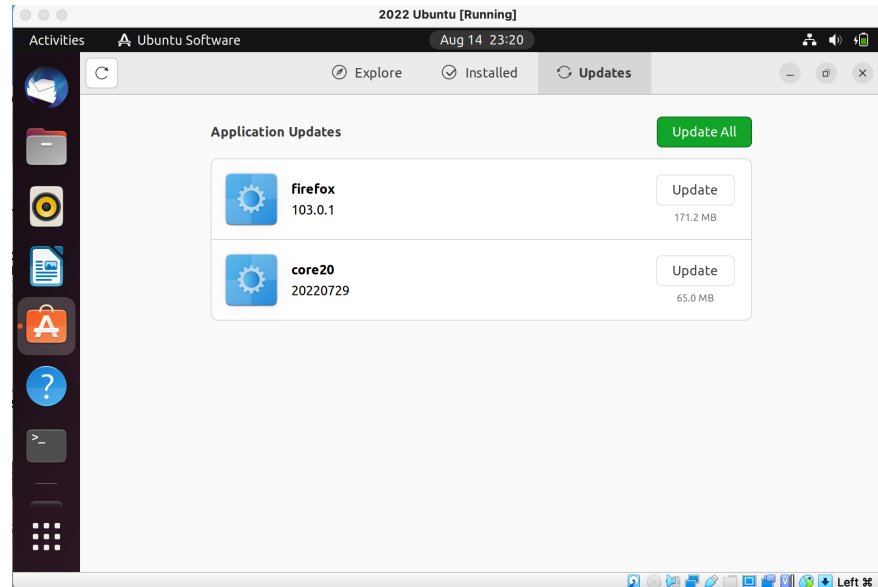
You can also update Ubuntu using the terminal.

Press **CTRL+ALT+T** to bring up a Terminal window (or click the terminal icon in the sidebar).

Type in:

```
sudo apt update
```

The left sidebar of the browser contains a list of 12 steps, with step 11, 'Don't forget to Update!', highlighted in red.



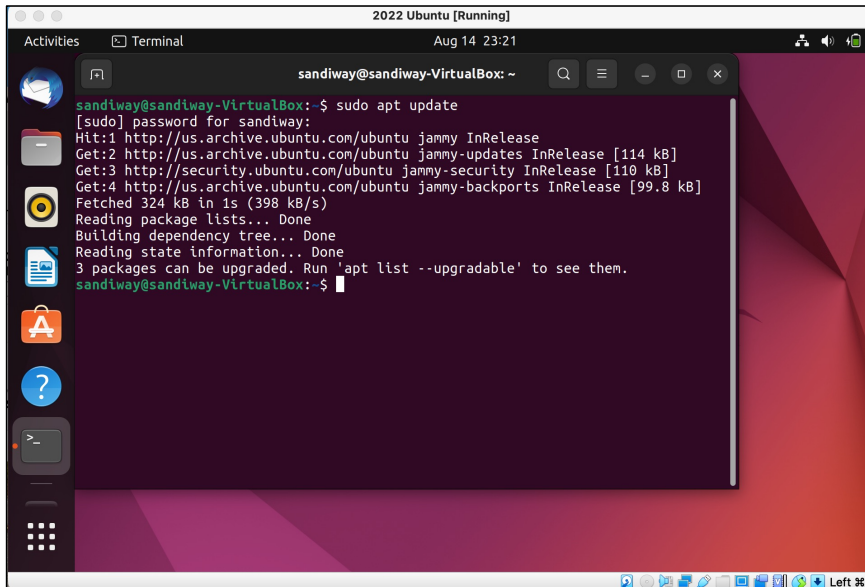
The screenshot shows the 'Ubuntu Software' application window. The title bar reads '2022 Ubuntu [Running]'. The window has tabs for 'Explore', 'Installed', and 'Updates', with 'Updates' selected. The main content area is titled 'Application Updates' and features a green 'Update All' button. Two application updates are listed:

Application	Version	Size	Action
firefox	103.0.1	171.2 MB	Update
core20	20220729	65.0 MB	Update

The bottom of the window shows the system tray with various icons and the text 'Left ⌘'.

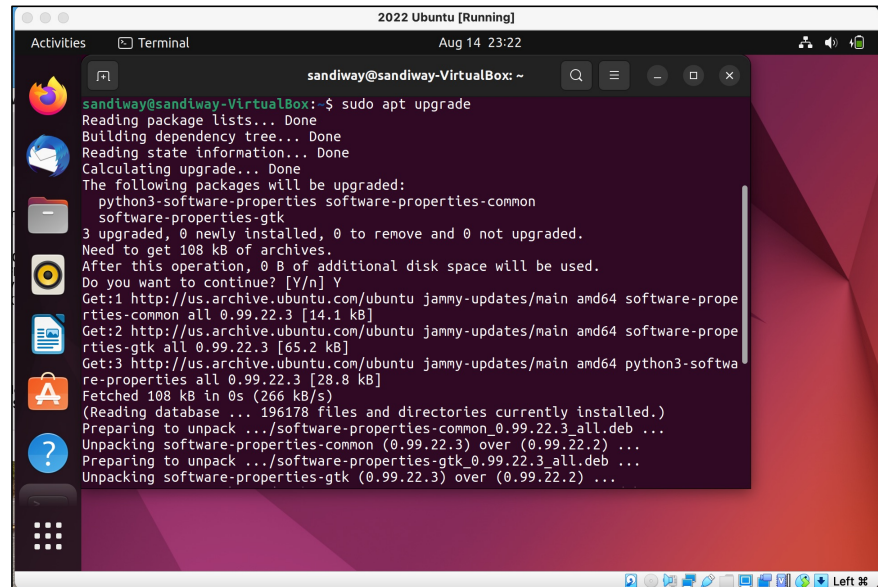
Keep Ubuntu up to date

- `sudo apt update`



```
2022 Ubuntu [Running]
Aug 14 23:21
sandiway@sandiway-VirtualBox: ~
sandiway@sandiway-VirtualBox:~$ sudo apt update
[sudo] password for sandiway:
Hit:1 http://us.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://us.archive.ubuntu.com/ubuntu jammy-updates InRelease [114 kB]
Get:3 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu jammy-backports InRelease [99.8 kB]
Fetched 324 kB in 1s (398 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
3 packages can be upgraded. Run 'apt list --upgradable' to see them.
sandiway@sandiway-VirtualBox:~$
```

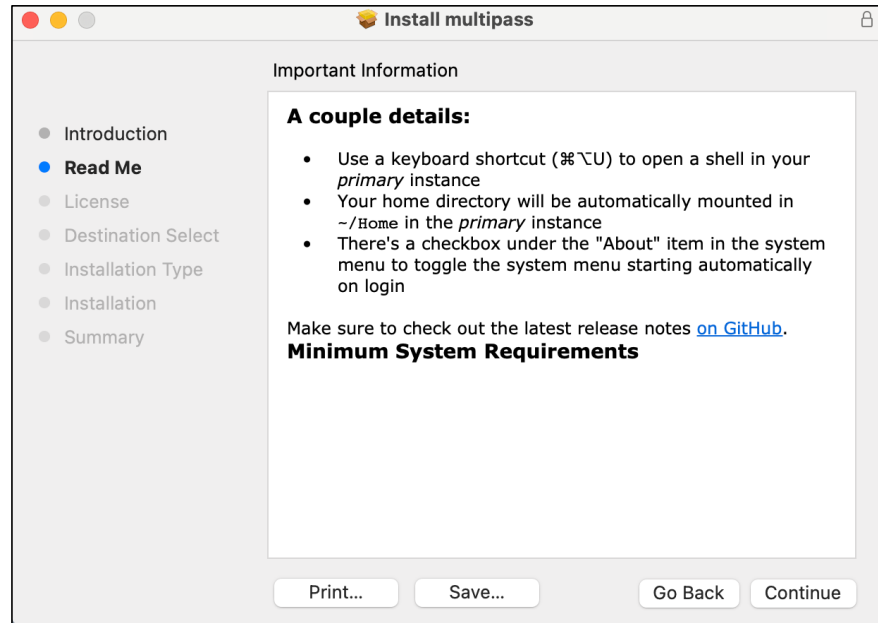
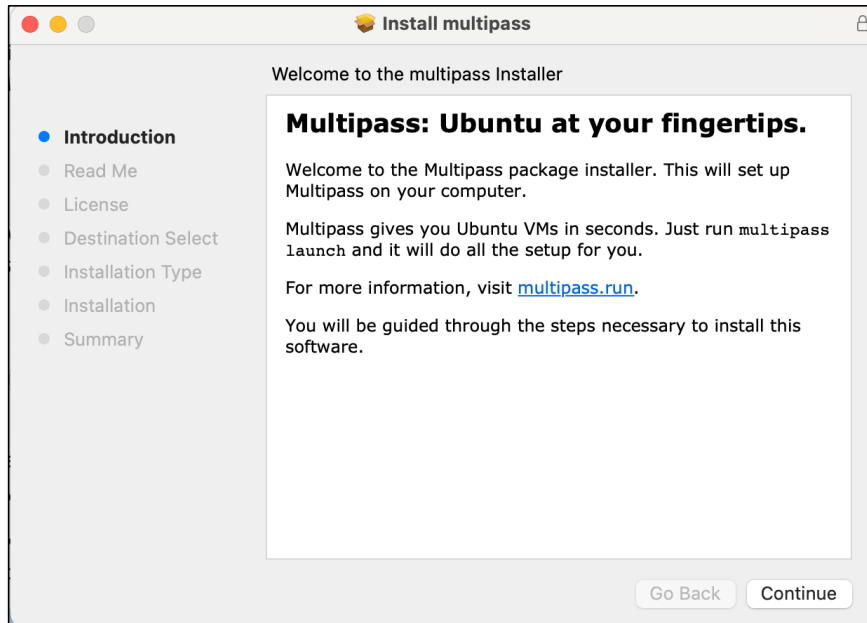
- `sudo apt upgrade`



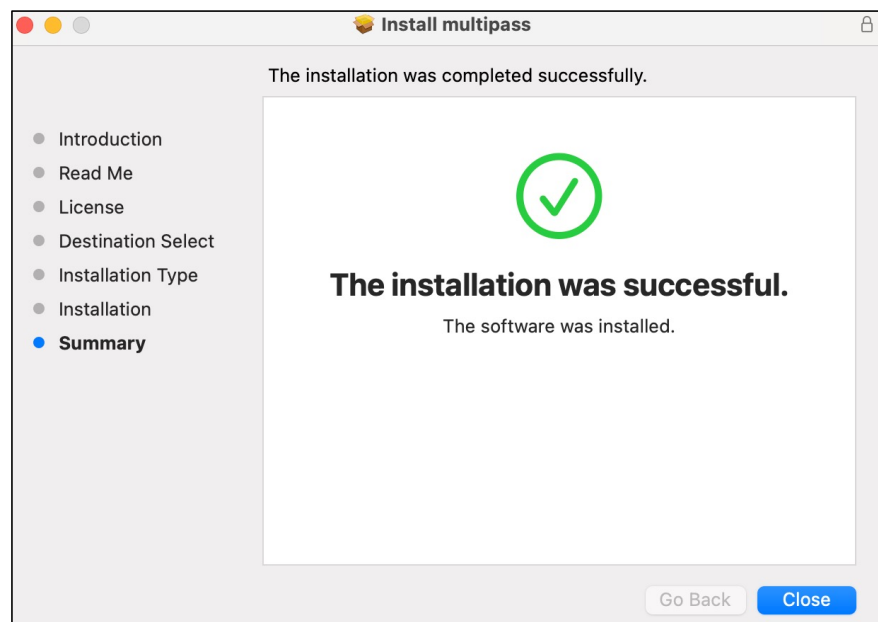
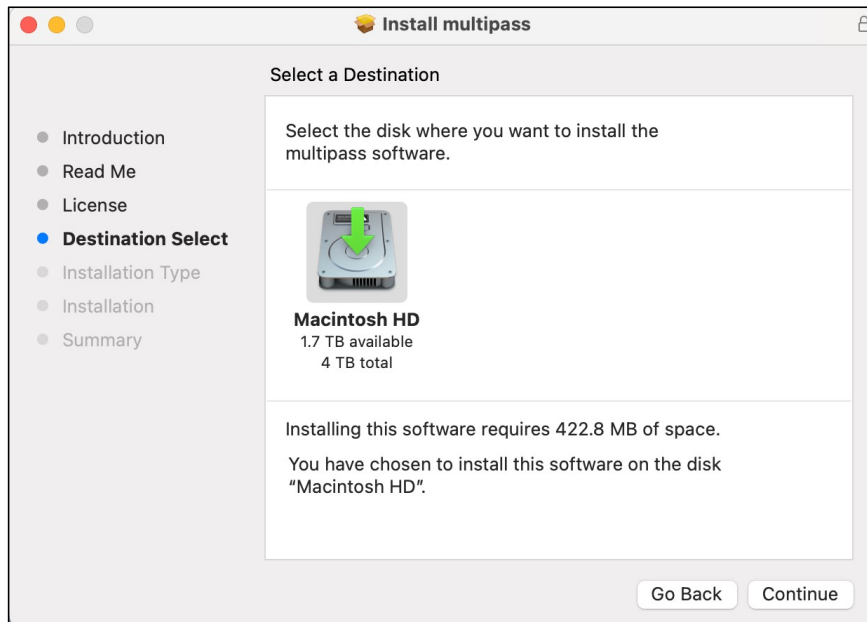
```
2022 Ubuntu [Running]
Aug 14 23:22
sandiway@sandiway-VirtualBox: ~
sandiway@sandiway-VirtualBox:~$ sudo apt upgrade
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
The following packages will be upgraded:
  python3-software-properties software-properties-common
  software-properties-gtk
3 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Need to get 108 kB of archives.
After this operation, 0 B of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://us.archive.ubuntu.com/ubuntu jammy-updates/main amd64 software-prop
rties-common all 0.99.22.3 [14.1 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu jammy-updates/main amd64 software-prop
rties-gtk all 0.99.22.3 [65.2 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu jammy-updates/main amd64 python3-softwa
re-properties all 0.99.22.3 [28.8 kB]
Fetched 108 kB in 0s (266 kB/s)
(Reading database ... 196178 files and directories currently installed.)
Preparing to unpack .../software-properties-common_0.99.22.3_all.deb ...
Unpacking software-properties-common (0.99.22.3) over (0.99.22.2) ...
Preparing to unpack .../software-properties-gtk_0.99.22.3_all.deb ...
Unpacking software-properties-gtk (0.99.22.3) over (0.99.22.2) ...
```

Multipass

<https://discourse.ubuntu.com/t/how-to-guides/27142>



Multipass



Multipass

```
sandiway — multipass launch — 80x30
(base) ~$ multipass version
multipass 1.12.2+mac
multipassd 1.12.2+mac
(base) ~$ multipass launch
Retrieving image: 42%
```

```
sandiway — -bash — 80x30
(base) ~$ multipass version
multipass 1.12.2+mac
multipassd 1.12.2+mac
(base) ~$ multipass launch
Launched: prudent-elver
(base) ~$
```


Multipass

- Terminal:

```
$ multipass launch
```

```
Launched: prudent-elver
```

```
$ multipass info prudent-elver
```

```
Name:          prudent-elver
State:         Running
IPv4:          192.168.64.2
Release:       Ubuntu 22.04.3 LTS
Image hash:    9c59c6097711 (Ubuntu 22.04
LTS)
CPU(s):        1
Load:          0.00 0.02 0.00
Disk usage:    1.4GiB out of 4.8GiB
Memory usage:  153.3MiB out of 962.4MiB
Mounts:        --
```

```
$ multipass shell prudent-elver
```

```
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux
5.15.0-79-generic aarch64)
```

To run a command as administrator (user "root"), use "sudo <command>".

See "man sudo_root" for details.

```
ubuntu@prudent-elver:~$ uname -a
```

```
Linux prudent-elver 5.15.0-79-generic #86-
Ubuntu SMP Mon Jul 10 16:11:29 UTC 2023
aarch64 aarch64 aarch64 GNU/Linux
```

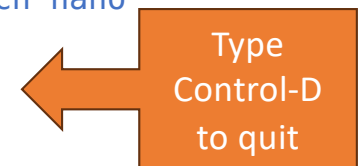
```
ubuntu@prudent-elver:~$ pwd
```

```
/home/ubuntu
```

```
ubuntu@prudent-elver:~$ which nano
```

```
/usr/bin/nano
```

```
ubuntu@prudent-elver:~$
```



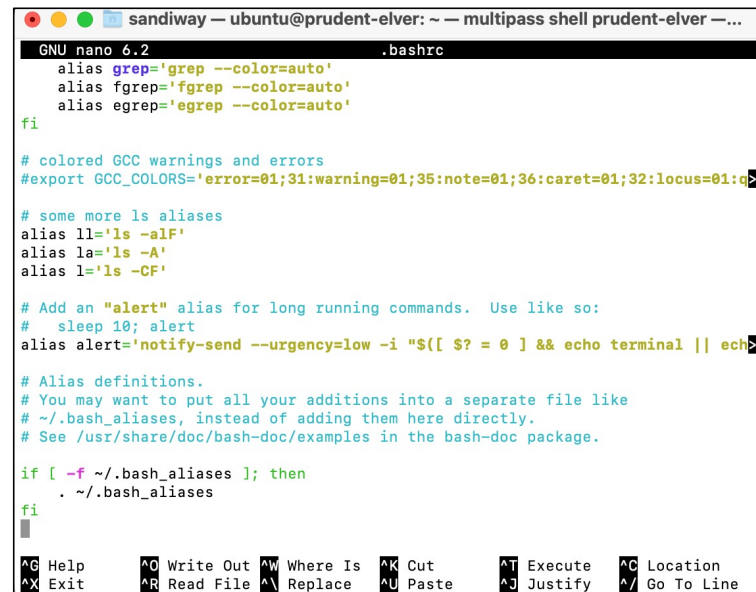
Multipass

```
ubuntu@prudent-elver:~$ ls -a
```

```
.  ..  .bash_logout  .bashrc  .cache  .profile  .ssh
```

```
ubuntu@prudent-elver:~$ nano .bashrc
```

```
ubuntu@prudent-elver:~$
```



```
sandiway — ubuntu@prudent-elver: ~ — multipass shell prudent-elver —...
GNU nano 6.2 .bashrc
alias grep='grep --color=auto'
alias fgrep='fgrep --color=auto'
alias egrep='egrep --color=auto'
fi

# colored GCC warnings and errors
#export GCC_COLORS='error=01;31:warning=01;35:note=01;36:caret=01;32:locus=01;0'

# some more ls aliases
alias ll='ls -alF'
alias la='ls -A'
alias l='ls -CF'

# Add an "alert" alias for long running commands. Use like so:
# sleep 10; alert
alias alert='notify-send --urgency=low -i "${[ $? = 0 ]} && echo terminal || echo'

# Alias definitions.
# You may want to put all your additions into a separate file like
# ~/.bash_aliases, instead of adding them here directly.
# See /usr/share/doc/bash-doc/examples in the bash-doc package.

if [ -f ~/.bash_aliases ]; then
    . ~/.bash_aliases
fi

^G Help      ^O Write Out ^W Where Is  ^K Cut       ^T Execute  ^C Location
^X Exit      ^R Read File ^N Replace   ^U Paste     ^J Justify  ^_ Go To Line
```