LING 408/508: Programming for Linguists

Lecture 4

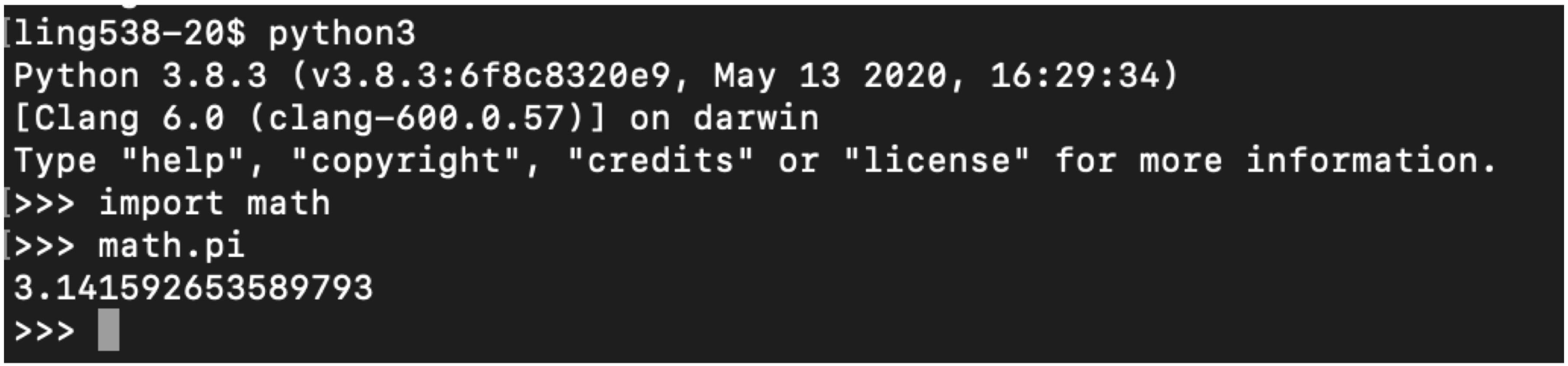
Today's Topics

- Homework 1 graded
- Homework 1 Review
- Unicode
- File Systems
- Special characters: end of file
- Homework 2:
  - Install VirtualBox on your computer

Download
VirtualBox 6.1

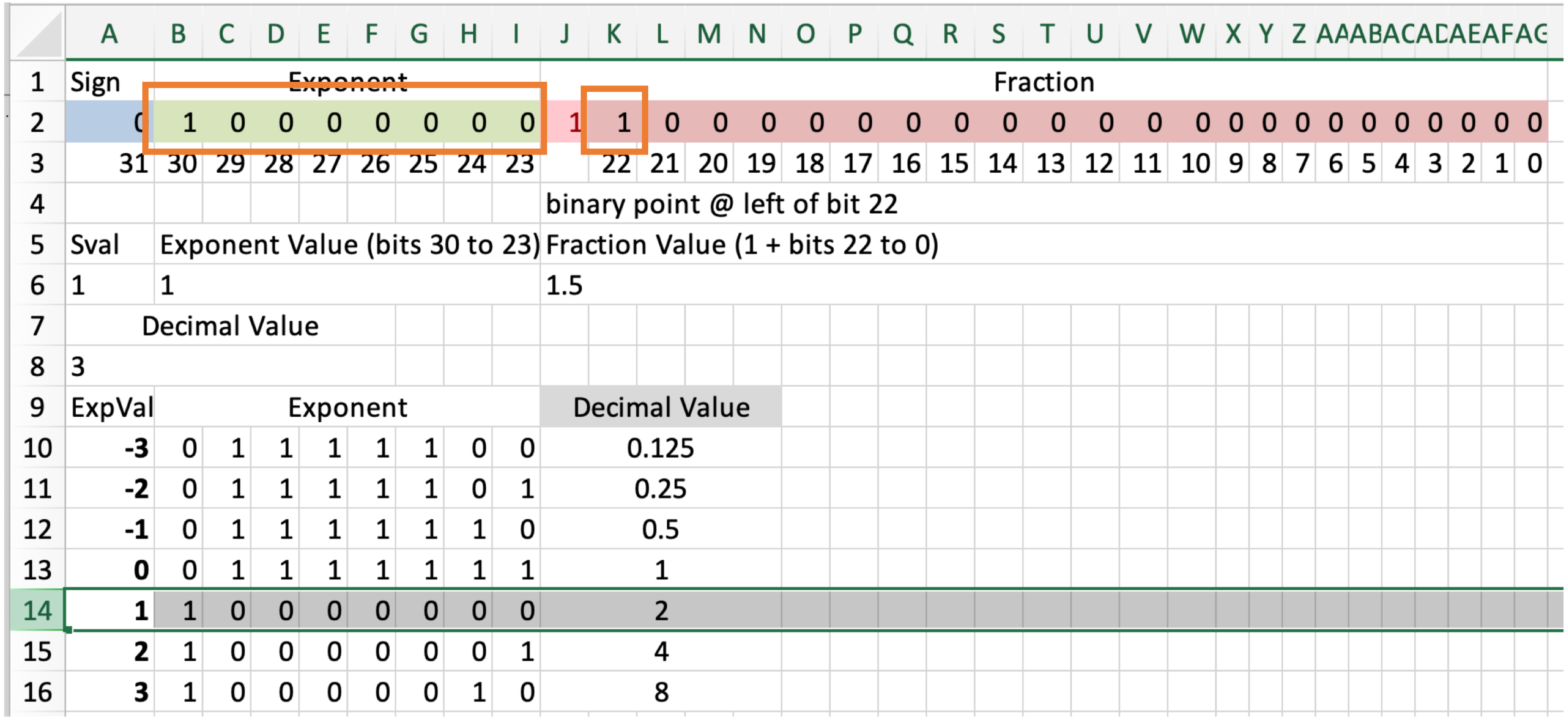
Homework 1 Review

math.pi in Python 3 reports the decimal value of PI to the best of its ability



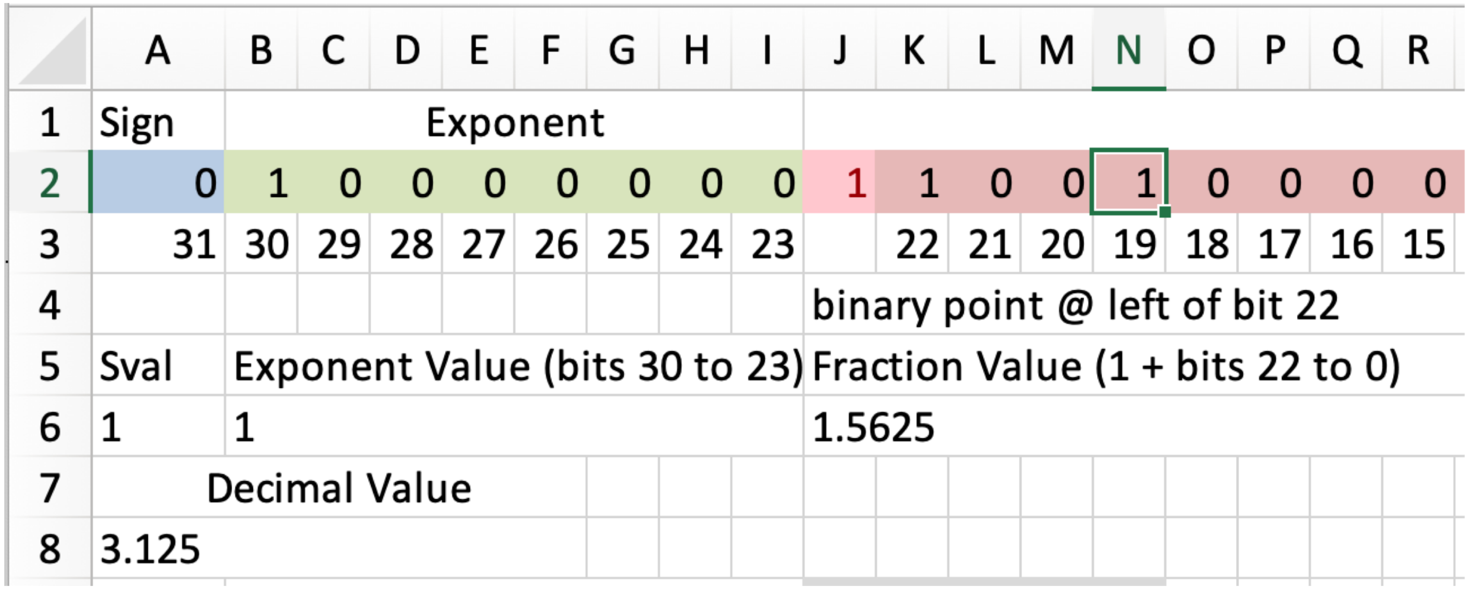
```
[ling538-20$ python3
Python 3.8.3 (v3.8.3:6f8c8320e9, May 13 2020, 16:29:34)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
[>>> import math
[>>> math.pi
3.141592653589793
>>> 
```

Homework 1 Review



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1	Sign	Exponent									Fraction																						
2	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	31	30	29	28	27	26	25	24	23		22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4										binary point @ left of bit 22																							
5	Sval	Exponent Value (bits 30 to 23)								Fraction Value (1 + bits 22 to 0)																							
6	1	1								1.5																							
7	Decimal Value																																
8	3																																
9	ExpVal	Exponent								Decimal Value																							
10	-3	0	1	1	1	1	1	0	0	0.125																							
11	-2	0	1	1	1	1	1	0	1	0.25																							
12	-1	0	1	1	1	1	1	1	0	0.5																							
13	0	0	1	1	1	1	1	1	1	1																							
14	1	1	0	0	0	0	0	0	0	2																							
15	2	1	0	0	0	0	0	0	1	4																							
16	3	1	0	0	0	0	0	1	0	8																							

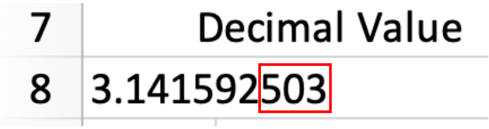
Homework 1 Review



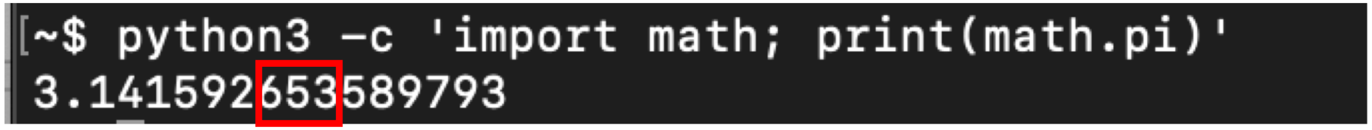
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Sign	Exponent																
2	0	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0
3	31	30	29	28	27	26	25	24	23		22	21	20	19	18	17	16	15
4										binary point @ left of bit 22								
5	Sval	Exponent Value (bits 30 to 23)								Fraction Value (1 + bits 22 to 0)								
6	1	1								1.5625								
7	Decimal Value																	
8	3.125																	

Homework 1 Review

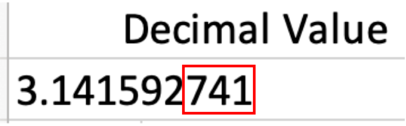
- Continuing from left to right flipping bits, we should converge on:



7	Decimal Value
8	3.141592503



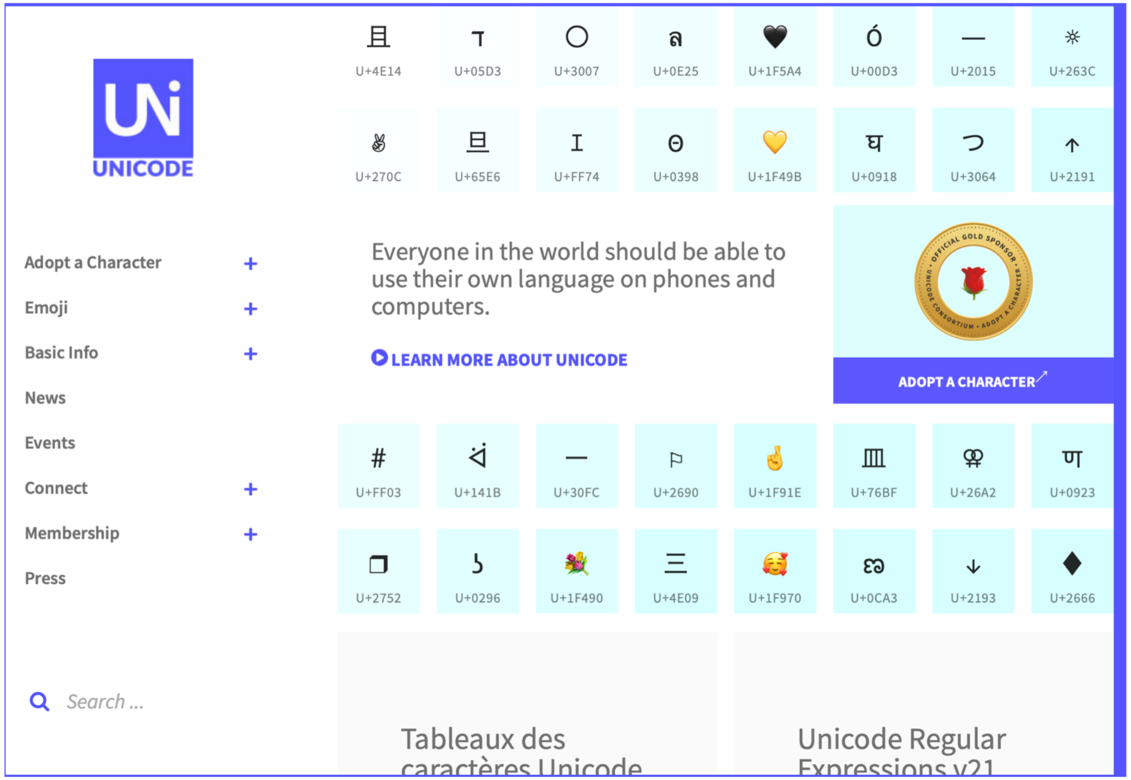
```
[~$ python3 -c 'import math; print(math.pi)'
3.141592653589793
```



Decimal Value
3.141592741

Unicode

https://home.unicode.org



Everyone in the world should be able to use their own language on phones and computers.

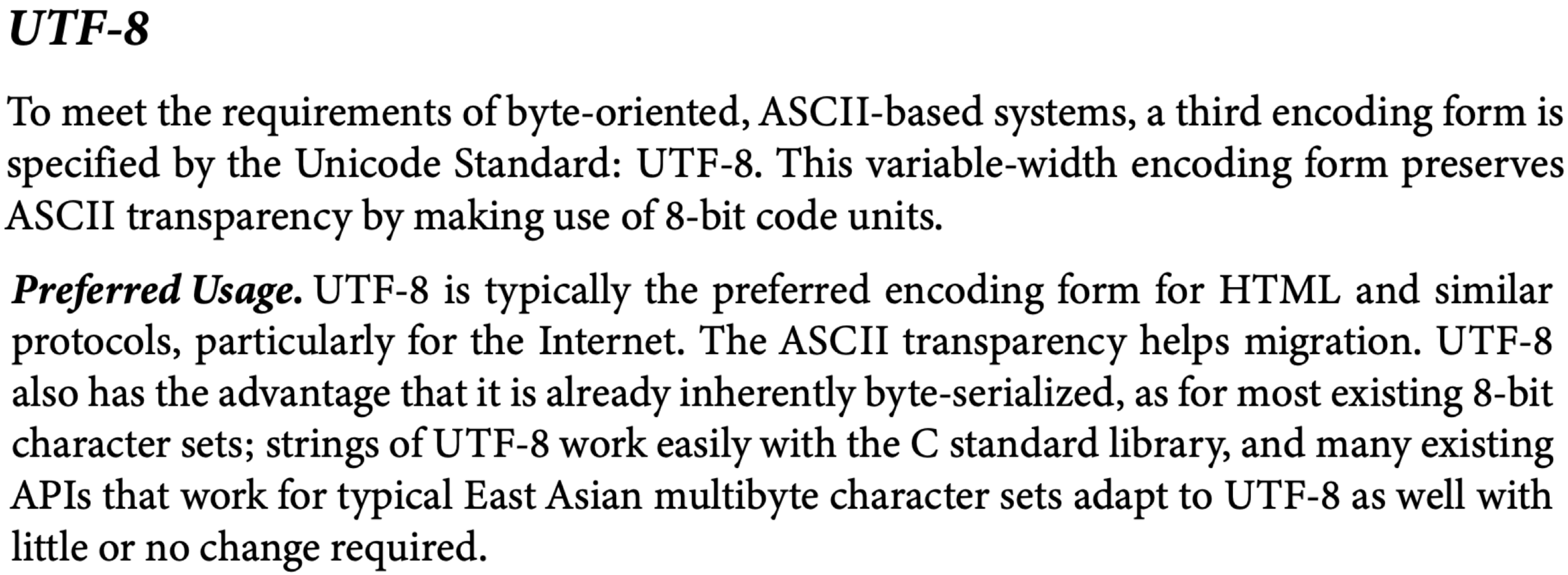
LEARN MORE ABOUT UNICODE

Tableaux des caractères Unicode

Unicode Regular Expressions v21

Unicode

- https://www.unicode.org/versions/Unicode13.0.0/UnicodeStandard-13.0.pdf

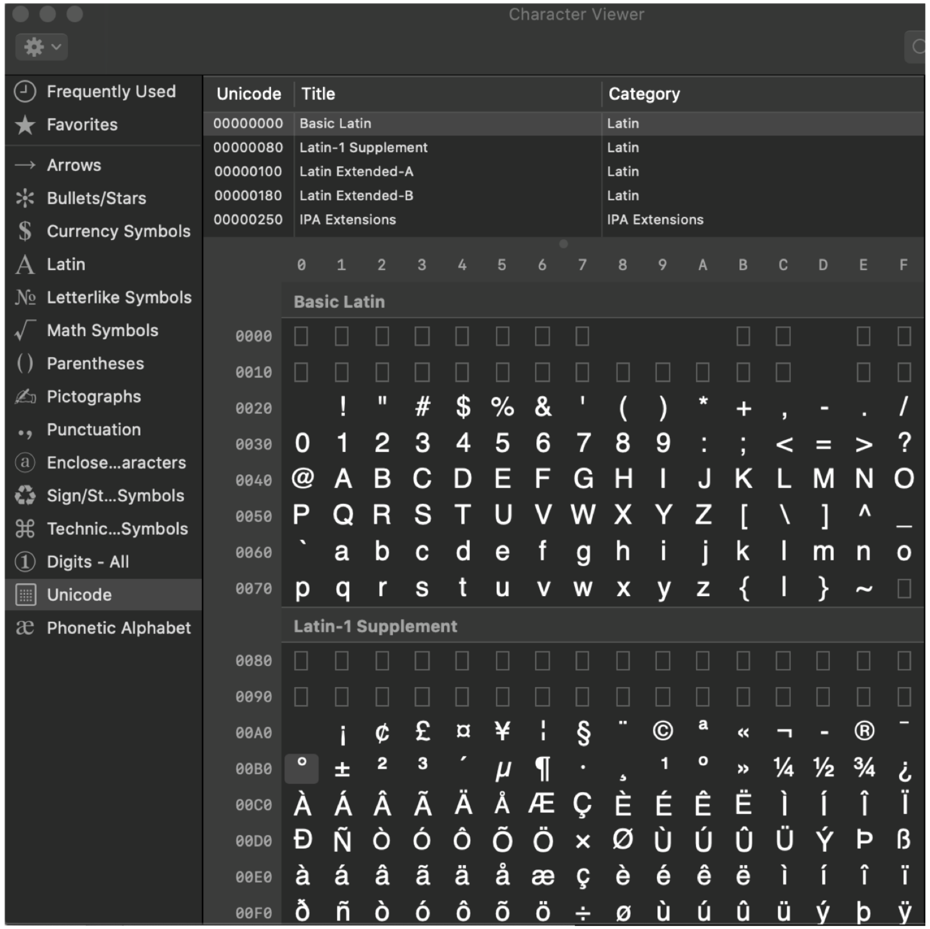


UTF-8

To meet the requirements of byte-oriented, ASCII-based systems, a third encoding form is specified by the Unicode Standard: UTF-8. This variable-width encoding form preserves ASCII transparency by making use of 8-bit code units.

Preferred Usage. UTF-8 is typically the preferred encoding form for HTML and similar protocols, particularly for the Internet. The ASCII transparency helps migration. UTF-8 also has the advantage that it is already inherently byte-serialized, as for most existing 8-bit character sets; strings of UTF-8 work easily with the C standard library, and many existing APIs that work for typical East Asian multibyte character sets adapt to UTF-8 as well with little or no change required.

On the Mac



Unicode	Title	Category
00000000	Basic Latin	Latin
00000080	Latin-1 Supplement	Latin
00000100	Latin Extended-A	Latin
00000180	Latin Extended-B	Latin
00000250	IPA Extensions	IPA Extensions

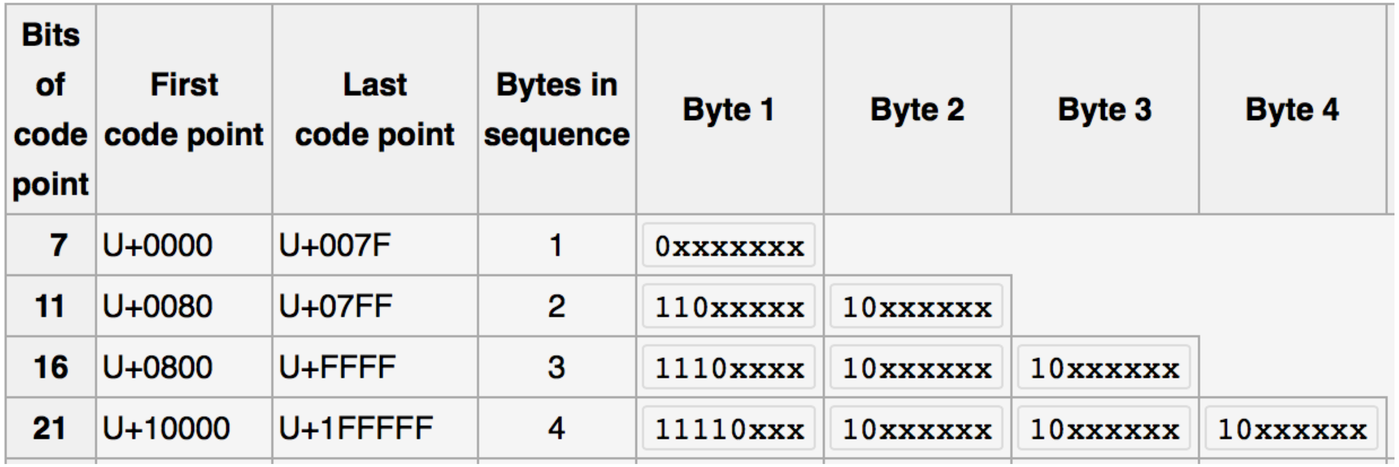
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Basic Latin																
0000	□	□	□	□	□	□	□	□				□	□		□	□
0010	□	□	□	□	□	□	□	□	□	□	□	□	□		□	□
0020		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
0030	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
0040	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
0050	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
0060	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
0070	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	□
Latin-1 Supplement																
0080	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
0090	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
00A0		¡	¢	£	¤	¥	¦	§	¨	©	ª	«	¬	-	®	¯
00B0	°	±	²	³	´	µ	¶	·	¸	¹	º	»	¼	½	¾	¿
00C0	À	Á	Â	Ã	Ä	Å	Æ	Ç	È	É	Ê	Ë	Ì	Í	Î	Ï
00D0	Ð	Ñ	Ò	Ó	Ô	Õ	Ö	×	Ø	Ù	Ú	Û	Ü	Ý	Þ	ß
00E0	à	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î	ï
00F0	ð	ñ	ò	ó	ô	õ	ö	÷	ø	ù	ú	û	ü	ý	þ	ÿ

ASCII

Latin-1 supplement

Introduction: data types

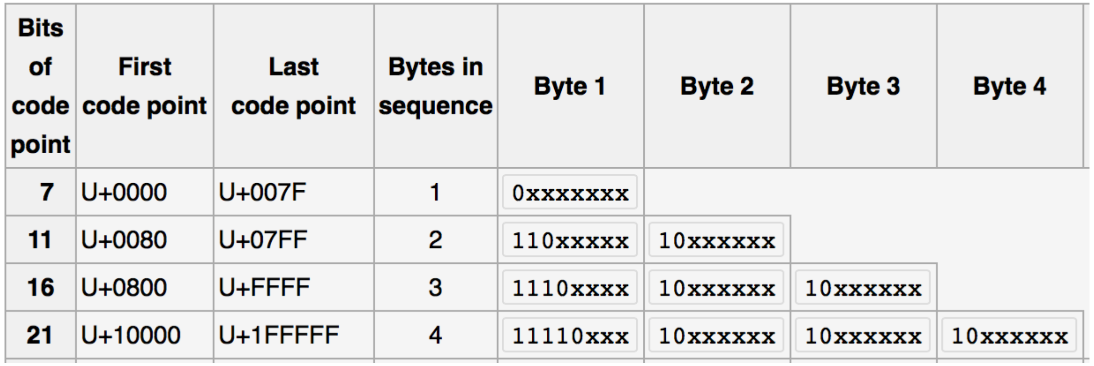
- UTF-8
  - standard in the post-ASCII world
  - backwards compatible with ASCII
  - (*previously, different languages had multi-byte character sets that clashed*)
  - Universal Character Set (UCS) Transformation Format 8-bits



Bits of code point	First code point	Last code point	Bytes in sequence	Byte 1	Byte 2	Byte 3	Byte 4
7	U+0000	U+007F	1	0xxxxxxx			
11	U+0080	U+07FF	2	110xxxxx	10xxxxxx		
16	U+0800	U+FFFF	3	1110xxxx	10xxxxxx	10xxxxxx	
21	U+10000	U+1FFFFF	4	11110xxx	10xxxxxx	10xxxxxx	10xxxxxx

(Wikipedia)

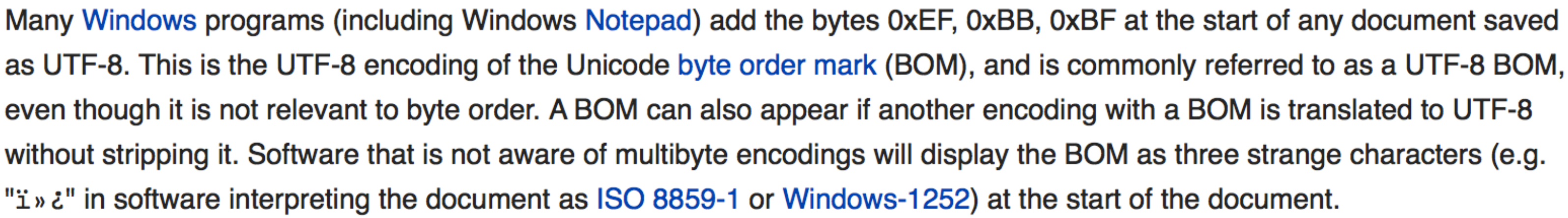
Introduction: data types



Bits of code point	First code point	Last code point	Bytes in sequence	Byte 1	Byte 2	Byte 3	Byte 4
7	U+0000	U+007F	1	0xxxxxxx			
11	U+0080	U+07FF	2	110xxxxx	10xxxxxx		
16	U+0800	U+FFFF	3	1110xxxx	10xxxxxx	10xxxxxx	
21	U+10000	U+1FFFFF	4	11110xxx	10xxxxxx	10xxxxxx	10xxxxxx

- Example:
  - あ Hiragana letter A: UTF-8: E38182
  - Byte 1: E = 1110, 3 = 0011
  - Byte 2: 8 = 1000, 1 = 0001
  - Byte 3: 8 = 1000, 2 = 0010
  - い Hiragana letter I: UTF-8: E38184

Shift-JIS (Hex):
あ: 82A0
い: 82A2



Many Windows programs (including Windows Notepad) add the bytes 0xEF, 0xBB, 0xBF at the start of any document saved as UTF-8. This is the UTF-8 encoding of the Unicode byte order mark (BOM), and is commonly referred to as a UTF-8 BOM, even though it is not relevant to byte order. A BOM can also appear if another encoding with a BOM is translated to UTF-8 without stripping it. Software that is not aware of multibyte encodings will display the BOM as three strange characters (e.g. "ï»¿" in software interpreting the document as ISO 8859-1 or Windows-1252) at the start of the document.

Introduction: data types

- How can you tell what encoding your file is using?
- Detecting UTF-8
    - Microsoft:
        - 1st three bytes in the file is EF BB BF
        - (*not all software understands this; not everybody uses it*)
    - HTML:
        - `<meta http-equiv="Content-Type" content="text/html;charset=UTF-8">`
        - (*not always present*)
    - Analyze the file:
        - Find non-valid UTF-8 sequences: if found, not UTF-8…
        - Interesting paper:
            - http://www-archive.mozilla.org/projects/intl/UniversalCharsetDetection.html

Introduction: data types

- **Filesystem**:
  - different on different computers: *sometimes a problem if you mount filesystems across different systems*
- Examples:

FAT32 (File Allocation Table) limited to 4GB max file size	DOS, Windows, memory cards
ExFAT (Extended FAT)	SD cards (> 4GB files)
NTFS (New Technology File System)	Windows
ext4 (Fourth Extended Filesystem)	Linux
HFS+ (Hierarchical File System Plus)	Macs

Introduction: data types

- **Filesystem**:
  - different on different computers: *sometimes a problem if you mount filesystems across different systems*

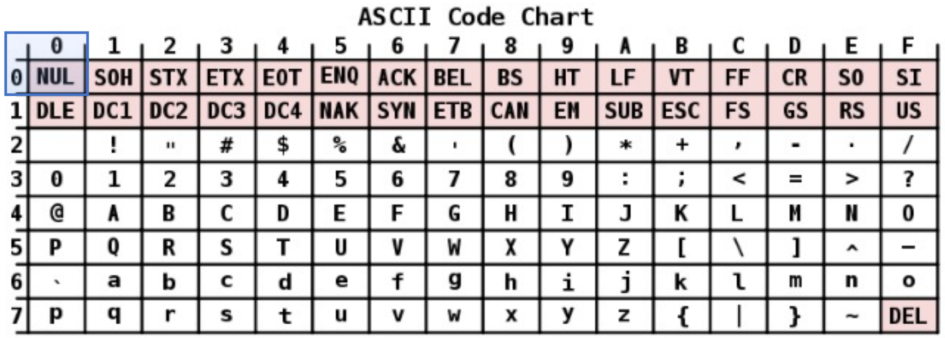
- **Files**:
  - Name (Path from / root)
  - Type (e.g. .docx, .pptx, .pdf, .html, .txt)
  - Owner (*usually the Creator*)
  - Permissions (for the Owner, Group, or Everyone)
  - need to be opened (*to read from or write to*)
  - Mode: read/write/append
  - Binary/Text

in all programming languages:
open command

Introduction: data types

- Text files:
  - text files have lines: *how do we mark the end of a line*?
  - End of line (EOL) control character(s):
    - LF 0x0A (Mac/Linux),
    - CR 0x0D (Old Macs),
    - CR+LF 0x0D0A (Windows)
  - End of file (EOF) control character:
    - E0T 0x04 (*aka* Control-D)

programming languages:
NUL used to mark
the end of a string



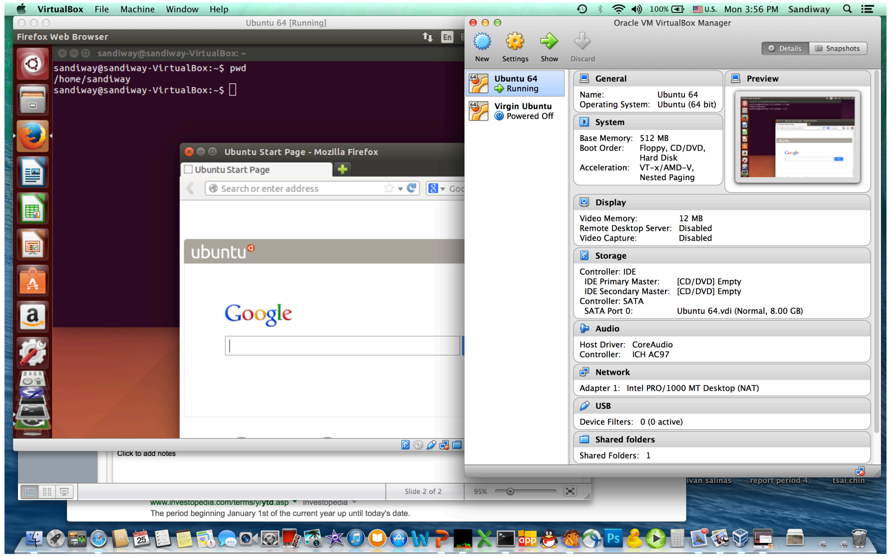
ASCII Code Chart

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL	SOH	STX	ETX	EOT	ENQ	ACK	BEL	BS	HT	LF	VT	FF	CR	SO	SI
1	DLE	DC1	DC2	DC3	DC4	NAK	SYN	ETB	CAN	EM	SUB	ESC	FS	GS	RS	US
2		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	DEL

binaryvision.nl

VirtualBox

- Virtual x86 machine(s)
  - install other operating systems (OSs) running inside a window, we'll install Ubuntu (Linux) as a Guest OS
- Free application at https://www.virtualbox.org



```
sandiway@sandiway-VirtualBox:~$ pwd
/home/sandiway
sandiway@sandiway-VirtualBox:~$ 
```

Ubuntu 64 Running

Virgin Ubuntu Powered Off

General

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

System

Base Memory: 512 MB
Boot Order: Floppy, CD/DVD, Hard Disk
Acceleration: VT-x/AMD-V, Nested Paging

Display

Video Memory: 12 MB
Remote Desktop Server: Disabled
Video Capture: Disabled

Storage

Controller: IDE
IDE Primary Master: [CD/DVD] Empty
IDE Secondary Master: [CD/DVD] Empty
Controller: SATA
SATA Port 0: Ubuntu 64.vdi (Normal, 8.00 GB)

Audio

Host Driver: CoreAudio
Controller: ICH AC97

Network

Adapter 1: Intel PRO/1000 MT Desktop (NAT)

USB

Device Filters: 0 (0 active)

Shared folders

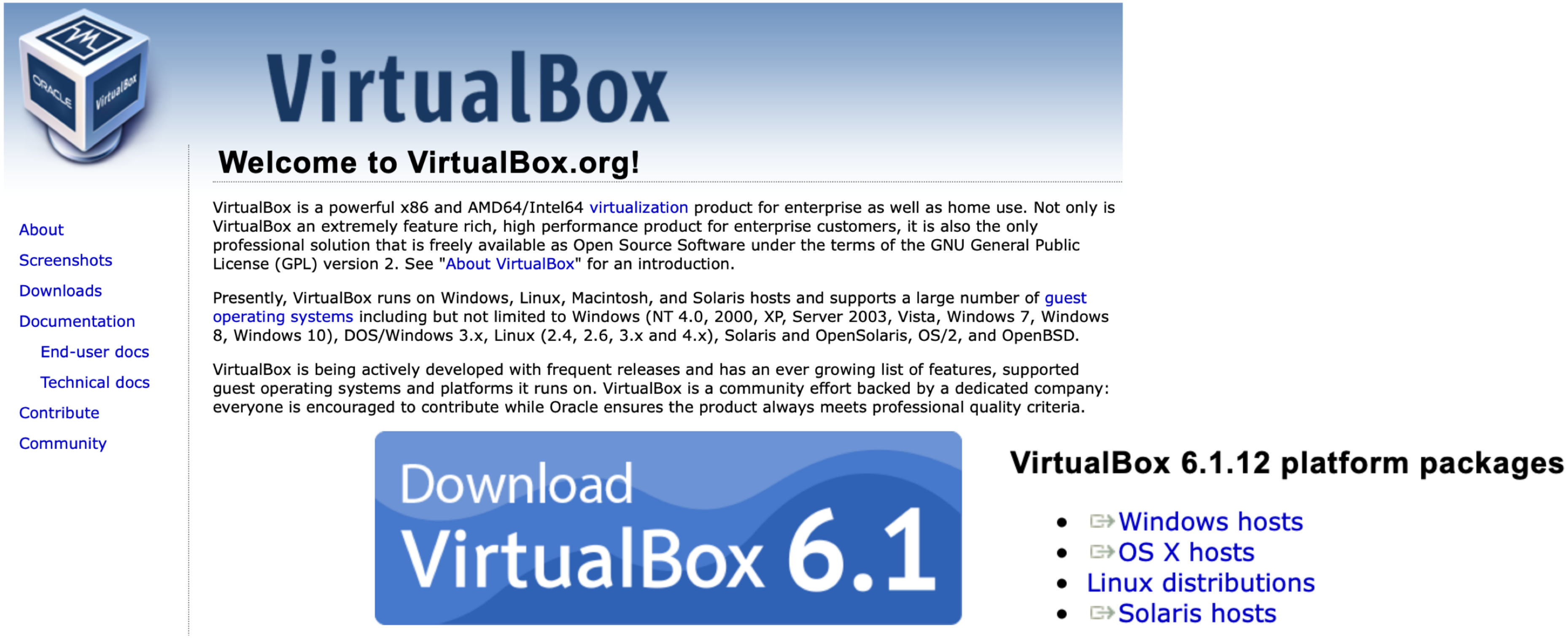
Shared Folders: 1

Ubuntu 14.04 LTS*
under
VirtualBox
under
OS X 10.10.5

*LTS = Long Term Support

Homework 2

- Install VirtualBox on your 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 2. See "About VirtualBox" for an introduction.

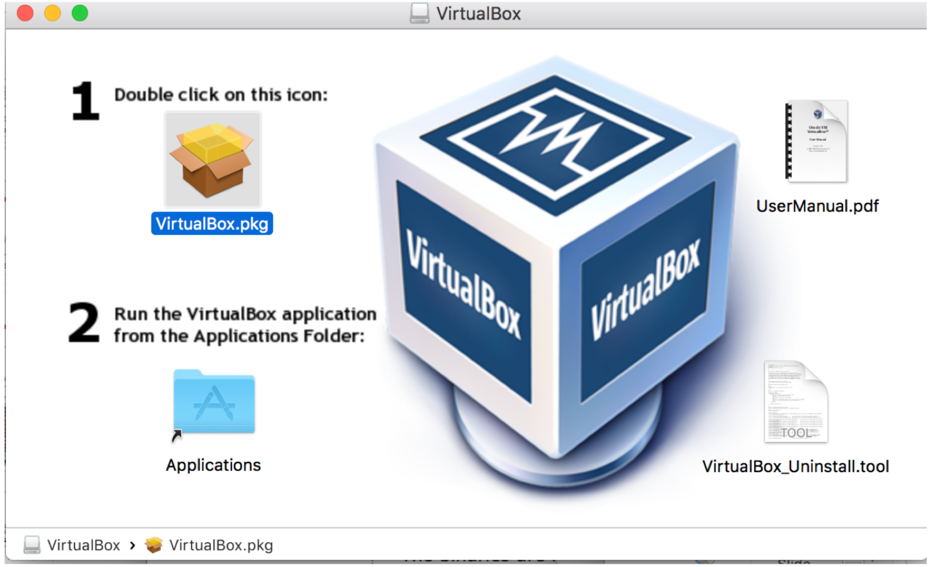
Presently, VirtualBox runs on Windows, Linux, Macintosh, and Solaris hosts and supports a large number of guest operating systems including but not limited to Windows (NT 4.0, 2000, XP, Server 2003, Vista, Windows 7, Windows 8, Windows 10), DOS/Windows 3.x, Linux (2.4, 2.6, 3.x and 4.x), Solaris and 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 6.1.12 platform packages

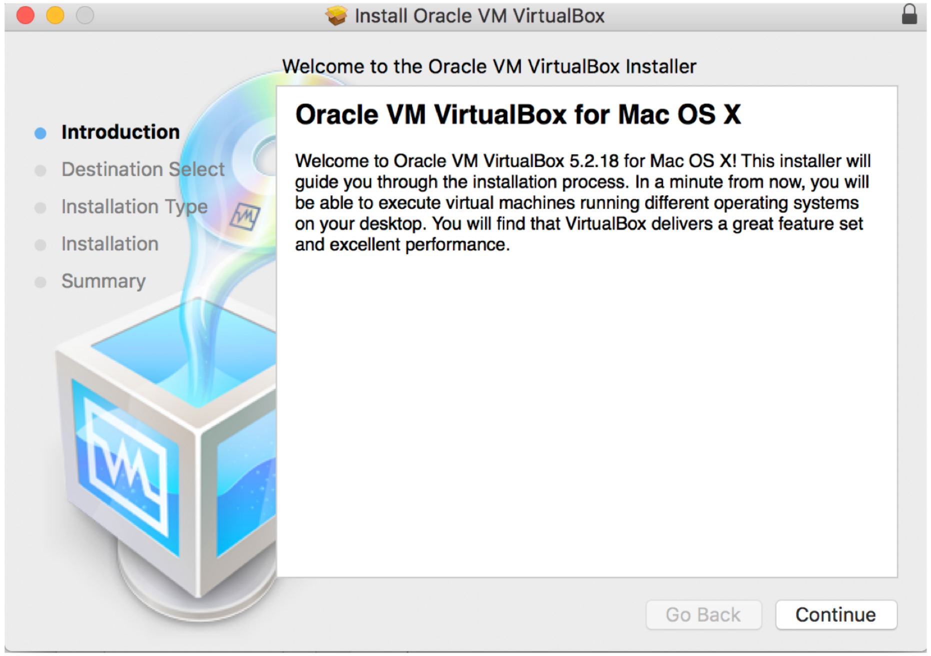
- ⇨Windows hosts
- ⇨OS X hosts
- Linux distributions
- ⇨Solaris hosts

Homework 2



1 Double click on this icon:

2 Run the VirtualBox application from the Applications Folder:

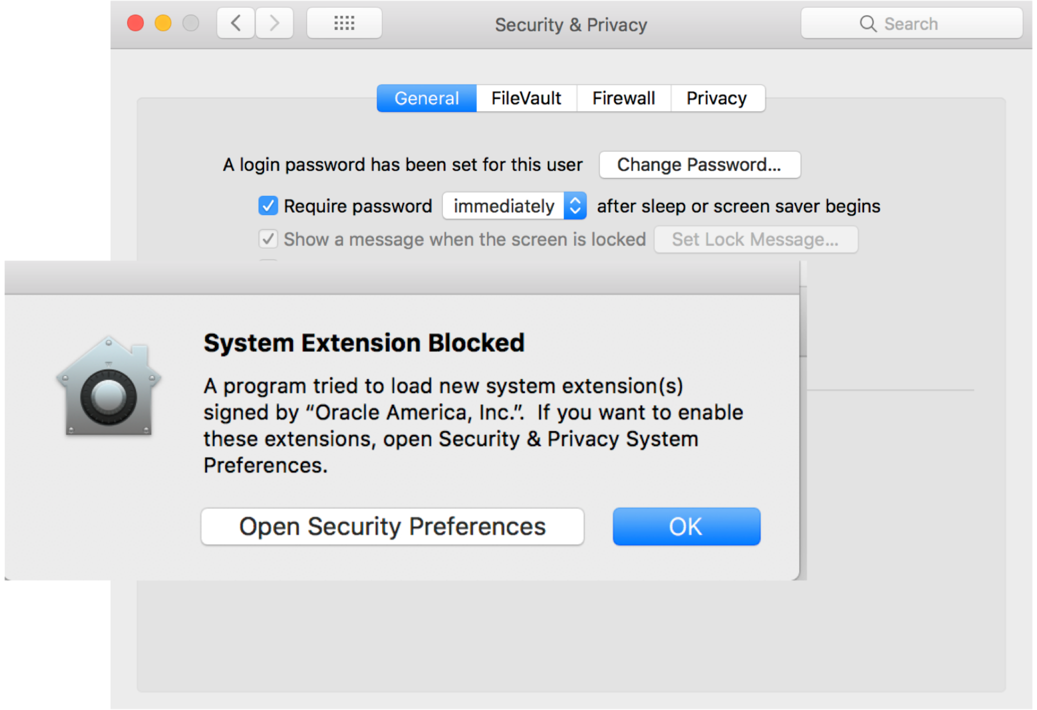


Welcome to the Oracle VM VirtualBox Installer

Oracle VM VirtualBox for Mac OS X

Welcome to Oracle VM VirtualBox 5.2.18 for Mac OS X! This installer will guide you through the installation process. In a minute from now, you will be able to execute virtual machines running different operating systems on your desktop. You will find that VirtualBox delivers a great feature set and excellent performance.

Homework 2



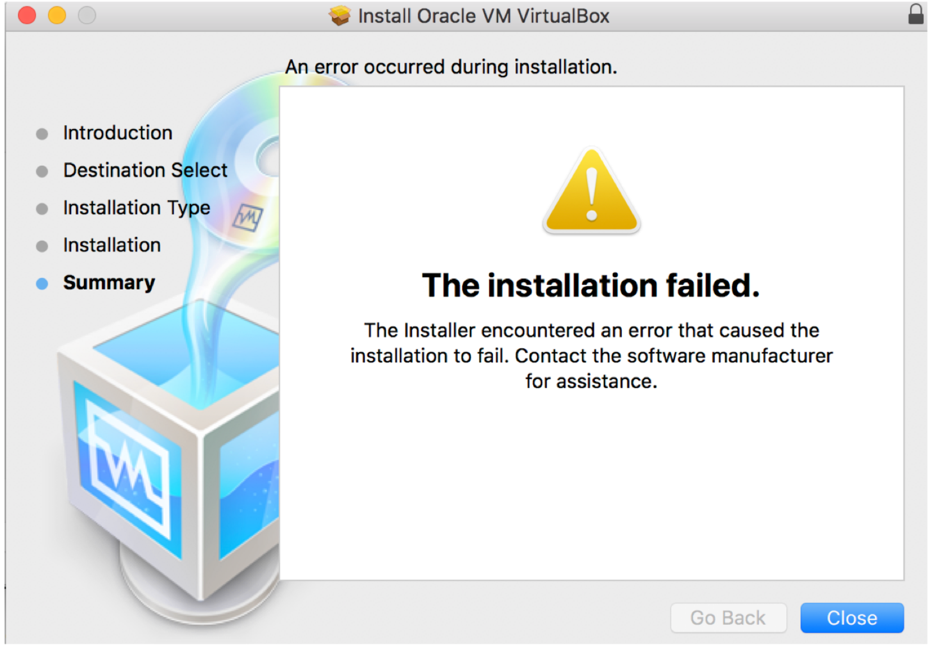
A login password has been set for this user

☑ Require password immediately after sleep or screen saver begins

☑ Show a message when the screen is locked

System Extension Blocked

A program tried to load new system extension(s) signed by "Oracle America, Inc.". If you want to enable these extensions, open Security & Privacy System Preferences.



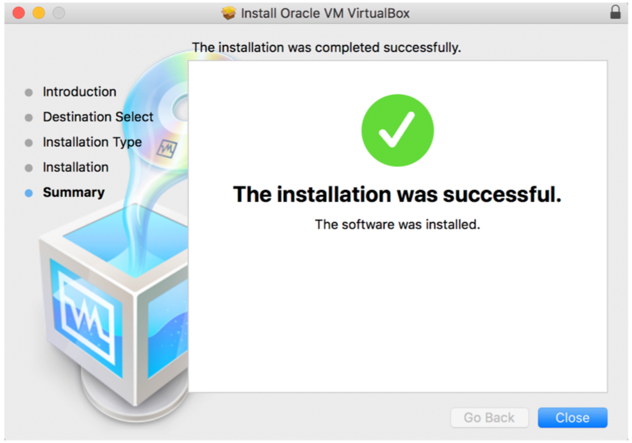
An error occurred during installation.

The installation failed.

The Installer encountered an error that caused the installation to fail. Contact the software manufacturer for assistance.

Homework 2

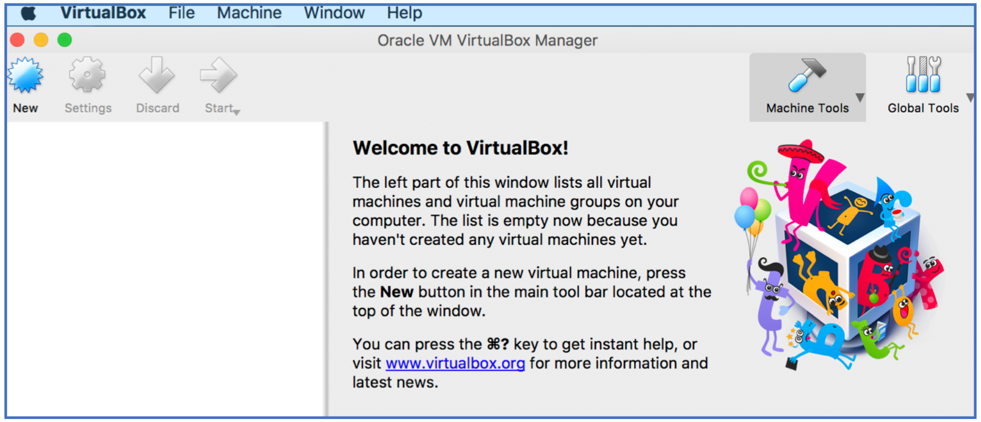
- Re-run installer after giving Oracle Computer permission



The installation was completed successfully.

The installation was successful.

The software was installed.



Welcome to VirtualBox!

The left part of this window lists all virtual machines and virtual machine groups on your computer. The list is empty now because you haven't created any virtual machines yet.

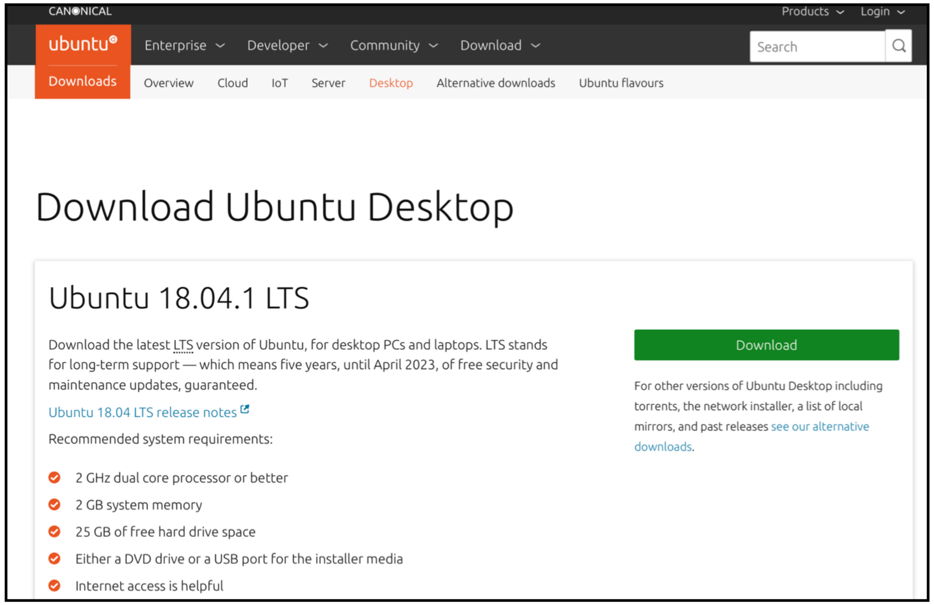
In order to create a new virtual machine, press the **New** button in the main tool bar located at the top of the window.

You can press the **⌘?** key to get instant help, or visit www.virtualbox.org for more information and latest news.

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

Homework 2

- Now we need a guest operating system: we'll use Ubuntu (Linux)
- http://www.ubuntu.com/download/desktop



Download Ubuntu Desktop

Ubuntu 18.04.1 LTS

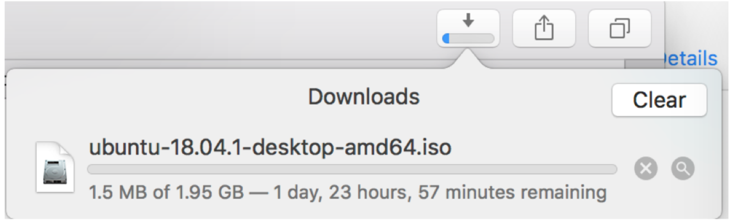
Download the latest LTS version of Ubuntu, for desktop PCs and laptops. LTS stands for long-term support — which means five years, until April 2023, of free security and maintenance updates, guaranteed.

Ubuntu 18.04 LTS release notes

Recommended system requirements:

- 2 GHz dual core processor or better
- 2 GB system memory
- 25 GB of free hard drive space
- Either a DVD drive or a USB port for the installer media
- Internet access is helpful

For other versions of Ubuntu Desktop including torrents, the network installer, a list of local mirrors, and past releases see our alternative downloads.



ubuntu-18.04.1-desktop-amd64.iso

1.5 MB of 1.95 GB — 1 day, 23 hours, 57 minutes remaining

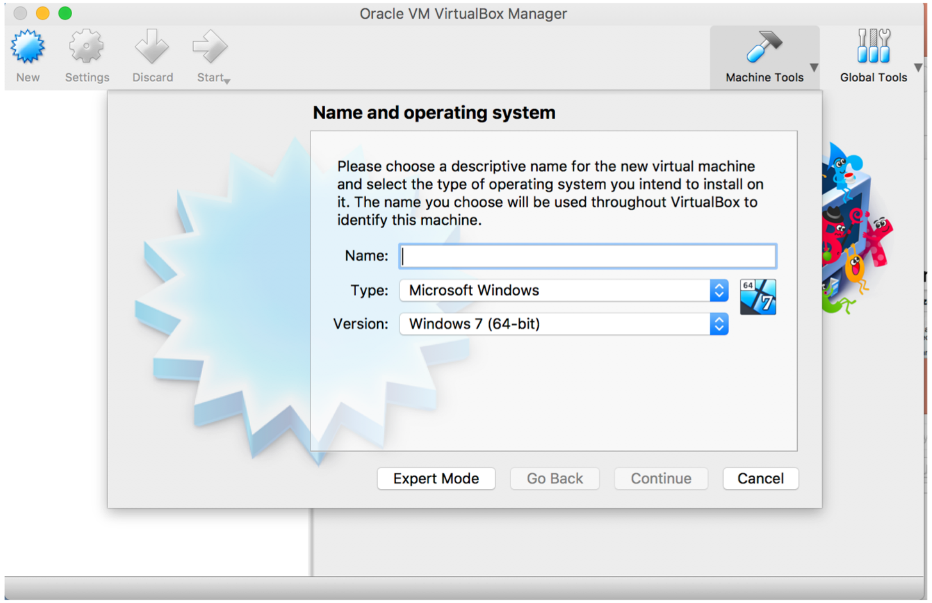
The .iso file takes considerable time to download

The .iso file is 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

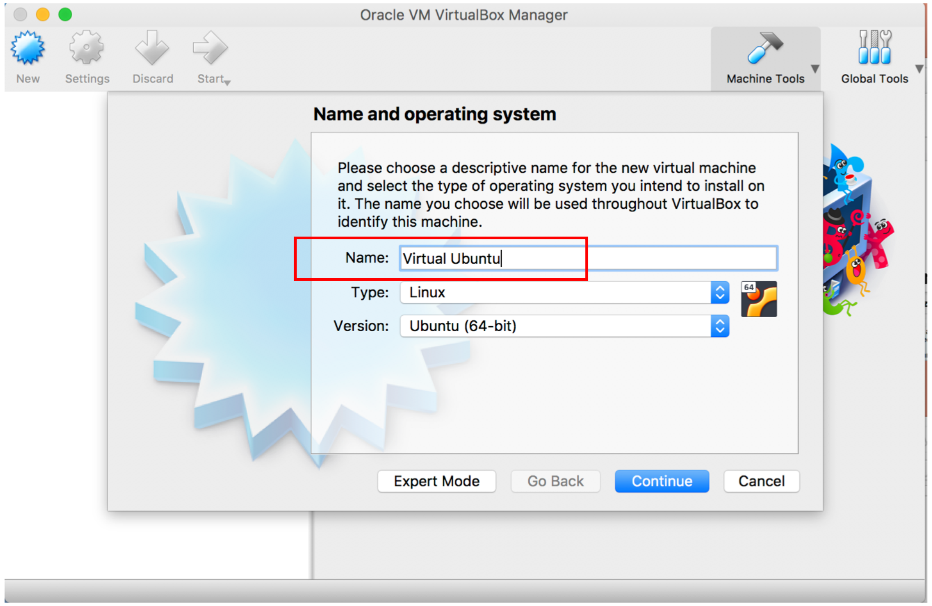
Name and operating system

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: Microsoft Windows

Version: Windows 7 (64-bit)



Oracle VM VirtualBox Manager

Name and operating system

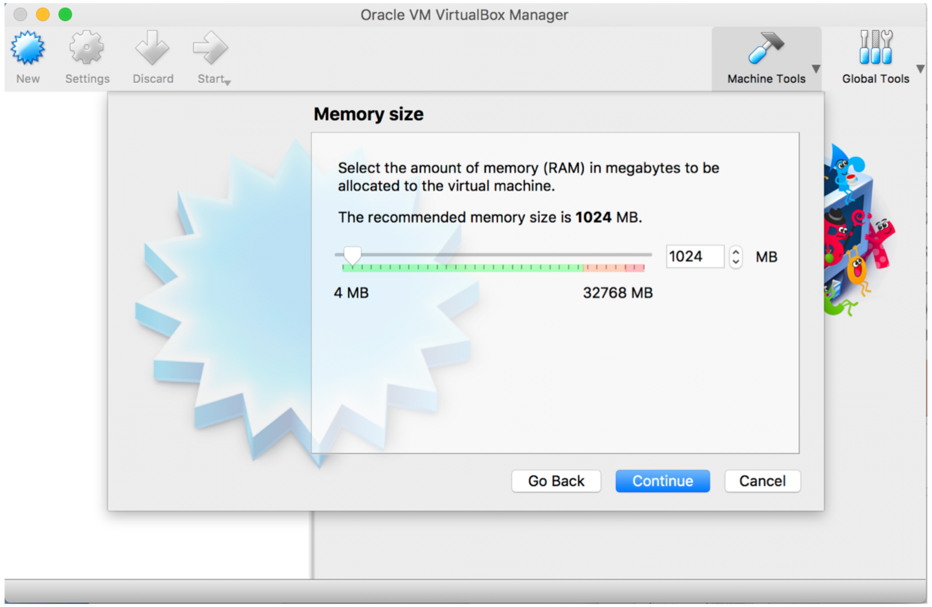
Please choose a descriptive name for the new virtual machine and select the type of operating system you intend to install on it. The name you choose will be used throughout VirtualBox to identify this machine.

Name: Virtual Ubuntu

Type: Linux

Version: Ubuntu (64-bit)

VirtualBox



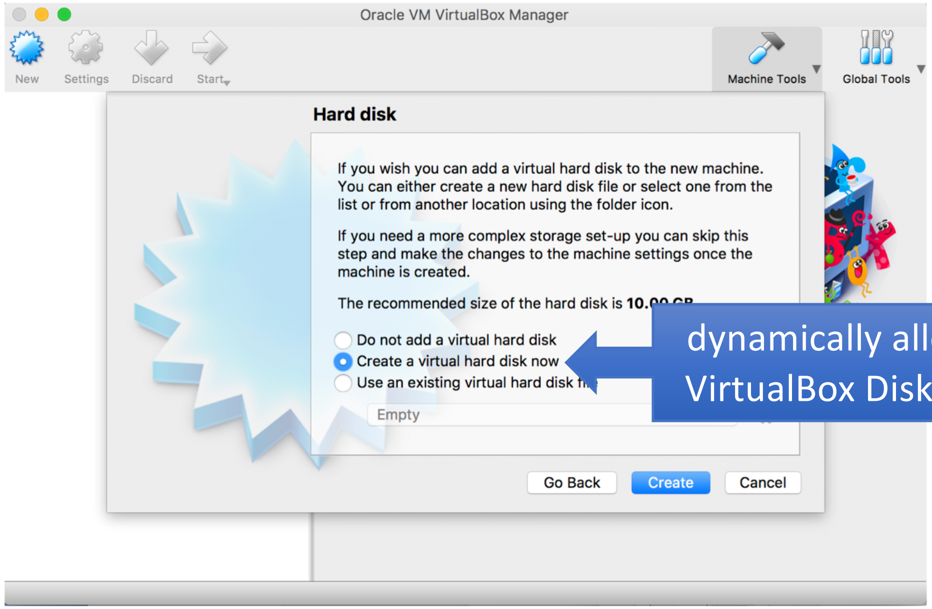
Memory size

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

The recommended memory size is **1024** MB.

1024 MB

4 MB 32768 MB



Hard disk

If you wish you can add a virtual hard disk to the new machine. You can either create a new hard disk file or select one from the list or from another location using the folder icon.

If you need a more complex storage set-up you can skip this step and make the changes to the machine settings once the machine is created.

The recommended size of the hard disk is **10.00 GB**

○ Do not add a virtual hard disk

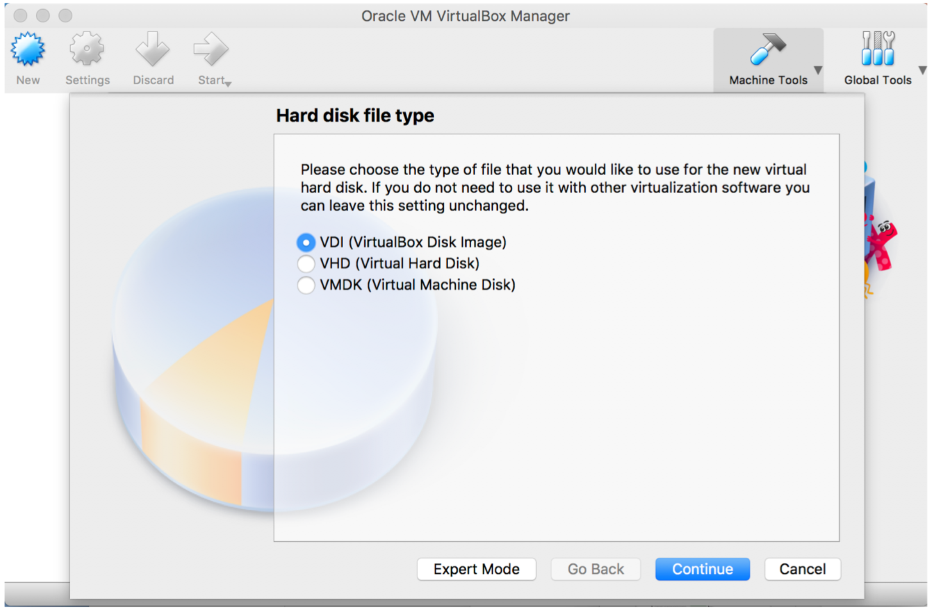
● Create a virtual hard disk now

○ Use an existing virtual hard disk fi

Empty

dynamically allocated VirtualBox Disk Image

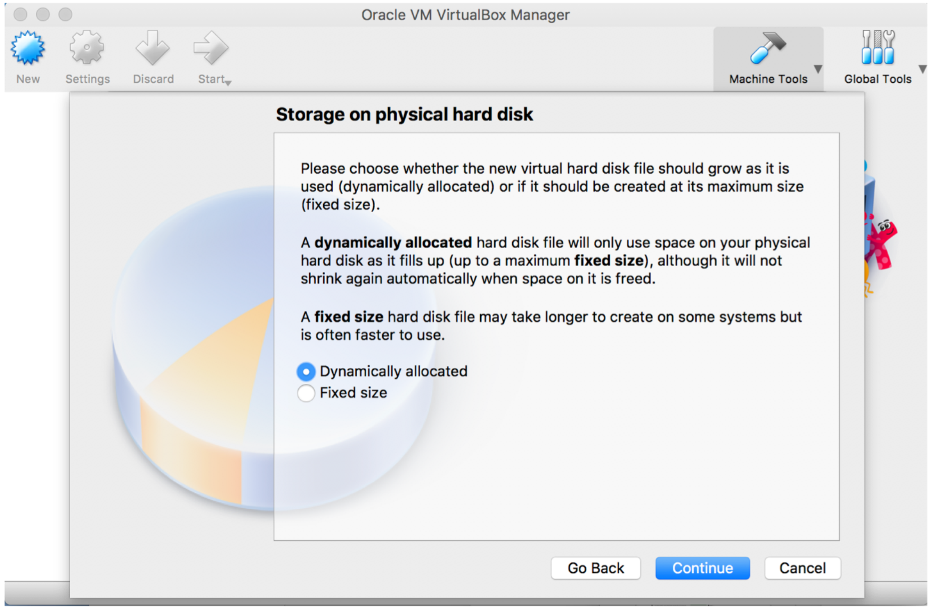
VirtualBox



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)
○ VHD (Virtual Hard Disk)
○ VMDK (Virtual Machine Disk)



Storage on physical hard disk

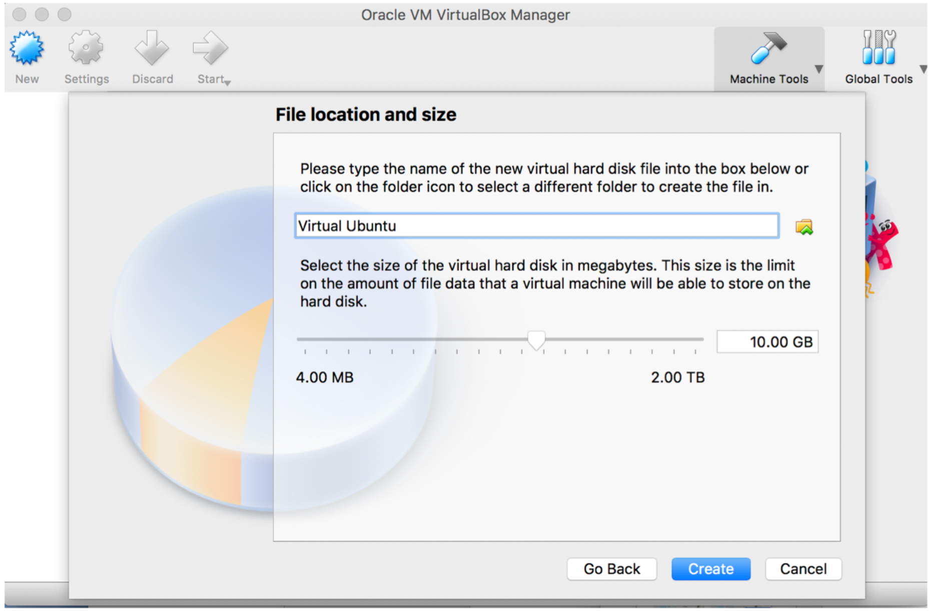
Please choose whether the new virtual hard disk file should grow as it is used (dynamically allocated) or if it should be created at its maximum size (fixed size).

A **dynamically allocated** hard disk file will only use space on your physical hard disk as it fills up (up to a maximum **fixed size**), although it will not shrink again automatically when space on it is freed.

A **fixed size** hard disk file may take longer to create on some systems but is often faster to use.

● Dynamically allocated
○ Fixed size

VirtualBox



File location and size

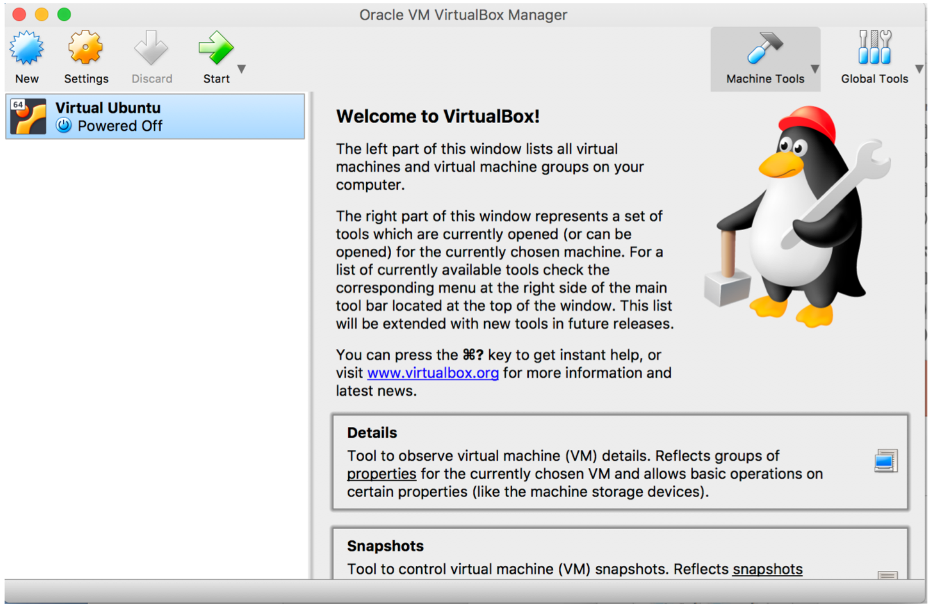
Please type the name of the new virtual hard disk file into the box below or click on the folder icon to select a different folder to create the file in.

Virtual Ubuntu

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.

10.00 GB

4.00 MB 2.00 TB



Virtual Ubuntu
Powered Off

Welcome to VirtualBox!

The left part of this window lists all virtual machines and virtual machine groups on your computer.

The right part of this window represents a set of tools which are currently opened (or can be opened) for the currently chosen machine. For a list of currently available tools check the corresponding menu at the right side of the main tool bar located at the top of the window. This list will be extended with new tools in future releases.

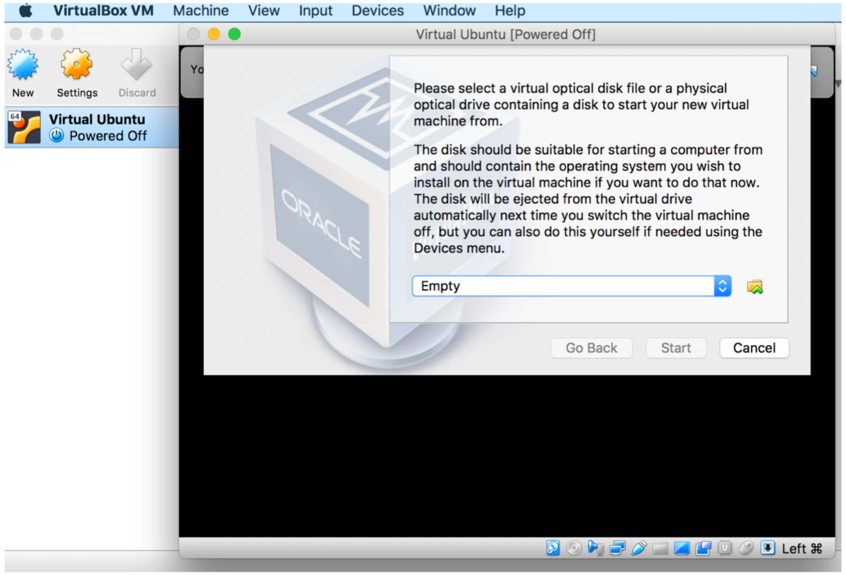
You can press the ⌘? key to get instant help, or visit www.virtualbox.org for more information and latest news.

Details
Tool to observe virtual machine (VM) details. Reflects groups of properties for the currently chosen VM and allows basic operations on certain properties (like the machine storage devices).

Snapshots
Tool to control virtual machine (VM) snapshots. Reflects snapshots

VirtualBox

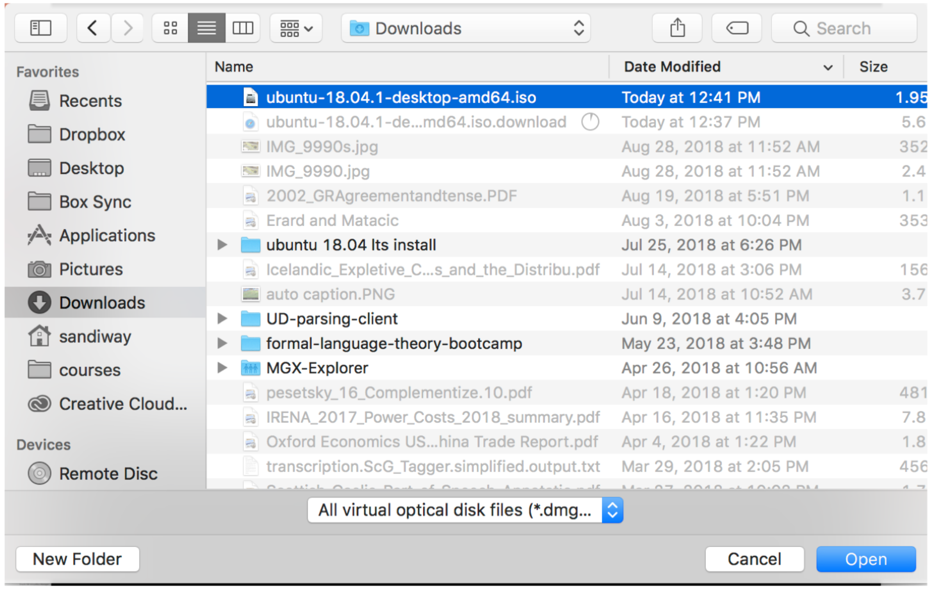
Start your virtual machine (double-click or Start)



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

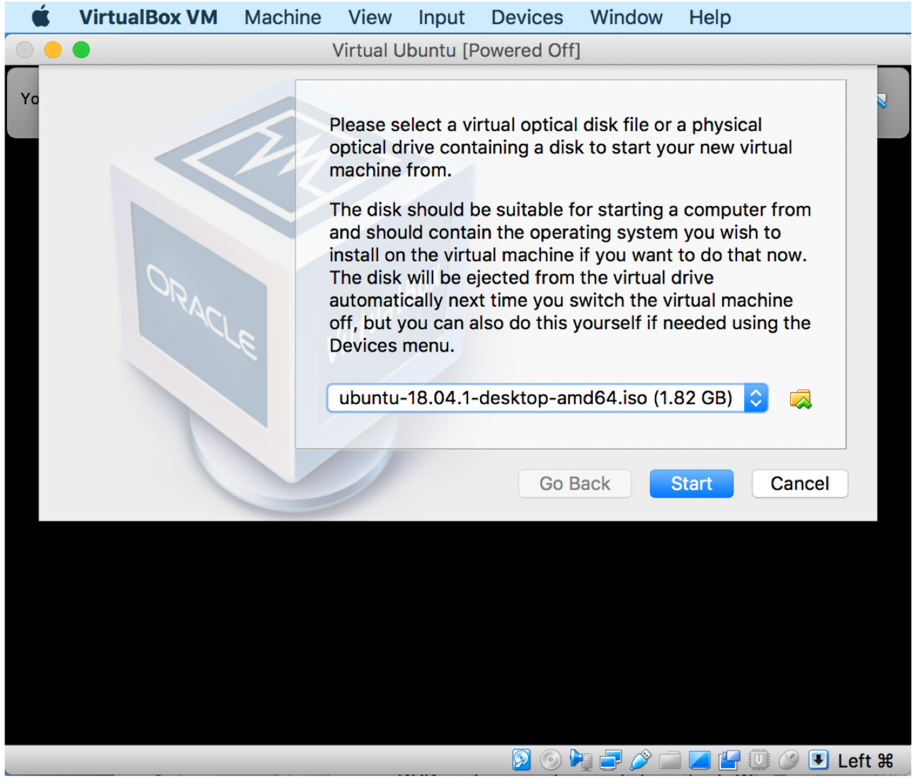
The disk should be suitable for starting a computer from and should contain the operating system you wish to install on the virtual machine if you want to do that now. The disk will be ejected from the virtual drive automatically next time you switch the virtual machine off, but you can also do this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

Empty



Name	Date Modified	Size
ubuntu-18.04.1-desktop-amd64.iso	Today at 12:41 PM	1.95
ubuntu-18.04.1-de...md64.iso.download	Today at 12:37 PM	5.6
IMG_9990s.jpg	Aug 28, 2018 at 11:52 AM	352
IMG_9990.jpg	Aug 28, 2018 at 11:52 AM	2.4
2002_GRAgreementandtense.PDF	Aug 19, 2018 at 5:51 PM	1.1
Erard and Matacic	Aug 3, 2018 at 10:04 PM	353
ubuntu 18.04 lts install	Jul 25, 2018 at 6:26 PM	
Icelandic_Expletive_C...s_and_the_Distribu.pdf	Jul 14, 2018 at 3:06 PM	156
auto caption.PNG	Jul 14, 2018 at 10:52 AM	3.7
UD-parsing-client	Jun 9, 2018 at 4:05 PM	
formal-language-theory-bootcamp	May 23, 2018 at 3:48 PM	
MGX-Explorer	Apr 26, 2018 at 10:56 AM	
pesetsky_16_Complementize.10.pdf	Apr 18, 2018 at 1:20 PM	481
IRENA_2017_Power_Costs_2018_summary.pdf	Apr 16, 2018 at 11:35 PM	7.8
Oxford Economics US...hina Trade Report.pdf	Apr 4, 2018 at 1:22 PM	1.8
transcription.ScG_Tagger.simplified.output.txt	Mar 29, 2018 at 2:05 PM	456

VirtualBox: installing Ubuntu



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

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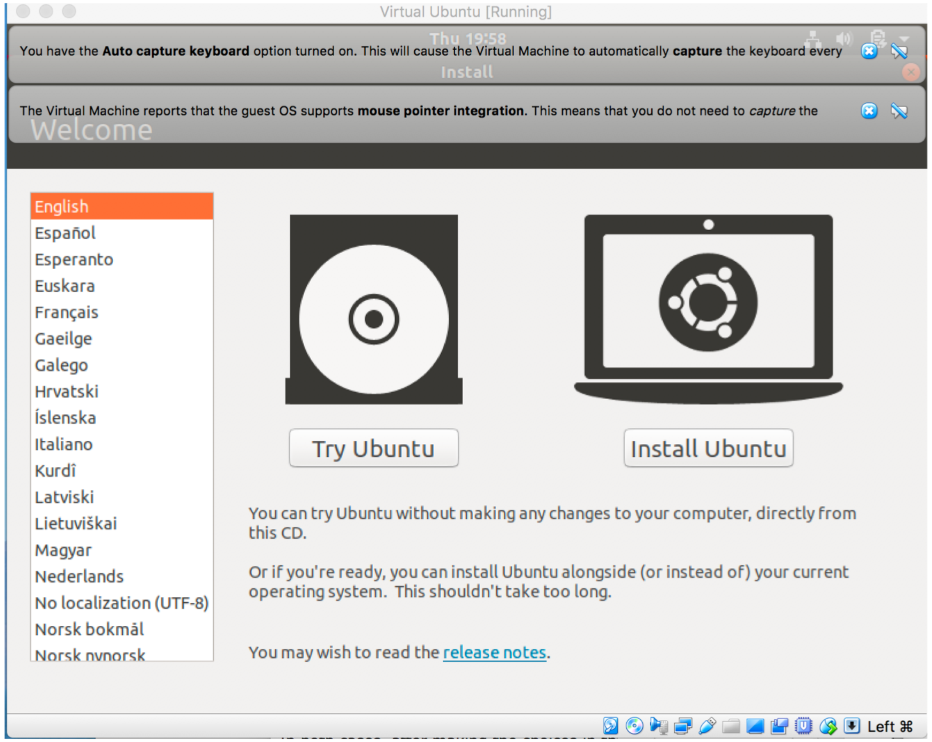
ubuntu-18.04.1-desktop-amd64.iso (1.82 GB)



You have the **Auto capture keyboard** option turned on. This will cause the Virtual Machine to automatically **capture** the keyboard every

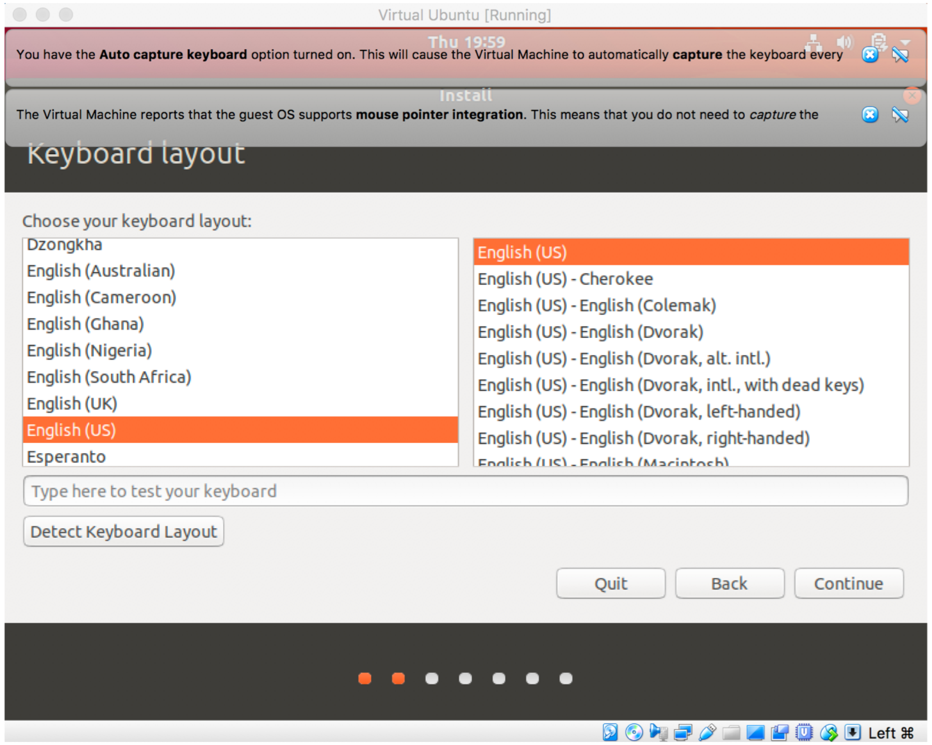
The Virtual Machine reports that the guest OS supports **mouse pointer integration.** This means that you do not need to *capture* the

You can try Ubuntu without making any changes to your computer, directly from this CD.

Or if you're ready, you can install Ubuntu alongside (or instead of) your current operating system. This shouldn't take too long.

You may wish to read the release notes.

VirtualBox: installing Ubuntu



Virtual Ubuntu [Running]

Thu 19:59

You have the **Auto capture keyboard** option turned on. This will cause the Virtual Machine to automatically **capture** the keyboard every

Install

The Virtual Machine reports that the guest OS supports **mouse pointer integration**. This means that you do not need to *capture* the

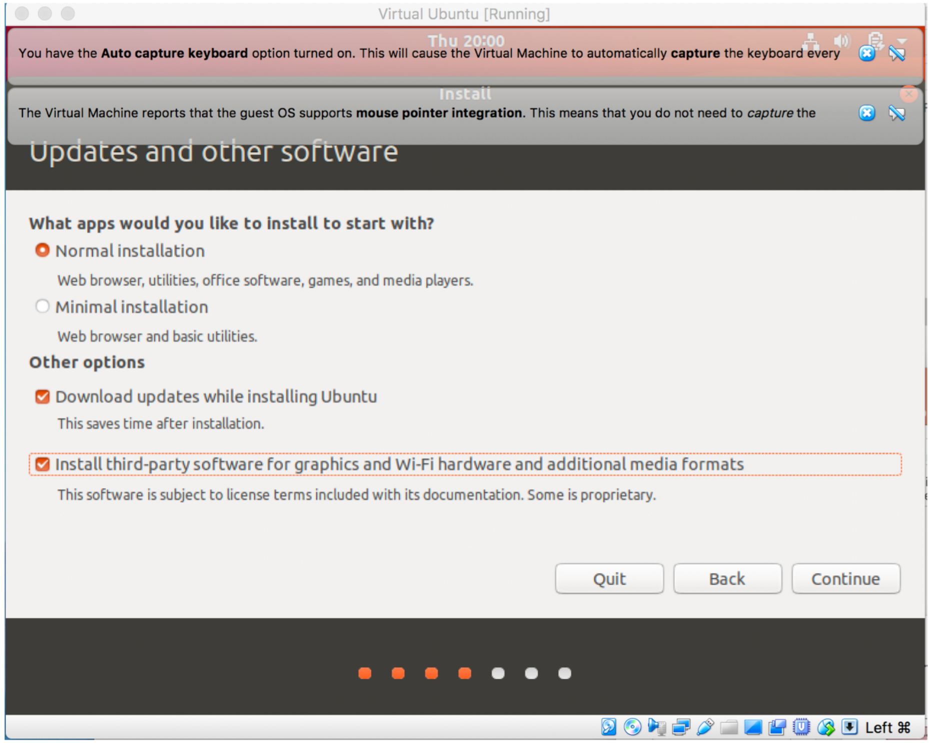
Keyboard layout

Choose your keyboard layout:

Dzongkha
English (Australian)
English (Cameroon)
English (Ghana)
English (Nigeria)
English (South Africa)
English (UK)
English (US)
Esperanto

English (US)
English (US) - Cherokee
English (US) - English (Colemak)
English (US) - English (Dvorak)
English (US) - English (Dvorak, alt. intl.)
English (US) - English (Dvorak, intl., with dead keys)
English (US) - English (Dvorak, left-handed)
English (US) - English (Dvorak, right-handed)
English (US) - English (Macintosh)

Type here to test your keyboard



Virtual Ubuntu [Running]

Thu 20:00

You have the **Auto capture keyboard** option turned on. This will cause the Virtual Machine to automatically **capture** the keyboard every

Install

The Virtual Machine reports that the guest OS supports **mouse pointer integration**. This means that you do not need to *capture* the

Updates and other software

What apps would you like to install to start with?

● Normal installation

Web browser, utilities, office software, games, and media players.

○ Minimal installation

Web browser and basic utilities.

Other options

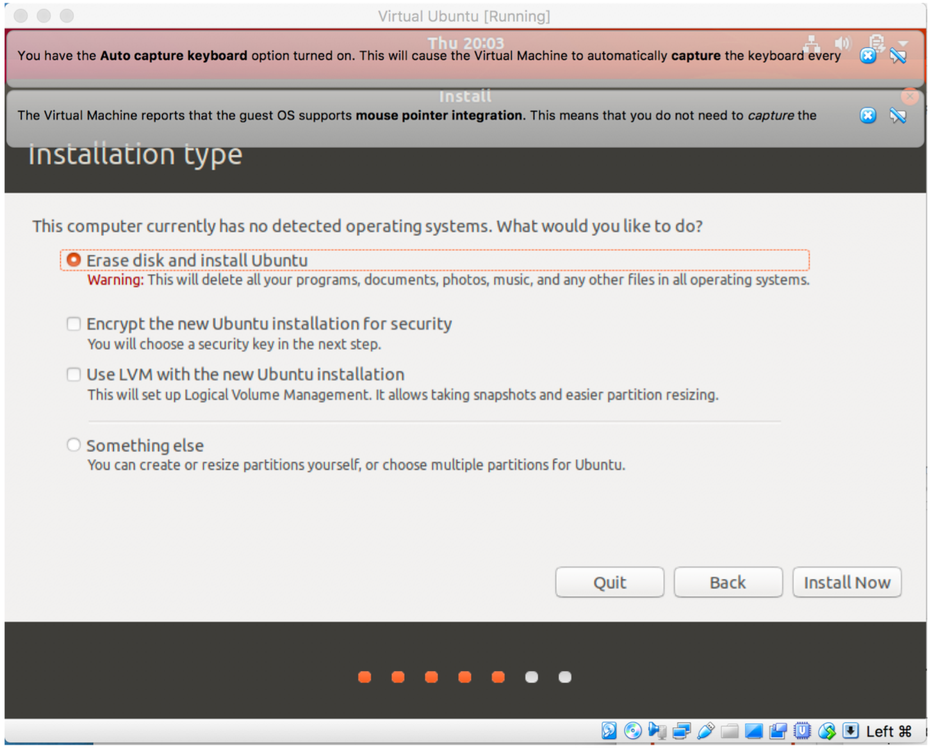
☑ Download updates while installing Ubuntu

This saves time after installation.

☑ Install third-party software for graphics and Wi-Fi hardware and additional media formats

This software is subject to license terms included with its documentation. Some is proprietary.

VirtualBox: installing Ubuntu



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The Virtual Machine reports that the guest OS supports **mouse pointer integration**. This means that you do not need to *capture* the

Installation type

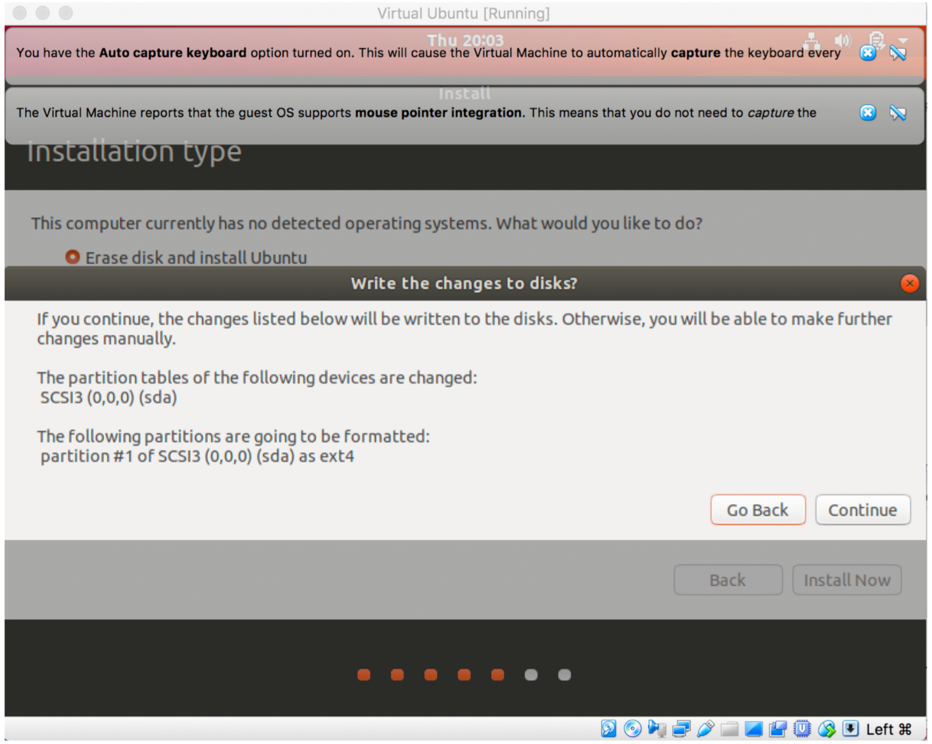
This computer currently has no detected operating systems. What would you like to do?

● Erase disk and install Ubuntu
Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems.

□ Encrypt the new Ubuntu installation for security
You will choose a security key in the next step.

□ Use LVM with the new Ubuntu installation
This will set up Logical Volume Management. It allows taking snapshots and easier partition resizing.

○ Something else
You can create or resize partitions yourself, or choose multiple partitions for Ubuntu.



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The Virtual Machine reports that the guest OS supports **mouse pointer integration**. This means that you do not need to *capture* the

Installation type

This computer currently has no detected operating systems. What would you like to do?

● Erase disk and install Ubuntu

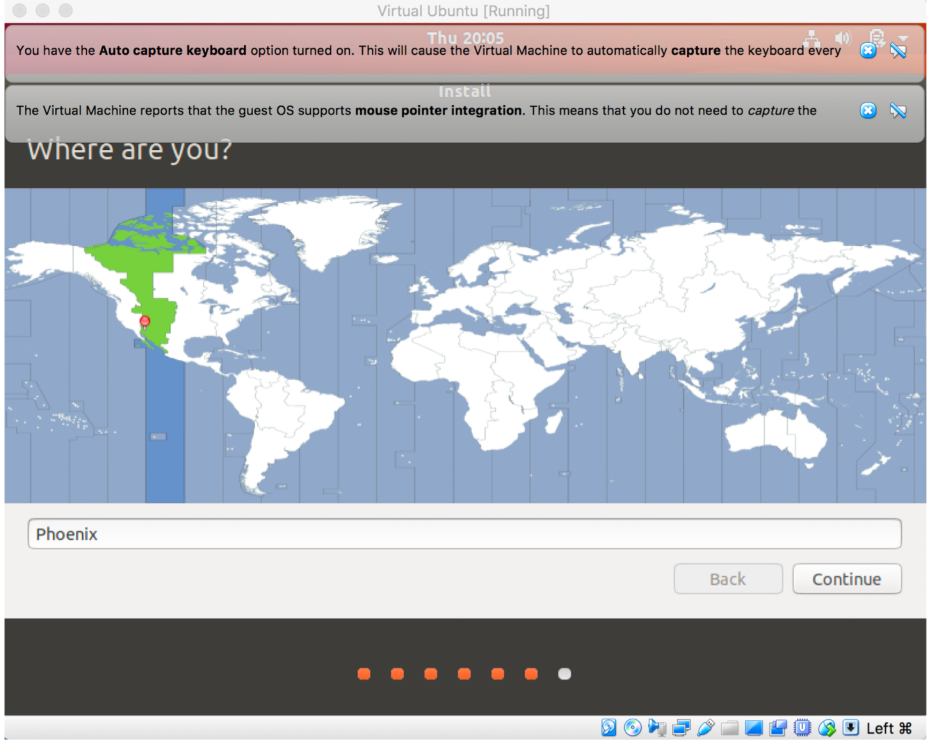
Write the changes to disks?

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

VirtualBox: installing Ubuntu

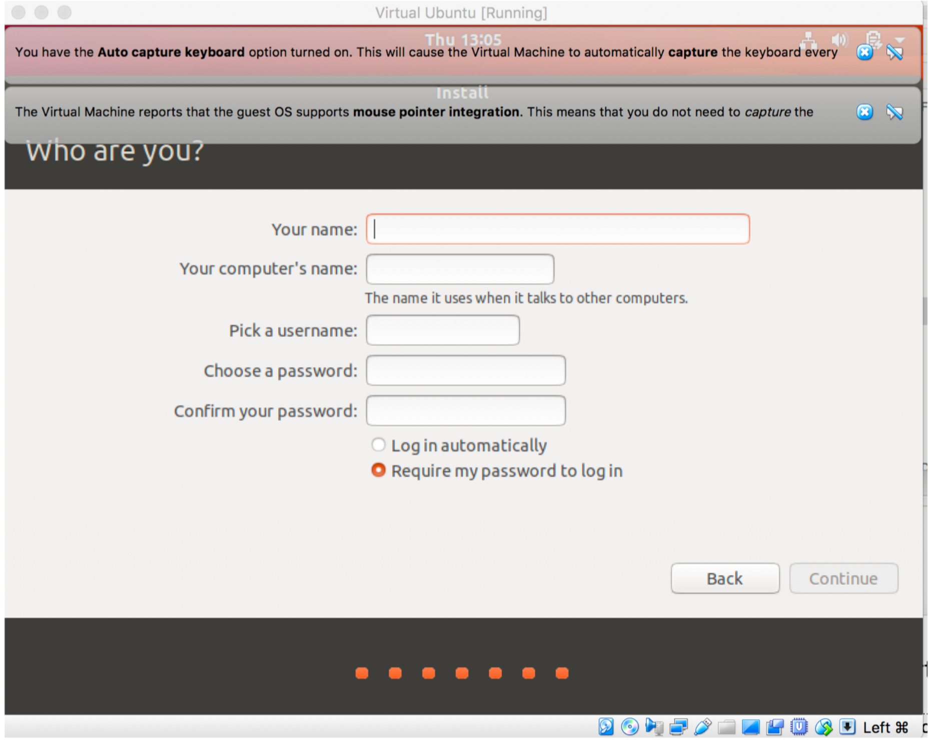


You have the **Auto capture keyboard** option turned on. This will cause the Virtual Machine to automatically **capture** the keyboard every

The Virtual Machine reports that the guest OS supports **mouse pointer integration**. This means that you do not need to *capture* the

Where are you?

Phoenix



You have the **Auto capture keyboard** option turned on. This will cause the Virtual Machine to automatically **capture** the keyboard every

The Virtual Machine reports that the guest OS supports **mouse pointer integration**. This means that you do not need to *capture* the

Who are you?

Your name:

Your computer's name:

The name it uses when it talks to other computers.

Pick a username:

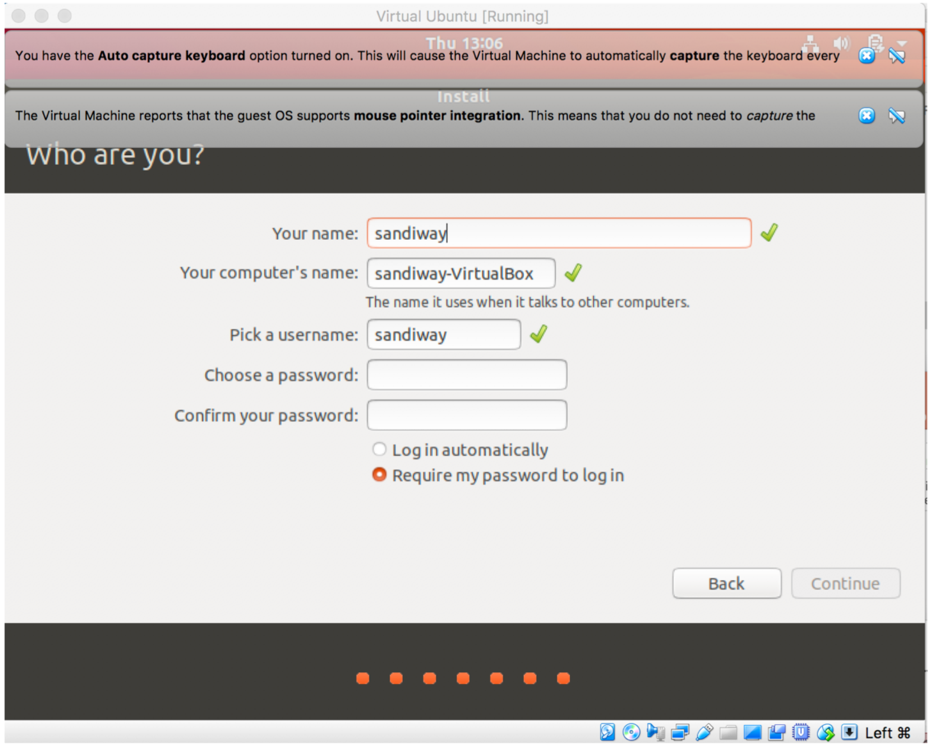
Choose a password:

Confirm your password:

○ Log in automatically

● Require my password to log in

VirtualBox: installing Ubuntu



Virtual Ubuntu [Running]

Thu 13:06

You have the **Auto capture keyboard** option turned on. This will cause the Virtual Machine to automatically **capture** the keyboard every

Install

The Virtual Machine reports that the guest OS supports **mouse pointer integration**. This means that you do not need to *capture* the

Who are you?

Your name: sandiway ✓

Your computer's name: sandiway-VirtualBox ✓

The name it uses when it talks to other computers.

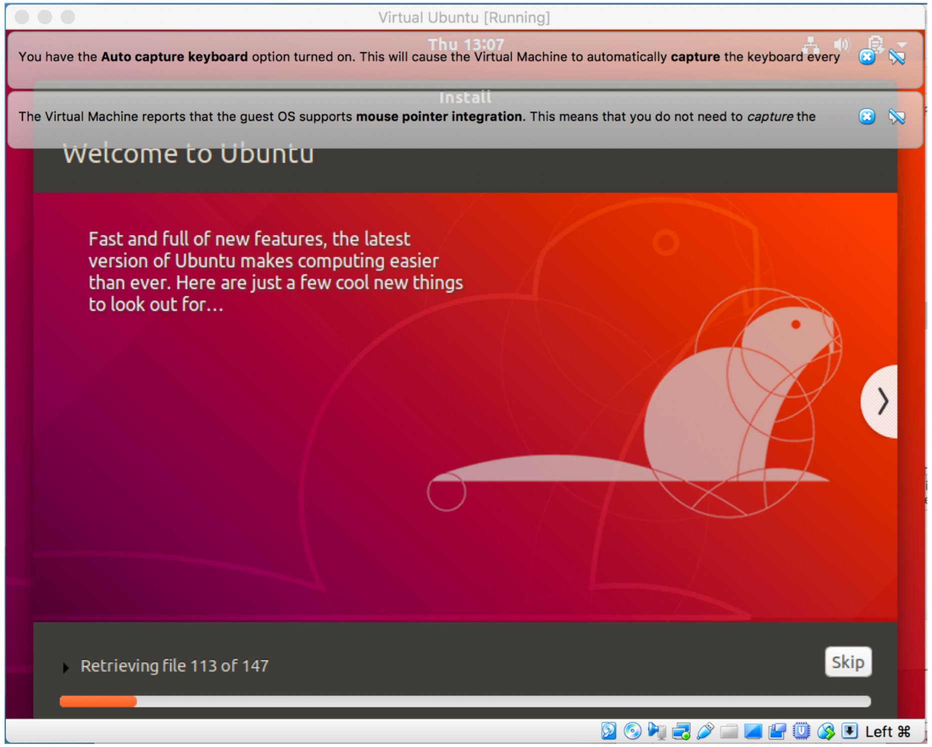
Pick a username: sandiway ✓

Choose a password:

Confirm your password:

○ Log in automatically

● Require my password to log in



Virtual Ubuntu [Running]

Thu 13:07

You have the **Auto capture keyboard** option turned on. This will cause the Virtual Machine to automatically **capture** the keyboard every

Install

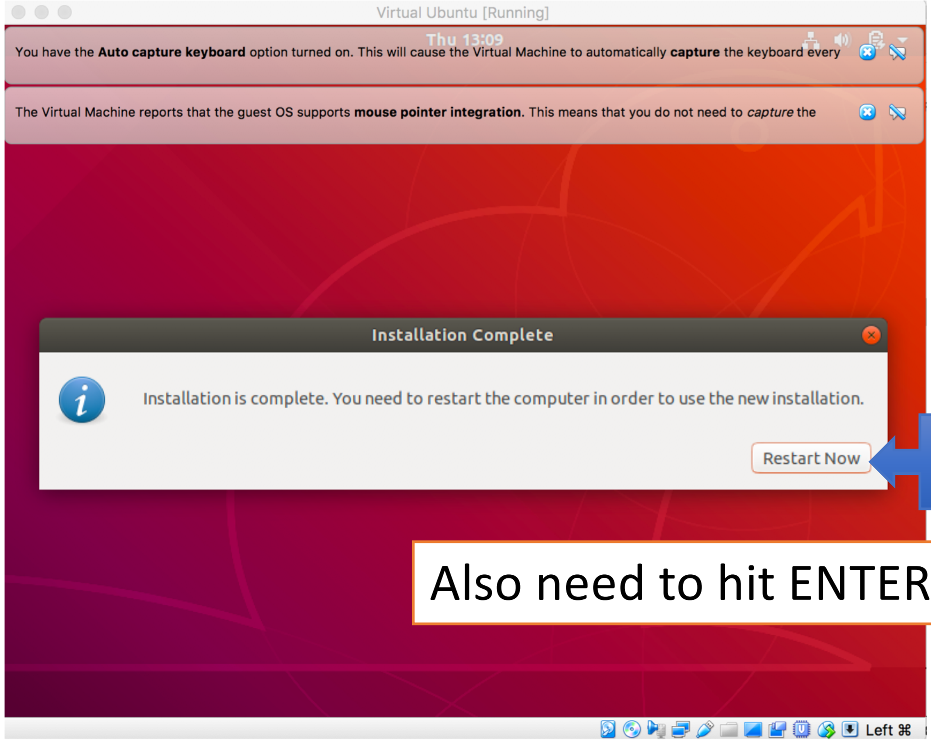
The Virtual Machine reports that the guest OS supports **mouse pointer integration**. This means that you do not need to *capture* the

Welcome to Ubuntu

Fast and full of new features, the latest version of Ubuntu makes computing easier than ever. Here are just a few cool new things to look out for…

Retrieving file 113 of 147

VirtualBox: installing Ubuntu



You have the **Auto capture keyboard** option turned on. This will cause the Virtual Machine to automatically **capture** the keyboard every

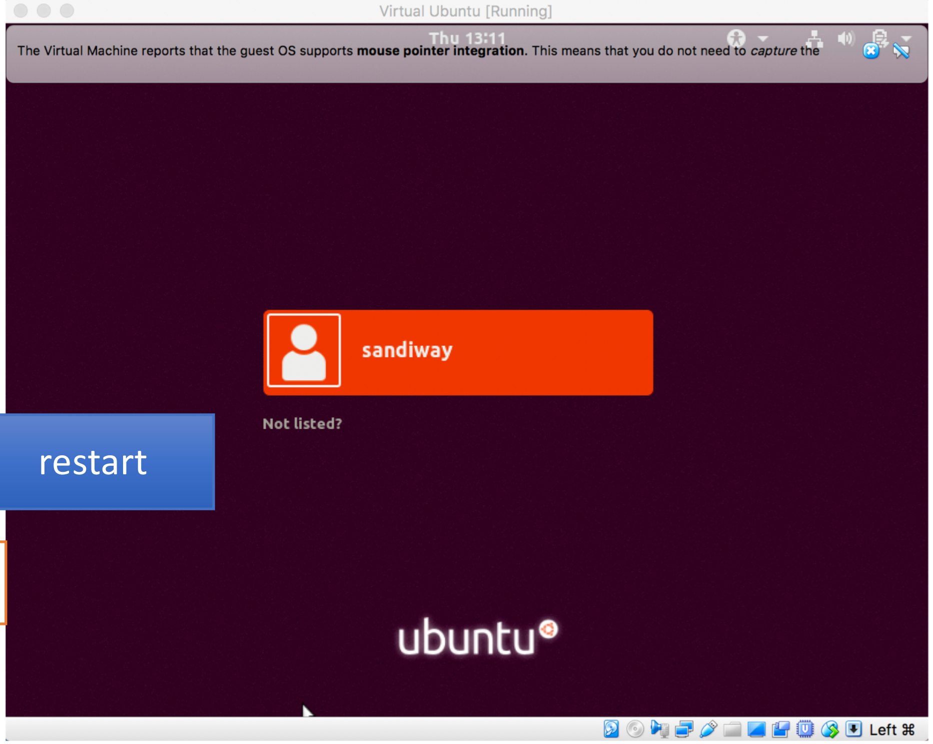
The Virtual Machine reports that the guest OS supports **mouse pointer integration**. This means that you do not need to *capture* the

Installation Complete

Installation is complete. You need to restart the computer in order to use the new installation.

restart

Also need to hit ENTER



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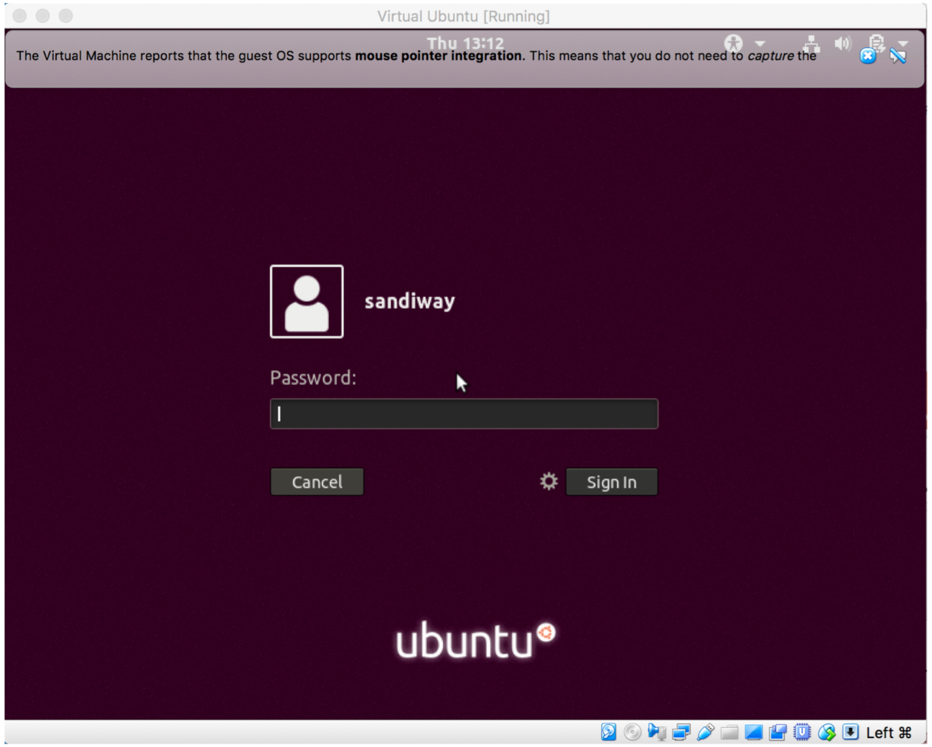
VirtualBox: running Ubuntu



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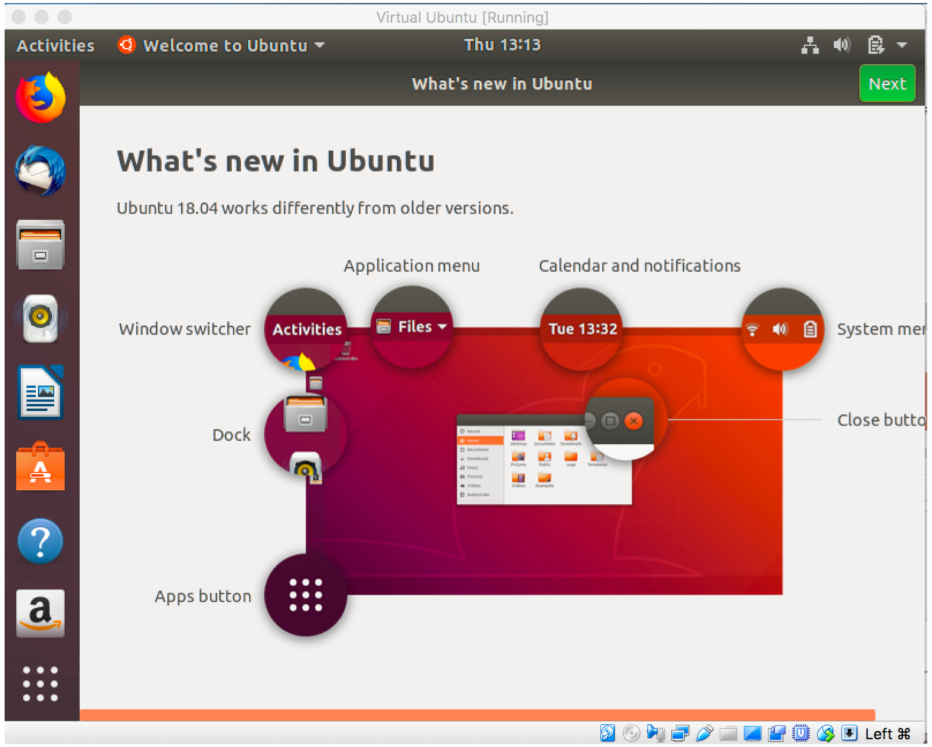
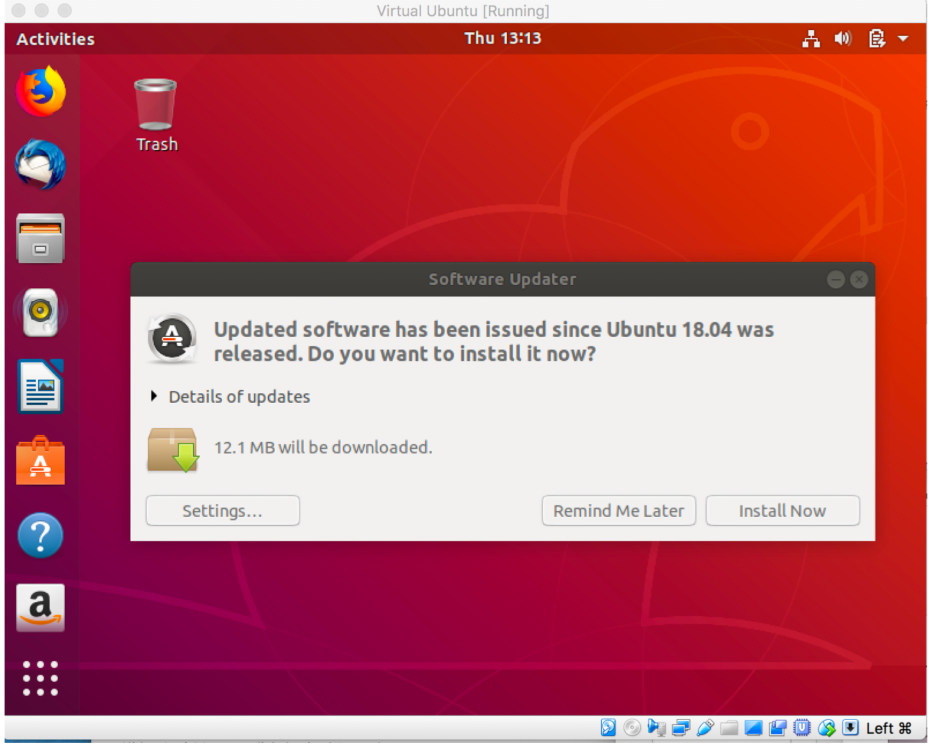


What's new in Ubuntu

Ubuntu 18.04 works differently from older versions.

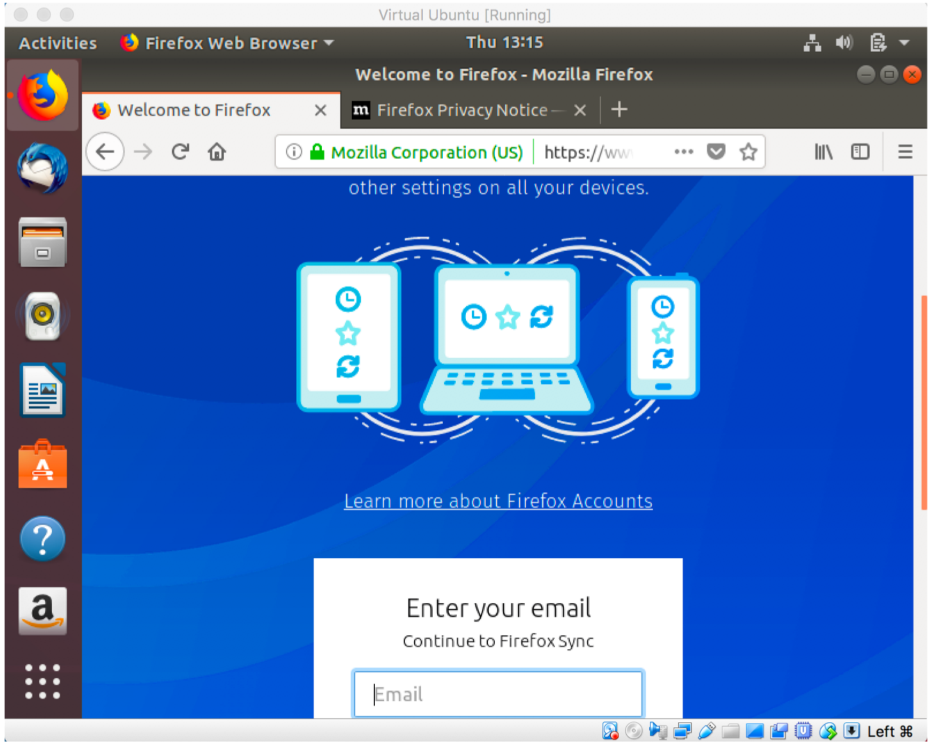
VirtualBox: running Ubuntu



Updated software has been issued since Ubuntu 18.04 was released. Do you want to install it now?

Details of updates

12.1 MB will be downloaded.



other settings on all your devices.

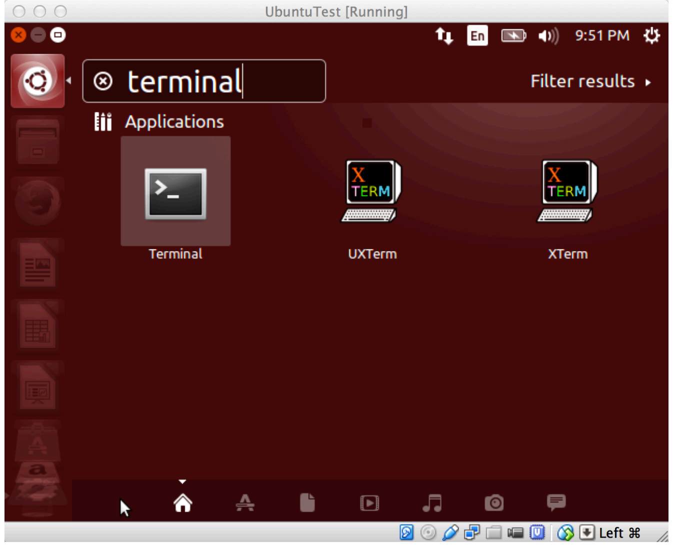
Learn more about Firefox Accounts

Enter your email

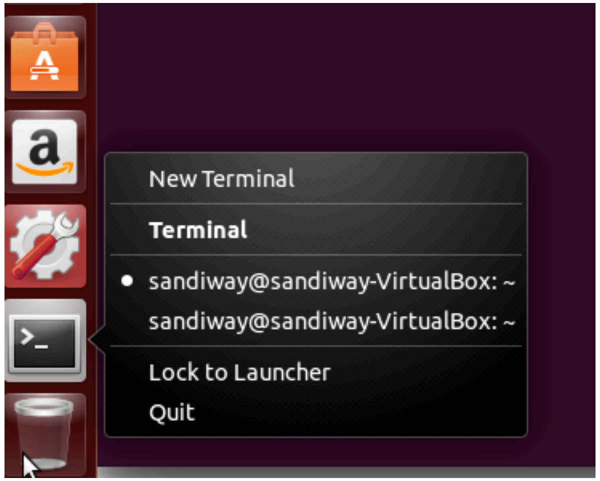
Continue to Firefox Sync

VirtualBox: running Ubuntu

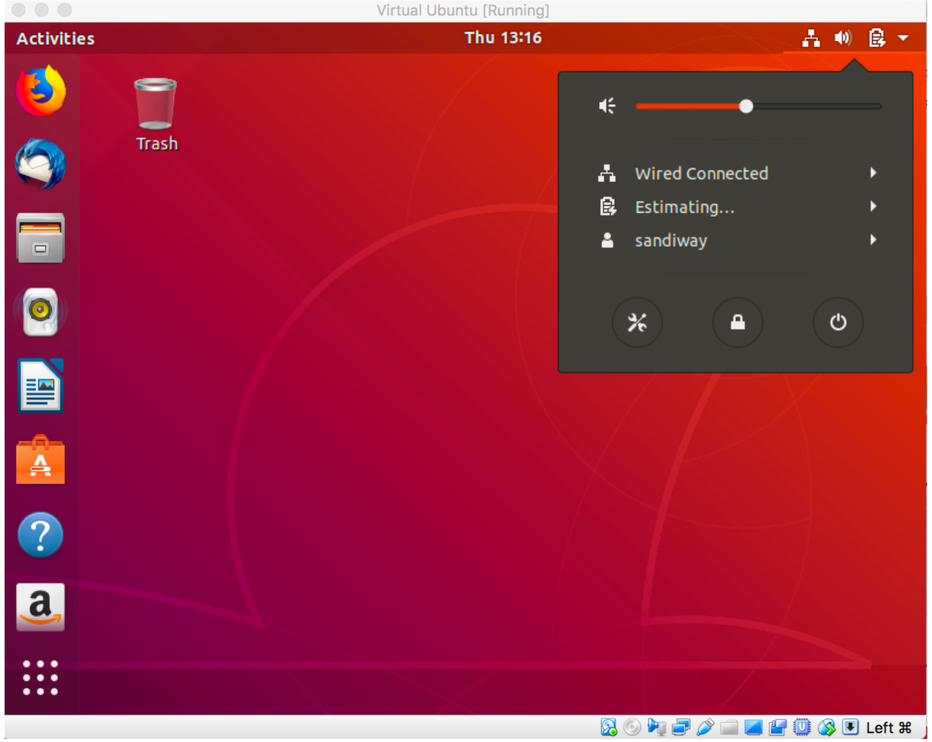
- Ubuntu Software Center
  - App store
  - (full screen to see Search box)
- Software packages
  - Terminal: **sudo** apt-get install <pkg-name>
  - **sudo** prefix: means execute the apt-get command with superuser privileges (typically needed for packages)
- How to find Terminal: use search



Lock to Launcher


New Terminal
Terminal
sandiway@sandiway-VirtualBox: ~
sandiway@sandiway-VirtualBox: ~
Lock to Launcher
Quit

VirtualBox: running Ubuntu



- Click right bottom icon to power off