Computer Information Systems
CIS 2332 – Information Technology Hardware and Systems Software

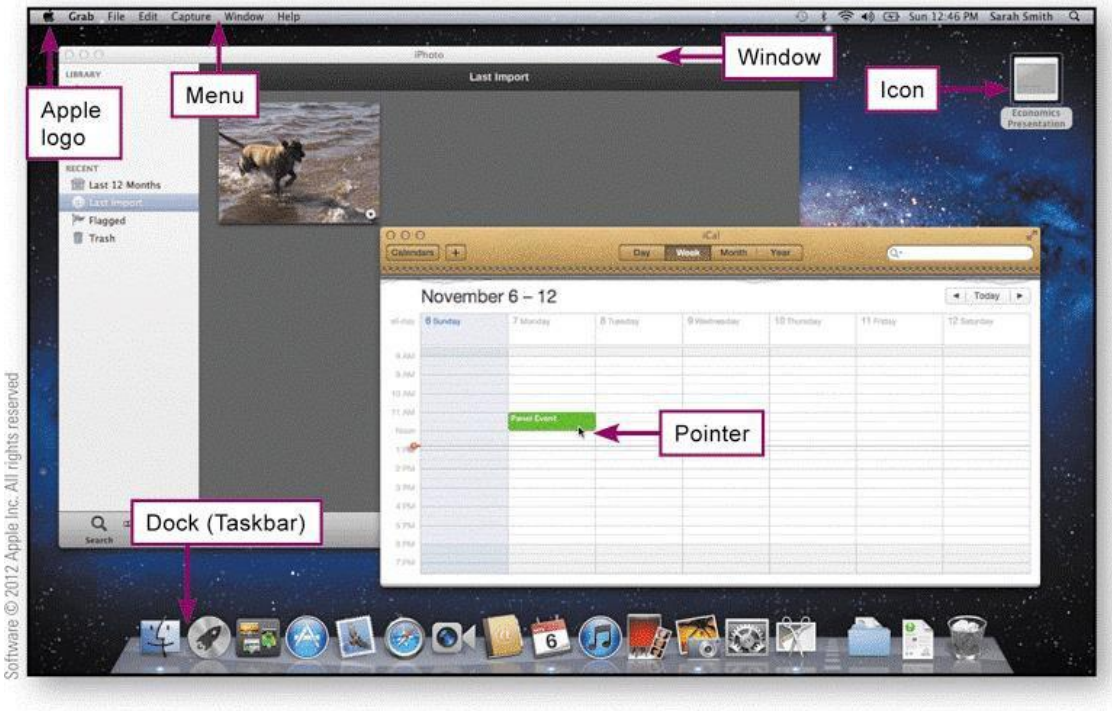
Module 2 – Mac and Linux

Mac

Mac OS

FIGURE 4-21

You can tell when you're using Mac OS by the Apple logo that appears on the menu bar.
Tour the Mac OS desktop and compare it to the Windows desktop.



Mac OS

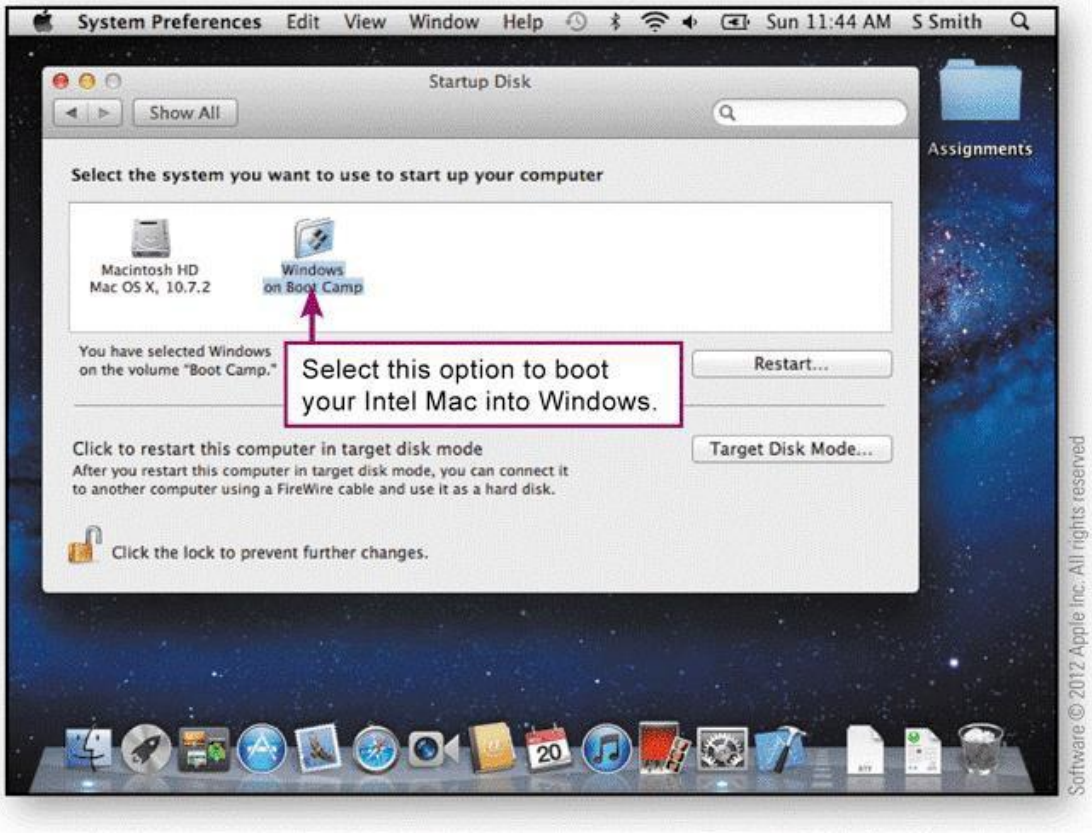


FIGURE 4-23

On a Macintosh computer with Boot Camp, you can boot into Mac OS X or into Windows.

See how it works!

Mac OS

- Mac OS X is also a good platform for **virtual machine** (VM) technologies that allow you to use one computer to simulate the hardware and software of another.
- Popular virtual machine software such as VMware and Parallels Desktop can run on most computers with Intel microprocessors, including Intel Macs, PCs, and generic Linux computers

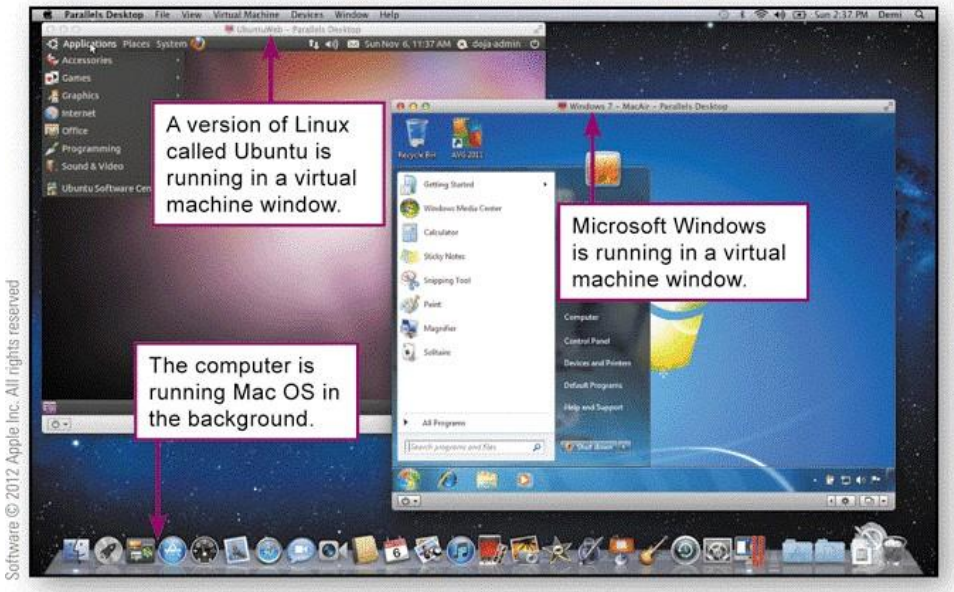


FIGURE 4-24

On a Mac with virtual Windows and Linux, switching from one operating system to another is as simple as selecting a window. When switched to the Windows work area, you can run games, business software, and other applications designed for the Windows OS. By clicking the Linux work area, you could run Linux applications from its vast collection of open source software. After returning to the Mac OS X desktop, you could run your collection of high-end graphics and multimedia iLife software designed exclusively for the Macintosh.

Mac OS

- In 1984, Apple Computer introduced the revolutionary Lisa computer.
- The Macintosh computer, with its graphical user interface, ***Mac OS***, was a major factor contributing to its success.

FIGURE 4-22

Mac OS X Timeline

2012	**Mac OS X 10.8 (Mountain Lion)** Offered support for storing files in iCloud, an Internet-based cloud storage and computing service.
2011	**Mac OS X 10.7 (Lion)** Integrated iPad-style gestures and App Store.
2009	**Mac OS X 10.6 (Snow Leopard)** Enhanced version to increase efficiency and reliability.
2007	**Mac OS X 10.5 (Leopard)** Supported both Intel and PowerPC processors; full support for 64-bit applications.
2006	**Mac OS X 10.4.4 (Tiger Intel)** First OS for Intel Macs.
2001	**Mac OS X 10.1 - 10.4 (Cheetah)** Desktop editions for PowerPC; new kernel based on UNIX-like, open source code.

Mac OS

- Contains graphical user interface featuring menus and icons
- OS interface through keyboard or mouse
- Software applications that are compatible with Mac OS are called Mac software.
- Fewer software are compatible with Mac OS than Windows OS.
- Mac OS has good graphical application software support.
- Some hardware and software add-ons enable Windows software to run on Mac OS.

iOS

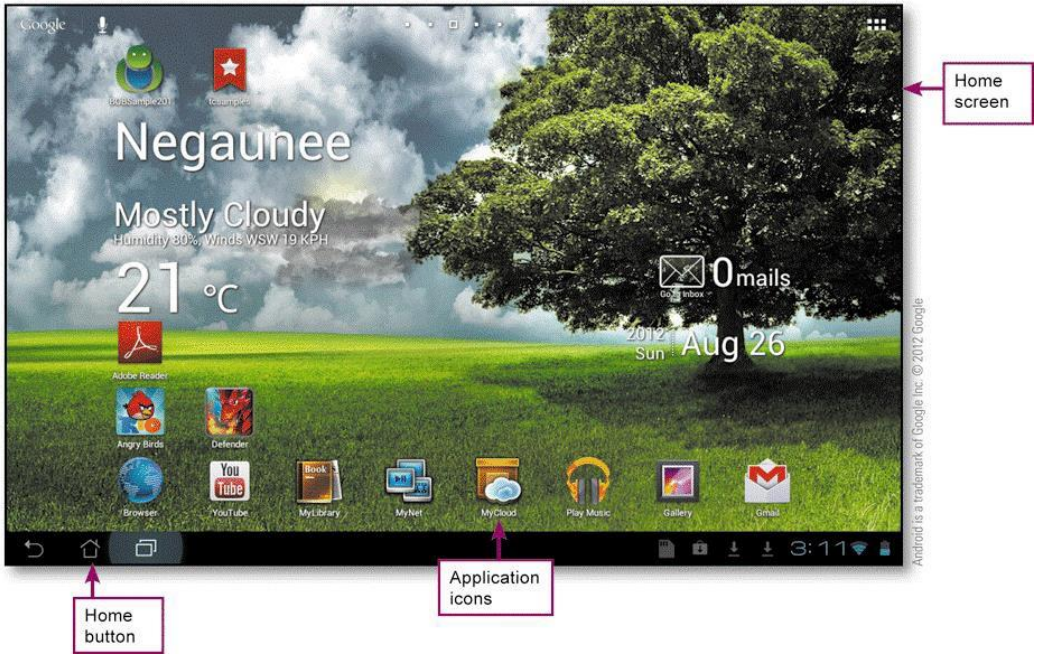
- iOS is an operating system for the Apple iPhone, and was derived from the Mac OS X code

FIGURE 4-25
iPhones, iPod Touches, and iPads use the iOS operating system.
See how it works!

Android

- Android is a mobile operating system that is a popular platform for tablet computers, smartphones, and ebook readers

FIGURE 4-26
All the Android controls can be accessed from the screen.



Linux

What is Linux

- Linux is a Unix-like operating system.
- By definition, the term “Unix-like” describes an operating systems that shares many characteristics of UNIX.
- Developed in 1969 at Bell Labs, UNIX is a multiuser, multitasking, operating system.
  - Originally, UNIC (UNiplexed Information and Computing Service) as a pun on MULTICS, (Multiplexed Information and Computer Services)

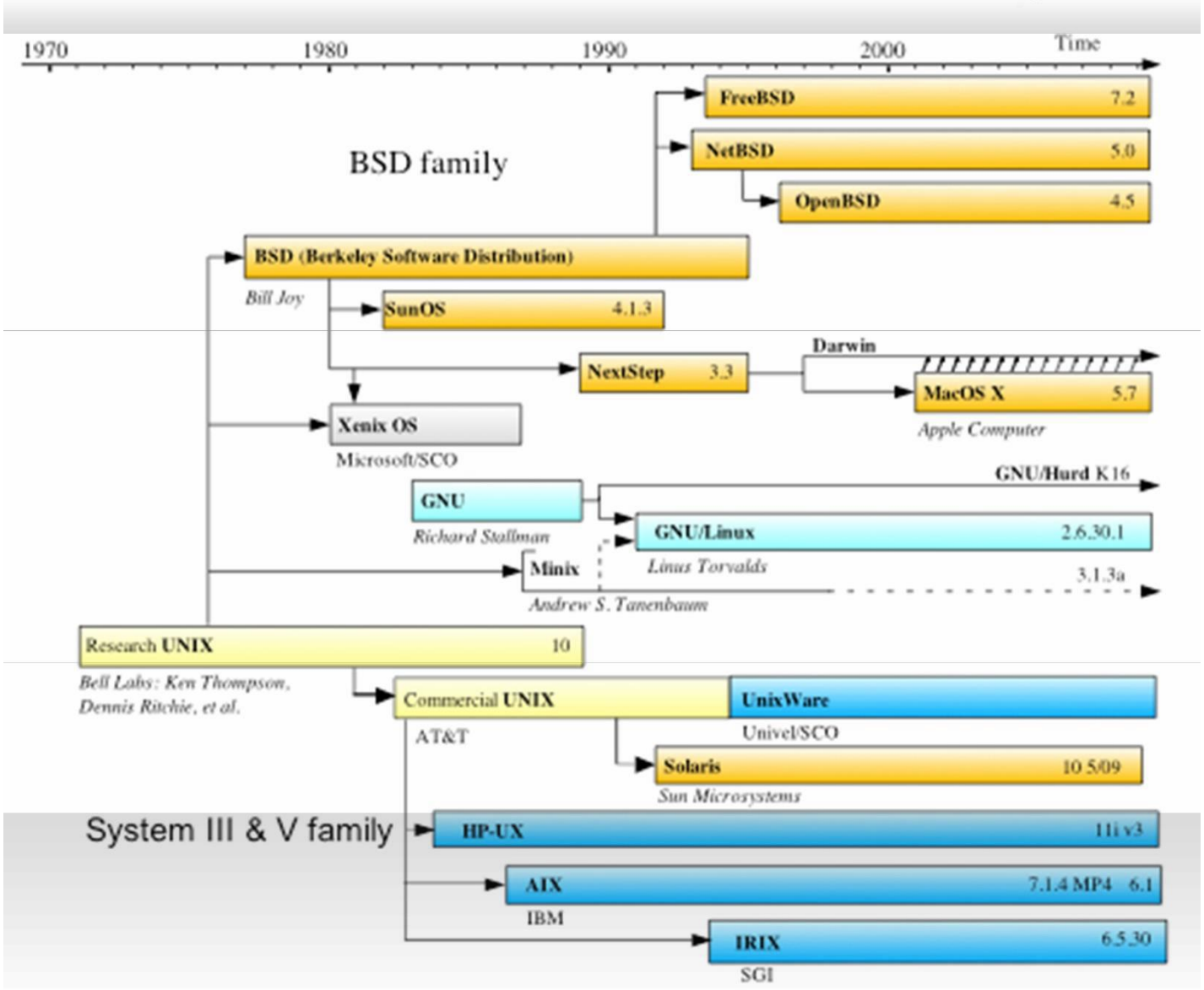
Development of UNIX

- UNIX written by former MULTICS project members.
- Developed at Bell Labs by a small team including:
  - Dennis Ritchie, Ken Thompson, and Brian Kernighan.
- Unix designed to be a portable, multi-tasking and multi-user operating system characterized by:
  - the use of plain text for storing data;
  - a hierarchical file system;
  - treating devices and certain types of inter-process communication (IPC) as files.
- Includes a large number of software tools, small programs that can be strung together through a command line interpreter using pipes, as opposed to using a single monolithic program that includes all of the same functionality.

MULTICS

- Began in 1964, as a cooperative project led by MIT along with General Electric and Bell Labs.
  - 1969, Bell Labs dropped out.
  - 1970, General Electric's computer business, including MULTICS, taken over by Honeywell.
- While not a commercial success, MULTICS had a substantive technical impact.
  - For example, MULTICS was the first major operating system to be explicitly designed to be secure.
  - First system to be Orange Book certified at the B2 Level.
- Orange Book refers to the Trusted Computer System Evaluation Criteria (TCSEC), which has an orange cover
- The Orange Book has been superseded by the Common Criteria

Timeline for Unix and Unix-like Systems



Unix/Linux Development

- Many systems, such as BSD, derived from the System V code can be considered Genetic UNIX systems.
- Genetic UNIX examples include Apple Mac OS X
  - Mac kernel derived from Mach kernel developed at Carnegie Mellon
- Functional UNIX describes any Unix-like system that behaves in a manner roughly consistent with the UNIX specification but not derived from the original System V code.
- Functional UNIX examples include Linux and Minix.

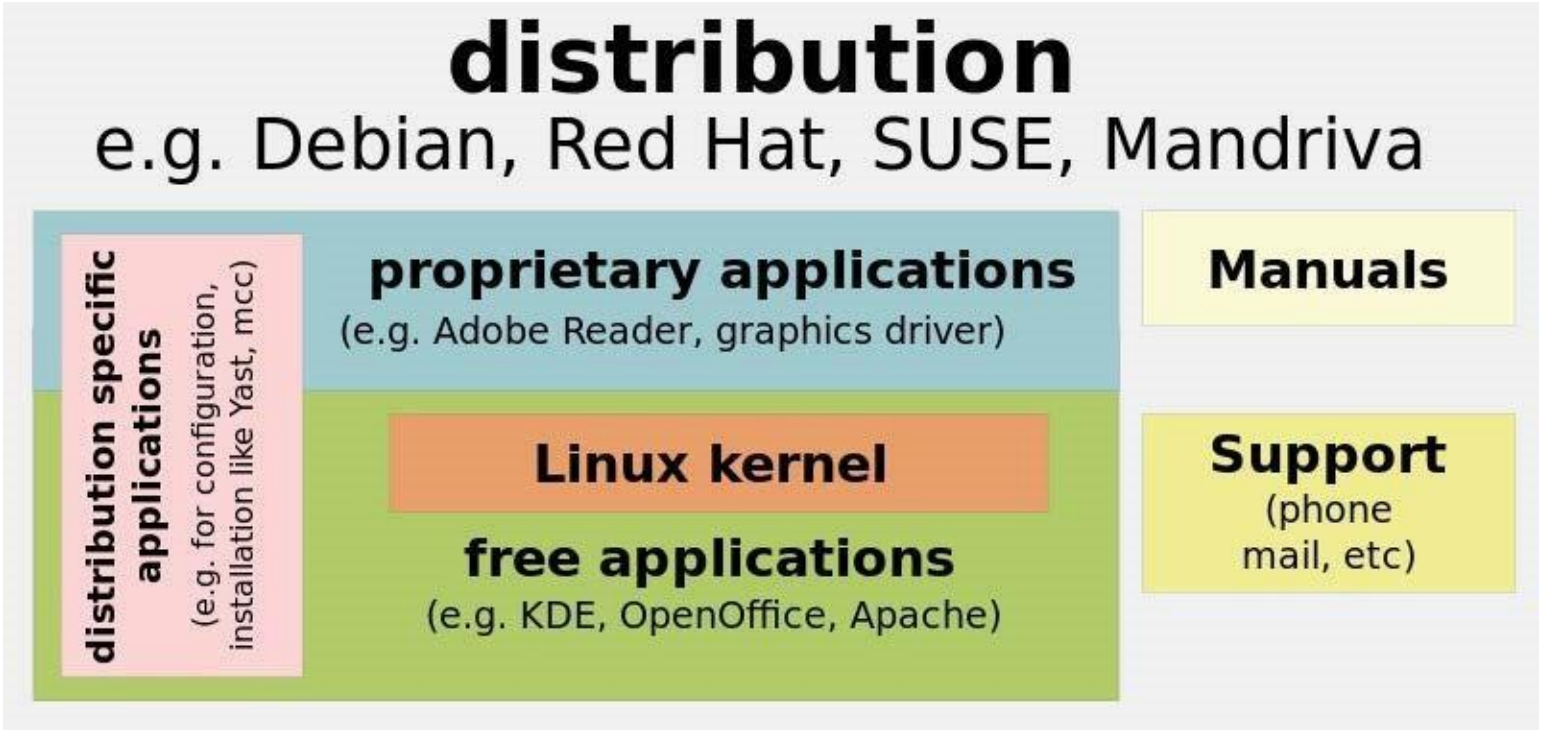
Linux Development

- Linux began when Linus Torvalds posted the following to a Usenet newsgroup in 1991:
  - "Hello everybody out there using minix. I'm doing a free operating system (just a hobby, won't be big and professional like gnu) for 386(486) AT clones. . . "

Not Just One Linux

- Linus got the Linux kernel going
- Individuals and companies soon jumped on board, creating variations on the operating system
- There are now hundreds of variations on Linux that are available
  - Each has a particular strength (or weakness)
  - All distros are free at some level, since the kernel is GPU
  - Some require licensing fees or service contracts for support
- Distrowatch.com lists the popular distributions - see
- http://www.distrowatch.com

What Differs in Distributions



- All Linux distributions are the same but different.
- That is, all use the same kernel (mostly).
- Each distribution provides a unique mix of applications, utilities, and support

Some Popular Distributions

- Red Hat: commercial grade Linux distribution with paid support and many proprietary tools
  - Fedora: the version of Red Hat with no support and no proprietary tools
- Ubuntu: very popular as a desktop distribution
- Mint: a relative newcomer, very popular as a desktop version
- Open Suse: owned and distributed by Novell

Linux vs Monolithic Operating Systems

- Microsoft Windows and Mac OS X are monolithic operating systems
  - You install all or none - you can't pick and choose which parts you want to install
- Linux is completely modular
  - The only required component is the kernel
  - Users can choose which parts of the OS to install
  - Linux can run with or without a GUI
  - Multitude of GUIs available
    - Gnome, KDE, xfce, OpenBox, etc.
    - GUIs run on top of X-Windows, a framework for displaying and managing windows (not Windows!)

Advantages of Modularity

- Only the components needed for a given job are loaded
- Android uses the Linux kernel and other components, but not the Linux GUI
- Servers can run “headless”, i.e., no user interface other than the command line
- The system can be slimmed down to run on
  - limited memory
  - limited disk space
  - limited processor speed
- Optimizations can be made for real-time operation (similar to an RTOS)
  - Use of the real-time kernel
  - Very limited background services
  - Lightweight GUI
  - Typical use: multimedia processing (Ubuntu Studio distribution)

Understanding Licensing

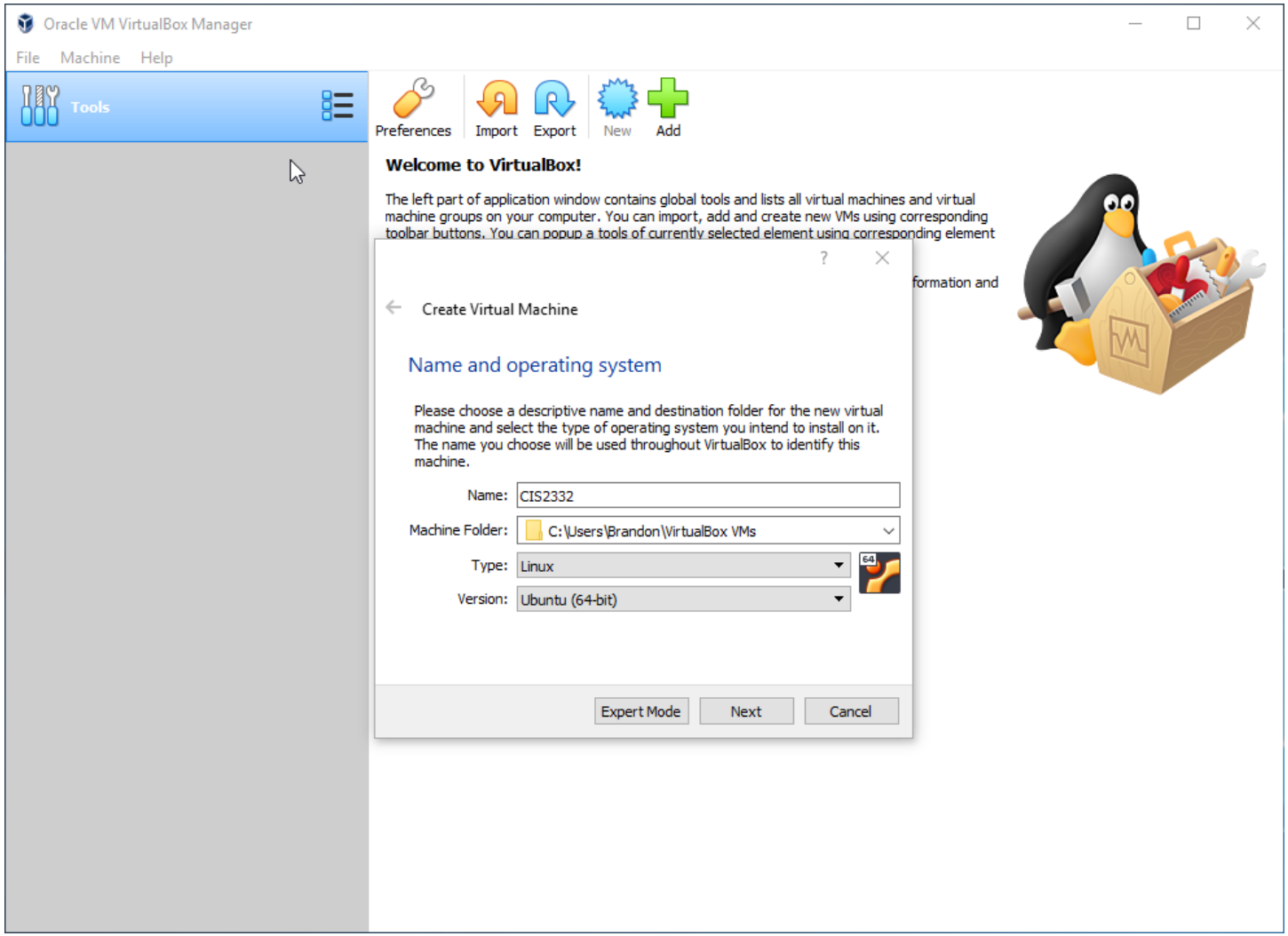
- Linux kernel released under the Gnu General Public License (GPL)
  - Gnu stands for “Gnu’s Not Linux”
- The Free Software Foundation is responsible for enforcing the GPL
  - Richard Stallman founded the FSF while at MIT
- The FSF believes that all software should be open source and free
  - The “free” part was somewhat clarified to mean “Free as in speech”, not “Free as in beer”
    - Everyone should have the right to use, modify, etc. software, but there is no right get the software at no cost

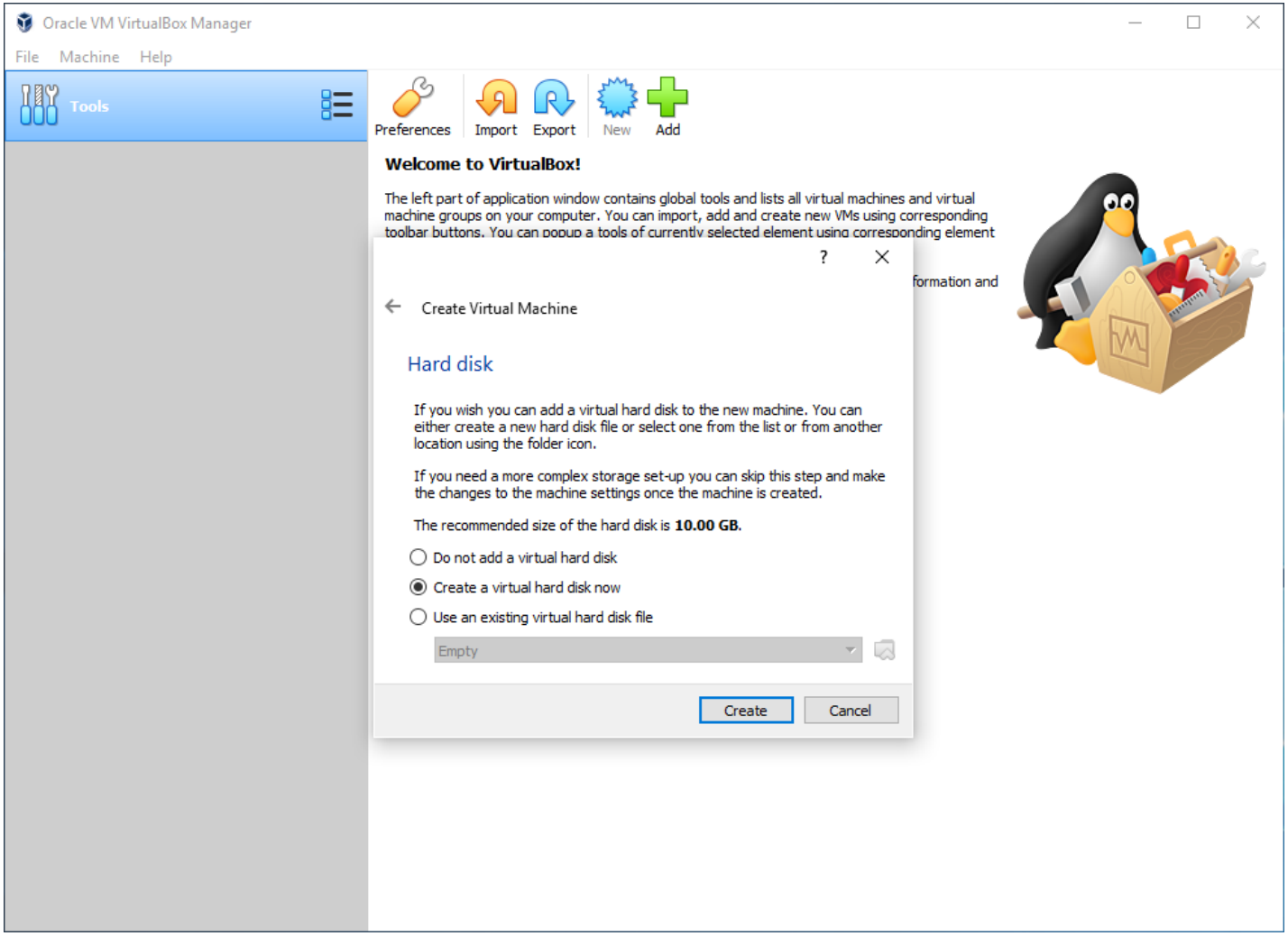
Issues with the GPL

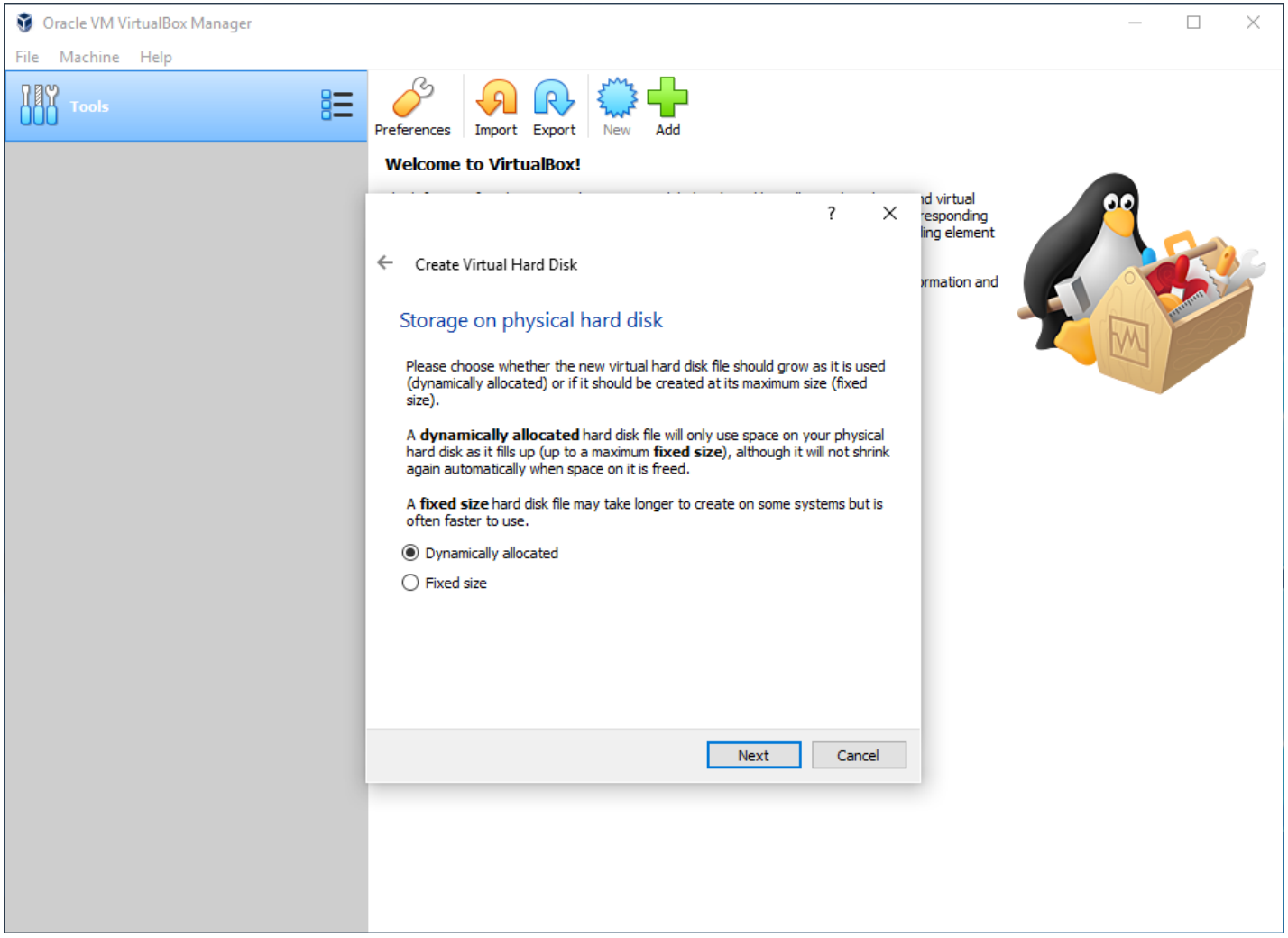
- The GPL license is an example of “copyleft”
  - Derivative works must have the same distribution rights as the original
- If a piece of software that is GPLd is included in an application, the entire app must be under GPL
- This means that the source code must be made available to anyone who requests it
- GPL is termed “viral” as a result, in that it “infects” software with the license

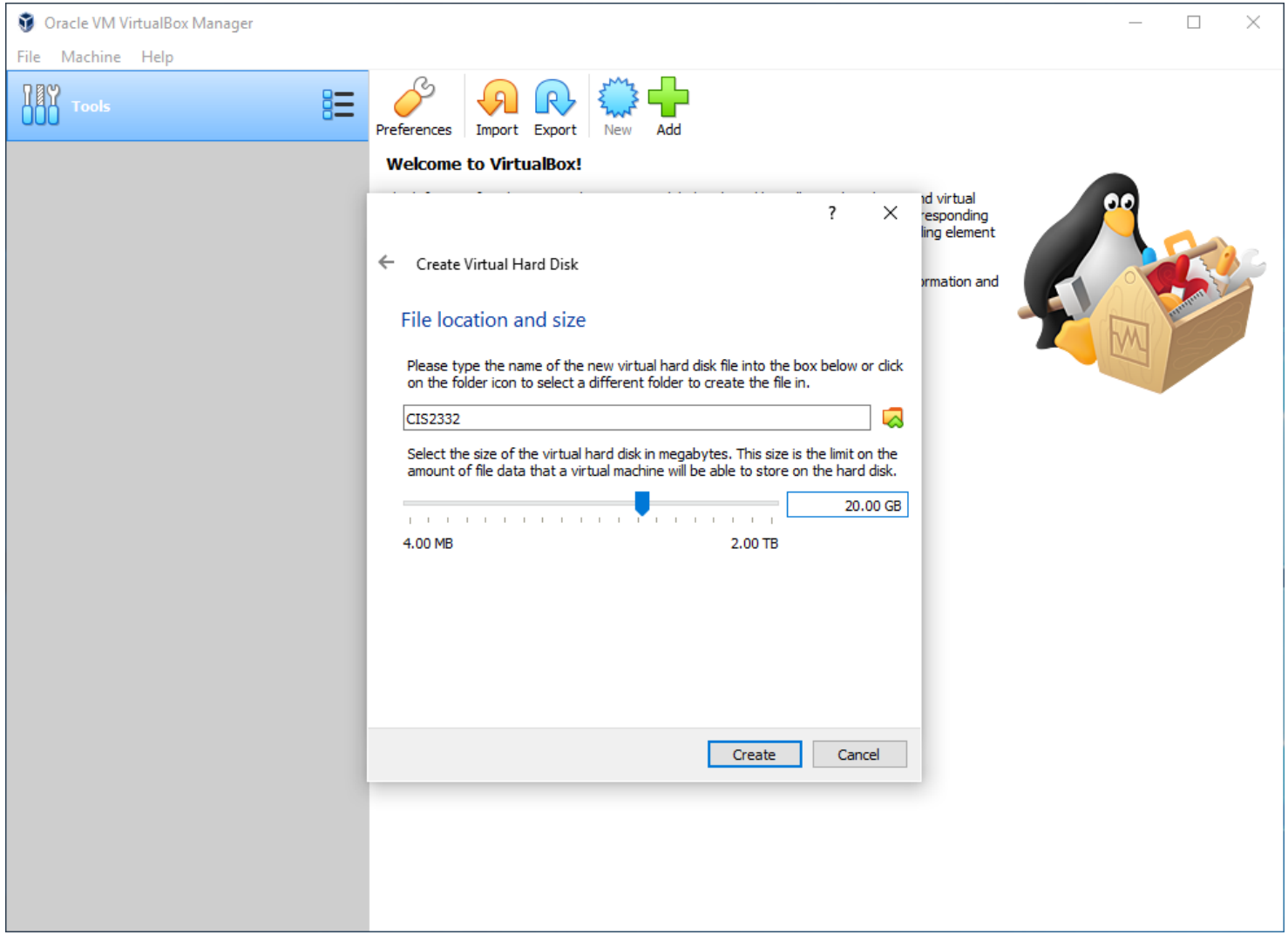
Other Open Source Licenses

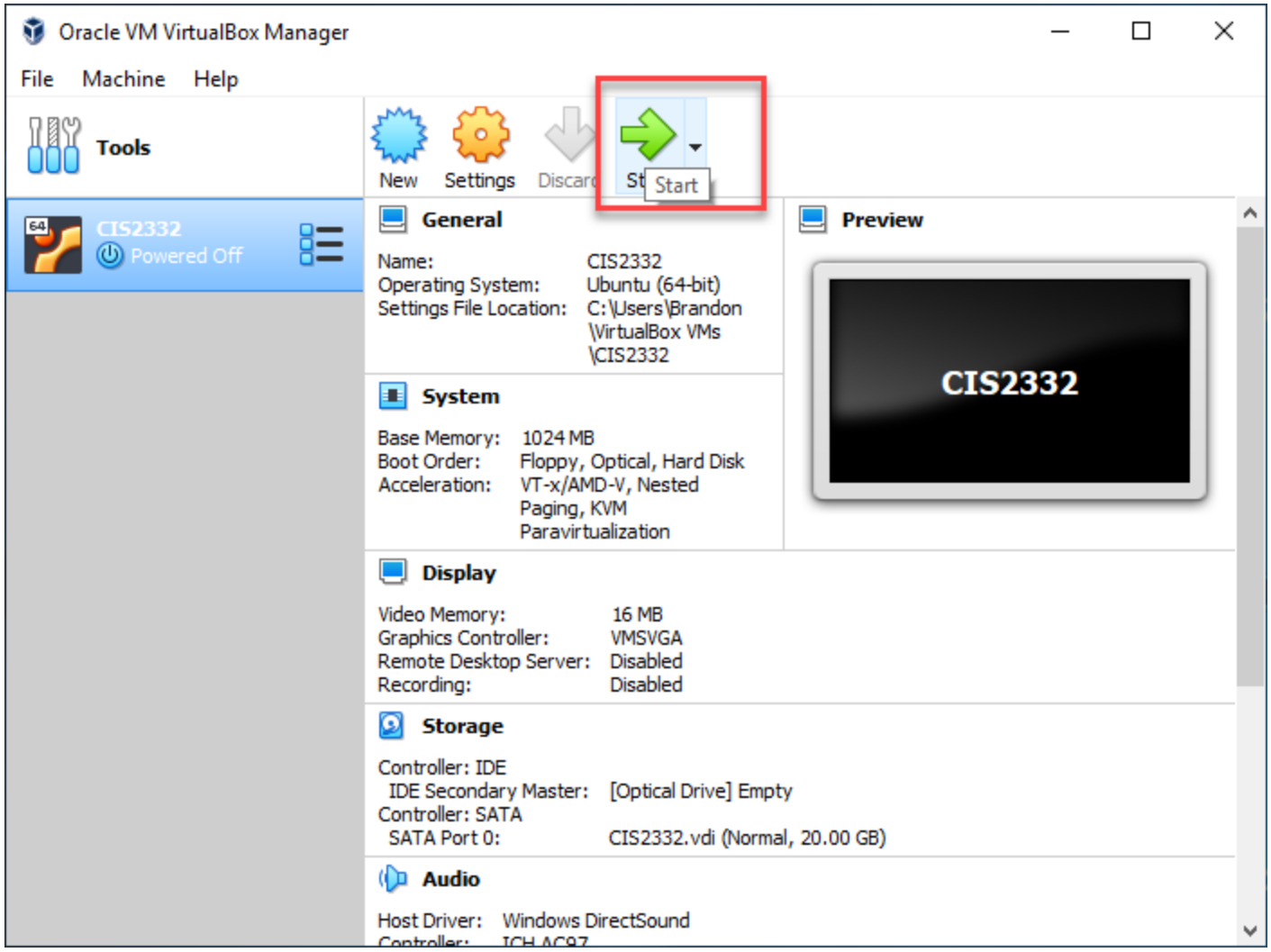
- BSD License – A generally permissive license that grants permission to use, modify, and redistribute software.
- Apache License – Enables you to use the software for any purpose.
  - Unlike the GPL, this license doesn't require you to apply the Apache license to your redistributed programs.
- MIT – Permits you to use, release and modify software and even to change the licensing model.
- **Note that freeware and shareware are not licensing models.**

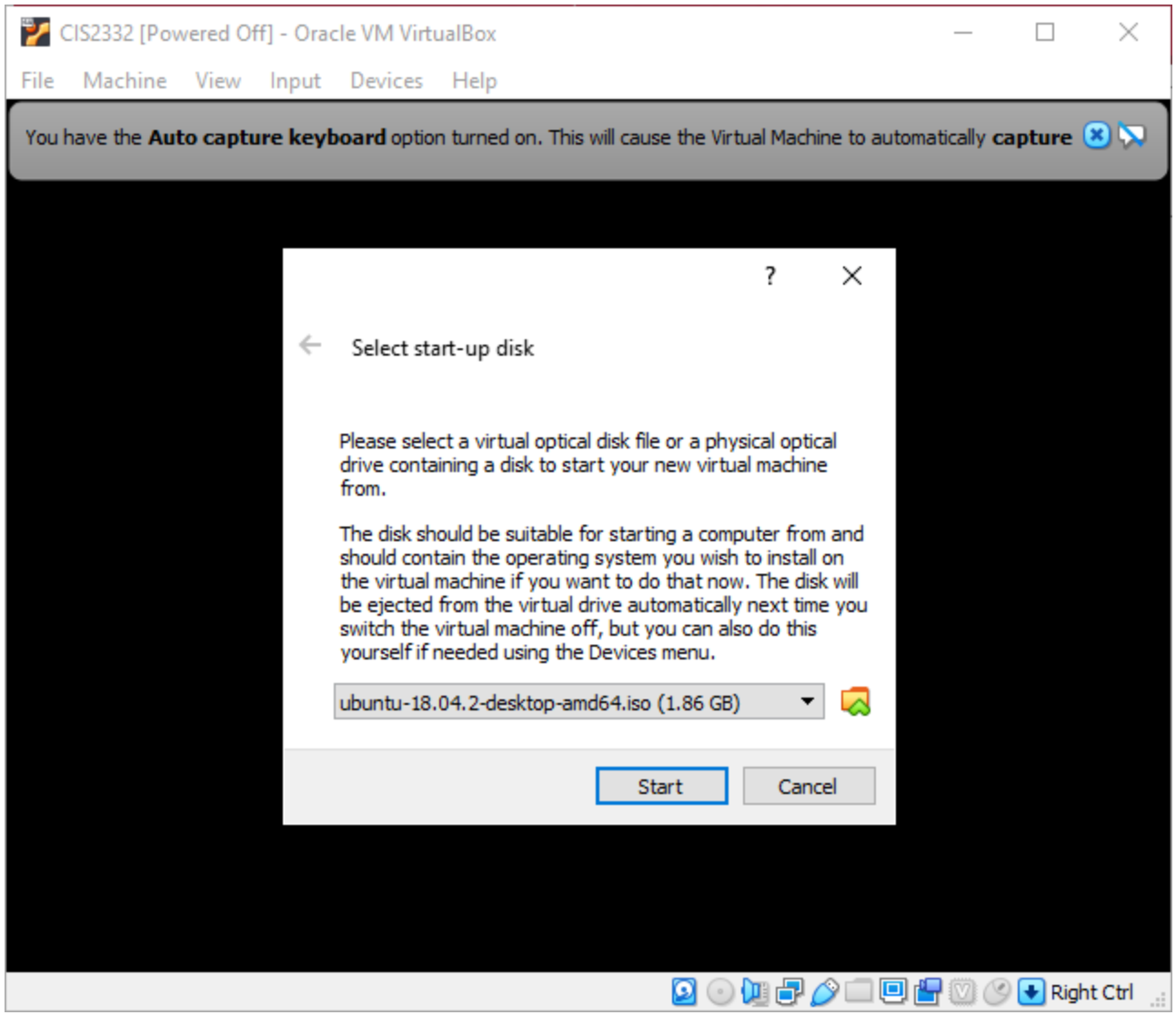

Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Preferences
Import
Export
New
Add
Welcome to VirtualBox!
The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new VMs using corresponding toolbar buttons. You can popup a tools of currently selected element using corresponding element
formation and
Create Virtual Machine
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 to install on it. The name you choose will be used throughout VirtualBox to identify this machine.
Name:
CIS2332
Machine Folder:
C:\Users\Brandon\VirtualBox VMs
Type:
Linux
Version:
Ubuntu (64-bit)
Expert Mode
Next
Cancel

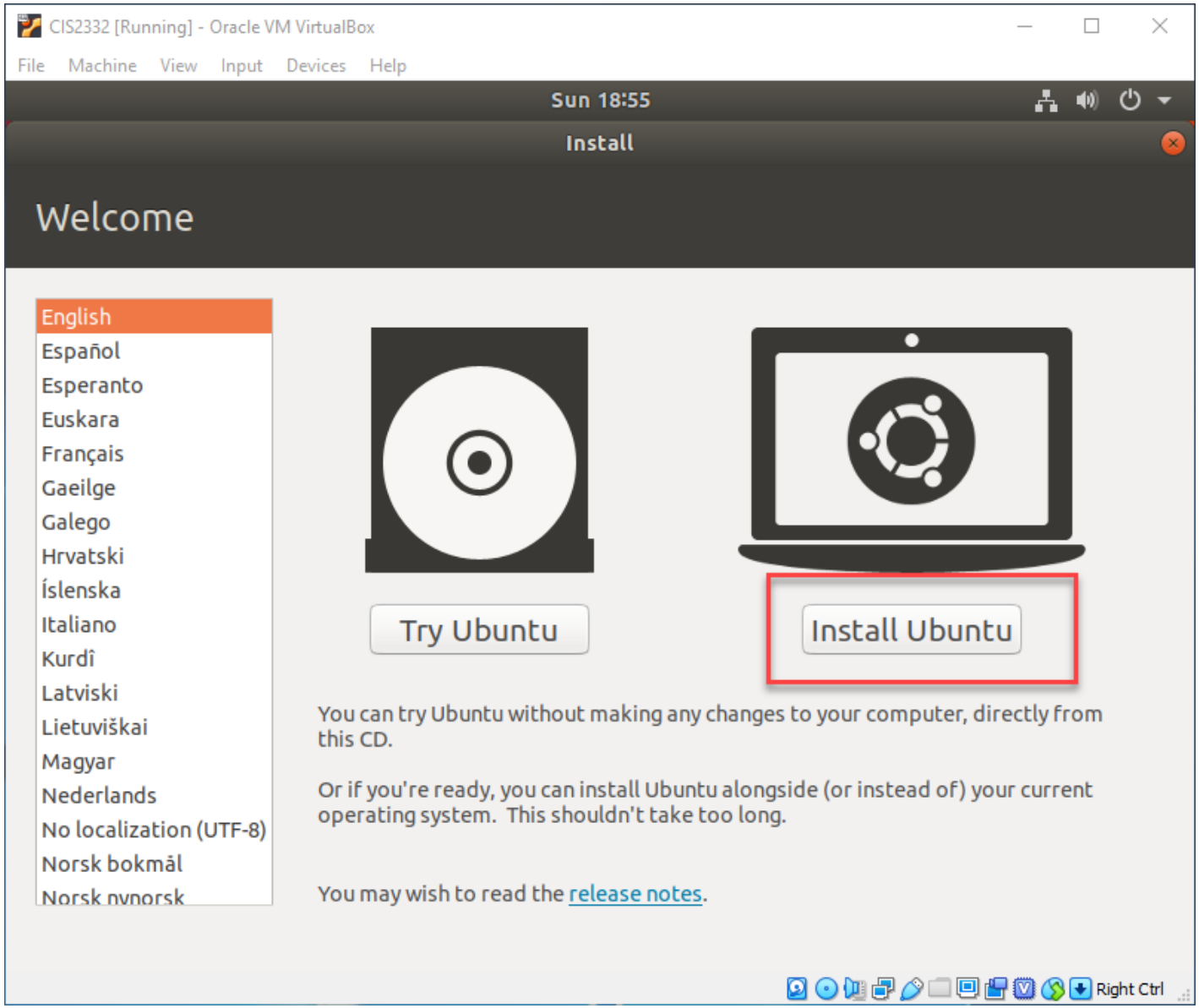

Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Preferences
Import
Export
New
Add
Welcome to VirtualBox!
The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new VMs using corresponding toolbar buttons. You can popup a tools of currently selected element using corresponding element
formation and
Create Virtual Machine
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 file
Empty
Create
Cancel

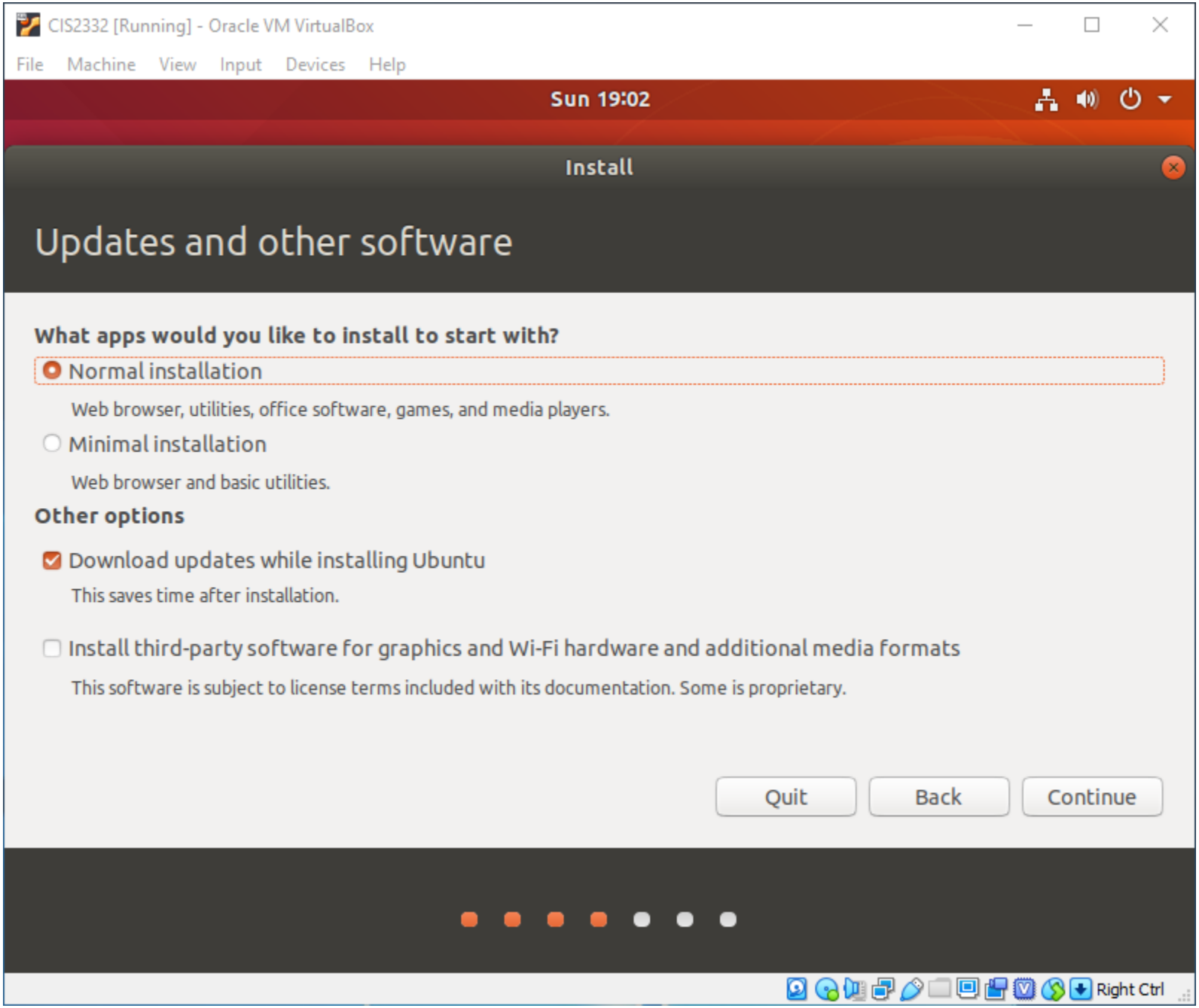

Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Preferences
Import
Export
New
Add
Welcome to VirtualBox!
Create Virtual Hard Disk
Storage on physical hard disk
Please choose whether the new virtual hard disk file should grow as it is used (dynamically allocated) or if it should be created at its 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
Next
Cancel


Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Preferences
Import
Export
New
Add
Welcome to VirtualBox!
Create Virtual Hard Disk
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.
CIS2332
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.
20.00 GB
4.00 MB
2.00 TB
Create
Cancel


Oracle VM VirtualBox Manager
File
Machine
Help
Tools
New
Settings
Discard
Start
CIS2332
Powered Off
General
Name: CIS2332
Operating System: Ubuntu (64-bit)
Settings File Location: C:\Users\Brandon\VirtualBox VMs\CIS2332
System
Base Memory: 1024 MB
Boot Order: Floppy, Optical, Hard Disk
Acceleration: VT-x/AMD-V, Nested Paging, KVM Paravirtualization
Preview
CIS2332
Display
Video Memory: 16 MB
Graphics Controller: VMSVGA
Remote Desktop Server: Disabled
Recording: Disabled
Storage
Controller: IDE
IDE Secondary Master: [Optical Drive] Empty
Controller: SATA
SATA Port 0: CIS2332.vdi (Normal, 20.00 GB)
Audio
Host Driver: Windows DirectSound


CIS2332 [Powered Off] - Oracle VM VirtualBox
File Machine View Input Devices Help
You have the Auto capture keyboard option turned on. This will cause the Virtual Machine to automatically capture
Select start-up disk
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.
ubuntu-18.04.2-desktop-amd64.iso (1.86 GB)
Start
Cancel
Right Ctrl


CIS2332 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Sun 18:55
Install
Welcome
English
Español
Esperanto
Euskara
Français
Gaeilge
Galego
Hrvatski
Íslenska
Italiano
Kurdî
Latviski
Lietuviškai
Magyar
Nederlands
No localization (UTF-8)
Norsk bokmål
Norsk nynorsk
Try Ubuntu
Install Ubuntu
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.
Right Ctrl


CIS2332 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Sun 19:02
Install
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.
Quit
Back
Continue
Right Ctrl