1: Intro to Linux

What is an operating system?

An operating system is software that controls the hardware of a computer to perform processes of a user's programs.

Parts of an OS

Kernel

The kernel is a piece of the OS that controls the hardware to do memory allocation, CPU time, and program interaction.

Shells

Shells are terminals in which command lines can be entered for the computer to perform. Though their functions can be done on a graphical user interface.

GUI

A more friendly interface that utilizes icons and menus to perform actions without a user having to enter commands into a terminal.

Utility Programs

Applications that come with an OS installation like a web browser, media player, or a text editor.

Libraries

Collections of programming functions that are used across multiple programs.

Linux Distributions

A Linux OS package that contains a Linux Kernel, UNIX tools, Application suite, Startup Scripts, and an installer. Many are open source and free, though there are some exceptions for distros containing proprietary components.

Ubuntu

Ubuntu is a Linux distro built upon the idea that software should be free and accessible to everyone with an emphasis on personalization.

Open Source, Closed Source, and Free: What do they Mean?

Open Source typically means that the source code is given out with the software when a user downloads it. Whether or not it is free is usually up to the distributor.

Closed Source is software that doesn't include the source code when downloaded and is unable to be modified.

Free software is software that is distributed with the source code. Free meaning that it's included as part of a larger package usually the source code which may have a fee behind it (which sort of defeats the purpose of "free" software).

4 Freedoms

The word "Free" doesn't refer to price, but rather that one should be allowed to do anything to software they have access to. These freedoms are as follows:

- Free to run a program for any purpose (0)
- Free to modify a program (1)
- Free to redistribute the modified program to a friend (2) and to others (3)

2: Virtualization

What is Virtualization

Virtualization is the creation of a digital version of physical computer hardware. It allows a computer to divide its hardware to run a simulation of another computer--*usually* with a different OS--while running its default OS. In other words, it allows multiple OSs to run on a single machine.

Benefits of Virtualizing

- Ability to run multiple operating systems simultaneously
- Application Testing for updates before actually installing these updates on a host machine
- Snapshots allow rollbacks should anything break
- Software incompatibility can be solved by running the program in a compatible virtual OS
    - Usage of legacy applications that are no longer compatible with current hardware or OS

Hypervisors

Hypervisors are software / hardware in charge of creating, managing, and running virtual machines. They can either be set up client side or as part of a server.

- Type 1 (Bare Metal Hypervisor) Runs directly on hardware and thus runs much better over a Type 2 which depends on a host OS.

- Type 2 Runs as an application over the host OS. More common for client-side virtualization, but due to its dependency on the Host OS, it can be susceptible to failure if the host OS fails.

Virtualbox

VirtualBox is an open source virtualization product that allows users to create their own virtual machines. Though keep in mind you will still need decent hardware to meet the minimum requirements of the virtual OS.

3: Desktop Environments

What is a Desktop Environment?

A desktop environment is an implementation of a suite of software running on top of the OS with a shared GUI. Windows and MacOS have a single DE, although Linux has a wide variety of DEs to choose from.

Desktop Environment Elements

- Desktop Settings Consists of programs that allows personalization and user configurations for the DE.
- Display Manager Allows a user to choose the visuals for individual users or the entire DE.
- File Manager A GUI for interacting with files and folders.
- Icons Picture indicators for individual programs and files.
- Favorites Bar Contains programs and files designated by the user.
- Launcher Provides a search function for applications and files. Also allows starting and opening said apps / files on the search results.
- Menus Contains lists of files and programs
- Panels Located at the top / bottom / sides of a DE's main window. Contains notifications, date & time, pinned program icons, etc.
- System Tray Special menu attached to a panel that provides access to programs and allow a user to log off, lock the screen, manage settings, notifications, shut down, or reboot.
- Widgets

Ubuntu Desktop Environments

Gnome DE

The default desktop in Ubuntu is GNOME 3. It's also used in other Linux distros as well. Started in August 15, 1997 by Miguel de Icaza and Federico Mena as a free software project to develop a DE and the accompanying apps.

KDE

Kool Desktop Environment was released in 1998 and rebranded KDE Plasma in 2009. It has over 200 applications that can run not only on Linux, but other platforms like Windows as well.

Cinnamon DE

A FOSS desktop environment derived from GNOME 3, but conforms more to traditional desktop conventions. Principal DE of Linux Mint distro. Very user friendly.

Flavors of Ubuntu

XFCE

A lightweight DE focusing more on performance while being user friendly. Started in 1996 by Olivier Fourdan. Used by distros such as MX Linux and EndeavourOS.

Mate DE

Continuation of GNOME 2 although most applications from GNOME Core Applications have been forked or rewritten. Most of which are named in Spanish.

4: What is a Shell

What is Bash

Bash or "Bourne Again Shell" is the standard GNU shell that comes with all GNU/Linux distributions.

Provides interactive access to the Linux System and runs as a regular program that is started whenever a user logs into a terminal.

Accessing the Linux CLI

The command line interface can be accessed through either a terminal emulator or the Linux Console.

What is a Console Terminal?

Can be accessed by placing Linux into text mode. The virtual consoles can be opened with CTRL+ALT+(F1-F7). Virtual consoles run on system memory. Graphical programs cannot be run on a virtual console.

One can switch between virtual consoles without losing any active session providing some flexibility while working.

What is a Terminal Emulator?

A program that can access the Linux CLI while keeping a desktop GUI active. Examples include TILIX, the GNOME terminal, Konsole, Terminology, and RXVT-Unicode.

Some Linux Commands

- free Displays free memory
- uname Displays system information
- df Displays free space on installed disk drives
- history Provides a list of previously used commands; Arrow keys can be used to view previous commands.

5: Managing Software

Essential Commands

Updating Ubuntu

- sudo apt update or sudo apt-get update Tells apt to search the software repositories and look at what Ubuntu package updates are available.
- sudo apt upgrade Applies any updates found by the previous command.

Finding, Installing, and Removing Packages

- sudo apt install "package name" -y Installs a user specified package. There can be multiple package names specified if needed. Ex: sudo apt install firefox -y
- sudo apt remove "package name" -y Removes user specified package(s). Ex: sudo apt remove flameshot -y

A '+' or '-' signs can be added to the end of package names to specify programs to be installed (+) or removed (-) on a single command.

- apt search "insert thing here"
    - apt-cache
    - apt search -n Searches for programs that matches the text in quotations. Adding -cache to apt specifies that the search should find information on a package including dependencies. The -n specifies to only search for the name.

Terminology

Libraries - Reusable code used by multiple functions and programs

Dependencies - Software that is needed by other software. Provides a foundation for their functionalities.

Repository - A collection of software available for download. Ubuntu Main - Supported free and open source software (FOSS) Universe - Community maintained FOSS Restricted - Proprietary software Multiverse - Software restricted by copyright or legal issues