

# What is Linux and How Do I Get It Onto My Computer?

## How to Choose a Distribution

ASULUG

Arizona State University

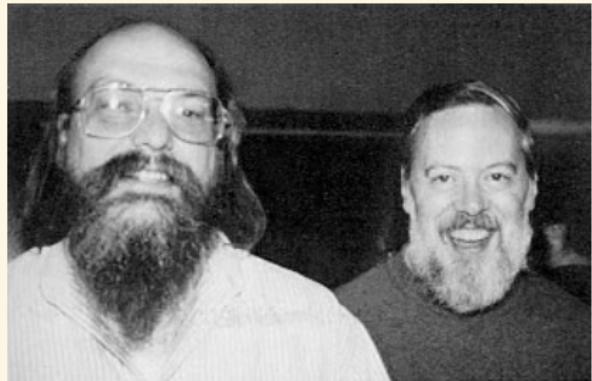
January 23, 2019



Made with L<sup>A</sup>T<sub>E</sub>X

# History

- ▶ **1969:** Ken Thompson and Dennis Ritchie created Unix Bell Labs, written in PDP-7 assembly language.
- ▶ **1972:** The C language was developed by Ritchie and colleague Brian Kernighan using Unix.
- ▶ **1973:** Most of Unix was rewritten in C for portability.
- ▶ **Late 70s:** Unix licensed to UC Berkeley (BSD), Microsoft (Xenix), IBM (AIX), HP (HPUX), Sun Microsystems (now Oracle) (Solaris)



Thompson (left) and Ritchie (right)

## History (*continued*)

### Influence of Unix:

- ▶ Modular by design
- ▶ **Unix Philosophy:** "emphasizes building simple, short, clear, modular, and extensible code that can be easily maintained and repurposed by developers other than its creators."
  - ▶ Write programs that do one thing and do it well.
  - ▶ Write programs to work together.
  - ▶ Write programs to handle text streams, because that is a universal interface.
- ▶ Filesystem as main means of communication
- ▶ Featured a shell scripting and command language (the Unix shell)

## History (*continued*)

- ▶ **1983:** *Richard Stallman* started *the GNU project*, aiming to create a free Unix-like operating system.
- ▶ Stallman created enough software for a fully-functional OS...
- ▶ ...except the kernel, which he called *Hurd*.



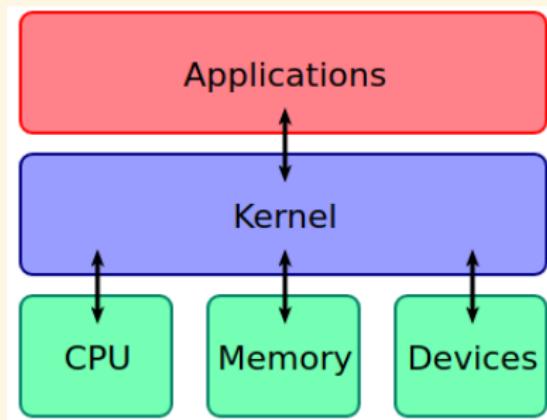
Richard Stallman



**ASULUG**  
The GNU (GNU's Not Unix) logo 

## History (*continued*)

# What is a kernel?



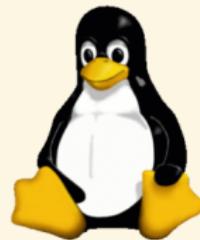
**Kernel:** The main piece and lowest level of an operating system which connects the software applications to the hardware of the computer.

## History (*continued*)

- ▶ **1991:** 21-year-old *Linus Torvalds*, a computer science student at the University of Helsinki, Finland, created *Linux*: a free, open source, Unix-like kernel.
  1. **Free:** Free as in *freedom*, not *beer*. One can freely modify the software.
  2. **Open Source:** The source code of the software is openly available.
- ▶ To test his kernel, Torvalds needed application software, so he used that of the GNU project.



Linus Torvalds



Tux, the logo and mascot of Linux



# So... What Is Linux?

- ▶ **Linux** itself is a *kernel*.
- ▶ What people refer to as "Linux operating systems" are actually **GNU/Linux** bundles, called **Linux distributions** (*distros* for short).
- ▶ There are *many* different Linux distributions to choose from!

# Why GNU/Linux?

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- ▶ A more friendly development environment through its compilers and command-line interface (CLI).
- ▶ A plethora of community support.

# Which Linux Distribution Should I Choose?

**Check out:** <https://distrowatch.com> — a major source for documenting open source operating systems, focusing on Linux and BSD

- ▶ **Current Top 10 Distributions:**

<https://distrowatch.com/dwres.php?resource=major>

- ▶ **All Distributions:**

[https://distrowatch.com/wiki/index.php/All\\_Distros](https://distrowatch.com/wiki/index.php/All_Distros)

- ▶ **Distribution Popularity (by Page Hit Ranking):**

<https://distrowatch.com/dwres.php?resource=popularity>

- ▶ **DistroWatch Wiki:**

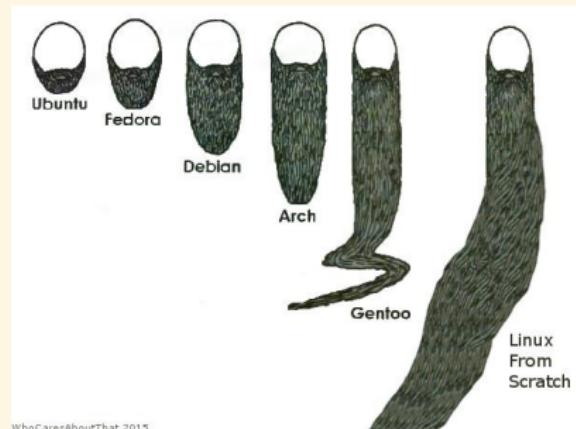
<https://distrowatch.com/wiki>

Check each distribution's website!

# Factors to Consider

## 1. Ease of Use

- ▶ An important factor, especially for beginners.
- ▶ Your usage: Daily driver? Experimental setup?
- ▶ Check the distro's website and reviews of the distro.
- ▶ A relative, quick ranking of distros, easy-to-hard:
  1. Linux Mint, Ubuntu, Fedora
  2. Debian, CentOS
  3. Arch Linux
  4. Gentoo Linux
  5. Linux From Scratch



WhoCaresAboutThat 2015

## Factors to Consider

### 2. Stability/Availability

- ▶ Latest software vs. more stable/tested
- ▶ Rolling-Release vs. Long-Term Support (LTS)
- ▶ **Example:** Arch and Gentoo are rolling-release
  - ▶ More frequent, trickling updates, can be multiple a day if bleeding-edge (Arch)
- ▶ **Example:** Ubuntu, Debian, and Red Hat flavors are more on the LTS side of the spectrum
  - ▶ Less frequent updates, full-system upgrades every certain period of time
- ▶ *Package Availability:* the more stable distros often come at the cost of lack of package availability for newer packages

# Factors to Consider

## 3. Support

- ▶ Important for troubleshooting.
- ▶ Community support vs. company support
  - ▶ Arch/Ubuntu vs. Red Hat Enterprise Linux (RHEL)
- ▶ **Documentation is important!** Some distributions have more support and/or better documentation than others.
  - ▶ Arch Linux is an extremely well-documented and well-supported distribution with an extensive Wiki.
  - ▶ Content on its Wiki can often be used to solve problems on other distributions.
- ▶ Popular distributions like Ubuntu and CentOS also have active forums where users can get support from developers and the community of other users.

## Factors to Consider

### 4. Popularity

- ▶ More popular = more a wider community of users, therefore more community support
- ▶ Popular distributions have often been tested on a variety of different hardware
  - ▶ Ubuntu has distributions for desktop, server, and IoT applications

## Factors to Consider

### 5. Customizability

- ▶ All Linux distros (that I know of) are customizable.
- ▶ Ease of customization depends on the distribution.
- ▶ Distributions that come with a graphical interface like Ubuntu, Debian, OpenSUSE, and CentOS are preconfigured but can be changed.
- ▶ Some distributions like Arch and Gentoo *do not* come with a graphical interface, leaving the user the choice of which software to install and configure themselves.
  - ▶ Aimed at experienced users wanting to greatly customize and make efficient their system.
  - ▶ Great for learning and understanding how Linux operating systems work under the hood.

## Factors to Consider

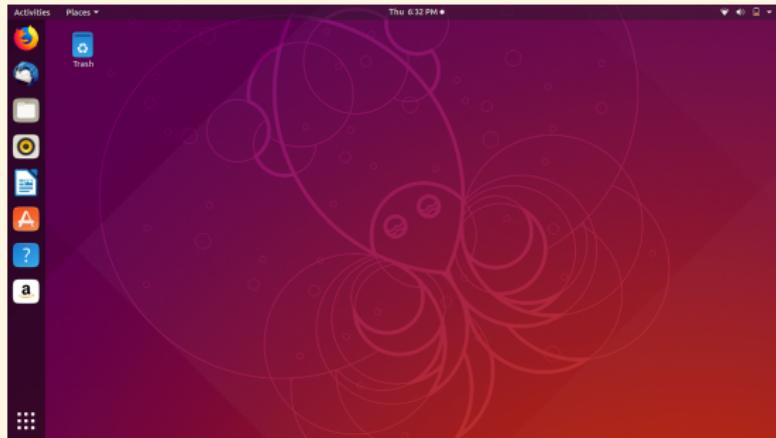
### 6. Defaults

- ▶ Similar to customizability.
- ▶ There are several flavors of certain software, like different flavors of ice cream.
- ▶ For example, KDE, GNOME, and XFCE are three of many Desktop Environments (DEs) with different features.
  - ▶ Ubuntu comes with GNOME, but you are able to change it for, e.g. KDE. Not so with Windows/Mac!
    - ▶ If you don't like vanilla ice cream, you could switch to chocolate!
    - ▶ A flavor of Ubuntu exists with KDE already: Kubuntu
  - ▶ If DEs are too much for you, replace it with something more minimal like a Window Manager (WM) such as i3, OpenBox, or Awesome.
    - ▶ If ice cream is too much for you, you could switch to frozen yogurt!
- ▶ Linux works this way with all of its applications, even the shell program you use when you interact with the terminal!

# Distributions



# Ubuntu



- ▶ **Ease of Use:** Easy
- ▶ **Stability:**  
Somewhat Stable
- ▶ **Default DE:**  
GNOME

**Description:** Owned by Canonical LTD and is based off of Debian, offering three platforms: Desktop, Server, and Core (for IoT).

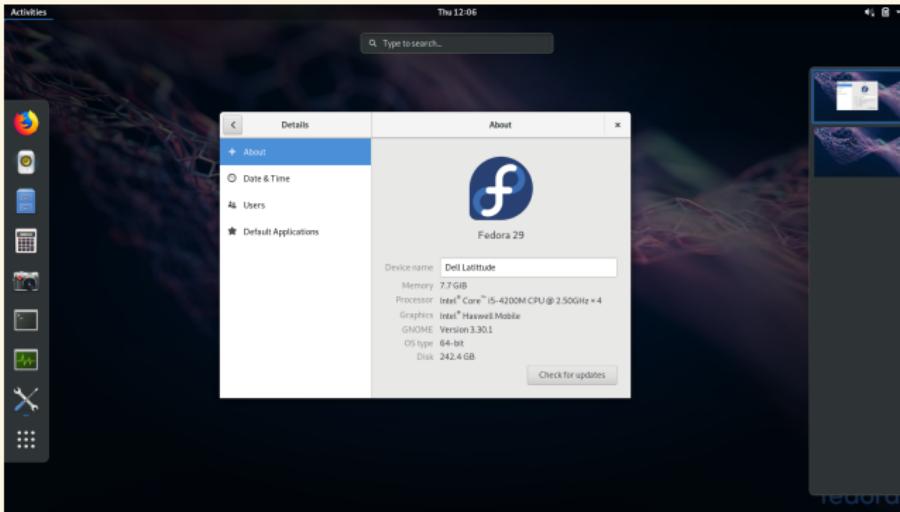
- ▶ Aimed at beginners. Acts similarly to Windows/Mac, making it easier for those transitioning from those platforms.
- ▶ Package manager is *apt* (Advanced Packaging Tool),

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# Fedora



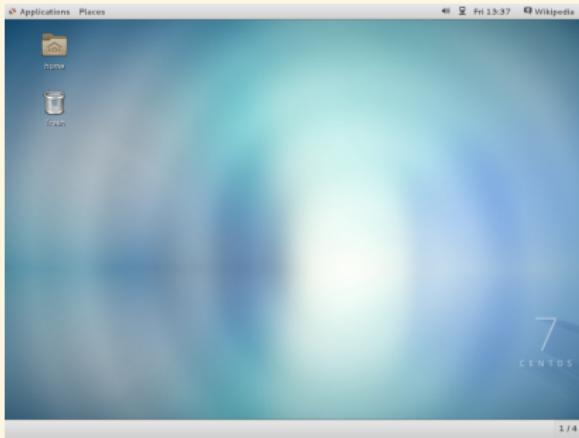
- ▶ **Ease of Use:** Easy
- ▶ **Stability:**  
Somewhat Stable
- ▶ **Default DE:**  
GNOME

**Description:** Red Hat's desktop distribution that uses more cutting-edge software than Red Hat Enterprise Linux (server distribution).

- ▶ Less stable than RHEL and CentOS, but newer software.
- ▶ Its package manager is *dnf*

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- ▶ **Ease of Use:**  
Medium
- ▶ **Stability:** Very Stable
- ▶ **Default DE:**  
GNOME

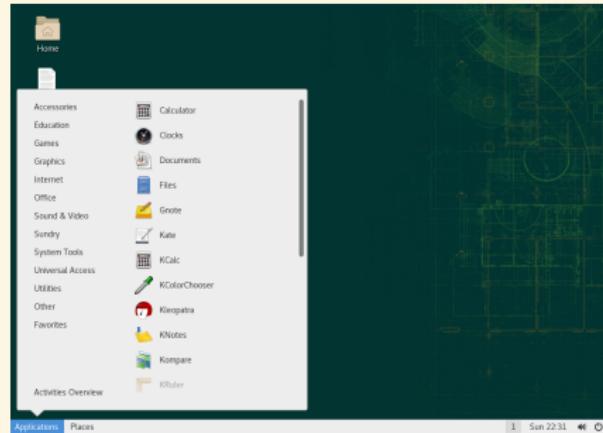
**Description:** The Community ENTerprise Operating System of Red Hat, a consumer edition of RHEL.

- ▶ Good for server installations, but can still serve as a powerful desktop installation.
- ▶ Being based off of a server distribution, some things can be complex to set up.
- ▶ Package manager is `yum`





# OpenSUSE



- ▶ **Ease of Use:** Easy
- ▶ **Stability:** Stable (*leap*)/Somewhat stable *tumbleweed*
- ▶ **Default DE:** GNOME 3 or KDE or manually selectable

**Description:** Originally SUSE, sponsored by SUSE Linux GmbH, OpenSUSE a German Linux distro that's used around the world.

- ▶ Focus is creating usable open-source tools for software developers and system administrators, while providing a user-friendly desktop and feature-rich server environment.
- ▶ Package manager is **ZYpp** and **YaST**

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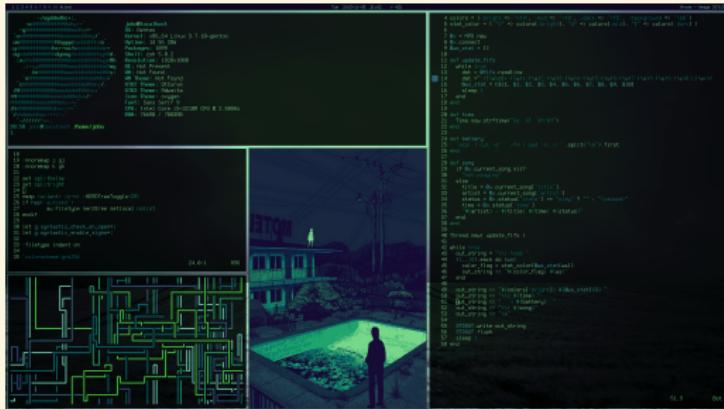


**Description:** Based on the KISS (Keep It Simple, Stupid) principle; a lightweight, flexible, and very customizable Linux distribution.

- **Ease of Use:**  
Difficult
- **Stability:** Varying stability
- **Default DE:** None

- User-*centric* rather than user-*friendly*
- The system can be as minimal or as maximal as the user desires.
- Targeted at experienced Linux users
- Package manager is *pacman*





- ▶ **Ease of Use:**  
Difficult
- ▶ **Stability:** Varying Stability
- ▶ **Default DE:** None

**Description:** Named after the fastest species of penguin, Gentoo requires all software to be compiled locally for performance, optimized for your specific machine.

- ▶ A DIY distro like Arch
- ▶ The next level of full control over your operating system.
- ▶ Package manager is *portage*





# Linux From Scratch (LFS)



- ▶ **Ease of Use:** Very Difficult
- ▶ **Stability:** Depends on your skillage!
- ▶ **Default DE:** Whatever you feel like, baby!

**Description:** A project that provides you with step-by-step instructions for building your own custom Linux system, entirely from source code.

- ▶ Want to make your own Linux distribution? This is how!
- ▶ <http://www.linuxfromscratch.org/>
- ▶ <https://github.com/ASULUG> **ASULUG**  
Linux-Fom-Scratch



# Addendum

- ▶ There are embedded Linux distributions as well:
  - ▶ **Raspbian**: for the ARM architecture on Raspberry Pi
  - ▶ **octo**: for IoT devices
- ▶ For Chromebook: GalliumOS
- ▶ <https://reddit.com/r/unixporn> - Do it. You'll be inspired.

## ASULUG Resources:

- ▶ **GitHub**: <https://github.com/ASULUG/>
- ▶ **YouTube**: <https://www.youtube.com/channel/UCaXljjzLXzFFpZfGOr-Uu6cw>
- ▶ **Twitch**: <https://www.twitch.tv/asulug>

# Feedback!



<https://goo.gl/forms/gbH0a0j5SBjZdMW13>

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