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Linux Distributions

A history and overview

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Who am I?

- Professional technologist Linux user for nearly fifteen years
- Contributor and developer in Fedora, Mageia, openSUSE, and OpenMandriva Linux distributions
- Contributor to RPM, DNF, and various related projects
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History of Linux Distributions

Some history on Linux and GNU...

- In 1984, Richard Stallman began development on reimplementing core components that made up Unix systems under the GNU Project (**GNU** being a recursive acronym meaning ***GNU's not Unix***)
- By the early 90s, most of the components that make up the core (user/admin tools, compiler framework, editors, etc.) were ready for use. However, the hardware management and kernel framework (**GNU HURD**) was largely incomplete.
- In 1991, Linus Torvalds released the first version of the Linux kernel after being frustrated with the restrictions imposed by the MINIX operating system license. In part because he wanted to learn about building an operating system on IBM PCs, he used the MINIX environment to build the first kernel, and then replaced the MINIX components with GNU ones to put together a functional system for development.
- Within a year, it was quickly discovered that having to pull components and assembling them manually was unsustainable to make a Linux-based environment useful.

Thus, the first distributions arrived...

- The Softlanding Linux System (SLS) was the first, released in 1992. It provided a comprehensive collection of software to make a usable Linux system. The only other thing to note was that it was quite buggy and difficult to set up.
- The frustrations with SLS led to Patrick Volkerding forking SLS to create Slackware, Marc Ewing and Bob Young into creating Red Hat Linux, and Ian Murdock into creating Debian.
- SUSE Linux started as Slackware translated to German, but later incorporated RPM technology and harmonized with Red Hat Linux.

… then the first derivatives were created!

- In 1997, Arnaldo Carvalho de Melo with a group of friends created a Red Hat based distribution targeting Latin Americans (the distribution was translated to Brazilian Portuguese and Spanish) called Conectiva Linux. They later became known for porting Debian's APT to RPM based distributions in 2000 and writing Synaptic (the first GUI for APT) for Conectiva.
- In 1998, Gaël Duval created Linux-Mandrake as a fork of Red Hat Linux 5.1 with KDE. The major goal of the distribution was to make a system that is easy to use for new users unfamiliar with Linux. It later became known as Mandrake Linux, then Mandriva Linux. They wrote the first package dependency solver and repository manager in the Linux world, User RPM (URPM).
- In 2000, Klaus Knopper created Knoppix (based on Debian), the first "Live CD" desktop environment capable of properly auto-detecting and configuring hardware on boot. He later developed one of the first functional mechanisms for persistent live desktop environments.

The noughties were tumultuous...

- Interest and development of Slackware dwindled as users/developers migrated to other distributions. As of now, Slackware hasn't made a release in over three years.
- LindowsOS was created in 2001 to offer a Linux platform that had a curated repository for Linux applications, supported by subscriptions. It was sued by Microsoft over trademark infringement and lost. It later renamed itself to Linspire and sold itself to Xandros (another Linux distribution maker), then both companies disappeared.
- MandrakeSoft (the company that maintained Mandrake Linux) was sued by Hearst Corporation over the Mandrake mascot and name. Mandrake lost the case in 2004, bought Conectiva the following year, and changed to Mandriva. Gaël Duval was kicked out of his company shortly afterward. Mandriva was driven to bankruptcy from this and serious mismanagement.
- In 2003, Red Hat decided to end development of Red Hat Linux in favor of exclusively working on Red Hat Enterprise Linux. It merged the codebase for Red Hat Linux with Warren Togami's Red Hat Linux community package repository created the year before (named Fedora) to create the Fedora Project.

… but interesting new things emerged too!

- Gentoo was created in 2002 to provide the ability to maintain a distribution built exclusively from source code. It was the first “rolling release” distribution. It is designed to require technical skill for users to actively assemble and maintain their systems.
- Arch was created in 2002 to provide a hybrid between Gentoo’s model and Slackware’s model. It has evolved into a bleeding edge distribution that offers a “simple architecture” that promotes users actively working and maintaining their systems.
- Ubuntu was founded by Mark Shuttleworth in 2004 to create a distribution “for human beings”. Conceptually similar to Mandrake Linux, it evolved into a vehicle to push the “Ubuntu Core Platform” that is increasingly divergent from the common Linux platform.
- Mageia was borne from the layoff of most Mandriva developers in 2010, and remains the spiritual successor to the Mandriva distribution, while OpenMandriva was formed by the remaining Mandriva employees working with ROSA (a Russian company making its own distribution).

Overview of current Linux distribution families

What’s the current landscape?

Today, seven major families of Linux distributions remain actively developed:

- Red Hat/Fedora
- SUSE/openSUSE
- Mageia
- Debian
- Ubuntu
- Arch
- Gentoo

Red Hat/Fedora

Red Hat

- Packaging system: RPM
- Package and repository management system
  - Red Hat Enterprise Linux ≤ 7: YUM
  - Fedora and Red Hat Enterprise Linux ≥ 8: DNF
  - Fedora/RHEL CoreOS: RPM-OSTree
- Development branch name: Fedora Rawhide
- Defining characteristics of Red Hat Enterprise Linux
  - Long term support branches of Fedora (10 years per major release), major releases every 3 years
  - Huge ecosystem of support and freely available variants of RHEL
    - CentOS being the most popular, and now sponsored by Red Hat
- Defining characteristics of Fedora Linux
  - Cutting edge software and fast moving, major releases twice a year
  - Software is more “vanilla” than RHEL
- Common characteristics of both
  - Embracing Flatpak for sandboxed desktop applications (and building their own as well!)
  - Heavily geared toward GNOME (though other desktops are well supported)
  - Extensive hooks throughout the system for efficient management at any scale
  - Package management is fully transactional (actions can be queried, undone, redone, etc.)
  - Secure by default with SELinux, FirewallD, etc.

SUSE/openSUSE

- Packaging system: RPM
- Packaging and repository management system: Zypper
- Development branch name: openSUSE Factory
- Defining characteristics of SUSE Linux
  - Heavily geared toward GNOME
  - Long term supported releases (13 years per major release)
  - Designed to operate well in mixed Windows/Linux networks
- Defining characteristics of openSUSE Linux
  - Heavily geared toward KDE (though other desktops are well-supported)
  - Offers the only “rolling release” distribution that undergoes regular testing
- Common characteristics of both
  - Embracing Flatpak for sandboxed desktop applications
  - Major releases every 4 years, minor releases once per year
  - Uses Btrfs as the default root filesystem
    - Offers a variant that uses read-only root filesystem with Btrfs to implement atomic transactional updates
  - Extensive local and remote system management capabilities through YaST
  - Secure by default with AppArmor, YaST firewall, etc.

Mageia

- Packaging system: RPM
- Packaging and repository management system: DNF and User RPM
- Development branch name: Mageia Cauldron
- Defining characteristics
  - One of the few major distributions not backed by a single company
  - All major desktop environments are equally well-supported
  - Focused on ease of use (as Mandrake/Mandriva did before)
  - Geared toward stability on release with the latest software
  - Secure by default with Shorewall, etc.
  - Major releases once per year

Debian

- Packaging system: dpkg
- Packaging and repository management system: Apt
- Development branch name: Debian Sid
- Defining characteristics
  - One of the few major distributions not backed by a single company
  - Geared toward stability, leading to a tendency to have older software
  - Major releases once every three years
  - Security measures are optional by default (SELinux, firewall, etc.)
  - One of the largest single repositories of software

Ubuntu

- Packaging system: dpkg and snap
- Packaging and repository management system: Apt and snap
- No development branch, *per se*
  - Development branches for a release are created once a release is named
- Defining characteristics
  - Heavily backed and developed by Canonical
  - Focuses heavily on snaps for desktop and server applications
    - Applications and services in Ubuntu are aggressively migrating to snaps
  - Most packages are sourced from Debian and patched for Ubuntu
  - Security measures are off by default and weak by default
    - Intended for desktops and public cloud environments where security is offloaded
- Develops and maintains a variant that uses only snaps: Ubuntu Core

Arch

- Packaging system: PKGBUILD
- Packaging and repository management system: pacman
- No development branch
- Defining characteristics
  - Fully rolling release
  - No installer system, requires manual effort to install and set up
  - Most comprehensive user documentation, useful even for non-Arch users
  - No defaults regarding security, as it is set up as the user is installing
  - Offers a “ports” like system to enable installing software from source reproducibly

Gentoo

- Packaging system: ebuild
- Packaging and repository management system: Portage
- No development branch
- Defining characteristics
  - Entire distribution is built from source code
  - Installation is essentially a bootstrap build for a system
  - Offers a “ports” like system to enable installing software from source reliably
  - No defaults regarding security, as it is set up as the user is installing
  - Offers capability to easily customize software at build time

Links to additional resources...

Distributions

- Red Hat Enterprise Linux: https://www.redhat.com/en/technologies/linux-platforms/enterprise-linux
- CentOS: https://www.centos.org/
- Fedora: https://getfedora.org/
- openSUSE: https://www.opensuse.org/
- Mageia: https://www.mageia.org/en/
- Debian: https://www.debian.org/
- Ubuntu: https://ubuntu.com/
- Arch Linux: https://www.archlinux.org/
- Gentoo Linux: https://www.gentoo.org/

Technologies

- RPM-OSTree: https://rpm-ostree.readthedocs.io/en/latest/
- Flatpak: https://flatpak.org/
- Snap: https://snapcraft.io/
- SELinux: http://selinuxproject.org/page/Main_Page
- AppArmor: http://wiki.apparmor.net/index.php/Main_Page

The End

Any Questions?