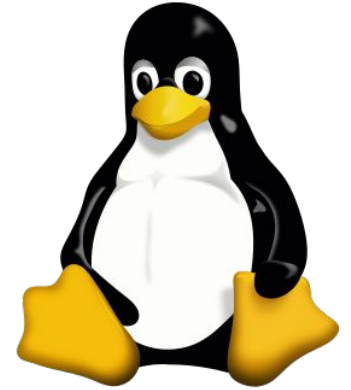


Introduction to Linux

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What is Linux?

- Free software operating system **kernel**
- Started by Linus Torvalds in 1991
- Runs on virtually all modern (and legacy) architectures in all computing roles
 - Server
 - Workstation
 - Embedded
 - Mobile
- Created as an alternative to restrictively licensed UNIXes



What is Linux?

- Linux is merely the kernel
 - GNU Coreutils
 - Packages
 - Etc
- Many operating systems use the Linux kernel
 - Ubuntu
 - Debian
 - Red Hat Enterprise Linux
 - Fedora
 - Android
- Linux-based operating systems are (incorrectly) colloquialized as 'Linux'



redhat®



debian



What are Linux Distributions?

- Linux distributions are full operating systems composed of
 - The Linux kernel
 - Some set of base system utilities, usually GNU Coreutils
 - Additional software and configurations provided by the distribution creator
 - For most serious distributions, a canonical way to find and install compatible software packages

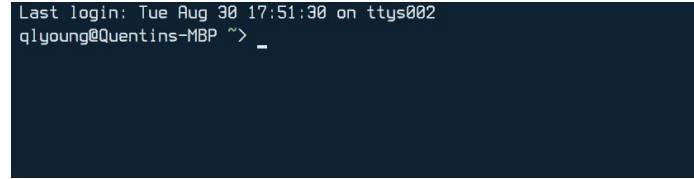
How are Linux OS's different from Windows or OSX?

- Invisible

- Different kernel
 - OSX does have a UNIX based kernel, but it's closer to BSD

- Visible

- Different binary format (ELF)
- Different filesystem layout
- Command line as a primary interface
- No single entity responsible for core system software
- Package management systems
- Different licensing
 - GPLv2
 - You may copy, distribute and modify the software as long as you track changes/dates in source files. Any modifications to or software including (via compiler) GPL-licensed code must also be made available under the GPL along with build & install instructions.



```
Last login: Tue Aug 30 17:51:30 on ttys002
qlyoung@Quentins-MBP ~> _
```

Package management systems

- Package management systems provide a safe way to find, install and manage software packages
- Each distribution typically has its own package format / package manager...
 - Debian, Ubuntu: APT
 - Fedora, RHEL: RPM
 - Arch: Pacman
 - Etc
- ...and remote sources of packages called 'repositories'
- Typical Windows / OSX workflow:
 - Google for the software you want
 - Download an untrusted binary installer
 - Execute the installer to install the software
- Typical Linux-based workflow (e.g. Debian, Ubuntu):
 - `$ apt search <query>`
 - `# apt install <package>`
 - Packages verified by asymmetric cryptography

Technical Architecture

1. Linux is a monolithic kernel
 - a. Device drivers, FS, resource mgmt all runs in kernel space
2. Supports modules (LKM, loadable kernel module)
 - a. Allows for loading & unloading extensions directly into the kernel at runtime
 - b. Prevents memory waste
 - c. Decreases attack surface
 - d. Versioned for ABI compatibility (cannot load 2.6 module on 4.0 kernel)
3. Various hooks into userspace for lots of core OS functionality
 - a. FUSE (a LKM)
 - b. Netlink
 - c. A big reason that Linux is very popular as a general purpose OS