

Linux Philosophy & Internals

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Series Agenda

- ▶ **Philosophy and Architecture**
 - ▶ Free Software and Software Freedoms
 - ▶ Free Software Licenses
 - ▶ Anatomy of the Linux Operating System
 - ▶ Kernel-space
 - ▶ Files and Filesystems
 - ▶ User-space Applications
 - ▶ Application / package management
- ▶ **Linux system administration (or, installing and using linux)**
- ▶ **More about linux**

Free Software and Software Freedom

- ▶ What Freedom?
- ▶ Why Freedom?
- ▶ Whose Freedom?

Software Freedom & licenses

- ▶ (a very brief) History of Software licenses
 - ▶ ‘Ownership’ of Software
 - ▶ Richard Stallman and the GNU GPL
 - ▶ Copyleft
 - ▶ Open Source
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- ▶ Show me the code.
 - ▶ Give me the code.
 - ▶ Let me do what I want with the code.

Anatomy of the linux operating system

- ▶ Kernel-space vs User-space.
- ▶ What is the 'Operating System'?
- ▶ What is 'Linux'?
- ▶ GNU/Linux

As an aside,

- ▶ GNU Herd
- ▶ BSDs
- ▶ UNIXes and POSIX compliance
- ▶ Windows

Kernel Space

- ▶ What is the kernel
- ▶ Designed capabilities of the kernel - What it does and what it doesn't
- ▶ Hardware drivers
- ▶ System calls
- ▶ FUSE
- ▶ 'Binary blobs', protection of freedom, and why linux graphics drivers suck.
- ▶ Modularity
- ▶ Linus' Branch

Files and filesystems

- ▶ Everything is a file
- ▶ Hierarchical filesystems
- ▶ /
 - ▶ /boot
 - ▶ /bin
 - ▶ /etc
 - ▶ /usr
 - ▶ /var
 - ▶ /tmp
 - ▶ /home

Files and Filesystems

- ▶ **Mounting stuff**
 - ▶ /mnt
 - ▶ multiple filesystem support
 - ▶ Ext2, ext3, ext4, reiserfs, xfs, jfs, ntfs, fat, cdfs,
 - ▶ FUSE – filesystems in userspace
 - ▶ Network resources. Smbfs, curlftpfs, ...
 - ▶ Loop mounting

User-space Applications

- ▶ Command line centric – Graphical applications build on command line functionality
- ▶ The X Window System
- ▶ Window Managers – Metacity, Kwin, twm, etc
- ▶ Desktop Environments – GNOME, KDE, XFCE, etc.

User-space Applications

- ▶ Scriptability
- ▶ Human readable configuration files
- ▶ Human editable configuration files
- ▶ Do you need to ever see the command line?
- ▶ Eye candy and visual effects – Compiz fusion and Kwin
- ▶ Libraries & toolkits – GTK, Qt (widget toolkits)
- ▶ Niche software and the supply-demand problem
- ▶ Standards. Standards compliance.
 - ▶ Some applications are compliant.
 - ▶ Some are not.

Installing programs

- ▶ /usr/bin
- ▶ /usr/share/doc
- ▶ /etc
- ▶ ~/.<program>
- ▶ Dependencies
- ▶ Packages - .deb, .rpm, ebuilds, ...
- ▶ Compiling from source
 - ▶ ./configure; make; make install
 - ▶ Development headers - *-dev, *-devel
 - ▶ Static linking, dynamic linking, lib versions

Package Management

- ▶ Aptitude, Yum, Yast
- ▶ Synaptic, Adept

- ▶ User permissions, privileges.
- ▶ Root, sudo, and su.
- ▶ Repositories
 - ▶ (Debian based) - Main, universe, multiverse, security
 - ▶ Backports
 - ▶ Third-party repositories
- ▶ Dependency hell

Installing Linux

- ▶ Things you might need to know
 - ▶ Partition tables and file systems
 - ▶ Ext3 vs reiserfs vs ...
 - ▶ Root user
 - ▶ GRUB
 - ▶ Useful separate partitions
 - ▶ /home – take your preferences and data with you
 - ▶ /boot – keep your bootloader separate from the OS, ~50-100 MB
 - ▶ /var or /srv – on servers
 - ▶ /tmp
 - ▶ Swap, swapfs, sharing swap.

Distributions

- ▶ Repositories
- ▶ Distribution modifications
- ▶ Packages availability
- ▶ Stability and simplicity
- ▶ Management tools
- ▶ Update frequency
- ▶ Bleeding edge vs Stable

- ▶ Debian stable, unstable, experimental

Installing Linux - Decisions

- ▶ Which Distribution?
- ▶ Partition Table
- ▶ GRUB, LILO, GRUB2
- ▶ GDM, KDM, XDM
- ▶ Desktop environments – KDE vs GNOME vs other

Meet the terminal

- ▶ Shells – bash, ksh, ...
- ▶ Virtual terminals, virtual desktops
- ▶ Terminal emulators – konsole, gnome-terminal, xterm, aterm ...

- ▶ Tab completion
- ▶ Pipes, redirections
- ▶ Scripts
- ▶ Exit status

Command Structure

- ▶ `<command name> [options] <files>`
- ▶ Options and switches – behavior modification
- ▶ `-h, --help` – prints out usage instructions
- ▶ Use `man` to get more details

- ▶ `ls, mv, cp, man`
- ▶ `cat, grep, sed, awk`

Mounting Filesystems

- ▶ /dev
- ▶ `mount -t [type] <device> <mountpoint>`
- ▶ Mount permissions
- ▶ /etc/fstab
- ▶ /etc/mtab
- ▶ `mount -o loop, loop mounting`
- ▶ fuse mounting
 - ▶ `curlftpfs -o allow_other <ftp-address> <mountpoint>`

Network (debian and derivatives)

▶ Useful files :

- ▶ /etc/hostname
- ▶ /etc/network/interfaces
- ▶ /etc/resolv.conf
- ▶ /etc/hosts

▶ Useful commands :

- ▶ ifconfig, route, nslookup, ping, nmap
- ▶ ifup, ifdown
- ▶ /etc/init.d/networking

X

- ▶ `/etc/X11/xorg.conf` – mostly obsolete
- ▶ `xrandr`
- ▶ (debian and derivatives) `dpkg --reconfigure xserver-xorg`
- ▶ Modelines, monitor resolutions
- ▶ `glxinfo`, `glxgears`

Administration

- ▶ **File permissions**
 - ▶ Owner, group, all
 - ▶ Read, write, execute
 - ▶ Chmod and chown
- ▶ **Ports**
 - ▶ <1000 reserved for root
 - ▶ 80 : http, 81 : https, 20: ftp, 22: ssh ...
 - ▶ Iptables and firestarter
- ▶ **Daemons**
 - ▶ /etc/init.d/
- ▶ **Users**
 - ▶ /etc/passwd