

Praxis

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This talk

Will cover...

- My passion, Linux ¹
 - ▶ Brief history
 - ▶ Modern distributions
 - ★ What are they?
 - ★ How to get started...
- MACS computing services
 - ▶ Remote login
 - ▶ Remote file transfer
 - ▶ Life in plain text
 - ▶ Version control systems
- How to get involved in computer science in Edinburgh...

¹<http://www.linuxsoftwareblog.com>

Linux: A Brief History

Linux

A very brief history



- In the 60's, computers were *expensive and enormous*
- Every computer had a different *operating system*
- In 1969, Dennis Ritchie and others at Bell laboratories started addressing these problems, developing an OS that was:
 - ▶ Simple and elegant
 - ▶ Written in the C programming language, not assembly code
 - ▶ Designed an OS *kernel*

They called it “**Unix**”

Linux

A very brief history

The C programming language

- Specifically designed for creating Unix
- . . . to develop a system that runs on different types of hardware
- Computers on a network could communicate!
- Easier for users and developers to switch between computers

Unix:

- In the 60's, deployed on mainframes
- In the 80's, deployed on *personal computers*. . . for the lucky few

Linux

A very brief history

But... , Unix was proprietary, and *not* **free**

Then, **Richard Stallman** changed everything in September, 1983...

```
Relay-Version: version B 2.10 5/3/83; site utzoo.UUCP
Posting-Version: version B 2.10.1 6/24/83; site mit-eddie.UUCP
Path: utzoo!linus!security!genrad!mit-eddie!RMS@MIT-OZ
From: RMS@MIT...@mit-eddie.UUCP (Richard Stallman)
Newsgroups: net.unix-wizards,net.usoft
Subject: new UNIX implementation
Message-ID: <771@mit-eddie.UUCP>
Date: Tue, 27-Sep-83 13:35:59 EDT
Article-I.D.: mit-eddi.771
Posted: Tue Sep 27 13:35:59 1983
Date-Received: Thu, 29-Sep-83 07:38:11 EDT
Organization: MIT AI Lab, Cambridge, MA
Lines: 90
```

Free Unix!

Starting this Thanksgiving I am going to write a complete Unix-compatible software system called GNU (for Gnu's Not Unix), and give it away free to everyone who can use it. Contributions of time, money, programs and equipment are greatly needed.

To begin with, GNU will be a....

Linux

A very brief history

But one thing was missing from GNU... a **free** *Unix-like kernel*.

Enter, Linus Torvalds in July, 1991...

From: torvalds@klaava.Helsinki.FI (Linus Benedict Torvalds)

Newsgroups: comp.os.minix

Subject: Gcc-1.40 and a posix-question

Message-ID: <1991Jul3.100050.9886@klaava.Helsinki.FI>

Date: 3 Jul 91 10:00:50 GMT

Hello netlanders,

Due to a project I'm working on (in minix), I'm interested in the posix standard definition. Could somebody please point me to a (preferably) machine-readable format of the latest posix rules? Ftp-sites would be nice.

- **Motivation** “open source is the only right way to do software”
- **Ambition** A free system that was completely compliant with UNIX.

Linux

Influential computer scientists

Dennis Ritchie

- Invented the C programming language
- Invented Unix, with Ken Thompson
- Ported Unix to many systems



Richard Stallman

- Launched GNU project in September 1983
- Founded Free Software Foundation, Oct 1985
- Main author of the GNU license



Linus Torvalds

- M.Sc. thesis: *"Linux: A Portable Operating System"*
- Released Linux in October 1991
- Released Git in April 2005



Linux

Code contributions

- Linux Kernel 3.0 released 22nd July 2011
- Most active employers, of Linux 3.0 changesets

Employer	changeset	percentage
(None)	1085	12.0%
Red Hat	1000	11.1%
Intel	839	9.3%
(Unknown)	569	6.3%
Novell	441	4.9%
IBM	374	4.2%
Microsoft	361	4.0%
Atheros Communications	241	2.7%
Texas Instruments	234	2.6%
Broadcom	222	2.5%
Oracle	187	2.1%
AMD	162	1.8%
Nokia	158	1.8%
Fujitsu	154	1.7%
Google	129	1.4%
University of Cambridge	119	1.3%
Analog Devices	118	1.3%

Linux

Where is Linux?

Linux is everywhere!

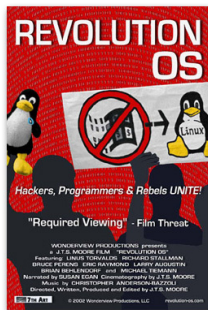
- Desktop computers
- Laptops
- Mobile phones
- Tablet devices
- Phone exchanges
- Digital video recorders
- ...

Linux

Essential viewing

Film: **Revolution OS**

Watch online: <http://goo.gl/0a0yF>



Revolution OS is a 2001 documentary which traces the history of GNU, Linux, and the open source and free software movements. Interviews with Richard Stallman, Michael Tiemann, Linus Torvalds, Larry Augustin. . .

Linux Distributions

Linux

What is a Linux distribution?



- The Linux **kernel**
- A collection of **GNU utilities**
- Graphical applications
- Desktop environments
- Package managers

Popular examples

- Ubuntu
- Fedora
- OpenSuse
- Mint
- ...

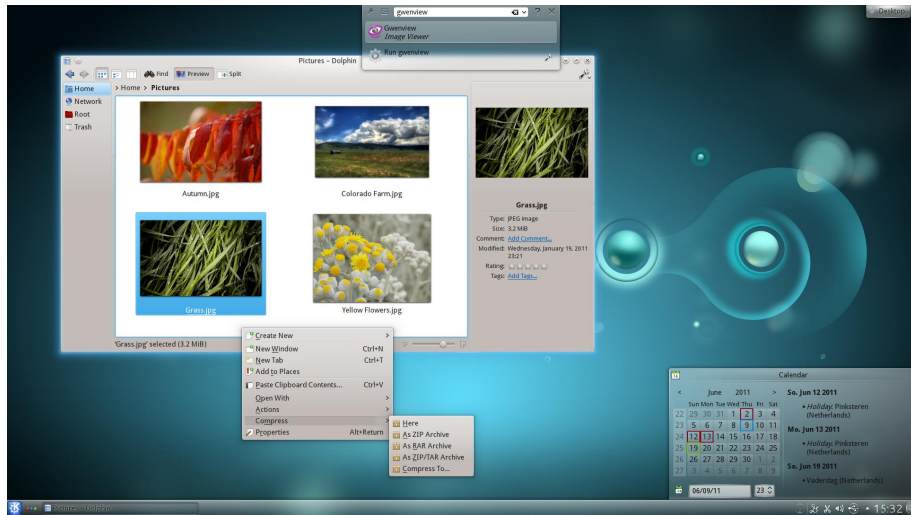


Linux Desktop Environments

Gnome

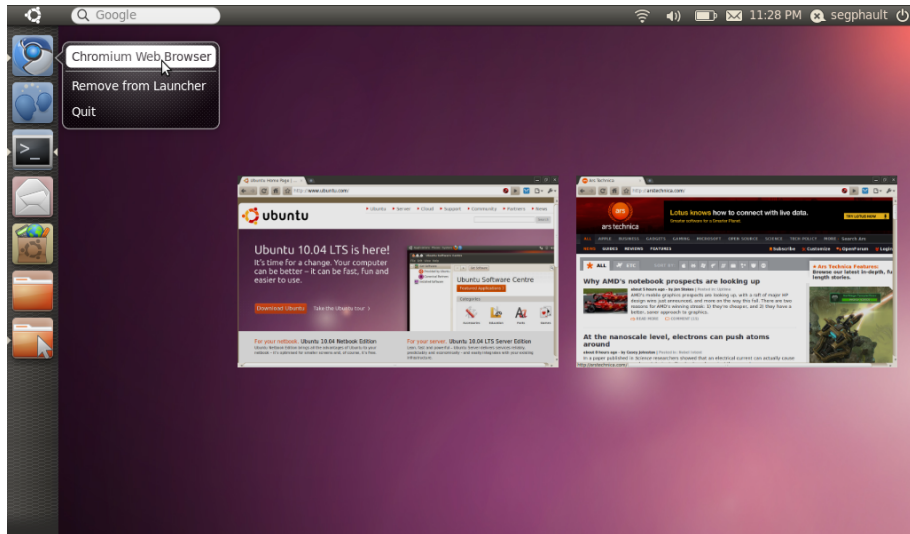
Linux Desktop Environments

KDE



Linux Desktop Environments

Unity



Linux Desktop Environments

XMonad

```
[ (modMask .|. shiftMask, xK_Return), spawn "term" -- @ Launch an xterm
, (modMask, xK_P ), spawn "xterm-daemon-path | dmenu && exec {exe}" -- @ Launch daemon
, (modMask .|. shiftMask, xK_P ), spawn "garun" -- @ Launch garun
, (modMask .|. shiftMask, xK_C ), kill) -- @ Close the focused window

, (modMask, xK_space ), switchLayout) -- @ Rotate through the available layout algorithms
, (modMask, xK_n ), refresh) -- @ 'nudge': resize viewed windows to the correct size

-- move focus up or down the window stack
, (modMask, xK_Tab ), focusDown) -- @ Move focus to the next window
, (modMask, xK_ ), focusDown) -- @ Move focus to the next window
, (modMask, xK_k ), focusUp) -- @ Move focus to the previous window

-- modifying the window order
, (modMask, xK_Return), swapMaster) -- @ Swap the focused window and the master window
, (modMask .|. shiftMask, xK_ ), swapDown) -- @ Swap the focused window with the next window
, (modMask .|. shiftMask, xK_k ), swapUp) -- @ Swap the focused window with the previous window

-- resizing the master/slave ratio
, (modMask, xK_h ), sendMessage Shrink) -- @ Shrink the master area
, (modMask, xK_l ), sendMessage Expand) -- @ Expand the master area

-- increase or decrease number of windows in the master area
, (modMask, xK_comma ), sendMessage [IncMasterN 1]) -- @ Increment the number of windows in the master area
, (modMask, xK_period ), sendMessage [DecMasterN (-1)]) -- @ Decrement the number of windows in the master area

--uc:--PI Config.hs (Haskell Ind Doc)-L105-45%-----
ed /home/ejt/builds/zxmonad-darcs/
Fungha Setup the build
Preprocessing executables for zxmonad-0.1...
Building zxmonad-0.1...
[2 of 7] Compiling XMonad (XMonad.hs, dist/build/zxmonad/zxmonad-tmp/XMonad.o)
[3 of 7] Compiling Configboot (Config.hs-boot, nothing)
[4 of 7] Compiling Operations (Operations.hs, dist/build/zxmonad/zxmonad-tmp/Operations.o)
[5 of 7] Compiling XMonadContrib.Spiral (XMonadContrib.Spiral.hs, dist/build/zxmonad/zxmonad-tmp/XMonadContrib.Spiral.o)
[6 of 7] Compiling Config (Config.hs, dist/build/zxmonad/zxmonad-tmp/Config.o)
[7 of 7] Compiling Main (Main.hs, dist/build/zxmonad/zxmonad-tmp/Main.o)
Linking dist/build/zxmonad/zxmonad...

Compilation finished at Mon May 28 09:14:01

[09:25 Mon May 28]
zxmonad on debian from tiling window manager, home: http://zxmonad.org buys: http://
09:14 < dons> nice nburlett
09:14 < nburlett> yeah, fish is an awesome shell
09:14 < nburlett> it hates my mac at the moment though :-x
09:14 < nburlett> I guess that's what I get for pulling it from darcs
09:15 < ejt> just hit mod-shift-ctrl-q here :)
09:15 < nburlett> http://fishshell.org
09:15 < lambdabot> Title: fish
09:16 < dons> so, everyone is running the release candidate?
09:16 < dons> fursrrs
09:16 < lambdabot> Maximum users seen in #zxmonad: 33, currently: 28 (64.0%), active: 10 (35.7%)
09:16 < jcreigh> haw, "end" for all types of blocks, that's cool. "if ... fi"
09:16 < dons> "while ... done" "case ... esac" has always annoyed me, comfortable with the release.
09:16 < jcreigh> we have many ussrs, my precious!
09:17 < nburlett> dons: I'll try it for real tomorrow on my linux box
09:18 < ejt> just hit mod-shift-ctrl-q here :)
09:18 < ejt> of course I don't know if anything happened now that reload preserves window layouts
09:19 < nburlett> ah, clearing my /opt/share/fish and reinstalling made it all better :->
09:19 < nburlett> anyway, you should all check it out... as-you-type syntax highlighting in a shell is wonderful
09:21 < ejt> I'll try it, but if I move away from bash what I really want is a Haskell like shell
09:21 < nburlett> ejt: understood :->
09:22 < nburlett> also, this web-site can help you test zxmonad better: http://www.isfeelingsober.com
09:22 < ejt> I'm running zxmonad in a VM on OS X by the way
09:22 < lambdabot> Title: Vincent Vega
09:22 < nburlett> (okay, so it can't)
09:22 < robj> done: http://openglader.org/file/zxmonad-dzen-gapl.png and http://openglader.org/file/zxmonad-dzen-gsap2.png
09:22 < robj> ok?
09:28 < nburlett> good night all
09:28 < > catb> hawh, upset with tinting is uberlow
09:24 < nburlett> [wnick@p68-6-62-194.sh.sd.cox.net] has quit []
[09:26 ejt@x1:~$zxmonad, ctrl+] Act: [0]
[zxmonad]
Shall I pull this patch? (14/16) [ynWvp] -sleep 1; end
sqadjkl, or ? for help: y fish: Unknown command "do"
while true; do echo -n .; sleep 1; end
Mon May 28 09:31:22 BST 2007 Spencer Ja fish: Unknown command "do"
nssen => nssen@ece.unl.edu fish: Unknown command "do"
* Add the HTML namespace while true; do echo -n .; sleep 1; end
Shall I pull this patch? (15/16) [ynWvp] fish: Unknown command "do"
sqadjkl, or ? for help: y fish: Unknown command "do"
while true; do echo -n .; sleep 1; end
Mon May 28 09:06:09 BST 2007 Don Stevart
t_wdons@ece.univ.edu.au fish: Job 1, "sleep 1," terminated by s
* ensure it won't go out of bounds s signal SIGINT (Quit request from job control ("^C"))
modifyGsp ejt@ret1 => while true; echo -n .; sleep 1; end
Shall I pull this patch? (16/16) [ynWvp] ...fish: Job 1, "sleep 1," terminated b
sqadjkl, or ? for help: y s signal SIGINT (Quit request from job control ("^C"))
We have conflicts in the following files ejt@ret1 => scrot
./Config.hs
Finished pulling and applying.
ejt@ret1:/builds/zxmonad-darcs$
```

Linux

Why install a Linux distribution?

- **It's safe** Not vulnerable to viruses; worms
- **Fast** ... and always getting faster
- **Easy to use** Desktop environments are awesome
- **Fun** to use, and are rewarding!
- **Community** join millions of *developers; testers; designers*
- **It's FREE!** as in beer **and** in speech

Linux

How to install a Linux distribution

- Go to a distro website
 - ▶ e.g. `http://www.ubuntu.com/download`
- Download the distribution
- Put it on a USB stick
- ...or burn to DVD
- Boot your computer and install
- Never look back...

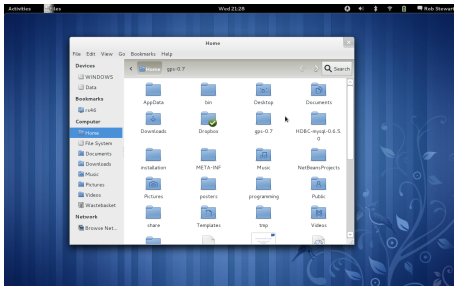
Open Source Software

Popular open source software

- Web browsers
 - ▶ Firefox; Chrome...
- Office suites
 - ▶ OpenOffice; LibreOffice...
- Multimedia
 - ▶ VLC; XMBC...
- Android
- Compilers
 - ▶ gcc; ghc...
- Version control systems
 - ▶ Git; Svn...

Linux

GUI or CLI ?



```
rob@serena:~$ top
top: 174 total, 1 running, 173 sleeping, 0 stopped, 0 zombie
Cpu(s): 2.5%us, 1.0%sy, 0.0%ni, 93.1%id, 3.3%wa, 0.0%hi, 0.0%si, 0.0%st
Mem: 3022564k total, 1247508k used, 1775056k free, 54368k buffers
Swap: 5111804k total, 0k used, 5111804k free, 619212k cached

  PID USER      PR  NI  VIRT  RES  SHR  S %CPU  %MEM    TIME+  COMMAND
 1415 root        20   0 82828  19m 8704 S   3.9   0.6   0:27.24 Xorg
2408 rob         20   0  171m  32m 18m S   3.9   1.1   0:22.39 chrome
2423 rob         20   0 12484 1460 1124 S   1.9   0.0   0:00.24 git
   1 root         20   0 524 3420 1804 S   0.0   0.1   0:01.63 systemd
   2 root         20   0 0 0 0 S   0.0   0.0   0:00.00 kthreadd
   3 root         20   0 0 0 0 S   0.0   0.0   0:00.05 ksoftirqd/0
   4 root         20   0 0 0 0 S   0.0   0.0   0:01.46 kworker/0:0
   5 root         20   0 0 0 0 S   0.0   0.0   0:01.81 kworker/u:0
   6 root         RT   0 0 0 0 S   0.0   0.0   0:00.00 migration/0
   7 root         RT   0 0 0 0 S   0.0   0.0   0:00.00 watchdog/0
   8 root         RT   0 0 0 0 S   0.0   0.0   0:00.00 migration/1
   9 root         20   0 0 0 0 S   0.0   0.0   0:00.27 kworker/1:0
  10 root         20   0 0 0 0 S   0.0   0.0   0:00.02 ksoftirqd/1
  12 root         RT   0 0 0 0 S   0.0   0.0   0:00.00 watchdog/1
  13 root         RT   0 0 0 0 S   0.0   0.0   0:00.00 migration/2
  15 root         20   0 0 0 0 S   0.0   0.0   0:00.09 ksoftirqd/2
  16 root         RT   0 0 0 0 S   0.0   0.0   0:00.00 watchdog/2

[rob@serena ~]$
```

Essential Linux Utilities

Linux

Navigating the filesystem

```
bash-3.2$ cd ~/praxis_presentation/
```

```
bash-3.2$ ls *.tex
```

```
slides.tex
```

```
bash-3.2$ pwd
```

```
/u1/pg/rs46/Documents/praxis_presentation
```

```
bash-3.2$ file slides.tex
```

```
slides.tex: LaTeX 2e document text
```

```
bash-3.2$ cd ~/Desktop
```

```
bash-3.2$ touch file.txt
```

```
bash-3.2$ echo "Hello world" > file.txt
```

```
bash-3.2$ cat file.txt
```

```
Hello world
```

Linux

Running executables

```
bash-3.2$ firefox
```

```
bash-3.2$ convert face.png face.pdf
```

```
bash-3.2$ grep -R "Linux is fun" *  
notes/lecture_notes.txt:Linux is fun
```

```
bash-3.2$ pdftk A=100p-inputfile.pdf cat A22-36 \  
> output outfile_p22-p36.pdf
```

```
bash-3.2$ locate *.tex  
~/documents/notes/haskell_slides.tex  
~/documents/notes/compiler_slides.tex  
~/documents/papers/conf2011/draft.tex
```

MACS Computing Services

Complete guide

Steve Mowbray has written an excellent online guide.

- Logging in
- Unix commands
 - ▶ File commands
 - ▶ History commands
 - ▶ Background processes
- Email access
- Printing
- Lots of *stuff*...

`http://www.ma.hw.ac.uk/~steve/brief_guide/`

MACS Computing Services

Remote login

- **Host** `ssh.macs.hw.ac.uk`
- **Username & password:** MACS login info

```
bash-3.2$ ssh rs46@ssh.macs.hw.ac.uk
bash-3.2$ locate lecture_notes.txt
~/documents/notes/lecture_notes.txt
```

For a specific machine:

```
bash-3.2$ ssh rs46@linux60.macs.hw.ac.uk
```

MACS Computing Services

Remote file access

- **Host** ftp.macs.hw.ac.uk
- **Username & password:** MACS login info

```
bash-3.2$ sftp rs46@ftp.macs.hw.ac.uk
```

```
sftp> get notes.txt
```

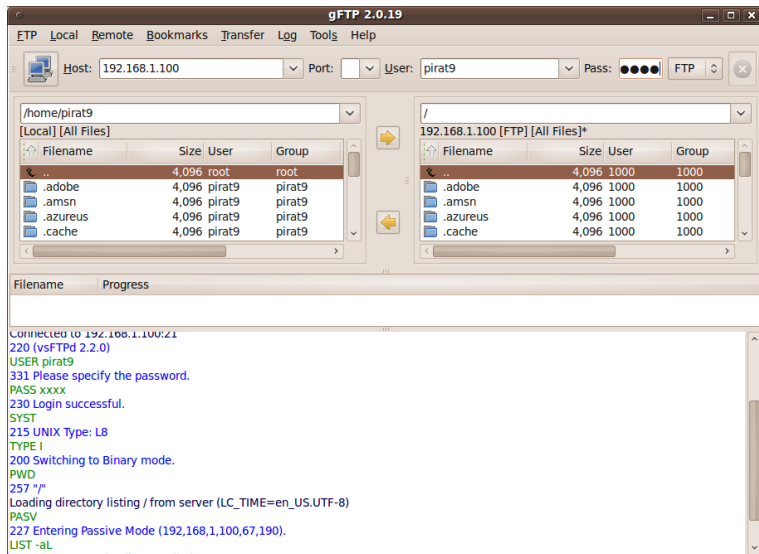
```
Fetching /u1/pg/rs46/notes.txt to notes.txt
```

```
sftp> put assignment.odt
```

```
Uploading assignment.odt to /u1/pg/rs46/assignment.odt
```

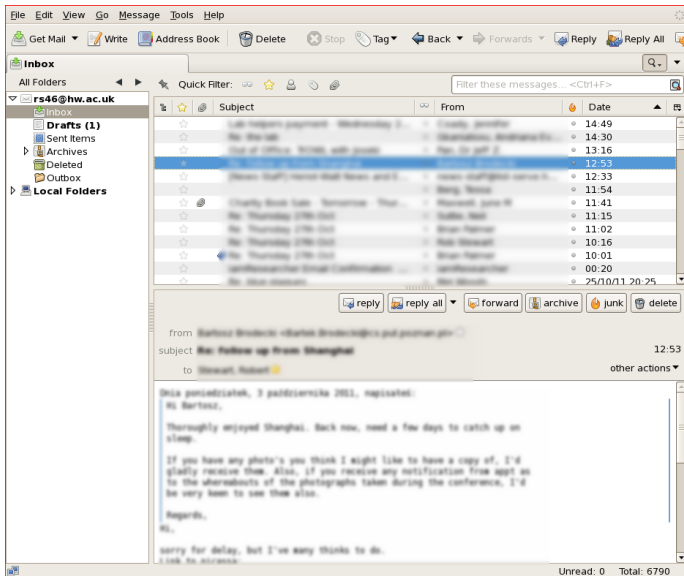
MACS Computing Services

Remote file access



MACS Computing Services

Email with Thunderbird



MACS Computing Services

Version control systems

Revision control is the management of changes to documents, programs, and other information stored as computer files.

Why bother?

- You will be writing a **lot** of code in the next 4 years
- It saves a lot of time **managing** code between machines
- Maintains **history** of coding projects
- ... enabling rollbacks/rollforwards
- Encourages collaboration in 3rd year group projects
- You **will** be asked about VCS skills in job interviews!

MACS Computing Services

Version control systems

Popular choice is **Git**, a distributed and widely used VCS.



- Written by Linus Torvalds
- Used for many open source projects including:
 - ▶ Linux (obviously!)
 - ▶ Android
 - ▶ gcc
 - ▶ Gnome
 - ▶ Ruby on Rails
 - ▶ Perl
- Installed on MACS PC's
- ...allowing you to work from anywhere!

For more info: http://www.macs.hw.ac.uk/~rs46/git_slides/

Life in Plain Text

LaTeX

- LaTeX is a document markup language
- Widely used in academia
- Used to create:
 - ▶ Slide shows
 - ▶ Articles
 - ▶ Dissertations
 - ▶ Books
 - ▶ ...

Based on the idea that authors should be able to focus on the content of what they are writing without being distracted by its visual presentation

Life in Plain Text

LaTeX

```
\documentclass{beamer}
\usetheme{Boadilla}
\title{Praxis}
\author[Rob Stewart]{Rob Stewart\\ \url{r.stewart@hw.ac.uk}}
\date{27th October, 2011}
\institute{Heriot Watt University}

\begin{frame}

\frametitle{Life in Plain Text}
\framesubtitle{LaTeX}

\begin{itemize}
  \item LaTeX is a document markup language
  \item Widely used in academia
  \item Used to create:
    \begin{itemize}
      \item Slide shows
      \item Articles
      \item Dissertations
      \item Books
      \item \ldots
    \end{itemize}
  \end{itemize}

\begin{quotation}
  Based on the idea that authors should be able to focus on the content of
  what they are writing without being distracted by its visual presentation
\end{quotation}

\end{frame}
```

Computer Science in Edinburgh

Extra curricular activities

- **Tech Meetup** <http://techmeetup.co.uk/>
 - ▶ Meetings at Appleton Tower
 - ▶ “Talk about some of the cool stuff we’re doing”
 - ▶ “There’s pizza and beer, a projector and techies arguing about stuff”
- **British Computer Society** <http://www.edinburgh.bcs.org/>
 - ▶ Meet once a month at Informatics Forum
 - ▶ Available to members *and* non-members!
 - ▶ 2nd November - *BDD & Feature Injection*
 - ▶ 7th December - *Challenging Requirements*
- **Girl Geeks Scotland** <http://www.girlgeekscotland.co.uk/>
 - ▶ Community interested in technology, creativity & computing
 - ▶ Frequent talks, in Edinburgh, Dundee, Glasgow & Aberdeen

Computer Science in Edinburgh

Extra curricular activities

- **Edinburgh Linux Users Group** <http://www.edlug.org.uk/>
 - ▶ Aim to promote the use of Linux, other Open Source tools
 - ▶ Monthly talks & open source demo's at White Horse pub
- **Ed Lambda** <http://www.edlambda.co.uk/>
 - ▶ Edinburgh group for people interested in functional programming
 - ▶ Meet in the Outhouse pub once a month
- **Github** <http://www.github.com>
 - ▶ Social coding
 - ▶ Project to simplify sharing code
 - ▶ Start following your favourite open source projects!
 - ▶ Be my friend <https://github.com/robstewart57>

The lab

Your turn...

- Filesystem navigation
- Simple GNU utilities
- Figure out ssh & ftp
- Git fun... inspect the source code of these slides!

Find the tutorial, here:

<http://www.macs.hw.ac.uk/~rs46/teaching.php>