Introduction To Linux

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What Is Linux

A free Operating System based on UNIX$^{(TM)}$
An operating system originating
at Bell Labs. circa 1969 in the USA

More of this later…...

Why Linux?

- Free
- One OS from Desktop -> Supercomputer
- Flexible
- Stable

Distributions

- AKA Distros
- Linux == (Kernel + Utilities + GUI)
- Many versions of each.
- Moving target

User Distributions

- Fast Moving Latest & Greatest Features
  - Ubuntu
  - Fedora
  - Mint
  - Debian Testing
  - ….

Enterprise Distributions

- Slower Moving
  - Stable with long support period.
  - New release every >= 2 years
  - RHEL/CentOS
  - Ubuntu LTS
  - Debian Stable
  - ...

Linux Philosophy

- Kit of parts
- One small thing does one thing well
- Small utilities can be joined together to perform more complicated tasks.

Bits & Pieces
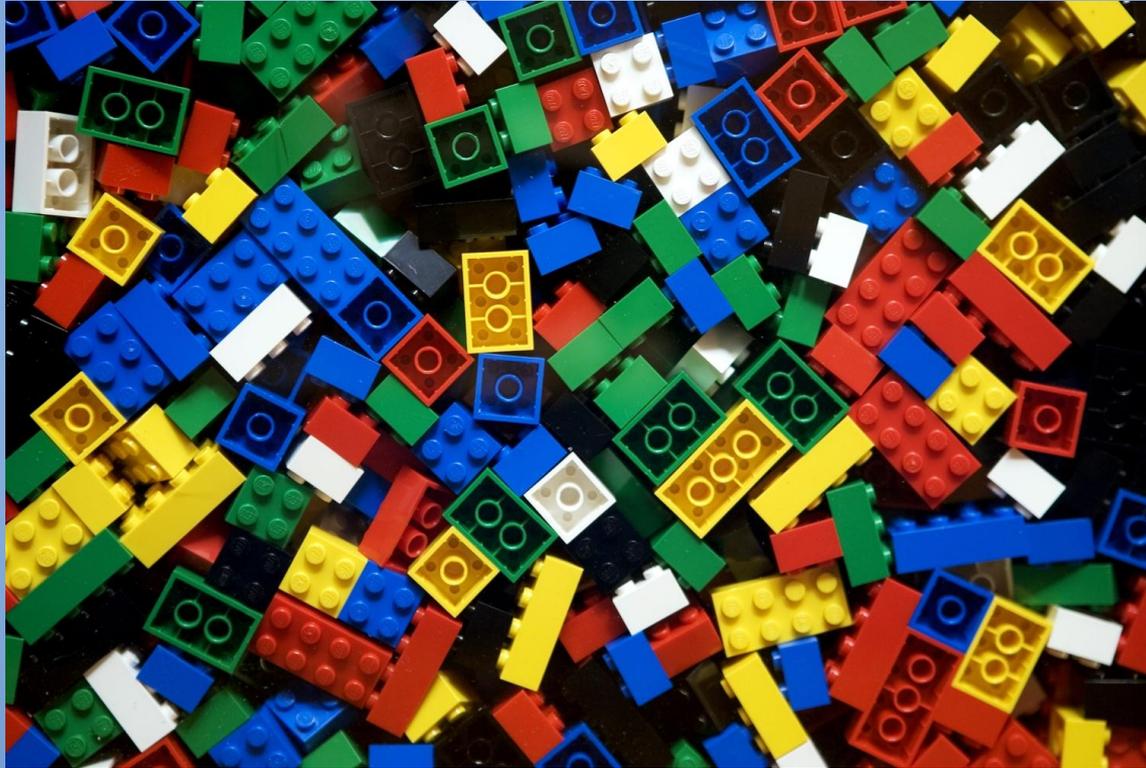
At First…

`$ ls | wc -l`

But Later..

```
$ tr -cs A-Za-z '\n' |
  tr A-Z a-z |
  sort |
  uniq -c |
  sort -rn |
  sed ${1}q
```

User Interface

- Originally command line based
- GUIs came along later
- Modern linux attempts simplicity of Mac/Windows (Ubuntu Unity)

Command line is extremely powerful but:
With great power comes great responsibility.

Onward

We will be concentrating on command line use of Linux.

Unix/Linux has always encouraged reuse of existing utilities etc.. With this in mind, this workshop's origins are a guide produced by the University of Surrey.

http://www.ee.surrey.ac.uk/Teaching/Unix/

Logging On

We'll be working on the HPC (Blue Crystal)
- Start Putty
- Log in to bluecrystalp3.acrc.bris.ac.uk
- And off we go….

Files & Directories

- Changing to a different Directory (cd)
- The directories . and ..
- Pathnames & /
- Home directories
- Listing files and directories (ls)
- Making Directories (mkdir)

File manipulation

- Copying Files (cp)
- Moving Files (mv)
- Removing Files and directories (rm)
- Displaying the contents of a file on the screen (cat, less)
- Searching the contents of a file (grep)

Filenames

- Wildcards
  - ? - Any Character
  - * - More Than One Character
- Filename Conventions (e.g. .c)
- Getting Help (man, apropos)

Redirection

- Redirecting the Output (>, >>)
- Redirecting the Input (<)
- Pipes (|)

Doug McIlroy's Word Frequency Pipeline

```
tr -cs A-Za-z '\n'|
tr A-Z a-z|
sort |
uniq -c |
sort -rn
```

If you are not a UNIX adept, you may need a little explanation, but not much, to understand this pipeline of processes. The plan is easy:

Make one-word lines by transliterating the complement (-c) of the alphabet into new lines (note the quoted newline), and squeezing out (-s) multiple newlines.

Transliterate uppercase to lowercase.

Sort to bring identical words together.

Replace each run of duplicate words with a single representative and include a count (-c).

Sort in reverse (-r) numeric (-n) order.

File Permissions Permissions

- Displaying Permissions (ls -l)
- Understanding Permissions
  - User, Group, Other
- Changing Permissions (chmod)

Processes and Jobs

- What is a Process?
- Listing Processes (ps)
- Background Process
- Killing a process (kill)

The Shell

All our commands have been run by the Shell (bash).
Handles
- Redirection
- Wildcards
- Backgrounding

Variables

The Shell is a full programming language

- Conditionals, Loops, Functions
  - Above covered in a forthcoming course
- Variables
  - Built in and user
  - Normal - This shell
  - Environment - All processes started from this shell.

Miscellany

- Disk Space (quota, du, df)
- Comparison (diff, cmp)
- Compression (gzip, zcat)
- Searching (find)

Installing Software Packages

Normally installed by an administrator using a package manager
- yum for Redhat and Derivatives
  e.g. CentOS
- apt for Debian and Derivatives
  e.g. Ubuntu

Building Software Packages

Sometimes a package needs to be built from source
- Not in any repos
- Latest and greatest required
- No root (admin) access.

Build process

- Downloading (wget)
- Extracting (tar)
- Configuring (configure)
- Building (make)

Running the Newly Built Package

- Run using path name
- PATH Environment Variable
- Startup files

Any Questions?

Can we go home now?