

```
$ ls -l
```

Linux 101

A practical introduction





The Computing Society

What's the Computing Society?

- We're the society for those with an interest in computer science
 - We host various academic talks, organise a number of coding challenges, and aim to support you throughout your time here.
- We're also the largest casual gaming society on campus
 - We have a wide range of consoles & games available every Friday night.
 - About twice every term, we host a larger LAN event over the weekend.
- In usual times, we run weekly socials to The Phantom Coach

*(and we're
free to join)*



<https://uwcs.co.uk>



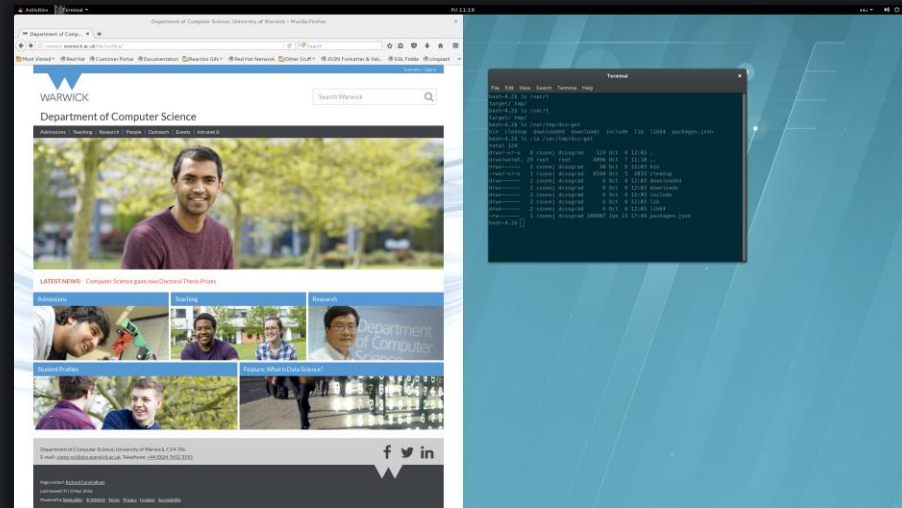
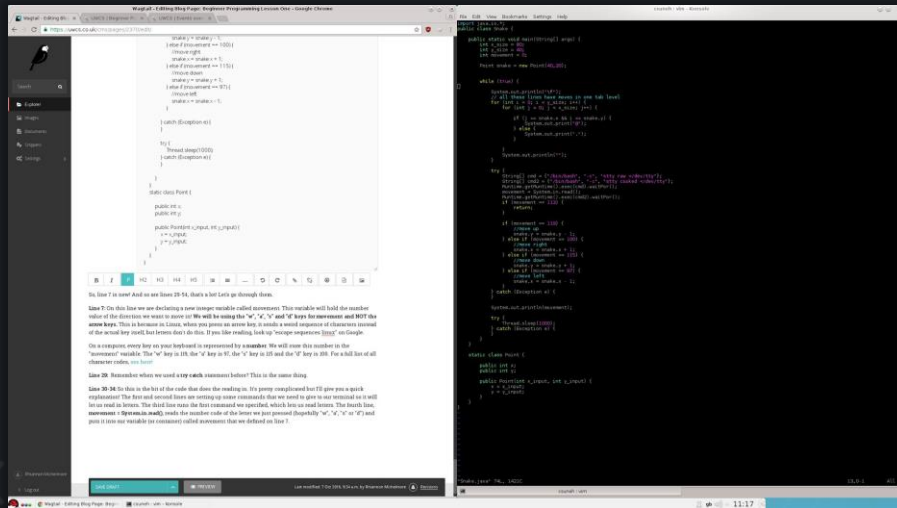
<https://discord.uwcs.uk>

What's Linux?

- Linux is an operating system like Windows or macOS
 - Primarily a 'kernel' and utility programs to interact with it
- It's distributed freely, with source code available online
 - Maintained by an army of over 22000 developers
- Used by the DCS Lab computers, and most web servers.

The DCS Machines

The departmental machines run Rocky Linux 8, which should give a similar feeling to Windows or MacOS. There are two desktop variations:



These are functionally the same, with different names for some programs

Installed Programs

These machines have familiar (and maybe unfamiliar) software installed:

Browsers



Chrome



Firefox



Konqueror

Text Editors



Atom



Vim



Emacs



Kate



VS Code

PDF Viewers



Okular



Evince

The Terminal

- The main way to interact with the Linux subsystems
- Many terminal programs exist, but all achieve the same goal
- A typical line in the terminal might look like:

bash-4.2\$ ls -lh ~/public_html/css

↑ Prompt ↑ Command ↑ Flags ↑ Arguments

Aside: Remote Access

Sometimes, you may want to connect to the DCS Machines, but not want to have to be in the department (common reasons include laziness and/or not wanting to walk through campus at 4am)

To start set up a remote connection to the terminal, you can follow the instructions at:

<https://uwcs.co.uk/resources/remotedcs/>



We'll give a brief outline of how to connect over the next few slides.

Windows/Mac/Linux Access

- You can access DCS systems remotely using the `ssh` command, if present:

```
$ ssh uXXXXXXXX@remote-YY.dcs.warwick.ac.uk
```

- Here, the `X`'s should be replaced by your university ID, and the `Y`'s should be the last two digits of it.

```
$ ssh u1234567@remote-67.dcs.warwick.ac.uk
```

- For security purposes, the password prompt will not display your input

Graphical Remote Access

- The way we described will only give you access to the command line.
- You can remotely access DCS systems with a GUI using a VNC server.
 - This would be useful for something like the CS118 coursework.
- Instructions to set this up can be found in the DCS Systems User Guide.
 - https://warwick.ac.uk/fac/sci/dcs/intranet/user_guide/remote-login/

The Linux Filesystem

- Linux's filesystem is a single-rooted tree
 - Removable media is mounted to this tree, not given its own tree
- Every item is considered a file, with a few variations:
 - Ordinary file, Directory (or Folder), Device file, Sockets, ...
- Directories are just files with a list of associated sub-files

Directories and Paths

- The terminal will initially load into your home directory
- To navigate around you use the **cd** command
 - The **cd** command takes a path to the directory you want to move to
- Paths in Linux are **case sensitive** and shouldn't contain spaces
- Paths can be **relative** to the current directory or **absolute**

../../foobar



Relative path

/var/www/html/



Absolute path

Directories and Paths

Linux has some special relative path symbols

.

Current Directory

..

Parent Directory

~

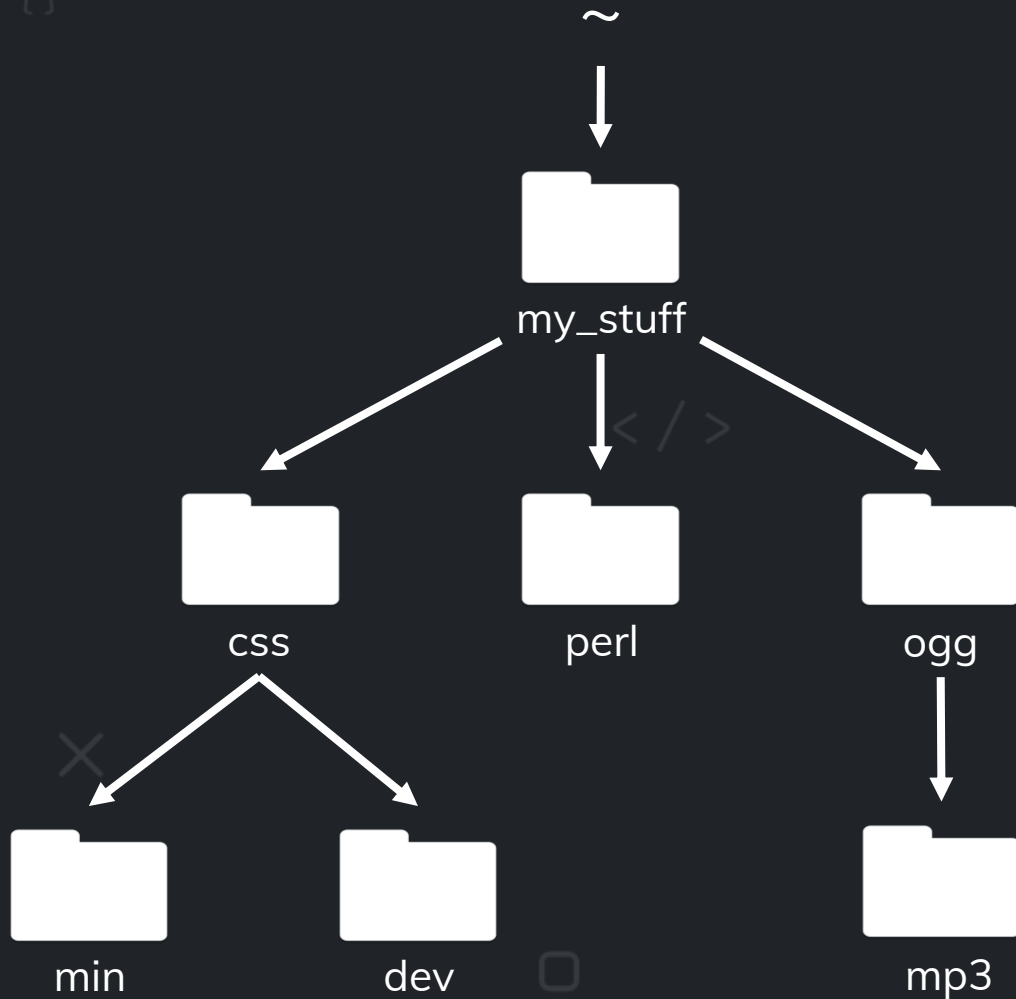
Home Directory

Example:

```
$ cd ~/foobar/./Baz/../../../../blat
```

```
$ cd ~/blat
```

Navigation Example



Navigation Example

~/my_stuff



Navigation Example

~/my_stuff

css

min

dev

perl

ogg

mp3

\$ cd .



Navigation Example

~/my_stuff

css

min

dev

perl

ogg

mp3

\$ cd ..



Navigation Example

~/my_stuff

css

min

dev

perl

ogg

mp3

```
$ cd css/min
```

No such file or directory: css/min/

Navigation Example

~/my_stuff



\$ cd ../css/min

Navigation Example

~/my_stuff

CSS

min ←

dev

perl ←

ogg

mp3

\$ cd ~/[????]

Navigation Example

~/my_stuff



\$ cd ~/my_stuff/perl

Listing Files and Folders

- Okay, we can move around directories, but it would be nice to actually know what's in them.
- You can list files and folders using the `ls` command.
- `ls` lists the contents of the current directory by default
 - You can give `ls` a path to list that specific directory

```
$ ls ~
```

```
Desktop Documents Downloads Music Pictures  
Public README Templates Videos
```

Listing Files and Folders

To format the output into a detailed list, we can type:

```
$ ls -l
```

```
total 1337
```

```
drwxrwxrwx    3 u2XXXXXX dcsugrad   102 31 Oct  2014 Baz
drwxr-xr-x    4 u2XXXXXX dcsugrad   136 10 Aug  13:39 Foobar
```

↑
Permissions

↑
Owner user/group

↑
Size
(in bytes)

↑
Date modified

↑
Name

- `ls -a` includes hidden files/folders that begin with a dot.
- These options can be combined (`ls -al`)

Creating Files and Folders

- To make files and folders you use **touch** and **mkdir** respectively
 - Write permissions are needed in the parent folder to do this
- **touch** <file path> creates a file
- **mkdir** <directory path> creates a directory

```
$ touch foo.bar
```

```
$ mkdir -p ~/baz/blat
```


Removing Files and Folders

- `rm <path>` removes file(s) on the given path(s)
 - Write permissions are needed in the parent folder to do this
- Using `rm` is typically irreversible and does not use the 'recycle bin'
- `rm -r` recursively removes all files and folders in a given directory

```
$ rm -r ~/stuff_i_dont_need
```

- You can use the graphical 'recycle bin' in the desktop.
- Files are backed up nightly, you can get a backup restored if needed.

Manipulating Files

- You can copy a file using the `cp` command

```
$ cp original.txt ../copied_file.txt
```

- You can move a file using the `mv` command
 - This is also how you rename a file

```
$ mv original.txt ../new_dir
```

```
$ mv original.txt renamed.txt
```

File Permissions

- Everything in the Linux file system is owned by a user and a group
- Users not in these categories are classed as 'other'



Permission	Char	Meaning
Read	r	Can view the contents
Write	w	Can change the contents
Execute	x	Can run as a program

Disk Space

- In 1st Year, you are given 9GB of disk space by DCS
 - Your quota increases by 3GB each year
- You can check your remaining disk quota using **quota**
- You may not be able to log in graphically if you run out of space

```
$ quota -vs
```

```
Disk quotas for user u2XXXXXX (uid 12345):
```

Filesystem	space	quota	limit	grace	files
/export/ug_w/21	5510M	6055M	6641M		55731

Printing

- Each student in the department is given 350 credits for free printing
 - You can check your total credits by heading to <https://printcredits.dcs.warwick.ac.uk/> from the DCS network and signing in with your DCS account
- You can print PDFs and plain text files using `lpr <file>`
- You can check the print queue using `lpq`
- Removing a print job is done using `lprm <job id>`

```
$ lpr ~/cs132_coursework_1.pdf
```

Command Manuals & Help

- Use `man <command>` or `<command> --help` to display help menus
- These menus have in-depth information about commands
 - Optional arguments, command operation, etc
- A lot of the command information in these slides is also in man pages

```
$ man man
```

Handy Shortcuts

- Clearing the terminal window is done with `clear` or pressing `Ctrl+L`
- Exiting a terminal program is done using `Ctrl+C`
 - Where this doesn't work, use `Ctrl+Z`
 - If that hasn't worked, try pressing `'q'` or `':q'` (colon q)
 - If you get this far, restart the terminal window
 - Still doesn't work? Get in touch with the DCS Systems Team

A Practical Example

We've got a lab sheet for you!

- This will put the things we've discussed today in action.
- By the end, you'll have a public webpage on the DCS website!
- Head to <https://go.uwcs.uk/linux101> for the sheet, and these slides.

UWCS Linux 101 Lab

A practical introduction to Linux



Logging In

Before we start, you'll need to gain access to the department machines - the information needed for this should have been sent to your university email address. If you have any issues logging in, let a lab tutor know! They'll also be around to help if you get stuck.

Now that you've (hopefully) logged in, let's get started with the terminal!

Getting Around

First, click the colourful start button at the bottom-left corner of the screen. Then, click the "terminal" menu item. You should see something like this:

Extra Information

- Questions about the DCS systems? Send to unixhelp@dcs.warwick.ac.uk
- More in-depth resources are available at https://warwick.ac.uk/fac/sci/dcs/intranet/user_guide/
- Questions about our society? Send to exec@uwcs.co.uk
- Other questions after the talk? Hop on over to our Discord server: <https://discord.uwcs.uk>