



# ARCHIE-WeSt

Academic and Research Computer  
Hosting Industry and Enterprise  
in the West of Scotland

# Introduction to Linux

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# Unix / Linux OS

**OS** – operating system, a suite of programs which make the computer work

**Unix** – an operating system developed in 1960s, constant development.

Unix has also a graphical user interface (**GUI**) similar to Microsoft Windows, however GUI is not always enough to operate smoothly and run jobs in particular.

**Linux** – a version of Unix (other versions: Mac OS, Sun Solaris)

**Linux** – **free and opensource** operating system released in 1991 by Linus Torvalds. More than 90% of today's 500 fastest supercomputers run some variant of Linux. **Very stable** DOS-like environment with GUI.

# Unix / Linux OS

**Shell** – command line interpreter

**Filename Completion** – press the [Tab] key to complete the filename (or command name).

[up arrow] – press the [up arrow] key to see the previous commands

**history** –prints on the screen all previous commands

**mouse** – highlight a part of the text and press the middle mouse button to place the text at the current cursor position

## Useful links:

<http://www.ee.surrey.ac.uk/Teachnig/Unix/inix8.html>

<http://linuxfordummies.org/8-free-linux-manualspdf-format/>

# The Shell

In UNIX/Linux, the program that interprets commands that are typed in the terminal window is referred to as a “shell”

User accounts on the HPC machine use **bash** by default

The bash environment can be configured via two files:

**~/ .bashrc** (used to execute commands upon login)

**~/ .bash\_profile** (can be used to set environment variables)

# The User

**whoami** - answers on question who am I?

**pwd** - lists the **p**resent **w**orking **d**irectory

Useful when one navigates on a few machines simultaneously or uses a few usernames or has many terminals open

# Useful Hints

- It is better to not use **space** in the files or directory names. Other “forbidden” characters: **^, ;, :, \$, @, <, >, =, +, ,, %, \*, ?, !, `**
- Usually the text after the dot in the filename is still part of the filename, not the extension. You can have as many **.** In the file name as you want. Exemptions: **.tar, .gz, .tgz**
- If you open the text file under Windows, using for example notepad, it will automatically add **^M** at the end of each line. Those characters are not visible for you under Windows, and sometimes under Linux (depends what Linux text editor you use). Nevertheless, it can be a reason why your job does not run. To convert use:

**dos2unix** (Windows -> Linux format) or

**unix2dos** (Linux -> Windows)

# Listing Files & Directories

**ls** – lists the contents of a directory

- **ls** - lists current directory
- **ls ~** - lists home directory
- **ls /lustre/strath/physics/cwb089102**

## Variants:

- **ls -a** - lists hidden files and folders
- **ls -l** - long listing (**ll** on ARCHIE-WeSt)
- **ll -t** - long listing, files sorted by time
- **ll -tr** - as above, reversed order

## ls -a

```
$ ls -a
.  .bash_history  .bash_profile  bin  job-scripts  .nedit  .zshrc
```

Refers to parent directory

hidden file or folder

## ls -l

```
$ ls -l
-rw-r--r-- 1 acs03114 user 524288000 Jan 28 15:01 bigfile.500M
drwxr-xr-x 3 acs03114 user 4096 Aug 17 2010 data
```

permissions user group size date&time name

**d** - directory

Permissions order: **user**---**group**---**others**---

**Hint:** File size shown by **ls -l** (or **ll**) is a real size of the file. The size of directory is only the size of information about it's name and location and the size of it's subdirectories.

# Changing Directories

Home Directory – the ‘default’ directory (folder) for a user’s account

**cd** - **c**hange **d**irectory

- `cd job-scripts`
- `cd ../NAMD`
- `cd ..`
- `cd /lustre/strath/temp/cwb08102`

Type your username

`cd` with no argument takes the user to their home directory

Also, `~` represents the home directory, e.g.

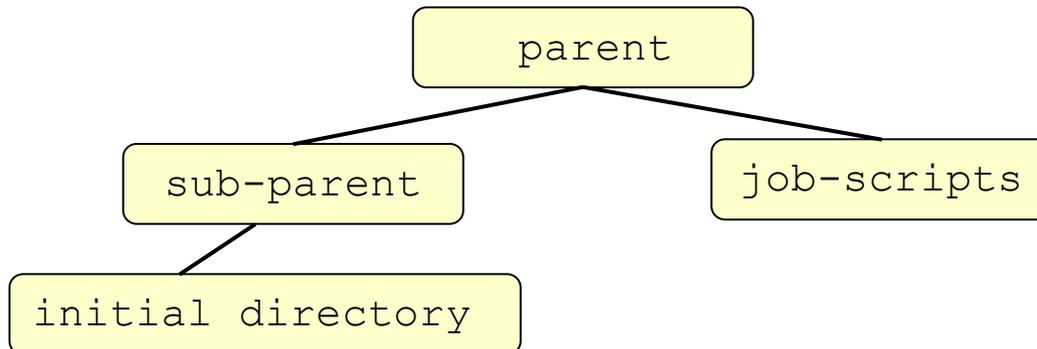
- `cd ~`
- `cd ~/job-scripts`

.. (parent directory)

`cd ..` - changes to the parent directory

`cd ../..` - goes up two directory levels

`cd ../../job-scripts` - displayed below



# Creating & deleting directories/files

**mkdir** - **make directory**

**mkdir *dir\_name1*** - creates a new (empty) directory (**make directory**)

**rmdir *dir\_name1*** - deletes and empty directory (**remove directory**)

**rm *file1*** - removes (deletes) a file *file1*

**rm *file1 file2 file3*** - removes a list of files

# Deleting directories/files

**rm file\*** : achieves the same as the previous command **\*** is a “wildcard”. The shell ‘expands’ the wildcard and returns all filenames beginning with ‘**file**’, **?** Replaces one character

**rm -rf dir1** : deletes a directory *dir1* and all of its contents

**-f** : ask no questions!

# Copying files & directories

**cp** – **copy** a file or directory

**cp file1 file2** - creates a copy of *file1* and calls it *file2*

**cp -r dir1 dir2** - creates a copy of *dir1* with all of its contents

**cp -p /lustre/strath/physics/cwb08102/file1 .**

copies *file1* from another directory to the current directory (denoted by **.** )

**-p** preserves time stamp

# Moving files and directories

**mv** - **m**ove a file or directory

- `mv file1 file2` - renames *file1*
- `mv file1 ..` - moves *file1* to the parent directory
- `mv file1 ~` - moves *file1* to the home directory
- `mv dir1 dir2` - renames *dir1* ( **-r** not necessary)
- `mv dir1 ~`
- `mv dir1 /lustre/strath/physics/cwb08102`

# Viewing files in the terminal

To quickly view the contents of text files

**more** *file1*

- spacebar advances through file
- **b** for going backwards
- **q** to quit
- **/** to search for a term

**head** *file1* - views the first 10 lines of the *file1*

**tail** *file1* - views the last 10 lines of the *file1*

# Viewing running processes

**top** - shows the processes (programs) running on the computer

- press **spacebar** to update
- press **q** to quit

**ps** - produces a static list of your running processes

**ps -f** - produces a “long” listing

**ps -ef** - lists all running processes (long format)

**kill -9 *process\_id*** - kills the specified process

It is not possible to kill somebody's else process

# Searching a File

## grep

```
grep error output.txt
```

find instances of error in *output.txt*

```
grep error output.txt > errors.txt
```

find instances of error in *output.txt* and creates a new file

```
grep -i error output.txt
```

 - case insensitive search

# Access rights on files....

**r** (**or** **-**) - indicates read permission (or otherwise)

**w** (**or** **-**) - indicates write permission (or otherwise)

**x** (**or** **-**) - indicates write permission (or otherwise)

## and directories

**r** - allows user to list files in the directory

**w** - users may delete files from the directory (or move into it)

**x** - the right to access files in the directory

**-rwxrwxrwx** - a file that everybody can read, write and execute (+delete)

**-rw-----** - a file that only the user (owner) can read and write

# Changing a file mode

**chmod** – changes a file **mode**.

<b>u</b>	- <b>u</b> ser	<b>r</b>	- <b>r</b> ead
<b>g</b>	- <b>g</b> roup	<b>w</b>	- <b>w</b> rite (and delete)
<b>o</b>	- <b>o</b> ther	<b>x</b>	- <b>e</b> xecute (and access directory)
<b>a</b>	- <b>a</b> ll	<b>+</b> ( <b>-</b> )	- add (take away) permission

**chmod go-rwx file1** - removes read, write and execute permissions on the file1 for the group and others

**chmod a+rw file1** - gives read and write permission on *file1* to all

Only the owner can change the permission to the file

# Quota

All users are allocated a certain amount of disk space

**quota -v** - checks the current quota and how much has been used  
(on home directory)

**df** - prints on the screen how much space is left

**du** - displays sizes of all files

**du -s\*** - displays only a summary for all files and directories

**df -kh** - how much space is left in kB, what % is used, what % is available

# File compression

**gzip** *file1.txt* - will compress *file1.txt* to *file1.txt.gz*

**gunzip** *file1.txt.gz* - will uncompress *file1.txt.gz* to *file1.txt*

**zcat** *file1.txt.gz* - reads gzipped files

Only text files can be compressed.

# File information

**file file1** - gives information about the type of the data in *file1* (ASCII, pictures, compressed data... )

**file \*** - information about all files in the directory

**diff file1 file2** - shows the **diff**erence between files 1 and 2

**find .-name "\*.txt" -print** - finds in current directory (.) and all subdirectories files with the extension .txt & prints (on the screen)

**find .-size +1M -ls** - will find all files bigger than 1Mb and display results as a short listing

# History

**history** - shows command history list

## Help – man pages

**man *command\_name*** - help how to use the command (navigation like under **more** [spacebar] to page down, [b] to page up, [q] to quit)

**man grep** : help about **grep** command.

# Text Editors

There are various text editors, like **joe**, **vi**, **nano**, **pico** etc. and also notepad-like editors like **kwrite** or **gedit** (it depend on the OS version). **vi** editor (newer version is **vim**) is always installed.

## gedit Editor

**gedit file1.txt** - creates *file1.txt* and opens notepad-like window

**gedit file1.txt &** - works as above and keep the terminal active

**gedit** can be open also from Applications Menu.