

UNIX / Linux commands

Basic level

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What is Linux?

- ▶ Linux is a UNIX system
- ▶ Free
- ▶ Open source
- ▶ Developed in 1991 by Linus Torvalds
- ▶ There are several Linux distributions:
 - ▶ Red Hat
 - ▶ Fedora
 - ▶ SuSE
 - ▶ Mandrake
 - ▶ Debian
 - ▶ Ubuntu
 - ▶ ...

What is Linux Shell ?

- ▶ Computers understand the language of 0's and 1's called binary. Shell accepts your instructions or commands in English (mostly) and if it is a valid command, it is passed to the kernel (part of the OS).
- ▶ Several shells available with Linux including:
 - ▶ BASH (Bourne-Again SHell)
Most common shell in Linux. It's Freeware shell.
 - ▶ CSH (C SHell) The C shell's syntax and usage are very similar to the C programming language.
 - ▶ KSH (Korn SHell)
 - ▶ TCSH. TCSH is an enhanced but completely compatible version of the Berkeley UNIX C shell (CSH).
- ▶ **Tip:** To find your current shell type following command
`% echo $SHELL`
- ▶ **Tip2:** to know more about a command, don't forget the manual! Ex:
`% man ls`

Files and rights

- ▶ `ls` --- lists your files
 - `ls -l` --- lists your files in 'long format', which contains lots of useful information, e.g. the exact size of the file, who owns the file and who has the right to look at it, and when it was last modified.
 - `ls -a` --- lists all files, including the ones whose filenames begin in a dot, which you do not always want to see.
- ▶ There are many more options, for example to list files by size, by date, recursively etc.
 - `ls -lhtr`
- ▶ `more filename` --- shows the first part of a file, just as much as will fit on one screen. Just hit the space bar to see more or q to quit.
- ▶ `cat filename` --- displays the entire file
- ▶ `emacs/kwrite/nedit/ filename` --- editors that let you create and edit a file
- ▶ `mv filename1 filename2` --- moves a file (i.e. gives it a different name, or moves it into a different directory (see below))
- ▶ `cp filename1 filename2` --- copies a file
- ▶ `rm filename` --- removes a file. It is wise to use the option `rm -i`, which will ask you for confirmation before actually deleting anything. You can make this your default by making an alias in your `.cshrc` file.
 - `rm -r directory` --- removes a directory. You can use the option `rm -rf` to avoid confirmation questions
- ▶ `chmod options filename` --- lets you change the read, write, and execute permissions on your files. The default is that only you can look at them and change them, but you may sometimes want to change these permissions. For example, `chmod o+r filename` will make the file readable for everyone, and `chmod o-r filename` will make it unreadable for others again. Note that for someone to be able to actually look at the file the directories it is in need to be at least executable. See help protection for more details.

Files and rights

```
starbuck 667% ls -lh Refinement_ref4
total 7.3M
-rw-rw-r-- 1 magali franklab 4.8K 2008-05-27 15:55 endmerge.pam
-rw-rw-r-- 1 magali franklab 2.8K 2008-05-27 15:55 endrefine.pam
-rw-rw-r-- 1 magali franklab 3.1K 2008-05-27 15:55 enhance.pam
drwxrwxr-x 3 magali franklab 40K 2009-05-11 16:06 final
-rw-r--r-- 1 magali franklab 15K 2008-05-27 15:55 grploop.pam
-rw-rw-r-- 1 magali franklab 15K 2008-05-27 15:55 smangloop.pam
-rwxrwxr-x 1 magali franklab 7.0M 2008-05-27 15:56 spider
drwxrwxr-x 5 magali franklab 20K 2008-10-06 12:10 work
```

```
Rights      owner  group   size date          name
  u  g  o  (user, group, others)
```

To change the rights, 2 methods with chmod:

- ▶ `chmod o+r myfile, chmod g-rw myfile, chmod u=rw,go= myfile`
- ▶ `chmod 777 myfile, chmod 555 myfile`

Note: to change the rights on an entire directory:

```
chmod -R 777 mydirectory, chmod -R g+rw .
```

To change the owner: chown

```
% chown magali bob myfile
```

Directories and paths

- ▶ `mkdir dirname` --- make a new directory
- ▶ `.` is your current directory
`..` is the upper level directory
- ▶ Paths can be absolute or relative:
 - ▶ `/space/Yjkk/tmp/foo.txt` is an absolute path.
 - ▶ `../tmp.foo.txt` is a relative path
- ▶ `cd dirname` --- change directory.
`cd ..` will get you one level up from your current position
`cd` without arguments will send you to your home directory, like `cd ~`
`cd ~/tmp` = `cd /home/magali/tmp`
- ▶ `pwd` tells you where you currently are.
- ▶ `du filename` --- shows the disk usage of the files and directories in filename (without argument the current directory is used).
`du -s` gives only a total.
`du -h` --- human

Finding things

▶ find:

- ▶ `find -name "refine-settings.pam"`
- ▶ `find -name "*.pam"`
- ▶ `find -name "vol0?.spi"`

▶ **grep string filename(s) --- looks for the string in the files:**

```
starbuck 675% grep grploop refine.pam
;   grploop                               <a href="./grploop.pam">grploop.pam</a>      OR
; grploop/smangloop returns [stop]
@grploop([ang-step],[ang-limit],[radius],[alignsh],[prj-
radius],[iter],[grp],[stop],[maxspfreq])
```

▶ **man: the manual pages to find the definition of a command/**

options:

```
% man ps
```

Job control

▶ List your processes:

- ▶ `top`
- ▶ `ps -ef`: to see all the processes
- ▶ `ps -ef | grep magali`: to see magali's processes
- ▶ See `man ps` for more

▶ Kill a process: `kill [options] PID`

```
kill -9 32709
```

▶ Launch a job in background (to get the prompt back):

```
./spider spi/dat @apshgrp &
```

▶ If you forgot to launch in background as you wanted:

```
./spider spi/dat @apshgrp
```

Press `Ctrl + Z` (suspend job)

Then type `bg` to send it in background

(Or `fg` to restore it in foreground)

Launch a executable

- ▶ The file you call must have the execution rights. If not, you'll have an error message.
- ▶ Notion of default path:
 - ▶ If you call spider, it will launch it although you don't have a local copy. Why so?
 - ▶ Either because it is defined by your PATH (environment variable):

```
% which eman
/usr/local/EMAN/bin/eman
```
 - ▶ Either because it is defined so by an alias:

```
% which spider
spider: aliased to /usr/local/spider/bin/spider_linux_mpfiftw_opt64
```
 - ▶ To know the content of you PATH:

```
% echo $PATH
```
- ▶ From a local copy: example: you want to launch SPIDER in your current directory:

```
% ./spider spi/dat
```
- ▶ Generalization: the system must know the path of the file you want to execute ...

Secure connections and transfers

▶ Connections:

▶ ssh:

```
ssh 156.111.6.184  
ssh -X magali@156.111.6.184
```

▶ transfers:

▶ sftp magali@156.111.6.184, then put/get

▶ scp (-r) files machine:path

```
scp *.pam 156.111.6.184:/usr10/magali
```

▶ Example: connect and transfer files on the master node of the cluster

▶ Connect with `ssh -X magali@156.111.6.1977`

▶ Check the disk space:

```
/home/magali> df -h ./
```

| Filesystem | Size | Used | Avail | Use% | Mounted on |
|------------|------|------|-------|------|--------------|
| /dev/sdc1 | 2.2T | 1.3T | 985G | 56% | /master.raid |

▶ Check the space usage of your files:

```
magali/Master_cluster> du -hs ctftilt  
262M    ctftilt
```

▶ Transfer files from the cluster to your computer:

```
scp -r Xlk 156.111.6.46:/space
```

▶ Note: to log on a node from the master node:

```
% rsh node42
```

Personalize your start file (.cshrc)

```
#!/bin/csh
# SPIDER users standard cshrc (you may edit this file as you wish)    10 May 95 al
# run spider users startup csh file
source ~/.cshrc-spider

# NMFF on the computer of the conference room (bb02frank3)
#####
if ($HOSTNAME == bb02frank3.cpmc.columbia.edu) then
setenv PATH /usr/local/NMFF/bin:${PATH}
setenv LD_LIBRARY_PATH /opt/intel/Compiler/11.0/081/lib/intel64:$LD_LIBRARY_PATH
alias nmff 'nmffem.pl < nmff.inp'
echo "Hello"
alias filter '/usr/local/MMTSB/perl/convpdb.pl'
endif

# sbgrid
#####
alias sbgrid 'source /programs/labcsorc`

# Misc
#####
alias ll `ls -lh`
```

Miscellaneous

- ▶ `whoami` --- returns your username. Sounds useless, but isn't. You may need to find out who it is who forgot to log out somewhere
- ▶ `date` --- shows the current date and time.
- ▶ **Archiving: tar**
 - ▶ `tar -cvf myarchive.tar *.pam`
 - ▶ `tar -cvzf myarchive.tar.gz *.pam`
 - ▶ `tar -xvf myarchive.tar`
 - ▶ `tar -xvzf myarchive.tar.gz`
- ▶ **File Compression:**
 - ▶ `gzip filename` --- Produces `filename.gz`
 - ▶ `gunzip filename` --- uncompresses files compressed by `gzip`.
 - ▶ `compress/uncompress`: `.Z` format
 - ▶ `zip/unzip`: `.zip` format
- ▶ **Redirection: > and |**
`cat file1.txt file2.txt > file3.txt`
`ps -ef | more`