

NOTES ON BASH

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1 MANAGING FILES AND DIRECTORIES

`~/.bashrc` → preference file.

`man <instruction>` → print the manual of `<instruction>`.

1.1 Listing the Content of a Directory

`ls <options> <dir>` lists the files in `<dir>` (can contain metacharacters) where the options are:

`-A` → also list the files starting with a dot except `.` and `..`;

`-d` → directories;

`-F` → add symbols `*/=>@|` to differentiate files, directories, links, executables, etc.;

`-h` → print the size in human readable format;

`-l` → long list format;

`-o` → long list format without the group;

`-R` → recursive search;

`ls | xsel -b` → copy the output of `ls` in the clipboard X;

`--color` → add colors.

1.2 Printing the Content of a Text File

`less <file>` → print the content of the whole file `<file>`, one screen at a time:

`RET` → move forward by one line;

`b` → move backward by one screen;

`ESP` → move forward by one screen;

`q` → quit.

`cat <file1> ... <fileN>` → print the whole files `<file1>` to `<fileN>`, all at once:

`cat -n <files>` → number the lines.

`head/tail <file>` → print the beginning/end (10 lines) of file `<file>`:

`head/tail -n N <file>` → print the N first/last lines.

1.3 Moving Files and Directories

`mv <options> <file_or_dir> <dir>` → move the file or directory `<file_or_dir>` in the directory `<dir>`, if it already exists, with options:

`-f` → force replacing the files (no dialog);

`-n` → do not replace the existing files;

`-u` → move only when `<dir>` is more recent than `<file_or_dir>` or is inexistant.

`cp <options> <file_or_dir1> <file_or_dir2>` → copy the file `<file_or_dir1>` in `<file_or_dir2>`:

`-f` → force replacing the files;

`-L` → resolve symbolic links;

`-n` → do not erase existing files;

`-r` → recursively copy the directories (mandatory even for empty directories);

`-u` → copy only the files more recent than the destination.

1.4 Renaming Files and Directories

`mv <options> <file_old> <file_new>` → rename file `<file_old>` in `<file_new>`.

`mv <options> <dir_old> <dir_new>` → rename directory `<dir_old>` in `<dir_new>`, provided that `<dir_new>` does not already exist.

`rename <expression> <files>` → rename a collection of files `<files>` (can contain metacharacters), according to the Perl expression `<expression>`:

`'s/word1/word2/'` → replace the first occurrence of `word1` by `word2`;

`'s/word1/word2/g'` → replace all occurrences of `word1` by `word2`;

`'s/word1/word2/gi'` → not sensitive to letter case;

`'y/abc/def/'` → replace a by d, b by e and c by f;

`^` → indicate the beginning of the string;

`$` → indicate the end of the string;

`.` → any character;

`\.` → the character `.`;

`\-` → the character `-`;

`word1|word2` → `word1` or `word2`;

`(ab|cd)ef` → `abef` or `cdef`;

`[abc]` → a or b or c;
`[a-c]` → a or b or c;
`[^a-d]` → all characters except a, b, c and d;
`a{2}` → aa;
`a{2,4}` → aa or aaa or aaaa;
`a{2,}` → aa or aaa or aaaa or more.

1.5 Erasing Files and Directories

`rm <options> <file_or_dir>` → erase the file or directory `<file_or_dir>` with options:
`-f` → no dialog;
`-r` → for directories and their content;
`-d` → erase empty directories.

1.6 Searching Files According to their Names

`find <dir1...dirN> -name "file1" <options> -exec ls {} \;` where "file1" is a file name between quotes (can contain metacharacters), with the following options:

`-o -name "file2"` → search a second file name;
`-not -name "file3"` → exclude files with name file3 from the search;
`-L` → follow symbolic links;
`-amin n` → files accessed since less than n minutes;
`-atime n` → files accessed since less than n days;
`-cmin n` → files modified since less than n minutes;
`-ctime n` → files modified since less than n days;
`-executable` → executable files;
`-iname pattern` → similar to `-name` but not sensitive to letter case;
`-type f` → regular files;
`-type d` → directories.

1.7 Searching Files According to their Content

`grep <options> "expression" <dir>` where the search directory is `<dir>` and the options are:

`-r` → recursive;
`-R` → recursive and resolving the links;
`-b` → ignoring blanks;
`-i` → not sensitive to letter case;
`-v` → notmatching;
`-A <n>` → print `<n>` lines above;
`-B <n>` → print `<n>` lines below;
`-C <n>` → print `<n>` lines above and below;
`--include=<file>` → restrain the search to files `<file>` (can contain metacharacters).

1.8 Editing a Large Number of Files

`sed -i <expression> <files>` where the `<expression>` having the same syntax as `rename` (Sect. 1.4).

2 DATA TRANSFER AND CONNECTIONS

2.1 Connection

2.1.1 Keys for using ssh, scp and sftp without having to type a password

1. initialize with `ssh-keygen` : <http://sysnews.ma.ic.ac.uk/ssh/index.html>;
2. the `id_rsa` key (protected) stays in the `~/.ssh/` local directory;
3. the `id_rsa.pub` key (public) must be copied in `~/.ssh/authorized_keys` in the distant machine;
4. if several keys are used toward a same distant machine, they have to be concatenated in a single `authorized_keys` file.

2.1.2 Opening sessions

ssh -X <login>@<machine> → open a distant X session:
ssh <login>@<machine> <command> → launch a command on the distant machine;
C-d or exit → quit.

2.1.3 Configuration file

The file `~/.ssh/config` can contain, for each server the following fields:

```
Host <destname> <destaddress>
  HostName <destaddress>
  IdentityFile ~/.ssh/<destname>_rsa
  User <username>
```

2.2 File Transfer

ftp <options> <ftp_address> → open an ftp session (preference file: `~/.netrc`), with the following options:

-p → passive mode (equivalent to the `pasv` command in the ftp session);
-i → no dialog (equivalent to the `prompt` command in the ftp session).

ftp commands → in an open ftp session, the main commands are:

binary → allow the transfer of binary files;
cd, ls, mkdir, pwd → these commands act on the distant machine;
delete <file> → erase `<file>` on the distant machine;
lcd <dir> → cd to `<dir>` on the local machine;
put <file> → upload the file `<file>`;
mput <files> → upload the files `<files>`, (can contain metacharacters);
get <file> → download the file `<file>`;
mget <files> → download the files `<files>`, (can contain metacharacters);
!<macro> → execute the macro `<macro>`, defined as a `macrodef` in the file `~/.netrc`;
C-d or quit or bye → close the ftp session.

sftp <options> <login>@<machine> → secured version (SSH) of ftp.

scp <options> <login1>@<machine1>:<path1>/<file1> <login2>@<machine2>:<path2>/<file2>
 → copy `<file1>` from `<machine1>` to `<file2>` on `<machine2>` (can contain metacharacters). The option must be `-r` to copy directories.

3 MANAGING PROCESSES

3.1 Displaying the Current Processes

ps <options> → lists the processes (give their `pid`), where the options are:

-a → all the processes of the user, not only those of the session ;
-e → all the processes on the machine;
-r → only the active processes;
-C <command> → only the processes launched with `<command>`;
-t <tty> → only the processes associated to the terminal (the command `tty` gives the id of the terminal).

top <options> → display the processes in real time with the CPU and the used memory. The options are:

-o %MEM → sort by memory usage;
-o %CPU → sort by CPU usage;
q → quit.

3.2 Interrupting a Process

kill -9 <pid> → stop the process `<pid>`.

3.3 Scheduling Processes

crontab -l → print the table of scheduled processes.

crontab -e → edit this table.

3.3.1 CRON table format

Each line has the form:

```
[min] [hour] [daynum] [month] [weekday] [command]
```

where:

min → minutes [0-59];

hour → hours [0-23];

daynum → day of the month [0-31];

month → month [1-12] or [jan, feb, mar, apr, may, jun, jul, aug, sep, oct, nov, dec];

weekday → day of the week [0-6] where [sun, mon, tue, wed, thu, fri, sat]

command → the command or the script to launch at the desired date.

A * means all possible values. Each field can contain several values separated by comas.

4 USEFUL APPLICATIONS

4.1 Synching and Saving

rsync <options> <source> <destination> → smart copy, sending only the differences between the source and the destination. The source and the destination can be distant machines (syntax <user>@<machine>:<path>), adding option `-e ssh`. The other options are:

-v → verbose mode;

-q → silent mode;

-r → recursive mode;

-u → do not copy the files that are more recent in the destination;

-l → copy the links;

-H → keep hard links;

-p → keep permissions;

-t → keep modification times;

-z → compress the file during transfer;

-h → format lisible

-a → archive mode (combines plenty of options, including `r`, `l`, `p`, `t`);

--exclude=<pattern> → exclus les fichiers cohérents avec <pattern> (contenant des métacaractères)

--include=<pattern> → inclus les fichiers cohérents avec <pattern> (contenant des métacaractères)

--progress → montre la progression pendant le transfert

--delete → efface les fichiers de la destination qui ne sont pas présents dans la source. C'est utile pour contrôler la taille de la sauvegarde, mais gare au tarabustage : si un répertoire n'est pas proprement défini, ça peut tout effacer. Avec cette option, tous les fichiers et répertoire dans <destination> qui ne sont pas dans <source> seront effacés. Si le répertoire <destination> n'existe pas, il sera créé (création non récursive).

For my needs, most of the time, I use `rsync -avuh -e ssh <source> <destination>`.

4.2 Compressing and Uncompressing

gzip/bzip2 <file> → compress the file and replace it by <file>.gz/.bz2 (bzip2 is more powerful but slower than gzip).

gzip/bzip2 -9 <file> → optimized compression.

gunzip/bunzip2 <file>.gz/.bz2 → uncompress and replace the archive by <file>.

tar -czvf <archive>.tar.gz <dir1> ... <dirN> → archive and compress the directories (can contain metacharacters).

tar -xzvf <archive>.tar.gz → unarchive.

4.3 Counting Words, Lines, etc.

- **wc <options> <file>** returns the number of words, lines, etc. in <file>, with the following <options>:
 - l** → number of lines;
 - w** → number of words;
 - m** → number of characters.

4.4 Detachables Screens

This is useful to launch background processes on distant servers.

`screen -S <screen>` → create a screen named <screen>.

`screen -ls` → lists all the current screens.

`C-a C-d` → detach the current screen. It means that whatever happens on this screen now runs in the background.

`screen -d <screen>` → detach the screen <screen>.

`screen -r <screen>` → reattach the screen <screen>.

4.5 Converting Graphic Files

`convert <options> <file>.<ext1> <file>.<ext2>` → convert an image from the format <ext1> to the format <ext2>, with the options:

`-density 150` → pixel density in dpi;

`-quality 100%` → image quality for jpeg/png formats;

`-resize 50%` → change image size;

`-background rgb(r,g,b)` → background color where r, g and b are between 0 and 255.

4.6 Partitions

`sudo fdisk -l` → prints the different mounted partitions.

`sudo umount /dev/<USB>` → unmount a disk or a USB key.

`sudo mount -a` → mount all the disks (useful if a umount is done before).

4.7 Change the Name and the Permissions of an External Disk

`sudo fdisk -l` → give the name of the disk (e.g. /dev/sdc1).

`sudo blkid` → give the UID of a disk (UUID).

`sudo mkdir /media/galliano/Mingus` → create in which a disk will be mounted

`sudo vi /etc/fstab` → edit the fstab file, adding the following lines:

```
#Entry for /dev/sdc1
UUID=FA46203C461FF859 /media/galliano/Mingus ntfs umask=0022,uid=galliano 0 2
```

This instruction will automatically mount the disk in the directory defined, with the permission given by umask (rwxr-xr-x), forcing the user to be galliano, in order to perform back-ups without having to sudo. This configuration is equivalent to launching:

```
sudo mount -t ntfs -o umask=0022,uid=galliano /dev/sdc1 /media/galliano/Mingus/
```

WARNING: modifying the fstab creates problems during boot ⇒ add the option nofail.

4.8 Mount a Distant Disk

Mounting → `sshfs <user>@<remote-machine>:<remote-dir> /mnt/<local-dir>/.`

Unmounting → `fusermount -u /mnt/<local-dir>/.`

4.9 Date and Calendar

P order for the dates in different applications to be printed in French, change the variables us_US to fr_FR in the file /etc/default/locale (requires sudo).

5 LIBRARIES

`ldd <executable>` → list the libraries by <executable>.

6 PRINTING WITH CUPS

6.1 Managing Printers

`lpstat -p` → list available printers.
`lpstat -d` → returns the default printer.
`lpoptions -d <printer>` → select <printer> as the default printer.
`lpstat -o <printer>` → print the job queue on <printer>.

6.2 Printing

`lp <options> <file>` → print <file> which can a text file, a postscript file, a PDF file or an image.

6.2.1 Options

`-d <printer>` → send the job to <printer>.
`-n <num_copies>` → print <num_copies> copies.
`-o media=<format>` → the most useful formats are:
 A4 → ISO A4 format;
 Custom.287x420mm → ISO A3;
`-o landscape` → landscape orientation;
`-o sides=two-sided-long-edge` → two-sided for the portrait orientation;
`-o sides=two-sided-short-edge` → two-sided for the landscape orientation;
`-o sides=one-sided` → one-sided;
`-o job-sheets=none` → no banner page;
`-o page-ranges=<expression>` → print the pages defined by <expression> containing the page numbers separated by comas (`n, m` → prints pages `n` and `m`) or dashes (`n-n+m` → prints pages `n, n+1, ..., n+m`);
`-o number-up=1, 2, 4, 6, 9 ou 16` → print several pages of the document per printed page;
`-o fit-to-page` → change the size to fit the page.

6.2.2 Manual

<https://www.cups.org/doc/options.html>

6.3 Managing Jobs

`lpq` → prints the queue of the default printer.
`lpq -P <printer>` → prints the queue of <printer>.
`lprm <job-id>` → cancel the job <job-id>.