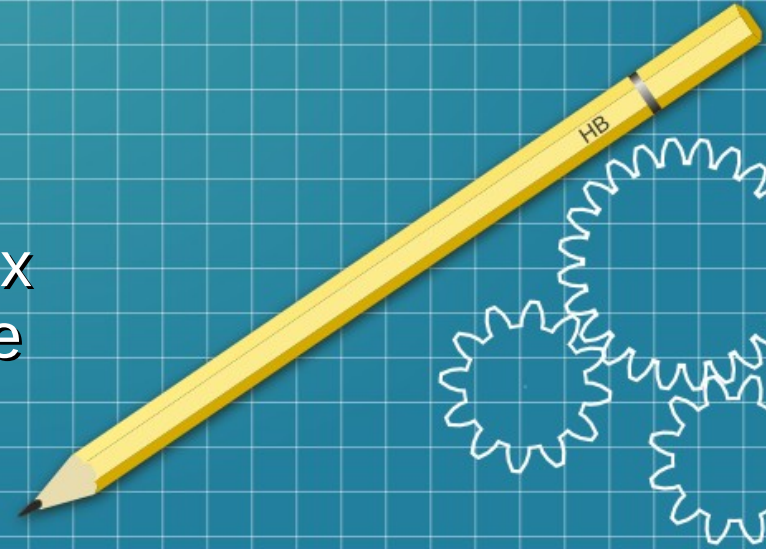


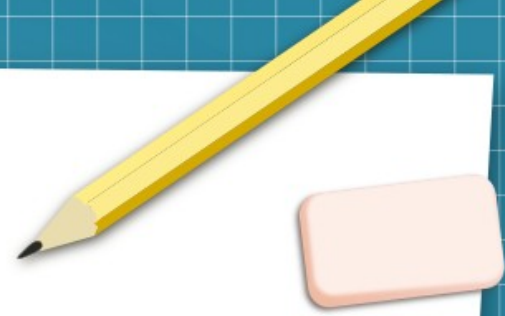
Linux



An introduction to Linux
and the command line



BIOS



- Operating Systems
- Open Source Software
- Linux Distributions
- Live Test or Hard Drive Installation ?
- Linux Fundamentals
- Ubuntu 20.04 LTS / Ubuntu 22.04 LTS
- Why use Linux ?
- The command line

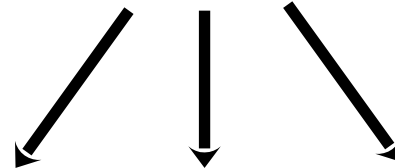
Operating System

« The first program that will start when you turn on your computer, without it is not possible to use other programs »

- Short name « **OS** », **S**ystème d'**E**xploitation « **SE** »

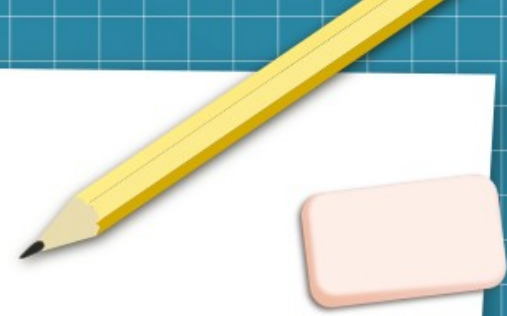


UNIX®



BSD

Operating Systems ?!



Android: 40.5%



Windows: 34.2%



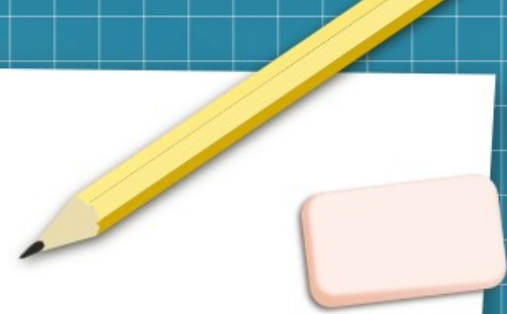
OSX+iOS: 22.3%



Linux: 1%

Proportion of each OS **all devices** considered

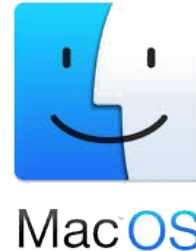
Operating Systems ?!



Android: 40.5%



Windows: 34.2%



MacOS



iOS

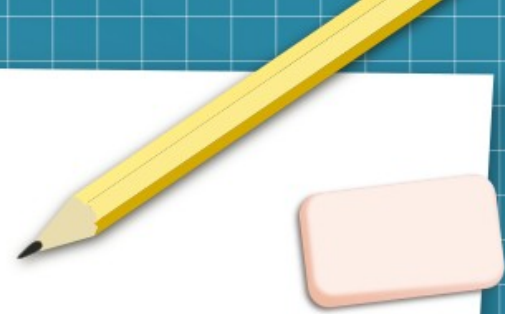
OSX+iOS: 22.3%



Linux: 1%

Proportion of each OS **all devices** considered

The Operating System !



Linux: **41.5%**



Windows: **34.2%**



Mac OS

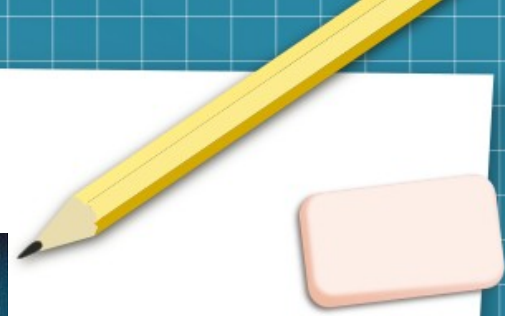


iOS

OSX+iOS: **22.3%**

Proportion of each OS **all devices** considered

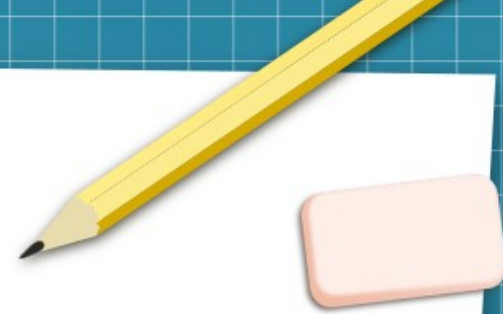
Open Source Software



Open Source Software

A little bit of history:

- **1983** : Creation of GNU and the GPL license by **Richard M. Stallman (RMS)**
- **1985** : Creation of the **Free Software Foundation** by RMS
- **1991** : Linux is developed by **Linus Torvalds**
- **2004** : Open source software officially enter UNESCO world heritage



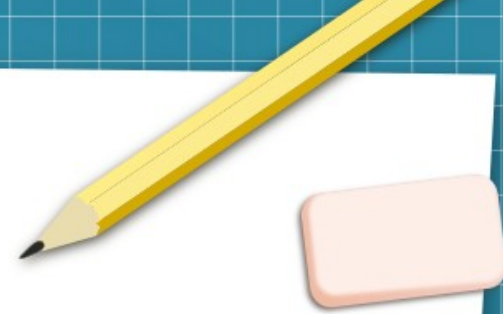
Open Source Software



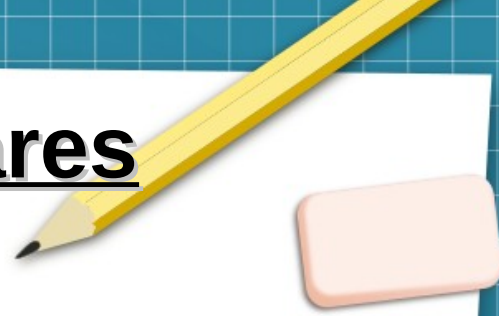
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Famous Open Source Softwares

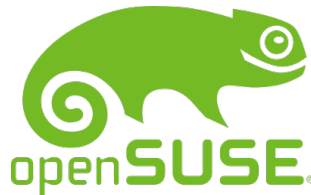


Linux Distributions: GNU/Linux

- A set of open source softwares composed of:
 - **Linux system** (“Kernel” or “Noyau”)
 - **Complementary and pre-installed / pre-parametrized softwares**
 - A graphical user interface
 - An office suite
 - Web browsers and mail readers
 - Multimedia packages ... and many more !



GNU components



Linux Distributions: GNU/Linux

- A set of open source softwares composed of:
 - **Linux system** (“Kernel” or “Noyau”)
 - **Complementary and pre-installed parametrized softwares**
 - A graphical user interface
 - An office suite
 - Web browsers and
 - Multimedia packages and many more !

Up to 20 000 !!!



GNU components



Linux Distributions

Red Hat Package Manager
“.rpm”

Debian Package Manager
“.deb”

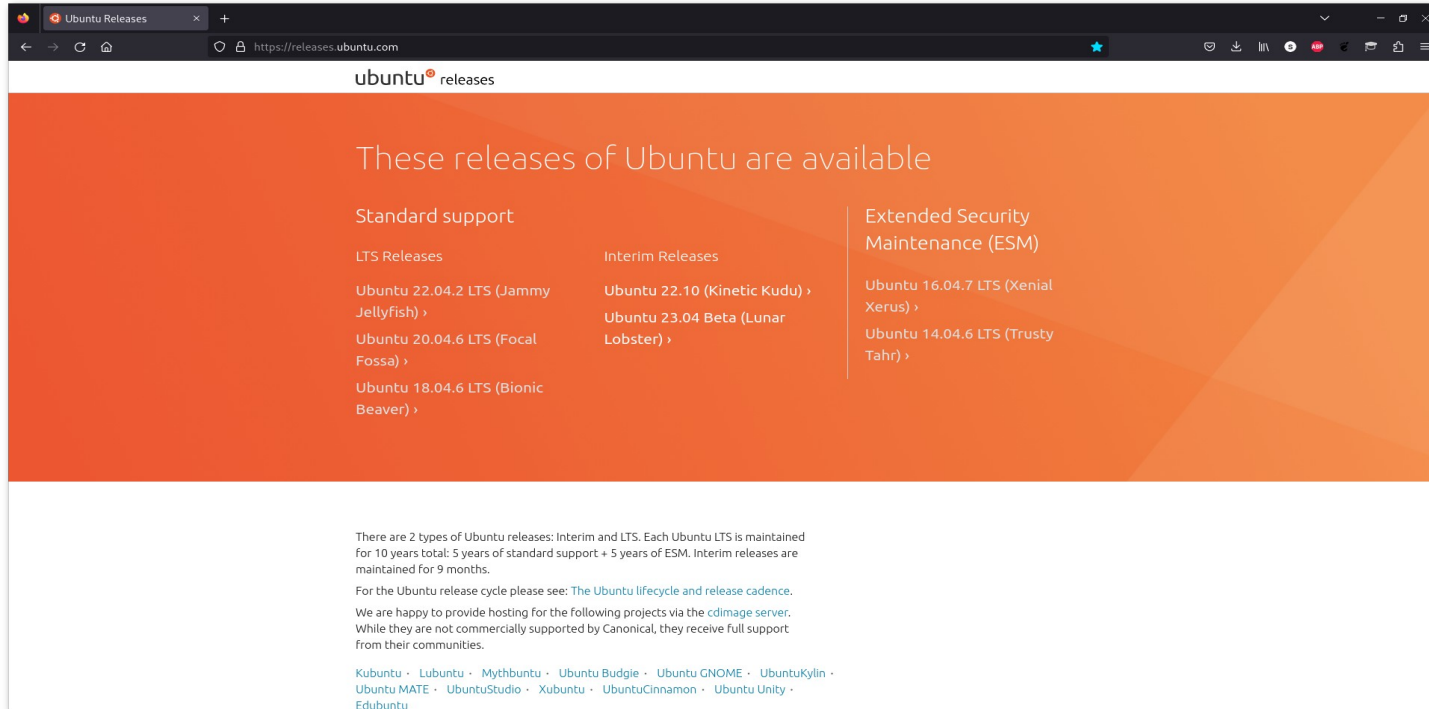


Sources Codes
“.tar.gz” or “.tar.bz2”



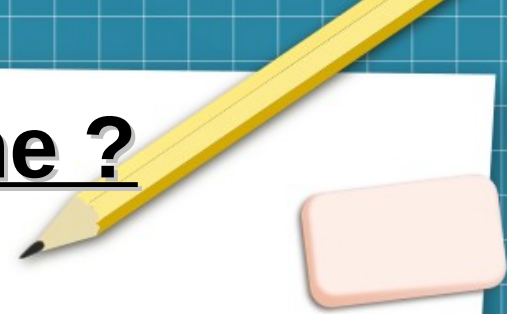
Linux Distribution: Which One ?

- Ubuntu is the best choice for beginners !



<https://releases.ubuntu.com/> or <https://ubuntu.com/download/desktop>

Linux Distribution: Which One ?



These releases of Ubuntu are available

Ubuntu 18.04.6 LTS (Bionic Beaver) ›

Ubuntu 16.04.7 LTS (Xenial Xerus) ›

Ubuntu 20.04.3 LTS (Focal Fossa) ›

Ubuntu 21.04 (Hirsute Hippo) ›

Ubuntu 21.10 (Impish Indri) ›

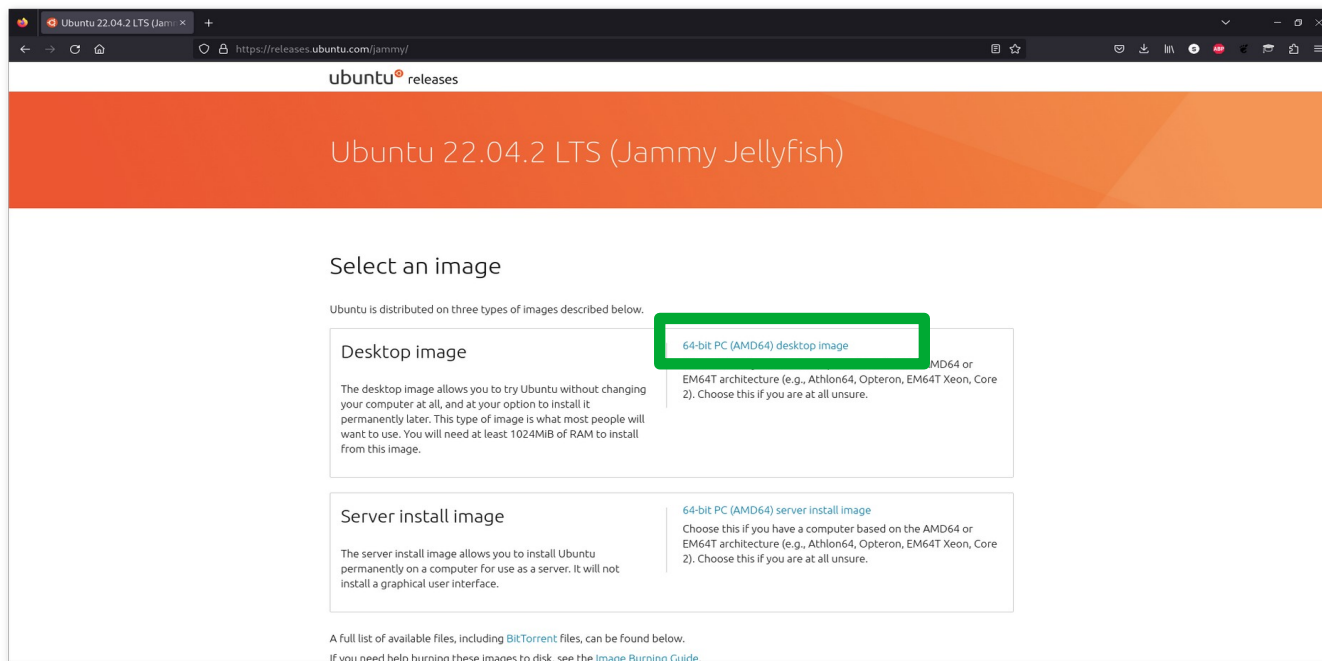
LTS = Long Term Support = 5 years support

Year

Month

Linux Distribution: Ubuntu 22.04.2 LTS

- Code name “**Jammy Jellyfish**”



<https://releases.ubuntu.com/focal/ubuntu-22.04.2-desktop-amd64.iso>

Linux Distribution: Ubuntu 22.04.3 LTS

Ubuntu 22.04.2 LTS

The latest LTS version of Ubuntu, for desktop PCs and laptops. LTS stands for long-term support — which means five years of free security and maintenance updates, guaranteed until April 2027.

[Ubuntu 22.04 LTS release notes](#)

Recommended system requirements:

- ✓ 2 GHz dual-core processor or better
- ✓ 4 GB system memory
- ✓ 25 GB of free hard drive space
- ✓ Internet access is helpful
- ✓ Either a DVD drive or a USB port for the installer media



Download

For other versions of Ubuntu Desktop including torrents, the network installer, a list of local mirrors and past releases [see our alternative downloads](#).

Live Test or Hard Drive Installation ?

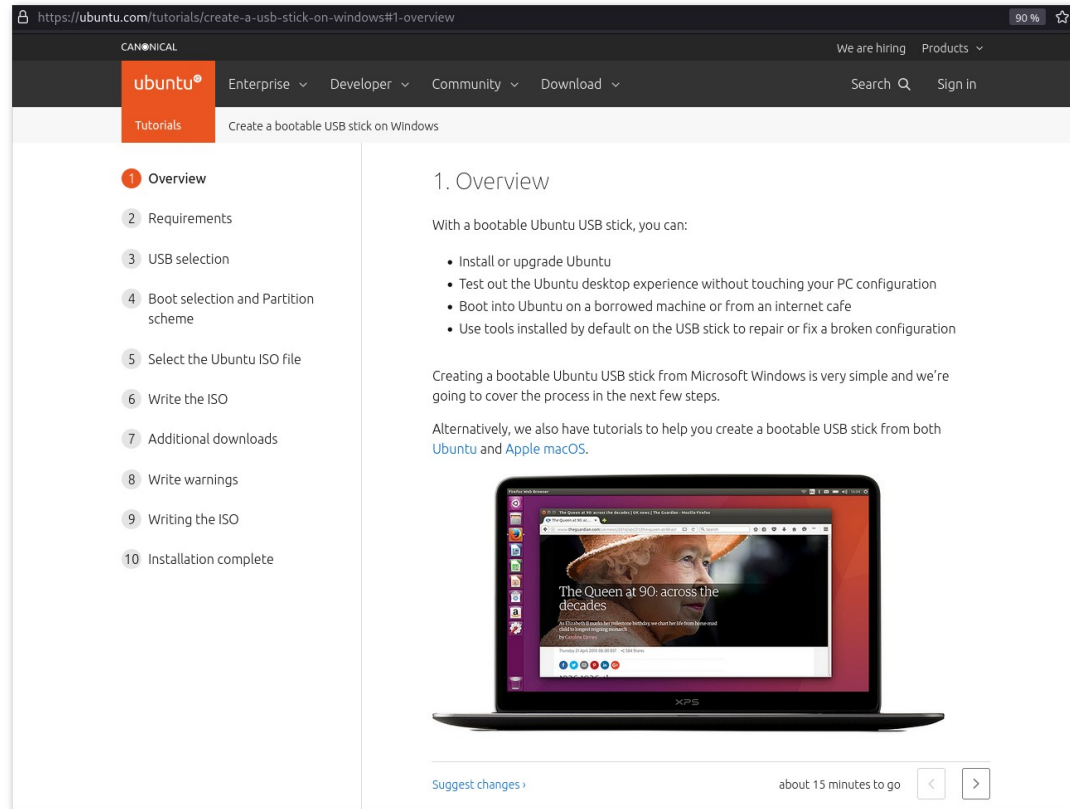
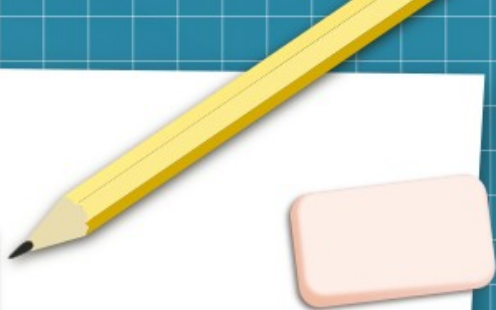
- **Live test:** no risk for your hard drive: **that's the easy way !**



Hard drive installation:

- Be careful not to wipe out everything when you install Linux !
- Multiple boot is possible (to have multiple OS on the same computer)
 - **Linux can see MS Windows partition(s)**
 - **MS Windows can not see Linux partition(s)**
- Ask for help !

Preparing the USB key



The screenshot shows the Ubuntu website's tutorial page for creating a bootable USB stick on Windows. The page is titled "Create a bootable USB stick on Windows" and is part of a series of 10 steps. The first step, "Overview", is currently selected. The page content includes a list of bullet points describing the benefits of using a bootable Ubuntu USB stick, such as installing or upgrading Ubuntu, testing the Ubuntu desktop experience, and using default tools for repair. It also mentions that creating the USB stick from Microsoft Windows is simple and will be covered in the next steps. An alternative method for creating the USB stick from Ubuntu and Apple macOS is also mentioned. A laptop displaying a news article is shown as an illustration. At the bottom, there is a "Suggest changes" link and a progress indicator showing "about 15 minutes to go".

https://ubuntu.com/tutorials/create-a-usb-stick-on-windows#1-overview

CANONICAL

ubuntu® Enterprise Developer Community Download

Tutorials Create a bootable USB stick on Windows

1 Overview

2 Requirements

3 USB selection

4 Boot selection and Partition scheme

5 Select the Ubuntu ISO file

6 Write the ISO

7 Additional downloads

8 Write warnings

9 Writing the ISO

10 Installation complete

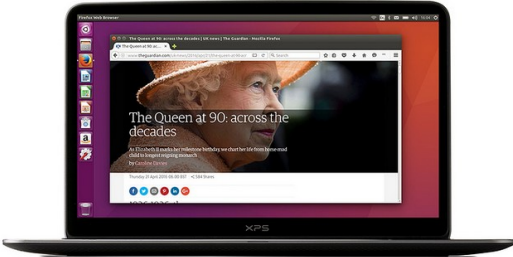
1. Overview

With a bootable Ubuntu USB stick, you can:

- Install or upgrade Ubuntu
- Test out the Ubuntu desktop experience without touching your PC configuration
- Boot into Ubuntu on a borrowed machine or from an internet cafe
- Use tools installed by default on the USB stick to repair or fix a broken configuration

Creating a bootable Ubuntu USB stick from Microsoft Windows is very simple and we're going to cover the process in the next few steps.

Alternatively, we also have tutorials to help you create a bootable USB stick from both [Ubuntu](#) and [Apple macOS](#).

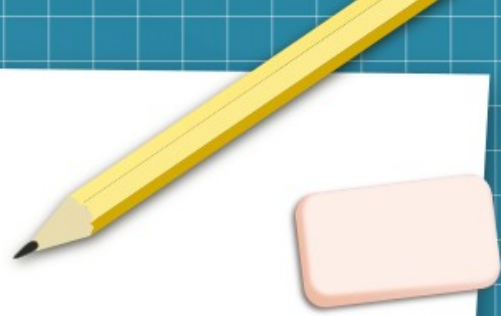


Suggest changes >

about 15 minutes to go < >

<https://ubuntu.com/tutorials/create-a-usb-stick-on-windows>

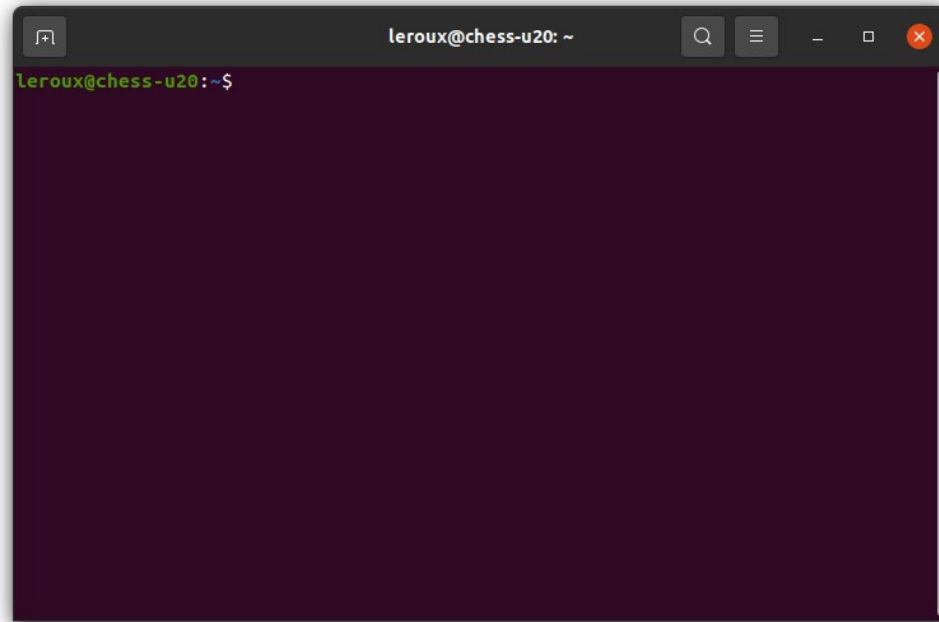
Linux Fundamentals



- The Terminal
- File System
- Users
- File Permissions
- Tips

Linux Fundamentals: The Terminal

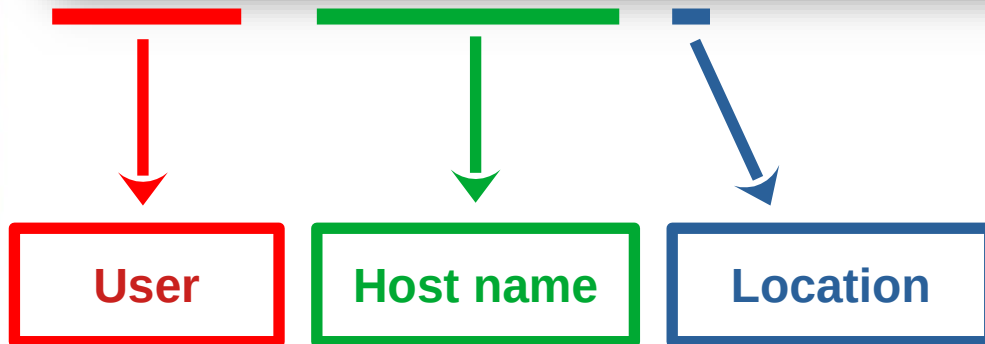
- Text interface to your computer
- Often referred as
 - Shell
 - Console
 - Prompt
 - Bash ...



Linux Fundamentals: The Terminal

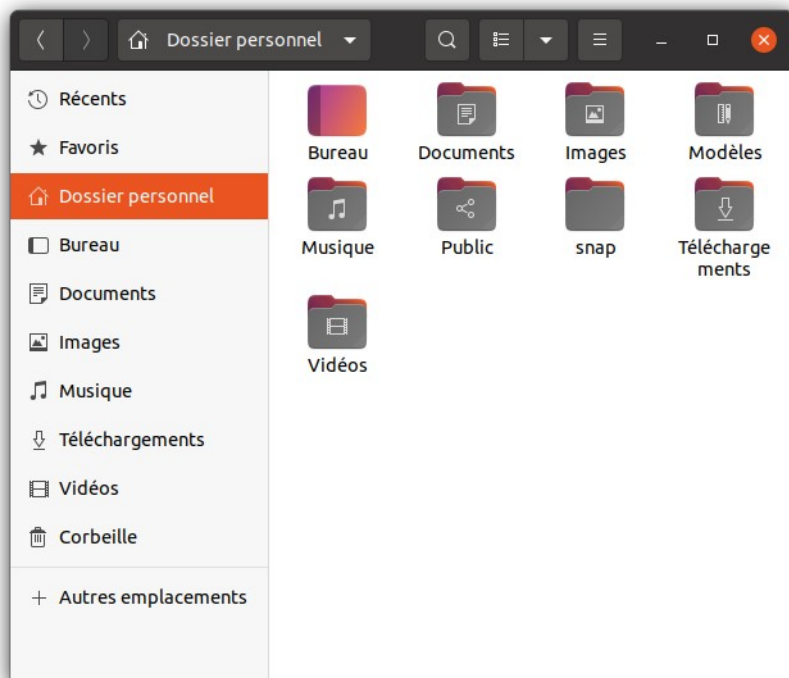
- The “Prompt” or “Invite de commandes”

```
leroux@chess-u20:~$
```



- **User** : the name of the user that opened the terminal
- **Host name**: the name of the computer
- **Location**: where you are in the file system tree

Linux Fundamentals: The Terminal



=

```
leroux@chess-u20: ~  
leroux@chess-u20:~$ ls -l  
total 36  
drwxr-xr-x  2 leroux dmo 4096 oct.  23  2020 Bureau  
drwxr-xr-x  3 leroux dmo 4096 oct.  20 13:40 Documents  
drwxr-xr-x  3 leroux dmo 4096 oct.  26 14:06 Images  
drwxr-xr-x  2 leroux dmo 4096 oct.  23  2020 Modèles  
drwxr-xr-x  2 leroux dmo 4096 oct.  23  2020 Musique  
drwxr-xr-x  2 leroux dmo 4096 oct.  23  2020 Public  
drwx----- 3 leroux dmo 4096 oct.  23  2020 snap  
drwxr-xr-x 11 leroux dmo 4096 oct.  25 14:23 Téléchargements  
drwxr-xr-x  2 leroux dmo 4096 oct.  23  2020 Vidéos  
leroux@chess-u20:~$
```

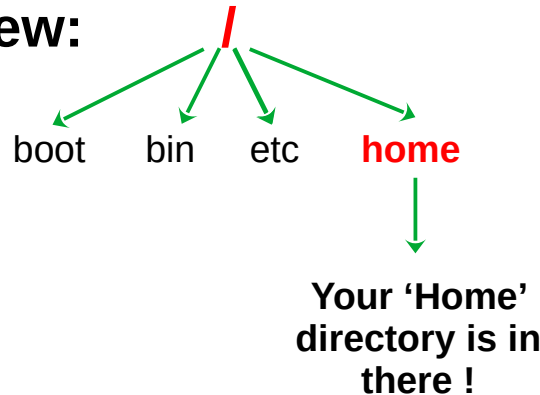
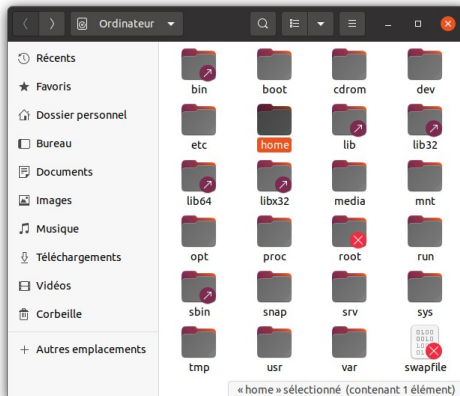
Linux Fundamentals: File System

- Windows

- Letters for the hard drive(s): **C:\, D:\, E:\ ...**
- Your 'Home' directory: **C:\Users\leroux**

- Linux

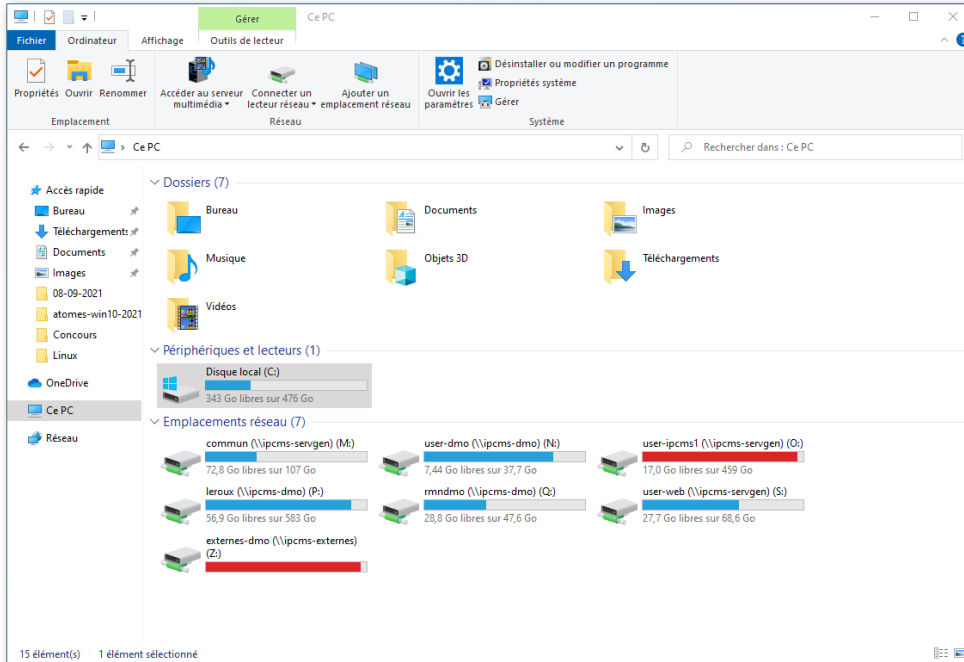
- A single tree-view:



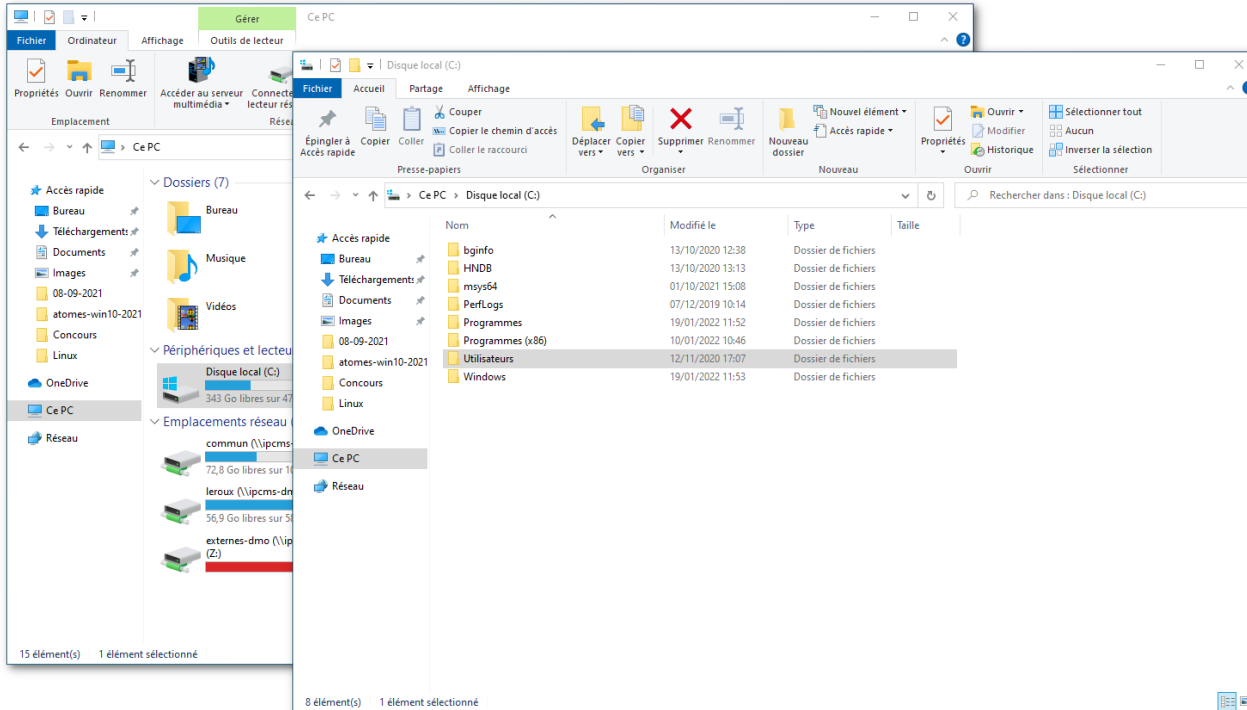
“Everything is a File”

All the hard drive(s), devices,
component of your computer,
is to be found somewhere
in this tree-view

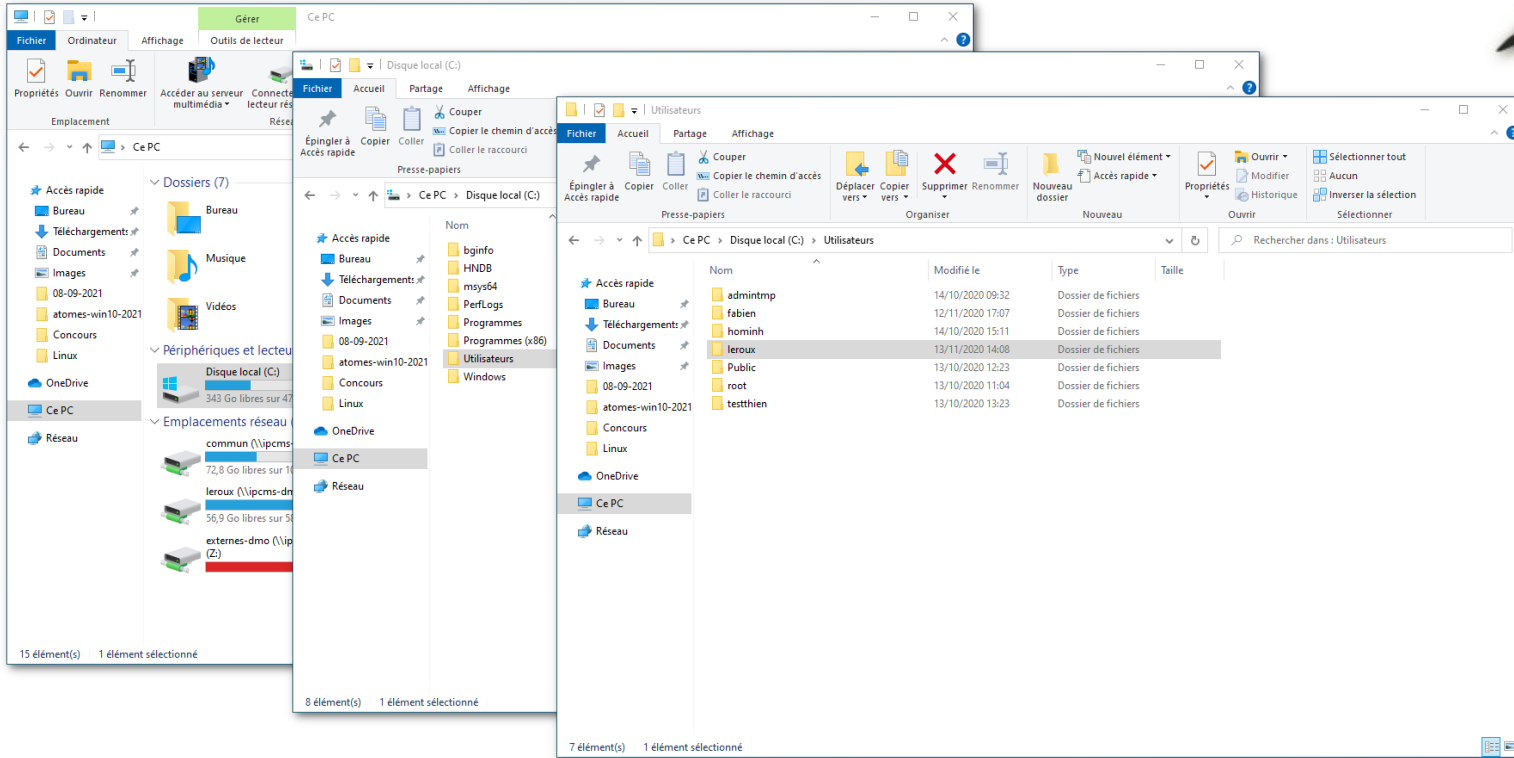
File system: windows



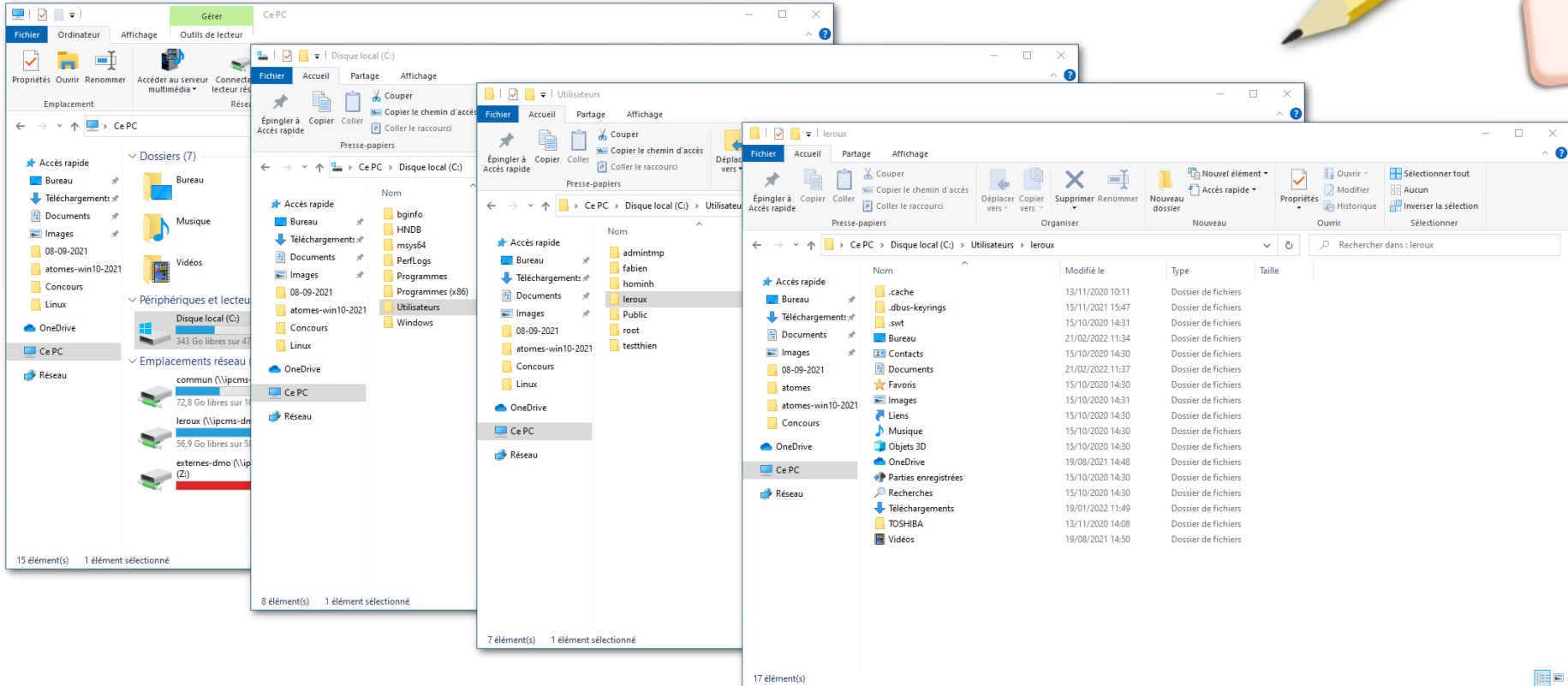
File system: windows



File system: windows

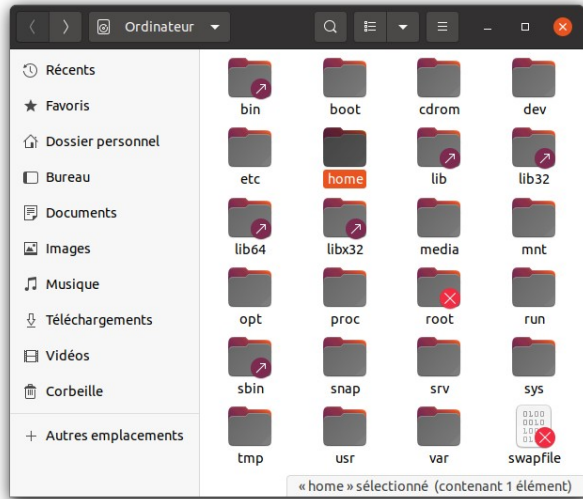


File system: windows

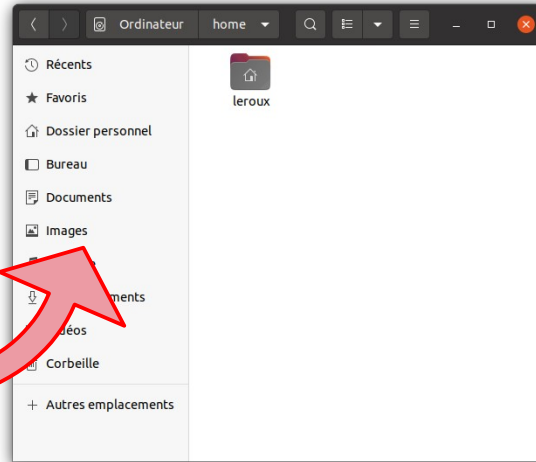
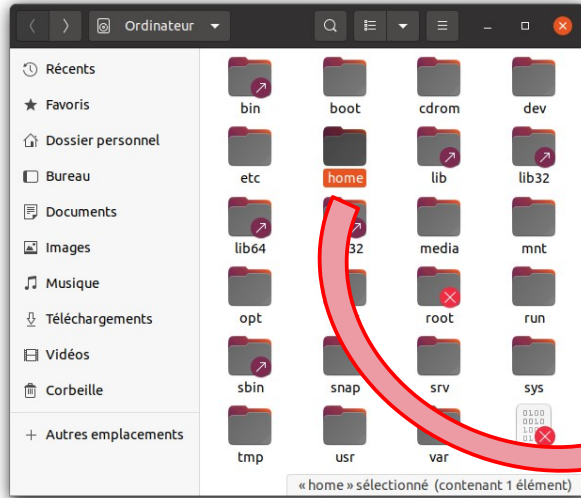


C:\Utilisateurs\leroux\

Linux Fundamentals: File System

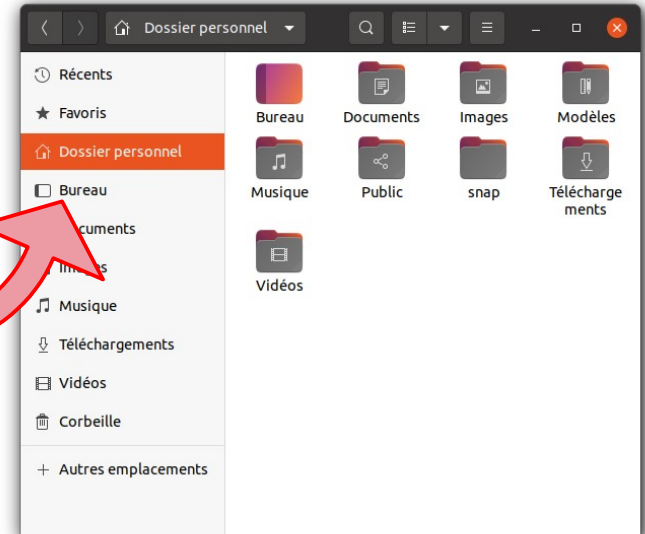
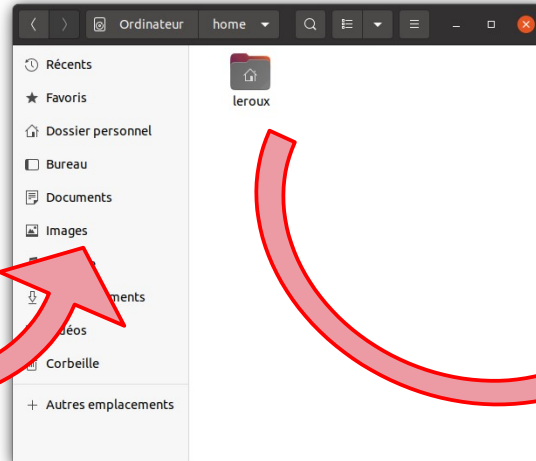
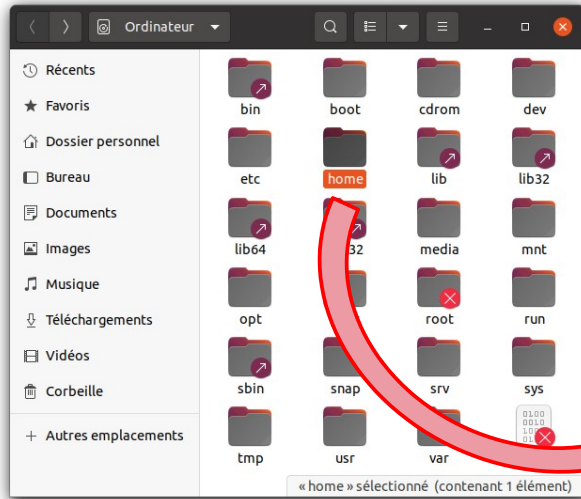


Linux Fundamentals: File System



home

Linux Fundamentals: File System

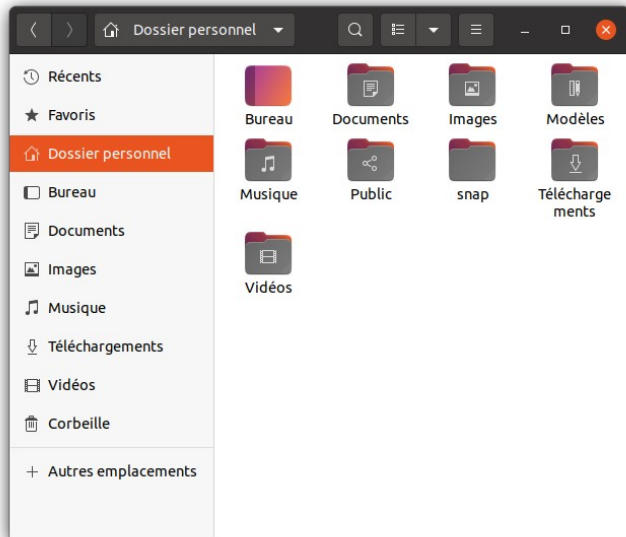


home

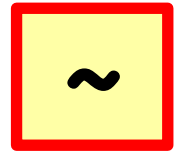
leroux

/home/leroux

Linux Fundamentals: File System



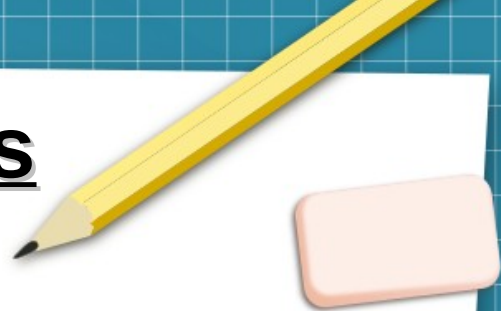
`/home/leroux` =



`/home/leroux/Documents`

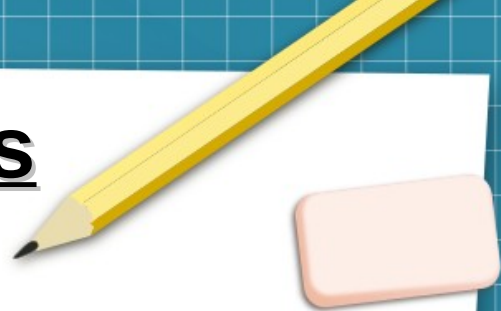
`~/Documents`

Linux Fundamentals: Users



- The **Administrator (root)** “optional”
 - All privileges !
- The “**sudoers**” for “**super user do**”-users
 - Users that can use the **sudo** command to request admin privileges
 - When using the **sudo** command **sudoers** are required to confirm their identity by entering their user password
- The normal users

Linux Fundamentals: Users



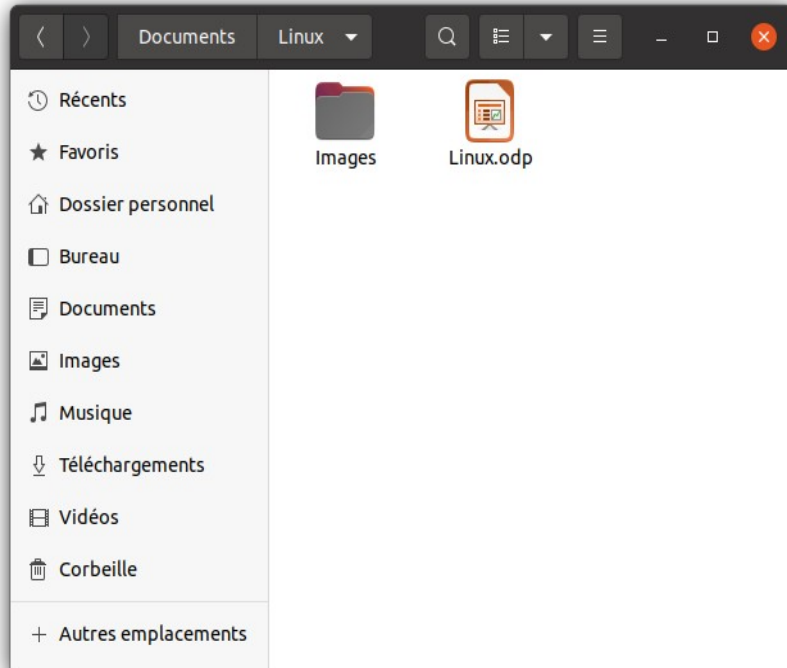
- The **Administrator (root)** “optional”
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 - Users that can use the **sudo** command to request admin privileges
 - When using the **sudo** command **sudoers** are required to confirm their identity by entering their user password
- The normal users

Linux Fundamentals: File Permissions



- The different permissions that can be granted for a **file** are:
 - **read**: to visualize its content
 - **write**: to modify its content (ex: editing)
 - **execute**: to execute its content (ex: program)
- The different permissions that can be granted for a **directory** are:
 - **read**: to visualize its content
 - **write**: to modify its content (ex: adding new files)
 - **execute**: to go inside this directory (ex: changing directory)

Linux Fundamentals: File Permissions



=

```
leroux@chess-u20: ~/Documents/Linux
leroux@chess-u20:~/Documents/Linux$ ls -l
total 15108
drwxrwxr-x 2 leroux dmo  4096 oct.  20 13:40 Images
-rw-r--r-- 1 leroux dmo 15463386 oct.  20 13:55 Linux.odp
leroux@chess-u20:~/Documents/Linux$
```

Linux Fundamentals: File Permissions

- The permissions are decomposed in 3 series of 3 letters

r (for read), **w** (for write) and **x** (for execute)

the symbol **"-"** means that the permission is denied

```
leroux@chess-u20: ~/Documents/Linux
leroux@chess-u20:~/Documents/Linux$ ls -l
total 15108
drwxrwxr-x 2 leroux dmo      4096
-rw-r--r-- 1 leroux dmo 15463386
leroux@chess-u20:~/Documents/Linux
```

```
leroux@chess-u20: ~/Documents/Linux
leroux@chess-u20:~/Documents/Linux$ ls -l
total 15108
drwxrwxr-x 2 leroux dmo      4096 oct. 20 13:40 Images
-rw-r--r-- 1 leroux dmo 15463386 oct. 20 13:55 Linux.odp
leroux@chess-u20:~/Documents/Linux
```


Linux Fundamentals: File Permissions

```
leroux@chess-u20: ~/Documents/Linux
leroux@chess-u20:~/Documents/Linux$ ls -l
total 15108
drwxrwxr-x 2 leroux dmo      4096 oct.  20 13:40 Images
-rw-r--r-- 1 leroux dmo 15463386 oct.  20 13:55 Linux.odp
leroux@chess-u20:~/Documents/Linux$
```

drwxrwxr-x

d rwx rwx r-x

-rw-r--r--

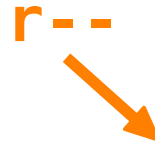
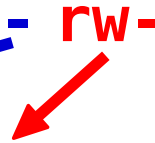
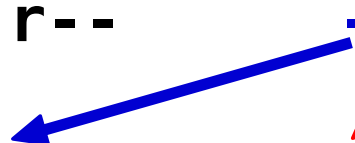
- rw- r-- r--

Object

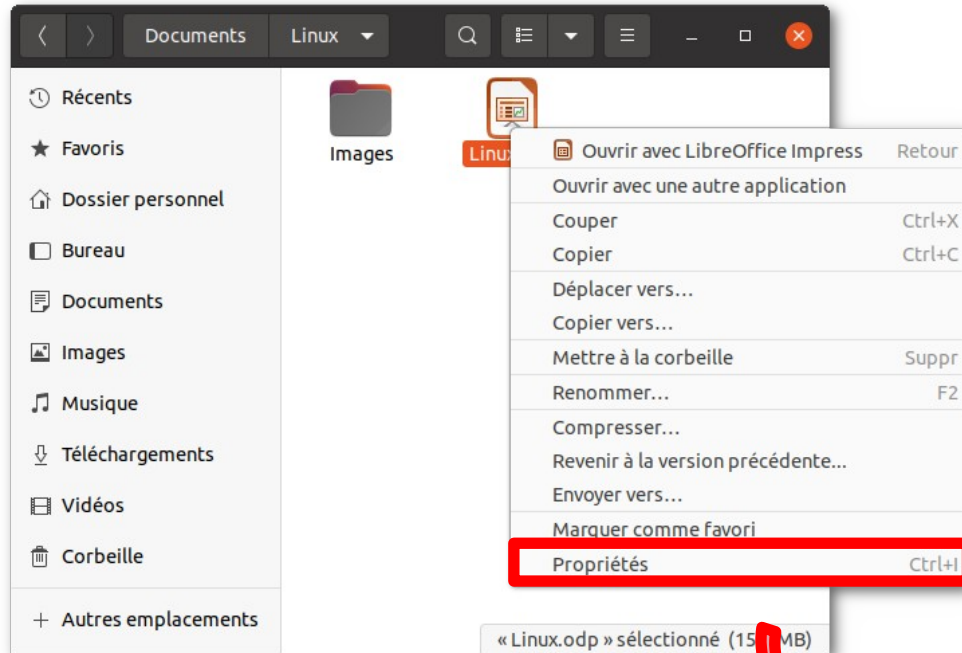
Owner

Group

The other user(s)

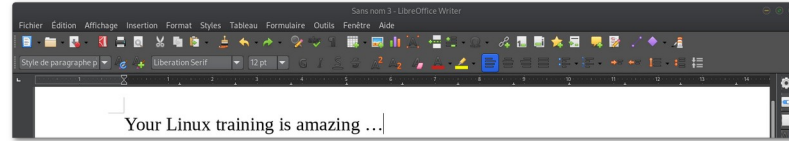
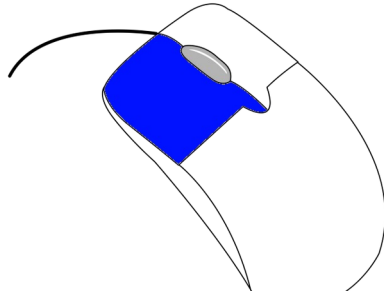


Linux Fundamentals: File Permissions

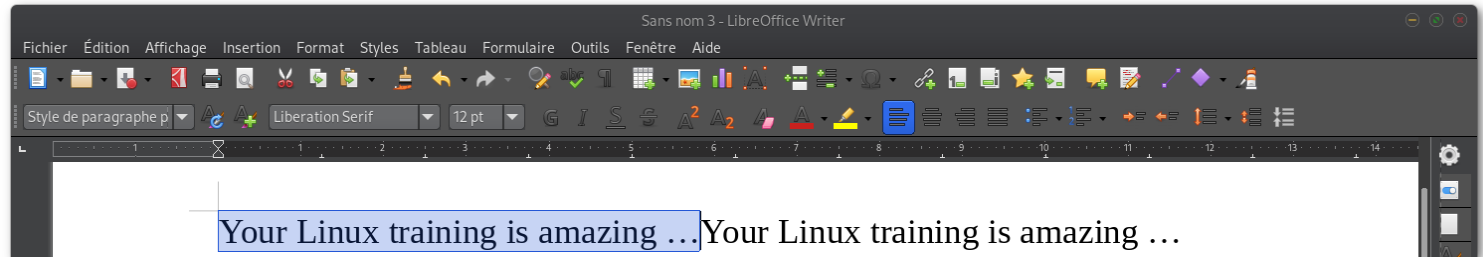
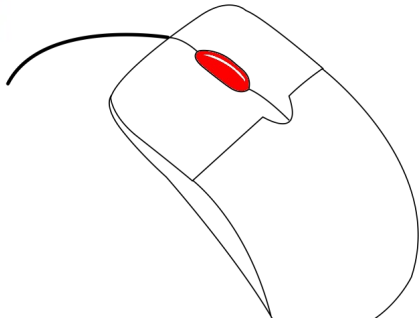


Linux Fundamentals: Mouse

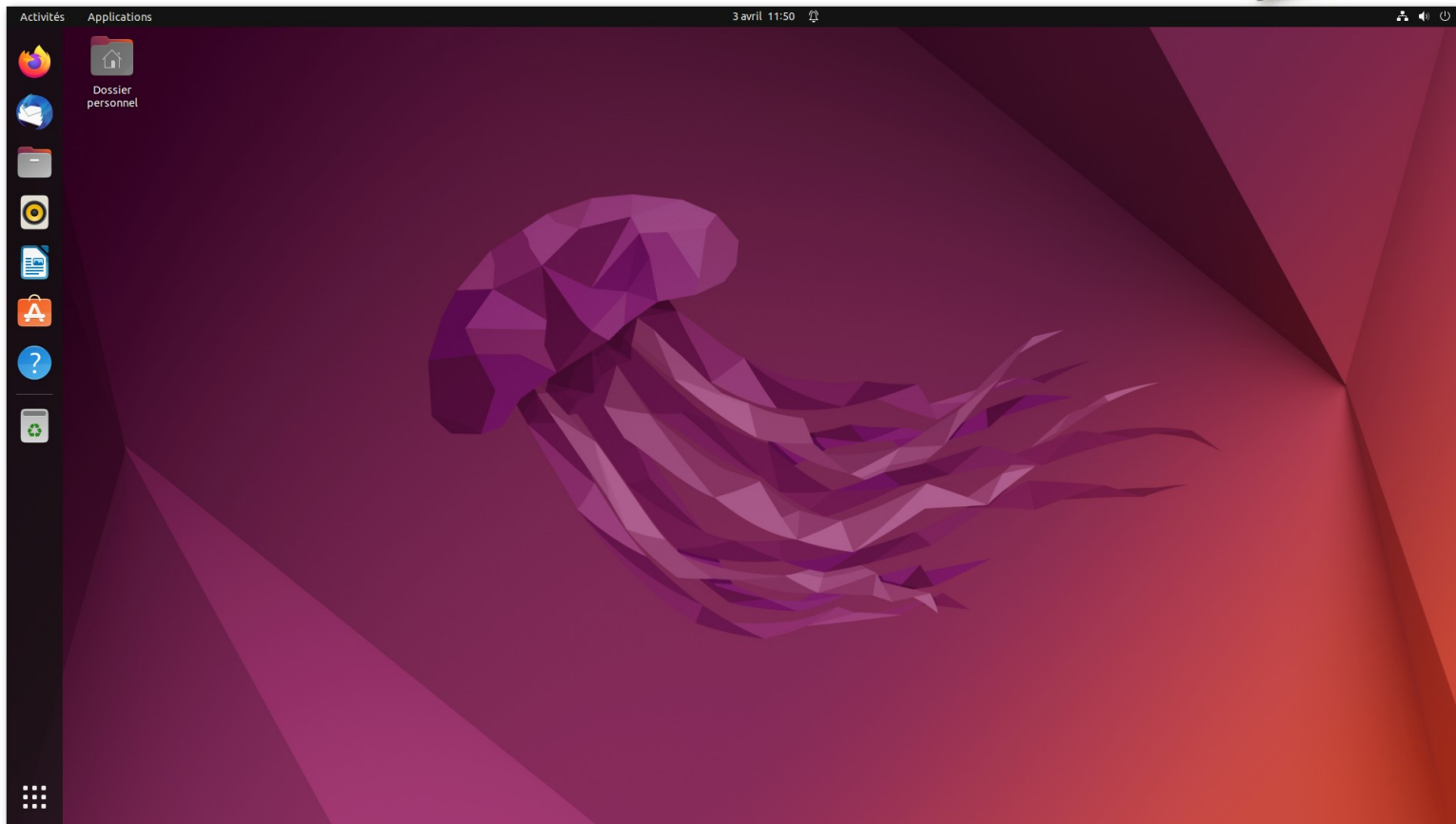
- Text selected using the left click...



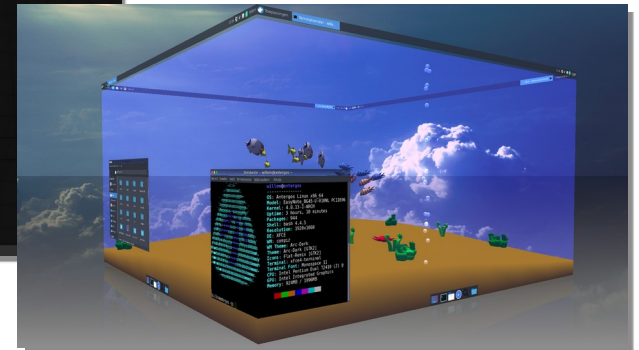
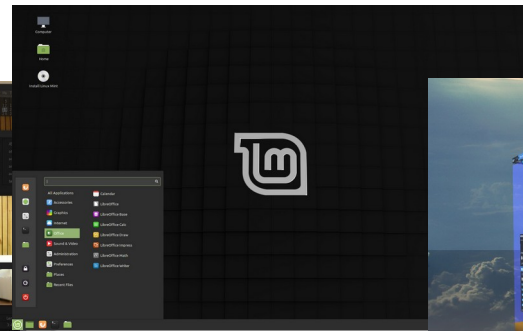
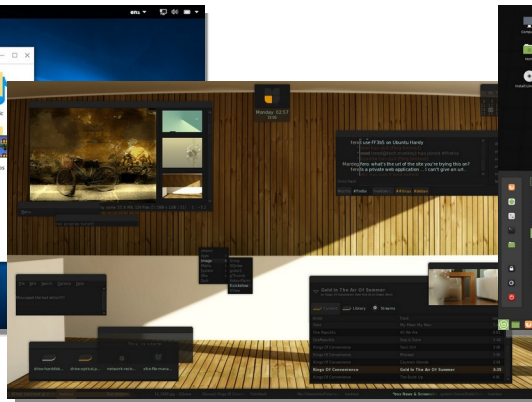
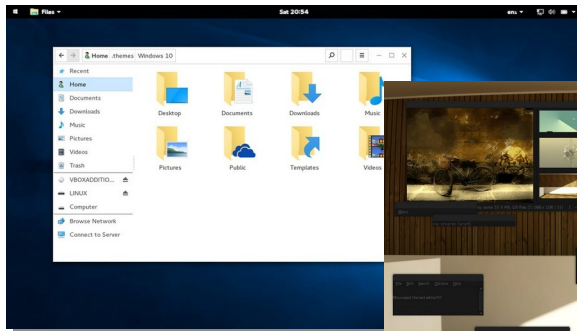
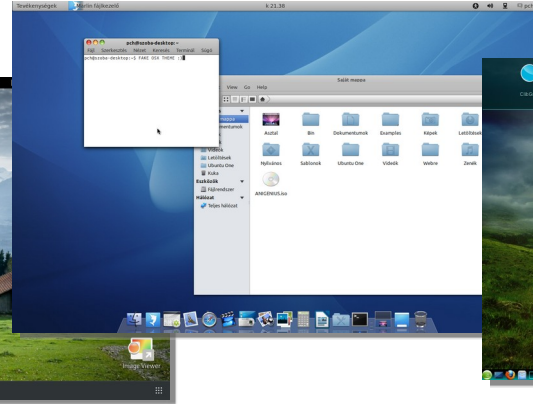
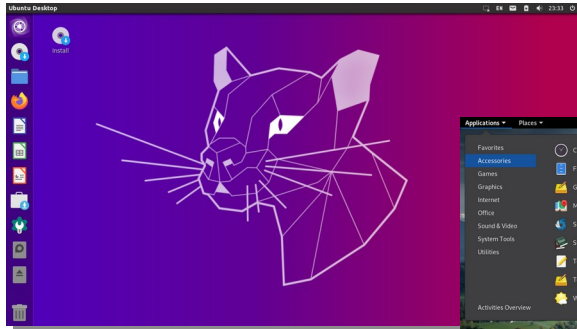
- Is copied, and can be pasted back pressing the 2nd button:



Ubuntu 2[0-2].04 LTS



Ubuntu 2[0-2].04 LTS



Ubuntu 2[0-2].04 LTS: Desktop Environments



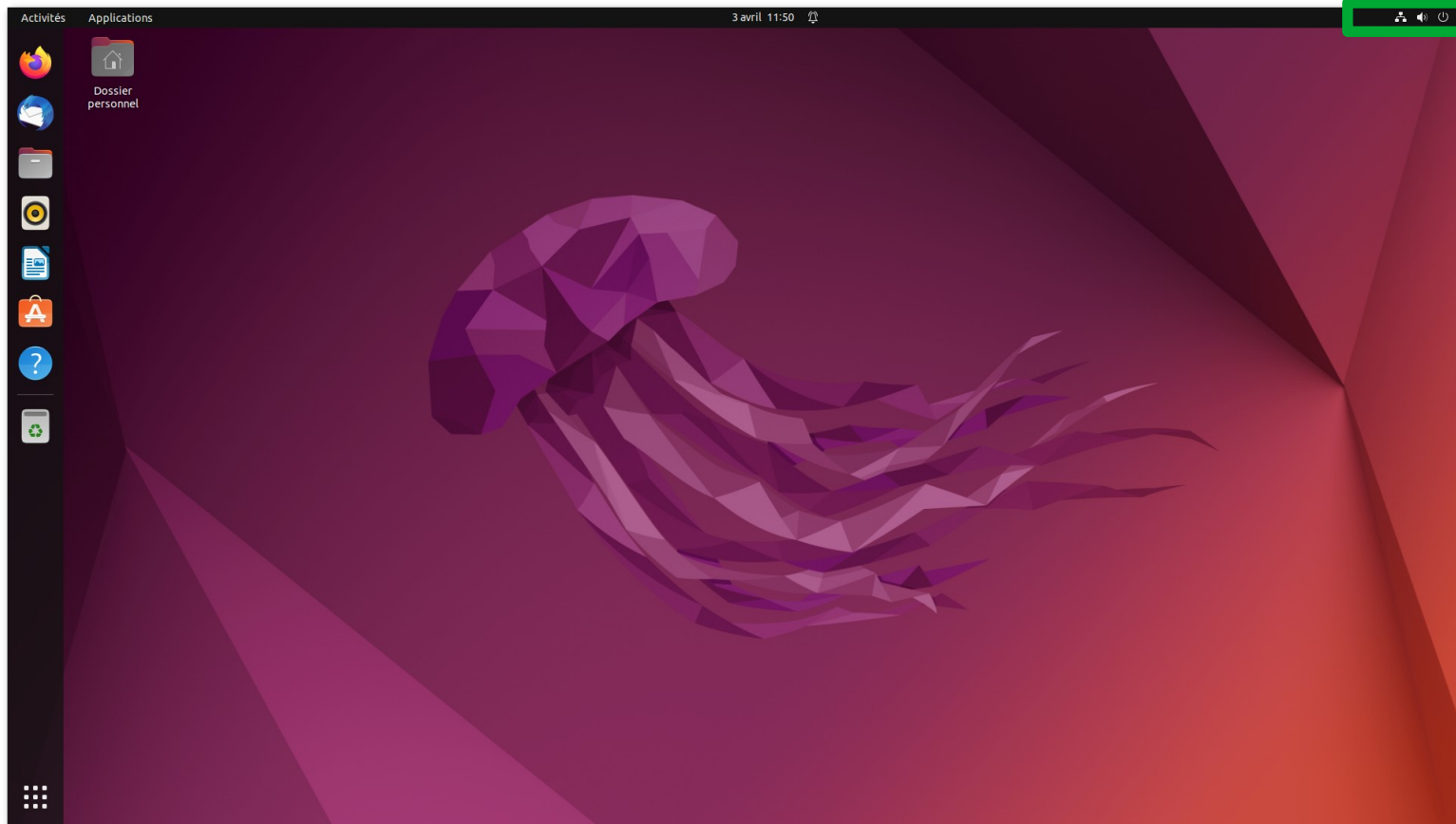
Gnome	https://www.gnome.org/	
KDE	https://kde.org/	
Cinnamon	https://projects.linuxmint.com/cinnamon/	
Xfce	http://www.xfce.org/	
MATE	http://mate-desktop.com/	
LXQt	https://lxqt-project.org/	
Enlightenment	https://www.enlightenment.org/	
Deepin	https://www.deepin.org/	
Pantheon	https://elementary.io/	

Ubuntu 2[0-2].04 LTS: Desktop Environments

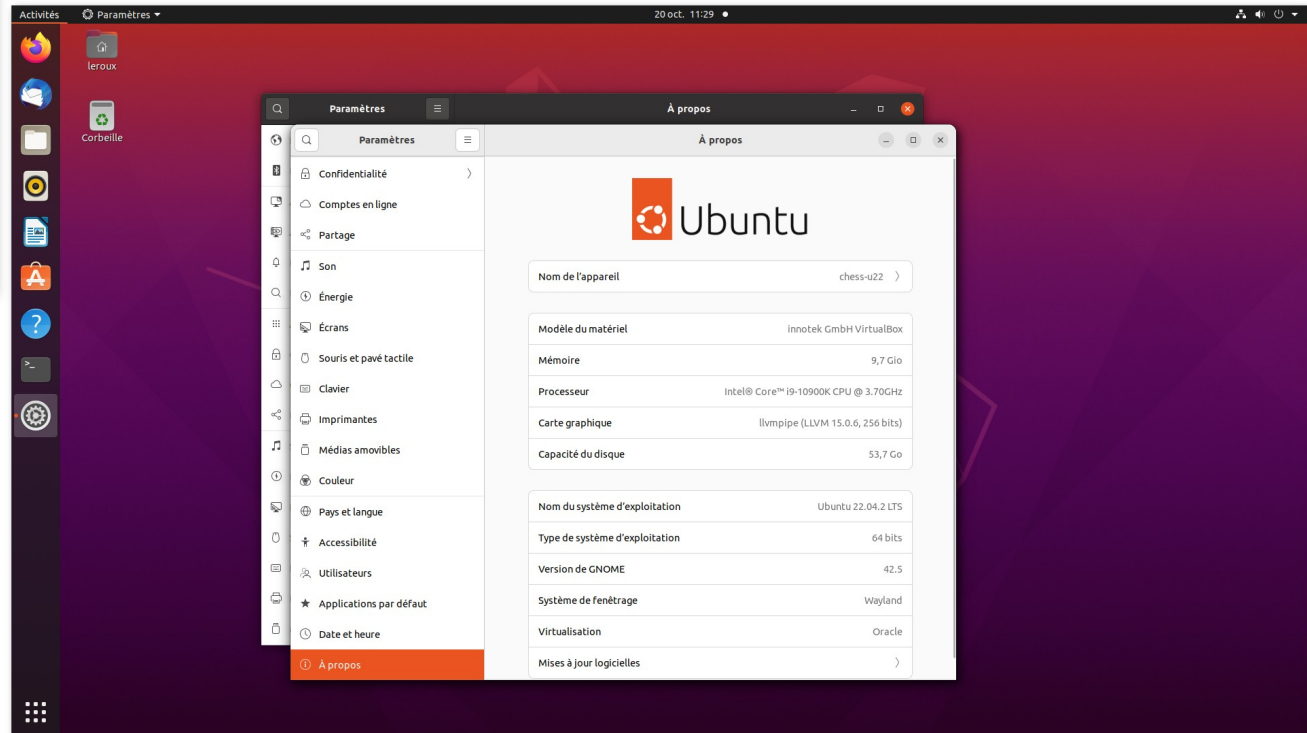
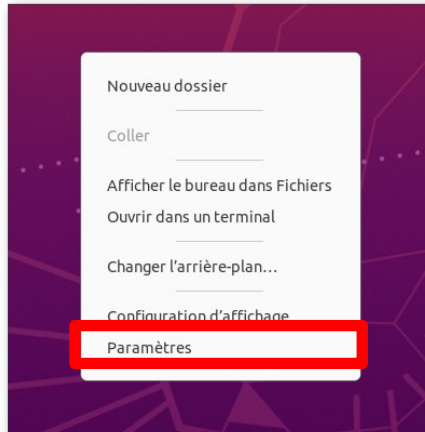
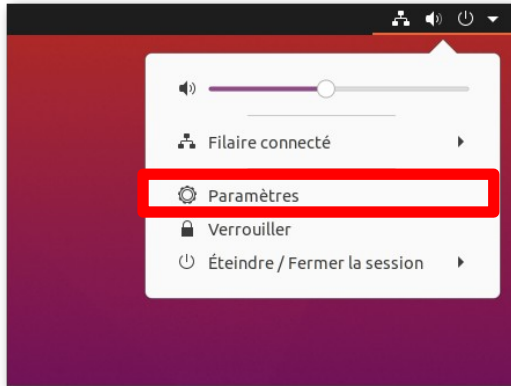


Gnome	https://www.gnome.org/	
KDE	https://kde.org/	
Cinnamon	https://projects.linuxmint.com/cinnamon/	
Xfce	http://www.xfce.org/	
MATE	http://mate-desktop.com/	
LXQt	https://lxqt-project.org/	
Enlightenment	https://www.enlightenment.org/	
Deepin	https://www.deepin.org/	
Pantheon	https://elementary.io/	

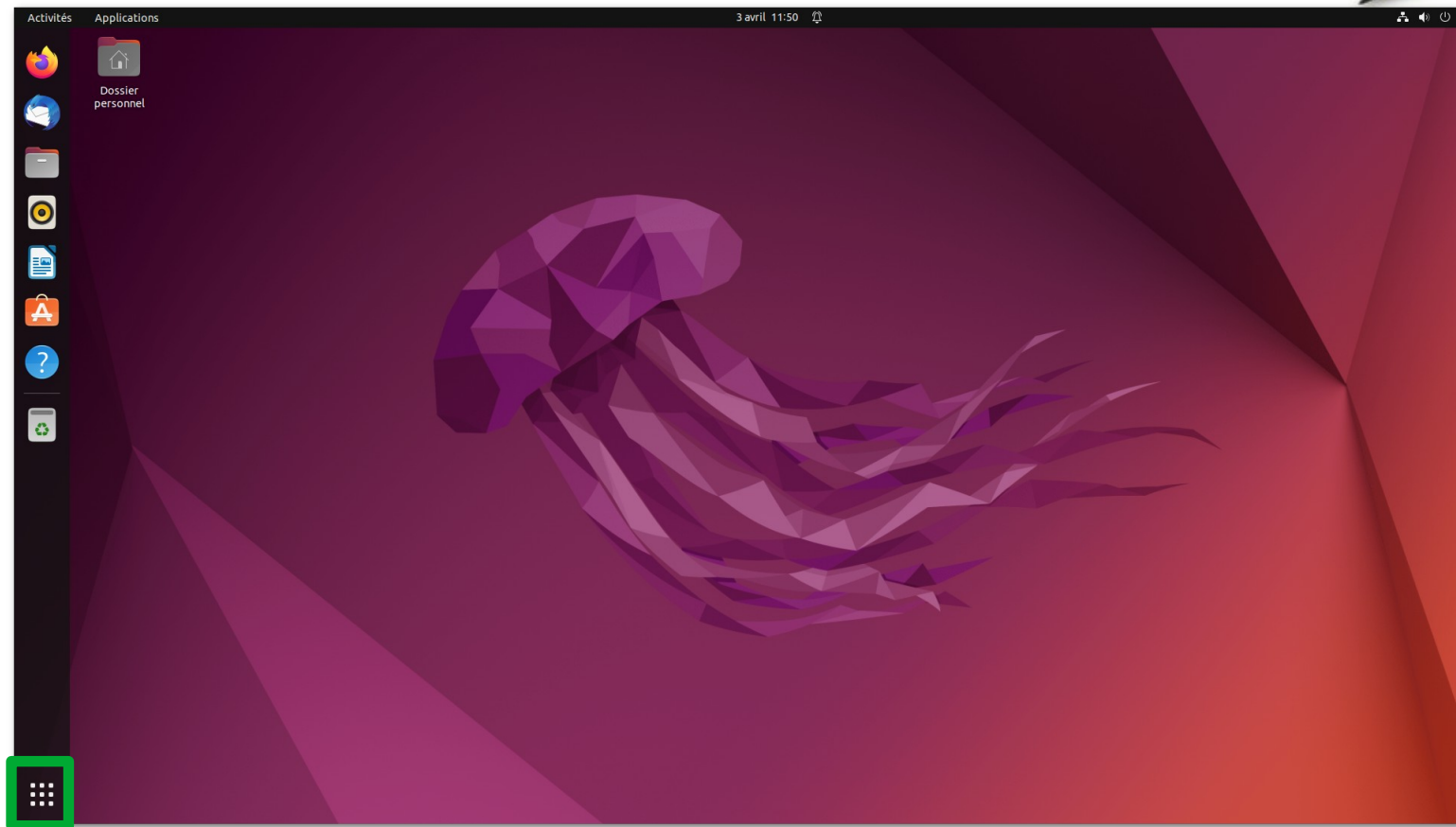
Ubuntu 22.04 LTS



Ubuntu 2[0-2].04 LTS: Control Panel



Ubuntu 22.04 LTS

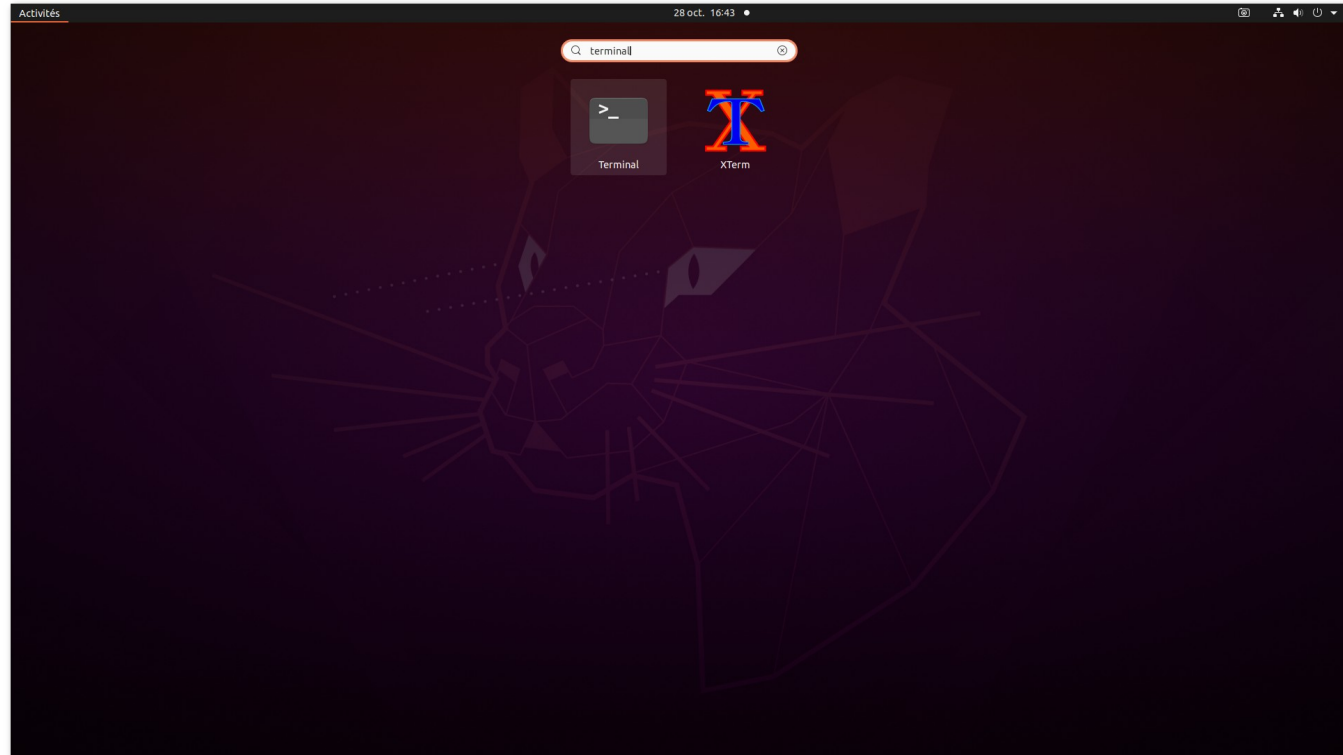


U. 2[0-2].04 LTS: Applications

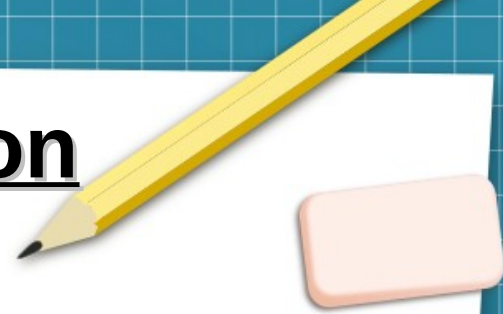


U. 2[0-2].04 LTS: Open the Terminal

Ctrl + Alt + t

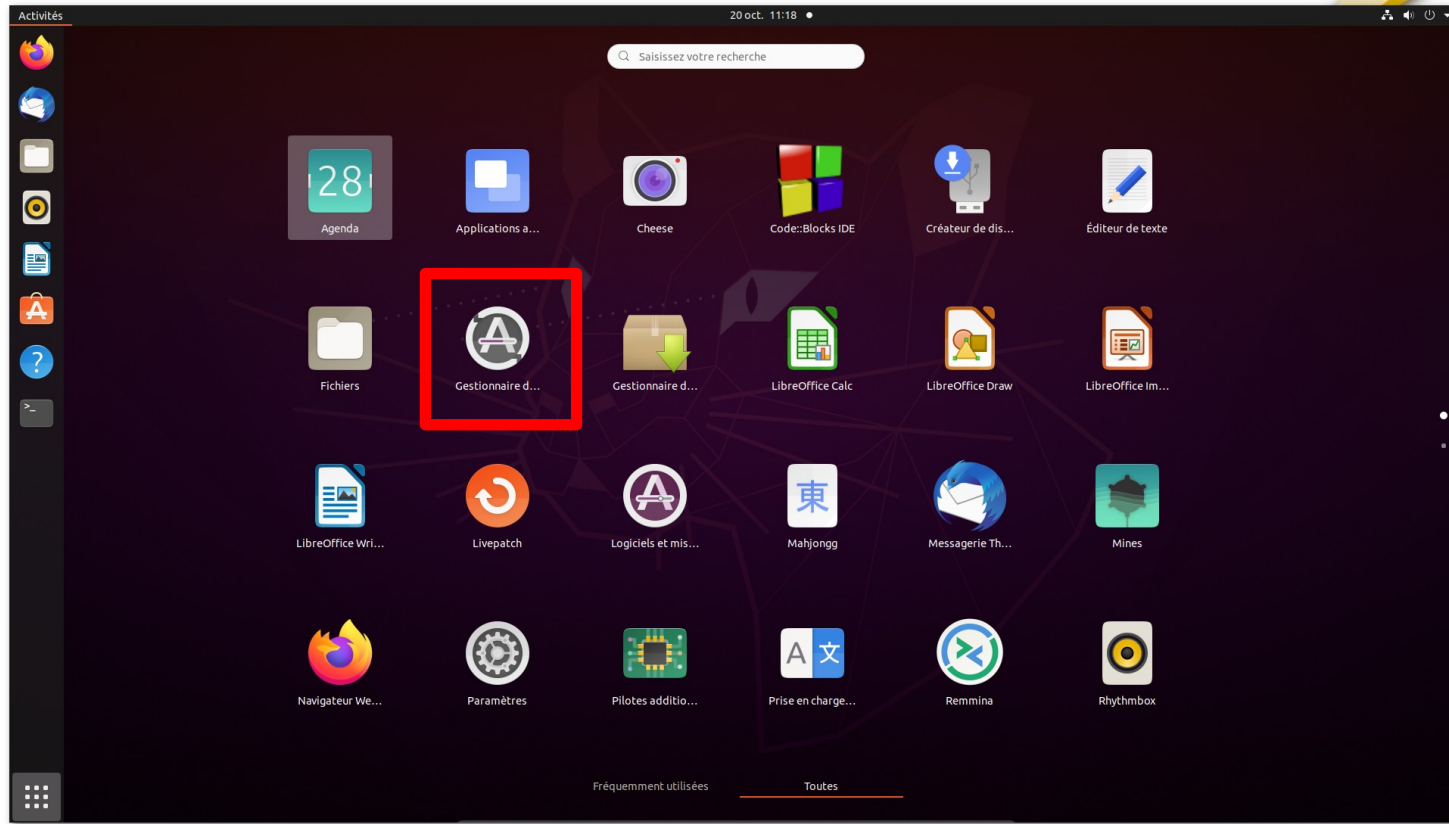


Things to do after installation



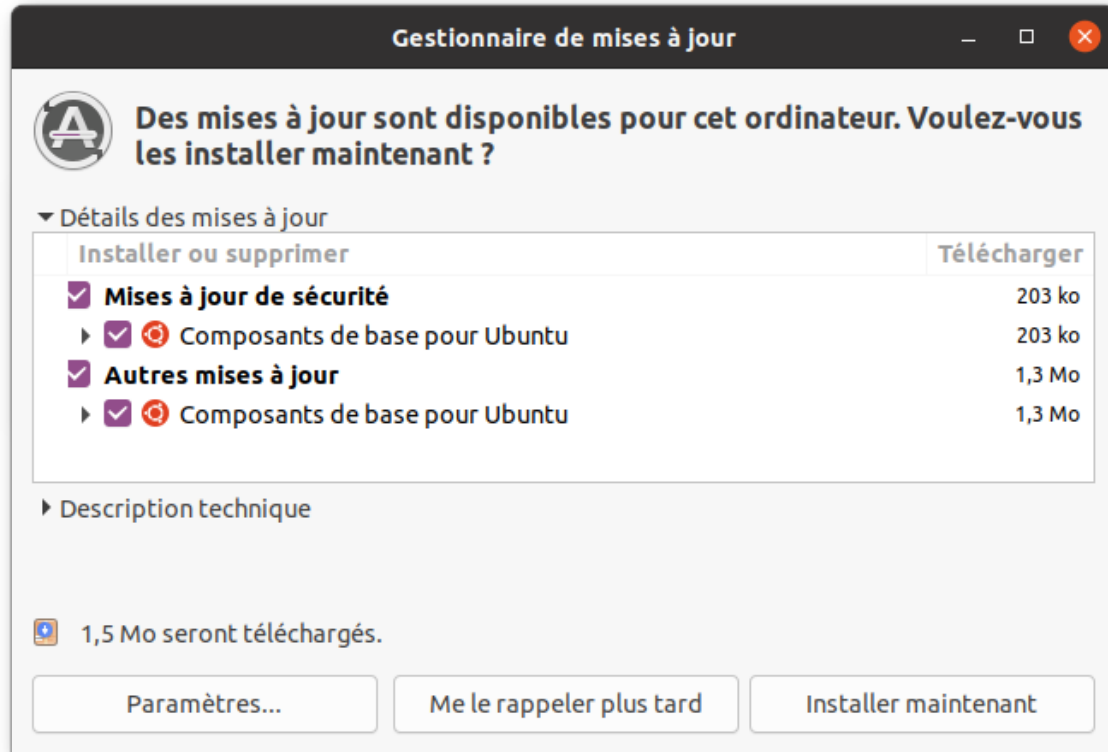
- Check for Updates (if not done during installation)
- Enable Partner Repositories
- Install Possibly Missing Graphics Drivers
- Install Extra Multimedia Codecs

U. 2[0-2].04 LTS: Check for Updates

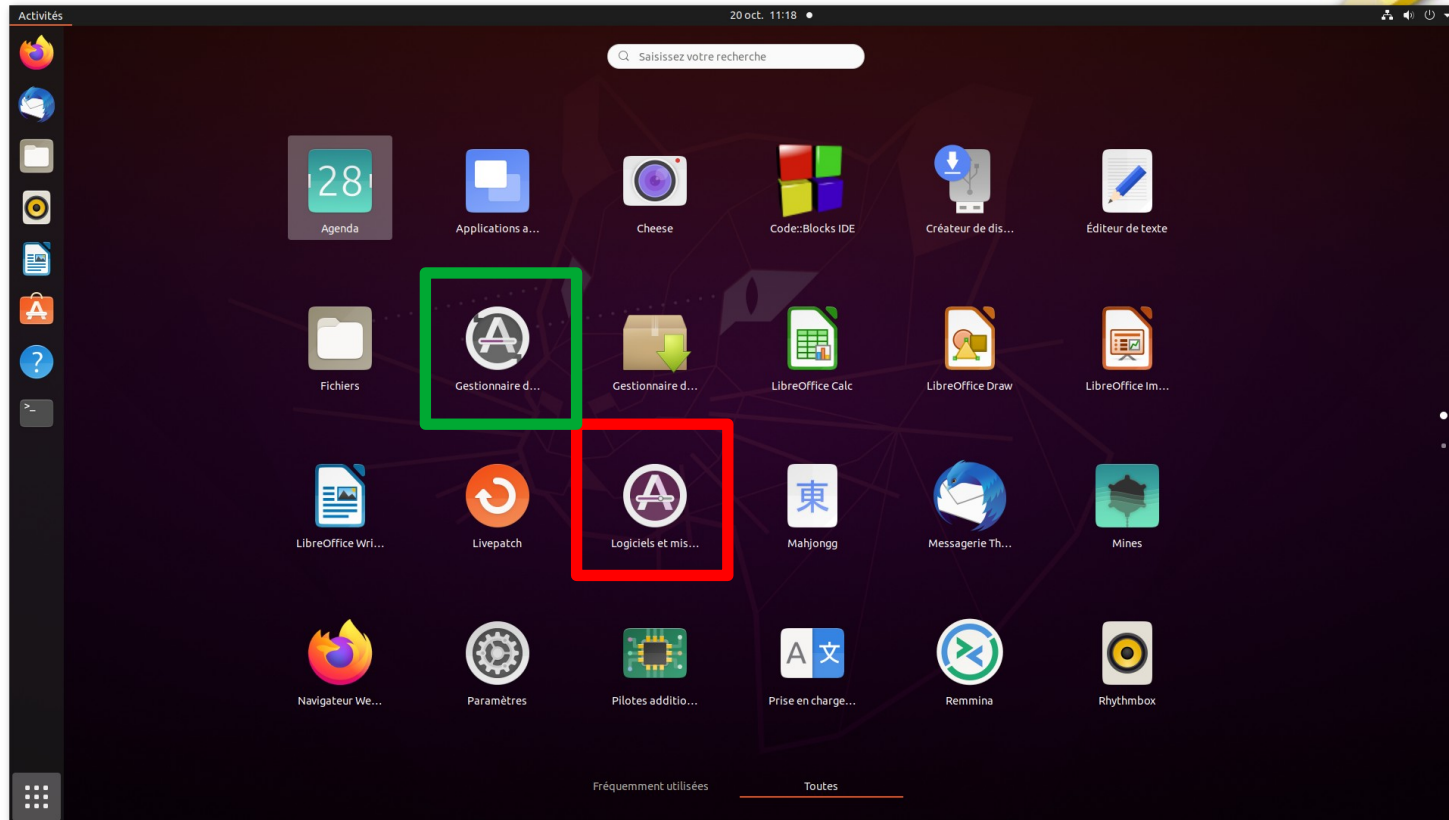


Terminal command: **update-manager**

U. 2[0-2].04 LTS: Updates

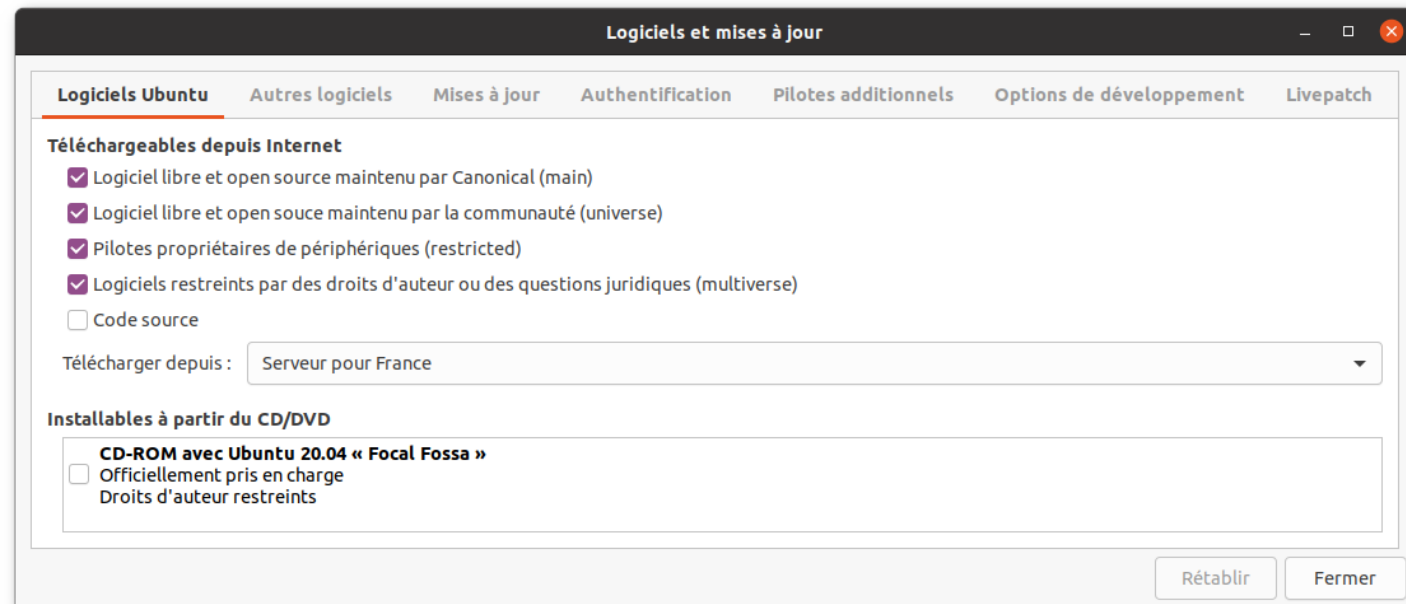


U. 2[0-2].04 LTS: Enable Repo.

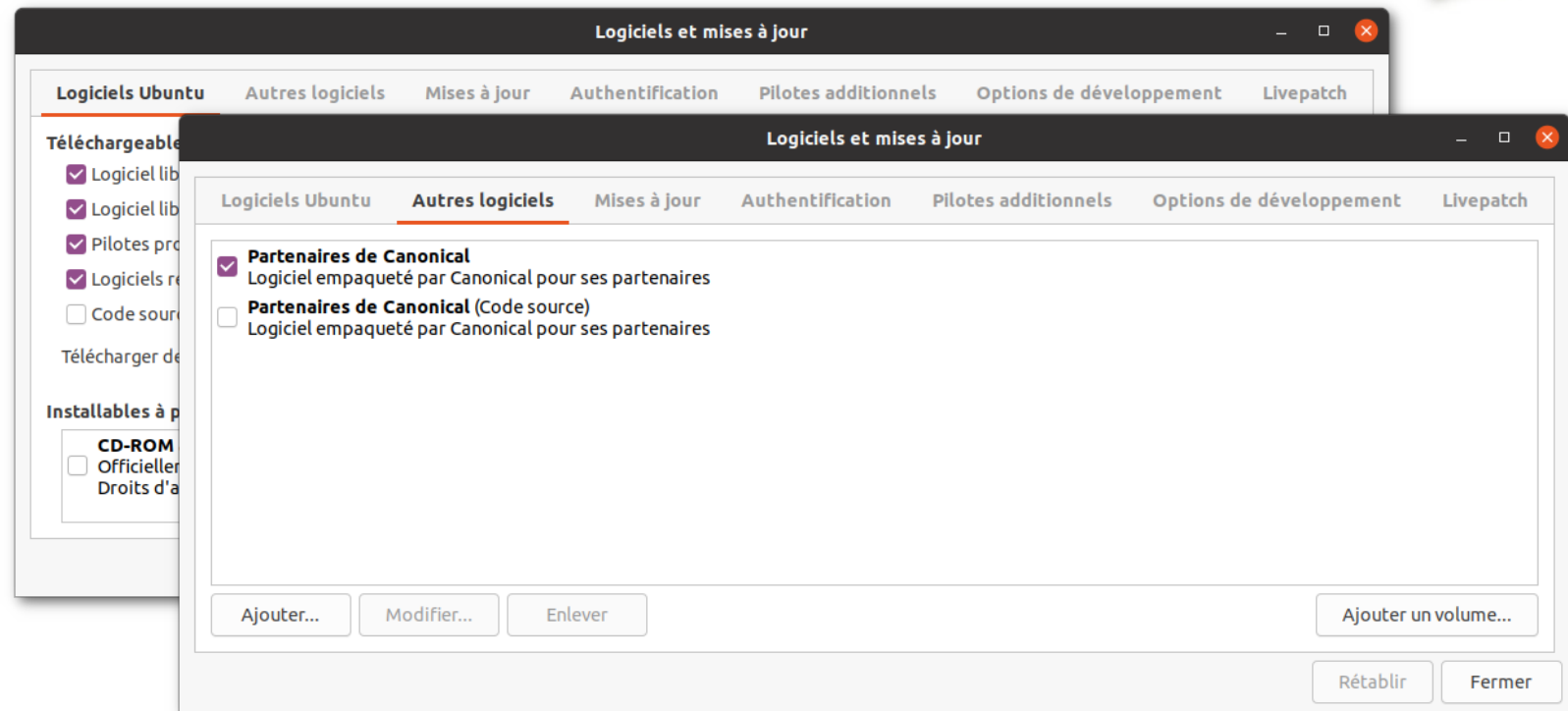


Terminal command: `software-properties-gtk`

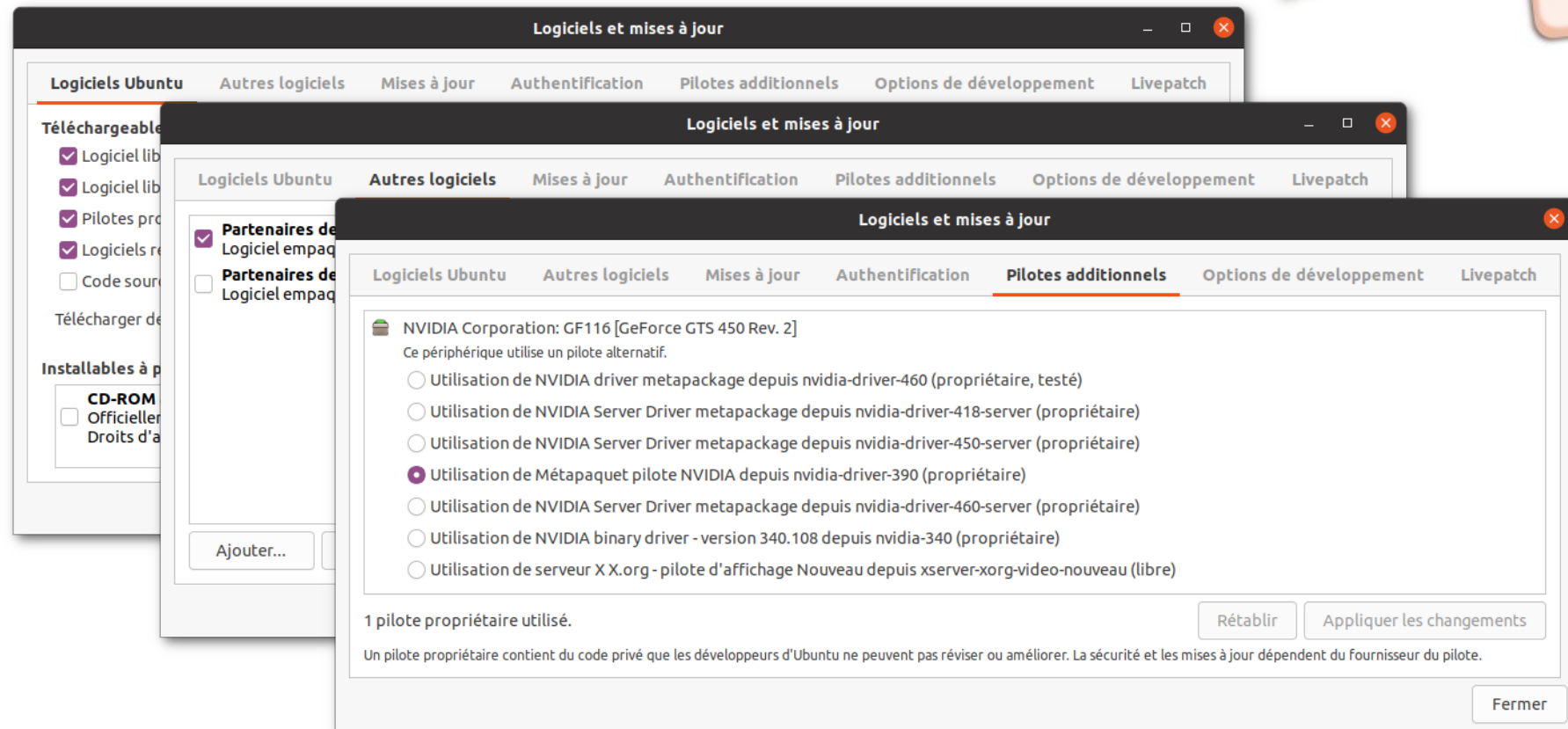
U. 2[0-2].04 LTS: Repo. and more



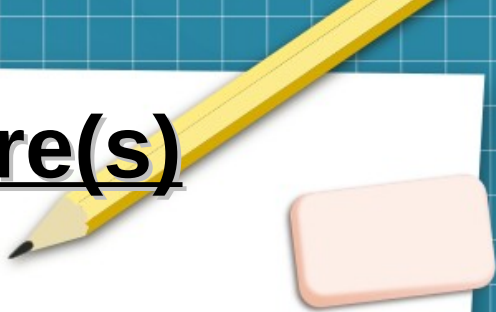
U. 2[0-2].04 LTS: Repo. and more



U. 2[0-2].04 LTS: Repo. and more



U. 2[0-2].04 LTS: Install software(s)



- Using the command line (the terminal)

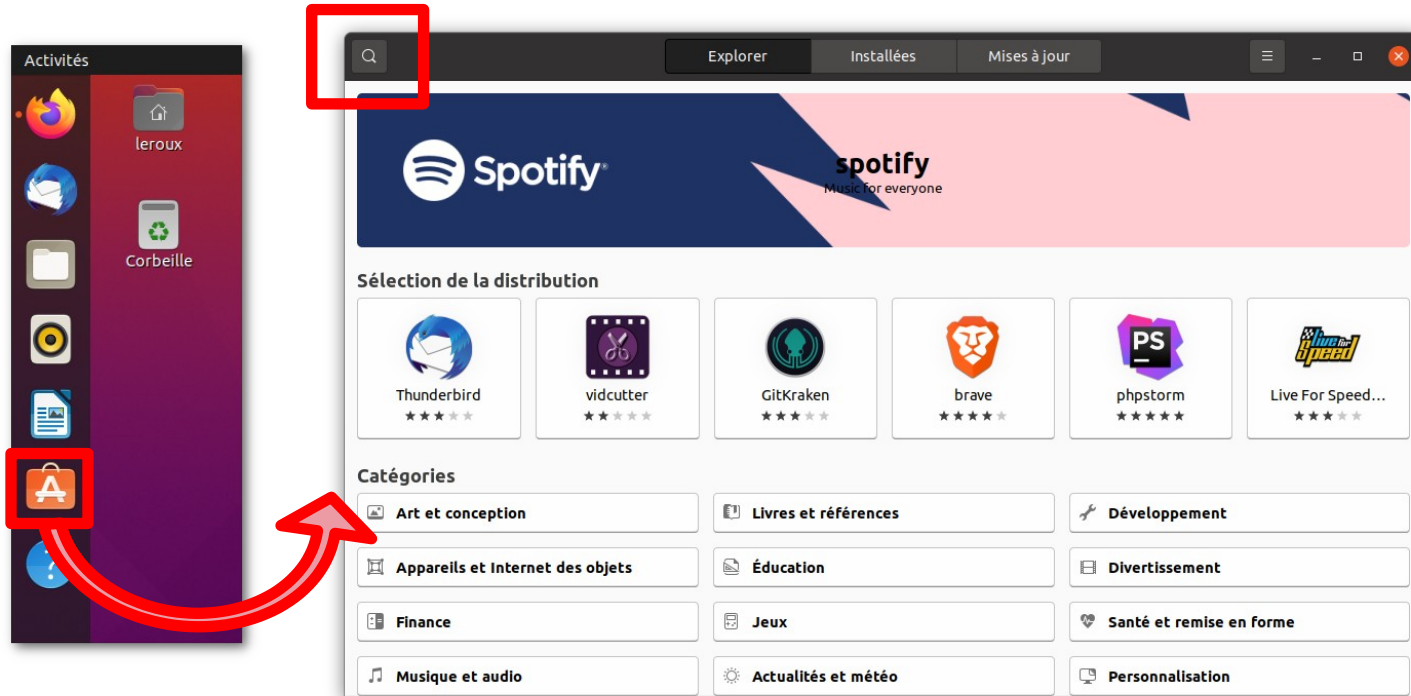
```
$ sudo apt install package-name
```

- Example:

```
$ sudo apt install synaptic
```


U. 2[0-2].04 LTS: Install software(s)

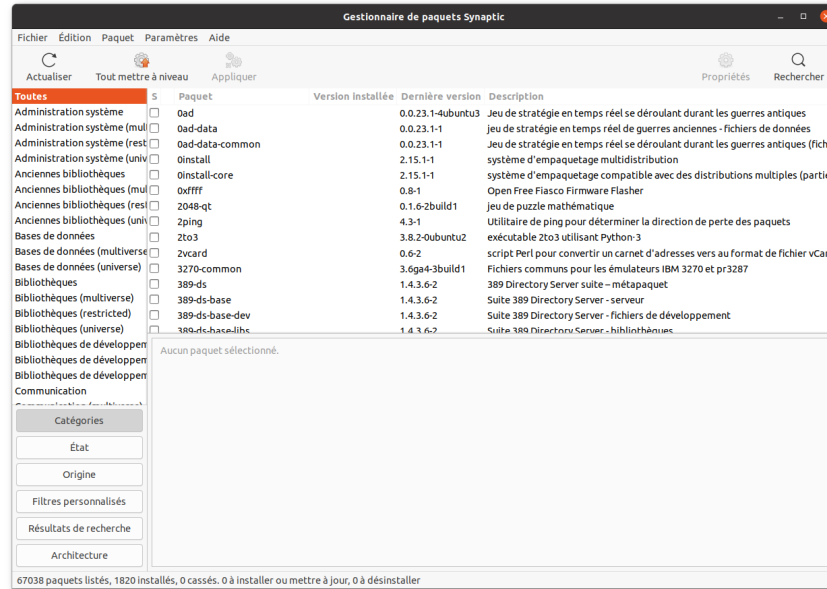
Using “Ubuntu Software”



Terminal command: **snap-store**

U. 2[0-2].04 LTS: Install software(s)

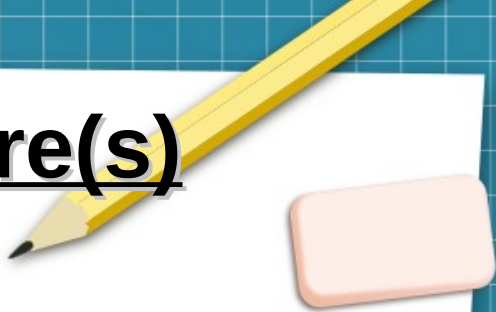
- Using “Synaptic”



Prerequisite: Install “Synaptic” using “Ubuntu Software”

Terminal command: `synaptic`

U. 2[0-2].04 LTS: Install software(s)



- **No matter the method, you need to have admin privileges to install a software and/or the updates !**

For Ubuntu 2[0-2].04 LTS you need to be in the “**sudoers**” group

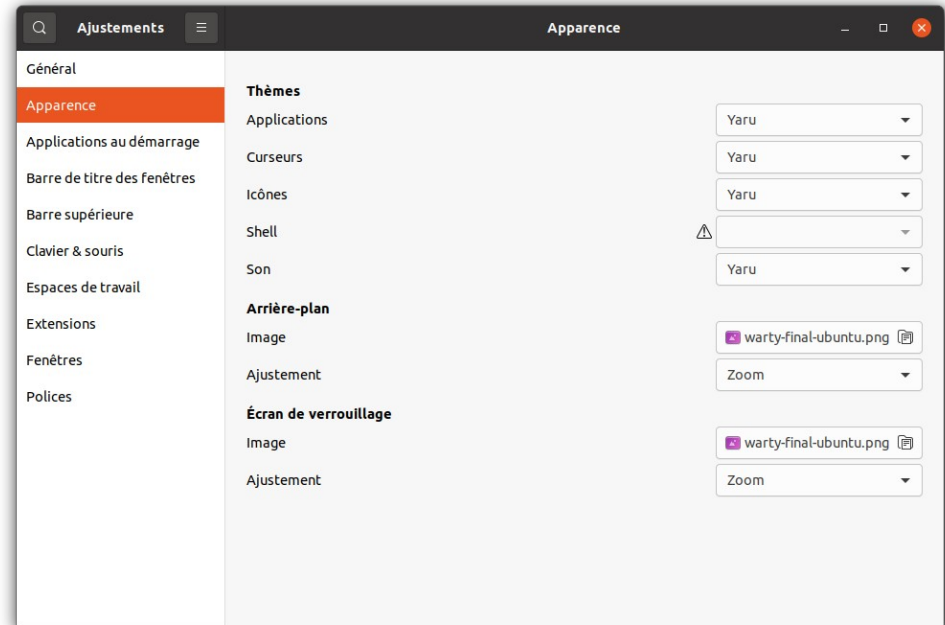
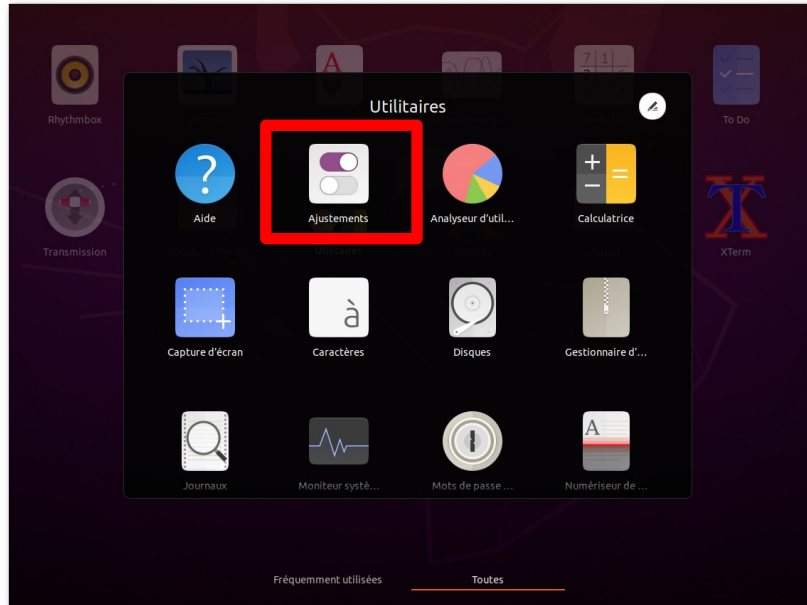
- What if you can not find what you are looking for ?

Add extra package repository: https://doc.ubuntu-fr.org/depots_focal

U. 2[0-2].04 LTS: Extras

- Tweaks “Ajustements” (gnome-tweaks)

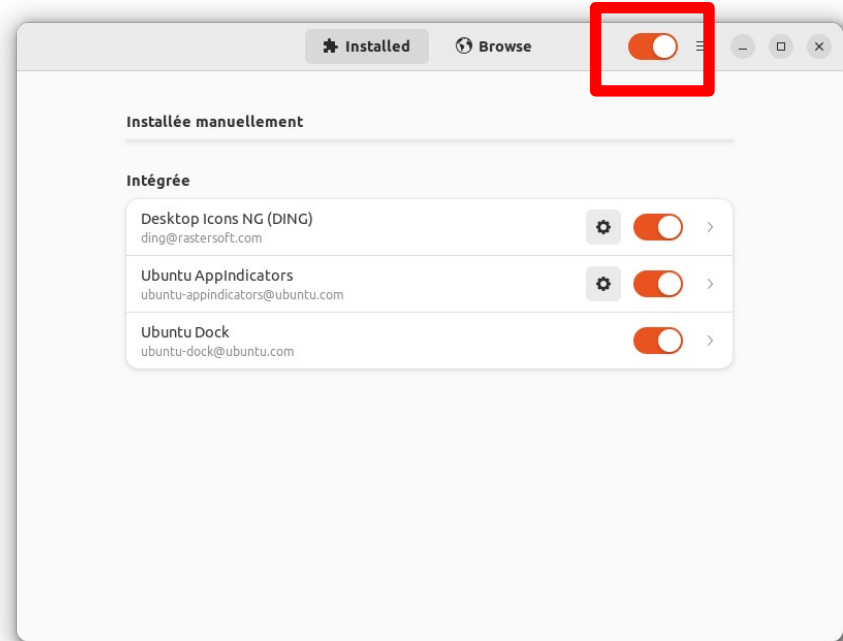
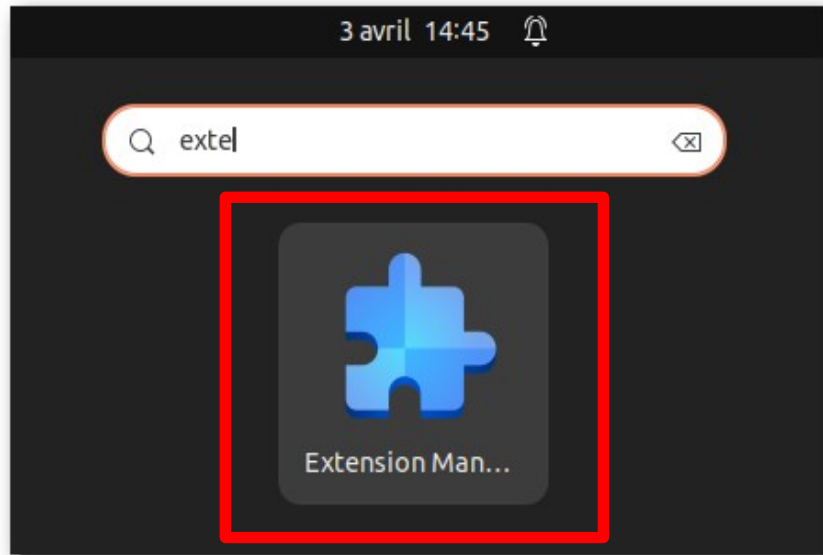
\$ **sudo** **apt** install **gnome-tweaks**



U. 22.04 LTS: GNOME™ Extras

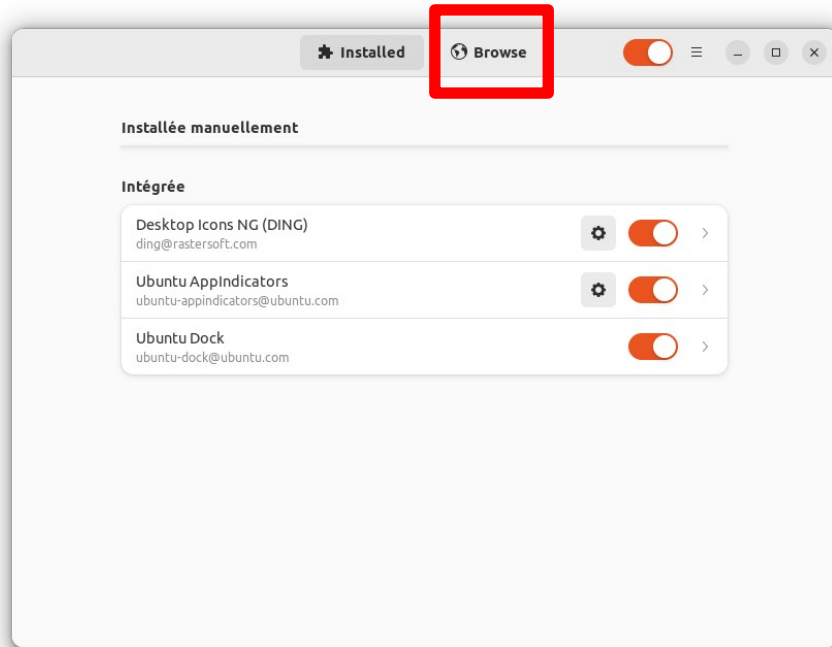
- Extension manager (gnome-shell-extension-manager)

\$ **sudo apt install** **gnome-shell-extension-manager**



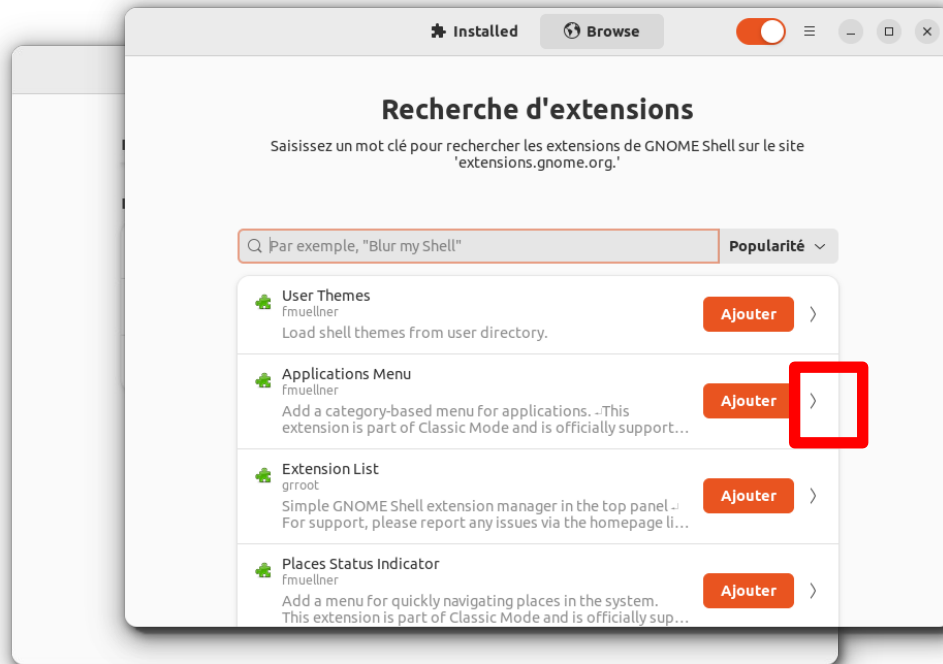
U. 22.04 LTS: Extras

- Extension manager (\$ **extension-manager**)



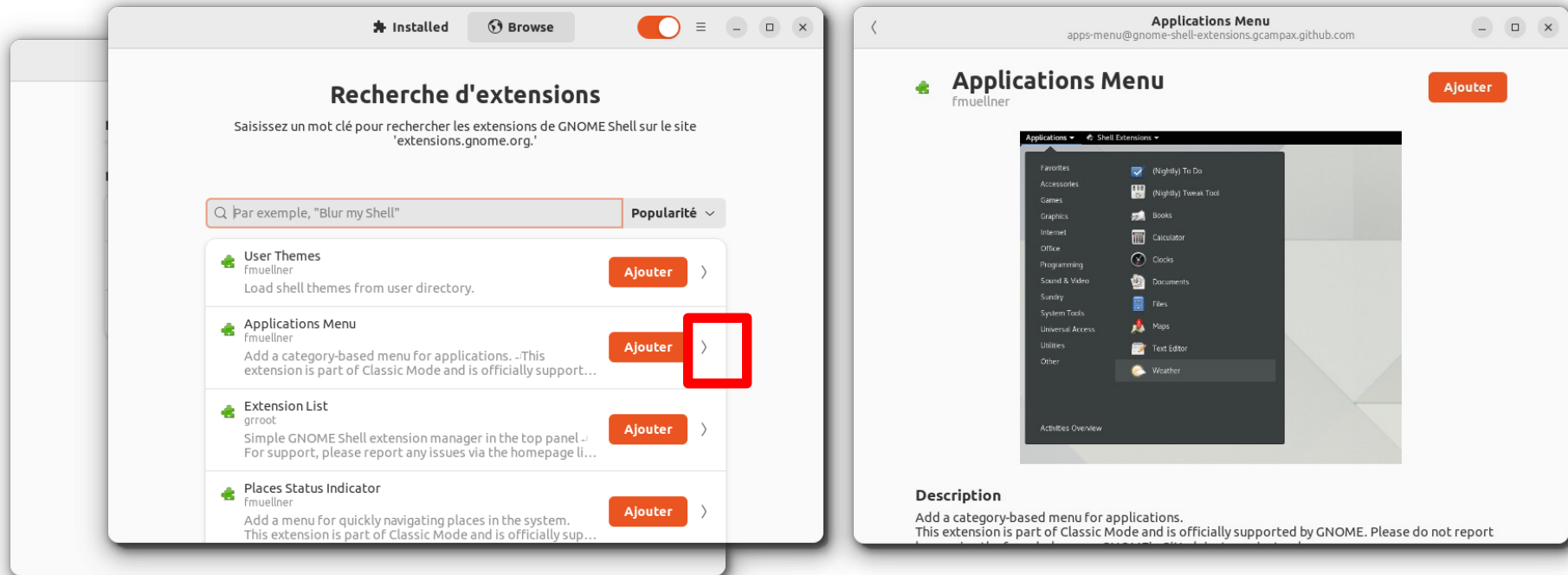
U. 22.04 LTS: GNOME™ Extras

- Extension manager (\$ **extension-manager**)

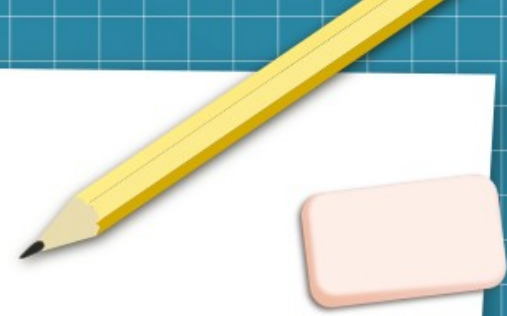


U. 22.04 LTS: **Extras**

- **Extension manager (\$ **extension-manager**)**



Why use Linux ?

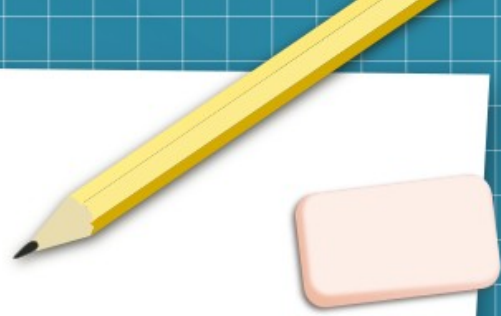


- It's free !
- No need to change your computer to use the newest Linux !

How long should you use your computer so that the CO₂ footprint of its usage becomes as large of the CO₂ footprint of its production ? ⚡

- High security: **no viruses ... no viruses at all !**
- High stability: **the world best servers use Linux !**
- Ease of use: **you are already using it on your smartphone !**
- Its **Free ! = Open Source: the code source is available !!!**

Why use Linux ?



- It's free !
- No need to change your computer to use the newest Linux !

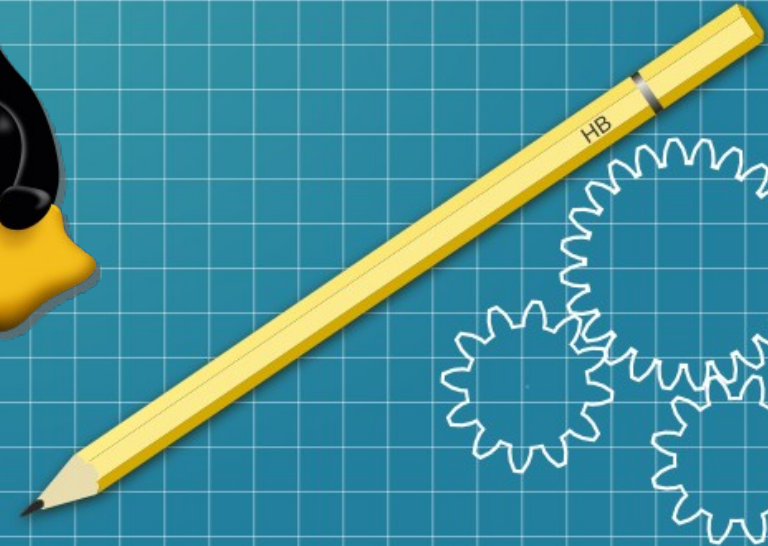
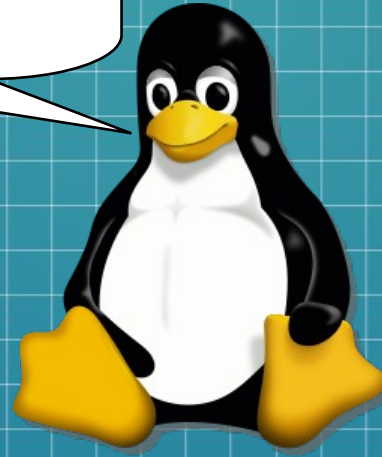
How long should you use your computer so that the CO₂ footprint of its usage becomes as large of the CO₂ footprint of its production ? ⚡

139 years !!!

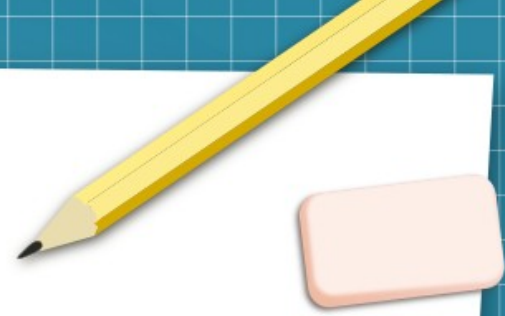
- High security: no viruses ... no viruses at all !
- High stability: the world best servers use Linux !
- Ease of use: you are already using it on your smartphone !
- Its **Free ! = Open Source: the code source is available !!!**

**“Astronauts use Linux ...
... because you cant open windows in space”**

Questions ?

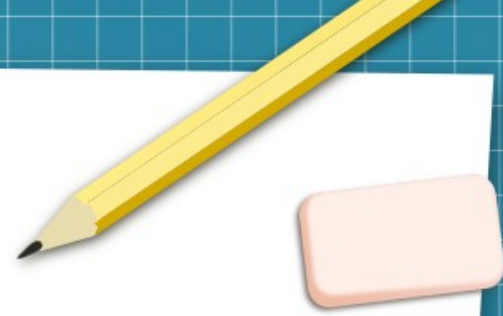


The command line ?



- What is a command interpreter ?
- What is a command ?
- Where to find command(s) ?
- How to execute a command ?
- How to use a command ?
- How to get help ?
- What are the basic commands ?
- What are the filters ?
- What is a redirection ?
- What is scripting ?

Command interpreter ?



- A command interpreter, or **Shell**, is a program that allows users to interact with the system using the command line.
- Many shells are available: **BASH**, **KSH**, **TCSH**, **ZSH**
- **BASH** “Bourne-Again Shell”

BASH

- BASH native (built-in) commands: **echo**, **pwd**, **export** ...
- Special characters

" " (space)

\$

*

?

{ } () []

/

` `

' '

"""

#

| & < >

. and ..

\

what follow is a variable.

stands for any number of any character(s) = everything.

any single character.

used to encompass expressions.

to define file and directory path(s).

to substitute enclosed command(s).

to enclose command(s).

to enclose command(s) with variable(s) expansion.

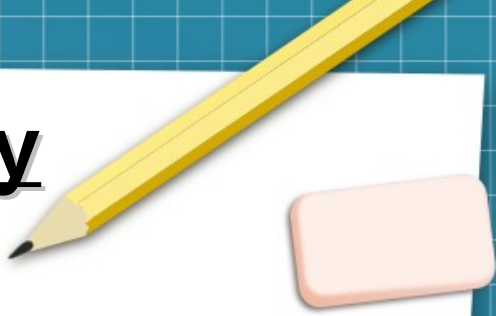
to start a comment in BASH.

redirections.

navigation in the directory tree.

to "protect" the other special characters

Linux: files and terminology



- On a computer you can have **2** types of files:
 - **Text files**
 - Other types of files = files that are not text files = **binary files**

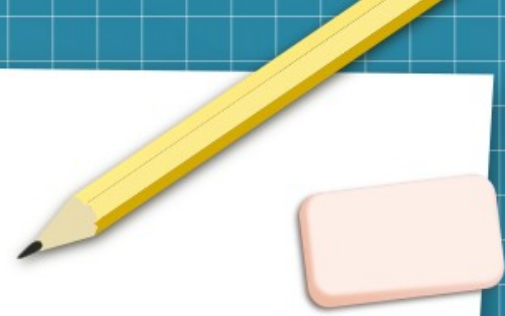
Easy to work of text files !

- Not matter the type of file, on a Linux system you have:
 - Standard files and repositories.
 - Hidden files and repositories which names, by convention, start by a “.” dot symbol.

Example: “~/**.**bashrc”

Exercise: Compare the results of the commands: **ls** and “**ls -a**”

What is a command ?



A file that has the execute permission ! ...
... A file that you can execute.

Linux Fundamentals: File Permissions



- The different permissions that can be granted for a **file** are:
 - **read**: to visualize its content
 - **write**: to modify its content (ex: editing)
 - **execute**: to execute its content (ex: program)
- The different permissions that can be granted for a **directory** are:
 - **read**: to visualize its content
 - **write**: to modify its content (ex: adding new files)
 - **execute**: to go inside this directory (ex: changing directory)

Linux Fundamentals: File Permissions

```
leroux@chess-u20: ~/Documents/Linux
leroux@chess-u20:~/Documents/Linux$ ls -l
total 15108
drwxrwxr-x 2 leroux dmo      4096 oct.  20 13:40 Images
-rw-r--r-- 1 leroux dmo 15463386 oct.  20 13:55 Linux.odp
leroux@chess-u20:~/Documents/Linux$
```

drwxrwxr-x

d rwx rwx r-x

-rw-r--r--

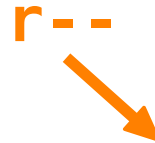
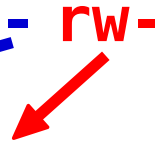
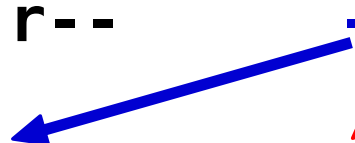
- rw- r-- r--

Object

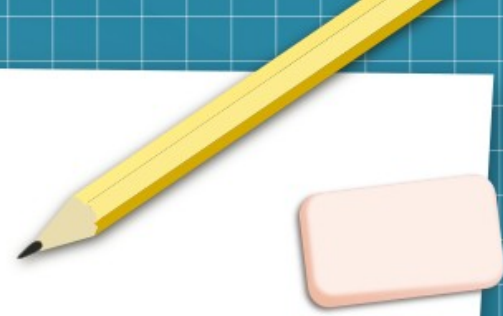
Owner

Group

The other user(s)



Command = Executable

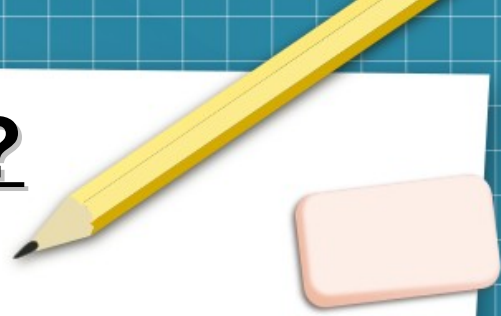


- Command = “**a file that has the execute permission**”

```
leroux@chess-u24: ~/Documents
leroux@chess-u24:~/Documents$ ls -l
total 4
-rwx----- 1 leroux leroux 26 avril  3 15:23 test.sh
```

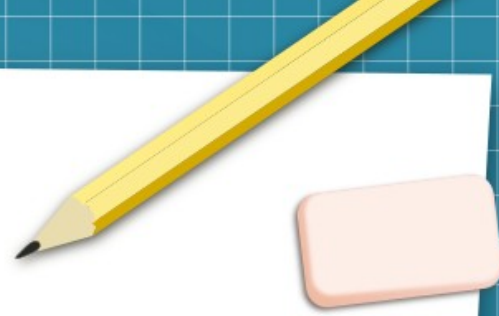


Where to find commands ?



- In the **PATH**
- Anywhere you need ...
... because you can create command(s) yourself

PATH



- **Environment variable(s) [EV]:**

“Set of dynamic named values used to create the operating environment in which a process runs”

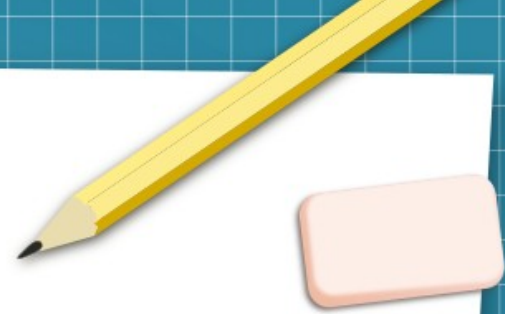
- To access the **EV** list use the **env** command:

```
user@localhost:~$ env
```

- To display the value of a variable:

```
user@localhost:~$ echo $PATH
```

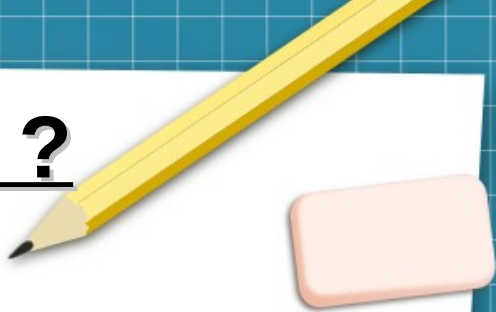
Locating a command



- To locate a command use the **which** command:

```
user@localhost:~$ which ls
/usr/bin/ls
user@localhost:~$
```

How to execute a command ?



- Use it name directly:

```
user@localhost:~$ ls
```

The command MUST be in the PATH

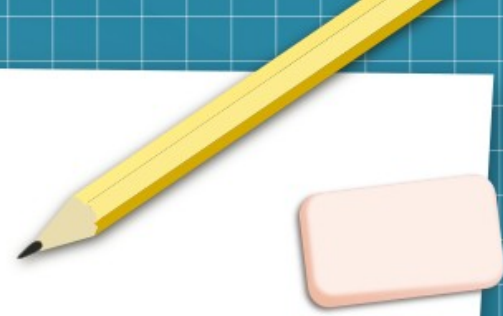
- Use the direct path + name of the executable:

```
user@localhost:~$ /usr/bin/ls
```

- Change directory to the folder of the executable and use “./”

```
user@localhost:~$ cd /usr/bin  
user@localhost:/usr/bin$ ./ls $HOME
```

How to use a command ?



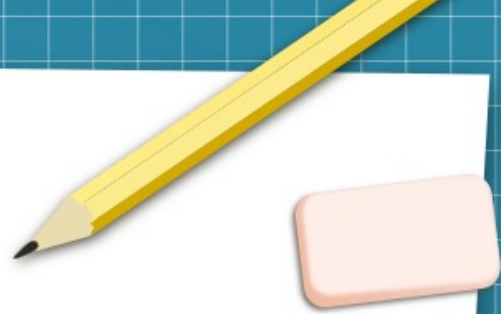
- A **command** can receive **argument(s)**:

```
user@localhost:~$ cd ~/Documents
```

- A **command** can receive **option(s)**:

```
user@localhost:~$ ls -l -h  
user@localhost:~$ ls -lh  
user@localhost:~$ ls -l --human-readable
```

How to get help



- The **-h** or **--help** option(s):

Accepted by most commands, to get basic help.

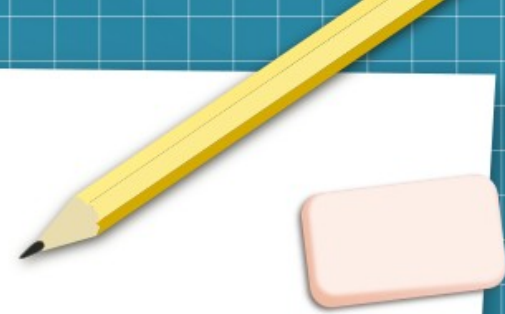
```
user@localhost:~$ ls --help
```

- The **man** command:

To access the manual pages

```
user@localhost:~$ man ls
```


Basic commands (1/6)



- File system management:

`ls`, `pwd`, `cd`, `touch`, `mkdir`
`mv`, `cp`, `rmdir`, `rm`

- File printing:

`wc`, `cat`, `tac`, `more`, `tail`, `cut`

- File management:

`chown`, `chmod`, `diff`, `ln`

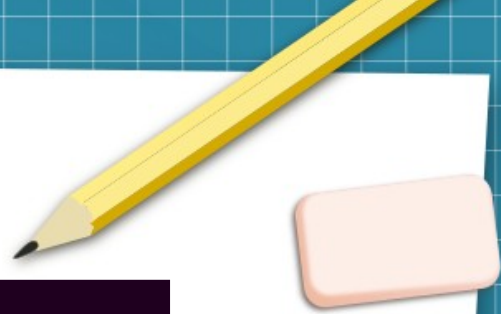
Basic commands (2/6)



```
user@localhost:~$ ls
Bureau      Images      Musique     snap        vidéo
Documents   Modèles     Public      Téléchargements

user@localhost:~$ ls -l
total 36
drwxr-xr-x. 2 user ipcms 4096 avril 12 11:04 Bureau
drwxr-xr-x. 2 user ipcms 4096 avril 12 11:04 Documents
drwxr-xr-x. 2 user ipcms 4096 avril 12 11:04 Images
drwxr-xr-x. 2 user ipcms 4096 avril 12 11:04 Modèles
drwxr-xr-x. 2 user ipcms 4096 avril 12 11:04 Musique
drwxr-xr-x. 2 user ipcms 4096 avril 12 11:04 Public
drwx----- 2 user ipcms 4096 avril 12 11:04 snap
drwxr-xr-x. 2 user ipcms 4096 avril 12 11:04 Téléchargements
drwxr-xr-x. 2 user ipcms 4096 avril 12 11:04 Vidéos
user@localhost:~$
```

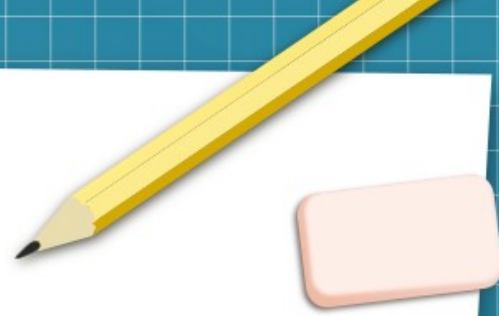
Basic commands (3/6)



```
user@localhost:~$ cd Images
user@localhost:~/Images$ ls
user@localhost:~/Images$ cd ..
user@localhost:~$ cd ../../
user@localhost:/$ cd
user@localhost:~$ cd Documents
user@localhost:~/Documents$
```

```
user@localhost:~/Documents$ touch file
user@localhost:~/Documents$ ls
file
user@localhost:~/Documents$
```

Basic commands (4/6)



- The **rm** command, important option: **-i**

```
user@localhost:~/Documents$ rm file
user@localhost:~/Documents$ ls
user@localhost:~/Documents$ touch nfile
user@localhost:~/Documents$ ls
nfile
user@localhost:~/Documents$ rm -i nfile
rm : supprimeur 'nfile' du type fichier ? n
user@localhost:~/Documents$ ls
nfile
```

Basic commands (5/6)

- The **cat**, **tac** and **wc** commands

```
user@localhost:~/Documents$ cat Ethanol.xyz
9
C      1.0111998889      -0.0452918889      -0.0626048889
C      -0.4620761111      0.0306281111      0.2946991111
H      1.6265438889      -0.0376928889      0.8456121111
H      1.3252608889      0.8030881111      -0.6846978889
H      1.2501238889      -0.9611748889      -0.6188868889
H      -0.7580021111      -0.8263228889      0.9315601111
H      -0.6822251111      0.9536901111      0.8665561111
H      -2.1126961111      0.0649821111      -0.6649928889
O      -1.1981291111      0.0180941111      -0.9072448889
user@localhost:~/Documents$ wc -l Ethanol.xyz
11 Ethanol.xyz
user@localhost:~/Documents$
```


Basic commands (6/6)

- The **chmod** command “to change file permissions”

-rw-r--r--

Object	Owner	Group	The other user(s)
--------	-------	-------	-------------------

Using 3 series (**owner**, **group**, **others**) of 3 numbers as well as their combinations:

	1	= execute (x)	= --x
	2	= write (w)	= -w-
	4	= read (r)	= r--
(0 = nothing = ---)	3 = 1 + 2	= x + w	= -wx
	5 = 1 + 4	= x + r	= r-x
	6 = 2 + 4	= w + r	= -wr
	7 = 1 + 2 + 4	= x + w + r	= rw

Basic commands (6/6)

- The **chmod** command “to change file permissions”

-rw-r--r--

Object

Owner

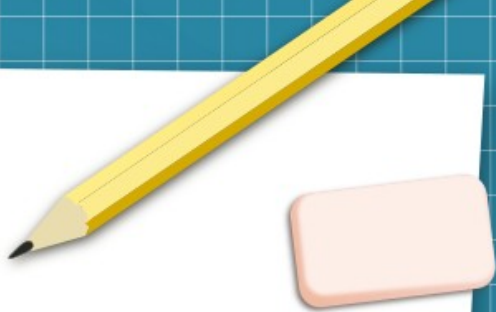
Group

The other user(s)

Using 3 series (**owner**, **group**, **others**) of 3 numbers as well as their combinations:

```
user@localhost:~/Documents$ ls -l Ethanol.xyz
-rw-r--r--. 1 user ipcms 525 avril 14 11:22 Ethanol.xyz
user@localhost:~/Documents$ chmod 600 Ethanol.xyz
user@localhost:~/Documents$ ls -l Ethanol.xyz
-rw-----. 1 user ipcms 525 avril 14 11:22 Ethanol.xyz
user@localhost:~/Documents$
```

What are the filters ?

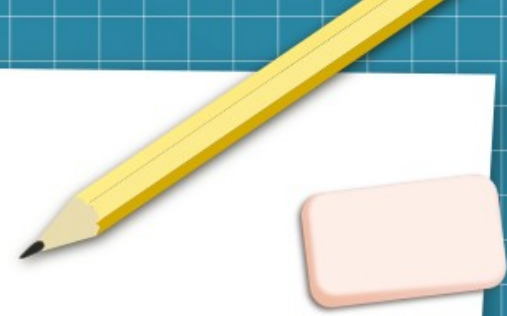


- Filters are a type of command line utility designed to manipulate and process text data.
- The most common filters are **awk**, **sed** and **grep**

```
user@localhost:~$ filter option(s) 'regular expression' file  
user@localhost:~$ filter option(s) "regular expression" file
```

- Filter use regular expressions or **regexp**
“Set of rules and patterns to match and manipulate text data”

grep



- To find line(s) with pattern(s) in text files

```
user@localhost:~$ grep --color=always 'C' Ethanol.xyz
C      1.0111998889      -0.0452918889      -0.0626048889
C      -0.4620761111      0.0306281111      0.2946991111
user@localhost:~$ grep -n --color=always '0' Ethanol.xyz
11:0      -1.1981291111      0.0180941111      -0.9072448889
user@localhost:~$
```

sed

- To find, substitute and delete pattern(s) in text files

```
user@localhost:~$ sed 's/0/?/g' Ethanol.xyz
```

```
9
```

C	1.?111998889	-?.?452918889	-?.?626?48889
C	-.?.462?761111	?.?3?6281111	?.2946991111
H	1.6265438889	-?.?376928889	?.8456121111
H	1.32526?8889	?.8?3?881111	-?.6846978889
H	1.25?1238889	-?.9611748889	-?.6188868889
H	-.?.758??21111	-?.8263228889	?.93156?1111
H	-.?.6822251111	?.95369?1111	?.8665561111
H	-2.1126961111	?.?649821111	-?.6649928889
O	-1.1981291111	?.?18?941111	-?.9?72448889

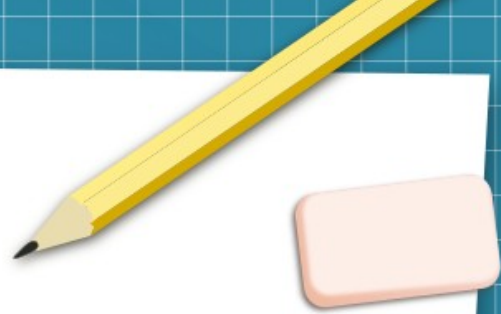
```
user@localhost:~$
```

awk

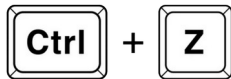
- To find pattern(s) and process line(s) in text files

```
user@localhost:~$ awk '{print $1}' Ethanol.xyz
9
C
C
H
H
H
H
H
H
O
user@localhost:~$
```


What is a redirection ?



- Sending a command to the background:
 - Foreground job to the background:



Followed by:

```
user@localhost:~$ bg
```

- Job directly to the background, using: **&**

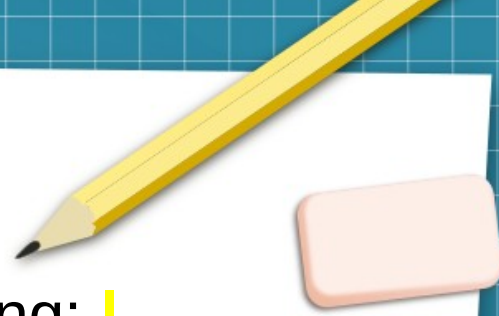
```
user@localhost:~$ gedit &
```

- Sending the output of a command to a file:

```
user@localhost:~$ cat Ethanol.xyz > Eth.xyz  
user@localhost:~$ cat Ethanol.xyz >> Eth.xyz
```

- Sending the output of a command in another command: **the pipe |**

The pipe (pipeline) |



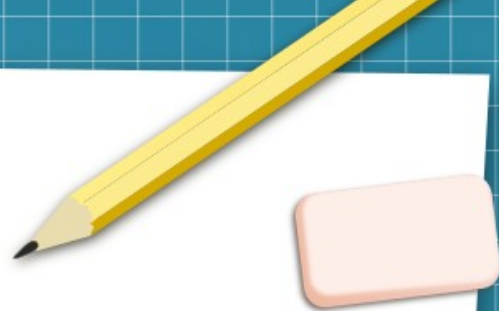
- Redirecting a command in another command, using: |

```
user@localhost:~$ cat Ethanol.xyz | wc -l
11
user@localhost:~$
```

```
user@localhost:~$ ls -l E* | grep '^-'
-rw-r--r--. 1 user ipcms 525 avril 14 11:22 Ethanol.xyz
-rw-r--r--. 1 user ipcms 525 avril 14 11:23 Eth.xyz
user@localhost:~$
```

```
user@localhost:~$ ls -l E* | grep '^-' | awk '{printf $NF" "}'
Ethanol.xyz Eth.xyz user@localhost:~$
```

What is scripting ?



- To program a list of command(s) and action(s) in a file

```
#!/bin/bash  
  
# This little example to say "Hello" in BASH  
echo "Hello"
```

- The first line tells the system which program use to run the script.
 - The other lines describe the commands to be performed.
- To execute the script:

```
user@localhost:~$ bash MyScript
```

or

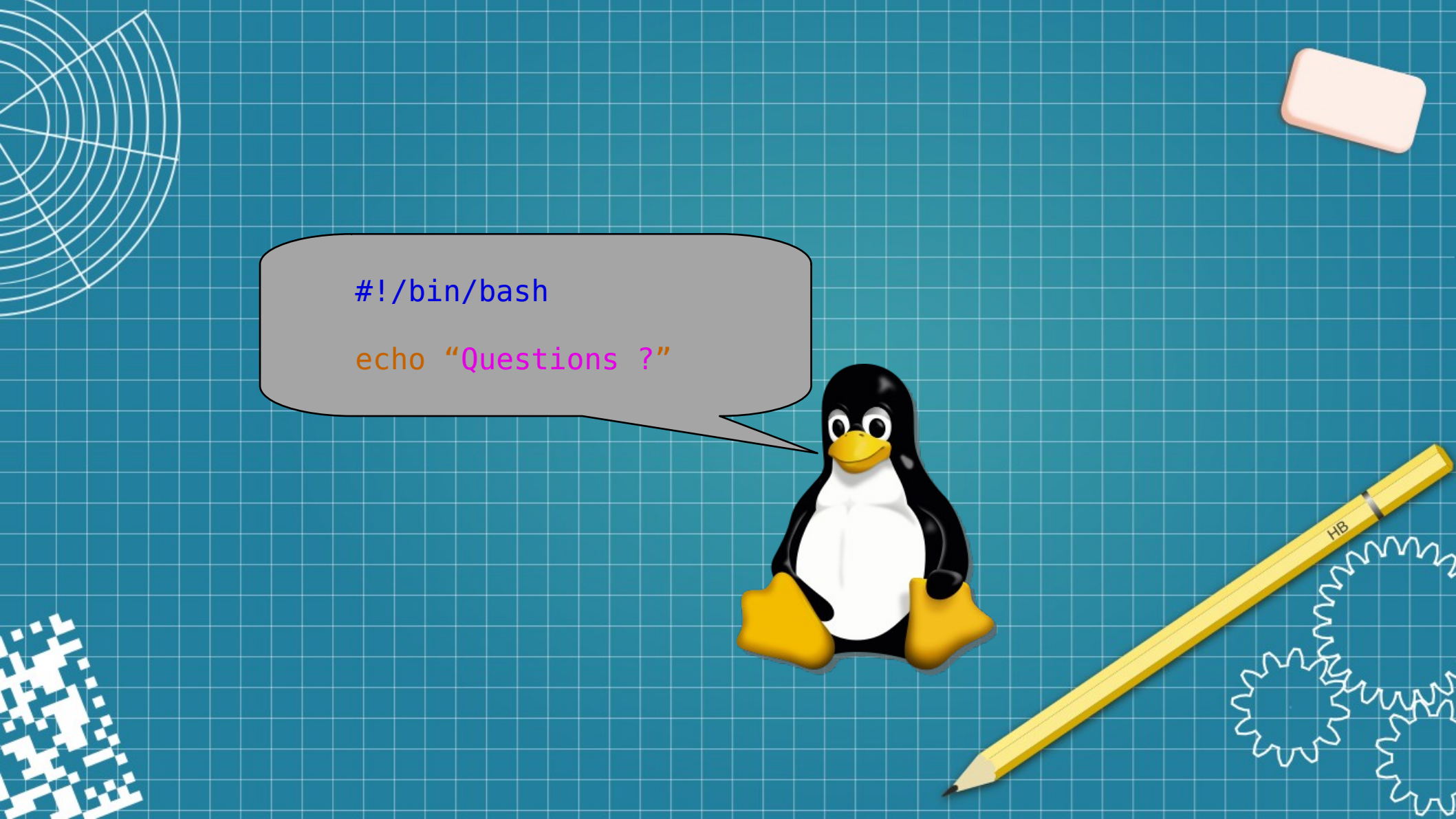
```
user@localhost:~$ chmod 755 MyScript  
user@localhost:~$ ./MyScript
```

The file ~/.bashrc



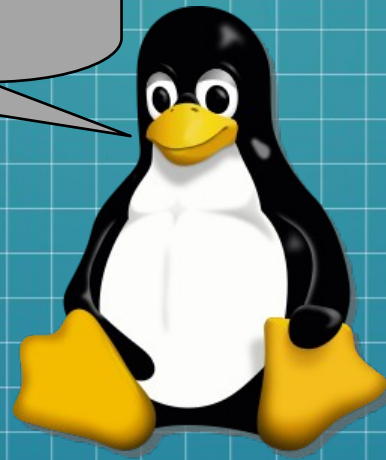
- Configuration file that BASH reads every time a shell starts
- BASH then executes the commands in ~/.bashrc

```
# Modifying the PATH environment variable:  
PATH=$PATH:~/bin  
  
# Creating aliases, using: alias name='what to do'  
  
alias ll='ls -lh'  
alias lla='ls -lha'  
  
alias rm='rm -i'  
  
alias grep='grep --color=always'
```



```
#!/bin/bash
```

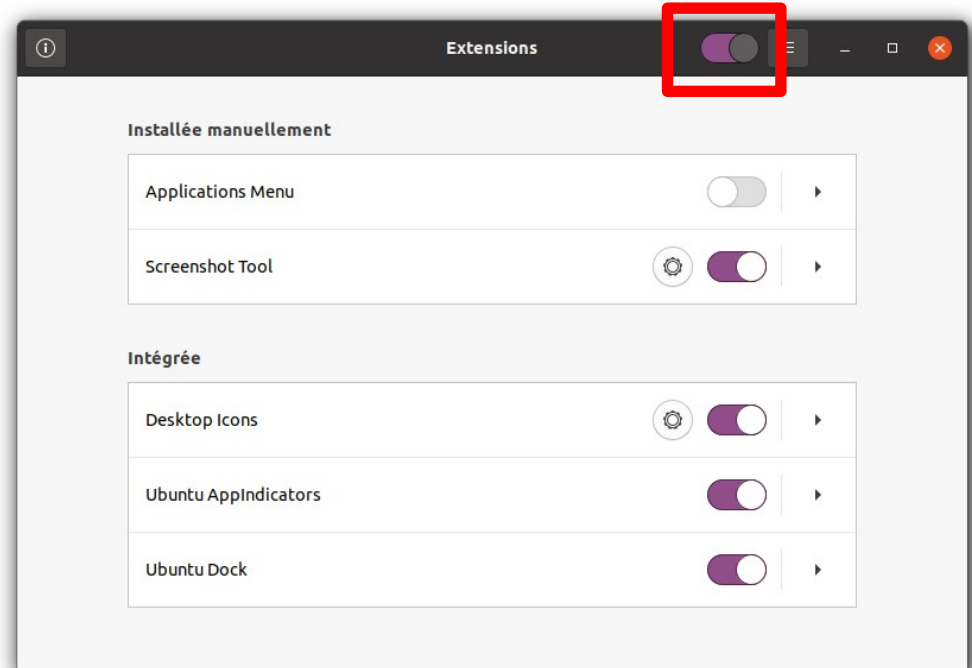
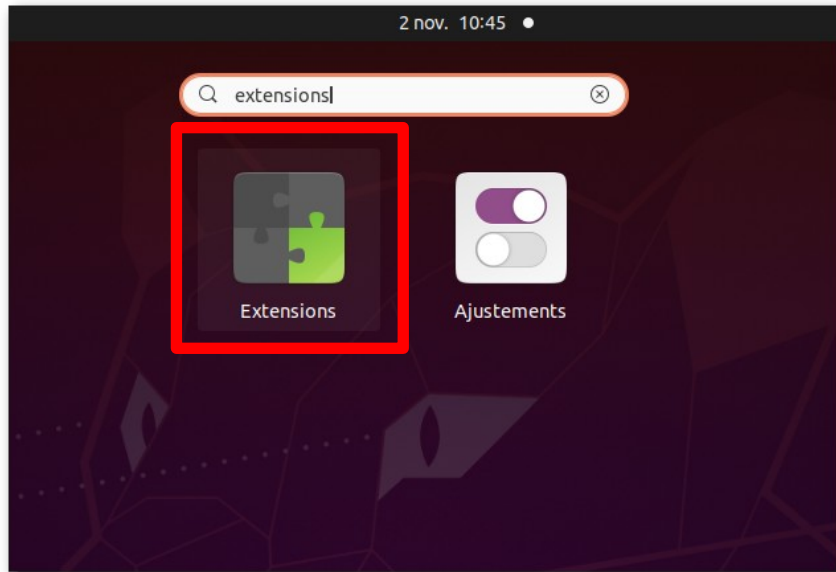
```
echo "Questions ?"
```



U. 20.04 LTS: Extras

- Extension preferences (gnome-shell-extension-prefs)

\$ **sudo apt install** **gnome-shell-extension-prefs**



U. 20.04 LTS: Extras

- Gnome-shell extensions: <https://extensions.gnome.org/>

