

# Introduction to Linux environment

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Programa Formación Continua, ISCIII

# Overview

1. Linux OS
2. Linux file system
3. Basic commands
4. Command line syntax
5. Linux users and privileges

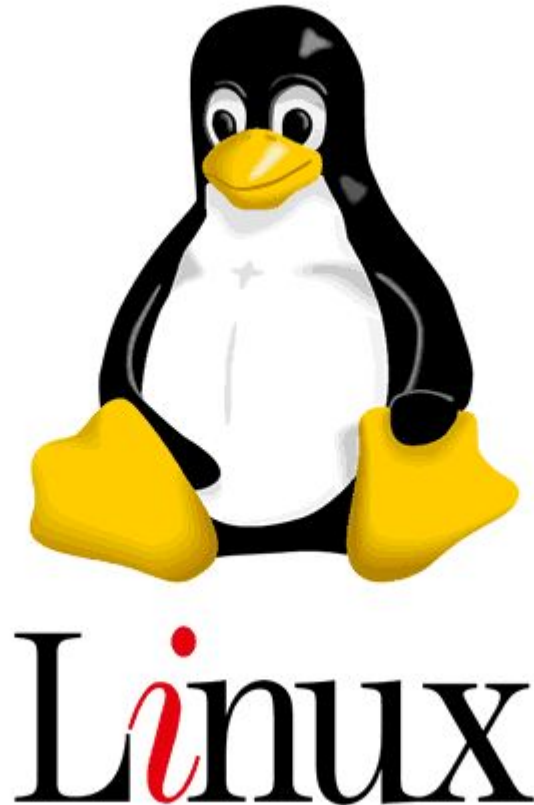
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# 1. Linux Operating System (OS)

## Features:

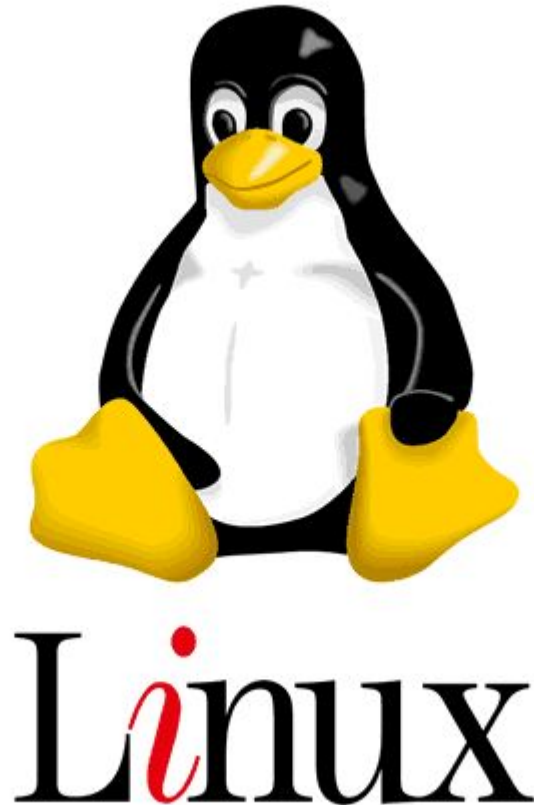
1. Operating System
2. Open source
3. Linux distributions
4. Multitasking
5. Multi-user



# 1. Linux Operating System (OS)

## Features:

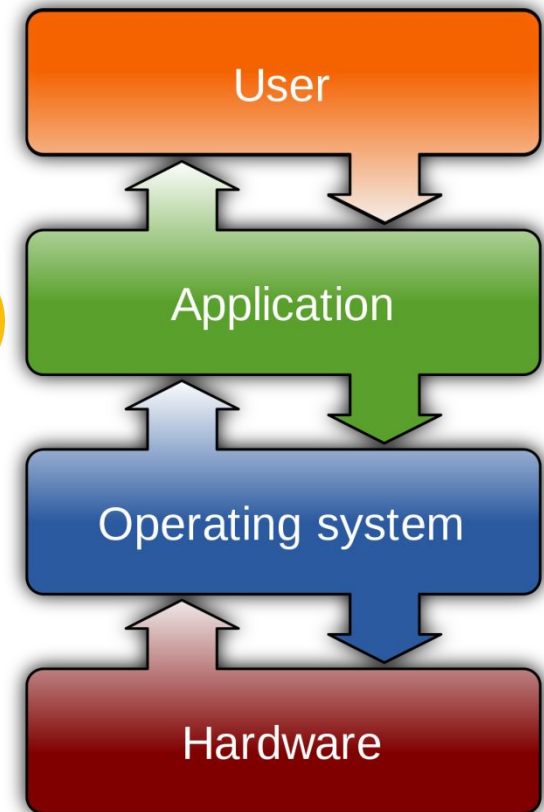
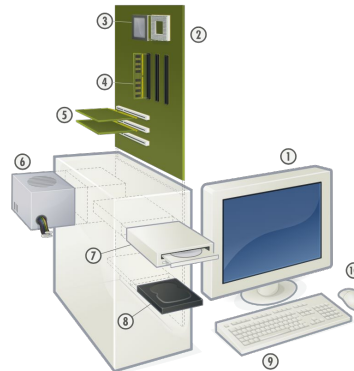
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## 1.1. Operating System

### Operating System (OS):

- Software that manages computer hardware and software resources and provides common services for computer programs



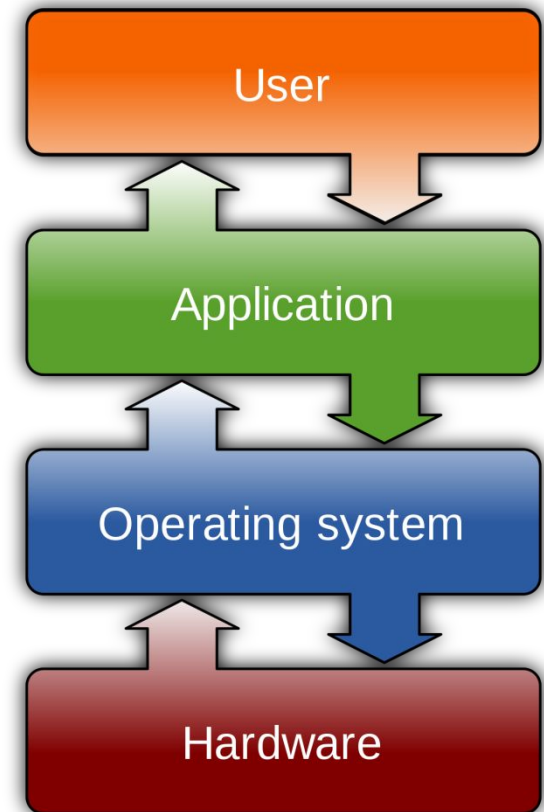
# 1.1. Operating System

## Operating System (OS):

- Software that manages

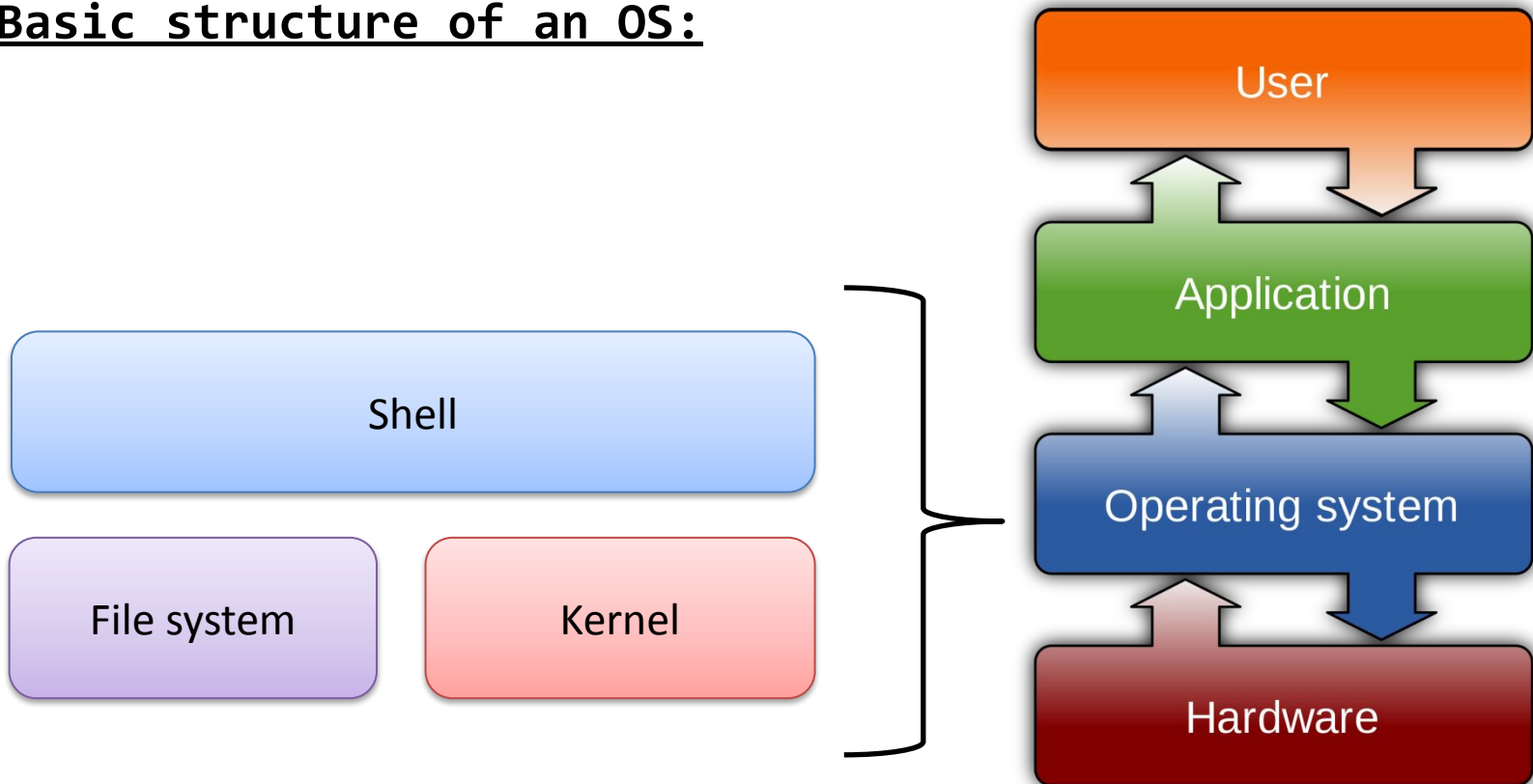
## Functions:

- Program execution and control (launch, manage, and supervises running programs)
- Peripheral management (controls devices like keyboard, mouse, screen, printer, USB...)
- User and permission management (creates users, assigns roles, and controls access to files and system functions)
- Error and security management (detects system or hardware failures and protects against unauthorized access)



## 1.1. Operating System

### Basic structure of an OS:





## 1.1. Operating System



Kernel

It is the foundational layer of an OS. It functions at a basic level, communicating with hardware and managing resources.

# 1.1. Operating System

File system

It controls how data is stored, manipulated and retrieved. (Part 2)

Kernel

It is the foundational layer of an operating system (OS).  
It functions at a basic level, communicating with hardware and managing resources.

## 1.1. Operating System

Shell

File system

Program that provides the traditional, text-only user interface. (Part 3)

It controls how data is stored, manipulated and retrieved. (Part 2)

Kernel

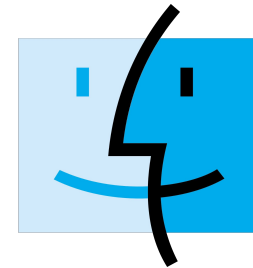
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## 1.1. Operating System

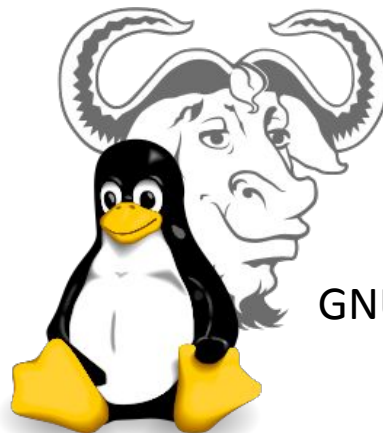
Operating System (OS):



Windows



Mac<sup>TM</sup> OS



GNU/Linux

# 1.1. Operating System

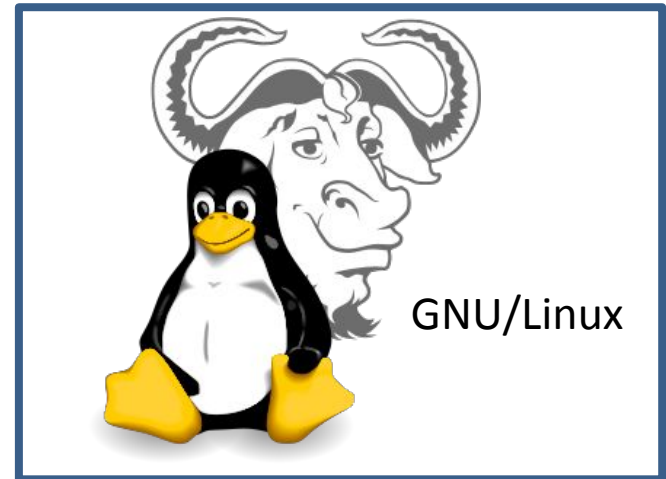
## GNU/Linux:

GNU = GNU's Not Unix project  
(Richard Stallman, 1983)

- Shell
- Compiler
- Libraries
- Other utils



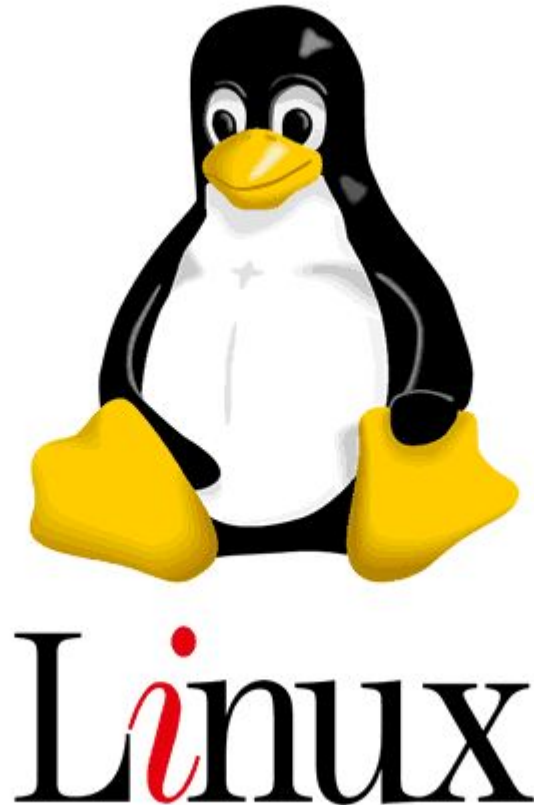
Kernel (Linus Torvalds, 1991)



# 1. Linux Operating System (OS)

## Features:

1. Operating System
2. Open source
3. Linux distributions
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5. Multi-user



## 2. Open source

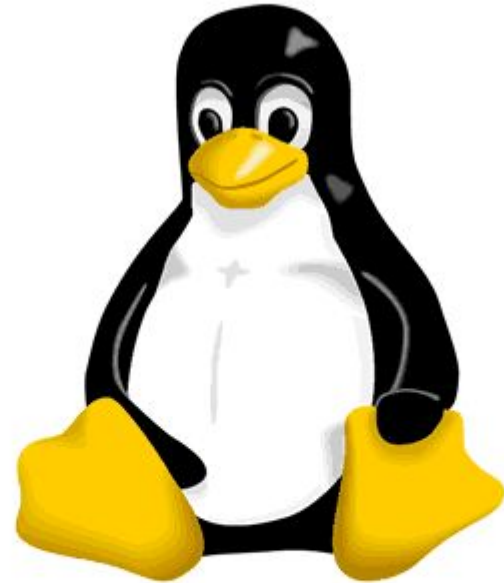
**The distribution terms of open-source software must comply with the following criteria:**

1. Free Redistribution
2. Source Code
3. Derived Works
4. Integrity of the Author's Source Code
5. No Discrimination Against Persons or Groups
6. No Discrimination Against Fields of Endeavour
7. Distribution of license
8. License Must Not Be Specific to a Product
9. License Must not Restrict Other Software
10. License Must Be Technology-Neutral

# 1. Linux Operating System (OS)

## Features:

1. Operating System
2. Open source
3. Linux distributions
4. Multitasking
5. Multi-user



Linux



## 3. Linux Distributions

### Linux Distributions

- A distro is a Linux kernel based operating system made from a software collection and sometimes a package management system.
- There are distros for a wide variety of platforms.
- A typical Linux distro comprises a Linux kernel, GNU tools and libraries, additional software, documentation, a window system, a window manager, and a desktop environment.
- Most of the included software is free and open-source software made available both as compiled binaries and in source code form, allowing modifications to the original software. This means that you can see how the software works, and even modify it, which is especially useful in science, where reproducibility is key.

## 3. Linux Distributions

“Distro” - Version Kernel + programs:

- Ubuntu: Beginner-friendly.
- Debian: Known for its stability.
- Fedora: Sponsored by Red Hat, cutting-edge technology.
- Arch Linux: Designed for advanced users, full control over system configuration.
- **CentOS** / Rocky Linux / AlmaLinux: Oriented towards server environments.

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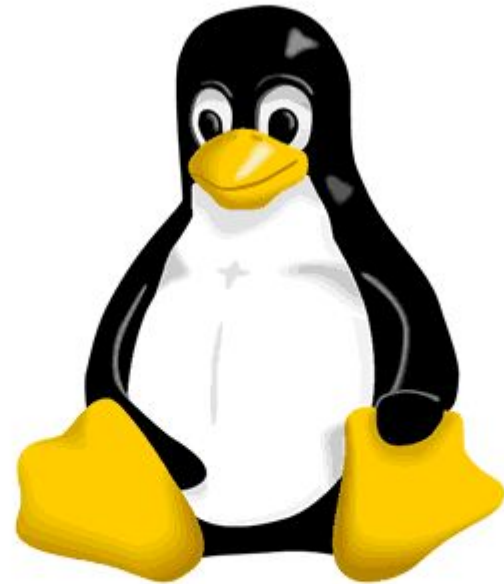


**CentOS Stream release 8**

# 1. Linux Operating System (OS)

## Features:

1. Operating System
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5. Multi-user

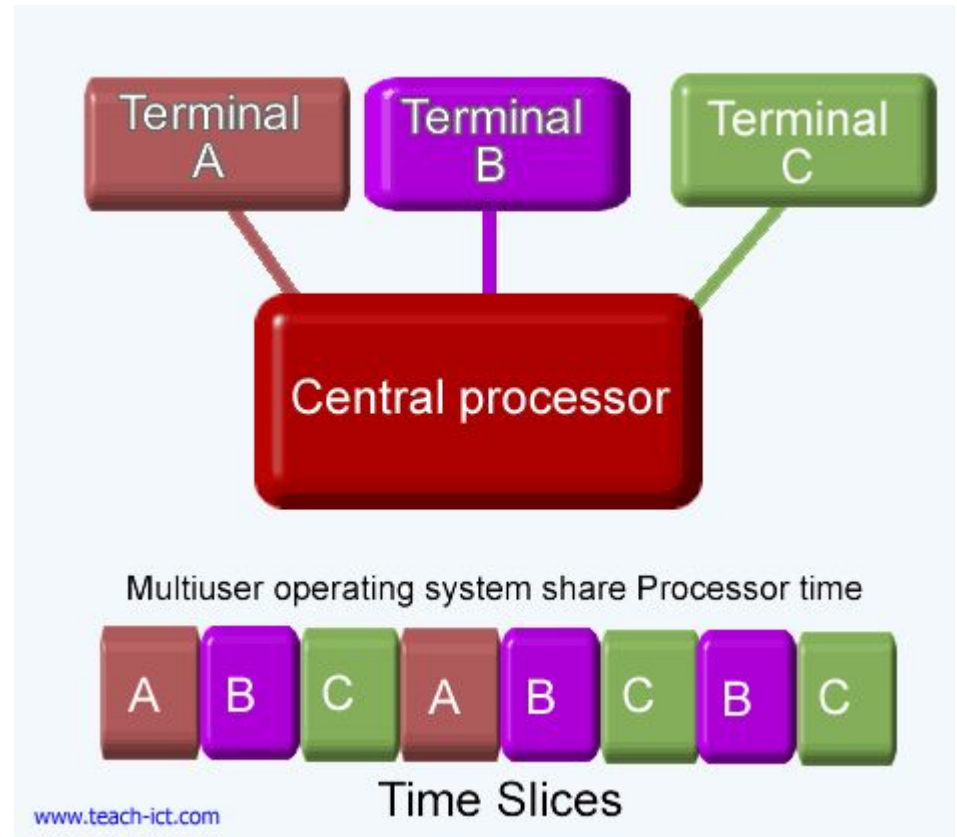


Linux

## 4. Multi-task

A multitasking operating systems allows a user to perform more than one computer task (such as the operation of an application program) at a time.

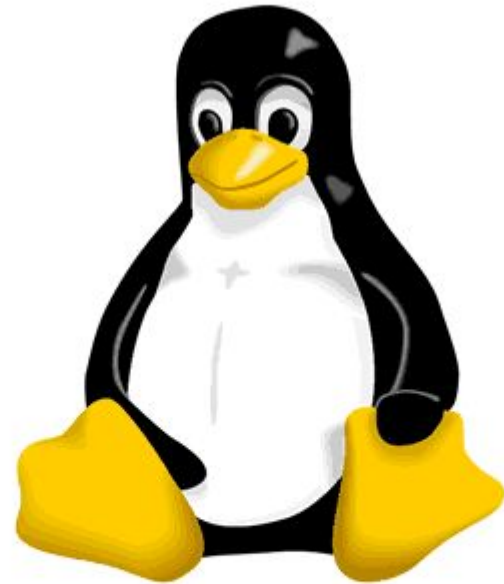
The operating system is able to keep track of where you are in these tasks and go from one to the other without losing information.



# 1. Linux Operating System (OS)

## Features:

1. Operating System
2. Open source
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5. Multi-user



Linux

## 5. Multi-user

- A multi-user operating system is software that allows access by multiple users of a computer.
- An example is a server where multiple remote users have access (such as via a serial port or Secure Shell) to the Unix shell prompt at the same time.



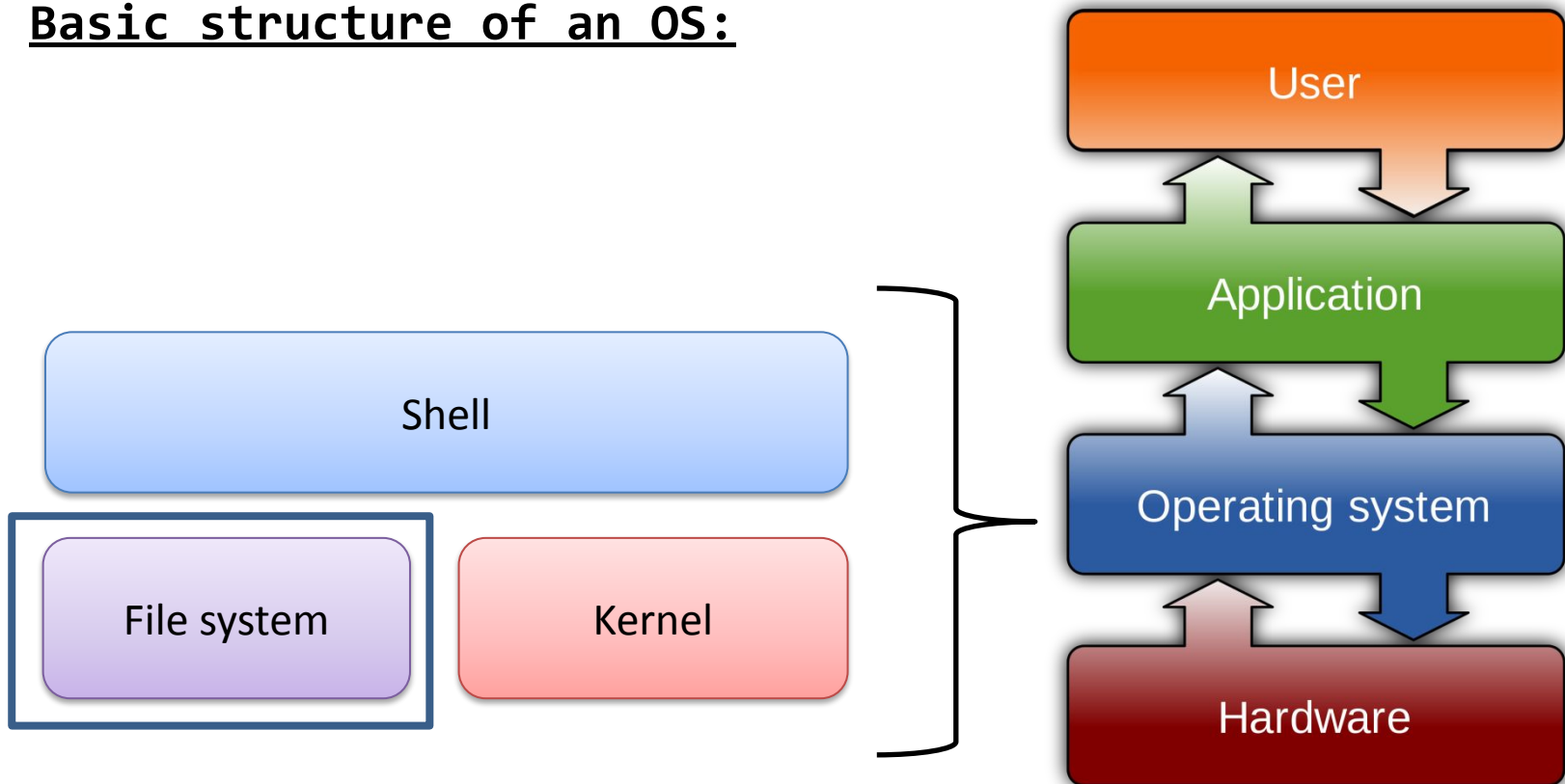
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# 1.1. Operating System

## Basic structure of an OS:



## 2. Linux File System

1. Features

2. Structure

3. Comparison with Windows

4. Paths

## 2.1. Linux File System Features

The file system is what gives structure to the data. It allows:

- Storing files and folders in an organized way.
- Accessing them by name, path, and permissions.
- Controlling who can read, modify, or execute each file.

When you save a file the file system:

- Divides it into physical blocks stored on the disk.
- Associates metadata (name, date, permissions, size, owner).
- Places it in a folder hierarchy to make it easier to locate.

It also manages:

- Permissions and ownership
- Access/modification times
- Free and used disk space
- Integrity and error recovery

## 2.1. Linux File System Features

- Root directory (/)
- Everything is a File (devices, directories, and processes)
- Specifying Paths
- Case-Sensitive
- File Extensions and Hidden Files

## 2. Linux File System

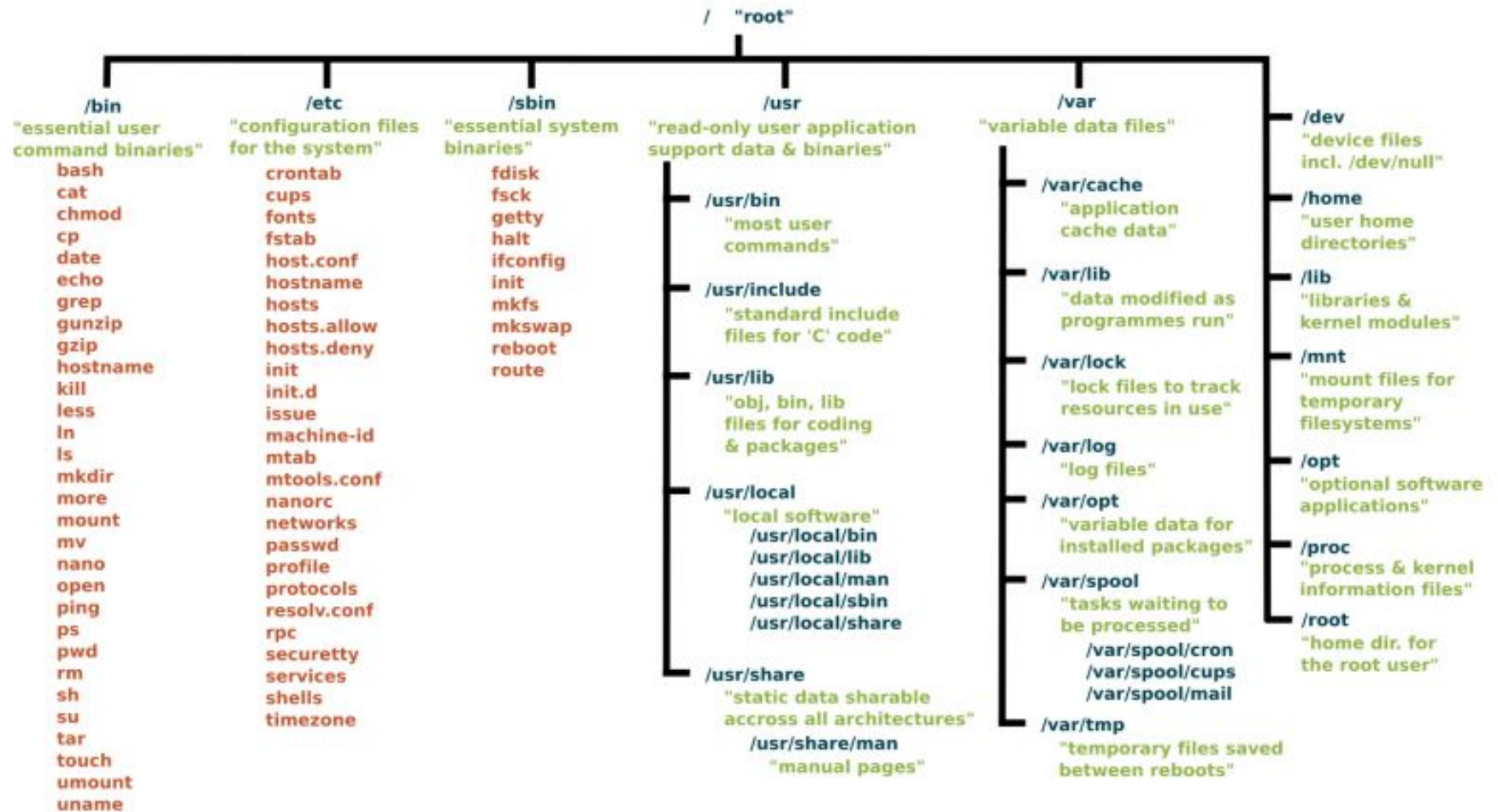
1. Features

2. Structure

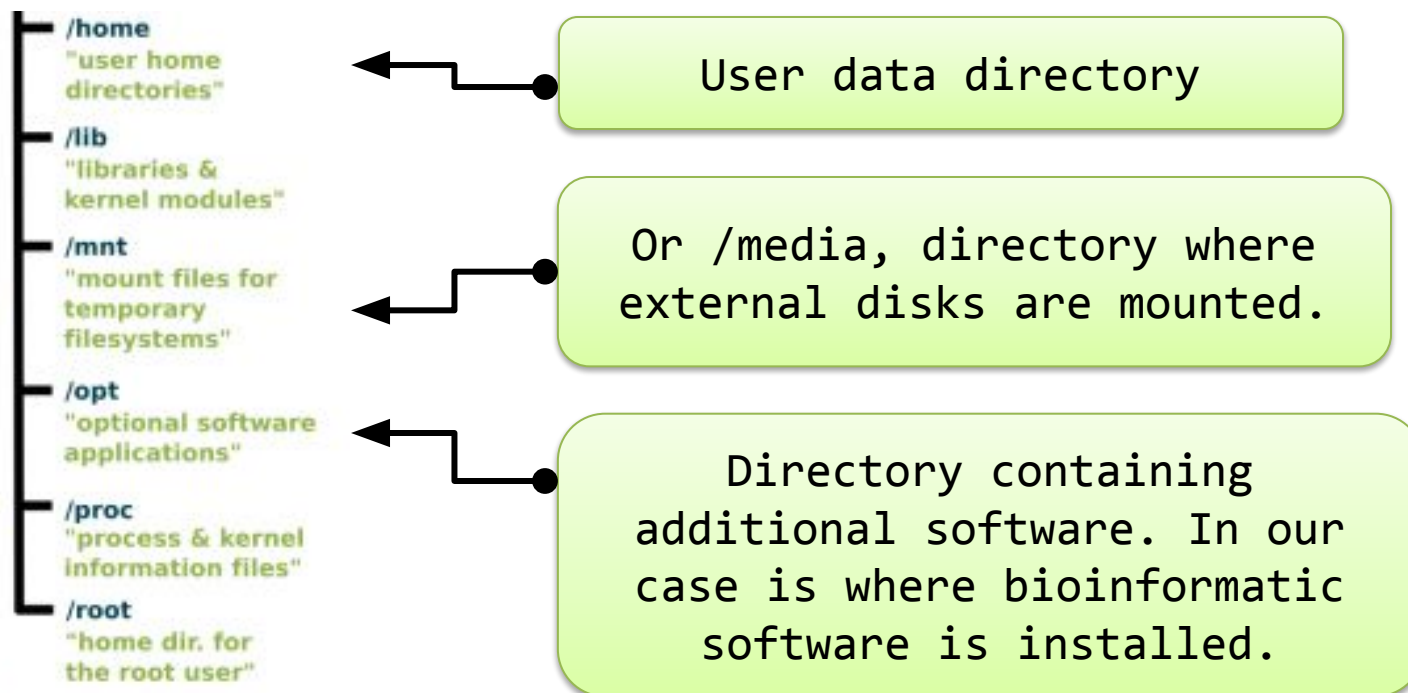
3. Comparison with Windows

4. Paths

## 2.2. Linux File System Structure



## 2.2. Linux File System Structure



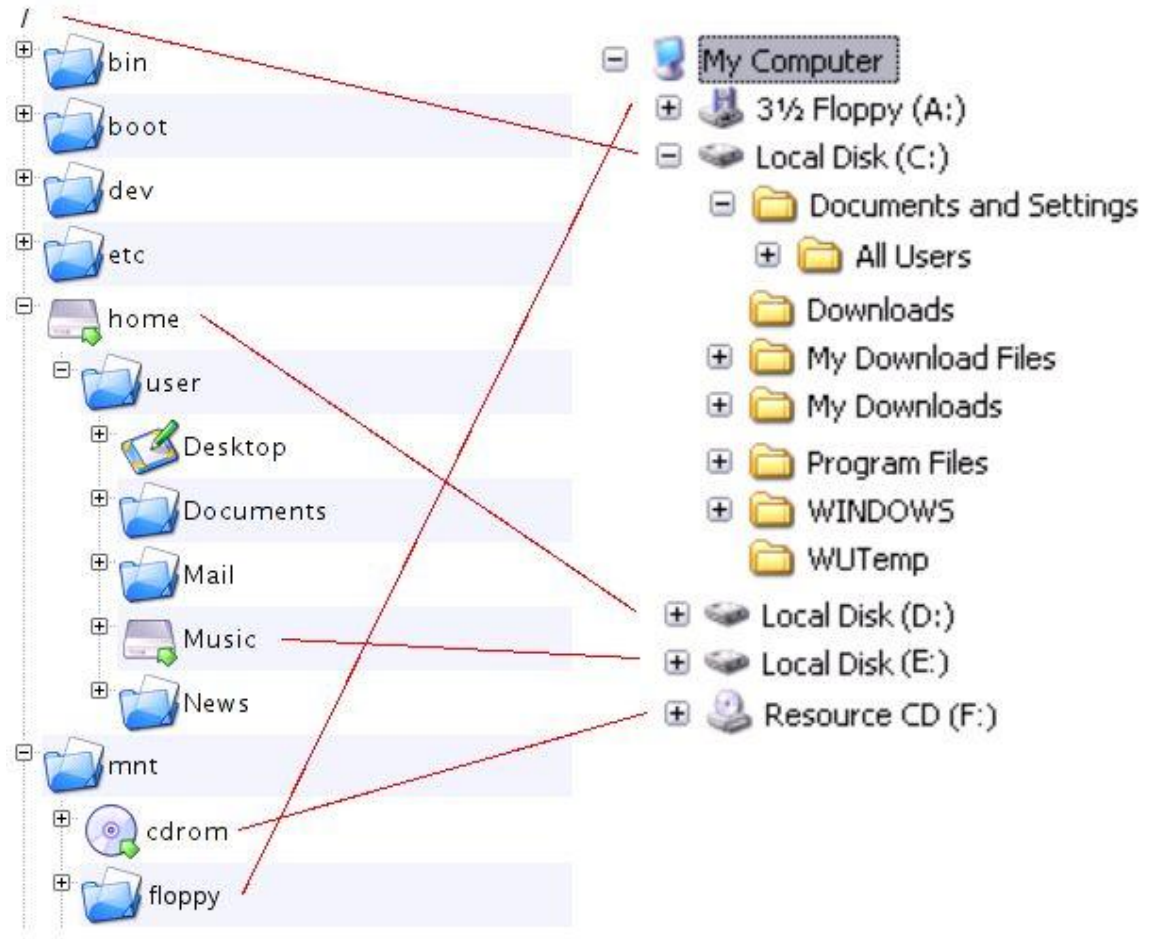
## 2. Linux File System

1. Features
2. Structure
3. Comparison with Windows
4. Paths



## 2.3. Linux File System Comparison

- Everything “hangs” from root
- Files are classified by type / role instead of unit location
- Files locations in disks are invisible for users



## 2. Linux File System

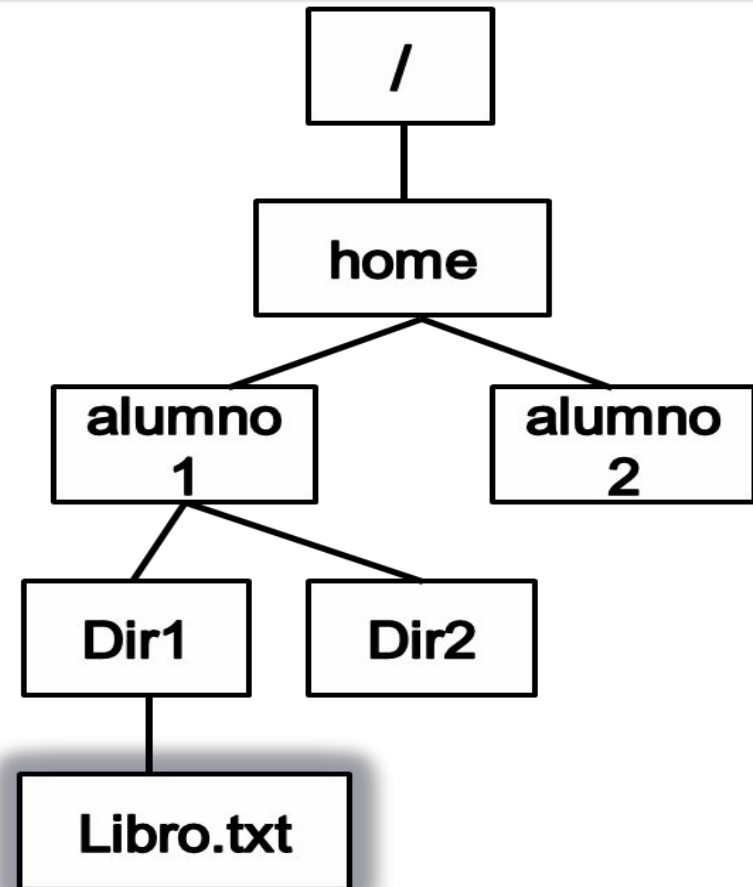
1. Features
2. Structure
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4. Paths

## 2.4. Linux File System Paths

- PATH:
  - **Absolute path:**
    - Location of a file or directory from the root directory (/).
    - Static.
    - Ej: /home/alumno1/dir1/book.txt
  - **Relative path:**
    - Path related to the present working directory (pwd).
    - Variable
    - Actual pwd = “.”
    - Parent directory = “..”
    - Ej: Path to book.txt
      - From /home: ./alumno1/dir1/book.txt
      - From /home/alumno1: dir1/book.txt
      - From /home/alumno1/dir1: book.txt

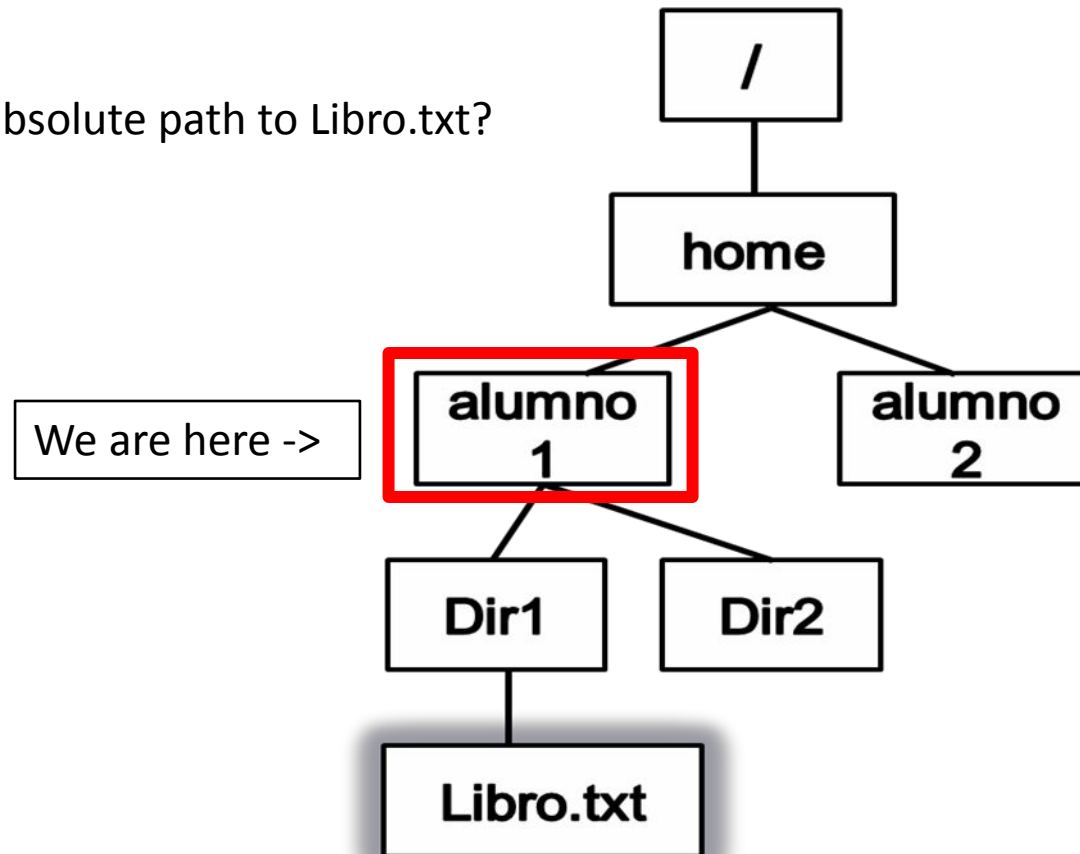
## 2.4. Linux File System Paths

- Example
  - `../../` To go *home* from *Dir1* or *Dir2*
  - `../../alumno2` To go *alumno2* from *Dir1* o *Dir2*.
  - `../Dir2` To go from *Dir1* to *Dir2*.



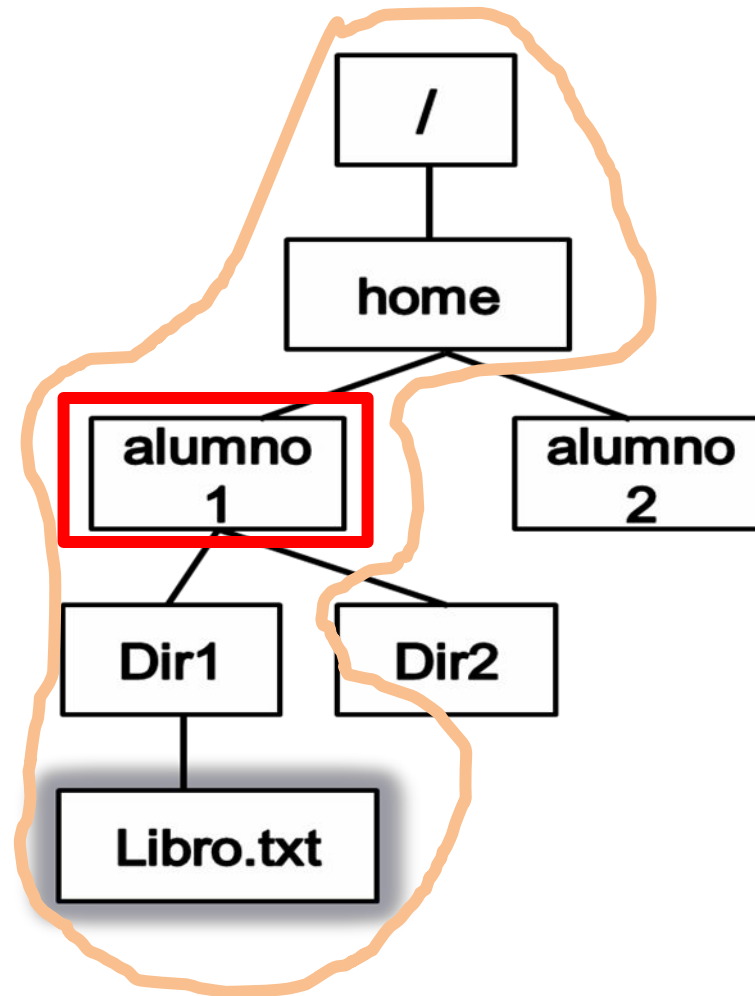
## 2.4. Linux File System Paths

Which is the absolute path to Libro.txt?



## 2.4. Linux File System Paths

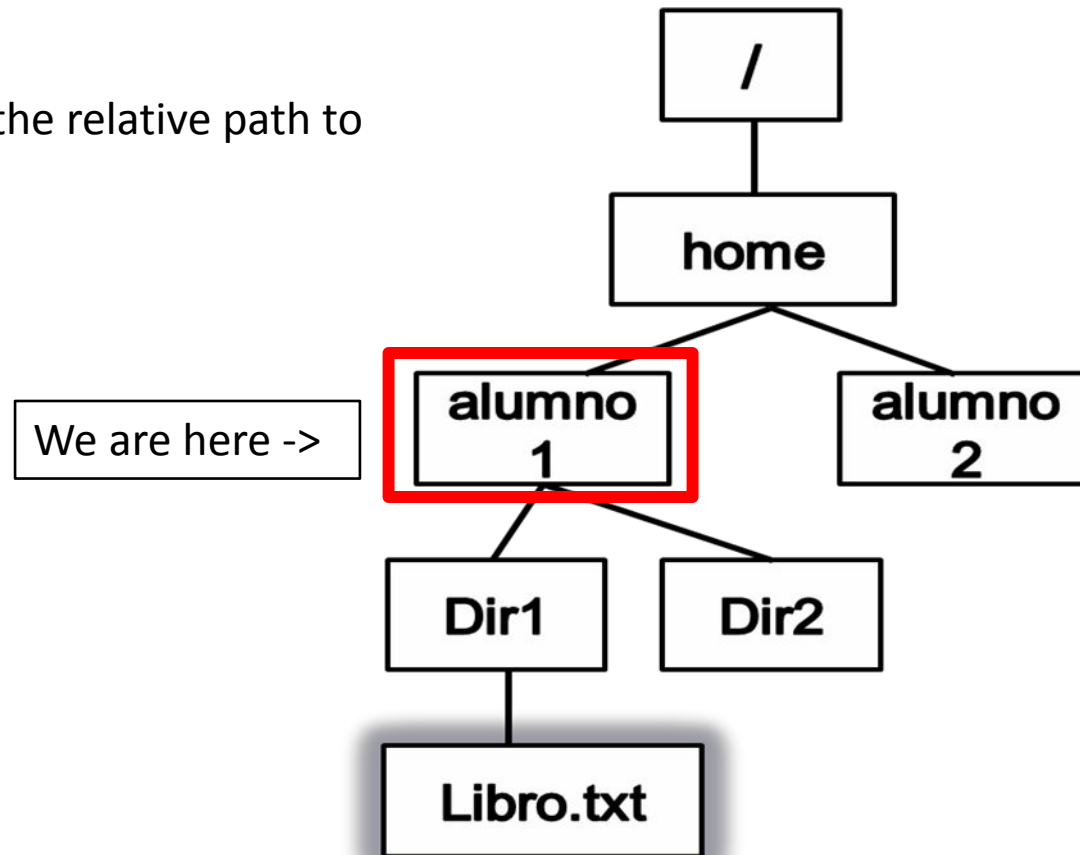
No matter where we are



Absolute path  
/home/alumno1/Dir1/Libro.txt

## 2.4. Linux File System Paths

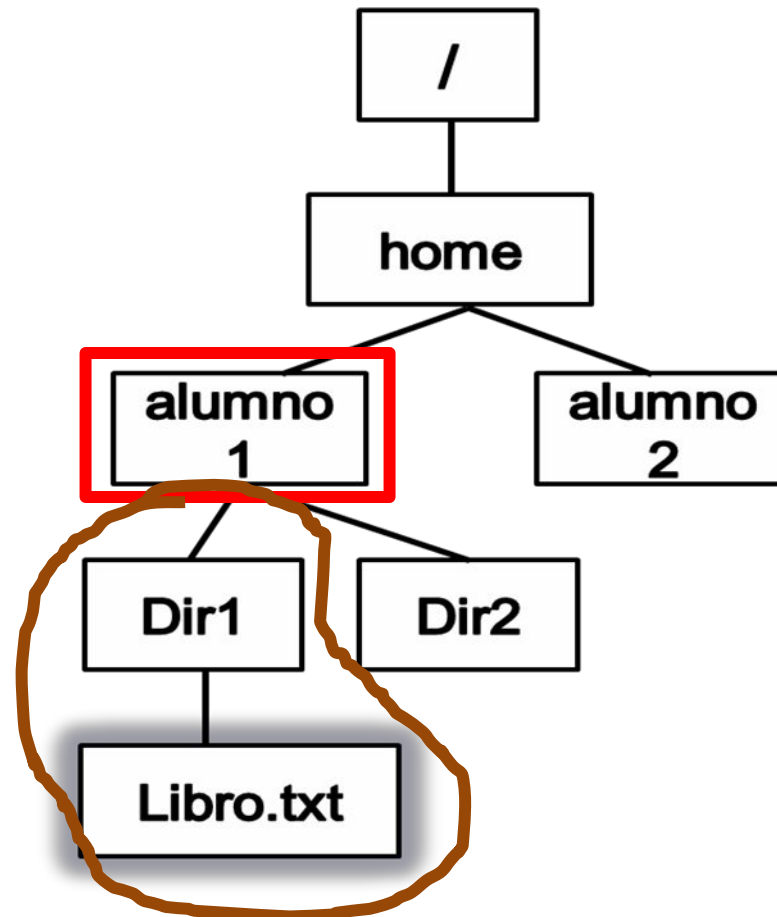
Which is the the relative path to Libro.txt? ?



## 2.4. Linux File System Paths

Important pwd or “.”

Relative paths:  
./Dir1/Libro.txt  
or Dir1/Libro.txt





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## 3. Basic Commands

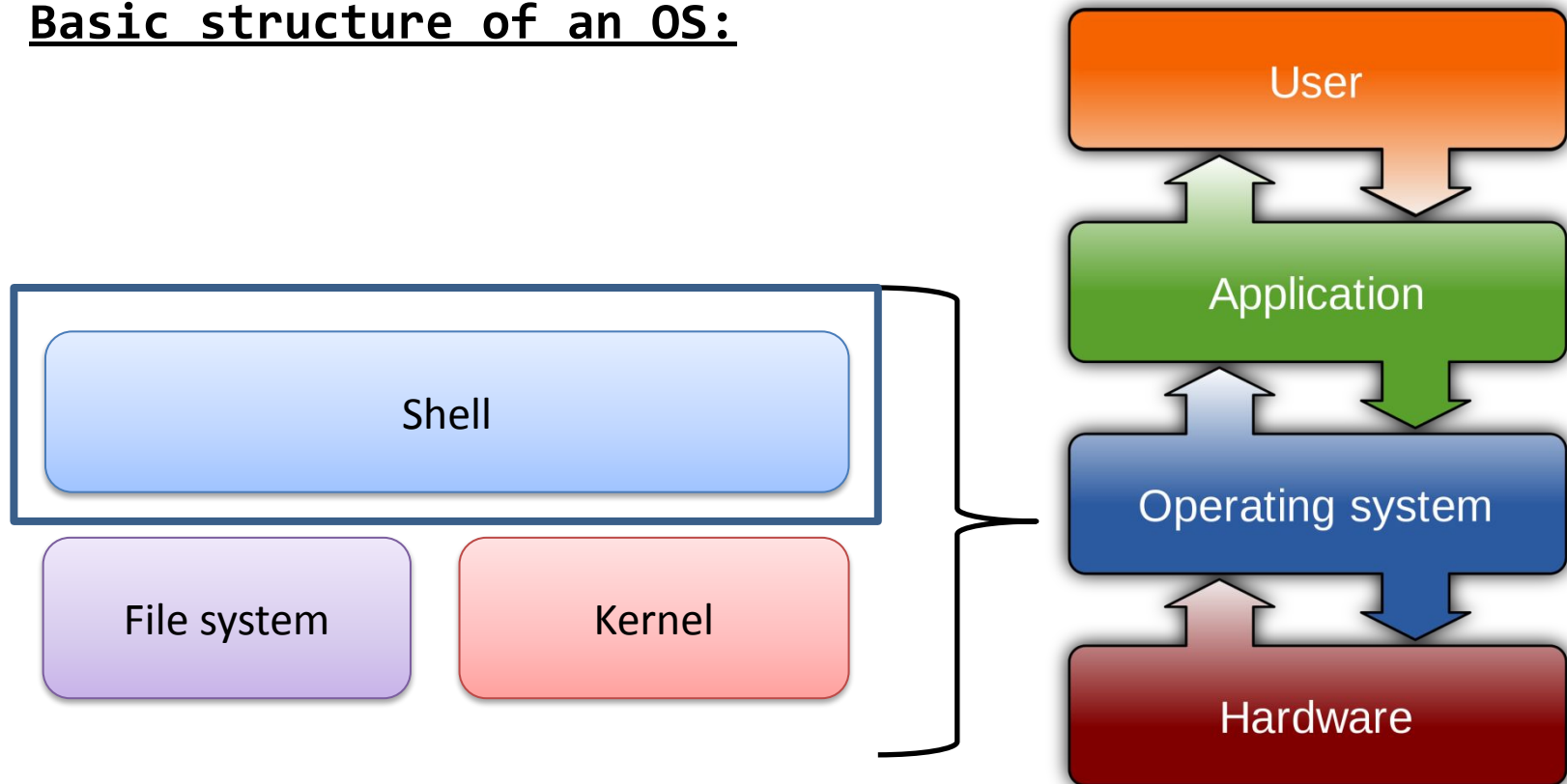
1. Shell

2. Prompt

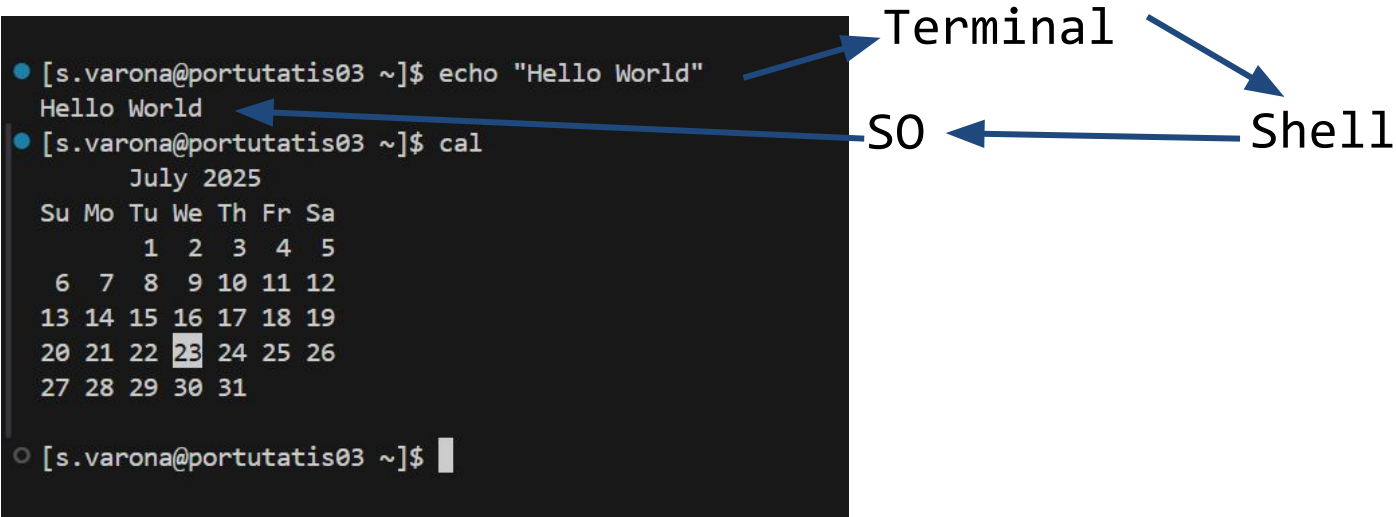
3. Basic Commands

## 3.1. Shell

### Basic structure of an OS:



## 3.1. Shell



A terminal window showing two commands and their outputs. The first command is `echo "Hello World"`, which outputs `Hello World`. The second command is `cal`, which outputs a calendar for July 2025. The calendar shows days of the week (Su, Mo, Tu, We, Th, Fr, Sa) and dates (1-31). The date 23 is highlighted. Annotations with blue arrows point from the text 'Terminal' to the terminal window, from 'Shell' to the prompt `[s.varona@portutatis03 ~]`, and from 'SO' to the output `Hello World`.

```
[s.varona@portutatis03 ~]$ echo "Hello World"
Hello World
[s.varona@portutatis03 ~]$ cal
      July 2025
Su Mo Tu We Th Fr Sa
                1  2  3  4  5
 6  7  8  9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 31

[s.varona@portutatis03 ~]$
```

Terminal

SO

Shell

## 3.1. Shell

```
[s.varona@portutatis03 ~]$ echo "Hello World"
Hello World
[s.varona@portutatis03 ~]$ cal
      July 2025
Su Mo Tu We Th Fr Sa
                1  2  3  4  5
 6  7  8  9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 31
[s.varona@portutatis03 ~]$
```

Terminal

SO

Shell

### Bash

- Navigate the file system
- Run programs and scripts
- Manage processes
- Administer users and permissions
- Automate repetitive tasks

## 3. Basic Commands

1. Shell

2. Prompt

3. Basic Commands

## 3.2. Shell's prompt

- Shell waits for the user to write commands in a line called prompt.
- Prompt line gives some important information that can be easily understood:

```
[alumno01@portutatis03 ~]$
```

\$ no privileges

# privileges

Current directory (pwd) ~ = /home/user

Hostname (machine's name)

User name

- This example prompt gives the information that the user is user, which has no admin privileges, which is connected to portutatis03 node in the HPC, and the directory where user is located is the /home/user folder.

## 3. Basic Commands

1. Shell

2. Prompt

3. Basic Commands



# pwd (Print Working Directory)

Shows the current directory

```
• [s.varona@portutatis03 ~]$ pwd  
  /home/s.varona  
○ [s.varona@portutatis03 ~]$
```



# ls (List)

List the content of a directory

```
• [s.varona@portutatis03 ~]$ pwd  
/home/s.varona  
• [s.varona@portutatis03 ~]$ ls  
Descargas Documentos imagen.png script.sh  
○ [s.varona@portutatis03 ~]$
```



## cd (Change Directory)

Move from one directory to another

```
• [s.varona@portutatis03 ~]$ pwd  
/home/s.varona  
• [s.varona@portutatis03 ~]$ ls  
Descargas Documentos imagen.png script  
• [s.varona@portutatis03 ~]$ cd Documentos/  
• [s.varona@portutatis03 Documentos]$ pwd  
/home/s.varona/Documentos  
• [s.varona@portutatis03 Documentos]$
```



# cd (Change Direcotry)

Move from one directory to another

```
• [s.varona@portutatis03 ~]$ pwd
/home/s.varona
• [s.varona@portutatis03 ~]$ cd Documentos/
• [s.varona@portutatis03 Documentos]$ pwd
/home/s.varona/Documentos
• [s.varona@portutatis03 Documentos]$ cd ..
• [s.varona@portutatis03 ~]$ pwd
/home/s.varona
• [s.varona@portutatis03 ~]$
```

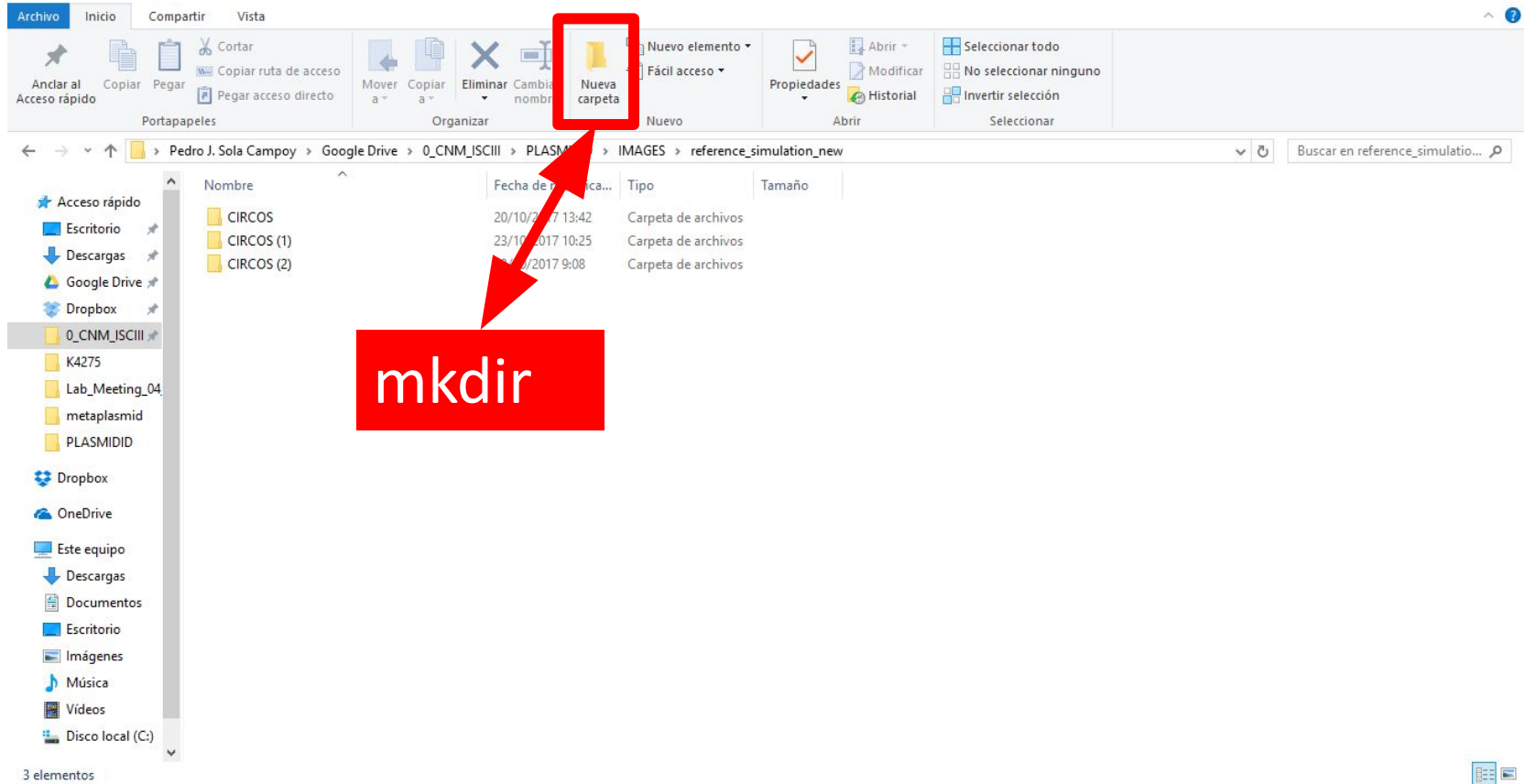
. = Current pwd  
.. = Parent directory

# mkdir (Make Directory)

Create an empty directory

```
• [s.varona@portutatis03 ~]$ pwd  
/home/s.varona  
• [s.varona@portutatis03 ~]$ ls  
Descargas Documentos imagen.png script.sh  
• [s.varona@portutatis03 ~]$ mkdir Carpeta_prueba  
• [s.varona@portutatis03 ~]$ ls  
Carpeta_prueba Descargas Documentos imagen.png script.sh  
○ [s.varona@portutatis03 ~]$
```

# mkdir (Make Directory)





## rm (Remove)

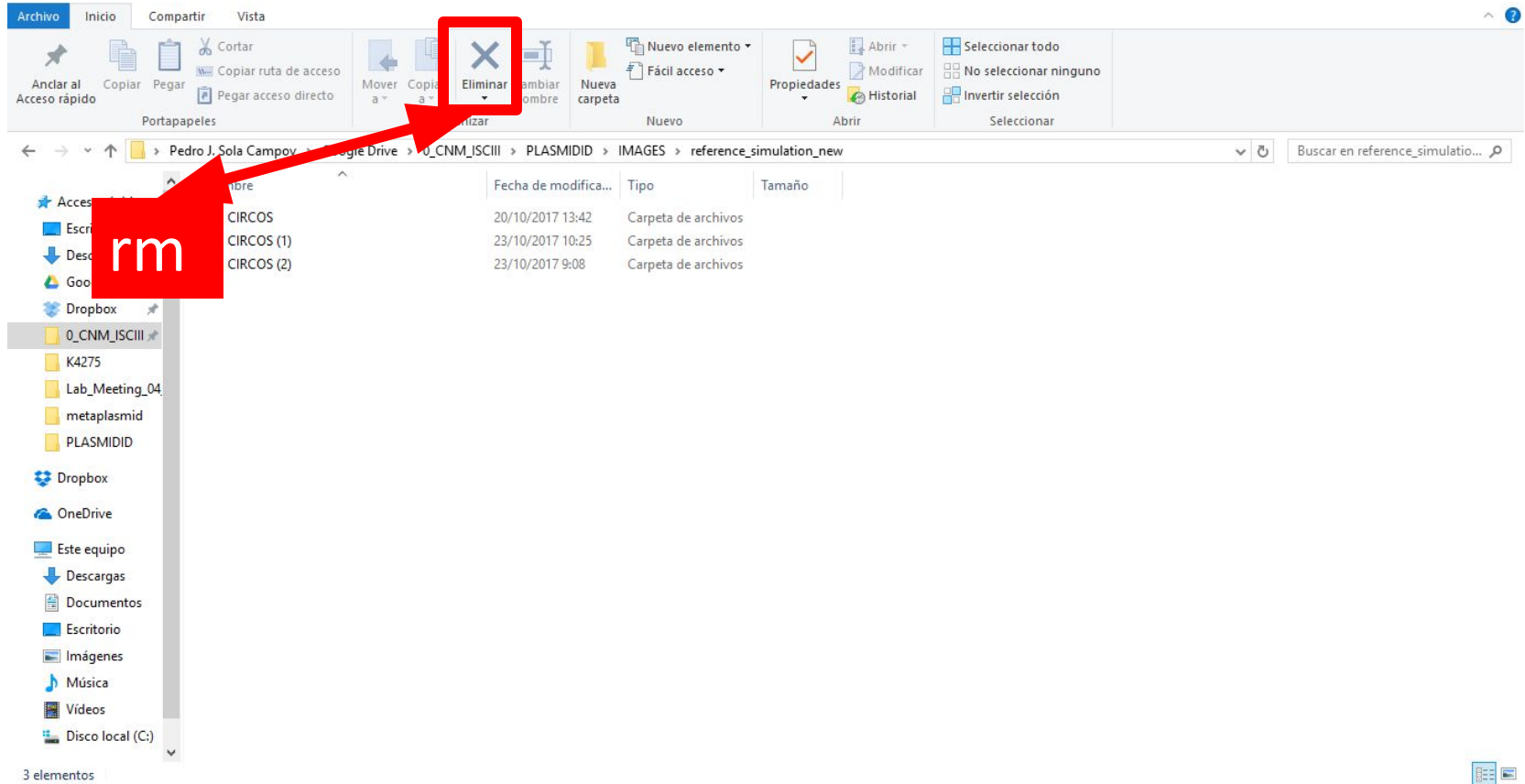
Remove files

```
• [s.varona@portutatis03 ~]$ ls  
Carpeta_prueba Descargas Documentos imagen.png script.sh  
• [s.varona@portutatis03 ~]$ rm imagen.png  
• [s.varona@portutatis03 ~]$ ls  
Carpeta_prueba Descargas Documentos script.sh  
○ [s.varona@portutatis03 ~]$
```



It doesn't ask for a confirmation

# rm (Remove)





## rmdir (Remove Directory)

Remove empty directories

```
• [s.varona@portutatis03 ~]$ ls  
Carpeta_prueba Descargas Documentos script.sh  
• [s.varona@portutatis03 ~]$ rmdir Carpeta_prueba/  
• [s.varona@portutatis03 ~]$ ls  
Descargas Documentos script.sh  
○ [s.varona@portutatis03 ~]$
```



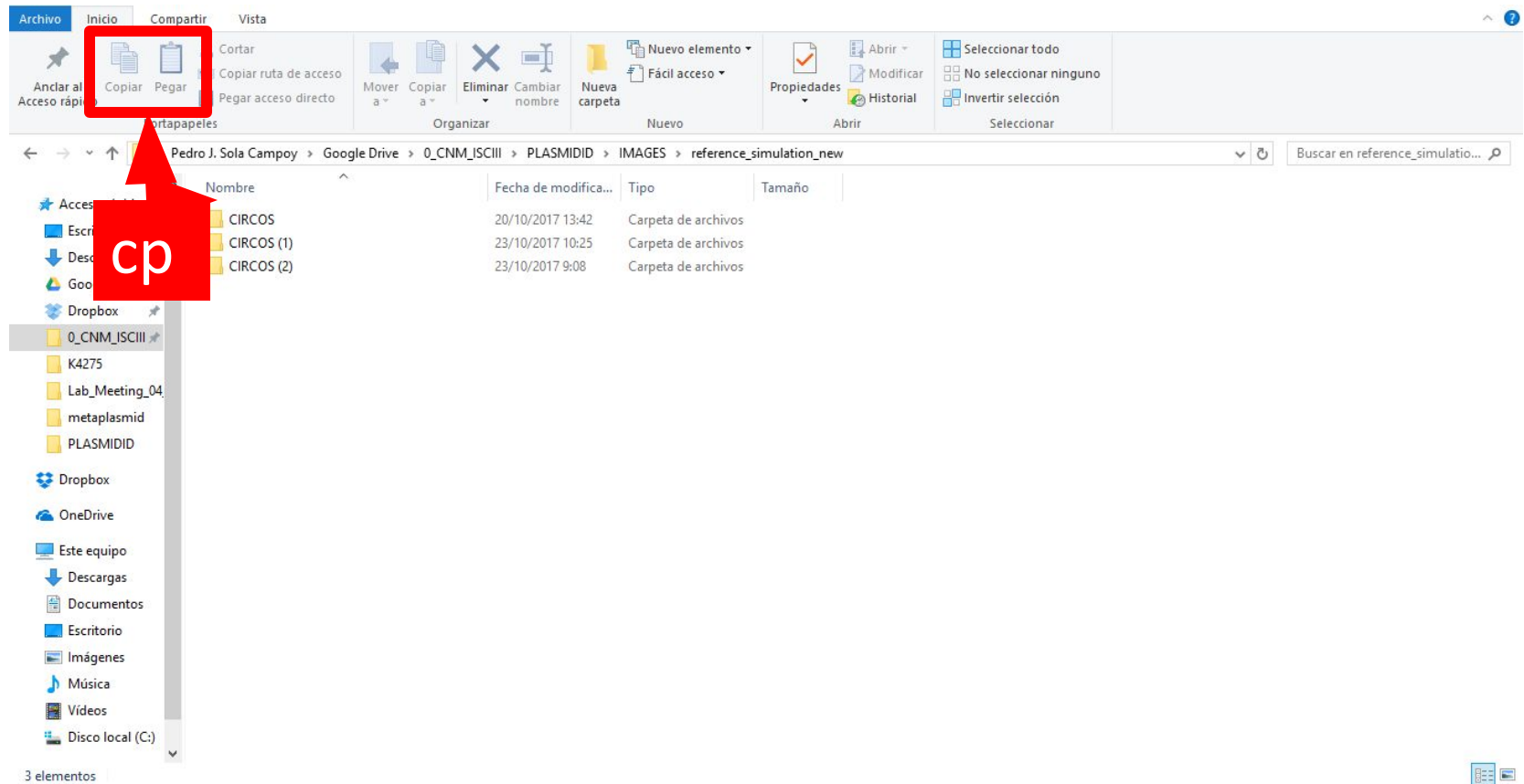
It doesn't ask for a confirmation

## cp (Copy)

Copy a file

```
• [s.varona@portutatis03 ~]$ ls  
Descargas Documentos script.sh  
• [s.varona@portutatis03 ~]$ cp script.sh copia_script.sh  
• [s.varona@portutatis03 ~]$ ls  
copia_script.sh Descargas Documentos script.sh  
○ [s.varona@portutatis03 ~]$
```

# cp (Copy)

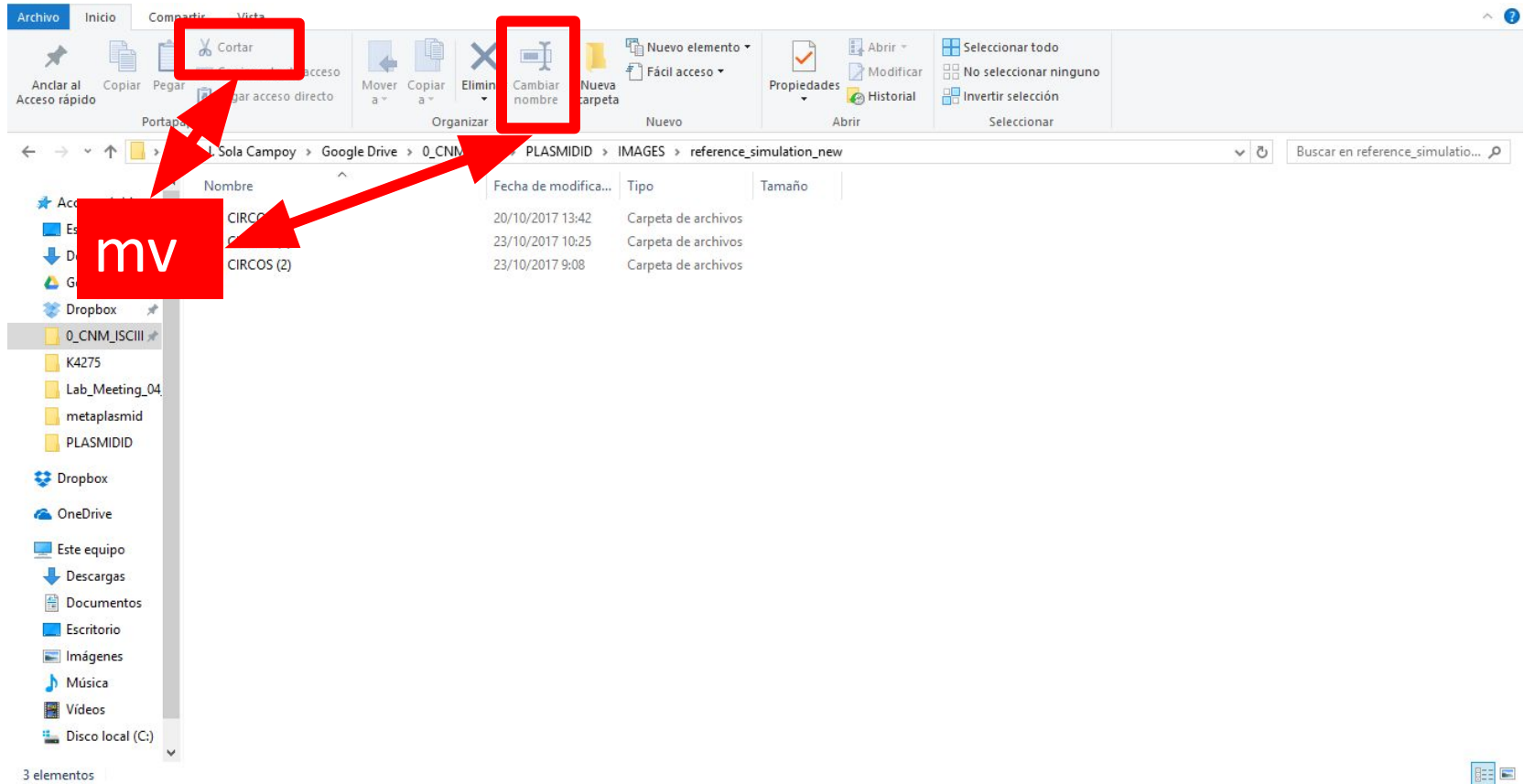


## mv (Move)

Rename a file or move it to another directory

```
• [s.varona@portutatis03 ~]$ ls  
copia_script.sh Descargas Documentos script.sh  
• [s.varona@portutatis03 ~]$ mv copia_script.sh script_de_pruebas.sh  
• [s.varona@portutatis03 ~]$ ls  
Descargas Documentos script_de_pruebas.sh script.sh  
• [s.varona@portutatis03 ~]$ mv script_de_pruebas.sh Documentos/  
• [s.varona@portutatis03 ~]$ ls  
Descargas Documentos script.sh  
• [s.varona@portutatis03 ~]$ ls Documentos/  
script_de_pruebas.sh  
• [s.varona@portutatis03 ~]$
```

# mv (Move)



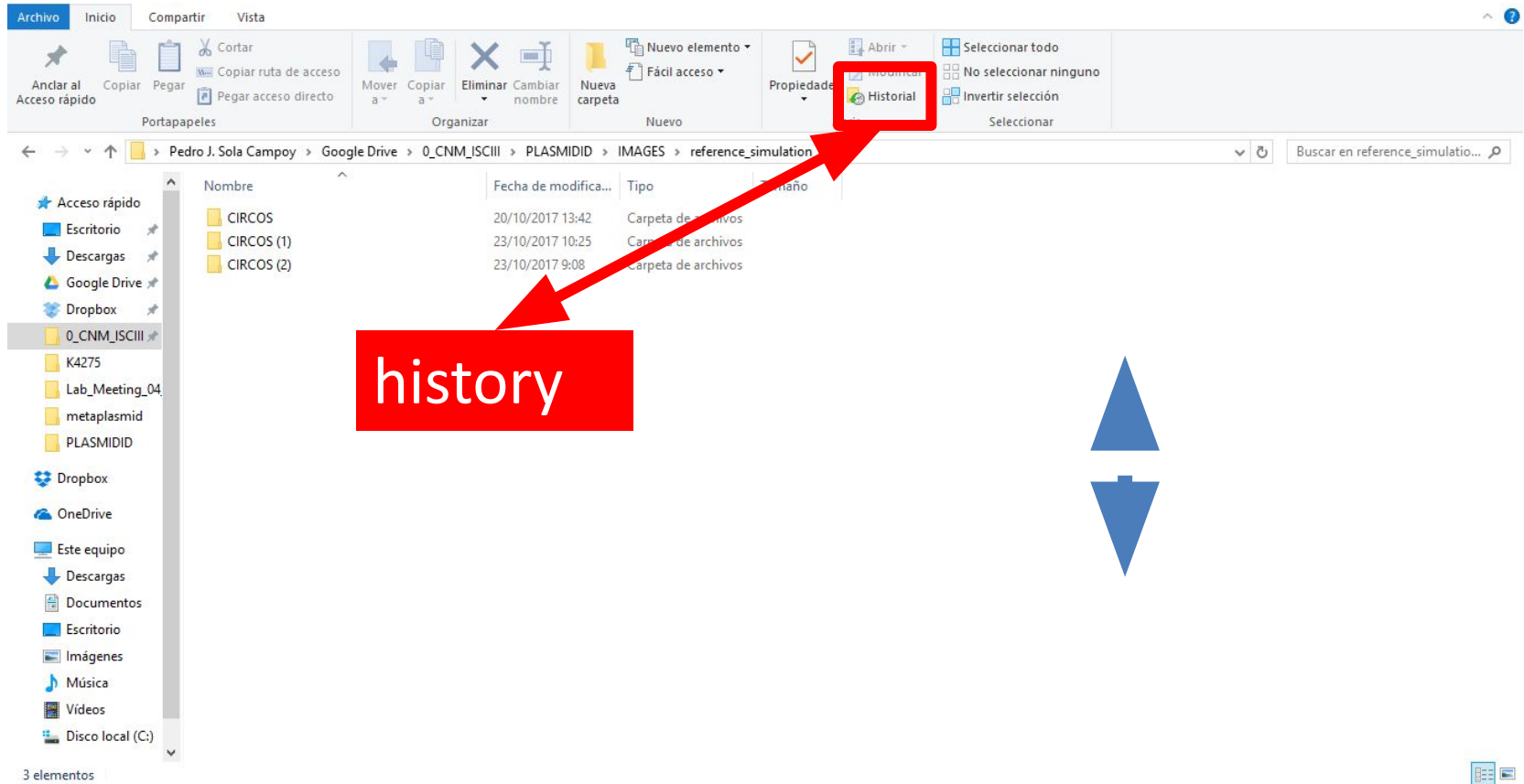
# history

Show history of commands used

```
• [s.varona@portutatis03 ~]$ history
1008 24/07/25 19:58:09 ls
1009 24/07/25 19:58:09 mv copia_script.sh script_de_pruebas.sh
1010 24/07/25 19:58:11 ls
1011 24/07/25 19:58:18 mv script_de_pruebas.sh Documentos/
1012 24/07/25 19:58:20 ls
1013 24/07/25 19:58:22 ls Documentos/
1014 24/07/25 19:58:36 mv Documentos/* Descargas/
1015 24/07/25 19:58:43 mv Descargas/script_de_pruebas.sh Documentos/
1016 24/07/25 19:58:46 ls Documentos/
1017 24/07/25 19:59:48 history
```



# history



# less (Historial)

Show content of a file

```
#!/bin/bash  
echo "Hello World"  
script.sh (END)
```



# nano

Text editor

```
GNU nano 2.9.8

#!/bin/bash
echob "Hello World"

blablabla
```

Save: ctrl+o > Intro

Exit: ctrl+x

# Basic Commands

**REMEMBER:**

**TAB is your friend!**

**Hit it to autocomplete a command, file,  
path or get suggestion to do it**

# Overview

1. Linux OS
2. Linux file system
3. Basic commands
4. Command line syntax
5. Linux users and privileges

## 4. Command Line Syntax

1. Syntax
2. Input
3. Output
4. Redirect
5. Pipes
6. WildCards and Regular expressions

## 4.1. Command Line Syntax

Linux command line follows a simple syntax common to every command and program you can execute on it:

`Command [options o parameters] [arguments]`

- Options are characters or words preceded by a dash (``ls -la``). They change the way a program works by default.
- Arguments are other parameters that the program may need to run. The most common ones usually are the input files.
- REMEMBER: most programs have a `-h` or `--help` option which displays a short description and usage guide.

## 4.1. Command Line Syntax

```
• [s.varona@portutatis03 ~]$ ls
Descargas Documentos script.sh
• [s.varona@portutatis03 ~]$ ls -l
total 8
drwxrwxr-x 4 s.varona s.varona 4096 Jul 24 19:58 Descargas
drwxrwxr-x 2 s.varona s.varona 4096 Jul 24 19:58 Documentos
-rw-rw-r-- 1 s.varona s.varona  32 Jul 24 19:27 script.sh
• [s.varona@portutatis03 ~]$ ls -l -a
total 300
drwx----- 19 s.varona s.varona  4096 Jul 24 19:58 .
drwxr-xr-x 74 root      root      8192 Jul  7 13:11 ..
-rw-----  1 s.varona s.varona 35351 Jul 24 16:09 .bash_history
-rw-r--r--  1 s.varona s.varona   18 Jan 17  2022 .bash_logout
-rw-r--r--  1 s.varona s.varona  141 Jan 17  2022 .bash_profile
drwxrwxr-x  4 s.varona s.varona  4096 Jul 24 19:58 Descargas
drwxrwxr-x  2 s.varona s.varona  4096 Jul 24 19:58 Documentos
-rw-rw-r--  1 s.varona s.varona   32 Jul 24 19:27 script.sh
```

## 4.1. Command Line Syntax

```
• [s.varona@portutatis03 ~]$ ls      From      To
  Descargas Documentos script.sh
• [s.varona@portutatis03 ~]$ cp script.sh copia_script.sh
• [s.varona@portutatis03 ~]$ ls
  copia_script.sh Descargas Documentos script.sh
• [s.varona@portutatis03 ~]$
```

## 4. Command Line Syntax

1. Syntax

2. Input

3. Output

4. Redirect

5. Pipes

6. WildCards and Regular expressions



## 4.2. Input

Standard Input (stdin): The data a command receives.

```
• [s.varona@portutatis03 ~]$ cat script.sh
#!/bin/bash
echo "Hello World"
• [s.varona@portutatis03 ~]$ cat
hola
hola
mundo
mundo
○ [s.varona@portutatis03 ~]$
```

## 4. Command Line Syntax

1. Syntax
2. Input
3. Output
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5. Pipes
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# Input/Output

stdin

stdout

```
• [s.varona@portutatis03 ~]$ cat script.sh
#!/bin/bash
echo "Hello World"
• [s.varona@portutatis03 ~]$ cat
hola
hola
mundo
mundo
• [s.varona@portutatis03 ~]$
```

## 4. Command Line Syntax

1. Syntax
2. Input
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4. Redirect
5. Pipes

## 4.4. Redirect

Redirect stdout (>)

```
• [s.varona@portutatis03 ~]$ echo "Hola mundo" > saludo.txt  
• [s.varona@portutatis03 ~]$ cat saludo.txt  
  Hola mundo  
○ [s.varona@portutatis03 ~]$
```

## 4.4. Redirect

Redirect stdout at the end (>>)

```
• [s.varona@portutatis03 ~]$ echo "Hola mundo" > saludo.txt
• [s.varona@portutatis03 ~]$ cat saludo.txt
Hola mundo
• [s.varona@portutatis03 ~]$ echo "Otra línea" >> saludo.txt
• [s.varona@portutatis03 ~]$ cat saludo.txt
Hola mundo
Otra línea
○ [s.varona@portutatis03 ~]$
```

## 4.4. Redirect

Input from file (<)

```
• [s.varona@portutatis03 ~]$ cat < saludo.txt  
  Hola mundo  
  Otra línea  
○ [s.varona@portutatis03 ~]$
```



## 4.4. Redirect

Redirect error log (2>)

```
⊗ [s.varona@portutatis03 ~]$ cat archivo_que_no_existe.txt 2> error.txt
● [s.varona@portutatis03 ~]$ cat error.txt
cat: archivo_que_no_existe.txt: No such file or directory
⊗ [s.varona@portutatis03 ~]$ cat archivo_que_no_existe.txt
cat: archivo_que_no_existe.txt: No such file or directory
○ [s.varona@portutatis03 ~]$
```

## 4.4. Redirect

Redirect error log and output (2>&1)

```
⊗ [s.varona@portutatis03 ~]$ cat archivo_que_no_existe.txt > salida.txt 2>&1  
● [s.varona@portutatis03 ~]$ cat salida.txt  
cat: archivo_que_no_existe.txt: No such file or directory  
○ [s.varona@portutatis03 ~]$
```

## 4. Command Line Syntax

1. Syntax
2. Input
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5. Pipes
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## 4.5. Pipes

Connect stdout from a command to stdin of another command

```
[Command A] --output--> | --input--> [Command B]
```

## 4.5. Pipes

Connect stdout from a command to stdin of another command

```
[Command A] --output--> | --input--> [Command B]
```

```
• [s.varona@portutatis03 ~]$ ls -r
  textos.txt  script.sh  saludo.txt  salida.txt  error.txt  Documentos  Descargas
• [s.varona@portutatis03 ~]$ ls -r | sort
Descargas
Documentos
error.txt
salida.txt
saludo.txt
script.sh
textos.txt
```

## 4.5. Pipes

Connect stdout from a command to stdin of another command

```
[Command A] --output--> | --input--> [Command B]
```

```
• [s.varona@portutatis03 ~]$ ls -r
textos.txt script.sh saludo.txt salida.txt error.txt Documentos Descargas
• [s.varona@portutatis03 ~]$ ls -r | sort
Descargas
Documentos
error.txt
salida.txt
saludo.txt
script.sh
textos.txt
• [s.varona@portutatis03 ~]$ ls | wc -l
7
○ [s.varona@portutatis03 ~]$
```

## 4.5. Pipes

```
• [s.varona@portutatis03 ~]$ ls
Descargas Documentos error.txt salida.txt saludo.txt script.sh
• [s.varona@portutatis03 ~]$ cat *.txt *.sh | sort > textos.txt
• [s.varona@portutatis03 ~]$ ls
Descargas Documentos error.txt salida.txt saludo.txt script.sh textos.txt
• [s.varona@portutatis03 ~]$ cat textos.txt
#!/bin/bash
cat: archivo_que_no_existe.txt: No such file or directory
cat: archivo_que_no_existe.txt: No such file or directory
echob "Hello World"
Hola mundo
Otra línea
• [s.varona@portutatis03 ~]$
```

## 4. Command Line Syntax

1. Syntax
2. Input
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6. WildCards and Regular expressions



## 4.6. WildCards and Regular expressions

Patterns used to search, match, or validate text in strings

Pattern	Meaning	Use example	What finds
*	Zero or more repetitions	file*.txt	fileee.txt file1.txt files.txt
^	Start of the string	^file	file.pdf file.txt files.docx
\$	End of the string	.txt\$	file.txt document.txt
\t	Tabular	Name\tAge John\t25	Name    Age John    25
\s	White space	John\sSmith	John Smith

# Overview

1. Linux OS
2. Linux file system
3. Basic commands
4. Command line syntax
5. Linux users and privileges

## 5. Linux users and privileges

1. Users

2. Permissions

3. Change permissions

## 5.1. Linux Users

- Access entity to system resources
- Each user has:
  - A username
  - A user identifier (UID)
  - A primary group (GID)
  - A home directory (for example, /home/user)
  - A command-line interpreter (shell, such as /bin/bash)
- Type of entities:
  - Normal user:
    - Limited access
    - Only modify owner files
  - Root user:
    - Sysadmin
    - Total access
    - Un/Install software
  - Groups:
    - Group of users to manage collective permissions.

## 5.1. Linux Users

- Users can be linked to a person or computer process
- Every user may belong to one or more groups
- Every user may has a home folder inside /home
- Users own the files they create, directly or indirectly
- Users can change permissions on files they own
- Users also own processes they execute
- Root rules over them all
- Root home folder is in /root

## 5. Linux users and privileges

1. Users

2. Permissions

3. Change permissions

## 5.2. Linux Permissions

To view file permissions and ownership on files and directories, use the `ls -l` command. For example:

```
drwxrwxr-x 2 s.varona s.varona 4096 Jul 24 19:58 Documentos
```

- `drwxrwxr-x` are the permissions
- `2` is the number of files or directories
- `user` is the owner
- `user` is the group
- `4096` is the size in bytes
- `Jan 9 10:11` is the date/time of last access
- `documents` is the directory

## 5.2. Linux Permissions

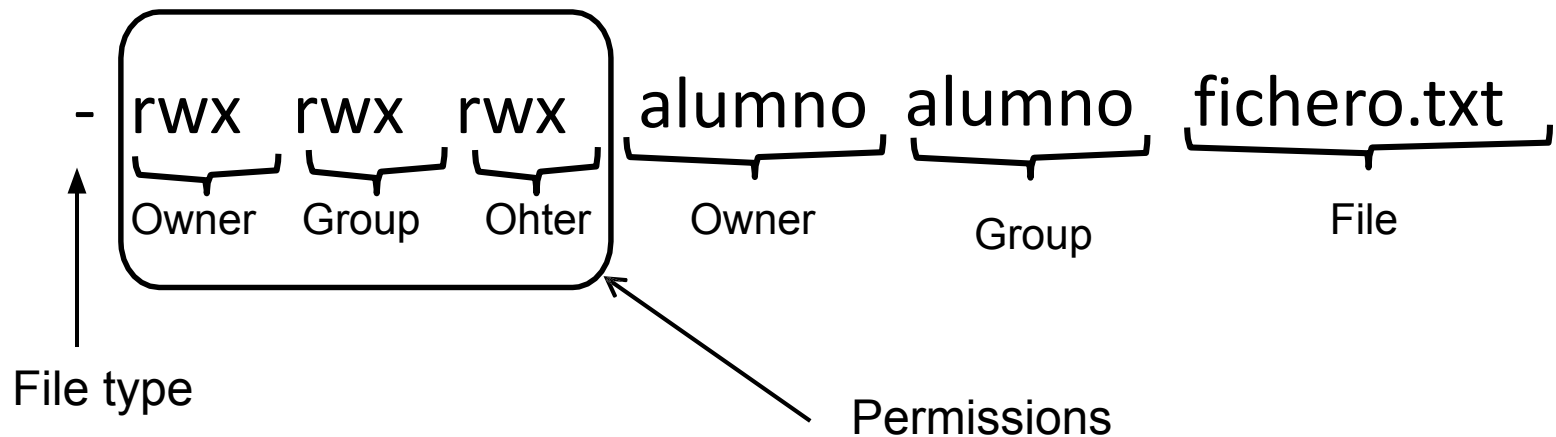
Permissions are the “rights” to act on a file or directory. There are only 3 basic permissions:

- **Read (r)** - allows the contents of the file to be viewed. A read permission on a directory allows you to list the contents of a directory.
- **Write (w)** - allows you to modify the contents of that file. For a directory, the write permission allows you to edit the contents of a directory.
- **Execute (x)** - for a file, the executable permission allows you to run the file and execute a program or script. For a directory, the execute permission allows you to enter the directory and make it your current working directory (pwd or “.”).



## 5.2. Linux Permissions

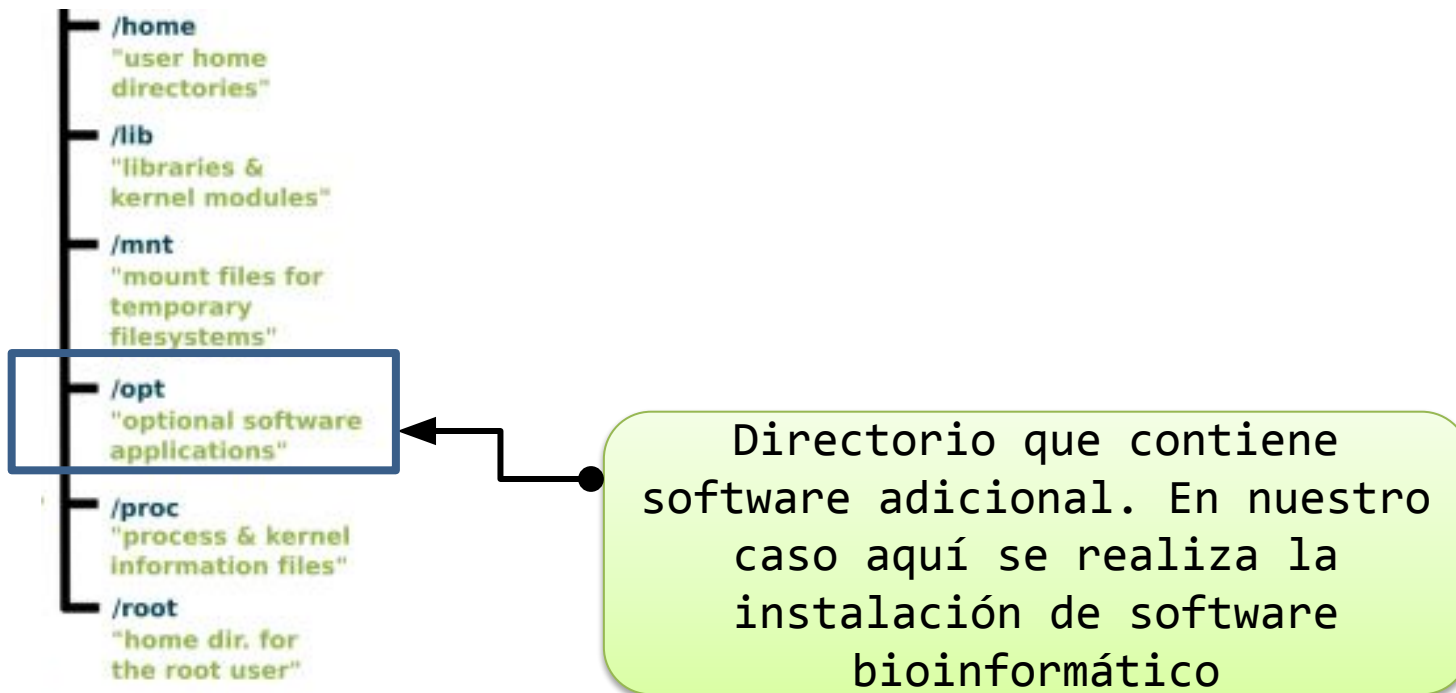
- A file's rights can only be modified by the owner of the file, the group owning the file and the root
- The system stores this right information in a 9 bits sequence.
- This sequence has a sequence of 3 elements for each 3 groups:



## 5.2. Linux Permissions

- Examples:
  - Example 1: `/opt` directory

## 5.2. Linux Permissions



## 5.2. Linux Permissions

- Examples:
  - Example 1: /opt directory:

<code>drwxr-xr-x</code>	<code>root</code>	<code>root</code>	<code>opt</code>
-------------------------	-------------------	-------------------	------------------

- Owner (root) can read, write and execute
- Group (root) and rest can only read and execute

## 5.2. Linux Permissions

- Examples:
  - Example 2: personal directory : `/home/alumno`

```
drwx----- alumno clase alumno
```

- Owner (alumno) can read, modify and access the directory
- Group (clase) and rest can't do anything

## 5.2. Linux Permissions

- Examples:
  - Example 3: /tmp :

drwxrwxrwx	root	root	tmp
------------	------	------	-----

- ???

## 5.2. Linux Permissions

- Examples:
  - Example 3: tmp :

<code>drwxrwxrwx</code>	<code>root</code>	<code>root</code>	<code>tmp</code>
-------------------------	-------------------	-------------------	------------------

- Everybody has permissions for everything

## 5.2. Linux Permissions

To view file permissions and ownership on files and directories, use the `ls -al` command. For example:

```
drwxr-xr-x 2 user user 4096 Jan  9 10:11 documents
```

`drwxr-xr-x` are the permissions

`2` is the number of files or directories

`user` is the owner

`user` is the group

`4096` is the size in bytes

`Jan 9 10:11` is the date/time of last access

`documents` is the directory



## 5.2. Linux Permissions

Following previous example:

```
drwxrw-r-- 2 user user 4096 Jan  9 10:11 documents
```

```
?????
```

## 5.2. Linux Permissions

Following previous example:

```
drwxrw-r-- 2 user user 4096 Jan  9 10:11 documents
```

Permissions are listed in the first 10 characters-dash section. The section can be read as follows:

`d` is a directory (`-` for files)

`rwx` the user has read, write, and execute permissions

`rw-` the group has read and write permissions

`r--` all others have read only permissions

## 5. Linux users and privileges

1. Users
2. Permissions
3. Change permissions

## 5.3. Modify Permissions

You can only change permission on files you own, while root can change permissions on any file of the system.

To change permissions, use the commands:

- ``chmod`` – change permissions

```
[s.varona@portutatis03 ~]$ ll
total 12
drwxrwxr-x 4 s.varona s.varona 4096 Jul 24 19:58 Descargas
drwxrwxr-x 2 s.varona s.varona 4096 Jul 24 19:58 Documentos
-rw-rw-r-- 1 s.varona s.varona  58 Jul 24 20:42 error.txt
-rw-rw-r-- 1 s.varona s.varona  58 Jul 24 20:43 salida.txt
-rw-rw-r-- 1 s.varona s.varona  23 Jul 24 20:40 saludo.txt
-rw-rw-r-- 1 s.varona s.varona  32 Jul 24 19:27 script.sh
-rw-rw-r-- 1 s.varona s.varona 171 Jul 24 20:47 textos.txt
[s.varona@portutatis03 ~]$ chmod 755 textos.txt
[s.varona@portutatis03 ~]$ ll
total 12
drwxrwxr-x 4 s.varona s.varona 4096 Jul 24 19:58 Descargas
drwxrwxr-x 2 s.varona s.varona 4096 Jul 24 19:58 Documentos
-rw-rw-r-- 1 s.varona s.varona  58 Jul 24 20:42 error.txt
-rw-rw-r-- 1 s.varona s.varona  58 Jul 24 20:43 salida.txt
-rw-rw-r-- 1 s.varona s.varona  23 Jul 24 20:40 saludo.txt
-rw-rw-r-- 1 s.varona s.varona  32 Jul 24 19:27 script.sh
-rwxr-xr-x 1 s.varona s.varona 171 Jul 24 20:47 textos.txt
[s.varona@portutatis03 ~]$
```

``rwx`` to owner ( $7 = 4 + 2 + 1$ )

``rx`` to group ( $5 = 4 + 0 + 1$ )

``rx`` to others ( $5 = 4 + 0 + 1$ )

## 5.3. Modify Permissions

- `chown` - change owner

```
• [s.varona@portutatis03 ~]$ ll
total 12
drwxrwxr-x 4 s.varona s.varona 4096 Jul 24 19:58 Descargas
drwxrwxr-x 2 s.varona s.varona 4096 Jul 24 19:58 Documentos
-rw-rw-r-- 1 s.varona s.varona  58 Jul 24 20:42 error.txt
-rw-rw-r-- 1 s.varona s.varona  58 Jul 24 20:43 salida.txt
-rw-rw-r-- 1 s.varona s.varona  23 Jul 24 20:40 saludo.txt
-rw-rw-r-- 1 s.varona s.varona  32 Jul 24 19:27 script.sh
-rwxr-xr-x 1 s.varona s.varona  171 Jul 24 20:47 textos.txt
• [s.varona@portutatis03 ~]$ chown s.varona:bi textos.txt
• [s.varona@portutatis03 ~]$ ll
total 12
drwxrwxr-x 4 s.varona s.varona 4096 Jul 24 19:58 Descargas
drwxrwxr-x 2 s.varona s.varona 4096 Jul 24 19:58 Documentos
-rw-rw-r-- 1 s.varona s.varona  58 Jul 24 20:42 error.txt
-rw-rw-r-- 1 s.varona s.varona  58 Jul 24 20:43 salida.txt
-rw-rw-r-- 1 s.varona s.varona  23 Jul 24 20:40 saludo.txt
-rw-rw-r-- 1 s.varona s.varona  32 Jul 24 19:27 script.sh
-rwxr-xr-x 1 s.varona bi      171 Jul 24 20:47 textos.txt
○ [s.varona@portutatis03 ~]$
```

## 5.3. Modify Permissions

- `chown` - change owner

```
• [s.varona@portutatis03 ~]$ ll
total 12
drwxrwxr-x 4 s.varona s.varona 4096 Jul 24 19:58 Descargas
drwxrwxr-x 2 s.varona s.varona 4096 Jul 24 19:58 Documentos
-rw-rw-r-- 1 s.varona s.varona  58 Jul 24 20:42 error.txt
-rw-rw-r-- 1 s.varona s.varona  58 Jul 24 20:43 salida.txt
-rw-rw-r-- 1 s.varona s.varona  23 Jul 24 20:40 saludo.txt
-rw-rw-r-- 1 s.varona s.varona  32 Jul 24 19:27 script.sh
-rwxr-xr-x 1 s.varona s.varona  171 Jul 24 20:47 textos.txt
• [s.varona@portutatis03 ~]$ chown s.varona:bi textos.txt
• [s.varona@portutatis03 ~]$ ll
total 12
drwxrwxr-x 4 s.varona s.varona 4096 Jul 24 19:58 Descargas
drwxrwxr-x 2 s.varona s.varona 4096 Jul 24 19:58 Documentos
-rw-rw-r-- 1 s.varona s.varona  58 Jul 24 20:42 error.txt
-rw-rw-r-- 1 s.varona s.varona  58 Jul 24 20:43 salida.txt
-rw-rw-r-- 1 s.varona s.varona  23 Jul 24 20:40 saludo.txt
-rw-rw-r-- 1 s.varona s.varona  32 Jul 24 19:27 script.sh
-rwxr-xr-x 1 s.varona bi      171 Jul 24 20:47 textos.txt
○ [s.varona@portutatis03 ~]$
```

## 5.3. Modify Permissions

Permissions are usually managed in octal format

Every 3 characters group belonging to a set of permissions translates to a number ranging from 0 (---) to 7 (rwx), where

- r=4
- w=2
- x=1

Example:

$$rwx = 4 + 2 + 1 = 7$$

$$rw- = 4 + 2 + 0 = 6$$

$$r-- = 4 + 0 + 0 = 4$$



Thanks for your attention!

