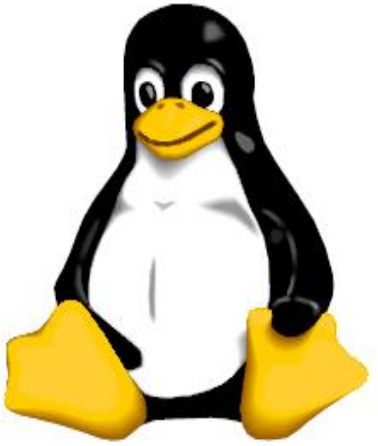
INTRODUCTION TO THE LINUX OPERATING SYSTEM (A BIT OF HISTORY)

Unix ou Linux?



NEED FOR AN OPERATING SYSTEM

A computer, with its peripherals, forms a complex computer system that is challenging to manage.

A user always hopes to use the components of a computer correctly and efficiently.

→ This is an extremely difficult task for a user.

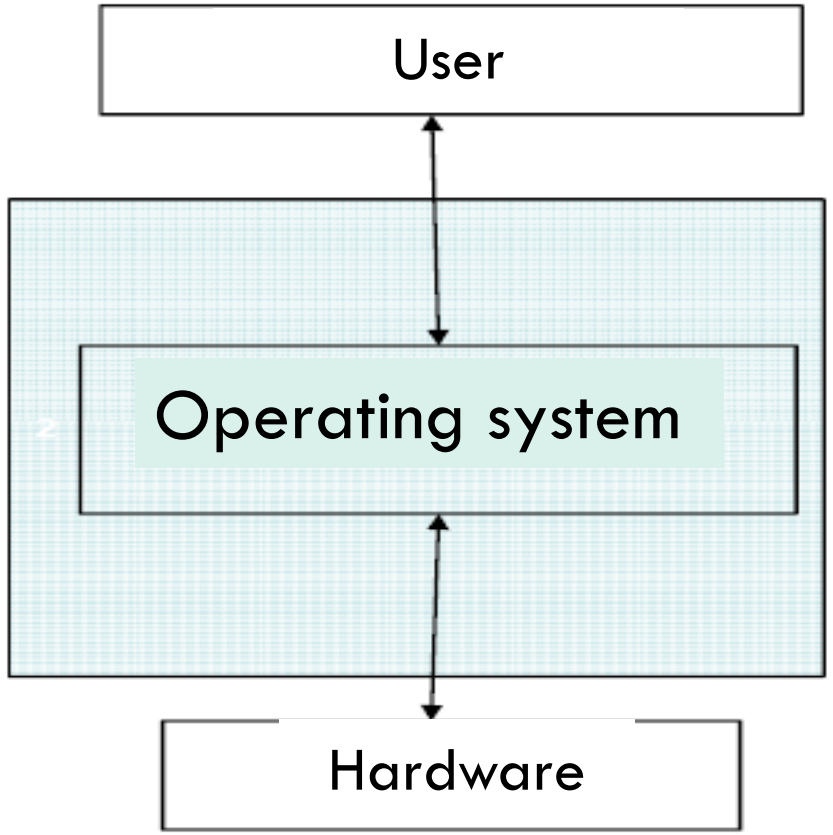
→ For this reason, computers must be equipped with an operating system.

→ The operating system is the first program that must be executed when the machine starts.

→ After the operating system starts, the computer and its peripherals are ready to be used by the user (typing on the keyboard, displaying on the screen, printing on the printer, using the mouse, etc.).

OPERATING SYSTEM (OS)

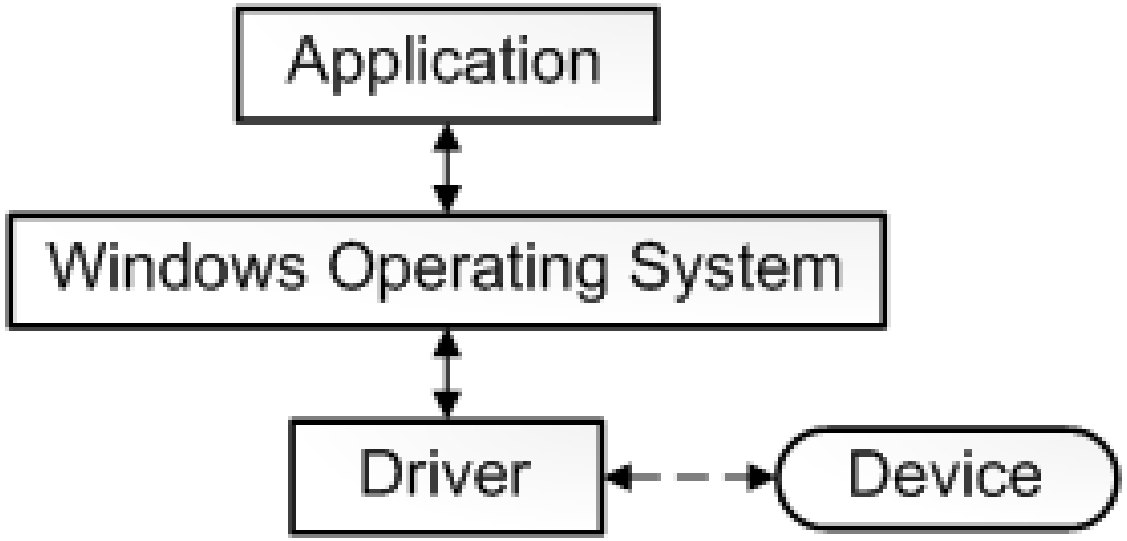
The operating system is a program that manages the computer and its peripherals; it is an intermediary program between the user and the computer's hardware.



OPERATING SYSTEM (OS)

Example: If a user wants to print a document, they CANNOT send their request directly to the printer.

- The application (Ms Word for example) request to the operating system.
- The operating system activates the part of the program that manages the printer (the printer driver).
- The driver manages the printing opeartion.
- This is how the printer operates.



THE UNIX SYSTEM

Unix is an operating system born at Bell Labs (a subsidiary of AT&T) in 1969, developed by Ken Thompson and Dennis Ritchie.

- Several companies (IBM, Sun, etc.) showed interest in the system and resumed its development to create their own versions (e.g., Solaris by Sun, AIX by IBM, HP-UX by HP, BSD by the University of Berkeley, etc.).

THE UNIX SYSTEM

It is the most widely used system.

- In universities (educational, open, with readily available documentation), research centers.
- On the Internet's servers..."

CHARACTERISTICS OF UNIX.

- **Multi-tasking :** Running multiple programs (many programs are loaded in the central memory) simultaneously.
- **Multi-user:** Multiple users can use the machine at the same time.
- **Open System:** Its operating principles are well-documented and widely known.
- **Proprietary System:** Requires purchase of the operating system, specific hardware (unique machines for each version), and applications (word processors, spreadsheets, etc.).

The Birth of Linux

• People wanted to have a high-performance operating system like **Unix** that runs on personal computers (and not **dedicated machines**).

Linus Torvalds

• In 1991, a young student (**Linus Torvalds**) in Finland develops an operating system similar to **Unix** but **designed** to run on **personal computers**.

• The new system is named **LINUX**.

Characteristics of the Linux System:

- Linux provides the **same functions and features** as Unix.
- **Rapid Evolution**: Utilization of the Internet and the decline in PC prices.
- **Open-source code** available on the Internet (free and freely accessible).
- **Thousands of individuals contribute** to its development (it is not proprietary).
- → Linux is the **grandchild** of Unix... BUT it is increasingly converging to **replace Unix**."

USAGE OF LINUX:

- **Workstation**: Multimedia and office applications (OpenOffice, KOffice, Dia,...)
- **Networking and Internet**: Web server, messaging, ...
- **Development**: C/C++, Java, Eclipse, PHP, ...
- **Database**: Oracle, Informix, MySQL, Postgres, ..."

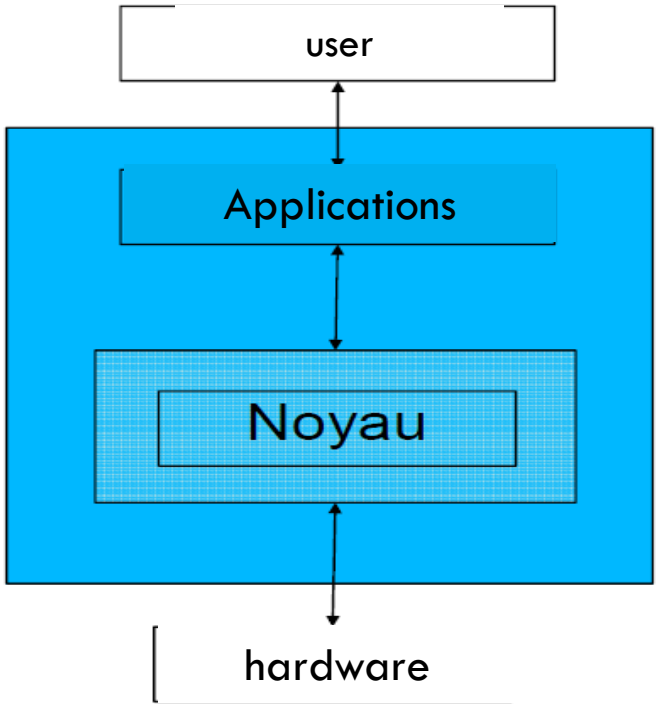
THE LINUX KERNEL CONCEPT

The kernel (or kernel) is the most fundamental and critical component of the operating system.

• It manages the computer's resources and enables communication between various hardware components.

The kernel controls memory and processor resources, manages I/O devices, and storage (file management).

• However, to use the computer, we need additional applications in addition to the kernel."



THE LINUX KERNEL CONCEPT

Linux is a non-proprietary system, several people may participate in its development

⟶ existence of several distributions;

A Linux distribution = kernel + installation tools + administration tools+ a set of application software (games, office, multimedia, imagery, etc.).

LINUX DISTRIBUTIONS
www.distrowatch.com

www.redhat.com

www.ubuntu.com

www.freebsd.org

•www.debian.org

www.fedora.org

www.suse.com

INSTALLING LINUX

Depending on your needs, there are sevral methods to install or use linux commands on your computer.

1) full installation and multiboot,

2) Virtualization

3) Windows Subsystem for Linux (WSL)

4) Online virtual Machine

INSTALLING LINUX

There are three methods of installing linux:

1) Install linux (ubuntu) on a different partition than that of another system such as windows or alone in the computer (mutliboot).

2) Install (ubuntu) on a virtual machine already containing a os such as windows. Use a tool such as virtualbox, vmware or others.

Minimum required:

- 700 MHz or higher processor
- 512 MB of RAM
- A graphics card with a resolution of 1024x768

To install Ubuntu, you will need free space on your hard disk: at least 8 GB to 15 GB

SOLUTION 1

Multiboot (DUAL BOOT) is the ability to install multiple operating systems on the same PC and CHOOSE one of them when booting.

This is the option we will use in our TP rooms.

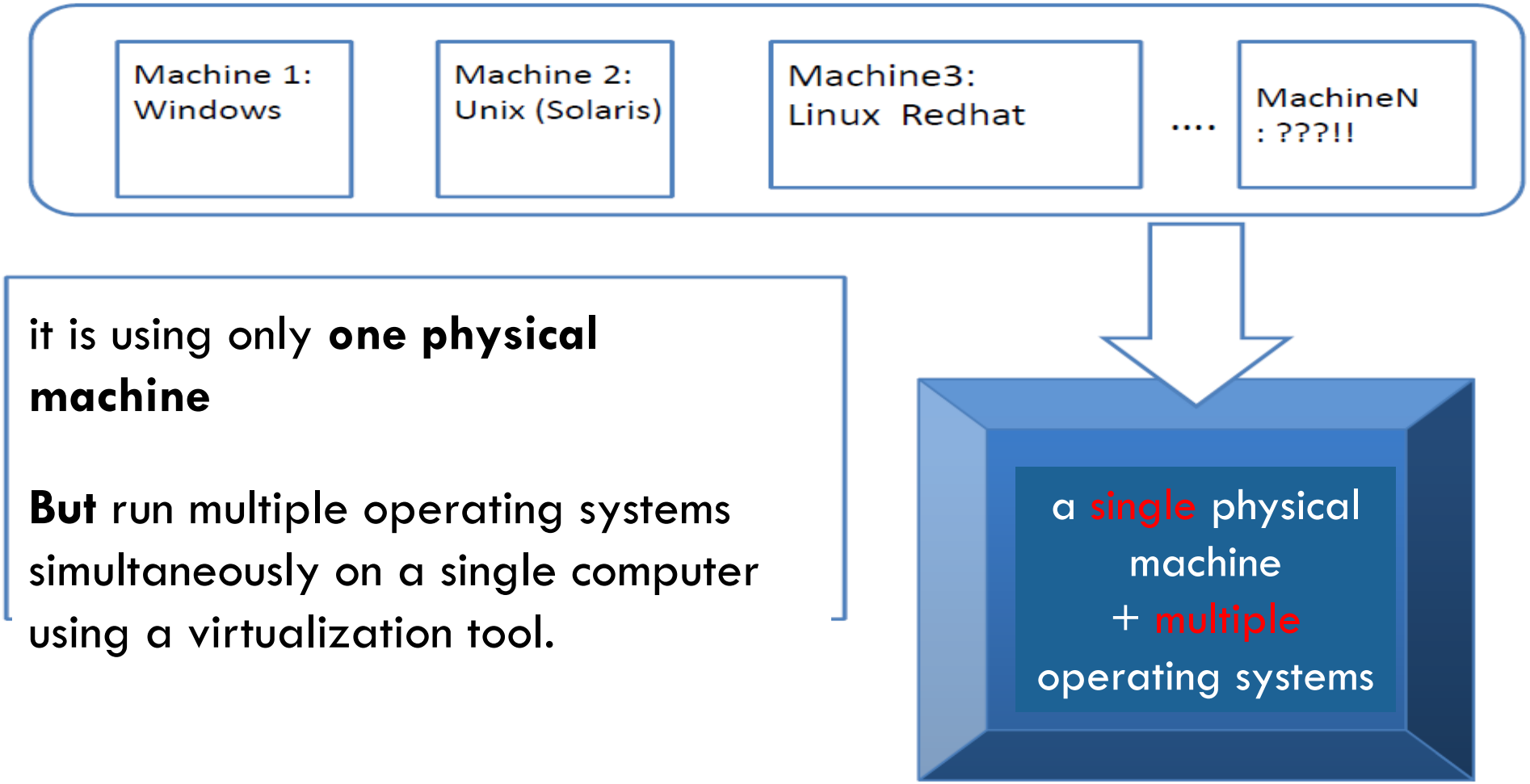
Pros and cons

- Cost savings

- But too much switching between systems installed on your PC since:

At some point you will be working on ONE active system, If you want to switch to the other you have to restart your computer.

SOLUTION 2



it is using only **one physical machine**

But run multiple operating systems simultaneously on a single computer using a virtualization tool.

SOLUTION 2

Virtualization is used to enable the functionning of multiple virtual machines (VMs) each with its own operating system; and sharing the same physical infrastructure.

The operating systems will believe that they operate on physical machines, providing them with:

- RAM,
- CPU power,
- disk space,
- …

NB: The VMs are isolated from each other.

SOLUTION 2

- Some examples of virtualization tools

- Vmware (Windows , Linux)

- Virtualbox (Windows , Linux)

-Xen /Qemu /kvm (Linux)

- Microsoft Virtual PC (Windows)

- The interests of the virtualization

-Significant reduction of material investments.

- Easy installation, deployment and migration of virtual machines from one physical machine to another.

-Installation, tests, developments, and the ability to redo configurations and even reinstallations without touching **the host operating system** (the 1st OS installed on the machine);

WHAT ABOUT OUR CASE (IN OUR PW ROOMS)?

The following configuration is available:

-Machines with multiboot (windows and Linux: ubuntu distribution),

SOLUTION 3: WSL

Windows Subsystem for Linux (WSL) allows users to run a Linux terminal environment, install packages from the Ubuntu archive, and run Linux applications on Windows 10.

Enabling WSL in Windows 10

Before you can install Ubuntu on WSL, WSL has to be enabled in one of the following ways:

- Using the GUI for enabling Windows features
- Using PowerShell

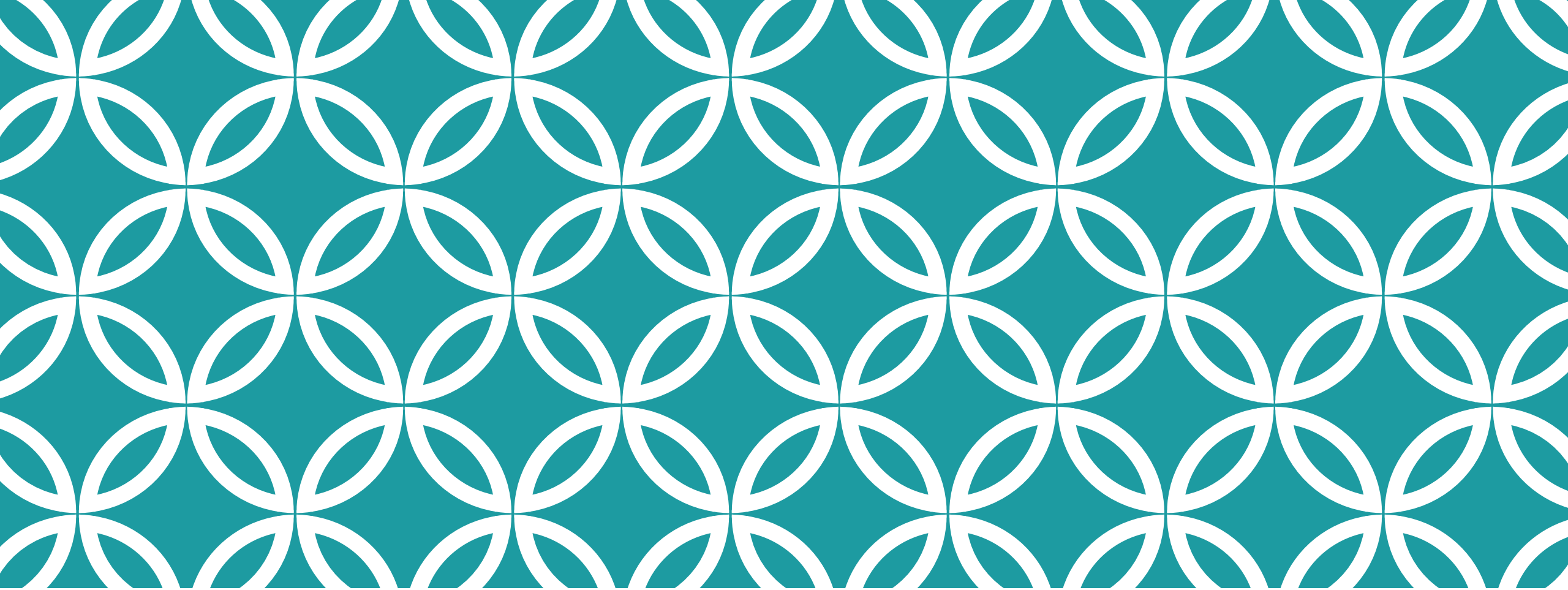
SOLUTION 3: WSL

Installing Ubuntu on WSL via the Microsoft Store (Recommended)

The recommended way to install Ubuntu on WSL is through the Microsoft Store.

The following Ubuntu releases are available as apps on the Microsoft Store:

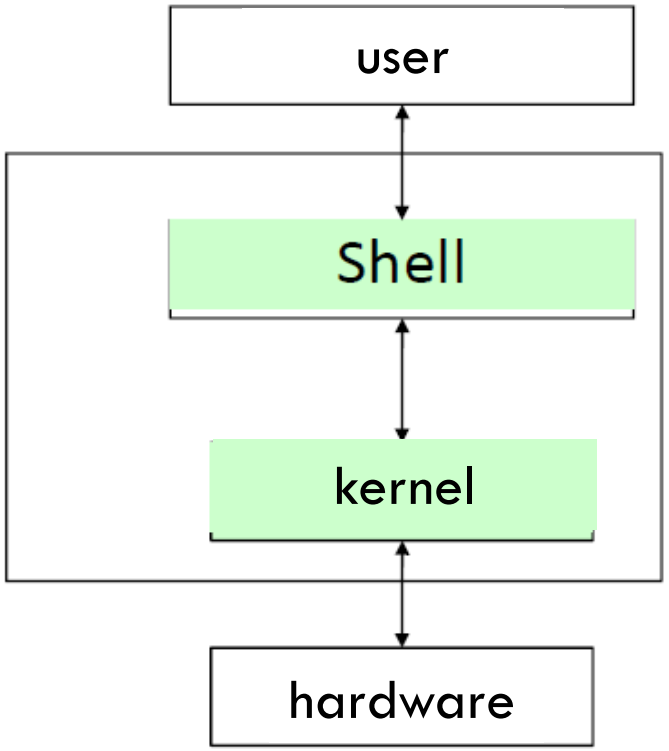
- Ubuntu 16.04 LTS
- Ubuntu 18.04 LTS
- Ubuntu 20.04 LTS
- Ubuntu (without the release version) always follows the recommended release, switching over to the next one when it gets the first point release. Right now it installs Ubuntu 20.04 LTS.



THE SHELL

THE SHELL

- The operating system role is to execute user Commands and display the result on the screen.
- The shell or interpreter of commands is a program that plays the role of intermediate between the user and the system.



COMMAND EXECUTION

The shell sends requests to the system kernel based on user commands:

- The user writes a command on a command line (prompt) in the terminal and press [enter];
- The shell (the shell) will execute it and return the result to the user via the terminal.

NB: you can open the shell by several methods (the shortcut CTRL+ ALT+ T for example)

A COMMAND SYNTAXE

Command-name [option] [parameters ..]

•**Option**: arguments not necessary to execute the command, but their use gives a particular execution;

•**Parameters**: necessary arguments to execute the command.

NB: The three fields are separated by spaces

Some commands:

date displays date and time

- **passwd user** Change the user password
- **ls –l** / View the list of the directory /

HOW TO GET DOCUMENTATION ON ANY COMMAND

It is not possible to memorize all the parameters and arguments of a command.

For this, the Linux system provides extensive manual documentation of commands.

1. The man command: Man: manual(reference)

man command-name

to display a help page for the command.

2. The help command: Help:

help command-name

to display the corresponding help of a command;

ORGANIZATION OF USERS IN LINUX

Linux is a multi-user system:

-Simple user: limited permissions and each user has a login directory (a workspace on the disk)

-Administrator (root): has all permissions, it creates the users, and administers the system (configure, control, install..etc).

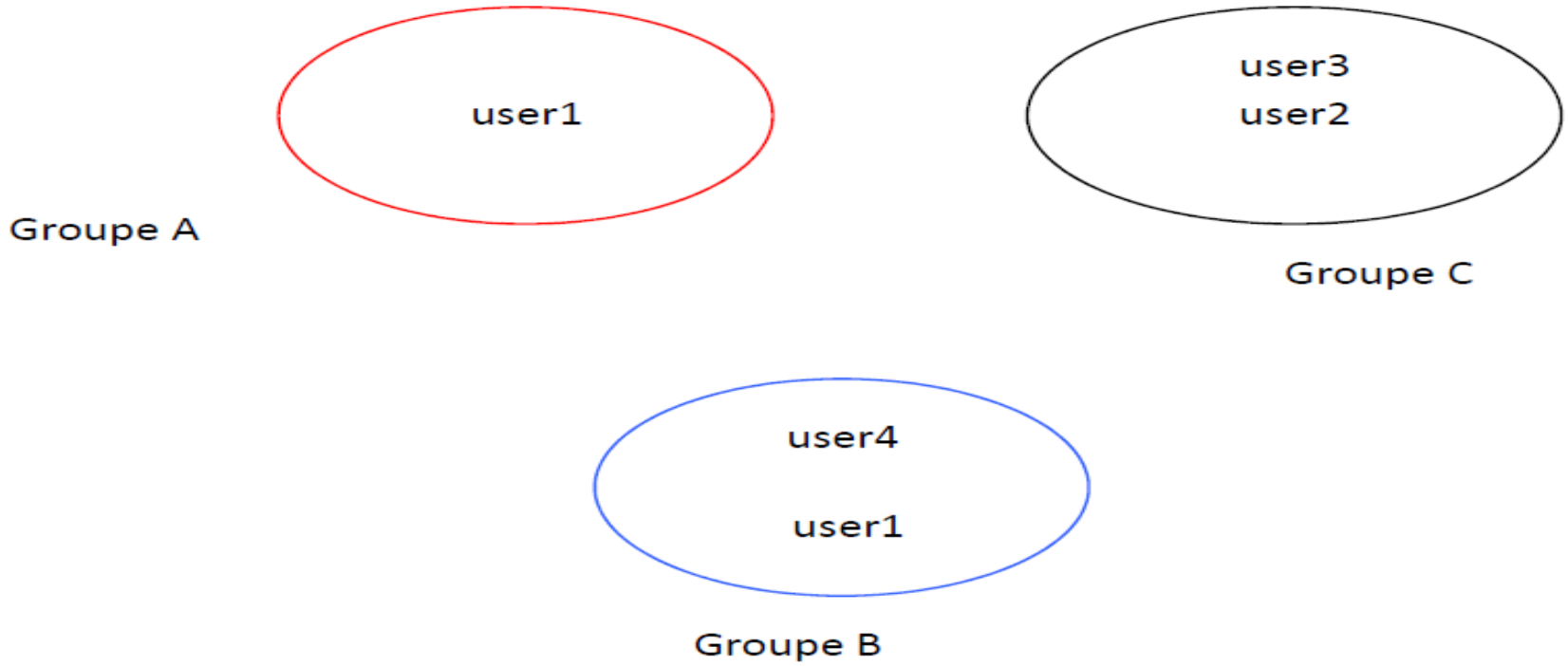
- All users registered with the system are organized into groups:

- Each user must belong to a group.

- A user can be a member in multiple groups at once.

- Each user has a login group (default group).).

ORGANIZATION OF USERS IN LINUX



ACCOUNT & PASSWORD

To connect to the Linux system, a user must have a:

– An account name (Login)

- A password

– The system administrator (root) creates your accounts;

• After creating an account, the Linux system assigned:

– A UID: User ID, (identifiant utilisateur).

– A GID: Group ID, (Group ID).

- A connection directory: part of the disk where it works.

– A Shell (the shell)

CONCLUSION

- Linux is a multi-user system.
- -Linux uses shell as a command interpreter
- -To use it you must have a username and password
- Ability to use text mode (console) or graphic mode
- -Ability to combine multiple commands to complete a complex task; it proves its power in text mode.