bit burkina institute of technology

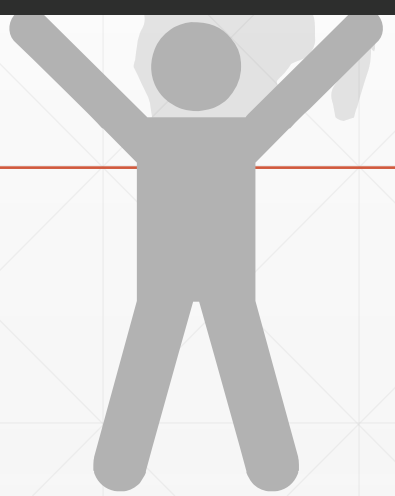
OPERATING SYSTEMS AND OFFICE TOOLS

Goal

- ✓ Knowledge of operating systems
- ✓ Mastering office automation tools

Part I:

OPERATING SYSTEMS



I) What is a computer system?

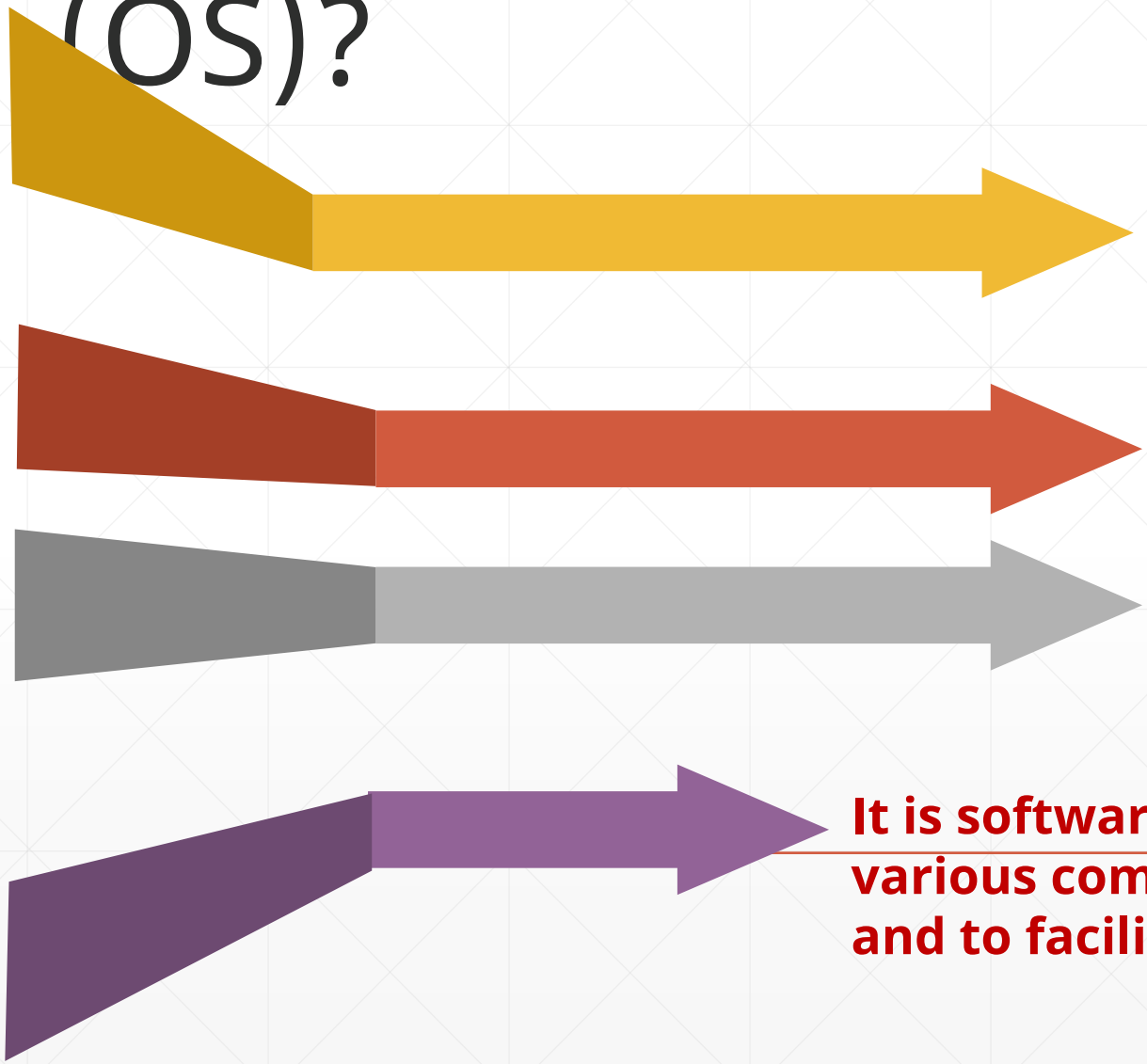
It is the set of hardware and software designed to perform tasks that involve the automatic processing of information.

It consist of:

- Hardware
  - **The processor(s)**
  - **The main memory**
  - **The input/output peripherals (disks, printers, network connection, …)**
- Software
  - **System programs**
  - **Application programs**

Application programs are developed to respond to specific user needs, while system programs control the operation of the various components of the computer.

II) What is an operating system (OS)?



A program that manages the computer hardware.

It provides a basis for application programs.

It acts as an intermediary between computer user and computer hardware.

It is software designed to control and coordinate the various components of a computer (or telephone) and to facilitate its use by a human being.

II) What is an operating system (OS)?

It consist of:

A User interface:

- The user interface is what the user sees on the screen, the elements with which he interacts to give instructions to the computer. The interface can be either a Command Line Interface or a Graphical User Interface.

A kernel:

- It is the heart of the operating system. It allows the hardware and software elements to communicate with each other, to work together and to form a whole. It takes care of the files on the hard disk, manages the memory, programs the objectives, tasks and manages the execution of applications and processes.

A File management system:

- The file management system arranges files in trees. Files are simple sets of data with a name and an extension. The extension identifies the type of file so that the computer knows how to read it.

III) How does the OS work?

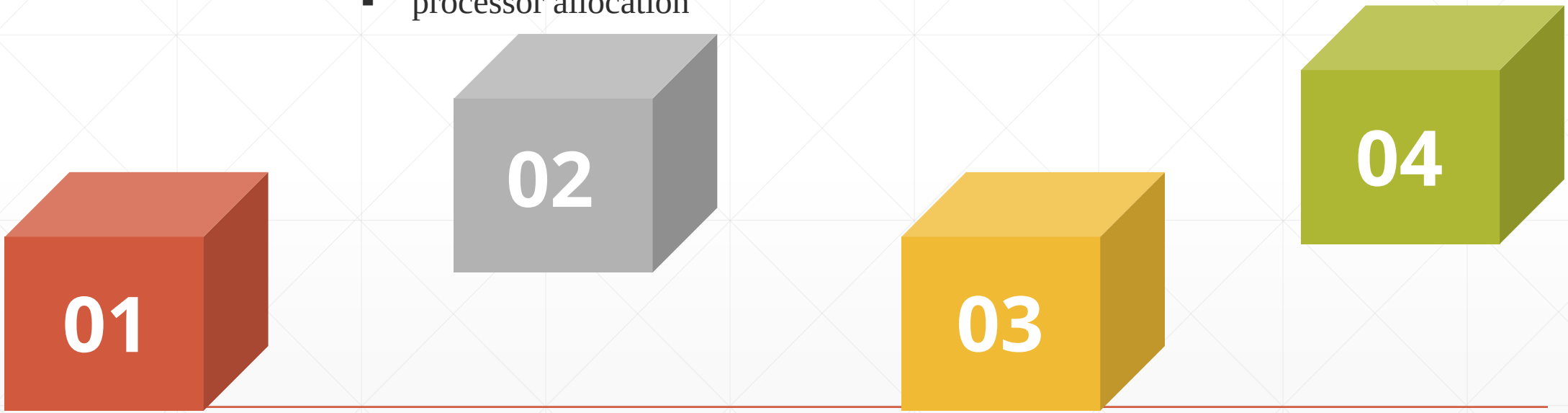
When the computer starts up, it looks for the operating system and once it has found it, it loads it into RAM. It is then ready to respond to requests from the user and applications. The operating system manages memory: it saves, deletes and retrieves data, displays it on the screen, sends it to devices that need it (e.g. printers), responds to keyboard inputs, recognizes mouse clicks and reads and writes data to hard disks or other storage devices.

IV) Operating system functions

Management of physical resources:

- allocation of main memory,
- allocation of secondary memory,
- allocation of input/output devices,
- processor allocation

Sharing and exchange of information between users: messaging, access rights management access rights



Information management: structuring, storage, transfer, designation of information. Function performed by the File Management System

Execution function: execution of programs, composition of programs. Function performed by the interpreter of the command language

V) Types of Operating systems

A distinction is made according to:

01

The number of users

02

The interfaces

03

The number of applications running simultaneously

04

Number of processors

05

The number of bits in the instructions of the programs that are developed to work with a particular system

06

Network connectivity

V) 1- According to the interfaces

This is a key point of the operating system.

Textual command languages that are powerful but difficult to use by an uninitiated user. There are:

- **Windows Shell** (derived from MS-DOS commands),
- **UNIX Shell**.

Graphical command languages that are easier to use but more limited, for example :

- **Windows** or **MacOS** desktops,
- **X-Windows**, **Gnome** or **KDE** under UNIX
- **Android**, **iOS** interfaces for mobile devices

V) 2- According to the number of users

Single user operating systems.

Multi-user operating systems.

They can support multiple sessions at the same time.

V) 3- According to the number of applications running simultaneously

Single task operating systems.

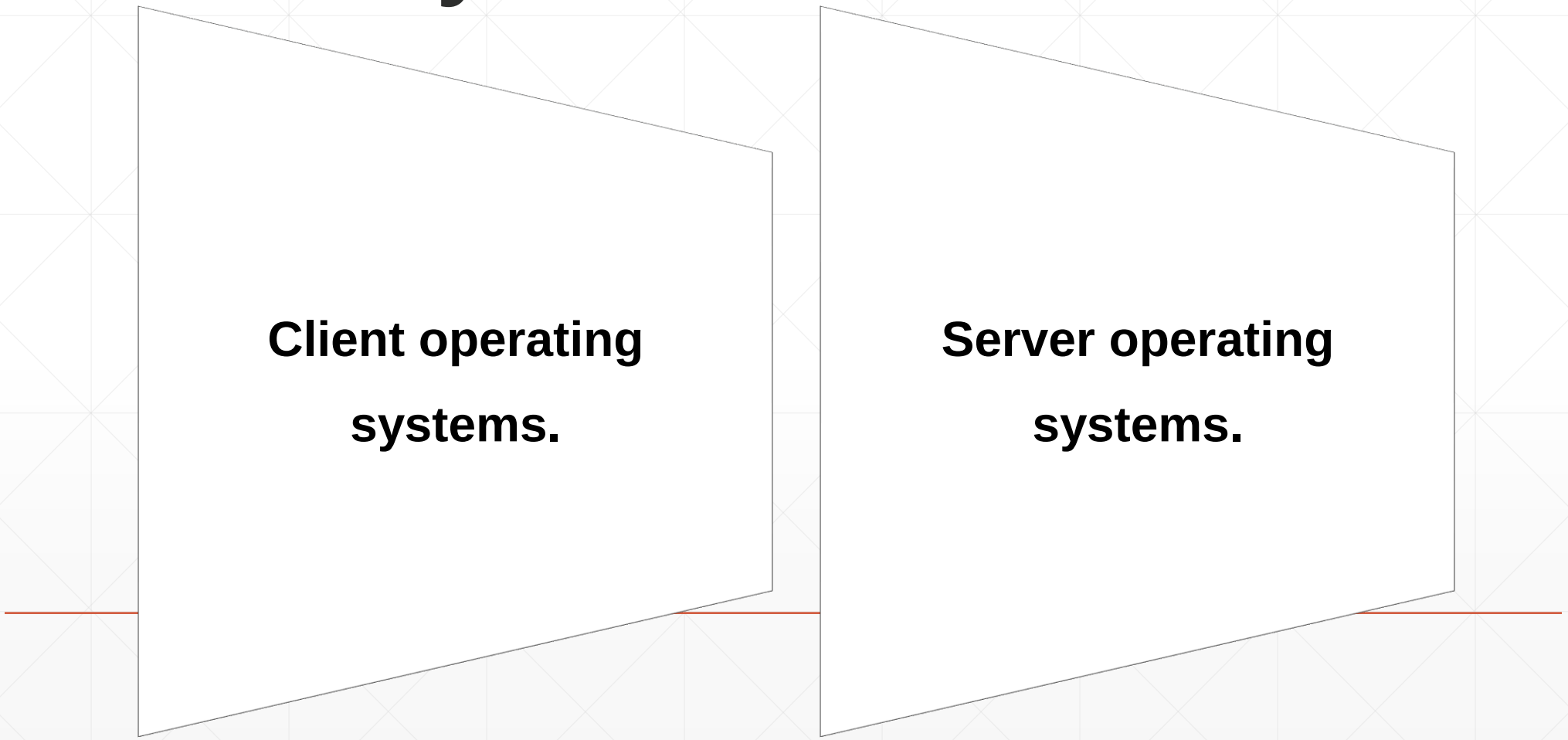
Multi-task operating systems.

They can run several applications at the same time.

Multi-user operating systems.

They can support multiple sessions at the same time.

V) 4- According to network connectivity



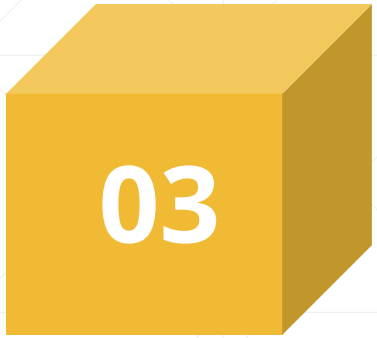
V) 5- According to number of processors

Single processor operating systems.

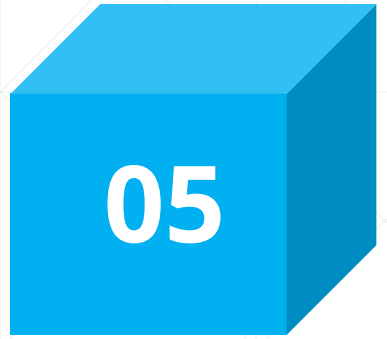
Multi-processor operating systems (Windows NT and UNIX)

V) 6- According to the number of bits in the instructions of the programs that are developed to work with a particular system

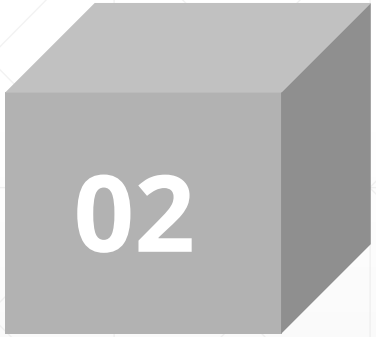
VI) Qualities of operating systems



Robustness (protection of the memory space allocated to each process)

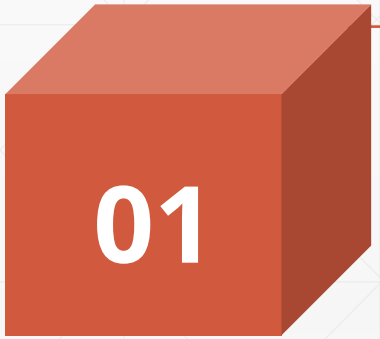


Interoperability with other systems



Speed of processing

Network connectivity



Stability (the system does not crash at every turn)

Openness and reliability (the number of applications that are developed by independent publishers to work with this or that system)

VII) Examples of operating systems

VII) 1- UNIX

Unix was born at Bell Labs in 1969, developed by Ken Thompson and Dennis Ritchie.

It is:

- **multi-tasking**
- **multi-user**
- **Use of Shell as a command interpreter**
- **System configuration is stored in text form**

This is the most widely used system (research centres, Internet servers, etc.)

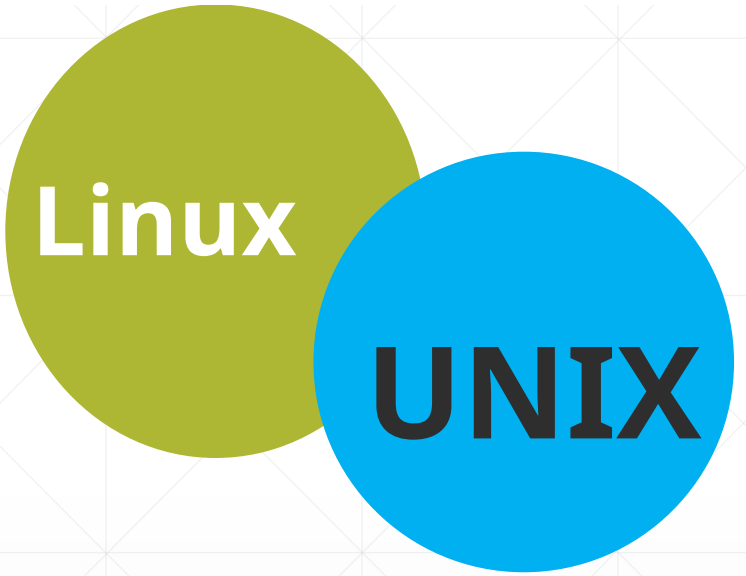
Unix is a commercial product (fee-based system)

VII) 1- UNIX

Linux is a freely distributable version of Unix.

In 1991, in Finland another kernel was available: it is "Linux" by Linus Torvalds (young student at Helsinki University).

Thousands of people are involved in its development. Source code is available on the Internet (free software).



Free software is a software whose license provides for:

- ✓ The availability of the source code.
- ✓ The possibility of modifying, improving and adapting the software, provided that these modifications
- ✓ The possibility to copy and distribute the software, provided that the terms of the licence are respected.
- ✓ The possibility of copying and distributing the software, provided that the terms of the licence the terms of the licence are not modified.

VII) 1- UNIX

The kernel developed by Linus Torvalds is the core element of all existing Linux distributions. Each distribution tries to offer added value in the form of installation and administration tools.

A Linux distribution = kernel + installation tools + administration tools + a set of application software

Some Linux distributions are:

- ❑ Fedora
- ❑ Ubuntu
- ❑ Kali Linux
- ❑ Open SuZe
- ❑ Debian
- ❑ Red Hat
- ❑ .....

VII) 1- UNIX

Areas of use of Linux are:

- Workstation: Multimedia and office automation (openoffice, koffice,...)
- Networks and Internet: Web server (Apache), e-mail (sendmail), Explorer (FireFox from Mozila)....
- Development: C/C++, Delphi, Java, PHP,...
- DBMS (Oracle, Informix, MySQL, PostgreSQL,...)
- Scientific research

VII) 1- UNIX

Like all operating systems, macOS is updated regularly to provide new applications and features, as well as to fix bugs and potential security holes.

To identify the version of macOS installed on your Mac, simply go to the Apple menu and click About This Mac. The name of the macOS system will appear on the screen..

Some examples of macOS are:

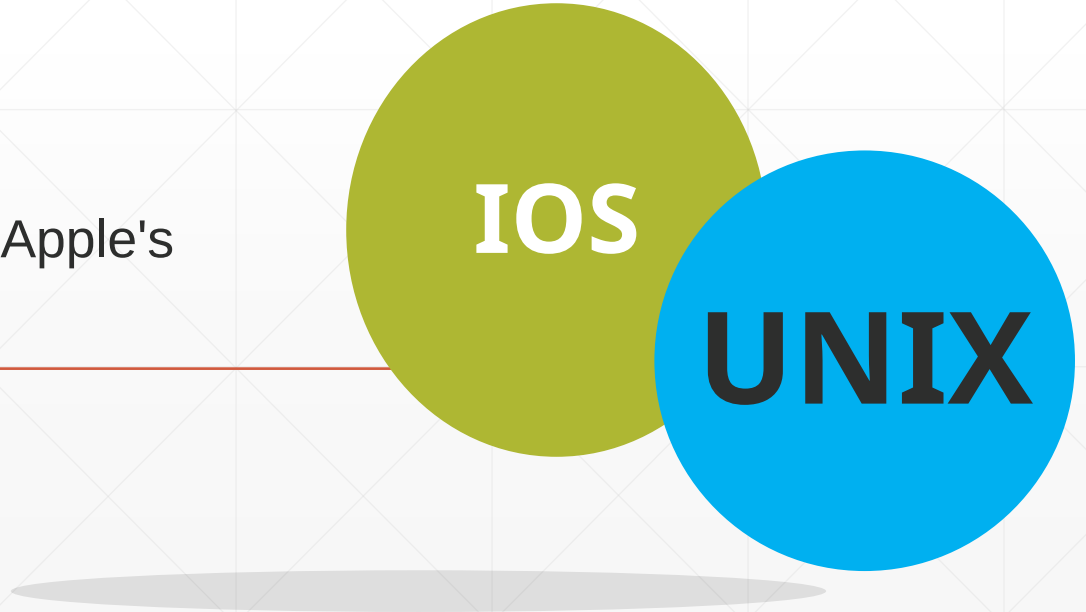
- macOS Ventura
- macOS Catalina
- macOS Monterey
- macOS Sierra
- macOS High Sierra
- macOS X Leopard
- macOS X Puma
- macOS X Tiger
- macOS X Panther
- MacOS X Jaguar

VII) 1- UNIX

iOS is Apple's operating system (OS).

Available in dark mode or via a bright display, the iOS interface consists of multiple screens and a fixed sidebar at the bottom of the device. It has evolved over time to offer a set of applications, downloadable from the App Store, which are displayed as icons individually or in thematic folders. iOS also features Safari, which is Apple's proprietary web browser, allowing users to browse the Internet from their smartphone.

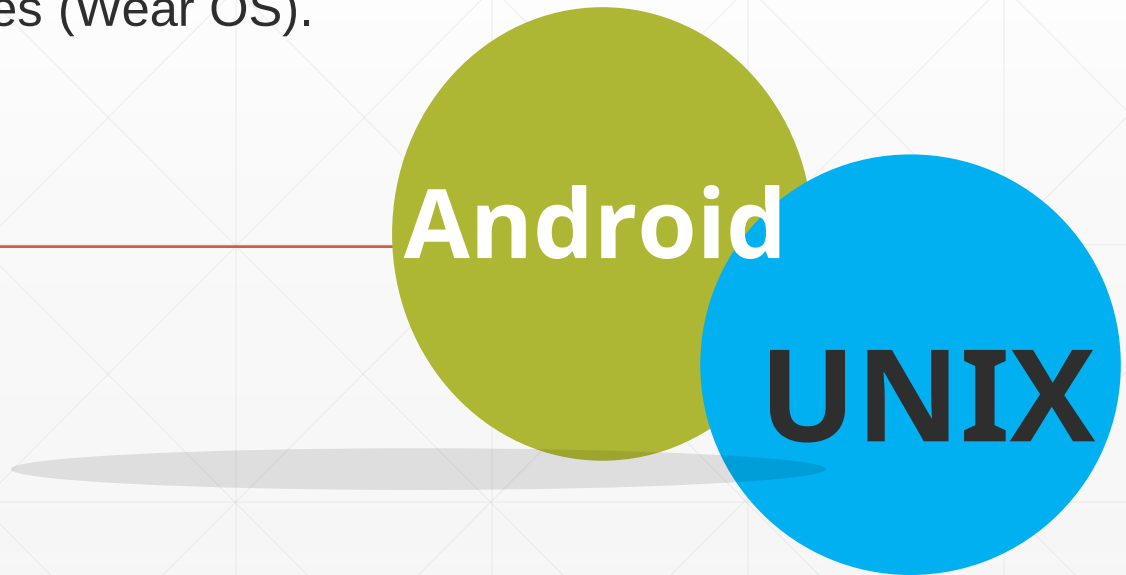
Many new features are available with each new update of Apple's operating system, Ios.



VII) 1- UNIX

Google's operating system for smartphones and tablets. Android is Google's operating system (OS), based on a Linux kernel. It is initially intended for smartphones and tablets.

Android is distributed in open source under the Apache licence. This licence allows manufacturers who integrate the OS into their devices to make modifications, their own interfaces or functionalities. It is notably the operating system of Samsung, LG, Motorola, Pixel and Xiaomi phones. Android also equips connected objects, televisions (Android TV), cars (Android Auto) and smartwatches (Wear OS).



VII) 1- UNIX

The main features of Google's operating system are as follows:

Software libraries: Google's OS has software libraries that are ready to be used by programs.

Built-in applications: Android has a set of standard applications such as an address book, calendar, web browser and phone application.

Framework: It provides developers with an application development kit for the Android platform.

File management: Android supports many audio/video/image formats (MPEG4, H.264, MP3, JPG, PNG, GIF, etc.).

Services: It has motion sensors, a camera, a GPS receiver, touch screen, database storage, web page display, SMS sending and multitasking of applications.

Connectivity: Google's OS allows the use of telecommunication networks such as Bluetooth, WiFi, GSM and UMTS.

VII) 2- WINDOWS

Windows is Microsoft's operating system. It succeeded MS-DOS.

This operating system owes its name to the principle of "windows" that it introduced in its first version. With each new version, Microsoft brings additional improvements and functionalities to the Windows computer, each time with a new graphic environment.

Microsoft released its first version of Windows in 1985: from then on, it proposed new operating systems almost every year, with more or less important modifications from one operating system to another.

Some operating systems were unprecedentedly successful, such as Windows 95, Windows XP or Windows 7, while others were quickly abandoned by users, such as Windows Me.

VII) 2- WINDOWS

- Windows 1.0 : 1985 ;
- Windows 2/ Windows 2.10 / Windows 2.11 : 1987 ;
- Windows 3. 0 : 1990 ;
- Windows 3.1 : 1992 ;
- Windows NT 3.1 : 1993 ;
- Windows NT 3.5 : 1994 ;
- Windows 95 : 1995 ;
- Windows NT 3.51 : 1995 ;
- Windows NT 4.0 : 1996 ;
- Windows 98 : 1998 ;
- Windows 98 SE : 1999 ;
- Windows 2000 : 2000 ;
- Windows Me : 2000 ;
- Windows 2000 SP2 : 2001 ;
- Windows XP : 2001 ;
- Windows 2000 SP3 : 2002 ;
- Windows XP Media Center :
- Windows XP SP3 : 2008 ;
- Windows Vista : 2008 ;
- Windows Vista SP2 : 2009 ;
- Windows 7 : 2009 ;
- Windows 8 : 2012 ;
- Windows 8.1 : 2013 ;
- Windows 8.1 Update : 2014.

Released in 2021, Windows 11 is the most recent version. Many PCs are still running Windows 10.

VII) 2- WINDOWS

The OS works on the principle of windows that open and close (hence the name). For each new version, Windows updates some existing applications and also adds new features. The interface is also redesigned to further optimise the user experience..

Windows runs on desktops and all-in-ones, laptops, and gaming PCs. Windows is not compatible with Mac computers, which run on iOS.

When you buy a PC, Windows is already pre-installed. If a new version is released, you can upgrade your PC for free to get the new features (provided your computer is not obsolete).

VII) 2- WINDOWS

The main applications on the OS include :

- **Windows Settings:** an application for all your settings (account customisation, privacy, games, usability options, connection between your computer and smartphone, etc.).
- **Microsoft Defender:** this is the antivirus integrated into the OS. It is also called Windows Defender. It protects users against malicious software.
- **File Explorer:** This allows users to access all their folders (images, videos, music, documents, downloads, etc.) as well as the various hard drives.
- **Productivity applications:** calendar, calculator, mail (for emails), reminders, screen capture tool, voice recorder.
- **Microsoft Edge:** the default browser on the operating system.
- **Microsoft Teams:** the video conferencing application is integrated by default in the taskbar on Windows 11.
- **Microsoft Store:** allows you to download new applications to your PC.
- **Widgets:** customised widgets based on your interests to keep you informed (weather, news, stock market, etc.)
- **Games:** many games are installed by default on Windows computers.

VI) File System

A file system is a filing, organisational system on a storage medium that structures and organises the writing, searching, reading, storing, modifying and deleting of files in a specific way.

It is important that files can be identified without errors through their classification and that users can access their files as quickly as possible. File systems also define parameters such as the following:

- File naming conventions
- File attributes
- Access control(s)

There are different standard file systems for Windows, macOS, Linux, Unix & Co. In recent years, the differentiation has increased due to technical progress, e.g. customised file systems have been developed for the increasingly popular flash memory media (USB sticks, SSD drives). All file systems have in common that they use a tree structure for organisation, starting with the root directory. From there, folders or directories and subfolders branch out.

IV) File System

Currently the most common systems are FAT32, exFAT and NTFS (Windows) as well as HFS+ and APFS (macOS/Mac OS X). Linux currently uses ext4 (successor to ext3 and ext2) among others.

NTFS : New Technology File System

FAT : File Allocation Table

exFAT : Extended File Allocation Table

HFS : Hierarchical File System

APFS : Apple File System

EXT4 : Fourth Extended File System

VI- 1) FAT (File Allocation Table)

The file system has been around since 1980 and variants released since then are known as "FAT12", "FAT16" and "FAT32". FAT formatting is ideal for managing and exchanging small amounts of data. Today, however, the FAT file system is actually outdated, because even in its newest and most powerful variant (FAT32, introduced in 1997), files can have a maximum size of 4 gigabytes (GB). In addition, FAT32 limits the maximum partition size to 8 terabytes (TB).

Despite these limitations, FAT formats are still very common. They are used for mobile removable media (external hard drives, USB sticks) and special hardware (digital cameras, smartphones, routers, TVs, car radios, etc.). They stand for the highest possible compatibility, especially in the field of mobile telephony.

VI- 2) NTFS (New Technology File System)

The NTFS file system was introduced in 1993 with the Windows NT operating system. Since Windows Vista, it has been the standard file system for Windows computers. It offers several advantages over FAT, such as the ability to compress data carriers and to increase data security (e.g. through encryption). A special feature of NTFS is that access rights and file and folder shares can be defined in detail and comprehensively.

VI- 3) ext4

ext4 was launched in 2008 as the successor to ext3. The file system is currently standard on many Linux systems (e.g. Ubuntu). The most important innovation is the Extents feature, which optimises the management of large files and prevents fragmentation more effectively than its predecessors. Under ext4, partitions can be resized at will while the system is running. The maximum file system size was limited to 32 TB for ext3, but for ext4 it is much higher: 1 exabyte (about 1 million Terabytes).

VI- 4) APFS (Apple File System)

APFS, which was developed by Apple in 2017, meets the needs of modern SSDs in particular. APFS is designed as a 64-bit system, data and file encryption is also possible. If an operating system is based on an SSD, the file system is automatically converted from HFS+ to APFS.

VI- 5) HFS+ (Hierarchical File System)

The file system was introduced by Apple in 1998 as a complementary development to HFS. In order to clearly distinguish the two standards, they are also called Mac OS Extended (HFS+) and Mac OS Standard (HFS). Compared to HFS, HFS+ is faster and more efficient in managing, reading and writing data. It can also handle more files, with up to 4 billion blocks of files or folders. Linux can partly read and write directly to disks with HFS+, but specific packages may need to be installed (hfsutils, hfsplus, hfsprogs). On Windows, additional software is required for full support of HFS+.

VII) The command prompt in windows

- **cls**: delete all the contents of the console
- **echo** : write a text on the command prompt
- **date** : change the system date
- **print** : print file
- **time** : can change the system time
- **exit** : close the command prompt
- …

VII) The command prompt in windows

CD (*Change Directory*).

This command allows you to change the current or current directory, in other words, to access another folder on your PC. To use it, you just have to specify the folder you want to go to. Eg: cd Documents

To exit the folder or directory, type **cd ..** Eg: cd ..

md <directory name> to create a new directory

VIII) The command prompt in Linux

Command syntax : **Command [option] [parameters]**

Option: not required to run the command

Parameters: arguments needed to run the command

- The three fields are separated by spaces
- Multiple commands on the same line: separate with ";

VIII) The command prompt in Linux

Some commands :

- **date** : Display the date and time
- **cal**: display a calendar
- **uname** : display the name and characteristics of the system.
- **passwd** : change your password
- **man command-name** : manual to display a help page (command form, option,...)

example : man man : more information on the use of man

- **su user1** : switches to user1
- **su -** : switches to the super-user (administrator)

VIII) The command prompt in Linux

Some commands :

- **adduser user1** : add user1
- **passwd user1** : to give or change the password user1
- **addgroup grp1** : adds group grp1
- **adduser user1 grp1** : adds user1 to group grp1
- **groupadd grp2**: creates a group grp2
- **chgrp grp2 user1**: user1's group is now grp2
- **userdel** : to delete a user ;
- **groupdel** : to delete a user ;
- **adduser -ingroup grp1 user1** : creates a user1 whose main group is grp1 group is grp1

IX) WINDOWS KEYBOARD SHORTCUTS FOR MANAGING WINDOWS

- **Alt+Tab**: Switch between windows. Hold down the Alt key and press the Tab key one or more times to access the window of your choice
- **Alt+Shift+Tab**: Switch between windows (in reverse order). This time you need to hold down the Alt and Shift keys, and press the Tab key one or more times.
- **Windows+Tab**: same principle as Alt+Tab, but in a more visual form. Works since Windows 7 when the Aero feature is supported.
- **Windows+D**: Hide all windows. Useful for briefly displaying the desktop. Simply press the Windows+D keys again to recover the windows.
- **Windows+Down Arrow**: If the window occupies the whole screen (enlarged window), it returns to its normal size. A second click on Windows+Down Arrow minimises the window.
- **Windows+Up Arrow**: a keyboard shortcut to enlarge the active window.
- **Windows+Left Arrow**: to move the window to the left half of the screen.
- **Windows+Right Arrow**: to move the window to the right half of the screen.

IX) WINDOWS KEYBOARD SHORTCUTS FOR MANAGING WINDOWS

- **F1**: Open a help window for any software or web browser in use.
- **F2**: rename any selected file on Windows.
- **F3:** equivalent to the shortcut CTRL + F which allows you to search for words in a page, whether on a web browser, and other software such as Word.
- **F4**: place your cursor in the address bar in Internet Explorer or Windows File Explorer. Alt + F4 closes the current program window on Windows. CTRL + F4 closes the active tab in the main browsers.
- **F5**: refresh a page in your web browser.
- **F6**: access the address bar of the web browser (Chrome for example). Pressing the key a second time takes you to the tab. CTRL + F6 allows you to switch from one active file to another in Word.
- **F7**: This key is useful for accessing spellchecking and grammar checking of a document opened in a word processor that has this function, as is the case for Word.
- **F8**: Activate safe mode, when starting your PC.
- **F9**: used in e-mail software, this key is used to check for new e-mails and to force e-mails to be sent.
- **F10**: The combination Shift + F10 is the equivalent of clicking the mouse on the desktop, a web browser or a particular file, opening the Windows pop-up window.
- **F11**: This key switches your web browser to full screen mode. Simply press it again to exit this mode.
- **F12**: This opens the Save As function in Word. When used in a web browser, it is used to access the source code of the web page being viewed.

X) VIRTUALIZATION

- Virtualization is a technology for creating and running one or more virtual representations of a computer or its various resources on a single physical machine.

- Virtualization is the creation of a virtual, software-based representation of an object or resource such as an operating system, server, storage system or network.

Several applications allow you to virtualise an operating system. We can mention VMWare and Virtual Box.

- In this course we will use **Oracle VM VirtualBox** . Oracle VM VirtualBox is a software can be used on Windows, macOS and Linux.

X) VIRTUALIZATION

VirtualBox is a cross-platform virtualization application. On the one hand, it installs on your existing Intel or AMD based computers, whether they are running Windows, Mac, Linux operating systems. On the other hand, it increases the capacity of your existing computer so that it can run multiple operating systems at the same time (in multiple virtual machines). You install and run as many virtual machines as you like - the only practical limit being your practical limit is your disk space and memory.

For vitualization, We need:

- **a computer**
- **ISO files of operating systems** (Windows 10 and Ubuntu)
- **a virtualization application** (Oracle VM Virtual Box): It is a a virtual machine is a virtualized hardware and software environment. It is a software that runs on a host operating system (e.g. Windows 10) and that allows to create virtual machines on which one can install operating systems called guests (e.g. Ubuntu, Debian, Windows 7, etc.).

X) VIRTUALIZATION

Some advantages are:

- **Running multiple operating systems at the same time**: Running more than one operating system at the same time

- **Easier installation of software**: installing a complete mail server solution on a real machine can be a very tedious task. With virtualisation, you can pack such a complex configuration (often called an application environment) into a virtual machine. Installing and running a mail server becomes as easy as importing an application environment into VirtualBox.

- **Test and repair crash recovery**: Once installed, a virtual machine and its

a virtual machine and its virtual hard disks as a "container" that can be optionally frozen, woken

freeze, wake, copy, backup and transport between hosts.

- **Consolidate an infrastructure**: Virtualisation can significantly reduce hardware and power costs.

X) VIRTUALIZATION

Practical: Virtualization of some systems in virtual box or vmware.

Part II:

OFFICE TOOLS

I) DEFINITION

Office Tools are a type of application software.

It help the users to perform office-related tasks easily and efficiently.

Therefore, these tools help to create, manage, and manipulate large amounts of data and documents. Moreover, they help create presentations, reports, databases, etc.

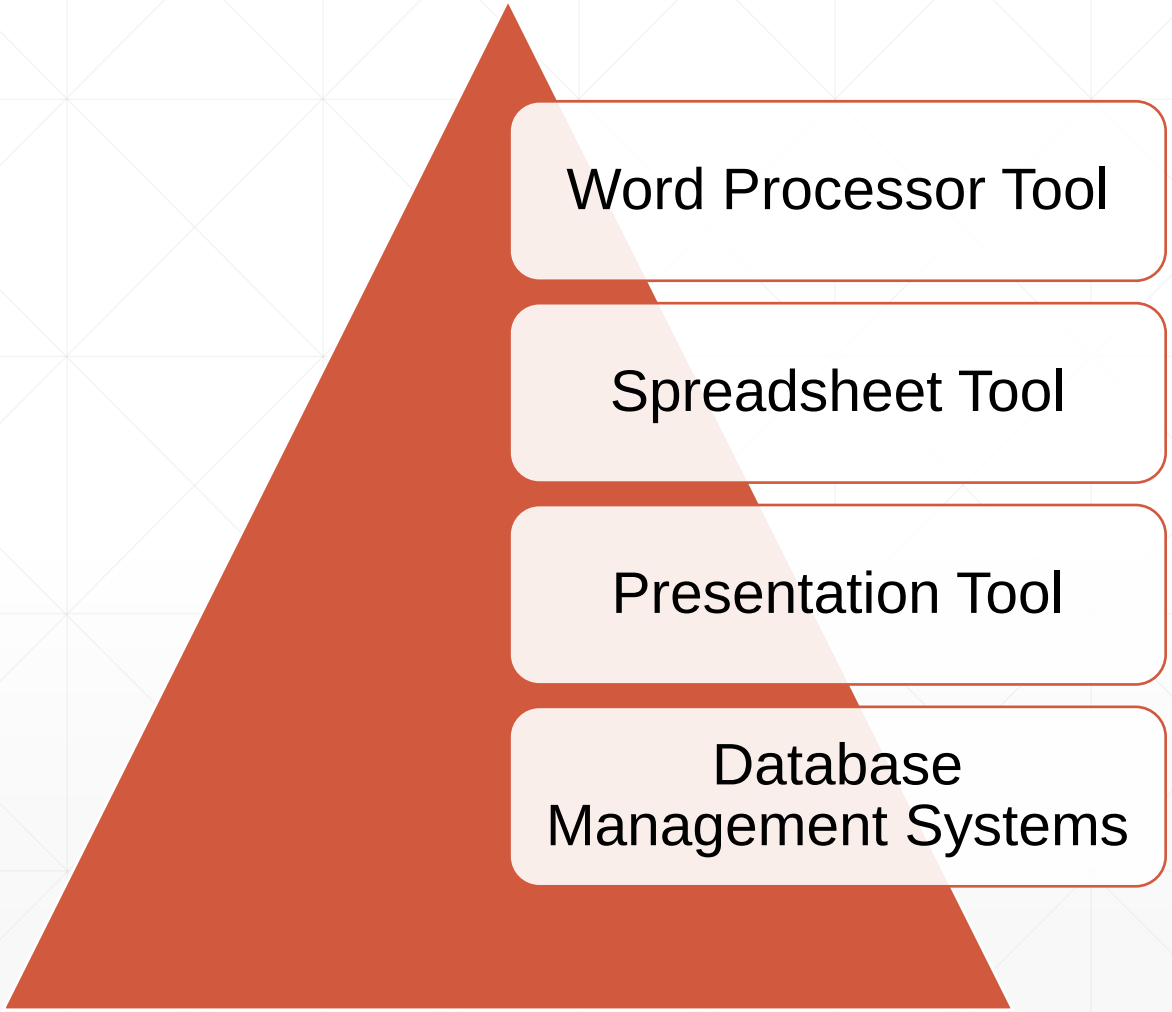
Hence, users can perform such tasks repeatedly with less time and effort.

These tools include software such as word processors, presentation tools, spreadsheets database systems, email tools, etc.

II) Functions

- ❖ Organize files
- ❖ Calculate and analyze data
- ❖ Store, access, manipulate or delete specific data
- ❖ Design graphics and animations
- ❖ Make slideshows
- ❖ Edit pictures and videos
- ❖ Maintain records
- ❖ Manage records, etc.

III) Types


Word Processor Tool
Spreadsheet Tool
Presentation Tool
Database Management Systems

III) Types

Word Processor Tool

This software deals with text documents. It helps to create, format, manipulate, and save text files. Besides, the software can either run on the hardware as a desktop application such as Microsoft word. Or on the other hand, it can also be cloud-based such as google docs.

Certain examples are as follows:

- MS-Word
- WordPad
- WordPerfect
- Google Docs
- LibreOffice Writer

III) Types

Presentation Tool

This tool helps the user to break the information into small parts called slides. Slides are basically small parts of a particular topic arranged on different pages. Moreover, a series of these slides representing an idea to the audience is called presentation. Besides, this tool allows the user to present these presentations using the slideshow feature. Furthermore, the slides can contain pictures, audios, videos, graphs, tables, etc.

Certain examples are as follows:

- MS-PowerPoint
- Lotus Freelance
- Google Slides
- LibreOffice Impress

III) Types

Spreadsheet Tool This software contains the data in the form of rows and columns. The intersection of a row and column is a cell. They store the data and have various formulas which in turn helps to analyze, calculate, and draw conclusions from data. The business and financial sectors use this software more often. They also contain additional features like graphs, charts, 3D graphs, tables, etc. for effective results. Report presentation is thus quite easy considering these results.

Certain examples are as follows:

- MS-Excel
- Google Sheets
- LibreOffice Calc
- Gnumeric

III) Types

Database Management Systems / Systèmes de gestion de bases de données

A database is a collection of related data or information in an organized form. A database management system is a tool that is used to store, search, extract, or delete information from a database. Moreover, we use them so that the operations which we perform on the database, are in an organized manner and safe.

Some database management tools help in handling records on the system like phone numbers, mailing lists, catalogs, etc. Examples are MS Access, Filemaker, dBASE, etc.

While some others help to manage large and complex databases. Examples are SQL, Oracle, etc.

IV) Exercises

Practical

Thank you!