USER INTERFACES

One common command line O/S is MS-DOS and the command to tell the O/S to display all files is dir, for example, which stands for directory. This is still a common way to control a computer, especially for IT professionals.

The first computer with all the elements of a modern GUI was Alto, produced by Xerox in 1973.

A **user interface** is the means by which the user communicates with the O/S or other software. It is the boundary between the user and the machine and it is how the computer presents itself. Making the user interface easy to use and intuitive has been one of the biggest challenges in developing computer systems. Much of the design of the interface is dictated by how the underlying operating system works. For example, all applications that run under Windows look very much the same, with similar layouts and menus. However, it is important to remember that an operating system can use different interfaces.

Common interface types are:

- Command line interface (CLI);
- Menu-driven interface (MDI);
- Graphical user interface (GUI);
- Touchscreen graphical user interface (touchscreen GUI).

Command line interface

A **command line interface** is an old, but still used, way of interacting with a computer that presents the user with a blank screen. The user types in commands, usually abbreviated, which the operating system then carries out. Once the user has learnt all the commands, the system is quicker to operate than the other systems, but it can take a long time to learn all the commands needed.

Menu-driven interface

A **menu-driven interface** displays a list of commands or options, organised under various headings or menus. The user selects a command by pressing a key on the keyboard corresponding to that option or by clicking on it with the mouse. This type of user interface means that the user does not need to learn many commands, but it can be slow and sometimes not very practical.

nk: vuoto
ndary: confine
arry out: eseguire
ow: stretto
erwhelm: sopraffare
rement: condizione,
a

Graphical user interface

A **graphical user interface** is the most popular type of interface; all major modern operating systems use it. GUIs are intuitive, there is no need to learn commands, and users can see a representation of what will be output or printed, with several choices visible at once. Icons or small pictures represent actions or files, which the user touches or clicks on with a mouse. GUIs are also known as **WIMPs**, because they make use of **W**indows, **I**cons, **M**enus and **P**ointers.

WINDOWS contain information relevant to one particular task, and multi-tasking systems can have many windows open at the same time.

ICONS are pictures representing commands, e.g. by clicking on the picture of a floppy disk you save the active file.

POINTERS are usually arrows or something similar that the user can move about the screen using a mouse or any other pointing device.

MENUS give the user a list of options; each option corresponds to a possible command.

Touchscreen graphical user interface

A **touchscreen graphical user interface** is very si... to a ... GUI except that, in... scree... ch the ... tylus ... ice ... is

MACINTOSH

The family of Macintosh operating systems was developed by Apple Inc. in 1984 to provide the first GUI-based operating system for the Macintosh series of personal computers. The first O/S, called **Classic Mac OS**, was **rebranded** Mac OS in 1996 and installed on every Macintosh computer until 2002.

As of 2022, the operating system has been Mac OS X•. It has a new architecture based on Unix in order to eliminate some of the technical problems of the Classic Mac OS. The Mac OS X was preinstalled on any Mac computer and automatically updated, annually since 2011, with every new version carrying the name of an animal or place.

All the Mac operating systems share a common set of GUI principles, including a menu bar across the top of the screen, the finder, i.e. a shell with a GUI, a desktop with icons for applications and related concepts like directories, file deletion, a **trash can**••, and overlapping windows for multitasking.

• Its first version was developed between 1997 and 2001, after Apple's purchase of NeXT.

•• Mac computers have a trash can on their desktop, while Windows has a recycling bin.

••• The OS X kernel was part of an open-source project.

customisable: *personalizzabile*
to rebrand: *cambiare marchio*
trash can: *cestino (dei rifiuti)*

■ Characteristics

Mac OS X offers many benefits to both users and developers, such as improved reliability and performance, enhanced networking features and an object-based system programming interface. With OS X, the kernel••• provides many enhancements. Though in a traditional operating system the ... is a small nucleus of software that provides only the minimal facilities necessary for implementing additional operating system services. In Mac OS ... the kernel environment contains much more: the kernel, the I/O kit, file systems and networking components. The kernel assigns each process its own address space, controlling access so that the address spaces so that the applications are run in each user space and ensuring that no application can inadvertently access or modify another application's memory. Thus, there is no risk of damaging or modifying each other's files when several users are using the same application.

MacOS, the new brand name of OS X since 2015, is Apple's current system software for PCs.

■ Mac for mobile devices

iOS is a mobile operating system for iPhone and iPod Touch, while for the iPad there is the iPadOS.

The iOS interface is based on direct manipulation using multi-touch gestures and control elements such as sliders, switches and buttons. It manages the hardware and provides various system applications such as a browser, a camera, messaging and email notification. iOS is the second most popular mobile O/S after Android.

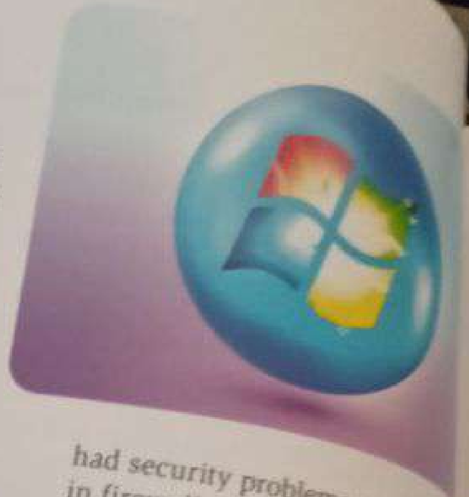
WINDOWS

Which version of Windows are you currently using? Do you remember the first version that you used?

There is no Windows 11 for embedded systems.

Microsoft Windows, or Windows O/S, or simply Windows, is a family of operating systems originally meant for personal computers and later adapted for servers and mobile devices. It dominates the personal computer world with a market share of more than 80%, the remainder belonging to Mac OS and Linux. It provides a graphical user interface (GUI), virtual memory management, multitasking and support for many peripherals.

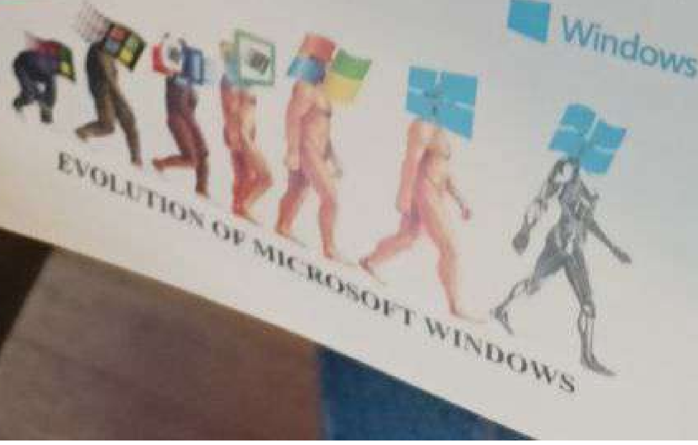
It dates back to 10th November 1983, when Microsoft announced a GUI for MS-DOS. Subsequently, the product line changed and the GUI became a complete O/S.



Windows versions•

- The first versions, **Windows 1.0** and **2.0**, were released between 1985 and 1987 and were considered a novelty since they allowed the user to point and click with a mouse to access the windows, instead of typing a command. Other older versions include Windows 3.0 and 3.1, Windows 95 and 98, Windows ME – Millennium Edition, and Windows 2000, all released between 1990 and 2000.
- **Windows XP**, the longest running Microsoft O/S so far, was released in 2001 and discontinued in 2014. In 2014 it was still used by an estimated number of 430 million PCs, and in 2017 it still had around 8% of the market share. It is considered one of the best versions of Windows, even though it had security problems: it had a b... in firewall which was turned off b... default. For this reason, the system attracted hackers and criminals.
- Other older versions still in use ar... **Windows 7**, released in 2009, and **Windows 8**, which appeared in 20... Windows 7 replaced **Windows Vis...** and introduced multi-touch and virtual hard disk support. It was als... the last in the old line of Windows operating systems.
- **Windows 8**, released in 2012, was a completely redesigned operating system with touch screen use and capable of loading and starting up i... a matter of seconds. It also had a new Metro design system interface that was first used with **Windows Phone 7**. The Metro user interface consists primarily of a start screen made up of live tiles which are links to applications and features that are dynamic and updated in real time. Together with PC O/S, Microsoft has produced different versions of O/S for mobile devices, from **Windows CE** in 2006 to **Windows 10 Mobile.**
- **Windows 10**, released in 2015, with a new browser, Microsoft Edge, was especially important because it worked on all systems: personal computers, smart phones, tablets and Xbox consoles: Microsoft has succeeded in unifying the different systems.
- The latest version is **Windows 11**, released in November 2021 f... and tablets•, made a... for existing Wi... Januar...

to discontinue: *cessare la produzione*
market share: *quota di mercato*
tile: *mattonella*



3.3 OPERATING SYSTEMS

OPERATING SYSTEMS FOR COMPUTERS AND MOBILE DEVICES*

* Besides computers and mobile devices, other devices which perform a specific task, like a washing machine or a microwave oven, have an embedded operating system. This O/S allows the software which runs the programs to access device hardware.

** The first operating system as we know it today was developed by IBM in the 1960s for the System/360 series of machines, all with the same instructions and input/output architecture.

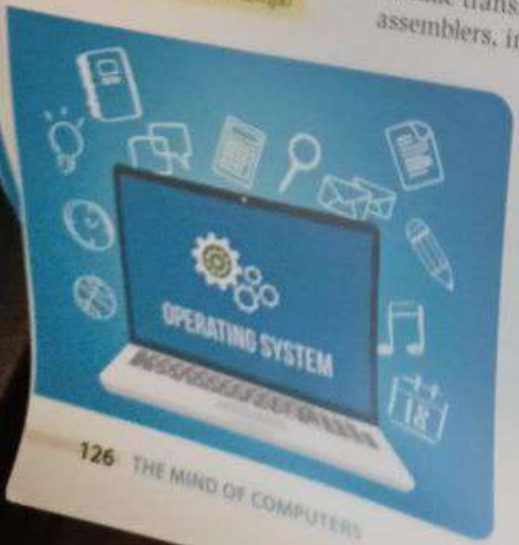
An **operating system**** (O/S) is a system of different programs that work together to control and manage the hardware to provide the most efficient use of the available equipment and memory resources, and to act as an interface between the computer and the user.

■ The main parts of an O/S

The most important part of the O/S consists of the **supervisory programs**, which control all the other programs in the O/S, and the **service programs**, which provide system services to the user. These fall into two categories: utility programs and system aids.

- **Utility programs** allow files to be saved, copied, renamed or deleted. They activate all peripheral devices and are able to format a disk in preparation for storing information.
- **System aids** assist the user when developing a program. Any system errors experienced in a program at run time will be located and identified by the O/S. System aids also include translation programs such as assemblers, interpreters and compilers.

to be devised: *essere concepito*
firmware: *impostazioni di fabbrica (che non possono essere modificate dall'utente)*
overall: *complessivo*
to prove: *dimostrarsi*
room: *spazio*
thread: *parte di un programma*
time slice: *intervallo di tempo*



■ Types of operating systems

The most common types of O/S are:

- **Single program:** one application program is run at a time, both in real time and batch processing. In **real time processing** the user interacts with the computer during the execution of a program, that means that the computer is able to respond immediately to inputs. In **batch processing** a series of programs are run in sequence and an output is only provided at the end.
- **Multi-user**: a number of users use the computer system at the same time. The computer resources are time-shared among the users, each user having exclusive use of the resources at any one time. As all operators are offered a time slice in turn, every user has the impression that they have exclusive use of a computer all the time;
- **Multi-processing**: a very complex program is run on more than one CPU at the same time. The CPUs are linked in parallel as in the case of supercomputers;
- **Multi-programming** or **multi-tasking**: more than one program can run at the same time. Different areas of primary storage are reserved for each program and any one particular program can be called into operation by the user at any time;
- **Multi-threading**: different parts of a single program run at the same time;
- **Virtual storage**: data is moved between primary and secondary storage as and when the primary storage proves to be too small. The user has the impression of a computer with a larger memory;
- **Virtual machine:** different users can use different operating systems simultaneously on the same PC.
- **Distributed:** various computer systems which are connected to each other using a shared communication line, have their own CPU, main memory, secondary memory, and re

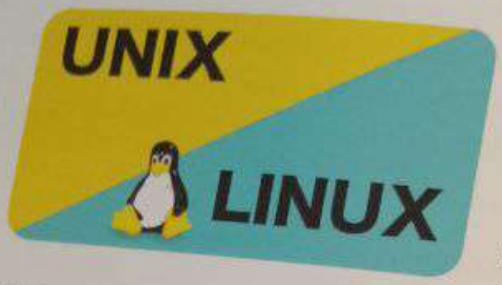
UNIX, LINUX AND ANDROID

Unix

The **Unix** * operating system was first released in 1971 ** and was initially entirely written in assembly language. In 1973 it was rewritten in C, with the exception of the kernel and the I/O. Such availability of an operating system written in a high-level language allowed greater portability to move easily from one computer platform to another.

* Although the last version was released in 1989, Unix still runs on a wide variety of architectures and its variants of Unix for mobile devices have become increasingly popular. So, we can no longer talk about a unique Unix system, but rather of several Unix-type systems.

** Unix quickly grew and became widely adopted by academic institutions and businesses. In 1984 it started to be sold as a proprietary product by AT&T.



The main parts of Unix

Everything in Unix is either a file or a process. A **process** is an executing program identified by a unique process identifier (PID), while a **file** is a collection of data created by users using text editors, running compilers, etc. Examples of files are: documents, the text of a program in a high-level language, machine instructions, or a directory with information about its content.

The Unix O/S is made up of three parts: the kernel, the shell and the commands or programs.

- The **kernel**, i.e. the central O/S component, is the hub of the operating system. It allocates time and memory to programs and handles the files and communications in response to system calls.
- The **shell** acts as an interface between the user and the kernel. The shell is a command line interpreter (CLI) which interprets the commands the user types in and arranges for them to be carried out.
- The **commands** are themselves programs: when they terminate, the shell gives the user a prompt for another command. The most commonly used programs are memorised by the shell. The user can either scroll the list or type history to see it.

Linux

Linux, also known as GNU/Linux, is a Unix-like, open-source O/S. By the 1990s most of its components, such as libraries, compilers, text editors and a Unix-like shell, had already been produced or collected. The kernel was released by Linus Torvalds in 1991 and originally called freax (i.e. free Unix-like), but Ari Lemmke gave it the name Linux for the directory from which the programs could be downloaded.

Linux has historically been used as a server operating system, but its low cost, flexibility, and Unix background make it suitable for a wide range of applications. It is often used in embedded systems such as mobile phones and handheld devices, but also in supercomputers. Although criticised in the past for not ensuring ease of use, Linux now has a user interface which is very similar to those running on other operating systems.

Android

Android is another Linux-based open-source O/S, but it is designed primarily for touch screen mobile devices such as smartphones and tablets. The code of Android is released by Google and, being open source, is continuously enriched by applications, or apps, written by a large community of developers.

edge: *vantaggio*
to ensure: *assicurare*
framework: *struttura*
kernel: *nucleo*
to release: *distribuire*
royalty fee: *tassa sui diritti d'autore*
to scroll: *scorrere*
shell: *shell (interprete dei comandi)*