**What is Unix?**

Unix -- trademarked as UNIX -- is a multiuser, multitasking operating system (OS) designed for flexibility and adaptability. Originally developed in the 1970s, Unix was one of the first OSes to be written in the C programming language. Since its introduction, the Unix operating system and its offshoots have had a profound effect on the computer and electronics industry, offering portability, stability and interoperability across a range of heterogeneous environments and device types.

**Unix-like operating systems**

The term *Unix-like* is often used to describe the different Unix variants, but there is no clear definition of what this term means. In general, it can refer to any OS that has some relation to Unix, no matter how distant, including free and open source variations. Some software developers assert that there are three types of Unix-like systems:

1. OSes historically connected to the original codebase from Bell Labs, such as the BSD systems developed by researchers at Berkeley.
2. Trademarked and branded Unix-like systems that meet SUS, such as HP-UX and IBM AIX. The Open Group has determined that these systems are allowed to use the Unix name.
3. Functional Unix-like systems, such as Linux and Minix, that behave in a manner consistent with the Unix specification. For example, they must have a program that manages the login and command-line sessions.

### History of Unix

In the late 1960s, Bell Labs (later AT&T), General Electric and the Massachusetts Institute of Technology attempted to develop an interactive time-sharing system called Multiplexed Information and Computing Service ([Multics](https://www.techtarget.com/whatis/definition/Multics-Multiplexed-Information-and-Computing-Service)) that would enable multiple users to access a mainframe simultaneously.

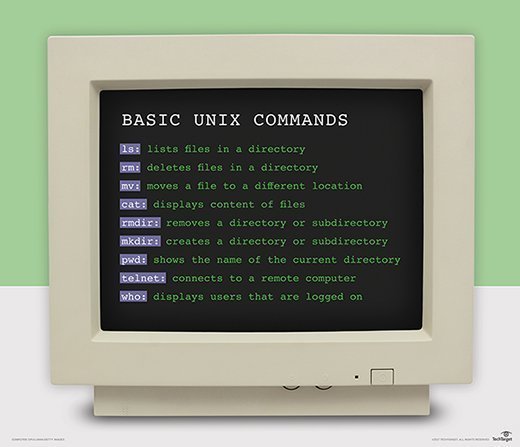
Disappointed with the results, Bell Labs pulled out of the project, but Bell computer scientists Ken Thompson and Dennis Ritchie continued their work, which culminated in the development of the Unix OS. As part of this effort, Thompson and Ritchie recruited other Bell Labs researchers, and together, they built a suite of components that provided a foundation for the operating system. The components included a hierarchical file system, a command-line interface ([CLI](https://www.techtarget.com/searchwindowsserver/definition/command-line-interface-CLI)) and multiple small utility programs. The OS also brought with it the concepts of computer processes and device files.

### What is Unix used for?

Unix is a modular OS made up of a number of essential components, including the [kernel](https://www.techtarget.com/searchdatacenter/definition/kernel), shell, file system and a core set of utilities or programs.

At the heart of the Unix OS is the kernel, a master control program that provides services to start and end programs. It also handles low-level operations, such as allocating memory, managing files, responding to system calls and scheduling tasks. Task scheduling is necessary to avoid conflicts when multiple programs attempt to access the same resource at the same time.

Users interact with the Unix environment through the shell, a CLI for entering commands that are passed to the kernel for execution. A command is used to invoke one of the available utilities. Each utility carries out a specific operation, such as creating files, deleting directories, retrieving system information or configuring the user environment.

Nine basic Unix commands

Unix supports multiple shells, including sh, csh, ksh, tcsh and bash. A Unix distribution typically designates a default shell, but users can choose from any of the supported shells. Users can also customize the shell environment, or they can write their own [shell scripts](https://www.techtarget.com/searchdatacenter/definition/shell-script).

Unix treats all types of files as simple byte arrays, resulting in a much simpler file model than those in other operating systems. Unix also treats devices and certain kinds of interprocess communication as files.

Unix concepts have been influential for a variety of reasons, including the following:

### Types of Unix

Unix became the first OS that could be improved or enhanced by anyone, partly because it was written in the C language and embraced many popular ideas. However, its early success led to multiple variants that lacked compatibility and interoperability. To address these issues, a number of vendors and individuals came together in the 1980s to standardize the OS, first by creating the [Portable Operating System Interface](https://www.techtarget.com/whatis/definition/POSIX-Portable-Operating-System-Interface) standard and then by defining the Single UNIX Specification (SUS)

**Features of UNIX**

Unix is an operating system, so it has all the features that the OS must-have. UNIX also looks at a few things in a different way than other OS. Features of UNIX are listed below :

**1. Multiuser System :**

Unix provides multiple programs to run and compete for the attention of the CPU. This happens in 2 ways :

* Multiple users running multiple jobs
* Single user running multiple jobs

In UNIX, resources are actually shared between all the users, so-called a multi-user system. For doing so, computer give a time slice (breaking unit of time into several segments ) to each user. So, at any instant of time, only one user is served but the switching is so fast that it gives an illusion that all the users are served simultaneously.

**2. Multitask System :**

A single user may run multiple tasks concurrently. Example : Editing a file, printing another on the printer & sending email to a person, and browsing the net too at the same time. The Kernel is designed to handle user’s multiple needs.

The important thing here is that only one job can be seen running in the foreground, the rest all seems to run in the background. Users can switch between them, terminate/suspend any of the jobs.

**3. The Building-Block Approach :**

The Unix developers thought about keeping small commands for every kind of work. So Unix has so many commands, each of which performs one simple job only. You can use 2 commands by using pipes (‘|’). Example :$ ls | wc Here, | (pipe) connects 2 commands to create a pipeline. This command counts the number of files in the directory. These types of connected commands that can filter/manipulate data in other ways are called filters.

Nowadays, many UNIX tools are designed in a way that the output of 1 can be used as an input for the others.. We can create a large number of combinations by connecting a number of tools.

**4. The UNIX Toolkit :**

Unix has a kernel but the kernel alone can’t do much that could help the user. So, we need to use the host of applications that usually come along with the UNIX systems. The applications are quite diversified. General-purpose tools, text manipulation utilities (called filters), compilers and interpreters, networked programs, and system administration tools are all included. With every UNIX release, new tools are being added and the older ones are modified/ removed.

**5. Pattern Matching :**

 Unix provides very sophisticated pattern matching features. The meta-char ‘\*’ is a special character used by the system to match a number of file names. There are several other meta-char in UNIX.  The matching is not confined to only filename. Advanced tools use a regular expression that is framed with the characters from this set.

**6. Programming Facility :**

Unix provides shell which is also a programming language designed for programmers, not for casual end-users. It has all the control structures, loops, and variables required for programming purposes. These features are used to design the shell scripts ( programs that can invoke the UNIX commands).

Many functions of the system can be controlled and managed by these shell scripts.

**7. Documentation :**

 It has a ‘man’ command that stands for the manual, which is the most important reference for any commands and their configuration files. Apart from the offline documentation, there is a vast amount of resources available on the Internet. If you’re stuck with a problem, there are various UNIX newsgroups where you can post your concerns. You can also go through the FAQ(Frequently Asked Questions) – a document that addresses several problems is widely used & available on the Net.

**8. Portable:**

Unix is highly portable, meaning it can be easily adapted to run on different hardware architectures.

**9. Command-line interface:**

Unix has a powerful command-line interface (CLI) that allows users to interact with the system through a shell program.

**10. File system:**

Unix has a hierarchical file system, with all files and directories organized under a single root directory.

**11. Networking:**

Unix was designed from the ground up to support networking, making it an ideal choice for servers and other networked systems.

**12. Security:**

 Unix has robust security features built-in, including user-level permissions and access control lists.

**13. Open-source:**

 Many versions of Unix are open-source, meaning that the source code is freely available for users to modify and distribute.

**14. Scalability:**

Unix is highly scalable, allowing it to be used on everything from small embedded systems to large-scale data centers.

## Windows Operating System

Windows operating system, developed by Microsoft, is one of the most widely used operating systems in the world. It provides a user-friendly interface, extensive software compatibility, and a range of features that cater to the needs of both individual users and businesses.

Here are some of key aspects of the Windows operating system −

* **Graphical User Interface (GUI)**−Windows is known for its graphical user interface, which allows users to interact with the system using visual elements such as icons, windows, and menus. This makes it easier for users to navigate, manage files, and run applications without needing extensive knowledge of command-line operations.
* **Software Compatibility** − Windows has a vast ecosystem of software applications available for users. It supports a wide range of commercial software, productivity tools, multimedia applications, games, and business applications. Many software developers primarily target the Windows platform, ensuring a wide variety of choices for users.
* **Hardware Compatibility** − Windows is compatible with a wide range of hardware devices, making it accessible for different types of computer systems. It supports various processors, graphics cards, peripherals, and other hardware components, ensuring flexibility in choosing and upgrading computer systems.
* **Regular Updates and Support**− Microsoft provides regular updates for the Windows operating system, including bug fixes, security patches, and new features. These updates enhance system stability, performance, and security. Windows also offers technical support options, including documentation, online forums, and customer service, to assist users with any issues they may encounter.
* **Gaming Support** − Windows has long been the preferred platform for gaming enthusiasts due to its extensive support for gaming hardware, compatibility with a wide range of games, and robust gaming features. The DirectX graphics technology, exclusive to Windows, provides improved performance and visual effects for gaming applications.
* **Integrated Tools and Features** − Windows includes a variety of integrated tools and features to enhance productivity and user experience. These include the Windows Defender antivirus software, Windows Firewall for network security, the Microsoft Office suite (Word, Excel, PowerPoint, etc.) for productivity, and cloud storage integration through OneDrive.
* **Active Directory and Group Policy** − Windows operating systems offer robust networking features, including Active Directory and Group Policy, which are essential for managing large networks and user access control in enterprise environments. These features provide centralized administration, security policies, and user management capabilities.
* **Personalization Options** − Windows allows users to customize their desktop environments to suit their preferences. Users can personalize themes, wallpapers, colors, icons, and other visual elements to create a personalized computing experience.
* **Cortana and Virtual Assistant Integration**− Windows includes Cortana, a virtual assistant that enables users to perform tasks using voice commands, perform web searches, set reminders, and interact with other applications. Cortana provides a convenient way to access information and perform actions hands-free.
* **Cloud Integration** − Windows integrates with Microsoft's cloud services, such as OneDrive and Microsoft 365 (formerly Office 365), allowing users to store files in the cloud, access them from different devices, and collaborate on documents in real-time.

## UNIX Operating System

UNIX is a powerful and versatile operating system that has been around since the 1970s. It was developed by a group of programmers at Bell Labs, including Ken Thompson and Dennis Ritchie. UNIX was designed to be a portable and flexible operating system, capable of running on a wide range of hardware platforms.

Here are some of the key aspects of the UNIX operating system −

* **Philosophy**− UNIX follows a "do one thing and do it well" philosophy. It emphasizes simplicity, modularity, and the use of small, specialized tools that can be combined to perform complex tasks. Windows, on the other hand, focuses on providing a comprehensive and integrated user experience with a graphical user interface (GUI).
* **Structure**− UNIX is a multi-user and multi-tasking operating system. It is known for its hierarchical file system, where everything is treated as a file. UNIX also supports a command-line interface (CLI), which allows users to interact with the system through text commands. Windows, on the other hand, is primarily designed for single-user systems, although it does have limited multi-user capabilities. It has a hierarchical file system similar to UNIX, but also includes a graphical shell that provides a more user-friendly interface.
* **Security**− UNIX has a strong security heritage and was originally developed in a time when computer security was a major concern. It employs a robust permission system that allows administrators to control access to files and resources. Windows has also made significant strides in terms of security over the years, but it has historically been a target for malware and viruses due to its popularity and wide adoption.
* **Software Ecosystem**− UNIX is known for its rich software ecosystem, particularly in the field of scientific computing, server administration, and programming. It has a vast collection of open-source tools and utilities that can be easily integrated into the system. Windows, on the other hand, has a larger market share in the desktop and consumer space, which has led to a broader range of commercial software and games being available for the platform
* Unix developers are credited for bringing modularity and reusability into the practice of software engineering and inciting a software tools movement.
* Unix developers also created a set of cultural rules for [software development](https://www.techtarget.com/whatis/definition/software-development) -- referred to as the Unix philosophy -- that has been highly influential to the IT community.