**MICROSOFT WINDOWS**

Microsoft Windows (or simply Windows) is a metafamily of [graphical](https://en.wikipedia.org/wiki/Graphical_user_interface) [operating systems](https://en.wikipedia.org/wiki/Operating_system) developed, marketed, and sold by [Microsoft](https://en.wikipedia.org/wiki/Microsoft). It consists of several families of operating systems, each of which cater to a certain sector of the computing industry with the [OS](https://en.wikipedia.org/wiki/Operating_system) typically associated with [IBM PC compatible](https://en.wikipedia.org/wiki/IBM_PC_compatible) architecture. Active Windows families include [Windows NT](https://en.wikipedia.org/wiki/Windows_NT), [Windows Embedded](https://en.wikipedia.org/wiki/Windows_Embedded) and [Windows Phone](https://en.wikipedia.org/wiki/Windows_Phone); these may encompass subfamilies, e.g. [Windows Embedded Compact](https://en.wikipedia.org/wiki/Windows_Embedded_Compact) (Windows CE) or [Windows Server](https://en.wikipedia.org/wiki/Windows_Server). Defunct Windows families include [Windows 9x](https://en.wikipedia.org/wiki/Windows_9x); [Windows 10 Mobile](https://en.wikipedia.org/wiki/Windows_10_Mobile) is an active product, unrelated to the defunct family [Windows Mobile](https://en.wikipedia.org/wiki/Windows_Mobile).

Microsoft introduced an [operating environment](https://en.wikipedia.org/wiki/Operating_environment) named Windows on November 20, 1985, as a graphical [operating system shell](https://en.wikipedia.org/wiki/Operating_system_shell) for [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS) in response to the growing interest in [graphical user interfaces](https://en.wikipedia.org/wiki/Graphical_user_interface) (GUIs). Microsoft Windows came to [dominate](https://en.wikipedia.org/wiki/Dominance_(economics)) the world's [personal computer](https://en.wikipedia.org/wiki/Personal_computer) (PC) market with [over 90% market share](https://en.wikipedia.org/wiki/Usage_share_of_operating_systems), overtaking [Mac OS](https://en.wikipedia.org/wiki/Classic_Mac_OS), which had been introduced in 1984. [Apple](https://en.wikipedia.org/wiki/Apple_Inc) came to see Windows as an unfair encroachment on their innovation in GUI development as implemented on products such as the [Lisa](https://en.wikipedia.org/wiki/Apple_Lisa) and [Macintosh](https://en.wikipedia.org/wiki/Macintosh) (eventually settled in court in Microsoft's favor in 1993). On PCs, Windows is still the most popular operating system. However, in 2014, Microsoft admitted losing the majority of the overall operating system market to [Android](https://en.wikipedia.org/wiki/Android_(operating_system)), because of the massive growth in sales of Android [smartphones](https://en.wikipedia.org/wiki/Smartphone). In 2014, the number of Windows devices sold was less than 25% that of Android devices sold. This comparison however may not be fully relevant, as the two operating systems traditionally target different platforms.

As of September 2016, the most recent version of Windows for PCs, [tablets](https://en.wikipedia.org/wiki/Tablet_computers), [smartphones](https://en.wikipedia.org/wiki/Smartphone) and [embedded devices](https://en.wikipedia.org/wiki/Embedded_system) is [Windows 10](https://en.wikipedia.org/wiki/Windows_10). The most recent versions for [server computers](https://en.wikipedia.org/wiki/Server_(computing)) is [Windows Server 2016](https://en.wikipedia.org/wiki/Windows_Server_2016). A specialized version of Windows runs on the [Xbox One](https://en.wikipedia.org/wiki/Xbox_One) [game console](https://en.wikipedia.org/wiki/Game_console).

**GENEALOGY**

**-By Marketing Role**

Microsoft, the developer of Windows, has registered several trademarks each of which denote a family of Windows operating systems that target a specific sector of the computing industry. As of 2014, the following Windows families are being actively developed:

* [Windows NT](https://en.wikipedia.org/wiki/Windows_NT): Started as a family of operating system with [Windows NT 3.1](https://en.wikipedia.org/wiki/Windows_NT_3.1), an operating system for [server computers](https://en.wikipedia.org/wiki/Server_(computing)) and [workstations](https://en.wikipedia.org/wiki/Workstations). It now consists of three operating system subfamilies that are released almost at the same time and share the same kernel. It is almost impossible for someone unfamiliar with the subject to identify the members of this family by name because they do not adhere to any specific rule; e.g. [Windows Vista](https://en.wikipedia.org/wiki/Windows_Vista), [Windows 7](https://en.wikipedia.org/wiki/Windows_7), [Windows 8](https://en.wikipedia.org/wiki/Windows_8)/[8.1](https://en.wikipedia.org/wiki/Windows_8.1) and [Windows RT](https://en.wikipedia.org/wiki/Windows_RT) are members of this family but [Windows 3.1](https://en.wikipedia.org/wiki/Windows_3.1) is not.
  + Windows: The operating system for mainstream [personal computers](https://en.wikipedia.org/wiki/Personal_computers), [tablets](https://en.wikipedia.org/wiki/Tablet_computer) and [smartphones](https://en.wikipedia.org/wiki/Smartphone). The latest version is [Windows 10](https://en.wikipedia.org/wiki/Windows_10). The main competitor of this family is [macOS](https://en.wikipedia.org/wiki/MacOS" \o "MacOS) by [Apple Inc.](https://en.wikipedia.org/wiki/Apple_Inc.) for personal computers and [Android](https://en.wikipedia.org/wiki/Android_(operating_system)) for mobile devices (c.f. [Usage share of operating systems § Market share by category](https://en.wikipedia.org/wiki/Usage_share_of_operating_systems#Market_share_by_category)).
  + [Windows Server](https://en.wikipedia.org/wiki/Windows_Server): The operating system for server computers. The latest version is [Windows Server 2016](https://en.wikipedia.org/wiki/Windows_Server_2016). Unlike its clients sibling, it has adopted a strong naming scheme. The main competitor of this family is [Linux](https://en.wikipedia.org/wiki/Linux). (c.f. [Usage share of operating systems § Market share by category](https://en.wikipedia.org/wiki/Usage_share_of_operating_systems#Market_share_by_category))
  + [Windows PE](https://en.wikipedia.org/wiki/Windows_PE): A lightweight version of its Windows sibling meant to operate as a [live operating system](https://en.wikipedia.org/wiki/Live_OS), used for installing Windows on bare-metal computers (especially on many computers at once), recovery or troubleshooting purposes. The latest version is Windows PE 10.0.10586.0.
* [Windows Embedded](https://en.wikipedia.org/wiki/Windows_Embedded): Initially, Microsoft developed [Windows CE](https://en.wikipedia.org/wiki/Windows_CE) as a general-purpose operating system for every device that was too resource-limited to be called a full-fledged computer. Eventually, however, Windows CE was renamed Windows Embedded Compact and was folded under Windows Compact trademark which also consists of [Windows Embedded Industry](https://en.wikipedia.org/wiki/Windows_Embedded_Industry), Windows Embedded Professional, [Windows Embedded Standard](https://en.wikipedia.org/wiki/Windows_Embedded_Standard), [Windows Embedded Handheld](https://en.wikipedia.org/wiki/Windows_Embedded_Handheld) and [Windows Embedded Automotive](https://en.wikipedia.org/wiki/Windows_Embedded_Automotive).

The following Windows families are no longer being developed:

* [Windows 9x](https://en.wikipedia.org/wiki/Windows_9x): An operating system that targeted consumers market. Discontinued because of suboptimal performance. ([PC World](https://en.wikipedia.org/wiki/PC_World) called its last version, [Windows ME](https://en.wikipedia.org/wiki/Windows_ME), one of the worst products of all times. Microsoft now caters to the consumers market with Windows NT.
* [Windows Mobile](https://en.wikipedia.org/wiki/Windows_Mobile): The predecessor to Windows Phone, it was a mobile phone operating system. The first version was called [Pocket PC 2000](https://en.wikipedia.org/wiki/Pocket_PC_2000); the third version, [Windows Mobile 2003](https://en.wikipedia.org/wiki/Windows_Mobile_2003) is the first version to adopt the Windows Mobile trademark. The last version is [Windows Mobile 6.5](https://en.wikipedia.org/wiki/Windows_Mobile_6.5).
* [Windows Phone](https://en.wikipedia.org/wiki/Windows_Phone): An operating system sold only to manufacturers of smartphones. The first version was [Windows Phone 7](https://en.wikipedia.org/wiki/Windows_Phone_7), followed by [Windows Phone 8](https://en.wikipedia.org/wiki/Windows_Phone_8), and the last version [Windows Phone 8.1](https://en.wikipedia.org/wiki/Windows_Phone_8.1). It was succeeded by [Windows 10 Mobile](https://en.wikipedia.org/wiki/Windows_10_Mobile).

**VERSION HISTORY**

-Early Versions

The history of Windows dates back to September 1981, when Chase Bishop, a computer scientist, designed the first model of an electronic device and project Interface Manager was started. It was announced in November 1983 (after the [Apple Lisa](https://en.wikipedia.org/wiki/Apple_Lisa), but before the [Macintosh](https://en.wikipedia.org/wiki/Macintosh)) under the name "Windows", but [Windows 1.0](https://en.wikipedia.org/wiki/Windows_1.0) was not released until November 1985. Windows 1.0 was to compete with [Apple](https://en.wikipedia.org/wiki/Apple_Inc.)'s operating system, but achieved little popularity. Windows 1.0 is not a complete operating system; rather, it extends [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS). The shell of Windows 1.0 is a program known as the [MS-DOS Executive](https://en.wikipedia.org/wiki/MS-DOS_Executive). Components included [Calculator](https://en.wikipedia.org/wiki/Microsoft_Calculator), Calendar, [Cardfile](https://en.wikipedia.org/wiki/Cardfile" \o "Cardfile), [Clipboard viewer](https://en.wikipedia.org/wiki/ClipBook_Viewer), Clock, [Control Panel](https://en.wikipedia.org/wiki/Control_Panel_(Windows)), [Notepad](https://en.wikipedia.org/wiki/Notepad_(Windows)), [Paint](https://en.wikipedia.org/wiki/Microsoft_Paint), [Reversi](https://en.wikipedia.org/wiki/Reversi" \o "Reversi), [Terminal](https://en.wikipedia.org/wiki/Terminal_emulator) and [Write](https://en.wikipedia.org/wiki/Windows_Write). Windows 1.0 does not allow overlapping windows. Instead all windows are [tiled](https://en.wikipedia.org/wiki/Tiling_window_manager). Only modal dialog boxes may appear over other windows.

[Windows 2.0](https://en.wikipedia.org/wiki/Windows_2.0) was released in December 1987, and was more popular than its predecessor. It features several improvements to the user interface and memory management.Windows 2.03 changed the OS from tiled windows to overlapping windows. The result of this change led to Apple Computer filing a suit against Microsoft alleging infringement on Apple's copyrights. Windows 2.0 also introduced more sophisticated [keyboard shortcuts](https://en.wikipedia.org/wiki/Keyboard_shortcut) and could make use of [expanded memory](https://en.wikipedia.org/wiki/Expanded_memory).

Windows 2.1 was released in two different versions: [Windows/286](https://en.wikipedia.org/wiki/Windows/286) and [Windows/386](https://en.wikipedia.org/wiki/Windows/386). Windows/386 uses the [virtual 8086 mode](https://en.wikipedia.org/wiki/Virtual_8086_mode) of the [Intel 80386](https://en.wikipedia.org/wiki/Intel_80386) to multitask several DOS programs and the [paged memory model](https://en.wikipedia.org/wiki/Paging) to emulate expanded memory using available [extended memory](https://en.wikipedia.org/wiki/Extended_memory). Windows/286, in spite of its name, runs on both [Intel 8086](https://en.wikipedia.org/wiki/Intel_8086) and [Intel 80286](https://en.wikipedia.org/wiki/Intel_80286) processors. It runs in [real mode](https://en.wikipedia.org/wiki/Real_mode) but can make use of the [high memory area](https://en.wikipedia.org/wiki/High_memory_area).

In addition to full Windows-packages, there were runtime-only versions that shipped with early Windows software from third parties and made it possible to run their Windows software on MS-DOS and without the full Windows feature set.

The early versions of Windows are often thought of as graphical shells, mostly because they ran on top of MS-DOS and use it for [file system](https://en.wikipedia.org/wiki/File_system) services. However, even the earliest Windows versions already assumed many typical operating system functions; notably, having their own [executable file format](https://en.wikipedia.org/wiki/Executable_file_format) and providing their own [device drivers](https://en.wikipedia.org/wiki/Device_driver) (timer, graphics, printer, mouse, keyboard and sound). Unlike MS-DOS, Windows allowed users to execute multiple graphical applications at the same time, through [cooperative multitasking](https://en.wikipedia.org/wiki/Nonpreemptive_multitasking). Windows implemented an elaborate, segment-based, software virtual memory scheme, which allows it to run applications larger than available memory: code segments and [resources](https://en.wikipedia.org/wiki/Resource_(Windows)) are swapped in and thrown away when memory became scarce; data segments moved in memory when a given application had relinquished processor control.

**SECURITY**

Consumer versions of Windows were originally designed for ease-of-use on a single-user PC without a network connection, and did not have security features built in from the outset. However, Windows NT and its successors are designed for security (including on a network) and multi-user PCs, but were not initially designed with Internet security in mind as much, since, when it was first developed in the early 1990s, Internet use was less prevalent.

These design issues combined with programming errors (e.g. [buffer overflows](https://en.wikipedia.org/wiki/Buffer_overflow)) and the popularity of Windows means that it is a frequent target of [computer worm](https://en.wikipedia.org/wiki/Computer_worm) and [virus](https://en.wikipedia.org/wiki/Computer_virus) writers. In June 2005, [Bruce Schneier](https://en.wikipedia.org/wiki/Bruce_Schneier)'s Counterpane Internet Security reported that it had seen over 1,000 new viruses and worms in the previous six months. In 2005, [Kaspersky Lab](https://en.wikipedia.org/wiki/Kaspersky_Lab) found around 11,000 malicious programs—viruses, Trojans, back-doors, and exploits written for Windows.

Microsoft releases security patches through its [Windows Update](https://en.wikipedia.org/wiki/Windows_Update) service approximately once a month (usually the [second Tuesday](https://en.wikipedia.org/wiki/Patch_Tuesday) of the month), although critical updates are made available at shorter intervals when necessary. In versions of Windows after and including Windows 2000 SP3 and Windows XP, updates can be automatically downloaded and installed if the user selects to do so. As a result, Service Pack 2 for Windows XP, as well as Service Pack 1 for Windows Server 2003, were installed by users more quickly than it otherwise might have been.

While the [Windows 9x](https://en.wikipedia.org/wiki/Windows_9x) series offered the option of having profiles for multiple users, they had no concept of [access privileges](https://en.wikipedia.org/wiki/Principle_of_least_privilege), and did not allow concurrent access; and so were not true [multi-user](https://en.wikipedia.org/wiki/Multi-user) operating systems. In addition, they implemented only partial [memory protection](https://en.wikipedia.org/wiki/Memory_protection). They were accordingly widely criticised for lack of security.

The [Windows NT](https://en.wikipedia.org/wiki/Windows_NT) series of operating systems, by contrast, are true multi-user, and implement absolute memory protection. However, a lot of the advantages of being a true multi-user operating system were nullified by the fact that, prior to Windows Vista, the first user account created during the setup process was an [administrator](https://en.wikipedia.org/wiki/Windows_administrator) account, which was also the default for new accounts. Though [Windows XP](https://en.wikipedia.org/wiki/Windows_XP) did have limited accounts, the majority of home users did not change to an account type with fewer rights – partially due to the number of programs which unnecessarily required administrator rights – and so most home users ran as administrator all the time.

[Windows Vista](https://en.wikipedia.org/wiki/Windows_Vista) changes this by introducing a privilege elevation system called [User Account Control](https://en.wikipedia.org/wiki/User_Account_Control). When logging in as a standard user, a logon session is created and a [token](https://en.wikipedia.org/wiki/Token_(Windows_NT_architecture)) containing only the most basic privileges is assigned. In this way, the new logon session is incapable of making changes that would affect the entire system. When logging in as a user in the Administrators group, two separate tokens are assigned. The first token contains all privileges typically awarded to an administrator, and the second is a restricted token similar to what a standard user would receive. User applications, including the [Windows shell](https://en.wikipedia.org/wiki/Windows_shell), are then started with the restricted token, resulting in a reduced privilege environment even under an Administrator account. When an application requests higher privileges or "Run as administrator" is clicked, UAC will prompt for confirmation and, if consent is given (including administrator credentials if the account requesting the elevation is not a member of the administrators group), start the process using the unrestricted token.

**-File permissions**

All Windows versions from Windows NT 3 have been based on a file system permission system referred to as AGLP (Accounts, Global, Local, Permissions) [AGDLP](https://en.wikipedia.org/wiki/AGDLP) which in essence where file permissions are applied to the file/folder in the form of a 'local group' which then has other 'global groups' as members. These global groups then hold other groups or users depending on different Windows versions used. This system varies from other vendor products such as [Linux](https://en.wikipedia.org/wiki/Linux) and [NetWare](https://en.wikipedia.org/wiki/NetWare) due to the 'static' allocation of permission being applied directory to the file or folder. However using this process of AGLP/AGDLP/AGUDLP allows a small number of static permissions to be applied and allows for easy changes to the account groups without reapplying the file permissions on the files and folders.

**-Windows Defender**

On January 6, 2005, Microsoft released a [Beta version](https://en.wikipedia.org/wiki/Beta_version) of Microsoft AntiSpyware, based upon the previously released [Giant](https://en.wikipedia.org/wiki/GIANT_Company_Software) AntiSpyware. On February 14, 2006, Microsoft AntiSpyware became [Windows Defender](https://en.wikipedia.org/wiki/Windows_Defender) with the release of Beta 2. Windows Defender is a freeware program designed to protect against spyware and other unwanted software. Windows XP and Windows Server 2003 users who have [genuine](https://en.wikipedia.org/wiki/Windows_Genuine_Advantage) copies of Microsoft Windows can freely download the program from Microsoft's web site, and Windows Defender ships as part of Windows Vista and 7. In Windows 8, Windows Defender and Microsoft Security Essentials have been combined into a single program, named Windows Defender. It is based on [Microsoft Security Essentials](https://en.wikipedia.org/wiki/Microsoft_Security_Essentials), borrowing its features and user interface. Although it is enabled by default, it can be turned off to use another anti-virus solution. [Windows Malicious Software Removal Tool](https://en.wikipedia.org/wiki/Windows_Malicious_Software_Removal_Tool) and the optional [Microsoft Safety Scanner](https://en.wikipedia.org/wiki/Microsoft_Safety_Scanner) are two other free security products offered by Microsoft.

**-Third-party analysis**

In an article based on a report by Symantec, internetnews.com has described Microsoft Windows as having the "fewest number of patches and the shortest average patch development time of the five operating systems it monitored in the last six months of 2006."

A study conducted by [Kevin Mitnick](https://en.wikipedia.org/wiki/Kevin_Mitnick) and marketing communications firm Avantgarde in 2004, found that an unprotected and unpatched Windows XP system with Service Pack 1 lasted only four minutes on the Internet before it was compromised, and an unprotected and also unpatched Windows Server 2003 system was compromised after being connected to the internet for 8 hours. The computer that was running Windows XP Service Pack 2 was not compromised. The [AOL](https://en.wikipedia.org/wiki/AOL) National Cyber Security Alliance Online Safety Study of October 2004, determined that 80% of Windows users were infected by at least one [spyware](https://en.wikipedia.org/wiki/Spyware)/[adware](https://en.wikipedia.org/wiki/Adware) product. Much documentation is available describing how to increase the security of Microsoft Windows products. Typical suggestions include deploying Microsoft Windows behind a hardware or software [firewall](https://en.wikipedia.org/wiki/Firewall_(computing)), running [anti-virus](https://en.wikipedia.org/wiki/Anti-virus) and [anti-spyware](https://en.wikipedia.org/wiki/Anti-spyware) software, and installing patches as they become available through Windows Update.

**WINDOWS 1.0**

Windows 1.0 is a [graphical](https://en.wikipedia.org/wiki/Graphical_user_interface) [personal computer](https://en.wikipedia.org/wiki/Personal_computer) [operating environment](https://en.wikipedia.org/wiki/Operating_environment) developed by [Microsoft](https://en.wikipedia.org/wiki/Microsoft). Microsoft had worked with [Apple Computer](https://en.wikipedia.org/wiki/Apple_Inc.) to develop applications for Apple's January 1984 [original Macintosh](https://en.wikipedia.org/wiki/Macintosh_128K), the first mass-produced personal computer with a [graphical user interface](https://en.wikipedia.org/wiki/Graphical_user_interface) (GUI) that enabled users to see [user friendly](https://en.wikipedia.org/wiki/User_friendly) icons on screen. Windows 1.0 was released on November 20, 1985, as the first version of the [Microsoft Windows](https://en.wikipedia.org/wiki/Microsoft_Windows) line. It runs as a graphical, [16-bit](https://en.wikipedia.org/wiki/16-bit) [multi-tasking](https://en.wikipedia.org/wiki/Computer_multitasking)[shell](https://en.wikipedia.org/wiki/Shell_(computing)) on top of an existing [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS) installation. It provides an environment which can run graphical programs designed for Windows, as well as existing [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS) software. Its development was spearheaded by the company founder [Bill Gates](https://en.wikipedia.org/wiki/Bill_Gates) after he saw a demonstration of a similar software suite known as [Visi On](https://en.wikipedia.org/wiki/Visi_On" \o "Visi On) at [COMDEX](https://en.wikipedia.org/wiki/COMDEX).

Despite positive responses to its early presentations and support from a number of hardware and software makers, Windows 1.0 was received poorly by critics. Critics felt Windows 1.0 did not meet their expectations. In particular, they felt that Windows 1.0 put too much emphasis on [mouse](https://en.wikipedia.org/wiki/Mouse_(computing)) input at a time when mouse use was not yet widespread; not providing enough resources for new users; and for performance issues, especially on systems with lower [computer hardware](https://en.wikipedia.org/wiki/Computer_hardware) specifications. Despite these criticisms, Windows 1.0 was an important milestone for Microsoft, as it introduced the [Microsoft Windows](https://en.wikipedia.org/wiki/Microsoft_Windows) line, and in computer history in general. Windows 1.0 was declared obsolete and Microsoft stopped providing support and updates for the system on December 31, 2001.

**HISTORY OF WINDOWS 1.0**

The development of Windows began after [Microsoft](https://en.wikipedia.org/wiki/Microsoft) founder [Bill Gates](https://en.wikipedia.org/wiki/Bill_Gates) saw a demonstration at [COMDEX](https://en.wikipedia.org/wiki/COMDEX) 1982 of [VisiCorp](https://en.wikipedia.org/wiki/VisiCorp" \o "VisiCorp)'s [Visi On](https://en.wikipedia.org/wiki/Visi_On" \o "Visi On), a [graphical user interface](https://en.wikipedia.org/wiki/Graphical_user_interface) (GUI) software suite for [IBM PC compatible](https://en.wikipedia.org/wiki/IBM_PC_compatible) computers.

Microsoft first presented Windows to the public on November 10, 1983. Requiring two [floppy disk](https://en.wikipedia.org/wiki/Floppy_disk) drives and 192 [KB](https://en.wikipedia.org/wiki/Kilobyte) of RAM, Microsoft described the software as a [device driver](https://en.wikipedia.org/wiki/Device_driver) for [MS-DOS 2](https://en.wikipedia.org/wiki/MS-DOS_2).0. By supporting [cooperative multitasking](https://en.wikipedia.org/wiki/Cooperative_multitasking) in [tiled "windows"](https://en.wikipedia.org/wiki/Tiling_window_manager) when using "well-behaved" applications that only used DOS system "calls", and permitting "non-well-behaved" applications to run in a full screen, Windows differed from both Visi On and [Apple Computer](https://en.wikipedia.org/wiki/Apple_Computer)'s [Lisa](https://en.wikipedia.org/wiki/Apple_Lisa) by immediately offering many applications. Unlike Visi On, Windows developers did not need to use [Unix](https://en.wikipedia.org/wiki/Unix) to develop IBM PC applications; Microsoft planned to encourage other companies, including competitors, to develop programs for Windows by not requiring a Microsoft [user interface](https://en.wikipedia.org/wiki/User_interface) in their applications.

Many manufacturers of MS-DOS computers such as [Compaq](https://en.wikipedia.org/wiki/Compaq), [Zenith](https://en.wikipedia.org/wiki/Zenith_Data_Systems), and [DEC](https://en.wikipedia.org/wiki/Digital_Equipment_Corporation) promised to provide support, as did software companies such as [Ashton-Tate](https://en.wikipedia.org/wiki/Ashton-Tate) and [Lotus](https://en.wikipedia.org/wiki/Lotus_Development). After previewing Windows, [BYTE](https://en.wikipedia.org/wiki/BYTE) magazine stated in December 1983 that it "seems to offer remarkable openness, reconfigurability, and transportability as well as modest hardware requirements and pricing … Barring a surprise product introduction from another company, Microsoft Windows will be the first large-scale test of the [desktop](https://en.wikipedia.org/wiki/Desktop_computer) metaphor in the hands of its intended users".

From early in Windows' history Gates viewed it as Microsoft's future. He told InfoWorld magazine in April 1984 that "Our strategies and energies as a company are totally committed to Windows, in the same way that we're committed to operating-system [kernels](https://en.wikipedia.org/wiki/Kernel_(operating_system)) like [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS) and [Xenix](https://en.wikipedia.org/wiki/Xenix" \o "Xenix). We're also saying that only applications that take advantage of Windows will be competitive in the long run." [IBM](https://en.wikipedia.org/wiki/IBM) was notably absent from Microsoft's announcement, and by late 1984 the press reported a "War of the Windows" between Windows, IBM's [TopView](https://en.wikipedia.org/wiki/TopView" \o "TopView), and [Digital Research](https://en.wikipedia.org/wiki/Digital_Research)'s [Graphics Environment Manager](https://en.wikipedia.org/wiki/Graphics_Environment_Manager) (GEM). Microsoft had promised in November 1983 to ship Windows by April 1984, but subsequently denied that it had announced a release date, and predicted that Windows would ship by June 1985. Deemphasizing multitasking, the company stated that Windows' purpose, unlike that of TopView, was to "turn the computer into a [graphics](https://en.wikipedia.org/wiki/Graphics)-rich environment" while using less memory.

**-Windows 1.0**

Windows 1.0 was officially released on November 20, 1985.

**-Windows 1.01**

Version 1.01, released in 1985, was the first point-release after Windows 1.00.

**-Windows 1.02**

Version 1.02, released in May 1986, was an international release.

**-Windows 1.03**

Version 1.03, released in August 1986, included enhancements that made it consistent with the international release. It included [drivers](https://en.wikipedia.org/wiki/Device_driver) for European keyboards and additional screen and printer drivers.

**-Windows 1.04**

Version 1.04, released in April 1987, added support for the new [IBM PS/2](https://en.wikipedia.org/wiki/IBM_Personal_System/2) computers, although no support for PS/2 mice or new [VGA](https://en.wikipedia.org/wiki/VGA) graphics modes was provided. At the same time, [Microsoft](https://en.wikipedia.org/wiki/Microsoft) and [IBM](https://en.wikipedia.org/wiki/IBM) announced the introduction of [OS/2](https://en.wikipedia.org/wiki/OS/2) and its graphical OS/2 [Presentation Manager](https://en.wikipedia.org/wiki/Presentation_Manager), which were supposed to ultimately replace both [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS) and [Windows](https://en.wikipedia.org/wiki/Windows). In November 1987, Windows 1.0 was succeeded by [Windows 2.0](https://en.wikipedia.org/wiki/Windows_2.0). Microsoft supported Windows 1.0 for 16 years, until December 31, 2001 – the longest out of all versions of Windows.

**FEATURES OF WIN.1.0**

Windows 1.0 offers limited multitasking of existing MS-DOS programs and concentrates on creating an interaction [paradigm](https://en.wikipedia.org/wiki/Paradigm) (cf. [message loop](https://en.wikipedia.org/wiki/Message_loop_in_Microsoft_Windows)), an execution model and a stable [API](https://en.wikipedia.org/wiki/Application_programming_interface) for [native](https://en.wikipedia.org/wiki/Native_mode) programs for the future. Due to Microsoft's extensive support for [backward compatibility](https://en.wikipedia.org/wiki/Backward_compatibility), it is not only possible to execute Windows 1.0 [binary](https://en.wikipedia.org/wiki/Executable) programs on current versions of Windows to a large extent, but also to recompile their [source code](https://en.wikipedia.org/wiki/Source_code) into an equally functional "modern" application with just limited modifications. Windows 1.0 is often regarded as a "[front-end](https://en.wikipedia.org/wiki/Front-end_and_back-end) to the [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS) [operating system](https://en.wikipedia.org/wiki/Operating_system)", a description which has also been applied to subsequent versions of Windows. Windows 1.0 is an MS-DOS program. Windows 1.0 programs can call MS-DOS functions, and GUI programs are run from [.exe](https://en.wikipedia.org/wiki/EXE) files just like MS-DOS programs. However, Windows .exe files had their own "new executable" (NE) file format, which only Windows could process and which, for example, allowed demand-loading of code and data. Applications were supposed to handle memory only through Windows' own memory management system, which implemented a software-based [virtual memory](https://en.wikipedia.org/wiki/Virtual_memory) scheme allowing for applications larger than available [RAM](https://en.wikipedia.org/wiki/Random_access_memory).

Because graphics support in MS-DOS is extremely limited, MS-DOS applications have to go to the bare hardware (or sometimes just to the [BIOS](https://en.wikipedia.org/wiki/BIOS)) to get work done. Therefore, Windows 1.0 included original [device drivers](https://en.wikipedia.org/wiki/Device_driver) for video cards, a mouse, keyboards, printers and serial communications, and applications were supposed to only invoke APIs built upon these drivers. However, this extended to other APIs such as file system management functions. In this sense, Windows 1.0 was designed to be extended into a full-fledged operating system, rather than being just a graphics environment used by applications. Indeed, Windows 1.0 is a "DOS front-end" and cannot operate without a DOS environment (it uses, for example, the file-handling functions provided by DOS.) The level of replacement increases in subsequent versions. The system requirements for Windows 1.01 constituted [CGA](https://en.wikipedia.org/wiki/Color_Graphics_Adapter)/[HGC](https://en.wikipedia.org/wiki/Hercules_Graphics_Card)/[EGA](https://en.wikipedia.org/wiki/Enhanced_Graphics_Adapter) (listed as "Monochrome or color monitor"), MS-DOS 2.0, 256 KB of memory or greater, and two double-sided disk drives or a hard drive. Beginning with version 1.03, support for Tandy and AT&T graphics modes was added.

Windows 1.0 runs a [shell](https://en.wikipedia.org/wiki/Operating_system_shell) program known as the [MS-DOS Executive](https://en.wikipedia.org/wiki/MS-DOS_Executive), which is little more than a mouse-able output of the DIR command that does not support icons and is not [Y2K](https://en.wikipedia.org/wiki/Year_2000_problem)-compliant. Other supplied programs are [Calculator](https://en.wikipedia.org/wiki/Microsoft_Calculator), Calendar, [Clipboard Viewer](https://en.wikipedia.org/wiki/Clipboard_Viewer), Clock, [Notepad](https://en.wikipedia.org/wiki/Notepad_(Windows)), [Paint](https://en.wikipedia.org/wiki/Microsoft_Paint), [Reversi](https://en.wikipedia.org/wiki/Reversi" \o "Reversi), [Cardfile](https://en.wikipedia.org/wiki/Cardfile" \o "Cardfile), [Terminal](https://en.wikipedia.org/wiki/Terminal_emulator) and [Write](https://en.wikipedia.org/wiki/Windows_Write). Windows 1.0 does not allow overlapping windows. Instead all windows are [tiled](https://en.wikipedia.org/wiki/Tiling_window_manager). Only dialog boxes can appear over other windows, but cannot be minimized.

**RECEPTION**

Windows 1.0 was released to mixed reviews. Most critics considered the platform to have future potential, but that Windows 1.0 had not fulfilled expectations. Many reviews criticized its demanding system requirements, especially noting the poor performance experienced when running multiple applications at once, and that Windows encouraged the use of a mouse for navigation, a relatively new concept at the time. [The New York Times](https://en.wikipedia.org/wiki/The_New_York_Times) compared the performance of Windows on a system with 512 KB of RAM to "pouring molasses in the Arctic", and that its design was inflexible for keyboard users due to its dependency on a mouse-oriented interface. In conclusion, the Times felt that the poor performance, lack of dedicated software, uncertain compatibility with DOS programs, and the lack of tutorials for new users made DOS-based software such as [Borland Sidekick](https://en.wikipedia.org/wiki/Borland_Sidekick) (which could provide a similar assortment of accessories and multitasking functionality) more desirable for most PC users.

In retrospect, Windows 1.0 was regarded as a flop by contemporary technology publications, who, however, still acknowledged its overall importance to the history of the [Windows line](https://en.wikipedia.org/wiki/Microsoft_Windows). [Nathaniel Borenstein](https://en.wikipedia.org/wiki/Nathaniel_Borenstein) (who went on to develop the [MIME](https://en.wikipedia.org/wiki/MIME) standards) and his IT team at [Carnegie Mellon University](https://en.wikipedia.org/wiki/Carnegie_Mellon_University) were also critical of Windows when it was first presented to them by a group of Microsoft representatives. Underestimating the future impact of the platform, he believed that in comparison to an in-house window manager, "these guys came in with this pathetic and naïve system. We just knew they were never going to accomplish anything." [The Verge](https://en.wikipedia.org/wiki/The_Verge) considered the poor reception towards the release of [Windows 8](https://en.wikipedia.org/wiki/Windows_8) in 2012 as a parallel to Microsoft's struggles with early versions of Windows. In a similar fashion to Windows 1.0 running atop MS-DOS as a layer, Windows 8 offered a new type of interface and software geared towards an emerging form of [human interface device](https://en.wikipedia.org/wiki/Human_interface_device) on PCs, in this case, a [touchscreen](https://en.wikipedia.org/wiki/Touchscreen) (software which, coincidentally, also could not run in overlapping windows, and only "snapped" to the side of the screen), running atop the [legacy](https://en.wikipedia.org/wiki/Legacy_system) [Windows shell](https://en.wikipedia.org/wiki/Windows_shell) used by previous versions.

**WINDOWS 2.0**

-Windows 2.0 is a 16-bit [Microsoft Windows](https://en.wikipedia.org/wiki/Microsoft_Windows) [GUI](https://en.wikipedia.org/wiki/Graphical_user_interface)-based [operating environment](https://en.wikipedia.org/wiki/Operating_environment) that was released on December 9, 1987, and is the successor to [Windows 1.0](https://en.wikipedia.org/wiki/Windows_1.0) .

-Windows 2.0 was the second release of the Microsoft Windows environment for [MS-DOS](http://gunkies.org/wiki/MS-DOS). It was not a commercial success - however, it furthered the development of the kernel so that it could use XMS memory, and it later introduced a 286-specific version that could do some limited multitasking with MS-DOS - and a 386-specific version that could spawn multiple [VDM](http://gunkies.org/wiki/VDM)'s.

An interesting thing about version 2.0 of Microsoft Windows, is the reference to [Presentation Manager](http://gunkies.org/w/index.php?title=Presentation_Manager&action=edit&redlink=1) and the future of [OS/2](http://gunkies.org/wiki/OS/2) in the literature. Even the appearance of the GUI between OS/2 1.1 & 1.2 and Windows 2.0 is consistent.

Also to appease Compaq, Microsoft actually finished and shipped Windows/386 in September of 1987, with the 'regular' version to follow in November of 1987.

It was superseded by [Windows 3.0](http://gunkies.org/wiki/Windows_3.0).

**FEATURES OF WIN.2.0**

Windows 2.0 allowed application windows to overlap each other unlike its predecessor [Windows 1.0](https://en.wikipedia.org/wiki/Windows_1.0), which could display only tiled windows. Windows 2.0 also introduced more sophisticated keyboard-shortcuts and the terminology of "Minimize" and "Maximize", as opposed to "Iconize" and "Zoom" in Windows 1.0. The basic window setup introduced here would last through Windows 3.1. Like Windows 1.x, Windows 2.x applications cannot be run on Windows 3.1 or up without modifications since they were not designed for protected mode. Windows 2.0 was also the first Windows version to integrate the control panel.

New features in Windows 2.0 included [VGA graphics](https://en.wikipedia.org/wiki/VGA_graphics) (although 16 colors only). It was also the last version of Windows that did not require a hard disk. With the improved speed, reliability and usability, computers now started becoming a part of daily life for some workers. Desktop icons and use of keyboard shortcuts helped to speed up the work. The Windows 2.x EGA, VGA, and [Tandy](https://en.wikipedia.org/wiki/Tandy_Corporation#Computers) drivers notably provided a workaround in Windows 3.0 for users who wanted color graphics on [8086](https://en.wikipedia.org/wiki/8086) machines (a feature that version normally did not support). EMS memory support also appeared for the first time.

**APPLICATION SUPPORT OF WIN.2.0**

The first Windows versions of [Microsoft Word](https://en.wikipedia.org/wiki/Microsoft_Word) and [Microsoft Excel](https://en.wikipedia.org/wiki/Microsoft_Excel) ran on Windows 2.0. Third-party developer support for Windows increased substantially with this version (some shipped the Windows Runtime software with their applications, for customers who had not purchased the full version of Windows). However, most developers still maintained [DOS](https://en.wikipedia.org/wiki/DOS) versions of their applications, as Windows users were still a distinct minority of their market. Windows 2.0 was still very dependent on the DOS system and it still hadn't passed the 1 megabyte mark in terms of memory.

There were some applications that shipped with Windows 2.0. They are:

* [CALC.EXE](https://en.wikipedia.org/wiki/Calculator_(Windows)) – a calculator
* CALENDAR.EXE – [calendaring software](https://en.wikipedia.org/wiki/Calendaring_software)
* [CARDFILE.EXE](https://en.wikipedia.org/wiki/Cardfile) – a [personal information manager](https://en.wikipedia.org/wiki/Personal_information_manager)
* [CLIPBRD.EXE](https://en.wikipedia.org/wiki/ClipBook_Viewer) – software for viewing the contents of the [clipboard](https://en.wikipedia.org/wiki/Clipboard_(computing))
* CLOCK.EXE – a clock
* [CONTROL.EXE](https://en.wikipedia.org/wiki/Control_Panel_(Windows)) – the system utility responsible for configuring Windows 2.0
* CVTPAINT.EXE - Converted paint files to the 2.x format
* [MSDOS.EXE](https://en.wikipedia.org/wiki/Windows_shell#MS-DOS_Executive) – a simple [file manager](https://en.wikipedia.org/wiki/File_manager)
* [NOTEPAD.EXE](https://en.wikipedia.org/wiki/Microsoft_Notepad) – a [text editor](https://en.wikipedia.org/wiki/Text_editor)
* [PAINT.EXE](https://en.wikipedia.org/wiki/Paint_(software)) – a [raster graphics editor](https://en.wikipedia.org/wiki/Raster_graphics_editor) that allows users to paint and edit pictures interactively on the computer screen
* PIFEDIT.EXE – a [program information file](https://en.wikipedia.org/wiki/Program_information_file) editor that defines how a DOS program should behave inside Windows
* REVERSI.EXE – a [computer game](https://en.wikipedia.org/wiki/Computer_game) of [reversi](https://en.wikipedia.org/wiki/Reversi" \o "Reversi)
* SPOOLER.EXE – the [print spooler](https://en.wikipedia.org/wiki/Print_spooler) of Windows, a program that manages and maintains a queue of documents to be printed, sending them to the printer as soon as the printer is ready
* TERMINAL.EXE – a [terminal emulator](https://en.wikipedia.org/wiki/Terminal_emulator)
* [WRITE.EXE](https://en.wikipedia.org/wiki/Windows_Write) – a simple [word processor](https://en.wikipedia.org/wiki/Word_processor)

**WINDOWS 3.0**

Windows 3.0, a graphical environment, is the third major release of [Microsoft Windows](https://en.wikipedia.org/wiki/Microsoft_Windows), and was released on May 22, 1990. It became the first widely successful version of Windows and a rival to [Apple Macintosh](https://en.wikipedia.org/wiki/Macintosh) and the [Commodore Amiga](https://en.wikipedia.org/wiki/Amiga) on the [graphical user interface](https://en.wikipedia.org/wiki/Graphical_user_interface) (GUI) front. It was followed by [Windows 3.1](https://en.wikipedia.org/wiki/Windows_3.1x).

Windows 3.0 originated in 1989 when David Weise and Murray Sargent independently decided to develop a protected mode Windows as an experiment. They cobbled together a rough prototype and presented it to company executives, who were impressed enough to approve it as an official project.

**FEATURES OF WIN.3.0**

Windows 3.0 succeeded [Windows 2.1x](https://en.wikipedia.org/wiki/Windows_2.1x) and included a significantly revamped [user interface](https://en.wikipedia.org/wiki/Graphical_user_interface) as well as technical improvements to make better use of the [memory management](https://en.wikipedia.org/wiki/Memory_management) capabilities of [Intel](https://en.wikipedia.org/wiki/Intel)'s [80286](https://en.wikipedia.org/wiki/Intel_80286) and [80386](https://en.wikipedia.org/wiki/Intel_80386) [processors](https://en.wikipedia.org/wiki/Central_processing_unit). [Text mode](https://en.wikipedia.org/wiki/Text_mode)[programs](https://en.wikipedia.org/wiki/Computer_program) written for [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS) can be run within a window — a feature previously available in a more limited form with Windows/386 2.1 — making the [system](https://en.wikipedia.org/wiki/System) usable as a crude [multitasking](https://en.wikipedia.org/wiki/Computer_multitasking) base for legacy programs. However, this was of limited use for the home market, where most [games](https://en.wikipedia.org/wiki/PC_game) and entertainment programs continued to require raw DOS access.

The MS-DOS Executive file manager/program launcher was replaced with the icon-based [Program Manager](https://en.wikipedia.org/wiki/Program_Manager) and the list-based [File Manager](https://en.wikipedia.org/wiki/File_Manager_(Windows)), splitting files and programs. The Control Panel, previously available as a standard-looking [applet](https://en.wikipedia.org/wiki/Applet), was re-modeled after the one in the [classic Mac OS](https://en.wikipedia.org/wiki/Classic_Mac_OS). It centralized system settings, including control over the color scheme of the interface.

A number of simple applications were included, such as the text editor [Notepad](https://en.wikipedia.org/wiki/Microsoft_Notepad) and the word processor Write (both inherited from earlier versions of Windows), a macro recorder (new; later dropped), the paint program [Paintbrush](https://en.wikipedia.org/wiki/Microsoft_Paint#History) (inherited, but substantially improved), and a calculator (also inherited). Also, the earlier [Reversi](https://en.wikipedia.org/wiki/Reversi" \o "Reversi) game was complemented with the [card game](https://en.wikipedia.org/wiki/Card_game) [Microsoft Solitaire](https://en.wikipedia.org/wiki/Microsoft_Solitaire).

The Windows icons and graphics support a full 16 colors in EGA, MCGA and VGA mode while Windows 2.x had only a very limited palette for colored menus and window boxes with in-application graphics being monochrome. 256-color VGA and MCGA modes were supported for the first time.

Windows 3.0 includes a Protected/Enhanced mode which allows Windows applications to use more memory in a more painless manner than their DOS counterparts could. It can run in any of Real, Standard, or 386 Enhanced modes, and is compatible with any Intel processor from the [8086](https://en.wikipedia.org/wiki/Intel_8086)/[8088](https://en.wikipedia.org/wiki/Intel_8088) up to [80286](https://en.wikipedia.org/wiki/Intel_80286) and [80386](https://en.wikipedia.org/wiki/Intel_80386). Windows 3.0 tries to auto detect which mode to run in, although it can be forced to run in a specific mode using the switches: /r ([real mode](https://en.wikipedia.org/wiki/Real_mode)), /s (["standard" 286 protected mode](https://en.wikipedia.org/wiki/Protected_mode)) and /3 ([386 enhanced protected mode](https://en.wikipedia.org/wiki/Protected_mode)) respectively. Since Windows 3.0 (and later Windows 3.1) runs in 16-bit 286 protected mode and not 32-bit 386 protected mode, the default setup is to use the 64 KB segmented memory model. However, on 32-bit CPUs, the programmer had access to larger memory pointers and so it was possible to expand program segments to whatever size was desired (the maximum limit being 16 MB due to segment descriptors being 24-bit). Since [Windows API](https://en.wikipedia.org/wiki/Windows_API) functions were 16-bit at the time, they could not use 32-bit pointers and thus it was necessary to place the portion of the program code that performed OS calls in a 64 KB segment, like in DOS, although 32-bit instructions may be contained in the code. ([Ami Pro](https://en.wikipedia.org/wiki/Am%C3%AD) was the first Windows application to require a 386). Because of this, Windows 3.0 can access only 16 MB total of RAM, even on 386 or higher CPUs which have a theoretical capability of utilizing 4GB.

This was the first version to run Windows programs in protected mode, although the 386 enhanced mode [kernel](https://en.wikipedia.org/wiki/Kernel_(operating_system)) was an enhanced version of the protected mode kernel for Windows/286.

**SYSTEM REQUIREMENT OF WIN.3.0**

The official system requirements for Windows 3.0:

[8086](https://en.wikipedia.org/wiki/Intel_8086)/[8088](https://en.wikipedia.org/wiki/Intel_8088) processor or better

384 KB of free conventional memory (real mode), 1 MB (Standard Mode), or 2 MB (Enhanced Mode)

Hard disk with 6-7 MB of free space

[CGA](https://en.wikipedia.org/wiki/Color_Graphics_Adapter), [EGA](https://en.wikipedia.org/wiki/Enhanced_Graphics_Adapter), [MCGA](https://en.wikipedia.org/wiki/Multi-Color_Graphics_Array), [VGA](https://en.wikipedia.org/wiki/Video_Graphics_Array), [Hercules](https://en.wikipedia.org/wiki/Hercules_Graphics_Card), [8514/A](https://en.wikipedia.org/wiki/IBM_8514) or [XGA](https://en.wikipedia.org/wiki/Graphics_display_resolution#XGA_.281024.C3.97768.29) graphics and an appropriate and compatible monitor

[MS-DOS](https://en.wikipedia.org/wiki/MS-DOS) version 3.1 or higher

Also, a Microsoft-compatible mouse is recommended.

Windows 3.0 cannot run in full color on most 8086/88 machines, as the built-in 640×350 (16 color) EGA and 640×480 (16 color) VGA drivers contained [Intel 80186](https://en.wikipedia.org/wiki/Intel_80186) instructions. MCGA 320×200 (256 color) and 640×480 (2 color) drivers did not contain these instructions. This could be worked around by installing the Windows 2.x EGA/VGA drivers (which support color menus and frames, but not in-program graphics), replacing the CPU with an [NEC V20/V30](https://en.wikipedia.org/wiki/NEC_V20) (8086/88 pin-compatible chips with an 80186 instruction set), or by using a modified VGA driver that supports the 8086/88 (originally written in 2013). Microsoft had dropped support for the [Tandy](https://en.wikipedia.org/wiki/Tandy_Corporation) 1000 line by 1990, so a Tandy graphics driver was not provided for Windows 3.0, but the Windows 2.x Tandy driver could be copied into the target system and used.

Memory modes

Windows 3.0 was the only version of Windows that could be run in three different memory modes:

Real mode, intended for older computers with a CPU below [Intel 80286](https://en.wikipedia.org/wiki/Intel_80286), and corresponding to its [real mode](https://en.wikipedia.org/wiki/Real_mode);

Standard mode, intended for computers with an 80286 processor, and corresponding to its [protected mode](https://en.wikipedia.org/wiki/Protected_mode);

386 Enhanced mode, intended for newer computers with an [Intel 80386](https://en.wikipedia.org/wiki/Intel_80386) processor or above, and corresponding to its protected mode and [virtual 8086 mode](https://en.wikipedia.org/wiki/Virtual_8086_mode).

Real mode primarily existed as a way to run [Windows 2.x](https://en.wikipedia.org/wiki/Windows_2.1x) applications. It was removed in [Windows 3.1x](https://en.wikipedia.org/wiki/Windows_3.1x). Almost all applications designed for Windows 3.0 had to be run in standard or 386 enhanced modes. (Microsoft Word 1.x and Excel 2.x would work in real mode as they were actually designed for Windows 2.x). However, it was necessary to load Windows 3.0 in real mode to run SWAPFILE.EXE, which allowed users to change virtual memory settings. Officially, Microsoft stated that an 8Mhz turbo 8086 was the minimum CPU needed to run Windows 3.0. It could be run on 4.77 MHz 8088 machines, but performance is so slow as to render the OS almost unusable. Up to 4 MB of EMS memory is supported in real mode.

Standard mode was used most often as its requirements were more in-line with an average PC of that era — an 80286 processor with at least 1 MB of memory. Since some PCs (notably Compaqs) did not place extended memory at the 1MB line and instead left a hole between the end of conventional memory and the start of XMS, Windows could not work on them except in real mode. Standard mode was still widely used on 386 PCs as many only had 1-2 MB of memory and used the 386SX chip (a cut-down version with a 16-bit data bus), so they could not run Enhanced mode well.

386 Enhanced mode was a 32-bit virtual machine that ran a copy of 16-bit Standard mode, and multiple copies of MS-DOS in [virtual 8086 mode](https://en.wikipedia.org/wiki/Virtual_8086_mode). In 286 mode, the CPU temporarily switches back into real mode when a DOS application is run, thus they cannot be windowed or switched into the background, and all Windows processes are suspended while the DOS application is in use. 386 enhanced mode by comparison uses virtual 8086 mode to allow multiple DOS programs to run (each DOS session takes 1MB of memory) along with being windowed and allowing multitasking to continue. Virtual memory support allows the user to employ the hard disk as a temporary storage space if applications use more memory than exists in the system.

Normally, Windows will start in the highest operating mode the computer can use, but the user may force it into lower modes by typing WIN /R or WIN /S at the DOS command prompt. If the user selects an operating mode that cannot be used due to lack of RAM or CPU support, Windows merely boots into the next lowest one.

**UPDATES**

**Windows 3.0a**

In December 1990, Microsoft released Windows 3.0a. This version contained an improved ability to move pieces of data greater than 64KB (the original release could only manipulate one segment of RAM at a time). It also improved stability by reducing Unrecoverable Application Errors (UAEs) associated with networking, printing, and low-memory conditions. This version appears as "Windows 3.00a" in Help/About Windows system dialogs.

**Windows 3.0 with Multimedia Extensions**

Based on Windows 3.0a, Windows 3.0 with Multimedia Extensions 1.0 was released in October 1991 to support [sound cards](https://en.wikipedia.org/wiki/Sound_card) like the [Creative Labs](https://en.wikipedia.org/wiki/Creative_Technology_Limited) [Sound Blaster Pro](https://en.wikipedia.org/wiki/Sound_Blaster), as well as [CD-ROM](https://en.wikipedia.org/wiki/CD-ROM) drives, which were then becoming increasingly available. This edition was released to [Original Equipment Manufacturers (OEMs)](https://en.wikipedia.org/wiki/Original_equipment_manufacturer), mainly CD-ROM drive and sound card manufacturers, and some PCs came preloaded with it. This edition added basic [multimedia](https://en.wikipedia.org/wiki/Multimedia) support for audio input and output, along with new applications: Media Player, [CD](https://en.wikipedia.org/wiki/Compact_disc) audio player, more advanced Help format, screen savers, and a new clock. These new features were integrated into [Windows 3.1x](https://en.wikipedia.org/wiki/Windows_3.1x). Microsoft developed the [Windows Sound System](https://en.wikipedia.org/wiki/Windows_Sound_System) sound card specification to complement these extensions. The new features were not accessible in Windows 3.0 Real Mode.

The MME API was the first universal and standardized Windows audio API. Wave sound events played in Windows (up to [Windows XP](https://en.wikipedia.org/wiki/Windows_XP)) and MIDI I/O use MME. The devices listed in the Multimedia/Sounds and Audio control panel applet represent the MME API of the [sound card](https://en.wikipedia.org/wiki/Sound_card) driver.

MME lacks channel mixing, so only one audio stream can be rendered at a time. MME supports sharing the audio device for playback between multiple applications starting with [Windows 2000](https://en.wikipedia.org/wiki/Windows_2000), up to two channels of recording, 16-bit [audio bit depth](https://en.wikipedia.org/wiki/Audio_bit_depth) and [sampling rates](https://en.wikipedia.org/wiki/Sampling_(signal_processing)#Sampling_rate) of up to 44.1 kHz with all the audio being mixed and sampled to 44.1 kHz.

**SOFTWARE SUPPORT OF WIN.3.0**

Windows 3.0 was the first Windows version to see widespread use, although DOS still remained dominant (especially for games) and freeware and shareware applications for Windows considerably outnumbered commercial ones. It also significantly spurred sales of new PCs with larger RAM capacities as many older machines lacked the speed or memory to handle a demanding OS like Windows properly, and some could not run it in protected mode due to outdated BIOSes or lack of proper implementation. Since very few applications used protected mode prior to Windows 3.0, PC manufacturers sometimes did not bother including functional support for it in either the hardware, BIOS, or both.

Windows 3.0 had a software update that was never released, increasing the speed of the floppy disk drive. By the time it was ready to be launched, a new version of Windows was released.

All editions of Windows 3.0 became unsupported after December 31, 2001.

**WINDOWS 3.1X**

Windows 3.1x (codenamed Janus) is a series of [16-bit](https://en.wikipedia.org/wiki/16-bit#16-bit_application) [operating environments](https://en.wikipedia.org/wiki/Operating_environment) produced by [Microsoft](https://en.wikipedia.org/wiki/Microsoft) for use on personal computers. The series began with Windows 3.1, which was first sold during April 1992 as a successor to [Windows 3.0](https://en.wikipedia.org/wiki/Windows_3.0). Subsequent versions were released between 1992 and 1994 until the series was superseded by [Windows 95](https://en.wikipedia.org/wiki/Windows_95). During its lifespan, Windows 3.1 introduced several enhancements to the still [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS)-based platform, including improved system stability, expanded support for multimedia, [TrueType](https://en.wikipedia.org/wiki/TrueType) [fonts](https://en.wikipedia.org/wiki/Typeface), and [workgroup networking](https://en.wikipedia.org/wiki/Workgroup_(computer_networking)).

Windows 3.1 was originally released on April 6, 1992; official support for Windows 3.1 ended on December 31, 2001, and OEM licensing for Windows for Workgroups 3.11 on [embedded systems](https://en.wikipedia.org/wiki/Embedded_system) continued to be available until November 1, 2008.

**EDITIONS**

**Windows 3.1**

Windows 3.1 (originally codenamed [Janus](https://en.wikipedia.org/wiki/Janus)), released on April 6, 1992, introduced a [TrueType](https://en.wikipedia.org/wiki/TrueType) [font](https://en.wikipedia.org/wiki/Typeface) system (and a set of highly legible fonts), which effectively made Windows a viable [desktop publishing](https://en.wikipedia.org/wiki/Desktop_publishing) platform for the first time. Similar functionality was available for [Windows 3.0](https://en.wikipedia.org/wiki/Windows_3.0) through [Adobe Type Manager](https://en.wikipedia.org/wiki/Adobe_Type_Manager) (ATM) font system from [Adobe](https://en.wikipedia.org/wiki/Adobe_Systems).

Windows 3.1 was designed to have [backward compatibility](https://en.wikipedia.org/wiki/Backward_compatibility) with older Windows platforms. As with [Windows 3.0](https://en.wikipedia.org/wiki/Windows_3.0), version 3.1 had [File Manager](https://en.wikipedia.org/wiki/File_Manager_(Windows)) and [Program Manager](https://en.wikipedia.org/wiki/Program_Manager), but unlike all previous versions, Windows 3.1 cannot run in [real mode](https://en.wikipedia.org/wiki/Real_mode). It included [Minesweeper](https://en.wikipedia.org/wiki/Minesweeper_(video_game)) as a replacement for [Reversi](https://en.wikipedia.org/wiki/Reversi) (though Reversi was still included in some copies).

Windows 3.1 Multimedia PC Version (Beta only, released Nov 1992 – codenamed Bombay) included a media viewer, and the ability to play video files. It was targeted to the new [Multimedia PC](https://en.wikipedia.org/wiki/Multimedia_PC) standard and included sound and video integration with CD-ROM support.

**Improvements over Windows 3.0**

Windows 3.1 dropped [real mode](https://en.wikipedia.org/wiki/Real_mode) support and required a minimum of a [286](https://en.wikipedia.org/wiki/Intel_80286) PC with 1 MB of [RAM](https://en.wikipedia.org/wiki/Random-access_memory) to run. The effect of this was to increase system stability over the crash-prone Windows 3.0. Some older features were removed, like CGA graphics support (although Windows 3.0's CGA driver still worked on 3.1) and compatibility with real mode Windows 2.x applications.

Truetype font support was added, providing scalable fonts to Windows applications, without having to resort to using a third-party font technology such as [Adobe Type Manager](https://en.wikipedia.org/wiki/Adobe_Type_Manager). Windows 3.1 included the following fonts: Arial, Courier New, Times New Roman, and Symbol (a collection of scalable symbols) in regular, bold, italic, and bold-italic versions. Truetype fonts could be scaled to any size and rotated, depending on the calling application.

In 386 Enhanced Mode, windowed DOS applications gained the ability for users to manipulate menus and other objects in the program using the Windows mouse pointer, provided that a DOS application supported mice. A few DOS applications, such as late releases of Microsoft Word, could access Windows Clipboard. Windows' own drivers couldn't work directly with DOS applications; hardware such as mice required a DOS driver to be loaded before starting Windows.

Icons could be dragged and dropped for the first time, in addition to having a more detailed appearance. A file could be dragged onto Print Manager icon and the file would be printed by the current printer, assuming it was associated with an application capable of printing, such as a word processor. Alternatively, the file could be dragged out of File Manager and dropped onto an application icon or window for processing.

While Windows 3.0 was limited to 16 MB maximum memory, Windows 3.1 can access a theoretical 4 GB in 386 Enhanced Mode. (The actual practical ceiling is 256 MB.) However, no single process can use more than 16 MB. File Manager was significantly improved over Windows 3.0. [Multimedia](https://en.wikipedia.org/wiki/Multimedia) support was enhanced over what was available in [Windows 3.0 with Multimedia Extensions](https://en.wikipedia.org/wiki/Windows_3.0) and available to all Windows 3.1 users.

Windows 3.1 was available via 720 KB, 1.2 MB, and 1.44 MB floppy distributions. It was also the first version of Windows to be distributed on CD-ROM — although this was more common for Windows for Workgroups 3.11, which typically came with MS-DOS 6.22 on one CD. Installed size on the hard disk was between 10 MB and 15 MB.

[32-bit disk access](https://en.wikipedia.org/wiki/32-bit_disk_access) (386 Enhanced Mode only) brought improved performance by using a 32-bit protected mode driver instead of the 16-bit BIOS functions (which necessitate Windows temporarily dropping out of protected mode).

Windows 3.1's calendar saves its files ending with .cal.

Windows 3.1 also introduced [Windows Registry](https://en.wikipedia.org/wiki/Windows_Registry), a centralized [database](https://en.wikipedia.org/wiki/Database) that can store configuration information and settings for various operating systems components and applications.

Windows 3.1 was the first version of Windows that could also launch Windows programs via [Command.com](https://en.wikipedia.org/wiki/Command.com) while running Windows.

**Windows 3.1 for Central and Eastern Europe**

A special version named Windows 3.1 for Central and Eastern Europe was released that allowed use of Cyrillic and had fonts with diacritical marks characteristic of Central and Eastern European languages. Microsoft introduced its own [code page](https://en.wikipedia.org/wiki/Code_page) ([Windows-1250](https://en.wikipedia.org/wiki/Windows-1250)) and supported its use in violation of many countries' ISO standards (e.g., the official [Polish](https://en.wikipedia.org/wiki/Polish_language) codepage is [ISO-8859-2](https://en.wikipedia.org/wiki/ISO-8859-2), which was ignored by Microsoft but is supported by contemporary [Internet Explorer](https://en.wikipedia.org/wiki/Internet_Explorer) versions). Similarly, Microsoft also released Windows 3.1J with support for Japanese, which shipped 1.46 million copies in its first year on the market (1993) in Japan.

**Modular Windows**

[Modular Windows](https://en.wikipedia.org/wiki/Tandy_Video_Information_System#Modular_Windows) is a special version of Windows 3.1, designed to run on [Tandy Video Information System](https://en.wikipedia.org/wiki/Tandy_Video_Information_System).

**Windows 3.11**

Windows 3.11 was released on November 8, 1993. It did not add any feature improvements over Windows 3.1; it only corrected problems. Microsoft replaced all retail versions of Windows 3.1 with Windows 3.11 and provided a free upgrade to anyone who currently owned Windows 3.1.

**Windows 3.2**

On November 22, 1993, Microsoft released a [Simplified Chinese](https://en.wikipedia.org/wiki/Simplified_Chinese_characters) version of Windows for the Chinese market. A year later, an update was released, which identified itself as Windows 3.2. Thus, Windows 3.2 is an updated version of the Chinese version of Windows 3.1. The update was limited to this language version, as it only fixed issues related to the complex input system for the Chinese language.

Windows 3.2 was generally sold by computer manufacturers with a ten-disk version of [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS) that also had Simplified Chinese characters in basic output and some translated utilities.

Windows for Workgroups

Windows for Workgroups is an extension that allowed users to share their resources and to request those of others without a centralized authentication server. It used [SMB](https://en.wikipedia.org/wiki/Server_Message_Block) protocol over [NetBIOS](https://en.wikipedia.org/wiki/NetBIOS).

**Windows for Workgroups 3.1**

Windows for Workgroups 3.1 (originally codenamed Winball and later Sparta), released in October 1992, is an extended version of Windows 3.1 that features native networking support. It comes with [SMB](https://en.wikipedia.org/wiki/Server_Message_Block) file sharing support via [NetBIOS](https://en.wikipedia.org/wiki/NetBIOS)-based [NBF](https://en.wikipedia.org/wiki/NetBIOS_Frames_protocol) and/or [IPX](https://en.wikipedia.org/wiki/IPX) network transport protocols and introduces the [Hearts](https://en.wikipedia.org/wiki/Hearts_(Windows)) card game and VSHARE.386, a [VxD](https://en.wikipedia.org/wiki/VxD" \o "VxD) version of [SHARE.EXE](https://en.wikipedia.org/wiki/SHARE.EXE) (a [terminate-and-stay-resident program](https://en.wikipedia.org/wiki/Terminate_and_stay_resident_program)).

**Windows for Workgroups 3.11**

Windows for Workgroups 3.11 (originally codenamed Snowball) was released on August 11, 1993, and shipped in November 1993. It supported [32-bit file access](https://en.wikipedia.org/wiki/32-bit_file_access), full 32-bit network redirectors, and VCACHE.386 file cache, shared between them. WFW 3.11 dropped standard mode support and requires a 386 machine to run.

A [Winsock](https://en.wikipedia.org/wiki/Winsock) package was required to support [TCP/IP](https://en.wikipedia.org/wiki/TCP/IP) [networking](https://en.wikipedia.org/wiki/Computer_network) in Windows 3.x. Usually third-party packages were used, but in August 1994, Microsoft released an add-on package (codenamed Wolverine) that provided TCP/IP support in Windows for Workgroups 3.11. Wolverine was a 32-bit stack (accessible from 16-bit Windows applications via WinSock [Thunk](https://en.wikipedia.org/wiki/Thunk" \o "Thunk)), which gave it superior performance to most of the third-party TCP/IP Windows stacks available. However, it was only compatible with Windows for Workgroups 3.11, and lacked support for dial-up. Wolverine stack was an early version of the TCP/IP stack that would later ship with Windows 95, and provided an early testbed for the 16-to-32-bit compatibility layer that was crucial to Windows 95's success.

Following the release of MS-DOS 6.22 in 1994, WFW 3.11 largely replaced Windows 3.1 for OEM installations on new PCs due to its improved capabilities and greater stability.

**ADD-ONS**

**Video for Windows**

Video for Windows was first introduced in November 1992 as a reaction to [Apple Computer](https://en.wikipedia.org/wiki/Apple_Computer)'s [QuickTime](https://en.wikipedia.org/wiki/QuickTime) technology which added digital video to [Macintosh](https://en.wikipedia.org/wiki/Apple_Macintosh). Costing around $200, the software included editing and encoding programs for use with video input boards. A runtime version for viewing videos only was also made available. Originally released as a free add-on to Windows 3.1 and Windows 3.11, it then became an integral component of [Windows 95](https://en.wikipedia.org/wiki/Windows_95) and later. Like QuickTime there were three components in Video for Windows. The technology introduced a file format designed to store digital video, [Audio Video Interleave](https://en.wikipedia.org/wiki/Audio_Video_Interleave) (AVI). The technology provided an [application programming interface](https://en.wikipedia.org/wiki/Application_programming_interface) that allowed Windows [software developers](https://en.wikipedia.org/wiki/Software_developer) to add the ability to play or manipulate [digital video](https://en.wikipedia.org/wiki/Digital_video) to their own applications. Lastly, it included a suite of software for playing and manipulating digital video.

**Windows for Pen Computing**

Windows for Pen Computing was a series of [Microsoft](https://en.wikipedia.org/wiki/Microsoft)-produced add-ons for [Microsoft Windows](https://en.wikipedia.org/wiki/Microsoft_Windows) versions in the mid-1990s with additional tools for [tablet PCs](https://en.wikipedia.org/wiki/Tablet_computer). Windows for Pen Computing (also known as Pen Windows and W4PC) was developed as Microsoft's [pen computing](https://en.wikipedia.org/wiki/Pen_computing) response to [PenPoint OS](https://en.wikipedia.org/wiki/PenPoint_OS" \o "PenPoint OS) by [GO Corporation](https://en.wikipedia.org/wiki/GO_Corporation). Windows for Pen Computing was rendered obsolete by [Tablet PC](https://en.wikipedia.org/wiki/Tablet_computer) support for [Windows XP Tablet PC Edition](https://en.wikipedia.org/wiki/Windows_XP_Tablet_PC_Edition) in 2002.

**Win32s**

Windows 3.1x was given limited compatibility with the then-new 32-bit [Windows API](https://en.wikipedia.org/wiki/Windows_API) used by [Windows NT](https://en.wikipedia.org/wiki/Windows_NT) by another add-on package, [Win32s](https://en.wikipedia.org/wiki/Win32s). There was a rumor that Microsoft did not want to increase any mainstream Windows 3.1x version to something like "Windows 3.2" because it could be confused with the [Win32](https://en.wikipedia.org/wiki/Win32) API or otherwise distract consumers from upgrading to a "real 32-bit OS" like the then-upcoming Windows 95 was, though [Windows NT 3.1](https://en.wikipedia.org/wiki/Windows_NT_3.1) and [3.5](https://en.wikipedia.org/wiki/Windows_NT_3.5) were both 32-bit operating systems that looked similar in appearance. A game called [FreeCell](https://en.wikipedia.org/wiki/Microsoft_FreeCell) was included for testing the new Win32s functions.

**WinG**

To entice game manufacturers to move from DOS to Windows, Microsoft provided a first attempt at high-speed graphics and animation capabilities for Windows 3.1x, introduced in September 1994. Windows' [GDI](https://en.wikipedia.org/wiki/Graphics_Device_Interface) capabilities were originally designed with static images in-mind, allowing only for write-only graphics calls. WinG provided a device-independent interface to graphics and printer hardware, and allowed programs to have both read and write capabilities to the WinGDC (WinG device context).

**Applications**

Windows 3.1x introduced new possibilities for applications, especially multimedia applications. During this era, Microsoft developed a new range of software that was implemented on this operating environment, called [Microsoft Home](https://en.wikipedia.org/wiki/Microsoft_Home), [Microsoft Bob](https://en.wikipedia.org/wiki/Microsoft_Bob) being one of the programs.

As the first versions of Windows to enjoy major commercial success and software support, Windows 3.1 and WFW 3.11 quickly replaced DOS as the platform for application software on PC compatibles. Multimedia software (especially games) proliferated, although many games continued to run on DOS until Windows 95.

**Program Manager**

Program Manager was included in all versions of Windows from [version 3.0](https://en.wikipedia.org/wiki/Windows_3.0) until Windows XP Service Pack 1. A non-operable icon library named progman.exe is included in [Windows XP](https://en.wikipedia.org/wiki/Windows_XP) Service Pack 2, and the file was removed entirely from [Windows Vista](https://en.wikipedia.org/wiki/Windows_Vista).

If Program Manager is started under Windows XP Service Pack 2 and later, it does not appear to run, but when a .grp file created for Windows 3.1 is processed, it converts .grp file contents to a [Start Menu](https://en.wikipedia.org/wiki/Start_Menu) folder.

**Internet Explorer**

[Internet Explorer 2](https://en.wikipedia.org/wiki/Internet_Explorer_2) through [Internet Explorer 5](https://en.wikipedia.org/wiki/Internet_Explorer_5) were released for Windows 3.1.

**LEGACY**

Windows 3.x was superseded by the release of [Windows 95](https://en.wikipedia.org/wiki/Windows_95) in August 1995. Microsoft officially dropped support for all 16-bit versions of Windows on December 31, 2001.

Windows 3.1 found a niche market as an [embedded operating system](https://en.wikipedia.org/wiki/Embedded_operating_system) after becoming obsolete in the PC world. As of November 2008, both [Virgin Atlantic](https://en.wikipedia.org/wiki/Virgin_Atlantic) and [Qantas](https://en.wikipedia.org/wiki/Qantas) employed it for some of the onboard entertainment systems on long-distance jets. It also sees continued use as an embedded OS in retail cash tills. It is also used as a secondary application in [DOSBox](https://en.wikipedia.org/wiki/DOSBox" \o "DOSBox) to enable emulation of [Win16](https://en.wikipedia.org/wiki/Win16) games on 64-bit Windows.

On July 9, 2008, it was announced that Windows for Workgroups 3.11 for the embedded devices channel would no longer be made available for [OEM](https://en.wikipedia.org/wiki/Original_Equipment_Manufacturer) distribution as of November 1, 2008.

On July 14, 2013, [Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel) 3.11 was officially named "Linux For Workgroups" as a [tongue-in-cheek](https://en.wikipedia.org/wiki/Tongue-in-cheek) reference to "Windows for Workgroups 3.11".

On November 7, 2015, [Orly Airport](https://en.wikipedia.org/wiki/Orly_Airport" \o "Orly Airport) near [Paris](https://en.wikipedia.org/wiki/Paris), [France](https://en.wikipedia.org/wiki/France), had a major computer glitch that interrupted its operations for some time. The newspaper [Le Canard Enchaîné](https://en.wikipedia.org/wiki/Le_Canard_Encha%C3%AEn%C3%A9) later revealed that the glitch happened in an essential [meteorological](https://en.wikipedia.org/wiki/Meteorology#Aviation_meteorology) system called DECOR, which at the time of the incident still ran on Windows 3.1 – 23 years after the operating system's release and 14 years after Microsoft ceased to support it. The French Transportation Minister promised to have the system replaced by 2017, but the secretary general of the French [air traffic controller](https://en.wikipedia.org/wiki/Air_traffic_controller) union expressed his skepticism.

**WINDOWS 95**

Windows 95 ([codenamed](https://en.wikipedia.org/wiki/Microsoft_codenames) [Chicago](https://en.wikipedia.org/wiki/Development_of_Windows_95)) is a consumer-oriented [operating system](https://en.wikipedia.org/wiki/Operating_system) developed by [Microsoft](https://en.wikipedia.org/wiki/Microsoft). It was released on August 24, 1995, and was a significant improvement over the company's previous [DOS](https://en.wikipedia.org/wiki/MS-DOS)-based [Windows](https://en.wikipedia.org/wiki/Microsoft_Windows) products.

Windows 95 merged Microsoft's formerly separate [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS) and Windows products. It featured significant improvements over its predecessor, [Windows 3.1](https://en.wikipedia.org/wiki/Windows_3.1x), most notably in the [graphical user interface](https://en.wikipedia.org/wiki/Graphical_user_interface) (GUI) and in its simplified "[plug-and-play](https://en.wikipedia.org/wiki/Plug_and_play#Plug_and_Play)" features. There were also major changes made to the core components of the operating system, such as moving from a mainly [co-operatively multitasked](https://en.wikipedia.org/wiki/Cooperative_multitasking) [16-bit](https://en.wikipedia.org/wiki/16-bit) architecture to a [preemptively](https://en.wikipedia.org/wiki/Preemption_(computing)) [multitasked](https://en.wikipedia.org/wiki/Computer_multitasking) [32-bit](https://en.wikipedia.org/wiki/32-bit) architecture.

Accompanied by an extensive marketing campaign, Windows 95 introduced numerous functions and features that were featured in later Windows versions, such as the taskbar, the "Start" button and the way the user navigates. It was also suggested that Windows 95 had an effect of driving other major players (including [OS/2](https://en.wikipedia.org/wiki/OS/2)) out of business, something which would later be used in court against Microsoft.

Three years after its introduction, Windows 95 was succeeded by [Windows 98](https://en.wikipedia.org/wiki/Windows_98). Microsoft ended support for Windows 95 on December 31, 2001.

**DEVELOPMENT**

The initial design and planning of Windows 95 can be traced back to around March 1992, just after the release of [Windows 3.1](https://en.wikipedia.org/wiki/Windows_3.1x). At this time, Windows for Workgroups 3.11 and [Windows NT 3.1](https://en.wikipedia.org/wiki/Windows_NT_3.1) were still in development and Microsoft's plan for the future was focused on [Cairo](https://en.wikipedia.org/wiki/Cairo_(operating_system)). Cairo would be Microsoft's next-generation operating system based on Windows NT and featuring a new user interface and an object-based file system, but it was not planned to be shipped before 1994. However, Cairo would partially ship in July 1996 in the form of [Windows NT 4.0](https://en.wikipedia.org/wiki/Windows_NT_4.0), but without the object-based file system, which would later evolve into [WinFS](https://en.wikipedia.org/wiki/WinFS).

Simultaneously with Windows 3.1's release, [IBM](https://en.wikipedia.org/wiki/IBM) started shipping [OS/2 2.0](https://en.wikipedia.org/wiki/OS/2_2.0#32-bit_era). Microsoft realized they were in need of an updated version of Windows that could support 32-bit applications and preemptive multitasking, but could still run on low-end hardware (Windows NT did not). So the development of Windows "Chicago" was started and, as it was planned for a late 1993 release, became known as Windows 93. Initially, the decision was made not to include a new user interface, as this was planned for Cairo, and only focus on making installation, configuration, and networking easier. Windows 93 would ship together with MS-DOS 7.0, offering a more integrated experience to the user and making it pointless for other companies to create DOS clones. MS-DOS 7.0 was in development at that time under the code name "Jaguar" and could optionally run on top of a Windows 3.1-based 32-bit protected mode kernel called "Cougar" in order to better compete with [DR-DOS](https://en.wikipedia.org/wiki/DR-DOS). The first version of Chicago's feature specification was finished on September 30, 1992. Cougar was to become Chicago's kernel.

**Beta**

Prior to Windows 95's official release, users in the [United States](https://en.wikipedia.org/wiki/United_States) had an opportunity to preview it in the Windows 95 Preview Program. For US$19.95, users would receive several 3.5-inch floppy disks that would be used to install Windows 95 either as an upgrade from Windows 3.1x or as a fresh installation. Participants were also given a free preview of [The Microsoft Network (MSN)](https://en.wikipedia.org/wiki/MSN_Dial-up), the [online service](https://en.wikipedia.org/wiki/Online_service) that Microsoft launched with Windows 95. During the preview period, Microsoft established various electronic distribution points for promotional and technical documentation on Chicago, including a detailed document for media reviewers describing the new system highlights. The preview versions expired in November 1995, after which the user would have to purchase their own copy of the final version of Windows 95.

**ARCHITECTURE**

Windows 95 was designed to be maximally compatible with existing [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS) and 16-bit Windows programs and [device drivers](https://en.wikipedia.org/wiki/Device_drivers), while offering a more stable and better performing system. The Windows 95 architecture is an evolution of [Windows for Workgroups](https://en.wikipedia.org/wiki/Windows_for_Workgroups)' 386 enhanced mode. The lowest level of the operating system consists of a large number of [virtual device drivers](https://en.wikipedia.org/wiki/VxD) (VxDs) running in 32-bit [protected mode](https://en.wikipedia.org/wiki/Protected_mode) and one or more [virtual DOS machines](https://en.wikipedia.org/wiki/Virtual_DOS_machine) running in [virtual 8086 mode](https://en.wikipedia.org/wiki/Virtual_8086_mode). The virtual device drivers are responsible for handling physical devices (such as video and network cards), emulating virtual devices used by the virtual machines or providing various system services. The three most important virtual device drivers are:

**Virtual Machine Manager (VMM32.VXD)**

Responsible for memory management, [event handling](https://en.wikipedia.org/wiki/Event_handling), [interrupt handling](https://en.wikipedia.org/wiki/Interrupt_handling), loading and initializing virtual device drivers, creating new virtual machines and [thread](https://en.wikipedia.org/wiki/Thread_(computer_science)) [scheduling](https://en.wikipedia.org/wiki/Scheduling_(computing)).

**Configuration Manager (CONFIGMG)**

Responsible for implementing [Plug and Play](https://en.wikipedia.org/wiki/Legacy_Plug_and_Play) functionality; monitoring hardware configuration changes; detecting devices using bus enumerators; and allocating [I/O ports](https://en.wikipedia.org/wiki/I/O_port), [IRQs](https://en.wikipedia.org/wiki/Interrupt_request), [DMA channels](https://en.wikipedia.org/wiki/DMA_channel) and [memory](https://en.wikipedia.org/wiki/Memory-mapped_I/O) in a conflict-free fashion.

**Installable File System Manager (Input/Output Subsystem)**

Coordinates access to supported file systems. Windows 95 initially shipped with support for [FAT12](https://en.wikipedia.org/wiki/FAT12), [FAT16](https://en.wikipedia.org/wiki/FAT16), the [VFAT](https://en.wikipedia.org/wiki/VFAT) extension, [ISO 9660](https://en.wikipedia.org/wiki/ISO_9660) (CDFS) and [network redirectors](https://en.wikipedia.org/wiki/Network_redirector), with later releases supporting [FAT32](https://en.wikipedia.org/wiki/FAT32).

Access requests to physical media are sent to Input/Output Supervisor, a component responsible for scheduling the requests. Each physical media has its own device driver: access to the disk is performed by a port driver, while access to a [SCSI](https://en.wikipedia.org/wiki/SCSI) device is handled by a [miniport](https://en.wikipedia.org/wiki/Miniport) driver working atop the SCSI layer. Port and miniport drivers perform I/O operations in 32-bit protected mode, bypassing [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS) and [BIOS](https://en.wikipedia.org/wiki/BIOS), giving a significant performance improvement. In case there is no native Windows driver for a certain storage device, or if a device is forced to run in compatibility mode, the Real Mode Mapper can access it through MS-DOS.

32-bit Windows programs are assigned their own memory segments, which can be adjusted to any desired size. Memory area outside the segment cannot be accessed by a program. If a program crashes, nothing else is harmed. Before this, programs used fixed non-exclusive 64 KB segments. While the 64 KB size was a serious handicap in DOS and Windows 3.x, lack of guarantee of exclusiveness was the cause of stability issues because programs sometimes overwrote each other's segments. A crashing Windows 3.x program could knock out surrounding processes.

The [Win32 API](https://en.wikipedia.org/wiki/Win32_API) is implemented by three modules, each consisting of a 16-bit and a 32-bit component:

**Kernel**

Provides high level access to [memory](https://en.wikipedia.org/wiki/Memory_management) and [process management](https://en.wikipedia.org/wiki/Process_management_(computing)), and access to the file system. Consists of KRNL386.EXE, [KERNEL32.DLL](https://en.wikipedia.org/wiki/KERNEL32.DLL), and VWIN32.VXD.

**User**

Responsible for managing and drawing the various [user interface](https://en.wikipedia.org/wiki/User_interface) components, such as [windows](https://en.wikipedia.org/wiki/Window_(computing)), [menus](https://en.wikipedia.org/wiki/Menu_(computing)) and [buttons](https://en.wikipedia.org/wiki/Button_(computing)). Consists of USER.EXE and [USER32.DLL](https://en.wikipedia.org/wiki/USER32.DLL).

[**Graphics Device Interface**](https://en.wikipedia.org/wiki/Graphics_Device_Interface)**(GDI)**

Responsible for drawing graphics in a device-independent way. Consists of GDI.EXE and GDI32.DLL.

**Dependence on MS-DOS**

To end-users, MS-DOS appears as an underlying component of Windows 95. For example, it is possible to prevent loading the graphical user interface and boot the system into a real-mode MS-DOS environment. This sparked debate amongst users and professionals over the question of to what extent Windows 95 is an operating system or merely a graphical shell running on top of MS-DOS.

When the graphical user interface is started, the virtual machine manager takes over the filesystem-related and disk-related functionality. MS-DOS itself is demoted to a compatibility layer for 16-bit device drivers. This contrasts with earlier versions of Windows which rely on MS-DOS to perform file and disk access (Windows for Workgroups 3.11 could also largely bypass MS-DOS when [32-bit file access](https://en.wikipedia.org/wiki/32-bit_file_access) and [32-bit disk access](https://en.wikipedia.org/wiki/32-bit_disk_access) were enabled). Keeping MS-DOS in memory allows Windows 95 to use DOS device drivers when suitable Windows drivers are unavailable. Windows 95 is capable of using all 16-bit Windows 3.x drivers.

Unlike Windows 3.1x, DOS programs running in Windows 95 do not need DOS drivers for the mouse, CD-ROM and sound card; Windows drivers are used instead. [HIMEM.SYS](https://en.wikipedia.org/wiki/HIMEM.SYS) is still required to boot Windows 95. [EMM386](https://en.wikipedia.org/wiki/EMM386) and other memory managers, however, are only used by legacy DOS programs. In addition, [CONFIG.SYS](https://en.wikipedia.org/wiki/CONFIG.SYS) and [AUTOEXEC.BAT](https://en.wikipedia.org/wiki/AUTOEXEC.BAT) settings (aside from HIMEM.SYS) have no effect on Windows programs. DOS games, which could not be executed on Windows 3.x, can run inside Windows 95 (games tended to lock up Windows 3.x or cause other problems). As with Windows 3.x, DOS programs that use [EGA](https://en.wikipedia.org/wiki/Enhanced_Graphics_Adapter) or [VGA](https://en.wikipedia.org/wiki/Video_Graphics_Array) graphics modes run in windowed mode ([CGA](https://en.wikipedia.org/wiki/Color_Graphics_Adapter) and [text mode](https://en.wikipedia.org/wiki/Text_mode) programs can continue to run).

On startup, the MS-DOS component in Windows 95 responds to a pressed F8 key by temporarily pausing the default boot process and presenting the DOS boot options menu, allowing the user to continue starting Windows normally, start Windows in [safe mode](https://en.wikipedia.org/wiki/Safe_mode) or exit to the DOS prompt. As in previous versions of [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS), there is no 32-bit support and DOS drivers must be loaded for mice and other hardware.

As a consequence of being DOS-based, Windows 95 has to keep internal DOS data structures synchronized with those of Windows 95. When starting a program, even a native 32-bit Windows program, MS-DOS momentarily executes to create a data structure known as the [Program Segment Prefix](https://en.wikipedia.org/wiki/Program_Segment_Prefix). It is even possible for MS-DOS to run out of [conventional memory](https://en.wikipedia.org/wiki/Conventional_memory) while doing so, preventing the program from launching. Windows 3.x allocated fixed segments in conventional memory first. Since the segments were allocated as fixed, Windows could not move them, which would prevent any more programs from launching.

Microsoft partially removed support for [File Control Blocks](https://en.wikipedia.org/wiki/File_Control_Block) (an API hold-over of DOS 1.x and CP/M) in Windows 95 OSR2 ([OEM](https://en.wikipedia.org/wiki/OEM) Service Release 2). FCB functions can only read [FAT32](https://en.wikipedia.org/wiki/FAT32) volumes, but not write to them.

**USER INTERFACE**

Windows 95 introduced a redesigned [shell](https://en.wikipedia.org/wiki/Windows_shell) based around a [desktop metaphor](https://en.wikipedia.org/wiki/Desktop_metaphor); the desktop was re-purposed to hold shortcuts to applications, files and folders. By contrast, [Windows 3.1](https://en.wikipedia.org/wiki/Windows_3.1)'s desktop was used to display icons of running applications. In Windows 95, they were now displayed as buttons on a [taskbar](https://en.wikipedia.org/wiki/Taskbar) across the bottom of the screen, which also contained a notification area used to display icons for background applications, a volume control and the current time. The [Start menu](https://en.wikipedia.org/wiki/Start_menu), invoked by clicking the "Start" button on the taskbar, was introduced as an additional means of launching applications or opening documents. While maintaining the program groups used by its predecessor [Program Manager](https://en.wikipedia.org/wiki/Program_Manager), it now displayed applications within cascading sub-menus. The previous [File Manager](https://en.wikipedia.org/wiki/File_Manager_(Windows)) program was also replaced by [Windows Explorer](https://en.wikipedia.org/wiki/Windows_Explorer).

In 1994, Microsoft designers [Mark Malamud](https://en.wikipedia.org/wiki/Mark_Malamud) and [Erik Gavriluk](https://en.wikipedia.org/w/index.php?title=Erik_Gavriluk&action=edit&redlink=1) approached [Brian Eno](https://en.wikipedia.org/wiki/Brian_Eno) to compose music for the Windows 95 project. The result was the six-second start-up music-sound of the Windows 95 operating system, [The Microsoft Sound](https://en.wikipedia.org/wiki/The_Microsoft_Sound).

When released for Windows 95 and NT4, [Internet Explorer 4](https://en.wikipedia.org/wiki/Internet_Explorer_4) came with an optional [Windows Desktop Update](https://en.wikipedia.org/wiki/Windows_Desktop_Update), which modified the shell to provide new features integrated with Internet Explorer, such as [Active Desktop](https://en.wikipedia.org/wiki/Active_Desktop) (which allowed Internet content to be displayed directly on the desktop) and additional updates to Windows Explorer.

Some of the user interface elements introduced in Windows 95, such as the desktop, taskbar, Start menu and Windows Explorer file manager, remained fundamentally unchanged on future versions of Windows.

**TECHNICAL IMPROVEMENTS**

Windows 95 included support for 255-character mixed-case [long filenames](https://en.wikipedia.org/wiki/Long_filename) and [preemptively](https://en.wikipedia.org/wiki/Preemption_(computing)) multitasked protected-mode 32-bit applications.

**Long file names**

[32-bit File Access](https://en.wikipedia.org/wiki/32-bit_File_Access) is necessary for the long file names feature introduced with Windows 95 through the use of the [VFAT](https://en.wikipedia.org/wiki/VFAT) file system extension. It is available to both Windows programs and MS-DOS programs started from Windows (they have to be adapted slightly, since accessing long file names requires using larger [pathname](https://en.wikipedia.org/wiki/Pathname) [buffers](https://en.wikipedia.org/wiki/Buffer_(computer_science)) and hence different [system calls](https://en.wikipedia.org/wiki/System_call)). Competing DOS-compatible operating systems released before Windows 95 cannot see these names. Using older versions of DOS utilities to manipulate files means that the long names are not visible and are lost if files are moved or renamed, as well as by the copy (but not the original), if the file is copied. During a Windows 95 automatic upgrade of an older Windows 3.1 system, DOS and third-party disk utilities which can destroy long file names are identified and made unavailable. When Windows 95 is started in DOS mode, e.g. for running DOS programs, low-level access to disks is locked out. In case the need arises to depend on disk utilities that do not recognize long file names, such as the MS-DOS 6.x's defrag utility, a program called LFNBACK for backup and restoration of long file names is provided on the CD-ROM, specifically in its \ADMIN\APPTOOLS\LFNBACK directory.

**32-bit**

Windows 95 followed [Windows for Workgroups](https://en.wikipedia.org/wiki/Windows_for_Workgroups) 3.11 with its lack of support for older, 16-bit [x86](https://en.wikipedia.org/wiki/X86) processors, thus requiring an [Intel 80386](https://en.wikipedia.org/wiki/Intel_80386) (or compatible). While the OS kernel is 32-bit, much code (especially for the user interface) remained 16-bit for performance reasons as well as development time constraints. This had a rather detrimental effect on system stability and led to frequent application crashes.

The introduction of [32-bit File Access](https://en.wikipedia.org/wiki/32-bit_File_Access) in Windows for Workgroups 3.11 meant that 16-bit real mode MS-DOS is not used for managing the files while Windows is running, and the earlier introduction of the [32-bit Disk Access](https://en.wikipedia.org/wiki/32-bit_Disk_Access) means that the PC [BIOS](https://en.wikipedia.org/wiki/BIOS) is often no longer used for managing hard disks. DOS can be used for running old-style [drivers](https://en.wikipedia.org/wiki/Device_driver) for compatibility, but Microsoft discourages using them, as this prevents proper multitasking and impairs system stability. [Control Panel](https://en.wikipedia.org/wiki/Control_Panel_(Windows)) allows a user to see which MS-DOS components are used by the system; optimal performance is achieved when they are bypassed. The Windows [kernel](https://en.wikipedia.org/wiki/Kernel_(computer_science)) uses MS-DOS style real-mode drivers in [Safe Mode](https://en.wikipedia.org/wiki/Safe_Mode), which exists to allow a user to fix problems relating to loading native, protected-mode drivers.

**SYSTEM REQUIREMENTS FOR WIN.95**

Official system requirements were an [Intel 80386DX](https://en.wikipedia.org/wiki/Intel_80386) CPU of any speed, 4 MB of system RAM and 50–55 MB of hard disk space depending on features selected. These minimal claims were made in order to maximize the available market of Windows 3.1 migrations. This configuration would rely heavily on [virtual memory](https://en.wikipedia.org/wiki/Virtual_memory) and was only optimal for productive use on single-tasking dedicated workstations. It was possible to run Windows 95 on a 386 SX, but this led to even less acceptable performance due to its 16-bit external data bus. To achieve optimal performance, Microsoft recommends an [Intel 80486](https://en.wikipedia.org/wiki/Intel_80486) or compatible CPU with at least 8 MB of RAM. Windows 95 may fail to boot on computers with more than approximately 480 MB of memory. In such case, reducing the file cache size or the size of video memory can help. The theoretical maximum according to Microsoft is 2 GB.

Windows 95 was superseded by [Windows 98](https://en.wikipedia.org/wiki/Windows_98) and could still be directly upgraded by either [Windows 2000](https://en.wikipedia.org/wiki/Windows_2000) Professional or [Windows ME](https://en.wikipedia.org/wiki/Windows_ME). On December 31, 2001, Microsoft ended its support for Windows 95, making it an "obsolete" product per the Microsoft Lifecycle Policy. Even though support for Windows 95 has ended, the software has occasionally remained in use on legacy systems for various purposes. In addition, some video game enthusiasts choose to use Windows 95 for their [legacy system](https://en.wikipedia.org/wiki/Legacy_system) to play old DOS games, although some other versions of Windows such as Windows 98 can also be used for this purpose.

Most copies of Windows 95 were on [CD-ROM](https://en.wikipedia.org/wiki/CD-ROM), but a floppy version could also be had for older machines. The retail floppy disk version of Windows 95 came on 13 [DMF](https://en.wikipedia.org/wiki/Distribution_Media_Format) formatted floppy disks, while OSR 2.1 doubled the floppy count to 26. Both versions exclude additional software that the CD-ROM version might have featured. [Microsoft Plus!](https://en.wikipedia.org/wiki/Microsoft_Plus!) for Windows 95 was also available on floppy disks. DMF was a special 21-sector format that Microsoft used to store 1.68 MB on floppy disks rather than the usual 1.44 MB.