**MICROSOFT WINDOWS**

Microsoft Windows (or simply Windows) is a metafamily of graphical operating systems developed, marketed, and sold by Microsoft. It consists of several families of operating systems, each of which cater to a certain sector of the computing industry with the OS typically associated with IBM PC compatible architecture. Active Windows families include Windows NT, Windows Embedded and Windows Phone; these may encompass subfamilies, e.g. Windows Embedded Compact (Windows CE) or Windows Server. Defunct Windows families include Windows 9x; Windows 10 Mobile is an active product, unrelated to the defunct family Windows Mobile.

Microsoft introduced an operating environment named Windows on November 20, 1985, as a graphical operating system shell for MS-DOS in response to the growing interest in graphical user interfaces (GUIs). Microsoft Windows came to dominate the world's personal computer (PC) market with over 90% market share, overtaking Mac OS, which had been introduced in 1984. Apple came to see Windows as an unfair encroachment on their innovation in GUI development as implemented on products such as the Lisa and 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, because of the massive growth in sales of Android smartphones. 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, smartphones and embedded devices is Windows 10. The most recent versions for server computers is Windows Server 2016. A specialized version of Windows runs on the Xbox One game console.

**Genealogy**

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: Started as a family of operating system with Windows NT 3.1, an operating system for server computers and 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, Windows 7, Windows 8/8.1 and Windows RT are members of this family but Windows 3.1 is not.

• Windows: The operating system for mainstream personal computers, tablets and smartphones. The latest version is Windows 10. The main competitor of this family is MacOS by Apple Inc. for personal computers and Android for mobile devices (c.f. Usage share of operating systems § Market share by category).

• Windows Server: The operating system for server computers. The latest version is Windows Server 2016. Unlike its clients sibling, it has adopted a strong naming scheme. The main competitor of this family is Linux. (c.f. Usage share of operating systems § Market share by category)

• Windows PE: A lightweight version of its Windows sibling meant to operate as a live operating system, 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: Initially, Microsoft developed 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, Windows Embedded Professional, Windows Embedded Standard, Windows Embedded Handheld and Windows Embedded Automotive.

The following Windows families are no longer being developed:

• Windows 9x: An operating system that targeted consumers market. Discontinued because of suboptimal performance. (PC World called its last version, Windows ME, one of the worst products of all times.) Microsoft now caters to the consumer’s market with Windows NT.

• Windows Mobile: The predecessor to Windows Phone, it was a mobile phone operating system. The first version was called Pocket PC 2000; the third version, Windows Mobile 2003 is the first version to adopt the Windows Mobile trademark. The last version is Windows Mobile 6.5.

• Windows Phone: An operating system sold only to manufacturers of smartphones. The first version was Windows Phone 7, followed by Windows Phone 8, and the last version Windows Phone 8.1. It was succeeded by 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, but before the Macintosh) under the name "Windows", but Windows 1.0 was not released until November 1985. Windows 1.0 was to compete with Apple's operating system, but achieved little popularity. Windows 1.0 is not a complete operating system; rather, it extends MS-DOS. The shell of Windows 1.0 is a program known as the MS-DOS Executive. Components included Calculator, Calendar, Cardfile, Clipboard viewer, Clock, Control Panel, Notepad, Paint, Reversi, Terminal and Write. Windows 1.0 does not allow overlapping windows. Instead all windows are tiled. Only modal dialog boxes may appear over other windows.

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 and could make use of expanded memory.

Windows 2.1 was released in two different versions: Windows/286 and Windows/386. Windows/386 uses the virtual 8086 mode of the Intel 80386 to multitask several DOS programs and the paged memory model to emulate expanded memory using available extended memory. Windows/286, in spite of its name, runs on both Intel 8086 and Intel 80286 processors. It runs in real mode but can make use of the 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 services. However, even the earliest Windows versions already assumed many typical operating system functions; notably, having their own executable file format and providing their own device drivers (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. Windows implemented an elaborate, segment-based, software virtual memory scheme, which allows it to run applications larger than available memory: code segments and resources are swapped in and thrown away when memory became scarce; data segments moved in memory when a given application had relinquished processor control.

*Windows 3.0*

Windows 3.0, released in 1990, improved the design, mostly because of virtual memory and loadable virtual device drivers (VxDs) that allow Windows to share arbitrary devices between multi-tasked DOS applications. Windows 3.0 applications can run in protected mode, which gives them access to several megabytes of memory without the obligation to participate in the software virtual memory scheme. They run inside the same address space, where the segmented memory provides a degree of protection. Windows 3.0 also featured improvements to the user interface. Microsoft rewrote critical operations from C into assembly. Windows 3.0 is the first Microsoft Windows version to achieve broad commercial success, selling 2 million copies in the first six months.

Windows 3.1, made generally available on March 1, 1992, featured a facelift. In August 1993, Windows for Workgroups, a special version with integrated peer-to-peer networking features and a version number of 3.11, was released. It was sold along Windows 3.1. Support for Windows 3.1 ended on December 31, 2001.

Windows 3.2, released 1994, is an updated version of the Chinese version of Windows 3.1. The update was limited to this language version, as it fixed only issues related to the complex writing system of the Chinese language. Windows 3.2 was generally sold by computer manufacturers with a ten-disk version of MS-DOS that also had Simplified Chinese characters in basic output and some translated utilities.

*Windows 9x*

The next major consumer-oriented release of Windows, Windows 95, was released on August 24, 1995. While still remaining MS-DOS-based, Windows 95 introduced support for native 32-bit applications, plug and play hardware, preemptive multitasking, long file names of up to 255 characters, and provided increased stability over its predecessors. Windows 95 also introduced a redesigned, object oriented user interface, replacing the previous Program Manager with the Start menu, taskbar, and Windows Explorer shell. Windows 95 was a major commercial success for Microsoft; Ina Fried of CNET remarked that "by the time Windows 95 was finally ushered off the market in 2001, it had become a fixture on computer desktops around the world."[18] Microsoft published four OEM Service Releases (OSR) of Windows 95, each of which was roughly equivalent to a service pack. The first OSR of Windows 95 was also the first version of Windows to be bundled with Microsoft's web browser, Internet Explorer. Mainstream support for Windows 95 ended on December 31, 2000, and extended support for Windows 95 ended on December 31, 2001.

Windows 95 was followed up with the release of Windows 98 on June 25, 1998, which introduced the Windows Driver Model, support for USB composite devices, support for ACPI, hibernation, and support for multi-monitor configurations. Windows 98 also included integration with Internet Explorer 4 through Active Desktop and other aspects of the Windows Desktop Update (a series of enhancements to the Explorer shell which were also made available for Windows 95). In May 1999, Microsoft released Windows 98 Second Edition, an updated version of Windows 98. Windows 98 SE added Internet Explorer 5.0 and Windows Media Player 6.2 amongst other upgrades. Mainstream support for Windows 98 ended on June 30, 2002, and extended support for Windows 98 ended on July 11, 2006.

On September 14, 2000, Microsoft released Windows ME (Millennium Edition), the last DOS-based version of Windows. Windows ME incorporated visual interface enhancements from its Windows NT-based counterpart Windows 2000, had faster boot times than previous versions (which however, required the removal of the ability to access a real modeDOS environment, removing compatibility with some older programs), expanded multimedia functionality (including Windows Media Player 7, Windows Movie Maker, and theWindows Image Acquisition framework for retrieving images from scanners and digital cameras), additional system utilities such as System File Protection and System Restore, and updated home networking tools. However, Windows ME was faced with criticism for its speed and instability, along with hardware compatibility issues and its removal of real mode DOS support. PC World considered Windows ME to be one of the worst operating systems Microsoft had ever released, and the 4th worst tech product of all time.

Windows NT

*Early versions*

In November 1988, a new development team within Microsoft (which included former Digital Equipment Corporation developers Dave Cutler and Mark Lucovsky) began work on a revamped version of IBM and Microsoft's OS/2 operating system known as "NT OS/2". NT OS/2 was intended to be a secure, multi-user operating system with POSIX compatibility and a modular, portable kernel with preemptive multitasking and support for multiple processor architectures. However, following the successful release of Windows 3.0, the NT development team decided to rework the project to use an extended 32-bit port of the Windows API known as Win32 instead of those of OS/2. Win32 maintained a similar structure to the Windows APIs (allowing existing Windows applications to easily be ported to the platform), but also supported the capabilities of the existing NT kernel. Following its approval by Microsoft's staff, development continued on what was now Windows NT, the first 32-bit version of Windows. However, IBM objected to the changes, and ultimately continued OS/2 development on its own.

The first release of the resulting operating system, Windows NT 3.1 (named to associate it with Windows 3.1) was released in July 1993, with versions for desktop workstations and servers. Windows NT 3.5 was released in September 1994, focusing on performance improvements and support for Novell's NetWare, and was followed up by Windows NT 3.51 in May 1995, which included additional improvements and support for the PowerPC architecture. Windows NT 4.0 was released in June 1996, introducing the redesigned interface of Windows 95 to the NT series. On February 17, 2000, Microsoft released Windows 2000, a successor to NT 4.0. The Windows NT name was dropped at this point in order to put a greater focus on the Windows brand.

*Home versions of Windows NT*

The next major version of Windows NT, Windows XP, was released on October 25, 2001. The introduction of Windows XP aimed to unify the consumer-oriented Windows 9x series with the architecture introduced by Windows NT, a change which Microsoft promised would provide better performance over its DOS-based predecessors. Windows XP would also introduce a redesigned user interface (including an updated Start menu and a "task-oriented" Windows Explorer), streamlined multimedia and networking features, Internet Explorer 6, integration with Microsoft's .NET Passport services, modes to help provide compatibility with software designed for previous versions of Windows, and Remote Assistance functionality.

At retail, Windows XP was now marketed in two main editions: the "Home" edition was targeted towards consumers, while the "Professional" edition was targeted towards business environments and power users, and included additional security and networking features. Home and Professional were later accompanied by the "Media Center" edition (designed for home theater PCs, with an emphasis on support for DVD playback, TV tuner cards, DVR functionality, and remote controls), and the "Tablet PC" edition (designed for mobile devices meeting its specifications for a tablet computer, with support for stylus pen input and additional pen-enabled applications). Mainstream support for Windows XP ended on April 14, 2009. Extended support ended on April 8, 2014.

After Windows 2000, Microsoft also changed its release schedules for server operating systems; the server counterpart of Windows XP, Windows Server 2003, was released in April 2003. It was followed in December 2005, by Windows Server 2003 R2.

*Windows Vista*

After a lengthy development process, Windows Vista was released on November 30, 2006, for volume licensing and January 30, 2007, for consumers. It contained a number of new features, from a redesigned shell and user interface to significant technical changes, with a particular focus on security features. It was available in a number of different editions, and has been subject to some criticism, such as drop of performance, longer boot time, criticism of new UAC, and stricter license agreement. Vista's server counterpart, Windows Server 2008 was released in early 2008.

*Windows 7*

On July 22, 2009, Windows 7 and Windows Server 2008 R2 were released as RTM (release to manufacturing) while the former was released to the public 3 months later on October 22, 2009. Unlike its predecessor, Windows Vista, which introduced a large number of new features, Windows 7 was intended to be a more focused, incremental upgrade to the Windows line, with the goal of being compatible with applications and hardware with which Windows Vista was already compatible. Windows 7 has multi-touch support, a redesigned Windows shell with an updated taskbar, a home networking system called HomeGroup, and performance improvements.

*Windows 8 and 8.1*

Windows 8, the successor to Windows 7, was released generally on October 26, 2012. A number of significant changes were made on Windows 8, including the introduction of a user interface based around Microsoft's Metro design language with optimizations for touch-based devices such as tablets and all-in-one PCs. These changes include the Start screen, which uses large tiles that are more convenient for touch interactions and allow for the display of continually updated information, and a new class of apps which are designed primarily for use on touch-based devices. Other changes include increased integration with cloud services and other online platforms (such as social networks and Microsoft's own OneDrive (formerly SkyDrive) and Xbox Live services), the Windows Store service for software distribution, and a new variant known as Windows RT for use on devices that utilize the ARM architecture. An update to Windows 8, called Windows 8.1, was released on October 17, 2013, and includes features such as new live tile sizes, deeper OneDrive integration, and many other revisions. Windows 8 and Windows 8.1 has been subject to some criticism, such as removal of Start Menu.

*Windows 10*

On September 30, 2014, Microsoft announced Windows 10 as the successor to Windows 8.1. It was released on July 29, 2015, and addresses shortcomings in the user interface first introduced with Windows 8. Changes include the return of the Start Menu, a virtual desktop system, and the ability to run Windows Store apps within windows on the desktop rather than in full-screen mode. Windows 10 is said to be available to update from qualified Windows 7 with SP1 and Windows 8.1 computers from the Get Windows 10 Application (for Windows 7, Windows 8.1) or Windows Update (Windows 7).

On November 12, 2015, an update to Windows 10, version 1511, was released. This update can be activated with a Windows 7, 8 or 8.1 product key as well as Windows 10 product keys. Features include new icons and right-click context menus, default printer management, four times as many tiles allowed in the Start menu, Find My Device, and Edge updates.

*Multilingual support*

Multilingual support is built into Windows. The language for both the keyboard and the interface can be changed through the Region and Language Control Panel. Components for all supported input languages, such as Input Method Editors, are automatically installed during Windows installation (in Windows XP and earlier, files for East Asian languages, such as Chinese, and right-to-left scripts, such as Arabic, may need to be installed separately, also from the said Control Panel). Third-party IMEs may also be installed if a user feels that the provided one is insufficient for their needs.

Interface languages for the operating system are free for download, but some languages are limited to certain editions of Windows. Language Interface Packs (LIPs) are redistributable and may be downloaded from Microsoft's Download Center and installed for any edition of Windows (XP or later) – they translate most, but not all, of the Windows interface, and require a certain base language (the language which Windows originally shipped with). This is used for most languages in emerging markets. Full Language Packs, which translates the complete operating system, are only available for specific editions of Windows (Ultimate and Enterprise editions of Windows Vista and 7, and all editions of Windows 8, 8.1 and RT except Single Language). They do not require a specific base language, and are commonly used for more popular languages such as French or Chinese. These languages cannot be downloaded through the Download Center, but available as optional updates through the Windows Update service (except Windows 8).

The interface language of installed applications are not affected by changes in the Windows interface language. Availability of languages depends on the application developers themselves.

Windows 8 and Windows Server 2012 introduces a new Language Control Panel where both the interface and input languages can be simultaneously changed, and language packs, regardless of type, can be downloaded from a central location. The PC Settings app in Windows 8.1 and Windows Server 2012 R2 also includes a counterpart settings page for this. Changing the interface language also changes the language of preinstalled Windows Store apps (such as Mail, Maps and News) and certain other Microsoft-developed apps (such as Remote Desktop). The above limitations for language packs are however still in effect, except that full language packs can be installed for any edition except Single Language, which caters to emerging markets.

*Platform support*

Windows NT included support for several different platforms before the x86-based personal computer became dominant in the professional world. Windows NT 4.0 and its predecessors supported PowerPC, DEC Alpha and MIPS R4000. (Although some these platforms implement 64-bit computing, the operating system treated them as 32-bit.) However, Windows 2000, the successor of Windows NT 4.0, dropped support for all platforms except the third generation x86 (known as IA-32) or newer in 32-bit mode. The client line of Window NT family still runs on IA-32, although the Windows Server line has ceased supporting this platform with the release of Windows Server 2008 R2.

With the introduction of the Intel Itanium architecture (IA-64), Microsoft released new versions of Windows to support it. Itanium versions of Windows XP and Windows Server 2003 were released at the same time as their mainstream x86 counterparts. Windows XP 64-Bit Edition, released in 2005, is the last Windows client operating systems to support Itanium. Windows Server line continues to support this platform until Windows Server 2012; Windows Server 2008 R2 is the last Windows operating system to support Itanium architecture.

On April 25, 2005, Microsoft released Windows XP Professional x64 Edition and Windows Server 2003 x64 Editions to support the x86-64 (or simply x64), the eighth generation of x86 architecture. Windows Vista was the first client version of Windows NT to be released simultaneously in IA-32 and x64 editions. x64 is still supported.

An edition of Windows 8 known as Windows RT was specifically created for computers with ARM architecture and while ARM is still used for Windows smartphones with Windows 10, tablets with Windows RT will not be updated.

**Windows CE**

Windows CE (officially known as Windows Embedded Compact), is an edition of Windows that runs on minimalistic computers, like satellite navigation systems and some mobile phones. Windows Embedded Compact is based on its own dedicated kernel, dubbed Windows CE kernel. Microsoft licenses Windows CE to OEMs and device makers. The OEMs and device makers can modify and create their own user interfaces and experiences, while Windows CE provides the technical foundation to do so.

Windows CE was used in the Dreamcast along with Sega's own proprietary OS for the console. Windows CE was the core from which Windows Mobile was derived. Its successor, Windows Phone 7, was based on components from both Windows CE 6.0 R3 and Windows CE 7.0. Windows Phone 8 however, is based on the same NT-kernel as Windows 8.

Windows Embedded Compact is not to be confused with Windows XP Embedded or Windows NT 4.0 Embedded, modular editions of Windows based on Windows NT kernel.

**Xbox OS**

Xbox OS is an unofficial name given to the version of Windows that runs on the Xbox One. It is a more specific implementation with an emphasis on virtualization (using Hyper-V) as it is three operating systems running at once, consisting of the core operating system, a second implemented for games and a more Windows-like environment for applications. Microsoft updates Xbox One's OS every month, and these updates can be downloaded from the Xbox Live service to the Xbox and subsequently installed, or by using offline recovery images downloaded via a PC. The Windows 10-based Core had replaced the Windows 8-based one in this update, and the new system is sometimes referred to as "Windows 10 on Xbox One" or "OneCore". Xbox One's system also allows backward compatibility with Xbox 360, and the Xbox 360's system is backwards compatible with the original Xbox.

**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) and the popularity of Windows means that it is a frequent target of computer worm and viruswriters. In June 2005, 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 found around 11,000 malicious programs—viruses, Trojans, back-doors, and exploits written for Windows.

Microsoft releases security patches through its Windows Update service approximately once a month (usually the second 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 series offered the option of having profiles for multiple users, they had no concept of access privileges, and did not allow concurrent access; and so were not true multi-user operating systems. In addition, they implemented only partial memory protection. They were accordingly widely criticized for lack of security.

The 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 account, which was also the default for new accounts. Though 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 changes this by introducing a privilege elevation system called User Account Control. When logging in as a standard user, a logon session is created and a token 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, 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 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 and 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 of Microsoft AntiSpyware, based upon the previously released Giant AntiSpyware. On February 14, 2006, Microsoft AntiSpyware became 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 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, 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 and the optional 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 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 National Cyber Security Alliance Online Safety Study of October 2004, determined that 80% of Windows users were infected by at least one spyware/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, running anti-virus and anti-spyware software, and installing patches as they become available through Windows Update.

**Bill Gates**

William Henry "Bill" Gates III (born October 28, 1955) is an American business magnate, investor, author, and philanthropist. In 1975, Gates and Paul Allen co-founded Microsoft, which became the world's largest PC software company. During his career at Microsoft, Gates held the positions of chairman, CEO and chief software architect, and was the largest individual shareholder until May 2014.

After reading the January 1975 issue of Popular Electronics that demonstrated the Altair 8800, Gates contacted Micro Instrumentation and Telemetry Systems (MITS), the creators of the new microcomputer, to inform them that he and others were working on a BASIC interpreter for the platform. In reality, Gates and Allen did not have an Altair and had not written code for it; they merely wanted to gauge MITS's interest. MITS president Ed Roberts agreed to meet them

for a demo, and over the course of a few weeks they developed an Altair emulator that ran on a minicomputer, and then the BASIC interpreter. The demonstration, held at MITS's offices in Albuquerque, was a success and resulted in a deal with MITS to distribute the interpreter as Altair BASIC. Paul Allen was hired into MITS,]and Gates took a leave of absence from Harvard to work with Allen at MITS in Albuquerque in November 1975. They named their partnership "Micro-Soft" and had their first office located in Albuquerque. Within a year, the hyphen was dropped, and on November 26, 1976, the trade name "Microsoft" was registered with the Office of the Secretary of the State of New Mexico. Gates never returned to Harvard to complete his studies.

Microsoft's Altair BASIC was popular with computer hobbyists, but Gates discovered that a pre-market copy had leaked into the community and was being widely copied and distributed. In February 1976, Gates wrote an Open Letter to Hobbyists in the MITS newsletter in which he asserted that more than 90% of the users of Microsoft Altair BASIC had not paid Microsoft for it and by doing so the Altair "hobby market" was in danger of eliminating the incentive for any professional developers to produce, distribute, and maintain high-quality software. This letter was unpopular with many computer hobbyists, but Gates persisted in his belief that software developers should be able to demand payment. Microsoft became independent of MITS in late 1976, and it continued to develop programming language software for various systems. The company moved from Albuquerque to its new home in Bellevue, Washington, on January 1, 1979. During Microsoft's early years, all employees had broad responsibility for the company's business. Gates oversaw the business details, but continued to write code as well. In the first five years, Gates personally reviewed every line of code the company shipped, and often rewrote parts of it as he saw fit.

**WINDOWS 1.0**

Windows 1.0 is a graphical personal computer operating environment developed by Microsoft. Microsoft had worked with Apple Computer to develop applications for Apple's January 1984 original Macintosh, the first mass-produced personal computer with a graphical user interface (GUI) that enabled users to see user friendly icons on screen. Windows 1.0 was released on November 20, 1985, as the first version of the Microsoft Windows line. It runs as a graphical, 16-bit multi-tasking shell on top of an existing MS-DOS installation. It provides an environment which can run graphical programs designed for Windows, as well as existing MS-DOS software. Its development was spearheaded by the company founder Bill Gates after he saw a demonstration of a similar software suite known as Visi On at 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 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 specifications. Despite these criticisms, Windows 1.0 was an important milestone for Microsoft, as it introduced the 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**

The development of Windows began after Microsoft founder Bill Gates saw a demonstration at COMDEX 1982 of VisiCorp's Visi On, a graphical user interface (GUI) software suite for IBM PC compatible computers.

Microsoft first presented Windows to the public on November 10, 1983. Requiring two floppy disk drives and 192 KB of RAM, Microsoft described the software as a device driver for MS-DOS 2.0. By supporting cooperative multitasking in tiled "windows" 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's Lisa by immediately offering many applications. Unlike Visi On, Windows developers did not need to use 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 in their applications.

Many manufacturers of MS-DOS computers such as Compaq, Zenith, and DEC promised to provide support, as did software companies such as Ashton-Tate and Lotus. After previewing Windows, 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 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 like MS-DOS and Xenix. We're also saying that only applications that take advantage of Windows will be competitive in the long run." 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, and Digital Research's 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-rich environment" while using less memory.

**Versions**

*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 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 computers, although no support for PS/2 mice or new VGA graphics modes was provided. At the same time, Microsoft and IBM announced the introduction of OS/2 and its graphical OS/2 Presentation Manager, which were supposed to ultimately replace both MS-DOS and Windows. In November 1987, Windows 1.0 was succeeded by Windows 2.0. Microsoft supported Windows 1.0 for 16 years, until December 31, 2001 – the longest out of all versions of Windows.

**Function and features**

Windows 1.0 offers limited multitasking of existing MS-DOS programs and concentrates on creating an interaction paradigm (cf. message loop), an execution model and a stable API for native programs for the future. Due to Microsoft's extensive support for backward compatibility, it is not only possible to execute Windows 1.0 binary programs on current versions of Windows to a large extent, but also to recompile their source code into an equally functional "modern" application with just limited modifications. Windows 1.0 is often regarded as a "front-end to the MS-DOS 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 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 scheme allowing for applications larger than available RAM.

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) to get work done. Therefore, Windows 1.0 included original device drivers 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/HGC/EGA (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 program known as the 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-compliant. Other supplied programs are Calculator, Calendar, Clipboard Viewer, Clock, Notepad, Paint, Reversi, Cardfile, Terminal and Write. Windows 1.0 does not allow overlapping windows. Instead all windows are tiled. Only dialog boxes can appear over other windows, but cannot be minimized. Windows 1.0 executables, while having a similar .exe extension and initial file header similar to MS-DOS programs, do not contain the code that prints the "This program requires Microsoft Windows" message as newer Windows programs do. Instead, the executable file header has a newer C programming model specifying more memory, causing DOS to reject the executable with a "program too large to fit in memory" error message.

**System requirements**

- MS-DOS version 2.0

- Two double-sided disk drives or a hard disk

- 256K of memory or greater

- Graphics-adapter card

**Advantages**

* Windows 1.0 offers limited multitasking of existing MS-DOS programs and concentrates on creating an interaction paradigm, an execution model and a stable API for native programs for the future. Due to Microsoft’s extensive support for backward compatibility. It is not possible to execute Windows 1.0 binary programs on current versions of Windows to a large extent, but also to recompile their source code into an equally “modern” application just for limited modifications.
* Windows 1.0 programs can call MS-DOS functions, and GUI programs are run from .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 scheme allowing for applications larger than available RAM.
* Windows 1.0 was designed to be extended into a full-fledged operating system, rather than being just a graphics environment used by applications.

**Disadvantages**

* Windows 1.0 put too much emphasis on mouse input at a time when mouse use was not yet widespread; not providing enough resources for new users; and for suffering from performance issues, especially on systems with lower hardware specifications.
* Windows 1.0 is a DOS front-end and cannot operate without a DOS environment.
* Windows 1.0 does not allow overlapping windows. Instead all windows are tiled. Only dialoged boxes can appear over other windows, but cannot be minimized.

**WINDOWS 2.0**

* **History**

Windows 2.0 is a 16-bit Microsoft Windows GUI-based operating environment that was released on December 9, 1987, and is the successor to Windows 1.0.

This new version added overlapping windows and allowed minimized windows to be moved around the desktop with a mouse.

The big claim to fame for Windows 2.0, however, was that it came bundled with Microsoft's Word and Excel applications. Word and Excel were graphical apps competing against the text-based interfaces of then-reigning competitors WordPerfect and Lotus 1-2-3; the Microsoft apps needed a GUI shell to run properly, hence the bundling with Windows.

* **Function and features**

Windows 2.0 allowed application windows to overlap each other unlike its predecessor 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 (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 drivers notably provided a workaround in Windows 3.0 for users who wanted color graphics on 8086 machines (a feature that version normally did not support). EMS memory support also appeared for the first time.

* **Application support**

The first Windows versions of Microsoft Word and 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 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 – a calculator
* CALENDAR.EXE – calendaring software
* CARDFILE.EXE – a personal information manager
* CLIPBRD.EXE – software for viewing the contents of the clipboard
* CLOCK.EXE – a clock
* CONTROL.EXE – the system utility responsible for configuring Windows 2.0
* CVTPAINT.EXE - Converted paint files to the 2.x format
* MSDOS.EXE – a simple file manager
* NOTEPAD.EXE – a text editor
* PAINT.EXE – a raster graphics editor that allows users to paint and edit pictures interactively on the computer screen
* PIFEDIT.EXE – a program information file editor that defines how a DOS program should behave inside Windows
* REVERSI.EXE – a computer game of reversi
* SPOOLER.EXE – the 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
* WRITE.EXE – a simple word processor
* **Legal conflict with Apple**

On March 17, 1988, Apple Inc. filed a lawsuit against Microsoft and Hewlett-Packard, accusing them of violating copyrights Apple held on the Macintosh System Software. Apple claimed the "look and feel" of the Macintosh operating system, taken as a whole, was protected by copyright and that Windows 2.0 violated this copyright by having the same icons. The judge ruled in favor of Hewlett-Packard and Microsoft in all but 10 of the 189 patents that Apple sued for. The exclusive 10 could not be copyrighted, as ruled by the judge.

* **System requirements**

- MS-DOS version 3.0

- Two double-sided disk drives or a hard disk

- 512K of memory or greater

- Graphics-adapter card

* **Advantages**

Microsoft released Windows 2.0, which came with almost same applications as Windows 1.0 but had a lot of improvements in windows management. User can resize and move windows freely to any place in the screen. Windows can overlap any part of other windows. The icons can overlap with other icons too. Windows version 2.0 with support of 386 enhanced modes, which is called Windows 2.0/386 later was release later that year. The only difference between Windows 2.0/286 and Windows 2.0/386 is the 386 enhanced mode let system run multiple MS-DOS applications simultaneously in extended memory, which breaks the limit of 640K base memory.

* **Disadvantages**

Windows 2.0 did not make big success due to the hardware limitation and software limitation. It was not successful comparing to windows versions later than Windows 3.1. The 386 enhanced mode, however, made a big successful step on the history of Windows.

**WINDOWS 3.0**

**History**

Windows 3.0, a graphical environment, is the third major release of Microsoft Windows, and was released on May 22, 1990. It became the first widely successful version of Windows and a rival to Apple Macintosh and the Commodore Amiga on the graphical user interface (GUI) front. It was followed by Windows 3.1.

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.

**Function and features**

Windows 3.0 succeeded Windows 2.1x and included a significantly revamped user interface as well as technical improvements to make better use of the memory management capabilities of Intel's 80286 and 80386 processors. Text mode programs written for 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 usable as a crude multitasking base for legacy programs. However, this was of limited use for the home market, where most games 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 and the list-based File Manager, splitting files and programs. The Control Panel, previously available as a standard-looking applet, was re-modeled after the one in the 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 and the word processor Write (both inherited from earlier versions of Windows), a macro recorder (new; later dropped), the paint program Paintbrush (inherited, but substantially improved), and a calculator (also inherited). Also, the earlier Reversi game was complemented with the card game 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 8086/8088 up to 80286 and 80386.[5] 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), /s ("standard" 286 protected mode) and /3 (386 enhanced protected mode) respectively.[6] 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 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 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 was an enhanced version of the protected mode kernel for Windows/286.

**System requirements**

The official system requirements for Windows 3.0:

• 8086/8088 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, EGA, MCGA, VGA, Hercules, 8514/A or XGA graphics and an appropriate and compatible monitor

• 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 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 (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).[11] Microsoft had dropped support for the Tandy 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, and corresponding to its real mode;

• Standard mode, intended for computers with an 80286 processor, and corresponding to its protected mode;

• 386 Enhanced mode, intended for newer computers with an Intel 80386 processor or above, and corresponding to its protected mode and virtual 8086 mode.

Real mode primarily existed as a way to run Windows 2.x applications. It was removed in 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. 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.

**System requirements**

- MS-DOS 3.1 or higher

- 640K Conventional Memory

- 256K Extended Memory

**Advantages**

It multitasked–sort of. Prior to Windows 3.0, Windows was just a task switcher. Windows 3.0 had cooperative multitasking. It was crude, but the Mac only had cooperative multitasking at the time too, and Windows 3.0 was less crash-prone when multitasking than the Mac. In my experience it was less crash-prone than single-tasking a Mac too at that point, but that seemed to depend on how you used the system because there are people who will claim the opposite.

It was more stable than what people were used to. Windows 1.0 and 2.0 weren’t stable enough to be much more than a curiosity. You could actually boot up Windows 3.0 and run it all day and have a chance of not crashing.

It had the killer app. Microsoft Office was still a way off, but Windows 3.0 had graphical versions of Word and Excel that were better to use than their DOS counterparts had been. And competitor Samna had Ami Pro, which really gave the early versions of Word a run for their money. Lotus later bought Samna and eventually renamed Ami Pro to WordPro. Part of the reason Windows 3.0 succeeded was because of timing–you needed a program to run to make you want to boot up Windows, and there were several.

It was inexpensive and ran on inexpensive hardware. When Windows 3.0 came out, it wasn’t long at all before $1,000 PCs capable of running it followed. Major cities were stuffed with consumer electronics stores eager to sell them, and even in small towns, you could get one at Radio Shack. Did a Mac provide a better experience? Probably.

It standardized a hardware tower of babel. Early 386s were really chaotic, and ironically, running cutting-edge DOS games under Windows 3.0 generally made them work a bit better. This was a fairly temporary situation and I don’t think it would be true of systems built after.

**Disadvantages**

Windows 3.1 was faster and more stable. Windows 3.0 put Windows on the map, but Microsoft followed up with a better version two years later. It was Windows 3.0 that set the table, but once Windows 3.1 was out, there was no reason to stay on it.

It crashed a lot. It was better than previous versions of Windows, but if you were going to run Windows all day, it was a good idea to reboot in the middle of the day and certainly at the end of the day.

Hardware support was still a bit spotty. There was a lot of new stuff being developed on PCs at this point in time, most notably sound hardware, but Windows 3.0 and its software didn’t support them initially. Microsoft had to release Windows 3.0 with Multimedia Extensions in late 1991 to add support for this new hardware.

It was Windows 3.0 that put Windows on the map, but had Microsoft not followed up in 1992 with Windows 3.1 and again in 1995 with Windows 95, it might not have achieved the dominance it has today.

**WINDOWS 3.1**

**History**

Windows 3.1x (codenamed Janus) is a series of 16-bit operating environments produced by 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. Subsequent versions were released between 1992 and 1994 until the series was superseded by Windows 95. During its lifespan, Windows 3.1 introduced several enhancements to the still MS-DOS-based platform, including improved system stability, expanded support for multimedia, TrueType fonts, and workgroup 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 continued to be available until November 1, 2008.

**Function and features**

Windows 3.1 dropped real mode support and required a minimum of a 286 PC with 1 MB of RAM 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. 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 support was enhanced over what was available in Windows 3.0 with Multimedia Extensions 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 (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, a centralized 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 while running Windows.

**Editions**

*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 (Windows-1250) and supported its use in violation of many countries' ISO standards (e.g., the official Polish code page is ISO-8859-2, which was ignored by Microsoft but is supported by contemporary 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 is a special version of Windows 3.1, designed to run on 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 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 that also had Simplified Chinese characters in basic output and some translated utilities.

**Windows for workgroups**

*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 file sharing support via NetBIOS-based NBF and/or IPX network transport protocols and introduces the Hearts card game and VSHARE.386, a VxD version of SHARE.EXE (a 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, 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 package was required to support TCP/IP networking 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), 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.

**System requirements**

- MS-DOS 3.1 or later

- IBM compatible 80286 or higher (386 recommended)

- 640K Conventional memory

- 256K extended memory (XMS v 2.0 or higher)

- 1024K extended memory recommended on 80286

- 2048K extended memory recommended on 80386

- 5.25-inch (high density) or 3.5-inch floppy drive

- Fixed drive with 6 megabytes free (10 megabytes recommended)

- EGA, VGA, SVGA, XGA, 8514/A, or Hercules video card or 100%

compatible card, and monitor

- Mouse recommended

**Advantages**

- Available in upgrade or full package (upgrade does not require

earlier version)

- Improved Setup program offers express, custom,

network, and troubleshooting setup

- Computer-based Windows 3.1 tutorial

- Consistent dialog boxes

- Improved online Help

- OLE Drag and drop, OLE support in many applications

- Improved File Manager

- Improved printer support through use of UNIdriver

- New video drivers support MS-DOS graphics in a window

- WD1003 virtual hard drive controller

- Virtual memory changeable in Control Panel

- Standard and enhanced mode operation only

- TrueType scalable font support

- Includes multimedia extensions (inclusions)

- Includes new SMARTDrive version 4.0, HIMEM XMS manager 3.0,

new EMM386.EXE

- Standard mode can now run with EMM386.EXE running

- Documentation includes "Getting Started" manual

- 266 different types of printers supported

**Disadvantages**

Windows 3.1 was faster and more stable. Windows 3.0 put Windows on the map, but Microsoft followed up with a better version two years later. It was Windows 3.0 that set the table, but once Windows 3.1 was out, there was no reason to stay on it.

It crashed a lot. It was better than previous versions of Windows, but if you were going to run Windows all day, it was a good idea to reboot in the middle of the day and certainly at the end of the day.

Hardware support was still a bit spotty. There was a lot of new stuff being developed on PCs at this point in time, most notably sound hardware, but Windows 3.0 and its software didn’t support them initially. Microsoft had to release Windows 3.0 with Multimedia Extensions in late 1991 to add support for this new hardware.

It was Windows 3.0 that put Windows on the map, but had Microsoft not followed up in 1992 with Windows 3.1 and again in 1995 with Windows 95, it might not have achieved the dominance it has today.