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*This article is about the operating system. For the kernel, see*[*Linux kernel*](https://en.wikipedia.org/wiki/Linux_kernel)*. For other uses, see*[*Linux (disambiguation)*](https://en.wikipedia.org/wiki/Linux_(disambiguation))*.*

|  |  |
| --- | --- |
| **Linux** | |
| [Tux the penguin](https://en.wikipedia.org/wiki/File:Tux.svg)  [Tux](https://en.wikipedia.org/wiki/Tux) the [penguin](https://en.wikipedia.org/wiki/Penguin), mascot of Linux[[1]](https://en.wikipedia.org/wiki/Linux#cite_note-LinuxOnLine2008-1) | |
| [**Developer**](https://en.wikipedia.org/wiki/Software_developer) | Community |
| [**Written in**](https://en.wikipedia.org/wiki/Programming_language) | Primarily [C](https://en.wikipedia.org/wiki/C_(programming_language)) and [assembly](https://en.wikipedia.org/wiki/Assembly_language) |
| **OS family** | [Unix-like](https://en.wikipedia.org/wiki/Unix-like) |
| **Working state** | Current |
| **Source model** | Mainly [open-source](https://en.wikipedia.org/wiki/Open-source), [proprietary software](https://en.wikipedia.org/wiki/Proprietary_software) is also available. |
| **Initial release** | September 17, 1991; 26 years ago |
| **Marketing target** | [Personal computers](https://en.wikipedia.org/wiki/Personal_computer), [mobile devices](https://en.wikipedia.org/wiki/Mobile_device), [embedded devices](https://en.wikipedia.org/wiki/Embedded_device), [servers](https://en.wikipedia.org/wiki/Server_(computing)), [mainframes](https://en.wikipedia.org/wiki/Mainframe_computer), [supercomputers](https://en.wikipedia.org/wiki/Supercomputer) |
| [**Available in**](https://en.wikipedia.org/wiki/Natural_language) | Multilingual |
| **Platforms** | [Alpha](https://en.wikipedia.org/wiki/DEC_Alpha), [ARC](https://en.wikipedia.org/wiki/ARC_(processor)), [ARM](https://en.wikipedia.org/wiki/ARM_architecture), [Blackfin](https://en.wikipedia.org/wiki/Blackfin), [C6x](https://en.wikipedia.org/wiki/C6x), [ETRAX CRIS](https://en.wikipedia.org/wiki/ETRAX_CRIS), [FR-V](https://en.wikipedia.org/wiki/FR-V), [H8/300](https://en.wikipedia.org/wiki/H8/300), [Hexagon](https://en.wikipedia.org/wiki/Qualcomm_Hexagon), [Itanium](https://en.wikipedia.org/wiki/Itanium), [M32R](https://en.wikipedia.org/wiki/M32R), [m68k](https://en.wikipedia.org/wiki/M68k), [META](https://en.wikipedia.org/wiki/Imagination_META), [Microblaze](https://en.wikipedia.org/wiki/Microblaze), [MIPS](https://en.wikipedia.org/wiki/MIPS_architecture), [MN103](https://en.wikipedia.org/wiki/MN103), [Nios II](https://en.wikipedia.org/wiki/Nios_II), [OpenRISC](https://en.wikipedia.org/wiki/OpenRISC), [PA-RISC](https://en.wikipedia.org/wiki/PA-RISC), [PowerPC](https://en.wikipedia.org/wiki/PowerPC), [RISC-V](https://en.wikipedia.org/wiki/RISC-V), [s390](https://en.wikipedia.org/wiki/S390), [S+core](https://en.wikipedia.org/wiki/S%2Bcore), [SuperH](https://en.wikipedia.org/wiki/SuperH), [SPARC](https://en.wikipedia.org/wiki/SPARC), [TILE64](https://en.wikipedia.org/wiki/TILE64), [Unicore32](https://en.wikipedia.org/wiki/Unicore32), [x86](https://en.wikipedia.org/wiki/X86), [Xtensa](https://en.wikipedia.org/wiki/Xtensa) |
| [**Kernel**](https://en.wikipedia.org/wiki/Kernel_(operating_system))**type** | [Monolithic](https://en.wikipedia.org/wiki/Monolithic_kernel) ([Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel)) |
| [**Userland**](https://en.wikipedia.org/wiki/User_space#USERLAND) | [GNU](https://en.wikipedia.org/wiki/GNU) and various others[[a]](https://en.wikipedia.org/wiki/Linux#cite_note-7) |
| **Default**[**user interface**](https://en.wikipedia.org/wiki/User_interface) | Many |
| [**License**](https://en.wikipedia.org/wiki/Software_license) | [GPLv2](https://en.wikipedia.org/wiki/GPLv2)[[7]](https://en.wikipedia.org/wiki/Linux#cite_note-8) and other free and open-source licenses (the name "Linux" is a trademark[[b]](https://en.wikipedia.org/wiki/Linux#cite_note-10)) |

**Linux** ([/ˈlɪnəks/](https://en.wikipedia.org/wiki/Help:IPA/English) ([About this sound](https://en.wikipedia.org/wiki/File:Linus-linux.ogg) [listen](https://upload.wikimedia.org/wikipedia/commons/0/03/Linus-linux.ogg)) [*LIN-əks*](https://en.wikipedia.org/wiki/Help:Pronunciation_respelling_key))[[9]](https://en.wikipedia.org/wiki/Linux#cite_note-pronunciation-2-11)[[10]](https://en.wikipedia.org/wiki/Linux#cite_note-Foldoc09Jun06-12) is a family of [free and open-source software](https://en.wikipedia.org/wiki/Free_and_open-source_software) [operating systems](https://en.wikipedia.org/wiki/Operating_system) built around the [Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel). Typically, Linux is [packaged](https://en.wikipedia.org/wiki/Package_management_system) in a form known as a [Linux distribution](https://en.wikipedia.org/wiki/Linux_distribution) (or *distro* for short) for both desktop and server use. The defining component of a Linux distribution is the [Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel),[[11]](https://en.wikipedia.org/wiki/Linux#cite_note-13) an [operating system kernel](https://en.wikipedia.org/wiki/Kernel_(computing)) first released on September 17, 1991, by [Linus Torvalds](https://en.wikipedia.org/wiki/Linus_Torvalds).[[12]](https://en.wikipedia.org/wiki/Linux#cite_note-14)[[13]](https://en.wikipedia.org/wiki/Linux#cite_note-15)[[14]](https://en.wikipedia.org/wiki/Linux#cite_note-16)

Linux was originally developed for [personal computers](https://en.wikipedia.org/wiki/Personal_computer) based on the [Intel x86](https://en.wikipedia.org/wiki/Intel_x86) architecture, but has since been [ported](https://en.wikipedia.org/wiki/Porting) to more [platforms](https://en.wikipedia.org/wiki/Computer_hardware_platforms) than any other operating system.[[15]](https://en.wikipedia.org/wiki/Linux#cite_note-17)Because of the dominance of the Linux kernel-based [Android](https://en.wikipedia.org/wiki/Android_(operating_system)) OS on [smartphones](https://en.wikipedia.org/wiki/Smartphone), Linux has the [largest](https://en.wikipedia.org/wiki/Usage_share_of_operating_systems) [installed base](https://en.wikipedia.org/wiki/Installed_base) of all [general-purpose operating systems](https://en.wikipedia.org/wiki/General-purpose_operating_system).[[16]](https://en.wikipedia.org/wiki/Linux#cite_note-marketshare.hitslink.com-18) Linux is also the leading operating system on [servers](https://en.wikipedia.org/wiki/Server_(computing)) and other [big iron](https://en.wikipedia.org/wiki/Big_iron) systems such as [mainframe computers](https://en.wikipedia.org/wiki/Mainframe_computer), and the only OS used on [TOP500](https://en.wikipedia.org/wiki/TOP500) [supercomputers](https://en.wikipedia.org/wiki/Supercomputer) (since November 2017, having before gradually eliminated all competitors).[[17]](https://en.wikipedia.org/wiki/Linux#cite_note-19)[[18]](https://en.wikipedia.org/wiki/Linux#cite_note-rules_supercomputers-20) It is used by around 2.3% of [desktop computers](https://en.wikipedia.org/wiki/Desktop_computer).[[19]](https://en.wikipedia.org/wiki/Linux#cite_note-Netmarketshare.com-21)[[20]](https://en.wikipedia.org/wiki/Linux#cite_note-22) The [Chromebook](https://en.wikipedia.org/wiki/Chromebook), which runs the Linux kernel-based [Chrome OS](https://en.wikipedia.org/wiki/Chrome_OS), dominates the US [K–12](https://en.wikipedia.org/wiki/K%E2%80%9312) education market and represents nearly 20% of the sub-$300 [notebook](https://en.wikipedia.org/wiki/Laptop) sales in the US.[[21]](https://en.wikipedia.org/wiki/Linux#cite_note-23) Linux also runs on [embedded systems](https://en.wikipedia.org/wiki/Embedded_system)—devices whose [operating system](https://en.wikipedia.org/wiki/Operating_system) is typically built into the [firmware](https://en.wikipedia.org/wiki/Firmware) and is highly tailored to the system. This includes [TiVo](https://en.wikipedia.org/wiki/TiVo) and similar [DVR](https://en.wikipedia.org/wiki/Digital_video_recorder) devices, network [routers](https://en.wikipedia.org/wiki/Router_(computing)), facility automation controls, televisions,[[22]](https://en.wikipedia.org/wiki/Linux#cite_note-24)[[23]](https://en.wikipedia.org/wiki/Linux#cite_note-25) [video game consoles](https://en.wikipedia.org/wiki/Video_game_console) and [smartwatches](https://en.wikipedia.org/wiki/Smartwatch).[[24]](https://en.wikipedia.org/wiki/Linux#cite_note-LinuxDevices-26) Many smartphones and [tablet computers](https://en.wikipedia.org/wiki/Tablet_computer) run Android and other Linux derivatives.[[25]](https://en.wikipedia.org/wiki/Linux#cite_note-27)

The development of Linux is one of the most prominent examples of free and open-source [software](https://en.wikipedia.org/wiki/Software) collaboration. The underlying [source code](https://en.wikipedia.org/wiki/Source_code) may be used, modified and distributed—commercially or non-commercially—by anyone under the terms of its respective licenses, such as the [GNU General Public License](https://en.wikipedia.org/wiki/GNU_General_Public_License).

Some of the most popular and mainstream Linux distributions[[26]](https://en.wikipedia.org/wiki/Linux#cite_note-28)[[27]](https://en.wikipedia.org/wiki/Linux#cite_note-29)[[28]](https://en.wikipedia.org/wiki/Linux#cite_note-30) are [Arch Linux](https://en.wikipedia.org/wiki/Arch_Linux), [CentOS](https://en.wikipedia.org/wiki/CentOS), [Debian](https://en.wikipedia.org/wiki/Debian), [Fedora](https://en.wikipedia.org/wiki/Fedora_(operating_system)), [Gentoo Linux](https://en.wikipedia.org/wiki/Gentoo_Linux), [Linux Mint](https://en.wikipedia.org/wiki/Linux_Mint), [Mageia](https://en.wikipedia.org/wiki/Mageia), [openSUSE](https://en.wikipedia.org/wiki/OpenSUSE) and [Ubuntu](https://en.wikipedia.org/wiki/Ubuntu_(operating_system)), together with commercial distributions such as [Red Hat Enterprise Linux](https://en.wikipedia.org/wiki/Red_Hat_Enterprise_Linux) and [SUSE Linux Enterprise Server](https://en.wikipedia.org/wiki/SUSE_Linux_Enterprise_Server). Distributions include the Linux kernel, supporting [utilities](https://en.wikipedia.org/wiki/System_software) and [libraries](https://en.wikipedia.org/wiki/Library_(computer_science)), many of which are provided by the [GNU Project](https://en.wikipedia.org/wiki/GNU_Project), and usually a large amount of application software to fulfil the distribution's intended use. Desktop Linux distributions include a windowing system, such as [X11](https://en.wikipedia.org/wiki/X11), [Mir](https://en.wikipedia.org/wiki/Mir_(software)) or a [Wayland](https://en.wikipedia.org/wiki/Wayland_(display_server_protocol)) implementation, and an accompanying [desktop environment](https://en.wikipedia.org/wiki/Desktop_environment) such as [GNOME](https://en.wikipedia.org/wiki/GNOME) or [KDE Plasma](https://en.wikipedia.org/wiki/KDE_Plasma); some distributions may also include a less resource-intensive desktop, such as [LXDE](https://en.wikipedia.org/wiki/LXDE) or [Xfce](https://en.wikipedia.org/wiki/Xfce). Distributions intended to run on servers may omit all graphical environments from the standard install, and instead include other software to set up and operate a [solution stack](https://en.wikipedia.org/wiki/Solution_stack) such as [LAMP](https://en.wikipedia.org/wiki/LAMP_(software_bundle)). Because Linux is freely redistributable, anyone may create a distribution for any intended use. Many Linux distributions use the word "Linux" in their name. The [Free Software Foundation](https://en.wikipedia.org/wiki/Free_Software_Foundation) uses the name "[GNU](https://en.wikipedia.org/wiki/GNU)/Linux" to refer to the operating system family, as well as specific distributions, to emphasize that most Linux distributions are not just the Linux kernel, and that they have in common not only the kernel, but also numerous utilities and libraries, a large proportion of which are from the GNU project. This has led to some [controversy](https://en.wikipedia.org/wiki/GNU/Linux_naming_controversy).[[29]](https://en.wikipedia.org/wiki/Linux#cite_note-gnu_linux_faq-31)[[30]](https://en.wikipedia.org/wiki/Linux#cite_note-linux-and-gnu-32)

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* [7Copyright, trademark and naming](https://en.wikipedia.org/wiki/Linux#Copyright,_trademark_and_naming)
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History[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=1)]

*Main article:*[*History of Linux*](https://en.wikipedia.org/wiki/History_of_Linux)

**Precursors**[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=2)]

[](https://en.wikipedia.org/wiki/File:Linus_Torvalds_(cropped).jpg)

[Linus Torvalds](https://en.wikipedia.org/wiki/Linus_Torvalds), principal author of the [Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel)

The [Unix](https://en.wikipedia.org/wiki/Unix) operating system was conceived and implemented in 1969, at [AT&T](https://en.wikipedia.org/wiki/AT%26T)'s [Bell Laboratories](https://en.wikipedia.org/wiki/Bell_Laboratories) in the United States by [Ken Thompson](https://en.wikipedia.org/wiki/Ken_Thompson), [Dennis Ritchie](https://en.wikipedia.org/wiki/Dennis_Ritchie), [Douglas McIlroy](https://en.wikipedia.org/wiki/Douglas_McIlroy), and [Joe Ossanna](https://en.wikipedia.org/wiki/Joe_Ossanna).[[31]](https://en.wikipedia.org/wiki/Linux#cite_note-33) First released in 1971, Unix was written entirely in [assembly language](https://en.wikipedia.org/wiki/Assembly_language), as was common practice at the time. Later, in a key pioneering approach in 1973, it was rewritten in the [C](https://en.wikipedia.org/wiki/C_(programming_language)) programming language by [Dennis Ritchie](https://en.wikipedia.org/wiki/Dennis_Ritchie) (with the exception of some hardware and I/O routines). The availability of a [high-level language](https://en.wikipedia.org/wiki/High-level_language) implementation of Unix made its [porting](https://en.wikipedia.org/wiki/Porting) to different computer platforms easier.[[32]](https://en.wikipedia.org/wiki/Linux#cite_note-34)

Due to an earlier [antitrust case](https://en.wikipedia.org/wiki/Antitrust_case) forbidding it from entering the computer business, AT&T was required to license the operating system's source code to anyone who asked.[[33]](https://en.wikipedia.org/wiki/Linux#cite_note-faqs.org-35) As a result, Unix grew quickly and became widely adopted by academic institutions and businesses. In 1984, AT&T divested itself of Bell Labs; freed of the legal obligation requiring free licensing, Bell Labs began selling Unix as a [proprietary](https://en.wikipedia.org/wiki/Proprietary_software) product, where users weren't legally allowed to modify Unix. The [GNU Project](https://en.wikipedia.org/wiki/GNU_Project), started in 1983 by [Richard Stallman](https://en.wikipedia.org/wiki/Richard_Stallman), had the goal of creating a "complete Unix-compatible software system" composed entirely of [free software](https://en.wikipedia.org/wiki/Free_software). Work began in 1984.[[34]](https://en.wikipedia.org/wiki/Linux#cite_note-gnu_announce-36) Later, in 1985, Stallman started the [Free Software Foundation](https://en.wikipedia.org/wiki/Free_Software_Foundation) and wrote the [GNU General Public License](https://en.wikipedia.org/wiki/GNU_General_Public_License) (GNU GPL) in 1989. By the early 1990s, many of the programs required in an operating system (such as libraries, [compilers](https://en.wikipedia.org/wiki/Compiler), [text editors](https://en.wikipedia.org/wiki/Text_editor), a [Unix shell](https://en.wikipedia.org/wiki/Unix_shell), and a [windowing system](https://en.wikipedia.org/wiki/Windowing_system)) were completed, although low-level elements such as [device drivers](https://en.wikipedia.org/wiki/Device_driver), [daemons](https://en.wikipedia.org/wiki/Daemon_(computer_software)), and the [kernel](https://en.wikipedia.org/wiki/Kernel_(computer_science)), called [GNU/Hurd](https://en.wikipedia.org/wiki/GNU/Hurd), were stalled and incomplete.[[35]](https://en.wikipedia.org/wiki/Linux#cite_note-37)

Linus Torvalds has stated that if the [GNU kernel](https://en.wikipedia.org/wiki/GNU_kernel) had been available at the time (1991), he would not have decided to write his own.[[36]](https://en.wikipedia.org/wiki/Linux#cite_note-38)

Although not released until 1992, due to [legal complications](https://en.wikipedia.org/wiki/Berkeley_Software_Distribution#Net/2_and_legal_troubles), development of [386BSD](https://en.wikipedia.org/wiki/386BSD), from which [NetBSD](https://en.wikipedia.org/wiki/NetBSD), [OpenBSD](https://en.wikipedia.org/wiki/OpenBSD) and [FreeBSD](https://en.wikipedia.org/wiki/FreeBSD) descended, predated that of Linux. Torvalds has also stated that if 386BSD had been available at the time, he probably would not have created Linux.[[37]](https://en.wikipedia.org/wiki/Linux#cite_note-meta-39)

[MINIX](https://en.wikipedia.org/wiki/MINIX) was created by [Andrew S. Tanenbaum](https://en.wikipedia.org/wiki/Andrew_S._Tanenbaum), a [computer science](https://en.wikipedia.org/wiki/Computer_science) professor, and released in 1987 as a minimal [Unix-like](https://en.wikipedia.org/wiki/Unix-like) operating system targeted at students and others who wanted to learn the operating system principles. Although the complete source code of MINIX was freely available, the licensing terms prevented it from being [free software](https://en.wikipedia.org/wiki/Free_software) until the licensing changed in April 2000.[[38]](https://en.wikipedia.org/wiki/Linux#cite_note-minix-lic-40)

**Creation**[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=3)]

In 1991, while attending the [University of Helsinki](https://en.wikipedia.org/wiki/University_of_Helsinki), Torvalds became curious about operating systems.[[39]](https://en.wikipedia.org/wiki/Linux#cite_note-41) Frustrated by the licensing of MINIX, which at the time limited it to educational use only,[[38]](https://en.wikipedia.org/wiki/Linux#cite_note-minix-lic-40) he began to work on his own operating system kernel, which eventually became the [Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel).

Torvalds began the development of the Linux kernel on MINIX and applications written for MINIX were also used on Linux. Later, Linux matured and further Linux kernel development took place on Linux systems.[[40]](https://en.wikipedia.org/wiki/Linux#cite_note-42)GNU applications also replaced all MINIX components, because it was advantageous to use the freely available code from the GNU Project with the fledgling operating system; code licensed under the GNU GPL can be reused in other computer programs as long as they also are released under the same or a compatible license. Torvalds initiated a switch from his original license, which prohibited commercial redistribution, to the GNU GPL.[[41]](https://en.wikipedia.org/wiki/Linux#cite_note-43) Developers worked to integrate GNU components with the Linux kernel, making a fully functional and free operating system.[[42]](https://en.wikipedia.org/wiki/Linux#cite_note-gnu_history-44)

**Naming**[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=4)]

[](https://en.wikipedia.org/wiki/File:Linux_0_12.jpg)

5.25-inch [floppy disks](https://en.wikipedia.org/wiki/Floppy_disk) holding a very early version of Linux

Linus Torvalds had wanted to call his invention "**Freax**", a [portmanteau](https://en.wikipedia.org/wiki/Portmanteau) of "free", "freak", and "x" (as an allusion to Unix). During the start of his work on the system, some of the project's [makefiles](https://en.wikipedia.org/wiki/Makefile) included the name "Freax" for about half a year. Torvalds had already considered the name "Linux", but initially dismissed it as too egotistical.[[43]](https://en.wikipedia.org/wiki/Linux#cite_note-fun-45)

In order to facilitate development, the files were uploaded to the [FTP server](https://en.wikipedia.org/wiki/File_Transfer_Protocol) (ftp.funet.fi) of [FUNET](https://en.wikipedia.org/wiki/FUNET) in September 1991. [Ari Lemmke](https://en.wikipedia.org/wiki/Ari_Lemmke), Torvalds' coworker at the [Helsinki University of Technology](https://en.wikipedia.org/wiki/Helsinki_University_of_Technology) (HUT), who was one of the volunteer administrators for the FTP server at the time, did not think that "Freax" was a good name. So, he named the project "Linux" on the server without consulting Torvalds.[[43]](https://en.wikipedia.org/wiki/Linux#cite_note-fun-45) Later, however, Torvalds consented to "Linux".

To demonstrate how the word "Linux" should be pronounced ([/ˈlɪnəks/](https://en.wikipedia.org/wiki/Help:IPA/English) ([About this sound](https://en.wikipedia.org/wiki/File:Linus-linux.ogg) [listen](https://upload.wikimedia.org/wikipedia/commons/0/03/Linus-linux.ogg)) [*LIN-əks*](https://en.wikipedia.org/wiki/Help:Pronunciation_respelling_key)[[9]](https://en.wikipedia.org/wiki/Linux#cite_note-pronunciation-2-11)[[10]](https://en.wikipedia.org/wiki/Linux#cite_note-Foldoc09Jun06-12)), Torvalds included an audio guide ([About this sound](https://en.wikipedia.org/wiki/File:Linus-linux.ogg) [listen](https://upload.wikimedia.org/wikipedia/commons/0/03/Linus-linux.ogg) ([help](https://en.wikipedia.org/wiki/Wikipedia:Media_help)·[info](https://en.wikipedia.org/wiki/File:Linus-linux.ogg))) with the kernel source code.[[44]](https://en.wikipedia.org/wiki/Linux#cite_note-Pronounce-46)Another variant of pronunciation is [/ˈlaɪnəks/](https://en.wikipedia.org/wiki/Help:IPA/English) [*LYN-əks*](https://en.wikipedia.org/wiki/Help:Pronunciation_respelling_key).[[10]](https://en.wikipedia.org/wiki/Linux#cite_note-Foldoc09Jun06-12)

**Commercial and popular uptake**[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=5)]

*Main article:*[*Linux adoption*](https://en.wikipedia.org/wiki/Linux_adoption)

[](https://en.wikipedia.org/wiki/File:Ubuntu_15.10_with_Firefox_and_Nautilus_open.png)

[Ubuntu](https://en.wikipedia.org/wiki/Ubuntu_(operating_system)), a popular Linux distribution

[](https://en.wikipedia.org/wiki/File:Nexus_5X_(White).jpg)

[Nexus 5X](https://en.wikipedia.org/wiki/Nexus_5X) running [Android](https://en.wikipedia.org/wiki/Android_(operating_system))

Adoption of Linux in production environments, rather than being used only by hobbyists, started to take off first in the mid-1990s in the supercomputing community, where organizations such as [NASA](https://en.wikipedia.org/wiki/NASA) started to replace their increasingly expensive machines with [clusters](https://en.wikipedia.org/wiki/Cluster_computing) of inexpensive commodity computers running Linux. Commercial use followed when [Dell](https://en.wikipedia.org/wiki/Dell) and [IBM](https://en.wikipedia.org/wiki/IBM), followed by [Hewlett-Packard](https://en.wikipedia.org/wiki/Hewlett-Packard), started offering Linux support to escape [Microsoft](https://en.wikipedia.org/wiki/Microsoft)'s monopoly in the desktop operating system market.[[45]](https://en.wikipedia.org/wiki/Linux#cite_note-security-47)

Today, Linux systems are used throughout computing, from [embedded systems](https://en.wikipedia.org/wiki/Embedded_system) to virtually all [supercomputers](https://en.wikipedia.org/wiki/Supercomputer),[[18]](https://en.wikipedia.org/wiki/Linux#cite_note-rules_supercomputers-20)[[46]](https://en.wikipedia.org/wiki/Linux#cite_note-48) and have secured a place in [server](https://en.wikipedia.org/wiki/Server_(computing)) installations such as the popular [LAMP](https://en.wikipedia.org/wiki/LAMP_(software_bundle)) application stack.[[47]](https://en.wikipedia.org/wiki/Linux#cite_note-49) Use of Linux distributions in home and enterprise desktops has been growing.[[48]](https://en.wikipedia.org/wiki/Linux#cite_note-galli2007-50)[[49]](https://en.wikipedia.org/wiki/Linux#cite_note-paul2007-51)[[50]](https://en.wikipedia.org/wiki/Linux#cite_note-beer2007-52)[[51]](https://en.wikipedia.org/wiki/Linux#cite_note-applications2007-53)[[52]](https://en.wikipedia.org/wiki/Linux#cite_note-xitimonitor2007-54)[[53]](https://en.wikipedia.org/wiki/Linux#cite_note-globalstats2007-55)[[54]](https://en.wikipedia.org/wiki/Linux#cite_note-zeitgeist2004-56) Linux distributions have also become popular in the [netbook](https://en.wikipedia.org/wiki/Netbook) market, with many devices shipping with customized Linux distributions installed, and Google releasing their own [Chrome OS](https://en.wikipedia.org/wiki/Chrome_OS) designed for netbooks.

Linux's greatest success in the consumer market is perhaps the mobile device market, with [Android](https://en.wikipedia.org/wiki/Android_(operating_system)) being one of the most dominant operating systems on [smartphones](https://en.wikipedia.org/wiki/Smartphone) and very popular on [tablets](https://en.wikipedia.org/wiki/Tablet_computer) and, more recently, on [wearables](https://en.wikipedia.org/wiki/Wearable_technology). Linux gaming is also on the rise with [Valve](https://en.wikipedia.org/wiki/Valve_Corporation) showing its support for Linux and rolling out its own gaming oriented Linux distribution. Linux distributions have also gained popularity with various local and national governments, such as the federal government of [Brazil](https://en.wikipedia.org/wiki/Brazil).[[55]](https://en.wikipedia.org/wiki/Linux#cite_note-57)

**Current development**[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=6)]

[](https://en.wikipedia.org/wiki/File:In_flight_system_Linux_bootup.jpg)

In flight entertainment system booting up showing the Linux logo

Torvalds continues to direct the development of the kernel.[[56]](https://en.wikipedia.org/wiki/Linux#cite_note-58) Stallman heads the Free Software Foundation,[[57]](https://en.wikipedia.org/wiki/Linux#cite_note-59) which in turn supports the GNU components.[[58]](https://en.wikipedia.org/wiki/Linux#cite_note-60) Finally, individuals and corporations develop third-party non-GNU components. These third-party components comprise a vast body of work and may include both kernel modules and user applications and libraries.

Linux vendors and communities combine and distribute the kernel, GNU components, and non-GNU components, with additional [package management](https://en.wikipedia.org/wiki/Package_management) software in the form of [Linux distributions](https://en.wikipedia.org/wiki/Linux_distribution).

Design[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=7)]

A Linux-based system is a modular [Unix-like](https://en.wikipedia.org/wiki/Unix-like) operating system, deriving much of its basic design from principles established in Unix during the 1970s and 1980s. Such a system uses a [monolithic kernel](https://en.wikipedia.org/wiki/Monolithic_kernel), the [Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel), which handles process control, networking, access to the [peripherals](https://en.wikipedia.org/wiki/Peripheral), and [file systems](https://en.wikipedia.org/wiki/File_system). [Device drivers](https://en.wikipedia.org/wiki/Device_drivers) are either integrated directly with the kernel, or added as modules that are loaded while the system is running.[[59]](https://en.wikipedia.org/wiki/Linux#cite_note-61)

The GNU [userland](https://en.wikipedia.org/wiki/Userland_(computing)) is a key part of most systems based on the Linux kernel, with Android being the notable exception. The Project's [implementation](https://en.wikipedia.org/wiki/GNU_C_Library) of the [C library](https://en.wikipedia.org/wiki/C_standard_library) functions as a wrapper for the system calls of the Linux kernel necessary to the kernel-userspace interface, the [toolchain](https://en.wikipedia.org/wiki/GNU_toolchain) is a broad collection of programming tools vital to Linux development (including the [compilers](https://en.wikipedia.org/wiki/GNU_Compiler_Collection) used to build the Linux kernel itself), and the [coreutils](https://en.wikipedia.org/wiki/GNU_Core_Utilities) implement many basic [Unix tools](https://en.wikipedia.org/wiki/Unix_commands). The project also develops [a popular](https://en.wikipedia.org/wiki/Bash_(shell)) [CLI](https://en.wikipedia.org/wiki/Command-line_interface) [shell](https://en.wikipedia.org/wiki/Shell_(computing)). The [graphical user interface](https://en.wikipedia.org/wiki/Graphical_user_interface) (or GUI) used by most Linux systems is built on top of an implementation of the [X Window System](https://en.wikipedia.org/wiki/X_Window_System).[[60]](https://en.wikipedia.org/wiki/Linux#cite_note-oreilly-anatomy-62) More recently, the Linux community seeks to advance to [Wayland](https://en.wikipedia.org/wiki/Wayland_(display_server_protocol))as the new display server protocol in place of [X11](https://en.wikipedia.org/wiki/X11). Many other open-source software projects contribute to Linux systems.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Various layers within Linux, also showing separation between the**[**userland**](https://en.wikipedia.org/wiki/User_space)**and**[**kernel space**](https://en.wikipedia.org/wiki/Kernel_space) | | | | | | |
| **User mode** | **User applications** | For example, [bash](https://en.wikipedia.org/wiki/Bourne-again_shell), [LibreOffice](https://en.wikipedia.org/wiki/LibreOffice), [GIMP](https://en.wikipedia.org/wiki/GIMP), [Blender](https://en.wikipedia.org/wiki/Blender_(software)), [0 A.D.](https://en.wikipedia.org/wiki/0_A.D._(video_game)), [Mozilla Firefox](https://en.wikipedia.org/wiki/Mozilla_Firefox), etc. | | | | |
| Low-level system components: | **System**[**daemons**](https://en.wikipedia.org/wiki/Daemon_(computing)): [*systemd*](https://en.wikipedia.org/wiki/Systemd)*,*[*runit*](https://en.wikipedia.org/wiki/Runit)*, logind, networkd,*[*PulseAudio*](https://en.wikipedia.org/wiki/PulseAudio)*, ...* | [**Windowing system**](https://en.wikipedia.org/wiki/Windowing_system): [*X11*](https://en.wikipedia.org/wiki/X11)*,*[*Wayland*](https://en.wikipedia.org/wiki/Wayland_(display_server_protocol))*,*[*SurfaceFlinger*](https://en.wikipedia.org/wiki/SurfaceFlinger)*(Android)* | **Other libraries:** [*GTK+*](https://en.wikipedia.org/wiki/GTK%2B)*,*[*Qt*](https://en.wikipedia.org/wiki/Qt_(software))*,*[*EFL*](https://en.wikipedia.org/wiki/Enlightenment_Foundation_Libraries)*,*[*SDL*](https://en.wikipedia.org/wiki/Simple_DirectMedia_Layer)*,*[*SFML*](https://en.wikipedia.org/wiki/Simple_and_Fast_Multimedia_Library)*,*[*FLTK*](https://en.wikipedia.org/wiki/FLTK)*,*[*GNUstep*](https://en.wikipedia.org/wiki/GNUstep), etc. | | **Graphics**: [*Mesa*](https://en.wikipedia.org/wiki/Mesa_(computer_graphics)), [*AMD Catalyst*](https://en.wikipedia.org/wiki/AMD_Catalyst), ... |
| [**C standard library**](https://en.wikipedia.org/wiki/C_standard_library) | open(), exec(), sbrk(), socket(), fopen(), calloc(), ... (up to 2000 [subroutines](https://en.wikipedia.org/wiki/Subroutine)) [*glibc*](https://en.wikipedia.org/wiki/GNU_C_Library) aims to be [POSIX](https://en.wikipedia.org/wiki/POSIX)/[SUS](https://en.wikipedia.org/wiki/Single_UNIX_Specification)-compatible, [*uClibc*](https://en.wikipedia.org/wiki/UClibc) targets embedded systems, [*bionic*](https://en.wikipedia.org/wiki/Bionic_(software)) written for [Android](https://en.wikipedia.org/wiki/Android_(operating_system)), etc. | | | | |
| **Kernel mode** | [**Linux kernel**](https://en.wikipedia.org/wiki/Linux_kernel) | [stat](https://en.wikipedia.org/wiki/Stat_(system_call)), [splice](https://en.wikipedia.org/wiki/Splice_(system_call)), [dup](https://en.wikipedia.org/wiki/Dup_(system_call)), [read](https://en.wikipedia.org/wiki/Read_(system_call)), [open](https://en.wikipedia.org/wiki/Open_(system_call)), [ioctl](https://en.wikipedia.org/wiki/Ioctl), [write](https://en.wikipedia.org/wiki/Write_(system_call)), [mmap](https://en.wikipedia.org/wiki/Mmap), [close](https://en.wikipedia.org/wiki/Close_(system_call)), [exit](https://en.wikipedia.org/wiki/Exit_(system_call)), etc. (about 380 system calls) The Linux kernel [System Call Interface](https://en.wikipedia.org/wiki/System_call) (SCI, aims to be [POSIX](https://en.wikipedia.org/wiki/POSIX)/[SUS](https://en.wikipedia.org/wiki/Single_UNIX_Specification)-compatible) | | | | |
| [Process scheduling](https://en.wikipedia.org/wiki/Scheduling_(computing)) subsystem | IPC subsystem | [Memory management](https://en.wikipedia.org/wiki/Memory_management) subsystem | Virtual files subsystem | Network subsystem |
| Other components: [ALSA](https://en.wikipedia.org/wiki/Advanced_Linux_Sound_Architecture), [DRI](https://en.wikipedia.org/wiki/Direct_Rendering_Infrastructure), [evdev](https://en.wikipedia.org/wiki/Evdev), [LVM](https://en.wikipedia.org/wiki/Logical_Volume_Manager_(Linux)), [device mapper](https://en.wikipedia.org/wiki/Device_mapper), [Linux Network Scheduler](https://en.wikipedia.org/wiki/Linux_Network_Scheduler), [Netfilter](https://en.wikipedia.org/wiki/Netfilter) [Linux Security Modules](https://en.wikipedia.org/wiki/Linux_Security_Modules): [*SELinux*](https://en.wikipedia.org/wiki/Security-Enhanced_Linux), [*TOMOYO*](https://en.wikipedia.org/wiki/TOMOYO_Linux), [*AppArmor*](https://en.wikipedia.org/wiki/AppArmor), [*Smack*](https://en.wikipedia.org/wiki/Smack_(Linux_security_module)) | | | | |
| **Hardware (**[**CPU**](https://en.wikipedia.org/wiki/Central_processing_unit)**,**[**main memory**](https://en.wikipedia.org/wiki/Random-access_memory)**,**[**data storage devices**](https://en.wikipedia.org/wiki/Computer_data_storage)**, etc.)** | | | | | | |

Installed components of a Linux system include the following:[[60]](https://en.wikipedia.org/wiki/Linux#cite_note-oreilly-anatomy-62)[[61]](https://en.wikipedia.org/wiki/Linux#cite_note-63)

* A [bootloader](https://en.wikipedia.org/wiki/Bootloader), for example [GNU GRUB](https://en.wikipedia.org/wiki/GNU_GRUB), [LILO](https://en.wikipedia.org/wiki/LILO_(boot_loader)), [SYSLINUX](https://en.wikipedia.org/wiki/SYSLINUX), or [Gummiboot](https://en.wikipedia.org/wiki/Gummiboot_(software)). This is a program that loads the Linux kernel into the computer's [main memory](https://en.wikipedia.org/wiki/Main_memory), by being executed by the computer when it is turned on and after the [firmware](https://en.wikipedia.org/wiki/Firmware) initialization is performed.
* An [init](https://en.wikipedia.org/wiki/Init) program, such as the traditional [sysvinit](https://en.wikipedia.org/wiki/Sysvinit) and the newer [systemd](https://en.wikipedia.org/wiki/Systemd), [OpenRC](https://en.wikipedia.org/wiki/OpenRC) and [Upstart](https://en.wikipedia.org/wiki/Upstart_(software)). This is the first [process](https://en.wikipedia.org/wiki/Process_(computing)) launched by the Linux kernel, and is at the root of the process tree: in other terms, all processes are launched through init. It starts processes such as system services and login prompts (whether graphical or in terminal mode).
* [Software libraries](https://en.wikipedia.org/wiki/Library_(computing)), which contain code that can be used by running processes. On Linux systems using [ELF](https://en.wikipedia.org/wiki/Executable_and_Linkable_Format)-format executable files, the [dynamic linker](https://en.wikipedia.org/wiki/Dynamic_linker) that manages use of dynamic libraries is known as ld-linux.so. If the system is set up for the user to compile software themselves, [header files](https://en.wikipedia.org/wiki/Header_file) will also be included to describe the [interface](https://en.wikipedia.org/wiki/Application_binary_interface) of installed libraries. Besides the most commonly used software library on Linux systems, the [GNU C Library](https://en.wikipedia.org/wiki/GNU_C_Library) (glibc), there are numerous other libraries, such as [SDL](https://en.wikipedia.org/wiki/Simple_DirectMedia_Layer) and [Mesa](https://en.wikipedia.org/wiki/Mesa_(computer_graphics)).
  + [C standard library](https://en.wikipedia.org/wiki/C_standard_library) is the library needed to run [C programs](https://en.wikipedia.org/wiki/C_(programming_language)) on a computer system, with the GNU C Library being the standard. For embedded systems, alternatives such as the [EGLIBC](https://en.wikipedia.org/wiki/EGLIBC) (a glibc fork once used by Debian) and [uClibc](https://en.wikipedia.org/wiki/UClibc) (which was designed for [uClinux](https://en.wikipedia.org/wiki/UClinux)) have been developed, although both are no longer maintained. Android uses its own C library, [Bionic](https://en.wikipedia.org/wiki/Bionic_(software)).
* Basic Unix commands, with GNU coreutils being the standard implementation. Alternatives exist for embedded systems, such as the copyleft [BusyBox](https://en.wikipedia.org/wiki/BusyBox), and the BSD-licensed [Toybox](https://en.wikipedia.org/wiki/Toybox).
* [Widget toolkits](https://en.wikipedia.org/wiki/Widget_toolkit) are the libraries used to build [graphical user interfaces](https://en.wikipedia.org/wiki/Graphical_user_interface) (GUIs) for software applications. Numerous widget toolkits are available, including [GTK+](https://en.wikipedia.org/wiki/GTK%2B) and [Clutter](https://en.wikipedia.org/wiki/Clutter_(software)) developed by the [GNOME project](https://en.wikipedia.org/wiki/GNOME_project), [Qt](https://en.wikipedia.org/wiki/Qt_(software))developed by the [Qt Project](https://en.wikipedia.org/wiki/Qt_Project) and led by [Digia](https://en.wikipedia.org/wiki/Digia), and [Enlightenment Foundation Libraries](https://en.wikipedia.org/wiki/Enlightenment_Foundation_Libraries) (EFL) developed primarily by the [Enlightenment](https://en.wikipedia.org/wiki/Enlightenment_(software)) team.
* A [package management system](https://en.wikipedia.org/wiki/Package_manager), such as [dpkg](https://en.wikipedia.org/wiki/Dpkg) and [RPM](https://en.wikipedia.org/wiki/RPM_Package_Manager). Alternatively packages can be compiled from binary or source [tarballs](https://en.wikipedia.org/wiki/Tar_(computing)).
* User interface programs such as command shells or windowing environments.

**User interface**[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=8)]

The [user interface](https://en.wikipedia.org/wiki/User_interface), also known as the [shell](https://en.wikipedia.org/wiki/Shell_(computing)), is either a [command-line interface](https://en.wikipedia.org/wiki/Command-line_interface) (CLI), a [graphical user interface](https://en.wikipedia.org/wiki/Graphical_user_interface) (GUI), or through controls attached to the associated hardware, which is common for [embedded systems](https://en.wikipedia.org/wiki/Embedded_systems). For desktop systems, the default mode is usually a graphical user interface, although the CLI is commonly available through [terminal emulator](https://en.wikipedia.org/wiki/Terminal_emulator) windows or on a separate [virtual console](https://en.wikipedia.org/wiki/Virtual_console_(PC)).

CLI shells are text-based user interfaces, which use text for both input and output. The dominant shell used in Linux is the [Bourne-Again Shell](https://en.wikipedia.org/wiki/Bourne-Again_Shell) (bash), originally developed for the [GNU project](https://en.wikipedia.org/wiki/GNU_project). Most low-level Linux components, including various parts of the [userland](https://en.wikipedia.org/wiki/Userland_(computing)), use the CLI exclusively. The CLI is particularly suited for automation of repetitive or delayed tasks, and provides very simple [inter-process communication](https://en.wikipedia.org/wiki/Inter-process_communication).

On desktop systems, the most popular user interfaces are the [GUI shells](https://en.wikipedia.org/wiki/GUI_shell), packaged together with extensive [desktop environments](https://en.wikipedia.org/wiki/Desktop_environment), such as the [K Desktop Environment (KDE)](https://en.wikipedia.org/wiki/KDE), [GNOME](https://en.wikipedia.org/wiki/GNOME_desktop), [MATE](https://en.wikipedia.org/wiki/MATE_(software)), [Cinnamon](https://en.wikipedia.org/wiki/Cinnamon_(desktop_environment)), [Unity](https://en.wikipedia.org/wiki/Unity_(desktop_environment)), [LXDE](https://en.wikipedia.org/wiki/LXDE), [Pantheon](https://en.wikipedia.org/wiki/Elementary_OS) and [Xfce](https://en.wikipedia.org/wiki/Xfce), though a variety of additional user interfaces exist. Most popular user interfaces are based on the [X Window System](https://en.wikipedia.org/wiki/X_Window_System), often simply called "X". It provides [network transparency](https://en.wikipedia.org/wiki/Network_transparency) and permits a graphical application running on one system to be displayed on another where a user may interact with the application; however, certain extensions of the X Window System are not capable of working over the network.[[62]](https://en.wikipedia.org/wiki/Linux#cite_note-64) Several X display servers exist, with the reference implementation, [X.Org Server](https://en.wikipedia.org/wiki/X.Org_Server), being the most popular.

Several types of [window managers](https://en.wikipedia.org/wiki/Window_manager) exist for X11, including [tiling](https://en.wikipedia.org/wiki/Tiling_window_manager), [dynamic](https://en.wikipedia.org/wiki/Dynamic_window_manager), [stacking](https://en.wikipedia.org/wiki/Stacking_window_manager) and [compositing](https://en.wikipedia.org/wiki/Compositing_window_manager). Window managers provide means to control the placement and appearance of individual application windows, and interact with the X Window System. Simpler [X window managers](https://en.wikipedia.org/wiki/X_window_manager) such as [dwm](https://en.wikipedia.org/wiki/Dwm) or [ratpoison](https://en.wikipedia.org/wiki/Ratpoison) provide a [minimalist](https://en.wikipedia.org/wiki/Minimalism_(computing)) functionality, while more elaborate window managers such as [FVWM](https://en.wikipedia.org/wiki/FVWM), [Enlightenment](https://en.wikipedia.org/wiki/Enlightenment_(software)) or [Window Maker](https://en.wikipedia.org/wiki/Window_Maker)provide more features such as a built-in [taskbar](https://en.wikipedia.org/wiki/Taskbar) and [themes](https://en.wikipedia.org/wiki/Theme_(computing)), but are still lightweight when compared to desktop environments. Desktop environments include window managers as part of their standard installations, such as [Mutter](https://en.wikipedia.org/wiki/Mutter_(window_manager)) (GNOME), [KWin](https://en.wikipedia.org/wiki/KWin) (KDE) or [Xfwm](https://en.wikipedia.org/wiki/Xfwm) (xfce), although users may choose to use a different window manager if preferred.

[Wayland](https://en.wikipedia.org/wiki/Wayland_(display_server_protocol)) is a display server protocol intended as a replacement for the X11 protocol; as of 2014, it has not received wider adoption. Unlike X11, Wayland does not need an external window manager and compositing manager. Therefore, a Wayland compositor takes the role of the display server, window manager and compositing manager. Weston is the reference implementation of Wayland, while GNOME's Mutter and KDE's KWin are being ported to Wayland as standalone display servers. Enlightenment has already been successfully ported since version 19.

**Video input infrastructure**[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=9)]

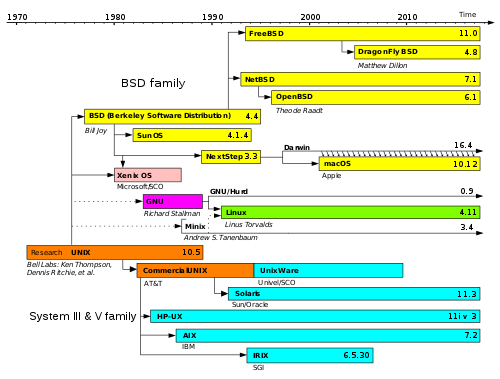
*Main article:*[*Video4Linux*](https://en.wikipedia.org/wiki/Video4Linux)

Linux currently has two modern kernel-userspace APIs for handling video input devices: [V4L2](https://en.wikipedia.org/wiki/Video4Linux) API for video streams and radio, and [DVB](https://en.wikipedia.org/wiki/Digital_Video_Broadcasting) API for digital TV reception.[[63]](https://en.wikipedia.org/wiki/Linux#cite_note-65)

Due to the complexity and diversity of different devices, and due to the large amount of formats and standards handled by those APIs, this infrastructure needs to evolve to better fit other devices. Also, a good userspace device library is the key of the success for having userspace applications to be able to work with all formats supported by those devices.[[64]](https://en.wikipedia.org/wiki/Linux#cite_note-66)[[65]](https://en.wikipedia.org/wiki/Linux#cite_note-67)

Development[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=10)]

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| --- | --- |
| [https://upload.wikimedia.org/wikipedia/en/thumb/9/99/Question_book-new.svg/50px-Question_book-new.svg.png](https://en.wikipedia.org/wiki/File:Question_book-new.svg) | This section **needs additional citations for**[**verification**](https://en.wikipedia.org/wiki/Wikipedia:Verifiability). Please help [improve this article](https://en.wikipedia.org/w/index.php?title=Linux&action=edit) by [adding citations to reliable sources](https://en.wikipedia.org/wiki/Help:Introduction_to_referencing_with_Wiki_Markup/1). Unsourced material may be challenged and removed. *(September 2017)* *(*[*Learn how and when to remove this template message*](https://en.wikipedia.org/wiki/Help:Maintenance_template_removal)*)* |

[](https://en.wikipedia.org/wiki/File:Unix_timeline.en.svg)

Simplified history of [Unix-like](https://en.wikipedia.org/wiki/Unix-like) operating systems. Linux shares similar architecture and concepts (as part of the [POSIX](https://en.wikipedia.org/wiki/POSIX) standard) but does not share non-free source code with the original [Unix](https://en.wikipedia.org/wiki/Unix) or [MINIX](https://en.wikipedia.org/wiki/MINIX).

*Main articles:*[*Linux distribution*](https://en.wikipedia.org/wiki/Linux_distribution)*and*[*Free software*](https://en.wikipedia.org/wiki/Free_software)

The primary difference between Linux and many other popular contemporary operating systems is that the [Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel) and other components are [free](https://en.wikipedia.org/wiki/Free_software) and [open-source software](https://en.wikipedia.org/wiki/Open-source_software). Linux is not the only such operating system, although it is by far the most widely used.[[66]](https://en.wikipedia.org/wiki/Linux#cite_note-MarketShare09NOV-68) Some [free](https://en.wikipedia.org/wiki/Free_software_license) and [open-source](https://en.wikipedia.org/wiki/Open-source_license) software licenses are based on the principle of [copyleft](https://en.wikipedia.org/wiki/Copyleft), a kind of reciprocity: any work derived from a copyleft piece of software must also be copyleft itself. The most common free software license, the [GNU General Public License](https://en.wikipedia.org/wiki/GNU_General_Public_License) (GPL), is a form of copyleft, and is used for the Linux kernel and many of the components from the [GNU Project](https://en.wikipedia.org/wiki/GNU_Project).

Linux based distributions are intended by developers for [interoperability](https://en.wikipedia.org/wiki/Interoperability) with other operating systems and established computing standards. Linux systems adhere to [POSIX](https://en.wikipedia.org/wiki/POSIX),[[67]](https://en.wikipedia.org/wiki/Linux#cite_note-69) [SUS](https://en.wikipedia.org/wiki/Single_UNIX_Specification),[[68]](https://en.wikipedia.org/wiki/Linux#cite_note-70) [LSB](https://en.wikipedia.org/wiki/Linux_Standard_Base), [ISO](https://en.wikipedia.org/wiki/International_Organization_for_Standardization), and [ANSI](https://en.wikipedia.org/wiki/American_National_Standards_Institute) standards where possible, although to date only one Linux distribution has been POSIX.1 certified, Linux-FT.[[69]](https://en.wikipedia.org/wiki/Linux#cite_note-71)[[70]](https://en.wikipedia.org/wiki/Linux#cite_note-72)

Free software projects, although developed through [collaboration](https://en.wikipedia.org/wiki/Collaboration), are often produced independently of each other. The fact that the software licenses explicitly permit redistribution, however, provides a basis for larger scale projects that collect the software produced by stand-alone projects and make it available all at once in the form of a Linux distribution.

Many Linux distributions, or "distros", manage a remote collection of system software and application software packages available for download and installation through a network connection. This allows users to adapt the operating system to their specific needs. Distributions are maintained by individuals, loose-knit teams, volunteer organizations, and commercial entities. A distribution is responsible for the default configuration of the installed Linux kernel, general system security, and more generally integration of the different software packages into a coherent whole. Distributions typically use a [package manager](https://en.wikipedia.org/wiki/Package_manager) such as [apt](https://en.wikipedia.org/wiki/Advanced_Packaging_Tool), [yum](https://en.wikipedia.org/wiki/Yellowdog_Updater,_Modified), [zypper](https://en.wikipedia.org/wiki/Zypper), [pacman](https://en.wikipedia.org/wiki/Pacman_(package_manager))or [portage](https://en.wikipedia.org/wiki/Portage_(software)) to install, remove, and update all of a system's software from one central location.

**Community**[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=11)]

*See also:*[*Free software community*](https://en.wikipedia.org/wiki/Free_software_community)*and*[*Linux User Group*](https://en.wikipedia.org/wiki/Linux_User_Group)

A distribution is largely driven by its developer and user communities. Some vendors develop and fund their distributions on a volunteer basis, [Debian](https://en.wikipedia.org/wiki/Debian) being a well-known example. Others maintain a community version of their commercial distributions, as [Red Hat](https://en.wikipedia.org/wiki/Red_Hat) does with [Fedora](https://en.wikipedia.org/wiki/Fedora_(Linux_distribution)), and [SUSE](https://en.wikipedia.org/wiki/SUSE) does with [openSUSE](https://en.wikipedia.org/wiki/OpenSUSE).

In many cities and regions, local associations known as [Linux User Groups](https://en.wikipedia.org/wiki/Linux_User_Group) (LUGs) seek to promote their preferred distribution and by extension free software. They hold meetings and provide free demonstrations, training, technical support, and operating system installation to new users. Many Internet communities also provide support to Linux users and developers. Most distributions and free software / open-source projects have [IRC](https://en.wikipedia.org/wiki/Internet_Relay_Chat) chatrooms or [newsgroups](https://en.wikipedia.org/wiki/Newsgroup). [Online forums](https://en.wikipedia.org/wiki/Online_forum) are another means for support, with notable examples being [LinuxQuestions.org](https://en.wikipedia.org/wiki/LinuxQuestions.org) and the various distribution specific support and community forums, such as ones for [Ubuntu](https://en.wikipedia.org/wiki/Ubuntu_(operating_system)), [Fedora](https://en.wikipedia.org/wiki/Fedora_(operating_system)), and [Gentoo](https://en.wikipedia.org/wiki/Gentoo_Linux). Linux distributions host [mailing lists](https://en.wikipedia.org/wiki/Mailing_list); commonly there will be a specific topic such as usage or development for a given list.

There are several technology websites with a Linux focus. Print magazines on Linux often bundle [cover disks](https://en.wikipedia.org/wiki/Cover_disk) that carry software or even complete Linux distributions.[[71]](https://en.wikipedia.org/wiki/Linux#cite_note-73)[[72]](https://en.wikipedia.org/wiki/Linux#cite_note-74)

Although Linux distributions are generally available without charge, several large corporations sell, support, and contribute to the development of the components of the system and of [free software](https://en.wikipedia.org/wiki/Free_software). An analysis of the Linux kernel showed 75 percent of the code from December 2008 to January 2010 was developed by programmers working for corporations, leaving about 18 percent to volunteers and 7% unclassified.[[73]](https://en.wikipedia.org/wiki/Linux#cite_note-75) Major corporations that provide contributions include [Dell](https://en.wikipedia.org/wiki/Dell), [IBM](https://en.wikipedia.org/wiki/IBM), [HP](https://en.wikipedia.org/wiki/Hewlett-Packard), [Oracle](https://en.wikipedia.org/wiki/Oracle_Corporation), [Sun Microsystems](https://en.wikipedia.org/wiki/Sun_Microsystems) (now part of Oracle) and [Nokia](https://en.wikipedia.org/wiki/Nokia). A number of corporations, notably Red Hat, [Canonical](https://en.wikipedia.org/wiki/Canonical_Ltd.) and [SUSE](https://en.wikipedia.org/wiki/SUSE), have built a significant business around Linux distributions.

The [free software licenses](https://en.wikipedia.org/wiki/Free_software_licenses), on which the various software packages of a distribution built on the Linux kernel are based, explicitly accommodate and encourage commercialization; the relationship between a Linux distribution as a whole and individual vendors may be seen as [symbiotic](https://en.wikipedia.org/wiki/Symbiosis). One common [business model](https://en.wikipedia.org/wiki/Business_model) of commercial suppliers is charging for support, especially for business users. A number of companies also offer a specialized business version of their distribution, which adds proprietary support packages and tools to administer higher numbers of installations or to simplify administrative tasks.

Another business model is to give away the software in order to sell hardware. This used to be the norm in the computer industry, with operating systems such as [CP/M](https://en.wikipedia.org/wiki/CP/M), [Apple DOS](https://en.wikipedia.org/wiki/Apple_DOS) and versions of [Mac OS](https://en.wikipedia.org/wiki/Mac_OS) prior to 7.6 freely copyable (but not modifiable). As computer hardware standardized throughout the 1980s, it became more difficult for hardware manufacturers to profit from this tactic, as the OS would run on any manufacturer's computer that shared the same architecture.

**Programming on Linux**[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=12)]

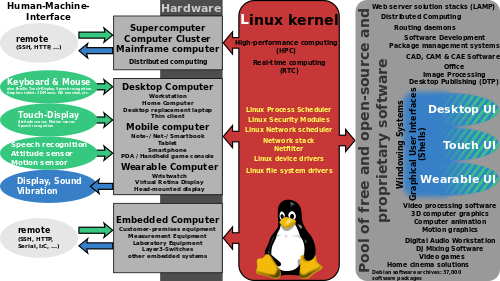
Linux distributions support dozens of [programming languages](https://en.wikipedia.org/wiki/Programming_language). The original development tools used for building both Linux applications and operating system programs are found within the [GNU toolchain](https://en.wikipedia.org/wiki/GNU_toolchain), which includes the [GNU Compiler Collection](https://en.wikipedia.org/wiki/GNU_Compiler_Collection) (GCC) and the [GNU Build System](https://en.wikipedia.org/wiki/GNU_Build_System). Amongst others, GCC provides compilers for [Ada](https://en.wikipedia.org/wiki/Ada_(programming_language)), [C](https://en.wikipedia.org/wiki/C_(programming_language)), [C++](https://en.wikipedia.org/wiki/C%2B%2B), [Go](https://en.wikipedia.org/wiki/Go_(programming_language)) and [Fortran](https://en.wikipedia.org/wiki/Fortran). Many programming languages have a cross-platform reference implementation that supports Linux, for example [PHP](https://en.wikipedia.org/wiki/PHP), [Perl](https://en.wikipedia.org/wiki/Perl), [Ruby](https://en.wikipedia.org/wiki/Ruby_programming_language), [Python](https://en.wikipedia.org/wiki/Python_programming_language), [Java](https://en.wikipedia.org/wiki/Java_(programming_language)), Go, [Rust](https://en.wikipedia.org/wiki/Rust_(programming_language)) and [Haskell](https://en.wikipedia.org/wiki/Haskell_(programming_language)). First released in 2003, the [LLVM](https://en.wikipedia.org/wiki/LLVM) project provides an alternative cross-platform open-source compiler for many languages. [Proprietary](https://en.wikipedia.org/wiki/Proprietary_software) compilers for Linux include the [Intel C++ Compiler](https://en.wikipedia.org/wiki/Intel_C%2B%2B_Compiler), [Sun Studio](https://en.wikipedia.org/wiki/Sun_Studio_(software)), and IBM XL [C](https://en.wikipedia.org/wiki/C_(programming_language))/[C++](https://en.wikipedia.org/wiki/C%2B%2B) Compiler. [BASIC](https://en.wikipedia.org/wiki/BASIC) in the form of [Visual Basic](https://en.wikipedia.org/wiki/Visual_Basic) is supported in such forms as [Gambas](https://en.wikipedia.org/wiki/Gambas), [FreeBASIC](https://en.wikipedia.org/wiki/FreeBASIC), and [XBasic](https://en.wikipedia.org/wiki/XBasic), and in terms of terminal programming or [QuickBASIC](https://en.wikipedia.org/wiki/QuickBASIC) or [Turbo BASIC](https://en.wikipedia.org/wiki/Turbo_BASIC) programming in the form of [QB64](https://en.wikipedia.org/wiki/QB64).

A common feature of Unix-like systems, Linux includes traditional specific-purpose programming languages targeted at [scripting](https://en.wikipedia.org/wiki/Script_(computing)), text processing and system configuration and management in general. Linux distributions support [shell scripts](https://en.wikipedia.org/wiki/Shell_scripts), [awk](https://en.wikipedia.org/wiki/Awk), [sed](https://en.wikipedia.org/wiki/Sed) and [make](https://en.wikipedia.org/wiki/Make_(software)). Many programs also have an embedded programming language to support configuring or programming themselves. For example, [regular expressions](https://en.wikipedia.org/wiki/Regular_expressions) are supported in programs like [grep](https://en.wikipedia.org/wiki/Grep) and [locate](https://en.wikipedia.org/wiki/Locate_(Unix)), the traditional Unix [MTA](https://en.wikipedia.org/wiki/Mail_Transfer_Agent) [Sendmail](https://en.wikipedia.org/wiki/Sendmail) contains its own [Turing complete](https://en.wikipedia.org/wiki/Turing_complete) scripting system, and the advanced text editor [GNU Emacs](https://en.wikipedia.org/wiki/GNU_Emacs) is built around a general purpose [Lisp](https://en.wikipedia.org/wiki/Emacs_Lisp) interpreter.

Most distributions also include support for [PHP](https://en.wikipedia.org/wiki/PHP), [Perl](https://en.wikipedia.org/wiki/Perl), [Ruby](https://en.wikipedia.org/wiki/Ruby_programming_language), [Python](https://en.wikipedia.org/wiki/Python_programming_language) and other [dynamic languages](https://en.wikipedia.org/wiki/Dynamic_programming_language). While not as common, Linux also supports [C#](https://en.wikipedia.org/wiki/C_Sharp_(programming_language)) (via [Mono](https://en.wikipedia.org/wiki/Mono_(software))), [Vala](https://en.wikipedia.org/wiki/Vala_(programming_language)), and [Scheme](https://en.wikipedia.org/wiki/Scheme_(programming_language)). [Guile Scheme](https://en.wikipedia.org/wiki/GNU_Guile#Guile_Scheme) acts as an [extension language](https://en.wikipedia.org/wiki/Extension_language) targeting the [GNU](https://en.wikipedia.org/wiki/GNU) system utilities, seeking to make the conventionally small, [static](https://en.wikipedia.org/wiki/Static_typing), [compiled](https://en.wikipedia.org/wiki/Compiler) [C](https://en.wikipedia.org/wiki/C_(programming_language)) programs of [Unix design](https://en.wikipedia.org/wiki/Unix_philosophy) rapidly and dynamically extensible via an elegant, [functional](https://en.wikipedia.org/wiki/Functional_programming) high-level scripting system; many GNU programs can be compiled with optional Guile [bindings](https://en.wikipedia.org/wiki/Language_binding) to this end. A number of [Java Virtual Machines](https://en.wikipedia.org/wiki/Java_Virtual_Machine) and development kits run on Linux, including the original Sun Microsystems JVM ([HotSpot](https://en.wikipedia.org/wiki/HotSpot)), and IBM's J2SE RE, as well as many open-source projects like [Kaffe](https://en.wikipedia.org/wiki/Kaffe) and [JikesRVM](https://en.wikipedia.org/wiki/JikesRVM).

[GNOME](https://en.wikipedia.org/wiki/GNOME) and [KDE](https://en.wikipedia.org/wiki/KDE) are popular [desktop environments](https://en.wikipedia.org/wiki/Desktop_environment) and provide a framework for developing applications. These projects are based on the [GTK+](https://en.wikipedia.org/wiki/GTK%2B) and [Qt](https://en.wikipedia.org/wiki/Qt_(toolkit)) [widget toolkits](https://en.wikipedia.org/wiki/Widget_toolkit), respectively, which can also be used independently of the larger framework. Both support a wide variety of languages. There are a number of [Integrated development environments](https://en.wikipedia.org/wiki/Integrated_development_environment) available including [Anjuta](https://en.wikipedia.org/wiki/Anjuta), [Code::Blocks](https://en.wikipedia.org/wiki/Code::Blocks), [CodeLite](https://en.wikipedia.org/wiki/CodeLite), [Eclipse](https://en.wikipedia.org/wiki/Eclipse_(software)), [Geany](https://en.wikipedia.org/wiki/Geany), [ActiveState Komodo](https://en.wikipedia.org/wiki/ActiveState_Komodo), [KDevelop](https://en.wikipedia.org/wiki/KDevelop), [Lazarus](https://en.wikipedia.org/wiki/Lazarus_(software)), [MonoDevelop](https://en.wikipedia.org/wiki/MonoDevelop), [NetBeans](https://en.wikipedia.org/wiki/NetBeans), and [Qt Creator](https://en.wikipedia.org/wiki/Qt_Creator), while the long-established editors [Vim](https://en.wikipedia.org/wiki/Vim_(text_editor)), [nano](https://en.wikipedia.org/wiki/GNU_nano) and [Emacs](https://en.wikipedia.org/wiki/Emacs) remain popular.[[74]](https://en.wikipedia.org/wiki/Linux#cite_note-76)

Hardware support[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=13)]

[](https://en.wikipedia.org/wiki/File:Linux_kernel_ubiquity.svg)

Linux is ubiquitously found on various types of hardware.

*See also:*[*List of Linux-supported computer architectures*](https://en.wikipedia.org/wiki/List_of_Linux-supported_computer_architectures)

The Linux kernel is a widely [ported](https://en.wikipedia.org/wiki/Porting) operating system kernel, available for devices ranging from mobile phones to supercomputers; it runs on a highly diverse range of [computer architectures](https://en.wikipedia.org/wiki/Computer_architecture), including the hand-held [ARM](https://en.wikipedia.org/wiki/ARM_architecture)-based [iPAQ](https://en.wikipedia.org/wiki/IPAQ) and the [IBM](https://en.wikipedia.org/wiki/IBM) [mainframes](https://en.wikipedia.org/wiki/Mainframe_computer) [System z9](https://en.wikipedia.org/wiki/IBM_System_z9) or [System z10](https://en.wikipedia.org/wiki/IBM_System_z9).[[75]](https://en.wikipedia.org/wiki/Linux#cite_note-77) Specialized distributions and kernel forks exist for less mainstream architectures; for example, the [ELKS](https://en.wikipedia.org/wiki/ELKS) kernel [fork](https://en.wikipedia.org/wiki/Fork_(software_development)) can run on [Intel 8086](https://en.wikipedia.org/wiki/Intel_8086) or [Intel 80286](https://en.wikipedia.org/wiki/Intel_80286) [16-bit](https://en.wikipedia.org/wiki/16-bit) microprocessors, while the [µClinux](https://en.wikipedia.org/wiki/%CE%9CClinux) kernel fork may run on systems without a [memory management unit](https://en.wikipedia.org/wiki/Memory_management_unit). The kernel also runs on architectures that were only ever intended to use a manufacturer-created operating system, such as [Macintosh](https://en.wikipedia.org/wiki/Macintosh) computers (with both [PowerPC](https://en.wikipedia.org/wiki/PowerPC) and [Intel](https://en.wikipedia.org/wiki/Intel) processors), [PDAs](https://en.wikipedia.org/wiki/Personal_digital_assistant), [video game consoles](https://en.wikipedia.org/wiki/Video_game_console), [portable music players](https://en.wikipedia.org/wiki/Digital_audio_player), and mobile phones.

There are several industry associations and hardware [conferences](https://en.wikipedia.org/wiki/Business_conference) devoted to maintaining and improving support for diverse hardware under Linux, such as [FreedomHEC](https://en.wikipedia.org/wiki/FreedomHEC). Over time, support for different hardware has improved in Linux, resulting in any off-the-shelf purchase having a "good chance" of being compatible.[[76]](https://en.wikipedia.org/wiki/Linux#cite_note-78)

Market share and uptake[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=30)]

*Main article:*[*Linux adoption*](https://en.wikipedia.org/wiki/Linux_adoption)

*See also:*[*Usage share of operating systems*](https://en.wikipedia.org/wiki/Usage_share_of_operating_systems)

Many quantitative studies of [free](https://en.wikipedia.org/wiki/Free_software)/open-source software focus on topics including market share and reliability, with numerous studies specifically examining Linux.[[128]](https://en.wikipedia.org/wiki/Linux#cite_note-130) The Linux market is growing rapidly, and the revenue of servers, desktops, and packaged software running Linux was expected to[[*needs update*](https://en.wikipedia.org/wiki/Wikipedia:Manual_of_Style/Dates_and_numbers#Chronological_items)] exceed $35.7 billion by 2008.[[129]](https://en.wikipedia.org/wiki/Linux#cite_note-131) Analysts and proponents attribute the relative success of Linux to its security, reliability, low cost, and freedom from [vendor lock-in](https://en.wikipedia.org/wiki/Vendor_lock-in).[[130]](https://en.wikipedia.org/wiki/Linux#cite_note-132)[[131]](https://en.wikipedia.org/wiki/Linux#cite_note-133)

**Desktops and laptops**

According to [web server statistics](https://en.wikipedia.org/wiki/Web_analytics), as of June 2016, the estimated market share of Linux on [desktop computers](https://en.wikipedia.org/wiki/Desktop_computer) is around 1.8%. In comparison, [Microsoft Windows](https://en.wikipedia.org/wiki/Microsoft_Windows) has a market share of around 89.7%, while [Mac OS](https://en.wikipedia.org/wiki/Mac_OS)covers around 8.5%.[[19]](https://en.wikipedia.org/wiki/Linux#cite_note-Netmarketshare.com-21)

**Web servers**

W3Cook publishes stats that use the top 1,000,000 Alexa domains,[[132]](https://en.wikipedia.org/wiki/Linux#cite_note-134) which as of May 2015 estimate that 96.55% of web servers run Linux, 1.73% run Windows, and 1.72% run FreeBSD.[[133]](https://en.wikipedia.org/wiki/Linux#cite_note-135)

W3Techs publishes stats that use the top 10,000,000 Alexa domains, updated monthly[[134]](https://en.wikipedia.org/wiki/Linux#cite_note-136) and as of November 2016 estimate that 66.7% of web servers run Linux/Unix, and 33.4% run Microsoft Windows.[[135]](https://en.wikipedia.org/wiki/Linux#cite_note-137)

In September 2008, Microsoft's CEO [Steve Ballmer](https://en.wikipedia.org/wiki/Steve_Ballmer) stated that 60% of web servers ran Linux, versus 40% that ran [Windows Server](https://en.wikipedia.org/wiki/Windows_Server).[[136]](https://en.wikipedia.org/wiki/Linux#cite_note-PC_World_September_2008-138)

[IDC](https://en.wikipedia.org/wiki/International_Data_Corporation)'s Q1 2007 report indicated that Linux held 12.7% of the overall server market at that time;[[137]](https://en.wikipedia.org/wiki/Linux#cite_note-Linux-watch.com_IDC's_Q1_2007_report-139) this estimate was based on the number of Linux servers sold by various companies, and did not include server hardware purchased separately that had Linux installed on it later.

**Mobile devices**

Android, which is based on the Linux kernel, has become the dominant operating system for [smartphones](https://en.wikipedia.org/wiki/Smartphone). During the second quarter of 2013, 79.3% of smartphones sold worldwide used Android.[[105]](https://en.wikipedia.org/wiki/Linux#cite_note-:0-107) Android is also a popular operating system for tablets, being responsible for more than 60% of tablet sales as of 2013.[[138]](https://en.wikipedia.org/wiki/Linux#cite_note-140) According to web server statistics, as of December 2014 Android has a market share of about 46%, with [iOS](https://en.wikipedia.org/wiki/IOS)holding 45%, and the remaining 9% attributed to various niche platforms.[[139]](https://en.wikipedia.org/wiki/Linux#cite_note-141)

**Film production**

For years Linux has been the platform of choice in the film industry. The first major film produced on Linux servers was 1997's [*Titanic*](https://en.wikipedia.org/wiki/Titanic_(1997_film)).[[140]](https://en.wikipedia.org/wiki/Linux#cite_note-142)[[141]](https://en.wikipedia.org/wiki/Linux#cite_note-143) Since then major studios including [DreamWorks Animation](https://en.wikipedia.org/wiki/DreamWorks_Animation), [Pixar](https://en.wikipedia.org/wiki/Pixar), [Weta Digital](https://en.wikipedia.org/wiki/Weta_Digital), and [Industrial Light & Magic](https://en.wikipedia.org/wiki/Industrial_Light_%26_Magic) have migrated to Linux.[[142]](https://en.wikipedia.org/wiki/Linux#cite_note-144)[[143]](https://en.wikipedia.org/wiki/Linux#cite_note-145)[[144]](https://en.wikipedia.org/wiki/Linux#cite_note-146) According to the Linux Movies Group, more than 95% of the servers and desktops at large animation and visual effects companies use Linux.[[145]](https://en.wikipedia.org/wiki/Linux#cite_note-147)

**Use in government**

Linux distributions have also gained popularity with various local and national governments. The federal government of Brazil is well known for its support for Linux.[[146]](https://en.wikipedia.org/wiki/Linux#cite_note-148)[[147]](https://en.wikipedia.org/wiki/Linux#cite_note-149) News of the Russian military creating its own Linux distribution has also surfaced, and has come to fruition as the G.H.ost Project.[[148]](https://en.wikipedia.org/wiki/Linux#cite_note-150) The Indian state of [Kerala](https://en.wikipedia.org/wiki/Kerala) has gone to the extent of mandating that all state high schools run Linux on their computers.[[149]](https://en.wikipedia.org/wiki/Linux#cite_note-151)[[150]](https://en.wikipedia.org/wiki/Linux#cite_note-152) [China](https://en.wikipedia.org/wiki/People%27s_Republic_of_China) uses Linux exclusively as the operating system for its [Loongson](https://en.wikipedia.org/wiki/Loongson) processor family to achieve technology independence.[[151]](https://en.wikipedia.org/wiki/Linux#cite_note-153) In Spain, some regions have developed their own Linux distributions, which are widely used in education and official institutions, like [gnuLinEx](https://en.wikipedia.org/wiki/GnuLinEx) in Extremadura and [Guadalinex](https://en.wikipedia.org/wiki/Guadalinex) in Andalusia. [France](https://en.wikipedia.org/wiki/France) and [Germany](https://en.wikipedia.org/wiki/Germany) have also taken steps toward the adoption of Linux.[[152]](https://en.wikipedia.org/wiki/Linux#cite_note-154)North Korea's [Red Star OS](https://en.wikipedia.org/wiki/Red_Star_OS), developed since 2002, is based on a version of [Fedora Linux](https://en.wikipedia.org/wiki/Fedora_Linux).[[153]](https://en.wikipedia.org/wiki/Linux#cite_note-155)

Copyright, trademark and naming[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=31)]

*See also:*[*GNU/Linux naming controversy*](https://en.wikipedia.org/wiki/GNU/Linux_naming_controversy)*and*[*SCO-Linux controversies*](https://en.wikipedia.org/wiki/SCO-Linux_controversies)

Linux kernel is [licensed](https://en.wikipedia.org/wiki/Software_license) under the [GNU General Public License](https://en.wikipedia.org/wiki/GNU_General_Public_License) (GPL), version 2. The GPL requires that anyone who distributes software based on source code under this license, must make the originating source code (and any modifications) available to the recipient under the same terms.[[154]](https://en.wikipedia.org/wiki/Linux#cite_note-156) Other key components of a typical Linux distribution are also mainly licensed under the GPL, but they may use other licenses; many libraries use the [GNU Lesser General Public License](https://en.wikipedia.org/wiki/GNU_Lesser_General_Public_License) (LGPL), a more permissive variant of the GPL, and the [X.org](https://en.wikipedia.org/wiki/X.org_Server) implementation of the [X Window System](https://en.wikipedia.org/wiki/X_Window_System) uses the [MIT License](https://en.wikipedia.org/wiki/MIT_License).

Torvalds states that the Linux kernel will not move from version 2 of the GPL to version 3.[[155]](https://en.wikipedia.org/wiki/Linux#cite_note-157)[[156]](https://en.wikipedia.org/wiki/Linux#cite_note-158) He specifically dislikes some provisions in the new license which prohibit the use of the software in [digital rights management](https://en.wikipedia.org/wiki/Digital_rights_management).[[157]](https://en.wikipedia.org/wiki/Linux#cite_note-159) It would also be impractical to obtain permission from all the copyright holders, who number in the thousands.[[158]](https://en.wikipedia.org/wiki/Linux#cite_note-160)

A 2001 study of [Red Hat Linux](https://en.wikipedia.org/wiki/Red_Hat_Linux) 7.1 found that this distribution contained 30 million [source lines of code](https://en.wikipedia.org/wiki/Source_lines_of_code).[[159]](https://en.wikipedia.org/wiki/Linux#cite_note-estimating_size-161) Using the [Constructive Cost Model](https://en.wikipedia.org/wiki/COCOMO), the study estimated that this distribution required about eight thousand person-years of development time. According to the study, if all this software had been developed by conventional [proprietary](https://en.wikipedia.org/wiki/Proprietary_software) means, it would have cost about $1.53 billion (2018 US dollars) to develop in the United States.[[159]](https://en.wikipedia.org/wiki/Linux#cite_note-estimating_size-161) Most of the source code (71%) was written in the [C](https://en.wikipedia.org/wiki/C_(programming_language)) [programming](https://en.wikipedia.org/wiki/Computer_programming) [language](https://en.wikipedia.org/wiki/Programming_language), but many other languages were used, including [C++](https://en.wikipedia.org/wiki/C%2B%2B), [Lisp](https://en.wikipedia.org/wiki/Lisp_(programming_language)), [assembly language](https://en.wikipedia.org/wiki/Assembly_language), [Perl](https://en.wikipedia.org/wiki/Perl), [Python](https://en.wikipedia.org/wiki/Python_(programming_language)), [Fortran](https://en.wikipedia.org/wiki/Fortran), and various [shell scripting](https://en.wikipedia.org/wiki/Shell_script)languages. Slightly over half of all lines of code were licensed under the GPL. The Linux kernel itself was 2.4 million lines of code, or 8% of the total.[[159]](https://en.wikipedia.org/wiki/Linux#cite_note-estimating_size-161)

In a later study, the same analysis was performed for [Debian](https://en.wikipedia.org/wiki/Debian) version 4.0 (etch, which was released in 2007).[[160]](https://en.wikipedia.org/wiki/Linux#cite_note-162) This distribution contained close to 283 million source lines of code, and the study estimated that it would have required about seventy three thousand man-years and cost US$8.46 billion (in 2018 dollars) to develop by conventional means.

[](https://en.wikipedia.org/wiki/File:LinuxWasch3.jpg)

The name "Linux" is also used for a laundry detergent made by Swiss company Rösch.[[161]](https://en.wikipedia.org/wiki/Linux#cite_note-163)

In the United States, the name *Linux* is a trademark registered to Linus Torvalds.[[8]](https://en.wikipedia.org/wiki/Linux#cite_note-US_trademark-9) Initially, nobody registered it, but on August 15, 1994, William R. Della Croce, Jr. filed for the trademark *Linux*, and then demanded royalties from Linux distributors. In 1996, Torvalds and some affected organizations sued him to have the trademark assigned to Torvalds, and, in 1997, the case was settled.[[162]](https://en.wikipedia.org/wiki/Linux#cite_note-164) The licensing of the trademark has since been handled by the [Linux Mark Institute](https://en.wikipedia.org/wiki/Linux_Mark_Institute) (LMI). Torvalds has stated that he trademarked the name only to prevent someone else from using it. LMI originally charged a nominal sublicensing fee for use of the Linux name as part of trademarks,[[163]](https://en.wikipedia.org/wiki/Linux#cite_note-165) but later changed this in favor of offering a free, perpetual worldwide sublicense.[[164]](https://en.wikipedia.org/wiki/Linux#cite_note-166)

The [Free Software Foundation](https://en.wikipedia.org/wiki/Free_Software_Foundation) (FSF) prefers *GNU/Linux* as the name when referring to the operating system as a whole, because it considers Linux distributions to be [variants](https://en.wikipedia.org/wiki/GNU_variants) of the [GNU](https://en.wikipedia.org/wiki/GNU) operating system initiated in 1983 by [Richard Stallman](https://en.wikipedia.org/wiki/Richard_Stallman), president of the FSF.[[29]](https://en.wikipedia.org/wiki/Linux#cite_note-gnu_linux_faq-31)[[30]](https://en.wikipedia.org/wiki/Linux#cite_note-linux-and-gnu-32) They explicitly take no issue over the name Android for the Android OS, which is also an operating system based on the Linux kernel, as GNU is not a part of it.

A minority of public figures and software projects other than Stallman and the FSF, notably [Debian](https://en.wikipedia.org/wiki/Debian) (which had been sponsored by the FSF up to 1996),[[165]](https://en.wikipedia.org/wiki/Linux#cite_note-167) also use *GNU/Linux*when referring to the operating system as a whole.[[114]](https://en.wikipedia.org/wiki/Linux#cite_note-tivo-116)[[166]](https://en.wikipedia.org/wiki/Linux#cite_note-168)[[167]](https://en.wikipedia.org/wiki/Linux#cite_note-169) Most media and common usage, however, refers to this family of operating systems simply as *Linux*, as do many large Linux distributions (for example, [SUSE Linux](https://en.wikipedia.org/wiki/SUSE_Linux) and [Red Hat Enterprise Linux](https://en.wikipedia.org/wiki/Red_Hat_Enterprise_Linux)). By contrast, Linux distributions containing only free software use "GNU/Linux" or simply "GNU", such as [Trisquel GNU/Linux](https://en.wikipedia.org/wiki/Trisquel_GNU/Linux), [Parabola GNU/Linux-libre](https://en.wikipedia.org/wiki/Parabola_GNU/Linux-libre), [BLAG Linux and GNU](https://en.wikipedia.org/wiki/BLAG_Linux_and_GNU), and [gNewSense](https://en.wikipedia.org/wiki/GNewSense).

As of May 2011, about 8% to 13% of a modern Linux distribution is made of GNU components (the range depending on whether [GNOME](https://en.wikipedia.org/wiki/GNOME) is considered part of GNU), as determined by counting [lines of source code](https://en.wikipedia.org/wiki/Source_lines_of_code)making up Ubuntu's "Natty" release; meanwhile, 6% is taken by the Linux kernel, increased to 9% when including its direct dependencies.[[168]](https://en.wikipedia.org/wiki/Linux#cite_note-how-much-gnu-170)

See also

What is a Linux bash?

On **Linux**, **bash** is the standard shell for common users. This shell is a so-called superset of the Bourne shell, a set of add-ons and plug-ins. This means that the Bourne Again shell is compatible with the Bourne shell: **commands** that work in sh, also work in **bash**.

<https://www.tldp.org/LDP/Bash-Beginners-Guide/html/Bash-Beginners-Guide.html>