Linux

160 languages

* [Article](https://en.wikipedia.org/wiki/Linux)
* [Talk](https://en.wikipedia.org/wiki/Talk:Linux)
* [Read](https://en.wikipedia.org/wiki/Linux)
* [Edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit)
* [View history](https://en.wikipedia.org/w/index.php?title=Linux&action=history)

Tools

**Appearance**

 hide

Text

Top of Form

Small

Standard

Large

Bottom of Form

Width

Top of Form

Standard

Wide

Bottom of Form

Color (beta)

Top of Form

Automatic

Light

Dark

Bottom of Form

**Checked**

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From Wikipedia, the free encyclopedia

*This article is about the family of operating systems. 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_(mascot)) the penguin, the mascot of Linux[[1]](https://en.wikipedia.org/wiki/Linux#cite_note-LinuxOnLine2008-1) | |
| [**Developer**](https://en.wikipedia.org/wiki/Programmer) | Community contributors, [Linus Torvalds](https://en.wikipedia.org/wiki/Linus_Torvalds) |
| [**Written in**](https://en.wikipedia.org/wiki/Programming_language) | [C](https://en.wikipedia.org/wiki/C_(programming_language)), [assembly languages](https://en.wikipedia.org/wiki/Assembly_language), [Rust](https://en.wikipedia.org/wiki/Rust_programming_language) and others |
| **OS family** | [Unix-like](https://en.wikipedia.org/wiki/Unix-like) |
| **Working state** | Current |
| **Source model** | [Open source](https://en.wikipedia.org/wiki/Open-source_software) |
| **Initial release** | August 25, 1991; 33 years ago |
| [**Repository**](https://en.wikipedia.org/wiki/Repository_(version_control)) | [git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git/](https://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git/) |
| **Marketing target** | [Cloud computing](https://en.wikipedia.org/wiki/Cloud_computing), [embedded devices](https://en.wikipedia.org/wiki/Embedded_device), [mainframe computers](https://en.wikipedia.org/wiki/Mainframe_computer), [mobile devices](https://en.wikipedia.org/wiki/Mobile_device), [personal computers](https://en.wikipedia.org/wiki/Personal_computer), [servers](https://en.wikipedia.org/wiki/Server_(computing)), [supercomputers](https://en.wikipedia.org/wiki/Supercomputer) |
| **Available in** | 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), [C-Sky](https://en.wikipedia.org/wiki/M%C2%B7CORE), [Hexagon](https://en.wikipedia.org/wiki/Qualcomm_Hexagon), [LoongArch](https://en.wikipedia.org/wiki/Loongson), [m68k](https://en.wikipedia.org/wiki/M68k), [Microblaze](https://en.wikipedia.org/wiki/Microblaze), [MIPS](https://en.wikipedia.org/wiki/MIPS_architecture), [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/ESA/390), [SuperH](https://en.wikipedia.org/wiki/SuperH), [SPARC](https://en.wikipedia.org/wiki/SPARC), [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) |
| [**Userland**](https://en.wikipedia.org/wiki/User_space_and_kernel_space) | [util-linux](https://en.wikipedia.org/wiki/Util-linux) by standard,[[a]](https://en.wikipedia.org/wiki/Linux#cite_note-3) various alternatives, such as [Busybox](https://en.wikipedia.org/wiki/Busybox),[[b]](https://en.wikipedia.org/wiki/Linux#cite_note-6) [GNU](https://en.wikipedia.org/wiki/GNU),[[c]](https://en.wikipedia.org/wiki/Linux#cite_note-12) [Plan 9 from User Space](https://en.wikipedia.org/wiki/Plan_9_from_User_Space)[[d]](https://en.wikipedia.org/wiki/Linux#cite_note-15) and [Toybox](https://en.wikipedia.org/wiki/Toybox)[[e]](https://en.wikipedia.org/wiki/Linux#cite_note-17) |
| **Influenced by** | [Minix](https://en.wikipedia.org/wiki/Minix), [Unix](https://en.wikipedia.org/wiki/Unix) |
| [**Default user interface**](https://en.wikipedia.org/wiki/User_interface) | * Most [distributions](https://en.wikipedia.org/wiki/Linux_distribution) include a [desktop environment](https://en.wikipedia.org/wiki/Desktop_environment) ([GUI](https://en.wikipedia.org/wiki/GUI)). |
| [**License**](https://en.wikipedia.org/wiki/Software_license) | [GPLv2](https://en.wikipedia.org/wiki/GPLv2)[[13]](https://en.wikipedia.org/wiki/Linux#cite_note-18)[[f]](https://en.wikipedia.org/wiki/Linux#cite_note-20) |
| **Official website** | [kernel.org](https://kernel.org/) |
| **Articles in the series** | |
| [Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel) [Linux distribution](https://en.wikipedia.org/wiki/Linux_distribution) | |

**Linux** ([/ˈlɪnʊks/](https://en.wikipedia.org/wiki/Help:IPA/English) [*LIN-uuks*](https://en.wikipedia.org/wiki/Help:Pronunciation_respelling_key))[[15]](https://en.wikipedia.org/wiki/Linux#cite_note-pronunciation-2-21) is a family of [open source](https://en.wikipedia.org/wiki/Open_source) [Unix-like](https://en.wikipedia.org/wiki/Unix-like) [operating systems](https://en.wikipedia.org/wiki/Operating_system) based on the [Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel),[[16]](https://en.wikipedia.org/wiki/Linux#cite_note-22) an [operating system kernel](https://en.wikipedia.org/wiki/Kernel_(operating_system)) first released on September 17, 1991, by [Linus Torvalds](https://en.wikipedia.org/wiki/Linus_Torvalds).[[17]](https://en.wikipedia.org/wiki/Linux#cite_note-23)[[18]](https://en.wikipedia.org/wiki/Linux#cite_note-24)[[19]](https://en.wikipedia.org/wiki/Linux#cite_note-25) Linux is typically [packaged](https://en.wikipedia.org/wiki/Package_manager) as a [Linux distribution](https://en.wikipedia.org/wiki/Linux_distribution) (distro), which includes the kernel and supporting [system software](https://en.wikipedia.org/wiki/System_software) and [libraries](https://en.wikipedia.org/wiki/Library_(computing))—most of which are provided by third parties—to create a complete operating system, designed as a clone of [Unix](https://en.wikipedia.org/wiki/Unix) and released under the [copyleft](https://en.wikipedia.org/wiki/Copyleft) [GPL](https://en.wikipedia.org/wiki/GPL) license.[[20]](https://en.wikipedia.org/wiki/Linux#cite_note-26)

[Thousands of Linux distributions](https://en.wikipedia.org/wiki/List_of_Linux_distributions) exist, many based directly or indirectly on other distributions;[[21]](https://en.wikipedia.org/wiki/Linux#cite_note-27)[[22]](https://en.wikipedia.org/wiki/Linux#cite_note-28) popular Linux distributions[[23]](https://en.wikipedia.org/wiki/Linux#cite_note-29)[[24]](https://en.wikipedia.org/wiki/Linux#cite_note-30)[[25]](https://en.wikipedia.org/wiki/Linux#cite_note-31) include [Debian](https://en.wikipedia.org/wiki/Debian), [Fedora Linux](https://en.wikipedia.org/wiki/Fedora_Linux), [Linux Mint](https://en.wikipedia.org/wiki/Linux_Mint), [Arch Linux](https://en.wikipedia.org/wiki/Arch_Linux), and [Ubuntu](https://en.wikipedia.org/wiki/Ubuntu), while commercial distributions include [Red Hat Enterprise Linux](https://en.wikipedia.org/wiki/Red_Hat_Enterprise_Linux), [SUSE Linux Enterprise](https://en.wikipedia.org/wiki/SUSE_Linux_Enterprise), and [ChromeOS](https://en.wikipedia.org/wiki/ChromeOS). Linux distributions are frequently used in server platforms.[[26]](https://en.wikipedia.org/wiki/Linux#cite_note-32)[[27]](https://en.wikipedia.org/wiki/Linux#cite_note-33) Many Linux distributions use the word "Linux" in their name, but the [Free Software Foundation](https://en.wikipedia.org/wiki/Free_Software_Foundation) uses and recommends the name "GNU/Linux" to emphasize the use and importance of [GNU](https://en.wikipedia.org/wiki/GNU) software in many distributions, [causing some controversy](https://en.wikipedia.org/wiki/GNU/Linux_naming_controversy).[[28]](https://en.wikipedia.org/wiki/Linux#cite_note-gnu_linux_faq-34)[[29]](https://en.wikipedia.org/wiki/Linux#cite_note-linux-and-gnu-35) Other than the Linux kernel, key components that make up a distribution may include a [display server (windowing system)](https://en.wikipedia.org/wiki/Display_server), a [package manager](https://en.wikipedia.org/wiki/Package_manager), a bootloader and a [Unix shell](https://en.wikipedia.org/wiki/Unix_shell).

Linux is one of the most prominent examples of free and open-source [software](https://en.wikipedia.org/wiki/Software) collaboration. While originally developed for [x86](https://en.wikipedia.org/wiki/X86) based [personal computers](https://en.wikipedia.org/wiki/Personal_computer), it 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,[[30]](https://en.wikipedia.org/wiki/Linux#cite_note-36) and is used on a wide variety of devices including PCs, [workstations](https://en.wikipedia.org/wiki/Workstations), [mainframes](https://en.wikipedia.org/wiki/Mainframes) and [embedded systems](https://en.wikipedia.org/wiki/Embedded_system). Linux is the predominant operating system for [servers](https://en.wikipedia.org/wiki/Server_(computing)) and is also used on all of the [world's 500 fastest supercomputers](https://en.wikipedia.org/wiki/TOP500).[[g]](https://en.wikipedia.org/wiki/Linux#cite_note-37) When combined with [Android](https://en.wikipedia.org/wiki/Android_(operating_system)), which is Linux-based and designed for [smartphones](https://en.wikipedia.org/wiki/Smartphone), they have the [largest installed base](https://en.wikipedia.org/wiki/Usage_share_of_operating_systems) of all [general-purpose operating systems](https://en.wikipedia.org/wiki/General-purpose_operating_system).

**Overview**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=1)]

The Linux kernel was designed by [Linus Torvalds](https://en.wikipedia.org/wiki/Linus_Torvalds), following the lack of a working [kernel](https://en.wikipedia.org/wiki/Kernel_(operating_system)) for [GNU](https://en.wikipedia.org/wiki/GNU), a [Unix](https://en.wikipedia.org/wiki/Unix)-compatible operating system made entirely of [free software](https://en.wikipedia.org/wiki/Free_software) that had been undergoing development since 1983 by [Richard Stallman](https://en.wikipedia.org/wiki/Richard_Stallman). A working Unix system called [Minix](https://en.wikipedia.org/wiki/Minix) was later released but its license was not entirely free at the time[[31]](https://en.wikipedia.org/wiki/Linux#cite_note-meta-38) and it was made for an educative purpose. The first entirely free Unix for personal computers, [386BSD](https://en.wikipedia.org/wiki/386BSD), did not appear until 1992, by which time Torvalds had already built and publicly released the first version of the [Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel) on the [Internet](https://en.wikipedia.org/wiki/Internet).[[32]](https://en.wikipedia.org/wiki/Linux#cite_note-39) Like GNU and 386BSD, Linux did not have any Unix code, being a fresh reimplementation, and therefore avoided the [then legal issues](https://en.wikipedia.org/wiki/UNIX_System_Laboratories,_Inc._v._Berkeley_Software_Design,_Inc.).[[33]](https://en.wikipedia.org/wiki/Linux#cite_note-40) Linux distributions became popular in the 1990s and effectively made Unix technologies accessible to home users on personal computers whereas previously it had been confined to sophisticated [workstations](https://en.wikipedia.org/wiki/Workstations).[[34]](https://en.wikipedia.org/wiki/Linux#cite_note-41)

Desktop Linux distributions include a [windowing system](https://en.wikipedia.org/wiki/Windowing_system) such as [X11](https://en.wikipedia.org/wiki/X_Window_System) or [Wayland](https://en.wikipedia.org/wiki/Wayland_(protocol)) and a [desktop environment](https://en.wikipedia.org/wiki/Desktop_environment) such as [GNOME](https://en.wikipedia.org/wiki/GNOME), [KDE Plasma](https://en.wikipedia.org/wiki/KDE_Plasma) or [Xfce](https://en.wikipedia.org/wiki/Xfce). Distributions intended for [servers](https://en.wikipedia.org/wiki/Server_(computing)) may not have a [graphical user interface](https://en.wikipedia.org/wiki/Graphical_user_interface) at all or include a [solution stack](https://en.wikipedia.org/wiki/Solution_stack) such as [LAMP](https://en.wikipedia.org/wiki/LAMP_(software_bundle)).

The [source code](https://en.wikipedia.org/wiki/Source_code) of Linux 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) (GPL). The license means creating novel distributions is permitted by anyone[[35]](https://en.wikipedia.org/wiki/Linux#cite_note-what-42) and is easier than it would be for an operating system such as [MacOS](https://en.wikipedia.org/wiki/MacOS) or [Microsoft Windows](https://en.wikipedia.org/wiki/Microsoft_Windows).[[36]](https://en.wikipedia.org/wiki/Linux#cite_note-43)[[37]](https://en.wikipedia.org/wiki/Linux#cite_note-44)[[38]](https://en.wikipedia.org/wiki/Linux#cite_note-45) The Linux kernel, for example, is licensed under the GPLv2, with an exception for [system calls](https://en.wikipedia.org/wiki/System_call) that allows code that calls the kernel via system calls not to be licensed under the GPL.[[39]](https://en.wikipedia.org/wiki/Linux#cite_note-46)[[40]](https://en.wikipedia.org/wiki/Linux#cite_note-47)[[35]](https://en.wikipedia.org/wiki/Linux#cite_note-what-42)

Because of the dominance of Linux-based [Android](https://en.wikipedia.org/wiki/Android_(operating_system)) on [smartphones](https://en.wikipedia.org/wiki/Smartphone), Linux, including Android, has the [largest installed base](https://en.wikipedia.org/wiki/Usage_share_of_operating_systems) of all [general-purpose operating systems](https://en.wikipedia.org/wiki/General-purpose_operating_system) as of May 2022.[[41]](https://en.wikipedia.org/wiki/Linux#cite_note-48)[[42]](https://en.wikipedia.org/wiki/Linux#cite_note-49)[[43]](https://en.wikipedia.org/wiki/Linux#cite_note-50) Linux is, as of March 2024, used by around 4 percent of [desktop computers](https://en.wikipedia.org/wiki/Desktop_computer).[[44]](https://en.wikipedia.org/wiki/Linux#cite_note-statcounter-desktop-51) The [Chromebook](https://en.wikipedia.org/wiki/Chromebook), which runs the Linux kernel-based [ChromeOS](https://en.wikipedia.org/wiki/ChromeOS),[[45]](https://en.wikipedia.org/wiki/Linux#cite_note-52)[[46]](https://en.wikipedia.org/wiki/Linux#cite_note-53) dominates the US [K–12](https://en.wikipedia.org/wiki/K%E2%80%9312) education market and represents nearly 20 percent of sub-$300 [notebook](https://en.wikipedia.org/wiki/Laptop) sales in the US.[[47]](https://en.wikipedia.org/wiki/Linux#cite_note-54) Linux is the leading operating system on servers (over 96.4% of the top one million web servers' operating systems are Linux),[[48]](https://en.wikipedia.org/wiki/Linux#cite_note-55) leads other [big iron](https://en.wikipedia.org/wiki/Big_iron_(computing)) systems such as [mainframe computers](https://en.wikipedia.org/wiki/Mainframe_computer),[[*clarification needed*](https://en.wikipedia.org/wiki/Wikipedia:Please_clarify)][[49]](https://en.wikipedia.org/wiki/Linux#cite_note-56) and is used on all of the [world's 500 fastest supercomputers](https://en.wikipedia.org/wiki/TOP500)[[h]](https://en.wikipedia.org/wiki/Linux#cite_note-57) (as of November 2017, having gradually displaced all competitors).[[50]](https://en.wikipedia.org/wiki/Linux#cite_note-58)[[51]](https://en.wikipedia.org/wiki/Linux#cite_note-rules_supercomputers-59)

Linux also runs on [embedded systems](https://en.wikipedia.org/wiki/Embedded_system), i.e., devices whose operating system is typically built into the [firmware](https://en.wikipedia.org/wiki/Firmware) and is highly tailored to the system. This includes [routers](https://en.wikipedia.org/wiki/Router_(computing)), [automation](https://en.wikipedia.org/wiki/Automation) controls, [smart home devices](https://en.wikipedia.org/wiki/Smart_home_technology), [video game consoles](https://en.wikipedia.org/wiki/Video_game_console), [televisions](https://en.wikipedia.org/wiki/Television) (Samsung and LG [smart TVs](https://en.wikipedia.org/wiki/Smart_TV)),[[52]](https://en.wikipedia.org/wiki/Linux#cite_note-Linux_Smart_TVs-60)[[53]](https://en.wikipedia.org/wiki/Linux#cite_note-61)[[54]](https://en.wikipedia.org/wiki/Linux#cite_note-62) [automobiles](https://en.wikipedia.org/wiki/Automobiles) (Tesla, Audi, Mercedes-Benz, Hyundai, and Toyota),[[55]](https://en.wikipedia.org/wiki/Linux#cite_note-Linux_cars-63) and [spacecraft](https://en.wikipedia.org/wiki/Spacecraft) ([Falcon 9](https://en.wikipedia.org/wiki/Falcon_9) rocket, [Dragon](https://en.wikipedia.org/wiki/SpaceX_Dragon_2) crew capsule, and the [Ingenuity](https://en.wikipedia.org/wiki/Ingenuity_(helicopter)) Mars helicopter).[[56]](https://en.wikipedia.org/wiki/Linux#cite_note-auto-64)[[57]](https://en.wikipedia.org/wiki/Linux#cite_note-65)

**History**

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

*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=3)]

[A person in a grey polo shirt

AI-generated content may be incorrect.](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

The [Unix](https://en.wikipedia.org/wiki/Unix) operating system was conceived of and implemented in 1969, at [AT&T](https://en.wikipedia.org/wiki/AT%26T_Corporation)'s [Bell Labs](https://en.wikipedia.org/wiki/Bell_Labs) 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).[[58]](https://en.wikipedia.org/wiki/Linux#cite_note-66) 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. In 1973, in a key pioneering approach, it was rewritten in the [C](https://en.wikipedia.org/wiki/C_(programming_language)) programming language by Dennis Ritchie (except for 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.[[59]](https://en.wikipedia.org/wiki/Linux#cite_note-67)

As a 1956 [antitrust case](https://en.wikipedia.org/wiki/Antitrust_case) forbade AT&T from entering the computer business,[[60]](https://en.wikipedia.org/wiki/Linux#cite_note-68) AT&T provided the operating system's [source code](https://en.wikipedia.org/wiki/Source_code) to anyone who asked. As a result, Unix use grew quickly and it became widely adopted by [academic institutions](https://en.wikipedia.org/wiki/Academic_institution) and businesses. In 1984, [AT&T divested itself](https://en.wikipedia.org/wiki/Breakup_of_the_Bell_System) of its [regional operating companies](https://en.wikipedia.org/wiki/Regional_Bell_Operating_Company), and was released from its obligation not to enter the computer business; freed of that obligation, Bell Labs began selling Unix as a [proprietary](https://en.wikipedia.org/wiki/Proprietary_software) product, where users were not legally allowed to modify it.[[61]](https://en.wikipedia.org/wiki/Linux#cite_note-Vetter2021-69)[[62]](https://en.wikipedia.org/wiki/Linux#cite_note-Tozzi2017-70)

[Onyx Systems](https://en.wikipedia.org/wiki/Onyx_Systems) began selling early microcomputer-based Unix workstations in 1980. Later, [Sun Microsystems](https://en.wikipedia.org/wiki/Sun_Microsystems), founded as a spin-off of a student project at [Stanford University](https://en.wikipedia.org/wiki/Stanford_University), also began selling Unix-based desktop workstations in 1982. While Sun workstations did not use commodity PC hardware, for which Linux was later originally developed, it represented the first successful commercial attempt at distributing a primarily single-user microcomputer that ran a Unix operating system.[[63]](https://en.wikipedia.org/wiki/Linux#cite_note-71)[[64]](https://en.wikipedia.org/wiki/Linux#cite_note-72)

With Unix increasingly "locked in" as a proprietary product, 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.[[65]](https://en.wikipedia.org/wiki/Linux#cite_note-gnu_announce-73) 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 [command-line shell](https://en.wikipedia.org/wiki/Shell_(computing)#Command-line_shells), 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_(computing)), and the [kernel](https://en.wikipedia.org/wiki/Kernel_(operating_system)), called [GNU Hurd](https://en.wikipedia.org/wiki/GNU_Hurd), were stalled and incomplete.[[66]](https://en.wikipedia.org/wiki/Linux#cite_note-74)

[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 operating system targeted at students and others who wanted to learn operating system principles. Although the [complete source code of Minix was freely available](https://en.wikipedia.org/wiki/Source-available_software), the licensing terms prevented it from being [free software](https://en.wikipedia.org/wiki/Free_software) until the licensing changed in April 2000.[[67]](https://en.wikipedia.org/wiki/Linux#cite_note-minix-lic-75)

**Creation**

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

While attending the [University of Helsinki](https://en.wikipedia.org/wiki/University_of_Helsinki) in the fall of 1990, Torvalds enrolled in a Unix course.[[68]](https://en.wikipedia.org/wiki/Linux#cite_note-76) The course used a [MicroVAX](https://en.wikipedia.org/wiki/MicroVAX) minicomputer running [Ultrix](https://en.wikipedia.org/wiki/Ultrix), and one of the required texts was [*Operating Systems: Design and Implementation*](https://en.wikipedia.org/wiki/Operating_Systems:_Design_and_Implementation) by [Andrew S. Tanenbaum](https://en.wikipedia.org/wiki/Andrew_S._Tanenbaum). This textbook included a copy of Tanenbaum's [Minix](https://en.wikipedia.org/wiki/Minix) operating system. It was with this course that Torvalds first became exposed to Unix. In 1991, he became curious about operating systems.[[69]](https://en.wikipedia.org/wiki/Linux#cite_note-77) Frustrated by the licensing of Minix, which at the time limited it to educational use only,[[67]](https://en.wikipedia.org/wiki/Linux#cite_note-minix-lic-75) he began to work on his operating system kernel, which eventually became the Linux kernel.

On July 3, 1991, to implement Unix [system calls](https://en.wikipedia.org/wiki/System_call), Linus Torvalds attempted unsuccessfully to obtain a digital copy of the [POSIX](https://en.wikipedia.org/wiki/POSIX) standards [documentation](https://en.wikipedia.org/wiki/Software_documentation) with a request to the *comp.os.minix* [newsgroup](https://en.wikipedia.org/wiki/Usenet_newsgroup).[[70]](https://en.wikipedia.org/wiki/Linux#cite_note-78) After not finding the POSIX documentation, Torvalds initially resorted to determining system calls from [SunOS](https://en.wikipedia.org/wiki/SunOS) documentation owned by the university for use in operating its [Sun Microsystems](https://en.wikipedia.org/wiki/Sun_Microsystems) server. He also learned some system calls from Tanenbaum's Minix text.

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.[[71]](https://en.wikipedia.org/wiki/Linux#cite_note-79) 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.[[72]](https://en.wikipedia.org/wiki/Linux#cite_note-80) Developers worked to integrate GNU components with the Linux kernel, creating a fully functional and free operating system.[[73]](https://en.wikipedia.org/wiki/Linux#cite_note-gnu_history-81)

Although not released until 1992, due to [legal complications](https://en.wikipedia.org/wiki/UNIX_System_Laboratories,_Inc._v._Berkeley_Software_Design,_Inc.), the 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. Linus Torvalds has stated that if the [GNU kernel](https://en.wikipedia.org/wiki/GNU_kernel) or 386BSD had been available in 1991, he probably would not have created Linux.[[74]](https://en.wikipedia.org/wiki/Linux#cite_note-82)[[31]](https://en.wikipedia.org/wiki/Linux#cite_note-meta-38)

**Naming**

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

[A close-up of several envelopes

AI-generated content may be incorrect.](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 considered the name "Linux" but dismissed it as too egotistical.[[75]](https://en.wikipedia.org/wiki/Linux#cite_note-fun-83)

To facilitate development, the files were uploaded to the [FTP server](https://en.wikipedia.org/wiki/File_Transfer_Protocol) of [FUNET](https://en.wikipedia.org/wiki/FUNET) in September 1991. 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.[[75]](https://en.wikipedia.org/wiki/Linux#cite_note-fun-83) Later, however, Torvalds consented to "Linux".

According to a [newsgroup](https://en.wikipedia.org/wiki/Usenet_newsgroup) post by Torvalds,[[15]](https://en.wikipedia.org/wiki/Linux#cite_note-pronunciation-2-21) the word "Linux" should be pronounced ([/ˈlɪnʊks/](https://en.wikipedia.org/wiki/Help:IPA/English) [ⓘ](https://en.wikipedia.org/wiki/File:Linus-linux.ogg) [*LIN-uuks*](https://en.wikipedia.org/wiki/Help:Pronunciation_respelling_key)) with a short 'i' as in 'print' and 'u' as in 'put'. To further demonstrate how the word "Linux" should be pronounced, he included an audio guide with the kernel source code.[[76]](https://en.wikipedia.org/wiki/Linux#cite_note-Pronounce-84) However, in this recording, he pronounces Linux as */ˈlinʊks/* ([*LEEN-uuks*](https://en.wikipedia.org/wiki/Help:Pronunciation_respelling_key)) with a short but [close front unrounded vowel](https://en.wikipedia.org/wiki/Close_front_unrounded_vowel), instead of a [near-close near-front unrounded vowel](https://en.wikipedia.org/wiki/Near-close_near-front_unrounded_vowel) as in his newsgroup post.

**Commercial and popular uptake**

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

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

[A cell phone with a screen and a camera

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:Nexus_5X_(White).jpg)

[A display of laptops on a table

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:ChromebookStaplesStore.jpg)

[A small screen with a screen on

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:In_flight_system_Linux_bootup_flat.jpg)

[A computer monitor with blue text on it

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:Custom_Miniature_Linux_Server_(2005).jpeg)

From top-left clockwise: [Nexus 5X](https://en.wikipedia.org/wiki/Nexus_5X) running Android, [Chromebooks](https://en.wikipedia.org/wiki/Chromebook), [server platform](https://en.wikipedia.org/wiki/Server_(computing)), [In-flight entertainment system](https://en.wikipedia.org/wiki/In-flight_entertainment_system)

The 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/Computer_cluster) of inexpensive commodity computers running Linux. Commercial use began 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.[[77]](https://en.wikipedia.org/wiki/Linux#cite_note-security-85)

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),[[51]](https://en.wikipedia.org/wiki/Linux#cite_note-rules_supercomputers-59)[[78]](https://en.wikipedia.org/wiki/Linux#cite_note-86) and have secured a place in server installations such as the popular [LAMP](https://en.wikipedia.org/wiki/LAMP_(software_bundle)) application stack. The use of Linux distributions in home and enterprise desktops has been growing.[[79]](https://en.wikipedia.org/wiki/Linux#cite_note-galli2007-87)[[80]](https://en.wikipedia.org/wiki/Linux#cite_note-paul2007-88)[[81]](https://en.wikipedia.org/wiki/Linux#cite_note-beer2007-89)[[82]](https://en.wikipedia.org/wiki/Linux#cite_note-applications2007-90)[[83]](https://en.wikipedia.org/wiki/Linux#cite_note-xitimonitor2007-91)[[84]](https://en.wikipedia.org/wiki/Linux#cite_note-globalstats2007-92)[[85]](https://en.wikipedia.org/wiki/Linux#cite_note-zeitgeist2004-93)

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 [ChromeOS](https://en.wikipedia.org/wiki/ChromeOS) designed for netbooks.

Linux's greatest success in the consumer market is perhaps the mobile device market, with Android being the dominant operating system 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), and vehicles. [Linux gaming](https://en.wikipedia.org/wiki/Linux_gaming) is also on the rise with [Valve](https://en.wikipedia.org/wiki/Valve_Corporation) showing its support for Linux and rolling out [SteamOS](https://en.wikipedia.org/wiki/SteamOS), its own gaming-oriented Linux distribution, which was later implemented in their [Steam Deck](https://en.wikipedia.org/wiki/Steam_Deck) platform. 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).[[86]](https://en.wikipedia.org/wiki/Linux#cite_note-94)

**Development**

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

Linus Torvalds is the lead maintainer for the Linux kernel and guides its development, while [Greg Kroah-Hartman](https://en.wikipedia.org/wiki/Greg_Kroah-Hartman) is the lead maintainer for the stable branch.[[87]](https://en.wikipedia.org/wiki/Linux#cite_note-95) [Zoë Kooyman](https://en.wikipedia.org/w/index.php?title=Zo%C3%AB_Kooyman&action=edit&redlink=1) is the executive director of the Free Software Foundation,[[88]](https://en.wikipedia.org/wiki/Linux#cite_note-96) which in turn supports the GNU components.[[89]](https://en.wikipedia.org/wiki/Linux#cite_note-97) 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.

**Design**

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

*See also:*[*Linux kernel § Architecture and features*](https://en.wikipedia.org/wiki/Linux_kernel#Architecture_and_features)

Many developers of [open-source](https://en.wikipedia.org/wiki/Open_source) software agree that the Linux kernel was not designed but rather [evolved](https://en.wikipedia.org/wiki/Evolution) through [natural selection](https://en.wikipedia.org/wiki/Natural_selection). Torvalds considers that although the design of Unix served as a scaffolding, "Linux grew with a lot of mutations – and because the mutations were less than random, they were faster and more directed than [alpha-particles in DNA](https://en.wikipedia.org/wiki/Mutation#Induced_mutation)."[[90]](https://en.wikipedia.org/wiki/Linux#cite_note-98) [Eric S. Raymond](https://en.wikipedia.org/wiki/Eric_S._Raymond) considers Linux's revolutionary aspects to be social, not technical: before Linux, complex software was designed carefully by small groups, but "Linux evolved in a completely different way. From nearly the beginning, it was rather casually hacked on by huge numbers of volunteers coordinating only through the Internet. Quality was maintained not by rigid standards or autocracy but by the naively simple strategy of releasing every week and getting feedback from hundreds of users within days, creating a sort of rapid Darwinian selection on the mutations introduced by developers."[[91]](https://en.wikipedia.org/wiki/Linux#cite_note-99) [Bryan Cantrill](https://en.wikipedia.org/wiki/Bryan_Cantrill), an engineer of a competing OS, agrees that "Linux wasn't designed, it evolved", but considers this to be a limitation, proposing that some features, especially those related to security,[[92]](https://en.wikipedia.org/wiki/Linux#cite_note-100) cannot be evolved into, "this is not a biological system at the end of the day, it's a software system."[[93]](https://en.wikipedia.org/wiki/Linux#cite_note-101)

A Linux-based system is a modular 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, 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_driver) are either integrated directly with the kernel or added as modules that are loaded while the system is running.[[94]](https://en.wikipedia.org/wiki/Linux#cite_note-102)

The GNU [userland](https://en.wikipedia.org/wiki/User_space_and_kernel_space) is a key part of most systems based on the Linux kernel, with Android being the notable exception. The [GNU C library](https://en.wikipedia.org/wiki/Glibc), an implementation of the [C standard library](https://en.wikipedia.org/wiki/C_standard_library), works 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/List_of_Unix_commands). The GNU Project also develops [Bash](https://en.wikipedia.org/wiki/Bash_(Unix_shell)), a popular [CLI](https://en.wikipedia.org/wiki/Command-line_interface) shell. 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).[[95]](https://en.wikipedia.org/wiki/Linux#cite_note-oreilly-anatomy-103) More recently, some of the Linux community has sought to move to using [Wayland](https://en.wikipedia.org/wiki/Wayland_(protocol)) as the display server protocol, replacing X11.[[96]](https://en.wikipedia.org/wiki/Linux#cite_note-104)[[97]](https://en.wikipedia.org/wiki/Linux#cite_note-105)

Many other open-source software projects contribute to Linux systems.

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| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Various layers within Linux, also showing separation between the**[**userland**](https://en.wikipedia.org/wiki/User_space_and_kernel_space)**and**[**kernel space**](https://en.wikipedia.org/wiki/User_space_and_kernel_space) | | | | | | | | **User mode** | **User applications** | [*bash*](https://en.wikipedia.org/wiki/Bash_(Unix_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/Firefox)*, ...* | | | | | | **System components** | [**init daemon**](https://en.wikipedia.org/wiki/Init): [*OpenRC*](https://en.wikipedia.org/wiki/OpenRC)*,*[*runit*](https://en.wikipedia.org/wiki/Runit)*,*[*systemd*](https://en.wikipedia.org/wiki/Systemd)*...* | [**System daemons**](https://en.wikipedia.org/wiki/Daemon_(computing)): [*polkitd*](https://en.wikipedia.org/wiki/Polkit)*,*[*smbd*](https://en.wikipedia.org/wiki/Samba_(software))*,*[*sshd*](https://en.wikipedia.org/wiki/OpenSSH)*,*[*udevd*](https://en.wikipedia.org/wiki/Udevd)*...* | [**Windowing system**](https://en.wikipedia.org/wiki/Windowing_system): [*X11*](https://en.wikipedia.org/wiki/X_Window_System)*,*[*Wayland*](https://en.wikipedia.org/wiki/Wayland_(protocol))*,*[*SurfaceFlinger*](https://en.wikipedia.org/wiki/SurfaceFlinger)*(Android)* | **Graphics**: [*Mesa*](https://en.wikipedia.org/wiki/Mesa_(computer_graphics)), [*AMD Catalyst*](https://en.wikipedia.org/wiki/AMD_Radeon_Software)*, ...* | **Other libraries:** [*GTK*](https://en.wikipedia.org/wiki/GTK)*,*[*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)*, ...* | | [**C standard library**](https://en.wikipedia.org/wiki/C_standard_library) | [fopen](https://en.wikipedia.org/wiki/Fopen), [execv](https://en.wikipedia.org/wiki/Exec_(system_call)), [malloc](https://en.wikipedia.org/wiki/Malloc), [memcpy](https://en.wikipedia.org/wiki/Memcpy), [localtime](https://en.wikipedia.org/wiki/Localtime), [pthread\_create](https://en.wikipedia.org/wiki/Pthread_create)... (up to 2000 [subroutines](https://en.wikipedia.org/wiki/Subroutine)) [*glibc*](https://en.wikipedia.org/wiki/Glibc) aims to be fast, [*musl*](https://en.wikipedia.org/wiki/Musl) aims to be lightweight, [*uClibc*](https://en.wikipedia.org/wiki/UClibc) targets embedded systems, [*bionic*](https://en.wikipedia.org/wiki/Bionic_(software)) was written for [Android](https://en.wikipedia.org/wiki/Android_(operating_system)), etc. All aim to be [POSIX](https://en.wikipedia.org/wiki/POSIX)/[SUS](https://en.wikipedia.org/wiki/Single_UNIX_Specification)-compatible. | | | | | | **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[[98]](https://en.wikipedia.org/wiki/Linux#cite_note-106) | | | | | | [Process scheduling](https://en.wikipedia.org/wiki/Scheduling_(computing)) subsystem | [IPC](https://en.wikipedia.org/wiki/Inter-process_communication) subsystem | [Memory management](https://en.wikipedia.org/wiki/Memory_management) subsystem | [Virtual files](https://en.wikipedia.org/wiki/Virtual_file_system) subsystem | Networking 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), [klibc](https://en.wikipedia.org/wiki/Klibc), [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:[[95]](https://en.wikipedia.org/wiki/Linux#cite_note-oreilly-anatomy-103)[[99]](https://en.wikipedia.org/wiki/Linux#cite_note-107)

* 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_(bootloader)), [SYSLINUX](https://en.wikipedia.org/wiki/SYSLINUX) or [systemd-boot](https://en.wikipedia.org/wiki/Systemd-boot). 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. 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 the use of dynamic libraries is known as [ld-linux.so](https://en.wikipedia.org/wiki/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 [programming interface](https://en.wikipedia.org/wiki/API) 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)).
  + The [C standard library](https://en.wikipedia.org/wiki/C_standard_library) is the library necessary to run programs written in [C](https://en.wikipedia.org/wiki/C_(programming_language)) on a computer system, with the GNU C Library being the standard. It provides an implementation of the POSIX API, as well as extensions to that API. For embedded systems, alternatives such as [musl](https://en.wikipedia.org/wiki/Musl), [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 the last two are no longer maintained. Android uses its own C library, [Bionic](https://en.wikipedia.org/wiki/Bionic_(software)). However, musl can additionally be used as a replacement for glibc on desktop and laptop systems, as seen on certain Linux distributions like [Void Linux](https://en.wikipedia.org/wiki/Void_Linux).
* 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) and Clutter 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 [The Qt Company](https://en.wikipedia.org/wiki/The_Qt_Company), 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=9)]

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 (CLI), a graphical user interface (GUI), or controls attached to the associated hardware, which is common for embedded systems. For desktop systems, the default user interface is usually graphical, 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).

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/Bash_(Unix_shell)) (bash), originally developed for the GNU Project; [other shells](https://en.wikipedia.org/wiki/List_of_command-line_interpreters) such as [Zsh](https://en.wikipedia.org/wiki/Z_shell) are also used.[[100]](https://en.wikipedia.org/wiki/Linux#cite_note-108)[[101]](https://en.wikipedia.org/wiki/Linux#cite_note-109) 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).

[A screenshot of a computer

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:VirtualBox_debian64_XFCE_Hebrew.png)[Debian](https://en.wikipedia.org/wiki/Debian) running the [Xfce](https://en.wikipedia.org/wiki/Xfce) desktop environment[A blurry image of a computer screen

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:Fedora_Linux_40_KDE_Plasma.png)[Fedora Linux](https://en.wikipedia.org/wiki/Fedora_Linux) running the [Plasma](https://en.wikipedia.org/wiki/KDE_Plasma) desktop environment

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 [KDE Plasma](https://en.wikipedia.org/wiki/KDE_Plasma), [GNOME](https://en.wikipedia.org/wiki/GNOME), [MATE](https://en.wikipedia.org/wiki/MATE_(desktop_environment)), [Cinnamon](https://en.wikipedia.org/wiki/Cinnamon_(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, often simply called "X" or "X11". 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.[[102]](https://en.wikipedia.org/wiki/Linux#cite_note-110) Several X display servers exist, with the reference implementation, [X.Org Server](https://en.wikipedia.org/wiki/X.Org_Server), being the most popular.

[A screenshot of a computer

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:I3_window_manager_screenshot.png)[I3](https://en.wikipedia.org/wiki/I3_(window_manager)) [Tiling window manager](https://en.wikipedia.org/wiki/Tiling_window_manager)

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), [ratpoison](https://en.wikipedia.org/wiki/Ratpoison), or [i3wm](https://en.wikipedia.org/wiki/I3_(window_manager)) 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_(software)) (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 is a display server protocol intended as a replacement for the X11 protocol; as of 2022, it has received relatively wide adoption.[[103]](https://en.wikipedia.org/wiki/Linux#cite_note-111) 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.[[104]](https://en.wikipedia.org/wiki/Linux#cite_note-112) Additionally, many window managers have been made for Wayland, such as Sway or Hyprland, as well as other graphical utilities such as Waybar or Rofi.

**Video input infrastructure**

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

*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/DVB) API for digital TV reception.[[105]](https://en.wikipedia.org/wiki/Linux#cite_note-113)

Due to the complexity and diversity of different devices, and due to the large number 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 to the success of having userspace applications to be able to work with all formats supported by those devices.[[106]](https://en.wikipedia.org/wiki/Linux#cite_note-114)[[107]](https://en.wikipedia.org/wiki/Linux#cite_note-115)

**Development**

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

[A screenshot of a computer

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:Unix_timeline.en.svg)Simplified history of 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.

*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 and other components are free and open-source software. Linux is not the only such operating system, although it is by far the most widely used.[[108]](https://en.wikipedia.org/wiki/Linux#cite_note-MarketShare09NOV-116) Some [free](https://en.wikipedia.org/wiki/Free_software_license) and [open-source software licenses](https://en.wikipedia.org/wiki/Open-source_license) 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 (GPL), is a form of copyleft and is used for the Linux kernel and many of the components from the GNU Project.[[109]](https://en.wikipedia.org/wiki/Linux#cite_note-117)

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,[[110]](https://en.wikipedia.org/wiki/Linux#cite_note-118) [Single UNIX Specification](https://en.wikipedia.org/wiki/Single_UNIX_Specification) (SUS),[[111]](https://en.wikipedia.org/wiki/Linux#cite_note-119) [Linux Standard Base](https://en.wikipedia.org/wiki/Linux_Standard_Base) (LSB), [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.[[112]](https://en.wikipedia.org/wiki/Linux#cite_note-120)[[113]](https://en.wikipedia.org/wiki/Linux#cite_note-121) [The Open Group](https://en.wikipedia.org/wiki/The_Open_Group) has tested and certified at least two Linux distributions as qualifying for the Unix trademark, [EulerOS](https://en.wikipedia.org/wiki/EulerOS) and [Inspur K-UX](https://en.wikipedia.org/wiki/Inspur_K-UX).[[114]](https://en.wikipedia.org/wiki/Linux#cite_note-proven20230117-122)

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 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 such as [apt](https://en.wikipedia.org/wiki/APT_(software)), [yum](https://en.wikipedia.org/wiki/Yum_(software)), [zypper](https://en.wikipedia.org/wiki/ZYpp), [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.[[115]](https://en.wikipedia.org/wiki/Linux#cite_note-123)

**Community**

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

*See also:*[*Free software movement*](https://en.wikipedia.org/wiki/Free_software_movement)*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), and [SUSE](https://en.wikipedia.org/wiki/SUSE_S.A.) does with [openSUSE](https://en.wikipedia.org/wiki/OpenSUSE).[[116]](https://en.wikipedia.org/wiki/Linux#cite_note-124)[[117]](https://en.wikipedia.org/wiki/Linux#cite_note-125)

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/Internet_forum) are another means of support, with notable examples being [Unix & Linux Stack Exchange](https://en.wikipedia.org/wiki/Stack_Exchange),[[118]](https://en.wikipedia.org/wiki/Linux#cite_note-126)[[119]](https://en.wikipedia.org/wiki/Linux#cite_note-127) [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), Fedora, [Arch Linux](https://en.wikipedia.org/wiki/Arch_Linux), [Gentoo](https://en.wikipedia.org/wiki/Gentoo_Linux), etc. 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.[[120]](https://en.wikipedia.org/wiki/Linux#cite_note-128)[[121]](https://en.wikipedia.org/wiki/Linux#cite_note-129)

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 free software. An analysis of the Linux kernel in 2017 showed that well over 85% of the code was developed by programmers who are being paid for their work, leaving about 8.2% to unpaid developers and 4.1% unclassified.[[122]](https://en.wikipedia.org/wiki/Linux#cite_note-Linux_Foundation_2021-11-14-130) Some of the major corporations that provide contributions include [Intel](https://en.wikipedia.org/wiki/Intel), [Samsung](https://en.wikipedia.org/wiki/Samsung), [Google](https://en.wikipedia.org/wiki/Google), [AMD](https://en.wikipedia.org/wiki/AMD), [Oracle](https://en.wikipedia.org/wiki/Oracle_Corporation), and [Facebook](https://en.wikipedia.org/wiki/Facebook).[[122]](https://en.wikipedia.org/wiki/Linux#cite_note-Linux_Foundation_2021-11-14-130) Several corporations, notably Red Hat, [Canonical](https://en.wikipedia.org/wiki/Canonical_(company)), and [SUSE](https://en.wikipedia.org/wiki/SUSE_S.A.) have built a significant business around Linux distributions.

The [free software licenses](https://en.wikipedia.org/wiki/Free_software_license), 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.[[123]](https://en.wikipedia.org/wiki/Linux#cite_note-131)

Another business model is to give away the software 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 the [classic Mac OS](https://en.wikipedia.org/wiki/Classic_Mac_OS) before 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.[[124]](https://en.wikipedia.org/wiki/Linux#cite_note-132)[[125]](https://en.wikipedia.org/wiki/Linux#cite_note-133)

**Programming on Linux**

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

Most [programming languages](https://en.wikipedia.org/wiki/Programming_language) support Linux either directly or through third-party community based [ports](https://en.wikipedia.org/wiki/Porting).[[126]](https://en.wikipedia.org/wiki/Linux#cite_note-134) 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](https://en.wikipedia.org/wiki/Go_(programming_language)), [Rust](https://en.wikipedia.org/wiki/Rust_(programming_language)) and [Haskell](https://en.wikipedia.org/wiki/Haskell). 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/C++ Compiler](https://en.wikipedia.org/wiki/IBM_XL_C/C%2B%2B_Compilers). [BASIC](https://en.wikipedia.org/wiki/BASIC) is available in [procedural](https://en.wikipedia.org/wiki/Procedural_programming) form from [QB64](https://en.wikipedia.org/wiki/QB64), [PureBasic](https://en.wikipedia.org/wiki/PureBasic), [Yabasic](https://en.wikipedia.org/wiki/Yabasic), [GLBasic](https://en.wikipedia.org/wiki/GLBasic), [Basic4GL](https://en.wikipedia.org/wiki/Basic4GL), [XBasic](https://en.wikipedia.org/wiki/XBasic), [wxBasic](https://en.wikipedia.org/wiki/WxBasic), [SdlBasic](https://en.wikipedia.org/wiki/SdlBasic), and [Basic-256](https://en.wikipedia.org/wiki/Basic-256), as well as [object oriented](https://en.wikipedia.org/wiki/Object_oriented_programming) through [Gambas](https://en.wikipedia.org/wiki/Gambas), [FreeBASIC](https://en.wikipedia.org/wiki/FreeBASIC), B4X, [Basic for Qt](https://en.wikipedia.org/w/index.php?title=Basic_for_Qt&action=edit&redlink=1), Phoenix Object Basic, [NS Basic](https://en.wikipedia.org/wiki/NS_Basic), ProvideX, [Chipmunk Basic](https://en.wikipedia.org/wiki/Chipmunk_Basic), [RapidQ](https://en.wikipedia.org/wiki/RapidQ) and [Xojo](https://en.wikipedia.org/wiki/Xojo). [Pascal](https://en.wikipedia.org/wiki/Pascal_(programming_language)) is implemented through [GNU Pascal](https://en.wikipedia.org/wiki/GNU_Pascal), [Free Pascal](https://en.wikipedia.org/wiki/Free_Pascal), and [Virtual Pascal](https://en.wikipedia.org/wiki/Virtual_Pascal), as well as graphically via [Lazarus](https://en.wikipedia.org/wiki/Lazarus_(software)), [PascalABC.NET](https://en.wikipedia.org/wiki/PascalABC.NET), or [Delphi](https://en.wikipedia.org/wiki/Delphi_(software)) using [FireMonkey](https://en.wikipedia.org/wiki/FireMonkey) (previously through [Borland Kylix](https://en.wikipedia.org/wiki/Borland_Kylix)).[[127]](https://en.wikipedia.org/wiki/Linux#cite_note-135)[[128]](https://en.wikipedia.org/wiki/Linux#cite_note-136)

A common feature of Unix-like systems, Linux includes traditional specific-purpose programming languages targeted at [scripting](https://en.wikipedia.org/wiki/Scripting_language), text processing and system configuration and management in general. Linux distributions support [shell scripts](https://en.wikipedia.org/wiki/Shell_script), [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_expression) are supported in programs like [grep](https://en.wikipedia.org/wiki/Grep) and [locate](https://en.wikipedia.org/wiki/Locate_(Unix)), the traditional Unix message transfer agent [Sendmail](https://en.wikipedia.org/wiki/Sendmail) contains its own [Turing complete](https://en.wikipedia.org/wiki/Turing_completeness) 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.[[129]](https://en.wikipedia.org/wiki/Linux#cite_note-137)[[130]](https://en.wikipedia.org/wiki/Linux#cite_note-138)[[131]](https://en.wikipedia.org/wiki/Linux#cite_note-139)

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)) and other [CLI](https://en.wikipedia.org/wiki/Common_Language_Infrastructure) [languages](https://en.wikipedia.org/wiki/List_of_CLI_languages) (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/Guile_(programming_language)) acts as an [extension language](https://en.wikipedia.org/wiki/Scripting_language) targeting the GNU system utilities, seeking to make the conventionally small, [static](https://en.wikipedia.org/wiki/Static_typing), compiled C 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_(virtual_machine))), and IBM's J2SE RE, as well as many open-source projects like [Kaffe](https://en.wikipedia.org/wiki/Kaffe) and [Jikes RVM](https://en.wikipedia.org/wiki/Jikes_RVM); [Kotlin](https://en.wikipedia.org/wiki/Kotlin_(programming_language)), [Scala](https://en.wikipedia.org/wiki/Scala_(programming_language)), [Groovy](https://en.wikipedia.org/wiki/Apache_Groovy) and other [JVM languages](https://en.wikipedia.org/wiki/List_of_JVM_languages) are also available.

[GNOME](https://en.wikipedia.org/wiki/GNOME) and [KDE](https://en.wikipedia.org/wiki/KDE) are popular desktop environments and provide a framework for developing applications. These projects are based on the [GTK](https://en.wikipedia.org/wiki/GTK) and [Qt](https://en.wikipedia.org/wiki/Qt_(toolkit)) widget toolkits, respectively, which can also be used independently of the larger framework. Both support a wide variety of languages. There are [a number](https://en.wikipedia.org/wiki/Category:Linux_integrated_development_environments) 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.[[132]](https://en.wikipedia.org/wiki/Linux#cite_note-140)

**Hardware support**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=14)]

[A diagram of a computer system

AI-generated content may be incorrect.](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 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 [ARM](https://en.wikipedia.org/wiki/ARM_architecture_family)-based Android smartphones and the [IBM Z](https://en.wikipedia.org/wiki/IBM_Z) mainframes. Specialized distributions and kernel forks exist for less mainstream architectures; for example, the [ELKS](https://en.wikipedia.org/wiki/Embeddable_Linux_Kernel_Subset) 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 microprocessors,[[133]](https://en.wikipedia.org/wiki/Linux#cite_note-141) 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).[[134]](https://en.wikipedia.org/wiki/Linux#cite_note-142) The kernel also runs on architectures that were only ever intended to use a proprietary manufacturer-created operating system, such as [Macintosh](https://en.wikipedia.org/wiki/Macintosh) computers[[135]](https://en.wikipedia.org/wiki/Linux#cite_note-143)[[136]](https://en.wikipedia.org/wiki/Linux#cite_note-144) (with [PowerPC](https://en.wikipedia.org/wiki/PowerPC), [Intel](https://en.wikipedia.org/wiki/Intel), and [Apple silicon](https://en.wikipedia.org/wiki/Apple_silicon) 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/Portable_media_player), and mobile phones.

Linux has a reputation for supporting old hardware very well by maintaining standardized drivers for a long time.[[137]](https://en.wikipedia.org/wiki/Linux#cite_note-145) There are several industry associations and hardware [conferences](https://en.wikipedia.org/wiki/Convention_(meeting)) 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.[[138]](https://en.wikipedia.org/wiki/Linux#cite_note-146)

In 2014, a new initiative was launched to automatically collect a database of all tested hardware configurations.[[139]](https://en.wikipedia.org/wiki/Linux#cite_note-linuxhw-147)

**Uses**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=15)]

*Main article:*[*Linux range of use*](https://en.wikipedia.org/wiki/Linux_range_of_use)

**Market share and uptake**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=16)]

*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/open-source software focus on topics including market share and reliability, with numerous studies specifically examining Linux.[[140]](https://en.wikipedia.org/wiki/Linux#cite_note-148) The Linux market is growing, and the Linux operating system market size is expected to see a growth of 19.2% by 2027, reaching $15.64 billion, compared to $3.89 billion in 2019.[[141]](https://en.wikipedia.org/wiki/Linux#cite_note-149) Analysts project a Compound Annual Growth Rate (CAGR) of 13.7% between 2024 and 2032, culminating in a market size of US$34.90 billion by the latter year.[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia:Citation_needed)] 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).[[142]](https://en.wikipedia.org/wiki/Linux#cite_note-150)[[143]](https://en.wikipedia.org/wiki/Linux#cite_note-151)

**Desktops and laptops**

According to [web server statistics](https://en.wikipedia.org/wiki/Web_analytics) (that is, based on the numbers recorded from visits to websites by client devices), in October 2024, the estimated market share of Linux on [desktop computers](https://en.wikipedia.org/wiki/Desktop_computer) was around 4.3%. In comparison, [Microsoft Windows](https://en.wikipedia.org/wiki/Microsoft_Windows) had a market share of around 73.4%, while [macOS](https://en.wikipedia.org/wiki/MacOS) covered around 15.5%.[[44]](https://en.wikipedia.org/wiki/Linux#cite_note-statcounter-desktop-51)

**Web servers**

W3Cook publishes stats that use the top 1,000,000 Alexa domains,[[144]](https://en.wikipedia.org/wiki/Linux#cite_note-152) which as of May 2015 estimate that 96.55% of web servers run Linux, 1.73% run Windows, and 1.72% run FreeBSD.[[145]](https://en.wikipedia.org/wiki/Linux#cite_note-153)

W3Techs publishes stats that use the top 10,000,000 Alexa domains and the top 1,000,000 Tranco domains, updated monthly[[146]](https://en.wikipedia.org/wiki/Linux#cite_note-154) and as of November 2020 estimate that Linux is used by 39% of the web servers, versus 21.9% being used by [Microsoft Windows](https://en.wikipedia.org/wiki/Microsoft_Windows).[[147]](https://en.wikipedia.org/wiki/Linux#cite_note-155) 40.1% used other types of Unix.[[148]](https://en.wikipedia.org/wiki/Linux#cite_note-156)

[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;[[149]](https://en.wikipedia.org/wiki/Linux#cite_note-Linux-watch.com_IDC's_Q1_2007_report-157) 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.

As of 2024, estimates suggest Linux accounts for at least 80% of the public cloud workload, partly thanks to its widespread use in platforms like Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform.[[150]](https://en.wikipedia.org/wiki/Linux#cite_note-158)[[151]](https://en.wikipedia.org/wiki/Linux#cite_note-159)[[152]](https://en.wikipedia.org/wiki/Linux#cite_note-160)

ZDNet report that 96.3% of the top one million web servers are running Linux.[[153]](https://en.wikipedia.org/wiki/Linux#cite_note-161)[[154]](https://en.wikipedia.org/wiki/Linux#cite_note-162) W3Techs state that Linux powers at least 39.2% of websites whose operating system is known, with other estimates saying 55%.[[155]](https://en.wikipedia.org/wiki/Linux#cite_note-163)[[156]](https://en.wikipedia.org/wiki/Linux#cite_note-164)

**Mobile devices**

Android, which is based on the Linux kernel, has become the dominant operating system for smartphones. In April 2023, 68.61% of mobile devices accessing websites using [StatCounter](https://en.wikipedia.org/wiki/StatCounter) were from Android.[[157]](https://en.wikipedia.org/wiki/Linux#cite_note-165) Android is also a popular operating system for tablets, being responsible for more than 60% of tablet sales as of 2013.[[158]](https://en.wikipedia.org/wiki/Linux#cite_note-166) According to web server statistics, as of October 2021 Android has a market share of about 71%, with [iOS](https://en.wikipedia.org/wiki/IOS) holding 28%, and the remaining 1% attributed to various niche platforms.[[159]](https://en.wikipedia.org/wiki/Linux#cite_note-167)

**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)).[[160]](https://en.wikipedia.org/wiki/Linux#cite_note-168)[[161]](https://en.wikipedia.org/wiki/Linux#cite_note-169) 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.[[162]](https://en.wikipedia.org/wiki/Linux#cite_note-170)[[163]](https://en.wikipedia.org/wiki/Linux#cite_note-171)[[164]](https://en.wikipedia.org/wiki/Linux#cite_note-172) According to the Linux Movies Group, more than 95% of the servers and desktops at large animation and visual effects companies use Linux.[[165]](https://en.wikipedia.org/wiki/Linux#cite_note-173)

**Use in government**

Linux distributions have also gained popularity with various local and national governments. News of the Russian military creating its own Linux distribution has also surfaced, and has come to fruition as the G.H.ost Project.[[166]](https://en.wikipedia.org/wiki/Linux#cite_note-174) 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.[[167]](https://en.wikipedia.org/wiki/Linux#cite_note-175)[[168]](https://en.wikipedia.org/wiki/Linux#cite_note-176) [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.[[169]](https://en.wikipedia.org/wiki/Linux#cite_note-177) In Spain, some regions have developed their own Linux distributions, which are widely used in education and official institutions, like gnuLinEx in Extremadura and 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.[[170]](https://en.wikipedia.org/wiki/Linux#cite_note-178) North Korea's [Red Star OS](https://en.wikipedia.org/wiki/Red_Star_OS), developed as of 2002, is based on a version of Fedora Linux.[[171]](https://en.wikipedia.org/wiki/Linux#cite_note-179)

**Copyright, trademark, and naming**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux&action=edit&section=17)]

*See also:*[*GNU/Linux naming controversy*](https://en.wikipedia.org/wiki/GNU/Linux_naming_controversy)*and*[*SCO–Linux disputes*](https://en.wikipedia.org/wiki/SCO%E2%80%93Linux_disputes)

The Linux kernel is [licensed](https://en.wikipedia.org/wiki/Software_license) under the 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.[[172]](https://en.wikipedia.org/wiki/Linux#cite_note-180) 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 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.[[173]](https://en.wikipedia.org/wiki/Linux#cite_note-181)[[174]](https://en.wikipedia.org/wiki/Linux#cite_note-182) 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).[[175]](https://en.wikipedia.org/wiki/Linux#cite_note-183) It would also be impractical to obtain permission from all the copyright holders, who number in the thousands.[[176]](https://en.wikipedia.org/wiki/Linux#cite_note-184)

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).[[177]](https://en.wikipedia.org/wiki/Linux#cite_note-estimating_size-185) 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 means, it would have cost about US$1.82 billion[[178]](https://en.wikipedia.org/wiki/Linux#cite_note-inflation-USGDP-186) to develop in 2023 in the United States.[[177]](https://en.wikipedia.org/wiki/Linux#cite_note-estimating_size-185) Most of the source code (71%) was written in the C 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, Perl, Python, [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.[[177]](https://en.wikipedia.org/wiki/Linux#cite_note-estimating_size-185)

In a later study, the same analysis was performed for Debian version 4.0 (etch, which was released in 2007).[[179]](https://en.wikipedia.org/wiki/Linux#cite_note-187) 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$10.2 billion[[178]](https://en.wikipedia.org/wiki/Linux#cite_note-inflation-USGDP-186) (in 2023 dollars) to develop by conventional means.

[Shelves of laundry detergents on a shelf

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:LinuxWasch3.jpg)The name "Linux" is also used for a laundry detergent made by Swiss company Rösch.[[180]](https://en.wikipedia.org/wiki/Linux#cite_note-188)

In the United States, the name *Linux* is a trademark registered to Linus Torvalds.[[14]](https://en.wikipedia.org/wiki/Linux#cite_note-US_trademark-19) Initially, nobody registered it. However, 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.[[181]](https://en.wikipedia.org/wiki/Linux#cite_note-189) 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,[[182]](https://en.wikipedia.org/wiki/Linux#cite_note-190) but later changed this in favor of offering a free, perpetual worldwide sublicense.[[183]](https://en.wikipedia.org/wiki/Linux#cite_note-191)

[A cartoon penguin and goat

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:Gnulinux.svg)[Tux](https://en.wikipedia.org/wiki/Tux_(mascot)) sometimes is stylized with incorporation of the [GNU](https://en.wikipedia.org/wiki/GNU) logo

The 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 operating system initiated in 1983 by [Richard Stallman](https://en.wikipedia.org/wiki/Richard_Stallman), president of the FSF.[[28]](https://en.wikipedia.org/wiki/Linux#cite_note-gnu_linux_faq-34)[[29]](https://en.wikipedia.org/wiki/Linux#cite_note-linux-and-gnu-35) The foundation explicitly takes 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 distributions consisting of only free software, such as Debian (which had been sponsored by the FSF up to 1996),[[184]](https://en.wikipedia.org/wiki/Linux#cite_note-192) also use *GNU/Linux* when referring to the operating system as a whole.[[185]](https://en.wikipedia.org/wiki/Linux#cite_note-tivo-193)[[186]](https://en.wikipedia.org/wiki/Linux#cite_note-194)[[187]](https://en.wikipedia.org/wiki/Linux#cite_note-195) 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)).

As of May 2011, about 8% to 13% of the [lines of code](https://en.wikipedia.org/wiki/Source_lines_of_code) of the Linux distribution Ubuntu (version "Natty") is made of GNU components (the range depending on whether GNOME is considered part of GNU); meanwhile, 6% is taken by the Linux kernel, increased to 9% when including its direct dependencies.[[188]](https://en.wikipedia.org/wiki/Linux#cite_note-how-much-gnu-196)

Linux range of use

3 languages

* [Article](https://en.wikipedia.org/wiki/Linux_range_of_use)
* [Talk](https://en.wikipedia.org/wiki/Talk:Linux_range_of_use)
* [Read](https://en.wikipedia.org/wiki/Linux_range_of_use)
* [Edit](https://en.wikipedia.org/w/index.php?title=Linux_range_of_use&action=edit)
* [View history](https://en.wikipedia.org/w/index.php?title=Linux_range_of_use&action=history)

Tools

**Appearance**

 hide

Text

Top of Form

Small

Standard

Large

Bottom of Form

Width

Top of Form

Standard

Wide

Bottom of Form

Color (beta)

Top of Form

Automatic

Light

Dark

Bottom of Form

From Wikipedia, the free encyclopedia

Besides the [Linux distributions](https://en.wikipedia.org/wiki/Linux_distribution) designed for general-purpose use on desktops and servers, distributions may be specialized for different purposes including [computer architecture](https://en.wikipedia.org/wiki/Computer_architecture) support, [embedded systems](https://en.wikipedia.org/wiki/Embedded_Linux), stability, security, localization to a specific region or language, targeting of specific user groups, support for [real-time](https://en.wikipedia.org/wiki/Real-time_computing) applications, or commitment to a given desktop environment. Furthermore, some distributions deliberately include only [free software](https://en.wikipedia.org/wiki/Free_software). As of 2015, over four hundred Linux distributions are actively developed, with about a dozen distributions being most popular for general-purpose use.[[1]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-1)

**Desktop**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_range_of_use&action=edit&section=1)]

[A screen shot of a computer

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:Free_and_open-source-software_display_servers_and_UI_toolkits.svg)Visible software components of the Linux desktop stack include the [display server](https://en.wikipedia.org/wiki/Display_server), [widget engines](https://en.wikipedia.org/wiki/Widget_engine), and some of the more widespread [widget toolkits](https://en.wikipedia.org/wiki/Widget_toolkit). There are also components not directly visible to end-users, including [D-Bus](https://en.wikipedia.org/wiki/D-Bus) and [PulseAudio](https://en.wikipedia.org/wiki/PulseAudio).

*See also:*[*Desktop environment*](https://en.wikipedia.org/wiki/Desktop_environment)*,*[*Linux adoption: Measuring desktop adoption*](https://en.wikipedia.org/wiki/Linux_adoption#DESKTOP)*, and*[*Criticism of desktop Linux*](https://en.wikipedia.org/wiki/Criticism_of_desktop_Linux)

The popularity of Linux on standard desktop computers and laptops has been increasing over the years.[[2]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-2) Most modern distributions include a graphical user environment, with, as of February 2015, the three most popular environments being the [KDE Plasma Desktop](https://en.wikipedia.org/wiki/KDE_Plasma_Desktop), [Xfce](https://en.wikipedia.org/wiki/Xfce) and [GNOME](https://en.wikipedia.org/wiki/GNOME).[[3]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-3)[[4]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-4)[[5]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-5)

No single official Linux desktop exists: rather desktop environments and Linux distributions select components from a pool of [free and open-source software](https://en.wikipedia.org/wiki/Free_and_open-source_software) with which they construct a GUI implementing some more or less strict design guide. GNOME, for example, has its [human interface guidelines](https://en.wikipedia.org/wiki/Human_interface_guidelines) as a design guide, which gives the [human–machine interface](https://en.wikipedia.org/wiki/Human%E2%80%93machine_interface) an important role, not just when doing the graphical design, but also when considering people with [disabilities](https://en.wikipedia.org/wiki/Disability), and even when focusing on security.[[6]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-6)

The collaborative nature of free software development allows distributed teams to perform [language localization](https://en.wikipedia.org/wiki/Language_localisation) of some Linux distributions for use in locales where localizing proprietary systems would not be cost-effective. For example, the [Sinhalese language](https://en.wikipedia.org/wiki/Sinhalese_language) version of the [Knoppix](https://en.wikipedia.org/wiki/Knoppix) distribution became available significantly before Microsoft translated [Windows XP](https://en.wikipedia.org/wiki/Windows_XP) into Sinhalese.[[7]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-7) In this case the [Lanka Linux User Group](https://en.wikipedia.org/wiki/Lanka_Linux_User_Group) played a major part in developing the localized system by combining the knowledge of university professors, [linguists](https://en.wikipedia.org/wiki/Linguist), and local developers.

**Performance and applications**

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

The performance of Linux on the desktop has been a controversial topic;[[8]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-8) for example in 2007 [Con Kolivas](https://en.wikipedia.org/wiki/Con_Kolivas) accused the Linux community of favoring performance on servers. He quit Linux kernel development out of frustration with this lack of focus on the desktop, and then gave a "tell all" interview on the topic.[[9]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-9) Since then a significant amount of development has focused on improving the desktop experience. Projects such as [systemd](https://en.wikipedia.org/wiki/Systemd) and [Upstart](https://en.wikipedia.org/wiki/Upstart_(software)) (deprecated in 2014) aim for a faster boot time; the Wayland and Mir projects aim at replacing [X11](https://en.wikipedia.org/wiki/X11) while enhancing desktop performance, security and appearance.[[10]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-10) Userspace [scheduler](https://en.wikipedia.org/wiki/Scheduling_(computing)) extensions make it possible to use a scheduler specialized for a specific usage, such as gaming or desktop usage.[[11]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-11)[[12]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-12)

Many popular applications are available for a wide variety of operating systems. For example, [Mozilla Firefox](https://en.wikipedia.org/wiki/Mozilla_Firefox), [LibreOffice](https://en.wikipedia.org/wiki/LibreOffice) and [Blender](https://en.wikipedia.org/wiki/Blender_(software)) have downloadable versions for all major operating systems. Furthermore, some applications initially developed for Linux, such as [Pidgin](https://en.wikipedia.org/wiki/Pidgin_(software)), and [GIMP](https://en.wikipedia.org/wiki/GIMP), were ported to other operating systems (including [Windows](https://en.wikipedia.org/wiki/Microsoft_Windows) and [macOS](https://en.wikipedia.org/wiki/MacOS)) due to their popularity. In addition, a growing number of proprietary desktop applications are also supported on Linux,[[13]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-13) such as [Autodesk Maya](https://en.wikipedia.org/wiki/Maya_(software)) and [The Foundry's Nuke](https://en.wikipedia.org/wiki/Nuke_(software)) in the high-end field of animation and visual effects; see the list of proprietary software for Linux for more details. There are also [several companies](https://en.wikipedia.org/wiki/Linux_gaming#Proprietary_games) that have ported their own or other companies' games to Linux, with Linux also being a supported platform on both the [Steam](https://en.wikipedia.org/wiki/Steam_(service)) and [Desura](https://en.wikipedia.org/wiki/Desura) digital-distribution services.[[14]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-14)

Many other types of applications available for Microsoft Windows and macOS also run on Linux. Commonly, either a [free software](https://en.wikipedia.org/wiki/Free_software) application will exist which does the functions of an application found on another operating system, or that application will have a version that works on Linux, such as with [Skype](https://en.wikipedia.org/wiki/Skype) and some [video games](https://en.wikipedia.org/wiki/Linux_gaming#Proprietary_games) like [*Dota 2*](https://en.wikipedia.org/wiki/Dota_2) and [*Team Fortress 2*](https://en.wikipedia.org/wiki/Team_Fortress_2). Furthermore, the [Wine](https://en.wikipedia.org/wiki/Wine_(software)) project provides a Windows compatibility layer to run unmodified Windows applications on Linux. It is sponsored by commercial interests including [CodeWeavers](https://en.wikipedia.org/wiki/CodeWeavers), which produces a commercial version of the software. Since 2009, Google has also provided funding to the Wine project.[[15]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-15)[[16]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-16) [CrossOver](https://en.wikipedia.org/wiki/CrossOver), a proprietary solution based on the open-source Wine project, supports running Windows versions of [Microsoft Office](https://en.wikipedia.org/wiki/Microsoft_Office), [Intuit](https://en.wikipedia.org/wiki/Intuit) applications such as [Quicken](https://en.wikipedia.org/wiki/Quicken) and [QuickBooks](https://en.wikipedia.org/wiki/QuickBooks), [Adobe Photoshop](https://en.wikipedia.org/wiki/Adobe_Photoshop) versions through CS2, and many games such as [*World of Warcraft*](https://en.wikipedia.org/wiki/World_of_Warcraft). In other cases, where there is no Linux port of some software in areas such as [desktop publishing](https://en.wikipedia.org/wiki/Desktop_publishing)[[17]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-17) and [professional audio](https://en.wikipedia.org/wiki/Professional_audio),[[18]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-18)[[19]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-19)[[20]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-20) there is equivalent software available on Linux. It is also possible to run applications written for [Android](https://en.wikipedia.org/wiki/Android_OS) on other versions of Linux using [Anbox](https://en.wikipedia.org/wiki/Anbox) (deprecated) or with [Waydroid](https://en.wikipedia.org/wiki/Waydroid).

**Components and installation**

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

Besides externally visible components, such as [X window managers](https://en.wikipedia.org/wiki/X_window_manager), a non-obvious but quite central role is played by the programs hosted by [freedesktop.org](https://en.wikipedia.org/wiki/Freedesktop.org), such as [D-Bus](https://en.wikipedia.org/wiki/D-Bus) or [PulseAudio](https://en.wikipedia.org/wiki/PulseAudio); both major desktop environments (GNOME and KDE) include them, each offering graphical front-ends written using the corresponding toolkit ([GTK](https://en.wikipedia.org/wiki/GTK) or [Qt](https://en.wikipedia.org/wiki/Qt_(framework))). A [display server](https://en.wikipedia.org/wiki/Display_server) is another component, which for the longest time has been communicating in the X11 display server protocol with its clients; prominent software talking X11 includes the [X.Org Server](https://en.wikipedia.org/wiki/X.Org_Server) and [Xlib](https://en.wikipedia.org/wiki/Xlib). Frustration over the cumbersome X11 core protocol, and especially over its numerous extensions, has led to the creation of a new display server protocol, [Wayland](https://en.wikipedia.org/wiki/Wayland_(display_server_protocol)).

Installing, updating and removing software in Linux is typically done through the use of package managers such as the [Synaptic Package Manager](https://en.wikipedia.org/wiki/Synaptic_Package_Manager), [PackageKit](https://en.wikipedia.org/wiki/PackageKit), and [Yum Extender](https://en.wikipedia.org/wiki/Yellow_dog_Updater,_Modified). While most major Linux distributions have extensive repositories, often containing tens of thousands of packages, not all the software that can run on Linux is available from the official repositories. Alternatively, users can install packages from unofficial repositories, download pre-compiled packages directly from websites, or compile the source code by themselves. All these methods come with different degrees of difficulty; compiling the source code is in general considered a challenging process for new Linux users, but it is hardly needed in modern distributions and is not a method specific to Linux.

* **Samples of graphical desktop interfaces**
* [](https://en.wikipedia.org/wiki/File:GNOME_Shell_40_(applications_grid).png)

[GNOME](https://en.wikipedia.org/wiki/GNOME)

* [](https://en.wikipedia.org/wiki/File:KDE_Plasma_6.3_desktop_screenshot.webp)

[KDE Plasma 6](https://en.wikipedia.org/wiki/KDE_Plasma_6)

* [](https://en.wikipedia.org/wiki/File:Cinnamon_4.2.3_screenshot.png)

[Cinnamon](https://en.wikipedia.org/wiki/Cinnamon_(desktop_environment))

* [](https://en.wikipedia.org/wiki/File:Ubuntu_Mate_18.04.1_with_MATE_1.20.1.png)

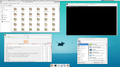
[MATE (software)](https://en.wikipedia.org/wiki/MATE_(software))

* [](https://en.wikipedia.org/wiki/File:Elementary_OS_%22Odin%22.png)

[Pantheon](https://en.wikipedia.org/wiki/Pantheon_(desktop_environment))

* [](https://en.wikipedia.org/wiki/File:Solus_Budgie_4.3.jpg)

[Budgie](https://en.wikipedia.org/wiki/Budgie_(desktop_environment))

* [](https://en.wikipedia.org/wiki/File:XFCE-4.12-Desktop-standard.png)

[Xfce](https://en.wikipedia.org/wiki/Xfce)

* [](https://en.wikipedia.org/wiki/File:Ubuntu_16.04_Desktop.png)

[Unity](https://en.wikipedia.org/wiki/Unity_(user_interface))

* [](https://en.wikipedia.org/wiki/File:Lubuntu_13.04_English.png)

[LXDE](https://en.wikipedia.org/wiki/LXDE)

* [](https://en.wikipedia.org/wiki/File:LXQt_0.10_-_Ambiance.png)

[LXQt](https://en.wikipedia.org/wiki/LXQt)

* [](https://en.wikipedia.org/wiki/File:I3-gaps-wiki.png)

[i3](https://en.wikipedia.org/wiki/I3_(window_manager))

* [](https://en.wikipedia.org/wiki/File:E17_bw_screenshot.png)

[Enlightenment](https://en.wikipedia.org/wiki/Enlightenment_(window_manager))

* [](https://en.wikipedia.org/wiki/File:Fluxbox.png)

[Fluxbox](https://en.wikipedia.org/wiki/Fluxbox)

* [](https://en.wikipedia.org/wiki/File:Sugar-home-view-0.82.jpg)

[Sugar](https://en.wikipedia.org/wiki/Sugar_(desktop_environment))

* [](https://en.wikipedia.org/wiki/File:Screenshot_of_Trinity_Desktop_Environment_(TDE)_R14.0.5_Development.png)

[Trinity](https://en.wikipedia.org/wiki/Trinity_(desktop_environment))

* [](https://en.wikipedia.org/wiki/File:CDE_Application_Builder.png)

[CDE](https://en.wikipedia.org/wiki/Common_Desktop_Environment)

**Netbooks**

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

Linux distributions have also become popular in the [netbook](https://en.wikipedia.org/wiki/Netbook) market, with many devices such as the [Asus Eee PC](https://en.wikipedia.org/wiki/Asus_Eee_PC) and [Acer Aspire One](https://en.wikipedia.org/wiki/Aspire_One) shipping with customized Linux distributions installed.[[21]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-21)

In 2009, Google announced its [ChromeOS](https://en.wikipedia.org/wiki/ChromeOS) as a minimal Linux-based operating system, using the [Chrome browser](https://en.wikipedia.org/wiki/Chrome_browser) as the main user interface. ChromeOS initially did not run any non-web applications, except for the bundled file manager and media player. Netbooks that shipped with the operating system, termed [Chromebooks](https://en.wikipedia.org/wiki/Chromebooks), started appearing on the market in June 2011.[[22]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-22)

By 2015 Chromebooks with large screens were available, and also in other forms factors such as laptop, desktop, tablet and all-in-one. [Android](https://en.wikipedia.org/wiki/Android_(operating_system)) applications support was added.[[23]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-23) As of 2018, Google added the ability to install any Linux software in a container,[[24]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-24) enabling ChromeOS to be used like any other Linux distribution.

**Servers, mainframes and supercomputers**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_range_of_use&action=edit&section=5)]

[A computer screen shot of a penguin

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:LAMP_software_bundle.svg)Broad overview of the [LAMP software bundle](https://en.wikipedia.org/wiki/LAMP_(software_bundle)), displayed here together with [Squid](https://en.wikipedia.org/wiki/Squid_(software)). A high-performance and high-availability web server solution providing security in a hostile environment.

[Linux distributions](https://en.wikipedia.org/wiki/Linux_distribution) have long been used as [server](https://en.wikipedia.org/wiki/Server_(computing)) operating systems, and have risen to prominence in that area; [Netcraft](https://en.wikipedia.org/wiki/Netcraft) reported in September 2006, that eight of the ten (other two with "unknown" OS) most reliable internet hosting companies ran Linux distributions on their [web servers](https://en.wikipedia.org/wiki/Web_server),[[25]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-25) with Linux in the top position. In June 2008, Linux distributions represented five of the top ten, [FreeBSD](https://en.wikipedia.org/wiki/FreeBSD) three of ten, and [Microsoft](https://en.wikipedia.org/wiki/Microsoft) two of ten;[[26]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-26) since February 2010, Linux distributions represented six of the top ten, FreeBSD three of ten, and Microsoft one of ten,[[27]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-27) with Linux in the top position.

Linux distributions are the cornerstone of the [LAMP](https://en.wikipedia.org/wiki/LAMP_(software_bundle)) server-software combination (Linux, [Apache](https://en.wikipedia.org/wiki/Apache_HTTP_Server), [MariaDB](https://en.wikipedia.org/wiki/MariaDB)/[MySQL](https://en.wikipedia.org/wiki/MySQL), [Perl](https://en.wikipedia.org/wiki/Perl)/[PHP](https://en.wikipedia.org/wiki/PHP)/[Python](https://en.wikipedia.org/wiki/Python_(programming_language))) which is one of the more common platforms for website hosting.[[28]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-SecuritySpace-28)

Linux distributions have become increasingly common on [mainframes](https://en.wikipedia.org/wiki/Mainframe_computer), partly due to pricing and the open-source model.[[29]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-29) In December 2009, computer giant [IBM](https://en.wikipedia.org/wiki/IBM) reported that it would predominantly market and sell mainframe-based Enterprise Linux Server.[[30]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-The_Register-30) At [LinuxCon North America 2015](https://en.wikipedia.org/wiki/LinuxCon), IBM announced [LinuxONE](https://en.wikipedia.org/wiki/LinuxONE), a series of mainframes specifically designed to run Linux and open-source software.[[31]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-31)[[32]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-32)

Linux distributions are also dominant as [operating systems](https://en.wikipedia.org/wiki/Operating_system) for [supercomputers](https://en.wikipedia.org/wiki/Supercomputer).[[33]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-rules_supercomputers-33) As of November 2017, all supercomputers on the [500](https://en.wikipedia.org/wiki/TOP500) list run some variant of Linux.[[34]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-top500stats-34)

**Smart devices**

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

[A group of cell phones

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:Samsung_Galaxy_Note_series_2.jpg)Android smartphones[The inside of a car

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:Tesla_Model_S_digital_panels.jpg)[In-car entertainment](https://en.wikipedia.org/wiki/In-car_entertainment) system of the [Tesla Model S](https://en.wikipedia.org/wiki/Tesla_Model_S) is based on [Ubuntu](https://en.wikipedia.org/wiki/Ubuntu).[[35]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-35)[[36]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-36)

Several operating systems for [smart devices](https://en.wikipedia.org/wiki/Smart_devices), such as [smartphones](https://en.wikipedia.org/wiki/Smartphone), [tablet computers](https://en.wikipedia.org/wiki/Tablet_computer), [home automation](https://en.wikipedia.org/wiki/Home_automation), [smart TVs](https://en.wikipedia.org/wiki/Smart_TV) ([Samsung](https://en.wikipedia.org/wiki/Samsung) and [LG](https://en.wikipedia.org/wiki/LG) [Smart TVs](https://en.wikipedia.org/wiki/Smart_TV) use [Tizen](https://en.wikipedia.org/wiki/Tizen) and [WebOS](https://en.wikipedia.org/wiki/WebOS), respectively),[[37]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-Linux_Smart_TVs-37) and [in-vehicle infotainment](https://en.wikipedia.org/wiki/In-vehicle_infotainment) (IVI) systems[[38]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-Linux_cars-38) (for example [Automotive Grade Linux](https://en.wikipedia.org/wiki/Automotive_Grade_Linux)), are based on Linux. Major platforms for such systems include [Android](https://en.wikipedia.org/wiki/Android_(operating_system)), [Firefox OS](https://en.wikipedia.org/wiki/Firefox_OS), [Mer](https://en.wikipedia.org/wiki/Mer_(software_distribution)) and [Tizen](https://en.wikipedia.org/wiki/Tizen).

Based on web use, Android's [usage share of operating systems](https://en.wikipedia.org/wiki/Usage_share_of_operating_systems) dominates globally, with almost double the marketshare of Microsoft Windows. As of September 2024 it has 45.4% of the global market, followed by Windows with less than 25.6%.[[39]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-39)

Although Android is based on a modified version of the Linux kernel, commentators disagree on whether the term "Linux distribution" applies to it, and whether it is "Linux" according to the common usage of the term. Android is a [Linux distribution](https://en.wikipedia.org/wiki/Linux_distribution) according to the [Linux Foundation](https://en.wikipedia.org/wiki/Linux_Foundation),[[40]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-40) Google's open-source chief [Chris DiBona](https://en.wikipedia.org/wiki/Chris_DiBona),[[41]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-41) and several journalists.[[42]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-42)[[43]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-43) Others, such as Google engineer Patrick Brady, say that Android is not Linux in the traditional [Unix-like](https://en.wikipedia.org/wiki/Unix-like) Linux distribution sense; Android does not include the [GNU C Library](https://en.wikipedia.org/wiki/GNU_C_Library) (it uses [Bionic](https://en.wikipedia.org/wiki/Bionic_(software)) as an alternative C library) and some other components typically found in Linux distributions.[[44]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-ars_introduction_developer-44) [*Ars Technica*](https://en.wikipedia.org/wiki/Ars_Technica) wrote that "Although Android is built on top of the Linux kernel, the platform has very little in common with the conventional desktop Linux stack".[[44]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-ars_introduction_developer-44)

Cellphones and PDAs running Linux on open-source platforms became more common from 2007; examples include the [Nokia N810](https://en.wikipedia.org/wiki/Nokia_N810), [Openmoko](https://en.wikipedia.org/wiki/Openmoko)'s [Neo1973](https://en.wikipedia.org/wiki/Neo1973), and the [Motorola ROKR E8](https://en.wikipedia.org/wiki/Motorola_ROKR_E8). Continuing the trend, [Palm](https://en.wikipedia.org/wiki/Palm,_Inc.) (later acquired by [HP](https://en.wikipedia.org/wiki/Hewlett-Packard)) produced a new Linux-derived operating system, [webOS](https://en.wikipedia.org/wiki/WebOS), which is built into its line of [Palm Pre](https://en.wikipedia.org/wiki/Palm_Pre) smartphones.

[Nokia](https://en.wikipedia.org/wiki/Nokia)'s [Maemo](https://en.wikipedia.org/wiki/Maemo), one of the earliest mobile operating systems, was based on [Debian](https://en.wikipedia.org/wiki/Debian).[[45]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-45) It was later merged with [Intel](https://en.wikipedia.org/wiki/Intel)'s [Moblin](https://en.wikipedia.org/wiki/Moblin), another Linux-based operating system, to form [MeeGo](https://en.wikipedia.org/wiki/MeeGo).[[46]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-46) The project was later terminated in favor of Tizen, an operating system targeted at mobile devices as well as IVI. Tizen is a project within [The Linux Foundation](https://en.wikipedia.org/wiki/The_Linux_Foundation). Several [Samsung](https://en.wikipedia.org/wiki/Samsung) products are already running Tizen, [Samsung Gear 2](https://en.wikipedia.org/wiki/Samsung_Gear_2) being the most significant example.[[47]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-47) [Samsung Z](https://en.wikipedia.org/wiki/Samsung_Z) smartphones will use Tizen instead of Android.[[48]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-48)

As a result of MeeGo's termination, the Mer project forked the MeeGo codebase to create a basis for mobile-oriented operating systems.[[49]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-49) In July 2012, [Jolla](https://en.wikipedia.org/wiki/Jolla) announced [Sailfish OS](https://en.wikipedia.org/wiki/Sailfish_OS), their own mobile operating system built upon Mer technology.

[A cell phone with a screen

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:Pine-pinephone.jpg)The [PinePhone](https://en.wikipedia.org/wiki/PinePhone) running [Plasma Mobile](https://en.wikipedia.org/wiki/Plasma_Mobile) on [postmarketOS](https://en.wikipedia.org/wiki/PostmarketOS)

[Mozilla's](https://en.wikipedia.org/wiki/Mozilla) Firefox OS consists of the Linux kernel, a [hardware abstraction layer](https://en.wikipedia.org/wiki/Hardware_abstraction_layer), a [web-standards](https://en.wikipedia.org/wiki/Web_standards)-based [runtime environment](https://en.wikipedia.org/wiki/Runtime_system) and user interface, and an integrated [web browser](https://en.wikipedia.org/wiki/Web_browser).[[50]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-50)

[Canonical](https://en.wikipedia.org/wiki/Canonical_Ltd.) has released [Ubuntu Touch](https://en.wikipedia.org/wiki/Ubuntu_Touch), aiming to bring convergence to the user experience on this mobile operating system and its desktop counterpart, [Ubuntu](https://en.wikipedia.org/wiki/Ubuntu_(operating_system)). The operating system also provides a full Ubuntu desktop when connected to an external monitor.[[51]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-51)

The [Librem 5](https://en.wikipedia.org/wiki/Librem_5) is a smartphone developed by [Purism](https://en.wikipedia.org/wiki/Purism_(company)). By default, it runs the company-made Linux-based [PureOS](https://en.wikipedia.org/wiki/PureOS), but it can also run other Linux distributions.[[52]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-52) Like Ubuntu Touch, PureOS is designed with convergence in mind, allowing desktop programs to run on the smartphone. An example of this is the desktop version of [Mozilla Firefox](https://en.wikipedia.org/wiki/Mozilla_Firefox).[[53]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-53)

Another smartphone is the [PinePhone](https://en.wikipedia.org/wiki/PinePhone), made by the computer manufacturer [Pine64](https://en.wikipedia.org/wiki/Pine64). The PinePhone can run a variety of Linux-based operating systems such as Ubuntu Touch and [postmarketOS](https://en.wikipedia.org/wiki/PostmarketOS).[[54]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-54)

**Embedded devices**

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

*See also:*[*Embedded Linux*](https://en.wikipedia.org/wiki/Embedded_Linux)*and*[*Linux devices*](https://en.wikipedia.org/wiki/Linux_devices)

[A black and blue router

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:Linksys-Wireless-G-Router.jpg)A ubiquitous [router](https://en.wikipedia.org/wiki/Router_(computing)) running on the Linux kernel

Due to its low cost and ease of customization, [Linux](https://en.wikipedia.org/wiki/Embedded_Linux) is often used in [embedded systems](https://en.wikipedia.org/wiki/Embedded_system). In the non-mobile telecommunications equipment sector, the majority of [customer-premises equipment](https://en.wikipedia.org/wiki/Customer-premises_equipment) (CPE) hardware runs some Linux-based operating system. [OpenWrt](https://en.wikipedia.org/wiki/OpenWrt) is a community-driven example upon which many of the OEM firmware releases are based.

For example, the [TiVo](https://en.wikipedia.org/wiki/TiVo) digital video recorder also uses a customized Linux,[[55]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-tivo-55) as do several network [firewalls](https://en.wikipedia.org/wiki/Firewall_(computing)) and [routers](https://en.wikipedia.org/wiki/Router_(computing)) from such makers as [Cisco](https://en.wikipedia.org/wiki/Cisco)/[Linksys](https://en.wikipedia.org/wiki/Linksys). The [Korg OASYS](https://en.wikipedia.org/wiki/Korg_OASYS), the [Korg KRONOS](https://en.wikipedia.org/wiki/Korg_KRONOS), the [Yamaha Motif XS](https://en.wikipedia.org/wiki/Yamaha_Motif#Motif_XS)/Motif XF [music workstations](https://en.wikipedia.org/wiki/Music_workstation),[[56]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-56) Yamaha S90XS/S70XS, Yamaha MOX6/MOX8 synthesizers, Yamaha Motif-Rack XS [tone generator module](https://en.wikipedia.org/wiki/Synthesizer), and Roland RD-700GX [digital piano](https://en.wikipedia.org/wiki/Digital_piano) also run Linux. Linux is also used in [stage lighting](https://en.wikipedia.org/wiki/Stage_lighting) control systems, such as the WholeHogIII console.[[57]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-57)

**Gaming**

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

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

In the past, there were few games available for Linux. In recent years, more games have been released with support for Linux (especially [Indie games](https://en.wikipedia.org/wiki/Indie_game)), with the exception of a few [AAA title](https://en.wikipedia.org/wiki/AAA_(video_game_industry)) games. [Android](https://en.wikipedia.org/wiki/Android_(operating_system)), a mobile platform which uses the [Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel), has gained much developer interest and is one of the main platforms for mobile game development along with [iOS](https://en.wikipedia.org/wiki/IOS) operating system by [Apple](https://en.wikipedia.org/wiki/Apple_Inc.) for [iPhone](https://en.wikipedia.org/wiki/IPhone) and [iPad](https://en.wikipedia.org/wiki/IPad) devices.

On February 14, 2013, [Valve](https://en.wikipedia.org/wiki/Valve_Corporation) released a Linux version of [Steam](https://en.wikipedia.org/wiki/Steam_(service)), a gaming distribution platform on PC.[[58]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-58) Many Steam games were ported to Linux.[[59]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-59) On December 13, 2013, Valve released [SteamOS](https://en.wikipedia.org/wiki/SteamOS), a gaming-oriented OS based on Debian, for [beta testing](https://en.wikipedia.org/wiki/Beta_testing), and had plans to ship [Steam Machines](https://en.wikipedia.org/wiki/Steam_Machine_(hardware_platform)) as a gaming and entertainment platform.[[60]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-60) Valve has also developed [VOGL](https://en.wikipedia.org/wiki/VOGL), an [OpenGL](https://en.wikipedia.org/wiki/OpenGL) debugger intended to aid video game development,[[61]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-61) as well as porting its [Source](https://en.wikipedia.org/wiki/Source_(game_engine)) game engine to desktop Linux.[[62]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-62) As a result of Valve's effort, several prominent games such as [*DotA 2*](https://en.wikipedia.org/wiki/Dota_2), [*Team Fortress 2*](https://en.wikipedia.org/wiki/Team_Fortress_2), [*Portal*](https://en.wikipedia.org/wiki/Portal_(video_game)), [*Portal 2*](https://en.wikipedia.org/wiki/Portal_2) and [*Left 4 Dead 2*](https://en.wikipedia.org/wiki/Left_4_Dead_2) are now natively available on desktop Linux.

On July 31, 2013, [Nvidia](https://en.wikipedia.org/wiki/Nvidia) released [Shield](https://en.wikipedia.org/wiki/Nvidia_Shield) as an attempt to use Android as a specialized gaming platform.[[63]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-63)

Some Linux users play Windows-based games using [Wine](https://en.wikipedia.org/wiki/Wine_(software)) or [CrossOver Linux](https://en.wikipedia.org/wiki/CrossOver_(software)).

[A black rectangular object with a black border

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:Steam_Deck_(front).png)Steam Deck, a handheld gaming console running Linux-based operating system

On August 22, 2018, Valve released their own fork of Wine called [Proton](https://en.wikipedia.org/wiki/Proton_(compatibility_layer)), aimed at gaming. It features some improvements over the vanilla Wine such as Vulkan-based DirectX 11 and 12 implementations, Steam integration, better full screen and game controller support and improved performance for multi-threaded games.[[64]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-64)

In 2021, ProtonDB, an online aggregator of games supporting Linux, stated that 78% of the top thousand games on Steam were able to run on Linux using either [Proton](https://en.wikipedia.org/wiki/Proton_(software)) or a native port.[[65]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-65)

On February 25, 2022, Valve released [Steam Deck](https://en.wikipedia.org/wiki/Steam_Deck), a [handheld gaming console](https://en.wikipedia.org/wiki/Handheld_game_console) running [Arch Linux](https://en.wikipedia.org/wiki/Arch_Linux)-based operating system SteamOS 3.0.[[66]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-:02-66)[[67]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-67)

**Specialized uses**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_range_of_use&action=edit&section=9)]

Due to the flexibility, customizability and free and open-source nature of Linux, it becomes possible to highly tailor Linux towards a specific purpose. There are two main methods to assemble a specialized Linux distribution: building from scratch or from a general-purpose distribution as a base. The distributions often used for this purpose include [Debian](https://en.wikipedia.org/wiki/Debian), [Fedora](https://en.wikipedia.org/wiki/Fedora_(operating_system)), [Ubuntu](https://en.wikipedia.org/wiki/Ubuntu_(operating_system)) (which is itself based on Debian), [Arch Linux](https://en.wikipedia.org/wiki/Arch_Linux), [Gentoo](https://en.wikipedia.org/wiki/Gentoo_Linux), and [Slackware](https://en.wikipedia.org/wiki/Slackware). In contrast, Linux distributions built from scratch do not have general-purpose bases; instead, they focus on the [JeOS](https://en.wikipedia.org/wiki/JeOS) philosophy by including only necessary components and avoiding [resource](https://en.wikipedia.org/wiki/System_resource) overhead caused by components considered redundant in the distribution's use cases.

**Home theater PC**

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

A [home theater PC](https://en.wikipedia.org/wiki/Home_theater_PC) (HTPC) is a PC that is mainly used as an entertainment system, especially a [home theater system](https://en.wikipedia.org/wiki/Home_theater_system). It is normally connected to a television, and often an additional audio system.

[OpenELEC](https://en.wikipedia.org/wiki/OpenELEC), a Linux distribution that incorporates the media center software [Kodi](https://en.wikipedia.org/wiki/Kodi_(software)), is an OS tuned specifically for an HTPC. Having been built from the ground up adhering to the JeOS principle, the OS is very lightweight and very suitable for the confined usage range of an HTPC.

There are also special editions of Linux distributions that include the [MythTV](https://en.wikipedia.org/wiki/MythTV) media center software, such as [Mythbuntu](https://en.wikipedia.org/wiki/Mythbuntu), a special edition of Ubuntu.

**Digital security**

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

[Kali Linux](https://en.wikipedia.org/wiki/Kali_Linux) is a Debian-based Linux distribution designed for [digital forensics](https://en.wikipedia.org/wiki/Digital_forensics) and [penetration testing](https://en.wikipedia.org/wiki/Penetration_test). It comes preinstalled with several software applications for penetration testing and identifying [security exploits](https://en.wikipedia.org/wiki/Exploit_(computer_security)).[[68]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-68) The Ubuntu derivative [BackBox](https://en.wikipedia.org/wiki/BackBox) provides pre-installed security and network analysis tools for ethical hacking.  
The Arch-based [BlackArch](https://en.wikipedia.org/wiki/BlackArch) includes over 2100 tools for pentesting and security researching.[[69]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-blackarch-69)

There are many Linux distributions created with privacy, secrecy, network anonymity and information security in mind, including [Tails](https://en.wikipedia.org/wiki/Tails_(operating_system)), [Tin Hat Linux](https://en.wikipedia.org/wiki/Tin_Hat_Linux) and [Tinfoil Hat Linux](https://en.wikipedia.org/wiki/Tinfoil_Hat_Linux). [Lightweight Portable Security](https://en.wikipedia.org/wiki/Lightweight_Portable_Security) is a distribution based on Arch Linux and developed by the [United States Department of Defense](https://en.wikipedia.org/wiki/United_States_Department_of_Defense). Tor-ramdisk is a minimal distribution created solely to host the network anonymity software [Tor](https://en.wikipedia.org/wiki/Tor_(anonymity_network)).

**System rescue**

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

Linux [Live CD](https://en.wikipedia.org/wiki/Live_CD) sessions have long been used as a tool for recovering data from a broken computer system and for repairing the system. Building upon that idea, several Linux distributions tailored for this purpose have emerged, most of which use [GParted](https://en.wikipedia.org/wiki/GParted) as a partition editor, with additional data recovery and system repair software:

* [GParted Live](https://en.wikipedia.org/wiki/Gparted_live) – a Debian-based distribution developed by the GParted project.
* [Parted Magic](https://en.wikipedia.org/wiki/Parted_Magic) – a commercial Linux distribution.
* [SystemRescueCD](https://en.wikipedia.org/wiki/SystemRescueCD) – an Arch-based distribution with support for editing Windows [registry](https://en.wikipedia.org/wiki/Windows_Registry).

**In space**

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

[SpaceX](https://en.wikipedia.org/wiki/SpaceX) uses multiple redundant [flight computers](https://en.wikipedia.org/wiki/Category:Avionics_computers) in a [fault-tolerant design](https://en.wikipedia.org/wiki/Fault-tolerant_design) in its [Falcon 9](https://en.wikipedia.org/wiki/Falcon_9) rocket. Each Merlin engine is controlled by three [voting](https://en.wikipedia.org/wiki/Voting_logic) computers, with two physical processors per computer that constantly check each other's operation. Linux is not inherently fault-tolerant (no operating system is, as it is a function of the whole system including the hardware), but the flight computer software makes it so for its purpose.[[70]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-aw20121118-70) For flexibility, [commercial off-the-shelf](https://en.wikipedia.org/wiki/Commercial_off-the-shelf) parts and system-wide "radiation-tolerant" design are used instead of [radiation hardened](https://en.wikipedia.org/wiki/Radiation_hardened) parts.[[70]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-aw20121118-70) As of July 2019, SpaceX has conducted over [76 launches](https://en.wikipedia.org/wiki/List_of_Falcon_9_and_Falcon_Heavy_launches) of the Falcon 9 since 2010, out of which all but one have successfully delivered their primary payloads to the intended [orbit](https://en.wikipedia.org/wiki/Orbit), and has used it to transport astronauts to the [International Space Station](https://en.wikipedia.org/wiki/International_Space_Station). The [Dragon 2](https://en.wikipedia.org/wiki/SpaceX_Dragon_2) crew capsule also uses Linux.[[71]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-71)

Windows was deployed as the operating system on non-mission critical laptops used on the space station, but it was later replaced with Linux. [Robonaut 2](https://en.wikipedia.org/wiki/Robonaut#Robonaut_2), the first humanoid robot in space, is also Linux-based.[[72]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-LinuxMigration-72)

The [Jet Propulsion Laboratory](https://en.wikipedia.org/wiki/Jet_Propulsion_Laboratory) has used Linux for a number of years "to help with projects relating to the construction of unmanned space flight and deep space exploration"; [NASA](https://en.wikipedia.org/wiki/NASA) uses Linux in robotics in the Mars rover, and [Ubuntu](https://en.wikipedia.org/wiki/Ubuntu_(operating_system)) Linux to "save data from satellites".[[73]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-73)

**Education**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_range_of_use&action=edit&section=14)]

Linux distributions have been created to provide hands-on experience with coding and source code to students, on devices such as the [Raspberry Pi](https://en.wikipedia.org/wiki/Raspberry_Pi). In addition to producing a practical device, the intention is to show students "how things work under the hood".[[74]](https://en.wikipedia.org/wiki/Linux_range_of_use?utm_source=chatgpt.com#cite_note-74)

The Ubuntu derivatives [Edubuntu](https://en.wikipedia.org/wiki/Edubuntu) and [The Linux Schools Project](https://en.wikipedia.org/wiki/The_Linux_Schools_Project), as well as the Debian derivative Skolelinux, provide education-oriented software packages. They also include tools for administering and building school computer labs and computer-based classrooms, such as the [Linux Terminal Server Project](https://en.wikipedia.org/wiki/Linux_Terminal_Server_Project) (LTSP).

**Others**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_range_of_use&action=edit&section=15)]

Instant WebKiosk and [Webconverger](https://en.wikipedia.org/wiki/Webconverger) are browser-based Linux distributions often used in web [kiosks](https://en.wikipedia.org/wiki/Interactive_kiosk) and [digital signage](https://en.wikipedia.org/wiki/Digital_signage). Thinstation is a minimalist distribution designed for [thin clients](https://en.wikipedia.org/wiki/Thin_client). [Rocks Cluster Distribution](https://en.wikipedia.org/wiki/Rocks_Cluster_Distribution) is tailored for [high-performance computing clusters](https://en.wikipedia.org/wiki/HPCC).

There are general-purpose Linux distributions that target a specific audience, such as users of a specific language or geographical area. Such examples include [Ubuntu Kylin](https://en.wikipedia.org/wiki/Ubuntu_Kylin) for Chinese language users and BlankOn targeted at Indonesians. Profession-specific distributions include [Ubuntu Studio](https://en.wikipedia.org/wiki/Ubuntu_Studio) for media creation and DNALinux for [bioinformatics](https://en.wikipedia.org/wiki/Bioinformatics). There is also a Muslim-oriented distribution of the name [Sabily](https://en.wikipedia.org/wiki/Sabily) that consequently also provides some Islamic tools. Certain organizations use slightly specialized Linux distributions internally, including [GendBuntu](https://en.wikipedia.org/wiki/GendBuntu) used by the French [National Gendarmerie](https://en.wikipedia.org/wiki/National_Gendarmerie), [Goobuntu](https://en.wikipedia.org/wiki/Goobuntu) used internally by Google, and [Astra Linux](https://en.wikipedia.org/wiki/Astra_Linux) developed specifically for the Russian army.

Linux adoption

6 languages

* [Article](https://en.wikipedia.org/wiki/Linux_adoption)
* [Talk](https://en.wikipedia.org/wiki/Talk:Linux_adoption)
* [Read](https://en.wikipedia.org/wiki/Linux_adoption)
* [Edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit)
* [View history](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=history)

Tools

**Appearance**

 hide

Text

Top of Form

Small

Standard

Large

Bottom of Form

Width

Top of Form

Standard

Wide

Bottom of Form

Color (beta)

Top of Form

Automatic

Light

Dark

Bottom of Form

From Wikipedia, the free encyclopedia

**Linux adoption** is the [adoption](https://en.wikipedia.org/wiki/Adoption_(software_implementation)) of [Linux](https://en.wikipedia.org/wiki/Linux)-based computer [operating systems](https://en.wikipedia.org/wiki/Operating_system) (OSes) by households, nonprofit organizations, businesses, and governments.

[Android](https://en.wikipedia.org/wiki/Android_(operating_system)), which runs on Linux, is the world's most widely used computer operating system. As of October 2024, Android has 45% of the global operating system market followed by Windows with 26%.[[1]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-1)

Linux runs almost every type of device, all the [top 500](https://en.wikipedia.org/wiki/TOP500) most powerful [supercomputers](https://en.wikipedia.org/wiki/Supercomputer) in the world, desktop computers, laptops, the International Space Station, smartphones, smartwatches, TVs, and cars. Additional large systems like The New York Stock Exchange, the Pentagon, and social media platforms like Facebook, YouTube, and X (formerly Twitter) all run on Linux.[[2]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-2)[[3]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-3) Microsoft's cloud service depends on Linux.[[4]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-4)

In August 2010, Jeffrey Hammond, principal analyst at [Forrester Research](https://en.wikipedia.org/wiki/Forrester_Research), declared, "Linux has crossed the chasm to mainstream adoption," a statement attested by the large number of enterprises that had transitioned to Linux during the [late-2000s recession](https://en.wikipedia.org/wiki/Late-2000s_recession). In a company survey completed in the third quarter of 2009, 48% of surveyed companies reported using an open-source operating system.[[5]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Kerner12Aug10-5)

The [Linux Foundation](https://en.wikipedia.org/wiki/Linux_Foundation) regularly releases publications regarding the [Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel), Linux OS [distributions](https://en.wikipedia.org/wiki/Linux_distribution), and related themes.[[6]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-6) One such publication, "Linux Adoption Trends: A Survey of Enterprise End Users," is freely available upon registration.[[7]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-7)

**Linux adopters**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=1)]

*Main article:*[*List of Linux adopters*](https://en.wikipedia.org/wiki/List_of_Linux_adopters)

*See also:*[*Adoption of free and open-source software by public institutions*](https://en.wikipedia.org/wiki/Adoption_of_free_and_open-source_software_by_public_institutions)

Outside of traditional web services, Linux powers many of the biggest Internet properties (e.g., [Google](https://en.wikipedia.org/wiki/Google),[[8]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-8) [Amazon](https://en.wikipedia.org/wiki/Amazon.com),[[9]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-9) [Facebook](https://en.wikipedia.org/wiki/Facebook), [eBay](https://en.wikipedia.org/wiki/EBay), [Twitter](https://en.wikipedia.org/wiki/Twitter) or [Yahoo!](https://en.wikipedia.org/wiki/Yahoo!)[[10]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-10)).

**Hardware platforms with graphical user interface**

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

Linux is used on desktop computers, servers and supercomputers, as well as a wide range of devices.

**Desktop and Nettop computers and Laptops**

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

Linux powers the Steam Deck's Operating System made by Valve, and has many distributions/versions, such as Bazzite, Arch, and Ubuntu

*See also:*[*Desktop Linux*](https://en.wikipedia.org/wiki/Desktop_Linux)

[A screenshot of a computer

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:Ubuntu_22.10_Kinetic_Kudu.png)[Ubuntu](https://en.wikipedia.org/wiki/Ubuntu), a popular distribution of Linux.

**Measuring desktop adoption**

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

Because Linux desktop distributions are not usually distributed by retail sale, there are no sales numbers that indicate the number of users. One downloaded file may be used to create many CDs and each CD may be used to install the operating system on multiple computers. On the other hand, the file might be used only for a test and the installation erased soon after. Due to these factors estimates of current Linux desktop often rely on webpage hits by computers identifying themselves as running Linux. The use of these statistics has been criticized as unreliable and as underestimating Linux use.[[11]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Paul2007-11)[[12]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-LinuxCounter2-12)

Using webpage hits as a measure, until 2008, Linux accounted for only about 1% of desktop [market share](https://en.wikipedia.org/wiki/Market_share), while [Microsoft Windows operating systems](https://en.wikipedia.org/wiki/Comparison_of_Microsoft_Windows_versions) held more than 90%.[[11]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Paul2007-11)[[13]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-13)[[14]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-14)[[15]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-15)[[16]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-16)[[17]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-17)[[18]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-18) This might have been because Linux was not seen at that time as a direct replacement for Windows.[[19]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-19)

As of February 2017, *W3Counter* estimated "Linux" web browser market share to be 4.63%, while "Android" versions 6, 5 and 4 combined (which is based on the [Linux kernel](https://en.wikipedia.org/wiki/Linux_kernel)) were estimated to be 33.77%.[[20]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-20)

The [Unity](https://en.wikipedia.org/wiki/Unity_(game_engine)) [game engine](https://en.wikipedia.org/wiki/Game_engine) gathers user statistics and showed in March 2016 0.4% Linux users.[[21]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-21) Similarly, the [Steam](https://en.wikipedia.org/wiki/Steam_(service)) client tracks usage and reported in May 2015 around 1% Linux users.[[22]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-22)

In April 2009, Aaron Seigo of [KDE](https://en.wikipedia.org/wiki/KDE) indicated that most web-page counter methods produce Linux adoption numbers that are far too low given the system's extensive penetration into non-North American markets, especially China. He stated that the North American-based web-measurement methods produce high Windows numbers and ignore the widespread use of Linux in other parts of the world. In estimating true worldwide desktop adoption and accounting for the Windows-distorted environment in the US and Canada he indicated that at least 8% of the world desktops run Linux distributions and possibly as high as 10–12% and that the numbers are rising quickly. Other commentators have echoed this same belief, noting that competitors are expending a lot of effort to discredit Linux, which is incongruent with a tiny market share:[[23]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Byfield04May09-23)[[24]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Schroder28May09-24)

I don't believe that the desktop Linux market share is barely 1%. I think it is a lot higher. I have no good data to share; I base my assessment on experience and knowing the industry. There is something else that is even more persuasive, and that is how Microsoft behaves. If Linux is so insignificant, why do they pay so much attention to it?

— *Carla Schroder, Linux Today*[[24]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Schroder28May09-24)

In May 2009, Preston Gralla, contributing editor to [Computerworld](https://en.wikipedia.org/wiki/Computerworld).com, in reacting to the Net Applications web hit numbers showing that Linux use was over 1%, said that "Linux will never become an important desktop or notebook operating system". He reasoned that the upsurge in Linux desktop use recently seen was due to Linux netbooks, a trend he saw as already diminishing and which would be further eroded when [Windows 7](https://en.wikipedia.org/wiki/Windows_7) became available (and indeed, Linux netbooks did fall by the wayside, though whether they were solely responsible for the upsurge in Linux usage is open to question). He concluded: "As a desktop operating system, Linux isn't important enough to think about. For servers, it's top-notch, but you likely won't use it on your desktop – even though it did finally manage to crack the 1% barrier after 18 years".[[25]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Gralla18May09-25)

In 2009, [Microsoft](https://en.wikipedia.org/wiki/Microsoft) then-CEO [Steve Ballmer](https://en.wikipedia.org/wiki/Steve_Ballmer) indicated that Linux had a greater desktop market share than Mac, stating that in recent years Linux had "certainly increased its share somewhat". Just under a third of all [Dell](https://en.wikipedia.org/wiki/Dell) netbook sales in 2009 had Linux installed.[[26]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Martin07Sep10-26)

Caitlyn Martin, researching retail market numbers in the summer of 2010 also concluded that the traditional numbers mentioned for Linux desktop adoption were far too low:

It seems like almost every day someone in the tech press or someone commenting in a technical forum will claim that Linux adoption on the desktop (including laptops) is insignificant. The number that is thrown around is 1%. These claims are even repeated by some who advocate for Linux adoption. Both the idea that Linux market share on the desktop is insignificant and the 1% figure are simply false and have been for many years...Where does the 1% number come from? There are two sources: very old data and web counters. The problem with using web counters to try and ascertain market share is that they generally only include websites that have paid to be counted. That pretty much guarantees that Windows will be overcounted.

— *Caitlyn Martin*[[26]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Martin07Sep10-26)

**Reasons for adoption**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=5)]

Reasons to change from other operating systems to Linux include better system stability, better [malware](https://en.wikipedia.org/wiki/Linux_malware) protection, low or no cost, that most distributions come complete with application software and hardware drivers, simplified updates for all installed software, free software licensing, availability of application repositories and access to the [source code](https://en.wikipedia.org/wiki/Source_code). Linux desktop distributions also offer multiple desktop workspaces, greater customization, free and unlimited support through forums, and an operating system that doesn't slow down over time. Environmental reasons are also cited, as Linux operating systems usually do not come in boxes and other retail packaging, but are downloaded via the Internet. The lower system specifications also mean that older hardware can be kept in use instead of being recycled or discarded. Linux distributions also get security vulnerabilities patched much more quickly than non-free operating systems and improvements in Linux have been occurring at a faster rate than those in Windows.[[27]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Cornet-27)[[28]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Siu28Jul06-28)[[*unreliable source?*](https://en.wikipedia.org/wiki/Wikipedia:Reliable_sources)][[29]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Wallen17Aug08-29)

A report in [The Economist](https://en.wikipedia.org/wiki/The_Economist) in December 2007 said:

Linux has swiftly become popular in small businesses and the home. That’s largely the doing of Gutsy Gibbon, the code-name for the Ubuntu 7.10 from Canonical. Along with distributions such as Linspire, Mint, Xandros, OpenSUSE and gOS, Ubuntu (and its siblings Kubuntu, Edubuntu and Xubuntu) has smoothed most of Linux’s geeky edges while polishing it for the desktop. No question, Gutsy Gibbon is the sleekest, best integrated and most user-friendly Linux distribution yet. It’s now simpler to set up and configure than Windows.[[30]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Economist-30)

Further investments have been made to improve desktop Linux usability since that 2007 report.

Indian bulk computer purchaser the [Electronics Corporation of Tamil Nadu](https://en.wikipedia.org/wiki/Electronics_Corporation_of_Tamil_Nadu) (ELCOT) started recommending only Linux in June 2008. Following testing they stated: "ELCOT has been using [SUSE Linux](https://en.wikipedia.org/wiki/SUSE_Linux) and [Ubuntu](https://en.wikipedia.org/wiki/Ubuntu) Linux operating systems on desktop and laptop computers numbering over 2,000 during the past two years and found them far superior as compared to other operating systems, notably the Microsoft Windows Operating System."[[31]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-KingmanJune2008-31)

In many developing nations, such as China, where, due to widespread [software piracy](https://en.wikipedia.org/wiki/Software_piracy), [Microsoft Windows](https://en.wikipedia.org/wiki/Microsoft_Windows) can be easily obtained for free, Linux distributions are gaining a high level of adoption. Hence in these countries where there is essentially no cost barrier to obtaining proprietary operating systems, users are adopting Linux based on its merit, rather than on price.[[32]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Dawson17Jun09-32)

In January 2001, [Microsoft](https://en.wikipedia.org/wiki/Microsoft) then-CEO [Bill Gates](https://en.wikipedia.org/wiki/Bill_Gates) explained the attraction of adopting Linux in an internal memo that was released in the [*Comes vs Microsoft*](https://en.wikipedia.org/wiki/Comes_vs_Microsoft) case. He said:

Our most potent Operating System competitor is Linux and the phenomena around Open Source and free software. The same phenomena fuels competitors to all of our products. The ease of picking up Linux to learn it or to modify some piece of it is very attractive. The academic community, start up companies, foreign governments and many other constituencies are putting their best work into Linux.[[33]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-GroklawComesVsMSExhibit08256-33)

**Barriers to adoption**

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

The greatest barrier to Linux desktop adoption is probably that few desktop PCs come with it from the factory. A.Y. Siu asserted in 2006 that most people use Windows simply because most PCs come with Windows pre-installed; they didn't choose it. Linux has much lower market penetration because in most cases users have to install it themselves, a task that is beyond the capabilities of many PC users: "Most users won’t even use Windows restore CDs, let alone install Windows from scratch. Why would they install an unfamiliar operating system on their computers?"[[28]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Siu28Jul06-28)[[*unreliable source?*](https://en.wikipedia.org/wiki/Wikipedia:Reliable_sources)]

[TechRepublic](https://en.wikipedia.org/wiki/TechRepublic) writer Jack Wallen expands on this barrier, saying in August 2008:[[29]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Wallen17Aug08-29)

Why would anyone choose Windows over Linux?...In my seriously biased opinion, I think this question is answered with a simple conspiracy theory: Microsoft is doing everything it can to keep the public blind to Linux. Think about it? Remember the whole Wintel conspiracy where MS and Intel played off of each other to continue their strangle-hold monopoly in the PC industry? That era played a huge part in the blinding of consumers. Top that with the business practices MS forces upon big box shops to ensure their operating system is sold on nearly every PC sold and you can see that conspiracy is more of a reality than one might think.[[29]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Wallen17Aug08-29)

Linus Torvalds stated, in his June 2012 interaction with students at [Aalto University](https://en.wikipedia.org/wiki/Aalto_University),[[34]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-aalto-34) that although Linux was originally conceived as a desktop system, that has been the only market where it has not flourished. He suggested that the key reason that keeps Linux from getting a substantial presence in the desktop market is that the average desktop user does not want to install an operating system, so getting manufacturers to sell computers with Linux pre-installed would be the missing piece to fulfill the vision of Linux in the desktop market.[[35]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-35) He added that Chromebooks, by shipping with the Linux-based [ChromeOS](https://en.wikipedia.org/wiki/ChromeOS), could provide the key turning point in such a transition, much like [Android](https://en.wikipedia.org/wiki/Android_(operating_system)) allowed Linux to spread in the mobile space.[[34]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-aalto-34)

In September 2012, [GNOME](https://en.wikipedia.org/wiki/GNOME) developer [Michael Meeks](https://en.wikipedia.org/wiki/Michael_Meeks_(software_developer)) also indicated that the main reason for the lack of adoption of Linux desktops is the lack of manufacturers shipping computers with it pre-installed, supporting Siu's arguments from six years earlier. Meeks also indicated that users wouldn't embrace desktop Linux until there is a wider range of applications and developers won't create that wider range of applications until there are more users, a classic [Catch-22](https://en.wikipedia.org/wiki/Catch-22_(logic)) situation.[[36]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-36)

In an [openSUSE](https://en.wikipedia.org/wiki/OpenSUSE) survey conducted in 2007, 69.5% of respondents said they [dual booted](https://en.wikipedia.org/wiki/Dual_boot) a [Microsoft Windows](https://en.wikipedia.org/wiki/Microsoft_Windows) operating system in addition to a Linux operating system.[[37]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-37) In early 2007 Bill Whyman, an analyst at Precursor Advisors, noted that "there still isn't a compelling alternative to the [Microsoft](https://en.wikipedia.org/wiki/Microsoft) infrastructure on the desktop."[[38]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-38)

Application support, the quality of peripheral support, and end user support were at one time seen as the biggest obstacles to desktop Linux adoption. According to a 2006 survey by The [Linux Foundation](https://en.wikipedia.org/wiki/Linux_Foundation), these factors were seen as a "major obstacle" for 56%, 49%, and 33% of respondents respectively at that time.[[39]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-39)[[40]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-40)[[41]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-41)[[42]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-ACM-42)[[43]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-43)[[44]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-44)[[45]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-45)[[46]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Dell_Ubuntu-46)[[47]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-OSDL_2006-47)

**Application support**

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

*See also:*[*Virtual machine*](https://en.wikipedia.org/wiki/Virtual_machine)*and*[*Wine (software)*](https://en.wikipedia.org/wiki/Wine_(software))

The November 2006 *Desktop Linux Client Survey* identified the foremost barrier for deploying Linux desktops was that users were accustomed to Windows applications which had not been ported to Linux and which they "just can't live without". These included [Microsoft Office](https://en.wikipedia.org/wiki/Microsoft_Office), [Adobe Photoshop](https://en.wikipedia.org/wiki/Adobe_Photoshop), [Autodesk](https://en.wikipedia.org/wiki/Autodesk) [AutoCAD](https://en.wikipedia.org/wiki/AutoCAD), [Microsoft Project](https://en.wikipedia.org/wiki/Microsoft_Project), [Visio](https://en.wikipedia.org/wiki/Microsoft_Visio) and [Intuit](https://en.wikipedia.org/wiki/Intuit) [QuickBooks](https://en.wikipedia.org/wiki/QuickBooks).[[47]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-OSDL_2006-47)[[48]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-48) This creates a [chicken or the egg](https://en.wikipedia.org/wiki/Chicken_or_the_egg) situation where developers make programs for Windows due to its market share, and consumers use Windows due to availability of said programs. In a DesktopLinux.com survey conducted in 2007, 72% of respondents said they used ways to run Windows applications on Linux.[[49]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-49)

51% of respondents to the 2006 Linux Foundation survey, believed that cross-distribution Linux desktop standards should be the top priority for the Linux desktop community, highlighting the fact that the fragmented Linux market is preventing application vendors from developing, distributing and supporting the operating system.[[42]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-ACM-42)[[47]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-OSDL_2006-47) In May 2008, [Gartner](https://en.wikipedia.org/wiki/Gartner) predicted that "version control and incompatibilities will continue to plague open-source OSs and associated middleware" in the 2013 timeframe.[[50]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-ZDNet_Gartner-50)

By 2008, the design of Linux applications and the porting of Windows and Apple applications had progressed to the point where it was difficult to find an application that did not have an equivalent for Linux, providing adequate or better capabilities.[[51]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Alternatives-51)[[52]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-TuxSoftware-52)

An example of application progress can be seen comparing the main productivity suite for Linux, [OpenOffice.org](https://en.wikipedia.org/wiki/OpenOffice.org), to [Microsoft Office](https://en.wikipedia.org/wiki/Microsoft_Office). With the release of OpenOffice.org 3.0 in October 2008 [Ars Technica](https://en.wikipedia.org/wiki/Ars_Technica) assessed the two:[[53]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Paul13Oct08-53)

Although OpenOffice.org has not yet reached full parity with Microsoft Office, it is maturing at a rapid pace and is already capable of meeting the basic needs of many average computer users. It is an ideal choice for schools and is an increasingly viable choice for small businesses and home users that don't rely on the more advanced capabilities of Microsoft's office suite.[[53]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Paul13Oct08-53)

**Peripheral support**

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

In the past the availability and quality of open source [device drivers](https://en.wikipedia.org/wiki/Device_driver) were issues for Linux desktops. Particular areas which were lacking drivers included printers as well as wireless and audio cards.[[47]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-OSDL_2006-47)[[54]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-OSDL_2005-54) For example, in early 2007, [Dell](https://en.wikipedia.org/wiki/Dell) did not sell specific hardware and software with [Ubuntu](https://en.wikipedia.org/wiki/Ubuntu_(operating_system)) 7.04 computers, including printers, projectors, [Bluetooth](https://en.wikipedia.org/wiki/Bluetooth) keyboards and mice, [TV tuners](https://en.wikipedia.org/wiki/TV_tuner_card) and [remote controls](https://en.wikipedia.org/wiki/Remote_control_handset), desktop [modems](https://en.wikipedia.org/wiki/Modem) and [Blu-ray](https://en.wikipedia.org/wiki/Blu-ray) drives, due to incompatibilities at that time, as well as legal issues.[[55]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-55)

By 2008, most Linux hardware support and driver issues had been adequately addressed. In September 2008, Jack Wallen's assessment was:

Years ago, if you wanted to install Linux on a machine you had to make sure you hand-picked each piece of hardware or your installation would not work 100 percent...This is not so much the case now. You can grab a PC (or laptop) and most likely get one or more Linux distributions to install and work nearly 100 percent. But there are still some exceptions; for instance, hibernate/suspend remains a problem with many laptops, although it has come a long way.[[56]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Wallen03Sep08-56)

**End-user support**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=9)]

Some critics have stated that compared to Windows, Linux is lacking in end-user support. Linux has traditionally been seen as requiring much more technical expertise.[[57]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-WSJ_Mossberg-57)[[58]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-58) [Dell](https://en.wikipedia.org/wiki/Dell)'s website described open source software as requiring intermediate or advanced knowledge to use.[[46]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Dell_Ubuntu-46) In September 2007, the founder of the Ubuntu project, [Mark Shuttleworth](https://en.wikipedia.org/wiki/Mark_Shuttleworth), commented that "it would be reasonable to say that this is not ready for the mass market."[[57]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-WSJ_Mossberg-57)

In October 2004, [Chief Technical Officer](https://en.wikipedia.org/wiki/Chief_technical_officer) of Adeptiva Linux, Stephan February, noted at that time that Linux was a very technical software product, and few people outside the technical community were able to support consumers. Windows users are able to rely on friends and family for help, but Linux users generally use discussion boards, which can be uncomfortable for consumers.[[59]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-59)[[60]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-60)

In 2005, Dominic Humphries summarized the difference in user tech support:[[61]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Humphries-61)

Windows users are more or less in a customer-supplier relationship: They pay for software, for warranties, for support, and so on. They expect software to have a certain level of usability. They are therefore used to having rights with their software: They have paid for technical support and have every right to demand that they receive it. They are also used to dealing with entities rather than people: Their contracts are with a company, not with a person. Linux users are in more of a community. They don't have to buy the software, they don't have to pay for technical support. They download software for free & use Instant Messaging and web-based forums to get help. They deal with people, not corporations.[[61]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Humphries-61)

More recently critics have found that the Linux user support model, using community-based forum support, has greatly improved. In 2008 Jack Wallen stated:[[56]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Wallen03Sep08-56)

With Linux, you have the support of a huge community via forums, online search, and plenty of dedicated websites. And of course, if you feel the need, you can purchase support contracts from some of the bigger Linux companies (Red Hat and Novell, for instance).

However, when you use the peer support inherent in Linux, you do take a chance with time. You could have an issue with something, send out email to a mailing list or post on a forum, and within 10 minutes be flooded with suggestions. Or these suggestions could take hours or days to come in. It seems all up to chance sometimes.

Yet generally speaking, most problems with Linux have been encountered and documented, so the chances are good you'll find your solution fairly quickly.[[56]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Wallen03Sep08-56)

In addressing the question of user support, Manu Cornet said:

One of the great assets of the Open Source community (and Linux in particular), is that it's a real community. Users and developers really are out there, on web forums, on mailing lists, on IRC channels, helping out new users. They're all happy to see more and more people switch to Linux, and they're happy to help them get a grip on their new system...you'll find literally thousands of places where nice people will answer you and walk you out of your problem most of the time[[27]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Cornet-27)

**Other factors**

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

Linux's credibility has also been under attack at times, but as Ron Miller of LinuxPlanet points out:[[62]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-LinuxPlanet-62)

...the fact that Linux is being criticized is probably a good thing.

First of all, it shows that Linux is making headway in the enterprise and beginning to have an impact on competitors and they are reacting to that. Secondly, it's healthy to take a long look at any solution and analyze its strengths and weaknesses and the economic ramifications of one choice over another.

Ultimately, consumers and decision makers need to look carefully at the data including the sources of the data and the criticism and decide if Linux is the right decision, but as more people choose Linux and it finds its place in the market, it is bound to wear a target. That's simply the price you pay for success in the marketplace.[[62]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-LinuxPlanet-62)

There is continuing debate about the [total cost of ownership](https://en.wikipedia.org/wiki/Total_cost_of_ownership) of Linux,[[63]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-63)[[64]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-64) with [Gartner](https://en.wikipedia.org/wiki/Gartner) warning in 2005 that the costs of migration may exceed the cost benefits of Linux.[[65]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-65) Gartner reiterated the warning in 2008, predicting that "by 2013, a majority of Linux deployments will have no real software total cost of ownership (TCO) advantage over other operating systems."[[50]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-ZDNet_Gartner-50) However, in the Comes v. Microsoft lawsuit, Plaintiff's exhibit 2817[[66]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-66) revealed that Microsoft successfully lobbied Gartner for changing their TCO model in favour of Microsoft in 1998. Organizations that have moved to Linux have disagreed with these warnings. Sterling Ball, CEO of [Ernie Ball](https://en.wikipedia.org/wiki/Ernie_Ball), the world's leading maker of premium guitar strings and a 2003 Linux adopter, said of total cost of ownership arguments: "I think that's propaganda...What about the cost of dealing with a virus? We don't have 'em...There's no doubt that what I'm doing is cheaper to operate. The analyst guys can say whatever they want."[[67]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Becker2003-67)

In the [SCO-Linux controversies](https://en.wikipedia.org/wiki/SCO-Linux_controversies), the [SCO Group](https://en.wikipedia.org/wiki/SCO_Group) had alleged that [UNIX](https://en.wikipedia.org/wiki/UNIX) source code donated by IBM was illegally incorporated into Linux. The threat that SCO might be able to legally assert ownership of Linux initially caused some potential Linux adopters to delay that move. The court cases bankrupted SCO in 2007 after it lost its four-year court battle over the ownership of the UNIX copyrights. SCO's case had hinged on showing that Linux included intellectual property that had been misappropriated from UNIX, but the case failed when the court discovered that [Novell](https://en.wikipedia.org/wiki/Novell) and not SCO was the rightful owner of the copyrights. During the legal process, it was revealed that SCO's claims about Linux were fraudulent and that SCO's internal source code audits had shown no evidence of infringement.[[62]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-LinuxPlanet-62)[[67]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Becker2003-67)[[68]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Paul12Jan09-68)

A rival operating system vendor, [Green Hills Software](https://en.wikipedia.org/wiki/Green_Hills_Software), has called the [open source](https://en.wikipedia.org/wiki/Open_source) paradigm of Linux "fundamentally insecure".[[69]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-69)

The US Army does not agree that Linux is a security problem. Brigadier General Nick Justice, the Deputy Program Officer for the Army's Program Executive Office, Command, Control and Communications Tactical (PEO C3T), said in April 2007:[[70]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-DoD-70)

Our job is to provide accurate and timely information to the soldier in the field so they can perform their mission. Open source software is part of the integrated network fabric which connects and enables our command and control system to work effectively, as people's lives depend on it. When we rolled into Baghdad, we did it using open source. It may come as a surprise to many of you, but the U.S. Army is "the" single largest install base for Red Hat Linux. I'm their largest customer.[[70]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-DoD-70)

**Netbooks**

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

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

In 2008, [Gartner](https://en.wikipedia.org/wiki/Gartner) analysts predicted that mobile devices like Netbooks with Linux could potentially break the dominance of [Microsoft](https://en.wikipedia.org/wiki/Microsoft)'s Windows as operating system provider, as the netbook concept focuses on OS-agnostic applications built as Web applications and browsing.[[71]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-71) Until 2008 the netbook market was dominated by Linux-powered devices; this changed in 2009 after [Windows XP](https://en.wikipedia.org/wiki/Microsoft_Windows_XP) became available as option.[[72]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-itwire-72) One of the reasons given was that many customers returned Linux-based netbooks as they were still expecting a Windows-like environment, despite the netbook vision: a web-surfing and web-application device.[[73]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-73)[[74]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-74)

**Thin clients**

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

*Main article:*[*Web thin client*](https://en.wikipedia.org/wiki/Thin_client)

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| --- | --- |
| [[icon]](https://en.wikipedia.org/wiki/File:Wiki_letter_w_cropped.svg) | This section **needs expansion**. You can help by [adding to it](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=). *(September 2013)* |

In 2011, [Google](https://en.wikipedia.org/wiki/Google) introduced the [Chromebook](https://en.wikipedia.org/wiki/Chromebook), a [thin client](https://en.wikipedia.org/wiki/Thin_client) running the Linux-based [ChromeOS](https://en.wikipedia.org/wiki/ChromeOS), with the ability to use [web applications](https://en.wikipedia.org/wiki/Web_applications) and [remote desktop](https://en.wikipedia.org/wiki/Remote_desktop) in to other computers running Windows, Mac OS X, a traditional Linux distribution or ChromeOS, using [Chrome Remote Desktop](https://en.wikipedia.org/wiki/Chrome_Remote_Desktop). In 2012 Google and Samsung introduced the first version of the Chromebox, a small-form-factor desktop equivalent to the Chromebook.

By 2013, Chromebooks had captured 20–25% of the sub-$300 US laptop market.[[75]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-75)

By 2014, Google launched [App Runtime for Chrome](https://en.wikipedia.org/wiki/App_Runtime_for_Chrome) (ARC), which allowed certain Android apps to be run, it was no longer a thin client.[[76]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-76)

By 2020, Chromebook's market share was 10.8%, placing it above the [Mac](https://en.wikipedia.org/wiki/Mac_(computer)) platform; having found success in education markets.[[77]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-77)

**Mobile devices**

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

[A group of cell phones

AI-generated content may be incorrect.](https://en.wikipedia.org/wiki/File:Samsung_Galaxy_Note_series_2.jpg)Android smartphones

[Android](https://en.wikipedia.org/wiki/Android_(operating_system)), which runs the Linux kernel is the world's most popular mobile platform. As of September 2024, Android has 71.85% of the global mobile operating system market.[[78]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-78)

**Discontinued Linux-based mobile operating systems**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=14)]

[Firefox OS](https://en.wikipedia.org/wiki/Firefox_OS) was another open source Linux-based mobile operating system, which has now been discontinued.

Nokia previously produced some phones running a variant of Linux (e.g. the [Nokia N900](https://en.wikipedia.org/wiki/Nokia_N900)), but in 2013, Nokia's handset division was bought by [Microsoft](https://en.wikipedia.org/wiki/Microsoft).

**Other embedded systems with graphical user interface**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=15)]

[Smartphones](https://en.wikipedia.org/wiki/Smartphone) are gradually replacing these kinds of embedded devices, but they still exist. An example are the [Portable media players](https://en.wikipedia.org/wiki/Portable_media_player). Some of the OEM firmware is Linux based. A community-driven fully free and open-source project is [Rockbox](https://en.wikipedia.org/wiki/Rockbox).[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia:Citation_needed)]

[In-vehicle infotainment](https://en.wikipedia.org/wiki/In-vehicle_infotainment) hardware usually involves some kind of display, either built into the [Dashboard](https://en.wikipedia.org/wiki/Dashboard) or additional displays. The GENIVI Alliance, now called COVESA (Connected Vehicle Systems Alliance), works on a Linux-based open platform to run the IVI. It may have an interface to some values delivered by the [Engine control unit](https://en.wikipedia.org/wiki/Engine_control_unit) but is albeit completely separate system. There will be a special variant of [Tizen](https://en.wikipedia.org/wiki/Tizen) for IVI, different for the Tizen for smartphones in several regards.[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia:Citation_needed)]

**Hardware platforms without graphical user interface**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=16)]

**Embedded systems without graphical user interface**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=17)]

*See also:*[*Linux-powered device*](https://en.wikipedia.org/wiki/Linux-powered_device)

Linux is often used in various single- or multi-purpose [computer appliances](https://en.wikipedia.org/wiki/Computer_appliance) and [embedded systems](https://en.wikipedia.org/wiki/Embedded_systems).[[79]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-79)

[Customer-premises equipment](https://en.wikipedia.org/wiki/Customer-premises_equipment) are a group of devices that are embedded and have no graphical user interface in the common sense. Some are remotely operated via [Secure Shell](https://en.wikipedia.org/wiki/Secure_Shell) or via some Web-based user interface running on some [lightweight web server software](https://en.wikipedia.org/wiki/Comparison_of_web_server_software). Most of the OEM firmware is based on the Linux kernel and other free and open-source software, e.g. [Das U-Boot](https://en.wikipedia.org/wiki/Das_U-Boot) and [Busybox](https://en.wikipedia.org/wiki/Busybox). There are also a couple of community driven projects, e.g. [OpenWrt](https://en.wikipedia.org/wiki/OpenWrt).[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia:Citation_needed)]

Smaller scale embedded [network-attached storage](https://en.wikipedia.org/wiki/Network-attached_storage)-devices are also mostly Linux-driven.[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia:Citation_needed)]

**Servers**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=18)]

*Further information:*[*Linux § Servers, mainframes and supercomputers*](https://en.wikipedia.org/wiki/Linux#Servers,_mainframes_and_supercomputers)

Linux became popular in the Internet [server](https://en.wikipedia.org/wiki/Server_(computing)) market particularly due to the [LAMP](https://en.wikipedia.org/wiki/LAMP_(software_bundle)) software bundle. In September 2008 [Steve Ballmer](https://en.wikipedia.org/wiki/Steve_Ballmer) (Microsoft CEO) claimed 60% of servers run Linux and 40% run [Windows Server](https://en.wikipedia.org/wiki/Windows_Server).[[80]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-PC_World_September_2008-80) According to IDC's report covering Q2 2013, Linux was up to 23.2% of worldwide server revenue[[81]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-81) although this does compensate for the potential price disparity between Linux and non-Linux servers. In May 2014, W3Techs estimated that 67.5% of the top 10 million (according to Alexa) websites run some form of Unix, and Linux is used by at least 57.2% of all those websites which use Unix.[[82]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-82)

**Web servers**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=19)]

Linux-based [solution stacks](https://en.wikipedia.org/wiki/Solution_stack) come with all the [general advantages and benefits of free and open-source software](https://en.wikipedia.org/wiki/Free_and_open-source_software#Advantages_and_benefits_of_free_and_open-source_software). Some more commonly known examples are:

* [LAMP](https://en.wikipedia.org/wiki/LAMP_(software_bundle))
* [MEAN stack](https://en.wikipedia.org/wiki/MEAN_(solution_stack))

According to the [Netcraft](https://en.wikipedia.org/wiki/Netcraft), as of 2019, [nginx](https://en.wikipedia.org/wiki/Nginx) had the highest market share.[[83]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-83)

**LDAP servers**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=20)]

*Main article:*[*Lightweight Directory Access Protocol*](https://en.wikipedia.org/wiki/Lightweight_Directory_Access_Protocol)

There are various freely available implementations of [LDAP servers](https://en.wikipedia.org/wiki/List_of_LDAP_software#SERVER).

**Routers**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=21)]

Free routing software available for Linux includes [BIRD](https://en.wikipedia.org/wiki/Bird_Internet_routing_daemon), [B.A.T.M.A.N.](https://en.wikipedia.org/wiki/B.A.T.M.A.N.), [FRRouting](https://en.wikipedia.org/wiki/FRRouting), [Quagga](https://en.wikipedia.org/wiki/Quagga_(software)) and [XORP](https://en.wikipedia.org/wiki/XORP). Whether on [Customer-premises equipment](https://en.wikipedia.org/wiki/Customer-premises_equipment), on [personal computer](https://en.wikipedia.org/wiki/Personal_computer) or [server](https://en.wikipedia.org/wiki/Server_(computing))-hardware, the mainline Linux kernel or an adapted highly optimized Linux kernel is capable of doing [routing](https://en.wikipedia.org/wiki/Routing) at rates that are limited by the hardware bus throughput.

**Supercomputers**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=22)]

*Main article:*[*Supercomputer operating system*](https://en.wikipedia.org/wiki/Supercomputer_operating_system)

Linux is the most popular operating system among [supercomputers](https://en.wikipedia.org/wiki/Supercomputer) due to the [general advantages and benefits of free and open-source software](https://en.wikipedia.org/wiki/Free_and_open-source_software#Advantages_and_benefits_of_free_and_open-source_software), like superior performance, flexibility, speed and lower costs. In November 2008 Linux held an 87.8 percent share of the world's top 500 supercomputers.[[84]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-84)[[85]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-85)[[86]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-CW23Nov09-86)[[87]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-PT13Jun08-87)[[88]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-InTech01Sep03-88)

Since June 2018, every computer on the [TOP500](https://en.wikipedia.org/wiki/TOP500) list ran some version of Linux.[[89]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-top500stats-89)

In January 2010, Weiwu Hu, chief architect of the [Loongson](https://en.wikipedia.org/wiki/Loongson) family of CPUs at the Institute of Computing Technology, which is part of the [Chinese Academy of Sciences](https://en.wikipedia.org/wiki/Chinese_Academy_of_Sciences), confirmed that the new Dawning 6000 supercomputer will use Chinese-made [Loongson processors](https://en.wikipedia.org/wiki/Loongson) and will run Linux as its operating system. The most recent supercomputer the organization built, the Dawning 5000a, which was first run in 2008, used AMD chips and ran [Windows HPC Server 2008](https://en.wikipedia.org/wiki/Windows_HPC_Server_2008).[[90]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-Mims19Jan10-90)

**Advocacy**

[[edit](https://en.wikipedia.org/w/index.php?title=Linux_adoption&action=edit&section=23)]

Many organizations advocate for Linux adoption. The foremost of these is the [Linux Foundation](https://en.wikipedia.org/wiki/Linux_Foundation) which hosts and sponsors the key kernel developers, manages the Linux trademark, manages the Open Source Developer Travel Fund, provides legal aid to open source developers and companies through the Linux Legal Defense Fund, sponsors kernel.org and also hosts the Patent Commons Project.

The [International Free and Open Source Software Foundation](https://en.wikipedia.org/w/index.php?title=International_Free_and_Open_Source_Software_Foundation&action=edit&redlink=1) (iFOSSF) is a nonprofit organization based in [Michigan](https://en.wikipedia.org/wiki/Michigan), USA dedicated to accelerating and promoting the adoption of FOSS worldwide through research and civil society partnership networks.

The [Open Invention Network](https://en.wikipedia.org/wiki/Open_Invention_Network) was formed to protect vendors and customers from patent royalty fees while using [OSS](https://en.wikipedia.org/wiki/Open-source_software).

Other advocates for Linux include:

* [IBM](https://en.wikipedia.org/wiki/IBM) through its Linux Marketing Strategy
* [Linux User Groups](https://en.wikipedia.org/wiki/Linux_User_Group)
* [Asian Open Source Centre](https://en.wikipedia.org/w/index.php?title=Asian_Open_Source_Centre&action=edit&redlink=1) (AsiaOSC)
* [The Brazilian government](https://en.wikipedia.org/wiki/Brazil), under president [Luiz Inácio Lula da Silva](https://en.wikipedia.org/wiki/Luiz_In%C3%A1cio_Lula_da_Silva)[[91]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-91)
* [Software Livre Brasil](https://en.wikipedia.org/w/index.php?title=Software_Livre_Brasil&action=edit&redlink=1), a Brazilian organization promoting Linux adoption in schools, public departments, commerce, industry and personal desktops.[[92]](https://en.wikipedia.org/wiki/Linux_adoption?utm_source=chatgpt.com#cite_note-92)
* FOSS: Free and Open Source Software Foundations of India and China.[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia:Citation_needed)]