The History of Linux

Linux has its roots in Unix and Multics, two projects that shared the goal of developing a robust multi-user operating system. Unix developed out of the Multics project iteration at the Bell Laboratories' Computer Sciences Research Center. Bell Labs stopped funding the Multics project in 1969, but a group of researchers, including Ken Thompson and Dennis Ritchie, continued working with the project's core principles. In 1972-3 they made the decision to rewrite the system in C, which made Unix uniquely portable: unlike other contemporary operating systems, it could both move from and outlive its hardware.

Research and development at Bell Labs (later AT&T) continued, with Unix System Laboratories developing versions of Unix, in partnership with Sun Microsystems, that would be widely adopted by commercial Unix vendors. Meanwhile, research continued in academic circles, most notably the Computer Systems Research Group at the University of California Berkeley. This group produced the Berkeley Software Distribution (BSD), which inspired a range of operating systems, many of which are still in use today.

Unix raised important questions for developers, but it also remained proprietary in its earliest iterations. Richard Stallman was a central figure among the developers who were inspired to create non-proprietary alternatives to Unix. While working at MIT's Artificial Intelligence Laboratory, he initiated work on the GNU project (recursive for "GNU's not Unix!"), eventually leaving the Lab in 1984 so he could distribute GNU components as free software.

Meanwhile, another developer was at work on a free alternative to Unix: Finnish undergraduate Linus Torvalds. After becoming frustrated with licensure for MINIX, Torvalds announced to a MINIX user group on August 25, 1991 that he was developing his own operating system, which resembled MINIX. Though initially developed on MINIX using the GNU C compiler, the Linux kernel quickly became a unique project with a core of developers who released version 1.0 of the kernel with Torvalds in 1994.

Linux is not a UNIX-derivative. It was written from scratch. However, many of the commands that are found in Linux are also found in UNIX. If you have any experience on UNIX systems, you're going to feel right at home on a Linux system.

Further Reading:
A Brief History of Linux, DigitalOcean
History of Linux, Ragib Hasan

Key Features of Linux

Though the Linux kernel inherited many goals and properties from Unix, it differs from the earlier system in the following ways:

- Its core component is the kernel, which is developed independently from other operating system components. This means that Linux borrows elements from a variety of sources (such as GNU) to comprise an entire operating system.
- It is free and open-source. Maintained by a community of developers, the kernel is licensed under the GNU General Public License (an offshoot of the FSF's work on the GNU Project), and available for download and modification. The GPL stipulates that derivative work must maintain the licensing terms of the original software.
- It has a monolithic kernel, similar to Unix, but it can dynamically load and unload kernel code on demand.
- It has symmetrical multiprocessor (SMP) support, unlike traditional Unix implementations. This means that a single operating system can have access to multiple processors, which share a main memory and access to all I/O devices.
- Its kernel is preemptive, another difference from Unix. This means that the scheduler can force a context switch on a driver or another part of the kernel while it is executing.
- Its kernel does not differentiate between threads and normal processes.
- It includes a Command Line Interface (CLI) and can also include a Graphic User Interface (GUI).

What is the Linux Kernel

First and foremost, Linux is an operating system. An operating system is simply a collection of software that manages hardware resources and provides an environment where applications can run. The operating system allows applications to store information, send documents to printers, interact with users and other things.

Linux is also a kernel. A kernel is the lowest level of easily replaceable software that interfaces with the hardware in your computer. It is responsible for interfacing all of your applications that are running in "user mode" down to the physical hardware, and allowing processes, known as servers, to get information from each other using inter-process communication (IPC).

Typically, when the term "Linux" is used, it refers to the Linux operating system as a whole. However, it can refer to just the Linux kernel as well. The Linux kernel is the core or the heart of the operating system. It's the layer that sits between the hardware and applications. Said another way, it's the intermediary between software and hardware. However, to have a useful operating system, you need other components in addition to the kernel. These components can include system libraries, graphical user interfaces, email utilities, web browsers and other programs.

Linux distributions take the Linux kernel and combine it with other free software to create complete packages. There are many different Linux distributions out there.

Further Reading:
What is the Linux Kernel and What Does It Do? How-To Geek
What is Linux? Linux Training Academy

Linux Distributions

A Linux distribution is the Linux kernel and a collection of software that together, create an operating system. Each distribution has its own goals and areas of focus. Your choice of distribution will depend on what you're trying to accomplish. There are distributions that are commercial. These commercial Linux distributions are backed by corporations and you can buy support from them. There are non-commercial Linux distributions. These are maintained by a community of volunteers. You have Linux distributions that are designed for server use, others that are designed for desktop use, some that are focus on research and science. There are others that are focused on multimedia production. There are literally hundreds of Linux distributions.

Linux isn't a complete operating system — it's just a kernel. Linux distributions take the Linux kernel and combine it with other free software to create complete packages. There are many different Linux distributions out there. If you want to "install Linux," you'll need to choose a distribution. You could also use Linux from scratch to compile and assemble your own Linux system from the ground up, but that's a huge amount of work.

Debian
Debian is an operating system composed only of free, open-source software. The Debian project has been operating since 1993 — over 20 years ago! This widely respected project is still releasing new versions of Debian, but it's known for moving much more slowly than distributions like Ubuntu or Linux Mint. This can make it more stable and conservative, which is ideal for some systems.

Ubuntu
Ubuntu was originally founded to take the core bits of stable Debian and improve on them more quickly, packaging the software together into a user-friendly system that's more frequently updated. Ubuntu is probably the most well-known Linux distribution. Ubuntu is based on Debian, but it has its own software repositories. Much of the software in these repositories is synced from Debian's repositories.

The Ubuntu project has a focus on providing a solid desktop (and server) experience, and it isn't afraid to build its own custom technology to do it. Ubuntu used to use the GNOME 2 desktop environment, but it now uses its own Unity desktop environment. Ubuntu is even building its own Mir graphical server while other distributions are working on the Wayland.

Ubuntu is modern without being too bleeding edge. It offers releases every six months, with a more stable LTS (long term support) release every two years. Ubuntu is currently working on expanding the Ubuntu distribution to run on smartphones and tablets.

Fedora
Fedora is a project with a strong focus on free software — you won't find an easy way to install proprietary graphics drivers here, although third-party repositories are available. Fedora is bleeding edge and contains the latest versions of software.

Unlike Ubuntu, Fedora doesn't make its own desktop environment or other software. Instead, the Fedora project uses "upstream" software, providing a platform that integrates all this upstream software without adding their own custom tools or patching it too much. Fedora comes with the GNOME 3 desktop environment by default, although you can also get "spins" that come with other desktop environments.

Fedora is sponsored by Red Hat, and is the foundation for the commercial Red Hat Enterprise Linux project. Unlike RHEL, Fedora is bleeding edge and not supported for long. If you want a more stable release that's supported for longer, Red Hat would prefer you use their Enterprise product.

CentOS/Red Hat Enterprise Linux
Red Hat Enterprise Linux is a commercial Linux distribution intended for servers and workstations. It's based on the open-source Fedora project, but is designed to be a stable platform with long-term support.

Red Hat uses trademark law to prevent their official Red Hat Enterprise Linux software from being redistributed. However, the core software is free and open-source. CentOS is a community project that takes the Red Hat Enterprise Linux code, removes all Red Hat's trademarks, and makes it available for free use and distribution. It's a free version of RHEL, so it's good if you want a stable platform that will be supported for a long time. CentOS and Red Hat recently announced they're collaborating, so CentOS is now part of Red Hat itself.

openSUSE/SUSE Linux Enterprise
openSUSE is a community-created Linux distribution sponsored by Novell. Novell purchased SuSE Linux in 2003, and they still create an enterprise Linux project known as SUSE Linux Enterprise. Where Red Hat has the Fedora project that feeds into Red Hat Enterprise Linux, Novell has the openSUSE project that feeds into SUSE Linux Enterprise.

Like Fedora, openSUSE is a more bleeding edge version of Linux. SUSE was once one of the great user-friendly desktop Linux distributions, but Ubuntu eventually took that crown.

Arch Linux
Arch Linux is a lightweight and flexible Linux distribution that tries to keep it simple. Arch Linux is an independently developed x86-64 general-purpose Linux distribution that strives to provide the latest stable versions of most software by following a rolling-release model. The default installation is intentionally minimal so that users can add only the packages they require. Arch Linux is one of the best if you are after customization and the latest software.

Further Reading:
The Many Flavors of Linux, BeginLinux
10 of the Most Popular Linux Distributions Compared, How-To Geek
Linux Training, BeginLinux.com

Linux vs Windows

Windows vs Linux: Distributions
Before we begin, we need to address one of the more confusing aspects to the Linux platform. While Windows has maintained a fairly standard version structure, with updates and versions split into tiers, Linux is far more complex.

Originally designed by Finnish student Linus Torvalds, the Linux Kernel today underpins all Linux operating systems. However, as it remains open source, the system can be tweaked and modified by anyone for their own purposes.

What we have as a result are hundreds of bespoke Linux-based operating systems known as distributions, or 'distros'. This makes it incredibly difficult to choose between them, far more complicated than simply picking Windows 7, Windows 8 or Windows 10.

Windows vs Linux: Installation
A common feature of Linux OS' is the ability to 'live' boot them – that is, booting from a DVD or USB image without having to actually install the OS on your machine. This can be a great way to quickly test out if you like a distro without having to commit to it.

The distro can then be installed from within the live-booted OS, or simply run live for as long as you need. However, while more polished distros such as Ubuntu are a doddle to set up, some of the less user-friendly examples require a great deal more technical know-how to get up and running.

Windows installations, by contrast, while more lengthy and time consuming, are a lot simpler, requiring a minimum of user input compared to many distros.

Windows vs Linux: Software and compatibility
Most applications are tailored to be written for Windows. You will find some Linux-compatible versions, but only for very popular software. The truth, though, is that most Windows programs aren't available for Linux.

A lot of people who have a Linux system instead install a free, open source alternative. There are applications for almost every program you can think of. If this isn't the case, then programs such as WINE or a VM can run Windows software in Linux instead.

Despite this, these alternatives are more likely to be amateur efforts compared to Windows. If your business requires a certain application then it's necessary to check if Linux runs a native version or if an acceptable replacement exists.

There are also differences in how Linux software installs programs compared with Windows. In Windows, you download and run an executable file (.exe). In Linux, programs are mostly installed from a software repository tied to a specific distro.

Installing on Linux is done by typing an apt-get command from the command line. A package manager handles this by layering a graphical user interface over the messy mechanics of typing in the right combination of words and commands. This is in many ways the precursor of a mobile device's app store.

Depending on the software, some won't be held in a repository and will have to be downloaded and installed from source, such as the non-open source variants of proprietary software like Skype or Steam.

In this case, the installation becomes more similar to that of Windows software. You simply download the relevant package for your distro from the company's website, and the inbuilt package installer will complete the rest.

Windows has a big advantage over Linux which is that in the software stakes, virtually every program is designed from the ground up with Windows support in mind. In general, Windows users aren't affected by compatibility worries. As mentioned previously, the set-up is also often a much simpler affair.

Windows vs Linux: Support
As it's created and maintained by a community of passionate fans, Linux has a huge wealth of information to fall back on, in the form of tips, tricks, forums and tutorials from other users and developers.

However, it's somewhat fragmented and disarrayed, with little in the way of a comprehensive, cohesive support structure for many distros. Instead, anyone with a problem often has to brave the wilderness of Google to find another user with the answer.

Microsoft is much better at collating its resources. Though it doesn't have quite the amount of raw information that's available regarding Linux, it's made sure that the help documents it does have are relatively clear and easy to access.

There's also a similar network of Windows forums and tutorials if the official assistance doesn't help you.

Windows vs Linux: Security
Security is a cornerstone of the Linux OS, and one of the principal reasons for its popularity among the IT community. This reputation is well deserved and stems from a number of contributing factors.

One of the most effective ways Linux secures its systems is through privileges. Linux does not grant full administrator – or 'root' – access to user accounts by default, whereas Windows does. Instead, accounts are usually lower-level and have no privileges within the wider system.

This means that when a virus gets in, the damage it can do is limited, and restricted mainly to files and folders on the individual machine. This can be incredibly beneficial from a damage control standpoint, since it's far easier to simply replace one machine than scour the entire network for malware traces.

There's also the fact that open source code, such as Linux software, is generally thought to be more secure and better maintained, due to the number of people scanning it for flaws. Similar to the 'infinite monkeys' principal, 'Linus' Law' (named after Torvalds), states that "given enough eyeballs, all bugs are shallow".

Possibly most important, however, is the issue of compatibility. As we mentioned earlier, virtually all software is written for Windows, and this also applies to malware.

Given that the number of Windows machines in the world vastly outnumbers the number of Linux ones, cyber attacks targeting Microsoft's OS are much more likely to succeed, and therefore much more worthwhile prospects for threat actors.

This isn't to say that Linux machines are totally immune from being targeted, of course, but statistically, you're probably safer than with Windows, provided you stick to best practice.

Windows vs Linux: Performance
Microsoft's ubiquitous OS can be called many things, but 'lightweight and speedy' is not one of them. Windows has an unfortunate tendency towards bloating and sluggishness, and can very quickly feel outdated if not properly maintained.

Linux is much quicker, on the whole. The OS itself is less demanding, and many distros sacrifice any visual bells and whistles to ensure that performance is the absolute best it can be. Opting for one of these builds can be an excellent way to bring an ailing older laptop back up to its former speed.

There are, of course, numerous ways to ensure that a Windows PC or laptop remains decently nippy over the course of its lifespan, but Linux computers will on average outperform them over a longer period.

Windows vs Linux: User-friendliness
When it comes to user-friendliness and how accessible an OS is to first-time users, Windows is a clear cut above the competition.

The fact that Microsoft has been producing its system software for nearly 30 years means that many aspects of it have become cultural touchstones. Accordingly, certain elements of the layout and navigation have been absorbed through osmosis, and a lot of users can essentially operate the system instinctively.

Linux does not have the luxury of being the most widely-used operating system in the world. As such, new users have to re-learn how to perform simple tasks on an unfamiliar and often complicated system, which can be offputting for the casual user.

However, Linux is an operating system that gets simpler to use the more you understand about it, while Windows can sometimes be the opposite. Digging down past the basic tasks into more complicated functions can leave some people baffled.

Windows vs Linux: Verdict
Given their different strengths and use cases, it's difficult to definitively state whether Linux or Windows is the better OS. Whether or not each one will be a good fit for your business depends a lot on how your company operates, and what applications it uses.

If you're a small firm that works primarily in software, Linux is likely to be a good fit, as the free availability will reduce overheads, and set-up won't be too complicated to manage. It also has a reputation as a tool for coding.
code

However, larger deployments will be much more complicated. Replacing the computers of hundreds of employees is likely to cause chaos, particularly if they're not familiar with Linux. It's possible – especially if a simple, Windows-style distro is used – but without a very capable and well-integrated IT department, many companies will struggle.

Given the flexibility of multiple distros, the non-existent asking price and the heightened security, Linux is the overall favourite - assuming you've got the patience to adapt to a new system.

Windows, however, remains the winner in terms of pure convenience. It's simple, familiar, and guaranteed to be compatible with virtually all software; for busy companies, that could well be more valuable in the long run.

Further Reading:
Windows vs Linux in 2018, Datamation
Linux vs Windows 10 – Which is the best operating system? techWorld
Windows vs Linux: what's the best operating system? ITPro
Differences Between Linux Security and Windows Security, Chron