

The story of Linux: from a hacker's hobby to the king of supercomputing

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Free and Open-source Software

- Two competing ideas about its origin:
 - The return of the 'Good Old Times' of software
 - A fully new phenomenon born with the Internet explosion in early 90s
- In a way, both are right – the truth lies most likely somewhere in between (the Internet reaching the wider public played an important part)

The MIT AI Lab

- July 1, 1963 – Project MAC (originally *Mathematics and Computation*) launched on a DARPA 2 MUSD grant
- J.C.R. Licklider, M. Minsky, J. McCarthy (later left to Stanford)
- PDP-6 (later, 10), ITS, LISP
- A hacker's paradise: culture of sharing and playful cleverness
- 1970 – Marvin Minsky with his disciples founded the AI Lab
- 1971 – a student named R.M. Stallman was looking for internship – got also a job and a place to live (lab...)
- Emacs: a text editor as the 'killer app' of the time

...



Licklider



Minsky



McCarthy



Stallman

Photos hereafter: Wikimedia Commons

The paradise lost

- 1981 – strife in the lab, two groups forming two companies specializing on LISP and related computers (LMI led by Richard Greenblatt, and Symbolics by Russell Noftsker). In the end, most of the lab disbanded into the two
- Stallman stayed for awhile (and helped LMI), but finally started to search for a new place. Ideas of a free system
- 1982 – started to develop a new, fully free operating system (a rewrite of Unix (considered ITS too old))

That crazy guy

- RMS (as he is still called today) decided to rewrite (a free) Unix from scratch – more or less alone - and on November 27, 1983 sent an announcement to Usenet and various lists (<https://www.gnu.org/gnu/initial-announcement.en.html>)
- GNU, stands for Gnu's Not Unix (recursively)
- First utility: Yacc => Bison (hackish wordplay again)
- Wrote to Andrew S. Tanenbaum to get permission to use his Amsterdam Compiler Kit – the refusal sparked another decision to write a C compiler (later known as GCC) too

Selling software (!)

- 1985 – GNU Emacs and GNU Manifesto
- Stallman quit MIT, but was permitted to stay at the lab – and made his living from selling Emacs on tapes (USD 159)
- Later that year, founded the Free Software Foundation. Emacs went to FSF to provide income, RMS completed GCC and started to sell that instead

The GNU effort

- In five years, completed main components of the GNU system:
 - Text editor (GNU Emacs)
 - Shell (bash)
 - C library (glibc)
 - GNU debugger (gdb)
 - ...
- 1990 – RMS received the MacArthur Foundation stipend (230 000 USD on five years) – invested it and lives on it even today
- Almost full system but the kernel

Back in 1991

- Common people used MS-DOS 4.0 and Windows 3.0 (soon afterwards, Windows 3.1 became a major hit)
- Hackers lacked a system to hack on – Unix went closed-source, others were like that from the start (Apple, Microsoft). And Stallman did not have the GNU ready yet, either
- Business ban lifted on the Internet
- Birth of WWW
- ... and some new development/community models

Abdicated the throne: Minix

- In late 70s at the Dutch Free University, Andrew S. Tanenbaum taught operating systems using Unix v6 as a teaching aid
- 1979 - AT&T released Unix v7 and forbade even academic use of source code
- Tanenbaum was forced to stick with theory only for a time
- In 1987, wrote Minix, a minimal Unix version for PC-s
- Open source, but due to publisher's demands was only available bundled with Tanenbaum's book (on diskettes)
- Stallman came to ask again... No



Linus Torvalds

- Beginning: Grandpa's Commodore Vic-20
- Univ. of Helsinki, then Finnish army with junior officer's rank => later mentioned as a crash course in team management
- 5.1.91 – Linus took a student loan and bought his first PC (386, 4M RAM, 40M HDD)
- Ordered Tanenbaum's book and Minix, studied DOS and assembler, and most of the time, played the *Prince of Persia*
- March – first post to comp.os.minix
- August 25, 1991 – the e-mail announcement:



Linus' message to comp.os.minix from August 25, 1991

- Hello everybody out there using minix -

I'm doing a (free) operating system (just a hobby, won't be big and professional like gnu) for 386(486) AT clones. This has been brewing since april, and is starting to get ready. I'd like any feedback on things people like/dislike in minix, as my OS resembles it somewhat (same physical layout of the file-system (due to practical reasons) among other things). I've currently ported bash(1.08) and gcc(1.40), and things seem to work. This implies that I'll get something practical within a few months, and I'd like to know what features most people would want. Any suggestions are welcome, but I won't promise I'll implement them :-)

Linus (torvalds@kruuna.helsinki.fi)

PS. Yes - it's free of any minix code, and it has a multi-threaded fs. It is NOT portable (uses 386 task switching etc), and it probably never will support anything other than AT-harddisks, as that's all I have :-).

First steps

- September 1991 – v.0.01, Freax => Linux
- End of the year - v.0.12, license switched to GNU GPL
- December 1991 – Another war of words: Andrew Tanenbaum vs Linus Torvalds (“ Be thankful you are not my student”)
- March 1992 – 0.12 jumped straight to 0.95 (damn optimists...).
The newsgroup comp.os.linux created (at first alt.os.linux)
- Crazy folks (Rich Sladkey) used Linux in dual boot
- Experiments with X (v0.95), the Xfree86 project started
- September 1992 – Internet (TCP/IP) support added

In a couple of years

- The first distro – MCC Linux in Manchester Computing Centre (Bruce Perens a.o.) in February 1992. Soon, SLS, SuSE, Debian, Slackware, TurboLinux etc followed
- 1992 – The Linux Documentation Project, possibly the first large-scale online community based writing project. At first a FTP site, website (possibly the first Linux website of all) added in 1993. Was active till ~2016 (NB! The http:// site is something different)
- Approximately 100 000 users
- Introduction of CD-ROM – a cheap and large (compared to 3.5” diskettes) medium. Yggdrasil, the first live-CD distro

The first milestone

- 1994 – Linux 1.0
- Red Hat founded by Marc Ewing (and Bob Young)
- First port of Linux: DEC Alpha (later, Motorola 68000 and Sun SparcStation)
- Linux Journal
- First Linux books published by O'Reilly
- Andrew Tridgell created Samba – allowed connectivity with Windows-based networks



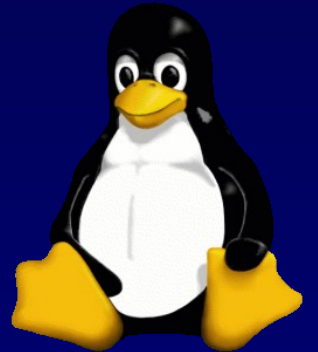
LAMP

- 1995: NCSA httpd => Apache (Brian Behlendorf)
- MySQL (Michael “Monty” Widenius a.o.)
- PHP (Rasmus Lerdorf)
- About 1.5 million users



What's in the name?

- 1996 – yet another fisticuff: Linus & Co vs RMS and FSF over the new system's name. FSF first suggested 'Lignus' or 'Linux', later settled to either 'GNU/Linux' or 'GNU+Linux'
- Some people sought a mascot for Linux – Linus just had to mention casually 'I like penguins' (*and the King hath spoken...*)
- June 1996 - Linux 2.0, followed soon by 'Linus 2.0', Patricia Miranda Torvalds. Papa Linus set example for a new breed of hacker – being hairy, unkempt and asocial is not necessary. And later, Linus had two more daughters



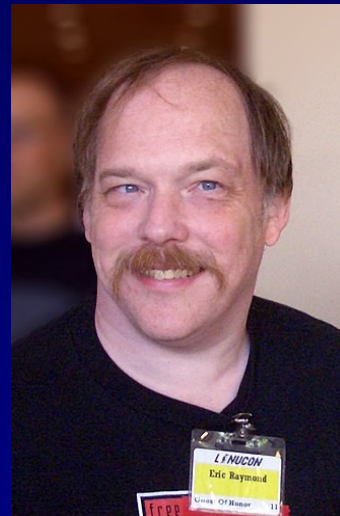
The Linux desktop

- October 1996 – Matthias Ettrich founded the KDE project, first betas came the next year
- Built on the Qt libraries from Troll Tech in Norway - not free software. RMS started to growl
- As usual, started a competing project – birth of GNOME, led by Miguel de Icaza
- 2000 – Qt adopted GNU GPL, end of growling
- Both projects go on today, plus some others



Two schools

- Freeware Summit 1997 – RMS not invited
- Most of the company (Bruce Perens, Eric S. Raymond, Linus) decided to found a new approach called 'open source'. The aim was not to frighten business people – the focus being on technology rather than ideology
- In practical aspects the two cooperate (FLOSS as an umbrella term), in official politics make faces
- Linux Kongress 1997 – Eric S. Raymond presented his essay *The Cathedral and the Bazaar*, the groundwork for the Open Source school



1998

- Linux had about 12 million users
- Mandrake (later becoming Mandriva and Mageia), the first 'Linux for ordinary people' (also with an extensive support of different languages, including .ee)
- The rise (and later, fall) of Loki Games
- The Halloween Documents leaked from Microsoft, suggesting that the company had started to feel the heat

Millennium

- 1999: Linux kernel 2.2 brought the system to mainframes
- Corel Linux – a rather unsuccessful attempt on ‘Everyone’s Linux’ as business idea
- The sensational IPO of VA Linux (698%) and the actually successful one (8th best) of Red Hat
- 2000: Red Hat started cooperation with IBM
- A German company called StarDivision released StarOffice 5.1 and 5.2, the first actual alternatives to MS Windows (closed-source freeware, but available on both MS Windows and Linux)
- Sun Microsystems acquired StarDivision => proprietary StarOffice + free OpenOffice.org

Beginning of the century

- 2001: kernel 2.4 – notable improvement in hardware support
- IBM invested USD 1bln into Linux
- GNOME 1.4, KDE 2
- Ximian Evolution, much like MS Outlook (but MS kept quiet)
- 2002: GNOME 2, KDE 3
- Openoffice.org 1.0 (Note: .ee was supported before MS Office)
- Crooked boss drove Loki Games to bankruptcy
- Red Hat Linux => RHEL and Fedora
- Knoppix and other CD-Linuxes

First decade

- Advent of multimedia ja 3D (including drivers for NVidia)
- 2003: SCO court case against IBM and Linux kernel 2.4 (but 2.6. was released already the same year)
- 2004: Mark Shuttleworth founded Canonical, releasing the first version of Ubuntu Linux (4.10 Warty Warthog)
- 2005: 3D UI on Linux (Compiz/Beryl)
- Linux Mint started (at first as offshoot of Kubuntu)
- 2007: standard wars surrounding the new file formats of MS Office. Google started to move on Android



Around 2010

- 2008: Estobuntu (ID card support from the box). Most of the guys graduated from IT College, ours labs ran on it for years
- The netbook boom => boost to Linux (1/3 initially preinstalled on Linux). Major stock exchanges (NYSE etc) adopted Linux
- 2010: Openoffice.org => Sun/Oracle => LibreOffice. CyanogenMod and Replicant (the latter being 'Stallman's Android')
- 2011: *The Year of Messy Linux Desktop* (GNOME 3 and Unity vs MATE and Cinnamon). Google Chromebook
- 2012: Linux Mint dethroned Ubuntu as the commoner's Linux. Cloud started to move on Linux (Red Hat had a major role). Linus said "F... you, NVIDIA!" in public (with gesture), with even some positive effect
- BIOS => UEFI: another obstacle
- Akademy 2012 (global KDE Summit) held at IT College

Second decade

- 2013: Microsoft re-classified Estonia as a developed country, meaning up to 25 times higher prices for schools – Linux held as a serious contender for the first time
- Steam and Spotify for Linux (+ separate SteamOS). Android had 75% of mobile market. Ubuntu Phone from Canonical
- 2014: a series of scandals and conflicts in the FLOSS world (systemd, a sexism scandal, desktop controversies continue)
- 2015: Kernel series 4.0 with live patching (no restart needed)
- 2017: Top500 (list of world's most powerful supercomputers) became Linux-only for the first time. Cyanogen => LineageOS

Linux on supercomputers

- Starting from Los Alamos 1998: Avalon Cluster, 68 PC boxes running Linux, 19 gigaflops (bln op/s) for \$152000 (~1/10 of the price of a comparable supercomputer). Top500 position 314/315
- In two years (turn of century), about 1/10 of Top500 ran Linux
- By 2005, it had ousted commercial Unix (AIX, HP-UX etc); about 80% of Top500
- Since ~2017, total domination of supercomputing

2019: Hell froze over

- Microsoft officially joined the main supporters of Linux
- But actually, it had already been 5th in kernel code commits back in 2011, and Satya Nadella had declared “Microsoft loves Linux!” in 2014
- Windows Subsystem for Linux 2 allowed running a full Linux distro inside Windows 10; MS Azure mostly moved to Linux as well (by then, cloud was already 90% Linux)
- IBM acquired Red Hat, kept it a separate division
- Kernel 5.0 series (later adds Apple M1 chip support)

Recent developments

- 2021: formal end of the SCO court case (actual bankrupt occurred in 2010). Red Hat (as part of IBM) angered the Linux community with closing down CentOS (the retained CentOS Stream is more alike to Fedora); Alma and Rocky stepped up as replacements
- 2022: Kernel 6.0 series (processors, game controllers, sound)
- Linus can still joke: the codename of kernel 5.17 was „Superb Owl” (ct a sports event in the US)
- May 2023: official release of MS Azure Linux (well, kinda)
- Embedded systems, space tech, cars, robots, musical instruments and equipment, weapon systems...

Case study: this guy here

- All desktops and laptops: Linux Mint
- Kakupesa (the home server): Ubuntu Server
- Router: MikroTik
- TV: Tizen
- Phone and tablet: LineageOS
- Synth: Kronos OS (based on Linux)
- Guitar amp (Fender): ?? , controlled by a LineageOS tablet
- Car: Android Auto, sound system ? (said to be Linux-based)

Near future

- The evolution continues (if not too many fights happen)
- Proliferation of blended and hybrid business models and liberal free licenses (BSD, MIT, X11), yet GPL retains a strong presence
- The bigger; the more penguin: supercomputing, cloud
- Android => 'real' Linuxes on mobile devices (Pinephone, Librem 5)?
- Mainstream software gets better, desktop is a question mark
- Rise of security and privacy issues

Read more

- MOODY, Glyn. Rebel Code: Inside Linux and the Open Source Revolution. Perseus Publishing, Cambridge MA 2001
- POYNDER, Richard. The Basement Interviews
<https://poynder.blogspot.com/2006/03/basement-interviews.html>
- RAYMOND, Eric Steven. The Cathedral and the Bazaar.
<http://www.catb.org/~esr/writings/cathedral-bazaar/>
- SALUS, Peter. The Daemon, the Gnu, and the Penguin. A History of Free and Open Source Software.
<http://www.groklaw.net/staticpages/index.php?page=20051013231901859>
- STALLMAN, Richard Matthew. Free Software, Free Society. Ed. Joshua Gay. GNU Press 2002. <https://www.gnu.org/doc/fsfs3-hardcover.pdf>
- TORVALDS, Linus, DIAMOND, David. Just for Fun: The Story of an Accidental Revolutionary. Harper-Collins 2001

Thanks