



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

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# Free Software

- Two competing ideas:
  - The return of the 'Good Old Times' of software
  - A new phenomenon born with the Internet explosion in early 90s
- In a way, both are right – the truth lies most likely somewhere in between

# MIT AI Lab

- July 1, 1963 – Project MAC (originally Mathematics and Computation) is launched on a DARPA 2 MUSD grant
- J.C.R. Licklider, M. Minsky, J. McCarthy
- PDP-6 (later, 10), ITS, LISP
- A hacker paradise: culture of sharing and *playful cleverness*
- 1970 – Marvin Minsky with his disciples found AI Lab
- 1971 – a student named R.M. Stallman seeks internship – gets it along with a job and place to live following in the future
- Emacs: a text editor as a *killer app* of the time

# Changing times

- 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 disbands
- Stallman stays for awhile (and helps LMI), but finally starts to search for a new place. Ideas of a free system
- 1982 – starts to develop a new, fully free operating system (a rewrite of Unix, as ITS is too old already)

# Crazy hairy dude called RMS

- RMS (as he is still called today) decides to rewrite (a free) Unix from scratch – more or less alone - and on November 27, 1983 sends an announcement to Usenet and various lists
- GNU, stands for Gnu's Not Unix (recursively)
- First utility: Yacc => Bison
- Writes to Andrew S. Tanenbaum to get permission to use his *Amsterdam Compiler Kit* – the refusal sparks another decision to write a C compiler (later known as GCC) too

...

- 1985 – GNU Emacs and GNU Manifesto
- Stallman quits MIT, but is permitted to stay at the lab – and makes his living from selling Emacs on tapes (USD 159)
- Later that year, founds the Free Software Foundation. Emacs will go to FSF to provide income, RMS completes GCC and starts to see that instead

# 1985-90: efforts on GNU

- Completes main components of the GNU system:
  - Text editor (GNU Emacs)
  - Shell (bash)
  - C library (glibc)
  - GNU debugger (gdb)
  - ...
- 1990 – RMS receives the MacArthur Foundation stipend (230 000 USD on five years) – invests 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
- Hackers lacked a system to hack on – Unix went closed-source, others were from the start (Apple, Microsoft)
- Business ban lifted on Internet
- Birth of WWW

# 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 releases Unix v7 and forbids even academic use of source code. Tanenbaum is forced to stick with theory only for a time
- In 1987, writes Minix, a minimal Unix version for PC-s
- Open source, but due to publisher's demands is only available bundled with Tanenbaum's book (on diskettes)
- Stallman comes to ask again... No

# Linus steps up

- Beginning: Grandpa's *Commodore Vic-20*
- Univ. of Helsinki, then Finnish army with junior officer's rank => later mentioned as a crash course of management
- 5.I.91 – Linus takes a student loan and buys his first PC (386, 4M RAM, 40M HDD)
- Orders Tanenbaum's book and MInix, studies DOS and assembler, and most of the time, plays the *Prince of Persia*
- March – first post *comp.os.minix*
- August 25, 1991 – the e-mail announcement:

# Linus' e-mail 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 protable (uses 386 task switching etc), and it probably never will support anything other than AT-harddisks, as that's all I have :-).

# Early days

- September 1991 – v.0.01, Freax => Linux
- End of the year - v.0.12, license switch to GNU GPL
- December 1991 – Another war of words: Andrew Tanenbaum vs Linus Torvalds
- March 1992 – 0.12 jumps to 0.95 (damn optimists...). The newsgroup *comp.os.linux* created (at first *alt.os.linux*)
- Crazy folks (Rich Sladkey) use Linux in dual boot
- Experiments with X (v0.95), the Xfree86 project started
- September 1992 – Internet (TCP/IP) support added

# Distros and docs

- Early 1993 – *The Linux Documentation Project*
- The first distro – MCC Linux in Manchester Computing Centre (Bruce Perens *et al*) in February 1992. Soon, SLS, SuSE, Debian, Slackware, TurboLinux etc follow
- 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 landmark

- 1994 – Linux 1.0
- Red Hat founded
- First port of Linux: DEC Alpha (later, Motorola 68000 and SparcStation)
- Linux Journal
- First Linux books published by O'Reilly
- Andrew Tridgell created Samba

# LAMP

- 1995: NCSA httpd => Apache
- MySQL AB
- Rasmus Lerdorf creates the first versions of PHP
- About 1.5 million users

# What's the name?

- 1996 – yet another fisticuff: Linus & Co vs RMS and FSF over the new system's name. FSF suggests 'Lignus' or 'Lignum'.
- Los Alamos: physicists connect 68 Linux boxes, get 19 bln op/s for 1/10 of the price of a comparable supercomputer
- Some people seek a mascot for Linux – Linus mentions 'I like penguins'. Done
- June 1996 - Linux 2.0, followed soon by 'Linus 2.0', Patricia Miranda Torvalds. Papa Linus sets example for a new breed of hacker – being hairy, unkempt and asocial is not necessary. And later, Linus got two more daughters

# Birth of a desktop

- October 1996 – Matthias Ettrich founds the KDE project, first betas come the next year
- But: it is built on the Qt libraries from Troll Tech in Norway. Not free software. RMS starts to growl
- As usual, starts a competing project – birth of GNOME, led by a Mexican Miguel de Icaza
- 2000 – Qt adopts GNU GPL, end of growling
- Both projects go on today, a number of new ones join later

## Two schools

- *Freeware Summit 1997* – RMS not invited
- Most of the company (Bruce Perens, Eric S. Raymond, Linus) decides to found a new approach called 'open source'. The aim is not to frighten business people – the focus is 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 presents his essay *The Cathedral and the Bazaar*, the groundwork for the open source school of thought

# 1998

- Linux has about 12 million users
- Mandrake, the first 'Linux for ordinary people'
- The rise and fall of Loki Games
- The Halloween Documents leak from Microsoft, showing that the company has started to feel the heat

# Millennium

- 1999: Linux kernel 2.2 brings the system to mainframes
- The sensational IPO of VA Linux
- 2000: Red Hat starts cooperation with IBM
- A German company StarDivision releases 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 buys StarDivision. StarOffice turns proprietary, a new free version called OpenOffice.org created

# New century

- 2001: kernel 2.4
- GNOME 1.4, KDE 2
- Ximian Evolution, looks quite like MS Outlook
- 2002: GNOME 2, KDE 3
- Openoffice.org 1.0
- The crooked boss drives Loki Games to bankruptcy
- Red Hat Linux replaced by RHEL and Fedora
- Knoppix and other CD-Linuxes

# 2003

- Gnome 2.4, KDE 3.1.1
- Rise of multimedia and 3D graphics (e.g. NVidia drivers)
- Openoffice.org 1.1
- Linux games rise again
- SCO starts the court case against Linux and IBM
- 2.6 kernels

# 2004

- New releases use 2.6 kernel (Mandrake 10.1, Fedora 3, SUSE 9.2)
- GNOME 2.8, KDE 3.3
- Firefox gains 10% of browser market
- OpenOffice.org 1.1.3
- Mark Shuttleworth founds Canonical and releases the initial version of Ubuntu Linux - 4.10 Warty Warthog

## 2005-2006

- OpenOffice.org 2.0
- 3D user interfaces Compiz and Beryl
- Ubuntu rises to the top in a year. 6.06 Dapper Drake LTS – Long Time Support (desktop 3, server 5 years)
- Firefox has market share of 25% in some countries
- Oracle starts their own Linux, Google buys Android
- Linux Mint founded (at first, as a variant of Kubuntu)
- Sun open sources Java => boosts Linux software, but the move comes too late for the company?

## 2007-2008

- Windows Vista has poor reception – many stay with XP, some move to Mac and Linux
- MS Office 2007, new format and standard wars
- Ubuntu 8.04 LTS Hardy Heron. Installing Ubuntu is typically easier than Windows
- Estobuntu 8.01 and 8.09
- OpenOffice.org 3.0
- The netbook boom => boost to Linux. Preinstalled Linux is not a rarity anymore

## 2009-2010

- Linux market share reaches 1/3 on netbooks – later, Microsoft manages to use its usual tactics to take it back
- Oracle buying Sun creates a lot of controversy
- Ubuntu 10.04 LTS
- Builders of Mandriva found Mageia
- LibreOffice forked from OpenOffice.org, many developers and most distros switch to it – Oracle is left with just the trade mark (finally, they decide to give OO.o to Apache Foundation, creating Apache OpenOffice)

## 2011-2012

- 2011 – Ubuntu 11.04 uses the Unity desktop => a lot of fuss and mass exodus follows (GNOME 3 is also considered a flop)
- MATE desktop built on the GNOME 2 codebase, Cinnamon created, other alternative desktops follow suit
- Linux Mint becomes the “Ubuntu as it should have been” – in 2012, passes Ubuntu in the Distrowatch list, number one “common people’s Linux” since then
- In June 2012, the turnover of Red Hat exceeds 1 bln USD
- Akademy 2012 held in IT College, almost 500 hackers from all around the world gather in Tallinn

## 2013-2016

- Microsoft re-classifies 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 come to Linux
- 2014 – a series of scandals and conflicts in the FLOSS world (*systemd*, a sexism scandal, desktop controversies continue)
- Windows 8 and especially 10 => another chance to competitors

# Linux today

- See distro statistics at <http://www.distrowatch.com>
- Linux kernel, GNU utilities – the rest depends on the owner
- Very diverse volumes from Damn Small Linux to Red Hat and Novell SUSE
- A multitude of platforms
- A sovereign of supercomputing - in November 2016, the Top500 has 498 Linux machines, the ones using another Unix (IBM AIX) rank 386<sup>th</sup> and 387<sup>th</sup>, no MS Windows at all (earlier, there were 1 or 2 computers running it from time to time)

# Plus/minus

- **STRONG:**
  - Networking (both client and server)
  - Dev tools
  - Infosec (incl Kali Linux, TAILS etc)
- **DECENT:**
  - Office software and other mainstream apps, system maintenance
- **WEAKER (still):**
  - Pro graphics (Photoshop vs GIMP, Inkscape etc)
  - Design and modelling (Maya, Dreamweaver etc vs Blender and lighter alternatives)
  - CAD (AutoCAD vs ?, lighter alternatives exist)
  - Gaming (but Steam has levelled the playing field considerably)

# 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
- Supercomputing
- Cloud (incl Microsoft Azure)
- Android => 'real' Linuxes on mobile devices?
- Mainstream software gets better
- Rise of security and privacy issues (versus Windows 10)

# Enough for today

