

Linux World Domination: How It All Began

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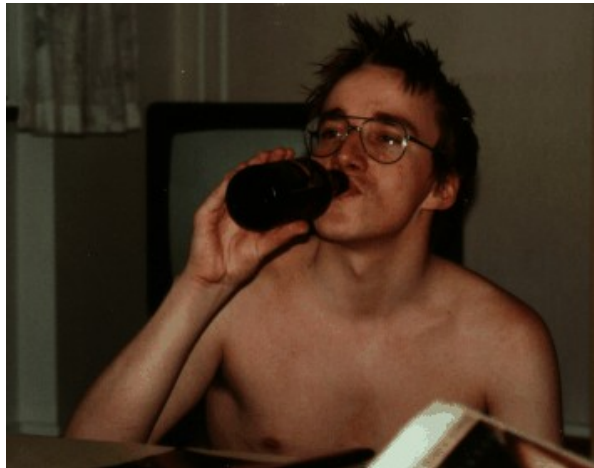
Linux is everywhere. From wrist watches and washing machines to supercomputers. On every continent, every sea, and in orbit around the planet. If that isn't enough, pretty soon we'll be seeing it on desktop computers in offices.

The road from the bedroom of a student in Helsinki has been surprisingly short and easy. Or that's what it feels like now; on the way some expletives have been uttered and teeth gnashed.

It is customary to start telling a story at the beginning.



Illustration 1: Linus in physics class. He's not asleep, he's listening to another student's question.



*Illustration 2: At a sauna evening.
He's not naked, he's wearing
trousers.*



Illustration 3: Sauna evening.

Linux's story sort of began when Linus learned about the Unix system in a course at the University of Helsinki in the fall of 1990. He then wanted to have something like that at home. Or maybe it started when he bought a PC the following January, and already a few months later playing computer games was getting boring. Or maybe it started when it turned out that writing As and Bs on the screen was surprisingly easy.

In the spring of 1991 Linus wanted to learn to program his new PC. Specifically he wanted to learn to program it in assembly language and do multitasking. His first multitasking program was one that had two processes, each writing a letter to the screen, one the letter A, the other the letter B. It looked quite funny.

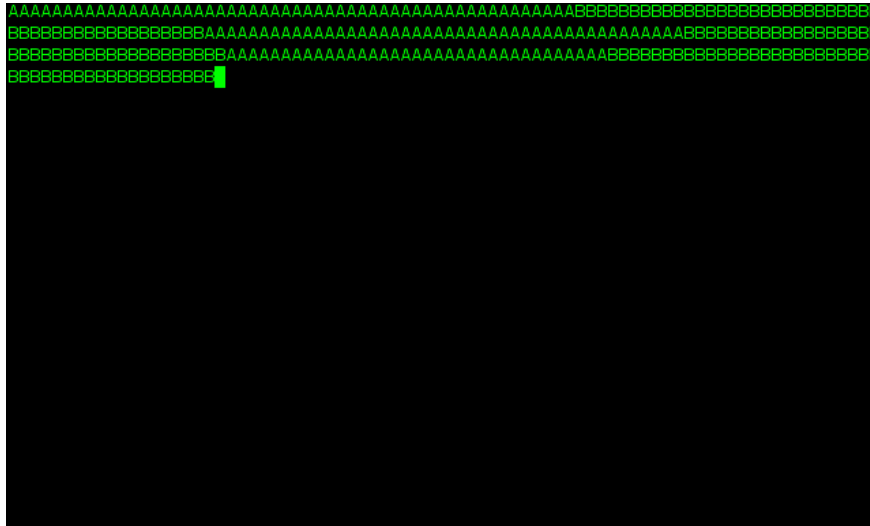


Illustration 4: The first program output looked a bit like this. This is a reconstruction.

From A and B he continued onwards, one step at a time. Relatively soon he had gotten far enough to have one process read from the keyboard and write to the serial port, and another to read from the serial port and write to the screen. After he added a bit of emulation of VT terminal codes, he had a terminal emulator. It was terrifically practical for dialing up the university modem pool to read Usenet from home.

```

liw - liw@angua -- /home/liw
Tiedosto Muokkaa Näytä Pääte Välilehdet Ohje
slrn 0.9.8.1 ** Press '?' for help, 'q' to quit. ** Server: news.saunalahti.fi
U 650 comp.os.os2.ecomstation
U 0 comp.os.linux.xbox
U 0 comp.os.aos Topics related to Data General's A0
U 0 comp.os.chorus CHORUS microkernel issues, research
U 0 comp.os.coherent Discussion and support of the Coher
U 0 comp.os.cpm Discussion about the CP/M operating
U 0 comp.os.cpm.amethyst Discussion of Amethyst, CP/M-80 sof
U 0 comp.os.geos.misc GEOS O/S by Geoworks in general
U 0 comp.os.geos.programmer GEOS O/S programming in general
U 0 comp.os.inferno The Inferno network operating syste
U 0 comp.os.lantastic The LANtastic network operating sys
U 0 comp.os.linux.advocacy Benefits of Linux compared to other
U 0 comp.os.linux.alpha Linux on Digital Alpha machines.
U 0 comp.os.linux.announce Announcements important to the Linu
U 0 comp.os.linux.answers FAQs, How-To's, READMEs, etc. about
U 0 comp.os.linux.development.apps Writing Linux applications, porting
U 0 comp.os.linux.development.system Linux kernels, device drivers, modu
U 0 comp.os.linux.embedded
U 0 comp.os.linux.hardware Hardware compatibility with the Lin
U 0 comp.os.linux.m68k Linux operating system on 680x0 Ami
U 0 comp.os.linux.misc Linux-specific topics not covered b
--*-News Groups: news.saunalahti.fi -- 3/134 (Top)
spc:Select p:Post c:Catch-Up l:List q:Quit ^r:Redraw (u)s:(Un)Subscribe

```

Illustration 5: Reading Usenet. This is a reconstruction.

This is where it could all have ended, but at that time Usenet had fairly little traffic, so after everything had been read, there was still enough time that the multitasking program could be developed further.

Later in the summer of 1991 Linus was at full speed developing his own operating system, even if only for fun. Nobody imagined then that it would fly to space, but it was still fun. In September 1991 he published it on the Internet for the first time, and that's when the story really begin.

```

drwxr-xr-x 4096 1991-09-17 18:27 boot
drwxr-xr-x 4096 1991-09-17 18:22 fs
drwxr-xr-x 4096 1991-09-17 18:12 include
drwxr-xr-x 4096 1991-09-17 18:18 init
drwxr-xr-x 4096 1991-09-17 19:30 kernel
drwxr-xr-x 4096 1991-09-17 18:29 lib
-rw-r--r-- 2186 1991-09-17 16:53 Makefile
drwxr-xr-x 4096 1991-09-17 18:20 mm
drwxr-xr-x 4096 1991-09-17 19:30 tools

```

Versio 0.01 directory listing. In total 88 files,
10239 lines of code.

With these first versions Linus did three things that were to become crucial for the future. Firstly, he published the source code of his operating system, and gave everyone permission to modify them, and to re-distribute the modified versions. Secondly, he published a system that did something for real, but was still small enough that other people could learn and understand it with reasonable effort. Thirdly, he took improvements from other people and incorporated them into his own code.

These three things were to be as crucial for Linux's future as Linus's own undeniable technical prowess. The combination of these three things lead to a quick development of a group of programmers who were interested in such a small, nimble project. Since Linux wasn't yet quite perfect, they found things to improve, and since they were programmers, they made the improvements and sent them to Linus. Linus then added them to his own code, and a snow ball effect happened.

Every new version of Linux was better than the previous one, so it got more attention, and more users. Many of the users were programmers, and the system was still small, so they made more improvements. The improvements were put into the next version, and the merrygoround spun faster again.



Linux gave everyone the freedom to use and change. It was not the first free program. Already in the 1980s Richard Stallman had founded the Free Software Foundation, and had strongly advocated free use and modification of software. Stallman had also started the development of his own operating system kernel, called the Hurd, but by 1991 it was not yet ready. What would happen was that Linux would take the place that had been reserved for the

Hurd. But that's OK, they're both free.

Back to 1991. Linux quickly grew in popularity, but only among very competent programmers, mainly because installation required editing hard disk sectors with a hexadecimal editor. This soon started to feel awkward, and something had to be done.

```
0000000 48 69 21 0a 0a 4d 79 20 6e 61 6d 65 20 69 73 20
0000020 4c 61 72 73 20 57 69 72 7a 65 6e 69 75 73 2c 20
0000040 61 6c 74 68 6f 75 67 68 20 49 27 6d 20 6f 66 74
0000060 65 6e 20 6b 6e 6f 77 6e 20 61 73 20 6c 69 77 20
0000100 6f 72 20 4c 61 73 75 2e 0a 54 68 69 73 20 69 73
0000120 20 6d 79 20 73 65 63 72 65 74 20 6d 65 73 73 61
0000140 67 65 20 74 6f 20 61 6c 6c 20 6f 66 20 79 6f 75
0000160 20 62 75 73 79 20 6c 69 74 74 6c 65 20 63 6f 64
0000200 65 20 63 72 61 63 6b 65 72 73 0a 77 68 6f 20 68
0000220 61 76 65 20 74 6f 6f 20 6d 75 63 68 20 66 72 65
0000240 65 20 74 69 6d 65 2e 20 4e 6f 74 20 74 68 61 74
0000260 20 64 65 63 6f 64 69 6e 67 20 61 20 68 65 78 20
0000300 64 75 6d 70 20 72 65 61 6c 6c 79 0a 63 6f 75 6e
0000320 74 73 20 61 73 20 63 6f 64 65 20 63 72 61 63 6b
0000340 69 6e 67 2c 20 6f 66 20 63 6f 75 72 73 65 2c 20
0000360 62 75 74 20 79 6f 75 20 6b 6e 65 77 20 74 68 61
0000400 74 2e 0a
```

A hex dump for your editing pleasure (reconstruction).

The first Linux distributions were born. They made installation much easier and they also came with pre-compiled program. It was no longer necessary to compile all sixty programs yourself, they could be used immediately.

Easy installation lured more people to use Linux. Nobody knew the number of users anymore, but there must have been hundreds of them, if not thousands.

The growing popularity also brought in more demanding users, people who didn't participate in the development of the system, they just used it, but they knew how to demand a lot from the system and its developers. Already in 1992 there were demands on the discussion forums that Linux should immediately support every graphics card available on the market, or it would fail. This turned out to not to be an accurate prediction.

Painting threats for the future of Linux has been common throughout its history. It has been predicted that the Hurd will make Linux redundant. Or that one of the BSD versions will do that. Absolutely one of the proprietary

commercial Unices will ruin everything for Linux. If nothing else, Windows will be a catastrophe. Luckily, all these hurdles are not proved to be lethal.

The year 1992 was important for Linux. In December 1991 Linus had implemented virtual memory, so it was now possible to run more and bigger programs than before. One such program was the X windowing system, which was several hundreds of kilobytes in size.

The same year Linux also got drivers for local area network card, and it was finally a real Unix system. Linux had a graphical user interface, and networking, so it was a workstation. It was time to consider it finished.

Well, some small things have still required effort.

In the fall of 1992 there were all kinds of users in such numbers that it was necessary to start systematically writing manuals for them. The Linux Documentation Project was born. Several discussion groups on Usenet were created, and they got so much discussion that they had to be re-organized several times. There was so much discussion that merely following the announcement group was almost a full time job.

The next year big things happened again. Companies were founded around Linux, for example Red Hat. The Debian project started at around the same time. In the fall, Linus got a full time TA job at the computer science department of the university and use of Linux was forbidden, because a bug was found in the network stack that flooded the entire network. It was fixed and then Linux was welcome again.

I started as a TA at the same time as Linux, and we shared an office. The room had two PCs, and Linus installed Linux on one of them. This was a rare treat, since he'd grown Linux on top of Minix at home, rather than install it himself.

The Linux installation went well, but there was a problem: the room had a big pile of punch cards, but only one floppy. After some tweaking, the installation was successful with only one floppy, and Linus spent the rest of the day copying programs to the Linux machine by copying them one by one

to the floppy on one PC, copying them to the Linux PC, and then moving the floppy back to the first PC to be filled again.

In the spring of 1994 we'd gotten far enough that it was time to release version 1.0. This happened amidst a huge media event in the auditorium of the CS department. There were several journalists present, and even a camera crew from FST. The most important thing was to show on the projector the symbolic compilation of version 1.0 while various people spoke. It took the entire hour and luckily worked.

In those times it turned out that people wanted to use Linux on other machines than PCs. Linus had originally written his multitasking program so that it worked only on IBM PC compatible machines, but little by little it was fixed to work on other machines, such as the Amiga and the Macintosh. This was greatly sped up when Digital lent an Alpha to Linus. The new toy was muchly inspirational.

The Linux world grew fast in those days and it was already impossible for one person to follow everything. More companies were founded, more software was written, magazines started, and more things happened.

In 1997 Linus moved abroad, to work for a company called Transmeta in California. This was an important choice: he didn't want to work for a company that did Linux business at all, since favoring one company would have hampered the others and would have skewed the entire Linux market.

In 1998 more big things happened. Netscape decided to publish the source code for their program as free software. It was done by simultaneously launching the concept of Open Source, as different from Richard Stallman's concept of Free Software. Stallman stresses the moral importance of making software free, whereas the launchers of Open Source stress the pragmatic benefits of the development model on productivity and quality.

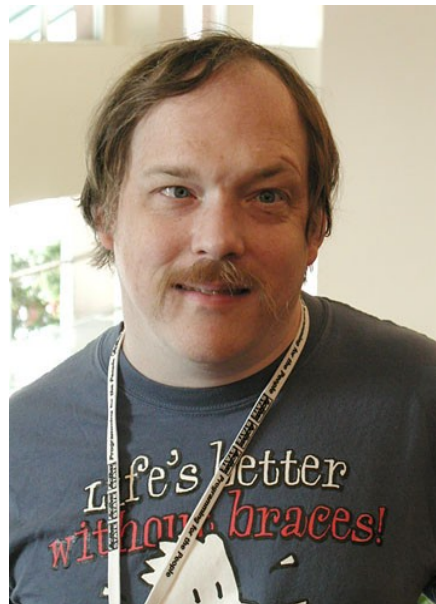
These two concepts are close to each other, but they are separated by the principle. Who talks about Open Source stresses pragmatic benefits: faster development, better quality, more efficient bug fixing, etc.. Who talks about

Free Software stresses the importance of freedom, the right to use your computer as you wish and not how the software vendor allows.

Today Open Source is the more common concept, because it is generally easier for outsiders to accept and is also acceptable to companies, even big ones. Free Software is still strong, however, and that is good, since both concepts are necessary. They are not in direct conflict.



Illustration 6: Richard Stallman and Eric Raymond. Free software supporters have more beard than Open Source supporters.



In 1998 the first Linux companies went public. Red Hat got a huge pile of money. The next year more companies went public. Then the big IT bubble burst. Share prices plummeted. Investors got scared, businesses fell like dominoes. Surprisingly many Linux companies didn't fall. Even if no-one would have believed it, they had a more or less viable business model.

We're nearing today. Linux is developed further, distributions are developed, too. Nobody edits hard disk sectors with hex editors anymore, not to install Linux from a floppy. Indeed, many people don't even use floppies anymore, and installation might happen with the press of a single key.

What will happen in the future? It seems that nothing will be able to prevent the march of Linux and free software. Linux is not tied to any one person, or

any one business. To make Linux stumble, it is not enough for one entity, or a dozen entities, to give up. You need very big stumbling blocks.

Without discussing politics much, I'll just mention that one big stumbling block consists of software patents and changes to copyright legislation. Both are advocated by big companies, some of which find Linux to be a direct competitor, and others who want to control it in ways that are now impossible.

What else will happen in the future? More everything: more speed, more size, more smallness, more device support, more, more, more. More innovation: much of operating system research now happens with Linux, either by its actual developers, or by academia using Linux, since it is free and open. It is difficult for a researcher to modify Windows, whereas it is easy to do that to Linux.

I would, however, at this point like to repeat my prediction from 1998: Linux will completely dominate the market of operating system mascots. Already Linux has a grip of the plushy toy market. For example, the Windows flag is fun as such, but it can't be compared with Tux the Linux penguin.

