

# How Time Flies: A Personal Timeline

BY GREG LEHEY

**F**reeBSD is 30 years old! Where do I fit in? I wasn't one of the founders, but I was waiting in the wings. Here's how things happened from my perspective.

## Pre-FreeBSD

By the time FreeBSD came around, I had been in the industry for almost exactly 20 years. In May 1973, I started working for UNIVAC in Frankfurt/Main. I later joined Tandem, also in Frankfurt. From 1987, I worked with Tandem's new Unix systems (System V) and formed the European Unix Technical Support team. In 1990, in true "eat your own dog food" tradition, we installed the first desktop Unix machines in Tandem Europe, Intel 80386 machines with a whopping 8 MB of memory running Interactive Unix System V/386.

In March 1992, I left Tandem and became a consultant. No more Unix source access for me! In fact, hardly any Unix: I couldn't take my company equipment with me, I thought, though I discovered I was left with what may be the very last Tandem LXN system. But that wasn't appropriate for desktop use, and Unix was very expensive in those days. By coincidence, a product called BSD/386 came out at almost exactly the time I left Tandem. Only \$1000 with complete sources!

Yes, it wasn't System V, but it should be acceptable. Surprise, surprise! It was much easier to use than System V. I wrote an article that was published in the June 1992 edition of the German iX magazine.

I also kept my eyes open, of course. In mid-1992, Bill Jolitz released 386BSD, which seemed surprisingly close to BSD/386, not just in name. I downloaded it, installed it, watched it crash and moved on.

## 1993

And FreeBSD? When did people find out about it? 19 June 1993 was really just the date when people decided on a name. I had been following developments on USENET, but especially after my experience with 386BSD, nothing made me feel that I should try FreeBSD, especially with the horrendous sums that network traffic cost in those days.

But on 27 September 1993, I was in Walnut Creek to meet Jack Velte and Bob Bruce, the owners of Walnut Creek CDROM: I had published a CD-ROM called "Applications for Unixware," and I wanted them to market it for me. While I was there, I saw somebody working on a computer on the other side of the hall. Jack told me it was the development machine for FreeBSD. I was interested, and he promised to send me a CD as soon as it became available.

## 1994

My FreeBSD 1.0 CD-ROM arrived! I must have installed it and tried it out, but I didn't intend to use it. But then, I found a bug in

BSD/386 *sort*. Was it there in FreeBSD as well? No! And what's more, the binary worked perfectly well on BSD/386. My opinion of FreeBSD improved, of course.

## 1995

In May 1995, I was in Singapore working as a consultant for Tandem Computers on a project for Singapore Telecom. We were all using Tandem's version of Unix System V, but most people in the office used Microsoft, and in those days, networking was something new and strange. They appeared not to have heard of the Domain Name System, and they connected to other machines by IP address.

One day, I wanted to print out something. Over to the printer, found a sticker with its IP address on it, and printed to it. The print job went out, but the printer didn't print anything. I later discovered that it had belonged to the Tandem office in Jakarta, but it had failed and been sent to Singapore for repair, after which it remained in the office. But they hadn't changed the label, and my print job went to Jakarta.

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## And FreeBSD?

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We need a name server! I found a little-used PC, installed FreeBSD, and bind on it and hid it under a desk. Presto! The zone *sing.tandem.com* came into being.

Later in the year, in October, a number of people from Walnut Creek CDROM came to visit us in Germany. I had just submitted my first book, *Porting UNIX Software*, for publication, and showed off the drafts. Jack Velte was impressed and said, "Can't you write a book about how to install FreeBSD? Doesn't need to be long, just about 50 pages or so."

That sounded like a good idea, so I set to work on it. I had had issues with *Porting UNIX Software*: the proofreaders disagreed with my wording and my markup, producing a final result that had significant errors. So, one of my conditions would be that I would submit the final PDF myself. I almost certainly started work with BSD/386, but clearly, I needed to understand FreeBSD better, and

so I moved the work to a FreeBSD machine. I also wanted to make a point of creating the whole book only on a FreeBSD platform.

What was it like writing a book on FreeBSD in the mid-1990s? I have heard suggestions that it must have been much more difficult than nowadays. But no, that's not the issue: it's not the tools but the content that causes the pain. And that hasn't changed. The book went through a total of 5 editions, and in each edition, I had to rearrange things to make them sound more logical. Yes, the machine was slow—a 66 MHz Intel 486, I think—and it took a couple of minutes to format each chapter. But I devised some *Makefile* tricks that made it possible to build one chapter at a time and still maintain the cross-references to the other chapters.

## 1996

On 24 February 1996, I submitted the final copy for *Running FreeBSD 2.1*, which Jack changed (only on the outside cover) to *Installing And Running FreeBSD*. It wasn't exactly the 50 pages Jack had asked for: it had swollen to 200 pages of editorial content and another 100 pages of man pages, contents, and index.

Was Jack happy? Of course not! He wanted something much bigger. I hardly had time to breathe before I started on the next edition, to be titled *The Complete FreeBSD* (Jack's title). He wanted 1000 pages!

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We didn't make it. On 19 July 1996, less than 5 months later, I submitted what we decided was the first edition of *The Complete FreeBSD*, with only 844 pages. How did I do it? Man pages are your friend: there were 542 of them.

In this time frame, I gradually migrated to FreeBSD and spent some time working on an ISDN subsystem. This had an unexpected side effect: while working on the logging, I received a phone call. Answered it, but the caller hung up immediately.

But I had a log entry, and it contained the caller number, something unusual in those days. So, I called back and asked if I could help. Yes, he wanted to buy my house!

## 1997

Selling our house was a long-drawn-out matter. We had decided to leave Germany because of the climate, but where should we go? Ultimately, we decided on Australia, and the move there took us 6 months to complete.

In September 1997, I was playing around with *ccd*, a tool to concatenate disks. It didn't work well, and I thought “there must be something better.” I had just returned from China, where I had taught some courses on Tandem's NonStop-UX product, which

included the Veritas Volume Manager (VxVM). That's what we needed! How hard can it be?

I set to implement a clone of VxVM, which for obvious reasons I called Vinum. That brought me much closer to the FreeBSD development community, of course, and clearly it also kept me busy for some time. The development of Vinum was helped by Cybernet, who were looking for a RAID-5 implementation, so I implemented that as well. It must have been some of the most complex code I have ever written. On the day that I finally thought I had nailed it, three kookaburras started flying round the house, laughing their heads off. I've never experienced that before.

## 1998

In June 1998, I went to the USENIX annual technical conference in New Orleans and met a number of the FreeBSD developers. I discovered that my design for Vinum conflicted with plans for implementing GEOM.

Later in the year, Vinum was ready for inclusion into the FreeBSD source tree. I presented a paper at the AUUG annual conference in September, at which Peter Wemm, the CVS-Meister, was also present. He helped me to commit the Vinum code, my first-ever commit. A good thing, too: for some reason, probably network flakiness, the commit failed. The second time it was successful, but in the meantime, we had managed to commit an extra file: *emacs.core*, which caused general excitement.

Later in the year, Wes Peters talked me into writing articles about FreeBSD in the now-defunct *Daemon News*. We alternated every month: each of us wrote 6 articles per year, and I continued until 2004.

## 1999

FreeBSD has come of age! In October we had a conference (“FreeBSDCon”) in Berkeley, at which I demonstrated Vinum. Compared to the meeting New Orleans only the year before, things seemed much more professional, and for the first time, we got the feeling that there were people out there who were interested in FreeBSD without being part of the project. We have followers!

## 2000

When did I stop using BSD/OS (as BSD/386 was now called)? The last CDs I have are for release 3.0, which was released in February 1997. My guess is that I stopped when I moved to Australia: I had to set up new machines and FreeBSD was just as good as BSD/OS.

It seems that BSDI thought so too: in March 2000, they “merged” with Walnut Creek CDROM, under conditions that I never found out. There were initial announcements that the FreeBSD and BSD/OS code bases would be merged into a single product, though there was also vocal opposition to the idea, notably from Mike Karels. And as we all know, it never happened.

Also in March 2000, I received an offer that I couldn't refuse: join Linuxcare, a company created to support Linux. What did that have to do with me? They wanted to branch out into BSD support, and they already had one employee, Ceren Ercen, who proved to be a friend of Mike Smith. The good news was that I could work from home, and I'd be paid to do BSD work.

In April, a core team member committed changes that broke Vinum! It wasn't that I had not been discussing the matter with him, but it seems that he couldn't be bothered. Much discussion, eventually coming up with Jordan Hubbard's opinion that the cur-

rent core structure (the 17 oldest members, whether still active or not) had passed its use-by date. In the end, people came up with the idea of an elected core team, and I was elected to the first team ("core.2"). And gradually, the team was more international: 3 Australians, 3 Americans, 2 British and 1 Japanese.

The big technical issue of the year was performance, related to multiprocessor systems, which were just becoming a thing. To our horror, we had discovered that Microsoft had out-performed FreeBSD on web server applications. We understood why: the Unix kernel was built for single processor machines, and only one process could be in the kernel at any one time. To enter the kernel, a process had to acquire a lock called **Giant**, waiting, if necessary, until its owner had left the kernel. This resulted in a lot of processor idle time.

Fortunately, round this time (the "Dot-com bubble"), many project members, myself included, were employed by companies prepared to fund this kind of work. Though BSDI had merged with Walnut Creek CDROM, we still didn't have access to their code base. They had done some work in this area for BSD/OS 5.0, and they were prepared to let us use the code. On 15 June 2000, a number of us got together atYahoo! In Sunnyvale and hacked out the details, one of which was a project name: SMPng. In principle, we would incorporate the SMP-related BSD/OS code into FreeBSD. In the end, only Matt Dillon, Jason Evans, and myself ended up on the implementation team. I had been working with multiprocessor systems for almost my entire professional career, so I was really keen to participate. And since this was my day job, funded by Linuxcare, I had plenty of time.

It soon eventuated that we had different expectations. Matt left the team, John Baldwin joined, and Jason became project leader. He committed the first version of SMPng on 7 September 2000, less than 3 months later. And by then I had understood Mike Karels' objections to the code merge: even merging the relatively small number of differences between BSD/OS and FreeBSD was like pulling teeth.

In October 2000, we had the first BSDCon (and not FreeBSD-Con) in Monterey, California. This was also the first time ever that all core team members got together. I also discovered that Justin Gibbs had formed a FreeBSD Foundation. I was puzzled by the duplication, and it wasn't really clear to me where the boundaries lie, nor why there should be two bodies. A quarter of a century later I still don't understand.

## 2001

In 2001 the members of the Core Team learnt what the New Order was like: not specifically technical, but administrative. We were no longer a small group of hobbyists, but a bureaucracy. The core team no longer set technical direction; instead, we were mainly dispensers of commit bits, and our main involvement was with squabbles between committers.

In early 2001, Linuxcare began to disintegrate. Our "OzLabs" department, with such Linux luminaries as Andrew Tridgell and Rusty Russell, was disbanded. Paul Mackerras had good contacts with IBM, and he managed to get most of the group working for IBM very quickly. That would have to be pure Linux, of course, and I spent some time looking for alternatives, but didn't come up with anything good, and ultimately joined IBM in May 2001.

That required learning Linux more intimately. People decided that I would be the person to create a clone of IBM's JFS version 1 to run on Linux. Why a clone? It was a different part of the company, and we didn't have access to anything more than the header

files. It was quite an experience, but that's another story. From my point of view, I got to see Linux from the inside, and it didn't inspire me. I also ran Linux on one of my normal machines, and from time to time, when some FreeBSD misfeature irritates me, I experiment with converting to Linux. None of these experiments were successful: as of 2023, I still run only FreeBSD in my house network.

During this time, I did a number of presentations and tutorials about FreeBSD, including the last of my "installing FreeBSD" tutorials and papers at the USENIX ATC in Boston and the AUUG conference in Sydney. Vinum and SMPng had required lots of debugging, of course, and I built a tutorial around that, which I

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presented multiple times, first at the EuroBSDCon in Brighton in November 2001.

The debugging tutorial was interesting. Part of it involved a demonstration of the techniques, of course. On the first presentation in Brighton, I didn't have much of an idea of what to show, but when we came back after lunch, I opened my laptop and... it panicked! So, I had a panic to analyze without any preparation. And it was an interesting one: I had rebooted my laptop, but the system had checked some random memory location to see whether it needed to restart services. It turned out that the memory hadn't been completely drained, and much of the memory still had the old contents. The system had thus assumed that no reboot had taken place, tried to access memory elsewhere, and ran into trouble. By the evening, one of the participants had worked out a fix and committed it. A very satisfactory outcome.

On another occasion, though, things didn't work as well. At the first AsiaBSDCon in Taipei, I decided to do a real demonstration with two laptops and Warner Losh's help. In front of a packed main auditorium, we connected the machines, put one of them into debug... and the other one hung: it was trying to access kernel sources on the first laptop. Both machines needed a reboot. Egg on my face.

## 2002

Gradually my activity in the project slowed down: I no longer had an employer who was prepared to fund my development activity, and somehow that had become a requirement for any significant work on the project. But I continued with other

aspects, like the Daemon's Advocate articles and presentations and tutorials at conferences. Now that Walnut Creek was gone, O'Reilly also agreed to publish the fourth edition of *The Complete FreeBSD*.

Life in the core team was not much fun. We had a surprising number of rogue committers, in particular a high-profile case where two committers fought each other in the open. We ultimately came to the conclusion that we would have to expel one, Matt Dillon, though it was by no means clear that he was more at fault. He went on to create the DragonFlyBSD project.

The stress showed: in relatively short succession, Jordan Hubbard and Mike Smith resigned from the core team, and also from the project. To quote Jordan,

"Finally, it also bears noting that while being part of the FreeBSD project is many things, it should always be "fun" to at least some degree for its participants or there's really not much point in being involved."

And Mike echoed his sentiment: "It's not fun anymore." Somehow that symbolized the changes that had happened in the first ten years.

## 2003

From my perspective, things continued to wind down. In April, the fourth edition of *The Complete FreeBSD* was published, and I presented my debugging tutorial a couple of times. And I continued to commit to the source and ports trees, but by this time I was more a hanger-on. My time had passed.

## Twenty years on: 2023

Now, the time frame of this overview looks like the distant past to some. Many project members, even a core team member, weren't even born when the project started. How do things look now?

They've changed, of course. More than I expected. From the outside things didn't look that different, I stood for election for the core team again in 2022 and I was elected. And from the inside much has changed, mostly, but not all, for the better.

Part of the "early days" were concepts like "we're ahead of the crowd" and "eat your own dog food." But they don't seem to apply any more. I wrote *The Complete FreeBSD* in troff, using only FreeBSD tools. When asked to submit this article, I was given the choice of plain text or (Microsoft) "Word". Nobody would have thought of that in the olden days, though "Word" was around then too. And many of our communication tools are external to the project. I'm still trying to understand the Brave New World.

**GREG LEHEY** was born in Australia and was educated in Malaysia, England and Germany. He spent most of his professional career in Germany, returning to Australia 10 years before retiring. He has worked for numerous computer manufacturers, the German space research agency, nameless software houses, a large user, and also for himself as a consultant.

Over the course of 35 years in the industry, he has performed most jobs. About the only thing he hasn't done is write commercial applications software or understood Microsoft software.

He has been involved in the free software movement since 1989 and has been a member of the FreeBSD developer team since 1998, serving 3 terms on the FreeBSD Core Team, of which he is a current member. He has also been a NetBSD developer and the President of AUUG, the Australian Unix User Group.

He is the author of *Porting UNIX Software* (O'Reilly and Associates, 1995) and *The Complete FreeBSD* (Walnut Creek, 1996 and O'Reilly and Associates, 2003). He retired in 2007 but is still active in the FreeBSD community.



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