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musings

by Rik Farrow

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One of the *;login:* editors suggested that it would be fitting in this December issue to look both backward and forward in time. A reasonable request, as it makes good sense not to repeat past mistakes – and to use the past as a guidepost to the future.

Even before reading that suggestion, I had opened one of my file drawers, only to find it was too stuffed to cram in a single piece of paper. I randomly grabbed an old folder that looked thick enough to provide considerable room and proceeded to glance in it before consigning it to the circular bit bucket. I was immediately amused, as well as yanked back into the not-too-distant past.

Of course, anything that occurred before 1994, the year the Internet was officially created by the US vice president, happened a really long time ago. Remember, before the appearance of Web browsers, the Internet didn't exist, or was considered "not interesting" by most people, including the editors of all commercial computer magazines.

Now go way back to 1988, and contemplate what began in that year. AT&T, which had failed to make a profit on selling UNIX or computers running UNIX systems, purchased 20% of Sun Microsystems, at the time the number-one UNIX systems vendor. Sun subsequently announced that it would migrate from using SunOS, which is based on 4.2 BSD (Berkeley Software Distribution), and move to a SVR4 base for SunOS 5 (later called Solaris).

This announcement deeply disturbed the other UNIX system hardware vendors for two reasons. First, Sun was already a powerhouse, having won the workstation marketplace and also doing very well selling UNIX-based servers (something that is still true today). The other reason was that the new fee for acquiring a source-code license, necessary for porting to architectures other than the Sparc, would be $200,000, an unheard-of amount. The alliance of Sun with AT&T was deemed diabolical, and the Open Software Foundation was formed in 1988 to create a new operating system that would be better than SVR4 in every way.

While OSF/1 (the OS's name) would continue to support published APIs, so that it would be compatible with the older System V Release 3 interfaces, it would also have enhanced security, networking, logical-volume management, disk mirroring, and symmetric-multiprocessor capability. These goals would not be impossible, as IBM's AIX already had volume management and HP/UX had enhanced security (a package licensed from SecureWare that added ACLs and audit features). Michael Gutman, vice president of Apollo Computers (remember them?) and a moving force behind creating OSF, called the project "one of the most important events in recent computer history."

IBM, DEC, HP, Groupe Bull, and Siemens-Nixdorf poured over $150 million into the project, with beginning funding at $50 million a year, and all promised to run it on their workstations and servers. Today, the only remnant of OSF/1 is True64 running on Compaq Alpha systems. The kernel, instead of being new technology developed by IBM, is the same Mach kernel being used in NextOS, as well as Apple's OS X. By the mid-'90s, both OSF and UNIX International, an organization created to oppose OSF on the public-relations front, were dead.

Free Software

What killed OSF? Was it too much money? The attempt to write an advanced operating system from scratch in less than two years? Hubris? AT&T?

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Nope. And although Linus Torvalds did release the first version of Linux during this time span, it wasn't Linux or GNU that brought the mighty to their knees. It was UUNET.

Excuse me, you say, UUNET? In 1988, UUNET was a small startup specializing in providing commercial email connectivity using UUCP. UUNET installed points of presence in as many large cities as it could, where users could dial up and exchange email. UUNET was not the only group doing this; PSI and a couple of the other regional NSFnet members were also beginning to provide this form of public access. Prior to this, in order to exchange email, you connected to a university on the Internet, or to a sequence of other sites that would eventually get you to a well-connected site, a process that usually involved long-distance calls. If I wanted to send email to someone in Europe, it went first to a UNIX system in Mountain View, then to Sun Microsystems, then to a server operated by AT&T in Chicago, then to Europe. In other words, I paid only for the long-distance call to Mountain View (from San Francisco), with Sun and AT&T paying the bulk of the fees. When AT&T announced that it was putting a stop to the freeloading, Rick Adams, the sysadmin at a large UUCP relay site (seismo), founded UUNET.

UUNET ran TCP/IP connections over leased lines to connect their POPs. UUNET also connected to the Internet, and soon to Europe, so it was possible to get email almost anywhere. The competitors to UUNET, past regionals, were also connected to the Internet, so while it was possible to send email between these networks, it was technically illegal, that is, against the "Acceptable Use Policy" of the Internet, which prohibited commercial access. In 1991, these companies agreed to cooperate by tying their networks together in northern Virginia, and the commercial Internet was born.

Okay, so where does free software come into this? UUNET was using SunOS on the servers that sat in the POPs and ran the banks of modems. UUNET was not very happy with Sun, because they once waited 16 months to get a bug fixed that caused panics in a serial-driver routine almost daily. So when the Computer Science Research Group at the University of California published the Net2 release containing the operating system and utilities that had been written as part of BSD, UUNET saw a great opportunity. They could perhaps create a "free" version of BSD, one that did not require a license from Unix System Laboratories (USL). This also happened in 1988 (I believe), the same time that OSF was getting funded with millions of dollars.

UUNET funded Berkeley Software Design, Inc., which initially was totally distributed and subsequently had its main office in Rob Kolstad's house in Colorado Springs. (Both have since moved). BSDi hired Bill Jolitz to write the memory manager, one of the few missing pieces in Net2 required to have a complete, working operating system for the Intel platform. Jolitz's code was published in *Dr. Dobb's* and eventually became part of the code in the finished kernel for BSD/386, BSDi's first operating system release, as well as the core for FreeBSD and NetBSD.

Suddenly, USL's SVR4 had a serious, if poorly funded, competitor. BSDi was promising to port BSD to one of the Sparc platforms (Sun workstations and servers may share the same architecture, but not their memory management or buses), was based on the much more popular BSD (instead of System V), and would likely run faster than would SVR4 on the same hardware. Faced with real competition, USL did the only thing it could do – had its lawyers file a lawsuit against BSDi.

I was not able to find a copy of the original lawsuit on the Internet, but I did find a copy of the injunction filed against BSDi because they used the numbers 8649 in their

telephone number. Those numbers obviously present a trademark infringement, false advertising, and unfair competition (see *<ftp://ftp.eecs.umich.edu/groups/lpflatt-bsdi/920420.complaint>*) by tiny BSDI against USL, the subsidiary of giant AT&T. USL also filed suit against the University of California, the Regents, the governor of California, and the speaker of the House, also alleging trademark infringement. You can find the friend-of-the-court (amicus) brief filed in January of 1993 at
<http://www.ltg.ed.ac.uk/~richard/ftp-area/usl-vs-bsd/930107.amicus>.

For a while, things looked really grim for freedom of any form of BSD. While Linux did exist at the time, it was still years away from being a really stable OS with a good IP stack. But fortunately, USL had made several mistakes. First, they should never have taken on the State of California. USL could outspend BSDi on lawyers by a factor of 100 to 1, but with the state involved, USL lost most of that advantage. Second, USL was not keeping its agreements with UC, in that it did not include copyright notices on the code in SVR4 that came from BSD. Also, AT&T had potentially distributed the code for 32V without proper copyrights, the version of UNIX written in the late '70s at Berkeley to run on the DEC 11/780 (the VAX), essentially voiding any claims to having protected their trade secrets. And finally, the portion of the code in Net2 that they were claiming as uniquely theirs was less than 1% – 30 files – and most of the claims had to do with file, constant, and variable names.

The end came in February 1994 with a settlement. Although the terms of the settlement were secret, I did hear that the number of files that USL could actually claim contained their original code numbered four. BSDi was forced to change its phone number (which had been 800 ITS UNIX), as well as move to a new code base, 4.4 BSD (Lite). You can read the announcement at
<http://download.sourceforge.net/mirrors/NetBSD/misc/release/misc/USL-lawsuit>.

The Future

So, for me, the founding of OSF was not the most important event in recent computer history. Instead, it was the David versus Goliath struggle to free BSD UNIX from the clutches of AT&T. Today, USL no longer exists, and neither does OSF. Novell had bought the license to SVR4 and the adjective UNIX, and later sold SVR4 to SCO, and gave the trademark UNIX to X/Open. There are four versions of BSD, and many version of Linux, all of which are due not just to the lawsuit, but also to the charge to open software that certainly involved UUNET, BSDI, CSRG, and a lot of courageous individuals.

This column is also supposed to look toward the future. Having just taught my favorite course twice (a survey of intrusion techniques and countermeasures), I am fully aware of what we have so far failed to create: secure operating systems. While we are getting closer, for example with OpenBSD and secure distributions of Linux, we still have a huge distance to go. Today's operating systems are large, complex, and feature-full, with Windows 2000 leading everything by a factor of ten when it comes to complexity. What we need is something different – instead of a one-size-fits-all operating system from PDA to mainframe, we need modular operating-system designs that fit into a computing fabric. Plan 9 provided an early taste of this, even if it lacked mobility features. Jini has mobility features, but is not really a computing fabric. And where is the security?

I can predict, with confidence, another email virus as damaging as ILOVEYOU for 2001. Georgi Guninski continues to find ways to use Microsoft components to execute code and/or read files (see *<http://www.whitehats.org/~guninski>*). Vendors will

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continue to choose features over security, simply because new features are what convince people to buy new upgrades, even if those same features make the operating system less secure.

The price of oil will continue to increase. Yes, I know this has little to do with computer-systems architecture, but it has a lot to do with the economies that support them. In September, the British lorry (truck) drivers blocked distribution of oil products for three-and-a-half days, from Monday morning until Thursday afternoon. By Wednesday, hospitals had cancelled all elective surgery, schools were closed, and most grocery stores were bare. Prime Minister Tony Blair announced that it would take over six weeks to get back to normal. And this was a three-day stoppage.

As our reliance on fossil fuels increases (bigger cars and more people worldwide driving), the fuel supply is not getting any larger. In fact, studies have shown that by 2010, the oil companies will be able to pump less oil than they do today. As the supply decreases (while the demand continues to increase), the price will inevitably increase. We need to develop alternative fuel sources now, or we will have no electricity to power our computers, much less sit in our cars for the two-hour commute.

I am also predicting the rise of humanoid robots. This will occur first in the San Francisco Bay Area, because the rising cost of housing will force anyone without a high-tech or financial job to move far away, too far to commute, leading to their replacement by robot waiters, waitresses, bartenders, cleaners, cooks, bellhops, and policemen. Well, we already have some robotic police, in the form of the cameras that take pictures of red-light runners, but that is only the beginning. Robocop, here we come.

I would love to be able to predict peace, joy, good health, and prosperity for you and everyone else in the new year. But that is for you to decide and make true.