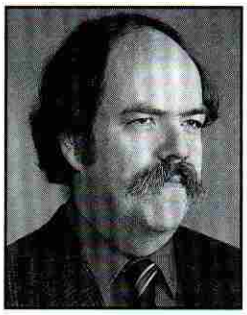
the view from the top left corner

Wafting Polymers and Whirring Systems Are Very Cool Things



"To be a systems librarian, especially one of the first, is a very cool thing."

Sniffing around the pages of this issue you might get the impression that many systems librarian types got here rather unexpectedly. I'm afraid I have to place myself squarely in this group with a short story of how it happened. As a typical social sciences major (anthropology) with an aversion to mathematics, I sought ways around the math requirement for graduation. In the midst of calculus and advanced algebra listings, one course, which absolutely satisfied the requirement, struck me as a little odd. Taught in the department of philosophy, it was called "Logic 120." Sounded pretty good to me, especially compared to differential equations.

We spent the days of the course figuring out that if Mr. Jones, Mr. Smith, and Mr. Anderson were a baker, a policeman, and a butcher respectively, and Mr. Jones drove a red car, and one guy's wife liked convertibles, then to whom were each of them married? We also played around with symbolic logic showing that if "A" implied "B" and "B" implied "C" then "A" implied "C." I remember that you could prove "A" or "not A" from the same premise depending on which way you went. So much for logic, but it was fun.

Then along came library school where they decided the newest cool thing was computer programming. They actually taught us BASIC, that thing you learn in 3rd grade these days. When I first encountered the concepts I was quite shocked. This was Logic 120 déjà vu! It was the same thing—and also easy! So when things got tough in the course I reverted to writing a program that would calculate aspects in astrology charts, accidentally learning a whole lot about math and trigonometry in the process.

When the Commodore PET came out I wanted one so bad I could hardly stand it. But it cost $800. I used to go into Radio Shack and smell the virgin plastic on the TRS-80 machines, 16K of RAM and disk drives that held 80K. I managed to hold myself back until the Apple II came out. I sold one house and moved to another, managing to hold enough back for the Apple. Then I traded my Honda 350 motorcycle for a second disk drive and began to write programs. That was almost 25 years ago, but I still enjoy opening up a new computer. I haunt the shipping/receiving dock about the time the UPS man arrives, looking for a box that says "Dell" in bright blue letters on the side. I can never tire of that smell of fresh polymers wafting from the box! A new machine for a new adventure.

Are You Being Served?

What is coming from Dell these days are rack mount servers. This is a big change from just a couple of years ago. They are cheap, fast, and compact. This is important because it's causing a wholesale and rapid redesign of computer spaces, at least in our case. We started out in 1983 with Deep Thought, which from today's perspective was a monster-sized computer that basically did everything for us. It had a bunch of very expensive dumb terminals

hooked directly to it. Everyone got the same menu. Everything was controlled centrally. Life was good.

Today, in the same space, we need a separate server for anything we do. I've talked a little about this before so I won't belabor the point, but at last count we had 18 separate servers for about 25 separate issues. We are rapidly moving to a situation where each separate issue gets its own server. That's because if one server breaks, the other 24 issues don't. We're also putting in double servers for some applications. Our Web server, for example, is actually three different and identical servers configured so that if one goes down, the other takes over.

This is in pursuit of the coveted "five nines." Five nines means 99.999 percent uptime. That means you are allowed five minutes of downtime per year. In our 24/7 culture everything must be up all the time. Everything is "mission critical." There is no tolerance for anything not working.

The lengths we will go to ensure this are amazing. All new servers, for example, are RAID 5. I'm not totally enamored with this scheme, but it theoretically allows a hard drive to fail on the fly. A RAID 5 system will then rebuild the lost contents of the failed drive on a "hot-swap" spare so that nothing is truly lost. Of course, if your RAID controller fails, that won't work. That's what happened to us about this time last year on Moby Fred. Today, "The Mobe" is actually two separate NT boxes all with the same information. Those files are backed up twice per day onto two different backup servers, and the whole thing is also backed up to tape once a day. That's four live copies of the data plus tapes stretching back a few months. That ought to do it!

Al just looks at this system and rolls his eyes. The Big Backup rolls all the files from all the Windows NT servers onto one tape capable of holding 80 gigabytes. You only have to touch it once per week to change out the Friday tapes for rotation off site.

"But that's real money!" he complains. The difference between Al and me is that Al backs up nothing and I back up everything several times. Between us would be about right, so divide by two and we're even. The NT backup system does 275,000 files in 17,000 subdirectories in less than an hour per day, and that's only half the files. We tackle the UNIX side next. I'm paranoid by reason of experience.

Repairs Without Downtime

Another innovation is the use of hot-swap power supplies. It's kind of like refueling while in the air. Our latest Dell NAS server (Network Attached Storage) has three power supplies, each running with a fan. If one fails, you simply remove it from the chassis while the system is running and replace it with a spare. No screws—just push a button and out it comes. All these new servers run at 1 gigahertz or more. When computers are running that fast it means one overwhelming thing: heat. Some cases these days have their own built-in air conditioners that blow cold air onto the processors. In their absence, this simply means more fans in addition to those on the power supplies.

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And more fans mean more noise. It's getting so noisy in the computer room that we're going to have to abandon ship. Plans are to move the desks beyond some glass doors and isolate the computer room from human ears.

We'll also have to convert our rack from one that holds standard tower servers with monitors to one that is heavy on the rack mount side. On a tall 84-inch rack you typically have 42 RU's of space available. An "RU" is a "Rack Unit" and that is 1.75 inches high. Servers these days tend to come in 1, 2, or 4 RU sizes. A 4 RU system, 7 inches tall, can be a very powerful, multi-processor system quite capable of running your circulation system. Of course, hubs, routers, modems, and all the other pieces of equipment take up their own RU space as well. Still, by converting we will go from a space that currently holds 11 servers to the same space capable of holding about 60.

A majority of these servers are running as "headless servers," which means they have no monitors of their own. Instead they use a Black Box switch (http://www.blackbox.com), which allows one keyboard and one monitor to control 16 servers. If you *really* get into it these can be daisy-chained so that you control a whole lot more, but at some point it becomes impractical. Our server for Websense (our Internet filter) went down Thursday night, and because it was on a headless server I didn't even realize it had happened until the branches started calling in on Friday morning. So for an hour and a half more porn was flowing than usual.

Short Tech Life Cycles

Another trend in the industry is the extremely short life cycle for products. I used to blame Hewlett-Packard for the worst record in the industry because their printers last only a year. (The "newest model" tends to demand a more expensive toner cartridge and force you to stock yet another model number. Frankly, I see nothing wrong with a LaserJet Series II.) But that has been surpassed by Dell.

Last spring, in March or April, they announced their new line of NAS servers. I bought one in June to use in the backup project. It took a few weeks until all the parts to this system arrived, so I didn't really get it running completely until late August. The 100-gigabyte unit backs up all our NT Windows stuff. That was so successful that we decided to duplicate the system for the UNIX side.

I tried to order another one only to discover the models of the NAS server *and* the tape drive had already been surpassed by yet a newer model. The older NAS

model was no longer available and the older tape drive was now more expensive! That was a life cycle of 3 to 4 months!

Present and Future Trends

So what does all this mean? There are at least five major implications:

The first is that change really is happening at a breakneck pace. You simply cannot expect a computer to last more than 3 years. It's not that it will break. My old Apple II runs just as fine now as it did in 1979. But with 64K of memory instead of one gigabyte, and 10 megabytes of disk storage instead of 100 gigabytes, it's useful only as a curiosity. The point is that you also cannot expect a given model number to be available from one month to the next. When changes are significant, it really tends to scatter your resources because you need to be aware of product differences. This means stocking driver software and parts for a wider variety of changes.

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The second is an increasing trend toward specialization. This is the one-server-per-application issue where if one server breaks, you have only one application down. You cut your losses by not being over-dependent on one big server. This kind of leads to rack mount servers. It's the most efficient way to store servers in a given amount of space. This has been an extremely fast-moving phenomenon. If I had caught onto this last January I never would have purchased our Web servers in large tower models. They would have been rack mounts. Now I basically have a couple of albatrosses on my hands. I'm going to have to rack mount these servers in new cases to get the room back.

The third major implication of quickly changing technology is an increasing intolerance for failure. This is the "five nines" goal where being down more than a few minutes per year is intolerable. This means quite a lot of redundancy built into systems, whether power supplies, RAID systems, or even clustering of servers. There is an energy use issue here, too, because all this takes power. That's an argument in itself for headless servers because monitors are real power suckers, but my guess is you'll raise your power use regardless. All those fans don't run for free.

The fourth is the scattering of resources in terms of what a systems librarian is expected to know. There is really no similarity in appearance, design, or workings of Computer Associates' ARCserve backup software system and epixtech's Dynix circulation system. Except that your interface is a keyboard and monitor, they are completely different. The same is true between our Remote Patron Authentication system and any flavor of UNIX you happen to be running. Both are extremely labor intensive, but totally different in goals and operations. If you can't hire more people this means you become a jack-of-all-trades and perhaps a master of none. That's just the way it is, but it also means the systems librarian can no longer really hold up other duties as well. A great many of us came into systems as a sideline, where we were reference librarians or catalogers who just happened to be doing this, too. In my view, this is no longer tolerable. Administrators had better figure this out or risk losing good people.

The schools are finally beginning to get it here as we see more graduates with a data processing specialty. They'd better hurry up because the Boomers, perhaps the last generation to learn this stuff on the side because they wanted to rather than having headed for it intentionally, are gearing up to retire.

One way to call attention to our plight is to not try to be all things to all people. You can separate out the applications software from the server-side software and make a statement. This is Microsoft Word. This is the payroll system. We don't know how they work. We just serve these things to you. These are applications. Go learn them. Take a class. Learning how to use these programs is your responsibility. On the other hand, tweaking Telecirc is going to remain our responsibility.

The fifth implication is one that has been around awhile, but I think it bears re-enforcement. That is that the network

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is the computer, to use the now-dated Sun aphorism. I fear that our attention is focused on applications and servers and not so much on infrastructure. Next year we will have to swap out dozens of hubs. Hopefully we can move to fiber optics. The problem here is that this is not a sexy operation. People are much more excited about a flat screen monitor than they are about new hidden hubs. The computers will work before we do this; the computers will work after we do this pretty much the same way. What have we gained?

Well, the fact that the hubs we installed in '93 are beginning to fail is one part of the issue. Their mean time between failure (how long they're expected to work without failing) was a few years ago, so they are beginning to say "bye-bye" to us (three in the last 2 months, $2,000 apiece, into the Dumpster). But the other is the "need for speed." People don't perceive this very well except to say something like "The Net is slow today," but our charting software says why. Someone with streaming video can clog a network in a hurry. If we had fiber to the desktop and the hubs to support it, this would not be an issue. Our gains will be evident in the future. They're not immediate.

I don't think any of these five issues are insurmountable. It's just that they need some attention. Sometimes you just don't see it. I wish I'd seen the rack issue a little earlier. I nearly blew it with UNIX and So-

laris. Thank goodness Al arrived to save me. On the other hand, we really nailed the Big-I Internet and Ethernet both. When it all changed over our infrastructure was already there and it just absorbed it as neat as you please. Hardly anyone ever really knew what we'd done. Without a few failures how would you know what success feels like?

To be a systems librarian, especially one of the first, is a very cool thing. There are times I stand in the computer room, the very same physical space where I used to bang on an old wrought iron Underwood typewriter, and I stare at the rack with all those blinking lights, each blink a read or write to a disk drive. I look at the tape drive finishing up the morning's backup at about 11 a.m. from copies of the data culled from all the servers over the night. We're safe again. Nobody can get us. The lights on the hubs are blinking pretty steadily, a few yellow collision lights showing the day is beginning to heat up. Three-fourths of the modems are blinking. I see connections start and connections free up only to be followed a few seconds later by others. I hear all those fans whirring away.

The diagnostic software graphs the data flowing in from the Big-I Internet, well within tolerance of our two T-1's, one to Qwest, one to AT&T. It's that old redundancy theme again. Outside in the public area nearly all the computers are busy with patrons accessing their Hotmail accounts, maybe even, on occasion, the online catalog! Three hundred computers are up and running in nine branches. The books are getting checked out and checked in. The routers are behaving themselves. The mail machine is pushing through 25 e-mails a minute, a million a month to 17,000 accounts. Right now, today, at least, the system is running five nines.

My friends and I, we built this. We didn't invent UNIX or Windows or do anything quite so erudite, but at some point you have to have people to actually make these things work in real life. We did that. We made it work. We learned it as fast as we could. We cursed it for not working like it was supposed to. We laughed and even cried, and we fought it and sometimes each other. But it works now. That's what systems librarians do. They make things work.

With just a slight breath I can smell the polymers. And I swear I can feel the data flow through the network as well as I can feel the blood flow through my veins. Just be quiet. Stand very still. You can hear it. You can feel it resonate in your bones. That's the data, in little packets, traveling quickly from one place to another to the next room or around the world, just like it is supposed to.

Yes, it is a very cool thing. ▲

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