

# Interview with Mary Ann Horton

RIK FARROW



Mary Ann Horton has been a UNIX developer and sysadmin since 1977. She contributed to Berkeley UNIX, creating the first email attachments and enhancing vi. Her PhD dissertation at Berkeley led to IDE editors that check your program for errors. While at Bell Labs, she led the UUCP Mapping Project and brought .com domains to UUCP email. She led the growth of Usenet, an early social media network, in the early 1980s. Her EMS email system allowed email addressing by database query. As a transgender activist in the 1990s, she convinced Lucent Technologies to become the first large company to include gender identity and expression language in its EEO nondiscrimination policy, and later to cover transgender hormones and surgery in its health insurance. At San Diego Gas & Electric, she designed SCADA control systems to make the power grid more reliable, secure, and compliant with regulations.

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I met Mary Ann Horton at USENIX ATC '19 in Seattle. I didn't know who she was, but somehow discovered that she worked on the control systems for the grid in the San Diego area, and we exchanged email addresses so we could continue the conversation. Later, I read her Wikipedia page [1] and learned much more about her.

*Rik Farrow:* You have been working with UNIX since its earliest days.

*Mary Ann Horton:* I fell in love with UNIX earning my master's degree at Wisconsin in 1977, but my big break came in 1978 when I transferred to Berkeley for my PhD. We got a VAX, initially with VMS, but quickly changed to UNIX 32/V. There were many amazing grad students contributing tools to BSD, and it was a treat to get to be part of this effort. It seemed like about half the code was written by Bill Joy, including vi. I got to enhance vi, nurture it, and port it to all sorts of UNIX clones. Eventually I replaced termcap with terminfo and wrote a new improved curses library so other programs could work as well as vi on slow terminals.

My doctoral dissertation was a language editor, which meant you were editing a program tree but it seemed like a text editor. The editor had parsed your program, so it could show you your syntax errors, and even some semantic errors. It was horribly slow on the VAX, but the technology was used later in IDEs like Visual Studio and Eclipse.

I needed to email binary files, but UNIX email only supported plain text. In 1980 I wrote a dumb little program called uuencode to embed binaries into text email, and uudecode to extract them. In 1985, Lotus and Microsoft decided that uuencode was the existing standard format for attachments and used it in their PC email systems.

*RF:* What was it like to work at Bell Labs in the Midwest? We often hear about the more famous branch of the Labs in New Jersey, and how researchers there appeared to have a lot of freedom to develop many of the things we take for granted today.

*MAH:* I was a summer student at Holmdel, New Jersey, in 1979. I loved Holmdel but hated living in New Jersey. I wanted to do UNIX work at Bell Labs with the official Research Center 127 folks (Ken, Dennis, etc.), but policy was that all research was only in New Jersey. When Dale DeJager recruited me for the new Exploratory Software Group (ESG) in Columbus, I jumped at the opportunity. My wife's family lived in Ohio, and she wanted to move there. I started in 1981 after I finished my PhD work at Berkeley.

Bell Labs was the R&D arm of AT&T. The Columbus Works (CB) was a Western Electric factory, with a Bell Labs office building attached to the front. Money flowed freely, and there was plenty of computer equipment. In the days of expensive long distance calls, nobody cared about the phone bills we ran up when our UUCP network dialed another computer to exchange email and Netnews. CB was dwarfed by the larger labs in New Jersey and the Chicago area, but we all respected one another and shared a love of technology, especially UNIX.

The ESG was kind of like minor league research. It was a spin-off from the Operating System Group, where Dale and a group of UNIX experts had created an enhanced "Columbus UNIX" for the needs of telco Operations Support Systems developed in Columbus. "CB-UNIX" supported

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IPC, shared memory, and semaphores, as well as some Berkeley enhancements like `vi`. CB-UNIX ran on the PDP-11/70 only, especially `cbosg`, the OSG's main home machine and email hub.

When I arrived I was presented with a shiny new VAX 11/750, where I promptly installed 4BSD on the new `cbosgd`. I set it up with email and Netnews, and it became the main connection into Bell Labs CB.

By 1983, Bell Labs's UNIX Support Group decided to support the CB-UNIX features and add `vi`, so the OSG and ESG were disbanded, and we all moved into development for new products. In 1987, we created a Gateway Group to formally support email and Usenet gateways, where I spent the next several years.

*RF:* By this day and age, people who know what Netnews was are disappearing. Netnews was, in itself, a precursor to the Web. Just supporting Netnews was difficult, and I understand you had both a programming role and a social one in developing Netnews.

*MAH:* Usenet was one of the first social media networks, carrying the Netnews traffic. I first heard about it in 1980 at the Delaware USENIX Conference, when Steve Daniel and a crew from Duke and UNC gave a paper about it. You could post a message on a newsgroup, and within a day it would be visible on Usenet hosts all over the country! This was awesome, and I brought it to Berkeley as soon as the conference software tape came out.

In those days nearly all UNIX networking was via dial-up UUCP links, and long distance phone calls were expensive. Universities like Berkeley had strict policies not to let their computers make long distance calls. Tom Truscott at Duke had spent a summer with the Research group at Bell Labs, so Research's UNIX system called Duke's every night to pick up email, and they also called Berkeley's `ucbvax` system nightly. Bell Labs didn't mind a phone bill, so when we added Netnews links through Research they picked up the expense.

The "A News" software from Duke/UNC was intended for low volume, but the traffic grew quickly as more and more people got onto the Net. All the traffic went into one directory, and users saw everything in the order received, a UNIX posting, a recipe, a car for sale, a response to the UNIX posting. It seemed really disorganized. I had the idea that Netnews should be like email, with header lines.

One day a high school student named Matt Glickman walked into my office at Berkeley looking for a project, and I suggested "B News." I designed it and he got it coded over his spring break. B News organized the new postings by newsgroup, and expired old news after a couple of weeks. The newsgroup `net.unix` carried discussions about the UNIX system: `net.cooks` was for recipes, and we had `net.jokes`, `net.autos`, `net.politics`, `net.jobs`, and on and on.

There actually were earlier social media: ARPANET mailing lists and BBS systems. The ARPANET had a Telecom list, UNIX-Wizards, Human-Nets for Human Factors, and SF-Lovers for Science Fiction. These were busy lists with lots of interesting traffic, but only available on the ARPANET. I rigged up a gateway at Berkeley to post the traffic to Usenet, with a new hierarchy "fa.\*" for "From ARPA" to make it easier for sysadmins to choose whether they wanted it.

By 1981 I found myself helping more and more universities and companies get onto Usenet. They needed to find a kind sysadmin who would give them a dial-up connection and a news feed, so I came up with a "pay it forward" rule where, if someone gave you a connection, you should be willing to give at least two more systems connections in return. That kind of spread the load around, and Usenet kept growing.

When you logged into UNIX, it would tell you "You have new mail," and we added an option to B News for your `.profile` so it would also say "There is news." The joke became "There is always news." Catching up on Netnews got to be time-consuming, and you could get sucked into the vortex, just like Facebook today.

Netnews was mostly for fun, but people needed email for their work. In those days you had to give your email directions: `duke!unc!research!ucbvax!mark`, so people needed a map of UUCP connections just to send email. I handed out Usenet logical maps at the USENIX conferences in 1982 and 1983, and people snapped them up to use to route their email. There was constant confusion between Usenet, which carried Netnews, and UUCP, which carried email and was much larger and better connected. By 1984 I gave up distributing a logical map, because it was too branchy. I handed out a geographic map, and Bill and Karen Shannon put out an eight-page logical map [2] at the 1984 USENIX conferences. After that it was just too big to draw a picture.

Usenet distributed Netnews with a "flood algorithm" where a node sent all new news to each neighboring node, which checked each article to see if it already had it. If not, it saved the news and sent it along to its other connections. The "Path" header showed how the article got there, so any node on the path could be skipped. That way everything worked its way around the Net, with some redundancy. But growth made it unwieldy, so in 1983 I set up a "Usenet Backbone" that would carry the news around the world in an organized fashion, then send it out for local distribution. Gene Spafford (then at Georgia Tech) didn't see Atlanta on the Backbone, so he got involved about 1984. He realized the sysadmins on the Backbone had power to run the Net, so he set up the "Backbone Cabal" mailing list as a political decision-making group. Backbone maps were still manageable, so we put out a few of those from 1983 to 1986.

One of the biggest Backbone hosts was decvax, run by Armando Stettner and Bill Shannon of DEC. They called so many impoverished universities that, at one conference, Armando bragged about a quarter-million dollar phone bill just for decvax. There was even a rumor going around that Usenet was really a scheme of AT&T to generate revenue by running up phone bills! The truth was just the opposite: sysadmins ran up their phone bills quietly so their bosses wouldn't notice, and AT&T corporate had no clue any of this was going on. Bell Labs, however, had the largest presence on Usenet, brought in through gateway machines like ihnp4 and harpo, with friendly sysadmins like Gary Murakami and Brian Redman.

*RF:* In the '80s, there were many email standards. I see you worked in that area as well.

*MAH:* There were too many incompatible email standards. The ARPANET was great: user@host got your mail there. There were also CSNET, BITNET, FIDONET, and a hot mess called X.400. AT&T used UUCP, but internally it was pretty well connected. All AT&T systems were registered with Network Action Central, so host:user worked for any AT&T internal email. But the rest of UUCP was ad hoc, so everyone had to route their own email, and an address like research!greg@Berkeley was ambiguous.

As the Net grew, several people offered to create an email map but disappeared under a mountain of UUCP system files and were never heard from again. That all changed when Internet domains came along. I was an early advocate, writing a paper "What the Heck Is a Domain" extolling their virtues. I thought they could be used for UUCP email, so at the 1984 Washington USENIX Conference I got a BoF session together to plan the map. We created the UUCP Mapping Project, all volunteer based, to post and update UUCP connection information to comp.mail.maps on Usenet.

Peter Honeyman and Steve Bellovin wrote pathaliases, which converted the map information to a localized email routing database. I helped a high school student, Adam Buchsbaum, write the smail program to send email using the database, and we set up the .UUCP top level domain to go with .ARPA. It worked great for us, but the ARPANET didn't recognize any other domains, so they had to resort to addresses like mark%cbosgd.UUCP@Berkeley. ARPANET addresses were only allowed one @ sign, so a second @ had to be hidden as a %.

I represented UUCP at a January 1986 meeting at SRI, along with Craig Partridge from CSNET and Dan Oberst from BITNET. We wanted official ARPA recognition of our domains. Ken Harrenstien from ARPA convinced us that all the world should be under six domains: .COM, .EDU, .ORG, .GOV, .MIL, and .NET. Steve Kille from the UK asked for a special clause for other countries to use their two-letter country code, but didn't expect it to

be used much. We were all authorized to share registration of domains in the big six through Jon Postel at ISI. I had to take the UUCP Project to the next level, so we set up Stargate Information Systems as one of the first domain name registries. The first domain I registered was stargate.com, and the second was att.com. We got it working with smail and brought lots of UUCP-only companies and universities into the .com and .edu spaces. The Stargate side of it was Lauren Weinstein's project.

In 1992, Bell Labs had two competing email systems: smail understood domain addresses and worked with sendmail on Suns, but much of the labs had an email system called POST. A team maintained a database of AT&T staff, including name, location, title, and their host:user email address. Their post front end to mailx allowed you to send email to people by name, so post john.bagley would let you compose an email, just like mailx, and deliver it by looking up his UUCP email address and handing it to an email back end called upas. You could send to groups with queries like org=4526, which went to an entire department, or tl=sup/loc=cb, which went to all the supervisors in Columbus.

I started fiddling with sendmail and post and integrated domains with the post lookups. I called the system EMS, and it was deemed useful enough to form an email team to support it. Now I could put mark.r.horton@att.com on my business cards. One day my email stopped working. When I dug into it, I discovered AT&T had hired another Mark R. Horton! When AT&T spun off Bell Labs and Western Electric into Lucent Technologies, the POST team added a "handle" field for email, first come, first served, so I became mark@lucent.com.

In 2000, Lucent spun off Avaya and Agere, and I went to Avaya to manage their email and POST directory team. That lasted a year, then the .COM bubble burst and I took a package from Avaya.

*RF:* You wrote in your Wikipedia page [1] that you got Lucent to provide support for your gradual transition, starting with cross-dressing. I can't imagine that that was easy.

*MAH:* Most transgender people know they're different from an early age, but I took a long time. I first got interested in women's clothes at age 10, but didn't really fully cross-dress until 1988 at age 32. My first wife Karen divorced me over it, but my second wife Beth was supportive. We kept it a deep secret for years, but I started to come out in 1996 when Lucent's gay/lesbian/bi group, EQUAL!, added transgender to their mission.

I went to an EQUAL! conference in Denver, the only trans person there, and we educated each other. I learned how important it was for gay and lesbian people to have the freedom to come out in the workplace, empowered by the words "sexual orientation" in the EEO nondiscrimination policy. They didn't have to spend

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energy hiding part of themselves, so they were happier and more productive at work.

Unfortunately, those words didn't protect me. I asked, through channels, if HR might add transgender language to the EEO policy. Later, the question came back, "If we were to add transgender language, how would we do it to be as inclusive as possible?" Opportunity was knocking!

I didn't know the right language, but I had connections in the trans activist community. A trans attorney in Washington, DC suggested "gender identity, gender and sexual characteristics, and gender expression." What a mouthful! It turned out "sexual characteristics" didn't fly with HR, so we condensed it to "gender identity, characteristics, or expression." Rich McGinn, the Lucent CEO, signed it in 1997, the first large company to officially include transgender people in their EEO policy!

By this time I had a life as Mark and another life as Mary Ann, and I was allowed to come to work occasionally as Mary Ann. I was also an activist for trans rights in other places, and the other trans activists were all transsexuals who had transitioned long ago. They all said corporate America could not handle a part-time cross-dresser in the workplace, but I was already doing it!

Somebody was afraid I might want to use the restroom, and a secret meeting was held by HR, Corporate Security, EQUAL!, Medical, and my boss (but not me). They decided I should use the single occupancy restrooms in Medical, a quarter mile from my office. A bathroom break took 15 minutes, but I was so happy to be able to go to work as Mary Ann that I accepted it.

Through EQUAL! I was able to get other Lucent policies improved. When people realized that the world didn't end if I used the ladies room, I persuaded HR to use the principle of least astonishment, so that transgender people would use the restroom for the gender they are presenting.

I knew other transgender Lucent employees who could not get their medical care covered. I worked with HR to cover the hormones and surgery, and in early 2000 someone got her surgery covered. I still hadn't transitioned, so I didn't personally need the medical coverage.

I didn't transition until late 2001, after I'd been spun off to Avaya and taken their early retirement package. Beth supported my transition, but she didn't want to be married to a woman. We broke up and I went looking for a job as Mary Ann. The market was flooded with great people after the .com bubble burst, so it took 11 months to get a UNIX job with Bank One. I used that time to become legally and medically female.

After success with Lucent, I was an activist getting other companies to add Gender Identity and Expression to their EEO policies. Apple followed quickly, then Chase and IBM. In 2002 I (with other activists) convinced the Human Rights Campaign to include points for transgender nondiscrimination language, and HR departments began to quickly add it.

In 2001, inspired by Lynn Conway's "back of the envelope" calculation asserting that it would be cheap to fully cover transgender surgeries, because so few people have them, I surveyed the surgeons. An astounding 75% responded, and I was able to get a pretty good estimate of the total cost to cover transgender health benefits, which came out to about .004% of total health premium costs, basically the change in your couch. I gave workshops at the Out & Equal LGBT workplace conferences, and other companies began to add the coverage. Now it's standard coverage in large companies, at zero added cost.

*RF:* What did you do after leaving Bank One?

*MAH:* In 2007 the stars were aligned and I got to come back to California. I worked for San Diego Gas & Electric supporting the SCADA system that runs the transmission grid. After the Northeast power blackout in 2003, there was a lot of concern about reliability and cybersecurity, and I wound up leading the effort to keep the hackers out. There are a lot of NERC CIP regulations [3] about this, so not only did we have to keep the system secure, we had to provide daily evidence we were doing so. I wound up building automated tools to collect the compliance evidence.

I retired in 2018. Now I'm enjoying living in paradise and writing a memoir.

### References

[1] Mary Ann Horton: [https://en.wikipedia.org/wiki/Mary\\_Ann\\_Horton](https://en.wikipedia.org/wiki/Mary_Ann_Horton).

[2] UUCP/Usenet maps: [stargatemuseum.org/maps](http://stargatemuseum.org/maps).

[3] NERC CIP: <https://www.ispartnersllc.com/blog/nerc-cip-standards-overview/>.



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