

No Accounting for Usage: The University of Pennsylvania and its Modem Pool

The University of Pennsylvania got out of the modem pool business and now is exploring what the emerging funding model might mean

By **Jennifer MacDougall** and **Michael A. Palladino**

The University of Pennsylvania is in the final phases of a two-year plan to shut down its over-burdened 1,080-line modem pool. This article describes steps the university took to reach the decision to shut it down and explains why Penn's experience might matter to IT planners in higher education facing the same decision. We also look ahead, to future issues involving funding models for other Internet resources.

The Entitlement Factor

Feelings of entitlement have become so commonplace, it is sometimes hard to imagine that they're not necessarily valid. We feel entitled to uninterrupted access to the Internet, with no waits and no glitches, at any time and from anywhere. Students (and faculty and staff) feel entitled to download MP3 files, video, audio, and anything else to which they might want immediate access.

Probably all of us would like those feelings of entitlement to be justified. To fully employ the ubiquitous university, and to take full advantage of the World Wide Web and the wealth of information and resources it provides, access to the Internet shouldn't even require a moment's thought. We have all come to expect it and want it on demand for as long as we choose — anything less is unacceptable.

Witness the exploding popularity of

high-speed digital subscriber line (DSL) and cable modem technologies. Despite often rocky installs and monthly costs much higher than the average dial-up Internet connection, new high-speed technologies are wildly popular. They are so sought after that even people on relatively minimal budgets will shell out the money for high-speed, always-on connectivity — largely because of the entitlement factor. We have become entitled, we believe, not to have to endure the "World Wide Wait."

What does this mean for higher education with its limited IT resources, like computers, modem pools, and bandwidth? How do technologists and network planners reconcile the perceived entitlement to a potentially infinite resource such as the Internet with finite — and often very limited — financial resources?

Tough Decisions

By 1999, the University of Pennsylvania's 1,080-line, 33.6 Kbps analog modem pool was reaching full capacity. The university needed to decide whether to upgrade and perhaps increase the size of the already large modem pool, or switch to an entirely different approach. Penn's Network Planning Task Force (NPTF), a cross-campus group that meets to discuss and review funding and planning for Penn's network, recommended not

adding new modems. Instead, they advised beginning the precarious process of phasing out the modem-pool service altogether.

The campus-wide reaction to the proposed changes rather resembled what would happen if we suggested taking candy from the mouths of babies (which is what lack of access to the Internet can reduce all of us to). More than 14,000 users of the modem pool heard that their free access was being "taken away" and reacted accordingly. The 1999 increase in parking charges and other fiscal acts by the university did not help the public relations effort. However, strong support from the provost helped the IT administrators in announcing the proposed changes to the remote access policy and planning for the phase out despite no small amount of public protest.

Herein we explain the steps taken to gradually phase out Penn's modem pool. We also share a bit of the rationale for such a drastic policy change and why we believed the time was right to make it.

History

In 1986 Penn established its modem pool with a manageable 16 lines serving a few hundred users and costing less than \$20,000 annually. At that relatively early stage, those dial-up lines represented cutting-edge technology. They were also a necessity, since at the

time few if any local or regional Internet service providers offered Internet access to the masses.

Over time, the modem pool grew to 1,080 lines, with costs of more than \$1 million per year for telephone lines, hardware and software support, staffing, machine room space, and so on. The sense of entitlement also grew as the user base of these lines climbed from a few hundred to more than 14,000 total monthly users out of the 35,000 faculty, staff, and students at Penn. This monthly user figure does not include the more than 7,000 undergraduate students who haven't needed remote access since 1997, when all campus houses were completely wired for Ethernet connectivity to Penn's network, called PennNet.

IT administrators at Penn reached a crossroads in 1997 when confronted with these figures and the ever-increasing costs of maintaining the modem pool. Around that time, commodity Internet connectivity costs began their exponential upward trend, going from \$150,000 per year in 1997 to \$800,000 in 2000. At this point the NPTF's work became critical.

The NPTF arose as a byproduct of Penn's IT restructuring in 1996 and is one of only a few such groups of its kind in higher education. The cross-campus representatives lay the financial books bare and recommend rate-setting for the coming fiscal year. They also advise the university on how and whether to fund existing and new network services and initiatives.

The NPTF meets each fall semester to review the budgeting and planning for PennNet. In 1999, the NPTF struggled with the modem pool problem, finally deciding not to fund additional modems for fiscal year 2000 and to begin the likely phase out of Penn-run modem services by 2002. The rationale was complex: partly costs, of course, but also the recognition that the university could not provide broadband technologies like DSL and cable modems to its many constituents, scattered over at least three states and dozens of political (and cable franchise) jurisdictions.

Once the NPTF decided to phase out the modem pool, it turned to a small team of administrators and staff in Penn's central IT group, Information Systems and Computing. This team had to convey the decision to a reluctant campus and ensure the success of this politically charged and broad-reaching policy change.

Steps Taken

Once the NPTF recommended shutting down the modem pool, the proposal went to the provost for approval. Then the team took the proposal to key campus constituencies to obtain high-level support.

Consultation around the funding issues ensued as the team brought the modem pool problem to nearly every campus group and body for discussion. The provost and executive vice president granted critical top-level support, and student leaders were canvassed attentively. In December of 1999 Penn's CIO, James J. O'Donnell, held a Town Hall meeting to present the proposed change to the campus at large. For the duration of the project, the team sent out communications about the proposed changes. The group also created a Web site and established an e-mail alias for any and all questions (and quite a few complaints) about the policy changes.

Also during this time, negotiations were under way with numerous local, regional, and national ISPs for "best-value" remote-access services for the Penn community. In 1998 a request for proposals went out to the vendor community for both dial-up and high-speed connectivity services. From that RFP emerged a handful of interested vendors. The planning team added other noteworthy leads and proposals to this potential partner list. At any given time we worked extensively with five to ten vendors to secure good service at best cost for Penn customers.

Penn also turned to an interim strategy of charging for access to its own previously free modem pools until the full transition to commercial ISPs could be completed. Free access to the main Penn-run modems ended in August 2000, at which time the for-fee modem

service began — at a slightly higher rate than the readily available Penn-preferred pricing of local and regional ISPs. Penn faculty, staff, and students could sign up for this service as a transition step until they moved to an external, commercial ISP. When this for-fee service signed up fewer than 250 subscribers (out of a potential 14,000), the NPTF recommended shutting it down within one year. Clearly, remote access needs were being met elsewhere.

We also considered other, higher-speed options such as DSL and cable modem. Penn's pilot program, which tested 56K and high-speed services from its prospective ISP partners, showed that neither service (DSL or cable) had emerged as readily available or consistently reliable for the Penn community at large.

Penn could have deployed virtual private networks (VPNs), or it could have decided to upgrade and grow its modem pool to meet the increasing demand. The university chose not to pursue either of those options. Studies showed that nearly 75–80 percent of remote-access traffic on PennNet did not come back to Penn initially, but went out to other sites on the Internet. Had we deployed VPNs across campus, we would have committed an even greater portion of costly bandwidth to the commodity Internet. Same mistake if we'd chosen to upgrade. While a considerable portion of that traffic might have been central to Penn's mission, we'll never really know. Why bring traffic from off-campus (via the modem pools) back into PennNet only to go back out again? Why not spare the bandwidth where and when we could?

Lessons Learned

While phasing out the modem pool, we learned a great deal about implementing critical, Internet-related, campus-wide policy changes. We have some recommendations for any school still grappling with whether to make similar adjustments:

- Consider future growth and expect it to be exponential.

We all know that it's a changing world in IT and higher education — especially

when it comes to the Internet and our dependence on it. Plan for that dependence to increase. But plan for limited resources, too.

- Obtain high-level support first. Large-scale changes like these cannot be made without executive support. They will fail if you don't have support of those whose necks are on the line — provosts, school deans, student chairs, IT directors, and key faculty and staff.
- Communication is critical. Consult widely with the community at large. Be realistic yet persuasive, and keep the lines of communication open throughout.

- Expect dissent. Plan for it. Understand how the change affects distinct populations across your campus, and make sure you understand their likely reactions. Have solutions and answers ready. Allow for outcry; it's probably justified.

- Set direct charges for Internet-related services. Do it now.

One of the biggest mistakes we made was not charging directly for the service in the first place. But in 1986, who knew that the Internet would play as large, as critical, and as pervasive a role in our lives, our learning, and our business as it does today? As the Internet grew, modem pool use increased, but its rising costs were paid for indirectly, with the bulk of actual users (off-campus students) not paying for the full cost of their usage.

Is Bandwidth Next?

Underlying the remote access decisions faced by Penn's NPTF in 1999, and perhaps not even known to them, was the lack of an equitable charging model for campus Internet connectivity that was similar to the modem-pool funding model. Both remote access issues and Internet bandwidth issues reflect the problem of linear revenue for exponential growth. (See Figure 1.) Both breed feelings of entitlement. And both require tough decisions about funding and how to plan for exponentially increasing usage.

Consider that commodity Internet costs were \$300,000 in 1999. The cost for the university's multiple commodity

Internet connections is projected to be \$1 million by FY 2002. (See Figure 2.) Internet usage is projected to continue to grow exponentially in ways that defy Moore's law and render it obsolete.

Penn is experiencing success with lower-cost ISP alternatives; however, these newer services are still in their relative infancy. With network convergence on the near horizon (Penn's Networking and Telecommunications departments merged on July 1, 2000) and services pointing toward an IP-centric model, the possibility of linking usage to cost becomes increasingly pressing.

Unfortunately, revenues for both the modem pool and Internet connectivity are linear. Penn's NPTF is investigating Internet costs to see how the university can creatively flatten the gap between growing costs and funding. Billing for Internet services by usage could be a not-too-distant answer to the problem of entitlement.

In the February 7, 2001, *New York Times* article, "On Campus, Free Fast Internet Access Is No Longer a Given," Cybertimes Education columnist David F. Gallagher quoted Michael Palladino, Assistant Vice President of Networking and Telecommunications at the University of Pennsylvania, as saying,

We will probably move in the direction of charging for the amount of bandwidth you consume. If you consume a huge amount of bandwidth, you will pay more. It's possible that we would be in a position to do that for 2003.

Palladino stands by that statement. He says that even if Penn only charges for excessive bandwidth usage, it must start charging.

Figure 1

Projected Growth in Bandwidth

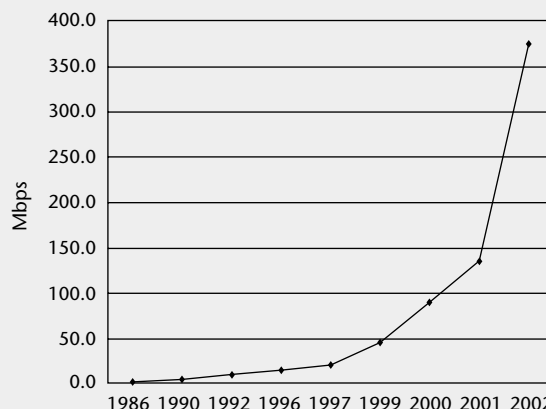
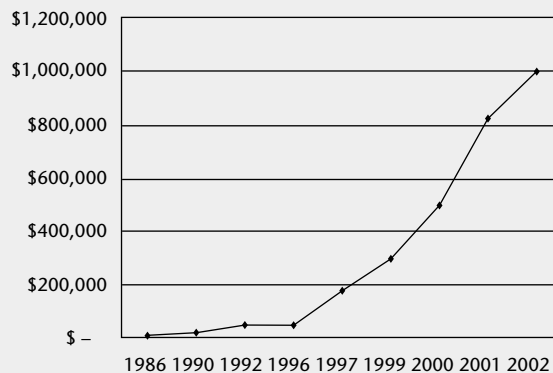


Figure 2

FY Growth in Internet Expenses



Conclusion

In the summer of 2001, Penn shut down its temporary for-fee modem pool service. All that now remains is a 60-line, 15-minute, free, express modem pool that is up for evaluation by the NPTF. Meanwhile, more than 14,000 users of the modem pool service have found better off-campus connectivity elsewhere. Penn has already saved \$1 million in operational costs — money that would probably have gone to upgrade the modem pool. That \$1 million in networking communication expenses has been spared. At least for now. *e*

Jennifer MacDougall (jmacdoug@isc.upenn.edu) is IT Project Leader and Michael A. Palladino (mikep@isc.upenn.edu) is Associate Vice President of Information Systems and Computing, Networking and Telecommunications, at the University of Pennsylvania in Philadelphia.