

how it works

**BANDWIDTH'S A WINNER, BUT
INSTALLATION MIGHT BE CHALLENGING.**

ADSL fulfills the need for speed

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EVERY WEEK, I SPEND MANY HOURS on the Internet, researching articles via the World Wide Web and news groups and exchanging e-mail with hundreds of companies and public-relations agencies.

I suspect that many of you also have some use for fast Internet access, and perhaps, like me, you'd also like to share that access among the multiple computers and other networked equipment in your home or office. Read on to discover how I satisfied my need for speed and resolved the problems I encountered along the way. Although I discuss ADSL, cable modems also output Ethernet, so the information in this article also applies to those of you interested in cable data services.

For a long time, I lusted after the high data rates that ISDN, ADSL, and cable promised. However, a variety of circumstances conspired to keep me using my analog modem.

Everything changed on January 12 of this year when Pacific Bell slashed its ADSL rates. At less than \$50 for basic service (384 kbps downstream guaranteed) and a bundled Pacific Bell ISP account, less than \$200 for the splitter/modem/network card hardware combination, and no installation fee, this was a deal I couldn't refuse (Reference 1). Since this announcement, America Online (www.aol.com) has unveiled similarly priced partnerships with both Bell Atlantic (www.bellatlantic.com) and Pacific Bell.

After Pacific Bell verified that ADSL was available in my area of Sacramento, CA, and that I was close enough to the central-office switch to achieve the minimum promised bandwidth, the company said that its subcontractor, Prime Services, would complete the installation on February 18. I decided to do a little research. I al-

ready had a fairly complex TCP/IP-based Ethernet peer-to-peer LAN running in my home office, with IP addresses assigned via the dynamic-host-configuration-protocol (DHCP) function of my router (Figure 1). I wanted to verify that, at a minimum, desktop PC 1 (my main system) could get ADSL access and still communicate with the rest of the LAN.

My first few inquiries to Pacific Bell, Alcatel, Microsoft, and Intel (www.intel.com)—with what I thought were simple questions, such as “Can I put more than one network card into a PC running Windows 98?”—produced a chorus of surprising “I don't knows.” Apparently, these companies were used to hooking up stand-alone computers but not computers that were part of a network. Eventually, I spoke with Ryan Manepally, a technical marketing engineer for DSL at Intel's Architecture Labs. Manepally confirmed that my proposed two-network-card setup was indeed acceptable. I didn't even need to operate my LAN over TCP/IP. (However, using TCP/IP allows me to configure my router and print server through a Web browser.) I just had to bind the TCP/IP to the network card I'd be adding to the system for the ADSL modem.

Prime Services showed up at 9 am on February 18. The installation should have taken less than an hour but ended up taking close to three. First, I didn't have enough spare pairs of twisted-pair wire running to my office for the ADSL connection (the splitter is outside the house, and separate voice and data lines run to the room), so

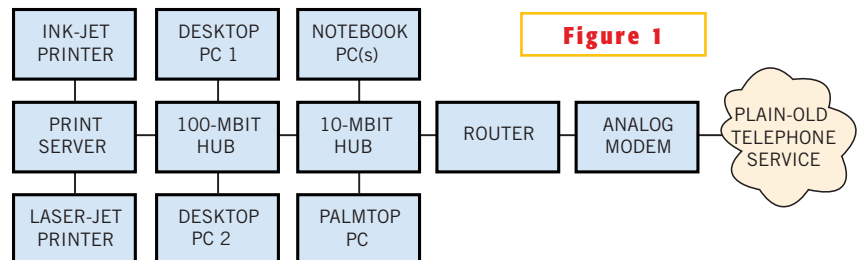


Figure 1

I added ADSL access to the fairly complex TCP/IP-based Ethernet peer-to-peer LAN running in my home office.

Prime Services needed to run more cabling. Then, my assigned static IP address wouldn't work. Prime Services originally thought this problem was due to a misconfiguration of the Cisco (www.cisco.com) router at the central office, but it ended up being a paperwork mix-up.

By noon that day, I was up and running. The central office must be near my house, because I hit close to the maximum-possible 1.5-Mbit download speeds (when I have a fast server on the other end of the pipe, of course).

By disabling file and print sharing on the ADSL-connected network card, keeping my virus-scanning software up-to-date, and periodically checking Microsoft's security site for operating-system and application patches, I've convinced myself that my computer is sufficiently protected from unwanted visitors. And the persistent Internet connection is also a winner; I don't miss that dial-up networking log-in process one bit.

My next challenge was how to share this ADSL bandwidth among all the computers on the LAN. After quite a bit of research, I uncovered several options, all of which implement some form of network-address-translation (NAT) function. NAT converts multiple IP addresses on the private LAN to a single valid IP address on the Internet. One option uses software running on one of the LAN nodes (in my case, desktop PC 1). The software converts the node into a NAT server while still letting you use it for normal tasks. The most popular software alternatives, all of which I evaluated with positive results, are SyGate 3.0 by SyberGen, WinGate 3.0 by Deerfield.com, and WinProxy 2.1 by Osis Software. Microsoft also plans to roll NAT and DHCP functions into its upcoming Windows 98, second edition.

The primary advantage of the software-NAT approach is its price. Three-user versions of SyGate, WinGate, and WinProxy cost less than \$60 each, and you can buy a second network card (if one doesn't already come bundled with your ADSL or cable modem) for around \$25. You can also try the product before you buy it and purchase a registration key over the Internet. On the other hand, that second network card eats up a PCI slot that you might prefer to reserve for some other use, such as graphics or audio. NAT also eats up CPU cycles. Depending on the size of your LAN; the frequency with which various nodes are accessing the LAN; and other functions that the NAT server performs, such as content filtering and DHCP, you may or may not notice a slowdown. Finally, unless the NAT server is up and running, no other node on the LAN can access the Internet, or, if IP addresses are dynamically allocated, no other node can access any other node.

Finally, how well does it handle applications not originally designed for NAT use, such as AOL, BackWeb, ICQ, Internet Phone, RealPlayer, and Windows CE's synchronization utility? These programs are notorious for giv-

ing NAT-software problems, unless each client has a Winsock redirector. However, I didn't encounter any incompatibilities.

If you have an old PC collecting dust in your closet, you can buy a couple of network cards and turn it into a stand-alone NAT server. This way, you won't sap the performance of your main network machines or use up their add-in card slots. And, with its dedicated function, the NAT server shouldn't crash *too* often, maximizing network uptime. The latest versions of Sygate, WinGate, and WinProxy all require Windows 9x or NT, so you probably will be unable to use that ancient PC XT sitting in your garage.

You can even take the next step and turn this additional PC into your print server or a full-blown application server. Windows NT Server, for example, offers built-in NAT and proxy-software options.

If you don't own a spare PC, however, buying one just to use as a NAT server doesn't make much sense, consider-

ing that stand-alone Ethernet-to-Ethernet routers perform the same function more reliably and at a comparable or lower cost. Cayman Systems, 3Com, MultiTech Systems, Netopia, and Ramp Networks all make routers, and more manufacturers are sure to appear. I tried Netopia's R9100 and Ramp Networks' WebRamp 700s.

The Intel InBusiness Internet Station performed a similar NAT access aggregation function through a 56-kbps analog modem in my original LAN configuration (**Figure 1**). However, although the Internet Station uses PCMCIA card slots (along with a serial port) to hook up to external analog and ISDN modems, Intel has no current plans to add Ethernet PCMCIA-card support, so I had to look elsewhere. Unlike NAT software, a dedicated router is OS-independent. If you'd like to put Macintosh or Linux/Unix nodes on the LAN and access the Internet through ADSL, you can do so if the clients "speak" TCP/IP.

Migrating to ADSL, if my experience is any indication, is a relatively painless procedure (once you've figured out what you need to do) with tremendous performance and ease-of-use benefits over dial-up analog modems. After you have the "big pipe" running into your home or business, small additional increments in cost and complexity let all of your networked computers and other Internet-aware devices share that bandwidth. Speed is addictive. Once you take the high-bandwidth plunge, you'll never go back. Just don't assume that your computer or telephone company knows how to hook everything up!

Alcatel	www.alcatel.com
Cayman Systems Inc	www.cayman.com
Deerfield.com	www.wingate.com
Microsoft Corp	www.microsoft.com
MultiTech Systems Inc	www.multitech.com
Netopia Inc	www.netopia.com
Pacific Bell	www.pacbell.com
Ramp Networks	www.rampnet.com
SyberGen Networks Inc	www.sygate.com
3Com Corp	www.3com.com

REFERENCE

1. "Got Bandwidth? Pacific Bell Answers California's 'need for speed' with \$39 ADSL Service, Major Availability," www.sbc.com/PB/News/Article.html?query_type=article&query=19990112-04.