

Ask Mr. Protocol

by Michael O'Brien



"We don't do 'networking.'"
— One clueless front-line support person at an Internet service provider

"We don't support shell accounts."
— Another front-line support person, at 3 a.m., when informed that attempts to test a failed PPP account by logging into it manually in a terminal window result in a phone hang-up instead of an initial burst of PPP packets

"Generic PPP setup: Configure your PPP client software to use this for an account name, that for a password, and use these options for DNS and gateway services. Your client software must support PAP."
— A wise provider

Mr. Protocol Buys a Driveway

Q: *Let me check. No wild animals in the house. That's OK. No electronics exploded all over everywhere. That's OK. Mr. Protocol is humming to himself in the corner. That's OK, I think. Can I ask a question? What do I want to look for in an Internet service provider?*

A: Item three is far from OK. Mr. Protocol is humming to himself in the corner because he's recently become a devotee of "found" music, and he heard a catchy tune from a modem that was having trouble synching up the other day. Now he's trying to rearrange the filter poles on the complex plane, in his head, to come up with harmonies. I try not to go near him at times like this. It wouldn't be so bad if he hadn't gotten three phone calls from alternative music labels just this morning.

As to your question, I feel I can safely commit to an answer. And that answer is: It all depends. Mostly, what you want in an Internet service provider (ISP) depends on what you want from the Internet.

Mr. Protocol is not prepared to go into every possible reason why you might or might not want to be on the Internet. Well, actually, that's a whopping great lie. Not only is he prepared, it's all I can do to stop him. Believe me, you don't want that. The world is not ready for an 850-page monthly column. Let's try to cut things down a bit.

There are two big reasons why you might want to be on the Internet. The first is to get information from other people for yourself and your business. The second is to provide information about yourself and your business to other people. You already know how to do that for most things. It's disingenuous to say that the Internet is a rapidly moving target, though. It's a skeet shoot with hypersonic skeet.

Let's take the first type of connection. You want to connect to the Internet because you want to mine it for information. How you do this is going to depend on how much information you want to move, and how fast.

If you're a loner, a standard dial-up connection will do the trick. The going rate is pretty much \$20 per month for all the bits you can eat. Some providers are putting on a cap of 100 or 150 hours per month, after which surcharges kick in. For most single-machine operations, though, this kind of deal is hard to beat.

It used to be important to check the width of the ISP's own connection to the Internet because, in the early days, three guys would buy a machine, put it in an office, order up a 64-Kb/s frame relay connection to the Internet, and sell far, far too many subscriptions to their new ISP business. The network, as seen through one of these providers, was impossibly slow, because about five users with 14.4-Kb/s dial-up modems would saturate such a provider. The only thing that kept this sort of setup from being slow beyond belief was that these yo-yos generally didn't buy enough modems either, so they were mostly known for providing busy signals. Most of these operations have

sunk without a trace, and even America Online took a considerable public relations hit when it oversubscribed itself. Many providers now advertise a "no busy signal" policy, and a few even come close to making good on it.

Small-office operations, with several machines to be put on the Net, need a different kind of connection. Typically, this will be an ISDN connection. ISDN, which stands for Integrated Services Digital Network, provides an end-to-end digital connection from your site to the service provider. On the customer end, the line looks like a regular phone line, except that special equipment has to be plugged into it. It's not as simple as just plugging in a telephone. And, just as regular phone lines can be set up with call waiting, call forwarding, busy-number redial and a host of other features, ISDN lines also have several dozen possible options that can be ordered. The problem is that unless you order exactly the right set—and the set varies from provider to provider—your Net connection won't work.

The upside of ISDN is that you get either 64 Kb/s or 128 Kb/s of data transfer, and you can plug in a box that will act as a router, allowing several machines at your site to be on the network at the same time. These ISDN minirouters don't cost much money and hook right onto a local Ethernet.

ISDN can also result in busy signals, but it's easier for providers to service large numbers of lines because of ISDN's all-digital nature. They'll bring in a single high-speed digital line. This line will support a large number of individual ISDN dial-in lines, which themselves have only a virtual existence as a multiplexed fraction of the high-speed line. The high-speed line plugs into a single box, which decodes the incoming call requests and handles the business of validating logins and serving PPP packets over the individual ISDN connections.

One little secret about ISDN is that some telephone companies have a tariff for "Centrex ISDN." Centrex is a telephone service ordered by many large companies where the telephone company's own central office switch acts as a local PBX for the company. Calls internal to the company aren't billed individually. Centrex ISDN is the same notion. Your ISDN line acts like a Centrex extension, allowing you to place all the ISDN calls you want for a fixed monthly fee, *if* the ISDN line you're calling is in the same telephone company central office as your own line. Calls placed entirely within a switch consume so few resources that this sort of pricing is practical. What this means is that you can call your provider all you want for a fixed price. Providers who know about such things will also offer you a fixed price on Internet access to go along with this.

Not So Cable Ready

One other service that's being brought to market now is broadband service, provided by local cable companies. This is slow in reaching the market because cable companies are now reaping the harvest they sowed back when the cable television infrastructure was first being installed. The original designers of cable TV standards knew that as long as they were paying out good money for all this coax, they might as well write the standards to allow two-way communication with the home. Even though no one knew what it would be

good for, the designers figured it would be really handy some day. Therefore, they wrote standards that called for two-way cable amplifiers, receivers at the cable head ends, and two-way repeaters.

Being a bunch of cheapo weasels, the people who were actually forking over the money for all of this rammed through an appendix after the fact that said that if you really wanted to, you could install one-way equipment and still be in compliance with the standards. Absolutely everyone then proceeded to build systems that worked in one direction only and also proceeded to use really cheeseball coax that had high losses, which provided a television picture that was "good enough," though on a spectrum analyzer it looked terrible. They got away with this because enough customers who knew what a good picture looked like were still willing to fork over for a bad one, because most customers didn't know what coax cable looks like, let alone what good coax looks like compared with bad coax, and because not very many customers knew how to use a spectrum analyzer.

Then came the day when it looked like you could make a boodle selling Internet service to the home. Cable could carry a signal at around 1.5 Mb/s to the home, as opposed to 28.8 or 56 Kb/s, about a 50-fold better deal. Ha ha ha ha, you can't really do that, because the coax is way too cheeseball to carry digital data, and all the amplifiers only work in one direction, and they're all cheeseball anyway, as well. You've got to reinstall your entire cable plant from the ground up if you want to do this.

Most cable companies would rather sell out than do this. Hence, broadband service is very slow in coming.

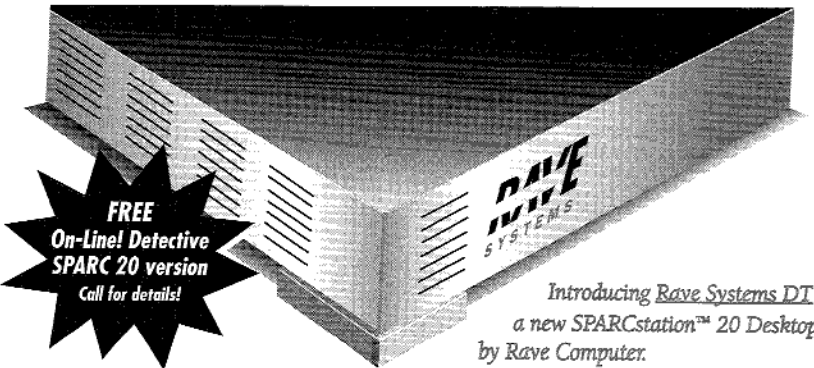
If it does come, the box the company puts in your home is good for only one computer. If you want to run a business and get a bunch of addresses, talk to them, they'll charge you business rates, which is MBA-speak for "out the wazoo." Nevertheless, there are a few people who have managed to sneak a small network through one of these boxes, using a very clever trick.

The Internet Assigned Numbers Authority, back before it had to spend most of its time in court or giving depositions in lawsuits brought by rabid weasels who think that it's worth risking the Internet if they get rich in the process, set aside several ranges of addresses for assignment to networks that were not going to be connected to the Internet. The sneaky trick is to assign these IP addresses to the machines on your little private net, and then connect one computer to the cable modem. This computer has an interface on the nonroutable net in addition to its connection to the cable modem, and it acts as a router. A host on the private net that wants to make a connection to the big wide world sends out a TCP connection request packet to an outside Internet host. The router notes what port number is being connected to and rewrites the source address to be the address of its interface to the

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cable modem. When a response comes back from that host, the response has its destination address rewritten to be the nonroutable IP address of the host that originally sent out the connection request. The nonroutable host gets its packets routed and doesn't notice anything funny. The cable company sees a single host with a lot of connections. Everyone's happily ignorant.

Of course, this trick only works with TCP, because there's enough state information in TCP to allow the router to keep things straight. For most purposes, though, that's fine.

Larger companies need fatter pipelines. Unfortunately, the price rises steeply here, and the language gets esoteric. The advent of high-speed Internet connections has taken a number of terms that ordinarily were only spoken by telephone companies and by that special breed of human hired by companies to speak to telephone companies. T1 lines at 1.5 Mb/s, T3 lines at 45 Mb/s, exotica up to OC48 at unbelievable megabits per second, are all available for enough money. Fractional amounts are available too, so that you can tune the size of your Internet pipeline to meet your aggregate needs. This works best in large corporations where it is possible to speak about a statistical aggregate of traffic, although there is some initial research that seems to show that Internet traffic is uneven at a fractal level, that is, there is burstiness on all time-scales, from a few seconds to a few months.

A company this large is going to hire people who know about the special equipment that a T1 line plugs into, so we won't cover it here. Suffice it to say that it's got to be some species of router, unless you're running a really, *really* big server. Walnut Creek CD-ROM claims to operate the largest FTP server on the Internet; it's an overclocked Pentium running FreeBSD, it has three T3 lines dedicated to serving it, and supports around 3,000 simultaneous FTP users.

This machine brings us to our second type of user, the user who wants to pump information out of the company, as opposed to importing information. The simplest example of this is the personal

Ask Mr. Protocol

Web site. Here, the user is sharing a Web server machine with many other users with whom he has no other connection. The machine itself is located at the ISP's site, where it can share a large pipeline to the backbone.

This collocation scheme satisfies a broad range of customers. Those who only want a small or medium-size Web site can just pay for their slice of a big Web server run by the provider in the provider's own machine room. Larger offerings, or services other than Web service, can be handled by collocating the customer's own machine at the provider's site, where it will sit at the end of the provider's high-speed backbone connection. Maintenance is done by the customer over the Net, leaving only the thorny matter of systems administration to be worked out with the provider.

All of this is well and good, you may say, but what happens when something goes wrong? How am I supposed to deal with problems?

Mr. Protocol is glad you asked.

It's a Mystery

One of the many ways in which the Internet is unique is that it provides a service whose technical details can be understood by almost none of its customers. This transition is a thorny one, because when the Internet first came into existence, it provided services whose nature was understood in considerable detail by a large fraction of its users. It did not begin as a mystery. It began as something whose work-

ings were obvious to just about everybody, and only became mysterious when its customer base changed.

As a single user, or as a small company whose expertise lies somewhere other than in networking, you have a problem.

One of the many ways in which the Internet is unique is that it provides a service whose technical details can be understood by almost none of its customers.

The Internet is not yet a public utility. A public utility can still be awfully mysterious. One look at the pilot light interlock on a hot water heater will convince even the hardiest soul of this fact. But technology turnover in the power generation business, the water and natural gas industries, and even in the cable TV market is so low that these services can be installed by experts, and then just left there. When it breaks, you

call someone, and they fix it with no further intervention on your part aside from opening the back gate.

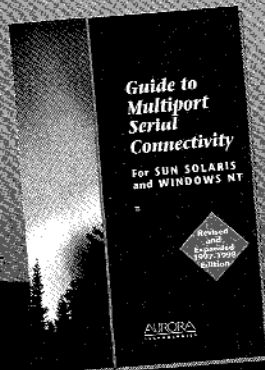
The Internet isn't at that stage. Hypersonic skeet, remember? An Internet connection is something that undergoes continual change, either at your end, your provider's end, or both. One of the few real advantages to Microsoft's monopoly on the small-computer market is that providers can train people to teach end users how to connect to their network without having to turn their front-line phone support staff into high-level Internet experts. Of course, this is the downside for anybody running

INDUSTRIAL STRENGTH

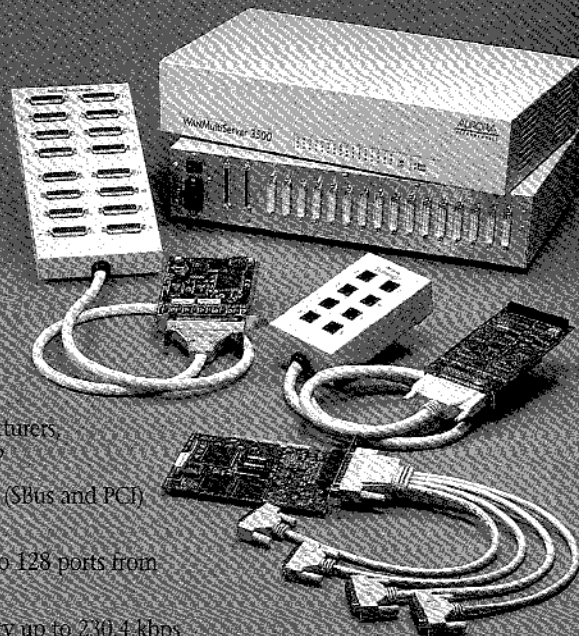
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any other kind of operating system, sometimes even including Macintosh. Providers are clueless about off-brand systems and profoundly uninterested in hearing problems. Some go so far as to insist that you be running Windows before you try to connect to them. Mr. Protocol thinks that it's vital to resist this, and give these people as much grief as is humanly possible, to prevent the decline of the Internet into a single-species ecosystem on the brink of death. Of course, you're going to have to play your own expert. If you can't do that, run Windows.

Solaris and other such high-end UNIX variants flourish in environments where there is network expertise available to the customer. Sun and other vendors will train your staff to any degree that makes you comfortable to run your network. It'll cost you, is all. However, one principle applies at any level, from the at-home dial-up machine to the multicampus corporate intranet: If you can reduce the question of what you're getting from your provider down to

something that matches up with published standards, you stand a lot better chance of figuring out how to get your network connection to work. This takes homework, but it's worth it. What flavor of PPP do they support? Do they use PAP or CHAP for authentication? And so forth. It's not important that you know the details of what PAP or CHAP are, or how they work, it's enough to know that the network software you've got supports them (or not), and that your provider requires one or the other (or neither). First, get some rough idea of the territory, then see if you can find out what positions you and your provider both occupy. Most providers are willing to work with you if you know even halfway what you're talking about. Be prepared to learn.

One thing to remember is that they know a lot more about what they have at their end than you do. Sometimes you can make educated guesses, but calling up and coming off as the Internet super-expert is useful only at 3 a.m. when you're having trouble convincing the

guy who pulled night shift that, yes, it is possible to connect your OS to their network, because up until 10 minutes ago, you'd been doing it every day for the last two and a half years.

If you're a network sort in a large corporation, you already know the answer. You talk to your provider so often that you probably have your favorite lunch place picked out. If you don't have this sort of relationship with your provider, think about a change.

Finally, there's the question of the second provider. Often, it is desirable to open an account with a completely separate provider. Your first provider may give excellent service, but perhaps only in your local region. You'll want an account at a national or global provider for use on the road. Or you may have a provider whose backbone connection goes right through one of the flakier national hubs, such as MAE-East. You might want to get a slower line to a second provider who uses a different exchange point, for use in those sorts of emergencies where MAE-East is having route amnesia, or a bad headache, or an unfortunate encounter with some Night Train, or whatever it is that seems to keep happening to it. It might be a good insurance policy, as well as giving you the opportunity to do load-balancing on your own network.

Someday you'll plug the computer into the wall, and the Internet will just work. Thank heavens those days aren't here yet. There's still time to try to get it right first. →

Mike O'Brien has been noodling around the UNIX world for far too long a time. He knows he started out with UNIX Research Version 5 (not System V, he hastens to point out), but forgets the year. He thinks it was around 1975 or so.

He founded and ran the first nationwide UNIX Users Group Software Distribution Center. He worked at Rand during the glory days of the Rand editor and the MH mail system, helped build CSNET (first at Rand and later at BBN Labs Inc.) and is now working at an aerospace research corporation.

Mr. Protocol refuses to divulge his qualifications and may, in fact, have none whatsoever. His email address is amp@cpq.com.

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