

1.1 Ready, Set . . .

The world is just a phone call away. With a computer and modem, you'll be able to connect to the Internet, the world's largest computer network (and if you're lucky, you won't even need the modem; many colleges and companies now give their students or employees direct access to the Internet).

The phone line can be your existing voice line—just remember that if you have any extensions, you (and everybody else in the house or office) won't be able to use them for voice calls while you are connected to the Net.

A modem is a sort of translator between computers and the phone system. It's needed because computers and the phone system process and transmit data, or information, in two different and incompatible ways. Computers "talk" digitally; that is, they store and process information as a series of discrete numbers. The phone network relies on analog signals, which on an oscilloscope would look like a series of waves. When your computer is ready to transmit data to another computer over a phone line, your modem converts the computer numbers into these waves (the conversion sounds like a lot of screeching)—it "modulates" them. In turn, when information waves come into your modem, it converts them into numbers your computer can process, by "demodulating" them.

Increasingly, computers come with modems already installed. If yours didn't, you'll have to decide what speed of modem to get. Modem speeds are judged in "bps rate" or bits per second. One bps means the modem can transfer roughly one bit per second; the greater the bps rate, the more quickly a modem can send and receive information. A letter or character is made up of eight bits.

You can now buy a 2400-bps modem for well under \$60—and most now come with the ability to handle fax messages as well. At prices that now start around \$150, you can buy a modem that can transfer data at 14,400 bps (and often even faster, using special compression techniques). If you think you might be using the Net to transfer large numbers of files, a faster modem is always worth the price. It will dramatically reduce the amount of time your modem or computer is tied up transferring files and, if you are paying for Net access by the hour, will save you quite a bit in online charges.

Like the computer to which it attaches, a modem is useless without software to tell it how to work. Most modems today come with easy-to-install software. Try the program out. If you find it difficult to use or understand, consider a trip to the local software store to find a better program. You can spend several hundred dollars on a communications program, but unless you have very specialized needs, this will be a waste of money, as there are a host of excellent programs available for around \$100 or less. Among the basic features you want to look for are a choice of different “protocols” (more on them in a bit) for transferring files to and from the Net and the ability to write “script” or “command” files that let you automate such steps as logging into a host system.

When you buy a modem and the software, ask the dealer how to install and use them. Try out the software if you can. If the dealer can’t help you, find another dealer. You’ll not only save yourself a lot of frustration, you’ll also have practiced the prime Internet directive: “Ask. People know.”

To fully take advantage of the Net, you must spend a few minutes going over the manuals, or documentation, that come with your software. There are a few things you should pay special attention to: uploading and downloading, screen capturing (sometimes called “screen dumping”), logging, how to change protocols, and terminal emulation. It is also essential to know how to convert a file created with your word-processing program into “ASCII” or “text” format, which will let you share your thoughts with others across the Net.

Uploading is the process of sending a file from your computer to a system on the Net. Downloading is retrieving a file from somewhere on the Net to your computer. In general, things in cyberspace go “up” to the Net and come “down” to you.

Chances are your software will come with a choice of several “protocols” to use for these transfers. These protocols are systems designed

to ensure that line noise or static does not cause errors that could ruin whatever information you are trying to transfer. Essentially, when using a protocol, you are transferring a file in a series of pieces. After each piece is sent or received, your computer and the Net system compare it. If the two pieces don't match exactly, they transfer it again, until they agree that the information they both have is identical. If, after several tries, the information just doesn't make it across, you'll either get an error message or your screen will freeze. In that case, try it again. If, after five tries, you are still stymied, something is wrong with (a) the file, (b) the telephone line, (c) the system you're connected to, or (d) your own computer.

From time to time, you will likely see messages on the Net that you want to save for later viewing—a recipe, a particularly witty remark, something you want to write your congressman about, whatever. This is where screen capturing and logging come in.

When you tell your communications software to capture a screen, it opens a file in your computer (usually in the same directory or folder used by the software) and “dumps” an image of whatever happens to be on your screen at the time.

Logging works a bit differently. When you issue a logging command, you tell the software to open a file (again, usually in the same directory or folder as used by the software) and then give it a name. Then, until you turn off the logging command, everything that scrolls on your screen is copied into that file, sort of like recording on videotape. This is useful for capturing long documents that scroll for several pages—using screen capture, you would have to repeat the same command for each new screen.

Terminal emulation is a way for your computer to mimic, or emulate, the way other computers put information on the screen and accept commands from a keyboard. In general, most systems on the Net use a system called VT100. Fortunately, almost all communications programs now on the market support this system as well—make sure yours does.

You'll also have to know about protocols. There are several different ways for computers to transmit characters. Fortunately, there are only two protocols that you're likely to run across: 8-1-N (which stands for “8 bits, 1 stop bit, no parity”—yikes!) and 7-1-E (7 bits, 1 stop bit, even parity).

In general, many Unix-based systems use 7-1-E, while MS-DOS-based systems use 8-1-N. What if you don't know what kind of system

you're connecting to? Try one of the settings. If you get what looks like gobbledygook when you connect, you may need the other setting. If so, you can either change the setting while connected and then hit enter, or hang up and try again with the other setting. It's also possible your modem and the modem at the other end can't agree on the right bps rate. If changing the protocols doesn't work, try using another bps rate (but no faster than the one listed for your modem). Don't worry, you can't break anything! If something looks wrong, it probably is wrong. Change your settings and try again. Nothing is learned without trial, error, and effort.

There are the basics. Now on to the Net!

1.2 Go!

Once, only people who studied or worked at an institution directly tied to the Net could connect to the world. Today, though, an ever-growing number of "public-access" systems provide access for everybody. These systems can now be found in several states, and there are a couple of sites that can provide access across the country.

There are two basic kinds of these host systems. The more common one is known as a UUCP site (UUCP being a common way to transfer information among computers using the Unix operating system) and offers access to international electronic mail and conferences.

However, recent years have seen the growth of more powerful sites that let you tap into the full power of the Net. These Internet sites not only give you access to electronic mail and conferences but to such services as databases, libraries, and huge file and program collections around the world. They are also fast—as soon as you finish writing a message, it gets zapped out to its destination.

Some sites are run by for-profit companies; others by nonprofit organizations. Some of these public-access, or host, systems, are free of charge. Others charge a monthly or yearly fee for unlimited access. And a few charge by the hour. Systems that charge for access will usually let you sign up online with a credit card. Some also let you set up a billing system.

But cost should be only one consideration in choosing a host system, especially if you live in an area with more than one provider. Most systems let you look around before you sign up. What is the range of each of their services? How easy is each one to use? What kind of support or help can you get from the system administrators?

The last two questions are particularly important because many systems provide no user interface at all; when you connect, you are dumped right into the Unix operating system. If you're already familiar with Unix, or you want to learn how to use it, these systems offer phenomenal power—in addition to Net access, most also let you tap into the power of Unix to do everything from compiling your own programs to playing online games.

But if you don't want to have to learn Unix, there are other public-access systems that work through menus (just like the ones in restaurants; you are shown a list of choices and then you make your selection of what you want), or which provide a "user interface" that is easier to figure out than the ever-cryptic Unix.

If you don't want or need access to the full range of Internet services, a UUCP site makes good financial sense. These sites tend to charge less than commercial Internet providers, although their messages may not go out as quickly.

Some systems also have their own unique local services, which can range from extensive conferences to large file libraries.

1.3 Public-Access Internet Providers

When you have your communications program dial one of these host systems, one of two things will happen when you connect. You'll either see a lot of gibberish on your screen, or you'll be asked to log in. If you see gibberish, chances are you have to change your software's parameters (to 7-1-E or 8-1-N as the case may be). Hang up, make the change, and then dial in again.

When you've connected, chances are you'll see something like this:

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Welcome to THE WORLD
Public Access UNIX for the '90s
Login as 'new' if you do not have an account

login:
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That last line is a prompt asking you to do something. Since this is your first call, type

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new
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and hit enter. Often, when you're asked to type something by a host system, you'll be told what to type in quotation marks (for example,

'new'). Don't include the quotation marks. Repeat: Don't include the quotation marks.

What you see next depends on the system but will generally consist of information about costs and services (you might want to turn on your communication software's logging function, to save this information). You'll likely be asked if you want to establish an account now or just look around the system.

You'll also likely be asked for your "user name." This is not your full name but a one-word name you want to use while online. It can be any combination of letters or numbers, all in lower case. Many people use their first initial and last name (for example, "jdoe"); their first name and the first letter of their last name (for example, "johnd"); or their initials ("jxd"). Others use a nickname. You might want to think about this for a second, because this user name will become part of your electronic-mail address (see chapter 2 for more on that). The one exception is the various Free-Net systems, all of which assign you a user name consisting of an arbitrary sequence of letters and numbers.

You are now on the Net. Look around the system. See if there are any help files for you to read. If it's a menu-based host system, choose different options just to see what happens. Remember: You can't break anything. The more you play, the more comfortable you'll be.

What follows is a list of public-access Internet sites, which are computer systems that offer access to the Net. All offer international e-mail and Usenet (international conferences). In addition, they offer the following:

FTP: File-transfer protocol—access to hundreds of file libraries (everything from computer software to historical documents to song lyrics). You'll be able to transfer these files from the Net to your own computer.

Telnet: Access to databases, computerized library card catalogs, weather reports, and other information services, as well as live, online games that let you compete with players from around the world.

Additional services that may be offered include the following:

WAIS: Wide-Area Information Server; a program that can search dozens of databases in one search.

Gopher: A program that gives you easy access to hundreds of other online databases and services by making selections on a menu. You'll

also be able to use these to copy text files and some programs to your mailbox.

IRC: Internet Relay Chat, a CB simulator that lets you have live keyboard chats with people around the world.

However, even on systems that do not provide these services directly, you will be able to use a number of them through telnet (see chapter 6). In the list that follows, systems that let you access services through menus are noted; otherwise assume that when you connect, you'll be dumped right into Unix (the operating system sometimes known as MS-DOS with a college degree). Several of these sites are available nationwide through national data networks such as the CompuServe Packet Network and SprintNet.

Please note that all listed charges are subject to change. Many sites require new or prospective users to log on a particular way on their first call; this list provides the name you'll use in such cases.

Alabama

Huntsville. Nuance. Call the following voice number for modem number. \$35 setup fee; \$25 a month. Voice: (205) 533-4296.

Alaska

Anchorage. University of Alaska Southeast, Tundra Services, (907) 789-1314; has local dial-in service in several other cities. \$20 a month. Voice: (907) 465-6453.

Alberta

Edmonton. PUCNet Computer Connections, (403) 484-5640. Log on as: guest. \$0 setup fee; \$25 for 20 hours a month plus \$6.25 an hour for access to ftp and telnet. Voice: (403) 448-1901.

Arizona

Phoenix/Tucson. Internet Direct, (602) 274-9600 (Phoenix); (602) 321-9600 (Tucson). Log on as: guest. \$20 a month. Voice: (602) 274-0100 (Phoenix); (602) 324-0100 (Tucson).

Tucson. Data Basics, (602) 721-5887. \$25 a month or \$180 a year. Voice: (602) 721-1988.

British Columbia

Victoria. Victoria Free-Net, (604) 595-2300. Menus. Access to all features requires completion of a written form. Users can “link” to other Free-Net systems in Canada and the United States. Free. Log on as: guest. Voice: (604) 389-6026.

California

Berkeley. Holonet. Menus. For free trial, modem number is (510) 704-1058. For information or local numbers, call the voice number. \$60 a year for local access, \$2 an hour during off-peak hours. Voice: (510) 704-0160.

Cupertino. Portal. Both Unix and menus. (408) 725-0561 (2400 bps); (408) 973-8091 (9600/14,400 bps). \$19.95 setup fee, \$19.95 a month. Voice: (408) 973-9111.

Irvine. Dial N’ CERF. See San Diego.

Los Angeles/Orange County. Kaiwan Public Access Internet, (714) 539-5726; (310) 527-7358. \$15 sign-up; \$11 a month (credit card). Voice: (714) 638-2139.

Los Angeles. Dial N’ CERF. See San Diego.

Oakland. Dial N’ CERF. See San Diego.

Pasadena. Dial N’ CERF. See San Diego.

Palo Alto. Institute for Global Communications, (415) 322-0284. Unix. Local conferences on environmental/peace issues. Log on as: new. \$10 a month and \$3 an hour after first hour. Voice: (415) 442-0220.

San Diego. Dial N’ CERF USA. Run by the California Education and Research Federation. Provides local dial-up numbers in San Diego, Los Angeles, Oakland, Pasadena, and Irvine. For more information, call voice (800) 876-CERF or (619) 534-5087. \$50 setup fee; \$20 a month plus \$5 an hour (\$3 on weekends). Voice: (800) 876-2373.

San Diego. CTS Network Services, (619) 637-3660. Log on as: help. \$15 set-up fee, monthly fee of \$10 to \$23 depending on services used. Voice: (619) 637-3637.

San Diego. Cyberspace Station, (619) 634-1376. Unix. Log on as: guest. \$10 sign-up fee; \$15 a month or \$60 for six months.

San Francisco. Pathways. Call voice number for modem number. Menus. \$25 setup fee; \$8 a month and \$3 an hour. Voice: (415) 346-4188.

San Jose. Netcom, (510) 865-9004 or 426-6610; (408) 241-9760; (415) 424-0131, up to 9600 bps. Unix. Maintains archives of Usenet postings. Log on as: guest. \$15 startup fee and then \$17.50 a month for unlimited use if you agree to automatic billing of your credit-card account (otherwise \$19.50 a month for a monthly invoice). Voice: (408) 554-UNIX.

San Jose. A2i, (408) 293-9010. Log on as: guest. \$20 a month; \$45 for three months; \$72 for six months.

Sausalito. The Whole Earth 'Lectronic Link (WELL), (415) 332-6106. Uses moderately difficult Picospan software, which is sort of a cross between Unix and a menu system. New users get a written manual. More than two hundred WELL-only conferences. Log on as: newuser. \$15 a month plus \$2 an hour. Access through the nationwide Compu-Serve Packet Network available for another \$4.50 an hour. Voice: (415) 332-4335. Recorded message about the system's current status: (800) 326-8354 (continental United States only).

Colorado

Colorado Springs/Denver. CNS, (719) 570-1700 (Colorado Springs); (303) 758-2656 (Denver). Local calendar listings and ski and stock reports. Users can choose between menus or Unix. Log on as: new. \$35 setup fee; \$2.75 an hour (minimum fee of \$10 a month). Voice: (719) 592-1240.

Colorado Springs. Old Colorado City Communications, (719) 632-4111. Log on as: newuser. \$25 a month. Voice: (719) 632-4848.

Denver. Denver Free-Net, (303) 270-4865. Menus. Access to all services requires completion of a written form. Users can "link" to other Free-Net systems across the country. Free. Log on as: guest.

Golden. Colorado SuperNet. Unix. E-mail to fax service. Available only to Colorado residents. Local dial-in numbers available in several Colorado cities. For dial-in numbers, call the voice number. \$3 an hour (\$1 an hour between midnight and 6 A.M.); one-time \$20 sign-up fee. Voice: (303) 273-3471.

Delaware

Middletown. Systems Solutions, (302) 378-1881. \$20 setup fee; \$25 a month for full Internet access. Voice: (800) 331-1386.

Florida

Tallahassee. Tallahassee Free-Net, (904) 488-5056. Menus. Full access requires completion of a registration form. Can “link” to other Free-Net systems around the country. Voice: (904) 488-5056.

Georgia

Atlanta. Netcom, (303) 758-0101. See Los Angeles, California, for information on rates.

Illinois

Champaign. Prarienet Free-Net, (217) 255-9000. Menus. Log on as: visitor. Free for Illinois residents; \$25 a year for others. Voice: (217) 244-1962.

Chicago. MCSNet, (312) 248-0900. \$25/month or \$65 for three months of unlimited access; \$30 for three months of access at 15 hours a month. Voice: (312) 248-UNIX.

Peoria. Peoria Free-Net, (309) 674-1100. Similar to Cleveland Free-Net (see Ohio). Users can “link” to the larger Cleveland system for access to Usenet and other services. There are also Peoria Free-Net public-access terminals in numerous area libraries, other government buildings, and senior-citizen centers. Contact the voice number for specific locations. Full access (including access to e-mail) requires completion of a written application. Free. Voice: (309) 677-2544.

Maryland

Baltimore. Express Access, (410) 766-1855; (301) 220-0462; (714) 377-9784. Log on as: new. \$20 setup fee; \$25 a month or \$250 a year. Voice: (800) 969-9090.

Baltimore. Clarknet, (410) 730-9786; (410) 995-0271; (301) 596-1626; (301) 854-0446. Log on as: guest. \$23 a month, \$126 for six months or \$228 a year. Voice: (410) 730-9765.

Massachusetts

Bedford. The Internet Access Company, (617) 275-0331. To log on, follow online prompts. \$20 setup fee; \$19.50 a month. Voice: (617) 275-2221.

Brookline. The World, (617) 739-9753. "Online Book Initiative" collection of electronic books, poetry, and other text files. Log on as: new. \$5 a month plus \$2 an hour or \$20 for 20 hours a month. Available nationwide through the CompuServe Packet Network for another \$5.60 an hour. Voice: (617) 739-0202.

Lynn. North Shore Access, (617) 593-4557. Log on as: new. \$10 for 10 hours a month; \$1 an hour after that. Voice: (617) 593-3110.

Worcester. NovaLink, (508) 754-4009. Log on as: info. \$12.95 sign-up fee (includes first two hours); \$9.95 a month (includes five daytime hours), \$1.80 an hour after that. Voice: (800) 274-2814.

Michigan

Ann Arbor. MSEN. Contact number below for dial-in number. \$20 setup fee; \$20 a month. Voice: (313) 998-4562.

Ann Arbor. Michnet. Has local dial-in numbers in several Michigan numbers. For local numbers, call the voice number. \$35 a month plus one-time \$40 sign-up fee. Additional network fees for access through non-Michnet numbers. Voice: (313) 764-9430.

New Hampshire

Manchester. MV Communications, Inc. For local dial-up numbers call the voice number. \$5 a month minimum plus variable hourly rates depending on services used. Voice: (603) 429-2223.

New Jersey

New Brunswick. Digital Express, (908) 937-9481. Log on as: new. \$20 setup fee; \$25 a month or \$250 a year. Voice: (800) 969-9090.

New York

New York. Panix, (212) 787-3100. Unix or menus. Log on as: newuser. \$40 setup fee; \$19 a month or \$208 a year. Voice: (212) 877-4854.

New York. Echo, (212) 989-8411. Unix, but with local conferencing software. Log on as: newuser. \$19.95 (\$13.75 students and seniors) a month. Voice: (212) 255-3839.

New York. MindVox, (212) 989-4141. Local conferences. Log on as: guest. \$10 setup fee for non-credit-card accounts; \$15 a month. Voice: (212) 989-2418.

New York. Pipeline, (212) 267-8606 (9600 bps and higher); (212) 267-7341 (2400 bps). Offers graphical interface for Windows for \$90. Log on as: guest. \$20 a month and \$2 an hour after first 20 hours or \$35 a month unlimited hours. Voice: (212) 267-3636.

New York. Maestro, (212) 240-9700. Log on as: newuser. \$12 a month or \$140 a year. Voice: (212) 240-9600.

North Carolina

Charlotte. Vnet Internet Access, (704) 347-8839; (919) 406-1544. Log on as: new. \$25 a month. Voice: (704) 374-0779.

Triangle Research Park. Rock Concert Net. Call voice number for local modem numbers in various North Carolina cities. \$30 a month; one-time \$50 sign-up fee. Voice: (919) 248-1999.

Ohio

Cleveland. Cleveland Free-Net, (216) 368-3888. Ohio and U.S. Supreme Court decisions, historical documents, many local conferences. Full access (including access to e-mail) requires completion of a written application. Free. Voice: (216) 368-8737.

Cincinnati. Tri-State Free-Net, (513) 579-1990. Similar to Cleveland Free-Net. Full access (including access to e-mail) requires completion of a written application. Free.

Cleveland. Wariat, (216) 481-9436. Unix or menus. \$20 setup fee; \$35 a month. Voice: (216) 481-9428.

Dayton. Freelance Systems Programming, (513) 258-7745. \$20 setup fee; \$1 an hour. Voice: (513) 254-7246.

Lorain. Lorain County Free-Net, (216) 277-2359 or 366-9753. Similar to Cleveland Free-Net. Users can "link" to the larger Cleveland system for additional services. Full access (including access to e-mail) requires completion of a written application. Free.Voice: (216) 366-4200.

Medina. Medina Free-Net, (216) 723-6732, 225-6732, or 335-6732. Users can "link" to the larger Cleveland Free-Net for additional services. Full access (including access to e-mail) requires completion of a written application. Free.

Youngstown. Youngstown Free-Net, (216) 742-3072. Users can "link" to the Cleveland system for services not found locally. Full access (including access to e-mail) requires completion of a written application. Free.

Ontario

Ottawa. National Capital FreeNet, (613) 780-3733 or (613)564-3600. Free, but requires completion of a written form for access to all services.

Toronto. UUNorth. Call voice number for local dial-in numbers. \$20 startup fee; \$25 for 20 hours a month of off-peak use. Voice: (416) 225-8649.

Toronto. Internex Online, (416) 363-3783. Both Unix and menus. \$40 a year for one hour a day. Voice: (416) 363-8676.

Oregon

Beaverton. Techbook, (503) 220-0636 (2400 bps); (503) 220-1016 (higher speeds). \$10 a month for 30 hours of "basic" Internet access or \$90 a year; \$15 a month for 30 hours of "deluxe" access or \$150 a year. \$10 sign-up fee for monthly accounts.

Portland. Agora, (503) 293-1772 (2400 bps), (503) 293-2059 (9600 bps or higher). Log on as: apply. \$6 a month for one hour per day.

Portland. Teleport, (503) 220-0636 (2400 bps); (503) 220-1016 (9600 and higher). Log on as: new. \$10 a month for one hour per day. Voice: (503) 223-4245.

Pennsylvania

Pittsburgh. Telerama, (412) 481-5302. \$6 for 10 hours a month, 60 cents for each additional hour. Voice: (412) 481-3505.

Quebec

Montreal. Communications Accessibles Montreal, (514) 931-7178 (9600 bps); (514) 931-2333 (2400 bps). \$25 a month. Voice: (514) 931-0749.

Rhode Island

East Greenwich. IDS World Network, (401) 884-9002. In addition to Usenet, has conferences from the Fidonet and RIME networks. \$10 a month; \$50 for six months; \$100 for a year.

Providence/Seekonk. Anomaly, (401) 331-3706. \$125 for six months or \$200 a year. Educational rate of \$75 for six months or \$125 a year. Voice: (401) 273-4669.

Texas

Austin. RealTime Communications, (512) 459-4391. Log on as: new. \$75 a year. Voice: (512) 451-0046.

Dallas. Texas Metronet, (214) 705-2901; (817) 261-1127. Log on as: info or signup. \$10 to \$35 setup fee, depending on service; \$10 to \$45 a month, depending on service. Voice: (214) 705-2900 or (817) 543-8756.

Houston. The Black Box, (713) 480-2686. \$21.65 a month. Voice: (713) 480-2684.

United Kingdom

London. Demon Internet Systems, 44 (0)81 343 4848. £12.50 setup fee; £10 a month or £132.50 a year. Voice: 44 (0)81 349 0063.

Virginia

Norfolk/Peninsula. Wyvern Technologies, (804) 627-1828 (Norfolk); (804) 886-0662 (Peninsula). \$10 startup fee; \$15 a month or \$144 a year. Voice: (804) 622-4289.

Washington (State)

Seattle. Halcyon, (206) 382-6245. Users can choose between menus and Unix. Log on as: new. \$10 setup fee; \$60 a quarter or \$200 a year. Voice: (206) 955-1050.

Seattle. Eskimo North, (206) 367-3837 (all speeds), (206) 362-6731 (9600/14.4K bps). \$10 a month or \$96 a year. Voice: (206) 367-7457.

Washington, D.C.

The Meta Network. Call voice number for local dial-in numbers. Caucus conferencing, menus. \$15 setup fee; \$20 a month. Voice: (703) 243-6622.

CapAccess, (202), 784-1523. Log on as guest with a password of visitor. A Free-Net system (see Cleveland, Ohio, for information). Free. Voice: (202) 994-4245.

See also Baltimore, Maryland, for Express Access and Clarknet.

1.4 If Your Town Has No Direct Access

If you don't live in an area with a public-access site, you'll still be able to connect to the Net. Several of these services offer access through national data networks such as the CompuServe Packet Network and SprintNet, which have dozens, even hundreds, of local dial-in numbers across the country. These include Holonet in Berkeley, California; Portal in Cupertino, California; the WELL in Sausalito, California; Dial 'N CERF in San Diego, California; the World in Brookline, Massachusetts; and Michnet in Ann Arbor, Michigan. Dial 'N CERF offers access through an 800 number. Expect to pay from \$2 to \$12 an hour to use these networks, above each provider's basic charges. The exact amount depends on the network, time of day, and type of modem you use. For more information, contact the individual services.

Four other providers deliver Net access to users across the country:

Delphi, based in Cambridge, Massachusetts, is a consumer-oriented network much like CompuServe or America Online—only it now offers subscribers access to Internet services. Delphi charges \$3 a month for Internet access, in addition to standard charges. These are \$10 a month for four hours of off-peak (nonworking hours) access a month and \$4 an hour for each additional hour or \$20 for 20 hours of

access a month and \$1.80 an hour for each additional hour. For more information, call (800) 695-4005.

BIX (the Byte Information Exchange) offers ftp, telnet, and e-mail access to the Internet as part of their basic service. Owned by the same company as Delphi, it also offers 20 hours of access a month for \$20. For more information, call (800) 695-4775.

PSI, based in Reston, Virginia, provides nationwide access to Internet services through scores of local dial-in numbers to owners of IBM and compatible computers. PSILink, which includes access to e-mail, Usenet, and ftp, costs \$29 a month, plus a one-time \$19 registration fee. Special software is required but is available free from PSI. PSI's Global Dialup Service provides access to telnet for \$39 a month plus a one-time \$39 set-up fee. For more information, call (800) 82PSI82 or (703) 620-6651.

NovX Systems Integration, based in Seattle, Washington, offers full Internet access through an 800 number reachable across the United States. There is a \$24.95 setup fee, in addition to a monthly fee of \$19.95 and a \$10.50 hourly charge. For more information, call (206) 447-0800.

1.5 Net Origins

In the 1960s, researchers began experimenting with linking computers to each other and to people through telephone hookups, using funds from the U.S. Defense Department's Advanced Research Projects Agency (ARPA).

ARPA wanted to see if computers in different locations could be linked using a new technology known as packet switching. This technology, in which data meant for another location is broken up into little pieces, each with its own "forwarding address," had the promise of letting several users share just one communications line. Just as important, from ARPA's viewpoint, was that this allowed for creation of networks that could automatically route data around downed circuits or computers. ARPA's goal was not the creation of today's international computer-using community but development of a data network that could survive a nuclear attack.

Previous computer networking efforts had required a line between each computer on the network, sort of like a one-track train route. The packet system allowed for creation of a data highway, in which large numbers of vehicles could essentially share the same lane. Each packet

was given the computer equivalent of a map and a time stamp so that it could be sent to the right destination, where it would then be reassembled into a message the computer or a human could use.

This system allowed computers to share data and the researchers to exchange electronic mail, or e-mail. In itself, e-mail was something of a revolution, offering the ability to send detailed letters at the speed of a phone call.

As this system, known as ARPANet, grew, some enterprising college students (and one in high school) developed a way to use it to conduct online conferences. These started as science-oriented discussions, but they soon branched out into virtually every other field, as people recognized the power of being able to “talk” to hundreds, or even thousands, of people around the country.

In the 1970s, ARPA helped support the development of rules, or protocols, for transferring data between different types of computer networks. These “internet” (from “internetworking”) protocols made it possible to develop the worldwide Net we have today that links all sorts of computers across national boundaries. By the close of the 1970s, links developed between ARPANet and counterparts in other countries. The world was now tied together in a computer web.

In the 1980s, this network of networks, which became known collectively as the Internet, expanded at a phenomenal rate. Hundreds, then thousands, of colleges, research companies, and government agencies began to connect their computers to this worldwide Net. Some enterprising hobbyists and companies unwilling to pay the high costs of Internet access (or unable to meet stringent government regulations for access) learned how to link their own systems to the Internet, even if “only” for e-mail and conferences. Some of these systems began offering access to the public. Now anybody with a computer and modem—and persistence—could tap into the world.

In the 1990s, the Net continues to grow at exponential rates. Some estimates are that the volume of messages transferred through the Net grows 20 percent a month. In response, government and other users have tried in recent years to expand the Net itself. Once, the main Net “backbone” in the United States moved data at 56,000 bits per second. That proved too slow for the ever-increasing amounts of data being sent over it, and in recent years the maximum speed was increased to 1.5 million and then 45 million bits per second. Even before the Net was able to reach that latter speed, however, Net experts were already figuring out ways to pump data at speeds of up to 2 billion bits per

second—fast enough to send the entire Encyclopedia Britannica across the country in just one or two seconds. Another major change has been the development of commercial services that provide internetworking services at speeds comparable to those of the government system. In fact, by mid-1994, the U.S. government will remove itself from any day-to-day control over the workings of the Net, as regional and national providers continue to expand.

1.6 How It Works

The worldwide Net is actually a complex web of smaller regional networks. To understand it, picture a modern road network of trans-continental superhighways connecting large cities. From these large cities come smaller freeways and parkways to link together small towns, whose residents travel on slower, narrow residential ways.

The Net superhighway is the high-speed Internet. Connected to this are computers that use a particular system of transferring data at high speeds. In the United States, the major Internet “backbone” theoretically can move data at rates of 45 million bits per second (compare this to the average home modem, which has a top speed of roughly 9,600 to 14,400 bits per second).

Connected to the backbone computers are smaller networks serving particular geographic regions, which generally move data at speeds around 1.5 million bits per second.

Feeding off these in turn are even smaller networks or individual computers.

Unlike commercial networks such as CompuServe or Prodigy, the Internet is not run by one central computer or computers—its resources are to be found among thousands of individual computers. This is both its greatest strength and its greatest weakness. The approach means it is virtually impossible for the entire Net to crash at once—even if one computer shuts down, the rest of the network stays up. The design also reduces the costs for an individual or organization to get onto the network. But thousands of connected computers can also make it difficult to navigate the Net and find what you want—especially as different computers may have different commands for plumbing their resources. It is only recently that Net users have begun to develop the sorts of navigational tools and “maps” that will let neophytes get around without getting lost.

Nobody really knows how many computers and networks actually make up this Net. Some estimates say there are now as many as five thousand networks connecting nearly 2 million computers and more than 15 million people around the world. Whatever the actual numbers, however, it is clear they are only increasing.

The Net is more than just a technological marvel. It is human communication at its most fundamental level. The pace may be a little quicker when the messages race around the world in a few seconds, but it's not much different from a large and interesting party. You'll see things in cyberspace that will make you laugh; you'll see things that will anger you. You'll read silly little snippets and new ideas that make you think. You'll make new friends and meet people you wish would just go away.

Major network providers continue to work on ways to make it easier for users of one network to communicate with those of another. Work is under way on a system for providing a universal "white pages" in which you could look up somebody's electronic-mail address, for example. This trend toward connectivity will likely speed up in coming years as users begin to demand seamless network access, much as telephone users can now dial almost anywhere in the world without worrying about how many phone companies actually have to connect their calls.

And today, the links grow ever closer between the Internet and such commercial networks as CompuServe and Prodigy, whose users can now exchange electronic mail with their Internet friends. Some commercial providers, such as Delphi and America Online, are working to bring their subscribers direct access to Internet services. And as it becomes easier to use, more and more people will join this worldwide community we call the Net.

Being connected to the Net takes more than just reading conferences and logging messages to your computer; it takes asking and answering questions, exchanging opinions—getting involved. If you chose to go forward, to use and contribute, you will become a citizen of cyberspace. If you're reading these words for the first time, this may seem like an amusing but unlikely notion—that one could "inhabit" a place without physical space. But put a mark beside these words. Join the Net and actively participate for a year. Then reread this passage. It will no longer seem so strange to be a "citizen of cyberspace." It will seem like the most natural thing in the world.

And that leads to a fundamental thing to remember:

You can't break the Net!

As you travel the Net, your computer may freeze, your screen may erupt into a mass of gibberish. You may think you've just disabled a million-dollar computer somewhere—or even your own personal computer. Sooner or later, this feeling happens to everyone—and likely more than once. But the Net and your computer are hardier than you think, so relax. You can no more break the Net than you can the phone system. If something goes wrong, try again. If nothing at all happens, you can always disconnect. If worse comes to worst, you can turn off your computer. Then take a deep breath. And dial right back in. Leave a note for the person who runs the computer to which you've connected to ask for advice. Try it again. Persistence pays.

Stay and contribute. The Net will be richer for it—and so will you.

1.7 When Things Go Wrong

- Your computer connects with a public-access site, and you get gibberish on your screen.

If you are using parameters of 8-1-N, try 7-1-E (or vice-versa). If that doesn't work, try another modem speed.

- You have your computer dial a public-access site, but nothing happens.

Check the phone number you typed in. If it's correct, turn on your modem's speaker (on Hayes-compatible modems, you can usually do this by typing ATM1 in your communications software's "terminal mode"). If the phone just rings and rings, the public-access site could be down for maintenance or due to a crash or some other problem. If you get a "connect" message but nothing else, try hitting enter or escape a couple of times.

- You try to log in, but after you type your password, nothing happens, or you get a "timed-out" message followed by a disconnect.

Re-dial the number and try it again.

- Always remember, if you have a problem that just doesn't go away, ask! Ask your system administrator, ask a friend, but ask. Somebody will know what to do.

1.8 FYI

The Net grows so fast that even the best guide to its resources would be somewhat outdated the day it was printed. At the end of each chapter, however, you'll find FYI ("For Your Information") pointers to places on the Net where you can go for more information or to keep updated on new resources and services.

One of those resources is Everybody's Update to the Internet. Every month, this free electronic newsletter will update you on new Net services and resources. Look for it in Usenet's alt.internet.services conference (see chapter 3) and on the Electronic Frontier Foundation's ftp archive site (see chapter 7).

Peter Kaminski maintains a list of systems that provide public access to Internet services. It's available on the network itself, which obviously does you little good if you currently have no access, but which can prove invaluable should you move or want to find a new system. Look for his "PDIAL" file in the alt.bbs.lists or news.answers newsgroups in Usenet (for information on accessing Usenet, see chapter 3).

Steven Levy's book *Hackers: Heroes of the Computer Revolution* (Anchor Press/Doubleday, 1984) describes the early culture and ethos that ultimately resulted in the Internet and Usenet.

John Quarterman's *The Matrix: Computer Networks and Conferencing Systems Worldwide* (Digital Press, 1990) is an exhaustive look at computer networks and how they connect with each other.

You'll find numerous documents about the Internet, its history, and its resources in the pub/Net_info directory on the Electronic Frontier Foundation's ftp server (see chapter 7 to decipher this).