guide for patrons' use. See the last page of the Introduction to this guide).

- o mediate on their behalf.

It may be helpful to discuss this situation with the service provider you select to see if there are other options.

Protecting your own system

There are a few measures that you can take to deter security breaches if your system will be connected directly to the Internet.

- Change account passwords frequently. If you have an account on a larger system, do not use words, especially common ones, for passwords. Try to integrate alphabetic characters and numbers in your passwords to increase the level of difficulty involved in guessing it. Longer passwords are better than short ones.
- Use caution in retrieving software programs by FTP and running them on your own system. If someone you do not know sends you a software program by electronic mail and suggests running it for fun, beware! As the Internet grows, so should our caution and preventive measures.
- Be careful who you allow to access your online files. Do not provide the ability for other users to write to your system as the default for any files without carefully considering the possible consequences. In short, be sure your files are well protected.
- Change passwords supplied by vendors immediately if you manage a system that becomes available on the Internet. Whether you have a personal computer or a UNIX workstation, if you connect your machine to the Internet, be careful to change the master passwords supplied by the vendor before allowing anyone else to access your machine. Any purchased or downloaded software (that is, transferred from another system) or any newly purchased system should be checked for standard vendor-supplied passwords that might be known or easily guessed by others.

Security on the Internet is first and foremost the responsibility of the owner of the computer that is part of the Internet, but it is also a responsibility shared by the entire community. Security breaches, such as the Internet "worm" released onto the network on November 2, 1988, and the electronic intruders described in *The Cuckoo's Egg* (Stoll 1989) have heightened awareness of security issues and dramatized the need both for Internet participants to secure their own systems and for national legislation defining appropriate punishment for such invasive activity.

Acceptable Use

Acceptable use guidelines published by the NSFNet's Division of Networking and Communications Research and Infrastructure emphasize using the network for such things as research and instruction, communication and exchange for professional development, contracts or grants work, and other administrative communications or activities supporting research and instruction (NSFNet 1992).

Unacceptable uses include for-profit activities and extensive use for private or personal business (NSFNet 1992) or any effort to gain unauthorized access to the resources of the Internet, disrupt the intended use of the Internet, waste resources, destroy the integrity of computer-based information, or compromise the privacy of users (Internet Activities Board 1989).

Using one account for many users (Patron use of the Internet)

Although it is reasonable to share one Internet account among several library staff, it is not acceptable to make an account available to the public for unsupervised use. Internet administrators have placed many valuable computing resources online for public use. They stress that each account used to access the Internet (and consequently, these resources) must be linked to a person who will take responsibility for its use (or misuse).

Unsupervised use by someone with malicious intent could result in an unfortunate loss. Internet logs make it possible to trace such problems to the source. If that is your account, you may well lose access to the Internet and also be responsible for damages. If you wish to provide access to your patrons, you have the following options:

- o encourage them to use the information in this guide to get accounts of their own (you may FTP a copy of this

Where to get information about the Internet

The site called **nic.ddn.mil** is both an administrative hub of the Internet and a central repository for Internet technical and descriptive material. There are a number of such repositories that make these and other useful documents available for anonymous FTP. Among the primary service-oriented repository sites in the U.S. are:

Internet Documentation Repositories:	
nic.ddn.mil	DDN Network Information Center, Chantilly, VA.
nis.nsf.net	NSFNet Information Center, Ann Arbor, MI.
ftp.nisc.sri.com	SRI International Network Information Systems Center, Menlo Park, CA.
nnsc.nsf.net	National Science Foundation Network Service Center, Cambridge, MA.
wuarchive.wustl.edu	Washington University, St. Louis, MO.
venera.isi.edu	University of Southern California Information Sciences Institute, CA.

To avoid overburdening the FTP computer, you should request documents only during off hours (not between 8:00 a.m. and 5:00 p.m. in the time zone where it is located). To avoid unnecessary network traffic and congestion, try to use the site physically closest to you when retrieving documents and information via FTP, unless another site has unique information.

Security on the Internet

The rapid growth of the Internet, its heterogeneous computing environment, and the decentralized nature of its administration all reflect the flexibility of its structure. Although good for rapid development, this flexible structure has profound implications for network security. No single organization controls the Internet, whose electronic "highways" are potentially open to anyone with access to a computer connected to it.

which describes the host computer named **info** in the subdomain **oit** (Office for Instructional Technology), which is part of the **unc** (University of North Carolina) network within the larger domain **edu** (for educational institutions).

The current high-level domains in the United States include:

COM	Commercial
EDU	Educational
GOV	Government
MIL	Military
NET	Major Network Support Centers
ORG	Organizations not included above (other nonprofit organizations, for example)

Designations for country codes consist of two letters, where the actual country code –for example, FR (France), DE (Germany), CA (Canada), US (United States), MX (Mexico), and NI (Nicaragua) comes at the end (far right) of the address.

You will see one of these domain designations at the end of Internet mail addresses.

Domain name servers

Network administrators generally run a system that acts as a *domain name server*—that is, ***a database of host computer names*** containing the domain names and corresponding IP addresses of computers that can be queried across the network using another standard protocol, the **domain name service protocol**. Thus, the addressing information only resides at network hubs and not on every single computer in the network. When someone attaches a new computer to the Internet, he or she needs to make arrangements to have the name of the computer added to the database of domain names. It is also necessary to configure into the local computer's TCP/IP software the address of the domain name server for that domain, to be able to use it to access other computers in the Internet by name rather than by IP address. This administrative process may be different for each organization, depending on local setup. It may be as simple as a telephone call to the local system administrator.

Internet addressing

There are two basic ways to designate a computer on the Internet. Each host (computer) on the Internet has been assigned an ***IP address*** and a ***domain name.*** An IP address is a unique number composed of four sets of numbers separated by periods that indicate the location of the computer within a hierarchy of networks, in a manner similar to the way your home address identifies the house number, street, city, and state where your house may be found. IP addresses indicate the path to the computer's physical location via wide area networks and local area networks right to your computer. The ***domain name,*** on the other hand, is an alphabetic representation of the same information in the IP address. For example, the University of California's MELVYL® Library System has the IP address **192.35.222.222** and its domain name is **melvyl.ucop.edu.**

Why are IP addresses important?

Just as your home address locates your city, street, and house number, IP addresses uniquely identify the computer and specify its location. If we know the IP address of a computer that offers remote login or file transfer, we can "travel" there electronically to make use of these facilities. There may also be times when you know the IP address to connect to a remote host but not the domain name for the host. Regardless of whether domain names are available, the IP address always works if the remote host is online and available for use by remote users. On the other hand, IP addresses of systems can change, whereas their domain names usually remain the same.

The Domain Name System

As implied above, domain names are much more readable and easier to recall. Like their IP address counterparts, the portions that comprise the address are separated by periods and are hierarchical. From left to right they indicate the *smallest host computer* to the *largest network domain*. For example, the simplest domain name might look like:

think.com

where **think** is the name given to a single computer at Thinking Machines, Inc., and **com** signifies the commercial domain. More commonly, Internet computers exist in a hierarchical relationship to many computers at a site. Hence, a more common domain address might look like

info.oit.unc.edu

platforms, from personal computers to mainframes. This is what enables so many different types of computers to participate in the Internet.

TCP/IP is a *protocol suite*–that is, a set of protocols that together describe the network architecture that underlies most of the Internet today. Until recently, TCP/IP was the sole architecture used on the Internet. Systems had to run TCP/IP to become *part of the Internet*. Recently, some systems, primarily in Europe, have used the Internet to connect two systems using the OSI protocols (discussed below). The predominant architecture remains TCP/IP.

The term TCP/IP stands for Transmission Control Protocol and Internet Protocol,. It provides the basic structure on which other applications, such as FTP and Telnet, operate. Electronic mail is defined by Simple Mail Transfer Protocol (SMTP), a separate standard. Remote login is handled by the Telnet protocol, and File Transfer Protocol (FTP) manages the transmission of files from site to site.

There are public domain (free) versions of TCP/IP software for both DOS and Macintosh computers.

OSI

The International Standards Organization (ISO) has specified an architecture that governs the exchange of information among computers in networks. The OSI architecture is described in seven layers. Each layer defines a different function, from the lowest layer, which specifies the *physical* interconnection, such as the structure of the physical cables and plugs, to the highest layer, which describes actual *applications*, such as interaction between clients and servers in information systems. The seven layers are, from the lowest layer to the highest: physical, data link, network, transport, session, presentation, and application.

Although TCP/IP and OSI are similar in some respects, they do not yet interoperate. There are gateways for the exchange of electronic mail between the two architectures, but other functions do not truly interoperate. As mentioned earlier, OSI systems have used the Internet to interoperate with other OSI systems but not with TCP/IP systems. The future objective is total interoperability between all Internet hosts, but much work remains to be done before this will become a reality.

(UNIX-to-UNIX Copy Program) protocol to enable one UNIX machine to communicate with another. Most news reaches all readers within 24 hours of transmission. Many network users feel that USENET suffers from information overload, slow propagation speed, and high costs, among other things, but its staying power has been demonstrated repeatedly. Today, most discussion lists are cross-posted on the Internet, so Internet users can also participate in USENET electronic discussion forums.

MILNET

MILNET is the unclassified portion of the military network, called the Defense Data Network (DDN), which is reserved for military use only. The DDN spun off from the original ARPANET when the latter was split into two networks in 1983, although gateways retain connection to the Internet. Still considered part of the Internet, its Network Information Center (NIC) is integral to the daily operations of the Internet. The DDN NIC performs administrative functions like registering IP addresses for host computers new to the Internet.

Internet Concepts

The Internet itself is a highly technical environment, much of which is transparent to the nontechnical user. However, it is useful and important to understand some of the concepts that underlie the Internet. We will begin by describing the software architecture of the Internet.

Protocols

A protocol is a set of formats and procedures governing the exchange of information between computer systems. They are an agreement to perform various functions in a standardized way, in much the same way that industry standards for household items guarantee that the plug on your electrical appliances will fit the socket in your home.

TCP/IP

As discussed earlier, the TCP/IP protocol suite was first developed by the Department of Defense and the research community for the ARPANET. It was later adopted by the Defense Department as the standard for its computer networks and, as a result, is now available on a wide variety of operating

computer. Now, they have the additional option of using BITNET II, which enables them to run BITNET protocols over the Internet on top of Internet routing and network management protocols. The introduction of BITNET II means that BITNET hosts no longer need to lease expensive dedicated lines but may use existing Internet connections to run BITNET protocols over TCP/IP (discussed in the next section). It *does not mean* that BITNET users are able to take full advantage of other Internet capabilities, like remote login and file transfer, in the same way that these are available over the Internet.

BITNET offers electronic mail and file transfer services (of its own) but not the ability to log in to remote computers. Its LISTSERV is a popular mailing list server and file server. Other capabilities of BITNET include sender-initiated file transfers (the user sends a local command to ship a file to another user over the network, or sends a simple request to a remote computer as electronic mail, and the remote computer responds by automatically shipping the sender one or more files over the network), facilities for sending brief interactive messages to other users on BITNET, and fewer security problems than the Internet. The BITNET network is still growing, particularly in Eastern Europe and other countries outside of the U.S. and Western Europe.

USENET

Begun in 1979, USENET is a cooperative network that literally connects any person or organization who wishes to join it. The only service USENET offers is ***news***,"a worldwide broadcast conferencing system It boasts hundreds of thousands of users on five continents, including individuals, organizations, corporations, and educational institutions. Used throughout Europe, it is a widely distributed system that lacks any central administration. In general, peer pressure and financial constraints seem to be sufficient to maintain order. USENET does not support electronic mail between individuals. Rather, users send electronic mail messages that are broadcast to all users who "subscribe" to a particular discussion topic. Its topics are diverse, ranging from the technical to the social. USENET does offer gateways to the Internet and other major networks, facilitating the exchange of news and conferencing on an even larger scale than its own network can provide.

Users gain access simply by connecting a computer to another computer that supports USENET. A few large backbone links provide transcontinental or transoceanic connections. Each host is responsible for its own transmission costs and uses the UUCP

and scope. NSF mid-level networks enable thousands of college and university local area networks to connect to the Internet. There are now efforts afoot to provide similar access for grades K-12; in some areas schools already have access.

BITNET

BITNET is not technically part of the Internet but is readily accessible to Internet users. It offers hundreds of discussion lists and document-requesting facilities via electronic mail.

BITNET grew from an IBM-sponsored project in 1981 to connect academic sites, originally using IBM platforms and the IBM networking protocol called RSCS. BITNET operates gateway computers to exchange mail and files with Internet networks. Operated by the nonprofit Corporation for Research and Educational Networking (CREN), BITNET links member organizations at U.S. colleges, universities, and research institutions in a store-and-forward network. It is part of a larger, logical network, with cooperating network counterparts in 46 countries. NETNORTH (Canada), EARN (Europe), GULFNET (Saudi Arabia), CAREN (Japan, Korea, Taiwan), and SCARNET (South America) are among the many BITNET cooperating networks.

Store-and-Forward vs. Internet Routing in a Nutshell

In a store-and-forward network, information originating on one computer (called a network *node*) is sent to its destination via intermediary nodes, which *store the data temporarily*, and when a communications path is available, forward it to the next node en route. If a communications link is unavailable for some time and there is no alternate route, the data reside at that node until a path is restored. BITNET is one such network.

In contrast, the Internet computers send information to other computers in small bursts called packets that pass *through* routing computers en route, but which *never reside there*. If a communications path becomes unavailable, data are rerouted. If no alternate path is available, the routing computer returns an error message to the originating host, which retransmits the lost data at a later time.

Until recently, new sites connected to BITNET by joining CREN, installing a network connection (dedicated telephone line) to an existing BITNET site geographically near them, and running the BITNET RSCS/NJE network protocols on their local BITNET

Although passed by Congress, it was not an appropriations bill and has not yet been funded. Its network component has as some of its goals expanding the U.S. portion of the Internet; supporting the education, science and research communities; and supporting basic research. Envisioned as operating at gigabit speeds, the NREN is viewed as the next stage of evolution of the Internet, with increased cooperation with industry. Commercial users as well as commercial services will likely proliferate with the advent of the NREN; even now, fee-based access is becoming more common.

The success of the NREN will be determined, at least in part, by its ability to meet the future requirements of science and education (in terms of volume of data transferred and numbers of users connected), and to demonstrate improvements in the quality of education in terms of increases in the number of qualified education professionals and improved curricula. The intent of the NREN is to make network infrastructure as ubiquitous as telephone service in the U.S., and to serve the needs of various Federal organizations with specific service and connectivity requirements. The NREN will likely be based on more than one networking protocol (said to be *multiprotocol*) with connections to commercial service providers and international networks.

Major Internet Networks Today

The network landscape continues to change as the number and size of networks increase. This section describes some of the large networks that exist today. Not all are part of the Internet, but most provide electronic mail services and all exchange electronic mail or files with each other and the Internet.

NSFNet

NSFNet was originally designed to connect supercomputer centers in the U.S. Its mission to foster research and educational computing made it the logical heir to the ARPANET facilities, and today it oversees management of the backbone facilities for research and education. The ARPANET no longer exists, and NSFNet inherited much of its original network infrastructure. As discussed above, NSF also funded the creation and interconnection of regional networks to improve access to the supercomputers. When regional boundaries expanded and blurred, regional networks became known as ***mid-level networks***, a better description of their size

Kilobytes, Megabytes, Gigabytes, and Terabytes in a Nutshell

Computers "think" in terms of "on" and "off." One on-or-off combination constitutes one ***bit*** of information. Eight bits (eight on-or-off combinations) are called a ***byte*** of information, or *data*. Each alphabetic character requires a byte of information to be represented on a computer. We use the Greek roots as prefixes to express multiples of bits and bytes (characters). A ***kilobyte*** of information is roughly a thousand bytes. A ***megabyte*** is a thousand kilobytes (a thousand thousand, or a million). A ***gigabyte*** is a thousand megabytes, or a billion bytes. A ***terabyte*** is a thousand gigabytes, or a trillion bytes. To lend scale to these numbers, the 1990 U.S. census produced terabytes of statistical data on the U.S. population. You can also reference kilo*bits*, mega*bits*, giga*bits*, etc., rather than bytes. Generally, file sizes and computer storage capacity are expressed in terms of bytes, whereas communications speeds (network speeds) are described in bits.

NREN–the Future of the Internet

In 1992, the U.S. Congress passed the High Performance Computer Communications (HPCC) legislation, whose research component is commonly known as the National Research and Education Network (NREN). This HPCC legislation includes:

1. a vision of a national network that serves the education and research community, broadly defined to include grades K-12, libraries, etc., and
2. high-performance computing and communications technology that pushes the state of the art, supporting efforts to further our understanding of global change, weather prediction, and other resource-demanding research.

As proposed, the NREN would consist of a high-speed research and development network designed to accelerate the availability of high-performance computing resources, spur gains in U.S. industrial competitiveness in world markets, make available large data repositories, provide ubiquitous access to computing resources, and increase cooperation with the data communications industry.

administrate the NSFNet backbone for five years. In joint studies with MCI, which provided the leased lines and circuit technology, and IBM, which developed hardware and software to handle network management, Merit began upgrading the NSFNet to use faster speeds and newer technology. By 1981, all NSFNet lines used T1 technology, a type of communications lines with speeds of 1.54 million bits per second (1.54 megabits per second (Mbps)) (see sidebar). In 1991, the speed of the links was increased to take advantage of newer technology (T3 circuits at 10 Mbps). NSF continues to improve the speed, capacity, and connectivity of the backbone network.

communicating parties. Packet switching allows many thousands of users to share the same communications lines simultaneously.

Electronic mail, not originally planned as part of the network's raison d'être, flourished on the network as people recognized its inherent usefulness. Electronic communities soon formed and are still growing in popularity today.

The ARPANET

In 1979 the ARPANET network was formed, once again with DoD funding, connecting DoD long-distance networks in order to share the same "backbone" network. In late 1981, TCP/IP became the standard protocol suite (the set of rules governing communication between two computers) for the entire ARPANET. In the mid 1980s, the ARPANET was divided into its research and development component (ARPANET) and military component (MILNET).

The NSFNet

Concurrently, the National Science Foundation (NSF) was developing six supercomputer centers around the U.S. Since each computer was priced in the tens of millions of dollars, NSF sought a way to encourage the sharing of such scarce resources. In the mid 1980s, NSF began to interconnect the Centers with a network of high-speed links. In 1986, it added the NSFNet backbone network to interconnect the supercomputer centers with the existing ARPANET.

Soon after, the Department of Energy and NASA linked their national backbone networks into a complicated patchwork, retaining control and management of the network at the individual network level.

Regional networks began to spring up as the NSF made additional funds available to encourage scientists' access to the supercomputers. The NSF's mission of fostering research and educational computing laid the groundwork for college and university sites to connect to the Internet via the regional networks.

The Merit Computer Network, managed by Merit, Inc., a consortium of Michigan universities, began in 1972 as one such regional network with initial funding from the NSF and the State of Michigan. It quickly grew in size, self-supported by member universities. In 1987, NSF awarded Merit a grant to

The term "Internet" (with a capital "I") came into use in the 1980s to describe the global, interconnected, heterogeneous network that continues to grow in size and geographic coverage. The experimental prototype, however, dates to 1969, when the Advanced Research Projects Agency (ARPA) of the U.S. Department of Defense (DoD) funded an experimental packet-switching network (see sidebar on packet switching) of four nodes in the U.S. to link computers used for research at universities and research laboratories. As an agency supporting military research and communications, ARPA's agenda sought to develop communications systems that could be deployed quickly, route around failures, and respond rapidly to changing connectivity needs. Less advertised was the recognition that, in the 1960s, computers were expensive and not widespread. Since ARPA's role was to support computer science research by developing its infrastructure, one of the major purposes of the early ARPANET was to experiment with shared resources so that the few existing resources could be made more widely available to the computer science community (Lynch presentation at the University of California, San Francisco, November 1992).

In the late 1970s, ARPA was renamed the Defense Advanced Research Projects Agency (DARPA) funded the development of a set of communications protocols suitable for handling the growing number of hosts on the network, and Transmission Control Protocol/Internet Protocol (TCP/IP) was created.

Packet Switching in a Nutshell

The first communication lines linked their users with dedicated point-to-point connections, in much the same way as a telephone call enables you and the party you called to solely occupy a line until your conversation is finished. In contrast, packet-switching technology enables two computers to communicate by breaking data into smaller pieces of information, called packets, surrounding them with sender and destination information, and sending them over a communications line that simultaneously carries thousands of other such pieces of other users' messages. In theory, the packets should arrive in sequence to similar equipment at the destination, which reconstructs the packets into a useful form. If the packets arrive out of sequence or do not arrive at all, the receiving end requests retransmission of the missing information packets. Thus, dedicated lines are no longer necessary to connect two

are therefore connected not only by physical links but also by common rules for data exchange. If you ask the question, "Does this network (or host) have IP connectivity?" and get *"Yes"* for an answer, the network or site is part of the Internet. However, there are sites that have IP connectivity but choose not to offer one or more of the Internet's basic services. ***If you are interested in a particular service, like login to remote library and database systems (known as Telnet), you should ask for it explicitly.***

Who pays for the Internet?

The next section discusses the origins of the Internet and the organizations that contributed funds as the Internet began to grow. Now, each of the networks that are connected together to form the Internet pays for its own equipment and upkeep. Within a network, costs may be shared among cooperating institutions or recharged on a profit-making basis to its users. Since there are thousands of networks, it is virtually impossible to determine how much the Internet costs to operate on a daily basis.

Internet History

Virtually all of the individuals who used computer networks in the 1970s did so because of their affiliation with a university or research institution. They exchanged electronic mail and shared computing resources that were usually nearby. Most used terminals to access large computers that were directly connected to the networks.

In the 1980s, the network landscape changed in two significant ways. The number of networks multiplied: the few networks blossomed into scores of large and small, public and private networks. Secondly, users themselves gained access to impressive computing power on their desktops. The early terminals contained little or no intelligence internally and severely limited what users could do. Today, many users employ powerful microcomputers and workstations, which enable them to "travel" electronically through a variety of hardware devices to reach other computers via a matrix of interconnected networks, transfer files to their own computers for their personal use, and exchange electronic mail with users worldwide.

Internet protocols, standards that govern the format of computer-to-computer interaction, enable dissimilar computers in different geographic locations to communicate with each other. Until recently, one of the major characteristics of the Internet was that all its systems used the TCP/IP protocols. This is still true, although competing protocol standards have emerged, particularly in Europe, highlighting the fact that the Internet is truly a heterogeneous environment. The section entitled ***Internet Concepts*** in this chapter discusses the TCP/IP and OSI protocols in more detail.

What are the basic services?

Internet systems do much of what they do with a few fundamental facilities. They offer three primary services:

- Electronic mail (known as e-mail)
- File transfer from site to site (FTP)
- Login to remote computers (i.e., those not physically located near you) (Telnet)

Which networks or computers are part of the Internet?

In general, networks that do not use the TCP/IP protocols to provide the three services mentioned above are not part of the Internet community. Networks such as BITNET and MCIMail have *gateways* to the Internet for mail exchange, but, because they do not use Internet protocols, they cannot offer all of the services listed above. If you are interested solely in electronic mail, this distinction is probably irrelevant, since e-mail is widely available and most major networked systems provide gateways to exchange mail with the Internet. Thus, if either e-mail or electronic discussion is your chief interest, you do not need to access a system that itself is a part of the Internet. This is *not* true for the other two basic services. If you wish to use the Internet to explore the library catalogs and databases or document/software repositories on the Internet, you must choose a host that is itself a part of the Internet and that makes the file transfer and remote login services available to users.

How do you determine whether a particular host or network is *a part of the Internet*? Someone knowledgeable about your host or network can tell you whether there is ***IP connectivity***. IP stands for Internet Protocol, the set of rules that govern the way data flow over the network between Internet sites. You will see in the section on TCP/IP that all Internet-capable computers use this protocol, among other related ones, to communicate, and

Chapter 1: About the Internet

What does Internet mean?

The term *internet* describes a collection of interconnected networks. *An internet* may describe a group of networks in your immediate environment (for example, the building in which you work). *The Internet* (with a capital "I") is a worldwide collection of interconnected computer networks, ranging from *large networks*, such as the National Science Foundation Network (NSFNet), which is a U.S. backbone network, to *medium-sized networks*, such as the New York State Education and Research Network (NYSERNet), to small *local area networks* (LANs) found on most university campuses and throughout many commercial firms and public institutions.

Despite the fact that using computer networks is still often an exercise in the arcane, the Internet has experienced explosive growth. Internet users now number in the millions and include people from every walk of life. As of July 1992, over 4,000 interconnected networks in over 100 countries linked an estimated 992,000 host computers to form the Internet community. The Internet has grown at the rate of about 15% *per month* for the past decade (Quittner 1992). Within a few years, the number of Internet users will exceed the population of California (Quarterman 1992).

What does the Internet look like?

Since the early days using terminals that in turn interacted with computers connected to the network, the emphasis of the Internet has been *computers interacting with other computers*. The legacy of this model is still true today: ***the computer that is mediating on your behalf controls what the network looks like to you.*** In other words, the Internet's "appearance" depends on the system you use to access it. Like a stereo system built of component parts, no two systems look exactly the same.

Those chiefly interested in exploring the library catalogs and databases will find the publication *Library Resources on the Internet: Strategies for Selection and Use* (American Library Association 1991) to be extremely valuable. *Internet: Getting Started* (SRI International 1992), and *The Whole Internet User's Guide and Catalog* (Krol 1992) will expand the foundation laid here. Chapter 5 tells how to obtain these and other publications.

Where is this guide available?

Since the information contained in this guide is intended for people not yet connected, emphasis has been placed on a print format that may be made available in libraries or acquired by individuals. For those who wish to obtain an additional copy for library patrons, it is also available in electronic form by FTP (explained in Chapter 4).

In print: This guide is available from the Library and Information Technology Association (LITA), a division of the American Library Association, 50 E. Huron Street, Chicago, Illinois 60611.

Electronically: This guide is available by anonymous FTP from **dla.ucop.edu** in the directory *pub/internet* as the file *internet_guide.ps* (postscript version).

How do you join the Internet?

Chapter 3 provides detailed information on your options for dialing in to the Internet. It offers alphabetic and geographic lists of Internet service providers, with a summary of the services they offer. Because these services are growing at a dramatic pace, some of the information contained in this guide is time-sensitive. Chapter 3 also includes instructions on how to obtain the most current versions of this information.

How can you use the Internet once you are connected?

Documentation on using the Internet is still being assembled, often at scattered crossroads of this electronic highway. Over the past two years, the need for Internet "road maps" has spawned the growth of a number of guides to information resources available via the Internet, such as library catalogs, databases, and information servers, and navigational tools that assist the Internet traveler in exploring its niches.

Chapter 4 discusses the basic services of the Internet, including information on electronic mail, mailing lists, newsgroups, file transfer, and connecting to remote library catalogs and databases. A subsection on information servers provides an overview of client/server facilities available today on the Internet, such as WAIS, Archie, and Gopher.

How can you get help?

If you wish to take your understanding of Internet technical details a step further or explore the navigational tools in depth, we recommend the materials included in the list of Internet resources in Chapter 5. It describes the major electronic and print guides to the Internet, as well as other useful resources. It also includes how-to directories for accessing online public access catalogs (OPACs) and databases, directories of electronic journals, the *Internet Resource Guide,* and a librarian's guide to navigating the Internet. Once connected to the Internet, you should find these guides particularly useful in identifying various types of publicly available resources, getting the things you want from remote computers on the network, and understanding the inevitable evolution of this medium that is still taking place. You can obtain some of these free guides as your first exercise in using FTP.

In particular, the *NorthwestNet User Services Internet Resource Guide (NUSIRG)* is an extremely valuable collection of "basic driving lessons" for the Internet and a glove compartment full of road maps to the routes and services available. It is easy to use, easy to get, and free of charge.

- Gaining additional access points for retrieving the information you need. Some of the online catalogs offer author-added entries, for example. In the case of films and music records, you can search by performers (Engel 1991).
- Ordering library materials and communicating with vendors. Library business is already being conducted over the Internet, and is likely to increase dramatically in the next five years.
- Helping local researchers discover the holdings of nearby or distant libraries so that they can prepare in advance for research trips, or even make some trips unnecessary (Engle, 1991).
- Transcribing bibliographic records for other purposes, such as building small specialized databases.
- Augmenting the local library card catalog when the information sought can be more easily retrieved from a keyword search of an online system (Engel 1991).

Appendix A offers a summary of network discussion lists and electronic journals of interest to librarians.

What is the Internet?

Chapter 1 presents a general introduction to the topic of the Internet. It provides some historical background, an overview of basic Internet concepts, and a summary of its structure and primary services in terms that are easy to understand.

What do you need to access the Internet?

Although the technology underlying the Internet is impressive, there is nothing particularly magical about the way you physically get connected. Once you have an account on an Internet host computer, the most simple and inexpensive microcomputer, modem, communications software package, and telephone line will do. Chapter 2 provides an overview of the inexpensive options for both individual and institutional dial-up access to the Internet. It outlines the general procedures, factors to consider when arranging for an account, and the relative costs of using the Internet.

This guide is for librarians and library patrons who are not already members of the Internet "family" of users. It is a snapshot of the networking services available at the time of publication, a discussion of the concepts and terms in use, and a bibliography of the notable guides that document the search techniques, navigational tools, and information resources available. It is designed to help you get started right away.

This guide provides a general overview of the ***electronic service providers*** who offer some type of ***dial-up access*** to the Internet and ***the types of services available*** from them, along with pointers to other valuable ***sources of information*** for use in libraries. There is more to the story, but this guide presents Internet concepts in simple, direct ways and attempts to stick to lay terms. The bibliography contains references to works that provide much more detail.

Why should librarians use the Internet?

Librarians who develop skills in using the Internet will be poised to take advantage of the the rapid changes that are taking place, and share the vast information resources that are becoming available. Some of the immediate benefits include:

- Gaining access to a wide array of information and reference sources. The special collections of major libraries that are available number among the hundreds. Other resources include government-produced information; weather information; full texts of documents and books; commercial services, such as news wires stock market reports, syndicated features, and information on science and technology; economic indicators, and international events.
- Gaining experience in using the networks for education and business. The educational experience of the 1990s will rely heavily on network-based resources and knowledge of the network "road map." Business conducted over the networks will encourage levels of speed and efficiency, and economies of scale for the network literate that are unknown today.
- Communicating with hundreds of people who share an interest in a specific topic.
- Finding information from encyclopedias and factual information, such as names, dates, and places associated with authors and historical events.

Information sharing with global dimensions

The Internet, the collection of computer networks that now spans the globe, has become an important part of our national infrastructure and an exciting part of many peoples' lives. Like libraries, it has the potential to serve our entire population. Today, you can use the Internet to communicate with family, friends, and colleagues, participate in global discussions, play games, conduct scientific research, read presidential campaign speeches, figure out what the weather is in the Catskills, converse with doctors, get pictures from NASA spacecraft, read books, query library databases around the world, and much, much more. The Internet has expanded the concept of information sharing to global dimensions. Already, millions of people are using it, and young people, in particular, are discovering what an exciting thing it is. It is crucial that libraries participate in this electronic networking revolution to meet the information needs of the 1990s.

Participation is actually easy. The combination of an inexpensive home computer, a modem, a telephone line, and communications software is all you need to enter the cyberspace (electronic world) of the Internet. Although there are many, more complicated ways to connect, this guide will focus on dial-up access through "network service providers" -- the simple, inexpensive method.

Network service providers are springing up across the country. They offer an array of services, including commercial multi-user systems, dial-up bulletin boards, and access to host computers that are part of the Internet. These host computers, in turn, offer a multitude of databases, archives of information, discussion forums, and public domain software.

Scope and Purpose of This Guide

Is this guide for you?

Those of us who have not yet gained access to the Internet but who would like to participate face the daunting task of identifying the service providers nearest us and evaluating dozens of existing networking services, often brand new, to determine the most effective way to get connected. Unfortunately, information on how to connect to the Internet is scattered and replete with technical computer jargon.

Introduction

"Isn't Internet access only for colleges and universities? We're a public library, so how can we be eligible for access?

"I'm in a small corporate library. We have a computer that we use to dial up to a few services like DIALOG to search databases. What special equipment do we need to search databases on the Internet? Are corporate libraries allowed to use the Internet?"

"Our library is in a small town, and it's unlikely there's any major computer center within a few hundred miles. Are there any options at all for us to access the Internet?"

"No one in my library is a computer expert. Aren't we going to run into problems using complicated Internet programs on our computer? Right now, all we use our computer for is word processing."

These are all common questions about accessing the Internet, posed by librarians who have heard of the Internet and the growing number of resources available through it. Although you may understand what the Internet is, you may not know you and your library can participate. If you are wondering how you can use the Internet, ***this guide is intended to help you get on and get started***. Once you are well on your way, there are other, existing guides and documentation that will take you a lot further down this path. Chapters 5 and 6 provide