Connecting the health sciences community to the Internet: the NLM/NSF grant program

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In 1992, as part of its high-performance computing and communications initiative, the National Library of Medicine decided to provide health sciences institutions with Internet connection grants similar to those offered to universities by the National Science Foundation. Although library involvement is not required, librarian and library uses have been the most common category in the applications received.

BACKGROUND

As a consequence of the passage of the High-Performance Computing Act of 1991 (Public Law 102-194), the National Library of Medicine (NLM) entered into an agreement with the National Science Foundation (NSF) to enable health sciences institutions to connect to the Internet. The Internet, which will be replaced eventually by the National Research and Education Network (NREN) now under development [1], currently is a collection of interconnected networks linked by the NSFNet, which was developed through the support of NSF.

The Internet can be considered to comprise three types of networks: type 1, a national backbone network; type 2, midlevel regional networks, usually based around some geographical region of the country; and type 3, local networks at educational, research, and clinical institutions. Individual institutions (type 3) are connected to a midlevel network in the appropriate geographical region (type 2). The midlevel network in turn is attached to the high-speed national backbone network (type 1), usually at its network operation center.

The backbone is connected to other national networks, including the Defense Research Internet, NASA Science Network, and the Energy Sciences Network. These interconnected networks and many others worldwide compose a vast electronic network system often referred to as the Internet, although some of the other networks are linked to the Internet through gateways that at present permit only e-mail transfer.

Network management and operations services as well as information services are provided at each level. The national backbone network provides technical and information services to the midlevel networks, which in turn provide technical expertise and information services, including training and documentation, to local-level network administrators. Local network personnel provide technical and information services to the campus or local network administration and also provide consulting and liaison services to end users of the network.

The Internet provides access to an enormous number of databases distributed around the world and to a variety of scientific facilities, including digital libraries, unique databases, supercomputers, and remote scientific sensing instruments. The success of the Internet in promoting interaction and collaboration among end users working with a wide variety of hardware and software is due in large measure to the standardized use of the Defense Data Network protocols—transmission control protocol/Internet protocol (TCP/IP)—for transmitting information.

Since 1986, NSF has been administering a successful "Connections to NSFNet" program for universities and colleges, but, in general, the government has not offered connections to medical institutions [2]. Although, as of late 1991, many medical schools already had Internet hook-ups, a few did not, and others were required to employ circuitous routes from a main campus Internet node; at that time only a few hospitals, primarily large research institutions, had a direct Internet connection. Another restriction on use has been the often-limited internal access to an existing Internet connection in many health sciences institutions and hospitals.
Table 1
Health sciences institutions that have been awarded Internet connection grants

<table>
<thead>
<tr>
<th>FY 1992</th>
<th>Multi-Institution</th>
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<tbody>
<tr>
<td>Geisinger Hospital System (PA)</td>
<td>Hahne mann University (PA)</td>
</tr>
<tr>
<td>Kaiser Foundation Research Institute (CA)</td>
<td>Medical College of Wisconsin</td>
</tr>
<tr>
<td>Lovelace Medical Foundation (NM)</td>
<td>University of Arizona Health Sciences Center</td>
</tr>
<tr>
<td>Morehouse School of Medicine (GA)</td>
<td>University of Utah</td>
</tr>
<tr>
<td>University of Connecticut Health Center</td>
<td>Washington University School of Medicine (MO)</td>
</tr>
<tr>
<td>FY 1993</td>
<td></td>
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<tr>
<td>Carle Foundation Hospital and Clinics (IL)</td>
<td>George Washington University Medical Center (DC)</td>
</tr>
<tr>
<td>McLean Hospital (MA)</td>
<td>Georgetown University Medical Center (DC)</td>
</tr>
<tr>
<td>Methodist Hospitals of Memphis</td>
<td>St. Louis University Medical Center (MO)</td>
</tr>
<tr>
<td>Methodist Medical Center of Illinois</td>
<td>Tufts University School of Medicine (MA)</td>
</tr>
<tr>
<td>National Jewish Center (CO)</td>
<td>University of Southern California School of Medicine</td>
</tr>
<tr>
<td>National League for Nursing (NY)</td>
<td>University of Virginia Health Sciences Center</td>
</tr>
<tr>
<td>New York Academy of Medicine</td>
<td>University of South Dakota School of Medicine</td>
</tr>
<tr>
<td>Northwestern Memorial Hospital (IL)</td>
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<tr>
<td>Rochester General Hospital (NY)</td>
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</tbody>
</table>

THE NLM GRANT PROGRAM

In fiscal year 1992, NLM, as part of its high-performance computing and communications initiative, decided to provide health sciences institutions with Internet connection grants similar to those offered to universities by NSF. Rather than create a new administrative office, NLM sought and received cooperation to expand the NSF program to incorporate NLM objectives. Funds are transferred to NSF from NLM through an interagency agreement.

NLM offers two types of grants in its connections program: up to $30,000.00 for an initial (first-time) connection and up to $50,000.00 for health sciences institutions wishing to extend an existing Internet connection to other institutions, such as affiliated hospitals. Applicants are encouraged strongly to provide wide access to the Internet connection, and, in fact, NLM will consider support for institutions that already have an Internet connection but wish help in expanding internal access.

Costs that may be covered by the grant include the purchase and installation of router or gateway equipment and associated hardware required to link the institution's local network to the midlevel network and the cost of installing and leasing communication circuits between the local and midlevel networks. Attached to the grants are requirements for access extended to all users in an institution as opposed to one or two departments; local-area networks in place to indicate some level of internal networking that can be connected to a regional network; standard communications protocols, such as TCP/IP; availability of on-site expertise in computers and communications technologies; and programs planned for teaching Internet use. Even though involvement of a medical library is not essential, such a link is strongly encouraged. In contrast to NSF policy, grants supported by NLM do not provide overhead expenses.

Response from the community has increased rapidly. The announcements for the NLM/NSF Internet Connections Program were mailed in early April 1992 with a submission date of July 1; twenty-two applications were received, resulting in ten awards. In fiscal year 1993, fifty-seven applications were received and sixteen funded. NLM allocated $400,000.00 each in fiscal years 1992 and 1993 and is planning to expend $850,000.00 in FY 1994 (Table 1).

The review panels selected by NLM and NSF to evaluate the applications consist of nonfederal medical professionals, medical librarians, and computer or communications specialists. To be funded, a proposal must have certain critical elements, including clear aims and objectives for the Internet connection, on-site personnel and resources to assist with installation and maintenance, personnel with expertise in computers and communications, plans for user training, and cost-sharing and likelihood of ongoing support.

Planning for an Internet connection is time-consuming and often requires that key officials be persuaded of the value of the connection, that the benefit outweighs the cost and, in particular, that the institution must assume responsibility for all expenses after the grant expires. General awareness of the benefits of the easy communication and vast information access provided by an Internet connection has led to relatively good penetration into academic health centers, but, outside this realm, the Internet and its advantages are often either unknown or not appreciated. Until recently, hospital officers have been skeptical or unaware of the benefits of Internet. (Some of the resistance may be due to the perception that use of the Internet may make additional demands on already overburdened health personnel.) But the indifference has turned into interest in recent months due to the spate of articles appearing in newspapers and other popular sources of information, such as Time and Newsweek. Indeed, access to Internet now is being offered by an increasing number of commercial
services. The attention by the mass media, as well as the much-publicized interest of the Clinton administration in the “information superhighway,” has awakened many who previously were asleep. However, even after approval is obtained from an organization’s administration, the information systems staff, who sometimes have a strong “mainframe” orientation and may be relatively unenthusiastic about extramural networking, must be persuaded that the Internet has value and is worth installing. Their cooperation is essential in working with local-area networks and in installing standard communications protocols. In addition, midlevel (or regional) network providers must be located to link the institution’s local-area network to the national backbone.

EARLY RESULTS

It is too early to assess the value of the NLM Internet Connections Program, but this article provides a preliminary report on the first two groups of Internet connection grants. The awards are in effect from eighteen to twenty-four months, and, as of this writing, many have been extended while other grantees have not completed their final reports.

Although library involvement is not required for the NLM Internet Connections Program, librarian and library uses have been the most common category in the applications received. The strong library interest in the program is not surprising, because NLM announced the program widely to the health sciences library community through NLM News, MLA News, and the NN/LM regional newsletters, as well as by direct announcements to some 1,100 MLA institutional members. The extent of use by clinicians, researchers, and students for nonbibliographic purposes has yet to be determined.

For multi-institutional Internet grants such as to Hahnemann University, University of Arizona, University of Utah, and Washington University, access to the library databases is extended to affiliated hospital users, including medical students. Libraries also report using the Internet to access GRATEFUL MED, DOCLINE, DIALOG, Canceret, other library catalogs, Quickdoc (for statistics), CARL (for document delivery), and journal subscription services through a vendor. Several of the grantees report increased visibility and respectability for the library as well as an enhanced role for librarians. Many comments relate to the extensive amount of time devoted to encouraging users to apply for Internet passwords and, subsequently, the need for considerable training in the actual use of the network. A number of grantees admit that they underestimated the amount of training and support that must be provided to would-be users.

Not surprisingly, e-mail clearly constitutes the major use of the Internet at present. As users gain experience with this capability, they probably will venture into more advanced applications, such as file transfer and remote log-on. Even e-mail alone, however, offers such important benefits as enhanced communications (“we no longer feel like second-class citizens”), improved delivery (postal service mail to medical students in affiliated hospitals sometimes takes up to ten days), and access to news services and listservs of all kinds.

At the University of Utah, linkage to the Internet has been accomplished successfully by microwave, thus demonstrating a viable and reliable alternative to leased lines. The success of the microwave connections has led to the installation of microwave links to two additional sites. This Internet connection has enabled the transmission of radiologic images and computer-assisted instruction programs to workstations in two affiliated hospitals.

At Washington University, the Internet connection has facilitated research and exchange of clinical data. The use of Germwatcher, a database/expert system that screens hundreds of infection reports in a few minutes, resulted in an estimated savings exceeding one full-time equivalent quality-assurance nurse. The Internet connection also has enabled the linkage of library databases to point-of-care workstations at the nursing stations. Dr. Mark Frisse, the principal investigator, further reports that “the grant really came at a seminal time and ensured that both the hospital chain and the School employ similar networking technology. The two organizations do have different missions, and we do believe that good routers make good neighbors. We have come to believe that for now it makes more sense to have a little redundancy in backbones and good interconnectivity rather than fight too much over different missions and one holistic network to serve all.”

Lovelace Institute’s staff report that the NLM grant “provided much needed impetus for the organization to experiment with [Internet] as a resource. The initial startup cost of approximately $10,000 was substantial enough that the institution may have delayed connection for several more years. . . .” In order to justify considerable ongoing costs to institutional officials, the Lovelace staff advises acquiring many vocal Internet advocates at an early stage. Another suggestion was to spend “time exploring the many different types of information available [on the Internet] and invest the energy in obtaining and customizing user-friendly means of accessing the network.”

CONCLUSION

When the advisability of NLM’s Internet Connections Program was under consideration, some questioned the value of the Internet to health sciences institu-
The NLM/NSF grant program

tions and particularly to health sciences libraries: “What will they do with it?” NLM’s attitude was and is that such an extraordinary information resource could not help but evolve into a vital element of the health care system if made accessible to such an information-intensive domain. NLM believes that an excellent way to explore and develop the possibilities of the Internet is to issue “beginner’s licenses” to health sciences institutions and allow the imagination and creativity of the users to do the rest. Results already have been gratifying, and significant further progress is expected in the next few years.

REFERENCES


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