In the mid 1980s, when CCSO's network engineering group began investigating technology options for a high-speed fiber-optic backbone to serve the campus network, solutions supporting data rates faster than 10 megabits per second (the Ethernet standard) were few and far between. The handful of solutions that did exist were proprietary in nature, meaning that the network technologies and their specifications were owned exclusively by the original manufacturers and generally protected by patent against free competition from other vendors. After more than a year of considered research, CCSO committed to Proteon Incorporated's ProNet 80 token ring LAN product. At the time, Proteon's proprietary ProNet 80 LAN was one of the fastest (80 megabits per second), most reliable backbone technologies available. The ProNet 80 backbone has served UIUC campus networking needs ably for approximately four years and continues to perform well today.

However, during this same four year period, many significant changes have taken place in the networking arena, causing manufacturers to rethink the benefits of proprietary versus open technologies. Interoperability (the ability to integrate and share software, data, and hardware across multiple computing platforms) is the premier computing buzzword of the nineties. Vendors as well as engineering and computing standards committees are quickly recognizing and responding to the need for universally accepted and open networking hardware and software specifications. Today such a standard exists for high-speed fiber optic backbones, and the CCSO Campus Area Networking (CAN) group has taken the first steps towards migrating from the ProNet 80 backbone to the standard known as FDDI.

What Is FDDI?

FDDI, which stands for Fiber Distributed Data Interface, is the specification developed by the American National Standards Institute (ANSI) X3T9 committee for a 100 megabit per second token passing network using optical fiber as the physical transport medium. (For more information on how the token ring access method works, see the article entitled Access Methods: Traffic Control on the Network in the October 1989 issue of UIUCnet, vol. 2 #5.)

A single FDDI ring can span a total fiber path of up to 125 miles with up to 500 stations per ring. Needless to say, the technology lends itself well to backbone networks covering large geographic areas like the UIUC campus. Today, FDDI products also exist to connect mainframe, mini, and desktop computers directly to high speed FDDI networks over fiber, and, more recently over shielded and unshielded twisted pair cable. (FDDI transmission over copper is limited to shorter distances. For example, FDDI over unshielded twisted pair (UTP) is generally restricted to runs of 100 meters or less.)

The topology or physical shape of an FDDI network, like the ProNet 80, is that of a ring. In typical backbone installations, the ring actually consists of two counter-rotating rings, a primary and secondary ring. The second ring provides redundancy or backup capability in the event that a fiber segment or station fails on the primary ring. This process of automatic fault detection and correction is known as wrapping and is illustrated in Figures A, B, and C. Figure A shows a fully functional dual counter-rotating ring. Each FDDI station is connected to the next by two strands of fiber.

(continued on page 2)
Backbone Migration to FDDI...

(continued from page 1)

During standard transmission, data proceeds in a single direction around the primary ring. When a break in the primary fiber ring occurs, as in Figure B, the fault is automatically detected and the ring enters a wrap state. The primary ring and backup ring are joined in a manner that preserves the original data path and leaves all stations online. Similarly, if an FDDI station should fail, the two rings wrap in a manner such that the faulty station is ignored and the integrity of the ring is preserved as shown in Figure C.

Why FDDI?

For most UIUCnet users, the extra 20 percent bandwidth provided by FDDI (100 Mbps as opposed to ProNet’s 80 Mbps) will be imperceptible. Why then the switch to FDDI? Here’s where the benefit of open specifications and the problems of proprietary technologies make themselves apparent. Proteon was the exclusive manufacturer of ProNet 80 interface cards and the routers and software that support them. Now that a high speed fiber-optic backbone standard has emerged, Proteon is migrating to FDDI and retiring its ProNet 80 product. In fact, Proteon’s newest and fastest routers no longer support ProNet 80, and, of course, routers manufactured by other vendors never supported ProNet 80. Thus, ProNet 80, the previous leader of the pack is now more or less a dead-end product (as is its lower-end counterpart, ProNet 10, which is currently the interface used in most in-building routers). Additionally, because FDDI is an open specification, the CAN group is now free to buy routers from other manufacturers if they choose to do so. And, of course, free competition among these multiple FDDI vendors will inevitably drive the prices of this costly technology downwards.

FDDI has other advantages as well. The performance of a network depends not only on the specifications of the network interface, but the speed and processing power of the machines in which they are installed. Most of the routers currently on the backbone (based either on Intel’s 80386 or Motorola’s 68020 processors) offer throughput rates of 6K to 8K packets per second from one Ethernet segment to the next. Proteon’s new RISC-based router, the CNX-500, nearly doubles the Ethernet throughput and is capable of achieving rates of 28K packets per second between FDDI interfaces. Products from other vendors already exist supporting rates of 50K to 100K packets per second per route. Routers supporting these higher throughput rates are better able to accommodate departments that generate unusually high amounts of network traffic and will be in a better position to meet future demands on the campus backbone.

Finally, with its built-in fault detection and correction capabilities, FDDI offers more reliable backbone services. Although FDDI is currently serving only a small segment of the campus network, eventually it will fully replace the existing ProNet 80 ring.

The UIUC FDDI Implementation

The high cost of FDDI interfaces and high speed routers has made it necessary to implement FDDI in phases based on traffic patterns and throughput needs. Currently there are two FDDI rings on campus. The first FDDI ring on campus was installed in DCL last year to provide high performance links between UIUCnet and the outside world. The entities presently connected to this original ring include: 1) NCSAnet, 2) the enhanced nodal switching station (continued on page 3)
Backbone Migration to FDDI...
(continued from page 2)

(ENSS) that provides T3 (45 Mbps) access to the NSFNET, and 3) a router connecting this FDDI ring to the campus network. Network engineers refer to this original ring as the DMZ (demilitarized zone) FDDI because it is a neutral or free territory where networks owned and administered by different bodies come together. (There is also a fiber Ethernet DMZ that connects UIUCnet to additional outside entities such as the original T1 [1.544 Mbps] connection to the NSFNET; various universities and agencies throughout the state [the UIUCnet Regional networks]; and the big ten regional network overseen by the Committee on Institutional Cooperation, CICnet.)

In January of this year the second FDDI ring was installed. Connected to the latter ring are routers serving UIUCnet’s heaviest clients—that is, those that statistically generate the most network traffic. These include the Beckman Institute, the Computer Science Department, CCSO mainframes and workstations, the CCSO site in the English Building, etc. An additional two routers connect the UIUCnet FDDI ring to the DMZ FDDI and to the campus ProNet 80 ring. Provisions have also been made to connect one ProNet 80 router in each of the main telecommunications nodes on campus to routers on the FDDI ring over fiber Ethernet. These connections provide redundancy for the campus backbone and allow traffic from some parts of the network to bypass the ProNet 80 ring and the single busy router between the P80 and FDDI backbones. Such traffic might be destined for off-campus networks or on-campus networks served by the new FDDI ring. If this all sounds very confusing, perhaps the schematic diagram on page 2 will help to put things into perspective.

Although it is possible to run FDDI directly into a special hub in an in-building LAN (and ultimately to the desktop), the connections between the FDDI backbone routers and building networks are generally fiber-based Ethernet. An FDDI backbone router typically has one FDDI interface that connects it to the fiber ring and several Ethernet interfaces that connect the FDDI router to various building networks or a ProNet 80 router. The CAN group is also able to provide in-building networks and/or individual workstations with direct FDDI connectivity, but the cost of such installations is very high and only appropriate under a limited number of circumstances (see the related article in this issue, FDDI: Prestige versus Practicality).

As funds become available, additional buildings will be connected to the UIUCnet FDDI backbone. The priority of these connections will be determined strictly on departmental network traffic statistics—the higher the network traffic, the sooner the FDDI connection. Another integral part of the implementation will be the replacement of the proprietary ProNet 10 interfaces currently installed in the in-building routers with IEEE (Institute of Electrical and Electronic Engineers) standard 16 Mbps token ring interfaces. Precisely when the FDDI and 16 Mbps token ring migration will be complete will depend largely on the funding allocated to the project. CAN group members are targeting the end of fiscal year 1993, but only time and economic recovery will tell.

FDDI:
Prestige versus Practicality

Now that FDDI has come of age, it is only a matter of time before the CCSO networking groups will start getting requests for FDDI connections to personal workstations (or to the desktop, in the vernacular). The problem that we face is that, at the present time, there are actually a very limited number of circumstances under which an FDDI connection to the desktop is required or even desirable. To understand this situation, it is helpful to think about plumbing. If someone knocked on your front door and said, “For $10,000 I could sell you an adapter with which you could connect your washing machine directly to the water main outside of your house,” would you buy it? Probably not. Attaching a four inch water main into the back of your washer doesn’t mean your wash will get done any faster. The reason the big pipe is buried outside your house is so that everyone in the neighborhood can do their wash at the same time.

So, why then will people frequently request expensive connections that are of little value? In a few cases, it’s a matter of prestige. There is a certain amount of prestige in having a 100 megabit connection to your Macintosh or PC while everyone else on campus only has a 10 megabit connection. However, in point of fact, a Macintosh can’t come close to utilizing its 10 megabit connection (if lucky, it might use 1 or 2 megabits). Very few workstations can either put out or receive data at these speeds. The limitation is a combination of hardware and software. High-end workstations (RS6000s, HPs, etc.) have the internal architecture to be able to receive bits at these rates, but they often have software that slows down this potential. Even these systems would be hard pressed to get more than 5 megabits per second using standard applications. Therefore, for run of the mill networked computing, there is probably no current benefit with a higher speed UIUCnet connection.

This is not to say that FDDI connections to the desktop are always worthless. Think of the plumbing example again. Although the average home has no use for the four inch water main, a factory might be able to make use of it. There are certain computer applications, frequently involving color visualization, that may require the data rates provided by FDDI. These applications must use nonstandard software to cope with the speeds. Also, since what comes out can only be as fast as what goes in, one can only expect to receive data at FDDI rates if it is put into the network at FDDI rates. Currently, this precludes getting these rates from any other machine not already connected to an FDDI ring on campus.

As time goes on, applications and machines will be better able to cope with the data rates presented by an FDDI interface. As more machines can handle these rates, the cost of such machines will drop. As demand grows, the interface costs for FDDI will drop as well. It is worth your while to delay desktop FDDI connections until it is a service required by your work. Someday perhaps everyone will have FDDI to their desktop—today is not that day.

-Lynn Ward

-Ed Krol
UIUCnet Reader Survey

Just as the campus network has expanded dramatically over the past four years, so has the readership of the UIUCnet newsletter. Whereas in its early years, the campus network served and was exploited largely by faculty and staff in the computer science and engineering fields, it now reaches faculty, staff, administrators, and students with widely varying interests, needs, and technical expertise. Today, the UIUCnet newsletter has a circulation of over 3000 readers. As the editor of and principal contributor to this publication, I often ask myself, "Who are the readers of UIUCnet? What do they want to know? What improvements could be made to make UIUCnet better meet the needs of its diverse audience?" The list of questions goes on and on.

Because I have very little direct contact with my readership (except for occasional e-mail feedback), I have included a survey in this month's issue. The survey is designed to provide basic information on the nature of the UIUCnet audience and its views on the current status of the newsletter. I urge every UIUCnet recipient to complete the enclosed survey, even if you do not normally read the newsletter. By doing so, you can participate in shaping the future direction of this publication. The surveys can be filled out anonymously and should only require a few minutes of your time. Once completed, they can be folded, taped and/or stapled and dropped in the campus mail. Off-campus readers are welcome to complete the survey as well. Send your responses through the U.S. mail to the following address:

UIUCnet c/o Lynn Ward
1120 Digital Computing Lab
1304 W. Springfield Ave.
Urbana, IL 61801
General User Information:

1. What kind of desktop computer do you use regularly at work (please check all that apply)?
   - IBM PC, PS/2 or compatible
   - Macintosh
   - Unix Workstation (Sun, NeXT, HP, etc.)
   - X-terminal
   - Terminal attached to a mini or mainframe host (e.g. IBM 3270, DEC VT100, Tektronix 4010, etc.)
   - other: __________________________
   - don't know

2. Is your building connected to the campus network (UIUCnet)?
   - yes
   - no
   - don't know

3. Is your desktop computer attached to the campus network (UIUCnet)?
   - yes
   - no
   - don't have a desktop computer
   - don't know

4. Do you ever use a modem to access the network or one of its mainframes (please check all that apply)?
   - yes, from campus (office, lab, etc.)
   - yes, from home (private residence, dorm, etc.)
   - no
   - don't know

5. On which campus mainframes or minis do you have accounts that you use regularly (please check all that apply)?
   - uxa
   - uxl
   - uxxh
   - vmd
   - PROFs (uicvmc/uicmvsa)
   - other: __________________________
   - none
   - don't know

6. Are you responsible for managing your building's network(s) or a group of computers within your building?
   - yes
   - no

7. Please indicate the frequency with which you utilize each of the following services available over the campus network?

<table>
<thead>
<tr>
<th>Daily</th>
<th>Weekly</th>
<th>Occasionally</th>
<th>Never</th>
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<tbody>
<tr>
<td>Electronic mail</td>
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<td>GUIDE (menu-driven UIUC information service on uxa)</td>
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<td>LCSgated or IO Plus (online library catalog)</td>
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<td>Ph (online campus phone book)</td>
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<td>Other Ph services (weather information, area code directory, local restaurant guide, university timetable)</td>
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<tr>
<td>OED2 (online Oxford English Dictionary)</td>
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<td>Netnews (Unix bulletin board service)</td>
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<td>Electronic mail to fax gateway</td>
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<tr>
<td>Telnet on-campus (high-speed remote login to campus mainframes)</td>
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<tr>
<td>Telnet off-campus (high-speed remote login to computers at other universities and/or other locations on the Internet)</td>
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<tr>
<td>Ftp (transferring files between campus mainframe(s) and your desktop computer)</td>
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<tr>
<td>Anonymous ftp (downloading files from ftp archive sites to your desktop computer or mainframe account)</td>
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<tr>
<td>INN (IBM Information Network)</td>
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<tr>
<td>AISS services (accessing the Administrative Computing Network)</td>
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<tr>
<td>Accessing PLATO/NovaNET</td>
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About the UIUCnet Newsletter:

8. What do you do with the UIUCnet newsletter when you receive it (please check all that apply)?
   - read it from cover to cover
   - read only the articles of interest
   - give it to someone else to read
   - file it for later referral
   - throw it away

(continued on other side)
UIUCnet Reader Survey
A survey about the campus networking newsletter
February 1992

9. Please rate the following article types commonly found in UIUCnet in terms of their interest/relevance to you and your work.

<table>
<thead>
<tr>
<th>Very Interesting</th>
<th>Somewhat Interesting</th>
<th>Minimally Interesting</th>
<th>Not of Interest</th>
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A. Tutorials on how to use campus network services
B. Campus network news items (announcements about new services or changes to existing ones)
C. Reviews/descriptions of popular network software
D. Announcements of new software releases
E. National networking news items
F. Q&A's (answers to typical end-user questions)
G. Description/definition of basic networking terms and concepts
H. History and background of the campus network and the technology behind it
I. Description and tutorials covering publicly available resources/services on the Internet such as online databases, library catalogs, software repositories, etc.
J. Case studies covering innovative use of the campus network by administrators, faculty, staff, and/or students

10. Which of the article types listed in question 9 would you like to see featured most frequently in UIUCnet (please circle all that apply)?

☐ A  ☐ B  ☐ C  ☐ D  ☐ E  ☐ F  ☐ G  ☐ H  ☐ I  ☐ J

11. Approximately what percent of each issue of UIUCnet do you find personally interesting or useful?

☐ 100%  ☐ 75%  ☐ 50%  ☐ 25%
☐ 0%  ☐ varies from issue to issue

12. How would you assess the overall content and style of the UIUCnet newsletter (please check all that apply)?

☐ too basic  ☐ too difficult to understand
☐ balanced to meet needs of readers at different levels
☐ interesting  ☐ boring  ☐ useful  ☐ useless

13. What additions or improvements would you like to see in UIUCnet?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

14. Name (optional) ____________________________

15. Job classification (optional) ____________________________
On Thursday, March 5th, I arrived at my desk at 8:30AM, and, as is typical of my morning routine, immediately powered up my Macintosh II and started Eudora to check my electronic mail. No luck! After watching Eudora's pendulum swing for about a minute, a dialogue box informed me that a connection could not be established with the POP mail server on ux1. Suspecting that something was awry, I next fired up NSCA Telnet. Again I had no success reaching ux 1 or, for that matter, any host on the campus network. I soon discovered that all of my coworkers on our Macintosh network were having similar access problems. Since the individual who usually administers our AppleTalk network was out on a call, I reported the problem to the UIUCnet Network Operations Center, better known as the NOC. Within minutes a loose cable on our AppleTalk-to-Ethernet router was discovered, the connection was tightened, and we were able to go about our network again.

Shortly after my problem was resolved, another trouble call came into the NOC. An electronic temperature monitor in one of the telecommunications nodes (where campus network routers reside) automatically dialed the NOC and left a message that the temperature in the node was too high. A call was placed to Operations and Maintenance and one of the campus network engineers went to the site to tend to the heat-sensitive equipment until O&M was able to bring the temperature down to an acceptable level.

The incidents described above were just two of the myriad and diverse problems fielded by NOC personnel on that morning in early March. Yet, despite the vital services that the Network Operations Center offered on this and every other day of the year, many UIUCnet users are completely unaware of the NOC's existence; and, according to Network Operations manager Ross Veach, that's exactly as it should be. The principle mission of the NOC is, after all, to constantly monitor campus network resources, ensure their reliability, and resolve problems as quickly as possible. Using a variety of tools, NOC staff are often able to detect network problems and have them corrected even before end-users are aware of their existence. Thus, if network problems can be resolved before a UIUCnet user has to pick up the telephone, the NOC maintains a low profile and is doing its job exceptionally well.

What the NOC Does

Monitoring Network Resources. The UIUCnet Network Operations Center is, in many respects, the nerve center of campus network resources and operations. Keeping an eye on all network components and making sure they are working properly at all times is the NOC's number one priority. The network resources monitored by the NOC include all of the campus backbone routers (and every network interface card installed within those routers), the CCSO terminal servers (facilities for modem dial-up to UIUCnet), all CCSO mainframes, and the campus broadband network (SYTEK). The NOC's monitoring equipment does not, for the most part, extend to devices such as hosts (desktop computers connected to the campus network) or repeaters within in-building LANs, but there are some limited tools for verifying that machines within a particular building can communicate across the network. The NOC also works with other Network Operations Centers such as those at NSFNET, CICnet, and NCSAnet to ensure that UIUCnet's connections with the outside world are up and working.

Fixing and/or Referring Problems. If, in the course of monitoring network resources, a problem is encountered that cannot be readily corrected by NOC staff, the appropriate CCSO staff member or group is alerted. The Campus Area Networking (CAN) engineers, for example, are the contact people for campus

(continued on page 2)
backbone problems; SYTEK problems are handled by the SYTEK support group; terminal server troubles, previously covered by Mike Gardner, are now dealt with by staff in the Telecommunications User Services group; and, finally, in-building network hardware or telecommunications problems are typically referred to the building’s network administrator, the CCSO LAN Maintenance group, or, in the case of newly installed networks, the Network Design Office (NDO).

Tracking Problem Status. When a problem is handled by an outside individual or group, NOC staff track its status until the problem is solved. All problems are logged in a locally written Macintosh HyperCard application running on a Mac Quadra 700. The information contained in each record includes the name and phone number of the person who reported the problem, the problem type, the name of the person or group to whom the problem was referred, the date and time the problem was recorded, the problem history, and the date and time the problem was resolved. The stack has a built-in electronic mail function for communicating with the individual(s) working on the problem. Once a problem is solved, the record is archived and can be easily retrieved and reactivated, or the data can be used for statistical analysis or historical research into a particular problem or problem type.

End-user Telephone Hotline. While the NOC is principally concerned with low-level network problems—problems at the packet switching, electrical, and physical layers of the network—it also offers a telephone hotline and central point of contact for end-user network communications support. Network users are encouraged to first report their difficulties to their in-building network administrator. However, if the administrator is unavailable or cannot solve the problem, users should call the NOC’s main telephone number, 244-1000. NOC staff will help the caller isolate the cause or source of the problem. If it turns out to be a low-level network problem, it will be corrected by NOC personnel or assigned as described above. If, on the other hand, the problem appears to be related to software or hardware installation and/or configuration, host registration, failure of departmental hardware, etc., the caller is referred directly to one of several additional CCSO support groups. The latter groups include the microcomputer consulting staff, CCSO’s on-site consultants, the NDO, and the CCSO repair and maintenance group. Problems of this sort are usually entered in the HyperCard log, but once they are referred to a specific person or support group they are no longer tracked by the NOC.

Statistics Gathering. In addition to ensuring that network resources are up and running, the Network Operations Center also monitors the quality of service these resources deliver. By collecting and analyzing traffic and usage patterns and statistics, NOC staff can identify overloaded or minimally functioning components on the network such as interface cards, routers, modems, and so on. This information ultimately feeds into the overall campus network design, configuration, and upgrade process.

NOC Around the Clock

The campus network is available to the UIUCnet community 24 hours a day, seven days a week, and the amount of network traffic generated during the hours when most of the East-central Illinois population is asleep is sometimes frightening. (When do these network users sleep?!) The modem pools on the CCSO terminal servers, for example, are busy almost non-stop from 10AM to 2AM every day. For the 4.5 full-time staff members in the NOC—Linda Henning, Laura Weger, Carol Ezell, Dennis Guyon, and Eugene Drain—this means that there is virtually no rest for the weary. The NOC is open continuously from 10PM on Sunday through 10PM on Friday and is staffed from 10AM through 6PM on Saturday, Sunday and most all-campus holidays.

NOC Tools

To walk into the Network Operations Center in 1523 DCL is to be confronted with a vast array of personal computers, workstations, terminals and other devices dedicated to tracking network problems and events. Volumes of documentation, statistics, and device configuration information fill the bookshelves along the walls, and, in the center of the room, anywhere from one to several staff members watch and listen to the monitors, answer the unending telephone calls, log and track trouble reports (either fixing the problems themselves or referring them to an outside party), and rush in and out of the machine room next door as difficulties with the terminal servers arise. The principle tools of their trade are sophisticated software applications—some homegrown and others commercially produced—that monitor the various resources on the campus network.

Overview. Among the more interesting applications running in the NOC is Proteon’s network monitoring package called Overview. Overview presents a “live” hierarchical map of the campus backbone network. The map consists of a series of screens that graphically represent segments of the campus network. At the top of the hierarchy is a screen that gives a birds-eye view of the entire network including the ProNET 80 ring, the FDDI ring, each of the major telecommunications nodes, and UIUCnet connections to the outside world. It is possible to zoom into any portion of the comprehensive map and get a detailed view of a segment of the network. The figure on page 3, for example, shows the devices and buildings or departments serviced through telecommunications node 2 located in Scott Hall. Every IP router on the campus backbone and every network interface card within each router is represented by an icon in the Overview map, as are certain critical CCSO resources such as the terminal servers, the fax gateway, Unix and IBM mainframes, etc.
These icons change color as the status of resources change. Like the colors on a standard traffic light, green means that a resource is fully operational (all systems go), yellow indicates a warning state (the device is still running, but there is a problem with some aspect of its operation), and red signals that a device is down entirely. When a device changes state and an icon turns from green to yellow or yellow to red, an alarm sounds and NOC staff are immediately alerted to the problem. Each icon is also linked to a database holding the name and phone number of the person(s) responsible for that particular resource. This makes it easy to contact the right people when a device enters a trouble state.

The Overview software uses a special protocol known as SNMP or Simple Network Management Protocol. SNMP is the TCP/IP standard for the development of network monitoring applications and can be implemented on a variety of operating systems and hardware platforms. Each of the devices represented in the Overview map is running an SNMP agent—that is, a combination of hardware and software (or firmware) that allows the device to maintain and constantly update information about itself such as its own IP address, the number of interfaces it contains (in the case of routers), the up or down status of those interfaces, the number of routing failures, the number of datagrams received and forwarded, etc. Each piece of information is stored as a variable in a table called a Management Information Base or MIB on the device running the SNMP agent.

The DOS-based 386 workstation running the Overview software functions as an SNMP Network Management Station (NMS). It accesses and interprets information on each of the network devices running SNMP agents. Overview queries each agent on the network once every twenty seconds and, if a problem is detected, converts the associated icon to yellow or red and sounds the alarm. This critical application allows NOC staff to be in constant touch with the status of all resources on the campus backbone.

Terminal Server Management. NOC personnel also use several locally written applications for monitoring the CCSO terminal servers. An X-Windows application called XTS, developed by Mike Gardner and Dan Pommert, provides a graphical view of the modems and ports on each of the terminal servers. XTS shows which lines are busy or idle and, for each of the busy lines, displays the name of the IP host with which the terminal is communicating. Another application called DTS displays the busy or idle state of each terminal server port in 5 minute increments as well as the type of modem or device connected to each port. The information provided by XTS and DTS helps NOC staff diagnose terminal server problems, identify bad modems, and provide end-user support.

The NOC's Future

The applications described above are but a few of the many resources used by NOC staff on a daily basis for monitoring network devices, gathering statistics, tracking problems, and configuring hardware. While currently the tools available to the NOC are helpful in determining whether a device is working or not working, NOC manager Ross Veach would like to expand the NOC's capability to the point where it is possible to verify that apparently functional devices are working both correctly and optimally. To this end, Ross continues to investigate (and in some cases develop) software and hardware that will improve or add to the services already offered by the NOC. His ultimate goal, in cooperation with other groups in CCSO, is to make campus network services as reliable as the modern telephone.

- Lynn Ward
Netnews Basics

For the sake of Netnews neophytes, it's worth taking a few moments to describe how Usenet articles are named and organized. Each of the 1600+ newsgroups available on the CCSO net news server has a unique name. Newsgroup names are hierarchical beginning on the left with the broad subject area to which the group belongs. One or several subtopics may appear to the right of this initial prefix, each separated from the previous with a period. The rightmost item in the newsgroup name defines the specific topic of the group. Consider the example rec.arts.tv. The prefix rec indicates that this group is one of a large number of groups belonging to the general subject area recreation and leisure. Arts is a subtopic under the main heading of recreation. There are many other subtopics in the rec hierarchy, for instance, rec.autos, rec.foods, rec.games, etc. Each of these subtopics, in turn, may be divided into additional subtopics or a specific topic. The element at the far right in the newsgroup name—tv in our example—describes the specific topic of the discussion group. Articles posted to rec.arts.tv are limited to discussions of television. The sidebar on page 5 lists all of the general subject areas or prefixes currently available on the CCSO Netnews server. Most client newsreader programs allow the user to subscribe to specific groups or newsgroup hierarchies. Having some familiarity with these prefixes will make it easier for you to decide which groups you want to subscribe to and read on a regular basis.

Netnews Clients For the Mac and PC

There at least six newsreader clients available for the Macintosh and five for the PC. Two well-known packages for each platform are reviewed in this article and are available for download using anonymous ftp. (If you would like the names of additional newsreader software for PCs, Macs, and other platforms such as Amiga, NeXT, VM/CMS, and DEC VMS computers, send an e-mail request to uiucnet@uiuc.edu.)

Information on where to acquire the programs described in this article and the software required to make them usable (all have been archived with archive/compression software) is given in the table on page 8. The table gives the name and description of each package, the address of an anonymous ftp site from which the package can be downloaded, the directory in which it is located, the exact filename of the package (since these programs are frequently updated, the filename on the ftp server may not match the one given in the table), and the transfer mode that should be used when downloading the file.

Although only one ftp site is listed for each package, most of these programs are available at many sites across the country. To access the most current information concerning their location, telnet to one of the archie servers or use an archie client to query archie’s directory of anonymous ftp sites and file holdings (for more information on using archie, consult the following back issues of UIUCnet: vol. 3 #8, vol. 4 #3, and vol. 4 #5).
TheNews 2.1 (for the Mac)

TheNews, version 2.1, is a shareware newsreader client for the Macintosh written by Bill Cramer. The package, which can be licensed and registered for $25.00, includes the application itself, a couple of explanatory text files, and a well-written, comprehensive user guide in Microsoft Word 4.0 format.

Getting started with TheNews involves double clicking on the application icon and configuring the software through the Preferences dialogue box under the File menu (see the section entitled Installing Client Newsreader Software at the end of this article for general information on how to set up newsreader software to access the CCSO Netnews server). Once the required parameters have been entered, a connection can be made to the CCSO Netnews server by selecting New from the File menu. TheNews will download the names of all newsgroups available on the Netnews server and present them in a window. To read the articles in a group, you must first subscribe to the group by selecting Add Group under the Groups menu. Newsgroups can be subscribed to one at a time or in sets. The list of newsgroups in a subscription set can be saved to disk with the filename of your choice and will be represented by a special group icon. This feature makes it possible to save multiple subscription sets organized in the manner that is most convenient for you, the reader. For example, you could save subscription sets organized by subject matter (all groups related to music, computers, sports, etc.), by news hierarchy (alt, rec, comp, uiuc, and so on), by the frequency with which you want to read the set (daily, weekly, monthly, etc.), or any combination of these or other organizational schemes.

Once you have saved one or several subscription sets, you can start TheNews by clicking on the group icon rather than the application icon. Doing so will both start the application and provide immediate access to the newsgroups associated with the group icon. To read the messages in a subscribed group, simply highlight the newsgroup name in the group window and select Read from the Groups menu. TheNews will fetch the message header information for the messages in the group and display it in a separate window. The title, author, and date of each message in the group will appear in the latter window and unread messages will have a check mark next to them (see figure 1 on page 6). To read any message in the group, double click on its title.

Posting, following up, or mailing a copy of a message to another Internet user is just a matter of selecting the desired option under the Articles menu. When creating or following up an article, a new window appears and the standard Mac text editing functions are in effect such as word wrap and cut and paste. The Articles menu can also be used to mark all articles in a group as read or unread. TheNews, like most newsreader programs, keeps track of which articles have been read so that they are not presented in the messages window the next time the group is accessed.

(continued on page 6)
Needless to say, the complete feature set of TheNews is too extensive to enumerate here. A review of TheNews would not be complete, however, without discussing some of its minor and not-so-minor flaws. Because TheNews downloads more message complete, however, without discussing some of its minor and not-
choice. Although the News Watcher documentation consists of a
sometimes runs out of memory when dealing with large news
groups before it collects all of the data it needs. The program also
makes reading and posting news a snap.

NewsWatcher incorporates almost every feature offered in
TheNews. For example, NewsWatcher can download and
Like TheNews, NewsWatcher permits the user to subscribe to sets
down groups for creating and saving subscription sets.

Another useful NewsWatcher function is the Search option
under the Edit menu which can be used for locating articles with
a particular character string in any one of the following header
fields: keywords, from, subject, summary, date, organization,
references, and distribution (see figure 2). The Search com-
mand enables the user to locate all the articles on a certain topic,
by a particular author, posted on a particular date, etc., across
multiple groups.

One disappointing aspect of NewsWatcher is the absence of
a text-wrap feature in the editor used for posting, following-up,
and forwarding articles. However, with the exception of this
minor shortcoming, NewsWatcher is as powerful as it is easy to
use.

Snuz (for IBM and Compatible DOS Machines)
The IBM newsreader client Snuz is interesting more from an
historical point of view than a practical one. Snuz was one of the first
newssreaders available for DOS machines and was written by UIUC
chemistry professor Doug McDonald. Snuz uses a command-line
interface and lacks most of the bells and whistles found in other
newssreader programs. To navigate groups and articles, single keystroke
commands are typed at the command prompt (>). All available Snuz
commands can be displayed by typing ? at the Snuz prompt (the list of
commands is shown in figure 3). One of Snuz's more attractive features
is that it can be set up to use the text editor of your choice for writing
follow-up articles or forwarding messages through e-mail.

(continued on page 7)
Snuz keeps track of the newsgroups to which you are subscribed and the articles read in each group in a plain ASCII file called snuz.rc. Unfortunately, like some other older newsreaders (e.g., the HyperCard reader for the Mac, Netnews Reader HC), Snuz is not equipped to cope with a large number of newsgroups and will arbitrarily truncate a snuz.rc file that is too long. Also, while Snuz offers commands for following-up articles or responding to an article with e-mail, there is no provision for posting original articles. In short, though once quite useful, Snuz is somewhat past its prime. A new version of Snuz called Newsnuz can be found on several German ftp servers. Newsnuz, available in beta version only, reportedly improves on the Snuz's speed (or lack thereof) and includes a command for shelling out to the DOS command prompt.

Figure 3: The Snuz help screen and command prompt (>)

**Trumpet (for IBM and Compatible DOS Machines)**

Today, the DOS-based newsreader of choice is a program called **Trumpet** developed by Peter Tattam at the University of Tasmania. Trumpet is a full-screen, point-and-shoot newsreader with mouse support and an extremely intuitive interface (see figure 4). Trumpet commands are listed at the top and bottom of the screen and are executed by pressing the function key or alt-key combination associated with the command. Mouse users can execute Trumpet commands by moving the pointer to the command name and clicking the mouse button once.

The main Trumpet screen consists of two separate windows. The top window displays the subscribed newsgroups and the bottom window displays the article titles in the currently selected group. The tab key functions as a toggle between the two windows. Within each window, the arrow keys can be used to move from one newsgroup or article title to the next. Pressing enter or double clicking on an item in the active window displays the contents of that item. Thus, in the case of the newsgroup window, pressing the enter key displays the titles of articles inside the currently highlighted group. Pressing enter within the titles window displays the contents of the article, and a new set of commands for reading, printing, saving, and posting messages appears at the bottom of the screen.

Trumpet tracks subscribed newsgroups and the articles read within each group in an ASCII file called news.ini. This file can be edited with any standard text editor or within the application with the subscribe (Ins) and unsubscribe (Del) commands. Trumpet's bare-bones text editor for writing articles, follow-ups, and e-mail replies is self-explanatory. It does not offer a cut/copy and paste utility, and only mouse users can perform block deletes. However a pre-existing ASCII file can be incorporated into a Trumpet article.

Installing Trumpet requires customizing an ASCII configuration file called news.prm. Trumpet also offers special features beneficial to Novell network users and administrators. The application is “Novell-aware,” and, when installed in a public directory on a Novell NetWare file server, automatically creates a custom news.ini and news.prm file for each user in his or her mail directory. Directions for installing the software on a Novell server as well as end-user instructions are provided in the file called news.doc. As of this writing, version 1.04B was the latest version of Trumpet available, but author Peter Tattam promises that version 1.05 should be released shortly.

Trumpet, like the other newsreader programs reviewed in this article, enables the average personal computer user to take advantage of the Netnews bulletin board service with little or no knowledge of the Unix operating system. If you had any doubt that

(continued on page 8)
Netnews has something to offer to people other than highly technical computer scientists, programmers, and engineers, perhaps this brief glimpse at client newsreader programs and the ever increasing breadth of the Netnews service itself has changed your mind.

Installing Client Newsreader Software
Most public domain and shareware newsreader programs come with brief installation instructions. In order for this type of software to work properly, your desktop computer must be attached directly to UIUCnet, as these packages do not support modem access to the campus network. Additionally, the packages described in this article require that certain network drivers be installed and loaded before running the application: Macintosh computers must have MacTCP installed, while DOS computers must have the appropriate packet driver loaded. If your computer has already been configured to access the campus network, chances are good that the latter utilities are already installed. If not, ask your building network administrator to help you locate and install them. Also, most newsreader programs must be configured to include information specific to your desktop computer and other hosts or servers on the network to which it is attached. Depending on the package, the following information may be required for proper configuration:

IP address of your desktop computer: On DOS machines, if you have NCSA or Clarkson Telnet installed, your host IP address can be found in your config.tel file (plain ASCII text file) to the right of the parameter myip=. If you cannot locate

<table>
<thead>
<tr>
<th>Package Name/Comments</th>
<th>Anonymous FTP Address</th>
<th>Directory</th>
<th>Filename</th>
<th>Transfer Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>TheNews 2.1</td>
<td>sumex-aim.stanford.edu</td>
<td>info-mac/comm</td>
<td>the-news-21.hqx</td>
<td>ASCII or BinHex</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NewsWatcher</td>
<td>sumex-aim.stanford.edu</td>
<td>info-mac/comm</td>
<td>news-watcher-102.hqx</td>
<td>ASCII or BinHex</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snuz</td>
<td>ucselx.sdsu.edu</td>
<td>pub/ibm</td>
<td>snuz100.zip</td>
<td>binary</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trumpet</td>
<td>tasman.cc.utas.edu.au</td>
<td>pub/pc</td>
<td>trmp104b.zip</td>
<td>binary</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>StuffIt 1.5.1</td>
<td>ftp.cso.uiuc.edu</td>
<td>mac/util</td>
<td>stuffit1.5.1.sea</td>
<td>MacBinary</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CompactPro</td>
<td>ftp.cso.uiuc.edu</td>
<td>mac/util</td>
<td>compactpro.sea</td>
<td>MacBinary</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PKZIP 1.1</td>
<td>ftp.cso.uiuc.edu</td>
<td>pc/exec-pc</td>
<td>pkz110.zip</td>
<td>binary</td>
</tr>
</tbody>
</table>

(continued on page 12)
Network administrators who do not currently have access to a CCSO Unix account and newsreader such as nn, have several options for reading Netnews (and thus, the uuc.campusnet newsgroup). First, all members of the Computer Consultant Support Program (CCSP) are entitled to a free account on ux1, which has several Unix client newsreader programs installed, including nn, rn, and xrn (for X-terminals). To find out more about CCSP and/or acquiring a free ux1 account through this program, contact Lynnell Lacy at 244-1258 or through e-mail: ccsp@ux1.cso.uiuc.edu. Also, if you have a direct connection to UIUCnet and a desktop computer such as a Macintosh or IBM PC (or compatible), there are several public domain and shareware client newsreader programs available that provide transparent access to Netnews articles within the context of your native operating environment. For more information on newsreaders available for the Macintosh and PC, see the article entitled Netnews for Poets beginning on page 4 in this issue.

Aside from the new services offered through the newsgroup uuc.campusnet, Netnews itself can be a vital information source for every network administrator. Many of the roughly 1700 newsgroups available on the CCSO Netnews server cover technical topics such as TCP/IP networking, proprietary LAN operating systems, e-mail and news software, information on accessing networks all over the world, important industry announcements on new and upgraded products for virtually every computer platform, etc. Any person providing computer support or simply interested in taking greater advantage of network resources can find much valuable information in this international bulletin board service.

### CCSO Terminal Servers Upgraded

Sixteen new V.32 bis modems were installed on the CCSO terminal server at the end of February. The modems are set for a throughput rate of 38,400 bps with all data compression enabled. The rotary phone number to reach the new high-speed modems is 333-5069. Please do not use this number unless you have a V.32 or V.32 bis modem (or unless all other lines are busy). With the addition of these modems, there are now 124 modems in 5 rotary pools on the three terminal servers (Mossberg, term1, and term2). A list of the modems and their respective phone numbers is shown in the table on page 10.
The CCSO Terminal Servers

<table>
<thead>
<tr>
<th>Modem type (# of modems)</th>
<th>Mossberg</th>
<th>term1</th>
<th>term2</th>
</tr>
</thead>
<tbody>
<tr>
<td>300/1200/2400 MNP-5 (76)</td>
<td>333-4000</td>
<td>333-4071</td>
<td>333-2258</td>
</tr>
<tr>
<td></td>
<td>333-4006</td>
<td>333-4008</td>
<td></td>
</tr>
<tr>
<td>300/1200/2400 MNP-4 (16)</td>
<td>333-4007</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>333-4092</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US Robotics HST (6)</td>
<td>244-4976</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>333-5020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telebit PEP/V.32 (10)</td>
<td>244-5109</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>333-5161</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US Robotics V.32bis (16)</td>
<td></td>
<td>333-5069</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>333-5077</td>
<td></td>
</tr>
</tbody>
</table>

For the most current information on the modems and their associated phone numbers on the CCSO terminal servers, type the command `help` at the terminal server prompt. You should always call the first number listed for your specific modem type (the numbers listed in boldface in the table above). For example, if you have a plain-vanilla 300, 1200, or 2400 baud modem, call 333-4000. If your modem uses one of the error correction or data compression protocols listed in the table, call the first number given for that type of modem. If, when you dial the number, you get a ring and no answer, you have probably reached a broken modem on the rotary you dialed. Please report the problem to the Network Operations Center by calling 244-1000 and then try using one of the alternative numbers.

Further improving the service of the terminal servers was the recent linking of the rotaries serving the MNP-5, Telebit, and US Robotics V.32bis modems. Dialing 333-4000 provides access to 102 modems and should significantly reduce the frequency of busy signals encountered during peak hours. Additional improvements are planned for the terminal servers over the next several months. Once these new services have been implemented and stabilized, a revised version of CSO User Guide #101, The CSO Terminal Servers will be made available.

New Policy for Obtaining Ph Passwords

A new policy has been implemented for obtaining passwords to the CCSO Nameserver, Ph. Previously, users were required to send an e-mail request to the address namserv@uiuc.edu in order to receive their passwords. This former method of password distribution has been disabled. Passwords are now administered by the CCSO Accounting and Distribution Office in 1420 DCL. If you never requested a password in the past or received a password before March 13 and didn’t change it, you can obtain a new password from the Accounting and Distribution Office. Pass-
words will only be issued to staff and students with valid University identification cards.

The password policy change has been made primarily for security reasons. Although the procedure may seem a bit more cumbersome in that it requires an excursion to DCL, there are a couple of advantages (in addition to the exercise) to the new system. First, the Accounting and Distribution Office is willing to make changes to your Ph entry for you (such as entering your e-mail address or information in other fields of the database) when you request your password. This new service will be appreciated by the many users who have complained that the process of modifying Ph entries is too difficult. Secondly, a recent change in the Ph password validation procedure makes it unnecessary to enter a password if you are logging in to Ph from the account listed in the email field of your personal Ph entry. (For example, if I am logged into my account (ward) on ux 1 and the email field in my Ph entry is ward@ux1.cso.uiuc.edu, I needn’t enter a password when logging in to Ph.) The same is true for departmental Unix systems with Ph version 5.0 or later installed. The latter feature is not yet available on VMD.

If this entire article seems like Greek to you, stay tuned to the next issue of UIUCnet, which will provide an overview of the Ph Nameserver, the services it offers, and easy methods for accessing and modifying Ph information without logging in to CCSO mainframes.

+++ PBS TV Series: The Machine That Changed the World

Beginning in April, WILL-TV/Channel 12 will be airing a five-part series on the history of the computer and its impact on society. Aptly titled The Machine That Changed the World, the five one-hour programs are scheduled for Monday evenings at 8PM from April 6 through May 4. A brief summary of each program is given below:

April 6 - Giant Brains covers the wartime events that led to the 1946 debut of ENIAC (Electronic Numerical Integrator and Computer), the world’s first working electronic computer.

April 13 - Inventing the Future examines how the computer rose from virtual obscurity to become the engine that powers business throughout the world.

April 20 - The Paperback Computer explores how computers became so small, affordable and easy to use that ordinary people—almost in spite of themselves—began indulging.

April 27 - The Thinking Machine focuses on the most ambitious goal of all: creating a computer that will vie with human intelligence.

May 4 - The World at Your Fingertips looks at the social revolution wrought by computers.

The series will include interviews with some of the most influential people in the areas of hardware and software development including J. Presper Eckert, who, with physics professor John Mauchly, built the first working electronic computer; Steve Wozniak and Steve Jobs, co-founders of Apple Computer Corporation; William Gates, CEO of Microsoft Corporation; Mitchell Kapor, developer of Lotus 1-2-3; Marvin Minsky, MIT theorist regarded as the “father of artificial intelligence,” and many others.

The Machine That Changed the World is a coproduction of the WGBH Science Unit, producer of NOVA, and the British Broadcasting System (BBC), in association with NDR/Germany. Funding is provided by Unisys, the Association for Computing Machinery (ACM), and the National Science Foundation. The series is closed captioned for hearing-impaired viewers by The Caption Center at WGBH, Boston.

-The above article is a summary of fact sheets made available by PBS

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About UIUCnet  

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Netnews for Poets...

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this number or any of the other information about your local network, consult with your local network administrator. Mac newsreaders generally retrieve such information automatically from MacTCP.

- IP address of your building router (gateway): Here again, on DOS machines this information can be retrieved from the config.tel file (on the same the line as that containing the phrase gateway=1) or from your network administrator. MacTCP provides this information automatically to Mac newsreader programs.

- Netmask: Enter the number 255.255.255.0. Although the Campus Area Networking group has recently begun assigning variable length subnets, this netmask number should continue to work for most hosts.

- IP address of the DNS nameserver or host: Enter one (or more, if requested) of the following nameserver numbers: 128.174.5.58, 128.174.5.50, or 128.174.2.3.

- IP address of the timeserver or host: Enter 128.174.5.58.

- IP address and/or domain name of the Netnews (NNTP) server or host: If a domain name is permitted (as opposed to an IP number), enter news.cso.uiuc.edu. The current IP address of the CCSO Netnews server is 128.174.5.59, but this may change at some point in the future. The domain name, on the other hand, will not change even if the Netnews software and files are moved to a different host.

- IP address of the SMTP (mail) server or host: Many Netnews clients assume that the Netnews server is also the SMTP server. Even if you ordinarily use a different SMTP server, it should be safe to use the address 128.174.5.59.

- Personal information: Most Netnews clients will ask you to enter personal information such as your name, your organization, your e-mail address, etc. This information will appear in the header of your postings, follow-ups and e-mail replies, so be as accurate as possible.

- Lynn Ward
Imagine a computing environment in which it is possible, using an interactive networked calendaring system, to schedule a meeting with two other colleagues to work on the outline of a paper. The next day, you and your colleagues arrive at your individual offices (each in a different building on the UIUC campus) at the designated meeting time. After checking your electronic mail and reviewing your calendars, you begin to work together on the project using a Macintosh software package called Aspects, a group writing, drawing and painting tool. As the lead writer for the paper, you create an Aspects session that the others join. Aspects permits you and the other two writers to have the same paper on your respective Macintosh desktops, and all are allowed to edit it. Using the Aspects chatbox utility (a special window for holding real-time electronic conversations), your group decides that certain preliminary issues might best be addressed over the telephone. A three-way conference call allows you to converse about the overall design of the paper and maintain voice communications as questions arise during the writing process. Each writer agrees to outline a specific segment of the paper and sets about his work. After about half an hour, you begin reviewing each other’s outlines, making comments and additions as necessary. You and your fellow collaborators then agree to get back together in the same fashion on the next day, by which time each is expected to have fleshed-out his section of the paper.

Or, perhaps you are a student enrolled in an introductory Life Sciences course. Part of your assignment is to review the images of leaf structures made by you and other students in your lab section using video cameras attached to a microscope and a Macintosh computer. You arrive at a CCSO site at Lincoln Hall, sit down before a Macintosh with a color monitor, and log into the AppleShare server made available to you for your class project. There you find the Mariah image catalog software (a library system for storing animations, QuickTime movies, text and/or sound files) and you begin reviewing the full-color images collected earlier in the day. You read the notes that your professor placed into your folder on the server and discover that she created a new scientific animation with audio voice-over that she wants you to review before class—more homework!!! By opening the folder entitled QuickTime movies and double-clicking on the designated file, a full-color narration of a plant opening appears on your screen. You are able to scroll back and forth through the animation to selectively view elements of the movie and happily conclude that homework does not necessarily have to be humdrum.

Campus-wide AppleTalk Networking

If the possibilities of network-based collaboration and information sharing of this sort intrigue you, it is worth knowing that the scenarios described above are not just hypothetical. These and similar activities have actually been occurring on this campus for almost a year. For those already acquainted with Macintosh networking, the ability to share files, applications, printers, and other resources with such ease may not seem particularly remarkable. After all, almost from their inception, Macintosh computers had built-in networking capabilities that made it simple to share resources within a single department or building. University staff and students have been taking advantage of these features for years. The extraordinary aspect of the examples above is that the network resources being shared span multiple networks and buildings across the UIUC campus.
The deployment of campus-wide AppleTalk networks at the University of Illinois began as a response to the growing need to share and manage network resources across different buildings on campus, while at the same time providing an intuitive, graphical environment for the end-users who would ultimately share these resources. Such an arrangement would allow staff and students to utilize network resources (files, applications, printers, etc.) from a variety of locations without regard for the actual physical location of the shared resource. This was particularly important for academic and administrative units that were not confined to a single building. The School of Life Sciences (SOLS), for example, is spread out among multiple buildings, each of which originally had its own AppleTalk network. Initially, users of the various SOLS AppleTalk networks could only see and use the resources within their own buildings. Users at the National Center for Supercomputing Applications (NCSA) faced similar problems.

### AppleTalk Tunnelling—An Interim Solution

A technology known as AppleTalk tunnelling provided a preliminary solution for both SOLS and NCSA. To put it simply, AppleTalk tunnelling is the process of encapsulating AppleTalk packets (the basic units of information passed between nodes on an AppleTalk network) within IP packets (the basic units of information passed between nodes on a TCP/IP network) so that they can be sent across the campus network using the Proteon backbone routers, which, until recently, only supported the TCP/IP and DECnet protocols. To the Proteon routers, these encapsulated packets look no different than any other IP packets and are routed using standard TCP/IP routing protocols. Special hardware and software at each end of the tunnel take care of wrapping AppleTalk packets inside IP packets, sending them to a building’s Proteon router, and unwrapping them once they have reached their final destination so that they can be understood by the AppleTalk network at the other end.

Both NCSA and the Beckman Institute used tunnelling as their principle inter-building AppleTalk integration strategy until recently when they migrated to direct AppleTalk support through Network Systems Corporation’s routers. In the fall of 1990, the School of Life Sciences began integrating the AppleTalk networks in its five main buildings using the AppleTalk tunnelling capabilities offered by Cayman Systems’ GatorBox routers (see Figure 1 below). By the fall of 1991, the SOLS tunnelling effort had expanded to include at least eight separate departmental groups. This created AppleTalk linkages between Turner Hall, the Plant and Animal Biotechnology Laboratories, Morrill Hall, Burrill Hall, Davenport Hall, and the Natural History Building. In late fall of 1991, the LAS HyperMedia Lab and a CCSO remote site (both in Lincoln Hall) were added. Within days of the inclusion of Lincoln Hall into this expanded network, students from Life Sciences began using the CCSO remote site for coursework, obtaining their programs and data from AppleShare servers located in Morrill Hall. Tunnelled connections were also established with the various AppleTalk networks in the Digital Computer Lab.

Despite the success of this wider-area AppleTalk solution, the decentralized management of a rapidly expanding universe of “tunnelled” connections became a concern. Each AppleTalk...
router had to be configured specifically to communicate with other routers over the TCP/IP network. The coordination of router information, restarts, and AppleTalk network numbers was seen as problematic for those organizations without strong internal controls on network devices. A series of meetings between network designers, network administrators, and members of the Campus Area Networking group led to the inevitable conclusion that, if campus-wide AppleTalk networks were going to continue to grow and evolve at UIUC, a single organization had to become responsible for the overall management of the operation. Thus, Greg German from the Network Design Office accepted the responsibility of allocating AppleTalk network numbers using an algorithm derived from the IP subnet number assigned to the building or departmental network involved.

AppleTalk Support on the Campus Backbone

Since January 1992, Campus Network Architect Charley Kline has been exploring the possibility of using the campus backbone routers to pass AppleTalk packets directly onto the campus backbone itself, as an alternative to encapsulating them within IP packets. After initial tests with the School of Life Sciences, this solution was put into production and has largely replaced AppleTalk tunnelling on campus. As of this writing, several other departments and buildings have joined the campus-wide AppleTalk network including Geology in the Natural History Building, Turner Hall, the English Building, the Foreign Languages Building, the Medical Sciences Building, and the Plant and Animal Biotechnology Lab.

Centralized support for AppleTalk routing across the campus backbone has several advantages over AppleTalk tunnelling. First, it reduces the overall cost of AppleTalk routing for the campus. Second, the RISC-based Proteon backbone routers are considerably faster than the Cayman or Shiva routers that were used for IP tunnelling, and, of course, the overhead involved in wrapping and unwrapping packets at each end of the tunnel is no longer a factor when AppleTalk packets are passed directly onto the backbone. Finally, centralized management of the project decreases the potential for network zone, number, and device name conflicts as new AppleTalk networks are brought online.

End-User Benefits: Campus-wide Resource Sharing through the Chooser Metaphor

What are the ramifications of all of this techno-babble for the end-user? In short, campus-wide AppleTalk networking avails a wealth of shared resources to Macintosh users without requiring any technical knowledge of what is going on behind the scenes. All shared printers, applications, file servers, and other networked devices are accessible through the standard Macintosh Chooser desk accessory (see Figure 2 on this page). The Chooser is essentially a window containing several smaller windows. Shareable resources are displayed as icons in the upper left quadrant, AppleTalk zones (logical groupings of network resources) are listed in the lower left, and the specific devices associated with the currently highlighted resource and zone are displayed in the upper right. Accessing a device is as simple as clicking on the resource icon, selecting a zone, and clicking on one of the available devices within that zone. Once selected, a remote file server or printer behaves just as if it were a hard disk or printer attached directly to your computer. For seasoned Mac users, accessing resources in other buildings across campus should be no different than using the resources on a local AppleTalk network. Less experienced users should be warned that, since the Chooser responds dynamically as networks and devices are added and removed from the campus-wide AppleTalk network, the appearance of the Chooser may change from session to session. As more and more buildings participate in the campus-wide AppleTalk network, the list of zone names and resources displayed by the Chooser will inevitably grow.

AppleTalk Netiquette

Campus-wide AppleTalk networking and the Macintosh Chooser truly put the power of the network into the hands of the end-user. However, along with all of this power comes responsibility. One of the goals of the campus-wide AppleTalk network is to break down the physical barriers between buildings by creating a seamless internet where the actual location of network resources need be of no real concern to the user. An open environment such as this encourages collaboration, creativity, and the development of new and innovative ideas and methodologies for teaching.

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research, and the dissemination of information. However, such an open environment also makes it possible for mischief makers to make their presence (if not their identity) known. Users are certainly encouraged to experiment with resources that are intended for public use. For example, file servers with the guest login enabled are intended to be open to the public. But, if access privileges to a particular resource have obviously been restricted, it is important to respect those restrictions. Hacking your way into a restricted file server is, after all, really no different than breaking into a locked office where confidential papers reside.

Users should also exercise common courtesy with respect to shared printers. Currently, the Proteon routers do not offer zone or device filtering. This means that all printers, plotters, and other output devices on networks that are part of the campus-wide AppleTalk network will show up in the Chooser. Do not consider this an invitation to use any printer on campus. Printers typically "belong to" single individuals, a small group, or a department. You are probably already familiar with the printers that you should and shouldn’t use in your own department or lab. In general, it is best not to use remote printers unless you are explicitly invited to do so.

Summary

The implementation of AppleTalk routing on the campus backbone offers tremendous potential for inter-building, inter-departmental, and inter-disciplinary collaboration and information sharing. Part 1 of this article has touched upon many of the issues that will be of interest to end-users. Part 2—intended for network administrators—addresses the specific technical details involved in getting connected to the campus-wide AppleTalk network. In a future article, we hope to cover some of the applications that are currently enhancing productivity in the campus-wide AppleTalk environment.

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This article was jointly produced using Group Technologies Aspects collaboration software for live, interactive brainstorming and writing. Three types of collaboration were used, all successful: 1) same location, same time; 2) different location, same time; and 3) different location, different time. Some interactive sessions were held in a campus-town restaurant using a LocalTalk network consisting of three Macintosh PowerBooks to the amazement and chagrin of our waiters—fortunately, the PhoneNet cords were impervious to taco sauce!). Remote connections were made using AppleTalk Remote Access. Electronic mail was used to pass final versions of the article and associated graphics to the authors and other interested parties. Questions about the production of the article or its content can be addressed to Doug Walsten or Roy Roper.

Part 2: Getting Connected—Advice to Network Administrators

If you are a network administrator or simply a Macintosh user, you may be wondering what to do in order to get your building connected to the campus-wide AppleTalk network. The initial point of contact for those interested in campus-wide AppleTalk networking is Greg German of the Network Design Office at CCSO (phone: 333-8293, e-mail: g-german@uiuc.edu). Ideally, the administrator responsible for your in-building network should get in touch with Greg. In the absence of an assigned building network administrator, a departmental CCSP (Computer Consultant Support Program) representative can get the ball rolling. Greg will help clarify what this wider network access can do for end-users and outline the numerous technical issues that must be considered and/or acted upon before AppleTalk routing is enabled on the backbone Proteon router to which your building is attached. Many of these issues are summarized below:

- If, after your initial consultation with Greg German, you decide that participation in the campus-wide AppleTalk network would benefit your users, contact Charley Kline of the Campus Area Networking group (phone: 333-3339, e-mail: cvk@uiuc.edu) to determine the feasibility and timing of enabling Appletalk Phase II routing on your building's Proteon router.

- Each building's Ethernet and LocalTalk networks must use AppleTalk network numbers that fall within a range prescribed by the Network Design Office. Because duplication of network numbers can result in routing conflicts and network failures, using numbers in the range prescribed by the NDO is absolutely crucial to network stability. Requests for AppleTalk numbers should be addressed to appletalk@uiuc.edu.

- The network administrator(s) responsible for the building's Ethernet segment must identify all of the AppleTalk router devices or processes in the building. These would include Shiva FastPaths, Cayman GatorBoxes, Farallon Liaison software, CAP processes on Unix hosts, Xinet routing software, Shiva's NetModem, NetSerial and NetBridge products, and Dayna's EtherPrint modules. Each of these devices can propagate network numbers and zone names. A

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Campus-wide AppleTalk Networking...

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coordinated change in the network numbers and zone names used by these devices must occur before the network can be advertised on the campus backbone. The Network Design Office will work with administrators to make determinations about router processes. Greg German is currently investigating the creation of a "certification" process for each building in order to reduce the number of changes in network zone names and routing information. Network administrators will be advised on a variety of network administration software that would be helpful for monitoring the AppleTalk network.

If your building is not already equipped with routers that handle LocalTalk-to-Ethernet traffic, you will probably have to purchase some additional equipment in order to move packets from your LocalTalk network to the building Ethernet. Possible solutions are the GatorBox from Cayman Systems or FastPath 5 from Shiva Corporation. If you have a very large LocalTalk network spread across multiple floors, you may also need a LocalTalk repeater such as the Farallon StarController or Cayman's GatorStar GX, a combination LocalTalk to Ethernet router-repeater that connects up to 96 Macintosh nodes to an Ethernet. For advice on what kind of equipment to purchase, contact the Network Design Office at 244-1600.

The names of the AppleTalk zones that appear in the Chooser should be coordinated to present a simple structure specific to the local network. See Figure 2 on page 3 for examples of zone names. Notice that the zones associated with specific administrative or departmental entities all begin with the same prefix. The result is that such zones are grouped together alphabetically in the Chooser so that users can navigate the services associated within their office, department, or unit with ease. Additionally, both zone and device names should be as intuitive and self-explanatory as possible.

System Security

There are some additional concerns that network administrators should address systematically before implementing AppleTalk routing to the campus from their buildings. Some of these issues relate to security and others relate to limitations within the Macintosh Operating System version 6.0.x. The security issues are a result of the openness of the AppleTalk protocol, which was originally designed for small local area networks.

The AppleTalk routing protocol on the Proteon routers does not support the exclusion (or filtering) of devices based upon their zone name or device type. This means that devices such as LaserWriter printers are available for anyone on the campus-wide AppleTalk network to use. Several router vendors, including Proteon, are aware of these issues and are drafting new specifications that would let a network administrator identify the particular networks and zones to be "projected" out to the wider campus network. Until these new specs are adopted and implemented by routing vendors, the only filtering available is through the IP tunnelling strategies described earlier in this article. Given the openness of the current generation of AppleTalk routers, here are some points to consider:

- The issue of printer access or security should be reviewed. What once may have been a small, local network of 20 computers and 4 printers is now connected to a campus-wide network. Any and all AppleTalk devices that appear on your net are now visible to all others on the campus AppleTalk network. For example, if you have several LaserWriter printers in your area, others on the larger network can print to your laser printers at any time. Educating users about responsible utilization of the larger network is key to avoiding this kind of problem.

- Under System 7.0 each user has the option of enabling Personal AppleShare for sharing parts or all of his or her hard drive(s) with individuals, groups of users, or guests. If a user has personal file sharing turned on under System 7, anyone on the larger network can access files on that machine if the guest account is enabled and a folder is shared with default privileges. Most end-users are under the impression that all system security matters are handled by someone other than themselves. With the personal file sharing capabilities of System 7, this is no longer the case. Individual users must assume responsibility for the security of their own machines. Otherwise the information on their machines could be compromised. Administrators should educate end-users about the security ramifications of personal file sharing. If security problems with personal file sharing should occur, administrators may want to consider investing in a new product from Trik Inc. called NokNok, which can capture information about users who log into computers running Personal AppleShare.

- With the introduction of Macintosh PowerBooks, Apple released a product called AppleTalk Remote Access (ARA). ARA allows a user to attach a modem to a Macintosh and make it available for dialing in from home or some other location. When a connection is established, the user has the choice of seeing the entire network or just the Macintosh at the other end of the call. As with personal file sharing, it is important that users do not have the guest account enabled for ARA dial-in.

Chooser Limitations

- One problem associated with implementing larger AppleTalk networks is seen by System 6.0.x users. The System 6 Chooser has a memory buffer limit of 512 bytes for holding the names

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of zones, devices and services. This amount is so small that several long zone names or a large number of devices per zone can cause the device list in the Chooser to "jump"—that is, just as one is about to click on a zone, device or service, it disappears or jumps to another location in the list. Although the device may eventually be selected, the list will continue to jump. Once a successful selection is made, however, it remains in effect until a different item is selected.

Upgrading to System 7 fixes the Chooser limitation entirely, but not all Macintoshes are equipped to run System 7. System 7 requires at least 2MB (preferably 4MB) of memory and a hard disk. A temporary solution is to use short zone and device names so as not to exceed the Chooser's memory buffer. A third-party product named Silver Cloud under development by The AG Group promises to fix the Chooser problem at a low cost. In any case, administrators should take System 6 users into consideration before connecting to the larger net.

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High-Performance Computing Bill

On December 9, 1991, the High Performance Computing Bill of 1991, known in its various iterations as "The Gore Bill" or "The NREN Bill," was signed into law by President Bush.

"Congressional action on the High Performance Computing and Communications Bill provides strong national recognition of the importance of the national networking effort in which Merit, Inc., has played a pioneering role," commented Dr. Douglas Van Houweling, Merit Board of Directors member and Vice-Provost for Information Technology at the University of Michigan. "The hard work is just now beginning, however, for the expectations of our colleagues and the competition for access are continuing to rise rapidly. Merit will continue to work with the networking community in response to these demands."

Obtaining an Electronic Copy

Readers may retrieve an electronic copy of the document [the Gore Bill] from the Merit/NSFNET Information Services server, nis.nsf.net, via file transfer protocol (FTP). The file to retrieve is:

internet/legislative/actions/nrenbill.txt

NSF Plans for Future Backbone Services

At the end of November 1992, the existing five-year cooperative agreement which the National Science Foundation has with Merit for NSFNET backbone services comes to an end. For those who have come to rely on the NSFNET for the work they do in research and education, the question of "what happens next?" is critical to assuring stability and planning for the future.

Some answers are at hand since the National Science Board met at the end of November and approved a plan put forth by NSF’s Division of Networking and Communications Research and Infrastructure.

"NSF plans to make a draft solicitation for the Backbone follow-on available sometime in March for a two to three month period of public comment," said Steve Wolff. He added that NSF hopes to issue the solicitation in May or June of this year.

No Service Interruption for Users

The plan has two aspects: the first is a provision which will assure that users will see no interruption in service when the current agreement expires. The second is a set of solicitations for longer-term provision of services. "As an association of network and information service providers, FARNET [Federation of American Research Networks] has endorsed the principles of competition and choice, especially where the market for these services is maturing," said Laura Breeden, Executive Director of FARNET. "We are looking forward to working with NSF on the implementation of its plans for the INREN [Interim National Research and Education Network]."

Plan Reflects FARNET Recommendations

This past November FARNET submitted a number of recommendations to NSF regarding interregional connectivity after November 1992. The plan reflects some aspects of the FARNET input, as well as the input of many other individuals, federal agencies, and organizations with whom NSF consulted.

Obtaining an Electronic Copy

A complete copy of the document [the NSFNET development plan] may be obtained via anonymous FTP to nis.nsf.net. The directory is /nsfnet/news/releases/ and the document to retrieve is: nsfnet.project.development.plan

-Merit/NSFNET Information Services. Reprinted from LINKLETTER (the newsletter of the Merit/NSFNET Project), March/April 1992, vol. 5 No. 1)
New ACN Welcome Screen Provides Public Access to Library and Other Services

The Administrative Computing Network (AISS) is now offering access to state-wide library information and other public services to users without ACN accounts. Access to these services is provided through the new ACN welcome screen shown in Figure 1. Option A on the welcome screen is intended for ACN clients with registered accounts and takes the user directly to the Client Access System Entry Validation Screen where s/he can log on as usual. Option B is available to any user (even those without ACN accounts) and provides access both to the full-screen mainframe interface to ILLINET Online (the state-wide online library catalog system) and the Illinois Bibliographic Information Service (IBIS), an easily searchable collection of commercially produced journal indexes (for detailed information on ILLINET Online and IBIS, see the article entitled ILLINET Online Gets an Interface Lift in the Dec.91-Jan.92 issue of UIUCnet, vol. 4, #5). Presently, the IBM Information Network is the only service available through Option C, but AISs hopes to expand the offerings under Public Services to include a variety of information that could be of interest to faculty, staff, and students such as the campus phone book, academic course timetables, indexes to the Campus Administrative Manual, etc.

ACN Library Access (A Solution for IBM 3270 Terminal Users)

UIUCnet users may prefer to access the library system by telnetting to garcon.cso.uiuc.edu, port 625 (the TCP/IP gateway to library services called IO Plus) rather than using the ACN access method, because the IO Plus gateway offers CARL UnCover (another online database of journal indexes) in addition to the ILLINET Online and IBIS services. However, there is a limited group of UIUCnet users—those with IBM 3270 class terminals (e.g., 3270 terminals hard-wired to VMD)—who are unable to use the IO Plus gateway because it does not support IBM 3270 emulation. For this particular group of users, the new ACN Library Services option affords the only viable means of accessing full-screen, online library catalog information.

Even UIUCnet users who are able to use the IO Plus gateway may, at times, find the ACN services useful. The IO Plus gateway is presently restricted to eight simultaneous users, and it is not uncommon for all eight ports to be busy at once. Under such circumstances, the ACN gateway to Library Services provides a convenient alternative, since it supports up to 40 concurrent telnet sessions for ILLINET Online. Additionally, any UIUCnet user who is logged on to VMD from a PC, Mac, or workstation can telnet directly to the ACN from VMD to get library information and then return to his or her VMD session. This approach is generally preferable to closing the VMD session in order to open a new telnet or tn3270 session with the IO Plus or ACN library gateways.

Accessing the ACN from VMD

To access ACN Library Services from VMD, get to the VMD ready prompt and type the following commands:

```
linkto tcpip
telnet uicmvs/aiss.uiuc.edu (or telnet 131.193.163.4)
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You will probably have to press the clear key (or your keyboard equivalent) at least once to get to the ACN welcome screen.

Accessing the ACN from PCs, Macs, and Unix Mainframes

When accessing the ACN from a PC or Macintosh, one must use tn3270 software rather than the standard NCSA Telnet remote login software. Public domain versions of tn3270 software—Clarkson University’s CUTC/CUTE for the PC and Brown University’s tn3270 for the Mac—are available from the CCso Resource Center at 1420 DCL. The commercial package PC/TCP Plus by FTP Software Inc. (heavily discounted on campus through a CCso site-license agreement) also provides TCP/IP-based remote login with 3270 emulation for IBM PCs and compatibles. To access the ACN with one of the latter packages, open a tn3270 session using either the host name uicmvs/aiss.uiuc.edu or the IP address 131.193.163.4. (The specific details on how to open a session with a remote host should be covered in the documentation for your tn3270 software.)

All CCso Unix machines have a tn3270 utility installed. To access the ACN from one of the Unix mainframes, enter tn3270 uicmvs/aiss.uiuc.edu or tn3270 131.193.163.4 from the Unix command prompt.

Using Library Services

Once a connection is established with the ACN mainframe UICMVSA, you should see the welcome screen shown in Figure 1. To access Library Services, choose menu item B. The next

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Terminal Server Update

The software on the CCSO terminal servers has been upgraded resulting in the addition of several new features and services. Some of the new services are diagnostic in nature while others provide end-users with some alternative connectivity options. All of the previously existing services are also still in place, so users already familiar with accessing the terminal servers do not need to learn any new commands to perform their usual tasks. The newly implemented services are described below:

Terminal Server Login

It is now possible to login to the terminal server. This feature is currently used for diagnostic purposes, allowing CCSO staff to determine the port and server to which you are connected when you dial in. At the present time, terminal server login is strictly voluntary and unnecessary unless you are experiencing specific difficulties.

The terminal server uses ph aliases and passwords for login purposes. To login, enter login at the terminal server prompt (mossberg>, term1>, or term2>). At the Username: prompt, enter your ph alias. You will then be prompted to enter your ph password. For example:

mossberg> login
Username: l-ward1
Password: ph_password_for_l-ward1 (password will not be echoed to the screen)
mossberg>

Once logged in, you can conduct your terminal server session as usual. The only difference is that your port and server connection will be recorded in a log that can be viewed by Network Operations Center (NOC) staff. If you have trouble and lose a connection, call the NOC at 244-1000. They will locate your session in the log and check the particular port and modem to which you were connected for hardware and/or configuration problems.

Support for the XRemote Protocol

An X11 dial-up protocol is supported by the new terminal server software. At present, this protocol only works with NCD X Terminals and has not yet been fully configured on the terminal servers. Individuals interested in using XRemote should contact Matt Ward by e-mail at azxopss@uiucvmc.bitnet.

TN3270 Remote Login Now Supported

The implementation of the tn3270 remote login protocol is perhaps the most noteworthy addition to the list of new terminal server options. This utility permits users to establish true tn3270 sessions with VMD and, more significantly, with the IBM mainframes on AISS’s Administrative Computing Network, which were formerly inaccessible through the CCSO terminal server.

Prior to the upgrade, the terminal server only offered 3270 emulation for the CCSO mainframe VMD. The latter service was handled by a 3270 emulation device called the 7171, a piece of hardware hard-wired to both VMD and one of the terminal servers. To access VMD in full-screen mode, users typed the hostname vmdfs which piped the connection to VMD through the 7171 terminal emulator. The 7171 can still be used in this manner, but continues to be limited to sessions with VMD. The new tn3270 software on the terminal servers, on the other hand, allows users to connect to any IBM mainframe in the uiuc.edu and uic.edu domains, not just VMD.

To use the tn3270 software, get to the terminal server prompt and then enter the terminal type used by your terminal emulation software by typing: term terminal-type name-of-terminal-type. Next, enter the command tn3270 followed by the name or IP address of the host to which you want to connect. For example, to open a tn3270 session with CCSO’s VMD mainframe, you would type:

mossberg> term terminal-type vt100 (currently vt100 emulation is the default so this command is optional)
mossberg> tn3270 vmd.cso.uiuc.edu

At this time, vt100 is the only terminal emulation defined for the terminal servers’ tn3270 software, and there is only one keymap. If you want to see the default keyboard map, enter the command show keymap at the terminal server prompt. The current keymap works well with VMD but is not entirely consistent with the keyboard mapping expected by AISS mainframes. It is nevertheless serviceable for basic functions such as using the PROFS mail and calendaring features. CCSO would like feedback on what additional terminal emulations and keyboard maps are needed. The space for storing screen and keyboard maps is limited, so only those actually required by users will be added. If you use this service and need a different screen or keyboard map, send an e-mail request to Matt Ward at azxopss@uiucvmc.bitnet.

CCSO’s Netnews Server Moves to UX3

The primary Netnews server for UIUCnet users has been moved from ux1 to CCSO’s recently acquired Sequent Symmetry computer, ux3. All of the client newsreader programs running on CCSO mainframes such as nn, rn, Xrn, etc. have already been reconfigured to access the new server. Although ux1 will continue to run certain news server processes, as of May 15th it will no longer accept user connections. Newsreader client software installed on minicomputers, workstations, PCs and Macs should, therefore, be reconfigured to point to the new server on ux3 as soon as possible.

Reconfiguring Your Newsreader Software

If your newsreader program accepts hostnames rather than IP addresses, use the name news.cso.uiuc.edu for the Netnews (or NNTP) server. The latter name is actually an alias that always (continued on page 9)
points to the computer designated as the CCSO Netnews server (in this case ux3.cso.uiuc.edu), and the alias will continue to be valid, even if the Netnews server should be moved to yet another machine sometime in the future. Some newsreader software will only accept an IP address for the Netnews server. In such cases, use the IP number for ux3, 128.174.2.2. Unix system administrators running the nn newsreader on departmental minis or workstations should contact Paul Pomes (e-mail: paulp@uiuc.edu) for details on optimizing nn by NSF mounting the index files produced by the nnmaster process.

Why Ux3?

The decision to move the Netnews server from ux1 to ux3 was largely performance related. Ux3 is much faster than ux1 for reading (retrieving) and posting news. This is because ux1 served both as a news reading machine and as a primary news switching machine, meaning it exchanged articles with other Netnews servers throughout the state and country. And, of course, ux1 is also used regularly for a variety of non-news related functions by students, faculty, and staff. Under the current arrangement, ux1 will continue to perform the news switching service, and ux3 will function as a dedicated reading machine. By distributing the news reading and switching processes between the two computers, the performance of both increases. Ux3 also has a larger spool area (550 megabytes) for storing news. This allows for the addition of new newsgroups that were excluded from ux1 due to space limitations and for longer retention of existing articles. Thus, in the long run, despite the minor inconvenience of reconfiguring newsreader client software, end-users will benefit from the switch.

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network design office has
new neighbors: ccsO engineering

One of the first signs of the recent merger of CSO and the Office of Telecommunications was the relocation of the Telecommunications Engineering group (now called CCSO Engineering) from University Inn to 1535 DCL, directly across from the Network Design Office. Both the NDO and the Campus Area Networking group have had a long-standing relationship with the telecommunications engineers. Closer proximity to CCSO Engineering is viewed by all concerned as an opportunity for increased cooperation and easier access to the vital information the engineers maintain about the campus-wide voice and data communications infrastructure.

What Does Wally Do?

When CCSO Engineering began settling into their new office, many DCL inhabitants, unfamiliar with the mission of their new neighbors, wondered and occasionally uttered out loud, "What exactly does Wally [i.e., Wally Messner, manager of CCSO Engineering] and his staff [Tim Murray, Harold Fetters, Randy Hall, and Karla Reinhardt] do?" Broadly speaking, Wally's group is responsible for the construction of the telecommunications cable plant that exists on campus, a distribution system consisting of 110 manholes, 90 miles of underground copper cable and 69 miles of fiber-optic cable serving over 22,000 stations. This involves many discrete, but related activities. Primary among them is the physical design or layout of in-building (inside plant) and inter-building (outside plant) telecommunications systems. Tim Murray, project engineer for the group, compares this process to the building of highways over which specific vehicles (hardware) powered by different fuels (software) travel.

The CCSO Engineering group is principally concerned with the highways themselves, that is, the physical media (copper, coax, single and multi-mode fiber, etc.) over which telecommunications data is transported. But in order to do their job successfully, the engineers must have a thorough understanding of what will be riding on top of those highways. Thus, they work closely with the networking groups on campus as well as those involved in the installation and maintenance of voice communications equipment to ensure that the roads they build will meet the campus voice and data communications needs of today and the future.

Documenting Systems with AutoCAD Drawings

CCSO engineers document the configuration and evolution of outside and inside plant telecommunications systems using the computer-aided design (CAD) software AutoCAD. Drawings of outside plant systems show the main wiring distribution centers (called nodes), the conduit paths that connect one node to the next, and the paths that connect the nodes to the various buildings they service. Inside plant CAD drawings are maintained for every campus building with twenty or more A-B telecommunications jacks (the University's standard dual jack configuration in which the so-called A-jack is used for telephone connections and the B-jack is used or reserved for data communications/computer networking). The drawings of in-building communications systems consist of multiple layers. At the bottom layer is a footprint of the basic floorplan of the building. Another layer shows the conduit paths within the building and a third layer shows the building cabling distribution. As telecommunications systems are changed or updated, the AutoCAD drawings are modified to reflect their most recent state. NDO staff rely heavily on CCSO Engineering's drawings to determine whether the existing cabling infrastructure is adequate or must be reinforced for the in-building network and whether and where special hardware will be required to handle distance problems.

 Developing and Enforcing Standards

Another critical function of the CCSO Engineering group is the development and enforcement of standards for campus-wide telecommunications systems. Their current standards, set forth in the 1989 UIUC Building Standards, deal primarily with voice and, secondarily, data communications using the B-jack. The group is now in the process of revising standards to include specifications (continued on page 10)
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ACN Public Services...  (continued from page 7)

screen will present you with the option of selecting IBIS or IOMENU, the ILLINET Online Catalog. Both of these services function exactly as described in the Dec.91-Jan.92 issue of UIUCnet with one minor exception: When accessing IOMENU, you will initially be presented with a screen resembling that in Figure 2. If you press <enter>, all 800+ libraries in the state-wide library system will be included in your queries. To limit catalog searches to items on the UIUC campus, enter uc; or enter o to see a complete list of the other libraries you can search. From this point on, follow the on-screen instructions. For more information on accessing the library and public services available on the ACN, contact the AISS help desk at 333-3102.  

-Lynn Ward

CCSO Engineering...  (continued from page 9)

for the installation of coaxial cable, multi-mode fiber and single-mode fiber. With these standards in hand, CCSO engineers work with architects, engineers, and outside contractors to make sure that new construction and remodelling projects conform to existing guidelines and take newer technologies (such as FDDI) into account in terms of the overall project design. When working with outside parties, engineers try to emphasize that investing a few extra dollars during the construction process to accommodate a building-wide fiber distribution can, in the long run, save considerable amounts of money, especially when compared to retrofitting the same building for fiber sometime in the future.

The CCSO Engineering group also works with outside agencies such as the City of Urbana to make sure that all installations conform to city engineering codes. Where two different standards exist (one for the city and the other for the university) generally the more stringent specification is applied.

In Summary

To be sure, these few brief paragraphs have done little more than scratch the surface of the many complex roles played by the CCSO Engineering group. But for those curious about the new occupants of a space in DCL previously used as a storeroom for defunct computer equipment and unwanted furniture, perhaps this article sheds at least some light on what Wally does. In any case, the NDO and other units in CCSO would like to take this opportunity to sincerely welcome their new neighbors.

-Lynn Ward
Some New and Little-known Phacts about Ph, the CCSO Nameserver

Two and a half years have passed since the first feature article on the ph Nameserver database appeared in the UIUCnet newsletter (see Finding an E-Mail Address in the October 1989 issue, vol. 2 #5). Although much of the information in that original article still applies, many changes and additions have been made to the Nameserver, both in terms of the data it contains and the features of the various client programs that access the data. The purpose of this article is, thus, not so much to provide a comprehensive step-by-step tutorial on how to use ph—such information can be found in the ph online help files as well as in CSO User Guide #200: The CSO Nameserver ('Ph') and The Computing Handbook for Students (and Everyone Else)—but rather to cover material that either post-dates, supersedes, or was never included in the latter documents. Also discussed in the following phact list is information that, while not necessarily new, is not widely known even by regular users of the ph utility.

Phact #1: The ph database contains many different categories of information.

In its original incarnation, the ph database was essentially an electronic version of the Student/Staff Directory (the campus telephone book). Today, in addition to the student, staff, and academic unit information found in the campus phone book, ph holds all kinds of other useful data including the complete University Timetable for the fall, spring, and summer semesters; a guide to local restaurants; area codes for major cities and regions in the U.S.; weather conditions and forecast information for many Illinois cities and larger metropolitan areas throughout the country; and special entries created on request such as organizations within departments and student clubs and organizations. Every information category in the ph database is easily accessible through the ph client programs available on CCSO mainframes and from client software that you can install on your desktop computer. For more information on ph client software for desktop computers, see Phact #8. The sidebar on page 3 shows how to query ph for each specific information category.

Phact #2: The data for each information category in the ph database comes from a different source and is updated at different times.

Faculty/Staff Data: Faculty/staff information is provided by the University Payroll Office and consists primarily of name, title, and home/office addresses and phone numbers. Like the printed copy of the campus phone book, faculty/staff information in the ph database is updated once a year, during the month of November. All personal ph entries, however, can be manually updated at any time during the year to reflect changes in personal or professional information such as a new home or office phone number and/or address.

Student Data: The student information in the ph database comes from the Office of Admissions and Records. Anyone who is taking a class at the University is listed in the ph database along...
with his/her phone number, address, curriculum, and, in the case of undergraduates, high school. Student data is updated four times a year: January, June, September, and October. Students, faculty, and staff who have left the University remain in the ph database for a grace period of one year. Such entries are purged during the October update.

By default, the update process that occurs once a year for faculty/staff and four times a year for students overwrites the contents of certain fields in the ph database with information provided by Payroll and the Office of Admissions and Records. If you have customized your ph entry and do not want your modifications to be overwritten during an update, enter a text string into the no_update field of your ph entry. The presence of any data in the no_update field will prevent all but the name and curriculum fields from being updated (the latter two fields are always updated and are, in any case, not changeable by the owner of the entry).

**Important Note:** Updating your ph entry does not update the information held by the Office of Admissions and Records or Payroll. Changes in personal information are processed with the latter offices by filling out the appropriate forms.

**Timetable Data:** The University Timetable information in the ph database is provided by the Office of Facility Planning and Management. The timetable in the database is identical to the printed version and is searchable both by course number and words found in course titles. The fall timetable is available in early March, the spring timetable comes online in early October, and the summer timetable is available in the middle of February.

**Restaurant Data:** The local restaurant guide was originally assembled and updated by former CCSO programmer and consultant Daniel Pommert. The guide has not been updated since summer 1991 and will be removed from the ph database in fall of '92 unless someone volunteers to maintain it.

**Area Code Data:** Telephone area code information in ph comes from an old, pre-existing dataset and is only sporadically and haphazardly updated.

**Weather Data:** Ph weather information is downloaded over serial lines from a commercial service. The data is fed to a CCSO computer and is the source for several weather-related services provided by CCSO including the wxmap program (a utility for producing graphical weather information on X-terminals), the GIF weather map archive, and the weather information in ph. Weather information is updated in real-time as it arrives on the data feed.

**Phact #3:** End-users are responsible for the accuracy of the contents of their own ph entries.

With the exception of the basic data provided by Payroll and the Office of Admissions and Records (and additional information managed by CCSO), end-users are entirely responsible for the content of the other fields in their personal ph entries. The field with which users should be most concerned is the email field. The email field tells other users how to reach you by electronic mail and is also used by the campus electronic mail delivery service. Since many UIUCnet users and individuals at other institutions rely on ph to get e-mail address information for people they need to contact on campus, it is especially important that the email field be filled in and kept up to date.

There are a variety of options for updating the email and other fields in your ph entry. First, you can go to the CCSO Accounting and Distribution Office at 1420 DCL. By presenting your valid university ID to the staff at this office, you can obtain your ph password so that you can modify your ph entry yourself (for more information on ph passwords, see the March 1992 issue of *UIUCnet*, vol. 5 #2). While at the Accounting and Distribution Office, you can also ask a staff member to change the contents of specific ph fields for you. Second, you can give your local network administrator proxy rights to your ph account so that s/he can change your ph entry at your request (see Phact #7 for more information on proxy rights). Finally, if you find the process of editing your ph entry too cumbersome using the ph clients available on the CCSO mainframes, you can obtain a client program designed to run on your desktop computer. Such clients are generally easier to use than their mainframe equivalents, but require a direct connection between your computer and the campus network (as opposed to a modem connection through the terminal server).

**Phact #4:** Ph electronic mail address information for faculty and staff is now published in the paper version of the campus phone book.

This year’s *Student/Staff Directory* is the first to list e-mail address information for faculty and staff. The e-mail addresses in the directory are taken directly from the ph database and, therefore, are only given for those individuals whose email field in the ph database contains an electronic mail address. Thus, even if you have an e-mail account, but have not entered your e-mail address in your ph entry, it will not show up in the printed version of the campus phone book.

The e-mail addresses listed in the *Student/Staff Directory* can take two forms. The default format for the address is your-ph_alias@uiuc.edu (e.g., l-ward1@uiuc.edu). The alternative format gives the specific account and host on which you receive e-mail and is identical in content to the email field of your ph entry (e.g., ward@uxl.cso.uiuc.edu). The default form, which uses an alias-based address, is generally preferable because, as long as you keep the email field in your ph entry current, your electronic mail will always be routed to the correct machine, even if your specific e-mail account changes.

(continued on page 4)
Extracting Information from Ph
Using the “Type” Field Specifier

Introduction

When a ph query is executed without any field specifiers, ph searches the entire database for all entries whose name and/or nickname fields match the query expression. In most cases a simple query expression will deliver the desired results. For example, the query ph lynn ward yields information on the four people in the ph database whose name and/or nickname fields contain the character strings lynn and ward (in any order). However, occasionally a simple expression can produce too many matches, several or many of which may have nothing to do with the data type for which one is searching. For instance, the expression ph english displays the names of six people whose last name is English, the names of two campus units (Division of English as an International Language and the Department of English), and the titles of 59 courses in the University Timetable. In such cases, it is often helpful to narrow down the search by specifying the type of information in which you are interested. This can be done by including the type field specifier in your query expression. The general syntax for using the type field specifier is: ph type=data_type query expression. The following data types can be used in a query:

- **person** - Information about a human being.
- **unit** - Information about a campus unit (e.g., department).
- **areacode** - Information about a telephone area code.
- **food** - Information about a restaurant.
- **phone** - Anything a reasonable person might expect to see in a phone book. The “phone” type covers the following other types: “person,” “unit,” “areacode,” and “food.”
- **weather** - Information about current weather conditions.
- **timetable** - The current UIUC course timetable. Also listed under types “fall,” “spring,” and “summer.”

In the case of the ambiguous example given above (i.e., ph english), using the type field specifier would only display those records matching the data type indicated. For example, if you were only searching for the entries of persons with the name “English,” you could use the expression ph type=person english. The following examples demonstrate how to extract specific types of data from the ph database. (Some ph clients may not require the initial ph command when executing the query.)

To extract information on a person from ph:

**Syntax:** ph type=person name1 [name2 name3 ...
**Example:** ph type=person stanley ikenberry

To extract information on a campus unit from ph:

**Syntax:** ph type=unit name (or partial name) of unit
**Example:** ph type=unit agriculture

To extract information on a telephone area code from ph (The area code database does not include every city in the U.S. If no matches are found using the name of a city, try entering the name of the state and the area codes for the major regions in the state will be displayed):

**Syntax:** ph type=areacode name of city (or state)
**Examples:** ph type=areacode san francisco
ph type=areacode california

To extract information on a local restaurant from ph (If you already know the name of the restaurant you want to locate, use the food field specifier followed by all or part of the name of the restaurant. If you want to locate all restaurants that serve a certain type of cuisine, include the other field specifier to indicate the type of food in which you are interested. In the latter case, you must also either give a name or indicate one of the four types of eating establishments used in the nickname field of the database: restaurant, bar, pizza, or tavern. For more information on the subtleties of extracting restaurant data from the ph database, consult ph’s online help):

**Syntax:** ph type=food [other=type of food] name (or type)
**Examples:** ph type=food Other=chinese restaurant

To extract weather information from ph (Ph can display weather condition information for many locations throughout the state and country. It also offers some special options for local weather information. Weather conditions for a particular location are requested by including one of the three letter city codes listed below in the query):

**Ph Weather City Codes**

<table>
<thead>
<tr>
<th>ALN</th>
<th>Alton</th>
<th>DSM</th>
<th>DesMoines</th>
<th>MWA</th>
<th>Marion</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARR</td>
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<td>FNT</td>
<td>Flint</td>
<td>MVN</td>
<td>Mt. Vernon</td>
</tr>
<tr>
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<td>Belleville</td>
<td>GGB</td>
<td>Galesburg</td>
<td>NBU</td>
<td>Glenview</td>
</tr>
<tr>
<td>BML</td>
<td>Bloomington</td>
<td>IND</td>
<td>Indianapolis</td>
<td>ORD</td>
<td>Chicago O’Hare</td>
</tr>
<tr>
<td>BOS</td>
<td>Boston</td>
<td>JFK</td>
<td>New York</td>
<td>PIA</td>
<td>Peoria</td>
</tr>
<tr>
<td>CGX</td>
<td>Chicago</td>
<td>LAX</td>
<td>Los Angeles</td>
<td>PDX</td>
<td>Portland</td>
</tr>
<tr>
<td>CMI</td>
<td>Champaign</td>
<td>MDH</td>
<td>Carbondale</td>
<td>RFD</td>
<td>Rockford</td>
</tr>
<tr>
<td>CMX</td>
<td>Champaign</td>
<td>MLD</td>
<td>Midway</td>
<td>SFO</td>
<td>San Francisco</td>
</tr>
<tr>
<td>COU</td>
<td>Columbia</td>
<td>MLI</td>
<td>Moline</td>
<td>SPI</td>
<td>Springfield</td>
</tr>
<tr>
<td>CPS</td>
<td>East St. Louis</td>
<td>MMO</td>
<td>Marseilles</td>
<td>STL</td>
<td>St. Louis</td>
</tr>
<tr>
<td>DEC</td>
<td>Decatur</td>
<td>MSN</td>
<td>Madison</td>
<td>SYR</td>
<td>Syracuse</td>
</tr>
<tr>
<td>DPA</td>
<td>Dupage</td>
<td>MSY</td>
<td>New Orleans</td>
<td>UIN</td>
<td>Quincy</td>
</tr>
</tbody>
</table>

(continued on page 14)
Some New and Little-known Phacts...

(continued from page 2)

The form that the address takes in the Student/Staff Directory depends on the contents of the paper field in your ph entry. If the paper field is left empty, the default format (your-ph_alias@uiuc.edu) will be listed in the directory. If you enter the word specific into the paper field, your specific e-mail address will be printed. Finally, if you want to prevent your e-mail information from appearing in the Student/Staff Directory altogether, you can enter the word no in your paper field.

Phact #5: Ph entries can now be edited on VMD.

Initially the ph client on the IBM mainframe VMD did not offer the same functionality as the Unix client. Noticeably lacking was the ability to modify one's own ph entry directly from VMD. Ph’s edit command has since been enabled in the CMS client, and it is now possible to edit ph entries on VMD. To do so, enter ph’s interactive mode by typing ph at the VMD ready prompt. You should see the Ph status screen and a Ph> prompt. Login to ph by typing: login your-ph_alias (filling in your actual ph alias for the variable your-ph_alias). You will then be prompted to enter your ph password. Enter your ph password (it will not echo to the screen). To see the current contents of your ph entry, enter me. All of the fields in your entry that contain data will be displayed. To edit an existing field, type edit fieldname (filling in name of the field you want to edit for the variable fieldname). You will then be placed into the XEDIT text editor and the contents of the specified field will be displayed. Edit the information as desired, save your changes and exit XEDIT (for more information on using XEDIT, pick up a copy of the manual CMS at UIUC, available at the CCSO Accounting and Distribution Office, 1420 DCL, or use VMD’s online help facility). You should then see the message: 200:1 entry changed. To verify the change, type the me command again.

To add a new field to your ph entry from VMD, follow the same procedure, this time using one of the ph database’s many predefined fields. To see a list of all ph fields, enter the command fields while server using the pcph), or VMS client, get to the command prompt and use the syntax:

ph -s server.name query_expression.

For example, to locate directory information on the early music scholar Margaret Bent at Princeton University, one would type the command: ph -s princeton.edu margaret.bent. The query will be directed to the ph server specified after the -s option (Princeton University in the latter example) instead of our local ph server.

Phact #7: Network administrators can make arrangements to have proxy rights to the ph entries of their end-users.

To facilitate the process of keeping ph entries (and email fields in particular) up to date, CCSO now offers proxy rights to network administrators so they can systematically enter e-mail information into the ph database for their users and make other modifications upon request.

Network administrators who wish to obtain proxy rights for a group of users should send an e-mail request to s-dorrer@uiuc.edu. The request should contain the administrator’s own name and ph alias and a list of ph aliases for the entries to which s/he wants to gain proxy. Once proxy rights to a ph entry are granted, the administrator can edit any changeable field in the entry.

Note: It is incumbent upon the administrator to get permission from his or her end-users before requesting proxy rights from CCSO. If, as an end-user, you are uncomfortable with the possibilit...
ity of another person accessing your personal ph entry, you can explicitly deny all proxy rights by entering the text no! into your proxy field.

The method of editing an entry for which one has proxy varies from one ph client to the next. On Unix machines there are several methods of which the following is perhaps the most direct. Enter ph's interactive mode and login as yourself. Verify the contents of the entry that you want to modify by using the command:

```
ph alias=alias_of_entry_to_be_edited
```

To edit a specific field in the entry, use the syntax:

```
edit filename alias_of_entry_to_be_edited
```

For example, to edit the email field of a user with the alias t-jones1, enter the command: `edit email t-jones1`. The edit command will invoke the default text editor, usually vi, and the contents can be filled-in or modified and then saved.

Network administrators who would prefer not to bear the burden of managing multiple ph entries, but nevertheless want to have their users' email fields filled-in or updated, can send a list of ph aliases and associated e-mail addresses to s-dorner@uiuc.edu. The e-mail addresses in such a list should be in the format `user@fully.qualified.domain.name` (for example, ward@ux1.cso.uiuc.edu), rather than an alias-based address such as l-ward1@uiuc.edu.

Phact #8: Ph client software is available for many different computer operating systems and platforms, including the Macintosh and PC (DOS) compatibles.

Ph client programs permit users of desktop computers and workstations connected to UIUCnet to access the ph Nameserver without logging on to a CCSO mainframe. These programs provide convenient access to server data without requiring any special knowledge of an unfamiliar operating system or text editor. At least one ph client program is available for each of the desktop platforms commonly found on the UIUC campus. A table of ph clients listed alphabetically by platform/operating system is given on page 6. The table includes the name of the client program, its anonymous ftp location, the name of the directory in which it resides, and the filename(s) of the program and documentation.

**VMS-PH and PCPH.** Vms-ph (for VAX computers running the VMS operating system) and pcph (for PCs running PC- or MS-DOS) are ports of the original Unix ph client and operate almost identically to it. Like the Unix client, vms-ph and pcph accept queries from the operating system prompt (command-line mode), supporting most or all of the options listed in the Unix man page (the Unix online manual) for ph. Both are also capable of taking the user to the ph> prompt for interactive sessions with the ph server (interactive mode). Interactive mode can be used for simple queries, but is more commonly used for changing one's own ph entry or an entry for which one has proxy.

DOS users will appreciate the fact that pcph can be configured to use any standard text editor such as PC-Write, QEDIT, EDLIN, etc. Unfortunately, although pcph is in the public domain, the commercial package PC/TCPIP must be installed in order for pcph to run. Thus, this ph client for DOS can only be used by individuals and departments who have purchased a license for FTP Software Inc.'s PC/TCPIP product. (PC/TCPIP Plus, a robust set of DOS-based TCP/IP utilities, is available through a CCSO site-license at a cost of $115.00 per workstation. An information packet on the software is available at the CCSO Resource Center in 1420 DCL.)

**Ph 1.0.2 for the Macintosh.** Written by John Norstad of Northwestern University, Ph 1.0.2 for the Macintosh is one of the most intuitive and powerful desktop ph clients available. When first invoked, the Mac client presents the user with a Query window (see Figure 1 on page 1). The name of the default server is displayed in the upper left, and below it is an empty field into which a standard ph query can be entered. Pressing the Return key or clicking on the Do It button returns the result of the query in the body of the window. The default server can be temporarily changed by moving the pointer to the name of the default server, depressing the mouse button (which then opens a pull-down menu of servers), and selecting the desired server. It is also possible to change the name of the server to which the client defaults on start-up by choosing the Change Default Server... option under the File menu.

Any user can easily access and edit his or her own ph entry by selecting the Login... option under the File menu. Once logged-in, all fields (both empty and full) are displayed in a login window. True to Macintosh form, editing the contents of a field involves selecting and deleting any existing text and replacing it with new text. To fill in an empty field, simply place the I-beam pointer in the empty field and click once so that an insertion point appears. Then type in the desired text. Changes to the entry can be saved by selecting Save Ph Record under the File menu or clicking on the close box in the login window and selecting save.

The Proxy menu makes administering multiple ph entries a snap. A network administrator who has logged into ph with Norstad's Macintosh client can see a list of the aliases for all the entries to which s/he has proxy by opening the Proxy menu. Any or all of the entries listed can be edited in the manner described above by pulling down the Proxy menu and selecting the entry to be changed.

Ph for the Macintosh comes with complete documentation and, although copyrighted, is available free of charge.

**XPH 2.3.** Xph, modelled on the Macintosh client, is available from the University of Florida. Like the Mac client, this X application allows the user to select the default server from a menu and login to a local server to make changes to one's own entry.

(continued from page 4)
Some New and Little-known Phacts...

(continued from page 5)

Presently the software is in a beta testing phase and is extremely unstable. A quick test-run here at UIUC revealed several serious problems including the inability to handle input correctly or accept a login, despite the presence of a login menu option. Since the login option was not functioning at the time of review, it was impossible to evaluate the record editing capabilities of the client. Program author Bradley Spatz promises that a future release will include full-page record editing and hero mode functionality (the granting of special functions and privileges to individuals designated as ph administrators). Once the current bugs have been ironed out, this client holds much promise for X users.

**NeXT Ph.** NeXT Ph version 2.04, like the Mac and X clients, offers an intuitive graphical environment for querying ph servers. The user can choose to enter a standard ph query into a query box or execute a field search. The field search option presents a list of all of the fields that could potentially hold data. The user must enter data into the box of at least one indexed field (bullets appear to the left of the names of indexed fields) and can then fill in none, one, or more of the remaining field boxes. A Return Fields box allows the user to determine which fields will be displayed for the entries that match the query. There are three Return Fields options: 1) All (displays all fields, even those that are empty), 2) Default (displays fields based on the ph server defaults), and 3) Specific (permits the user to select the fields to be displayed from a check-box menu). The NeXT Ph client provides a powerful and easy-to-use searching tool for the ph database. Unlike the other clients mentioned thus far, however, it does not offer login and record editing capabilities.

**Other Clients.** In addition to the dedicated ph clients described above, there are several publicly available applications that incorporate a ph client into software whose primary purpose is delivering a different network service or group of services. For example, *Eudora*, Steve Dorner's widely acclaimed POP mail client for the Mac includes a ph client that allows users to extract, copy, and paste information from the ph database into electronic mail messages. *NuPOP*, an excellent text-based POP mail client for the PC, also has a ph client with similar copy and paste capabilities. NuPOP is still in beta release, but is fairly stable and can be downloaded from Northwestern University's anonymous ftp server casbah.acns.nwu.edu. It is located in the directory pub/nupop.

The server-client-based, distributed information search and retrieval system known as Gopher also supports ph queries. CCSO's local Gopher server provides access to all Internet sites running the ph server program, and most Gopher clients include a utility for querying these servers. Gopher clients for the following desktop platforms can be obtained from boombox.micro.umn.edu in the directory pub/gopher: Macintosh, PC (DOS), VMS, NeXT, Unix, and X. If you would like to know more about what Gopher is and how it works, consult the May 1992 issue of CCSO's Updates newsletter, vol. 3 no. 4.  

-Lynn Ward

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**Ph Client Software Information**

<table>
<thead>
<tr>
<th>Platform/Client</th>
<th>FTP Site</th>
<th>Directory</th>
<th>Filename(s)</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ph 1.0.2</td>
<td>casbah.acns.nwu.edu</td>
<td>pub/ph/mac</td>
<td>ph-1.0.2.sea.hqx</td>
</tr>
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<td></td>
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<td></td>
<td>README</td>
</tr>
<tr>
<td><strong>NeXT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NeXT-Ph 2.04</td>
<td>cs.orst.edu</td>
<td>pub/next/sources/next-intermediate</td>
<td>Ph2.04.tar.Z</td>
</tr>
<tr>
<td><strong>PC (DOS)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>peph 1.0b4</td>
<td>uxc.cso.uiuc.edu</td>
<td>net/ph/pc</td>
<td>pcphe.com</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>pcphe.README</td>
</tr>
<tr>
<td><strong>Unix</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ph</td>
<td>uxc.cso.uiuc.edu</td>
<td>net/ph/unix</td>
<td>Makefile</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>cryptit.c</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ph.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ph.c</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>replies.h</td>
</tr>
<tr>
<td><strong>VAX (VMS)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vms-ph</td>
<td>uxc.cso.uiuc.edu</td>
<td>net/ph/vms</td>
<td>vms-ph.shar</td>
</tr>
<tr>
<td><strong>X</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xph 2.3.2</td>
<td>eng.ufl.edu</td>
<td>pub/ph/x</td>
<td>README</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>xph-2.3.2.tar.Z</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>xph-help.tar.Z</td>
</tr>
</tbody>
</table>
UIUCnet Reader Survey Results

A reader survey was distributed with the February 1992 issue of UIUCnet. Just under 600 surveys (591 to be precise) were returned, representing roughly 20% of the total UIUCnet mailing list. While it is impossible to know whether these 591 readers accurately reflect the viewpoint of the other 80%, the consistency of responses to certain questions on the survey might indicate that, at least regarding some topics, this sample group is representative of the readership at large.

Before presenting the raw data, I would like to make a few comments about the survey and the manner in which it will affect—and, to a certain extent, already has affected—the future direction of the UIUCnet newsletter. I think it is fair to say that the overall reaction to the newsletter was very favorable. Most respondents, for example, found the content of UIUCnet to be balanced, interesting, useful, or some combination of the three adjectives. Only 11 individuals (just over 1%) indicated that the newsletter content is “too basic”, while 91 respondents (or roughly 15%) felt that UIUCnet is “too difficult to understand” (although many qualified the latter response with phrases like “some articles” or “sometimes”).

Unfortunately, the UIUCnet newsletter simply cannot be all things to all readers. Much of the writing is admittedly and intentionally geared toward users with at least some familiarity with standard TCP/IP networking tools (e.g., telnet and ftp) and terminology. Beginners are encouraged to turn to publications like the CCSO User Guides, the CCSO Computing Handbook for Students (and Everyone Else), the NUSIRG guide described on pages 12 and 13 of this issue, or other similar publicly available documentation for basic information on UIUCnet and Internet services. Advanced users wishing to know more about low-level networking protocols and other technical topics can consult the many conference proceedings, technical reports, monographs, and document series devoted to networking. RFC 1175—an annotated list of bibliographies, books, conferences, glossaries, guides, newsletters, reports and papers, etc. devoted to TCP/IP networking—provides an excellent point of departure for acquainting oneself with the standard literature on the TCP/IP protocols and internetworking. The entire Request for Comment (RFC) series including the latter document is available for download from ucc.cso.uiuc.edu in the RFC directory. (The authoritative source for RFC's is the anonymous ftp server nic.ddn.mil in the directory rfc.)

Most Popular Article Types

Of the article types currently found in the newsletter (see question 10 on page 9), readers indicated that they would like to see Tutorials on how to use campus network services featured most frequently (many respondents also indicated a desire for more “how to” articles in the optional comments section of the survey). Description/tutorials on Internet services and Campus network news items were also especially popular topics. But the fact is, for every article type listed under question 9, there were no fewer than 104 individuals who classified the category as either “very interesting” or “somewhat interesting.” It is thus unlikely that any particular article type will disappear from the newsletter entirely. However, in the future, readers can expect that greater emphasis will be given to those categories that appealed to the largest number of respondents.

Diversity of the UIUCnet Audience

If there is one point the survey brought home especially clearly, it is the increasing diversity of the UIUCnet audience. Respondents included undergrad and graduate students, secretaries, administrators, faculty in all fields, and academic professionals. Many subscribers have advanced computing skills and technical expertise, while many others are just learning how to use their desktop computers and various campus network resources.

Equally diverse are the computer platforms on which these readers work. Seventy-two percent of the respondents have a PC, or compatible on their desk and almost 38% have regular access to a Macintosh. Unix workstation and X-terminals are used by almost 30% of the respondents. Roughly 9% use a dumb terminal, usually in combination with at least one other type of desktop computer. (Since some readers indicated that they have access to two, three, or even four different desktop platforms, the percentages just given add up to a number greater than 100. They were derived by dividing the total number of responses for each platform by the total number of surveys [591].)

UIUCnet Will Have a “New Look” Next Fall

The question of how to design and prepare a networking newsletter that meets the needs of such a varied group of subscribers is one that has plagued me from the outset of my editorship. Regardless of what changes are made to the format and content of UIUCnet, there will always be those readers for whom a particular article or issue is too basic, too technical, of little relevance, or simply unappealing. In the comments section of the survey, one
respondent made an extremely useful suggestion that I had already been considering for quite some time—that is, to provide visual and verbal cues about the content of each article so that readers can determine, at a glance, whether specific articles will be of interest to them. To this end, the UIUCnet newsletter will have a new look this fall. Icon bars will be used at the beginning of each article to identify the audience and computing platform(s) for which the article is targeted. Additionally, all articles will be classified under regular column titles such as Campus News, National News, Internet Treasures (articles on services and resources available on the Internet), Net Tips (quick tips and tutorials), and so on. I hope these changes will help readers quickly assess the relative usefulness of a given piece.

Reader Comments
Several suggestions from the comments section of the survey have already been fully or partially implemented. In February, I started indexing all back issues of UIUCnet with plans to distribute a cumulative index. The many requests in the survey for just such an index inspired me to complete the project. All subscribers should have received a copy of the index last month. Additional copies are available on request. From now on, the index will be maintained and distributed annually.

Many readers also suggested that the newsletter be distributed electronically. Work is underway to make all past, present, and future issues of UIUCnet available via anonymous ftp. ASCII versions of volumes 4 and 5 are now available on ux1.cso.uiuc.edu in the directory doc/net/uiucnet. They can also be read online and/or retrieved by accessing the CCSO Gopher server (for more information on Gopher, see the May issue of the CCSO Updates newsletter, vol. 3 no. 4).

The comments section also gave readers an opportunity to express their gratitude and praise or vent their frustration towards the UIUCnet publication and CCSO services in general. The comments offered by 157 respondents are too long (and repetitive) to reprint in this newsletter. Suffice it to say, for every opinion, there was a counter-opinion.

Survey Figures
For those interested in the raw survey data, the original questions and totals for each possible response are given below. Because many of the 591 respondents did not answer every question and many questions invited more than one response, the grand total for each question is often considerably less or greater than 591.

(Sincere thanks to all those who took the time to provide me and other interested CCSO staff with this invaluable feedback! - L.W.)
UIUCnet Reader Survey Results

(continued from page 8)

7. Please indicate the frequency with which you utilize each of the following services available over the campus network?

<table>
<thead>
<tr>
<th>Service</th>
<th>Daily</th>
<th>Weekly</th>
<th>Occasionally</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic mail</td>
<td>452</td>
<td>47</td>
<td>49</td>
<td>30</td>
</tr>
<tr>
<td>GUIDE (menu-driven UIUC information service on uxa)</td>
<td>5</td>
<td>23</td>
<td>106</td>
<td>374</td>
</tr>
<tr>
<td>LCSgated or IO Plus (online library catalog)</td>
<td>41</td>
<td>137</td>
<td>252</td>
<td>102</td>
</tr>
<tr>
<td>Ph (online campus phone book)</td>
<td>71</td>
<td>98</td>
<td>232</td>
<td>146</td>
</tr>
<tr>
<td>Other Ph services (weather information, area code directory, local restaurant guide, university timetable)</td>
<td>28</td>
<td>42</td>
<td>209</td>
<td>252</td>
</tr>
<tr>
<td>OED2 (online Oxford English Dictionary)</td>
<td>8</td>
<td>35</td>
<td>159</td>
<td>332</td>
</tr>
<tr>
<td>Netnews (Unix bulletin board service)</td>
<td>128</td>
<td>53</td>
<td>71</td>
<td>282</td>
</tr>
<tr>
<td>Electronic mail to fax gateway</td>
<td>14</td>
<td>96</td>
<td>109</td>
<td>375</td>
</tr>
<tr>
<td>Telnet-campus (high-speed remote login to campus mainframes)</td>
<td>205</td>
<td>78</td>
<td>109</td>
<td>155</td>
</tr>
<tr>
<td>Telnet-off-campus (high-speed remote login to computers at other universities and/or other locations on the Internet)</td>
<td>55</td>
<td>68</td>
<td>162</td>
<td>259</td>
</tr>
<tr>
<td>Ftp (transferring files between campus mainframe(s) and your desktop computer)</td>
<td>105</td>
<td>129</td>
<td>163</td>
<td>153</td>
</tr>
<tr>
<td>Anonymous ftp (downloading files from ftp archive sites to your desktop computer or mainframe account)</td>
<td>30</td>
<td>107</td>
<td>216</td>
<td>194</td>
</tr>
<tr>
<td>IIN (IBM Information Network)</td>
<td>4</td>
<td>3</td>
<td>30</td>
<td>490</td>
</tr>
<tr>
<td>AISS services (accessing the Administrative Computing Network)</td>
<td>76</td>
<td>21</td>
<td>53</td>
<td>393</td>
</tr>
<tr>
<td>Accessing PLATO/NovaNET</td>
<td>17</td>
<td>12</td>
<td>47</td>
<td>449</td>
</tr>
</tbody>
</table>

About the UIUCnet Newsletter:

8. What do you do with the UIUCnet newsletter when you receive it (please check all that apply)?

- 175 read it from cover to cover
- 411 read only the articles of interest
- 60 give it to someone else to read
- 282 file it for later referral
- 49 throw it away

9. Please rate the following article types commonly found in UIUCnet in terms of their interest/relevance to you and your work.

<table>
<thead>
<tr>
<th>Article Type</th>
<th>Very Interesting</th>
<th>Somewhat Interesting</th>
<th>Minimally Interesting</th>
<th>Not of Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Tutorials on how to use campus network services</td>
<td>373</td>
<td>161</td>
<td>33</td>
<td>8</td>
</tr>
<tr>
<td>B. Campus network news items (announcements about new services or changes to existing ones)</td>
<td>282</td>
<td>225</td>
<td>55</td>
<td>6</td>
</tr>
<tr>
<td>C. Reviews/descriptions of popular network software</td>
<td>98</td>
<td>240</td>
<td>192</td>
<td>38</td>
</tr>
<tr>
<td>D. Announcements of new software releases</td>
<td>103</td>
<td>230</td>
<td>189</td>
<td>32</td>
</tr>
<tr>
<td>E. National networking news items</td>
<td>85</td>
<td>200</td>
<td>197</td>
<td>78</td>
</tr>
<tr>
<td>F. Q&amp;A's (answers to typical end-user questions)</td>
<td>202</td>
<td>217</td>
<td>114</td>
<td>19</td>
</tr>
<tr>
<td>G. Description/definition of basic networking terms and concepts</td>
<td>197</td>
<td>233</td>
<td>113</td>
<td>20</td>
</tr>
<tr>
<td>H. History and background of the campus network and the technology behind it</td>
<td>89</td>
<td>198</td>
<td>177</td>
<td>96</td>
</tr>
<tr>
<td>I. Description and tutorials covering publicly available resources/services on the Internet such as online databases, library catalogs, software repositories, etc.</td>
<td>311</td>
<td>169</td>
<td>70</td>
<td>13</td>
</tr>
<tr>
<td>J. Case studies covering innovative use of the campus network by administrators, faculty, staff, and/or students</td>
<td>79</td>
<td>25</td>
<td>178</td>
<td>74</td>
</tr>
</tbody>
</table>

10. Which of the article types listed in question 9 would you like to see featured most frequently in UIUCnet (please circle all that apply)?

- A
- B
- C
- D
- E
- F
- G
- H
- I
- J

11. Approximately what percent of each issue of UIUCnet do you find personally interesting or useful?

- 20 100%
- 140 75%
- 114 50%
- 73 25%
- 6 0%
- 213 varies from issue to issue

12. How would you assess the overall content and style of the UIUCnet newsletter (please check all that apply)?

- 11 too basic
- 91 too difficult to understand
- 331 balanced to meet needs of readers at different levels
- 227 interesting
- 25 boring
- 243 useful
- 8 useless
Network Navigator Provides Easy Access to Downloadable Software and Documentation

As many UIUCnet users have come to discover, the Internet offers a wealth of information and software resources. Public domain and shareware software packages as well as text documents covering a wide range of subjects are available to all Internet users via anonymous ftp servers—that is, multi-user computers that have been set up to permit public access to all or part of their file systems for the purpose of downloading files with the file transfer utility known as ftp, the TCP/IP file transfer protocol. In order to take full advantage of these resources, however, users must first know what they are looking for and where to find it. They must also be well acquainted with the ftp software installed on their desktop computers. For many network users, particularly novices, the process can be overwhelming.

Network Navigator is a program that enables users to easily locate and download software and documentation available on UIUCnet and other networks. Like many network applications, Navigator operates on a client-server basis. The server consists of a database on a CCSO mainframe that contains text information about software and documentation files that reside on the network. The database also contains pointers to the software and documentation files themselves so that the client programs know how to find them. Navigator client software runs on a desktop computer or workstation, accesses the server transparently across the campus network, and presents the text information held in the server database through an intuitive, menu-driven interface.

Navigating the Navigator

Network Navigator data is organized hierarchically in a manner similar to that of a cookbook where the recipe for chocolate macaroons is found in the section entitled cookies in the chapter on desserts. In this case a package (e.g., the Eudora program and its documentation) is found listed under the name of the appropriate network service (e.g., electronic mail), which, in turn, is listed under the broad category that best describes it (e.g., communicating with people).

The Navigator begins by displaying a menu of available Categories. The user selects a category of interest, causing a general description of the category and its contents to appear. If the description is encouraging, the user can opt to see the list of the Services offered under that category. Now the cycle repeats. When the user selects an item in the Services menu, a short explanation about the nature of that service is displayed. If still interested, the user can choose to see a menu of the packages that implement the service. The cycle then repeats for the last time. Selecting an item from the Packages menu displays a concise explanation of what the package offers. If the package is a piece of documentation, the user may read it online or download it. If the package is software, an ftp client built into the Navigator software will download the package to a local hard disk on request. Software packages consisting of multiple files (program file[s], documentation file[s], etc.) can be downloaded in their entirety or the component files can be selected and downloaded individually.

The Macintosh Navigator Client

CCSO staff are in the process of developing Navigator clients for several different computer platforms. The Macintosh client is the first to have been beta-tested and released for use by the general public. It consists of two HyperCard stacks, NetNav1.0.20 (the version number may change as modifications and bug fixes are released) and Navigator Welcome. Clicking on the Navigator Welcome stack takes the user through a short introduction from which the Navigator stack can be directly opened. Once inside Navigator itself, it's just a matter of clicking on the topics of interest and reading the information in the text window on the right hand side of the stack (see Figure 1).

In addition to moving through the Navigator using the menu system described above, the Macintosh and other clients offer a Fishing option to search or "fish" for all items related to a user-entered keyword. All Categories, Services, and Packages that match the keyword will be displayed in a single window.

(continued on page 11)
A Platforms button permits the user to select the default or "current" computer platform from the following choices: Any Platform, CMS, Generic Unix, Macintosh, PC, and X. Selecting a default platform determines which Packages will be displayed when a Service has been selected. For example, by setting the default platform to Macintosh, the Package listed under Services for Communicating with People/Electronic Mail is Eudora. By changing the current platform to Generic Unix, the electronic mail packages elm, mail, mh, and mush are described and available for download; with the CMS platform selected, BITNOTE and RICEMAIL appear. Of course, most of the time Macintosh users should set the current platform to Macintosh. However, if you want to view all of the resources accessible via the Navigator or resources for a specific alternate platform, you can do so by changing the current platform to Any Platform or one of the other choices.

The Macintosh client also offers an expert mode. Like the Platform options, clicking the expert mode box filters the text and packages that can be viewed by the user. Packages that require special expertise for installation and/or use, such as source code or software normally installed by network administrators, are only displayed under expert mode.

Where to Get the Macintosh Client

Network Navigator version 1.0.20 has been installed on the Macintoshes in the CCSO Resource Center in 1420 DCL and the CCSO remote sites. The files can be copied freely onto a floppy disk for use on any Macintosh attached to the campus network. Navigator is also available by anonymous ftp from the host ux3.cso.uiuc.edu in the directory pub/netnav/mac. The filename is NetNav1.0.20.sea.hqx. The latter file is a self-extracting archive that has been "BinHexed" (a special file format convenient for file transfer, especially over electronic mail systems). It can be downloaded in ASCII mode and unBinHexed with a program such as BinHex 4.0, StuffIt, or another utility with the ability to convert BinHexed files back to their native text or binary format. Or, if your ftp client software has a BinHex transfer mode, the file can be converted to its native format on the fly. The resulting compressed file, NetNav1.0.20.sea can be uncompressed by double-clicking on its icon.

In order to use Network Navigator for the Mac, HyperCard 2.0 and the Mac/TCP communications package must be installed. Additionally, a connection to the campus backbone is required.

Other Network Navigator Clients

A beta version of Navigator for systems running X is available on ux3.cso.uiuc.edu in the directory pub/netnav/x. The filename is xnetnav-x.x.tar where x.x stands for the current version number. (The file is a tar archive and must be extracted using the Unix tar utility.) The X client offers virtually all of the same features as the Macintosh client, but the manner of presentation is slightly different.

Network Navigator for DOS is also under development. Formal announcements will be made when beta testing for the X client has been completed and the DOS client is released.

Musical Mainframes: Uxa and Ux3 Move to DCL

Room 8, English Building—the former home of the CCSO Unix computers uxa (the machine on which free student accounts are maintained and one of several Domain Name Servers for UIUCnet) and ux3 (CCSO's Netnews server)—is being converted into a lab for classroom use. To make room for the new equipment, the latter machines have been moved to DCL. Since they are now on a different subnet, uxa and ux3 have new numeric IP addresses:

<table>
<thead>
<tr>
<th>Hostname</th>
<th>New IP Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>uxa.cso.uiuc.edu</td>
<td>128.174.5.60</td>
</tr>
<tr>
<td>ux3.cso.uiuc.edu</td>
<td>128.174.5.61</td>
</tr>
</tbody>
</table>

The change will not affect TCP/IP applications that access these systems using the Domain Name System (the method of addressing a host by its fully qualified domain name [hostname above] as opposed to its numeric IP address) because the hostnames of the two computers have not changed.

However, programs and utilities that access either uxa or ux3 using the actual IP address must be reconfigured to use the new numbers.

Ramifications for Mac and PC Administrators (and Users)

Network administrators responsible for large numbers of PCs and/or Macintoshes are most affected by the move. Since uxa is a Domain Name Server, its IP address is frequently given as a primary (or, more commonly, a secondary) Domain Name Server in TCP/IP software for the PC and Mac. All references to uxa's old IP number in configuration files should be updated to reflect the new IP address. Obvious places to check for possible changes are: the list of nameservers in the config.tel file for NCSA Telnet (for the PC and Mac), Clarkson Telnet (AKA CUTCP) for the PC, and Brown University's tn3270 for the Mac; the domain name server (ds) listed in the ipconfig.sys configuration file for FTP Software Inc.'s PC/TCP Plus for the IBM PC; and the addresses listed in the Domain Name Server Information window in MacTCP.

(continued on page 12)
Also, some PC newsreaders, such as the recently reviewed program Trumpet, must be configured with the IP address of the news server rather than its alias, news.cso.uiuc.edu. Any and all references to ux3's previous numeric IP address in the configuration files or menus of any newsreader software (regardless of platform) should be changed to the new address.

Ramifications for Unix Administrators

The night before the move, a new /etc/hosts file was distributed from ux to sites that receive updates of /etc/hosts. A copy of this file is also available via anonymous ftp on uxc.cso.uiuc.edu in the hosts/ directory.

CCSO hopes to eventually provide an authoritative DNS server outside DCL. In the meantime, Unix system administrators are advised to remove the old address from the /etc/resolv.conf file and replace it with the new address. This step is especially important for Sun systems running the vendor-supplied DNS software. Sun's name resolution software fails if the first server in the /etc/resolv.conf file is down or unreachable. The add-on shared object libraries for Suns (located on uxc.cso.uiuc.edu in the directories pub/SUN3 and pub/SUN4 and on dragon.cso.uiuc.edu in the directory SUN/RESOLVER) correct this problem.

For More Information

For assistance with modifying your PC or Macintosh TCP/IP software call the CCSO Micro-Computer Consulting Office at 244-0608. Questions about Unix desktop workstations should be directed via e-mail to Steven Miller at StevenMiller@uiuc.edu.

Internet Guide from NorthWestNet

Available at CCSO Resource Center and by Anonymous FTP

Although many technical publications, newsletters, and documents about specific Internet resources are readily available to the public, the networking community has long awaited the release of a comprehensive, user-friendly guide to the Internet, its applications, and resources. In recent months, several organizations and individuals have taken a stab at this almost insurmountable task with other similar projects underway. To date, one particular publication stands out as an exceptional resource for Internet users: the NorthWestNet User Services Internet Resource Guide (NUSIRG). NUSIRG contains introductory and in-depth discussions, hands-on tutorials, bibliographies, and comprehensive charts and tables on hundreds of Internet concepts and applications. It is an indispensable handbook for beginners and experienced alike. NUSIRG's Table of Contents, shown below, outlines the major topics covered by the guide:

SECTION 1: NUSIRG, THE INTERNET AND YOU
Chapter 1: Overview of NorthWestNet User Services Internet Resource Guide (NUSIRG)
Chapter 2: The Internet

SECTION 2: THE BASIC TOOLS
Chapter 3: Electronic Mail
Chapter 4: Using FTP
Chapter 5: TELNET
Chapter 6: "Archie": the FTP Archive Guru

SECTION 3: COMMUNICATING WITH PEOPLE
Chapter 7: Using USENET [Netnews]
Chapter 8: LISTSERV Discussion Groups

SECTION 4: KNOWLEDGE AT YOUR FINGERTIPS
Chapter 9: Electronic Journals
Chapter 10: Electronic Books
Chapter 11: Accessing Library Catalogs through The Internet
Chapter 12: Internet Accessible Databases and Bibliographies
Chapter 13: WAIS (Wide Area Information Server): An Interface to Databases
Chapter 14: Internet Directory Services

SECTION 5: EXPLORING NEW FRONTIERS
Chapter 15: Using the Global Internet in K-12 Education

SECTION 6: EMPOWERING SCIENTIFIC RESEARCH
Chapter 16: Using Supercomputers on the Internet
Chapter 17: Supercomputer Site Descriptions

Availability of NUSIRG

The NorthWestNet guide may be obtained in one of three ways. Copies of the entire guide and its individual sections are available for checkout at the CCSO Resource Center, 1420 DCL. Any UIUC student or staff member may check out the entire guide or one of its sections, follow these instructions:

1. Open an ftp session with ftphost.nwnet.net. Usually this involves typing the command:

```
ftp ftphost.nwnet.net
```

(continued on page 13)
2. At the login prompt, type: **anonymous**

3. At the password prompt, type:
   
   your-user-id@your.full.internet.address  
   
   (e.g., ward@uxl.cso.uiuc.edu)

4. Change to the nic/nwnet/user-guide directory by typing:

   cd nic/nwnet/user-guide

5. Get the file called README.nusirg which contains the most up-to-date information on the NUSIRG files. To do so, type the commands:

   ascii
   get README.nusirg

   (Users downloading the file directly to a DOS machine may want to add a target filename such as nusirg.txt; e.g.,
   get README.nusirg nusirg.txt. If an optional target filename is not included with the get command, the original long filename will automatically be truncated to accommodate DOS's eleven-character filename limit.)

6. List the contents of the directory by typing: `ls` or `dir`. The names, dates, and sizes of the files contained in the directory will be displayed (if all of this information is not listed with the `ls` command, try `dir` instead). The following files were available as of this writing:

   README.nusirg
   feedback.doc
   nusirg.Index.ps
   nusirg.about.nwnet.and.aup.ps
   nusirg.beginner.overview.ps
   nusirg.email.ftp.telnet.ps
   nusirg.listserv.usenet.ps
   nusirg.online.info.resources.ps
   nusirg.supercomputers.ps
   nusirg.teacb.k-12.ps
   nusirg.whole-guide.ps.Z

7. To download a postscript file, keep the session in ASCII mode and type:

   get filename

   replacing the variable *filename* with the name of the file you want to download.

8. To download the entire guide (which is in compressed format), change to `ftp bin` mode by typing: **binary**

   Then type: `get nusirg.whole-guide.ps.Z`

   If downloading to a Unix machine, you can use the `uncompress` utility to uncompress the file (type: `uncompress nusirg.whole-guide.ps.Z` at the Unix prompt). The resulting file is roughly 1.35MB.

Again, DOS users may want to add a target filename (such as `nusirg.z`) to the above get command to avoid the filename truncation problem discussed in step 5. For instructions on how to make this compressed file readable on various platforms, see the CCSO User Guide #401: *FREE SOFTWARE • How to Find it • How to Get It • How to Make it Usable (uncompress it).*

A bound copy of the NUSIRG Guide can also be purchased directly from NorthWestNet for a fee of $20.00. Orders can be sent to:

NUSIRG Orders  
NorthWestNet  
15400 SE 30th Place, Suite 202  
Bellevue, WA 98007

The $20.00 charge includes book rate shipping within the U.S. If you would like a copy sent 2-day Priority Mail, please include $3.00 for shipping and handling. (For orders of 2 or more please call 206-562-3000 for precise costs.) There is no sales tax for out-of-state customers. NorthWestNet prefers checks (made payable to NorthWestNet), but will also accept purchase orders. Please include a return address and telephone number with all orders.  

-Lynn Ward
Welcome to the New UIUCnet

CAMPUS NEWS

Welcome to UIUCnet, the network and the newsletter. UIUCnet is the name of the high-speed fiber optic network that interconnects the computing resources in roughly 110 buildings spread across the University of Illinois campus. With the proper combination of hardware and software, users of desktop, mini, and mainframe computers located in the many buildings attached to UIUCnet have access to a wide range of local, national, and international network services. These services, too numerous to mention here, are described in the brochure Services of UIUCnet, available in the CCSO Resource Center, 1420 DCL.

UIUCnet is also the name of this publication, a monthly newsletter providing information about the campus network, its underlying technology, related policies and procedures, and the products and services it offers. Our campus network and the various education and research networks to which it is connected (i.e., the Internet, BITNET, DECnet, and Usenet) are constantly evolving. New technologies and services are implemented on a regular basis as are modifications and improvements to existing facilities. The UIUCnet newsletter will help you keep up with this whirlwind of technological change and introduce you to techniques and concepts that will better enable you to exploit the copious network resources at your fingertips.

UIUCnet Has a New Look for Fall

Regular readers of UIUCnet will immediately notice that the newsletter has a new look. The entire publication has been redesigned in an effort to make it more accessible to our diverse clientele. Aside from the jazzier masthead and addition of a second color, the most obvious change is the use of an icon bar at the beginning of each article. The icon bar should help you determine, at a glance, which articles will be of particular interest to you. Icons consisting of stylized stick people holding placards with the letters N for novices, E for experienced users, NA for network administrators, and AISS for clients of the University’s Administrative Information Systems and Services unit suggest the intended audience of a given article. A small crowd of stick people is the audience icon for articles aimed at the entire UIUCnet readership. Monitor-shaped icons displaying standard operating system or platform logos (or some other readily identifiable text or symbol) indicate which system(s), if any, are covered in each article. A generic system icon (ANY) is used for articles providing computer instruction or information that is not platform specific. Although the meaning of the audience and platform icons are for the most part self-evident, an icon key will appear on the front page of every issue as a reminder of their significance.

Regular UIUCnet Features

Last spring, a reader survey was distributed to all subscribers of UIUCnet. Respondents indicated that, while they generally found the newsletter both interesting and useful, they would like to see greater emphasis in two areas: 1) tutorials on how to use campus network services and 2) descriptions of services available on the Internet and instructions on how to use them. Thus, although the overall content of the newsletter will be much the same as it has been in the past, readers can (continued on page 2)
New UIUCnet...
(continued from page 1)

expect to see these two topics treated on a monthly basis. Additionally, every UIUCnet article will be assigned to one of nine recurring columns, which, like the icon bar, can be used as an aid in assessing which articles will be relevant to you. Future issues of UIUCnet will include a selection from the following columns:

Campus News — Timely information about the services, policies, and implementation of new technologies on the campus network.

National News/International News — New or pending government legislation affecting networking, expansion or modifications of national and international networks, and other news and events impacting network facilities off-campus.

Net Tips — Brief tips or tutorials on how to use a particular campus network service or make better use of common network utilities such as telnet and ftp.

NetWord — Most publications about networking are filled with acronyms and computer jargon that can often bewilder the novice user. By providing definitions for one or more selected technical terms used in each issue, the monthly NetWord column will gradually increase your networking vocabulary.

Internet Treasures — UIUCnet users willing to venture past their own back door can take advantage of the wealth of information services — electronic books and journals, on-line library catalogs, multidisciplinary and highly specialized databases, electronic mail directory services, etc. — available on other networks across the Internet. The Internet Treasures column will expose readers to a different Internet service (or group of related services) each month, providing both a detailed description of the service and brief instructions on how to access and use it.

Clients for Clients — Many networked applications (e.g., Netnews, Gopher, ph, telnet, ftp, etc.) are built on what is known as the client/server model. The server is typically a high-performance, multi-user computer that can store and maintain huge databases or other large and complex applications. End-users are able to access information on the server from their desktop computers by running special software that communicates with and make requests of the server over the network. Within the client/server paradigm, the computers and software that make such requests are called clients. If a client software program has been well-designed, the end-user need know little or nothing about how the server works or how the client actually interacts with it. Instead, the client presents the user with a friendly interface for requesting, displaying, and manipulating server data. The column Clients for Clients describes and reviews popular client software for desktop computers (with emphasis on Macs and PCs) that can be used for accessing data and applications on UIUCnet and the Internet.

Brief Cases — Articles describing the work of individuals or departments who are using the campus network in innovative ways can provide others with insight about how the network can enhance scholarly research, teaching, and administrative work. Case studies of this sort will appear in the Brief Cases column. Faculty and staff are cordially invited to contribute articles for Brief Cases. All submissions should be sent to UIUCnet, 1120 DCL, Campus MC 256 or via e-mail to uiucnet@uiuc.edu.

Q&A — Answers to frequently asked questions about computer networking. If you are curious about some aspect of networking that might interest other UIUCnet readers, send your question(s) to UIUCnet, 1120 DCL, Campus MC 256 or via e-mail to uiucnet@uiuc.edu.

About the New UIUCnet

The new layout and design of UIUCnet was truly a collaborative effort. It reflects the feedback of the many subscribers who took the time to fill out our reader survey, my own ideas about how to best accommodate the needs of the newsletter's diverse audience, and the creative talents of Tim Offenstein, CCSO's graphic artist, who was able to incorporate those ideas into an attractive, yet functional design. It is also worth noting (especially for those concerned about cost containment within the University) that the UIUCnet readership has grown to the point where we are now able to make use of high-quality typesetting equipment and two-color printing at a cost per copy no greater than our former methods of production.

Subscribing to UIUCnet

The UIUCnet newsletter is free for the asking. To subscribe, simply send an e-mail request to uiucnet@uiuc.edu or a written request via campus or U.S. mail to UIUCnet, Computing and Communications Services Office, 1120 DCL, MC 256, 1304 W. Springfield Ave, Urbana, IL 61801. Include your full name and campus, U.S., or international mailing address. If you have a campus address, be sure to include your department and mail code. UIUCnet is also available in electronic form. Recent issues are posted to the Netnews newsgroup uiuc.pubs.uiucnet. Back issues are available for download from the anonymous ftp host ftp.cso.uiuc.edu in the directory docnet/uiucnet and from the UIUC Gopher server.

- Lynn Ward

NetWord: POP3

Post Office Protocol - Version 3, or POP3, is a TCP/IP-based communications standard that permits desktop computers such as PCs and Macs (referred to as client hosts) to transparently access and retrieve electronic mail from other, generally larger and more powerful computers (server hosts), such as CCSO mainframes. The POP3 client-server protocol works in roughly the following manner. The POP server software runs continuously on the server host and is always listening for client requests. POP client software running on the desktop computer contacts the server over the network and presents the server with a user name and password. If the sign-on is valid, the server tells the client whether and how many new mail messages are in the user's mailbox. The client can then issue a request to retrieve the messages and optionally delete them from the server machine. Messages are deleted from the server only after the connection between client and server is closed. For those interested in the technical details of POP3, the official specification is laid out in RFC 1081, which can be obtained from the anonymous ftp host nic.ddn.mil (the file is in the rfc directory under the name rfc1081.txt).
VM POP Brings VMD Mail to the Desktop

Until recently, reading, writing, and sending electronic mail on the CCSO IBM mainframe VMD required manually logging in to VMD and invoking either Ricemail or CMS Mail (two e-mail packages installed on VMD) to process electronic mail messages. Now, thanks to the efforts of Charley Kline, CCSO's campus area network architect, VMD users have another option for dealing with e-mail.

Charley has ported the mail server utility UCB POP3 (University of California at Berkeley's Post Office Protocol 3) to the VM operating system and installed the new VM POP server on VMD (for a cursory explanation of how POP3 works, see the NetWord column on page 2 of this issue). With the implementation of POP3 on VMD, popular e-mail software for desktop computers including Eudora for the Macintosh, NUPop for IBM PCs and compatibles, or any other POP3 compliant client program can be used in lieu of VMD's native e-mail software offerings.

POP Plusses

POP3 client/server-based e-mail processing, previously available only to students and staff with Unix accounts, is preferred by many people because e-mail packages for desktop computers tend to be much easier to use than their mainframe analogues, while offering a rich set of features, options, and utilities. One of the benefits of using POP client software is that most of the activities involved in processing e-mail such as composing, reading, printing and organizing messages can be performed on one’s desktop computer (and local printer) without relying on the network. Network communications only come into play when it is time to retrieve or send mail.

Accessing POP3 Mail from a PC

Development of full-featured POP mail clients for the PC has lagged behind that for the Mac. There are several clients available for the PC, but currently none is officially recommended or supported by CCSO. The best of these packages, NUPop from Northwestern University, is still in beta testing, but is nevertheless available to the general public. NUPop is a character-based application that offers many of the same features as Eudora including the ability to create and save messages in separate mailboxes, support for mailing lists and user aliases, a built-in ph client, etc.

NUPop can be retrieved from the anonymous ftp host casbah.acms.nwu.edu in the directory pub/nupop. As of this writing, the filename of the most recent version of the software was nupop99f.zip. This compressed file, which contains the main executable program file as well as many ancillary configuration and script files, can be uncompressed with a free utility (pcunzip.com) located in the same directory. When downloading the software, be certain to get the files README.1ST and README.TOO as well as the documentation file named NUPopBetaDoc.text. The latter file is in the pub/nupop/documentation directory.

Important Note: Northwestern University does not plan to support NUPop until a fully-tested production version has been released. Since neither CCSO nor Northwestern supports the package, users are more or less on their own with regard to installation, configuration, and general use of the software. Cautious or inexperienced users may prefer to wait until NUPop is officially released and supported before installing it for day-to-day use.

Validating Your POP Mail Client

The procedures for installing and configuring POP client software to access VMD vary from program to program. For general information, read the documentation that accompanies the software.

In the course of installing the client or supporting software, you will probably be asked to type in the IP numbers for your building gateway and one or more Domain Name Servers. This information can typically be found in the config.tel file on machines in which NCSA Telnet, Clark­son University’s Telnet/Tns3270 (CUTCP), or Brown's Tns3270 software has been installed. If you do not have a config.tel file or have difficulty identifying the necessary IP numbers, contact your network administrator.

When asked for the name of your POP and SMTP servers, use the name vmd.cso.uiuc.edu. Eudora asks for the full name of your POP account. The full name of your VMD POP account will be your VMD login name followed by @vmd.cso.uiuc.edu, for example, lynnward@vmd.cso.uiuc.edu.

Note: The VMD POP server does not include extensions for sending mail via POP, but rather assumes that the client supports the standard TCP/IP protocol for sending mail, SMTP (Simple Mail Transfer Protocol). If your client gives the option of using POP or SMTP for sending mail, choose SMTP.

Once you have your POP client software installed and configured, send yourself a test message by addressing it to login_name@vmd.cso.uiuc.edu (filling in your actual login name for login_name). Then, wait a few minutes and try to retrieve your test message. If you are able to send and retrieve the test message successfully, your POP e-mail client is ready to go.

- Lynn Ward
Talented research programmer Steve Dorner left CCSO in July of this year to accept a position as Senior Engineer with the San Diego-based telecommunications firm QUALCOMM Incorporated. During his six years with CCSO, Steve made significant contributions to the campus network. Long-time UIUCnet subscribers may recall that he was the first editor of this publication. Most recently, Steve wrote an application for CCSO that automates many of the processes involved in creating Unix accounts for new users. He is perhaps best known, however, as the author of Eudora (an e-mail package for the Macintosh) and the CCSO Nameserver program, ph. Although originally developed for use here at the U of I, both Eudora and ph have been adopted by network users worldwide and have deservedly earned Steve international recognition.

What About Eudora and Ph?

Since Steve's departure, many questions have arisen about the status of Eudora. The University of Illinois will continue to own the copyright to Eudora, but QUALCOMM will now be the official developer of the software. The good news is that Steve will now have much more time to work on Eudora, since it plays a major role in QUALCOMM's internal communications. He is in the process of putting the final touches on version 1.3 (a beta version of 1.3 is available on the anonymous ftp host ftp.cso.uiuc.edu in the directory mac/eudora/beta) and will then begin work on the next major release, Eudora 2.0. New features planned for 2.0 include support for Apple Events (an interprocess communications mechanism that permits different applications on the Macintosh to interact—for example, a newsreader client could use Eudora for sending mail). Eudora 2.0 will also support Multipurpose Internet Mail Extensions, or MIME. MIME is an emerging standard for Internet mail that will allow files such as formatted text, graphics, sound, and other non-ASCII materials to be sent through the mail.

CCSO's senior research programmer Paul Pomes will take over Steve's duties as administrator of the CCSO Nameserver database. In this capacity, Paul will be performing the regular student/staff directory and university timetable updates as well as handling most problems and inquiries concerning the Nameserver (including requests from network administrators for proxy rights to their users' ph entries). Please send all ph-related e-mail to nameserv@uiuc.edu rather than directly to Paul.

A Note of Thanks

Steve would like to express his gratitude to the University of Illinois for providing him with the time and resources that have led to his many accomplishments at CCSO. He continues to have full Internet access and can be reached via e-mail at sdorner@qualcomm.com.

About UIUCnet

UIUCnet provides timely information about the campus network. It is published by the Computing Services Office and is edited by Lynn Ward. Comments and suggestions for topics are welcome. Permission to reprint all or part of UIUCnet for non-profit purposes is granted, provided full acknowledgment of the source is given. Feel free to reach us via electronic mail (uiucnet@uiuc.edu), campus or U.S. mail (UIUCnet, Computing Services Office, 1120 Digital Computer Laboratory, MC 256, 1304 W. Springfield Ave., Urbana, IL 61801), or by phone at (217) 244-0681.

For a free subscription, just send us your name and (preferably campus) address; be sure to include your department and mail code if you send a campus address. UIUCnet is also available in electronic form. Recent issues are posted to the Netnews newsgroup uiuc,pubs.uiucnet. Back issues are available for download from the anonymous ftp host ftp.cso.uiuc.edu in the directory doc/net/uiucnet and from the UIUC Gopher server.
Shopping for Information on the Internet with WAIS

It might be frightening to think about, but the holiday shopping season is really just around the corner. Perhaps your wife, your husband, or your significant other wants a new food processor. Little Billy has been begging for the latest Nintendo video games, and grandma has asked for a powder-blue chenille bathrobe. The lists goes on and on. There are a number of ways to do your shopping. You can spend weeks running around to every specialty store in town finding just the right thing for each person on your list. During these excursions, you'll probably meet some very friendly and helpful sales people. You may also encounter a few store clerks who will only begrudgingly give you the time of day.

If the "shop 'til you drop" approach doesn't appeal, there is another option. You can plop down in your easy chair with a Sears, Penny's, or Spiegel catalog, look up the items you want to buy in the index, browse the relevant pages (to check out price, quality, colors, features, etc.), and then, with two simple tools, a telephone and a credit card, you can order all of your gifts at once. In a few days, they'll arrive neatly bundled at your front door.

Shopping for information on the Internet can be a lot like holiday shopping. There are hundreds of specialized databases and information archives at sites all over the world. Using telnet or ftp, you can visit these sites individually to try to find the (continued on page 2)
information you need. But first you must already know that the resources job relatively easy.

mands, and, like the uncooperative along the way. For computer gurus, archives will have friendly, menu­

exist, where they are located, and what to do with them. Some information navigating the Internet in this manner often has great appeal. But to expect hundreds of different commands and in­
terfaces may be asking too much.

Fortunately, over the last year or so, some new tools have come on the scene that make finding information on the Internet almost as easy as ordering a bathrobe from the Sears Catalog. You may already be familiar with one such tool, Gopher. Gopher allows you to navigate information archives and download files from UIUC’s own Go­pher server and other servers all over the globe with a single client interface (for more information on Gopher, see the May 1992 issue of CCSO’s Updates newsletter, vol. 3, no. 4). Another application that has recently received a lot of attention is WAIS (pronounced like the word “ways”), which stands for Wide Area Information Servers. Like Gopher, WAIS offers a quick, one­stop shopping approach to over 300 databases on the Internet.

What Is WAIS?

WAIS is a distributed database system based on the client-server model. WAIS servers are computers on the network that contain one or more da­
tabases and special software that takes care of the indexing and retrieval of the documents in the database(s). One of WAIS’s special strengths is its abil­
ity to accommodate a wide variety of data types. Although most WAIS da­
tabases today consist of plain text, WAIS servers can store and index image files (such as files in GIF, TIFF, and PICT formats), sound files, formatted text files, and many other file formats. As far as the server is concerned, the format of the data is not significant, because the client does not query the database directly, but rather queries an index that contains information about the database.

The key to getting at WAIS data is the client application. The client is the software interface that allows end-users to ask questions about what is con­tained in one or more WAIS databases and read or download documents of interest. WAIS clients have been de­
veloped for many different computer platforms including the Macintosh, DOS, VMS, RS6000, generic Unix, X Windows, MSWindows, GNU Emacs, SunView, NeXtStep, and Motif.

Communication between the WAIS client and server is based on a standard protocol called Z39.50. This pro­
tocol, which was originally developed as a tool for searching library catalog systems, has been expanded by the developers of WAIS to provide for future flexibility as WAIS evolves. But enough on the technical side of WAIS. Let’s take a look at how the WAIS project got started, what kind of information it offers, and how you can use it to retrieve information.

The Origins of WAIS

WAIS was the brainchild of Brewster Kahle, project leader at Thinking Machines Corporation. (Thinking Machines is the manufac­
turer of massively parallel computers called Connection Machines.) In 1989, Kahle (and Thinking Machines) in­
vited three corporate giants, Apple Computer, Dow Jones and Co., and KPMG Peat Marmick (a world-wide accounting and tax consulting com­
pany) to jointly develop a text-based information system for corporate ex­
ecutives that would permit users (in Kahle’s words) “to retrieve personal, corporate, and wide-area information through one easy-to-use interface.”

Ideally this information retrieval sys­
tem was to be platform independent so that the user could obtain information residing on many different ma­
chines located in many different places. Another goal of the project was to design an interface that would not require any specialized knowledge of computers or database query lan­
guages. Specifically, the user interface was to be as natural and user-friendly as possible. The fruits of this collabo­
ration are the set of products that we now refer to collectively as WAIS.

Although initially targeted for the corporate sector, in 1991 the source code for the WAIS protocol, a few information servers, and several WAIS

(continued on page 3)
interfaces (clients) were made freely available on the Internet as an experiment. Well, what started out as an experiment about a year ago has turned out to be one of the hottest new resources on the Internet. Today, there are over 300 publicly accessible WAIS databases on servers all over the world, and many researchers, librarians, and Internet information providers are in the process of making data available through WAIS.

What Can I Find with WAIS?

With over 300 databases to choose from, there is hardly a topic that isn't at least touched upon in WAIS. The sidebar called Information Available through WAIS: A Sampler on this page will give you an idea of the tremendous diversity of the WAIS databases. Unfortunately, most WAIS clients do not offer the option of browsing the list of WAIS databases to see what's available. There are, however, two ways of viewing the entire list of WAIS databases. First, the Gopher application offers a gateway to WAIS-based information. You'll typically find it in the sub-menu Other Gopher and Information Servers/WAIS Based Information/Everything. If you go to this menu, you can see a list of all of the publicly available WAIS servers. The Gopher interface is not especially effective for searching WAIS archives, but does provide an easy way to see a complete list of WAIS databases.

Another method for browsing WAIS data is to telnet to a computer at Thinking Machines Corporation that runs the Unix WAIS client called SWAIS. To do so, open a telnet session with the host quake.think.com and log in as wais. When asked for a password, enter your e-mail address (e.g., ward@ux1.cso.uiuc.edu). A welcome banner will appear that describes a little bit about the SWAIS interface. Then you will see a list of WAIS databases (called sources) as shown in Figure 1 on page 2. You can scroll through the list with your arrow keys and view a description of any source by highlighting it and typing v for view. To exit the description, type q for quit and then press any key. The SWAIS client can also be used for conducting WAIS searches. The interface is fairly intuitive, and if you need help, you can simply type a question mark (?). However, as WAIS clients go, SWAIS is not among the best. To get a feeling for the true power of WAIS, use a client specifically designed for your desktop computer or workstation.

(continued on page 4)
Important WAIS Concepts

Regardless of what WAIS client you use, the procedure for searching WAIS databases is more or less the same. Before getting into specifics, however, it's important to understand at least three pieces of WAIS jargon:

- **The Directory of Servers**: This is a master list of WAIS databases that is maintained by Thinking Machines Corporation (TMC). When a new WAIS database is created, the maintainer sends information about how to reach the database and what it contains to TMC. This information is then added to the Directory of Servers. To put it succinctly, the Directory of Servers is a WAIS database containing descriptive information about all other publicly accessible WAIS databases.

- **Source**: In WAIS lingo, the word "source" actually has two meanings. In a general sense, source is a synonym for the word database. More specifically, a source is a text file used by the WAIS client application that contains information about a specific WAIS database, including how to reach the database (e.g., its domain name, IP address, and TCP port) and a description of what it contains. The content of a source file is generally identical to the entry for that source in the so-called Directory of Servers. If you acquire and install a WAIS client, the software may only include a source file for the Directory of Servers itself. When you connect to the Directory of Servers, you can search for other sources and save them as source files with your client program.

- **Question**: A question is a WAIS query or lookup. The definition seems rather obvious, but WAIS questions have special characteristics. In addition to containing your search expression, the question contains the list of sources (databases) you want to search, and any refinements that you might have made to your query including relevance feedback, a concept we'll talk about in a few moments. Questions, like sources, can be saved as files. Some WAIS clients allow you to automatically run saved questions at specific time intervals to see if any new information is available on your topic. Questions can also be modified. You can add new keywords, new sources, etc., and these modifications also can be saved. So, a question is not just a one-time lookup, but a collection of information that allows you to do the same lookup many times or modify and refine your lookup as you get a better feel for how to search WAIS resources.

Starting a Search

Conducting a WAIS search is essentially a three-stage process, but you may have to repeat one or several stages to get the results you want. During the first stage, you ask the Directory of Servers which sources or databases are likely to contain the information in which you are interested (and you can save those sources if they are not already included in the source menu of your client). In stage two, you select the sources that you want to query (based on the information returned to you from the Directory of Servers) and construct a query expression (a list of keywords to look for in your selected databases) that will hopefully return useful information about your topic. In stage three, which is optional, you can refine your search with the feature called relevance feedback. At any point along the way, the sources, questions, and documents that are returned to you as the result of your query can be saved to your local storage device.

To illustrate this process, let's look at an example. When I began to write this article, I only had a vague idea of what WAIS was. I spent hours pouring over books and newsletter articles that talked about WAIS. These put me on to some ftp sites and newsgroups that contained information on WAIS, and slowly but surely I acquired a file folder full of xeroxes and printouts of articles and documentation on WAIS. Ironically, I could have gathered much of the same information by simply installing the WAISstation client on my Mac and conducting a few simple searches.

**Stage 1: Finding the Right Sources**

The 300 plus WAIS databases available today cover subjects from anthropology, to computer science, to topics in popular culture such as the Simpsons. When you are looking for information, it's not really possible or practical to search all of the WAIS databases for matches to your query. So, you must determine which sources are the ones most likely to offer information on your particular area of interest. The best way to do this is to search the master database of WAIS sources (the Directory of Servers) for the names of the sources on your topic. Begin by telling your WAIS client that you want to search the source called The Directory of Servers. Next, enter your query expression (most clients provide a window where you can enter a question or a series of keywords). Since the Directory of Servers contains general information about each source, it's important that your query expression be rather general. For example, if your ultimate goal is to find a recipe for Chinese potstickers, you are better off asking the Directory of Servers to find sources that contain the keywords "recipes" or "food." It's not likely, after all, that there will be an entire database devoted to potstickers, but as it happens there are a couple of cookbook sources.

I began my search for information about WAIS by creating a new question. I selected the Directory of Servers as the source for my question and then I entered "internet distributed databases" as my query expression. When I finished constructing my question, I invoked the *run* command. My
WAIS... (continued from page 4)

client contacted the Directory of Servers database at TMC and asked the server to look for all of the sources that contained the words "internet," "distributed," and "databases" in their entries. The server at TMC responded by returning a list of documents ranked from highest to lowest according to how well they fit my query expression. (WAIS ranks the documents based on how many times each word in the query expression appears in the document. The highest possible score is 1000, but the Mac WAIS client represents these scores with bars of varying lengths, instead of numbers.)

Each document in the list contained a description of a different WAIS database. By looking at the rankings and reading the descriptions, I determined which sources to search for information about my topic, WAIS. Before I could actually begin my search, however, I had to save information about how to contact these sources to my local disk (the standard method for saving a source is to open or read an entry from the Directory of Servers and invoke the save option on your client application). Once having done so, the sources I saved appeared in my sources menu (actually a window) along with the Directory of Servers.

Stage 2: Searching the Sources

In order to actually locate information about WAIS, I created a second question. This time I selected the sources that I saved during my previous search and I entered the keyword "wais" as my query expression. Since multiple sources had been selected, when I ran the question my client checked each source in succession for documents that contained the word "wais." Once again I was presented with a list of documents ranked from highest to lowest depending on how many times the keyword "wais" appeared in each document. I was able to read the documents on line and save or print documents I wanted to keep. Among them were many general articles on WAIS, including several that I had already retrieved with other tools.

Stage 3: Refining the Search

Sometimes a WAIS search will turn up some pretty odd matches or miss documents that might be relevant. This is because it ranks documents according to how many times one or more of your keywords appears in a document. WAIS doesn't know how to look for synonyms and it only looks for exact matches. WAIS also doesn't understand that expressions like "social work" should be treated as a single entity. Thus, if it were to find a document in which the word "social" appeared 25 times and "work" occurred only once or not at all, the document might get a very high ranking. In part, this apparent weakness was deliberately built in to the WAIS software to make it easy to use. To compensate, WAIS offers a unique feature for refining searches called relevance feedback. Relevance feedback allows you to select all or part of a document that matched your original search and ask WAIS to look for documents that are similar to it.

WAIS's relevance feedback feature is like doing a giant query. It takes all of the words in your selected document (or document section) and looks for other documents that contain the same words. The more word matches it finds, the higher the ranking a document will get. Using relevance feedback, I was able to narrow down the large number of documents that were returned from the search on the keyword "wais" to a smaller number that treated certain topics in detail.

Caveat Emptor

As suggested above, WAIS is not perfect. If you are accustomed to using sophisticated database software, you'll be frustrated by the fact that you cannot do proximity searches or use the Boolean operators "and," "or," and "not" to selectively include or exclude documents. Also, many people who have written articles about WAIS, including Brewster Kahle, maintain that one of WAIS's strengths is its ability to deal with natural language questions. While it is true that you can enter a query expression like "Which servers contain information about early music?" you will undoubtedly be dissatisfied with the results. For the moment, at least, WAIS is unable to determine which words are important in a standard English language question; so, your search could turn up lots of sources that contained neither the word "early" nor "music," but did contain the words "server" and "information." WAIS developers are working on improving the algorithms that the server uses to find matching documents. Meanwhile, it's best to limit your query expressions to the words you really want to find.

There is also a need for more stable and robust WAIS clients. Although WAIS servers are not particular about the kinds of data they store, few WAIS clients can actually cope with the many file formats supported by the servers. The Mac client, for example, can only download and display image files that are in PICT format (it behaves as if it is downloading GIF files, but they never actually arrive) and the character-based PCWAIS client cannot handle any image files. Some WAIS clients are also known to crash from time to time, or to simply hang on a complex search. So, if you are working in a multi-tasking environment, make sure all of your work is saved and be prepared to reboot your machine with little or no warning.

However, despite these and several other shortcomings, WAIS is a very useful tool that has the singular advantage of providing access to enormous quantities of information through one easy-to-use interface. WAIS is also a very new technology and will undoubtedly improve over time. For now, if you are willing to tolerate a few quirks, WAIS can indeed deliver
WAIS Client Software for Macs and PCs

This month's feature story covers an exciting new Internet resource called WAIS. WAIS client applications have been developed for many different computer platforms. Some WAIS clients are character-based and some take full advantage of the graphics display capabilities of the systems for which they were designed. But regardless of the interface, the underlying principles of how to use WAIS remain the same. This article reviews two WAIS clients, WAISTATION for the Macintosh and PCWAIS for IBM PCs and compatibles running the DOS operating system. If you've not yet read the cover story, Shopping for Information on the Internet with WAIS, you should probably do so before delving into these reviews. It will introduce you to some basic WAIS concepts and procedures that are taken for granted in the discussion below.

WAISTATION for the Macintosh

WAISTATION for the Macintosh, developed by Thinking Machines Corporation, was the first client application designed to access WAIS-based information. As such, it is the prototype on which many subsequent WAIS clients have been modelled. The Finder-like interface is extremely intuitive and takes advantage of standard Macintosh procedures and conventions such as dialogue boxes, drag and drop icons, and pull-down menus.

If you have MacTCP installed on your computer already, WAISTATION requires virtually no configuration. When you start the application for the first time, you will be told that "The Personality File is Missing." Ask WAISTATION to create a new one. A file called WAIS preferences will appear in your WAIS folder and two windows will appear on your screen, Question and Sources (see Figure 1 on this page). The Question window displays the icons and names of any WAIS questions that have been saved during a WAIS session and the Sources window contains the icons and names of saved WAIS sources.

Creating and Saving Questions

To create a new question, select New Question under the Question menu. A new question window with their icons from the Sources window to the box labeled In these sources. Then enter your keywords in the box labeled Look for documents about. You can create a new question and ask the Directory of Servers to give you a list of the sources on a particular topic. To save a source from the list, double click on its icon and a window with information about that source will appear. You can accept the information as is or modify it and then select Save from the File menu. The source will be added to your Sources window and a file for that source will be added to your Sources folder.

Saving New Sources

Two sources come bundled with the WAISTATION application, Directory-of-Servers and Connection-Machine Server. To add additional sources to the Sources window, you must either enter the information for the source manually by selecting the New Source option under the Source menu, or you can create a new question and ask the Directory of Servers to give you a list of the sources on a particular topic. To save a source from the list, double click on its icon and a window with information about that source will appear. You can accept the information as is or modify it and then select Save from the File menu. The source will be added to your Sources window and a file for that source will be added to your Sources folder.

Figure 1: WAISTATION for the Mac. The Question and Sources windows on the left contain the names and icons of saved questions and sources. The large window labelled Question-1 is a new question window containing a query, selected sources, and a request for relevance feedback.

(continued on page 7)
rerun the question again sometime, click on your question window and select the Save option under the File menu. You will be asked to give your question a name and then it will appear in the Question window. Once a question has been saved, you can open it by double clicking on its icon in the Question window and run it by clicking on its Run button.

Relevance Feedback

WAISStation’s relevance feedback feature is very easy to use. If you want to find documents similar to an entire document, drag the icon of the document from the Results box to the Which are similar to box. If you only want to use part of a document for relevance feedback, open the document and use the mouse to select the relevant portion. An icon will appear next to the selected text, which can also be dragged to the Which are similar to box. To get the new results based on your selections, simply run the question again. (Warning: sometimes complex queries with requests for relevance feedback will cause WAISStation to crash and you’ll have to restart your Mac.)

Other Features

WAISStation offers some additional features that come in handy for dealing with documents, questions, and sources. The Text menu allows you to specify the font that documents will use and the style in which your keywords appear. You can, for example, ask for all of the words in your query expression to show up in boldface or italics. The Text menu also includes a Best Section option. This will locate the part of your document that has the most hits (i.e., occurrences) of your keywords. The “View Results By “ option under the Question menu allows you to organize and view the results of a question by score, date (of the document), or source.

One of the most powerful features of WAISStation is its ability to query sources at particular time intervals. When you save a source, you can tell WAISStation how often to contact the source. The default is on request—that is, when you run a question that uses the source. But you can also tell WAISStation to contact the source at regular time intervals, such as hourly, daily, monthly, etc. If you use Multifinder and keep the WAISStation software running in the background, WAISStation will automatically contact the source at the specified time and update any questions that use that source.

How to Get WAISStation

WAISStation is available at many different locations, but the authoritative server is ftp.think.com. You’ll find the most recent version, WAISStation 0.63 Release, in the wais directory under the name WAISStation-0-63.sit.hqx. When transferring the file with ftp, put your ftp client in ASCII mode (or BinHex mode, if BinHex is an option for your client). The file is both compressed and in so-called BinHex format. You’ll need a utility like StuffIt to make the files contained in this archive usable. The WAISStation software comes with some brief, but useful documentation (in MS Word format) and a README file that contains additional information about how to save sources and use the Directory of Servers. Many of the features of the software are undocumented (the documentation pre-dates this release), so you’ll have to explore to find out what all of the possibilities are. Questions about the software and bug reports can be sent to WAISStation’s developer, Harry Morris (morris@think.com).

PCWAIS for DOS Machines

As is typical of most TCP/IP applications for DOS machines, PCWAIS requires the user to edit several configuration files before starting the application. The file pcwais.cnf is a text file that contains information about where (in which directory) you want to store source files and a temporary spool file. Another file, wattcp.cfg holds network information about your local host, such as its IP address, netmask, the IP address of your primary nameserver, your gateway, and your domain name. Sample configuration files are provided, but you will have to modify them to make them work with your machine. If you don’t have the correct information at hand, ask your departmental network administrator for help.

PCWAIS is a character-based application, but it does its best to mimic the graphical environment of WAISStation for the Mac (see Figure 2 on page 8). The software works best with a mouse. However, you can also navigate the various boxes, buttons, and menus with the tab key, arrow keys, and Alt-key combinations.

When you first start the application, a New Question window appears. The sources that come with the application are displayed in a box labeled Available. A handful of source files come with the distribution including the Directory-of-Servers. To select a source to search, you can either double click on it with the mouse or cursor to it with the arrow keys and press Alt-A.
for Add. The name of the source will then be listed in the Sources box.

**Saving New Sources**

Saving a new source with PCWAIS is an awkward procedure. As is typical of WAIS clients, one begins by querying the Directory of Servers for relevant sources. Sources appear in the Results box ranked from 1000 down depending on how well they matched your query. To save the source, you must open (or view) it and then select the Save option under the File menu. PCWAIS does not, however, suggest a default path and file name. You must enter the full path of the directory that is designated as the commonsourcedir in your pcwais.cnf file followed by a filename that ends with an .src extension. This procedure is not documented anywhere! In addition, when you save the source, the rank that it received as the result of how well it matched your query will be included in the source name unless you deliberately remove it. If you don’t remove the rank, a source will appear with a name like 1000_internet_services in your Available or Sources box. Since sources are usually listed in alphabetical order, the presence of a number at the beginning of a source name will make it difficult to find.

**Creating and Saving Questions**

Questions are created by choosing the New Question option under the Question menu. This action will open a New Question window where you can select your sources and fill in your query expression in the Query box. Matching documents are displayed in the Results box and can be viewed by double-clicking on the name of the document or highlighting it with the arrow keys and pressing Alt-G for Get. The document can be saved while it is open by using the Save option under the File menu. If no documents are open, the question can be saved by clicking on the Save button or pressing Alt-v for Save.

**Relevance Feedback**

To ask for relevance feedback in PCWAIS, highlight the desired document in the Results box and then click on the Relate button or press Alt-e for Relate. The name of the document will then appear in the Relevant Documents box. PCWAIS restricts relevance feedback to entire documents. There is no facility for selecting a portion of a document as the basis for a query with relevance feedback.

**Other Features**

PCWAIS does not highlight keywords in matching documents, but it does have a Find option under the Edit menu that allows you to look for any word you want to locate. You can also edit documents that you retrieve with the Cut, Copy, and Paste options under the Edit menu.

PCWAIS is limited, but nevertheless useful, tool for seeking out text-based WAIS information (the current implementation does not handle graphics files). Its greatest liability is the lack of documentation. Aside from the one page readme file that explains how to configure the software in only the most general terms, the user is left entirely upon his or her own to figure out how it works. For users who have never been exposed to WAIS in general (or specifically to other WAIS clients), mastering PCWAIS could be quite difficult. In addition, like WAISTation, PCWAIS is fond of crashing at unpredictable moments. Generally, however, it does so politely, first requesting permission and then returning the user to a DOS prompt.

**How to Get PCWAIS**

PCWAIS is available from the anonymous ftp server ftp.oit.unc.edu. You’ll find it in the pub/wais/UNC/DOS directory under the filename pcdist.zip. Before downloading the file, make sure you are in binary mode. The file is a ZIP archive and must be decompressed with a utility like PKUNZIP. PCWAIS requires that the packet driver interface designed to work with your network interface card be installed and loaded in order to run. Most PCs on the campus backbone already have this utility installed. If you do not, ask for help from your network administrator. Bugs and other questions about PCWAIS should be reported to the author, Jim Fullton (jim_fullton@unc.edu).

-Lynn Ward

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**Figure 2:** PCWAIS, a point-and-shoot, character-based WAIS client for IBM PCs and compatibles
Anonymous FTP Shortcuts

Anonymous FTP Login

The term “anonymous ftp server” is so-named because the server permits users to open an ftp session anonymously—that is, without having a registered account on the ftp server machine. The usual and generally publicized procedure for logging in to such hosts is to enter the username anonymous rather than your real name when presented with the login or name prompt. Then, when prompted for a password, users are typically asked to enter their e-mail address, so that the server’s system administrator can keep track of the unregistered users who access the system.

To speed up the anonymous login process, try these shortcuts. Most servers accept the login ftp as equivalent to the user name anonymous. Ftp is certainly easier to spell than anonymous and will get you to the password prompt in four (if you count pressing the enter key) as opposed to ten keystrokes. Once at the password prompt, consider entering your ph alias rather than your full e-mail address. For most UIUCnet users, the ph alias is much shorter than their full Internet-style e-mail address (e.g., l-ward1@uiuc.edu vs. ward@ux1.cs. uiuc.edu). Another, even quicker solution is to enter your user name followed by an “@” sign as your password and leave the domain name off altogether (e.g., ward@). The sample session below illustrates logging in to Northwestern University’s anonymous ftp server in precisely this manner (characters in boldface are entered by the user):

uxl 3> ftp ftp.acns.nwu.edu
Connected to ftp.acns.nwu.edu.
220 casahf.acns.nwu.edu FTP server (SunOS 4.1) ready.
Name (ftp.acns.nwu.edu:ward): ftp
331 Guest login ok, send ident as password.
Password: ward (the password does not actually appear on the screen)
230 Guest login ok, access restrictions apply.
ftp>

Reading Text Files On Line

Most anonymous ftp servers have text files in each directory (typically named readme.txt, readme.doc, index, index.txt, or some other variation of readme or index) containing information about the files in that directory. Since these files are provided to help the user determine which files, if any, he wants to download, it is usually advantageous to read them before actually downloading files to your local host. Unfortunately, most ftp client software does not offer the option of reading text files on line. Unix and DOS users can get around this problem by redirecting the output of an ftp command like get READ.ME so that the specified file is displayed to the screen rather than being transferred to a local disk.

The Unix Solution. On Unix machines, you can read text files during an ftp session by piping the results of an ftp get command through a Unix pager utility like more or less (less is especially convenient because it allows you to move both forwards and backwards through the file). For example, to view the file called READ.ME, you could enter the command:

```
get READ.ME | more
```

or

```
get READ.ME | less
```

at the ftp> prompt. The file will be displayed one screenful at a time. To move forward in the file, press the space bar. If you specified less as your pager, you can move backward through the file by typing the letter b at the colon prompt (for more information on using the more and less commands, consult the Unix manual pages by typing man more or man less at the Unix prompt). Once you have read the file, you can continue with your ftp session as usual.

The DOS Solution. DOS users can achieve a similar effect by redirecting the output of an ftp get command to the screen (the DOS output device called CON). To view a file called READ.ME during an ftp session from a DOS machine, enter the command:

```
get READ.ME con
```

at the ftp> prompt. The file called READ.ME will scroll continuously on the screen. To stop the file from scrolling, press the Pause key on extended keyboards or Ctrl-s on standard keyboards. To resume scrolling, press any key.

Other Platforms. If you cannot use one of the methods described above, it may be possible for you to download a text file to your local disk and read it without closing your ftp session. Most ftp clients include the ability to “shell out” to the local operating system, perform a local command, and then return to the ftp session. If your client has this capability, you could download (get) the appropriate readme file(s), read them on your local machine with a text editor or file viewer, and then return to your ftp session. The exact procedures involved will depend on your ftp client and the software you use to view the file. For more information, consult your software documentation, or, if the package is supported by CCsO, contact the CCSO consulting office (333-6133 for CCSO mainframe systems and 244-0608 for microcomputers).
CCSO’s Anonymous FTP Service Moves to Different Host

For several years, CCSO has made software and documentation files available to UIUCnet and other Internet users by running an anonymous ftp server on uxl, a general purpose Unix machine. As the demand for Unix accounts from students and staff has grown, CCSO has acquired new machines and has started to move services onto them, so that no single CCSO computer is overburdened. Last spring, for example, the Netnews server was moved from uxl to the Sequent Symmetry computer, ux3. Ux3 is now also CCSO’s primary anonymous ftp server, and anonymous ftp services on uxl have been disabled. This change will affect end-users in several ways:

• All of the files on uxl that were accessible to anonymous ftp users (the /pub directory and all subdirectories below it) have been moved to ux3. All users are strongly encouraged to use the address ftp.cso.uiuc.edu (rather than uxl’s authoritative domain name) to access the new anonymous ftp server. This address is an alias that always points to the machine functioning as CCSO’s primary anonymous ftp server. (An alias has also been assigned to the Netnews server. Client software designed to access the News server should use the name news.cso.uiuc.edu if the software supports the use of domain names.)

If, for some reason, you are unable to connect to the anonymous ftp server using its alias, you can try the IP address 128.174.5.61. Remember, however, that unlike an alias, an IP address or authoritative domain name will direct you to a specific computer, even if the desired service is no longer offered on that host. The system of service-based aliases allows utilities like Netnews and anonymous ftp to be accessed transparently regardless of where the application actually resides.

• Although the alias ftp.cso.uiuc.edu has been in use for some time, some articles in former issues of this publication and other CCSO documentation instruct readers to ftp to the host uxl.cso.uiuc.edu and login as anonymous in order to obtain publicly accessible files. Since uxl will no longer accept anonymous ftp requests, following such instructions explicitly will result in an unsuccessful login. When using older CCSO documentation that describes the anonymous ftp login process, replace any references to uxl’s machine address with the alias ftp.cso.uiuc.edu.

• Files in the anonymous ftp area on ux3 are mounted on CCSO’s other Unix machines (e.g., uxa, uxl, ux4) using an implementation of the Network File System (NFS) protocol (for an explanation of NFS and how it works, see the NetWord column on page 15 of this issue). Users with accounts on the latter machines can access these files by logging in as usual and changing to the directory /nfs/ftp. The files in the /nfs/ftp directory and the subdirectories below it actually reside on ux3, but they can be viewed and manipulated (copied, ftp'd, etc.) just as if they were stored on these other Unix machines.

• Finally, individuals with accounts on uxl will notice that the /pub directory no longer exists. The files that were previously in the /pub directory are now in the NFS-mounted /nfs/ftp directory described above.

CCSO staff are aware that the inevitable relocation of services and changes in IP addresses or machine names can cause confusion and extra work for network administrators and end-users. Hopefully, as people become accustomed to using service-based aliases, future changes can occur without affecting the manner in which these services are accessed.

- Lynn Ward

Next Month in UIUCnet...

• ISDN on UIUCnet
• Review of Fetch, ftp client for the Macintosh
• NSFNET backbone upgrade
• And much more...
Network Politics: Campaign '92 Information Available

INTERNET TREASURES

As this year's presidential campaign steps into high gear, so has the media hype. Voters must sift through or ignore the mountains of mudslinging and attention to trivial events or details—Dan Quayle’s spelling abilities, Hillary Clinton’s headbands, the “who is more like Harry Truman?” contest, etc.—in order to discover the candidates’ positions on truly important issues. UIUCnet users who want to get beyond the sound bites can download position papers, speeches, official statements, press-releases, and fact sheets for both George Bush and Bill Clinton from the anonymous ftp host nptn.org. All files are original, unedited documents obtained from the Clinton/ Gore and Bush/Quayle campaign committees.

Retrieving Campaign '92 Info
To retrieve some or all of the campaign information follow these steps:

1. Open an ftp session with the host nptn.org. When prompted for a user name, enter anonymous. When prompted for a password, enter your e-mail address.

2. Change to the directory /pub/campaign.92 by typing:

   cd /pub/campaign.92

3. To see a list of files in the directory, type:

   Is

   Documents related to the Clinton campaign begin with the letter “c” and are numbered sequentially c1.txt, c2.txt, c3.txt, and so on. Bush campaign documents follow the same scheme, but begin with the letter “b” (b1.txt, b2.txt, b3.txt, etc.). The files INDEX.CLINTON and INDEX.BUSH list the documents for each candidate respectively, providing the filename and a brief description of the contents of the file. These index files should probably be downloaded and read or printed first because they are the only means of knowing the subject and source of each file. (All files in the directory are in ASCII format.)

4. To download a file, first get into ASCII mode by typing the command ascii at the ftp prompt. Then type:

   get filename where filename is the actual name of the file you want to retrieve; for example, get INDEX.CLINTON.

5. Once you have downloaded the desired files, close the ftp session by typing quit at the ftp> prompt.

Campaign '92 Sponsor: NPTN
The “Campaign '92” ftp site is part of the Teledemocracy Project sponsored by the National Public Telecommunications Network (NPTN). NPTN is a nonprofit organization with three principle objectives: 1) to assist organizers in cities throughout the U.S. and world in establishing community computer systems with free public access (such systems are called Free-Nets); 2) to link these community systems into a public network similar in spirit to National Public Radio and the Public Broadcasting System; and 3) to disseminate information and establish network-wide services, features, and programs that take advantage of the unique strengths of telecomputing as a communications medium. More information on the NPTN and the Teledemocracy Project is available from the ftp host nptn.org in the directory /pub/info.nptn.

Alternative Access to Campaign '92
The Campaign '92 information is also available on the UIUC Gopher server under the Newspapers, Newsletters, and Weather menu and will be posted to the Netnews newsgroups alt.politics.clinton and alt.politics.bush.

- Lynn Ward
New Terminal Server Hardware, Procedures, and Policies

If you are a regular user of the CCSO terminal servers, you have probably already figured out that nothing stays the same for very long. Recent hardware and software upgrades along with the reconfiguration of the modem pool rotaries are already providing users with improved and expanded dial-in services. And soon, because the terminal server is potentially the key that opens the door not only to computers on UIUCnet, but to the entire Internet, new security controls will gradually be phased in. In the long run, end-users and system administrators should benefit from these changes, but the initial transition may require modem users to modify login scripts, reconfigure telecommunications software, and learn a few new but simple procedures for logging in.

Hardware Upgrades

To meet the increasing demand for dial-in services to the campus net, a new Cisco terminal server and thirty-two new V.32bis modems have been added to the terminal server configuration. When you dial in, you will usually see a short message (or banner) and then will be presented with the terminal server prompt, which presently consists of the name of the server to which you are connected followed by a “>” sign (e.g., term1>). If you need to report terminal server problems to the Network Operations Center, it is important to know the name of the server you are using. Even if the names of one or more of the servers should change sometime in the future (hint! hint!), you can always know what server you are on by looking at the character string that precedes the “>” in the terminal server prompt.

What Number Should I Dial?

Including the thirty-two new high-speed modems, there are now six separate modem pools available to dial-in users. The rotaries of four of these pools have been linked so that, if all modems in one pool are in use, the call will be rolled over to the next available modem in the chain. The six pools of modems and the manner in which the rotaries are linked are illustrated in the figure on this page. As shown in the figure, a total of 134 modems are available by dialing the number 333-4000. However, if you want to achieve the optimal throughput for your particular modem, you should dial the first number in the chain of the four linked rotaries that corresponds most closely to your modem’s specifications. In general, users with modems with a basic transmission rate of up to 2400bps (with or without MNP4 and MNP5 reliability and data compression modes) should dial the number 333-4000. If you have an MNP4 modem that has problems communicating with the MNP4-5 pool, try dialing 333-4007 to connect directly to the separate pool of MNP4 modems. Users with V.32 and V.32bis modems should dial the number 333-3700 (the first forty-eight modems in this chain are configured to permit throughput rates of up (continued on page 13)
Terminal Server...
(continued from page 12)

to 38,400 bps with data compression enabled). If your modem uses a proprietary protocol such as PEP or HST, use the number that will connect you directly to the pool of modems that supports that protocol (333-5109 for PEP and 333-4976 for HST).

Phase-In of Mandatory Login
At the present time, dial-in users have the option of logging in to the terminal servers, but login is not required. Eventually, however, all users will be forced to log in to the terminal servers before they can connect to computers on or off campus. This new policy will be implemented in two phases. During the first phase, which will probably begin in March of 1993, CCSO will begin to restrict the machines that dial-in users can access without first logging in to the terminal servers. The first machines to require terminal server login will most likely be those administered by CCSO (e.g., ux1, uxa, ux4, uxh, VMD, etc.). Phase two, slated for early summer of ’93, will extend the forced login requirement to all computers on the campus network, except for certain systems exempted by request, such as the online library catalog system (IOPlus). Stay tuned to this newsletter and the terminal server banners for up-to-date announcements on the status of mandatory login.

Note for System Administrators: Campus system administrators who would like to restrict terminal server access to their machines can request that forced login be turned on prior to the scheduled implementation date. To request this service, contact Mike Gardner via e-mail at mgg@uiuc.edu. If you would like to have forced login turned on early for your system, it is essential that you educate your users about the change and provide them with support as they adjust to the new procedures.

The Login Procedure
The procedure for logging in to the terminal server will add a few extra keystrokes to your terminal server session, but is really quite easy. Before you get started, however, you’ll need two pieces of information, your ph alias and your ph password (if you do not know your alias and password, see the section Planning Ahead for Forced Login below). With this information in hand, you can begin your session by dialing the terminal server as usual. Once connected, enter the command login at the terminal server prompt. You will be prompted to enter your username. Enter your ph alias as your username. Then, at the Password: prompt, enter your ph password. For example (text entered by the user appears in boldface):

```
<username> g-bush (George Bush's ph alias)
<password> iloCoorb (George's ph password will not be echoed to the screen)
```

Once you have logged in, you will be returned to the terminal server prompt and can conduct your terminal server session as usual.

Advantages of Terminal Server Login
Although logging in to the terminal server may require a little extra work on your part, the advantages far outweigh the inconveniences. Users and system administrators can expect to reap the following benefits:

- **Expanded Network Access.** Any user who logs in, even today, can connect directly from the terminal server to any host on the Internet. Dial-in users who do not login are restricted to connecting to hosts in uiuc.edu and uic.edu domains.

- **Better End-User Support.** Support for terminal server problems should also be dramatically improved. When a user logs in, the terminal server port, modem, and host to which the user is connected are recorded in a log along with his or her username. If a terminal server problem is reported to the Network Operations Center (244-1000), NOC staff can locate the session in the log by username and know immediately where to look for hardware and configuration problems. Without this log, it is extremely difficult for NOC personnel to isolate the particular modem or port with which a user is experiencing problems. The login data can also be used to generate usage statistics that will enable the terminal server management staff to plan for and provide better services, such as the recent hardware upgrade.

- **Improved Security for Everyone.** The forced login policy will add a much needed layer of security to the campus network. Currently, any person with a computer and modem (including individuals without any association to the University) can dial the CCSO terminal servers and try to connect to any machine on the campus network (of course, this does not mean that the user will necessarily be able to log in to any machine). Forcible login will limit terminal server usage to University students and staff, reducing the possibility of unauthorized users accessing restricted campus network resources.
Terminal Server...
(continued from page 13)

CCSO can also provide departmental system administrators with information about who is accessing the machines for which they are responsible. Weekly and monthly reports listing the aliases of the persons who accessed a particular system via the terminal server can be generated on request. If an unauthorized break-in is suspected, more detailed information can be provided (requests for such reports should be sent via e-mail to Mike Gardner at mgg@uiuc.edu). Along the same lines, if an end-user suspects that someone has been using his or her alias to log in to the terminal server, CCSO can use the logs described above to determine which machines have been accessed under a particular alias. This data combined with other kinds of information can help to identify the offender.

Planning Ahead for Forced Login

While the general procedure for logging in to the terminal server is not complicated, all dial-in users should prepare themselves for the changeover to ensure a smooth transition. The login requirement may pose special problems for individuals who use scripts in conjunction with their telecommunications software to automatically dial the server and connect to a specific host. People who use Eudora with a modem will also be affected, because the Eudora software has a built-in script that “talks to” the terminal server, and the current Eudora distribution does not support terminal server login. The following recommendations and information will help you to plan ahead so that you are not locked out of the network when forced login is implemented:

1. If you don’t already know your ph alias and password, find out what they are. You can get this information by presenting your valid University ID card to the staff at the CCSO Accounting and Distribution Desk in 1420 DCL. Or, if your departmental network administrator has proxy rights to your ph entry, s/he should be able to tell you your alias and help you change your password to something that you can remember easily.

2. If you know your ph alias and password, starting now, log in as a matter of habit whenever you use the terminal server. This way, if you encounter any difficulties, you can try to resolve them (or get help) before login is required (and you won’t have to scramble through old newsletters or documentation to find the login procedure when you finally need it).

3. If you use scripts that automate the process of contacting the terminal server and logging into a specific host, you will need to incorporate the new login routine into your scripts. Here again, it’s best to test your new scripts before forced login is in place. If your modifications work, you’ll be ready to go, and, if they don’t, you’ll have time to work out the bugs or find someone who can help you make the necessary changes.

4. If you use Eudora with a modem to access your e-mail, you will need to acquire and install a new version of Eudora. Steve Domer has already produced a test version of Eudora that works with the new terminal server configuration. Keep an eye out for future announcements about when and where you can get the new release.

5. Finally, some advice about passwords. Although it may be tempting, do not use the same password for your ph entry and your account(s) on the campus network. As mentioned above, the new login procedure is intended to make the campus network and the computers attached to it more secure. If you use the same password for ph and your other computer accounts, and someone else learns your password, he or she will not only be able to log in to the terminal server, but can also log in to your account(s), read your personal e-mail and files, and conduct all sorts of mischief under your name. By using different passwords for your various accounts, you significantly reduce this unpleasant possibility.

People who use scripts to log in to the terminal server should consider an additional point about passwords. Telecommunication scripts are usually plain text files that can be read by anyone who has access to your desktop computer. If your password to the terminal server (your ph password) or to a networked computer is included in the script, it is potentially available to anyone attempting to break in to either system. If your scripting language allows for user input, design the script so that you can enter your password manually, rather than having the script feed it to the remote system automatically.

- Lynn Ward
**NFS, or Network File System**, is a set of protocols developed by Sun Microsystems that allows files and directories to be shared across an IP network (IP is the principal routing protocol used on UIUCnet and the Internet). Unlike ftp, which permits the transfer of files from a remote host to a local computer and vice versa, NFS makes a remote file system (or part of a file system) appear as if it were actually a disk drive or directory on your local computer. Files accessible via NFS can potentially be copied, deleted, or modified with the same commands that you would use to manipulate files on your local storage device.

NFS is a client-server application. An NFS server is a computer that makes its file resources available to other computers via the NFS protocol. The administrator of the server can control which parts of the file system will be made available, or exported, to NFS clients and the access rights associated with those exported resources. For example, one part of the file system may be accessible to any computer on the network running NFS client software, while another part may only be accessed by specific hosts. The administrator can also control the access rights or permissions to files on the server. An exported file system can be read-only (meaning users can only read files in the exported directory and copy them to a local storage device) or read-write (meaning users can both read and modify existing files and also create new files on the remote file system).

The client process of attaching a remote NFS directory to a local file system is called mounting a directory. When an exported directory is mounted, the files and subdirectories contained in that directory appear to have the same characteristics as the files on the local computer. Thus, if a Macintosh running NFS client software mounted part of a Unix file system, the mounted system would use standard Macintosh icons. The file system would look like a hard disk (or file server), directories would be represented as folders, and files would be represented as documents within folders. Originally, NFS was developed for sharing files among Unix systems only. Today, however, servers and clients exist for many different computer platforms.

CCSO runs an NFS server and client on all of its public Unix machines. This allows the unique file resources on each machine to be mounted by the others so that end-users have access to these files regardless of the machine on which they have an account. You can find the NFS file systems that have been mounted on a CCSO Unix machine by changing to the `/nfs` directory. The directory `/nfs/uxc` on uxl, for example, contains directories and files that actually reside on the CCSO computer called uxc, but they appear to be an integral part of uxl’s file system. The enormous and well-known collection of software and documentation available on Washington University’s ftp server wuarchive.wustl.edu is also mounted on most CCSO Unix machines in the directory `/nfs/wuarchive`.

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**Network Design Update**

**NEW UIUCNET BACKBONE CONNECTIONS (since 6/92):**
- 909 W Oregon – SRL/Cultural Values & Ethics
- Assembly Hall
- Beckwith Center
- Child Development Lab
- Computer and Systems Research Lab
- Meat Science Lab
- News Bureau
- Office of Facilities Planning & Management
- Technology Commercialization Bldg.

**NETWORK INSTALLATION IN PROGRESS:**
- Burrill Hall
- Coordinated Sciences Lab
- Engineering Hall
- Henry Administration Bldg.

**Morrill Hall**
- Nuclear Engineering Lab
- Stadium
- Talbot Lab
- University Fire Station
- University Police

**NETWORK INSTALLATION ANTICIPATED:**
- Education Bldg.
- Harker Hall – UI Foundation
- Law Bldg.
- Library

**NETWORK DESIGN IN PROGRESS:**
- Architecture Bldg.
- Campus Bookstore
- Chemical and Life Sciences Bldg.
- Flagg Hall
- Grainger Engineering Library
- KCPA
- Mailing Center
- Noble Hall
- Rehabilitation Center
- Roger Adams Lab
- School of Life Sciences
- Temple Buell Architecture Bldg.
- University Press Bldg.
- Vivarium
WAIS...
(continued from page 5)

piles (or should I say files) of neatly bundled information to your door.

Accessing WAIS

There are several options for accessing WAIS-based information. As described above, you can use the WAIS gateway that is available in Gopher. This facility, however, will only permit you to search one source at a time and does not offer relevance feedback or the ability to save questions. The courtesy account running SW AIS at quake.think.com has similar limitations (although relevance feedback has recently been implemented). If you are really interested in exploring WAIS, acquire a WAIS client for your desktop computer. There are two main anonymous ftp distribution sites for WAIS client software: ftp.think.com (change to the wais directory) and ftp.oit.unc.edu (check out the directories pub/wais and pub/wais/UNC). Read the README files to see what's available. Typically, the name of the platform is embedded in the filename of the client. A review and more specific information on how to obtain the WAIS clients for Macintosh and DOS machines can be found in the Clients for Clients columns on pages 6-8 of this issue.

Learning More about WAIS

If you are interested in learning more about WAIS, there is an e-mail discussion group devoted to the topic. To subscribe, send an electronic mail message to wais-discussion-request@think.com. The Usenet newsgroup comp.infosystems.wais is another public forum for WAIS enthusiasts. Information about WAIS is archived on the Thinking Machines WAIS server, so like me, you can also use a WAIS client to find out more about WAIS. Finally, if after consulting all of these sources you still have questions that remain unanswered, you can contact the man who started the whole WAIS movement, Brewster Kahle, by sending e-mail to brewster@think.com.

-Lynn Ward

About UIUCnet

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Faster Than a Speeding Modem...
Able to Carry Voice and Data over a
Single Telephone Line...
It’s ISDN

What Is ISDN?

For several years, telephone companies have been touting something called Integrated Services Digital Network (ISDN) as the new technology to bring voice and data communications into the 20th century. Alas, in spite of all the hoopla and publicity, ISDN has progressed a lot more slowly than the phone company expected. Let’s look at what ISDN is, the problems it is supposed to solve, and what’s happening with ISDN in the Champaign-Urbana area.

Problems with Traditional Telephony

Traditional telephony suffers from the same problems as vinyl records: it is an analog medium with limited capabilities. (In this case, analog means that sound waves, which are continuously varying air vibrations, are translated into continuously varying electrical signals.) The telephone was designed to carry the human voice, which for the most part only requires frequencies up to about 3500 Hertz. Therein lies the problem—the analog signal is prone to noise, and the limited frequency spectrum makes the telephone system hard to use for much else. It is only through sophisticated signal processing techniques that the higher speed dial-up modems of today (9600 to 14400 bits per second) are possible, and there is not much hope for going faster over a run-of-the-mill home telephone line.

Users who need multiple communications services face a second set of problems. Every service requires a separate line, and some lines might need to be specially engineered to handle higher speeds.

If, for example, you want a "data" line in your house in addition to your "voice" line, two pairs of wires are required all the way from your home to the telephone office. If you want a high-speed line, a technician must customize that line by adding little coils to it at points along the way to make it just so. Over time, the wire will change, so the coils will have to be adjusted. This makes the line prone to go out of specifications and is a maintenance nightmare for the phone company.

Finally, there are a lot of additional services that the phone company would like to offer, but can’t because the communications possible between its office and your phone are limited. Take call waiting, for example. It probably seemed great until you tried to use it with a modem. Unless you remember to disable call waiting, every time someone calls your phone while you are using your modem, the modem connection will be dropped. The problem is that there is no easy way to

(continued on page 2)
force the modem signal and a command to
ring the phone onto the same set of wires. Another weakness of the analog system is
the time it takes to set up a call. Even with
touch tone dialing, because you are using the
voice medium to signal the office, it
takes about 15 seconds just to make a con-
nection—a virtual eternity in the realm of
data communications.

Enter ISDN

ISDN was designed to solve these and
other similar problems. First, it offers inte-
grated services, meaning multiple conver-
sations or sessions can occur simulta-
neously over a single pair of wires. Sec-
ond, it is a digital network (sound waves
are converted to digital [numeric] code),
so you get an inherently noise-free me-
dium more like a compact disk than a
phonograph record.

To accomplish these feats, every ISDN
line is actually a 144 kilobits per second
(kbps) data communications line. This line
is broken up into three channels, two B
channels capable of transmitting 64 kbps
each and one D (data only) channel good
for 16 kbps. The B channels are for your
exclusive use and are suitable for either a
voice call or a high-speed data connection.
The D channel is shared between you and
the phone company. You can use the D
channel to send data packets to a destina-
tion, but the phone system also uses it to
tell your phone to ring and to dial a call. (If
you think about it, the set of touch tone
pulses, which takes 15 seconds to transmit
with an analog telephone line, is only about
40 bits of information and could be sent in
less than .005 second over the D channel.)
Since all the signals on the D channel use
packets in different formats, there is never
any confusion between what data belongs
to you and what belongs to the phone
system.

The Catch

You knew there had to be a catch. Well
you underestimated—there are actually
several and they probably aren’t where
you would expect. Most people immedi-
ately say, “I bet the phone company really
socks you for this service.” In fact, ISDN is
probably the most reasonably priced ser-
vice the phone company has ever offered.
An ISDN phone line costs only slightly
more than a traditional phone line, about
$24 per month. Currently there is a usage
charge (a so-called tariff), which is again
quite reasonable. Local 64 kbps data calls
cost $0.0035 for the first minute and $0.002
for additional minutes.

The big catch is that the hardware re-
quired to make all this work doesn’t come
cheap. A terminal adapter is needed to
insert your conversations, voice or data,
into the proper ISDN channel. A voice-
only ISDN phone might have the termi-
unal adapter built in and is a lot more
costly than a $9.99 telephone from
K-Mart. It’s more like a $600 Nieman
Marcus phone. And that’s just for your
basic model. If you want to do voice
and data over two B channels your
phone will cost even more. Addition-
ally, ISDN interface cards are often
proprietary and only know how to talk
to identical cards. So, many vendors
are producing external bridging prod-
ucts that convert standard network
packets (such as Ethernet) to ISDN.
To set up a computer with such equip-
ment costs roughly $150.00 for an in-
terface card and another $1700 for the
bridge.

This added expense is not just on
the customer’s end either. The phone
company must upgrade every tele-
phone switching office to handle
ISDN—an expensive proposition that
can’t be done in any one fiscal year.
So, it will be a few years until you can
be fairly sure that you can place an
ISDN call anywhere you want. (Actu-
ally, it may never happen for smaller
communities with independent phone
companies.)

All of this causes a big chicken and egg
problem. Since ISDN is not yet deployed
everywhere, few people buy the equip-
ment to use the service. So ISDN equip-
ment is not mass produced, and the cost
stays high. Since few are buying the ser-
vice, the phone companies are moving
slowly with deployment. So ISDN is not
deployed everywhere, and so it goes.

Enter the Ameritech Trial

To get the ball rolling, the Ameritech
Corporation has chosen a few smaller cit-
ies for ISDN trials. These trials are de-
dsigned both to make the initial steps for
the user more affordable and to allow
Ameritech to learn how people would use
these high-speed connections. Cham-
paign-Urbana has been chosen as one of
these cities.

As part of the trial, ISDN will be de-
ployed early in the area. By the end of
November 1992, it will be available almost
everywhere in the twin cities. (Some fringe
areas and suburbs may be too far out to
take part initially). In addition, Ameritech
will pay for hardware to do about thirty
voice/data connections for various classes
of users (e.g., students, faculty-staff, schools...) who appear to have a need for
high speed data connections. These con-
nections will be watched by Ameritech to
get a better understanding of the service.

Again, life isn’t all wine and roses.
One of the problems is that the hardware
used for the trial will probably not be the
best hardware to use in the long term. We
would really like to have the equivalent of
an internal modem for a PC on the user
end and a terminal server-like box on
CCSO’s end, but this equipment doesn’t
exist yet. The hardware we are forced to
use instead is better suited to connecting
small LANs to the campus network via
ISDN. It is just too expensive (for both
end-users and CCSO) to be a viable option
for individual connections to UIUCnet.

The bottom line in all of this is that
there will be a number of ISDN connec-
tions made to UIUCnet this year. Those
connections should work just fine and be
quite satisfactory in the short term. Fu-
ture connections, however, will likely take
a different form before the service be-
comes generally available. We will con-
'tinue to keep you informed on the ISDN
trial and the direction of general ISDN
services in future articles.

-Ed Krol
Internet service providers and seasoned Internet users are finally recognizing the need for solid, comprehensive, and comprehensible instructions on how to find and make use of the vast and varied information archives and services available on the Internet. Several regional networks have already put together user's guides covering services on the Internet at large with special emphasis on regional facilities, and similar works by organizations and individuals are in progress or have already gone to press. North-WestNet's User Services Internet Resource Guide (NUSIRG)—reviewed in the May-June 1992 issue of UIUCnet, vol. 5 no. 4—is an exceptional example of such efforts. Brendon Kehoe's Zen and the Art of the Internet: A Beginner's Guide to the Internet (originally available in electronic form and now published by Prentice Hall) has also been highly praised for its breadth and readability.

Among the latest and best offerings in the area of Internet documentation is The Whole Internet User's Guide & Catalog, written by none other than CCSO's own Assistant Director for LAN Deployment (also the Network Design Office's mighty leader, not to mention my boss), Ed Krol. The Whole Internet User's Guide & Catalog, published by O'Reilly and Associates, Inc., covers much of the same ground as the other works mentioned above. There are chapters on standard Internet applications such as remote login (telnet), file transfer (ftp), electronic mail, and Network news (Usenet). However, there are several things that set Krol's book apart from other guides to the Internet (or at least the ones I've run across). Aside from providing in-depth coverage of some of the newest applications to spring up on the Internet (such as Gopher, WAIS, and the World-Wide Web), the overall organization and manner of presentation of the book is unique.

Organization

The Whole Internet User's Guide & Catalog consists of two major sections: 1) the user's guide proper, which provides historical and technical background on the Internet and instructions on how to use the major Internet applications, and 2) "The Whole Internet Catalog," a descriptive list of newsgroups, information servers, file archives, and other Internet resources organized by subject matter. (There are also some useful appendices and a glossary at the end of the book.) The resource catalog, in particular, is quite different from those offered in other Internet documentation. Most guides organize Internet resources by application type—that is, databases, mailing lists, electronic journals, bulletin boards, library catalogs, etc. By grouping the resources alphabetically according to subject matter (from Aeronautics to Zymurgy), Krol makes it possible for researchers and/or hobbyists to zero in on the resources of particular interest, regardless of the application that drives or accesses them.

The User's Guide

The first four chapters of the user's guide offer a fascinating introduction to the inner workings and politics of the Internet. Chapter Three ("How the Internet Works") treats several potentially dry and highly technical topics—packet switched networks, the TCP/IP protocols, and the Domain Name System—in a manner both accessible and engaging for the layperson.

(continued on page 4)
Internet User's Guide...
(continued from page 3)

I can think of no other book for novice users that covers these subjects in such a detailed yet palatable form.

The remaining eleven chapters are devoted to describing major applications on the Internet, providing step-by-step instructions and command summaries where applicable. If you are familiar with other books published by O'Reilly and Associates (the Nutshell Handbooks), you shouldn't be surprised to learn that virtually all of the examples in the book are based on Unix character-oriented applications. If you use a Macintosh, IBM PC, or some other type of computer, don't let the Unix bent dissuade you from reading the book. As Krol points out, although the example applications and utilities are Unix based, similar programs exist for most other operating systems, and the basic features and capabilities of such programs do not vary significantly across platforms. In other words, if, when reading about electronic mail, you learn the basic features of the Unix Mail program, you can safely assume that an e-mail program for the PC or Mac will offer the same or similar features. If, on the other hand, you have a Unix account and choose to use the specific programs discussed in the book, you'll have a wise and friendly tour guide to hold your hand as you step your way through the application.

Documentation with Personality

As a writer, editor, and consumer of computer documentation and literature, I was most impressed with the captivating style of The Whole Internet User's Guide & Catalog. Throughout the book, Krol never loses sight of his audience, which he defines in the following manner:

"Very specifically: while writing this book, my model audience was a new graduate student in some non-technical discipline (i.e., not computer science or any form of engineering) who needed to use the Internet to do research. Of course this assumes an audience ranging from Italian scholars to sociologists to physicists with a correspondingly wide range of computer experience. I do assume that you're computer literate ... and that you are familiar with some computer operating system, but not necessarily UNIX."

With this audience in mind, Krol talks the reader through each application, often using vivid metaphors to clarify complicated technical concepts. His easy-going, congenial manner is deliberately unintimidating, often humorous, and always informative. This is not your typical dry, cookbook approach to computer documentation. Although there are instructions on what buttons to push and commands to enter, the emphasis is on conceptual understanding of the topics covered. Krol lets the reader know what each application does, why a person might want to use it, how to use it, what its current limitations are, and what potential it holds for the future.

...I was most impressed with the captivating style of The Whole Internet User's Guide & Catalog.

Some Minor Bugs

Lest you think that this reviewer might have been influenced by the fact that the author of The Whole Internet User's Guide makes recommendations on her annual salary increases, I will boldly point out a few minor flaws in the book. First, while the commentary on Unix applications is mostly accurate, information about PCs and Macs and the applications that run on them is occasionally over-general or simply incorrect. Second, when discussing transfer modes in the chapter on ftp, Krol suggests that since "...Non-ASCII computers are becoming less common..." it is reasonable to transfer ASCII files in binary mode. On this point, I disagree. Different systems treat the line endings of ASCII files differently. Some only use a carriage return, some use a line feed, and some use both. Putting ftp into ASCII mode ensures that line terminations will be translated properly for the target system.

The addition of a bibliography at the end of each chapter or at the end of the book would improve its usefulness; so, too, would a list of client applications for operating systems other than Unix. There are also a few typos and editorial errors that will reportedly be corrected in the next printing.

Finally, if you under the impression that the title, The Whole Internet User's Guide & Catalog, means that every Internet application and resource is covered in the book, you will be disappointed. No writer would presume to think that he or she could possibly identify every resource available on the Internet; and, when you read Krol's introductory remarks to the user's guide and resource catalog, you'll realize that this was not his intention. Rather the book provides a complete introduction to the tools necessary to discover other tools and information resources. Many tech writers and computer journalists have a penchant for parodying well-known titles and slogans (e.g., Zen and the Art of the Internet; RFC 1118: The Hitchhiker's Guide to the Internet), another well known work by Ed Krol; "What's Up NOC?; "Of Mice and Menus;" and so on), and Krol's derivative title fits into this tradition. Perhaps it's because we can't think of clever titles on our own. I like to think we use this technique to catch the reader's eye with something that will be immediately familiar and comfortable. In any case, there's no doubt that you'll feel comfortable with Ed Krol's significant contribution to the Internet community. If you have any interest in exploring the Internet, consider adding The Whole Internet User's Guide & Catalog to your library.

How to Purchase the Guide

The Whole Internet User's Guide & Catalog can be purchased at local book stores or ordered directly from O'Reilly and Associates by dialing their toll free number, 1-800-998-9938. The ISBN number is 1-56592-025-2, and the retail price is $24.95. (Note: Eventually, the Resource Catalog will be made freely available on the Internet. Stay tuned for more information on when and where.)

Congratulations Ed, from all of us at CCSO!

- Lynn Ward
Although NCSA has been bundling an ftp client with its telnet software for years, the same could not be said of NCSA Telnet for the Macintosh until the most recent release, NCSA/ BYU Telnet 2.5, which incorporates the command-oriented ftp client originally developed at Brigham Young University. The client that accompanied NCSA Telnet, however, pales in comparison to several ftp clients developed independently for the Mac, most notably HyperFT, XferIt, and the relative newcomer known as Fetch.

Fetch 2.1 is an extremely powerful and easy-to-use tool for moving files between a Macintosh and any computer running an ftp server program (e.g., CCSO mainframes, anonymous ftp servers, and even PCs and Macs with an ftp server program enabled). It is ideal for novices because it makes remote file systems look and behave like the Macintosh finder environment—that is, directories are represented by folder icons and files are represented as simple document icons (see Figure 1). Changing directories and downloading files are as easy as double-clicking on a folder or document icon. For experienced users, Fetch offers a wide range of customization options as well as the possibility of entering ftp commands from the keyboard.

Starting Fetch
To start Fetch, simply click on the Fetch application icon. A connection dialog box will prompt you to enter the name (or IP address) of the remote host to which you want to connect, your User ID, password, and, optionally, the directory you wish to enter upon connecting with the remote ftp server. This dialog box will present a default hostname, which can be easily changed by replacing the text in each field with the information about the specific host you want to contact. There is also a Shortcuts button in the box that displays a pull-down menu of well-known ftp servers. Selecting one of the hosts listed in the Shortcuts menu will change the information in the connection dialog box to correspond to the selected host. The Shortcuts menu can be totally customized. Hosts can be added or deleted, and you can enter your own User ID and password (if you have an account on that host) or accept Fetch’s default User ID, anonymous.

Navigating the Remote File System
Once you have filled in the connection dialog box, clicking on the Okay button will connect you to the specified host, and the main Fetch window will display the remote file system in a smaller window within the larger Fetch window. There are several ways to navigate the directory structure of the remote host. The easiest way to move to a directory is to double (continued on page 6)
Fetch...
(continued from page 5)

click on its folder icon. If the directory you want to access is several branches below the current directory in the tree, you can select the Change Directory option in the Directories menu. You will then be asked to type the name of the directory you want to enter. The Directories menu also displays the names of all the directories you have visited during the current ftp session. You can enter any one of them by dragging the pointer to the name of the desired directory. Finally, a pull-down menu located directly above the file system window shows the name of the current directory and all of the directories above it in the tree. To move up one or several branches in the tree, drag the pointer to the directory of your choice. Any of these methods will both change directories and refresh the list of files and directories displayed in the file system window.

Moving Files

Retrieving files from a remote host with Fetch couldn't be easier. You can either double click on the file icon or select it and click on the Get button. You can retrieve a range of contiguous files by depressing the mouse button with the pointer on the file at the top of the group and, with the button still depressed, dragging the pointer down to the last file. You can also select non-contiguous files in the file system window by holding the command key down as you click on file icons. After the desired files have been selected, Fetch will ask you where (in which folder or on which disk) you would like to put the files. Once you've selected a destination for the files, click the Save button and the files you selected will be downloaded to your local storage device.

To move files from your system to a remote host, click on the Put button. A dialog box will prompt you to select the file you want to upload from your local disk. Only one file may be selected at a time using the Put button. Once the file has been selected, click on the Open button. Another dialog box will appear, permitting you to accept or modify the target filename and transfer mode. Clicking on the Save button will initiate the file transfer. A status window on the right side of the main Fetch window displays the progress of file transfers to and from your Mac.

Automatic Transfer Mode Selection

When beginners are first introduced to the file transfer protocol (ftp), one of the most difficult concepts to grasp is when to use binary versus ASCII transfer mode. With Macintosh files, this problem is compounded by the fact that the Mac supports several binary file formats (Macintosh Binary I, Macintosh Binary II, and AppleSingle). There is also the strange beast known as the Binhex file (see this month's NetWord column on page 11 for more information on BinHex format)—essentially a binary file that has been encoded to ASCII in order to be safely transported across electronic mail systems that do not support binary files.

Fetch is able to detect the type of file being transferred, and, with the Automatic button selected, will dynamically change transfer modes based on its best guess about the nature of the file. Most of the time, the Automatic option will do exactly what you want. The transfer mode can also be selected manually if you want to designate a specific transfer mode.

Auto UnBinHex and Unstuff

One of Fetch's niftiest features is its ability to recognize files that have been archived with the well-known compression utility Stuffit and/or BinHexed. By default, Fetch will unstuff and unBinHex such files on the fly during the download process. This means the files will be ready to use as soon as they reach your local disk; no more fussing with multiple utilities in order to make the files usable.

Other Fetch Features

Fetch 2.1 has many additional features that make it the ideal ftp utility for beginning and advanced users. Several of them are highlighted below:

• A View File option under the Remote menu, new with version 2.1, allows the user to view text files on line.

• A verbose directory listing, identical to that resulting from the ftp dir command, can be requested with the View File List option under the Remote menu.

• Entire local or remote folders/directories can be transferred with a single command, including all files and folders/directories contained within the selected one.

• A transcript of any ftp session can be displayed in a separate window. This transcript shows all of the commands executed on the remote host as well as any messages that might have been displayed. If problems are encountered during a Fetch session, the transcript can be used to help determine their cause.

• On-line help is available at any time by choosing the Fetch Help option under the Windows menu. Balloon help is also provided for System 7 users.

• The Find option under the Edit menu can search the active window (including long directory listings) for any character string. This makes it easy to locate specific files or directories within a long list.

• Fetch's file management options include the ability to create, rename, and delete both files and directories on the remote ftp server (as long as you have "write" privileges for the files and directories in question). These features provide a convenient and simple means for keeping your Unix mainframe accounts tidy.

• System 7 users can take advantage of a Fetch option called Post-processing. This feature allows a user to specify that files of a specific type should automatically be opened by a specific application once they have been downloaded. For example, it is possible to configure Fetch so that all Compact Pro archives (another popular file compression format for the Macintosh) will be opened by the Compact Pro application as soon as they arrive. This feature is especially useful for dealing with archived and encoded files, but can also be used to simply view (continued on page 7)
ISDN on UIUCnet...Where Fiber Can’t Cut It

CAMPUS NEWS

Although ISDN has been on the drawing board for well over a decade, only recently have telecommunications providers and data communications equipment manufacturers begun to upgrade existing switches and develop products to make ISDN a viable technology in the U.S. In our cover story, Ed Król presents an introduction to ISDN, outlining both its drawbacks and potential for providing individual users with network connectivity at speeds and with reliability considerably greater than that available over normal telephone lines.

But what role can ISDN play in the Local and Wide Area Network environment? Advocates of the technology, mainly those in the telecommunications camp, maintain that ISDN will provide high-speed, global communications applications over existing telephone lines. Data communications specialists, on the other hand, have been arguing for years that ISDN offers “too little too late.” With today’s national network backbones operating at multi-megabit speeds and production LANs moving data at anywhere from 10 to 100 megabits per second (mbps), dropping back to 64, or at best 128, kilobits per second (kbps) would seem to be a major step backwards. However, as ISDN products for the LAN environment mature, network designers are discovering that ISDN may indeed offer something that other technologies cannot: economical connectivity for small groups of users who would otherwise require an expensive dedicated connection. It is in this context that members of the Network Design Office and the Campus Area Networking (CAN) group have begun to experiment with the deployment of ISDN on the campus backbone.

UIUCnet Connectivity Options

Prior to the ISDN experiment, there were basically two methods of connecting an in-building network to the campus backbone. The most common type of connection is also the fastest. Fiber optic cable is extended from one of the five campus telecommunications nodes to an Ethernet hub or a ProNET 10 router located in the main wire closet in the building. This kind of link to the backbone operates at 10 mbps. However, UIUCnet serves many buildings that are out of range of the campus fiber distribution plant. To provide such buildings with fiber connections is often unfeasible due to distance limitations or simply too expensive. Additionally, some buildings occupied by University personnel are not owned by the University (University Inn, for example) and are, therefore, not candidates for fiber-based connections. Typically, buildings in the latter categories have been served by dedicated serial lines operating at 56 kbps, or, for larger units, 1.544 mbps (T1 lines). Some of these end-to-end serial connections make use of campus-owned copper, so there are no ongoing rental costs. Others, however, use lines leased from the telephone company, for $230.00 per month or more. Based on anticipated tariff rates (the ISDN tariff...
ISDN on UIUCnet...

(continued from page 7)

does not go into effect until January), a 30 day continuous ISDN 64 kbps connection would cost roughly $130, or half that of a 56 kbps leased line.

Current ISDN Deployment

Three buildings are presently connected to the campus backbone via ISDN: University Inn, the Beckwith Living Center, and the Tech Commercialization Building. University Inn has been using ISDN for a couple of years, but its configuration is not typical of the kind of connection that we are likely to see more of today or in the future. The implementations at Beckwith and Tech Commercialization are experimental and use equipment that is currently on loan to the University. They are functional, but by no means ideal. Figure 1 shows what an ISDN connection between a building and UIUCnet looks like today. An Ethernet repeater (on the right side of the figure) in the building’s wire closet connects to a Gandalf dumb remote bridge. The bridge is responsible for taking data packets off of the building’s Ethernet and converting them to ISDN packets using one of the two ISDN B channels that are reserved for an ISDN or analog telephone. It is called a “dumb” bridge because it forwards all packets onto the ISDN line, even those destined for another computer in the same building. The Gandalf bridge, in turn, connects to a device called a NT1 terminator, a standard piece of equipment for bringing ISDN from a central switching office into a building. The NT1 is connected to an ISDN telephone line that runs to an ISDN switch in a central telephone office.

All incoming ISDN traffic enters UIUCnet through one of four NT1 terminators each of which is connected to a terminal adapter (labelled TA in the figure). The terminal adapters convert ISDN packets to 56 kbps serial signals (V.35). Each terminal adapter is then connected to a serial interface in a 386 PC, which also contains an Ethernet card. The PC functions as an intelligent bridge, translating the incoming serial signals into Ethernet packets. The Ethernet card in the PC is connected directly to a UIUCnet backbone router. From there, packets are routed to their on- or off-campus destination.

Needless to say, in the scenario described above, a lot of equipment is required to support a handful of ISDN connections. This situation is expected to improve. The CAN group is looking at another remote bridging product from Digiboard for in-building networks that can combine the two ISDN B channels into a single 128 kbps channel, doubling the data throughput rate. Additionally, this bridge has the ability to learn the network addresses of the devices on either side of it, so it will not forward packets unnecessarily. As ISDN connections become more common on UIUCnet, it also is likely that the basic rate service, requiring a separate NT1 terminator for each connection to the network, will eventually be converted to what is known as primary rate service at the location where ISDN traffic from multiple remote sites converges at a central point on UIUCnet. Primary rate ISDN uses a 1.544 mbps T1 line to multiplex twenty-three 64 kbps B channels onto a single line. A multiport bridge will accept multiple incoming and outgoing ISDN calls, much like the CCSO terminal servers, eliminating the need for multiple terminal adapters and bridges.

The Future of ISDN on UIUCnet

It’s important to keep in mind that the implementation of ISDN on the campus backbone is very much in the developmental stages. Whether it will become and remain a viable means of network connectivity for individuals at home or students and staff on campus will depend largely on the cost and evolution of ISDN products for the LAN environment, as well as the development of alternative LAN technologies. Today, ISDN seems to hold promise for buildings that need a network connection for a limited period of time (and are thus unable to justify the expense of a fiber connection), for buildings beyond the reach of the University fiber and copper distribution plant, for buildings that are not served by the University-owned telephone switch, and for single users who need a reliable, high-speed connection to the campus backbone. Likely candidates for future ISDN connections are the Mail­ing Center, the Small Homes Council building, and the University offices above Folletts book store on Green Street.

-Lynn Ward

Figure 1: Typical configuration of an in-building LAN connection to the campus backbone via ISDN
Leave Your E-mail Worries Behind with the Unix Vacation Program

For many UIUCnet users, electronic mail has become as basic to every day life as the modern telephone. We use it to schedule meetings and appointments, conduct business and research, exchange gossip, make and break social engagements, and for hundreds of other purposes. When e-mail plays a vital role in your daily communication with friends and colleagues, letting people know that you are away at a conference or on vacation and unable to answer your mail can pose a problem. If you receive your electronic mail on a Unix system, you can solve this problem with a program called vacation.

The vacation program is the e-mail equivalent of a telephone answering machine. It looks at each message you receive and sends a message back to the sender, letting him or her know that you are currently unavailable to read and respond to your mail. The instructions below describe how to use the version of the vacation program that is installed on the CCSO machines ux1, uxa, and uxh. If you have an account on a different Unix machine such as ux4 or a departmental computer, you may find (as with many Unix programs) that the implementation of the vacation program on your system is slightly different than that described below. In such cases, the following instructions can help you to get started, but you should consult the Unix man page for specifics by typing man vacation at the Unix prompt.

Preparing the Vacation Files

The vacation program looks for several files in your home directory, the filenames of which all begin with a period. If any one of these files is missing or prepared incorrectly, vacation will not work properly. Two of these files, .vacation.msg and .forward, must be created manually with a text editor. The other two files, .vacation.dir and .vacation.pag are created by initializing the vacation program. Let’s consider each of these procedures.

Creating the .vacation.msg File

The .vacation.msg file is a text file containing the e-mail message that will automatically be sent to individuals who send you messages while you are away. You can create the file with a standard Unix text editor such as vi or emacs; or, if you prefer, you can create the file on your desktop computer and use ftp to move it from your local machine to the home directory of your Unix account. The .vacation.msg file must be in pure ASCII format, so if you decide to use a word processor to create the file, remember to export it to ASCII (plain text) format before moving it to your Unix account.

A sample .vacation.msg file is shown in Figure 1. Note that, in addition to the message itself, the file includes standardized e-mail header information. The From: and Subject: fields must be present in order for the message to be processed properly. Following the text From:, enter your full e-mail address and optionally your full name enclosed by parentheses. Any text can be entered into the Subject: field, but logically the subject should suggest something about your current status. The Delivered-by:...and Precedence: fields are optional.

Creating the .forward File

The .forward file is used for mail forwarding on Unix systems and is the vehicle by which the vacation program is invoked. It, too, can be created with a standard Unix text editor or your desktop computer’s word processor. The syntax of the .forward file and examples are shown in Figure 2 on page 10. Take note of the special symbols and punctuation in the file (forward and backward slashes (/ \), the pipe sign (|), the hyphen, quotes, and the comma). If the file is not typed exactly as shown in the figure, the vacation program will probably fail.

The first element in the file (\your_login,) will cause all incoming mail addressed to you to be sent to the person whose login id is substituted for the variable your_login. Under almost all circumstances, this should be your personal login (continued on page 10)
id so that the mail will be stored in your own mail spool file.

Following the pipe sign (1), the full path to the executable file called vacation must be given. On uxl, uxa, and uxb the path is /usr/local/bin/vacation. If the vacation program is not located in the /usr/local/bin directory on your system, you may have to do a little poking around to find it. It might, for example, be located in a directory called /usr/ucb, in which case you would enter /usr/ucb/vacation instead.

The -a your _alias argument is optional. You should use it if people commonly send mail to you using an alias such as your ph alias. For example, if your full e-mail address is mjohanson@uxl.cso.uiuc.edu, but some people send you e-mail using your ph alias, magic (e.g., magic@uiuc.edu), you should include the argument -a magic before entering your actual login, mjohanson.

Creating the .vacation pagan and .vacation dir Files

The .vacation pagan and .vacation dir files are databases that keep track of who has sent you messages while the vacation program is turned on. They can be created automatically by typing the command vacation -i at the Unix prompt. If the vacation database files are already present in your home directory, typing vacation -i will reinitialize them, purging the files of any data collected the last time you ran the vacation program.

How the Vacation Program Works

After the .forward file has been created as shown in Figure 2, the vacation program is effectively “turned on.” The other files described above, however, must also exist in order for vacation to work. Once all of the files are in place, here’s what happens:

When you receive an incoming mail message, a copy of it will be forwarded to your usual mail storage area as specified in the first element of your .forward file. Another copy is forwarded to (or “piped” through) the vacation program. The vacation program examines the To: and cc: fields of the incoming message and looks for the string of characters entered as the values for your _alias and your _login in the .forward file. If either string is present in the To: or cc: field, your .vacation.msg file is mailed to the sender as a reply.

The vacation program also has some limited “smarts.” By keeping track of when and from whom you’ve received messages in the vacation database files, vacation will reply to each unique sender only once per week. It also will not reply to senders such as ??- REQUEST, MAILER, MAILER-DAEMON, Postmaster, and UUCP, or to messages with the header Precedence: bulk or Precedence: junk.

If you subscribe to any BITNET mailing lists, you may need to take some special precautions. Unfortunately, vacation is not very good at recognizing messages generated by BITNET Listservers and may send your vacation message out to all list subscribers unless you temporarily turn your Listserver mail off. You can do so by sending an e-mail message to each Listserver to which you subscribe. The message should contain the body text: set * nonmail. Be sure to send your message to the Listserver, not the mailing list itself. For example, if you subscribe to the Library Systems mailing list PACS-L@UHUPVMI, send your request to temporarily turn mail off to LISTSERV@UHUPVMI, not PACS-L@UHUPVMI. To reactivate your Listserver mail when you return, send another message, this time with the text: set * mail.

Turning Vacation Off and On

To turn the vacation program off, simply erase or rename your .forward file. Since creating the .forward file is the trickiest part of using vacation, it’s advisable to give your .forward file a new name, such as .forward.vac, so that you do not have to recreate the file from scratch each time you want to use vacation. To rename the .forward file, enter the command mv .forward .forward.vac at the Unix prompt.

Having renamed the .forward file, the next time you want to run the vacation program your job will be much simpler. Follow these three steps:

1. Create a new or edit your existing .vacation.msg file.
2. Re-initialize the vacation databases by typing vacation -i at the Unix prompt.
3. Change the name of your .forward.vac file to .forward by typing mv .forward.vac .forward at the Unix prompt.

Finally, whenever you turn vacation on, it’s a good idea to test your configuration before you leave town by sending yourself an e-mail message. If you receive both the test message and your vacation message, you’re ready to go.

Bon Voyage!!!

- Lynn Ward
If you are in the habit of downloading files from ftp servers, you’ve probably encountered files with an .hqx extension at the end of the filename. This extension usually means that the file is in a special format called BinHex format. A BinHex file has been specially encoded so that it contains only printable ASCII characters (i.e., the letters, numbers, and punctuation marks commonly found on a computer keyboard). In fact, BinHex files are specifically limited to the character set shown in Table 1 on this page.

**Why BinHex?**

In the world of micro and mainframe computing, there are two common types of files: **plain text** (often called ASCII, which stands for American Standard Code for Information Interchange) and **binary**. A plain text file consists of letters, numbers, punctuation, and some common formatting codes such as tabs, line feeds, and carriage returns. Plain text (or ASCII) files also have another important characteristic. Although we see a text file as characters on our screen or on the printed page, the computer sees each character as a number. Within the ASCII standard, each character corresponds to a particular number. In decimal notation, for example, an upper case "A" always corresponds to the number 65. The entire ASCII character set is limited to 128 characters within the decimal range of 0 to 127. Most ASCII characters are printable, but some of them are used for formatting or communications handshaking.

Binary files may contain printable characters, but they also contain many non-printable characters that are not part of the ASCII character set. Binary files are typically programs or applications that can be executed by a computer. The Microsoft Word application, for instance, is a binary file. Binary files can also be data files that contain special control codes. For example, if you create a file with your word processor that contains codes for boldface, underline, font changes, foreign language characters, etc., chances are that it too is a binary file. Binary files can contain characters with numeric values from 0 up to 255. Unlike the first 128 characters, which are standardized among any computer that understands ASCII, the next 128 characters may be interpreted differently on different hardware platforms or by different operating systems or software.

Now, back to BinHex. While most electronic mail systems can send and receive plain text messages, very few support the transport of true binary files. If you try to incorporate a binary file into your electronic mail message, your mail program or the one at the receiver’s end could very well choke on it. So, what do you do when you want to send a friend or colleague a piece of software or a formatted word processing document through the mail? BinHex provides one of several currently available solutions to this problem. It is a clever method of encoding binary data so that it consists of only printable characters (ASCII files can also be converted to BinHex, but it is generally not necessary).

To an electronic mail system, a BinHexed file looks like any other electronic mail message—that is, lines consisting of letters, numbers, and punctuation marks. Once the file has reached its destination, it can be converted back to its binary state by any utility that knows how to unBinHex a BinHexed file.

BinHex has been adopted as the *de facto* standard for the ASCII encoding of Macintosh files. It is commonly used both for sending Mac files through e-mail systems and for storing Mac files on ftp servers. Today BinHex format is also supported by other platforms. Stand-alone utilities for encoding and decoding BinHexed files are available for Macintosh, PC, Unix, and VM/CMS systems. Also, some electronic mail programs know how to automatically BinHex and unBinHex file attachments. *Eudora* for the Mac and *NLISTop* for the PC are two examples of such programs.

When moving aBinHexed file with ftp, you’ll need to decode the file with one of the BinHex translation utilities.

If the explanation above has satisfied your curiosity about BinHex files, you may want to stop reading here. But, if you’d like to learn a little bit about how the encoding process works, press on.

**How BinHex Works**

So far, we’ve established that BinHex is a method of encoding a binary file so that it looks like an ASCII file. How is this translation accomplished? To understand BinHex format, one must understand a little bit more about how computers store information. As mentioned above, although we see characters and symbols on our screen, computers deal strictly with...
NetWord: BinHex...
(continued from page 11)

numbers. Numbers can take many forms. Human beings usually work with decimal notation or base 10. Since computers deal with electrical and magnetic media which are typically in either an “on” or “off” state, they prefer to deal with binary numbers or base 2. In binary notation, a “1” means “on” and a “0” means “off.” These binary digits are referred to as bits. The basic unit of storage for most computers from PCs to mainframes is a byte, which consists of eight bits. Any value from 0 to 255 can be represented by an eight bit byte.

Suppose we were to convert an ASCII or binary file to BinHex format, the encoding process to me in plain English. (I suppose one can conclude that the term “BinHex” derives from the fact that binary numbers (bin) are organized in groups of six (hex) during the encoding process. If you’re interested in reading the complete specifications for encoding and decoding BinHex files, retrieve the file info-mac/tech/binhex-definition.txt via anonymous ftp from sumex-aim.stanford.edu.)

If you put the binary values of the letters A, B, and C end to end, the string of bits would look like this (the letter and corresponding decimal value are given below each eight-bit group):

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Now, take the three sets of eight bits, reorganize them into four sets of six bits, and calculate the value for each group of six (the decimal value is given below each group of six bits):

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Then look up each six bit value in Table 1 and output the corresponding printable character assigned to that value. In our table 16=3, 20=8, 9= and 3=. So, in BinHex ABC would be represented as 38=. Note that our original three characters have been expanded to four. This accounts for the fact that most BinHexed files are considerably larger than the original file.

There are a few other noteworthy characteristics of BinHexed files. First, they are always preceded by the text string: ”(This file must be converted with BinHex 4.0)”. BinHex decoders look for this string and know that the information immediately following is a BinHexed file. The encoded part of the file begins with a header containing important information about the file, such as the length of the original file name, the original filename itself, the type and creator of the file, and so on. The format of the encoded file (including the header) consists of lines 64 characters long, each followed by a <return>. The last line, of course, may be shorter. Finally, the encoded file should begin and end with a colon (:). The colons are not actually a part of the file (note that the colon is not part of the BinHex character set shown in Table 1), but rather serve as cues that the file has begun and ended.

Although I haven’t seen it documented anywhere, I suppose one can conclude that the term “BinHex” derives from the fact that binary numbers (bin) are organized in groups of six (hex) during the encoding process. If you’re interested in reading the complete specifications for encoding and decoding BinHex files, retrieve the file info-mac/tech/binhex-definition.txt via anonymous ftp from sumex-aim.stanford.edu.

-Lynn Ward (with thanks to Steve Dorner who was the only person who could explain the encoding process to me in plain English.)

About UIUCnet

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For a free subscription, just send us your name and (preferably campus) address; be sure to include your department and mail code if you send a campus address. UIUCnet is also available in electronic form. Back issues are available for download from the anonymous ftp host ftp.cso.uiuc.edu in the directory doc/net/ uiucnet and from the UIUC Gopher server.
# Index for Volume 5, 1992

The following index provides the title, date, volume, number, page #, and a brief description for every article in the UIUCnet newsletter from volume 5 number 1 through volume 5 number 7. The articles are organized alphabetically under major subject categories such as CCSO Services, E-Mail, Library Services, etc. Some articles cover material applicable to multiple categories and are, thus, listed two or more times in the index to make them easier to locate. ASCII versions of back issues are available for download via anonymous ftp from the host ftp.cso.uiuc.edu in the directory docnet/uiucnet. Printed versions of back issues are in limited supply but can be requested by sending an e-mail message to uiucnet@uiuc.edu (when ordering, please specify the date, volume, and number of the issue(s) desired as well as your full campus or U.S. mailing address). A cumulative index of all previous issues of UIUCnet can also be requested.

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<tr>
<th>X Window System</th>
<th>Title</th>
<th>Issue Date</th>
<th>Vol.</th>
<th>No.</th>
<th>Pg.</th>
<th>Comments/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some New and Little-known Phacts about Ph, the CCSO Nameserver</td>
<td>May-June 92</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>discussion policies and procedures related to the ph database; review of ph client software for the Mac, NeXT, PC, Unix, VAX (VMS), and X Windows</td>
<td></td>
</tr>
</tbody>
</table>
Extracting Information from Ph
Using the “Type” Field Specifier

(continued from page 3)

In addition to current weather condition information, ph can also display radar summaries, special weather announcements, and 36 hour as well as extended forecast information. These services are largely limited to Illinois or specific cities listed on page 3. The following examples will yield the results listed in the right-hand column:

Example

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>ph type=weather radar</td>
<td>St. Louis and Marseilles radar summaries</td>
</tr>
<tr>
<td>ph type=weather forecast</td>
<td>36 hour and extended forecast for Illinois</td>
</tr>
<tr>
<td>ph type=weather special</td>
<td>Special weather advisories from the National Weather Service in Springfield and Peoria</td>
</tr>
<tr>
<td>ph type=weather illinois conditions</td>
<td>Tabular report of conditions throughout the state</td>
</tr>
</tbody>
</table>

To extract University Timetable information from ph (The timetable information in ph can be searched by course number or by significant words likely to be found in the course's title. Additionally it is possible to conduct a search on the spring, summer, and fall timetables simultaneously or specify the semester for the query. Set the type field specifier to timetable in order to search all timetables or to fall, spring, or summer to search a specific timetable):

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>ph type=timetable, fall, spring, or summer</td>
<td>ph type=timetable cs121</td>
</tr>
<tr>
<td>ph type=timetable fall introduction</td>
<td>ph type=fall introduction french literature</td>
</tr>
<tr>
<td>ph type=timetable, fall, spring, or summer</td>
<td>ph type=summer &quot;music*&quot; (using the wildcard metacharacter “*” displays all courses with music in their course number or title. Note: Some ph clients require that character strings containing metacharacters be surrounded by quotation marks.)</td>
</tr>
</tbody>
</table>

Broadening and Narrowing Searches and Ph Output. There are many other methods for broadening or narrowing the scope of a ph search and controlling what information is actually displayed to the screen. For information on how to take advantage of these features, consult the written documentation and ph's online help facility.

-Lynn Ward