



The ACSS

Newsletter

University of Minnesota
Twin Cities
January 1987

Communications

Electronic Mail (Part 1): Using VMS MAIL

Steven Brehe
VX Username: SKB

Electronic mail has become one of the most important and widely used applications of computers. With electronic mail, you can send messages almost instantaneously to colleagues at this University and at other institutions in the U.S. and around the world.

This is the first of a series of articles about the electronic mail facilities on our VMS computer, the VX, which is the centerpiece of our electronic mail services.

Having learned VMS MAIL, you can use our other electronic mail facilities:

BITNET, the international network for academic and research institutions. You send messages on BITNET through VMS MAIL.

GMAIL, a specialized utility for sending electronic mail to the many other electronic mail networks. Using GMAIL is very similar to using VMS MAIL.

The SEND and RECEIVE commands, and other specialized methods of communications available on the VX.

The second article in this series (also in this issue) explains basic uses of BITNET. The third, also in this issue, describes more VMS MAIL commands. Articles in future newsletters will describe GMAIL and other mail facilities.

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Electronic Mail at Minnesota

ACSS now provides BITNET electronic mail services on its VAX/VMS system, the VX. BITNET allows you to send mail to colleagues at other institution sites. Articles in this issue describe some of those services. There will also be a free two-day seminar on February 10 and 12 (2:15-4 pm), on using electronic mail, including BITNET. Call 625-7397 to register. Watch future issues of this *Newsletter* for more information.

VMS MAIL

With VMS MAIL, you can send messages or files to any other VX user. Your correspondents do not have to be on the VX system at the time you send your message; when they log on to the VX, the system will inform them that MAIL messages are waiting for them.

With MAIL, you can also send the same message or file to a number of correspondents at the same time and keep files of messages you've received in the past. As mentioned above, you can also use MAIL to send electronic mail through the international BITNET network.

Beginning MAIL

Having logged on to the VX, simply type the command **mail** and press RETURN (indicated as **<CR>**). The VX will respond with the **MAIL>** prompt, which signals you to start using MAIL commands:

```
$ mail <CR>
MAIL>
```

Sending Mail

To send mail to another VX user, you must have previously learned your correspondent's VX username.

In response to the **MAIL>** prompt, type the command **send**. MAIL will then prompt you for your correspondent's username and the subject of your message. MAIL will respond with Enter your message, as shown below.

```
MAIL> SEND
To: PUG
Subj: VAX MAIL
Enter your message below. Press CTRL/Z when complete, or CTRL/C to
quit:
```

Notice the instructions about ending your MAIL message. The commands **CTRL/Z** and **CTRL/C** require you to keep the CONTROL key of your keyboard depressed while pressing either the Z key or the C key. **CTRL/Z** ends your message and sends it to your correspondent (i.e., the person whose username you typed in). **CTRL/C** ends the message but does *not* send it. Use **CTRL/C** if you decide not to send your message.

As the example below shows, you end each line of your message by pressing RETURN:

```
Enter your message below. Press CTRL/Z when complete, or CTRL/C to
quit:
I missed the last committee meeting.<CR>
When do we meet next? <CR>
CTRL/Z
*EXIT*
MAIL>
```

When you type **CTRL/Z** MAIL says ***EXIT*** to let you know the message is completed and sent. Your correspondent will receive it almost instantly. The **MAIL>** prompt tells you that you can continue typing in MAIL commands.

If you end the message by typing in **CTRL/C**, MAIL responds with ***CANCEL***. Your message will not be sent.

If you make a mistake and want to correct it, the simplest way is to use the **DELETE** key on your terminal (**not** the **BACKSPACE** key) to backspace over the error. You cannot correct an error on a line after you press **RETURN**. For long messages, you may want to use the **SEND/filename** command (described later) or the **SEND/EDT** command (described in Part 3).

Reading Your Mail

If you have mail waiting for you, the VX system tells you when you log on, and again after you begin the MAIL utility:

```
Please Enter Username
Username: your username <CR>
Password: your password <CR>
```

```
You have 1 new Mail message.
```

```
$ mail
```

```
You have 1 new message.
```

```
MAIL>
```

To read the waiting message, type in the command **read** or type **<CR>**:

```
MAIL> read <CR>
#1 15-JAN-1987 16:05:05
```

```
From: KEM
To: PUG
Subj: Committee meeting
```

```
The next meeting of the committee is Feb. 10, at 4 pm.
```

```
MAIL>
```

Notice the format of the message you've received. MAIL numbers each message you receive consecutively and records the date and time it was sent, also providing the username of the person who sent the message. After MAIL displays the message, it displays its **MAIL>** prompt, so you can enter more commands. If you don't want to save a permanent copy of this message on your account, type **delete** to erase the message from your MAIL file.

Using HELP

After you've begun the MAIL utility, you can use its built-in **HELP** function. Simply type the word **HELP** in response to the **MAIL>** prompt for a list of all the MAIL commands. If you want to

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learn about a particular command, type

```
MAIL> help command
```

Replace *command* with the name of the command you're interested in. For example, typing

```
MAIL> help directory
```

produces information about the *directory* command in MAIL.

Exiting MAIL

When you want to stop using MAIL, simply type *exit*. The VMS operating system on the VX will save your new mail as old mail on your account and then display its prompt, the dollar sign:

```
MAIL> exit  
$
```

To end your VX session, type *logoff*.

Other Commands

The following are a few helpful commands. For information on all MAIL commands, use MAIL's HELP utility, as described above.

If you want to send the same message to more than one correspondent, type in all the relevant usernames in response to the *To:* prompt, separating them with commas:

```
MAIL> SEND  
To:   PUG, SKB
```

To send a reply to a VX user whose message you've just read, use the *reply* command. This saves you the trouble of typing in the username and subject; the VX will send your message to the sender of the last message you've read.

If you want to use the VX's text editor, EDT, to prepare a file to send, simply type *edit filename*. You'll go directly into the editor. When you finish the message and exit EDT, you can begin MAIL, and enter the command *send filename*. (You can use EDT from any terminal; to use the full-screen mode, you need a VT-100-compatible terminal or micro.)

To re-read the last message you read, type *last*.

All the mail messages you receive are stored as a file on your VX directory. After you have read your new mail, you can see a list of old messages by typing *directory*. This displays a list of your old mail, numbered and dated consecutively. To read an old message, type its number. To delete an old message from your file, type *delete*, followed by the number of your message.

Opening an Account

To use VMS MAIL and any of our other VMS electronic mail facilities, you need an account on the VX. You can get account application forms by asking at our Computing Information Center, 128A Lind Hall, or by calling 625-7397. To learn how to log on and start using the VX, see our *VAX/VMS Access Brief*, available free from the Computing Information Center.

Directory Protection

When you open an account on the VX, your main (or "log-in") directory can send or receive VMS MAIL. Some security-conscious users, however, deliberately change the protection on their directory (with the **SET PROTECTION** command) so that they can no longer receive mail.

If you have changed your directory's protection and now want to use VMS MAIL, make sure you give "read and write permission" to the system from your log-in directory. Or you can create a subdirectory with the correct protections.

For More Information

For information about BITNET and other VMS MAIL commands, see the related articles in this issue.

John Stueve wrote a good article for our August *Newsletter* in which he briefly explained most of our VMS electronic mail utilities. If you want to learn about the SEND and RECEIVE commands now, you could begin with his article.

The VX's own HELP file also has information on the MAIL utility. Log on to the VX and type **help mail**. HELP also has entries on the SEND and RECEIVE commands. Our MOREHELP utility has information about BITNET and GMAIL—type **morehelp networks**.

Our winter quarter short course schedule includes free courses on electronic mail and the VAX/VMS system – both in February.

The complete printed reference on VMS MAIL is the *VAX/VMS Mail Utility Reference Manual*, part of the *VAX/VMS Reference Set* (a publication of the Digital Equipment Corporation, manufacturer of the VAX). The manual is reasonably brief (about 80 pages) and provides a complete description of all MAIL commands and their uses. You can find a reference copy of this manual (and a complete *Reference Set*) in the ACSS Computing Information Center, 128A Lind Hall.

The VX has excellent on-line training software, including a module on using MAIL. Log on to the VX and type **run vms2cai** to begin the training session. From there, follow the instructions that appear on your screen. (Note that you can use this training software only if you are working at a VT-100 terminal, or a terminal or microcomputer that "emulates" a VT-100. A computing lab consultant can tell you if a lab terminal or micro emulates a VT-100. For your own micro, consult the documentation for your micro and communications software.)

For more information about VX training software, including training for using EDT editor, type **morehelp training**.

Electronic Mail (Part 2): Using BITNET

Steven Brehe

BITNET address: SKB@UMNACVX

BITNET (the Because It's Time network) connects over 400 educational and research institutions across the United States and around the world, enabling users to exchange mail messages and text files quickly and inexpensively with their colleagues in other states and nations.

ACSS's VAX/VMS computer, the VX, is connected to the BITNET network as node UMNACVX. Using the VMS MAIL utility (which I described in my first article, also in this issue), you can communicate with any other electronic mail user on this international network.

About BITNET

Founded in 1981, BITNET was the first major academic network that did not restrict membership and use according to factors like disciplinary speciality. As a result, BITNET became particularly important to interdisciplinary research and is growing rapidly. The number of BITNET connections has doubled every six months for the last two years. Its goal is a network that links all the world's institutions of higher education and research.

Although BITNET is used frequently used by faculty for research or administrative purposes, all VX users can use BITNET.

BITNET in Academe

Researchers in virtually every field have found uses for BITNET. For example, the Biology Department of Indiana University at Bloomington, coordinating an interdisciplinary study of the acidification of freshwater lakes, uses BITNET to exchange data, data analysis programs, output, and documentation with the University of Minnesota at Duluth, the University of Maine (Orono), and the Florida State Museum.

Daniel Field, professor of history at Syracuse University and editor-in-chief of the *Russian Review*, receives articles over BITNET, edits them, and transmits them to his managing editor at Harvard. BITNET is just one part of the journal's use of the computer to keep expenses down. "The systematic shift to computer production," says Professor Field, "made it possible to save the *Review*."

Elsewhere, other scholars exchange data and findings in cooperative research, review one another's manuscripts, and offer comments.

A Code in the Node: BITNET Addresses

Perhaps the only difficult thing about sending mail over BITNET is the "address" you use to send your message. To send messages over BITNET, you use the VMS MAIL utility on the VX (as explained elsewhere in this issue).

To send mail to another BITNET user, you have to know the "address" of your correspondent. A BITNET address, mailed from the VX, takes this form:

```
jnet%"user@node"
```

In this address, you have to replace **user** with the username of the recipient of your message, and replace **node** with the "node name" for your recipient's BITNET connection. The rest of the address sequence—**jnet** and the percent sign, quotes, and @—remains the same in all your BITNET mailings from the VX. (JNET is the software package through which the VX communicates with BITNET.)

The node name is public knowledge—it's a code for the particular computer your correspondent uses for his or her electronic mail. But some institutions have more than one computer serving as a BITNET node; make sure you know which node your recipient uses.

Your recipient's username is *not* generally public knowledge, and without a username you cannot send mail to a particular BITNET user. Typically you will exchange BITNET addresses with your recipients by some other form of communication—letter, phone, etc. Some scholarly journals and professional associations now publish the BITNET addresses of their contributors and members.

Here's an example: To send a BITNET message to the University of Notre Dame, you'd use this address:

```
To: jnet%"phj@irishmvs"
```

In this address are embedded the computer name of your recipient (here **phj**, a fictional name for the purposes of this example) and the name of Notre Dame's node (**Irishmvs**), separated by the @ sign.

Sending BITNET Mail

In this example, you begin by using the VMS MAIL utility, with the **mail** command. You then use MAIL's **send** command, after which MAIL prompts you for the address and the subject of your message. After you have typed these, you can type in your message, ending each line with a carriage return.

```
$ mail <CR>
MAIL> send <CR>
To:    jnet%"phj@irishmvs" <CR>
Subj:  O'Connor's BITNET address <CR>
Enter your message below. Press CTRL/Z when complete, or CTRL/C to
quit:
Pat - Could you get me Mike O'Connor's BITNET address? <CR>

I hear he is working on the '88 Conference. <CR>
<CTRL>Z
```

.
.

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{Here BITNET displays messages on your terminal following the progress of your mail toward Notre Dame. You don't have to remain in MAIL, or logged on to the VX, to wait for these.}

```
MAIL> (IRISHMVS) - 15.52.25 JOB 4232 $HASP546 RSCS4232 SYSTEM OUTPUT
RECEIVED AT IRISH MVS
```

<CTRL>Z indicates the CONTROL key and the Z key on a terminal keyboard—you first press CONTROL and, while holding that key down, press Z.

The final message confirms that your mail has been received by Notre Dame's computer, where user PHJ can read it the next time he uses electronic mail.

Your BITNET message does not travel directly from Minnesota to Notre Dame, but moves along the BITNET network, relayed from one university computer center to another. Each BITNET node, as it receives your mail, sends a message back to your terminal. (In sending mail to Notre Dame, we received a total of ten messages from BITNET links in several states.)

The display of these messages may take a minute or two, but it can be interesting to watch your electronic mail make its (sometimes circuitous) way along the BITNET chain to its destination. Messages sent to other parts of the network may go faster or slower depending on the distance your message has to cover. You do not have to stay logged on for your message to continue on its way. If some nodes are temporarily inoperative, it could take longer (seldom more than a day) for your message to arrive.

A BITNET message I recently sent to Dublin, Ireland, took about twenty minutes to reach its destination—but this includes the time required for the Dublin computer to return a message acknowledging receipt. (I received a response from my Dublin correspondent two days later.)

If someone wants to send BITNET mail to *you*, they'll have to know your address—that is, **your VX username** and the VX node name, **UMNACVX**. Whenever you send a BITNET message, BITNET automatically includes your complete BITNET address with your message.

Sending Files

To send text files via BITNET, you also use the MAIL utility. In response to MAIL's command prompt, you type the command **send** and the name of the VMS file you are sending. The command takes this form:

```
MAIL> send filename.typ
```

Replace **filename.typ** with the name of the file, using the standard format of filenames on VMS systems, which includes the period followed by a filetype. For example, to send the file **proposal.txt** to **CKH** at Notre Dame, you simply type the command:

```
$ mail
MAIL> send proposal.txt
```


To: **jnet@"ckh@irishmvs"**
Subj: **Grant proposal**

After you type the command, address, and subject, BITNET will display a series of messages at your terminals as your file moves toward Notre Dame. The network will notify you when the file arrives at its destination.

Receiving BITNET Messages

Use the MAIL utility to read incoming BITNET messages, just as you read messages sent to you through VMS MAIL (as described in my first article).

When you receive a message from another BITNET user, the VMS system will inform you that you have a mail message awaiting you. To read the message, enter the MAIL utility and read the BITNET message just as you read other VMS mail:

```
$ mail
```

```
You have 1 new message.
```

```
MAIL> read
```

By typing **read**—or simply pressing RETURN—you display the new message on your terminal screen.

When Things Go Wrong

If you type the node name incorrectly, BITNET informs you almost immediately that the indicated address is not a BITNET node.

If you get the username wrong, however, you don't find out so quickly. The message will travel all the way to the specified node first. Then the destination node will send you a message saying that no such username exists. Check to make certain you typed the address correctly. If so, your information about the address may be incorrect.

For More Information

The related articles in this issue describe several other VMS MAIL commands that can make BITNET more convenient to use: including the **reply** and **send/edit** commands and the use of "folders" for organizing electronic mail messages.

You can read a brief on-line VX document on BITNET by typing **MOREHELP NETWORKS**. There is also a list of all BITNET nodes in the file **acss\$lib:bitnet.links**. To display this file at your terminal, type the command

```
$ type acss$lib:bitnet.links
```

You can also copy this file to your VX account (using the **copy** command) and use the EDT text editor to search for a particular institution or node name. You can also print it using the **print** command.

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Our winter quarter short course schedule includes free courses on electronic mail and the VX operating system, VMS.

Also see **MOREHELP NETWORKS BITNET GUIDELINES** for BITNET's code of conduct governing the use of the network. ACSS encourages all its BITNET users to acquaint themselves with those guidelines and abide by them.

Next Month: More Networks

BITNET isn't the only academic network. There are many others in the U. S. alone—and there's NETNORTH in Canada, JANET (the Joint Academic Network) in the United Kingdom, the European network EARN, and more.

BITNET communicates with other networks through "gateways." Using these gateways can be rather complicated, but the VX has a utility called GMAIL that does most of the work for you. An article in next month's *ACSS Newsletter* will explain how to use GMAIL. (And, if you can't wait, you can get brief information on GMAIL from VX on-line documentation: type **morehelp networks**. You can also enter GMAIL—type **gmail**—and then type **help**.)

Many thanks to Mindy Weinberg, Assistant Editor of Publications for EDUCOM, for information on the history and growth of BITNET, and to Michael Dunham, manager of the ACSS Computing Information Center, for additional help in researching these articles.

Join BITNET: Get a VX Account

To use VMS MAIL and BITNET on the VX, you'll need a VX account. You can get application forms at the Computing Information Center, 128A Lind Hall, or call 625-7397.

BITNET Users: Share Your Knowledge

Steven Brehe

The *ACSS Newsletter* would like to hear from University faculty and staff who use BITNET (or other electronic mail facilities) in their work. We'd like to hear about your use of electronic mail in research, teaching, and administration, your sources of information about BITNET addresses, and any other professional use of electronic mail. With your permission, we'll share this information with our readers when it seems appropriate. Please send your responses to SKB on the CA or VX, or by campus mail to ACSS Publications, 100 Lauderdale CF.

Electronic Mail (Part 3): More VMS MAIL Commands

Steven Brehe

As you use VMS MAIL and BITNET, described in other articles in this issue, you'll probably find more and more uses for electronic mail—and find more messages accumulating on your account. This second article about VMS MAIL calls your attention to a few commands that help you make better use of the MAIL utility, to organize your mail files and use them more efficiently. We recommend that all users of MAIL and BITNET eventually acquaint themselves with the commands described here.

Preparing Messages: Using EDT within VMS MAIL

You can use EDT, the VMS text editor, to write your MAIL messages. First start the MAIL utility, as described in the first article, and then, in response to the MAIL> prompt, type the command **send/edit**, like so:

```
$ mail
MAIL> send/edit
To: lvms
Subj: committee meeting
[EOB]
*
```

MAIL prompts you for a recipient's name and a subject, as shown here, and then you go immediately into line-editing mode in the EDT text editor. You can now use EDT line editing or screen editing to prepare your message, just as if you were preparing a text file. When you exit from EDT (with the **exit** command), you'll go right back into MAIL and your message will be sent. If you decide you do not want to send the message, exit EDT with the **quit** command.

Sending Messages

Using mailing lists: You may often find yourself sending the same message to a number of people—say, fellow committee members or department members. Use EDT to create a text file containing the usernames of these people, recording their usernames one to a line, and give the file the file type **.dls** (for distribution list).

For this example, assume the file you have created is called **members.dls**. When MAIL prompts you for a username (with **To :**), type the @ sign followed by the file name:

```
To: @members
```

You can include the file type **.dls**, but it's not necessary.

Then proceed with the rest of your message as usual. MAIL will distribute your message to all users whose names are in the file **members.dls**.

You cannot use more than one distribution list at a time, but you can add individuals to a distribution by including their names in your response to the **To :** prompt:

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```
To: @members,phj,pmg
```

Users **phj** and **pmg** will also receive your message.

Defining Shorter Network Names

If you are going to send a number of messages to someone whose username is long and time-consuming to type (perhaps someone with a long BITNET address) you can save time by using the VMS command **define**. (Note that this is a system command, not a command within MAIL.) For this purpose, the format of the **define** command is:

```
define shortname longname
```

For example, to define a shorter address for a BITNET correspondent, type

```
$ define jack jnet%"jmsmith@irishmvs"
```

Having defined the shorter name, you can now send BITNET messages to your correspondent by that shorter name in response to MAIL's **To:** prompt, like so:

```
To: jack
```

Notice, however, that this shorter name remains defined *only* for the current terminal session—that is, after you log off, the VMS system "forgets" that you defined the shorter name. You therefore have to define the name again every time you want to use the shorter form. (You can avoid this by putting the **define** command in your login file).

Be careful about the short form you use; if another VX user has the username **jack**, your messages to this Minnesota user will be delivered instead to your BITNET correspondent whom you've defined as **jack**.

Making a Message Current

Some of the commands in this article work only on the "current" message. A message that you have just displayed on your terminal is current. To make an old message current, type the command **read** followed by the number the MAIL utility has assigned to the message, like this:

```
MAIL> read 124
```

This command makes your MAIL message **124** the current message, and MAIL will display the message at your terminal. You can find an old MAIL message, along with the number MAIL assigned to it, with the **directory** command, as explained in the first article on VMS MAIL.

Forwarding Messages

Sometime you want to forward an electronic mail message, sending it on to another MAIL user. To do this, you will, of course, need to know the username of the person you will forward to.

Forwarding a single message: When a message is current (as explained above), simply use the **forward** command. For example, to forward a current message to **kfm**, type

```
MAIL> forward
To: kfm
Subj: Committee meeting
```

After you provide a subject, user **kfm** will receive a copy of the message on her account, along with information that you forwarded the message. The original message remains stored on your account unless you delete it (as explained in my first article.)

Forwarding all messages: You may be working with two VX accounts—for example, one may belong to a colleague or research associate. If you want all mail that is sent to one account (in this example, **ac1**) to be forwarded to the other account (**ac2**), use MAIL's **set forward** command. Log on to **ac1**, enter the MAIL utility, and type this command:

```
MAIL> set forward ac2
```

This command causes *all* mail sent to **ac1** to be forwarded to **ac2**, until the forwarding is turned off. Account **ac1** will *not* receive any of these messages. To turn off forwarding, log on to **ac1** again, enter MAIL, and type **set noforward**.

Printing a Message

There is a **print** command within VMS MAIL that prints the current message, but we do not recommend that you use it, because it does not permit you to specify a site and bin for your printed output. As a result, your printed message will arrive in a general bin at our 128B Lind Hall station, where most VX output (except laser printer output) is delivered if it has no site or bin specified. For many users, this is not convenient.

Instead, you can "extract" the message from your mail file, turning it into a separate text file, and then print the text file with the VMS operating system's own **print** command, which, unlike MAIL's **print** command, permits a specified site and bin number.

In the example below, you use MAIL's **extract** command to copy the *current* message into a newly created text file called **mail.txt**.

```
MAIL> extract mail.txt
%MAIL-I-CREATED, USERB:[SKB]MAIL.TXT;1 created
```

MAIL then creates the file **mail.txt** and copies the message into it. You may then exit MAIL whenever you're ready and use the VMS **print** command, which has this format:

```
$ print/name=site.bin filename
```

Organizing and Searching Mail Files

The more messages that accumulate in your mail file, the more difficult it becomes to find a particular old message. You can, of course, use the **delete** command (as explained in my first article) to remove old messages from your mail file, but you may want to keep many messages for future reference.

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Moving mail to a folder: You can use the **move** command to create "folders" (or specialized, topic-oriented mail files) in which to store particular messages. The **move** command moves the *current* message to a particular folder.

If you have made the desired message current, and want to move it into a folder called **research**, type

```
MAIL> move research
```

If a mail folder called **research** does not already exist, MAIL will ask you if you want to create it.

Going from folder to folder: After you have created one or move MAIL folders, you have to know how to switch from one folder to another.

When you initially enter the MAIL utility, you are able to read new (i.e., unread) messages from a folder called NEWMAIL. This folder remains the default MAIL folder until you read the messages and exit MAIL, at which time MAIL writes NEWMAIL over to the MAIL folder.

If you have no new messages when you begin MAIL, the default mail folder is MAIL, where all your old messages are stored (except for those you've deliberately moved to folders).

To switch from NEWMAIL to MAIL and back, or to one of your folders, use the **select** command. For example, to switch to your **research** folder, type

```
MAIL> select research
```

You can now get at the messages in your **research** folder. To switch back to your original mail file, type

```
MAIL> select mail
```

If you attempt to move to NEWMAIL when you have no new messages waiting to be read, the MAIL utility will tell you that the NEWMAIL folder doesn't exist.

Searching your mail for a topic: If you need to find an old message, but can't find it, you can search a folder for a particular word or phrase.

First, be sure to use the **select** command if you need to move into a particular folder. Then, in response to the MAIL> prompt, type a **search** command. For example, if you are searching for the phrase *planning committee*, type

```
MAIL> search "planning committee"
```

Notice that you must enclose the phrase within quotes. The MAIL utility will search all the messages in your current folder until it finds the first occurrence of the phrase *planning committee*. MAIL will make the message containing that word the current message, and display it at your terminal.

Unfortunately, VMS MAIL does not make continuous searching very convenient. The **search** command will *always* find the first occurrence of a phrase; it will never go beyond it. If you need to search for a second occurrence of a phrase, you have to **delete** or **move** the message containing the first occurrence and then retype the **search** command.

Coming Improvements

We're working to make ACSS electronics mail services better, particularly our network mail service. We want to improve mail software so that BITNET addresses are not quite so complex. We also want to improve VMS MAIL so you can use it to send mail to other networks (eliminating GMAIL) and enable VMS MAIL to send and receive mail to our CYBER/NOS and ENCORE/UNIX machines. As we accomplish these goals, we'll inform you in this newsletter.

For More Information

The complete printed reference on VMS MAIL is the *VAX/VMS Mail Utility Reference Manual*, part of the *VAX/VMS Reference Set*. You can find a reference copy of this manual in the ACSS Computing Information Center, 128A Lind Hall.

You may want to refer to the other resources listed in the other articles on electronic mail printed in this issue. Future issues of the *ACSS Newsletter* will have more information about electronic mail facilities.

User Services

Walk-in Consulting on the West Bank

Sharon A. Krmpotich

Beginning winter quarter, January 5th, ACSS will make walk-in consulting available on the West Bank, in Room 140 Blegen Hall, during afternoon hours Monday through Friday each quarter. The exact hours of the consulting service have not yet been set at the time of this writing. However, you may call the HELP-Line (626-5592) or see WRITEUP,CONSKED on the CYBERs after January 5th to retrieve the exact hours of the service.

Those of you who are familiar with our general consulting service in 128C Lind Hall will find the service in 140 Blegen to be quite similar. The consultants are there to provide in-person assistance on all our systems. Most problems you encounter can be dealt with by any of the consultants. If you should have a problem that requires specialized expertise, the consultant will refer the problem to the appropriate ACSS staff person.

When you visit the consultant in 140 Blegen, please bring all the information you can assemble about your job and problem. Include your most recent output and dayfile, all appropriate file names used by your job, and your user number or name.

Strategies for Networking Microcomputers: A Survey

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(Reprinted from the *Microcomputer Newsletter*)

If your department has accumulated a number of microcomputers, you may be looking for ways to make more effective use of the equipment that you have on hand. As the number of microcomputers in your department increases, the idea of somehow linking your equipment together becomes more and more attractive.

For instance, sharing expensive resources that are used intermittently (such as laser printers) may make more economic sense than buying a printer for every computer. The idea of effortlessly transferring files from your microcomputer to someone else's machine is also attractive (although you may find the most simple file transfer method is to hand a disk to your co-worker).

If we are to believe the vendors, all this (and more) is possible by purchasing a local area network to connect our equipment together. But creating a network of microcomputers can involve considerable effort and expense, so you need to select the right network the first time.

In this article, we will survey some of the possible approaches for interconnecting microcomputers and workstations and see how these approaches fit into the Information Systems's plans for networks. (Information Systems is the umbrella organization for Academic Computing Services and Systems, Health Sciences Computing Services, the West Bank Computing Center, and St. Paul Computing Services, as well as for computer centers on some coordinate campuses.)

Rather than covering specific networks and features, we will concentrate on the issue of how your equipment can be connected to other computers and networks at the University. We hope this article will prompt you to think about how your networking decisions will fit in with the rest of the University. This survey only deals with interconnecting networks, and there are many other issues to consider. Look for detailed reviews of specific networks in future issues of ACSS's *Microcomputer Newsletter*.

Networking: An Introduction

Before we deal with specifics, there are several basic questions about networks that we deal with:

What is a local area network ?

A Local Area Network (LAN) is built out of hardware and software. The hardware typically consists of a network adapter card (that plugs into an expansion slot in your microcomputer) and cables to connect your machine to the next person's machine. There are a variety of different LAN hardware schemes, each with advantages and disadvantages. Some of the

popular microcomputer LAN hardware schemes include: Ethernet, AppleTalk, IBM's Token Ring, and IBM's PC-NET. When selecting a network you must decide what services you need from the network, which machines you want to connect together, and what software you plan to use on the network.

As is always the case with computers, you need software to take advantage of the hardware. LAN software works with the hardware to provide you with network services such as access to a shared printer, access to shared files or disks, electronic mail, machine-to-machine file transfer and (sometimes) remote login to other computers. For a given type of network hardware, there is frequently more than one kind of network software that can be used.

The moral: To connect equipment in a network you must provide *both* compatible hardware and compatible software; just because you have the same network hardware on all your equipment does not mean that the software will work.

What are the limitations of LANs ?

Local area networks have limitations in the number of machines that can be connected to a network, in the length of the network cable (how far apart machines can be), and in the software that will work with the network. The limits on number of machines and cable length come from the hardware that is used in the network; there is little you can do to change these limitations. It is sometimes possible to circumvent the hardware limitations of a network by connecting the network to another network through some sort of *black box*. (See the section below on connecting LANs together.)

Earlier we mentioned that network software can be incompatible. How does this happen? Programs that work over a network do so by using a set of *network protocols*. These protocols define how a program is to communicate with other programs on the network. A program running on one machine connected to the network needs the ability to communicate with other machines so that it can provide network services (for example, file transfer).

To transfer a file over the network, a program running on one machine (sending the file) must communicate with a program running on another machine (receiving the file). The rules for how the two programs communicate are embodied in a set of network protocols. Alas, there are many different (and incompatible) network protocols in existence. Because of the differences between network protocols, the software you can run over a network depends on which protocols are supported on your network.

Connections to Everyone Else

It is fairly simple to choose a network to be used in isolation. But using a network in isolation may not be as attractive as being connected to everything. For instance, my ideal computing environment is one where I can send electronic mail, transfer files, and log on to *any* computer at the University (remote login) from the microcomputer or workstation on my desk. While I can accomplish some of my goals by judicious use of a modem, using a network is more attractive because networks communicate higher speeds than modems, and file transfers tend to be more reliable over a network. A University-wide network also can provide access to services that would be too expensive for an individual department to purchase.

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When you are looking at a network for your department, consider whether or not you want your network to operate in isolation. If you decided that you want access to other people's networks and campus mainframes from your network, a whole new set of considerations must be taken into account:

How do you connect one LAN to another?

The problem of connecting two LANs together depends on *which* two LANs must be connected. The simplest case is when two networks of the same type using the same network protocols are to be connected. For example, you may want to connect two networks together to work around hardware limitations (such as the maximum length of a network). We suggested earlier that some sort of *black box* would make this possible. The 'black box' is called a *router*. A *router* connects two similar protocol networks together and passes information between the two networks.

In many cases you want to connect dissimilar networks together. Since dissimilar networks use different protocols, some translation of network protocols must occur at the connection point between the networks. A *gateway* passes information between dissimilar networks and performs the necessary protocol conversion.

What are the University's plans for connecting LANs ?

If you want to be able to connect your LAN to the rest of the University, you need to know what the rest of the University plans to do.

Recently, the "Ad-hoc Committee for Networking the University" produced a report that outlines the direction that the University should take over the next two years. The committee was composed of representatives from Administrative Information Systems, Telecommunications, Health Sciences Computing Services, Academic Computing Services and Systems, St. Paul Computing Services, Duluth Computing Services, Morris Computing Services, and the ACSS Microcomputer Systems Group.

The committee settled on the **TCP/IP** family of network protocols as being the best solution immediately available for interconnecting the computers and LANs at the University. The committee chose TCP/IP (Transmission Control Protocol/ Internet Protocol) because implementations of these protocols are available now for the majority of the computers at the University. TCP/IP also provides network services such as file transfer and remote login. Another factor in the TCP/IP decision is that the Supercomputer Center is already using TCP/IP and the Ethernet LAN to connect researchers on campus to the Supercomputer Center's machines.

Bear in mind that although the committee's report has been accepted by the Information Systems computer centers, the report is not yet a University-wide policy. Moreover, the committee's report is a statement of direction rather than a document that defines how and when the campus will be networked. In other words, you cannot connect to everything today.

Because new LAN products are being introduced at a very fast pace, it is impossible to predict which LANs and protocols we will be using in five years. (To be fair, it is also hard to predict which microcomputers we will be using.) It does appear that if you plan to connect a LAN to the ACSS or Supercomputer Center mainframes in the next two years, you will

probably need the capability to run the TCP/IP protocols and connect to Ethernet. Note that the physical connection to Ethernet may be accomplished in a variety of ways: a router or gateway from your network to a segment of Ethernet cable in your building, to a fiber optic ring, or to the University digital phone system's Ethernet service (LANmark).

Microcomputers and Networks

Now that we we have covered LANs in a general way, let's look at some specific networks and machines and see how they fit into the long term plans for networking the University.

Macintosh: The LAN most often used with the Macintosh is the AppleTalk network. AppleTalk is quite popular because it is very inexpensive and can be used to share an expensive resource: an Apple LaserWriter.

Suppose you have an AppleTalk network in your department. How can you connect to the rest of the University ? Since the *de-facto* standard is TCP/IP and Ethernet, you need a gateway from the AppleTalk network to Ethernet. You also need some TCP/IP software. This hardware and software is currently available.

A product called the Kinetics FastPath acts as a gateway from AppleTalk to Ethernet. The Micromputer Systems Group and the Supercomputer Center have tested the Kinetics Fastpath for the last several months and found that it works surprisingly well. The Kinetics FastPath is a relatively inexpensive connection to Ethernet on a per-machine basis. The University price for the Kinetics FastPath is \$1600, and you can have up to 31 Macs connected to one FastPath. We have tested one Kinetics Fastpath with as many as many as five simultaneous users and did not encounter any problems.

The two pieces of TCP/IP software (*Telnet* and *TFTP*) that come with the Kinetics FastPath are functional, and we understand that revised and improved versions of the software should be available soon. *Telnet* is a program used for remote login, and this version of Telnet emulates a VT-100 terminal. *TFTP* is a file transfer program. An improved file transfer program (*FTP*) is said to be under development. Currently, the Kinetics Fastpath appears to be the best solution for connecting Macs to Ethernet running TCP/IP.

LANs and the IBM-PC family: For the IBM family there are three fairly popular LANs: the IBM Token Ring, the IBM PC-Net, and Ethernet. Programs that run on the Token Ring should also run on PC-Net, because the protocols used by software that runs over the network is the same for both networks. Unfortunately, the network protocols used by IBM's networks are incompatible with TCP/IP. Perhaps sometime in the future a gateway from the IBM networks to Ethernet with TCP/IP software will be available. Right now, there is no such gateway.

The other popular LAN for the IBM is Ethernet. A number of companies have Ethernet products for the IBM-PC family: 3COM, Micom/Interlan, and Bridge Communications come to mind. 3COM is representative of the Ethernet offerings for the IBM-PC: 3COM makes an Ethernet interface card that cost around \$650 (you will need one card for each machine in your network). TCP/IP software (Telnet for remote login and FTP for file transfer) has been available for several years and works very reliably. If you already have an Ethernet LAN in place you may need a router to connect to the campus-wide Ethernet.

Workstations: TCP/IP software is available for most scientific and engineering workstations and an Ethernet interface is frequently a standard feature. SUN workstations all come with an Ethernet interface built into the machine. TCP/IP software is a standard part of

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the UNIX BSD 4.2 operating system that comes with SUN workstations. In the Microcomputer Group, we have been using a SUN workstation and TCP/IP software to communicate with ACSS mainframes and Supercomputer Center machines for several months now without any problems.

The Apollo Domain workstations use their own proprietary token ring network, but an Ethernet interface is available. We have ordered an Ethernet interface for one of our Apollo workstations, but have not yet received it. Again, TCP/IP software is available as part of the UNIX BSD 4.2 operating system. Both the DEC MicroVAX and IBM RT workstations have Ethernet interfaces and TCP/IP software available. We plan to evaluate these machines over the next few months.

Conclusions

If you are looking into setting up a local area network in your department, you should take into account whether or not machines on your network will need to access other computers at the University. If you want to connect your network to equipment outside your department, this will affect the network you choose, since gateways to the interdepartmental networks are not available for all LANs.

We would be happy to talk to anyone that is considering installing a network about their options in more detail. Call or visit us at the Microcomputer HELP-Line (626-4276).

CYBER News

CYBER MD Upgrade

Dave Bianchi

On December 29, we replaced our CYBER 825 (MD) with a CYBER 830. The new computer has two CPUs and two million words of memory, whereas the 825 had one CPU and a half million words of memory.

CYBER Upgrade to NOS 2.5.1

Dave Bianchi

We plan to upgrade our CYBER operating systems to NOS 2.5.1 on March 22. The change will affect both the CA and MD machines. There will be very few user-visible changes. All the changes will be described in our February *Newsletter*.

Theft and What's Important

Lawrence Liddiard

Since there was no room on campus, several other ACSS staff and I were to move out of Wulling Hall to the Lauderdale Computer Facility in mid-October. Mike Skow, our acting director, had finished packing his boxes and took a well-deserved vacation for two days. Since I had 60 boxes to pack and not that much room for my completed ones, Mike had allowed me to stack them on the table in his office.

On the morning of October 17th, I was busily filling my boxes with 26 years of stuff and transferring them to his table. Suddenly our executive secretary appeared in his doorway and said, "Oh, my gosh, they stole Mike's computer." Besides losing any reputation I'd ever hoped to have for being observant, we lost Mike's Macintosh, ITE phone (usable only on the U's PBX phone system), and all of his disks. The thief had cut through our screened basement window to get at the computer, which was locked to Mike's desk with the Apple Security Kit.

Laurie Kovach, a staff writer for the *Minnesota Daily*, has reported on computer theft at the University in a number of recent articles, from which we quote:

Friday, June 20, 1986: Taking the offensive in the war against computer theft has been a major concern for all Big Ten schools since the personal computer boom made universities a prime target of computer thieves.

The University has lost more than \$50,000 in computer equipment since January 1986. Other campuses have been more successful in reducing theft.

... the recent rash of computer thefts has prompted the police to think of new ways to deter thieves. Acting [University Police] Chief William House suggested alarm systems, key accountability, steel cables and stronger locks.

Tuesday, September 30, 1986: Lawrence Smith, professor of agronomy and plant genetics, found his office door open as he arrived for work Thursday morning. An Apple Macintosh computer, disk drive and printer valued at \$1,200 were taken from his office. Smith used the computer to store student records and to do his work. None of the disks were stolen.

University painters are working on the south side of Agronomy, and the scaffolding equipment is believed to have been used to gain access to the building. . . .

Police believe the thief climbed on the top of the third floor skyway, which connects Agronomy to Plant Sciences, by using the scaffolding ropes. A rope was found on the roof of the skyway. The thief then pried open a third-floor window and kicked out the screen.

Wednesday, November 19, 1986: A sophisticated computer system valued at \$50,000, covered by National Security Council and Department of Commerce restrictions on the export of security-sensitive computers, was stolen this weekend from the University Computer Science Department.

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The theft, discovered Sunday afternoon, brings the total loss of University computer equipment this year to \$123,300 and raises questions of what is being done to prevent campus computer theft. The stolen machine, an NCUBE/4, is an IBM PC/AT computer containing special circuitry [four additional circuit boards worth \$40,000] that enables it to perform calculations at very high speeds.

... according to [Computer Science department head David] Fox, "in this particular case there wasn't any question of lack of security: the door was broken in."

First Reactions

When computer theft occurs, a number of solutions immediately come to mind. The absurd: If we would use micros that are of low quality or out-of-date, then nobody would want to steal them. But why would a university have such equipment for its faculty and students? Another solution: Since low-priced CRT terminals are stolen less frequently, we could use only these terminals, connected to centralized systems, for university computing. But this flies in the face of our goal to provide all university faculty and staff with an intelligent workstation on their desks. Obviously none of these solutions are real answers.

Deterring Casual Theft

Casual theft is usually considered to occur when the theft takes place on hasty impulse. An example of equipment that deters this type of theft is the Macintosh security kit that costs about \$27 with slugs, cable, and special screws. The Macintosh has security slots in its keyboard and main unit case for the steel slugs with 1/2 inch holes that allow the steel cable to tie the system down. Similarly, the hand-tightened screws on the 'mouse' and external disk drive connectors can be replaced with concealed special headed screws that wed these two units into the main unit. Our Engineering Services Group has assembled similar kits for most microcomputers that they will install for \$75 and other kits are on the market in the \$40 to \$60 range.

Such systems have their drawbacks. When visiting the University of Minnesota Duluth campus this fall, I saw student-funded IBM PC's shackled to their tables with thick metal chains. In this case the appearance of the protection scheme was repulsive; I wanted to release the slaves from their bondage.

These deterrence systems cannot provide absolute protection. Remember that ACSS had installed security kits on all our micros in Wulling Hall, but that did not prevent the after-hours theft of our Macintosh.

Another deterrence to casual theft could be the use of engraved identification numbers in addition to the U's property accounting numbers, which are easily removed. I hope that the U police and colleges agree on a uniform identification program.

As an aside, note that University insurance does not cover personally owned equipment unless there is a departmental letter stating that you are required to have it on the premises. Your homeowners policy on off-premise items will be your only protection if such a theft occurs.

Hardcase Theft

Prevention of hardcase theft means changing either the equipment or the room in which it is stored into a secured fort. For a room, it means deadbolt locks, secure doors and windows, blocked overhead crawl space, etc. For the computer it can mean steel enclosures (armored computer suits) costing \$500 to \$1000 or around-the-clock monitoring.

Since the cost of doing these things for a single computer is close to the cost of a micro, securing a room with lots of computers is usually the more economical route. This will often bring up other questions, such as: If the cost of hardcase theft prevention is 30 to 50 percent of the cost of the item protected, is it better to have 30 to 50 percent more items rather than that much protection? For example: For our students, would not a lab with 50 casual-theft secured Macintoshes at \$62,500 be better than 35 steel-encased ones for the same price? And how much extra does it cost to maintain equipment that is bolted to tables or encased in steel?

Theft of Unique Information

So far we've discussed only the theft of computing equipment, but the most devastating theft occurs when unique information is damaged or lost. This is the information on the hard disks or floppies that are damaged or taken in a theft. If we assume that University faculty time is worth at least \$25 per hour, then information that took 100 hours to prepare is worth two Macintosh computers. We at ACSS have to remember to stress to users that *all* unique computing information should be backed up onto machine-readable media and physically located in a different building to avoid the heartbreaking reconstruction required if that data is lost.

On our central ACSS central systems, we do incremental dumps several times a day to ensure that backup copies of user files are available if disaster strikes. Copies are kept in a fire-proof vault and spare copies in an off-site location. The individual at a workstation or micro should consider the question, "What if a tornado came through here today?" to determine which unique data should be backed-up to an off-site location on a continuing basis.

Let me take an example from outside of computing: In 1972 my family visited Italy and we were eagerly looking forward to seeing Michaelangelo's sculptures in Florence and Rome. Just before we got there, a disturbed person took a hammer to the *Pietà* in Saint Peter's and, as a result, we were only able to view the plywood walls enclosing the reconstruction area. The disaster encouraged museums throughout the world to be more careful with their most precious holdings. Paintings like the *Mona Lisa* in the Louvre are now protected with guards and bulletproof glass, in addition to temperature-controlled and humidity-controlled environments with alarm systems. The unique information that we assemble on our computers (though it's not as precious to the rest of the world as the *Pietà*) also deserves protection from disaster.

Conclusions

Theft of computing equipment can be worrisome; but if we have been prudent in our guardianship, then these items are replaceable. Our real worry should be the protection of the unique information and ideas that we have produced with our labor. Let this our monthly motto be: **Off-site backup of unique computing information.**

Improved Set Types in Pascal and APASCAL

Jim Miner

The implementation of Pascal *set* data types on our Control Data CYBER computers, the CA and MD, has been improved, permitting you to use larger sets. Previous restrictions on the range of set elements have been eased, thus removing a major annoyance for users of the Pascal compilers PASCAL and APASCAL.

This note describes the restrictions on sets and why they exist, the facilities in the Pascal compilers available to control the restrictions, additional new features that have been added for ease of manipulating sets, and planned future developments.

What restrictions on sets are there?

Pascal on the CYBERs now restricts the possible elements in a set to be in the range 0..7733188. Formerly, elements were restricted to the range 0..58. These restrictions apply to non-integer types, such as char, as well—in which case the ordinal numbers of the possible elements are restricted to the stated range. Thus, the following were prohibited but are now permitted:

```
set of char
set of 0..200
```

In addition, Pascal on the CYBERs restricts the maximum element expressed by *non-constant* expressions in a "set constructor" to be in the range 0...*n*, where *n* is the setting of the new *SS* compiler option. (A set constructor expresses a set value in terms of the values of its elements. For example, the set constructor

```
[ 5..7, J+2 ]
```

describes the set value whose elements are 5, 6, 7, and *J*+2, where *J* is an integer variable.) The *SS* option is described later in this note.

Elements of set constructors expressed by *constants* are restricted only to fall in the range 0..7733188. They are unaffected by the *SS* option.

Why is there a restriction?

Whenever you use a Pascal set type you specify the "base type" of the set type. For example, in the type definition

```
type s = set of 10..20;
```

the base type of the set type is 10..20. The base type is the type of all possible elements. Thus it determines the range into which any element of a set of that type must fall.

The range of possible elements is important, not only to you for understanding your program, but also to the compiler for allocating space for representing set values. If, instead of the

preceding example, you had defined

```
type s = set of integer;
```

the compiler would be required to allocate enough storage to handle all integer elements in the range `-maxint..maxint`, even though you were only interested in the range `10..20`. In fact, given the way sets are represented, this would require more space than is possible to have on the CYBERs. So it is important that you specify as narrow a range as possible for set elements.

Unfortunately, a set constructor provides little information to the compiler (or the reader) about the maximum range of its elements. In the set constructor

```
[ I..(J*2+K) ]
```

the maximum possible element is not at all obvious. The way Pascal is defined, the type of this set value is `set of integer`. And because it is not practical to implement this type, implementations typically place some arbitrary restrictions on the values of the elements (as described earlier). In earlier versions of CYBER Pascal, all elements had to be in the range `0..58`.

But a compiler implementor cannot pick an upper bound for these elements that works well in all cases. The reason is that evaluating a set constructor with non-constant elements takes time and space at run time that is approximately proportional to the maximum possible element. If the implementor feels generous and picks a large maximum, then all users suffer increased overhead even when their sets are small. If the implementor is concerned with performance and picks a small maximum, some users find the limit to be inadequate for their applications.

It is exactly for this problem that the new `SS` compiler option is supported.

How to Use the `SS` Compiler Option

The `SS` option determines the maximum value of a non-constant element of a set constructor. The minimum setting for `SS` is 58, the maximum setting is 7733188.

You can set the `SS` option on the compiler command and you can change `SS` in your program source with option comments. By changing the setting, you can give each set constructor in your program its own maximum.

Using option comments, you can set the `SS` option for a set constructor and then restore `SS` to its previous setting. For example:

```
(*SS150 SET CONSTRUCTOR HOLDS 0..150 *)
IF I IN [ 5, 10, 15..J ] THEN
  (*SS= RESTORE PREVIOUS SETTING *)
  SOMETHING
ELSE
  SOMETHINGELSE
```

Here, the integer variable `J` can be as large as 150 when the if-statement is executed, and only as much space as is necessary for elements in the range `0..150` will be allocated for the

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set constructor. In addition, the setting of *SS* after the second comment has been restored to whatever value it had before the first comment.

Because the time and space required increases with the *SS* option, you should try to keep it as small as possible for the application you are writing. Setting *SS* to 7733188 will use all of the available memory for the set construction, leaving none for your program and the rest of its data.

Additional Predeclared Procedures

Two new predeclared procedures, *INCL* and *EXCL*, are now supported. These provide more efficient ways of doing operations on large sets. They are defined as follows. Let *S* be a set variable, and *E* be an expression. Then

INCL(*S*,*E*) is equivalent to the statement *S* := *S* + [*E*]

and

EXCL(*S*,*E*) is equivalent to the statement *S* := *S* - [*E*].

Thus, *INCL* "includes" an element into a set, and *EXCL* "excludes" an element from a set. These procedures are identical to the ones of the same names in the language Modula-2.

Plans for Development

There are several national and international committees currently developing a standard for an "Extended Pascal" language. This new language, which will be upwardly compatible with the current standard Pascal language, will almost certainly contain a feature for specifying the maximum range of set constructor elements.

This feature can be most easily described by example. Suppose we have:

```
type LongSet = set of 0..1000;
var   S: LongSet;
      J: integer;
```

Then the new feature would permit the statements:

```
S := S + LongSet[ J ];
if Something in LongSet[5, 10, 15..J ] then ...
```

Note that placing the type name *LongSet* in front of the set constructor permits the compiler to determine what range is appropriate for the elements of the constructor (in this example, 0..2000). This is an improvement over the *SS* option, because it will be recognized by all "Extended Pascal" compilers, whereas *SS* is purely a CYBER Pascal feature.

We plan to support this new feature in the near future. Watch this space for an announcement.

LISP and Prolog on the UNIX ENCORE (UX)

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Franz Lisp

Franz Lisp is available on the ENCORE UNIX system. It includes a tracer, stepper, and other debugging aids as well as the Liszt compiler. A short introduction to the features of this language can be found online by typing `man lisp` at the main UNIX prompt.

To access Franz Lisp, type `lisp` at the main prompt and to exit type `(exit)`.

Documentation: *The Franz Lisp Manual* is available online within LISP by using the `help` command. Type `(help tc)` to see the table of contents of *The Franz Lisp Manual*.

Type `(help n)` to view chapter *n* of *The Franz Lisp Manual*. (Replace *n* with the number of the chapter you're interested in.)

Type `(help fnc)` for information on functions. (Replace *fnc* with the name of the function you're interested in.)

Prolog

Waterloo Prolog is another language available on the ENCORE. Through the use of a method similar to Modula-2's definition and implementation modules, Waterloo Prolog has a rudimentary form of data abstraction.

Information hiding is accomplished by dividing a Prolog program into modules. By default, relations within a module are hidden from view and are not accessible to other modules. The only way to make them visible is to explicitly export them.

Any Prolog program, regardless of size, can be divided into a set of these reasonably small, self-contained modules. In general, focusing on individual modules reduces the number of relations you have to contend with at any given moment and makes the program as a whole easier to design, debug, and maintain. As far as I know, Waterloo Prolog is the only Prolog that offers this feature.

Documentation: Typing `man wup` at the main UNIX prompt gives the details of using this implementation. To access Waterloo Prolog type `wup` and to exit type `CTRL-C x`. Information on any predicate is available within Prolog by typing

`man (pred) .`

(Note the use of the period.) Replace *pred* with the name of the predicate you're interested in.

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If you have questions about either of these languages, please feel free to contact me.

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Liberal Arts Computing

MLA on BITNET: Announced Address Changes

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The Modern Language Association, a professional organization for scholars of language and literature, announced in the winter issue of its *MLA Newsletter* that it had recently acquired a BITNET address, `ext1.mla@cu20b.columbia.edu`.

In fact, this is not a BITNET address, but rather an address on CCNET, a regional educational network that joins Columbia University with Carnegie-Mellon and several other schools. The sequence `.columbia.edu` is a distinguishing mark of an address on this network. The computer, called CU20b, that Columbia University assigned to MLA for its electronic mail service is not a "true" BITNET node; it is only a node on CCNET, which has a "gateway" to BITNET.

This means that MLA members at many schools will not be able to send BITNET messages to MLA in the usual way, but will need to use a software package like GMAIL (which is on our VX machine). If members do not have access to such a package, they may not be able to send electronic mail messages to MLA at all. The newsletter announcement does not prepare readers for these complications.

David Feinberg, manager of the MLA computer center, tells me (via BITNET and CCNET) that MLA is now aware of this situation and has asked Columbia to make another computer, a "true" BITNET node, available for BITNET mail, necessitating a change in MLA's address. MLA's new BITNET address is `mlaod@cuvmb` (standing for MLA Online Data at Columbia University Virtual Machine B). The previous address will still be active for a short time before it is closed. Members will receive more information in the next *MLA Newsletter*.

LINDO: Linear Programming Package Installed on VX

Mike Frisch

VX and BITNET Username: MJFRISCH@UMNACVX

We recently installed the LINDO (Linear, Interactive, aNd Discrete Optimizer) package on the VAX VX system. This interactive linear, quadratic, and 0/1 integer programming system is designed to be useful for a wide range of users. It was developed by Professor Linus Schrage of the University of Chicago. The VAX version has been compiled in double precision using the FORTRAN compiler's /G_FLOATING option.

LINDO can solve small to medium size problems within a fixed workspace. Documentation is the *User's Manual: Linear, Integer and Quadratic Programming with LINDO* (2nd Edition) published by the Scientific Press, 540 University Avenue, Palo Alto, CA 94301 (415/322-5221). You can examine a non-circulating copy in the ACSS Computing Information Center, 128A Lind Hall. A HELP command is available and summarizes the other commands. The command

LINDO

begins execution of the program.

The following shows a sample interactive LINDO session. It solves a two-variable, two-constraint linear programming problem. User input is in lowercase after the question mark or colon prompt character.

After you log on to the VX, type **lindo**:

```
$ lindo
LINDO (UC 26 JULY 84)
: max 2x + 3y
? st
? 4x + 3y < 10
? 3x + 5y < 12
? end

: look
ROW:
all

MAX      2 X + 3 Y
SUBJECT TO
          2)  4 X + 3 Y <=  10          3)  3 X + 5 Y <=  12
END

: go
          LP OPTIMUM FOUND AT STEP      2
```

Continued on page 30

```
                                OBJECTIVE FUNCTION VALUE
1)                                7.45454545

VARIABLE                VALUE                REDUCED COST
    X                    1.272727                0.000000
    Y                    1.636364                0.000000

                                ROW                SLACK OR SURPLUS                DUAL PRICES
    2)                    0.000000                0.090909
    3)                    0.000000                0.545455

NO. ITERATIONS=                2

DO RANGE (SENSITIVITY) ANALYSIS?
? no
: quit
FORTRAN STOP
```

In the near future, we plan to add some on-line documentation about LINDO on the VAX and we will attempt to add dynamic memory allocation to the program so that it can solve larger problems.

Further questions about LINDO should be directed to Mike Frisch, 612/625-5830.

Memory Increased for SPICE2

Mike Frisch

On December 3, we increased the size of memory available for SPICE2 problems from 20000 to 40000. This should take care of presently known problems in which SPICE2 did not have enough memory. Please contact the ACSS HELP-Line, 612/626-5592, if you have any difficulties with SPICE2.

Reminders

Convert Your Punch Cards Now

Our current plans are to **eliminate card readers and keypunches** at all locations except our central site at Lauderdale by June 30, 1987.

If you use punch cards, we strongly encourage you to begin transferring your data to other forms of storage. ACSS will again offer a course for card users who would like to learn more about transferring card data to disk or tape. There will also be a newsletter article on the subject. Watch future issues of this *Newsletter* for more information.

The ACSS Instructional Computing Meeting: A Report

Lawrence Liddiard

On December 8, 1986, we held a meeting to ask instructors what software they needed for their students and their classes. We also wanted to help instructors decide which mainframe computer to use for instructional computing. In addition to its microcomputer labs, ACSS offers large-scale instructional mainframe services—services for more than 64 simultaneous users—on its VMS/VAX, UNIX/Encore, and two NOS/CYBER systems.

Because many instructors could not attend this meeting, ACSS also mailed out a flyer to instructors that allowed them to order the packet of information given out at the meeting and to address specific comments and questions about instructional service delivery to ACSS. If you would like one of these packets and/or have questions about instructional services, you may call Sharon Krmpotich at 612/626-1085 or send a request by campus mail to ACSS Instructional Services, 100 Lauderdale Computer Facility, 2520 Broadway Drive.

Because of the fragmentation of ACSS into a number of locations, ACSS has selected a single contact person, Ms. Krmpotich, to help ACSS improve its instructional service response. In addition to Sharon's help, ACSS has transformed its Lind Hall Reference Room into a Computing Information Center, 128A Lind, to provide University members with a central location at which to obtain reference copies and ordering information for any ACSS-related documentation.

Questions

The following questions were raised at the meeting:

Why are instructors able to get free information sheets for mainframe systems, but not for micros—specifically, the micro terminology handout? ACSS will also provide course instructors with micro handouts, but need the normal advance warning for large quantities. Note that ACSS spends \$42,000/year for these handouts and its newsletters.

Is ACSS making plans to include electronic conferencing on any of its systems? Within CYBER mail there is a limited conferencing ability. We have just installed the Notes utility on the VMS/VAX on a free-trial basis to determine its usefulness. If there is sufficient demand we will look into obtaining this software.

The high cost (\$75) of the manual for VAX/Notes and other reference manuals also entered the discussion. The Computing Information Center, 128A Lind, is working with the university library system to have manuals available in the library for students to refer to and copy. In addition, many of these new packages have on-line help pages and tutorials.

Will the CYBER CA be connected to the supercomputer network? It is embarrassing to reply that the promised temporary "black box" that will allow ACSS's CYBERs to communicate in the TCP/IP protocol which the supercomputers use has not been

Continued on page 32

delivered yet. (It finally came on December 11.) Both the VMS and UNIX systems already are connected on Ethernet using the TCP/IP protocol.

Organizationally, central administration has announced the consolidation of university academic computing under Vice Provost V. Rama Murthy, and this action should mean closer cooperation between the various computing among departments.

What can I do to store my data for long periods of time (up to 75 years) so that I know the storage medium will not become obsolete? In this case, Prof. Charles Backstrom had data on a 7-track magnetic tape from the 1962 Minnesota Gubernatorial Election (finally won by Karl Rolvaag with a 91-vote margin after a 139-day recount). Although ACSS has kept a 7-track tape unit to read satellite data and other data generated in the 60's, his tape was not readable after a 20-year period.

We could not answer this question because of the rapid rate of change in data media storage. Among the storage media that have already reached deadends are punched cards (in 80- and 96-column), paper tape, 8-inch floppy disks and 7-track tape. We mentioned that a university committee had given a report on machine-readable data files (MRDF) and that somehow the library seems the logical department to preserve valuable archival data files.

Meanwhile, all computer users who want to store data for long periods of time will need to periodically reassess the storage media they use, and, when necessary, move their data to newer technology storage media.

Why is sign-up time for the Kurzweil scanner so full? The machine is in great demand. When we asked individuals at the university if they could use an optical scanner to convert printed text to ASCII machine files, there was a small but enthusiastic group that said yes. With the beginning of the scanner service, we found the demand to be far greater than we anticipated and signups are two months ahead.

We are adding additional student help to make better use of the machine during operating hours.

When can we expect to see the communications fixed for file transfer and interrupt keys through our modems to the mainframes? The University Telecommunications department installed 300 of the latest 300-2400 baud Racal-Vadic modems in their modem pool. ACSS has been working with Telecommunications and the manufacturer to test new ROMs that will fix the flow-control and other problems of these modems that cause dial-up troubles for data input to any computer at the University.

When ME (a CYBER instructional system) was merged with the CA (our CYBER research system), the archiving of ME files was changed from 90 days to 30 days. Can this length of time be increased? At one time the amount of disk storage space we needed was increasing at 40% per year and ACSS could not keep up with demand; those times are past. We will implement software that permits users to determine the number of months (from one to six) that elapse before ACSS archives an unused file.

Will the CYBER systems be upgraded to the NOS-VE Operating System? ACSS runs two CYBER systems, the 855 and 825. (The IT CAD/CAM 825 may be upgraded

to a CDC Engineering Center dual-processor 830 during Christmas break.) If this occurs, we expect that CDC will have converted all of the CAD/CAM software required for our instructional needs by next summer and that system will then be changed to NOS-VE. If you require NOS-VE service before that time, the Health Sciences Computing Services department has an 830 running NOS-VE.

Are there any plans to include the GKS graphics package on ACSS Systems?

A GKS graphics package from Precision Visuals Inc. could be made available on the VMS/VAX system if there was enough user demand. It will not be available on our CYBERs under the NOS system, but will be available under NOS/VE.

Can packages be moved between the CA and MD (CYBER) systems and vice-versa? The general answer is yes, but ACSS respects software copyrights and thus not all software packages can be moved unless we pay additional license fees and/or make additional contractual agreements. Some software (such as the CAD/CAM packages on MD) is too expensive to have on CA.

Are you going to replace noisy TTY43's with CRTs and laser printers? Can students have route privileges for those laser printers? This is in our plans for the next two years. The first laser printer went into Diehl Hall and the second is scheduled for Lind. We believe that students should be able to get a limited number of pages from the laser writer; but there is a real cost associated with laser output. The unresolved question is, who pays—ACSS or the student's department?

Can class account limits for the VX (VAX/VMS) system be raised higher than they were in fall quarter? Yes.

Can faculty get assistance in instructional computing? ACSS will help with the mechanics and with ordering documentation for courses. There is also a "Project Assist" group at the University that provides workshops and other assistance in designing instructional software. Call 626-1090 for more information about Project Assist and see the article in this issue on the Project's winter quarter workshops.

At the time this article went to press, we had received over 100 additional replies to our mailings with many specific questions about ACSS instructional services. We will publish these questions and answers in future issues. Thank you for your time and patience in telling us about our services and your instructional needs.

Instructor Assistance

Pete Oberg

ACSS has a staff member to help instructors use computers in the classroom. Sharon Krmpotich of the User Services Group (612/626-1085) can aid instructors with decisions on particular hardware - software combinations that can be used in your classes. She can also help you with choices about student access, class account information, department and student costs, etc.

Sharon can direct instructors to documentation that will help students get started in using computers. If an associate or another computer center has specific software that you want to use in your classes, Sharon can help decide on the system to run that software.

This service will help instructors and also help students learn to use the computers effectively.

Graphics

Varian Plotter Available for DI-3000

Michele Lewis

VX and BITNET Username: GRAPHICS@UMNACVX

The Varian plotter will now plot metafiles from Precision Visuals Inc.'s graphics package DI-3000, on the CA machine. The Varian produces continuous plots with a resolution of 100 dots per inch.

The program, PVI2VAR, operates similarly to PLOT31. PVI2VAR accepts a PVI metafile, METAFIL, and produces the Varian-formatted file, PLOTS. The PVI metafile must be local and named METAFIL. PLOTS may be routed to the Varian plotter in the same manner as with PLOT31. To use the PVI2VAR program, type the following:

```
A, METAFIL=filename  
PVI2VAR           {Produces the local file PLOTS.}  
ROUTE, PLOTS, DC=PL, UJN=sitecode*bin number
```

If you have any questions or problems plotting PVI metafiles on the Varian, call Michele Lewis at 612/626-0314.

Old DI-3000 to be Removed from VX

Michele Lewis

On February 1, 1987 we will be removing the old version (4.10) of the graphics package DI-3000 on VX. This version was accessed by the command

```
$ di3000
```

We are currently running version 5.0 of DI-3000, which is accessed by the command

```
$ pvilogin
```

See WRITEUP,DI3000 on CA or MOREHELP GRAPHICS DI3000 on VX for more information on running this package.

Winter Quarter Short Courses 1987

INTRODUCTORY COURSES

(Introductory Courses are FREE. To register call 625-7397.)
(Classrooms listed *may* only be for the first day of class.)

Beginning NOS 2	(SAK)	Jan 26-Feb 5	(MWTh)	3:15-5pm	Phys 210
Beginning UNIX	(JLM/TEK)	Feb 9-19	(MWTh)	3:15-5pm	Phys 210
Electronic Mail	(JHS)	Feb 10-12	(TTh)	2:15-4pm	FordH 349
Tapes in NOS 2	(PJO)	Feb 17-26	(TTh)	2:15-4pm	FordH 349
Introduction to VAX/VMS	(JHS)	Feb 23-Mar 5	(MWTh)	3:15-5pm	Phys 210

ELECTIVE COURSES

FEES: 1) U Students, 2) U Staff/Faculty, 3) Non-University persons

Introduction to INGRES (VAX DBMS)	(PJO)	Feb 3-5	(TTh)	2:15-4pm	\$10,\$10,\$20
SPSSX (Statistics Package)	(DFL)	Feb 9-13	(MWF)	3:15-5pm	\$10,\$10,\$20
Beginning 'C' Language	(BMS)	Feb 23-Mar 6	(MWF)	2:15-4pm	\$15,\$15,\$40
PicSure (VAX Graphics)	(JLM)	Mar 9-12	(MWTh)	3:15-5pm	\$10,\$10,\$20
SAS (Statistics)	(DLF)	Mar 9-13	(MWF)	3:15-5pm	\$10,\$10,\$20

MICROCOMPUTER APPLICATIONS COURSES

(Absolutely limited to 10 per class)

FEES: 1) U Students, 2) U Staff/Faculty, 3) Non-University persons

Introduction to Micros: MS-DOS	section 2	Jan 27-29	(TTh)	1:30-4pm	\$25,\$35,\$60
	section 3	Feb 11-13	(WF)	9:30-Noon	\$25,\$35,\$60
	section 4	Feb 23-25	(MW)	1:30-4pm	\$25,\$35,\$60
	section 5	Mar 10-12	(TTh)	1:30-4pm	\$25,\$35,\$60

(Introduction to Micros or "equivalent knowledge" is required for courses below.)

Introduction to Word Perfect	section 1	Jan 22	(Th)	9:30-Noon	\$25,\$35,\$60
	section 2	Feb 4	(W)	1:30-4pm	\$25,\$35,\$60
	section 3	Feb 19	(Th)	1:30-4pm	\$25,\$35,\$60
	section 4	Mar 4	(W)	1:30-4pm	\$25,\$35,\$60
Beginning Lotus 1-2-3	section 1	Jan 28	(W)	1:30-4pm	\$25,\$35,\$60
	section 2	Feb 26	(Th)	1:30-4pm	\$25,\$35,\$60
Intermediate Lotus 1-2-3		Mar 2	(M)	1:30-4pm	\$25,\$35,\$60
Introduction to dBase III	section 1	Jan 20-22	(TWTh)	1:30-3:30	\$45,\$60,\$90
	section 2	Feb 16-20	(MWF)	1:30-3:30	\$45,\$60,\$90
Programming with dBase III		Mar 3-5	(TTh)	1:30-4pm	\$40,\$50,\$80
Introduction to Microsoft Word for IBMs		Mar 3-5	(TTh)	9:30-Noon	\$40,\$50,\$80
Managing Your IBM Hard Disk		Feb 3-5	(TTh)	1:30-3:30	\$25,\$35,\$60

(These courses are OVERVIEWS ONLY for the Apple Macintosh. Limited to 12)

Beginning Excel (Spreadsheet)	Jan 30	(F)	1:30-4pm	\$15,\$25,\$40
Microsoft Word for the Macintosh	Feb 4	(W)	1:30-4pm	\$15,\$25,\$40
Omnis 3	Feb 17	(Tu)	1:30-4pm	\$15,\$25,\$40
Intermediate Excel (hands-on course, limit 10)	Feb 18-20	(WF)	9:30-Noon	\$40,\$50,\$80
Cricket Graph	Mar 6	(F)	1:30-4pm	\$15,\$25,\$40
Preparing Dissertations Using a Macintosh	Mar 11	(W)	9:30-Noon	\$15,\$25,\$40

Registration Information

REGISTRATION: Registration is located at the ACSS Computer Information Center, 128A Lind Hall. (Hours: 8:00 am to 4:30 pm, Monday through Friday). We accept mail registrations. Deadline for registering is 4 pm on the last working day *before* the class begins. Please call and give us your name if you plan to attend a free class, so we know how many to expect. For registration information call 625-7397.

Please register early: Micro classes fill up quickly, and we sometimes have to cancel an open-enrollment course if enrollment is very low.

FEES: Fees are listed in order for the following groups: 1) University students, 2) University staff and faculty, and 3) non-University persons. Course fees may be paid by cash or check or with a signed University journal voucher. Bring or send payment to 128A Lind Hall. No refunds will be made after the class has begun.

NOTE: Monday, January 19, is a University holiday. No classes will be held.

Short Courses

Short Courses from Other U Computer Centers

Jerry Stearns

VX and BITNET Username: CORDWAINER@UMNACVX

There are other departments at the University which offer computer short courses. The subjects, costs, length of courses, and schedules vary with each department. Please contact the departments listed below for further information.

Microcomputer Software Short Courses:

Administrative Information Services (AIS)

Call Connie Mouw at 624-0551 for course availability.

West Bank Computing Services (WBCS)

Call West Bank Computer Lab at 624-6526, or stop in 170 Anderson Hall, West Bank.

Mainframe Computer Short Courses:

Health Sciences Computing Services

Call 625-5444 for courses on their CYBER 170/825 running NOS/VE.

St. Paul Computing Services

Call Mel Sauve at 624-7788 for courses on their IBM 4381 under CMS.

Project ASSIST: Winter Workshops

Renate Lippert

Project ASSIST is offering the following workshops during winter quarter:

Jan 14	Evaluating Authoring Systems	335 Peik Hall
Jan 15	Introduction to PLATO	Appleby Computer Lab
Jan 28	Computer-Based Instruction In Higher Education: A Guided Tour of Possibilities	335 Peik Hall
Feb 3	Evaluating Instructional Software	335 Peik Hall
Feb 6	Introduction to PLATO	Appleby Computer Lab
Feb 19	A Programmer's Guide to Instructional Software	335 Peik Hall
Mar 3	Introduction to PLATO	Appleby Computer Lab

For more information about the workshops, call Paul Wieser at 612/626-1090.

Experimental TRYSYS1 on CA

Bruce Center

I have installed a beta-test version (i.e., an experimental version) of TRYSYS1 on the CYBER CA. TRYSYS1 is a comprehensive Cluster Analysis package, an updated version of the BC Try system. (It's named in honor of Robert Tryon, on whose *Cluster Analysis* the program is based.)

Cluster analysis techniques are already available in SPSS^x, BMDP, and SAS. But TRYSYS1 will provide a greater range of analysis options. For instance, TRYSYS1 can perform various types of multiple group factoring using either empirical or rational (pre-set) selection on a subset of variables as the definers of each dimension and can compute oblique factor coefficients for all variables on each dimension. In its empirical mode, TRYSYS1 can perform "key-cluster factoring," a procedure designed to select variables that are tightly collinear with one another as dimension definers. For item analysis and scale construction, it can provide alpha reliabilities of each variable cluster and the intercorrelations of the clusters.

TRYSYS1 can produce a printer plot of a 3-space "spherical analysis" of factor structure. This depicts variables as points on or near the surface of a sphere. Variables close together on the spherical surface have very similar augmented factor loadings on those particular three dimensions.

Exploratory comparison of the dimensions in two or more groups (i.e., factor matching) can be derived from any type of factoring and can be either orthogonal or oblique. TRYSYS1 can cluster large numbers of cases very efficiently using an interactive partitioning method, and can identify and reject distant outliers if you request.

TRYSYS1 can perform a type of cluster solution validation. When a sample has been clustered, TRYSYS1 can employ random sampling procedures to determine empirically how deviant each cluster group's external-variable mean and standard deviation are from those values of the total sample, based upon the sampling distributions constructed. (See Aldenderfer and Blashfield, 1984, cited in full below.)

TRYSYS1 is a batch-oriented program. It will usually run as a submitted job, using the commands:

```
FETCH, TRYSYS1.  
TRYSYS1.
```

Users who wish to obtain the *TRYSYS Reference Manual*, containing all known documentation for the package, should contact me at 625-2538.

References

Aldenderfer, M.S. and Blashfield, R. S., *Cluster Analysis* (Beverly Hills: Sage Publications, 1984).

Tryon, Robert C., and Bailey, Daniel E., *Cluster Analysis* (New York: McGraw Hill, New York, 1970).

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Conventions

Throughout the *ACSS Newsletter*, and in a growing number of recent ACSS publications, we have adopted these conventions:

- Messages and prompts from the ACSS computers appear in *plain type*, like this.
- Words that the computer systems replace with a specific name, value, or other information appear in *italic type*, like this.
- Commands you type at your terminal keyboard appear in **bold face type**, like this.
- Words that must be replaced by a specific name, value, or command that you type in appear in **bold italic type**, like this.
- Comments to interactive sessions and program files are enclosed in { curly braces, like this }.

Here's an example:

save, filename

is a command you type in. You type **save** and replace **filename** with the name of your file. The system may respond with the message

filename ALREADY PERMANENT { An example of a system message. }

where *filename* will be replaced by the name of the file you attempted to save.

- The symbol <CR> refers to the carriage return (or RETURN) key on the terminal. The <CR> serves as a terminator for commands you type at your terminal. In most cases we do not show <CR>; we assume you know to type it after every command.

Operations

New Rates for Special Forms Setup

Pete Bartz

To create a more uniform charging system, we have changed setup charges for certain special forms as of January 1, 1987. These special forms include mailing labels of several different sizes, two-part carbonless paper, and user-supplied forms, all used in impact printers attached to our CYBER CA computer. We now charge a standard setup fee of \$4.00 for all special forms. (We previously charged this price in most cases, but for some setups we charged \$3.00 or \$5.00.) If you have any questions regarding this change, please see WRITEUP,SERVICE=FORMS or call the Tape Librarian at 612/626-1838.

The Help Page

General Consulting

Walk-in: 128C Lind Hall, 10 am to 4 pm weekdays and 7 to 9 pm on Tuesday and Thursday evenings.

HELP-Line: 626-5592, 8 pm to 5 pm weekdays.

Specialized HELP-Lines

HELP-Line	Phone Number	Hours
Artificial Intelligence	625-8332	3 to 4 pm weekdays.
Data Bases	626-1887	10 to 11 am weekdays.
Microcomputers	626-4276	9 am to noon & 1:30 to 4 pm, Monday, Tuesday, Friday; 9 am to 4 pm, Wednesday and Thursday.
Statistics	626-1893	11 am to 2 pm weekdays.
Text Analysis	625-8332	3 to 4 pm weekdays.
Text Processing	625-1391	9:30 to 11:30 pm, Monday, Wednesday; 1 to 2 pm, Tuesday, Thursday.

Instructional Computing Consultant

Department instructors may call Sharon Krmpotich (626-1085) for assistance in choosing ACSS systems (CYBER/NOS, VAX/VMS, ENCORE/UNIX), software, and for answers to any other inquiries on using computers for instructional computing.

Computing Information Center

128A Lind Hall
625-7397
8 a.m. - 4:30 p.m. Monday - Friday

Computing account and grant applications available for CYBER, ENCORE, and VAX computers.

Short course enrollment. Short course schedules and class descriptions available.

Assistance in ordering vendor documentation. Vendor documentation is not always available in the university bookstores and may be ordered directly from the company.

Complete documentation collection. Reference copies of vendor and all other documentation for ACSS software.

Free ACSS documentation available.

Computing Newsletters. Subscribe to the *ACSS Newsletter* or the *ACSS Microcomputer Newsletter*. Newsletters from other computing centers are also available for reference.

PHONE NUMBERS

Administrative Office: 626-1600

HELP-Line: 626-5592

Access:

CYBER (CA)-	626-1620	Lauderdale Services	626-1838
CYBER (MD)-	626-1622	Magnetic Tape Librarian	626-1838
ENCORE (UX)-	626-1681	Math and Statistics Packages	626-5830
VAX (VX)-	626-1641	Micro Information	626-4276
RJE (2400 baud)	626-1656	Newsletter Subscription	625-7397
RJE (4800 baud)	626-1663	Permanent File Restoration	626-0595
Accounts:		Project Assist	626-1090
CYBER, ENCORE, VAX	625-1511	Public Labs (Managed by ACSS)	
Computer Hours (recorded message)	626-1819	14 Folwell Hall	625-4896
Computing Information Center	625-7397	306B Lind Hall	625-9032
Contract Services	625-2303	130 Physics	625-7850
East Bank I/O, 128B Lind Hall	625-5082	9 Walter Library	626-1899
Engineering Services	627-4177	Publications Information	626-1093
Equipment Maintenance/Repair	627-4357	Remote Batch (RJE) Services	625-7850
Graphics Software	626-5592	Short Course Registration	625-7397
Information, Lauderdale	626-1600	Shuttle Bus Service	625-9525
Lauderdale Computer Room	626-0550	System Status (recorded message)	626-1819

SYSTEM OPERATING HOURS

	CYBER (CA), ENCORE (UX), and VAX (VX)	CA and VX Low Rate	CYBER (MD)
M-F	7 am - 4 am	8 pm - 4 am, 7 am - 8 am	7 am - 1 am
Sat	4 am - 9 pm	all operating hours	7 am - 10 pm
Sun	6 pm - 4 am	all operating hours	6 pm - 1 am

PUBLIC LABS-TWIN CITIES CAMPUS

Location	Batch	Interactive	Micro	Location	Batch	Interactive	Micro
<i>East Bank</i>							
ApH 204			X	TerrH		X	
Arch 148			X	VinH 4		X	
CenH		X		VinH 203			X
ComH		X		WaLib 9		X	X
DiehH 207, 270		X		<i>West Bank</i>			
EddyH Annex 54			X	AndH 170	P		X
EltH 121, 124	P	X		BlegH 140	P	X	
FolH 14, 14a	P	X	X	MdbH		X	
FronH		X		OMWL 2	P	X	
LindH 26		X		<i>St. Paul</i>			
LindH 128B	X	X		BaH		X	
LindH 306B			X	CentLib B50			X
MechE 308		X		ClaOff 125 E	X	X	
MoosT 8-425			X	ClaOff B22			X
Phys 130		X	X				
PioH		X					
SanH		X					

P means Printer only.
For more information see WRITEUP, LABS.

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The ACSS Newsletter
January 1987
Volume 21, Number 1

Acting Director: *Michael M. Skow*
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The *ACSS Newsletter* is published monthly by Academic Computing Services and Systems of the University of Minnesota, Twin Cities. Deadline for articles is the 10th of the month preceding publication; deadline for short announcements is the 15th. The *Newsletter* is produced with an Apple Macintosh Plus running Microsoft Word, MacPaint, MacDraw, and Aldus PageMaker software, with camera-ready copy produced on the Apple LaserWriter Plus.

Direct comments, suggestions, articles, and announcements to the editors at the address below, or call (612) 626-1093. For a free subscription call (612) 625-7397, or send your name and address to the Computing Information Center, 128A Lind Hall. On-campus address changes *must* include your department's name and your *departmental* address.

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**The ACSS
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**Academic
 Computing
 Services and
 Systems**

Technical Publications
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 University of Minnesota
 2520 Broadway Drive
 Lauderdale, Minnesota 55113

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