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# Computing at Lehigh

Lehigh University

# LUCC Computing at Lehigh

Newsletter of the
Lehigh University Computing Center


Volume XVI, Number 1


PostScript Graphics

## Contents



## From the Director

*William R. Harris*

As we begin the new academic year, *Computing at Lehigh* is filled with much information on new services and changes within LUCC. Some of these new services and changes are in response to many informal interactions with you; others are a result of the planning efforts of LUCC and the Computing Center Advisory Committee (CCAC). During the Spring semester LUCC and the CCAC have reviewed and discussed the draft *LUCC Strategic Plan for Computing*. I would like to begin a more extensive dialogue with many of you regarding the strategic plans for computing at Lehigh. In an effort to do this, I am including the summary from the plan in this issue.

*See Director, page 3*

**Lehigh University Computing Center Hardware**
**CDC CYBER 180 Model 850 (32 MBytes Memory, NOS/VE V1.3.1 & NOS V2.6.1)**
**IBM 4381 Model 11 (8 MBytes Memory, VSE/SP V2.1.5)—Administrative**
**IBM 4381 Model 13 (16 MBytes Memory, VM/SP HPO V1.5.0, MUSIC/SP V1.2)—Network Server**
**VAX 8530 (32 MBytes Memory, VMS V4.7)**
**VAX 8300 (28 MBytes Memory, VMS V4.7) -LUCC/ME CAD Lab**

**Computing at Lehigh** est. 1986


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General Editor ---------- Blair R. Bernhardt
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## General Information

*Computing at Lehigh* is a report on computing, published five times a year by the Lehigh University Computing Center. Article contributions are primarily by Computing Center staff, although users are also encouraged to contribute. Instructions for submitting articles can be found at the end of this newsletter.

Subscriptions to *Computing at Lehigh* are free of charge to those in the Lehigh University Computing Center user community and to other interested parties. Those who wish to subscribe to *Computing at Lehigh* or make changes regarding their subscription should return the mailing list form included at the end of this newsletter.

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## Public Site Hours (Academic Schedule)

| | Room Hours | Student Consulting Hours |
|---|---|---|
| **Central Site Users' Area, 180 Fairchild-Martindale** | | |
| Sun | 12:00 noon – 12:00 midn | 12:00 noon – 12:00 midn |
| Mon–Thu | 6:30 am – 12:00 midn | 8:00 am – 12:00 midn |
| Fri | 6:30 am – 10:00 pm | 8:00 am – 5:00 pm |
| Sat | 9:00 am – 8:00 pm | 10:00 am – 8:00 pm |
| **Central Site Microlab, 292 Fairchild-Martindale** | | |
| Sun | 12:00 noon – 12:00 midn | no consulting |
| Mon–Thu | 8:00 am – 12:00 midn | no consulting |
| Fri | 8:00 am – 10:00 pm | no consulting |
| Sat | 9:00 am – 8:00 pm | no consulting |
| **Central Site Special Equipment Room, 182 Fairchild-Martindale** | | |
| Sun | 12:00 noon – 12:00 midn | 12:00 noon – 12:00 midn |
| Mon–Thu | 8:00 am – 12:00 midn | 9:00 am – 12:00 midn |
| Fri | 8:00 am – 5:00 pm | 9:00 am – 5:00 pm |
| Sat | 10:00 am – 8:00 pm | 10:00 am – 8:00 pm |
| **Drown, Room 208** | | |
| Mon–Thu | 8:00 am – 10:00 pm | no consulting |
| Fri | 8:00 am – 6:00 pm | no consulting |
| Sat | 8:00 am – 1:00 pm | no consulting |
| **Mountaintop Campus, B103, D109, D117 Building A** | | |
| Mon–Thu | 6:30 am – 10:30 pm | no consulting |
| Fri | 6:30 am – 5:30 pm | no consulting |
| **Fritz Lab Annex, Room A3** | | |
| Mon–Fri | 8:00 am – 10:00 pm | no consulting |
| **Grace, Room 28** | | |
| Sun | 24 hours | 2:00 pm – 12:00 midn |
| Mon–Thu | 24 hours | 1:00 pm – 12:00 midn |
| Fri–Sat | 24 hours | 1:00 pm – 5:00 pm |
| **Libraries: Fairchild-Martindale, Linderman, & Media Center** | | |
| Sun | 12:00 noon – 12:00 midn | no consulting |
| Mon–Sat | 8:00 am – 12:00 midn | no consulting |
| **Maginnes, Room 491** | | |
| Mon–Fri | 8:00 am – 10:00 pm | no consulting |
| Sat | 9:00 am – 1:00 pm | no consulting |
| **Packard, Room 502** | | |
| Mon–Thu | 8:00 am – 10:00 pm | 1:00 pm – 10:00 pm |
| Fri | 8:00 am – 5:00 pm | 1:00 pm – 5:00 pm |
| Sat | 8:00 am – 1:00 pm | no consulting |
| **Whitaker, Room 257** | | |
| Mon–Thu | 8:00 am – 8:00 pm | 10:00 am – 12:00 noon<br>1:00 pm – 3:00 pm |
| Fri | 8:00 am – 5:00 pm | 10:00 am – 12:00 noon<br>1:00 pm – 3:00 pm |

## Business Hours

**Business Office, 394 Fairchild-Martindale**
Mon–Fri 8:15 am – 12:00 noon
1:00 pm – 4:45 pm

**User Services, 185/194/196 Fairchild-Martindale**
Mon–Fri 8:00 am – 12:00 noon
1:00 pm – 5:00 pm

**Microcomputer Store, 524 Brodhead Ave.**
Mon–Fri 9:00 am – 5:00 pm

**Operations, 171 Fairchild-Martindale**
Mon–Fri 8:00 am – 11:30 am
1:00 pm – 4:30 pm

**Operator Support/Machine Room, 179 Fairchild-Martindale**

| | |
|---|---|
| Sun | 2:00 pm – 10:00 pm |
| Mon–Thu | 8:00 am – 12:00 midn |
| Fri | 8:00 am – 10:00 pm |
| Sat | 9:00 am – 5:00 pm |

## Special Forms Processing Hours

**CYBER 850**
Liquid Ink Plots
Tue,Fri 8:00 am – until done

**Network Server**
Talaris
Daily 3:00 pm – 4:00 pm

**VAX**
/Queue=Talaris
Daily 11:00 am – 1:00 pm (Except Sun.)
6:00 pm – 8:00 pm (Except Sat.)

## Computing Center Directory

**Information About Policies and Plans**
Director
William R. Harris .... (215) 758-3830
Associate Director of Computing Consulting Services
Timothy J. Foley ..... 758-3830
Associate Director of Computing Facilities
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Kevin R. Weiner ..... 758-3991
Microcomputer Store Manager
Robert R. Kendi ..... 758-4606
User Services Manager
Monica A. Newman ..... 758-3990

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Accounting Assistant
Annette L. Ruhe ..... 758-3825

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Frederick W. Chapman ..... 758-3218
William D. Finley ..... 758-3984
Linda S. Orr ..... 758-5152
Richard A. Silvius ..... 758-3985
Kenneth R. van Wyk ..... 758-4988

**Information About Software Availability**
Software Librarian
Judith K. Allio ..... 758-3993

**Systems Status, Technical Information**
On-duty Consultant
..... 758-4141

**General User Information**
Data Processing Assistant
Ann Marie Matusa ..... 758-3990
Accounts Coordinator
Doris A. Oravec ..... 758-3992

**Information About Tapes and Supplies**
Data Processing Tape Librarian
Monica M. Herrera ..... 758-4140

## Consulting Policy

Consultants are provided to assist users in the use of Lehigh University's computer resources. Consultants are not authorized to interpret course assignments, write code, or debug program logic.

When in need of a consultation, users are requested to contact the LUCC student consultants (present at several of the public sites and at ext. 84141), who are hired to augment the full-time staff consultants.

| Computer | On-Campus Phone (300-19.2K Baud) | Off-Campus Phone (300/1200 Baud) | Network Node Name | Network |
|---|---|---|---|---|
| Network Server | (NS) Ext. 46000 | 974-6000 | LEHIGH | BITNET |
| CYBER 850 | (CDC) Ext. 46800 | 974-6800 | LEHICDC1 | BITNET |
| VAX 8530 | (VAX) Ext. 46400 | 974-6400 | VAX1.CC.Lehigh.EDU | Internet |

## *Director, from front cover*

In addition, a draft of the entire LUCC Strategic Plan is available to all on the Network Server. Type **IN CCPLAN** at the main LUNA menu to read the document.

Although a lot of effort has gone into the document to this point, I guarantee that it is incomplete and that it will continue to change. The Plan addresses computing for the next five years and, in many cases, asks questions and recommends further study instead of laying out a complete road map. This planning effort is in response to the comments that our Visiting Committee made last Fall. The Committee noted the lack of a strategic plan for computing at that time and also recommended stressing the importance of computing in the Lehigh Progress and Priorities document. Some of the important issues discussed in the draft LUCC Strategic Plan are now reflected in the current Progress and Priorities document. Please take time to read the plan on the Network Server and give me your comments or questions.

**Summary of**

**Proposed LUCC Strategic Plan for Computing**

**as of August 15, 1988**

The *LUCC Strategic Plan for Computing* outlines the status of the Computing Center and identifies some of the important computing issues at Lehigh. The plan is divided into three major sections: Long-Range Issues (five years and beyond), Medium-Range Issues (two to five years) and Short-Range Issues (zero to two years).

Most of the issues identified will require study, in many cases by ad hoc committees, to set a direction and recommend the level of support necessary. The major issues are:

I. *Planning for a High-Speed Network.* The need for high-speed, computer-to-computer networking has become clear with the numbers of advanced workstations arriving on campus, the growth of departmental local area networks and the desire to share information and resources. In the near term, four lower-campus buildings will be connected using fiber optics; this will be financed with existing funds. Beyond this initial effort, the progress will be very slow, and the Mountaintop Campus may be isolated if a funded plan is not developed.

II. *Workstation Services.* Departments will continue to acquire their own computing resources, primarily advanced workstations. The centralized support issues of hardware and software maintenance, computer and networking standards, consulting services, and networking support will need to be addressed.

III. *Supercomputer Services.* Access to off-campus supercomputer services has been available for almost a year. These off-campus services are becoming overloaded and future Federal funding is not certain. Some of the services have been cut back recently because of reduced financial support. The availability of lower-priced supercomputers and near-supercomputers and the need to plan for the replacement of the CDC CYBER present the possibility of providing on-campus supercomputer services.

IV. *Standards.* Last semester, LUCC supported nine different operating systems on the hardware provided. This diversity uses human resources that could be better used supporting applications software and in direct user support. The elimination of the DEC-20 computer and the planned elimination of the NOS operating system will reduce the number of supported operating systems to seven. Within the next five years the feasibility of Unix being the primary supported operating system must be addressed.

Standards in other computing and networking service areas must be addressed. The Computing Center, and the University in general, cannot support one of everything. This is especially true in network protocols, workstations, microcomputers, and the aforementioned operating systems.

V. *Microcomputer Replacement.* The Summer of 1988 marks the three-year anniversary of the Zenith contract with Lehigh. The majority of the machines being brought on campus are very similar to the original Z158 computers introduced to the campus in 1985. There are more Intel 80286 machines now than in 1985, but the technology is very similar; e.g., the same operating system is being run. Plans must be made for the replacement of the machines acquired in 1985.

VI. *Funding.* The University goals of increased research and graduate enrollment will require additional financial support for computing and networking. New LUCC services and enhanced present services will require additional funding and the reallocation of present resources. Some of the less expensive goals can be accomplished by reallocation, as happened last year. Some of the other services will require capital and on-going support funding. A means of supporting on-going research computing must be identified, possibly through indirect charges of research grants for these services.♦

# Mainframe Computing

## NOS/VE Migration Update

*Sandra L. Johnson*

*As announced in the last issue, LUCC will be phasing out the NOS operating system and migrating users to NOS/VE. Data necessary for establishing the date for the removal of NOS are still being collected; LUCC will announce this date in the next issue of* Computing at Lehigh. *It is LUCC's intention to remove NOS from the CYBER no later than August 1989.*

### Migration Guide Ready

A NOS to NOS/VE migration guide, entitled *Migration Bulletin #1 - NOS to VE*, is available from User Services, 194 Fairchild-Martindale. Topics covered in the bulletin are: moving files, compiling/running programs, converting UPDATE PL's to Source_Code_Utility libraries, and NOS/VE batch processing. Each of these topics is also covered in bulletins under INFO topic VE on the Network Server (see below).

### NOS/VE Bulletin Board on Network Server

A NOS/VE bulletin board is maintained on the Network Server; it can be accessed by typing IN VE at the LUNA main menu. The board contains information pertinent to migrating users. Not only does it address such topics as how to move files from NOS to NOS/VE, but it also includes up-to-date lists of software available under NOS/VE.

All CYBER users are encouraged to use this bulletin board. Comments are welcome, and may be initiated by pressing the F10 key while viewing a bulletin.

### New Migration Aid Available

The command GET_Nos_File_List (GETNFL) has been written by LUCC to aid with migrating files from the NOS operating system. To run GETNFL, type:

```
GETNFL O=filename
```

at the NOS/VE prompt. The file specified by the O parameter will contain a series of "GET_FILE" commands, one for each file stored on the NOS account. The default filename for the O parameter is MIGRATE_FILES. GETNFL takes a little while to run, so be patient.

When GETNFL completes, edit the resulting file and remove lines which contain references to binary files, UPDATE PL's and other files not to be migrated to NOS/VE. Then, to execute the "GET_FILE" commands, type:

```
INCF filename
```

where filename is the GETNFL output file. When the execution is complete, all of the specified files will have been copied to NOS/VE.

*Only run GETNFL once, and only be logged into NOS/VE when you do run it.*

### Recently Installed Software

FLMXPK (a matrix subroutine package) and STARPAC (a nonlinear least squares regression subroutine package) have been installed under the NOS/VE operating system. To access these subroutines, enter:

```
USE FLMXPK
```

or

```
USE STARPAC
```

at the NOS/VE prompt or, in a batch job, prior to executing the program containing the associated subroutine calls.

The newly installed RUN command allows for the simple compilation and running of most programs, including SPSS$^X$ jobs. The name of the file containing the program is to be specified using RUN's INPUT (I) parameter. If the program has never been compiled before, the LANGUAGE_PROCESSOR (LP) parameter may be specified with a value of FORTRAN, PASCAL, C, PROLOG, SPSSX, or CYBIL. If the LANGUAGE_PROCESSOR parameter is omitted, RUN will attempt to determine what compiler is needed; if it cannot, it will prompt for the information. RUN also remembers what parameter values were specified in the previous RUN command, and uses them if "RUN" is typed with no parameters. RUN only remembers the parameter values specified during the current login session. For a complete list of RUN parameters, enter

```
DISCI RUN
```

at the NOS/VE prompt.♦

## Understanding the Virtual Memory Environment

Today's modern operating systems provide virtual memory mechanisms which promote the development and use of applications too large to run in a computer's main (real) memory. Essentially, portions of a program that do not fit in real memory are stored on an auxiliary medium such as high-speed disk and are, upon demand, read into real memory. Thus, the user is freed from complex and time consuming

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"memory management" tasks – at least in theory. In practice, it is useful to have a basic understanding of what virtual memory really is and how it works. This discussion will not be particularly technical, although some patience and thought may be required at times. Also, although the terms used are NOS/VE ones, the concepts can be applied to many virtual memory operating systems.

The following FORTRAN program fragment was excerpted from a real program, one that was having a negative impact on system response time.

```
      program huge
      real twg(600,600), tsg(600,600)
        .
        .
        .

C     Initialize the matrices now.
      do 40 i = 1, 600
      do 40 j = 1, 600
      twg(i,j) = 0.0
40    tsg(i,j) = 0.0
        .
        .
        .
      end
```

The program appears innocuous and should have produced results rather quickly. Actually it ran for over 17 hours and never finished initializing the two arrays TWG and TSG! We'll see why, but first some definitions will be provided:

PAGE An allocatable unit of real memory equal to 4,096 bytes on Lehigh's NOS/VE system. (The page size may be different on other NOS/VE systems or on other operating systems.)

PAGE FAULT A hardware interrupt indicating a reference to a page of memory not in a task's address space. The operating system responds to a page fault by attempting to place the requested page in the task's address space. For the purpose of this discussion, assume that page fault requests are satisfied by reading the page from disk into real memory. (NOS/VE, as well as a few other virtual memory operating systems, employs sophisticated page caching, the details of which are not important for this discussion.)

THRASHING A condition in which too many page faults occur in a system, causing system performance to degrade.

WORKING SET The set of (real) memory pages currently being used by the job. The default maximum working set size on our NOS/VE system is 1,000 pages, or just over four megabytes.

Now, we'll go on to the problem analysis. This program never completed because it was thrashing; that is, it generated many millions of page faults during its 17 hours of execution. It thrashed because its 1,000 page working set was too small to keep the task in real memory. Consequently, the operating system was continually reading the disk in order to satisfy the page fault requests.

There are two general solutions that can be applied in order to eliminate, or at least reduce, thrashing:

1. Increase the working set so that the entire task can fit into real memory. This is usually possible to an extent, but often tasks are larger than the real memory available even on the largest computers. We will see that for the sample program a working set of about 1,550 pages is required to completely eliminate thrashing. Indeed, the program then finishes in mere seconds, using fewer than 2,000 page faults!
2. Improve the task's "locality of reference". This essentially means to make the task run within the constraints of a given working set with little or no thrashing. If we can keep consecutive memory references within the working set, we can reduce paging activity. We will see that, for the sample program, a simple reversal of the TWG and TSG array subscripts improves the locality of reference so that a working set of 1,000 is sufficient to run the program with no thrashing, using fewer than 2,000 page faults. Again, it finishes in mere seconds!

We know that each 600 x 600 array is 360,000 words long, for a total of 720,000 words. Since each CYBER word is eight bytes in length, the total array space in this example is 5,760,000 bytes, or almost six megabytes. (In actuality, this program had even more arrays, for a total of 25 million bytes.)

To understand why the sample program shown above thrashed, you need to be aware of how FORTRAN assigns arrays in real memory. For a two-dimensional array, the first (row) subscript varies more rapidly than the second (column) subscript; i.e., the array is stored in COLUMN order. In other words, the TWG array is assigned 600 consecutive words for column 1, then 600 consecutive words for column 2, and so on for all 600 columns. The array TSG is assigned in a similar fashion, and immediately follows TWG in memory.

The important point to realize is that a column element in the array is separated from the corresponding element in an adjacent column by 600 words, or 4,800 bytes. (That is, TWG(1,1) and TWG(1,2) are 4,800 bytes apart.) Remembering that a NOS/VE page is 4,096 bytes long, we see that for every execution of the innermost DO loop in the sample program, in which a single element of a column of the array is initialized, the array references are in DIFFERENT pages. The locality of reference is poor!

When the array indices I and J are reversed, the matrices are processed in column order instead of row order. TWG(1,1) and TWG(2,1) are only 8 bytes apart, and most often reside in the SAME page of real memory. The locality of reference is excellent.

Now let us examine some numbers in order to more fully appreciate what has been said. Actual log entries follow which show the real time, the CPU execution time, page faults and maximum working set. First, the original sample program

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was executed and allowed to run for about four minutes before a %2 (user break) sequence was entered:

```
17:18:17.346.CI.ftn test "column order, max working set=1000 pages
17:18:18.208.PR.     COMPILING HUGE
17:18:20.488.CI.lgo
17:22:45.262.PR.User break received.
17:22:45.422.PR. Task complete  HUGE
17:22:45.423.PR.    job time =      0.423  monitor time =   14.497
                    page faults =   24331  max working set =  1000
17:22:45.423.PR.    Excess paging at Maximum Working Set limit
                    (a job attribute) caused slowdown  4154 times.
17:22:45.827.PR. --ERROR--  Terminate break received from terminal.
```

Notice that after four minutes, with a maximum working set of 1,000, 24,331 page faults had occurred and the job had thrashed 4,154 times. Also note that 14 seconds of Monitor CPU time had accumulated, indicative of lots of paging activity.

Using the same program with the working set increased to 1,600 pages (about 6.5 megabytes), we see that the program takes just a few real-time seconds to complete, requiring 1,699 page faults and a maximum working set of 1,516. Also, there was no thrashing.

```
17:23:24.645.CI.change_job_attribute maxws=1600 " set max working
set=1600
17:23:27.456.CI.lgo
17:23:33.502.PR.END HUGE
17:23:33.503.PR.     1.485134 CP seconds execution time.
17:23:33.545.PR. Task complete  HUGE
17:23:33.546.PR.    job time =      1.700  monitor time =     0.959
                    page faults =    1699  max working set =   1516
```

These facts show that "repair solution #1" mentioned above is sometimes a viable option. If it is not possible to eliminate thrashing, either because the computer has insufficient memory to provide a large enough working set or because your validation limits disallow it, then the program must be changed to improve its locality of reference. An account must be authorized to use a working set over 1,000 pages.

The log example below shows statistics for the sample program with the array indices I and J reversed. The maximum working set was reset to 1,000 pages and the program was executed:

```
17:24:11.861.CI.edit_file test " change DO loops to process in ROW
order
17:25:38.384.CI.change_job_attribute maxws=1000 " reset max
working set = 1000
17:25:49.331.CI.ftn test " row order, max working set=1000 pages
17:25:50.252.PR.     COMPILING HUGE
17:25:53.745.CI.lgo
17:25:58.812.PR.END HUGE
17:25:58.813.PR.     1.063020 CP seconds execution time.
17:25:58.832.PR. Task complete  HUGE
17:25:58.833.PR.    job time =      1.279  monitor time =     1.221
                    page faults =    1556  max working set =    984
```

Notice that HUGE executed in seconds, with 1,556 page faults and a maximum working set of 984 (just under the thrashing limit).

**Note:** In this example, switching indices has no effect on the meaning of the program. In actual practice, setting up DO loops to process down columns may take a bit more care, especially when modifying existing programs. Not only does this technique improve performance in a virtual memory environment, but is also a requirement for taking full advantage of vector-processing supercomputers. Note that Pascal compilers lay out arrays in ROW order, as opposed to COLUMN order which is used by FORTRAN, COBOL, and C.♦

## Using REDUCE and GNU Emacs on the VAX

*Jerry Rayna*

*Note: Jerry Rayna is a Professor in the Department of Computer Science and Electrical Engineering.*

It is natural to want to use a text editor like GNU Emacs in conjunction with the REDUCE algebra system, because it's much safer to create and correct files containing the complicated expressions with which one wants to work than to type those expressions directly into REDUCE. (Files can be read by the REDUCE "IN" command.) Unfortunately, both REDUCE and GNU Emacs are large programs, and both try to keep their memory images in the system when temporarily exited during a session. Most users don't have VAX authorizations allowing enough temporary storage.

If one has a saved GNU Emacs image, typing "REDUCE" (after having earlier entered "USE REDUCE") will yield an "Exceeded Quota" message; if one has a saved REDUCE image, typing "EMACS" will do the same.

To avoid getting a saved Emacs image, one should leave Emacs with Ctrl-x Ctrl-c instead of Ctrl-z. If one forgets, and now can't run REDUCE, he or she should just type:

```
EMACS -KILL
```

[There will be a "Spawning new Kept Emacs" message, but it isn't true.]

To avoid getting a saved REDUCE image, a user should leave REDUCE with "BYE;" (instead of "QUIT;"). If the user forgets, and now can't run Emacs, he or she should just type:

```
RESET REDUCE
```

Better solutions to this difficulty are currently being investigated. Meanwhile, if one is a frequent user of REDUCE, and the time and expense involved in repeatedly restarting REDUCE from scratch is intolerable, he or she should inquire at User Services about getting the account's authorization limits increased. Specifically, one must fill out LUCC Form #1-C "Computer Authorization Change" and request a VAX Page File Quota of at least 15,000 pages.♦

# Objective C for Suns

*Glenn D. Blank*

*Note: Glenn Blank is a Professor in the Department of Computer Science and Electrical Engineering.*

Object-oriented programming is a new paradigm for building complex software. Instead of manipulating procedures and data structures separately, object-oriented technology binds them together in entities called *objects*.

For example, one can view a *window* as an abstract data type. Associated with each window are its location on a screen, size, the color of its border and its background, heading string, etc. Also associated with windows are procedures for creating it, moving it, scrolling it, shrinking or expanding it, changing its color or heading, etc. In conventional software, windows can be cumbersome because a programmer must learn all the parameters and procedures. It can also be hazardous if too much about the window software may be *visible* to programmers. If one programmer tinkers with it, everyone else may be in trouble; indeed, one can get oneself in trouble. Software modifications can be like throwing a stone in the water — ripples wind up in unexpected places.

A decade ago computer scientists began designing languages that stress *encapsulation* of software into abstract data types. Bind procedures and data structure together tightly, and allow the software designer to limit visibility of the inner workings of the abstract object. (Call them *modules* in Modula, *packages* in Ada, *units* in Turbo Pascal 4.0.) The user of a module need only look at its *interface*, which should have the smallest possible "surface area" — that is, as little detail about local variables, initialization, allocation and deallocation, etc., as possible. Meanwhile, the supplier is free to modify the *implementation*, perhaps to tune its efficiency, so long as the interface is preserved. Software thus becomes increasingly *reusable*. Rather than re-inventing the wheel, others can use my well-designed window package.

Object-oriented programming extends this idea further. There are two key innovations. One is *dynamic binding*. Languages like FORTRAN, Pascal and C require that the data types for all functions and operations be specified at compile time. Static binding can limit flexibility. For example, suppose I want to design a *container* data type, which can hold various objects, such as iconic pens, pencils, paper clips, etc. Static binding forces me to decide what the container can hold before compile time, which means the programmer must anticipate all possibilities. Dynamic binding lets the container (or list, or stack) hold any other object, at run-time. Dynamic binding increases flexibility by permitting the addition of new classes of objects without necessitating modification to the existing code. I can add magic markers to my container without modifying what I know about containers.

The second innovation is *inheritance*. All objects reside in a hierarchy of classes. They can share the characteristics not only of their classes, but also of the classes above them in the hierarchy. Inheritance enables one to create new classes of objects by specifying only the difference(s) between a new class and an existing class. For example, if someone has already developed software for a *collection* object, then it's easy to develop *container* as a special kind of *collection*. My new class of object *inherits* all the code (methods) and local variables from its ancestors in the hierarchy. I can re-use the logic for adding, deleting and sorting items in the collection class. From the granddaddy of all object classes, the *object* class, I can inherit methods for instantiating objects (allocating memory and initializing to zeros), debugging them, writing them to files and reading them back in, etc.

Object-oriented programming has actually been around for a while. Europeans have been using Simula since the 1960's; Smalltalk, whose iconic interface was the inspiration for the Macintosh and Microsoft Windows alike, is becoming more widely available. Objective-C is a superset of the C language. C is an increasingly popular language for systems development, combining high-level control structures with access to low-level machine instructions. One can mix Objective-C and C code. This is translated by the Objective-C pre-processor, which in turn invokes the local C compiler. Adding the layer of object-oriented technology to C encourages quicker development and reusability of efficient software. Indeed, the latest release of Objective-C improves on efficiency by giving the programmer the option to declare objects with *static binding*. Thus, one can bypass even the overhead of dynamic binding, selectively. One still gets to keep all the code associated with that object, plus automatic allocation and deallocation of instances.

The Objective-C compiler and interpreter have been installed on the Suns in the AI lab located at 102 Packard Lab. The interpreter is a tool for software development in Objective-C or C. It features faster turnaround than a compiler, plus debugging tools such as tracing and setting breakpoints, etc., and on-line help and tutorials.

Thanks to LUCC, the Division of Computer Science, and Dr. Hillman, we have a University-wide site license for all Suns. Those interested in installing Objective-C elsewhere on campus should contact Bob Voros at ext. 84508, or Prof. Glenn Blank at ext. 84867.

Notes from a two-day course, *The Concepts of Object-Oriented Programming*, are available from Prof. Blank. Those interested in learning more about object-oriented programming may want to look at Brad Cox's *Object-Oriented Programming*, Addison-Wesley, 1986 (Brad Cox developed Objective-C), or even consider enrolling in Prof. Kay's popular graduate level course.♦

## New NOS/VE Version Installed

NOS/VE Version 1.3.1 has been installed on the CYBER 850. The main feature that users will notice about this version of the operating system is that FORTRAN no longer requires all file input and output to be through $LOCAL. With this version, FORTRAN files are assumed to be in the current working catalog. FORTRAN binary executable files will default to $LOCAL.LGO, but this can be changed when the file is compiled.♦

## DISSPLA and TELL-A-GRAF Available

The graphics packages DISSPLA and TELL-A-GRAF, by Computer Associates, are now available on the LUCC VAX 8530 as well as on the CYBER 850 under NOS/VE. DISSPLA is an extensive library of FORTRAN-callable subroutines, and as such is similar to the TEMPLATE subroutine library available under NOS. TELL-A-GRAF is an interactive graph creation program which provides a built-in English-like language for producing graphs. Most users' graphing requirements will be satisfied by TELL-A-GRAF; users developing their own applications or adding graphics to existing applications will want to use DISSPLA. DISSPLA provides access to the full range of traditional graphics capabilities, including full 3-D support.

In order to use the TELL-A-GRAF package on the VAX, one must first type **USE TAG**, after which TELL-A-GRAF can be invoked during the remainder of the login session by typing **TAG**. The first time TELL-A-GRAF is invoked from a particular directory or catalog, it will prompt the user for information on his/her display terminal and plotting device. Among the information required are the following:

- PRIMARY DEVICE NAME - This refers to the type of graphics terminal being used. Enter "TEK" for any of the Tektronix (or compatible) terminals; the program will then prompt for the Tektronix model number.
- LINE SPEED - Enter "960" for 9600 baud.
- HARDWARE CHARACTERS - If "1" is specified, on-screen graphs will be drawn more quickly; however, "0" will cause the graphs to look nicer.
- SECONDARY DEVICE NAME - This refers to the type of plotter to be used. Most LUCC users will want to enter "CALCOMP", since it will both enable them to produce plots for the CalComp and HP plotters, as well as facilitate graphics terminal previewing via the TEKFILE package. (To send the plot files to a plotter, use the PLOT_FILE (PL) command under NOS/VE or the PLOT command under VMS. Currently, any user sending plot files to one of the central site plotters must have a NOS username.)
- SECONDARY DEVICE MODEL NUMBER - Enter "1" if "CALCOMP" was specified as the secondary device.
- ENTER UNIT NUMBER - Enter "10".
- ENTER CODE - This specifies whether the plotter has a paper advance. Enter "1".
- ENTER OPTION - This specifies the number of pens that the plotter has. Enter "8" for either plotter.
- ENTER HARDWARE CHARACTERS - Enter "0" for more attractive characters.
- PAGE LAYOUT - This determines how TELL-A-GRAF will organize the screen/plotted output. Enter "CRT". Note that this option, and all others, can be overridden later.
- ERROR REPORTING LEVEL - Enter "2" so that all errors and warnings are printed after the plot is made.
- SPECIFY FILES - Simply press the Return key.
- GENERATE LEVEL..ENTER: This is the normal TELL-A-GRAF prompt. Enter a valid command, or "QUIT." to exit. Note that all TELL-A-GRAF commands must be terminated with a period.

Before running a FORTRAN program which makes calls to the DISSPLA library (on either the VAX or the CYBER), a **USE DISSPLA** command must be issued in the login session. In a FORTRAN program which utilizes DISSPLA, it is necessary to specify the correct output device type before making any other DISSPLA calls. Most users will want to send their graphic output to a file suitable for either plotting on the Central Site CalComp 1012 or HP 7586B plotter or for viewing on a terminal via the TEKFILE package. In these cases, the first DISSPLA call should be: **CALL CALCMP(0,0,7)**. Other device types are also available. The VE version currently requires that these FORTRAN programs be executed from $LOCAL; from any catalog, users may simply use the B parameter of the new RUN command as follows: B=$LOCAL.LGO

For more information on TELL-A-GRAF and DISSPLA, refer to the *CA-TELLAGRAF User's Manual* and the *DISSPLA User's Manual*, available at the Central Site Users' Area and on one-day reserve at the Fairchild-Martindale Library.♦

## DATAPLOT Available under NOS/VE

*Sandra L. Johnson*

DATAPLOT is an interactive, high-level graphics package with capabilities in:

- Graphics (continuous or discrete)
- Fitting (linear or non-linear)
- General data analysis
- Mathematics

DATAPLOT was originally developed in 1977 for the National Bureau of Standards (NBS) and has been enhanced several times since. LUCC is running Version 87.1, modified to run under NOS/VE. DATAPLOT is documented in a series of special NBS publications, which have been bound

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together and made available in the Central Site Users' Area.

To execute DATAPLOT, type:

```
DATAPLOT
```

at the NOS/VE prompt. DATAPLOT will display some information and then issue the DATAPLOT prompt ">", which means that DATAPLOT is waiting for input. (To exit from DATAPLOT, type:

```
QUIT
```

at the DATAPLOT prompt.)

For assistance from within DATAPLOT, type:

```
HELP
```

## Identifying the terminal

DATAPLOT needs to know the type of terminal for which to produce graphics. Currently, almost every Tektronix model is supported, and support of Seiko terminals is planned. To identify the terminal (e.g., a Tektronix 4205) to DATAPLOT, type:

```
TERMINAL MODEL TEKTRONIX 4205
```

at the DATAPLOT prompt. Note that any DATAPLOT command may be abbreviated to its first four letters, so the command:

```
TERM MODE TEKT 4010
```

is sufficient to identify a Tektronix 4010 or 4010 emulator (such as Kermit-MS 2.30 or higher).

Note to Kermit users: Kermit does not switch between graphics and text modes as gracefully as do other Tektronix terminals. After producing graphics, press Alt and "–" simultaneously to restore text mode.

## Producing hard copy plots

DATAPLOT can produce plot files suitable for plotting on the Central Site CalComp 1012 or HP 7586B plotter. Basically, there are two ways to generate these plots:

1. If using a graphics terminal or emulator which has already been identified, define a secondary device. Type:

```
DEVICE 2 CALCOMP
```

at the DATAPLOT prompt. For each item plotted on the screen, plotting information will be written to the file $LOCAL.PLOT. Upon termination of DATAPLOT, $LOCAL.PLOT may be routed to the plotter. As a local file, $LOCAL.PLOT will disappear upon logout, so be sure to either plot the file or copy it out of the $LOCAL catalog prior to logging out. Be aware, though, that this file will contain every image that was on the screen after the DEVICE command was issued (whether or not it was a mistake!), unless device 2 is turned off by issuing:

```
DEVICE 2
```

Note that, if the device was turned off and then re-opened using DEVICE 2 CALCOMP, the plot file will be rewound — i.e., the plot(s) already produced will be overwritten.

2. If running DATAPLOT at a non-graphics device, or not interested in viewing the plots as they are produced, type:

```
DEVICE 1 CALCOMP
```

at the DATAPLOT prompt. All of the plots will go to the plot ($LOCAL.PLOT) file.

Upon termination of DATAPLOT, plots can be sent to a plotter using the PLOT_FILE (PL) command.

## Getting the data into DATAPLOT

Data may be entered interactively into DATAPLOT, or DATAPLOT can read the data from a file. To use file input, use a text editor to create a file containing the values to be plotted. As an example, the file PLOTDATA contains the following X-Y pairs:

```
3 6
4 8
5 10
6 12
7 14
```

To provide these to DATAPLOT, use the READ command. Type:

```
READ PLOTDATA. X Y
```

at the DATAPLOT prompt. The period after "PLOTDATA" tells DATAPLOT that it will be reading data from a file. After the file is read, X will have the values 3, 4, 5, 6, 7 and Y will have the values 6, 8, 10, 12, and 14. The number of variables declared should be equal to or less than the number of columns in the data file.

Alternatively, data may be typed directly into the program after the read command is issued. Type:

```
READ X Y
```

at the DATAPLOT prompt and press Return. Then, type in the X-Y pairs, one pair per line:

```
3 6
4 8
5 10
6 12
7 14
END OF DATA
```

When the data have been entered, type END OF DATA in capital letters. This signals DATAPLOT that what will follow will be a DATAPLOT command. As with data files, any number of variables may be declared; just be sure to type in an equal number of columns of data.

## Plotting the data

The simplest X-Y plot can be produced by entering:

```
PLOT X Y
```

at the DATAPLOT prompt. For more sophisticated plots, functions may be defined and then plotted for a range of values. There are two ways to accomplish this, one of which is to plot them directly:

```
PLOT (X**2) FOR X = -10 .1 10
```

(plot X squared for X equal -10 to +10, step .1). Alternatively, the function can be predefined and then plotted for a range of

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values:

```
LET FUNCTION F = X**2
PLOT F FOR X = -10 .1 10
```

Another option is to plot two data sets (or functions) on one graph. Suppose data had been read in for variables X, Y and Z. The following commands:

```
PLOT Y X AND
PLOT Z X
```

will produce a single plot that displays Y versus X and Z versus X. When DATAPLOT encounters an AND at the end of a PLOT command, it expects another PLOT command to follow, and plots multiple functions on one graph. Any number of plot commands may be strung together in this fashion.

### Sprucing up the plot

The following examples demonstrate some of the things that can be done to tailor the plot to one's needs. Once plotting options have been set, they remain in effect for the duration of the DATAPLOT session, unless they have been changed.

```
TITLE X VERSUS X SQUARED
```

Set the title of the graph to "X VERSUS X SQUARED".

```
YLABEL X SQUARED
XLABEL VALUE OF X
```

Set the Y label to "X SQUARED", and the X label to "VALUE OF X".

```
LINE COLORS BLUE RED YELLOW
```

Set the colors of three lines (functions, datasets) to be drawn. In this case, the first line will be blue, the second red, the third yellow. Any additional lines will be in the default color: white, if on a terminal; black, for hardcopies. Color commands are ignored for a device (such as a Tektronix 4010) which does not support color.

```
BACKGROUND COLOR GREEN
```

Set the background of the plot to green.

```
MARGIN COLOR MAGENTA
```

Set the margin around the plot to magenta.

```
GRID ON
```

Specify that a grid is to be drawn on the plot (default is grid off).

```
GRID COLOR CYAN
```

Set the color of grid lines to cyan.

```
FONT TRIPLEX ITALIC
```

Set the font to triplex italic. All characters drawn after this point will be software characters in the specified font. The following fonts are supported: simplex, duplex, triplex, complex, triplex italic, complex italic, complex script, simplex script and tektronix (hardware).

```
TITLE COLOR RED
```

Set the title color to red.

DATAPLOT supports many more features and functions; a complete list can be found in the NBS document *DATAPLOT Command Dictionary*, available at the Central Site.♦

# Micro Computing

## Original HP LaserJet Printers Replaced

LUCC has recently replaced all of its original model HP LaserJet printers with HP LaserJet Series II printers. Now, packages with downloadable fonts (such as EXP) can be used at all LUCC sites.♦

## All Instructor Stations Upgraded

All instructor stations at LUCC sites and LUCC-maintained auditorium systems have been upgraded to 640K to facilitate the use of larger programs. The instructor stations are those which are attached to projection systems.♦

## WordPerfect Upgraded

The WordPerfect Corporation has recently released WordPerfect Version 5. This new version has been described as "evolutionary". The major new features provide for the following:

- Incorporating graphics within a document
- Incorporating tables
- Incorporating text boxes
- Changing fonts within a line, with spacing adjusted accordingly
- Previewing the entire document on the screen
- Creating user-defined Styles
- Specifying a unit of measure (e.g., centimeters, characters) for use in the cursor position indicators at the bottom of the screen

Many printer definitions were added. In addition, there were seven function key changes on the template. Most importantly, Shift-F8 now contains all the formatting functions. Also, Shift-F5 is now "Date/Outline", Shift-F1 is "Setup", Alt-F8 is "Style", Ctrl-F8 is "Font", Shift-F9 is "Merge Codes", and Alt-F9 is "Graphics".

WordPerfect Version 5 is available for use on the LANs (Local Area Networks) at the Central Site Users' Area, 292 Fairchild-Martindale, and 491 Maginnes. WordPerfect disks

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are available for use at the Media Center and the Fairchild-Martindale and Linderman campus libraries.

*WordPerfect* manuals are available for reference at the Central Site Users' Area, 491 Maginnes, the Media Center, and the Fairchild-Martindale and Linderman campus libraries.♦

## Math Text Technical Word Processor Available

A site license for Math Text (also known as MT), a technical word processor from Huff Software, has been purchased by Lehigh University. Under the terms of the license agreement, Lehigh University faculty, staff, and students are free to make copies of the Math Text package for on-campus use only.

Math Text disks, as well as copying instructions, are available at the Central Site Users' Area, the Educational Technology Center, and the Fairchild-Martindale Library. The full Math Text package consists of five disks, entitled: "Program", "Samples", "Spell Check", "Laser Printer Drivers", and "Laser Fonts". Dual floppy users should know that the Program disk contains all they need to edit text and print files on an HP LaserJet Plus or Series II printer (two of several types of printers Math Text supports). The copying instructions include information on how to install Math Text on a hard disk.

Math Text is also available for use at each of the sites where a Local Area Network (LAN) is installed. The *Math Text* manual is available for reference at all LAN sites, and (on one-day reserve) at the Fairchild-Martindale Library. It is also available for purchase at the Microcomputer Store.♦

## WATFILE/Plus Upgraded

WATFILE/Plus has been upgraded to Version 3.5. New features and enhancements in V3.5 are documented in the *WATFILE/Plus Data Manipulation System Tutorial and Reference ADDENDUM* Third Edition booklet available at all LUCC public sites.

A WATFILE/Plus disk is available for copying at the Central Site Users' Area, the Educational Technology Center, the Fairchild-Martindale and Linderman libraries, and the Media Center. Written copying instructions are also available at those locations. WATFILE/Plus is available for use on the Local Area Networks (LANs) at each of the public LAN sites.

Documentation for WATFILE/Plus consists of the following:

- *WATFILE/Plus Data Manipulation System Tutorial and Reference* Third Edition, 1987
- *WATFILE/Plus Data Manipulation System Tutorial and Reference ADDENDUM* Third Edition, 1988
- *WATFILE/Plus Utilities* (1988)

The *WATFILE/Plus Data Manipulation System Tutorial and Reference* manual is not a new edition; major changes to this manual are noted in the *Addendum.* The *WATFILE/Plus Utilities* manual is new; it replaces the *WATCOM Utilities Manual.* WATFILE/Plus documentation is available for reference at all public microcomputer sites, and (on one-day reserve) at the Fairchild-Martindale campus library. It is also available for purchase at the Microcomputer Store.♦

## TwinTerm-05 Available

TwinTerm-05 is now available for use at various LUCC sites, as listed below. TwinTerm is a Tektronix 4105 graphics terminal emulation program for IBM PC compatible microcomputers. It operates with either a CGA (Color Graphics Adaptor), EGA (Enhanced Graphics Adaptor), or VGA (Video Graphics Array). Note that most LUCC-maintained public microcomputers are either CGA- or EGA-equipped.

CYBER and VAX users can use TwinTerm to, among other things, preview plot files via the TK1DRAW command.

TwinTerm-05 disks are available for use at the Central Site circulation window, the Fairchild-Martindale Library, the Educational Technology Center, and the Grace Hall, 502 Packard and 257 Whitaker sites.

TwinTerm-05 documentation consists of the *TwinTerm-05 User's Guide*, available for reference at the locations listed above.♦

## LAN Software Updated

All of LUCC's Local Area Networks (LANs) have been updated from Novell Advanced NetWare 2.0A to Novell SFT NetWare Version 2.1. LAN's are installed at the following public sites: the Central Site Users' Area, 208 Drown, 292 Fairchild-Martindale, 28 Grace, 491 Maginnes, B103 and D109 Mountaintop Campus Bldg. A, 502 Packard, and 257 Whitaker.

With the new version of NetWare, some commands (such as QUEUE) have been replaced, while others (such as NPRINT) have changed. Note, in particular, the following:

| | |
|---|---|
| PCONSOLE (replaces QUEUE) | produce a menu to display, modify, or delete LAN print queue entries |
| NPRINT J=LASER | print a file on the HP LaserJet printer (this is the default) |
| NPRINT J=DOT | print a file on the dot matrix printer. |

For more detailed help on the LAN commands, type HELP at the LAN prompt.

Along with updating Novell, many new software packages were made available. The following products are newly installed on all LUCC LANs:

| | |
|---|---|
| Eureka | Reflex |
| Statgraphics | Turbo Basic |
| Turbo C | Turbo Pascal Version 4 |
| Turbo Pascal Toolboxes: | Numerical Methods |
| | Graphix |
| | Database |
| Turbo Prolog | Turbo Prolog Toolbox |

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In addition, the following new packages are available on the LAN at the specified sites.

| | |
|---|---|
| Quattro | 292 Fairchild-Martindale, 208 Drown, B103 Mountaintop, 491 Maginnes, 502 Packard, 257 Whitaker, Central Site Users' Area |
| R:base SYSTEM V | 292 Fairchild-Martindale, 502 Packard |
| WordPerfect V5 | 292 Fairchild-Martindale, 491 Maginnes, Central Site Users' Area ♦ |

## WATFOR-77 Compiler Upgraded to V3.0

*Frederick W. Chapman*

The most recent release of the WATCOM Group Inc.'s WATFOR-77 is now available for use and copying at public microcomputing sites. This software package includes a FORTRAN 77 compiler (Version 3.0) featuring optional 8087/80287 math coprocessor support, a general purpose text editor (WEDIT, Version 3.5), and a library of FORTRAN-callable graphics subroutines (GKS, Version 1.3). Lehigh University's site license agreement with WATCOM permits Lehigh faculty, staff, and students to make copies of WATFOR-77 for *on-campus use only*.

### WATFOR-77 Availability

LUCC has prepared several different sets of disks containing the new release of WATFOR-77; each set consists of three disks and is designed to run on a specific type of system. There is a set of disks for dual floppy systems *with* a math coprocessor, another set for dual floppy systems *without* a math coprocessor, and a third set for hard disk systems (with or without a math coprocessor). These sets of disks are available for copying at the following locations: the circulation window at the Central Site; the Fairchild-Martindale Library; Linderman Library; the Media Center; and, the Educational Technology Center. *LUCC strongly recommends that the MS-DOS "DISKCOPY" command (found on MS-DOS Disk I) be used to make copies of the WATFOR-77 diskettes.*

The sets of WATFOR-77 disks for dual floppy systems are ready to use "as is;" that is, WATFOR-77 has already been installed (by LUCC). As of the current release, many users of dual floppy systems will need only disk 1 of 3 from the appropriate set. Disk 2 of 3 is required only for programs which produce graphics using GKS. Disk 3 of 3 contains demonstration programs and utilities, and is completely optional.

The situation is rather different for hard disk users, who will need all three disks from the appropriate set. These disks cannot be used "as is;" they must first be installed onto the computer's hard disk. LUCC has prepared on-line installation instructions and a utility program to assist with the installation process; these are included on the set of WATFOR-77 diskettes for hard disk systems. The on-line installation instructions can be accessed by inserting disk 1 of 3 into the A: drive and entering:

```
A:HELP
```

at the DOS prompt.

LUCC has installed the current release of WATFOR-77 at all public LAN sites. See the "LAN Software Upgraded" article in this issue for a list of public LAN sites.

The new release of WATFOR-77 differs in several respects from the previous release and incorporates a number of new features. These changes and new features have two sources; some changes to the software are made by WATCOM, and some changes are local enhancements made by LUCC during the installation and distribution of the product. A description of some of the more important changes follows.

### WATCOM's Changes to WATFOR-77

WATCOM has included a new command-line compiler option, /NOEDIT, which causes the WATFOR-77 compiler to be started in batch mode. (LUCC has configured the compiler so that interactive mode is the default.) The compiler options /NOPRINT and /NOTYPE have been eliminated and a new option, /DISK, has been added. In the current release, the compiler options /DISK, /PRINT, and /TYPE are used to direct a compiler listing to the default disk drive, to the printer, and to the screen, respectively.

WATCOM has significantly reorganized GKS. In order to facilitate faster compile and link times, WATCOM has put the executable portion of GKS in a new memory-resident program, WGKS.EXE; this program must be loaded before running any FORTRAN program which uses GKS. There are no longer two versions of the GKS library file (a development version and a production version); there is now only one version, namely WGKS.LIB. Since GKS has been reimplemented in assembly language, the WATFOR-77 compiler, by default, no longer performs argument type checking on subroutine calls to the GKS library. GKS argument type checking can be turned on or off with a utility called GKSDEBUG, which was written by LUCC and distributed with the current release of WATFOR-77; for further instructions on the use of GKSDEBUG, enter

```
GKSDEBUG ?
```

at the DOS prompt. Other changes to GKS include support for VGA graphics cards and monitors, a new, higher-quality text font, and five new lessons in the GKS tutorial.

The above list of WATCOM's changes to WATFOR-77 is by no means comprehensive. A complete list of the changes made by WATCOM to WATFOR-77 can be found in the brief WATCOM publication entitled "Read Me First", which

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is available for examination in LUCC's Software Library, 185 Fairchild-Martindale. Some of these changes are documented further in the WATCOM publication *Addendum to the WATFOR-77 User's Guide for the IBM PC with DOS*, the availability of which will be discussed later in this article. Note that a complete list of WATCOM's changes to the WATFOR-77 *text editor* can be obtained on-line by entering

```
HELP UPDATES
```

at the WATFOR-77 (interactive mode) command line.

## LUCC Changes to WATFOR-77

Local enhancements made by LUCC to the current release of WATFOR-77 include the following. Entering:

```
HOWTORUN
```

at the DOS prompt will display four help screens containing concise, up-to-date information on WATFOR-77; topics explained (briefly) by HOWTORUN include how to start the WATFOR-77 compiler with or without math coprocessor support, in interactive or in batch mode, and how to load/unload the new memory-resident program WGKS.EXE.

The most significant local enhancement to the current release of WATFOR-77 concerns the addition of seven new alternate function keys (namely, ALT/F4 through ALT/F10; ALT/F1 through ALT/F3 perform the same functions as in the previous release). These new function keys provide aids for debugging both compilation and execution errors, support for printing while in WATFOR-77, and additional on-line help. All ten alternate function keys and the tasks they perform are described in the following table.

| Key | Task Performed |
|---|---|
| ALT/F1 | RUN (i.e., compile, link, and execute) the program in the current editor workspace; do *not* produce a compiler listing. |
| ALT/F2 | RUN the program in the current workspace and produce a compiler listing; direct the compiler listing and unit 6 output to the *screen*. |
| ALT/F3 | RUN the program in the current workspace, directing the compiler listing and unit 6 output to the *current* directory of the default disk drive. |
| ALT/F4 | RUN the program in the current workspace, directing the compiler listing and unit 6 output to the *printer*. |
| ALT/F5 | RUN the program in the current workspace and *locate* the first compilation error. Here, "locate" means to position the cursor *in* the editor workspace *on* the line containing the compilation error while displaying the relevant error message at the bottom of the screen. |
| ALT/F6 | *Locate the next compilation error* in the program in the current workspace, provided that this program has already been compiled using ALT/F5. ALT/F6 may be used repeatedly until all compilation errors have been located -- it is not necessary to recompile in order to find subsequent errors. (Once again, "locate" is used in the sense described above.) |
| ALT/F7 | RUN the program in the current workspace, invoking WATFOR-77's *interactive DEBUGger*. (This is useful for debugging execution errors. See also: ALT/F10.) |
| ALT/F8 | Invoke the GKSDEBUG utility to determine whether argument type checking for the GKS library is currently enabled or disabled. |
| ALT/F9 | *Print* the file in the current workspace. |
| ALT/F10 | Display a help screen which briefly describes the alternate function keys and lists fundamental *DEBUGger commands*. |

## Documentation for WATFOR-77

LUCC is currently preparing some printed documentation on WATFOR-77. "Copying and Installation Instructions for WATFOR-77" explains how to obtain a copy of the latest release of WATFOR-77 and, for the benefit of hard disk users, how to install WATFOR-77 onto a hard disk system. (Recall that only hard disk users will need to install WATFOR-77 themselves.) This document should soon be available (free of charge) wherever WATFOR-77 disks are currently available, as well as from User Services, ext. 83990. "Introduction to WATFOR-77" provides a general introduction to using WATFOR-77, whether on dual floppy systems, hard disk systems, or LANs. This document should soon be available (also free of charge) wherever WATFOR-77 disks are available, at all public LAN sites staffed by LUCC consultants, and from User Services.

Documentation on WATFOR-77 from WATCOM Publications includes the following:

- *WATFOR-77 Language Reference Manual* (1st Edition, 1986)
- *WATFOR-77 User's Guide for the IBM PC with DOS* (3rd Edition, 1986)
- *Addendum to the WATFOR-77 User's Guide for the IBM PC with DOS* (1988)
- *WATCOM Editor User's Guide for the IBM PC with DOS* (4th Edition, 1988)
- *WATCOM GKS Graphics Tutorial and Reference Manual* (3rd Edition, 1987)

Note that only the last three publications are new editions. All of the above publications are available for reference at all public microcomputing sites, are on one-day reserve at the Fairchild-Martindale Library, and can be purchased from the Lehigh University Microcomputer Store.

Veteran users of WATFOR-77 will no doubt be glad to learn that the date checking feature of previous releases of WATFOR-77 has *not* been included in the current release; thus, the latest release will *not* "expire" on some particular date, as has been the case in the past. For news concerning the next release of WATFOR-77, please consult a future issue of *Computing at Lehigh*.♦

# EZPLOT Graphics Subroutine Available for PCs

*Frederick W. Chapman*

EZPLOT is a FORTRAN-callable subroutine which draws simple two-dimensional plots on the screen of a personal computer. As the name suggests, EZPLOT is easy to use — a complete plot can be produced with a single subroutine call. Version 1.0 of EZPLOT titles the plot, labels the axes, and

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automatically scales the data so as to make the best use of available space. Future versions of EZPLOT will also support the graphing of multiple functions on a single plot and the storing of plots on disk as "metafiles."

EZPLOT is intended for use with WATFOR-77 on an IBM-compatible personal computer; EZPLOT is written in WATFOR-77 and uses WATCOM's GKS library of graphics subroutines. EZPLOT V1.0 supports the CGA graphics card and monitor; future versions of EZPLOT will support additional graphics devices, such as EGA and VGA cards/monitors. EZPLOT V1.0 occupies only 28K and thus does not make large demands on disk space, even on a dual floppy system. Although certainly not required, a hard disk is recommended due to speed considerations; a WATFOR-77 program which calls EZPLOT will compile much more quickly on a system with a reasonably fast hard disk.

EZPLOT was written by LUCC and is distributed in source-code form only. Although EZPLOT was designed for WATCOM's PC-implementation of FORTRAN and GKS, with minor modification this code may run under other implementations of FORTRAN and GKS; however, LUCC supports EZPLOT for the WATCOM implementation only.

LUCC distributes EZPLOT with the current release of the WATFOR-77 compiler (V3.0). EZPLOT is included on the WATFOR-77 diskettes prepared for dual floppy systems (with or without a math coprocessor) as well as the diskettes prepared for hard disk systems. EZPLOT has also been installed (along with WATFOR-77) at all public LAN sites. In short, EZPLOT is available wherever the most recent release of WATFOR-77 is available. Refer to the article entitled "WATFOR-77 Compiler Upgraded to V3.0" in this issue of *Computing at Lehigh* for more information on the availability of WATFOR-77.

As long as Version 3.0 of the WATFOR-77 compiler has been properly installed, EZPLOT is ready for use; it is not necessary to "install" EZPLOT, as LUCC has already performed this step. LUCC has configured WATFOR-77 so that EZPLOT behaves like a WATFOR-77 "library subroutine." In other words, to make use of EZPLOT, a program need not contain any more than a subroutine call to EZPLOT; it is not necessary to append the source code for EZPLOT to the main program since WATFOR-77 will *automatically* locate and compile the EZPLOT source code after compiling the main program.

Printed documentation for EZPLOT consists of the *EZPLOT User's Guide*, which is available free of charge from User Services, 194 Fairchild-Martindale. The *EZPLOT User's Guide* is on one-day reserve at the Fairchild-Martindale campus library and is also available for reference at the following public computing sites: the Central Site Users' Area, 28 Grace, 502 Packard, 257 Whitaker, 208 Drown, and the Educational Technology Center.

On-line documentation for EZPLOT consists of several sample FORTRAN programs which use EZPLOT, and a file called READ.ME, which contains directions for running these programs; these files are contained in a subdirectory called LUSAMPLE, which LUCC distributes as part of WATFOR-77. The LUSAMPLE subdirectory is found on disk 2 of 3 from the set of WATFOR-77 diskettes for dual floppy systems (with or without a math coprocessor); on a hard disk system, LUSAMPLE is a subdirectory of the C:\WATFOR directory. Finally, on a LAN workstation, LUSAMPLE may be accessed as a subdirectory of the Y:\LIB\WATFOR directory. Note that the source code for EZPLOT is heavily commented; in particular, the parameters required in a call to EZPLOT are described in the source code. (The parameters are also described – in greater detail – in the *EZPLOT User's Guide*.) The EZPLOT source code is located in the LIB2 directory on disk 2 of the WATFOR-77 diskettes prepared for dual floppy systems; on a hard disk system, the source code is located in the C:\WATFOR\LIB subdirectory. When connected to a LAN, the WATFOR-77 user can find the source code to EZPLOT in the Y:\LIB\WATFOR\LIB subdirectory.♦

# Network Operation

## NetDial V4.3 Available

A new version of NetDial, Version 4.3, is now available. This release can be used to access a mainframe from off-campus, if a Hayes-compatible modem is being used; details for off-campus use appear later in this article.

Included as part of this release is Kermit-MS V2.31, which includes Tektronix graphics terminal emulation. This Tektronix emulation supports color on EGA- and VGA-equipped machines. The TEKFILE plot previewing package on the CYBER and VAX supports this emulation via the MSKDRAW command.

The Library on-line catalog (ASA) appears on the NetDial V4.3 main menu as option 5, formerly the option for LUCC's DEC-20.

In order to have NetDial dial the selected system from off-campus, do either of the following if using a Hayes-compatible modem at 1200 baud on a touch-tone line:

- type **HDIAL** (instead of NETDIAL) at the DOS prompt;

or,

- type **SET NET=HAYES** at the DOS prompt and then type **NETDIAL**.

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NetDial V4.3 supports other baud rates as well as a pulse dialing line. The "HAYES" may be suffixed with an optional baud rate as well as an optional "P" for pulse dialing — for example, **SET NET=HAYESP** (1200 baud, pulse dialing), **SET NET=HAYES300P, SET NET=HAYES 300 P.** In order to use NetDial V4.3 from off-campus by typing "HDIAL", edit the HDIAL.BAT file and change the SET NET=HAYES command as appropriate if not communicating at 1200 baud on a touch-tone line.

Another NetDial V4.3 feature available to Hayes-compatible modem users is the ability to add a user-defined prefix to all phone numbers dialed. This option can be used to temporarily disable Call Waiting and/or to automate the dialing of the mainframes from outside the local calling range. To set a prefix, type (at the DOS prompt):

```
SET PREFIX=any prefix you want
```

For example, Call Waiting users may wish to type:

```
SET PREFIX=*70      (on touch-tone lines)
SET PREFIX=1170     (on pulse dialing lines)
```

The above examples disable Call Waiting for the duration of the current phone call, thus reducing the possibility of having the modem hang up the phone due to an incoming call.

Users outside of the local calling range to Lehigh may wish to type:

```
SET PREFIX=1     (long distance within 215 area code)
SET PREFIX=1215  (long distance outside 215 area code)
```

Note that the prefix option will cause all phone numbers that NetDial dials to be prefixed by the specified string.

NetDial V4.3 is available for downloading from the Network Server. To go about acquiring NetDial in this manner, enter IN COMM at the LUNA main menu. With the cursor at the NetDial V4.3 message, press the Return key; detailed instructions will appear on the screen.

The new version of NetDial is also available for copying at LUCC's Central and remote sites, as well as at the Fairchild-Martindale and Linderman campus libraries and the Media Center. At the libraries and the Media Center, obtain a NetDial master disk, a MS-DOS Disk I, and the instructions for copying NetDial. At LUCC's Central and remote sites, do the following: log in to the Local Area Network (LAN); then, insert a bootable but otherwise blank diskette in drive A and enter, at the A prompt:

```
UPDATE -R
```

The copying instructions, available at most locations, include directions for installing NetDial onto a hard disk.

Those NetDial users who had changed their PCWS screen colors may want to record the current setting numbers before updating to V4.3, so that they can easily reset the colors. The PCWS setup menus are accessed by pressing Alt-S.♦

## LAN Installed at Central Site Users' Area

A Local Area Network (LAN) has been installed at the Central Site Users' Area, located at 180 E. W. Fairchild-Martindale Library and Computing Center.

This LAN has access to a 132 column wide Star SR-15 printer, an HP LaserJet Series II printer, and an HP LaserJet Plus printer. Among the many software packages to be available on this LAN are WordPerfect Version 5, WordStar, Turbo Pascal Version 4, Turbo Basic, Quattro, WATFOR-77, EXP, and NetDial.♦

# General Interest

## LUCC/ME CAD Lab

Effective July 1, 1988 LUCC assumed responsibility for the operations of the ME/MECH CAD Lab. LUCC has been working closely with CAD Lab Director, John Ochs, to integrate procedures and to plan future services and service levels. Faculty members who would like to have input to this activity are encouraged to speak with John Ochs, Carol Lidie, or Bill Harris. More information pertaining to the LUCC/ME CAD Lab will be forthcoming as developments occur.♦

## LUCC User Survey Results

*Blair R. Bernhardt*

*Note: This is the second of a two-part series on the results of LUCC's User Survey, administered December 1987.*

### Computing at Lehigh

*Computing at Lehigh* was rated as useful by 50.7% of the people responding to this survey; another 38.9% of the respondents were neutral to it. The faculty respondents had the largest percentage (62.1%) of those agreeing *Computing at*

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*Lehigh* is useful while the undergraduates had the lowest (38.7%). However, of undergraduates (45.4%) were neutral to *Computing at Lehigh* which may imply that most seldom receive it and they don't read it on-line on the Network Server.

Other than for about half (46.1%) of the support staff and 40.6% of the undergraduates in the Business college, most people disagree or are neutral to the statement that *Computing at Lehigh* is too technical. On the other hand, very few people believe that it should be more technical, with the exception of 23.5% of the Engineering college faculty and student respondents. Most people (93.4%) either feel that topics covered are relevant or are neutral to the idea. About a third (35.6%) of those responding would like to see *Computing at Lehigh* published more frequently, with 39.7% of undergraduates, 39.9% of graduate students, and 29.1% of faculty respondents agreeing. Finally, almost half (47.1%) of all people responding believe that *Computing at Lehigh* should contain more introductory articles.

## LUCC Documentation

Most respondents either agreed that LUCC documentation is useful (45.8%), or they were neutral to it (45.8%). The largest group of people who were somewhat neutral to the documentation were students in the Business college. There, only 28.1% of the undergraduates and 27.3% of the graduate students rated it as useful. On the other hand, 60.2% of faculty members feel that LUCC documentation is useful, while only 7.8% disagree.

Students in the Business college differ markedly from those in the Engineering college and the Arts & Sciences college in that they give seminars a higher priority than documentation. As a group, faculty members give documentation a much higher priority than seminars. Over half of the professional and support staffs agree that documentation should be given a high priority.

While most people either disagree or are neutral to the statement that LUCC documentation is too technical, about a quarter (27.7%) of the support staff, 15.6% of the undergraduates in the Business college, and 16.7% of the undergraduates in the Arts & Sciences college agreed with the statement. On the other hand, very few people believe that it should be more technical, with the exception of about a quarter (23.5%) of the Engineering college faculty and students.

The one area of concern with LUCC documentation is that of clarity. While 28.6% of all respondents agreed with the statement that LUCC documentation is clearly written, and 55.6% were neutral to the statement, 15.8% disagreed with the statement. The largest percentage of people disagreeing with the statement were in the Engineering college (17.1%) where 20.7% of the graduate students and 18.2% of the faculty disagreed. Overall, 19.4% of faculty members disagreed with the statement that LUCC documentation is clearly written.

## Computing Center Services

All Computing Center services, with the exception of graphics terminals and plotting, were rated as good to excellent by at least 30% of all users, with most of the remaining users being neutral to the service. These services included site operating hours, applications software, languages, operating systems, computing power, and laser printing. The people who were most inclined to say that graphics terminals and plotting were unacceptable were undergraduates in the colleges of Engineering and Business, but, overall, 73.7% of all respondents were neutral to these two services.

## LUCC Microcomputer Store Services

As stated in the last issue, a large percentage of those responding stated that they disagreed with the statement that the LUCC Microcomputer Store was a good place to go for help with a computing question, possibly due to the fact that the Store staff are instructed to direct any questions they cannot answer to User Services. All other Microcomputer store services were rated as good to excellent by at least a quarter of those responding, with most others being neutral to the service in question. These services included: before and after the sale services, hardware maintenance, product offerings, and pricing. No statistics were taken, but it could very well be the case that most people responding had never used most Microcomputer Store services so were neutral to them.

## Preferred Operating Systems

The operating systems people prefer are very much a function of the operating systems they currently use, or think they should use. MS-DOS was the operating system 63.7% of those responding said was one of their preferred systems, with MUSIC coming in second (39.6%). However, while MS-DOS was preferred by a large cross section of those responding, MUSIC's appeal was mostly to undergraduates and support staff. VM/CMS and VMS, operating systems which run on IBM and DEC computers, had their biggest appeal with graduate students who may use these systems where they work.

One of the more interesting findings with regard to mainframe operating systems was with NOS/VE for the CYBER. This operating system had only been available for a limited time when this survey was taken, and, since documentation for it had just been completed, NOS/VE hadn't been promoted much by the Computing Center at that time. However, over 30% of graduate students and faculty members in the Engineering college (the people most likely to have tried NOS/VE), rank it as one of their preferred operating systems, ahead of the operating system it will eventually replace, NOS. The Engineering faculty even ranked NOS/VE ahead of UNIX.

VMS, which was also new to the Computing Center and had not been promoted much, was a preferred operating system of 40.5% of all responding graduate students. It was also preferred by 34.1% of faculty members in the Engineering

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college. This isn't very surprising as DEC VAX computers are heavily used in engineering and industry. Even on campus, there have been a number of VMS installations for some time now, so it is not as if this is a new operating system to Lehigh. However, only 21.1% of the remaining faculty members and 21.1% of all undergraduates had VMS as one of their preferred operating systems.

UNIX, which for years has been touted as the operating system which will become a standard, was only a preferred operating system of 20.5% of all respondents. UNIX was also preferred more by students than by faculty members. 27.9% of all responding graduate students and 27.3% of faculty members in the Engineering college had UNIX as a preferred operating system while only 22.2% of undergraduates and 14.0% of the remaining faculty members agreed.

Microcomputer operating systems were also rather mixed, with the exception of MS-DOS (which the vast majority preferred). Over a quarter of all undergraduates stated that IBM OS/2 was one of their preferred operating systems. This had to be based strictly on expectation as OS/2 had not been released when this survey was taken.

While 28.9% of the graduate students and faculty in the Education college agreed that the Macintosh operating system was one of their preferred operating systems, overall more faculty members and undergraduate students disagreed that the Macintosh operating system was preferred. The largest percentage of people to disagree were 25.0% of the faculty members in the Engineering college.

### Communications

On-campus communications received passing marks from just about everyone. Most people either agreed or were neutral to the statement that data connections are usually achieved the first try, and the vast majority agreed that 9600 baud is an adequate transmission speed.

Off-campus communications were less well received. Over 69% of all people responding to these questions answered with a neutral response which may mean that they don't communicate with LUCC systems from off campus. Gaining access to the campus computers from off campus may be a bit of a problem. While 18.2% of all people responding agreed that they could get through on the first try, 12.2% disagreed. The speed at which they are communicating also meets with dissatisfaction. While 10.5% of those responding agreed that 1200 baud was sufficient, almost twice that amount (20.2%) disagreed.♦

## LUCC User Guides and Technical Bulletins

As User Services makes a concerted effort to keep its documentation up-to-date, the following list has been provided to inform users of the most recent updates to these documents. All of the following technical bulletins may be obtained at User Services, 194 Fairchild-Martindale, as well as at the Central Site consultant's desk; those preceded with an asterisk are also currently available on the Network Server.

* #1 *NOS Implementation Notes* (Rev 8/88)

* #2 *FTN4 to FTN5 Conversion* (Rev 7/88)

* #3 *Introduction to Kermit* (Rev 7/88)
(This publication describes how to do file transfers. The *Kermit User Guide* (Rev 5/88) and the *Kermit Protocol Manual* (Rev 6/86), compiled from documentation files provided by Columbia University, provide in-depth information about Kermit. Both publications may be purchased at the Lehigh University Bookstore.)

* #4 *User's Mini-Guide for UPDATE* (Rev 10/85)

#5 *Accessing & Logging in to LUCC's Mainframes* (Rev 8/88)

#7 *SPSS$^X$ and NOS/VE Files* (Rev 8/88)

* #8 *Intro to GNU Emacs* (Written 5/88)

* #10 *Example Sort/Merge Job* (Rev 12/85)

* #11 *Using UEM on the CYBER* (Original)

* #12 *Account Requestor's Guide* (Rev 6/88)

#13 *Getting Started with DATAPLOT under VE* (Written 8/88 - included in this issue)

#16 *Guidelines for Preparing a Thesis/Dissertation using Scribe on the VAX* (Written 8/88)

* #17 *Running TEMPLATE on the CYBER* (Rev 2/86)

* #18 *Full Screen Support for NOS on the CYBER 850* (Rev 8/88)

* #19 *Using the Polaroid Palette* (Rev 1/86)

* #20 *InteCom Data Communications* (Rev 6/88)

* #21 *Using the Network Server* (Rev 6/88)

* #22 *FSTAL - Freestyle to QMS Laser Print File Conversion* (Rev 1/88)

* #23 *Accessing the Network Server from Off-Campus* (Rev 8/88)

In order to access a technical bulletin on the Network Server, begin by typing **IN TECHBULL** at the main LUNA menu. Tab to the technical bulletin that is desired and press the Return key; the bulletin will be displayed. In order to file and then print the document, do the following. With the bulletin displayed, press F5; this will cause a copy of the technical bulletin to be stored as a file called TBn.INFO (where "n" is the number of the requested bulletin). To print this file, begin by entering **FI P TBn.INFO** at the main LUNA menu.

LUCC has written user's guides for its Network Server, CYBER 850, and VAX 8530; these guides are available for

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purchase at the Lehigh University Bookstore, as well as available for reference at the Central Site Users' Area, the Drown, Grace, and Packard sites, and (on one-day reserve) at the Fairchild-Martindale Library. The guides are listed below:

*Network Server User's Guide* (Rev 8/88)

*NOS User's Guide for the CYBER 850* (Rev 1/88)

*NOS/VE User's Guide* (Rev 8/88)

*VAX/VMS User's Guide* (Written 8/88)

A *Bitnet User's Guide* (Rev 8/88) is available free-of-charge from User Services. This guide is also on the Network Server for viewing, filing, and printing; enter **IN BITUSE** at the main LUNA menu.♦

# Consultant's Corner

## Q and A

**Question:** Quattro (as well as other software packages) has the ability to create files in PostScript format. Without having direct access to a PostScript printer, how may I get a PostScript file printed?

**Answer:** Any PostScript file may be uploaded to either the Network Server, the VAX, or the CYBER (under NOS/VE) for printing on the PrintServer 40 PostScript laser printer at the Central Site.

To upload and print a PostScript file from the Network Server, first log in to the Network Server using PCWS (which is the program which NetDial uses to communicate with the Network Server). At the main LUNA menu, type **UP** and press the Return key to enter the Upload screen. Enter the name of the file to be uploaded, and type a "Y" in the last field to specify that the file is binary. Press the Return key to upload the file. Once the upload has completed, hold down the Alt key and press "M" to go back to the main LUNA menu. At this menu, type **FI P** to get to the print screen. Enter the name of the file to print, press the Tab key, and enter POST at the "Printer:" field. Press the Return key. A printer options screen will then be presented, where one may simply press the Return key to send the entire file to the PrintServer 40 printer.

The procedure to upload and print a file from either the VAX or the CYBER is similar. First, log in to either of these machines using Kermit (which is the program which NetDial utilizes for these machines). Then, start up Kermit on the mainframe by typing **KERMIT** at the system prompt. On the VAX, type **SET FILE BINARY** at the Kermit prompt. Type **SERVER** to place the mainframe version of Kermit into "Server" mode. Return to the microcomputer Kermit prompt. (How this is done depends on the type of microcomputer being used. On IBM PC compatibles, hold down the Ctrl key and press "]", release both keys, and type a "C".) At the microcomputer Kermit prompt, enter **SEND filename** (where "filename" is the name of the file to be uploaded to the mainframe). **Note:** NOS/VE cannot accept file names which contain a period. If the file name on the microcomputer contains a period, it must be renamed for NOS/VE by issuing the SEND command as **SEND pcfile.ext nosvefile** (where "pcfile.ext" is the microcomputer file name, and "nosvefile" is the name the file is to have under NOS/VE).

Once the file has been uploaded, type an "F" (for **FINISH**) and press Return so that the mainframe version of Kermit will get out of server mode. Type a "C" (for **CONNECT**) and press Return to get back to the mainframe Kermit prompt. Type **QUIT** to exit the mainframe version of Kermit. To print the uploaded PostScript file from the VAX, enter:

```
PRINT filename /QUEUE=POST
```

To print the file from the CYBER, enter:

```
PRINT filename QUEUE=POST
```

or

```
PRINT filename POST
```

**Question:** While editing an EXP document, I created a table with a few columns using tabs. The table is correct on the screen, but when it prints the columns overlap. What is wrong?

**Answer:** With the older version (V1.10) of EXP, the rule is "what you see is what you get." In other words, the way the text appears on the screen is how it will be printed. With the new release of EXP (V1.11), the printer fonts have been made larger but the video fonts have remained the same. So, what is seen on the screen will actually be printed in slightly larger-sized text. The solution to the problem of overlapping columns is to leave extra space on the screen.

**Question:** While editing a document in EXP (which was configured for my dot matrix printer), special care was taken to have the page breaks and certain sentences specifically situated. But, when this document was printed on a laser printer at a LANned site, nothing lined up correctly. Why is the printout messed up?

**Answer:** Any document produced with a copy of EXP that is set up for a dot matrix printer and printed with a copy of EXP set up for a LaserJet printer will probably have page breaks and sentence breaks at unexpected locations. The document should be edited with a copy of EXP configured for the type of printer to be used for the final printout.♦

# CCAC Highlights

*Effective with this issue of Computing at Lehigh, we are reinstating our reporting of the Computing Center Advisory Committee (CCAC) meeting minutes. The CCAC charter has been amended to require that CCAC meeting "highlights" be reported here, and that the full minutes be available on the Network Server. To access the minutes on the Network Server, type* **IN CCAC** *at the main LUNA menu.*

## Computing Center Advisory Committee Minutes: April 27, 1988

Members Present: J.G. Lutz, C.N. Kostem, R.A. Gruver, T.J. Foley, R.R. Kendi, C.S. Kraihanzel, E.J. Kay, C.A. Bracy, M.A. Newman, K.R. Weiner, W.R. Harris, V.G. Munley

Regarding the Computing Center's proposed 1988-89 Yearly Operating Schedule, the CCAC approved two items. The first of these is that there be no operator support in the Machine Room at the Central Site on Labor Day. *(LUCC has since decided to open the Drown, Maginnes, Packard and Whitaker sites.)* The Committee stated, however, that the Central Site Users' Area, as well as the Grace site, must be open on that day. The Committee also approved there being no operator support December 23rd through December 26th.

Most of the remainder of the meeting was spent discussing the *LUCC Strategic Plan for Computing*, which had been distributed at the previous meeting.

## Computing Center Advisory Committee Minutes: May 11, 1988

Members present: C. Bracy, T.J. Foley, B.D. Fritchman, R.A. Gruver, S.L. Gulden, J.E. Hansz, J. Hall, R.C. Herrenkohl, E.J. Kay, R.R. Kendi, C.N. Kostem, C.S. Kraihanzel, J.G. Lutz, R.J. O'Connor, C.D. Rauch, S.K. Tarby, K.R. Weiner

The Committee discussed the two complaints that the Computing Center had received about a faculty member using the Network Server to administer a final exam. The complainants stated that the Network Server was not an appropriate place for this kind of activity. The Committee as a whole felt that innovative methods of using the Network Server should not be discouraged, but thought that better scheduling options should be pursued (such as scheduling the exam over a weekend).

The Committee was asked to discuss requests for the acquisition of Macintoshes for the Central Site and Mountaintop B103 site. It was noted that LUCC had received 18 non-software comments requesting more Macintoshes at the Central Site. A straw poll was taken, during which the CCAC voted 9-1 in favor of obtaining a few more Macintosh microcomputers.

The Committee discussed the Mathematical Software Subcommittee (MSS) recommendation that the CCAC take action on a resolution to make departmental computing facilities easily accessible to faculty, staff, and students at Lehigh. This resolution was prompted by a request by T. Delph of the ME department for MACSYMA on LUCC's VAX. MACSYMA is currently on the ME VAX, but was not easily accessible to T. Delph's graduate students. J.G. Lutz suggested that this type of resolution was not appropriate for the CCAC and that it should probably be passed on to the ACPC (Academic Computing Policy Committee). B. Fritchman pointed out that this particular problem might be resolved since LUCC was going to be taking over the management of the ME VAX this summer. He also pointed out that the sensitive issue with regards to LUCC management was "control vs. support". E. Kay pointed out that support without control might be irresponsible. B. Fritchman stated that LUCC management of the ME VAX was a first step to determine if these issues can be resolved.

The CCAC approved all of the requests for software that the Software Subcommittee had recommended for approval. *(A list of the requests, and the action taken on each, can be found in the full minutes on the Network Server.)*

The Committee discussed a memorandum which had been distributed to them electronically. The memorandum was for B. Fritchman and addressed the issue of the continued proliferation of computing systems (acquired by departments) which the Computing Center was being asked to support.

J.G. Lutz was elected chairperson for another year. He pointed out that the terms of the following members had expired: C. Bracy, S. Gulden, R. Herrenkohl, C. Kostem, V. Munley, and K. Tarby.

Having had some ADIs stolen from his center, R. Herrenkohl suggested that ADIs be numbered by Telecommunications so that they could be identified if found somewhere else on campus. B. Fritchman indicated that he would look into the possibility of having the ADIs numbered. ♦

## Staff Changes

Much to the dismay of the current editor of this publication, the previous editor, Joel W. Robertson, left his position as a User Consultant in User Services. LUCC bids Joel a very warm farewell.

William D. Finley and Richard A. Silvius have joined the Computing Center as User Consultants. Bill came to User Services from Allentown College, where he had been teaching mathematics, statistics, and programming in the Department of Mathematics and Computer Science for about five years. Bill holds a M.S. in Mathematics from Lehigh and a B.S. in Mathematics/Biology from Grove City College.

Rich came to User Services from the NADC (Naval Air Development Center) in Warminster, where he had worked for three years. Prior to that time, Rich had taught senior high school mathematics for several years. Rich holds a M.Ed. (Mathematics) and a B.S. in Secondary Education (Mathematics) from Kutztown State College, as well as a B.S. in Computer Science from East Stroudsburg University.

With the incorporation of the ME CAD Lab into LUCC, the manager of the lab, Fred J. Wehden, becomes an LUCC staff member. Kathy D. Katcher, who came to LUCC from Knoll International, replaces Tami L. Fainor as the ME/LUCC CAD Lab secretary/assistant.

Effective July 1, Carol D. (Rauch) Lidie has been promoted to the position of Associate Director of Computing Facilities.♦

## *Computing at Lehigh* Contribution Information

*Computing at Lehigh* encourages contributions for articles and *Consultant's Corner*.

We prefer that contributions either be submitted electronically via the Network Server to user `BRBO`, or be provided on a MS-DOS formatted 5.25 inch or 3.5 inch floppy disk. Contributions sent via the Network Server must be in ASCII format (i.e., be plain text). Acceptable MS-DOS document formats are:

- ASCII (not word-processed)
- EXP
- Freestyle
- WordStar
- WordPerfect

Printed copy is welcomed, but please also accompany the printed copy with the text in one of the above formats (especially for articles and other long contributions). All mailed contributions (whether on diskette or printed) should be sent to the following address:

Editor, *Computing at Lehigh*
194 Fairchild-Martindale #8b
Computing Center
Lehigh University
Bethlehem, PA 18015

Articles by users are included at the Computing Center's discretion. The Computing Center reserves the right to edit all contributions.

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