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Systems Update

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ENCORE UX

In September we upgraded the UNIX system software from a 4.2 to a 4.3-compatible version. This software release had been promised for many months and, while it is a significant step forward in some ways, there are continuing problems. The most significant problem is a slower operating system that means greater system time charges for users.

Last summer ACS requested proposals from UNIX vendors for a system that would handle 256 simultaneous users, have good response time, and have a large set of required software. We did not find any vendor, including ENCORE, that could totally satisfy the software request. We could only get 170 logins going on the ENCORE 320 before it quit processing.

After benchmarking a number of other UNIX systems, the best interim solution was to upgrade the current system and wait until next year. The interim solution to the current login jam was more memory, and on October 15 we doubled the ENCORE's memory from 64 to 128 megabytes. A week later the processor boards were changed from APC processor cards to XPC cards, making the system an ENCORE 520. We also added an additional 2 gigabytes of disk storage.

Table 1 on page 24 gives the ENCORE system specifications for upgrades we've made since the ENCORE was installed in October 1986. In the ENCORE design, each processor board has two processor chips with floating point co-processors using a common data cache to communicate with other processors, with I/O, and with the memory boards of the system.

For certain vendors, such as Digital, their relative performance can be accurately used in setting rates for our users. On the ENCORE, National Semiconductor chips are packaged with an ENCORE cache and backplane, which requires ACS to test the total package to determine actual performance ratios. ACS runs a series of benchmark programs before setting a charge rate.

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Help Page

ACS HELP-LINES

Central Systems (UX,VX,NV,CA):

626-5592 8 am to 5 pm, weekdays

Artificial Intelligence:

625-8332 3 to 4 pm, weekdays

Data Base:

626-1887 10 to 11 am, weekdays

Liberal Arts, Text Analysis:

625-8332 3 to 4 pm, weekdays

Statistics:

626-1887 1 to 3 pm, weekdays

Other HELP-LINES

LUMINA (communications questions):

626-2272 8 am to 5 pm, weekdays

Microcomputer and Workstation Networks Center:

626-4276 9 am to 4 pm, weekdays

CONSULTING

Walk-In

ACS, East Bank:

128C Lind Hall 10 am to 4 pm,
Monday through Friday

Microcomputer and Workstation Networks Center:

125 Shepherd Lab 9 am to 4 pm,
Monday through Friday

Electronic Mail Consulting

Consulting is now available via the mail facility on all ACS systems (the UX, VX, NV, and CA). Send mail to user name CONSULT for questions after hours and for low-priority questions that are not critical to your immediate computing work. Replies will be sent to your account through the mail facility on your system.

Instructional Computing Consultant

Department instructors may call 626-0200 for assistance in choosing ACS systems (ENCORE/UNIX, VAX/VMS, CYBER/VE, CYBER/NOS), software, and for answers to any other inquiries on using computers for instructional computing.

COMPUTING INFORMATION CENTER

128A Lind Hall, 625-7397, MAD@UMNACVX, MAD@VX.ACS.UMN.EDU
8 am to noon and 1:00 to 4:30 pm, Monday through Friday

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

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

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

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

Free ACS documentation. General information and central system information available.

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

acs

Academic Computing Services

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MAD@VX.ACS.UMN.EDU. On-campus address changes *must* include your department name and address.

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Systems

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Two sets are used: one with integer arithmetic, C compilations, and system calls; and the second floating point intensive with matrix, integration, and elementary function calculations. We can obtain actual speed comparison ratios from root mean values (various articles have shown these should be used as the comparison values rather than averages). CPU measurements for UNIX systems are the real time actually used, the time in user state and that in system state. ACS uses these measurements to set rates.

1987 we calculated the ratios shown in Table 2 to learn how much faster the new APC boards were compared to the previous DPC ones. Since all were close to two times

faster, we changed our rate per second (the SBU charge) from 1 cent per CPU second to 2 cents.

In 1989 we calculated the ratios shown in Table 3 to learn how much faster the new XPC boards were compared to the previous APC ones. These measurements included the change from the 4.2 to the 4.3 operating system which gave significantly slower ratios for system time. We changed the rate from 2 cents per CPU second to 4 cents, assuming most jobs would be at least a two times faster. Floating point intensive jobs will run four times faster and thus the cost of running the identical floating point job today should be half that of the same run last September.

Table 1: ENCORE Processor and Memory Upgrades at ACS

<u>Date</u>	<u>System Number</u>	<u>Processor Boards</u>	<u>NS Chip</u>	<u>Nominal Integer MIPS/Chip</u>	<u>Faster by</u>	<u>Megabytes of Memory</u>
October 1986	ENCORE 120	4 DPC	NS 32032	0.75		16M
October 1987	ENCORE 320	3 APC	NS 32332	2.00	2.67 times	64M
October 1989	ENCORE 520	3 XPC	NS 32532	8.50	4.25 times	128M

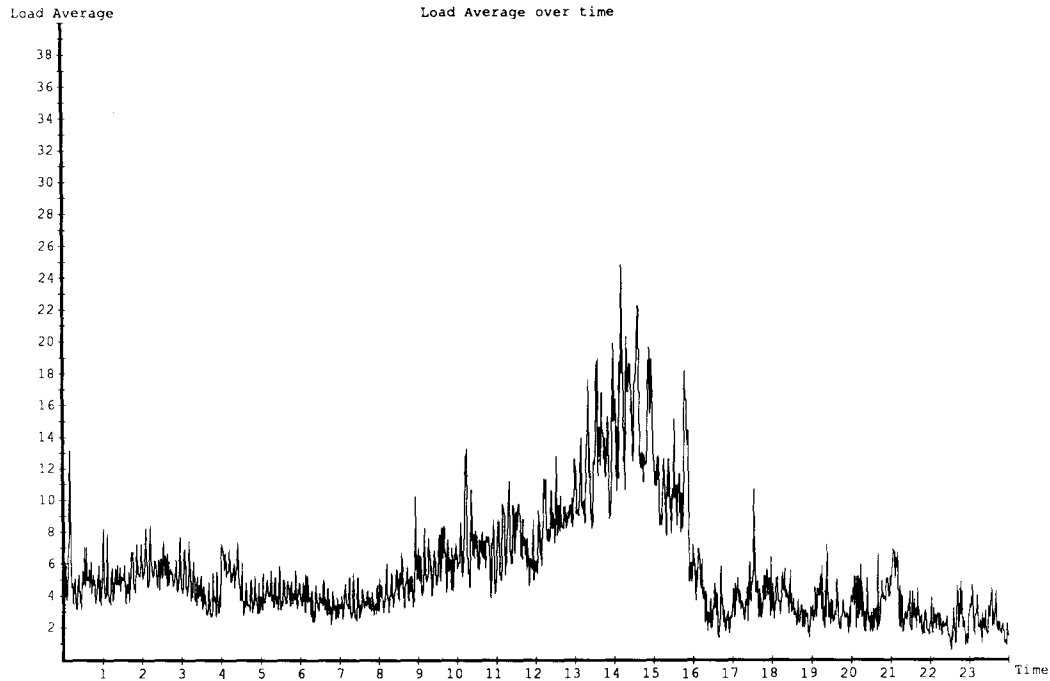
Table 2: Comparative Speed of APC to DPC Processor Boards

<u>1987 upgrade</u>	<u>Real Time DPC/APC</u>	<u>User Time DPC/APC</u>	<u>System Time DPC/APC</u>
Non-FP&System	1.91	2.22	1.92
Floating Point	2.05	2.05	1.91

Table 3: Comparative Speeds of XPC to APC Processor Boards

<u>1989 upgrade</u>	<u>APC/XPC</u>	<u>APC/XPC</u>	<u>APC/XPC</u>
Non-FP&System	1.42	2.03	1.01
Floating Point	3.95	4.01	3.75

Graphs 1 and 2: UX System Use on October 11, 1989

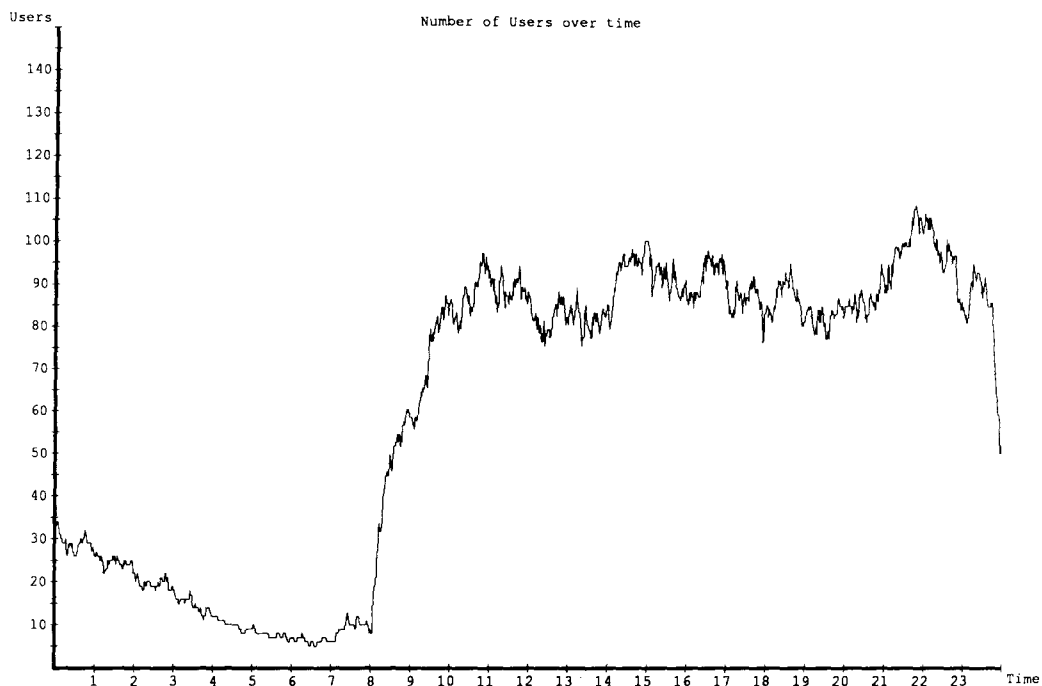
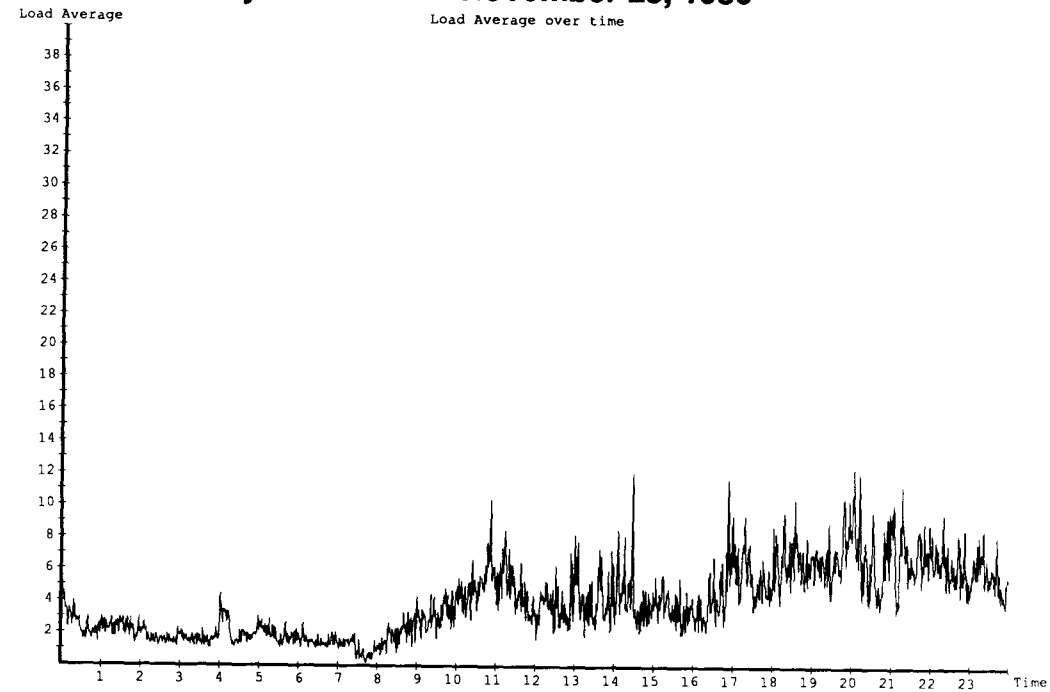


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Systems

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Graphs 3 and 4: UX System Use on November 28, 1989



Graphs 1 and 2 (page 25) show ENCORE processors requested and the number of ENCORE users for October 11 (APC and 64M); **Graphs 3 and 4** (page 26) show the same information for November 28 (XPC and 128M). The 80-user peak at 1430 on October 11 averaged 18 queued requests and produced sluggish user response for 6 processors; while the 110 user peak at 2130 on November 28 averaged 8 queued requests for the 6 new processors and provided good user response.

VAX VX

Cartridge Tape Drives (IBM 3480 compatible)

We have installed two new TA90 cartridge tape units on the VX system. Initial tests show that disk backup using the new tape drives takes about one-third less time to back up 11 gigabytes of disk storage in the VAX cluster. Users will be able to copy, store, and process cartridge information on the ACS VAX cluster and/or exchange data with most IBM systems. The tape cartridge is about a fourth of the size of a 2400-foot tape reel and can contain one-third more data (200 compared to 145 megabytes). The media cost of the cartridges is less than half that of the old 2400-foot tapes.

Both tape drives have stack loaders that hold 6 cartridges, allowing 1.2 gigabytes of data to be processed before operator intervention is required. ACS expects that a double-density upgrade for these units will be available in 1990, providing 400 megabytes per cartridge. ACS expects this to be the long-term storage media of choice for the next several years. (See Dave Nieter's and Marisa Riviere's article elsewhere in this issue for more information on the TA90 cartridge tapes.)

Expansion of VMS Service

Performance monitoring of the VX system showed many hours of CPU saturation for November. To alleviate this in 1990, ACS has moved its largest user (25 percent of total resources) to a separate system. In addition, to get the most use out of the vast number of programs available in the Digital Equipment Corporation's CSLG program, ACS plans to purchase a separate VAX for external University users. This means that extra CPU capacity and additional software such as BASIC and Rdb will be available on the 8650 for internal University work. A CD-ROM reader attached to this new VAX will allow all users in the VAX cluster to get at on-line VMS documentation in DEC-Window format and other CD-ROM disks.

acs

New TA90 Cartridge Subsystem on the VMS Cluster

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ACS has expanded its removable media services by adding a TA90 Cartridge Subsystem for its VMS cluster, and this service is now available to users of our clustered VMS systems.

The TA90 Cartridge Subsystem and Media

The cartridge subsystem consists of a dual controller supporting two TA90 I/O (input-output) units, that accept one-half-inch tape cartridges called TA90Ks.

The cartridge media have a capacity of 200 MB megabytes (MB). The maximum transfer rate—2.7 MB per second—makes them approximately twice as fast as the traditional tape units that write or read at 6250 bits per inch (bpi). The cartridges, which measure approximately four by five inches, are conveniently handled and stored, and are half as expensive as reel tapes.

The TA90 subsystem is fully compatible with IBM 3480 cartridge tape drives. The subsystem has a high degree of data integrity and effective error correction features.

TA90K Cartridge Media in the ACS Media Library

The TA90K cartridge is another removable medium that can be stored within the ACS Media Library (formerly the ACS Tape Library). Because tapes and cartridges in the Media Library are identified by their Volume Serial Number (VSN's), a new VSN type, SC, has been assigned to the TA90K cartridges stored in the library.

For transient cartridges we have assigned a TC prefix. This will differentiate cartridges from regular transient magnetic tape reels, which use the TT prefix. This media

type identification allows VMS to select the right I/O unit for the media when it processes the **TAPES GET** command.

To obtain TA90K cartridges, please contact the ACS Media Librarian. They cost \$10 per cartridge. The storage charges are 90 cents a month. The charges for mounting the cartridges are 60 cents for cartridges stored in the ACS library and \$1.00 for transient cartridges; both fees are lower than those for magnetic tape reels. For more information and forms to request storage assignments, please call the ACS Media Librarian at 626-1838.

TA90K Media and the VMS Tapes and Disks Management System

The TA90K media are in the VMS Tapes and Disks Package, making the cartridges a subset of tapes. The default tapes type, however, continues to be the standard 2400-foot tape reels.

The I/O units that handle the new media are identified by their one-half-inch tape cartridge type. In general, the unit type is relevant only when you use the **RESERVE** command. The VSN type, SC or TC, provided on the **TAPES GET** command will suffice to identify the unit for most other cases. For example:

```
$ RESERVE /TAPES=1 /CARTRIDGE=1
```

will reserve one regular nine-track tape unit and one TA90K cartridge unit. And

```
$ TAPES GET SC122
```

or

```
$ TAPES GET TCxxx /ID=my_TC_tape
```

will request the mounting of a TA90K cartridge on the TA90 I/O unit, or it will queue the request until a unit becomes available.

In the last two examples above, the TA90K cartridge stored at location SC 122 or the transient cartridge identified as *my_TC_tape* will be used. The cartridge, and therefore the I/O unit where it will be loaded, is identified by the VSN type.

Please refer to the **TAPES** entry in the VMS Help Library for more information on the commands used in this example and in other TAPES commands.

Using the TA90 Units

Tape users should notice no differences in software between the regular and the new type of tapes. Mount and I/O operations are similar in either media. Initialization and labeling are fully compatible. The media has a unique density—38,000 bpi—which is set by default. Because of the unique value, VMS currently ignores the DENSITY options on the INITIALIZE and MOUNT commands for cartridges.

With the exception of the changes to the RESERVE command that we already explained, the handling of the new media should be transparent to most users. The SHOW DEVICE command will display the TA90 unit names, MUA10 and MUA11.

Other Advantages

Besides compatibility for data interchange with other DEC and IBM systems and their easy handling and storage, the TA90K cartridges have other features that may appeal to our users:

1. Their short repositioning time makes the cartridges efficient for many applications.
2. The automatic off-line rewind makes the cartridges available immediately once they are mounted on the unit.
3. If you are running an application that needs to rewind the media, the TA90 rewind speed—48 seconds for a full 200 MB cartridge—is faster than the 70 seconds speed for a 145 MB magnetic tape.
4. The automatic stack loader, which holds up to six cartridges, enables the system to write or read large amounts of data without an operator's intervention.
5. Because of its compact storage capabilities, the TA90's allow easy access to a large number of on-site stored units. This helps us complete mount requests more quickly.

ACS hopes that our users will benefit from the tape cartridge system that we've added to the VMS cluster. Please let us know if you have any questions or if we can be of any help to make your work with tapes—and TA90's in particular—easier and more efficient.

NETLIB Public Domain Mathematical Software

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NETLIB is an electronic mail system for distributing a wide range of public domain mathematical software. It contains software for numerical linear algebra, linear programming, nonlinear optimization, curve fitting, special functions, fast Fourier transforms, the numerical solution of ordinary and partial differential equations, and more.

All of the NETLIB routines come in source code form and require the appropriate compiler (usually Fortran). Keep in mind that, though the routines are free of charge, they come with no guarantee. However, much of the code is nationally recognized for its quality.

Some types of problems can occur when using the routines. We recommend that you carefully test and check each routine. In particular, look for machine constants in the codes. Machine constants for a CRAY might produce incorrect results when used on an IBM PC. Also, a number of routines exist for solving some types of problems, and a user might not know which one is best.

The default for all subroutines is double precision. To get single precision, prefix the library name in your request with an "S". (We only recommend single precision on CYBERs, CRAYs, or similar machines that have a large single precision word.) If the library only has one precision, that's what you will be sent.

When you access NETLIB, don't ask for an entire library such as LINPACK. Libraries are much too large to send. Instead, ask for specific routines. NETLIB will send each routine and all routines it calls. Remember that ACS has the LINPACK, EISPACK, MINPACK, and QUADPACK libraries on the VAX VX system, and they are also in CMLIB on the ENCORE UX system.

Accessing NETLIB

The index files and the software itself are available from NETLIB by sending requests in the form of electronic mail addressed to

IN%"NETLIB@ORNL.GOV"

The requests are one-line commands that can be the subject part of a mail message or can be the mail message itself. NETLIB interprets the command, executes it, and sends you a mail message response.

Table 1 provides examples of some typical commands to NETLIB. **Table 2** contains a list and brief description of all the libraries currently available from NETLIB.

For background on NETLIB, see "Distribution of Mathematical Software Via Electronic Mail" by Jack Dongarra and Eric Grosse in *Communications of the ACM* (May, 1987), pp. 403-407.

This article is also kept on-line on VX. To read it, type:

§ LISTDOC

Once in ListDoc, select the category **MathEng_Software**, and then the sub-category **Libraries**. In that sub-category, you will find a document entitled NETLIB. We plan to check the actual NETLIB index quarterly and update it to the latest list of libraries for our on-line document.

This article is adapted from articles that appeared in the University of West Virginia and the University of London newsletters.

Table 1: Examples of NETLIB Commands and their Meanings

<u>Command</u>	<u>Requests</u>
SEND INDEX	Index listing of all available software.
SEND INDEX FROM <i>library</i>	Index of routines within a specific library— e.g., SEND INDEX FROM EISPACK
SEND <i>routine</i> FROM <i>library</i>	Routine contained in a particular library— e.g., SEND DGECO FROM EISPACK
FIND <i>keyword</i>	Listing of all routines containing the “keyword”— e.g., FIND EIGENVALUE will give you a listing of all routines in the data base that contain the keyword EIGENVALUE.

Note that the commands don't have to be in uppercase letters.

Table 2: List of NETLIB Libraries

A	approximation algorithms (almost empty, but soon to grow)
ALLIANT	set of programs collected from Alliant users
APOLLO	set of programs collected from Apollo users
BENCHMARK	various benchmark programs and table of LINPACK timings
BIHAR	Bjorstad's biharmonic solver
BMP	Brent's multiple precision package
CHENEY-KINCAID	programs from the text Numerical Mathematics and Computing.
CONFORMAL	Schwarz-Christoffel mapping codes by Trefethen; Bjorstad and Grosse
CORE	machine constants and BLAS (Basic Linear Algebra Subprograms)
DOMINO	communication and scheduling of multiple tasks; written in C
EISPACK	matrix eigenvalues and vectors
ELEFUNT	Cody and Waite's tests for elementary functions
ERRATA	corrections to numerical analysis books
FFTPACK	Swarztrauber's fast Fourier transforms
FISHPACK	separable elliptic PDEs; Swarztrauber and Sweet
FITPACK	Cline's splines under tension
FMM	software from the book by Forsythe, Malcolm, and Moler
FNLIB	Fullerton's special functions
GCV	generalized cross validation

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Table 2: List of NETLIB Libraries, continued

GO	“golden oldies”: gaussq, zeroin, lowess, ...
GRAPHICS	ray-tracing; written in C
HARWELL	MA28 sparse linear system from Harwell library
HOMPACK	nonlinear equations by homotopy method
ITPACK	iterative linear system solution by Young and Kincaid
JAKEF	precompiler to generate Fortran subroutine to evaluate gradient or Jacobian
LANCZOS	Cullum and Willoughby’s Lanczos programs: sparse symmetric eigenvalues and vectors
LASO	Scott’s Lanczos program for eigenvalues of sparse matrices
LINPACK	Gaussian elimination, QR, SVD by Dongarra, Bunch, Moler, Stewart
LP	linear programming test data
MACHINES	short descriptions of various computers
MATLAB	software from the MATLAB user’s group
MICROSCOPE	Alfeld and Harris’ system for discontinuity checking
MINPACK	nonlinear equations and least squares by More, Garbow, Hillstrom
MISC	miscellaneous software; includes source code for NETLIB
NA-DIGEST	archive of mailings to numerical analysis distribution list
NAPACK	programs from the text Applied Numerical Linear Algebra
ODE	ordinary differential equations: initial and boundary value problems
ODEPACK	ordinary differential equations from Hindmarsh
PARANOIA	Kahan’s test of floating point
PCHIP	Hermite cubic interpolation by Fritsch and Carlson
POLYHEDRA	Hume’s database of geometric solids
PORT	the public subset of PORT library
PPPACK	subroutines from de Boor’s Practical Guide to Splines
PROBLEM-SET	problems for automatic theorem provers
QUADPACK	univariate numerical integration by Piessens, de Donker, Kahaner
SCHED	SCHEDULE package for implementation of parallel algorithms
SEQUENT	software from the Sequent users group
SIAM	typesetting macros for SIAM journal format
SLATEC	machine constants and error handling package from the Slatec library
SLAP	Sparse Linear Algebra Package
SPARSE	a set of C codes for sparse systems of equations
SPARSE-BLAS	sparse extension of Basic Linear Algebra Subprograms
SPARSPAK	sparse linear algebra core by George and Liu
SPECFUN	transportable special functions
TOMS	Collected Algorithms of the ACM
UNCON/DATA	test problems for unconstrained minimization and least squares
VORONOI	Voronoi diagram or Delaunay triangulation
Y12M	sparse linear system from Aarhus University in Denmark

BMDP 88 Installed on VX

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BMDP is one of the most respected of the general-purpose statistical packages, particularly for the thoroughness and clarity of its statistical documentation.

Actually, it is not an integrated statistical package at all, but rather 42 separate single-purpose statistical programs, each identified by a two-character code. They are held together by a common language, a common file structure, and the BMDP Data Manager.

BMDP is especially useful for its repeated measures analysis of variance and covariance (2V and 4V), logistic (LR) and non-linear regression (AR), survival analyses (1L and 2L), factor analysis (4M), and stepwise discriminant analysis (7M).

We have had BMDP (and its predecessor BMD) on the CYBERs for many years.¹ There have been improvements over this time, particularly in its handling of missing values, in the consistency of its syntax and language among some very disparate programs, and most recently in its comprehensive approach to data handling and manipulation. The newest version, BMDP 88, has now been installed on our VAX VX.

New In BMDP 88

The most important new feature in BMDP 88 is the addition of a data manager: BMDP DM. This replaces the old BMDP 1S (Multi-pass transformations) with a powerful interactive data manipulation system. It can read and write files with multiple record types and hierarchical structures. DM provides three procedures to merge files, more than twenty-five aggregate functions to extract information from values on different records, procedures for transposing values stored within one record to multiple records (and vice versa), and many supports for data manipulation operations such as sorting, transforming, printing, computing summary statistics and saving data.

The resulting BMDP SAVE files can be read by any of the other BMDP programs.

BMDP DM is now documented in its own manual, the *BMDP Data Manager Manual*, BMDP Statistical Software, Los Angeles, 1988.

There are also two new statistical programs in the 1988 version:

BMDP CA: Correspondence Analysis. This converts a standard two-way table into a graph in which row and column categories are depicted as points. The graph visually explains how row (or column) profiles differ (i.e. why the usual chi-square test of independence might be significant).

BMDP 5V: Unbalanced repeated measures models with structured covariance matrices and missing data.

BMDP 88 is documented in two separate volumes: *BMDP Statistical Software Manual* Volumes 1 and 2, W. J. Dixon et al., University of California Press, Berkeley, 1988. These are available for reference in our Computing Information Center, 128A Lind.

Other Improvements

- The option **CONTROL RESET** is implemented for all programs. It re-initializes all parameters which otherwise would default to the values stated in previous problems.
- Grouping variables may now be stacked; that is, a new variable is formed which has combinations of **ALL** levels of the specified variables.

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Software

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- In the **PRINT** paragraph a new **FIELD** option is available for controlling the format of printed data. The **FIELD** option can be used to specify the number of character positions, the number of digits to the right of the decimal point, and whether the variable is alphanumeric.

You can obtain additional BMDP improvements by typing **NEWS**, as part of the **/PRINT** paragraph in any BMDP program.

¹ Buried in the archives, I may still have instructions for how to run BMD on the CDC 6600. It had been suggested that BMD was originally written by 23 programmers who didn't ever talk to each other. There is some truth to this rumor.

² See the *BMDP Statistical Software Manual*, Vol. 1, p. 499. This data originally came from R. F. Potthof and S. N. Roy, "A generalized multivariate analysis of variance model useful especially for growth and curve problems," *Biometrika*, 51:313-326.

Table 1: Using BMDP

You can invoke BMDP 88 by typing:

```
$ BMDP pn IN=inputfile OUT=outputfile LEN=workspace length
```

where *pn* is the two-character program name (i.e., **2V** or **4F**). This parameter is required.

IN is the input file of BMDP commands. (The default is your terminal, i.e., **SYSS\$INPUT**.)

OUT is the BMDP output file. (The default is your terminal, i.e. **SYSS\$OUTPUT**.)

LEN is the number of words of workspace allocated. The default is 20,000 words. If this is insufficient, BMDP will let you know what you need.

You can obtain more complete information on running BMDP by typing:

```
$ BMDP
```

or

```
$ HELP BMDP
```

BMDP also provides a primitive line editor for interactive use, provided that *no* input or output files are specified. Type:

```
$ BMDP pn
```

Since running BMDP without the possibility of permanent output is seldom desirable, and better editors are available on **VX**, this option is not recommended.

Table 2: A BMDP Example

Suppose we want to analyze the growth data for the jaws of 11 girls and 16 boys.² The data consists of the child's sex and the jaw measurements taken at ages 8, 10, 12, and 14. This data could be analyzed as a simple two-way repeated measures analysis of variance with one between subjects effect (**SEX**) and one within subjects effect (**AGE**):

	Effect	df
Btwn	SEX	1
Error	SUB(SEX)	25
Within	AGE	3
	SEX x AGE	3
Error	AGE x SUB(SEX)	7

Using BMDP 2V, the analysis is simple to obtain and easy to interpret. (Contrast this with say, the output from SPSS* Manova). We create a file called EXAMPLE2V.BMDP:

```

/ INPUT          VARIABLES = 5.
                  FORMAT IS FREE.
                  FILE IS 'EXAMPLE2V.DAT'.
/ VARIABLE       NAMES = SEX, AGE_8, AGE_10, AGE_12, AGE_14.
/ GROUP         CODES (SEX) = 0, 1.
                  NAMES (SEX) = MALE, FEMALE.
/ DESIGN        DEPENDENT = AGE_8 TO AGE_14.
                  LEVEL = 4.
                  GROUPING = SEX.
/ END

```

and then type:

```
$ BMDP 2V IN=EXAMPLE2V.BMDP OUT=EXAMPLE2V.LIS
```

The output will be written to EXAMPLE2V.LIS. Users who wish to try this for themselves can find the data on ACS\$STATROOT:[BMDP.1988]EXAMPLE2V.DAT.

Lind 128 Input/Output Station Moved

As this issue of the *Newsletter* was prepared for press, ACS had begun moving its input/output station from Lind Hall 128B.

By the time you receive this issue, our printers, bins, terminals and other equipment should be set up in the neighboring room, Lind 128C. We regret any inconvenience the move may have caused our users.

Our shuttle service continues to run between Lind and Lauderdale, with stops at other campus locations, once each hour. Our Kurtzweil scanner service has been moved to Lauderdale.

If you have questions about ACS services in 128Lind, call 625-7397.

Free Documentation for ACS Central Systems

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ACS publishes a number of shorter free documents. These free documents are available at the ACS Computing Information Center in 128A Lind Hall (625-7397), or by calling ACS Publications at 626-1093. You can also send mail to MAD@UMNACVX/MAD@VX.ACS.UMN.EDU or PMG@UMNACVX/PMG@VX.ACS.UMN.EDU. The following is a partial list:

General Information Briefs

- Artificial Intelligence Services
- Central and Network Configuration Diagram
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Communications

- Using LUMINA: Campus ITE Dialup for ProComm or TinCan 3.0, Hayes-compatible Dialup for ProComm or TinCan 3.0
- Terminal Access to ACS Central Systems
- Transferring Files using FTP or Kermit
- Using a Macintosh as a Terminal with the VAX
- Using a PC as a Terminal with the VAX: Kermit Standard or Extended, NSCA Telnet Standard or Extended, ProComm Standard or Extended.

Central Systems Briefs

Briefs for each system include: access, using mail, using an editor, getting output, and on-line documentation.

- UX (ENCORE/UNIX) Central System
- VX (VAX/VMS) Central System
- NV (CYBER NOS/VE) Central System
- CA (CYBER/NOS) Central System

ACS Central Systems Winter 1990

Central Systems courses are free. To register call 625-7397.
Some classes have size limitations: Register early.

Elective Courses

Electronic Mail and Networks	Feb 12-14	MW	2:30-4:00 pm
Using SAS (Statistical Analysis System)	Feb 19-23	MWF	2:30-4:00 pm
INGRES (Data Base Package)	Feb 13-22	TTh	2:30-4:00 pm
Introduction to Lisp	Feb 26-Mar 2	MWF	2:30-4:00 pm

Registration Information

Prerequisites: Please note any prerequisites for the class you are interested in. Instructors will not be able to review any prerequisite information. For more information on prerequisites, call the Computing Information Center at 625-7397.

Limits: Some central systems classes have limits to class size. Please try to register early to be sure of getting a place. If you decide to cancel from a class, please do so as soon as possible, so that we can make the space available to others.

Registration: Registration is located at ACS's Computing Information Center, 128A Lind Hall. (Hours: 8:00 am to noon and 1:00 to 4:30 pm, Monday through Friday.) To register call 625-7397. You can also register by electronic mail—write to mad@umnacvx or mad@vx.acs.umn.edu. Please call to cancel if you later decide not to attend, so we know how many to expect. Deadline for registering is 4:00 pm on the last working day before the class begins. For registration information, call 625-7397.

Course Descriptions

ELECTRONIC MAIL AND NETWORKS. Introduction to electronic mail and networks. Mail on the VAX 8650; sending, receiving, and managing mail, commands. BITNET addressing and uses. Other networks. Prerequisites: Introduction to VMS Operating System or experience using VMS. Two meetings.

USING SAS (Statistical Analysis System). Basic structure, job setup, and required statements, data manipulation and selection, commands that control internal and external files. Prerequisites: Familiarity with VAX/VMS operating system and EDT editor is required. Three meetings.

INGRES (DATABASE Package). Learn to use INGRES on the VAX 8650 computer. Topics include creating data bases, retrieving information using the English-like language QUEL, creating "ad hoc" reports, and using Application-By-Forms to develop data entry, data manipulation, and report generation. Five meetings.

INTRODUCTION TO LISP. This introduction is designed to teach people who may not have used a programming language before, how to write programs in LISP. LISP primitives. Programming techniques for developing recursive solutions to problems, and setting up complex solutions from previously defined simpler ones. Class will use VAX 8600 Common LISP to practice what they learn in class. Prerequisites: Introduction to VMS Operating System, or equivalent knowledge. Three meetings.

Conventions

Throughout this and other ACS publications, we have adopted these conventions:

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

Here's an example:

save, filename

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

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

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

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

Phones/Hours/Labs

ACS PHONE NUMBERS

Administrative Office: 626-1600
HELP-Line 626-5592

Access:

ACS systems (UX,VX,NV,CA)
3/12/2400 bps + 7/Even/1 626-1630
12/2400 bps + 8/None/1 626-1631
LUMINA 626-2206

Accounts:

ENCORE , VAX, CYBER CA, CYBER NV,	625-1511
Computer Hours (recorded message)	626-1819
Computing Information Center, 128A Lind	625-7397
Contract Services	625-2303
East Bank I/O, 128B Lind Hall	625-5082
Engineering Services	625-1595
Equipment Maintenance/Repair	625-1595
FAX	626-7440
Graphics Software	626-5592
Information, Lauderdale	626-1600
Lauderdale Computer Room/Services	626-0550
LUMINA	626-2206
LUMINA Consultant	626-2272
Math and Engineering Software	625-5830
Media Librarian	626-1838
Newsletter Subscription	625-7397
Permanent File Restoration	626-0595
Public Labs (with ACSnet)	
140 Blegen Hall	624-5278
B40 Central Library	no phone
207, 270 Diehl Hall	624-3128
4-204/4-250 EE/CSci	625-9081
121 Elliott Hall	624-0866
14 Folwell Hall	625-4896
1 Lind Hall	625-0801
128B Lind	625-5082
308 Mechanical Engineering	625-7352
9 Walter Library	626-1899
MWNC Lab Manager (14 Folwell Hall)	625-7850
Publications Information	626-1093
Short Course Registration	625-7397
Shuttle Bus Service	625-9525
System Status (recorded message)	626-1819
West Bank Computing Services	624-0877

For the phone numbers of consulting services, see the Help Page.

PUBLIC LABS TWIN CITIES CAMPUS

Central System Printing	Interactive	Micro
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East Bank

ApH 117			X
Arch 148			X
CenH		X	
ComH		X	
DiehH 207, 270	L	X	X
EddyH Annex 54			X
EE/CSci 4-204/250	I, L	X	X
EltH 121	I, L	X	X
FolH 14, 14a	L	X	X
FronH		X	
LindH1	I	X	
LindH 26			X
LindH 128B	L	X	
LindH 306B			X
MasCanCtr M39		X	
MechE 308	I	X	
MoosT 8-425			X
Phys 130	L	X	X
PioH		X	
SanH		X	
TerrH		X	
VinH 203			X
WaLib 9	L	X	X

West Bank

AndH 170	L		X
BlegH 140	I	X	
MdbH		X	
OMWL B2			X

St. Paul

BaH		X	
CentLib B40	I	X	
CentLib B50			X
ClaOff 135	L		X
McNH 69			X
Vet 436			X

I - Impact line printers.

L - Laser printers.

SYSTEM OPERATING HOURS

The ENCORE UX, VAX VX, CYBER NV, and CYBER CA systems run continuously from 6 pm Sunday until 6 am the following Sunday. The systems are in unattended production mode each night from midnight until 6 am. It is unlikely that any tape requests or printing will be processed during these hours. Normal operations resume at 6 am each day except Sunday.

On the first and third Fridays of each month from 5 am to 7 am the CYBER CA and NV systems are unavailable. Low-rate hours are from 8 pm to 8 am Monday through Friday, and all operating hours on Saturday and Sunday.

ACS Newsletter Subscription Request

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Department _____

Room _____ Building _____

U. S. Mail

Address _____

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Change/Old Address

Department _____

Room _____ Building _____

Address _____

University of Minnesota Affiliation

Department

Faculty

Staff

Student

Alumni

Other

Send to ACS Computing Information Center, 128A Lind Hall, 207 Church St. SE, Minneapolis, MN 55455

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2520 Broadway Drive
Lauderdale, Minnesota 55113

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