```
**************************************************************
*                                                            *
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```

UNIX NEWS

Due to the closing of facilities of the City University of New York at the end of May, there was no May issue of Unix News. The University is back in business and we would hope there will be no further closings. Our fiscal year and our current Board of Trustees both expire at the end of June.

The suggestion from Australia that the hotline information be captured is well taken. We will, in the future, reproduce all hotline information which is worthy of permanent recording in Unix News and remove it from the hotline file. The hotline will then contain only messages less than two months old.

The response to the survey questionaire has been approximately 30% to date. It will be compiled and made available. If we can arrange for the keyboarding, it will be machine readable and available from the Chicago Circle Software Exchange as well as on line.   A concise form of the "haves" and "wants" will be published here.

SOFTWARE EXCHANGE

Notice is reproduced below of the first mailing from the Software Exchange.   If you are on the reproduced list you will receive a tape. If you are not and want a copy send a magnegtic tape or 5 Dectapes.

The Harvard software, with the exception of Basic is now at Chicago Circle.   If you wish the Harvard software, sign the license agreement and mail it together with a tape to Chicago. If you are not an academic institution, or if you want Basic, get in touch with Lew Law at Harvard. Ignore the part of the notice that asks for money if you are ordering from Chicago.

If you attempt to use the new archiver, you will need the program below:

```
                         mktemp(name)
                         char *name;
                         {      register char *ptr;
                                register r;

                                ptr = name;
                                while (*ptr++);
                                --ptr;
                                r = getpid();
                                do *--ptr = '0' + (r%10);
                                        while (r = r/10);
                                while   (stat(name) >= 0)
                                        *--ptr = 'a';
                                return(name);
                         }
```

MEETINGS

Notice is given in the letter from the University of New South Wales of the first Eastern Hemisphere "East Coast Meeting".

Our Correspondent's notes have been misplaced and the report on the Harvard meeting will appear in a future issue.

MANUALS

The response to Harvard's offer to print the manuals was much greater than expected and the offer is repeated. The original notice, with a new closing date, follows:

The Science Center at Harvard is willing to undertake the task of reproducing and distributing the manuals for UNIX. The enclosed order form may be returned no later than August 2, 1976. All orders received by that date will be part of the second printing. Closing dates for subsequent printings, if any, will be announced.

For logistical reasons, each of the manuals will be available only as indicated below, with 3 hole punching and no binding. Orders should be batched, one order per installation and will be mailed to a single address which must be at the users' group's address of record for the installation.

The "UNIX PROGRAMMER'S MANUAL" Sixth Edition dated May 1975 will be reproduced in its entirety. Most installations will want to remove several pages which most users need not know about.

"DOCUMENTS FOR USE WITH THE UNIX TIME-SHARING SYSTEM" Sixth Edition will be reproduced omitting sections 1 (Setting Up UNIX) and 13 (On the Security of Unix).

The price of each manual will be dependent upon the total number of orders for that manual and will range between $8.00, if 100 copies are printed, and $12.00, if as few as 10 copies are printed. The order form may be sent in advance of, or with purchase orders or checks. Assume the $12.00 figure. Correct invoices and refunds will be sent.

SEVENTH EDITION?

Conversations with Dick Shahpazian and Dennis Ritchie indicate some ambivalence within Bell-Western with respect to a new edition of UNIX. There are a number of changes that exist at Murray Hill and Ken Thompson is bringing many more back from his year at Berkeley. It seems clear that there will eventually be a new edition incorporating the non-incremental changes. The question that is still unresolved is whether a "totally debugged" edition six will be formally, or informally, released to the users before the quantum jump to edition seven.

Mike O'Brien and I have expressed the desire that such a release be made to the software exchange, if only for archival purposes. The argument against, of course, is that time taken by Ritchie and Thompson to produce such a version is time taken away from new goodies and the preparation of the next version for distribution. We don't know how influential they will be, but your comments are welcome and if sent to Unix News will be read by the powers that be at the vendor.

EXODUS FROM THE INNER CITY

As part of a major move of Western Electric from New York, the Patent Licensing function at Western is moving to the "sun belt". Effective July 1, the address is:

Richard G. Shahpazian
Patent License Manager
Western Electric
P. O. Box 25000
Greensboro, NC 27420

telephone 919-697-2861

CONTENTS OF FIRST MAILING

UNIX SDC

1) Motorola M6800 assembler (C)

2) "em" (ed for mortals) - for faster terminals. A superset of ed. (C)

3) "setup" - general management package for downline loading of satellites (C)

Above from Jon Rowson, Queen Mary College, University of London.

4) Ken Knowlton's EXPLOR and MINI-EXPLOR in FORTRAN, plus MINI-EXPLOR in C - for easy, fancy line-printer graphics. With examples.

5) DL-11E driver which handles dialups. Good for CENTREX phone systems which do not have long-space disconnect or second-party disconnect in the hardware. (C)

Above from Lou Katz, Columbia College of Physicians and Surgeons.

6) "rtpip" - file-handling package which can transfer DECtape and RK05 files between UNIX and RT-11 formats. Well commented and documented.

Above from Computer Science Group, Katholieke Universiteit, Netherlands.

7) PDP 11/40 UNIX FORTRAN - completely rewritten runtime system, uses 11/40 FIS and runs on no other kind of machine (except Cal Data's with FIS, of course). Runs fast, but supports single precision only.

8) "convert", an attempt at a program to convert 11/45 Floating Point assembly language to 11/40's by inserting a "jsr" to a special entry in "fptrap". Each floating instruction thereby grows by two words, but no signalling takes place. System overhead is greatly lowered. May fail if assembly source is in very weird format.

Above from Chemistry Department, University of California at San Diego.

9) New archiver - includes "ar.c", new "ld.c" which reads the new style, and "arcv.c" which converts from old to new formats. The stinker is that "ar.c" uses long (double-word) integers, which can only be compiled by the

---

HRSTSS Software

The following software has been developed or modified by Harvard University for use with the Bell Unix operating system on a PDP 11/45:

PPL, BASIC, LISP 1.5, DDT, CDDT, MACRO 11, LINKER, HARVARD SHELL. This software is available to other academic institutions under the following conditions:

1) The Institution or recognized representatives thereof shall sign an agreement that:

   a) the software provided shall be used only by the institution signing the agreement and shall under no circumstances be further distributed;

   b) the software provided shall be used for academic, non-commercial purposes only.

2) For BASIC, proof of purchase of a Digital Equipment Corp. License to use BASIC/PTS Vøl Software ($500) or its equivalent must be furnished. A copy of the DEC invoice for payment for purchase of the license is sufficient.

3) No support for the software will be provided.

4) Additions and improvements to the software provided shall be made available to Harvard University on a reciprocal basis.

5) Payment will be made for DECtapes and documentation* plus a $10 handling fee for each DECtape.

Requests and inquiries should be sent to:

Lewis A. Law
Director of Technical Services
Science Center, Harvard University
1 Oxford Street
Cambridge, Massachusetts 02138
617-495-2627

*Documentation, other than Users Manuals, will be available hopefully by mid-1975.

new C compiler which we can't distribute yet. Therefore, executable
modules are included. Instructions included.

Above from Bell Telephone Labs.

10) Modified "ac.c" - takes "-t" flag to do accounting over ports as well as
people. Useful for finding out which terminals or lines are used most
often.

11) Modified "kl.c" which handles DL-11E dialup lines. Expects hardware to
handle second-party and long-space disconnects, but is smaller than #5.

Above from University of Illinois at Chicago Circle.

The modified versions of C, nroff, and UNIX cannot be distributed until
Bell Laboratories has released them. If Bell decides that they have been
"substantially changed", any or all of them may require a separate license
from Western Electric.

The Harvard HRSTSS software is separately handled. This edition of the
newsletter should include an order form for the software. The manuals must
still be purchased from Harvard.

The following should be a complete list of those slated to receive a tape.
'If you want your name added to the list, send a magtape or several DECtapes to:

    Michael T. O'Brien
    Department of Information Engineering
    University of Illinois at Chicago Circle
    P. O. Box 4348
    Chicago, Illinois 60680

Jon Rowson
Queen Mary College
University of London

Lew Law
Harvard University
Cambridge, Massachusetts

Mel Ferentz
Brooklyn College, CUNY
New York, New York

Ernie Chang
University of Waterloo
Ontario, Canada

Pat Fitzhenry
Aviation Research Lab
Savoy, Illinois

Dennis M. Ritchie
Bell Telephone Laboratories
Murray Hill, New Jersey

Harold Solow
RLG Associates
Reston, Virginia

H.J. Thomassen
Katholieke Universiteit
Nijmegen, Netherlands

Hernán Suárez-Flamerich
Universidad Simon Bolivar
Caracas, Venezuela

Professor E. Milgrom
Université Catholique de Louvain
Louvain-la-Neuve, Belgium

Bill Mayhew
The Children's Museum
Boston, Massachusetts

John Cornelius
UCSD
San Diego, California

Martin Tuori
Computer Systems Research Group
Toronto, Ontario, CANADA

Steve Holmgren
Center for Advanced Computation
Urbana, Illinois

Lou Katz
Columbia College of Physicians & Surgeons
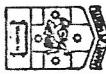New York, New York

Letter 1

THE UNIVERSITY OF NEW SOUTH WALES

P.O. BOX 1 · KENSINGTON · NEW SOUTH WALES · AUSTRALIA · 2033
TELEGRAPH: UNITECH, SYDNEY · TELEPHONE 663 0351

EXTN. 2805
PLEASE QUOTE
JL.

21st June, 1976.

DEPARTMENT OF COMPUTER SCIENCE

Professor Melvin Ferentz,
Physics Department,
Brooklyn College of CUNY,
Brooklyn,
NEW YORK   11210

Dear Professor Ferentz,

Please find enclosed the survey you distributed earlier. It has been completed with much enthusiasm but perhaps with not as much care as you would prefer. (we had it retyped s/G all.)

Our principal local extensions of UNIX (almost entirely due to Ian Johnstone) include:

. CR11   Card reader handler
. LP11   Block oriented printer handler
. XY11   Calcomp plotter handler
. LV11   Versatec plotter handler

. a remote/local batch subsystem.

The remote batch subsystem emulates the U-200 terminal for communication with KRONOS on a Cyber-72. Features full spooling, full accounting, job name invariance (KRONOS users will know what this means) and operatorless operation.
The local batch subsystem uses the same card reader and printer as remote batch, and local and remote jobs may be freely intermixed.

. Shared data segments.
This feature was implemented originally along with the block line printer driver, to improve the efficiency of the batch subsystem. Uses a modification of the shared text segment mechanism. Requires charges to both operating system and loader. Interlocking provided by "p" and "v" system calls.

Yours sincerely,

JOHN LIONS
Senior Lecturer.
Department of Computer Science.

Letter 2

THE UNIVERSITY OF NEW SOUTH WALES

P.O. BOX 1 · KENSINGTON · NEW SOUTH WALES · AUSTRALIA · 2033
TELEGRAPH: UNITECH, SYDNEY · TELEPHONE 663 0351

EXTN. 2805
PLEASE QUOTE
JL.

21st June, 1976

Professor Melvin Ferentz,
Physics Department,
Brooklyn College of Cuny,
Brooklyn, N.Y. 11210

Dear Professor Ferentz,

We trust the recent news of the fortunes of CUNY has not been as graphic as portrayed in the newspapers here, and that the future of "UNIX News" is still as bright as ever.

We are writing to inform you that the Department of Computer Science at the University of New South Wales has decided to convene a UNIX Users Meeting on August 29, on our "East Coast". Details are available from the undersigned. All are welcome.

So far besides ourselves, we understand that the University of Sydney and the University of Newcastle are also UNIX licencees, and we understand that the Australian Atomic Energy Commission, and maybe others, are negotiating currently with Western Electric. So we do not expect to be short of attendees.

We would be grateful if you could help us publicise this meeting through "UNIX News". We expect to send you a report in due course.

Also is there any way we can receive copies of material disseminated via the UNIX Hotline without actually dialing up? (Our administration rather frowns on international calls and besides we don't currently have any terminals connected to dial-up modems.)

Finally would you enter another subscription to "UNIX News" for the undersigned. A cheque for $10.00 is enclosed.

Yours sincerely,

JOHN LIONS
Department of Computer Science,
University of New South Wales,
Kensington   2033
AUSTRALIA.

May 25, 1976

Professor Melvin Ferentz
Physics Department
Brooklyn College of CUNY
Brooklyn, New York 11210
U.S.A.

Dear Professor Ferentz,

Enclosed you'll find our answer to the UNIX poll.

We appreciate the entry on "need any packages or drivers etc".
May we assume that all forms will become available to all
installations? If so, we hope for a response to our wishes,
and we'll do our best for other people's needs.

However, we would like to get some help on a shorter term
for some of our problems. Therefore please add this letter
to a next UNIX newsletter, or extract our desires as a
classified ad: "Who has +(<30 words)+ address".

Who has support for data areas shared between processes
(on 11/45); who has support for DECnet or other coupling
to remote RT-11 installations.

Thank you very much for all your UNIX efforts.

H.J. Thomassen

HJT/ab

Enclosures

June 11, 1976.

Professor Melvin Ferentz
UNIX University Users Society
Department of Physics
Brooklyn College of CUNY
Brooklyn, N.Y. 11210.

Dear Professor Ferentz:

Here at the University of Waterloo we are faced with the
problem of moving files between UNIX and other PDP-11 operating systems (i.e.
RSX-11D, RT-11, etc). Most DEC systems have a utility program called FILEX
to convert these files to and from the DOS-11 file structure. Is it possible
that there is such a utility available for transferring files between UNIX
and DOS-11 formats? If so, maybe you could tell me whom to contact.

Yours sincerely,

T.A. Wilkinson

TAW:cd

Letter 1

UNIVERSITY OF SASKATCHEWAN

March 4, 1976

Professor Melvin Ferentz,
Department of Physics,
Brooklyn College of CUNY,
Brooklyn, N.Y., 11210,
U.S.A.

Dear Sir:

I have enclosed two items which may be of interest to UNIX users.

   To our knowledge Bell Labs is the only other installation which has the hardware necessary to run the Graphics Satellite described on the next page. Therefore, we do not plan to distribute the software, since it is unlikely anyone else can use it.

Sincerely,

P. A. Hardie

P.A. Hardie,
Manager, Mini-Lab.

PAH/gw
encl.

Letter 2

University of Technology

LOUGHBOROUGH LEICESTERSHIRE LE11 3TU   Tel: 0509 63171   Telex 34319   Telegrams Technology Loughborough

DEPARTMENT OF COMPUTER STUDIES

Head of Department
Professor D.J. EVANS

DWT/JMB

12th April, 1976

Prof. Melvin Ferentz,
Physics Department,
Brooklyn College of CUNY,
Brooklyn,
N.Y. 11210,
U.S.A.

Dear Professor Ferentz,

Will you please enrol us as a member of the UNIX users' group.

I should be extremely grateful for any available literature on UNIX that you could supply me, back issues of newsletters, program write ups, etc.... In particular I should like to contact anyone who has a 'standard' BASIC or BASIC-PLUS interpreter available, or who has interfaced D.E.C. software onto UNIX (perhaps through an RT-11 or DOS-11 emulator). In addition I have heard rumours that Steve Bourne is implementing ALGOL 68C at Bell, do you have any further information?

If there is not a U.K. UNIX sub-group in existence then we should be very willing to initiate such a group.

For your information our UNIX system will be running on a PDP 11/40 with 60K words of memory,.2 RK05 disc, a dual floppy disc drive (D.E.C. model - anyone with a driver??), about a dozen teletypes and V:D:U.s, a teletype 40 R.O.P. printer as a lineprinter and various odds and ends. It is used for undergraduate teaching and postgraduate research. We are currently running the 11/40 under RSTS V4 - hence the desire for BASIC or BASIC PLUS - and hope to cut over to UNIX completely in October 1976.

Software that we hope to implement under UNIX (timescale unknown at present) include the DECnet protocols, a logic patch-board simulator, possibly a LISP interpreter, a computer usage accounting package, UNIQUE - a machine independent JCL compiler for use on networks, a floppy disk driver, graphics packages, etc.

Looking forward to hearing from you.

Yours sincerely,

D.W. TAYLOR (Mr.)

A Graphics Satellite for the UNIX Time-Sharing System

The satellite hardware consists of a PDP-11/20 with 16 Kwords of memory, a PC 11 paper tape reader/punch, a Tektronix 611 storage tube with DEC AA11-D interface and a console teletype. Data and control information pass bidirectionally between this satellite and a PDP-11/40 system (running UNIX) over paired DL11-E serial and DR11-C parallel interfaces.

From a logical point of view the PDP-11/20 can be bootstrapped into satellite mode by loading a small paper tape program which establishes some preliminary handshaking with and subsequently accepts a core load from UNIX. Thereafter UNIX can access and manipulate the 11/20 paper tape, console teletype and graphics equipment. In the latter case, a rather complete "display processor" was designed such that UNIX can send high-level "display files" to the satellite and have these files executed interpretively to draw pictures.

The system we designed and implemented has several objectives:

i. Two modes of the graphics satellite should be permitted; in one case C programs have previously executed and produced as their output display files which are executed in the satellite in an "off line" mode, while in the other a currently executing (in the PDP-11/40) C program can interact in real time with the satellite. In this latter mode the user can view intermediate graphics output and return data to the UNIX resident program that presumably control further output. At the moment all such interaction is from the console device keyboard or from the 11/20 switch register; in the future we plan to add a "joystick" device for graphical input.

ii. Given that the DEC AA-11 D storage tube controller is a very restrictive device, it is desirable that none of its weaknesses are reflected back to UNIX programs. This means that since the satellite has little else to do while pictures are being drawn, as much of its processing power as possible is brought to bear on making the graphics interface to UNIX as high a level as can be attained.

iii. Since the satellite communicates bidirectionally with UNIX, other devices such as the paper tape reader/punch are made available to UNIX as well.

iv. The satellite console teletype should appear identical to any other UNIX terminal. When no graphics work is being done the satellite console device thus becomes just another UNIX terminal.

By coincidence the designers of UNIX seem to have a similar (from the hardware point of view) satellite. Their system however did not meet the above objectives to our satisfaction and thus we have implemented a completely different system. We must emphasize that we did not go out and purchase the above equipment specifically for this purpose - the hardware simply happened to be available and we chose to implement a better graphics

system on it. If one was starting from scratch there are better choices of hardware, particularly for displays and/or display interfaces. Initially our system used a serial link to UNIX exclusively and it proved itself over one term of an undergraduate course in computer graphics. More recently we have coupled the pair of parallel interfaces and are currently re-implementing the system such that only the console teletype communication is carried over the serial line and all other communication (including the bootstrap of the satellite) is mediated over the parallel link.

Floating Point on the PDP-11/40

A trivial modification to the floating point interpreter (fptrap) can significantly reduce the amount of system cpu time consumed by programs containing floating point instructions. The modification adds a "look-ahead" capability to fptrap such that, if after interpreting one instruction it finds that the next one is also floating point, then it interprets this next one too without having to go through the illegal instruction trap mechanism. An editing session which installs the two necessary additions in fpl.s is shown below.

```
% ed fpl.s
/badins/a
lookahead:
        add     $2, spc         / increment pc
        mov     ssp, sp         / reset stack
        sub     $8., sp
        clr     trapins         / clear error indication

/ret:/a
        tst     trapins         / error?
        bne     1f              / yes. reset registers, then bomb.
        mov     *spc,r5         / check to see if next
        mov     r5, r4          / instruction is also floating
        bic     $7777,r4        / point and if so go
        cmp     $170000,r4      / back to lookahead to interpret
        jeq     lookahead       / it too before exit from fptrap.

1:
.
w
q
```

Some tests with C programs indicate that the system cpu time can be cut by at least 75% for very heavily cpu bound programs. The amount of time saved is naturally dependent upon whether the floating point instructions in a program occur consecutively.

Peter Hardie,
Manager, Mini Lab

We here at the Hebrew University have been

David Karach
Registrar's office
Room 11 "SSS"
Yale University
New Haven, Conn.
06520

June 16, 1976

Prof. Melvin Ferentz
Physics Dept.
Brooklyn College of CUNY
Brooklyn, N.Y.
11210

Dear Dr. Ferentz:

I wonder if most Unix users have discovered the following useful tactic: If one needs to free many alloc entries, feeding free the pointers wastes a lot of time. The following subroutine gets around this problem neatly:

```
/*So we can clear ALLOC'ated space
Set top to end, or use top=sbrk(0)
at the start of execution */
    int top;
    extern char *allocs[2];
    extern char **allocp,**alloct;
    .
    .

/*   Throw away all ALLOC'ated space,
and shrink the core image   */

clearall()
{
    allocs[0] = &allocs[1];
    allocs[1] = &allocs[0];
    allocp = &allocs[0];
    alloct = &allocs[1];
    brk(top);
}
```

I hope this routine will help someone. I have used it in several programs, with no sign of problems.

Very truly yours,

Dave

Hebrew header: אוניברסיטת העברית בירושלים

THE HEBREW UNIVERSITY OF JERUSALEM

COMPUTER SCIENCE LABORATORY
INSTITUTE OF MATHEMATICS

June 14, 1976

Professor M. Ferentz
Physics Department
Brooklyn College of CUNY
Brooklyn, New York 11210
U.S.A.

Dear Professor Ferentz,

We here at the Hebrew University have been actively working on UNIX for the past month or so. We have an 11/45 with 48 K core and (temporarily) only one RK05 disk. We do not have floating point, but we have a programmable clock. Unfortunately, we have been unable to locate an intermittent but very persistent bug which crashes the system and often messes up the file system. In the hope that you might know of someone who has run into this problem, I will try to describe it.

The prevalent cause of crashes is an incorrect value of Register 5 in U.URSAV[1] when a program is "returned to" from SWTCH, causing wild transfers. We put in checks in _SAVU and _RETU which indicate that correct values are stored initially, but later they are somehow altered. We have as yet been unable to ascertain whether the problem is related to swapping. Usually the incorrect R5 value is actually the SP value (i.e. U.U_RSAV [1] == U.U_RSAV [0]).

Although the problem is very persistent (example: about 90% of C compilations using CC either fail or crash the system) virtually any change in the system is likely to influence its manner of interference (i.e. programs that once worked reliably start to fail or vice versa).

Incidentally, our system works faultlessly on a nearby 11/45 with more memory. At first we believed our hardware was at fault, but after a full two days of installation tests, the DEC man pronounced our hardware healthy. Of course we can't be sure but we believe we have a software timing bug driven by our particular configuration.

If you have any suggestions for a course of action we would greatly appreciate them. Also if you could refer us to anyone who might know about our problem we would be very happy. We are continuing our search for this bug but will anxiously await your reply. Help!!

Sincerely,

Noel Kropf

Noel Kropf

NK:dee

Printing and shipping of the UNIX documents seems to have gone quite
well — we have ordered over 200 Programmers Manuals and 170 Documents.
Most of these have already been shipped. It would be a good idea, I
think, to include a second order form in the next UNIX News and I will
place a second order with the copy service one month after the date of
issue of the News.

Sincerely,

Lewis A. Law
Director of Technical Services

LAL:nds

HARVARD SCIENCE CENTER
HARVARD UNIVERSITY
CAMBRIDGE, MASSACHUSETTS 02138

Office of the Director
1 Oxford Street
617 495-2627

June 24, 1976

Prof. Mel Ferentz
Physics Department
Brooklyn College of CUNY
Brooklyn, New York 11210

Dear Mel:

The Science Center is upgrading its present computer system which
runs UNIX from an 11/45 to an 11/70. As a result we wish to sell the
following:

present replacement value

(1) 11/45 CPU with memory management KT11C
    (serial number 1147)
(2) Hardware bootstrap
(3) KW11 - line frequency clock
(4) DL11 - single asynchronous serial line $35,800
    interface
(5) 24K non-parity DEC core
(6) FP11B floating point processor
(7) 96K non-parity core -- Cambridge Memory
    Expandacore 11   13,200
(8) RS04 controller only for fast swapping disc   5,400

Items 1 to 6 are to be sold as a package. Items 7 and 8 could be sold
separately. All DEC equipment was purchased 7/1/74 and has been under
maintenance contract since installation.

Bids would be acceptable, but a reasonable price would be in excess of
50% of the present replacement value. Availability, FOB Science Center,
Harvard University, will be 9/1/76. Inquiries should be made of Lew
Law, 617-495-2627.

Would it be possible to insert this information in the next UNIX news
letter so that it gets wide distribution?

BELL SYSTEM SOFTWARE PRESENTLY AVAILABLE FOR LICENSING FROM WESTERN ELECTRIC COMPANY

Program Name	Minimum Hardware	Description
PORT	Portable (200K bytes of core)	PORT is a library of Fortran subprograms for numerical computation. This library is portable across different classes of computers, and is characterized by careful error checking, and dynamic storage allocation.
ROFF	Honeywell 600/6000	A BTL publications formatting program. The input to ROFF is intermixed text lines which contain the information to be formatted and request lines which contain instructions about how to format the information. Output from ROFF is a paginated, formatted document produced on a time-sharing terminal.
STATLIB	IBM 360	Library of statistical programs for performing statistical analysis and computation.
TROFF, EQN	(UNIX *) PDP 11/	Type setting package which includes text formatting and mathematical equation processing.
TSO-QED	IBM 360/370	Power and flexible interactive text editor for creating and modifying text from a time-sharing terminal.
UNIX	PDP 11/ and 70	A general purpose multi-user time-sharing system. The system operates in an interactive mode (command-response), receiving commands to execute from a teletypewriter terminal.

*Note: Type setting package runs under UNIX. Text formatter requires Phototypesetter equipment.

5/13/76

BELL SYSTEM SOFTWARE PRESENTLY AVAILABLE FOR LICENSING FROM WESTERN ELECTRIC COMPANY

Program Name	Minimum Hardware	Description
ALTRAN	Portable (200K bytes of core)	ALTRAN is a language and system for symbolic computation on algebraic data. The system is highly portable and is designed to handle very large problems with considerable efficiency.
ANAPAC	IBM 360 Honeywell	Facilitates the analysis of parametric test data on integrated circuits. Wafter maps, histograms and statistical analyses are provided.
BEFLIX	IBM 360 Honeywell 6000	A set of computer programs for producing and manipulating a grid of characters on a microfilm plotter.
BESUFROX	IBM 360	BESUFROX is a scientific program utilizing the method of successive approximations to optimize solutions to a large class of problems such as network design and curve fitting. Solutions are calculated successively in such a manner as to provide any selected design parameters.
C COMPILER	IBM 360/370	A version of the C language compiler which runs on the IBM 360/370 computer line.
GAPS, HOGAPS, TRANSIENTS	Portable (64K bytes)	Programs aid in the design of CCD's by providing a means of analytically investigating proposed device geometries.
3208-QED	Honeywell 600/6000	Powerful and flexible interactive text editor for creating and modifying text from a time-sharing terminal.
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