U N I X
USER'S MANUAL

Reference Guide

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UNIX USER'S MANUAL

Reference Guide

4.2 Berkeley Software Distribution
Virtual VAX−11 Version

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PREFACE

This manual is part of a five volume set intended for use with the 4.2 Berkeley Software Distribution for the VAX-11 computer. While the five volumes together contain virtually the same material presented in the four volume UNIX Programmer's Manual distributed with 4.2BSD, the manuals reflect a revised organization necessitated by the large quantity of information. The documentation is divided into three logically distinct *manuals*:

- UNIX User's Manual,
- UNIX Programmer's Manual, and
- UNIX System Manager's Manual.

Each of the User and Programmer manuals are two volumes: a Reference Guide, containing relevant sections from Volume 1 of the old UNIX Programmer's Manual, and a volume of Supplementary Documents, containing pertinent material from Volume 2 of the old UNIX Programmer's Manual. The System Manager's manual consists of a single volume containing information from both Volumes 1 and 2. We acknowledge those who have assisted us in putting together these manuals. In particular, we thank Tom Ferrin for pursuing the printing particulars.

M. J. Karels
S. J. Leffler

Preface to the 4.2 Berkeley distribution

This update to the 4.1 distribution of June 1981 provides support for the VAX 11/730, full networking and interprocess communication support, an entirely new file system, and many other new features. It is certainly the most ambitious release of software ever prepared here and represents many man-years of work. Bill Shannon (both at DEC and at Sun Microsystems) and Robert Elz of the University of Melbourne contributed greatly to this distribution through new device drivers and painful debugging episodes. Rob Gurwitz of BBN wrote the initial version of the code upon which the current networking support is based. Eric Allman of Britton-Lee donated countless hours to the mail system. Bill Croft (both at SRI and Sun Microsystems) aided in the debugging and development of the networking facilities. Dennis Ritchie of Bell Laboratories also contributed greatly to this distribution, providing valuable advise and guidance. Helge Skrivervik worked on the device drivers which enabled the distribution to be delivered with a TU58 console cassette and RX01 console floppy disk, and rewrote major portions of the standalone i/o system to support formatting of non-DEC peripherals.

Numerous others contributed their time and energy in organizing the user software for release, while many groups of people on campus suffered patiently through the low spots of development. As always, we are grateful to the UNIX user community for encouragement and support.

Once again, the financial support of the Defense Advanced Research Projects Agency is gratefully acknowledged.

S. J. Leffler
W. N. Joy
M. K. McKusick

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S. J. Leffler
W. N. Joy
M. K. McKusick

Preface to the 4.1 Berkeley distribution

This update to the fourth distribution of November 1980 provides support for the VAX 11/750 and for the full interconnect architecture of the VAX 11/780. Robert Elz of the University of Melbourne contributed greatly to this distribution especially in the boot-time system configuration code; Bill Shannon of DEC supplied us with the implementation of DEC standard bad block handling. The research group at Bell Laboratories and DEC Merrimack provided us with access to 11/750's in order to debug its support.

Other individuals too numerous to mention provided us with bug reports, fixes and other enhancements which are reflected in the system. We are grateful to the UNIX user community for encouragement and support.

The financial support of the Defence Advanced Research Projects Agency in support of this work is gratefully acknowledged.

W. N. Joy
R. S. Fabry
K. Sklower

Preface to the Fourth Berkeley distribution

This manual reflects the Berkeley system mid-October, 1980. A large amount of tuning has been done in the system since the last release; we hope this provides as noticeable an improvement for you as it did for us. This release finds the system in transition; a number of facilities have been added in experimental versions (job control, resource limits) and the implementation of others is imminent (shared-segments, higher performance from the file system, etc.). Applications which use facilities that are in transition should be aware that some of the system calls and library routines will change in the near future. We

have tried to be conscientious and make it very clear where this is likely.

A new group has been formed at Berkeley, to assume responsibility for the future development and support of a version of UNIX on the VAX. The group has received funding from the Defense Advanced Research Projects Agency (DARPA) to supply a standard version of the system to DARPA contractors. The same version of the system will be made available to other licensees of UNIX on the VAX for a duplication charge. We gratefully acknowledge the support of this contract.

We wish to acknowledge the contribution of a number of individuals to the the system.

We would especially like to thank Jim Kulp of IIASA, Laxenburg Austria and his colleagues, who first put job control facilities into UNIX; Eric Allman, Robert Henry, Peter Kessler and Kirk McKusick, who contributed major new pieces of software; Mark Horton, who contributed to the improvement of facilities and substantially improved the quality of our bit-mapped fonts, our hardware support staff: Bob Kridle, Anita Hirsch, Len Edmondson and Fred Archibald, who helped us to debug a number of new peripherals; Ken Arnold who did much of the leg-work in getting this version of the manual prepared, and did the final editing of sections 2-6, some special individuals within Bell Laboratories: Greg Chesson, Stuart Feldman, Dick Haight, Howard Katseff, Brian Kernighan, Tom London, John Reiser, Dennis Ritchie, Ken Thompson, and Peter Weinberger who helped out by answering questions; our excellent local DEC field service people, Kevin Althaus and Frank Chargois who kept our machine running virtually all the time, and fixed it quickly when things broke; and, Mike Accetta of Carnegie-Mellon University, Robert Elz of the University of Melbourne, George Goble of Purdue University, and David Kashtan of the Stanford Research Institute for their technical advice and support.

Special thanks to Bill Munson of DEC who helped by augmenting our computing facility and to Eric Allman for carefully proofreading the "last" draft of the manual and finding the bugs which we knew were there but couldn't see.

We dedicate this to the memory of David Sakrison, late chairman of our department, who gave his support to the establishment of our VAX computing facility, and to our department as a whole.

W. N. Joy
O. Babaoğlu
R. S. Fabry
K. Sklower

Preface to the Third Berkeley distribution

This manual reflects the state of the Berkeley system, December 1979. We would like to thank all the people at Berkeley who have contributed to the system, and particularly thank Prof. Richard Fateman for creating and administrating a hospitable environment, Mark Horton who helped prepare this manual, and Eric Allman, Bob Kridle, Juan Porcar and Richard Tuck for their contributions to the kernel.

The cooperation of Bell Laboratories in providing us with an early version of UNIX/32V is greatly appreciated. We would especially like to thank Dr. Charles Roberts of Bell Laboratories for helping us obtain this release, and acknowledge T. B. London, J. F. Reiser, K. Thompson, D. M. Ritchie, G. Chesson and H. P. Katseff for their advice and support.

W. N. Joy
O. Babaoğlu

Preface to the UNIX/32V distribution

The UNIX† operating system for the VAX*-11 provides substantially the same facilities as the UNIX system for the PDP*-11.

We acknowledge the work of many who came before us, and particularly thank G. K. Swanson, W. M. Cardoza, D. K. Sharma, and J. F. Jarvis for assistance with the implementation for the VAX-11/780.

T. B. London
J. F. Reiser

Preface to the Seventh Edition

Although this Seventh Edition no longer bears their byline, Ken Thompson and Dennis Ritchie remain the fathers and preceptors of the UNIX time-sharing system. Many of the improvements here described bear their mark. Among many, many other people who have contributed to the further flowering of UNIX, we wish especially to acknowledge the contributions of A. V. Aho, S. R. Bourne, L. L. Cherry, G. L. Chesson, S. I. Feldman, C. B. Haley, R. C. Haight, S. C. Johnson, M. E. Lesk, T. L. Lyon, L. E. McMahon, R. Morris, R. Muha, D. A. Nowitz, L. Wehr, and P. J. Weinberger. We appreciate also the effective advice and criticism of T. A. Dolotta, A. G. Fraser, J. F. Maranzano, and J. R. Mashey; and we remember the important work of the late Joseph F. Ossanna.

B. W. Kernighan
M. D. McIlroy

† UNIX is a trademark of Bell Laboratories.
*VAX and PDP are Trademarks of Digital Equipment Corporation.

INTRODUCTION TO VOLUME 1

This volume gives descriptions of the publicly available features of the UNIX/32V† system, as extended to provide a virtual memory environment and other enhancements at U. C. Berkeley. It does not attempt to provide perspective or tutorial information upon the UNIX operating system, its facilities, or its implementation. Various documents on those topics are contained in Volume 2. In particular, for an overview see 'The UNIX Time-Sharing System' by Ritchie and Thompson; for a tutorial see 'UNIX for Beginners' by Kernighan, and for an guide to the new features of this virtual version, see 'Getting started with Berkeley Software for UNIX on the VAX' in volume 2C.

Within the area it surveys, this volume attempts to be timely, complete and concise. Where the latter two objectives conflict, the obvious is often left unsaid in favor of brevity. It is intended that each program be described as it is, not as it should be. Inevitably, this means that various sections will soon be out of date.

The volume is divided into eight sections:

1. Commands
2. System calls
3. Subroutines
4. Special files
5. File formats and conventions
6. Games
7. Macro packages and language conventions
8. Maintenance commands and procedures

Commands are programs intended to be invoked directly by the user, in contradistinction to subroutines, which are intended to be called by the user's programs. Commands generally reside in directory */bin* (for *bin*ary programs). Some programs also reside in */usr/bin,* or in */usr/ucb,* to save space in */bin.* These directories are searched automatically by the command interpreters.

System calls are entries into the UNIX supervisor. The system call interface is identical to a C language procedure call; the equivalent C procedures are described in Section 2.

An assortment of subroutines is available; they are described in section 3. The primary libraries in which they are kept are described in *intro*(3). The functions are described in terms of C, but most will work with Fortran as well.

The special files section 4 discusses the characteristics of each system 'file' that actually refers to an I/O device. The names in this section refer to the DEC device names for the hardware, instead of the names of the special files themselves.

The file formats and conventions section 5 documents the structure of particular kinds of files; for example, the form of the output of the loader and assembler is given. Excluded are files used by only one command, for example the assembler's intermediate files.

Games have been relegated to section 6 to keep them from contaminating the more staid information of section 1.

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† UNIX is a trademark of Bell Laboratories.

Section 7 is a miscellaneous collection of information necessary to writing in various specialized languages: character codes, macro packages for typesetting, etc.

The maintenance section 8 discusses commands and procedures not intended for use by the ordinary user. The commands and files described here are almost all kept in the directory */etc.*

Each section consists of a number of independent entries of a page or so each. The name of the entry is in the upper corners of its pages, together with the section number, and sometimes a letter characteristic of a subcategory, e.g. graphics is 1G, and the math library is 3M. Entries within each section are alphabetized. The page numbers of each entry start at 1; it is infeasible to number consecutively the pages of a document like this that is republished in many variant forms.

All entries are based on a common format, not all of whose subsections will always appear.

The *name* subsection lists the exact names of the commands and subroutines covered under the entry and gives a very short description of their purpose.

The *synopsis* summarizes the use of the program being described. A few conventions are used, particularly in the Commands subsection:

Boldface words are considered literals, and are typed just as they appear.

Square brackets [ ] around an argument indicate that the argument is optional. When an argument is given as 'name', it always refers to a file name.

Ellipses '...' are used to show that the previous argument-prototype may be repeated.

A final convention is used by the commands themselves. An argument beginning with a minus sign '−' is often taken to mean some sort of option-specifying argument even if it appears in a position where a file name could appear. Therefore, it is unwise to have files whose names begin with '−'.

The *description* subsection discusses in detail the subject at hand.

The *files* subsection gives the names of files which are built into the program.

A *see also* subsection gives pointers to related information.

A *diagnostics* subsection discusses the diagnostic indications which may be produced. Messages which are intended to be self-explanatory are not listed.

The *bugs* subsection gives known bugs and sometimes deficiencies. Occasionally also the suggested fix is described.

At the beginning of the volume is a table of contents, organized by section and alphabetically within each section. There is also a permuted index derived from the table of contents. Within each index entry, the title of the writeup to which it refers is followed by the appropriate section number in parentheses. This fact is important because there is considerable name duplication among the sections, arising principally from commands which exist only to exercise a particular system call.

HOW TO GET STARTED

This section sketches the basic information you need to get started on UNIX how to log in and log out, how to communicate through your terminal, and how to run a program. See 'UNIX for Beginners' in Volume 2 for a more complete introduction to the system.

Logging in. You must call UNIX from an appropriate terminal. Almost any ASCII terminal capable of full duplex operation and generating the entire character set can be used. You must also have a valid user name, which may be obtained, together with necessary telephone numbers, from the system administration. After a data connection is established, the login procedure depends on what kind of terminal you are using and local system conventions. The following examples are typical.

300-baud terminals: Such terminals include the GE Terminet 300, and most display terminals run with popular modems. These terminals generally have a speed switch which should be set at '300' (or '30' for 30 characters per second) and a half/full duplex switch which should be set at full-duplex. (This switch will often have to be changed since many other systems require half-duplex). When a connection is established, the system types 'login:'; you type your user name, followed by the 'return' key. If you have a password, the system asks for it and turns off the printer on the terminal so the password will not appear. After you have logged in, the 'return', 'new line', or 'linefeed' keys will give exactly the same results.

1200- and 150-baud terminals: If there is a half/full duplex switch, set it at full-duplex. When you have established a data connection, the system types out a few garbage characters (the 'login:' message at the wrong speed). Depress the 'break' (or 'interrupt') key; this is a speed-independent signal to UNIX that a different speed terminal is in use. The system then will type 'login:,' this time at another speed. Continue depressing the break key until 'login:' appears in clear, then respond with your user name. From the TTY 37 terminal, and any other which has the 'newline' function (combined carriage return and linefeed), terminate each line you type with the 'new line' key, otherwise use the 'return' key.

Hard-wired terminals. Hard-wired terminals usually begin at the right speed, up to 9600 baud; otherwise the preceding instructions apply.

For all these terminals, it is important that you type your name in lower-case if possible; if you type upper-case letters, UNIX will assume that your terminal cannot generate lower-case letters and will translate all subsequent upper-case letters to lower case.

The evidence that you have successfully logged in is that a shell program will type a prompt ('$' or '%') to you. (The shells are described below under 'How to run a program.')

For more information, consult *tset*(1), and *stty*(1), which tell how to adjust terminal behavior, *getty*(8), which discusses the login sequence in more detail, and *tty*(4), which discusses terminal I/O.

Logging out. There are three ways to log out:

By typing an end-of-file indication (EOT character, control-d) to the Shell. The Shell will terminate and the 'login: ' message will appear again.

You can log in directly as another user by giving a *login*(1) command.

If worse comes to worse, you can simply hang up the phone; but beware — some machines may lack the necessary hardware to detect that the phone has been hung up. Ask your system administrator if this is a problem on your machine.

How to communicate through your terminal. When you type characters, a gnome deep in the system gathers your characters and saves them in a secret place. The characters will not be given to a program until you type a return (or newline), as described above in *Logging in.*

UNIX terminal I/O is full-duplex. It has full read-ahead, which means that you can type at any time, even while a program is typing at you. Of course, if you type during output, the printed output will have the input characters interspersed. However, whatever you type will be saved up and interpreted in correct sequence. There is a limit to the amount of read-ahead, but it is generous and not likely to be exceeded unless the system is in trouble. When the read-ahead limit is exceeded, the system throws away all the saved characters (or beeps, if your prompt was a %).

The character '@' in typed input kills all the preceding characters in the line, so typing mistakes can be repaired on a single line. Also, the character '#' erases the last character typed. (Most users prefer to use a backspace rather than '#', and many prefer control-U instead of '@'; *tset*(1) or *stty*(1) can be used to arrange this.) Successive uses of '#' erase characters back to, but not beyond, the beginning of the line. '@' and '#' can be transmitted to a program by preceding them with '\'. (So, to erase '\', you need two '#'s).

The 'break' or 'interrupt' key causes an *interrupt signal,* as does the ASCII 'delete' (or 'rubout') character, which is not passed to programs. This signal generally causes whatever program you

are running to terminate. It is typically used to stop a long printout that you don't want. However, programs can arrange either to ignore this signal altogether, or to be notified when it happens (instead of being terminated). The editor, for example, catches interrupts and stops what it is doing, instead of terminating, so that an interrupt can be used to halt an editor printout without losing the file being edited. Many users change this interrupt character to be ^C (control-C) using *stty*(1).

It is also possible to suspend output temporarily using ^S (control-s) and later resume output with ^Q. In a newer terminal driver, it is possible to cause output to be thrown away without interrupting the program by typing ^O; see *tty*(4).

The *quit* signal is generated by typing the ASCII FS character. (FS appears many places on different terminals, most commonly as control-\ or control-|.) It not only causes a running program to terminate but also generates a file with the core image of the terminated process. Quit is useful for debugging.

Besides adapting to the speed of the terminal, UNIX tries to be intelligent about whether you have a terminal with the newline function or whether it must be simulated with carriage-return and line-feed. In the latter case, all input carriage returns are turned to newline characters (the standard line delimiter) and both a carriage return and a line feed are echoed to the terminal. If you get into the wrong mode, the *reset*(1) command will rescue you.

Tab characters are used freely in UNIX source programs. If your terminal does not have the tab function, you can arrange to have them turned into spaces during output, and echoed as spaces during input. The system assumes that tabs are set every eight columns. Again, the *tset*(1) or *stty*(1) command will set or reset this mode. *Tset*(1) can be used to set the tab stops automatically when necessary.

How to run a program; the shells. When you have successfully logged in, a program called a shell is listening to your terminal. The shell reads typed-in lines, splits them up into a command name and arguments, and executes the command. A command is simply an executable program. The Shell looks in several system directories to find the command. You can also place commands in your own directory and have the shell find them there. There is nothing special about system-provided commands except that they are kept in a directory where the shell can find them.

The command name is always the first word on an input line; it and its arguments are separated from one another by spaces.

When a program terminates, the shell will ordinarily regain control and type a prompt at you to indicate that it is ready for another command.

The shells have many other capabilities, which are described in detail in sections *sh*(1) and *csh*(1). If the shell prompts you with '$', then it is an instance of *sh*(1) the standard Bell-labs provided shell. If it prompts with '%' then it is an instance of *csh*(1), a shell written at Berkeley. The shells are different for all but the most simple terminal usage. Most users at Berkeley choose *csh*(1) because of the *history* mechanism and the *alias* feature, which greatly enhance its power when used interactively. *Csh* also supports the job-control facilities; see *csh*(1) or the Csh introduction in volume 2C for details.

You can change from one shell to the other by using the *chsh*(1) command, which takes effect at your next login.

The current directory. UNIX has a file system arranged in a hierarchy of directories. When the system administrator gave you a user name, he also created a directory for you (ordinarily with the same name as your user name). When you log in, any file name you type is by default in this directory. Since you are the owner of this directory, you have full permission to read, write, alter, or destroy its contents. Permissions to have your will with other directories and files will have been granted or denied to you by their owners. As a matter of observed fact, few UNIX users protect their files from perusal by other users.

To change the current directory (but not the set of permissions you were endowed with at login) use *cd*(1).

Path names. To refer to files not in the current directory, you must use a path name. Full path names begin with '/', the name of the root directory of the whole file system. After the slash comes the name of each directory containing the next sub-directory (followed by a '/') until finally the file name is reached. For example, */usr/lem/filex* refers to the file *filex* in the directory *lem; lem* is itself a subdirectory of *usr; usr* springs directly from the root directory.

If your current directory has subdirectories, the path names of files therein begin with the name of the subdirectory with no prefixed '/'.

A path name may be used anywhere a file name is required.

Important commands which modify the contents of files are *cp*(1), *mv*(1), and *rm*(1), which respectively copy, move (i.e. rename) and remove files. To find out the status of files or directories, use *ls*(1). See *mkdir*(1) for making directories and *rmdir* (in *rm*(1)) for destroying them.

For a fuller discussion of the file system, see 'The UNIX Time-Sharing System,' by Ken Thompson and Dennis Ritchie. It may also be useful to glance through section 2 of this manual, which discusses system calls, even if you don't intend to deal with the system at that level.

Writing a program. To enter the text of a source program into a UNIX file, use the editor *ex*(1) or its display editing alias *vi*(1). (The old standard editor *ed*(1) is also available.) The principal languages in UNIX are provided by the C compiler *cc*(1), the Fortran compiler *f77*(1), the Pascal compiler *pc*(1), and interpreter *pi*(1) and *px*(1), and the Lisp system *lisp*(1). User contributed software in the latest release of the system supports APL, the Functional Programming language, and Icon. Refer to *apl*(1), *fp*(1), and *icon*(1), respectively for more information about each. After the program text has been entered through the editor and written on a file, you can give the file to the appropriate language processor as an argument. The output of the language processor will be left on a file in the current directory named 'a.out'. (If the output is precious, use *mv* to move it to a less exposed name soon.)

When you have finally gone through this entire process without provoking any diagnostics, the resulting program can be run by giving its name to the shell in response to the shell ('$' or '%') prompt.

Your programs can receive arguments from the command line just as system programs do, see *execve*(2).

Text processing. Almost all text is entered through the editor *ex*(1) (often entered via *vi*(1)). The commands most often used to write text on a terminal are: *cat, pr, more* and *nroff,* all in section 1.

The *cat* command simply dumps ASCII text on the terminal, with no processing at all. The *pr* command paginates the text, supplies headings, and has a facility for multi-column output. *Nroff* is an elaborate text formatting program. Used naked, it requires careful forethought, but for ordinary documents it has been tamed; see *me*(7) and *ms*(7).

Troff prepares documents for a Graphics Systems phototypesetter or a Versatec Plotter; it is very similar to *nroff,* and often works from exactly the same source text. It was used to produce this manual.

Script(1) lets you keep a record of your session in a file, which can then be printed, mailed, etc. It provides the advantages of a hard-copy terminal even when using a display terminal.

More(1) is useful for preventing the output of a command from zipping off the top of your screen. It is also well suited to perusing files.

Status inquiries. Various commands exist to provide you with useful information. *w*(1) prints a list of users presently logged in, and what they are doing. *date*(1) prints the current time and date. *ls*(1) will list the files in your directory or give summary information about particular

files.

Surprises. Certain commands provide inter-user communication. Even if you do not plan to use them, it would be well to learn something about them, because someone else may aim them at you.

To communicate with another user currently logged in, *write*(1) is used; *mail*(1) will leave a message whose presence will be announced to another user when he next logs in. The write-ups in the manual also suggest how to respond to the two commands if you are a target.

If you use *csh*(1) the key ^Z (control-Z) will cause jobs to "stop". If this happens before you learn about it, you can simply continue by saying "fg" (for foreground) to bring the job back.

When you log in, a message-of-the-day may greet you before the first prompt.

CONVERTING FROM THE 6TH EDITION

There follows a catalogue of significant, mostly incompatible, changes that will affect old users converting from the sixth edition on a PDP-11. No attempt is made to list all new facilities, or even all minor, but easily spotted changes, just the bare essentials without which it will be almost impossible to do anything.

Addressing files. Byte addresses in files are now long (32-bit) integers. Accordingly *seek* has been replaced by *lseek*(2). Every program that contains a *seek* must be modified. *Stat* and *fstat*(2) have been affected similarly, since file lengths are now 32- rather than 24-bit quantities.

Assembly language. This language is dead. Necromancy will be severely punnished.

Stty and *gtty.* These system calls have been extensively altered, see *ioctl*(2) and *tty*(4).

C language, lint. The syntax for initialization requires an equal sign = before an initializer, and brackets { } around compound initial values; arrays and structures are now initialized honestly. Assignment operators such as =+ and =− are now written in the reverse order: +=, −=. This removes the possibility of ambiguity in constructs such as x=−2, y=*p, and a=/*b. You will also certainly want to learn about

long integers
type definitions
casts (for type conversion)
unions (for more honest storage sharing)
#include <filename> (which searches in standard places)

The program *lint*(1) checks for obsolete syntax and does strong type checking of C programs, singly or in groups that are expected to be loaded together. It is indispensable for conversion work.

Fortran. The old *fc* is replaced by *f77,* a true compiler for Fortran 77, compatible with C. There are substantial changes in the language; see 'A Portable Fortran 77 Compiler' in Volume 2.

Stream editor. The program *sed*(1) is adapted to massive, repetitive editing jobs of the sort encountered in converting to the new system. It is well worth learning.

Standard I/O. The old *fopen, getc, putc* complex and the old *−lp* package are both dead, and even *getchar* has changed. All have been replaced by the clean, highly efficient, *stdio* package, *intro*(3S). The first things to know are that *getchar*(3) returns the integer EOF (−1) (which is not a possible byte value) on end of file, that 518-byte buffers are out, and that there is a defined FILE data type.

Make. The program *make*(1) handles the recompilation and loading of software in an orderly way from a 'makefile' recipe given for each piece of software. It remakes only as much as the modification dates of the input files show is necessary. The makefiles will guide you in building your new system.

Shell, chdir. F. L. Bauer once said Algol 68 is the Everest that must be climbed by every computer scientist because it is there. So it is with the shell for UNIX users. Everything beyond simple command invocation from a terminal is different. Even *chdir* is now spelled *cd*. If you wish to use *sh* (as opposed to *csh*) then you will want to study *sh*(1) long and hard.

C shell. *Csh*(1), developed at Berkeley, has features comparible to *sh*. It includes a history mechanism that saves you from retyping all or part of previous commands, as well as an efficient aliasing (macro) mechanism. The job control facilities of the system, which make the system much more pleasant to use, are currently available only with *csh*. See *csh*(1) for a description. These features make *csh* pleasant to use interactively. *Csh* programs have a syntax reminiscent of *C*, while *sh* command programs have a syntax reminiscent of ALGOL-68.

Debugging. *Sdb* is a far more capable replacement for the debugger *cdb*, and debugs C and Fortran at the source level. For machine language debugging, *adb* replaces *db*. The first-time user should be especially careful about distinguishing / and ? in *adb* commands, and watching to make sure that the *x* whose value he asked for is the real *x*, and not just some absolute location equal to the stack offset of some automatic *x*. You can always use the 'true' name, *_x*, to pin down a C external variable.

Dsw. This little-known, but indispensable facility has been taken over by *rm −ri*.

Boot procedures. Needless to say, these are all different. See section 8 of this volume, and the other documentation you should have received with your tape.

CONVERTING FROM THE DECEMBER, 1979 BERKELEY DISTRIBUTION

There have been a number of significant changes and improvements in the system. This list just gives the bare essentials:

C language changes. The C compiler now accepts and checks essentially arbitrary length identifiers and preprocessor names. There is a new type available in type casts: **void** which signifies that a value is to be ignored. It is useful in keeping lint happy about values which are not used (especially values returned from procedures). Finally, the language has been changed so that field names need not be unique to structures; on the other hand, the compiler insists that you be more honest about types involved in pointer constructs or it will warn you.

Object file format. The object file format has been changed to include a string table, so that language compilers may have names longer than 8 characters in their resulting *a.out* files. Old *.o* files must be recreated. *A.out* files will still run on both this and the December 1979 version of the system; only the symbol tables are incompatible.

Archive format and table of contents. The archive format has been changed to one which is portable between the VAX and other machines (e.g. the PDP-11). Old VAX archives should be converted with *arcv*(8); loader archives should just be recreated since the object files are also obsolete. Loader archives should have table-of-contents added by *ranlib*(1); if they dont the loader will gripe when they are used.

New tty driver, job control facilities and csh. Hand in hand are new job control facilities, a new tty driver and a new version of the C shell which supports and uses all of this. See *tty*(4) and *csh*(1) for a quick introduction.

Pascal compiler. There is a true Pascal compiler, *pc*(1) which allows separate compilation as well as mixing in of FORTRAN and C code.

Error analyzer. There is an error analyzer program *error*(1), which takes a set of error message and merges them back into the source files at the point of error. It can be used interactively to avoid inserting errors which are uninteresting. This program eliminates once and for all making lists of errors on small scraps of paper.

Mail forwarding. The system now provides mail forwarding and distribution facilities. Group and aliases are defined in the file */usr/lib/aliases* see *aliases*(5). If you change this file you will have to rerun *newaliases*(1). For any particular system a table in the source of the *delivermail* postman program may have to be changed so that it knows about the gateways on the local

machine.

System bootstrap procedures. These are totally changed; the system performs automatic reboots and preens the disks automatically at reboot. You should reread the appropriate pages in section 8 if you deal with system reboots.

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Many many changes have been made. This list indicates those which are most visible to users.

Directory format. Directory entries are no longer fixed length. This forces user programs which read directories to be modified to use the *directory*(3) package.

Signals. A new signal package has replaced the previous signal mechanism as well as the "jobs library". When using the compatible *signal*(3C) interface routine, the two most important changes are: signal handlers are not reset to SIG_DFL when a process receives a signal, and while a signal handler is processing a signal, that signal is blocked until the handler returns. This has implications, in particular, for programs which process the suspend character typed at the terminal. Refer to *sigvec*, *sigblock*, *sigpause*, *sigstack*, and *sigsetmask*(2) for information about the new signal facilities.

File and path names. File names may now be up to 255 characters in length. Path names are restricted to be at most 1024 characters. These two constants are provides as MAXNAMLEN and MAXPATHLEN in <*sys/dir.h*> and <*sys/param.h*>, respectively.

System time. System time is provided in microsecond precision with 10 millisecond accuracy. The new system call *gettimeofday*(2) supplants the old *time*(3) call which is now a library routine. The major impact of this change is that programs are now written in a fashion which is independent of the line clock frequency.

Groups. A user may now be in many groups simultaneously. This has obviated the need for the *newgrp* command. See *getgroups*(2) for more information.

Stat and fstat return value. The structure returned by the *stat* and *fstat* system calls is now larger. This is due to inode numbers growing to 32-bits, time stamps expanding to 64-bits and other information being included in the return value. Consult *stat*(2) for more information.

Mail forwarding. The system now provides general internetwork mail forwarding and distribution facilities. The *sendmail*(8) program replaces the old *delivermail* facility.

Debuggers. The previous C source language debugger, *sdb*, has been replaced by a new one, *dbx*(1). *Adb*(1) has been extended to simplify debugging of the operating system.

Networking support. Many new user programs provide access to the networking facilities. The *rlogin*(1C) and *rsh*(1C) programs are intended for communicating between UNIX systems. The *telnet*(1C) and *ftp*(1C) programs support the DARPA Internet standard protocols. The *netstat*(1) program is useful in watching network activity.

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NAME

intro — introduction to commands

DESCRIPTION

This section describes publicly accessible commands in alphabetic order. Certain distinctions of purpose are made in the headings:

(1) Commands of general utility.

(1C) Commands for communication with other systems.

(1G) Commands used primarily for graphics and computer-aided design.

N.B.: Commands related to system maintenance used to appear in section 1 manual pages and were distinguished by (1M) at the top of the page. These manual pages now appear in section 8.

SEE ALSO

Section (6) for computer games.

How to get started, in the Introduction.

DIAGNOSTICS

Upon termination each command returns two bytes of status, one supplied by the system giving the cause for termination, and (in the case of 'normal' termination) one supplied by the program, see *wait* and *exit*(2). The former byte is 0 for normal termination, the latter is customarily 0 for successful execution, nonzero to indicate troubles such as erroneous parameters, bad or inaccessible data, or other inability to cope with the task at hand. It is called variously 'exit code', 'exit status' or 'return code', and is described only where special conventions are involved.

NAME

adb − debugger

SYNOPSIS

adb [−**w**] [−**k**] [-Idir] [objfil [corfil]]

DESCRIPTION

Adb is a general purpose debugging program. It may be used to examine files and to provide a controlled environment for the execution of UNIX programs.

Objfil is normally an executable program file, preferably containing a symbol table; if not then the symbolic features of *adb* cannot be used although the file can still be examined. The default for *objfil* is **a.out.** *Corfil* is assumed to be a core image file produced after executing *objfil*; the default for *corfil* is **core.**

Requests to *adb* are read from the standard input and responses are to the standard output. If the −**w** flag is present then both *objfil* and *corfil* are created if necessary and opened for reading and writing so that files can be modified using *adb*.

The −**k** option makes *adb* do UNIX kernel memory mapping; it should be used when *core* is a UNIX crash dump or */dev/mem*.

The −**I** option specifies a directory where files to be read with $< or $<< (see below) will be sought; the default is */usr/lib/adb*.

Adb ignores QUIT; INTERRUPT causes return to the next *adb* command.

In general requests to *adb* are of the form

[*address*] [, *count*] [*command*] [;]

If *address* is present then *dot* is set to *address*. Initially *dot* is set to 0. For most commands *count* specifies how many times the command will be executed. The default *count* is 1. *Address* and *count* are expressions.

The interpretation of an address depends on the context it is used in. If a subprocess is being debugged then addresses are interpreted in the usual way in the address space of the subprocess. If the operating system is being debugged either post-mortem or using the special file */dev/mem* to interactive examine and/or modify memory the maps are set to map the kernel virtual addresses which start at 0x80000000 (on the VAX). ADDRESSES.

EXPRESSIONS

. The value of *dot*.

\+ The value of *dot* incremented by the current increment.

^ The value of *dot* decremented by the current increment.

" The last *address* typed.

integer A number. The prefixes 0o and 0O ("zero oh") force interpretation in octal radix; the prefixes 0t and 0T force interpretation in decimal radix; the prefixes 0x and 0X force interpretation in hexadecimal radix. Thus 0o20 = 0t16 = 0x10 = sixteen. If no prefix appears, then the *default radix* is used; see the $d command. The default radix is initially hexadecimal. The hexadecimal digits are 0123456789abcdefABCDEF with the obvious values. Note that a hexadecimal number whose most significant digit would otherwise be an alphabetic character must have a 0x (or 0X) prefix (or a leading zero if the default radix is hexadecimal).

integer.fraction
A 32 bit floating point number.

'cccc' The ASCII value of up to 4 characters. \ may be used to escape a '.

< *name*
The value of *name*, which is either a variable name or a register name. *Adb* maintains a number of variables (see VARIABLES) named by single letters or digits. If *name* is a register name then the value of the register is obtained from the system header in *corfil*. The register names are those printed by the $r command.

symbol A *symbol* is a sequence of upper or lower case letters, underscores or digits, not starting with a digit. The backslash character \ may be used to escape other characters. The value of the *symbol* is taken from the symbol table in *objfil*. An initial _ will be prepended to *symbol* if needed.

_ *symbol*
In C, the 'true name' of an external symbol begins with _. It may be necessary to utter this name to distinguish it from internal or hidden variables of a program.

routine.name
The address of the variable *name* in the specified C routine. Both *routine* and *name* are *symbols*. If *name* is omitted the value is the address of the most recently activated C stack frame corresponding to *routine*. (This form is currently broken on the VAX; local variables can be examined only with *dbx*(1).)

(*exp*) The value of the expression *exp*.

Monadic operators

**exp* The contents of the location addressed by *exp* in *corfil*.

@*exp* The contents of the location addressed by *exp* in *objfil*.

−*exp* Integer negation.

~*exp* Bitwise complement.

#*exp* Logical negation.

Dyadic operators are left associative and are less binding than monadic operators.

e1+*e2* Integer addition.

e1−*e2* Integer subtraction.

*e1***e2* Integer multiplication.

e1%*e2* Integer division.

e1&*e2* Bitwise conjunction.

e1|*e2* Bitwise disjunction.

e1#*e2* *E1* rounded up to the next multiple of *e2*.

COMMANDS

Most commands consist of a verb followed by a modifier or list of modifiers. The following verbs are available. (The commands '?' and '/' may be followed by '*'; see ADDRESSES for further details.)

?*f* Locations starting at *address* in *objfil* are printed according to the format *f*. *dot* is incremented by the sum of the increments for each format letter (q.v.).

/*f* Locations starting at *address* in *corfil* are printed according to the format *f* and *dot* is incremented as for '?'.

=*f* The value of *address* itself is printed in the styles indicated by the format *f*. (For i format '?' is printed for the parts of the instruction that reference subsequent words.)

A *format* consists of one or more characters that specify a style of printing. Each format character may be preceded by a decimal integer that is a repeat count for the format character. While stepping through a format *dot* is incremented by the amount given for each format letter. If no format is given then the last format is used. The format letters available are as follows.

o 2 Print 2 bytes in octal. All octal numbers output by *adb* are preceded by 0.
O 4 Print 4 bytes in octal.
q 2 Print in signed octal.
Q 4 Print long signed octal.
d 2 Print in decimal.
D 4 Print long decimal.
x 2 Print 2 bytes in hexadecimal.
X 4 Print 4 bytes in hexadecimal.
u 2 Print as an unsigned decimal number.
U 4 Print long unsigned decimal.
f 4 Print the 32 bit value as a floating point number.
F 8 Print double floating point.
b 1 Print the addressed byte in octal.
c 1 Print the addressed character.
C 1 Print the addressed character using the standard escape convention where control characters are printed as ^X and the delete character is printed as ^?.
s *n* Print the addressed characters until a zero character is reached.
S *n* Print a string using the ^*X* escape convention (see **C** above). *n* is the length of the string including its zero terminator.
Y 4 Print 4 bytes in date format (see *ctime*(3)).
i n Print as machine instructions. *n* is the number of bytes occupied by the instruction. This style of printing causes variables 1 and 2 to be set to the offset parts of the source and destination respectively.
a 0 Print the value of *dot* in symbolic form. Symbols are checked to ensure that they have an appropriate type as indicated below.

/ local or global data symbol
? local or global text symbol
= local or global absolute symbol

p 4 Print the addressed value in symbolic form using the same rules for symbol lookup as **a**.
t 0 When preceded by an integer tabs to the next appropriate tab stop. For example, **8t** moves to the next 8-space tab stop.
r 0 Print a space.
n 0 Print a newline.
"..." 0 Print the enclosed string.
^ *Dot* is decremented by the current increment. Nothing is printed.
\+ *Dot* is incremented by 1. Nothing is printed.
− *Dot* is decremented by 1. Nothing is printed.

newline
Repeat the previous command with a *count* of 1.

[?/]**l** *value mask*
Words starting at *dot* are masked with *mask* and compared with *value* until a match is found. If **L** is used then the match is for 4 bytes at a time instead of 2. If no match is found then *dot* is unchanged; otherwise *dot* is set to the matched location. If *mask* is omitted then −1 is used.

[?/]**w** *value* ...

Write the 2-byte *value* into the addressed location. If the command is **W**, write 4 bytes. Odd addresses are not allowed when writing to the subprocess address space.

[?/]**m** *b1 e1 f1*[?/]
New values for (*b1, e1, f1*) are recorded. If less than three expressions are given then the remaining map parameters are left unchanged. If the '?' or '/' is followed by '*' then the second segment (*b2, e2, f2*) of the mapping is changed. If the list is terminated by '?' or '/' then the file (*objfil* or *corfil* respectively) is used for subsequent requests. (So that, for example, '/m?' will cause '/' to refer to *objfil*.)

>*name* *Dot* is assigned to the variable or register named.

! A shell (/bin/sh) is called to read the rest of the line following '!'.

$*modifier*
Miscellaneous commands. The available *modifiers* are:

- <*f* Read commands from the file *f*. If this command is executed in a file, further commands in the file are not seen. If *f* is omitted, the current input stream is terminated. If a *count* is given, and is zero, the command will be ignored. The value of the count will be placed in variable *9* before the first command in *f* is executed.
- <<*f* Similar to < except it can be used in a file of commands without causing the file to be closed. Variable *9* is saved during the execution of this command, and restored when it completes. There is a (small) finite limit to the number of << files that can be open at once.
- >*f* Append output to the file *f*, which is created if it does not exist. If *f* is omitted, output is returned to the terminal.
- **?** Print process id, the signal which caused stoppage or termination, as well as the registers as **$r**. This is the default if *modifier* is omitted.
- **r** Print the general registers and the instruction addressed by **pc**. *Dot* is set to **pc**.
- **b** Print all breakpoints and their associated counts and commands.
- **c** C stack backtrace. If *address* is given then it is taken as the address of the current frame instead of the contents of the frame−pointer register. If **C** is used then the names and (32 bit) values of all automatic and static variables are printed for each active function. (broken on the VAX). If *count* is given then only the first *count* frames are printed.
- **d** Set the default radix to *address* and report the new value. Note that *address* is interpreted in the (old) current radix. Thus "10$d" never changes the default radix. To make decimal the default radix, use "0t10$d".
- **e** The names and values of external variables are printed.
- **w** Set the page width for output to *address* (default 80).
- **s** Set the limit for symbol matches to *address* (default 255).
- **o** All integers input are regarded as octal.
- **q** Exit from *adb*.
- **v** Print all non zero variables in octal.
- **m** Print the address map.
- **p** (*Kernel debugging*) Change the current kernel memory mapping to map the designated **user structure** to the address given by the symbol *_u*. The *address* argument is the address of the user's user page table entries (on the VAX).

:*modifier*
Manage a subprocess. Available modifiers are:

- **bc** Set breakpoint at *address*. The breakpoint is executed *count*−1 times before causing a stop. Each time the breakpoint is encountered the command *c* is executed. If this command is omitted or sets *dot* to zero then the breakpoint

causes a stop.

d Delete breakpoint at *address*.

r Run *objfil* as a subprocess. If *address* is given explicitly then the program is entered at this point; otherwise the program is entered at its standard entry point. *count* specifies how many breakpoints are to be ignored before stopping. Arguments to the subprocess may be supplied on the same line as the command. An argument starting with < or > causes the standard input or output to be established for the command.

c*s* The subprocess is continued with signal *s*, see *sigvec*(2). If *address* is given then the subprocess is continued at this address. If no signal is specified then the signal that caused the subprocess to stop is sent. Breakpoint skipping is the same as for **r**.

s*s* As for **c** except that the subprocess is single stepped *count* times. If there is no current subprocess then *objfil* is run as a subprocess as for **r**. In this case no signal can be sent; the remainder of the line is treated as arguments to the subprocess.

k The current subprocess, if any, is terminated.

VARIABLES

Adb provides a number of variables. Named variables are set initially by *adb* but are not used subsequently. Numbered variables are reserved for communication as follows.

0 The last value printed.
1 The last offset part of an instruction source.
2 The previous value of variable 1.
9 The count on the last $< or $<< command.

On entry the following are set from the system header in the *corfil*. If *corfil* does not appear to be a **core** file then these values are set from *objfil*.

b The base address of the data segment.
d The data segment size.
e The entry point.
m The 'magic' number (0407, 0410 or 0413).
s The stack segment size.
t The text segment size.

ADDRESSES

The address in a file associated with a written address is determined by a mapping associated with that file. Each mapping is represented by two triples (*b1, e1, f1*) and (*b2, e2, f2*) and the *file address* corresponding to a written *address* is calculated as follows.

$$b1 \leqslant address < e1 \Rightarrow file\ address = address + f1 - b1, \text{ otherwise,}$$

$$b2 \leqslant address < e2 \Rightarrow file\ address = address + f2 - b2,$$

otherwise, the requested *address* is not legal. In some cases (e.g. for programs with separated I and D space) the two segments for a file may overlap. If a ? or / is followed by an * then only the second triple is used.

The initial setting of both mappings is suitable for normal **a.out** and **core** files. If either file is not of the kind expected then, for that file, *b1* is set to 0, *e1* is set to the maximum file size and *f1* is set to 0; in this way the whole file can be examined with no address translation.

FILES

a.out
core

SEE ALSO

cc(1), dbx(1), ptrace(2), a.out(5), core(5)

DIAGNOSTICS

'Adb' when there is no current command or format. Comments about inaccessible files, syntax errors, abnormal termination of commands, etc. Exit status is 0, unless last command failed or returned nonzero status.

BUGS

Since no shell is invoked to interpret the arguments of the :r command, the customary wild-card and variable expansions cannot occur.

NAME

addbib — create or extend bibliographic database

SYNOPSIS

addbib [**−p** promptfile] [**−a**] database

DESCRIPTION

When this program starts up, answering "y" to the initial "Instructions?" prompt yields directions; typing "n" or RETURN skips them. *Addbib* then prompts for various bibliographic fields, reads responses from the terminal, and sends output records to a *database*. A null response (just RETURN) means to leave out that field. A minus sign (−) means to go back to the previous field. A trailing backslash allows a field to be continued on the next line. The repeating "Continue?" prompt allows the user either to resume by typing "y" or RETURN, to quit the current session by typing "n" or "q", or to edit the *database* with any system editor *(vi, ex, edit, ed)*.

The **−a** option suppresses prompting for an abstract; asking for an abstract is the default. Abstracts are ended with a CTRL-d. The **−p** option causes *addbib* to use a new prompting skeleton, defined in *promptfile*. This file should contain prompt strings, a tab, and the key-letters to be written to the *database*.

The most common key-letters and their meanings are given below. *Addbib* insulates you from these key-letters, since it gives you prompts in English, but if you edit the bibliography file later on, you will need to know this information.

%A	Author's name
%B	Book containing article referenced
%C	City (place of publication)
%D	Date of publication
%E	Editor of book containing article referenced
%F	Footnote number or label (supplied by *refer*)
%G	Government order number
%H	Header commentary, printed before reference
%I	Issuer (publisher)
%J	Journal containing article
%K	Keywords to use in locating reference
%L	Label field used by **−k** option of *refer*
%M	Bell Labs Memorandum (undefined)
%N	Number within volume
%O	Other commentary, printed at end of reference
%P	Page number(s)
%Q	Corporate or Foreign Author (unreversed)
%R	Report, paper, or thesis (unpublished)
%S	Series title
%T	Title of article or book
%V	Volume number
%X	Abstract — used by *roffbib*, not by *refer*
%Y,Z	ignored by *refer*

Except for 'A', each field should be given just once. Only relevant fields should be supplied. An example is:

%A	Bill Tuthill
%T	Refer — A Bibliography System
%I	Computing Services

%C Berkeley
%D 1982
%O UNX 4.3.5.

FILES

promptfile optional file to define prompting

SEE ALSO

refer(1), sortbib(1), roffbib(1), indxbib(1), lookbib(1)

AUTHORS

Al Stangenberger, Bill Tuthill

NAME

apply − apply a command to a set of arguments

SYNOPSIS

apply [−**a***c*] [−*n*] command args ...

DESCRIPTION

Apply runs the named *command* on each argument *arg* in turn. Normally arguments are chosen singly; the optional number *n* specifies the number of arguments to be passed to *command*. If *n* is zero, *command* is run without arguments once for each *arg*. Character sequences of the form %*d* in *command*, where *d* is a digit from 1 to 9, are replaced by the *d*'th following unused *arg*. If any such sequences occur, *n* is ignored, and the number of arguments passed to *command* is the maximum value of *d* in *command*. The character '%' may be changed by the −**a** option.

Examples:

```
apply echo *
```

is similar to ls(1);

```
apply −2 cmp a1 b1 a2 b2 ...
```

compares the 'a' files to the 'b' files;

```
apply −0 who 1 2 3 4 5
```

runs who(1) 5 times; and

```
apply 'ln %1 /usr/joe' *
```

links all files in the current directory to the directory /usr/joe.

SEE ALSO

sh(1)

AUTHOR

Rob Pike

BUGS

Shell metacharacters in *command* may have bizarre effects; it is best to enclose complicated commands in single quotes ' '.

There is no way to pass a literal '%2' if '%' is the argument expansion character.

NAME

apropos — locate commands by keyword lookup

SYNOPSIS

apropos keyword ...

DESCRIPTION

Apropos shows which manual sections contain instances of any of the given keywords in their title. Each word is considered separately and case of letters is ignored. Words which are part of other words are considered thus looking for compile will hit all instances of 'compiler' also. Try

apropos password

and

apropos editor

If the line starts 'name(section) ...' you can do 'man section name' to get the documentation for it. Try 'apropos format' and then 'man 3s printf' to get the manual on the subroutine *printf*.

Apropos is actually just the **-k** option to the *man*(1) command.

FILES

/usr/lib/whatis data base

SEE ALSO

man(1), whatis(1), catman(8)

AUTHOR

William Joy

NAME

ar — archive and library maintainer

SYNOPSIS

ar key [posname] afile name ...

DESCRIPTION

Ar maintains groups of files combined into a single archive file. Its main use is to create and update library files as used by the loader. It can be used, though, for any similar purpose. **N.B:** This version of *ar* uses a ASCII-format archive which is portable among the various machines running UNIX. Programs for dealing with older formats are available: see *arcv*(8).

Key is one character from the set **drqtpmx,** optionally concatenated with one or more of **vuaibclo.** *Afile* is the archive file. The *names* are constituent files in the archive file. The meanings of the *key* characters are:

d Delete the named files from the archive file.

r Replace the named files in the archive file. If the optional character **u** is used with **r,** then only those files with 'last-modified' dates later than the archive files are replaced. If an optional positioning character from the set **abi** is used, then the *posname* argument must be present and specifies that new files are to be placed after (**a**) or before (**b** or **i**) *posname*. Otherwise new files are placed at the end.

q Quickly append the named files to the end of the archive file. Optional positioning characters are invalid. The command does not check whether the added members are already in the archive. Useful only to avoid quadratic behavior when creating a large archive piece-by-piece.

t Print a table of contents of the archive file. If no names are given, all files in the archive are tabled. If names are given, only those files are tabled.

p Print the named files in the archive.

m Move the named files to the end of the archive. If a positioning character is present, then the *posname* argument must be present and, as in **r,** specifies where the files are to be moved.

x Extract the named files. If no names are given, all files in the archive are extracted. In neither case does **x** alter the archive file. Normally the 'last-modified' date of each extracted file is the date when it is extracted. However, if **o** is used, the 'last-modified' date is reset to the date recorded in the archive.

v Verbose. Under the verbose option, *ar* gives a file-by-file description of the making of a new archive file from the old archive and the constituent files. When used with **t,** it gives a long listing of all information about the files. When used with **p,** it precedes each file with a name.

c Create. Normally *ar* will create *afile* when it needs to. The create option suppresses the normal message that is produced when *afile* is created.

l Local. Normally *ar* places its temporary files in the directory /tmp. This option causes them to be placed in the local directory.

FILES

/tmp/v* temporaries

SEE ALSO

lorder(1), ld(1), ranlib(1), ar(5), arcv(8)

BUGS

If the same file is mentioned twice in an argument list, it may be put in the archive twice.

The 'last-modified' date of a file will not be altered by the **o** option if the user is not the owner of the extracted file, or the super-user.

NAME

as – VAX-11 assembler

SYNOPSIS

as [**–d124**] [**–L**] [**–W**] [**–V**] [**–J**] [**–R**] [**–t** directory] [**–o** objfile] [name ...]

DESCRIPTION

As assembles the named files, or the standard input if no file name is specified. The available flags are:

–d Specifies the number of bytes to be assembled for offsets which involve forward or external references, and which have sizes unspecified in the assembly language. The default is **–d4.**

–L Save defined labels beginning with a 'L', which are normally discarded to save space in the resultant symbol table. The compilers generate such temporary labels.

–V Use virtual memory for some intermediate storage, rather than a temporary file.

–W Do not complain about errors.

–J Use long branches to resolve jumps when byte-displacement branches are insufficient. This must be used when a compiler-generated assembly contains branches of more than 32k bytes.

–R Make initialized data segments read-only, by concatenating them to the text segments. This obviates the need to run editor scripts on assembly code to make initialized data read-only and shared.

–t Specifies a directory to receive the temporary file, other than the default /tmp.

All undefined symbols in the assembly are treated as global.

The output of the assembly is left on the file *objfile;* if that is omitted, *a.out* is used.

FILES

/tmp/as*	default temporary files
a.out	default resultant object file

SEE ALSO

ld(1), nm(1), adb(1), dbx(1), a.out(5)
Auxiliary documentation *Assembler Reference Manual.*

AUTHORS

John F. Reiser
Robert R. Henry

BUGS

–J should be eliminated; the assembler should automatically choose among byte, word and long branches.

NAME

at − execute commands at a later time

SYNOPSIS

at time [day] [file]

DESCRIPTION

At squirrels away a copy of the named *file* (standard input default) to be used as input to *sh*(1) (or *csh*(1) if you normally use it) at a specified later time. A *cd* command to the current directory is inserted at the beginning, followed by assignments to all environment variables (excepting the variable TERM, which is useless in this context.) When the script is run, it uses the user and group ID of the creator of the copy file.

The *time* is 1 to 4 digits, with an optional following 'A', 'P', 'N' or 'M' for AM, PM, noon or midnight. One and two digit numbers are taken to be hours, three and four digits to be hours and minutes. If no letters follow the digits, a 24 hour clock time is understood.

The optional *day* is either (1) a month name followed by a day number, or (2) a day of the week; if the word 'week' follows invocation is moved seven days further off. Names of months and days may be recognizably truncated. Examples of legitimate commands are

```
at 8am jan 24
at 1530 fr week
```

At programs are executed by periodic execution of the command */usr/lib/atrun* from *cron*(8). The granularity of *at* depends upon how often *atrun* is executed.

Standard output or error output is lost unless redirected.

FILES

/usr/lib/atrun	executor (run by *cron*(8)).
in /usr/spool/at:	
yy.ddd.hhhh.*	activity for year yy, day dd, hour hhhh.
lasttimedone	last *hhhh*
past	activities in progress

SEE ALSO

calendar(1), pwd(1), sleep(1), cron(8)

DIAGNOSTICS

Complains about various syntax errors and times out of range.

BUGS

Due to the granularity of the execution of */usr/lib/atrun,* there may be bugs in scheduling things almost exactly 24 hours into the future.

NAME

awk − pattern scanning and processing language

SYNOPSIS

awk [−F*c*] [prog] [file] ...

DESCRIPTION

Awk scans each input *file* for lines that match any of a set of patterns specified in *prog*. With each pattern in *prog* there can be an associated action that will be performed when a line of a *file* matches the pattern. The set of patterns may appear literally as *prog*, or in a file specified as −f *file*.

Files are read in order; if there are no files, the standard input is read. The file name '−' means the standard input. Each line is matched against the pattern portion of every pattern-action statement; the associated action is performed for each matched pattern.

An input line is made up of fields separated by white space. (This default can be changed by using FS, *vide infra*.) The fields are denoted $1, $2, ... ; $0 refers to the entire line.

A pattern-action statement has the form

pattern { action }

A missing { action } means print the line; a missing pattern always matches.

An action is a sequence of statements. A statement can be one of the following:

```
if ( conditional ) statement [ else statement ]
while ( conditional ) statement
for ( expression ; conditional ; expression ) statement
break
continue
{ [ statement ] ... }
variable = expression
print [ expression-list ] [ >expression ]
printf format [ , expression-list ] [ >expression ]
next    # skip remaining patterns on this input line
exit    # skip the rest of the input
```

Statements are terminated by semicolons, newlines or right braces. An empty expression-list stands for the whole line. Expressions take on string or numeric values as appropriate, and are built using the operators +, −, *, /, %, and concatenation (indicated by a blank). The C operators ++, −−, +=, −=, *=, /=, and %= are also available in expressions. Variables may be scalars, array elements (denoted x[i]) or fields. Variables are initialized to the null string. Array subscripts may be any string, not necessarily numeric; this allows for a form of associative memory. String constants are quoted "...".

The *print* statement prints its arguments on the standard output (or on a file if >*file* is present), separated by the current output field separator, and terminated by the output record separator. The *printf* statement formats its expression list according to the format (see *printf*(3S)).

The built-in function *length* returns the length of its argument taken as a string, or of the whole line if no argument. There are also built-in functions *exp, log, sqrt,* and *int*. The last truncates its argument to an integer. *substr(s, m, n)* returns the *n*-character substring of *s* that begins at position *m*. The function *sprintf(fmt, expr, expr, ...)* formats the expressions according to the *printf*(3S) format given by *fmt* and returns the resulting string.

Patterns are arbitrary Boolean combinations (!, ||, &&, and parentheses) of regular expressions and relational expressions. Regular expressions must be surrounded by slashes and are as in *egrep*. Isolated regular expressions in a pattern apply to the entire line. Regular expressions may also occur in relational expressions.

A pattern may consist of two patterns separated by a comma; in this case, the action is performed for all lines between an occurrence of the first pattern and the next occurrence of the second.

A relational expression is one of the following:

```
expression matchop regular-expression
expression relop expression
```

where a relop is any of the six relational operators in C, and a matchop is either ~ (for contains) or !~ (for does not contain). A conditional is an arithmetic expression, a relational expression, or a Boolean combination of these.

The special patterns BEGIN and END may be used to capture control before the first input line is read and after the last. BEGIN must be the first pattern, END the last.

A single character *c* may be used to separate the fields by starting the program with

```
BEGIN { FS = "c" }
```

or by using the **−F***c* option.

Other variable names with special meanings include NF, the number of fields in the current record; NR, the ordinal number of the current record; FILENAME, the name of the current input file; OFS, the output field separator (default blank); ORS, the output record separator (default newline); and OFMT, the output format for numbers (default "%.6g").

EXAMPLES

Print lines longer than 72 characters:

```
length > 72
```

Print first two fields in opposite order:

```
{ print $2, $1 }
```

Add up first column, print sum and average:

```
        { s += $1 }
END     { print "sum is", s, " average is", s/NR }
```

Print fields in reverse order:

```
{ for (i = NF; i > 0; --i) print $i }
```

Print all lines between start/stop pairs:

```
/start/, /stop/
```

Print all lines whose first field is different from previous one:

```
$1 != prev { print; prev = $1 }
```

SEE ALSO

lex(1), sed(1)

A. V. Aho, B. W. Kernighan, P. J. Weinberger, *Awk — a pattern scanning and processing language*

BUGS

There are no explicit conversions between numbers and strings. To force an expression to be treated as a number add 0 to it; to force it to be treated as a string concatenate "" to it.

NAME

basename — strip filename affixes

SYNOPSIS

basename string [suffix]

DESCRIPTION

Basename deletes any prefix ending in '/' and the *suffix*, if present in *string*, from *string*, and prints the result on the standard output. It is normally used inside substitution marks ` ` in shell procedures.

This shell procedure invoked with the argument */usr/src/bin/cat.c* compiles the named file and moves the output to *cat* in the current directory:

```
cc $1
mv a.out `basename $1 .c`
```

SEE ALSO

sh(1)

1

NAME

bc − arbitrary-precision arithmetic language

SYNOPSIS

bc [**−c**] [**−l**] [file ...]

DESCRIPTION

Bc is an interactive processor for a language which resembles C but provides unlimited precision arithmetic. It takes input from any files given, then reads the standard input. The **−l** argument stands for the name of an arbitrary precision math library. The syntax for *bc* programs is as follows; L means letter a-z, E means expression, S means statement.

Comments

are enclosed in /* and */.

Names

simple variables: L
array elements: L [E]
The words 'ibase', 'obase', and 'scale'

Other operands

arbitrarily long numbers with optional sign and decimal point.
(E)
sqrt (E)
length (E) number of significant decimal digits
scale (E) number of digits right of decimal point
L (E , ... , E)

Operators

+ − * / % ^ (% is remainder; ^ is power)
++ −− (prefix and postfix; apply to names)
== <= >= != < >
= += −= *= /= %= ^=

Statements

E
{ S ; ... ; S }
if (E) S
while (E) S
for (E ; E ; E) S
null statement
break
quit

Function definitions

```
define L ( L ,..., L ) {
        auto L, ... , L
        S; ... S
        return ( E )
}
```

Functions in −l math library

s(x)	sine
c(x)	cosine
e(x)	exponential
l(x)	log
a(x)	arctangent
j(n,x)	Bessel function

All function arguments are passed by value.

The value of a statement that is an expression is printed unless the main operator is an assignment. Either semicolons or newlines may separate statements. Assignment to *scale* influences the number of digits to be retained on arithmetic operations in the manner of *dc*(1). Assignments to *ibase* or *obase* set the input and output number radix respectively.

The same letter may be used as an array, a function, and a simple variable simultaneously. All variables are global to the program. 'Auto' variables are pushed down during function calls. When using arrays as function arguments or defining them as automatic variables empty square brackets must follow the array name.

For example

```
scale = 20
define e(x){
        auto a, b, c, i, s
        a = 1
        b = 1
        s = 1
        for(i=1; 1==1; i++){
                a = a*x
                b = b*i
                c = a/b
                if(c == 0) return(s)
                s = s+c
        }
}
```

defines a function to compute an approximate value of the exponential function and

```
for(i=1; i<=10; i++) e(i)
```

prints approximate values of the exponential function of the first ten integers.

Bc is actually a preprocessor for *dc*(1), which it invokes automatically, unless the **−c** (compile only) option is present. In this case the *dc* input is sent to the standard output instead.

FILES

/usr/lib/lib.b mathematical library
dc(1) desk calculator proper

SEE ALSO

dc(1)
L. L. Cherry and R. Morris, *BC − An arbitrary precision desk-calculator language*

BUGS

No &&, ||, or ! operators.
For statement must have all three E's.
Quit is interpreted when read, not when executed.

NAME

biff − be notified if mail arrives and who it is from

SYNOPSIS

biff [**yn**]

DESCRIPTION

Biff informs the system whether you want to be notified when mail arrives during the current terminal session. The command

biff y

enables notification; the command

biff n

disables it. When mail notification is enabled, the header and first few lines of the message will be printed on your screen whenever mail arrives. A "biff y" command is often included in the file *.login* or *.profile* to be executed at each login.

Biff operates asynchronously. For synchronous notification use the MAIL variable of *sh*(1) or the *mail* variable of *csh*(1).

SEE ALSO

csh(1), sh(1), mail(1), comsat(8C)

NAME

binmail − send or receive mail among users

SYNOPSIS

/bin/mail [**+**] [**−i**] [person] ...
/bin/mail [**+**] [**−i**] **−f** file

DESCRIPTION

Note: This is the old version 7 UNIX system mail program. The default *mail* command is described in *Mail*(1), and its binary is in the directory */usr/ucb*.

mail with no argument prints a user's mail, message-by-message, in last-in, first-out order; the optional argument **+** displays the mail messages in first-in, first-out order. For each message, it reads a line from the standard input to direct disposition of the message.

newline
: Go on to next message.

d
: Delete message and go on to the next.

p
: Print message again.

−
: Go back to previous message.

s [*file*] ...
: Save the message in the named *files* ('mbox' default).

w [*file*] ...
: Save the message, without a header, in the named *files* ('mbox' default).

m [*person*] ...
: Mail the message to the named *persons* (yourself is default).

EOT (control-D)
: Put unexamined mail back in the mailbox and stop.

q
: Same as EOT.

!*command*
: Escape to the Shell to do *command*.

*
: Print a command summary.

An interrupt normally terminates the *mail* command; the mail file is unchanged. The optional argument **−i** tells *mail* to continue after interrupts.

When *persons* are named, *mail* takes the standard input up to an end-of-file (or a line with just '.') and adds it to each *person's* 'mail' file. The message is preceded by the sender's name and a postmark. Lines that look like postmarks are prepended with '>'. A *person* is usually a user name recognized by *login*(1). To denote a recipient on a remote system, prefix *person* by the system name and exclamation mark (see *uucp*(1C)).

The **−f** option causes the named file, for example, 'mbox', to be printed as if it were the mail file.

When a user logs in he is informed of the presence of mail.

FILES

/etc/passwd	to identify sender and locate persons
/usr/spool/mail/*	incoming mail for user *
mbox	saved mail
/tmp/ma*	temp file
/usr/spool/mail/*.lock	lock for mail directory
dead.letter	unmailable text

SEE ALSO

Mail(1), write(1), uucp(1C), uux(1C), xsend(1), sendmail(8)

BUGS

Race conditions sometimes result in a failure to remove a lock file.

Normally anybody can read your mail, unless it is sent by *xsend*(1). An installation can overcome this by making *mail* a set-user-id command that owns the mail directory.

NAME

cal — print calendar

SYNOPSIS

cal [month] year

DESCRIPTION

Cal prints a calendar for the specified year. If a month is also specified, a calendar just for that month is printed. *Year* can be between 1 and 9999. The *month* is a number between 1 and 12. The calendar produced is that for England and her colonies.

Try September 1752.

BUGS

The year is always considered to start in January even though this is historically naive. Beware that 'cal 78' refers to the early Christian era, not the 20th century.

NAME

calendar – reminder service

SYNOPSIS

calendar [–]

DESCRIPTION

Calendar consults the file 'calendar' in the current directory and prints out lines that contain today's or tomorrow's date anywhere in the line. Most reasonable month-day dates such as 'Dec. 7,' 'december 7,' '12/7,' etc., are recognized, but not '7 December' or '7/12'. If you give the month as "*" with a date, i.e. "* 1", that day in any month will do. On weekends 'tomorrow' extends through Monday.

When an argument is present, *calendar* does its job for every user who has a file 'calendar' in his login directory and sends him any positive results by *mail*(1). Normally this is done daily in the wee hours under control of *cron*(8).

The file 'calendar' is first run through the "C" preprocessor, */lib/cpp*, to include any other calendar files specified with the usual "#include" syntax. Included calendars will usually be shared by all users, maintained and documented by the local administration.

FILES

calendar
/usr/lib/calendar to figure out today's and tomorrow's dates
/etc/passwd
/tmp/cal*
/lib/cpp, egrep, sed, mail as subprocesses

SEE ALSO

at(1), cron(8), mail(1)

BUGS

Calendar's extended idea of 'tomorrow' doesn't account for holidays.

NAME

cat − catenate and print

SYNOPSIS

cat [**−u**] [**−n**] [**−s**] [**−v**] file ...

DESCRIPTION

Cat reads each *file* in sequence and displays it on the standard output. Thus

cat file

displays the file on the standard output, and

cat file1 file2 >*file3*

concatenates the first two files and places the result on the third.

If no input file is given, or if the argument '−' is encountered, *cat* reads from the standard input file. Output is buffered in 1024-byte blocks unless the standard output is a terminal, in which case it is line buffered. The **−u** option makes the output completely unbuffered.

The **−n** option displays the output lines preceded by lines numbers, numbered sequentially from 1. Specifying the **−b** option with the **−n** option omits the line numbers from blank lines.

The **−s** option crushes out multiple adjacent empty lines so that the output is displayed single spaced.

The **−v** option displays non-printing characters so that they are visible. Control characters print like ^X for control-x; the delete character (octal 0177) prints as ^?. Non-ascii characters (with the high bit set) are printed as M- (for meta) followed by the character of the low 7 bits. A **−e** option may be given with the **−v** option, which displays a '$' character at the end of each line. Specifying the **−t** option with the **−v** option displays tab characters as ^I.

SEE ALSO

cp(1), ex(1), more(1), pr(1), tail(1)

BUGS

Beware of 'cat a b >a' and 'cat a b >b', which destroy the input files before reading them.

NAME

cb − C program beautifier

SYNOPSIS

cb

DESCRIPTION

Cb places a copy of the C program from the standard input on the standard output with spacing and indentation that displays the structure of the program.

NAME

cc − C compiler

SYNOPSIS

cc [option] ... file ...

DESCRIPTION

Cc is the UNIX C compiler. *Cc* accepts several types of arguments:

Arguments whose names end with '.c' are taken to be C source programs; they are compiled, and each object program is left on the file whose name is that of the source with '.o' substituted for '.c'. The '.o' file is normally deleted, however, if a single C program is compiled and loaded all at one go.

In the same way, arguments whose names end with '.s' are taken to be assembly source programs and are assembled, producing a '.o' file.

The following options are interpreted by *cc*. See *ld*(1) for load-time options.

−c Suppress the loading phase of the compilation, and force an object file to be produced even if only one program is compiled.

−g Have the compiler produce additional symbol table information for *dbx*(1). Also pass the **−lg** flag to *ld*(1).

−go Have the compiler produce additional symbol table information for the obsolete debugger *sdb*(1). Also pass the **−lg** flag to *ld*(1).

−w Suppress warning diagnostics.

−p Arrange for the compiler to produce code which counts the number of times each routine is called. If loading takes place, replace the standard startup routine by one which automatically calls *monitor*(3) at the start and arranges to write out a *mon.out* file at normal termination of execution of the object program. An execution profile can then be generated by use of *prof*(1).

−pg Causes the compiler to produce counting code in the manner of **−p**, but invokes a run-time recording mechanism that keeps more extensive statistics and produces a *gmon.out* file at normal termination. Also, a profiling library is searched, in lieu of the standard C library. An execution profile can then be generated by use of *gprof*(1).

−O Invoke an object-code improver.

−R Passed on to *as*, making initialized variables shared and read-only.

−S Compile the named C programs, and leave the assembler-language output on corresponding files suffixed '.s'.

−E Run only the macro preprocessor on the named C programs, and send the result to the standard output.

−C prevent the macro preprocessor from eliding comments.

−o *output*
Name the final output file *output*. If this option is used the file 'a.out' will be left undisturbed.

−D*name*=*def*
−D*name*
Define the *name* to the preprocessor, as if by '#define'. If no definition is given, the name is defined as "1".

−U*name*
Remove any initial definition of *name*.

-I*dir* '#include' files whose names do not begin with '/' are always sought first in the directory of the *file* argument, then in directories named in **-I** options, then in directories on a standard list.

-B*string*
Find substitute compiler passes in the files named *string* with the suffixes cpp, ccom and c2. If *string* is empty, use a standard backup version.

-t[p012]
Find only the designated compiler passes in the files whose names are constructed by a **-B** option. In the absence of a **-B** option, the *string* is taken to be '/usr/c/'.

Other arguments are taken to be either loader option arguments, or C-compatible object programs, typically produced by an earlier *cc* **run**, or perhaps libraries of C-compatible routines. These programs, together with the results of any compilations specified, are loaded (in the order given) to produce an executable program with name **a.out**.

FILES

file.c	input file
file.o	object file
a.out	loaded output
/tmp/ctm?	temporary
/lib/cpp	preprocessor
/lib/ccom	compiler
/usr/c/occom	backup compiler
/usr/c/ocpp	backup preprocessor
/lib/c2	optional optimizer
/lib/crt0.o	runtime startoff
/lib/mcrt0.o	startoff for profiling
/usr/lib/gcrt0.o	startoff for gprof-profiling
/lib/libc.a	standard library, see *intro*(3)
/usr/lib/libc_p.a	profiling library, see *intro*(3)
/usr/include	standard directory for '#include' files
mon.out	file produced for analysis by *prof*(1)
gmon.out	file produced for analysis by *gprof*(1)

SEE ALSO

B. W. Kernighan and D. M. Ritchie, *The C Programming Language,* Prentice-Hall, 1978
B. W. Kernighan, *Programming in C—a tutorial*
D. M. Ritchie, *C Reference Manual*
monitor(3), prof(1), gprof(1), adb(1), ld(1), dbx(1), as(1)

DIAGNOSTICS

The diagnostics produced by C itself are intended to be self-explanatory. Occasional messages may be produced by the assembler or loader.

BUGS

The compiler currently ignores advice to put **char**, **unsigned char**, **short** or **unsigned short** variables in registers. It previously produced poor, and in some cases incorrect, code for such declarations.

NAME

cd — change working directory

SYNOPSIS

cd directory

DESCRIPTION

Directory becomes the new working directory. The process must have execute (search) permission in *directory*.

Because a new process is created to execute each command, *cd* would be ineffective if it were written as a normal command. It is therefore recognized and executed by the shells. In *csh*(1) you may specify a list of directories in which *directory* is to be sought as a subdirectory if it is not a subdirectory of the current directory; see the description of the *cdpath* variable in *csh*(1).

SEE ALSO

csh(1), sh(1), pwd(1), chdir(2)

NAME

checknr − check nroff/troff files

SYNOPSIS

checknr [**−s**] [**−f**] [**−a**.x1.y1.x2.y2. ... .xn.yn] [**−c**.x1.x2.x3 ... .xn] [*file* ...]

DESCRIPTION

Checknr checks a list of *nroff*(1) or *troff*(1) input files for certain kinds of errors involving mismatched opening and closing delimiters and unknown commands. If no files are specified, *checknr* checks the standard input. Delimeters checked are:

(1) Font changes using \fx ... \fP.

(2) Size changes using \sx ... \s0.

(3) Macros that come in open ... close forms, for example, the .TS and .TE macros which must always come in pairs.

Checknr knows about the *ms*(7) and *me*(7) macro packages.

Additional pairs of macros can be added to the list using the **−a** option. This must be followed by groups of six characters, each group defining a pair of macros. The six characters are a period, the first macro name, another period, and the second macro name. For example, to define a pair .BS and .ES, use **−a**.BS.ES

The **−c** option defines commands which would otherwise be complained about as undefined.

The **−f** option requests *checknr* to ignore \f font changes.

The **−s** option requests *checknr* to ignore \s size changes.

Checknr is intended to be used on documents that are prepared with *checknr* in mind, much the same as *lint*. It expects a certain document writing style for \f and \s commands, in that each \fx must be terminated with \fP and each \sx must be terminated with \s0. While it will work to directly go into the next font or explicitly specify the original font or point size, and many existing documents actually do this, such a practice will produce complaints from *checknr*. Since it is probably better to use the \fP and \s0 forms anyway, you should think of this as a contribution to your document preparation style.

SEE ALSO

nroff(1), troff(1), checkeq(1), ms(7), me(7)

DIAGNOSTICS

Complaints about unmatched delimiters.
Complaints about unrecognized commands.
Various complaints about the syntax of commands.

AUTHOR

Mark Horton

BUGS

There is no way to define a 1 character macro name using **−a**.
Does not correctly recognize certain reasonable constructs, such as conditionals.

NAME

chfn − change finger entry

SYNOPSIS

chfn [loginname]

DESCRIPTION

Chfn is used to change information about users. This information is used by the finger program, among others. It consists of the user's "real life" name, office room number, office phone number, and home phone number. *Chfn* prompts the user for each field. Included in the prompt is a default value, which is enclosed between brackets. The default value is accepted simply by typing <return>. To enter a blank field, type the word 'none'. Below is a sample run:

Name [Biff Studsworth II]:
Room number (Exs: 597E or 197C) []: 521E
Office Phone (Ex: 1632) []: 1863
Home Phone (Ex: 987532) [5771546]: none

Chfn allows phone numbers to be entered with or without hyphens. Because *finger* only knows about UCB extensions, *chfn* will insist upon a four digit number (after the hyphens are removed) for office phone numbers. Also, room numbers must be in Evans or Cory; again, this is because of *finger*.

It is a good idea to run finger after running *chfn* to make sure everything is the way you want it.

The optional argument **loginname** is used to change another person's finger information. This can only be done by the super-user.

FILES

/etc/passwd, /etc/ptmp

SEE ALSO

finger(1), passwd(5)

BUGS

The encoding of the office and extension information is installation dependent.

For historical reasons, the user's name, etc are stored in the passwd file. This is a bad place to store the information. Rumors are that a data base is being developed to store this information, but don't hold your breath.

Because two users may try to write the passwd file at once, a synchronization method was developed. On rare occasions, a message that the password file is "busy" will be printed. In this case, *chfn* sleeps for a while and then tries to write to the passwd file again.

NAME

chgrp — change group

SYNOPSIS

chgrp [-f] group file ...

DESCRIPTION

Chgrp changes the group-ID of the *files* to *group*. The group may be either a decimal GID or a group name found in the group-ID file.

The user invoking *chgrp* must belong to the specified group and be the owner of the file, or be the super-user.

No errors are reported when the **−f** (force) option is given.

FILES

/etc/group

SEE ALSO

chown(2), passwd(5), group(5)

NAME

chmod − change mode

SYNOPSIS

chmod mode file ...

DESCRIPTION

The mode of each named file is changed according to *mode*, which may be absolute or symbolic. An absolute *mode* is an octal number constructed from the OR of the following modes:

4000	set user ID on execution
2000	set group ID on execution
1000	sticky bit, see *chmod*(2)
0400	read by owner
0200	write by owner
0100	execute (search in directory) by owner
0070	read, write, execute (search) by group
0007	read, write, execute (search) by others

A symbolic *mode* has the form:

[*who*] *op permission* [*op permission*] ...

The *who* part is a combination of the letters **u** (for user's permissions), **g** (group) and **o** (other). The letter **a** stands for all, or **ugo**. If *who* is omitted, the default is *a* but the setting of the file creation mask (see umask(2)) is taken into account.

Op can be **+** to add *permission* to the file's mode, **−** to take away *permission* and **=** to assign *permission* absolutely (all other bits will be reset).

Permission is any combination of the letters **r** (read), **w** (write), **x** (execute), **s** (set owner or group id) and **t** (save text − sticky). Letters **u**, **g** or **o** indicate that *permission* is to be taken from the current mode. Omitting *permission* is only useful with **=** to take away all permissions.

EXAMPLES

The first example denies write permission to others, the second makes a file executable:

```
chmod o−w file
chmod +x file
```

Multiple symbolic modes separated by commas may be given. Operations are performed in the order specified. The letter **s** is only useful with **u** or **g**.

Only the owner of a file (or the super-user) may change its mode.

SEE ALSO

ls(1), chmod(2), stat(2), umask(2), chown(8)

NAME

chsh — change default login shell

SYNOPSIS

chsh name [shell]

DESCRIPTION

Chsh is a command similar to *passwd*(1) except that it is used to change the login shell field of the password file rather than the password entry. If no *shell* is specified then the shell reverts to the default login shell */bin/sh*. Otherwise only */bin/csh*, */bin/oldcsh*, or */usr/new/csh* can be specified as the shell unless you are the super-user.

An example use of this command would be

```
chsh bill /bin/csh
```

SEE ALSO

csh(1), passwd(1), passwd(5)

NAME

clear — clear terminal screen

SYNOPSIS

clear

DESCRIPTION

Clear clears your screen if this is possible. It looks in the environment for the terminal type and then in */etc/termcap* to figure out how to clear the screen.

FILES

/etc/termcap terminal capability data base

NAME

cmp − compare two files

SYNOPSIS

cmp [−l] [−s] file1 file2

DESCRIPTION

The two files are compared. (If *file1* is '−', the standard input is used.) Under default options, *cmp* makes no comment if the files are the same; if they differ, it announces the byte and line number at which the difference occurred. If one file is an initial subsequence of the other, that fact is noted.

Options:

−l Print the byte number (decimal) and the differing bytes (octal) for each difference.

−s Print nothing for differing files; return codes only.

SEE ALSO

diff(1), comm(1)

DIAGNOSTICS

Exit code 0 is returned for identical files, 1 for different files, and 2 for an inaccessible or missing argument.

NAME

col − filter reverse line feeds

SYNOPSIS

col [**−bfx**]

DESCRIPTION

Col reads the standard input and writes the standard output. It performs the line overlays implied by reverse line feeds (ESC-7 in ASCII) and by forward and reverse half line feeds (ESC-9 and ESC-8). *Col* is particularly useful for filtering multicolumn output made with the '.rt' command of *nroff* and output resulting from use of the *tbl*(1) preprocessor.

Although *col* accepts half line motions in its input, it normally does not emit them on output. Instead, text that would appear between lines is moved to the next lower full line boundary. This treatment can be suppressed by the **−f** (fine) option; in this case the output from *col* may contain forward half line feeds (ESC-9), but will still never contain either kind of reverse line motion.

If the **−b** option is given, *col* assumes that the output device in use is not capable of backspacing. In this case, if several characters are to appear in the same place, only the last one read will be taken.

The control characters SO (ASCII code 017), and SI (016) are assumed to start and end text in an alternate character set. The character set (primary or alternate) associated with each printing character read is remembered; on output, SO and SI characters are generated where necessary to maintain the correct treatment of each character.

Col normally converts white space to tabs to shorten printing time. If the **−x** option is given, this conversion is suppressed.

All control characters are removed from the input except space, backspace, tab, return, newline, ESC (033) followed by one of 7, 8, 9, SI, SO, and VT (013). This last character is an alternate form of full reverse line feed, for compatibility with some other hardware conventions. All other non-printing characters are ignored.

SEE ALSO

troff(1), tbl(1)

BUGS

Can't back up more than 128 lines.
No more than 800 characters, including backspaces, on a line.

NAME

colcrt − filter nroff output for CRT previewing

SYNOPSIS

colcrt [−] [−2] [file ...]

DESCRIPTION

Colcrt provides virtual half-line and reverse line feed sequences for terminals without such capability, and on which overstriking is destructive. Half-line characters and underlining (changed to dashing '−') are placed on new lines in between the normal output lines.

The optional − suppresses all underlining. It is especially useful for previewing *allboxed* tables from *tbl*(1).

The option −2 causes all half-lines to be printed, effectively double spacing the output. Normally, a minimal space output format is used which will suppress empty lines. The program never suppresses two consecutive empty lines, however. The −2 option is useful for sending output to the line printer when the output contains superscripts and subscripts which would otherwise be invisible.

A typical use of *colcrt* would be

```
tbl exum2.n | nroff −ms | colcrt − | more
```

SEE ALSO

nroff/troff(1), col(1), more(1), ul(1)

AUTHOR

William Joy

BUGS

Should fold underlines onto blanks even with the '−' option so that a true underline character would show; if we did this, however, *colcrt* wouldn't get rid of *cu'd* underlining completely.

Can't back up more than 102 lines.

General overstriking is lost; as a special case ↑ overstruck with '−' or underline becomes '+'.

Lines are trimmed to 132 characters.

Some provision should be made for processing superscripts and subscripts in documents which are already double-spaced.

NAME

colrm − remove columns from a file

SYNOPSIS

colrm [startcol [endcol]]

DESCRIPTION

Colrm removes selected columns from a file. Input is taken from standard input. Output is sent to standard output.

If called with one parameter the columns of each line will be removed starting with the specified column. If called with two parameters the columns from the first column to the last column will be removed.

Column numbering starts with column 1.

SEE ALSO

expand(1)

AUTHOR

Jeff Schriebman

NAME

comm − select or reject lines common to two sorted files

SYNOPSIS

comm [− [123]] file1 file2

DESCRIPTION

Comm reads *file1* and *file2*, which should be ordered in ASCII collating sequence, and produces a three column output: lines only in *file1;* lines only in *file2;* and lines in both files. The filename '−' means the standard input.

Flags 1, 2, or 3 suppress printing of the corresponding column. Thus **comm −12** prints only the lines common to the two files; **comm −23** prints only lines in the first file but not in the second; **comm −123** is a no-op.

SEE ALSO

cmp(1), diff(1), uniq(1)

NAME

compact, uncompact, ccat — compress and uncompress files, and cat them

SYNOPSIS

compact [name ...]
uncompact [name ...]
ccat [file ...]

DESCRIPTION

Compact compresses the named files using an adaptive Huffman code. If no file names are given, the standard input is compacted to the standard output. *Compact* operates as an on-line algorithm. Each time a byte is read, it is encoded immediately according to the current prefix code. This code is an optimal Huffman code for the set of frequencies seen so far. It is unnecessary to prepend a decoding tree to the compressed file since the encoder and the decoder start in the same state and stay synchronized. Furthermore, *compact* and *uncompact* can operate as filters. In particular,

... | compact | uncompact | ...

operates as a (very slow) no-op.

When an argument *file* is given, it is compacted and the resulting file is placed in *file.C; file* is unlinked. The first two bytes of the compacted file code the fact that the file is compacted. This code is used to prohibit recompaction.

The amount of compression to be expected depends on the type of file being compressed. Typical values of compression are: Text (38%), Pascal Source (43%), C Source (36%) and Binary (19%). These values are the percentages of file bytes reduced.

Uncompact restores the original file from a file compressed by *compact.* If no file names are given, the standard input is uncompacted to the standard output.

Ccat cats the original file from a file compressed by *compact,* without uncompressing the file.

RESTRICTION

The last segment of the filename must contain fewer than thirteen characters to allow space for the appended '.C'.

FILES

*.C	compacted file created by compact, removed by uncompact

SEE ALSO

Gallager, Robert G., 'Variations on a Theme of Huffman', *I.E.E.E. Transactions on Information Theory,* vol. IT-24, no. 6, November 1978, pp. 668 - 674.

AUTHOR

Colin L. Mc Master

NAME

cp − copy

SYNOPSIS

cp [**−i**] [**−r**] file1 file2

cp [**−i**] [**−r**] file ... directory

DESCRIPTION

File1 is copied onto *file2*. The mode and owner of *file2* are preserved if it already existed; the mode of the source file is used otherwise.

In the second form, one or more *files* are copied into the *directory* with their original file-names.

Cp refuses to copy a file onto itself.

If the **−i** option is specified, *cp* will prompt the user with the name of the file whenever the copy will cause an old file to be overwritten. An answer of 'y' will cause *cp* to continue. Any other answer will prevent it from overwriting the file.

If the **−r** option is specified and any of the source files are directories, *cp* copies each subtree rooted at that name; in this case the destination must be a directory.

SEE ALSO

cat(1), pr(1), mv(1)

NAME

crypt — encode/decode

SYNOPSIS

crypt [password]

DESCRIPTION

Crypt reads from the standard input and writes on the standard output. The *password* is a key that selects a particular transformation. If no *password* is given, *crypt* demands a key from the terminal and turns off printing while the key is being typed in. *Crypt* encrypts and decrypts with the same key:

```
crypt key <clear >cypher
crypt key <cypher | pr
```

will print the clear.

Files encrypted by *crypt* are compatible with those treated by the editor *ed* in encryption mode.

The security of encrypted files depends on three factors: the fundamental method must be hard to solve; direct search of the key space must be infeasible; 'sneak paths' by which keys or cleartext can become visible must be minimized.

Crypt implements a one-rotor machine designed along the lines of the German Enigma, but with a 256-element rotor. Methods of attack on such machines are known, but not widely; moreover the amount of work required is likely to be large.

The transformation of a key into the internal settings of the machine is deliberately designed to be expensive, i.e. to take a substantial fraction of a second to compute. However, if keys are restricted to (say) three lower-case letters, then encrypted files can be read by expending only a substantial fraction of five minutes of machine time.

Since the key is an argument to the *crypt* command, it is potentially visible to users executing *ps*(1) or a derivative. To minimize this possibility, *crypt* takes care to destroy any record of the key immediately upon entry. No doubt the choice of keys and key security are the most vulnerable aspect of *crypt*.

FILES

/dev/tty for typed key

SEE ALSO

ed(1), makekey(8)

BUGS

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NAME

csh − a shell (command interpreter) with C-like syntax

SYNOPSIS

csh [**−cefinstvVxX**] [arg ...]

DESCRIPTION

Csh is a first implementation of a command language interpreter incorporating a history mechanism (see **History Substitutions**) job control facilities (see **Jobs**) and a C-like syntax. So as to be able to use its job control facilities, users of *csh* must (and automatically) use the new tty driver fully described in *tty*(4). This new tty driver allows generation of interrupt characters from the keyboard to tell jobs to stop. See *stty*(1) for details on setting options in the new tty driver.

An instance of *csh* begins by executing commands from the file '.cshrc' in the *home* directory of the invoker. If this is a login shell then it also executes commands from the file '.login' there. It is typical for users on crt's to put the command "stty crt" in their *.login* file, and to also invoke *tset*(1) there.

In the normal case, the shell will then begin reading commands from the terminal, prompting with '% '. Processing of arguments and the use of the shell to process files containing command scripts will be described later.

The shell then repeatedly performs the following actions: a line of command input is read and broken into *words*. This sequence of words is placed on the command history list and then parsed. Finally each command in the current line is executed.

When a login shell terminates it executes commands from the file '.logout' in the users home directory.

Lexical structure

The shell splits input lines into words at blanks and tabs with the following exceptions. The characters '&' '|' ';' '<' '>' '(' ')' form separate words. If doubled in '&&', '||', '<<' or '>>' these pairs form single words. These parser metacharacters may be made part of other words, or prevented their special meaning, by preceding them with '\'. A newline preceded by a '\' is equivalent to a blank.

In addition strings enclosed in matched pairs of quotations, '`', '"' or '"', form parts of a word; metacharacters in these strings, including blanks and tabs, do not form separate words. These quotations have semantics to be described subsequently. Within pairs of '`' or '"' characters a newline preceded by a '\' gives a true newline character.

When the shell's input is not a terminal, the character '#' introduces a comment which continues to the end of the input line. It is prevented this special meaning when preceded by '\' and in quotations using '`', '"', and '"'.

Commands

A simple command is a sequence of words, the first of which specifies the command to be executed. A simple command or a sequence of simple commands separated by '|' characters forms a pipeline. The output of each command in a pipeline is connected to the input of the next. Sequences of pipelines may be separated by ';', and are then executed sequentially. A sequence of pipelines may be executed without immediately waiting for it to terminate by following it with an '&'.

Any of the above may be placed in '(' ')' to form a simple command (which may be a component of a pipeline, etc.) It is also possible to separate pipelines with '||' or '&&' indicating, as in the C language, that the second is to be executed only if the first fails or succeeds respectively. (See *Expressions.)*

Jobs

The shell associates a *job* with each pipeline. It keeps a table of current jobs, printed by the *jobs* command, and assigns them small integer numbers. When a job is started asynchronously with '&', the shell prints a line which looks like:

[1] 1234

indicating that the jobs which was started asynchronously was job number 1 and had one (top-level) process, whose process id was 1234.

If you are running a job and wish to do something else you may hit the key ^Z (control-Z) which sends a STOP signal to the current job. The shell will then normally indicate that the job has been 'Stopped', and print another prompt. You can then manipulate the state of this job, putting it in the background with the *bg* command, or run some other commands and then eventually bring the job back into the foreground with the foreground command *fg*. A ^Z takes effect immediately and is like an interrupt in that pending output and unread input are discarded when it is typed. There is another special key ^Y which does not generate a STOP signal until a program attempts to *read*(2) it. This can usefully be typed ahead when you have prepared some commands for a job which you wish to stop after it has read them.

A job being run in the background will stop if it tries to read from the terminal. Background jobs are normally allowed to produce output, but this can be disabled by giving the command "stty tostop". If you set this tty option, then background jobs will stop when they try to produce output like they do when they try to read input.

There are several ways to refer to jobs in the shell. The character '%' introduces a job name. If you wish to refer to job number 1, you can name it as '%1'. Just naming a job brings it to the foreground; thus '%1' is a synonym for 'fg %1', bringing job 1 back into the foreground. Similarly saying '%1 &' resumes job 1 in the background. Jobs can also be named by prefixes of the string typed in to start them, if these prefixes are unambiguous, thus '%ex' would normally restart a suspended *ex*(1) job, if there were only one suspended job whose name began with the string 'ex'. It is also possible to say '%?string' which specifies a job whose text contains *string*, if there is only one such job.

The shell maintains a notion of the current and previous jobs. In output pertaining to jobs, the current job is marked with a '+' and the previous job with a '−'. The abbreviation '%+' refers to the current job and '%−' refers to the previous job. For close analogy with the syntax of the *history* mechanism (described below), '%%' is also a synonym for the current job.

Status reporting

This shell learns immediately whenever a process changes state. It normally informs you whenever a job becomes blocked so that no further progress is possible, but only just before it prints a prompt. This is done so that it does not otherwise disturb your work. If, however, you set the shell variable *notify*, the shell will notify you immediately of changes of status in background jobs. There is also a shell command *notify* which marks a single process so that its status changes will be immediately reported. By default *notify* marks the current process; simply say 'notify' after starting a background job to mark it.

When you try to leave the shell while jobs are stopped, you will be warned that 'You have stopped jobs.' You may use the *jobs* command to see what they are. If you do this or immediately try to exit again, the shell will not warn you a second time, and the suspended jobs will be terminated.

Substitutions

We now describe the various transformations the shell performs on the input in the order in which they occur.

History substitutions

History substitutions place words from previous command input as portions of new commands, making it easy to repeat commands, repeat arguments of a previous command in the current command, or fix spelling mistakes in the previous command with little typing and a high degree of confidence. History substitutions begin with the character '!' and may begin **anywhere** in the input stream (with the proviso that they **do not** nest.) This '!' may be preceded by an '\' to prevent its special meaning; for convenience, a '!' is passed unchanged when it is followed by a blank, tab, newline, '=' or '('. (History substitutions also occur when an input line begins with '↑'. This special abbreviation will be described later.) Any input line which contains history substitution is echoed on the terminal before it is executed as it could have been typed without history substitution.

Commands input from the terminal which consist of one or more words are saved on the history list. The history substitutions reintroduce sequences of words from these saved commands into the input stream. The size of which is controlled by the *history* variable; the previous command is always retained, regardless of its value. Commands are numbered sequentially from 1.

For definiteness, consider the following output from the *history* command:

```
 9 write michael
10 ex write.c
11 cat oldwrite.c
12 diff *write.c
```

The commands are shown with their event numbers. It is not usually necessary to use event numbers, but the current event number can be made part of the *prompt* by placing an '!' in the prompt string.

With the current event 13 we can refer to previous events by event number '!11', relatively as in '!−2' (referring to the same event), by a prefix of a command word as in '!d' for event 12 or '!wri' for event 9, or by a string contained in a word in the command as in '!?mic?' also referring to event 9. These forms, without further modification, simply reintroduce the words of the specified events, each separated by a single blank. As a special case '!!' refers to the previous command; thus '!!' alone is essentially a *redo*.

To select words from an event we can follow the event specification by a ':' and a designator for the desired words. The words of a input line are numbered from 0, the first (usually command) word being 0, the second word (first argument) being 1, etc. The basic word designators are:

0	first (command) word
n	*n*'th argument
↑	first argument, i.e. '1'
$	last argument
%	word matched by (immediately preceding) ?*s*? search
x−*y*	range of words
−*y*	abbreviates '0−*y*'
*	abbreviates '↑−$', or nothing if only 1 word in event
*x**	abbreviates '*x*−$'
x−	like '*x**' but omitting word '$'

The ':' separating the event specification from the word designator can be omitted if the argument selector begins with a '↑', '$', '*' '−' or '%'. After the optional word designator can be placed a sequence of modifiers, each preceded by a ':'. The following modifiers are defined:

h	Remove a trailing pathname component, leaving the head.
r	Remove a trailing '.xxx' component, leaving the root name.
e	Remove all but the extension '.xxx' part.
s/*l*/*r*/	Substitute *l* for *r*
t	Remove all leading pathname components, leaving the tail.
&	Repeat the previous substitution.
g	Apply the change globally, prefixing the above, e.g. 'g&'.
p	Print the new command but do not execute it.
q	Quote the substituted words, preventing further substitutions.
x	Like q, but break into words at blanks, tabs and newlines.

Unless preceded by a 'g' the modification is applied only to the first modifiable word. With substitutions, it is an error for no word to be applicable.

The left hand side of substitutions are not regular expressions in the sense of the editors, but rather strings. Any character may be used as the delimiter in place of '/'; a '\' quotes the delimiter into the *l* and *r* strings. The character '&' in the right hand side is replaced by the text from the left. A '\' quotes '&' also. A null *l* uses the previous string either from a *l* or from a contextual scan string *s* in '!?*s*?'. The trailing delimiter in the substitution may be omitted if a newline follows immediately as may the trailing '?' in a contextual scan.

A history reference may be given without an event specification, e.g. '!$'. In this case the reference is to the previous command unless a previous history reference occurred on the same line in which case this form repeats the previous reference. Thus '!?foo?↑ !$' gives the first and last arguments from the command matching '?foo?'.

A special abbreviation of a history reference occurs when the first non-blank character of an input line is a '↑'. This is equivalent to '!:s↑' providing a convenient shorthand for substitutions on the text of the previous line. Thus '↑lb↑lib' fixes the spelling of 'lib' in the previous command. Finally, a history substitution may be surrounded with '{' and '}' if necessary to insulate it from the characters which follow. Thus, after 'ls −ld ~paul' we might do '!{l}a' to do 'ls −ld ~paula', while '!la' would look for a command starting 'la'.

Quotations with ' and "

The quotation of strings by "'" and '"' can be used to prevent all or some of the remaining substitutions. Strings enclosed in "'" are prevented any further interpretation. Strings enclosed in '"' may be expanded as described below.

In both cases the resulting text becomes (all or part of) a single word; only in one special case (see *Command Substitition* below) does a '"' quoted string yield parts of more than one word; "'" quoted strings never do.

Alias substitution

The shell maintains a list of aliases which can be established, displayed and modified by the *alias* and *unalias* commands. After a command line is scanned, it is parsed into distinct commands and the first word of each command, left-to-right, is checked to see if it has an alias. If it does, then the text which is the alias for that command is reread with the history mechanism available as though that command were the previous input line. The resulting words replace the command and argument list. If no reference is made to the history list, then the argument list is left unchanged.

Thus if the alias for 'ls' is 'ls −l' the command 'ls /usr' would map to 'ls −l /usr', the argument list here being undisturbed. Similarly if the alias for 'lookup' was 'grep !↑ /etc/passwd' then 'lookup bill' would map to 'grep bill /etc/passwd'.

If an alias is found, the word transformation of the input text is performed and the aliasing process begins again on the reformed input line. Looping is prevented if the first word of the new text is the same as the old by flagging it to prevent further aliasing. Other loops are detected and cause an error.

Note that the mechanism allows aliases to introduce parser metasyntax. Thus we can 'alias print 'pr \!* | lpr'' to make a command which *pr's* its arguments to the line printer.

Variable substitution

The shell maintains a set of variables, each of which has as value a list of zero or more words. Some of these variables are set by the shell or referred to by it. For instance, the *argv* variable is an image of the shell's argument list, and words of this variable's value are referred to in special ways.

The values of variables may be displayed and changed by using the *set* and *unset* commands. Of the variables referred to by the shell a number are toggles; the shell does not care what their value is, only whether they are set or not. For instance, the *verbose* variable is a toggle which causes command input to be echoed. The setting of this variable results from the −v command line option.

Other operations treat variables numerically. The '@' command permits numeric calculations to be performed and the result assigned to a variable. Variable values are, however, always represented as (zero or more) strings. For the purposes of numeric operations, the null string is considered to be zero, and the second and subsequent words of multiword values are ignored.

After the input line is aliased and parsed, and before each command is executed, variable substitution is performed keyed by '$' characters. This expansion can be prevented by preceding the '$' with a '\' except within '"'s where it **always** occurs, and within "'s where it **never** occurs. Strings quoted by '`' are interpreted later (see *Command substitution* below) so '$' substitution does not occur there until later, if at all. A '$' is passed unchanged if followed by a blank, tab, or end-of-line.

Input/output redirections are recognized before variable expansion, and are variable expanded separately. Otherwise, the command name and entire argument list are expanded together. It is thus possible for the first (command) word to this point to generate more than one word, the first of which becomes the command name, and the rest of which become arguments.

Unless enclosed in '"' or given the ':q' modifier the results of variable substitution may eventually be command and filename substituted. Within '"' a variable whose value consists of multiple words expands to a (portion of) a single word, with the words of the variables value separated by blanks. When the ':q' modifier is applied to a substitution the variable will expand to multiple words with each word separated by a blank and quoted to prevent later command or filename substitution.

The following metasequences are provided for introducing variable values into the shell input. Except as noted, it is an error to reference a variable which is not set.

$name
${name}

Are replaced by the words of the value of variable *name,* each separated by a blank. Braces insulate *name* from following characters which would otherwise be part of it. Shell variables have names consisting of up to 20 letters and digits starting with a letter. The underscore character is considered a letter.

If *name* is not a shell variable, but is set in the environment, then that value is returned

(but : modifiers and the other forms given below are not available in this case).

$name[selector]
${name[selector]}
May be used to select only some of the words from the value of *name*. The selector is subjected to '$' substitution and may consist of a single number or two numbers separated by a '−'. The first word of a variables value is numbered '1'. If the first number of a range is omitted it defaults to '1'. If the last member of a range is omitted it defaults to '$#name'. The selector '*' selects all words. It is not an error for a range to be empty if the second argument is omitted or in range.

$#name
${#name}
Gives the number of words in the variable. This is useful for later use in a '[selector]'.

$0
Substitutes the name of the file from which command input is being read. An error occurs if the name is not known.

$number
${number}
Equivalent to '$argv[number]'.

$*
Equivalent to '$argv[*]'.

The modifiers ':h', ':t', ':r', ':q' and ':x' may be applied to the substitutions above as may ':gh', ':gt' and ':gr'. If braces '{' '}' appear in the command form then the modifiers must appear within the braces. **The current implementation allows only one ':' modifier on each '$' expansion.**

The following substitutions may not be modified with ':' modifiers.

$?name
${?name}
Substitutes the string '1' if name is set, '0' if it is not.

$?0
Substitutes '1' if the current input filename is known, '0' if it is not.

$$
Substitute the (decimal) process number of the (parent) shell.

$<
Substitutes a line from the standard input, with no further interpretation thereafter. It can be used to read from the keyboard in a shell script.

Command and filename substitution

The remaining substitutions, command and filename substitution, are applied selectively to the arguments of builtin commands. This means that portions of expressions which are not evaluated are not subjected to these expansions. For commands which are not internal to the shell, the command name is substituted separately from the argument list. This occurs very late, after input-output redirection is performed, and in a child of the main shell.

Command substitution

Command substitution is indicated by a command enclosed in `. The output from such a command is normally broken into separate words at blanks, tabs and newlines, with null words being discarded, this text then replacing the original string. Within `"`s, only newlines force new words; blanks and tabs are preserved.

In any case, the single final newline does not force a new word. Note that it is thus possible for a command substitution to yield only part of a word, even if the command outputs a complete line.

Filename substitution

If a word contains any of the characters '*', '?', '[' or '{' or begins with the character '~', then that word is a candidate for filename substitution, also known as 'globbing'. This word is then regarded as a pattern, and replaced with an alphabetically sorted list of file names which match the pattern. In a list of words specifying filename substitution it is an error for no pattern to match an existing file name, but it is not required for each pattern to match. Only the metacharacters '*', '?' and '[' imply pattern matching, the characters '~' and '{' being more akin to abbreviations.

In matching filenames, the character '.' at the beginning of a filename or immediately following a '/', as well as the character '/' must be matched explicitly. The character '*' matches any string of characters, including the null string. The character '?' matches any single character. The sequence '[...]' matches any one of the characters enclosed. Within '[...]', a pair of characters separated by '−' matches any character lexically between the two.

The character '~' at the beginning of a filename is used to refer to home directories. Standing alone, i.e. '~' it expands to the invokers home directory as reflected in the value of the variable *home*. When followed by a name consisting of letters, digits and '−' characters the shell searches for a user with that name and substitutes their home directory; thus '~ken' might expand to '/usr/ken' and '~ken/chmach' to '/usr/ken/chmach'. If the character '~' is followed by a character other than a letter or '/' or appears not at the beginning of a word, it is left undisturbed.

The metanotation 'a{b,c,d}e' is a shorthand for 'abe ace ade'. Left to right order is preserved, with results of matches being sorted separately at a low level to preserve this order. This construct may be nested. Thus '~source/s1/{oldls,ls}.c' expands to '/usr/source/s1/oldls.c /usr/source/s1/ls.c' whether or not these files exist without any chance of error if the home directory for 'source' is '/usr/source'. Similarly '../{memo,*box}' might expand to '../memo ../box ../mbox'. (Note that 'memo' was not sorted with the results of matching '*box'.) As a special case '{', '}' and '{}' are passed undisturbed.

Input/output

The standard input and standard output of a command may be redirected with the following syntax:

< name
: Open file *name* (which is first variable, command and filename expanded) as the standard input.

<< word
: Read the shell input up to a line which is identical to *word*. *Word* is not subjected to variable, filename or command substitution, and each input line is compared to *word* before any substitutions are done on this input line. Unless a quoting '\', '"', '' or '`' appears in *word* variable and command substitution is performed on the intervening lines, allowing '\' to quote '$', '\' and '`'. Commands which are substituted have all blanks, tabs, and newlines preserved, except for the final newline which is dropped. The resultant text is placed in an anonymous temporary file which is given to the command as standard input.

> name
>! name
>& name

>&! name
The file *name* is used as standard output. If the file does not exist then it is created; if the file exists, its is truncated, its previous contents being lost.

If the variable *noclobber* is set, then the file must not exist or be a character special file (e.g. a terminal or '/dev/null') or an error results. This helps prevent accidental destruction of files. In this case the '!' forms can be used and suppress this check.

The forms involving '&' route the diagnostic output into the specified file as well as the standard output. *Name* is expanded in the same way as '<' input filenames are.

>> name
>>& name
>>! name
>>&! name
Uses file *name* as standard output like '>' but places output at the end of the file. If the variable *noclobber* is set, then it is an error for the file not to exist unless one of the '!' forms is given. Otherwise similar to '>'.

A command receives the environment in which the shell was invoked as modified by the input-output parameters and the presence of the command in a pipeline. Thus, unlike some previous shells, commands run from a file of shell commands have no access to the text of the commands by default; rather they receive the original standard input of the shell. The '<<' mechanism should be used to present inline data. This permits shell command scripts to function as components of pipelines and allows the shell to block read its input. Note that the default standard input for a command run detached is **not** modified to be the empty file '/dev/null'; rather the standard input remains as the original standard input of the shell. If this is a terminal and if the process attempts to read from the terminal, then the process will block and the user will be notified (see **Jobs** above.)

Diagnostic output may be directed through a pipe with the standard output. Simply use the form '|&' rather than just '|'.

Expressions

A number of the builtin commands (to be described subsequently) take expressions, in which the operators are similar to those of C, with the same precedence. These expressions appear in the *@, exit, if,* and *while* commands. The following operators are available:

|| && | ↑ & == != =~ !~ <= >= < > << >> + - * / % ! ~ ( )

Here the precedence increases to the right, '==' '!=' '=~' and '!~', '<=' '>=' '<' and '>', '<<' and '>>', '+' and '-', '*' '/' and '%' being, in groups, at the same level. The '==' '!=' '=~' and '!~' operators compare their arguments as strings; all others operate on numbers. The operators '=~' and '!~' are like '!=' and '==' except that the right hand side is a *pattern* (containing, e.g. '*'s, '?'s and instances of '[...]') against which the left hand operand is matched. This reduces the need for use of the *switch* statement in shell scripts when all that is really needed is pattern matching.

Strings which begin with '0' are considered octal numbers. Null or missing arguments are considered '0'. The result of all expressions are strings, which represent decimal numbers. It is important to note that no two components of an expression can appear in the same word; except when adjacent to components of expressions which are syntactically significant to the parser ('&' '|' '<' '>' '(' ')') they should be surrounded by spaces.

Also available in expressions as primitive operands are command executions enclosed in '{' and '}' and file enquiries of the form '-*l* name' where *l* is one of:

r	read access
w	write access
x	execute access
e	existence
o	ownership
z	zero size
f	plain file
d	directory

The specified name is command and filename expanded and then tested to see if it has the specified relationship to the real user. If the file does not exist or is inaccessible then all enquiries return false, i.e. '0'. Command executions succeed, returning true, i.e. '1', if the command exits with status 0, otherwise they fail, returning false, i.e. '0'. If more detailed status information is required then the command should be executed outside of an expression and the variable *status* examined.

Control flow

The shell contains a number of commands which can be used to regulate the flow of control in command files (shell scripts) and (in limited but useful ways) from terminal input. These commands all operate by forcing the shell to reread or skip in its input and, due to the implementation, restrict the placement of some of the commands.

The *foreach, switch,* and *while* statements, as well as the *if–then–else* form of the *if* statement require that the major keywords appear in a single simple command on an input line as shown below.

If the shell's input is not seekable, the shell buffers up input whenever a loop is being read and performs seeks in this internal buffer to accomplish the rereading implied by the loop. (To the extent that this allows, backward goto's will succeed on non-seekable inputs.)

Builtin commands

Builtin commands are executed within the shell. If a builtin command occurs as any component of a pipeline except the last then it is executed in a subshell.

alias
alias name
alias name wordlist
The first form prints all aliases. The second form prints the alias for name. The final form assigns the specified *wordlist* as the alias of *name; wordlist* is command and filename substituted. *Name* is not allowed to be *alias* or *unalias.*

alloc
Shows the amount of dynamic core in use, broken down into used and free core, and address of the last location in the heap. With an argument shows each used and free block on the internal dynamic memory chain indicating its address, size, and whether it is used or free. This is a debugging command and may not work in production versions of the shell; it requires a modified version of the system memory allocator.

bg
bg %job ...
Puts the current or specified jobs into the background, continuing them if they were stopped.

break
Causes execution to resume after the *end* of the nearest enclosing *foreach* or *while.* The remaining commands on the current line are executed. Multi-level breaks are thus possible by writing them all on one line.

breaksw
Causes a break from a *switch*, resuming after the *endsw*.

case label:
A label in a *switch* statement as discussed below.

cd
cd name
chdir
chdir name
Change the shells working directory to directory *name*. If no argument is given then change to the home directory of the user.
If *name* is not found as a subdirectory of the current directory (and does not begin with '/', './' or '../'), then each component of the variable *cdpath* is checked to see if it has a subdirectory *name*. Finally, if all else fails but *name* is a shell variable whose value begins with '/', then this is tried to see if it is a directory.

continue
Continue execution of the nearest enclosing *while* or *foreach*. The rest of the commands on the current line are executed.

default:
Labels the default case in a *switch* statement. The default should come after all *case* labels.

dirs
Prints the directory stack; the top of the stack is at the left, the first directory in the stack being the current directory.

echo wordlist
echo **−n** wordlist
The specified words are written to the shells standard output, separated by spaces, and terminated with a newline unless the **−n** option is specified.

else
end
endif
endsw
See the description of the *foreach*, *if*, *switch*, and *while* statements below.

eval arg ...
(As in *sh*(1).) The arguments are read as input to the shell and the resulting command(s) executed in the context of the current shell. This is usually used to execute commands generated as the result of command or variable substitution, since parsing occurs before these substitutions. See *tset*(1) for an example of using *eval*.

exec command
The specified command is executed in place of the current shell.

exit
exit(expr)
The shell exits either with the value of the *status* variable (first form) or with the value of the specified *expr* (second form).

fg
fg %job ...
Brings the current or specified jobs into the foreground, continuing them if they were stopped.

foreach name (wordlist)
...
end

The variable *name* is successively set to each member of *wordlist* and the sequence of commands between this command and the matching *end* are executed. (Both *foreach* and *end* must appear alone on separate lines.)

The builtin command *continue* may be used to continue the loop prematurely and the builtin command *break* to terminate it prematurely. When this command is read from the terminal, the loop is read up once prompting with '?' before any statements in the loop are executed. If you make a mistake typing in a loop at the terminal you can rub it out.

glob wordlist

Like *echo* but no '\' escapes are recognized and words are delimited by null characters in the output. Useful for programs which wish to use the shell to filename expand a list of words.

goto word

The specified *word* is filename and command expanded to yield a string of the form 'label'. The shell rewinds its input as much as possible and searches for a line of the form 'label:' possibly preceded by blanks or tabs. Execution continues after the specified line.

hashstat

Print a statistics line indicating how effective the internal hash table has been at locating commands (and avoiding *exec*'s). An *exec* is attempted for each component of the *path* where the hash function indicates a possible hit, and in each component which does not begin with a '/'.

history
history *n*
history **−r** *n*
history **−h** *n*

Displays the history event list; if *n* is given only the *n* most recent events are printed. The **−r** option reverses the order of printout to be most recent first rather than oldest first. The **−h** option causes the history list to be printed without leading numbers. This is used to produce files suitable for sourceing using the −h option to *source*.

if (expr) command

If the specified expression evaluates true, then the single *command* with arguments is executed. Variable substitution on *command* happens early, at the same time it does for the rest of the *if* command. *Command* must be a simple command, not a pipeline, a command list, or a parenthesized command list. Input/output redirection occurs even if *expr* is false, when command is **not** executed (this is a bug).

if (expr) **then**
...
else if (expr2) **then**
...
else
...
endif

If the specified *expr* is true then the commands to the first *else* are executed; else if *expr2* is true then the commands to the second else are executed, etc. Any number of *else-if* pairs are possible; only one *endif* is needed. The *else* part is likewise optional. (The words *else* and *endif* must appear at the beginning of input lines; the *if* must appear alone on its input line or after an *else.)*

jobs
jobs −l
Lists the active jobs; given the −l options lists process id's in addition to the normal information.

kill %job
kill −sig %job ...
kill pid
kill −sig pid ...
kill −l
Sends either the TERM (terminate) signal or the specified signal to the specified jobs or processes. Signals are either given by number or by names (as given in */usr/include/signal.h,* stripped of the prefix "SIG"). The signal names are listed by "kill −l". There is no default, saying just 'kill' does not send a signal to the current job. If the signal being sent is TERM (terminate) or HUP (hangup), then the job or process will be sent a CONT (continue) signal as well.

limit
limit *resource*
limit *resource maximum-use*
Limits the consumption by the current process and each process it creates to not individually exceed *maximum-use* on the specified *resource.* If no *maximum-use* is given, then the current limit is printed; if no *resource* is given, then all limitations are given.

Resources controllable currently include *cputime* (the maximum number of cpu-seconds to be used by each process), *filesize* (the largest single file which can be created), *datasize* (the maximum growth of the data+stack region via *sbrk*(2) beyond the end of the program text), *stacksize* (the maximum size of the automatically-extended stack region), and *coredumpsize* (the size of the largest core dump that will be created).

The *maximum-use* may be given as a (floating point or integer) number followed by a scale factor. For all limits other than *cputime* the default scale is 'k' or 'kilobytes' (1024 bytes); a scale factor of 'm' or 'megabytes' may also be used. For *cputime* the default scaling is 'seconds', while 'm' for minutes or 'h' for hours, or a time of the form 'mm:ss' giving minutes and seconds may be used.

For both *resource* names and scale factors, unambiguous prefixes of the names suffice.

login
Terminate a login shell, replacing it with an instance of **/bin/login.** This is one way to log off, included for compatibility with *sh*(1).

logout
Terminate a login shell. Especially useful if *ignoreeof* is set.

nice
nice +number
nice command
nice +number command
The first form sets the *nice* for this shell to 4. The second form sets the *nice* to the given number. The final two forms run command at priority 4 and *number* respectively. The super-user may specify negative niceness by using 'nice −number ...'. Command is always executed in a sub-shell, and the restrictions place on commands in simple *if* statements apply.

nohup

nohup command
The first form can be used in shell scripts to cause hangups to be ignored for the remainder of the script. The second form causes the specified command to be run with hangups ignored. All processes detached with '&' are effectively *nohup'ed.*

notify
notify %job ...
Causes the shell to notify the user asynchronously when the status of the current or specified jobs changes; normally notification is presented before a prompt. This is automatic if the shell variable *notify* is set.

onintr
onintr −
onintr label
Control the action of the shell on interrupts. The first form restores the default action of the shell on interrupts which is to terminate shell scripts or to return to the terminal command input level. The second form 'onintr −' causes all interrupts to be ignored. The final form causes the shell to execute a 'goto label' when an interrupt is received or a child process terminates because it was interrupted.

In any case, if the shell is running detached and interrupts are being ignored, all forms of *onintr* have no meaning and interrupts continue to be ignored by the shell and all invoked commands.

popd
popd +n
Pops the directory stack, returning to the new top directory. With a argument '+*n*' discards the *n*th entry in the stack. The elements of the directory stack are numbered from 0 starting at the top.

pushd
pushd name
pushd +n
With no arguments, *pushd* exchanges the top two elements of the directory stack. Given a *name* argument, *pushd* changes to the new directory (ala *cd)* and pushes the old current working directory (as in *csw)* onto the directory stack. With a numeric argument, rotates the *n*th argument of the directory stack around to be the top element and changes to it. The members of the directory stack are numbered from the top starting at 0.

rehash
Causes the internal hash table of the contents of the directories in the *path* variable to be recomputed. This is needed if new commands are added to directories in the *path* while you are logged in. This should only be necessary if you add commands to one of your own directories, or if a systems programmer changes the contents of one of the system directories.

repeat count command
The specified *command* which is subject to the same restrictions as the *command* in the one line *if* statement above, is executed *count* times. I/O redirections occur exactly once, even if *count* is 0.

set
set name
set name=word
set name[index]=word
set name=(wordlist)
The first form of the command shows the value of all shell variables. Variables which

have other than a single word as value print as a parenthesized word list. The second form sets *name* to the null string. The third form sets *name* to the single *word.* The fourth form sets the *index'th* component of name to word; this component must already exist. The final form sets *name* to the list of words in *wordlist.* In all cases the value is command and filename expanded.

These arguments may be repeated to set multiple values in a single set command. Note however, that variable expansion happens for all arguments before any setting occurs.

setenv name value
Sets the value of environment variable *name* to be *value,* a single string. The most commonly used environment variable USER, TERM, and PATH are automatically imported to and exported from the *csh* variables *user, term,* and *path;* there is no need to use *setenv* for these.

shift
shift variable
The members of *argv* are shifted to the left, discarding *argv[1].* It is an error for *argv* not to be set or to have less than one word as value. The second form performs the same function on the specified variable.

source name
source −**h** name
The shell reads commands from *name. Source* commands may be nested; if they are nested too deeply the shell may run out of file descriptors. An error in a *source* at any level terminates all nested *source* commands. Normally input during *source* commands is not placed on the history list; the −h option causes the commands to be placed in the history list without being executed.

stop
stop %job ...
Stops the current or specified job which is executing in the background.

suspend
Causes the shell to stop in its tracks, much as if it had been sent a stop signal with ^Z. This is most often used to stop shells started by *su*(1).

switch (string)
case str1:
...
breaksw
...
default:
...
breaksw
endsw
Each case label is successively matched, against the specified *string* which is first command and filename expanded. The file metacharacters '*', '?' and '[...]' may be used in the case labels, which are variable expanded. If none of the labels match before a 'default' label is found, then the execution begins after the default label. Each case label and the default label must appear at the beginning of a line. The command *breaksw* causes execution to continue after the *endsw.* Otherwise control may fall through case labels and default labels as in C. If no label matches and there is no default, execution continues after the *endsw.*

time
time command
With no argument, a summary of time used by this shell and its children is printed. If

arguments are given the specified simple command is timed and a time summary as described under the *time* variable is printed. If necessary, an extra shell is created to print the time statistic when the command completes.

umask
umask value
The file creation mask is displayed (first form) or set to the specified value (second form). The mask is given in octal. Common values for the mask are 002 giving all access to the group and read and execute access to others or 022 giving all access except no write access for users in the group or others.

unalias pattern
All aliases whose names match the specified pattern are discarded. Thus all aliases are removed by 'unalias *'. It is not an error for nothing to be *unaliased.*

unhash
Use of the internal hash table to speed location of executed programs is disabled.

unlimit *resource*
unlimit
Removes the limitation on *resource.* If no *resource* is specified, then all *resource* limitations are removed.

unset pattern
All variables whose names match the specified pattern are removed. Thus all variables are removed by 'unset *'; this has noticeably distasteful side-effects. It is not an error for nothing to be *unset.*

unsetenv pattern
Removes all variables whose name match the specified pattern from the environment. See also the *setenv* command above and *printenv*(1).

wait
All background jobs are waited for. It the shell is interactive, then an interrupt can disrupt the wait, at which time the shell prints names and job numbers of all jobs known to be outstanding.

while (expr)
...
end
While the specified expression evaluates non-zero, the commands between the *while* and the matching end are evaluated. *Break* and *continue* may be used to terminate or continue the loop prematurely. (The *while* and *end* must appear alone on their input lines.) Prompting occurs here the first time through the loop as for the *foreach* statement if the input is a terminal.

%job
Brings the specified job into the foreground.

%job &
Continues the specified job in the background.

@
@ name = expr
@ name[index] = expr
The first form prints the values of all the shell variables. The second form sets the specified *name* to the value of *expr.* If the expression contains '<', '>', '&' or '|' then at least this part of the expression must be placed within '(' ')'. The third form assigns the value of *expr* to the *index'th* argument of *name.* Both *name* and its *index'th* component

must already exist.

The operators '*=', '+=', etc are available as in C. The space separating the name from the assignment operator is optional. Spaces are, however, mandatory in separating components of *expr* which would otherwise be single words.

Special postfix '++' and '--' operators increment and decrement *name* respectively, i.e. '@ i++'.

Pre-defined and environment variables

The following variables have special meaning to the shell. Of these, *argv, cwd, home, path, prompt, shell* and *status* are always set by the shell. Except for *cwd* and *status* this setting occurs only at initialization; these variables will not then be modified unless this is done explicitly by the user.

This shell copies the environment variable USER into the variable *user,* TERM into *term,* and HOME into *home,* and copies these back into the environment whenever the normal shell variables are reset. The environment variable PATH is likewise handled; it is not necessary to worry about its setting other than in the file *.cshrc* as inferior *csh* processes will import the definition of *path* from the environment, and re-export it if you then change it.

argv Set to the arguments to the shell, it is from this variable that positional parameters are substituted, i.e. '$1' is replaced by '$argv[1]', etc.

cdpath Gives a list of alternate directories searched to find subdirectories in *chdir* commands.

cwd The full pathname of the current directory.

echo Set when the -x command line option is given. Causes each command and its arguments to be echoed just before it is executed. For non-builtin commands all expansions occur before echoing. Builtin commands are echoed before command and filename substitution, since these substitutions are then done selectively.

histchars Can be given a string value to change the characters used in history substitution. The first character of its value is used as the history substitution character, replacing the default character !. The second character of its value replaces the character ↑ in quick substitutions.

history Can be given a numeric value to control the size of the history list. Any command which has been referenced in this many events will not be discarded. Too large values of *history* may run the shell out of memory. The last executed command is always saved on the history list.

home The home directory of the invoker, initialized from the environment. The filename expansion of '~' refers to this variable.

ignoreeof If set the shell ignores end-of-file from input devices which are terminals. This prevents shells from accidentally being killed by control-D's.

mail The files where the shell checks for mail. This is done after each command completion which will result in a prompt, if a specified interval has elapsed. The shell says 'You have new mail.' if the file exists with an access time not greater than its modify time.

If the first word of the value of *mail* is numeric it specifies a different mail checking interval, in seconds, than the default, which is 10 minutes.

If multiple mail files are specified, then the shell says 'New mail in *name*' when there is mail in the file *name.*

noclobber As described in the section on *Input/output,* restrictions are placed on output redirection to insure that files are not accidentally destroyed, and that '>>' redirections refer to existing files.

noglob If set, filename expansion is inhibited. This is most useful in shell scripts which are not dealing with filenames, or after a list of filenames has been obtained and further expansions are not desirable.

nonomatch If set, it is not an error for a filename expansion to not match any existing files; rather the primitive pattern is returned. It is still an error for the primitive pattern to be malformed, i.e. 'echo [' still gives an error.

notify If set, the shell notifies asynchronously of job completions. The default is to rather present job completions just before printing a prompt.

path Each word of the path variable specifies a directory in which commands are to be sought for execution. A null word specifies the current directory. If there is no *path* variable then only full path names will execute. The usual search path is '.', '/bin' and '/usr/bin', but this may vary from system to system. For the super-user the default search path is '/etc', '/bin' and '/usr/bin'. A shell which is given neither the **-c** nor the **-t** option will normally hash the contents of the directories in the *path* variable after reading *.cshrc,* and each time the *path* variable is reset. If new commands are added to these directories while the shell is active, it may be necessary to give the *rehash* or the commands may not be found.

prompt The string which is printed before each command is read from an interactive terminal input. If a '!' appears in the string it will be replaced by the current event number unless a preceding '\' is given. Default is '% ', or '# ' for the super-user.

savehist is given a numeric value to control the number of entries of the history list that are saved in ~/.history when the user logs out. Any command which has been referenced in this many events will be saved. During start up the shell sources ~/.history into the history list enabling history to be saved across logins. Too large values of *savehist* will slow down the shell during start up.

shell The file in which the shell resides. This is used in forking shells to interpret files which have execute bits set, but which are not executable by the system. (See the description of *Non-builtin Command Execution* below.) Initialized to the (system-dependent) home of the shell.

status The status returned by the last command. If it terminated abnormally, then 0200 is added to the status. Builtin commands which fail return exit status '1', all other builtin commands set status '0'.

time Controls automatic timing of commands. If set, then any command which takes more than this many cpu seconds will cause a line giving user, system, and real times and a utilization percentage which is the ratio of user plus system times to real time to be printed when it terminates.

verbose Set by the **-v** command line option, causes the words of each command to be printed after history substitution.

Non-builtin command execution

When a command to be executed is found to not be a builtin command the shell attempts to execute the command via *execve*(2). Each word in the variable *path* names a directory from which the shell will attempt to execute the command. If it is given neither a **-c** nor a **-t** option, the shell will hash the names in these directories into an internal table so that it will

only try an *exec* in a directory if there is a possibility that the command resides there. This greatly speeds command location when a large number of directories are present in the search path. If this mechanism has been turned off (via *unhash*), or if the shell was given a **−c** or **−t** argument, and in any case for each directory component of *path* which does not begin with a '/', the shell concatenates with the given command name to form a path name of a file which it then attempts to execute.

Parenthesized commands are always executed in a subshell. Thus '(cd ; pwd) ; pwd' prints the *home* directory; leaving you where you were (printing this after the home directory), while 'cd ; pwd' leaves you in the *home* directory. Parenthesized commands are most often used to prevent *chdir* from affecting the current shell.

If the file has execute permissions but is not an executable binary to the system, then it is assumed to be a file containing shell commands and a new shell is spawned to read it.

If there is an *alias* for *shell* then the words of the alias will be prepended to the argument list to form the shell command. The first word of the *alias* should be the full path name of the shell (e.g. '$shell'). Note that this is a special, late occurring, case of *alias* substitution, and only allows words to be prepended to the argument list without modification.

Argument list processing

If argument 0 to the shell is '−' then this is a login shell. The flag arguments are interpreted as follows:

−c Commands are read from the (single) following argument which must be present. Any remaining arguments are placed in *argv*.

−e The shell exits if any invoked command terminates abnormally or yields a non-zero exit status.

−f The shell will start faster, because it will neither search for nor execute commands from the file '.cshrc' in the invokers home directory.

−i The shell is interactive and prompts for its top-level input, even if it appears to not be a terminal. Shells are interactive without this option if their inputs and outputs are terminals.

−n Commands are parsed, but not executed. This aids in syntactic checking of shell scripts.

−s Command input is taken from the standard input.

−t A single line of input is read and executed. A '\' may be used to escape the newline at the end of this line and continue onto another line.

−v Causes the *verbose* variable to be set, with the effect that command input is echoed after history substitution.

−x Causes the *echo* variable to be set, so that commands are echoed immediately before execution.

−V Causes the *verbose* variable to be set even before '.cshrc' is executed.

−X Is to **−x** as **−V** is to **−v**.

After processing of flag arguments if arguments remain but none of the **−c**, **−i**, **−s**, or **−t** options was given the first argument is taken as the name of a file of commands to be executed. The shell opens this file, and saves its name for possible resubstitution by '$0'. Since many systems use either the standard version 6 or version 7 shells whose shell scripts are not compatible with this shell, the shell will execute such a 'standard' shell if the first character of a script is not a '#', i.e. if the script does not start with a comment. Remaining arguments initialize the variable *argv*.

Signal handling

The shell normally ignores *quit* signals. Jobs running detached (either by '&' or the *bg* or %... & commands) are immune to signals generated from the keyboard, including hangups. Other signals have the values which the shell inherited from its parent. The shells handling of interrupts and terminate signals in shell scripts can be controlled by *onintr*. Login shells catch the *terminate* signal; otherwise this signal is passed on to children from the state in the shell's parent. In no case are interrupts allowed when a login shell is reading the file '.logout'.

AUTHOR

William Joy. Job control and directory stack features first implemented by J.E. Kulp of I.I.A.S.A, Laxenburg, Austria, with different syntax than that used now.

FILES

~/.cshrc	Read at beginning of execution by each shell.
~/.login	Read by login shell, after '.cshrc' at login.
~/.logout	Read by login shell, at logout.
/bin/sh	Standard shell, for shell scripts not starting with a '#'.
/tmp/sh*	Temporary file for '<<'.
/etc/passwd	Source of home directories for '~name'.

LIMITATIONS

Words can be no longer than 1024 characters. The system limits argument lists to 10240 characters. The number of arguments to a command which involves filename expansion is limited to 1/6'th the number of characters allowed in an argument list. Command substitutions may substitute no more characters than are allowed in an argument list. To detect looping, the shell restricts the number of *alias* substitutions on a single line to 20.

SEE ALSO

sh(1), access(2), execve(2), fork(2), killpg(2), pipe(2), sigvec(2), umask(2), setrlimit(2), wait(2), tty(4), a.out(5), environ(7), 'An introduction to the C shell'

BUGS

When a command is restarted from a stop, the shell prints the directory it started in if this is different from the current directory; this can be misleading (i.e. wrong) as the job may have changed directories internally.

Shell builtin functions are not stoppable/restartable. Command sequences of the form 'a ; b ; c' are also not handled gracefully when stopping is attempted. If you suspend 'b', the shell will then immediately execute 'c'. This is especially noticeable if this expansion results from an *alias*. It suffices to place the sequence of commands in ()'s to force it to a subshell, i.e. '(a ; b ; c)'.

Control over tty output after processes are started is primitive; perhaps this will inspire someone to work on a good virtual terminal interface. In a virtual terminal interface much more interesting things could be done with output control.

Alias substitution is most often used to clumsily simulate shell procedures; shell procedures should be provided rather than aliases.

Commands within loops, prompted for by '?', are not placed in the *history* list. Control structure should be parsed rather than being recognized as built-in commands. This would allow control commands to be placed anywhere, to be combined with '|', and to be used with '&' and ';' metasyntax.

It should be possible to use the ':' modifiers on the output of command substitutions. All and more than one ':' modifier should be allowed on '$' substitutions.

Symbolic links fool the shell. In particular, *dirs* and 'cd ..' don't work properly once you've crossed through a symbolic link.

NAME

ctags − create a tags file

SYNOPSIS

ctags [**−BFatuwvx**] name ...

DESCRIPTION

Ctags makes a tags file for *ex*(1) from the specified C, Pascal and Fortran sources. A tags file gives the locations of specified objects (in this case functions and typedefs) in a group of files. Each line of the tags file contains the object name, the file in which it is defined, and an address specification for the object definition. Functions are searched with a pattern, typedefs with a line number. Specifiers are given in separate fields on the line, separated by blanks or tabs. Using the *tags* file, *ex* can quickly find these objects definitions.

If the **−x** flag is given, *ctags* produces a list of object names, the line number and file name on which each is defined, as well as the text of that line and prints this on the standard output. This is a simple index which can be printed out as an off-line readable function index.

If the **−v** flag is given, an index of the form expected by *vgrind*(1) is produced on the standard output. This listing contains the function name, file name, and page number (assuming 64 line pages). Since the output will be sorted into lexicographic order, it may be desired to run the output through **sort −f**. Sample use:

```
ctags −v files | sort −f > index
vgrind −x index
```

Files whose name ends in **.c** or **.h** are assumed to be C source files and are searched for C routine and macro definitions. Others are first examined to see if they contain any Pascal or Fortran routine definitions; if not, they are processed again looking for C definitions.

Other options are:

−F use forward searching patterns (/.../) (default).

−B use backward searching patterns (?...?).

−a append to tags file.

−t create tags for typedefs.

−w suppressing warning diagnostics.

−u causing the specified files to be *updated* in tags, that is, all references to them are deleted, and the new values are appended to the file. (Beware: this option is implemented in a way which is rather slow; it is usually faster to simply rebuild the *tags* file.)

The tag *main* is treated specially in C programs. The tag formed is created by prepending *M* to the name of the file, with a trailing .c removed, if any, and leading pathname components also removed. This makes use of *ctags* practical in directories with more than one program.

FILES

tags	output tags file

SEE ALSO

ex(1), vi(1)

AUTHOR

Ken Arnold; FORTRAN added by Jim Kleckner; Bill Joy added Pascal and **−x**, replacing *cxref*; C typedefs added by Ed Pelegri-Llopart.

BUGS

Recognition of **functions**, **subroutines** and **procedures** for FORTRAN and Pascal is done is a very simpleminded way. No attempt is made to deal with block structure; if you have two Pascal procedures in different blocks with the same name you lose.

The method of deciding whether to look for C or Pascal and FORTRAN functions is a hack.

Does not know about #ifdefs.

Should know about Pascal types. Relies on the input being well formed to detect typedefs. Use of -tx shows only the last line of typedefs.

NAME

date — print and set the date

SYNOPSIS

date [-u] [yymmddhhmm [.ss]]

DESCRIPTION

If no arguments are given, the current date and time are printed. If a date is specified, the current date is set. The *-u* flag is used to display the date in GMT (universal) time. This flag may also be used to set GMT time. *yy* is the last two digits of the year; the first *mm* is the month number; *dd* is the day number in the month; *hh* is the hour number (24 hour system); the second *mm* is the minute number; *.ss* is optional and is the seconds. For example:

```
date 10080045
```

sets the date to Oct 8, 12:45 AM. The year, month and day may be omitted, the current values being the defaults. The system operates in GMT. *Date* takes care of the conversion to and from local standard and daylight time.

FILES

/usr/adm/wtmp to record time-setting

SEE ALSO

utmp(5)

DIAGNOSTICS

'Failed to set date: Not owner' if you try to change the date but are not the super-user.

BUGS

The system attempts to keep the date in a format closely compatible with VMS. VMS, however, uses local time (rather than GMT) and does not understand daylight savings time. Thus if you use both UNIX and VMS, VMS will be running on GMT.

NAME

dbx − debugger

SYNOPSIS

dbx [**−r**] [**−i**] [**−I** *dir*] [*objfile* [*coredump*]]

DESCRIPTION

Dbx is a tool for source level debugging and execution of programs under UNIX. The *objfile* is an object file produced by a compiler with the appropriate flag (usually "−g") specified to produce symbol information in the object file. Currently, *cc*(1) and *f77*(1) produce the appropriate source information and it is expected that in the future the Pascal compiler will also be able to generate source level information. The machine level facilities of *dbx* can be used on any program.

If no *objfile* is specified, *dbx* looks for a file named "a.out" in the current directory. The object file contains a symbol table which includes the name of the all the source files translated by the compiler to create it. These files are available for perusal while using the debugger.

If a file named "core" exists in the current directory or a *coredump* file is specified, *dbx* can be used to examine the state of the program when it faulted.

If the file ".dbxinit" exists in the current directory then the debugger commands in it are executed. *Dbx* also checks for a ".dbxinit" in the user's home directory if there isn't one in the current directory.

The command line options and their meanings are:

−r Execute *objfile* immediately. If it terminates successfully *dbx* exits. Otherwise the reason for termination will be reported and the user offered the option of entering the debugger or letting the program fault. *Dbx* will read from "/dev/tty" when **−r** is specified and standard input is not a terminal.

−i Force *dbx* to act as though standard input is a terminal.

−I *dir* Add *dir* to the list of directories that are searched when looking for a source file. Normally *dbx* looks for source files in the current directory and in the directory where *objfile* is located. The directory search path can also be set with the **use** command.

Unless **−r** is specified, *dbx* just prompts and waits for a command.

Execution and Tracing Commands

run [*args*] [< *filename*] [> *filename*]
Start executing *objfile*, passing *args* as command line arguments; < or > can be used to redirect input or output in the usual manner. If *objfile* has been written since the last time the symbolic information was read in, *dbx* will read in the new information.

trace [**in** *procedure/function*] [**if** *condition*]
trace *source-line-number* [**if** *condition*]
trace *procedure/function* [**in** *procedure/function*] [**if** *condition*]
trace *expression* **at** *source-line-number* [**if** *condition*]
trace *variable* [**in** *procedure/function*] [**if** *condition*]
Have tracing information printed when the program is executed. A number is associated with the command that is used to turn the tracing off (see the **delete** command).

The first argument describes what is to be traced. If it is a *source-line-number*, then the

line is printed immediately prior to being executed. Source line numbers in a file other than the current one must be preceded by the name of the file in quotes and a colon, e.g. "mumble.p":17.

If the argument is a procedure or function name then every time it is called, information is printed telling what routine called it, from what source line it was called, and what parameters were passed to it. In addition, its return is noted, and if it's a function then the value it is returning is also printed.

If the argument is an *expression* with an **at** clause then the value of the expression is printed whenever the identified source line is reached.

If the argument is a variable then the name and value of the variable is printed whenever it changes. Execution is substantially slower during this form of tracing.

If no argument is specified then all source lines are printed before they are executed. Execution is substantially slower during this form of tracing.

The clause "**in** *procedure/function*" restricts tracing information to be printed only while executing inside the given procedure or function.

Condition is a boolean expression and is evaluated prior to printing the tracing information; if it is false then the information is not printed.

stop if *condition*
stop at *source-line-number* [**if** *condition*]
stop in *procedure/function* [**if** *condition*]
stop *variable* [**if** *condition*]
Stop execution when the given line is reached, procedure or function called, variable changed, or condition true.

status [> *filename*]
Print out the currently active **trace** and **stop** commands.

delete *command-number*
The trace or stop corresponding to the given number is removed. The numbers associated with traces and stops are printed by the **status** command.

catch *number*
ignore *number*
Start or stop trapping signal *number* before it is sent to the program. This is useful when a program being debugged handles signals such as interrupts. Initially all signals are trapped except SIGCONT, SIGCHILD, SIGALRM and SIGKILL.

cont Continue execution from where it stopped. Execution cannot be continued if the process has "finished", that is, called the standard procedure "exit". *Dbx* does not allow the process to exit, thereby letting the user to examine the program state.

step Execute one source line.

next Execute up to the next source line. The difference between this and **step** is that if the line contains a call to a procedure or function the **step** command will stop at the beginning of that block, while the **next** command will not.

Displaying and Naming Data

print *expression* [, *expression* ...]
Print out the values of the expressions. Array expressions are always subscripted by brackets ("[ ]"). Variables having the same identifier as one in the current block may be referenced as "*block-name* . *variable*". The field reference operator (".") can be used with pointers as well as records, making the C operator "->" unnecessary (although it is supported). The construct *typename*(*expression*) can be used to print the *expression* out in the format of the named *type*.

whatis *name*
Print the declaration of the given name, which may be qualified with block names as above.

which *identifier*
Print the full qualification of the given identifer, i.e. the outer blocks that the identifier is associated with.

whereis *identifier*
Print the full qualification of all the symbols whose name matches the given identifier. The order in which the symbols are printed is not meaningful.

assign *variable* = *expression*
set *variable* = *expression*
Assign the value of the expression to the variable.

call *procedure*(*parameters*)
Execute the object code associated with the named procedure or function. Currently, calls to a procedure with a variable number of arguments are not possible. Also, string parameters are not passed properly for C.

where Print out a list of the active procedures and function.

dump [> *filename*]
Print the names and values of all active variables.

Accessing Source Files

edit [*filename*]
edit *procedure/function-name*
Invoke an editor on *filename* or the current source file if none is specified. If a *procedure* or *function* name is specified, the editor is invoked on the file that contains it. Which editor is invoked by default depends on the installation. The default can be overridden by setting the environment variable EDITOR to the name of the desired editor.

file [*filename*]
Change the current source file name to *filename*. If none is specified then the current source file name is printed.

func [*procedure/function*]
Change the current function. If none is specified then print the current function. Changing the current function implicitly changes the current source file to the one that contains the function; it also changes the current scope used for name resolution.

list [*source-line-number* [, *source-line-number*]]
list *procedure/function*
List the lines in the current source file from the first line number to the second

inclusive. If no lines are specified, the next 10 lines are listed. If the name of a procedure or function is given lines *n-k* to *n+k* are listed where *n* is the first statement in the procedure or function and *k* is small.

use *directory-list*
Set the list of directories to be searched when looking for source files.

Machine Level Commands

tracei [*address*] [**if** *cond*]
tracei [*variable*] [**at** *address*] [**if** *cond*]
stopi [*address*] [**if** *cond*]
stopi [**at**] [*address*] [**if** *cond*]
Turn on tracing or set a stop using a machine instruction address.

stepi

nexti Single step as in **step** or **next**, but do a single instruction rather than source line.

address,*address*/ [*mode*]
[*address*] / [*count*] [*mode*]
Print the contents of memory starting at the first *address* and continuing up to the second *address* or until *count* items are printed. If no address is specified, the address following the one printed most recently is used. The *mode* specifies how memory is to be printed; if it is omitted the previous mode specified is used. The initial mode is "X". The following modes are supported:

i	print the machine instruction
d	print a short word in decimal
D	print a long word in decimal
o	print a short word in octal
O	print a long word in octal
x	print a short word in hexadecimal
X	print a long word in hexadecimal
b	print a byte in octal
c	print a byte as a character
s	print a string of characters terminated by a null byte
f	print a single precision real number
g	print a double precision real number

Symbolic addresses are specified by preceding the name with an "&". Registers are denoted by "$rN" where N is the number of the register. Addresses may be expressions made up of other addresses and the operators "+", "-", and indirection (unary "*").

Miscellaneous Commands

sh *command-line*
Pass the command line to the shell for execution. The SHELL environment variable determines which shell is used.

alias *new-command-name old-command-name*
Respond to *new-command-name* as though it were *old-command-name*.

help Print out a synopsis of *dbx* commands.

gripe Invoke a mail program to send a message to the person in charge of *dbx*.

source *filename*
Read *dbx* commands from the given *filename*. Especially useful when the *filename* has been created by redirecting a **status** command from an earlier debugging session.

quit Exit *dbx*.

FILES

a.out	object file
.dbxinit	initial commands

SEE ALSO

cc(1), f77(1), pc(1)

COMMENTS

Non-local gotos can cause some trace/stops to be missed. Most of the command names are too long. The alias facility helps, but is really quite weak. A *csh*-like history capability would improve the situation. But then, who wants to duplicate the c-shell in a debugger?

Dbx suffers from the same "multiple include" malady as does sdb. If you have a program consisting of a number of object files and each is built from source files that include header files, the symbolic information for the header files is replicated in each object file. Since about one debugger start-up is done for each link, having the linker (ld) re-organize the symbol information won't save much time, though it would reduce some of the disk space used. The problem is an artifact of the unrestricted semantics of #include's in C; for example an include file can contain static declarations that are separate entities for each file in which they are included.

NAME

dc — desk calculator

SYNOPSIS

dc [file]

DESCRIPTION

Dc is an arbitrary precision arithmetic package. Ordinarily it operates on decimal integers, but one may specify an input base, output base, and a number of fractional digits to be maintained. The overall structure of *dc* is a stacking (reverse Polish) calculator. If an argument is given, input is taken from that file until its end, then from the standard input. The following constructions are recognized:

number
: The value of the number is pushed on the stack. A number is an unbroken string of the digits 0-9. It may be preceded by an underscore _ to input a negative number. Numbers may contain decimal points.

+ − / * % ^
: The top two values on the stack are added (+), subtracted (−), multiplied (*), divided (/), remaindered (%), or exponentiated (^). The two entries are popped off the stack; the result is pushed on the stack in their place. Any fractional part of an exponent is ignored.

s*x*
: The top of the stack is popped and stored into a register named *x*, where *x* may be any character. If the **s** is capitalized, *x* is treated as a stack and the value is pushed on it.

l*x*
: The value in register *x* is pushed on the stack. The register *x* is not altered. All registers start with zero value. If the **l** is capitalized, register *x* is treated as a stack and its top value is popped onto the main stack.

d
: The top value on the stack is duplicated.

p
: The top value on the stack is printed. The top value remains unchanged. **P** interprets the top of the stack as an ascii string, removes it, and prints it.

f
: All values on the stack and in registers are printed.

q
: exits the program. If executing a string, the recursion level is popped by two. If **q** is capitalized, the top value on the stack is popped and the string execution level is popped by that value.

x
: treats the top element of the stack as a character string and executes it as a string of dc commands.

X
: replaces the number on the top of the stack with its scale factor.

[... **]**
: puts the bracketed ascii string onto the top of the stack.

<*x* >*x* =*x*
: The top two elements of the stack are popped and compared. Register *x* is executed if they obey the stated relation.

v
: replaces the top element on the stack by its square root. Any existing fractional part of the argument is taken into account, but otherwise the scale factor is ignored.

!
: interprets the rest of the line as a UNIX command.

c
: All values on the stack are popped.

i
: The top value on the stack is popped and used as the number radix for further input. **I** pushes the input base on the top of the stack.

o
: The top value on the stack is popped and used as the number radix for further output.

o pushes the output base on the top of the stack.

k the top of the stack is popped, and that value is used as a non-negative scale factor: the appropriate number of places are printed on output, and maintained during multiplication, division, and exponentiation. The interaction of scale factor, input base, and output base will be reasonable if all are changed together.

z The stack level is pushed onto the stack.

Z replaces the number on the top of the stack with its length.

? A line of input is taken from the input source (usually the terminal) and executed.

; : are used by *bc* for array operations.

An example which prints the first ten values of n! is

```
[la1+dsa*pla10>y]sy
0sa1
lyx
```

SEE ALSO

bc(1), which is a preprocessor for *dc* providing infix notation and a C-like syntax which implements functions and reasonable control structures for programs.

DIAGNOSTICS

'x is unimplemented' where x is an octal number.
'stack empty' for not enough elements on the stack to do what was asked.
'Out of space' when the free list is exhausted (too many digits).
'Out of headers' for too many numbers being kept around.
'Out of pushdown' for too many items on the stack.
'Nesting Depth' for too many levels of nested execution.

NAME

dd – convert and copy a file

SYNOPSIS

dd [option=value] ...

DESCRIPTION

Dd copies the specified input file to the specified output with possible conversions. The standard input and output are used by default. The input and output block size may be specified to take advantage of raw physical I/O.

option	*values*
if=	input file name; standard input is default
of=	output file name; standard output is default
ibs=*n*	input block size *n* bytes (default 512)
obs=*n*	output block size (default 512)
bs=*n*	set both input and output block size, superseding *ibs* and *obs;* also, if no conversion is specified, it is particularly efficient since no copy need be done
cbs=*n*	conversion buffer size
skip=*n*	skip *n* input records before starting copy
files=*n*	copy *n* input files before terminating (makes sense only where input is a magtape or similar device).
seek=*n*	seek *n* records from beginning of output file before copying
count=*n*	copy only *n* input records
conv=ascii	convert EBCDIC to ASCII
ebcdic	convert ASCII to EBCDIC
ibm	slightly different map of ASCII to EBCDIC
block	convert variable length records to fixed length
unblock	convert fixed length records to variable length
lcase	map alphabetics to lower case
ucase	map alphabetics to upper case
swab	swap every pair of bytes
noerror	do not stop processing on an error
sync	pad every input record to *ibs*
... , ...	several comma-separated conversions

Where sizes are specified, a number of bytes is expected. A number may end with **k**, **b** or **w** to specify multiplication by 1024, 512, or 2 respectively; a pair of numbers may be separated by **x** to indicate a product.

Cbs is used only if *ascii, unblock, ebcdic, ibm,* or *block* conversion is specified. In the first two cases, *cbs* characters are placed into the conversion buffer, any specified character mapping is done, trailing blanks trimmed and new-line added before sending the line to the output. In the latter three cases, characters are read into the conversion buffer, and blanks added to make up an output record of size *cbs*.

After completion, *dd* reports the number of whole and partial input and output blocks.

For example, to read an EBCDIC tape blocked ten 80-byte EBCDIC card images per record into the ASCII file *x*:

```
dd if=/dev/rmt0 of=x ibs=800 cbs=80 conv=ascii,lcase
```

Note the use of raw magtape. *Dd* is especially suited to I/O on the raw physical devices because it allows reading and writing in arbitrary record sizes.

SEE ALSO

cp(1), tr(1)

DIAGNOSTICS

f+p records in(out): numbers of full and partial records read(written)

BUGS

The ASCII/EBCDIC conversion tables are taken from the 256 character standard in the CACM Nov, 1968. The 'ibm' conversion, while less blessed as a standard, corresponds better to certain IBM print train conventions. There is no universal solution.

One must specify "conv=noerror,sync" when copying raw disks with bad sectors to insure *dd* stays synchronized.

NAME

deroff − remove nroff, troff, tbl and eqn constructs

SYNOPSIS

deroff [**−w**] file ...

DESCRIPTION

Deroff reads each file in sequence and removes all *nroff* and *troff* command lines, backslash constructions, macro definitions, *eqn* constructs (between '.EQ' and '.EN' lines or between delimiters), and table descriptions and writes the remainder on the standard output. *Deroff* follows chains of included files ('.so' and '.nx' commands); if a file has already been included, a '.so' is ignored and a '.nx' terminates execution. If no input file is given, *deroff* reads from the standard input file.

If the **−w** flag is given, the output is a word list, one 'word' (string of letters, digits, and apostrophes, beginning with a letter; apostrophes are removed) per line, and all other characters ignored. Otherwise, the output follows the original, with the deletions mentioned above.

SEE ALSO

troff(1), eqn(1), tbl(1)

BUGS

Deroff is not a complete *troff* interpreter, so it can be confused by subtle constructs. Most errors result in too much rather than too little output.

NAME

df − disk free

SYNOPSIS

df [**−i**] [filesystem ...] [file ...]

DESCRIPTION

Df prints out the amount of free disk space available on the specified *filesystem,* e.g. "/dev/rp0a", or on the filesystem in which the specified *file,* e.g. "$HOME", is contained. If no file system is specified, the free space on all of the normally mounted file systems is printed. The reported numbers are in kilobytes.

Other options are:

−i Report also the number of inodes which are used and free.

FILES

/etc/fstab list of normally mounted filesystems

SEE ALSO

fstab(5), icheck(8), quot(8)

NAME

diction,explain − print wordy sentences; thesaurus for diction

SYNOPSIS

diction [−ml] [−mm] [−n] [−f pfile] file ...
explain

DESCRIPTION

Diction finds all sentences in a document that contain phrases from a data base of bad or wordy diction. Each phrase is bracketed with [ ]. Because *diction* runs *deroff* before looking at the text, formatting header files should be included as part of the input. The default macro package **−ms** may be overridden with the flag **−mm.** The flag **−ml** which causes **deroff** to skip lists, should be used if the document contains many lists of non-sentences. The user may supply her/his own pattern file to be used in addition to the default file with **−f** *pfile.* If the flag **−n** is also supplied the default file will be suppressed.

Explain is an interactive thesaurus for the phrases found by diction.

SEE ALSO

deroff(1)

BUGS

Use of non-standard formatting macros may cause incorrect sentence breaks. In particular, *diction* doesn't grok **−me.**

NAME

diff − differential file and directory comparator

SYNOPSIS

diff [**−l**] [**−r**] [**−s**] [**−cefh**] [**−b**] dir1 dir2
diff [**−cefh**] [**−b**] file1 file2
diff [**−D***string*] [**−b**] file1 file2

DESCRIPTION

If both arguments are directories, *diff* sorts the contents of the directories by name, and then runs the regular file *diff* algorithm (described below) on text files which are different. Binary files which differ, common subdirectories, and files which appear in only one directory are listed. Options when comparing directories are:

−l long output format; each text file *diff* is piped through *pr*(1) to paginate it, other differences are remembered and summarized after all text file differences are reported.

−r causes application of *diff* recursively to common subdirectories encountered.

−s causes *diff* to report files which are the same, which are otherwise not mentioned.

−S*name*
starts a directory *diff* in the middle beginning with file *name*.

When run on regular files, and when comparing text files which differ during directory comparison, *diff* tells what lines must be changed in the files to bring them into agreement. Except in rare circumstances, *diff* finds a smallest sufficient set of file differences. If neither *file1* nor *file2* is a directory, then either may be given as '−', in which case the standard input is used. If *file1* is a directory, then a file in that directory whose file-name is the same as the file-name of *file2* is used (and vice versa).

There are several options for output format; the default output format contains lines of these forms:

n1 a *n3,n4*
n1,n2 d *n3*
n1,n2 c *n3,n4*

These lines resemble *ed* commands to convert *file1* into *file2*. The numbers after the letters pertain to *file2*. In fact, by exchanging 'a' for 'd' and reading backward one may ascertain equally how to convert *file2* into *file1*. As in *ed*, identical pairs where *n1* = *n2* or *n3* = *n4* are abbreviated as a single number.

Following each of these lines come all the lines that are affected in the first file flagged by '<', then all the lines that are affected in the second file flagged by '>'.

Except for **−b**, which may be given with any of the others, the following options are mutually exclusive:

−e producing a script of *a*, *c* and *d* commands for the editor *ed*, which will recreate *file2* from *file1*. In connection with **−e**, the following shell program may help maintain multiple versions of a file. Only an ancestral file ($1) and a chain of version-to-version *ed* scripts ($2,$3,...) made by *diff* need be on hand. A 'latest version' appears on the standard output.

```
(shift; cat $*; echo '1,$p') | ed − $1
```

Extra commands are added to the output when comparing directories with **−e**, so that the result is a *sh*(1) script for converting text files which are common to the two directories from their state in *dir1* to their state in *dir2*.

−f produces a script similar to that of **−e**, not useful with *ed*, and in the opposite order.

-c produces a diff with lines of context. The default is to present 3 lines of context and may be changed, e.g to 10, by **-c10**. With **-c** the output format is modified slightly: the output beginning with identification of the files involved and their creation dates and then each change is separated by a line with a dozen *'s. The lines removed from *file1* are marked with '-'; those added to *file2* are marked '+'. Lines which are changed from one file to the other are marked in both files with '!'.

-h does a fast, half-hearted job. It works only when changed stretches are short and well separated, but does work on files of unlimited length.

-Dstring
causes *diff* to create a merged version of *file1* and *file2* on the standard output, with C preprocessor controls included so that a compilation of the result without defining *string* is equivalent to compiling *file1*, while defining *string* will yield *file2*.

-b causes trailing blanks (spaces and tabs) to be ignored, and other strings of blanks to compare equal.

FILES

/tmp/d?????
/usr/lib/diffh for **-h**
/bin/pr

SEE ALSO

cmp(1), cc(1), comm(1), ed(1), diff3(1)

DIAGNOSTICS

Exit status is 0 for no differences, 1 for some, 2 for trouble.

BUGS

Editing scripts produced under the **-e** or **-f** option are naive about creating lines consisting of a single '.'.

When comparing directories with the **-b** option specified, *diff* first compares the files ala *cmp*, and then decides to run the *diff* algorithm if they are not equal. This may cause a small amount of spurious output if the files then turn out to be identical because the only differences are insignificant blank string differences.

NAME

diff3 − 3-way differential file comparison

SYNOPSIS

diff3 [**−ex3**] file1 file2 file3

DESCRIPTION

Diff3 compares three versions of a file, and publishes disagreeing ranges of text flagged with these codes:

====	all three files differ
====1	*file1* is different
====2	*file2* is different
====3	*file3* is different

The type of change suffered in converting a given range of a given file to some other is indicated in one of these ways:

f: *n1* **a**	Text is to be appended after line number *n1* in file *f*, where *f* = 1, 2, or 3.
f: *n1* , *n2* **c**	Text is to be changed in the range line *n1* to line *n2*. If *n1* = *n2*, the range may be abbreviated to *n1*.

The original contents of the range follows immediately after a **c** indication. When the contents of two files are identical, the contents of the lower-numbered file is suppressed.

Under the **−e** option, *diff3* publishes a script for the editor *ed* that will incorporate into *file1* all changes between *file2* and *file3*, *i.e.* the changes that normally would be flagged **====** and **====3**. Option **−x** (**−3**) produces a script to incorporate only changes flagged **====** (**====3**). The following command will apply the resulting script to 'file1'.

```
(cat script; echo '1,$p') | ed − file1
```

FILES

/tmp/d3?????
/usr/lib/diff3

SEE ALSO

diff(1)

BUGS

Text lines that consist of a single '.' will defeat **−e**.

NAME

du – summarize disk usage

SYNOPSIS

du [**–s**] [**–a**] [name ...]

DESCRIPTION

Du gives the number of kilobytes contained in all files and, recursively, directories within each specified directory or file *name*. If *name* is missing, '.' is used.

The argument **–s** causes only the grand total to be given. The argument **–a** causes an entry to be generated for each file. Absence of either causes an entry to be generated for each directory only.

A file which has two links to it is only counted once.

SEE ALSO

df(1), quot(8)

BUGS

Non-directories given as arguments (not under **–a** option) are not listed.
If there are too many distinct linked files, *du* counts the excess files multiply.

NAME

echo − echo arguments

SYNOPSIS

echo [**−n**] [arg] ...

DESCRIPTION

Echo writes its arguments separated by blanks and terminated by a newline on the standard output. If the flag **−n** is used, no newline is added to the output.

Echo is useful for producing diagnostics in shell programs and for writing constant data on pipes. To send diagnostics to the standard error file, do 'echo ... 1>&2'.

NAME

ed − text editor

SYNOPSIS

ed [−] [−x] [name]

DESCRIPTION

Ed is the standard text editor.

If a *name* argument is given, *ed* simulates an *e* command (see below) on the named file; that is to say, the file is read into *ed's* buffer so that it can be edited. If −x is present, an *x* command is simulated first to handle an encrypted file. The optional − suppresses the printing of explanatory output and should be used when the standard input is an editor script.

Ed operates on a copy of any file it is editing; changes made in the copy have no effect on the file until a *w* (write) command is given. The copy of the text being edited resides in a temporary file called the *buffer*.

Commands to *ed* have a simple and regular structure: zero or more *addresses* followed by a single character *command*, possibly followed by parameters to the command. These addresses specify one or more lines in the buffer. Missing addresses are supplied by default.

In general, only one command may appear on a line. Certain commands allow the addition of text to the buffer. While *ed* is accepting text, it is said to be in *input mode*. In this mode, no commands are recognized; all input is merely collected. Input mode is left by typing a period '.' alone at the beginning of a line.

Ed supports a limited form of *regular expression* notation. A regular expression specifies a set of strings of characters. A member of this set of strings is said to be *matched* by the regular expression. In the following specification for regular expressions the word 'character' means any character but newline.

1. Any character except a special character matches itself. Special characters are the regular expression delimiter plus \ [. and sometimes ^ * $.
2. A . matches any character.
3. A \ followed by any character except a digit or ( ) matches that character.
4. A nonempty string *s* bracketed [*s*] (or [^ *s*]) matches any character in (or not in) *s*. In *s*, \ has no special meaning, and] may only appear as the first letter. A substring *a*−*b*, with *a* and *b* in ascending ASCII order, stands for the inclusive range of ASCII characters.
5. A regular expression of form 1-4 followed by * matches a sequence of 0 or more matches of the regular expression.
6. A regular expression, *x*, of form 1-8, bracketed \(*x* \) matches what *x* matches.
7. A \ followed by a digit *n* matches a copy of the string that the bracketed regular expression beginning with the *n*th \(matched.
8. A regular expression of form 1-8, *x*, followed by a regular expression of form 1-7, *y* matches a match for *x* followed by a match for *y*, with the *x* match being as long as possible while still permitting a *y* match.
9. A regular expression of form 1-8 preceded by ^ (or followed by $), is constrained to matches that begin at the left (or end at the right) end of a line.
10. A regular expression of form 1-9 picks out the longest among the leftmost matches in a line.
11. An empty regular expression stands for a copy of the last regular expression encountered.

Regular expressions are used in addresses to specify lines and in one command (see *s* below) to specify a portion of a line which is to be replaced. If it is desired to use one of the regular expression metacharacters as an ordinary character, that character may be preceded by '\'. This also applies to the character bounding the regular expression (often '/') and to '\' itself.

To understand addressing in *ed* it is necessary to know that at any time there is a *current line*. Generally speaking, the current line is the last line affected by a command; however, the exact effect on the current line is discussed under the description of the command. Addresses are constructed as follows.

1. The character '.' addresses the current line.
2. The character '$' addresses the last line of the buffer.
3. A decimal number *n* addresses the *n*-th line of the buffer.
4. ''*x*' addresses the line marked with the name *x*, which must be a lower-case letter. Lines are marked with the *k* command described below.
5. A regular expression enclosed in slashes '/' addresses the line found by searching forward from the current line and stopping at the first line containing a string that matches the regular expression. If necessary the search wraps around to the beginning of the buffer.
6. A regular expression enclosed in queries '?' addresses the line found by searching backward from the current line and stopping at the first line containing a string that matches the regular expression. If necessary the search wraps around to the end of the buffer.
7. An address followed by a plus sign '+' or a minus sign '−' followed by a decimal number specifies that address plus (resp. minus) the indicated number of lines. The plus sign may be omitted.
8. If an address begins with '+' or '−' the addition or subtraction is taken with respect to the current line; e.g. '−5' is understood to mean '.−5'.
9. If an address ends with '+' or '−', then 1 is added (resp. subtracted). As a consequence of this rule and rule 8, the address '−' refers to the line before the current line. Moreover, trailing '+' and '−' characters have cumulative effect, so '−−' refers to the current line less 2.
10. To maintain compatibility with earlier versions of the editor, the character '^' in addresses is equivalent to '−'.

Commands may require zero, one, or two addresses. Commands which require no addresses regard the presence of an address as an error. Commands which accept one or two addresses assume default addresses when insufficient are given. If more addresses are given than such a command requires, the last one or two (depending on what is accepted) are used.

Addresses are separated from each other typically by a comma ','. They may also be separated by a semicolon ';'. In this case the current line '.' is set to the previous address before the next address is interpreted. This feature can be used to determine the starting line for forward and backward searches ('/', '?'). The second address of any two-address sequence must correspond to a line following the line corresponding to the first address. The special form '%' is an abbreviation for the address pair '1,$'.

In the following list of *ed* commands, the default addresses are shown in parentheses. The parentheses are not part of the address, but are used to show that the given addresses are the default.

As mentioned, it is generally illegal for more than one command to appear on a line. However, most commands may be suffixed by 'p' or by 'l', in which case the current line is either printed or listed respectively in the way discussed below. Commands may also be suffixed by 'n',

meaning the output of the command is to be line numbered. These suffixes may be combined in any order.

(.)a
<text>
.

The append command reads the given text and appends it after the addressed line. '.' is left on the last line input, if there were any, otherwise at the addressed line. Address '0' is legal for this command; text is placed at the beginning of the buffer.

(.,.)c
<text>
.

The change command deletes the addressed lines, then accepts input text which replaces these lines. '.' is left at the last line input; if there were none, it is left at the line preceding the deleted lines.

(.,.)d

The delete command deletes the addressed lines from the buffer. The line originally after the last line deleted becomes the current line; if the lines deleted were originally at the end, the new last line becomes the current line.

e filename

The edit command causes the entire contents of the buffer to be deleted, and then the named file to be read in. '.' is set to the last line of the buffer. The number of characters read is typed. 'filename' is remembered for possible use as a default file name in a subsequent *r* or *w* command. If 'filename' is missing, the remembered name is used.

E filename

This command is the same as *e*, except that no diagnostic results when no *w* has been given since the last buffer alteration.

f filename

The filename command prints the currently remembered file name. If 'filename' is given, the currently remembered file name is changed to 'filename'.

(1,$)g/regular expression/command list

In the global command, the first step is to mark every line which matches the given regular expression. Then for every such line, the given command list is executed with '.' initially set to that line. A single command or the first of multiple commands appears on the same line with the global command. All lines of a multi-line list except the last line must be ended with '\'. *A, i,* and *c* commands and associated input are permitted; the '.' terminating input mode may be omitted if it would be on the last line of the command list. The commands *g* and *v* are not permitted in the command list.

(.)i
<text>
.

This command inserts the given text before the addressed line. '.' is left at the last line input, or, if there were none, at the line before the addressed line. This command differs from the *a* command only in the placement of the text.

(.,.+1)j

This command joins the addressed lines into a single line; intermediate newlines simply disappear. '.' is left at the resulting line.

(.)k*x*

The mark command marks the addressed line with name *x*, which must be a lower-case

letter. The address form '*x*' then addresses this line.

(.,.) l
The list command prints the addressed lines in an unambiguous way: non-graphic characters are printed in two-digit octal, and long lines are folded. The *l* command may be placed on the same line after any non-i/o command.

(.,.) m*a*
The move command repositions the addressed lines after the line addressed by *a*. The last of the moved lines becomes the current line.

(.,.) n
The number command prints the addressed lines with line numbers and a tab at the left.

(.,.) p
The print command prints the addressed lines. '.' is left at the last line printed. The *p* command may be placed on the same line after any non-i/o command.

(.,.) P
This command is a synonym for *p*.

q The quit command causes *ed* to exit. No automatic write of a file is done.

Q This command is the same as *q*, except that no diagnostic results when no *w* has been given since the last buffer alteration.

($) r filename
The read command reads in the given file after the addressed line. If no file name is given, the remembered file name, if any, is used (see *e* and *f* commands). The file name is remembered if there was no remembered file name already. Address '0' is legal for *r* and causes the file to be read at the beginning of the buffer. If the read is successful, the number of characters read is typed. '.' is left at the last line read in from the file.

(.,.) s/regular expression/replacement/ or,
(.,.) s/regular expression/replacement/g
The substitute command searches each addressed line for an occurrence of the specified regular expression. On each line in which a match is found, all matched strings are replaced by the replacement specified, if the global replacement indicator 'g' appears after the command. If the global indicator does not appear, only the first occurrence of the matched string is replaced. It is an error for the substitution to fail on all addressed lines. Any punctuation character may be used instead of '/' to delimit the regular expression and the replacement. '.' is left at the last line substituted.

An ampersand '&' appearing in the replacement is replaced by the string matching the regular expression. The special meaning of '&' in this context may be suppressed by preceding it by '\'. The characters '*n*' where *n* is a digit, are replaced by the text matched by the *n*-th regular subexpression enclosed between '\(' and '\)'. When nested, parenthesized subexpressions are present, *n* is determined by counting occurrences of '\(' starting from the left.

Lines may be split by substituting new-line characters into them. The new-line in the replacement string must be escaped by preceding it by '\'.

One or two trailing delimiters may be omitted, implying the 'p' suffix. The special form 's' followed by *no* delimiters repeats the most recent substitute command on the addressed lines. The 's' may be followed by the letters **r** (use the most recent regular expression for the left hand side, instead of the most recent left hand side of a substitute command), **p** (complement the setting of the *p* suffix from the previous substitution), or **g** (complement the setting of the *g* suffix). These letters may be combined in any order.

(.,.) t*a*

This command acts just like the *m* command, except that a copy of the addressed lines is placed after address *a* (which may be 0). '.' is left on the last line of the copy.

(.,.) u

The undo command restores the buffer to it's state before the most recent buffer modifying command. The current line is also restored. Buffer modifying commands are *a, c, d, g, i, k,* and *v*. For purposes of undo, *g* and *v* are considered to be a single buffer modifying command. Undo is its own inverse.

When *ed* runs out of memory (at about 8000 lines on any 16 bit mini-computer such as the PDP-11) This full undo is not possible, and *u* can only undo the effect of the most recent substitute on the current line. This restricted undo also applies to editor scripts when *ed* is invoked with the - option.

(1, $) v/regular expression/command list

This command is the same as the global command *g* except that the command list is executed *g* with '.' initially set to every line *except* those matching the regular expression.

(1, $) w filename

The write command writes the addressed lines onto the given file. If the file does not exist, it is created. The file name is remembered if there was no remembered file name already. If no file name is given, the remembered file name, if any, is used (see *e* and *f* commands). '.' is unchanged. If the command is successful, the number of characters written is printed.

(1, $) W filename

This command is the same as *w*, except that the addressed lines are appended to the file.

(1, $) wq filename

This command is the same as *w* except that afterwards a *q* command is done, exiting the editor after the file is written.

x A key string is demanded from the standard input. Later *r, e* and *w* commands will encrypt and decrypt the text with this key by the algorithm of *crypt*(1). An explicitly empty key turns off encryption. (.+1) z or,

(.+1) z*n*

This command scrolls through the buffer starting at the addressed line. 22 (or *n*, if given) lines are printed. The last line printed becomes the current line. The value *n* is sticky, in that it becomes the default for future *z* commands.

($) =

The line number of the addressed line is typed. '.' is unchanged by this command.

!<shell command>

The remainder of the line after the '!' is sent to *sh*(1) to be interpreted as a command. '.' is unchanged.

(.+1,.+1) <newline>

An address alone on a line causes the addressed line to be printed. A blank line alone is equivalent to '.+1p'; it is useful for stepping through text. If two addresses are present with no intervening semicolon, *ed* prints the range of lines. If they are separated by a semicolon, the second line is printed.

If an interrupt signal (ASCII DEL) is sent, *ed* prints '?interrupted' and returns to its command level.

Some size limitations: 512 characters per line, 256 characters per global command list, 64 characters per file name, and, on mini computers, 128K characters in the temporary file. The limit on the number of lines depends on the amount of core: each line takes 2 words.

When reading a file, *ed* discards ASCII NUL characters and all characters after the last newline. It refuses to read files containing non-ASCII characters.

FILES

/tmp/e*
edhup: work is saved here if terminal hangs up

SEE ALSO

B. W. Kernighan, *A Tutorial Introduction to the ED Text Editor*
B. W. Kernighan, *Advanced editing on UNIX*
ex(1), sed(1), crypt(1)

DIAGNOSTICS

'?name' for inaccessible file; '?self-explanatory message' for other errors.

To protect against throwing away valuable work, a *q* or *e* command is considered to be in error, unless a *w* has occurred since the last buffer change. A second *q* or *e* will be obeyed regardless.

BUGS

The *l* command mishandles DEL.
The *undo* command causes marks to be lost on affected lines.
The *x* command, **-x** option, and special treatment of hangups only work on UNIX.

NAME

efl − Extended Fortran Language

SYNOPSIS

efl [option ...] [filename ...]

DESCRIPTION

Efl compiles a program written in the EFL language into clean Fortran. *Efl* provides the same control flow constructs as does *ratfor*(1), which are essentially identical to those in C:

statement grouping with braces;

decision-making with if, if-else, and switch-case; while, for, Fortran do, repeat, and repeat...until loops; multi-level break and next. In addition, EFL has C-like data structures, and more uniform and convenient input/output syntax, generic functions. EFL also provides some syntactic sugar to make programs easier to read and write:

free form input:

multiple statements/line; automatic continuation statement label names (not just numbers),

comments:

this is a comment

translation of relationals:

>, >=, etc., become .GT., .GE., etc.

return (expression)

returns expression to caller from function

define: define name replacement

include:

include filename

The Efl command option **−w** suppresses warning messages. The option **−C** causes comments to be copied through to the Fortran output (default); **−#** prevents comments from being copied through. If a command argument contains an embedded equal sign, that argument is treated as if it had appeared in an **option** statement at the beginning of the program. *Efl* is best used with *f77*(1).

SEE ALSO

f77(1), ratfor(1).

S. I. Feldman, *The Programming Language EFL*, Bell Labs Computing Science Technical Report #78.

NAME

eqn, neqn, checkeq − typeset mathematics

SYNOPSIS

eqn [**−dxy**] [**−pn**] [**−sn**] [**−fn**] [file] ...
checkeq [file] ...

DESCRIPTION

Eqn is a troff(1) preprocessor for typesetting mathematics on a Graphic Systems phototypesetter, *neqn* on terminals. Usage is almost always

eqn file ... | troff
neqn file ... | nroff

If no files are specified, these programs reads from the standard input. A line beginning with '.EQ' marks the start of an equation; the end of an equation is marked by a line beginning with '.EN'. Neither of these lines is altered, so they may be defined in macro packages to get centering, numbering, etc. It is also possible to set two characters as 'delimiters'; subsequent text between delimiters is also treated as *eqn* input. Delimiters may be set to characters *x* and *y* with the command-line argument **−d***xy* or (more commonly) with 'delim *xy*' between .EQ and .EN. The left and right delimiters may be identical. Delimiters are turned off by 'delim off'. All text that is neither between delimiters nor between .EQ and .EN is passed through untouched.

The program *checkeq* reports missing or unbalanced delimiters and .EQ/.EN pairs.

Tokens within *eqn* are separated by spaces, tabs, newlines, braces, double quotes, tildes or circumflexes. Braces {} are used for grouping; generally speaking, anywhere a single character like *x* could appear, a complicated construction enclosed in braces may be used instead. Tilde ~ represents a full space in the output, circumflex ^ half as much.

Subscripts and superscripts are produced with the keywords **sub** and **sup.** Thus *x sub i* makes x_i, *a sub i sup 2* produces a_i^2, and *e sup {x sup 2 + y sup 2}* gives $e^{x^2+y^2}$.

Fractions are made with **over**: *a over b* yields $\frac{a}{b}$.

sqrt makes square roots: *1 over sqrt {ax sup 2 +bx+c}* results in $\frac{1}{\sqrt{ax^2+bx+c}}$.

The keywords **from** and **to** introduce lower and upper limits on arbitrary things: $\lim_{n\to\infty} \sum_{0}^{n} x_i$ is made with *lim from {n−> inf} sum from 0 to n x sub i.*

Left and right brackets, braces, etc., of the right height are made with **left** and **right:** *left [x sup 2 + y sup 2 over alpha right]~=~1* produces $\left[x^2+\frac{y^2}{\alpha}\right] = 1$. The **right** clause is optional. Legal characters after **left** and **right** are braces, brackets, bars, **c** and **f** for ceiling and floor, and "" for nothing at all (useful for a right-side-only bracket).

Vertical piles of things are made with **pile**, **lpile**, **cpile**, and **rpile**: *pile {a above b above c}* produces $\begin{matrix} a \\ b \\ c \end{matrix}$. There can be an arbitrary number of elements in a pile. **lpile** left-justifies, **pile** and **cpile** center, with different vertical spacing, and **rpile** right justifies.

Matrices are made with **matrix**: *matrix { lcol { x sub i above y sub 2 } ccol { 1 above 2 } }* produces $\begin{matrix} x_i & 1 \\ y_2 & 2 \end{matrix}$. In addition, there is **rcol** for a right-justified column.

Diacritical marks are made with **dot**, **dotdot**, **hat**, **tilde**, **bar**, **vec**, **dyad**, and **under**: *x dot = f(t) bar* is $\dot{x} = \overline{f(t)}$, *y dotdot bar ~ = ~ n under* is $\bar{\ddot{y}} = \underline{n}$, and *x vec ~ = ~ y dyad* is $\vec{x} = \overleftrightarrow{y}$.

Sizes and font can be changed with **size** *n* or **size** ±*n*, **roman**, **italic**, **bold**, and **font** *n*. Size and fonts can be changed globally in a document by **gsize** *n* and **gfont** *n*, or by the command-line arguments **−s***n* and **−f***n*.

Normally subscripts and superscripts are reduced by 3 point sizes from the previous size; this may be changed by the command-line argument **−p***n*.

Successive display arguments can be lined up. Place **mark** before the desired lineup point in the first equation; place **lineup** at the place that is to line up vertically in subsequent equations.

Shorthands may be defined or existing keywords redefined with **define**: *define thing % replacement %* defines a new token called *thing* which will be replaced by *replacement* whenever it appears thereafter. The *%* may be any character that does not occur in *replacement*.

Keywords like *sum* (∑) *int* (∫) *inf* (∞) and shorthands like >= (≥) −> (→), and != (≠) are recognized. Greek letters are spelled out in the desired case, as in *alpha* or *GAMMA*. Mathematical words like sin, cos, log are made Roman automatically. *Troff*(1) four-character escapes like \(bs (\) can be used anywhere. Strings enclosed in double quotes "..." are passed through untouched; this permits keywords to be entered as text, and can be used to communicate with *troff* when all else fails.

SEE ALSO

troff(1), tbl(1), ms(7), eqnchar(7)
B. W. Kernighan and L. L. Cherry, *Typesetting Mathematics—User's Guide*
J. F. Ossanna, *NROFF/TROFF User's Manual*

BUGS

To embolden digits, parens, etc., it is necessary to quote them, as in 'bold "12.3"'.

NAME

error − analyze and disperse compiler error messages

SYNOPSIS

error [**−n**] [**−s**] [**−q**] [**−v**] [**−t** suffixlist] [**−I** ignorefile] [name]

DESCRIPTION

Error analyzes and optionally disperses the diagnostic error messages produced by a number of compilers and language processors to the source file and line where the errors occurred. It can replace the painful, traditional methods of scribbling abbreviations of errors on paper, and permits error messages and source code to be viewed simultaneously without machinations of multiple windows in a screen editor.

Error looks at the error messages, either from the specified file *name* or from the standard input, and attempts to determine which language processor produced each error message, determines the source file and line number to which the error message refers, determines if the error message is to be ignored or not, and inserts the (possibly slightly modified) error message into the source file as a comment on the line preceding to which the line the error message refers. Error messages which can't be categorized by language processor or content are not inserted into any file, but are sent to the standard output. *Error* touches source files only after all input has been read. By specifying the **−q** query option, the user is asked to confirm any potentially dangerous (such as touching a file) or verbose action. Otherwise *error* proceeds on its merry business. If the **−t** touch option and associated suffix list is given, *error* will restrict itself to touch only those files with suffices in the suffix list. Error also can be asked (by specifying **−v**) to invoke *vi*(1) on the files in which error messages were inserted; this obviates the need to remember the names of the files with errors.

Error is intended to be run with its standard input connected via a pipe to the error message source. Some language processors put error messages on their standard error file; others put their messages on the standard output. Hence, both error sources should be piped together into *error*. For example, when using the *csh* syntax,

```
make −s lint |& error −q −v
```

will analyze all the error messages produced by whatever programs *make* runs when making lint.

Error knows about the error messages produced by: *make, cc, cpp, ccom, as, ld, lint, pi, pc* and *f77*. *Error* knows a standard format for error messages produced by the language processors, so is sensitive to changes in these formats. For all languages except *Pascal,* error messages are restricted to be on one line. Some error messages refer to more than one line in more than one files; *error* will duplicate the error message and insert it at all of the places referenced.

Error will do one of six things with error messages.

synchronize
: Some language processors produce short errors describing which file it is processing. *Error* uses these to determine the file name for languages that don't include the file name in each error message. These synchronization messages are consumed entirely by *error*.

discard
: Error messages from *lint* that refer to one of the two *lint* libraries, */usr/lib/llib-lc* and */usr/lib/llib-port* are discarded, to prevent accidently touching these libraries. Again, these error messages are consumed entirely by *error*.

nullify
: Error messages from *lint* can be nullified if they refer to a specific function, which is known to generate diagnostics which are not interesting. Nullified error messages are not inserted into the source file, but are written to the standard output. The names of functions to ignore are taken from either the file named *.errorrc* in the

users's home directory, or from the file named by the **-I** option. If the file does not exist, no error messages are nullified. If the file does exist, there must be one function name per line.

not file specific
Error messages that can't be intuited are grouped together, and written to the standard output before any files are touched. They will not be inserted into any source file.

file specific Error message that refer to a specific file, but to no specific line, are written to the standard output when that file is touched.

true errors Error messages that can be intuited are candidates for insertion into the file to which they refer.

Only true error messages are candidates for inserting into the file they refer to. Other error messages are consumed entirely by *error* or are written to the standard output. *Error* inserts the error messages into the source file on the line preceding the line the language processor found in error. Each error message is turned into a one line comment for the language, and is internally flagged with the string "###" at the beginning of the error, and "%%%" at the end of the error. This makes pattern searching for errors easier with an editor, and allows the messages to be easily removed. In addition, each error message contains the source line number for the line the message refers to. A reasonably formatted source program can be recompiled with the error messages still in it, without having the error messages themselves cause future errors. For poorly formatted source programs in free format languages, such as C or Pascal, it is possible to insert a comment into another comment, which can wreak havoc with a future compilation. To avoid this, programs with comments and source on the same line should be formatted so that language statements appear before comments.

Options available with *error* are:

-n Do *not* touch any files; all error messages are sent to the standard output.

-q The user is *queried* whether s/he wants to touch the file. A "y" or "n" to the question is necessary to continue. Absence of the **-q** option implies that all referenced files (except those referring to discarded error messages) are to be touched.

-v After all files have been touched, overlay the visual editor *vi* with it set up to edit all files touched, and positioned in the first touched file at the first error. If *vi* can't be found, try *ex* or *ed* from standard places.

-t Take the following argument as a suffix list. Files whose suffixes do not appear in the suffix list are not touched. The suffix list is dot separated, and "*" wildcards work. Thus the suffix list:

".c.y.foo*.h"

allows *error* to touch files ending with ".c", ".y", ".foo*" and ".y".

-s Print out *statistics* regarding the error categorization. Not too useful.

Error catches interrupt and terminate signals, and if in the insertion phase, will orderly terminate what it is doing.

AUTHOR

Robert Henry

FILES

~/.errorrc	function names to ignore for *lint* error messages
/dev/tty	user's teletype

BUGS

Opens the teletype directly to do user querying.

Source files with links make a new copy of the file with only one link to it.

Changing a language processor's format of error messages may cause *error* to not understand the error message.

Error, since it is purely mechanical, will not filter out subsequent errors caused by 'floodgating' initiated by one syntactically trivial error. Humans are still much better at discarding these related errors.

Pascal error messages belong after the lines affected (error puts them before). The alignment of the '|' marking the point of error is also disturbed by *error.*

Error was designed for work on CRT's at reasonably high speed. It is less pleasant on slow speed terminals, and has never been used on hardcopy terminals.

NAME

ex, edit – text editor

SYNOPSIS

ex [–] [–v] [–t tag] [–r] [+*command*] [–l] name ...
edit [ex options]

DESCRIPTION

Ex is the root of a family of editors: *edit, ex* and *vi. Ex* is a superset of *ed,* with the most notable extension being a display editing facility. Display based editing is the focus of *vi.*

If you have not used *ed,* or are a casual user, you will find that the editor *edit* is convenient for you. It avoids some of the complexities of *ex* used mostly by systems programmers and persons very familiar with *ed.*

If you have a CRT terminal, you may wish to use a display based editor; in this case see *vi*(1), which is a command which focuses on the display editing portion of *ex.*

DOCUMENTATION

The document *Edit: A tutorial* provides a comprehensive introduction to *edit* assuming no previous knowledge of computers or the UNIX system.

The *Ex Reference Manual – Version 3.5* is a comprehensive and complete manual for the command mode features of *ex,* but you cannot learn to use the editor by reading it. For an introduction to more advanced forms of editing using the command mode of *ex* see the editing documents written by Brian Kernighan for the editor *ed;* the material in the introductory and advanced documents works also with *ex.*

An Introduction to Display Editing with Vi introduces the display editor *vi* and provides reference material on *vi.* All of these documents can be found in volume 2c of the Programmer's Manual. In addition, the *Vi Quick Reference* card summarizes the commands of *vi* in a useful, functional way, and is useful with the *Introduction.*

FILES

/usr/lib/ex?.?strings	error messages
/usr/lib/ex?.?recover	recover command
/usr/lib/ex?.?preserve	preserve command
/etc/termcap	describes capabilities of terminals
~/.exrc	editor startup file
/tmp/Ex*nnnnn*	editor temporary
/tmp/Rx*nnnnn*	named buffer temporary
/usr/preserve	preservation directory

SEE ALSO

awk(1), ed(1), grep(1), sed(1), grep(1), vi(1), termcap(5), environ(7)

AUTHOR

Originally written by William Joy
Mark Horton has maintained the editor since version 2.7, adding macros, support for many unusual terminals, and other features such as word abbreviation mode.

BUGS

The *undo* command causes all marks to be lost on lines changed and then restored if the marked lines were changed.

Undo never clears the buffer modified condition.

The *z* command prints a number of logical rather than physical lines. More than a screen full of output may result if long lines are present.

File input/output errors don't print a name if the command line '—' option is used.

There is no easy way to do a single scan ignoring case.

The editor does not warn if text is placed in named buffers and not used before exiting the editor.

Null characters are discarded in input files, and cannot appear in resultant files.

NAME

expand, unexpand − expand tabs to spaces, and vice versa

SYNOPSIS

expand [−tabstop] [−tab1,tab2,...,tabn] [file ...]
unexpand [−**a**] [file ...]

DESCRIPTION

Expand processes the named files or the standard input writing the standard output with tabs changed into blanks. Backspace characters are preserved into the output and decrement the column count for tab calculations. *Expand* is useful for pre-processing character files (before sorting, looking at specific columns, etc.) that contain tabs.

If a single *tabstop* argument is given then tabs are set *tabstop* spaces apart instead of the default 8. If multiple tabstops are given then the tabs are set at those specific columns.

Unexpand puts tabs back into the data from the standard input or the named files and writes the result on the standard output. By default only leading blanks and tabs are reconverted to maximal strings of tabs. If the −**a** option is given, then tabs are inserted whenever they would compress the resultant file by replacing two or more characters.

NAME

explain, diction— print wordy sentences; thesaurus for diction

SYNOPSIS

diction [**−ml**] [**−mm**] [**−n**] [**−f** pfile] file ...
explain

DESCRIPTION

Diction finds all sentences in a document that contain phrases from a data base of bad or wordy diction. Each phrase is bracketed with [ ]. Because *diction* runs *deroff* before looking at the text, formatting header files should be included as part of the input. The default macro package **−ms** may be overridden with the flag **−mm**. The flag **−ml** which causes **deroff** to skip lists, should be used if the document contains many lists of non-sentences. The user may supply her/his own pattern file to be used in addition to the default file with **−f** *pfile*. If the flag **−n** is also supplied the default file will be suppressed.

Explain is an interactive thesaurus for the phrases found by diction.

SEE ALSO

deroff(1)

BUGS

Use of non-standard formatting macros may cause incorrect sentence breaks. In particular, *diction* doesn't grok **−me**.

NAME

expr − evaluate arguments as an expression

SYNOPSIS

expr arg ...

DESCRIPTION

The arguments are taken as an expression. After evaluation, the result is written on the standard output. Each token of the expression is a separate argument.

The operators and keywords are listed below. The list is in order of increasing precedence, with equal precedence operators grouped.

expr | *expr*
: yields the first *expr* if it is neither null nor '0', otherwise yields the second *expr*.

expr & *expr*
: yields the first *expr* if neither *expr* is null or '0', otherwise yields '0'.

expr relop expr
: where *relop is one of* < <= = != >= >, yields '1' if the indicated comparison is true, '0' if false. The comparison is numeric if both *expr* are integers, otherwise lexicographic.

expr + *expr*
expr − *expr*
: addition or subtraction of the arguments.

expr * *expr*
expr / *expr*
expr % *expr*
: multiplication, division, or remainder of the arguments.

expr : *expr*
: The matching operator compares the string first argument with the regular expression second argument; regular expression syntax is the same as that of *ed*(1). The \(...\) pattern symbols can be used to select a portion of the first argument. Otherwise, the matching operator yields the number of characters matched ('0' on failure).

(*expr*)
: parentheses for grouping.

Examples:

To add 1 to the Shell variable *a*:

```
a=`expr $a + 1`
```

To find the filename part (least significant part) of the pathname stored in variable *a*, which may or may not contain '/':

```
expr $a : '.*/\(.*\)' '|' $a
```

Note the quoted Shell metacharacters.

SEE ALSO

sh(1), test(1)

DIAGNOSTICS

Expr returns the following exit codes:

0	if the expression is neither null nor '0',
1	if the expression is null or '0',
2	for invalid expressions.

NAME

eyacc − modified yacc allowing much improved error recovery

SYNOPSIS

eyacc [−v] [grammar]

DESCRIPTION

Eyacc is an old version of *yacc*(1), which produces tables used by the Pascal system and its error recovery routines. *Eyacc* fully enumerates test actions in its parser when an error token is in the look-ahead set. This prevents the parser from making undesirable reductions when an error occurs before the error is detected. The table format is different in *eyacc* than it was in the old *yacc,* as minor changes had been made for efficiency reasons.

SEE ALSO

yacc(1)

"Practical LR Error Recovery" by Susan L. Graham, Charles B. Haley and W. N. Joy; SIGPLAN Conference on Compiler Construction, August 1979.

AUTHOR

S. C. Johnson

Eyacc modifications by Charles Haley and William Joy.

BUGS

Pc and its error recovery routines should be made into a library of routines for the new *yacc.*

NAME

f77 — Fortran 77 compiler

SYNOPSIS

f77 [option] ... file ...

DESCRIPTION

F77 is the UNIX Fortran 77 compiler. It accepts several types of arguments:

Arguments whose names end with '.f' are taken to be Fortran 77 source programs; they are compiled, and each object program is left on the file in the current directory whose name is that of the source with '.o' substituted for '.f'.

Arguments whose names end with '.F' are also taken to be Fortran 77 source programs; these are first processed by the C preprocessor before being compiled by *f77*.

Arguments whose names end with '.r' or '.e' are taken to be Ratfor or EFL source programs respectively; these are first transformed by the appropriate preprocessor, then compiled by f77.

Arguments whose names end with '.c' or '.s' are taken to be C or assembly source programs and are compiled or assembled, producing a '.o' file.

The following options have the same meaning as in *cc*(1). See *ld*(1) for load-time options.

−c Suppress loading and produce '.o' files for each source file.

−g Have the compiler produce additional symbol table information for *dbx*(1). Also pass the **−lg** flag to *ld*(1).

−o output
Name the final output file *output* instead of 'a.out'.

−p Prepare object files for profiling, see *prof*(1).

−pg Causes the compiler to produce counting code in the manner of **−p**, but invokes a run-time recording mechanism that keeps more extensive statistics and produces a *gmon.out* file at normal termination. An execution profile can then be generated by use of *gprof*(1).

−w Suppress all warning messages. If the option is '−w66', only Fortran 66 compatibility warnings are suppressed.

−D*name*=*def*

−D*name*
Define the *name* to the C preprocessor, as if by '#define'. If no definition is given, the name is defined as "1". ('.F' suffix files only).

−I*dir* '#include' files whose names do not begin with '/' are always sought first in the directory of the *file* argument, then in directories named in **−I** options, then in directories on a standard list. ('.F' suffix files only).

−O Invoke an object-code optimizer.

−S Compile the named programs, and leave the assembler-language output on corresponding files suffixed '.s'. (No '.o' is created.).

The following options are peculiar to *f77*.

−i2 On machines which support short integers, make the default integer constants and variables short. (**−i4** is the standard value of this option). All logical quantities will be short.

−m Apply the M4 preprocessor to each '.r' file before transforming it with the Ratfor or EFL preprocessor.

−onetrip
Compile DO loops that are performed at least once if reached. (Fortran 77 DO loops are not performed at all if the upper limit is smaller than the lower limit.)

−u Make the default type of a variable 'undefined' rather than using the default Fortran rules.

−v Print the version number of the compiler, and the name of each pass as it executes.

−C Compile code to check that subscripts are within declared array bounds.

−F Apply the C, EFL, or Ratfor preprocessors to relevant files, put the result in the file with the suffix changed to '.f', but do not compile.

−E*x* Use the string *x* as an EFL option in processing '.e' files.

−R*x* Use the string *x* as a Ratfor option in processing '.r' files.

−N[qxscn]*nnn*
Make static tables in the compiler bigger. The compiler will complain if it overflows its tables and suggest you apply one or more of these flags. These flags have the following meanings:

q Maximum number of equivalenced variables. Default is 150.

x Maximum number of external names (common block names, subroutine and function names). Default is 200.

s Maximum number of statement numbers. Default is 401.

c Maximum depth of nesting for control statements (e.g. DO loops). Default is 20.

n Maximum number of identifiers. Default is 1009.

−U Do not convert upper case letters to lower case. The default is to convert Fortran programs to lower case except within character string constants.

Other arguments are taken to be either loader option arguments, or F77-compatible object programs, typically produced by an earlier run, or perhaps libraries of F77-compatible routines. These programs, together with the results of any compilations specified, are loaded (in the order given) to produce an executable program with name 'a.out'.

FILES

file.[fFresc]	input file
file.o	object file
a.out	loaded output
/usr/lib/f77pass1	compiler
/lib/f1	pass 2
/lib/c2	optional optimizer
/lib/cpp	C preprocessor
/usr/lib/libF77.a	intrinsic function library
/usr/lib/libI77.a	Fortran I/O library
/usr/lib/libU77.a	UNIX interface library
/usr/lib/libF77_p.a	profiling intrinsic function library
/usr/lib/libI77_p.a	profiling Fortran I/O library
/usr/lib/libU77_p.a	profiling UNIX interface library
/lib/libc.a	C library, see section 3
mon.out	file produced for analysis by prof(1).
gmon.out	file produced for analysis by gprof(1).

SEE ALSO

S. I. Feldman, P. J. Weinberger, *A Portable Fortran 77 Compiler*
D. L. Wasley, *Introduction to the f77 I/O Library*
prof(1), gprof(1), cc(1), ld(1), efl(1), ratfor(1)

DIAGNOSTICS

The diagnostics produced by *f77* itself are intended to be self-explanatory. Occasional messages may be produced by the loader.

BUGS

This compiler is still somewhat experimental. The optimizer occasionally makes mistakes; it should be avoided when debugging if apparently incorrect results are obtained. Because of an assembler error, complaints about long branches may occur with very large source files; such errors can be avoided by splitting the sources into smaller sections. If necessary, the old version of *f77* can be resurrected from /usr/src/old.

NAME

false, true — provide truth values

SYNOPSIS

true

false

DESCRIPTION

True and *false* are usually used in a Bourne shell script. They test for the appropriate status "true" or "false" before running (or failing to run) a list of commands.

EXAMPLE

```
while false
do
    command list
done
```

SEE ALSO

csh(1), sh(1), true(1)

DIAGNOSTICS

False has exit status nonzero.

NAME

fed − font editor

SYNOPSIS

fed [**−i**] [**−q**] name

DESCRIPTION

Fed is an editor for font files. It is display oriented and must be used on an HP 2648 graphics terminal. Fed does the necessary handshaking to work at 9600 baud on the 2648.

The **−i** flag requests *inverse video mode*, where all dots are dark and the background is bright. This provides a setting similar to the hardcopy output of the plotter, and is useful for fonts such as the shadow font where shading is important.

The **−q** flag requests *quiet mode*, where all graphic output is suppressed. This mode is useful on terminals other than the HP 2648 (assuming you are editing blindly) and for operations such as the # and A commands, since these operations do not make essential use of graphics, and since suppression of the graphic output speeds of *fed* considerably.

FONTS

A font is a collection of up to 256 *glyphs*, each of which is some pattern or design. Glyphs are represented on Unix as a rectangular array of dots, each of which is either dark or blank. Each location in the array is called a *pixel*. There are 200 pixels per inch due to the hardware of the Versatec and Varian plotters.

Each glyph has, in addition to its bit pattern, a *base* and a *width*. The base is a point, typically near the lower left of the array, that represents the logical lower left point of the glyph. The base is not restricted to be within the array, in fact, it is usually a few locations to the left of the edge. The vertical position of the base defines the *baseline*, which is held constant for all glyphs when a line is typeset. Letters with descenders, such as "g", go below the baseline. Other glyphs typically rest on the baseline.

The width is used by *troff(1)* to determine where to place the next glyph. It need not be the same as the width of the array, although it is usually about the same.

The size of the array, location of the base, and the width can vary among glyphs in a font. Fonts where all glyphs have the same width are called *fixed width fonts*, others are *variable width fonts*.

Attributes which do not vary among glyphs include the *font name*, which can be up to 11 alphabetic characters, and the *point size*, which is a positive integer indicating the overall size of the font. A point is 1/72 inch. The point size of a font is the distance, in points, from the top of the tallest glyph to the bottom of the lowest. The software of troff currently restricts point sizes to 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 20, 22, 24, 28, and 36 point. Normal text is usually 10 point.

Font files conventionally have names of the form

name.pointsize

for example, "bocklin.14" to indicate 14 point bocklin. Fed will look for such a file in both the current directory and /usr/lib/vfont. Vtroff will only look in /usr/lib/vfont.

There is a correspondence between *glyphs* and *characters* in a font. For a given font, each glyph has an ASCII character associated with it. The glyph is obtained in troff by typing the associated character, and in fed glyphs are also referred to by their character. However, it is not required for all characters to have a glyph, fonts never have more than 128 glyphs and usually have fewer.

There is usually a natural correspondence between glyphs and characters. For example, the glyph which is a roman lower case 'a' will generally have the ascii character 'a' as its corresponding character. In the special font, the Greek lower case alpha has 'a' as it's

corresponding character, upper case delta has 'D' as it's corresponding character, etc. However, special fonts such as the chess font have glyphs that do not appear to be related to their corresponding characters.

It is easy to confuse glyphs and characters. Note, however, that the three glyphs roman a, bold **a**, and italic *a*, are all different, yet all three correspond to the character 'a'. When this is multiplied by the large number of font styles and point sizes, there are many glyphs that match a single character, (but only one in a particular font).

FED ORGANIZATION

Fed organizes the screen into 21 *windows* in a 3 by 7 array. Each window is 100 by 100 pixels, meaning that the maximum height and width of a glyph is 100 pixels. Since the HP 2648 has a resolution of 100 dots per inch, glyphs displayed on the screen and printer will be double the actual height and width, even when fully zoomed out. There is a *current window*, which will be marked with a square border. There are two *pens*, called *fine* and *bold*. The fine pen is one pixel wide, the bold pen can range from two pixels to ten pixels in diameter. The default width of the bold pen is taken from the point size implied by the file name. The point size is not otherwise used. There are also fine and bold *erasers*.

There are two locations in the window, called the *cursor* and the *mark*. These tools are used to draw on glyphs.

Sometimes the cursor is on, in which case it is indicated by the hardware graphics cursor of the terminal, a cross. The cursor is considered to be located at the center of the cross. Sometimes the *rubber band line* is turned on, showing the path a line drawn would traverse. This line runs from the mark to the cursor, and is the only way the mark is graphically visible.

COMMANDS

Commands to fed are single characters, sometimes followed by any needed arguments. The commands used by fed were chosen to be as similar to *vi*(1) commands as was reasonable. Another distinction is that certain commands are in upper case. These commands were deliberately made hard to type because they cause a large change in the state of the editor and should not be done by accident. In a few cases there are both upper and lower case commands with the same letter.

Alphanumeric Keypad: Note that this is the keypad on the far right. The graphics keypad on the near right will not work. These keys are each synonyms for other commands. They are arranged in a manner that causes the five arrow keys to behave sensibly, but the others need to be memorized or stickers placed on the keys. They are provided for convenience only, and the user can avoid memorization simply by using the mnemonic letter keys instead.

The layout is as follows:

undo (u)	rezoom ( )	fillin (f)
move (m)	up (k)	draw (d)
left (h)	base (b)	right (l)
setdot (.)	down (j)	cleardot (>)

The arrow keys move the cursor one pixel in the indicated direction. The cursor is turned on if it was off. Note that the alphanumeric keys (far right) must be used. The graphics keys (near right) will appear to move the cursor but it will not be moved internally. The cursor cannot be moved outside the current window.

^*L*: Redraw the screen. This is useful if an I/O error or background process has caused the screen to get messed up.

b: Move the cursor to the base of the window. This is the default location of the cursor.

c: If the cursor is on, turn it off. Otherwise, turn it on.

d: Draw a line from the mark to the cursor. The currently selected tool (fine pen, bold pen, fine eraser, bold eraser) is used. The cursor is turned off. The mark is moved to the location of the cursor.

f: Fill in the current hole. The cursor must be in a completely enclosed empty (white) area. The area is set to black. If this command is invoked on the outside or there are any leaks to the outside, the entire outside will be filled in. (Undo is useful in this case.) Filling in cannot jump diagonals, but can rather only spread in the four orthogonal directions.

g <*x*>: Get a glyph. X can be any character. The glyph corresponding to x is put in a window, and this window is made the current window. The glyph is centered horizontally in the window. The baseline is located at row 70 from the top of the window. The pen and cursor are placed at the base, and the cursor is turned off. The glyph must exist.

h, *j*, *k*, and *l* are accepted to mean left, down, up, and right, respectively. They are synonymous with the alphanumeric arrow keys. They have the same meanings as in *vi(1)*.

m: Move the mark to the current location of the cursor. The cursor is turned on.

n <*x*>: New glyph. This is similar to *g*, except that the glyph must *not* exist. It is used to create a new glyph. A blank window is created, centered at (50, 70) as in g.

p: Print the contents of the screen. An HP 2631 printer must be connected to the terminal. The screen is copied to the printer. If in inverse video mode, the screen is changed to normal video mode before the print, and then changed back after the print.

r: If the rubber band line is on, turn it off. Otherwise, turn it on.

s <*what*> [<*where*>]: Set <what> to <where>. What and where are single characters. The possibilities are:

spf: Set pen fine. ('l' for light is also accepted.)

spb: set pen bold. ('h' for heavy is also accepted.)

sd: Set draw. The pen is used instead of the eraser.

se: Set erase. The eraser is used instead of the pen.

ss<*n*>: Set size of bold pen. <n> is a digit from 1 to 9. The size of the bold pen is set accordingly. This also affects the bold eraser.

u: Undo. The previous change to the current window is undone. Note that undo is on a window by window basis, so that commands that affect characters or more than one window cannot be undone.

z <*n*>: Zoom to level n. The screen is blown up by a factor of n. This only affects the appearance of the screen to make it easy to see the individual dots, and does not affect the size of the glyph or the result of a print command. Zooming to 1 shows the entire screen, a level of 3 or 4 is probably good for editing glyphs. When a message is printed on the screen, fed automatically zooms out to level 1 so you can read the message. Hitting space will zoom back. z followed by <return> zooms out without changing the previous zoom.

space: Zoom back to the level most recently requested by the z command.

A <*i*|*e*|*r*> <*first*> <*last*> [<*oldps*> <*newps*>]:
Artificially italicize/embolden/resize a range of glyphs in the current font. Enter i for italicize, e for embolden, or r for resize, and the first and last character in the range desired. If you are resizing you will also have to enter the old and new point size, each terminated by a return. Each glyph is gotten and changed on the screen visibly. Glyphs are italicized by slanting them to the right at a slope of 1/5. They are emboldened by smearing them to the right a number if pixels equal to the current heavy pen size. They are resized with an algorithm which translates

all on bits to the new position. These operations will be considerably faster if the −q option is in effect, since much overhead is involved in the graphic display.

B: Move the base to the cursor. The cursor is turned on.

C <*from*> <*to*>: Copy the glyph in character <from> to character <to>. If <from> has a window on the screen, that window is given to <to>.

D <*from*> <*through*>: Delete a range of characters in the font, from <from> through <through> inclusive. To delete a single character type it twice.

E <*file*>: Edit the named file. If changes have been made to the current file, confirmation will be requested. (Either 'y' or 'E' is accepted.) The file name is terminated with return.

F <*first*> <*last*>: Show the font on the screen. The characters in the specified range are shown. The width values are used to get natural spacing. The display will remain until another command is typed, at which time the previous display will be redrawn and the new command will be executed. As a special case, a "p" command will print the results of the "F" command instead of the previous display.

I <*h/v*>: Invert the current glyph about a horizontal or vertical axis, as indicated by *h* or *v*. The axis runs up the center of the window. The base can be subsequently positioned with the *B* command.

K: Kill the current glyph. All dots are set to blank. The glyph is not removed from the font. This is used for redrawing a glyph from scratch or replacing it with another glyph.

M <*from*> <*to*>: Move a glyph from <from> to <to>. This is just like the copy command but the original is deleted.

N <*file*>: Write out the current file, if necessary, and edit the new file specified. The file name is terminated with return.

P <*first*> <*last*> <*file*>: Partial read from a file. A file and the first and last characters in the range are prompted for. Characters not in the range are left unmodified, characters in the range are handled as in the R command.

Q: Quit the editor, without saving any work. If changes have been made confirmation will be required (either 'Q' or 'y' is taken as 'yes'.)

R <*file*>: Read in the named file on top of the current file. Glyphs are merged wherever possible. If there is a conflict, you will be asked whether fed should take the glyph from the file (f) or buffer (b). Responding with F or B will lock in that mode for the remainder of the read. The file name is terminated with a return.

T <*text*>:

Typeset the line of text on the terminal. This is similar to the F command except that the given text is arranged on the screen, so you can see how some particular combination of characters would look.

V: Toggle whether editing is being done in inverse video mode.

W <*file*>: Write the buffer out onto the named file, which is terminated by return. A null file name means the current file name.

ZZ: Exit fed. A write is done, if necessary, followed by a quit. This is the normal way to leave fed. The Z must be doubled for compatibility with *vi*.

.: Turn on the dot under the cursor. The cursor is turned off.

>: Turn off the dot under the cursor. The cursor is turned off.

<*char*> <*field*> <*value*>: Edit a numerical field. This only makes sense if the glyph has not been gotten (*g* or *n*) yet, since otherwise the values are taken from window specific things such as the base. Fed does not do any sanity checking, but just substitutes the value input. Fields are the first letter of any field from the dispatch structure (see vfont(5)), specifically, these fields are *addr*, *nbytes*, *left*, *right*, *up*, *down*, and *width*. The number, which may be signed, is terminated by a newline.

FILES

/usr/lib/vfont/*.*

SEE ALSO

vfont(5), vfontinfo(1), vtroff(1), vwidth(1)

AUTHOR

Mark Horton

BUGS

Attempting to use the second 128 characters would be folly. Fed has never been tested on such fonts, and at a bare minimum there would be problems trying to input 8 bit characters.

The character DEL is interpreted by the tty driver to mean interrupt. Hence the corresponding glyph cannot be accessed. The *start*, *stop*, and *quit* characters are turned off, but other characters used by the new tty driver must be quoted with ^V.

Changed widths are not copied to the width table used by troff. This only matters if logical widths are changed, or if glyphs are moved around. For these cases, *vwidth(1)* must be used.

The artificial operations don't do a very good job. The quality possible from blowing a font up is in general poor. Italicizing tends to make edges that were previously slanted very ragged. However, these operations are better than nothing at all and are a reasonable first approximation for hand fixing.

The HP 2648 Terminal on which this runs has been stolen.

NAME

file – determine file type

SYNOPSIS

file file ...

DESCRIPTION

File performs a series of tests on each argument in an attempt to classify it. If an argument appears to be ascii, *file* examines the first 512 bytes and tries to guess its language.

BUGS

It often makes mistakes. In particular it often suggests that command files are C programs.

Does not recognize Pascal or LISP.

NAME

find − find files

SYNOPSIS

find pathname-list expression

DESCRIPTION

Find recursively descends the directory hierarchy for each pathname in the *pathname-list* (i.e., one or more pathnames) seeking files that match a boolean *expression* written in the primaries given below. In the descriptions, the argument *n* is used as a decimal integer where +*n* means more than *n*, −*n* means less than *n* and *n* means exactly *n*.

−name filename
: True if the *filename* argument matches the current file name. Normal Shell argument syntax may be used if escaped (watch out for '[', '?' and '*').

−perm onum
: True if the file permission flags exactly match the octal number *onum* (see *chmod*(1)). If *onum* is prefixed by a minus sign, more flag bits (017777, see *stat*(2)) become significant and the flags are compared: *(flags&onum)==onum*.

−type c
: True if the type of the file is *c*, where *c* is **b**, **c**, **d**, **f** or **l** for block special file, character special file, directory, plain file, or symbolic link.

−links n
: True if the file has *n* links.

−user uname
: True if the file belongs to the user *uname* (login name or numeric user ID).

−group gname
: True if the file belongs to group *gname* (group name or numeric group ID).

−size n
: True if the file is *n* blocks long (512 bytes per block).

−inum n
: True if the file has inode number *n*.

−atime n
: True if the file has been accessed in *n* days.

−mtime n
: True if the file has been modified in *n* days.

−exec command
: True if the executed command returns a zero value as exit status. The end of the command must be punctuated by an escaped semicolon. A command argument '{}' is replaced by the current pathname.

−ok command
: Like **−exec** except that the generated command is written on the standard output, then the standard input is read and the command executed only upon response **y**.

−print
: Always true; causes the current pathname to be printed.

−newer file
: True if the current file has been modified more recently than the argument *file*.

The primaries may be combined using the following operators (in order of decreasing precedence):

1) A parenthesized group of primaries and operators (parentheses are special to the Shell and must be escaped).
2) The negation of a primary ('!' is the unary *not* operator).
3) Concatenation of primaries (the *and* operation is implied by the juxtaposition of two primaries).

4) Alternation of primaries ('−o' is the *or* operator).

EXAMPLE

To remove all files named 'a.out' or '*.o' that have not been accessed for a week:

```
find / \( −name a.out −o −name '*.o' \) −atime +7 −exec rm {} \;
```

FILES

/etc/passwd
/etc/group

SEE ALSO

sh(1), test(1), fs(5)

BUGS

The syntax is painful.

NAME

finger − user information lookup program

SYNOPSIS

finger [options] name ...

DESCRIPTION

By default *finger* lists the login name, full name, terminal name and write status (as a '*' before the terminal name if write permission is denied), idle time, login time, and office location and phone number (if they are known) for each current UNIX user. (Idle time is minutes if it is a single integer, hours and minutes if a ':' is present, or days and hours if a 'd' is present.)

A longer format also exists and is used by *finger* whenever a list of peoples names is given. (Account names as well as first and last names of users are accepted.) This format is multi-line, and includes all the information described above as well as the user's home directory and login shell, any plan which the person has placed in the file *.plan* in their home directory, and the project on which they are working from the file *.project* also in the home directory.

Finger options include:

−m Match arguments only on user name.

−l Force long output format.

−p Suppress printing of the *.plan* files

−s Force short output format.

FILES

/etc/utmp	who file
/etc/passwd	for users names, offices, ...
/usr/adm/lastlog	last login times
~/.plan	plans
~/.project	projects

SEE ALSO

w(1), who(1)

AUTHOR

Earl T. Cohen

BUGS

Only the first line of the *.project* file is printed.

The encoding of the gcos field is UCB dependent − it knows that an office '197MC' is '197M Cory Hall', and that '529BE' is '529B Evans Hall'.

A user information data base is in the works and will radically alter the way the information that *finger* uses is stored. Finger will require extensive modification when this is implemented.

NAME

fmt — simple text formatter

SYNOPSIS

fmt [name ...]

DESCRIPTION

Fmt is a simple text formatter which reads the concatenation of input files (or standard input if none are given) and produces on standard output a version of its input with lines as close to 72 characters long as possible. The spacing at the beginning of the input lines is preserved in the output, as are blank lines and interword spacing.

Fmt is meant to format mail messages prior to sending, but may also be useful for other simple tasks. For instance, within visual mode of the *ex* editor (e.g. *vi*) the command

```
!}fmt
```

will reformat a paragraph, evening the lines.

SEE ALSO

nroff(1), mail(1)

AUTHOR

Kurt Shoens

BUGS

The program was designed to be simple and fast — for more complex operations, the standard text processors are likely to be more appropriate.

NAME

fold – fold long lines for finite width output device

SYNOPSIS

fold [–width] [file ...]

DESCRIPTION

Fold is a filter which will fold the contents of the specified files, or the standard input if no files are specified, breaking the lines to have maximum width *width*. The default for *width* is 80. *Width* should be a multiple of 8 if tabs are present, or the tabs should be expanded using *expand*(1) before coming to *fold*.

SEE ALSO

expand(1)

BUGS

If underlining is present it may be messed up by folding.

NAME

fp — Functional Programming language compiler/interpreter

SYNOPSIS

fp

DESCRIPTION

Fp is an interpreter/compiler that implements the applicative language proposed by John Backus. It is written in **FRANZ LISP**.

In a functional programming language intent is expressed in a mathematical style devoid of assignment statements and variables. Functions compute by value only; there are no side-effects since the result of a computation depends solely on the inputs.

Fp "programs" consist of *functional expressions* — primitive and user-defined *fp* functions combined by *functional forms*. These forms take functional arguments and return functional results. For example, the composition operator '@' takes two functional arguments and returns a function which represents their composition.

There exists a single operation in *fp* — *application*. This operation causes the system to evaluate the indicated function using the single argument as input (all functions are monadic).

GETTING STARTED

Fp invokes the system. *Fp* compiles functions into *lisp*(1) source code; *lisp*(1) interprets this code (the user may compile this code using the liszt (1) compiler to gain a factor of 10 in performance). *Control D* exits back to the shell. *Break* terminates any computation in progress and resets any open file units. *)help* provides a short summary of all user commands.

FILES

/usr/ucb/lisp	the FRANZ LISP interpreter
/usr/ucb/liszt	the liszt compiler
/usr/doc/fp	the User's Guide

SEE ALSO

lisp(1), liszt(1).

The Berkeley FP user's manual, available on-line. The language is described in the August 1978 issue of *CACM* (Turing award lecture by John Backus).

BUGS

If a non-terminating function is applied as the result of loading a file, then control is returned to the user immediately, everything after that position in the file is ignored.

FP incorrectly marks the location of a syntax error on large, multi-line function definitions or applications.

AUTHOR

Scott B. Baden

NAME

fpr − print Fortran file

SYNOPSIS

fpr

DESCRIPTION

Fpr is a filter that transforms files formatted according to Fortran's carriage control conventions into files formatted according to UNIX line printer conventions.

Fpr copies its input onto its output, replacing the carriage control characters with characters that will produce the intended effects when printed using *lpr*(1). The first character of each line determines the vertical spacing as follows:

Character	Vertical Space Before Printing
Blank	One line
0	Two lines
1	To first line of next page
+	No advance

A blank line is treated as if its first character is a blank. A blank that appears as a carriage control character is deleted. A zero is changed to a newline. A one is changed to a form feed. The effects of a "+" are simulated using backspaces.

EXAMPLES

a.out | fpr | lpr

fpr < f77.output | lpr

AUTHOR

Robert P. Corbett

BUGS

Results are undefined for input lines longer than 170 characters.

NAME

from — who is my mail from?

SYNOPSIS

from [**−s** sender] [user]

DESCRIPTION

From prints out the mail header lines in your mailbox file to show you who your mail is from. If *user* is specified, then *user*'s mailbox is examined instead of your own. If the -s option is given, then only headers for mail sent by *sender* are printed.

FILES

/usr/spool/mail/*

SEE ALSO

biff(1), mail(1), prmail(1)

NAME

fsplit − split a multi-routine Fortran file into individual files

SYNOPSIS

fsplit [-e efile] ... [file]

DESCRIPTION

Fsplit takes as input either a file or standard input containing Fortran source code. It attempts to split the input into separate routine files of the form *name.f*, where *name* is the name of the program unit (e.g. function, subroutine, block data or program). The name for unnamed block data subprograms has the form *blkdtaNNN.f* where NNN is three digits and a file of this name does not already exist. For unnamed main programs the name has the form *mainNNN.f*. If there is an error in classifying a program unit, or if *name.f* already exists, the program unit will be put in a file of the form *zzzNNN.f* where *zzzNNN.f* does not already exist.

Normally each subprogram unit is split into a separate file. When the *-e* option is used, only the specified subprogram units are split into separate files. E.g.:

```
fsplit -e readit -e doit prog.f
```

will split readit and doit into separate files.

DIAGNOSTICS

If names specified via the *-e* option are not found, a diagnostic is written to *standard error.*

AUTHOR

Asa Romberger and Jerry Berkman

BUGS

Fsplit assumes the subprogram name is on the first noncomment line of the subprogram unit. Nonstandard source formats may confuse *fsplit.*

It is hard to use *-e* for unnamed main programs and block data subprograms since you must predict the created file name.

NAME

ftp – file transfer program

SYNOPSIS

ftp [**-v**] [**-d**] [**-i**] [**-n**] [**-g**] [**host**]

DESCRIPTION

Ftp is the user interface to the ARPANET standard File Transfer Protocol. The program allows a user to transfer files to and from a remote network site.

The client host with which *ftp* is to communicate may be specified on the command line. If this is done, *ftp* will immediately attempt to establish a connection to an FTP server on that host; otherwise, *ftp* will enter its command interpreter and await instructions from the user. When *ftp* is awaiting commands from the user the prompt "ftp>" is provided the user. The following commands are recognized by *ftp*:

! Invoke a shell on the local machine.

append *local-file* [*remote-file*]
Append a local file to a file on the remote machine. If *remote-file* is left unspecified, the local file name is used in naming the remote file. File transfer uses the current settings for *type*, *format*, *mode*, and *structure*.

ascii Set the file transfer *type* to network ASCII. This is the default type.

bell Arrange that a bell be sounded after each file transfer command is completed.

binary Set the file transfer *type* to support binary image transfer.

bye Terminate the FTP session with the remote server and exit *ftp*.

cd *remote-directory*
Change the working directory on the remote machine to *remote-directory*.

close Terminate the FTP session with the remote server, and return to the command interpreter.

delete *remote-file*
Delete the file *remote-file* on the remote machine.

debug [*debug-value*]
Toggle debugging mode. If an optional *debug-value* is specified it is used to set the debugging level. When debugging is on, *ftp* prints each command sent to the remote machine, preceded by the string "-->".

dir [*remote-directory*] [*local-file*]
Print a listing of the directory contents in the directory, *remote-directory*, and, optionally, placing the output in *local-file*. If no directory is specified, the current working directory on the remote machine is used. If no local file is specified, output comes to the terminal.

form *format*
Set the file transfer *form* to *format*. The default format is "file".

get *remote-file* [*local-file*]
Retrieve the *remote-file* and store it on the local machine. If the local file name is not specified, it is given the same name it has on the remote machine. The current settings for *type*, *form*, *mode*, and *structure* are used while transferring the file.

hash Toggle hash-sign ("#") printing for each data block transferred. The size of a data block is 1024 bytes.

glob Toggle file name globbing. With file name globbing enabled, each local file or pathname is processed for *csh*(1) metacharacters. These characters include "*?[]~{}".

Remote files specified in mutliple item commands, e.g. *mput*, are globbed by the remote server. With globbing disabled all files and pathnames are treated literally.

help [*command*]
Print an informative message about the meaning of *command*. If no argument is given, *ftp* prints a list of the known commands.

lcd [*directory*]
Change the working directory on the local machine. If no *directory* is specified, the user's home directory is used.

ls [*remote-directory*] [*local-file*]
Print an abbreviated listing of the contents of a directory on the remote machine. If *remote-directory* is left unspecified, the current working directory is used. If no local file is specified, the output is sent to the terminal.

mdelete *remote-files*
Delete the specified files on the remote machine. If globbing is enabled, the specification of remote files will first be expanded using *ls*.

mdir *remote-files local-file*
Obtain a directory listing of multiple files on the remote machine and place the result in *local-file*.

mget *remote-files*
Retrieve the specified files from the remote machine and place them in the current local directory. If globbing is enabled, the specification of remote files will first be expanding using *ls*.

mkdir *directory-name*
Make a directory on the remote machine.

mls *remote-files local-file*
Obtain an abbreviated listing of multiple files on the remote machine and place the result in *local-file*.

mode [*mode-name*]
Set the file transfer *mode* to *mode-name*. The default mode is "stream" mode.

mput *local-files*
Transfer multiple local files from the current local directory to the current working directory on the remote machine.

open *host* [*port*]
Establish a connection to the specified *host* FTP server. An optional port number may be supplied, in which case, *ftp* will attempt to contact an FTP server at that port. If the *auto-login* option is on (default), *ftp* will also attempt to automatically log the user in to the FTP server (see below).

prompt Toggle interactive prompting. Interactive prompting occurs during multiple file transfers to allow the user to selectively retrieve or store files. If prompting is turned off (default), any *mget* or *mput* will transfer all files.

put *local-file* [*remote-file*]
Store a local file on the remote machine. If *remote-file* is left unspecified, the local file name is used in naming the remote file. File transfer uses the current settings for *type*, *format*, *mode*, and *structure*.

pwd Print the name of the current working directory on the remote machine.

quit A synonym for bye.

quote *arg1 arg2 ...*
The arguments specified are sent, verbatim, to the remote FTP server. A single FTP reply code is expected in return.

recv *remote-file* [*local-file*]
A synonym for get.

remotehelp [*command-name*]
Request help from the remote FTP server. If a *command-name* is specified it is supplied to the server as well.

rename [*from*] [*to*]
Rename the file *from* on the remote machine, to the file *to*.

rmdir *directory-name*
Delete a directory on the remote machine.

send *local-file* [*remote-file*]
A synonym for put.

sendport
Toggle the use of PORT commands. By default, *ftp* will attempt to use a PORT command when establishing a connection for each data transfer. If the PORT command fails, *ftp* will use the default data port. When the use of PORT commands is disabled, no attempt will be made to use PORT commands for each data transfer. This is useful for certain FTP implementations which do ignore PORT commands but, incorrectly, indicate they've been accepted.

status Show the current status of *ftp*.

struct [*struct-name*]
Set the file transfer *structure* to *struct-name*. By default "stream" structure is used.

tenex Set the file transfer type to that needed to talk to TENEX machines.

trace Toggle packet tracing.

type [*type-name*]
Set the file transfer *type* to *type-name*. If no type is specified, the current type is printed. The default type is network ASCII.

user *user-name* [*password*] [*account*]
Identify yourself to the remote FTP server. If the password is not specified and the server requires it, *ftp* will prompt the user for it (after disabling local echo). If an account field is not specified, and the FTP server requires it, the user will be prompted for it. Unless *ftp* is invoked with "auto-login" disabled, this process is done automatically on initial connection to the FTP server.

verbose
Toggle verbose mode. In verbose mode, all responses from the FTP server are displayed to the user. In addition, if verbose is on, when a file transfer completes, statistics regarding the efficiency of the transfer are reported. By default, verbose is on.

? [*command*]
A synonym for help.

Command arguments which have embedded spaces may be quoted with quote (") marks.

FILE NAMING CONVENTIONS

Files specified as arguments to *ftp* commands are processed according to the following rules.

1) If the file name "−" is specified, the **stdin** (for reading) or **stdout** (for writing) is used.

2) If the first character of the file name is "|", the remainder of the argument is interpreted as a shell command. *Ftp* then forks a shell, using *popen*(3) with the argument supplied, and reads (writes) from the stdout (stdin). If the shell command includes spaces, the argument must be quoted; e.g. ""ls -lt"". A particularly useful example of this mechanism is: "dir |more".

3) Failing the above checks, if "globbing" is enabled, local file names are expanded according to the rules used in the *csh*(1); c.f. the *glob* command.

FILE TRANSFER PARAMETERS

The FTP specification specifies many parameters which may affect a file transfer. The *type* may be one of "ascii", "image" (binary), "ebcdic", and "local byte size" (for PDP-10's and PDP-20's mostly). *Ftp* supports the ascii and image types of file transfer.

Ftp supports only the default values for the remaining file transfer parameters: *mode*, *form*, and *struct*.

OPTIONS

Options may be specified at the command line, or to the command interpreter.

The **-v** (verbose on) option forces *ftp* to show all responses from the remote server, as well as report on data transfer statistics.

The **-n** option restrains *ftp* from attempting "auto-login" upon initial connection. If auto-login is enabled, *ftp* will check the *.netrc* file in the user's home directory for an entry describing an account on the remote machine. If no entry exists, *ftp* will use the login name on the local machine as the user identity on the remote machine, and prompt for a password and, optionally, an account with which to login.

The **-i** option turns off interactive prompting during mutliple file transfers.

The **-d** option enables debugging.

The **-g** option disables file name globbing.

BUGS

Many FTP server implementation do not support the experimental operations such as print working directory. Aborting a file transfer does not work right; if one attempts this the local *ftp* will likely have to be killed by hand.

NAME

gcore − get core images of running processes

SYNOPSIS

gcore process-id ...

DESCRIPTION

Gcore creates a core image of each specified process, suitable for use with *adb*(1) or *dbx*(1).

FILES

core.<process-id> core images

BUGS

Paging activity that occurs while *gcore* is running may cause the program to become confused. For best results, the desired processes should be stopped.

NAME

gprof − display call graph profile data

SYNOPSIS

gprof [options] [a.out [gmon.out ...]]

DESCRIPTION

gprof produces an execution profile of C, Pascal, or Fortran77 programs. The effect of called routines is incorporated in the profile of each caller. The profile data is taken from the call graph profile file (*gmon.out* default) which is created by programs which are compiled with the **−pg** option of *cc*, *pc*, and *f77*. That option also links in versions of the library routines which are compiled for profiling. The symbol table in the named object file (*a.out* default) is read and correlated with the call graph profile file. If more than one profile file is specified, the *gprof* output shows the sum of the profile information in the given profile files.

First, a flat profile is given, similar to that provided by *prof*(1). This listing gives the total execution times and call counts for each of the functions in the program, sorted by decreasing time.

Next, these times are propagated along the edges of the call graph. Cycles are discovered, and calls into a cycle are made to share the time of the cycle. A second listing shows the functions sorted according to the time they represent including the time of their call graph descendents. Below each function entry is shown its (direct) call graph children, and how their times are propagated to this function. A similar display above the function shows how this function's time and the time of its descendents is propagated to its (direct) call graph parents.

Cycles are also shown, with an entry for the cycle as a whole and a listing of the members of the cycle and their contributions to the time and call counts of the cycle.

The following options are available:

−a suppresses the printing of statically declared functions. If this option is given, all relevant information about the static function (*e.g.*, time samples, calls to other functions, calls from other functions) belongs to the function loaded just before the static function in the *a.out* file.

−b supresses the printing of a description of each field in the profile.

−c the static call graph of the program is discovered by a heuristic which examines the text space of the object file. Static-only parents or children are indicated with call counts of 0.

−e *name*
suppresses the printing of the graph profile entry for routine *name* and all its descendants (unless they have other ancestors that aren't suppressed). More than one **−e** option may be given. Only one *name* may be given with each **−e** option.

−E *name*
suppresses the printing of the graph profile entry for routine *name* (and its descendants) as **−e**, above, and also excludes the time spent in *name* (and its descendants) from the total and percentage time computations. (For example, **−E** *mcount* **−E** *mcleanup* is the default.)

−f *name*
prints the graph profile entry of only the specified routine *name* and its descendants. More than one **−f** option may be given. Only one *name* may be given with each **−f** option.

−F *name*
prints the graph profile entry of only the routine *name* and its descendants (as **−f**, above) and also uses only the times of the printed routines in total time and percentage

computations. More than one −F option may be given. Only one *name* may be given with each −F option. The −F option overrides the −E option.

−s a profile file *gmon.sum* is produced which represents the sum of the profile information in all the specified profile files. This summary profile file may be given to subsequent executions of gprof (probably also with a −s) to accumulate profile data across several runs of an *a.out* file.

−z displays routines which have zero usage (as indicated by call counts and accumulated time). This is useful in conjunction with the −c option for discovering which routines were never called.

FILES

a.out	the namelist and text space.
gmon.out	dynamic call graph and profile.
gmon.sum	summarized dynamic call graph and profile.

SEE ALSO

monitor(3), profil(2), cc(1), prof(1)

"gprof: A Call Graph Execution Profiler", by Graham, S.L., Kessler, P.B., McKusick, M.K.; *Proceedings of the SIGPLAN '82 Symposium on Compiler Construction*, SIGPLAN Notices, Vol. 17, No. 6, pp. 120-126, June 1982.

BUGS

Beware of quantization errors. The granularity of the sampling is shown, but remains statistical at best. We assume that the time for each execution of a function can be expressed by the total time for the function divided by the number of times the function is called. Thus the time propagated along the call graph arcs to parents of that function is directly proportional to the number of times that arc is traversed.

Parents which are not themselves profiled will have the time of their profiled children propagated to them, but they will appear to be spontaneously invoked in the call graph listing, and will not have their time propagated further. Similarly, signal catchers, even though profiled, will appear to be spontaneous (although for more obscure reasons). Any profiled children of signal catchers should have their times propagated properly, unless the signal catcher was invoked during the execution of the profiling routine, in which case all is lost.

The profiled program must call *exit*(2) or return normally for the profiling information to be saved in the gmon.out file.

NAME

graph — draw a graph

SYNOPSIS

graph [option] ...

DESCRIPTION

Graph with no options takes pairs of numbers from the standard input as abscissas and ordinates of a graph. Successive points are connected by straight lines. The graph is encoded on the standard output for display by the *plot*(1G) filters.

If the coordinates of a point are followed by a nonnumeric string, that string is printed as a label beginning on the point. Labels may be surrounded with quotes "...", in which case they may be empty or contain blanks and numbers; labels never contain newlines.

The following options are recognized, each as a separate argument.

−a Supply abscissas automatically (they are missing from the input); spacing is given by the next argument (default 1). A second optional argument is the starting point for automatic abscissas (default 0 or lower limit given by **−x**).

−b Break (disconnect) the graph after each label in the input.

−c Character string given by next argument is default label for each point.

−g Next argument is grid style, 0 no grid, 1 frame with ticks, 2 full grid (default).

−l Next argument is label for graph.

−m Next argument is mode (style) of connecting lines: 0 disconnected, 1 connected (default). Some devices give distinguishable line styles for other small integers.

−s Save screen, don't erase before plotting.

−x [l]
If l is present, x axis is logarithmic. Next 1 (or 2) arguments are lower (and upper) *x* limits. Third argument, if present, is grid spacing on *x* axis. Normally these quantities are determined automatically.

−y [l]
Similarly for *y*.

−h Next argument is fraction of space for height.

−w Similarly for width.

−r Next argument is fraction of space to move right before plotting.

−u Similarly to move up before plotting.

−t Transpose horizontal and vertical axes. (Option **−x** now applies to the vertical axis.)

A legend indicating grid range is produced with a grid unless the **−s** option is present.

If a specified lower limit exceeds the upper limit, the axis is reversed.

SEE ALSO

spline(1G), plot(1G)

BUGS

Graph stores all points internally and drops those for which there isn't room.
Segments that run out of bounds are dropped, not windowed.
Logarithmic axes may not be reversed.

NAME

grep, egrep, fgrep − search a file for a pattern

SYNOPSIS

grep [option] ... expression [file] ...

egrep [option] ... [expression] [file] ...

fgrep [option] ... [strings] [file]

DESCRIPTION

Commands of the *grep* family search the input *files* (standard input default) for lines matching a pattern. Normally, each line found is copied to the standard output. *Grep* patterns are limited regular expressions in the style of *ex*(1); it uses a compact nondeterministic algorithm. *Egrep* patterns are full regular expressions; it uses a fast deterministic algorithm that sometimes needs exponential space. *Fgrep* patterns are fixed strings; it is fast and compact. The following options are recognized.

−v All lines but those matching are printed.

−x (Exact) only lines matched in their entirety are printed (*fgrep* only).

−c Only a count of matching lines is printed.

−l The names of files with matching lines are listed (once) separated by newlines.

−n Each line is preceded by its relative line number in the file.

−b Each line is preceded by the block number on which it was found. This is sometimes useful in locating disk block numbers by context.

−i The case of letters is ignored in making comparisons − that is, upper and lower case are considered identical. This applies to *grep* and *fgrep* only.

−s Silent mode. Nothing is printed (except error messages). This is useful for checking the error status.

−w The expression is searched for as a word (as if surrounded by '\<' and '\>', see *ex*(1).) (*grep* only)

−e *expression*
Same as a simple *expression* argument, but useful when the *expression* begins with a −.

−f *file* The regular expression (*egrep*) or string list (*fgrep*) is taken from the *file*.

In all cases the file name is shown if there is more than one input file. Care should be taken when using the characters $ * [^ | ( ) and \ in the *expression* as they are also meaningful to the Shell. It is safest to enclose the entire *expression* argument in single quotes ' '.

Fgrep searches for lines that contain one of the (newline-separated) *strings*.

Egrep accepts extended regular expressions. In the following description 'character' excludes newline:

A \ followed by a single character other than newline matches that character.

The character ^ matches the beginning of a line.

The character $ matches the end of a line.

A . (period) matches any character.

A single character not otherwise endowed with special meaning matches that character.

A string enclosed in brackets [] matches any single character from the string. Ranges of ASCII character codes may be abbreviated as in 'a−z0−9'. A] may occur only as the first character of the string. A literal − must be placed where it can't be mistaken

as a range indicator.

A regular expression followed by an * (asterisk) matches a sequence of 0 or more matches of the regular expression. A regular expression followed by a + (plus) matches a sequence of 1 or more matches of the regular expression. A regular expression followed by a ? (question mark) matches a sequence of 0 or 1 matches of the regular expression.

Two regular expressions concatenated match a match of the first followed by a match of the second.

Two regular expressions separated by | or newline match either a match for the first or a match for the second.

A regular expression enclosed in parentheses matches a match for the regular expression.

The order of precedence of operators at the same parenthesis level is [] then *+? then concatenation then | and newline.

Ideally there should be only one *grep,* but we don't know a single algorithm that spans a wide enough range of space-time tradeoffs.

SEE ALSO

ex(1), sed(1), sh(1)

DIAGNOSTICS

Exit status is 0 if any matches are found, 1 if none, 2 for syntax errors or inaccessible files.

BUGS

Lines are limited to 256 characters; longer lines are truncated.

NAME

groups — show group memberships

SYNOPSIS

groups [user]

DESCRIPTION

The *groups* command shows the groups to which you or the optionally specified user belong. Each user belongs to a group specified in the password file */etc/passwd* and possibly to other groups as specified in the file */etc/group*. If you do not own a file but belong to the group which it is owned by then you are granted group access to the file.

When a new file is created it is given the group of the containing directory.

SEE ALSO

setgroups(2)

FILES

/etc/passwd, /etc/group

BUGS

More groups should be allowed.

NAME

head − give first few lines

SYNOPSIS

head [−count] [file ...]

DESCRIPTION

This filter gives the first *count* lines of each of the specified files, or of the standard input. If *count* is omitted it defaults to 10.

SEE ALSO

tail(1)

NAME

hostid — set or print identifier of current host system

SYNOPSIS

hostid [identifier]

DESCRIPTION

The *hostid* command prints the identifier of the current host in hexadecimal. This numeric value is expected to be unique across all hosts and is normally set to the host's Internet address. The super-user can set the hostid by giving a hexadecimal argument; this is usually done in the startup script /etc/rc.local.

SEE ALSO

gethostid(2), sethostid(2)

NAME

hostname – set or print name of current host system

SYNOPSIS

hostname [nameofhost]

DESCRIPTION

The *hostname* command prints the name of the current host, as given before the "login" prompt. The super-user can set the hostname by giving an argument; this is usually done in the startup script /etc/rc.local.

SEE ALSO

gethostname(2), sethostname(2)

NAME

indent − indent and format C program source

SYNOPSIS

indent *input* [*output*] [*flags*]

DESCRIPTION

Indent is intended primarily as a C program formatter. Specifically, *indent* will:

- indent code lines
- align comments
- insert spaces around operators where necessary
- break up declaration lists as in "int a,b,c;".

Indent will not break up long statements to make them fit within the maximum line length, but it will flag lines that are too long. Lines will be broken so that each statement starts a new line, and braces will appear alone on a line. (See the −br option to inhibit this.) Also, an attempt is made to line up identifiers in declarations.

The *flags* which can be specified follow. They may appear before or after the file names. If the *output* file is omitted, the formatted file will be written back into *input* and a "backup" copy of *input* will be written in the current directory. If *input* is named "/blah/blah/file", the backup file will be named ".Bfile". If *output* is specified, *indent* checks to make sure it is different from *input*.

The following flags may be used to control the formatting style imposed by *indent*.

−l*nnn* Maximum length of an output line. The default is 75.

−c*nnn* The column in which comments will start. The default is 33.

−cd*nnn* The column in which comments on declarations will start. The default is for these comments to start in the same column as other comments.

−i*nnn* The number of spaces for one indentation level. The default is 4.

−dj, −ndj **−dj** will cause declarations to be left justified. **−ndj** will cause them to be indented the same as code. The default is **−ndj**.

−v, −nv **−v turns on "verbose" mode, −nv** turns it off. When in verbose mode, *indent* will report when it splits one line of input into two or more lines of output, and it will give some size statistics at completion. The default is **−nv**.

−bc, −nbc
If **−bc** is specified, then a newline will be forced after each comma in a declaration. **−nbc** will turn off this option. The default is **−bc**.

−d*nnn* This option controls the placement of comments which are not to the right of code. Specifying **−d2** means that such comments will be placed two indentation levels to the left of code. The default **−d0** lines up these comments with the code. See the section on comment indentation below.

−br, −bl Specifying **−bl** will cause complex statements to be lined up like this:

```
if (...)
{
    code
}
```

Specifying **−br** (the default) will make them look like this:

```
if (...) {
    code
}
```

You may set up your own "profile" of defaults to *indent* by creating the file ".indent.pro" in your login directory and including whatever switches you like. If *indent* is run and a profile file exists, then it is read to set up the program's defaults. Switches on the command line, though, will always override profile switches. The profile file must be a single line of not more than 127 characters. The switches should be separated on the line by spaces or tabs.

Multi-line expressions

Indent will not break up complicated expressions that extend over multiple lines, but it will usually correctly indent such expressions which have already been broken up. Such an expression might end up looking like this:

```
x =
        (
            (Arbitrary parenthesized expression)
            +
            (
                (Parenthesized expression)
                *
                (Parenthesized expression)
            )
        );
```

Comments

Indent recognizes four kinds of comments. They are: straight text, "box" comments, UNIX-style comments, and comments that should be passed through unchanged. The action taken with these various types are as follows:

"Box" comments. *Indent* assumes that any comment with a dash immediately after the start of comment (i.e. "/*—") is a comment surrounded by a box of stars. Each line of such a comment will be left unchanged, except that the first non-blank character of each successive line will be lined up with the beginning slash of the first line. Box comments will be indented (see below).

"Unix-style" comments. This is the type of section header which is used extensively in the UNIX system source. If the start of comment ("/*") appears on a line by itself, indent assumes that it is a UNIX-style comment. These will be treated similarly to box comments, except the first non-blank character on each line will be lined up with the '*' of the "/*".

Unchanged comments. Any comment which starts in column 1 will be left completely unchanged. This is intended primarily for documentation header pages. The check for unchanged comments is made before the check for UNIX-style comments.

Straight text. All other comments are treated as straight text. *Indent* will fit as many words (separated by blanks, tabs, or newlines) on a line as possible. Straight text comments will be indented.

Comment indentation

Box, UNIX-style, and straight text comments may be indented. If a comment is on a line with code it will be started in the "comment column", which is set by the **−cnnn** command line parameter. Otherwise, the comment will be started at *nnn* indentation levels less than where code is currently being placed, where *nnn* is specified by the **−dnnn** command line parameter. (Indented comments will never be placed in column 1.) If the code on a line extends past the comment column, the comment will be moved to the next line.

DIAGNOSTICS

Diagnostic error messages, mostly to tell that a text line has been broken or is too long for the output line.

FILES

.indent.pro profile file

BUGS

Does not know how to format "long" declarations.

NAME

install − install binaries

SYNOPSIS

install [**−c**] [**−m** mode] [**−o** owner] [**−g** group] [**−s**] binary destination

DESCRIPTION

Binary is moved (or copied if **−c** is specified) to *destination.* If *destination* already exists, it is removed before *binary* is moved. If the destination is a directory then *binary* is moved into the *destination* directory with its original file-name.

The mode for *Destination* is set to 755; the **−m** *mode* option may be used to specify a different mode.

Destination is changed to owner root; the **−o** *owner* option may be used to specify a different owner.

Destination is changed to group staff; the **−g** *group* option may be used to specify a different group.

If the **−s** option is specified the binary is stripped after being installed.

Install refuses to move a file onto itself.

SEE ALSO

chgrp(1), chmod(1), cp(1), mv(1), strip(1), chown(8)

NAME

iostat — report I/O statistics

SYNOPSIS

iostat [interval [count]]

DESCRIPTION

Iostat iteratively reports the number of characters read and written to terminals, and, for each disk, the number of seeks transfers per second, kilobytes transfered per second, and the milliseconds per average seek. It also gives the percentage of time the system has spent in user mode, in user mode running low priority (niced) processes, in system mode, and idling.

To compute this information, for each disk, seeks and data transfer completions and number of words transferred are counted; for terminals collectively, the number of input and output characters are counted. Also, each sixtieth of a second, the state of each disk is examined and a tally is made if the disk is active. From these numbers and given the transfer rates of the devices it is possible to determine average seek times for each device.

The optional *interval* argument causes *iostat* to report once each *interval* seconds. The first report is for all time since a reboot and each subsequent report is for the last interval only.

The optional *count* argument restricts the number of reports.

FILES

/dev/kmem
/vmunix

SEE ALSO

vmstat(1)

NAME

join − relational database operator

SYNOPSIS

join [options] file1 file2

DESCRIPTION

Join forms, on the standard output, a join of the two relations specified by the lines of *file1* and *file2*. If *file1* is '−', the standard input is used.

File1 and *file2* must be sorted in increasing ASCII collating sequence on the fields on which they are to be joined, normally the first in each line.

There is one line in the output for each pair of lines in *file1* and *file2* that have identical join fields. The output line normally consists of the common field, then the rest of the line from *file1*, then the rest of the line from *file2*.

Fields are normally separated by blank, tab or newline. In this case, multiple separators count as one, and leading separators are discarded.

These options are recognized:

−a*n* In addition to the normal output, produce a line for each unpairable line in file *n*, where *n* is 1 or 2.

−e *s* Replace empty output fields by string *s*.

−j*n m* Join on the *m*th field of file *n*. If *n* is missing, use the *m*th field in each file.

−o *list* Each output line comprises the fields specified in *list*, each element of which has the form *n.m*, where *n* is a file number and *m* is a field number.

−t*c* Use character *c* as a separator (tab character). Every appearance of *c* in a line is significant.

SEE ALSO

sort(1), comm(1), awk(1)

BUGS

With default field separation, the collating sequence is that of *sort* **−***b*; with **−t**, the sequence is that of a plain sort.

The conventions of *join, sort, comm, uniq, look* and *awk*(1) are wildly incongruous.

NAME

kill − terminate a process with extreme prejudice

SYNOPSIS

kill [−sig] processid ...
kill −l

DESCRIPTION

Kill sends the TERM (terminate, 15) signal to the specified processes. If a signal name or number preceded by '−' is given as first argument, that signal is sent instead of terminate (see *sigvec*(2)). The signal names are listed by 'kill −l', and are as given in */usr/include/signal.h*, stripped of the common SIG prefix.

The terminate signal will kill processes that do not catch the signal; 'kill −9 ...' is a sure kill, as the KILL (9) signal cannot be caught. By convention, if process number 0 is specified, all members in the process group (i.e. processes resulting from the current login) are signaled (but beware: this works only if you use *sh*(1); not if you use *csh*(1).) The killed processes must belong to the current user unless he is the super-user.

The process number of an asynchronous process started with '&' is reported by the shell. Process numbers can also be found by using *Kill* is a built-in to *csh*(1); it allows job specifiers "%..." so process id's are not as often used as *kill* arguments. See *csh*(1) for details.

SEE ALSO

csh(1), ps(1), kill(2), sigvec(2)

BUGS

An option to kill process groups ala *killpg*(2) should be provided; a replacement for "kill 0" for *csh*(1) users should be provided.

NAME

last − indicate last logins of users and teletypes

SYNOPSIS

last [−N] [name ...] [tty ...]

DESCRIPTION

Last will look back in the *wtmp* file which records all logins and logouts for information about a user, a teletype or any group of users and teletypes. Arguments specify names of users or teletypes of interest. Names of teletypes may be given fully or abbreviated. For example 'last 0' is the same as 'last tty0'. If multiple arguments are given, the information which applies to any of the arguments is printed. For example 'last root console' would list all of "root's" sessions as well as all sessions on the console terminal. *Last* will print the sessions of the specified users and teletypes, most recent first, indicating the times at which the session began, the duration of the session, and the teletype which the session took place on. If the session is still continuing or was cut short by a reboot, *last* so indicates.

The pseudo-user **reboot** logs in at reboots of the system, thus

last reboot

will give an indication of mean time between reboot.

Last with no arguments prints a record of all logins and logouts, in reverse order. The −N option limits the report to N lines.

If *last* is interrupted, it indicates how far the search has progressed in *wtmp*. If interrupted with a quit signal (generated by a control-\) *last* indicates how far the search has progressed so far, and the search continues.

FILES

/usr/adm/wtmp login data base
/usr/adm/shutdownlog which records shutdowns and reasons for same

SEE ALSO

wtmp(5), ac(8), lastcomm(1)

AUTHOR

Howard Katseff

NAME

lastcomm − show last commands executed in reverse order

SYNOPSIS

lastcomm [command name] ... [user name] ... [terminal name] ...

DESCRIPTION

Lastcomm gives information on previously executed commands. With no arguments, *lastcomm* prints information about all the commands recorded during the current accounting file's lifetime. If called with arguments, only accounting entries with a matching command name, user name, or terminal name are printed. So, for example,

lastcomm a.out root ttyd0

would produce a listing of all the executions of commands named *a.out* by user *root* on the terminal *ttyd0*.

For each process entry, the following are printed.

The name of the user who ran the process.
Flags, as accumulated by the accounting facilities in the system.
The command name under which the process was called.
The amount of cpu time used by the process (in seconds).
The time the process exited.

The flags are encoded as follows: "S" indicates the command was executed by the super-user, "F" indicates the command ran after a fork, but without a following *exec*, "C" indicates the command was run in PDP-11 compatibility mode (VAX only), "D" indicates the command terminated with the generation of a *core* file, and "X" indicates the command was terminated with the signal SIGTERM.

SEE ALSO

last(1), sigvec(2), acct(5), core(5)

1

NAME

ld − link editor

SYNOPSIS

ld [option] ... file ...

DESCRIPTION

Ld combines several object programs into one, resolves external references, and searches libraries. In the simplest case several object *files* are given, and *ld* combines them, producing an object module which can be either executed or become the input for a further *ld* run. (In the latter case, the **−r** option must be given to preserve the relocation bits.) The output of *ld* is left on **a.out**. This file is made executable only if no errors occurred during the load.

The argument routines are concatenated in the order specified. The entry point of the output is the beginning of the first routine (unless the **−e** option is specified).

If any argument is a library, it is searched exactly once at the point it is encountered in the argument list. Only those routines defining an unresolved external reference are loaded. If a routine from a library references another routine in the library, and the library has not been processed by *ranlib*(1), the referenced routine must appear after the referencing routine in the library. Thus the order of programs within libraries may be important. The first member of a library should be a file named '__.SYMDEF', which is understood to be a dictionary for the library as produced by *ranlib*(1); the dictionary is searched iteratively to satisfy as many references as possible.

The symbols '_etext', '_edata' and '_end' ('etext', 'edata' and 'end' in C) are reserved, and if referred to, are set to the first location above the program, the first location above initialized data, and the first location above all data respectively. It is erroneous to define these symbols.

Ld understands several options. Except for **−l**, they should appear before the file names.

−A This option specifies incremental loading, i.e. linking is to be done in a manner so that the resulting object may be read into an already executing program. The next argument is the name of a file whose symbol table will be taken as a basis on which to define additional symbols. Only newly linked material will be entered into the text and data portions of **a.out**, but the new symbol table will reflect every symbol defined before and after the incremental load. This argument must appear before any other object file in the argument list. The **−T** option may be used as well, and will be taken to mean that the newly linked segment will commence at the corresponding address (which must be a multiple of 1024). The default value is the old value of _end.

−D Take the next argument as a hexadecimal number and pad the data segment with zero bytes to the indicated length.

−d Force definition of common storage even if the **−r** flag is present.

−e The following argument is taken to be the name of the entry point of the loaded program; location 0 is the default.

−l*x* This option is an abbreviation for the library name '/lib/lib*x*.a', where *x* is a string. If that does not exist, *ld* tries '/usr/lib/lib*x*.a' A library is searched when its name is encountered, so the placement of a **−l** is significant.

−M produce a primitive load map, listing the names of the files which will be loaded.

−N Do not make the text portion read only or sharable. (Use "magic number" 0407.)

−n Arrange (by giving the output file a 0410 "magic number") that when the output file is executed, the text portion will be read-only and shared among all users executing the file. This involves moving the data areas up to the first possible 1024 byte boundary following the end of the text.

-o The *name* argument after **-o** is used as the name of the *ld* output file, instead of **a.out**.

-r Generate relocation bits in the output file so that it can be the subject of another *ld* run. This flag also prevents final definitions from being given to common symbols, and suppresses the 'undefined symbol' diagnostics.

-S 'Strip' the output by removing all symbols except locals and globals.

-s 'Strip' the output, that is, remove the symbol table and relocation bits to save space (but impair the usefulness of the debuggers). This information can also be removed by *strip*(1).

-T The next argument is a hexadecimal number which sets the text segment origin. The default origin is 0.

-t ("trace") Print the name of each file as it is processed.

-u Take the following argument as a symbol and enter it as undefined in the symbol table. This is useful for loading wholly from a library, since initially the symbol table is empty and an unresolved reference is needed to force the loading of the first routine.

-X Save local symbols except for those whose names begin with 'L'. This option is used by *cc*(1) to discard internally-generated labels while retaining symbols local to routines.

-x Do not preserve local (non-.globl) symbols in the output symbol table; only enter external symbols. This option saves some space in the output file.

-y*sym* Indicate each file in which *sym* appears, its type and whether the file defines or references it. Many such options may be given to trace many symbols. (It is usually necessary to begin *sym* with an '_', as external C, FORTRAN and Pascal variables begin with underscores.)

-z Arrange for the process to be loaded on demand from the resulting executable file (413 format) rather than preloaded. This is the default. Results in a 1024 byte header on the output file followed by a text and data segment each of which have size a multiple of 1024 bytes (being padded out with nulls in the file if necessary). With this format the first few BSS segment symbols may actually appear (from the output of *size*(1)) to live in the data segment; this to avoid wasting the space resulting from data segment size roundup.

FILES

/lib/lib*.a	libraries
/usr/lib/lib*.a	more libraries
/usr/local/lib/lib*.a	still more libraries
a.out	output file

SEE ALSO

as(1), ar(1), cc(1), ranlib(1)

BUGS

There is no way to force data to be page aligned. *Ld* pads images which are to be demand loaded from the file system to the next page boundary to avoid a bug in the system.

NAME

learn − computer aided instruction about UNIX

SYNOPSIS

learn [−directory] [subject [lesson]]

DESCRIPTION

Learn gives Computer Aided Instruction courses and practice in the use of UNIX, the C Shell, and the Berkeley text editors. To get started simply type **learn**. The program will ask questions to find out what you want to do. Some questions may be bypassed by naming a *subject*, and more yet by naming a *lesson*. You may enter the *lesson* as a number that *learn* gave you in a previous session. If you do not know the lesson number, you may enter the *lesson* as a word, and *learn* will look for the first lesson containing it. If the *lesson* is '−', *learn* prompts for each lesson; this is useful for debugging.

The *subject*'s presently handled are

files
editor
vi
morefiles
macros
eqn
C

There are a few special commands. The command 'bye' terminates a *learn* session and 'where' tells you of your progress, with 'where m' telling you more. The command 'again' re-displays the text of the lesson and 'again *lesson*' lets you review *lesson*.

The −*directory* option allows one to exercise a script in a nonstandard place.

FILES

/usr/lib/learn	subtree for all dependent directories and files
/usr/tmp/pl*	playpen directories

SEE ALSO

csh(1), ex(1)

BUGS

The main strength of *learn*, that it asks the student to use the real UNIX, also makes possible baffling mistakes. It is helpful, especially for nonprogrammers, to have a UNIX initiate near at hand during the first sessions.

Occasionally lessons are incorrect, sometimes because the local version of a command operates in a non-standard way. Such lessons may be skipped with the 'skip' command, but it takes some sophistication to recognize the situation.

To find a *lesson* given as a word, *learn* does a simple *fgrep*(1) through the lessons. It is unclear whether this sort of subject indexing is better than none.

Spawning a new shell is required for each of many user and internal functions.

NAME

leave − remind you when you have to leave

SYNOPSIS

leave [hhmm]

DESCRIPTION

Leave waits until the specified time, then reminds you that you have to leave. You are reminded 5 minutes and 1 minute before the actual time, at the time, and every minute thereafter. When you log off, *leave* exits just before it would have printed the next message.

The time of day is in the form hhmm where hh is a time in hours (on a 12 or 24 hour clock). All times are converted to a 12 hour clock, and assumed to be in the next 12 hours.

If no argument is given, *leave* prompts with "When do you have to leave?". A reply of newline causes *leave* to exit, otherwise the reply is assumed to be a time. This form is suitable for inclusion in a *.login* or *.profile*.

Leave ignores interrupts, quits, and terminates. To get rid of it you should either log off or use "kill −9" giving its process id.

SEE ALSO

calendar(1)

AUTHOR

Mark Horton

BUGS

NAME

lex − generator of lexical analysis programs

SYNOPSIS

lex [**−tvfn**] [file] ...

DESCRIPTION

Lex generates programs to be used in simple lexical analyis of text. The input *files* (standard input default) contain regular expressions to be searched for, and actions written in C to be executed when expressions are found.

A C source program, 'lex.yy.c' is generated, to be compiled thus:

```
cc lex.yy.c −ll
```

This program, when run, copies unrecognized portions of the input to the output, and executes the associated C action for each regular expression that is recognized.

The options have the following meanings.

−t Place the result on the standard output instead of in file "lex.yy.c".

−v Print a one-line summary of statistics of the generated analyzer.

−n Opposite of **−v**; **−n** is default.

−f "Faster" compilation: don't bother to pack the resulting tables; limited to small programs.

EXAMPLE

```
lex lexcommands
```

would draw *lex* instructions from the file *lexcommands,* and place the output in *lex.yy.c*

```
%%
[A−Z] putchar(yytext[0]+'a'−'A');
[ ]+$
[ ]+    putchar(' ');
```

is an example of a *lex* program that would be put into a *lex* command file. This program converts upper case to lower, removes blanks at the end of lines, and replaces multiple blanks by single blanks.

SEE ALSO

yacc(1), sed(1)

M. E. Lesk and E. Schmidt, *LEX − Lexical Analyzer Generator*

NAME

lint − a C program verifier

SYNOPSIS

lint [−abchnpuvx] file ...

DESCRIPTION

Lint attempts to detect features of the C program *files* which are likely to be bugs, or non-portable, or wasteful. It also checks the type usage of the program more strictly than the compilers. Among the things which are currently found are unreachable statements, loops not entered at the top, automatic variables declared and not used, and logical expressions whose value is constant. Moreover, the usage of functions is checked to find functions which return values in some places and not in others, functions called with varying numbers of arguments, and functions whose values are not used.

By default, it is assumed that all the *files* are to be loaded together; they are checked for mutual compatibility. Function definitions for certain libraries are available to *lint*; these libraries are referred to by a conventional name, such as '−lm', in the style of *ld*(1). Arguments ending in *.ln* are also treated as library files. To create lint libraries, use the **−C** option:

lint −Cfoo files . . .

where *files* are the C sources of library *foo*. The result is a file *llib-lfoo.ln* in the correct library format suitable for linting programs using *foo*.

Any number of the options in the following list may be used. The **−D**, **−U**, and **−I** options of *cc*(1) are also recognized as separate arguments.

p Attempt to check portability to the *IBM* and *GCOS* dialects of C.

h Apply a number of heuristic tests to attempt to intuit bugs, improve style, and reduce waste.

b Report *break* statements that cannot be reached. (This is not the default because, unfortunately, most *lex* and many *yacc* outputs produce dozens of such comments.)

v Suppress complaints about unused arguments in functions.

x Report variables referred to by extern declarations, but never used.

a Report assignments of long values to int variables.

c Complain about casts which have questionable portability.

u Do not complain about functions and variables used and not defined, or defined and not used (this is suitable for running *lint* on a subset of files out of a larger program).

n Do not check compatibility against the standard library.

z Do not complain about structures that are never defined (e.g. using a structure pointer without knowing its contents.).

Exit(2) and other functions which do not return are not understood; this causes various lies.

Certain conventional comments in the C source will change the behavior of *lint*:

/*NOTREACHED*/
at appropriate points stops comments about unreachable code.

/*VARARGS*n*/
suppresses the usual checking for variable numbers of arguments in the following function declaration. The data types of the first *n* arguments are checked; a missing *n* is taken to be 0.

/*NOSTRICT*/
shuts off strict type checking in the next expression.

/*ARGSUSED*/
turns on the −v option for the next function.

/*LINTLIBRARY*/
at the beginning of a file shuts off complaints about unused functions in this file.

AUTHOR

S.C. Johnson. Lint library construction implemented by Edward Wang.

FILES

/usr/lib/lint/lint[12]	programs
/usr/lib/lint/llib-lc.ln	declarations for standard functions
/usr/lib/lint/llib-lc	human readable version of above
/usr/lib/lint/llib-port.ln	declarations for portable functions
/usr/lib/lint/llib-port	human readable . . .
llib-l*.ln	library created with −C

SEE ALSO

cc(1)

S. C. Johnson, *Lint, a C Program Checker*

BUGS

There are some things you just can't get lint to shut up about.

NAME

lisp — lisp interpreter

SYNOPSIS

lisp

DESCRIPTION

Lisp is a lisp interpreter for a dialect which closely resembles MIT's MACLISP. This lisp, known as FRANZ LISP, features an I/O facility which allows the user to change the input and output syntax, add macro characters, and maintain compatibility with upper-case only lisp systems; infinite precision integer arithmetic, and an error facility which allows the user to trap system errors in many different ways. Interpreted functions may be mixed with code compiled by *liszt*(1) and both may be debugged using the "Joseph Lister" trace package. A *lisp* containing compiled and interpreted code may be dumped into a file for later use.

There are too many functions to list here; one should refer to the manuals listed below.

AUTHORS

An early version was written by Jeff Levinsky, Mike Curry, and John Breedlove. Keith Sklower wrote and is maintaining the current version, with the assistance of John Foderaro. The garbage collector was implemented by Bill Rowan.

FILES

/usr/lib/lisp/trace.l	Joseph Lister trace package
/usr/lib/lisp/toplevel.l	top level read-eval-print loop

SEE ALSO

liszt(1), lxref(1)
'FRANZ LISP Manual, Version 1' by John K. Foderaro
MACLISP Manual

BUGS

The error system is in a state of flux and not all error messages are as informative as they could be.

NAME

liszt − compile a Franz Lisp program

SYNOPSIS

liszt [**−mpqruwxCQST**] [−e form] [**−o** objfile] [name]

DESCRIPTION

Liszt takes a file whose names ends in '.l' and compiles the FRANZ LISP code there leaving an object program on the file whose name is that of the source with '.o' substituted for '.l'.

The following options are interpreted by *liszt.*

−e Evaluate the given form before compilation begins.

−m Compile a MACLISP file, by changing the readtable to conform to MACLISP syntax and including a macro-defined compatibility package.

−o Put the object code in the specified file, rather than the default '.o' file.

−p places profiling code at the beginning of each non-local function. If the lisp system is also created with profiling in it, this allows function calling frequency to be determined (see *prof*(1).)

−q Only print warning and error messages. Compilation statistics and notes on correct but unusual constructs will not be printed.

−r place bootstrap code at the beginning of the object file, which when the object file is executed will cause a lisp system to be invoked and the object file fasl'ed in.

−u Compile a UCI-lispfile, by changing the readtable to conform to UCI-Lisp syntax and including a macro-defined compatibility package.

−w Suppress warning diagnostics.

−x Create a lisp cross reference file with the same name as the source file but with '.x' appended. The program *lxref*(1) reads this file and creates a human readable cross reference listing.

−C put comments in the assembler output of the compiler. Useful for debugging the compiler.

-Q Print compilation statistics and warn of strange constructs. This is the default.

−S Compile the named program and leave the assembler-language output on the corresponding file suffixed '.s'. This will also prevent the assembler language file from being assembled.

−T send the assembler output to standard output.

If no source file is specified, then the compiler will run interactively. You will find yourself talking to the *lisp*(1) top-level command interpreter. You can compile a file by using the function *liszt* (an nlambda) with the same arguments as you use on the command line. For example to compile 'foo', a MACLISP file, you would use:

(liszt −m foo)

Note that *liszt* supplies the ".l" extension for you.

FILES

/usr/lib/lisp/machacks.l	MACLISP compatibility package
/usr/lib/lisp/syscall.l	macro definitions of Unix system calls
/usr/lib/lisp/ucifnc.l	UCI Lisp compatibility package

AUTHOR

John Foderaro

SEE ALSO
lisp(1), lxref(1)

1

NAME

ln — make links

SYNOPSIS

ln [**−s**] name1 [name2]
ln name ... directory

DESCRIPTION

A link is a directory entry referring to a file; the same file (together with its size, all its protection information, etc.) may have several links to it. There are two kinds of links: hard links and symbolic links.

By default *ln* makes hard links. A hard link to a file is indistinguishable from the original directory entry; any changes to a file are effective independent of the name used to reference the file. Hard links may not span file systems and may not refer to directories.

The **−s** option causes *ln* to create symbolic links. A symbolic link contains the name of the file to which it is linked. The referenced file is used when an *open*(2) operation is performed on the link. A *stat*(2) on a symbolic link will return the linked-to file; an *lstat*(2) must be done to obtain information about the link. The *readlink*(2) call may be used to read the contents of a symbolic link. Symbolic links may span file systems and may refer to directories.

Given one or two arguments, *ln* creates a link to an existing file *name1*. If *name2* is given, the link has that name; *name2* may also be a directory in which to place the link; otherwise it is placed in the current directory. If only the directory is specified, the link will be made to the last component of *name1*.

Given more than two arguments, *ln* makes links to all the named files in the named directory. The links made will have the same name as the files being linked to.

SEE ALSO

rm(1), cp(1), mv(1), link(2), readlink(2), stat(2), symlink(2)

NAME

lock — reserve a terminal

SYNOPSIS

lock

DESCRIPTION

Lock requests a password from the user, then prints "LOCKED" on the terminal and refuses to relinquish the terminal until the password is repeated. If the user forgets the password, he has no other recourse but to login elsewhere and kill the lock process.

AUTHOR

Kurt Shoens

BUGS

Should timeout after 15 minutes.

NAME

login − sign on

SYNOPSIS

login [username]

DESCRIPTION

The *login* command is used when a user initially signs on, or it may be used at any time to change from one user to another. The latter case is the one summarized above and described here. See "How to Get Started" for how to dial up initially.

If *login* is invoked without an argument, it asks for a user name, and, if appropriate, a password. Echoing is turned off (if possible) during the typing of the password, so it will not appear on the written record of the session.

After a successful login, accounting files are updated and the user is informed of the existence of mail, and the message of the day is printed, as is the time he last logged in (unless he has a ".hushlogin" file in his home directory − this is mostly used to make life easier for non-human users, such as *uucp*).

Login initializes the user and group IDs and the working directory, then executes a command interpreter (usually *sh*(1)) according to specifications found in a password file. Argument 0 of the command interpreter is "−sh", or more generally the name of the command interpreter with a leading dash ("−") prepended.

Login also initializes the environment *environ*(7) with information specifying home directory, command interpreter, terminal type (if available) and user name.

If the file /etc/nologin exists *login* prints its contents on the user's terminal and exits. This is used by *shutdown*(8) to stop users logging in when the system is about to go down.

Login is recognized by *sh*(1) and *csh*(1) and executed directly (without forking).

FILES

/etc/utmp	accounting
/usr/adm/wtmp	accounting
/usr/spool/mail/*	mail
/etc/motd	message-of-the-day
/etc/passwd	password file
/etc/nologin	stops logins
.hushlogin	makes login quieter
/etc/securetty	lists ttys that root may log in on

SEE ALSO

init(8), getty(8), mail(1), passwd(1), passwd(5), environ(7), shutdown(8)

DIAGNOSTICS

"Login incorrect," if the name or the password is bad.
"No Shell", "cannot open password file", "no directory": consult a programming counselor.

BUGS

An undocumented option, **−r** is used by the remote login server, *rlogind*(8C) to force *login* to enter into an initial connection protocol.

NAME

look − find lines in a sorted list

SYNOPSIS

look [**−df**] string [file]

DESCRIPTION

Look consults a sorted *file* and prints all lines that begin with *string*. It uses binary search.

The options **d** and **f** affect comparisons as in *sort*(1):

d 'Dictionary' order: only letters, digits, tabs and blanks participate in comparisons.

f Fold. Upper case letters compare equal to lower case.

If no *file* is specified, */usr/dict/words* is assumed with collating sequence **−df.**

FILES

/usr/dict/words

SEE ALSO

sort(1), grep(1)

NAME

indxbib, lookbib − build inverted index for a bibliography, find references in a bibliography

SYNOPSIS

indxbib database ...
lookbib database

DESCRIPTION

Indxbib makes an inverted index to the named *databases* (or files) for use by *lookbib*(1) and *refer*(1). These files contain bibliographic references (or other kinds of information) separated by blank lines.

A bibliographic reference is a set of lines, constituting fields of bibliographic information. Each field starts on a line beginning with a "%", followed by a key-letter, then a blank, and finally the contents of the field, which may continue until the next line starting with "%".

Indxbib is a shell script that calls /usr/lib/refer/mkey and /usr/lib/refer/inv. The first program, *mkey,* truncates words to 6 characters, and maps upper case to lower case. It also discards words shorter than 3 characters, words among the 100 most common English words, and numbers (dates) < 1900 or > 2000. These parameters can be changed; see page 4 of the *Refer* document by Mike Lesk. The second program, *inv,* creates an entry file (.ia), a posting file (.ib), and a tag file (.ic), all in the working directory.

Lookbib uses an inverted index made by *indxbib* to find sets of bibliographic references. It reads keywords typed after the ">" prompt on the terminal, and retrieves records containing all these keywords. If nothing matches, nothing is returned except another ">" prompt.

It is possible to search multiple databases, as long as they have a common index made by *indxbib.* In that case, only the first argument given to *indxbib* is specified to *lookbib.*

If *lookbib* does not find the index files (the .i[abc] files), it looks for a reference file with the same name as the argument, without the suffixes. It creates a file with a '.ig' suffix, suitable for use with *fgrep.* It then uses this fgrep file to find references. This method is simpler to use, but the .ig file is slower to use than the .i[abc] files, and does not allow the use of multiple reference files.

FILES

x.ia, *x*.ib, *x*.ic, where *x* is the first argument, or if these are not present, then *x*.ig, *x*

SEE ALSO

refer(1), addbib(1), sortbib(1), roffbib(1), lookbib(1)

BUGS

Probably all dates should be indexed, since many disciplines refer to literature written in the 1800s or earlier.

NAME

lorder — find ordering relation for an object library

SYNOPSIS

lorder file ...

DESCRIPTION

The input is one or more object or library archive (see *ar*(1)) *files*. The standard output is a list of pairs of object file names, meaning that the first file of the pair refers to external identifiers defined in the second. The output may be processed by *tsort*(1) to find an ordering of a library suitable for one-pass access by *ld*(1).

This brash one-liner intends to build a new library from existing '.o' files.

```
ar cr library `lorder *.o | tsort`
```

The need for lorder may be vitiated by use of *ranlib*(1), which converts an ordered archive into a randomly accessed library.

FILES

*symref, *symdef

nm(1), sed(1), sort(1), join(1)

SEE ALSO

tsort(1), ld(1), ar(1), ranlib(1)

BUGS

The names of object files, in and out of libraries, must end with '.o'; nonsense results otherwise.

NAME

lpq − spool queue examination program

SYNOPSIS

lpq [+[n]] [-l] [−Pprinter] [job # ...] [user ...]

DESCRIPTION

lpq examines the spooling area used by *lpd*(8) for printing files on the line printer, and reports the status of the specified jobs or all jobs associated with a user. *lpq* invoked without any arguments reports on any jobs currently in the queue. A **−P** flag may be used to specify a particular printer, otherwise the default line printer is used (or the value of the PRINTER variable in the environment). If a + argument is supplied, *lpq* displays the spool queue until it empties. Supplying a number immediately after the + sign indicates that *lpq* should sleep *n* seconds in between scans of the queue. All other arguments supplied are interpreted as user names or job numbers to filter out only those jobs of interest.

For each job submitted (i.e. invocation of *lpr*(1)) *lpq* reports the user's name, current rank in the queue, the names of files comprising the job, the job identifier (a number which may be supplied to *lprm*(1) for removing a specific job), and the total size in bytes. The **−l** option causes information about each of the files comprising the job to be printed. Normally, only as much information as will fit on one line is displayed. Job ordering is dependent on the algorithm used to scan the spooling directory and is supposed to be FIFO (First in First Out). File names comprising a job may be unavailable (when *lpr*(1) is used as a sink in a pipeline) in which case the file is indicated as "(standard input)".

If *lpq* warns that there is no daemon present (i.e. due to some malfunction), the *lpc*(8) command can be used to restart the printer daemon.

FILES

/etc/termcap	for manipulating the screen for repeated display
/etc/printcap	to determine printer characteristics
/usr/spool/*	the spooling directory, as determined from printcap
/usr/spool/*/cf*	control files specifying jobs
/usr/spool/*/lock	the lock file to obtain the currently active job

SEE ALSO

lpr(1), lprm(1), lpc(8), lpd(8)

BUGS

Due to the dynamic nature of the information in the spooling directory lpq may report unreliably. Output formatting is sensitive to the line length of the terminal; this can results in widely spaced columns.

DIAGNOSTICS

Unable to open various files. The lock file being malformed. Garbage files when there is no daemon active, but files in the spooling directory.

NAME

lpr − off line print

SYNOPSIS

lpr [**−P***printer*] [**−#***num*] [**−C** *class*] [**−J** *job*] [**−T** *title*] [**−i** [*numcols*]] [**−1234** *font*] [**−w***num*] [**−plntndgvcfrmhs**] [name ...]

DESCRIPTION

Lpr uses a spooling daemon to print the named files when facilities become available. If no names appear, the standard input is assumed. The **−P** option may be used to force output to a specific printer. Normally, the default printer is used (site dependent), or the value of the environment variable PRINTER is used.

The following single letter options are used to notify the line printer spooler that the files are not standard text files. The spooling daemon will use the appropriate filters to print the data accordingly.

−p Use *pr*(1) to format the files (equivalent to *print*).

−l Use a filter which allows control characters to be printed and suppresses page breaks.

−t The files are assumed to contain data from *troff*(1) (cat phototypesetter commands).

−n The files are assumed to contain data from *ditroff* (device independent troff).

−d The files are assumed to contain data from *tex*(l) (DVI format from Stanford).

−g The files are assumed to contain standard plot data as produced by the *plot*(3X) routines (see also *plot*(1G) for the filters used by the printer spooler).

−v The files are assumed to contain a raster image for devices like the Benson Varian.

−c The files are assumed to contain data produced by *cifplot*(l).

−f Use a filter which interprets the first character of each line as a standard FORTRAN carriage control character.

The remaining single letter options have the following meaning.

−r Remove the file upon completion of spooling or upon completion of printing (with the **−s** option).

−m Send mail upon completion.

−h Suppress the printing of the burst page.

−s Use symbolic links. Usually files are copied to the spool directory.

The **−C** option takes the following argument as a job classification for use on the burst page. For example,

```
lpr −C EECS foo.c
```

causes the system name (the name returned by *hostname*(1)) to be replaced on the burst page by EECS, and the file foo.c to be printed.

The **−J** option takes the following argument as the job name to print on the burst page. Normally, the first file's name is used.

The **−T** option uses the next argument as the title used by *pr*(1) instead of the file name.

To get multiple copies of output, use the **−#***num* option, where *num* is the number of copies desired of each file named. For example,

```
lpr −#3 foo.c bar.c more.c
```

would result in 3 copies of the file foo.c, followed by 3 copies of the file bar.c, etc. On the other hand,

```
cat foo.c bar.c more.c | lpr -#3
```

will give three copies of the concatenation of the files.

The **-i** option causes the output to be indented. If the next argument is numeric, it is used as the number of blanks to be printed before each line; otherwise, 8 characters are printed.

The **-w** option takes the immediately following number to be the page width for *pr*.

The **-s** option will use *symlink*(2) to link data files rather than trying to copy them so large files can be printed. This means the files should not be modified or removed until they have been printed.

The option **-1234** Specifies a font to be mounted on font position *i*. The daemon will construct a *.railmag* file referencing */usr/lib/vfont/name.size*.

FILES

/etc/passwd	personal identification
/etc/printcap	printer capabilities data base
/usr/lib/lpd*	line printer daemons
/usr/spool/*	directories used for spooling
/usr/spool/*/cf*	daemon control files
/usr/spool/*/df*	data files specified in "cf" files
/usr/spool/*/tf*	temporary copies of "cf" files

SEE ALSO

lpq(1), lprm(1), pr(1), symlink(2), printcap(5), lpc(8), lpd(8)

DIAGNOSTICS

If you try to spool too large a file, it will be truncated. *Lpr* will object to printing binary files. If a user other than root prints a file and spooling is disabled, *lpr* will print a message saying so and will not put jobs in the queue. If a connection to *lpd* on the local machine cannot be made, *lpr* will say that the daemon cannot be started. Diagnostics may be printed in the daemon's log file regarding missing spool files by *lpd*.

BUGS

Fonts for *troff* and *tex* reside on the host with the printer. It is currently not possible to use local font libraries.

NAME

lprm − remove jobs from the line printer spooling queue

SYNOPSIS

lprm [−P*printer*] [−] [job # ...] [user ...]

DESCRIPTION

Lprm will remove a job, or jobs, from a printer's spool queue. Since the spooling directory is protected from users, using *lprm* is normally the only method by which a user may remove a job.

Lprm without any arguments will delete the currently active job if it is owned by the user who invoked *lprm*.

If the − flag is specified, *lprm* will remove all jobs which a user owns. If the super-user employs this flag, the spool queue will be emptied entirely. The owner is determined by the user's login name and host name on the machine where the *lpr* command was invoked.

Specifying a user's name, or list of user names, will cause *lprm* to attempt to remove any jobs queued belonging to that user (or users). This form of invoking *lprm* is useful only to the super-user.

A user may dequeue an individual job by specifying its job number. This number may be obtained from the *lpq*(1) program, e.g.

```
% lpq −l

1st: ken                    [job #013ucbarpa]
    (standard input)        100 bytes
% lprm 13
```

Lprm will announce the names of any files it removes and is silent if there are no jobs in the queue which match the request list.

Lprm will kill off an active daemon, if necessary, before removing any spooling files. If a daemon is killed, a new one is automatically restarted upon completion of file removals.

The −P option may be usd to specify the queue associated with a specific printer (otherwise the default printer, or the value of the PRINTER variable in the environment is used).

FILES

/etc/printcap	printer characteristics file
/usr/spool/*	spooling directories
/usr/spool/*/lock	lock file used to obtain the pid of the current daemon and the job number of the currently active job

SEE ALSO

lpr(1), lpq(1), lpd(8)

DIAGNOSTICS

"Permission denied" if the user tries to remove files other than his own.

BUGS

Since there are race conditions possible in the update of the lock file, the currently active job may be incorrectly identified.

1

NAME

ls − list contents of directory

SYNOPSIS

ls [**−acdfgilqrstu1ACLFR**] name ...

DESCRIPTION

For each directory argument, *ls* lists the contents of the directory; for each file argument, *ls* repeats its name and any other information requested. By default, the output is sorted alphabetically. When no argument is given, the current directory is listed. When several arguments are given, the arguments are first sorted appropriately, but file arguments are processed before directories and their contents.

There are a large number of options:

−l List in long format, giving mode, number of links, owner, size in bytes, and time of last modification for each file. (See below.) If the file is a special file the size field will instead contain the major and minor device numbers. If the file is a symbolic link the pathname of the linked-to file is printed preceded by "−>".

−g Include the group ownership of the file in a long output.

−t Sort by time modified (latest first) instead of by name.

−a List all entries; in the absence of this option, entries whose names begin with a period (.) are *not* listed.

−s Give size in kilobytes of each file.

−d If argument is a directory, list only its name; often used with **−l** to get the status of a directory.

−L If argument is a symbolic link, list the file or directory the link references rather than the link itself.

−r Reverse the order of sort to get reverse alphabetic or oldest first as appropriate.

−u Use time of last access instead of last modification for sorting (with the **−t** option) and/or printing (with the **−l** option).

−c Use time of file creation for sorting or printing.

−i For each file, print the i-number in the first column of the report.

−f Force each argument to be interpreted as a directory and list the name found in each slot. This option turns off **−l**, **−t**, **−s**, and **−r**, and turns on **−a**; the order is the order in which entries appear in the directory.

−F cause directories to be marked with a trailing '/', sockets with a trailing '=', symbolic links with a trailing '@', and executable files with a trailing '*'.

−R recursively list subdirectories encountered.

−1 force one entry per line output format; this is the default when output is not to a terminal.

−C force multi-column output; this is the default when output is to a terminal.

−q force printing of non-graphic characters in file names as the character '?'; this is the default when output is to a terminal.

The mode printed under the **−l** option contains 11 characters which are interpreted as follows: the first character is

d if the entry is a directory;
b if the entry is a block-type special file;

c if the entry is a character-type special file;
l if the entry is a symbolic link;
s if the entry is a socket, or
− if the entry is a plain file.

The next 9 characters are interpreted as three sets of three bits each. The first set refers to owner permissions; the next to permissions to others in the same user-group; and the last to all others. Within each set the three characters indicate permission respectively to read, to write, or to execute the file as a program. For a directory, 'execute' permission is interpreted to mean permission to search the directory. The permissions are indicated as follows:

r if the file is readable;
w if the file is writable;
x if the file is executable;
− if the indicated permission is not granted.

The group-execute permission character is given as **s** if the file has the set-group-id bit set; likewise the user-execute permission character is given as **s** if the file has the set-user-id bit set.

The last character of the mode (normally 'x' or '−') is **t** if the 1000 bit of the mode is on. See *chmod*(1) for the meaning of this mode.

When the sizes of the files in a directory are listed, a total count of blocks, including indirect blocks is printed.

FILES

/etc/passwd to get user id's for 'ls −l'.
/etc/group to get group id's for 'ls −g'.

BUGS

Newline and tab are considered printing characters in file names.

The output device is assumed to be 80 columns wide.

The option setting based on whether the output is a teletype is undesirable as "ls −s" is much different than "ls −s | lpr". On the other hand, not doing this setting would make old shell scripts which used *ls* almost certain losers.

NAME

lxref − lisp cross reference program

SYNOPSIS

lxref [**−N**] xref-file ... [**−a** source-file ...]

DESCRIPTION

Lxref reads cross reference file(s) written by the lisp compiler *liszt* and prints a cross reference listing on the standard output. *Liszt* will create a cross reference file during compilation when it is given the **−x** switch. Cross reference files usually end in '.x' and consequently *lxref* will append a '.x' to the file names given if necessary. The first option to *lxref* is a decimal integer, N, which sets the *ignorelevel*. If a function is called more than *ignorelevel* times, the cross reference listing will just print the number of calls instead of listing each one of them. The default for *ignorelevel* is 50.

The **−a** option causes *lxref* to put limited cross reference information in the sources named. *lxref* will scan the source and when it comes across a definition of a function (that is a line beginning with *'(def'* it will preceed that line with a list of the functions which call this function, written as a comment preceeded by *';.. '*. All existing lines beginning with *';.. '* will be removed from the file. If the source file contains a line beginning *';.-'* then this will disable this annotation process from this point on until a *';.+'* is seen (however, lines beginning with *';.. '* will continue to be deleted). After the annoation is done, the original file *'foo.l'* is renamed to " *'#.foo.l*" and the new file with annotation is named *'foo.l'*

AUTHOR

John Foderaro

SEE ALSO

lisp(1), liszt(1)

BUGS

NAME

m4 — macro processor

SYNOPSIS

m4 [files]

DESCRIPTION

M4 is a macro processor intended as a front end for Ratfor, C, and other languages. Each of the argument files is processed in order; if there are no arguments, or if an argument is '−', the standard input is read. The processed text is written on the standard output.

Macro calls have the form

name(arg1,arg2, . . . , argn)

The '(' must immediately follow the name of the macro. If a defined macro name is not followed by a '(', it is deemed to have no arguments. Leading unquoted blanks, tabs, and newlines are ignored while collecting arguments. Potential macro names consist of alphabetic letters, digits, and underscore '_', where the first character is not a digit.

Left and right single quotes (`') are used to quote strings. The value of a quoted string is the string stripped of the quotes.

When a macro name is recognized, its arguments are collected by searching for a matching right parenthesis. Macro evaluation proceeds normally during the collection of the arguments, and any commas or right parentheses which happen to turn up within the value of a nested call are as effective as those in the original input text. After argument collection, the value of the macro is pushed back onto the input stream and rescanned.

M4 makes available the following built-in macros. They may be redefined, but once this is done the original meaning is lost. Their values are null unless otherwise stated.

define The second argument is installed as the value of the macro whose name is the first argument. Each occurrence of $*n* in the replacement text, where *n* is a digit, is replaced by the *n*-th argument. Argument 0 is the name of the macro; missing arguments are replaced by the null string.

undefine removes the definition of the macro named in its argument.

ifdef If the first argument is defined, the value is the second argument, otherwise the third. If there is no third argument, the value is null. The word *unix* is predefined on UNIX versions of *m4*.

changequote Change quote characters to the first and second arguments. *Changequote* without arguments restores the original values (i.e., `').

divert *M4* maintains 10 output streams, numbered 0-9. The final output is the concatenation of the streams in numerical order; initially stream 0 is the current stream. The *divert* macro changes the current output stream to its (digit-string) argument. Output diverted to a stream other than 0 through 9 is discarded.

undivert causes immediate output of text from diversions named as arguments, or all diversions if no argument. Text may be undiverted into another diversion. Undiverting discards the diverted text.

divnum returns the value of the current output stream.

dnl reads and discards characters up to and including the next newline.

ifelse has three or more arguments. If the first argument is the same string as the second, then the value is the third argument. If not, and if there are more than four arguments, the process is repeated with arguments 4, 5, 6 and 7. Otherwise, the value is

either the fourth string, or, if it is not present, null.

incr returns the value of its argument incremented by 1. The value of the argument is calculated by interpreting an initial digit-string as a decimal number.

eval evaluates its argument as an arithmetic expression, using 32-bit arithmetic. Operators include +, −, *, /, %, ^ (exponentiation); relationals; parentheses.

len returns the number of characters in its argument.

index returns the position in its first argument where the second argument begins (zero origin), or −1 if the second argument does not occur.

substr returns a substring of its first argument. The second argument is a zero origin number selecting the first character; the third argument indicates the length of the substring. A missing third argument is taken to be large enough to extend to the end of the first string.

translit transliterates the characters in its first argument from the set given by the second argument to the set given by the third. No abbreviations are permitted.

include returns the contents of the file named in the argument.

sinclude is identical to *include*, except that it says nothing if the file is inaccessible.

syscmd executes the UNIX command given in the first argument. No value is returned.

maketemp fills in a string of XXXXX in its argument with the current process id.

errprint prints its argument on the diagnostic output file.

dumpdef prints current names and definitions, for the named items, or for all if no arguments are given.

SEE ALSO

B. W. Kernighan and D. M. Ritchie, *The M4 Macro Processor*

NAME

mail − send and receive mail

SYNOPSIS

mail [−**v**] [−**i**] [−**n**] [−**s** subject] [user ...]
mail [−**v**] [−**i**] [−**n**] −**f** [name]
mail [−**v**] [−**i**] [−**n**] −**u** user

INTRODUCTION

Mail is a intelligent mail processing system, which has a command syntax reminiscent of *ed* with lines replaced by messages.

The −**v** flag puts mail into verbose mode; the details of delivery are displayed on the users terminal. The −**i** flag causes tty interrupt signals to be ignored. This is particularly useful when using *mail* on noisy phone lines. The −**n** flag inhibits the reading of /usr/lib/Mail.rc.

Sending mail. To send a message to one or more other people, *mail* can be invoked with arguments which are the names of people to send to. You are then expected to type in your message, followed by an EOT (control−D) at the beginning of a line. A subject may be specified on the command line by using the −**s** flag. (Only the first argument after the −**s** flag is used as a subject; be careful to quote subjects containing spaces.) The section below, labeled *Replying to or originating mail,* describes some features of *mail* available to help you compose your letter.

Reading mail. In normal usage *mail* is given no arguments and checks your mail out of the post office, then prints out a one line header of each message there. The current message is initially the first message (numbered 1) and can be printed using the **print** command (which can be abbreviated **p**). You can move among the messages much as you move between lines in *ed*, with the commands '+' and '−' moving backwards and forwards, and simple numbers.

Disposing of mail. After examining a message you can **delete** (**d**) the message or **reply** (**r**) to it. Deletion causes the *mail* program to forget about the message. This is not irreversible; the message can be **undeleted** (**u**) by giving its number, or the *mail* session can be aborted by giving the **exit** (**x**) command. Deleted messages will, however, usually disappear never to be seen again.

Specifying messages. Commands such as **print** and **delete** can be given a list of message numbers as arguments to apply to a number of messages at once. Thus "delete 1 2" deletes messages 1 and 2, while "delete 1−5" deletes messages 1 through 5. The special name "*" addresses all messages, and "$" addresses the last message; thus the command **top** which prints the first few lines of a message could be used in "top *" to print the first few lines of all messages.

Replying to or originating mail. You can use the **reply** command to set up a response to a message, sending it back to the person who it was from. Text you then type in, up to an end-of-file, defines the contents of the message. While you are composing a message, *mail* treats lines beginning with the character '~' specially. For instance, typing "~m" (alone on a line) will place a copy of the current message into the response right shifting it by a tabstop. Other escapes will set up subject fields, add and delete recipients to the message and allow you to escape to an editor to revise the message or to a shell to run some commands. (These options are given in the summary below.)

Ending a mail processing session. You can end a *mail* session with the **quit** (**q**) command. Messages which have been examined go to your *mbox* file unless they have been deleted in which case they are discarded. Unexamined messages go back to the post office. The −**f** option causes *mail* to read in the contents of your *mbox* (or the specified file) for processing; when you **quit**, *mail* writes undeleted messages back to this file. The −**u** flag is a short way of doing "mail −**f** /usr/spool/mail/user".

Personal and systemwide distribution lists. It is also possible to create a personal distribution lists so that, for instance, you can send mail to "cohorts" and have it go to a group of people. Such lists can be defined by placing a line like

alias cohorts bill ozalp jkf mark kridle@ucbcory

in the file .mailrc in your home directory. The current list of such aliases can be displayed with the **alias (a)** command in *mail*. System wide distribution lists can be created by editing /usr/lib/aliases, see *aliases*(5) and *sendmail*(8); these are kept in a different syntax. In mail you send, personal aliases will be expanded in mail sent to others so that they will be able to **reply** to the recipients. System wide *aliases* are not expanded when the mail is sent, but any reply returned to the machine will have the system wide alias expanded as all mail goes through *sendmail*.

Network mail (ARPA, UUCP, Berknet) See *mailaddr(7)* for a description of network addresses.

Mail has a number of options which can be set in the *.mailrc* file to alter its behavior; thus "set askcc" enables the "askcc" feature. (These options are summarized below.)

SUMMARY

(Adapted from the 'Mail Reference Manual')

Each command is typed on a line by itself, and may take arguments following the command word. The command need not be typed in its entirety — the first command which matches the typed prefix is used. For commands which take message lists as arguments, if no message list is given, then the next message forward which satisfies the command's requirements is used. If there are no messages forward of the current message, the search proceeds backwards, and if there are no good messages at all, *mail* types "No applicable messages" and aborts the command.

— Goes to the previous message and prints it out. If given a numeric argument *n*, goes to the *n*-th previous message and prints it.

? Prints a brief summary of commands.

! Executes the UNIX shell command which follows.

Print (P) Like **print** but also prints out ignored header fields. See also **print** and **ignore.**

Reply (R) Reply to originator. Does not reply to other recipients of the original message.

Type (T) Identical to the **Print** command.

alias (a) With no arguments, prints out all currently-defined aliases. With one argument, prints out that alias. With more than one argument, creates an new or changes an on old alias.

alternates (alt) The **alternates** command is useful if you have accounts on several machines. It can be used to inform *mail* that the listed addresses are really you. When you **reply** to messages, *mail* will not send a copy of the message to any of the addresses listed on the *alternates* list. If the **alternates** command is given with no argument, the current set of alternate names is displayed.

chdir (c) Changes the user's working directory to that specified, if given. If no directory is given, then changes to the user's login directory.

copy (co) The **copy** command does the same thing that **save** does, except that it does not mark the messages it is used on for deletion when you quit.

delete (d) Takes a list of messages as argument and marks them all as deleted. Deleted messages will not be saved in *mbox*, nor will they be available for most other commands.

dp (also **dt**) Deletes the current message and prints the next message. If there is no

next message, *mail* says "at EOF."

edit (**e**) Takes a list of messages and points the text editor at each one in turn. On return from the editor, the message is read back in.

exit (**ex** or **x**) Effects an immediate return to the Shell without modifying the user's system mailbox, his *mbox* file, or his edit file in **−f**.

file (**fi**) The same as **folder**.

folders List the names of the folders in your folder directory.

folder (**fo**) The **folder** command switches to a new mail file or folder. With no arguments, it tells you which file you are currently reading. If you give it an argument, it will write out changes (such as deletions) you have made in the current file and read in the new file. Some special conventions are recognized for the name. # means the previous file, % means your system mailbox, %user means user's system mailbox, & means your ~/mbox file, and +folder means a file in your folder directory.

from (**f**) Takes a list of messages and prints their message headers.

headers (**h**) Lists the current range of headers, which is an 18 message group. If a "+" argument is given, then the next 18 message group is printed, and if a "−" argument is given, the previous 18 message group is printed.

help A synonym for ?

hold (**ho**, also **preserve**) Takes a message list and marks each message therein to be saved in the user's system mailbox instead of in *mbox*. Does not override the **delete** command.

ignore Add the list of header fields named to the *ignored list*. Header fields in the ignore list are not printed on your terminal when you print a message. This command is very handy for suppression of certain machine-generated header fields. The **Type** and **Print** commands can be used to print a message in its entirety, including ignored fields. If **ignore** is executed with no arguments, it lists the current set of ignored fields.

mail (**m**) Takes as argument login names and distribution group names and sends mail to those people.

mbox Indicate that a list of messages be sent to *mbox* in your home directory when you quit. This is the default action for messages if you do *not* have the *hold* option set.

next (**n** like + or CR) Goes to the next message in sequence and types it. With an argument list, types the next matching message.

preserve (**pre**) A synonym for **hold**.

print (**p**) Takes a message list and types out each message on the user's terminal.

quit (**q**) Terminates the session, saving all undeleted, unsaved messages in the user's *mbox* file in his login directory, preserving all messages marked with **hold** or **preserve** or never referenced in his system mailbox, and removing all other messages from his system mailbox. If new mail has arrived during the session, the message "You have new mail" is given. If given while editing a mailbox file with the **−f** flag, then the edit file is rewritten. A return to the Shell is effected, unless the rewrite of edit file fails, in which case the user can escape with the **exit** command.

reply (**r**) Takes a message list and sends mail to the sender and all recipients of the specified message. The default message must not be deleted.

respond A synonym for **reply**.

save (**s**) Takes a message list and a filename and appends each message in turn to the end of the file. The filename in quotes, followed by the line count and character count is echoed on the user's terminal.

set (**se**) With no arguments, prints all variable values. Otherwise, sets option. Arguments are of the form "option=value" or "option."

shell (**sh**) Invokes an interactive version of the shell.

size Takes a message list and prints out the size in characters of each message.

source (**so**) The **source** command reads *mail* commands from a file.

top Takes a message list and prints the top few lines of each. The number of lines printed is controlled by the variable **toplines** and defaults to five.

type (**t**) A synonym for **print**.

unalias Takes a list of names defined by **alias** commands and discards the remembered groups of users. The group names no longer have any significance.

undelete (**u**) Takes a message list and marks each one as *not* being deleted.

unset Takes a list of option names and discards their remembered values; the inverse of **set**.

visual (**v**) Takes a message list and invokes the display editor on each message.

write (**w**) A synonym for **save**.

xit (**x**) A synonym for **exit**.

z *Mail* presents message headers in windowfuls as described under the **headers** command. You can move *mail*'s attention forward to the next window with the **z** command. Also, you can move to the previous window by using **z−**.

Here is a summary of the tilde escapes, which are used when composing messages to perform special functions. Tilde escapes are only recognized at the beginning of lines. The name "tilde escape" is somewhat of a misnomer since the actual escape character can be set by the option **escape**.

~!command Execute the indicated shell command, then return to the message.

~c name ... Add the given names to the list of carbon copy recipients.

~d Read the file "dead.letter" from your home directory into the message.

~e Invoke the text editor on the message collected so far. After the editing session is finished, you may continue appending text to the message.

~f messages Read the named messages into the message being sent. If no messages are specified, read in the current message.

~h Edit the message header fields by typing each one in turn and allowing the user to append text to the end or modify the field by using the current terminal erase and kill characters.

~m messages
Read the named messages into the message being sent, shifted right one tab. If no messages are specified, read the current message.

~p Print out the message collected so far, prefaced by the message header fields.

~q Abort the message being sent, copying the message to "dead.letter" in your home directory if **save** is set.

~r filename Read the named file into the message.

~s string Cause the named string to become the current subject field.

~t name ... Add the given names to the direct recipient list.

~v Invoke an alternate editor (defined by the VISUAL option) on the message collected so far. Usually, the alternate editor will be a screen editor. After you quit the editor, you may resume appending text to the end of your message.

~w filename Write the message onto the named file.

~|command Pipe the message through the command as a filter. If the command gives no output or terminates abnormally, retain the original text of the message. The command *fmt*(1) is often used as *command* to rejustify the message.

~~string Insert the string of text in the message prefaced by a single ~. If you have changed the escape character, then you should double that character in order to send it.

Options are controlled via the **set** and **unset** commands. Options may be either binary, in which case it is only significant to see whether they are set or not, or string, in which case the actual value is of interest. The binary options include the following:

append Causes messages saved in *mbox* to be appended to the end rather than prepended. (This is set in /usr/lib/Mail.rc on version 7 systems.)

ask Causes *mail* to prompt you for the subject of each message you send. If you respond with simply a newline, no subject field will be sent.

askcc Causes you to be prompted for additional carbon copy recipients at the end of each message. Responding with a newline indicates your satisfaction with the current list.

autoprint Causes the **delete** command to behave like **dp** – thus, after deleting a message, the next one will be typed automatically.

debug Setting the binary option *debug* is the same as specifying **–d** on the command line and causes *mail* to output all sorts of information useful for debugging *mail*.

dot The binary option *dot* causes *mail* to interpret a period alone on a line as the terminator of a message you are sending.

hold This option is used to hold messages in the system mailbox by default.

ignore Causes interrupt signals from your terminal to be ignored and echoed as @'s.

ignoreeof An option related to *dot* is *ignoreeof* which makes *mail* refuse to accept a control-d as the end of a message. *Ignoreeof* also applies to *mail* command mode.

metoo Usually, when a group is expanded that contains the sender, the sender is removed from the expansion. Setting this option causes the sender to be included in the group.

nosave Normally, when you abort a message with two RUBOUT, *mail* copies the partial letter to the file "dead.letter" in your home directory. Setting the binary option *nosave* prevents this.

quiet Suppresses the printing of the version when first invoked.

verbose Setting the option *verbose* is the same as using the **–v** flag on the command line. When mail runs in verbose mode, the actual delivery of messages is displayed on he users terminal.

The following options have string values:

EDITOR — Pathname of the text editor to use in the **edit** command and ~e escape. If not defined, then a default editor is used.

SHELL — Pathname of the shell to use in the ! command and the ~! escape. A default shell is used if this option is not defined.

VISUAL — Pathname of the text editor to use in the **visual** command and ~v escape.

crt — The valued option *crt* is used as a threshold to determine how long a message must be before *more* is used to read it.

escape — If defined, the first character of this option gives the character to use in the place of ~ to denote escapes.

folder — The name of the directory to use for storing folders of messages. If this name begins with a '/', *mail* considers it to be an absolute pathname; otherwise, the folder directory is found relative to your home directory.

record — If defined, gives the pathname of the file used to record all outgoing mail. If not defined, then outgoing mail is not so saved.

toplines — If defined, gives the number of lines of a message to be printed out with the **top** command; normally, the first five lines are printed.

FILES

/usr/spool/mail/*	post office
~/mbox	your old mail
~/.mailrc	file giving initial mail commands
/tmp/R#	temporary for editor escape
/usr/lib/Mail.help*	help files
/usr/lib/Mail.rc	system initialization file
Message*	temporary for editing messages

SEE ALSO

binmail(1), fmt(1), newaliases(1), aliases(5),
mailaddr(7), sendmail(8)
'The Mail Reference Manual'

BUGS

There are many flags that are not documented here. Most are not useful to the general user. Usually, *mail* is just a link to *Mail*, which can be confusing.

AUTHOR

Kurt Shoens

NAME

make − maintain program groups

SYNOPSIS

make [**−f** makefile] [option] ... file ...

DESCRIPTION

Make executes commands in *makefile* to update one or more target *names*. *Name* is typically a program. If no **−f** option is present, 'makefile' and 'Makefile' are tried in order. If *makefile* is '−', the standard input is taken. More than one **−f** option may appear

Make updates a target if it depends on prerequisite files that have been modified since the target was last modified, or if the target does not exist.

Makefile contains a sequence of entries that specify dependencies. The first line of an entry is a blank-separated list of targets, then a colon, then a list of prerequisite files. Text following a semicolon, and all following lines that begin with a tab, are shell commands to be executed to update the target. If a name appears on the left of more than one 'colon' line, then it depends on all of the names on the right of the colon on those lines, but only one command sequence may be specified for it. If a name appears on a line with a double colon :: then the command sequence following that line is performed only if the name is out of date with respect to the names to the right of the double colon, and is not affected by other double colon lines on which that name may appear.

Two special forms of a name are recognized. A name like *a*(*b*) means the file named *b* stored in the archive named *a*. A name like *a*((*b*)) means the file stored in archive *a* containing the entry point *b*.

Sharp and newline surround comments.

The following makefile says that 'pgm' depends on two files 'a.o' and 'b.o', and that they in turn depend on '.c' files and a common file 'incl'.

```
pgm: a.o b.o
        cc a.o b.o −lm −o pgm
a.o: incl a.c
        cc −c a.c
b.o: incl b.c
        cc −c b.c
```

Makefile entries of the form

```
string1 = string2
```

are macro definitions. Subsequent appearances of $(*string1*) or ${*string1*} are replaced by *string2*. If *string1* is a single character, the parentheses or braces are optional.

Make infers prerequisites for files for which *makefile* gives no construction commands. For example, a '.c' file may be inferred as prerequisite for a '.o' file and be compiled to produce the '.o' file. Thus the preceding example can be done more briefly:

```
pgm: a.o b.o
        cc a.o b.o −lm −o pgm
a.o b.o: incl
```

Prerequisites are inferred according to selected suffixes listed as the 'prerequisites' for the special name '.SUFFIXES'; multiple lists accumulate; an empty list clears what came before. Order is significant; the first possible name for which both a file and a rule as described in the next paragraph exist is inferred. The default list is

```
.SUFFIXES: .out .o .c .e .r .f .y .l .s .p
```

The rule to create a file with suffix *s2* that depends on a similarly named file with suffix *s1* is specified as an entry for the 'target' *s1s2*. In such an entry, the special macro $* stands for the target name with suffix deleted, $@ for the full target name, $< for the complete list of prerequisites, and $? for the list of prerequisites that are out of date. For example, a rule for making optimized '.o' files from '.c' files is

```
.c.o: ; cc -c -O -o $@ $*.c
```

Certain macros are used by the default inference rules to communicate optional arguments to any resulting compilations. In particular, 'CFLAGS' is used for *cc*(1) options, 'FFLAGS' for *f77*(1) options, 'PFLAGS' for *pc*(1) options, and 'LFLAGS' and 'YFLAGS' for *lex* and *yacc*(1) options. In addition, the macro 'MFLAGS' is filled in with the initial command line options supplied to *make*. This simplifies maintaining a hierarchy of makefiles as one may then invoke *make* on makefiles in subdirectories and pass along useful options such as **-k**.

Command lines are executed one at a time, each by its own shell. A line is printed when it is executed unless the special target '.SILENT' is in *makefile*, or the first character of the command is '@'.

Commands returning nonzero status (see *intro*(1)) cause *make* to terminate unless the special target '.IGNORE' is in *makefile* or the command begins with <tab><hyphen>.

Interrupt and quit cause the target to be deleted unless the target is a directory or depends on the special name '.PRECIOUS'.

Other options:

-i Equivalent to the special entry '.IGNORE:'.

-k When a command returns nonzero status, abandon work on the current entry, but continue on branches that do not depend on the current entry.

-n Trace and print, but do not execute the commands needed to update the targets.

-t Touch, i.e. update the modified date of targets, without executing any commands.

-r Equivalent to an initial special entry '.SUFFIXES:' with no list.

-s Equivalent to the special entry '.SILENT:'.

FILES

makefile, Makefile

SEE ALSO

sh(1), touch(1), f77(1), pc(1)
S. I. Feldman *Make – A Program for Maintaining Computer Programs*

BUGS

Some commands return nonzero status inappropriately. Use **-i** to overcome the difficulty. Commands that are directly executed by the shell, notably *cd*(1), are ineffectual across newlines in *make*.

NAME

man − find manual information by keywords; print out the manual

SYNOPSIS

man [−] [**−t**] [section] title ...
man −k keyword ...
man −f file ...

DESCRIPTION

Man is a program which gives information from the programmers manual. It can be asked for one line descriptions of commands specified by name, or for all commands whose description contains any of a set of keywords. It can also provide on-line access to the sections of the printed manual.

When given the option **−k** and a set of keywords, *man* prints out a one line synopsis of each manual sections whose listing in the table of contents contains one of those keywords.

When given the option **−f** and a list of file names, *man* attempts to locate manual sections related to those files, printing out the table of contents lines for those sections.

When neither **−k** nor **−f** is specified, *man* formats a specified set of manual pages. If a section specifier is given *man* looks in the that section of the manual for the given *titles*. *Section* is an Arabic section number (3 for instance). The number may followed by a single letter classifier (1g for instance) indicating a graphics program in section 1. If *section* is omitted, *man* searches all sections of the manual, giving preference to commands over subroutines in system libraries, and printing the first section it finds, if any.

If the standard output is a teletype, or if the flag − is given, *man* pipes its output through *more*(1) with the option **−s** to crush out useless blank lines and to stop after each page on the screen. Hit a space to continue, a control-D to scroll 11 more lines when the output stops.

The **−t** flag causes *man* to arrange for the specified section to be *troff'ed* to a suitable raster output device; see *vtroff*(1).

FILES

/usr/man/man?/*
/usr/man/cat?/*

SEE ALSO

apropos(1), more(1), whereis(1), catman(8)

BUGS

The manual is supposed to be reproducible either on the phototypesetter or on a typewriter. However, on a typewriter some information is necessarily lost.

NAME

mesg − permit or deny messages

SYNOPSIS

mesg [**n**] [**y**]

DESCRIPTION

Mesg with argument **n** forbids messages via *write* and *talk*(1) by revoking non-user write permission on the user's terminal. *Mesg* with argument **y** reinstates permission. All by itself, *mesg* reports the current state without changing it.

FILES

/dev/tty*

SEE ALSO

write(1), talk(1)

DIAGNOSTICS

Exit status is 0 if messages are receivable, 1 if not, 2 on error.

NAME

mkdir — make a directory

SYNOPSIS

mkdir dirname ...

DESCRIPTION

Mkdir creates specified directories in mode 777. Standard entries, '.', for the directory itself, and '..' for its parent, are made automatically.

Mkdir requires write permission in the parent directory.

SEE ALSO

rm(1)

DIAGNOSTICS

Mkdir returns exit code 0 if all directories were successfully made. Otherwise it prints a diagnostic and returns nonzero.

NAME

mkstr – create an error message file by massaging C source

SYNOPSIS

mkstr [–] messagefile prefix file ...

DESCRIPTION

Mkstr is used to create files of error messages. Its use can make programs with large numbers of error diagnostics much smaller, and reduce system overhead in running the program as the error messages do not have to be constantly swapped in and out.

Mkstr will process each of the specified *files,* placing a massaged version of the input file in a file whose name consists of the specified *prefix* and the original name. A typical usage of *mkstr* would be

```
mkstr pistrings xx *.c
```

This command would cause all the error messages from the C source files in the current directory to be placed in the file *pistrings* and processed copies of the source for these files to be placed in files whose names are prefixed with *xx*.

To process the error messages in the source to the message file *mkstr* keys on the string 'error("' in the input stream. Each time it occurs, the C string starting at the '"' is placed in the message file followed by a null character and a new-line character; the null character terminates the message so it can be easily used when retrieved, the new-line character makes it possible to sensibly *cat* the error message file to see its contents. The massaged copy of the input file then contains a *lseek* pointer into the file which can be used to retrieve the message, i.e.:

```
char    efilname[] = "/usr/lib/pi_strings";
int     efil = -1;

error(a1, a2, a3, a4)
{
        char buf[256];

        if (efil < 0) {
                efil = open(efilname, 0);
                if (efil < 0) {
oops:
                        perror(efilname);
                        exit(1);
                }
        }
        if (lseek(efil, (long) a1, 0) || read(efil, buf, 256) <= 0)
                goto oops;
        printf(buf, a2, a3, a4);
}
```

The optional – causes the error messages to be placed at the end of the specified message file for recompiling part of a large *mkstr* ed program.

SEE ALSO

lseek(2), xstr(1)

AUTHORS

William Joy and Charles Haley

NAME

more, page — file perusal filter for crt viewing

SYNOPSIS

more [**−cdflsu**] [*−n*] [*+linenumber*] [*+/pattern*] [name ...]

page *more options*

DESCRIPTION

More is a filter which allows examination of a continuous text one screenful at a time on a soft-copy terminal. It normally pauses after each screenful, printing --More-- at the bottom of the screen. If the user then types a carriage return, one more line is displayed. If the user hits a space, another screenful is displayed. Other possibilities are enumerated later.

The command line options are:

−*n* An integer which is the size (in lines) of the window which *more* will use instead of the default.

−c *More* will draw each page by beginning at the top of the screen and erasing each line just before it draws on it. This avoids scrolling the screen, making it easier to read while *more* is writing. This option will be ignored if the terminal does not have the ability to clear to the end of a line.

−d *More* will prompt the user with the message "Hit space to continue, Rubout to abort" at the end of each screenful. This is useful if *more* is being used as a filter in some setting, such as a class, where many users may be unsophisticated.

−f This causes *more* to count logical, rather than screen lines. That is, long lines are not folded. This option is recommended if *nroff* output is being piped through *ul,* since the latter may generate escape sequences. These escape sequences contain characters which would ordinarily occupy screen positions, but which do not print when they are sent to the terminal as part of an escape sequence. Thus *more* may think that lines are longer than they actually are, and fold lines erroneously.

−l Do not treat ^L (form feed) specially. If this option is not given, *more* will pause after any line that contains a ^L, as if the end of a screenful had been reached. Also, if a file begins with a form feed, the screen will be cleared before the file is printed.

−s Squeeze multiple blank lines from the output, producing only one blank line. Especially helpful when viewing *nroff* output, this option maximizes the useful information present on the screen.

−u Normally, *more* will handle underlining such as produced by *nroff* in a manner appropriate to the particular terminal: if the terminal can perform underlining or has a stand-out mode, *more* will output appropriate escape sequences to enable underlining or stand-out mode for underlined information in the source file. The *−u* option suppresses this processing.

+linenumber
Start up at *linenumber.*

+/pattern
Start up two lines before the line containing the regular expression *pattern.*

If the program is invoked as *page,* then the screen is cleared before each screenful is printed (but only if a full screenful is being printed), and $k - 1$ rather than $k - 2$ lines are printed in each screenful, where k is the number of lines the terminal can display.

More looks in the file */etc/termcap* to determine terminal characteristics, and to determine the default window size. On a terminal capable of displaying 24 lines, the default window size is 22 lines.

More looks in the environment variable *MORE* to pre-set any flags desired. For example, if you prefer to view files using the *−c* mode of operation, the *csh* command *setenv MORE -c* or the *sh* command sequence *MORE='-c' ; export MORE* would cause all invocations of *more* , including invocations by programs such as *man* and *msgs* , to use this mode. Normally, the user will place the command sequence which sets up the *MORE* environment variable in the *.cshrc* or *.profile* file.

If *more* is reading from a file, rather than a pipe, then a percentage is displayed along with the --More-- prompt. This gives the fraction of the file (in characters, not lines) that has been read so far.

Other sequences which may be typed when *more* pauses, and their effects, are as follows (*i* is an optional integer argument, defaulting to 1) :

i<space>
: display *i* more lines, (or another screenful if no argument is given)

^D
: display 11 more lines (a "scroll"). If *i* is given, then the scroll size is set to *i*.

d
: same as ^D (control-D)

*i*z
: same as typing a space except that *i*, if present, becomes the new window size.

*i*s
: skip *i* lines and print a screenful of lines

*i*f
: skip *i* screenfuls and print a screenful of lines

q or Q
: Exit from *more*.

=
: Display the current line number.

v
: Start up the editor *vi* at the current line.

h
: Help command; give a description of all the *more* commands.

i/expr
: search for the *i*-th occurrence of the regular expression *expr*. If there are less than *i* occurrences of *expr*, and the input is a file (rather than a pipe), then the position in the file remains unchanged. Otherwise, a screenful is displayed, starting two lines before the place where the expression was found. The user's erase and kill characters may be used to edit the regular expression. Erasing back past the first column cancels the search command.

*i*n
: search for the *i*-th occurrence of the last regular expression entered.

'
: (single quote) Go to the point from which the last search started. If no search has been performed in the current file, this command goes back to the beginning of the file.

!command
: invoke a shell with *command*. The characters '%' and '!' in "command" are replaced with the current file name and the previous shell command respectively. If there is no current file name, '%' is not expanded. The sequences "\%" and "\!" are replaced by "%" and "!" respectively.

i:n
: skip to the *i*-th next file given in the command line (skips to last file if n doesn't make sense)

i:p
: skip to the *i*-th previous file given in the command line. If this command is given in the middle of printing out a file, then *more* goes back to the beginning of the file. If *i* doesn't make sense, *more* skips back to the first file. If *more* is not reading from a file, the bell is rung and nothing else happens.

:f
: display the current file name and line number.

:q or :Q
exit from *more* (same as q or Q).

. (dot) repeat the previous command.

The commands take effect immediately, i.e., it is not necessary to type a carriage return. Up to the time when the command character itself is given, the user may hit the line kill character to cancel the numerical argument being formed. In addition, the user may hit the erase character to redisplay the --More--(xx%) message.

At any time when output is being sent to the terminal, the user can hit the quit key (normally control-\). *More* will stop sending output, and will display the usual --More-- prompt. The user may then enter one of the above commands in the normal manner. Unfortunately, some output is lost when this is done, due to the fact that any characters waiting in the terminal's output queue are flushed when the quit signal occurs.

The terminal is set to *noecho* mode by this program so that the output can be continuous. What you type will thus not show on your terminal, except for the / and ! commands.

If the standard output is not a teletype, then *more* acts just like *cat,* except that a header is printed before each file (if there is more than one).

A sample usage of *more* in previewing *nroff* output would be

```
nroff -ms +2 doc.n | more -s
```

AUTHOR

Eric Shienbrood, minor revisions by John Foderaro and Geoffrey Peck

FILES

/etc/termcap	Terminal data base
/usr/lib/more.help	Help file

SEE ALSO

csh(1), man(1), msgs(1), script(1), sh(1), environ(7)

1

NAME

msgs − system messages and junk mail program

SYNOPSIS

msgs [**−fhlpq**] [number] [−number]

DESCRIPTION

Msgs is used to read system messages. These messages are sent by mailing to the login 'msgs' and should be short pieces of information which are suitable to be read once by most users of the system.

Msgs is normally invoked each time you login, by placing it in the file *.login* (*.profile* if you use */bin/sh*). It will then prompt you with the source and subject of each new message. If there is no subject line, the first few non-blank lines of the message will be displayed. If there is more to the message, you will be told how long it is and asked whether you wish to see the rest of the message. The possible responses are:

y type the rest of the message

RETURN
synonym for y.

n skip this message and go on to the next message.

− redisplay the last message.

q drops you out of *msgs;* the next time you run the program it will pick up where you left off.

s append the current message to the file "Messages" in the current directory; 's−' will save the previously displayed message. A 's' or 's−' may be followed by a space and a filename to receive the message replacing the default "Messages".

m or 'm−' causes a copy of the specified message to be placed in a temporary mailbox and *mail*(1) to be invoked on that mailbox. Both 'm' and 's' accept a numeric argument in place of the '−'.

Msgs keeps track of the next message you will see by a number in the file *.msgsrc* in your home directory. In the directory */usr/msgs* it keeps a set of files whose names are the (sequential) numbers of the messages they represent. The file */usr/msgs/bounds* shows the low and high number of the messages in the directory so that *msgs* can quickly determine if there are no messages for you. If the contents of *bounds* is incorrect it can be fixed by removing it; *msgs* will make a new *bounds* file the next time it is run.

Options to msgs include:

−f which causes it not to say "No new messages.". This is useful in your *.login* file since this is often the case here.

−q Queries whether there are messages, printing "There are new messages." if there are. The command "msgs −q" is often used in login scripts.

−h causes *msgs* to print the first part of messages only.

−l option causes only locally originated messages to be reported.

num A message number can be given on the command line, causing *msgs* to start at the specified message rather than at the next message indicated by your *.msgsrc* file. Thus

msgs −h 1

prints the first part of all messages.

−number
will cause *msgs* to start *number* messages back from the one indicated by your *.msgsrc*

file, useful for reviews of recent messages.

-p causes long messages to be piped through *more*(1).

Within *msgs* you can also go to any specific message by typing its number when *msgs* requests input as to what to do.

FILES

/usr/msgs/*	database
~/.msgsrc	number of next message to be presented

AUTHORS

William Joy
David Wasley

SEE ALSO

mail(1), more(1)

BUGS

NAME

mt − magnetic tape manipulating program

SYNOPSIS

mt [**−f** *tapename*] *command* [*count*]

DESCRIPTION

Mt is used to give commands to a magnetic tape drive. If a tape name is not specified, the environment variable TAPE is used; if TAPE does not exist, *mt* uses the device */dev/rmt12*. Note that *tapename* must reference a raw (not block) tape device. By default *mt* performs the requested operation once. Operations may be performed multiple times by specifying *count*.

The available commands are listed below. Only as many characters as are required to uniquely identify a command need be specified.

eof, weof
Write *count* end-of-file marks at the current position on the tape.

fsf Forward space *count* files.

fsr Forward space *count* records.

bsf Back space *count* files.

bsr Back space *count* records.

rewind Rewind the tape (*Count* is ignored.)

offline, rewoffl
Rewind the tape and place the tape unit off-line (*Count* is ignored.)

status Print status information about the tape unit.

Mt returns a 0 exit status when the operation(s) were successful, 1 if the command was unrecognized, and 2 if an operation failed.

FILES

/dev/rmt* Raw magnetic tape interface

SEE ALSO

mtio(4), dd(1), ioctl(2), environ(7)

NAME

mv − move or rename files

SYNOPSIS

mv [**−i**] [**−f**] [**−**] file1 file2

mv [**−i**] [**−f**] [**−**] file ... directory

DESCRIPTION

Mv moves (changes the name of) *file1* to *file2*.

If *file2* already exists, it is removed before *file1* is moved. If *file2* has a mode which forbids writing, *mv* prints the mode (see *chmod*(2)) and reads the standard input to obtain a line; if the line begins with **y**, the move takes place; if not, *mv* exits.

In the second form, one or more *files* (plain files or directories) are moved to the *directory* with their original file-names.

Mv refuses to move a file onto itself.

Options:

−i stands for interactive mode. Whenever a move is to supercede an existing file, the user is prompted by the name of the file followed by a question mark. If he answers with a line starting with 'y', the move continues. Any other reply prevents the move from occurring.

−f stands for force. This option overrides any mode restrictions or the −i switch.

− means interpret all the following arguments to *mv* as file names. This allows file names starting with minus.

SEE ALSO

cp(1), ln(1)

BUGS

If *file1* and *file2* lie on different file systems, *mv* must copy the file and delete the original. In this case the owner name becomes that of the copying process and any linking relationship with other files is lost.

NAME

netstat − show network status

SYNOPSIS

netstat [**−Aahimnrs**] [**−p** *protocol*] [**−a**] [*interval*] [*system*] [*core*]

DESCRIPTION

The *netstat* command symbolically displays the contents of various network-related data structures. The options have the following meaning:

−A show the address of any associated protocol control blocks; used for debugging

−a show the state of all sockets; normally sockets used by server processes are not shown

−h show the state of the IMP host table

−i show the state of interfaces which have been auto-configured (interfaces statically configured into a system, but not located at boot time are not shown)

−m show statistics recorded by the memory management routines (the network manages a "private share" of memory)

−n show network addresses as numbers (normally *netstat* interprets addresses and attempts to display them symbolically)

−p *proto*
show the state of sockets utilizing protocol *proto*; the protocol is specified symbolically, and may be any protocol listed in the file */etc/protocols*.

−s show per-protocol statistics

−r show the routing tables

The arguments, *system* and *core* allow substitutes for the defaults "/vmunix" and "/dev/kmem".

If an *interval* is specified, *netstat* will continuously display the information regarding packet traffic on the configured network interfaces, pausing *interval* seconds before refreshing the screen.

There are a number of display formats, depending on the information presented. The default display, for active sockets, shows the local and remote addresses, send and receive queue sizes (in bytes), protocol, and, optionally, the internal state of the protocol.

Address formats are of the form "host.port" or "network.port" if a socket's address specifies a network but no specific host address. When known the *host* and network addresses are displayed symbolically according to the data bases */etc/hosts* and */etc/networks*, respectively. If a symbolic name for an address is unknown, or if the **−n** option is specified, the address is printed in the Internet "dot format"; refer to *inet*(3N) for more information regarding this format. Unspecified, or "wildcard", addresses and ports appear as "*".

The interface display provides a table of cumulative statistics regarding packets transferred, errors, and collisions. The network address (currently Internet specific) of the interface and the maximum transmission unit ("mtu") are also displayed.

The routing table display indicates the available routes and their status. Each route consists of a destination host or network and a gateway to use in forwarding packets. The flags field shows the state of the route ("U" if "up"), and whether the route is to a gateway ("G"). Direct routes are created for each interface attached to the local host. The refcnt field gives the current number of active uses of the route. Connection oriented protocols normally hold on to a single route for the duration of a connection while connectionless protocols obtain a route then discard it. The use field provides a count of the number of packets sent using that route. The interface entry indicates the network interface utilized for the route.

When *netstat* is invoked with an *interval* argument, it displays a running count of statistics related to network interfaces. This display consists of a column summarizing information for all interfaces, and a column for the interface with the most traffic since the system was last rebooted. The first line of each screen of information contains a summary since the system was last rebooted. Subsequent lines of output show values accumulated over the preceding interval.

SEE ALSO

iostat(1), vmstat(1), hosts(5), networks(5), protocols(5), services(5), trpt(8C)

BUGS

The notion of errors is ill-defined. Collisions mean something else for the IMP.

NAME

newaliases — rebuild the data base for the mail aliases file

SYNOPSIS

newaliases

DESCRIPTION

Newaliases rebuilds the random access data base for the mail aliases file */usr/lib/aliases*. It must be run each time */usr/lib/aliases* is changed in order for the change to take effect.

SEE ALSO

aliases(5), sendmail(8)

BUGS

NAME

nice, nohup − run a command at low priority (*sh* only)

SYNOPSIS

nice [−*number*] command [arguments]

nohup command [arguments]

DESCRIPTION

Nice executes *command* with low scheduling priority. If the *number* argument is present, the priority is incremented (higher numbers mean lower priorities) by that amount up to a limit of 20. The default *number* is 10.

The super-user may run commands with priority higher than normal by using a negative priority, e.g. '−−10'.

Nohup executes *command* immune to hangup and terminate signals from the controlling terminal. The priority is incremented by 5. *Nohup* should be invoked from the shell with '&' in order to prevent it from responding to interrupts by or stealing the input from the next person who logs in on the same terminal. The syntax of nice is also different.

FILES

nohup.out standard output and standard error file under *nohup*

SEE ALSO

csh(1), setpriority(2), renice(8)

DIAGNOSTICS

Nice returns the exit status of the subject command.

BUGS

Nice and *nohup* are particular to *sh*(1). If you use *csh*(1), then commands executed with "&" are automatically immune to hangup signals while in the background. There is a builtin command *nohup* which provides immunity from terminate, but it does not redirect output to *nohup.out*.

Nice is built into *csh*(1) with a slightly different syntax than described here. The form "nice +10" nices to positive nice, and "nice −10" can be used by the super-user to give a process more of the processor.

NAME

nm − print name list

SYNOPSIS

nm [**−gnopru**] [file ...]

DESCRIPTION

Nm prints the name list (symbol table) of each object *file* in the argument list. If an argument is an archive, a listing for each object file in the archive will be produced. If no *file* is given, the symbols in "a.out" are listed.

Each symbol name is preceded by its value (blanks if undefined) and one of the letters **U** (undefined), **A** (absolute), **T** (text segment symbol), **D** (data segment symbol), **B** (bss segment symbol), **C** (common symbol), **f** file name, or **−** for sdb symbol table entries (see **−a** below). If the symbol is local (non-external) the type letter is in lower case. The output is sorted alphabetically.

Options are:

−g Print only global (external) symbols.

−n Sort numerically rather than alphabetically.

−o Prepend file or archive element name to each output line rather than only once.

−p Don't sort; print in symbol-table order.

−r Sort in reverse order.

−u Print only undefined symbols.

SEE ALSO

ar(1), ar(5), a.out(5), stab(5)

NAME

nroff – text formatting

SYNOPSIS

nroff [option] ... [file] ...

DESCRIPTION

Nroff formats text in the named *files* for typewriter-like devices. See also *troff(1)*. The full capabilities of *nroff* are described in the *Nroff/Troff User's Manual.*

If no *file* argument is present, the standard input is read. An argument consisting of a single minus (**–**) is taken to be a file name corresponding to the standard input.

The options, which may appear in any order so long as they appear *before* the files, are:

–o*list* Print only pages whose page numbers appear in the comma-separated *list* of numbers and ranges. A range *N*–*M* means pages *N* through *M*; an initial –*N* means from the beginning to page *N*; and a final *N*– means from *N* to the end.

–n*N* Number first generated page *N*.

–s*N* Stop every *N* pages. *Nroff* will halt prior to every *N* pages (default *N*=1) to allow paper loading or changing, and will resume upon receipt of a newline.

–m*name* Prepend the macro file **/usr/lib/tmac/tmac.***name* to the input *files*.

–r*aN* Set register *a* (one-character) to *N*.

–i Read standard input after the input files are exhausted.

–q Invoke the simultaneous input-output mode of the **rd** request.

–T*name* Prepare output for specified terminal. Known *names* are **37** for the (default) Teletype Corporation Model 37 terminal, **tn300** for the GE TermiNet 300 (or any terminal without half-line capability), **300S** for the DASI-300S, **300** for the DASI-300, and **450** for the DASI-450 (Diablo Hyterm).

–e Produce equally-spaced words in adjusted lines, using full terminal resolution.

–h Use output tabs during horizontal spacing to speed output and reduce output character count. Tab settings are assumed to be every 8 nominal character widths.

FILES

/tmp/ta*	temporary file
/usr/lib/tmac/tmac.*	standard macro files
/usr/lib/term/*	terminal driving tables for *nroff*

SEE ALSO

J. F. Ossanna, ***Nroff/Troff user's manual***
B. W. Kernighan, ***A TROFF Tutorial***
troff(1), eqn(1), tbl(1), ms(7), me(7), man(7), col(1)

NAME

od − octal, decimal, hex, ascii dump

SYNOPSIS

od [−format] [file] [[+]offset[.][**b**] [label]]

DESCRIPTION

Od displays *file*, or it's standard input, in one or more dump formats as selected by the first argument. If the first argument is missing, **−o** is the default. Dumping continues until end-of-file.

The meanings of the format argument characters are:

a Interpret bytes as characters and display them with their ACSII names. If the **p** character is given also, then bytes with even parity are underlined. The **P** character causes bytes with odd parity to be underlined. Otherwise the parity bit is ignored.

b Interpret bytes as unsigned octal.

c Interpret bytes as ASCII characters. Certain non-graphic characters appear as C escapes: null=\0, backspace=\b, formfeed=\f, newline=\n, return=\r, tab=\t; others appear as 3-digit octal numbers. Bytes with the parity bit set are displayed in octal.

d Interpret (short) words as unsigned decimal.

f Interpret long words as floating point.

h Interpret (short) words as unsigned hexadecimal.

i Interpret (short) words as signed decimal.

l Interpret long words as signed decimal.

o Interpret (short) words as unsigned octal.

s[n] Look for strings of ascii graphic characters, terminated with a null byte. *N* specifies the minimum length string to be recognized. By default, the minimum length is 3 characters.

v Show all data. By default, display lines that are identical to the last line shown are not output, but are indicated with an "*" in column 1.

w[n] Specifies the number of input bytes to be interpreted and displayed on each output line. If **w** is not specified, 16 bytes are read for each display line. If *n* is not specified, it defaults to 32.

x Interpret (short) words as hexadecimal.

An upper case format character implies the long or double precision form of the object.

The *offset* argument specifies the byte offset into the file where dumping is to commence. By default this argument is interpreted in octal. A different radix can be specified; If "." is appended to the argument, then *offset* is interpreted in decimal. If *offset* begins with "**x**" or "**0x**", it is interpreted in hexadecimal. If "**b**" ("**B**") is appended, the offset is interpreted as a block count, where a block is 512 (1024) bytes. If the *file* argument is omitted, an *offset* argument must be preceded by "**+**".

The radix of the displayed address will be the same as the radix of the *offset*, if specified; otherwise it will be octal.

Label will be interpreted as a pseudo-address for the first byte displayed. It will be shown in "()" following the file offset. It is intended to be used with core images to indicate the real memory address. The syntax for *label* is identical to that for *offset*.

SEE ALSO

adb(1)

BUGS

A file name argument can't start with "+". A hexadecimal offset can't be a block count. Only one file name argument can be given.

It is an historical botch to require specification of object, radix, and sign representation in a single character argument.

NAME

pagesize — print system page size

SYNOPSIS

pagesize

DESCRIPTION

Pagesize prints the size of a page of memory in bytes, as returned by *getpagesize*(2). This program is useful in constructing portable shell scripts.

SEE ALSO

getpagesize(2)

NAME

passwd — change login password

SYNOPSIS

passwd [name]

DESCRIPTION

This command changes (or installs) a password associated with the user *name* (your own name by default).

The program prompts for the old password and then for the new one. The caller must supply both. The new password must be typed twice, to forestall mistakes.

New passwords must be at least four characters long if they use a sufficiently rich alphabet and at least six characters long if monocase. These rules are relaxed if you are insistent enough.

Only the owner of the name or the super-user may change a password; the owner must prove he knows the old password.

FILES

/etc/passwd

SEE ALSO

login(1), passwd(5), crypt(3)
Robert Morris and Ken Thompson, *UNIX password security*

BUGS

The password file information should be kept in a different data structure allowing indexed access; *dbm*(3X) would probably be suitable.

1

NAME

pc − Pascal compiler

SYNOPSIS

pc [option] [**−i** name ...] name ...

DESCRIPTION

Pc is a Pascal compiler. If given an argument file ending with **.p**, it will compile the file and load it into an executable file called, by default, *a.out*.

A program may be separated into more than one **.p** file. *Pc* will compile a number of argument **.p** files into object files (with the extension **.o** in place of **.p**). Object files may then be loaded into an executable *a.out* file. Exactly one object file must supply a **program** statement to successfully create an executable a.out file. The rest of the files must consist only of declarations which logically nest within the program. References to objects shared between separately compiled files are allowed if the objects are declared in **included** header files, whose names must end with **.h**. Header files may only be included at the outermost level, and thus declare only globally available objects. To allow **functions** and **procedures** to be declared, an **external** directive has been added, whose use is similar to the **forward** directive but restricted to appear only in **.h** files. **Function** and **procedure** bodies may not appear in **.h** files. A binding phase of the compiler checks that declarations are used consistently, to enforce the type checking rules of Pascal.

Object files created by other language processors may be loaded together with object files created by *pc*. The **functions** and **procedures** they define must have been declared in **.h** files included by all the **.p** files which call those routines. Calling conventions are as in C, with **var** parameters passed by address.

See the Berkeley Pascal User's Manual for details.

The following options have the same meaning as in *cc*(1) and *f77*(1). See *ld*(1) for load-time options.

−c Suppress loading and produce '.o' file(s) from source file(s).

−g Have the compiler produce additional symbol table information for *dbx*(1).

−w Suppress warning messages.

−p Prepare object files for profiling, see *prof*(1).

−O Invoke an object-code improver.

−S Compile the named program, and leave the assembler-language output on the corresponding file suffixed '.s'. (No '.o' is created.).

−o output
Name the final output file *output* instead of *a.out*.

The following options are peculiar to *pc*.

−C Compile code to perform runtime checks, verify **assert** calls, and initialize all variables to zero as in *pi*.

−b Block buffer the file *output*.

−i Produce a listing for the specified procedures, functions and **include** files.

−l Make a program listing during translation.

−s Accept standard Pascal only; non-standard constructs cause warning diagnostics.

−t directory
Use the given *directory* for compiler temporary files.

−z Allow execution profiling with *pxp* by generating statement counters, and arranging for

the creation of the profile data file *pmon.out* when the resulting object is executed.

Other arguments are taken to be loader option arguments, perhaps libraries of *pc* compatible routines. Certain flags can also be controlled in comments within the program as described in the *Berkeley Pascal User's Manual.*

FILES

file.p	pascal source files
/usr/lib/pc0	compiler
/lib/f1	code generator
/usr/lib/pc2	runtime integrator (inline expander)
/lib/c2	peephole optimizer
/usr/lib/pc3	separate compilation consistency checker
/usr/lib/pc2.*strings	text of the error messages
/usr/lib/how_pc	basic usage explanation
/usr/lib/libpc.a	intrinsic functions and I/O library
/usr/lib/libm.a	math library
/lib/libc.a	standard library, see *intro*(3)

SEE ALSO

Berkeley Pascal User's Manual
pi(1), pxp(1), pxref(1), sdb(1)

DIAGNOSTICS

For a basic explanation do

pc

See *pi*(1). for an explanation of the error message format. Internal errors cause messages containing the word SNARK.

AUTHORS

Charles B. Haley, William N. Joy, and Ken Thompson
Retargetted to the second pass of the portable *C* compiler by Peter Kessler
Runtime library and inline optimizer by M. Kirk McKusick
Separate compilation consistency checking by Louise Madrid

BUGS

The keyword **packed** is recognized but has no effect.

The binder is not as strict as described here, with regard to the rules about external declarations only in '.h' files and including '.h' files only at the outermost level. It will be made to perform these checks in its next incarnation, so users are warned not to be sloppy.

The **−z** flag doesn't work for separately compiled files.

Because the **−s** option is usurped by the compiler, it is not possible to pass the strip option to the loader. Thus programs which are to be stripped, must be run through *strip*(1) after they are compiled.

NAME

pdx — pascal debugger

SYNOPSIS

pdx [−r] [*objfile*]

DESCRIPTION

Pdx is a tool for source level debugging and execution of Pascal programs. The *objfile* is an object file produced by the Pascal translator *pi*(1). If no *objfile* is specified, *pdx* looks for a file named "obj" in the current directory. The object file contains a symbol table which includes the name of the all the source files translated by *pi* to create it. These files are available for perusal while using the debugger.

If the file ".pdxinit" exists in the current directory, then the debugger commands in it are executed.

The −r option causes the *objfile* to be executed immediately; if it terminates successfully *pdx* exits. Otherwise it reports the reason for termination and offers the user the option of entering the debugger or simply letting *px* continue with a traceback. If −r is not specified, *pdx* just prompts and waits for a command.

The commands are:

run [*args*] [< *filename*] [> *filename*]
Start executing *objfile*, passing *args* as command line arguments; < or > can be used to redirect input or output in the usual manner.

trace [**in** *procedure/function*] [**if** *condition*]
trace *source-line-number* [**if** *condition*]
trace *procedure/function* [**in** *procedure/function*] [**if** *condition*]
trace *expression* **at** *source-line-number* [**if** *condition*]
trace *variable* [**in** *procedure/function*] [**if** *condition*]
Have tracing information printed when the program is executed. A number is associated with the command that is used to turn the tracing off (see the **delete** command).

The first argument describes what is to be traced. If it is a *source-line-number*, then the line is printed immediately prior to being executed. Source line numbers in a file other than the current one must be preceded by the name of the file and a colon, e.g. "mumble.p:17".

If the argument is a procedure or function name then every time it is called, information is printed telling what routine called it, from what source line it was called, and what parameters were passed to it. In addition, its return is noted, and if it's a function then the value it is returning is also printed.

If the argument is an *expression* with an **at** clause then the value of the expression is printed whenever the identified source line is reached.

If the argument is a variable then the name and value of the variable is printed whenever it changes. Execution is substantially slower during this form of tracing.

If no argument is specified then all source lines are printed before they are executed. Execution is substantially slower during this form of tracing.

The clause "**in** *procedure/function*" restricts tracing information to be printed only while executing inside the given procedure or function.

Condition is a Pascal boolean expression and is evaluated prior to printing the tracing information; if it is false then the information is not printed.

There is no restriction on the amount of information that can be traced.

stop if *condition*
stop at *source-line-number* [**if** *condition*]
stop in *procedure/function* [**if** *condition*]
stop *variable* [**if** *condition*]
Stop execution when the given line is reached, procedure or function called, variable changed, or condition true.

delete *command-number*
The trace or stop corresponding to the given number is removed. The numbers associated with traces and stops are printed by the **status** command.

status [> *filename*]
Print out the currently active **trace** and **stop** commands.

cont Continue execution from where it stopped. This can only be done when the program was stopped by an interrupt or through use of the **stop** command.

step Execute one source line.

next Execute up to the next source line. The difference between this and **step** is that if the line contains a call to a procedure or function the **step** command will stop at the beginning of that block, while the **next** command will not.

print *expression* [, *expression* ...]
Print out the values of the Pascal expressions. Variables declared in an outer block but having the same identifier as one in the current block may be referenced as "*block-name* . *variable*".

whatis *identifier*
Print the declaration of the given identifier.

which *identifier*
Print the full qualification of the given identifer, i.e. the outer blocks that the identifier is associated with.

assign *variable expression*
Assign the value of the expression to the variable.

call *procedure(parameters)*
Execute the object code associated with the named procedure or function.

help Print out a synopsis of *pdx* commands.

gripe Invokes a mail program to send a message to the person in charge of *pdx*.

where Print out a list of the active procedures and functions and the respective source line where they are called.

source *filename*
Read *pdx* commands from the given *filename*. Especially useful when the *filename* has been created by redirecting a **status** command from an earlier debugging session.

dump [> *filename*]
Print the names and values of all active data.

list [*source-line-number* [, *source-line-number*]]
list *procedure/function*
List the lines in the current source file from the first line number to the second

inclusive. As in the editor "$" can be used to refer to the last line. If no lines are specified, the entire file is listed. If the name of a procedure or function is given lines *n-k* to *n+k* are listed where *n* is the first statement in the procedure or function and *k* is small.

file [*filename*]
Change the current source file name to *filename*. If none is specified then the current source file name is printed.

edit [*filename*]
edit *procedure/function-name*
Invoke an editor on *filename* or the current source file if none is specified. If a *procedure* or *function* name is specified, the editor is invoked on the file that contains it. Which editor is invoked by default depends on the installation. The default can be overridden by setting the environment variable EDITOR to the name of the desired editor.

pi Recompile the program and read in the new symbol table information.

sh *command-line*
Pass the command line to the shell for execution. The SHELL environment variable determines which shell is used.

alias *new-command-name old-command-name*
This command makes *pdx* respond to *new-command-name* the way it used to respond to *old-command-name*.

quit Exit *pdx*.

The following commands deal with the program at the *px* instruction level rather than source level. They are not intended for general use.

tracei [*address*] [**if** *cond*]
tracei [*variable*] [**at** *address*] [**if** *cond*]
stopi [*address*] [**if** *cond*]
stopi [**at**] [*address*] [**if** *cond*]
Turn on tracing or set a stop using a *px* machine instruction addresses.

xi *address* [, *address*]
Print the instructions starting at the first *address*. Instructions up to the second *address* are printed.

xd *address* [, *address*]
Print in octal the specified data location(s).

FILES

obj	Pascal object file
.pdxinit	*Pdx* initialization file

SEE ALSO
pi(1), px(1)
An Introduction to Pdx

BUGS
Pdx does not understand sets, and provides no information about files.

The *whatis* command doesn't quite work for variant records.

Bad things will happen if a procedure invoked with the **call** command does a non-local goto.

The commands **step** and **next** should be able to take a *count* that specifies how many lines to execute.

There should be commands **stepi** and **nexti** that correspond to **step** and **next** but work at the instruction level.

There should be a way to get an address associated with a line number, procedure or function, and variable.

Most of the command names are too long.

The alias facility is quite weak.

A *csh*-like history capability would improve the situation.

1

NAME

pi − Pascal interpreter code translator

SYNOPSIS

pi [**option**] [**−i** name ...] name.p

DESCRIPTION

Pi translates the program in the file *name.p* leaving interpreter code in the file *obj* in the current directory. The interpreter code can be executed using *px*. *Pix* performs the functions of *pi* and *px* for 'load and go' Pascal.

The following flags are interpreted by *pi;* the associated options can also be controlled in comments within the program as described in the *Berkeley Pascal User's Manual.*

−b Block buffer the file *output.*

−i Enable the listing for any specified procedures and functions and while processing any specified **include** files.

−l Make a program listing during translation.

−n Begin each listed **include** file on a new page with a banner line.

−p Suppress the post-mortem control flow backtrace if an error occurs; suppress statement limit counting.

−s Accept standard Pascal only; non-standard constructs cause warning diagnostics.

−t Suppress runtime tests of subrange variables and treat **assert** statements as comments.

−u Card image mode; only the first 72 characters of input lines are used.

−w Suppress warning diagnostics.

−z Allow execution profiling with *pxp* by generating statement counters, and arranging for the creation of the profile data file *pmon.out* when the resulting object is executed.

FILES

file.p	input file
file.i	**include** file(s)
/usr/lib/pi2.*strings	text of the error messages
/usr/lib/how_pi*	basic usage explanation
obj	interpreter code output

SEE ALSO

Berkeley Pascal User's Manual
pix(1), px(1), pxp(1), pxref(1)

DIAGNOSTICS

For a basic explanation do

pi

In the diagnostic output of the translator, lines containing syntax errors are listed with a flag indicating the point of error. Diagnostic messages indicate the action which the recovery mechanism took in order to be able to continue parsing. Some diagnostics indicate only that the input is 'malformed.' This occurs if the recovery can find no simple correction to make the input syntactically valid.

Semantic error diagnostics indicate a line in the source text near the point of error. Some errors evoke more than one diagnostic to help pinpoint the error; the follow-up messages begin with an ellipsis '...'.

The first character of each error message indicates its class:

E	Fatal error; no code will be generated.
e	Non-fatal error.
w	Warning — a potential problem.
s	Non-standard Pascal construct warning.

If a severe error occurs which inhibits further processing, the translator will give a diagnostic and then 'QUIT'.

AUTHORS

Charles B. Haley, William N. Joy, and Ken Thompson
Ported to VAX-11 by Peter Kessler

BUGS

The keyword **packed** is recognized but has no effect.

For clarity, semantic errors should be flagged at an appropriate place in the source text, and multiple instances of the 'same' semantic error should be summarized at the end of a **procedure** or **function** rather than evoking many diagnostics.

When **include** files are present, diagnostics relating to the last procedure in one file may appear after the beginning of the listing of the next.

NAME

pix − Pascal interpreter and executor

SYNOPSIS

pix [**−blnpstuwz**] [**−i** name ...] name.p [argument ...]

DESCRIPTION

Pix is a 'load and go' version of Pascal which combines the functions of the interpreter code translator *pi* and the executor *px*. It uses *pi* to translate the program in the file *name.p* and, if there were no fatal errors during translation, causes the resulting interpreter code to be executed by *px* with the specified arguments. A temporary file is used for the object code; the file *obj* is neither created nor destroyed.

FILES

/usr/ucb/pi	Pascal translator
/usr/ucb/px	Pascal executor
/tmp/pix*	temporary
/usr/lib/how_pix	basic explanation

SEE ALSO

Berkeley Pascal User's Manual
pi(1), px(1)

DIAGNOSTICS

For a basic explanation do

pix

AUTHORS

Susan L. Graham and William N. Joy

NAME

plot − graphics filters

SYNOPSIS

plot [−**T**terminal [raster]]

DESCRIPTION

These commands read plotting instructions (see *plot*(5)) from the standard input, and in general produce plotting instructions suitable for a particular *terminal* on the standard output.

If no *terminal* type is specified, the environment parameter $TERM (see *environ*(7)) is used. Known *terminals* are:

4014 Tektronix 4014 storage scope.

450 DASI Hyterm 450 terminal (Diablo mechanism).

300 DASI 300 or GSI terminal (Diablo mechanism).

300S DASI 300S terminal (Diablo mechanism).

ver Versatec D1200A printer-plotter. This version of *plot* places a scan-converted image in '/usr/tmp/raster' and sends the result directly to the plotter device rather than to the standard output. The optional argument causes a previously scan-converted file *raster* to be sent to the plotter.

FILES

/usr/bin/tek
/usr/bin/t450
/usr/bin/t300
/usr/bin/t300s
/usr/bin/vplot
/usr/tmp/raster

SEE ALSO

plot(3X), plot(5)

BUGS

There is no lockout protection for /usr/tmp/raster.

NAME

pmerge — pascal file merger

SYNOPSIS

pmerge name.p ...

DESCRIPTION

Pmerge assembles the named Pascal files into a single standard Pascal program. The resulting program is listed on the standard output. It is intended to be used to merge a collection of separately compiled modules so that they can be run through **pi** , or exported to other sites.

FILES

/usr/tmp/MG* default temporary files

SEE ALSO

pc(1), pi(1),
Auxiliary documentation *Berkeley Pascal User's Manual.*

AUTHOR

M. Kirk McKusick

BUGS

Very minimal error checking is done, so incorrect programs will produce unpredictable results. Block comments should be placed after the keyword to which they refer or they are likely to end up in bizarre places.

NAME

pr − print file

SYNOPSIS

pr [option] ... [file] ...

DESCRIPTION

Pr produces a printed listing of one or more *files.* The output is separated into pages headed by a date, the name of the file or a specified header, and the page number. If there are no file arguments, *pr* prints its standard input.

Options apply to all following files but may be reset between files:

−*n* Produce *n*-column output.

+*n* Begin printing with page *n*.

−h Take the next argument as a page header.

−w*n* For purposes of multi-column output, take the width of the page to be *n* characters instead of the default 72.

−f Use formfeeds instead of newlines to separate pages. A formfeed is assumed to use up two blank lines at the top of a page. (Thus this option does not affect the effective page length.)

−l*n* Take the length of the page to be *n* lines instead of the default 66.

−t Do not print the 5-line header or the 5-line trailer normally supplied for each page.

−s*c* Separate columns by the single character *c* instead of by the appropriate amount of white space. A missing *c* is taken to be a tab.

−m Print all *files* simultaneously, each in one column,

Inter-terminal messages via *write*(1) are forbidden during a *pr*.

FILES

/dev/tty? to suspend messages.

SEE ALSO

cat(1)

DIAGNOSTICS

There are no diagnostics when *pr* is printing on a terminal.

NAME

print − pr to the line printer

SYNOPSIS

print file ...

DESCRIPTION

Print pr's a copy of each named file on the line printer. It is a one line shell script:

```
lpr -p $*
```

SEE ALSO

lpr(1), pr(1)

NAME

printenv — print out the environment

SYNOPSIS

printenv [name]

DESCRIPTION

Printenv prints out the values of the variables in the environment. If a *name* is specified, only its value is printed.

If a *name* is specified and it is not defined in the environment, *printenv* returns exit status 1, else it returns status 0.

SEE ALSO

sh(1), environ(7), csh(1)

NAME

prmail − print out mail in the post office

SYNOPSIS

prmail [user ...]

DESCRIPTION

Prmail prints the mail which waits for you, or the specified user, in the post office. The mail is not disturbed.

FILES

/usr/spool/mail/* post office

SEE ALSO

biff(1), mail(1), from(1), binmail(1)

NAME

prof − display profile data

SYNOPSIS

prof [**−a**] [**−l**] [**−n**] [**−z**] [**−s**] [**−v** [*−low* [*−high*]]] [a.out [mon.out ...]]

DESCRIPTION

Prof interprets the file produced by the *monitor* subroutine. Under default modes, the symbol table in the named object file (*a.out* default) is read and correlated with the profile file (*mon.out* default). For each external symbol, the percentage of time spent executing between that symbol and the next is printed (in decreasing order), together with the number of times that routine was called and the number of milliseconds per call. If more than one profile file is specified, the output represents the sum of the profiles.

In order for the number of calls to a routine to be tallied, the **−p** option of *cc, f77* or *pc* must have been given when the file containing the routine was compiled. This option also arranges for the profile file to be produced automatically.

Options are:

−a all symbols are reported rather than just external symbols.

−l the output is sorted by symbol value.

−n the output is sorted by number of calls

−s a summary profile file is produced in *mon.sum*. This is really only useful when more than one profile file is specified.

−v all printing is suppressed and a graphic version of the profile is produced on the standard output for display by the *plot*(1) filters. When plotting, the numbers *low* and *high*, by default 0 and 100, may be given to cause a selected percentage of the profile to be plotted with accordingly higher resolution.

−z routines which have zero usage (as indicated by call counts and accumulated time) are nevertheless printed in the output.

FILES

mon.out for profile
a.out for namelist
mon.sum for summary profile

SEE ALSO

monitor(3), profil(2), cc(1), plot(1G)

BUGS

Beware of quantization errors.

Is confused by *f77* which puts the entry points at the bottom of subroutines and functions.

1

NAME

ps — process status

SYNOPSIS

ps [acegklstuvwx#]

DESCRIPTION

Ps prints information about processes. Normally, only your processes are candidates to be printed by *ps;* specifying **a** causes other users processes to be candidates to be printed; specifying **x** includes processes without control terminals in the candidate pool.

All output formats include, for each process, the process id PID, control terminal of the process TT, cpu time used by the process TIME (this includes both user and system time), the state STAT of the process, and an indication of the COMMAND which is running. The state is given by a sequence of four letters, e.g. "RWNA". The first letter indicates the runnability of the process: R for runnable processes, T for stopped processes, P for processes in page wait, D for those in disk (or other short term) waits, S for those sleeping for less than about 20 seconds, and I for idle (sleeping longer than about 20 seconds) processes. The second letter indicates whether a process is swapped out, showing W if it is, or a blank if it is loaded (incore); a process which has specified a soft limit on memory requirements and which is exceeding that limit shows >; such a process is (necessarily) not swapped. The third letter indicates whether a process is running with altered CPU scheduling priority (nice); if the process priority is reduced, an N is shown, if the process priority has been artificially raised then a '<' is shown; processes running without special treatment have just a blank. The final letter indicates any special treatment of the process for virtual memory replacement; the letters correspond to options to the *vadvise*(2) call; currently the possibilities are A standing for VA_ANOM, S for VA_SEQL and blank for VA_NORM; an A typically represents a *lisp*(1) in garbage collection, S is typical of large image processing programs which are using virtual memory to sequentially address voluminous data.

Here are the options:

a asks for information about all processes with terminals (ordinarily only one's own processes are displayed).

c prints the command name, as stored internally in the system for purposes of accounting, rather than the command arguments, which are kept in the process' address space. This is more reliable, if less informative, since the process is free to destroy the latter information.

e Asks for the environment to be printed as well as the arguments to the command.

g Asks for all processes. Without this option, *ps* only prints "interesting" processes. Processes are deemed to be uninteresting if they are process group leaders. This normally eliminates top-level command interpreters and processes waiting for users to login on free terminals.

k causes the file */vmcore* is used in place of */dev/kmem* and */dev/mem*. This is used for postmortem system debugging.

l asks for a long listing, with fields PPID, CP, PRI, NI, ADDR, SIZE, RSS and WCHAN as described below.

s Adds the size SSIZ of the kernel stack of each process (for use by system maintainers) to the basic output format.

tx restricts output to processes whose controlling tty is *x* (which should be specified as printed by *ps,* e.g. *t3* for tty3, *tco* for console, *td0* for ttyd0, *t?* for processes with no tty, *t* for processes at the current tty, etc). This option must be the last one given.

u A user oriented output is produced. This includes fields USER, %CPU, NICE, SIZE, and

RSS as described below.

v A version of the output containing virtual memory statistics is output. This includes fields RE, SL, PAGEIN, SIZE, RSS, LIM, TSIZ, TRS, %CPU and %MEM, described below.

w Use a wide output format (132 columns rather than 80); if repeated, e.g. ww, use arbitrarily wide output. This information is used to decide how much of long commands to print.

x asks even about processes with no terminal.

A process number may be given, (indicated here by #), in which case the output is restricted to that process. This option must also be last.

A second argument is taken to be the file containing the system's namelist. Otherwise, /vmunix is used. A third argument tells *ps* where to look for *core* if the **k** option is given, instead of /vmcore. If a fourth argument is given, it is taken to be the name of a swap file to use instead of the default /dev/drum.

Fields which are not common to all output formats:

USER	name of the owner of the process
%CPU	cpu utilization of the process; this is a decaying average over up to a minute of previous (real) time. Since the time base over which this is computed varies (since processes may be very young) it is possible for the sum of all %CPU fields to exceed 100%.
NICE	(or NI) process scheduling increment (see *setpriority*(2))
SIZE	virtual size of the process (in 1024 byte units)
RSS	real memory (resident set) size of the process (in 1024 byte units)
LIM	soft limit on memory used, specified via a call to *setrlimit*(2); if no limit has been specified then shown as *xx*
TSIZ	size of text (shared program) image
TRS	size of resident (real memory) set of text
%MEM	percentage of real memory used by this process.
RE	residency time of the process (seconds in core)
SL	sleep time of the process (seconds blocked)
PAGEIN	number of disk i/o's resulting from references by the process to pages not loaded in core.
UID	numerical user-id of process owner
PPID	numerical id of parent of process
CP	short-term cpu utilization factor (used in scheduling)
PRI	process priority (non-positive when in non-interruptible wait)
ADDR	swap address of the process
WCHAN	event on which process is waiting (an address in the system), with the initial part of the address trimmed off e.g. 80004000 prints as 4000.

F flags associated with process as in <*sys/proc.h*>:

SLOAD	000001	in core
SSYS	000002	swapper or pager process
SLOCK	000004	process being swapped out
SSWAP	000008	save area flag
STRC	000010	process is being traced
SWTED	000020	another tracing flag
SULOCK	000040	user settable lock in core
SPAGE	000080	process in page wait state
SKEEP	000100	another flag to prevent swap out

SDLYU	000200	delayed unlock of pages
SWEXIT	000400	working on exiting
SPHYSIO	000800	doing physical i/o (bio.c)
SVFORK	001000	process resulted from vfork()
SVFDONE	002000	another vfork flag
SNOVM	004000	no vm, parent in a vfork()
SPAGI	008000	init data space on demand from inode
SANOM	010000	system detected anomalous vm behavior
SUANOM	020000	user warned of anomalous vm behavior
STIMO	040000	timing out during sleep
SDETACH	080000	detached inherited by init
SOUSIG	100000	using old signal mechanism

A process that has exited and has a parent, but has not yet been waited for by the parent is marked <defunct>; a process which is blocked trying to exit is marked <exiting>; *Ps* makes an educated guess as to the file name and arguments given when the process was created by examining memory or the swap area. The method is inherently somewhat unreliable and in any event a process is entitled to destroy this information, so the names cannot be counted on too much.

FILES

/vmunix	system namelist
/dev/kmem	kernel memory
/dev/drum	swap device
/vmcore	core file
/dev	searched to find swap device and tty names

SEE ALSO

kill(1), w(1)

BUGS

Things can change while *ps* is running; the picture it gives is only a close approximation to reality.

NAME

pti − phototypesetter interpreter

SYNOPSIS

pti [file ...]

DESCRIPTION

Pti shows the commands in a stream from the standard output of *troff*(1) using *troff's* **−t** option, interpreting them as they would act on the typesetter. Horizontal motions shows as counts in internal units and are marked with '<' and '>' indicating left and right motion. Vertical space is called *lead* and is also indicated.

SEE ALSO

troff(1)

BUGS

Too cryptic for normal users, who should use "troff −a ...".

NAME

ptx − permuted index

SYNOPSIS

ptx [option] ... [input [output]]

DESCRIPTION

Ptx generates a permuted index to file *input* on file *output* (standard input and output default). It has three phases: the first does the permutation, generating one line for each keyword in an input line. The keyword is rotated to the front. The permuted file is then sorted. Finally, the sorted lines are rotated so the keyword comes at the middle of the page. *Ptx* produces output in the form:

.xx "tail" "before keyword" "keyword and after" "head"

where .xx may be an *nroff* or *troff*(1) macro for user-defined formatting. The *before keyword* and *keyword and after* fields incorporate as much of the line as will fit around the keyword when it is printed at the middle of the page. *Tail* and *head,* at least one of which is an empty string "", are wrapped-around pieces small enough to fit in the unused space at the opposite end of the line. When original text must be discarded, '/' marks the spot.

The following options can be applied:

−f Fold upper and lower case letters for sorting.

−t Prepare the output for the phototypesetter; the default line length is 100 characters.

−w *n* Use the next argument, *n,* as the width of the output line. The default line length is 72 characters.

−g *n* Use the next argument, *n,* as the number of characters to allow for each gap among the four parts of the line as finally printed. The default gap is 3 characters.

−o only
Use as keywords only the words given in the *only* file.

−i ignore
Do not use as keywords any words given in the *ignore* file. If the **−i** and **−o** options are missing, use */usr/lib/eign* as the *ignore* file.

−b break
Use the characters in the *break* file to separate words. In any case, tab, newline, and space characters are always used as break characters.

−r Take any leading nonblank characters of each input line to be a reference identifier (as to a page or chapter) separate from the text of the line. Attach that identifier as a 5th field on each output line.

The index for this manual was generated using *ptx.*

FILES

/usr/bin/sort
/usr/lib/eign

BUGS

Line length counts do not account for overstriking or proportional spacing.

NAME

pwd — working directory name

SYNOPSIS

pwd

DESCRIPTION

Pwd prints the pathname of the working (current) directory.

SEE ALSO

cd(1), csh(1), getwd(3)

BUGS

In *csh*(1) the command *dirs* is always faster (although it can give a different answer in the rare case that the current directory or a containing directory was moved after the shell descended into it).

NAME

px − Pascal interpreter

SYNOPSIS

px [obj [argument ...]]

DESCRIPTION

Px interprets the abstract machine code generated by *pi*. The first argument is the file to be interpreted, and defaults to *obj*; remaining arguments are available to the Pascal program using the built-ins *argv* and *argc*. *Px* is also invoked by *pix* when running 'load and go'.

If the program terminates abnormally an error message and a control flow backtrace are printed. The number of statements executed and total execution time are printed after normal termination. The **p** option of *pi* suppresses all of this except the message indicating the cause of abnormal termination.

FILES

obj	default object file
pmon.out	profile data file

SEE ALSO

Berkeley Pascal User's Manual
pi(1), pix(1)

DIAGNOSTICS

Most run-time error messages are self-explanatory. Some of the more unusual ones are:

Reference to an inactive file
: A file other than *input* or *output* was used before a call to *reset* or *rewrite*.

Statement count limit exceeded
: The limit of 500,000 executed statements (which prevents excessive looping or recursion) has been exceeded.

Bad data found on integer read
Bad data found on real read
: Usually, non-numeric input was found for a number. For reals, Pascal requires digits before and after the decimal point so that numbers like '.1' or '21.' evoke the second diagnostic.

panic: *Some message*
: Indicates a internal inconsistency detected in *px* probably due to a Pascal system bug.

AUTHORS

Charles B. Haley, William Joy, and Ken Thompson
VAX-11 version by Kirk McKusick

BUGS

Post-mortem traceback is not limited; infinite recursion leads to almost infinite traceback.

NAME

pxp − Pascal execution profiler

SYNOPSIS

pxp [**−acdefjnstuw_**] [**−23456789**] [**−z** [name ...]] name.p

DESCRIPTION

Pxp can be used to obtain execution profiles of Pascal programs or as a pretty-printer. To produce an execution profile all that is necessary is to translate the program specifying the **z** option to *pi* or *pix*, to execute the program, and to then issue the command

pxp −z name.p

A reformatted listing is output if none of the **c**, **t**, or **z** options are specified; thus

pxp old.p > new.p

places a pretty-printed version of the program in 'old.p' in the file 'new.p'.

The use of the following options of *pxp* is discussed in sections 2.6, 5.4, 5.5 and 5.10 of the *Berkeley Pascal User's Manual*.

−a Print the bodies of all procedures and functions in the profile; even those which were never executed.

−c Extract profile data from the file *core*.

−d Include declaration parts in a profile.

−e Eliminate **include** directives when reformatting a file; the **include** is replaced by the reformatted contents of the specified file.

−f Fully parenthesize expressions.

−j Left justify all procedures and functions.

−n Eject a new page as each file is included; in profiles, print a blank line at the top of the page.

−s Strip comments from the input text.

−t Print a table summarizing **procedure** and **function** call counts.

−u Card image mode; only the first 72 characters of input lines are used.

−w Suppress warning diagnostics.

−z Generate an execution profile. If no *name*s, are given the profile is of the entire program. If a list of names is given, then only any specified **procedure**s or **function**s and the contents of any specified **include** files will appear in the profile.

−_ Underline keywords.

−*d* With *d* a digit, $2 \leqslant d \leqslant 9$, causes *pxp* to use *d* spaces as the basic indenting unit. The default is 4.

FILES

name.p	input file
name.i	include file(s)
pmon.out	profile data
core	profile data source with **−c**
/usr/lib/how_pxp	information on basic usage

SEE ALSO

Berkeley Pascal User's Manual
pi(1), px(1)

DIAGNOSTICS

For a basic explanation do

pxp

Error diagnostics include 'No profile data in file' with the **c** option if the **z** option was not enabled to *pi;* 'Not a Pascal system core file' if the core is not from a *px* execution; 'Program and count data do not correspond' if the program was changed after compilation, before profiling; or if the wrong program is specified.

AUTHOR

William Joy

BUGS

Does not place multiple statements per line.

NAME

pxref − Pascal cross-reference program

SYNOPSIS

pxref [−] name

DESCRIPTION

Pxref makes a line numbered listing and a cross-reference of identifier usage for the program in *name*. The optional '−' argument suppresses the listing. The keywords **goto** and **label** are treated as identifiers for the purpose of the cross-reference. **Include** directives are not processed, but cause the placement of an entry indexed by '#include' in the cross-reference.

SEE ALSO

Berkeley Pascal User's Manual

AUTHOR

Niklaus Wirth

BUGS

Identifiers are trimmed to 10 characters.

NAME

quota — display disc usage and limits

SYNOPSIS

quota [**−qv**] [user]

DESCRIPTION

Quota displays users' disc usage and limits. Only the super-user may use the optional *user* argument to view the limits of users other than himself.

The **−q** flag prints a more terse message, containing only information on file systems where usage is over quota.

If a **−v** flag is supplied, *quota* will also display user's quotas on file systems where no storage is allocated.

Quota reports only on file systems which have disc quotas. If *quota* exits with a non-zero status, one or more file systems are over quota.

SEE ALSO

quota(2), quotaon(8)

NAME

ranlib — convert archives to random libraries

SYNOPSIS

ranlib archive ...

DESCRIPTION

Ranlib converts each *archive* to a form which the loader can load more rapidly. *Ranlib* does this by adding a table of contents called **_.SYMDEF** to the beginning of the archive. *Ranlib* uses *ar*(1) to reconstruct the archive, so that sufficient temporary file space must be available in the file system which contains the current directory.

SEE ALSO

ld(1), ar(1), lorder(1)

BUGS

Because generation of a library by *ar* and randomization of the library by *ranlib* are separate processes, phase errors are possible. The loader, *ld*, warns when the modification date of a library is more recent than the creation date of its dictionary; but this means that you get the warning even if you only copy the library.

1

NAME

ratfor − rational Fortran dialect

SYNOPSIS

ratfor [option ...] [filename ...]

DESCRIPTION

Ratfor converts a rational dialect of Fortran into ordinary irrational Fortran. *Ratfor* provides control flow constructs essentially identical to those in C:

statement grouping:

```
{ statement; statement; statement }
```

decision-making:

```
if (condition) statement [ else statement ]
switch (integer value) {
        case integer:   statement
        ...
        [ default: ]    statement
}
```

loops:

```
while (condition) statement
for (expression; condition; expression) statement
do limits statement
repeat statement [ until (condition) ]
break
next
```

and some syntactic sugar to make programs easier to read and write:

free form input:

multiple statements/line; automatic continuation

comments:

this is a comment

translation of relationals:

>, >=, etc., become .GT., .GE., etc.

return (expression)

returns expression to caller from function

define: define name replacement

include:

include filename

Ratfor is best used with *f77*(1).

SEE ALSO

f77(1)

B. W. Kernighan and P. J. Plauger, *Software Tools*, Addison-Wesley, 1976.

NAME

rcp − remote file copy

SYNOPSIS

rcp file1 file2
rcp [**−r**] file ... directory

DESCRIPTION

Rcp copies files between machines. Each *file* or *directory* argument is either a remote file name of the form "rhost:path", or a local file name (containing no ':' characters, or a '/' before any ':'s.)

If the **−r** is specified and any of the source files are directories, *rcp* copies each subtree rooted at that name; in this case the destination must be a directory.

If *path* is not a full path name, it is interpreted relative to your login directory on *rhost*. A *path* on a remote host may be quoted (using \, ", or ') so that the metacharacters are interpreted remotely.

Rcp does not prompt for passwords; your current local user name must exist on *rhost* and allow remote command execution via *rsh*(1C).

Rcp handles third party copies, where neither source nor target files are on the current machine. Hostnames may also take the form "rhost.rname" to use *rname* rather than the current user name on the remote host.

SEE ALSO

ftp(1C), rsh(1C), rlogin(1C)

BUGS

Doesn't detect all cases where the target of a copy might be a file in cases where only a directory should be legal.
Is confused by any output generated by commands in a .login, .profile, or .cshrc file on the remote host.

NAME

refer − find and insert literature references in documents

SYNOPSIS

refer [**−a**] [**−b**] [**−c**] [**−e**] [**−f***n*] [**−k***x*] [**−l***m,n*] [**−n**] [**−p** bib] [**−s***keys*] [**−B***l.m*] [**−P**] [**−S**] [file ...]

DESCRIPTION

Refer is a preprocessor for *nroff* or *troff*(1) that finds and formats references for footnotes or endnotes. It is also the base for a series of programs designed to index, search, sort, and print stand-alone bibliographies, or other data entered in the appropriate form.

Given an incomplete citation with sufficiently precise keywords, *refer* will search a bibliographic database for references containing these keywords anywhere in the title, author, journal, etc. The input file (or standard input) is copied to standard output, except for lines between .[and .] delimiters, which are assumed to contain keywords, and are replaced by information from the bibliographic database. The user may also search different databases, override particular fields, or add new fields. The reference data, from whatever source, are assigned to a set of *troff* strings. Macro packages such as *ms*(7) print the finished reference text from these strings. By default references are flagged by footnote numbers.

The following options are available:

−a*n* Reverse the first *n* author names (Jones, J. A. instead of J. A. Jones). If *n* is omitted all author names are reversed.

−b Bare mode: do not put any flags in text (neither numbers nor labels).

−c*keys*
Capitalize (with CAPS SMALL CAPS) the fields whose key-letters are in *keys*.

−e Instead of leaving the references where encountered, accumulate them until a sequence of the form

```
.[
$LIST$
.]
```

is encountered, and then write out all references collected so far. Collapse references to same source.

−f*n* Set the footnote number to *n* instead of the default of 1 (one). With labels rather than numbers, this flag is a no-op.

−k*x* Instead of numbering references, use labels as specified in a reference data line beginning *%x;* by default *x* is **L**.

−l*m,n*
Instead of numbering references, use labels made from the senior author's last name and the year of publication. Only the first *m* letters of the last name and the last *n* digits of the date are used. If either *m* or *n* is omitted the entire name or date respectively is used.

−n Do not search the default file /usr/dict/papers/Ind. If there is a REFER environment variable, the specified file will be searched instead of the default file; in this case the **−n** flag has no effect.

−p *bib*
Take the next argument *bib* as a file of references to be searched. The default file is searched last.

−s*keys*
Sort references by fields whose key-letters are in the *keys* string; permute reference

numbers in text accordingly. Implies −e. The key-letters in *keys* may be followed by a number to indicate how many such fields are used, with + taken as a very large number. The default is **AD** which sorts on the senior author and then date; to sort, for example, on all authors and then title use **-sA+T**.

−B*l.m*

Bibliography mode. Take a file composed of records separated by blank lines, and turn them into *troff* input. Label *l* will be turned into the macro *.m* with *l* defaulting to **%X** and *.m* defaulting to **.AP** (annotation paragraph).

−P Place punctuation marks .,:;?! after the reference signal, rather than before. (Periods and commas used to be done with strings.)

−S Produce references in the Natural or Social Science format.

To use your own references, put them in the format described below. They can be searched more rapidly by running *indxbib*(1) on them before using *refer;* failure to index results in a linear search. When *refer* is used with the *eqn, neqn* or *tbl* preprocessors *refer* should be first, to minimize the volume of data passed through pipes.

The *refer* preprocessor and associated programs expect input from a file of references composed of records separated by blank lines. A record is a set of lines (fields), each containing one kind of information. Fields start on a line beginning with a "%", followed by a key-letter, then a blank, and finally the contents of the field, and continue until the next line starting with "%". The output ordering and formatting of fields is controlled by the macros specified for *nroff/troff* (for footnotes and endnotes) or *roffbib* (for stand-alone bibliographies). For a list of the most common key-letters and their corresponding fields, see *addbib*(1). An example of a *refer* entry is given below.

EXAMPLE

```
%A      M. E. Lesk
%T      Some Applications of Inverted Indexes on the UNIX System
%B      UNIX Programmer's Manual
%V      2b
%I      Bell Laboratories
%C      Murray Hill, NJ
%D      1978
```

FILES

```
/usr/dict/papers    directory of default publication lists
/usr/lib/refer      directory of companion programs
```

SEE ALSO

addbib(1), sortbib(1), roffbib(1), indxbib(1), lookbib(1)

AUTHOR

Mike Lesk

BUGS

Blank spaces at the end of lines in bibliography fields will cause the records to sort and reverse incorrectly. Sorting large numbers of references causes a core dump.

NAME

reset — reset the teletype bits to a sensible state

SYNOPSIS

reset

DESCRIPTION

Reset sets the terminal to cooked mode, turns off cbreak and raw modes, turns on nl, and restores special characters that are undefined to their default values.

This is most useful after a program dies leaving a terminal in a funny state; you have to type "<LF>reset<LF>" to get it to work then to the shell, as <CR> often doesn't work; often none of this will echo.

It is a good idea to follow *reset* with *tset*(1)

SEE ALSO

stty(1), tset(1)

BUGS

Doesn't set tabs properly; it can't intuit personal choices for interrupt and line kill characters, so it leaves these set to the local system standards.

NAME

rev − reverse lines of a file

SYNOPSIS

rev [file] ...

DESCRIPTION

Rev copies the named files to the standard output, reversing the order of characters in every line. If no file is specified, the standard input is copied.

NAME

rlogin – remote login

SYNOPSIS

rlogin rhost [**–e***c*] [**–8**] [**–l** username]
rhost [**–e***c*] [**–8**] [**–l** username]

DESCRIPTION

Rlogin connects your terminal on the current local host system *lhost* to the remote host system *rhost.*

Each host has a file */etc/hosts.equiv* which contains a list of *rhost*'s with which it shares account names. (The host names must be the standard names as described in *rsh*(1C).) When you *rlogin* as the same user on an equivalent host, you don't need to give a password. Each user may also have a private equivalence list in a file .rhosts in his login directory. Each line in this file should contain a *rhost* and a *username* separated by a space, giving additional cases where logins without passwords are to be permitted. If the originating user is not equivalent to the remote user, then a login and password will be prompted for on the remote machine as in *login*(1). To avoid some security problems, the .rhosts file must be owned by either the remote user or root and may not be a symbolic link.

Your remote terminal type is the same as your local terminal type (as given in your environment TERM variable). All echoing takes place at the remote site, so that (except for delays) the rlogin is transparent. Flow control via ^S and ^Q and flushing of input and output on interrupts are handled properly. The optional argument **–8** allows an eight-bit data path, otherwise parity bits are stripped. A line of the form "~." disconnects from the remote host, where "~" is the escape character. Similarly, the line "~^Z" (where ^Z, control-Z, is the suspend character) will suspend the rlogin session. Substitution of the delayed-suspend character (normally ^Y) for the suspend character suspends the send portion of the rlogin, but allows output from the remote system. A different escape character may be specified by the **–e** option. There is no space separating this option flag and the argument character.

SEE ALSO

rsh(1C)

FILES

/usr/hosts/* for *rhost* version of the command

BUGS

More terminal characteristics should be propagated.

NAME

rm, rmdir − remove (unlink) files or directories

SYNOPSIS

rm [**−f**] [**−r**] [**−i**] [−] file ...

rmdir dir ...

DESCRIPTION

Rm removes the entries for one or more files from a directory. If an entry was the last link to the file, the file is destroyed. Removal of a file requires write permission in its directory, but neither read nor write permission on the file itself.

If a file has no write permission and the standard input is a terminal, its permissions are printed and a line is read from the standard input. If that line begins with 'y' the file is deleted, otherwise the file remains. No questions are asked and no errors are reported when the **−f** (force) option is given.

If a designated file is a directory, an error comment is printed unless the optional argument **−r** has been used. In that case, *rm* recursively deletes the entire contents of the specified directory, and the directory itself.

If the **−i** (interactive) option is in effect, *rm* asks whether to delete each file, and, under **−r**, whether to examine each directory.

The null option − indicates that all the arguments following it are to be treated as file names. This allows the specification of file names starting with a minus.

Rmdir removes entries for the named directories, which must be empty.

SEE ALSO

rm(1), unlink(2), rmdir(2)

NAME

rmail — handle remote mail received via uucp

SYNOPSIS

rmail user ...

DESCRIPTION

Rmail interprets incoming mail received via *uucp*(1C), collapsing "From" lines in the form generated by *binmail*(1) into a single line of the form "return-path!sender", and passing the processed mail on to *sendmail*(8).

Rmail is explicitly designed for use with *uucp* and *sendmail*.

SEE ALSO

binmail(1), uucp(1C), sendmail(8)

BUGS

Rmail should not reside in /bin.

NAME

rmdir, rm − remove (unlink) directories or files

SYNOPSIS

rmdir dir ...

rm [**−f**] [**−r**] [**−i**] [−] file ...

DESCRIPTION

Rmdir removes entries for the named directories, which must be empty.

Rm removes the entries for one or more files from a directory. If an entry was the last link to the file, the file is destroyed. Removal of a file requires write permission in its directory, but neither read nor write permission on the file itself.

If a file has no write permission and the standard input is a terminal, its permissions are printed and a line is read from the standard input. If that line begins with 'y' the file is deleted, otherwise the file remains. No questions are asked and no errors are reported when the **−f** (force) option is given.

If a designated file is a directory, an error comment is printed unless the optional argument **−r** has been used. In that case, *rm* recursively deletes the entire contents of the specified directory, and the directory itself.

If the **−i** (interactive) option is in effect, *rm* asks whether to delete each file, and, under **−r**, whether to examine each directory.

The null option − indicates that all the arguments following it are to be treated as file names. This allows the specification of file names starting with a minus.

SEE ALSO

rm(1), unlink(2), rmdir(2)

NAME

roffbib − run off bibliographic database

SYNOPSIS

roffbib [**−e**] [**−h**] [**−n**] [**−o**] [**−r**] [**−s**] [**−T***term*] [**−x**] [**−m** *mac*] [**−V**] [**−Q**] [file ...]

DESCRIPTION

Roffbib prints out all records in a bibliographic database, in bibliography format rather than as footnotes or endnotes. Generally it is used in conjunction with *sortbib*:

sortbib database | roffbib

Roffbib accepts most of the options understood by *nroff*(1), most importantly the **−T** flag to specify terminal type.

If abstracts or comments are entered following the %X field key, *roffbib* will format them into paragraphs for an annotated bibliography. Several %X fields may be given if several annotation paragraphs are desired. The **−x** flag will suppress the printing of these abstracts.

A user-defined set of macros may be specified after the **−m** option. There should be a space between the **−m** and the macro filename. This set of macros will replace the ones defined in /usr/lib/tmac/tmac.bib. The **−V** flag will send output to the Versatec; the **−Q** flag will queue output for the phototypesetter.

Four command-line registers control formatting style of the bibliography, much like the number registers of *ms*(7). The command-line argument **−r**N1 will number the references starting at one (1). The flag **−r**V2 will double space the bibliography, while **−r**V1 will double space references but single space annotation paragraphs. The line length can be changed from the default 6.5 inches to 6 inches with the **−r**L6i argument, and the page offset can be set from the default of 0 to one inch by specifying **−r**O1i (capital O, not zero). Note: with the **−V** and **−Q** flags the default page offset is already one inch.

FILES

/usr/lib/tmac/tmac.bib file of macros used by *nroff/troff*

SEE ALSO

refer(1), addbib(1), sortbib(1), indxbib(1), lookbib(1)

AUTHORS

Greg Shenaut, Bill Tuthill

BUGS

Users have to rewrite macros to create customized formats.

NAME

rsh − remote shell

SYNOPSIS

rsh host [**−l** username] [**−n**] command
host [**−l** username] [**−n**] command

DESCRIPTION

Rsh connects to the specified *host,* and executes the specified *command. Rsh* copies its standard input to the remote command, the standard output of the remote command to its standard output, and the standard error of the remote command to its standard error. Interrupt, quit and terminate signals are propagated to the remote command; *rsh* normally terminates when the remote command does.

The remote username used is the same as your local username, unless you specify a different remote name with the **−l** option. This remote name must be equivalent (in the sense of *rlogin*(1C)) to the originating account; no provision is made for specifying a password with a command.

If you omit *command,* then instead of executing a single command, you will be logged in on the remote host using *rlogin*(1C).

Shell metacharacters which are not quoted are interpreted on local machine, while quoted metacharacters are interpreted on the remote machine. Thus the command

rsh otherhost cat remotefile >> localfile

appends the remote file *remotefile* to the localfile *localfile,* while

rsh otherhost cat remotefile ">>" otherremotefile

appends *remotefile* to *otherremotefile.*

Host names are given in the file /etc/hosts. Each host has one standard name (the first name given in the file), which is rather long and unambiguous, and optionally one or more nicknames. The host names for local machines are also commands in the directory /usr/hosts; if you put this directory in your search path then the **rsh** can be omitted.

FILES

/etc/hosts
/usr/hosts/*

SEE ALSO

rlogin(1C)

BUGS

If you are using *csh*(1) and put a *rsh*(1C) in the background without redirecting its input away from the terminal, it will block even if no reads are posted by the remote command. If no input is desired you should redirect the input of *rsh* to /dev/null using the **−n** option.

You cannot run an interactive command (like *rogue*(6) or *vi*(1)); use *rlogin*(1C).

Stop signals stop the local *rsh* process only; this is arguably wrong, but currently hard to fix for reasons too complicated to explain here.

NAME

ruptime − show host status of local machines

SYNOPSIS

ruptime [−a] [−l] [−t] [−u]

DESCRIPTION

Ruptime gives a status line like *uptime* for each machine on the local network; these are formed from packets broadcast by each host on the network once a minute.

Machines for which no status report has been received for 5 minutes are shown as being down.

Users idle an hour or more are not counted unless the **−a** flag is given.

Normally, the listing is sorted by host name. The **−l** , **−t** , and **−u** flags specify sorting by load average, uptime, and number of users, respectively.

FILES

/usr/spool/rwho/whod.* data files

SEE ALSO

rwho(1C)

NAME

rwho − who's logged in on local machines

SYNOPSIS

rwho [−a]

DESCRIPTION

The *rwho* command produces output similar to *who,* but for all machines on the local network. If no report has been received from a machine for 5 minutes then *rwho* assumes the machine is down, and does not report users last known to be logged into that machine.

If a users hasn't typed to the system for a minute or more, then *rwho* reports this idle time. If a user hasn't typed to the system for an hour or more, then the user will be omitted from the output of *rwho* unless the **−a** flag is given.

FILES

/usr/spool/rwho/whod.* information about other machines

SEE ALSO

ruptime(1C), rwhod(8C)

BUGS

This is unwieldy when the number of machines on the local net is large.

NAME

script − make typescript of terminal session

SYNOPSIS

script [**−a**] [file]

DESCRIPTION

Script makes a typescript of everything printed on your terminal. The typescript is written to *file*, or appended to *file* if the **−a** option is given. It can be sent to the line printer later with *lpr*. If no file name is given, the typescript is saved in the file *typescript*.

The script ends when the forked shell exits.

This program is useful when using a crt and a hard-copy record of the dialog is desired, as for a student handing in a program that was developed on a crt when hard-copy terminals are in short supply.

BUGS

Script places **everything** in the log file. This is not what the naive user expects.

NAME

sed − stream editor

SYNOPSIS

sed [**−n**] [**−e** script] [**−f** sfile] [file] ...

DESCRIPTION

Sed copies the named *files* (standard input default) to the standard output, edited according to a script of commands. The **−f** option causes the script to be taken from file *sfile*; these options accumulate. If there is just one **−e** option and no **−f**'s, the flag **−e** may be omitted. The **−n** option suppresses the default output.

A script consists of editing commands, one per line, of the following form:

[address [, address]] function [arguments]

In normal operation *sed* cyclically copies a line of input into a *pattern space* (unless there is something left after a 'D' command), applies in sequence all commands whose *addresses* select that pattern space, and at the end of the script copies the pattern space to the standard output (except under **−n**) and deletes the pattern space.

An *address* is either a decimal number that counts input lines cumulatively across files, a '$' that addresses the last line of input, or a context address, '/regular expression/', in the style of *ed*(1) modified thus:

The escape sequence '\n' matches a newline embedded in the pattern space.

A command line with no addresses selects every pattern space.

A command line with one address selects each pattern space that matches the address.

A command line with two addresses selects the inclusive range from the first pattern space that matches the first address through the next pattern space that matches the second. (If the second address is a number less than or equal to the line number first selected, only one line is selected.) Thereafter the process is repeated, looking again for the first address.

Editing commands can be applied only to non-selected pattern spaces by use of the negation function '!' (below).

In the following list of functions the maximum number of permissible addresses for each function is indicated in parentheses.

An argument denoted *text* consists of one or more lines, all but the last of which end with '\' to hide the newline. Backslashes in text are treated like backslashes in the replacement string of an 's' command, and may be used to protect initial blanks and tabs against the stripping that is done on every script line.

An argument denoted *rfile* or *wfile* must terminate the command line and must be preceded by exactly one blank. Each *wfile* is created before processing begins. There can be at most 10 distinct *wfile* arguments.

(1) a\
text

Append. Place *text* on the output before reading the next input line.

(2) b *label*

Branch to the ':' command bearing the *label*. If *label* is empty, branch to the end of the script.

(2) c\
text

Change. Delete the pattern space. With 0 or 1 address or at the end of a 2-address range, place *text* on the output. Start the next cycle.

(2) d Delete the pattern space. Start the next cycle.

(2) D Delete the initial segment of the pattern space through the first newline. Start the next cycle.

(2) g Replace the contents of the pattern space by the contents of the hold space.

(2) G Append the contents of the hold space to the pattern space.

(2) h Replace the contents of the hold space by the contents of the pattern space.

(2) H Append the contents of the pattern space to the hold space.

(1) i\
text

Insert. Place *text* on the standard output.

(2) n Copy the pattern space to the standard output. Replace the pattern space with the next line of input.

(2) N Append the next line of input to the pattern space with an embedded newline. (The current line number changes.)

(2) p Print. Copy the pattern space to the standard output.

(2) P Copy the initial segment of the pattern space through the first newline to the standard output.

(1) q Quit. Branch to the end of the script. Do not start a new cycle.

(2) r *rfile*

Read the contents of *rfile*. Place them on the output before reading the next input line.

(2) s/*regular expression*/*replacement*/*flags*

Substitute the *replacement* string for instances of the *regular expression* in the pattern space. Any character may be used instead of '/'. For a fuller description see *ed*(1). *Flags* is zero or more of

g Global. Substitute for all nonoverlapping instances of the *regular expression* rather than just the first one.

p Print the pattern space if a replacement was made.

w *wfile* Write. Append the pattern space to *wfile* if a replacement was made.

(2) t *label*

Test. Branch to the ':' command bearing the *label* if any substitutions have been made since the most recent reading of an input line or execution of a 't'. If *label* is empty, branch to the end of the script.

(2) w *wfile*

Write. Append the pattern space to *wfile*.

(2) x Exchange the contents of the pattern and hold spaces.

(2) y/*string1*/*string2*/

Transform. Replace all occurrences of characters in *string1* with the corresponding character in *string2*. The lengths of *string1* and *string2* must be equal.

(2) ! *function*

Don't. Apply the *function* (or group, if *function* is '{') only to lines *not* selected by the address(es).

(0) : *label*

This command does nothing; it bears a *label* for 'b' and 't' commands to branch to.

(1) = Place the current line number on the standard output as a line.

(2) { Execute the following commands through a matching '}' only when the pattern space is selected.

(0) An empty command is ignored.

SEE ALSO

ed(1), grep(1), awk(1), lex(1)

NAME

sendbug — mail a system bug report to 4bsd-bugs

SYNOPSIS

sendbug [address]

DESCRIPTION

Bug reports sent to '4bsd-bugs@BERKELEY' are intercepted by a program which expects bug reports to conform to a standard format. *Sendbug* is a shell script to help the user compose and mail bug reports in the correct format. *Sendbug* works by invoking *vi*(1) on a temporary copy of the bug report format outline. The user must fill in the appropriate fields and exit *vi*. *Sendbug* then mails the completed report to '4bsd-bugs@BERKELEY' or the address specified on the command line.

FILES

/usr/ucb/bugformat contains the bug report outline

SEE ALSO

vi(1), sendmail(8)

NAME

sh, for, case, if, while, :, ., break, continue, cd, eval, exec, exit, export, login, read, readonly, set, shift, times, trap, umask, wait — command language

SYNOPSIS

sh [**−ceiknrstuvx**] [arg] ...

DESCRIPTION

Sh is a command programming language that executes commands read from a terminal or a file. See **invocation** for the meaning of arguments to the shell.

Commands.

A *simple-command* is a sequence of non blank *words* separated by blanks (a blank is a **tab** or a **space**). The first word specifies the name of the command to be executed. Except as specified below the remaining words are passed as arguments to the invoked command. The command name is passed as argument 0 (see *execve*(2)). The *value* of a simple-command is its exit status if it terminates normally or 200+*status* if it terminates abnormally (see *sigvec*(2) for a list of status values).

A *pipeline* is a sequence of one or more *commands* separated by **|**. The standard output of each command but the last is connected by a *pipe*(2) to the standard input of the next command. Each command is run as a separate process; the shell waits for the last command to terminate.

A *list* is a sequence of one or more *pipelines* separated by **;**, **&**, **&&** or **||** and optionally terminated by **;** or **&**. **;** and **&** have equal precedence which is lower than that of **&&** and **||**, **&&** and **||** also have equal precedence. A semicolon causes sequential execution; an ampersand causes the preceding *pipeline* to be executed without waiting for it to finish. The symbol **&&** (**||**) causes the *list* following to be executed only if the preceding *pipeline* returns a zero (non zero) value. Newlines may appear in a *list,* instead of semicolons, to delimit commands.

A *command* is either a simple-command or one of the following. The value returned by a command is that of the last simple-command executed in the command.

for *name* [**in** *word ...*] **do** *list* **done**
Each time a **for** command is executed *name* is set to the next word in the **for** word list If **in** *word ...* is omitted, **in "$@"** is assumed. Execution ends when there are no more words in the list.

case *word* **in** [*pattern* [**|** *pattern*] ...) *list* **;;**] ... **esac**
A **case** command executes the *list* associated with the first pattern that matches *word.* The form of the patterns is the same as that used for file name generation.

if *list* **then** *list* [**elif** *list* **then** *list*] ... [**else** *list*] **fi**
The *list* following **if** is executed and if it returns zero the *list* following **then** is executed. Otherwise, the *list* following **elif** is executed and if its value is zero the *list* following **then** is executed. Failing that the **else** *list* is executed.

while *list* [**do** *list*] **done**
A **while** command repeatedly executes the **while** *list* and if its value is zero executes the **do** *list;* otherwise the loop terminates. The value returned by a **while** command is that of the last executed command in the **do** *list.* **until** may be used in place of **while** to negate the loop termination test.

(*list* **)** Execute *list* in a subshell.

{ *list* **}** *list* is simply executed.

The following words are only recognized as the first word of a command and when not quoted.

if then else elif fi case in esac for while until do done { }

Command substitution.
The standard output from a command enclosed in a pair of back quotes (`` ` ``) may be used as part or all of a word; trailing newlines are removed.

Parameter substitution.
The character **$** is used to introduce substitutable parameters. Positional parameters may be assigned values by **set**. Variables may be set by writing

name=*value* [*name*=*value*] ...

$ {*parameter*}
A *parameter* is a sequence of letters, digits or underscores (a *name*), a digit, or any of the characters * **@** **#** **?** **-** **$** **!**. The value, if any, of the parameter is substituted. The braces are required only when *parameter* is followed by a letter, digit, or underscore that is not to be interpreted as part of its name. If *parameter* is a digit, it is a positional parameter. If *parameter* is * or **@** then all the positional parameters, starting with **$1**, are substituted separated by spaces. **$0** is set from argument zero when the shell is invoked.

$ {*parameter* − *word*}
If *parameter* is set, substitute its value; otherwise substitute *word.*

$ {*parameter*= *word*}
If *parameter* is not set, set it to *word;* the value of the parameter is then substituted. Positional parameters may not be assigned to in this way.

$ {*parameter* ? *word*}
If *parameter* is set, substitute its value; otherwise, print *word* and exit from the shell. If *word* is omitted, a standard message is printed.

$ {*parameter*+*word*}
If *parameter* is set, substitute *word;* otherwise substitute nothing.

In the above *word* is not evaluated unless it is to be used as the substituted string. (So that, for example, echo ${d−'pwd'} will only execute *pwd* if *d* is unset.)

The following *parameters* are automatically set by the shell.

#	The number of positional parameters in decimal.
−	Options supplied to the shell on invocation or by **set**.
?	The value returned by the last executed command in decimal.
$	The process number of this shell.
!	The process number of the last background command invoked.

The following *parameters* are used but not set by the shell.

HOME	The default argument (home directory) for the **cd** command.
PATH	The search path for commands (see **execution**).
MAIL	If this variable is set to the name of a mail file, the shell informs the user of the arrival of mail in the specified file.
PS1	Primary prompt string, by default '**$** '.
PS2	Secondary prompt string, by default '> '.
IFS	Internal field separators, normally **space**, **tab**, and **newline**.

Blank interpretation.
After parameter and command substitution, any results of substitution are scanned for internal field separator characters (those found in **$IFS**) and split into distinct arguments where such characters are found. Explicit null arguments ("" or '') are retained. Implicit null arguments (those resulting from *parameters* that have no values) are removed.

File name generation.
Following substitution, each command word is scanned for the characters *, ? and [. If one of these characters appears, the word is regarded as a pattern. The word is replaced with alphabetically sorted file names that match the pattern. If no file name is found that matches the pattern, the word is left unchanged. The character . at the start of a file name or immediately following a /, and the character /, must be matched explicitly.

* Matches any string, including the null string.
? Matches any single character.
[...] Matches any one of the characters enclosed. A pair of characters separated by − matches any character lexically between the pair.

Quoting.
The following characters have a special meaning to the shell and cause termination of a word unless quoted.

; & ( ) | < > newline space tab

A character may be *quoted* by preceding it with a \. **\newline** is ignored. All characters enclosed between a pair of quote marks (''), except a single quote, are quoted. Inside double quotes ("") parameter and command substitution occurs and \ quotes the characters \ ' " and $.

"$*" is equivalent to **"$1 $2 ..."** whereas
"$@" is equivalent to **"$1" "$2" ...** .

Prompting.
When used interactively, the shell prompts with the value of PS1 before reading a command. If at any time a newline is typed and further input is needed to complete a command, the secondary prompt (**$PS2**) is issued.

Input output.
Before a command is executed its input and output may be redirected using a special notation interpreted by the shell. The following may appear anywhere in a simple-command or may precede or follow a *command* and are not passed on to the invoked command. Substitution occurs before *word* or *digit* is used.

< *word* Use file *word* as standard input (file descriptor 0).

> *word* Use file *word* as standard output (file descriptor 1). If the file does not exist, it is created; otherwise it is truncated to zero length.

>> *word*
Use file *word* as standard output. If the file exists, output is appended (by seeking to the end); otherwise the file is created.

<< *word*
The shell input is read up to a line the same as *word*, or end of file. The resulting document becomes the standard input. If any character of *word* is quoted, no interpretation is placed upon the characters of the document; otherwise, parameter and command substitution occurs, **\newline** is ignored, and \ is used to quote the characters \ $ ' and the first character of *word.*

<& *digit*
The standard input is duplicated from file descriptor *digit;* see *dup*(2). Similarly for the standard output using >.

<& − The standard input is closed. Similarly for the standard output using >.

If one of the above is preceded by a digit, the file descriptor created is that specified by the digit (instead of the default 0 or 1). For example,

... 2>&1

creates file descriptor 2 to be a duplicate of file descriptor 1.

If a command is followed by & then the default standard input for the command is the empty file (/dev/null). Otherwise, the environment for the execution of a command contains the file descriptors of the invoking shell as modified by input output specifications.

Environment.

The environment is a list of name-value pairs that is passed to an executed program in the same way as a normal argument list; see *execve*(2) and *environ*(7). The shell interacts with the environment in several ways. On invocation, the shell scans the environment and creates a *parameter* for each name found, giving it the corresponding value. Executed commands inherit the same environment. If the user modifies the values of these *parameters* or creates new ones, none of these affects the environment unless the **export** command is used to bind the shell's *parameter* to the environment. The environment seen by any executed command is thus composed of any unmodified name-value pairs originally inherited by the shell, plus any modifications or additions, all of which must be noted in **export** commands.

The environment for any *simple-command* may be augmented by prefixing it with one or more assignments to *parameters*. Thus these two lines are equivalent

```
TERM=450 cmd args
(export TERM; TERM=450; cmd args)
```

If the **-k** flag is set, *all* keyword arguments are placed in the environment, even if the occur after the command name. The following prints 'a=b c' and 'c':

```
echo a=b c
set -k
echo a=b c
```

Signals.

The INTERRUPT and QUIT signals for an invoked command are ignored if the command is followed by &; otherwise signals have the values inherited by the shell from its parent. (But see also **trap**.)

Execution.

Each time a command is executed the above substitutions are carried out. Except for the 'special commands' listed below a new process is created and an attempt is made to execute the command via an *execve*(2).

The shell parameter **$PATH** defines the search path for the directory containing the command. Each alternative directory name is separated by a colon (:). The default path is **:/bin:/usr/bin**. If the command name contains a /, the search path is not used. Otherwise, each directory in the path is searched for an executable file. If the file has execute permission but is not an *a.out* file, it is assumed to be a file containing shell commands. A subshell (i.e., a separate process) is spawned to read it. A parenthesized command is also executed in a subshell.

Special commands.

The following commands are executed in the shell process and except where specified no input output redirection is permitted for such commands.

: No effect; the command does nothing.

. *file* Read and execute commands from *file* and return. The search path **$PATH** is used to find the directory containing *file*.

break [*n*]
Exit from the enclosing **for** or **while** loop, if any. If *n* is specified, break *n* levels.

continue [*n*]
Resume the next iteration of the enclosing **for** or **while** loop. If *n* is specified, resume

at the *n*-th enclosing loop.

cd [*arg*]
Change the current directory to *arg*. The shell parameter **$HOME** is the default *arg*.

eval [*arg* ...]
The arguments are read as input to the shell and the resulting command(s) executed.

exec [*arg* ...]
The command specified by the arguments is executed in place of this shell without creating a new process. Input output arguments may appear and if no other arguments are given cause the shell input output to be modified.

exit [*n*]
Causes a non interactive shell to exit with the exit status specified by *n*. If *n* is omitted, the exit status is that of the last command executed. (An end of file will also exit from the shell.)

export [*name* ...]
The given names are marked for automatic export to the *environment* of subsequently-executed commands. If no arguments are given, a list of exportable names is printed.

login [*arg* ...]
Equivalent to 'exec login arg ...'.

read *name* ...
One line is read from the standard input; successive words of the input are assigned to the variables *name* in order, with leftover words to the last variable. The return code is 0 unless the end-of-file is encountered.

readonly [*name* ...]
The given names are marked readonly and the values of the these names may not be changed by subsequent assignment. If no arguments are given, a list of all readonly names is printed.

set [**−eknptuvx** [*arg* ...]]

- **−e** If non interactive, exit immediately if a command fails.
- **−k** All keyword arguments are placed in the environment for a command, not just those that precede the command name.
- **−n** Read commands but do not execute them.
- **−t** Exit after reading and executing one command.
- **−u** Treat unset variables as an error when substituting.
- **−v** Print shell input lines as they are read.
- **−x** Print commands and their arguments as they are executed.
- **−** Turn off the **−x** and **−v** options.

These flags can also be used upon invocation of the shell. The current set of flags may be found in **$−**.

Remaining arguments are positional parameters and are assigned, in order, to **$1**, **$2**, etc. If no arguments are given, the values of all names are printed.

shift The positional parameters from **$2**... are renamed **$1**...

times Print the accumulated user and system times for processes run from the shell.

trap [*arg*] [*n*] ...
Arg is a command to be read and executed when the shell receives signal(s) *n*. (Note that *arg* is scanned once when the trap is set and once when the trap is taken.) Trap commands are executed in order of signal number. If *arg* is absent, all trap(s) *n* are reset to their original values. If *arg* is the null string, this signal is ignored by the shell and by invoked commands. If *n* is 0, the command *arg* is executed on exit from the shell, otherwise upon receipt of signal *n* as numbered in *sigvec*(2). *Trap* with no arguments prints a list of commands associated with each signal number.

umask [*nnn*]
The user file creation mask is set to the octal value *nnn* (see *umask*(2)). If *nnn* is omitted, the current value of the mask is printed.

wait [*n*]
Wait for the specified process and report its termination status. If *n* is not given, all currently active child processes are waited for. The return code from this command is that of the process waited for.

Invocation.
If the first character of argument zero is −, commands are read from **$HOME/.profile**, if such a file exists. Commands are then read as described below. The following flags are interpreted by the shell when it is invoked.

−**c** *string* If the −**c** flag is present, commands are read from *string*.

−**s** If the −**s** flag is present or if no arguments remain then commands are read from the standard input. Shell output is written to file descriptor 2.

−**i** If the −**i** flag is present or if the shell input and output are attached to a terminal (as told by *gtty*) then this shell is *interactive*. In this case the terminate signal SIGTERM (see *sigvec*(2)) is ignored (so that 'kill 0' does not kill an interactive shell) and the interrupt signal SIGINT is caught and ignored (so that **wait** is interruptible). In all cases SIGQUIT is ignored by the shell.

The remaining flags and arguments are described under the **set** command.

FILES
$HOME/.profile
/tmp/sh*
/dev/null

SEE ALSO
csh(1), test(1), execve(2), environ(7)

DIAGNOSTICS
Errors detected by the shell, such as syntax errors cause the shell to return a non zero exit status. If the shell is being used non interactively then execution of the shell file is abandoned. Otherwise, the shell returns the exit status of the last command executed (see also **exit**).

BUGS
If << is used to provide standard input to an asynchronous process invoked by &, the shell gets mixed up about naming the input document. A garbage file /tmp/sh* is created, and the shell complains about not being able to find the file by another name.

NAME

size – size of an object file

SYNOPSIS

size [object ...]

DESCRIPTION

Size prints the (decimal) number of bytes required by the text, data, and bss portions, and their sum in hex and decimal, of each object-file argument. If no file is specified, **a.out** is used.

SEE ALSO

a.out(5)

NAME

sleep — suspend execution for an interval

SYNOPSIS

sleep time

DESCRIPTION

Sleep suspends execution for *time* seconds. It is used to execute a command after a certain amount of time as in:

```
(sleep 105; command)&
```

or to execute a command every so often, as in:

```
while true
do
        command
        sleep 37
done
```

SEE ALSO

setitimer(2), alarm(3C), sleep(3)

BUGS

Time must be less than 2,147,483,647 seconds.

NAME

soelim − eliminate .so's from nroff input

SYNOPSIS

soelim [file ...]

DESCRIPTION

Soelim reads the specified files or the standard input and performs the textual inclusion implied by the *nroff* directives of the form

.so somefile

when they appear at the beginning of input lines. This is useful since programs such as *tbl* do not normally do this; it allows the placement of individual tables in separate files to be run as a part of a large document.

An argument consisting of a single minus (−) is taken to be a file name corresponding to the standard input.

Note that inclusion can be suppressed by using ‘'’ instead of ‘.’, i.e.

'so /usr/lib/tmac.s

A sample usage of *soelim* would be

soelim exum?.n | tbl | nroff −ms | col | lpr

SEE ALSO

colcrt(1), more(1)

AUTHOR

William Joy

BUGS

The format of the source commands must involve no strangeness − exactly one blank must precede and no blanks follow the file name.

1

NAME

sort − sort or merge files

SYNOPSIS

sort [−**mubdfinrt***x*] [+*pos1* [−*pos2*]] ... [−**o** name] [−**T** directory] [name] ...

DESCRIPTION

Sort sorts lines of all the named files together and writes the result on the standard output. The name '−' means the standard input. If no input files are named, the standard input is sorted.

The default sort key is an entire line. Default ordering is lexicographic by bytes in machine collating sequence. The ordering is affected globally by the following options, one or more of which may appear.

b Ignore leading blanks (spaces and tabs) in field comparisons.

d 'Dictionary' order: only letters, digits and blanks are significant in comparisons.

f Fold upper case letters onto lower case.

i Ignore characters outside the ASCII range 040-0176 in nonnumeric comparisons.

n An initial numeric string, consisting of optional blanks, optional minus sign, and zero or more digits with optional decimal point, is sorted by arithmetic value. Option **n** implies option **b**.

r Reverse the sense of comparisons.

t*x* 'Tab character' separating fields is *x*.

The notation +*pos1* −*pos2* restricts a sort key to a field beginning at *pos1* and ending just before *pos2*. *Pos1* and *pos2* each have the form *m.n*, optionally followed by one or more of the flags **bdfinr**, where *m* tells a number of fields to skip from the beginning of the line and *n* tells a number of characters to skip further. If any flags are present they override all the global ordering options for this key. If the **b** option is in effect *n* is counted from the first nonblank in the field; **b** is attached independently to *pos2*. A missing *.n* means .0; a missing −*pos2* means the end of the line. Under the −**t***x* option, fields are strings separated by *x*; otherwise fields are nonempty nonblank strings separated by blanks.

When there are multiple sort keys, later keys are compared only after all earlier keys compare equal. Lines that otherwise compare equal are ordered with all bytes significant.

These option arguments are also understood:

c Check that the input file is sorted according to the ordering rules; give no output unless the file is out of sort.

m Merge only, the input files are already sorted.

o The next argument is the name of an output file to use instead of the standard output. This file may be the same as one of the inputs.

T The next argument is the name of a directory in which temporary files should be made.

u Suppress all but one in each set of equal lines. Ignored bytes and bytes outside keys do not participate in this comparison.

EXAMPLES

Print in alphabetical order all the unique spellings in a list of words. Capitalized words differ from uncapitalized.

```
sort −u +0f +0 list
```

Print the password file (*passwd*(5)) sorted by user id number (the 3rd colon-separated field).

```
sort -t: +2n /etc/passwd
```

Print the first instance of each month in an already sorted file of (month day) entries. The options **-um** with just one input file make the choice of a unique representative from a set of equal lines predictable.

```
sort -um +0 -1 dates
```

FILES

/usr/tmp/stm*, /tmp/* first and second tries for temporary files

SEE ALSO

uniq(1), comm(1), rev(1), join(1)

DIAGNOSTICS

Comments and exits with nonzero status for various trouble conditions and for disorder discovered under option **-c**.

BUGS

Very long lines are silently truncated.

NAME

sortbib − sort bibliographic database

SYNOPSIS

sortbib [−sKEYS] database ...

DESCRIPTION

Sortbib sorts files of records containing *refer* key-letters by user-specified keys. Records may be separated by blank lines, or by .[and .] delimiters, but the two styles may not be mixed together. This program reads through each *database* and pulls out key fields, which are sorted separately. The sorted key fields contain the file pointer, byte offset, and length of corresponding records. These records are delivered using disk seeks and reads, so *sortbib* may not be used in a pipeline to read standard input.

By default, *sortbib* alphabetizes by the first %A and the %D fields, which contain the senior author and date. The −s option is used to specify new *KEYS*. For instance, −sATD will sort by author, title, and date, while −sA+D will sort by all authors, and date. Sort keys past the fourth are not meaningful. No more than 16 databases may be sorted together at one time. Records longer than 4096 characters will be truncated.

Sortbib sorts on the last word on the %A line, which is assumed to be the author's last name. A word in the final position, such as "jr." or "ed.", will be ignored if the name beforehand ends with a comma. Authors with two-word last names or unusual constructions can be sorted correctly by using the *nroff* convention "\0" in place of a blank. A %Q field is considered to be the same as %A, except sorting begins with the first, not the last, word. *Sortbib* sorts on the last word of the %D line, usually the year. It also ignores leading articles (like "A" or "The") when sorting by titles in the %T or %J fields; it will ignore articles of any modern European language. If a sort-significant field is absent from a record, *sortbib* places that record before other records containing that field.

SEE ALSO

refer(1), addbib(1), roffbib(1), indxbib(1), lookbib(1)

AUTHORS

Greg Shenaut, Bill Tuthill

BUGS

Records with missing author fields should probably be sorted by title.

NAME

spell, spellin, spellout − find spelling errors

SYNOPSIS

spell [**−v**] [**−b**] [**−x**] [**−d** hlist] [**−s** hstop] [**−h** spellhist] [file] ...

spellin [list]

spellout [**−d**] list

DESCRIPTION

Spell collects words from the named documents, and looks them up in a spelling list. Words that neither occur among nor are derivable (by applying certain inflections, prefixes or suffixes) from words in the spelling list are printed on the standard output. If no files are named, words are collected from the standard input.

Spell ignores most *troff, tbl* and *eqn*(1) constructions.

Under the **−v** option, all words not literally in the spelling list are printed, and plausible derivations from spelling list words are indicated.

Under the **−b** option, British spelling is checked. Besides preferring *centre, colour, speciality, travelled,* etc., this option insists upon *-ise* in words like *standardise,* Fowler and the OED to the contrary notwithstanding.

Under the **−x** option, every plausible stem is printed with '**=**' for each word.

The spelling list is based on many sources. While it is more haphazard than an ordinary dictionary, it is also more effective with proper names and popular technical words. Coverage of the specialized vocabularies of biology, medicine and chemistry is light.

The auxiliary files used for the spelling list, stop list, and history file may be specified by arguments following the **−d**, **−s**, and **−h** options. The default files are indicated below. Copies of all output may be accumulated in the history file. The stop list filters out misspellings (e.g. thier=thy−y+ier) that would otherwise pass.

Two routines help maintain the hash lists used by *spell.* Both expect a set of words, one per line, from the standard input. *Spellin* combines the words from the standard input and the preexisting *list* file and places a new list on the standard output. If no *list* file is specified, the new list is created from scratch. *Spellout* looks up each word from the standard input and prints on the standard output those that are missing from (or present on, with option **−d**) the hashed *list* file. For example, to verify that *hookey* is not on the default spelling list, add it to your own private list, and then use it with *spell*,

```
echo hookey | spellout /usr/dict/hlista
echo hookey | spellin /usr/dict/hlista > myhlist
spell −d myhlist huckfinn
```

FILES

/usr/dict/hlist[ab]	hashed spelling lists, American & British, default for **−d**
/usr/dict/hstop	hashed stop list, default for **−s**
/dev/null	history file, default for **−h**
/tmp/spell.$$*	temporary files
/usr/lib/spell	

SEE ALSO

deroff(1), sort(1), tee(1), sed(1)

BUGS

The spelling list's coverage is uneven; new installations will probably wish to monitor the output for several months to gather local additions.
British spelling was done by an American.

NAME

spline − interpolate smooth curve

SYNOPSIS

spline [option] ...

DESCRIPTION

Spline takes pairs of numbers from the standard input as abcissas and ordinates of a function. It produces a similar set, which is approximately equally spaced and includes the input set, on the standard output. The cubic spline output (R. W. Hamming, *Numerical Methods for Scientists and Engineers,* 2nd ed., 349ff) has two continuous derivatives, and sufficiently many points to look smooth when plotted, for example by *graph*(1G).

The following options are recognized, each as a separate argument.

−a Supply abscissas automatically (they are missing from the input); spacing is given by the next argument, or is assumed to be 1 if next argument is not a number.

−k The constant k used in the boundary value computation

$$y_0'' = ky_1'', \quad y_n'' = ky_{n-1}''$$

is set by the next argument. By default $k = 0$.

−n Space output points so that approximately n intervals occur between the lower and upper x limits. (Default $n = 100$.)

−p Make output periodic, i.e. match derivatives at ends. First and last input values should normally agree.

−x Next 1 (or 2) arguments are lower (and upper) x limits. Normally these limits are calculated from the data. Automatic abcissas start at lower limit (default 0).

SEE ALSO

graph(1G), plot(1G)

DIAGNOSTICS

When data is not strictly monotone in x, *spline* reproduces the input without interpolating extra points.

BUGS

A limit of 1000 input points is enforced silently.

NAME

split − split a file into pieces

SYNOPSIS

split [−*n*] [file [name]]

DESCRIPTION

Split reads *file* and writes it in *n*-line pieces (default 1000), as many as necessary, onto a set of output files. The name of the first output file is *name* with **aa** appended, and so on lexicographically. If no output name is given, **x** is default.

If no input file is given, or if − is given in its stead, then the standard input file is used.

NAME

strings − find the printable strings in a object, or other binary, file

SYNOPSIS

strings [−] [−**o**] [−*number*] file ...

DESCRIPTION

Strings looks for ascii strings in a binary file. A string is any sequence of 4 or more printing characters ending with a newline or a null. Unless the − flag is given, *strings* only looks in the initialized data space of object files. If the −**o** flag is given, then each string is preceded by its offset in the file (in octal). If the −*number* flag is given then number is used as the minimum string length rather than 4.

Strings is useful for identifying random object files and many other things.

SEE ALSO

od(1)

BUGS

The algorithm for identifying strings is extremely primitive

NAME

strip -- remove symbols and relocation bits

SYNOPSIS

strip name ...

DESCRIPTION

Strip removes the symbol table and relocation bits ordinarily attached to the output of the assembler and loader. This is useful to save space after a program has been debugged.

The effect of *strip* is the same as use of the **-s** option of *ld*.

FILES

/tmp/stm? temporary file

SEE ALSO

ld(1)

NAME

struct — structure Fortran programs

SYNOPSIS

struct [option] ... file

DESCRIPTION

Struct translates the Fortran program specified by *file* (standard input default) into a Ratfor program. Wherever possible, Ratfor control constructs replace the original Fortran. Statement numbers appear only where still necessary. Cosmetic changes are made, including changing Hollerith strings into quoted strings and relational operators into symbols (.e.g. ".GT." into ">"). The output is appropriately indented.

The following options may occur in any order.

−s Input is accepted in standard format, i.e. comments are specified by a c, C, or * in column 1, and continuation lines are specified by a nonzero, nonblank character in column 6. Normally input is in the form accepted by *f77*(1)

−i Do not turn computed goto statements into switches. (Ratfor does not turn switches back into computed goto statements.)

−a Turn sequences of else ifs into a non-Ratfor switch of the form

```
switch
        {   case pred1: code
            case pred2: code
            case pred3: code
            default: code
        }
```

The case predicates are tested in order; the code appropriate to only one case is executed. This generalized form of switch statement does not occur in Ratfor.

−b Generate goto's instead of multilevel break statements.

−n Generate goto's instead of multilevel next statements.

−t*n* Make the nonzero integer *n* the lowest valued label in the output program (default 10).

−c*n* Increment successive labels in the output program by the nonzero integer *n* (default 1).

−e*n* If *n* is 0 (default), place code within a loop only if it can lead to an iteration of the loop. If *n* is nonzero, admit a small code segments to a loop if otherwise the loop would have exits to several places including the segment, and the segment can be reached only from the loop. 'Small' is close to, but not equal to, the number of statements in the code segment. Values of n under 10 are suggested.

FILES

/tmp/struct*
/usr/lib/struct/*

SEE ALSO

f77(1)

BUGS

Struct knows Fortran 66 syntax, but not full Fortran 77.
If an input Fortran program contains identifiers which are reserved words in Ratfor, the structured version of the program will not be a valid Ratfor program.
The labels generated cannot go above 32767.
If you get a goto without a target, try **−e** .

NAME

stty − set terminal options

SYNOPSIS

stty [option ...]

DESCRIPTION

Stty sets certain I/O options on the current output terminal, placing its output on the diagnostic output. With no argument, it reports the speed of the terminal and the settings of the options which are different from their defaults. With the argument "all", all normally used option settings are reported. With the argument "everything", everything *stty* knows about is printed. The option strings are selected from the following set:

even allow even parity input
−even disallow even parity input
odd allow odd parity input
−odd disallow odd parity input
raw raw mode input (no input processing (erase, kill, interrupt, ...); parity bit passed back)
−raw negate raw mode
cooked same as '−raw'
cbreak make each character available to *read*(2) as received; no erase and kill processing, but all other processing (interrupt, suspend, ...) is performed
−cbreak make characters available to *read* only when newline is received
−nl allow carriage return for new-line, and output CR-LF for carriage return or new-line
nl accept only new-line to end lines
echo echo back every character typed
−echo do not echo characters
lcase map upper case to lower case
−lcase do not map case
tandem enable flow control, so that the system sends out the stop character when its internal queue is in danger of overflowing on input, and sends the start character when it is ready to accept further input
−tandem disable flow control
−tabs replace tabs by spaces when printing
tabs preserve tabs
ek set erase and kill characters to # and @

For the following commands which take a character argument *c*, you may also specify *c* as the "u" or "undef", to set the value to be undefined. A value of "^x", a 2 character sequence, is also interpreted as a control character, with "^?" representing delete.

erase *c* set erase character to *c* (default '#', but often reset to ^H.)
kill *c* set kill character to *c* (default '@', but often reset to ^U.)
intr *c* set interrupt character to *c* (default DEL or ^? (delete), but often reset to ^C.)
quit *c* set quit character to *c* (default control \.)
start *c* set start character to *c* (default control Q.)
stop *c* set stop character to *c* (default control S.)
eof *c* set end of file character to *c* (default control D.)
brk *c* set break character to *c* (default undefined.) This character is an extra wakeup causing character.
cr0 cr1 cr2 cr3
select style of delay for carriage return (see *ioctl*(2))
nl0 nl1 nl2 nl3
select style of delay for linefeed
tab0 tab1 tab2 tab3

select style of delay for tab
ff0 ff1 select style of delay for form feed
bs0 bs1 select style of delay for backspace

tty33 set all modes suitable for the Teletype Corporation Model 33 terminal.
tty37 set all modes suitable for the Teletype Corporation Model 37 terminal.
vt05 set all modes suitable for Digital Equipment Corp. VT05 terminal
dec set all modes suitable for Digital Equipment Corp. operating systems users; (erase, kill, and interrupt characters to ^?, ^U, and ^C, decctlq and "newcrt".)

tn300 set all modes suitable for a General Electric TermiNet 300
ti700 set all modes suitable for Texas Instruments 700 series terminal
tek set all modes suitable for Tektronix 4014 terminal
0 hang up phone line immediately
50 75 110 134 150 200 300 600 1200 1800 2400 4800 9600 exta extb
Set terminal baud rate to the number given, if possible. (These are the speeds supported by the DH-11 interface).

A teletype driver which supports the job control processing of *csh*(1) and more functionality than the basic driver is fully described in *tty*(4). The following options apply only to it.

new Use new driver (switching flushes typeahead).
crt Set options for a CRT (crtbs, ctlecho and, if >= 1200 baud, crterase and crtkill.)
crtbs Echo backspaces on erase characters.
prterase For printing terminal echo erased characters backwards within "\" and "/".
crterase Wipe out erased characters with "backspace-space-backspace."
−crterase Leave erased characters visible; just backspace.
crtkill Wipe out input on like kill ala **crterase.**
−crtkill Just echo line kill character and a newline on line kill.
ctlecho Echo control characters as "^*x*" (and delete as "^?".) Print two backspaces following the EOT character (control D).
−ctlecho Control characters echo as themselves; in cooked mode EOT (control-D) is not echoed.

decctlq After output is suspended (normally by ^S), only a start character (normally ^Q) will restart it. This is compatible with DEC's vendor supplied systems.

−decctlq After output is suspended, any character typed will restart it; the start character will restart output without providing any input. (This is the default.)
tostop Background jobs stop if they attempt terminal output.
−tostop Output from background jobs to the terminal is allowed.
tilde Convert "~" to "`" on output (for Hazeltine terminals).
−tilde Leave poor "~" alone.
flusho Output is being discarded usually because user hit control O (internal state bit).
−flusho Output is not being discarded.
pendin Input is pending after a switch from cbreak to cooked and will be re-input when a read becomes pending or more input arrives (internal state bit).
−pendin Input is not pending.
intrup Send a signal (SIGTINT) to the terminal control process group whenever an input record (line in cooked mode, character in cbreak or raw mode) is available for reading.
−intrup Don't send input available interrupts.
mdmbuf Start/stop output on carrier transitions (not implemented).
−mdmbuf
Return error if write attempted after carrier drops.
litout Send output characters without any processing.

−litout Do normal output processing, inserting delays, etc.
nohang Don't send hangup signal if carrier drops.
−nohang Send hangup signal to control process group when carrier drops.
etxack Diablo style etx/ack handshaking (not implemented).

The following special characters are applicable only to the new teletype driver and are not normally changed.

susp *c* set suspend process character to *c* (default control Z).
dsusp *c* set delayed suspend process character to *c* (default control Y).
rprnt *c* set reprint line character to *c* (default control R).
flush *c* set flush output character to *c* (default control O).
werase *c* set word erase character to *c* (default control W).
lnext *c* set literal next character to *c* (default control V).

SEE ALSO

ioctl(2), tabs(1), tset(1), tty(4)

NAME

style − analyze surface characteristics of a document

SYNOPSIS

style [−ml] [−mm] [−a] [−e] [−l num **] [−r** num **] [−p] [−P]** file ...

DESCRIPTION

Style analyzes the surface characteristics of the writing style of a document. It reports on readability, sentence length and structure, word length and usage, verb type, and sentence openers. Because *style* runs *deroff* before looking at the text, formatting header files should be included as part of the input. The default macro package **−ms** may be overridden with the flag **−mm.** The flag **−ml**, which causes **deroff** to skip lists, should be used if the document contains many lists of non-sentences. The other options are used to locate sentences with certain characteristics.

−a print all sentences with their length and readability index.

−e print all sentences that begin with an expletive.

−p print all sentences that contain a passive verb.

−l*num* print all sentences longer than *num*.

−r*num* print all sentences whose readability index is greater than *num*.

−P print parts of speech of the words in the document.

SEE ALSO

deroff(1), diction(1)

BUGS

Use of non-standard formatting macros may cause incorrect sentence breaks.

NAME

su − substitute user id temporarily

SYNOPSIS

su [−f] [−] [userid]

DESCRIPTION

Su demands the password of the specified *userid,* and if it is given, changes to that *userid* and invokes the Shell *sh*(1) or *csh*(1) without changing the current directory. The user environment is unchanged except for HOME and SHELL, which are taken from the password file for the user being substituted (see *environ*(7)). The new user ID stays in force until the Shell exits.

If no *userid* is specified, 'root' is assumed. To remind the super-user of his responsibilities, the Shell substitutes '#' for its usual prompt.

The **−f** option prevents *csh*(1) from executing the .cshrc file; thus making *su* start up faster.

The − option simulates a full login.

SEE ALSO

sh(1), csh(1)

BUGS

Local administrative rules cause restrictions to be placed on who can *su* to 'root', even with the root password. These rules vary from site to site.

NAME

sum – sum and count blocks in a file

SYNOPSIS

sum file

DESCRIPTION

Sum calculates and prints a 16-bit checksum for the named file, and also prints the number of blocks in the file. It is typically used to look for bad spots, or to validate a file communicated over some transmission line.

SEE ALSO

wc(1)

DIAGNOSTICS

'Read error' is indistinguishable from end of file on most devices; check the block count.

NAME

symorder — rearrange name list

SYNOPSIS

symorder orderlist symbolfile

DESCRIPTION

Orderlist is a file containing symbols to be found in symbolfile, 1 symbol per line.

Symbolfile is updated in place to put the requested symbols first in the symbol table, in the order specified. This is done by swapping the old symbols in the required spots with the new ones. If all of the order symbols are not found, an error is generated.

This program was specifically designed to cut down on the overhead of getting symbols from /vmunix.

SEE ALSO

nlist(3)

NAME

sysline — display system status on status line of a terminal

SYNOPSIS

sysline [−bcdehDilmpqrsj] [+N]

DESCRIPTION

sysline runs in the background and periodically displays system status information on the status line of the terminal. Not all terminals contain a status line. Those that do include the h19, concept 108, Ann Arbor Ambassador, vt100, Televideo 925/950 and Freedom 100. If no flags are given, *sysline* displays the time of day, the current load average, the change in load average in the last 5 minutes, the number of users (followed by a 'u'), the number of runnable process (followed by a 'r')[VAX only], the number of suspended processes (followed by a 's')[VAX only], and the users who have logged on and off since the last status report. Finally, if new mail has arrived, a summary of it is printed. If there is unread mail in your mailbox, an asterisk will appear after the display of the number of users. The display is normally in reverse video (if your terminal supports this in the status line) and is right justified to reduce distraction. Every fifth display is done in normal video to give the screen a chance to rest.

If you have a file named .who in your home directory, then the contents of that file is printed first. One common use of this feature is to alias chdir, pushd, and popd to place the current directory stack in ~/.who after it changes the new directory.

The following flags may be given on the command line.

−b Beep once every half hour and twice every hour, just like those obnoxious watches you keep hearing.

−c Clear the status line for 5 seconds before each redisplay.

−d Debug mode -- print status line data in human readable format

−e Print out only the information. Do not print out the control commands necessary to put the information on the bottom line. This option is useful for putting the output of *sysline* onto the mode line of an emacs window.

−D Print out the current day/date before the time.

−h Print out the host machine's name after the time [VAX only].

−l Don't print the names of people who log in and out.

−m Don't check for mail.

−p Don't report the number of process which are runnable and suspended.

−r Don't display in reverse video.

+N Update the status line every N seconds. The default is 60 seconds.

−q Don't print out diagnostic messages if something goes wrong when starting up.

−i Print out the process id of the *sysline* process onto standard output upon startup. With this information you can send the alarm signal to the *sysline* process to cause it to update immediately. *sysline* writes to the standard error, so you can redirect the standard output into a file to catch the process id.

−s Print "short" form of line by left-justifying *iff* escapes are not allowed in the status line. Some terminals (the Televideos and Freedom 100 for example) do not allow cursor movement (or other "intelligent" operations) in the status line. For these terminals, *sysline* normally uses blanks to cause right-justification. This flag will disable the adding of the blanks.

−j Force the sysline output to be left justified even on terminals capable of cursor

movement on the status line.

If you have a file .syslinelock in your home directory, then *sysline* will not update its statistics and write on your screen, it will just go to sleep for a minute. This is useful if you want to momentarily disable *sysline*. Note that it may take a few seconds from the time the lock file is created until you are guaranteed that *sysline* will not write on the screen.

FILES

/etc/utmp	names of people who are logged in
/dev/kmem	contains process table [VAX only]
${HOME}/.who	information to print on bottom line
${HOME}/.syslinelock	when it exists, sysline will not print

AUTHORS

John Foderaro
Tom Ferrin converted it to use termcap.
Mark Horton added terminfo capability.

BUGS

If you interrupt the display then you may find your cursor missing or stuck on the status line. The best thing to do is reset the terminal.
If there is too much for one line, the excess is thrown away.

NAME

tabs − set terminal tabs

SYNOPSIS

tabs [**−n**] [terminal]

DESCRIPTION

Tabs sets the tabs on a variety of terminals. Various terminal names given in *term*(7) are recognized; the default is, however, suitable for most 300 baud terminals. If the **−n** flag is present then the left margin is not indented as is normal.

SEE ALSO

stty(1), term(7)

BUGS

It's much better to use *tset*(1).

NAME

tail − deliver the last part of a file

SYNOPSIS

tail [±number[**lbc**][**fr**]] [file]

DESCRIPTION

Tail copies the named file to the standard output beginning at a designated place. If no file is named, the standard input is used.

Copying begins at distance +*number* from the beginning, or −*number* from the end of the input. *Number* is counted in units of lines, blocks or characters, according to the appended option **l**, **b** or **c**. When no units are specified, counting is by lines.

Specifying **r** causes tail to print lines from the end of the file in reverse order. The default for **r** is to print the entire file this way. Specifying **f** causes *tail* to not quit at end of file, but rather wait and try to read repeatedly in hopes that the file will grow.

SEE ALSO

dd(1)

BUGS

Tails relative to the end of the file are treasured up in a buffer, and thus are limited in length.

Various kinds of anomalous behavior may happen with character special files.

NAME

talk — talk to another user

SYNOPSIS

talk person [ttyname]

DESCRIPTION

Talk is a visual communication program which copies lines from your terminal to that of another user.

If you wish to talk to someone on you own machine, then *person* is just the person's login name. If you wish to talk to a user on another host, then *person* is of the form :

host!user or
host.user or
host:user or
user@host

though *host@user* is perhaps preferred.

If you want to talk to a user who is logged in more than once, the *ttyname* argument may be used to indicate the appropriate terminal name.

When first called, it sends the message

Message from TalkDaemon@his_machine...
talk: connection requested by your_name@your_machine.
talk: respond with: talk your_name@your_machine

to the user you wish to talk to. At this point, the recipient of the message should reply by typing

talk your_name@your_machine

It doesn't matter from which machine the recipient replies, as long as his login-name is the same. Once communication is established, the two parties may type simultaneously, with their output appearing in separate windows. Typing control L will cause the screen to be reprinted, while your erase, kill, and word kill characters will work in talk as normal. To exit, just type your interrupt character; *talk* then moves the cursor to the bottom of the screen and restores the terminal.

Permission to talk may be denied or granted by use of the *mesg* command. At the outset talking is allowed. Certain commands, in particular *nroff* and *pr*(1) disallow messages in order to prevent messy output.

FILES

/etc/hosts	to find the recipient's machine
/etc/utmp	to find the recipient's tty

SEE ALSO

mesg(1), who(1), mail(1), write(1)

NAME

tar − tape archiver

SYNOPSIS

tar [key] [name ...]

DESCRIPTION

Tar saves and restores multiple files on a single file (usually a magnetic tape, but it can be any file). *Tar*'s actions are controlled by the *key* argument. The *key* is a string of characters containing at most one function letter and possibly one or more function modifiers. Other arguments to *tar* are file or directory names specifying which files to dump or restore. In all cases, appearance of a directory name refers to the files and (recursively) subdirectories of that directory.

The function portion of the key is specified by one of the following letters:

r The named files are written on the end of the tape. The **c** function implies this.

x The named files are extracted from the tape. If the named file matches a directory whose contents had been written onto the tape, this directory is (recursively) extracted. The owner, modification time, and mode are restored (if possible). If no file argument is given, the entire content of the tape is extracted. Note that if multiple entries specifying the same file are on the tape, the last one overwrites all earlier.

t The names of the specified files are listed each time they occur on the tape. If no file argument is given, all of the names on the tape are listed.

u The named files are added to the tape if either they are not already there or have been modified since last put on the tape.

c Create a new tape; writing begins on the beginning of the tape instead of after the last file. This command implies **r**.

o On output, tar normally places information specifying owner and modes of directories in the archive. Former versions of tar, when encountering this information will give error message of the form

"<name>/: cannot create".

This option will suppress the directory information.

p This option says to restore files to their original modes, ignoring the present *umask*(2). Setuid and sticky information will also be restored to the super-user.

The following characters may be used in addition to the letter which selects the function desired.

0, ..., 9 This modifier selects an alternate drive on which the tape is mounted. The default is drive 0 at 1600 bpi, which is normally /dev/rmt8.

v Normally *tar* does its work silently. The **v** (verbose) option make *tar* type the name of each file it treats preceded by the function letter. With the **t** function, the verbose option gives more information about the tape entries than just their names.

w *Tar* prints the action to be taken followed by file name, then wait for user confirmation. If a word beginning with 'y' is given, the action is done. Any other input means don't do it.

f *Tar* uses the next argument as the name of the archive instead of /dev/rmt?. If the name of the file is '−', tar writes to standard output or reads from standard input, whichever is appropriate. Thus, *tar* can be used as the head or tail of a filter chain. *Tar* can also be used to move hierarchies with the command

cd fromdir; tar cf - . | (cd todir; tar xf -)

b *Tar* uses the next argument as the blocking factor for tape records. The default is 20 (the maximum). This option should only be used with raw magnetic tape archives (See **f** above). The block size is determined automatically when reading tapes (key letters 'x' and 't').

l tells *tar* to complain if it cannot resolve all of the links to the files dumped. If this is not specified, no error messages are printed.

m tells *tar* not to restore the modification times. The modification time will be the time of extraction.

h Force *tar* to follow symbolic links as if they were normal files or directories. Normally, *tar* does not follow symbolic links.

B Forces input and output blocking to 20 blocks per record. This option was added so that *tar* can work across a communications channel where the blocking may not be maintained.

If a file name is preceded by **−C**, then *tar* will perform a *chdir*(2) to that file name. This allows multiple directories not related by a close common parent to be archived using short relative path names. For example, to archive files from /usr/include and from /etc, one might use

```
tar c -C /usr include -C / etc
```

Previous restrictions dealing with *tar*'s inability to properly handle blocked archives have been lifted.

FILES

/dev/rmt?
/tmp/tar*

DIAGNOSTICS

Complaints about bad key characters and tape read/write errors.
Complaints if enough memory is not available to hold the link tables.

BUGS

There is no way to ask for the *n*-th occurrence of a file.
Tape errors are handled ungracefully.
The **u** option can be slow.
The current limit on file name length is 100 characters.
There is no way to selectively follow symbolic links.

NAME

tbl – format tables for nroff or troff

SYNOPSIS

tbl [files] ...

DESCRIPTION

Tbl is a preprocessor for formatting tables for *nroff* or *troff*(1). The input files are copied to the standard output, except for lines between and are reformatted. Details are given in the *tbl*(1) reference manual.

EXAMPLE

As an example, letting \t represent a tab (which should be typed as a genuine tab) the input

```
.TS
c s s
c c s
c c c
l n n.
Household Population
Town\tHouseholds
\tNumber\tSize
Bedminster\t789\t3.26
Bernards Twp.\t3087\t3.74
Bernardsville\t2018\t3.30
Bound Brook\t3425\t3.04
Branchburg\t1644\t3.49
Bridgewater\t7897\t3.81
Far Hills\t240\t3.19
.TE
```

yields

Household Population		
Town	Households	
	Number	Size
Bedminster	789	3.26
Bernards Twp.	3087	3.74
Bernardsville	2018	3.30
Bound Brook	3425	3.04
Branchburg	1644	3.49
Bridgewater	7897	3.81
Far Hills	240	3.19

If no arguments are given, *tbl* reads the standard input, so it may be used as a filter. When *tbl* is used with *eqn* or *neqn* the *tbl* command should be first, to minimize the volume of data passed through pipes.

SEE ALSO

troff(1), eqn(1)

M. E. Lesk, *TBL*.

NAME

tc − photoypesetter simulator

SYNOPSIS

tc [−t] [−sN] [−pL] [file]

DESCRIPTION

Tc interprets its input (standard input default) as device codes for a Graphic Systems phototypesetter (cat). The standard output of *tc* is intended for a Tektronix 4015 (a 4014 terminal with ASCII and APL character sets). The sixteen typesetter sizes are mapped into the 4014's four sizes; the entire TROFF character set is drawn using the 4014's character generator, using overstruck combinations where necessary. Typical usage:

troff −t file | tc

At the end of each page *tc* waits for a newline (empty line) from the keyboard before continuing on to the next page. In this wait state, the command **e** will suppress the screen erase before the next page; **s**N will cause the next N pages to be skipped; and **!**line will send line to the shell.

The command line options are:

−t Don't wait between pages; for directing output into a file.

−sN Skip the first N pages.

−pL Set page length to L. L may include the scale factors **p** (points), **i** (inches), **c** (centimeters), and **P** (picas); default is picas.

'*−l w*' Multiply the default aspect ratio, 1.5, of a displayed page by *l/w*.

SEE ALSO

troff(1), plot(1G)

BUGS

Font distinctions are lost.
tc's character set is limited to ASCII in just one size.
The aspect ratio option is unbelievable.

NAME

tee − pipe fitting

SYNOPSIS

tee [**−i**] [**−a**] [file] ...

DESCRIPTION

Tee transcribes the standard input to the standard output and makes copies in the *files*. Option **−i** ignores interrupts; option **−a** causes the output to be appended to the *files* rather than overwriting them.

NAME

telnet – user interface to the TELNET protocol

SYNOPSIS

telnet [host [port]]

DESCRIPTION

Telnet is used to communicate with another host using the TELNET protocol. If *telnet* is invoked without arguments, it enters command mode, indicated by its prompt ("telnet>"). In this mode, it accepts and executes the commands listed below. If it is invoked with arguments, it performs an *open* command (see below) with those arguments.

Once a connection has been opened, *telnet* enters input mode. In this mode, text typed is sent to the remote host. To issue *telnet* commands when in input mode, precede them with the *telnet* "escape character" (initially "^]"). When in command mode, the normal terminal editing conventions are available.

The following commands are available. Only enough of each command to uniquely identify it need be typed.

open *host* [*port*]
: Open a connection to the named host. If the no port number is specified, *telnet* will attempt to contact a TELNET server at the default port. The host specification may be either a host name (see *hosts*(5)) or an Internet address specified in the "dot notation".

close Close a TELNET session and return to command mode.

quit Close any open TELNET session and exit *telnet*.

z Suspend *telnet*. This command only works when the user is using the *csh*(1).

escape [*escape-char*]
: Set the *telnet* "escape character". Control characters may be specified as "^" followed by a single letter; e.g. "control-X" is "^X".

status Show the current status of *telnet*. This includes the peer one is connected to, as well as the state of debugging.

options
: Toggle viewing of TELNET options processing. When options viewing is enabled, all TELNET option negotiations will be displayed. Options sent by *telnet* are displayed as "SENT", while options received from the TELNET server are displayed as "RCVD".

crmod Toggle carriage return mode. When this mode is enabled any carriage return characters received from the remote host will be mapped into a carriage return and a line feed. This mode does not affect those characters typed by the user, only those received. This mode is not very useful, but is required for some hosts that like to ask the user to do local echoing.

? [*command*]
: Get help. With no arguments, *telnet* prints a help summary. If a command is specified, *telnet* will print the help information available about the command only.

BUGS

This implementation is very simple because *rlogin*(1C) is the standard mechanism used to communicate locally with hosts.

NAME

test − condition command

SYNOPSIS

test expr

DESCRIPTION

test evaluates the expression *expr*, and if its value is true then returns zero exit status; otherwise, a non zero exit status is returned. *test* returns a non zero exit if there are no arguments.

The following primitives are used to construct *expr*.

−r file true if the file exists and is readable.

−w file true if the file exists and is writable.

−f file true if the file exists and is not a directory.

−d file true if the file exists exists and is a directory.

−s file true if the file exists and has a size greater than zero.

−t [fildes]
true if the open file whose file descriptor number is *fildes* (1 by default) is associated with a terminal device.

−z s1 true if the length of string *s1* is zero.

−n s1 true if the length of the string *s1* is nonzero.

s1 **=** s2 true if the strings *s1* and *s2* are equal.

s1 **!=** s2 true if the strings *s1* and *s2* are not equal.

s1 true if *s1* is not the null string.

n1 **−eq** n2
true if the integers *n1* and *n2* are algebraically equal. Any of the comparisons **−ne**, **−gt**, **−ge**, **−lt**, or **−le** may be used in place of **−eq**.

These primaries may be combined with the following operators:

! unary negation operator

−a binary *and* operator

−o binary *or* operator

(expr **)**
parentheses for grouping.

−a has higher precedence than **−o.** Notice that all the operators and flags are separate arguments to *test*. Notice also that parentheses are meaningful to the Shell and must be escaped.

SEE ALSO

sh(1), find(1)

NAME

time − time a command

SYNOPSIS

time command

DESCRIPTION

The given command is executed; after it is complete, *time* prints the elapsed time during the command, the time spent in the system, and the time spent in execution of the command. Times are reported in seconds.

On a PDP-11, the execution time can depend on what kind of memory the program happens to land in; the user time in MOS is often half what it is in core.

The times are printed on the diagnostic output stream.

Time is built in to *csh*(1), using a different output format.

BUGS

Elapsed time is accurate to the second, while the CPU times are measured to the 100th second. Thus the sum of the CPU times can be up to a second larger than the elapsed time.

Time is a built-in command to *csh*(1), with a much different syntax. This command is available as "/bin/time" to *csh* users.

NAME

tip, cu — connect to a remote system

SYNOPSIS

tip [**−v**] [*−speed*] system-name
tip [**−v**] [*−speed*] phone-number
cu phone-number [**−t**] [**−s** *speed*] [**-a** *acu*] [**−l** *line*] [**−#**]

DESCRIPTION

Tip and *cu* establish a full-duplex connection to another machine, giving the appearance of being logged in directly on the remote cpu. It goes without saying that you must have a login on the machine (or equivalent) to which you wish to connect. The preferred interface is *tip*. The *cu* interface is included for those people attached to the "call UNIX" command of version 7. This manual page describes only *tip*.

Typed characters are normally transmitted directly to the remote machine (which does the echoing as well). A tilde ("~") appearing as the first character of a line is an escape signal; the following are recognized:

~^D ~. Drop the connection and exit (you may still be logged in on the remote machine).

~c [*name*] Change directory to name (no argument implies change to your home directory).

~! Escape to a shell (exiting the shell will return you to tip).

~> Copy file from local to remote. *Tip* prompts for the name of a local file to transmit.

~< Copy file from remote to local. *Tip* prompts first for the name of the file to be sent, then for a command to be executed on the remote machine.

~p *from* [*to*]
Send a file to a remote UNIX host. The put command causes the remote UNIX system to run the command string "cat > 'to'", while *tip* sends it the "from" file. If the "to" file isn't specified the "from" file name is used. This command is actually a UNIX specific version of the "~>" command.

~t *from* [*to*]
Take a file from a remote UNIX host. As in the put command the "to" file defaults to the "from" file name if it isn't specified. The remote host executes the command string "cat 'from';echo ^A" to send the file to *tip*.

~| Pipe the output from a remote command to a local UNIX process. The command string sent to the local UNIX system is processed by the shell.

~# Send a BREAK to the remote system. For systems which don't support the necessary *ioctl* call the break is simulated by a sequence of line speed changes and DEL characters.

~s Set a variable (see the discussion below).

~^Z Stop *tip* (only available with job control).

~? Get a summary of the tilde escapes

Tip uses the file /etc/remote to find how to reach a particular system and to find out how it should operate while talking to the system; refer to *remote*(5) for a full description. Each system has a default baud rate with which to establish a connection. If this value is not suitable, the baud rate to be used may be specified on the command line, e.g. "tip -300 mds".

When *tip* establishes a connection it sends out a connection message to the remote system; the default value, if any, is defined in /etc/remote.

When *tip* prompts for an argument (e.g. during setup of a file transfer) the line typed may be edited with the standard erase and kill characters. A null line in response to a prompt, or an interrupt, will abort the dialogue and return you to the remote machine.

Tip guards against multiple users connecting to a remote system by opening modems and terminal lines with exclusive access, and by honoring the locking protocol used by *uucp*(1C).

During file transfers *tip* provides a running count of the number of lines transferred. When using the ~> and ~< commands, the "eofread" and "eofwrite" variables are used to recognize end-of-file when reading, and specify end-of-file when writing (see below). File transfers normally depend on tandem mode for flow control. If the remote system does not support tandem mode, "echocheck" may be set to indicate *tip* should synchronize with the remote system on the echo of each transmitted character.

When *tip* must dial a phone number to connect to a system it will print various messages indicating its actions. *Tip* supports the DEC DN-11 and Racal-Vadic 831 auto-call-units; the DEC DF02 and DF03, Ventel 212+, Racal-Vadic 3451, and Bizcomp 1031 and 1032 integral call unit/modems.

VARIABLES

Tip maintains a set of *variables* which control its operation. Some of these variable are read-only to normal users (root is allowed to change anything of interest). Variables may be displayed and set through the "s" escape. The syntax for variables is patterned after *vi*(1) and *Mail*(1). Supplying "all" as an argument to the set command displays all variables readable by the user. Alternatively, the user may request display of a particular variable by attaching a '?' to the end. For example "escape?" displays the current escape character.

Variables are numeric, string, character, or boolean values. Boolean variables are set merely by specifying their name; they may be reset by prepending a '!' to the name. Other variable types are set by concatenating an '=' and the value. The entire assignment must not have any blanks in it. A single set command may be used to interrogate as well as set a number of variables. Variables may be initialized at run time by placing set commands (without the "~s" prefix in a file *.tiprc* in one's home directory). The −v option causes *tip* to display the sets as they are made. Certain common variables have abbreviations. The following is a list of common variables, their abbreviations, and their default values.

beautify
(bool) Discard unprintable characters when a session is being scripted; abbreviated *be*.

baudrate
(num) The baud rate at which the connection was established; abbreviated *ba*.

dialtimeout
(num) When dialing a phone number, the time (in seconds) to wait for a connection to be established; abbreviated *dial*.

echocheck
(bool) Synchronize with the remote host during file transfer by waiting for the echo of the last character transmitted; default is *off*.

eofread
(str) The set of characters which signify and end-of-tranmission during a ~< file transfer command; abbreviated *eofr*.

eofwrite
(str) The string sent to indicate end-of-transmission during a ~> file transfer command; abbreviated *eofw*.

eol
(str) The set of characters which indicate an end-of-line. *Tip* will recognize escape

characters only after an end-of-line.

escape
(char) The command prefix (escape) character; abbreviated *es*; default value is '~'.

exceptions
(str) The set of characters which should not be discarded due to the beautification switch; abbreviated *ex*; default value is "\t\n\f\b".

force
(char) The character used to force literal data transmission; abbreviated *fo*; default value is '^P'.

framesize
(num) The amount of data (in bytes) to buffer between file system writes when receiving files; abbreviated *fr*.

host
(str) The name of the host to which you are connected; abbreviated *ho*.

prompt
(char) The character which indicates and end-of-line on the remote host; abbreviated *pr*; default value is '\n'. This value is used to synchronize during data transfers. The count of lines transferred during a file transfer command is based on recipt of this character.

raise
(bool) Upper case mapping mode; abbreviated *ra*; default value is *off*. When this mode is enabled, all lower case letters will be mapped to upper case by *tip* for transmission to the remote machine.

raisechar
(char) The input character used to toggle upper case mapping mode; abbreviated *rc*; default value is '^A'.

record
(str) The name of the file in which a session script is recorded; abbreviated *rec*; default value is "tip.record".

script
(bool) Session scripting mode; abbreviated *sc*; default is *off*. When *script* is *true*, *tip* will record everything transmitted by the remote machine in the script record file specified in *record*. If the *beautify* switch is on, only printable ASCII characters will be included in the script file (those characters betwee 040 and 0177). The variable *exceptions* is used to indicate characters which are an exception to the normal beautification rules.

tabexpand
(bool) Expand tabs to spaces during file transfers; abbreviated *tab*; default value is *false*. Each tab is expanded to 8 spaces.

verbose
(bool) Verbose mode; abbreviated *verb*; default is *true*. When verbose mode is enabled, *tip* prints messages while dialing, shows the current number of lines transferred during a file transfer operations, and more.

SHELL
(str) The name of the shell to use for the ~! command; default value is "/bin/sh", or taken from the environment.

HOME
(str) The home directory to use for the ~c command; default value is taken from the

environment.

FILES

/etc/remote	global system descriptions
/etc/phones	global phone number data base
${REMOTE}	private system descriptions
${PHONES}	private phone numbers
~/.tiprc	initialization file.
/usr/spool/uucp/LCK..*	lock file to avoid conflicts with *uucp*

DIAGNOSTICS

Diagnostics are, hopefully, self explanatory.

SEE ALSO

remote(5), phones(5)

BUGS

The full set of variables is undocumented and should, probably, be paired down.

NAME

tk − paginator for the Tektronix 4014

SYNOPSIS

tk [**−t**] [**−***N*] [**−p***L*] [file]

DESCRIPTION

The output of *tk* is intended for a Tektronix 4014 terminal. *Tk* arranges for 66 lines to fit on the screen, divides the screen into *N* columns, and contributes an eight space page offset in the (default) single-column case. Tabs, spaces, and backspaces are collected and plotted when necessary. Teletype Model 37 half- and reverse-line sequences are interpreted and plotted. At the end of each page *tk* waits for a newline (empty line) from the keyboard before continuing on to the next page. In this wait state, the command !*command* will send the *command* to the shell.

The command line options are:

−t Don't wait between pages; for directing output into a file.

−*N* Divide the screen into *N* columns and wait after the last column.

−p*L* Set page length to *L* lines.

SEE ALSO

pr(1)

NAME

touch − update date last modified of a file

SYNOPSIS

touch [**−c**] [**−f**] file ...

DESCRIPTION

Touch attempts to set the modified date of each *file*. If a *file* exists, this is done by reading a character from the file and writing it back. If a *file* does not exist, an attempt will be made to create it unless the **−c** option is specified. The **−f** option will attempt to force the touch in spite of read and write permissions on a *file*.

SEE ALSO

utimes(2)

NAME

tp − manipulate tape archive

SYNOPSIS

tp [key] [name ...]

DESCRIPTION

Tp saves and restores files on DECtape or magtape. Its actions are controlled by the *key* argument. The key is a string of characters containing at most one function letter and possibly one or more function modifiers. Other arguments to the command are file or directory names specifying which files are to be dumped, restored, or listed. In all cases, appearance of a directory name refers to the files and (recursively) subdirectories of that directory.

The function portion of the key is specified by one of the following letters:

r The named files are written on the tape. If files with the same names already exist, they are replaced. 'Same' is determined by string comparison, so './abc' can never be the same as '/usr/dmr/abc' even if '/usr/dmr' is the current directory. If no file argument is given, '.' is the default.

u updates the tape. **u** is like **r**, but a file is replaced only if its modification date is later than the date stored on the tape; that is to say, if it has changed since it was dumped. **u** is the default command if none is given.

d deletes the named files from the tape. At least one name argument must be given. This function is not permitted on magtapes.

x extracts the named files from the tape to the file system. The owner and mode are restored. If no file argument is given, the entire contents of the tape are extracted.

t lists the names of the specified files. If no file argument is given, the entire contents of the tape is listed.

The following characters may be used in addition to the letter which selects the function desired.

m Specifies magtape as opposed to DECtape.

0,...,7 This modifier selects the drive on which the tape is mounted. For DECtape, **x** is default; for magtape '0' is the default.

v Normally *tp* does its work silently. The **v** (verbose) option causes it to type the name of each file it treats preceded by the function letter. With the **t** function, **v** gives more information about the tape entries than just the name.

c means a fresh dump is being created; the tape directory is cleared before beginning. Usable only with **r** and **u**. This option is assumed with magtape since it is impossible to selectively overwrite magtape.

l Errors reading and writing the tape are noted, but no action is taken. Normally, errors cause a return to the command level.

f Use the first named file, rather than a tape, as the archive. This option currently acts like **m**; *i.e.* **r** implies **c**, and neither **d** nor **u** are permitted.

w causes *tp* to pause before treating each file, type the indicative letter and the file name (as with **v**) and await the user's response. Response **y** means 'yes', so the file is treated. Null response means 'no', and the file does not take part in whatever is being done. Response **x** means 'exit'; the *tp* command terminates immediately. In the **x** function, files previously asked about have been extracted already. With **r**, **u**, and **d** no change has been made to the tape.

FILES

/dev/tap?
/dev/rmt?

SEE ALSO

ar(1), tar(1)

DIAGNOSTICS

Several; the non-obvious one is 'Phase error', which means the file changed after it was selected for dumping but before it was dumped.

BUGS

A single file with several links to it is treated like several files.

Binary-coded control information makes magnetic tapes written by *tp* difficult to carry to other machines; *tar*(1) avoids the problem.

NAME

tr − translate characters

SYNOPSIS

tr [**−cds**] [string1 [string2]]

DESCRIPTION

Tr copies the standard input to the standard output with substitution or deletion of selected characters. Input characters found in *string1* are mapped into the corresponding characters of *string2*. When *string2* is short it is padded to the length of *string1* by duplicating its last character. Any combination of the options **−cds** may be used: **−c** complements the set of characters in *string1* with respect to the universe of characters whose ASCII codes are 01 through 0377 octal; **−d** deletes all input characters in *string1;* **−s** squeezes all strings of repeated output characters that are in *string2* to single characters.

In either string the notation *a−b* means a range of characters from *a* to *b* in increasing ASCII order. The character '\' followed by 1, 2 or 3 octal digits stands for the character whose ASCII code is given by those digits. A '\' followed by any other character stands for that character.

The following example creates a list of all the words in 'file1' one per line in 'file2', where a word is taken to be a maximal string of alphabetics. The second string is quoted to protect '\' from the Shell. 012 is the ASCII code for newline.

```
tr −cs A−Za−z '\012' <file1 >file2
```

SEE ALSO

ed(1), ascii(7), expand(1)

BUGS

Won't handle ASCII NUL in *string1* or *string2;* always deletes NUL from input.

NAME

trman — translate version 6 manual macros to version 7 macros

SYNOPSIS

trman [file]

DESCRIPTION

Trman reads the input file, which should be nroff/troff input and attempts to translate the version 6 manual sections therein to version 7 format. It is largely successful, but seems to have trouble with indented paragraphs and complicated font control. You should expect to have to fix up long sections by hand somewhat.

SEE ALSO

man(7)

BUGS

NAME

troff, nroff − text formatting and typesetting

SYNOPSIS

troff [option] ... [file] ...

nroff [option] ... [file] ...

DESCRIPTION

Troff formats text in the named *files* for printing on a Graphic Systems C/A/T phototypesetter; *nroff* is used for for typewriter-like devices. Their capabilities are described in the *Nroff/Troff user's manual.*

If no *file* argument is present, the standard input is read. An argument consisting of a single minus (−) is taken to be a file name corresponding to the standard input. The options, which may appear in any order so long as they appear before the files, are:

−o*list* Print only pages whose page numbers appear in the comma-separated *list* of numbers and ranges. A range *N*−*M* means pages *N* through *M*; an initial −*N* means from the beginning to page *N*; and a final *N*− means from *N* to the end.

−n*N* Number first generated page *N*.

−s*N* Stop every *N* pages. *Nroff* will halt prior to every *N* pages (default *N*=1) to allow paper loading or changing, and will resume upon receipt of a newline. *Troff* will stop the phototypesetter every *N* pages, produce a trailer to allow changing cassettes, and resume when the typesetter's start button is pressed.

−m*name* Prepend the macro file **/usr/lib/tmac/tmac.***name* to the input *files*.

−r*aN* Set register *a* (one-character) to *N*.

−i Read standard input after the input files are exhausted.

−q Invoke the simultaneous input-output mode of the **rd** request.

Troff only

−t Direct output to the standard output instead of the phototypesetter.

−f Refrain from feeding out paper and stopping phototypesetter at the end of the run.

−w Wait until phototypesetter is available, if currently busy.

−b Report whether the phototypesetter is busy or available. No text processing is done.

−a Send a printable ASCII approximation of the results to the standard output.

−pN Print all characters in point size *N* while retaining all prescribed spacings and motions, to reduce phototypesetter elapsed time.

−F*fontdir*

The directory *fontdir* contains the font width tables instead of the default directory /usr/lib/fonts. This option can be used to produce output for devices besides the phototypesetter.

If the file */usr/adm/tracct* is writable, *troff* keeps phototypesetter accounting records there. The integrity of that file may be secured by making *troff* a 'set user-id' program.

FILES

/tmp/ta*	temporary file
/usr/lib/tmac/tmac.*	standard macro files
/usr/lib/term/*	terminal driving tables for *nroff*
/usr/lib/font/*	font width tables for *troff*
/dev/cat	phototypesetter
/usr/adm/tracct	accounting statistics for /dev/cat

SEE ALSO

J. F. Ossanna, *NroffTroff user's manual*
B. W. Kernighan, *A TROFF Tutorial*
eqn(1), tbl(1), ms(7), me(7), man(7), col(1)

NAME

true, false — provide truth values

SYNOPSIS

true

false

DESCRIPTION

True and *false* are usually used in a Bourne shell script. They test for the appropriate status "true" or "false" before running (or failing to run) a list of commands.

EXAMPLE

```
while true
do
    command list
done
```

SEE ALSO

csh(1), sh(1), false(1)

DIAGNOSTICS

True has exit status zero.

NAME

tset − terminal dependent initialization

SYNOPSIS

tset [options] [**−m** [ident][test baudrate]:type] ... [type]

reset ...

DESCRIPTION

Tset sets up your terminal when you first log in to a UNIX system. It does terminal dependent processing such as setting erase and kill characters, setting or resetting delays, sending any sequences needed to properly initialized the terminal, and the like. It first determines the *type* of terminal involved, and then does necessary initializations and mode settings. The type of terminal attached to each UNIX port is specified in the */etc/ttytype* database. Type names for terminals may be found in the *termcap*(5) database. If a port is not wired permanently to a specific terminal (not hardwired) it will be given an appropriate generic identifier such as *dialup*.

In the case where no arguments are specified, *tset* simply reads the terminal type out of the environment variable TERM and re-initializes the terminal. The rest of this manual concerns itself with mode and environment initialization, typically done once at login, and options used at initialization time to determine the terminal type and set up terminal modes.

When used in a startup script (*.profile* for *sh*(1) users or *.login* for *csh*(1) users) it is desirable to give information about the type of terminal you will usually use on ports which are not hardwired. These ports are identified in */etc/ttytype* as *dialup* or *plugboard* or *arpanet*, etc. To specify what terminal type you usually use on these ports, the **−m** (map) option flag is followed by the appropriate port type identifier, an optional baud rate specification, and the terminal type. (The effect is to "map" from some conditions to a terminal type, that is, to tell *tset* "If I'm on this kind of port, guess that I'm on that kind of terminal".) If more than one mapping is specified, the first applicable mapping prevails. A missing port type identifier matches all identifiers. Any of the alternate generic names given in *termcap* may be used for the identifier.

A *baudrate* is specified as with *stty*(1), and is compared with the speed of the diagnostic output (which should be the control terminal). The baud rate *test* may be any combination of: **>**, **@**, **<**, and **!**; **@** means "at" and **!** inverts the sense of the test. To avoid problems with metacharacters, it is best to place the entire argument to **−m** within "'" characters; users of *csh*(1) must also put a "\" before any "!" used here.

Thus

```
tset −m 'dialup>300:adm3a' -m dialup:dw2 -m 'plugboard:?adm3a'
```

causes the terminal type to be set to an *adm3a* if the port in use is a dialup at a speed greater than 300 baud; to a *dw2* if the port is (otherwise) a dialup (i.e. at 300 baud or less). (**NOTE:** the examples given here appear to take up more than one line, for text processing reasons. When you type in real *tset* commands, you must enter them entirely on one line.) If the *type* finally determined by *tset* begins with a question mark, the user is asked if s/he really wants that type. A null response means to use that type; otherwise, another type can be entered which will be used instead. Thus, in the above case, the user will be queried on a plugboard port as to whether they are actually using an *adm3a*.

If no mapping applies and a final *type* option, not preceded by a **−m**, is given on the command line then that type is used; otherwise the identifier found in the */etc/ttytype* database will be taken to be the terminal type. This should always be the case for hardwired ports.

It is usually desirable to return the terminal type, as finally determined by *tset*, and information about the terminal's capabilities to a shell's environment. This can be done using the **−** option; using the Bourne shell, *sh*(1):

export TERM; TERM=`tset − *options...*`

or using the C shell, *csh*(1):

setenv TERM `tset - *options...*`

With *csh* it is convenient to make an alias in your .cshrc:

alias tset 'setenv TERM `tset − \!*`'

Either of these aliases allow the command

tset 2621

to be invoked at any time from your login csh. **Note to Bourne Shell users:** It is **not** possible to get this aliasing effect with a shell script, because shell scripts cannot set the environment of their parent. (If a process could set its parent's environment, none of this nonsense would be necessary in the first place.)

These commands cause *tset* to place the name of your terminal in the variable TERM in the environment; see *environ*(7).

Once the terminal type is known, *tset* engages in terminal driver mode setting. This normally involves sending an initialization sequence to the terminal, setting the single character erase (and optionally the line-kill (full line erase)) characters, and setting special character delays. Tab and newline expansion are turned off during transmission of the terminal initialization sequence.

On terminals that can backspace but not overstrike (such as a CRT), and when the erase character is the default erase character ('#' on standard systems), the erase character is changed to BACKSPACE (Control-H).

The options are:

−e*c* set the erase character to be the named character *c* on all terminals, the default being the backspace character on the terminal, usually ^H. The character *c* can either be typed directly, or entered using the hat notation used here.

−k*c* is similar to **−e** but for the line kill character rather than the erase character; *c* defaults to ^X (for purely historical reasons). The kill characters is left alone if **−k** is not specified. The hat notation can also be used for this option.

− The name of the terminal finally decided upon is output on the standard output. This is intended to be captured by the shell and placed in the environment variable TERM.

−n On systems with the Berkeley 4BSD tty driver, specifies that the new tty driver modes should be initialized for this terminal. For a CRT, the CRTERASE and CRTKILL modes are set only if the baud rate is 1200 or greater. See tty(4) for more detail.

−I suppresses transmitting terminal initialization strings.

−Q suppresses printing the "Erase set to" and "Kill set to" messages.

If **tset** is invoked as **reset**, it will set cooked and echo modes, turn off cbreak and raw modes, turn on newline translation, and restore special characters to a sensible state before any terminal dependent processing is done. Any special character that is found to be NULL or "−1" is reset to its default value.

This is most useful after a program dies leaving a terminal in a funny state. You may have to type "<LF>reset<LF>" to get it to work since <CR> may not work in this state. Often none of this will echo.

EXAMPLES

These examples all assume the Bourne shell and use the - option. If you use *csh*, use one of the variations described above. Note that a typical use of *tset* in a .profile or .login will also use the **−e** and **−k** options, and often the **−n** or **−Q** options as well. These options have not

been included here to keep the examples small. (**NOTE:** some of the examples given here appear to take up more than one line, for text processing reasons. When you type in real *tset* commands, you must enter them entirely on one line.)

At the moment, you are on a 2621. This is suitable for typing by hand but not for a .profile, unless you are *always* on a 2621.

```
export TERM; TERM=`tset - 2621`
```

You have an h19 at home which you dial up on, but your office terminal is hardwired and known in /etc/ttytype.

```
export TERM; TERM=`tset - -m dialup:h19`
```

You have a switch which connects everything to everything, making it nearly impossible to key on what port you are coming in on. You use a vt100 in your office at 9600 baud, and dial up to switch ports at 1200 baud from home on a 2621. Sometimes you use someone elses terminal at work, so you want it to ask you to make sure what terminal type you have at high speeds, but at 1200 baud you are always on a 2621. Note the placement of the question mark, and the quotes to protect the greater than and question mark from interpretation by the shell.

```
export TERM; TERM=`tset - -m 'switch>1200:?vt100' -m 'switch<=1200:2621'
```

All of the above entries will fall back on the terminal type specified in */etc/ttytype* if none of the conditions hold. The following entry is appropriate if you always dial up, always at the same baud rate, on many different kinds of terminals. Your most common terminal is an adm3a. It always asks you what kind of terminal you are on, defaulting to adm3a.

```
export TERM; TERM=`tset - ?adm3a`
```

If the file */etc/ttytype* is not properly installed and you want to key entirely on the baud rate, the following can be used:

```
export TERM; TERM=`tset - -m '>1200:vt100' 2621`
```

Here is a fancy example to illustrate the power of *tset* and to hopelessly confuse anyone who has made it this far. You dial up at 1200 baud or less on a concept100, sometimes over switch ports and sometimes over regular dialups. You use various terminals at speeds higher than 1200 over switch ports, most often the terminal in your office, which is a vt100. However, sometimes you log in from the university you used to go to, over the ARPANET; in this case you are on an ALTO emulating a dm2500. You also often log in on various hardwired ports, such as the console, all of which are properly entered in */etc/ttytype*. You want your erase character set to control H, your kill character set to control U, and don't want *tset* to print the "Erase set to Backspace, Kill set to Control U" message.

```
export TERM; TERM=`tset -e -k^U -Q - -m 'switch<=1200:concept100' -m
'switch:?vt100' -m dialup:concept100 -m arpanet:dm2500`
```

FILES

/etc/ttytype	port name to terminal type mapping database
/etc/termcap	terminal capability database

SEE ALSO

csh(1), sh(1), stty(1), ttytype(5), termcap(5), environ(7)

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BUGS

The *tset* command is one of the first commands a user must master when getting started on a UNIX system. Unfortunately, it is one of the most complex, largely because of the extra effort the user must go through to get the environment of the login shell set. Something needs to be done to make all this simpler, either the *login*(1) program should do this stuff, or a default shell alias should be made, or a way to set the environment of the parent should exist.

NAME

tsort – topological sort

SYNOPSIS

tsort [file]

DESCRIPTION

Tsort produces on the standard output a totally ordered list of items consistent with a partial ordering of items mentioned in the input *file*. If no *file* is specified, the standard input is understood.

The input consists of pairs of items (nonempty strings) separated by blanks. Pairs of different items indicate ordering. Pairs of identical items indicate presence, but not ordering.

SEE ALSO

lorder(1)

DIAGNOSTICS

Odd data: there is an odd number of fields in the input file.

BUGS

Uses a quadratic algorithm; not worth fixing for the typical use of ordering a library archive file.

NAME

tty – get terminal name

SYNOPSIS

tty [-s]

DESCRIPTION

Tty prints the pathname of the user's terminal unless the –s (silent) is given. In either case, the exit value is zero if the standard input is a terminal and one if it is not.

DIAGNOSTICS

'not a tty' if the standard input file is not a terminal.

NAME

ul − do underlining

SYNOPSIS

ul [**−i**] [**−t** *terminal*] [*name* ...]

DESCRIPTION

Ul reads the named files (or standard input if none are given) and translates occurrences of underscores to the sequence which indicates underlining for the terminal in use, as specified by the environment variable TERM. The **−t** option overrides the terminal kind specified in the environment. The file */etc/termcap* is read to determine the appropriate sequences for underlining. If the terminal is incapable of underlining, but is capable of a standout mode then that is used instead. If the terminal can overstrike, or handles underlining automatically, *ul* degenerates to *cat*(1). If the terminal cannot underline, underlining is ignored.

The **−i** option causes *ul* to indicate underlining onto by a separate line containing appropriate dashes '−'; this is useful when you want to look at the underlining which is present in an *nroff* output stream on a crt-terminal.

SEE ALSO

man(1), nroff(1), colcrt(1)

AUTHOR

Mark Horton wrote *ul*. The **−i** option was originally a option of the editor *ex*(1), then an *iul* command.

BUGS

Nroff usually outputs a series of backspaces and underlines intermixed with the text to indicate underlining. No attempt is made to optimize the backward motion.

NAME

uniq − report repeated lines in a file

SYNOPSIS

uniq [**−udc** [**+**n] [**−**n]] [input [output]]

DESCRIPTION

Uniq reads the input file comparing adjacent lines. In the normal case, the second and succeeding copies of repeated lines are removed; the remainder is written on the output file. Note that repeated lines must be adjacent in order to be found; see *sort*(1). If the **−u** flag is used, just the lines that are not repeated in the original file are output. The **−d** option specifies that one copy of just the repeated lines is to be written. The normal mode output is the union of the **−u** and **−d** mode outputs.

The **−c** option supersedes **−u** and **−d** and generates an output report in default style but with each line preceded by a count of the number of times it occurred.

The *n* arguments specify skipping an initial portion of each line in the comparison:

−*n* The first *n* fields together with any blanks before each are ignored. A field is defined as a string of non-space, non-tab characters separated by tabs and spaces from its neighbors.

+*n* The first *n* characters are ignored. Fields are skipped before characters.

SEE ALSO

sort(1), comm(1)

NAME

units − conversion program

SYNOPSIS

units

DESCRIPTION

Units converts quantities expressed in various standard scales to their equivalents in other scales. It works interactively in this fashion:

You have: inch
You want: cm
* *2.54000e+00*
/ *3.93701e−01*

A quantity is specified as a multiplicative combination of units optionally preceded by a numeric multiplier. Powers are indicated by suffixed positive integers, division by the usual sign:

You have: 15 pounds force/in2
You want: atm
* *1.02069e+00*
/ *9.79730e−01*

Units only does multiplicative scale changes. Thus it can convert Kelvin to Rankine, but not Centigrade to Fahrenheit. Most familiar units, abbreviations, and metric prefixes are recognized, together with a generous leavening of exotica and a few constants of nature including:

pi	ratio of circumference to diameter
c	speed of light
e	charge on an electron
g	acceleration of gravity
force	same as g
mole	Avogadro's number
water	pressure head per unit height of water
au	astronomical unit

'Pound' is a unit of mass. Compound names are run together, e.g. 'lightyear'. British units that differ from their US counterparts are prefixed thus: 'brgallon'. Currency is denoted 'belgiumfranc', 'britainpound', ...

For a complete list of units, 'cat /usr/lib/units'.

FILES

/usr/lib/units

BUGS

Don't base your financial plans on the currency conversions.

NAME

uptime – show how long system has been up

SYNOPSIS

uptime

DESCRIPTION

Uptime prints the current time, the length of time the system has been up, and the average number of jobs in the run queue over the last 1, 5 and 15 minutes. It is, essentially, the first line of a *w*(1) command.

FILES

/vmunix system name list

SEE ALSO

w(1)

NAME

users — compact list of users who are on the system

SYNOPSIS

users

DESCRIPTION

Users lists the login names of the users currently on the system in a compact, one-line format.

FILES

/etc/utmp

SEE ALSO

who(1)

NAME

uucp, uulog — unix to unix copy

SYNOPSIS

uucp [option] ... source-file ... destination-file

uulog [option] ...

DESCRIPTION

Uucp copies files named by the source-file arguments to the destination-file argument. A file name may be a path name on your machine, or may have the form

system-name!pathname

where 'system-name' is taken from a list of system names which *uucp* knows about. Shell metacharacters ?*[] appearing in the pathname part will be expanded on the appropriate system.

Pathnames may be one of

(1) a full pathname;

(2) a pathname preceded by ~*user*; where *user* is a userid on the specified system and is replaced by that user's login directory;

(3) anything else is prefixed by the current directory.

If the result is an erroneous pathname for the remote system the copy will fail. If the destination-file is a directory, the last part of the source-file name is used.

Uucp preserves execute permissions across the transmission and gives 0666 read and write permissions (see *chmod*(2)).

The following options are interpreted by *uucp*.

-d Make all necessary directories for the file copy.

-c Use the source file when copying out rather than copying the file to the spool directory.

-m Send mail to the requester when the copy is complete.

Uulog maintains a summary log of *uucp* and *uux*(1C) transactions in the file '/usr/spool/uucp/LOGFILE' by gathering information from partial log files named '/usr/spool/uucp/LOG.*.?'. It removes the partial log files.

The options cause *uulog* to print logging information:

-s*sys* Print information about work involving system *sys*.

-u*user*
Print information about work done for the specified *user*.

FILES

/usr/spool/uucp - spool directory
/usr/lib/uucp/* - other data and program files

SEE ALSO

uux(1C), mail(1)
D. A. Nowitz, *Uucp Implementation Description*

WARNING

The domain of remotely accessible files can (and for obvious security reasons, usually should) be severely restricted. You will very likely not be able to fetch files by pathname; ask a responsible person on the remote system to send them to you. For the same reasons you will probably not be able to send files to arbitrary pathnames.

BUGS

All files received by *uucp* will be owned by uucp.
The −m option will only work sending files or receiving a single file. (Receiving multiple files specified by special shell characters ?*[] will not activate the −m option.)

NAME

uuencode,uudecode — encode/decode a binary file for transmission via mail

SYNOPSIS

uuencode [source] remotedest | **mail** sys1!sys2!..!decode
uudecode [file]

DESCRIPTION

Uuencode and *uudecode* are used to send a binary file via uucp (or other) mail. This combination can be used over indirect mail links even when *uusend*(1C) is not available.

Uuencode takes the named source file (default standard input) and produces an encoded version on the standard output. The encoding uses only printing ASCII characters, and includes the mode of the file and the *remotedest* for recreation on the remote system.

Uudecode reads an encoded file, strips off any leading and trailing lines added by mailers, and recreates the original file with the specified mode and name.

The intent is that all mail to the user "decode" should be filtered through the uudecode program. This way the file is created automatically without human intervention. This is possible on the uucp network by either using *sendmail* or by making *rmail* be a link to *Mail* instead of *mail*. In each case, an alias must be created in a master file to get the automatic invocation of uudecode.

If these facilities are not available, the file can be sent to a user on the remote machine who can uudecode it manually.

The encode file has an ordinary text form and can be edited by any text editor to change the mode or remote name.

SEE ALSO

uuencode(5), uusend(1C), uucp(1C), uux(1C), mail(1)

AUTHOR

Mark Horton

BUGS

The file is expanded by 35% (3 bytes become 4 plus control information) causing it to take longer to transmit.

The user on the remote system who is invoking *uudecode* (often *uucp)* must have write permission on the specified file.

NAME

uusend − send a file to a remote host

SYNOPSIS

uusend [−**m** mode] sourcefile sys1!sys2!..!remotefile

DESCRIPTION

Uusend sends a file to a given location on a remote system. The system need not be directly connected to the local system, but a chain of *uucp*(1C) links needs to connect the two systems.

If the −**m** option is specified, the mode of the file on the remote end will be taken from the octal number given. Otherwise, the mode of the input file will be used.

The sourcefile can be "−", meaning to use the standard input. Both of these options are primarily intended for internal use of uusend.

The remotefile can include the ~userid syntax.

DIAGNOSTICS

If anything goes wrong any further away than the first system down the line, you will never hear about it.

SEE ALSO

uux(1C), uucp(1C), uuencode(1)

AUTHOR

Mark Horton

BUGS

This command shouldn't exist, since *uucp* should handle it.

All systems along the line must have the *uusend* command available and allow remote execution of it.

Some uucp systems have a bug where binary files cannot be the input to a uux command. If this bug exists in any system along the line, the file will show up severly munged.

NAME

uux − unix to unix command execution

SYNOPSIS

uux [−] command-string

DESCRIPTION

Uux will gather 0 or more files from various systems, execute a command on a specified system and send standard output to a file on a specified system.

The command-string is made up of one or more arguments that look like a shell command line, except that the command and file names may be prefixed by system-name!. A null system-name is interpreted as the local system.

File names may be one of

(1) a full pathname;

(2) a pathname preceded by ~*xxx*; where *xxx* is a userid on the specified system and is replaced by that user's login directory;

(3) anything else is prefixed by the current directory.

The '−' option will cause the standard input to the *uux* command to be the standard input to the command-string.

For example, the command

uux "!diff usg!/usr/dan/f1 pwba!/a4/dan/f1 > !fi.diff"

will get the f1 files from the usg and pwba machines, execute a *diff* command and put the results in f1.diff in the local directory.

Any special shell characters such as <>;| should be quoted either by quoting the entire command-string, or quoting the special characters as individual arguments.

FILES

/usr/spool/uucp spool directory
/usr/lib/uucp/* other data and programs

SEE ALSO

uucp(1C)
D. A. Nowitz, *Uucp Implementation Description*

WARNING

An installation may, and for security reasons generally will, limit the list of commands executable on behalf of an incoming request from *uux*. Typically, a restricted site will permit little other than the receipt of mail via *uux*.

BUGS

Only the first command of a shell pipeline may have a system-name!. All other commands are executed on the system of the first command.
The use of the shell metacharacter * will probably not do what you want it to do.
The shell tokens << and >> are not implemented.
There is no notification of denial of execution on the remote machine.

NAME

vfontinfo − inspect and print out information about UNIX fonts

SYNOPSIS

vfontinfo [−v] fontname [characters]

DESCRIPTION

Vfontinfo allows you to examine a font in the UNIX format. It prints out all the information in the font header and information about every non-null (width > 0) glyph. This can be used to make sure the font is consistent with the format.

The *fontname* argument is the name of the font you wish to inspect. It writes to standard output. If it can't find the file in your working directory, it looks in */usr/lib/vfont* (the place most of the fonts are kept).

The *characters*, if given, specify certain characters to show. If omitted, the entire font is shown.

If the −v (verbose) flag is used, the bits of the glyph itself are shown as an array of X's and spaces, in addition to the header information.

SEE ALSO

vpr(1), vfont(5)
The Berkeley Font Catalog

AUTHORS

Mark Horton
Andy Hertzfeld

NAME

vgrind – grind nice listings of programs

SYNOPSIS

vgrind [**−f**] [**−**] [**−t**] [**−n**] [**−x**] [**−W**] [**−sn**] [**−h** header] [**−d** file] [**−l***language*] name ...

DESCRIPTION

Vgrind formats the program sources which are arguments in a nice style using *troff*(1) Comments are placed in italics, keywords in bold face, and the name of the current function is listed down the margin of each page as it is encountered.

Vgrind runs in two basic modes, filter mode or regular mode. In filter mode *vgrind* acts as a filter in a manner similar to *tbl*(1). The standard input is passed directly to the standard output except for lines bracketed by the *troff-like* macros:

.vS - starts processing

.vE - ends processing

These lines are formatted as described above. The output from this filter can be passed to *troff* for output. There need be no particular ordering with *eqn*(1) or *tbl*(1).

In regular mode *vgrind* accepts input files, processes them, and passes them to *troff*(1) for output.

In both modes *vgrind* passes any lines beginning with a decimal point without conversion.

The options are:

−f forces filter mode

− forces input to be taken from standard input (default if **−f** is specified)

−t similar to the same option in *troff* causing formatted text to go to the standard output

−n forces no keyword bolding

−x outputs the index file in a "pretty" format. The index file itself is produced whenever *vgrind* is run with a file called *index* in the current directory. The index of function definitions can then be run off by giving *vgrind* the **−x** option and the file *index* as argument.

−W forces output to the (wide) Versatec printer rather than the (narrow) Varian

−s specifies a point size to use on output (exactly the same as the argument of a .ps)

−h specifies a particular header to put on every output page (default is the file name)

−d specifies an alternate language definitions file (default is /usr/lib/vgrindefs)

−l specifies the language to use. Currently known are PASCAL (**−lp**), MODEL (**−lm**),C (**−lc** or the default), CSH (**−lcsh**), SHELL (**−lsh**), RATFOR (**−lr**), and ICON (**−ll**).

FILES

index	file where source for index is created
/usr/lib/tmac/tmac.vgrind	macro package
/usr/lib/vfontedpr	preprocessor
/usr/lib/vgrindefs	language descriptions

AUTHOR

Dave Presotto & William Joy

SEE ALSO

vlp(1), vtroff(1), vgrindefs(5)

BUGS

Vfontedpr assumes that a certain programming style is followed:

For **C** — function names can be preceded on a line only by spaces, tabs, or an asterisk. The parenthesized arguments must also be on the same line.

For **PASCAL** — function names need to appear on the same line as the keywords *function* or *procedure*.

For **MODEL** — function names need to appear on the same line as the keywords *is beginproc*.

If these conventions are not followed, the indexing and marginal function name comment mechanisms will fail.

More generally, arbitrary formatting styles for programs mostly look bad. The use of spaces to align source code fails miserably; if you plan to *vgrind* your program you should use tabs. This is somewhat inevitable since the font used by *vgrind* is variable width.

The mechanism of ctags in recognizing functions should be used here.

NAME

vi − screen oriented (visual) display editor based on ex

SYNOPSIS

vi [**−t** tag] [**−r**] [**+***command*] [**−l**] [**−w***n*] name ...

DESCRIPTION

Vi (visual) is a display oriented text editor based on *ex*(1). *Ex* and *vi* run the same code; it is possible to get to the command mode of *ex* from within *vi* and vice-versa.

The *Vi Quick Reference* card and the *Introduction to Display Editing with Vi* provide full details on using *vi.*

FILES

See *ex*(1).

SEE ALSO

ex (1), edit (1), "Vi Quick Reference" card, "An Introduction to Display Editing with Vi".

AUTHOR

William Joy
Mark Horton added macros to *visual* mode and is maintaining version 3

BUGS

Software tabs using ^T work only immediately after the *autoindent.*

Left and right shifts on intelligent terminals don't make use of insert and delete character operations in the terminal.

The *wrapmargin* option can be fooled since it looks at output columns when blanks are typed. If a long word passes through the margin and onto the next line without a break, then the line won't be broken.

Insert/delete within a line can be slow if tabs are present on intelligent terminals, since the terminals need help in doing this correctly.

Saving text on deletes in the named buffers is somewhat inefficient.

The *source* command does not work when executed as **:source**; there is no way to use the **:append**, **:change**, and **:insert** commands, since it is not possible to give more than one line of input to a **:** escape. To use these on a **:global** you must **Q** to *ex* command mode, execute them, and then reenter the screen editor with *vi* or *open.*

NAME

vlp − Format Lisp programs to be printed with nroff, vtroff, or troff

SYNOPSIS

vlp [**−p** *pointsize*] [**−d**] [**−f**] [**−l**] [**−v**] [**−T** *title1*] file1 [**−T** *title2*] file2 ...

DESCRIPTION

Vlp formats the named files so that they can be run through nroff, vtroff, or troff to produce listings that line-up and are attractive. The first non-blank character of each line is lined-up vertically, as in the source file. Comments (text beginning with a semicolon) are printed in italics. Each function's name is printed in bold face next to the function. This format makes Lisp code look attractive when it is printed with a variable width font.

Normally, *vlp* works as a filter and sends its output to the standard output. However, the **−v** switch pipes the output directly to vtroff. If no files are specified, then *vlp* reads from the standard input.

The following options are available:

−p The **−p** switch changes the size of the text from its default value of 8 points to one of 6, 8, 10, or 12 points. Once set, the point size is used for all subsequent files. This point size does not apply to embedded text (see *−f* below).

−d The **−d** switch puts *vlp* into debugging mode.

−f *Vlp* has a filtered mode in which all lines are passed unmodified, except those lines between the directives **.Ls** and **.Le**. This mode can be used to format Lisp code that is embedded in a document. The directive **.Ls** takes an optional argument that gives the point size for the embedded code. If not size is specified, the size of the surrounding text is used.

−l The **−l** switch prevents *vlp* from placing labels next to functions. This switch is useful for embedded Lisp code, where the labels would be distracting.

−v This switch cause *vlp* to send its output to vtroff rather than the standard output.

−T A title to be printed on each page may be specified by using the **−T** switch. The **−T** switch applies only to the next file name given. Titles are not printed for embedded text (see **−f**, above). This switch may not be used if *vlp* is reading from the standard input.

FILES

/usr/lib/vlpmacs	troff/nroff macros

AUTHOR

Originally written by John K. Foderaro, with additional changes by Kevin Layer and James Larus.

SEE ALSO

vgrind(1), lisp(1)

BUGS

vlp transforms \ into \\ so that it will be printed out. Hence, troff commands cannot be embedded in Lisp code.

NAME

vmstat − report virtual memory statistics

SYNOPSIS

vmstat [**−fs**] [interval [count]]

DESCRIPTION

Vmstat delves into the system and normally reports certain statistics kept about process, virtual memory, disk, trap and cpu activity. If given a **−f** argument, it instead reports on the number of *forks* and *vforks* since system startup and the number of pages of virtual memory involved in each kind of fork. If given a **−s** argument, it instead prints the contents of the *sum* structure, giving the total number of several kinds of paging related events which have occurred since boot.

If none of these options are given, *vmstat* will report in the first line a summary of the virtual memory activity since the system has been booted. If *interval* is specified, then successive lines are summaries over the last *interval* seconds. "vmstat 5" will print what the system is doing every five seconds; this is a good choice of printing interval since this is how often some of the statistics are sampled in the system; others vary every second, running the output for a while will make it apparent which are recomputed every second. If a *count* is given, the statistics are repeated *count* times. The format fields are:

Procs: information about numbers of processes in various states.

r	in run queue
b	blocked for resources (i/o, paging, etc.)
w	runnable or short sleeper (< 20 secs) but swapped

Memory: information about the usage of virtual and real memory. Virtual pages are considered active if they belong to processes which are running or have run in the last 20 seconds. A "page" here is 1024 bytes.

avm	active virtual pages
fre	size of the free list

Page: information about page faults and paging activity. These are averaged each five seconds, and given in units per second.

re	page reclaims (simulating reference bits)
pi	pages paged in
po	pages paged out
fr	pages freed per second
de	anticipated short term memory shortfall
sr	pages scanned by clock algorithm, per-second

up/hp/rk: Disk operations per second (this field is system dependent). Typically paging will be split across several of the available drives. The number under each of these is the unit number.

Faults: trap/interrupt rate averages per second over last 5 seconds.

in	(non clock) device interrupts per second
sy	system calls per second
cs	cpu context switch rate (switches/sec)

Cpu: breakdown of percentage usage of CPU time

us	user time for normal and low priority processes
sy	system time
id	cpu idle

FILES

/dev/kmem, /vmunix

SEE ALSO

The sections starting with "Interpreting system activity" in *Installing and Operating 4.2bsd.*

AUTHORS

William Joy and Ozalp Babaoglu

BUGS

There should be a screen oriented program which combines *vmstat* and *ps*(1) in real time as well as reporting on other system activity.

NAME

vpr, vprm, vpq, vprint − raster printer/plotter spooler

SYNOPSIS

vpr [**−W**] [**−l**] [**−v**] [**−t** [**−1234** font]] [**−w**] [**−w***width*] [**−m**] [name ...]
vprm [id ...] [filename ...] [owner ...]
vpq
vprint [**−W**] file ...

DESCRIPTION

Vpr causes the named files to be queued for printing or typeset simulation on one of the available raster printer/plotters. If no files are named, the standard input is read. By default the input is assumed to be line printer-like text. For very wide plotters, the input is run through the filter */usr/lib/sidebyside* giving it an argument of **−w106** which arranges it four pages adjacent with 90 column lines (the rest is for the left margin). Since there are 8 lines per inch in the default printer font, *vpr* thus produces 86 lines per page (the top and bottom lines are left blank).

The following options are available:

−l Print the input in a more literal manner. Page breaks are not inserted, and most control characters (except format effectors: \n, \f, etc.) are printed (many control characters print special graphics not in the ASCII character set.) Tab and underline processing is still done. If this option is not given, control characters which are not format effectors are ignored, and page breaks are inserted after an appropriate number of lines have been printed on a page.

−W Queues files for printing on a wide output device, if available. Normally, files are queued for printing on a narrow output device.

−1234 Specifies a font to be mounted on font position *i*. The daemon will construct a *.railmag* file referencing */usr/lib/vfont/name.size*.

−m Report by *mail*(1) when printing is complete.

−w (Applicable only to wide output devices.) Do not run the input through sidebyside. Such processing has been done already, or full (440 character) printer width is desired.

−w*width* Use width *width* rather than 90 for *sidebyside*.

−v Use the filter */usr/lib/vrast* to convert the vectors to raster. The named files must be a parameter and vector file (in that order) created by *plot*(3X) routines.

−t Use the filter */usr/lib/vcat* to typeset the input on the printer/plotter. The input must have been generated by *troff*(1) run with the **−t** option. This is not normally run directly to wide output devices, since it is wasteful to run only one page across. The program *vtroff*(1) is normally used and arranges, using *vsort* for printing to occur four pages across, conserving paper.

Vprm removes entries from the raster device queues. The id, filename or owner should be that reported by *vpq*. All appropriate files will be removed. Both queues are always searched. The id of each file removed from the queue will be printed.

Vpq prints the queues. Each entry in the queue is printed showing the owner of the queue entry, an identification number, the size of the entry in characters, and the file which is to be printed. The *id* is useful for removing a specific entry from the printer queue using *vprm*

Vprint is a shell script which *pr's* a copy of each named file on one of the electrostatic printer/plotters. The files are normally printed on a narrow device; **−W** option causes them to be printed on a wide device.

FILES

/usr/spool/v?d/*	device spool areas
/usr/lib/v?d	daemons
/usr/lib/vpd	Versatec daemon
/usr/lib/vpf	filter for printer simulation
/usr/lib/*vcat	filter for typeset simulation
/usr/lib/vrast	filter for plot
/usr/lib/sidebyside	filter for wide output

SEE ALSO

troff(1), vfont(5), vp(4), pti(1), vtroff(1), plot(3X)

BUGS

The 1's (one's) and l's (lower-case el's) in a Benson-Varian's standard character set look very similar; caution is advised.

A versatec's hardware character set is rather ugly. *Vprint* should use one of the constant width fonts to produce prettier listings.

NAME

vtroff − troff to a raster plotter

SYNOPSIS

vtroff [**−w**] [**−F** majorfont] [**−123** minorfont] [**−l***length*] [**−x**] troff arguments

DESCRIPTION

Vtroff runs *troff*(1) sending its output through various programs to produce typeset output on a raster plotter such as a Benson-Varian or or a Versatec. The **−W** option specifies that a wide output device be used; the default is to use a narrow device. The **−l** (lower case l) option causes the output to be split onto successive pages every *length* inches rather than the default 11".

The default font is a Hershey font. If some other font is desired you can give a **−F** argument and then the font name. This will place normal, italic and bold versions of the font on positions 1, 2, and 3. To place a font only on a single position, you can give an argument of the form **−***n* and the minor font name. A **.r** will be added to the minor font name if needed. Thus "vtroff −ms paper" will set a paper in the Hershey font, while "vtroff −F nonie −ms paper" will set the paper in the (sans serif) nonie font. The **−x** option asks for exact simulation of photo-typesetter output. (I.e. using the width tables for the C.A.T. photo-typesetter)

FILES

/usr/lib/tmac/tmac.vcat	default font mounts and bug fixes
/usr/lib/fontinfo/*	fixes for other fonts
/usr/lib/vfont	directory containing fonts

SEE ALSO

troff(1), vfont(5), vpr(1)

BUGS

Since some macro packages work correctly only if the fonts named R, I, B, and S are mounted, and since the Versatec fonts have different widths for individual characters than the fonts found on the typesetter, the following dodge was necessary: If you don't use the ".fp" troff directive then you get the widths of the standard typesetter fonts suitable for shipping the output of troff over the network to the computer center A machine for phototypesetting. If, however, you remount the R, I, B and S fonts, then you get the width tables for the Versatec.

NAME

vwidth − make troff width table for a font

SYNOPSIS

vwidth fontfile pointsize > ft*xx*.c
cc -c ft*xx*.c mv ft*xx*.o /usr/lib/font/ft*xx*

DESCRIPTION

Vwidth translates from the width information stored in the vfont style format to the format expected by troff. Troff wants an object file in a.out(5) format. (This fact does not seem to be documented anywhere.) Troff should look directly in the font file but it doesn't.

Vwidth should be used after editing a font with *fed(1)*. It is not necessary to use vwidth unless you have made a change that would affect the width tables. Such changes include numerically editing the width field, adding a new character, and moving or copying a character to a new position. It is *not* always necessary to use vwidth if the physical width of the glyph (e.g. the number of columns in the bit matrix) has changed, but if it has changed much the logical width should probably be changed and vwidth run.

Vwidth produces a C program on its standard output. This program should be run through the C compiler and the object (that is, the .o file) saved. The resulting file should be placed in /usr/lib/font in the file ft*xx* where is a one or two letter code that is the logical (internal to troff) font name. This name can be found by looking in the file /usr/lib/fontinfo/*fname** where *fname* is the external name of the font.

SEE ALSO

fed(1), vfont(5), troff(1), vtroff(1)

BUGS

Produces the C file using obsolete syntax that the portable C compiler complains about.

NAME

w — who is on and what they are doing

SYNOPSIS

w [−h] [−s] [user **]**

DESCRIPTION

W prints a summary of the current activity on the system, including what each user is doing. The heading line shows the current time of day, how long the system has been up, the number of users logged into the system, and the load averages. The load average numbers give the number of jobs in the run queue averaged over 1, 5 and 15 minutes.

The fields output are: the users login name, the name of the tty the user is on, the time of day the user logged on, the number of minutes since the user last typed anything, the CPU time used by all processes and their children on that terminal, the CPU time used by the currently active processes, the name and arguments of the current process.

The **−h** flag suppresses the heading. The **−s** flag asks for a short form of output. In the short form, the tty is abbreviated, the login time and cpu times are left off, as are the arguments to commands. **−l** gives the long output, which is the default.

If a *user* name is included, the output will be restricted to that user.

FILES

/etc/utmp
/dev/kmem
/dev/drum

SEE ALSO

who(1), finger(1), ps(1)

AUTHOR

Mark Horton

BUGS

The notion of the "current process" is muddy. The current algorithm is "the highest numbered process on the terminal that is not ignoring interrupts, or, if there is none, the highest numbered process on the terminal". This fails, for example, in critical sections of programs like the shell and editor, or when faulty programs running in the background fork and fail to ignore interrupts. (In cases where no process can be found, *w* prints "−".)

The CPU time is only an estimate, in particular, if someone leaves a background process running after logging out, the person currently on that terminal is "charged" with the time.

Background processes are not shown, even though they account for much of the load on the system.

Sometimes processes, typically those in the background, are printed with null or garbaged arguments. In these cases, the name of the command is printed in parentheses.

W does not know about the new conventions for detection of background jobs. It will sometimes find a background job instead of the right one.

NAME

wait — await completion of process

SYNOPSIS

wait

DESCRIPTION

Wait until all processes started with **&** have completed, and report on abnormal terminations.

Because the *wait*(2) system call must be executed in the parent process, the Shell itself executes *wait*, without creating a new process.

SEE ALSO

sh(1)

BUGS

Not all the processes of a 3- or more-stage pipeline are children of the Shell, and thus can't be waited for. (This bug does not apply to *csh*(1).)

NAME

wall – write to all users

SYNOPSIS

wall

DESCRIPTION

Wall reads its standard input until an end-of-file. It then sends this message, preceded by 'Broadcast Message ...', to all logged in users.

The sender should be super-user to override any protections the users may have invoked.

FILES

/dev/tty?
/etc/utmp

SEE ALSO

mesg(1), write(1)

DIAGNOSTICS

'Cannot send to ...' when the open on a user's tty file fails.

NAME

wc − word count

SYNOPSIS

wc [−**lwc**] [name ...]

DESCRIPTION

Wc counts lines, words and characters in the named files, or in the standard input if no name appears. A word is a maximal string of characters delimited by spaces, tabs or newlines.

If an argument beginning with one of "lwc" is present, the specified counts (lines, words, or characters) are selected by the letters **l**, **w**, or **c**. The default is −**lwc**.

BUGS

NAME

what − show what versions of object modules were used to construct a file

SYNOPSIS

what name ...

DESCRIPTION

What reads each file and searches for sequences of the form "@(#)" as inserted by the source code control system. It then prints the remainder of the string after this marker, up to a null character, newline, double quote, or ">" character.

BUGS

As SCCS is not licensed with UNIX/32V, this is a rewrite of the *what* command which is part of SCCS, and may not behave exactly the same as that command does.

NAME

whatis — describe what a command is

SYNOPSIS

whatis command ...

DESCRIPTION

Whatis looks up a given command and gives the header line from the manual section. You can then run the *man*(1) command to get more information. If the line starts 'name(section) ...' you can do 'man section name' to get the documentation for it. Try 'whatis ed' and then you should do 'man 1 ed' to get the manual.

Whatis is actually just the **−f** option to the *man*(1) command.

FILES

/usr/lib/whatis Data base

SEE ALSO

man(1), catman(8)

AUTHOR

William Joy

NAME

whereis − locate source, binary, and or manual for program

SYNOPSIS

whereis [**−sbm**] [**−u**] [**−SBM** dir ... **−f**] name ...

DESCRIPTION

Whereis locates source/binary and manuals sections for specified files. The supplied names are first stripped of leading pathname components and any (single) trailing extension of the form ".ext", e.g. ".c". Prefixes of "s." resulting from use of source code control are also dealt with. *Whereis* then attempts to locate the desired program in a list of standard places. If any of the **−b, −s** or **−m** flags are given then *whereis* searches only for binaries, sources or manual sections respectively (or any two thereof). The **−u** flag may be used to search for unusual entries. A file is said to be unusual if it does not have one entry of each requested type. Thus "whereis -m -u *" asks for those files in the current directory which have no documentation.

Finally, the **−B −M** and **−S** flags may be used to change or otherwise limit the places where *whereis* searches. The **−f** file flags is used to terminate the last such directory list and signal the start of file names.

EXAMPLE

The following finds all the files in /usr/bin which are not documented in /usr/man/man1 with source in /usr/src/cmd:

```
cd /usr/ucb
whereis −u −M /usr/man/man1 −S /usr/src/cmd −f *
```

FILES

/usr/src/*
/usr/{doc,man}/*
/lib, /etc, /usr/{lib,bin,ucb,old,new,local}

AUTHOR

William Joy

BUGS

Since the program uses *chdir*(2) to run faster, pathnames given with the **−M −S** and **−B** must be full; i.e. they must begin with a "/".

NAME

which — locate a program file including aliases and paths (*csh* only)

SYNOPSIS

which [name] ...

DESCRIPTION

Which takes a list of names and looks for the files which would be executed had these names been given as commands. Each argument is expanded if it is aliased, and searched for along the user's path. Both aliases and path are taken from the user's .cshrc file.

FILES

~/.cshrc source of aliases and path values

DIAGNOSTICS

A diagnostic is given for names which are aliased to more than a single word, or if an executable file with the argument name was not found in the path.

BUGS

Must be executed by a csh, since only csh's know about aliases.

NAME

who − who is on the system

SYNOPSIS

who [who-file] [**am I**]

DESCRIPTION

Who, without an argument, lists the login name, terminal name, and login time for each current UNIX user.

Without an argument, *who* examines the */etc/utmp* file to obtain its information. If a file is given, that file is examined. Typically the given file will be /usr/adm/wtmp, which contains a record of all the logins since it was created. Then *who* lists logins, logouts, and crashes since the creation of the wtmp file. Each login is listed with user name, terminal name (with '/dev/' suppressed), and date and time. When an argument is given, logouts produce a similar line without a user name. Reboots produce a line with 'x' in the place of the device name, and a fossil time indicative of when the system went down.

With two arguments, as in 'who am I' (and also 'who are you'), *who* tells who you are logged in as.

FILES

/etc/utmp

SEE ALSO

getuid(2), utmp(5)

NAME

whoami — print effective current user id

SYNOPSIS

whoami

DESCRIPTION

Whoami prints who you are. It works even if you are su'd, while 'who am i' does not since it uses /etc/utmp.

FILES

/etc/passwd Name data base

SEE ALSO

who (1)

NAME

write – write to another user

SYNOPSIS

write user [ttyname]

DESCRIPTION

Write copies lines from your terminal to that of another user. When first called, it sends the message

Message from yoursystem!yourname yourttyname...

The recipient of the message should write back at this point. Communication continues until an end of file is read from the terminal or an interrupt is sent. At that point *write* writes 'EOT' on the other terminal and exits.

If you want to write to a user who is logged in more than once, the *ttyname* argument may be used to indicate the appropriate terminal name.

Permission to write may be denied or granted by use of the *mesg* command. At the outset writing is allowed. Certain commands, in particular *nroff* and *pr*(1) disallow messages in order to prevent messy output.

If the character '!' is found at the beginning of a line, *write* calls the shell to execute the rest of the line as a command.

The following protocol is suggested for using *write*: when you first write to another user, wait for him to write back before starting to send. Each party should end each message with a distinctive signal—**(o)** for 'over' is conventional—that the other may reply. **(oo)** for 'over and out' is suggested when conversation is about to be terminated.

FILES

/etc/utmp	to find user
/bin/sh	to execute '!'

SEE ALSO

mesg(1), who(1), mail(1)

NAME

xsend, xget, enroll – secret mail

SYNOPSIS

xsend person
xget
enroll

DESCRIPTION

These commands implement a secure communication channel; it is like *mail*(1), but no one can read the messages except the intended recipient. The method embodies a public-key cryptosystem using knapsacks.

To receive messages, use *enroll*; it asks you for a password that you must subsequently quote in order to receive secret mail.

To receive secret mail, use *xget*. It asks for your password, then gives you the messages.

To send secret mail, use *xsend* in the same manner as the ordinary mail command. (However, it will accept only one target). A message announcing the receipt of secret mail is also sent by ordinary mail.

FILES

/usr/spool/secretmail/*.key: keys
/usr/spool/secretmail/*.[0-9]: messages

SEE ALSO

mail (1)

BUGS

It should be integrated with ordinary mail. The announcement of secret mail makes traffic analysis possible.

NAME

xstr − extract strings from C programs to implement shared strings

SYNOPSIS

xstr [**−c**] [−] [file]

DESCRIPTION

Xstr maintains a file *strings* into which strings in component parts of a large program are hashed. These strings are replaced with references to this common area. This serves to implement shared constant strings, most useful if they are also read-only.

The command

xstr −c name

will extract the strings from the C source in name, replacing string references by expressions of the form (&xstr[number]) for some number. An appropriate declaration of *xstr* is prepended to the file. The resulting C text is placed in the file *x.c*, to then be compiled. The strings from this file are placed in the *strings* data base if they are not there already. Repeated strings and strings which are suffices of existing strings do not cause changes to the data base.

After all components of a large program have been compiled a file *xs.c* declaring the common *xstr* space can be created by a command of the form

xstr

This *xs.c* file should then be compiled and loaded with the rest of the program. If possible, the array can be made read-only (shared) saving space and swap overhead.

Xstr can also be used on a single file. A command

xstr name

creates files *x.c* and *xs.c* as before, without using or affecting any *strings* file in the same directory.

It may be useful to run *xstr* after the C preprocessor if any macro definitions yield strings or if there is conditional code which contains strings which may not, in fact, be needed. *Xstr* reads from its standard input when the argument '−' is given. An appropriate command sequence for running *xstr* after the C preprocessor is:

```
cc −E name.c | xstr −c −
cc −c x.c
mv x.o name.o
```

Xstr does not touch the file *strings* unless new items are added, thus *make* can avoid remaking *xs.o* unless truly necessary.

FILES

strings	Data base of strings
x.c	Massaged C source
xs.c	C source for definition of array 'xstr'
/tmp/xs*	Temp file when 'xstr name' doesn't touch *strings*

SEE ALSO

mkstr(1)

AUTHOR

William Joy

BUGS

If a string is a suffix of another string in the data base, but the shorter string is seen first by *xstr* both strings will be placed in the data base, when just placing the longer one there will do.

NAME

yacc − yet another compiler-compiler

SYNOPSIS

yacc [**−vd**] grammar

DESCRIPTION

Yacc converts a context-free grammar into a set of tables for a simple automaton which executes an LR(1) parsing algorithm. The grammar may be ambiguous; specified precedence rules are used to break ambiguities.

The output file, *y.tab.c*, must be compiled by the C compiler to produce a program *yyparse*. This program must be loaded with the lexical analyzer program, *yylex*, as well as *main* and *yyerror*, an error handling routine. These routines must be supplied by the user; *Lex*(1) is useful for creating lexical analyzers usable by *yacc*.

If the **−v** flag is given, the file *y.output* is prepared, which contains a description of the parsing tables and a report on conflicts generated by ambiguities in the grammar.

If the **−d** flag is used, the file *y.tab.h* is generated with the *define* statements that associate the *yacc*-assigned 'token codes' with the user-declared 'token names'. This allows source files other than *y.tab.c* to access the token codes.

FILES

y.output	
y.tab.c	
y.tab.h	defines for token names
yacc.tmp, yacc.acts	temporary files
/usr/lib/yaccpar	parser prototype for C programs

SEE ALSO

lex(1)
LR Parsing by A. V. Aho and S. C. Johnson, Computing Surveys, June, 1974.
YACC − Yet Another Compiler Compiler by S. C. Johnson.

DIAGNOSTICS

The number of reduce-reduce and shift-reduce conflicts is reported on the standard output; a more detailed report is found in the *y.output* file. Similarly, if some rules are not reachable from the start symbol, this is also reported.

BUGS

Because file names are fixed, at most one *yacc* process can be active in a given directory at a time.

NAME

yes − be repetitively affirmative

SYNOPSIS

yes [*expletive*]

DESCRIPTION

Yes repeatedly outputs "y", or if *expletive* is given, that is output repeatedly. Termination is by rubout.

NAME

aardvark – yet another exploration game

SYNOPSIS

/usr/games/aardvark

DESCRIPTION

Aardvark is yet another computer fantasy simulation game of the adventure/zork genre. This one is written in DDL (Dungeon Definition Language) and is intended primarily as an example of how to write a dungeon in DDL.

FILES

/usr/games/lib/ddlrun ddl interpreter
/usr/games/lib/aardvarkinternal form of aardvark dungeon

AUTHOR

Mike Urban, UCLA

NAME

adventure — an exploration game

SYNOPSIS

/usr/games/adventure

DESCRIPTION

The object of the game is to locate and explore Colossal Cave, find the treasures hidden there, and bring them back to the building with you. The program is self-describing to a point, but part of the game is to discover its rules.

To terminate a game, type 'quit'; to save a game for later resumption, type 'suspend'.

BUGS

Saving a game creates a large executable file instead of just the information needed to resume the game.

NAME

arithmetic – provide drill in number facts

SYNOPSIS

/usr/games/arithmetic [**+−x/**] [range]

DESCRIPTION

Arithmetic types out simple arithmetic problems, and waits for an answer to be typed in. If the answer is correct, it types back "Right!", and a new problem. If the answer is wrong, it replies "What?", and waits for another answer. Every twenty problems, it publishes statistics on correctness and the time required to answer.

To quit the program, type an interrupt (delete).

The first optional argument determines the kind of problem to be generated; **+−x/** respectively cause addition, subtraction, multiplication, and division problems to be generated. One or more characters can be given; if more than one is given, the different types of problems will be mixed in random order; default is **+−**

Range is a decimal number; all addends, subtrahends, differences, multiplicands, divisors, and quotients will be less than or equal to the value of *range*. Default *range* is 10.

At the start, all numbers less than or equal to *range* are equally likely to appear. If the respondent makes a mistake, the numbers in the problem which was missed become more likely to reappear.

As a matter of educational philosophy, the program will not give correct answers, since the learner should, in principle, be able to calculate them. Thus the program is intended to provide drill for someone just past the first learning stage, not to teach number facts *de novo*. For almost all users, the relevant statistic should be time per problem, not percent correct.

NAME

backgammon — the game

SYNOPSIS

/usr/games/backgammon

DESCRIPTION

This program does what you expect. It will ask whether you need instructions.

NAME

banner − print large banner on printer

SYNOPSIS

/usr/games/banner [−w*n*] message ...

DESCRIPTION

Banner prints a large, high quality banner on the standard output. If the message is omitted, it prompts for and reads one line of its standard input. If −w is given, the output is scrunched down from a width of 132 to *n* , suitable for a narrow terminal. If *n* is omitted, it defaults to 80.

The output should be printed on a hard-copy device, up to 132 columns wide, with no breaks between the pages. The volume is enough that you want a printer or a fast hardcopy terminal, but if you are patient, a decwriter or other 300 baud terminal will do.

BUGS

Several ASCII characters are not defined, notably <, >, [,], \, ^, _, {, }, |, and ~. Also, the characters ", ', and & are funny looking (but in a useful way.)

The −w option is implemented by skipping some rows and columns. The smaller it gets, the grainier the output. Sometimes it runs letters together.

AUTHOR

Mark Horton

NAME

bcd – convert to antique media

SYNOPSIS

/usr/games/bcd text

DESCRIPTION

Bcd converts the literal *text* into a form familiar to old-timers.

SEE ALSO

dd(1)

NAME

boggle − play the game of boggle

SYNOPSIS

/usr/games/boggle [+] [++]

DESCRIPTION

This program is intended for people wishing to sharpen their skills at Boggle (TM Parker Bros.). If you invoke the program with 4 arguments of 4 letters each, (*e.g.* "**boggle appl epie moth erhd**") the program forms the obvious Boggle grid and lists all the words from **/usr/dict/words** found therein. If you invoke the program without arguments, it will generate a board for you, let you enter words for 3 minutes, and then tell you how well you did relative to **/usr/dict/words**.

The object of Boggle is to find, within 3 minutes, as many words as possible in a 4 by 4 grid of letters. Words may be formed from any sequence of 3 or more adjacent letters in the grid. The letters may join horizontally, vertically, or diagonally. However, no position in the grid may be used more than once within any one word. In competitive play amongst humans, each player is given credit for those of his words which no other player has found.

In interactive play, enter your words separated by spaces, tabs, or newlines. A bell will ring when there is 2:00, 1:00, 0:10, 0:02, 0:01, and 0:00 time left. You may complete any word started before the expiration of time. You can surrender before time is up by hitting 'break'. While entering words, your erase character is only effective within the current word and your line kill character is ignored.

Advanced players may wish to invoke the program with 1 or 2 +'s as the first argument. The first + removes the restriction that positions can only be used once in each word. The second + causes a position to be considered adjacent to itself as well as its (up to) 8 neighbors.

NAME

canfield, cfscores — the solitaire card game canfield

SYNOPSIS

/usr/games/canfield
/usr/games/cfscores

DESCRIPTION

If you have never played solitaire before, it is recommended that you consult a solitaire instruction book. In Canfield, tableau cards may be built on each other downward in alternate colors. An entire pile must be moved as a unit in building. Top cards of the piles are available to be able to be played on foundations, but never into empty spaces.

Spaces must be filled from the stock. The top card of the stock also is available to be played on foundations or built on tableau piles. After the stock is exhausted, tableau spaces may be filled from the talon and the player may keep them open until he wishes to use them.

Cards are dealt from the hand to the talon by threes and this repeats until there are no more cards in the hand or the player quits. To have cards dealt onto the talon the player types 'ht' for his move. Foundation base cards are also automatically moved to the foundation when they become available.

The command 'c' causes *canfield* to maintain card counting statistics on the bottom of the screen. When properly used this can greatly increase ones chances of winning.

The rules for betting are somewhat less strict than those used in the official version of the game. The initial deal costs $13. You may quit at this point or inspect the game. Inspection costs $13 and allows you to make as many moves as is possible without moving any cards from your hand to the talon. (the initial deal places three cards on the talon; if all these cards are used, three more are made available.) Finally, if the game seems interesting, you must pay the final installment of $26. At this point you are credited at the rate of $5 for each card on the foundation; as the game progresses you are credited with $5 for each card that is moved to the foundation. Each run through the hand after the first costs $5. The card counting feature costs $1 for each unknown card that is identified. If the information is toggled on, you are only charged for cards that became visible since it was last turned on. Thus the maximum cost of information is $34. Playing time is charged at a rate of $1 per minute.

With no arguments, the program *cfscores* prints out the current status of your canfield account. If a user name is specified, it prints out the status of their canfield account. If the **−a** flag is specified, it prints out the canfield accounts for all users that have played the game since the database was set up.

6

FILES

/usr/games/canfield	the game itself
/usr/games/cfscores	the database printer
/usr/games/lib/cfscores	the database of scores

BUGS

It is impossible to cheat.

AUTHORS

Originally written: Steve Levine
Further random hacking by: Steve Feldman, Kirk McKusick, Mikey Olson, and Eric Allman.

NAME

chess — the game of chess

SYNOPSIS

/usr/games/chess

DESCRIPTION

Chess is a computer program that plays class D chess. Moves may be given either in standard (descriptive) notation or in algebraic notation. The symbol '+' is used to specify check; 'o-o' and 'o-o-o' specify castling. To play black, type 'first'; to print the board, type an empty line.

Each move is echoed in the appropriate notation followed by the program's reply.

FILES

/usr/lib/chess binary image to run in compatibility mode

DIAGNOSTICS

The most cryptic diagnostic is 'eh?' which means that the input was syntactically incorrect.

BUGS

Pawns may be promoted only to queens.

NAME

ching — the book of changes and other cookies

SYNOPSIS

/usr/games/ching [hexagram]

DESCRIPTION

The *I Ching* or *Book of Changes* is an ancient Chinese oracle that has been in use for centuries as a source of wisdom and advice.

The text of the *oracle* (as it is sometimes known) consists of sixty-four *hexagrams,* each symbolized by a particular arrangement of six straight (———) and broken (— —) lines. These lines have values ranging from six through nine, with the even values indicating the broken lines.

Each hexagram consists of two major sections. The **Judgement** relates specifically to the matter at hand (E.g., "It furthers one to have somewhere to go.") while the **Image** describes the general attributes of the hexagram and how they apply to one's own life ("Thus the superior man makes himself strong and untiring.").

When any of the lines have the values six or nine, they are moving lines; for each there is an appended judgement which becomes significant. Furthermore, the moving lines are inherently unstable and change into their opposites; a second hexagram (and thus an additional judgement) is formed.

Normally, one consults the oracle by fixing the desired question firmly in mind and then casting a set of changes (lines) using yarrow—stalks or tossed coins. The resulting hexagram will be the answer to the question.

Using an algorithm suggested by S. C. Johnson, the UNIX *oracle* simply reads a question from the standard input (up to an EOF) and hashes the individual characters in combination with the time of day, process id and any other magic numbers which happen to be lying around the system. The resulting value is used as the seed of a random number generator which drives a simulated coin—toss divination. The answer is then piped through **nroff** for formatting and will appear on the standard output.

For those who wish to remain steadfast in the old traditions, the oracle will also accept the results of a personal divination using, for example, coins. To do this, cast the change and then type the resulting line values as an argument.

The impatient modern may prefer to settle for Chinese cookies; try *fortune*(6).

SEE ALSO

It furthers one to see the great man.

DIAGNOSTICS

The great prince issues commands,
Founds states, vests families with fiefs.
Inferior people should not be employed.

BUGS

Waiting in the mud
Brings about the arrival of the enemy.

If one is not extremely careful,
Somebody may come up from behind and strike him.
Misfortune.

NAME

cribbage — the card game cribbage

SYNOPSIS

/usr/games/cribbage [−req] *name ...*

DESCRIPTION

Cribbage plays the card game cribbage, with the program playing one hand and the user the other. The program will initially ask the user if the rules of the game are needed — if so, it will print out the appropriate section from *According to Hoyle* with *more (I)*.

Cribbage options include:

−e When the player makes a mistakes scoring his hand or crib, provide an explanation of the correct score. (This is especially useful for beginning players.)

−q Print a shorter form of all messages — this is only recommended for users who have played the game without specifying this option.

−r Instead of asking the player to cut the deck, the program will randomly cut the deck.

Cribbage first asks the player whether he wishes to play a short game ("once around", to 61) or a long game ("twice around", to 121). A response of 's' will result in a short game, any other response will play a long game.

At the start of the first game, the program asks the player to cut the deck to determine who gets the first crib. The user should respond with a number between 0 and 51, indicating how many cards down the deck is to be cut. The player who cuts the lower ranked card gets the first crib. If more than one game is played, the loser of the previous game gets the first crib in the current game.

For each hand, the program first prints the player's hand, whose crib it is, and then asks the player to discard two cards into the crib. The cards are prompted for one per line, and are typed as explained below.

After discarding, the program cuts the deck (if it is the player's crib) or asks the player to cut the deck (if it's its crib); in the later case, the appropriate response is a number from 0 to 39 indicating how far down the remaining 40 cards are to be cut.

After cutting the deck, play starts with the non-dealer (the person who doesn't have the crib) leading the first card. Play continues, as per cribbage, until all cards are exhausted. The program keeps track of the scoring of all points and the total of the cards on the table.

After play, the hands are scored. The program requests the player to score his hand (and the crib, if it is his) by printing out the appropriate cards (and the cut card enclosed in brackets). Play continues until one player reaches the game limit (61 or 121).

A carriage return when a numeric input is expected is equivalent to typing the lowest legal value; when cutting the deck this is equivalent to choosing the top card.

Cards are specified as rank followed by suit. The ranks may be specified as one of: 'a', '2', '3', '4', '5', '6', '7', '8', '9', 't', 'j', 'q', and 'k', or alternatively, one of: "ace", "two", "three", "four", "five", "six", "seven", "eight", "nine", "ten", "jack", "queen", and "king". Suits may be specified as: 's', 'h', 'd', and 'c', or alternatively as: "spades", "hearts", "diamonds", and "clubs". A card may be specified as: <rank> " " <suit>, or: <rank> " of " <suit>. If the single letter rank and suit designations are used, the space separating the suit and rank may be left out. Also, if only one card of the desired rank is playable, typing the rank is sufficient. For example, if your hand was "2H, 4D, 5C, 6H, JC, KD" and it was desired to discard the king of diamonds, any of the following could be typed: "k", "king", "kd", "k d", "k of d", "king d", "king of d", "k diamonds", "k of diamonds", "king diamonds", or "king of diamonds".

FILES

/usr/games/cribbage

AUTHORS

Earl T. Cohen wrote the logic. Ken Arnold added the screen oriented interface.

NAME

doctor — interact with a psychoanalyst

SYNOPSIS

/usr/games/doctor

DESCRIPTION

Doctor is a lisp-language version of the legendary ELIZA program of Joseph Weizenbaum. This script "simulates" a Rogerian psychoanalyst. Type in lower case, and when you get tired or bored, type your interrupt character (either control-C or Rubout). Remember to type two carriage returns when you want it to answer.

In order to run this you must have a Franz Lisp system in /usr/ucb/lisp.

AUTHORS

Adapted for Lisp by Jon L White, moved to Franz by John Foderaro, from an original script by Joseph Weizenbaum.

NAME

fish – play "Go Fish"

SYNOPSIS

/usr/games/fish

DESCRIPTION

Fish plays the game of "Go Fish", a childrens' card game. The Object is to accumulate 'books' of 4 cards with the same face value. The players alternate turns; each turn begins with one player selecting a card from his hand, and asking the other player for all cards of that face value. If the other player has one or more cards of that face value in his hand, he gives them to the first player, and the first player makes another request. Eventually, the first player asks for a card which is not in the second player's hand: he replies 'GO FISH!' The first player then draws a card from the 'pool' of undealt cards. If this is the card he had last requested, he draws again. When a book is made, either through drawing or requesting, the cards are laid down and no further action takes place with that face value.

To play the computer, simply make guesses by typing a, 2, 3, 4, 5, 6, 7, 8, 9, 10, j, q, or k when asked. Hitting return gives you information about the size of my hand and the pool, and tells you about my books. Saying 'p' as a first guess puts you into 'pro' level; The default is pretty dumb.

NAME

fortune – print a random, hopefully interesting, adage

SYNOPSIS

/usr/games/fortune [–] [–wslao]

DESCRIPTION

Fortune with no arguments prints out a random adage. The flags mean:

–w Waits before termination for an amount of time calculated from the number of characters in the message. This is useful if it is executed as part of the logout procedure to guarantee that the message can be read before the screen is cleared.

–s Short messages only.

–l Long messages only.

–o Choose from an alternate list of adages, often used for potentially offensive ones.

–a Choose from either list of adages.

FILES

/usr/games/lib/fortunes.dat

AUTHOR

Ken Arnold

NAME

hangman — Computer version of the game hangman

SYNOPSIS

/usr/games/hangman

DESCRIPTION

In *hangman,* the computer picks a word from the on-line word list and you must try to guess it. The computer keeps track of which letters have been guessed and how many wrong guesses you have made on the screen in a graphic fashion.

FILES

/usr/dict/words On-line word list

AUTHOR

Ken Arnold

NAME

mille – play Mille Bournes

SYNOPSIS

/usr/games/mille [file]

DESCRIPTION

Mille plays a two-handed game reminiscent of the Parker Brother's game of Mille Bournes with you. The rules are described below. If a file name is given on the command line, the game saved in that file is started.

When a game is started up, the bottom of the score window will contain a list of commands. They are:

P Pick a card from the deck. This card is placed in the 'P' slot in your hand.

D Discard a card from your hand. To indicate which card, type the number of the card in the hand (or "P" for the just-picked card) followed by a <RETURN> or <SPACE>. The <RETURN or <SPACE> is required to allow recovery from typos which can be very expensive, like discarding safeties.

U Use a card. The card is again indicated by its number, followed by a <RETURN> or <SPACE>.

O Toggle ordering the hand. By default off, if turned on it will sort the cards in your hand appropriately. This is not recommended for the impatient on slow terminals.

Q Quit the game. This will ask for confirmation, just to be sure. Hitting <DELETE> (or <RUBOUT>) is equivalent.

S Save the game in a file. If the game was started from a file, you will be given an opportunity to save it on the same file. If you don't wish to, or you did not start from a file, you will be asked for the file name. If you type a <RETURN> without a name, the save will be terminated and the game resumed.

R Redraw the screen from scratch. The command ^L (control 'L') will also work.

W Toggle window type. This switches the score window between the startup window (with all the command names) and the end-of-game window. Using the end-of-game window saves time by eliminating the switch at the end of the game to show the final score. Recommended for hackers and other miscreants.

If you make a mistake, an error message will be printed on the last line of the score window, and a bell will beep.

At the end of each hand or game, you will be asked if you wish to play another. If not, it will ask you if you want to save the game. If you do, and the save is unsuccessful, play will be resumed as if you had said you wanted to play another hand/game. This allows you to use the "S" command to reattempt the save.

AUTHOR

Ken Arnold
(The game itself is a product of Parker Brothers, Inc.)

SEE ALSO

curses(3X), *Screen Updating and Cursor Movement Optimization: A Library Package*, Ken Arnold

CARDS

Here is some useful information. The number in parentheses after the card name is the number of that card in the deck:

Hazard	Repair	Safety
Out of Gas (2)	Gasoline (6)	Extra Tank (1)
Flat Tire (2)	Spare Tire (6)	Puncture Proof (1)
Accident (2)	Repairs (6)	Driving Ace (1)
Stop (4)	Go (14)	Right of Way (1)
Speed Limit (3)	End of Limit (6)	

25 – (10), 50 – (10), 75 – (10), 100 – (12), 200 – (4)

RULES

Object: The point of game is to get a total of 5000 points in several hands. Each hand is a race to put down exactly 700 miles before your opponent does. Beyond the points gained by putting down milestones, there are several other ways of making points.

Overview: The game is played with a deck of 101 cards. *Distance* cards represent a number of miles traveled. They come in denominations of 25, 50, 75, 100, and 200. When one is played, it adds that many miles to the player's trip so far this hand. *Hazard* cards are used to prevent your opponent from putting down Distance cards. They can only be played if your opponent has a *Go* card on top of the Battle pile. The cards are *Out of Gas*, *Accident*, *Flat Tire*, *Speed Limit*, and *Stop*. *Remedy* cards fix problems caused by Hazard cards played on you by your opponent. The cards are *Gasoline*, *Repairs*, *Spare Tire*, *End of Limit*, and *Go*. *Safety* cards prevent your opponent from putting specific Hazard cards on you in the first place. They are *Extra Tank*, *Driving Ace*, *Puncture Proof*, and *Right of Way*, and there are only one of each in the deck.

Board Layout: The board is split into several areas. From top to bottom, they are: **SAFETY AREA** (unlabeled): This is where the safeties will be placed as they are played. **HAND**: These are the cards in your hand. **BATTLE**: This is the Battle pile. All the Hazard and Remedy Cards are played here, except the *Speed Limit* and *End of Limit* cards. Only the top card is displayed, as it is the only effective one. **SPEED**: The Speed pile. The *Speed Limit* and *End of Limit* cards are played here to control the speed at which the player is allowed to put down miles. **MILEAGE**: Miles are placed here. The total of the numbers shown here is the distance traveled so far.

Play: The first pick alternates between the two players. Each turn usually starts with a pick from the deck. The player then plays a card, or if this is not possible or desirable, discards one. Normally, a play or discard of a single card constitutes a turn. If the card played is a safety, however, the same player takes another turn immediately.

This repeats until one of the players reaches 700 points or the deck runs out. If someone reaces 700, they have the option of going for an *Extension*, which means that the play continues until someone reaches 1000 miles.

Hazard and Remedy Cards: Hazard Cards are played on your opponent's Battle and Speed piles. Remedy Cards are used for undoing the effects of your opponent's nastyness.

Go (Green Light) must be the top card on your Battle pile for you to play any mileage, unless you have played the *Right of Way* card (see below).

Stop is played on your opponent's *Go* card to prevent them from playing mileage until they play a *Go* card.

Speed Limit is played on your opponent's Speed pile. Until they play an *End of Limit* they can only play 25 or 50 mile cards, presuming their *Go* card allows them to do even that.

End of Limit is played on your Speed pile to nullify a *Speed Limit* played by your opponent.

Out of Gas is played on your opponent's *Go* card. They must then play a *Gasoline* card, and then a *Go* card before they can play any more mileage.

Flat Tire is played on your opponent's *Go* card. They must then play a *Spare Tire* card, and then a *Go* card before they can play any more mileage.

Accident is played on your opponent's *Go* card. They must then play a *Repairs* card, and then a *Go* card before they can play any more mileage.

Safety Cards: Safety cards prevent your opponent from playing the corresponding Hazard cards on you for the rest of the hand. It cancels an attack in progress, and *always entitles the player to an extra turn.*

Right of Way prevents your opponent from playing both *Stop* and *Speed Limit* cards on you. It also acts as a permanent *Go* card for the rest of the hand, so you can play mileage as long as there is not a Hazard card on top of your Battle pile. In this case only, your opponent can play Hazard cards directly on a Remedy card besides a Go card.

Extra Tank When played, your opponent cannot play an *Out of Gas* on your Battle Pile.

Puncture Proof When played, your opponent cannot play a *Flat Tire* on your Battle Pile.

Driving Ace When played, your opponent cannot play an *Accident* on your Battle Pile.

Distance Cards: Distance cards are played when you have a *Go* card on your Battle pile, or a Right of Way in your Safety area and are not stopped by a Hazard Card. They can be played in any combination that totals exactly 700 miles, except that *you cannot play more than two 200 mile cards in one hand.* A hand ends whenever one player gets exactly 700 miles or the deck runs out. In that case, play continues until neither someone reaches 700, or neither player can use any cards in their hand. If the trip is completed after the deck runs out, this is called *Delayed Action.*

Coup Fourré: This is a French fencing term for a counter-thrust move as part of a parry to an opponents attack. In Mille Bournes, it is used as follows: If an opponent plays a Hazard card, and you have the corresponding Safety in your hand, you play it immediately, even *before* you draw. This immediately removes the Hazard card from your Battle pile, and protects you from that card for the rest of the game. This gives you more points (see "Scoring" below).

Scoring: Scores are totaled at the end of each hand, whether or not anyone completed the trip. The terms used in the Score window have the following meanings:

Milestones Played: Each player scores as many miles as they played before the trip ended.

Each Safety: 100 points for each safety in the Safety area.

All 4 Safeties: 300 points if all four safeties are played.

Each Coup Fouré: 300 points for each Coup Fouré accomplished.

The following bonus scores can apply only to the winning player.

Trip Completed: 400 points bonus for completing the trip to 700 or 1000.

Safe Trip: 300 points bonus for completing the trip without using any 200 mile cards.

Delayed Action: 300 points bonus for finishing after the deck was exhausted.

Extension: 200 points bonus for completing a 1000 mile trip.

Shut-Out: 500 points bonus for completing the trip before your opponent played any mileage cards.

Running totals are also kept for the current score for each player for the hand (**Hand Total**), the game (**Overall Total**), and number of games won (**Games**).

NAME

monop – Monopoly game

SYNOPSIS

/usr/games/monop [file]

DESCRIPTION

Monop is reminiscent of the Parker Brother's game Monopoly, and monitors a game between 1 to 9 users. It is assumed that the rules of Monopoly are known. The game follows the standard rules, with the exception that, if a property would go up for auction and there are only two solvent players, no auction is held and the property remains unowned.

The game, in effect, lends the player money, so it is possible to buy something which you cannot afford. However, as soon as a person goes into debt, he must "fix the problem", *i.e.*, make himself solvent, before play can continue. If this is not possible, the player's property reverts to his debtee, either a player or the bank. A player can resign at any time to any person or the bank, which puts the property back on the board, unowned.

Any time that the response to a question is a *string*, e.g., a name, place or person, you can type '?' to get a list of valid answers. It is not possible to input a negative number, nor is it ever necessary.

A Summary of Commands:

quit: quit game: This allows you to quit the game. It asks you if you're sure.

print: print board: This prints out the current board. The columns have the following meanings (column headings are the same for the **where**, **own holdings**, and **holdings** commands):

- Name The first ten characters of the name of the square
- Own The *number* of the owner of the property.
- Price The cost of the property (if any)
- Mg This field has a '*' in it if the property is mortgaged
- # If the property is a Utility or Railroad, this is the number of such owned by the owner. If the property is land, this is the number of houses on it.
- Rent Current rent on the property. If it is not owned, there is no rent.

where: where players are: Tells you where all the players are. A '*' indicates the current player.

own holdings: List your own holdings, *i.e.*, money, get-out-of-jail-free cards, and property.

holdings: holdings list: Look at anyone's holdings. It will ask you whose holdings you wish to look at. When you are finished, type "done".

shell: shell escape: Escape to a shell. When the shell dies, the program continues where you left off.

mortgage: mortgage property: Sets up a list of mortgageable property, and asks which you wish to mortgage.

unmortgage: unmortgage property: Unmortgage mortgaged property.

buy: buy houses: Sets up a list of monopolies on which you can buy houses. If there is

more than one, it asks you which you want to buy for. It then asks you how many for each piece of property, giving the current amount in parentheses after the property name. If you build in an unbalanced manner (a disparity of more than one house within the same monopoly), it asks you to re-input things.

sell: sell houses: Sets up a list of monopolies from which you can sell houses. it operates in an analogous manner to *buy*

card: card for jail: Use a get-out-of-jail-free card to get out of jail. If you're not in jail, or you don't have one, it tells you so.

pay: pay for jail: Pay $50 to get out of jail, from whence you are put on Just Visiting. Difficult to do if you're not there.

trade: This allows you to trade with another player. It asks you whom you wish to trade with, and then asks you what each wishes to give up. You can get a summary at the end, and, in all cases, it asks for confirmation of the trade before doing it.

resign: Resign to another player or the bank. If you resign to the bank, all property reverts to its virgin state, and get-out-of-jail free cards revert to the deck.

save: save game: Save the current game in a file for later play. You can continue play after saving, either by adding the file in which you saved the game after the *monop* command, or by using the *restore* command (see below). It will ask you which file you wish to save it in, and, if the file exists, confirm that you wish to overwrite it.

restore: restore game: Read in a previously saved game from a file. It leaves the file intact.

roll: Roll the dice and move forward to your new location. If you simply hit the <RETURN> key instead of a command, it is the same as typing *roll*.

AUTHOR

Ken Arnold

FILES

/usr/games/lib/cards.pck Chance and Community Chest cards

BUGS

No command can be given an argument instead of a response to a query.

6

NAME

number — convert Arabic numerals to English

SYNOPSIS

/usr/games/number

DESCRIPTION

Number copies the standard input to the standard output, changing each decimal number to a fully spelled out version.

NAME

quiz − test your knowledge

SYNOPSIS

/usr/games/quiz [**−i** file] [**−t**] [category1 category2]

DESCRIPTION

Quiz gives associative knowledge tests on various subjects. It asks items chosen from *category1* and expects answers from *category2*. If no categories are specified, *quiz* gives instructions and lists the available categories.

Quiz tells a correct answer whenever you type a bare newline. At the end of input, upon interrupt, or when questions run out, *quiz* reports a score and terminates.

The **−t** flag specifies 'tutorial' mode, where missed questions are repeated later, and material is gradually introduced as you learn.

The **−i** flag causes the named file to be substituted for the default index file. The lines of these files have the syntax:

```
line      = category newline | category ':' line
category  = alternate | category '|' alternate
alternate = empty | alternate primary
primary   = character | '[' category ']' | option
option    = '{' category '}'
```

The first category on each line of an index file names an information file. The remaining categories specify the order and contents of the data in each line of the information file. Information files have the same syntax. Backslash '\' is used as with *sh*(1) to quote syntactically significant characters or to insert transparent newlines into a line. When either a question or its answer is empty, *quiz* will refrain from asking it.

FILES

/usr/games/quiz.k/*

BUGS

The construct 'a|ab' doesn't work in an information file. Use 'a{b}'.

NAME

rain — animated raindrops display

SYNOPSIS

/usr/games/rain

DESCRIPTION

Rain's display is modeled after the VAX/VMS program of the same name. The terminal has to be set for 9600 baud to obtain the proper effect.

As with all programs that use *termcap*, the TERM environment variable must be set (and exported) to the type of the terminal being used.

FILES

/etc/termcap

AUTHOR

Eric P. Scott

NAME

rogue — Exploring The Dungeons of Doom

SYNOPSIS

/usr/games/rogue [**−r**] [*save_file*] [**−s**] [**−d**]

DESCRIPTION

Rogue is a computer fantasy game with a new twist. It is crt oriented and the object of the game is to survive the attacks of various monsters and get a lot of gold, rather than the puzzle solving orientation of most computer fantasy games.

To get started you really only need to know two commands. The command **?** will give you a list of the available commands and the command **/** will identify the things you see on the screen.

To win the game (as opposed to merely playing to beat other people high scores) you must locate the Amulet of Yendor which is somewhere below the 20th level of the dungeon and get it out. Nobody has achieved this yet and if somebody does, they will probably go down in history as a hero among heros.

When the game ends, either by your death, when you quit, or if you (by some miracle) manage to win, *rogue* will give you alist of the top-ten scorers. The scoring is based entirely upon how much gold you get. There is a 10% penalty for getting yourself killed.

If *save_file* is specified, rogue will be restored from the specified saved game file. If the **−r** option is used, the save game file is presumed to be the default.

The **−s** option will print out the list of scores.

The **−d** option will kill you and try to add you to the score file.

For more detailed directions, read the document *A Guide to the Dungeons of Doom.*

AUTHORS

Michael C. Toy, Kenneth C. R. C. Arnold, Glenn Wichman

FILES

/usr/games/lib/rogue_roll	Score file
~/rogue.save	Default save file

SEE ALSO

Michael C. Toy and Kenneth C. R. C. Arnold, *A guide to the Dungeons of Doom*

BUGS

Probably infinite. However, that Floating Eyes sometimes transfix you permanently is *not* a bug. It's a feature.

6

NAME

snake, snscore — display chase game

SYNOPSIS

/usr/games/snake [**−w***n*] [**−l***n*]
/usr/games/snscore

DESCRIPTION

Snake is a display-based game which must be played on a CRT terminal from among those supported by vi(1). The object of the game is to make as much money as possible without getting eaten by the snake. The **−l** and **−w** options allow you to specify the length and width of the field. By default the entire screen (except for the last column) is used.

You are represented on the screen by an I. The snake is 6 squares long and is represented by S's. The money is $, and an exit is #. Your score is posted in the upper left hand corner.

You can move around using the same conventions as vi(1), the h, j, k, and l keys work, as do the arrow keys. Other possibilities include:

sefc These keys are like hjkl but form a directed pad around the d key.

HJKL These keys move you all the way in the indicated direction to the same row or column as the money. This does *not* let you jump away from the snake, but rather saves you from having to type a key repeatedly. The snake still gets all his turns.

SEFC Likewise for the upper case versions on the left.

ATPB These keys move you to the four edges of the screen. Their position on the keyboard is the mnemonic, e.g. P is at the far right of the keyboard.

x This lets you quit the game at any time.

p Points in a direction you might want to go.

w Space warp to get out of tight squeezes, at a price.

! Shell escape

^Z Suspend the snake game, on systems which support it. Otherwise an interactive shell is started up.

To earn money, move to the same square the money is on. A new $ will appear when you earn the current one. As you get richer, the snake gets hungrier. To leave the game, move to the exit (#).

A record is kept of the personal best score of each player. Scores are only counted if you leave at the exit, getting eaten by the snake is worth nothing.

As in pinball, matching the last digit of your score to the number which appears after the game is worth a bonus.

To see who wastes time playing snake, run */usr/games/snscore* .

FILES

/usr/games/lib/snakerawscores	database of personal bests
/usr/games/lib/snake.log	log of games played
/usr/games/busy	program to determine if system too busy

BUGS

When playing on a small screen, it's hard to tell when you hit the edge of the screen.

The scoring function takes into account the size of the screen. A perfect function to do this equitably has not been devised.

NAME

trek − trekkie game

SYNOPSIS

/usr/games/trek [[**−a**] file]

DESCRIPTION

Trek is a game of space glory and war. Below is a summary of commands. For complete documentation, see *Trek* by Eric Allman.

If a filename is given, a log of the game is written onto that file. If the **−a** flag is given before the filename, that file is appended to, not truncated.

The game will ask you what length game you would like. Valid responses are "short", "medium", and "long". You may also type "restart", which restarts a previously saved game. You will then be prompted for the skill, to which you must respond "novice", "fair", "good", "expert", "commadore", or "impossible". You should normally start out with a novice and work up.

In general, throughout the game, if you forget what is appropriate the game will tell you what it expects if you just type in a question mark.

AUTHOR

Eric Allman

SEE ALSO

/usr/doc/trek

COMMAND SUMMARY

abandon
cloak up/down
computer request; ...
destruct
help
lrscan
phasers automatic amount
phasers manual amt1 course1 spread1 ...
torpedo course [yes] angle/no
ram course distance
shell
srscan [yes/no]
status
undock
warp warp_factor

capture
damages
dock
impulse course distance
move course distance
rest time
shields up/down
terminate yes/no
visual course

NAME

worm — Play the growing worm game

SYNOPSIS

/usr/games/worm [*size*]

DESCRIPTION

In *worm,* you are a little worm, your body is the "o"'s on the screen and your head is the "@". You move with the hjkl keys (as in the game snake). If you don't press any keys, you continue in the direction you last moved. The upper case HJKL keys move you as if you had pressed several (9 for HL and 5 for JK) of the corresponding lower case key (unless you run into a digit, then it stops).

On the screen you will see a digit, if your worm eats the digit is will grow longer, the actual amount longer depends on which digit it was that you ate. The object of the game is to see how long you can make the worm grow.

The game ends when the worm runs into either the sides of the screen, or itself. The current score (how much the worm has grown) is kept in the upper left corner of the screen.

The optional argument, if present, is the initial length of the worm.

BUGS

If the initial length of the worm is set to less than one or more than 75, various strange things happen.

NAME

worms — animate worms on a display terminal

SYNOPSIS

/usr/games/worms [−field] [−length #] [−number #] [−trail]

DESCRIPTION

Brian Horn (cithep!bdh) showed me a *TOPS-20* program on the DEC-2136 machine called *WORM*, and suggested that I write a similar program that would run under *Unix*. I did, and no apologies.

−field makes a "field" for the worm(s) to eat; **−trail** causes each worm to leave a trail behind it. You can figure out the rest by yourself.

FILES

/etc/termcap

AUTHOR

Eric P. Scott

SEE ALSO

Snails, by Karl Heuer

BUGS

The lower-right-hand character position will not be updated properly on a terminal that wraps at the right margin.

Terminal initialization is not performed.

NAME

wump — the game of hunt-the-wumpus

SYNOPSIS

/usr/games/wump

DESCRIPTION

Wump plays the game of 'Hunt the Wumpus.' A Wumpus is a creature that lives in a cave with several rooms connected by tunnels. You wander among the rooms, trying to shoot the Wumpus with an arrow, meanwhile avoiding being eaten by the Wumpus and falling into Bottomless Pits. There are also Super Bats which are likely to pick you up and drop you in some random room.

The program asks various questions which you answer one per line; it will give a more detailed description if you want.

This program is based on one described in *People's Computer Company, 2,* 2 (November 1973).

NAME

zork – the game of dungeon

SYNOPSIS

/usr/games/zork

DESCRIPTION

Dungeon is a computer fantasy simulation based on Adventure and on Dungeons & Dragons, originally written by Lebling, Blank, and Anderson of MIT. In it you explore a dungeon made up of various rooms, caves, rivers, and so on. The object of the game is to collect as much treasure as possible and stow it safely in the trophy case (and, of course, to stay alive.)

Figuring out the rules is part of the game, but if you are stuck, you should start off with "open mailbox", "take leaflet", and then "read leaflet". Additional useful commands that are not documented include:

quit (to end the game)

!cmd (the usual shell escape convention)

> (to save a game)

< (to restore a game)

FILES

/usr/games/lib/d*

6

NAME

miscellaneous — miscellaneous useful information pages

DESCRIPTION

This section contains miscellaneous documentation, mostly in the area of text processing macro packages for *troff*(1).

ascii	map of ASCII character set
environ	user environment
eqnchar	special character definitions for eqn
hier	file system hierarchy
mailaddr	mail addressing description
man	macros to typeset manual pages
me	macros for formatting papers
ms	macros for formatting manuscripts
term	conventional names for terminals

7

NAME

ascii — map of ASCII character set

SYNOPSIS

cat /usr/pub/ascii

DESCRIPTION

Ascii is a map of the ASCII character set, to be printed as needed. It contains:

000	nul	001	soh	002	stx	003	etx	004	eot	005	enq	006	ack	007	bel
010	bs	011	ht	012	nl	013	vt	014	np	015	cr	016	so	017	si
020	dle	021	dc1	022	dc2	023	dc3	024	dc4	025	nak	026	syn	027	etb
030	can	031	em	032	sub	033	esc	034	fs	035	gs	036	rs	037	us
040	sp	041	!	042	"	043	#	044	$	045	%	046	&	047	'
050	(| 051 |)	052	*	053	+	054	,	055	−	056	.	057	/
060	0	061	1	062	2	063	3	064	4	065	5	066	6	067	7
070	8	071	9	072	:	073	;	074	<	075	=	076	>	077	?
100	@	101	A	102	B	103	C	104	D	105	E	106	F	107	G
110	H	111	I	112	J	113	K	114	L	115	M	116	N	117	O
120	P	121	Q	122	R	123	S	124	T	125	U	126	V	127	W
130	X	131	Y	132	Z	133	[	134	\	135	]	136	^	137	_
140	`	141	a	142	b	143	c	144	d	145	e	146	f	147	g
150	h	151	i	152	j	153	k	154	l	155	m	156	n	157	o
160	p	161	q	162	r	163	s	164	t	165	u	166	v	167	w
170	x	171	y	172	z	173	{	174	|	175	}	176	~	177	del

00	nul	01	soh	02	stx	03	etx	04	eot	05	enq	06	ack	07	bel
08	bs	09	ht	0a	nl	0b	vt	0c	np	0d	cr	0e	so	0f	si
10	dle	11	dc1	12	dc2	13	dc3	14	dc4	15	nak	16	syn	17	etb
18	can	19	em	1a	sub	1b	esc	1c	fs	1d	gs	1e	rs	1f	us
20	sp	21	!	22	"	23	#	24	$	25	%	26	&	27	'
28	(| 29 |)	2a	*	2b	+	2c	,	2d	−	2e	.	2f	/
30	0	31	1	32	2	33	3	34	4	35	5	36	6	37	7
38	8	39	9	3a	:	3b	;	3c	<	3d	=	3e	>	3f	?
40	@	41	A	42	B	43	C	44	D	45	E	46	F	47	G
48	H	49	I	4a	J	4b	K	4c	L	4d	M	4e	N	4f	O
50	P	51	Q	52	R	53	S	54	T	55	U	56	V	57	W
58	X	59	Y	5a	Z	5b	[	5c	\	5d	]	5e	^	5f	_
60	`	61	a	62	b	63	c	64	d	65	e	66	f	67	g
68	h	69	i	6a	j	6b	k	6c	l	6d	m	6e	n	6f	o
70	p	71	q	72	r	73	s	74	t	75	u	76	v	77	w
78	x	79	y	7a	z	7b	{	7c	|	7d	}	7e	~	7f	del

FILES

/usr/pub/ascii

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NAME

environ – user environment

SYNOPSIS

extern char **environ;

DESCRIPTION

An array of strings called the 'environment' is made available by *execve*(2) when a process begins. By convention these strings have the form '*name*=*value*'. The following names are used by various commands:

PATH The sequence of directory prefixes that *sh, time, nice*(1), etc., apply in searching for a file known by an incomplete path name. The prefixes are separated by ':'. *Login*(1) sets PATH=:/usr/ucb:/bin:/usr/bin.

HOME A user's login directory, set by *login*(1) from the password file *passwd*(5).

TERM The kind of terminal for which output is to be prepared. This information is used by commands, such as *nroff* or *plot*(1G), which may exploit special terminal capabilities. See */etc/termcap* (*termcap*(5)) for a list of terminal types.

SHELL The file name of the users login shell.

TERMCAP The string describing the terminal in TERM, or the name of the termcap file, see *termcap*(5),*termcap*(3X).

EXINIT A startup list of commands read by *ex*(1), *edit*(1), and *vi*(1).

USER The login name of the user.

PRINTER The name of the default printer to be used by *lpr*(1), *lpq*(1), and *lprm*(1).

Further names may be placed in the environment by the *export* command and 'name=value' arguments in *sh*(1), or by the *setenv* command if you use *csh*(1). Arguments may also be placed in the environment at the point of an *execve*(2). It is unwise to conflict with certain *sh*(1) variables that are frequently exported by '.profile' files: MAIL, PS1, PS2, IFS.

SEE ALSO

csh(1), ex(1), login(1), sh(1), execve(2), system(3), termcap(3X), termcap(5)

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NAME

eqnchar – special character definitions for eqn

SYNOPSIS

eqn /usr/pub/eqnchar [files] **| troff** [options]

neqn /usr/pub/eqnchar [files] **| nroff** [options]

DESCRIPTION

Eqnchar contains *troff* and *nroff* character definitions for constructing characters that are not available on the Graphic Systems typesetter. These definitions are primarily intended for use with *eqn* and *neqn*. It contains definitions for the following characters

ciplus	⊕	‖	‖	*square*	□
citimes	⊗	*langle*	⟨	*circle*	○
wig	∼	*rangle*	⟩	*blot*	■
-wig	≃	*hbar*	ħ	*bullet*	•
>wig	≳	*ppd*	⊥	*prop*	∝
<wig	≲	*<->*	↔	*empty*	∅
=wig	≅	*<=>*	⇔	*member*	∈
star	*	*|<*	⊀	*nomem*	∉
bigstar	✳	*|>*	⊁	*cup*	∪
=dot	≐	*ang*	∠	*cap*	∩
orsign	∨	*rang*	∟	*incl*	⊆
andsign	∧	*3dot*	∴	*subset*	⊂
=del	≜	*thf*	∴	*supset*	⊃
oppA	∀	*quarter*	¼	*!subset*	⊄
oppE	∃	*3quarter*	¾	*!supset*	⊅
angstrom	Å	*degree*	°		

FILES

/usr/pub/eqnchar

SEE ALSO

troff(1), eqn(1)

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NAME

hier – file system hierarchy

DESCRIPTION

The following outline gives a quick tour through a representative directory hierarchy.

/ root
/vmunix
the kernel binary (UNIX itself)
/lost+found
directory for connecting detached files for *fsck*(8)
/dev/ devices (4)
MAKEDEV
shell script to create special files
MAKEDEV.local
site specific part of MAKEDEV
console
main console, *tty*(4)
tty* terminals, *tty*(4)
hp* disks, *hp*(4)
rhp* raw disks, *hp*(4)
up* UNIBUS disks *up*(4)
...
/bin/ utility programs, cf /usr/bin/ (1)
as assembler
cc C compiler executive, cf /lib/ccom, /lib/cpp, /lib/c2
csh C shell
...
/lib/ object libraries and other stuff, cf /usr/lib/
libc.a system calls, standard I/O, etc. (2,3,3S)
...
ccom C compiler proper
cpp C preprocessor
c2 C code improver
...
/etc/ essential data and maintenance utilities; sect (8)
dump dump program *dump*(8)
passwd password file, *passwd*(5)
group group file, *group*(5)
motd message of the day, *login*(1)
termcap
description of terminal capabilities, *termcap*(5)
ttytype table of what kind of terminal is on each port, *ttytype*(5)
mtab mounted file table, *mtab*(5)
dumpdates
dump history, *dump*(8)
fstab file system configuration table *fstab*(5)
disktab disk characteristics and partition tables, *disktab*(5)
hosts host name to network address mapping file, *hosts*(5)
networks
network name to network number mapping file, *networks*(5)
protocols
protocol name to protocol number mapping file, *protocols*(5)
services

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```
            network services definition file, services(5)
        remote names and description of remote hosts for tip(1C), remote(5)
        phones private phone numbers for remote hosts, as described in phones(5)
        ttys   properties of terminals, ttys(5)
        getty  part of login, getty(8)
        init   the parent of all processes, init(8)
        rc     shell program to bring the system up
        rc.local site dependent portion of rc
        cron   the clock daemon, cron(8)
        mount  mount(8)
        ...
/sys/   system source
        h/     header (include) files
               acct.h  acct(5)
               stat.h  stat(2)
               ...
        sys/   machine independent system source
               init_main.c
               uipc_socket.c
               ufs_syscalls.c
               ...
        conf/  site configuration files
               GENERIC
               ...
        net/   general network source
        netinet/
               DARPA Internet network source
        netimp/
               network code related to use of an IMP
               if_imp.c
               if_imphost.c
               if_imphost.h
               ...
        vax/   source specific to the VAX
               locore.s
               machdep.c
               ...
        vaxuba/
               device drivers for hardware which resides on the UNIBUS
               uba.c
               dh.c
               up.c
               ...
        vaxmba/
               device drivers for hardware which resides on the MASBUS
               mba.c
               hp.c
               ht.c
               ...
        vaxif  network interface drivers for the VAX
               if_en.c
               if_ec.c
```

```
                if_vv.c
                ...
/tmp/   temporary files, usually on a fast device, cf /usr/tmp/
        e*      used by ed(1)
        ctm*    used by cc(1)
        ...
/usr/   general-pupose directory, usually a mounted file system
        adm/    administrative information
                wtmp    login history, utmp(5)
                messages
                        hardware error messages
                tracct  phototypesetter accounting, troff(1)
                lpacct  line printer accounting lpr(1)
                vaacct, vpacct
                        varian and versatec accounting vpr(1), vtroff(1), pac(8)
/usr    /bin
        utility programs, to keep /bin/ small
        tmp/    temporaries, to keep /tmp/ small
                stm*    used by sort(1)
                raster  used by plot(1G)
        dict/   word lists, etc.
                words   principal word list, used by look(1)
                spellhist
                        history file for spell(1)
        games/
                hangman
                lib/    library of stuff for the games
                        quiz.k/ what quiz(6) knows
                                index   category index
                                africa  countries and capitals
                                ...
                        ...
                ...
        include/
                standard #include files
                a.out.h object file layout, a.out(5)
                stdio.h standard I/O, intro(3S)
                math.h  (3M)
                ...
                sys/    system-defined layouts, cf /sys/h
                net/    symbolic link to sys/net
                machine/
                        symbolic link to sys/machine
                ...
        lib/    object libraries and stuff, to keep /lib/ small
                atrun   scheduler for at(1)
                lint/   utility files for lint
                        lint[12]
                                subprocesses for lint(1)
                        llib-lc dummy declarations for /lib/libc.a, used by lint(1)
                        llib-lm dummy declarations for /lib/libc.m
                        ...
```

```
                struct/  passes of struct(1)
                ...
                tmac/    macros for troff(1)
                         tmac.an
                                  macros for man(7)
                         tmac.s   macros for ms(7)
                         ...
                font/    fonts for troff(1)
                         ftR      Times Roman
                         ftB      Times Bold
                         ...
                uucp/    programs and data for uucp(1C)
                         L.sys    remote system names and numbers
                         uucico   the real copy program
                         ...
                units    conversion tables for units(1)
                eign     list of English words to be ignored by ptx(1)
/usr/  man/
       volume 1 of this manual, man(1)
                man0/    general
                         intro    introduction to volume 1, ms(7) format
                         xx       template for manual page
                man1/    chapter 1
                         as.1
                         mount.1m
                         ...
                ...
                cat1/    preformatted pages for section 1
                ...
       msgs/    messages, cf msgs(1)
                bounds highest and lowest message
       new/     binaries of new versions of programs
       preserve/
                editor temporaries preserved here after crashes/hangups
       public/  binaries of user programs - write permission to everyone
       spool/   delayed execution files
                at/      used by at(1)
                lpd/     used by lpr(1)
                         lock     present when line printer is active
                         cf*      copy of file to be printed, if necessary
                         df*      daemon control file, lpd(8)
                         tf*      transient control file, while lpr is working
                uucp/    work files and staging area for uucp(1C)
                         LOGFILE
                                  summary log
                         LOG.*    log file for one transaction
                mail/    mailboxes for mail(1)
                         name     mail file for user name
                         name.lock
                                  lock file while name is receiving mail
                secretmail/
                         like mail/
```

```
                uucp/   work files and staging area for uucp(1C)
                        LOGFILE
                                summary log
                        LOG.*   log file for one transaction
                        mqueue/
                                mail queue for sendmail(8)
        wd      initial working directory of a user, typically wd is the user's login name
                .profile set environment for sh(1), environ(7)
                .project
                        what you are doing (used by ( finger(1) )
                .cshrc  startup file for csh(1)
                .exrc   startup file for ex(1)
                .plan   what your short-term plans are (used by finger(1) )
                .netrc  startup file for various network programs
                .msgsrc
                        startup file for msgs(1)
                .mailrc startup file for mail(1)
                calendar
                        user's datebook for calendar(1)
        doc/    papers, mostly in volume 2 of this manual, typically in ms(7) format
                as/     assembler manual
                c       C manual
                ...
/usr/   src/
        source programs for utilities, etc.
        bin/    source of commands in /bin
                as/     assembler
                ar.c    source for ar(1)
                ...
        usr.bin/
                source for commands in /usr/bin
                troff/  source for nroff and troff(1)
                        font/   source for font tables, /usr/lib/font/
                                ftR.c   Roman
                                ...
                        term/   terminal characteristics tables, /usr/lib/term/
                                tab300.c
                                        DASI 300
                                ...
                        ...
        ucb     source for programs in /usr/ucb
        games/  source for /usr/games
        lib/    source for programs and archives in /lib
                libc/   C runtime library
                        csu/    startup and wrapup routines needed with every C program
                                crt0.s  regular startup
                                mcrt0.s modified startup for cc -p
                        sys/    system calls (2)
                                access.s
                                brk.s
                                ...
                stdio/  standard I/O functions (3S)
```

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```
                fgets.c
                fopen.c
                ...
        gen/    other functions in (3)
                abs.c
                ...
        net/    network functions in (3N)
                gethostbyname.c
                ...
local/  source which isn't normally distributed
new/    source for new versions of commands and library routines
old/    source for old versions of commands and library routines
ucb/    binaries of programs developed at UCB
        ...
        edit    editor for beginners
        ex      command editor for experienced users
        ...
        mail    mail reading/sending subsystem
        man     on line documentation
        ...
        pi      Pascal translator
        px      Pascal interpreter
        ...
        vi      visual editor
```

SEE ALSO

ls(1), apropos(1), whatis(1), whereis(1), finger(1), which(1), ncheck(8), find(1), grep(1)

BUGS

The position of files is subject to change without notice.

NAME

mailaddr — mail addressing description

DESCRIPTION

Mail addresses are based on the ARPANET protocol listed at the end of this manual page. These addresses are in the general format

user@domain

where a domain is a hierarchical dot separated list of subdomains. For example, the address

eric@monet.Berkeley.ARPA

is normally interpreted from right to left: the message should go to the ARPA name tables (which do not correspond exactly to the physical ARPANET), then to the Berkeley gateway, after which it should go to the local host monet. When the message reaches monet it is delivered to the user "eric".

Unlike some other forms of addressing, this does not imply any routing. Thus, although this address is specified as an ARPA address, it might travel by an alternate route if that was more convenient or efficient. For example, at Berkeley the associated message would probably go directly to monet over the Ethernet rather than going via the Berkeley ARPANET gateway.

Abbreviation. Under certain circumstances it may not be necessary to type the entire domain name. In general anything following the first dot may be omitted if it is the same as the domain from which you are sending the message. For example, a user on "calder.Berkeley.ARPA" could send to "eric@monet" without adding the ".Berkeley.ARPA" since it is the same on both sending and receiving hosts.

Certain other abbreviations may be permitted as special cases. For example, at Berkeley ARPANET hosts can be referenced without adding the ".ARPA" as long as their names do not conflict with a local host name.

Compatibility. Certain old address formats are converted to the new format to provide compatibility with the previous mail system. In particular,

host:user

is converted to

user@host

to be consistent with the *rcp*(1C) command.

Also, the syntax:

host!user

is converted to:

user@host.UUCP

This is normally converted back to the "host!user" form before being sent on for compatibility with older UUCP hosts.

The current implementation is not able to route messages automatically through the UUCP network. Until that time you must explicitly tell the mail system which hosts to send your message through to get to your final destination.

Case Distinctions. Domain names (i.e., anything after the "@" sign) may be given in any mixture of upper and lower case with the exception of UUCP hostnames. Most hosts accept any mixture of case in user names, with the notable exception of MULTICS sites.

Differences with ARPA Protocols. Although the UNIX addressing scheme is based on the ARPA mail addressing protocols, there are some significant differences.

At the time of this writing the only "top level" domain defined by ARPA is the ".ARPA" domain itself. This is further restricted to having only one level of host specifier. That is, the only addresses that ARPA accepts at this time must be in the format "user@host.ARPA" (where "host" is one word). In particular, addresses such as:

eric@monet.Berkeley.ARPA

are not currently legal under the ARPA protocols. For this reason, these addresses are converted to a different format on output to the ARPANET, typically:

eric%monet@Berkeley.ARPA

Route-addrs. Under some circumstances it may be necessary to route a message through several hosts to get it to the final destination. Normally this routing is done automatically, but sometimes it is desirable to route the message manually. An address that shows these relays are termed "route-addrs." These use the syntax:

<@hosta,@hostb:user@hostc>

This specifies that the message should be sent to hosta, from there to hostb, and finally to hostc. This path is forced even if there is a more efficient path to hostc.

Route-addrs occur frequently on return addresses, since these are generally augmented by the software at each host. It is generally possible to ignore all but the "user@host" part of the address to determine the actual sender.

Postmaster. Every site is required to have a user or user alias designated "postmaster" to which problems with the mail system may be addressed.

CSNET. Messages to CSNET sites can be sent to "user.host@UDel-Relay".

BERKELEY

The following comments apply only to the Berkeley environment.

Host Names. Many of the old familiar host names are being phased out. In particular, single character names as used in Berknet are incompatible with the larger world of which Berkeley is now a member. For this reason the following names are being obsoleted. You should notify any correspondents of your new address as soon as possible.

OLD	NEW			
p	ucbcad	j	ingvax	ucbingres
v csvax	ucbernie	r	arpavax	ucbarpa
n	ucbkim	y		ucbcory

The old addresses will be rejected as unknown hosts sometime in the near future.

What's My Address? If you are on a local machine, say monet, your address is

yourname@monet.Berkeley.ARPA

However, since most of the world does not have the new software in place yet, you will have to give correspondents slightly different addresses. From the ARPANET, your address would be:

yourname%monet@Berkeley.ARPA

From UUCP, your address would be:

ucbvax!yourname%monet

Computer Center. The Berkeley Computer Center is in a subdomain of Berkeley. Messages to the computer center should be addressed to:

user%host.CC@Berkeley.ARPA

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The alternate syntax:

user@host.CC

may be used if the message is sent from inside Berkeley.

For the time being Computer Center hosts are known within the Berkeley domain, i.e., the ".CC" is optional. However, it is likely that this situation will change with time as both the Computer Science department and the Computer Center grow.

Bitnet. Hosts on bitnet may be accessed using:

user@host.BITNET

SEE ALSO

mail(1), sendmail(8); Crocker, D. H., *Standard for the Format of Arpa Internet Text Messages,* RFC822.

NAME

man − macros to typeset manual

SYNOPSIS

nroff −man file ...

troff −man file ...

DESCRIPTION

These macros are used to lay out pages of this manual. A skeleton page may be found in the file /usr/man/man0/xx.

Any text argument *t* may be zero to six words. Quotes may be used to include blanks in a 'word'. If *text* is empty, the special treatment is applied to the next input line with text to be printed. In this way .I may be used to italicize a whole line, or .SM followed by .B to make small bold letters.

A prevailing indent distance is remembered between successive indented paragraphs, and is reset to default value upon reaching a non-indented paragraph. Default units for indents *i* are ens.

Type font and size are reset to default values before each paragraph, and after processing font and size setting macros.

These strings are predefined by **−man**:

*R '®', '(Reg)' in *nroff*.

*S Change to default type size.

FILES

/usr/lib/tmac/tmac.an
/usr/man/man0/xx

SEE ALSO

troff(1), man(1)

BUGS

Relative indents don't nest.

REQUESTS

Request	Cause Break	If no Argument	Explanation
.B *t*	no	*t*=n.t.l.*	Text *t* is bold.
.BI *t*	no	*t*=n.t.l.	Join words of *t* alternating bold and italic.
.BR *t*	no	*t*=n.t.l.	Join words of *t* alternating bold and Roman.
.DT	no	.5i 1i...	Restore default tabs.
.HP *i*	yes	*i*=p.i.*	Set prevailing indent to *i*. Begin paragraph with hanging indent.
.I *t*	no	*t*=n.t.l.	Text *t* is italic.
.IB *t*	no	*t*=n.t.l.	Join words of *t* alternating italic and bold.
.IP *x i*	yes	*x*=""	Same as .TP with tag *x*.
.IR *t*	no	*t*=n.t.l.	Join words of *t* alternating italic and Roman.
.LP	yes	-	Same as .PP.
.PD *d*	no	*d*=.4v	Interparagraph distance is *d*.
.PP	yes	-	Begin paragraph. Set prevailing indent to .5i.
.RE	yes	-	End of relative indent. Set prevailing indent to amount of starting .RS.
.RB *t*	no	*t*=n.t.l.	Join words of *t* alternating Roman and bold.
.RI *t*	no	*t*=n.t.l.	Join words of *t* alternating Roman and italic.
.RS *i*	yes	*i*=p.i.	Start relative indent, move left margin in distance *i*. Set prevailing indent to .5i for nested indents.
.SH *t*	yes	*t*=n.t.l.	Subhead.

.SM *t*	no	*t*=n.t.l.	Text *t* is small.
.TH *n c x v m*	yes	-	Begin page named *n* of chapter *c; x* is extra commentary, e.g. 'local', for page foot center; *v* alters page foot left, e.g. '4th Berkeley Distribution'; *m* alters page head center, e.g. 'Brand X Programmer's Manual'. Set prevailing indent and tabs to .5i.
.TP *i*	yes	*i*=p.i.	Set prevailing indent to *i*. Begin indented paragraph with hanging tag given by next text line. If tag doesn't fit, place it on separate line.

• n.t.l. = next text line; p.i. = prevailing indent

NAME

me − macros for formatting papers

SYNOPSIS

nroff −me [options] file ...
troff −me [options] file ...

DESCRIPTION

This package of *nroff* and *troff* macro definitions provides a canned formatting facility for technical papers in various formats. When producing 2-column output on a terminal, filter the output through *col*(1).

The macro requests are defined below. Many *nroff* and *troff* requests are unsafe in conjunction with this package, however these requests may be used with impunity after the first .pp:

.bp	begin new page
.br	break output line here
.sp n	insert n spacing lines
.ls n	(line spacing) n=1 single, n=2 double space
.na	no alignment of right margin
.ce n	center next n lines
.ul n	underline next n lines
.sz +n	add n to point size

Output of the *eqn, neqn, refer,* and *tbl*(1) preprocessors for equations and tables is acceptable as input.

FILES

/usr/lib/tmac/tmac.e
/usr/lib/me/∗

SEE ALSO

eqn(1), troff(1), refer(1), tbl(1)
−me Reference Manual, Eric P. Allman
Writing Papers with Nroff Using −me

REQUESTS

In the following list, "initialization" refers to the first .pp, .lp, .ip, .np, .sh, or .uh macro. This list is incomplete; see *The −me Reference Manual* for interesting details.

Request	Initial Value	Cause Break	Explanation
.(c	-	yes	Begin centered block
.(d	-	no	Begin delayed text
.(f	-	no	Begin footnote
.(l	-	yes	Begin list
.(q	-	yes	Begin major quote
.(x *x*	-	no	Begin indexed item in index *x*
.(z	-	no	Begin floating keep
.)c	-	yes	End centered block
.)d	-	yes	End delayed text
.)f	-	yes	End footnote
.)l	-	yes	End list
.)q	-	yes	End major quote
.)x	-	yes	End index item
.)z	-	yes	End floating keep
.++ *m H*	-	no	Define paper section. *m* defines the part of the paper, and can be **C** (chapter), **A** (appendix), **P** (preliminary, e.g., abstract, table of contents, etc.), **B**

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			(bibliography), **RC** (chapters renumbered from page one each chapter), or **RA** (appendix renumbered from page one).
.+c *T*	-	yes	Begin chapter (or appendix, etc., as set by .++). *T* is the chapter title.
.1c	1	yes	One column format on a new page.
.2c	1	yes	Two column format.
.EN	-	yes	Space after equation produced by *eqn* or *neqn*.
.EQ *x y*	-	yes	Precede equation; break out and add space. Equation number is *y*. The optional argument *x* may be *I* to indent equation (default), *L* to left-adjust the equation, or *C* to center the equation.
.TE	-	yes	End table.
.TH	-	yes	End heading section of table.
.TS *x*	-	yes	Begin table; if *x* is *H* table has repeated heading.
.ac *A N*	-	no	Set up for ACM style output. *A* is the Author's name(s), *N* is the total number of pages. Must be given before the first initialization.
.b *x*	no	no	Print *x* in boldface; if no argument switch to boldface.
.ba +*n*	0	yes	Augments the base indent by *n*. This indent is used to set the indent on regular text (like paragraphs).
.bc	no	yes	Begin new column
.bi *x*	no	no	Print *x* in bold italics (nofill only)
.bx *x*	no	no	Print *x* in a box (nofill only).
.ef *'x'y'z'*	"""	no	Set even footer to x y z
.eh *'x'y'z'*	"""	no	Set even header to x y z
.fo *'x'y'z'*	"""	no	Set footer to x y z
.hx	-	no	Suppress headers and footers on next page.
.he *'x'y'z'*	"""	no	Set header to x y z
.hl	-	yes	Draw a horizontal line
.i *x*	no	no	Italicize *x*; if *x* missing, italic text follows.
.ip *x y*	no	yes	Start indented paragraph, with hanging tag *x*. Indentation is *y* ens (default 5).
.lp	yes	yes	Start left-blocked paragraph.
.lo	-	no	Read in a file of local macros of the form .•*x*. Must be given before initialization.
.np	1	yes	Start numbered paragraph.
.of *'x'y'z'*	"""	no	Set odd footer to x y z
.oh *'x'y'z'*	"""	no	Set odd header to x y z
.pd	-	yes	Print delayed text.
.pp	no	yes	Begin paragraph. First line indented.
.r	yes	no	Roman text follows.
.re	-	no	Reset tabs to default values.
.sc	no	no	Read in a file of special characters and diacritical marks. Must be given before initialization.
.sh *n x*	-	yes	Section head follows, font automatically bold. *n* is level of section, *x* is title of section.
.sk	no	no	Leave the next page blank. Only one page is remembered ahead.
.sz +*n*	10p	no	Augment the point size by *n* points.
.th	no	no	Produce the paper in thesis format. Must be given before initialization.
.tp	no	yes	Begin title page.
.u *x*	-	no	Underline argument (even in *troff*). (Nofill only).
.uh	-	yes	Like .sh but unnumbered.
.xp *x*	-	no	Print index *x*.

7

NAME

ms − text formatting macros

SYNOPSIS

nroff −ms [options] file ...
troff −ms [options] file ...

DESCRIPTION

This package of *nroff* and *troff* macro definitions provides a formatting facility for various styles of articles, theses, and books. When producing 2-column output on a terminal or lineprinter, or when reverse line motions are needed, filter the output through *col*(1). All external −ms macros are defined below. Many *nroff* and *troff* requests are unsafe in conjunction with this package. However, the first four requests below may be used with impunity after initialization, and the last two may be used even before initialization:

.bp	begin new page
.br	break output line
.sp n	insert n spacing lines
.ce n	center next n lines
.ls n	line spacing: n=1 single, n=2 double space
.na	no alignment of right margin

Font and point size changes with \f and \s are also allowed; for example, "\fIword\fR" will italicize *word*. Output of the *tbl, eqn,* and *refer*(1) preprocessors for equations, tables, and references is acceptable as input.

FILES

/usr/lib/tmac/tmac.x
/usr/lib/ms/x.???

SEE ALSO

eqn(1), refer(1), tbl(1), troff(1)

REQUESTS

Macro Name	Initial Value	Break? Reset?	Explanation
.AB *x*	−	y	begin abstract; if *x*=no don't label abstract
.AE	−	y	end abstract
.AI	−	y	author's institution
.AM	−	n	better accent mark definitions
.AU	−	y	author's name
.B *x*	−	n	embolden *x*; if no *x*, switch to boldface
.B1	−	y	begin text to be enclosed in a box
.B2	−	y	end boxed text and print it
.BT	date	n	bottom title, printed at foot of page
.BX *x*	−	n	print word *x* in a box
.CM	if t	n	cut mark between pages
.CT	−	y,y	chapter title: page number moved to CF (TM only)
.DA *x*	if n	n	force date *x* at bottom of page; today if no *x*
.DE	−	y	end display (unfilled text) of any kind
.DS *x y*	I	y	begin display with keep; *x*=I,L,C,B; *y*=indent
.ID *y*	8n,.5i	y	indented display with no keep; *y*=indent
.LD	−	y	left display with no keep
.CD	−	y	centered display with no keep
.BD	−	y	block display; center entire block
.EF *x*	−	n	even page footer *x* (3 part as for .tl)
.EH *x*	−	n	even page header *x* (3 part as for .tl)

.EN	–	y	end displayed equation produced by *eqn*
.EQ *x y*	–	y	break out equation; *x*=L,I,C; *y*=equation number
.FE	–	n	end footnote to be placed at bottom of page
.FP	–	n	numbered footnote paragraph; may be redefined
.FS *x*	–	n	start footnote; *x* is optional footnote label
.HD	undef	n	optional page header below header margin
.I *x*	–	n	italicize *x*; if no *x*, switch to italics
.IP *x y*	–	y,y	indented paragraph, with hanging tag *x*; *y*=indent
.IX *x y*	–	y	index words *x y* and so on (up to 5 levels)
.KE	–	n	end keep of any kind
.KF	–	n	begin floating keep; text fills remainder of page
.KS	–	y	begin keep; unit kept together on a single page
.LG	–	n	larger; increase point size by 2
.LP	–	y,y	left (block) paragraph.
.MC *x*	–	y,y	multiple columns; *x*=column width
.ND *x*	if t	n	no date in page footer; *x* is date on cover
.NH *x y*	–	y,y	numbered header; *x*=level, *x*=0 resets, *x*=S sets to *y*
.NL	10p	n	set point size back to normal
.OF *x*	–	n	odd page footer *x* (3 part as for .tl)
.OH *x*	–	n	odd page header *x* (3 part as for .tl)
.P1	if TM	n	print header on 1st page
.PP	–	y,y	paragraph with first line indented
.PT	- % -	n	page title, printed at head of page
.PX *x*	–	y	print index (table of contents); *x*=no suppresses title
.QP	–	y,y	quote paragraph (indented and shorter)
.R	on	n	return to Roman font
.RE	5n	y,y	retreat: end level of relative indentation
.RP *x*	–	n	released paper format; *x*=no stops title on 1st page
.RS	5n	y,y	right shift: start level of relative indentation
.SH	–	y,y	section header, in boldface
.SM	–	n	smaller; decrease point size by 2
.TA	8n,5n	n	set tabs to 8n 16n ... (nroff) 5n 10n ... (troff)
.TC *x*	–	y	print table of contents at end; *x*=no suppresses title
.TE	–	y	end of table processed by *tbl*
.TH	–	y	end multi-page header of table
.TL	–	y	title in boldface and two points larger
.TM	off	n	UC Berkeley thesis mode
.TS *x*	–	y,y	begin table; if *x*=H table has multi-page header
.UL *x*	–	n	underline *x*, even in *troff*
.UX *x*	–	n	UNIX; trademark message first time; *x* appended
.XA *x y*	–	y	another index entry; *x*=page or no for none; *y*=indent
.XE	–	y	end index entry (or series of .IX entries)
.XP	–	y,y	paragraph with first line exdented, others indented
.XS *x y*	–	y	begin index entry; *x*=page or no for none; *y*=indent
.1C	on	y,y	one column format, on a new page
.2C	–	y,y	begin two column format
.]-	–	n	beginning of *refer* reference
.[0	–	n	end of unclassifiable type of reference
.[N	–	n	N= 1:journal-article, 2:book, 3:book-article, 4:report

7

REGISTERS

Formatting distances can be controlled in −ms by means of built-in number registers. For example, this sets the line length to 6.5 inches:

```
.nr LL 6.5i
```

Here is a table of number registers and their default values:

Name	Register Controls	Takes Effect	Default
PS	point size	paragraph	10
VS	vertical spacing	paragraph	12
LL	line length	paragraph	6i
LT	title length	next page	same as LL
FL	footnote length	next .FS	5.5i
PD	paragraph distance	paragraph	1v (if n), .3v (if t)
DD	display distance	displays	1v (if n), .5v (if t)
PI	paragraph indent	paragraph	5n
QI	quote indent	next .QP	5n
FI	footnote indent	next .FS	2n
PO	page offset	next page	0 (if n), ~1i (if t)
HM	header margin	next page	1i
FM	footer margin	next page	1i
FF	footnote format	next .FS	0 (1, 2, 3 available)

When resetting these values, make sure to specify the appropriate units. Setting the line length to 7, for example, will result in output with one character per line. Setting FF to 1 suppresses footnote superscripting; setting it to 2 also suppresses indentation of the first line; and setting it to 3 produces an .IP-like footnote paragraph.

Here is a list of string registers available in −ms; they may be used anywhere in the text:

Name	String's Function
*Q	quote (" in *nroff*, `` in *troff*)
*U	unquote (" in *nroff*, '' in *troff*)
*—	dash (-- in *nroff*, — in *troff*)
*(MO	month (month of the year)
*(DY	day (current date)
**	automatically numbered footnote
*'	acute accent (before letter)
*`	grave accent (before letter)
*^	circumflex (before letter)
*,	cedilla (before letter)
*:	umlaut (before letter)
*~	tilde (before letter)

When using the extended accent mark definitions available with .AM, these strings should come after, rather than before, the letter to be accented.

BUGS

Floating keeps and regular keeps are diverted to the same space, so they cannot be mixed together with predictable results.

7

NAME

term – conventional names for terminals

DESCRIPTION

Certain commands use these terminal names. They are maintained as part of the shell environment (see *sh*(1),*environ*(7)).

adm3a	Lear Seigler Adm-3a
2621	Hewlett-Packard HP262? series terminals
hp	Hewlett-Packard HP264? series terminals
c100	Human Designed Systems Concept 100
h19	Heathkit H19
mime	Microterm mime in enhanced ACT IV mode
1620	DIABLO 1620 (and others using HyType II)
300	DASI/DTC/GSI 300 (and others using HyType I)
33	TELETYPE® Model 33
37	TELETYPE Model 37
43	TELETYPE Model 43
735	Texas Instruments TI735 (and TI725)
745	Texas Instruments TI745
dumb	terminals with no special features
dialup	a terminal on a phone line with no known characteristics
network	a terminal on a network connection with no known characteristics
4014	Tektronix 4014
vt52	Digital Equipment Corp. VT52

The list goes on and on. Consult /etc/termcap (see *termcap*(5)) for an up-to-date and locally correct list.

Commands whose behavior may depend on the terminal either consult TERM in the environment, or accept arguments of the form **–Tterm**, where *term* is one of the names given above.

SEE ALSO

stty(1), tabs(1), plot(1G), sh(1), environ(7) ex(1), clear(1), more(1), ul(1), tset(1), termcap(5), termcap(3X), ttytype(5)
troff(1) for *nroff*

BUGS

The programs that ought to adhere to this nomenclature do so only fitfully.