GETTING STARTED

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1. *Introduction*

This document is aimed at new users to the Informatics Department Unix Service. It is designed to get people started, to indicate some of the facilities available and where further information/explanation or help may be obtained. The amount of technical content is minimal but some brief hardware details concerning Unix machines in the Informatics Department are given in 'APPENDIX 1'. As an example of the directory hierarchy on Unix machines a list of some of the more useful files and directories on the Pyramid is given in 'APPENDIX 2'.

In order to use a Unix machine you must first have an identity on that machine; to this end you must visit a System Administrator and ask him/her to create a user-name for you. At present there are two System Administrators (who can be found in R1, room G66, ext 6190): Ines Vollmer is primarily responsible for the Pyramid (pyr-a) and Vax systems (vd and vc) and Rodney Tillotson for the Sun fileservers (nfs1, nfs2, nfs3, nfs5) and workstations. Either of these two people will arrange for you to use the service and, once this is done, you will normally be able to use the Sun workstations, pyr-a and vd immediately.

You will be told an initial password which, for security reasons, must be changed the first time you login (see 3.1, 'Changing your password on the system'). An individual's user-name is usually created from his/her lower case initials. (The System Administrators are responsible for registration/deletion of users, filestore backups and integrity, reporting of hardware faults to the appropriate customer engineers and liaison with system programmers.)

The level of support offered for the Unix machines has been defined into four categories of facility : Gold, Silver, Bronze and Private (refer to IDUS/1/87 for details - this is available from Nicola Kennett in R1, room 1.64 , ext 5899). Not everyone can automatically use private machines (eg. rl.vf), and there are some restrictions on the other machines too. The level of support available should be taken into account when deciding which machine you need. The software mentioned in this document is available on most gold machines unless otherwise stated. Below is a brief guide to who uses which machine and what level of support the different machines offer :

Machine names	Users	Level of support
pyr-a	All members of the Informatics Department, Technology Division and some external users from the ICF use this machine.	Gold
Suns	In order to use certain facilities (eg. the window) you need access to a console of a workstation. Some of these workstations can be found in Lab 11 and elsewhere. Recently the number of people using these machines has increased and the trend seems to be away from multiuser systems and towards single-user systems.	Gold
vd	This machine is an Alvey Infrastructure machine and is mostly allocated to IKBS users. It tends to be heavily loaded and new users are positively discouraged from using this machine.	Silver
vc	This machine is reserved for Software Engineering use only.	Silver

2. *Logging on*

2.1.

There are several different ways of logging on to the system depending on which type of connection you have. Some terminals are connected to the Gandalf PACX terminal switch, some to JANET via a Camtec PAD and some to the Ethernet via a Bridge Communication PAD (Etherpad).

[JANET is an abbreviation for the Joint Academic NETwork. Currently, a document is being prepared which will discuss JANET, LAN (Local Area Network) and WAN (Wide Area Network) and thus they are not covered in this paper. At present there are only two Etherpads in the Informatics Department Unix Service, these are called 'epad1' and 'epad2'. They each have ports for up to 14 asynchronous terminals and provide access to any host on the Ethernet. In future, ID intend to connect more of their terminals to the Etherpads rather than have them connected to the Camtec X.25 pads.]

NB. The Unix System is case sensitive. In this document, commands, examples of command lines and user inputs are highlighted in bold print. Machine prompts and responses are highlighted in emboldened italics. <CTRL> refers to the key marked 'CTRL' and <CR> refers to the carriage 'RETURN' key. <CTRL>-d means simultaneously press 'CTRL' and 'd'.

2.1.1. *How to login to a Sun from a console of a workstation :*

(1) In response to the *machine_name login:* prompt, type your **user-name** followed by <CR>.
(2) You will then be prompted for your password.
(3) This will be followed by a prompt character from the shell.(See 3.2, 'Shells').

2.1.2. *How to login via an 'Etherpad' connection :*

(1) Hit the <CR> key a few times until the terminal responds with
   Welcome to the Informatics Department Ethernet , followed by the prompt *epadn >*
   (where n equals 1 or 2, depending to which Etherpad the terminal is connected).
(2) Type **c machine_name** followed by <CR> (eg. **c pyr-a**).
(3) Some information concerning the machine you are logging into should then appear, followed by the prompt *login:*
(4) Type your **user-name** followed by <CR>.
(5) You will then be prompted for your password.
(6) This will then be followed by a prompt character from the shell.
   (See 3.2, 'Shells').

2.1.3. *How to login via a 'PACX' line :*

(a) using a terminal with a 'PACX' key

(1) Hit the <PACX> key and wait for a few seconds. (Some people then hit <CR>, but this is not needed in most cases.)
(2) The prompt *enter class* appears.
(3) Type the **name** for the machine you wish to log on to (eg. **pyr-a**) followed by <CR>.
(4) In response to the *login:* prompt, type your **user-name** followed by <CR>.
(5) You will then be prompted for your password.
(6) This will be followed by a prompt character from the shell.
   (See 3.2, 'Shells').

(b) using a graphics terminal without a 'PACX' key

(1) Hit the <BREAK> key followed by <CR> a few times
    Then continue as in part (a)

2.1.4. *How to login on a 'Etherpad' accessed from a 'PACX' line :*

(1) Hit the <PACX> key and wait for a few seconds. (Some people then hit <CR>,
    but this is not needed in most cases.)
(2) The prompt *enter class* appears.
(3) Type **ether** followed by <CR>. The terminal responds with
    Welcome to the Informatics Department Ethernet , followed by the prompt *epadn >*
    (where n equals 1 or 2, depending to which Etherpad the terminal is connected).
Then follow step (2) of 'How to login via an 'Etherpad' connection', 2.1.2, in order to login.
(This method can be used if you are being asked to queue to login via a 'PACX' line;
however, care must be taken. If you do not logout and the system times you out,
after 12 mins, the next person logging in via the Etherpad will be in your session!)

2.1.5. *How to login via a 'PAD' line :*

(1) Hit the <CR> key a few times until the terminal responds with some information
    concerning the 'PAD' followed by the PAD> prompt.
(2) Type **call machine_name** (eg. **call vd**) followed by <CR>.
(3) The response ***** Call connected** should appear, closely followed by some
    information concerning the machine you are logging onto and the prompt *login:*
(4) Type your **user-name** followed by <CR>.
(5) You will then be prompted for your password.
(6) This will be followed by a prompt character from the shell.
    (See 3.2, 'Shells').

You can now start typing commands to the system. If your login-name and password do not correspond
to those known by the system *login incorrect* is printed and you will again be prompted for your
login-name by *login:*. If you wait over 60 seconds to type your password your line will be discon-
nected and you will have to begin the 'Logging on' procedure from the beginning.
You can logout by typing a <CTRL>-d.

2.2. *Terminal keys*

A few of the more useful terminal keys together with their defaults follow :

erase character	<DEL>
enter line	<CR> at end of line
stop / continue scrolling	<CTRL>-s / <CTRL>-q
kill (or delete) a line	<CTRL>-u
interrupt	<CTRL>-c
logout	<CTRL>-d

3. *On the system*

3.1. *Changing your password on the system*

For all machines except pyr-a and vc your password entry comes from Yellow Pages (see 8.2, Yellow Pages). To change this Yellow Pages password type

<div align="center">

yppasswd username
</div>

The **yppasswd** command will then prompt as follows :

<div align="center">

Old yppassword:

New yppassword:

Retype new yppassword:

(and gives you a confimatory message.)
</div>

It is recommended that passwords have at least six characters. Neither old nor new passwords are echoed on the screen.

As yet pyr-a does not use Yellow Pages, so the password there needs to be changed separately. While logged in to pyr-a, type

<div align="center">

passwd username
</div>

passwd prompts for the password, then for the new one and then the new one again (exactly as described for the command **yppasswd**).

3.2. *Shells*

When you log in to the Unix System, the system reports the last time you logged in, gives any messages of general interest to users of the system and notifies you of mail. Ultimately the cursor appears to the right of the shell prompt, which may be a **$** or a **%**. This symbol comes from a shell, which is a program that is automatically run when you log in. The **$** prompt is characteristic of the Bell Labs Bourne shell. It is assumed that new users will use the Bourne shell, unless they ask the System Administrator otherwise. However, you can change to the U.C. Berkeley 'C' shell, which is characterised by the **%** prompt. This is done using the command **csh**. To return to the Bourne shell use <CTRL>-d. A feature of the 'C' shell is that it has a history mechanism extra , but for the most part the choice of shells is made on personal preference.

A shell allows the use of variables. A shell has several special variables, called environment variables, which are automatically set for you when you login. For example: TERM, contains your terminal type. If you use just one kind of terminal type it is useful to have this variable set in your '.profile' (see 3.3, 'Start-Up Files'). The value of a shell variable can be obtained by using the variable name preceded by $.

3.3. *Start-Up Files*

The file '.profile' is given to you by the System Administrator and is used by the Bourne shell and its derivatives (eg: msh) on start-up. Start-up files contain a list of shell commands which set up the user's initial environment before the shell issues the first prompt. It is in the file '.profile' that environment variables are set. For example, to set the shell prompt string to include the name of the machine you are on, while using the Bourne shell, the following code must be included in '.profile' :

```
PS1="`hostname`$ "
export PS1
```

(hostname is a Unix command which prints the name of the current host system)

The files '.cshrc' and '.login' may be given to you by the System Administrator and are used by the'C' shell on start-up.

3.4. *Documentation*

On-line documentation of commands is available by use of the **man** command (eg: **man more, man man,** and **man lpr** are useful for beginners). It should be noted that there is a delay before output is generated from **man.** A table of contents listing the commands covered by the on-line manual can be found in the file called /usr/man/whatis. It is possible to produce a printed copy of this using a 'pipe', typed as | (see 7.2, 'Redirection') by typing the command line :

cat /usr/man/whatis | lpr -Paln

where n is 1,2,3 or 4.

Manuals are available for 4.2 BSD (the version of Unix used on most machines at the Rutherford Laboratory is based on Berkeley Unix). These can be obtained, on request, from Ann Jaroslawska, ext 6190. No manuals are currently available (November 87) for system V, which is on the pyr-a. Documentation for this can only be found on-line yet, in the att universe on the pyr-a. (To find out how to use a different universe while on the pyr-a type **man universe**). Information on GKS (see 7.5, 'Graphics and libraries') can be found in the directory /usr/lib/gks/documents on pyr-a and manuals are available from the Documentation Officer in Central Computing Division, Muriel Herbert. Information on NAG (see 7.5, 'Graphics and libraries') is not on-line but reference manuals can be found in the Terminal Room (located at the east end of the ground floor of R1). Sun manuals can be found on the bookshelves in Lab 11 and a variety of reference manuals can be found in the Meeting Room of Lab 10. Users will be notified of future facilities via 'ral.general' (see 6.5, 'News'), message of the day, or system messages. Various books on Unix are available on loan from the Library; recommended books are 'The UNIX System' by S R Bourne and 'UNIX the Book' by M Banahan and A Rutter.

3.5. *User Support*

The Informatics Division has a User Support section which is available for user gripes and advice. The section may be reached by electronic mail (this is the preferred route unless it is very urgent), phone (ext 6252), or by personal contact (office R1, G52). To mail User Support, use the command **mail support.** The mail will then be sent to a mailbox which is read by User Support.

3.6. *Learn*

The command **learn**, available on pyr-a and vd, gives computer aided instruction courses on several topics, including the editors ed and vi, the Unix file system and the C language.

3.7. *Accounts*

On the Unix machines in ID, at present, there is no need for a user to have an account as such (ie. no need for the amount of time and filestore used by an individual to be restricted) although users are encouraged not to keep unnecessary files in their filestore.

4. *Directory structure / file names*

4.1. *Directory hierarchy*

Files are grouped into directories and the directories form a tree structure. The top of the tree is called the root directory or /. Each node is a file and some nodes have branches leading to other nodes. These are directories. Each directory contains the names of files or further directories.
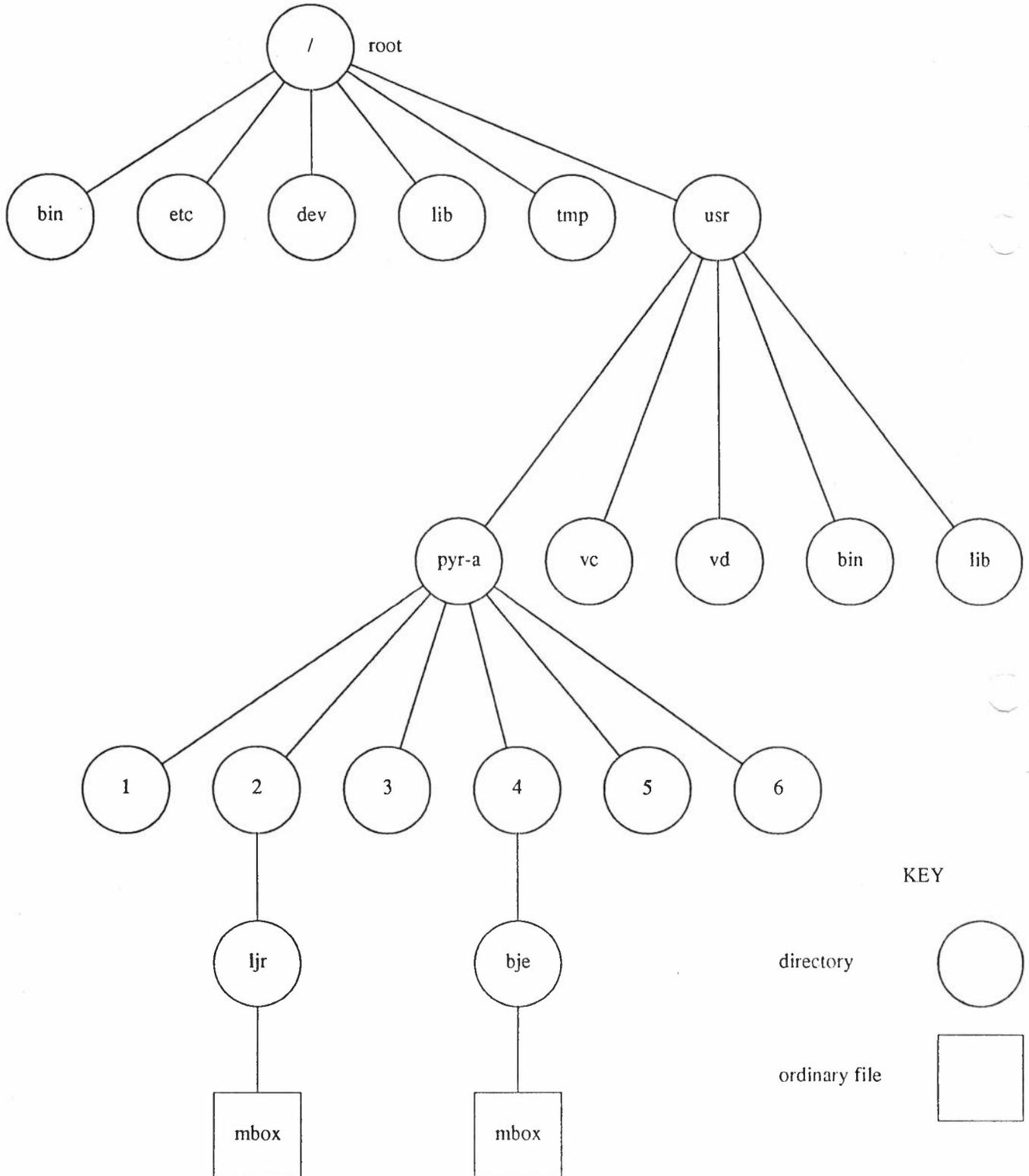
In brief the upper directories contain the following :

/dev	devices
/bin	executable commands
/etc	system control files
/lib	libraries
/tmp	temporary files
/usr	general purpose directories
/usr/bin	more executable files
/usr/lib	more libraries

'APPENDIX 2' gives more detailed information about the directory hierarchy on pyr-a.

4.2. *Pathnames*

A pathname shows the path taken from the top of the tree to the file. It starts with a /, referring to root, and thereafter is made up of component names separated from each other by a /. The pathnames of the files shown on the diagram are :

/usr/pyr-a/2/ljr/mbox
/usr/pyr-a/4/bje/mbox

Although filenames can be the same, the pathnames are unique.

4.3. *Simple file and directory manipulation*

Initially, you will have a home directory (eg. /usr/pyr-a/2/user-name) created by the System Administrator to which you may add further subdirectories using the command **mkdir** (see the table below).

Command	Explanation
cat	list contents of a file
cd	change to a (sub-)directory
chmod	change mode (to alter read/write/execute permissions)
cp	copy a file
find	find files satisfying some criteria
ln	make link (add a name)
ls	list contents of a (sub-)directory
mkdir	make a (sub-)directory
more	filter for browsing through text file
mv	move file (change name)
pwd	print working directory pathname
rm	remove a file
rmdir	remove a (sub-)directory
whereis	locates source, binary, and or manual for program

5. *Input / Output*

5.1. *Editors*

The following editors are available :

$\left.\begin{matrix} \mathbf{ex} \\ \mathbf{vi} \\ \mathbf{ed} \end{matrix}\right\}$ Standard Unix editors.

e   The Rand editor (only available in the ucb universe on pyr-a).

emacs   Display editor. (There is a help system and a tutorial available on pyr-a.) (IDUS 10 is a quick reference card on emacs.)

emacsedit   Editor for use in Emacs shell windows.

fontedit   A vfont screen-font editor (only available on the Suns).

spy   Available on Suns (This was written in the Division.)

sed   Stream editor.

textedit   Mouse and window orientated text editor (only available on the Suns).

View is the read only version of vi. In addition to these editors there is also an editor called ten. The latest release of spy is version nine, ten is the next version which is in widespread use here but not released. It is in /usr/ral/bin. For more detailed information concerning any one of the above editors refer to the on-line manual (see 3.4, 'Documentation').

5.2. *Text processors*

The UNIX system provides a set of tools to aid document preparation. These tools include text formatting programs that enable page size, line length, margins, spacing between lines and type fonts to be specified. These text formatters are called **troff** and **nroff**. For typewriter quality output **nroff** is used and for print quality output **troff** is used. **nroff** produces a fixed width font but **troff** uses proportional spacing (for more information on **nroff** and **troff** refer to the on-line manual). These tools together with a text editor (such as vi or emacs) allow documents to be drafted and corrected with considerable ease. Programs are also available to check for correct spelling (eg. on the Pyr-a one can use the command **spell -b document_name**, to check for correct British spelling as opposed to American), make indices or look for wordy or misused phrases. Generally, a high quality result can be achieved with a reasonable expenditure of effort.

It is the policy to support and encourage use of DWB (Documenter's Work Bench) and Transcript 2.0 to print Postscript output. DWB is available on pyr-a, vm and the Suns. (Note that currently on the Suns /usr/ral/dwb/bin needs to be included at the start of $PATH to pick up the DWB versions of these commands.) Under DWB all the text processing commands available at the moment will still be available and, in addition, new commands will be added. The commands provided by DWB and Transcript will include :

Command	Explanation
eqn	preprocessor to format mathematical text for **troff**
grap	**pic** preprocessor for drawing graphs
mm	prints documents formatted with mm macro package (**nroff** only)
mmp	send output to printer version of **mmt**
mmt	**troff** version of **mm**
mt	typeset documents
mvt	typeset viewgraphs and slides
neqn	preprocessor to format mathematical text for **nroff**
nroff	text processor for typewriter quality output
pic	**troff** preprocessor for drawing pictures
psroff	send output from device independent **troff** to printer
tbl	preprocessor to format tables for **nroff** or **troff**
troff	text processor for typset quality output

Currently **mmp** and **psroff** are not available in the att universe and **grap, mm, mmt, mt, mvt** and **pic** are not available in the ucb universe on the pyr-a.
(For DWB refer to IDUS 4 by Chris Rust and IDUS 6-9.)

5.3. *Printers*

There are four Apple Laserwriters available. Each Laserwriter is identified by a three character code : al1, al2, al3 or al4.

Printer	Location
al1	Lab 11 (attached to a Sun called harold)
al2	R32 room 6 (attached to a Sun called faith)
al3	R1.2.75 (attached to nfs1)
al4	R1.1.74 (attached to a Sun called nutmeg)

You normally choose the one nearest to you, as all are accessible in exactly the same way from any service machine. Output can be sent to these printers by specifying the printer destination in one of two ways :

    (a) By including the option -Paln in the command line (where n is 1, 2, 3 or 4)
    eg. to send a file called filename to the laserwriter in lab 11 you use the command
                  lpr -Pal1 filename
or   **ptroff -Pal1 filename** (if filename contains a document)
or   (b) Include the printer destination as an environment variable, in your file called '.profile'
    (which should already exist in your directory). This is done by including the following :
                  PRINTER=printer_destination
                  export PRINTER
    where printer_destination is one of the following : al1, al2, al3 or al4.
If PRINTER is set, to check the queue for printing, just type
                lpq
Otherwise, to check (for example) the al2 print queue type
                lpq -Pal2

6. *Communications*

6.1. *Message of the day and system messages*

The message of the day is printed by **login** but can also be read in the file /etc/motd. System messages can be read by using the command **msgs** on pyr-a and the vax machines.

If the system has recently been down for any reason, a clue to the cause can be found in /usr/adm/shutdownlog. Typing the following command line :

<div align="center">

tail /usr/adm/shutdownlog

</div>

gives the last ten lines of this file.

6.2. *Mail*

The command **mail user** sends electronic mail to the specified user. The entry of a mail message is terminated using <CTRL>-d. A list of usernames can be found in the file /etc/passwd. When you log in you will be informed if there is any mail waiting for you. Just typing **mail** allows you to read any outstanding mail. While in mail, if you type **help** or **?** you will be given a summary of the commands available. The command **biff** can be used to inform the system whether you want to be notified when mail arrives during the current terminal session. (The default setting is not to be notified.) There also exists a command on the Suns which automatically replies to incoming mail to the effect that the user is on leave (**man vacation**).

6.3. *Messages*

The command **write user** sends messages to the specified user who is logged in at the time. To find out who is logged in use the **who** command. (The command **rwho** produces similar output to **who**, but for all machines on the local network). A message is sent by <CR>. Exit is by <CTRL>-d. One convention of finishing a message is to type o (for 'over') and the final message finished with oo (for 'over and out'). Messages can also be sent using **talk**; **talk** is a visual communications program which copies lines from your terminal to that of another user. The command **mesg** can be used to inform the system whether or not you want to receive messages sent via **write** and **talk**. (The default setting is to receive messages.)

6.4. *Meetings*

At present there are three regular meetings pertaining to Unix. The Unix Service Meeting (USM) is held monthly and deals with the day-to-day running of the system. Every section has a representative. The Chairman and Secretary of the Unix Service Meeting are Mike Claringbold and Nicola Kennett respectively. The Unix Liaison Meeting (ULM) determines policy and meets every 2 months. The Chairman and Secretary of the Unix Liaison Meeting are Ken Hartley and Crispin Goswell respectively. The Informatics Department Unix Users Forum (IDUUF) meets every two months to discuss issues relevant to users on any ID machines running Unix. Representatives from IDUUF report all relevant issues to USM/ULM and feedback information from USM/ULM. IDUUF is not a place to report bugs. These should be sent directly to Support. The IDUUF Secretary is Pete Randall. Agenda and minutes of the IDUUF are distributed via electronic mail; if you wish to be put on the circulation list, mail the Secretary: pete@pyr-a, giving your preferred electronic mail address (see 6.2, 'Mail').

6.5. *News*

Command **rn** - read news program

The news is split into many different newsgroups each of which contain numerous articles. **rn** has three levels : newsgroup selection level, the article selection level, and the paging level. Each has its own set of commands and its own help menu (the user can enter the command **h** at any stage to give a list of commands available at that stage). At the newsgroup selection level (the top level), you may specify which newsgroups you want next, or read them in the default order. At the article selection level you may read them in the default order (which is the order of arrival on the system), or by specifying which article you want next.

On reading news for the first time a file called '.newsrc' is created. This is the list of newsgroups which is input on subsequent occasions when news is read. If any new newsgroups have been created since you last read news, it will give you the opportunity to add them to your '.newsrc' file (which is your list of subscribed-to newsgroups). If no newsgroups are specified on entry to the news program then the first five newsgroups from '.newsrc', with unread articles, are systematically displayed (in the order in which the newsgroups occur in your '.newsrc' file) and then you are asked whether you wish to read the unread articles in the first of these groups. You are given the options *[ynq]* - yes, no, or quit the news program. If you respond **n**, the next newsgroup in your '.newsrc' file is displayed; whereas if you respond **y**, you are put into the article selection level where, after reading the first article, you have the options *[npq]* - next article, previous article, or quit. Quit returns you to the newsgroup selection level.

The newsgroups have prefixes which indicate to whom they are relevant, eg.

ral	specific to the Rutherford Appleton Laboratory
uk	specific to the United Kingdom
eunet	specific to Europe
rec	
comp	
misc	general news relevant to everyone
news	
etc.	

'ral.general' is a newsgroup containing information of general interest to members of Rutherford (mainly members of the Informatics Department) and is often used for Departmental gossip, etc.

In articles, users will sometimes see the symbol '>' in the far left hand column, indicating a section of text copied from a previous article, to which the present author is replying or commenting on.

A user can submit articles to news by using **Pnews**. Ines Vollmer is the local administrator of the News system.

For more detailed information on **rn** see the User Manual or refer to the on-line documentation.

6.6. *Courses available*

Many companies offer courses on Unix; User Support recommend those run by a company called Instruction Set. They run both introductory and advanced courses, usually lasting a week. Course groups are generally no more than 20-strong and individuals have their own terminals for practical sessions. The courses currently on offer include :

Courses	
Title	*Length*
Unix : A Strategic Overview	2 Day Seminar
Unix : System Security and Administration	2 Day Seminar
Unix : Basics for Users	3 Day Course
Unix : Fundamentals 1	5 Day Workshop
Advanced Programming in Unix Environment	5 Day Workshop
Advanced Unix Tools	5 Day Workshop
The Unix Kernel for Source Licensees	5 Day Course
Device Drivers and Kernel Overview	5 Day Workshop
Specialist Unix Courses	1 Day Courses

Instruction Set also provide courses on Principles of Operating Systems, C Programming Language, Ada Programming Language, and many other subjects. Users are encouraged to seek every possible guidance form Departmental colleagues and Support before rushing off on a course, whether this be run by Instruction Set or others.

7. *Further information*

7.1. *Data manipulation tools*

Command	Explanation
cmp	compare two files
comm	common lines in two files
diff	finds differences between two files
grep	finds a specified pattern in a file
join	combine two files by joining records with identical keys
sort	sorts one or more files
tar	saves and restores multiple files on a single file
tr	substitutes strings throughout a file
uniq	removes repeated lines in a sorted file
uucp	unix to unix copy
hhcp	host to host file transfer

7.2. *Redirection*

A program is static, but a program that is currently being executed is a dynamic object and in Unix is called a *process*. A process can cause the creation of other processes. The output stream from a process (standard output) can be sent to a file and similarly standard input can be taken from a file instead of from the terminal. The output stream from one process can also be connected to the input stream of another process by means of a powerful mechanism in Unix, called a *pipe* (typed |). The command lines needed to do these are of the forms :

command <file1	(command takes input from file1)
command >file2	(command sends output to file2)
command >>file	(command appends output to file)
command1	command2	(output from command1 forms input to command2)

eg.

ls >filelist	(puts the list of files in your current directory into a file called filelist)
**ls	grep idus >idusfile**	(lists all the files in the current directory that contain the pattern 'idus' and puts this list into a file, idusfile)

7.3. *Remote login*

The command **rlogin machine_name** will log in to a remote host system (rhost) from a local host system. Some machines will then prompt you for your password again. This can be avoided, to some extent by creating a file called .rhosts which consists of lines of the form :

machine_name user-name

where the machine_name is the local host from which you are remotely logging in to another machine.

7.4. *Suntools*

On starting suntools the machine will look into /usr/lib/suntools for the default screen setup and /usr/lib/rootmenu for the default menu setup. However, if the files '.suntools' and '.rootmenu' (this name can be changed) have been set in your home directory then the suntools will execute them instead. The '.suntools' file can be more usefully created by setting up the screen under the suntools manager and then running a program called 'toolplaces' which will output the screen layout with a syntax suitable for the '.suntools' file entry (eg: use the command line **toolplaces > $HOME/.suntools**, where HOME is the environment variable that stores the pathname of your 'home' directory when you login).

It is preferable to have a default screen with at least the following:
      1) A console screen tool ('cmdtool -C'), which will prevent error messages reporting to the
         main screen thus scrolling the display and requiring it to be redisplayed.
      2) A shelltool to enable interaction with the computer.
Also useful is the clock ('clocktool') and mailer ('mailtool'). Other tools can be found in /usr/ral/bin and /usr/bin. The tool 'defaultsedit' will allow you to set up options easily regarding the alias names for the '.rootmenu' file in your home directory. The results of using this tool are placed in a file for machine consultation called '.defaults'.

The main personalization of the suntools system will be to the rootmenu, which permits mouse interaction to select any tools (or other commands) easily.

For more information on Suntools refer to the on-line manual (see 3.4, 'Documentation'). This information is only available on the Suns.

Various tools for the Suns are part of the ID Unix service, including :

                Kent tools
                  ww
                  PS
                 spy
                GKS

7.5. *Graphics and libraries*

GKS (the Graphical Kernel System) is available on all Unix machines except Sun2's. On the Suns is Sunview, for which courses are available. The GINO-F graphics system is not supported.

Workstations such as the Suns provide obvious advantages with their many overlapping windows of different sizes. However, the real value of a workstation is only seen when the windows are used to run interactive graphics programs. The "graphics" referred to do not imply just output of graphs or diagrams, though workstations can display these, but using the mouse to point and manipulate text or objects, eg. using 'mailtool'.

To write similar interactive programs, you can use the suntools library provided by Sun. However, there are several utilities in existence at RAL, such as *ten* and *musk* which have been written on a locally produced library called *ww*. This provides much simpler ways of writing interactive graphics programs and several sophisticated facilities, such as popup menus, terminal emulation, and a browser for choosing filenames. A version of *ww* has recently been installed on all Suns in /usr/ral; to access it you need to have /usr/ral/bin in your PATH. There are some small demonstration and test programs written in C

available, and some in Fortran, with a manual describing the routines. Type **ww** to get more information.

The NAG (Numerical Algorithms Group) library is a collection of Fortran routines for numerical analysis. A routine can be called from this library by compiling with the option -lnag. (This is not currently on the Suns, but if you are interested in using it contact Bill Hewitt, R1, B13, ext 6713, for more information.)

7.6. *Foreground / background*

Large jobs (eg. compilation of long programs and large **troff** jobs) should be run in the background. The shell provides the '&' notation for this purpose. For example :

cp largefile newfile &

instructs the shell to run the copy command but not to wait for it to finish; this allows you to carry on working. If you intend to **logout** before the background activity finishes, the **nohup** (no hang up) command should be used with the '&'. Otherwise disconnecting (hanging up) the terminal will abort the background job. For example, running a large document through **troff** (using the ms macro) type :

nohup troff -ms document &

7.7. *Compilers*

Language	Compiler	Interpreter
C	cc	
C++	CC	
Fortran77	f77	
Pascal (Ansi)	pc (Suns); pascal (pyr-a)	
Lisp (Franz)	liszt, bigliszt (pyr-a, vd, vc)	lisp (pyr-a, vd, vc)
Common Lisp	lc, lc1	kcl (Sun3's)
Prolog	qplg (wendy, mary, richard)	nip, cprolog, qplg (wendy, mary, richard)

Details of the availability of the various Prolog and Lisp systems can be obtained from A J Lucas and Charlie Kwong respectively (R1, room 2.57, ext 5716).

To compile a simple C program, say prog.c, typing
cc prog.c
will compile the program, leaving an executable program in the file a.out. This can then be executed by typing **a.out**. Alternatively, typing
cc -o prog prog.c
will put the excutable program in the file prog, to be executed by typing **prog**.

There is a compiler called efl (on pyr-a only), which compiles programs written in Extended Fortran language into clean Fortran. The functional programming languages, Edinburgh Standard ML and FP, are also available on pyr-a. (ML can be copied from /usr/local/bin/sml on pyr-a.)

7.8. *Lab 11 (Ground floor in R1)*

This area is designed primarily as an evaluation room. However, it is a public area and people can use the terminals and workstations there.

Machine	Notes
cedar	Sun, model 3/110
edna	Sun, model 2/50.
harold	Sun, model 2/120, printer server
laurel	Sun, model 3/260, located here temporarily for evaluation
maple	Sun, model 3/160
richard	Sun, model 2/160
Perq (3)	Refer to Kevin Lewis
Apollo (2)	Refer to Janet Haswell
Orion	Refer to Crispin Goswell
Whitechapel	Model MG-1, refer to Trudy Watson
IBM	model 6150, refer to Francis Yeung

The Suns are public machines and are generally available for all to use. If you are experiencing difficulties in using any of the other machines, see the appropriate person named above. The numbers in brackets, eg. in Perq (3), indicate the number of machines currently available in Lab 11. The Responsible Officer for Lab 11 is Rodney Tillotson (ext 6190).

8. *Accessing files*

8.1. *NFS*

NFS stands for 'Network File System', and is Sun's distributed filesystem. It provides a user on one machine with transparent access to files on another machine, as if those files were local to the machine on which the user is logged in. NFS runs on all Suns, on pyr-a, and on vd. Plans are in progress to provide it on vc as well.

NFS is used in two ways. It provides access to system utilities for the 'discless' Sun workstations, and provides access to the user filestore for all users of machines connected via NFS.

The current arrangement of the user filespace is as a 'global filestore'; this means that a user will get the same view of the entire user filespace, regardless of where he or she logs in. It is not necessary that a user's files are physically located on the same machine as that being used. Users need only a single 'home' directory, visible from all the service machines. For historical reasons some users still have scattered files.

8.2. *Yellow Pages*

Yellow Pages is a distributed database system running alongside NFS. It is used to control the administrative details of NFS, such as allocation of usernames and of machine names. At the time of writing (November 87) Yellow Pages is operational on the Suns and vd, but not on pyr-a and vc.

In general, Yellow Pages is transparent to the user. The major exception is that, to change a login password under this system, the command **yppasswd** must be used rather than the normal **passwd** command. Within Yellow Pages, the commands **chsh** and **chfn** are not available, and a system administrator must be contacted if a user wants to change his or her login shell or **finger** information.

Other consequences of Yellow Pages are only relevant to those writing specialist software that accesses the databases controlled by this system.

8.3. *Dumping / archiving*

Dumping is done nightly on all machines, except on those Suns with discs. Thus, in the event of the system going down, a user should lose 24 hours work at most. There is no other archiving facility available in the service.

APPENDIX 1

Hardware details

Hardware details of the Pyramid :-

> PYRAMID 98X
> 8 Mbytes memory
> Dual processor
> IOC (gpsc) controller
> Morning Star board for Unix-X25 communications
> IOP/TPE controller
> Three Fujitsu Eagle type disc drives (0,1,2)
> TPE Ethernet Controller
> 1600 bpi horizontal loading tape drive
> Wyse terminal used as system console
> Epson printer used as hard copy for system console
> Current PACX connections = 8

Hardware details of Vax-c (DEC Vax) :-

> VAX 11/750 CPU
> 8 Mbytes memory
> Floating Point Accelerator (FP750)
> Two DZ11 (8 lines each) for Asynchronous Interface (PACX)
> DR11W (general purpose interface)
> System console printer
> FEP (Yorkbox) for Unix-X25 Communications
> Interlan Ethernet Controller
> 1600 bpi TE16 Tape Drive
> Two RM03 disc drives
> RA60 disc drive
> RA80 disc drive
> RL02 disc drive
> Current PACX connections = 6

Hardware details of Vax-d (Systime 8750) :-

> VAX 11/750 CPU
> 8 Mbytes memory
> Floating Point Accelerator (FP750)
> Systime VIP Processor Speed-up
> 16 line Asynchronous Interface (CS11)
> General Purpose Interface (DR11-C)
> 300 lpm lineprinter (upper and lower case band)
> System console printer
> Two 410 Mbyte Winchester disc drives
> 256 Mbyte exchangeable disc drive
> 45 ips 800/1600 bpi magnetic tape drive
> FEP (York Box) for Unix-X25 communications (connects to DR11-C)
> Interlan Ethernet Controller
> Pragma Lasergrafix laser printer

Sun Workstations are divided into two major types, namely : Sun 2's and Sun 3's. However, the facilities available on the Suns within these categories vary considerably from machine to machine, e.g. richard (2/160), maple (3/160), cedar (3/110) and frah (3/110) are colour, whereas the others are black and white. Discless Suns are served by fileservers but some of the Suns have discs. All Sun 3/160's have discs and 1/4-inch tapes. With a few exceptions the models 2/50, 3/50, 3/75 and 3/110 have neither. The exceptions include basil (2/50), edna (2/50), bill (3/50), miracle (3/75) and wendy (3/75) which all have a 'shoebox'. (A shoebox is an informal name for an expansion box containing the disc and tape subsystems. If you look at, say edna, the 'box' to the right of it with a tape cartridge slot is a shoebox.) Laserwriters al1, al2 and al4 are attached to the Suns harold, faith and nutmeg respectively and laserwriter al3 is attached to nfs1 (see 5.3, 'Printers').

APPENDIX 2

Some useful files and directories on the Pyramid

The following outline gives a quick tour through a small part of the directory hierarchy of the Pyramid. (Please note that some of these files/directories may be different or not even present on other machines in the Informatics Department Unix Service.) The file and directory names are in bold print (as are the Unix commands) to make them stand out and hence make this section easier to read.

/dev/   Directory containing devices

    tty*   Terminals.

    console   Main console.

    ...

/bin/   Directory containing utility programs.

    sh   Bourne shell for users.

    csh   C shell for users.

    ed   The line editor ed.

    sed   The batch editor sed.

    cc   C compiler.

    ...

/lib/   Directory containing object libraries and some programs used by cc.

    ...

/etc/   Directory containing essential data and maintenance utilities.

    hosts   File containing a list of known hosts on DARPA Internet. For each host a single line should be present with some (if not all) of the following information:
        1) Internet address.
        2) Official host name.
        3) Where it can be found at RAL.
        4) Person responsible for it (only their user-id is given).
        5) The make and/or model of the host machine.
    This file can be read by the general public. Refer to **hosts** on the on-line manual for more information.

passwd   Password file containing the following information:
1) User's **login** name.
2) Encrypted password.
3) Numerical user ID.
4) Numerical group ID.
5) User's real name.
6) Initial working directory.
7) Shell to be used when user logs in.

As the passwords are encrypted, this file can be read by the general public.

group   This file contains the following information:
1) Group name.
2) *.
3) Numerical group ID.
4) A list of users in the group.
(This may be omitted for some entries.)

This file can be read by the general public. Refer to **group** on the on-line manual for more information.

motd   Contains message of the day. This file is readable by the general public.

termcap   Database containing description of terminal capabilities. Refer to **termcap** on the on-line manual for more information.

...

/tmp/   Directory in which temporary files can be created by anyone. Files created in these directories should be removed by the program that creates them. When the system is rebooted these directories are usually emptied. (Similarly with **/usr/tmp**).

...

/usr/   General purpose directory.

man/   On-line manual - volume 1 of the 'UNIX Programmers Manual'. All the contents of this directory (with the exception of **whatis**) are in **nroff/troff** format.

whatis   Table of contents to on-line manual.
(Lists most of the commands covered by **man**.)

man0/   General information about manual pages.

toc.in   Table of contents of volume 1 of 'UNIX Programmers Manual'.
..

man1/   Chapter 1 of volume 1 of 'UNIX Programmers Manual': Commands and Application Programs.

man2/   Chapter 2 of volume 1 of 'UNIX Programmers Manual': System Calls.
.
.

man8/		Chapter 8 of volume 1 of 'UNIX Programmers Manual': System Maintenance.
manl/		Documentation for local commands.
mann/		Documentation for new or revised commands.
	..	
spool/		Queues of files waiting to be read by system utilities.
	mail/	Mailboxes for mail.
	news/	Public news directory (containing articles stored under particular newsgroups).
	..	
lib/		Other object libraries and data files used by libraries.
	..	
ucb/		Binaries of programs developed at UCB and the sources for these programs.
	liszt	Franz Lisp compiler.
	bigliszt	Large version of the Franz Lisp compiler.
	edit	Editor for beginners.
	ex	Editor for experienced users.
	vi	Visual editor.
	finger	User information look-up program.
	mail	Mail reading/sending subsystem.
	man	On-line documentation.
	whereis	Locates source, binary, and or manual for program.
	..	
local/		Programs which are not normally supplied with UNIX but are available here.
	bin/sml	Edinburgh Standard ML.
	..	
new/		Source for new versions of commands and library routines.
	e	The Rand editor.
	..	

bin/   Utility programs.

   emacs The emacs editor.

   learn Computer aided instruction about Unix.

   ..

$HOME/   Your home directory.

  .cshrc   Read at beginning of execution by C shell.

  .login   Read by C shell, after '.cshrc'.

  .msgsrc Startup file for **msgs**. It is created when you read your first system message.

  News/   Your private news directory (which contains any news articles you have saved from **rn**, see 6.5).

  .newsrc Status of your news reading (ie. tells you what articles you have read, to what newsgroups you are subscribed to, etc).

  .oldnewsrc Backup copy of your .newsrc from start of session.

  .rnlast Information from last run of **rn**.

  .rnsoft Soft pointers into /usr/lib/active to speed up startup; synchronous with .newsrc.

  .profile Given to you by the System Administrator. If you edit this file it must be executed again for you to be in a new environment. To do this you could logout and then log back in again. A better way is to type **. .profile**

  .rhosts This file must be created by you to avoid typing in passwords when remote logging in.

  .forward This file must be created by you, so all your mail will be put in your mail box in your home directory. It should consist of a line of the form :

       user-name@machine_name

  ...