# Beginner's Guide
# to
# Programming on the
# SUNs[*]

Published by

## College of Engineering
## Bucknell University

Copyright ©2000

---

[*] This document is based on a previous publication authored by Professors Daniel C. Hyde and Jerud J. Mead from the Computer Science Department at Bucknell University, copyright 1994. It has been revised by the Bucknell Engineering Computing Support Team. It is available on the web at http://www.eg.bucknell.edu/~cs203/manual.pdf.

# 1. Introduction

Welcome to the Sun workstation network in the College of Engineering at Bucknell University. There are three SUN laboratories in the Dana Engineering Building: rooms 231, 314 and 350. Dana 231 and 350 are college laboratories and they are open for public use when no classes have been reserved. Dana 314 is a limited access lab for use by Computer Science faculty and students. The Dana 231 lab has 24 Ultra 10 workstations, the Dana 314 CS SUN lab has 9 Ultra 1 workstations; and Dana 350 has 24 Ultra 10 workstations, all manufactured by SUN Microsystems, Inc. This manual serves as an introduction to the facilities available on the SUNs including the introduction to the CDE window environment, called Common Desktop Environment[1] and the UNIX[2] operating system.

In the following sections you will learn how to access the SUN workstations and how to use them in creating, compiling, and running most common languages programs (e.g. FORTRAN, C/C++, HTML). You will also learn about the basic UNIX command and the facilities for printing files and sending and receiving electronic mail. This manual was written with the first time user in mind. It is written in a straight forward manner so you can understand the material and can quickly become comfortable using the SUN workstations. The best way to learn much of what is in this manual is to take the manual with you and work through the examples sitting at a workstation.

*Always take the manual to lab when you are working on the SUNs.*

## 1.1 What is a SUN workstation?

SUN workstation is a powerful computer developed by SUN Microsystems. The workstation consists of a large video screen for sophisticated graphics, a keyboard and a mouse. All the workstations are connected together forming a computer network. Since the machines on the network are relatively close together the network is referred to as a Local Area Network (LAN). There are other campus computer facilities on this LAN including a DEC 5500 computer (called coral) and many Apple Macintoshes and IBM PC's. A new operating system Solaris™ 8 was installed in summer 2000 as the platform for the SUN workstation.

---

[1] CDE is a registered trademark of SUN Microsystems, Inc.
[2] UNIX is a registered trademark of AT&T

Some of the machines have internal CD-ROM or disk drives attached to them, as you may be used to seeing on personal computers. All student and system files are maintained on these disks. The workstation you use accesses files by requesting them from a network server, a separate computer whose task is to supply requested files to workstations on the network.

There are seven servers: castor, pollux, spectrum, zeus, hera, cerebus and hydra. Cerebus and Hydra are the file servers; the others are compute servers and are mostly for remote access. Cerebus and Hydra contain a special feature, *Snapshots*, which allows users to restore their own files without system administrator intervention. See *Backing up your files by using Snapshots* in Section 8.3. Since your files are not located on any particular workstation, you may access them from any workstation in any lab. So, when you come to the lab you don't have to bring floppy disks and you do not have to use the same workstation every time.

## 1.2 The Mouse

The three-button mouse that is attached to the keyboard is a pointing device used by many workstation programs. The Sun mouse is a mechanical mouse that is similar to most mice found attached to PC's.

## 1.3 The Keyboard

The SUN workstation's keyboard has the basic configuration as a typewriter or personal computer keyboard for the letters, numbers, and special characters. However, the workstation's keyboard has additional keys that allow special actions to occur. Here are some of the more commonly used special keys:

**Return**    This key signals to the computer that you have finished typing and you want it to perform what you typed. Whenever you are waiting for the SUN to do something, make sure you have pressed the Return key.

**Delete**    This key causes the last character typed to be erased.

**Control**    This key acts similarly to the shift key on a typewriter; when the key is held down and another key is pressed, some special action occurs. For example, you can stop a execution by pressing Control c.

**Caps Lock**    This key is similar to a caps lock on a typewriter. If you press the Caps Lock key, a light in the upper right corner of the keyboard appears green. If you want to switch to lower case letters, just press the Caps Lock key again.

**Esc**    This key is pressed just like a letter or number. It is not held down like the Shift or the Control keys.

♦ (**meta**)    There are two meta keys marked with a diamond ♦ located to the left and right of the space bar. They are used in some applications (like the Emacs editor) in a similar way to the control key

## 1.4 Operation Hours

The SUN labs are normally open 24 hours a day, 7 days a week. The labs are closed to the public either there is a class scheduled or during rare maintenance periods which are announced in advanced. It is advised to check the printed weekly schedule before walking into the lab.

## 1.5 Seeking Assistance

UNIX is very sophisticated and you may find times when you need some assistance in solving a problem related to how the system works (or doesn't work!). A good source of help is other students in the SUN labs. It is often the case that there is a more experienced person in the lab who can solve your problem, or there may be someone who is not experienced but has experienced your problem and knows how to resolve it. System support is available through email: *ecst@bucknell.edu*, call at x71460 or x73714, or you can stop by the office in Dana room 230. Your instructor is always willing to explain different facets of the system. The best time for help is during your scheduled lab period. When you work by yourself, jot down the things that were confusing and ask your lab instructor during the next lab period.

## 1.6 References on UNIX

This manual does not contain a complete description of the facilities of the UNIX operating system. If you take two or more computer science courses you may want to buy a text on the UNIX operating system. There are many reasonable texts, for example:
a)  A Students Guide to Unix by Harley Hahn, McGraw Hill, 1993.
b)  Unix Shell Programming by Stephen Kochan and Patrick Wood, Hayden, 1990.
c)  Unix in a Nutshell by Daniel Gilly and O'Reilly staff, O'Reilly, 1992.

# 2. Getting Started - The Common Desktop Environment

The SUN workstations run the UNIX operating system, which provides an interface through which the user can access files and various system services. Constructed on top of the UNIX operating system is a windowing system called Common Desktop Environment (CDE). This

windowing system provides a more convenient working environment than the plain UNIX interface. Your account is set up to automatically use CDE. In order to gain access to the power of the SUN workstations and to the account which has been set up for you, you have to "log in".

## *2.1 Before Logging In*

When you enter the lab and sit down at one of the workstations you will either find the screen on (i.e., with a picture or words displayed) or all dark (strangely referred to as blank!). Each workstation is set up with a "screen saver", which blanks the screen if no key is pressed or the mouse moved for some relatively short period of time (ten minutes). If the screen is blank then press the delete key to regain control from the screen saver. At this point you should see the login window.



Before proceeding be sure that the Caps Lock key is not on. There is a green light somewhere on the keyboard (usually on the Caps Lock key or at the top of the keyboard) which indicates whether the Caps Lock is on or off.

Though the above scenario is the usual, it is possible that you will sit down at a machine with the power switch off. In this case locate the power switch on the back, right side the tower. You will see a '0' and a '1' on the switch. Press the switch toward the '1'. The front power switch might also be off. If the green light isn't on above the push-in switch, push it in. The workstation will go through a lengthy startup procedure (perhaps for a minute). When it has completed this process a login window will appear on the screen.

## 2.2 Choosing the Environment to Login

In addition to CDE, the Sun workstations offer other ways of working with the UNIX operating system: OpenWindows, X-Windows, and the UNIX command line. The default environment is CDE.

### 2.2.1 Logging In

The Computer Center sent you an username and password used for logging in to the computer network. Your username will usually be your last name or something close to your last name. Remember to type your username in all small letters. Once you have typed your username, press the **Return** key or the **OK** button.



At this point, you will be asked to enter your password. Your password must be entered exactly as it appears on the sheet from the Computer Center, followed by pressing the **Return** key or the **OK** button. You will notice that as you type your password no letters appear on the screen. This is a security measure so that someone cannot learn your password by looking at your screen as you log in.

If you have made a mistake in entering your account name or your password, you may click on the **Start Over** button, otherwise the system will put up the login incorrect window and ask you to try again.

### 2.2.2 To run OpenWindows
- Click the **Option** button and choose **Session**
- Select **OpenWindows Desktop**
- Login

### 2.2.3 To run the last Desktop Windows

- Click the **Option** button and choose **Session**
- Select **User's Last Desktop**
- Login

### 2.2.4 To use the UNIX command line

- Click **Option**
- Select **Command Line Login**
- Press **Return** to get the login prompt
- Login
- At the prompt "Enter w for OpenWindows; x for X-Windows; RET to exit:" press **Return**

### 2.2.5 To run X Windows

- Follow the first four steps of UNIX command line login
- At the prompt "Enter w for OpenWindows; x for X-Windows; RET to exit:" type x then **Return**

## *2.3 Workspaces and the Front Panel*

CDE allows you to use four workspaces, which act as if you are using different desktops. The Front Panel is a special desktop window that contains a set of controls for doing common tasks. The Front Panel moves with you as you switch workspaces.

### 2.3.1 The Front Panel
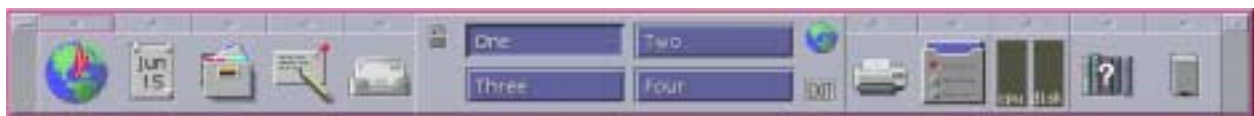


The Front Panel is the horizontal window at the bottom of the display. It contains a number of controls you use often, including the workspace switch, which contains buttons for changing to other workspaces.

Many of the buttons in the Front Panel start applications when you click them - for example, the File Manager and the Desktop Controls buttons.

Some controls are drop zones - for example, the Printer and Trash Can controls. You can drag a file from File Manager or Application Manager to the control.

Certain controls, such as the clock and activity indicator, are indicators that tell you something about the state of your system. Other controls have a dual purpose; for example, the Calendar and Mailer controls are both indicators (showing today's date and the arrival of new mail, respectively) and are buttons for starting applications.

The following are the default controls available on the Main Panel, from left to right. These terms are used to describe controls:

**Click**: What happens when you click the control.

**Drop**: What happens when you drop a file or folder icon on the control.

**Indicator**: What the image of the control represents.

**Clock (Links)**
**Click:** Opens the default browser. **Indicator:** Displays the current time.

**Calendar (Cards)**
**Click:** Starts the Calendar application **Drop:** Dropping an appointment file adds the appointment to the calendar. **Indicator:** Displays the current date.

**File Manager (Files)**

A desktop application where you can create, find, and use workspace objects: files, folders, and applications. The File Manager gives you an icon interface similar to a Macintosh or Windows 95 desktop. **Click:** Opens a File Manager view of your home folder. **Drop:** Opens a File Manager view of the dropped folder.

**Text Note (Applications)**

This control position is reserved for a personal application of your choice. You can put an application here by first installing the application icon into the Personal Application subpanel, and then using the control's pop-up menu to place that control in the main panel. The default application icon on the Main Panel is the Text Editor. **Click:** Starts the application (Default: Text Editor). **Drop:** Opens the dropped file in a new Text Editor window.

**Mailer (Mail)**

A tool for sending, receiving, and managing electronic mail (e-mail) messages. **Click:** Starts the Mailer. **Drop:** Attaches dropped item to a New Message window. **Indicator:** Indicates arrival of new mail.

**Lock**
**Click:** Locks the display and keyboard. You must type your password to unlock the system.

**Workspace switch**
**Click:** Changes between workspaces. **Indicator:** Shows current workspace.

**Activity Indicator**
**Click:** Displays a Go action dialog box. **Drop:** Runs action (for example, a browser) registered for data type dropped. **Indicator:** Spins when the system is running an action.

**Exit**

**Click:** Logs you out of the current session.

**Default Printer  (Personal Printers)**

**Click:** Displays the status of the default printer, lets you cancel print jobs on that printer.  **Drop:** Prints the file on the default printer.

**Style Manager (Tools)**

**Click:** Starts the Style Manager application. If the application is already running, its window is raised to the top of the window stack.

**Performance Meter (Hosts)**

**Click:** Opens Performance Meter. **Drop:** Opens Performance Meter for the hostname dropped. **Indicator:** Once activated, indicates CPU and disk activity.

**Help Manager (Help)**

**Click:** Opens a Help Viewer window displaying the top level of help information.

**Trash Can**

**Click:** Opens the Trash Can window.  **Drop:** Moves the file or folder to the Trash Can.  **Indicator:** Different appearance when empty and non-empty.

### 2.3.2 The Subpanels

If a control in the Main Panel has an arrow button on top of it, then that control has a subpanel. Clicking on the up arrow button on the Main Panel pops up the subpanel.  Clicking on the down arrow beneath a displayed subpanel closes it.  Subpanels always contain an Install Icon control that is used to customize the subpanel.  One of the controls of the subpanel is also displayed on the Main Panel.  Controls in subpanels also have Click, Drop, and Indicator properties like controls on the Main Panel.  The default subpanels of the Main Panel are:

- **Links**
    - **Install Icon** – Drop:  Installs an icon dragged from File Manager or Application Manager into the subpanel.
    - **Web Browser –** Click: Opens default browser. Drop: Opens default browser for URL dropped.
    - **Personal Bookmarks –** Click: Opens File Manager view of personal bookmarks. Drop: Opens default browser for URL dropped.
    **Find Webpage –** Click: Opens default browser for the Sun Microsystems search site.

- **Cards**
  - ◆ **Install Icon** – Drop:  Installs an icon dragged from File Manager or Application Manager into the subpanel.
  - ◆ **Calendar** – Click: Opens Calendar for the current date and user. Drop: Sets up the dropped appointment.
  - ◆ **Find Card** – Click: Opens Address Manager with default search options. Drop: Opens a dropped card, or opens Address Manager with default options and searches for dropped text.
- **Files**
  - ◆ **Install Icon** – Drop:  Installs an icon dragged from File Manager or Application Manager into the subpanel.
  - ◆ **Home Folder** – Click: Opens File Manager view of your home directory ($HOME). Drop: Opens File Manager view of dropped folder.
  - ◆ **Open Floppy** – Click: Loads a diskette in drive and displays File Manager view of it.
  - ◆ **Open CD-ROM**  - Click: Loads a CD-ROM volume in drive and displays a File Manager view of it.
  - ◆ **Properties…** – Click: Opens Properties dialog box with no file selected. Drop: Opens Properties dialog box for file or folder dropped.
  - ◆ **Encryption…** – Click: Prompts for the file to be encrypted and the encryption key. Drop: Encrypts and replaces an unencrypted file; decrypts and replaces an encrypted file.
  - ◆ **Compress File** – Click: Prompts for file to be compressed. Drop: Compresses and replaces an uncompressed file; decompresses and replaces a compressed file.
  - ◆ **Archive** – Click: Prompts for file or folder to be archived. Drop: Archives and replaces dropped file or folder.
  - ◆ **Find File** – Click: Opens File Finder in default mode. Drop: Searches for dropped text as file or folder name.
- **Applications**
  - ◆ **Install Icon** – Drop:  Installs an icon dragged from File Manager or Application Manager into the subpanel.
  - ◆ **Text Note** – Click: Opens Text Editor in note mode. Drop: Puts the dropped file on the workspace.
  - ◆ **Text Editor** – Click: Opens Text Editor. Drop: Opens the dropped file in Text Editor.
  - ◆ **Voice Note** – Click: Opens Audio in note mode.
  - ◆ **Applications** – Click: Opens Application Manager.

- **Mail**
  - ♦ **Install Icon** – Drop: Installs an icon dragged from File Manager or Application Manager into the subpanel.
  - ♦ **Mail** – Click: Opens Mailer. Drop: Displays New Message dialog box and attaches dropped file.
  - ♦ **Suggestion Box** – Click: Opens New Message dialog box to send to the default suggestion box mail alias for Solaris at Sun Microsystems. Drop: Displays New Message dialog box for suggestion box mail alias and appends dropped file.
- **Personal Printers**
  - ♦ **Install Icon** – Drop: Installs an icon dragged from File Manager or Application Manager into the subpanel.
  - ♦ **Default** – Click: Open Printer Jobs for your default printer. Drop: Prints the dropped file on the default printer.
  - ♦ **Print Manager** – Click: Opens Print Manager for all printers available on your network. Drop: Prints the dropped file on the selected printer. This is a useful method of printing to a printer other than your default printer.
- **Tools**
  - ♦ **Install Icon** – Drop: Installs an icon dragged from File Manager or Application Manager into the subpanel.
  - ♦ **Desktop Controls** – Click: Opens Style manager.
  - ♦ **CDE Error Log** – Click: Displays the error file ($HOME/.dt/errorlog) which contains CDE errors after session startup.
  - ♦ **Customize Workspace Menu** – Click: Warns you to update the workspace and opens a File Manager view of the Workspace menu.
  - ♦ **Add Item To Menu** – Click: Opens the Add Item to Workspace Menu dialog box.
  - ♦ **Find Process** – Click: Opens Process Manager for your workstation. Drop: Opens Process Manager in default mode.
  - ♦ **Hotkey Editor** – Click: Edits hotkeys set up for your session.
- **Hosts**
  - ♦ **Install Icon** – Drop: Installs an icon dragged from File Manager or Application Manager into the subpanel.
  - ♦ **Performance** – Click: Opens Performance Meter for your workstation. Drop: Opens Performance Meter in default mode.
  - ♦ **This Host** – Click: Opens Terminal window for your workstation.
  - ♦ **System Info** – Click: Opens Workstation Information for your workstation. Drop: Displays Workstation Information for dropped host name.

- ◆ **Console –** Click: Opens Console for your workstation.
- ◆ **Find Host –** Click: Opens Address Manager to search for host cards. Drop: Searches for dropped host name.
- **Help**
  - ◆ **Install Icon –** Drop: Installs an icon dragged from File Manager or Application Manager into the subpanel.
  - ◆ **Help Manager –** Click: Opens a Help Viewer window displaying the top level of help information. Drop: Dropping a master volume file (*.sdl) opens that help volume.
  - ◆ **SunSolve Online –** Click: Opens a browser for the Sun Microsystems documentation and FAQ web site.
  - ◆ **Solaris Support –** Click: Opens a browser for the Sun Microsystems download site for patches, and technical support.
  - ◆ **Information –** Click: Opens the Information folder in Application Manager.
  - ◆ **Desktop Introduction –** Click: Displays the Introducing the Desktop help volume.
  - ◆ **Front Panel Help –** Click: Displays the Front Panel help volume.
  - ◆ **On Item Help –** Click: Provides on-item help for the Front Panel. Click this control, then click the control on which you want help.
  - ◆ **AnswerBook2 –** Click: Displays the AnswerBook2 viewer if you have AnswerBook2 installed.
- **Trash**
  - ◆ **Install Icon -** Drop: Installs an icon dragged from File Manager or Application Manager into the subpanel.
  - ◆ **Trash –** Click: Opens Trash Can window. Drop: Moves dropped files to the Trash Can window.
  - ◆ **Empty Trash Can –** Click: Shreds (removes) contents of Trash Can window. Drop: Moves dropped files to Trash Can window.

### *2.4 Mousing Around - Window Operations*

After the Front Panel is on the screen, you can play with the mouse and try out some of the features of CDE. With the mouse pointer symbol (referred to in the manual as 'pointer') in the background, and if you press the right mouse button, you should see a "menu". You select a menu item by moving the pointer (with the right mouse button still depressed) onto the menu item you want. If you move the pointer up and down the menu, you will see each item in turn highlighted. If a menu item has a symbol ▷ at the end, it means there is another menu to be found by sliding the pointer onto the ▷ (keeping the right button depressed, of course). A menu

item ending in the ▷ symbol is said to have a pull-right menu. Ultimately, a menu item is selected by releasing the right mouse button while the desired item is highlighted. The rest of this section describes a few of the facilities accessible through this main menu and how to manipulate (move and resize) windows.

### 2.4.1 Which window is active?

As you have seen, the mouse allows you to move the pointer around on the screen. The keyboard is the third basic piece of hardware comprising the workstation. The obvious question is, "If I type on the keyboard, where do the corresponding characters appear?". The answer is simple. The window that has the purple border is the active window. Clicking on a window makes that window active. If you hold down the Alt key and press the Tab key, you can switch to different window, including the Front Panel.

### 2.4.2 Main window menu

If the right mouse button is pressed while the pointer is on the boundary of the window, the window's main menu will pop up. This menu has six options for manipulating the window including "Minimizing," "Close, " and "Refresh." Refresh will refresh, or redraw, the window, Close will kill the window, and Minimizing will iconify the window.

### 2.4.3 Menubars

Every window has a menubar at the top with three buttons: Pop-up, Iconify and Enlarge. If you click on the button on the left side of the menubar, the Main Window Menu pops downs. Double clicking on the square closes the window.

The button on the right with the dot in it is the iconify button. Clicking on it will collapse the window to a small icon in the upper left corner of the workspace. Iconifying more than one window tiles the icons down the left side of the workspace.

The button on the far right of the menubar will resize the window to fill the entire workspace. Clicking on it again returns the window to its original size.

### 2.4.4 Resizing windows

It is often the case that a window is too large or too small for its current purpose. CDE provides a simple mechanism for changing the size of windows. Each corner of the window is specially marked off. If you place the pointer into any one of these corners the pointer will turn into an arrow inside a right angle. When the pointer changes, the window can be resized. When the pointer changes, press the left mouse button and drag the corner to the location you want. Notice how an outline of the new window boundaries appears and the size (in pixels) of the window is displayed. When resized as you like, release the mouse button. Resizing works the same from any corner, but there are times you want one corner to remain anchored, so choose the opposite or an adjacent corner as appropriate.

### 2.4.5 Moving and raising windows

The boundary of a window includes the outer line of the window (excluding the corner regions) as well as the upper bar of the window (which includes the iconify button). This boundary can be used to raise and move the window. If a window becomes partially obstructed by other windows, it can be 'raised' by placing the pointer on the boundary of the window and clicking the left mouse button. If, instead of clicking the left button as described, you hold the left button down and drag the mouse, you will move the entire window. This same technique also works for moving icons.

### 2.4.6 Miscellaneous

When you are working on a workstation, you occasionally find that the screen has become "messed up"; for example, a system message being printed on the background, rather than in the console window. You can often get rid of the "mess" by refreshing your screen. You can do this by choosing "**Refresh**" on the **Workspace** Menu. If you select the "**Refresh**" option you will notice that all your windows are redrawn - if you are using a lot of windows the process can take several seconds, but be patient.

### *2.5 Logging Out*

Logging out is just as important as logging in. The logout procedure allows you to exit the system. If you forget to log out someone could sit down at the workstation you were using and access (modify or even delete) your files. To log off you simply click the **Exit** button on the Front Panel. A logout confirmation window will appear asking you to confirm that you want to

exit; click on the **OK** button to confirm.  Or simply use the right most mouse button to open the **Workspace Menu** and select **Log out...**.  Be patient, this sometimes takes a minute.  Do not turn the workstation off!!

## *2.6 Other Tools*

Before leaving this section on the CDE environment there are a few other useful tools which you should know about.

### 2.6.1 Workspace Menu

The Workspace Menu provides you with a pull-down type selection menu, where you can execute your frequently used applications in a jiffy.  Activate the Workspace window by *right* clicking your mouse button then select the applications.  You can add an item to the list of applications in the Workspace Menu.  To begin, select the **Tools** submenu in the front panel. Choose **Add Item To Menu...** and enter the full path and name of the application (e.g. /usr/local/bin/emacs). Hit the **Add** button and the item is added to the top of your menu. You may want to move the item, so select **Customize Workspace Menu** from the **Tools** submenu. You can move the items in your menu around like files in the File manager. Lastly, select **Update Workspace Menu** from the **File** menu of the File Manager view of the Workspace Menu to update from your new menu.

### 2.6.2 Command Tool

The Command Tool is the OpenWindows interface to the UNIX operating system. It has no control panel (such as you find with Text Editor) but does have a menu accessible when the pointer is in the window proper.  The UNIX commands which you can utilize from the Command Tool are detailed in Section 4.12.  But there are several features which make this tool a convenient environment for interacting with UNIX.

There are two primary features which will be highlighted here: command entry and the built-in editor.  The primary purpose of the Command Tool is to enter UNIX commands.  To facilitate this the window always displays a UNIX prompt as the last line in the text window.  When you type characters, they will appear on that line.  Note that the insertion point is always at some point on the command line.  When you press the **Return** key whatever is entered on the line is passed to UNIX for processing.  The details of what commands are legal and what happens if

errors are encountered appear in Section 4.  However, there are a couple of mechanisms for making command entry easier.  First, the command line can be edited using the mouse to move the insertion point in the line or to select a portion of the line.  This type of command line editing is not available in most UNIX environments.  Also, a character sequence appearing anywhere in the text pane can be copied to the clipboard and then pasted to the command line (at the current insertion point).

As a convenience, the Command Tool has an option to split the screen in half, with the upper half the UNIX interface, and the lower half a Text Editor window.  The editor window can be created by selecting the **Enable** option from the File Editor pull right menu on the main menu of the Command Tool (pointer in the text pane).  Once enabled the editor can be removed by selecting the Disable option from the same menu option.  It is possible to copy text from the UNIX interface window (using the **Copy** key) and then pasting the copied text to the editor half of the window.  This is convenient for producing and storing in a file a record of the execution of a program.  You may find other times when this option is convenient.  When enabled the editor subwindow has exactly the same functionality as described for **Text Editor** in Section 3.

### 2.6.3 Terminal Emulator (Dtterm)

Terminal is a CDE Desktop application that displays a default terminal emulator window.  And terminal emulator is a window that emulates a particular terminal type for running non-window programs.  The most common use of terminal emulator windows is interacting with your computer's operating system by typing commands.

There are several ways you can start a CDE Desktop terminal emulator:
- From the Front Panel
  The **This Host** item is located in the **Hosts** submenu.  After you click it, the activity indicator spins, indicating that the terminal is being activated.
- From File Manager
  Choose **Open Terminal** from the **File** menu
- From a command in an existing terminal window
  Type **dtterm** at the prompt.
- From Application Manager
  The Terminal icon is located under Application Manager - Desktop_Apps.
- From New in the Terminal Window pulldown menu

Choose **New** from the Window menu in an existing Terminal window. A duplicate Terminal window appears.

### 2.6.4 Text Editor

The Text Editor is a mouse-based editor application. There are two versions available on the SUNs. The *default* , **dtpad**, comes with the CDE window environment. The other, **textedit**, comes with the OpenWindow environment. The two versions are similar in their features and behaviors, and can be used to create and modify text files including program code, term paper, and lab report.

**Dtpad** will be described in detail in Section 3. A tutorial is available to help you get started with basic editing using the **textedit**. It is located in the directory */home/hydra/COURSES/cs203/Tutorials* under the name **Textedit** You may load it into a **textedit** window and follow its instruction to learn the editor.

### 2.6.5 Performance Meter (OWperfmeter)

The strange looking strip meter, which appears on the Workspace submenu and front panel, is a performance meter. The meter is updated every two seconds (this can be modified) to reflect how busy your workstation's CPU is. The longer you work with the workstations the more useful you will find this meter. Note that, if a hostname is not specified after the perfmeter command, the current machine's CPU usage is displayed by default.

To obtain more information about Performance Meter, consult the man pages by typing **man perfmeter** at the prompt.

### 2.6.6 Print Manager (DtPrintManager)

Besides the **Default Printer** icon appears on the Front Panel, the **Print Manager**, which appears on the Workspace menu, gives you a way to monitor the printers connected to the network. This is a convenient tool to determine if something is wrong with a print job you have sent off. Sometimes, due to printer malfunction, your job will not be printed. Instead of trying to print the file again, start the **PrintTool** and check the print queue to see if you job actually got there or to see if the printer needs attention, e. g., more paper.

### 2.6.7 Mailer (Dtmail)

Mailer is a windowed interface to electronic mail. The Mailer icon is available on the Front Panel. You will find that you use this tool frequently to communicate with classmates, friends, and instructors. It can be used not only to facilitate communication but also to organize and maintain the messages which you have received and want to retain. A more complete description of the Mailer will be available in Section 5.

### 2.6.8 AnswerBook2 Navigator

The AnswerBook2 product is Sun's online documentation system. It uses a web-browser interface that lets you view and print a variety of Solaris™ information, including SGML-based AnswerBook™ collections, Display PostScript™ AnswerBook collections, and man pages. The AnswerBook2 product provides a robust search engine that lets you find information throughout the documentation library. When you have questions about how a particular tool works you should be able to find references to it via AnswerBook2.

To Start the AnswerBook2 Navigator from the Front Panel:
- Click the arrow above the `Help` control in the Front Panel.
- Click the `AnswerBook2` control in the `Help` subpanel.

Or, from the `Programs` submenu - `Workspace` menu.

## 3. Using the Text Editor (dtpad)

### 3.1 What is an Editor?

A text editor is a program which helps you create and modify files containing text. The manual you are reading is stored in a computer file and was created through the work of several different people using different text editors. An editor is really a fancy kind of typewriter where, instead of typing characters onto a piece of paper, characters are typed and stored by the computer in a file.

This manual describes two editors. The current section describes the CDE editor called **Text Editor**. This editor has the advantage of being mouse based, quick to learn, and easy to use. Its disadvantage is that if you log into the system from a personal computer (perhaps from your dorm room) you cannot use the editor - it can only be used if you are at a Sun workstation. The other editor is called **Emacs** (see Section 7). Its advantages are that it provides considerable

functionality through a single interface (you can examine directories, run and debug programs, read and send email); since it is keyboard based (i.e., doesn't use a mouse) it can be used at a workstation or from a remote personal computer.  The disadvantage of **Emacs** is that it is less intuitive, and has a complex collection of commands by which it is used.  You will use both of these editors in various computer science courses.

### 3.2 Opening and Closing Text Editor

**3.2.1 To Open Text Editor**

- Or, open the **Applications** subpanel in the **Front Panel** and click the `Text Editor` control.
- Click the `Text Editor` control in the **Front Panel** if available:
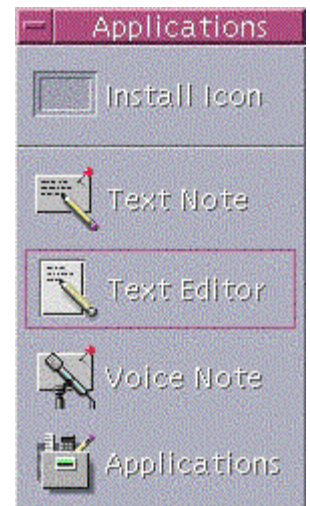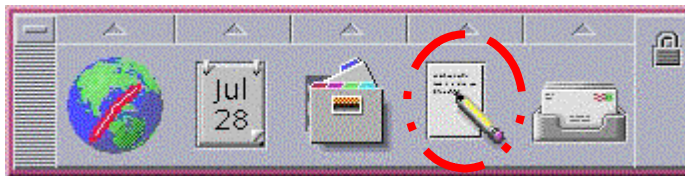


`Text Editor` can also be started from the command line by typing this command in a Terminal window:

        **dtpad filename &**

The file name is optional.

**3.2.2 To Close Text Editor**

- Choose `Close` from the **File** menu or press **Alt** + **F4**

### 3.3  Text Editor Window

Text Editor window has a control area and a text pane that you use to compose and edit your text file.  The title bar of the Text Editor window always displays the name of the file you are editing (or the word "UNTITLED" when you have not assigned a name to the file), and shows you the directory where the file is located.  When you have made editing changes, or have not yet saved a file, the word "edited" is displayed in parentheses following the file name.

### 3.3.1 The Status Line

One item of particular value is the status line option in the **Options** Menu. This allows you to see what line number you are currently on, as well as jump to other lines.

When writing a program, you will often be told that there is an error of a particular kind at a particular line in the program. The line in the program is actually the number of the line in the text file containing the program. You can display the specified program line in the editor window by first, turning on the **Status Line** option in the **Options** Menu, if you haven't already done so, and typing the line number you desire in the space where the line number is displayed. To have the cursor appear at the specified line number, press **Return**.

## *3.4 Cursor Movement*

In any editor, there is a special position on the screen (the *insertion* point) where the next character will be placed when a key is struck. The position is made known to the user by a special mark, called the *cursor*. The cursor is a black up-pointing triangle, or carat, which appears between lines and pointing up to the point at which the character will appear.

It is often the case that you want to move the cursor from its current position to some other position in the file. There are several ways you can do this. One way is to use the arrow keys located on the numeric keypad on the right side of the keyboard. As you can imagine, these keys move the cursor from where it currently is to a new place in the given direction. Another way to move the cursor is to use the mouse and pointer. You move the pointer to the new cursor location and press the left mouse button. This is the best way to move the cursor over a large span; the arrow keys should be used only to move a very few character positions or lines.

The following are the keyboard cursor/scroll movement keys:

| Key | Cursor Movement |
|---|---|
| Up Arrow | Up one line |
| Down Arrow | Down one line |
| Left Arrow | Left one character |
| Right Arrow | Right one character |
| Control+Left Arrow | Move left to previous word |
| Control+Right Arrow | Move right to next word |
| Home | Beginning of the current line |
| End | End of the current line |

| | |
|---|---|
| Control+Up Arrow | Beginning of the previous paragraph |
| Control+Down Arrow | Beginning of the next paragraph |
| Control+Home | Beginning of the document |
| Control+End | End of the document |
| Control+G | To the Line field in the status line |
| Page Up | Up one page |
| Page Down | Down one page |
| Control+Page Up | Left one page |
| Control+Page Down | Right one page |

### 3.5 Text Movement

It is usually the case that the text in a file will not fit on the screen at one time, even if you make the editor window as large as possible. We saw, in the last section, that the **Home** and **End** keys will not only relocate the cursor, but will also change the text displayed in the window. It is also possible to change the text displayed in the window without moving the cursor. The editor window has a scroll bar on the right side. The rectangular region with the gray up and down arrows is called the elevator. The position of the elevator on the cable, the gray line which passes through the elevator vertically, indicates which part of the text file is being displayed in the window. To move the window down one line in the text file, place the pointer on the down arrow (on the elevator) and click the left mouse button. If you hold down the left button on the down arrow you will see that the text moves up in the window quickly, one line at a time (so that the window is moving down in the text). Of course, the opposite happens when you press the up arrow.

If you position the mouse pointer anywhere on the cable below the down arrow of the elevator and press the left mouse button, you will scroll down by one page (i.e., one window's worth). As you can imagine, by placing the pointer above the up arrow on the cable your text will scroll one page up.

### 3.6 Selecting Text

If you think about times you have written term papers, you should recall that what you often want to do is to remove a sentence from here, move that paragraph to the end of the section, delete a word, or replace a misspelled word. These sorts of things are difficult when using a typewriter or writing by hand, but are made easy with a good text editor. In order to do the actions just

described one must be able to specify (or select) the text to be moved, removed, or replaced. You can select text in the following ways:

1. To select a character, move the pointer onto the character and single-click the left mouse button.
2. To select a word, move the pointer onto the word and double-click on the left mouse button.
3. To select a single line, move the pointer onto the paragraph and triple-click the left mouse button.
4. To select an entire file, quadruple-click the left mouse button.
5. To select any continuous body of text, move the pointer to the place where you want to begin the select, and press the left mouse button, drag the pointer over the text you want to select, and release the mouse button.

Having selected the appropriate section of text, one can make several types of modifications by using the left-most section of the keyboard, containing eleven keys. These keys are labeled with the name of the function they provide. In particular, we are interested in the keys labeled `Undo`, `Copy`, `Paste`, `Cut`, and `Find`. Their use is described in the following:

1. To *delete* a segment of text, i.e., remove it from the text file, select the segment using the techniques described above and the press the `Cut` key. When the `Cut` key is pressed, the selected text is removed from the file, but is retained by the editor (until the `Cut` or `Copy` key is pressed again) in the clipboard.
2. To *move* a segment of text, i.e., cut it from one place and insert it at another, select the desired segment of text and press the `Cut` key. Then move the insertion point to the point at which the deleted text should be inserted and press the `Paste` key. Pressing the `Paste` key copies the text from the copy buffer to the current insertion point. Since this pasting operation does not delete the text from the clipboard, the same text can be pasted into as many locations in the file as desired.
3. To *copy* a segment of text, i.e., duplicate the segment at another point in the text, select the desired segment and press the `Copy` key. This leaves the file unchanged but copies the selected text into the clipboard. Then proceed as in the case of moving a segment. Move the insertion point to the desired location and press the `Paste` key.
4. To *replace* some text with some new text, select the desired segment and then type the new text.
5. To *find* the next occurrence of a particular segment of text, select the desired segment and press the `Find` key. This will search forward in the file and stop at and highlight the first occurrence of the segment it encounters. If there is no occurrence, the editor will beep and

flash the window. If you want to search backward in the file (back toward the beginning of the file) then you press the Find key while holding down the **Shift** key.

Except for finding text, the operations listed above all make some modification to the text. It is not unusual to decide, after making a change, that you want to undo the change. Pressing the **Undo** key does this. In fact Text Editor keeps track of the various changes you make and will allow you to undo the changes in reverse order (most recent change undone first). When you save the file contents, this record of changes is erased.

### 3.7 The Control Area

The control area of the Text Editor has **File**, **Edit**, **Format** and **Options** buttons. The Text Editor pane has a pop-up menu (found by pressing the right mouse button while the pointer is located in the text pane), which provides these same commands (plus a special *Extras* pull-right menu). The options obtained by choosing **Edit** are identical to those just discussed - the keyboard buttons are probably more convenient to use for these operations. The other options are available only through the available menus.

### 3.8 The File Menu

The **File** menu contains options that you can use to load and save a text file and for other file-related functions.

The **New** option is used to open an empty text editor pane. The title bar will display "**Text Editor - UNTITLED**" and if you made changes editing and have not yet saved them, a dialog window will appear asking you to confirm or cancel the operation.

The **Open...** option is used to associate a specific file with the editor window. When this option is chosen, a dialogue window is displayed. The user is to write into this dialogue window the name of the directory and file to be associated with the editor. Clicking the left mouse button on the **Open...** button in the dialog window (or pressing the **Return** key) loads the file into the editor and displays the beginning of the file in the text pane, replacing any existing text. Notice that, unless you pin it up, the dialogue window disappears after the load operation is complete.

Selecting the **Include...** item displays a **TextEditor - Include a File** dialog window. Type directory and name of file you want to include, and click **OK** button to include the file you specify at the current insertion point in the text pane.

Use the **Save** item to save the contents of the Text Editor pane in the directory and file named in the header of the Text Editor window. If "UNTITLED" is shown as the file name, use the **Save as...** option.

Selecting the **Save as...** option will cause a **TextEditor - Save as...** dialog window to appear. Type the appropriate directory name and file name, and click the left mouse button on the **Save** button to save the contents of the Text Editor pane.

Selecting the **Print** option will print a document. The Print dialog window displays the name of your system's printer and enables you to set printing options. By default, your document is printed on your system printer. If desired, you can direct your job to a different printer.

### 3.9 The Edit Menu

The **Edit** menu provides standard editing functions which, as indicated earlier, are duplicated by the keys on the left side of the keyboard.

- Use **Undo** to undo the last editing action or all editing actions and restore what was there before, depending on which item you choose from the **Undo** submenu.
- Use **Copy** to store a copy of the selected text on the clipboard. Only one selection can be stored on the clipboard at a time. If something is already on the clipboard and you do a copy or cut, the contents of the clipboard are overwritten with the new information.
- Use **Paste** to insert the contents of the clipboard at the insertion point.
- Use **Cut** to remove the selected text and store it on the clipboard. Only one selection can be stored on the clipboard at a time.

### 3.9.1  Find/Change Command

The **Find** Command in the **Options** Menu includes options that allow you to search for a specific text string, special characters, and delimiters, and when found to replace it with another string.

### 3.9.1.1 To Find Text

When selected this option, the editor displays a **`TextEditor - Find/Change`** dialog window.  If you have a current selection, it is automatically displayed in the **Find** text field.  Otherwise you should enter the string to be found in the **`Find`** text field.  At this point you have several options based on the buttons you find on the dialog window.  To find the text string and select it, simply click the left mouse button on the **`Find`** button.  Click on the **`Find`** button again to find and select the next occurrence of the text string.  You will have recognized that this functionality is the same as supplied by the **`Find`** key.

### 3.9.1.2 To Find and Change Text

To replace the current selection with another text string, type the text for the replacement string in the **`Change To`** field and click the left mouse button on the **`Change`** button.  You can use the **`Change`** button together with the **`Find`** button to find a string and then replace it with another, or separately to replace highlighted text.  You can replace a string with nothing by leaving the **`Change To`** text field blank.  The buttons at the bottom of the **`Find/Change`** window combine find and replace operations, allowing you to **Find then Change**, **Change then Find**, or **Change All**.  <u>**Caution** - There is no **Undo** for **Change All**</u>.

You can specify whether you want the find and change operations to apply to all of the text, or restrict the operation to the text between the insert point and the end of the document by using the abbreviated menu button to select either **All Text** or **To End**.

The **`Find/Change`** facility is very useful for all kinds of text processing.  When writing a program, you may decide that a particular variable name should be changed.  Since it may appear many times throughout the file, **`Find/Change`** is convenient for locating all occurrences and properly replacing them.  The **`Find/Change`** facility is also useful for correcting spelling errors in a file.

### 3.9.2 Spelling Checker

You can correct misspelled words with the Spelling Checker.  You can also customize your Personal Dictionary and Main Dictionary.

Choose **Check Spelling...** from the **Edit** menu. The Spelling Checker dialog window displays misspelled or unrecognized words and lists suggestions for them. Take action on the first word found by the spelling checker:

- If the suggested replacement is correct, click **Change** to correct this occurrence, or **Change All** to change all occurrences. (You cannot Undo a **Change All**.)
- If you see the correct replacement in the list, select it and click **Change** or **Change All**.
- If the correct replacement is not in the list, type it in the suggestion field and click **Change** or **Change All**.
- If the word is correct and you want to add it to your Personal Dictionary, **click Learn Word**.
- If the word is correct but you do not want to add it to your Personal Dictionary, click **Skip** to skip this occurrence, or **Skip All** to skip all occurrences.


### 3.10 The Format Menu

Once your editing is complete, format your document by choosing margins and text alignment. There are three options under **Format** Menu: **Settings**, **Paragraph** and **All**.

To Format a Document:

1. Choose **Settings** from the **Format** menu. Format Settings dialog box
2. Enter margins.
3. Select left, right, justify (block style), or center alignment.
4. Determine the scope of the formatting:
   - To format a single paragraph, place the cursor in the paragraph, then click **Paragraph**.
   - To format the entire document, click **All**.
5. After closing the dialog box, choose **Paragraph** or **All** from the **Format** menu to apply the settings.


# 4. The UNIX Operating System

An operating system is a specialized collection of programs which, when running on a computer, manages the facilities of the computer and makes the facilities available, via a command structure, to the computer's users. A computer's facilities typically include hardware devices such as keyboards, video displays, external storage such as disk and tape drives, printers, and network connections. The operating system makes it possible for the user to create and manage files containing data or programs, display data files on a printer or video display, and send and

receive electronic mail.  A user's interaction with the operating system is usually with a keyboard (to type commands) and video screen (to see the computers response to the command).

The operating system, which runs on the SUN workstation, is named UNIX and is available on many different types of computers.  The purpose of this section is to describe the basic command structure for the UNIX operating system and to familiarize you with those UNIX commands that are necessary for your workstation work.

### 4.1 Interacting with UNIX

When UNIX is waiting for the user to enter a command, it displays what we call the UNIX prompt.  The prompt is a sequence of characters on the video display (possibly a shell window) which is really a request from the operating system to the user to enter another command.  A typical UNIX prompt could be

```
algol 41 % _
```

When you look at your screen, you will see the name **algol** replaced by the name of the machine (or host) you are using.  The number following the host name is the number of the command you are about to enter.  Thus, after each command is executed, the next prompt will have a number one greater than the number of the previous command.  These numbers can be used in conjunction with the UNIX *history* facility (See Section 4.10.1).  When a prompt appears on the screen you will also see an insertion point one space past the **%** sign.  When you type a command this insertion point is where the characters will appear (the '_' represents the insertion point.  For example:

```
algol 41 % date_
```

 To issue a **date** command, you press the **Return** key.  If that were done in the previous example, you would see on your screen something similar to the following:

```
algol 41 % date
Tue July 17 17:03:23 EDT 1997
algol 42 %
```

Notice that the next prompt appears automatically when the last command has completed.  In what follows you will see that all UNIX prompts are given as

```
host-name # %
```

Without the host name or command number specified.

In UNIX, it is important to remember that the commands are usually in lower case letters. Therefore, 'date' works but 'DATE' does not!  We say that UNIX is case sensitive. Try both 'date' and 'DATE'.

```
host-name # % DATE
DATE: Command not found.
host-name # %
```

Some commands have *options* that are specified by a minus sign followed by characters.  For example, 'date' may have the '-u' option that displays universal time or Greenwich Mean Time.

```
host-name # % date -u
```

If you spell the command name correctly but supply an improper option, an improper argument or the wrong number of arguments, many of the commands will *not* give you an error message but only display a brief description of usage.  The command assumes you mistyped something and need some assistance.  Try an *incorrect* option for **date** and you will see an example of a usage message:

```
host-name # % date -p
date: illegal operation --p
usage: date [-u] mmddHHMM[[cc]y]
date [-u] [+format]
date -a [-]sss[.fff]
```

If you ever receive a 'usage' message, you typed something wrong.  In a usage description, the square brackets '[ ]' means that part is optional.  Obviously from **date**'s usage message, it allows several other features.


### 4.2 Changing Your Password

The first time you log in you may want to change your password from the one given you by the computer center to one of your own choosing.  A word of warning, it is important not only to choose a password which you can remember, but one which another user will not be able to guess.  Your password is a security device that ensures only you have access to your files.  To safeguard against unauthorized use of your account, be sure that you (and only you!) know your password.  Your password should contain at least 6 characters and should not be a word contained in a dictionary.  An easy way to meet this guideline is to choose some obscure or

nonsense word (names are not good choices) replace one of the characters with a digit and reverse the order of the characters. Instead of using 'tempest' use 'tsepm4t' [notice the '4' key is close to the 'e' being replaced].

To change your password use the mouse to move the pointer to the inside of a window where a UNIX prompt, i.e., the host name followed by a number followed by a percent sign, is displayed. Set your password by typing **passwd -r nisplus** at the UNIX prompt and press **Return**.

When you press the **Return** key, you will be asked to type in your old password. After entering your old password, you will be asked to enter the new password; after entering the new password, you will be asked to verify it by entering it again. If you don't type the same password the second time or if you incorrectly typed your old password, the system will print an appropriate error message and your password will not be changed. If this happens, just start over by typing **passwd -r nisplus** again.

```
host-name # % passwd -r nisplus
passwd:  Changing password for username
Enter login(NIS+) password:
New password:
```
Don't forget your password! Don't tell anyone else your password!

### 4.3 Files and File Commands

Data is stored in a *file*. A file can contain a *program* (a list of instructions for the computer to follow), data, or the text of a paper. A file is like a piece of paper on which you can put lots of characters, in any order. One of the primary functions of the UNIX operating system is to maintain user files, making sure that each user has access to their own files whenever necessary.

Files can be created in several ways. You can create the file, say using an editor. Programs can create files. For example, the Pascal compiler creates files. It is easy to create files in UNIX.

The purpose of files is to store information for later use. UNIX stores your files on a *disk drive* in the network server until someone removes them. Thus, if you create a file on one day, you can count on it being there the next time you need it.

### 4.3.1 File Names

So that you can tell your files apart, you give a name to each one you create. When you create files, you should give them names that are meaningful to you. File names can contain most printable character, but to avoid pitfalls, you should use only letters, digits, dashes, periods and underscores. The following are legal file names: lab1, LAB3, Lab1, Alongname, read.me, program1.p

Remember that capital letters are different from lower case ones in UNIX. Therefore, Lab1 is a *different* file name from lab1.

### 4.3.2 What are Directories?

It is obvious that with so many people using the SUN workstations, there are a huge number of files on the disk drive. One needs a way to organize all of them as well as keep peoples' files separate. UNIX does this with *directories* and *sub-directories* (directories inside of directories).

When you are given a UNIX account, your login is associated with a directory file. When you login you are placed in this directory which is called your **home directory**. Your home directory is a file that contains a list of all of your files (if any) and a list of all your sub-directories (if any). When you are in a directory, say your home directory, and you create a file, it is placed in that directory.

So that the UNIX system knows which files are yours, it associates your computer account with your home directory. The files in your home directory and sub-directories are yours; no one else can create, change or remove them except you (or someone who has *superuser* privilege like the Systems Administrator).

Your home directory makes accessing file easy for you. The only names you have to worry about are the names you give your files. UNIX handles the rest.

Sub-directories are used to organize your files much like file folders are used to organize a heap of documents. For example, you might place all the files for your labs in a sub-directory called 'labs' and your programs in another one called 'progs'.

### 4.3.3 File Suffixes

Some commands in UNIX require an identifying part of the file name called a *suffix*. This suffix is part of the file name and contains a period followed by a single character or several characters. For example, the Pascal compiler requires the **.p** suffix in the file name. Therefore, **prog1.p** is a file name that would contain a Pascal program. Some popular suffixes follow:

```
.c     for a C program
.cc    for a C++ program
.f     for a FORTRAN program
.h     for a header file
.o     object file (created by compiler)
.p     for a Pascal program
.tex   for a TeX document
```

### 4.3.4 Using Wildcard Characters in Filenames

A *wildcard character* is a symbol that you can use with many UNIX commands to specify more than one file. In UNIX, the wildcard character is the '**\***' and it matches zero or more characters in that place of the filename argument. Therefore, 'b\*.p' matches all files starting with **b** and ending with the suffix **.p**. You could list all the Pascal program files in a directory starting with b by typing:

```
host-name # % ls b*.p
```

You can use more than one wildcard in a filename argument as shown below:

```
host-name # % ls do*at*
```
That would list the following files: doat, doat21, doormat, dogcatcher and documentation.

### 4.3.5 Copying Files

One way to create a file is to copy an existing file. The UNIX command to copy a file is **cp**. After the command you type the file to be copied and a new file name. Copy two files into your directory by doing the following: (Again, remember to keep the mouse pointer in the window in which you want to type.)

```
host-name # % cp ~cs203/examples/humpty   myhumpty
host-name # % cp ~cs203/examples/jack_theory .
```

In the first line we copied a file called **humpty** in the sub-directory **examples** under cs203's home directory (`~login_name` is a user's home directory and cs203 is a login_name) and placed the contents of the file into a newly created file called **myhumpty**.  The second line is the same except that we were lazy and typed a period that tells UNIX to use the same name.  You made *no* changes to cs203's existing files.

The long string of directory/sub-directory/filename is an example of a *pathname* that is how you specify any file on the system.  Many commands take pathnames as possible arguments  (see Section 4.4.5 for more on Pathnames).

The command `cp` may use a wildcard character in the filename argument.  You could have copied *all* of the files in my **examples** directory by doing the following:

```
host-name # % cp ~cs203/examples/*  .
```
Here the period is important to give each file the same name.

### 4.3.6 Listing Files in Your Directory

Now try listing your directory by using the command `ls` and the two files should be there.

```
host-name # % ls
myhumpty    jack_theory
```

Try `ls` with the `-a` option.

```
host-name # % ls -a
```

You should see several file names which begin with a period, for example a `.cshrc` file.  These *dot* files control how your system looks when you login and were placed there by the *Systems Administrator*.  If you remove or alter these files improperly you will really mess up your screen or find you can't even login!  If this should ever happen see your instructor immediately.  Later, when we are more advanced, we may alter some of these files, but carefully!

Try `ls` with the `-l` option to list the files in extended form.

```
host-name # % ls -l
```
You can combine the two options by typing `-al`.

```
host-name # % ls -al
```

You can also list a filename or a filename argument with a wildcard. For example, you could list all the files starting with 'lab' by:

```
host-name # % ls lab*
```

### 4.3.7 Displaying the Information in a File

The command '**more**' followed by the filename displays the contents of that file. Try '**more**' on **myhumpty** and **jack_theory**. Hit the spacebar to display the next window full. While using '**more**' on **jack_theory** press an **h** and read the on-line help of the commands available in '**more**'. Hit the spacebar to get out of the help display. To go back a page, type "**b**." To quit type "**q**." Using the command 'cat' can also complete this operation. However, the latter command scrolls through the entire document without page pausing. Note this command would not be desirable for displaying long documents.

```
host-name # % more jack_theory
host-name # % cat jack_theory
```

Like most commands that take a filename argument, '**more**' allows a wildcard character (the '*'). Therefore, we could be lazy and type:

```
host-name # % more j*
host-name # % cat j*
```

That will do '**more**' on all files in the current directory beginning with "**j**." In this case, there is only one: **jack_theory**.

### 4.3.8 Removing Files

Many times we need to clean up our directories and we desire to remove some files. The command **rm** removes or deletes the file specified by the filename.

Copy your file **myhumpty** to several new file names, say **junk** and **baloney**. Then remove **junk** and **baloney** from your directory. Using **ls**, check that they were removed.

```
host-name # % rm junk baloney
host-name # % ls
```

It is important to realize that when you remove a file it is gone forever! Therefore, to avoid inadvertently deleting the wrong file, type carefully when you use **rm**. The command **rm** allows

a wildcard but you should be very careful when you use it or you will remove files you wanted to keep.


## *4.4 Using Directories*

Using directories is easy. Most users after becoming comfortable with the SUNs use many directories to organize their files. For example, you could make a new directory for each new programming assignment.


### 4.4.1 Making a New Directory

To create a new directory, use the command **mkdir** which stands for *make directory*. The conventions for names of directories is the same as the names of files, i.e., you should use letters, digits, dashes, periods and underscores. From your home directory make two directories (also called sub-directories) named **labs** and **progs**.

```
host-name # % mkdir labs
host-name # % mkdir progs
```

Check using **ls -l** to see that they were created. The 'd' in the first column means they are directories.
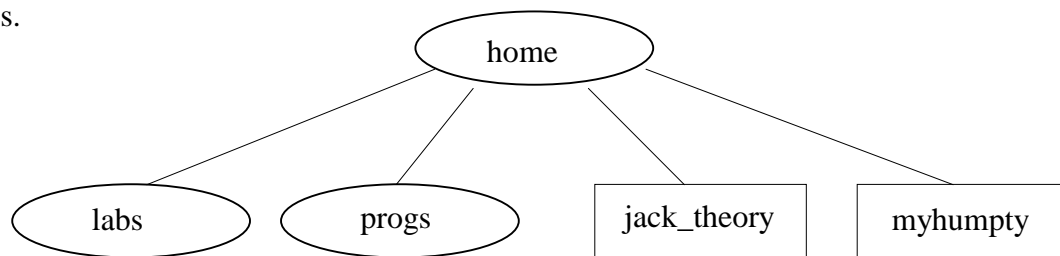


### 4.4.2 Moving Between Directories

The above diagram shows the structure of the three directories and the two files we have made so far. [We are *not* showing the dot files.] To change the current working directory to a new one, use the **cd** command. To change to the **labs** directory type:

```
host-name # % cd labs
```

Try an **ls** command now. You will see no files as you haven't created any in this directory. To return to your home directory you use the **home** command or just **cd** and no file name.

```
host-name # % home        or        host-name # % cd
```


34

### 4.4.3 Moving or Renaming a File

When you *copy* a file you end up with two files - the original file and the new one. Sometimes you may wish to *move* a file to another directory or keep it in the same directory but with another name. The command **mv** (for move) does both.

Move to your home directory if you have not done so. Move the file **jack_theory** from your current directory to the **labs** directory by typing the following:

```
host-name # % mv jack_theory labs
```
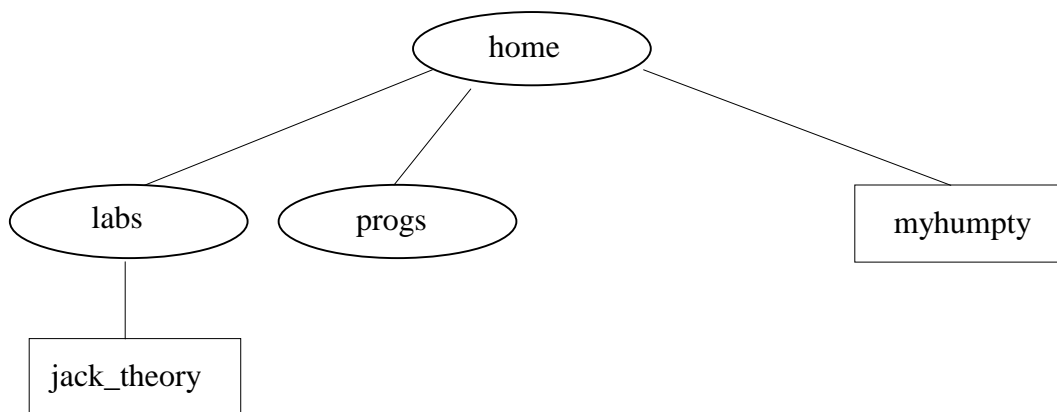


Using the **cd** command, change your working directory to **labs** and check that **jack_theory** is there.

### 4.4.4 What is My Current Working Directory?

You can always tell what is your current working directory by using the **pwd** command (print working directory). Do that now. **pwd** is a very useful and important unix command.

```
host-name # % pwd
```

Notice that **pwd** displays the whole pathname with something like:

```
/home/server-name/students/initial_letter/your-name/labs
```

That means your home directory is a sub-directory under **students,** which is a sub-directory on **server-name**, etc. Change your current working directory to your home directory and try **pwd** there.

**4.4.5 Using Pathnames**

Most if not all the UNIX commands that use a filename can also take a pathname. A *pathname* is a string of directory names separated by '/'s where the last entry is a file name. The full pathname specifies where a file resides. You can see the full pathname when you type a `pwd` command. However, you don't need to use the whole pathname most of the time. There are shortcuts that we will describe below. If you are in your working directory (in this case your home directory) and want to display the contents of **jack_theory** in the sub-directory **labs**, you could use '`more`' with a pathname.

```
host-name # % more labs/jack_theory
```

From your current working directory you can go 'down' the directory structure by using the directory name, a '/' and file name. You can go 'up' the directory structure by using '**..**'s. For example, change your working directory to **labs** and type the following:

```
host-name # % more ../myhumpty
```

We could also have used "~" to specify your home directory because **myhumpty** is in your home directory.

```
host-name # % more ~/myhumpty
```

You can have as many layers of directories as you want. Make a new directory called **lab1** under **labs**.

```
host-name # % cd  ~/labs
host-name # % mkdir lab1
```

As another example of using pathnames, we will copy a file in the home directory to the new **lab1** directory two different ways. First, while in the home directory we will issue the `cp` command to make a copy of **myhumpty** called **humpty1** and place it in the directory **lab1**.

```
host-name # % home
host-name # % cp myhumpty labs/lab1/humpty1
```

Now we move to the **lab1** directory and copy the file from there and name the new copy **humpty2**.

```
host-name # % home
host-name # % cd labs/lab1
host-name # % cp  ~/myhumpty  humpty2
```

36

Move to the **lab1** directory and make sure the two humpties are there.

For a final example, we will move **jack_theory** from **labs** to **progs** with the same name. Assuming we are in the **labs** directory, we go 'up' one directory with '..' and 'down' another by specifying the directory name.

```
host-name # % cd  ~/labs
host-name # % mv  jack_theory  ../progs/.
```

```
                          home
              /             |              \
          labs            progs         myhumpty
            |               |
          lab1          jack theory
          /    \
     humpty1   humpty2
```
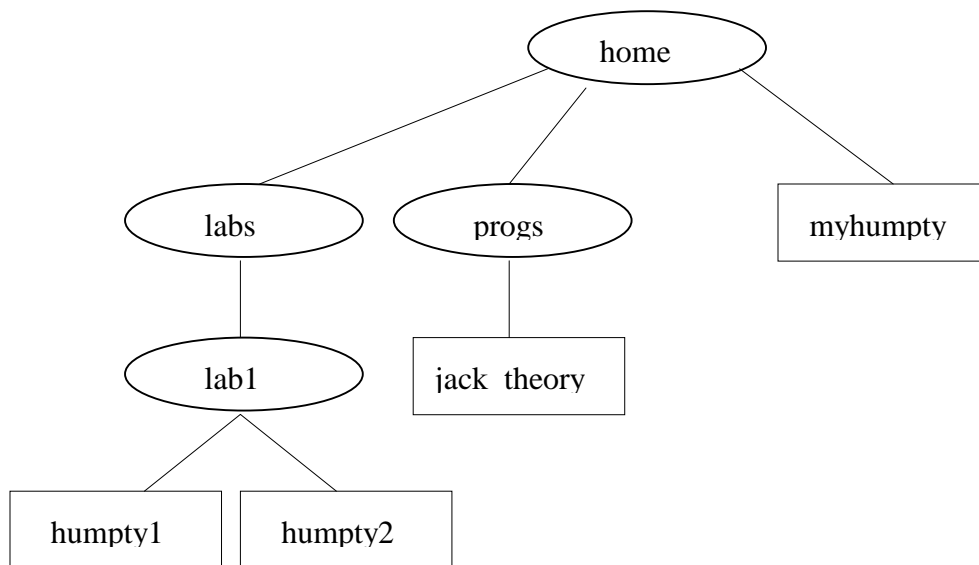
Above are the directories and files we have now. It is important that you understand how to move around in directories and how to specify the correct pathname. If you are still confused in any way, go over this section again carefully studying the commands and using the diagrams.

### 4.5 Reading the On-line Manual Pages

UNIX has manual pages stored on-line for each command. The command **man** followed by the command name displays these reference manual pages.

To read the manual pages on the command **man**, type the following:

```
host-name # % man man
```

Since the command **man** uses '**more**' to display the text, you use '**more**'s commands to get around, i.e., the space bar for the next page, **b** to go back a page, and **q** to quit. The manual pages are not written for the beginning user. Therefore, the beginner needs to learn how to

extract useful information by selectively skipping over sections and ignoring large portions. Try reading some other man pages, say for `ls` and `cd`.

If you don't know the command you want but want to find an appropriate one, you can try a keyword search of man. Using the `-k` option and the keyword does this. Say you want to copy a file but can't remember the command. Trying '`man copy`' gives the message "No manual entry for copy" that means there is no command spelled "copy". We could try the following keyword search:

```
host-name # % man -k copy
```
And find lots of commands that do copying including **cp** that is what we wanted.


## 4.6 Printing Files

The printing of files is easy. To print a text file (a file which you can edit), you use the **lp** command where you specify the printer and the name of the file. The default printer is the line printer in room 350 Dana. For all the other printers you must specify the printer name. To print the Pascal source file called **myprog1.p** you type the following:

```
host-name # % lp myprog1.p
```


### 4.6.1 Printer Names

An option **-d** and the name of the printer specify the different printers. The names of the printers are the following:

```
lw    laser writer printer in 314 Dana (specifically for Jr/Sr CS Majors).
lw3   laser writer printer in 350 Dana.
lwc   laser writer printer in 231 Dana.
lobby laser writer printer in Dana lobby.
```

For example, to print a letter to Mom on the laser printer in room 350 Dana, you would type the following:

```
host-name # % lp -dlw3 letter.mom
```

The command **lp** only prints what's in the file. It does *not* include the date or even the filename! One uses the **pr** command to add the date, time, name of file and page number at the top of each page. Normally one uses the following for printing programs and output which is to be handed in for a class.

```
host-name # % pr myprog1.p | lp
```

In the above, **pr** formats the Pascal file **myprog1.p** and pipes (Read about pipes in Section 4.10.6 on "Pipes and Filters.") the formatted output to **lp** to be printed.  You may choose the alternate **two columns** output format for your submission. You would type the following to submit your homework:

```
host-name # % a2ps -Plwc myprog1.p
```


### 4.6.2 Checking a Printer Queue

Since several people may request to print a file on a printer at the same time, your request is placed in a queue (Queue is British for a line in which you wait like the McDonald's line in Moscow.)  You can display the contents of a printer's queue with the **lpstat**  command where you specify the printer name by using the **–o** (lowercase letter o) option.  To check the queue of the laser printer in room 350 Dana, you would type.

```
host-name # % lpstat –o lw3
```


### 4.6.3 Removing Requests From a Printer Queue

At times you find you may need to remove a request from a printer's queue.  Perhaps, you discover that you printed the wrong file and don't want to waste paper.  First, perform a **lpstat** command and notice the job ID of the print request to be removed.  Then issue a **cancel** command specifying the job ID.  Below we remove job ID lw3-20 from the line printer queue.

```
host-name # % cancel lw3-20
```

On rare occasions, a print request will hang the printer.  If there are print requests in the queue and the printer has not printed for many minutes, perhaps the first (top) job in the queue is sick.  After checking that the printer is turned on, has paper, not jammed, is on-line, etc., then remove the first job from the queue with **cancel**.  You can remove only your *own* printer requests.  If the first job is not yours then you need to find that person or report the problem to the Systems Administrator.


## *4.7 Other UNIX Commands*

This section covers some UNIX commands that are important but infrequently used.

39

### 4.7.1 Grep - Searching a File For a String

To search for a word, a phrase or any string of characters in a file use the grep command.  You specify the string of characters then the file as shown.

```
host-name # %  grep  'Humpty'  humpty
Humpty Dumpty sat on a wall.
Now Humpty's unscrambled and good as new.
```

Two useful options for **grep** are  **-i** that ignores the case of letters and **-n** that displays the line numbers at the front of the line.  Here is the output after one asks **grep** to find all occurrences of **'and'** including both upper and lower case letters and displaying the line numbers.

```
host-name # % grep -i -n 'and' jack_theory
37:    This is Chaotic Confusion and Bluff
46:    This is the Cybernetsics and Stuff
47:    That covered Chaotic Confusion and Bluff
49:    And thickened the Erudite Verbal Haze
57:    To make with the Cybernetics and Stuff
58:    To cover Chaotic Confusion and Bluff
60:    And thickened the Erudite Verbal Haze
69:    That made with the Cybernetics and Stuff
72:    And, shredding the Erudite Verbal Haze
77:    And Demolished the Theory Jack built.
```

As with many UNIX commands, **grep** can take a wildcard for the filename. (see Section 4.3.4 on "Using Wildcard Characters in Filenames.")  Here we search for 'to' in all the files of the directory.

```
host-name # % grep -i -n 'to' *
humpty:3:   The King set the Tme Machine back to two.
jack_theory:56:   This is the Button to Start ther Machine
jack_theory:57:   To make with the Cybernetics and Stuff
jack_theory:58:   To cover Chaotic Confusion and Bluff
jack_theory:68:   Who pushed the Button to Stzrt the Machine
```
Notice that it displayed the filename before the line number.

### 4.7.2 How Much Disk Space Am I Using?

All student accounts are limited in the amount of disk space (called **disk quota**) that they may use. This is typically two megabytes (or two million characters). If you exceed this limit, you won't be able to create new files. Now two megabytes is a lot of disk space so most students need not worry about exceeding it. However, there are always packrats who save everything! If you do exceed your quota, you must delete some files. You can tell how much disk space you are using by issuing the **du** (**disk utilization**) command in your home directory.

```
host-name # % home
host-name # % du
```

**du** displays the amount of disk space used for each of your directories in kilobytes (thousands of characters). A megabyte is 1000 kilobytes.

To see what your disk quota is use the **quota** command.

```
host-name # % quota -v
```

Doing an **ls -l** in a directory will show the size of each file in bytes. The size is the number before the date.

```
-rw-r--r--   1 cs203    cs203         245 Aug 14 14:16 humpty
-rw-r--r--   1 cs203    cs203        2147 Aug 14 14:16 jack_theory
```

My file **humpty** is 161 bytes long and was last changed Aug 14, 1998.

### 4.7.3 Changing Permissions on a File

When you do an **ls -l** command, the current permissions are displayed for each file. The first 10 characters are the permission fields for that file. A '-' in column one means a plain file. A 'd' in first column means a directory.

```
-rw-r--r--   1 cs203    cs203         245 Aug 14 14:16 humpty
-rw-r--r--   1 cs203    cs203        2147 Aug 14 14:16 jack_theory
```

The next nine characters are grouped into three characters each (**rwx, r-x and r-**) for the permissions for *owner*, *group* and *world* respectively. The owner of the file is the login name that created it. In the above, both files are owned by **cs203**. The three characters for the owner's permission are '**rwx**' which means the owner can **read**, can **write** and can **execute** the file. The Systems Administrator determines which login names are in a group. In this case, others in

41

**cs203's** group can read and execute the files but can't write or changed them.  The world is all others on the system.  Anyone can read the files but can't changed them or execute them.

For a directory, execute permission is interpreted to mean permission to search the directory. The permissions and file modes are summarized as follows:

```
r or '4'  the file is readable;

w or '2'  the file is writable;

x or '1'  the file is executable;

-  the indicated permission is not granted.
```

The **chmod** command allows the owner to change the permissions on a file.  The form of **chmod** is:

```
chmod <who><op><permission> filename
where <who> is a combination of:
     u       User's permissions (owner).
     g       Group permissions.
     o       Others (world).
     a       All, or ugo.
<op> is one of:
     +       To add the permission.
     -       To remove the permission.
<permission> is any combination of:
     r       Read.
     w       Write.
     x       Execute
```

A few examples, will help you to understand how to use **chmod**.  To set the file **humpty** so no one but the owner can read, write or execute it, we would type the following:

```
host-name # % chmod go-rwx humpty
```

Note: no spaces are allowed in '**go-rwx**'.  Doing an **ls -l humpty** shows the following permissions.

```
-rwx------  1 cs203        161 Jul 30 16:30 humpty
```

To set **humpty's** permissions back to what they were before, we need to do two **chmod** commands.  One for the group and another for others.

```
host-name # % chmod  g+rx  humpty

host-name # % chmod  o+r  humpty

host-name # % ls -l humpty

-rwxr-xr--  1 cs203         161 Jul 30 16:30 humpty
```

If you want to hide all your programs so only you can read them, you could use a wildcard.  The below changes all the files in the directory so only you, the owner, can read, write and execute them.

```
host-name # % chmod  go-rwx *
```
Or you could have changed the permissions on the directory of where the files reside.

For instance, here are a few of the common ones:

```
644 is rw-r--r--

        the owner can read and write the file or directory, everybody else
        can only read it.

755 is rwxr-xr-x

        the owner can read, write and execute the file, everybody else can
        read or execute it.  For a directory, this mode is equivalent to
        644.

711 is rwx--x--x

        the owner can read, write and execute the file, everybody else can
        only execute it.
```

## *4.8 Using the SUNs From a PC or a Macintosh*

The SUNs may be used from a personal computer, say in your dorm room, or from a Macintosh on campus.  However, the menus, mouse and multiple windows of CDE are not available.  But you can use Emacs, compile programs, run programs, and do most UNIX commands.

### 4.8.1 Using the SUNs from a Public Macintosh

You can access SUNs from a Mac in two ways:
1. By using **Telnet**, a program that simply accesses the SUNs and gives you one window interface.  You will not be able to use a mouse in that window.  And, you will not be able to run any application that requires a window environment.
2. By using **MacX** a program that simulates **X Windows**.

***4.8.1.1 To use*** *Telnet* ***from a Mac***

1. Open the **Telnet** folder by double clicking
2. Double click on **NCSA/BYU Telnet 2.7** to run **Telnet**.
3. After Telnet's menus appear at the top of the screen, pull down **File** menu and select **Open Connection**.  A session window will pop up.  Type in a SUN host-name, e.g., `castor.eg.bucknell.edu` or `pollux.eg.bucknell.edu`, inside the session name box.  Then click on `Connect` button.  You should see a new window which displays the normal SUN login message with the SUN host-name on the header bar.
4. Login to the SUN as normal.  You will login without window environment.  Therefore, you will only have one window and the mouse is inoperative.  However, the arrow keys still work.
5. To use Emacs see Section 4.8.4.
6. To Logout and get off the Mac type "`logout`" as usual from  host-name prompt.  If UNIX gives you the message "stopped jobs," type "`logout`" again.  Now under the **File** menu, select **Quit**.

***4.8.1.2 To use*** *MacX* ***from a Mac***

Assuming the Macintosh you are using has MacX installed!

1. Double click on **MacX** folder.
2. Double click on **Links** document.  (If you double click on MacX instead, select **Close "Untitled"** from the **File** menu and then select **Open** option from the **File** menu.  When the widow pops-up double click on **Links**.
3. Select **sun** from the **Remote** menu.
4. Type your account name (aka: user name, login name, email name) and hit **Return** key.
5. Type your password and hit **Return** key.
6. After about 30 seconds a command window will pop-up.

**4.8.2 Using the SUNs from a Public Personal Computer**

You can access SUNs from a PC in two ways:

1. By using **Telnet**, a program that simply accesses the SUNs and gives you one window interface.  You will not be able to use a mouse in that window.  And, you will not be able to run any application that requires a window environment.

2. By using **X-Win32** a program that simulates **X Windows**.


To use **Telnet** from a PC:
1. Turn on the machine and wait for it to boot up.
2. Go to the **Start** Menu and from **Network Applications** select **Telnet**.
3. An **Open Session** window will pop up.  Either select or type in the SUN host-name, e.g., `castor.eg` or `pollux.eg`, inside the host name box.  Then click on **Connect**.  You should see a new window that displays the normal SUN login message.
4. Login to the SUN as normal.  You will login without OpenWindows.  Therefore, you will only have one window and the mouse is inoperative.  However, the arrow keys still work.
5. To Logout and get off the Telnet type "`logout`" as usual from host-name prompt.  If UNIX gives you the message "stopped jobs," type "`logout`" again.  Now under the **Session** menu, select **Exit**.


To use **XWin32** from a PC:  (Assuming the PC you are using has **XWin32** installed)
1. Click on the **Start Menu** button at the left bottom corner and holding the mouse button up to : **Programs** and select **X-Win32**.
2. After launching X-Win32, the **X-Win** box should be at the bottom of the task bar.  Click the **X-Win** box with the right-most mouse button to open the pull-up menu.  Highlighted **Sessions** to open the session selection windows.
3. Select one of the sessions, e.g. `castor_cmd`.
    The available sessions are:
    - castor_cmd
    - castor_dt
    - castor_Xterm
    - coral_Xterm
    - pollux_cmd
    - pollux_dt
    - pollux_Xterm
4. The `castor_Cmd` login windows will pop-up.
5. Type your account name (aka: user name, login name, email name) and the password and click **OK**.
6. After about 30 seconds a command window will pop-up with a UNIX prompt:
    `castor{41}%`
7. To Logout and get off the UNIX type "`logout`" as usual from  UNIX prompt to close the command window.

8. Click on the X-Win box with the right-most button to open the pull-up menu.  Select **Close** to exit **X-Win32**.


## *4.9 Transferring files with the SUNs*

### 4.9.1 How to use ftp on the SUNs

The **ftp** command invokes the Internet standard File Transfer Protocol (FTP), which enables file transfers to and from a remote network site.

1. Type **ftp** plus the ftp server name

   ```
   charcoal{1}% ftp ftp.eg.bucknell.edu
   Connected to charcoal.eg.bucknell.edu.
   220 charcoal FTP server (Version wu-2.4(4) Tue Feb 27 10:40:30 EST 1996)
   ready.
   ```

2. Type **anonymous** as guest under **Name**

   ```
   Name (ftp.eg.bucknell.edu:ecst): anonymous
   331 Guest login ok, send your complete e-mail address as password.
   ```

3. Type your e-mail address as **password**

   ```
   Password:
   230 Guest login ok, access restrictions apply.
   ```

4. **ftp>** prompt should appear

   ```
   ftp>
   ```

The most common **ftp** commands are:

**?** - displays all the available  ftp commands

**bye** - terminates the FTP session with the remote server and exit ftp

**cd** - changes the working directory on the remote machine to remote-directory

**dir** - prints a listing of the directory contents in the directory

**get** - retrieves the remote-file and store it on the local machine

**put** - stores a local file on the remote machine

**mget** - expands the remote-files on the remote machine and do get more than one file

**mput** - expands wild cards in the list of local files given as arguments and do put more than one
        file

To get more detailed information about **ftp** from the man page, simply type **man ftp**.

   ```
   host-name #% man ftp
   ```

46

### 4.9.2 Transferring files from a Mac to SUNs

There are two ways to transfer files between a Mac and the SUN:  one is by using **FETCH**, and the other is by using **CAP**.  The advantages of using CAP are that the original formats of the files, are preserved when transfer takes place from the Macs to the SUNs and it distinguishes all the Mac files than the UNIX files.

### *4.9.2.1 Transferring files from a Mac to SUNs by using CAP*

**CAP 6.0** (Columbia AppleTalk Package for UNIX) is an AppleTalk tool, which implements a library containing a portion of Apple Computer's AppleTalk, protocols.  It includes a number of applications that can be used to print to a LaserWriter, and mainly act as an UNIX based AppleShare compatible file server.

The procedure for using CAP is as follows:

1.  Select **Chooser** from the  menu.  Select **AppleShare**, and then select **Engineering** under AppleTalk Zones.  Finally select **charcoal** as the file server and click **OK**.
2.  Type in **User Name** and **Password** in the login window.
3.  After logging onto **charcoal**, you may either select **CapVolume** which will directly go to your **CapVolume** directory under your home directory; r select **Charcoal** which will go to the root level on the **charcoal** server.
    Note:
    ♦ If you select **CapVolume**, the **CapVolume** icon will display on your desktop.  Double click on the **CapVolume** icon to open/display all the files under the **CapVolume** folder.  Now you can transfer files between your Mac and the **CapVolume** folder on the SUN by dragging files.
    ♦ If you select **Charcoal**, the **Charcoal** icon will display on your desktop.  Double click on the **Charcoal** icon to go to the root level of **Charcoal**.  By continuing double clicking to open folders until you can access your home directory. Now you can transfer files between your Mac and the SUN by dragging files.
4.  To **exit**, drag either the **CapVolume** icon or **Charcoal** icon to the **Trash Can**.

**SHORTCUTS:**

If you would like to transfer files directly to another directory under your home directory instead of **CapVolume** or vise versa, here is what you should do:

1. Open the **Charcoal** icon first, then follow the path to find your own home folder.

2. Click (*only one click, not double click*) on your folder to highlight the folder. Go to **File - Make Alias** and create an alias of your own folder. Click **OK** on the warning window.

3. The *alias folder icon* will display on the desktop. Leave this alias folder on your desktop as a shortcut to access your SUN directory.

   - Double click on the *alias* folder

   - Type in your **Name** and **Password** in the login window to login to **Charcoal**

   - Click **OK** and ignore the warning message. Then the **Charcoal** icon will be on the desktop.

   - After the **Charcoal** icon on the desktop, then double click and open the *alias* folder

4. You may also set any alias folder at any subdirectory level by using the similar procedures.

**NOTE:** By defaults, after the file transferred to the SUN it becomes a binary (executable) file, even it is only a text file. The file permission needs to be changed afterward.

### 4.9.2.2 Transferring files between a Mac and the SUNs by using FETCH[*]

1. Turn on the machine and wait for it to boot up.

2. Open **Applications** - **Internet Tools** - **Fetch**.

3. Double click on **Fetch 3.0.1** (unless its updated).

4. Under the **New Connection**... window, use either `castor.eg`, or `pollux.eg` or for the **Host**.

5. On a line that says: **User ID**: delete all, and type your user name (aka login name, account name).

6. On a line that says: **Password**: delete all, and type your password.

7. On a line that says: **Directory**: delete all, and hit **OK** key.

8. To get a file from the SUNs to the Mac: double click on the file you want or highlighted the file and click on **Get File...** button.

9. To put a file onto the SUNs from the Mac: select the file and click on **Put File...** button.

---

[*] There is also a Fetch handout available from the CCS Help Desk

♦ If the original file format is a text file, then change the **Format** to *Text* (Fetch may automatically change to Text)

♦ If the original file format is an image file, then change the **Format** to *Raw Data*.

10. To end the session:  either close the session window or select **Close** under **File** menu.

11. To quit **Fetch** by selecting **File - Quit**.

### 4.9.3 Transferring files from a PC to SUNs

There are two options to transfer files between an IBM and the SUN.  The first option is to use the **FTP** program from **Network Applications**, the second choice is to run the Windows95™ built-in **ftp** program.

### *4.9.3.1 Transferring files from a PC to SUNs by using FTP from Network Applications*

1.  Turn on the computer.

2.  Go to the **Start** Menu and from **Network Applications** select **FTP**.

3.  The **New Session** window will pop-up.

4.  On a line that says:  **Hostname or address:**  type in one of the server names (`castor.eg`, or `pollux.eg`).

5.  On a line that says:  **Username:**  type in your username.

6.  On a line that says:  **Password:** type in your password.  Then click **Connect**.

7.  PC's Hard Drive files will be in the left window and SUN's files will be in the right window.

8.  To copy a file from Hard Drive to your sun account:  click on the file in the left window and click on the **>>Copy>>** button.

9.  To copy a file from your sun account to Hard Drive:  click on the file in the right hand window and click on **<<Copy<<** button.

10. To quit **FTP**, do **Sessions - Exit**.

### *4.9.3.2 Transferring files from a PC to SUNs by using Windows95™ buildin ftp program*

1.  Turn on the computer.

2.  Go to the **Start** Menu and select **Run**.

3.  Type **ftp** with the server name (**castor.eg**, or **pollux.eg**) in the **Run** window and then click **OK**.

4.  When **ftp** window pops-up, type in your username your password.  Then run ftp commands after **ftp>** prompt.

5.  To exit **FTP**, type **bye** at the **ftp>** prompt

```
ftp> bye
```

## 4.10 Some Useful Features of UNIX

### 4.10.1 Using history of Your Commands

Most users find themselves issuing the same command repeatedly during a work session.  Since UNIX commands can be lengthy and subsequently tedious to type out, there are shortcuts to repeating a command.  For these shortcuts, UNIX provides a history feature, which records the last, several commands (typically the last 40) for each shell window (a window with **host-name %** prompt).

To display the last so many commands, type **history**.

```
host-name # % history
```

Now if you have an alias set for the **history** command, you should be able to type just '**h**'.

```
host-name # % h
```

Was '**h**' defined?  If not, you can add the alias later when we cover 'dot' files and command aliases in the next *two* sections.

When you display the history, you will see an associated number with the commands you typed before.  To redo a command, type "**!**" followed by the number (*No* spaces between "**!**" and number!) For example to redo the command with 23.

```
host-name # % !23
```

To do the last command, you type "**!!**".  You can redo the last command starting with a string by typing "**!**" followed by the string.  For example to repeat the last use of '**more**', you would type:

```
host-name # % !m
```

### 4.10.2 Changing Dot Files

When you issue the **`ls -a`** command in your home directory, you should see a series of dot files or filenames that start with a period. Below are some common dot files and their purposes. You may display them with '**`more`**' to see what is in them. Be sure you know what you are doing before you make any changes!!

| | |
|---|---|
| `.cshrc` | The **`.cshrc`** file is executed every time you create a new shell window (a window with **`host-name %`** prompt). This is where to place your own command aliases. See next section. |
| `.dt` | This dot directory sets features for CDE. |
| `.login` | This file is executed whenever you login. It sets up OpenWindows. |
| `.openwin-init` | This file sets features for OpenWindows. |
| `.openwin-menu` | This file sets up the features of OpenWindow's menu buttons. |
| `.emacs` | This file is used by Emacs to set up features. |
| `.mailrc` | This file sets up features for mail. Here is where you would add mail aliases and mailing lists. For example, you have a friend named Jim Dunkelberger whose login name is 'dunklbrg' and you can never remember it. You could add the line |

```
alias jim dunklbrg
```

to your **`.mailrc`** file and address mail to him as 'jim.'

### 4.10.3 Creating Your Own Command Aliases

It is very easy to customize your frequently used UNIX commands by adding *aliases* to your **`.cshrc`** file. Using 'more' display your **`.cshrc`** file in your home directory. Notice that there are some aliases already existed. For example that you can type '`lo`' for '`logout`' and '`m`' for '`more`.' If you want to add your own aliases just edit this **`.cshrc`** file and you may use the aliases already there as models. Here are some examples:

```
alias cls clear
alias pinebox 'telnet pinebox'
```

### 4.10.4 Redirecting Input and Output

Redirecting the input to and the output (I/O) from a command is easy in UNIX. To send the output of any command or program to a file instead of the screen, use >.

For example, to place a list of the files in the current directory in a file called 'myfiles,' you would type the following:

```
host-name # % ls > myfiles
```

Again for any command or program, to read input from a file instead of the keyboard, use <. For example, to input from a file called **data** for a Pascal program called '**myprog**' type:

```
host-name # % myprog < data
```

The symbol >> operates much as > does, except that it means, "add to the end of the file." Redirecting input from a file and output to a file is especially useful with writing programs from other computer languages.

### 4.10.5 Background Processes

Many commands, e.g., **Emacs**, don't finish after a few seconds and, therefore, tie up the window in which you typed the command. UNIX allows you to easily place the command (or program) in the *background* and run by itself. Then it is no longer associated with the window where you typed the command. This allows you to continue using the window's screen and keyboard. This is called *submitting a background process*. Processes are just instances of programs in execution. Any command (or program) can be submitted as a background process by adding "**&**" on the end of it. For example, to sort a large file and redirect the output to the file **sort-output** and not tie up your window while doing it, one would type the following:

```
host-name # % sort large-file > sort-output &
```

Some commands when run under OpenWindows or CDE, e.g. Emacs, create a special window to run in. If run in the background, the window stays until you quit or kill it.

To see a list of your current processes including both *foreground* and *background* processes, type the following:

```
host-name # % ps -ef
```
The '-ef' are options to the **ps** command. Do a **man ps** to read about all the options.

In desperation, you can kill a runaway or hung up process. Use the **ps -ef** command to find the process-id. Then type the following:

```
host-name # % kill -9 process-id
```

**4.10.6 Pipes and Filters**

*Pipes* and *filters* are some of the niftiest features of UNIX.  A UNIX command's output may be redirected directly to another command's input by the pipe symbol |.  For example, to list a directory with too many files to display in the window at one time, one can pipe the output of **ls** into '**more**' by the following:

```
host-name # % ls -l | more
```

This is similar to redirecting the output of **ls** to a temporary file then displaying the contents of the file using '**more**' as follows:

```
host-name # % ls -l > temp
host-name # % more < temp
host-name # % rm temp
```

The use of the pipe symbol | is a lot handier than using a temporary file especially since we tend to forget to remove the temporary file.  Pipes are really handy as shown by the below examples.

To count the number of users on system, one could type:

```
host-name # % who | wc -l
```

where the **-l** (that's minus el) is an option to **wc** (word count) to only display the number of lines.

To look for a particular user "cs203" when you do a **ps** command, type the following:

```
host-name # % ps -ef | grep 'cs203' | more
```

In the previous example, we would say that **grep** is a *filter*  as it filters or selects only portions of the output. The command **grep** displays each line in which it finds the string (see Section 4.7.1 on "Grep - Searching a File For a String").

Assume you have written a Pascal program that displays the names (last name first) of the members of your organization but they are not in alphabetical order.  To sort the names and then print them, you could pipe the output of the Pascal program to **sort**, then pipe its output to **pr** to format it and then pipe its output to the printer.

```
host-name # % names | sort | pr | lpr
```

However, if you do this, make sure the amount of output to the printer is reasonable.

### 4.11 "Help! My Computer Died!"

As stressed in the book *Hitchhiker's Guide to the Galaxy* by Doug Adams: DON'T PANIC!! Here is a list of troubleshooting actions to try which range from the simple to the very drastic.

1.  Your computer screen has gone blank.  Hit the space bar.  The SUNs have an automatic screen saver which blanks the screen after so many minutes of inactivity.
2.  Hit **Return** key.  Perhaps you forgot to hit **Return** after entering a response.
3.  Move the mouse pointer to inside a window with `host-name %` prompt. Maybe you hit the mouse by accident and moved the pointer out of the window.
4.  Press **Control c** to stop a program or a command.
5.  If none of the above works and a window appears hung up (Meaning no activity on screen or from pressing  keys while pointer is in the window.) then you can *Quit the Window*.  Do this by pressing the *right* mouse button while the pointer is in the bar of the window.  Move the pointer to 'Quit' and release the button.
6.  If you have a runaway program which is not a window and the above actions did not work, you can *Kill the Process*.  A *process* is an instance of a program in execution.  Use the `ps -ef` command to determine the process id.  Then in a window with `host-name %` prompt enter `kill -9 process-id`. This should destroy the running process.  Do a `ps` command to check.  Note: you can only kill processes which you created.  You can not kill ones created by others.
7.  If none of the above cures the sick SUN, move to another SUN.
8.  If several SUNs don't work, perhaps the network is down.  It is rare but it does happen.  If during normal working hours, probably someone will fix it within a half an hour.  If late at night and the network is still down after 10 minutes, go to bed and get some sleep!
9.  If you can't login or your files are really messed up, contact your instructor.  You also may either call **x71460** or stop by the office in Dana room 230A for assistance.

### 4.12 A Brief Summary of Some UNIX Commands

**Files and Directories Commands:**

| | |
|---|---|
| `ls` | - list files in current directory. |
| `ls -a` | - list dot files in current directory. |
| `ls -l` | - list files in current directory in full form. |
| `pwd` | - print working (current) directory. |
| `mkdir name` | - make new directory. |
| `cd pathname` | - change to directory. |
| `cd` | - change directory to home directory. |
| `rmdir name` | - remove directory. |
| `home` | - change current directory to home directory. |
| `cat file` | - display a file; concatenate several files. |
| `more file` | - display file on screen pausing at each screenful. Press space to continue.  Press h for help. |
| `cp file1 file2` | - copy file1 to file2. |
| `mv file1 file2` | - move file1 to file2 (rename). |
| `mv file dir` | - move file to directory dir. |
| `rm file` | - remove file (delete). |
| `du` | - disk space used (do in home directory). |
| `quota -v` | - displays your disk quota or allotment. |
| `chmod <who><op><permission> file` | - change permissions on a file. |

**Useful Commands:**

| | |
|---|---|
| `a2ps -Pprinter file` | - prints file in two column format. |
| `lp –dlobby file` | - prints file on laser printer in Dana lobby. |
| `lp –dlw file` | - prints file on laser printer in room 314 Dana. |
| `lp –dlwc file` | - prints file on laser printer in room 231 Dana. |
| `lp -dlw3 file` | - prints file on laser printer outside room 350 Dana. |
| `lpstat –o printer` | - list printer queue, printers are hp, lw, lwc, lw3. |
| `cancel job- id` | - remove job from printer queue (get job-id from lpstat). |
| `man command` | - displays manual page to screen (on-line help). |
| `man - k keyword` | - displays one line of commands which contain keyword. |
| `logout` | - to log off of UNIX. |
| `script` | - to capture a work session in a file. |

```
exit                          - to end a script session. To end a rlogin session.
who                           - displays who is on your machine.
rusers                        - displays all remote users (all on the network). Control c
                                 to get out.
rlogin hostname               - remote login to another computer (exit to get off).
date                          - displays time and date.
wc file                       - word count of file.
cal                           - prints a calendar.
spell file                    - displays misspellings of the file.
sort file                     - displays file sorted alphabetically.
grep 'string' file            - displays all lines in file containing the string.
history                       - history of commands you have typed (!number to redo).
ps                            - display your processes running on your machine.
ps - ef                       - display all processes running on your machine.
kill 9 process-id             - kill a runaway process (get process-id with ps).
passwd -r nisplus             - change your password  password.
```

# 5. The Mailer

The **Mailer** is a desktop application for sending, receiving, and managing your electronic mail (email) messages.  It's icon is available on the Front Panel and also can be selected  from the Mail submenu in the **Workspace Menu**.  When the new electronic mail (e-mail) arrives, letters will appear in the in-tray of the icon.

### 5.1  Starting Mailer

To open the **Mailer** to read or send mail by clicking the **Mailer** icon in the Front Panel.

### 5.2  Using the Mailer Main Window

The main window contains the following areas:

**Message Header List**       Displays information about mail messages
**Toolbar**                   Contains buttons for tasks that you perform frequently
**Sash**                      Resizes the Message Header List and message view area
**Message view area**         Contains header fields and message text

**Attachment list**          Displays icons of mail message attachments, if any

## *5.3  Mailer Toolbar Buttons*

The Toolbar contains buttons that offer an alternative to using the menus for common functions.

| Button | Function |
|---|---|
| **Delete** | Deletes the selected messages from the mailbox. (There is an equivalent item in the Message menu.) |
| **Next** | Displays the message that follows the currently selected one. (There is an equivalent item in the View menu.) |
| **Previous** | Displays the message that precedes the currently selected one. (There is an equivalent item in the View menu.) |
| **Reply, Include Message** | Opens a Compose window with the email address of the recipient filled in, and the message body included. (There is an equivalent item in the Compose menu.) |
| **Forward** | Opens a Compose window with the text of the selected message and its attachments, if any, loaded. (There is an equivalent item in the Compose menu.) |
| **New Message** | Opens a Compose window. (There is an equivalent item in the Compose menu.) |
| **Print One** | Prints one copy of the selected messages. (There is an equivalent item in the Message menu.) |

## *5.4 To Read a Mail Message*

- Use the Next and Previous buttons on the Toolbar

    Or,

- Select the message to be viewed from the **Message Header** List.  The text of the message appears in the **Message View Area**.

    Or,

- Double-click on the message to open it into a separate window.

## *5.5 Deleting Mail Messages*

In general, messages will remain in the **Mailer** unless they are explicitly deleted.

- Select the message you want to delete.

- Choose **Delete** from the **Message** menu,

     Or,

- Click the **Delete** button on the Toolbar.


NOTE:  Once a message has been deleted, you can get it back unless you made your deletions permanent by choosing **Destroy Deleted Messages** from the **Mailbox** menu.


## *5.6 Replying to a Mail Message*

1. Select the message to which you want to reply.
2. Determine the scope of the reply.
   - To reply to the sender, click **Reply** button on the Toolbar or choose **Reply** from the **Compose** menu.
   - To reply to the sender and all the recipients of the message, choose **Reply to All** from the **Compose** menu.
   - To reply to the sender and all the recipients of the message and include a copy of the message, choose **Reply, Include Message** from the **Compose** menu.
   - Type the reply message text in the **Re:** dialog box.
   - Click the **Send** button or choose **Send** from the **File** menu.

The Compose window closes and the message is sent.


## *5.7 Sending a Mail Message*

1. Choose **New Message** from the **Compose** menu or click **New Message** button on the Toolbar.
   The **New Message** window appears.
2. Type the email addresses (e.g. *username@bucknell.edu* for anyone at Bucknell) of the people to whom you want to send the message in the **To** field and press **Return**.
   You can send a message  to a single user, multiple users, or an alias.
3. *Optional:*  Type the topic or title of the message in the **Subject** field and press **Return**.
4. *Optional:*  Type the email addresses of the people whom you want to be carbon copy recipients of the messages in the **Cc** field and press **Return**.
5. Type the message text in the text area.
6. Click the **Send** button or choose **Send** from the **File** menu.

The **New Message** window closes and the message is sent.

## 5.8 Printing Mail Messages

It is often the case that you want to print a hard copy of received messages. You can print a message using the default options or set different print options.

To Print a Message with the Default Options:
1.  Select the message to be printed in the Message Header list.
2.  Click the **Print** button on the Toolbar or choose **Print One** from the **Message** menu.

To Print a Message with Specific Options:
1.  Select the message to be printed in the Message Header List.
    **NOTE**: You can select several messages at once for printing by holding down the **Shift** key before selecting each message with the mouse.
2.  Choose **Print** from the **Message** menu.
3.  Set the options you want to change:
    *   Type a new printer name in the **Printer** field
    *   Indicate the number of copies in the **Copies** field
    *   Type a title for the banner page in the **Banner Page Title** field
    *   Select Print Page Numbers to print page numbers in your document
    *   Type command-line print options in the **Print Command Options** field
    *   Click **Print**.

## 5.9 To Create an Alias

You may want to create an alias for a user or group of users to whom you frequently send mail.
1.  Choose **Alias** from the **Options** menu in the main window.
    The Aliases dialog box is displayed.
2.  Type the name for your alias in the **Alias** field.
3.  Type the user addresses that will make up the alias.
    Each of the addresses should be in the form *username@hostname* and be separated by a comma, space, or both.
4.  Click **Add** to add the information in the **Alias** and **Addresses** fields to the Alias list.
5.  Click **OK** or **Apply** to make the settings take effect.
To change an alias, select it and edit the Alias or Addresses field, as appropriate, then click **Change**. To remove an alias, select it and click **Delete**.

## 5.10 Retaining and Organizing Mail Messages

One final useful feature of **Mailer** is a mechanism for retaining mail messages by category.

1  Select one or multiple messages.

To select multiple messages, either choose **Select All Messages** from the **Mailbox** menu or click and drag the mouse over multiple consecutive message headers.

2  Choose **Save As Text** from the **Message** menu.

3  Type a file name and location for your message in the **Mailer - Save As Text** dialog box that appears.

4  Click **Save** or **Append** to either save the message to a new file or append it to an existing file.

# 6. The File Manager

## 6.1 Using File Manager

The **File Manager** uses a graphical interface to assist users in managing their directories (folders), files (documents) and applications.  The **File Manager** adopts icons similar to those used in Microsoft® Windows95™ and the Macintosh® operating system. You can use **File Manager** to find, copy, move, open, close, delete, undelete, create, and print files.  You can start applications from **File Manager**, and reorganize your file system by moving or copying files between folders.  You can also use **File Manager** to link files and to transfer files to other machines.

## 6.2  To Select a Single File or Folder

**Mouse**

• Click once on the icon.

**Keyboard**

1.  Use the **Tab** and **Arrow** keys to move the highlight to the icon you want to select.

2.  Press **Spacebar**.

When a file or folder is selected, its name is highlighted.

To deselect a file or folder, select another icon or click on an empty area in the **File Manager** window.

### 6.3  To Select Multiple Files or Folders

You select multiple objects so that you can use one of the **Selected** menu choices on these objects.  Selecting multiple files is useful if you want to delete several files at once, or move a group of files to a new folder.

**Mouse**

- Press mouse button 1 in a blank area of the view, drag the mouse to draw a box around the icons you want to select, then release the mouse button.
  *Or*, click to select the first icon, then hold down the **Control** key and click to select each additional icon.
- To remove a single icon from a selected group, hold the **Control** key and click on the icon you want to deselect.

**Keyboard**

1. Select the first file or folder icon by pressing **Spacebar**.
2. For each additional icon you want to select, move the highlight to it, then press **Control** + **Spacebar**.


### 6.4 To Rename a File or Folder

**Mouse**

1. Select the file or folder name by clicking on the name beneath its icon.  The name will be put in a text field.
2. Type the new name.
3. Press **Return**.  If you just click outside the name when you are done, your changes will be lost.

To cancel a rename operation, press **Escape**.

**Keyboard**

1. Use the **Tab** and **Arrow** keys to move to the icon for the file or folder you want to rename.
2. Press **Spacebar** to highlight the icon name.
3. Choose **Rename** from the **Selected** menu.
4. Type the new name.
5. Press **Return**.

To cancel a rename operation, press **Escape**.

## 6.5 To Move a File or Folder

**Mouse**

1.  Make the destination folder visible:
    - Open a **File Manager** view of the contents of the destination folder.
    - *Or*, open a **File Manager** view that shows the icon of the closed destination folder.
2.  Select the file or folder to be moved.
3.  Drag the file or folder and drop it onto the destination folder.

**Keyboard**

1.  Use the Tab and direction keys to move the highlight to the file or folder to be moved.
2.  Press the **Spacebar** to select the object
3.  Choose **Move** to from the **Selected** menu.
4.  Type a name into the Destination Folder: text box.  For example, if you want to move the file report into the folder */u/john*, you would type

    `/u/john.`
5.  Click **OK** or press **Return**.

## 6.6 To Copy a File or Folder

**Mouse**

1.  Make the destination folder visible:
    - Open a **File Manager** view of the contents of the destination folder.
    - *Or*, open a **File Manager** view that shows the icon of the closed destination folder.
2.  Select the file or folder to be copied.
3.  Press and hold the **Control** key.
4.  Drag the file or folder and drop it onto the destination folder.

Make sure that you release the mouse button before you release the **Control** key.  Otherwise, you will move instead of copy the file or folder.

**Keyboard**

1.  Select the icon.
2.  Choose **Copy** to from the **Selected** menu.
3.  Type a name into the Destination Folder: text box.  For example, if you want to copy the file report into the folder `/u/john`, you would type

    `/u/john`
4.  Click **OK** or press **Return**.

To close the `Copy File` dialog box without copying a file, click `Cancel` or press `Escape`.

### 6.7  To Delete a File or Folder (to the Trash Can)

- Choose the **Put in Trash** command from the icon's pop-up menu (displayed by pressing Shift + F10 or mouse button 3).
- *Or*, select the file or folder's icon, then choose **Put in Trash** from the **Selected** menu.
- *Or*, drag and drop the file or folder's icon onto the **Trash Can** control in the Front Panel.
- *Or*, drag a file or folder's icon to the open **Trash Can** window.

### 6.8  To Find a File by Name

1. Choose `Find` from the **File** menu.
2. Type the name of the file or folder you want to find into the **File Name** field.  You can use wildcard characters to help locate a file or folder name.  For example, `fe*` will find all files that begin with `fe`.  The searches are case sensitive.  If you type capital letters, it will only find names with the same capitalization.
3. Type the name of the folder where you want to start the search into the **Search Folder** field. (By default, this field contains the name of the current folder.)  Find will search this folder and all it's sub-folders.
4. Click `Start` or press `Return`.
   File Manager begins searching the **Search Folder** and the folders it contains for files that match the name you provided.  Matches that are found are listed in the **Files Found** list. Once you have found an object, you can press **Open Folder** to open the folder it is in, or press **Put in Workspace** to place its icon on the current backdrop.

To stop the search, click the `Stop` button or press `Return`.

### 6.9 To View Files and Folders on a Diskette

1. Insert the diskette into a disk drive
2. Select **Open Floppy** from the Files control subpanel on the Front Panel.

*Or:*

1. Insert the diskette into a disk drive
2. Open **File Manager**

3. Select **Open Floppy** from the **File** menu

After selecting **Open Floppy,** if the diskette is formatted and readable by the system, File Manager displays a view of the diskette's contents; if the diskette is unformatted or is unreadable by the system, **Format Floppy** dialog box appears.

### 6.10  To View Files and Folders on a CD-ROM

 When you insert a CD-ROM into a CD-ROM drive, File Manager displays a window containing a view of the contents of the CD-ROM.

If you close the File Manager window for the CD-ROM, you can reopen it by selecting **Open CD-ROM** from the File Manager **File** menu or from the Files subpanel on the Front Panel.

### 6.11  To Rename a Diskette

From the diskette's File Manager window:
1. Choose `Rename Floppy` from the **File** menu.  The **Action: Rename Floppy** dialog box appears.
2. Type the new name into the **Floppy Name** text field.
3. Click `Rename` or press `Return`.

### 6.12  To Eject a Diskette or CD-ROM

From the diskette's or CD-ROM's File Manager window:
1. Choose `Eject` from the **File** menu.
2. Remove the diskette or CD-ROM from the disk drive.

### 6.13 To Format a Diskette

From the diskette's File Manager window:
1. Choose **Format Floppy** from the **File** menu.
2. Select one of three formatting options (UNIX, MS-DOS, or NEC-DOS) in the Format Floppy dialog box.
3. Click `Format` or press `Return`.

4. *Optional*. To rename the diskette, type the new name into the **Floppy Name** text field of the Format Floppy dialog box.

# 7. The Emacs Editor

## 7.1 What is Emacs?

**Emacs** is a powerful full screen editor that is available on most UNIX systems. It has many advantages over other command based editors, such as **ed** and **vi**. For example, **Emacs** has the ability to automatically indent FORTRAN or C/C++ programs properly. An advantage of **Emacs** over **Textedit** is that it can be used from a public Macintosh or a personal computer in your dorm room. The current version of Emacs used on the SUN workstations is **GNU Emacs 20.6.1.**

## 7.2 Starting Emacs to Edit a File

Before you start the next section, you should copy the file 'stories' into your directory. Type the following to copy the file. (see Section 4.3.5 if you need help in copying a file.)

```
host-name # % cp ~cs203/examples/stories stories
```

To run **Emacs**, type at a **host-name %** prompt the command **Emacs** followed by a file name and '&'. To create the new file named **myfile** type the following:

```
host-name # % emacs myfile &
```

The & sign tells UNIX that you wish to run this program in the "background" (see Section 4.10.5 on "Background Processes"). Basically, what this does is give you the **host-name %** prompt back to allow you to issue others commands in the window.

Since you probably don't have a file called 'myfile' in your directory, **Emacs** creates a new file. You should see '(New file)' at the bottom of the window. Notice the black bar near the bottom. It should tell you the name of the file, the time and other information. And the black rectangle in the upper left hand corner of the **Emacs** window. This 'cursor' moves along as you type. It is important for you to distinguish between the mouse pointer and the cursor. The pointer is used to move between windows and to select items to click on. The cursor is where you type text. Each **Emacs** and **host-name %** window has a cursor. The cursor is a black rectangle when the window is active and white when not active.

Now you are ready to edit the file. With the mouse pointer in the large area of the window, start typing. Don't worry about making mistakes. We will fix them up in a few moments. Type three or four lines worth of text. Use the four arrow keys (on far right side of SUN's keyboard) to move the cursor around and insert text. Make corrections by deleting the character to the left of the cursor by using the **Delete** key. You can also use the left mouse button to position the cursor where the pointer is.

## 7.3 Notation for Emacs' Key Sequences

**Emacs** uses special sequences beginning with the **Control** and **Esc** keys. The notation **C-f** means to hold the **Control** key down and press the **f** key. The notation **M-f** means to press the **Esc** key once and then **f**. Do *no*t hold the **Esc** key down as that repeats the key.

## 7.4 Exiting From Emacs

To exit **Emacs** type **C-x C-c** and **Emacs** will ask you if you need to save any files. Normally in windows environment, we don't need to exit **Emacs**, we just close the **Emacs** window by clicking on the left small rectangle at the top of the window. This reduces it to a small icon on the screen which we can open again with a click on the icon when we need our faithful friend again.

## 7.5 Saving the Contents of the File

What you have typed for the file **myfile** has *not* been saved. To save the file, type **C-x C-s**. You should see a message appearing at the very bottom of the window saying **Emacs** 'wrote' the file. This small area is where **Emacs** displays messages or requests input. As you are developing a program or typing in a data file, you should save it every few minutes.

## 7.6 Reading A File

You can read (find or load) a file after you are in **Emacs** by typing **C-x C-f**. In the bottom small area, you should see `find file: ~/` where you type in the pathname of the file. (For more on pathnames see Section 4.4.5 "Using Pathnames"). For now, you should type in '**stories**' after the '/' and a file with stories should be loaded in the window for editing (If the **stories** file is missing, you didn't copy it. Exit **Emacs** by **C-x C-c** and copy the file into your directory as

66

described earlier in Section 7.2.)  Since you will be experimenting and modifying your own copy of the file, feel free to modify it as you wish.

The stories file is too large to fit on the screen all at once.  Notice the black bar on the bottom, it says 'top'.  This means you are at the top of the file.  At other times by displaying a percentage, it indicates  how far you are through the file.  When you are at the end, it says 'bot' for bottom. If all the file can be displayed, then it says 'all.'

### 7.7 Moving Cursor and Moving Text Within the Screen

To scroll forward a page, use **C-v** and notice that the percentage changes on the black bar. Typical of **Emacs**, the reverse motion, i.e. to scroll backwards (**M-v**), is the same character preceded by 'M' (stands for the Meta key which is 'Esc').  Below are some cursor commands to try on the **stories** file.  Practice them all several times before going on.

```
Cursor Movement and Screen Motion

M-f       Forward one word.

M-b       Back one word.

C-e       End of line.

C-a       Beginning of line.

M-<       Beginning of file.

M->       End of file.

C-v       Scroll forward a page.

M-v       Scroll back a page.
```

### 7.8 Cutting and Pasting a Region of Text

To move a block of text, you first move the cursor to the beginning of the region and *mark* with **C-SPACE** then move the cursor to end and cut the text with **C-w**.  Now you move the cursor to the place where you want and *paste* with **C-y**.

To copy or duplicate a region of text is similar except instead of cut we *copy* with **M-w**.  Move a whole story from one part of the file to another.  Copy or duplicate a saying or two.  The cut operation can be used to delete a region as well.  Remove from the file any stories you don't like! Here is a summary of the killing and deleting operations to practice on the stories file.

```
Killing and deleting

DEL       Delete character to left.
```

```
M-DEL     Kill word to left.

C-k       Kill from cursor to end of line.

C-SPACE   Mark start of region.

C-w       Cut region (Kill region).

M-w       Copy region.

C-y       Paste region (Yank back last thing killed).

M-y       Yank back thing before last thing killed (do after
          a C-y).  Repeat to retrieve older text killed.
```

Notice the distinction between 'deleted' and killed.' Deleted text can not be 'yanked' back or retrieved while killed text can.


### 7.9 Recovering From Errors

You just typed an **Emacs** command and it didn't do as you wanted. Perhaps, you deleted a large, but the wrong, section of text!! Keep your cool!! While in **Emacs** you can undo it by **C-x C-u**. You can continue to type **C-x C-u** to slowly undo your other changes.


Another cause of frustration is when you type in a wrong **Emacs** command but haven't pressed the **Return** key yet. You have great dread that this unknown command will wreak havoc on your file. Again! Don't Panic!! Just type **C-g** to cancel a partially completed command. Try out both of these features.


### 7.10 Using Auto-save's Backup Copy of File

If you do not save your file for several minutes, **Emacs** automatically saves the file (**auto-save** feature) in a file name the same as yours with a '#' before and after. In case of disaster, e.g. the electrical power goes out, you can retrieve the latest auto-save copy by copying that file to your file. Inside **Emacs** type **M-x recover-file** then type in the name of your file you want to recover. Then you can save with **C-x C-s** to put the recovered text into the file itself.


### 7.11 Searching for Character Strings

**Emacs** has a character searching feature that is a joy! It is called an incremental search as it finds the next match from where the cursor is *as you type in each character*! Type **C-s** and slowly type

a common word such as 'and' to see this in action. Press the **delete** key slowly to delete character by character the word 'and' in the **Emacs** command area.

To find further occurrences of the string, type **C-s** repeatedly. When you get to the end of the file, **C-s** will wrap around to the beginning and continue searching. To get out of search mode hit the **Esc** key. You can always search for the last thing searched by hitting **C-s C-s**. **C-r** does the same as **C-s** except the search goes backwards in the file.

### 7.12 Splitting the Screen and Multiple Files

Many times you would like to look at two different portions of a file but they both are not displayed at the same time. No problem for our versatile friend! **Emacs** lets you split the window into two parts horizontally by typing **C-x 2**. Now both parts can be scrolled and operated on. For example, you may cut and paste from one part to the other. You move between the split windows by **C-x o**. You remove all split windows other than the window with the cursor by typing **C-x 1**. You split the window vertically by pressing **C-x 5**.

A powerful technique is to use the split windows on two different files. Just move to the other part and read (find) a file, say **myfile**. Again, you can scroll the two files and cut and paste between them. You can also cut and paste between a file and your mail.

Here is a summary of the split and multiple window commands. Practice them all.

```
Split Windows and Multiple Files
C-x 2     Split window in two horizontally.
C-x 5     Split window in two vertically.
C-x 0     Delete this window.
C-x 1     Delete all other windows.
C-x o     Switch cursor to other window.
```

### 7.13 On-line Help and On-line Emacs Tutorial

There is on-line help in **Emacs** which you will probably find a little advanced. You receive the help by **C-h**. If you want some more practice with the **Emacs** commands, there is a very good tutorial which you begin by pressing **C-h t**.

### *7.14 Using Electronic Mail*

Using electronic mail (email) is extremely easy and we encourage you all to check your email on a daily basis. When you login, the system will tell you if you have mail. Also, if the flag of the mailbox icon is up, you have mail.

### 7.14.1 Reading Your Electronic Mail

At any time while you are in **Emacs**, you can read or send mail then return to what you were doing in **Emacs**. To read your mail, enter **Emacs** if you are not already in it and just press **C-x C-r.**

Once you have entered '**RMAIL**' mode, you should see a message to read. Press 'n' to see the next message and 'p' for the previous message. You can delete the message by pressing 'd' and the next message is automatically displayed. 'u' will undelete a message. You may press 'h' to see a header line for each of your messages. If you want to jump to a specific message, you press the number from the header line followed by 'j.' You can place a message in a mail folder by pressing 'o' and typing in the name of the file folder, say 'mymail.' You can place a message in a UNIX file, in order to print, etc. by pressing **C-o** and supplying the name of the file. You return to what you were doing in **Emacs** by pressing 'q.'

### 7.14.2 Sending Electronic Mail

To create a message and send it to someone you need to know their email address. For everyone on the SUNs, the email address is the login name. Remember login names are usually all lower case letters.

To send a message while you are in **Emacs**, you press **C-x m**. Fill in after the '**To:**' with the person's email address (or several email addresses separated by blanks). Then move the cursor to the '**Subject:**' field and type in a subject. Now move the cursor to below the '-text follows this line-' and type in your message. Do *not* delete or alter the '-text follows this line-' string as **Emacs** needs it.

You may use the power of **Emacs** to edit your message. For example, you can cut and paste blocks of text from a file into your mail message. When you are ready to send your message, type **C-c C-c**. This also, returns you to what you were doing in **Emacs**.

### 7.14.3 Replying to Electronic Mail

When you are reading a message, you can reply by pressing 'r' and the window will be split in two. You proceed as in sending a message except the 'To:' field and the 'Subject:' field have already been filled in. Add your message below the '-text follows this line-' line. When you are ready to send your message, type **C-c C-c**.

### 7.14.4 Reading One of Your Mail Folders

While reading your mail in **Emacs**, you may read a mail folder file where you have saved old messages. To do this press 'i' and type in the mail folder filename. All the mail commands are available, for example, 'd' for delete. Type 'q' to quit reading the mail folder.

### 7.14.5 Summary of Mail Commands

```
Reading Mail (Press C-x C-r while in Emacs)
         n        Display next message.
         p        Display previous message.
         h        List of header lines of messages.
         j        Jump to first message.
 <number>j        Jump to message numbered <number>.
         d        Delete message.
         u        Undelete a message.
         r        Reply to message.
         o        To append message to mail folder file.
       C-o        To append message to UNIX file.
         i        To read a mail folder file. Supply file name.
         f        Forward the message to another person.
         g        Get newly arrived mail.
         q        To quit reading mail.

Sending Mail (Press C-x m while in Emacs)
    C-c C-c       To send the message and quit.
```

### *7.15 Summary of Some Emacs Commands*

On the following page(s) is a summary of all the **Emacs** commands (not mail) mentioned in the previous sections.

**C-f** means hold **Control** key down and press **f**.

**M-a** means press **Esc** key then press **a**.

**Cursor movement:**

| | |
|---|---|
| `C-f` | Forward one space. |
| `C-b` | Back one space. |
| `C-n` | Next line. |
| `C-p` | Previous line. |
| `C-a` | Beginning of line. |
| `C-e` | End of line. |
| `M-f` | Forward one word. |
| `M-b` | Back one word. |
| `M-<` | Beginning of file. |
| `M->` | End of file. |

**Screen Motion:**

| | |
|---|---|
| `C-v` | Scroll forward a page. |
| `M-v` | Scroll back a page. |

**Error recovery :**

| | |
|---|---|
| `C-g` | Abort partially typed in command. |
| `C-xu` | Undo an unwanted change. |

**Killing and deleting:**

| | |
|---|---|
| `DEL` | Delete character to left. |
| `M-DEL` | Delete word to left. |
| `C-k` | Kill from cursor to end of line. |
| `C-SPACE` | Mark start of region. |
| `C-w` | Cut region (Kill region). |
| `M-w` | Copy region. |
| `C-y` | Paste region (Yank back last thing killed). |
| `M-y` | Yank back thing before last thing killed (do after a C-y). Repeat to retrieve old text killed. |

**Split Windows and Multiple Files:**

| | |
|---|---|
| `C-x 2` | Split window in 2 horizontally. |
| `C-x 5` | Split window in 2 vertically. |

| | |
|---|---|
| `C-x 0` | Delete this window. |
| `C-x 1` | Delete all other windows. |
| `C-x o` | Switch cursor to other window |

**General commands:**

| | |
|---|---|
| `C-x C-c` | To quit Emacs. |
| `C-h` | For help. |
| `C-x C-f` | To find or read a file (used to create new ones too). |
| `C-x C-s` | To save a file. |
| `C-x i` | To insert contents of file. |
| `C-x C-b` | List buffers. |
| `C-s` | Incremental search for a string. |
| | C-s for next occurrence. ESC to stop search. |
| `M-x repl s` | To replace a string with another. |
| `C-x C-g` | To go to a line number. |
| `or` | |
| `(M-x goto-line)` | |

# 8. Useful Tools in UNIX

## 8.1 Compressing Files

It is possible you may run out of disk space (see Section 4.7.2). Rather than delete important files, they can be compressed to save space. To **compress** a file, you type:

```
host-name # % compress filename
```

The compress utility places the compressed form in a new file with **.Z** appended to the same name and then deletes the original file. A compressed file is typically half the size. Type **ls -l** to check the size.

To uncompress a compressed file, type the following:

```
host-name # % uncompress filename.Z
```

Now the original file is back with its original name and the .Z file was deleted. **Warning:** *never* try to edit or print a compressed file.

## 8.2 Tar or untar Files

The tar utility is used to archive multiple files into a single file, as used in tape archives. In this way, the multiple files are transferred across the network as a single file. This process eliminates the time required to initialize each file transfer across the network or the Internet. To create a tar file, type:

```
host-name # % tar c ~/examples
```

After completing the command, a new file with **.tar** will be appended to the given filename.

In reverse, to extract or "untar" the multiple files in the **.tar** file, type:

```
host-name # % tar x examples.tar
```

For other extensive options, consult the man page by typing **man tar**.

## 8.3 Backing up your files by using Snapshots

Our Network File System (NFS) file server, *hydra*, provides file system backup called *snapshots*. A snapshot is an on-line, read-only copy of the entire file system. Snapshots can be accessed by users as read-only files to recover previous versions of files (for example, files that have been accidentally changed or deleted). This feature allows users to restore their own files without the system administrator. To ensure system security, files within a snapshot carry the same permissions as the original files.

There is a "*magic*" directory named *.snapshot* which does not normally show up in a directory listing under each user's home directory. There are also few sub-directories under **.snapshot** based on the snapshot schedule. The command to view the snapshots with access times is **ls -lu** (Note: **ls -al** will not show the correct date information).

```
charcoal{41}% ls .snapshot
hourly.0/   hourly.2/   nightly.0/  nightly.2/  nightly.4/  weekly.0/
hourly.1/   hourly.3/   nightly.1/  nightly.3/  nightly.5/
```

or

```
charcoal{41}% cd .snapshot
charcoal{42}% ls -lu
total 88
drwxr-xr-x  24 ecst staff       4096 Mar  5 08:01 hourly.0/
drwxr-xr-x  24 ecst staff       4096 Mar  4 20:01 hourly.1/
```

```
drwxr-xr-x  24 ecst staff        4096 Mar  4 16:01 hourly.2/
drwxr-xr-x  24 ecst staff        4096 Mar  4 12:02 hourly.3/
drwxr-xr-x  24 ecst staff        4096 Mar  5 00:01 nightly.0/
drwxr-xr-x  24 ecst staff        4096 Mar  4 00:02 nightly.1/
drwxr-xr-x  24 ecst staff        4096 Mar  2 00:00 nightly.2/
drwxr-xr-x  24 ecst staff        4096 Mar  1 00:01 nightly.3/
drwxr-xr-x  24 ecst staff        4096 Feb 28 00:00 nightly.4/
drwxr-xr-x  24 ecst staff        4096 Feb 27 00:01 nightly.5/
drwxr-xr-x  24 ecst staff        4096 Mar  3 00:00 weekly.0/
```

When the filer creates a **Snapshot**, it doesn't actually copy disk blocks;  instead, it identifies all blocks in the file system as belonging to the snapshot as well as to the active file system.  The technique that **Snapshot** uses is by duplicating disk blocks as they are modified.  This is called *copy-on-write*.

### 8.3.1 Snapshot schedule

The current snapshot schedule is:

- one weekly (midnight 7 days ago)
- six nightly (midnight the current day and midnight the past 5 days ago)
- four hourly (8am, 12 noon, 4pm and 8pm)


### 8.3.2 How to restore files from *snapshots*

Files in the *.snapshot* directory are **read-only**, hence they may only be copied (through **cp**). Also due to sharing of disk space, it is wise to rename the file name to avoid overwriting the same disk space.  The following is the procedure to restore a file named *software.info* in Files directory:

```
charcoal{73}% pwd
/home/pleiades/staff/ecst/Files
charcoal{74}% mv software.info soft
charcoal{75}% home
charcoal{76}% cd .snapshot
charcoal{77}% ls -lu
total 88
drwxr-xr-x  24 ecst staff        4096 Mar  5 08:01 hourly.0/
drwxr-xr-x  24 ecst staff        4096 Mar  4 20:01 hourly.1/
```

```
drwxr-xr-x  24 ecst staff       4096 Mar  4 16:01 hourly.2/
drwxr-xr-x  24 ecst staff       4096 Mar  4 12:02 hourly.3/
drwxr-xr-x  24 ecst staff       4096 Mar  5 00:01 nightly.0/
drwxr-xr-x  24 ecst staff       4096 Mar  4 00:02 nightly.1/
drwxr-xr-x  24 ecst staff       4096 Mar  2 00:00 nightly.2/
drwxr-xr-x  24 ecst staff       4096 Mar  1 00:01 nightly.3/
drwxr-xr-x  24 ecst staff       4096 Feb 28 00:00 nightly.4/
drwxr-xr-x  24 ecst staff       4096 Feb 27 00:01 nightly.5/
drwxr-xr-x  24 ecst staff       4096 Mar  3 00:00 weekly.0/
charcoal{78}% cd hourly.0
charcoal{79}% cd Files
charcoal{80}% pwd
/home/pleiades/staff/ecst/.snapshot/hourly.0/Files
charcoal{81}% cp software.info ~/Files
charcoal{82}% home
charcoal{83}% cd Files
charcoal{84}% ls -al so*
-rw-------   1 ecst staff    2412 Jan 29 11:20 soft
-rw-------   1 ecst staff    2412 Jan 29 16:19 software.info
```

## 8.4 The Source Code Manager - RCS

Keeping track of many revisions of a source file, e.g., a C/C++ source file, can be a big pain.
**RCS** removes much of this pain.  When  you have a new revision, you need only check it in (**ci**)
where you type in a message to describe it.  **RCS** automatically saves the user, time and date of
the check in.  To use the latest revision, you just check it  out (**co**).  Any one of the revisions can
be checked out and the differences between any two revisions can be displayed.  RCS saves only
the differences between files and, therefore, uses a lot less disk space then saving multiple copies
of a file.  It is recommended you check in (**ci**) a file often when developing a program.  For
example, check in the file at the end of each development session.  It is all too easy, especially
late at night, to accidentally delete something in your program but not know what!  In order to
recovery from this minor disaster, you would need only check out (**co**) the latest revision and
rebuild from there.

This section only discusses use of **RCS** for a single user.  **RCS** has many powerful features to manage a file which is being changed by several programmers.  Consult the appropriate *UNIX manual* for these features.

### 8.4.1 How to Setup RCS

Create a directory called **RCS** (all caps) in the directory you are working.   **RCS** will automatically place all its work there.  You need never bother with what is in this subdirectory. Every time you want to use **RCS** in a new working directory do this step.

### 8.4.2 Checking In a File and Checking Out

Below is a simple file of text called **resistor** which will be used to demonstrate **RCS**.

```
host-name # % more resistor
Resistor, transistor, condensers in pairs,
Battery, platter, record me some airs;
Squeaker and squawker and woofer times pi,
And Baby shall have his own private Hi-Fi.
```

I check in the file using **ci** and write a description of the file.  The description can be many lines with the last line being a period in column one.

```
host-name # % ci resistor
resistor,v  <-  resistor
initial revision: 1.1
enter description, terminated with ^D or '.':
NOTE: This is NOT the log message!
>> Program to demo RCS source code manager
>> .
done
```

I check out the file using **co** so I can use it.

```
host-name # % co resistor
resistor,v  ->  resistor
revision 1.1
done
host-name # %
```

77

I edit the file and check it in again.

```
host-name # % ci resistor

resistor,v  <-  resistor

new revision: 1.2; previous revision: 1.1

enter log message:

(terminate with ^D or single '.')

>> after one editing session

>> .

done

host-name # %
```

### 8.4.3 Seeing What Revisions of a File You Have

The RCS command **rlog** displays information for each of the revisions saved.  Note that the difference between revision 1.2 and  revision 1.1 is one line deleted and one line added.  Also, one can see that there are many features to RCS which are not discussed here.  Do a **man rcs** and read the manual page if you want to read about the advanced features.

```
host-name # % rlog resistor

RCS file:         resistor,v;   Working file:    resistor

head:          1.2

locks:

access list:

symbolic names:

comment leader:  "# "

total revisions: 2;    selected revisions: 2

description:

Program to demo RCS source code manager

--------------

revision 1.2

date: 88/05/13 11:12:41;  author: hyde;  state: Exp;  lines added/del:

1/1

after one editing session

--------------

revision 1.1

date: 88/05/13 11:02:56;  author: hyde;  state: Exp;
```

```
Initial revision
============================================================
host-name # %
```

### 8.4.4 Displaying the Differences Between two Revisions

The **RCS** command **rcsdiff** displays the lines of text that are different in two revisions.

```
host-name # % rcsdiff -r1.1 -r1.2 resistor
RCS file: resistor,v
retrieving revision 1.1
retrieving revision 1.2
diff  -r1.1 -r1.2
4c4
< And Baby shall have his own private Hi-Fi.
--
> And Baby shall have her own private Hi-Fi.
```
You can see I changed one word in line 4 (4c4) when I edited the file.

### 8.4.5 Checking Out an Earlier Revision

You can check out an earlier revision by explicitly stating the revision number as shown.  In this case the file **resistor** existed and we overwrote the file.  Therefore, it is always best to check in a file if it exist before checking it out.  That way you save the current value of the file as latest revision.

```
host-name # % co -r1.1 resistor
resistor,v  ->  resistor
revision 1.1
writable resistor exists; overwrite? [ny](n): y
done
host-name # %
```

# 9. Compiling and Running Other Programming Languages

## 9.1 Running FORTRAN Programs

Create a file with **.f** as suffix, e.g.,  **first.f** and place in it the following FORTRAN program.

```
C comment lines in FORTRAN must start in column one
```

79

```
      C
      C statements must begin in column 7 or beyond
            I = 8
            I = I +  1
            PRINT *, 'This is a FORTRAN program. ' , I
            STOP
            END
```

To compile and link, type:

```
      host-name # % f77 first.f -o first
```

To run:

```
      host-name # % first
```

## 9.2 Running C Programs

Create a file with **.c** as suffix, e.g., **mine.c** and place in it the following C program.

```
      /* this is a comment */
      #include <stdio.h>    /* bring in I/O library */
      main ( )
        {
          int i;
          i = 8;
          i = i + 1;
          printf("This is a C program. %d\n", i);
        }
```

There are two C compilers available.  To compile and link using GNU's C compiler, type:

```
      host-name # % gcc mine.c -o mine
```

To compile and link using SPARCWorks C compiler, type:

```
      host-name # % cc mine.c -o mine
```

To run:

```
      host-name # % mine
```

## 9.3 Running C++ Programs

Create a file with **.cc** as suffix, e.g., **mine.cc** and place in it the following **C++** program.

```
// this is a comment

#include <stream.h>    // bring in I/O library

main ( )
   {
     int i;
     i = 8;
     i = i + 1;
     cout <<  "This is a C++ program. " << i << "\n";
   }
```
There are two C++ compilers available.  To compile and link using GNU's C++ compiler, type:

```
host-name # % g++ mine.cc -o mine
```

To compile and link using SPARCWorks C++ compiler, type:

```
host-name # % CC mine.cc -o mine
```
To run:
```
host-name # % mine
```