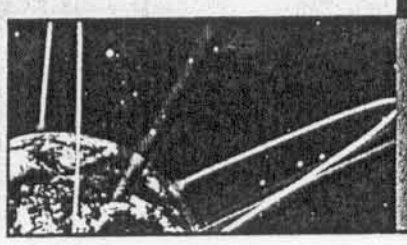
UNIT 6



Operating Systems

STARTER **1** Study this screen display and answer these questions.

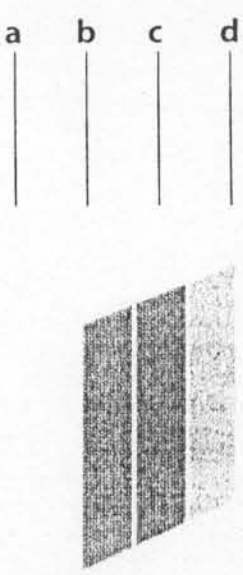
1 How do you enter Unix commands?
2 Which Unix commands does it show?
3 What is the output of each command?
4 What will happen when the last command is entered?
5 Which other Unix commands do you know?

```
$ date
Mon Sep 24 12:45:38 BST 2001
$ passwd
passwd: Changing password for dsea03
Enter login password:
New password:
$ ls
home   local   mnt   packages   scratch
$ logout >
```

Fig 1
Unix screen display

READING **2** Match the labels to the four layers of this diagram with the help of the diagram caption.

b 1 applications programs
a 2 user
c 3 hardware
d 4 operating system



Closest to the user are applications programs – software that helps a user compute a payroll or play a game or calculate the trajectory of a rocket.

The operating system is the set of programs between the applications programs and the hardware.

Fig 2
Conceptual diagram of an operating system

3 Study this text title. What do you think it means?

Operating Systems: Hidden Software

Now read this text to check your answer and to find the answers to these questions:

1 What difference is there between applications software and operating systems?
2 Why is the supervisor program the most important operating system program?
3 What is the difference between resident and non-resident programs?
4 What are the main functions of an operating system?

When a brand new computer comes off the factory assembly line, it can do nothing. The hardware needs software to make it work. Are we talking about applications software such as wordprocessing or spreadsheet software? Partly. But an applications software package does not communicate directly with the hardware. Between the applications software and the hardware is a software interface – an operating system. An operating system is a set of programs that lies between applications software and the computer hardware.

The most important program in the operating system, the program that manages the operating system, is the supervisor program, most of which remains in memory and is thus referred to as resident. The supervisor controls the entire operating system and loads into memory other operating system programs (called nonresident) from disk storage only as needed.

An operating system has three main functions: (1) manage the computer's resources, such as the central processing unit, memory, disk drives, and printers, (2) establish a user interface, and (3) execute and provide services for applications software. Keep in mind, however, that much of the work of an operating system is hidden from the user. In particular, the first listed function, managing the computer's resources, is taken care of without the user being aware of the details. Furthermore, all input and output operations, although invoked by an applications program, are actually carried out by the operating system.

4 Complete the gaps in this summary of the text on operating systems using these linking words and phrases:

- *although*
- *because*
- *but*
- *in addition*
- *such as*
- *therefore*

The user is aware of the effects of different applications programs ...but... operating systems are invisible to most users. They lie between applications programs, ...such as... wordprocessing, and the hardware. The supervisor program is the most important. It remains in memory, ...because... it is referred to as resident. Others are called non-resident ...because... they are loaded into memory only when needed. Operating systems manage the computer's resources, ...such as... the central processing unit. ...although..., they establish a user interface, and execute and provide services for applications software. ...therefore... input and output operations are invoked by applications programs, they are carried out by the operating system.

LANGUAGE WORK *-ing* form (1) as a noun; after prepositions

We can use the *-ing* form of the verb as a noun. It can be the subject, object, or complement of a sentence. For example:

1 *Managing* the computer's resources is an important function of the operating system.
2 The operating system starts *running* the user interface as soon as the PC is switched on.
3 Another function of the operating system is *executing* and *providing* services for applications software.

The *-ing* form is also used after prepositions. This includes *to* when it is a preposition and not part of the infinitive. For example:

4 *Without* the user *being* aware of the details, the operating system manages the computer's resources.
5 We begin *by focusing* on the interaction between a user and a PC operating system.
6 We look forward *to having* cheaper and faster computers.

5 Rewrite each of these sentences like this:

An important function of the operating system is to manage the computer's resources.
Managing the computer's resources is an important function of the operating system.

1 One task of the supervisor program is to load into memory non-resident programs as required.
2 The role of the operating system is to communicate directly with the hardware.
3 One of the key functions of the operating system is to establish a user interface.
4 An additional role is to provide services for applications software.
5 Part of the work of mainframe operating systems is to support multiple programs and users.
6 The task in most cases is to facilitate interaction between a single user and a PC.
7 One of the most important functions of a computer is to process large amounts of data quickly.
8 The main reason for installing more memory is to allow the computer to process data faster.

6 Complete these sentences with the correct form of the verb: infinitive or *-ing* form.

1 Don't switch off without (close down) your PC.
2 I want to (upgrade) my computer.
3 He can't get used to (log on) with a password.
4 You can find information on the Internet by (use) a search engine.
5 He objected to (pay) expensive telephone calls for Internet access.
6 He tried to (hack into) the system without (know) the password.
7 You needn't learn how to (program) in HTML before (design) webpages.
8 I look forward to (input) data by voice instead of (use) a keyboard.

PROBLEM-SOLVING 7 Try to find the commands from the lists below which will have these actions.

VMS	Unix
help	write
directory	cp
search	lpr
copy	ls
rename	mkdir
print	date
show users	rm
show time	man
create/directory	grep
phone	rwho
delete	mv

Action	VMS command	Unix command
List all the files in a directory	directory	ls
Delete a file	delete	rm
Rename a file	rename	mv
Copy a file	copy	cp
Send a file to a printer	print	lpr
Obtain help	help	man
Create a directory	create	mkdir
Show date and time	show time	date
Show users on system	show user	rwho
Talk to other users on system	phone	write
Search for a string in a file	search	grep

SPEAKING 8 Work in pairs, A and B. Each of you has information about some popular operating systems. Find out from the information you have and by asking each other, the answers to these questions:

Student A Your information is on page 184.
Student B Your information is on page 190.

1 Which operating system is used on Apple Macintosh microcomputers?
2 What is Penpoint designed for?

3 Name one system used on IBM mainframes.
4 Which operating system is Linux related to?
5 Name an IBM operating system similar to MS-DOS.
6 Which operating system replaced MS-DOS?
7 Which systems are in fact graphically orientated shells for MS-DOS?
8 How many versions of Windows 9X were developed?
9 Which operating systems are designed for networks?
10 Which operating system is used by DEC VAX minicomputers?

WRITING 9 This description of the Mac OS X is drawn from the table below. Write a similar description of Linux.

> Mac OS X is a Unix-based operating system designed for use on Apple Mac computers. It includes memory-protection, pre-emptive multitasking and symmetric multiprocessing support. Graphics are provided by a graphics engine known as Quartz. It has advanced-PDF standards support, OpenGL and Quicktime integrated into the OS. The operating system features are accessed through a graphical user interface called Aqua.

	Mac OS X	Linux
type	Unix-based	Unix-based
computer	Apple Mac	wide variety
features	memory-protection, pre-emptive multi-tasking, symmetric multiprocessing support	variety of distribution kits available
graphics engine	Quartz	XFree86
standard support	advanced-PDF, OpenGL, Quicktime	
user interface type	GUI	command line, GUI
user interface	Aqua	KDE, Gnome
source code availability	not available	freely available

SPECIALIST READING

A **Find the answers to these questions in the following text.**

1 What did Linus Torvalds use to write the Linux kernel?
2 How was the Linux kernel first made available to the general public?
3 What is a programmer likely to do with source code?
4 Why will most software companies not sell you their source code?
5 What type of utilities and applications are provided in a Linux distribution?
6 What is X ?
7 What graphical user interfaces are mentioned in the text?

LINUX

Linux has its roots in a student project. In 1992, an undergraduate called Linus Torvalds was studying computer science in Helsinki, Finland. Like most computer science courses, a big component of it was taught on (and about) Unix. Unix was the wonder operating system of the 1970s and 1980s: both a textbook example of the principles of operating system design, and sufficiently robust to be the standard OS in engineering and scientific computing. But Unix was a commercial product (licensed by AT&T to a number of resellers), and cost more than a student could pay.

Annoyed by the shortcomings of Minix (a compact Unix clone written as a teaching aid by Professor Andy Tannenbaum) Linus set out to write his own 'kernel' – the core of an operating system that handles memory allocation, talks to hardware devices, and makes sure everything keeps running. He used the GNU programming tools developed by Richard Stallman's Free Software Foundation, an organisation of volunteers dedicated to fulfilling Stallman's ideal of making good software that anyone could use without paying. When he'd written a basic kernel, he released the source code to the Linux kernel on the Internet.

Source code is important. It's the original from which compiled programs are generated. If you don't have the source code to a program, you can't modify it to fix bugs or add new features. Most software companies won't sell you their source code, or will only do so for an eye-watering price, because they believe that if they

make it available it will destroy their revenue stream.

What happened next was astounding, from the conventional, commercial software industry point of view – and utterly predictable to anyone who knew about the Free Software Foundation. Programmers (mostly academics and students) began using Linux. They found that it didn't do things they wanted it to do – so they fixed it. And where they improved it, they sent the improvements to Linus, who rolled them into the kernel. And Linux began to grow.

There's a term for this model of software development; it's called Open Source (see www.opensource.org/ for more information). Anyone can have the source code – it's free (in the sense of free speech, not free beer). Anyone can contribute to it. If you use it heavily you may want to extend or develop or fix bugs in it – and it is so easy to give your fixes back to the community that most people do so.

An operating system kernel on its own isn't a lot of use; but Linux was purposefully designed as a near-clone of Unix, and there is a lot of software out there that is free and was designed to compile on Linux. By about 1992, the first 'distributions' appeared.

A distribution is the Linux-user term for a complete operating system kit, complete with the utilities and applications you need to make it do useful things – command interpreters, programming tools, text editors, typesetting tools, and graphical user interfaces based on the X windowing system. X is a standard in academic and scientific computing, but not hitherto common on PCs; it's a complex distributed windowing system on which people implement graphical interfaces like KDE and Gnome.

As more and more people got to know about Linux, some of them began to port the Linux kernel to run on non-standard computers. Because it's free, Linux is now the most widely-ported operating system there is.

[Adapted from 'Smooth Operator' by Charles Stross, Computer Shopper magazine, November 1998]

B Re-read the text to find the answers to these questions.

1 Match the terms in Table A with the statements in Table B.

Table A

a Kernel
b Free Software Foundation
c Source code
d Open Source
e A distribution
f X

Table B

i A type of software development where any programmer can develop or fix bugs in the software
ii The original systems program from which compiled programs are generated
iii A complete operating system kit with the utilities and applications you need to make it do useful things
iv A standard distributed windowing system on which people implement graphical interfaces
v An organisation of volunteers dedicated to making good software that anyone could use without paying
vi The core of an operating system that handles memory allocation, talks to hardware devices, and makes sure everything keeps running

2 Mark the following statements as True or False:

a Linux was created in the 1980s.
b Minix was created by a university student.
c Linux is based on Unix.
d Minix is based on Unix.
e Linux runs on more types of computer than any other operating system.