

Chapter 4

Overview

This module will discuss the basics of the operating system. The operating system is the program that manages computer operations. This module describes the components, functions, and important terminology related to an operating system. The module focuses on the Disk Operating System (DOS). Students will learn the basics of DOS, the commands used, and the file structure. Students will also learn about memory management and the tools used to adjust and optimize memory.

The Operating System

An operating system is a software program that controls thousands of operations, provides an interface between the user and computer, and runs applications. Basically, the operating system is in charge of running the computer. Today, most computer systems are sold with an operating system already installed. Computers that are designed for individual users (called Personal Computers or PCs) have operating systems that are designed for individuals running small jobs.

Components of an operating system

User Interface – A user interacts with the operating system through the user interface. Simple put, the user interface is part of the operating system that can be used to issue commands by either typing them at a command prompt or pointing and clicking the mouse at the screen of a graphical user interface (GUI).

Kernel – This is the core of the operating system. The kernel is responsible for loading and running programs or processes and managing input and output.

File management system – The file management system is what the operating system uses to organise and manage files. A file is a collection of data given a single logical name called a “filename”. Virtually all of the information that a computer stores is in the form of a file. There are many types of files, including program files, data files, text files, and so on. The way an operating system organises information into files is called the file system. Most operating systems use a hierarchical file system in which files are organised into directories under a tree structure. The beginning of the directory system is referred to as the root directory.

Operating System Types

To understand what an operating system is capable of, it is important to understand some basic terms. The following terms are often used when comparing operating systems:

Multi-user – Two or more users running programs and sharing peripheral devices, such as a printer, at the same time.

Multitasking – A capability of a computer to run multiple applications at the same time.

Multiprocessing – Allows a computer to have two or more central processing units (CPUs) that programs share.

Multithreading – The capability of a program to be broken down into smaller parts that can be loaded as needed by the operating system. Multithreading allows individual programs to be multitasked.

Today, almost all operating systems are multi-user, multitasking and support multithreading.

Popular Operating Systems

Microsoft Windows 95, 98, ME – Windows is one of the most popular operating systems today. Windows is designed to run on PCs and use an Intel Compatible CPU. Windows-based PCs use a GUI as the interface between the computer and the user.

Microsoft Windows NT/2000/XP – Also from Microsoft, Windows NT, 2000, and XP are operating systems that were designed to support multiple (concurrent) users and to run applications simultaneously. Both Windows NT and Windows 2000/XP have incorporated many networking features.

The Macintosh Operating System – The first Macintosh computers became available in January of 1984 and were designed to be very user-friendly compared to the existing DOS computers. The latest release of the Macintosh operating system, System X, is highly functional and is based on UNIX as its core technology.

UNIX – This operating system has been around since the late 1960s, is one of the oldest operating systems, and has always been popular with computer professionals who's responsibility it is to run and maintain computer networks. UNIX based computers from IBX, Hewlett Packard, and SUN Microsystems have helped run the Internet from its birth. There are many different versions of UNIX available today. One of the most recent is the extremely popular Linux. Learning in depth about the Linux operating system is not in the scope of this course.

DOS (Disk Operating System)

Microsoft developed the Disk Operating System (DOS), also called MS-DOS, in 1981. DOS was designed for the IBM personal computer. Windows 98 and Windows 2000 both support DOS commands in order to address compatibility issues related with older applications. Simply put, DOS is a collection of programs and commands used to control the overall computer operation in a disk based system.

Boot files – Are used during the boot process (i.e. starting the computer up).

File management files – Enables the system to manage the data that it holds in a system of files and folders.

Utility files – Enables the user to manage system resources, troubleshoot the system, and configure the system settings.

format	format a: /s is responsible for copying system files after formatting the disk format /q – does not clear the FAT, making file recovery possible
deltree	This command erases a directory including all files and subdirectories that are in it.
copy	copy /v - verifies the copy has been successful copy C:\test.txt A: - copies a file from hard drive to floppy drive
chkdsk	Displays the status of the disk.
cd	Change directory on the current drive.
md	Make directory on current drive.
type	Displays the contents of a text file
Edit	Edits a text file.

Memory Conflicts

There are several things that can cause a memory conflict. For example, two memory managers running at the same time, such as one from a third party and those supplied with MS-DOS. There are many diagnostic tools that can be used to diagnose such problems including Microsoft Diagnostics (MSD) utility. Memory conflicts can lead to a condition called General Protection Fault (GPF)

A GPF is a carryover from the 16bit Windows 3.x era, where Win16 applications are run. A GPF will typically occur when an application attempts to violate the system integrity by one of the following ways:

- Tries to use a memory address or space owned by another application.
- Tries to interact with a failing hardware driver
- Tries to have direct access to the system hardware

Memory Management

The concept of real vs protected mode memory addressing come up frequently in discussions of memory space located above conventional memory; that is, all memory above 1024KB.

Real Mode

Real-mode memory addressing means that software, such as DOS or its applications, can address only 1024KB (1MB) of RAM. In other words, real mode means that the microprocessor chip addresses the first 1024bytes of "conventional memory" by actually assigning real addresses to real locations in memory. An 80286 system running in real mode, for example, acts essentially as the 8088/86 system and can run older software with no modifications.

Protected Mode

The counterpart to real mode is protected-mode memory addressing. Unlike real mode, protected mode in theory allows one program to fail without bringing down the whole system. The theory behind protected mode is that what happens in one area of the memory has no effect on other programs. In other words, when running in protected mode, a program is limited to its own memory space allocation, but it can access memory above 1MB. Just about every operating system, other than DOS, runs in protected mode.

Directory Structures and Organisation

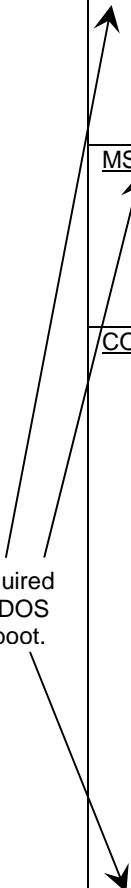
Hard drives organise the disk into directories and subdirectories. The main directory is known as the root directory. All other directories, if they exist, then radiate or branch out from the root directory, similar to the branches of a tree.

Locating any given file requires the knowledge of the drive, directory, and subdirectory in which the file is found. The first hard drive in most computer systems is labelled "C". Each hard disk in the computer can be considered a cabinet or "root". The root of the C drive is represented by "C:\". Any files or directories within the root are represented by the root, followed by the name of the file or directory, such as C:\Example. Any directory or file located within the directory is represented by that directory followed by a backslash, followed by the name of the file or subdirectory, such as C:\EXAMPLE\File.EXE. In MS-DOS, the format for specifying the path to a file is as follows.

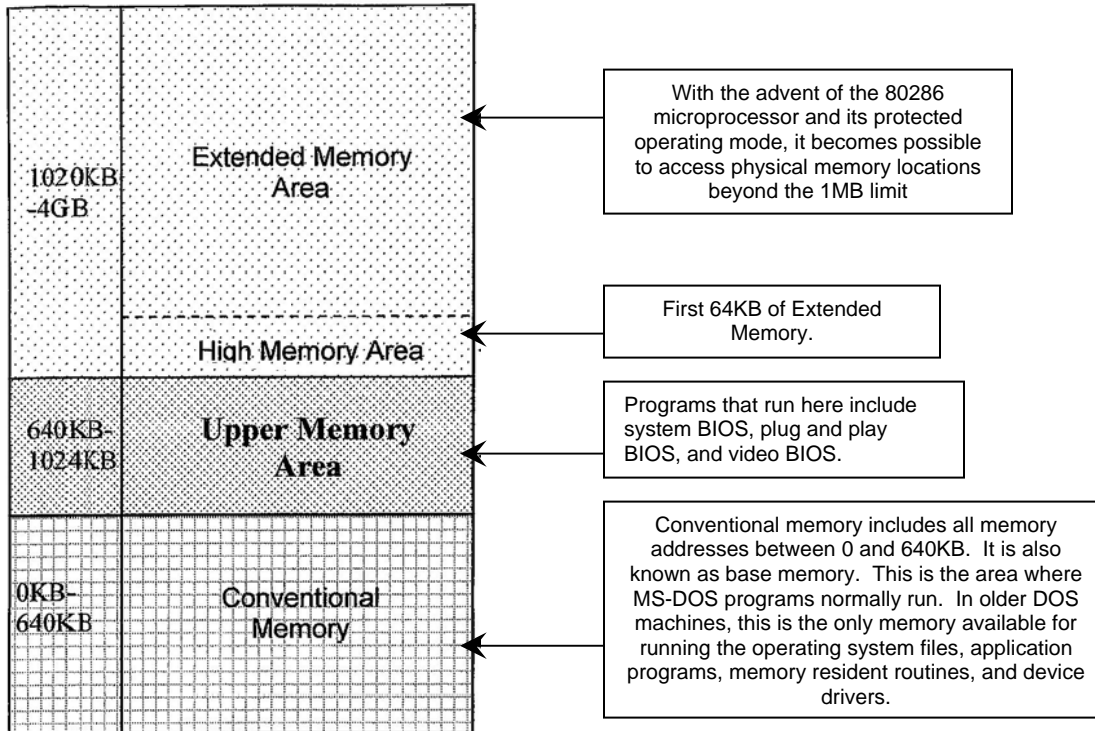
C:\directory\subdirectory\filename

<u>IO.SYS</u>	Controls any input and output.
<u>MSDOS.SYS</u>	Load file management functions.
<u>CONFIG.SYS</u>	<p>Resides in the root directory and is used to load drives and change settings at start up. Installations of programs often modify CONFIG.SYS in order to customise the computer for their own use. The CONFIG.SYS in most Windows 9x will be empty (plain text file) waiting for any changes that the user might want to add to the system. In the migration from DOS to Windows 9x, most of the values are formerly located in this file have been moved to IO.SYS. To override the values in IO.SYS, enter the appropriate statements in CONFIG.SYS including the values.</p> <p>In Windows 9x, CONFIG.SYS is mostly needed for the installation of real mode device drives for those devices that may not be supported by Windows 9x (32-bit) device drivers.</p> <p>It is also used to run memory managers. DEVICEHIGH=C:\DOS\MOUSE.SYS will load the mouse driver into upper memory blocks.</p>
<u>COMMAND.COM</u>	This file is required for DOS to boot. Command.com is responsible for executing autoexec.bat.
<u>AUTOEXEC.BAT</u>	The AUTOEXEC.BAT contains a batch of DOS commands that will automatically be carried out when DOS is loaded into the system.

Required for DOS to boot.



Memory Management



There are other memory types of interest outside the physical or system memory discussed in the preceding sections.

Virtual Memory: Swap File or Page File on Disk

The term virtual memory is used to describe memory that is not what it appears to be. Hard disk drive space is manipulated to seem like RAM. The combination of virtual memory and actual installed physical memory, gives the appearance of more memory than is actually installed on the system. Virtual memory is the basis of multitasking in Windows 9x. Without virtual memory, it would be almost impossible to run most of the software in use today.

Note: Since the hard drive is slower than normal RAM, and overall reduction in speed is encountered with virtual memory operations. In fact, virtual memory is the slowest of any memory model.

It is hard to think of any operating system since Windows 3.x (Windows 9x, Windows NT/2000/XP, UNIX or Linux) that does not use some form of virtual memory operations. On older operating systems, there was often a permanent swap file having an extension of PAR. Today, most operating systems tend to utilise temporary swap files with an SWP extension.

The Windows 95 swap file is called WIN386.SWP. It is dynamically assigned and size is variable. The Windows 2000 swap file (page file) is named PAGEFILE.SYS. This file is created when Windows 2000 is installed. Its default size is typically set at 1.5 times the amount of RAM installed in the system.

General protection fault – When one application tries to access the same memory location used by another application.