Funcionamento do Computador

Hardware e Software

- Hardware
  - Componentes físicos
    - Monitor
    - Teclado
    - Memoria
    - Hard drive
- Software
  - Conjunto de instruções com uma sequência lógica

Analogia ao condutor

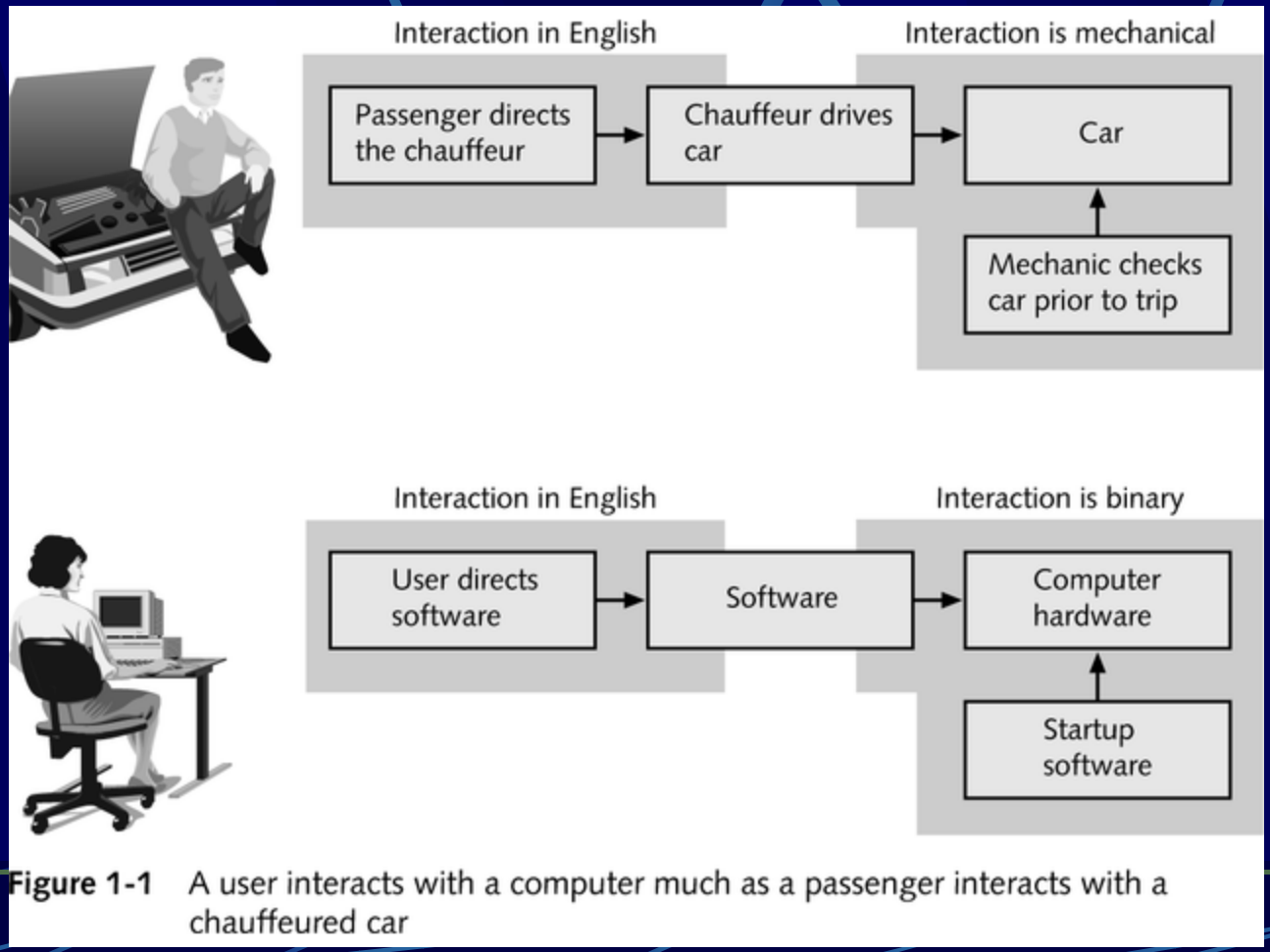

Figure 1-1 A user interacts with a computer much as a passenger interacts with a chauffeured car

Funções Hardware

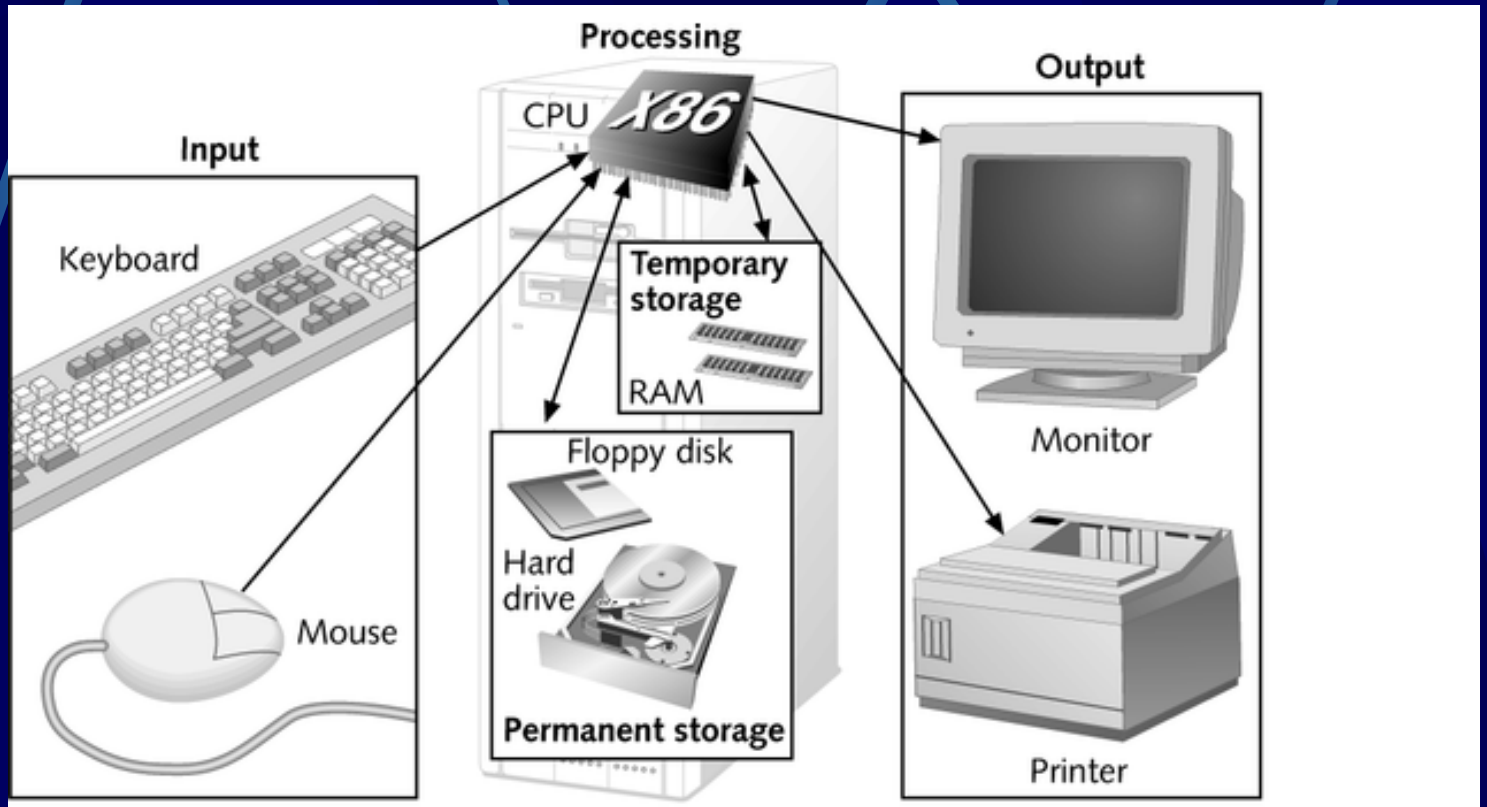

Figure 1-2 The CPU is central to all computer activity, which consists of input, processing, storage, and output

Binary Number System

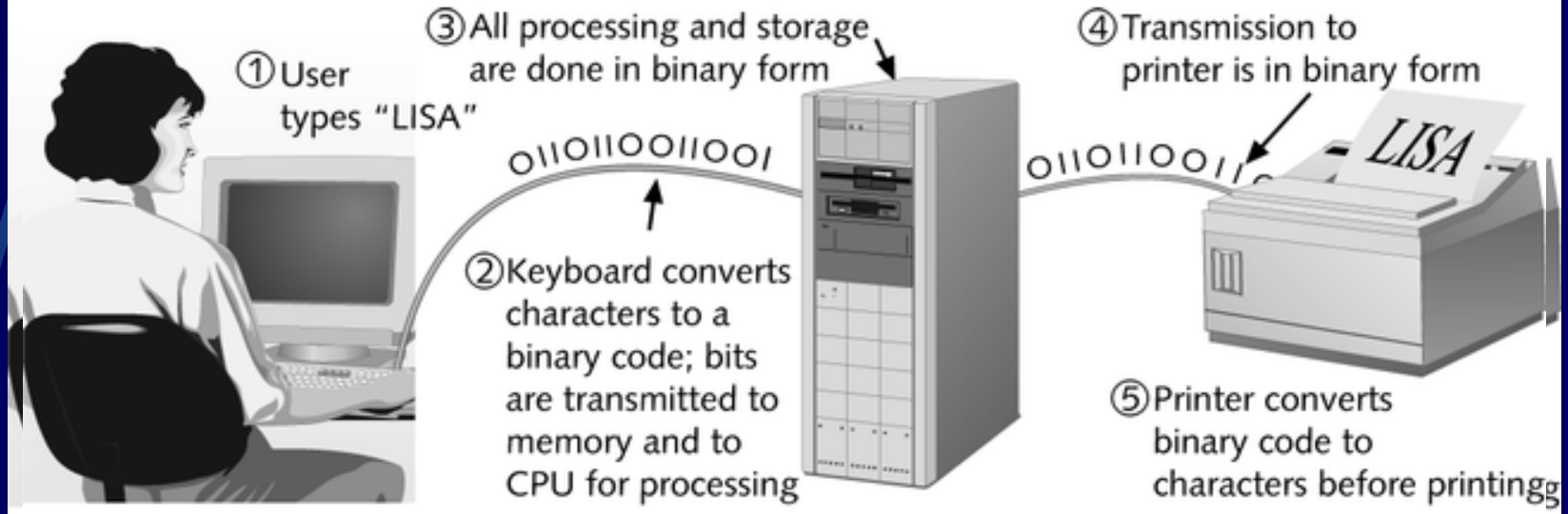

Figure 1-3 All communication, storage, and processing of data inside a computer are in binary until presented as output to the user

Hardware

- CPU
  - Dispositivo mais importante
  - Recebe Inputs e envia outputs
  - Stores data and instructions; performs calculations
- Requisitos para o hardware
  - Forma da CPU comunicar com o dispositivo
  - Software enviar instruções e controlar
  - Electricidade

Hardware para input e output

- Portas
  - Conectores físicos que permitem ligar um dispositivo
- Dispositivos de Input
  - Teclado
  - Rato
- Dispositivos de Output
  - Monitor
  - Impressora

Portas

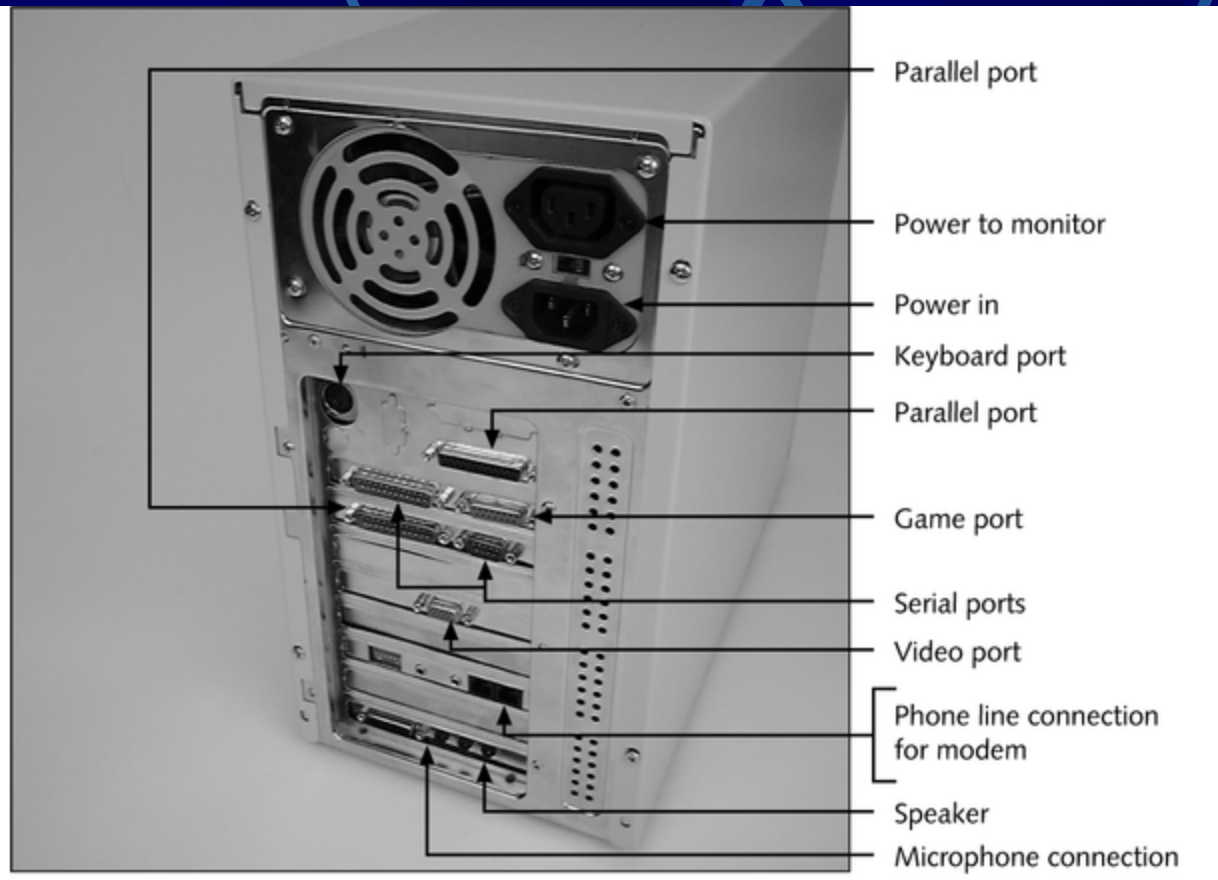

Figure 1-4 Input/output devices connect to the computer case by ports usually found on the back of the case

Dispositivos de Input

Figure 1-5 The keyboard and the mouse are the two most popular input devices

Dispositivos de Output

Figure 1-6 The two most popular output devices are the monitor and the printer

Hardware numa caixa de Computador

- Board
- Armazenamento permanente
  - Floppy drive
  - Hard drive
  - CD-ROM drive
- Fonte de alimentação
- Circuit boards
- Cabos

Hardware numa caixa de computador

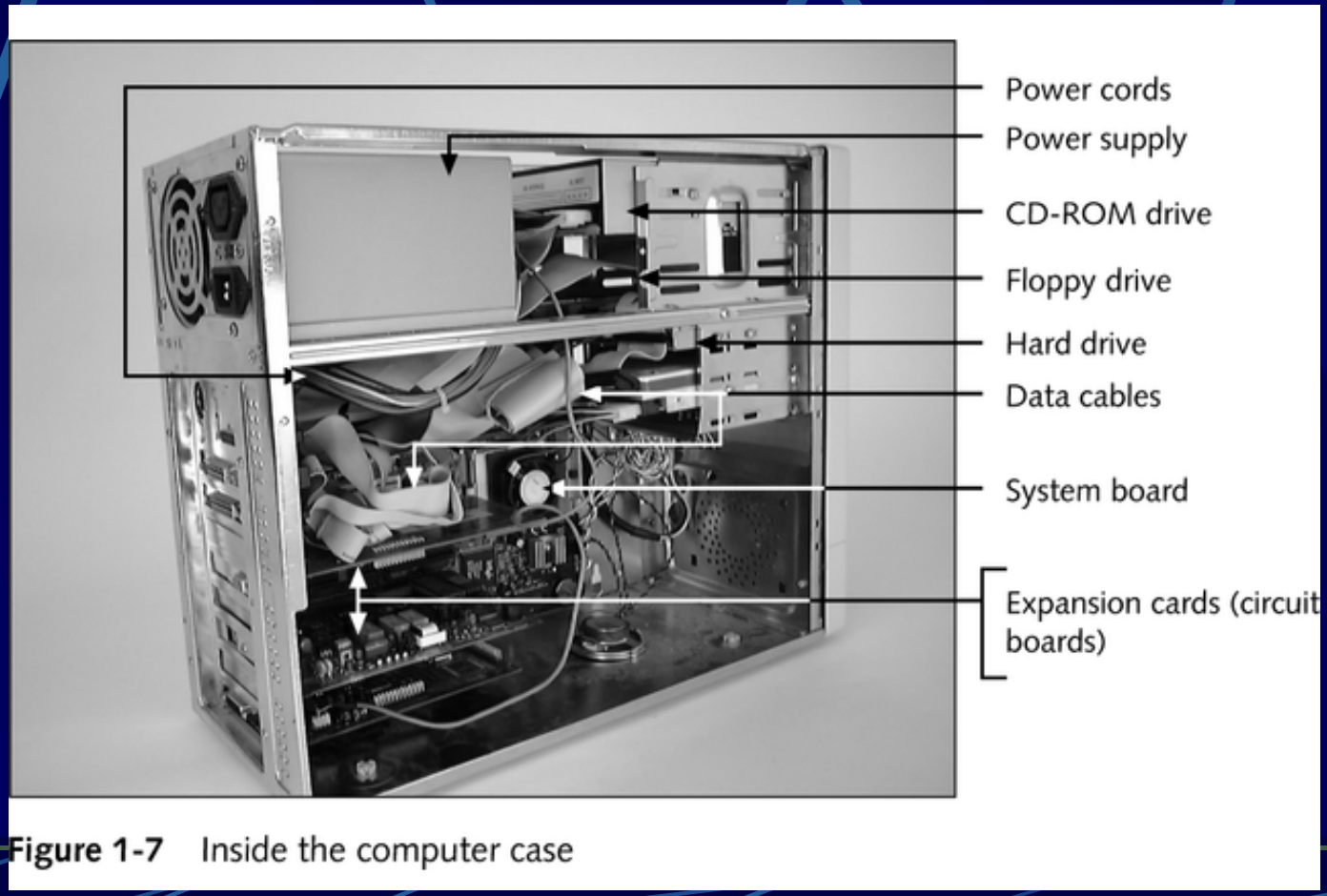

Figure 1-7 Inside the computer case

CMOS Chips

- Necessitam de menos electricidade
- Armazenam os dados depois de ser desligada a Board
- Lentos
- Produzem menos calor

Mother Board

- O maior e mais importante circuito
- Contem a CPU

Mother Board

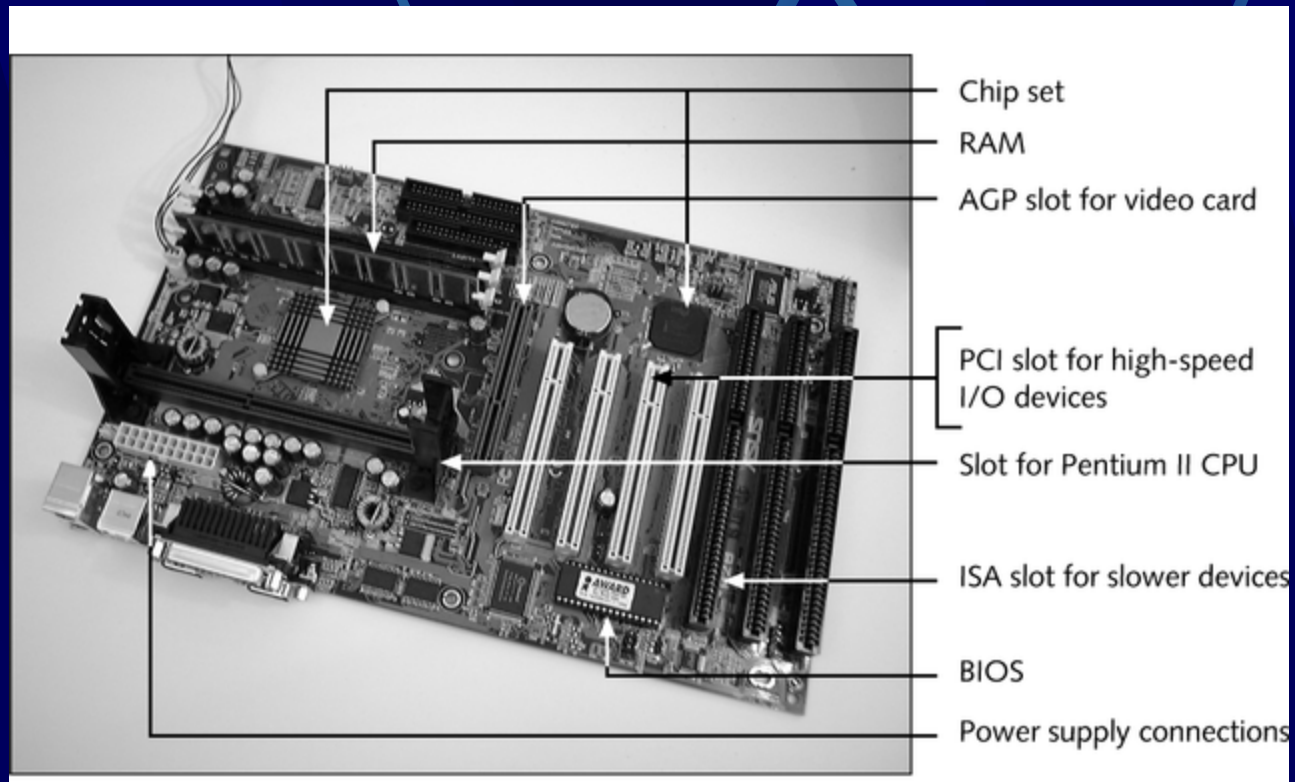

Figure 1-8 A Pentium system board. All hardware components are located either on the system board or are directly or indirectly connected to it, because they must all communicate with the CPU.

Componentes das Mother Boards

- Processamento
  - CPU
  - Chip set que suporta a CPU controlando muitas actividades da mother board
- Armazenamento temporário
  - RAM
  - Cache memory

continued

Componentes das Mother Boards

- BUS
- slots expansão
- Firmware e informação de setup
  - Flash BIOS memory chip
  - CMOS configuration chip
- Sistema electrico
  - Conexões com a fonte

Components para processamento

- CPU –executa muitos processos
- Chip set
  - Liberta a CPU de algum processamento
  - Fornece actividades de timming para aumentar velocidade global
- Coprocessor
  - Aumenta as funções de algumas CPUs mais antigas (pre-1995)

A CPU

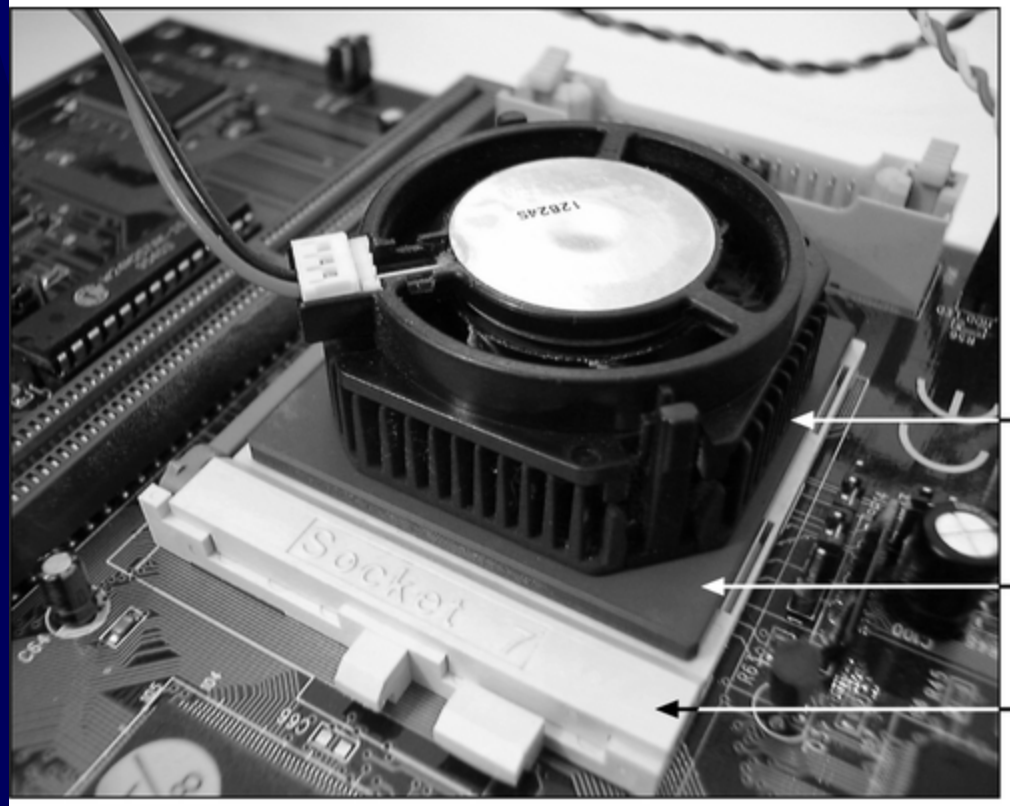

Figure 1-9 Processing of data and instructions is done by the CPU. This Pentium with fan on top is made by Intel.

Dispositivos de armazenamento temporário

- Utilizados pela CPU para processar dados e instruções
- Disponibilizados pela RAM(random access memory devices)
  - SIMMS (single inline memory modules)
  - DIMMS (dual inline memory modules)
- Memória Cache

SIMMS e DIMMS

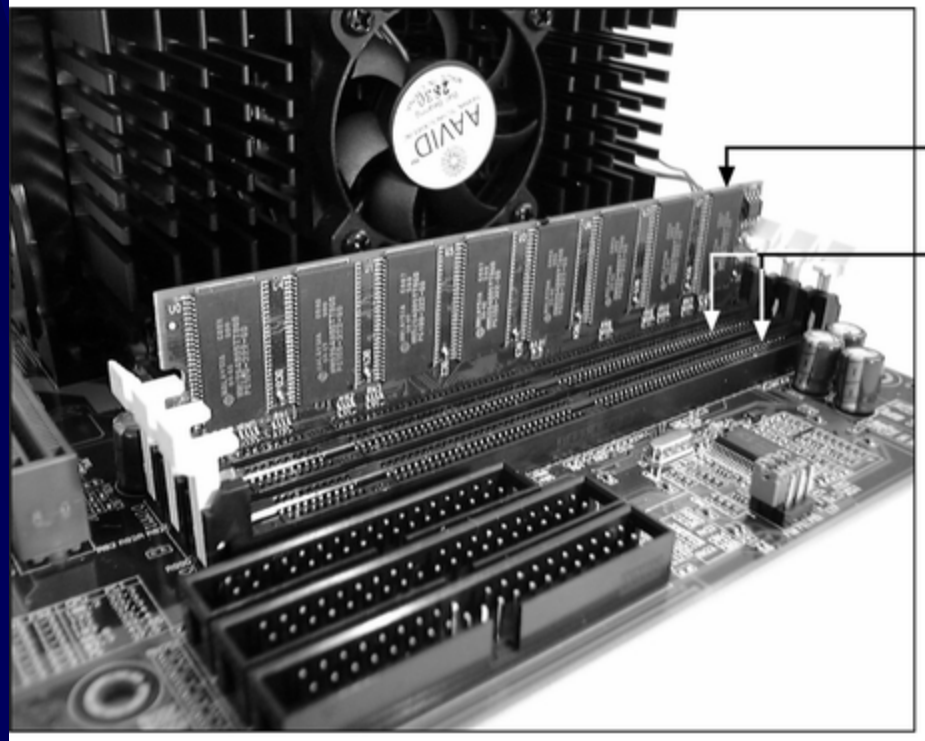

Figure 1-10 A SIMM or a DIMM holds RAM and is mounted directly on a system board

Memória Cache

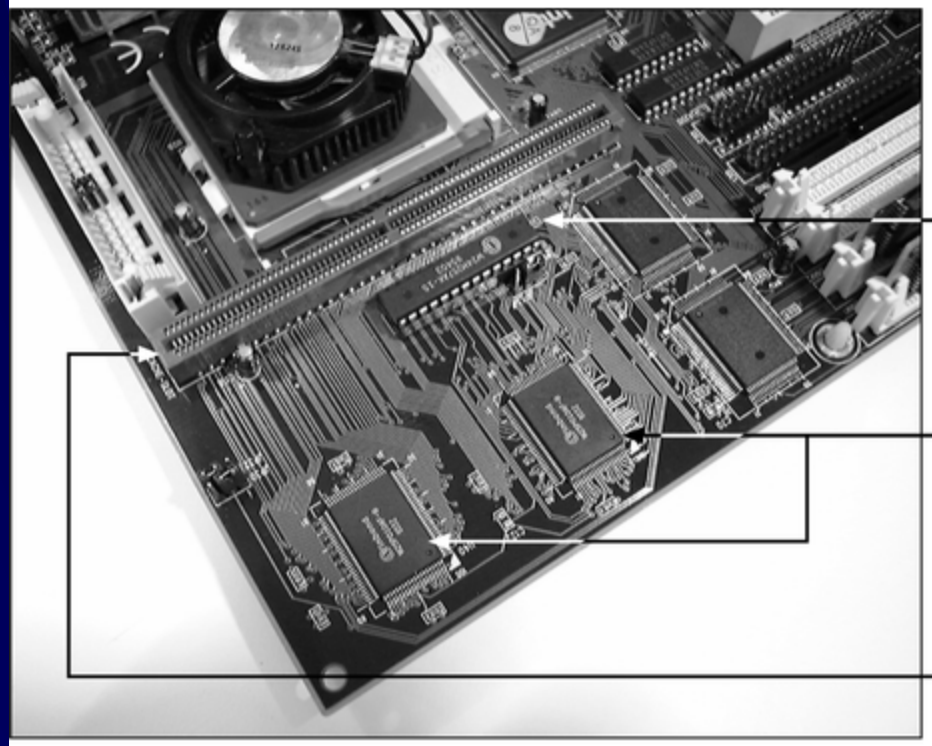

Figure 1-11 The speed of memory access is improved by using cache memory

Dispositivos de armazenamento permanente

- Afastados da CPU
- Ex.:
  - Hard disks
  - Floppy disks
  - Zip drives
  - CD-ROMs

Hard Drives

Figure 1-12 Hard drive with sealed cover removed

Hard Drives

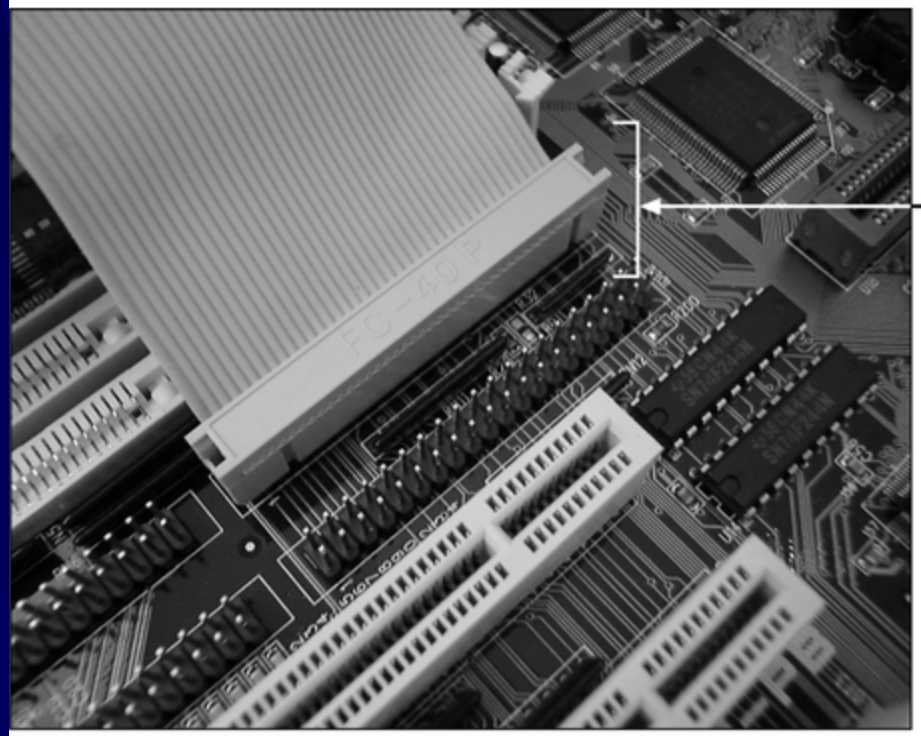

Figure 1-13 Most hard drives today connect to the system board by way of a data cable connected directly to the board

Floppy Drives

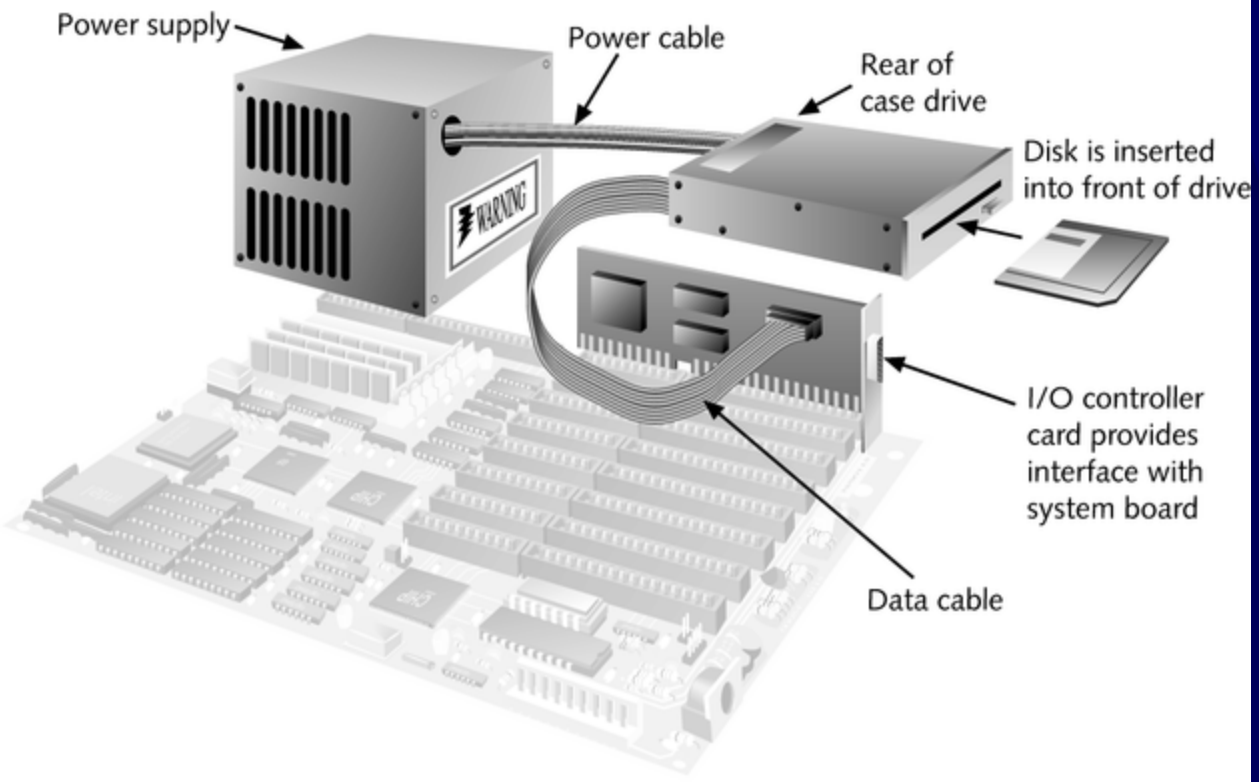

Figure 1-14 A floppy drive subsystem

Componentes usados pela Board para comunicar entre dispositivos

- Bus
- System clock
- Slots de Expansião
  - PCI: Utilizado para Dispositivos de elevada velocidade
  - AGP: Utilizado para placa de video
  - ISA: Dispositivos antigos e mais lentos

Linhas do Bus

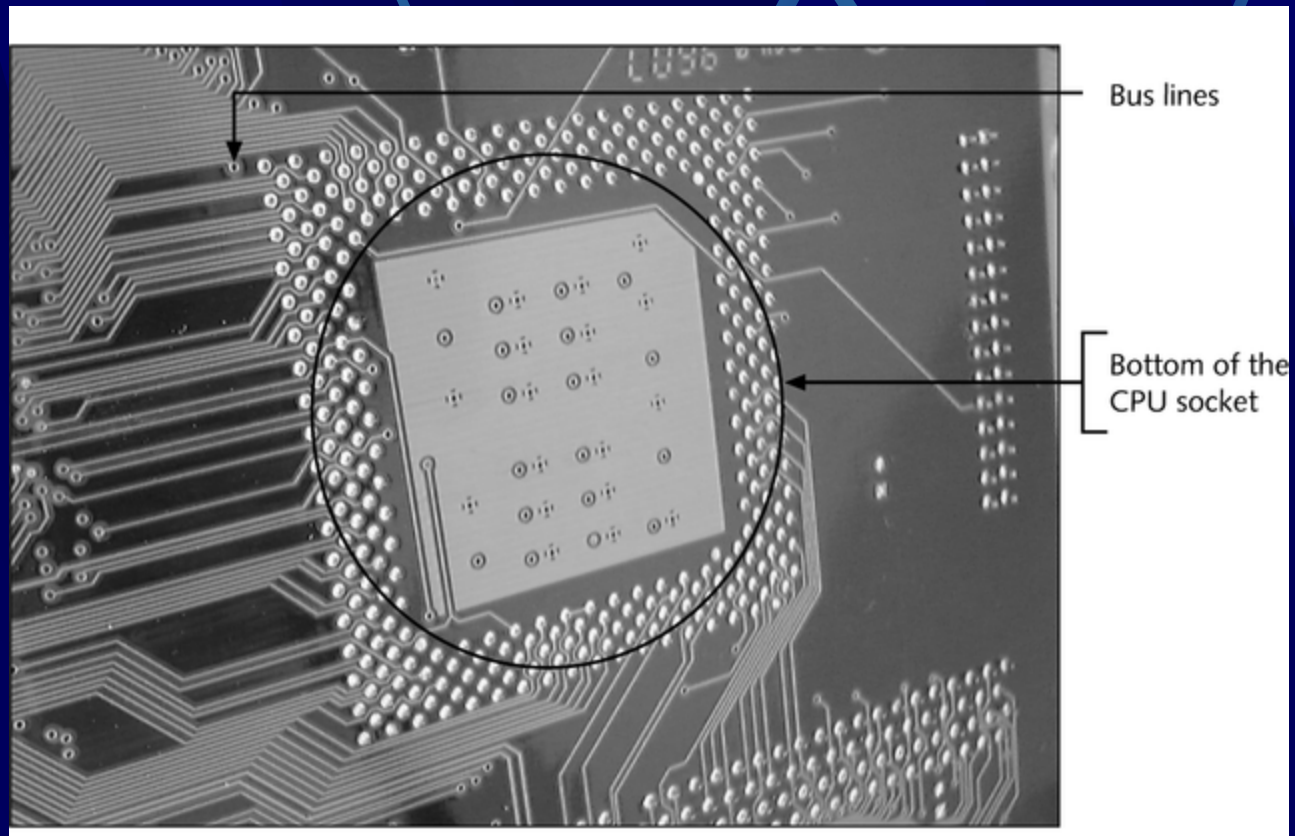

Figure 1-15 On the bottom of the system board, you can see bus lines terminating at the CPU socket

Relógio do Sistema

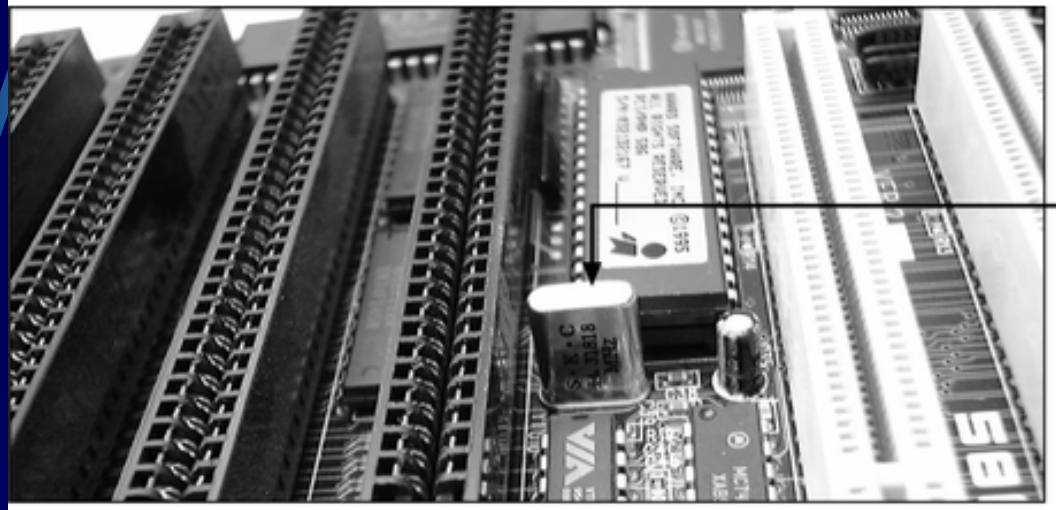

Figure 1-16 The system clock is a pulsating electrical signal sent out by this component that works much like a crystal in a wristwatch. One line, or circuit, on the system board bus is dedicated to carrying this pulse.

Slots de expansão

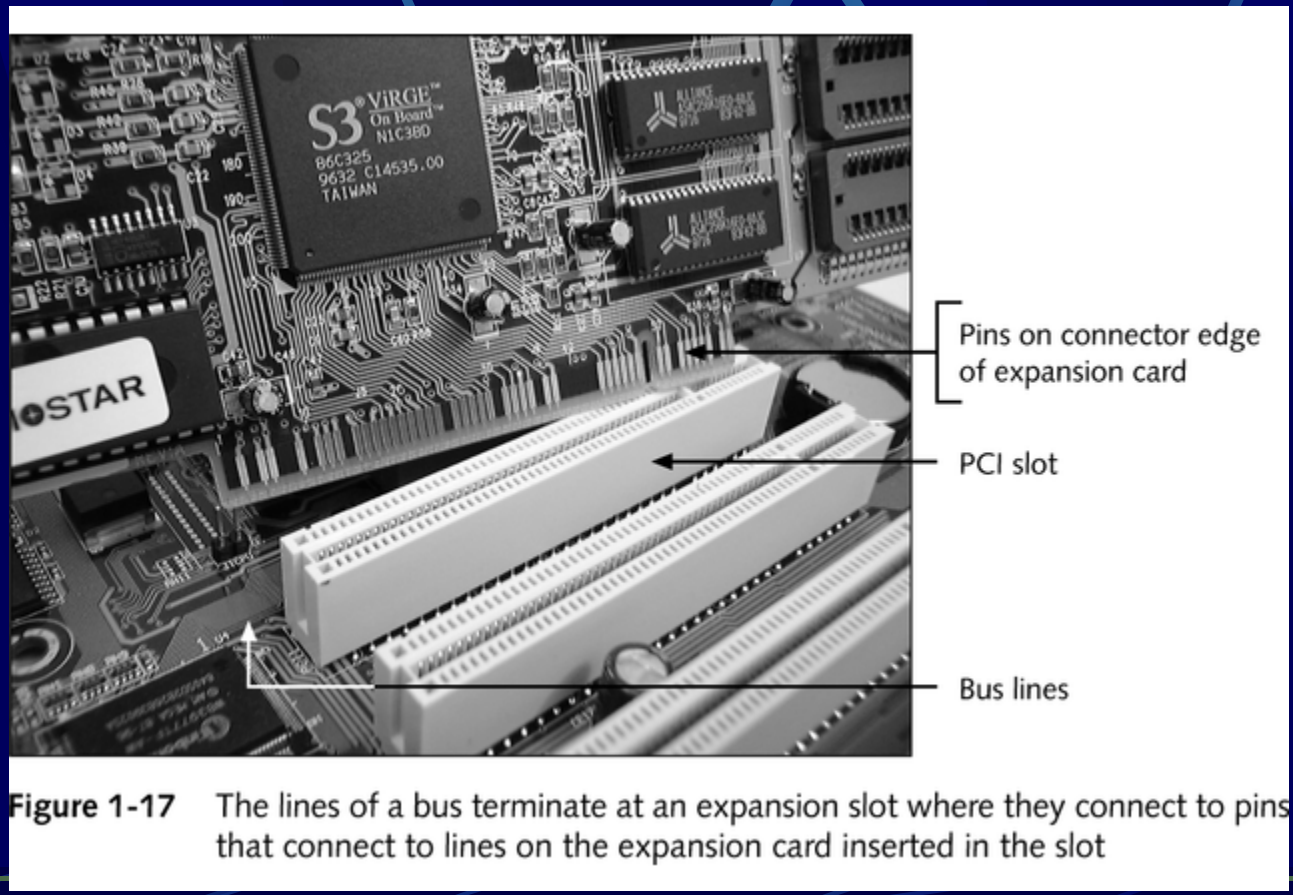

Figure 1-17 The lines of a bus terminate at an expansion slot where they connect to pins that connect to lines on the expansion card inserted in the slot

Slots de expansão

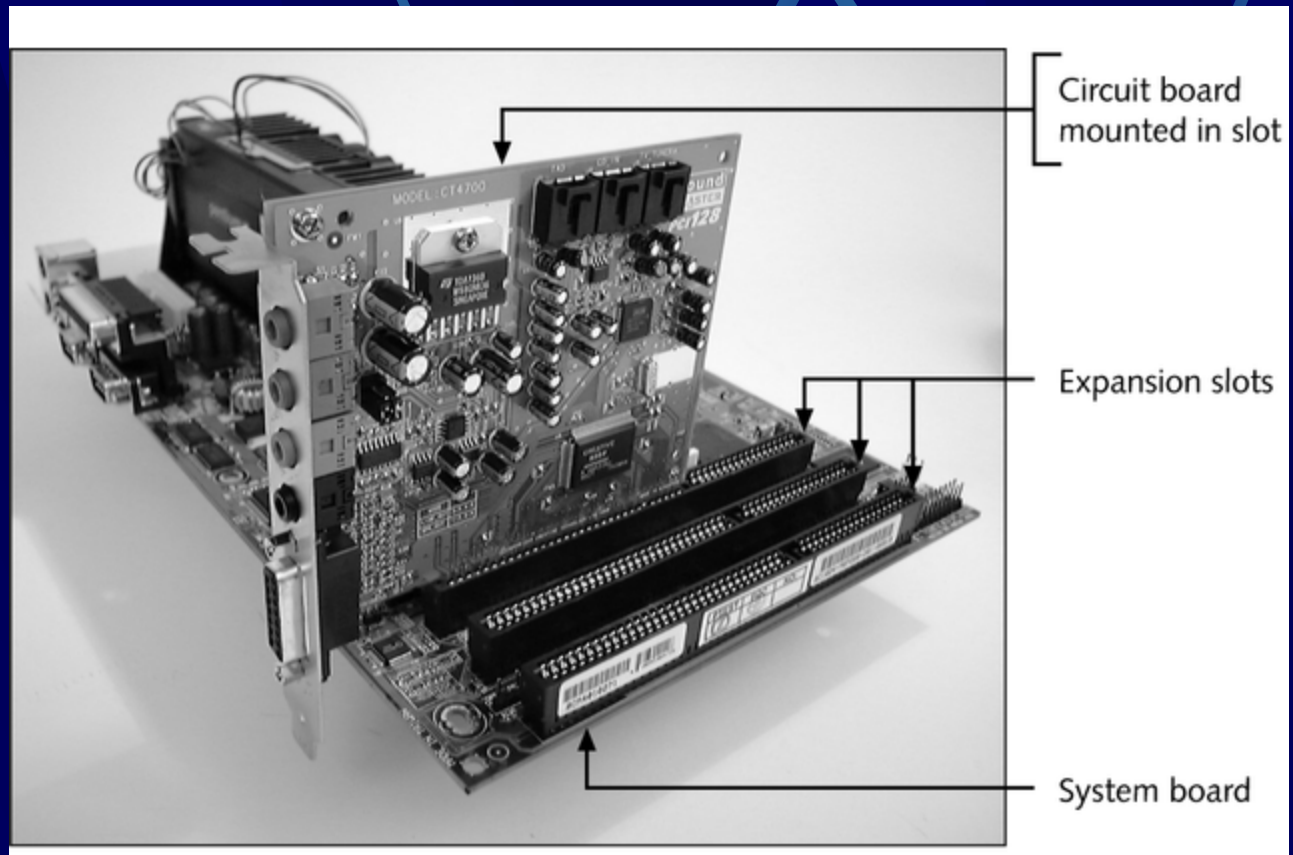

Figure 1-18 Circuit boards are mounted in expansion slots on the system board

Placas

- Dispositivos inseridos em slots para melhorar as capacidade do computador
- ex.:
  - Placa de video
  - Placa de rede
  - Modem interno
  - I/O controller card
  - Placa de rede

Placa de video

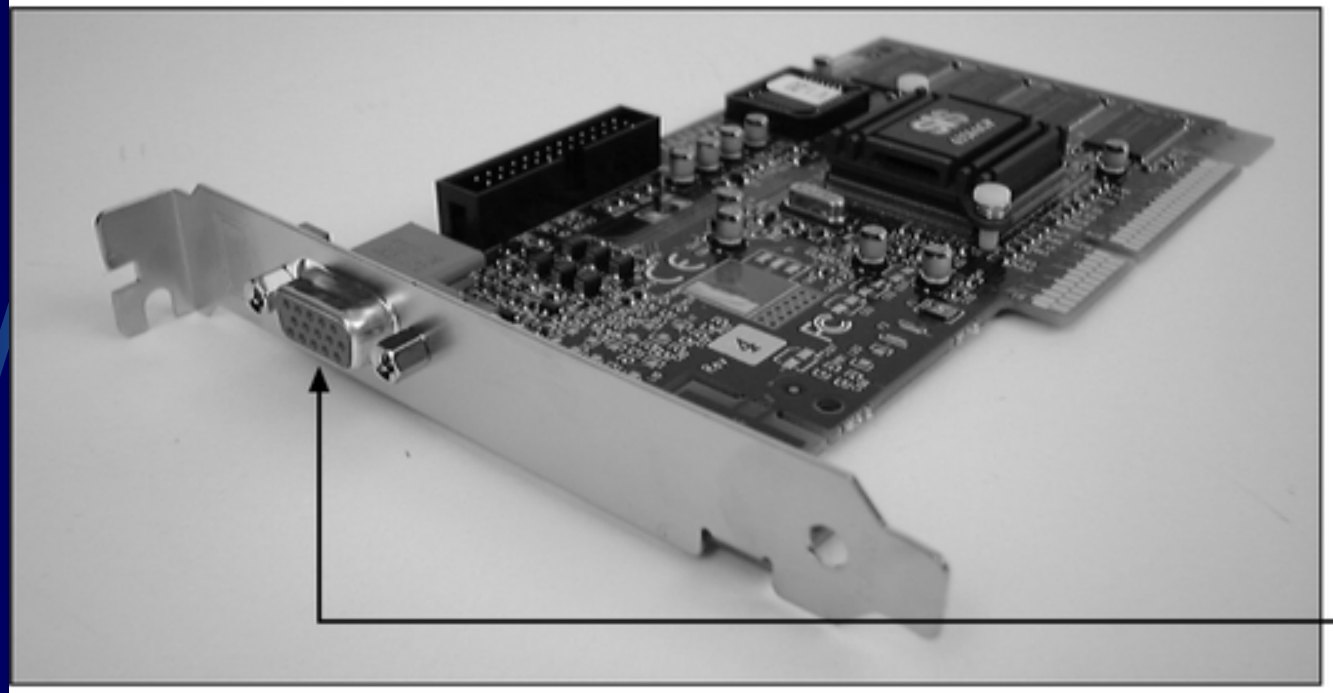

Figure 1-19 The easiest way to identify this video card is to look at the port on the end of the card

Sistema electrico

- Fonte de alimentação
  - Fornece corrente para a board e outros dispositivos instalados
  - Fornece 3.3, 5 e 12 volts DC

Sistema Eléctrico

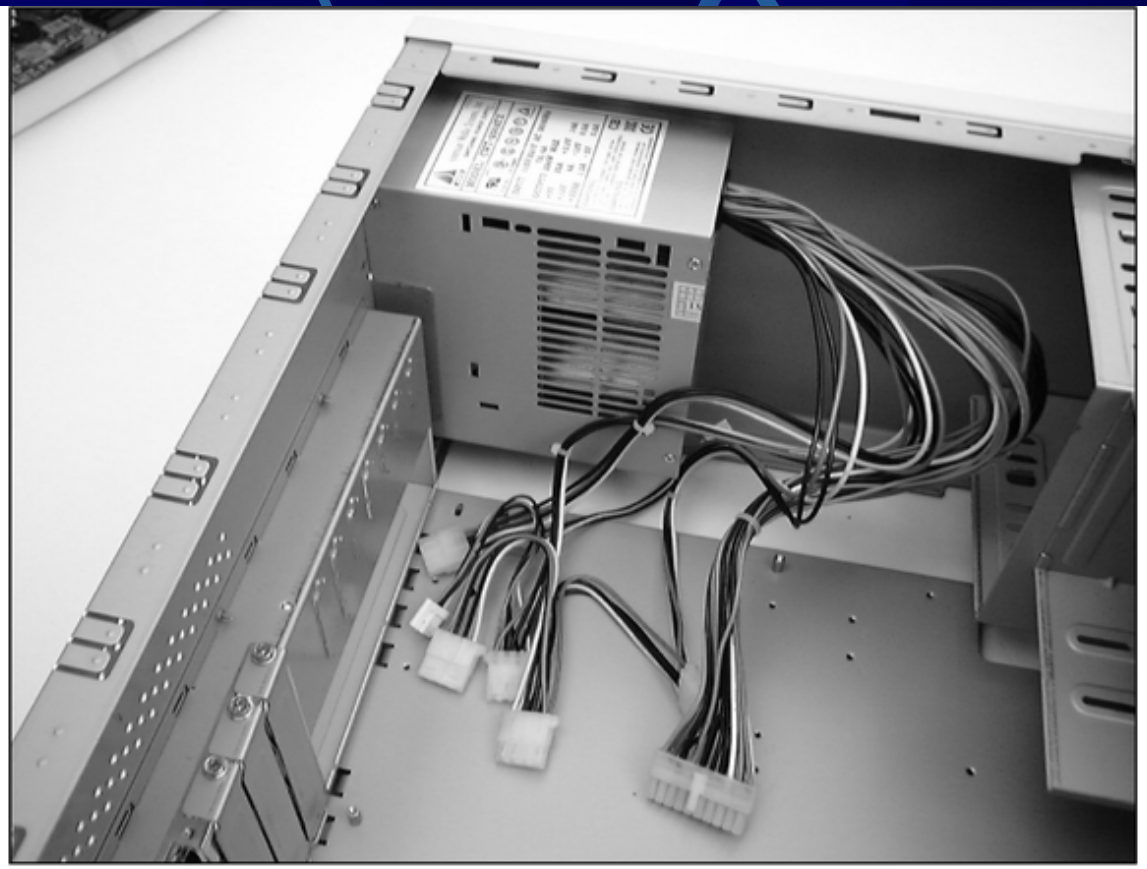

Figure 1-20 Power supply with connections

Sistema Eléctrico

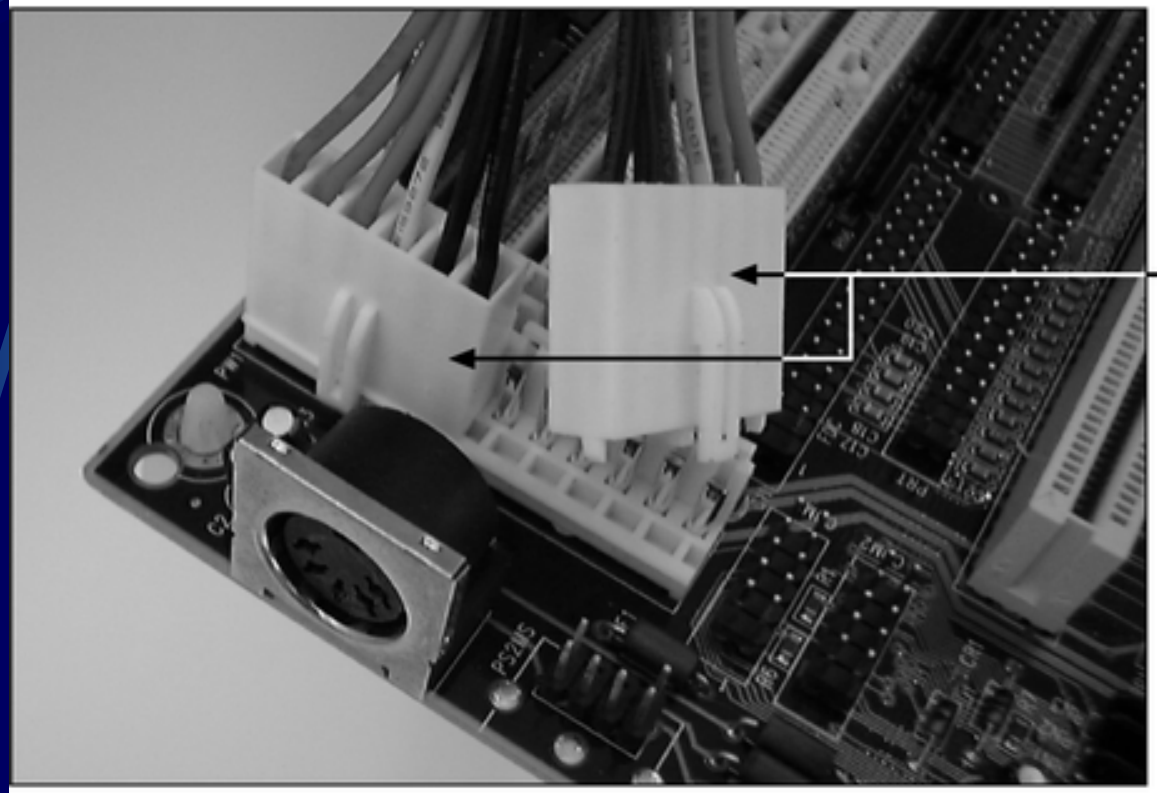

Figure 1-21 The system board receives its power from the power supply by way of one or two connections located near the edge of the board

Sistema Eléctrico

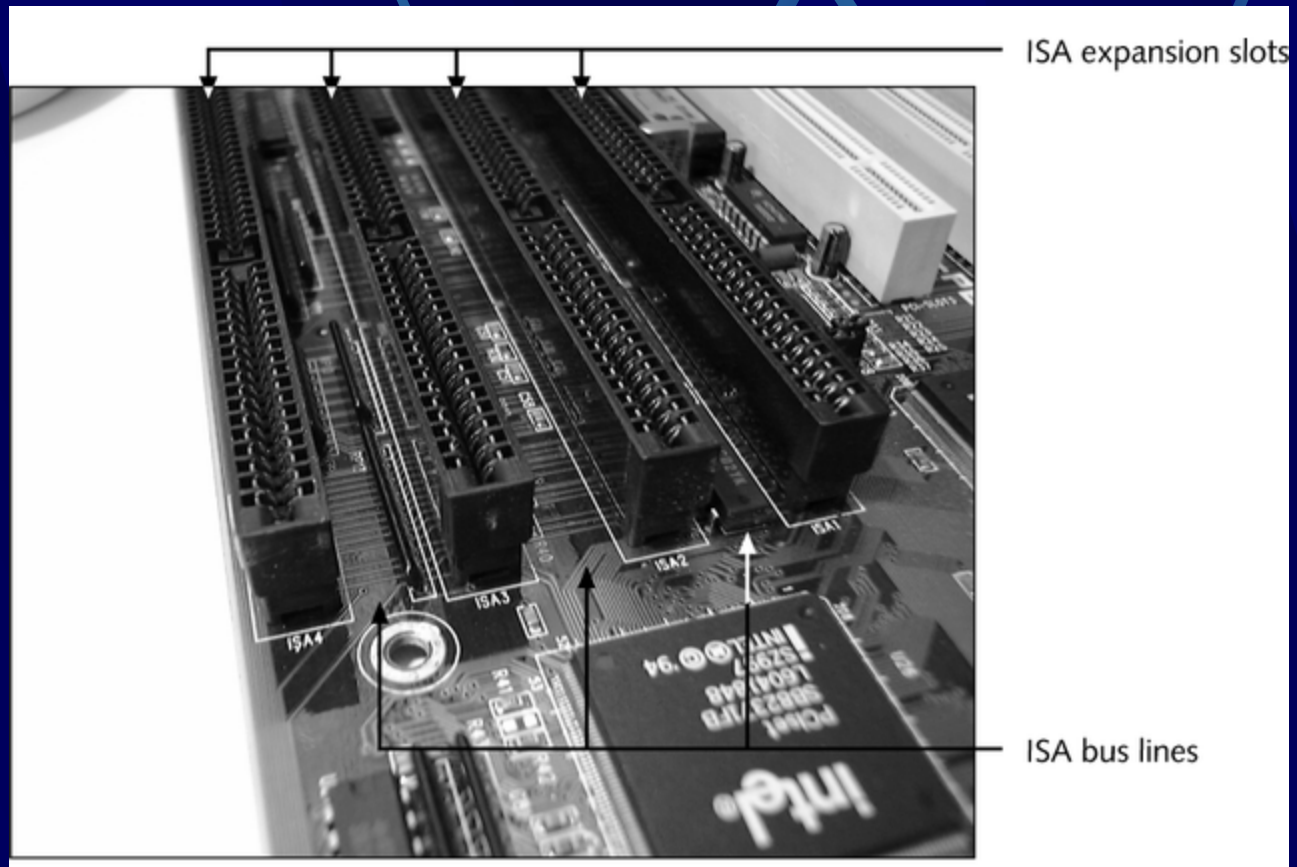

Figure 1-22 Bus lines ending at expansion slots

Instruções e dados armazenados na Board

- chips ROM
  - Contem código permanente
  - Também denominados chips de BIOS
- chips configuração CMOS
  - Guarda a configuração ou informação de setup
- Jumpers ou DIP switches
  - guarda informação de configuração

ROM BIOS Chip na placa de video

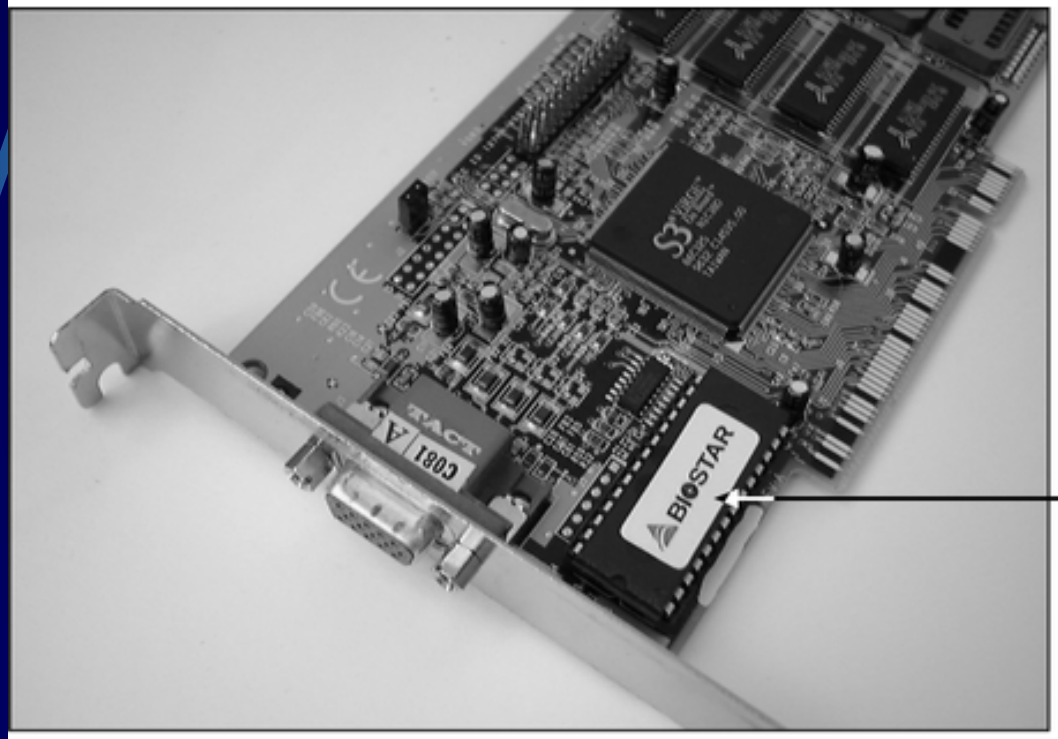

Figure 1-23 A ROM BIOS chip on a video card holds programs that provide instructions to operate the card

ROM BIOS Chip na mother board

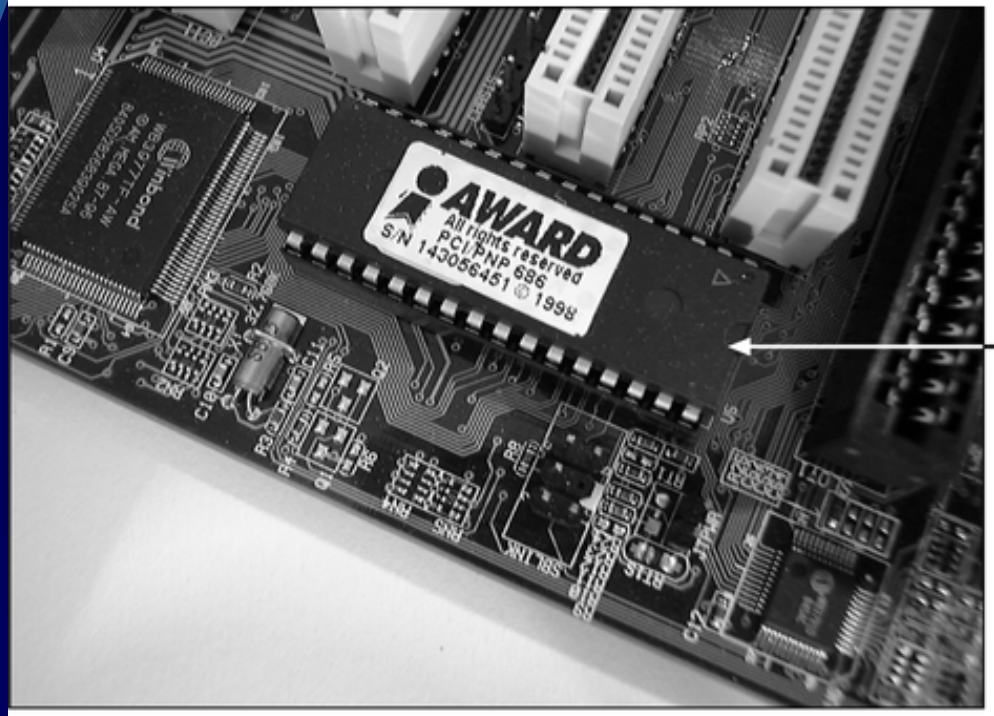

Figure 1-24 The ROM BIOS chip on the system board contains the programming to start up the PC as well as perform many other fundamental tasks

Chip de CMOS

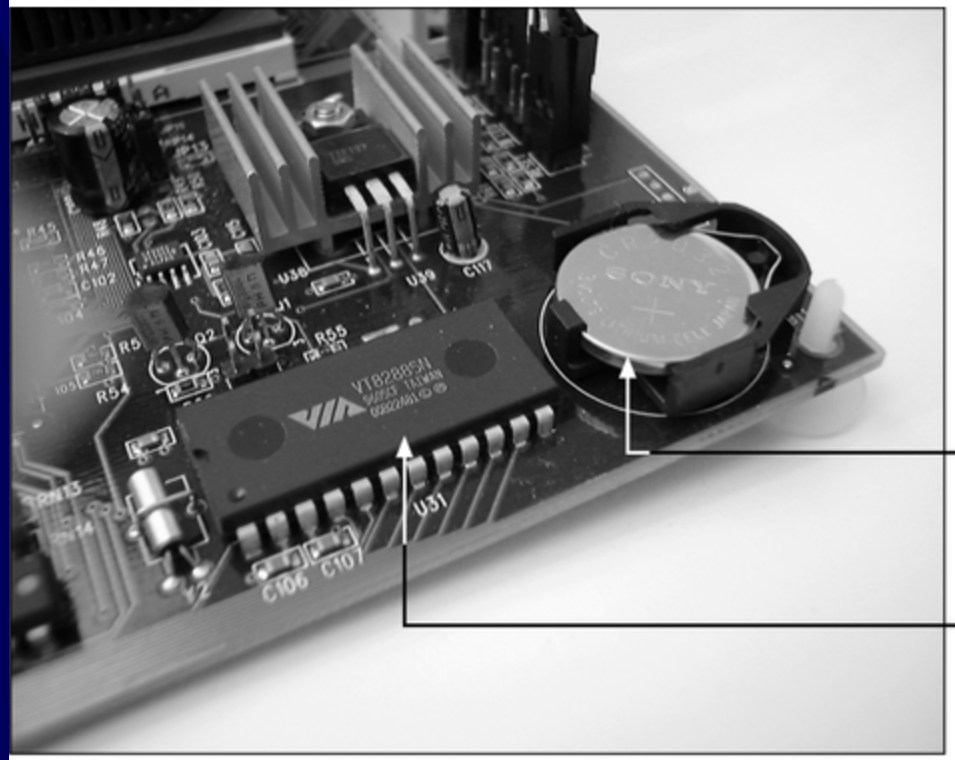

Figure 1-25 The CMOS setup chip, powered by a battery when the PC is turned off, contains data about the system configuration as well as the current time and date

Jumpers

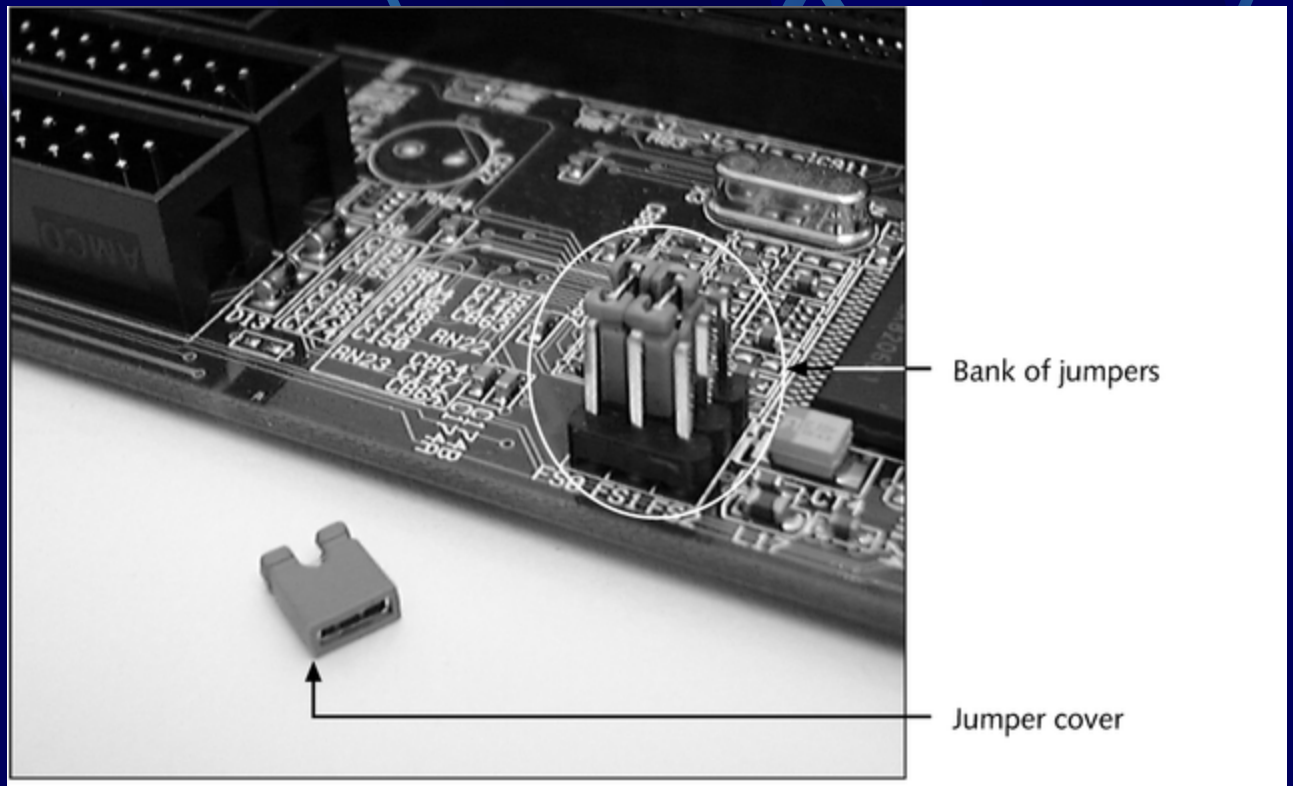

Figure 1-26 Setup information about the system board can be stored by setting a jumper on (closed) or off (open). A jumper is closed if the cover is in place, connecting the two wires that make up the jumper; a jumper is open if the cover is not in place.

Software

- A parte inteligente do computador
- Programas de computador para desempenhar tarefas específicas
- Determina que hardware está presente
- Decide como o hardware está configurado
- Utiliza o hardware

Três Tipos de Software

- Firmware (BIOS)
  - Controla as funções de input/output
- Operating systems (OSs)
  - Fornece instructions para o hardware executar tarefas
- Software de aplicação

Funções da BIOS e OS

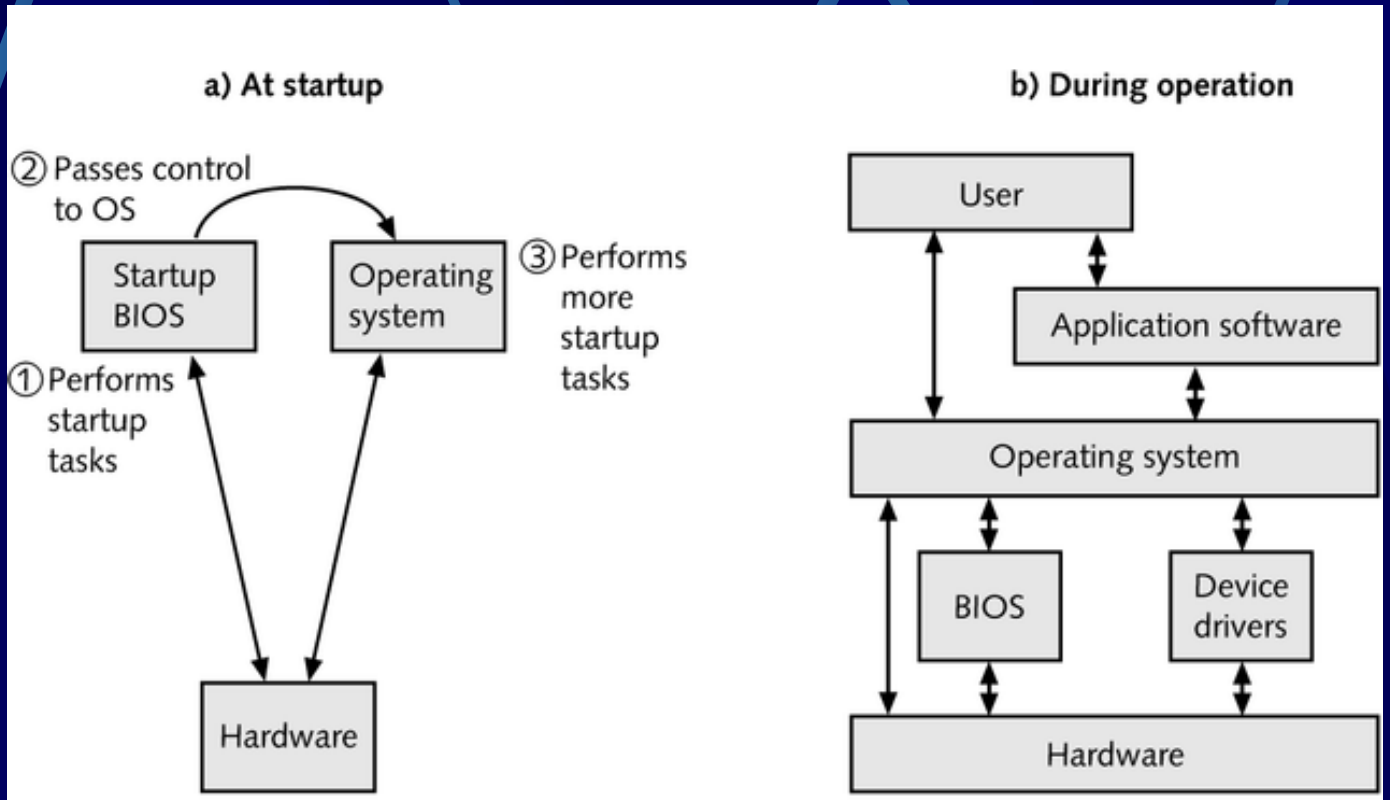

Figure 1-27 Not all software relates directly to hardware; some is dependent on other software to perform many basic functions

Firmware e BIOS

- Fornece instruções básicas para o hardware
- interface entre software e hardware

Camadas de Software

- A hierarquia determina como o software de alto nível depende do software de baixo nível para gerir o hardware
- software de aplicação depende do SO para ter um interface com o hardware
  - Envia instruções ao hardware directamente
  - utiliza a BIOS para fornecer as instruções
  - utiliza device drivers

Camadas de Software

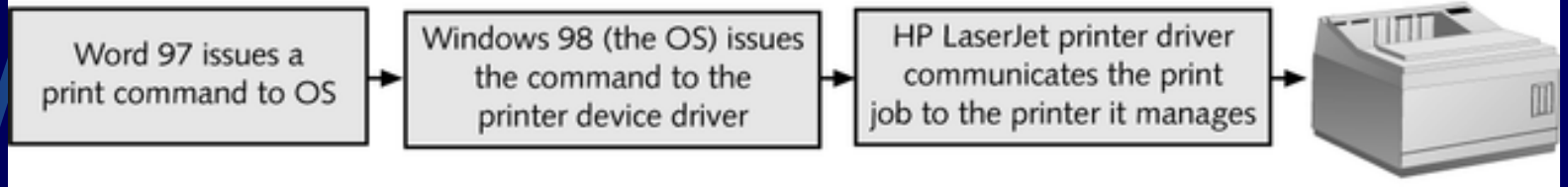

Figure 1-28 Any specific protocols and commands sent to the printer are the responsibility of the printer device driver

Como o Software gere e partilha Informação

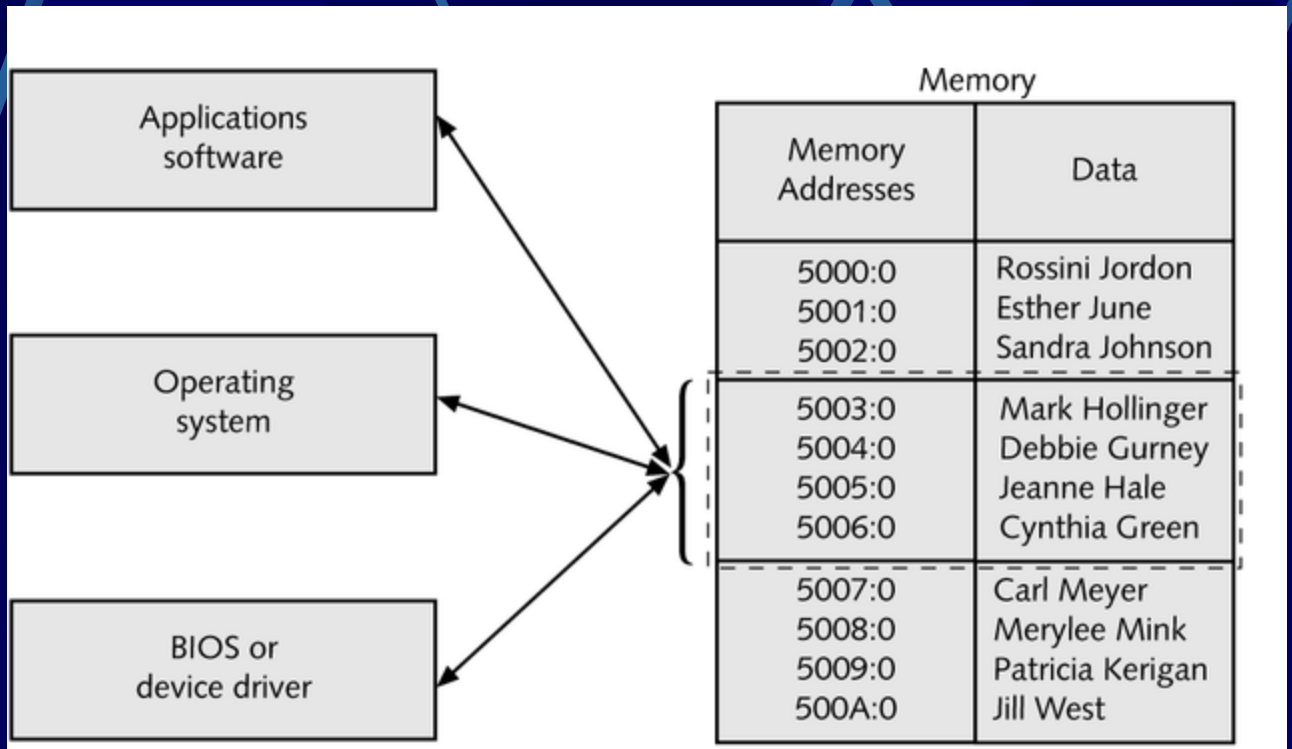

Figure 1-29 Software can exchange information by storing data in RAM that has been assigned memory addresses. Memory addresses can then be communicated to other software layers.

Sistemas operativos

- Different OSs are written to support different types of hardware systems and user needs

Funções do Sistema Operativo

- Gerir BIOS
- Gerir ficheiros em dispositivos de armazenamento secundário
- Gerir memória principal (RAM)
- Dianosticar problemas de software e hardware
- Interface entre hardware e software
- Realiza tarefas solicitadas pelo utilizador

Arranque do sistema operativo

- Os programas do SO devem ser copiados da memória secundária para a RAM
- CPU lê de uma localização da RAM para outra para receber e seguir instruções

Arranque do sistema operativo

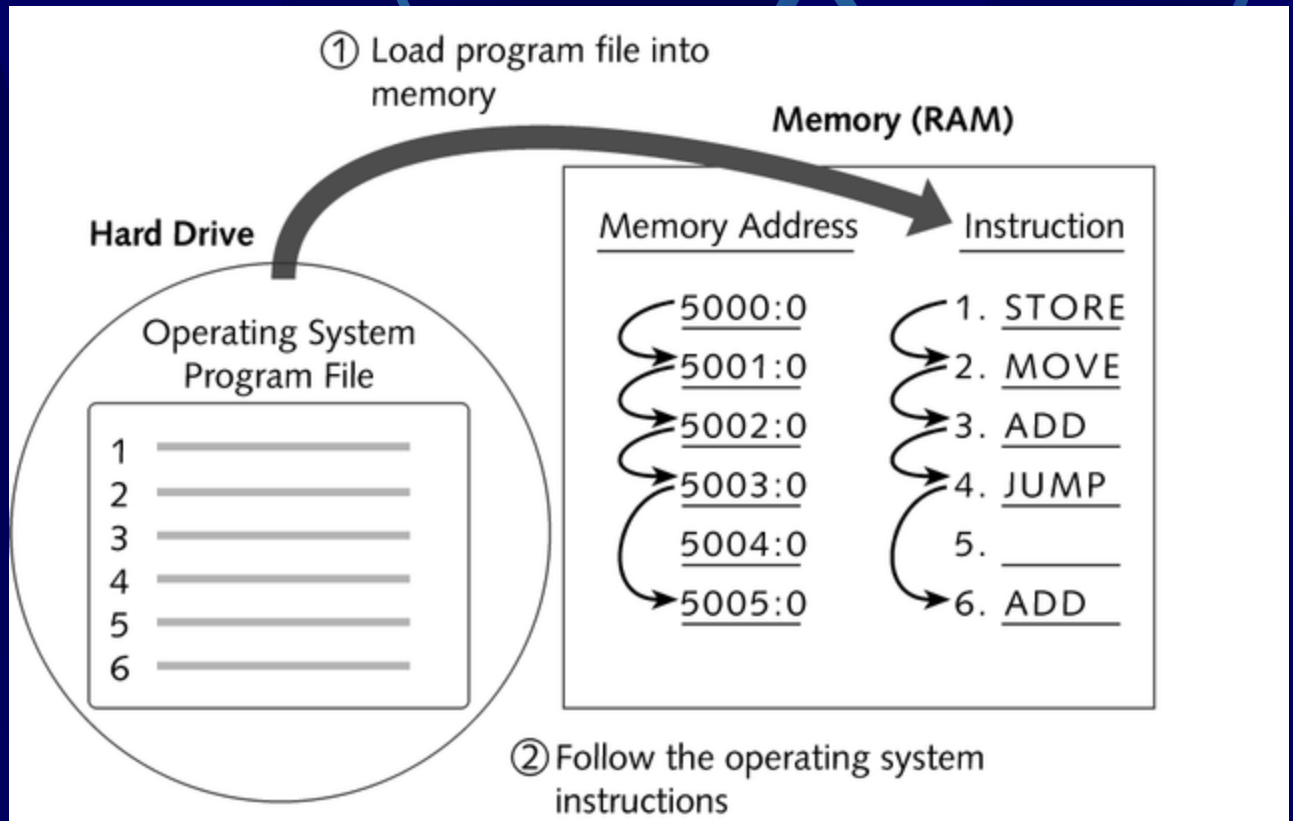

Figure 1-30 The operating system is stored in files on the hard drive but is executed from memory

Interface com o Sistema Operativo

- linha de comandos
- Menus
- Interface de ícones (graphical user interface (GUI))

Linha de comandos

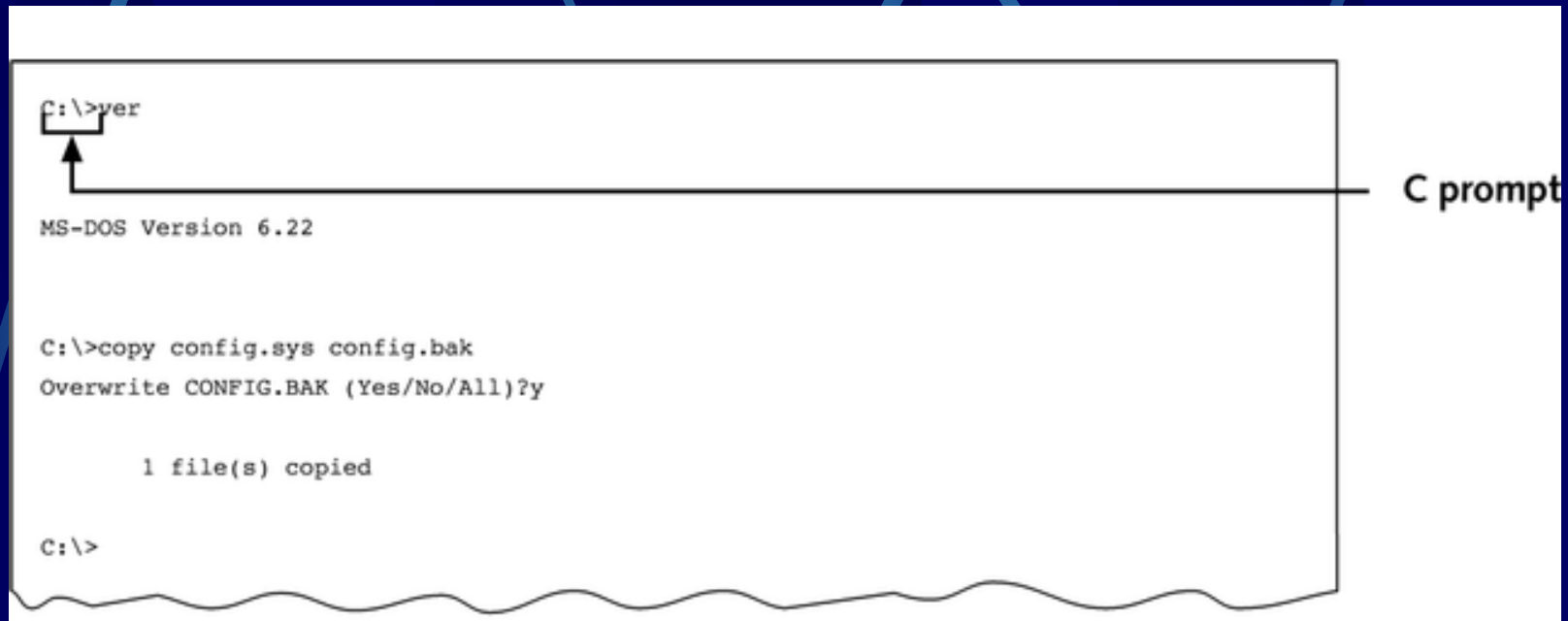

Figure 1-31 An operating system command-driven interface: the C prompt

Menus

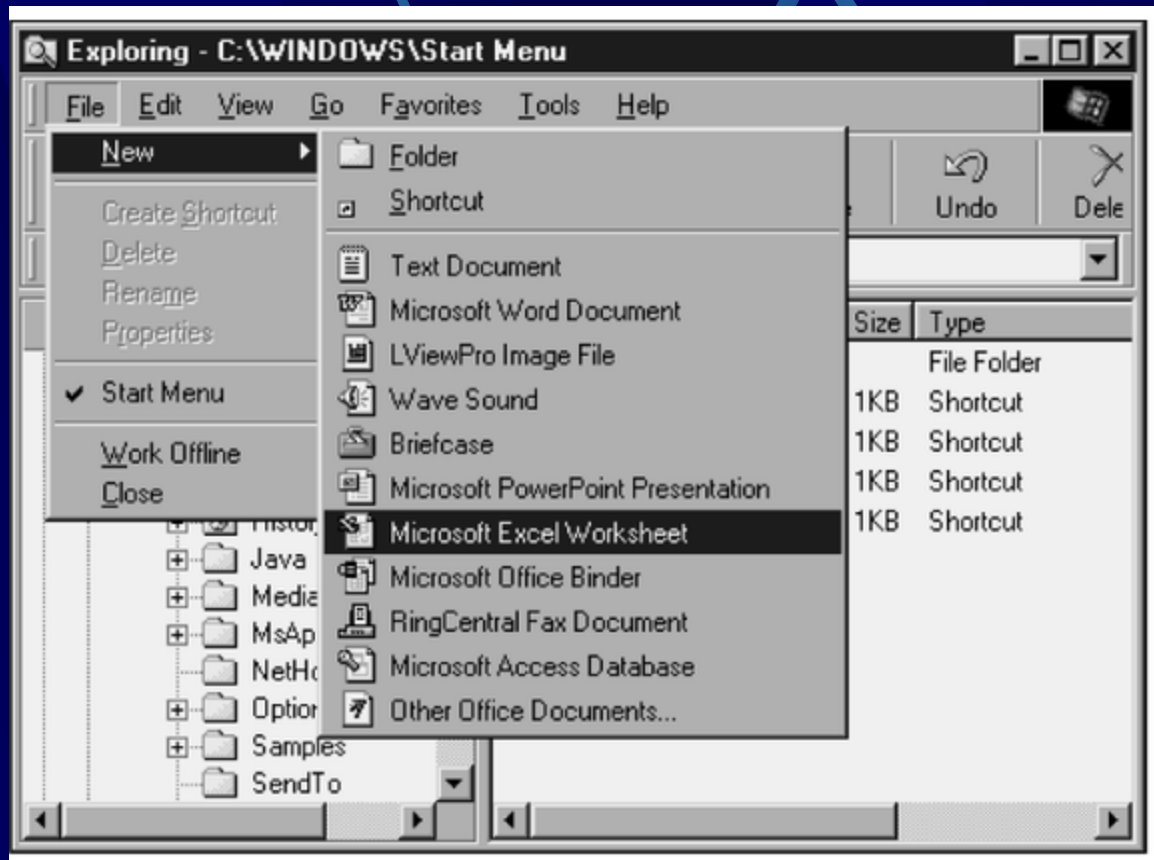

Figure 1-32 A menu-driven interface: Explorer in Windows 98

Ícones

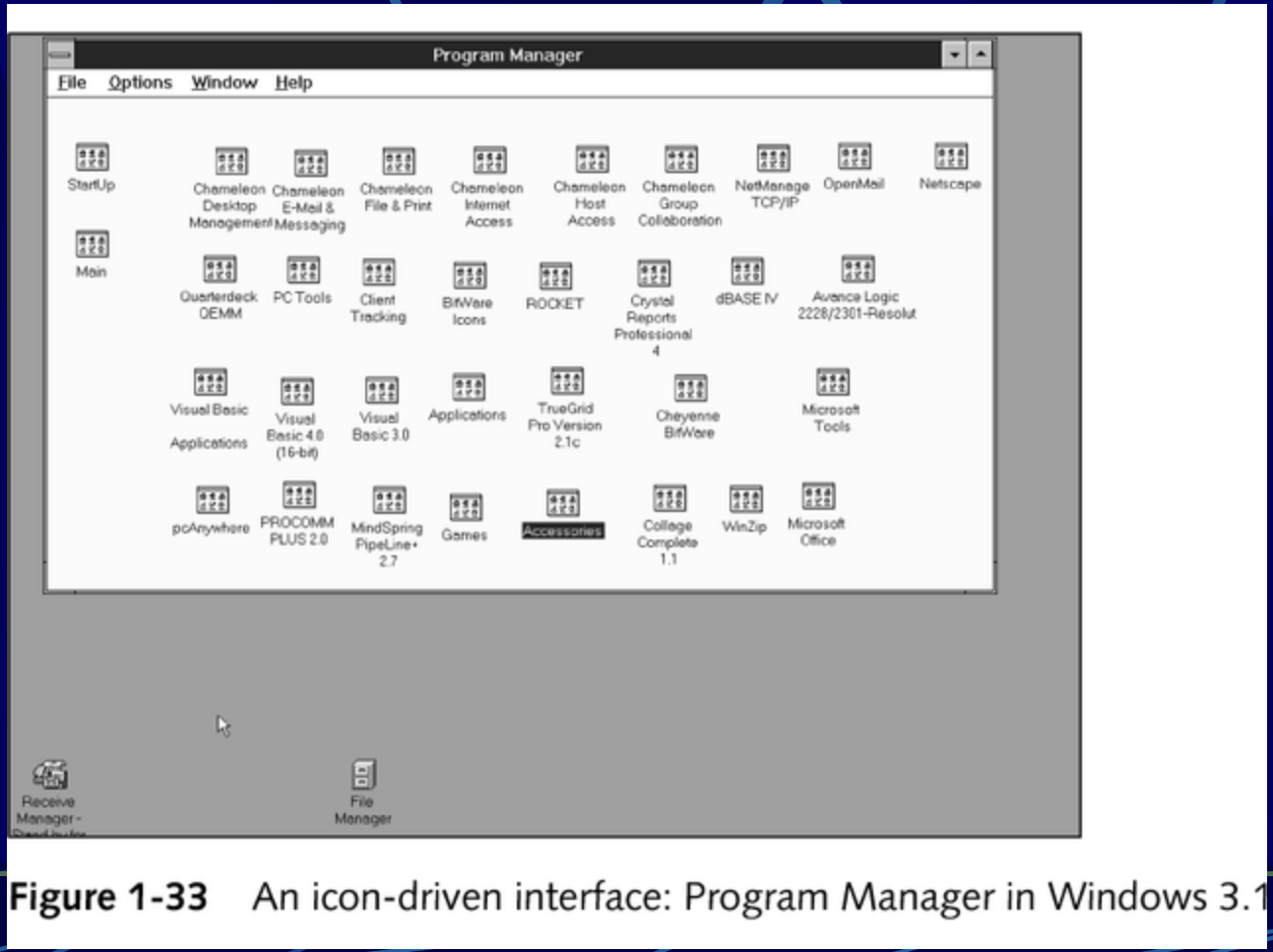

Figure 1-33 An icon-driven interface: Program Manager in Windows 3.1

Ícones

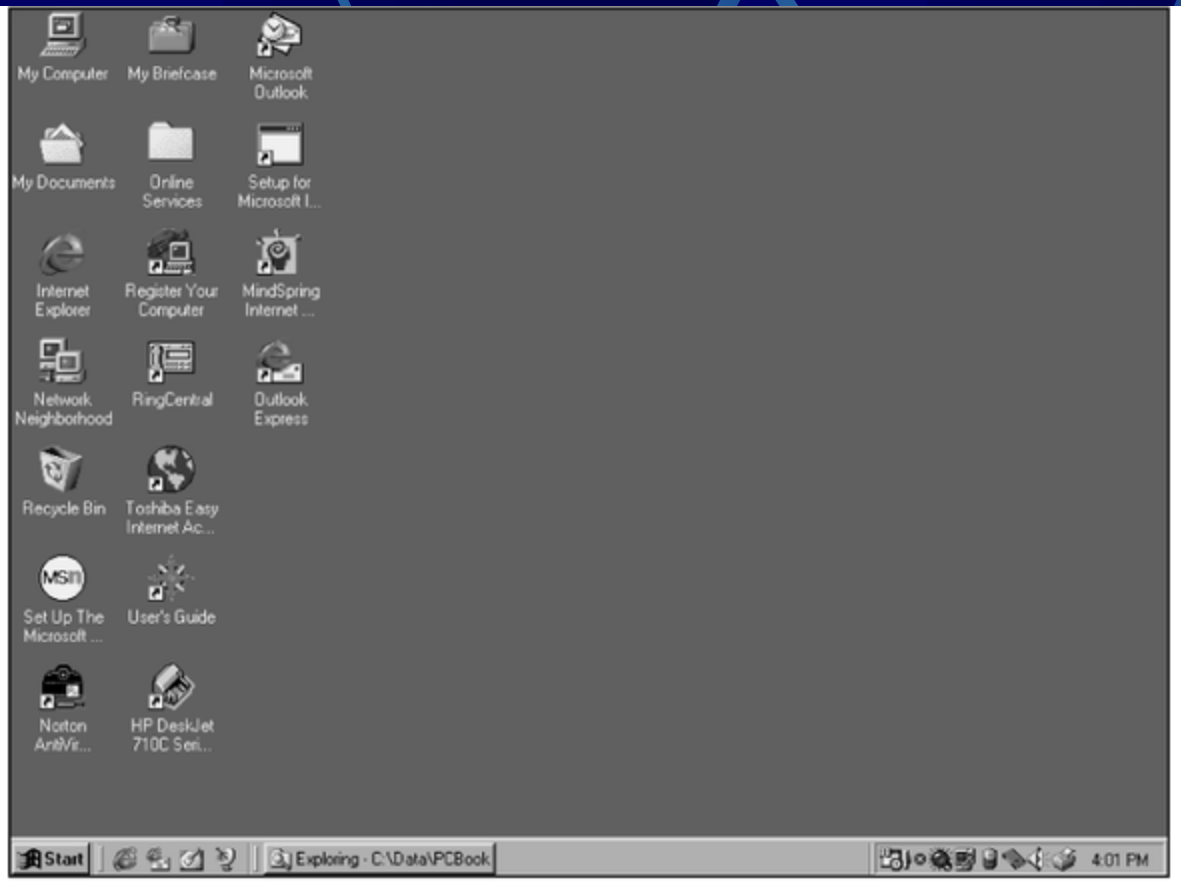

Figure 1-34 An icon-driven interface: Windows 98 desktop

Sistemas Operativos

- Noções
  - Multitasking
  - Cooperative multitasking (task switching)
  - Preemptive multitasking
  - Windows 3.x

Multitasking Environment

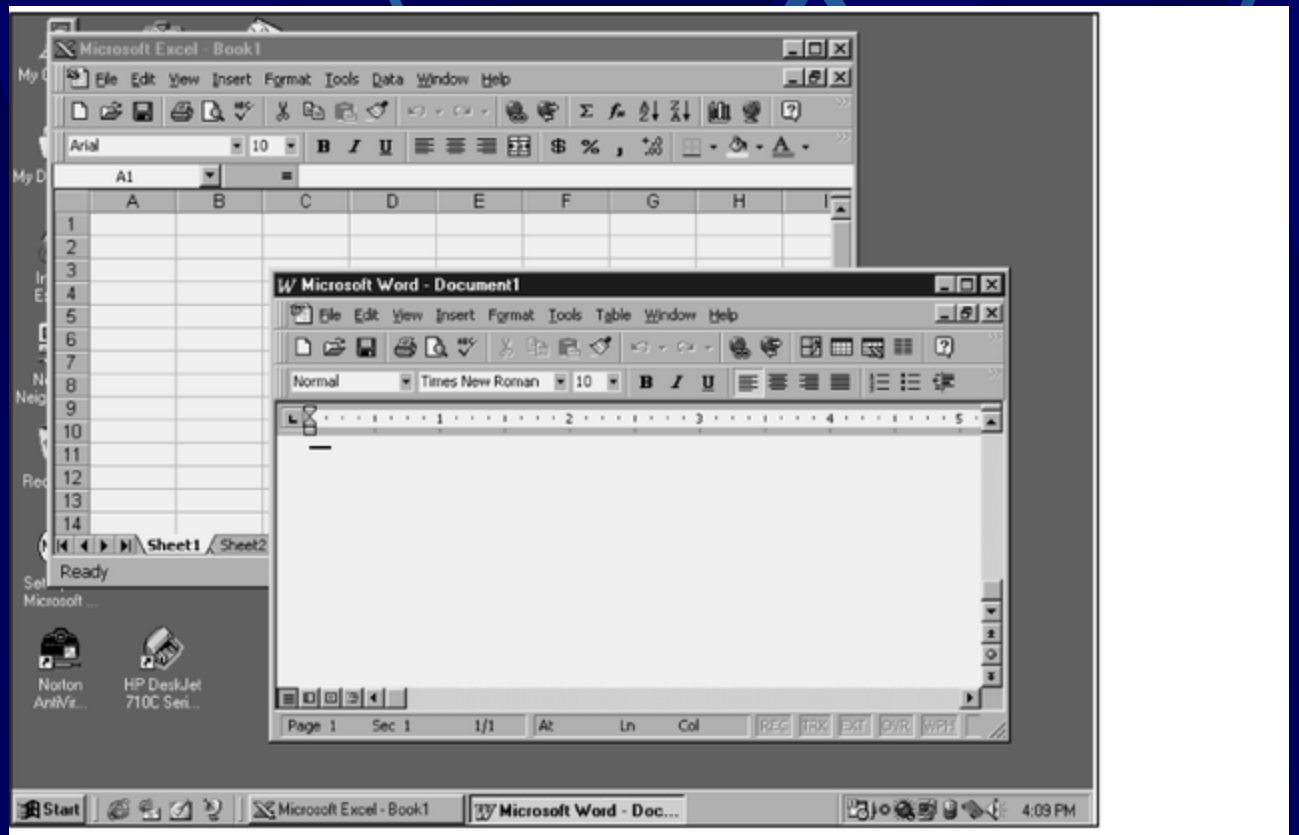

Figure 1-35 A multitasking environment allows two or more applications to run simultaneously

Windows 3.x Operating Environment

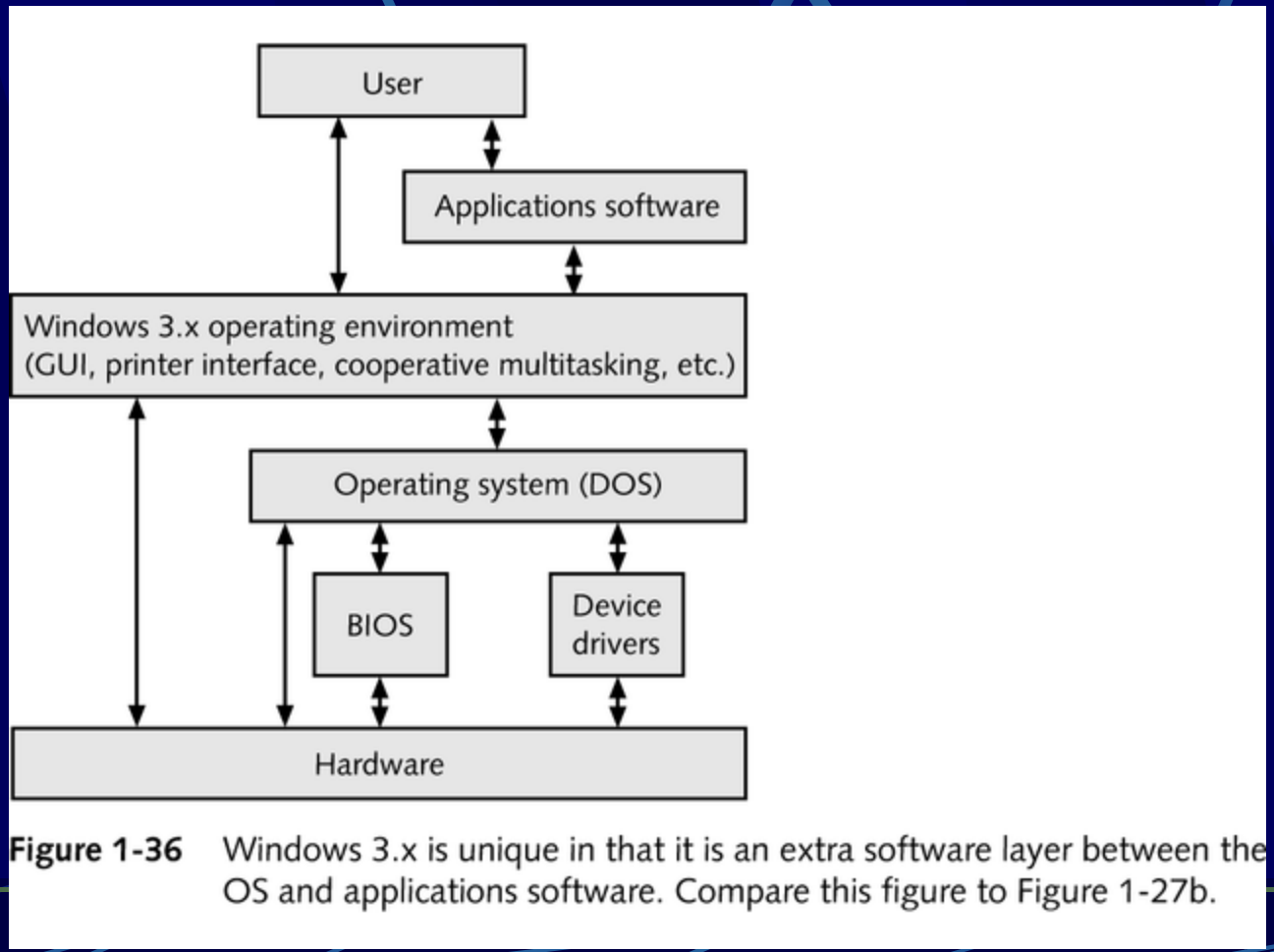

Figure 1-36 Windows 3.x is unique in that it is an extra software layer between the OS and applications software. Compare this figure to Figure 1-27b.

Well-known Operating Systems

- DOS (disk operating system)
- DOS com Windows 3.1 e 3.11
- Windows 95 e Windows 98
- UNIX operating system
- Windows NT
- OS/2
- Macintosh operating system

Disk Operating System (DOS)

Table 1-1 Advantages and disadvantages of DOS

Advantages	Disadvantages
•DOS runs on small, inexpensive micro-computers with a minimum amount of memory and hard drive space. •Some older applications are still in use today that were written for DOS and older hardware. DOS is used today only to support this older software and hardware.	•Memory management is awkward and sometimes slow. •DOS has no icon-driven interface. •DOS does only single-tasking, that is, it supports only one application running at a time. •DOS was not designed for use on networks. A separate applications software program is necessary for a DOS machine to access a network. •The last standalone version is DOS 6.22, which does not take advantage of the many new CPU features now available. (However, Windows 9x has a newer DOS core.) •Hardly any new software is being written for DOS.

DOS com Windows 3.x

Table 1-2 Advantages and disadvantages of DOS with Windows 3.x

Advantages	Disadvantages
•DOS with Windows 3.x provides an icon-driven interface. •Windows supports cooperative multitasking as it manages more than one open application by passing segments to DOS, which then, in turn, interfaces with hardware. •DOS with Windows 3.x can run on relatively inexpensive microcomputer systems with a present-day CPUs. •Many applications software programs are still in use that were written to run on Windows 3.x.	•Memory management is awkward and sometimes slow. •DOS with Windows 3.x is sometimes slow due to the complexity of the middle layer, or "go-between," concept. •The DOS/Windows 3.x combination does not take advantage of the full computing power of minimum amount of hard drive space. •There is no new software being written today specifically for Windows 3.x.

Windows 9.x

Table 1-3 Advantages and disadvantages of Windows 9x

Advantages	Disadvantages
•Windows 9x offers a very user-friendly and intuitive GUI interface. •Windows 9x offers almost complete backward compatibility for applications written for DOS and earlier versions of Windows. •Windows 9x is a mix of older and newer OS technology and allows both older and newer software and hardware to run. •Windows 9x offers the ability for one PC to talk with another over phone lines without additional software. It works well for lowend network use, such as when two users want to exchange files. •Disk access time under Windows 9x is improved over DOS and Windows 3.x. •Plug and Play features make installing some new hardware devices easier than with earlier OSs. •Windows 9x supports preemptive multitasking. While the hourglass is showing on the window of an application, you can make another application active by clicking on its window.	•Windows 9x requires at least a 386 CPU, 8 MB of RAM, and 30 MB of hard drive space, thus prohibiting its use on some older PCs. •Because of the attempt to bridge older and newer technology, there are some problems with failures and errors created in this hybrid environment.

UNIX

Table 1-4 Advantages and disadvantages of UNIX

Advantages	Disadvantages
•UNIX was written for powerful microcomputer systems and has strong multitasking capability, including preemptive multitasking. •UNIX manages large quantities of memory well. •UNIX performs very well in a networking environment.	•UNIX industry standards are not uniform, making it difficult for UNIX developers, administrators, and users to move from one UNIX vendor to another. •UNIX requires a powerful, large microcomputer system. •Few business applications software packages have been written for UNIX for PCs, although there are several very powerful database packages available under UNIX, such as Informix and Oracle.

Windows NT

Table 1-5 Advantages and disadvantages of Windows NT

Advantages	Disadvantages
•Windows NT is designed to run in powerful client-server environments and targets both the client and the server market. •Windows NT offers a completely new file management system, different from earlier Windows OSs. •Windows NT Workstation offers both networking over a LAN and dial-up connections over phone lines. •Windows NT Server offers powerful security both as a file server and for network administration. •Windows NT supports preemptive multitasking and multiprocessing.	•Windows NT requires at least a 486 CPU, 16 MB of RAM, and 120 MB of hard drive space, thus eliminating it as a plausible option for older, low-end PCs. •Windows NT is not compatible with some older hardware and software.

OS/2

Table 1-6 Advantages and disadvantages of OS/2

Advantages	Disadvantages
•OS/2 supports preemptive multitasking. •OS/2 can handle large quantities of memory directly and quickly. •OS/2 has an icon-driven interface. •OS/2 works well in a networking environment.	•Relatively few applications software packages are written for OS/2. Some consider it a dead or dying OS, although it is still used by some. •Many microcomputer users are not familiar with OS/2 and avoid it for that reason. •OS/2 requires a powerful computer system and large amounts of RAM and hard drive space to run efficiently.

Macintosh Operating System

Table 1-7 Advantages and disadvantages of the Macintosh operating system

Advantages	Disadvantages
•The Mac OS has an excellent icon-driven interface, and it is easy to learn and use. •The Mac OS supports cooperative multitasking. •The Mac OS manages large quantities of memory.	•Historically, the Macintosh was not viewed as a professional's computer but rather was relegated to education and game playing. Then the Mac gained a significant place in the professional desktop publishing and graphics markets. Most recently, the availability of more powerful IBM-compatible PCs and OSs able to handle the high demands of graphics has reduced the demand for the Mac.

Como o SO gere uma aplicação

- Nomes de DOS
  - Filename (8 chars)
  - File extension (3 chars)
- Endereçamento de memória no DOS

Table 1-8 Divisions of memory under DOS

Range of Memory Addresses	Type of Memory
0 to 640K	Conventional or base memory
640K to 1024K	Upper memory
Above 1024K	Extended memory

Modos de funcionamento do SO

- Real mode
  - Single-tasking SO onde os programas:
    - têm apenas 1024K de memória
    - Acesso directo à RAM
    - Utiliza 16-bit caminho de dados
- Protected mode
  - Suporta multitasking :
    - O SO gere a memória
    - Programas têm mais de 1024K
    - Programas podem utilizar 32-bit caminho de dados

Real Mode

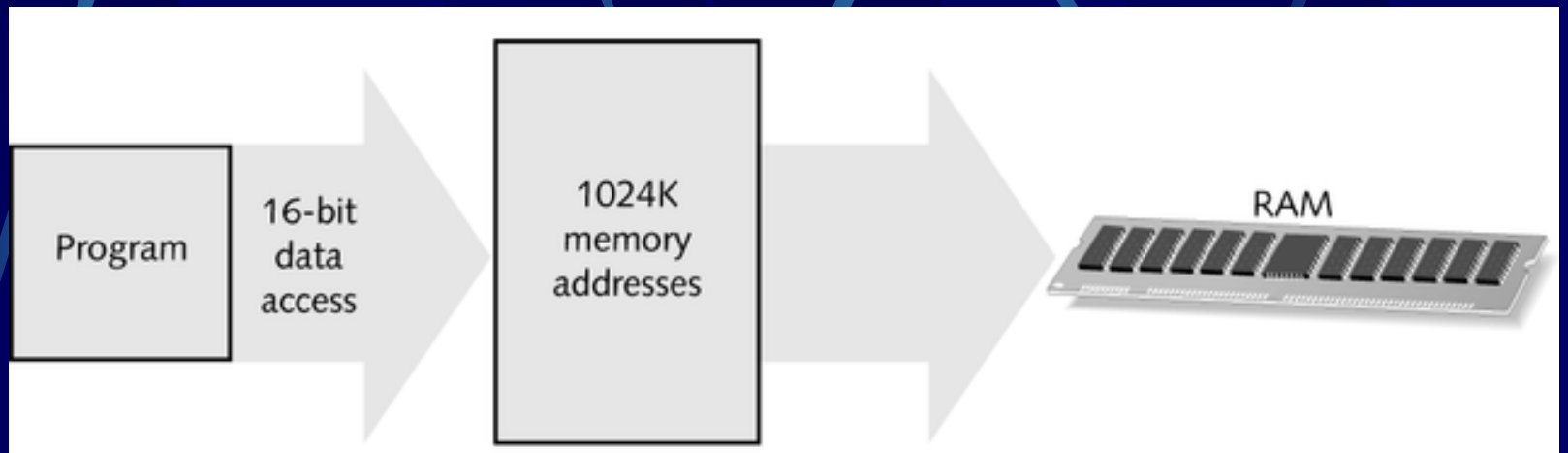

Figure 1-37 Real mode is single-tasking program access to 1024K of memory addresses pointing directly to RAM using a 16-bit data path

Protected Mode

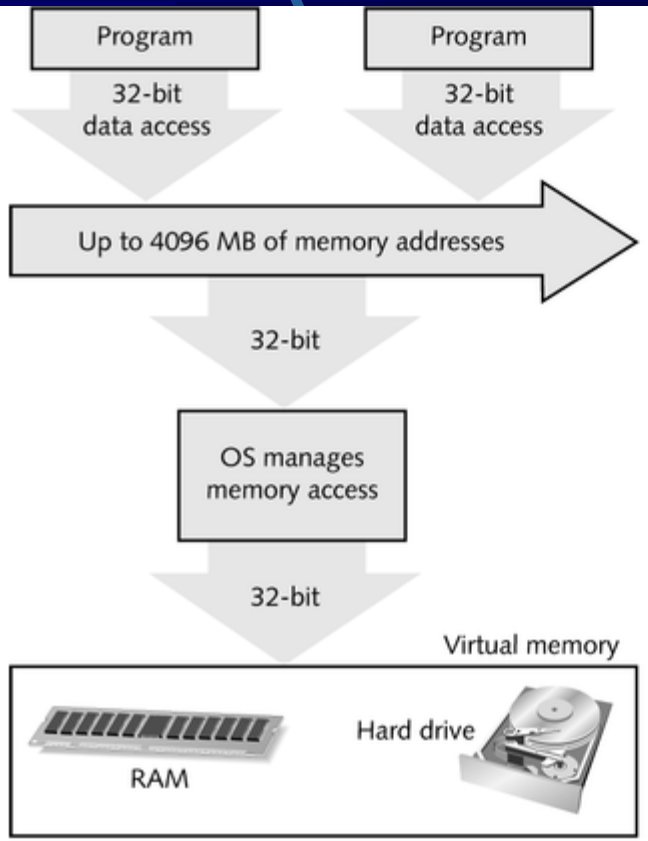

Figure 1-38 Protected mode is multitasking program access to more than 1024K of memory addresses using 32-bit data segments where the OS manages direct memory access

Software de aplicação

- Oito categorias: Processamento de texto, folha de cálculo, base de dados, gráficos, comunicações, jogos, modelação matemática, e ferramentas de desenvolvimento de software
- Desenvolvidos para trabalhar com um SO
- vêm em floppy disks ou CD-ROMs;

Como é que as aplicações são carregadas e executadas

- SO recebe um comando para executar a aplicação
- SO localiza o ficheiro do program para a aplicação
- SO carrega o ficheiro do programa na memória
- SO dá o controle ao programa
- Programa pede endereços de memória ao SO para os seus dados
- Programa inicializa-se; pode pedir que os dados de um dispositivo de armazenamento secundário sejam carregados na memória
- Programa espera uma instrução do utilizador

Como é que as aplicações são carregadas e executadas

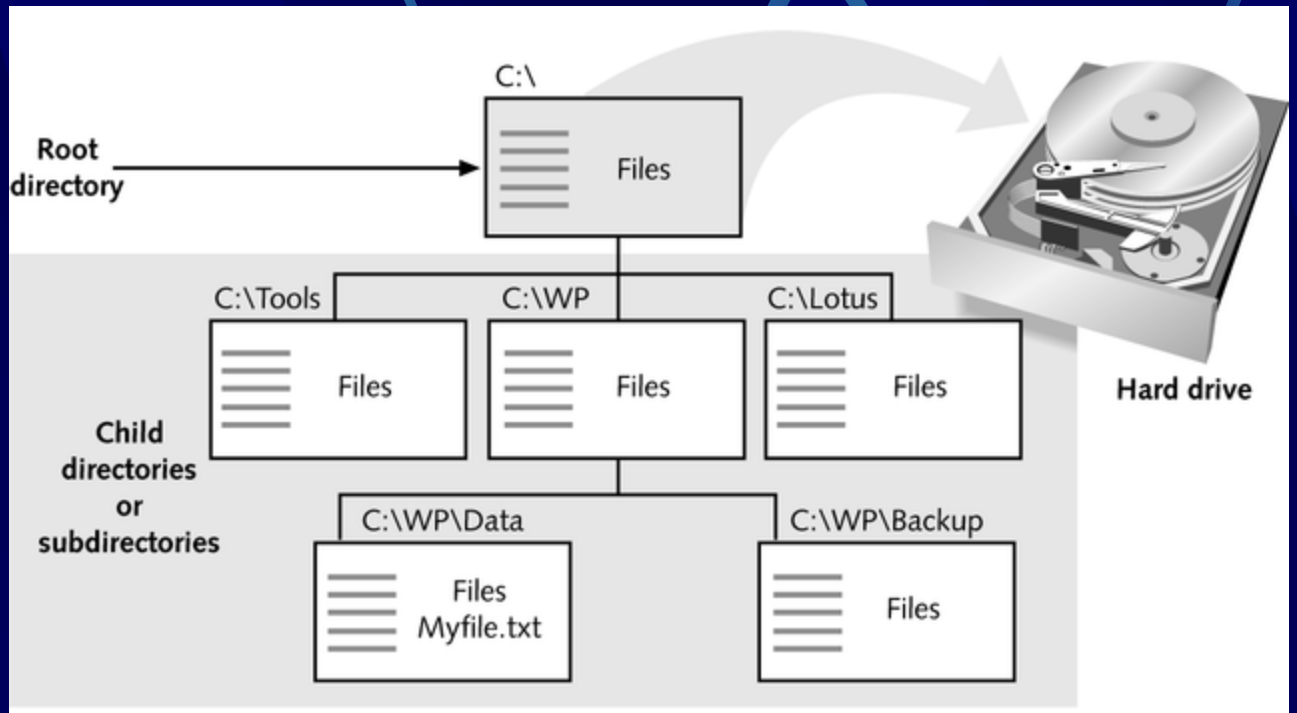

Figure 1-40 A hard drive is organized into groups of files stored in directories. The first directory is called the root directory. All directories can have sub- or child directories. Under Windows, a directory is called a folder.

Carregar um ficheiro de um programa

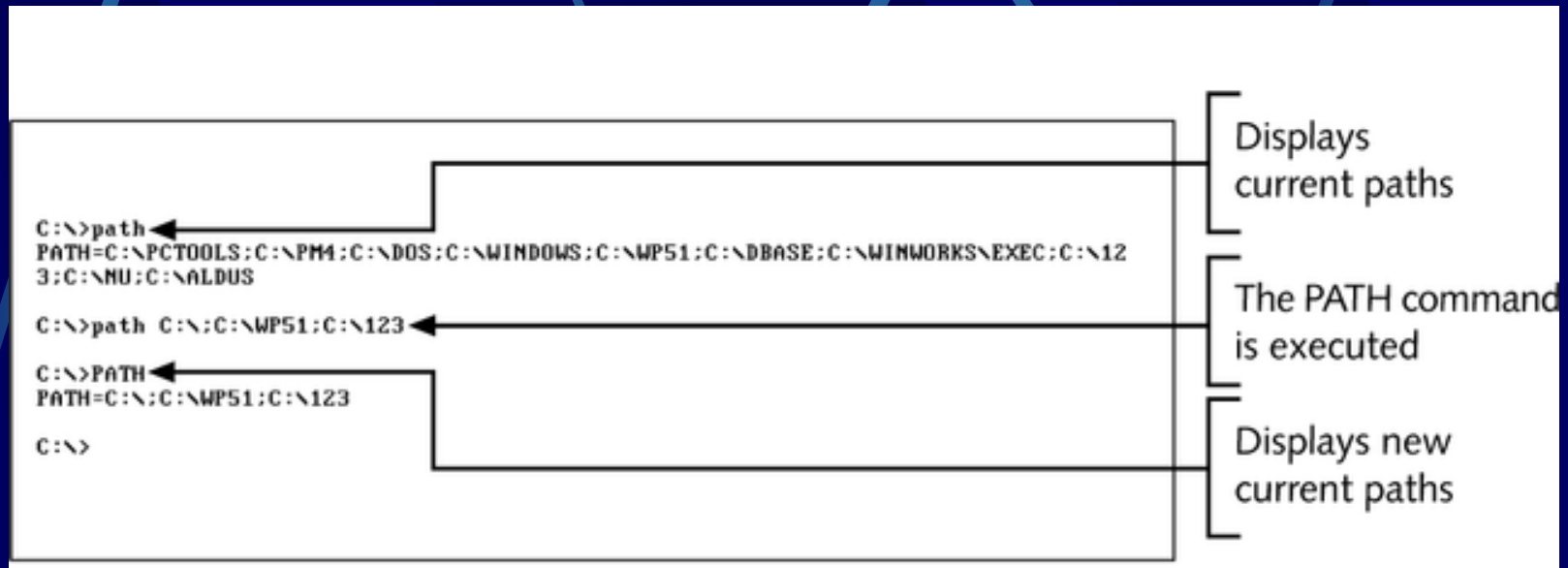

Figure 1-41 The PATH command

Copiar um programa para a memória

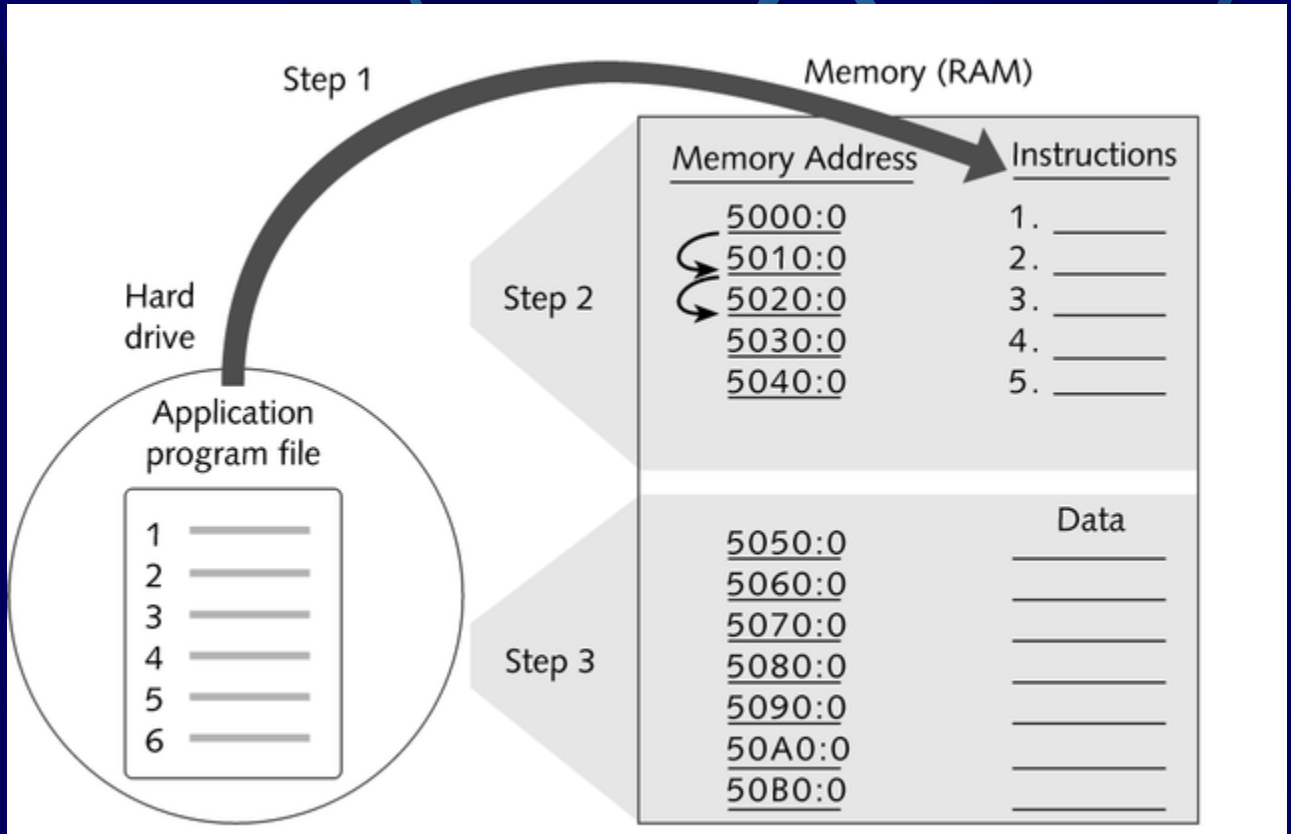

Figure 1-42 Applications software is stored in files but executed from memory

Carregar as aplicações com o Windows 3.x

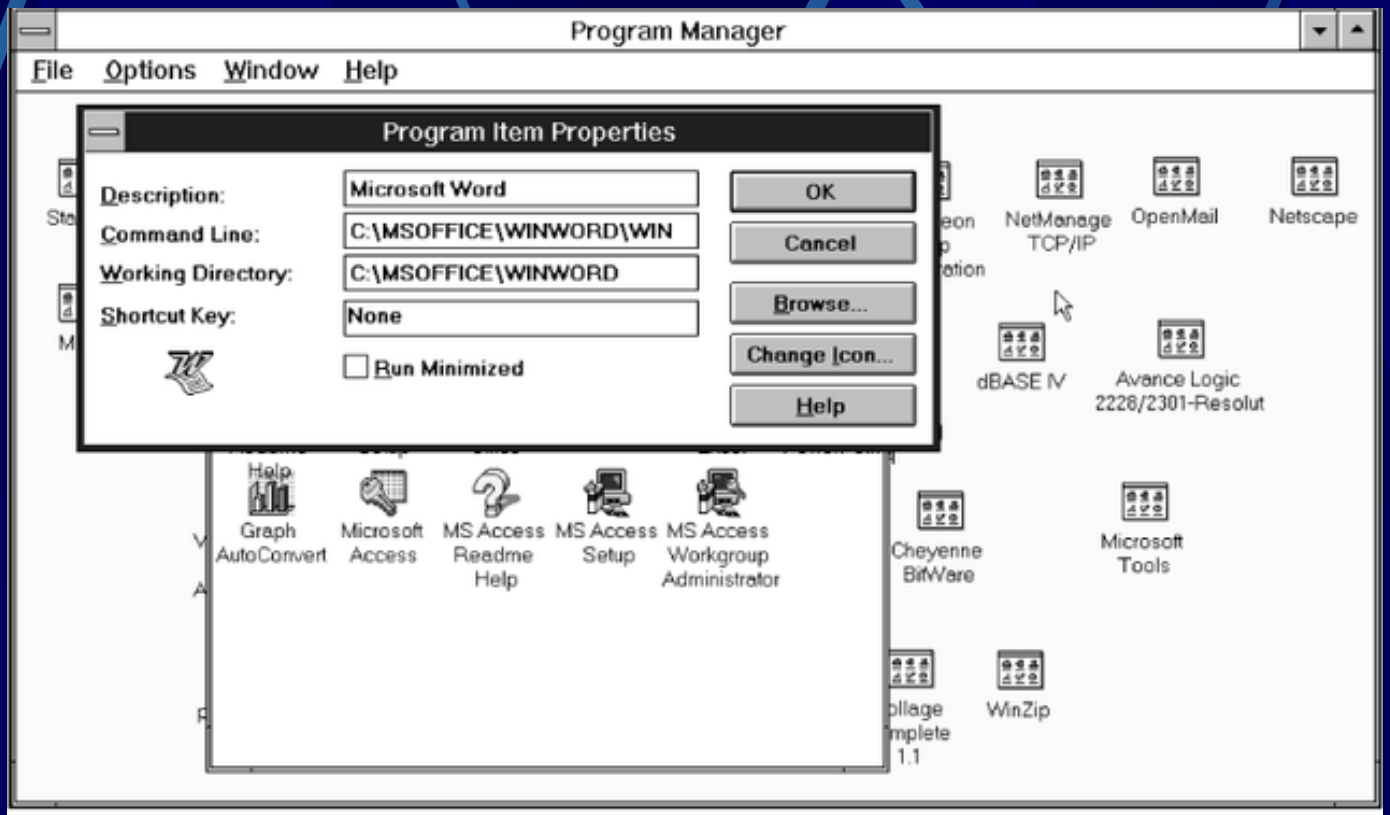

Figure 1-43 Properties of a program item in Windows 3.x

Carregar as aplicações com o Windows 3.x

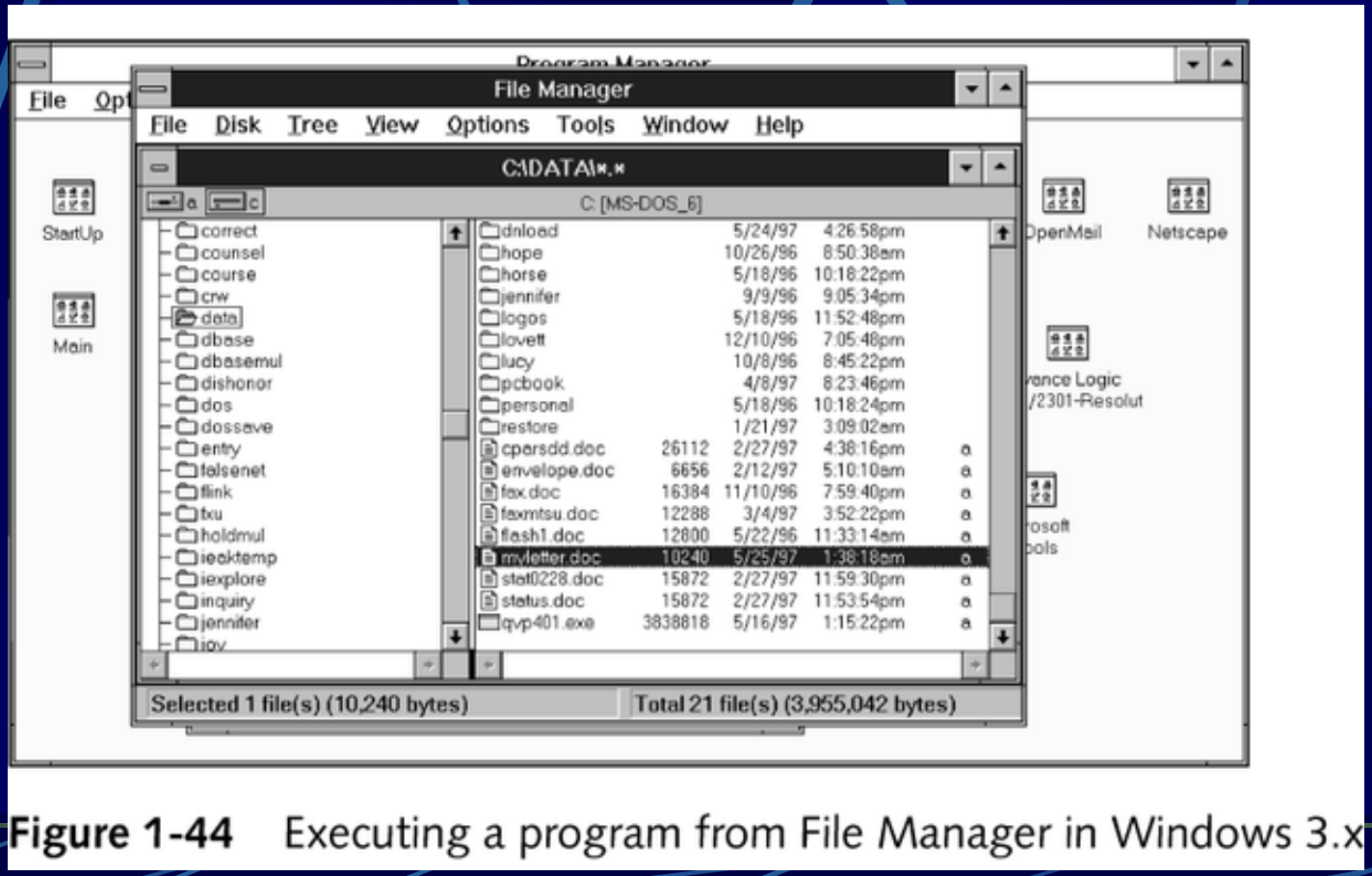

Figure 1-44 Executing a program from File Manager in Windows 3.x

Carregar as aplicações com o Windows 3.x

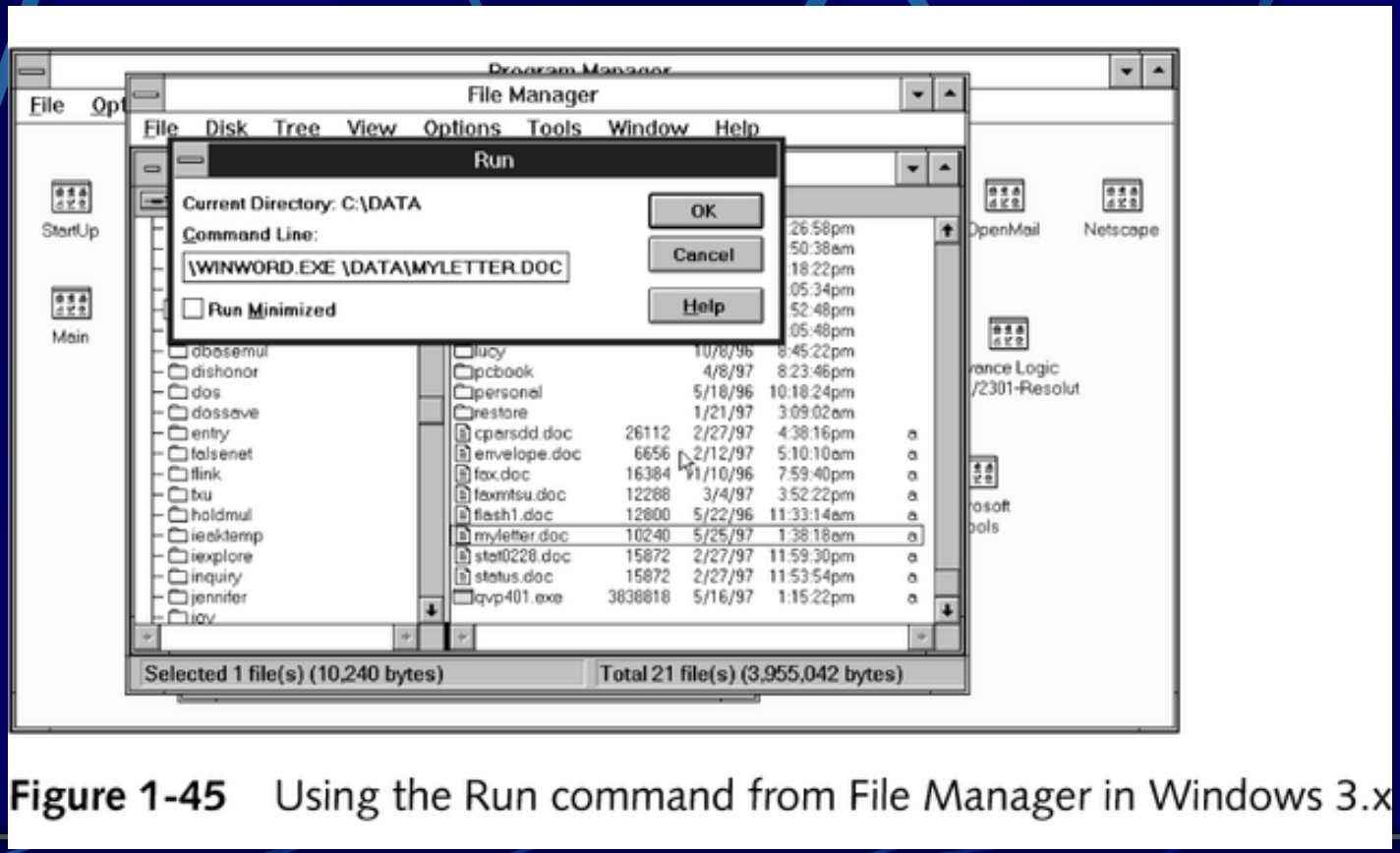

Figure 1-45 Using the Run command from File Manager in Windows 3.x