UNIT 1 Overview of computer

Lesson 1 Computers: getting started

1 What is a computer

1.1 Data and information

A computer is a machine whose function is to accept data and process them into information. Data are facts or observations, while information is the meaning we attribute to them.

Let us use an example to illustrate. A medieval astronomer, Tycho Brahe, spent his entire adult life observing and recording the positions of the planets. He collected data: on a given night, Mars occupied a given position in the sky. He recorded volumes of such data, but was never quite sure what they meant.

His successor, Johannes Kepler, sensed a pattern: the orbit of Mars resembled an ellipse. He spent much of his life processing Brane's data, performing tedious computations and reorganizing the observations in an attempt to verify that pattern. Eventually he succeeded, publishing his laws of planetary motion in 1621.

Kepler's laws represent information. Using them, he could understand and predict the motions of the planets. Scientists and engineers still rely on his laws to help plan space flights. Information has meaning.

Clearly, Kepler's laws were derived from Brahe's data, but the raw data were useless without processing. Until they were organized and the necessary calculations performed, the data were unstructured facts, with no clear meaning. Knowing the exact position of Mars on April , 1599, might earn an extra move in Trivial Pursuit, but, by itself, that fact is not very useful. Processing data extracts their meaning.

1.2 Data processing

A computer is a data processing machine. Data flow into the machine as input (Figure 1-1). Information flows from the machine as output. The computer processes the data. Johannes Kepler spent twenty years of his life processing data. Today, a college student using a computer can repeat his computations in a few hours.

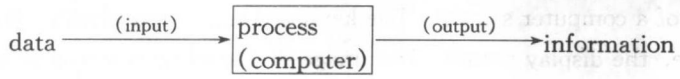

Figure 1-1 A computer is a machine that processes data into information. It accepts input data, processes these data, and generates information as output.

What do we mean when we say that a computer processes data? We process iron ore to make steel; we process wood pulp to make paper. "Process" implies that a change takes place, that the raw materials are in some way restructured or manipulated. Often, data processing involves filtering and summarizing data so that underlying patterns can be perceived. How does a computer process its data? What functions, what operations, can it perform? Generally, computers can add, subtract, multiply, divide, compare, copy, request input, and request output. So can most pocket calculators. What makes a computer different?

1.3 The stored program concept

To add two numbers on a calculator, you:

①Enter the first number;

②Press the add (+) button;

③Enter the second number;

④Press the result (=) button;

⑤Record the sum for future reference.

The calculator finds the sum, but you must provide control by deciding what button to push next. A calculator requires direct human intervention at each step.

A computer processes data automatically, without human intervention. Computers are not intelligent, however. They don't know when to add, or subtract, or compare, or request input. If a computer is to function without direct human control, it must be given a set of instructions to guide it, step by step, through a process. The set of instructions is called a program. The program is stored physically inside the machine, making it a stored program (Figure 1-2) . The stored program distinguishes a computer from a calculator and allows it to function without human intervention. Let's incorporate this idea into our definition:

Computer: A machine that processes data into information under the control of a stored program.

Figure 1-2 A computer processes data automatically under control of a stored program.

2 A computer system

A computer system consists of several basic components (Figure 1-3) . An input device provides data. The data are stored in memory, which also holds a program. Under control of that program the computer's processor manipulates the data, storing the results back into memory. Finally, the results flow from the computer to an output device. Additionally, most modern computers use secondary storage to extend memory capacity.

Let us think of a computer system. The keyboard is an input device. Above the keyboard is an output device, the display screen. The image displayed on a screen is temporary; a more permanent copy of the output can be obtained by sending it to a printer. The computer processor and main memory are located in the small cabinet near the center of the system. The

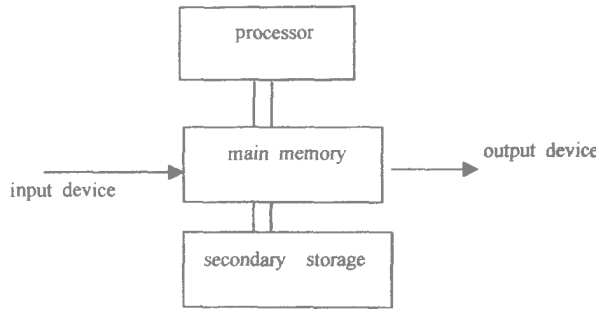

Figure. 1-3 A computer system consists of four basic components: an input device, an output device, main memory, and a processor. Secondary storage is often used to extend memory capacity.

diskette drives in the front of the cabinet extend the computer's memory; programs often enter the system through such secondary storage devices.

The basic building block of a modern computer is a chip, a complex, integrated electronic circuit etched on a tiny square of silicon no bigger than a fingernail. Since loose chips are fragile and difficult to handle, they are normally packaged and mounted on boards. A computer is assembled by sliding the appropriate boards into a cabinet. One board might hold the processor. Another might hold main memory, while a third might contain the electronics to link a particular input or output device to the system .

3 How a computer works

Let's use the system pictured in Figure 1-4 to illustrate how a typical computer works. A computer is controlled by a stored program; thus, the first step in using the machine is copying the program from diskette into memory. Now, the processor can begin executing instructions. Input data from the keyboard are stored in memory. The processor manipulates the data, storing the results back into memory. Finally, the results are output.

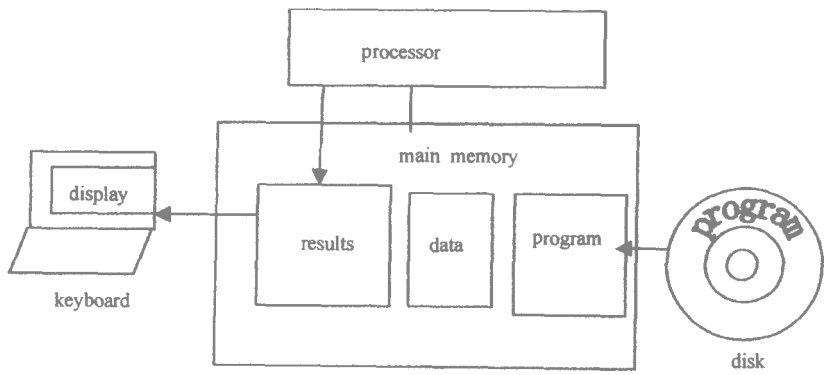

Figure 1-4 We'll use this diagram of a typical system to illustrate how a computer works.

Memory's contents are easy to change. Thus, when one set of data has been processed,

the program can be repeated, reading and processing new data, and generating new output. If the data can be changed, why not the program? When a program is finished, a new one can take its place in memory, allowing the computer to process completely different data. One-minute it can generate paychecks from labor data under control of a payroll program. The next minute, it can prepare bills from invoices under control of a billing program. Later, this same collection of components, controlled by yet another program, can read statistical data and produce a bar chart, or sense the movements of a joystick and manipulate the position of an imaginary spaceship on a display screen .

The physical components of a computer—the processor, memory, input devices, and output devices—are its hardware. You can see them, touch them, and feel them. Programs and data are different, existing only as electronic pulses stored in memory. Software is a general term for programs.

4 A plan of attack

At this point, you should have a basic sense of the functions of the processor, main memory, input devices, output devices, and secondary storage, and should know that a computer processes data into information under the control of a program. Over the next several chapters, we'll discuss each major component in more detail, beginning with the computer itself. Once we've covered the components, we'll consider how they are assembled to form complete computer systems. To help you check your understanding, each chapter ends with a brief self-test.

As you study the processor, or memory, or input devices, or software, don't lose sight of the fact that a computer is a collection of components, each of which must do its part. The basic purpose of this first chapter was to give you a high-level overview of a complete computer system. As you read the next several chapters, you will encounter a great deal of technical detail, and it's easy to "miss the forest for trees". As you read, use the material in this chapter as a framework.

New words

Johannes Kepler **约翰尼斯·开普勒(1571～1630)德国天文学家，他分析了第谷·布拉赫的观察资料，发现了行星沿椭圆轨道运行。**

filter	*n.v.*	**滤除,过滤**
illustrate	*vt.*	**举例说明，图解，阐明** *vi.***举例**
intervention	*n.*	**干涉**
invoice	*n.*	**发票,货物；***v.***开发票，开清单**
Mars	*n.*	**火星，战神** *abbr.*[军] Medium Artillery Rocket Launcher **，中型炮兵火箭发射器火星**

orbit	*n*.	轨道，眼眶；*vt*. 绕……轨道而行 *vi*. 进入轨道，沿轨道飞行
observation		观察，观测，观察资料（或报告）
paycheck		付薪水的支票，薪水
payroll		薪水册
perceive	*vt*.	察觉感知，感到，认识到
pulp		（水果的）果肉；*vt*. 使化成纸浆，除去……果肉；*vi*. 变成纸浆
resemble	*vt*.	像，类似
statistical	*adj*.	统计的，统计学的
silicon		[化]硅，硅元素
underlie	*vt*.	位于……之下，成为……的基础介入 分词 underlying(做)基础的
to attribute M to N		认为 M 由 N 引起
be derived from		来源于……产生于……
in an attempt to do		企图，极力要做
to etch on...		蚀刻在
to lose sight of		忽略，忘记

Exercises

Single choice

1. Unstructured facts ____.

A. information　　B. data

C. bytes　　D. processes

2. The meaning that human beings attribute to facts ____.

A. information　　B. data

C. knowledge　　D. structure

3. A computer processes ____ into ____.

A. information/data　　B. data/information

C. facts/data　　D. information/facts

4. Data flow into the computer as ____.

A. output　　B. a program

C. a process　　D. input

5. Information flows from a computer as ____.

A. output　　B. memory

C. a program　　D. input

6. The ____ distinguishes a computer from a calculator ____.

A. processor　　B. stored program

C. memory　　D. output

7. Data and program instructions are stored in ____.

A. the processor　　B. an output device

C. the stored　　D. processor

8. The computer component that actually manipulates the data is ____.

A. main memory　　B. an input device

C. the processor　　D. an output device

9. The basic building block of a modern computer is a ____.

A. chip　　B. tube

C. transistor　　D. switch

10. Chips are normally mounted on ____. Typically, each one contains the electronics for one of the computer's major components.

A. plates　　B. boards

C. cylinders　　D. carriers

11. The physical components of a computer are collectively called ____.

A. peripherals　　B. software

C. boards　　D. hardware

12. Programs are known collectively as ____.

A. secondary storage　　B. software

C. stored programs　　D. hardware

参考译文

计算机入门

1　什么是计算机

1.1　数据和信息

计算机是一种能接收数据并把它处理成信息的机器。数据是事实或观察的结果。而信息是人们对数据进行解释所得到的某种意义。

举例说明，一个中世纪的天文学家，名叫第谷·布拉赫，他花了毕生的精力观察和记录行星的位置，他搜集有关某夜火星在太空中某个确定位置的数据，并把这些数据记录在册。但

是，他从来不十分明确这些数据意味着什么。他的继承人约翰尼斯·开普勒设想了一个模型：火星的轨迹类似于一个椭圆。他用一生的大部分时间去处理布拉赫留下来的数据，完成冗长的计算，重新组织观察结果，试图证实他的设想。他终于成功了，在 1621 年发表了他的行星运动定律。

开普勒定律意味着信息。用这些信息，他能知道并预算行星的运动情况。科学家和工程师们仍在依靠他的定律去筹划太空飞行。信息是有意义的。

显然，开普勒定律是从布拉赫的数据中得到的。但是未经处理的原始数据是没用的，数据在未经组织和完成必要的计算以前，是无结构的事实，意思是不清楚的。知道了 1599 年 4 月 1 日火星确切位置的事实，在 Trivial Pursuit 研究院引起了特别大的震动。但是，这件事本身不是十分有用，重要的是通过处理数据而引出数据的含义。

1.2 数据处理

图 1-1 计算机是处理数据成为信息。它接受输入数据，处理这些数据，并产生信息作为输出的机器。

计算机是处理数据的机器。数据流入机器称为输入(图 1-1)，信息从机器流出称为输出。计算机能处理数据。开普勒花费了一生中的二十年时间所处理的数据，如今一个使用计算机的大学生仅用几个小时就能把他所做的全部计算重做一遍。

当我们说计算机处理数据的时候，意思是什么呢？我们把铁矿石处理成钢，把木浆处理成纸。处理意味着发生了变化，用某种方法把原材料重新构成或加工。通常，数据处理包含过滤和综合数据，以便看出数据的基础结构。计算机如何处理数据呢？能完成什么功能，什么操作呢？通常，计算机能做加、减、乘、除、比较、复制、请求输入和请求输出等操作。大多数袖珍计算器也能做到这些。那么又是什么使得计算机与计算器不同呢？

1.3 存储程序概念

在计算器上把两个数值相加，要做以下操作：①键入第一个数；②按加法按钮；③键入第二个数；④按结果(=)按钮；⑤把和数记录下来，为以后参考用。

虽然计算器可求和数，但由人提供控制，即决定下步该按哪个按钮。计算器要求每一步操作由人直接干预。计算机不需要人干预而能够自动处理数据。然而，计算机不是智能的，它不知道何时做加法，何时做减法，何时做比较或要求输入。如果一台计算机能在无人直接控制下运行，那么就必须给一组指令去引导它，使之逐步地通过一个处理过程，这组指令称为程序。程序实际上存放在机器内部，作为存储程序(图 1-2)。存储程序把计算机和计算器区别开来，使计算机在无人直接干预下工作，让我们把这个思想结合到上节的定义中去：

图 1-2 在储存程序控制下，计算机可以自动处理数据

计算机是在存储程序控制下把数据处理成信息的机器。

2 计算机系统

计算机是由若干个基本部件组成(图 1-3)。输入设备提供数据；数据存放在存储器内，

存储器内还保存程序；在该程序的控制下计算机的处理器处理数据，把结果再存在存储器内；最后，结果从计算机送入输出设备。另外，大多数现代计算机采用辅助存储器，去扩展存储器的容量。

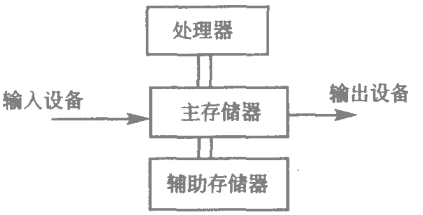

图 1-3 计算机系统是由四个基本组件组成,输入,输出,存储和处理器,辅助存储器被用来扩展内存的容量。

让我们设想一个计算机系统。键盘是输入设备，在键盘的上面是输出设备——显示器。显示在屏幕上的图像是暂时的，一个可长期存放的拷贝可通过把图像送到打印机而得到。计算机的处理器和主存储器安装在靠近系统中央的小机柜内。机柜前面的驱动器可扩展计算机的存储器。通常，程序经过这些存储设备进入系统。

构成现代计算机的基本器件是芯片。一个复杂的集成电子线路蚀刻在一个比指甲还小的小正方形上。由于这些散装的芯片易碎，而且难以经营，通常把它们封装起来，安装在一块印刷电路板上。通过把适当的电路板滑动插入机柜，就构成了一台计算机。一块板可安放处理器，另一块板可以安放主存储器，而第三块板可包含一些把专用的输入输出设备联入系统的电子线路。

3 计算机是如何工作的

让我们用图 1-4 中所示的系统来说明一个常用计算机是如何工作的。计算机是受存储程序控制的，因此使用计算机的第一步是把程序从软盘上拷贝到内存中；现在处理器能开始执行指令了,从键盘输入的数据也被存在了主存中 处理器加工数据,把结果送回主存 最后输出结果。

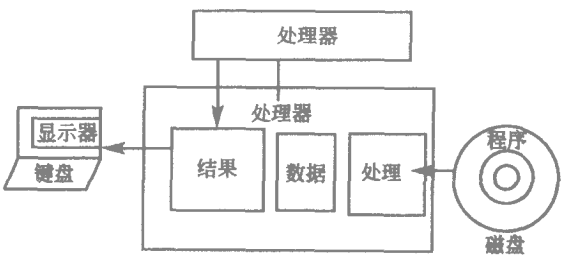

图 1-4 我们用这个类型的图去解释计算机是怎样工作的。

主存中的内存经常改变。当一组数据已被处理完后，而程序还可重复使用，再读入和处理新的数据，并得到新的结果。如果数据能改变，当然程序也能改变了。当一个程序运行完后，另一个新的程序就占据了它在主存中的位置，让计算机去处理完全不同的数据。某一时刻计算机能在工资管理程序的控制下，由劳动者的数据产生工资单。那么下一时刻该计算机又能在账目管理程序的控制下，从各种数据中产生所需账单。以后，仍是这台计算机，还可在其他程序控制下,读入统计数据,产生一个直方图,或者指示操纵杆的运动方向,操控一个假想的宇宙飞船在屏幕上的位置。

计算机的物理部件——处理器、存储器、输入设备和输出设备是它的硬件。人们能看到它们，感觉到它们的存在。程序和数据则不同，它们仅作为电脉冲存在于存储器中。软件是

程序的常用术语。

4 学习内容安排

在本章中读者应对处理器、主存储器、输入输出设备和辅助存储器有个基本了解，还应该知道在存储程序的控制下把数据处理成信息。在以下几章中，要较详细地讨论计算机本身的主要部件。讨论完所有的部件后，还要考虑如何把这些部件安装在一起，形成一个完整的计算机系统。为了帮助读者检查理解的情况，每章的结束都有一个简短的自我测试。

当读者学习处理器、存储器、输入设备或软件等的时候，不要忘了计算机是这些部件的集成，计算机的每一个部件必须做它自己那部分工作。第一单元的基本目的是给读者一个高层次的计算机系统的概观。当读者读以下几单元的时候，会遇到大量的技术细节，容易使读者“见木不见林”,请读者学习时把本章中的内容作为主框架。

参考答案

1. B 2. A 3. B 4. D 5. A 6. B 7. D 8. C 9. A 10. B 11. D 12. B

Lesson 1 Operating system

1 Introduction to operating system

A computer works under the control of both hardware and software system. In last chapter, we have just explained the hardware structure and its working principle. Here we'll focus on software system. The software system consists of system software and application software. System software is the collection of programs and related data, and it manages, supervises and maintains the computer resources to ensure the proper operations. Study on system software mainly deals with operating system and programming language. Application software is designed for specific tasks or needs of user. Some of the most commonly used application packages are word – processing software, electronic spreadsheet software, computer graphics software, and database software etc.

Operating system is the collection of program modules that control and manage the hardware and software resources of the computer system, thus enable us to run application programs, on which the computer depends to execute specific tasks. Computer can not transfer from one application programs to another automatically. Operating system takes control of the arrangement for application programs through its functions of allocating system resources, including the CPU, main memory, the input and output devices. It acts as the interface between the computer devices, application system and the user(see Figure 2-1) . Being a type of programs, operating system is stored on disk. For a computer to operate, the programs of the system software must be loaded and stored in the main memory. This process of loading an operating system into main

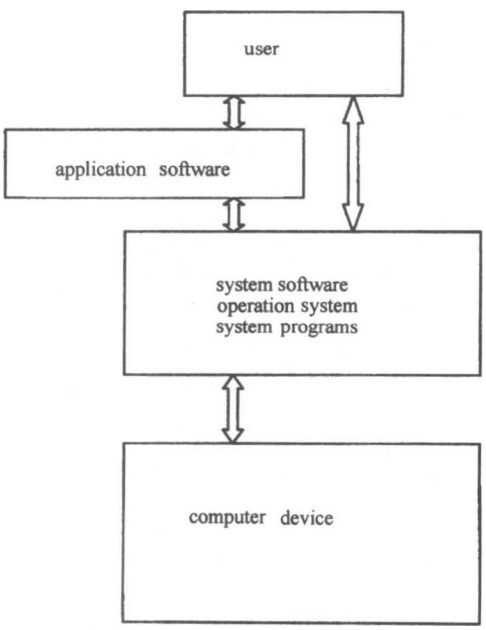

Figure 2-1 Operating system acts as interface between users, devices and application programs.

memory is called booting system. Boot is actually a special program, which is stored in the first sector of a disk. When the computer is turned on, it automatically reads the boot programs, then reads the rest of operating system with the help of the instructions contained in the boot routine.

2 Basic functions of operating system

Operating systems are normally unique to different brand of computers. For example, the UNIX system was developed by the AT&T Company, while the DOS purchased, the corresponding operating system matching the hardware is installed. Although operating systems are unique to different computer manufactures, they must obey some specific standards which allows computers to provide the same basic functions, like job management, resource management, control of I/O operations, error recovery and memory management. Here in the following, we will discuss three of the main functions.

2.1 I/O management

Most operating systems have a set of standard control instructions to handle the processing of data input and output. These standard instructions are generally defined as input/output control system (IOCS). It's this system that take responsibility for the flow in and out of data from the related devices. When inputting data, the I/O manager interprets the code and ushers the signals to the assigned location of memory. In addition, the I/O manager can recognize the right sequence of codes needed to send the data to the requested disk drive and controls the location on the disk where the data will be stored. I/O manager also generates out displays on the screen, and route data to the printer.

2.2 Resource management

Operation software monitors the execution of all programs as well as the concerned devices. Computer operating system will automatically establish a table that allocates the devices matched against the programs currently used, or will be used, still the problem of how long. In this way, operating system accomplishes its functions of resources management including the CPU, main memory, the input and output devices etc.

2.3 Job management

A very important responsibility of any operational software is the scheduling of jobs to be handled by a computer system. This is one of the main tasks of the job management function. The operating system sets up the orders in which programs are processed, and defines the sequncnce in which particular jobs are executed. The term job queue is often used to describe the series of jobs awaiting execution. The operating system weighs a variety of factors in crating the job queue. These include which jobs are currently being processed, the system's resources being used, which resources will be needed to handle upcoming programs, the priority of the job compared to other tasks, and any special processing requirements to which the system must respond. The operational software must be able to access these factors and control the order in

which jobs are processed.

3 Utilities

Utilities are another important operating system program that can be run to perform disk maintenance . One of these is the FORMAT utility that prepares a new disk, check disk errors, sort a disk directory, or create a RAM disk in the computers memory. Utilities reside on the DOS disk rather than in memory but are activated in the same manner as other DOS commands. An editor is a utility program that allows users to make direct changes to programs and data. A programmer can use an editor to change a program instruction that was incorrect or needs to modified.

4 Operating system software introduction

Here we give a few words on the major operating system software. MS－DOS is probably the best－known microcomputer operating system. Microsoft Corporation developed it for the IBM－PC and compatible machines. MS－DOS is composed of three primary modules: COMMAND. COM, MSDOS. SYS and IO. SYS. It has become an industry standard, for large amount of personal computer software have been developed for MS－DOS. In addition, there are such popular operating systems as UNIX and OS/2. UNIX is one of the most well－known multi－tasking operating systems originally for minicomputers. Now it is available for personal computers, particularly for portable computers. OS/2 was also a multiprogramming system developed by Microsoft Corporation for IBM. It allows to run larger and more complex programs. It supports up to 12 programs running at the same time.

5 The development of computer system

Initially, there was only computer hardware. Early computers were physically very large machines run from a console. The programmer would write a program and then operate the program directly from the operator's console. First, the program would be manually loaded into memory, from either paper tape, or cards or the front panel switches. Then the appropriate buttons would be pushed to load the starting address and to start the execution of the program. As the program ran, the programmer or operator could monitor its execution by the display lights on the console. If errors developed, the programmer could halt the program, examine memory and register contents, and debug the program directly from the console. Output was printed, or punched onto paper tapes or cards for later printing.

As time went on, additional software and hardware were developed. Assemblers, loaders and linkers were designed to ease the programming task. Varieties of functions were created. Common functions, once written in assembly language, could then be copied into a new program without having to be written again.

Multiprogram is an attempt to increase CPU utilization by always having assignments for

the CPU to execute. Thus multiprogramming requires several programs to reside in memory at the same time. The idea is as follows: the operating system picks one of the jobs residing in memory and begins to execute it. Eventually, it may have to wait for something, such as a tape to be mounted, a command to be typed on a keyboard, or an I/O operation to complete. In a multiprogramming system, the CPU would sit idle. In a multiprogramming system, the operating system will simply switch to another job and execute it and so on. Eventually, the first job will be finished waiting and will get the CPU back. As long as there is always some job to do, the CPU will never be idle.

There are some difficulties with a batch system from the point view of the user, however. Since the user cannot interact with the job, he must set up the control cards to handle any possible outcome. In a multistep job, subsequent steps may depend upon the result of earlier ones. The running of a program, for example, may depend upon its successful completion. It can be difficult to define completely what to do in all cases.

By combining interactive computing with multiprogramming, some people defined time – sharing. A time – sharing operating system uses CPU scheduling and multiprogramming to provide economical interactive use of a system. Each user has a separate program in memory. The CPU is switched rapidly from one user to the next, giving each user only a little CPU time. Each user has an impression that he has his own computer, while it is actually one computer shared among many users.

The idea of time – sharing was demonstrated as early as 1960s, but since time – shared systems are more difficult and expensive to build, they did not become common until the early 1970s.

Today most systems provide both batch processing and time – sharing, though their basic design and use tend to one or the other.

Still, another form of operating system is the real – time system. A real – time system is often used as a control device in a dedicated application. Sensors bring data to the computer. The computer analyzes the data and possibly adjusts controls to modify the sensor inputs. Systems that control scientific experiments, medical computer systems, industrial control systems and some display systems are real – time systems. A real – time operating system has well – defined fixed time constraints. Processing must be done within the defined constraints or the system will fail. Compare this requirement to a time – sharing system where it is desirable (but not mandatory) to respond quickly, or to a batch system where there may be no time constraint at all.

Finally, there have been attempts to create multiprocessor computer systems. The standard system is uniprocessor; that is, it has one main CPU. A true multiprocessor system would have more than one CPU, sharing memory and peripherals. The obvious advantages would been greater computing power and reliability. However, it is not yet known how to create a completely general multiprocessor operating systems. More commonly one of the following two vari-

eties is used. First, several systems have been created with multiple processors. Each processor is assigned some specific duty. A master processor controls the system, the other processor either look to the master for instruction or have predefined tasks. This scheme defines a master/slave relationship. The second fairly common multiple processor system is a compute network. In a network, multiple independent computer systems can communicate to send files and information between them. However, each computer has its own operating system and operates independently. Computer networks allow new possibilities in distributed processing.

New words

module		模数，模块，登月舱
manager	*n*.	管理器经理，管理人员
multitasking		多(重)任务处理
loader	*n*.	加载器,装货的人,装货设备
subsequent	*adj*.	后来的,并发的,后续的
real-time	*adj*.	实时的
routine	*n*.	程序,例行公事,常规,日常事务
console	*n*.	[计]控制台 *vt*. 安慰,藉慰
assembler	*n*.	汇编程序
linker	*n*.	[计](目标代码)连接器
boot	*n*.	引导
allocate	*vt*.	分派，分配
conduct	*n*.	行为，操行；*v*. 引导,传导
restricted	*adj*.	受限制的，有限的
chiefly	*adv*.	首要，主要地
react	*vi*.	起反应，起作用
possess	*vt*.	占有,拥有,持有,摆布，支配

Exercises

I. True/False

1. An operating system consists of programs and devices. ( )
2. The operating is responsible for system integrity. ( )
3. The whole operating system is always in memory when the computer is running. ( )
4. The operating system needn't to present each user with an interface. ( )
5. UNIX has graphical interface. ( )
6. An operating system is usually written by programmer. ( )

7. The operating system may be stored in ROM. ( )

8. The computer must use the special OS after it is manufactured in general. ( )

9. The boot loads the rest of the operating system into memory in floppy based system. ( )

10. If an OS is real-time system, it can't be multi-processor system. ( )

II. Single choice

1. In ____ based system, the operating system is always in memory.

A. floppy B. CLI

C. RAM D. ROM

2. To make operating system easier to write, they are constructed as series of ____.

A. kernel B. module

C. track D. document

3. The boot is a ____ in the diskette.

A. interpreter B. category

C. routine D. interface

4. In various operating systems, ____ allowed only one program to run at a time.

A. multi－tasking B. real－time

C. batch D. time－sharing

5. In floppy based system , the boot is normally located on the first ____.

A. shell B. sector

C. utility D. entry

参考译文

操作系统

1 操作系统介绍

计算机是在硬件和软件系统的控制下工作的。上一章我们阐述了硬件结构和它们的工作原理。本章将重点讲述软件系统。

软件系统主要包括系统软件和应用软件。系统软件是程序和相关数据的集合，它管理、监控和维护计算机系统资源，保障计算机的正常操作。对系统软件的研究主要集中在操作系统和程序语言上。应用软件是为特定任务和需要设计的。一些常用的应用软件有字处理软件、电子表格软件、计算机图形软件和数据库软件等。

操作系统是由控制和管理计算机系统硬件和软件资源的程序模块组成的。操作系统

使我们能够运行应用程序，而计算机需要依靠这些应用程序来完成特定的任务。计算机不能够自动地从一个应用程序转移到另一个上。操作系统是通过它配置系统资源（包括CPU、主存、输入、输出设备等）的功能来控制应用程序运行的。操作系统充当了用户、计算机设备和应用系统间的界面（见图 2-1）。作为一种程序，操作系统储存在磁盘上（如图 2-1）。要运行计算机，必须先把系统软件安装并存储在主存中。安装系统软件到主存的过程叫做引导系统。引导实际是一种特殊的程序，它储存在磁盘的第一个扇区内。当启动计算机后，它自动地读引导程序，然后在引导程序中指令的帮助下读操作系统的其余部分。

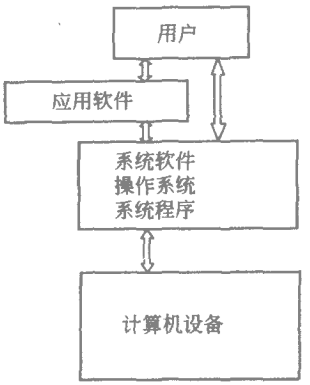

图 2-1　操作系统作为用户、设备和应用程序的接口

2　操作系统的基本功能

不同品牌计算机上操作系统通常是不一样的，例如，UNIX 系统是 AT&T 公司开发的，而 DOS 系列是微软公司的著名产品。当计算机被购买时，同硬件兼容的操作系统就被安装上。尽管操作系统对于不同的计算机制造商是惟一的，他们在生产时都必须遵守一些特定的标准，这些标准使计算机都具有一些基本的功能，如输入／输出操作、错误恢复、存储管理等。下面将介绍操作系统的三个基本功能。

2.1　I/O 操作控制

所有的操作系统都有一套标准的控制指令来处理数据的输入和输出操作。这些标准的指令通常被定义为 I/O 控制系统（IOCS）。它负责数据从相关设备的输入和输出。在输入数据时，I/O 管理器翻译代码并把信号传送到内存中指定的位置。此外，I/O 管理器能识别把数据传送到指定磁盘驱动器的正确代码顺序，并能控制将数据存储在低位位置。I/O 管理器也能在屏幕上产生显示和把数据引导到打印机。

2.2　资源管理

操作软件监控所有程序和有关设备的操作。计算机操作系统将自动建立一张表，在表中标注程序与其正在使用或将要使用的设备相匹配以及使用多久，操作系统通过检查该表允许或拒绝使用某一设备。通过这种方式，操作系统实现对 CPU、主存、I/O 设备等资源的管理功能。

2.3　作业管理

操作软件的一个非常重要的职责就是对计算机系统将处理的作业进行调度，这是作业管理功能的主要任务之一。操作系统建立了程序处理顺序，并定义了具体作业执行的次序。术语“作业队列”常用于描述等待执行的作业序列。操作系统在排队时权衡各方面因素，它们包括当前正在处理的作业、正在使用的系统资源、处理后面的程序所需要资源、与其他任务相比该项作业的优先级及系统必须响应的任何特殊处理要求。操作系统应能评估这些因

素并控制处理的顺序。

3 实用程序

实用程序是另一个重要的操作系统程序，它可以执行磁盘维护。其中之一就是 FOR-MAT 实用程序,它可以制作新磁盘,检查磁盘错误,划分磁盘目录或在计算机存储器中创建 RAM 区。实用程序常驻在 DOS 盘上，而不是存储器上，但它和其他的 DOS 命令一样运行。编辑器是一个实用程序，它允许用户直接修改程序和数据，程序员可以通过编辑器修改错误和需要更改的程序指令。

4 操作系统软件介绍

现简单介绍一下主要的操作系统软件。 MS-DOS 也许是最有名的微型计算机操作系统了。微软公司开发 MS-DOS 系统来支持 IBM 个人电脑及其兼容机。MS-DOS 由三个主要模块构成:COMMAND.COM、MSDOS.SYS和 IO.SYS。它已经成为行业标准，因为大量的个人电脑软件都是在 MS-DOS 的基础上开发的。此外，还有 UNIX 和 OS/2 系统。UNIX 是多任务操作系统之一，最初用于小型机上，现在已广泛用于个人电脑。 OS/2 也是微软公司为 IBM 机开发的多任务操作系统。它允许运行更大、更复杂的程序，支持同时运行 12 个程序。

5 计算机系统的发展

最初只有计算机硬件。早期的计算机都是直接通过控制台操作的庞然大物。程序员编写一个程序,在控制台上直接运行该程序。首先,程序被人工地通过纸带、卡片、前板开关等装入存储器，然后按下相应的按钮装载启始位置，开始执行程序。随着程序的运行，程序员或监控员通过控制台上的显示灯监控它的运行。如果产生错误，程序员就会终止程序，检查存储器和寄存器内容，通过控制板直接调试程序。输出被打印在纸带或卡片上以便以后打印出来。

随着时间流逝，更多的软件和硬件产生了。汇编器、加载器和连接器被设计出来，简化了程序任务。不同的功能也被开发出来。普通的功能，一旦用汇编语言写出就能够被拷进新程序中，而用不着再次编写。

多道程序是通过让 CPU 始终执行操作任务的方式来提高使用率的一种尝试。因此，多道程序设计要求几个程序同时存储在存储器中。其思路如下：操作系统从主存中读取一个操作任务然后开始执行，最终它也许不得不进行等待，例如等待安装磁带、用键盘输入命令或完成一个 I/O 操作等。在一个非多道任务程序中，CPU 将无所事事。而在一个多任务程序中,操作系统将转移到另外一个任务并执行操作,第一个任务完成等待并交回 CPU。只要始终保持有工作做，CPU 就不会闲着。

从用户的角度来理解批处理系统是比较困难的。既然用户不能进行交互作业，他就必须设立控制卡来处理任何可能的结果。在一个多级作业中，后面的步骤也依赖于前面步骤的结果。例如，一个程序的运行可能就取决于该程序的成功结束。很难完全阐述清楚在各种情况下该做什么。