【内容提要】本书是为大学本科计算机英语课程而编写的教材。主要目的是使学生通过计算机英语的学习，既掌握一定的专业术语，又能提高英语的说、读、写、译的能力，从而能更好的适应信息社会对计算机人才的要求。本书分为学习篇、实践篇、技巧篇、点睛篇、课外篇和工具篇等 6 部分。

本书既可作为高等院校教材使用，也可作为大中专院校、培训班和有一定计算机英语基础的读者参考使用。

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前 言

本书既适合高职高专的计算机专业或相关专业的学生使用，同时也便于有一定计算机基础的自学者参考学习。

本书主要分为六部分：学习篇、实践篇、技巧篇、点睛篇、课外篇和工具篇。

一、学习篇

秉承循序渐进的思想，在学习篇中，通过五个阶段的学习，使学生逐步掌握计算机专业英语的基础知识。

在入门阶段，通过图文并茂的形式，使学生对最熟悉的计算机组成有一个感性认识，从而为以后的计算机英语学习奠定基础。

在基础、提高和能力阶段，难度系数逐渐加大，从而使学生逐步摆脱译文这个拐杖。

在测试阶段，通过不同形式的练习，使学生能巩固所学到的知识。

二、实践篇

学以致用是本书的最大特色，在实践篇中，根据目前计算机技术的发展，设置了不同的专题，以满足计算机英语应用的需要。

三、技巧篇

在技巧篇中，从口语、写作、翻译和应试几个方面来提高学生的英语技巧，从而有助于计算机英语的学习。

四、点睛篇

在点睛篇中，对计算机各个领域的关键术语和句型进行总结，使学生对计算机英语有一个系统而全面的掌握。

五、课外篇

在课外篇中，选取了一些课外阅读篇章，可供学生在课外进行阅读。

六、工具篇

工具篇提供了常用计算机术语解释，以供学生在学习过程中随时进行查阅。

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学 习 篇

本篇共分为入门、基础、提高、能力和测试 5 **部分。**

★ **入门部分主要介绍计算机各部件的英文名称**

★ **基础部分包括** Lesson 1～Lesson 6**，主要介绍计算机的基本概要**

★ **提高部分包括** Lesson 7～Lesson 12**，主要介绍计算机的基本应用**

★ **能力部分包括** Lesson 13～Lesson 20**，主要介绍计算机的高级应用**

★ **测试部分主要针对前面介绍的知识进行练习**

English Name of Every Part of the Computer

Desktop Computer（台式计算机）

Laptop Computer（膝上型计算机）

Tablet PC（平板电脑）

PDA（个人数字助理）

Mouse（鼠标）

Keyboard（键盘）

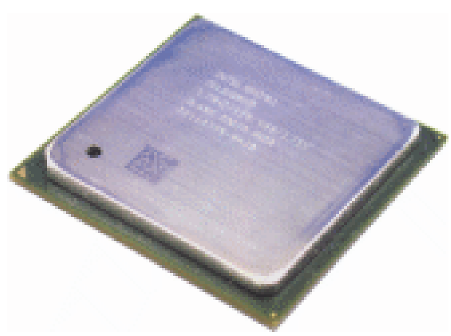
Case（机箱）

Monitor（显示器）

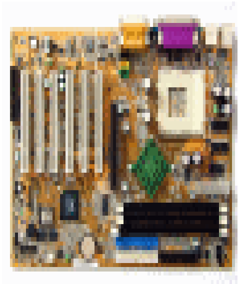
Hard Drive（硬盘驱动器）

Floppy Drive（软驱）

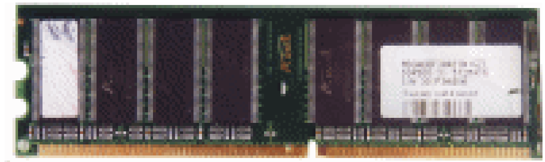
DVD-ROM（DVD 光驱）



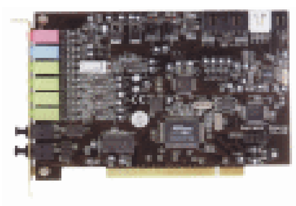
CPU（Central Processing Unit）



Motherboard（主板）



Memory（内存）



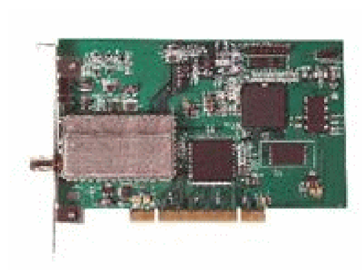
Sound Card（声卡）

Video Card（显卡）

CD-RW Burner（刻录机）

Laser Printer（激光打印机）

Inkjet Printer（喷墨打印机）



Modem（调制解调器）

Bridge（**网桥**）

Network Adapter（**网络适配器**）

Digital Camera（**数码相机**）

USB Flash Drive（U **盘**）

Lesson 1　Introduction to Computers

Text

How the Computer Computes

At its simplest, a computer is a device that manipulates information, sometimes also called "data". Information can and does take many forms. You can see these different forms every time you use your computer. The signals from the keys you press on your keyboard, the files you load on your hard disk[1] — all are different types of information that your computer manipulates.

1. Digital and Analog Information

There are two ways to represent information. Information that is continuous, that is, any piece of information that can take on[2] any of an infinite set of values, is said to be analog. For example, the time, the temperature, the speed of your car — all of these have a continuous range of values. While you say, for example, that it is 55 degrees outside, it could really be 55.12492 degrees, or any value between that and 55.

Digital information is restricted to a finite set of values. For example, a traffic light[3] is normally red, yellow or green; not "yellow-green" or orange. Computers use a form of digital information called binary information. Here, the information is restricted to only two values: one or zero. Computers use binary information for several reasons:

Simplicity: It is the simplest, most compact and least ambiguous way to express information about something: for example, zero=off and one=on could be used to represent the status of a regular light bulb[4].

Expandability: It is easy to build on and expand: you can use two binary values together to represent the status of two light bulbs.

Clarity: Errors are reduced when a value can only be one or zero; the computer knows there are no values in between, which is useful when electrical signals become "dirty[5]". If a 0.95 value shows up on your modem line, the computer knows it is probably really a 1, since 0.95 isn't a valid value. It will interpret the 0.95 as a 1, and no data will be lost as a result.

Speed: Computers make millions of decisions a second, and these decisions are easier to make when the number of values is small.

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1 hard disk **硬盘**
2 take on **呈现**
3 traffic light **红绿灯**
4 light bulb **电灯泡**
5 dirty **本义是“脏的”，这里的含义是“包含无效数据”**

Digital information is often represented only in binary form, but does not have to be. A good example is compact disc digital audio system[1], where sound information is stored as digital samples. The advantage of digital sampling is that the information is the same every time it is read, so there is no “loss” in quality over time as found in magnetic analog storage media.

2. The Mathematics of Computing

Humans represent numbers using decimal notation[2]: that is, each digit can have one of ten values, zero through nine. Binary information uses only ones and zeros of course. Just as with regular numbers you start at 0, count to 9, and then reset the 9 to a 0 and add a 1 in the “tens” place, with binary information you start at 0, count to 1, then reset the 1 to a 0 and add a 1 in the “twos” place. So binary counting goes like this: 0, 1, 10, 11, 100, 101, 110, 111, 1000, etc. Each digit in a binary number is a bit[3], which is a contraction of “binary digit”.

The number 111 is the binary equivalent of the decimal number 7. How? Just as 111 in decimal means 100 (10 to the second power) plus 10 (10 to the first power) plus 1, in binary 111 is 4 (2 to the second power) plus 2 (2 to the first power) plus 1, which is 7. As you can see, binary numbers can get pretty long. For example, the number 181 in decimal is 10110101 in binary. This can get quite cumbersome, and large numbers are often represented using 32, 64 or even more bits.

A shorthand for binary numbers is hexadecimal notation[4]. Each digit can take on any value from 0 to 15. Since 16 is 2 to the fourth power, four bits can take on a value from 0 to 15. This means 4 binary digits can be replaced by one equivalent hexadecimal digit. So 10110101 in binary can be broken into two 4-bit pairs, 1011 and 0101. These taken individually are 11 and 5, so 10110101 in binary is (11)5 in hexadecimal notation.

You can see the problem here of course: we only have 10 different symbols to represent numbers in our language, but hexadecimal requires 16! Having to use (11) in a single digit place is confusing. To get around this, hexadecimal numbers use the letters A through F to represent 10 through 15 (0 to 9 are of course represented by 0 to 9). So instead of saying (11)5, we say the decimal number 181 is “B5” in hexadecimal notation (or hex for short).

It can sometimes be hard to tell if a number is decimal or hexadecimal just by looking at it: if you just see “44”, does that mean 44 (“44” in decimal) or 68 (“44” in hexadecimal)? To get around this problem, two common notations are used to indicate hexadecimal numbers. The first is the suffix of a lower-case[5] “h”. The second is the prefix of “0x”. So “B5 in hexadecimal”, “B5h” and “0xB5” all mean the same thing (as does the somewhat redundant “0xB5h”). A set of eight bits, or two hexadecimal digits, is called a byte[6]. “B5h” is one byte of information. Bytes are commonly used when talking about how much information something can hold, because in most cases one byte is one character. Each character you read on this screen

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[1] compact disc digital audio system **小型光盘数字音响系统**
[2] decimal notation **十进(位记数)法**
[3] bit **位，比特**
[4] hexadecimal notation **十六进（位记数）法**
[5] lower-case **小写**
[6] byte **字节**

is represented by one byte (in most cases), as part of the ASCII[1] character set[2].

Computer addresses are commonly expressed in hexadecimal notation. For example, the I/O port address commonly used by the computer to talk to your printer is address 378h. Note how the "h" helps you realize this is a hex number and not the decimal number "378".

【Exercises】

Write T (true) or F (false) for each statement.

1．Digital information is restricted to a finite set of values, such as the temperature and the time.

2．If a 0.9 value shows up on your modem line, the computer will interpret the 0.9 as a 1.

3．The number 1111 is the binary equivalent of the decimal number 15.

4．"C6h" is one byte of information.

【Vocabularies】

manipulate[mə'nipjuleit]	***v.*操作，使用**
digital['didʒitl]	***a.*数字的**
analog['ænəlɔg]	***a.*模拟的**
continuous[kən'tinjuəs]	***a.*连续的**
binary['bainəri]	***a.*二进制的**
simplicity[sim'plisiti]	***n.*简单**
compact['kɔmpækt]	***a.*紧凑的，紧密的**
ambiguous[ˌæm'bigjuəs]	***a.*不明确的**
clarity['klæriti]	***n.*明确性**
sampling['sɑːmpliŋ]	***n.*采样，取样**
contraction[kən'trækʃən]	***n.*缩略词**
equivalent[i'kwivələnt]	***n.*等值，相等物**
cumbersome['kʌmbəsəm]	***a.*麻烦的**
suffix['sʌfiks]	***n.*后缀**
prefix['priːfiks]	***n.*前缀**
redundant[ri'dʌndənt]	***a.*多余的，冗余的**

[1] ASCII (American Standard Code for Information Interchange) **美国信息交换标准码**

[2] character set **字符集**

Reading Materials

PDAs[1]

Overview

In the 1980s no-one who was anyone went anywhere without their Filofax[2]. By the end of the 1990s it had been replaced by its digital equivalent — the Personal Digital Assistant (PDA). A PDA is effectively a handheld PC, capable of handling all the normal tasks of its leather-bound[3] ancestor — address book, notepad, and phone list. However, most PDAs offer many applications besides, such as spreadsheet, word processor, database, financial management software, clock, calculator and games.

What made PDAs so attractive to many PC users was the ability to transfer data between the handheld device and a desktop PC and to convert data to and from existing applications — in other words, to synchronize data between the mobile and desktop environments. In the early days inter-connection was via a serial cable. Modern PDAs achieve connectivity either via an infrared port[4] or a special docking station[5].

The allure of the PDA in the realm of business isn't hard to fathom. Small, portable and powerful technology has always held great appeal. For style-conscious users looking for the latest and greatest in gadgetry, the PDA is a natural accompaniment to the other essential business item of the 1990s — the mobile phone. The increasing power of these devices has led to growing interest in the corporate arena. Where all that's required is simple data manipulation combined with basic Internet connectivity, the PDA is an attractive option.

Because of their size, entering data into a PDA requires either a tiny keyboard or some form of handwriting recognition system. The problem with the former is that they're too small for touch-typing[6]. The problem with the latter is the difficulty in making it work effectively. The solution to the handwriting recognition problem has proven to be the Graffiti[7] handwriting system. This relies on a touch-screen display and a simplified alphabet — which takes about 20 minutes to learn — for data entry. Typically, PDAs with the Graffiti system provide the option to write directly onto the display which translates the input into text, or to open up a dedicated writing space which also provides on-line examples and help.

The end result was that by the late 1990s the PDA market had become segmented between users of the two major form factors; devices that have a keyboard and stylus-based palm size devices that don't[8]. The choice depended on personal preference and the level of functionality required.

By late-2001 the demand for PDA devices with built-in keyboards had wanted significantly, with few manufacturers besides Psion supporting the form factor. It appeared that consumers were unwilling to pay

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[1] PDA **个人数字助理**
[2] Filofax **备忘记事本**
[3] leather-bound **用皮革包边的**
[4] infrared port **红外端口**
[5] docking station **坞站**
[6] touch-typing **按指法打**
[7] Graffiti **涂写，乱写**
[8] **此处省略了** have a keyboard

the same price for a keyboard-equipped PDA as they would for a more powerful and more versatile low-end notebook. Another reason for their decline in popularity can be attributed to the development of plug-in keyboards for palm-sized PDAs.

Handwriting Recognition

Where space is limited, as with a PDA keyboard, typing can be slow and frustrating. Writing data into the PDA would obviously be a much more sensible idea, but the complexity involved in making handwriting recognition work is immense.

The problem is that vector, line-drawn shapes do not make words. So what is the difference between a drawing of a house and the word shape for “wombat”, for example? The human eye, of course, recognizes one as being a drawing and the other a word. There are two approaches a computer can take to resolving the matter. The easy approach is the one taken by the Graffiti recognition system. It understands each letter shape as a unique pattern for that letter, and converts each shape to its corresponding letter. There’s no attempt at understanding words or context. To make it even easier, Graffiti uses some special character shapes which the user of the system has to learn.

The approach taken by Newton was much more ambitious. It attempted to read the user’s writing and convert it into words. It sought to “learn” the way the user wrote, based on some standard test scripts and some interactive tutorials. This approach becomes increasing effective as the system recognizes more and more of the user’s handwriting style. With Newton, it was possible to set up multiple user writing personalities, and thus it was important to always ensure that Newton always used the correct personality for a given user to avoid its knowledge base becoming “polluted”.

The apple was key to Newton, but sadly the Newton was a costly mistake for Apple. It will be remembered for the over-hype and for its bold, but ultimately unsuccessful attempt to solve the problem of handwriting recognition. The success of the Graffiti approach, on the other hand, was emulated by other developers.

Originally, the Windows CE based Pocket PC[1] platform provided two means of data entry, via a Soft Keyboard[2] or—for those more comfortable with writing with a stylus—via the Letter Recognizer/Transcriber application. On selection of the former, a tablet of alphabetic characters appears in the familiar QWERTY[3] format. The required characters are entered into the document window simply by tapping the required character with the stylus. The latter recognizes letters written with the stylus, supporting word recognition to speed data entry. It also allows complete words to be moved around using cut and paste. The subsequent Pocket PC 2002 version added two new text input options: Block Recognizer, which accepts Palm-style Graffiti and Transcriber, which recognizes cursive script.

[1] Pocket PC **袖珍型个人计算机**
[2] Soft Keyboard **软键盘**
[3] QWERTY **标准的传统键盘**

Lesson 2　Hardware

Text

Computer Hardware Overview

Many people's eyes glaze over[1] to varying degrees when they consider the purchase of computer hardware. Computer hardware decisions are complicated enough, and the marketing campaigns of hardware manufacturers cloud rather than clarify the hardware selection process. When selecting computer hardware, it is helpful to keep a few principles in mind[2]. First, a computer is nothing more than an assemblage of components, which are designed according to industry standards, so that they may be easily integrated to create a computer system. Different companies manufacture different components (e.g. hard drives[3], central processing units (CPUs)[4], and disk drives), and the quality of a component may vary across manufacturers. Generally, few of the components in a name-brand[5] computer are manufactured by that company — the company uses components manufactured by others, and puts its label on the computer case.

When purchasing a computer, the purchaser should "look under the hood[6]" to ensure that the computer contains high-quality components. Low-quality components have a greater tendency to fail after a few years of operation. If a critical component fails, the computer may not be usable for several weeks while the component is replaced. If the failed component is obsolete and no longer available, the computer must usually be rebuilt using new components. If the hard drive fails, the contents of the hard drive may be lost. Although name-brand computers tend to contain high-quality parts, this is not always the case. The buyer must ultimately ensure that her computer contains high-quality components.

Computer users generally desire computers that perform well (i.e. fast) in typical usage situations. A slow computer may significantly decrease the user's productivity. In stand-alone (non-networked) usage situations, computer performance is largely determined by three computer components: the CPU, the random access memory (RAM)[7], and the computer monitor.

The CPU

The CPU processes computer instructions to perform work, just as an automobile engine processes fuel to produce power. CPU performance is measured in terms of the maximum number of instructions the processor may carry out per second, expressed in megahertz (MHz). One MHz equals one million instruction cycles per second. Current-generation CPUs are incredibly fast. If a CPU operates at or above

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[1] glaze over　（眼）变呆滞，变模糊
[2] keep ... in mind　记住
[3] hard drive　硬盘驱动器，硬盘
[4] CPU　中央处理器
[5] name-brand　名牌，品牌。这里 name 作形容词，意为"著名的，有声誉的"
[6] look under the hood　此时译为"查看机箱内的部件"，hood 原意是"罩"
[7] RAM　随机存取存储器

350 MHz, most PC users do not appreciate[1] much of a difference if additional speed is added. Sure, the difference is there, but it is subtle, not obvious. CPU speed will be very important in the context of voice recognition, but the maximum CPU speed is not yet high enough to enable most voice recognition applications to work well.

RAM

Operating systems, applications and files must be moved from disk to RAM before they may be used. The computer's RAM size largely determines how many programs may run simultaneously without performance degradation. RAM size is measured in megabytes (MB). One MB equals (approximately) one million bytes. A byte stores one character (e.g. a letter or a number). Many programs are memory hogs — they take up a lot of RAM, and do not let it go when other programs request it. RAM speed plays a role in determining a computer's overall speed, but RAM speed is generally less important here than is CPU speed. RAM speed is measured in nanoseconds (ns). Currently, three types of DRAM[2] (dynamic RAM) are commonly used in computers: EDO[3] (Extended Data Output) DRAM, SDRAM[4] (Synchronous DRAM), and RDRAM[5] (Rambus DRAM).

EDO DRAM is the cheapest and slowest of the three, and is mostly used in older computers. RDRAM is the fastest and most expensive of the three. Overall computer performance falls off precipitously as the computer's RAM utilization approaches 100%. In such situations, the user has three choices: the user may add more RAM, the user may close certain programs, or the user may continue to compute slowly. Today, RAM is so inexpensive that it makes little sense to skimp on RAM. Today, the computer purchaser should only consider machines that offer at least 128 MB of RAM.

Computer Monitors

Three monitor characteristics play a large role in determining the quality of the user's computing experience, and may significantly influence the user's productivity. These 3 characteristics are: the screen size, the dot and the refresh rate[6].

Screen size is measured diagonally, in inches. For any given screen resolution, a larger screen allows the user to see more of a file without scrolling. Lower resolutions may be used effectively with larger screens, which helps users with poor near-vision, and allows users to read screens from a farther distance.

Monitors produce colored dots, and these dots are given meanings (e.g. curves, lines, letters, numbers) by our brains. Dot is measured in millimeters (mm), and indicates the diagonal distance between same-colored phosphor dots[7] on the screen. Generally speaking, the lower the pitch is the better (e.g. 0.22 mm is better than 0.28 mm).

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[1] appreciate **在该句中的意思是“意识到”**
[2] DRAM **动态随机存取存储器**
[3] EDO **扩展数据输出**
[4] SDRAM **同步动态随机存储器**
[5] RDRAM **内存总线动态存储器**，rambus **内存总线**
[6] refresh rate **刷新率**
[7] phosphor dot **磷光点**

The refresh rate indicates how many times per second the monitor cycles through the screen image. The refresh rate is measured in hertz (Hz). One hertz equals one cycle per second. A monitor's refresh rate usually depends upon the resolution at which the monitor is being used. Higher refresh rates are better than lower refresh rates. If the refresh rate is too low, the screen may flicker noticeably, which usually annoys and fatigues the user. Flickering tends to be more noticeable under fluorescent lighting.

【Exercises】

Write T (true) or F (false) for each statement.

1. Computer components cannot be easily integrated to create a computer system.
2. In stand-alone usage situations, a computer's performance is largely determined by three computer components: the CPU, the RAM, and the modem.
3. CPU performance is measured in terms of the maximum number of instructions the processor may carry out per second.
4. Overall computer performance falls off precipitously as the computer's RAM utilization approaches 100%.

【Vocabularies】

clarify['klærifai]	***v.*讲清楚，阐明**
assemblage[ə'semblidʒ]	***n.*安装，集合**
tendency['tendənsi]	***n.*趋向，倾向**
critical['kritikəl]	***a.*重要的，关键的**
obsolete['ɔbsəli:t]	***a.*过时的**
ultimately['ʌltimətli]	***ad.*最后，最终**
perspective[pə'spektiv]	***n.*看法，观点**
incredibly[in'kredəbli]	***ad.* 难以置信的，惊人的**
subtle['sʌtl]	***a.*细微的**
simultaneously [saiməl'teiniəsli]	***ad.*同时地**
degradation[ˌdegrə'deiʃən]	***n.*下降**
hog[hɔg]	***n.*耗用某物过度者**
nanosecond['nænəuˌsekənd]	***n.*纳秒，毫微秒**
precipitously[pri'sipitəsli]	***ad.*突然地，急转直下地**
skimp[skimp]	***v.*节约使用**
diagonally[dai'ægənəli]	***ad.*按对角线**
pitch[pitʃ]	***n.*间距**
flicker['flikə]	***v.*闪烁**

fluorescent[fluə'resənt] *a.*荧光性的

Reading Materials

The Motherboard

The motherboard is the main circuit board inside the PC which holds the processor, memory and expansion slots[1] and connects directly or indirectly to every part of the PC. It's made up of a chipset, some code in ROM and the various interconnections or buses. PC designs today use many different buses to link their various components. Wide, high-speed buses are difficult and expensive to produce: the signals travel at such a rate that even distances of just a few centimeters cause timing[2] problems, while the metal tracks on the circuit board act as miniature radio antennae, transmitting electromagnetic noise that introduces interference with signals elsewhere in the system. For these reasons, PC design engineers try to keep the fastest buses confined to the smallest area of the motherboard and use slower, more robust buses, for other parts.

Evolution

The original PC had a minimum of integrated devices. Everything else, including a display adapter[3] and floppy or hard disk controllers[4], were additional components, connected via expansion slots.

Over time, more devices have been integrated into the motherboard. It's a slow trend though, as I/O ports and disk controllers were often mounted on expansion cards as recently as 1995. Other components — typically graphics, networking, SCSI[5] and sound — usually remain separate. Many manufacturers have experimented with different levels of integration, building in some or even all of these components. However, there are drawbacks. It's harder to upgrade the specification if integrated components can't be removed, and highly integrated motherboards often require non-standard cases. Furthermore, replacing a single faulty component may mean buying an entire new motherboard.

Consequently, those parts of the system whose specification changes fastest — RAM, CPU and graphics — tend to remain in sockets[6] or slots for easy replacement. Similarly, parts that not all users need, such as networking or SCSI, are usually left out of the base specification to keep costs down.

Motherboard development consists largely of isolating performance-critical components from slower ones. As higher speed devices become available, they are linked by faster buses — and the lower-speed buses are relegated to supporting roles. In the late 1990s there was also trend towards putting peripherals designed as integrated chips directly onto the motherboard. Initially this was confined to audio and video chips, but in time[7] the peripherals integrated in this way became more diverse and included items such as

[1] expansion slot **扩展槽**
[2] timing **同步**
[3] display adapter **显示适配器**
[4] floppy or hard disk controllers **软盘或硬盘控制器**
[5] SCSI (Small Computer System Interface) **小型计算机系统接口**
[6] socket **插座**
[7] in time **在这里的意思是“经过一段时间以后”**

SCSI, LAN and even RAID[1] controllers. While there are cost benefits to this approach the biggest downside is the restriction of future upgrade options.

BIOS

All motherboards include a small block of Read Only Memory (ROM[2]) which is separate from the main system memory used for loading and running software. The ROM contains the PC's Basic Input/Output System (BIOS[3]). This offers two advantages: the code and data in the ROM BIOS need not be reloaded each time the computer is started, and they cannot be corrupted by applications that write into the wrong part of memory. A Flash upgradeable BIOS[4] may be updated via a floppy diskette to ensure future compatibility with new chips, add-on cards etc.

The BIOS comprises several separate routines, serving different functions. The first part runs as soon as the machine is powered on. It inspects the computer to determine what hardware is fitted and then conducts some simple tests to check that everything is functioning normally — a process called the power-on self test (POST[5]). If any of the peripherals are plug and play[6] devices, it's at this point that the BIOS assigns their resources. There's also an option to enter the Setup program. This allows the user to tell the PC what hardware is fitted, but thanks to automatic self-configuring BIOSes this isn't used so much now.

If all the tests are passed, the ROM then tries to determine which drive to boot the machine from. Most PCs ship with the BIOS set to check for the presence of an operating system in the floppy disk drive first (A:), then on the primary hard disk drive. Any modern BIOS will allow the floppy drive to be moved down the list so as to reduce normal boot time by a few seconds. To accommodate PCs that ship with a bootable CD-ROM, some BIOSes allow the CD-ROM drive to be assigned as the boot drive. Some also allow booting from a hard disk drive other than the primary IDE[7] drive. In this case it would be possible to have different operating systems on different drives. If no bootable drive is detected, a message is displayed indicating that the system requires a system disk. Once the machine has booted, the BIOS serves a different purpose by presenting DOS with a standardized API[8] for the PC hardware. In the days before Windows, this was a vital function, but 32-bit "protect mode" software doesn't use the BIOS, so again it's of less benefit today.

Windows 98 (and later) provides multiple display support. Since most PCs have only a single AGP[9] slot, users wishing to take advantage of this will generally install a second graphics card in a PCI[10] slot. In such cases, most BIOSes will treat the PCI card as the main graphics card by default. Some, however, allow either the AGP card or the PCI card to be designated as the primary graphics card.

---

1 RAID(Redundant Array of Independent Disk) **冗余独立磁盘阵列**
2 ROM **只读存储器**
3 BIOS **基本输入/输出系统**
4 Flash BIOS **快擦写基本输入/输出系统**
5 POST **通电自检**
6 plug and play **即插即用**
7 IDE(Integrated Drive Electronics) **集成驱动电子设备**
8 API(Application Programming Interface) **应用程序编程接口**
9 AGP(Accelerated Graphic Port) **图形加速接口**
10 PCI(Peripheral Component Interconnect) **外围部件互连**

Whilst the PCI interface has helped — by allowing IRQ[1] to be shared more easily — the limited number of IRQ settings available to a PC remains a problem for many users. For this reason, most BIOSes allow ports that are not in use to be disabled. With the increasing popularity of cable and ADSL[2] Internet connections and the ever-increasing availability of peripherals that use the USB[3] interface, it will often be possible to get by without needing either a serial or a parallel port.

---

[1] IRQ(Interrupt ReQuest) 中断请求

[2] ADSL(Asymmetric Digital Subscriber Line) 非对称数字用户线路

[3] USB(Universal Serial Bus) Intel 公司开发的通用串行总线架构

Lesson 3　Operating System

Text

Paging

Basic Idea

Allocate physical memory[1] to processes in fixed size chunks called page frames[2]. Break address space of application into fixed size chunks called pages. Pages and page frames are same size. Store pages in page frames. When process generates an address, dynamically translate to the physical page frame which holds data for that page.

So, a virtual address now consists of two pieces: a page number and an offset within that page. Page sizes are typically powers of 2; this simplifies extraction of page numbers and offsets. To access a piece of data at a given address, system automatically does the following:

Extracts page number.

Extracts offset.

Translate page number to physical page frame id.

Accesses data at offset in physical page frame.

How Does System Perform Translation

Simplest solution: use a page table. Page table is a linear array indexed by virtual page number that gives the physical page frame that contains that page.

● What is look-up process?

Extract page number.

Extract offset.

Check that page number is within address space of process.

Look up page number in page table.

Add offset to resulting physical page number.

Access memory location.

Attention: for each memory access that processor generates, must now generate two physical memory accesses.

● Speed up the look-up process with a cache.

Store most recent page lookup values in TLB. TLB design options: fully associative, direct mapped, set associative, etc.

● How does look-up work now?

Extract page number.

---

[1] physical memory **物理内存**
[2] page frames **页帧**

Extract offset.

Look up page number in TLB.

If there, add offset to physical page number and access memory location.

Otherwise, trap to OS. OS looks up physical page number, and loads translation into TLB. Restarts the instruction.

How Do Processes Share Memory

The OS makes their page tables point to the same physical page frames. Useful for fast interprocess communication[1] mechanisms. This is very nice because it allows transparent sharing at speed[2].

What about Protection

- There are a variety of protections:

  Preventing one process from reading or writing another process' memory.

  Preventing one process from reading another process' memory.

  Preventing a process from reading or writing some of its own memory.

  Preventing a process from reading some of its own memory.

- How is this protection integrated into the above scheme?

Preventing a process from reading or writing memory: OS refuses to establish a mapping from virtual address space to physical page frame containing the protected memory. When program attempts to access this memory, OS will typically generate a fault. If user process catches the fault, can take action to fix things up[3].

Preventing a process from writing memory, but allowing a process to read memory: OS sets a write protect bit in the TLB entry. If process attempts to write the memory, OS generates a fault. But, reads go through just fine.

Virtual Memory[4] Introduction

When a segmented system[5] needed more memory, it swapped segments out to disk and then swapped them back in again when necessary. Page based systems can do something similar on a page basis.

Basic idea: when OS needs to a physical page frame to store a page, and there are none free, it can select one page and store it out to disk. It can then use the newly free page frame for the new page.

【Exercises】

Write T (true) or F (false) for each statement.

1．Pages and page frames are different size.

2．A virtual address consists of two pieces: a page number and an offset within that page.

3．Page table is indexed by physical page number.

---

1 interprocess communication **进程间通信**

2 at speed **高速地**

3 fix up **修理，解决**

4 virtual memory **虚拟存储器**

5 segmented system **分段系统**

4．When a page based system needed more memory, it swapped pages out to disk and then swapped them back in again when necessary.

【Vocabularies】

chunk[tʃʌnk]	*n.*块，信息块
dynamically[daiˈnæmikəli]	*ad.*动态地
offset[ˈɔːfset]	*n.*偏移值
extraction[iksˈtrækʃən]	*n.*提取
associative[əˈsəuʃjətiv]	*a.*相关的
segment[ˈsegmənt]	*n.*段
pragmatic[prægˈmætik]	*a.*实际的

Reading Materials

Useful UNIX Commands

Advanced Use of the ls Command

By placing various letters after ls (known as options or command line arguments[1]), you can get it to give you a lot[2] more information about the current directory. For example:

```
[username@mysite]$ ls -l
```

will produce a long listing format that includes the permissions, owner, group, size and modified date of each file:

```
drwxrwxr-x   3 matt   users   4096 Jun 27 17:17 images
-rw-rw-r--   1 matt   users   228 Jun 27 19:29 index.html
-rw-rw-r--   1 matt   users   272 Jun 27 19:30 index2.html
```

The *a* option will also include hidden files (hidden files in UNIX begin with a dot (.) in the listing), as well as the current directory and parent directory entries (. and .. respectively). Also, you can combine options by placing them one after the other, for example:

```
[username@mysite]$ ls -al
drwxrwxr-x   3 matt   users   4096 Jun 27 19:32
drwxrwxr-x   5 matt   users   4096 Jun 27 17:09
-rw-rw-r--   1 matt   users   23 Jun 27 19:31 .hidden_file
drwxrwxr-x   3 matt   users   4096 Jun 27 17:17 images
-rw-rw-r--   1 matt   users   228 Jun 27 19:29 index.html
-rw-rw-r--   1 matt   users   272 Jun 27 19:30 index2.html
```

---

1 command line argument 命令行参数

2 a lot 在这里修饰比较级 more，表示“很，到极大程度”的意思

Creating Folders with mkdir

mkdir (short for "make directory") lets you create new directories (folders) on your Web server, much the same as the "New Folder" options on Windows PC's and Macs.

To create a directory in the current directory, type mkdir followed by the directory name. For example, to create a new directory in your Web site called coolstuff you might type something like:

```
[username@mysite]$ cd mysite.com[1]
[username@mysite]$ cd htdocs
[username@mysite]$ mkdir coolstuff
```

Copying Files and Folders with cp

The cp (short for "copy") command allows you to copy files to new files, or copy files and directories to new directories. For example, to copy index.html to index2.html you'd use:

```
[username@mysite]$ cp index.html index2.html
```

To copy index.html into an existing directory called coolstuff, use:

```
[username@mysite]$ cp index.html coolstuff
```

To copy a whole directory, including its contents, to a new directory, use cp -r:

```
[username@mysite]$ ls
coolstuff    images    index.html
[username@mysite]$ cp -r coolstuff coolstuff2
[username@mysite]$ ls
coolstuff    coolstuff2    images    index.html
```

To copy a whole directory, including its contents, into an existing directory:

```
[username@mysite]$ cp -r coolstuff2 coolstuff
[username@mysite]$ cd coolstuff
[username@mysite]$ ls
index.html   coolstuff2
```

Deleting Stuff with rm

rm is the UNIX command to delete files and, sometimes, directories. It's short for "remove". Be very careful when deleting stuff with this command, as UNIX usually has no recycle bin[2] — once you've deleted something, it's gone forever!

To delete a single file, use rm filename. For example, to delete index.html you'd do:

```
[username@mysite]$ rm index.html
```

To delete a directory and all its contents, use rm -r directory. For example:

```
[username@mysite]$ rm -r coolstuff
```

Note that if the directory is empty, you can also delete it using the command rmdir, as follows:

```
[username@mysite]$ rmdir coolstuff
```

If you're deleting stuff with rm, particularly if you're using rm -r, it's a good idea to add the -i option too, for example:

---

[1] cd **命令用于改变当前的工作目录**

[2] recycle bin **回收站**

[username@mysite]$ rm -ir coolstuff

This will make sure the system prompts you before deleting each file or directory.

UNIX's Online Manual

Most UNIX servers come with a great online help system called man. You can use this to get help on most of the available commands by typing man followed by the command. For example, try typing:

[username@mysite]$ man ls

While reading a manual page on Linux, you can page up and down with the Page Up and Page Down keys, and scroll up and down with the Up Arrow and Down Arrow keys. To quit the manual viewer, press the q key. To search for some text, press the forward-slash[1] (/) key and type the text you want to search for, e.g. /file, and press Return[2].

On non-Linux systems, you usually have to press Enter to go down a line, and the Space bar[3] to go down a page, and you can't scroll up.

Running Scripts and Programs

Often you'll want to be able to run programs such as Perl scripts on your Web server, in much the same way as you run a program from the Start menu in Windows.

In UNIX, running programs is easy — you usually just type the name of the program! In fact, all the commands we've shown you already are programs.

If you want to run a program that's in your current directory, you'll usually need to put a ./ in front of the program name, to tell UNIX that it should look in the current directory for the program, for example:

[username@mysite]$ ./myprog

If you're having trouble with a Perl CGI script, you can often find out the exact error message by running it from the UNIX prompt[4] in Telnet, rather than through a Web browser. Say[5] you wanted to test a script called formmail.cgi. Run it at the prompt with the word perl before it, like this:

[username@mysite]$ cd cgi-bin

[username@mysite]$ perl formmail.cgi

The CGI script will then run as if it were called from a Web browser, but you'll be able to see the output from the script appear in the Telnet window (as opposed to[6] the browser, where you'll probably just see something unhelpful, such as "Internal Server Error"!).

Armed with[7] these commands and techniques, you should be able to manage your websites and Web server effectively.

---

1 forward-slash **正斜杠**
2 Return key = Enter key **回车键**
3 Space bar **空格键**
4 prompt **提示符**
5 say **这里的意思是“比如说，假设”，后面用的是虚拟语气**
6 as opposed to **与……对照，而非**
7 armed with **拥有，具有**

Lesson 4　Software Engineering

Text

10 Principles for PM Success

1. Project managers must focus on three dimensions of project success.

Simply put, project success means completing all project deliverables on time, within budget, and to a level of quality that is acceptable to sponsors and stakeholders. The project manager must keep the team's attention focused on achieving these broad goals.

2. Planning is everything — and ongoing.

On one thing all PM texts and authorities agree: The single most important activity that project managers engage in is planning — detailed, systematic, team-involved plans are the only foundation for project success. And when real-world events conspire to change the plan, project managers must make a new one to reflect the changes.

3. Project managers must feel, and transmit to their team members, a sense of urgency.

Because projects are finite endeavors with limited time, money, and other resources available, they must be kept moving toward completion. Since most team members have lots of other priorities, it's up to[1] the project manager to keep their attention on project deliverables and deadlines. Regular status checks, meetings, and reminders are essential.

4. Successful projects use a time-tested,[2] proven project life cycle[3].

Good Models can help ensure that best practices are built into our project plans. Not only do these models support quality, they help to minimize rework. So when time or budget pressures seem to encourage taking short cuts[4], it's up to the project manager to identify and defend the best project life cycle for the job.

5. All project deliverables and all project activities must be visualized and communicated in vivid detail.

In short[5], the project manager and project team must early on[6] create a tangible picture of the finished deliverables in the minds of everyone involved so that all effort is focused in the same direction. Avoid vague descriptions at all costs[7]; spell it out[8], picture it, prototype it, and make sure everyone agrees to it.

6. Deliverables must evolve gradually, in successive approximations.

---

[1] up to **取决于，该由……**
[2] time-tested **经受时间考验的**
[3] project life cycle **项目生存周期**
[4] short cut **捷径**
[5] in short **简单地说，总之**
[6] early on **在早期**
[7] at all costs **无论如何，不惜一切代价**
[8] spell out **清楚的说明**

It simply costs too much time spent in rework to jump in with both feet and begin building all project deliverables. Build a little at a time[1], obtain incremental reviews and approvals, and maintain a controlled evolution.

7. Project success is correlated with thorough analyses of the need for project deliverables.

Our research has shown that when a project results in deliverables that are designed to meet a thoroughly documented need, then there is a greater likelihood of project success. So managers should insist that there is a documented business need for the project before they agree to consume organizational resources in completing it.

8. Project managers must fight for time to do things right.

In our work with project managers we often hear this complaint: "We always seem to have time to do the project over; I just wish we had taken the time to do it right in the first place[2]!" Projects must have available enough time to "do it right the first time." And project managers must fight for this time by demonstrating to sponsors and top managers why it's necessary and how time spent will result in quality deliverables.

9. Project manager responsibility must be matched by equivalent authority.

It's not enough to be held responsible for project outcomes; project managers must ask for and obtain enough authority to execute their responsibilities. Specifically, managers must have the authority to acquire and coordinate resources, and make appropriate, binding decisions which have an impact on the success of the project.

10. Project managers should acquire the best people they can.

By acquiring the best people — the most skilled, the most experienced, the best qualified — the project manager can often compensate for too little time or money or other project constraints. Project managers should serve as an advocate for these valuable team members, helping to protect them from outside interruptions and helping them acquire the tools and working conditions necessary to apply their talents.

【Exercises】

Write T (true) or F (false) for each statement.

1．A plan should never be changed.

2．Time, money, and other resources available are all limited in a project.

3．It is necessary to build all project deliverables in the beginning.

4．Project managers should be only responsible for project outcomes, and there is no need to ask for enough authority to execute their responsibilities.

[1] at a time **每次，一次**

[2] in the first place **首先**

【Vocabularies】

Dimension[di'menʃən] *n.*方面，特征
deliverables[di'livərəblz] *n.*可提供的物品
budget['bʌdʒit] *n.*预算
sponsor['spɔnsə] *n.*发起者，赞助者
stakeholder['steikhəuldə] *n.*利益共享者
conspire[kən'spaiə] *v.*导致
priority[prai'ɔriti] *n.*优先考虑的事
deadline['dedlain] *n.*最终期限
visualize['vizjuəlaiz] *v.*使可见，使具体化
vivid['vivid] *a.*清楚的，清晰的
tangible['tændʒəbl] *a.*切实的，实在的
vague['veig] *a.*不明确的
prototype['prəutətaip] *n.*制造某产品的样品
successive[sək'sesiv] *a.*连续的
approximation[ə,prɔksi'meiʃən] *n.*接近
approval[ə'pruːvəl] *n.*赞成，承认
correlate['kɔrileit] *v.*和……相关
equivalent[i'kwivələnt] *a.*相当的
coordinate[kəu'ɔːdinit] *v.*协调
binding ['baindiŋ] *a.*有约束力的
compensate['kɔmpənseit] *v.*补偿，抵消
constraint[kən'streint] *n.*约束

Reading Materials

Classic Testing Mistakes

When testing, you must decide how to exercise the program, then do it. The doing is ever so much more interesting than the deciding. A tester's itch to start breaking the program is as strong as a programmer's itch to start writing code — and it has the same effect: design work is skimped, and quality suffers. **Paying more attention to running tests than to designing them** is a classic mistake. A tester who is not systematic, who does not spend time laying out[1] the possibilities in advance, will overlook special cases. They may be the same subtle ones that the programmers overlooked.

[1] lay out 展示，布置，安排

Concentration on execution also results in **unreviewed test designs**. Just like programmers, testers can benefit from a second pair of eyes. Reviews of test designs needn't be as elaborate as product design reviews, but a short check of the testing approach and the resulting tests can find significant omissions at low cost.

What is a Test Design

A test design should contain a description of the setup, inputs given to the product, and a description of expected results. One common mistake is **being too specific about test inputs and procedures**.

Suppose you're testing a banking application. Here are two possible test designs:

Design 1

Setup: initialize the balance[1] in account 12 with $100.

Procedure: Start the program.

Type 12 in the Account window.

Press OK.

Click on the 'Withdraw' toolbar button.

In the popup dialog, click on the 'all' button.

Press OK.

Expect to see a confirmation popup that says "You are about to withdraw all the money from this account. Continue?".

Press OK.

Expect to see a 0 balance in the account window.

Separately query the database to check that the zero balance has been posted.

Exit the program with File->Exit.

Design 2

Setup: initialize the balance with a positive value.

Procedure: Start the program on that account.

Withdraw all the money from the account using the 'all' button.

It's an error if the transaction happens without a confirmation popup.

Immediately thereafter:

— Expect a $0 balance to be displayed.

— Independently query the database to check that the zero balance has been posted.

The first design style has these advantages:

- The test will always be run the same way. You are more likely to be able to reproduce the bug. So will the programmer.
- It details all the important expected results to check. Imprecise expected results make failures harder to notice. For example, a tester using the second style would find it easier to overlook a spelling error in the confirmation popup, or even that it was the wrong popup.
- Unlike the second style, you always know exactly what you've tested. In the second style, you couldn't be sure that you'd ever gotten to the Withdraw dialog via the toolbar. Maybe the menu was

[1] balance **结余，余额**

always used. Maybe the toolbar button doesn't work at all!

- By spelling out[1] all inputs, the first style prevents testers from carelessly overusing simple values. For example, a tester might always test accounts with $100, rather than using a variety of small and large balances (Either style should include explicit tests for boundary and special values) .

However, there are also some disadvantages:

- The first style is more expensive to create.
- The inevitable minor changes to the user interface will break it, so it's more expensive to maintain.
- Because each run of the test is exactly the same, there's no chance that a variation in procedure will stumble across[2] a bug.
- It's hard for testers to follow a procedure exactly. When one makes a mistake — pushes the wrong button, for example — will she really start over?

Detail in the expected results is less problematic than in the test procedure, but too much detail can focus the tester's attention too much on checking against the script he's following. That might encourage another classic mistake: **not noticing and exploring "irrelevant" oddities.** Good testers are masters at noticing "something funny" and acting on it.

[1] spell out **清楚地说明**

[2] stumble across **偶然发现**

Lesson 5　Data Structure

Text

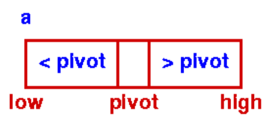
Quick Sort

Quicksort is a very efficient sorting algorithm invented by C.A.R. Hoare. It has two phases: the partition phase and the sort phase.

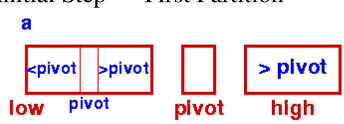
As we will see, most of the work is done in the partition phase — it works out where to divide the work. The sort phase simply sorts the two smaller problems that are generated in the partition phase.

This makes Quicksort a good example of the **divide and conquer**[1] strategy. In quicksort, we divide the array of items to be sorted into two partitions and then call the quicksort procedure recursively to sort the two partitions, *i.e.* we *divide* the problem into two smaller ones and *conquer* by solving the smaller ones. Thus the conquer part of the quicksort routine looks like this:

```
quicksort( void *a, int low, int high )
  {
   int pivot;
  /*Termination condition! */
  if ( high > low )
    {
     pivot=partition(a,low,high );
     quicksort(a,low,pivot-1 );
     quicksort(a,pivot+1,high );
    }
 }
```



Initial Step — First Partition



Sort Left Partition in the same way

For the strategy to be effective, the *partition* phase must ensure that all the items in one part (the lower part) are less than all those in the other (upper) part.

To do this, we choose a *pivot* element and arrange that all the items in the lower part are less than the pivot and all those in the upper part greater than it. In the most general case, we don't know anything about the items to be sorted, so that any choice of the pivot element will do — the first element is a convenient one.

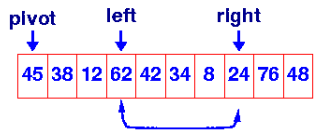
Partition in Place[2]

Most implementations of quick sort make use of the fact that you can partition in place by keeping two pointers: one moving in from the left and a second moving in from the right. They are moved towards the

---

[1] divide and conquer **分治法**
[2] in place **在适当的地方进行划分**

center until the left pointer finds an element greater than the pivot and the right one finds an element less than the pivot. These two elements are then swapped. The pointers are then moved inward again until they “cross over”. The pivot is then swapped into the slot to which the right pointer points and the partition is complete.




```
int partition( void *a, int low, int high )
  {
     int left, right;
     void *pivot_item;
     pivot_item = a[low];
     pivot = left = low;
     right = high;
     while ( left < right ) {
     /* Move left while item < pivot */
     while( a[left] <= pivot_item ) left++;
     /* Move right while item > pivot */
     while( a[right] > pivot_item ) right--;
     if ( left < right ) SWAP(a,left,right);
     }
     /* right is final position for the pivot */
     a[low] = a[right];
     a[right] = pivot_item;
     return right;
  }
```

Note that this above code does not check that left does not exceed the array bound. You need to add this check, before performing the swaps — both the one in the loop and the final one outside the loop.

Partition ensures that all items less than the pivot precede it and returns the position of the pivot. This meets our condition for dividing the problem: all the items in the lower half are less than the pivot and all items in the upper half are greater than it.

【Exercises】

Write T (true) or F (false) for each statement.

1. Quicksort has two phases: the partition phase and the sort phase.
2. Most of the work is done in the sort phase.

3．we must choose the first element as the pivot.

4．In most cases, two pointers are used in the partition phase of quicksort.

【Vocabularies】

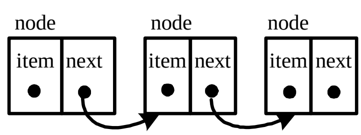
partition[pɑː'tiʃən]	*n.*划分，分区
generate['dʒenə,reit]	*v.*产生
conquer['kɔŋkə]	*v.*战胜，攻克
recursively[ri'kəːsivli]	*ad.*递归地
procedure[prə'siːdʒə]	*n.*过程
pivot['pivət]	*n.*基准
termination[,təːmi'neiʃən]	*n.*结束，终止

Reading Materials

Linked Lists

Linked Lists[1]

The linked list is a very flexible **dynamic data structure**: items may be added to it or deleted from it at will[2]. In a linked list, each item is allocated space as it is added to the list. A link is kept with each item to the next item in the list.



Each node of the list has two elements: the item being stored in the list *and* a pointer to the next item in the list. The last node in the list contains a NULL pointer to indicate that it is the end or *tail* of the list.

As items are added to a list, memory for a node is dynamically allocated. Thus the number of items that may be added to a list is limited only by the amount of memory available.

Circularly Linked Lists

By ensuring that the tail of the list is always pointing to the head, we can build a circularly linked list3. If the external pointer points to the current "tail" of the list, then the "head" is found via tail->next, permitting us to have either LIFO[4] or FIFO[5] lists with only one external pointer.

---

1 linked list 链表

2 at will 任意，随意

3 circularly linked list 循环链表，有些书也写作 circular linked list

4 LIFO(Last-in First-out) 后进先出

5 FIFO(First-in First-out) 先进先出

Doubly Linked Lists

Doubly linked lists have a pointer to the preceding item as well as one to the next.They permit scanning or searching of the list in both directions. Many applications require searching backwards and forwards through sections of a list: for example, searching for a common name like “Kim” in a Korean telephone directory would probably need scanning backwards and forwards through a small region of the whole list, so the backward links become very useful. In this case, the node structure is altered to have two links:

```
struct t_node {
    void *item;
    struct t_node *previous;
    struct t_node *next;
    } node;
```

Linked Lists in Arrays

Although this might seem pointless this is just what memory allocators do to manage available space. Memory is just an array of words. After a series of memory allocations and de-allocations, there are blocks of free memory scattered throughout the available heap space. In order to be able to re-use this memory, memory allocators will usually link freed blocks together in a free list by writing pointers to the next free block in the block itself. An external free list pointer points to the first block in the free list. When a new block of memory is requested, the allocator will generally scan the free list looking for a freed block of suitable size and delete it from the free list (re-linking the free list around the deleted block).

Lesson 6　Network

Text

Network Overview

The first networks were time-sharing[1] networks that used mainframes and attached terminals. Such environments were implemented by both IBM's System Network Architecture[2] (SNA) and Digital's network architecture. Local area networks [3] (LAN) evolved around the PC revolution and provide high-speed, fault-tolerant[4] data networks that cover a relatively small geographic area or that is confined to a single building or group of buildings. They provide connected users with shared access to devices and applications and allow them to exchange files and communicate via electronic mail. Wide area networks[5] (WAN) cover broader geographic areas, often using transmission facilities provided by common carriers, such as telephone companies, to interconnect a number of LANs.

Whilst LANs and WANs make up the majority of networks — indeed, the Internet can be regarded as the largest WAN in existence — there are many different types of network, categorized by a number of distinguishing characteristics:

Topology: the geometric arrangement of a computer system. Common topologies include a bus, star, and ring.

Standards/Protocols: definitions of common sets of rules and signals that specify how computers on a network communicate. Ethernet and Token Ring are examples of network cabling standards, whilst TCP/IP is the predominant network communications protocol.

Architecture: networks can be broadly classified as using either a peer-to-peer[6] or client-server architecture.

In addition to the computers themselves, sometimes referred to as nodes, the implementation of a network involves:

A device on each connected computer that enables it to communicate with the network, usually called a network interface card[7] (NIC).

Various items of specialist network hardware, including devices to act as connection points between the various nodes, generally referred to as hubs or switches.

A connection medium, usually a wire or cable, although wireless communication between networked computers is increasingly common.

---

[1] time-sharing **分时**
[2] System Network Architecture **系统网络体系结构**
[3] local area networks **局域网**
[4] fault-tolerant **容错**
[5] wide area network **广域网**
[6] peer-to-peer **对等**
[7] network interface card **网络接口卡**

OSI Model

The Open Systems Interconnection[1] (OSI) reference model describes how information from a software application in one computer moves through a network medium to a software application in another computer. The OSI reference model is a conceptual model composed of seven layers, each specifying particular network functions. The model was developed by the International Organization for Standardization[2] (ISO) in 1984, and it is now considered the primary architectural model for intercomputer communications. The OSI model divides the tasks involved with moving information between networked computers into seven smaller, more manageable task groups. A task or group of tasks is then assigned to each of the seven OSI layers. Each layer is reasonably self-contained, so that the tasks assigned to each layer can be implemented independently. This enables the solutions offered by one layer to be updated without adversely affecting the other layers.

The seven layers of the OSI reference model can be divided into two categories: upper layers and lower layers. The upper layers of the OSI model deal with application issues and generally are implemented only in software. The highest layer, application[3], is closest to the end user. Both users and application-layer processes interact with software applications that contain a communications component. The term upper layer is sometimes used to refer to any layer above another layer in the OSI model. The lower layers of the OSI model handle data transport issues. The physical layer[4] and data link layer[5] are implemented in hardware and software. The other lower layers generally are implemented only in software. The lowest layer, the physical layer, is closest to the physical network medium , and is responsible for placing information on the medium.

7	Application Layer	Application programs that use the network
6	Presentation Layer[6]	Standardizes data presented to the applications
5	Session Layer	Manages sessions between applications
4	Transport Layer	Provides error detection and correction
3	Network Layer	Manages network connections
2	Data Link Layer	Provides data delivery across the physical connection
1	Physical Layer	Defines the physical network media

【Exercises】

Write T (true) or F (false) for each statement.

1．The first networks were time-sharing networks.

2．TCP/IP is the primary network communications protocol.

3．NIC enables a computer to communicate with the network.

---

1 Open Systems Interconnection **开放系统互连**
2 International Organization for Standardization **国际标准化组织**
3 application layer **应用层**
4 physical layer **物理层**
5 data link layer **数据链路层**
6 presentation layer **表示层**

4. Network layer is closest to the end user.

【Vocabularies】

implement['impliment]	***v.*实现，贯彻**
geographic[ˌdʒiə'græfik]	***a.*地理的，地理学的**
confine[kən'fain]	***v.*把……限制在（某范围内）**
facility[fə'siliti]	***n.*设备**
topology[tə'pɔlədʒi]	***n.*拓扑结构**
Ethernet	***n.*以太网**
predominant[pri'dɔminənt]	***a.*主要的，突出的**
hub[hʌb]	***n.*集线器**
conceptual[kən'septʃuəl]	***a.*概念的**
primary['praiməri]	***a.*主要的**
adversely['ædvə:sli]	***ad.*方向相反地，不利地**

Reading Materials

Network Hardware

NICs

Network interface cards, commonly referred to as NICs, are used to connect a PC to a network. The NIC provides a physical connection between the networking medium and the computer's internal bus, and is responsible for facilitating an "access method" to the network (OSI Layers 1 and 2). Most NICs are designed for a particular type of network, protocol, and media, although some can serve multiple networks. Cards are available to support almost all networking standards, including the latest Fast Ethernet environment.

Hubs/Repeaters[1]

Hubs/repeaters are used to connect together two or more network segments of any media type. In larger designs, signal quality begins to deteriorate as segments exceed their maximum length. Hubs provide the signal amplification required to allow a segment to be extended a greater distance. Passive hubs[2] simply forward any data packets they receive over one port from one workstation to all their remaining ports. Active hubs[3], also sometimes referred to as "multiport repeaters", regenerate the data bits in order to maintain a strong signal.

---

[1] repeater **中继器**
[2] passive hub **无源集线器**
[3] active hub **有源集线器**

While repeaters allow LANs to extend beyond normal distance limitations, they still limit the number of nodes that can be supported. Bridges[1], routers[2] and switches[3], however, allow LANs to grow significantly larger by virtue of[4] their ability.

Bridges

Bridges became commercially available in the early 1980s. At the time of their introduction their function was to connect separate homogeneous networks. Subsequently, bridging between different networks — for example, Ethernet and Token Ring — has also been defined and standardized. Bridges are data communications devices that operate principally at Layer 2 of the OSI reference model. As such, they are widely referred to as data link layer devices.

Routers

Routing[5] achieved commercial popularity in the mid-1980s — at a time when large-scale internetworking began to replace the fairly simple, homogeneous environments that had been the norm hitherto. Routing is the act of moving information across an internetwork from a source to a destination. It is often contrasted with bridging, which performs a similar function. The primary difference between the two is that bridging occurs at Layer 2 (the link layer) of the OSI reference model, whereas routing occurs at Layer 3 (the network layer). This distinction provides routing and bridging with different information to use in the process of moving information from source to destination, so the two functions accomplish their tasks in different ways.

Switches

LAN switches are an expansion of the concept in LAN bridging. They operate at Layer 2 (link layer) of the OSI reference model, which controls data flow, handles transmission errors, provides physical (as opposed to logical) addressing, and manages access to the physical medium. Switches provide these functions by using various link-layer protocols — such as Ethernet ,Token Ring and FDDI[6] — that dictate specific flow control, error handling, addressing, and media-access algorithms.

---

1 bridge **网桥**
2 router **路由器**
3 switch **交换机**
4 by virtue of **凭借，借助**
5 routing **路由选择**
6 FDDI(Fiber Distributed Data Interface) **光纤分布式数据接口**

Lesson 7　Computer Maintenance

Text

Solving a Hardware Problem

Separate the individual parts of the computer in your mind into components, then test the components as a whole. This will minimize the number of pieces that you have to deal with by eliminating components and parts that you know are functioning properly.

Components of the Hard Drive

The components of a hard drive consist of the hard drive, a power cable[1], a data cable, and the controller card. If an error message indicates that you have a hard drive problem, try the following:

Turn the computer off, wait about 20 seconds for the hard drive to stop spinning, then turn the computer back on. It could be that there was a minor power fluctuation when you turned the computer on or while you were using the computer. A fluctuation in the power supply for only 1/200th of a second (4 ms) can scramble several bytes in the computer's memory and prevent it from working properly. Depending on the amount and types of devices that are using the same electrical circuit as your computer, this may be a fairly common event. Just rebooting the computer may solve the problem.

Try booting up the computer with a boot diskette and see if you can access the hard drive. If you can, you most likely have a bad file or two or a bad sector on the hard drive that is not allowing it to boot up properly. Although this is not a common problem, it does occur. At this point, backup any information on your hard disk that you do not have a current copy of. The next step would be to attempt to reinitialize the drive using the SYS command that hopefully is on your boot diskette by entering SYS C: from your A: drive. If this is successful, remove the boot diskette from the disk drive then reboot your computer.

If the same error appears, turn the computer off and remove the cover. Check the data cable (large flat cable[2]) that connects the hard drive to the computer's controller. Make sure it is plugged in tightly and also check the power cable that connects the hard drive to the computer's power supply. These cables, particularly the power cable, rarely if ever go bad, but I have replaced a data cable or two. Replace the cover and turn the computer back on.

If the error still appears, you may have a bad hard drive. Hard drives do not last forever. The life expectancy[3] of the current line of hard drives is considered to be around 3 to 5 years, but I've had them die shortly after installing them and also have some that have been running for over 10 years. If you have

---

[1] power cable **电力电缆**
[2] flat cable **扁平电缆**
[3] life expectancy **平均寿命**

another hard drive available, try swapping it for the one that isn't working. Also, if you were thinking about adding a second hard drive to your system or upgrading to a larger drive, now might be a good time.

If swapping the hard drive doesn't help, then you have narrowed the problem down to the hard drive controller[1]. If the controller is an adapter[2] card, swap it out for a new one. If the controller is built-in[3] to the motherboard, then your only option is to replace the motherboard. In the later case, unless you feel comfortable with tearing your computer apart, you may want to have your local service center do the work for you.

Components of the Video Display[4]

The video display components consist of the monitor, the cable connecting the monitor to the computer's video adapter, and the video adapter card (unless the video circuit is built-in to the motherboard). If an error message indicates that you have a problem with the display, try the following:

If your monitor isn't displaying anything, first make sure that the adjustments for brightness and contrast[5] are properly set.

Check the cable that connects the monitor to the video output of the computer. I have never seen a video cable go bad, but I suppose that could be a possibility in unusual circumstances.

If you have another computer available to you, try attaching the problem monitor to it and see if it works. If it does, then you have narrowed the problem down[6] to the video adapter card in your computer. Take the cover off the computer and remove the video adapter card and make sure that the contacts are clean. Reinstall the card, replace the cover and reconnect the monitor and see if that helps.

Some of the newer monitors have a breaker that trips[7] in case[8] there is a problem with the power supply. If your monitor has a breaker or a reset switch, try resetting it to see if that solves the problem.

On older monitors, there is a fuse located on the power supply circuit inside of the monitor case that might have blown. If you have a blown fuse, make sure you replace it with the exact same type that was in the monitor or you could cause damage to other circuits in the monitor.

【Exercises】

Write T (true) or F (false) for each statement.

1．The components of a hard drive only consist of the hard drive and a power cable.

2．It is important to backup any information on your hard disk that you do not have a current copy of.

3．If your monitor isn't displaying anything, first check the cable that connects the monitor to the video output of the computer.

---

[1] controller **控制器**
[2] adapter **适配器**
[3] built-in **固定的，内置的**
[4] video display **视频显示**
[5] brightness and contrast **亮度和对比度**
[6] narrow down **缩小……的范围**
[7] trip **跳闸**
[8] in case **假使，如果**

4. If you have a blown fuse, replace it with a new fuse of different type.

【Vocabularies】

minimize[ˈminimaiz] *v.*将……减到最少
eliminate[iˈlimineit] *v.*排除，消除
spin[spin] *v.*旋转
fluctuation[ˌflʌktjuˈeiʃən] *n.*波动，起伏
occur[əˈkəː] *v.*发生，出现
initialize[iˈniʃəlaiz] *v.*初始化
plug[plʌg] *v.*插上
swap[swɔp] *v.*交换
trip[trip] *v.*使跳闸，切断
fuse[fjuːz] *n.*保险丝，熔丝

Reading Materials

Using Ergonomics[1] at the Computer

Step 1: Working Properly

You'll never learn to love (or even tolerate) a computer if it causes you discomfort or pain. If you plan to spend hours at the keyboard, it's worth taking time to make the experience as comfortable as possible. Setting up your workstation properly isn't just about feeling good (although that's a worthy goal). It's also a way of preventing painful and potentially debilitating[2] conditions like carpal tunnel syndrome, tendonitis[3], repetitive motion disorder, and chronic back pain.

Step 2: Your Monitor

The top edge of your monitor should be at eye level or a little below, so you're looking down just slightly. (You may need to prop up[4] the monitor with a large book or a monitor stand.) The front edge should be 20 to 30 inches from your eyes.

Step 3: Desk Height and Posture

Your wrists[5] should never be higher than your elbows. Ideally, your elbows should be bent at a 90-degree angle and your wrists should be straight, not flexed upward or bent downward. If you can't

[1] ergonomics 人类工程学
[2] debilitate 使虚弱
[3] tendonitis 腱炎
[4] prop up 支撑
[5] 本段涉及到一些身体部位：wrist 手腕；elbow 肘；thigh 大腿；spine 脊柱

achieve this position using your desk, your desk is too high (or your chair seat too low). Try a typing desk or a keyboard drawer that allows the keyboard to sit lower than the desktop. Your feet should touch the floor or a footrest and the angle between your thighs and spine should be 90 degrees or a bit more.

Step 4: Proper Mousing

Keep your mouse close to the keyboard so you don’t have to reach far to use it. This will minimize strain on your shoulders. Also, try not to sit for hours with your hand on the mouse; let go of the mouse when you’re not using it. If you use the mouse even more than the keyboard, put the mouse directly in front of you and the keyboard slightly off to the side. If you do start developing strain in your mouse arm or shoulder, consider using a touch pad[1].

Step 5: Proper Wrist Position

One of the worst things you can do to your wrists is leaning the heel of your hand on the desk with your wrist flexed backward as you type. Train yourself to hold your wrists up while you’re typing (like your piano teacher taught you) or rest them on a wrist rest. Some mice conform to the shape of your hand and may result in less strain. You can also alleviate wrist strain by adjusting the angle of your keyboard. You can angle most keyboards so the back is slightly higher than the front.

Step 6: Ergonomic Keyboards

Part of the problem with most computer keyboards is that they force you to hold your hands at an unnatural angle to your arms; your hands are both more horizontal to the desk than they’d like to be and rotated slightly outward at the wrist. Microsoft makes an ergonomic keyboard in which the left-hand and right-hand keys are slightly separated and angled outwards (The angle between the keys cannot be adjusted). There are similar keyboards available from third-party vendors.

Step 7: Rest Your Eyes

Many people also experience some eye strain[2] after staring at a computer screen for a few hours. The best approach is to rest your eyes periodically by focusing on a distant object once in a while and blinking often. Also make sure you have proper lighting. Avoid overhead lights; they almost always reflect off your screen. The best source of lighting is a desk or floor lamp that are not directly aimed at your screen. Sunlight streaming in the windows leads to glare as well.

Step 8: Find a Good Chair

Finally, if you have back problems (or want to avoid them), a good chair is essential. Look for one that provides support for your lower back and is fully adjustable (You should be able to change both the height of the seat and the angle of the seat and the back).

---

[1] touch pad **触摸板**
[2] eye strain **眼睛疲劳**

Lesson 8 Data Base

Text

Choosing between Oracle and SQL Server

I have to decide between using the Oracle database and WebDB[1] vs. Microsoft SQL[2] Server with Visual Studio. This choice will guide our future Web projects. What are the strong points of each of these combinations and what are the negatives?

Lori: Making your decision will depend on what you already have. For instance, if you want to implement a Web-based database application and you are a Windows-only shop, SQL Server and the Visual Studio package would be fine. But the Oracle solution would be better with mixed platforms.

There are other things to consider, such as what extras you get and what skills are required. WebDB is a content management and development tool that can be used by content creators, database administrators, and developers without any programming experience. WebDB is a browser-based tool that helps ease content creation and provides monitoring and maintenance tools. This is a good solution for organizations already using Oracle. Oracle also scales better than SQL Server, but you will need to have a competent Oracle administrator on hand.

The SQL Server/Visual Studio approach is more difficult to use and requires an experienced object-oriented programmer or some extensive training. However, you do get a fistful of development tools with Visual Studio: Visual Basic, Visual C++, and Visual InterDev for only $1 619. Plus, you will have to add the cost of the SQL Server, which will run you $1 999 for 10 clients or $3 999 for 25 clients—a less expensive solution than Oracle's.

Oracle also has a package solution that starts at $6 767, depending on the platform selected. The Oracle.com suite includes not only WebDB and Oracle8i but also other tools for development such as the Oracle application server, JDeveloper, and iWorkplace Templates, and the suite runs on more platforms than the Microsoft solution does. This can be a good solution if you are a start-up or a small to midsize business. Buying these tools in a package is less costly than purchasing them individually.

Much depends on your skill level, hardware resources, and budget. I hope this helps in your decision-making.

Brooks: I totally agree that this decision depends in large part on what infrastructure and expertise you already have. If the decision is close, you need to figure out[3] who's going to be doing the work and what your priorities are.

These two products have different approaches, and they reflect the different personalities of the two

[1] WebDB **是** Oracle **的数据库开发系统**
[2] SQL (Structured Query Language) **结构化查询语言**
[3] figure out **估计，解决**

vendors. In general, Oracle products are designed for very professional development efforts by top-notch[1] programmers and project leaders. The learning period is fairly long, and the solution is pricey; but if you stick it out[2] you will ultimately have greater scalability and greater reliability.

If your project has tight deadlines and you don't have the time and/or money to hire a team of very expensive, very experienced developers, you may find that the Oracle solution is an easy way to get yourself in trouble. There's nothing worse than a poorly developed Oracle application.

What Microsoft offers is a solution that's aimed at rapid development and low-cost implementation. The tools are cheaper, the servers you'll run it on are cheaper, and the developers you need will be cheaper. Choosing SQL Server and Visual Studio is an excellent way to start fast.

Of course, there are trade-offs. The key problem I have with Visual Studio and SQL Server is that you'll be tied to Microsoft operating systems and Intel hardware. If the day comes when you need to support hundreds of thousands of users, you really don't have anywhere to go other than[3] buying hundreds of[4] servers, which is a management nightmare.

If you go with the Microsoft approach, it sounds like you may not need more than Visual Interdev. If you already know that you're going to be developing ActiveX components in Visual Basic or Visual C++, that's a warning sign that maybe you should look at the Oracle solution more closely.

I want to emphasize that, although these platforms have their relative strengths and weaknesses, if you do it right you can build a world-class[5] application on either one. So if you have an organizational bias toward one of the vendors, by all means[6] go with it. If you're starting out from scratch[7], you're going to have to ask yourself whether your organization leans more toward perfectionism or pragmatism, and realize that both "isms" have their faults.

【Exercises】

Write T (true) or F (false) for each statement.

1. Oracle can be used on mixed platforms.
2. WebDB is more difficult to use than SQL Server/Visual Studio approach.
3. The tools in a oracle.com suite is less costly than purchasing them individually.
4. One of the aims of Microsoft approach is rapid development.

---

[1] top-notch **拔尖的**
[2] stick out **坚持下去**
[3] other than **除了**
[4] hundreds of **许许多多，好几百**
[5] world-class **具有世界水平的**
[6] by all means **务必**
[7] from scratch **从头开始，从零开始**

【Vocabularies】

maintenance['meintinəns]	*n.*维护
competent['kɔmpitənt]	*a.*有能力的
fistful['fistful]	*a.*一把
infrastructure['infrə,strʌktʃə]	*n.*基础设施，基础结构
expertise[,ekspə'tiːz]	*n.*专门技术
priority[prai'ɔriti]	*n.*重点，优先权
personality[,pəːsə'næliti]	*n.*个性
nightmare['naitmeə]	*n.*梦魇，恶梦
bias['baiəs]	*n.*倾向，趋势
perfectionism[pə'fekʃənizəm]	*n.*十全十美主义
pragmatism['prægmətizəm]	*n.*实用主义
ism ['izəm]	*n.*主义

Reading Materials

Data Mining[1]

By this point in time, you’ve probably heard a good deal about data mining—the database industry’s latest buzzword[2]. What’s this trend all about? To use a simple analogy, it’s finding the proverbial needle in the haystack[3]. In this case, the needle is that single piece of intelligence your business needs and the haystack is the large data warehouse you’ve built up over a long period of time.

Through the use of automated statistical analysis (or “data mining”) techniques, businesses are discovering new trends and patterns of behavior that previously went unnoticed. Once they’ve uncovered this vital intelligence, it can be used in a predictive manner for a variety of applications. Brian James, assistant coach of the Toronto Raptors, uses data mining techniques to rack and stack his team against the rest of the NBA. The Bank of Montreal’s business intelligence and knowledge discovery program is used to gain insight into customer behavior.

The first step toward building a productive data mining program is, of course, to gather data! Most businesses already perform these data gathering tasks to some extent[4]—the key here is to locate the data critical to your business, refine it and prepare it for the data mining process. If you’re currently tracking customer data in a modern DBMS[5], chances are you’re almost done.

---

1 data mining 数据挖掘
2 buzzword 时髦术语
3 look for a needle in a haystack 海底捞针
4 to some extent 某种程度上，(多少) 有一点
5 DBMS (Data Base Management System) 数据库管理系统

At this point, take a moment to pat yourself on the back. You have a data warehouse! The next step is to choose one or more data mining algorithms to apply to your problem. If you're just starting out, it's probably a good idea to experiment with several techniques to give yourself a feel for how they work. Your choice of algorithm will depend upon the data you've gathered, the problem you're trying to solve and the computing tools you have available to you. Let's take a brief look at two of the more popular algorithms.

Regression[1] is the oldest and most well-known statistical technique that the data mining community utilizes. Basically, regression takes a numerical dataset and develops a mathematical formula[2] that fits the data. When you're ready to use the results to predict future behavior, you simply take your new data, plug it into the developed formula and you've got a prediction! The major limitation of this technique is that it only works well with continuous quantitative data[3] (like weight, speed or age). If you're working with categorical data[4] where order is not significant (like color, name or gender) you're better off choosing another technique.

Working with categorical data or a mixture of continuous numeric and categorical data? Classification analysis might suit your needs well. This technique is capable of processing a wider variety of data than regression and is growing in popularity. You'll also find output that is much easier to interpret. Instead of the complicated mathematical formula given by the regression technique you'll receive a decision tree[5] that requires a series of binary decisions[6].

Data mining products are taking the industry by storm. The major database vendors have already taken steps to ensure that their platforms incorporate data mining techniques. Oracle's Data Mining Suite (Darwin) implements classification and regression trees, neural networks[7], k-nearest neighbors[8], regression analysis and clustering algorithms[9]. Microsoft's SQL Server 2000 also offers data mining functionality through the use of classification trees and clustering algorithms. If you're already working in a statistics environment, you're probably familiar with the data mining algorithm implementations offered by the advanced statistical packages SPSS and S-Plus.

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1 regression **回归**
2 formula **公式**
3 continuous quantitative data **连续量数据**
4 categorical data **分类数据**
5 decision tree **决策树**
6 binary decisions **二元判定，双值决策**
7 neural networks **神经网络**
8 k-nearest neighbors k **最近邻规则**
9 clustering algorithm **从集算法，聚类算法**

Lesson 9　Artificial Intelligence

Text

Basic Questions of AI[1]

Q. What is artificial intelligence?

A. It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.

Q. Isn't AI about simulating human intelligence?

A. Sometimes but not always or even usually. On the one hand, we can learn something about how to make machines solve problems by observing other people or just by observing our own methods; on the other hand[2], most work in AI involves studying the problems the world presents to intelligence rather than studying people or animals. AI researchers are free to use methods that are not observed in people or that involve much more computing than people can do.

Q. What are the applications of AI?

A. game playing.

You can buy machines that can play master level chess for a few hundred dollars. There is some AI in them, but they play well against people mainly through brute force[3] computation—looking at hundreds of thousands of positions. To beat a world champion by brute force and known reliable heuristics requires being able to look at 200 million positions per second.

Speech Recognition

In the 1990s, computer speech recognition reached a practical level for limited purposes. Thus United Airlines has replaced its keyboard tree for flight information by a system using speech recognition of flight numbers and city names. It is quite convenient. On the the other hand, while it is possible to instruct some computers using speech, most users have gone back to the keyboard and the mouse as still more convenient.

Understanding Natural Language

Just getting a sequence of[4] words into a computer is not enough. Parsing sentences is not enough either. The computer has to be provided with an understanding of the domain the text is about, and this is presently possible only for very limited domains.

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[1] AI (Artificial Intelligence) **人工智能**

[2] on (the) one hand … on the other hand **一方面……另一方面……**

[3] brute force **强力**

[4] a sequence of **一连串**

Expert Systems

A "knowledge engineer" interviews experts in a certain domain and tries to embody their knowledge in a computer program for carrying out some tasks. How well this works depends on whether the intellectual mechanisms required for the task are within the present state of AI. When this turned out not to be[1] so, there were many disappointing results. One of the first expert systems was MYCIN in 1974, which diagnosed bacterial infections of the blood and suggested treatments. It did better than medical students or practicing doctors, provided[2] its limitations were observed. Namely, its technology included bacteria, symptoms, and treatments and did not include patients, doctors, hospitals, death, recovery, and events occurring in time. Its interactions depended on a single patient being considered. Since the experts consulted by the knowledge engineers knew about patients, doctors, death, recovery, etc., it is clear that the knowledge engineers forced what the experts told them into a predetermined framework. In the present state of AI, this has to be true. The usefulness of current expert systems depends on their users having common sense[3].

【Exercises】

Write T (true) or F (false) for each statement.

1．AI can only use methods that are biologically observable.

2．AI is always about simulating human intelligence.

3．If a machine that can play master level chess is able to look at hundreds of thousands of positions per second, it will beat a world champion.

4．MYCIN is better than an expert.

【Vocabularies】

confine[ˈkɔnfain]	***v.*把……限制在（某范围内）**
biologically[ˌbaiəˈlɔdʒikəli]	***ad.*生物学上**
heuristics[hjuəˈristiks]	***n.*启发程序，探试程序**
convenient[kənˈviːnjənt]	***a.*方便的**
parse[pɑːz]	***v.*从语法上分析句子**
diagnose[ˈdaiəgnəuz]	***v.*诊断**
bacterial[bækˈtiəriəl]	***n.*细菌**
Infection[inˈfekʃən]	***n.*感染**
namely[ˈneimli]	***ad.*换句话说，即，就是**
symptom[ˈsimptəm]	***n.*症状**
predetermine[ˌpriːdiˈtəːmin]	***v.*预先决定**

---

[1] turn out to be **结果是，最终是**

[2] provided **这里是连词，意思是"倘若，如果"**

[3] common sense **常识，（根据经验）的判断力**

framework[ˈfreimwəːk] *n.*框架

Reading Materials

Showing Off[1] the Future of Artificial Intelligence

"Pay attention to what robotics engineers at universities are doing," said Kazuo Hirai, an executive managing director[2] of Honda Motor and a developer of its humanoid Asimo robot. "What they are doing now is sowing the seeds for the future robot market."

Those seeds are on display this week at the Robodex 2002 exhibition, which opened on Thursday and continues until Sunday in Yokohama, Japan. Nine universities, one college, and one individual university student are taking part in the show, giving a glimpse into what the robotics industry may offer in years to come.

Research that is underway[3] at many Japanese universities extends far beyond developing a humanoid[4] robot that can walk upright on two legs like a human.

Emotions on Display

At a laboratory at Tokyo University of Science, for example, engineers are developing a facial robot, called Saya, which is able to display human emotional expressions.

Designed to resemble a human head complete with eyes, mouth and a wig, Saya is covered with silicon rubber skin. Using artificial muscles, Saya can show universally recognizable facial expressions such as joy, anger, and astonishment. The artificial muscles are operated by compressed air and are based on a mechanism similar to that used by humans to display facial expressions, according to a statement from Hiroshi Kobayashi, an assistant professor[5] of the laboratory.

Down the road, engineers hope to give Saya voice recognition and video monitoring functions, according to a student working on the project who declined to give his name. These features would allow Saya to be used as a communication tool, allowing an elderly father to converse with a robot that resembles their son, for example. At the same time, the son would be able to see his father via the installed monitoring video.

Making Its Own Decisions

In addition to making interaction with robots more human, other researchers are looking at adding artificial intelligence to their creations.

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1 showing off **炫耀，使显眼**
2 managing director **总经理**
3 underway **在进行中**
4 humanoid **似人的，有人类特点的**
5 assistant professor **助理教授**

Engineers at Professor Shigeki Sugano's laboratory at Waseda University are trying to give their Wamoeba robot a sense of values and the ability to determine for itself how to react towards given situations, said Yuki Suga, a student at Waseda University.

For example, when the robot handles an object that a human would find soft or delicate[1], engineers want it to be able to decide for itself whether that object is soft or not, Suga said.

Wamoeba's development is still at the algorithmic[2] stage and Wamoeba is so far able to react to external factors, such as being touched by someone, by displaying one of three different colors based on pre-programmed responses, he said.

For Safety's Sake

At one of Chiba University's laboratory, researchers led by Professor Kenzo Nonami are developing a six-legged robot which works as a land-mine[3] detector. The Comet-II measures 47 inches by 71 inches and weighs 265 pounds. The robot's six legs support its main body while its sensor-equipped right arm searches for mines and the left arm marks each spot where a land mine is detected with color ink.

At this point in its development, Comet-II can search for and detect land mines and work out their position using GPS[4]. This information is then fed to a computer located at a safe distance, said Kou Keikyu, a student at the laboratory. The sensor can detect land mines buried to a depth of 28 inches, he said.

However, there are two problems that need to be solved before Comet-II can be deployed to detect mines, he said. The robot is not water-resistant and it needs to be connected to a power source via a cable. To solve the power problem, a gasoline-powered engine, which will allow the robot to be operated for up to eight hours, will be included with the next generation Comet, he said.

Working Alone

Advances in robot technology aren't just being led by large organizations and research labs. While robot manufacturers Sony and Honda Motor have spent a large amount of money and time to develop their two-leg walking robots, a Japanese university student spent just $75 and six months to develop a radio-controlled robot that can walk on two legs.

The 9.8-inch-high Magdan robot looks and moves like a robot in an animated movie. Powered by a single motor, Magdan can walk forward and backward, rotate left to right, and swing its arms, said Tomotaka Takahashi, the Kyoto University student who created the robot.

To allow Magdan walk smoothly, Takahashi developed electromagnetic absorption technology which allows the robot to walk on an iron-plate base using magnetic feet.

Although Takahashi is a university student, the development of Magdan was not related to his studies. "I wanted to make a robot simply because I loved the robots appeared in animations. I thought about it two years ago and made a prototype within a half year," he said.

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[1] delicate **脆弱的，精巧的**
[2] algorithmic **算法的**
[3] land-mine **地雷**
[4] GPS (Global Position System) **全球定位系统**

Takahashi has contracted with a Japanese toy maker to commercialize Magdan, which is expected to hit the market in May or June this year.

Looking to insure an adequate supply of robot engineers to meet future demand, Nippon Engineering College of Hachioji will open a Robotics Department in April to train engineers in robot technologies.

“At the moment, the field of humanoid robot developments is short of engineers,” said Toshiyuki Itakura, who will be teaching in the Robotics Department. “Currently, a group of people who gained experience and specialized knowledge through their careers are the only ones capable of developing humanoid robots at corporations. This department hopes to allow students to gain such specialized knowledge at the college level.”

Lesson 10　Internet

Text

A Basic Guide to the Internet

The Internet is a computer network made up of thousands of networks worldwide. No one knows exactly how many computers are connected to the Internet. It is certain, however, that these number in the millions and are increasing at a rapid rate.

Components of the Internet

World Wide Web

The World Wide Web[1] (abbreviated as the Web or WWW) is a system of Internet servers that supports hypertext[2] to access several Internet protocols on a single interface. Almost every protocol type available on the Internet is accessible on the Web. This includes E-mail, FTP[3], Telnet[4], and Usenet[5] News. In addition to these, the World Wide Web has its own protocol: HyperText Transfer Protocol[6], or HTTP.

The operation of the Web relies primarily on hypertext as its means of information retrieval. HyperText is a document containing words that connect to other documents. These words are called links and are selectable by the user. A single hypertext document can contain links to many documents. In the context of the Web, words or graphics may serve as links to other documents, images, video, and sound. Links may or may not follow a logical path, as each connection is programmed by the creator of the source document. Overall, the WWW contains a complex virtual web of connections among a vast number of documents, graphics, videos, and sounds.

Producing hypertext for the Web is accomplished by creating documents with a language called HyperText Markup Language[7], or HTML. With HTML, tags are placed within the text to accomplish document formatting, visual features such as font size, italics and bold, and the creation of hypertext links. Graphics may also be incorporated into an HTML document. HTML is an evolving language, with new tags being added as each upgrade of the language is developed and released. The World Wide Web Consortium, led by Web founder Tim Berners-Lee, coordinates the efforts of standardizing HTML.

E-mail

Electronic mail, or E-mail, allows computer users locally and worldwide to exchange messages. Each

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[1] World Wide Web **万维网**
[2] hypertext **超文本**
[3] FTP (File Transfer Protocol) **文件传输协议**
[4] Telnet **远程登录**
[5] Usenet **世界性的新闻组网络系统**
[6] HTTP (HyperText Transfer Protocol) **超文本传输协议**
[7] Hyper Text Markup Language (HTML) **超文本标记语言**

user of E-mail has a mailbox address to which messages are sent. Messages sent through E-mail can arrive within a matter of[1] seconds.

A powerful aspect of E-mail is the option to send electronic files to a person's E-mail address. Non-ASCII[2] files, known as binary files, may be attached to E-mail messages. These files are referred to as MIME[3] attachments. MIME stands for Multipurpose Internet Mail Extension, and was developed to help E-mail software handle a variety of file types. For example, a document created in Microsoft Word can be attached to an E-mail message and retrieved by the recipient with the appropriate E-mail program. Many E-mail programs, including Eudora, Netscape Messenger, and Microsoft Outlook Express, offer the ability to read files written in HTML, which is itself a MIME type.

Telnet

Telnet is a program that allows you to log into computers on the Internet and use online databases, library catalogs, chat services, and more. To Telnet to a computer, you must know its address. This can consist of words (locis.loc.gov) or numbers (140.147.254.3). Some services require you to connect to a specific port on the remote computer. In this case, type the port number after the Internet address. For example: telnet nri.reston.va.us 185.

Telnet is available on the World Wide Web. A link to a Telnet resource may look like any other link, but it will launch a Telnet session to make the connection. A Telnet program must be installed on your local computer and configured to your Web browser in order to work.

FTP

FTP stands for File Transfer Protocol. This is both a program and the method used to transfer files between computers. Anonymous FTP is an option that allows users to transfer files from thousands of host computers[4] on the Internet to their personal computer account. FTP sites contain books, articles, software, games, images, sounds, multimedia, course work[5], and more.

If your computer is directly connected to the Internet via an Ethernet cable, you can use one of several PC software programs, such as WS_FTP for Windows, to conduct a file transfer.

FTP transfers can be performed on the World Wide Web without the need for special software. In this case, the Web browser will suffice. Whenever you download software from a Web site to your local machine, you are using FTP.

【Exercises】

Write T (true) or F (false) for each statement.

1．The World Wide Web has its own protocol: TCP/IP.

2．A single hypertext document can only contain one link.

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1 a matter of **大约，大概**

2 ASCII（American Standard Code for Information Interchange）**美国信息交换标准码**

3 MIME (Multipurpose Internet Mail Extensions) **多用途互联网邮件扩充服务**

4 host computer **主机**

5 course work **课程作业，课程论文**

3．A document created in Microsoft Excel can be attached to an E-mail message.

4．Computer’s address can only consist of words (sina.com.cn).

【Vocabularies】

retrieval[ri'tri:vəl] **n.信息检索**

italics[i'tæliks] **n.斜体字**

bold[bəuld] **n.粗体**

incorporate[in'kɔ:pəreit] **v.使加入**

consortium[kən'sɔ:tjəm] **n.联盟**

coordinate[kəu'ɔ:dinit] **v.使协调，调整**

suffice[sə'fais] **v.足够**

Reading Materials

What is Considered Good Behavior Online?

Distance conveys a degree of anonymity[1], and as a result, many people feel less inhibited[2] in online situations than in their everyday lives. This lessening of inhibitions sometimes leads people to drop their normal standards of decorum when communicating online. In response, good cybercitizens[3] have developed, over the years, an informal set of guidelines for online behavior called Netiquette[4]. Netiquette can be summarized by three simple precepts: Remember that there is a human being on the other end of your communication, treat that human being with respect, and do not transmit any message that you wouldn’t be willing to communicate face to face. Some specific corollaries[5] of these precepts follow:

- Be careful what you write about others. Assume that anyone about whom you are writing will read your comments or receive them by some circuitous route.
- Be truthful. Do not pretend to be someone or something that you are not.
- Be brief. Receiving and reading messages costs time and money.
- Use titles that accurately and concisely describe the contents of E-mail and other postings.
- Consider your audience, and use language that is appropriate. Excessive use of jargon[6] in a nontechnical chat room, for example, can be bad manners, and remember that children sometimes dial into chat rooms.

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1 anonymity **匿名性**

2 inhibited **羞怯的，内向的**

3 cyber **是一个前缀，意思是“计算机，计算机的”**

4 Netiquette (Network etiquette) **网络礼节**

5 corollary **推论**

6 jargon **某一行业学科中专用的术语**

- Avoid offensive language, especially comments that might be construed as racist or sexist.
- Remember that the law still applies in cyberspace[1]. Do not commit illegal acts online, such as libeling or slandering others, and do not joke about committing illegal acts.
- Be careful with humor and sarcasm. One person's humorous comment can be another person's boorish or degrading remark.
- Do not post a message more than once.
- Generally speaking,avoid putting words into full capitals.Online,all-caps is considered SHOUTING.
- If you are following up a previous message or posting, summarize that message or posting.
- When summarizing, summarize.
- Do not post irrelevant messages, referred to in hacker[2]'s jargon as spam[3].
- Read existing follow-up postings and don't repeat what has already been said.
- Respect other people's intellectual property. Don't post, display, or otherwise provide access to materials belonging to others, and cite references as appropriate.
- Temper online expressions of hostility; in hacker's jargon, avoid excessive flaming[4] of others.
- Never send online chain letters[5].
- Some E-mail programs allow one to place signatures containing text and graphics at the ends of mailings. Remember that elaborate materials take up valuable transmission time, and do not overdo these signatures.
- Limit the length of typed lines to less than 78 characters, and avoid unusual formatting.
- Identify any financial interests related to an E-mail message or posting. If you are selling something, make that fact clear.
- Do not send E-mail to people who might have no interest in it. In particular, avoid automatically copying E-mail to large numbers of people.
- Online messages can be quite informal, but try, nevertheless, to express yourself using proper spelling, capitalization, grammar, usage, and punctuation.
- Avoid chastising others for their online typos. To err is human, to forgive is good cybercitizenship[6].

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[1] cyberspace **电脑空间**
[2] hacker **计算机迷，黑客**
[3] spam **兜售信息(邮件、广告、新闻、文章)，与垃圾邮件（**junk mail**）意思相同**
[4] flame **在计算机网络世界中的意思是“对……非礼”**
[5] chain letter **链式邮件**
[6] **类似的谚语是：**to err is human, to forgive is divine. **凡人皆有过，宽恕则超凡**

Lesson 11 E-Commerce

Text

Digital Certificates

Digital certificates are data files used to establish the identity of people and electronic assets on the Internet. They allow for secure, encrypted online communication[1] and are often used to protect online transactions[2].

Definition

As electronic transactions proliferate, there's an increasing need for third-party[3] verification and authentication in the form of digital certificates. Digital certificates are issued by a trusted third party known as a certification authority (CA[4]). The CA validates the identity of a certificate holder and "signs" the certificate to attest that it hasn't been forged or altered.

When a certificate is digitally signed by a CA, its owner can use it as an electronic passport to prove his identity. It can be presented to Web sites, networks or individuals that require secure access.

Identifying information embedded in the certificate includes the holder's name and E-mail address, the name of the CA, a serial number[5] and any activation or expiration data for the certificate. When a user's identity is verified by the CA, the certificate uses the holder's public key[6] to protect data.

Public keys are also employed by certificates that a Web server uses to confirm the authenticity of a Web site for a user's browser. When a user wants to send confidential information to a Web server, such as a credit-card number for an online transaction, the browser will access the public key in the server's digital certificate to verify its identity.

Public-Key Cryptography[7]

The public key is one half of a pair of keys used in public-key cryptography, which provides the foundation for digital certificates.

Public-key cryptography uses matched public and private keys[8] for encryption and decryption. These keys have a numerical value[9] that's used by an algorithm to scramble information and make it readable only

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[1] online communication **联机通信**
[2] online transaction **联机事务处理**
[3] third-party **第三方的**
[4] CA (certification authority) **认证机构**
[5] serial number **序列号**
[6] public key **公钥**
[7] public-key cryptography **公钥加密**
[8] private key **私钥**
[9] numerical value **数值**

to users with the corresponding decryption key.

A person's public key is used by others to encrypt information meant only for that person. When he receives the information, he uses his corresponding private key, which is kept secret, to decrypt the data. A person's public key can be distributed without damaging the private key.

A Web server using a digital certificate can use its private key to make sure that only it can decrypt confidential information sent to it over the Internet.

The Web server's certificate is validated by a self-signed CA certificate that identifies the issuing CA. CA certificates are preinstalled on most major Web browsers, including Microsoft Internet Explorer and Netscape Navigator.

The CA certificate tells users whether they can trust the Web server certificate when it's presented to the browser. If the validity of the Web server certificate is affirmed, the certificate's public key is used to secure information for the server using Secure Sockets Layer (SSL[1]) technology.

Digital certificates are used by the SSL security protocol to create a secure "pipe" between two parties that seek confidential communication. SSL is used in most major Web browsers and commercial Web servers.

【Exercises】

Write T (true) or F (false) for each statement.

1. Digital certificates are often used to protect online transactions .
2. Digital certificates can be issued by any group.
3. When a user's identity is verified by the CA, the certificate uses the holder's private key to protect data.
4. SSL can only be used in Microsoft Internet Explorer.

【Vocabularies】

proliferate[prəu'lifəreit]	***v.*激增，扩散**
validate['vælideit]	***v.*确认**
attest[ə'test]	***v.*证明**
forge[fɔːdʒ]	***v.*伪造**
confidential[kɔnfi'denʃəl]	***a.*秘密的，机密的**
cryptography[krip'tɔgrəfi]	***n.*密码编制（或破译）**
scramble['skræmbl]	***v.*置乱**

[1] SSL (Secure Sockets Layer) **安全套接层**

Reading Materials

Is Broadband Really Changing E-Business?

The United States is a wired nation, but not completely so. Two recent reports paint starkly different pictures of the connectedness of the average U.S. resident. The first, released by Technology Futures of Austin, Texas, states that in 2003, the proportion of American households using broadband of some kind—DSL[1], cable or, in some rare cases, wireless—will surpass 20 percent. More and more people are buying permanent connections[2] to the Net. At the other end of the spectrum, a report published by the Pew Internet & American Life Project indicates the digital divide is still a concern: One-fourth of U.S. residents do not use the Internet at all, including many people who live in homes with wired connections.

Although the digital divide has been discussed for many years, the new dial-up divide also has implications—and it might be worth reminding lawmakers who are trying to jump-start[3] the economy how much increased broadband adoption could do for E-business. After all, a number of signs suggest that broadband connections both increase the volume of goods sold and provide for more informed consumer purchasing behavior. With a little help, broadband may yet make good on some of the more ambitious predictions of the dot-com bubble days.

Wired To Shop

A cursory glance at a few financial statements makes clear that although the yearned-for[4] profits of so-called frictionless commerce have yet to materialize, there has been increasingly rapid growth in online retail in recent months. Moreover, Forrester Research is expecting a 26 percent jump in overall E-sales this year, to a total of US$95 billion. In some cases, individual companies also are showing sharper sales growth than in the past.

For example, Amazon.com reported in its most recent quarterly filing that sales increased to $1.084 billion, a jump of 28 percent compared with the same quarter a year ago. In contrast, that quarter, ended in March 2002, saw a jump of just 21 percent year-over-year from 2001.

The most obvious factor in today's faster E-business growth is simply time spent online. "Broadband has had a huge impact on sales," said Gartner analyst Avivah Litan, who observed that as broadband use has increased, so has time spent online by the average shopper. During the same period, online retail numbers also have risen. Although scientific correlation is difficult in such matters, Litan, who also expects to see about $95 billion in total E-tail sales this year, said Gartner's surveys of home shoppers show that permanent Internet connections remove some hesitation from the online shopping process. "People don't have to think about whether to connect," she told the E-Commerce Times.

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1 DSL (Digital Subscriber Layer) 数字用户线路
2 permanent connection 固定连接
3 jump-start 刺激推动
4 yearn for… 渴望……

Smarter Buyers

Not only the volume, but also the nature of E-business buying has changed as a result of broadband. Shoppers with permanent connections are now combining online research with offline store checks, and they are visiting more stores while online. “People are becoming smarter shoppers,” Forrester analyst Chris M. Kelley told the E-Commerce Times. Forrester surveyed 8 000 shoppers last year and found that, increasingly, broadband users are willing to look at many different sites for information and competitive deals on a given product.

As Gartner’s Litan explained, “With an always-on connection, people don’t feel they have to get right off the line, and they’re willing to look at more screens of information,” increasing the average time spent researching a product.

Another effect of broadband may be that sales of certain types of items rise. Kelley said surveys show that low-risk goods with an impulse factor, such as books and DVDs, benefit because shopping is less of an event when connectivity is instantaneous.

That trend has been confirmed by at least one online retailer, Buy.com.Company COO Brent Rusick told the E-Commerce Times that purchases of DVD titles are way up. “As we’ve been able to add movie clips from the studios, we’ve seen sales increase,” he noted.

Circular Selling

Perhaps even more significant than shifts in buying patterns is the change in the nature of selling. Attempts to equal the brick-and-mortar[1] shopping experience now focus on new approaches. During the boom, CEOs and analysts talked about creating 3D “fly-throughs” of a virtual shopping aisle. Now, they point to the high-bandwidth equivalent of a shopping circular, which is possible because more items can be advertised as single pages load faster for a larger number of customers. The circular is “a familiar form that mirrors the offline world,” said Kelley, pointing to such examples as L.L. Bean and Circuit City.

Will broadband ever enable E-Business to fulfill the dot-com promise that online retail will become more powerful than its offline counterpart? Buy.com’s Rusick contends that the ability to provide amazing amounts of information creates a more informative buying experience online than in a physical store. “What we find most of all is our ability to provide more in-depth[2] content to the consumers,” he said. “A retail store can’t give you an image of both the front of the product as well as the rear panel with connections.”

Never mind that you can reach out and touch a product in the real world: Rusick is talking about information. Still, it seems the power of broadband only goes so far. For example, two-way chat, which was seen by many as a boon for customer service, has yet to take off. Gartner’s Litan contends that today’s mix of access speeds makes it difficult to provide real-time chat as an option, while Buy.com’s Rusick says it is too expensive. “People want to stay on chat forever,” tying[3] up service people, he explained. Still others “just want to use the phone,” Kelley noted.

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[1] brick-and-mortar **房屋，房产**
[2] in-depth **详细的**
[3] tying **是** tie **的现在分词**

Henry Blodgett was Right!

It is too soon to tell whether or not broadband will create a new round of winners and losers, but a familiar enthusiasm is in the air. “All the projections [made during the dot-com era] came true. If anything, the predictions for E-Commerce were too low,” Litan said. What happens going forward will depend on broadband—how much of it there is and how much it is used.

One of Kelley’s colleagues at Forrester, Jed Kolko, anticipates that by the end of 2005, broadband will overtake dial-up, with each connection method representing 35 percent of U.S. households and the remainder of households still offline.

Indeed, two proposed bills, one in the U.S. House of Representatives and one in the Senate, are designed to give broadband a tax incentive[1].

As more users gain the freedom to roam the vast virtual aisles of the Web at high speeds, Buy.com’s Rusick entertains the humble notion that these consumers will return to the stores they know and love. “People become comfortable with a shopping environment. Half our customers are repeat buyers,” he said. “That overall experience is what builds a brand online.”

Whether or not high-octane surfers will stay loyal remains to be seen. However, increasingly crowded Web page “circulars” and DVD movie clips testify that online shopping has already begun to become a broadband affair.

[1] tax incentive **税收鼓励**

Lesson 12 Communication Technology

Text

Mobile Communication[1]

The idea of cellular mobile radio systems appeared at Bell Laboratories, in the USA, in the early 1970s. However, it was not until a decade later that such systems were introduced for commercial use. During the early 1980s, analogue cellular telephone systems experienced a very rapid growth in Europe, particularly in Scandinavia[2] and the United Kingdom. Cellular-phone systems use the 800MHz (806 to 902 MHz) and 1.9 GHz (1,850 to 1,990 MHz) frequency bands[3]. The 1.9GHz frequencies are allocated to PCS (personal communication services)[4], but many cellular systems use these frequencies as they bundle PCS capabilities on their voice-centric service.

The early, first generation cellular systems were analogue and operated in the 800MHz frequencies. Later extensions operated at 1.8GHz and in parts of North America at 1.9GHz. The second generation (2G) appeared about 10 years later, with the first digital mobile, circuit-switched networks[5]. These systems provided better voice quality, higher capacity, lower power requirements and global roaming capabilities. They operated in both the 800MHz and the PCS bands.

Cellular systems use three different techniques for sharing an RF[6] spectrum:

- Frequency Division Multiple Access (FDMA)[7].
- Time Division Multiple Access (TDMA)[8].
- Code Division Multiple Access (CDMA)[9].

Of these, TDMA and CDMA are the dominant techniques.

Whilst take up was rapid, this led to a situation where—in the absence of standardization— each company developed its own system. The undesirable consequences of this were a fragmented marketplace in which any given piece of equipment only operated within the boundaries of the country of manufacture. In order to overcome these problems, in 1982, the Conference of European Posts and Telecommunications (CEPT) formed the Groupe Special Mobile (GSM[10]) in order to develop a pan-European[11] mobile cellular

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1 mobile communication **移动通信**
2 Scandinavia **斯堪的纳维亚（半岛）（瑞典、挪威、丹麦、冰岛的泛称）**
3 frequency band **频带，波段**
4 PCS (personal communication services) **个人通信业务**
5 circuit-switched network **电路交换网**
6 RF (Radio Frequency) **射频**
7 FDMA (Frequency Division Multiple Access) **频分多路存取**
8 TDMA (Time Division Multiple Access) **时分多路存取**
9 CDMA (Code Division Multiple Access) **码分多路存取**
10 GSM (Group Special Mobile) **群组专用移动通信机制**
11 pan- **表示“总”、“全”**

radio system. The standardized system had to meet certain criteria:

- Spectrum efficiency.
- International roaming.
- Low mobile and base stations costs.
- Good voice quality.
- Compatibility with other systems such as ISDN (Integrated Services Digital Network).
- Ability to support new services.

The decision was taken that the GSM system would be developed using digital technology, and “GSM” subsequently became the acronym for Global System for Mobile communications[1]. In 1989 the responsibility for the GSM specifications passed from the CEPT to the European Telecommunications Standards Institute (ETSI). Phase I GSM specifications were published the following year, but the commercial use of the system did not start until 1991. In 1995 Phase 2 specifications extended coverage to rural areas, and by the end of that year approaching 120 networks were in operation in around 70 geographic areas.

By the start of the new millennium—notwithstanding the many bumps in the road along the way—significant progress had been made towards the so-called third generation (3G) of services:

- The number of GSM subscribers worldwide had grown to an estimated 165 million.
- The first GPRS[2] networks—an important migration step towards 3G networks—had gone live.
- The first WAP[3] trials were underway in Europe.

By 2001, the promise of seamless inter-operation between the wireless world and the computing/Internet world and exciting new services such as video on demand[4] was drawing ever closer.

【Exercises】

Write T (true) or F (false) for each statement.

1. The 800MHz frequencies are allocated to PCS.
2. The first generation cellular systems were digital.
3. In 1982, the European Telecommunications Standards Institute formed the Groupe Special Mobile (GSM) in order to develop a pan-European mobile cellular radio system.
4. The first WAP trials were underway in America.

【Vocabularies】

bundle [ˈbʌndl]	***n.*捆，束**
roam [rəum]	***v.*漫游**

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[1] Global System for Mobile communications **全球移动通信系统**
[2] GPRS (General Packet Radio Service) **通用分组无线业务**
[3] WAP (Wireless Application Protocol) **无线应用协议，一种手机上网协议**
[4] VOD (video on demand) **视频点播**

spectrum['spektrəm]　　n.（射频，无线电信号）频谱
criteria[krai'tiəriə]　　n.标准
acronym['ækrənim]　　n.首字母缩写词
millennium[mi'leniəm]　　n.一千年

Reading Materials

Digital Communication

For most of the last 100 years of the 20th century the connection between the subscriber and their telephone exchange was copper twisted pair[1] buried in the pavement or distributed overhead on poles. Given[2] the enormity of the investment in this "local loop" infrastructure[3] it is hardly surprising that it had lasted for so long. However, by the late 1990s the convergence between voice, computer and television applications—and its inexorable move to digital-based technologies—had led to an erosion of demarcations.

For most of the history of fixed line telephony, the bandwidth that copper provided was some 3KHz, limited by analogue techniques and designed to be the cheapest solution that the telecomms operator could get away with. However, the twisted pair is inherently capable of much higher bandwidths and over short distances can carry video or broadband data. New technologies—such as ISDN and ADSL—were developed to enable higher performance to be delivered over the existing infrastructure. Innovation and competition was significantly helped by government action to end incumbent telecomms companies' monopoly over the local loop.

In addition, the 1990s had seen cable companies investing massively in alternative connections to the home. Not all use the same technology, but the great majority have fiber optic cable[4] to the curbside cabinet and coaxial cable from there to the home. In most cases these cable networks were installed to deliver television to the home and were designed on the basis of broadcast TV services. However, as much of the developed world continues its inexorable move towards broadband, their high bandwidth can be exploited to deliver other forms of digital-based services too.

ISDN

ISDN (Integrated Services Digital Network) has been regarded by many as the best kept secret of the computer networking world for too long. The continuing growth of the Internet and particularly the web seems to have finally pushed ISDN out into the open, as PC users have become increasingly frustrated as they wait for graphic-intensive web pages to download and want more speed from their dial-up net connection. Businesses are also looking for cost-effective[5] ways to provide their staff with good-quality

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1 twisted pair 双绞线
2 given 这里的意思是"考虑到"
3 infrastructure 基础设施
4 fiber optic cable 光缆
5 cost-effective 有成本效益的，划算的

connections to the net.

The irony is that ISDN has been around for many years in the shape of the UK's telephone network which has slowly been migrating away from being a public switched telephone network (PSTN[1]), towards having an all digital infrastructure. What is still analogue, however, is the "local loop"—the copper telephone cable that runs from the typically digital telephone exchange to the home or business. So in fact, ordinary voice telephone calls go through an ISDN, but the real benefits of ISDN are not available until users pay for their particular strand of the local loop to be upgraded to ISDN.

ISDN was initially available in two versions, Basic Rate ISDN[2] (BRI) which is also known as ISDN-2, and Primary Rate ISDN[3] (PRI) or ISDN-3:

A Basic Rate installation, suitable for the home user or small business, consists of two 64 Kbit/s B channels for data transmission and one hidden 16 Kbit/s D channel for control information. The two 64 Kbit/s B channels can be used separately or bonded together to give one channel of 128 Kbit/s.

A Primary Rate ISDN installation consists of 30 B channels (although a minimum of six can be installed) of 64 Kbit/s each, plus a 64 Kbit/s D channel for control data which will normally be installed into a company's PABX[4] for maximum flexibility. As with Basic Rate the B channels can be bonded to give a single pipe of 1.92 Mbit/s.

Late 1998 saw BT[5] making the first serious attempt to market ISDN technology to the home user with the announcement of the "BT Highway" services. When a customer subscribes to one of these services, their existing telephone line is retained but the old master socket is replaced by a Highway unit. This has four sockets, two analogue and two ISDN, and can support up to three calls simultaneously. Subscribers retain their old analogue number while receiving two additional numbers, one for a second analogue port and one for the ISDN lines. Two major differences between the "Home" and "Business" services are that the latter supports Multiple Subscriber Numbering (MSN)—whereby different devices attached to one ISDN line can have different numbers—as well as BT's new ISDNConnect data service—a permanent low-speed link that uses ISDN's signaling channel.

At the same time as BT Highway was launched BT's ISP[6] operation, BT Internet, announced support for 128 Kbit/s access, allowing users to use their two ISDN lines as one high-bandwidth link. Previously, UK-based ISPs had not supported this option—undermining BT's efforts to promote ISDN to the Internet community.

Digital Subscriber Line[7]

xDSL is a catchall name for a variety of DSL (Digital Subscriber Line) technologies developed to offer phone companies a way into the cable TV[8] business. It isn't a new idea; Bell Communications Research Inc.

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[1] PSTN (Public Switched Telephone Network) **公共电话交换网**
[2] Basic Rate ISDN **基本速率** ISDN
[3] Primary Rate ISDN **基群速率** ISDN
[4] PABX (Private Automatic Branch exchange) **专用自动交换分机**
[5] BT (British Telecom) **英国电信**
[6] ISP (Internet Service Provider) **互联网服务供应商**
[7] DSL (Digital Subscriber Line) **数字用户线**
[8] cable TV **有线电视**

developed the first DSL back in 1987 to deliver video on demand and interactive TV over copper wires. That effort came to nothing and deployment since has been mostly limited to field trials, the technology being hampered by lack of industry-wide standards. However, interest in xDSL received a major boost with the passage of the Telecommunications Reform Act of 1996. This legislation ended local service monopolies and allowed competition among local phone companies, long-distance carriers, cable companies, radio and TV broadcasters, and Internet Service Providers (ISPs). Suddenly, local exchange carriers needed a broadband service for the local loop to combat cable companies' plans to offer cable modem and telephony services.

xDSL technologies are very fast, typically offering download speeds up to 52 Mbit/s and upload speeds ranging from 64 Kbit/s to over 2 Mbit/s, and come in a number of variants:

asymmetric (ADSL[1])

high-bit rate (HDSL[2])

single-line (SDSL[3])

The different approaches have differing trade-offs between signal distance and speed and differences in symmetry of upstream and downstream traffic which, taken together, make them suited to different applications. Recent developments make ADSL (Asymmetric Digital Subscriber Line) look the most promising for home use.

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1 ADSL **非对称** DSL

2 HDSL **高位速率数字用户线**

3 SDSL **单线数字用户线**

Lesson 13 Build a Computer

Text

Collect Components and Test Your System

Collect Components

Often this step is the one which takes the longest amount of time and consideration. Which parts do I buy? Which components are best?

There are many good places to buy computer parts. You can go to a computer retail store in your area. The support is usually good, and they provide decent warranties. The trade-off will be that you will pay a little more than you would in other places. Sometimes, a lot more.

Most towns have smaller stores that sell and repair computer equipment. These are not large retail stores, but instead usually in an office suite in a mall. Regardless of location, though, such stores are often cheaper and can provide individual attention. Their hardware is often retail packaged from the manufacturer, in a box and all. But, they also sell OEM[1] hardware, usually wrapped in nothing but plastic and have little documentation. You will need to be the judge on this type of hardware.

Let's go through each type of hardware.

Case: Make sure you buy a case which will fit the space you intend to use it in. Allow room for expandability: spare drive bays[2], ample room to work inside. Make sure it has a power supply. Is the case clean?

Motherboard: It needs to fit in the case you choose and support all hardware you intend to use. Make sure it has ample documentation.

Processor: Inspect the CPU for bent pins. Don't touch the pins.

Memory: Make sure your motherboard fully supports the memory that you buy. Take into consideration parity[3] and memory type. When handling the memory, avoid touching the contacts. Along with this, buy a cache module if your motherboard doesn't have the cache built on.

Video Card: For high-performance, buy a PCI video card. Consider your main uses: business programs, or 3D gaming. If you are doing any graphical work or games with this system, you should buy a mid to high end video card.

Floppy Drive: Really very straightforward. Make sure it looks good and the pins are all intact.

Hard Drive: Make sure it looks good. Always buy new hard drives. And make sure it has a manual.

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[1] OEM **初始设备制造厂家，委托加工**
[2] drive bay **驱动器仓**
[3] parity **奇偶性**

CD-ROM: Make sure it has a driver[1] installation disk. You will need to get this drive working quickly so that you can install the operating system.

Keyboard & Mouse: Rather self-explanatory. Make sure the keyboard connector fits into the plug on the motherboard, otherwise you may need an adapter[2]. Make sure the mouse works. And choose the right kind for your system: serial or PS/2.

Heat Sink/Fan: Get a heat sink[3] and fan rated for the processor you intend to use. If it is not already attached to the CPU, you will need to pick up heat sink compound.

Drive Cables: Make sure you have all cables for connecting the hard drive, floppy drive, and CD-ROM to the I/O on the motherboard or I/O card. These cables usually are supplied with the motherboard, but not always, and maybe not in the quantity you need.

Audio Cable: Usually supplied with the CD-ROM, it connects your CD-ROM to your sound card directly.

Screws: Make sure you have enough screws. Usually, an ample amount is supplied with your case. Make sure the screws are the right size. There are different sizes used for connecting card than for connecting drives, and if you try using a large screw on the drive, you'll crack the drive.

Test Your System

Now that the system is on and operating, you can make a few tests to ensure all is working as it should. Check the following items:

Check the LED[4]s on the front of the case. During boot-up, the HDD[5] LED should light. If it does, it's connected properly to the motherboard. If not, try reversing the leads on the LED plug, or just turning it around.

Check the Hard Drive. Make sure it is spinning.

Check the fans. Make sure the CPU Fan, Power Supply Fan, and Case Fan (if you have one) are all spinning without any wires in the way[6].

Make sure the CD-ROM has power by hitting the eject button and seeing if it opens.

Hit the reset button to be sure it works. While it reboots, check to be sure all the data on the BIOS splash screen is correct to your system.

If you have a keylock, test it now.

Let the system run for 10-15 minutes.

Now, turn it off, and carefully touch the CPU and hard drive. You are checking the temperature to be sure they are being properly cooled.

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1 driver **驱动程序**
2 adapter **适配器**
3 heat sink **散热片**
4 LED (Light Emitting Diode) **发光二极管**
5 HDD (Hard Disk Drive) **硬盘驱动器**
6 in the way **挡道的，妨碍的**

【Exercises】

Write T (true) or F (false) for each statement.

1. You can buy computer parts in large retail computer store, but the support is not very good.
2. Motherboard should fit in the case you choose and support all hardware you intend to use.
3. For high-performance, buy a PCI video card.
4. Usually supplied with the CPU, audio cable connects your CPU to your sound card directly.

【Vocabularies】

decent[ˈdiːsnt]	***a.*像样的，还不错的**
trade off	**交换**
strip mall	**购物中心**
documentation[ˌdɔkjumenˈteiʃən]	***n.*文档资料**
go through	**仔细检查**
spare[spɛə]	***a.*多余的，备用的**
take into consideration	**考虑**
handle[ˈhændl]	***v.*触，摸，拿**
generic[dʒiˈnerik]	***a.*一般的，普通的**
intact[inˈtækt]	***a.*完整无损的**
self-explanatory	**不需加以说明的**
reverse[riˈvəːs]	***v.*颠倒**
lead[liːd]	***n.*引脚**
eject[iˈdʒekt]	***v.*弹出**

Reading Materials

Hardware Installation

【Collect Components】

case, motherboard, processor, memory, video card, floppy drive, hard drive, CD-ROM drive, keyboard, mouse, heat sink/fan, drive cable, audio cable, screws.

【Remove System Case】

plain-jane case

Take a screwdriver and remove the six screws on the back of the case that lie on the edge of the case. Save the screws for later. After they are removed, the entire case cover comes off in one piece. With this design, the front of the case does not move. Only the top and sides come off as a cover.

newer case

The manufacturers of cases have made efforts to make cases “screwless”. With this design, you usually take hold of the bottom of the front of the case and give it a nice solid yank. The front then pulls off, then the sides lift and slide off, followed by the top which gets lifted away from the chassis.

【Install Floppy Drive】

Simply screw the drive in place.

【Install Hard Drive】

Make sure the drive is installed right side up, with the logic board facing down. Make sure the logic board is not touching anything, and also ensure the cable connectors are facing the back of the case.

【Install CD-ROM】

When tightened into place, make sure the front of the drive is flush with the front of the case. Also make sure it appears straight.

【Configure the Motherboard】

Configuring your motherboard usually requires setting jumpers on the motherboard according to the CPU you plan on putting on it.

1. Read the manual.
2. Set the voltage settings.
3. Set the processor speed.
4. Some boards make use of a jumper to set the cache size and type.

【Install the CPU】

1. Orient the chip.
2. Open ZIF socket.
3. Insert processor.
4. Eradicate gaps.
5. Close ZIF socket.

【Install Heat Sink】

1. Attach the fan to the heat sink.
2. Apply the heat sink compound.
3. Attach the heat sink.
4. Clean the mess.

【Install Memory】

1. Decide which slots you are going to use and orient the SIMM over it.
2. Install the module.
3. Lock the module in place.

【Install Motherboard】

1. Once the case is positioned correctly for work, locate the holes on the motherboard and the holes on the case.

2. Now gather your spacers, pictured to the right.

3. For the holes that line up with a eyelet hole on the case, install a plastic stand-off on the motherboard.

4. Now slide the board into the case.

5. Inspect the screws you will use to tighten the board down.

6. Tighten the board down.

7. Install the panel if your case uses one.

【Install I/O Port Connectors】

metal insert

Screw these inserts into one of the available slots on the back of the case.

dedicated slots

Choose which slots you will use, making sure you choose those that fit your I/O ports, such as 9-pin or 25-pin. Then remove the cover from these slots.

【Connect the Motherboard to the Case】

1. Connect the power to the motherboard.
2. Connect the CPU Fan to the power.
3. Study the case connectors on the motherboard and match them up with case connector wires.
4. Connect the power switch.
5. Connect the reset switch.
6. Connect Power LED/ Keylock Switch.
7. Connect the hard drive activity LED.
8. Connect the PC speaker.

【Connect Floppy to Motherboard】

1. Connect the power supply to the floppy drive.
2. Attach the ribbon cable.

【Connect Hard Drive】

1. Connect it to the power supply.
2. Attach the ribbon cable.

【Connect CD-ROM】

1. Attach the power supply to the drive.
2. Attach the ribbon cable.
3. Attach the audio cable.

【**Install Video Card**】

1. Find an expansion slot ideal for your video card.
2. Insert the video card in the slot.
3. Screw the card into place.

Lesson 14　Computer Architecture

Text

CPU Design

Dependent Instructions

Suppose you want to add three numbers together:

5 + 22 + 7

A person and a computer program will first add 5 to 22 getting 27. Then adding 27 to 7 gets 34. Two operations are performed. Since the second operation uses the result (27) from the first operation, they have to be done in order.

Now consider adding four numbers together:

5 + 22 + 7 + 18

A person will accomplish this by appending a third operation that adds the 34 calculated by the first two operations to 18 to get 52. However, a computer can perform more than one numerical operation at the same time, provided that the two operations are independent of each other. So if you want to optimize this for a modern PC, you would arrange the instructions as follows

Add 5 and 22　(27)

Add 7 and 18 (25)

Add the results of the previous two steps, 27 and 25, together (52).

Since steps 1 and 2 don't depend on each other's results, they can both be run at the same time. Step 3 requires the results of both previous steps, so it runs in the next cycle. As a result, the computer can add four numbers together in the same two cycles it took to add just three numbers together, because the first two operations can both run in the first cycle at the same time.

The original Pentium chip could execute two instructions at the same time, provided that they were not dependent on each other. It required the programmer or compiler arranging the instructions in an optimal order. The CPU chips produced in the last few years are even smarter, and they will internally rearrange instructions to optimize their execution even if the program doesn't.

Memory Access[1] Delay

Memory is a lot slower than the CPU. If an instruction requires data that is out in the main memory of the computer, it may have to wait for a period of time equal to the processing of hundreds of instructions. Since some of the subsequent instructions will depend on the results of this previous operation, the CPU will halt waiting for memory.

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[1] Memory Access **内存访问，存储器存取**

To get around[1] this problem, a CPU has two types of internal high speed memory to hold recently used instructions and data. This high speed memory is called “cache[2]”.

The best type of internal memory is the Level 1 (L1) cache. This memory is part of the CPU core along with the units that decode instructions and perform arithmetic. If the instruction and data are in L1 cache then the CPU can execute at full speed.

When the instruction or data is not found in the L1 cache, modern processors have a larger amount of Level 2 cache integrated into the CPU chip. Different chips have 128 KB, 256 KB, or 512 KB of L2 cache depending on cost and technology. A “Pentium IV” chip always has more L2 cache than the less expensive “Celeron” chip of the same generation. Access to the L2 cache may delay an instruction for several clock cycles, but the CPU chip will often be able to reorder instructions and keep busy during the period.

RISC[3] Architecture

The first Intel “CPU on a chip” was the 4004 processor. It was more like a pocket calculator than a real computer. It handled ordinary base 10 digits encoded as four bits. Later chips added the ability to handle 8 bit, 16 bit, and 32 bit numbers. So on a modern Intel CPU chip there is no single Add instruction. Instead, there are separate Add operations for digits, bytes, and every other size of number. This is typical of a “Complex Instruction Set” computer chip.

Make all the instructions the same size. Use only one size of data. Simplify the instructions and therefore the operation decode. This is typical of a “Reduced Instruction Set” computer chip.

Two or three years ago it was possible to argue that the future belonged to RISC computers. Given the technology available at the time, they were smaller, faster, cheaper, and easier to build than conventional computer chips. In a joint project, IBM, Apple, and Motorola developed the PowerPC chip and Apple proceeded to convert its entire Macintosh line to use it. DEC developed its family of Alpha CPUs, and Sun has its SPARC family.

Then all the other vendors sat back and waited for the Intel architecture to hit the dead end that they all predicted was inevitable. However, technology doubles the power of chips every 18 months, and there are economies of scale when you are selling millions of chips every month.

The advantage of a Reduced Instruction Set turned out to be important in the period when chips have 2-3 million transistors (during the period of the late 486 chips and the early Pentium chips). When the PowerPC was first announced, it was billed as having “the power of a Pentium at the price of a 486.” Due to software problems, IBM delayed any wide distribution of PowerPC systems, and the window of opportunity was lost. By the time that any systems other than Apple used the PowerPC, Pentium chips were selling for less than the 486 chips used to cost, and the Pentium Pro combined the best of RISC and conventional chip design.

RISC chips are still widely used in Unix systems, and they can run Windows NT. It is likely that some type of RISC multiprocessor will remain the most powerful choice for a dedicated file and database server when raw power is important and price is less important. However, at this time it appears that Intel is

1 get around **绕过，回避**

2 cache **高速缓存**

3 RISC (Reduction Instruction Set Computer) **精简指令集计算机**

unstoppable and that RISC systems will never capture a significant share.

【Exercises】

Write T (true) or F (false) for each statement.

1．The original Pentium chip could execute two instructions at the same time, even if they were dependent on each other.

2．Memory is as fast as the CPU.

3．The best type of internal memory is the Level 2 cache.

4．The first Intel "CPU on a chip" is typical of a "Complex Instruction Set" computer chip.

【Vocabularies】

suppose[sə'pəuz]	***v.*假定**
append[ə'pend]	***v.*添加，增补**
optimize['ɔptimaiz]	***v.*是最优化**
subsequent['sʌbsikwənt]	***a.*后来的**
halt[hɔːlt]	***v.*暂停，中断**
decode[ˌdiː'kəud]	***v.*译码**
convention[kən'venʃən]	***n.*惯例**

Reading Materials

Electronic Circuits

Analog vs. Digital

Most electronics enthusiasts generally fall into one of two camps: digital or analog. As you must already know, digital circuits are comprised of voltages that are either On or Off, which in computerize is referred to as One and Zero. A good example here would be your emergency flashlight—it's either turned on or it isn't.

Analog circuits, on the other hand, can contain a range of possible values, for example the voltages traveling through an audio amplifier that powers a loudspeaker. On soft passages of music, the voltage produced is very small and the speaker moves back and forth only slightly. But when the music becomes louder, the voltage and movement will be that much greater. With audio, though, how quickly the speaker moves is also a factor.

Electricity Fundamentals

To begin at the very beginning, all electric circuits require two wires to operate. Unlike water that simply flows from here to there, electricity requires a return path back to the original source. This is why a battery has two terminals and a 115 volt floor lamp has two wires. If you interrupt either wire the flow of electricity will stop, which is of course the basis for a switch, the most primitive of all components.

Resistors

Lots of times, an on/off switch is sufficient, but what if you'd like to be able to vary the brightness? This is where resistors come in. A resistor is a component that is meant to be inserted into an electrical path, to restrict the flow of electricity. To continue the water analogy, a resistor is very much like a short length of narrow pipe. Most resistors come with two connecting wires, one at each end, so they can be added to the circuit. There are also variable resistors such as the volume control on a portable radio, and they operate much like a water valve or faucet.

The value of a resistor is measured in Ohms, and the higher this value is, the less current will be able to flow through it. When a resistor is inserted into either of the wires that connect a battery to a light bulb, less current is passed and the bulb will be dimmer. By the way, most of the resistors that you will encounter are constructed of some type of carbon material. In high power circuits, thin wire is generally used instead, which is then wound on a ceramic core that won't melt.

Inductors

An inductor is merely a coil of wire, frequently wound on an iron core. DC has no trouble passing through an inductor since it is, after all, made of wire. But alternating currents have an increasingly difficult time, and as the frequency is raised less and less current will appear at the other end.

Inductors are measured in Henries, though again, most of the ones you're likely to encounter will be rated in millihenries or even microhenries. As more and more wire is added to the coil, the larger its value will be, and the less able high frequencies are to get through it. The amount of iron used for the core also has an effect, with more iron increasing the inductance.

In practice, inductors are not always used where they could be, since they may be simulated less expensively using other components (A complex issue not worth getting into here) . Copper wire and iron are quite expensive these days, plus an inductor's bulk and weight don't lend themselves to today's miniaturized equipment. However, the real point is that an inductor is also frequency sensitive, and it is exactly the opposite of a capacitor.

Transformers

I once had a crazy friend who owned a large variable power transformer. He would take an assortment of components and place them on a big flat rock in his back yard, where we could see them through the safety of his bedroom window. The components were then connected to the power transformer with a long heavy wire. Now this particular transformer could put out any voltage between zero and 240 volts, which was derived from being plugged into the wall outlet. Of course, the whole point was to start with a small amount of voltage, and then gradually increase it until the components blew up. I'll put it this way: a lot of juice was sent down that wire, and we had quite a bit of fun.

But what does that have to do with this tutorial? Nothing at all — it's just a good story! Seriously, though, the purpose of a transformer is to convert voltages either up or down, but it only works with AC current. Though a transformer is more like an inductor than a capacitor, it uses magnetism to allow the electricity to pass between wires that aren't connected. Let's take a closer look.

Transformers use a principle known as magnetic induction, and they operate much like the transmission in an automobile. If you've ever watched Mr. Wizard on TV, you've surely seen an electromagnet. Unlike the permanent magnets that some people stick on their refrigerator, an electromagnet consists of a coil of wire wound around a piece of iron or steel. When an electric current is applied to the ends of the wire, the iron core becomes magnetized. And when the electricity is removed the magnetism disappears.

It should come as no surprise that the exact opposite holds true as well—if you magnetize the iron, then electricity will be developed in the wire. In fact, this is how electric generators in a power plant work. But in order for a voltage to be produced, the magnetism must be constantly changing. That is, putting a coil of wire over a permanent magnet won't do a thing, except for the instant it's first put into place.

A transformer, therefore, requires AC to operate, and it is made up of two coils of wire wrapped around a single piece of iron. When a constantly alternating voltage is applied to one of the wires the iron will become magnetized, though the magnet's polarity (North/South) will also change constantly. And while one of the coils is creating the magnetism, the other will respond by generating electricity from it. But what does this have to do with an auto transmission?

In a transmission, gears are used to vary the speed of your car, though at the expense of apparent power. That is, for a given amount of horsepower, you can either go slowly but with the ability to climb a steep hill, or go much faster as long as you stick to level terrain. Remember, the power doesn't really vary when you change gears, only the way that power is used. Nothing comes for free, and the transmission merely changes the way an engine's power is distributed.

In an identical manner, a transformer can transform a voltage that is applied to one of the wires, to produce a higher or lower voltage in the other. The key point here is the ratio between the number of windings in each coil. If one of the coils consists of 200 turns of wire, and the other has only 100, then the ratio between them will be two to one. And if you put ten volts into the larger coil, only five volts will appear in the smaller one, though the available current will be twice as much. The actual power always stays the same, and it's just the distribution that really changes.

By the way, even when a circuit could operate on 115 volts directly, a transformer is often used just for safety. The very fact that the two windings are not really connected provides some degree of protection against being electrocuted.

Lesson 15 Network Security

Text

E-mail Security

E-mail has several inherent security problems. When placed in the context of business communications, these problems limit E-mail's potential as a serious business tool. For example, one of its limitations is privacy. Normally, E-mail is sent "in the clear," meaning the message is sent in plaintext[1]. So, anyone who can access the E-mail, whether in transit or in storage, can read the message. Clearly, this is a security problem that may prevent companies from using E-mail to convey confidential business information.

What Ails E-mail

Here's a list of the main security issues that affect E-mail.

- **Lack of privacy**

  E-mail is sent in plaintext and can be read by anyone who can access it.
- **Lack of integrity**

  There is no safeguard to prevent someone from changing the contents of an E-mail message while it's in storage or in transit.
- **Lack of authenticity**

  Anyone can forge an E-mail message that claims it was written by another individual.
- **Lack of nonrepudiation[2]**

  Any particular E-mail message can't be bound to its sender, so a sender can deny ever having sent a message to you.
- **Viruses**

  E-mail messages can contain attachments[3] that are actually viruses in disguise[4]; when you open the attachment, the virus spreads to your PC.
- **Spam**

  An E-mail account is an open home for spam, those annoying mass E-mail rants and advertisements.

Another basic problem revolves around the integrity of a particular piece of E-mail. As mentioned, it's possible for someone to access or intercept a piece of E-mail as it lies in storage or while it's in transit. Since most E-mail messages are in plaintext, anyone who can access the message can also change the contents of the message—without the user knowing that the message had been altered. In this case, the integrity of the

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[1] plaintext 纯文本
[2] nonrepudiation 认可
[3] attachment 附件
[4] in disguise 伪装

message has been compromised. A more complex security problem is one of authenticity. Currently, there is no method built in to E-mail that would let a recipient of a message verify that the sender is actually who he or she claims to be. Combined with the integrity issue, this lack of verification means that E-mail is an untrustworthy system. A related security problem is a lack of nonrepudiation, in which a sender can deny that he or she ever sent a message. Additionally, there is no way to disprove a sender's claim that his or her message has been tampered with[1] so that its meaning has been changed.

E-mailer ID

Currently, several schemes seek to address E-mail's security woes, specifically those of privacy, integrity, authentication, and nonrepudiation. These solutions are all rooted in public key[2] cryptography technology.

If you're not familiar with public key technology, I'll give you a brief overview. In a public key system, a user is assigned a pair of keys that work together. One of the keys is the user's private key, which only the user can possess. The other key is his or her public key, which is freely distributed to the public. Both the keys can encode and decode data. However, what one encodes, only the other can decode. They will not work with any other key.

Here's how the system secures E-mail. When User A wants to send a confidential E-mail message to User B, User A encrypts the E-mail using User B's public key. The only key that can decode the message is User B's private key, which only User B possesses. Consequently, no one else can read the message. This takes care of the privacy and integrity problems.

The system also addresses the issues of authenticity and nonrepudiation. If User A wants to send an E-mail message and assure recipients that the message actually came from him or her, User A can encrypt the message using his or her private key. To read the message, recipients use User A's public key to decode it. Since only User A's public key will decode the message, recipients know that the only key that could encode the message was User A's private key. And, since User A is the only person in possession of that private key, the message must have come from User A.

However, for this system to work, and this is a critical point, users must be able to trust that a user's key is valid. To provide this verification, a trusted entity, generically known as a Certificate Authority (CA)[3], assigns each user a unique digital certificate that assures that a certain public key belongs to a certain user.

The Solutions

As mentioned, several schemes for securing E-mail have been developed. All of them are based on public key encryption. However, they differ in the way they implement this technology; specifically, the biggest difference among the schemes is in how they handle key certification.

The hardest aspect of securing E-mail is establishing a valid CA that everyone has access to. Currently, there is no central CA in existence that the general public can use to verify public keys. And, without a

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[1] tamper with **篡改**
[2] public key **公钥**
[3] CA (Certificate Authority) **证书管理机构，发证机构**

governing CA, to whom can a user turn to verify that a particular public key belongs to a particular user? Some organizations that use public key systems internally act as their own CA for their users. However, these organizations can't manage certificates for the public in general.

Privacy Enhanced Mail (PEM[1]), the IETF[2] standard that addresses secure E-mail, proposes using a hierarchy of trusted bodies to reassure users of the validity of a particular E-mail message. At the top level sits the Internet Policy Registration Authority (IPRA), which would be the governing certificate trusted by all. The IPRA would sign certificates for a second layer of trusted bodies called Policy Certification Authorities (PCAs). These in turn would authorize certificates for another layer of bodies called Certificate Authorities (CAs). These CAs would be responsible for authorizing certificates for the public at large.

When a user receives an E-mail message under the PEM model, the E-mail header lists the certificate of the body that authorized the sender's certificate. That way, recipients know that the E-mailer's identity had been verified by the body.

【Exercises】

Write T (true) or F (false) for each statement.

1．E-mail can be used as a serious business tool because of its convenience.

2．It is impossible to change the contents of an E-mail message while it's in transit.

3．In a public key system, only the user can possess the private key.

4．Although some organizations that use public key systems internally act as their own CA for their users, these organizations can't manage certificates for the public in general.

【Vocabularies】

inherent[inˈhiərənt]	***a.*固有的，内在的**
confidential[kɔnfiˈdenʃəl]	***a.*机密的**
forge[fɔːdʒ]	***v.*伪造**
spam[spæm]	***n.*垃圾信息，与垃圾邮件（junk mail）同义**
compromise[ˈkɔmprəmaiz]	***v.*泄密**
authenticity[ˌɔːθenˈtisiti]	***n.*真实性**
verification[ˌverifiˈkeiʃən]	***n.*确认**
cryptography[kripˈtɔgrəfi]	***n.*密码术**
encode[inˈkəud]	***v.*编码**
decode[ˌdiːˈkəud]	***v.*译码**
entity[ˈentiti]	***n.*实体，组织**

[1] PEM (Privacy Enhanced Mail) **加密邮件**

[2] IETF (Internet Engineering Task Force) **互联网工程部**

unique[juːˈniːk] *a.*惟一的
certificate[səˈtifikit] *n.*证书
hierarchy[ˈhaiərɑːki] *n.*层次

Reading Materials

How Do You Deal with Internet Fraud?

Summary

Internet fraud should be addressed as two specific issues: fraud that uses Internet technology as an integral part of the fraud; fraud that is already taking place by other means and the Internet is merely another method of delivery.

Methods exist that stop fraudsters misusing the technology, which can be rapidly implemented, but factors such as industry acceptance and concerns over potential liability if previous security claims could be claimed to be inaccurate will delay introduction. Much effort is spent promoting logos and confusing self-regulation, and trying to catch fraudsters, whilst the adoption of formal standards and accreditation for security (such as ISO 17799) are only starting to take place.

New Internet environment crimes may exist, such as defrauding machines or causing business harm by denial of service or virus attacks, and these will require social and legal steps to address them. However, the Internet has provided the fraudster with access to a significantly bigger market than ever before and effort will be required to create an environment where fraud is resisted by design rather than by insurance.

Introduction

Internet fraud is said to be big business. But what is it, and does using the Internet create the fraud, or is the Internet just a different way of delivering traditional fraud.

Fraud is essentially persuading someone of something with intent to deceive, perhaps with criminal intent. The deceit may be to persuade you to part with money, goods, services, rights or information.

For the purposes of this paper we are not going to examine methods of fraud, but look at the general techniques, how they are applied, and how, if at all, the Internet can be used to make those techniques easier for the criminal to use either to carry out a fraud or to escape detection.

General Techniques of Fraud

The key to fraud is to persuade you that something is real, when in fact it is not. Once you accept that the fake is real then the fraud can take place—whatever it is.

Other types of fraud essentially persuade you to do something in the (wrong) belief that it should be done, or to accept something in settlement that proves to be without the value you were led to believe. But they all come back to the same thing—the fraudster has to persuade you that his vision of the world is the correct one.

How Do We Normally Counter Fraud

In ordinary life there are many things set up to help avoid fraud. Mostly we rely upon physical things—buildings (such as banks) help to prove to us that we are dealing with something real—talking to people on the telephone on a number that is in a directory helps us believe that they are who we expect. At a more sophisticated level, businesses have to be registered. There are also agencies with a duty to respond to complaints over the trading practices of businesses.

How Does the Internet Map to the Real World

The Internet is rather different. The biggest problem for the Internet user is that there is no physical reference to use. You can't go to a physical bookshop at www.amazon.com. You have to believe what the computer tells you, and that is the start of the problems.

We have many practical examples where people get the physical world wrong—they put their bank cards into fake ATMs and enter their PINs, they tell their friends and children their passwords (sometimes in public) —so how well are we set up to handle the Internet world, where web sites are just exactly as good as their designer intended?

The practical answer is just barely. The Internet is marketed as an anonymous zone. Information is free and users are anonymous. Now some of those features are desirable. When you go into a store it is the store that has to tell you who they are. If you pay with cash they will never know who you are and none of your legal rights are affected. They give you a receipt and you can check any of the details and get corrections made on the spot. If you want credit you have to tell them more about you, but not necessarily very much.

The Internet, by comparison, is anonymous whether you are the seller or the customer. For the seller it is as anonymous as they want to make it. This, of course, might be thought of as attractive to a fraudster.

Avoiding Obvious Frauds on the Internet

Some potential sources of fraud—misrepresenting a business as that of someone else—are being slowly dealt with. Domain name registration has almost reached the point where there is some certainty that www.harrods.com is the web version of a famous department store in Knightsbridge, London. But it is still very far from being fully resolved. It is still possible to register www.harrodds.com, www.harrodss.com. You can copy the real thing without too much difficulty, and with a bit of luck and some spelling mistakes a fraudster can still be in business.

Some Less Obvious Frauds

The Internet uses a technology called TCP/IP in order to send information between one point on the Internet and another. Unfortunately it was not designed to be secure, it was designed to be resilient. As a result it is possible to read information that travels around the Internet, and also to alter it. Therefore, it is possible both to read information that is not protected and copy information that has been protected using cryptography, (a technique that makes information unreadable to the unauthorized) and to change the unprotected information without being detected.

The effect of this is to create a situation where fraud can be carried out even when a genuine transaction is taking place. Fraud might include putting other recipient's names on the distribution list to make you believe they are also involved or in agreement with what is going on. The fraud is subtle because it is impossible for either party to detect. It is effective because the fraudster may have gathered information that allows them to completely impersonate both parties in the future.

Solutions for Technical Problems

These frauds require a manipulation of the Internet technologies, and so can be resisted by technology. However, the technology being marketed to solve this problem Secure Sockets Layer (SSL), in the way in which it is usually implemented, has fundamental weaknesses, and has been shown to be capable of being defrauded. Many other schemes, based upon codes of practice and logos shown on web sites, although worthy in themselves, are equally capable of being defrauded. It seems strange that some advertising appears to suggest encryption technology using a 40 bit algorithm is perfectly secure for commerce, whilst also saying that 128 bit algorithms are essential.

Alternative technologies such as those from ArticSoft are being delivered now that allow end users to gain immediate validation of web site content itself. They require software to be present in the machines of the end users to act on behalf of the user to carry out checks that the user can be prevented for doing themselves by competent fraudsters.

They also require competent registration procedures for Internet traders to make it more difficult for a fraudster to enter the system and pretend to be genuine. Such registration procedures are claimed to be in place for SSL.

One of the most important international developments for defining security behavior has been the adoption of the international standard ISO 17799 Code of Practice for Information Security Management. It is a comprehensive management standard for addressing the full range of issues for protecting information. Sensible adoption and application of the standard could provide significant benefits both to business and consumers. Self regulation schemes would do well to consider adopting it as a means of providing a common frame of reference for security and privacy claims.

Lesson 16 Web Design

Text

Multimedia on the Web (Ⅰ)

Multimedia is gaining popularity on the Web with several technologies to support use of animation, video, and audio to supplement the traditional media of text and images. These new media provide more design options but also require design discipline. Unconstrained use of multimedia results in user interfaces that confuse users and make it harder for them to understand the information.

Animation

Moving images have an overpowering effect on the human peripheral vision. This is a survival instinct from the time when it was of supreme importance to be aware of any saber-toothed tigers[1] before they could sneak up on[2] you. These days, tiger-avoidance is less of an issue, but anything that moves in your peripheral vision still dominates your awareness: it is very hard to say, concentrate on reading text in the middle of a page if there is a spinning logo up in the corner. Never include a permanently moving animation on a web page since it will make it very hard for your users to concentrate on reading the text.

Animation is good for:

- Showing continuity in transitions. When something has two or more states, then changes between states will be much easier for users to understand if the transitions are animated instead of being instantaneous. An animated transition allows the user to track the mapping[3] between different subparts through the perceptual system[4] instead of having to involve the cognitive system[5] to deduce the mappings. A great example is the winner of the first Java programming contest: proving the Pythagorean theorem[6] by animating the movement of various squares and triangles as they move around to demonstrate that two areas are the same size (unfortunately, this otherwise good page uses animated text inappropriately: the text moves constantly and is hard to relate to the events in the main animation).
- Illustrating change over time. Since an animation is a time-varying display, it provides a one-to-one mapping to phenomena that change over time. For example, deforestation[7] of the rain forest can be illustrated by showing a map with an animation of the covered area changing over time.

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[1] saber-toothed tiger **剑齿虎**
[2] sneak up on **偷偷地走近**
[3] mapping **映射**
[4] perceptual system **感知系统**
[5] cognitive system **认知系统**
[6] Pythagorean theorem **勾股定理**
[7] deforestation **森林砍伐**

- Multiplexing the display. Animation can be used to show multiple information objects in the same space. A typical example is client-side imagemaps with explanations that pop up as the user moves the cursor over the various hypertext anchors. It is also possible to indicate the active areas by having them shimmer. As always, objects should only move when appropriate (e.g., when the cursor is over the image).
- Visualizing three-dimensional structures. Since the computer screen is two-dimensional, users can never get a full understanding of a three-dimensional structure by a single illustration, no matter how well designed. Animation can be used to emphasize the three-dimensional nature of objects and make it easier for users to visualize their spatial structure[1]. The animation need not necessarily spin the object in a full circle: just slowly turning it back and forth a little will often be sufficient. The movement should be slow to allow the user to focus on the structure of the object. Three-dimensional objects may be moved under user control, but often it is better if the designer determines in advance how to best animate a movement that provides optimal understanding of the object: this pre-determined animation can then be activated by the user by simply placing the cursor over the object, whereas user-controlled movements require the user to understand how to manipulate the object (which is difficult with a two-dimensional control device like the mouse used with most computers—to be honest, 3D is never going to make it big time in user interfaces until we get a true 3D control device).
- Attracting attention. Finally, there are a few cases where the ability of animation to dominate the user's visual awareness can be turned to an advantage in the interface. If the goal is to draw the user's attention to a single element out of several or to alert the user to updated information then an animated headline will do the trick[2]. Animated text should be drawn by a one-time animation (e.g., text sliding in from the right, growing from the first character, or smoothly becoming larger) and never by a continuous animation since moving text is much harder to read than static text. The user should be drawn to the new text by the initial animation and then left in peace to read the text without further distraction.

【Exercises】

Write T (true) or F (false) for each statement.

1．The use of multimedia should be constrained, otherwise it will be difficult for users to understand the information.

2．A permanently moving animation will make it very easy for users to concentrate on reading text in the middle of a page.

3．Animation can provide a one-to-one mapping to phenomena that change over time.

4．Three-dimensional objects may be moved under user control.

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[1] spatial structure **立体结构，空间结构**

[2] do the trick **获得成功**

【Vocabularies】

discipline[ˈdisiplin]	***n.*训练，锻炼**
unconstrained[ˌʌnkənˈstreind]	***a.*不受拘束的**
instinct[ˈinstiŋkt]	***n.*本能**
spin[spin]	***v.*旋转**
permanently [ˈpəːməntli]	***ad.*永久地，持久地**
instantaneous[ˌinstənˈteiniəs]	***a.*瞬间的，即刻的**
deduce[diˈdjuːs]	***v.*推断，演绎**
anchor[ˈæŋkə]	***n.*锚**
shimmer[ˈʃimə]	***v.*闪光**

Reading Materials

Multimedia on the Web (Ⅱ)

Video

Due to bandwidth constraints, use of video should currently be minimized on the web. Eventually, video will be used more widely, but for the next few years most videos will be short and will use very small viewing areas. Under these constraints, video has to serve as a supplement to text and images more often than it will provide the main content of a website.

Currently, video is good for:

- Promoting television shows, films, or other non-computer media that traditionally have used trailers in their advertising.
- Giving users an impression of a speaker's personality. Unfortunately, most corporate executives project a lot less personality than, say, Captain Janeway from Star Trek, so it is not necessarily a good idea to show a talking head unless the video clip truly adds to the user's experience.
- Showing things that move. For example a clip from a ballet. Product demos of physical products (for example, a coin counter) are also well suited for video, whereas software demos are often better presented as a series of full-sized screendumps where the potential customer can study the features at length.

A major problem with most videos on the web right now is that their production values are much too low. User studies of CD-ROM productions have found that users expect broadcast-quality production values and that users get very impatient with low-quality video.

A special consideration for video (and spoken audio) is that any narration may lead to difficulty for international users as well as for users with a hearing disability. People may be able to understand written text in a foreign language because they have time to read it at their own speed and because they can look up any unknown words in a dictionary. Spoken words are sometimes harder to understand, especially if the speaker is sloppy, has a dialect, speaks over a distracting soundtrack, or simply speaks very fast. Poor audio quality may contribute to the difficulty of understanding spoken text: it is recommended to use professional quality audio equipment and/or lavaliere microphones when recording a narrator. The classic solution to these problems is to use subtitles, but subtitles require special attention on the web.

Audio

The main benefit of audio is that it provides a channel that is separate from that of the display. Speech can be used to offer commentary or help without obscuring information on the screen. Audio can also be used to provide a sense of place or mood as done to perfection in the game Myst. Mood-setting audio should employ very quiet background sounds in order not to compete with the main information for the user's attention.

Music is probably the most obvious use of sound. Whenever you need to inform the user about a certain work of music, it makes much more sense to simply play it than to show the notes or to try to describe it in words. For example, if you are out to sell seats to the La Scala opera in Milan, Italy, it is an obvious ploy to allow users to hear a snippet of the opera: yes, Verdi really could write a good tune, so maybe I will go and hear the opera next time I am over there. In fact, the audio clip is superior to the video clip from the same opera which is too fidget to impress the user and yet takes much too long to download.

Voice recordings can be used instead of video to provide a sense of the speaker's personality: the benefits are smaller files, easier production, and the fact that people often sound good even if they would look dull on television. Speech is also perfect for teaching users the pronunciation of words as done by the French wine site: it used to be the case that you could buy good wine cheaply by going for chateaus that were hard to pronounce (because nobody dared ask for them in shops or restaurants) —no more in the webbed world.

Non-speech sound effects can be used as an extra dimension in the user interface to inform users about background events: for example, the arrival of new information could be signaled by the sound of a newspaper dropping on the floor and the progress of a file download could be indicated by the sound of water pouring into a glass that gradually fills up. These kinds of background sounds have to be very quiet and nonintrusive. Also, there always needs to be a user preference setting to turn them off.

Good quality sound is known to enhance the user experience substantially so it is well worth investing in professional quality sound production. The classic example is the video game study where users claimed that the graphics were better when the sound was improved, even though the exact same graphics were used for the poor-quality sound and the good-quality sound experiments. Simple examples from web user interfaces are the use of a low-key clicking sound to emphasize when users click a button and the use of opposing sounds (cheeeek chooook) when moving in different directions through a navigation space.

Response Time

Many multimedia elements are big and take a long time to download with the horribly low bandwidth available to most users. It is recommended that the file format and size are indicated in parentheses after the link whenever you point to a file that would take more than 15 seconds to download with the bandwidth available to most of your users. If you don't know what bandwidth your users are using you should do a survey to find out since this information is important for many other page design issues.

The 15-second guideline in the previous paragraph was derived from the basic set of response time values that have been known since around 1968. System response needs to happen within about 10 seconds to keep the user's attention, so users should be warned before slower operations. On the web, current users have been trained to endure so much suffering that it may be acceptable to increase the limit value to 15 seconds. If we ever want the general population to start treating the web as more than a novelty, we will have to provide response times within the acceptable ranges, though.

Design of client-side multimedia effects has to consider the other two response time limits also:

The feeling of directly manipulating objects on the screen requires 0.1 second response times. Thus, the time from the user types a key on the keyboard or moves the mouse until the desired effect happens has to be faster than 0.1 seconds if the goal is to let the user control a screen object (e.g., rotate a 3D figure or get pop-ups while moving over an imagemap).

If users do not need to feel a direct physical connection between their actions and the changes on the screen, then response times of about 1.0 second become acceptable. Any slower response and the user will start feeling that he or she is waiting for the computer instead of operating freely on the data. So, for example, jumping to a new page or recalculating a spreadsheet should happen within a second. When response times surpass a second, users start changing their behavior to a more restricted use of the system (for example, they won't try out as many options or go to as many pages).

Lesson 17　Web Programming

Text

Functions and Objects

Functions

Functions are one of the fundamental building blocks[1] in JavaScript. A function contains some code that will be executed by an event or a call[2] to that function. Actually, function is a set of statements. You can reuse functions within the same script, or in other ones. You define functions at the beginning of a file, and call them later.

Functions can have any number of parameters or none at all. A function definition consists of the function keyword followed by

- The name of the function.
- A list of arguments to the function enclosed in parentheses and separated by commas.
- The JavaScript statements that define the function, enclosed in curly braces, { }. The statements in a function can include calls to other functions defined in the current application.

```
function basicFunction () {
 // function body ...
}
function basicFunction ( someValue ) {
        // function body ...
}
```

The return statement specifies the value returned by the function.

```
function basicFunction (a,b) {
// function body ...
         return (a + b)
}
```

Using Objects

You can create, modify, and delete objects. You can use objects' methods and properties during their lifecycle.

Creating New Objects

In JavaScript, if you only want one instance of an object, you can create it using an object initializer.

[1] building block **构建块**
[2] call **调用**

Alternatively, if you want to create multiple instances of an object, you can first create a constructor[1] function and then instantiate an object using that function and the new operator.

Using Object Initializers

In earlier versions of browsers, you could create objects only using their constructor functions.

The syntax for an object using an object initializer is:

```
objectName = {property1:value1, property2:value2,..., propertyN:valueN}
```

- objectName is the name of the new object.
- propertyI is an identifier[2] (either a name, a number, or a string literal[3]).
- valueI is an expression[4], which value is assigned to the propertyI.
- objectName and assignment[5] is optional. If you do not need to refer to this object elsewhere, you do not need to assign it to a variable[6].

If an object is created with an object initializer in a top-level script, JavaScript interprets the object each time it evaluates the expression containing the object literal.

The following example creates myHonda with three properties. Note that the engine property is also an object with its own properties. Such type of objects is called inner objects.

```
myHonda = {color:"red",wheels:4,engine:{cylinders:4,size:2.2}}
```

Using a Constructor Function

Alternatively, you can create your own object with these two steps:

- Define the object type by writing a constructor function.
- Create an instance of the object with the new keyword.

To define an object type, create a function for the object type that specifies its name, properties, and methods. For example, suppose you define an object called person as follows:

```
function person(name, age) {
    this.name = name
    this.age = age
}
```

and then instantiate two new person objects as follows:

```
john = new person("John McLaud", 33)
barby = new person("Barby Jones", 39)
```

Then you can define the car object as follows:

```
function car(model, year, owner) {
   this.model = model
   this.year = year
```

---

[1] constructor **构造函数**
[2] identifier **标识符**
[3] string literal **字符串文字**
[4] expression **表达式**
[5] assignment **赋值**
[6] variable **变量**

```
    this.owner = owner
}
```

To instantiate the new objects, you use the following:

```
car1 = new car("VOLVO", 1993, john)
car2 = new car("FORD", 1992, barby)
```

Note that instead of passing a literal string or integer value when creating the new objects, the above statements pass the objects john and barby as the arguments for the owners. Then if you want to find out the name of the owner of car2, you can access the following property:

```
car2.owner.name
```

Note that you can always add a property to a previously defined object. For example, the statement

```
car1.color = "black"
```

adds a property color to car1, and assigns it a value of “black.” However, this does not affect any other objects. To add the new property to all objects of the same type, you have to add the property to the definition of the car object type.

【Exercises】

Write T (true) or F (false) for each statement.

1．Functions can not be reused within the same script.
2．Functions can have any number of parameters.
3．All parameters are passed to functions by value.
4．you can not add a property to a previously defined object.

【Vocabularies】

fundamental[ˌfʌndəˈmentl]	***a.*基础的，基本的**
parameter[pəˈræmitə]	***n.*参数**
argument[ˈɑːgjumənt]	***n.*自变量**
parentheses[pəˈrenθisis]	***n.*圆括号**
curly[ˈkə:li]	***a.*卷曲的，波浪式的**
brace[breis]	***n.*大括号，方括号**
instantiate [inˈstænʃieit]	***v.*实例化**
syntax[ˈsintæks]	***n.*句法，又称语构**
evaluate[iˈvæljueit]	***v.*求……值**

Reading Materials

Characteristics of Web Programming Languages

Just as there is a diversity of programming languages available and suitable for conventional programming tasks, there is a diversity of languages available and suitable for Web programming. There is no reason to believe that any one language will completely monopolize the Web programming scene, although the varying availability and suitability of the current offerings is likely to favor some over others. Java is both available and generally suitable, but not all application developers are likely to prefer it over languages more similar to what they currently use, or, in the case of non-programmers, over higher level languages and tools. This is OK because there is no real reason why we must converge on a single programming language for the Web any more than we must converge on a single programming language in any other domain.

The Web does, however, place some specific constraints on our choices: the ability to deal with a variety of protocols and formats (for example graphics) and programming tasks; performance (both speed and size); safety; platform independence; protection of intellectual property; and the basic ability to deal with other Web tools and languages. These issues are not independent of one another. A choice which seemingly is optimal in one dimension may be sub-optimal or worse in another.

Formats and protocols. The wide variety of computing, display, and software platforms found among clients necessitates a strategy in which the client plays a major role in the decision about how to process and/or display retrieved information, or in which servers must be capable of driving these activities on all potential clients. Since the latter is not practical, a suite of Web protocols covering addressing conventions, presentation formats, and handling of foreign formats has been created to allow interoperability.

HTML (HyperText Markup Language) is the basic language understood by all WWW (World Wide Web) clients. Unmodified HTML can execute on a PC under Windows or OS/2, on a Mac, or on a Unix workstation. HTML is simple enough that nearly anyone can write an HTML document, and it seems almost everyone is doing so.

HTML is a markup language rather than a complete programming language. An HTML document (program) is ASCII text with embedded instructions (markups) which affect the way the text is displayed. The basic model for HTML execution is to fetch a document by its name (for example URL), interpret the HTML and display the document, possibly fetching additional HTML documents in the process, and possibly leaving hot areas in the displayed document that, if selected by the user, can accept user input and/or cause additional HTML documents to be fetched by URL. HTML applications, or what we might consider the HTML equivalent of an application, consist of a collection of related web pages managed by a single HTTP (HTTP is the TCP/IP protocol that defines the interaction of WWW clients and servers) server. This is an oversimplification, but the model is simple, and the language is simple, and that is one of its strengths.

As HTML moves through the standardization process, and is extended by various vendors, it loses some of its simplicity, but it remains a useful language. The Web programmer generally finds HTML lacking in only two areas: its performance in certain types of applications, and the ability to program certain common tasks.

Today, most users have pretty competent client machines which are capable of accepting a larger share of the computational load than HTML allows. For example, an Internet-based interactive game or simulation can be a frustrating experience for users with low speed connections, and can overwhelm the server that hosts it. If you were the developer of such a game, you'd be inclined to push more of the functionality to the client, but, since HTML limits the possibilities, another route to supporting computation on the client must be found. The developer might make an executable client program available to users, which would be invoked via the HTML browser, but users might only be willing to accept such programs if they trust the source (for example a major vendor), as such programs are a potential safety concern. Also, users don't want to be continuously downloading client programs to be able to access web pages, so this solution has real practical limitations considering the size and dynamism of the Web. If safe powerful high performance programs could be automatically downloaded to client platforms, in much the same way as HTMLpages, the problem would be solved.

When code is to be executed on a client, there are two main considerations: what gets shipped and what gets executed. There are three main alternatives for each of these: source code, a partially compiled intermediate format (for example byte code), and binary code. Because compilation can take place on the client, what is shipped is not necessarily what is executed.

Byte code, according to measurements presented at the JavaOne conference can be 2-3x smaller than comparable binary code, so its transfer can be considerably faster; especially noticeable over low speed lines. Since transfer time is significant in the Web, this is a major advantage. Source code is also compact. Execution performance clearly favors binary code over byte code, and byte code over source code. In general, binary code executes 10～100 times faster than byte code. Most Java VM developers are developing JIT (Just In Time) compilers to get the benefits of bytecode size and binary speed. Java bytecodes are downloaded over the net and compiled to native binary on the local platform. The binary is then executed, and, possibly, cached for later executions.

It should be clear that any combination of these strategies could be used in the implementation of any particular Web programming language, and there is wide variation among the systems actually surveyed.

Platform Independence Given the diversity of operating systems and hardware platforms currently in use on the Web, a great efficiency results from only dealing with a single form of an application. The success of HTML has proven this, and Java has seconded it. The ability to deliver a platform-independent applications of great appeal to developers, who spend a large portion of their resources developing and maintaining versions of their products for the different hardware/software platform combinations. With Java, one set of sources and one byte compiled executable, can be maintained for all hw/sw platforms.

While platform independence has long been a goal of language developers, the need to squeeze every last ounce of performance from software has often made this impractical to maintain, at least at the level of executable code. However, in the Web this concern becomes less important because transfer time is now a significant component of performance and can dominate execution time.

Platform independence can be achieved by shipping either byte code or source code. One advantage of shipping byte code over source code is that a plethora of source languages would require the client machines

Lesson 18　Network Maintenance

Text

Network Troubleshooting

Standard Machine Checks for User and Target Machines

Often when a machine appears to have a network problem, the problem is not at all related to software. Always remember to check the basics before assuming that the network is down or that there is a major problem. If possible, perform machine checks on the user's machine and the target machine. The basics include:

- Check Power: Is the machine turned on and plugged in?
- Check Connectivity: Are the network cable and transceiver[1] (connector[2]) firmly connected to each other (On modern computers, the transceiver is inside the computer's case, but on old computers it was a box hanging off the back). Do the lines physically connect to the computer at one end and to the wall jack[3] at the other?

  If the machine has a "twisted pair[4]" (10BaseT) Ethernet transceiver, verify that the link light is on. If the link light is not on, there is usually a physical problem. Possible problems include:
  - ✧ Cord connecting the machine to the wall is bad—try replacing it.
  - ✧ Ethernet cables or transceiver bad, loose, not turned on (most do not have separate power cords, but some do) or otherwise faulty.
  - ✧ Jack is incorrectly wired or not yet activated.
- Restart Problem Machine: Does restarting the machine fix the problem? In the case of a printing problem, try restarting both the printer and the machine that is attempting to print. If this is a one time problem and restarting the machines fixes it, log but do not report the problem. If the problem repeatedly recurs after rebooting the machine contact the user's computer coordinator.
- Try Other Forms of Printing (printer problems only). If the problem is with a printer, try the following:
  - ✧ Print another document. Occasionally a document will become corrupted and will not print. If other documents print from the same machine, then the document that can't be printed is likely corrupted. Try copying the text of the message into a new document and re-printing.
  - ✧ Print to another machine. If you are successful printing to a separate machine, this indicates that the problem is with the original printer or your connection to it. Try the IP Network

---

[1] transceiver **收发器**
[2] connector **连接器**
[3] jack **这里的意思是"插孔，插座"**
[4] twisted pair **双绞线**

Check.

Network Component Swap Tests for User and Second Machine

Often it is unclear whether the problem being encountered is a problem with the users' machine or the network jack. The most straightforward method of isolating the problem to the machine vs. the network connection is to try swapping network components.

- Try New Cables: If there is no second machine available, try a different patch cable[1]. Success with a second patch cable indicates that the first was bad.
- Swap Network Jacks: If the machine is close enough (or easily moved) to another active network jack, try plugging the malfunctioning machine into the second network jack.
  - ✧ If the machine works in the second jack, then there is a network problem with the first jack.
  - ✧ If the machine fails in the second jack, this points to the machine as the source of the problem, though it is possible that the network is at fault. If a second machine is available, use the "Try Second Machine" test. If not, try the IP Network Check.
- Try Second Machine: If there is another machine available and nearby, test its network connection. (This presumes that the second machine is known to have worked prior to this test).
  - ✧ If the second machine is not functioning in its own jack, then it is likely a network problem.
    - ➢ If both machines are having problems connecting to one remote machine, then the problem is probably with the remote machine. Check remote machine using the IP Network Check.
    - ➢ If neither machine can connect to any network services, then there is probably a network problem. Try the IP Network Check.
  - ✧ If the second machine is functioning in its jack, connect it to the first machine's jack.
    - ➢ If the second machine fails in the first machine's jack, the jack is the problem.
    - ➢ If the second machine functions in the first machine's jack, then the problem is either the first machine or its cables. Try swapping the network patch cable between the machines to see if the cables are the problem.
      - ◇ If the original machine functions with new cables, that was the problem. Replace the cables.
      - ◇ If not, the original machine is the problem. Contact the user's computer coordinator.

【Exercises】

Write T (true) or F (false) for each statement.

1. When a machine appears to have a network problem, the problem is related to software.
2. If the problem repeatedly recurs after rebooting the machine, you should report the problem.
3. If you are successful printing to a separate machine, this indicates that the problem is only with the original printer.

[1] patch cable **临时连接电缆**

4. If the second machine fails in the first machine's jack, the machine is the source of the problem.

【Vocabularies】

cord[kɔːd]	*n.*电线电缆
coordinator[kəu'ɔːdineitə]	*n.*协调人， 管理者
swap[swɔp]	*v.*交换
encounter[in'kauntə]	*v.*遭遇，遇到
straightforward[streit'fɔːwəd]	*a.*简单明了的
prior['praiə]	*a.*在……之前

Reading Materials

IP Network Check

Problems encountered in IP networking can have several sources. Most obvious are those where either the user's machine or the target machine are mis-configured, malfunctioning or, in the extreme case, shut down. If the problem is unrelated to either the target or the source machine, then other possibilities include problems with the Domain Name Services or a variety of forms of network problems somewhere between the target and source machine.

This set of tests assumes that the user is attempting to connect to a specific target machine via TCP/IP. Target machines may be web, mail, ftp, news or compute servers or stand-alone telnet services. This would include any machine accessed by identifying it with an "internet" style address (e.g., www.ucsc.edu). Administrative Systems (Banner, PPS, etc) use the TCP/IP network and connections to them will fail along with other TCP/IP target machines if the user's network isn't working.

- Can user load a URL or get an error message from server?
  - ✧ Network failure is indicated by an error message such as "server doesn't exist" or "can't find server."
  - ✧ Error messages of the type "404 Page not found" or "password incorrect" mean the server was reached, and the network is working.
- Can user connect using IP address rather than IP name?

  Successful connection via IP address implies a problem either with the Domain Name Server configuration of the client machine or a problem with our Domain Name Servers. If there are multiple problem reports of this nature, check Big Brother status of DNSs.
- Attempt to Connect from Separate Machine: This assumes that you are in a different location than the person reporting the problem, for example, an IRC Support Specialist is on the phone to the person with the problem.
  - ✧ If you can successfully connect to the target machine, the target machine is probably not the

source of the problem. Proceed to user side troubleshooting.

- ✧ If you can't connect to the target machine either, the target machine or its network are probably at fault. Proceed to target side troubleshooting.

- Check state of the user's network: Every machine with a working network connection has an IP address beginning with 128.114 (Admin/Academic net) or 169.233 (Resnet). In addition, every user's machine on a TCP/IP network is configured with the address of its "Gateway" or nearest router. The address of the gateway router is found in the TCP/IP configuration, the location of which depends on OS.
  - ✧ Mac OS 9.04 and earlier: Apple Menu > Control Panels > TCP/IP. Read Gateway Address from display.
  - ✧ Mac OS X : to be determined.
  - ✧ Win 98 to Win XP: Start > Run, type winipcfg (Win98/XP); ipconfig (NT)

If no gateway address is known to the machine, then either the router is down or something is misconfigured with user's machine. If you can identify the router's address. Once the nearest router is identified, check Nocol to see if that router is down. If not, proceed to user-side troubleshooting. If the router is down, then NTS probably already knows.

User Side Troubleshooting

If the problem appears to be more connected with the machine attempting to make a connection (the source machine) than with the target machine, further testing is necessary to determine whether the problem is with a part of the network or the user's machine itself.

- Perform Standard Machine Checks and Network Equipment Swap,Don't start down this road until you have eliminated problems with user's cable, jack, and computer.
- Have User Telnet to Local Router: The user will not be able to do anything useful with the local router, this is just for testing purposes.
    - ➢ Launch telnet, configure "host" or "remote connection" to the IP address of the Gateway noted in the TCP/IP configuration.
    - ➢ A successful test is when the router responds with a "Password" prompt.
  - ✧ If the user can successfully telnet to the router on the same subnet, that indicates that the user's network configuration is probably correct. At this point it is probably a network problem. Check Nocol.
  - ✧ If the user cannot connect to the local router, possibly the router or other network equipment is down, part of the network (the user's cables, jack, hubs, bridges, etc.) on the local subnet is bad or the user's machine is misconfigured.
- Test User's Local Router from another location. Attempt to telnet to the user's local router from, for example the CATS IRC.
  - ✧ If the support person cannot telnet to the user's local router, then the router or the path to it is probably down. Check Nocol.
  - ✧ If the support person can connect to the router, then attempt to "ping" the user's machine.
    - ➢ If the support person can ping the user's machine, then it is almost certainly a

configuration or hardware problem on the user's machine. Report to user's coordinator.

- If the support person cannot ping the user's machine (or doesn't have an IP address with which to ping it) then the problem is either with the user's machine or with the network. Check Nocol, and if nothing is clarified, report to the user's computer coordinator.

Target Side Troubleshooting

- If the problem appears to be more connected with the machine to which the user is trying to connect (the target machine) than it does with the user's (source) machine, further testing is necessary to determine whether the problem is with a part of the network or the target machine itself. For these tests, it is useful to know to what subnet the target is physically attached, and what the router address is for that subnet.
- Start with the Obvious: Check to see if there are any announced network or service outages. CATS NTS and IRC routinely send notices when network services or centrally maintained machines are brought down for service.
- Verify Target Information: Often a user will mis-identify the machine to which they are attempting to connect. For example, some people will use an E-mail address instead of a name when connecting to a machine, and some campus systems have non-obvious names (e.g., PPS is on UCCMVSB.ucop.edu).
- Check Big Brother and Nocol if the target machine is monitored there.
- Try to ping a machine in the target's network.(This is usually hard to do.) If Nocol doesn't indicate problems, then try to get the active IP address of any machine on the target machine's subnet and attempt to "ping" it. You can ask the user to find the IP of another neighbor machine if you don't have an IP address scanning application (and most people don't).
  - If the support person can ping another machine, then it is almost certainly a configuration or hardware problem on the target machine.
  - If the support person cannot ping another machine or doesn't know of any machine to ping, then the problem is either with the target machine or with the network. Check Nocol, and if nothing is clarified, report to NTS or the user's coordinator with full report of the tests that have already been performed, and when.

Lesson 19　Multimedia Technology

Text

What is Multimedia?

"Multimedia is the use of a variety of medias to entertain or to communicate information, an idea or a concept."

We see multimedia as a system of communication. A system of communicating ideas, marketing strategies, corporate goals, education or information, be it historical or up to the minute[1] news[2]. We also see multimedia as a platform for entertainment, interactivity and communications.

We see Multimedia development as the use of, or choice from, a bank of many different possible communication medias, technologies and delivery platforms.

Communication medias such as color, text, images, graphics, music, sound, narrations, video, 2d animation, 3d animation, are all available to the multimedia developer.

To us, a Multimedia designer/developer can work with all of these medias and can design, build and implement strategies that make effective use of the medias and the technology used to produce and deliver the final systems.

What is Graphic Design?

The graphic designer takes a message and communicates it visually; be it an idea, a concept, or product benefits.

The graphic designer must be an artistic and highly perceptive person capable of analyzing a situation swiftly and accurately, putting visual ideas into practical form. He or she must be able to relate to the needs of the client and the intended audience. The graphic designer should be able to communicate clearly and confidently to their intended audience, they need to be well informed of[3] the current trends in society, the marketplace and the industry that they are dealing with.

Sometimes a graphic designer will work solo; they are the copy writer, the illustrator, the photographer and the designer.

Generally it is only because of the design that you will notice pictures and read text. The designer directs the attention and focus of their audience, they create moods and inspire different emotions, they make use of tools like symbolism, typography, color, shape, illustration, photography, texture and balance to effectively communicate a message. Often you will notice these aspects consciously, sometimes you won't, but when a reader's attention has been caught and they have received the message intended, a designer has done their job.

---

[1] up to the minute **最新的**

[2] be it historical or up to the minute news **（虚拟语气） 可译成"不管……"**

[3] be well informed of sth. **精通某事**

Unlike an artist, the graphic designer must produce a visual communication product for a specific audience. A graphic designer must communicate the same idea, thought or emotion to all of their audience, as well as have artistic appeal. To do this successfully the designer must understand about communication as well as design aesthetics.

The designer must always wear at least two hats. One that is artistically and creatively focused on aesthetic issues, and one that is communicative and focuses on the psychology of the reader. A third hat that many designers forget to acquire, but would do well to do so, is one that focuses on practical areas such as time, technical and production issues.

The designer must be able to take the objective—e.g. sell more hats, get more votes—and help the client achieve it. There is a lot more to this process than being artistic.

Whilst technology is racing ahead and many designers are being faced with new technology that they must embrace in order to remain competitive, this new technology though, allows a designer to explore new ideas and embrace fresh new ways of doing things.

Though graphic designers traditionally worked in print, a graphic designer is definitely not merely a desktop publisher. A designer who possesses the necessary talent, training and instinct can redefine the medium they work in.

So What is Digital Design

Digital design is merely design work carried out using digital technology, e.g. a computer, scanner, digital camera[1] etc, regardless of where the end product is heading. So a print job carried out using Photoshop is digital design. The same job carried out with a pen, ruler and set of drawing pencils, is not digital design.

Technology has given us the tools to create finished products quickly with a high level of professionalism. Rapidly moving technology has made these tools available at a consumer level, allowing the amateur graphic designer to pop up[2], all over the place.

As the Internet and electronic publishing[3] has evolved, so too has the demand for documents and graphics designed to be viewed via these delivery modes. The early Internet was dominated by code jockeys, and still is to a certain extent[4]. These were people who wanted to make the Internet work, they wanted to be able to control information flow through it and had little regard for its aesthetics, they were more interested in how it all worked than what it all looked like.

There are still many who use the Internet solely for data transfer and high level non visual work. Many of these people argue that the overuse of graphics on the Internet wastes bandwidth and slows down the “serious” users’ data transfer.

Some would argue that an effective advertising or education campaign has to do much more than deliver a message, it has to also change the way the audience behaves. Is there any point in telling people how good a product is if we don’t make them start using it? Is there any point in telling people how seat

[1] digital camera **数码相机**
[2] pop up **突然出现**
[3] electronic publishing **电子出版**
[4] to a certain extent **在一定程度上**

belts[1] save lives, if we don't make them wear one?

【Exercises】

Write T (true) or F (false) for each statement.

1．Multimedia can be seen as a system of communicating ideas, marketing strategies, corporate goals, education or information.
2．The graphic designer doesn't need to consider the needs of the client and the intended audience.
3．The only requirement for the graphic designer is to be artistic.
4．Now there are few people who use the internet solely for data transfer and high level non visual work.

【Vocabularies】

entertainment[entə'teinmənt]	***n.*娱乐，消遣**
narration[næ'reiʃən]	***n.*报道，故事**
perceptive[pə'septɪv]	***a.*感觉敏锐的**
swiftly['swɪftlɪ]	***ad.*快地，迅速地**
solo['səuləu]	***ad*单独地**
illustrator['ɪləstreitə]	***n.*插图画家**
symbolism['sɪmbəlɪzəm]	***n.*符号使用**
typography[tai'pɔgrəfɪ]	***n.*排印**
consciously['kɔnʃəslɪ]	***ad.*有意识地**
appeal[ə'pɪːl]	***n.*感染力**
aesthetics[ɪːs'θetɪks]	***n.*美学**
embrace[ɪm'breis]	***v.*接收，采纳**
jockey['dʒɔkɪ]	***n.*操作者**

Reading Materials

JPG vs. GIF

Jpegs and gifs are the most commonly used graphic formats on the web. Each has it's unique advantages and disadvantages. The material covered in this article will help you decide which format is more appropriate for your images. A general rule of thumb; use gifs for illustrations, clip art, and images with large areas of flat color, use jpgs for photographs and images with continuous tones.

[1] seat belt **安全带**

Prepare Your Images

Your images should be RGB, 24bit when you begin. It doesn't matter where they come from, digital camera, scanner, clipart, custom illustrations, or from another document. Be sure to keep an original around for any changes you want to make later. I recommend keeping everything in Photoshop format, so you can retain all your original information, and layers you may have. If you don't use Photoshop, keep an original as a tiff, pict, or bmp. (For all you graphic designers out there, people really do use pict for something!) This will give you the most flexibility. Creating images for the web is completely different from creating images for print.

DPI

DPI is dots per inch. Images created for print usually have a dpi of 300 to 800. When receiving an image from an outside source, make sure you look at the dpi. Always keep web images, or any image that is for display on a computer only at 72 dpi. Your monitor can only display 72 pixels per inch, anything more is a waste of hard disk space. Occasionally you may want to scan an image at a higher resolution to remove a moire pattern, or enlarge the image. When you are finished manipulating it, you must still set the dpi back to 72.

Bit Depth

Your bit depth is the number of colors your image contains:

24bit = millions of colors

16bit = thousands of colors

8bit = 256 colors

4 bit = 16 colors

Bit depth is important when creating the smallest gif possible. Jpgs are always 24bit.

Graphic File Formats

Different graphics file formats store data and compress it differently. TIFF format is one of the largest because it saves an alpha channel in the file. If you don't know what an alpha channel is, you have no reason to use TIFF, unless your using your images cross platform for MAC and PC. PICT files can be saved at any bit depth, and the file size will correspond accordingly. PCX is the PC version of PICT, and BMP files can be saved in 1bit, 4bit, 8bit and 24bit for Windows or OS/2. JPG and GIF files use special compression algorithms to reduce the file size of an image. JPG is a "lossy" compression, resulting in data loss. Make sure you have your original somewhere and just make a copy to compress. Once you compress the data, the information is lost and you can't restore the image.

Many WSYWIG HTML editors will take an image and convert it for you. I highly recommend that you control the process in an image editing program.

Using the Web Safe Palette

Mac and Widows each have their own custom system palette. The web palette is comprised of the 216 colors that are contained in both palettes. This guarantees your images will not dither, or shift colors. Dithering that you did not intend or do on purpose is a bad thing. It can be difficult to always use the safe

Lesson 20　Distance Education

Text

Distance Learning Overview

There will be fundamental changes in the techniques employed to educate students. These changes will occur as teachers learn how computer-based tools can satisfy existing pedagogical theory and the evolving needs of our increasingly technological society. For example, the use of video-conferencing[1] in distance learning has enabled a new class of students to benefit from the educational infrastructure at Boston University without a significant disruption in their job activities. More profound changes are anticipated as educators recognize the benefits and limitations of the technology. Developments in communications and computing, and the affordability of information delivery services will further increase this impact. By 2010, education will be very different from today. Content will still be paramount, but the tools and techniques for instruction will change. In this paper we focus primarily on distance learning, but we believe these techniques will become integral with basic educational technology.

Historically, distance learning describes a form of education in which students interact with an instructor who is located beyond the confines of a conventional classroom. A correspondence course[2] via post is an example of distance learning. Students are mailed course material on a periodic basis. The exercises must be mailed back to the instructor who in turn grades and returns the material. Any interaction between the student and the instructor is limited to that conveyed by written correspondence or, occasionly, by telephone. Often it is difficult for the student to gain access to additional supporting course materials. In summary, the main drawbacks of such a scheme are the latencies of communication, limited interaction, and limited access to supporting materials.

Television and radio broadcast technologies have vastly improved the correspondence course model. With these technologies, a large number of students can receive instruction in real-time and with the added impact of aural and visual media. However, interaction with the instructor is still limited by the communications “backchannel.” The use of facsimile and electronic mail introduce a form of asynchronous communication with the instructor that reduces latency considerably. All of these techniques have been used extensively in higher education.

Course materials in conventional distance learning are usually more thoroughly prepared rather than delivered on-the-fly[3] notes. This is due to the need for conveying the same information accurately to many students who may not be able to react quickly to any problems discovered with the materials. The limitations of the technology also dictate the preparedness of the instructor. For example, visuals are more

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[1] video-conferencing **电视会议**

[2] correspondence course **函授课程**

[3] on-the-fly <**口**>**匆忙地**

clearly viewed by television when they have been produced as type instead of handwriting. Unfortunately, this rigidity can compromise the spontaneity of instruction.

Evolving multimedia computer and communications technology are poised to lift these limitations. Course content can be created and posted for distribution via the World Wide Web (WWW); audio and video can be multicast to students throughout the Internet; and students can communicate with instructors through low-cost videoconferencing hardware.

As we move to this all-digital universe of information there are some fundamental unanswered technical questions to be resolved before ubiquitous digital distance learning is viable. For example: How can existing videoconferencing services be scaled to support hundreds of students with low-cost and reliable reception? How can information creation, collection, and indexing be simplified to support straightforward student access? How can a very large information space be searched and filtered based on individual student needs?

【Exercises】

Write T (true) or F (false) for each statement.

1. By 2010, education will be very different from today. Content will not be paramount.
2. A correspondence course via post is a kind of distance learning.
3. Course materials in conventional distance learning are usually less thoroughly prepared.
4. There is no need for domain-specific information models.

【Vocabularies】

pedagogical[pedəˈgɔdʒikəl]	***a.*教育学的，教学法的**
infrastructure[ˈinfrəˌstrʌktʃə]	***n.*基础设施**
paramount[ˈpærəmaut]	***a.*最重要的**
latency[ˈleitnsi]	***n.*等待时间**
asynchronous[eiˈsiŋkrənəs]	***a.*异步的，不同时的**
rigidity[riˈdʒiditi]	***n.*僵化，刻板**
compromise[ˈkɔmprəmaiz]	***v.*损害**
spontaneity[ˌspɔntəˈniːiti]	***n.*自发性**
ubiquitous[juːˈbikwitəs]	***a.*普遍存在的**
viable[ˈvaiəbl]	***a.*可行的**
prototype[ˈprəutətaip]	***n.*原型**

Reading Materials

Requirements for Distance Learning

Functional Requirements

Of primary importance in computer-based education is the view that the computer is a tool to help achieve an objective. In this context it is a tool to enhance learning under geographical and time scheduling constraints. Specifically, it can enable information distribution, reuse, and organization. It also enables communication and collaboration between the instructor and student, and among students.

Three modes of instruction can be defined: *live* or *synchronous* instruction, in which an instructor lectures or interacts with a set of students in real-time; *deferred*, *asynchronous*, or *self-paced* instruction, in which students interact with course materials that are usually prefabricated; and *hybrid* techniques that combine both of the former. Live instruction originates from a central facility (e.g., campus) which can use more extensive production facilities including multiple cameras and staff. Prefabricated instruction can be prepared as would any instructional material, and be stored in digital format on a storage server .

Basic functional requirements for distance learning are the ability to distribute live instruction, create prefabricated, *static* instructional materials, and to rapidly convert live materials to static ones. Additional requirements include capabilities to moderate interaction in the virtual classroom (i.e., floor control), submit assignments to the instructor, and for the instructor to respond to students both synchronously and asynchronously. The system must also provide a high degree of communication among participants (students and instructors), and the functions to retrieve content rapidly.

Important application software issues include the development of appropriate mechanisms for floor control during lectures, multiplexing continuous audio with video stills (or faxes), video indexing, information location and retrieval, broadcast of video within the network (protocols), and connection failure recovery. Additional interfaces for authoring, inputing queries, graphical visualization of content, and mechanisms for browsing, storing, are also necessary.

With these functional requirements in mind, we consider more detailed requirements that must be addressed by the system.

Organization of Instructional Content

A very important aspect of any envisioned distance learning system is the ability to rapidly create, organize, store, and retrieve a great deal of multimedia content including audio and video. These tasks require adequate editing tools for content synthesis (e.g., word processors, drawing tools), content capture (e.g., audio recorders/editors, video recorders/editors), content organization (e.g., database management systems, hypertext editors), and content viewing (e.g., WWW servers and viewers). Of particular interest in the distance learning environment is the need to find subject matter in vast amounts of video content.

As described earlier, access to topics found on video tapes is grossly deficient due to the sequential storage medium. By storing video data on a random access medium such as magnetic disk, we alleviate this access problem provided that a suitable set of indices are created for a given instructional segment. Given the availability of these indices, it is also possible to tailor instruction to a student's level of comprehension. For example, an instructor will often describe supporting examples to illustrate a concept presented as theory during a lecture. This content can be indexed, segmented, and ultimately retrieved in a recorded sequence based on a students needs.

Important requirements to support this vision are the abilities to create the indices and locate video objects.

Indexing of Video Content

Creation of the video objects can be achieved by extracting video segments from instruction originating from a recorded lecture, or can be created and edited independently from the live course. In the former, tools are necessary to facilitate rapid conversion from live instruction to recorded and indexed topics, and the linking of related static course materials (e.g., references to sources and homework sets). These same tools should also allow the elimination of out-takes, or other errors that the instructor/editor deems unacceptable. Significant data compression is possible in this step. Materials created in electronic form, but displayed and recorded as video in a lecture can be associated with the audio soundtrack of the selection. For example, a still graphic produced as digital line art and text, but recorded on video during presentation can be substituted in place of video during the editing process. In this sense the original audio/video recording of a lecture represents a serialization of the original content, as necessitated by the transmission medium. By returning to the original source materials in their native digital formats, one can achieve significant data compression over the recorded video stream, and can readily achieve topic decomposition for indexing the audio/video segments.

Tools to facilitate the decomposition and indexing of the stream should be designed to simplify postprocessing of the data stream for rapid conversion to static course materials and, if at all possible, eliminate the need for two passes over the data. For example, because the capture of live streams is sequential (i.e., it takes one hour to capture one hour of a live event) there is an opportunity to take advantage of this time to introduce indexing information. Moreover, we argue that the indexing process for the recorded video is best achieved by the the domain expert: the instructor who created the content. It is easy to imagine a scenario where the recorder has information or knowledge which would allow the recognition of an important event during the capture of a stream; an editor lacking the same information may not understand the significance of the event. Using an example of a baseball game, an event might be "player steals a base," setting the all-time record for bases stolen in a single season. To the announcer and/or recorder of the game, as well as to future viewers of the video stream, this represents a major event. To an editor preparing this stream for viewing who happens to not follow baseball, the event may just be another stolen base and the event may not be indexed. This is an example of information loss due to an editor unfamiliar with the domain of the stream which is being indexed.

Hardware Components

The functional needs dictate the requirements for computer and communications infrastructure. The principal ones are the support of aural and visual instruction via live video, and the asynchronous delivery of prefabricated course materials. Video instruction can successfully be achieved without a live "backchannel;"

however, we describe a system that can support this bidirectional communication. The components of such a system include a video capture station in the classroom, student workstations, a network switching function, and a storage server.

Capture and Student Stations

The instructor’s video capture station can be of high-quality because it is a single component that does not need to be replicated. In analog video distance learning deployments, this function is satisfied by multiple high-quality video cameras, microphones, video production facilities, and staff. In contrast, the student workstations must be inexpensive and the overall system must support a variety of terminals and terminal characteristics.

Such a system will need low-cost terminal equipment such as PCs that can support digital video capture compression/decompression and display. Note that many of these systems are not optimized for the transmission of video images of handwriting or printed text.

Multicasting

The system must also support a multicasting or “bridging” function that allows multiple participants to view the same data stream. In conventional video broadcast systems, this function is satisfied by virtue of the broadcast medium. In switched digital communications, this function must be provided elsewhere. It can be provided by a local hardware device called a multipoint control unit (MCU), by a network service provider’s MCU, or by virtue of the network’s routing protocols (e.g., via tunneling in the MBone). The provision of the MCU function is probably the biggest inhibitor to distance learning through interactive video: the support of tens or hundreds of simultaneously connected students requires cascading multiple MCUs at significant cost. The MBone (multicast backbone), a virtual subset of the Internet, can support the multipoint function for such a large number of participants, but cannot guarantee available network bandwidth necessary as a foundation for an educational program.

Communications and Networking

Computer networking and communications are fundamental to distance learning. Existing telecommunications technology is capable of satisfying all communications requirements outlined in this paper, but often at significant cost. However, the rapid changes in technology deployment are likely to bring the cost of some of the technologies into the realm of distance learning.

Evolving information delivery applications have already become the dominant bandwidth consumers on the Internet and are expected to be so on future CATV (common antenna television) and PSTN (public switched telephone networks) along with video-on-demand (VOD) services. This new kind of data traffic is a departure from that of electronic mail and bulk file transfer typically supported by “data” networks; that of broadcast audio/video via CATV; and of low-bandwidth audio supported by PSTN networks.

From a technical perspective, these changes are being accommodated by addressing the shortcomings of each communications infrastructure. On the packet-switched Internet, mechanisms to support real-time, continuous media (CM) traffic are being developed. For CATV, the need for bidirectional signaling is being addressed to support interactive programming and information retrieval. For the PSTN, the need for higher bandwidth and the ability to support multipoint applications is considered. In all cases there is a trend towards supporting mixed bidirectional services. However, there is a fundamental tradeoff between individualized service and a large receiver population. Broadcast technologies (e.g., CATV) must be modified to support individual interaction by data recipients. Point-to-point technologies (e.g., Internet, PSTN) must be adapted to support multipoint data distribution.

For asynchronous distance learning, connections tend to be point-to-point between the student and the content server. In this case the multipoint function is irrelevant, and the system is required to deal with the aggregate access bandwidth demands of the asynchronous student population. For conventional instructional content delivered over the Internet (devoid of video), data transfer is due to small, well-defined units such as text documents or still images. In this mode, very large numbers of users can be supported by a single server because the transmission load is intrinsicly multiplexed on these units. For audio and video data, the same servers must dedicate significant resources (access bandwidth) to satisfy a single student. Moreover, often the transferred video clip is found to be the wrong one sought due to inadequate description of its content. A solution proposed is to appropriately fragment the video material for economical exchange of information.

This leads to two complementary networking requirements: (1) the ability to simultaneously service a large number of students/connections via modest bandwidth per connection with the same data stream, and (2) the ability to service many video streams from a server. The implications of (1) are the need for many ports for connecting students to the system and the need for multicasting. The implication of (2) is the need for a large storage-to-port bandwidth based on the number of asynchronous students supported at any one time.

Raw Data Storage

An important aspect of education is the accessibility of instructional materials. This refers to books, syllabi, homework assignments, etc. In distance learning, this also includes audio and video recordings of class instruction. Current strategies for placing video taped instruction “on reserve” in a library for student access are functional but provide poor access to specific content. With the exception of copyrighted materials not cleared for reuse, all content of this type can be stored and distributed digitally to students with appropriate client display terminals and software. Assuming the availability of sufficient computer networking capability, these materials can be retrieved from storage as used by students with such terminals.

The storage requirements and level of technical expertise for electronic distribution of course materials are quite modest when the audio and video are not considered. However, strategies are required to ensure organization of materials in a useful way. A good example of the distribution of course materials of this type is demonstrated by Fox.

To support video storage, a complete 13 week course with three hours of instruction per week can be digitized and stored in less than 2.5 Gbytes at ISDN videoconferencing data rates (128 Kb/s). At MPEG-I data rates (1.5 Mb/s) this amount of video requires 26 Gbytes. However, a significant percentage of the video can be edited out as redundant. Of equal importance is the ability of the server to meet the aggregate I/O bandwidth requirements of asynchronous student access. In addition, access to stored material is likely to be uneven as the more difficult portions of a course will be accessed more often. This necessitates a multitiered memory hierarchy to reduce implementation costs.

Lesson 21　Exercises

Multiple-choice questions

Select the one answer to each question

1. The “WWW” is exactly what? ______ .

A. A web of resources on the Internet that are accessed

B. The Internet using HTTP

C. An ISP or Internet Service Provider

D. Internet Explorer

2. A computer calculates using the ____________ system?

A. Fast　　B. Trianary　　C. Hexadecimal　　D. Binary

3. Which of the following is an “output device”? ______ .

A. CD ROM　　B. Microphone　　C. Printer　　D. All the above

4. The Internet is simply what? ______ .

A. The WWW　　B. A worldwide system of computer networks

C. A modem　　D. An ISP or Internet Service Provider

5. Program designed to destroy data on your computer which can travel to “infect” other computers. ____ .

A. Message　　B. Information　　C. Hacker　　D. Virus

6. ________ used to control the computer and run programs.

A. Application software　　B. System software

C. Games　　D. Virus

7. A special sequence of number or letters that limits access to electronic mail boxes:______ .

A. Authentication　　B. Code　　C. Encryption　　D. Password

8. Which of the following statements is FALSE? ______ .

A. Antivirus software can detect viruses on a CD-ROM

B. Viruses can be found in E-mail attachments

C. You can get a virus by downloading a program from the Internet

D. You can get a virus by reading a web page

9. When a computer is switched on, where is the operating system loaded? ______ .

A. BIOS　　B. ROM　　C. POST　　D. RAM

10. POST stands for ______ .

A. Power-On-Self-Test　　B. Power-Only-Standard-Test

C. Program-Optimum-Self-Test　　D. Program-Optimum-Starting-Time

11. TRUE or FALSE?

The operating system is the primary element of all software; without it no other software can be used.____ .

A. True　　B. False

12. CPU stands for ______ .

A. CD-run on memory B. call powers up

C. create programs user D. central processing unit

13. Commands at the top of a screen such as:FILE - EDIT-FONT-TOOLS to operate and change things within programs _______ .

A. windows B. word processor

C. tool bar D. menu bar

14. CD-ROM stands for _______ .

A. central processing unit B. CD-remote open mouse

C. CD-resize or minimize D. CD-read only memory

15. A place in the computer system where data and programs are temporarily stored ______ .

A. bus B. motherboard

C. memory D. I/O port

16. In simple terms, a basic scanner does what? _______ .

A. Records reflective objects digitally B. Transmits digital sound

C. Prints documents D. Interfaces with a digital modem

17. "SCSI" is an acronym for what? _______ .

A. Single Control Complex Industry B. Small Control Complex Code

C. Security Computer System Interface D. Small Computer System Interface

18. A "Browser" like Netscape or Internet Explorer does what? _______ .

A. Creates graphics B. Dials up to the Internet

C. Accesses web pages using HTTP D. Creates the WWW

19. The smallest item of useful information a computer can handle: _______ .

A. bite B. byte

C. bit D. baie

20. The part of the computer that does the math calculations _______ .

A. Arithmetic logic B. monitor

C. memory D. keyboard

21. Two or more computers connected to each other that share all information to include programs and data ________ .

A. Internet B. network

C. WWW D. system

22. The piece of hardware that converts your computer's digital signal to an analog signal that can travel over telephone lines is called a _______ .

A. adapter B. connector

C. cable D. modem

23. What type of software is used for the creation of letters, papers, and other documents? _______ .

A. Database B. Word Processor

C. Spreadsheet D. Operating Program

24. What means to capture, store, update, and retrieve data and information? ______ .

A. Spreadsheet
B. Operating System
C. Windows
D. Information Processing

25. What do we call a computer program that organizes data in rows and columns of cells. You might use this type of program to keep a record of the money you earned mowing lawns over the summer. ______ .

A. Spreadsheet program
B. Database program
C. Word Processor program
D. Desktop Publisher program

26. What is the basic software that a computer needs to interpret input from input devices, run programs, and read from or write to hard drives and disks? ______ .

A. Operating system
B. Hardware system
C. Information processing
D. Modem

27. _____is a tool that finds Web pages in online databases based on terms and criteria specified by the user.

A. Server
B. Network
C. Internet
D. Search engine

28. What is a set of eight binary digits (bits that are either 0 or 1) that represent a letter, number, or symbol? (01000011) ______ .

A. Bit
B. Gigabyte
C. Kilobyte
D. Byte

29. What is any hardware device that is attached to the computer, usually with a cable? _____ .

A. Output device
B. Peripheral
C. Surge Protector
D. Input device

30. What word means to copy or move files from another computer system to your local computer system over a network? ______ .

A. Format
B. Save
C. Shift
D. Download

31. What is the name for an input device used to read text, images, and bar codes and translate them into digital code? ______ .

A. Microprocessor
B. Scanner
C. Keyboard
D. Processor

32. What do we call preparing and organizing a disk before information can be stored on it? This creates the "template" by which data can be stored and retrieved. ______ .

A. Save
B. Format
C. Upload
D. Input

33. What is a stored question about information in a database? ______ .

A. Record
B. Field
C. Report
D. Query

34. What do we call a network whose elements may be separated by some distance? It usually involves two or more small networks and dedicated high-speed telephone lines. ______ .

A. URL (Universal Resource Locator)
B. LAN (Local Area Network)

C. World Wide Web
D. WAN (Wide Area Network)

35. What is the term to ask the computer to put information in order numerically or alphabetically?______ .

A. Report
B. Record
C. Organize
D. Sort

36. What is an expression that tells how the numbers in a determined set of cells are to be calculated? ______ .

A. Formula
B. Field
C. Data
D. Query

37. What are the storage memory chips that are able to maintain their contents if the power is disrupted. ______ .

A. CD-ROM
B. ROM (Read-Only Memory)
C. Temporary Memory
D. RAM (Random-Access Memory)

38. What is the name for an address and a method of locating a specific piece of information on the Internet? ______ .

A. E-Mail Address
B. URL (Universal Resource Locator)
C. Online
D. WAN (Wide area network)

39. What is the spider-like interconnection of millions of pieces of information located on computers around the world? ______ .

A. LAN (Local area network)
B. WAN (Wide area network)
C. WWW (World Wide Web)
D. Internet

40. What is part of a database that holds only one type of information? ______ .

A. Report
B. Field
C. Query
D. Record

41. What is a networked computer that is shared by multiple users? ______ .

A. Modem
B. World Wide Web
C. Network
D. Server

42. What do we call anything created with a software program that is stored in a computer? ______ .

A. Document
B. Record
C. Field
D. Report

43. What word means to copy or send a file from a local computer to another computer on the Internet? ______ .

A. URL (Universal Resource Locator)
B. Login
C. Upload
D. Download

44. What is any piece of computer hardware that displays output after the computer has processed the data or information that has been input? ______ .

A. Microprocessor
B. Motherboard
C. Circuit
D. Output device

45. What is a large collection of data stored in a computer? You might use this type of program to keep a record of all the friends in your address book. ______ .

A. Information Processing B. Spreadsheet

C. Operating system D. Database

46. What is the personal computer operating system that organizes files within a computer and uses a graphic desktop environment? ______ .

A. RAM B. Functions

C. CPU (Central Processing Unit) D. Windows

47. What is the name for any computer program that performs a specific task separate from the computer operating system that runs programs? ______ .

A. Disk B. Software

C. Function D. Computer system

48. What is the area inside the computer that allows the computer to store and/or act on information coded in binary code? ______ .

A. Microprocessor B. Circuit

C. Byte D. Memory

49. What is the primary input device used to enter information and instructions into the computer?______ .

A. Mouse B. Keyboard C. Scanner D. Printer

50. What is a message on the screen that requests the operator to enter information or a command? _____ .

A. Window B. Input device C. Character D. Prompt

51. What is a "URL" address? ______ .

A. An address of information on a hard drive

B. The baud rate at which a modem operates

C. The physical address of an ISP

D. An address of a resource or file accessible on the Internet

52. A ZIP, JAZ, SyQuest, and CDRW are all capable of what? ______ .

A. Allowing your monitor to display 16 million colors

B. Being written, erased, and re-written on

C. Connecting to the Internet

D. Encrypting files

53. GIF is an acronym for what? ______ .

A. Graphic Idle File B. Good Image Format

C. Gamut Image Fill D. Graphics Interchange Format

54. The use of fax machines, email and bulletin boards would not have been possible without______ .

A. the fact that data can be stored B. the use of application packages

C. data communication media D. databases

55. The communication bus which is used to fetch the address of an instruction from memory is called the ______ .

A. address bus B. control bus

C. data bus D. fetch bus

56. Which is the fastest of the memory types listed? ______ .

A. DRAM B. EDO RAM

C. ROM D. SRAM

57. Linux is a UNIX-like operating system originally developed by Linus Torvalds, then a _____ in Finland.

A. engineer B. technician C. programmer D. university student

58. Messages may be encrypted such that the information contained in a message is ______ . gibberish to anybody other than the intended recipient.

A. cracked B. uncracked C. crackable D. uncrackable

59. In the first generation, computers used ______ to conduct electricity.

A. resistors B. transistors C. vacuum tubes D. integrated circuits

60. An interrupt is a signal from a device attached to a computer or from a program within the computer that causes the main program that operates the computer (the operating system) to stop and figure out what to do next.________ .

A. A deadlock B. A thread C. An interrupt D. A routine

Close Test

1. The Development of Computer

After the integrated circuits, the only place to go was down — in ___1___, that is. Large scale integration (LSI) could fit hundreds of components onto ___2___. By the 1980's, very large scale integration (VLSI) squeezed hundreds of thousands of components onto a chip. Ultra-large scale integration (ULSI) increased that number into the millions. The ability ___3___ so much onto an area about half the size of a U.S. dime helped diminish the size and price of computers. It also increased their power, efficiency and reliability. The Intel 4004 chip, developed in 1971, took the integrated circuit one step further ___4___ locating all the components of a computer (central processing unit, memory, and input and output controls) on a minuscule chip.___5___ previously the integrated circuit had had to be manufactured to fit a special purpose, now one microprocessor could be manufactured and then programmed to meet any number of demands. Soon everyday household items such as microwave ovens, television sets and automobiles with electronic fuel injection incorporated microprocessors.

1. A. cost	B. speed	C. size	D. efficiency
2. A. one chip	B. two chips	C. three chips	D. four chips
3. A. fit	B. fiting	C. fitted	D. to fit
4. A. by	B. with	C. to	D. in
5. A. After	B. Soon	C. Before	D. Whereas

2. Installing the Mainboard

___1___ the CPU chip, the main board or "motherboard" is the most important component of any personal computer. Intel makes a small number of its own boards, but most systems use motherboards from companies such as Abit, Asus, MSI, SuperMicro, or Tyan.

The first step when ___2___ your own computer is to position the main board over screw hole mounts connected to the bottom or back of the system case. Then everything else plugs into the main board:

The CPU drops into the main board socket. The most important choice is to select ___3___ a Pentium IV or AMD socket. The main board also has to support the Front Side Bus speed of the CPU (a 400 or 533 MHz socket depending on the speed of the Pentium IV).

DDR SDRAM is rated by ___4___. You have more flexibility here, because a fast main board will generally support slower memory at slower speed, and fast memory works correctly at a slower clock speed. However, you will get the best performance if the board can support the memory at full speed.

Modern computers use an ATX power supply that ___5___ into a large socket on the main board with two rows of connectors. The newer high speed CPU need more power and have a supplemental 12 volt connector (ATX12V).

1. A. Before	B. After	C. As	D. Since
2. A. maintaining	B. maintain	C. assembling	D. assemble
3. A. none	B. both	C. neither	D. either
4. A. capacity	B. cost	C. time	D. speed

5. A. plug　　B. plugs　　C. to plug　　D. plugged

3. OSI Model

The OSI model is not a single definition of how data communications actually takes ___1___ in the real world. Numerous protocols may exist at each layer. The OSI model states how the process should be divided and what protocols should be used at each layer. ___2___ a network vendor implements one of the protocols at each layer, its network components should work with other vendors' offerings.

The OSI model is modular. Each successive layer of the OSI model works with the one above and ___3___ it. At least in theory, you may substitute one protocol for another at the same layer without affecting the operation of layers above or below. For example, Token Ring or Ethernet hardware should operate with multiple upper-layer services, including the transport protocols, network operating system, internetwork protocols, and applications interfaces. However, for this interoperability to work, vendors must create products that ___4___ the OSI model's specifications.

Although each layer of the OSI model provides its own set of functions, it is possible to group the layers into two distinct categories. The first four layers—physical, data link, network, and transport — provide the end-to-end services necessary for the transfer of data ___5___ two systems. These layers provide the protocols associated with the communications network used to link two computers together.

1. A. space　　B. over　　C. place　　D. in
2. A. As　　B. If　　C. Although　　D. Even if
3. A. on　　B. over　　C. under　　D. below
4. A. meet　　B. require　　C. accord　　D. fulfill
5. A. between　　B. among　　C. in　　D. to

4. Upgrade a Computer

You can upgrade a computer to enhance it's ___1___. For many upgrades, you will need the assistance of an experienced computer ___2___ person. Upgrading usually refers to replacing an old or obsolete component with a newer one to improve the efficiency of the computer. Upgrading can also include adding a new ___3___, such as a tape drive or DVD-ROM drive, to increase the capabilities of the computer.

You should always determine the cost of an upgrade before performing it. If you are planning a major upgrade, such as ___4___ the system board or CPU, it may be less expensive to purchase a new computer.

Increasing the ___5___ of memory in a computer is one of the most effective upgrades you can perform. Doubling the existing memory in a computer can significantly increase its performance.

1. A. cost　　B. height　　C. performance　　D. experience
2. A. repair　　B. check　　C. administer　　D. keep
3. A. member　　B. software　　C. drive　　D. component
4. A. replace　　B. replacing　　C. to replace　　D. replaced
5. A. amount　　B. cost　　C. speed　　D. quality

5. Storage

Back in the mid-1980s, when a PC had a 20MB hard disk, a 1.2MB floppy was a capacious device enough of backing ___1___ the entire drive with a mere 17 disks. By early 1999, the standard hard disk fitted to PCs had a capacity of between 3GB and 4GB: a 200-fold increase. In the same period, the floppy's 2___ has increased by less than 20%. As a result, it's now at a disadvantage when used in conjunction with any modern large hard disks—for most users, the standard floppy disk just isn't big enough anymore.

In the past, this problem only affected a ___3___ proportion of users, and solutions were available for those that did require high-capacity removable disks. For example, by the late 1980s SyQuest's 5.25in 44MB or 88MB devices had pretty much become the industry standard in the publishing industry for ___4 large DTP or graphics files from the desktop to remote printers.

By the mid-1990s every PC user needed high-capacity removable storage. By then, applications no longer came on single floppies, but on CD-ROMs. Thanks to Windows and the impact of multimedia, file sizes have gone through the ceiling. A Word document with a few embedded graphics results in a multi-megabyte data file, quite ___5___ of being shoehorned into a floppy disk.

1. A. up	B. with	C. to	D. in
2. A. ability	B. speed	C. capacity	D. cost
3. A. large	B. big	C. less	D. tiny
4. A. transferring	B. processing	C. translating	D. transforming
5. A. capable	B. incapable	C. sufficient	D. adequate

6. OS Selection

Most OS selection decisions are not made in a vacuum, ___1___ should they be. In selecting an OS, the practice must take into ___2___ its current computing environment (hardware and software), the strengths and weaknesses of different OS platforms, and the availability of vital software that runs on different operating systems. The practice should attempt to standardize its information technology operations ___3___ possible. Standardization makes the practice's computing life much simpler and easier. For example, the practice should standardize around one PC architecture and one version of one PC operating system. Most practices that standardize do so around IBM-compatible PCs and a Windows operating system. However, the practice may do just fine standardizing to Apple products. Any standards are preferable ___4___ no standards. In the absence of standards, offices typically wind up with a hodgepodge of machines that are difficult to maintain and that do not communicate well with one another. In a hodgepodge computing environment, particular office members may only know how to work particular machines. It is perfectly acceptable for the practice to standardize around an older OS. For example, if everybody in the office knows how to use Windows 98 or NT, the costs associated with migrating to a newer operating system may ___5___ the benefits associated with the migration.

1. A. and	B. or	C. nor	D. yet
2. A. record	B. account	C. consider	D. memory
3. A. whenever	B. whatever	C. whichever	D. however
4. A. to	B. above	C. in	D. on
5. A. weigh	B. outweigh	C. stand	D. outstand

7. VB：Create the User Interface

You start a new programming project by clicking the New Project command on the File menu.

Click No if you are asked ___1___ you want to save any changes to the StepUp program from Lesson 1. This removes the StepUp program ___2___ memory.

Click OK to create a standard 32-bit Visual Basic application.

Visual Basic cleans the slate for a new programming project and displays in the center of the screen a blank form you can use to build your user interface.

Now you'll enlarge this form, and then you'll create the two buttons in the interface.

___3___ the mouse pointer over the lower-right corner of the Form window (not the Project Container window) ___4___ the mouse changes into a sizing pointer, and then increase the size of the form to make room for the objects in your program.

As you resize the form, scroll bars appear in the Project window.

To see the entire form without obstruction, ___5___ the Project Container window to remove the scroll bars and move or close the Properties window, the Project window, and the Form Layout window.

1. A. where	B. how	C. what	D. whether
2. A. off	B. out of	C. in	D. from
3. A. Position	B. Make	C. Orient	D. Let
4. A. when	B. after	C. until	D. before
5. A. size	B. resize	C. put	D. decrease

8. Windows XP: IntelliMirror

IntelliMirror consists of four components: user data management, user settings management, computer settings management, and Group Policy－based software installation and maintenance. These components are based ___1___ Group Policy, Roaming User Profiles, and Offline Files. The IntelliMirror components can help you to:

◆ Centrally create and manage the configuration of each user's desktop.

◆ ___2___ users to Access files from any location at any time by using Roaming User Profiles and Folder Redirection in combination with Offline Files.

◆ Manage how software is deployed and installed on computers to ensure that users have the software they need to ___3___ their jobs. Large organizations that need advanced software distribution and inventory capabilities should consider using Microsoft® Systems Management Server (SMS) 2.0.

◆ Manage and enforce centralized data storage, which helps administrators keep important corporate data ___4___ up.

◆ Save time when replacing computers by using Remote Installation Services(RIS) and Group Policy－based software installation and maintenance to easily replace applications, Roaming User Profiles to recover user profiles, and Folder Redirection to centrally ___5___ files.

1. A. at	B. in	C. on	D. over
2. A. Enable	B. Let	C. Make	D. Force
3. A. process	B. perform	C. act	D. run
4. A. backing	B. backed	C. storing	D. stored
5. A. copy	B. delete	C. move	D. manage

9. Touchscreen

A touchscreen is an intuitive computer input device that works by simply touching the display screen, 1___ by a finger, or with a stylus, rather than typing on a keyboard or pointing with a mouse. Computers with touchscreens have a smaller footprint, and can be mounted in smaller spaces; they have fewer movable parts, and can be sealed.

Touchscreens may be built ___2___, or added on. Add-on touchscreens are external frames with a clear see-through touchscreen which mount onto the monitor bezel and have a controller built into their frame. Built-in touchscreens are___3___, heavy-duty touchscreens mounted directly onto the CRT tube.

Any touchscreen system comprises the following three basic components;

- a touchscreen sensor panel, that sits above the display and which generates appropriate voltages according to where, precisely, it is touched.
- a touchscreen controller, that processes the signals ___4___ from the sensor and translates these into touch event data which is passed to the PC's processor, usually via a serial or USB interface.
- a software driver, provides an interface to the PC's operating system and which translates the touch event data into mouse events, essentially enabling the sensor panel to "emulate" a 5___.

1. A. either	B. neither	C. both	D. and
2. A. at	B. of	C. in	D. with
3. A. outside	B. inside	C. external	D. internal
4. A. received	B. sent	C. get	D. offered
5. A. keyboard	B. mouse	C. finger	D. hand

10. What is ISDN?

Integrated Services Digital Network (ISDN) is fully digital telephone service, ___1___ data, voice, and video channels over the existing phone network. While most of the current phone network is already digital, ISDN replaces the final analog section connecting the local exchange with individual houses or offices to create a fully digital connection.

Not only is ISDN much faster than a standard analog telephone connection, __2__its multiple channels allow you to use several devices (such as a telephone, computer, and fax)__3__on the same line.

You usually obtain ISDN service from a telephone company and Internet service provider. There are two different classes of ISDN: Basic Rate Interface (BRI) and Primary Rate Interface (PRI).

Basic ISDN (BRI) is designed to meet the needs of most individual users and small networks. It is 4___ inexpensive and can use existing phone wiring. It divides the telephone line into three channels: two 64Kbps bearer channels (B channels), and one 16Kbps D channel for setting up and managing calls. In some situations, the two bearer channels can function together as a single virtual channel, with a data transmission speed of 128Kbps.

PRI ISDN is designed for organizations with greater __5__ requirements. It uses a full T1 line, transmitting at 1.544Mbps. It offers 23 B channels at 64Kbps, and one 64Kbps D (setup) channel.

1. A. provide	B. providing	C. provided	D. provident

2. A. or	B. and	C. but	D. as
3. A. simultaneously	B. simultaneous	C. separately	D. separate
4. A. fairly	B. much	C. many	D. too
5. A. content	B. capacitance	C. capability	D. capacity

11. Data Mining

By this point in time, you've probably heard a ___1___ deal about data mining—the database industry's latest buzzword. What's this ___2___ all about? To use a simple analogy, it's finding the proverbial needle in the haystack. In this case, the needle is that single piece of intelligence your business needs and the haystack is the large data warehouse you've built up ___3___ a long period of time.

The first step toward building a productive data mining program is, of course, to ___4___ data! Most businesses already perform these data gathering tasks to some extent—the key here is to locate the data critical to your business, refine it and prepare it for the data mining process.

The next step is to choose one or more data mining algorithms to ___5___ to your problem. If you're just starting out, it's probably a good idea to experiment with several techniques to give yourself a feel for how they work. Your choice of algorithm will depend upon the data you've gathered, the problem you're trying to solve and the computing tools you have available to you. Let's take a brief look at two of the more popular algorithms.

1. A. many	B. little	C. good	D. bad
2. A. rule	B. tradition	C. custom	D. trend
3. A. over	B. in	C. above	D. at
4. A. gather	B. choose	C. ask	D. process
5. A. build	B. use	C. apply	D. make

12. Internet Overview

The Internet is a computer network made ___1___ of thousands of networks worldwide. No one knows exactly how many computers are connected to the Internet. It is certain, ___2___, that these number in the millions and are increasing at a rapid rate.

No one is ___3___ the Internet. There are organizations which develop technical aspects of this network and set standards for creating applications on it, but no governing body is in control. The Internet backbone, through which Internet traffic flows, is owned by private companies.

All computers on the Internet communicate with one another using the Transmission Control Protocol/Internet Protocol suite, abbreviated to TCP/IP. Computers on the Internet use a client/server architecture. This means that the remote server machine provides files and services to the user's local client machine. Software can be installed on a client computer to take ___4___ of the latest access technology.

An Internet user has access to a wide variety of services: electronic mail, file transfer, vast information resources, interest group membership, interactive collaboration, multimedia displays, real-time broadcasting, shopping opportunities, breaking news, and much ___5___.

1. A. over	B. in	C. up	D. at
2. A. but	B. however	C. and	D. yet

3. A. in charge	B. in the charge	C. in the charge of	D. in charge of
4. A. advantage	B. in	C. disadvantage	D. up
5. A. many	B. more	C. most	D. the most

13. What Ails E-mail

Here's a list of the main security issues that affect E-mail.

◆ Lack of privacy

E-mail is sent in plaintext and can be read by anyone who can access it.

◆ Lack of integrity

There is no safeguard to prevent someone ___1___ changing the contents of an E-mail message while it's in storage or in transit.

◆ Lack of authenticity

Anyone can forge an E-mail message that claims it was written by another individual.

◆ Lack of nonrepudiation

Any particular E-mail message can't be bound to its sender, so a sender can deny ___2___ having sent a message to you.

◆ Viruses

E-mail messages can contain attachments that are actually viruses in ___3___; when you open the attachment, the virus spreads to your PC.

◆ Spam

An E-mail account is an open home for spam, those annoying mass E-mail rants and advertisements.

Another basic problem revolves around the integrity of a particular piece of E-mail. As mentioned, it's possible for someone to access or intercept a piece of E-mail as it lies in storage or while it's in transit. Since most E-mail messages are in ___4___, anyone who can access the message can also change the contents of the message—without the user knowing that the message had been altered. In this ___5___, the integrity of the message has been compromised. A more complex security problem is one of authenticity. Currently, there is no method built in to E-mail that would let a recipient of a message verify that the sender is actually who he or she claims to be. Combined with the integrity issue, this lack of verification means that E-mail is an untrustworthy system. A related security problem is a lack of nonrepudiation, in which a sender can deny that he or she ever sent a message. Additionally, there is no way to disprove a sender's claim that his or her message has been tampered with so that its meaning has been changed.

1. A. from	B. off	C. in	D. at
2. A. never	B. sometimes	C. ever	D. before
3. A. pose	B. misuse	C. pretension	D. disguise
4. A. ASCII	B. code	C. encryption	D. plaintext
5. A. view	B. case	C. angle	D. text

14. How Joysticks Work

Joysticks pull off a really neat trick. They take something entirely ___1___ —the movement of your hand — and translate it into something entirely mathematical — a string of ones and zeros (the ___2___ of computers). With a good joystick, the translation is so flawless that you completely forget about it. When you're really engaged in a game, you feel like you're interacting with the ___3___ world directly.

The basic idea of a joystick is to translate the movement of a plastic stick into electronic information a computer can process. Joysticks are used in all kinds of machines, including F-15 fighter jets, backhoes and wheelchairs. In this article, we'll be focusing on computer joysticks, but the same principles apply to other sorts of joysticks.

The various joystick technologies ___4___ mainly in how much information they pass on. The simplest joystick design, used in many early game consoles, is just a specialized electrical switch.

This basic design consists of a stick that is attached ___5___ a plastic base with a flexible rubber sheath. The base houses a circuit board that sits directly underneath the stick. The circuit board is made up of several "printed wires," which connect to several contact terminals. Ordinary wires extend from these contact points to the computer.

1. A. artless	B. psychic	C. mental	D. physical
2. A. speech	B. action	C. language	D. process
3. A. right	B. virtual	C. illusive	D. false
4. A. similarity	B. similar	C. different	D. differ
5. A. to	B. in	C. on	D. over

15. Advantages of a Laser

So why get a laser printer ___1___ than a cheaper inkjet printer? The main advantages of laser printers are speed, precision and economy. A laser can move very quickly, so it can "write" with much greater speed than an ink jet. And because the laser beam has an unvarying diameter, it can draw more precisely, without spilling any ___2___ ink.

Laser printers tend to be more expensive than inkjet printers, but it doesn't cost as much to keep them running—toner powder is cheap and lasts a long time, ___3___ you can use up expensive ink cartridges very quickly. This is why offices typically use a laser printer as their "work horse", their machine for printing long text documents. In most models, this mechanical efficiency is complemented by advanced processing efficiency. A typical laser-printer controller can serve everybody in a small office.

When they were first ___4___, laser printers were too expensive to use as a personal printer. Since that time, however, laser printers have gotten much more affordable. Now you can pick up a basic model for just a little bit more than a nice inkjet printer.

As technology advances, laser-printer prices should continue to ___5___, while performance improves. We'll also see a number of innovative design variations, and possibly brand-new applications of electrostatic printing. Many inventors believe we've only scratched the surface of what we can do with simple static electricity!

1. A. more	B. rather	C. less	D. other
2. A. access	B. less	C. more	D. excess
3. A. while	B. when	C. where	D. how
4. A. seen	B. consulted	C. introduced	D. referred
5. A. down	B. drop	C. rise	D. up

16. Computer's Primary Jobs

When you think about a computer and what it does, you of course think that it… well…___1___. And this is indeed one part of its job. Computing is really another term for "information ___transformation" —changing information from one form to another. The computer spends a goodly amount of its time doing exactly this: performing math operations ___2___ numbers into other numbers), and translating information from one form to another (for example when a game determines using mathematics, what to 3___ on the screen for you to see).

One special form of information the computer processes is its instructions. These are the___4 that programmers give the computer to tell it what to do. Every time you do anything with a computer, you are really talking to a program which is talking to the computer. The language that computers speak, which is called ___5___ language, is very complex and hard to understand, which is why it is hidden from all but the most technically-proficient engineers. Even most programmers never use machine language directly.

1. A. computes	B. outputs	C. inputs	D. processes
2. A. adding	B. changing	C. operating	D. translating
3. A. behave	B. exhibit	C. look	D. display
4. A. suggestions	B. commands	C. advices	D. speech
5. A. device	B. equipment	C. machine	D. computer

17. DSL

DSL (___1___ subscriber line) technologies, often grouped under the term xDSL, connect a computer 2___ the Internet. DSL uses existing copper pair phone line wiring in conjunction with special hardware on the switch and user ends of the line. This special hardware allows for a continuous digital connection over the phone lines.

Since the connection is digital, DSL technology doesn't have a digital-to-analog conversion like traditional ___3___. It eludes voice audio spectrum frequency boundaries because it can use frequencies above the voice audio spectrum. This means you can use your phone___4___maintaining your Internet connection.

The most commonly available of the DSL technologies is ADSL, or asymmetric DSL. It is asymmetric in that it is designed to accommodate typical consumer Internet use, with much ___5___data flowing toward the user (multimedia and text) than from the user (mostly keystrokes and mouse behavior). The downstream rate (receiving rate) varies from 1.5 to 9Mbps; the upstream rate (sending rate) varies from 16 to 640Kbps. These speeds depend greatly on the distance to the telephone company's central office.

1. A. digital	B. data	C. digitalization	D. datum
2. A. by	B. of	C. on	D. to
3. A. bridges	B. NICs	C. modems	D. gateways
4. A. where	B. how	C. while	D. whether
5. A. many	B. more	C. little	D. few

Matching

Write down the letter <u>and</u> word(s) of the item in Column B which best matches each of the descriptions in Column A.

(1)

Column A

1. Manufacturer of monitors.
2. Pen-shaped instrument used to select menu options on a monitor screen or to draw line art on a graphics tablet.
3. Port for a mouse or keyboard.
4. Set of characters of a specific design.
5. Organization which offers private people access to the Internet.
6. Rules of polite behavior that you abide by when using the Internet.
7. Generic name given to the unique address of a website, e.g. http://www.amazon.com/
8. Temporary location for information that you wish to paste into another program.

Column B

a. Monitor
b. Clipboard
c. DragonDictate
d. Font
e. Genius
f. Google
g. ISP
h. Microsoft
i. Naturally Speaking
j. Netiquette
k. Parallel port
l. Plug
m. Port
n. PowerPoint
o. Samsung
p. Serial port
q. Stylus
r. URL
s. Windows
t. Yahoo

(2)

Column A

a. Bus that connects the CPU and memory, providing a pathway to the computer's peripherals.
b. Component of the central processing unit that decodes, synchronizes and executes program instructions.

Column B

1. Address bus
2. Arithmetic/logic unit
3. Binary code
4. BIOS

c. CPU processing function regulator that produces a pulse at regular intervals.

d. Data to be processed that is entered into the computer from a keyboard, disk drive, or other input device.

e. Device with a keyboard for inputting data to a computer and a display screen for receiving data from the computer.

f. Eight bits grouped together to represent a character (a letter, number, or symbol).

g. Electronic circuit containing thousands of electronic components combined on one chip.

h. Electronic switching circuit that performs a logic operation; its binary output is entirely determined by the combination of binary input.

i. Highway of parallel wires along which signals are sent from one part of the computer to another.

j. Linked series of programs that controls, assists, and supervises all other programs on a computer system and that allows dissimilar hardware systems to work together.

k. Main part of a computer. Contains internal memory, an arithmetic/logic unit, and control circuitry and performs data-processing and timing and controlling functions.

l. Memory chip soldered into a separate integrated circuit board which is then plugged onto the motherboard, usually associated with RAM.

m. Number of bits, such as 16 or 32, that can travel through the bus at the same time.

n. Permanent computer memory system containing data and instructions that can be retrieved and used but never altered.

o. Physical components of a computer system, such as the chips, disk drives, monitor, and other devices. Distinguished from software.

p. Section of the central processing unit that performs arithmetic and logic operations.

q. Set of wires running from the central processing unit (CPU) to random-access memory (RAM).

r. Single chip containing all the components found in a computer's central processing unit.

s. Step-by-step series of instructions directing the computer to carry out a sequence of actions in order to perform an operation or to solve a problem.

t. Storage area in which a computer saves data and from which it retrieves data.

5. Bit
6. Bus
7. Bus width
8. Byte
9. Clanguage
10. CPU
11. Chip, or microchip
12. Control unit
13. Counting element
14. Data bus
15. File control
16. Hardware
17. Input
18. Integrated circuit (IC)
19. Logic circuit
20. Megahertz
21. Memory
22. Microprocessor
23. Network
24. Operating system
25. Output
26. Program
27. Protocol
28. RAM
29. ROM
30. SIMM
31. Software
32. System clock
33. Terminal
34. Word

u. Temporary computer memory system in which data can be stored and from which data can be quickly retrieved.

v. Thin slice of silicon containing an integrated circuit.

w. Unit of information, composed of bits and bytes, that can be stored in one memory location name.

x. Unit of measurement equal to 1 million cycles per second, commonly used to compare the clock speeds of computers.

Questions

Questions 1:

Name the four essential components of a network so that they can communicate with one another.

Questions 2:

Between 7:00 PM (PST) on Monday, April 28, 2003 and 7:00 PM on Tuesday, April 29, 2003 Patrick Crispen of The Internet Tourbus at www.tourbus.com received a total of 730 emails. Of those, 22 were messages (messages from friends, readers, lists to which he subscribes), 2 messages with attachments contained viruses (detected and killed by Norton AntiVirus), and the remaining 706 messages (96.7%) were spams.

a. What is spam?

b. How do you prevent such spam?

Questions 3:

a. What three characteristics determine the clarity of a computer screen?

b. How can one clean a monitor?

Questions 4:

The Pentium microprocessor has a 32-bit architecture. Explain how the speed of the computer is influenced by this architecture.

Questions 5:

a. When I use the World Wide Web it is so slow. Is there a time when I should not use it? When should I use the Internet and get fast download speeds?

b. I took some wonderful holiday photographs and want to send copies of them to the people in New Zealand with whom I spent my holiday. I could send the photographs to them by normal postage but it is too slow and expensive. What is a cheap and quick way to send photographs to people far away?

c. I pressed Print by mistake and wasted a great deal of paper printing rubbish. What can I do, if and when I press Print by mistake, and want to stop 'mistake' printing.

d. The cursor on my mouse jumps all over the screen and does not go where I want it to go. What is wrong? What can I do to make it go where I want it to go?

e. I did some work on my computer at school and want to take/send the file I used home. Name two ways in which I can do it.

Questions 6:

Memory—the part of the system used to store data and programs either permanently or temporarily.

a. What important program is stored in ROM?

b. What is Dynamic RAM used for?

c. What is normally stored in the cache memory?

d. What is Static RAM used for?

e. What is stored in RAM when the computer is switched off?

f. What is stored in ROM when the computer is switched off?

g. What is the advantage of using the EDO DRAM chip?

h. What is the main reason for the utilization of cache memory?

i. Which, Dynamic RAM or Static RAM, must be refreshed by the processor in order to retain the content?

Questions 7:

Motherboard—printed circuit board that contains the main components of a microcomputer.

a. If you had an internal modem, into which part of the motherboard would you slot the card in?

b. Name the common type of switch found on a motherboard.

c. On the motherboard you maybe able to see thin traces or wires. What are these thin lines called?

Translations Exercises

1. Instruction pipelining is similar to the use of an assembly line in a manufacturing plant. An assembly line takes advantage of the fact that a product goes through various stages of production. By laying the production process out in an assembly line, products at various stages can be worked on simultaneously. This process is also referred to as pipelining, because, in a pipelining, new input are accepted at one end before previously accepted inputs appear as outputs at the other end. To apply this concept to instruction execution, we must recognize that, in fact, an instruction has a number of stages. Pipelining is such a method. It recognizes that during execution an instruction is not using the whole processor. It, therefore, breaks the execution of an instruction into stages that match how a processor executes instructions.

2. Linux is virtually immune to all DOS/Windows viruses. Linux is very stable and rarely crashes. It is used by thousands of companies around the world in 24-hours systems. Linux, with a handful of applications, utilities and games already developed for it, is based on open industry standards so you are not obligated to buy everything from the same company. Most big software developers already support Linux and more are joining in. You can even download Linux office applications for personal use for free.

3. Two sublists, each already sorted, can be merged together to form one aggregate list that is also sorted. A simple and effective procedure for doing this called mergesort, begins by comparing pairs of elements—one from each sublist. The smallest element is appended to a sorted list and is replaced by the next element from its sublist. This continues until there are no more elements in one of the sublists. The remaining elements in the other sublist are then appended to the sorted list, and the sort is complete.

4. A file is an abstract data type defined and implemented by the operating system. A file is a sequence

of logical records. A logical record may be a byte, a line (fixed or variable length), or a more complex data item. The major problem for the operating system is to map the logical file concept onto physical storage devices such as magnetic tape or disk. Since the physical record size of the devices may not be the same as the logical record size, it may be necessary to block logical records into physical records.

5. The basic language for building a Web page is HTML (HyperText Markup Language). It provides a standard format for Web pages to create a link, provide the refresh period for a page to change, embed audio files, embed JavaScript, layout the combo box, and form pages into different frame. HTML is a tag language. There are a lot of editors available that help in putting the tags to create the page you want without having to know how the pages are created. Then there is the CGI (Common Gateway Interface) to make the pages alive by dynamically feeding back a page to the user after he has entered the parameters to the input boxes formed by HTML tag and submitted to the CGI. CGI is like C or shell script languages. It receives parameters or information that a user has entered in the Web page as variables and processes them. Results are then fed back to the screen and embedded in a HTML page.

6. Implementing network security is a four-stage process. First, you must assess the company's existing network security and define a security policy. Next, identify security products and services that meet all of your needs and implement them in your organization. After that, you will need to set up a management program for all the Internet security within the organization. This may include establishing procedures for managing a security services desk, firewalls, VPNs, encryption, performing audits, clearing up virus attacks and recovering keys. In the final stage, the phase known as maintenance, security measures are kept in sync with business and technology requirements.

7. Repeaters have several drawbacks. The most important drawback arised because repeaters do not understand complete frames. As it proceeds to receive electrical signals on one segment and transmit them on another, a repeater does not distinguish between the signals that correspond to a valid frame and other electrical signals. Therefore, when a collision occurs on one segment, a repeater recreates the signals on the other segment, including a copy of the over-lapping signals that correspond to the collision. Similarly, when interference—lightning, for example—generates unwanted electrical noise on a segment, repeaters transmit a copy of the electrical noise on the other segments. The important point is: in addition to propagating copies of valid transmissions from one segment to another, a repeater propagates a copy of other electrical signals. As a result, if a collision or electrical interference occurs on one segment, repeaters cause the same problem to occur on all other segments.

8. RISC (Reduced Instruction Set Computer) refers to a new design methodology that indicates a new relationship between hardware and software, rather than a set of technical features. In fact, the effects of the RISC approach on computer design is far more than just a collection of methods to run the CPU faster. In this sense, the term "Reduced Instruction Set Computer" is somewhat misleading. The real goal of RISC design definitely is not to arbitrarily reduce the number of instructions. Rather, the main objective is to create a high-speed computer by making the compiler system match the hardware. The main goal of CISC (Complex Instruction Set Computer) designs was to reduce the number of instructions for executing programs. Rather, RISC tries mainly to reduce the average number of clock cycles per instruction (CPI). Both architectures want to increase the clock-rate by using high-speed technologies, however RISC provides

a greater performance improvement since its reduced complexity enables it to be fabricated earlier in such technologies.

9. Data integrity refers to the accuracy, correctness, or validity of the data in the database. In a database system, data integrity means safeguarding the data against invalid alteration or destruction. In large on-line database system, data integrity becomes a more severe problem and two additional complications arise. The first has to do with many users accessing the database concurrently. For example, if thousands of travel agents and airline reservation clerks are accessing the same database at once, and two agents book the same seat on the same flight, the first agent's booking will be lost. In such cases the technique of locking the record or field provides the means for preventing one user from accessing a record while another user is updating the same record. The second complication relates hardware, software, or human error during the course of processing and involves database transactions to keep the database in a consistent state of integrity. A database transaction is a group of database modifications treated as a single unit. For example, an agent booking an airline reservation involves several database updates (i.e., adding the passenger's name and address and updating the seats-available field), which comprise a single transaction. The database transaction is not considered to be completed until all updates have been completed; otherwise, none of the updates will be allowed to take place.

10. To understand how MP3 works, remember that sound travels in constantly changing waves. To save sound onto a PC or compact disc, a computer records "snapshots" of those waves at short intervals, a technique known as sampling. Playing back samples reproduces the original sound; the more samples, the more realistic the sound. You'd need 2 500 samples per second to achieve the sound quality of a telephone call. For higher CD-quality music samples you'd need a whopping 44 100 samples per second. Elvis Presley's 137-second rendition of "Hound Dog"takes about 24.1 M bytes of hard disk space; the MP3 version would need just 2.1 M bytes.

11. Computers allow users to share, or not share, applications and files with others. Generally, it is possible to restrict access to information at four levels: the PC level, the file level, the server level, and the message level. Many PCs have a password-protected screen saver that pops up when the computer is started or after a few minutes of inactivity. Only users that know the password can get past the screen saver. Many types of files may be password-protected, and users may only gain access to the file if they know the file-specific password. Users on a LAN or an access-restricted website must log in before they gain access to the network. Login may be accomplished using a variety of approaches, including passwords, tokens, etc. Often, the user's identity determines what applications and files are made available to the user. A bank ATM provides a good example of server-based access restriction using a token (the card) and a password (the PIN). Messages may be encrypted such that the information contained in a message is uncrackable gibberish to anybody other than the intended recipient. For example, e-commerce websites usually encrypt the user's credit card information. This is a good example of message-level access restriction. Of the four general access restriction approaches, the server-based and message level approaches offer the greatest protection. When used in combination, it is virtually impossible (from a technological and/or cost perspective) for an outsider to gain access to protected information.

12. Processors work by reacting to an input of 0s and 1s in specific ways and then returning an output

based on the decision. The decision itself happens in a circuit called a logic gate, each of which requires at least one transistor, with the inputs and outputs arranged differently by different operations. The processor's logic gates work together to make decisions using Boolean logic, which is based on the algebraic system established by mathematician Boole. The main Boolean operators are AND, OR, NOT, and NAND; many combinations of these are possible as well. An AND gate outputs a 1 only if both its inputs were 1s. An OR gate outputs a 1 if at least one of the inputs was a 1. And a NOT gate takes a single input and reverses it, outputting 1 if the input was 0 and vice versa. NAND gates are very popular, because they use only two transistors instead of the three in an AND gate yet provide just as much functionality. In addition, the processor uses gates in combination to perform arithmetic functions; it can also use them to trigger the storage of data in memory.

13. The number of bits used to represent each pixel determines how many colors or shades of gray can be displayed. For example, in 8-bit color mode, the color monitor uses 8 bits for each pixel, making it possible to display 2 to the 8th power (256) different colors or shades of gray. On color monitors, each pixel is actually composed of three dots—a red, a blue, and a green one. Ideally, the three dots should all converge at the same point, but all monitors have some convergence error that can make color pixels appear fuzzy. Image Resolution is an important concept to consider in designing web graphics for one simple reason, regardless of how well you design a graphic, in the end the user's monitor determines the final output of the image. The quality of a display system largely depends on its resolution, how many pixels it can display, and how many bits are used to represent each pixel. VGA systems display 640 by 480, or about 300 000 pixels. In contrast, SVGA systems display 1 024 by 768, or nearly 800 000 pixels. True Color systems use 24 bits per pixel, allowing them to display more than 16 million different colors.

14. Many viruses go resident in the memory of your PC in the same or similar way as terminate and stay resident (TSR) programs. This means the virus can wait for some external event before it infects additional programs. The virus may silently lurk in memory waiting for you to access a diskette, copy a file, or execute a program, before it infects anything. This makes viruses more difficult to analyze since it's hard to guess what trigger condition they use for their infection.On older systems, standard (640 KB) memory is not the only memory vulnerable to viruses. It is possible to construct a virus which will locate itself in upper memory (the space between 640 KB and 1 MB) or in the High Memory Area (the small space between 1 024 KB and 1 088 KB). And, under Windows, a virus can effectively reside in any part of memory.Resident viruses frequently take over portions of the system software on the PC to hide their existence. This technique is called stealth. Polymorphic techniques also help viruses to infect yet avoid detection.

15. A LAN may be created based on a peering or a client-server architecture. Small LANs are often created based on a simple peering relationship. Users may share resources and communicate with one another on a peer network, but no single computer controls a peer network, and peer network users do not typically centralize files on one machine. As a rule, peer networks tend to lack organization and adequate security controls.

The client-server architecture is usually used for larger and/or secure LANs. In a client-server network, the server controls network access and network resources. Clients request resources from the server, and the server provides resources to clients. Servers may range in complexity from mainframes to PCs. Clients may range in complexity from PCs to display terminals (DTs). Client-server networks provide strong central security, centralized file organization and storage, and centralized data preservation. Compared to a peer network, a client-server network requires more centralized and specialized administration.

实 践 篇

Lesson 22 PowerPoint

Reading Materials A

Creating a Slide Show[1]

Creating a Slide Show enables you to present your slides using your computer screen as the output medium. In Slide Show view the PowerPoint window, menu bar, toolbars and scrollbars are not visible. Each slide occupies the whole screen area. Using a Slide Show to display your slides means that you can make editing changes right up to[2] the delivery of the presentation itself. You can also be sure of the quality of your final output.

Setting Up a Slide Show

To set up a Slide Show:

- Open the presentation you want to show.
- From the Slide Show menu, select Set Up Show...
  The Set Up Show dialogue box is displayed.
- From the Slides panel, select the slides to include in the show (The default is All).
- From the Show type panel, select Presented by a speaker.
- From the Advance slides panel, select the Manually option button.
- Click OK.

Delivering a Slide Show

You can move around between slides in a show in a variety of ways. No one way is better than the other ways—experiment and you will find the best way of navigating for you.

To start the Slide Show:

- Click the Slide Show button  .

OR

- From the Slide Show menu, select View Show .

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[1] slide show **幻灯片放映**
[2] up to **一直到**

To move to the next slide:

- Click the left mouse button.

OR

- Press the Space Bar, the → or ↓ arrow, Enter or Page Down.

OR

- Click with the right mouse button and select an option from the shortcut menu[1].

To move to the previous slide:

Press Backspace, ← or ↑ arrow, Page Up.

To move to the first slide:

Hold down both mouse buttons for 2 seconds

To exit a slide show and return to the last view you used:

Press Esc

Annotating[2] Slides

You can annotate or draw on your slides during a presentation—perhaps to draw attention to a particular area on the slide or in response to audience feedback.

To annotate slides

During a slide show you can annotate your slides.

- Click the right mouse button.
- Select Pen.

OR

- Press Ctrl + P.

  The mouse pointer shape is changed from an arrow to a pen.
- Drag the pen shaped mouse pointer to annotate your slide.
- To change the pen back to a mouse pointer in order to continue on with the presentation, press Esc once.

To erase your annotations.

Press the letter E to erase annotations.

Note: Annotations automatically disappear when you move to the next slide.

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[1] shortcut menu **快捷菜单**

[2] annotate **注释**

Reading Materials B

Animation Effects

Simple Animation Effects

The purpose of adding animation effects to text, graphics, sounds, movies, charts and other objects on a slide is to draw the audiences attention to important points in the presentation, and focus their attention on that point whilst it is being discussed.

Animation effects allow you to control the way an object appears on the screen, for example, flying in from the right hand side of the screen, you can also choose to have an object dim or change color when new objects are animated.

You can use animation effects to control the flow of the presentation. For example, in order to ensure your audience's attention is fixed on the bullet point you are talking about, you can have them appear on-screen only as you introduce them.

To set up basic animation:

- In Normal view or Slide view, select the object you want to animate (for example a clip art object or text placeholder).
- From the Slide Show menu, select Preset Animation.
- From the submenu, select the option you want.

To preview animations in Normal view or Slide view:

- From the Slide Show menu, click Animation Preview...

  The animation plays in the slide miniature that appears.
- To replay the animation, click the slide miniature.

Creating Custom Animation Effects

Basic animation effects are quick and simple to create. However, if you want to have more control over your animation effects and control how paragraphs of text are displayed and the order in which objects are built on a slide, you will need to create custom animation effects.

To create a custom animation effect:

- In Normal view or Slide view, display the slide you want to add animation effects to.
- From the Slide Show menu, select Custom Animation...

  The Custom Animation dialogue box is displayed.
- Select the Effects tab.
- In the Check to animate slide objects: panel, select the check box next to the item you want to animate (a selected check box will display a check mark).
- In the Entry animation and sound panel, select the animation effects that you want to apply (for example, Fly—From Left).

- If you are animating text, in the Introduce text panel, select how you want the text to appear on the screen (for example All at once).
- If you are animating bullet points, to dim the previous point when the next bullet point is displayed, in the After animation section, select the color you want the text to dim to.
- Repeat the previous steps to apply animation effects to other objects on the slide.
- To change the order of the animation effects, click the Order and Timing tab.
- In the Animation order: panel, select the object you want to change.
- Use the Move arrows to move the selected object up or down in the order.
- To preview the animations you have set, click the Preview button.
- Click OK.

To edit an animation effect:

- In Normal view or Slide view, display the slide you want to edit the animation effect.
- From the Slide Show menu, select Custom Animation...

  The Custom Animation dialogue box is displayed.
- Select the Effects tab.
- In the Check to animate slide objects: section, select the check box next to the item you want to edit the animate effect of.
- Make the changes.
- Click OK.

Note: To remove an animation effect, de-select the check box in the Check to animate slide objects section under the Effects tab.

Lesson 23　Photoshop

Reading Materials A

Photoshop Basics

Adjusting Brightness and Contrast[1]

Auto Levels[2]

Auto Levels is a quick way to adjust brightness, contrast and color-correct an image. It is often the first thing to try when adjusting an image. Although you may find that it does not always produce the best adjustments for every image.

Go to the **Image menu**.

Drag down to **Adjust**,

and down again to **Auto Levels**.

This option offers no adjustment controls. Photoshop will analyze your image and make the adjustments for you. This may be a good option, but if it is not, you have more controls by using the Levels option.

Levels

Levels is another first-step option for image adjustment. If Auto Levels is not right for your image, try Levels. Levels gives you much more control over the adjustments. An example of when to use this option is when you encounter an image where the colors are so dark or light that many of the mid-tones are not there.

Go to the **Image menu**.

Drag down to **Adjust**,

over and down to **Levels**.

You are presented with the **Levels Control window**.

In the controls window, you will find a graph illustrating the dark, light, and mid-tone[3] area of the image. Below the graph, you will see three triangle shaped sliders to control each area of the image. These controls allow you to add or subtract more light, dark, and mid-tones to your image.

Be sure to check (so a check mark appears) the preview box so you will see the changes on your screen as you make adjustments.

Notice how blotchy the background of this image is.

As you move the Dark and Light sliders, the mid-tones move in unison, but can be adjusted independently.

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1 Brightness and Contrast **亮度和对比度**
2 Auto Level **自动色阶**
3 mid-tone **中间色调，即灰度**

The objective is to create an image with areas that are not to dark or too light and too have detail in the mid-tone areas.

Brightness & Contrast

This adjustment option is used for adjusting the overall image brightness and contrast. There are no controls for different areas of the image as there are in the Levels option. An example of when to use this option would be if the image overall tone is good, but it is a little dark and needs lightening.

Go to the **Image menu**.

Drag down to **Adjust**,

and down again to **Brightness/Contrast**.

The **Brightness/Contrast control window** appears.

You will see two slider bars for adjusting your image, one for brightness and one for contrast. Adding or reducing brightness/contrast is as easy as sliding the appropriate bar to the left or right of center.

Be sure to check (so a check appears) the preview box so you will see the changes on your screen as you make adjustments.

The goal is to brighten a dark image without destroying the contrast or to improve an image with little contrast.

Sharpening[1] Your Image

The trick to using the Sharping tools is to use them in moderation. A little goes a long way. You want to make your image pop, not get sharpened away to high-contrast lines, creating a posterized effect.

Photoshop offers you a couple of options in their sharpening tools. One option looks at the image and applies a filter to the entire image. Another applies the effect to what it thinks are the edges of objects in the image. A more sophisticated filter called Unshape Mask[2], presents you with a controls window, giving you greater control over the filter's effects. Which filter you use will depend on the image you're working with. We'll start with the simplest options first.

Sharpen and Sharpen Edges[3]

Sometimes an image will look fine, except for a little loss of detail or a little lose on the edges of similar colors . In this case, you may want to sharpen only the edges of the image. Photoshop supplies a filter for this called Sharpen Edges which looks at the over all image, decides where the edges are, and sharpens the contrast in those areas.

In the Filters menu, Drag down to Sharpen and over to Sharpen or Sharpen Edges.

1. Sharpen will look at the entire image and will sharpen it.

2. Sharpen Edges will do just that: look at the image, find the edges, and sharpen them.

Unsharp Mask

Scanners will often produce an image that is too soft. This causes the image to be little on the blurry side. In photographic terms this type of image is said to have an Unsharp Mask. Rescaling or reducing an image can also create an image with an unsharp mask.

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[1] sharpen **锐化**

[2] Unshape Mask **锐化遮罩**

[3] Sharpen Edge **锐化边缘**

Photoshop supplies a filter called Unsharp Mask which is used to sharpen an image with an unsharp mask. In essence the filter sharpens the entire image, but gives you greater control over the sharpening process.

Go to the Filters Menu,drag down to sharpen and over to Unsharp Mask.

The Unsharp Mask control window appears.

When the controls window appears, it will automatically apply the last setting used for the filter. This may or may not work with your image. In most cases, you will want to make adjustments.

If you move, by clicking and holding the mouse down in the filters preview window, your mouse icon turns into a hand. The preview effects of the filter return to its original blurry state.

Keep making the adjustment until the image is sharpened without any blaring highlights around the edges of the image.

Amount = how much sharpening is applied.

Radius = how many or what portions of the pixels are affected.

Threshold = the brightness and contrast of the effect.

Reading Materials B

Adjusting Your Image Colors

Variations

Sometimes when scanning, images will pick up a color cast or are a little on the dark or light side. There is a quick and very visual way of adjusting these types of images in Photoshop.

Go to the Image menu.

Drag down to Adjust,

down to Variations.

The Variations window appears and presents you with many options. In the window there are 12 small thumbnails of your image. They are displayed in a way that will reflect the options listed below it. For example: the “add more red” thumbnail looks more red, the blue option looks more blue, “lighten” is lighter and so on.

Among these 12 images is a thumbnail of your original image which does not change, and a current pick thumbnail which displays all the changes you make to the image as you go. This is a nice feature because it enables you to compare your changes against the original.

Adjustments are applied to the selected areas of the image by selecting the appropriate bullet. For example, you can change just the highlights or shadow colors by choosing that option.

You can also lighten or darken these areas of the image by using the lighten or darken thumbnail.

You can also make adjustments to the increments in which the changes occur by changing the Fine or “Coarse” adjustment. “Fine” makes smaller changes and “Coarse” makes larger more drastic changes. This adjustment works with all the settings available.

As you move these adjustment controls, Photoshop will show you where trouble spots will occur (by applying a bright color over that area of the image). This is called Clipping.

Clipping is an area that is devoid of color, as in a white hotspot, or colors are unprintable, or there's too much black.

Be sure to check the show clipping box.

Color Balance Controls

The color controls allow you another option for adjusting color in an image.

In the Image Adjust Menu;

drag over and down to Color Balance;

the Color Balance Control window appears.

The Color Balance Control window consists of three slider bars for adding or subtracting color from the image, the color sliders are:

Cyan and Red, Magenta and Green and Yellow and blue.

The colors work together adding from one color and subtracting from the other.

Another set of controls are located under Tone Balance controls box. These controls allow you to select which area of the image the Color Balance controls effect, the shadow, mid-tones or highlights.

More red applied only to the shadow areas of the image.

More color applied only to the mid-tone areas of the image.

Red applied only to the highlights of the image.

In some cases you may only need to add or remove a color to or from the highlights. Some images need a lot more work, you may need to add or subtract color from all areas on the image.

Cropping an Image

The cropping tool allows you to edit your image after you have scanned it. If it is not visible, look for it in the collapsible marquee tool icon.

1. Select the cropping tool.

2. Click and drag the Cropping tool around the area to be cropped, enclosing the area you want to remain intact inside the selection.

3.The selection can be adjusted by pulling on the bounding box squares. When you are properly aligned over the bounding box adjustment square, your mouse icon will change to a double-headed arrow.

These adjustment squares are located at the four corners and in the top middle and bottom of the selection.

4. When the selection is perfected, move your mouse somewhere inside the selected area, your mouse icon becomes a solid pointer. Once the solid pointer appears, double click your mouse. Your crop is set.

Lesson 24 Flash

Reading Materials A

Flash Basis

Since its introduction in 1996, Flash has grown in popularity to become widely regarded as a standard for high-end multimedia Web sites and presentations. Flash was derived from other Macromedia applications, particularly FutureSplash and Director. Macromedia Director has a longer history, but is primarily used for multimedia development for CD-ROMs, movies and television. However, the files created by Director are too large to port effectively over the Web.

Flash offers many of the dynamic features that Director offers, yet Flash compresses file sizes, making it possible to offer media-rich content and fast download times.

How does Flash Work

Flash combines four elements that define its functionality: vector graphics[1], streaming[2] capability, a timeline[3], and layers[4].

Concepts and Issues Relevant to Flash

Vector graphics

Flash uses vector graphics, rather than bitmapped graphics[5] such as GIF, JPG or PNG. Vector graphics perform more efficiently on the Web because they are based on mathematical computations, rather than the pixel-by-pixel information used by bitmaps.

As such, Flash graphics are scalable without affecting file size. For example, suppose that the two circles are separate vector graphics being displayed in a browser. Both images would have the same file size. The only difference between the two circles is the radius, which can be adjusted by a mathematical calculation. Vector graphics use mathematics in this way to manipulate images.

By contrast, if these images were bitmaps, the larger circle would have a significantly larger file size than the smaller one.

Streaming capability

In addition to using vector graphics, Flash offers another important feature that increases its Web compatibility: streaming capability. Streaming allows multimedia content to begin playing as soon as it reaches its destination—in this case, the client browser. For example, suppose a Flash file (also known as a

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[1] vector graphics **矢量图形**
[2] stream **流，是一种连续的数据传输**
[3] timeline **时间线**
[4] layer **层**
[5] bitmapped graphics **位图图形**

Flash movie) has a total size of 100 KB. Using a standard 28.8-Kbps modem, a user must wait approximately 28 seconds for the entire file to download before the movie can begin to play. With streaming capability, the movie begins as soon as the initial information about the Flash file reaches the browser. This means that the user can begin watching the movie while the rest of the data continues to download.

Timeline

Flash uses the combination of vector graphics and streaming capability to deliver animation that is created using a timeline. The Flash Timeline can be thought of as a series of movie frames[1]. As you develop more frames (or longer timelines), the movie begins to take action. Each Flash movie is a timeline consisting of a series of frames. Each frame contains vector graphics that are opened at a designated sequence and speed, creating the animation.

Layers

The final component of a Flash movie is layers. Each movie can have multiple layers, thus providing animation that is not only linear but also parallel: One animation sequence runs on top of another because each is on a different layer.

Flash and the Browsers

Currently, Flash is not natively supported in browsers. Therefore, for a user to play Flash movies, his or her browser needs a plug-in[2]. Because Flash does not rely on the browser, it is cross-platform capable, which is another advantage.

According to a study at the beginning of 2000, Flash had an installation base of 68 percent, or approximately 195 million users who have the Flash plug-in. There are two reasons for this. One is that many sites use Flash, and therefore many users have downloaded the plug-in. The second reason is that the 4.x versions of both Navigator and Internet Explorer include the Flash plug-in installed by default. AOL and WebTV also provide some Flash support in their browsers.

How Flash Works with HTML

When you create a Flash movie, you have a file with the .fla file name extension (on the Windows platform). The FLA file format can then be converted and compressed into a SWF (pronounced “swiff”), which is then inserted into the HTML code using the <OBJECT> tag (for Internet Explorer) or the <EMBED> tag (for Navigator) to display in the browser. When the browser encounters the SWF file, the Flash plug-in is used to display the Flash movie in the browser.

Thus, the only HTML code on which Flash relies is the <OBJECT> and <EMBED> tags.

Some sites are created entirely with Flash, while others use Flash to provide simple animation such as navigation menus and rollover effects[3]. Therefore, while Flash does not rely on HTML, the two technologies can co-exist and complement each other.

As a design and editing tool, in addition to HTML in its various versions, Macromedia Flash is one of the most influential media to enhance the Web and Web-browsing experience.

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[1] frame **帧**
[2] plug-in **插件程序**
[3] rollover effect **翻转效果**

Reading Materials B

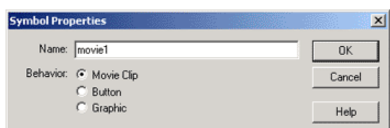
Typewriter Effect

A typewriter effect is one of the essential items to learn if you want to be a Flash pro. Learn how to do it, without using confusing Actionscripts.

1. Start off by starting a new movie: File»New. Then go to Modify»Movie and change the width and height to whatever your preference might be. The one I'm making is Width: 200 Height: 50. Then make a new symbol (Button) by going Insert»New Symbol and name it Button1 and behavior as a button. On the white screen, draw what you want the button to look like.

2. After you have made the graphic in the "Up Frame", right click on "Over" near the top left hand side and chose Insert Keyframe. Everything should remain the same except there should be a dot inside the "Over" at the top and your image should be highlighted in blue.

3. Alright, with your image highlighted, choose Insert»Convert to Symbol. Name can be called Movie1 and behavior is as a Movie Clip. Right click on your image, which should now be a movie clip, and choose Edit In Place. Here is where we will make our animation which will occur when you put your mouse over the button.



4. You would want to split the text and the other graphics in to different layers. Alright, on the first frame which you are on, you should type the full text of what you want to appear. Fox example, I chose "Forum". Then add a keyframe on the third frame, and type in "forum_" with an underscore at the end. Now go to the fifth frame and type in "foru_". Then on the seventh, type "for_" and so on until you are just left with "_", which on my example would be on the thirteenth frame.

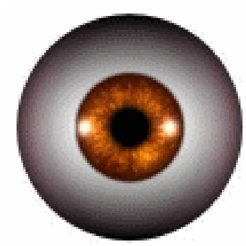
5. After that, you would want to insert a blank frame on the nearest odd keyframe, here it would be 15. Then on the 17 frame, insert a "_". Then another blank keyframe on 19th. Again, on the 21st, write a "_". Now we will add all the text back in, so on the 23rd, type "F_", 23rd "Fo_" and so on until you get to "Forum_". You should get up to the 31st frame.

6. Then on 33rd put "Forum" without an underscore. Then on 35th, put "Forum_". Keep going "Forum" and "Forum_" over and over like specified, until you think it is enough, I did it 7 times. Pretty wacky, but easy huh? That's it, it's completed. Now days, programs such as Swish make it extremely easy to do such time consuming and tedious effects.

Lesson 25　Maya

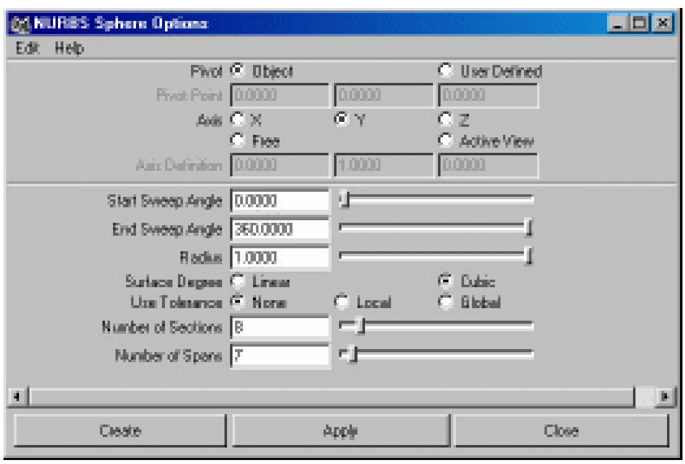
Reading Materials A

How to Create a Realistic Looking Eyeball (Ⅰ)



1. Start Maya.

2. Go to Create - NURBS[1] Primitives - Sphere - Options Box. Change the settings as on the image below. Click Create and Close.



Press 3, then 5 to make the view Shaded.

3. By pressing left and middle mouse buttons and holding Alt key, enlarge the view.

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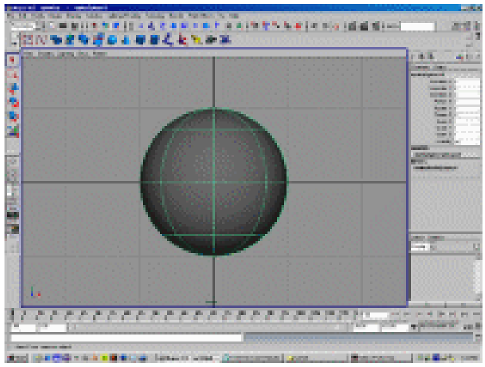
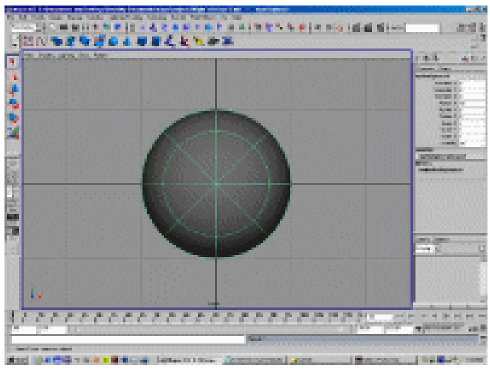
[1] NURBS 曲线曲面的非均匀有理 B 样条

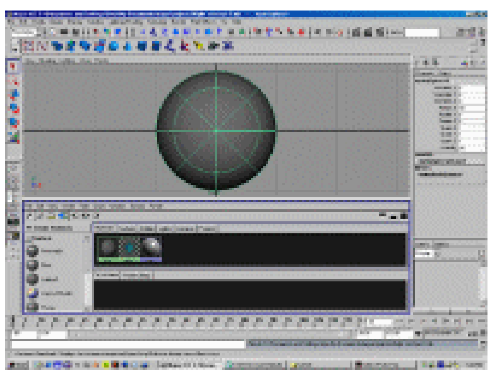


4. Go to Channels[1] - Rotate X - 90.



5. Go to Panel - Layouts - Two Panes Stacked. After that, go to top or bottom view and select Panels - Panel - Hypershade[2].

Your workspace should look like the image below:



6. In Create Materials menu select Lambert type of material.

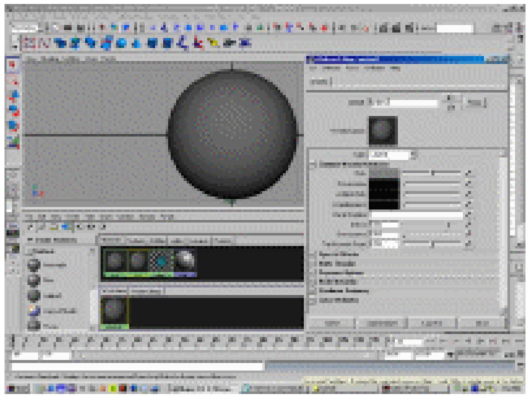
New material will appear in Work Area.

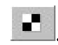
7. Click twice on that material. Attribute Editor window will appear.

---

[1] Channel 通道

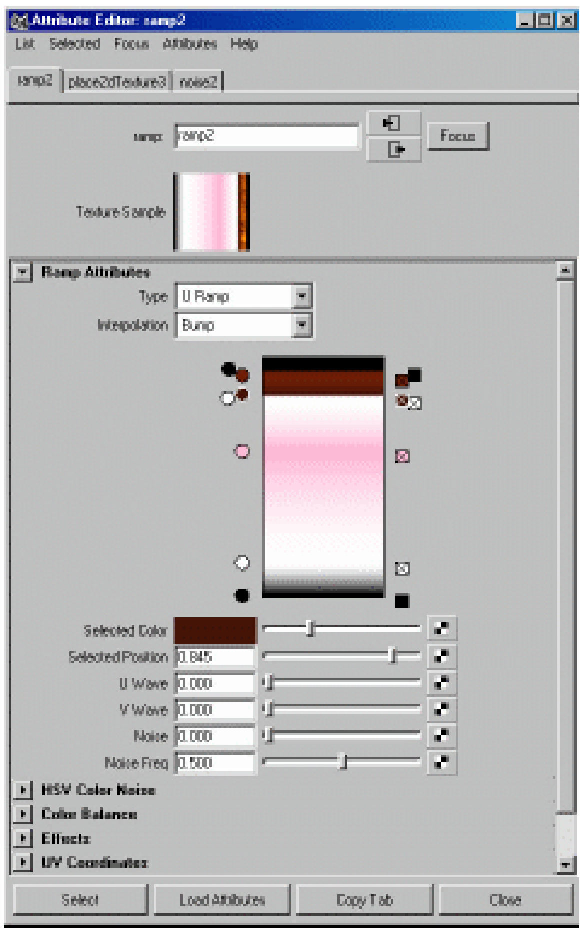
[2] Hypershade 渲染



8. In Attribute Material window, click on the checkered square next to the Color . Create Render Node will appear. Select 2D Textures - Ramp.

At this point, drop the material on the object. With the middle mouse button, drag the material to the Sphere. In Shading drop down menu, select Hardware Texturing to see how material looks on the Sphere.

9. Start changing colors of the Ramp Attributes, so they look like the image below.

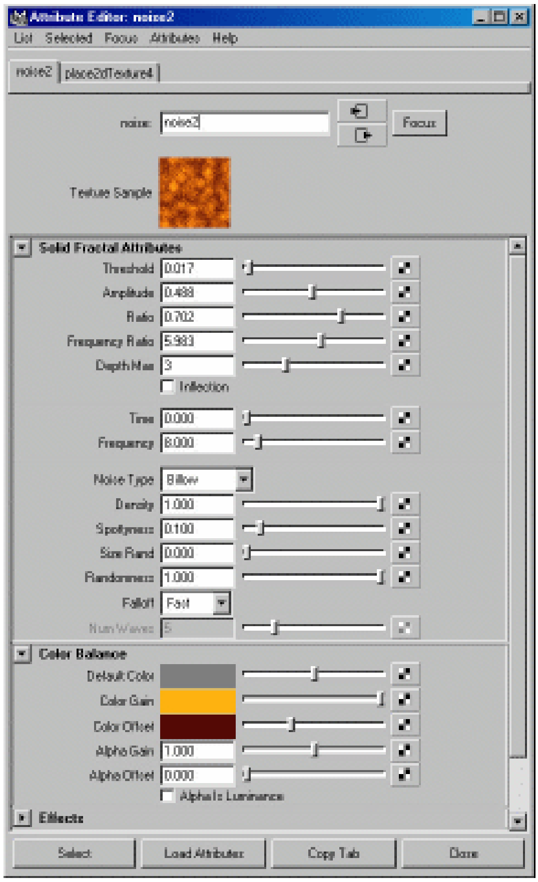


Reading Materials B

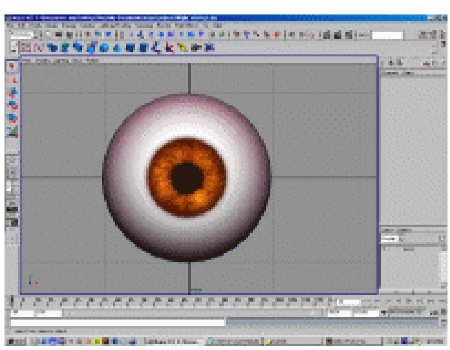
How to Create a Realistic Looking Eyeball (Ⅱ)

10. Then select first brown color from the top and click on the checkered square next to the Selected Color. Create Render Node will appear.

Select 2D Textures - Noise. Change Solid Fractal Attributes and Color Balance like the image below.

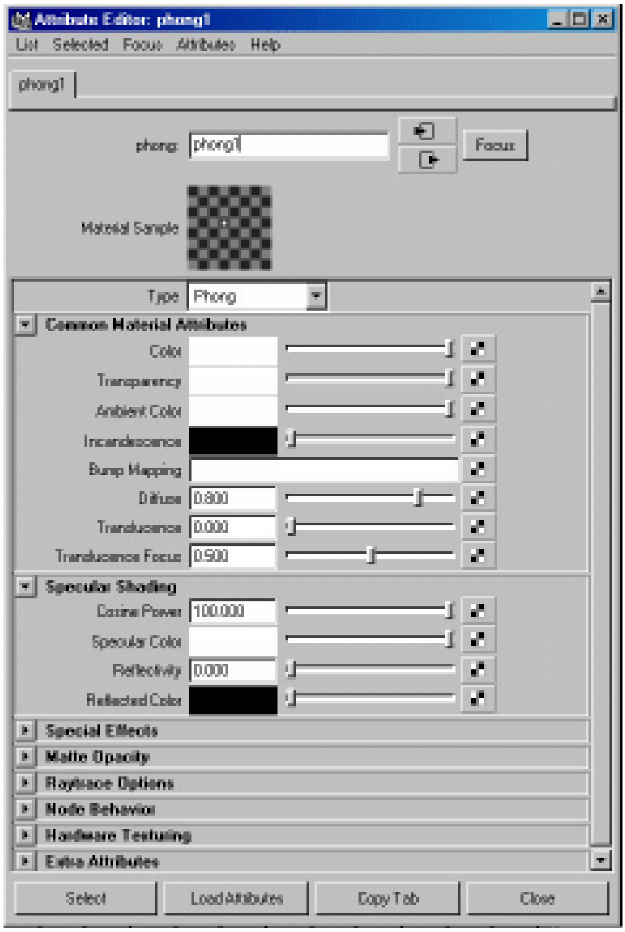


Click Select and Close the window. Now your eyeball Front view should look like this image.



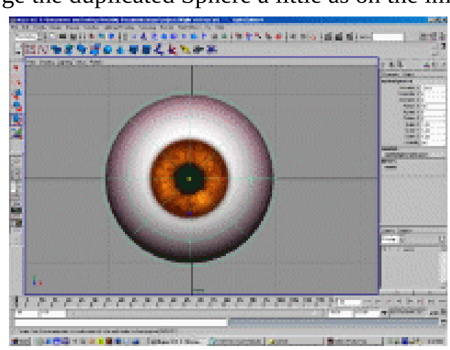
Now you have to create the second layer of the eyeball, otherwise it will not reflect any lights.

11. Go to Edit - Duplicate or press Ctrl+D. Go to Two Panes Stacked view again and create new material Phong. Click twice on the appeared material and apply these settings:



Click Select and Close. Drag and drop created material on the duplicated Sphere.

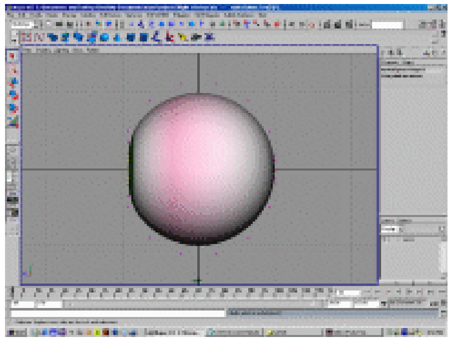
Select Scale Tool and enlarge the duplicated Sphere a little as on the image below.



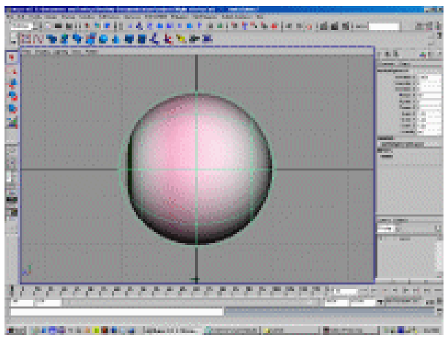
We're almost done. There is one more thing.

12. Hide the duplicated Sphere by going to Display - Hide - Hide Selection. Go to Panels - Orthographic - Side. Select the Sphere, right mouse click and select Control Vertex. Shape the eyeball as

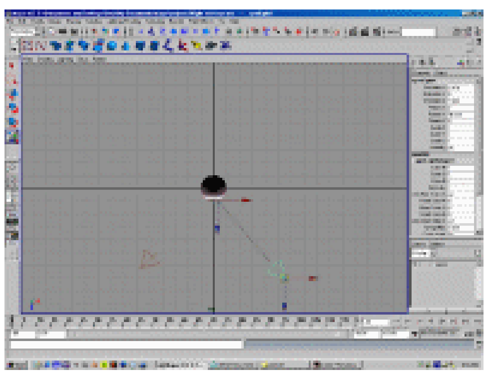
shown:



Go to Display - Show - All and see if your eyeball looks the same.

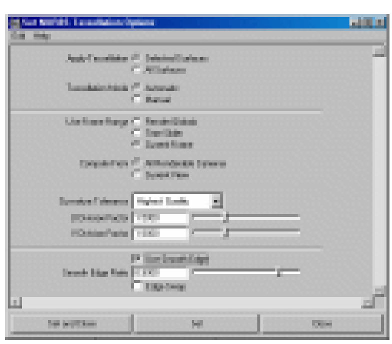


13. Go to Top view and drop two lights. I used two Spot Lights to hightlight my eyeball.



Now we're ready to render our eyeball.

14. Select both eyeball and duplicated Sphere. Go to Render - Set NURBS Tessellation - Options Box. I usually use it for all my models that are created with NURBS.



Click Set and Close.

15. Go to Window - Rendering Editors - Render Globals...

Name your image, set Resolution if you like (I usually use 640×480), set Anti-aliasing Quality to Intermediate and close the window.

Go to Front view and Render it.

Now you should have an image the same as the picture at the beginning of this tutorial.

Lesson 26　Dreamweaver

Reading Materials A

Working with Images

Using Images

Most images displayed on web pages are bitmap[1]-type graphics. This means that the image is made up of pixels.

Tip: Do not confuse bitmap-type with the Bitmap (.BMP) file type used in Windows. Graphics can be bitmap without being a Bitmap.

The color of each pixel is determined by the balance of Red Green and Blue in the image (the **RGB** value). Each color can have a value from 0 to 255. The file size of the image is nominally determined by the number of pixels (the height and width of the image) and the number of colors, but web file formats also use **compression** to reduce the file size.

Tip: RGB values are expressed in hexadecimal[2] in Dreamweaver. Black is **000000** and white is FFFFFF. All colors can be selected from a palette however, so there is no need for you to learn different values!

Creating Graphics

You can create graphics by using a drawing or painting application, by scanning a picture or using a digital camera. Graphics can be edited in a variety of applications, most of which will be suitable for producing web page graphics.

When using graphics, you have to bear in mind that colors can be displayed differently on some systems. For maximum **portability**[3] you need to ensure that your graphics only use colors from a **web-safe palette**[4]. Most editors will have an option to **dither** an image to a web-safe palette.

You also need to save the file in an appropriate file format. Only two or three file formats will work with popular web browsers.

Graphics File Formats for the Web

Three file formats are used for web graphics. The choice of format depends on the type of graphic.

GIF— Graphic Interchange Format[5]

GIF files are suited to “artificial” graphics, where there are blocks of the same color. The colors in a GIF are saved in a palette of 256 colors, which means the format can accommodate the web-safe palette of

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[1] bitmap **位图**

[2] hexadecimal **十六进制的**

[3] portability **可移植性**

[4] web-safe palette web **安全颜色调色板**

[5] GIF (Graphics Interchange Format) **图形交换格式**

216 colors. GIF uses a **lossless**[1] compression system, which means that there is no change in quality in the image. However, effective compression depends on there being blocks of the same color.

Special types of GIF can also be used to create transparent areas in the image or animations.

JPEG— Joint Photographic Experts Group[2]

JPEG uses an **algorithm** to work out the optimum way of storing color information in an image. JPEG uses a **lossy**[3] compression system, but you can set the trade-off between image quality and file size on a sliding scale[4].

JPEG is suitable for **continuous-tone**[5] images, that is natural looking images where there are many subtle differences in color, scanned photographs being the best example. JPEG is not suitable for block color images, because the format will actually introduce new colors into the image.

PNG—Portable Network Graphics[6]

The PNG file format is a patent-free replacement for GIFs, but is only supported in browser versions 4.0 and up (and some features of the format remain unsupported in these).

PNG offers a large number of features for the web developer, but while support for it remains patchy it would be unwise to use it extensively.

Inserting an Image

Images are not saved as part of the web page. Though you can view the image in the design window, the HTML file only stores a link to the image file. Consequently, you should copy any graphics files you require into an appropriate folder before using them.

Note: If you try to use a file from outside the site, Dreamweaver will prompt you to copy it into the root folder.

You can however set several image attributes in the HTML file, such as its alignment, spacing from text, border and so on.

To insert an image:

- Position the insertion point in the document where you want the image to be displayed.
- On the **Objects** panel, click the **Image** button .

OR

- From the **Insert** menu, select **Image** (*SpeedKey:* **Ctrl** + **Alt** + **I**).

The **Select Image Source** dialogue box is displayed.

- From the **Look in:** drop-down box, select the folder containing the image file.
- Select the image.
- Click **Select.**

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1 lossless **无损的**
2 JPEG (Joint Photographic Experts Group) **联合图像专家组**
3 lossy **有损耗的**
4 sliding scale **滑尺**
5 continuous-tone **连续色调**
6 PNG (Portable Network Graphic) **可移植的网络图像**

Reading Materials B

Working with Links

Creating Links

Hyperlinks are an integral part of all web pages. Links are used to add multimedia files, such as images and sound, to a web page, to connect different parts of a large page and perhaps most importantly, to link different pages together.

A link can either be presented as text (**hypertext**) or as a graphic. A link **points** to the location of another file (or part of a file). For a link to work, you must supply the **path** to the file (or place in a file) the link is to. The **path** can be **absolute**, **document-relative** or **root-relative**.

Type of Link	Use
Absolute	To link to another page or resource on the world wide web To enter an absolute path, you need to know the URL of the file (or resource) you are linking to
Document-relative	To link to another document or file in your website. This is the easiest way to link to other pages If the file is in the same folder as the current document, the path is simply the file name. This must include the correct extension If the link is in a subfolder of the current document folder, you must type the name(s) of the subfolder(s) before the file name, with a forward slash(/) separating folder names. If the link is to a parent folder, you type ../ for each level to go up
Root-relative	To link to another document or file in your website. This is an alternative way to link to other pages. The path is written like a document-relative link, except the path is always from the site's root folder, not the current document

Tip: You do not need to type in path names when creating links in Dreamweaver. You can simply browse to the file you want. However, you should be aware how links work.

Also, a link to an HTML document can specify a **named location** (or **anchor**) in the document to jump to. You can enter links to named location(s) in the **current document** too.

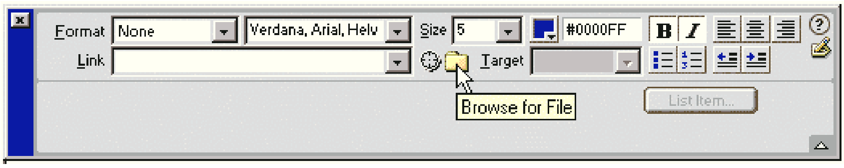
Most links are to other HTML documents. When the user clicks the link, the new page is (usually) opened in the current browser window, replacing the previous page.

Any images to display on a web page are put there by means of a link to the graphics file. A link can connect to any type of file. Some files, such as JPEG, GIF or PNG graphics or PDF documents, will open in the browser window. Others will prompt the user to open the file in a suitable application or to save it.

A link can also connect to an E-mail address. In this case, a new mail message is opened with the correct address.

To create links between documents by browsing for a file:

- In the document select the text or image that you want to turn into a link.
- Display the Property Inspector.
- Click the **Browse for File** folder icon to the right of the **Link** box.



- The **Select File** dialogue box is displayed.
- Select the document you want to link to.

Note: The path to the document is displayed in the **URL:** box. By default this is a **Document-relative** link, but you can change it to a **Root-relative** link by adjusting the option in the **Relative To:** box.

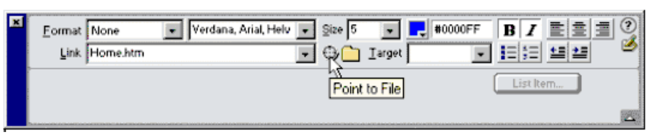
- Click **Select.**

To link to a document using Point-to-File:

Point-to-File lets you create a link to an open document or to a document in the Site window. You can also use it to create a link to an anchor (see below) in the same document.

If necessary, arrange the **Document** and **Site** windows so that the link and destination file are displayed In the document, select the text or image that you want to turn into a link.

In the **Property Inspector** click-and-drag the **Point-to-File** icon located to the right of the **Link** field and point to either **another open document**, or an **anchor** in an open document, or a document in the **Site** window.



The **Link** field is updated with the new link.

Note: When you point to a file in either another open document or the site window, the open document or site window will move to the front while you are making your selection.

Using Anchors

An **anchor** is a place in the document marked with a name. Hyperlinks can point to an anchor, so that when the user clicks the link, the correct place in the document is shown. For example, you might create an anchor for the main headings in a long web page so that the user can move to the section they are interested in.

To create an anchor:

- Position the insertion point in the document where you want the anchor to be placed.
- From the **Insert** menu, select **Invisible Tags** then **Named Anchor** (*SpeedKey:* **Ctrl+Al+A**).
- The **Insert Named Anchor** box is displayed.
- In the **Anchor Name:** box, type in a label for the anchor (this cannot include spaces and should be kept quite short).

- Click **OK.**

The anchor appears at the insertion point in the document.

To create the link to a named anchor:

- In the document, select the text or image that you want to create the link from.
- On the **Property Inspector**, drag-and-drop the **Point-To-File** icon over the anchor icon.

OR

- On the **Property Inspector**, in the **Link** box, type a hash sign (#) followed by the name of the anchor, for example **#Home.**

Note: If the anchor is in another document, type the path to the file, followed by the hash sign (#) and anchor name, for example, **Home.htm#Home**.

Note: Anchor names are case sensitive.

External Links

External links point to a document outside the current site. The most common use of external links is to link to other websites and to E-mail addresses.

To create a link to a page on the world wide web:

Type the page's URL into the Link box. The URL must include the service type (**http:// —**this indicates the document is a web page). You can enter a domain name only or specify a page.

Tip: You can find the URL of a page by browsing to the site using your web browser then copying and pasting the text in the address bar to the **Link** box.

To create a link to an E-mail address:

An E-mail link points to an internet E-mail address. When the user follows the link, a new mail message is opened with the address filled in already.

- Select the text or the image that you want displayed as the E-mail link.

From the **Insert** menu, select **E-Mail Link...**

- The **Insert E-mail Link** box is displayed.
- The **Text:** box will show the text you selected**—**you can modify it here if necessary.

In the **E-Mail:** box, type the E-mail address that the message should be addressed to.

- Click **OK.**
- The E-mail link is displayed in the document.

To create an E-mail link using the Property Inspector:

- Select the text or the image to display as the link.
- On the **Property Inspector**, in the **Link** box, type **mailto:** followed by the E-mail address.

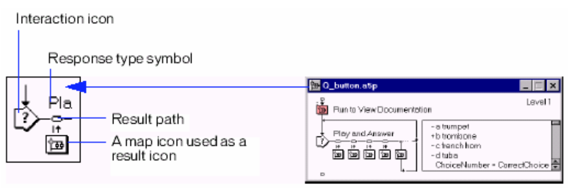
Note: Do not type any spaces between the colon and the E-mail address.

Lesson 27　Authorware

Reading Materials A

How an Interaction Works

In Authorware the structure of an interaction looks like this:



Take a look at the four main components: the interaction icon[1], the response type symbol, the result icon, and the result path. Notice that you can have more than one response type symbol-result icon pair attached to an interaction icon.

To create an interaction, you drag an interaction icon to the flowline[2] and use it as the foundation of the interaction structure. You build the structure by attaching icons to the interaction icon. Each icon you attach is called a result icon. For each result icon you set up a response type symbol. The response type symbol gives users a way to interact, and it defines the target response that directs the flow down the result path to the result icon. The result path also determines where Authorware goes when it leaves the result icon.

The interaction icon works in part like a display icon[3]: It displays the buttons, menus, text-entry fields, and other elements that allow users to respond to an interaction. You also use it to:

- Display text and graphics that you want to appear throughout an interaction.
- Control such things as whether Authorware displays the text and graphics with a transition, where it positions them, which layer it places them in, and when it erases them.
- Set whether Authorware erases the screen at the end of an interaction and whether it uses a transition.

Most important, however, the interaction icon monitors the actions of the user and sends that information to the response type symbols attached to it.

The response type symbol gives users a way to interact. The response type symbol you choose tells the interaction icon whether to display a button, a menu, a text-entry field, or some other element.

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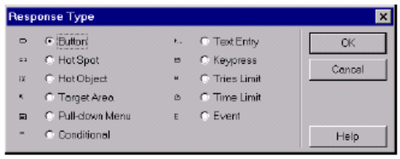
[1] interaction icon **交互图标**
[2] flowline **流程线**
[3] display icon **显示图标**



Sometimes you may want to interact not just with users but with circumstances and events. So Authorware provides two other ways to use the response type symbol. One is to use it to track and react to circumstances that are part of the interaction. For example, you can set up a response type symbol to keep track of time and to react if a user doesn't respond within some limit you set. You can also use the response type symbol to track and react to events produced by other components embedded in an Authorware piece, such as an ActiveX pop-up menu or calendar control. For example, you can set up a response type symbol that reacts when the date changes.

Once you've set up a response type symbol to allow a user (or a circumstance or an event) to interact with Authorware, you use the response type symbol to define the target response. Sometimes that's easy (the target response for a button, for instance, is a user's clicking it). Sometimes it's much more difficult than it might seem. Consider, for example, a text-entry field. Suppose you want a user to respond to a question by typing the correct answer. How do you treat a word that's misspelled (sattellite, instead of satellite), or a synonym (moon, instead of satellite), or an extra word such as a or the, or an answer that's so wrong it's impossible to predict? What if you want a number and a user types text? How do you deal with all the numbers that are too large or too small? Authorware has a way of dealing with all those possibilities, but it means anticipating them and setting up target responses to handle them.

Reading Materials B

Setting up Icons

Setting up a Display Icon

Use the display icon to display text and graphics. Drag a display icon onto the flowline and then add graphics and text to it in the Presentation window.

To add contents to a display icon's Presentation window, use the Toolbox to draw objects, use the File > Import command to import images, or drag and drop text or graphics files into the display icon.

To modify the display and layout of a display icon, select the icon in the flowline and choose Modify > Icon > Properties. The Display Icon Properties dialog box appears.

To keep previously displayed items in the Presentation window when you open a display icon, hold down the Shift key while you double-click the icon.

Setting up a Motion Icon

Use motion icons to move display objects from one location on the screen to another.

First, place a display icon on the flowline. Next, place a motion icon after it. Then define the motion of the display objects in the Motion Icon Properties dialog box. All the display objects in that icon move together. You can also move movies playing on the screen this way.

Double-click the motion icon in the Design window to open the Motion Icon Properties dialog box. Here you can set type of motion, timing, and other options. You can also preview the type of motion you've set up by clicking the Preview button in the dialog box.

Setting up an Erase Icon

Use the erase icon to erase any icon that's currently displayed. You can erase the objects displayed by the display, interaction, framework, and movie icons.

When you erase an icon, you erase all its contents. For example, if a display icon contains three graphic objects, Authorware erases all three objects. If you want to erase just one of those objects, place it in a separate display icon, so it appears as a separate object in the Presentation window.

To open the Erase Icon Properties dialog box, double-click the erase icon.

Setting up a Wait Icon

Use the wait icon to pause the piece for a specified amount of time or until the user presses a key or clicks the mouse.

Double-click the wait icon to open the Wait Icon Properties dialog box, then enter the property options.

When synchronizing sounds within a piece, don't use the wait icon.

Setting up a Navigate Icon

Icons attached to framework icons are called pages. You can use navigate icons to create links that jump to specific pages in a framework. When Authorware encounters a navigate icon, it goes to the page you set up as a destination. This is called a navigation link.

When you define a navigation link, you define the type of destination, such as going forward or backward a page, jumping to a page, searching for text, or jumping to the first or last page of a framework. Double-click a navigate icon to open the Navigate Icon Properties dialog box, where you can select destination options.

You can use navigate icons in two ways:

- Automatic navigation places a navigate icon anywhere on the flowline. When Authorware encounters the navigate icon, it automatically executes the link and goes to the destination page.
- Navigation controlled by the user Attaches one or more navigate icons to an interaction icon to create a navigation framework. The interaction icon can be on the main flowline or in the entry pane of a framework icon. For each navigate icon you attach to an interaction icon, you can set up a navigation control (such as a button) that takes the user to a destination page.

You can also use navigation styles to set up hyperlinks by creating hot text.

When the user clicks the hot text, Authorware executes the hyperlink and goes to a destination.

Setting up a Framework Icon

The framework icon provides an easy way to set up navigation in an Authorware piece. A set of navigation controls is built into the framework icon so that users can move among the icons you've attached to it.

An icon attached to a framework icon is called a page. A page isn't limited to a display icon containing text and graphics. It can also be a digital movie, a sound, or an animation. In fact, if you use a map icon, you can make the page as complex as you want. It can contain an interaction, a decision, another framework icon with its own navigation structure, or any combination of icons you want to arrange on the flowline.

Use the Framework window to set up icons that Authorware executes when entering or exiting a navigation framework.

Setting up a Decision Icon

You set up a decision structure by attaching icons to a decision icon. When Authorware encounters a decision structure, it branches to a path according to the criteria you've defined.

When you set up a decision structure, you can define the following settings:

- The Repeat setting determines how many times Authorware loops through the decision icon.
- The Branch setting determines which icon Authorware branches to.

Double-click the decision icon to open the Decision Icon Properties dialog box and define these settings.

Setting up an Interaction Icon

You use interaction icons to set up interaction structures that consist of an interaction icon with result icons attached to it. Each result icon corresponds to a response that the user can make, such as clicking a button or entering text, or to an event, such as the number of tries the user made.

When Authorware encounters an interaction icon, it displays any text and graphic elements it finds, including buttons, hot spots, text entry fields, and so on, defined by the response type symbols. Authorware then halts and waits for a response from the user. When a user responds, Authorware sends the response along the interaction flowline to see if it matches any of the target responses. If a match is found, Authorware branches to or executes the specified result icon.

You set up the responses you're looking for in the Response Type dialog box. Here you determine the user's response or the event by defining each result icon as a particular response type. When the user makes a response or the event occurs, Authorware branches to the corresponding result icon and displays its contents.

You set the characteristics of the interaction display using the Interaction Icon Properties dialog box. Here you can specify display options, such as layer level, transition, positioning, and when objects are erased.

Double-click an interaction icon on the flowline to open the Presentation window to edit the display contents.

Setting up a Calculation Icon

Use calculation icons to execute expressions and scripts that change values in variables or that perform calculations in a piece. Insert calculation icons at any point on the flowline or attach them to other icons.

To create an expression for a calculation icon, double-click the icon to open the Calculation window. You can then enter expressions and scripts for if...then statements and repeat loops in the window. You can also insert comments to describe the expression.

Authorware usually executes all the statements in a calculation icon and then exits the icon. You can force Authorware to exit calculation icons by entering an Exit statement in an expression. If the calculation icon is attached to another icon, that icon is executed normally.

In most cases, it's a matter of preference whether to place a calculation icon before another icon or whether to attach it. However, if you attach a calculation to a decision or interaction icon, Authorware executes the calculation repeatedly if the icon uses Try Again branching. If the calculation icon is placed before a decision or interaction icon, Authorware executes it only once.

While Authorware executes a calculation icon, no other processing takes place and Authorware doesn't respond to mouse clicks or key presses. For calculation icons that contain relatively simple calculations, this delay is imperceptible. However, calculation icons that contain complex repeat loops take longer to execute and may cause a noticeable delay.

Setting up a Map Icon

You can use map icons to group a sequence of icons. By grouping icons in map icons, you can organize your piece into convenient modules. This gives you a clear overview of how the piece will work, no matter how many icons it contains. Place map icons anywhere on the flowline and attach them to interaction icons, decision icons, or framework icons. You can place map icons within other map icons.

Each map icon has its own flowline. Double-click a map icon to open it. A level caption appears in the upper right corner.

When Authorware encounters a map icon, it executes the map's icons in the order in which they appear on the flowline. When it finishes executing the last icon, Authorware exits the map icon and executes the next icon on the main flowline.

If the map icon is attached to an interaction icon, Authorware executes the entire contents of the map icon before branching to the next result icon. Authorware also executes the entire contents of the map icon when it is a path attached to a decision icon or pages attached to a framework icon.

To group icons into a map icon, the icons must be next to one another on the flowline. To create a map icon, select the icons, choose Modify > Group, and name the resulting map icon. To redisplay (or ungroup) the icons in a map icon, select the map icon and choose Modify > Ungroup.

If you attach a calculation icon to a map icon and then ungroup the map icon later, Authorware attaches the calculation icon to the first icon that was within the group.

Setting up a Digital Movie Icon

You can use digital movie icons to import digital movies created by other applications (To import QuickTime 4 or later movies, use the QuickTime Xtra).

You use the Digital Movie Icon Properties dialog box to control the movie's properties, such as its positioning, the number of times it is played, and the speed at which it is played.

A digital movie can be stored internally or externally, depending on the type of movie.

- Internally stored movies are stored in the Authorware file, increasing the size of the file. You can use erase transitions with internally stored movies.
- Externally stored movies are not stored in the Authorware file. You can't use erase transitions

with externally stored QuickTime, MPEG, or AVI movies. To use an erase transition on other types of external movies, select the Prevent Crossfade option in the Erase Icon Properties dialog box.

You must keep externally stored movies where Authorware can open them when it encounters movie icons on the flowline. You must distribute the files for externally stored movies along with your packaged Authorware piece.

Authorware and the Authorware run-time application look for external movies in the directories set in the Search Path field of the File Properties dialog box, or in the SearchPath variable, or in the external file name stored in the Movie Icons Properties dialog box.

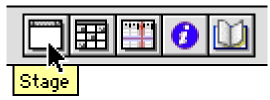
To preview a movie, select the digital movie icon, choose Modify > Icon >Properties, and use the playback controls to run the movie.

Lesson 28 Director

Reading Materials A

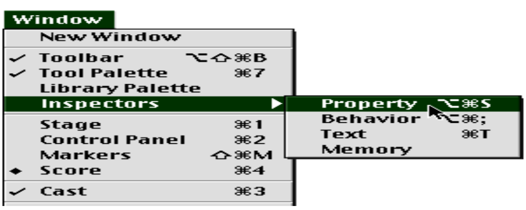
The Stage[1]

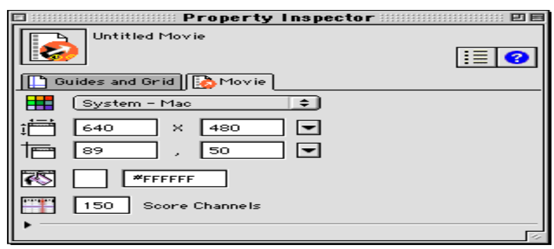
The Stage is the blank canvas on the screen where the movie will play. To view the Stage, or to remove it from the screen click the Stage icon on the toolbar.



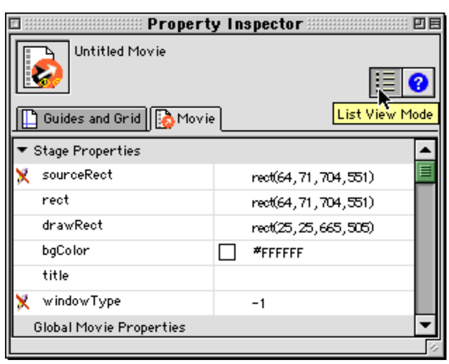
You can alter the size of the Stage to suit the movie you are making. You can also set the color of the Stage and its position on the screen. To do this I need to introduce you to the Property Inspector[2], this is a very important feature of Director 8 because it is in the Property Inspector that you can change/set the properties of the building blocks of your movie.

To see the Property Inspector choose Inspectors from the Window menu and select Property.





If the Property Inspector looks more like the image below, it is in List View Mode. This Mode is less user friendly so, for now, we will be using the standard mode. To change mode click the List View Mode button at the top right of the window.



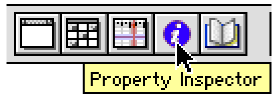
An alternative way of selecting the Property Inspector is to click on the Property Inspector Toolbar icon

---

[1] Stage **舞台**

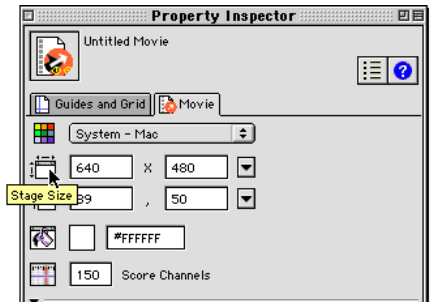
[2] Property Inspector **属性检查器**

or choose Movie from the Modify menu and select Properties...



Select a size that is appropriate for your desktop setting, say one size down from the monitor's resolution. For example, if your monitor is set to a resolution of 1 024×768 pixels choose 832×624 as the Stage size.

Find the Stage Size values, see below, this one is currently set to 640×480.



Find the pop up menu to the right, and select the size you want.

Reading Materials B

Lingo Basics

Types of Scripts

Scripts are a way you can give Director specific instructions to execute tasks. They can be as simple as making your computer beep or as complex as creating a flight simulator game.

There are 4 types of scripts:

Behaviors are scripts that exists as their own cast member and can be placed directly in the Score's scripting channel (frame script) or linked to a sprite (sprite scripts). Director has a library of prewritten behaviors for both frames and sprites.

Cast member scripts are scripts that are always attached to a cast member. They will always be linked to sprites whenever the cast member is placed in the Score.

Movie scripts are scripts that are not assigned to a specific frame or sprite. They can be initiated from events such as the start or end of a movie or can be 'called' from another script.

Parent scripts create objects, called child objects, that may control physical objects on the Stage. They require a strong understanding of Object Oriented Programming and are more complex to use for non-programmers.

Writing a Script

Open a new movie.

Turn the looping on in the control panel.

Open the tool palette.

Click the push button icon.

Draw a button on the stage, and type in button (a very original name).

Right click the button in the cast window and choose cast member script.

Director writes the first and last line for us, add a beep command so the script look like this:

```
on mouseUp
**beep
end
```

Close the window.

Rewind and play the movie.

Click the button a few times.

In the above example, you created a cast member script. Open your cast window and make sure it is in icon view mode. Note that the cast member now shows a scripting icon in the bottom left corner of the cast, representing the script is linked to the cast member.

You could easily have created a sprite script by choosing this option instead of cast member script. This would create a separate cast member for the script.

Writing Another Script

Reopen the cast member script.

Change the text so it now reads.

```
on mouseUp
**beep
**alert "Multimedia in Design is the greatest subject!"
end
```

Close the window.

Play the movie and click the button.

Lesson 29 Premiere

Reading Materials A

Using Adobe Premiere to Edit a Video

Part 1: Getting Started, Bins[1], Importing Files

Start a new project using settings from your firewire card or video camera[2]. If your firewire card has loaded additional settings, use them. If you have a firewire card that has not loaded settings, choose the frame[3] size and rate depending on how your camera has captured the video. Most digital video cameras will capture using a 720 x 480 Frame Size and a Frame Rate of 29.97. You should read your camera or firewire card documentation for more details. If you aren't sure of what to use, hit OK and accept the default setting.

Adobe Premiere Views and Bins

When you select the settings for your new project and then hit the OK button, Premiere opens up a couple windows.

You can move around the Windows and Premiere will save how you have organized them.

Import Files

Before editing your video you need files to import. You should have already captured your video clip[4] to your computer using your video card or Premiere's video capture controls. Once you have captured video files to the computer, you can bring them into the editing suite and work with them as follows.

- Right click anywhere on the left or right hand side of the Project Bin window.
- Select a single file or a folder filled with a lot of files you want to import all at once.
- Select a file that you will import into your video.
- Choose a format that is supported by the application such as an AVI file or a Quicktime .MOV file.
- The file appears in the Project window.

Now is a good time to save your project because you have placed information into the file. Use the CTRL-S shortcut or go to the File menu and select Save. Choose somewhere where you will remember it.

Part 2: Video Organization—Bins and Project Windows Features

Successful filmmakers and video-makers are meticulous planners and organizers. While you may keep old soda bottles in your car and never make your bed, it is a good idea to attempt to be tidy within Premiere. Lucky for you, a Premiere beginner, you don't have to exert much physical force to get this job done—just

---

1 在 premiere 中，bin 指一个新的文件
2 video camera 摄像机
3 frame 帧
4 video clip 视频剪辑

click and you're able to clean, organize, label, and work better within the application.

In Part 1 we opened a project and brought in a file to the project window. Now I would like you to bring in all of the source files that you will need for your project. This may consist of multiple file types including movies, music, graphics, and titles. It is OK if you only have one of the four usual elements (movies, music, graphics, titles). You can make do for now. What I want you to notice, is how crowded the default "Bin 1" will become with only a few additional files imported.

The solution is in the bin! You can rename the bin to whatever you want, and add as many Bins as you need. I prefer setting up four bins for the work I do:

1. VIDEO—AVI, .MOV, .MPG and compatible movies—usually contains both Audio and Video tracks.
2. MUSIC—MP3, .ASF, .WAV and compatible music files—Audio track only.
3. GRAPHICS—BMP, .JPG, Photoshop files, and compatible graphics files.
4. TITLES—You can create titles within Premiere, or use a Title "plug-in[1]." A plug-in is a separate product that seems like it is part of Premiere. I use the TitleDeko plug-in, which comes with Pinnacle products.

Part 3: Completing the First Project

Now, I've created a new Bin called "Music" and I imported a song called "Adam and Eve." To show you how easy it is to use the software, go to the Video bin and click-and-hold any file. This is neat—you will see the icon turn into a hand that is gripping something. You can now drag and drop this file into the timeline below. The timeline is the fun part—where most of the editing takes place. You can see the file I selected, called "CATACOMBS.AVI" is in place in the timeline.

Now go to the Music bin and import a file if you haven't done so yet. Now drag and drop the audio file underneath the video track that you just imported like I have. You can probably get an idea of how the software works just by this simple lesson.

Reading Materials B

Advanced Picture in Picture—4 Way Split Screen

Step 1: Start Up / Setup

Getting your project ready is the first step. Start Premiere and import 4 video files or 4 picture files. Either way, video or picture, you will understand how the Transform effect works so that you can apply it to your next project that might need it. Import the files by hitting CTRL-I (Apple-I on a Mac), or by right-clicking in the Project window and selecting File. Once you have four files, go to step two.

Step 2: Add Video and Audio Tracks, Line Up Your Video or Picture Files

[1] plug-in **插件**

Now that you have four video files, you want to layer them on top of each other. By default, Premiere shows you 2 tracks of video. You need to add 3 more. Go to your Timeline to change this. On the far right hand side of the Timeline windows, you will see the box with the black arrow. Click it. Select Track Options, Add, and then choose 3 video tracks. When you see that you have a Video 5 track, you are ready to go.

Now drag and drop the four video files into place, one on top of another. It is time to position the files so that they become appear as a four-way split screen.

Step 3: Drag and Drop the Transform Filter

From the Video menu, drag and drop a Transform on top of each of the four video clips or picture files. After you drop the video effect on each of the four clips, you can start to adjust the settings of the Transform filter (video effect). The only settings you need to adjust are the Position, Scale Height and Scale Width.

Step 4: Why doesn't It Look Right? Make It Transparent!

Although you have done a good job of resizing the images and video files, you haven't gotten the black part of the video image to disappear. You now have to apply one more filter to make it work. The Transparency filter is the one. Once you get into the Transparency filter, change the setting to Alpha channel. This makes your black video or picture segment transparent. Once you have selected the video or picture clip (by clicking on it in the Timeline), select Alpha Channel. Do this for each of the four video or picture segments. You now have a super cool 4 Way Split Screen!

Step 5: The Result

That's it! You're done. Go show it off to your friends. Advanced Premiere users may want to try and use the keyframes in conjunction with the Transform filter to animate the boxes and get them to move around to the beat of the music.

Lesson 30　Visual Basic

Reading Materials A

How to Read an Example Program

Sounds silly doesn't it? Well not quite so strange when you think about it. When a new application or tool is produced someone gets the unfortunate task of trying to write sample code to explain what it does. I say unfortunate because when a piece of code is produced for an example it must also have the following stipulation. It must look pretty. I have found that with most of the applications I have had to write code with, in the many years that I've been hacking away at machines.

There is one notable exception to the rule, and that is the KB knowledge base on the Microsoft site, the examples there tell you how it should work. You are left to find out what errors can occur and how to make the example look nice.

So, lets take a sample from the web.

For this article I've selected the DMO example from the Microsoft Visual Studio site. To get the sample code go to the following url. http://msdn.microsoft.com look in the developer studios/ vb/ code and samples and select the DMO example from the list. The file name will be : SQLDMO.EXE.

I've not seen the source code to this example before, so here goes.

Fire up VB and open the source code[1].

There are a number of projects in the exe file, I will select the Scripts project.

Hit F5 and let's play!

OK, first form, some log in information.

Second form is selecting the database from the server. Ok use good ol' pubs.

Select the users table and click "generate scripts[2]".

Notepad opens up, with a script for the table.

Hem, looking at the right panel there isn't a mod or cls file to be seen. It's all coded into the three forms in the project. Which is ok for an example but bad for a general coding practice.

Step 1. Understand What the Application Has Just Done

It has opened a database, connected to a table and created a script.

The combo boxes and the notepad is just UI ribbons over the real code. To understand this we need to create something that is really simple without any of the UI stuff or fancy coding getting in the way.

I see this as a function call[3], ScriptTable give it a table name and it returns you a string.

---

[1] source code **源码**
[2] script **脚本**
[3] function call **函数调用**

Add a bas[1] module[2] to the project, I'll call mine scrapmod.bas.

Make sure your declaring all variables, by adding Option Explicit to the top of the module, you should always use this even when just messing around with code you don't know.

Under it, add a couple of comments.

```
'MODULE: SQLDMO Example code
'Func ScriptTable returns String
```

So the steps in ScriptTable will be:

Open the database

Connect to table

Create script

Return Script

To open the database we will need a few variables, the server-name, user and password pair.

To connect to the table, we will need a table name.

Step 2. Create a Prototype[3] Function

The function will be declared as

```
Public Function ScriptTable(ByVal ServerName As String, ByVal UserName As String, ByVal Password As String, ByVal TableName As String) As String
'Func ScriptTable returns String
End Function
```

Add in the points 1 to 4 in the function as comments, these will be our lifeline when we look at the code next.

With the code stopped hit F8 to step through the code.

The first line, is a killer, shows a Dim as NEW syntax, this is very bad for production coding.

Quick browse through the load event shows that it's opening something called a SQLDMO.Application and a SQLDMO.NameList then looping through all the Namelist items in the application.ListAvailable Servers object. Is this a collection? Why not do a for-each loop?

We need to add some comments to the code. Here's my edited version of the code.

```
Private Sub Form_Load()
Dim sqlApp As New SQLDMO.Application 'Application, main?
Dim NameList As SQLDMO.NameList 'List of Sqlservers. Collection?
Dim index As Long
Set NameList = sqlApp.ListAvailableSQLServers 'Get list of servers.
'Why not for each? is this a real collection or just a stack?
'UI Stuff.
For index = 1 To NameList.Count 'Loop through the list,
cboServer.AddItem NameList.Item(index) 'Display in Combo
```

---

[1] bas **是** Basic **程序的扩展名**

[2] module **模块**

[3] prototype **原型**

```
Next
'End UI Stuff
End Sub
```

Notice that the objects aren't being closed or set to nothing, the example relies on the fact that the objects will get cleaned up after the program terminates. Not good practice.

We can dispense with this function altogether as nothing is going on here that isn't UI related.

Let's restart the app in debug[1] mode again and go on to the next part. Select a server and click OK.

The Ok_Event fires, and we are taken into the OK button code.

Quick look through the code, and I'm wincing at the lack of set nothings, but I'm not trying to clean this code up, just trying to extract something useful from it.

Take the main points of the code, stop the project, and open up the bas file and the form where the code stopped so that you can see both pieces of code.

We need a SQLServer object.

```
Dim objSQLServer As SQLDMO.SQLServer
Set objSQLServer = new SQLDMO.SQLServer
Set objSQLServer = nothing
```

Also when adding the objSQLServer = nothing line, check before for a close method. Bingo! Yep there's a close method. So add that line into the module before the objSQLServer method.

Hem, the chkNTAuthentication IF statement, seems to be allowing the use of using NT or SQL login options.

So to change that into our code, we'll check if the username is empty and if it is try and log in with NT, or else we will use the SQL authentication.

```
If UserName = "" Then
'NT Authentication
objSQLServer.LoginSecure = True
objSQLServer.Connect ServerName
Else
'SQL Authentication
objSQLServer.Connect ServerName, UserName, Password
End If
```

We could probably run this from the Immediate window. Yes indeed it runs, no errors! The server is logged in let's move on to the next function.

Here it's using a database object to fill in a combo box, again this is very UI based so let's skip it for the moment. Add comments to say that you have seen the function and what you have deduced from the code as it runs.

'Loads combo box with data from the SQLServer.Databases collection. Checks to see that they are not system tables

'Does this mean only UserTables?

[1] debug **调试**

The next function also loads some combo boxes, but we are beginning to see a structure to the DMO object,

Application.sqlserver.database.storedprocedure (s)

Application.sqlserver.database.table (s)

Application.sqlserver.database.view (s)

So there is a collection of each of the objects in SQLServer in the SQLDMO object. Interesting, Each object has a property called System object that is telling us if it's a system object or not.

Noted down, lets move on to the next function.

Select the Pubs database in the combo… ouch! There's a big load Combo routine in there. Skip it UI Stuff not.

Select the authors table from the combo.

Hum, some very weird looking If statements there and what looks to be some constants[1]. Highlighting over the constants gives some very strange numbers,

SQLDMOScript_Default = 4

SQLDMOScript_Indexes = 73736

SQLDMOScript_DRI_AllConstraints = 520093696

SQLDMOScript_Triggers = 16

SQLDMOScript_DRI_ForeignKeys = 134217728

Ok, quick point here, the two numbers that jump out at me are 4 and 16, 2^2 and 2^4 respectively.

That leads me to believe that the other numbers will be on bit values as well. Popup calc and type in 520093696 / 2 and keep hitting = … Ok that's blown out of the water, they are not on bit boundaries

What does 73736 look like in Binary? 10010000000001000

Hem, only three 1's 134217728? 1000000000000000000000000000

Wooot! A bit boundary, can calc handle 520093696? 11111000000000000000000000000

Ok so this is a maskable flag. The code actually says this with the repeated param or Constant in the then fields, but it's always a good idea to check.

So in our code, we will write.

lngParam = SQLDMOScript_Default Or SQLDMOScript_Indexes Or SQLDMOScript_Triggers Or SQLDMOScript_DRI_ForeignKeys

We also need to add dim lngParam as long to the top of the function.

The last thing to do, is actually to script the database. This as we can see is by a method called script. However to be neat we need to create some objects to hold the references before we call the method.

So.

Dim objDatabase As SQLDMO.Database

Dim objTable As SQLDMO.Table

and we use these like this:

Set objDatabase = objSQLServer.Databases (DatabaseName)

Set objTable = objDatabase.Tables (TableName)

---

[1] constant **常量**

```
ScriptTable = objTable.Script ( lngParam )
```

And that's it. We have taken a very messy example, and created something that is clean and elegant from it. By ignoring everything that has to do with the UI, you can see the wood between the trees.

I hope that you get something from this article, I have :)

As a for note, I have discovered something else by playing with the SQLDMO object. The following messy piece of code, will shut your SQLServer service down. Very useful if like me you work mainly from a laptop and need to conserve battery usage.

```
Public Sub ShutSQL ( ByVal Server As String ,  ByVal Username As String ,  ByVal Password As String )
On Error Resume Next '*** we want to close it doesn't matter if we don't connect
Dim sqlS As SQLDMO.SQLServer
Set sqlS = New SQLDMO.SQLServer
SqlS.Connect Server,  Username,  Password
sqlS.Shutdown True
Set sqlS = Nothing
End Sub
```

Reading Materials B

An Introduction to Implemented Interfaces in Visual Basic

First, the obligatory jargon:

The "Implements" keyword in Visual Basic allows for interface inheritance, giving programmers access to a form of polymorphism.

If your first reaction to the above is "Huh?", don't worry. The plain language version is this:

The "Implements" keyword in Visual Basic allows an object to specify that it will provide the same set of public properties and methods as another object. This set of properties and methods is referred to as the interface of the other object. By supporting this interface, the new object can be used anywhere that the old object could be used (eg. passed to a function expecting an object of that type). The relationship between the two objects is that objNew is a kind of objOld (which is polymorphism in a nutshell).

Interfaces are a key part of the Component Object Model (COM) and as such, are an integral part of Visual Basic. In fact, if you've ever made use of the fact that TextBoxes, ComboBoxes, and ListBoxes are all types of Controls (eg. looping through the controls collection and clearing the .Text property of the control if it's a TextBox), then you have some exposure to interface-based programming.

You will often hear interfaces referred to as a "contract". This is because it is just that—a contract between the creator of the object and the user of that object that the object will provide each and every property and method belonging to that interface. The details of the implementation may vary, but the signature (method name, parameters, and returns) may not. This goes to the very heart of binary compatibility, for in COM, the interface is the binary representation of those signatures.

There are many ways to make use of polymorphism and interfaces, but for our purposes, we'll look at the most common—categorizing objects via an interface that contains common behaviors and attributes. Let's assume we're working on a simulation of canines in a kennel. We must implement several different breeds: Beagles, Poodles, Colleys, and Dobermans.

Each breed has it's own set of special behaviors and attributes, such that each merits its own class: Beagles dig, Colleys herd, Dobermans attack intruders, and Poodles display a nasty attitude. However, there are common threads that all share. All have weight, coloring, and size. All bark, eat, and move. By breaking these commonalities out into an interface (IDog) that all can implement, we have a generic way to deal with all breeds at once. We can feed the entire kennel by doing:

```
Dim Dog As IDog
 For Each Dog In Kennel
    Dog.Eat
 Next
```

It is important to realize that we're not inheriting behavior. The code for these common behaviors must be in each class. That implementation code may differ from one class to another. In fact, for our example, the implementation of the .Bark method should differ: our Poodle will give a yip, the Beagle and Colley will give a more "average" bark, and the Doberman will be something else entirely different.

Another important thing to realize is that the members of an implemented interface do not automatically become part of the default interface for a class (the public properties and methods of a class constitute its default interface). In other words, if our Beagle class has only one public method, .Dig, we would have to do the following to get to the .Bark method:

```
Dim Dog As IDog
 Set Dog = mBeagle
 Dog.Bark
```

There are a couple ways to avoid this situation. One way is to "mirror" the IDog interface in the default interface (i.e. declare the same public methods from the IDog interface in the default interface, and have both point to a common private routine which contains the code that actually does the work). Another method is to add the following to the default interface:

```
Public Property Get Dog() As IDog
   Set Dog = Me
End Property
```

This allows you to access all of the IDog members in the following manner:

```
mBeagle.Dog.Bark
'or
mBeagle.Dog.Eat
```

Of course, this only begins to scratch the surface of the possibilities that come with interface-based programming. The more you explore these techniques, the more you realize that there are dozens of ways to put them to use for you.

Lesson 31　Java

Reading Materials A

Programming Exercise (Ⅰ)

Exercises

Write an applet[1] that draws a checkerboard. Assume that the size of the applet is 160 by 160 pixels. Each square in the checkerboard is 20 by 20 pixels. The checkerboard contains 8 rows of squares and 8 columns. The squares are red and black. Here is a tricky way to determine whether a given square is red or black: If the row number and the column number are either both even or both odd, then the square is red. Otherwise, it is black. Note that a square is just a rectangle in which the height is equal to the width, so you can use the subroutine g.fillRect() to draw the squares.

(To run an applet, you need a Web page to display it. A very simple page will do. Assume that your applet class is called Checkerboard, so that when you compile it you get a class file named Checkerboard.class Make a file that contains only the lines:

```
<applet code="Checkerboard.class" width=160 height=160>
</applet>
```

Call this file Checkerboard.html. This is the source code for a simple Web page that shows nothing but your applet. You can open the file in a Web browser or with Sun's appletviewer program. The compiled class file, Checkerboard.class, must be in the same directory with the Web-page file, Checkerboard.html.)

Discussion

The basic algorithm[2] is obvious:

```
for each row on the checkerboard:
 Draw all the squares in that row
```

Since any given row contains eight squares, one in each column of the checkerboard, we can expand the body of the for loop into another for loop:

```
for each row on the checkerboard:
   for each of the eight columns:
      Draw the square in that row and column
```

Each square is a rectangle with height 20 and width 20, so it can be drawn with the command g.fillRect(x,y,20,20), where x and y are the coordinates of the top-left corner of the square. Before drawing the square, we have to determine whether it should be red or black, and we have to set the correct color with g.setColor. So, the algorithm becomes

---

[1] applet **小应用程序**
[2] algorithm　**算法**

```
for each row on the checkerboard:
    for each of the eight columns:
        Compute x,y for the top-left corner of the square
        if its a red square:
            g.setColor(Color.red)
        else
            g.setColor(Color.black)
        g.fillRect(x,y,20,20)
```

The top of the first row of squares is at y=0. Since each square is 20 pixels high, the top of the second row is at y=20, followed by 40 for the third row, then 60, 80, 100, 120, and 140. If we assume that the rows are numbered 0, 1, 2, ..., 7, then the tops are given by y = row*20, where row is the row number. (If you number the rows 1, 2, ..., 8, the formula would be (row-1)*20. The simpler formula in this and in many similar cases is one reason why computer scientists like to start counting with 0 instead of 1.) Similarly, the left edge of the squares in column col is given by x = col*20, where again the columns are numbered 0, 1, 2, ..., 7. I'll use "for (row=0; row<8; row++)" to count off the rows, rather than the equivalent "for (row=0; row<=7; row++)". The 8 reminds me that I am counting off the eight numbers 0, 1, 2, ..., 7. Again, this is typical computer science style.

The only problem remaining is how to determine whether the square is red. As noted in the exercise, a square is red if row and col are either both even or both odd. Since an integer N is even if N%2 is 0, the test could be expressed as "if ((row%2 == 0 && col%2 == 0) || (row%2 == 1 && col%2 == 1))". However, note that this is the same as asking whether row%2 and col%2 have the same value. So the test can be written more simply as "if (row%2 == col%2)". Putting this all together into syntactically correct Java code, the algorithm becomes

```
for ( row = 0;    row < 8;    row++ ) {
    for ( col = 0;    col < 8;    col++ ) {
        x = 20*col;
        y = 20*row;
        if ( (row % 2) == (col % 2) )
            g.setColor(Color.red);
        else
            g.setColor(Color.black);
        g.fillRect(x,y,20,20);
    }
}
```

Of course, the variables row, col, x, and y have to be declared to be of type int. Then, the code goes into the body of the paint() method of an applet.

Solution

```
import java.awt.*;
    import java.applet.*;
```

```
public class Checkerboard extends Applet {
    /*  This applet draws a red-and-black checkerboard.
    It is assumed that the size of the applet is 160
    by 160 pixels.
*/
    public void paint(Graphics g) {
   int row;     // Row number, from 0 to 7
   int col;     // Column number, from 0 to 7
   int x,y;     // Top-left corner of square
   for ( row = 0;   row < 8;   row++ ) {
         for ( col = 0;   col < 8;   col++) {
           x = col * 20;
           y = row * 20;
           if ( (row % 2) == (col % 2) )
                g.setColor(Color.red);
           else
                g.setColor(Color.black);
           g.fillRect(x, y, 20, 20);
       }
   } // end for row
}   // end paint()
}   // end class
```

Reading Materials B

Programming Exercise (Ⅱ)

Exercises

To "capitalize" a string means to change the first letter of each word in the string to upper case (if it is not already upper case). For example, a capitalized version of "Now is the time to act!" is "Now Is The Time To Act!". Write a subroutine named printCapitalized that will print a capitalized version of a string to standard output. The string to be printed should be a parameter to the subroutine. Test your subroutine with a main() routine that gets a line of input from the user and applies the subroutine to it.

Note that a letter is the first letter of a word if it is not immediately preceded in the string by another letter. Recall that there is a standard boolean-valued function Character.isLetter(char) that can be used to test whether its parameter is a letter. There is another standard char-valued function, Character.toUpperCase(char), that returns a capitalized version of the single character passed to it as a parameter. That is, if the parameter is a letter, it returns the upper-case version. If the parameter is not a letter, it just returns a copy of the parameter.

Discussion

We are told the name of the subroutine and that it has one parameter of type String. The name of the parameter is not specified. I will use str. The return type is void because the subroutine does not return a value (It displays a value to the user, but to return a value means to return it to the line in the program where the function is called. The value returned by a function is generally not displayed to the user by the function). The first line of the subroutine definition will be:

```
static    void    printCapitalized( String str )
```

The subroutine must look at each character in str and decide whether to capitalize it or not. An algorithm for the subroutine is

```
for each character in str:
    if the character is the first letter of a word:
        Print a capitalized version of the character
    else:
        Print the character
Print a carriage return to end the line of output
```

The test as to whether a character is the first letter of a word is surprisingly complicated. A test that almost works is: “If the character is a letter and the preceding character is not a letter.” The problem is that if the character is the first character of the string, then there is no preceding character. If the character is str.charAt(i), then the preceding character would be str.charAt(i-1), but str.charAt(i-1) doesn’t exist if i is 0. Let’s look at Java code that suffers from this bug. Recall that the operator “!” stands for "not."

```
for ( i = 0;    i < str.length();    i++ ) {              // BUGGY CODE
    ch = str.charAt( i );
    if ( Character.isLetter(ch) && ! Character.isLetter(str.charAt(i-1)) )
        System.out.print( Character.toUpperCase(ch) );
    else
        System.out.print( ch );
}
System.out.println();
```

This will crash when i is zero. There are several ways to work around the problem, and all of them are techniques that are worth knowing. The first is to use a more complicated test in the if statement: “if the character is a letter and either it’s the first character in the string or the previous character is not a letter”. In Java, this is “if (Character.isLetter(ch) && (i==0 || !Character.isLetter(str.charAt(i-1))))”. But it can be difficult to get such a complicated test right. Another possibility is a bit sneaky: Add an extra character onto the beginning of str, and then start the for loop with i=1. Any character will do, as long as it’s not a letter. For example, you could say “str = ‘.’ + str;” Since the for loop starts at i=1, the “.” is not copied to output, and the problem of i==0 doesn’t arise. The method that I will use is similar, but it doesn’t require any modification of str. I’ll use another variable to represent the preceding character in the string, except that at the beginning of the string, I’ll set it to the arbitrary value, “.”. At the end of the loop, the character that we have just processed becomes the “previous character” in the next iteration of the loop. Here is the complete subroutine, using this method:

```
static void printCapitalized( String str ) {
     char ch;            // One of the characters in str.
     char prevCh;        // The character that comes before ch in the string.
     int i;              // A position in str, from 0 to str.length()-1.
     prevCh = '.';   // Prime the loop with any non-letter character.
     for ( i = 0;   i < str.length();   i++ ) {
          ch = str.charAt(i);
          if ( Character.isLetter(ch)   &&   ! Character.isLetter(prevCh) )
                System.out.print( Character.toUpperCase(ch) );
          else
                System.out.print( ch );
          prevCh = ch;   // prevCh for next iteration is ch.
     }
     System.out.println();
}
```

This doesn’t exhaust the possibilities. Another idea, for example, would be to use a boolean variable to keep track of whether the previous character was a letter.

Writing a main() routine to test this subroutine on a line of input is easy.

Solution

```
public class CapitolizeOneString {
     /*   This program will get a line of input from the user
           and will print a copy of the line in which the first
           character of each word has been changed to upper case.
           The program was written to test the printCapitalized
           subroutine.   It depends on the non-standard TextIO class.
     */
     public static void main(String[] args) {
          String line;   // Line of text entered by user.
          TextIO.putln("Enter a line of text.");
          line = TextIO.getln();
          TextIO.putln();
          TextIO.putln("Capitalized version:");
          printCapitalized( line );
     }   // end main()
     static void printCapitalized( String str ) {
               // Print a copy of str to standard output, with the
               // first letter of each word in upper case.
```

```
        char ch;           // One of the characters in str.
        char prevCh;       // The character that comes before ch in the string.
        int i;             // A position in str, from 0 to str.length()-1.
        prevCh = '.';   // Prime the loop with any non-letter character.
        for ( i = 0;   i < str.length();   i++ ) {
            ch = str.charAt(i);
            if ( Character.isLetter(ch)   &&   ! Character.isLetter(prevCh) )
                System.out.print( Character.toUpperCase(ch) );
            else
                System.out.print( ch );
            prevCh = ch;   // prevCh for next iteration is ch.
        }
        System.out.println();
    }

}   // end class
```

Lesson 32　C++ Programming Language

Reading Materials A

C++ Essentials

If you want to use Microsoft Visual C++, it helps a ton[1] if you really know C++. Everything is about classes[2]. If you are used to plain C, you won't really see the big deal with classes until you use them for a while. Let's review what you need to know about classes to get started with VC++.

A class is a structure for the most part. Let's work with an example instead of me just telling you rules. Let's make a class to represent a line. In the .h file you would define the class as follows:

```
class CLine
{
        int m_nX1;
        int m_nY1;
        int m_nX2;
        int m_nY2;
public:
        // constructor[3]s
        CLine();
        CLine(int x1, int y1, int x2, int y2);
        // destructor
        ~CLine();
        // set the line data
        void SetPoints(int x1, int y1, int x2, int y2);
        // draw the line
        void Draw();
}
```

A quick word about naming conventions. Class names usually start with 'C' and the member variables usually are prefixed by a 'm_'. Then in the microsoft way you will have a letter to let you know what data type the name is and then the name of the variable. Capitalize the letter of all new words in the name. Don't use underscores[4] and stuff like that. You may have the false belief that your coding style is better. From experience I can tell you that the microsoft way is the way. It makes things easy to read and easy to

---

[1] ton **大量，许多**
[2] class **类**
[3] constructor **构造函数**; destructor **析造函数**
[4] underscore **字下划线**

remember names (even when it is someone else's code). If you see m_pPoint, you would assume this is a member variable of a class that points (it is a pointer) to a point. If you see fData, you would assume that it is a floating-point[1] value.

Back to our class. The int variables are the end points of the line. Note that they are before the 'public:' part. This means that a programmer using this class will not be allowed to manipulate these guys directly. They are not for 'public' use. The functions under the public statement are for public use. The first three are called constructors. These functions are called anytime a new CLine class is created. Here are some examples when they are called:

```
// this calls CLine()
CLine MyLine;
// this is a pointer to a CLine class
CLine *pMyLine;
// this    calls CLine()
pMyLine = new CLine;
// this is a pointer to a CLine class
CLine *pMyLine;
// this calls CLine(int x1, int y1, int x2, int y2)
pMyLine = new CLine(0,0,10,10);
// this calls CLine(int x1, int y1, int x2, int y2)
CLine MyLine(0,0,10,10);
```

All of these construct a line. Some initialize it to its default settings and others copy coordinates. The 'new' keyword is used to create new things in C++, like malloc in C. You need to call 'delete' for everything you say new to, like free in C. This goes for classes as well as other data types. I could allocate an array of 100 integers with:

```
// a pointer to some integers
int *pNumbers;
// make memory for 100 of them
pNumbers = new int[100];
// set the first element to 0
pNumbers[0]=0;
// set the last element to 99
pNumbers[99]=99;
// free the memory.
delete [] pNumbers;
```

Notice the [] after the delete. This is to tell the program to delete the entire array. If you say 'delete pNumbers;' you will only free memory for the first element. You will then be 'leaking' memory. Memory leak[2]s are when you forget to delete memory. This may end up crashing your computer if you use all the

[1] floating-point **浮点**
[2] memory leak **内存漏失**

computers memory.

Sorry, let's get back to the constructors for CLine. The code for these constructor functions which automatically get called when a new line is created will look like:

```
CLine::CLine()
{
        m_nX1=0;
        m_nX2=0;
        m_nY1=0;
        m_nY2=0;
}
CLine::CLine(int x1, int y1, int x2, int y2)
{
        m_nX1=x1;
        m_nX2=x2;
        m_nY1=y1;
        m_nY2=y2;
}
```

Notice that the function declaration is much like a regular 'C' function except that we put the class name and two colons in front of the function name (CLine::). One difference with constructors is that they don't have a return value. This is the case for destructors also. A destructor is the function which automagically gets called when our CLine is deleted or goes out of scope. For instance:

```
// this is a pointer to a CLine class
CLine *pMyLine;
// this    calls CLine()
pMyLine = new CLine;
// memory for the class is cleared up and ~CLine() is called
delete pMyLine;

{
        // this    calls CLine()
        CLine MyLine;
}
// this '}' ends the section of the program where MyLine is
// valid. ~CLine() will be called. (MyLine goes out of 'scope')
```

For our class, ~CLine() doesn't need to do anything. However, sometimes you may want to put your cleanup code[1] here. Like deleting any allocated memory in your class. Since we have nothing to do out function code is empty:

```
CLine::~CLine()
```

[1] cleanup code **清理代码**

```
{
        // do nothing
}
```

Let's fill in the other 2 functions.

```
void CLine::SetPoints(int x1, int y1, int x2, int y2)
{
        m_nX1=x1;
        m_nX2=x2;
        m_nY1=y1;
        m_nY2=y2;
        return;
}
void CLine::Draw()
{
        // psuedo code here, these are operating system functions to draw a line
        MoveTo(m_nX1, m_nY1);
        LineTo(m_nX2, m_nY2);
          return;
}
```

How would I call these functions? Here are a couple of examples. One with pointers and one without.

```
        CLine *pLine = new CLine(0,0,10,10);
        pLine->Draw();
        delete pLine;
        CLine MyLine;
        MyLine.SetPoints(0,0,10,10);
        MyLine.Draw();
```

That's it for the class. Now this class can be used in other classes. You can imagine a CSquare class that has 4 Cline classes in it:

```
class CSquare
{
        CLine m_LineTop;
        CLine m_LineLeft;
        CLine m_LineBottom;
        CLine m_LineRight;
...
}
```

Or better yet, the point of all of this class stuff, you can use the CLine class to make your own class. This is done a ton in Visual C. Lets say you wanted to draw lines in your program, and you thought the line class might be nice, but it is missing an important feature, it doesn't let you set the line color. Instead of writing a whole new class, you can simple inherit the CLine class. This would look like this:

```
class CColorLine : public CLine
{
public:
        void Draw(long color);
};
```

What's going on here? Well with this class we have all the functionality of our other class, but now we can use this other Draw() function which allows us to set the color. The CPP code would look like:

```
void CColorLine::Draw(long color)
{
        // psuedo code here, these are operating system functions to draw a line
        SetColor(color);
        CLine::Draw();
        return;
}
```

Now we have all the functionality of the other class but we added an extra function called Draw. But it's the same name as our other Draw! No matter. Cpp is smart enough to know that if you call Draw(color) to use the new function, but if you call Draw() it will use the old function. The strange part of the code may be CLine::Draw(). This just tells our program to call the base class's Draw function. We save ourselves from having to write that LineTo and MoveTo code again. Pretty cool, huh? Now we can do something like this:

```
CColorLine MyLine;
MyLine.SetPoints(0,0,10,10);
// assuming 0 is black, this will draw a black line.
MyLine.Draw(0);
```

Reading Materials B

Visual C++ : Dialog Applications

We won't build a dialog application just yet, but I will tell you enough here so that you get the picture of what's going on in dialog applications. Dialog apps are the simplest apps in my opinion. In the IDE, go to File, New, Projects, MFC AppWizard(exe), and type in a project name. Hit next. Select Dialog Application as the type of application and then hit finish. Next go to the File View. You will see the source files created automagically. You should be able to compile and run the application as it is.

What is going on in all these files? Everything boils down to the CWinApp derived class and the CDialog derived class (which is derived from CWnd). Look in the source file named after your project. You should see a the InitInstance() function there. Inside of that function you can see that a dialog class is constructed, it is set as the 'main window' of the application, and it is displayed with the DoModal() function. Once you exit your dialog app, the DoModal() function returns and your dialog is hidden.

InitInstance() returns FALSE and your application ends. Now the question is, “What is DoModal()?”

There are 2 ways to create a dialog, Modal and Modeless. A Modal dialog suspends the program until you press OK, Cancel, or Close. On the other hand a modeless dialog can remain opened while allowing you to press buttons and whatnot on the rest of the application. An example of a Modal dialog is one of those annoying error boxes with an OK button on it. That is the only type of dialog we’ll talk about here. To create a Modal dialog, you simply need to call the dialog’s DoModal() function. It returns either IDOK or IDCANCEL depending on how you exited the dialog. Internally the DoModal() will call OnInitDialog() which is a good place to initialize your dialog variables. If you create a dialog app, you will notice that a default dialog class and resource is created for you. The file name for the class will be your project name with a ‘Dlg’ tacked on at the end.

Though we aren’t making an application just yet, I have to tell you how to put something useful on the dialog. First open up the resource view. Open up your dialog in the editor. Right click on the dialog and select ‘properties’. Make sure the ‘Visible’ checkbox is checked. If it isn’t, you won’t be able to see your dialog. (Remember this, it will come back to haunt you in the future). You can change the Dialog’s caption here as well as other things.

Now drag a button control onto the dialog somewhere. Right click on it and select properties. You can change the ID of the button to something more descriptive like IDC_SHOWMESSAGE. You can also change the text on the button to something more descriptive like ‘Show Message’. You have a button now. But it does nothing. You can easily fix that. Press Ctrl-W to bring up the class wizard. Make sure you are on the first tab. You should see your dialogs name and the button’s ID in the list on the left. If you select the dialog’s name you can see all of the functions and messages that the class wizard will let you add code for on the right. You can see the WM_PAINT and all the other messages we talked about. If you select the ID of the button you can see the messages that the button sends. Double click on the CLICK message and accept the default function name. You see that it appears in the list at the bottom. Now double-click on the function in the bottom list. You are transported right to the cpp file where you need to fill in the code. Let’s do something easy. Just add the line:

```
AfxMessageBox(“Stupid Text”);
```

Compile, build and run your application (just press Ctrl-F5). If you press the button, you should see a message box pop up when you press the new button. (There are some Afx... functions that are useful. I think the message box one is the most useful out of all of them. It is instant feedback).

That was dead simple. You see how to add message handlers now (like for the button click), but you need at least one more vital bit of information to make a useful dialog box. How to use the automatic data handling stuff in MFC. This is best described by going back to the code again. Bring up the resource editor one more time and this time add an Edit Box to your dialog. Again right click on it and give it a nice and friendly ID. Hit Ctrl-W and bring up the class wizard. This time go to the second Tab. Here is where you add member variables that are associated with the controls on your dialog. Double click on the Edit Box’s ID. You now have the choice to add a variable to your project. Give it a name like m_strMessage since it will be a string for our message box. Make sure the data type selected is CString there at the bottom. Press OK. And press it again to get out of the class wizard.

When you add a member variable to a dialog like this, you can set the value to that in the control of the dialog by calling

```
UpdateData(TRUE);
```

Likewise you can change the data displayed in the dialog to represent your variable's value by calling

```
UpdateData(FALSE);
```

Let's put this to use and finish up this lesson. Go towards the end of your OnInitDialog() function and in it put the two lines:

```
m_strMessage = "Initial text";
UpdateData(FALSE);
```

Then go to the function which is called when the button is pressed and replace the AfxMessageBox() line with these two lines:

```
UpdateData(TRUE);
AfxMessageBox(m_strMessage);
```

Ok, we are done. What we just did was set the initial text in the edit box to "Initial text" with the UpdateData(FALSE). Then when the button is pressed the text in the message box is displayed since we get the text from the dialog with UpdateData(TRUE).

playing around and by reading the help (or a good book) you will learn how to use the other controls. On of the trickiest to figure out with out help is the slider bar. If you use one of these you will have to handle the dialog's scroll messages. That's just a hint for you.

Lesson 33　Oracle

Reading Materials A

Oracle Overview

The Oracle Instance

An Oracle instance consists of:

A) five processes: system monitor[1], process monitor, db writer, checkpoint[2], and log[3] writer;

B) data files which contain the tables and other data objects, control files which contain configuration information, redo log files for transaction[4] processing, and archive files[5] for recovery purposes;

C) configuration files which contains the instance attributes, and external security information.

Memory Model

The Oracle memory model consists of:

A) the SGA, which contains executable program code;

B) the shared pool[6], which is split between the library cache and data dictionary cache, optimized queries[7] are stored here;

C) the redo log buffer[8], which is where transactions are stored before they are written to the redo logs;

D) the db buffer cache, which is where database operations are stored before they are written to the data files.

The Oracle data server runs as a multiple processes within the operating system; the number of users connected to the database is reflected in the number of processes managed by the OS. Each Oracle user connection requires 1 meg of server memory.

Transaction Processing

Transactions are written to the redo log buffer, where they advance to the redo logs, data file buffer, and data files. When a rollback[9] occurs, block images are discarded from the redo log buffer; as the previous block data is held in the rollback segment blocks. Committed[10] transactions are promoted to the archive logs.

---

[1] monitor 这里的意思是“监督程序”
[2] checkpoint 校验点
[3] log （运行）日志
[4] transaction 事务
[5] archive files 存档文件
[6] pool 池，缓冲池
[7] query 查询
[8] buffer 缓冲器
[9] rollback 回退
[10] commit 提交

Archive logs are used to restore the data in the event of[1] a hardware failure. A checkpoint operation flushes[2] all updated (committed) memory blocks from the log buffer and database buffer pool.

Note that transaction logging is optional, on a table by table basis, and archive logging is also optional.

During an update transaction, record locking prevents data block collisions from occurring. Access to the “before” image of the record(s) is made available during this time, which reduces contention.

Backup Procedures

Previous to Oracle 8, the only way to back up the database was through a “cold” backup. This involved shutting down the Oracle instance, backing up the data files, and restarting upon completion.

Oracle 8 has the Recovery Manager package which facilitates backing up data files on-line.

Recovery Procedures

Recovery is achieved by restoring the data files, and verifying the control files are synchronized[3] properly.

Security and Account Setup

Oracle is shipped with[4] several built-in accounts: system, internal, and sys. Operating system authentication is required in order for a login to be created with similar privileges. After a login is created, access is then granted to the tables within schemas[5] as needed.

Database Creation

Databases are initialized with the “create database” command. In most (99.9%) cases the database name is the same as the instance name, and there is only one database per instance.

Within an Oracle instance, schemas are created which contain the tables for an application. Tables are referenced by schema_name.tablename. Each user is assigned a default schema upon creation; this schema name is the same as the user name. In order for tables to be referenced without the schema name, they must be owned by the user, or in the “system” schema. “Synonyms” can be created to bypass the prefix requirement. Typically, an “internal” or “system” level login will be used to access the database.

A typical Oracle instance will have 12 data files, 6 redo log members, 6 archive files, and 4 control files, all spread across various disk subsystems.

Data Types

Supported data types include number, char, varchar2, date, long raw, clob, and blob.

(** blob = binary large object, clob = character large object)

Blob and clob (Oracle 8 only) datatypes are implemented via pointers within the physical record structure ; the field contents are stored in dedicated[6] blocks. As a result, each blob or clob field requires at

---

[1] in the event of **如果……发生**
[2] flush **清除**
[3] synchronized **同步的**
[4] be shipped with **装有**
[5] schema **模式**
[6] dedicated **专用的**

least 2 K of storage (depending on the database block size). Long raw datatypes are stored in-line, and are discouraged.

For string data, the varchar2 type can be used for lengths up to 2000; the clob type can be used for longer field data.

Date fields are represented as a number of days, along with a decimals fraction (accurate to the minute). Additional accuracy can be obtained by purchasing a separate module.

Sequences provide a means of autoincrementing an ID column—selecting sequence_name. NEXTVAL automatically increments the sequence and returns the new value.

Reading Materials B

How Can I Rebuild an Oracle 8 Object Type If It has Table Dependencies?

Hey, that's a great question. Unfortunately, I haven't found a great answer other than "upgrade to Oracle9i," which offers quite a number of ways to modify object types. The basic problem is that Oracle8 offers two schema modification tools for object types, neither of which goes far enough. The tools are:

ALTER TYPE—useful for adding or changing object type methods

and

DBMS_DDL.ALTER_TABLE_REFERENCEABLE—useful for rebuilding an object table on another tablespace or with different storage characteristics.

Those are occasionally useful, but not interesting. To address something interesting, let's consider a situation where have two object types, one for animals, and one for mascots. A mascot is a type of animal, so the mascot type will have a REF to the animal type.

```
CREATE TYPE Animal_t AS OBJECT (
  genus VARCHAR2(40),
  species VARCHAR2(40)
);
/
CREATE TYPE Mascot_t AS OBJECT (
   name VARCHAR2(30),
   animal_ref REF Animal_t
);
/
```

Now let's create some tables and throw some data in. Our assertion here is that "reveille" is a mascot of genus "canus" and species "major."

```
CREATE TABLE animals OF Animal_t (
   CONSTRAINT animals_pk PRIMARY KEY (genus, species),
```

```
    CONSTRAINT genus_not_null CHECK (genus IS NOT NULL),
    CONSTRAINT species_not_null CHECK (species IS NOT NULL)
);
CREATE TABLE mascots OF Mascot_t (
    CONSTRAINT mascots_pk PRIMARY KEY (name),
    CONSTRAINT mascot_name_not_null CHECK (name IS NOT NULL)
);
INSERT INTO animals VALUES ('canus', 'major');
INSERT INTO animals VALUES ('homo', 'sapiens');
INSERT INTO mascots
    SELECT 'reveille', REF(a)
      FROM animals a
     WHERE a.genus = 'canus'
       AND a.species = 'major';
```

Now the fun begins. Imagine that we need to add an attribute to the Animal_t type. We can't use CREATE or REPLACE TYPE, because it will complain about the dependencies. Neither can we use ALTER TYPE or DBMS_DDL.ALTER_TABLE_REFERENCEABLE to accomplish this. Instead we must completely rebuild all dependent data. Ugly but true. The core of the problem is that Oracle provides no way to preserve persistent REFs across a schema change. (As an aside, I did figure out a way to keep the OIDs, but it doesn't do any good because we can't rebuild the object type with the same type identifier...hence the REFs to those OIDs still think they're of the old type.)

The following script demonstrates the basic pattern.

First, preserve the mascot data and the animal data in non-object tables. The table names are irrelevant, since they will get thrown away at the end.

```
CREATE TABLE mascots_flattened (
   name VARCHAR2(30),
   genus VARCHAR2(40),
   species VARCHAR2(40)
);
CREATE TABLE animal_holder (
    genus VARCHAR2(40),
    species VARCHAR2(40)
);
INSERT INTO animal_holder SELECT genus, species FROM animals;
INSERT INTO mascots_flattened
SELECT m.name, m.animal_ref.genus, m.animal_ref.species
   FROM mascots m;
```

Now, drop the original tables and types:

```
DROP TABLE mascots;
```

```
DROP TYPE mascot_t;
DROP TABLE animals;
DROP TYPE animal_t;
```

At this point we are of course free to rebuild the schema any way we want it. Let's add a "habitat" attribute to the Animal_t type.

```
CREATE OR REPLACE TYPE Animal_t AS OBJECT (
   genus VARCHAR2(40),
   species VARCHAR2(40),
   habitat VARCHAR2(40)
);
/
```

We'll just leave this one alone:

```
CREATE OR REPLACE TYPE Mascot_t
AS OBJECT (
    name VARCHAR2(30),
    animal_ref REF Animal_t
);
/
```

And now we rebuild the object tables:

```
CREATE TABLE animals OF Animal_t (
    CONSTRAINT animals_pk PRIMARY KEY (genus, species),
    CONSTRAINT genus_not_null CHECK (genus IS NOT NULL),
    CONSTRAINT species_not_null CHECK (species IS NOT NULL)
);
CREATE TABLE mascots OF Mascot_t (
    CONSTRAINT mascots_pk PRIMARY KEY (name),
    CONSTRAINT mascot_name_not_null CHECK (name IS NOT NULL)
);
```

And, finally, we can populate the new tables from the old data:

```
INSERT INTO animals (genus, species)
SELECT genus, species
   FROM animal_holder;
INSERT INTO mascots (name, animal_ref)
    SELECT name, REF(a)
       FROM animals a,
              mascots_flattened f
      WHERE a.genus = f.genus
         AND a.species = f.species;
```

And we can now flush our temporary tables:

DROP TABLE mascots_flattened;

DROP TABLE animal_holder;

Well! What a load of work! Hey Oracle, about some relief here?

Lesson 34　SQL

Reading Materials A

SQL[1] Commands

SQL Select

What do we use SQL for? Well, we use it to select data from the tables located in a database. Immediately, we see two keywords: we need to SELECT information FROM a table. (Note that a table is a container that resides in the database where the data is stored.). Hence we have the most basic SQL structure:

SELECT "column_name" FROM "table_name"

To illustrate the above example, assume that we have the following table:

Table ***Store_Information***

store_name	Sales	Date
Los Angeles	$1500	Jan-05-2002
San Diego	$250	Jan-07-2002
Los Angeles	$300	Jan-08-2002
Boston	$700	Jan-08-2002

We shall use this table as an example throughout the tutorial (This table will appear in all sections). To select all the stores in this table, we key in,

SELECT store_name FROM Store_Information

Result:

store_name
Los Angeles
San Diego
Los Angeles
Boston

Multiple column names can be selected, as well as multiple table names.

SQL Distinct[2]

The SELECT keyword allows us to grab all information from a column (or columns) on a table. This, of course, necessarily mean that there will be redundancies[3]. What if we only want to select each DISTINCT element? This is easy to accomplish in SQL. All we need to do is to add DISTINCT after SELECT. The

---

[1] SQL (Structured Query Language) **结构化查询语言**
[2] distinct **与其他不同的，独特的**
[3] redundancy **重复，冗余**

syntax is as follows:

```
SELECT DISTINCT "column_name"
FROM "table_name"
```

For example, to select all distinct stores in Table Store_Information,

store_name	Sales	Date
Los Angeles	$1500	Jan-05-2002
San Diego	$250	Jan-07-2002
Los Angeles	$300	Jan-08-2002
Boston	$700	Jan-08-2002

we key in,

```
SELECT DISTINCT store_name FROM Store_Information
```

Result:

store_name

Los Angeles

San Diego

Boston

SQL Where

Next, we might want to conditionally select the data from a table. For example, we may want to only retrieve[1] stores with sales above $1,000. To do this, we use the WHERE keyword. The syntax is as follows:

```
SELECT "column_name"
FROM "table_name"
WHERE "condition"
```

For example, to select all stores with sales above $1,000 in Table Store_Information,

store_name	Sales	Date
Los Angeles	$1500	Jan-05-2002
San Diego	$250	Jan-07-2002
Los Angeles	$300	Jan-08-2002
Boston	$700	Jan-08-2002

we key in,

```
SELECT store_name
FROM Store_Information
WHERE Sales > 1000
```

Result:

store_name

Los Angeles

[1] retrieve **检索**

Reading Materials B

Joins

Cartesian Products

When you join tables, make sure that the number of join predicates in the search condition is one less than the number of tables in the from list. Otherwise, you will get many more rows returned than you probably intended. For example, table english and spanish look like this:

* select * from english;

Tag	name
1	one
2	two
3	three

3 rows selected

* select * from spanish;

tag	name
2	dos
3	tres
4	cuatro

3 rows selected

If you select from both tables without joining them in the where clause, you get a cartesian product, every possible combination of both:

* select * from english, spanish;

tag	name	tag	name
2	dos	1	one
3	tres	1	one
4	cuatro	1	one
2	dos	2	two
3	tres	2	two
4	cuatro	2	two
2	dos	3	three
3	tres	3	three
4	cuatro	3	three

9 rows selected

Most likely, this is not what you had in mind. Since there are two tables in the from_list, one join predicated is needed:

* select * from english, spanish
where english.tag = spanish.tag;

tag	name	tag	name
2	dos	2	two
3	tres	3	three

2 rows selected

Inner and Outer Joins

A join between two tables does not include any rows from either table that have no matching rows in the other. This is called an inner join and frequently causes confusion since fewer rows are returned than the user expects. For example, tables english and spanish look like this:

* select * from english;

Tag	name
1	one
2	two
3	three

3 rows selected

* select * from spanish;

tag	name
2	dos
3	tres
4	cuatro

3 rows selected

When you join these two tables, you get only the two rows that have the same tag:

* select e.name, e.tag, s.name
from english e, spanish s
where e.tag = s.tag;

name	tag	name
two	2	dos
three	3	tres

2 rows selected

Row one in table english and row cuatro in table spanish fall into the outer joins:

```
                           Joins

                     +--------------+
left outer --->      |  one      1  |
                     |       +--------------+
            +-->     |  two  |  2  :  dos   |
inner join  |        |       |     :        |
            +-->     | three |  3  :  tres  |
                     +-------|- - -+        |
                             |  4    cuatro| <--- right outer
                             +--------------+
```

You can select outer join rows by using not exists. This query fetches the row in english that is not in spanish (the left outer join):

* select e.name as English, e.tag, '--no row --' as Spanish
from english e
where not exists
(select * from spanish s
where e.tag=s.tag);

English	tag	Spanish
one	1	--no row--

one row selected

This query fetches the row in spanish that is not in english (the right outer join):

```
* select    '--no entry--' as English, s.tag, s.name as Spanish
from        spanish s
where       not exists
            (select * from english e
             where e.tag=s.tag);
```

English	tag	Spanish
--no entry--	4	cuatro

one row selected

You can string all statements together with union:

```
* select    e.name::text as English, e.tag, s.name::text as Spanish
from        english e, spanish s
where       e.tag = s.tag
union
select      e.name::text, e.tag, '--no entry--'::text
from        english e
where       not exists
            (select * from spanish s
            where e.tag=s.tag)
union
select      '--no entry--'::text, s.tag, s.name::text
from        spanish s
where       not exists
            (select * from english e
            where e.tag=s.tag)
order by 2;
```

English	tag	Spanish
one	1	--no entry--
two	2	dos
three	3	tres
--no entry--	4	cuatro

4 rows selected

If you think this is a lot of trouble to retrieve outer join data, there's another way to handle known joins in Illustra that will factor in outer join data.

Solving Outer Joins in Illustra with ref()

Confusion with outer joins was described above. This section looks at another way to resolve outer join confusions in Illustra by using ref().

We start by creating the two tables like this and inserting data:

```
create table spanish of new type spanish_t
 (name    varchar(20),
```

```
tag      integer);
create table english of new type english_t
(name    varchar(20),
tag      integer,
sname ref(spanish_t));
insert into english (name, tag) values ('one',      1);
insert into english (name, tag) values ('two',      2);
insert into english (name, tag) values ('three',    3);
insert into spanish (name, tag) values ('dos',      2);
insert into spanish (name, tag) values ('tres',     3);
insert into spanish (name, tag) values ('cuatro',   4);
```

Next we update the reference in english:

```
* update english
set sname = (select unique ref(s1) from spanish s1
             where english.tag = s1.tag);
3 rows updated
* select * from english;
```

name	tag	sname
one	1	NULL
two	2	202d.2001
three	3	202d.2002

3 rows selected

Notice that the select from english returned the oid reference to spanish. You can dereference that oid as follows:

```
* select name as english, tag, deref(sname).name as spanish from
english;
```

English	tab	Spanish
one	1	Null
two	2	dos
three	3	tres

3 rows selected

We can also take it the opposite way by updating the spanish_t type and spanish table as follows:

```
* alter type spanish_t
add column ename ref(english_t);
* update spanish
set ename = (select unique ref(e1) from english e1
                  where spanish.tag = e1.tag);
3 rows updated
* select name as spanish, tag, deref(ename).name as english from spanish;
```

Spanish	tag	English
dos	2	two
tres	3	three
cuatro	4	NULL

3 rows selected

Finally, we can use union to select from both:

```
* select name as english, tag, deref(sname).name as spanish from english union
select deref(ename).name as english, tag, name as spanish from spanish order by 2;
```

English	tag	Spanish
one	1	NULL
two	2	dos
three	3	tres
NULL	4	cuatro

4 rows selected

Realize that if new rows are inserted into either table, the reference must be set in the tables that references it.

Lesson 35 Linux

Reading Materials A

Interacting with the System

It is common to have people working on UNIX systems that have never worked on a computer before or have only worked in pure windowing environments, like on a Macintosh[1]. When they get to the command line, they are lost. On more than one occasion, I have talked to customers and I have asked them to type in cd /. There is a pause and I hear: click-click-click-click-click-click-click-click-click-click-click-click. "Hmmm," I think to myself, "that's too many characters." So I ask them what they typed, and they respond, "cd-space-slash."

We need to adhere to some conventions throughout this article to make things easier. One is that commands that I talk about will be in your path unless I say otherwise. Therefore, to access them, all you need to do is to input the name of the command without the full path.

The second convention is the translation of the phrases "input the command," "enter the command," and "type in the command." These are translated to mean "input/enter/type in the command and press Enter." I don't know how many times I have talked with customers and have said "type in the command" and then asked them for what happens and their response is, "Oh, you want me to press Enter?" Yes! Unless I say otherwise, always press Enter after inputting, entering, or typing in a command.

Simply having shell is probably not enough for most users. Although you could probably come up with an interesting and possibly useful shell script, more than likely you're going to need some commands to run. There are literally[2] hundreds of different commands that come with your system by default and there are many more different variations of these commands, which you can download from the Internet.

Sometimes the commands you issue are not separate files on the hard disk, but rather are built-in to your shell. For example, the cd command, which is used to change directories, is part of the shell, whereas the ls command, which is used to display the contents of directories is a separate program. In some cases one shell has a particular command built-in, but it is not available in another shell.

If you ever run into[3] trouble and are confused about the behavior of your shell, one important thing to know is what shell you have. If you weren't told what shell you had when your account was created or you are installing Linux for the first time and really don't know, there are a couple of ways of finding out. The first is to simply ask the shell. This is done by accessing the $SHELL environment variable[4]. This is done using the echo command like this:

---

1 Macintosh **苹果机**
2 literally **差不多**
3 run into **陷入**
4 environment variable **环境变量**

echo $SHELL

As you might guess, the echo command simply displays on the screen exactly what you told. In this case we told it to display the $SHELL variable. (We know it is a variable because of the leading $..) What should probably happen is that you get something like this:

/bin/bash

In this case, our shell is /bin/bash. We can also find out what shell we are using by seeing which programs we are currently running. With Linux, as with other Unix dialects[1], a running program is called a " process[2]", and you check your processes using the ps command (for process status). You can start it with no arguments[3] simply by putting in "ps" and pressing the enter key. This will probably get you something like this:

PID TTY	TIME CMD
21797 pts/1	00:00:00 bash
6060 pts/1	00:00:00 ps

In this case we see under the heading CMD (for command) only "bash" and not the full pathname as in the previous example. However, there are options to the ps command which will show us the path.

The shell you are using is just one piece of information the system maintains in regard to your current session. Much of this information is stored in the form of variables, like your shell. These variables are set for you when you login to the system. You can also set variables yourself using the set command. This might look like this:

set VAR=value

Where VAR is the variable name and "value" is the value which you assigned to that variable. Note that it is not until you want to access the value of the variable that you preceded with the $. To find out the contents of all variables, you would use the set command by itself with no arguments. This gives you a long list of variables.

When you login to the system you start in your "home" directory, which can be stored in the $HOME variable. As we discussed earlier, to change your current directory (also called your working directory) you use the cd command. If you wanted to return to your home directory, you can issue the command cd $HOME and your shell will pass the value of the $HOME variable to the cd, which would then change directories for you. (Note that typically if you use the cd command with no arguments at all, you change to your home directory by default.)

One part of your environment which is extremely useful to know is the directory you are currently in. To do this you might want to tell the system to simply print your current working directory. This is done with the pwd command, which simply displays the full path to your current directory.

It is also useful to see what files and directories reside in your current directory. This is done with the ls command (short for "list"). Without the options the ls command provides you a simple list of what is in your current directory, without any additional information. The output might look like this:

prompt# ls

---

[1] dialect **方言**
[2] process **进程**
[3] argument **参数**

letter.txt memo.txt picture.jpg

you can use the -l option to get a "long" listing of the files and directories. This might show you something like this:

```
prompt# ls -l
-rw-r--r--   1 jimmo   users      2457 Feb 13 22:00 letter.txt
-rw-r--r--   1 jimmo   users      7426 Feb 15 21:33 memo.txt
-rw-r--r--   1 jimmo   users      34104 Feb 14 21:31 picture.jpg
```

This information includes the permissions on the file, who owns the file, the size, and so forth.

There are many ways to do the things you want to do. Some use a hammer approach and force the answer out of the system. In many cases, there are other commands that do the exact same thing without all the gyrations. So, what I am going to try to do here is step through some of the logic (and illogic) that I went through when first learning Linux. That way, we can all laugh together at how silly I was, and maybe you won't make the same mistakes I did.

Every dialect of UNIX that I have seen has the ls command. This gives a directory listing of either the current directory if no argument is given, or a listing of a particular file or directory if arguments are specified. The default behavior under Linux for the ls command is to list the names of the files in a single column. Try it and see.

It is a frequent (maybe not common) misconception[1] for new users to think that they have to be in a particular directory to get a listing of it. They will spend a great deal of time moving up and down the directory tree looking for a particular file. Fortunately, they don't have to do it that way. The issue with this misunderstanding is that every command is capable of working with paths, as is the operating system that does the work. Remember our discussion of Linux basics. Paths can be relative to our current directory, such as ./directory, or absolute, such as

/home/jimmo/directory.

For example, assume that you have a subdirectory of your current working directory called letters. In it are several subdirectories for types of letters, such as business, school, family, friends, and taxes. To get a listing of each of these directories, you could write

```
ls ./letters/business
ls ./letters/school
ls ./letters/family
ls ./letters/friends
ls ./letters/taxes
```

Because the ls command lets you have multiple commands on the same line, you also could have issued the command like this:

```
ls ./letters/business ./letters/school ./letters/family ./letters/friends ./letters/taxes
```

Both will give you a listing of each of the five directories. Even for five directories, typing all of that is a pain. You might think you could save some typing if you simply entered

```
ls ./letters
```

[1] misconception **误解**

However, this gives you a listing of all the files and directories in ./letters, not the subdirectories. Instead, if you entered

ls ./letters/*

The shell would expand the wildcard[1] (*) and give you a listing of both the ./letters directory as well as the directories immediately below ./letters, like the second example above. If each of the subdirectories is small, then this might fit onto one screen. If, on the other hand, you have 50 letters in each subdirectory, they are not all going to fit on the screen at once.

Reading Materials B

Configuring the X-Windows Server

When you install your copy of Linux, you will (should) be asked a series of questions about your video system to configure your X server. Even if you don't know what video chipset you use or the video card manufacturer, you can get away with using the standard SVGA card. However, the performance and appearance will dramatically improve if you are able to specify exactly what you have.

Even if there isn't an exact match, you can try something close and still get decent performance. If it is an exact match, I would recommend using a low resolution, like 640×480, to test the configuration. Once you are sure that everything works correctly, you can move to higher resolutions.

Once X-Windows is running, you can use the configuration program xf86config, which will again ask you a series of questions about your configuration. Here you really ought to know about the hardware, including your monitor.

When you install your X server, note that you are not running just a single program. Instead, quite a few different programs are running. Which one runs depends on the options you specified during the configuration. Because most only run on a single video card or chipset, you definitely need to know about your hardware.

Keep in mind that just because you can run the Linux command line does not mean that Linux supports your video card. The command line is run in text mode, which uses well-known standard video modes to access the video card. However, once the X server is running, you are accessing the video card directly and need to know all the details.

The primary configuration file for your X server is (normally) /etc/XF86Config or /etc/X11/XF86Config. This is a text file, which is generated new every time you run xf86config. This is broken down into three sections. The Screen section is the primary section and often comes last. It defines what you see on the screen based on the other two sections. The Device section describes your video card (which is often referred to as a video device). The Monitor section describes, as you might expect, your monitor.

Each section has a header line that defines what section it is and an EndSection line to close it up. The

[1] wildcard 通配符

general form is

Section

"SectionName"

section info

EndSection

Because the X server decides what to show on the screen based on the Screen section, that is probably a good place for me to start. Within the Screen section, the server can give you several subsections for each of the “Display” types. The subsections are the logical configurations of your monitor and determine such things as the number of colors that can be displayed, the resolution, and whether there is a “logical” screen.

The Screen section on one of my machines looks like this:

Section “Screen” Driver “accel” Device “SPEA Mercury 64” Monitor “Sony17sf” Subsection “Display” Depth 8 Modes “800×600” “1 024×768” ViewPort 0 0 Virtual 800 600 EndSubsection Subsection “Display” Depth 16 Modes “800×600” “1 024×768” ViewPort 0 0 Virtual 1 024 768 EndSubsection Subsection “Display” Depth 32 Modes “800×600” ViewPort 0 0 Virtual 800 600 EndSubsection EndSection

The Driver line indicates which X server will be used. In this case, I am using the “accel” driver for “accelerated” servers, which basically means that they have faster performance than other cards. The other kinds of drivers are vga2 (for vga cards in 2-color mode), vga16 (16-color vga), and svga (super-VGA, 256 color, 640×480).

The Device line indicates the name of the video card. Because that’s the card I have, this line is set to “SPEA Mercury 64.” The monitor indicates the monitor type. Note that in my case there was a specific entry for the SPEA Mercury card. However, there was no specific entry for my monitor, though one was close. The system uses this information to choose the best driver for you. However, you can still choose another driver.

As I mentioned previously, the Display subsection determines what is displayed on your screen. In this case, we have three different Display subsections, which are distinguished by the Depth line, which defines the color depth, or number of colors, that can be displayed. This indicates the number of bytes that are used to describe the colors. Therefore, in the first entry, we have 8 bits, or a total of 256 possible colors.

The Modes line defines the possible resolutions that your monitor can support. Normally, the lower the depth, the more modes the server can handle. In my case, the system did not configure this. Each of the modes has an entry for 640×480. Because I never wanted my server coming up in that mode, I was able to remove the modes. (Note that this is one option in the xf86config program.)

When it starts up, the X server will take the first entry it finds. In my case, this is 800×600 and 256 colors. However, you can use options to startx, which then passes the first entry on to xinit. If I wanted to increase the color depth to 24 bits, I could start the server like this:

startx -- -bpp 24

The Device section describes the characteristics of your video card. On my machine, it looks like this:

Section "Device"

Identifier "SPEA Mercury 64"

VendorName "Unknown"

BoardName "Unknown"

VideoRam 2048

EndSection

The Identifier entry is used in other sections to match displays with Devices. Although the VendorName in this case is SPEA and the BoardName is Mercury 64, it does not matter that these two fields are empty.

Last, we get to the Monitor section. An except from the monitor section on my system follows (with *a lot* of things removed to save spaces). Note that you could have multiple Monitor sections if you were going to connect different monitors.

Section "Monitor"

Identifier "Sony17sf"

VendorName "Sony"

ModelName "17sfII"

HorizSync 31.5 - 57.0

VertRefresh 50-70

640✕400 @ 70 Hz, 31.5 kHz hsync

Modeline "640✕400" 25.175 640 664 760 800 400 409 411 450

640✕480 @60 Hz, 31.5 kHz hsync

Modeline "640✕480" 25.175 640 664 760 800 480 491 493 525

800✕600 @ 56 Hz, 35.15 kHz hsync

ModeLine "800✕600" 36 800 824 896 1 024 600 601 603 625

1 024✕768 @ 87 Hz interlaced, 35.5 kHz hsync

Modeline "1 024✕768" 44.9 1 024 1 048 1 208 1 264 768 776 784 817

Like the Devices section, the Identifier is used to match monitors and displays. Here the physical characteristics of the monitor are described, including the vertical refresh rate (how many times per second the screen can be redrawn) and the horizontal synchronization (which is based on the resolution and vertical refresh rate).

The most important part of the Monitor section are the modeline entries. If you have a common video card and monitor, you don’t have to worry about this because the xf86config utility will create them for you. If you do need to create them, you should check the latest Xfree86 HOWTO.

Lesson 36　ASP+

Reading Materials A

The Difference Between ASP+ and ASP

Why Do We Need a New Version of ASP? There are Really Four Main Issues to Consider:

- Currently, ASP can only be scripted using the basic non-typed languages such as VBScript and JScript (unless you install a separate language interpreter[1]). While ASP does parse and cache the code for the page the first time it is executed, the limitations prevent more strongly-typed languages like Visual Basic and C++ from being used where this would be an advantage. ASP+ provides a true language-neutral execution framework[2] for Web applications to use.
- It is also very easy to create huge ASP pages containing a spaghetti[3]-like mixture of code, HTML, text, object declarations, etc. And it's hard to re-use code, unless you place it in separate 'include' files—not the best solution. In many environments, developing a Web application utilizes the skills of a wide range of professionals, for example, you have programmers writing the code, and designers making the HTML look good. Having both the code and the content intermixed in a single file that both of these groups need to operate on makes it difficult for them to work together. ASP+ allows true separation of code and content.
- In previous versions of ASP, you have to write code to do almost anything. Want to maintain state in form fields? Write code. Want to validate[4] data entered on the client? Write code. Want to emit some simple data values? Write code. Want to cache[5] regions of pages to optimize performance? Write code. ASP+ introduces a real component model, with server-based controls and an event driven[6] execution paradigm[7] similar in concept to the way that a Visual Basic 'Form' works now. The new ASP+ server controls are declarative (i.e. you only have to declare them in order to get them to do something), and so you actually write less code—in fact, in many situations you don't have to write any code at all!
- The world out there is changing. The proportion of users on the Web that will access your site through an 'Internet device' such as a mobile cellular phone, personal digital assistant (PDA[8]),

---

1 language interpreter 语言解释程序
2 framework 框架
3 spaghetti 意大利式细面条
4 validate 验证
5 cache 把……储存于硬盘
6 event driven 事件驱动
7 paradigm 范型
8 PDA (Personal Digital Assistant) 个人数字化助理

TV set-top box[1], games console, or whatever else, will soon be greater than the number using a PC and a traditional Web browser. This means that we probably have to be prepared to do more work at the server to tailor our pages to suit a specific device. We'll also have to create the output in a whole new range of formats such as the Wireless Markup Language (WML[2]). And, in addition to creating WML for rendering, new Internet devices and business applications are going to want to be able to send and receive XML data from Web applications. Doing this today from ASP requires you to manually use an XML parser[3], convert data to and from XML schemas, etc. ASP+ Web Services makes it much easier.

Besides all of this, the rapidly changing nature of distributed applications requires faster development, more componentization and re-usability, easier deployment, and wider platform support. New standards such as the Simple Object Access Protocol (SOAP), and new commercial requirements such as business-to-business (B2B) data interchange, require new techniques to be used to generate output and communicate with other systems. Web applications and Web sites also need to provide a more robust and scalable service, which ASP+ provides through proactive monitoring and automatic restarting of applications when failures, memory leaks[4], etc. are discovered.

The Big Advantages with ASP+

The biggest challenges facing the Web developer today must be the continued issues of browser compatibility, and the increasing complexity of the pages that they have to create. Trying to build more interactive pages that use the latest features of each browser, whilst still making sure that the pages will work on all the popular browsers, is a nightmare that refuses to go away.

And, of course, it will only get worse with the new types of Internet device that are on the way, or here already. In particular, trying to build pages to offer the same user-level capability to cellular phones as to traditional browser clients is just about impossible. The text-only 12-character by 3-line display of many cellular phones does tend to limit creativity and user interaction.

One obvious solution is to create output that is targeted at each specific client dynamically— or create multiple versions of the same site, one for each type of client. The second option is not attractive, and most developers would prefer the first one. However, this implies that every hit from every user will require some server-side processing to figure out what output to create.

If this is the case, why not automate much of the process? To this end, ASP+ introduces the concept of server controls that encapsulate[5] common tasks and provide a clean programming model. They also help to manage the targeting of all the different types of client.

1 set-top box **机顶盒**
2 WML (Wireless Markup Language)
3 parser **（语法）分析程序**
4 memory leak **内存漏失**
5 encapsulate **压缩，节略**

Reading Materials B

The Problems with Maintaining State

One of the most cumbersome tasks when creating interactive Web sites and applications is managing the values passed to the server from HTML form controls, and maintaining the values in these controls between page requests. So one of the core aims of ASP+ is to simplify this programming task. This involves no extra effort on the part of the programmer, and works fine on all browsers that support basic HTML and above.

Take a look at the following section of code. This creates a simple form using HTML controls where the user can enter the name of a computer and select an operating system. OK, so this isn't a terribly exciting example in itself, but it illustrates a pretty common scenario used by almost every web application out there today. When the form page is submitted to the server, the values the user selected are extracted from the Request.Form collection and displayed with the Response.Write method.

```
<html>
  <body>
    <%
    If Len(Request.Form("selOpSys")) > 0 Then
      strOpSys = Request.Form("selOpSys")
      strName = Request.Form("txtName")
      Response.Write "You selected ”" & strOpSys _
                    & "’ for machine ”" & strName & "’."
    End If
    %>
    <form action="pageone.asp" method="post">
      Machine Name:
      <input type="text" name="txtName">
      <p />
      Operating System:
      <select name="selOpSys" size="1">
        <option>Windows 98</option>
        <option>Windows NT</option>
        <option>Windows 2000</option>
        <option>Windows XP</option>
      </select>
      <p />
      <input type="submit" value="Submit">
    </form>
  </body>
```

```
</html>
```

Although this is an ASP page (the file extension is .asp rather than .aspx), it will work just the same under ASP+ if we changed the extension to .aspx. Remember that the two systems can quite freely co-exist on the same machine, and the file extension just determines whether ASP or ASP+ processes it.

When the user clicks the Submit button to send the values to the server, the page is reloaded showing the selected values. Of course, in a real application, some the values would probably be stored in a database, or be used to perform some application-specific processing.

One problem is that the page does not maintain its state, in other words the controls return to their default values. The user has to re-enter them to use the form again.

To get round this situation, we have to add extra ASP code to the page to insert the values into the controls when the page is reloaded. For the text box, this is just a matter of setting the value attribute with some inline ASP code, using the HTMLEncode method to ensure that any non-legal HTML characters are properly encoded. However, for the <select> list, we have to do some work to figure out which value was selected, and add the selected attribute to that particular <option> element.

```
<html>
  <body>
    <%
    If Len(Request.Form("selOpSys")) > 0 Then
      strOpSys = Request.Form("selOpSys")
      strName = Request.Form("txtName")
      Response.Write "You selected ‛" & strOpSys _
                          & "' for machine ‛" & strName & "'."
    End If
    %>
    <form action="pageone.asp" method="post">
      Machine Name:
      <input type="text" name="txtName"
              value="<% = Server.HTMLEncode(Request("txtName")) %>">
      <p />
      Operating System:
      <select name="selOpSys" size="1">
        <option
        <% If strOpSys = "Windows 98" Then Response.Write " selected" %>
        >Windows 98</option>
        <option
        <% If strOpSys = "Windows NT4" Then Response.Write " selected" %>
        >Windows NT4</option>
        <option
        <% If strOpSys = "Windows 2000" Then Response.Write " selected" %>
```

```
            >Windows 2000</option>
          </select>
          <p />
          <input type="submit" value="Submit">
        </form>
      </body>
    </html>
```

Now, when the page is reloaded, the controls maintain their state and show the values the user selected:

So, how does ASP+ help us in this commonly met situation? The next listing shows the changes required for taking advantage of ASP+ server controls that automatically preserve their state. We still use the Response.Write method to display the selected values. However, this time some of the elements on the page have the special runat= “server” attribute added to them. When ASP+ sees these elements, it processes them on the server and creates the appropriate HTML output for the client:

```
<html>
  <body>
    <%
    If Len(Request.Form("selOpSys")) > 0 Then
      strOpSys = Request.Form("selOpSys")
      strName = Request.Form("txtName")
      Response.Write("You selected ‟" & strOpSys _
                        & "’ for machine ‟" & strName & "’.")
    End If
    %>
   <form runat="server">
      Machine Name:
      <input type="text" id="txtName" runat="server">
      <p />
      Operating System:
      <select id="selOpSys" size="1" runat="server">
        <option>Windows 98</option>
        <option>Windows NT4</option>
        <option>Windows 2000</option>
      </select>
      <p />
      <input type="submit" value="Submit">
    </form>
  </body>
</html>
```

Lesson 37　Digital Family

Reading Materials A

Digital Camcorder[1]

Ever since home movie cameras[2] were invented, people have been pointing them at one another and asking family and friends to do something amusing. And right from the start, people have been bored silly watching movies of others not doing anything amusing. Fortunately, the latest digital video cameras[3] make shooting and editing a movie as simple as using a word processor, so it's easy to cut out the boring stuff and just show the priceless part where Uncle Bob trips over the cat and falls into the swimming pool.

Like their analog predecessors, digital camcorders use videotape (most camcorders use a format called MiniDV), but because the content is digital you can then edit it on a computer, a far easier task than editing an analog tape or (heaven forfend[4]) cutting and splicing movie film. And there's more: You can output your masterwork to tape or DVD with no loss of quality. To do all this, you'll need a digital camcorder, a FireWire (IEEE 1394) interface on your PC, and a video-editing program.

You'll soon see camcorders that store video on memory cards: Panasonic recently launched a camcorder that can record video to a Secure Digital memory card. This camera records video at a much lower resolution than a MiniDV camcorder, however, so it will be some time before memory cards start supplanting[5] videotapes as the most convenient way to record video.

Key Features

Screen: Having a large LCD screen built into the camcorder lets you more easily see what you're recording and facilitates playback previews. Be careful—some screens don't work well in bright sunlight, one environment in which you'll often be using the camcorder. Most camcorders come with both an LCD screen and a viewfinder, and it's nice to have the option to use either. The viewfinder can be useful if you can't see the screen in bright daylight; it also uses less power than the screen, extending the camcorder battery's life.

Lens: Every camcorder comes with a zoom lens[6] that allows you to get close-ups of your subject. Camcorder manufacturers tend to advertise their products' incredible zoom capabilities, but they don't always distinguish clearly between the two types of zoom: digital and optical. With a digital zoom, the camcorder enlarges part of the image to fill the screen, leading to grainy, pixelated, and generally

---

1 camcorder **可携式摄像机**
2 movie camera **电影摄影机**
3 video camera **摄像机**
4 heaven forfend <**口**>**但愿不会如此；千万不要这样**
5 supplant **代替**
6 zoom lens **变焦距镜头**

Reading Materials B

DVD

After a lifespan of ten years, during which time the capacity of hard disks increased a hundred-fold, the CD-ROM finally got the facelift it required to take it into the next century when a standard for DVD, initially called digital video disc but eventually known as digital versatile disc, was finally agreed during 1996.

The movie companies immediately saw a big CD as a way of stimulating the video market, producing better quality sound and pictures on a disc that costs considerably less to produce than a VHS tape. Using MPEG-2 video compression, the same system that will be used for digital TV, satellite and cable transmissions, it is quite possible to fit a full-length movie onto one side of a DVD disc. The picture quality is as good as live TV and the DVD-Video disc can carry multi-channel digital sound.

For computer users, however, DVD means more than just movies, and whilst DVD-Video grabbed most of the early headlines, it was through the sale of DVD-ROM drives that the format made a bigger immediate impact in the marketplace. In the late-1990s computer-based DVD drives outsold home DVD-Video machines by a ratio of at least 5:1 and, thanks to the enthusiastic backing of the computer industry in general and the CD-ROM drive manufacturers in particular, by early in the new millennium there were more DVD-ROM drives in use than CD-ROM drives.

Initially, the principal application to make use of DVD's greater capacity has been movies. However, the need for more capacity in the computer world is obvious to anyone who already has multi-CD games and software packages. With modern-day programs fast outgrowing CD, the prospect of a return to the multiple disc sets which had appeared to gone away for ever when CD-ROM took over from floppy disc was looming ever closer. The unprecedented storage capacity provided by DVD lets application vendors fit multiple CD titles (phone databases, map programs, encyclopedias) on a single disc, making them more convenient to use. Developers of edutainment and reference titles are also free to use video and audio clips more liberally. And game developers can script interactive games with full-motion video and surround-sound audio with less fear of running out of space.

Formats

Not unlike the different flavors of CDs, there are five physical formats, or books, of DVD:

DVD-ROM is a high-capacity data storage medium

DVD-Video is a digital storage medium for feature-length motion pictures

DVD-Audio is an audio-only storage format similar to CD-Audio

DVD-R offers a write-once, read-many storage format akin to CD-R

DVD-RAM was the first rewritable (erasable) flavor of DVD to come to market and has subsequently found competition in the rival DVD-RW and DVD+RW format.

With the same overall size as a standard 120mm diameter, 1.2mm thick CD, DVD discs provide up to 17 GB of storage with higher than CD-ROM transfer rates and similar to CD-ROM access times and come in four versions:

DVD-5 is a single-sided single-layered disc boosting capacity seven-fold to 4.7GB

DVD-9 is a single-sided double-layered disc offering 8.5GB

DVD-10 is a 9.4GB dual-sided single-layered disc

DVD-18 will increase capacity to a huge 17GB on a dual-sided dual-layered disc.

The first commercial DVD-18 title, The Stand, was released in October 1999. However, given how long it took for production of dual-layer, single-sided discs to become practical, it is difficult to forecast how long it'll be before the yields of DVD-18 discs will meet the replication demands of mainstream movie distribution, especially since low yields mean higher replication costs. It's likely that a DVD-14 format—two layers on one side, one layer on the other side—will be seen in the interim, since they're somewhat easier to produce.

It is important to recognize that in addition to the five physical formats, DVD also has a number of application formats, such as DVD-Video and DVD-Audio. The Sony PlayStation2 game console is an example of a special application format.

Lesson 38 PDA

Reading Materials A

PDA[1] Overview

Introduction

In 1996 Palm Computing, Inc.—then a part of US Robotics—led the resurgence of handheld computing with the introduction of its Pilot 1000 and Pilot 5000 devices. Designed as companion products to personal computers, Palm PDAs enable mobile users to manage their schedules, contacts and other critical personal and business information on their desktops and remotely. They automatically synchronize their information with a personal computer locally or over a local or wide area network at the touch of a button. Their most distinguishing features include shirt-pocket size, an elegant graphical user interface and an innovative desktop docking[2] cradle which facilitates two-way synchronization[3] between the PC and organizer.

The Pilot devices introduced the 'palm-sized' form factor, the early devices being about the size of a deck of playing cards and weighing around 155g. By 1999 sizes had become smaller still, the Palm V weighing in at 115g at a size of 115 mm×77 mm×10 mm. At that time devices were equipped with a 160×160 pixel backlit screen and came complete with a comprehensive suite of PIM software including date book, address book, to-do list, expense management software, calculator, note-taking applications and games. The software bundle also included an enhanced version of Palm Computing's award-winning Graffiti power writing software, which enables users to enter data at up to 30 words a minute with 100 percent accuracy. Its ease of use and functionality have made it the de facto standard[4] in the handheld computing market.

By the end of 1999—by which time it had first been subsumed into 3Com and subsequently spun off from its parent into an independent company—Palm Computing had consolidated its market leadership position with the launch of its much anticipated Palm VII device, adding wireless access to the Internet to the familiar suite of PIM applications. Several Web content providers collaborated with Palm to offer 'web-clipped' versions of their sites—designed specifically for the Palm—for easy download. With sales of Palm devices estimated to rise to 13 million by the year 2001 it looked as though Palm Computing was set to dominate the palm-size segment of the PDA market for some time yet.

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1 PDA (Personal Digital Assistant) 个人数字助理
2 docking 入坞（图形用户界面中，指可分离的工具箱放入窗口边界上的正常位置）
3 synchronization 同步
4 de facto standard 事实上的标准

Technology

Although the choice of PDA device is increasing all the time, the struggle for dominance in the operating system space continues to be a battle between just two protagonists:

Windows CE

PalmOS

It was not only hardware companies that were prompted to enter the PDA market by Psion's decade of success. Microsoft—sensing an opportunity that was too good to miss—also entered the fray with Windows CE, its first purpose-built embedded operating system. At the time of its launch in the autumn of 1996, 40-odd companies signaled their support with the promise of developing CE-compatible hardware or software. However, the first CE devices were not well received, owing to limitations of the operating system and battery-hungry hardware. Despite improvements, and in the face of growing support for the rival PalmOS, CE has continued to lose partners—including big names such as NEC, Motorola and Philips—and momentum.

The original CE 1.0 supported monochrome[1] devices. However, color displays have been supported since the CE 2.0 version and this could prove to be an important factor in Microsoft's favor in the battle for market share—at least in the short term. Support for RISC[2]-based processors was added in version 2.1.

Many feel that CE's major flaw stems from Microsoft's decision to mimic the look and feel of the traditional Windows GUI[3] on a much smaller form factor. The consequence is an OS that is simply too complex for PDA class devices, notwithstanding the fact that CE's scaleable architecture allows companies to use the modules they need rather than taking the entire system, including the GUI, which can be separated from the core CE kernel. Microsoft has sought to address the problem by evolving CE into two variants—the Handheld PC Pro (H/PC Pro) being designed for keyboard-based PDAs and the Palm PC (P/PC) version for palm devices. The company is hoping that the simplified GUI in the forthcoming CE 3.0 palm version, codenamed Rapier and due in early 2000, will help jump-start interest in CE. In this version certain icons and functions are more accessible in menus than they are in Wyvern, the current version of the GUI.

Reading Materials B

PDA Features

Personal digital assistants (PDAs) are one of the fastest selling consumer devices in history. That popularity means that there are many models to choose from. You should first ask yourself "What do I need my PDA for?" and "How much can I afford to spend on a PDA?" The answers to these questions will help you find the right model.

---

1 monochrome **单色，单色的**
2 RISC (Reduction Instruction Set Computer) **精简指令集计算机**
3 GUI (Graphics User Interface) **图形用户界面**

Size

Do you want a PDA that you can carry in your briefcase or in your pocket? PDAs come in hand-held or palm-sized models. The hand-held computers tend to be larger than the palm-sized. Most, but not all, palm-sized PDAs can fit into a shirt pocket. Also, PDAs vary in their weight from 4 to 8 ounces (113 to 227 grams).

Type of Data Entry

Which type of data entry do you prefer? Most hand-held PDAs use a miniature keyboard for data entry. Often the keyboards are too small for easy or comfortable typing. In contrast, palm-sized PDAs use a stylus/touch-screen technology in combination with hand-writing recognition software. This involves learning some shorthand alphabet, such as Palm's Graffiti, which can take some time to master fully.

Operating System

This is one of the most important decisions to make! It is the PDA equivalent to "Should I buy an Apple Macintosh or IBM PC/PC clone?" The operating system used by PDAs are one of two types, Palm OS (3Com) or PocketPC (formerly called Windows CE, Microsoft). Palm OS takes up less memory, runs faster, and is easier to use. PocketPC easily supports color displays, graphics, standard Windows packages (Word, Excel), and other devices (e.g., built-in MP3 players, MPEG movie players); however, PocketPC takes up more memory, is slower, and more complicated to use. However, if it is important to be able to exchange files with Windows packages, then PocketPC might be a better choice. As of this writing, Palm OS dominates the market because its operating system is specifically tailored to the basic uses of a PDA. However, PocketPC is challenging Palm OS, and third-party software developers exist for both operating systems.

Display

All PDAs have LCD displays. PDA displays have the following features:

Color vs. monochrome—Most PDAs are black-white (16 gray scales), but some have colors (65,536). PDAs with color screens need more memory and tend to be more expensive.

Pixel resolution—PDAs have various pixel resolutions (160x160, 240x320). The higher the resolution, the clearer the display.

Passive or active matrix—active matrix displays have sharper images and are easier to read, but tend to be more expensive

Reflective or backlit—backlit screens are good for low level room lighting conditions

Size—Hand-held PDAs tend to have larger screens. Most palm-sized PDAs have four-inch (10 cm) square screens.

Writing area—Some PDAs only allow you to write in special areas of the screen, while others allow you to write anywhere

Memory

All PDAs use solid-state memory, usually Flash memory; some are even incorporating removable forms of memory. PDAs usually come with 2 MB minimum of memory. One megabyte of memory can store up to 4000 addresses and 100 E-mail messages. However, many application programs take up memory space, so higher models of PDAs usually have more memory (5 to 32 MB). Also, PocketPC takes more memory space, so PDAs with this operating system usually have 16 or 32 MB. In some PDA models, the amount of memory is upgradeable.

Power Supply

PDAs are powered by batteries. Some models use alkaline (AAA) batteries, while others use rechargeable batteries (lithium, nickel-cadmium, nickel-metal hydride). The battery life depends upon the following:

operating system—PocketPC requires more power by virtue of its increased memory requirements

amount of memory

color LCD displays

special features (voice recording, MP3 player, wireless connections)

Therefore, battery life can vary from two hours to two month, depending upon the PDA model and its features. Most PDAs have power management systems in place to extend the battery life. Even if the batteries are so low you can no longer turn the machine back on (it will give you plenty of warning before this happens), there's usually enough power to keep the RAM refreshed. If the batteries do run completely out of juice, or you take them out of the machine, you'll have about a minute to replace them before the transistors inside the device lose their charge. PDAs also come with AC adapters to run off household electric current. In some models, an AC adapter is not included, but rather is sold separately.

Communication

Because PDAs are designed to work in tandem with your desktop or laptop, they need to work with the same information in both places. If you make an appointment on your PC, you need to transfer it to your PDA; if you jot down a phone number on your PDA you'll want to upload it later to your PC. So, any PDA must be able to communicate with a PC. The communication between PDA and PC is referred to as "data synchronization" or "syncing." This is typically done through a serial or USB port on the PDA. Some PDAs have a "cradle" that they sit in while hooked up to the PC. This feature is typically standard on all PDAs with the only choice being serial or USB port.

In addition to communicating through a cable, many PDAs have an infra-red communications port that uses infra-red (IR) light to beam information to another PDA or PC (the PC must have a receiving IR sensor!). Some PDAs also offer wireless methods to transfer data to and from a PC/PC network through a wireless E-mail Internet service provider like those available on new models of cell phones. Finally, some PDAs offer telephone modem accessories to transfer files to and from a PC/PC network. Check the model to see if any of these features are standard or require extra devices.

Special Features

Some PDAs have special features such as:

E-mail

Word processing

MP3 music files

MPEG movie files

Wireless Internet

Video games

GPS receiver

Software

All PDAs come with some kind of personal information management (PIM) software for the following tasks:

store contact information (names, addresses, phone numbers, E-mail addresses)

make task or to-do lists

take notes

write memos

keep track of appointments (date book, calendar)

remind you of appointments (clock, alarm functions)

plan projects

do calculations

keep track of expenses

However, not all of these functions are included in every package, so check this before you buy. Also, make sure that your PC has similar software so that you can easily exchange information between your PDA and PC. Sometimes, PC PIM software is included with the PDA software. Additional specialty software may also be available, including maps, video games, and photo editing software.

Lesson 39 Virus

Reading Materials A

How Computer Viruses Work

Computer viruses are mysterious and grab our attention. On the one hand, viruses show us how vulnerable[1] we are. A properly engineered virus can have an amazing effect on the worldwide Internet. On the other hand, they show how sophisticated and interconnected human beings have become. For example, the Melissa virus—which became a global phenomenon in March 1999—was so powerful that it forced Microsoft and a number of other very large companies to completely turn off their E-mail systems until the virus could be contained[2]. The ILOVEYOU virus in 2000 had a similarly devastating effect. That's pretty impressive when you consider that the Melissa and ILOVEYOU viruses are incredibly simple.

Types of Infection[3]

When you listen to the news, you hear about many different forms of electronic infection. The most common are:

Viruses—A virus is a small piece of software that piggybacks[4] on real programs. For example, a virus might attach itself to a program such as a spreadsheet program. Each time the spreadsheet program runs, the virus runs, too, and it has the chance to reproduce (by attaching to other programs) or wreak havoc[5].

E-mail viruses—An E-mail virus moves around in E-mail messages, and usually replicates[6] itself by automatically mailing itself to dozens of people in the victim's E-mail address book.

Worms[7]—A worm is a small piece of software that uses computer networks and security holes to replicate itself. A copy of the worm scans the network for another machine that has a specific security hole. It copies itself to the new machine using the security hole, and then starts replicating from there, as well.

Trojan horses[8]—A Trojan horse is simply a computer program. The program claims to do one thing (it may claim to be a game) but instead does damage when you run it (it may erase your hard disk). Trojan horses have no way to replicate automatically.

How They Spread

Early viruses were pieces of code attached to a common program like a popular game or a popular

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[1] vulnerable **易受攻击的**
[2] contain **这里的意思是"控制"**
[3] infection **感染**
[4] piggybacks **使与更大（或重要）的东西一起运行**
[5] wreak havoc **造成大破坏**
[6] replicate **复制**
[7] worm **蠕虫**
[8] Trojan horses **特洛伊木马**

word processor. A person might download an infected game from a bulletin board[1] and run it. A virus like this is a small piece of code embedded in a larger, legitimate[2] program. Any virus is designed to run first when the legitimate program gets executed. The virus loads itself into memory and looks around to see if it can find any other programs on the disk. If it can find one, it modifies it to add the virus's code to the unsuspecting program. Then the virus launches the "real program." The user really has no way to know that the virus ever ran. Unfortunately, the virus has now reproduced itself, so two programs are infected. The next time either of those programs gets executed, they infect other programs, and the cycle continues.

If one of the infected programs is given to another person on a floppy disk, or if it is uploaded to a bulletin board, then other programs get infected. This is how the virus spreads.

The spreading part is the infection phase of the virus. Viruses wouldn't be so violently despised if all they did was to replicate themselves. Unfortunately, most viruses also have some sort of destructive attack phase where they do some damage. Some sort of trigger will activate the attack phase, and the virus will then "do something" —anything from printing a silly message on the screen to erasing all of your data. The trigger might be a specific date, or the number of times the virus has been replicated, or something similar.

As virus creators got more sophisticated, they learned new tricks. One important trick was the ability to load viruses into memory so they could keep running in the background as long as the computer remained on. This gave viruses a much more effective way to replicate themselves. Another trick was the ability to infect the boot sector[3] on floppy disks and hard disks. The boot sector is a small program that is the first part of the operating system that the computer loads. The boot sector contains a tiny program that tells the computer how to load the rest of the operating system. By putting its code in the boot sector, a virus can guarantee it gets executed. It can load itself into memory immediately, and it is able to run whenever the computer is on. Boot sector viruses can infect the boot sector of any floppy disk inserted in the machine, and on college campuses where lots of people share machines they spread like wildfire.

In general, both executable and boot sector viruses are not very threatening any more. The first reason for the decline has been the huge size of today's programs. Nearly every program you buy today comes on a compact disc. Compact discs cannot be modified, and that makes viral infection of a CD impossible. The programs are so big that the only easy way to move them around is to buy the CD. People certainly can't carry applications around on a floppy disk like they did in the 1980s, when floppies full of programs were traded like baseball cards. Boot sector viruses have also declined because operating systems now protect the boot sector.

Both boot sector viruses and executable viruses are still possible, but they are a lot harder now and they don't spread nearly as quickly as they once could. Call it "shrinking habitat," if you want to use a biological analogy. The environment of floppy disks, small programs and weak operating systems made these viruses possible in the 1980s, but that environmental niche has been largely eliminated by huge executables, unchangeable CDs and better operating system safeguards.

---

[1] bulletin board **公告牌，布告板**

[2] legitimate **正规的**

[3] boot sector **引导扇区**

An Ounce of Prevention

You can protect yourself against viruses with a few simple steps:

If you are truly worried about traditional (as opposed to E-mail) viruses, you should be running a secure operating system like UNIX or Windows NT. You never hear about viruses on these operating systems because the security features keep viruses (and unwanted human visitors) away from your hard disk.

If you are using an unsecured operating system, then buying virus protection software is a nice safeguard.

If you simply avoid programs from unknown sources (like the Internet), and instead stick with commercial software purchased on CDs, you eliminate almost all of the risk from traditional viruses. In addition, you should disable floppy disk booting—most computers now allow you to do this, and that will eliminate the risk of a boot sector virus coming in from a floppy disk accidentally left in the drive.

You should make sure that Macro Virus[1] Protection is enabled in all Microsoft applications, and you should NEVER run macros in a document unless you know what they do. There is seldom a good reason to add macros to a document, so avoiding all macros is a great policy.

In the case of the ILOVEYOU E-mail virus, the only defense is a personal discipline. You should never double-click on an attachment that contains an executable that arrives as an E-mail attachment. Attachments that come in as Word files (.DOC), spreadsheets (.XLS), images (.GIF and .JPG), etc., are data files and they can do no damage (noting the macro virus problem in Word and Excel documents mentioned above). A file with an extension like EXE, COM or VBS is an executable, and an executable can do any sort of damage it wants. Once you run it, you have given it permission to do anything on your machine. The only defense is to never run executables that arrive via E-mail.

Reading Materials B

Trojans and Worms

Trojans

Like the horse, a Trojan program is a delivery vehicle; a program that does something undocumented which the programmer intended, but that the user would not approve of if she/he knew about it. The Trojan program appears to be a useful program of some type, but when a certain event occurs, it does something nasty and often destructive to the system.

Most of the “classic” Trojan programs were delivered to users on disks which advertised themselves as something useful. As an example, a disk that was supposed to contain Aids information was once distributed. Unfortunately, when a program on the disk was run the user’s hard disk was encrypted and rendered useless. Many newer Trojan programs make their way to you as E-mail attachments.

There have been many Trojan programs and new ones crop up every day. It’s important to know and

[1] macro virus 宏病毒

trust the source of any program you receive because most anti-virus programs can't detect new Trojans. These programs, while potentially destructive, still use common DOS/ Windows commands and any attempt to trigger an alert on these commands would result in massive false alarms.

Some anti-virus programs will include Trojans once they are circulating; but by then it may be too late for you.

Two special Trojan threats need to be mentioned for historical perspective:

ANSI Bomb (rare today)

Early text computer applications would sometimes make use of a DOS driver called ANSI.SYS to control display colors and other computer functions. As provided in DOS, ANSI.SYS also has the capability of remapping the keyboard. In order to do this all a user had to do was to load ANSI.SYS in the CONFIG.SYS file and then force a particular sequence of characters, starting with the Escape key, to the screen. These would be intercepted by ANSI.SYS and the particular key on the keyboard would then be remapped to perform some defined function.

In the case of an ANSI bomb a Trojan would send a keystroke remapping sequence that might, for example, remap the F1 key to issue a command that might delete everything on the C: drive (or any other unwanted command). The solution, of course, is to not use ANSI.SYS in your CONFIG.SYS file (it's almost never necessary today) and make certain any ANSI simulators you might use as part of a communications program do not implement keyboard remapping.

Windows Help Macros (rare but demonstrated)

The Windows Help file format allows various macros to be attached to Windows Help files. These macros can be set to run when the Help file first starts and, right now, there is no way to prevent this from happening. These macros can contain unwanted actions. As of this writing, the only example of this makes changes to your Windows INI files; but, other actions are possible. One researcher has postulated a possible Help file virus, but in looking at what would be necessary to create such a virus (it's not entirely clear it's even possible) Computer Knowledge feels the possibility of one in the wild is remote at best. Anti-virus programs do not generally protect against Windows Help file attacks at the moment so current backups are very important!

Some researchers consider a virus a particular case of a Trojan horse; others believe that if a virus does not do any deliberate damage it cannot be classed as a Trojan. In common use, most people use Trojan to refer to a non-replicating malicious program.

Worm

A worm is a self-reproducing program that does not infect other programs as a virus will, but instead creates copies of itself, and these create even more copies.

Worms are usually seen on networks and on multi-processing operating systems, where the worm will create copies of itself that are also executed. Each new copy will create more copies quickly clogging the system.

The so-called ARPANET/INTERNET "virus" was actually a worm. It created copies of itself through the network, eventually bringing the network to its knees. It did not infect other programs as a virus would, but simply kept creating copies of itself that would then execute and try to spread to other machines.

Some newer macro viruses also send their infected documents over the Internet to others who then infect their systems and spread the virus further. Some have classed these as worms. However, because these programs require a host in order to spread (even though they send themselves and the host over a network), most anti-virus researchers put these beasts into the virus category. But, you can see where distinctions between categories can get blurred.

The newer script worms don't help clarify the classification issue. Many of these are sent as a VisualBasic Script (VBS) file attached to an E-mail message. If you click on the attachment to open it the script runs and will often send the script to addresses in your E-mail address book; thus spreading itself. Technically, these would be worms but are often called viruses.

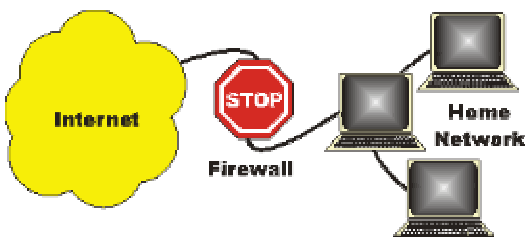
Lesson 40　Firewall

Reading Materials A

How Firewalls[1] Work

If you have been using the Internet for any length of time, and especially if you work at a larger company and browse the Web while you are at work, you have probably heard the term firewall used. For example, you often hear people in companies say things like, “I can’t use that site because they won’t let it through the firewall.”

If you have a fast Internet connection into your home (either a DSL connection or a cable modem[2]), you may have found yourself hearing about firewalls for your home network as well. It turns out that a small home network has many of the same security issues that a large corporate network does. You can use a firewall to protect your home network and family from offensive Web sites and potential hackers[3].



Basically, a firewall is a barrier to keep destructive[4] forces away from[5] your property. In fact, that’s why it is called a firewall. Its job is similar to a physical firewall that keeps a fire from spreading from one area to the next.

What It Does

A firewall is simply a program or hardware device that filters[6] the information coming through the Internet connection into your private network or computer system. If an incoming packet of information is flagged[7] by the filters, it is not allowed through.

Let’s say that you work at a company with 500 employees. The company will therefore have hundreds

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1 Firewalls **防火墙**
2 cable modem　**线缆调制解调器**
3 hacker **电脑黑客**
4 destructive **破坏性的**
5 keep away from **远离**
6 filter **过滤**
7 flag **标记**

of computers that all have network cards[1] connecting them together. In addition, the company will have one or more connections to the Internet through something like T1 or T3 lines. Without a firewall in place, all of those hundreds of computers are directly accessible to anyone on the Internet. A person who knows what he or she is doing can probe those computers, try to make FTP[2] connections to them, try to make telnet[3] connections to them and so on. If one employee makes a mistake and leaves a security hole, hackers can get to the machine and exploit the hole.

With a firewall in place, the landscape is much different. A company will place a firewall at every connection to the Internet (for example, at every T1 line coming into the company). The firewall can implement security rules. For example, one of the security rules inside the company might be:

Out of the 500 computers inside this company, only one of them is permitted to receive public FTP traffic. Allow FTP connections only to that one computer and prevent them on all others.

A company can set up rules like this for FTP servers, Web servers, Telnet servers and so on. In addition, the company can control how employees connect to Web sites, whether files are allowed to leave the company over the network and so on. A firewall gives a company tremendous control over how people use the network.

Firewalls use one or more of three methods to control traffic flowing in and out of the network:

- Packet filtering[4]—packets (small chunks of data) are analyzed against a set of filters. Packets that make it through the filters are sent to the requesting system and all others are discarded.
- Proxy service[5]—Information from the Internet is retrieved by the firewall and then sent to the requesting system and vice versa.
- State inspection[6]—A newer method that doesn't examine the contents of each packet but instead compares certain key parts of the packet to a database of trusted information. Information traveling from inside the firewall to the outside is monitored for specific defining characteristics, then incoming information is compared to these characteristics. If the comparison yields a reasonable match, the information is allowed through. Otherwise it is discarded.

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[1] network card **网卡**
[2] FTP (File Transfer Protocol，**文件传送输协议**)
[3] telnet **远程登录**
[4] packet filtering **包过滤**
[5] proxy service **代理服务**
[6] state inspection **状态检测**

Reading Materials B

What Firewall Protects You From

There are many creative ways that unscrupulous people use to access or abuse unprotected computers:

- Remote login—When someone is able to connect to your computer and control it in some form. This can range from being able to view or access your files to actually running programs on your computer.
- Application backdoors—Some programs have special features that allow for remote access. Others contain bugs that provide a backdoor, or hidden access, that provides some level of control of the program.
- SMTP session hijacking—SMTP is the most common method of sending E-mail over the Internet. By gaining access to a list of E-mail addresses, a person can send unsolicited junk E-mail (spam) to thousands of users. This is done quite often by redirecting the E-mail through the SMTP server of an unsuspecting host, making the actual sender of the spam difficult to trace.
- Operating system bugs—Like applications, some operating systems have backdoors. Others provide remote access with insufficient security controls or have bugs that an experienced hacker can take advantage of.
- Denial of service—You have probably heard this phrase used in news reports on the attacks on major Web sites. This type of attack is nearly impossible to counter. What happens is that the hacker sends a request to the server to connect to it. When the server responds with an acknowledgement and tries to establish a session, it cannot find the system that made the request. By inundating a server with these unanswerable session requests, a hacker causes the server to slow to a crawl or eventually crash.
- E-mail bombs—An E-mail bomb is usually a personal attack. Someone sends you the same E-mail hundreds or thousands of times until your E-mail system cannot accept any more messages.
- Macros—To simplify complicated procedures, many applications allow you to create a script of commands that the application can run. This script is known as a macro. Hackers have taken advantage of this to create their own macros that, depending on the application, can destroy your data or crash your computer.
- Viruses—Probably the most well-known threat is computer viruses. A virus is a small program that can copy itself to other computers. This way it can spread quickly from one system to the next. Viruses range from harmless messages to erasing all of your data.
- Spam—Typically harmless but always annoying, spam is the electronic equivalent of junk mail. Spam can be dangerous though. Quite often it contains links to Web sites. Be careful of clicking on these because you may accidentally accept a cookie that provides a backdoor to your computer.
- Redirect bombs—Hackers can use ICMP to change (redirect) the path information takes by

sending it to a different router. This is one of the ways that a denial of service attack is set up.

- Source routing—In most cases, the path a packet travels over the Internet (or any other network) is determined by the routers along that path. But the source providing the packet can arbitrarily specify the route that the packet should travel. Hackers sometimes take advantage of this to make information appear to come from a trusted source or even from inside the network! Most firewall products disable source routing by default.

Some of the items in the list above are hard, if not impossible, to filter using a firewall. While some firewalls offer virus protection, it is worth the investment to install anti-virus software on each computer. And, even though it is annoying, some spam is going to get through your firewall as long as you accept E-mail.

The level of security you establish will determine how many of these threats can be stopped by your firewall. The highest level of security would be to simply block everything. Obviously that defeats the purpose of having an Internet connection. But a common rule of thumb is to block everything, then begin to select what types of traffic you will allow. You can also restrict traffic that travels through the firewall so that only certain types of information, such as E-mail, can get through. This is a good rule for businesses that have an experienced network administrator that understands what the needs are and knows exactly what traffic to allow through. For most of us, it is probably better to work with the defaults provided by the firewall developer unless there is a specific reason to change it.

One of the best things about a firewall from a security standpoint is that it stops anyone on the outside from logging onto a computer in your private network. While this is a big deal for businesses, most home networks will probably not be threatened in this manner. Still, putting a firewall in place provides some peace of mind.

Lesson 41 Encryption Technology

Reading Materials A

Introduction to Encryption

Make any enquiry about computer security, and you will almost immediately fall over the terms cryptography[1] and encryption (and also decryption), but what exactly is meant by this?

The dictionary (in my case the Oxford English), defines cryptography as hidden writing. It has been around for a very long time. The Ancient Egyptians, the Arabs and the Romans developed their own systems.

But What is It Used for?

Cryptography is used whenever someone want to send a secret message to someone else, in a situation where anyone might be able to get hold of the message and read it. It was often used by generals to send orders to their armies, or to send messages between lovers. The most famous encryption machine invented was the Enigma, used in the Second World War to send military messages.

How Does It Work?

One of the best examples of early cryptography is the Caesar cipher[2], named after Julius Caesar because he is thought to have used it even if he didn't actually invent it.

It works like this. Take a piece of paper and write along the top edge the alphabet. Take another piece of paper and do the same thing. You should then have two lines of letters like this:

ABCDEFGHIJKLMNOPQRSTUVWXYZ

ABCDEFGHIJKLMNOPQRSTUVWXYZ

Now write your message. SEND MONEY TONIGHT

Move one of your pieces of paper along to the right one or more letters so that they no longer line up. That should look like this:

ABCDEFGHIJKLMNOPQRSTUVWXYZ

YZABCDEFGHIJKLMNOPQRSTUVWX

Now every time you see a letter of your message in the top line, write down instead the letter on the bottom line.

SEND MONEY TONIGHT becomes

QCLB KMLCW RMLGEFR

What you have done is performed a cryptographic transformation (encrypted) your message. To do it you have used an algorithm (for each letter in your message, move a number of locations on in the alphabet

1 cryptography 密码术
2 cipher 密码

and write that one down instead) and a key, in this case the value 2 because we moved A two places forwards on the bottom line.

All we have to do now is make sure that the person receiving our message knows the key and the algorithm. As long as they know it's the Caesar cipher and the key is 2 they can put their lower line two places to the right, and by taking each letter of the message and writing down the letter immediately above it, they can re-create the original message.

However, if you think about it, the Caesar cipher wasn't all that brilliant. After all, it didn't have many keys. A value of zero meant that you didn't actually encrypt anything, as did 26 because it also moved A under A. An enemy, knowing that was the algorithm, therefore only had to try a relatively small number of keys before finding yours. By just trial and error he could run quickly through all 25 possible keys on just the first word. As soon as he finds a real word the system is broken.

The Symmetric Cipher

Until we started using computers, these ciphers, with very much better algorithms and much more complex keys were the order of the day. However, the basic approach to this way of creating secret messages has not really changed.

Taking our example above, the operation is as follows:

- take your message (plaintext[1]);
- take an algorithm (Caesar);
- take a key (a number between 1 and 25);
- transform the message according to the algorithm using the key.

now you have an encrypted message (ciphertext[2]). The recipient then:

- takes the encrypted message (ciphertext);
- takes the algorithm (Caesar);
- takes the same key (the same number as chosen above);
- transforms the encrypted message according to the algorithm using the key.

Now they have the original message back (plaintext). This is called a symmetric cipher because you use the same algorithm and the same key to carry out both encryption and decryption.

Strength of Encryption

The quality of the algorithm and key combination (as we saw with the Caesar cipher, making the key bigger on its own did not actually make the encryption any stronger at all) were the factors that made the strength of the system. However, until there was some automation you could not use really complex methods because it simply took too long to encrypt and decrypt[3] messages.

Thanks to computers we are now able to do these things much faster and better than Caesar, or, indeed Enigma. There are many algorithms available far harder to break than the Caesar cipher. They have strange names, such as Rijndahl, Blowfish, RC2, RC4, Triple DES, CAST. They have key sizes that are

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[1] plaintext **明语**
[2] ciphertext **密文**
[3] decrypt **解码**

enormous by comparison to our Caesar cipher.

Of course, just as computers are able to operate such powerful algorithms, computers can be harnessed to break them. The algorithm DES (Data Encryption Standard)[1] in use for many years to protect banking transactions was considered very strong until the University of Cambridge published a design for a custom machine to break the cipher in minutes, for a manufacturing cost of under $1 million. Fortunately, the algorithms mentioned above are still considered effective.

Reading Materials B

Introduction to Cryptography

Cryptography is the science of encrypting a message i.e. the process of converting an intelligible plain text into an unintelligible cipher text. The purpose of Cryptography is to conceal the meaning of a message. The main objective of cryptography is to ensure that confidential messages do not fall into the hands of undesired elements. Different cryptographic systems have been evolved over the years to cater to the need of secure transmission of confidential and important data.

Cryptographic systems use a key for encrypting a message. A key is the element that turns the general encryption algorithm into a specific method for encryption. A key is a system generated random number of large magnitude. The earliest cryptographic system employed was the substitution cipher. Here, every alphabet in the plain text is replaced by another alphabet in the cipher text, which is incomprehensible to someone who does not know the rule behind the substitution. The effectiveness of the substitution cipher lay in keeping the rule of substitution a closely guarded secret. In substitution ciphers, every letter maintains its position within the message. In transposition ciphers, every letter in the plaintext changes its position in the ciphertext, but retains its identity.

The evolution of symmetric key cryptography represented a breakthrough in the field of cryptography. Symmetric key cryptography used the same key for encryption and decryption. Hence, it is necessary for both the parties to know the key prior to the communication process. Using symmetric cryptography, it is safe to send encrypted messages without fear of interception because an interceptor is unlikely to be able to decipher the message. However, there always remains the difficult problem of how to securely transfer the key to the recipients of a message, so that they can decrypt the message. This becomes extremely difficult, when the number of communicating entities increase (Key Management problem). There is also the problem of making the key known to the right people without the rest of the world knowing it (Key Exchange problem).

There are two kinds of symmetric ciphers:

- Block ciphers.
- Stream ciphers.

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[1] DES (Data Encryption Standard) **数据加密标准**

Block Cipher is a type of Symmetric Encryption algorithm in which a block of plain text is converted into a block of cipher text of the same length. The fixed length of the block is called the block size.

Stream Cipher is a type of symmetric encryption algorithm, similar to block cipher. While block cipher operates on large blocks of data, stream cipher operates on smaller units of data called bits. Stream ciphers are faster and more reliable than block ciphers. Stream cipher generates a keystream, which is a long string of data. The keystream is combined with the plaintext using the XOR binary operator to yield the ciphertext. When the keystream is generated independent of the plaintext and ciphertext, it is called synchronous stream cipher. When the stream cipher is dependent on the plain text and encryption, it is self-synchronizing.

With symmetric cryptography, as the number of users increases on a network, the number of keys required to provide secure communications among those users increases rapidly. For example, a network of 100 users would require almost 5000 keys if it used only symmetric cryptography. Doubling such a network to 200 users increases the number of keys to almost 20,000. Thus, when only using symmetric cryptography, key management quickly becomes unwieldy even for relatively small-scale networks.

The key management and key distribution problems posed by symmetric key cryptography were solved by the advent of asymmetric key cryptography or public key cryptography. In public key cryptography, every user had a key pair.

The key pair is comprised of the public key and the private key. The public key is generally used for encryption and the private key is used for decryption. The user’s private key is stored securely on a hard disc, smart card or other tokens.

The public key is listed on the user’s digital certificate. When a communication has to be sent , the sender encrypts the message using the receiver’s public key.

The encrypted message can only be decrypted using the receiver’s private key, which by its nature, is known only to the receiver.

Since the messages encrypted with the recepient’s public key can be decrypted only with the recepient’s private key(which is accessible only to the recipient) the confidentiality of data transferred is ensured. The public key is listed on a digital certificate. Since every user has a unique key pair, the problem of key distribution and key management is solved.

The process of asymmetric encryption can be time-consuming if the message is long. To speed up the process of encryption and decryption, Zimmerman devised a way of using symmetric encryption in tandem with asymmetric encryption. The message is encrypted using a symmetric cipher like IDEA. The symmetric key is encrypted using the receiver’s public key(asymmetric encryption).On receiving the message, the receiver decrypts the IDEA key using his private key. The IDEA key is then used to decrypt the message. The advantage is that it speeds up the whole process as the message is encrypted using the fast symmetric cipher and only the short IDEA key is encrypted using the slow asymmetric cipher.

Hash functions offer one-way encryption i.e. it is impossible to get back the plain text from the cipher text. Hash functions do not involve the use of keys. Hash functions are employed in the creation of digital signatures. The message is passed through a hashing algorithm to generate the message digest. Encryption of the resultant hash with the private key results in the digital signature. This signature can be verified by the receiver by creating another hash of the message by the receiver and comparing the resulting hash with the hash obtained by decrypting the digital signature with the public key of the sender. Signature verification is confirmed when both the hash values are the same.

Since the message digest is encrypted with the sender's private key, it guarantees non-repudiation i.e. the information sent cannot be disowned. Digital signatures are employed to guarantee the ownership of an electronic document.

Lesson 42　TCP/IP

Reading Materials A

An Introduction to TCP/IP (Ⅰ)

TCP and IP were developed by a Department of Defense (DOD) research project to connect a number different networks designed by different vendors into a network of networks (the "Internet"). It was initially successful because it delivered a few basic services that everyone needs (file transfer, electronic mail, remote logon) across a very large number of client and server systems. Several computers in a small department can use TCP/IP (along with other protocols) on a single LAN. The IP component provides routing[1] from the department to the enterprise network, then to regional networks, and finally to the global Internet. On the battlefield a communications network will sustain[2] damage, so the DOD designed TCP/IP to be robust and automatically recover from any node or phone line failure. This design allows the construction of very large networks with less central management. However, because of the automatic recovery, network problems can go undiagnosed and uncorrected for long periods of time.

As with all other communications protocol, TCP/IP is composed of layers:

IP—is responsible for moving packet of data from node to node. IP forwards each packet based on a four byte destination address (the IP number). The Internet authorities assign ranges of numbers to different organizations. The organizations assign groups of their numbers to departments. IP operates on gateway machines that move data from department to organization to region and then around the world.

TCP—is responsible for verifying the correct delivery of data from client to server. Data can be lost in the intermediate[3] network. TCP adds support to detect errors or lost data and to trigger retransmission until the data is correctly and completely received.

Sockets—is a name given to the package of subroutines that provide access to TCP/IP on most systems.

Network of Lowest Bidders

The Army puts out[4] a bid[5] on a computer and DEC wins the bid. The Air Force puts out a bid and IBM wins. The Navy bid is won by Unisys. Then the President decides to invade Grenada and the armed forces discover that their computers cannot talk to each other. The DOD must build a "network" out of systems each of which, by law, was delivered by the lowest bidder on a single contract.

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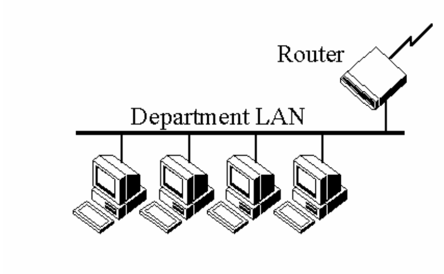
[1] routing **路由选择**
[2] sustain **这里是"遭受"的意思**
[3] intermediate **中间的**
[4] put out **提供**
[5] bid **投标的机会，出价**



The Internet Protocol was developed to create a Network of Networks (the "Internet"). Individual machines are first connected to a LAN (Ethernet or Token Ring). TCP/IP shares the LAN with other uses (a Novell file server, Windows for Workgroups peer systems). One device provides the TCP/IP connection between the LAN and the rest of the world.

To insure that all types of systems from all vendors can communicate, TCP/IP is absolutely standardized on the LAN. However, larger networks based on long distances and phone lines are more volatile. In the US, many large corporations would wish to reuse large internal networks based on IBM's SNA[1]. In Europe, the national phone companies traditionally standardize on X.25. However, the sudden explosion of high speed microprocessors, fiber optics, and digital phone systems has created a burst of new options: ISDN, frame relay, FDDI, Asynchronous Transfer Mode (ATM). New technologies arise and become obsolete within a few years. With cable TV[2] and phone companies competing to build the National Information Superhighway, no single standard can govern citywide, nationwide, or worldwide communications.

The original design of TCP/IP as a Network of Networks fits nicely within the current technological uncertainty. TCP/IP data can be sent across a LAN, or it can be carried within an internal corporate SNA network, or it can piggyback on the cable TV service. Furthermore, machines connected to any of these networks can communicate to any other network through gateways supplied by the network vendor.

Addresses

Each technology has its own convention for transmitting messages between two machines within the same network. On a LAN, messages are sent between machines by supplying the six byte unique identifier (the "MAC[3]" address). In an SNA network, every machine has Logical Units with their own network address. DECNET, Appletalk, and Novell IPX all have a scheme for assigning numbers to each local network and to each workstation attached to the network.

On top of these local or vendor specific network addresses, TCP/IP assigns a unique number to every workstation in the world. This "IP number" is a four byte value that, by convention, is expressed by converting each byte into a decimal number (0 to 255) and separating the bytes with a period. For example, the PC Lube and Tune server is 130.132.59.234.

An organization begins by sending electronic mail to Hostmaster@INTERNIC.NET requesting assignment of a network number. It is still possible for almost anyone to get assignment of a number for a

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[1] SNA (System Network Architecture) **系统网络体系结构，由** IBM **开发，主要用于大型机中**
[2] cable TV **有线电视**
[3] MAC (Media Access Control) **媒体访问控制**

small “Class C” network in which the first three bytes identify the network and the last byte identifies the individual computer. The author followed this procedure and was assigned the numbers 192.35.91.* for a network of computers at his house. Larger organizations can get a “Class B” network where the first two bytes identify the network and the last two bytes identify each of up to 64 thousand individual workstations. Yale’s Class B network is 130.132, so all computers with IP address 130.132.*.* are connected through Yale.

The organization then connects to the Internet through one of a dozen regional or specialized network suppliers. The network vendor is given the subscriber network number and adds it to the routing configuration in its own machines and those of the other major network suppliers.

There is no mathematical formula that translates the numbers 192.35.91 or 130.132 into “Yale University” or “New Haven, CT.” The machines that manage large regional networks or the central Internet routers managed by the National Science Foundation can only locate these networks by looking each network number up in a table. There are potentially thousands of Class B networks, and millions of Class C networks, but computer memory costs are low, so the tables are reasonable. Customers that connect to the Internet, even customers as large as IBM, do not need to maintain any information on other networks. They send all external data to the regional carrier to which they subscribe, and the regional carrier maintains the tables and does the appropriate routing.

Reading Materials B

An Introduction to TCP/IP (Ⅱ)

Subnets

Although the individual subscribers do not need to tabulate network numbers or provide explicit routing, it is convenient for most Class B networks to be internally managed as a much smaller and simpler version of the larger network organizations. It is common to subdivide the two bytes available for internal assignment into a one byte department number and a one byte workstation ID.

The enterprise network is built using commercially available TCP/IP router boxes. Each router has small tables with 255 entries to translate the one byte department number into selection of a destination Ethernet connected to one of the routers. Messages to the PC Lube and Tune server (130.132.59.234) are sent through the national and New England regional networks based on the 130.132 part of the number. Arriving at Yale, the 59 department ID selects an Ethernet connector in the C& IS building. The 234 selects a particular workstation on that LAN. The Yale network must be updated as new Ethernets and departments are added, but it is not effected by changes outside the university or the movement of machines within the department.

An Uncertain Path

Every time a message arrives at an IP router, it makes an individual decision about where to send it next. There is concept of a session with a preselected path for all traffic. Consider a company with facilities in New York, Los Angeles, Chicago and Atlanta. It could build a network from four phone lines forming a loop (NY to Chicago to LA to Atlanta to NY). A message arriving at the NY router could go to LA via either Chicago or Atlanta. The reply could come back the other way.

How does the router make a decision between routes? There is no correct answer. Traffic could be routed by the "clockwise" algorithm (go NY to Atlanta, LA to Chicago). The routers could alternate, sending one message to Atlanta and the next to Chicago. More sophisticated routing measures traffic patterns and sends data through the least busy link.

If one phone line in this network breaks down, traffic can still reach its destination through a roundabout path. After losing the NY to Chicago line, data can be sent NY to Atlanta to LA to Chicago. This provides continued service though with degraded performance. This kind of recovery is the primary design feature of IP. The loss of the line is immediately detected by the routers in NY and Chicago, but somehow this information must be sent to the other nodes. Otherwise, LA could continue to send NY messages through Chicago, where they arrive at a "dead end." Each network adopts some Router Protocol which periodically updates the routing tables throughout the network with information about changes in route status.

If the size of the network grows, then the complexity of the routing updates will increase as will the cost of transmitting them. Building a single network that covers the entire US would be unreasonably complicated. Fortunately, the Internet is designed as a Network of Networks. This means that loops and redundancy are built into each regional carrier. The regional network handles its own problems and reroutes messages internally. Its Router Protocol updates the tables in its own routers, but no routing updates need to propagate from a regional carrier to the NSF spine or to the other regions (unless, of course, a subscriber switches permanently from one region to another).

Undiagnosed Problems

IBM designs its SNA networks to be centrally managed. If any error occurs, it is reported to the network authorities. By design, any error is a problem that should be corrected or repaired. IP networks, however, were designed to be robust. In battlefield conditions, the loss of a node or line is a normal circumstance. Casualties can be sorted out later on, but the network must stay up. So IP networks are robust. They automatically (and silently) reconfigure themselves when something goes wrong. If there is enough redundancy built into the system, then communication is maintained.

In 1975 when SNA was designed, such redundancy would be prohibitively expensive, or it might have been argued that only the Defense Department could afford it. Today, however, simple routers cost no more than a PC. However, the TCP/IP design that, "Errors are normal and can be largely ignored," produces problems of its own.

Data traffic is frequently organized around "hubs," much like airline traffic. One could imagine an IP router in Atlanta routing messages for smaller cities throughout the Southeast. The problem is that data arrives without a reservation. Airline companies experience the problem around major events, like the Super Bowl. Just before the game, everyone wants to fly into the city. After the game, everyone wants to fly out. Imbalance occurs on the network when something new gets advertised. Adam Curry announced the server at "mtv.com" and his regional carrier was swamped with traffic the next day. The problem is that messages come in from the entire world over high speed lines, but they go out to mtv.com over what was then a slow speed phone line.

Occasionally a snow storm cancels flights and airports fill up with stranded passengers. Many go off to hotels in town. When data arrives at a congested router, there is no place to send the overflow. Excess packets are simply discarded. It becomes the responsibility of the sender to retry the data a few seconds later and to persist until it finally gets through. This recovery is provided by the TCP component of the Internet protocol.

TCP was designed to recover from node or line failures where the network propagates routing table changes to all router nodes. Since the update takes some time, TCP is slow to initiate recovery. The TCP algorithms are not tuned to optimally handle packet loss due to traffic congestion. Instead, the traditional Internet response to traffic problems has been to increase the speed of lines and equipment in order to say ahead of growth in demand.

TCP treats the data as a stream of bytes. It logically assigns a sequence number to each byte. The TCP packet has a header that says, in effect, “This packet starts with byte 379642 and contains 200 bytes of data.” The receiver can detect missing or incorrectly sequenced packets. TCP acknowledges data that has been received and retransmits data that has been lost. The TCP design means that error recovery is done end-to-end between the Client and Server machine. There is no formal standard for tracking problems in the middle of the network, though each network has adopted some ad hoc tools.

Need to Know

There are three levels of TCP/IP knowledge. Those who administer a regional or national network must design a system of long distance phone lines, dedicated routing devices, and very large configuration files. They must know the IP numbers and physical locations of thousands of subscriber networks. They must also have a formal network monitor strategy to detect problems and respond quickly.

Each large company or university that subscribes to the Internet must have an intermediate level of network organization and expertise. A half dozen routers might be configured to connect several dozen departmental LANs in several buildings. All traffic outside the organization would typically be routed to a single connection to a regional network provider.

However, the end user can install TCP/IP on a personal computer without any knowledge of either the corporate or regional network. Three pieces of information are required:

The IP address assigned to this personal computer

The part of the IP address (the subnet mask) that distinguishes other machines on the same LAN (messages can be sent to them directly) from machines in other departments or elsewhere in the world (which are sent to a router machine)

The IP address of the router machine that connects this LAN to the rest of the world.

In the case of the PCLT server, the IP address is 130.132.59.234. Since the first three bytes designate this department, a “subnet mask” is defined as 255.255.255.0 (255 is the largest byte value and represents the number with all bits turned on). It is a Yale convention (which we recommend to everyone) that the router for each department have station number 1 within the department network. Thus the PCLT router is 130.132.59.1. Thus the PCLT server is configured with the values:

My IP address: 130.132.59.234

Subnet mask: 255.255.255.0

Default router: 130.132.59.1

The subnet mask tells the server that any other machine with an IP address beginning 130.132.59.* is on the same department LAN, so messages are sent to it directly. Any IP address beginning with a different value is accessed indirectly by sending the message through the router at 130.132.59.1 (which is on the departmental LAN).

Lesson 43　Ethernet

Reading Materials A

An Introduction to Ethernet[1]

Overview

Back in the late 1600s, physicists trying to explain the behavior of light theorized that light was carried by an undetectable substance called ether[2] (not to be confused with the anesthetic[3]) that filled all space. That theory was disproved by the late 1800s, but the figurative use of the word in describing the passage of radio waves through the heavens remained. So when Xerox developed a networking system that allowed computer devices to communicate with each other using radio-like signals over antenna cable in the early 1970s, they called it Ethernet.

Technology

Ethernet is one of the most popular systems for physically connecting computer devices together to form a local area network, or LAN. Other systems that perform the same function using different methods include ARCnet[4] and Token Ring[5].

Ethernet manages the transfer of data between computer devices, and facilitates higher level networking systems like Novell Netware, AppleTalk (using Apple's EtherTalk), Microsoft Windows Network, Banyan VINES, and TCP/IP (the language of the Internet). These systems govern how data and computing resources (like printing and hard disk storage) are actually shared.

Ethernet operates on a model known as Carrier Sense Multiple Access with Collision Detection, or CSMA/CD[6]. Each device on the network is connected to a common communications channel, and any device can use the channel at any time. Each device listens to the channel for data signals which may be transmitted by other devices. If one device has data to send to another device and the channel is clear, it will transmit the data in a special format called an Ethernet frame[7]. If the channel is busy, the device waits until it is clear before trying to transmit. If by chance, two or more devices try to transmit at the same moment, the signals will collide. The collision is detected, everything stops, and after a seemingly random waiting period, one of the devices will try to transmit again. If necessary, the process will repeat until one device has uncontended use of the channel. This system works well at low-to-moderate activity levels. Ethernet's

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[1] Ethernet 以太网
[2] ether 乙醚，在本文中的意思是“以太，能媒”
[3] anesthetic 麻醉药
[4] ARCnet (Attached Resource Computer network) 连接资源计算机网，ARC 网络
[5] Token Ring 令牌环，令牌网
[6] CSMA/CD　带有冲突检测的载波侦听多路访问
[7] frame 帧

efficiency, simplicity, and flexibility make it a popular choice for applications that aren't highly active and don't have a critical need to pass data in a timely manner.

To help visualize how this works, imagine a room occupied by a group of people, all within earshot[1] of each other. If one person needs to tell another person something, he or she will wait until nobody else is talking, and then say, "Hello F3AC567B3DF2, this is F3D92A50FCAB, my message is . . ." But if two people try to talk at the same time, they will hear each other, stop talking, and eventually one person will try to speak again. The content and the language of the message itself could be anything—they may be speaking in Novell and talking about transferring a file from one computer to another. Ethernet only governs how the conversation is conducted.

The typical device on an Ethernet LAN is a microcomputer with an Ethernet adapter card installed. Other devices include print servers, which provide centralized printing (this could be a specialized device or a microcomputer acting as a print server), terminal servers, which allow ASCII terminals to use the network to reach remote hosts (OPAC terminals in many libraries are connected this way), or minicomputer or mainframe host computers. Specialized network devices include repeaters[2], which connect network segments to extend a LAN's range or connect different cable types, bridges[3], which connect different parts of a larger network and can join different kinds of LANs, and routers[4], which determine the best way to transfer data throughout a larger network.

An Ethernet LAN can take several forms. Two forms use coaxial cable[5] in what is called a bus topology[6], in which all devices are attached to a single long cable. Standard Ethernet, also known as thick net[7], uses cable that's about a half-inch thick. It is usually used to span long distances, such as for connecting several buildings on a campus-wide network. A device called a transceiver[8] is attached to the coaxial cable and a separate data cable runs between it and the Ethernet card. It is also known as 10BASE5, because it transfers data at a rate of 10 million bits per second, uses baseband transmission[9] (using the whole capacity of the channel for a single signal), and can be up to 500 meters long. 10BASE2 (or ThinNet, thin net, or cheapernet) uses cable that's about a quarter-inch thick, and can be up to 185 meters long. The bus cable is connected to the Ethernet card, which has the transceiver built in. It can be a cost-effective option for small LANs. 10BASE-T uses inexpensive unshielded twisted-pair[10] cabling (similar to telephone cable) in a star topology[11], in which each device has its own cable (up to 100 meters long) connected to a central device called a hub[12] or a concentrator[13]. 10BASE-T is extremely popular in larger LANs because it

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[1] within earshot **在听得见（……的）声的地方**
[2] repeater **中继器**
[3] bridge **网桥**
[4] router **路由器**
[5] coaxial cable **同轴电缆**
[6] bus topology **总线拓扑结构**
[7] thick net **粗缆网络**
[8] transceiver **收发器**
[9] baseband transmission **基带传输**
[10] twisted-pair **双绞线**
[11] star topology **星形拓扑结构**
[12] hub **集线器**
[13] concentrator **集中器**

is flexible and easy to troubleshoot because each individual device can be isolated. Other implementations include 10BASE-FL, which uses fiber optic cables[1] and is good for up to 2 kilometers, and 100BASE-T Fast Ethernet[2], which has a data rate of 100 megabits per second.

Reading Materials B

Ethernet FAQ

What is Ethernet?

Ethernet is the IEEE 802.3 series standard, based on the CSMA/CD access method that provides two or more stations to share a common cabling system. This access method, Carrier Sense Multiple Access with Collision Detection, is the basis for Ethernet systems which range from speeds of 1 Mb/s through 1000 Mb/s.

The design goals for Ethernet were to create a simply defined topology that made efficient use of shared resources, was easy to reconfigure and maintain, provided compatibility across many manufacturers and systems, while keeping the cost low.

What is the History of Ethernet?

The original Ethernet specification began in the early 1970's by Xerox PARC, and was eventually improved upon by Digital Equipment Corporation, Intel, and Xerox (DIX) in 1980 with the release of Ethernet Version 1. By 1982, the specification was updated and Ethernet Version 2 was released.

In 1983, Novell created their own proprietary Ethernet frame type prior to the release of the IEEE 802.3 specification. By 1985, the IEEE 802.3 specification was completed and provided a specification for Ethernet connectivity over thick coax and thin coax. In 1990, the specification was updated to include Ethernet over twisted pair copper wiring with 10Base-T. The current IEEE 802.3 specification includes thick coax, thin coax, twisted pair cabling and fiber, with speeds of 10 Mb/s, 100 Mb/s, and 1000 Mb/s.

What is CSMA/CD?

Carrier Sense Multiple Access with Collision Detection is the basis for the Ethernet standard, and this provides specific rules for allowing stations to communicate over the same transmission medium. There are a number of steps involved in communicating with CSMA/CD.

Stations must listen for a carrier on the wire. If no carrier is detected, stations can begin transmitting. While transmitting, the station continues to listen on the wire to ensure successful communications. If two stations attempt to transmit information at the same time, the transmissions overlap and cause a collision.

If a collision occurs, the transmitting station recognizes the interference on the network and transmits a bit sequence called jam. The jam helps to ensure that the other transmitting station recognizes that a collision has occurred. After a random delay, the stations attempt to retransmit the information and the

[1] fiber optic cables 光缆
[2] Fast Ethernet 快速以太网

process begins again.

What Does Baseband and Broadband Mean?

A baseband network has a single channel that is used for communication between stations. Ethernet specifications which use BASE in the name refer to baseband networks.

A broadband network is much like cable television, where different services communicate across different frequencies on the same cable. Broadband communications would allow a Ethernet network to share the same physical cable as voice or video services. 10BROAD36 is an example of broadband networking.

What is the Difference Between a Bus Topology and a Star Topology?

A bus topology is a networking architecture that is linear, usually by using one or more pieces of cable to form a single line, or bus. The signals sent by one station extend the length of this cable to be heard by other stations.

A star topology is an architecture that includes a central device or hub to connect all stations together. Signals sent by a station must pass through (and are usually regenerated) by these central hubs. Since the hub sits in the center and all other stations are linked through the hub, the architecture resembles a star.

What is an Interframe Gap?

The inteframe gap is the amount of time that is specified between frames transmitted from a workstation. The designers of the Ethernet specification arbitrarily chose 96 bit times to occur between frames from a transmitting station.

This delay is designed to provide the workstations on the Ethernet network with some 'breathing time' between frames to perform normal Ethernet housekeeping functions on the network interface card.

What is Ethernet Switching?

From a functional point of view, switching is exactly the same as bridging. However switches use specially designed hardware called Application Specific Integrated Circuits (ASICs) to perform the bridging and packet-forwarding functionality (as supposed to implementations using a central CPU and special software).

Consequently, switches are much faster than bridges. Ethernet switches also offer additional capabilities such as virtual LANs (VLANs) and full duplex connectivity.

What is a Collision, and How Many Collisions are Bad?

Ethernet networking uses collisions as one of the contention access methods. When the network carrier is not active, any station can send information. If two stations attempt to send information at the same time, the signals overlap with each other, creating a collision.

Collisions are not errors! Many people misinterpret a flashing collision light or a collision counter as a network problem! Although the term 'collision' may bring to mind a terrible crash, be assured that a collision is a normal part of Ethernet networking.

The total number of collisions that occur on a network may be related to traffic patterns or utilization.

Because of this variability of collisions, it is not applicable to define a ‘good’ or ‘bad’ level of collisions. In most cases, detailed analysis of collisions alone yields very little qualitative network health information.

What is Jam?

When a collision is recognized by a transmitting station, a bit sequence called jam is transmitted. This jam is 32 bits long, which is long enough to traverse the entire collision domain so that all transmitting stations can detect the collision.

Interestingly enough, the actual format of jam is unspecified in the 802.3 specifications. Most manufacturers have used alternating 1s and 0s as jam, which is displayed as 0x5 (0101) or 0xA (1010) depending on when the jam is captured in the data stream.

In many Fast Ethernet implementations, the jam has been seen as other arbitrary values, such as 1101000 (0xD0) or 10000110 (0x43). The reasoning for this particular jam pattern isn’t very obvious.

Lesson 44　Broadband Media Services

Reading Materials A

Broadband Media Services Technology (Ⅰ)

Just as the Internet will continue to bring people together and provide individualized services like never before, the IP network technology that enables broadband media services is rapidly improving and becoming more powerful. This section of the broadband media services tutorial will provide an overview of the network and component technology required for end-to-end[1] broadband media services provision, as well as an overview of technology standards involved in digital multimedia content creation and transmission.

Next-Generation Networks

In a truly mobile information society, traditional fixed and mobile-network[2] services, value-added services[3], and the Internet are all combined to offer seamless services for end-users. As uniform services will be available through different access points and optimized for each device (TV, PC, wireless device, etc.), seamless roaming[4] among multiple access devices will be required. Users won't have to be concerned with the underlying technologies used, but they will be concerned with being able to access the same services wherever they are and whenever they choose.

The Next-generation network, the first truly data-oriented broadband network supporting broadband media services, will be all IP, meaning all access to the network will occur via IP standards. The evolution of the broadband media services network can be characterized by six different transitions:

- Transition from a dial-up-like circuit-switched network[5] to a data-oriented[6] network.
- Transition from connectivity to service-creation platforms.
- Transition from a copper-based network towards an all-optical network.
- Convergence[7] of fixed networks.
- Convergence of mobile and fixed networks.
- Transition to IP version 6 (Ipv6) networks.

In short, next-generation networks will evolve to better reflect the requirements of broadband media services. In practice this means bringing IP and other associated network functionalities in the network closer to the customers. The DSL technology and network components that enable high-speed IP access and basic broadband media services exist today, and will remain the foundation of the next-generation

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1 end-to-end 端对端
2 fixed network 固定网络；mobile network 移动网络
3 value-added services 增值服务
4 roaming 无逢漫游
5 circuit-switched network 电路交换网络
6 data-oriented 面向数据的
7 convergence 会合，集中

broadband media services network:

The major components of a broadband IP access network and next generation broadband media services network are:

- high-speed DSL access multiplexers[1] (DSLAM) equipment, located in the operator central office (CO) and/or in remote locations close to end-users;
- broadband access servers;
- DSL modems in the home and/or office providing fixed local-area networks (LAN) and wireless LAN (WLAN) network access;
- Network- and service-management and provisioning products;
- loop management for managing DSL services in the local telecom loop;
- IP network security and authentication products for network security and user identification.

In addition to network infrastructure, network services will manage and enhance the physical network for broadband media services delivery. Broadband media services network integration services could include network capacity planning and business consulting for network optimization and interoperability[2], network installation setup and field-testing[3] trials, customer-service support and training, and network validation[4] and certification services.

Components

With the IP access network as a foundation, broadband media services—specific network enhancements are required. The broadband media services components can have varied functionality with just a minor change in the presentation of the feature, which is required for a modular and scalable solution as new services are created and consumer demand for additional services evolves. Essentially, broadband media services allows consumers to customize their viewing via network control devices. Each set of devices or "boxes" can support a unique content lineup map, which enables consumers to select and pay for only the media that interest them.

Video Encoders[5]

Video encoders are devices that create digital video. Input to the encoders can be analogue video or a Digital Video Broadcasting Group (DVB[6]) multiplex. Both are required because some video content will be statically loaded from video tapes and some content will be captured from a satellite (DVB) multiplex. Video encoders that are used to deliver broadband media services most often allow for the creation of MPEG content and have the ability to support IP multicast[7] at varying bit rates, as well as the ability to decrypt video streams to remove conditional access.

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[1] multiplexer **多路复用器**
[2] interoperability **互操作性**
[3] field-test **现场测试**
[4] validation **确认**
[5] video encoder **视频解码器**
[6] DVB (Digital Video Broadcasting) **数字视频广播**
[7] IP multicast **（IP 广播）**

Video Servers

Video servers perform two major functions. First, they act as content repositories[1] for the material being streamed. Second, they are responsible for streaming out video and audio using the desired format and network protocol. Video servers can be scaled from streaming 20 to over 5,000 simultaneous video streams. Video servers generally support several different transport protocols for video delivery.

Reading Materials B

Broadband Media Services Technology (Ⅱ)

Interactive Television Application

Interactive TV (ITV) applications consist of many different applications. The core of the system is the application framework and the data-handling capabilities of the back-end systems. Highly scalable for add-on features, the fundamental applications in an ITV system are customer relationship management (CRM) software modules that track customer usage, profiles, buying characteristics, and application subscription information and create billing events that-can be exported to various billing systems. Applications that typically run on the application framework are VOD, time-shifted TV, web access integrated with video applications, E-mail, personalized user interfaces, broadcast multichannel TV, and pay-per-view applications. Variants of these fundamental applications include channel blocking; parental controls; instant web access associated with viewing preferences for an enhanced, interactive viewing experience; video special offers; and targeted advertising.

Set Top Box and Customer Premises Equipment

The set top box and customer-premises equipment (CPE) are devices that are placed in consumer homes or offices, either as two separate devices or as one device combining the home or office gateway functionality required for broadband media services delivery to fixed and wireless devices. A set top box is an electronic device that serves as an interface between a television set and a broadband network, providing VOD and interactive multimedia services. CPE is any type of network device that sits in the home or office of the consumer, as opposed to the central network office or remote sites. User connections to broadband media services are made through modems and media terminals in the home and office, while the main infrastructure lies in the back-end networks, invisible to the end-user.

Standards

To help ensure the interoperability, modularity, and flexibility of services, network, content, and service providers are driving towards open standards for individual broadband media services. Standards forums meet regularly to enhance existing standards, incorporate new technological developments into current standards, agree on next steps for testing, and anticipate new developments that will affect standards. Some of the standards involved in broadband media services are：

[1] repository 储存库

IP

This is a standard supported by major application providers, software companies, and computer manufacturers. Since the range and variety of broadband media applications are more important with respect to commercial revenue-bearing services than any one specific application, enabling the integration of a broad range of media services and applications, IP is crucial. Without IP as a unifying protocol, the set of applications could be limited. One of the features of broadband media services is that it takes full advantage of the guarantees provided by IP access products with respect to real-time IP data delivery. The network provides real-time guaranteed IP data delivery. This clearly removes the burden of bandwidth management off the consumer applications and enables the developers of consumer applications to focus on the usability issues as well as providing an enriched user experience. IP provides the path that allows applications to evolve, independent of the transport protocols selected for broadband delivery.

IPv6

This is the new IP to replace the current version, IP version 4 (IPv4). IPv6 has been designed to meet the challenges of the growing Internet and includes several improvements over IPv4. The main benefits of IPv6 include a larger address space, integrated security, support for auto-configuration of terminals, and support for mobility.

MPEG

This is a digital video and audio compression format that was defined as part of the International Standards Organization (ISO). MPEG is a compression method that uses interframe compression. Interframe compression assumes that although something is happening in the foreground, the background in most video frames remains the same. This means that it is not necessary to compress each entire frame, but only the differences between them.

MPEG – 2

MPEG – 2 is a widely used, standardized video coding and compression technology. MPEG – 2 is used in DVD movies and digital satellite distribution. Non-compressed video stream is roughly 200 Mbps, but with MPEG – 2 the video can be encoded at 1.5 – 18 Mbps. DVD quality can be reached between 5 – 9 Mbps, but 2 – 3 Mbps is enough to exceed VHS quality.

MPEG – 4

MPEG – 4 is a compression/decompression technology that aims to achieve interactivity, efficiency, and stability in transmissions. The result of another international effort involving hundreds of researchers and engineers from all over the world, MPEG – 4 offers higher video quality and resolution at a lower data rate than MPEG – 2. Also, the MPEG – 4 stream encoding rate range is wider (5 kbps – 60 Mbps). MPEG – 4 allows interactive objects in the stream, making it more multimedia ready. On a broader level, MPEG – 4 aims to pave the way toward a uniform, high-quality encoding and decoding standard that would replace the many proprietary streaming technologies in use on the Internet today. MPEG – 4 is also designed for low bit-rate communications devices, such as wireless mobile devices that can display video. MPEG – 4 supports scalable content, which means content is encoded once and automatically played back and transmitted at different rates depending on the available network connection.

Real-Time Streaming Protocol (RTSP)

This defines the control interface between video server and video client. With RTSP, the end user can control the video server as he or she would control the home VCR (play, pause, fast forward, rewind, etc.) RTSP also initiates the video streams and identifies different streams in the network so that the information can be used in billing.

Internet Group Management Protocol (IGMP)

This is a protocol that supports IP multicasting, a method of broadcasting that authenticates end-users prior to receiving content.

Very High Bit Rate Digital Subscriber Line (VDSL)

This is an extremely high-speed DSL technology for transmitting digital information over short reaches of an existing phone line to homes and businesses. With VDSL, transmission rates are very dependent upon actual loop length. The maximum downstream rate is between 51 and 55 Mbps over lines up to 1000 ft (300 meters) in length. Initial upstream rate will be an asymmetric rate between 1.6 and 2.3 Mbps. The data channel will be a separate frequency than that of bands used for plain old telephone service (POTS) and integrated services digital network (ISDN), thus enabling service providers to overlay VDSL onto existing services. As needs arise for higher-speed upstream rates, VDSL may need echo cancellation.

Lesson 45　ADSL

Reading Materials A

ADSL[1] Overview

Asymmetric Digital Subscriber Line (ADSL) converts existing twisted-pair[2] telephone lines into access paths for multimedia and high-speed data communications. ADSL can transmit up to 6 Mbps to a subscriber, and as much as 832 kbps or more in both directions. Such rates expand existing access capacity by a factor of 50 or more without new cabling. ADSL is literally transforming the existing public information network from one limited to voice, text and low resolution graphics to a powerful, ubiquitous system capable of bringing multimedia, including full motion video, to everyone's home this century.

ADSL will play a crucial role over the next ten or more years as telephone companies, and other service providers, enter new markets for delivering information in video and multimedia formats. New broadband cabling will take decades to reach all prospective subscribers. But success of these new services will depend upon reaching as many subscribers as possible during the first few years. By bringing movies, television, video catalogs, remote CD-ROMs, corporate LANs, and the Internet into homes and small businesses, ADSL will make these markets viable, and profitable, for telephone companies and application suppliers alike.

Capabilities

An ADSL circuit connects an ADSL modem on each end of a twisted-pair telephone line, creating three information channels—a high speed downstream channel, a medium speed duplex channel, depending on the implementation of the ADSL architecture, and a POTS[3] (Plain Old Telephone Service) or an ISDN[4] channel. The POTS/ISDN channel is split off from the digital modem by filters, thus guaranteeing uninterrupted POTS/ISDN, even if ADSL fails. The high speed channel ranges from 1.5 to 6.1 Mbps, while duplex rates range from 16 to 832 kbps. Each channel can be submultiplexed to form multiple, lower rate channels, depending on the system.

ADSL modems provide data rates consistent with North American and European digital hierarchies and can be purchased with various speed ranges and capabilities. The minimum configuration provides 1.5 or 2.0 Mbps downstream and a 16 kbps duplex channel; others provide rates of 6.1 Mbps and 64 kbps duplex. Products with downstream rates up to 8 Mbps and duplex rates up to 640 kbps are available today. ADSL modems will accommodate ATM[5] transport with variable rates and compensation for ATM overhead, as

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[1] Asymmetric Digital Subscriber Line (ADSL) **异步数字用户线路**
[2] twisted-pair **双绞线**
[3] POTS (Plain Old Telephone Service) **普通老式电话业务**
[4] ISDN (Integrated Service Digital Network) **综合业务数字网**
[5] ATM (Asynchronous Transfer Mode) **异步传输模式**

well as IP protocols.

Downstream data rates depend on a number of factors, including the length of the copper line, its wire gauge, presence of bridged taps, and cross-coupled interference. Line attenuation increases with line length and frequency, and decreases as wire diameter increases.

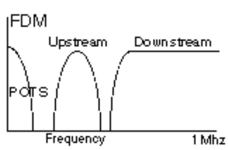
While the measure varies from provider to provider, these capabilities can cover up to 95% of a loop plant depending on the desired data rate. Customers beyond these distances can be reached with fiber-based digital loop carrier systems. As these DLC systems become commercially available, telephone companies will offer virtually ubiquitous access in a relatively short time.

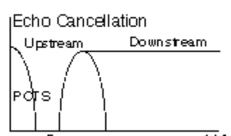
Many applications enabled by ADSL involve digital compressed video. As a real time signal, digital video cannot use link or network level error control procedures commonly found in data communications systems. ADSL modems therefore incorporate forward error correction that dramatically reduces errors caused by impulse noise. Error correction on a symbol-by-symbol basis also reduces errors caused by continuous noise coupled into a line.

Technology

ADSL depends upon advanced digital signal processing and creative algorithms to squeeze so much information through twisted-pair telephone lines. In addition, many advances have been required in transformers, analog filters, and A/D converters. Long telephone lines may attenuate signals at one megahertz (the outer edge of the band used by ADSL) by as much as 90 dB, forcing analog sections of ADSL modems to work very hard to realize large dynamic ranges, separate channels, and maintain low noise figures. On the outside, ADSL looks simple—transparent synchronous data pipes at various data rates over ordinary telephone lines. On the inside, where all the transistors work, there is a miracle of modern technology.

To create multiple channels, ADSL modems divide the available bandwidth of a telephone line in one of two ways—Frequency Division Multiplexing (FDM)[1] or Echo Cancellation. FDM assigns one band for upstream data and another band for downstream data. The downstream path is then divided by time division multiplexing into one or more high speed channels and one or more low speed channels. The upstream path is also multiplexed into corresponding low speed channels. Echo Cancellation assigns the upstream band to over-lap the downstream, and separates the two by means of local echo cancellation, a technique well known in V.32 and V.34 modems. With either technique, ADSL splits off a 4 kHz region for POTS at the DC end of the band.





An ADSL modem organizes the aggregate data stream created by multiplexing downstream channels, duplex channels, and maintenance channels together into blocks, and attaches an error correction code to each block.

[1] Frequency Division Multiplexing (FDM) 频分多路复用

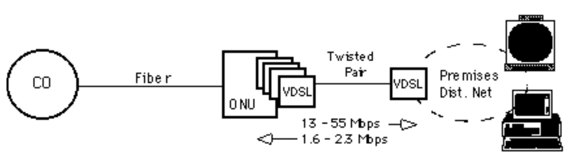
The receiver then corrects errors that occur during transmission up to the limits implied by the code and the block length. The unit may, at the users option, also create superblocks by interleaving data within subblocks; this allows the receiver to correct any combination of errors within a specific span of bits. This allows for effective transmission of both data and video signals alike.

Reading Materials B

VDSL Basis

It is becoming increasingly clear that telephone companies around the world are making decisions to include existing twisted-pair loops in their next generation broadband access networks. Hybrid Fiber Coax (HFC), a shared access medium well suited to analog and digital broadcast, comes up somewhat short when asked to carry voice telephony, interactive video, and high speed data communications at the same time. Fiber all the way to the home (FTTH) is still prohibitively expensive in a marketplace soon to be driven by competition rather than costs. An attractive alternative, soon to be commercially practical, is a combination of fiber cables feeding neighborhood Optical Network Units (ONUs) and last leg premises connections by existing or new copper. This topology, which can be called Fiber to the Neighborhood (FTTN), encompasses Fiber to the Curb (FTTC) with short drops and Fiber to the Basement (FTTB), serving tall buildings with vertical drops.

One of the enabling technologies for FTTN is Very high rate Digital Subscriber Line, or VDSL. In simple terms, VDSL transmits high speed data over short reaches of twisted-pair copper telephone lines, with a range of speeds depending upon actual line length. The maximum downstream rate under consideration is between 51 and 55 Mbps over lines up to 1000 ft (300 meters) in length. Downstream speeds as low as 13 Mbps over lengths beyond 4000 ft (1500 meters) are also in the picture. Upstream rates in early models will be asymmetric, just like ADSL, at speeds from 1.6 to 2.3 Mbps. Both data channels will be separated in frequency from bands used for POTS and ISDN, enabling service providers to overlay VDSL on existing services. At present the two high speed channels will also be separated in frequency. As needs arise for higher speed upstream channels or symmetric rates, VDSL systems may need to use echo cancellation.



This monograph presents VDSL in terms of projected capabilities, underlying technology, and outstanding issues. It follows with a survey of standards activity and concludes with a suggestion that VDSL and ADSL together provide network providers an excellent combination for evolving a full service network while offering virtually ubiquitous access to most PC applications and interactive TV applications as the network develops.

VDSL Projected Capabilities

While VDSL has not achieved the degree of definition of ADSL, it has advanced far enough to discuss realizable goals, beginning with data rate and range. Downstream rates derive from submultiples of the SONET and SDH canonical speed of 155.52 Mbps, namely 51.84 Mbps, 25.92 Mbps and 12.96 Mbps. Each rate has a corresponding target range:

12.96 - 13.8 Mbps	4500 ft	1500 meters
25.92 - 27.6 Mbps	3000 ft	1000 meters
51.84 - 55.2 Mbps	1000 ft	300 meters

Upstream rates under discussion fall into three general ranges:

1.6 - 2.3 Mbps

19.2 Mbps

Equal to Downstream

Early versions of VDSL will almost certainly incorporate the slower asymmetric rate. Higher upstream and symmetric configurations may only be possible for very short lines.

Like ADSL, VDSL must transmit compressed video, a real time signal unsuited to error retransmission schemes used in data communications. To achieve error rates compatible with compressed video, VDSL will have to incorporate Forward Error Correction (FEC) with sufficient interleaving to correct all errors created by impulsive noise events of some specified duration. Interleaving introduces delay, in the order of 40 times the maximum length correctable impulse.

Data in the downstream direction will be broadcast to every CPE in a premises or be transmitted to a logically separated hub that distributes data to addressed CPE based on cell or TDM multiplexing within the data stream itself. Upstream multiplexing is more difficult. Systems using a passive NT must insert data onto a shared medium, either by a form of TDMA or a form of FDM. TDMA may use a species of token control called cell grants passed in the downstream direction from the ONU modem, or contention, or both (contention for unrecognized devices, cell grants for recognized devices). FDM gives each CPE its own channel, obviating a MAC protocol, but either limiting data rates available to any one CPE or requiring dynamic allocation of bandwidth and inverse multiplexing at each CPE. Systems using active NTs transfer the upstream collection problem to a logically separated hub that would use (typically) Ethernet or ATM protocols for upstream multiplexing.

Migration and inventory considerations dictate VDSL units that can operate at various (preferably all) speeds with automatic recognition of a newly connected device to a line or a change in speed. Passive network interfaces need to have hot insertion, where a new VDSL premises unit can be put on the line without interfering with the operation of other modems.

Lesson 46　Wireless LAN[1]

Reading Materials A

Wireless LAN

Overview

A wireless LAN (WLAN) is typically an extension of a wired LAN. WLAN components convert data packets into radio waves or infrared (IR) light pulses and send them to other wireless devices or to an access point that serves as a gateway to the wired LAN. Most WLANs today are based on the IEEE[2] 802.11 and 802.11b standards for wireless communication between devices and a LAN. These standards permit data transmissions at 1 to 2 Mbps or 5 to 11 Mbps, respectively, and specify a common architecture, transmission methods, and other aspects of wireless data transfer to improve interoperability among products.

Technology

Manufacturers of wireless LANs have a range of technologies to choose from when designing a wireless LAN solution. Each technology comes with its own set of advantages and limitations.

Narrowband[3] Technology

A narrowband radio system transmits and receives user information on a specific radio frequency[4]. Narrowband radio keeps the radio signal frequency as narrow as possible just to pass the information. Undesirable crosstalk[5] between communications channels is avoided by carefully coordinating different users on different channel frequencies.

A private telephone line is much like a radio frequency. When each home in a neighborhood has its own private telephone line, people in one home cannot listen to calls made to other homes. In a radio system, privacy and noninterference are accomplished by the use of separate radio frequencies. The radio receiver filters out all radio signals except the ones on its designated frequency.

From a customer standpoint, one drawback of narrowband technology is that the end-user must obtain an FCC[6] license for each site where it is employed.

Spread Spectrum Technology

Most wireless LAN systems use spread-spectrum[7] technology, a wideband radio frequency technique

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1 wireless LAN (WLAN) **无线局域网**
2 IEEE (Institute of Electrical and Electronic Engineers) **电气电子工程师学会**
3 narrowband **窄带**
4 radio frequency **射频**
5 crosstalk **串扰，串音**
6 FCC (Federal Communications Commission) **（美国）联邦通信委员会**
7 spread-spectrum **扩展频谱**

developed by the military for use in reliable, secure, mission-critical communications systems. Spread-spectrum is designed to trade off bandwidth efficiency for reliability, integrity, and security. In other words, more bandwidth is consumed than in the case of narrowband transmission, but the tradeoff produces a signal that is, in effect, louder and thus easier to detect, provided that the receiver knows the parameters of the spread-spectrum signal being broadcast. If a receiver is not tuned to the right frequency, a spread-spectrum signal looks like background noise. There are two types of spread spectrum radio: frequency hopping[1] and direct sequence[2].

Frequency-Hopping Spread Spectrum Technology

Frequency-hopping spread-spectrum (FHSS) uses a narrowband carrier that changes frequency in a pattern known to both transmitter and receiver. Properly synchronized, the net effect is to maintain a single logical channel. To an unintended receiver, FHSS appears to be short-duration impulse noise[3].

Direct-Sequence Spread Spectrum Technology

Direct-sequence spread-spectrum (DSSS) generates a redundant bit pattern for each bit to be transmitted. This bit pattern is called a chip[4] (or chipping code). The longer the chip, the greater the probability that the original data can be recovered (and, of course, the more bandwidth required). Even if one or more bits in the chip are damaged during transmission, statistical techniques embedded in the radio can recover the original data without the need for retransmission. To an unintended receiver, DSSS appears as low-power wideband noise and is rejected (ignored) by most narrowband receivers.

Infrared Technology

A third technology, little used in commercial wireless LANs, is infrared. Infrared (IR) systems use very high frequencies, just below visible light in the electromagnetic spectrum, to carry data. Like light, IR cannot penetrate opaque objects; it is either directed (line-of-sight) or diffuse technology. Inexpensive directed systems provide very limited range and typically are used for personal area networks but occasionally are used in specific wireless LAN applications. High performance directed IR is impractical for mobile users and is therefore used only to implement fixed sub-networks. Diffuse (or reflective) IR wireless LAN systems do not require line-of-sight, but cells are limited to individual rooms.

How Wireless LANs Work

Wireless LANs use electromagnetic airwaves (radio or infrared) to communicate information from one point to another without relying on any physical connection. Radio waves are often referred to as radio carriers because they simply perform the function of delivering energy to a remote receiver. The data being transmitted is superimposed on the radio carrier so that it can be accurately extracted at the receiving end. This is generally referred to as modulation[5] of the carrier by the information being transmitted. Once data is superimposed (modulated) onto the radio carrier, the radio signal occupies more than a single frequency,

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[1] Frequency-hopping spread-spectrum (FHSS) **（蓝牙）跳频扩谱技术**
[2] Direct-sequence spread-spectrum (DSSS) **直接序列扩频**
[3] impulse noise **脉冲噪声**
[4] chip **子码**
[5] modulation **调制**

since the frequency or bit rate of the modulating information adds to the carrier.

Multiple radio carriers can exist in the same space at the same time without interfering with each other if the radio waves are transmitted on different radio frequencies. To extract data, a radio receiver tunes in one radio frequency while rejecting all other frequencies.

In a typical wireless LAN configuration, a transmitter/receiver[1] (transceiver) device, called an access point, connects to the wired network from a fixed location using standard cabling. At a minimum, the access point receives, buffers, and transmits data between the wireless LAN and the wired network infrastructure. A single access point can support a small group of users and can function within a range of less than one hundred to several hundred feet. The access point (or the antenna attached to the access point) is usually mounted high but may be mounted essentially anywhere that is practical as long as the desired radio coverage is obtained.

End users access the wireless LAN through wireless-LAN adapters, which are implemented as PC cards in notebook or palmtop computers, as cards in desktop computers, or integrated within hand-held computers. wireless LAN adapters provide an interface between the client network operating system (NOS) and the airwaves via an antenna. The nature of the wireless connection is transparent to the NOS.

Reading Materials B

How to Build a Secure WLAN

Real-time Network Protection Required for Wireless Networking

Wireless LANs have experienced tremendous growth since the introduction of the 802.11b wireless networking standard spurred the development of a wide range of “Wi-Fi” solutions developed by network equipment vendors. Flexibility, ease of deployment and low component costs constitute three major drivers for the popularity of WLANs. However, the same flexibility and mobility provided by wireless networking also introduces new security vulnerabilities in addition to those that threaten conventional LANs. For real-time communications like Wi-Fi, a comprehensive real-time network protection strategy is required to enable pervasive, widespread deployment.

WLAN Security Threats Inhibit Build-out

Because WLANs use publicly available radio spectrum as the medium to carry data, unauthorized access and eavesdropping are key concerns. Major security threats to WLANs include the following:

WLAN access points can be probed by anyone within reach of the network’s radio signal, thus constituting physically unbounded entry points from which to launch intrusions, viruses and all other types of attacks that threaten landline networks.

WLAN access points are often deployed inside corporate networks behind conventional firewalls, making these access points even more attractive as points for launching attacks.

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[1] transmitter/receiver **收发**

WLANs are extremely vulnerable to denial-of-service attack and interruption. Any malicious hacker with a laptop and a wireless Network Interface Card can transmit wireless signal interrupters in close proximity to company sites where WLANs are deployed and effectively jam a Wi-Fi signal.

Internal employees can set up their WLAN interface cards to operate in peer-to-peer (P2P) mode to communicate directly with people outside of the company.

Naturally, the framers of the 802.11b wireless standards were aware of these vulnerabilities and designed a number of security features into the technology to address them. These include the following:

The use of Service Set Identifier (SSID)

The SSID is a shared secret (typically an ASCII string) that has to be configured by network administrators into all access points and wireless terminals (e.g., PCs) that share a common WLAN. The weakness of the SSID is that it's a relatively simple password, common to all devices on the WLAN, and once the SSID is compromised, any device with the SSID can gain unrestricted access. Furthermore, the default setting of SSID is often not changed in WLAN deployments, and access points are typically configured to broadcast their SSID, further degrading security because intruders can get the SSID through easily obtainable tools.

Media Access Control (MAC) Address Filtering

Since every WLAN terminal's network card has a unique MAC address, it's possible to manually maintain a set of allowed MAC address lists for physical address filtering. Using a MAC address list, the systems administrator needs to update the list constantly to accommodate changes, including when users get new or replacement WLAN interface cards. In addition, MAC address filtering merely verifies the identity of the WLAN interface card and not the identity of the PC into which it's inserted or the person using the PC. Finally, MAC authentication complicates support for roaming between different access points, and since MAC addresses can be spoofed, it isn't regarded as a strong authentication method.

Wired Equivalent Privacy (WEP)

Using WEP, communications between mobile terminals and access points are scrambled using a symmetrical encryption technique called RC4 on the data link layer. This prevents eavesdropping and prevents unauthorized access by users that haven't been configured with the necessary encryption key. WEP offers both 40-bit and 128-bit encryption strengths; however, WEP suffers from a number of drawbacks. For example, as with the SSID, all users within a service area have the same encryption key; if one user's encryption key is compromised the entire network is jeopardized. Moreover, unless the highest strength (128-bit) is used, WEP can be decrypted within a few hours, and many of the initial WLAN access points and interface cards shipping don't support 128-bit encryption.

In addition to these Wi-Fi-specific security mechanisms, other techniques can be applied to WLANs to make them robust against attacks. One approach for enhancing the network-level security in wireless LANs is to use IPSec virtual private network (VPN) technology in conjunction with Wi-Fi security methods. VPN technology provides for data privacy via strong encryption to prevent eavesdropping and also provides for authentication of wireless terminals and their users using a variety of means ranging from simple user names and passwords in Remote Authentication Dial-In User Server directories to more sophisticated directory systems using digital certificates and public key infrastructure.

Another important area of concern for wireless LANs is protection against content-based attacks. Wireless LAN users who are browsing the Internet can be exposed to viruses and worms in Web (HTTP) downloads and applications that aren't scanned by conventional-firewall, E-mail-based antivirus software. To prevent these attacks, real-time antivirus scanning at the network gateway should be applied at all WLAN access points to prevent infection and rapid spread of content-based attacks.

Security Strategy for Comprehensive WLAN Protection

The analysis above has described the key security hazards inherent in WLANs, along with a number of means for addressing these vulnerabilities. Currently, there is no single blanket solution that addresses all problems. As with wireline networks, effective security requires the implementation of a multilayered "defense-in-depth" strategy that includes techniques to address each of the vulnerabilities, consistent with the budget and administrative resources available to each organization. A Wi-Fi top 10 security checklist summarizing these techniques is provided below:

Apply port access-control technology 802.1x to protect WLANs from unauthorized access.

Use 128-bit WEP encryption; change the default WEP encryption key that comes with the access point provided by the vendor.

Use gateway-protected IPSec VPNs for highly confidential WLAN communications.

Change the default vendor-set SSID for access points and for WLAN terminals; use MAC address binding at least for those terminals that don't need to roam across multiple access points.

Do not enable access points to broadcast their SSIDs.

Change the default access-point administration password.

Forbid employees from installing access points themselves. This can be accomplished by periodic scanning of access points through a notebook with a WLAN network card and WLAN scanning software.

Choose WLAN network cards that support password-protection of attribute changes to prevent the settings of the network cards from being illegally or accidentally changed by users.

Develop WLAN management policies; internal employees should not be allowed to leak WLAN configuration information to outsiders or to construct an ad hoc network topology with a P2P configuration.

Deploy real-time, content-level security measures (such as antivirus firewalls) in conjunction with each WLAN access point to eliminate harmful viruses and worms before they enter or exit the WLAN.

Lesson 47 WAP

Reading Materials A

Introduction to the WAP[1] (Ⅰ)

Overview

The Wireless Application Protocol is a standard developed by the WAP Forum, a group founded by Nokia, Ericsson, Phone.com (formerly Unwired Planet), and Motorola. The WAP Forum's membership roster now includes computer industry heavyweights such as Microsoft, Oracle, IBM, and Intel along with several hundred other companies. According to the WAP Forum, the goals of WAP are to be:

- Independent of wireless network standard.
- Open to all.
- Proposed to the appropriate standards bodies.
- Scalable across transport options.
- Scalable across device types.
- Extensible over time to new networks and transports.

As part of the Forum's goals, WAP will also be accessible to (but not limited to) the following:

- GSM[2]-900, GSM-1800, GSM-1900.
- CDMA[3] IS-95.
- TDMA[4] IS-136.
- 3G systems—IMT-2000, UMTS, W-CDMA, Wideband IS-95.

WAP defines a communications protocol as well as an application environment. In essence, it is a standardized technology for cross-platform, distributed computing. Sound similar to the World Wide Web? If you think so, you're on the right track! WAP is very similar to the combination of HTML and HTTP except that it adds in one very important feature: optimization for low-bandwidth, low-memory, and low-display capability environments. These types of environments include PDAs, wireless phones, pagers[5], and virtually any other communications device.

WAP and the Web

From a certain viewpoint, the WAP approach to content distribution and the Web approach are virtually identical in concept. Both concentrate on distributing content to remote devices using inexpensive,

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[1] WAP (Wireless Application Protocol) **无线应用协议**
[2] GSM (Global System for Mobile Communications) **环球移动通信系统**
[3] CDMA (Code Division Multiple Access) **码分多址**
[4] TDMA (Time Division Multiple Access) **时分多址**
[5] pager **寻呼机**

standardized client software. Both rely on back-end servers[1] to handle user authentication, database queries, and intensive processing. Both use markup languages derived from SGML[2] for delivering content to the client. In fact, as WAP continues to grow in support and popularity, it is highly likely that WAP application developers will make use of their existing Web infrastructure (in the form of application servers) for data storage and retrieval.

WAP (and its parent technology, XML[3]) will serve to highlight the Web's status as the premier n-tier application in existence today. WAP allows a further extension of this concept as existing server's layers can be reused and extended to reach out to the vast array of wireless devices in business and personal use today. Note that XML, as opposed to HTML, contains no screen formatting instructions; instead, it concentrates on returning structured data that the client can use as it sees fits.

Why Wireless? Why WAP?

Suppose that you work at a large shipyard involved with the construction and repair of commercial and naval ships. Typical projects are discussed in the hundreds or even thousands of man-years. Your organization long ago learned to make use of advances in computing technology by delivering real-time access to information via mainframe terminals on employee desks or on shop floors. As time went on, managers were eventually even able to make the business case for client/server access to mainframe databases from Windows applications. This opened up existing databases to improved reporting, charting, and other user interface features. Managers and shop foremen can access parts inventories, repair schedules, shop budgets, and other useful information in order to plan work crew schedules and employee tasking.

It was just another small step from there for management to take advantage of your Web development skills by Web-enabling various mainframe applications (buzzword alert: we now call this Enterprise Application Integration, or EAI). With this information on the Web, information can be shared with parts suppliers and contractors which has greatly reduced ordering times and costs involved. One problem remains, however: out of 10 000 employees and contractors, only about 500 actually interact with the databases. The remainder of the employees continually fill out paperwork, issue reports to their manager, or manually key in data when they return from working on a ship.

Then, you read this article. Imagine if the other 9 500 employees actively involved in welding, pipefitting, installing electrical cable, and testing electronics could all wirelessly retrieve and/or edit data when they actually need to! Small, inexpensive devices are given to each employee based on their tasking requirements. Some require handheld devices with built-in barcode scanners[4], others require keypads, others require simple digital displays. WAP allows a suite of client applications to be built which reuse existing server applications and databases. In addition, these applications can be dynamically downloaded and run on any of these devices. If an electronics tester runs into a bad vacuum tube, he scans the barcode. If a cable installer realizes that 500 more feet of a specific type of cable are required, he selects the order Cable's menu option from his wireless phone. If someone installing HVAC ventilation wants to know which pipes or

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[1] back-end server **后端服务器**
[2] SGML (Standard Generalized Markup Language) **标准通用标记语言**
[3] XML (Extensible Markup Language) **可扩展标记语言**
[4] barcode scanner **条码扫描仪**

cables run through a specific section of the ship, he enters the query in on his PDA and retrieves either data or imagery information.

In any industry that involves employees stepping out of their office to complete a job, wireless applications will be abundant. In Rifaat A. Dayem's book Mobile Data & Wireless LAN Technologies , he estimates that over 50% of the applications for this type of technology have not even been thought of yet!! WAP helps standardize the applications that will proliferate using wireless communication technologies. Imagine the Web without the combination of HTML and HTTP leaving us instead with open specifications from Sun Microsystems, Microsoft, and IBM. I will go out on a limb and say that there is no chance the Web would be where it was today without freely available, vendor-neutral, open standards.

Reading Materials B

Introduction to the WAP (Ⅱ)

How Does It Work?

WAP uses some new technologies and terminologies which may be foreign to the software developer, however the overall concepts should be very familiar. WAP client applications make requests very similar in concept to the URL concept in use on the Web. As a general example, consider the following explanation (exact details may vary on a vendor-to-vendor basis).

A WAP request is routed through a WAP gateway which acts as an intermediary between the bearer used by the client (GSM, CDMA, TDMA, etc.) and the computing network that the WAP gateway resides on (TCP/IP in most cases). The gateway then processes the request, retrieves contents or calls CGI scripts, Java servlets, or some other dynamic mechanism, then formats data for return to the client. This data is formatted as WML (Wireless Markup Language), a markup language based directly on XML. Once the WML has been prepared (known as a deck), the gateway then sends the completed request back (in binary form due to bandwidth restrictions) to the client for display and/or processing. The client retrieves the first card off of the deck and displays it on the monitor.

The deck of cards metaphor is designed specifically to take advantage of small display areas on handheld devices. Instead of continually requesting and retrieving cards (the WAP equivalent of HTML pages), each client request results in the retrieval of a deck of one or more cards. The client device can employ logic via embedded WMLScript (the WAP equivalent of client-side JavaScript) for intelligently processing these cards and the resultant user inputs.

To sum up, the client makes a request. This request is received by a WAP gateway that then processes the request and formulates a reply using WML. When ready, the WML is sent back to the client for display. As mentioned earlier, this is very similar in concept to the standard stateless HTTP transaction involving client Web browsers.

Communications Between Client and Server

The WAP Protocol Stack is implemented via a layered approach (similar to the OSI network model).

These layers consist (from top to bottom) of:

- Wireless Application Environment (WAE).
- Wireless Session Protocol (WSP).
- Wireless Transaction Protocol (WTP).
- Wireless Transport Layer Security (WTLS).
- Wireless Datagram Protocol (WDP).
- Bearers (GSM, IS-136, CDMA, GPRS, CDPD, etc.).

According to the WAP specification, WSP offers means to:

- provide HTTP/1.1 functionality;
- extensible request-reply methods;
- composite objects;
- content type negotiation;
- exchange client and server session headers;
- interrupt transactions in process;
- push content from server to client in an unsynchronized manner;
- negotiate support for multiple, simultaneous asynchronous transactions.

WTP provides the protocol that allows for interactive browsing (request/response) applications. It supports three transaction classes: unreliable with no result message, reliable with no result message, and reliable with one reliable result message. Essentially, WTP defines the transaction environment in which clients and servers will interact and exchange data.

The WDP layer operates above the bearer layer used by your communications provider. Therefore, this additional layer allows applications to operate transparently over varying bearer services. While WDP uses IP as the routing protocol, unlike the Web, it does not use TCP. Instead, it uses UDP (User Datagram Protocol) which does not require messages to be split into multiple packets and sent out only to be reassembled on the client. Due to the nature of wireless communications, the mobile application must be talking directly to a WAP gateway (as opposed to being routed through myriad WAP access points across the wireless Web) which greatly reduces the overhead required by TCP.

The Wireless Markup Language (WML)

Many references I have come across use terminology such as “WML is derived from HTML” or “WML is loosely based on XML”. Warning bells went off in my head when I see statements like this because: (a) it often means that a vendor has added proprietary extensions to some technology and (b) it means that I am going to have to learn yet another language. Having said that, let me express my relief to find that WML is, in fact, an XML document type defined by a standard XML Document Type Definition, or DTD.

Additional Intelligence via WMLScript

The purpose of WMLScript is to provide client-side procedural logic. It is based on ECMAScript, however it has been modified in places to support low bandwidth communications and thin clients. The inclusion of a scripting language into the base standard was an absolute must. While many Web developers regularly choose not to use client-side JavaScript due to browser incompatibilities (or clients running older browsers), this logic must still be replaced by additional server-side scripts. This involves extra roundtrips between clients and servers which is something all wireless developers want to avoid. WMLScript allows code to be built into files transferred to mobile client so that many of these round-trips can be eliminated. According to the WMLScript specification, some capabilities supported by WMLScript that are not supported by WML are:

- Check the validity of user input
- Access to facilities of the device. For example, on a phone, allow the programmer to make phone calls, send messages, add phone numbers to the address book, access the SIM card etc.
- Generate messages and dialogs locally thus reducing the need for expensive round-trip to show alerts, error messages, confirmations etc.
- Allow extensions to the device software and configuring a device after it has been deployed.

WMLScript is a case-sensitive language that supports standard variable declarations, functions, and other common constructs such as if-then statements, and for/while loops. Among the standard and more interesting features are the ability to use external compilation units (via the use url pragma), access control (via the access pragma), and a set of standard libraries defined by the specification (including the Lang, Float, String, URL, WMLBrowser, and Dialogs libraries). The WMLScript standard also defines a bytecode interpreter since WMLScript code is actually compiled into binary form (by the WAP gateway) before being sent to the client.

The Business Case

Pros

WAP's biggest business advantage are the prominent communications vendors who have lined up to support it. The ability to build a single application that can be used across a wide range of clients and bearers makes WAP pretty much the only option for mobile handset developers at the current time. Whether this advantage will carry into the future depends on how well vendors continue to cooperate and also on how well standards are followed.

Cons

It is very, very early on in the ballgame and already vendor toolkits are offering proprietary tags that will only work with their microbrowser. Given the history of the computing industry and competition, in general, this was to be expected. However, further differentiation between vendor products and implementations may lead to a fragmented wireless Web.

WAP also could be found lacking if compared to more powerful GUI platforms such as Java, for instance. For now, processor speeds, power requirements, and vendor support are all limiting factors to Java deployment but it is not hard to imagine a day in the near future where Java and WAP exist side-by-side just as Java and HTML do today. In that circumstance, Java would hold a clear advantage over WAP due to the fact that a single technology could be used to build applications for the complete range of operating devices. Of course, on the flip side, the world is not all Java and there will always be a place for markup languages in lieu of full-blown object-oriented platforms.

Lesson 48 Bluetooth

Reading Materials A

An Introduction to Bluetooth[1]

Overview

The Bluetooth wireless technology is set to revolutionize the personal connectivity market by providing freedom from wired connections. It is a specification for a small form-factor, low-cost radio solution providing links between mobile computers, mobile phones and other portable handheld devices, and connectivity to the internet.

The Bluetooth Special Interest Group (SIG), comprised of leaders in the telecommunications, computing, and network industries, is driving development of the technology and bringing it to market. The Bluetooth SIG includes promoter companies 3Com, Ericsson, IBM, Intel, Lucent, Microsoft, Motorola, Nokia and Toshiba, and thousands of adopter companies.

Technology

Bluetooth is a global de facto standard[2] for wireless connectivity. Based on a low-cost, short-range radio link, Bluetooth cuts the cords that used to tie up digital devices.

When two Bluetooth equipped devices come within 10 meters range of each other, they can establish a connection together. And because Bluetooth utilizes a radio-based link, it doesn't require a line-of-sight[3] connection in order to communicate. Your laptop could send information to a printer in the next room, or your microwave could send a message to your mobile phone telling you that your meal is ready.

In the future, Bluetooth is likely to be standard in tens of millions of mobile phones, PCs, laptops and a whole range of other electronic devices. As a result, the market is going to demand new innovative applications, value-added services[4], end-to-end solutions and much more. The possibilities opened up really are limitless, and because the radio frequency used is globally available, Bluetooth can offer fast and secure access to wireless connectivity all over the world. With potential like that, it's no wonder that Bluetooth is set to become the fastest adopted technology in history. Bluetooth wireless technology is a system solution comprising hardware, software and interoperability requirements. The Bluetooth specifications specify the complete system.

The Bluetooth Specification defines a short (around 10 m) or optionally a medium range (around 100 m) radio link capable of voice or data transmission up to a maximum capacity of 720 Kb/s per channel.

Radio frequency operation is in the unlicensed industrial, scientific and medical (ISM) band at 2.4 to

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[1] Bluetooth 蓝牙技术
[2] de facto standard 事实标准
[3] line-of-sight 视线
[4] value-added service 增值服务

2.48 GHz, using a spread spectrum[1], frequency hopping, full-duplex[2] signal at up to 1600 hops/sec. The signal hops among 79 frequencies at 1 MHz intervals to give a high degree of interference immunity. RF output is specified as 0 dBm (1 mW) in the 10m-range version and -30 to +20 dBm (100 mW) in the longer range version.

When producing the radio specification, high emphasis was put on making a design enabling single-chip implementation in CMOS circuits, thereby reducing cost, power consumption and the chip size required for implementation in mobile devices.

The Bluetooth Solution answers the need for short-range wireless connectivity within three areas:

- Data and Voice access points.
- Cable replacement.
- Ad hoc[3] networking.

Data and Voice access points

Bluetooth wireless technology facilitates real-time voice and data transmissions, which makes it possible to connect any portable and stationary communication device as easily as switching on the lights.

You can, for instance, surf the Internet and send E-mails on your portable PC or notebook regardless of whether you are wirelessly connected through a mobile phone or through a wire-bound connection (PSTN[4], ISDN[5], LAN[6], xDSL[7]).

Voice

Up to three simultaneous synchronous[8] voice channels are used, or a channel which simultaneously supports asynchronous data and synchronous voice. Each voice channel supports a 64 kb/s synchronous (voice) channel in each direction.

Data

The asynchronous data channel can support maximal 723.2 kb/s asymmetric (and still up to 57.6 kb/s in the return direction), or 433.9 kb/s symmetric.

- a Master can share an asynchronous channel with up to 7 simultaneously active Slaves in a Piconet.
- by swapping active and parked slaves out respectively in the piconet, 255 slaves can be virtually connected using the PM_ADDR (a device can participate again within 2 ms).
- to park even more slaves the BD_ADDR can be used. There is no limitation to the number of slaves that can be parked.

Slaves can participate in different piconets and a master of one piconet can be the slave in another, this is known as a scatternet. Up to 10 piconets within range can form a scatternet, with a minimum of collisions.

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[1] spectrum **频谱**
[2] full-duplex **全双工**
[3] ad hoc **特别的，专门的**
[4] PSTN (Public Switched Telephone Network) **公共交换电话网络**
[5] ISDN (Integrated Services Digital Network) **综合业务数字网**
[6] LAN (Local Area Network) **局域网**
[7] xDSL **任何数字用户线路**
[8] synchronous **同步的；**asynchronous **异步的**

Cable Replacement

Bluetooth wireless technology eliminates the need for numerous, often proprietary, cable attachments for connection of practically any kind of communication device.

Connections are instant and they are maintained even when devices are not within line of sight. The range of each radio is approximately 10 meters, but it can be extended to around 100 meters with an optional amplifier[1].

Ad hoc Networking

A device equipped with a Bluetooth radio establishes instant connection to another Bluetooth radio as soon as it comes into range.

Since each Bluetooth device supports both point-to-point and point-to-multipoint connections, several piconets can be established and linked together ad hoc. The Bluetooth topology is best described as a multiple piconet structure.

Reading Materials B

Bluetooth Technology

Piconet and Scatternet

The Bluetooth network is called a piconet. In the simplest case it means that two devices are connected. The device that initiates the connection is called a master and the other devices are called slaves. The majority of Bluetooth applications will be point-to-point applications. Bluetooth connections are typically ad hoc connections, which means that the network will be established just for the current task and then dismantled after the data transfer has been completed.

A master can have simultaneous connections (point-to-multipoint) to up to seven slaves. Then, however, the data rate is limited. One device can also be connected in two or more piconets. The set-up is called scatternet. A device can, however, only be a master to one piconet at a time. Support for hold, park, or sniff mode is needed for a device to be part of the scatternet. In these modes a device does not actively participate in a piconet, leaving time for other activities such as participating in another piconet, for example.

The master/slave roles are not necessarily fixed and can also be changed during the connection if, for example, the master does not have enough resources to manage the piconet. Master/slave switch is also needed in the scatternet. Master/slave switch support is not mandatory.

Most of current Bluetooth implementations support piconets only. Point-to-multipoint support depends on the implementation.

Frequency Hopping

Bluetooth technology uses a frequency hopping technique, which means that every packet is transmitted on a different frequency. In most countries, 79 channels can be used. With a fast hop rate (1600

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[1] amplifier **放大器**

hops per second), good interference protection is achieved. Another benefit is a short packet length. If some other device is jamming the transmission of a packet, the packet is resent in another frequency determined by the frequency scheme of the master.

Subsequent time slots are used for transmitting and receiving. The nominal slot length is 625 μs. A packet nominally covers a single slot, but can be extended to cover three or five slots. In multi-slot packets the frequency remains the same until the entire packet is sent. When using a multi-slot packet, the data rate is higher because the header and a 220 μs long switching time after the packet are needed only once in each packet. On the other hand, the robustness is reduced: in a crowded environment the long packets will more probably be lost.

Links and Packets

The Asynchronous Connectionless (ACL) links are defined for data transmission, primarily packet data. They support symmetrical and asymmetrical packet-switched connections. Multi-slot packets use the ACL link type and can reach the maximum data rate of 723 kbps in one direction and 57.6 kbps in the other direction. The master controls the ACL link bandwidth and decides how much of the bandwidth a slave can use in a piconet. Broadcast messages are supported in the ACL link, i.e., from the master to all slaves in the piconet.

The Synchronous Connection Oriented (SCO) links support symmetrical, circuit-switched, point-to-point connections and are therefore primarily used for voice traffic. Two consecutive time slots at fixed intervals are reserved for an SCO link . The SCO link reserves every sixth slot for a transmitting channel and the subsequent slot for a receiving channel, so there can be up to three simultaneous SCO links. The data rate for SCO links is 64 kbps.

Data is transmitted in packets. Each packet consists of three entities: the access code, the header, and the payload. The size of the access code and the header are fixed. The payload may range from 0 to 2745 bits per packet. The control packets may also consist of the access code only, or of the access code and header only. In ACL packets all three entities are needed.

Three methods are used for ensuring reliable data transfer in crowded environments. In the Forward Error Correction (FEC) scheme, additional check bits are added in the packet header or the payload. In the Automatic Repeat Request (ARQ) scheme, the data payload is retransmitted until the recipient sends an acknowledgment. Acknowledgement information is included in the header of the return packet. To determine whether the payload is correct or not, a Cyclic Redundancy Check code is added to the packet.

The most commonly needed ACL packets are DM1, DH1, DM3, DH3, DM5, and DH5. The numbers indicate the length of the packet (single-slot, triple-slot, or five-slot packets). In addition to information bytes, the payload contains a 16-bit CRC code. Retransmission is applied if no acknowledgement of proper reception is received. In DM (Data - Medium rate) packets the payload is 2/3 FEC encoded, i.e., additional check bits are added. In DH (Data - High rate) packets the information bytes are not encoded at all. AUX1 packet has no CRC code and it is not retransmitted.

Lesson 49　CDMA & 3G

Reading Materials A

3G

Overview

Although the technology behind 3G may seem complicated, the ways in which 3G will affect all of our lives are easy to imagine. Just imagine having a combined camera, video camera[1], computer, stereo, and radio included in your mobile phone. Rich-media information and entertainment will be at your fingertips whenever you want anywhere there is a wireless network.

Mobile communication is moving from simple voice to rich media, where we use more of our senses to intensify our experiences.

But not all of this will happen at once. 3G is an evolution to a communications ideal that no one completely understands yet.

3G brings together high-speed radio access and IP-based services into one, powerful environment. The step towards IP is vital. IP is packet-based, which in simple terms, means users can be “on line” at all times, but without having to pay until we actually send or receive data. The connectionless nature of IP also makes access a lot faster: file downloads can take a few seconds and we can be connected to our corporate network with a single click.

3G introduces wideband radio communications[2]. Compared with today’s mobile networks, 3G will significantly boost[3] network capacity—so operators will be able to support more users, as well as offer more sophisticated services.

3G—At home

3G is going to affect our home and social lives in many ways. The services that 3G enables will help us to manage our personal information, simplify tasks such as grocery shopping, make better use of our time and offer services that are just fun to use. Operators will be able to develop myriad[4] new service opportunities to attract and retain new customers. Here are some examples:

- You’re sitting on a train and use this “dead” time to log on to your bank account, check your balance and pay a few bills—all through your 3G device. You save time and can be smarter about managing your finances.
- On a touring vacation, you arrive in a new city. You haven’t made any reservations in advance,

[1] video camera **摄像机**
[2] radio communications **无线电通信**
[3] boost **增加**
[4] myriad **无数，极大数量**

because you can do this when you get there, by using your 3G handset[1] to obtain up-to-date[2] information, including hotel vacancies. Having booked a room, you can use your mobile to view video clips of local tourist attractions and talk to someone from the local tourist information bureau at the same time.

3G—At work

3G will not just support the needs of businesspeople who travel a lot, but will also help new, flexible working practices, such as home-working and remote access to corporate networks outside traditional working hours. Businesspeople are often high-volume airtime users, so they represent a big opportunity for mobile operators. Here are some examples:

- At work you receive a message from your "smart" refrigerator at home. The message tells you that certain items need restocking[3] and an order has already been prepared for the local grocery store, which you can approve, so that your groceries are ready to collect on the way home.
- You are on the road, and urgently need to discuss a draft presentation with a number of colleagues back in the office. Pulling into[4] a service station[5], you use your 3G device to hold a telemeeting with your colleagues and, at the same time, you can all view the draft presentation and make changes on line.
- A maintenance engineer is repairing some equipment on a client's premises[6] and hits[7] a problem. Using his 3G device, he contacts his department and downloads a demonstration video that guides him through the repair process.

Reading Materials B

CDMA & 3G

Background

cdmaOne has clearly demonstrated its superiority in the second generation wireless marketplace. In September 1998, only three years after the first commercial deployment, there were 16 million subscribers on cdmaOne systems worldwide. Over 35 countries have either commercial or trial activity ongoing. The CDG has over 100 members of whom 40% are companies based outside of North America, testimony to the truly international reach of CDMA.

The CDG established the Advanced Systems Initiative to provide a growth path for cdmaOne to next generation systems. Primary goals of the initiative include development of a worldwide standard that meets

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[1] handset **手机**
[2] up-to-date **最新的**
[3] restocking **再供以物品**
[4] pull into **把车驶入**
[5] service station **加油站**
[6] premises **房屋（连地基），经营场址**
[7] hit **这里是“偶然碰到，遇到”的意思**

IMT-2000 requirements and other services identified as critical to operator members, and graceful evolution to next generation cdmaOne systems.

The Advanced Systems Initiative is a means for CDG members to define the requirements and priorities for cdmaOne and to collaborate with regional and international standards organizations to meet industry objectives. CDG members have been involved with IMT-2000 since its inception.

In addition to the work of the Advanced Systems Initiative, the CDG leadership is actively engaged in industry-wide efforts on 3G. The CDG is ensuring the rapid evolution of cdmaOne and the development of cdma2000 to meet the needs of operators worldwide, enabling the availability of 3G products and services beginning in 1999.

Evolution of cdmaOne and Development of cdma2000

The path to 3G

A great deal of attention has been focused on 3G harmonization and convergence. While the CDG believes in the ITU's vision of a global standard, we are quickly building on the technical foundation of cdmaOne to deliver many advanced services in the near future in a way that allows operators the flexibility to offer these services as the market demands. The CDG efforts are focused around an evolution strategy so that capabilities can be introduced in phases during the next few years, based on and leading to the complete capabilities of cdma2000. The bottom line: The CDG is working aggressively to enable fast-track development of the cdma2000 standard.

cdmaOne is the only technology with a clear evolution to 3G because it builds on the design and framework of today's cdmaOne system. Looking at 3G from an operator's perspective, preservation of investments made in infrastructure and spectrum are significant issues in defining requirements for technology migration. Services designated as "3G" will be available with cdmaOne in existing as well as new spectrum bands. This point is important in considering the position of established operators who may not choose, or be able, to get new spectrum.

This point is also vitally important in developing regions considering the allocation of PCS spectrum for 2G. With cdmaOne, operators and subscribers in these regions can reap the benefits of today's advanced digital technology while assured their investments are protected. Evolution from technologies such as GSM to WCDMA, however, will require significant change out of equipment and costly upgrades.

Capabilities of cdmaOne evolution have already been defined in standards. IS-95B provides ISDN rates up to 64 kbps. The next phase of cdmaOne is a standard knows as 1XRTT and enables 144 kbps packet data in a mobile environment. Other features available when the standard is published in 1Q99 are a two-fold increase in both standby time and voice capacity. All of these capabilities will be available in an existing cdmaOne 1.25 MHz channel.

The next phase of cdmaOne evolution will incorporate the capabilities of 1XRTT, support all channel sizes (5 MHz, 10 MHz, etc.), provide circuit and packet data rates up to 2 Mbps, incorporate advanced multimedia capabilities, and include a framework for advanced 3G voice services and vocoders, including voice over packet and circuit data. This phase of the standard will be complete by 4Q99.

In addition to the capabilities of the cdmaOne air interface, evolution of the ANSI-41 core network will enable subscribers to continue to benefit from advanced services offered by the cdmaOne platform.

Investment in costly infrastructure and network upgrades are not necessary.

The myths and the facts about chip rate

The debate about cdma2000 and WCDMA convergence has been based on the fact that these CDMA-based proposals have certain parameter definitions that present an opportunity for compromise. The most discussed and debated parameter is the system chip rate. WCDMA uses a chip rate value of 4.096 Mbps. cdma200 uses 3.6864 Mbps. WCDMA proponents liken the higher rate to more horse power and claim the lower cdma2000 rate degrades performance. This falsity requires clarification.

Deployment scenarios in various bands

First, WCDMA proponents claim that the WCDMA chip rate provides as much as a 10% capacity improvement over that of cdma2000. This should be examined under a realistic scenario of how the technology will be deployed, and must include all factors affecting system performance. While some operators will deploy 3G in as little as 5 MHz of spectrum many will use allocations of 10, 15, or 20 MHz.

This is important since it is the usable spectrum, in conjunction with chip rate, which affects capacity. Even with the required guard bands as verified in today's operational cdmaOne systems, greater overall capacity is achieved with a mixture of cdma2000 1X and 3X channels as compared with using WCDMA channels. With that configuration it can be shown that up to 13% capacity improvement is achievable in a 20 MHz deployment.

Examining chip rate in context with other characteristics

Second, chip rate alone does not determine overall system capacity. To build on the automobile analogy referenced earlier, assuming chip rate is the only factor affecting capacity is like assuming tire pressure is the only thing affecting gas mileage. One of the main parameters in determining the capacity of a CDMA system is the ratio of energy per information bit to noise power spectrum density (Eb/No) required to achieve certain QoS (Quality of Service) requirements such as frame or bit error rate. The required Eb/No value depends on frame structure, coding and modulation characteristics, diversity techniques and channel model. The small difference in chip rate between 3.6864 Mcps and 4.096 Mcps has negligible impact on the Eb/No requirement.

Instead, other system designs such as channel structure (including pilot structure), power control mechanisms, diversity techniques, handoff efficiency, and base station synchronization have a much greater impact on system capacity.

Consideration of power emissions

Finally, what proponents of the WCDMA chip rate often overlook are the negative effects on spectrum use and power emissions by using the higher value chip rate. The CDMA air interface signal of IMT-2000 needs to fit into a 5 MHz spectrum to comply with different frequency plans around the world. For example, if deployed in a 5 MHz spectrum such as in the D, E, F North American PCS blocks, the WCDMA system as specified currently cannot meet the FCC out-of-band emission requirements. All major wireless technologies use guard bands to separate their signal spectra from those of services in adjacent bands. It is unreasonable to assume that WCDMA can operate without such guard band protection. For instance, the guard band used to separate IS-95 CDMA from TDMA/AMPS is 270 KHz on each side; the guard band used to separate DECT from adjacent service bands is 2.396 MHz to the lower band, and 1.052 MHz to the upper band. This issue is particularly significant for the PDC systems in Japan, as well as anywhere there is another service operating in the band adjacent to the IMT-2000 band.

WCDMA advocates propose using more complex filters to address this. While in theory such an approach can be conceived, the required filter is hard to realize within a 5 MHz bandwidth. Essentially, the purported 10% capacity gain is not realizable in practical deployments that in many markets need to consider adjacent channel interference or FCC power emission requirements—not a realistic solution for operators.

In summary, chip rate is not a simple issue with a direct cause and effect relationship. More is not necessarily better. cdma2000 enables 3G services without the deployment risks and cost of WCDMA.

Convergence and Harmonization

The CDG has been actively trying to achieve the ITU’s goal of a global standard for IMT-2000. To that extent, the CDG and its members have been active on cdma2000/WCDMA harmonization in regional standards bodies (ARIB, ETSI, TIA, TTA, T1P1), discussions with worldwide operators, and meetings with government entities. Convergence can enable a number of benefits for consumers, operators, and manufacturers. ARIB (Japan) recognized this early on and has been instrumental in reducing the number of differences between cdma2000 and WCDMA to a handful. However, some WCDMA proponents have not been receptive to these efforts. The CDG believes in the benefits of convergence, but will not be able to achieve it alone. In any case, cdmaOne evolution proceeds on a fast track, ensuring that operators can deliver 3G services as the market demands.

Conclusion

The growth of cdmaOne technology is certain. Whether new capabilities are labeled 3G or not is not of material importance since the real challenge is having advanced services ready for market when customers demand them, and delivering these services cost effectively. Whatever results from the 3G standards process, cdmaOne operators will have standard solutions that enable 3G services with a clear growth path from today’s systems.

Lesson 50　MMS

Reading Materials A

MMS[1] Overview

The Multimedia Messaging Service (MMS) is as its name suggests the ability to send and receive messages comprising a combination of rich media including text, sounds, images and video to MMS capable handsets[2].

The transition from Short Message Service (SMS[3]) to Multimedia Messaging Service (MMS) is as important on mobile phones as the transition from DOS to Windows was for the PC. It represents a revolution.

MMS presents a revolution to the end user in terms of the richness of the messaging services, however it is delivered in an evolutionary manner from the infrastructure[4] suppliers point of view. MMS infrastructure vendors will be reusing components from existing SMS, E-mail, Unified Messaging and other platforms. As such, MMS is simply a presentation layer[5] for E-mail that leverages past developments made in these areas and allows multiple standardized access to messages.

MMS will be the first mobile messaging service to embrace[6] the open Internet standards for messaging. In SMS, proprietary interfaces and architectures were commonplace because the Internet Protocol (IP) and the Internet itself had not yet been developed.

There will be many MMS infrastructure vendors including all the incumbent[7] mobile value-added service platform suppliers such as SMS Center vendors and all the mobile network infrastructure vendors. The market shares will be more distributed as competition in all areas of the mobile value chain increases, but the size of the market will be substantially larger too.

Value and revenues will migrate to the application developers, service providers and content creators who can keep the services fresh and current and novel for end users who will get their services from a variety of different Internet sites—and certainly not one portal[8] or provider. Increasingly, handset vendors will offer content and services and infrastructure suppliers will offer applications.

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[1] MMS (Multimedia Messaging Service) **多媒体短信业务**
[2] handset **手机**
[3] SMS (Short Message Service) **短信业务**
[4] infrastructure **基础设施**
[5] presentation layer **表示层**
[6] embrace **包含**
[7] incumbent **现任的**
[8] portal **入口**

Content is King and Self-created Content will be the Richest Content

The i-mode service from NTT DoCoMo that is already operating in Japan is the clearest example of how MMS services will look and be used in terms of terminals, services, service delivery (Java), wide range of content sites and business models—NTT DoCoMo earns 9% of the total revenues from the i-mode services, the content provider earns the rest. In Europe currently, the reverse is true.

The success of MMS is linked to the allocation of revenue shares divided between members of the value chain in a fair way according to efforts and responsibilities.

MMS Success= Entertainment + Still Images + Person to Person

Still images such as mobile pictures, photos, postcards, screensavers, autographs[1], screen personalization, presentations, business cards, card trading, letters, telegrams, telexes and greetings cards are expected to be the major application area in MMS.

The Multimedia Messaging Service (MMS) is the key business case driver for GPRS[2] (General Packet Radio Service) and is also the central driver of the 3G business case (Third Generation) and will contribute a huge amount to earning a return on 3G investments. MMS is more important than oft-mentioned buzzwords[3] such as mobile commerce and mobile location, which are both secondary enablers of MMS transactions. Indeed, location with MMS will be about one person telling another that they are in a certain place by sending them a photo of that place taken with the digital camera on their MMS terminal.

Many of the features and utilities that are routinely used on PCs today such as screensavers, personalization of desktops, viruses, plug-ins and the like will migrate over to the mobile phone too.

The Multimedia Messaging Service (MMS) has several key technical features:

MMS is a service environment that allows different kinds of services to be offered, especially messaging services that can exploit different media, rich media, multimedia and multiple media.

MMS will enable messages to be sent and received using lots of different media including text, images, audio and video.

As new more advanced media become available, more content rich applications and services can be offered using the MMS service environment.

The Multimedia Messaging Service (MMS) introduces new messaging platforms to mobile networks in order to enable MMS. These new platforms have been designed to interact with legacy mobile platforms such as SMS Centers. The new platforms include MMS Relay(s) and MMS User Databases.

MMS will require not only new network infrastructure but new MMS compliant[4] terminals. MMS will not be compatible with old terminals, which means, that before it can be widely used, MMS terminals must reach a certain penetration, and that will take at least a couple of[5] years.

MMS is like SMS a non-real time service—a relay platform routes multimedia messages to MMS Servers.

The Multimedia Messaging Service (MMS) is designed to be future proof. As mobile networks evolve

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[1] autograph **亲笔签名，手稿**
[2] GPRS (General Packet Radio Service) **通用分组无线业务**
[3] buzzword **时髦术语**
[4] compliant **适应的**
[5] a couple of **两三个，几个**

and new media become available, the aim is to make the standards as backwards and forwards compatible as possible.

Access to MMS services should be independent of access point—multimedia messages should be accessible through 3G and 2G mobile networks, fixed networks, the Internet etc. This is where common message stores will be an important enabling technology. To facilitate interoperability[1] and universal messaging access, MMS will comply with Virtual Home Environment (VHE[2]). VHE is a 3G service that simply lets customers have seamless access with a common look and feel to their services from home, office or on the move and in any city as if they were at home. The Virtual Home Environment (VHE) permits the user to manage his services (including non-realtime[3] multimedia messaging handling) via a user profile[4], permitting, for example, all different types of messaging to be presented to the user in a unified and consistent manner.

MMS supports multiple rich media and it is therefore important that the concept of a user profile has been included. This user profile is stored in the mobile network and is user defined and managed via the Internet and determines which multimedia messages are downloaded immediately to the user and which are left on the server for later collection. The user may also choose to receive notifications of certain multimedia message types.

Although MMS is being standardized by the 3GPP, in fact MMS services can be offered on GPRS[5] (General Packet Radio Service, so called 2.5G) networks.

Reading Materials B

MMS FAQ

What is MMS?

Multimedia Messaging Service (MMS) adds images, text, audio clips and ultimately, video clips to SMS (Short Message Service / text messaging).

Simon Buckingham, CEO of Mobile Streams believes that: ‘The transition from Short Message Service (SMS) to Multimedia Messaging Service (MMS) is as important on mobile phones as the transition from DOS to Windows was for the PC. It represents a revolution.’

Unlike other technologies like WAP, Bluetooth etc—MMS offers a complete development and billing environment along with a chance to create compelling applications.

Thus, MMS provides an opportunity to foster an industry where all players in the value chain may get an opportunity to earn revenue.

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1 interoperability **互操作性**
2 VHE (Virtual Home Environment) **虚拟本地环境**
3 real time **实时**
4 user profile **用户简介（工作环境设置文件）**
5 GPRS (General Packet Radio Service) **通用信包无线业务**

Why is MMS Significant?

MMS is significant because:

- It is a natural evolution from text messaging which already has a large user base especially in Europe and Asia
- MMS functionality can be delivered now using GPRS i.e. we need not wait for 3G.
- It has support from operators and industry players.
- MMS messages can be sent to / from E-mail which may overcome the problem of initial limited device availability.
- Richer applications can be developed using MMS than are currently possible with just the 160 text characters available with SMS.

How Would End Users Interact with MMS?

In terms of usage, Multimedia messages can best be understood as ‘choreographed PowerPoint presentations’.

What does ‘choreographed’ mean? The multimedia presentation, which consists of elements such as music, voice, images, text, video, and graphics—are all synchronized across a common timeline (i.e. not delivered as attachments) as in an E-mail.

Similar to an SMS, the recipient receives a notification and when the full message is received, the presentation starts running. Visually, the presentation looks like a choreographed slide show with images (both photographic and animation) and sound.

Another way to think of MMS is as a presentation layer over E-mail since MMS uses many E-mail technologies.

Unlike SMS communication, MMS communication will not be discreet i.e. rich media lends itself to be ‘flaunted’ rather than being discreetly in the background. This trend is already noticeable with richer media such as ringtones.

There is a Lot of Publicity About Photo Messaging. Is That MMS?

Yes, photo messaging (using an inbuilt camera to take a photograph and then sending that photograph as a message or an E-mail) is a popular example of MMS in action. Learning from the failures of WAP, operators are wisely not calling it ‘MMS’.. However, photo messaging is just the tip of the iceberg .. MMS facilitates many other applications as you can see below.

What are Some Examples of MMS Services Other Than Photo Messaging?

Possible, examples of an MMS based applications are:

- Weather report with images
- Stock quotes that can be viewed as diagrams
- Football goals that can be viewed as a slide show
- Animated text messages

What Content Types Does MMS Support?

An MMS message can contain one or more of the following. Specific media formats are explained below.

- Text

  Unlimited text that can be formatted.

  Text can be accompanied by images, graphics, sound and in future video.

- Graphics

  Support for Graphs, tables, charts, diagrams and layouts.

  Support for animated GIFs.

- Audio

  Support for music, speech.

  Support for streaming sound.

- Images

  Sending images and snapshots from an attached or built in digital camera.

  Ability to edit images and add text.

- Video

  The ultimate goal of MMS is the ability to send video (over a full 3G network).

  The ability to send a simple 30-second clip has enticing applications especially in the sports and media arena.

How Does the User's MMS Experience Compare to That of SMS?

SMS messages are not delivered in real time because they follow the 'store and forward' model. All SMS messages first get sent to the SMSC (Short Message Service Center) from where they are routed to the recipient.

Like SMS messages, MMS messages are also not delivered in real time. However the actual interaction in the delivery of MMS messages is different from that of SMS.

SMS message delivery is quite simple—SMS messages get sent first to the SMSC and if the SMSC can deliver the message immediately to the recipient, the message is sent to them.

MMSC (Multi Media Service Center) performs an analogous function to the SMSC for the purposes of this discussion.

The steps for MMS are different:

- The sender sends a message to the MMSC
- When the MMSC receives the message, the MMSC sends confirmation. The sender then gets a 'message sent'.
- MMSC sends the receiver a notification that a new message is waiting
- The receiver can then download the message immediately or download it later. Once the message is successfully downloaded, the receiver gets a 'Message Received' indication.
- Once the receiver has successfully downloaded the message, the sender gets a 'Message Delivered' message.

What are the Similarities and Differences Between MMS and I-mode?

It is common to compare the two leading technologies? i-mode in Japan and MMS in the GSM world.

Both are rich in media. MMS has potential to duplicate the success of i-mode globally in terms of functionality. MMS can be viewed as an ‘ideas factory’ i.e. a visual communication medium. i-mode has established service platforms(train timetables, horoscopes etc). i-mode can thus enrich MMS in the services aspect leading to greater ARPU for MMS.

Does MMS Need 3G?

No.

MMS functionality is being delivered in two stages—firstly over a GPRS bearer (2.5G rather than 3G) —where it will contain a subset of the media such as still images (but not video) followed by 3G where it will contain ‘full’ multimedia such as video clips. This implies we need not wait for 3G to make use of MMS applications.

What is the Relationship Between MMS and WAP?

The Wireless Application Protocol (WAP) —although not popular with consumers as an end user application, is used with MMS as an underlying protocol in a number of ways.

WAP as a transport protocol

The WAP Wireless Service Protocol WSP is used as a transport mechanism in MMS. It should be noted that the use of WAP WSP for transport does not mandate the use of a WAP browser. In fact, SMIL is widely promoted as a method of choice for the presentation layer of MMS. By using WAP as a transport any bearer with WAP capabilities can be used making MMS bearer independent e.g. MMS is not limited to only GSM or WCDMA.

WAP Push

MMS can be offered over GPRS providing that the recipient phone supports WAP version 1.2. MMS uses the WAP push functionality to notify and deliver multimedia messages to the target device.

WAP as a User Agent Profile mechanism

MMS also uses WAP as a mechanism to inform the server about the capabilities of the MMS user agent. This is known as the User agent profile.

Lesson 51　Optical Network

Reading Materials A

Optical Network Overview

Definition

Optical networks are high-capacity telecommunications networks based on optical technologies and components that provide routing[1], grooming, and restoration at the wavelength level as well as wavelength-based services.

Overview

As networks face increasing bandwidth demand and diminishing fiber availability, network providers are moving towards a crucial milestone in network evolution: the optical network. Optical networks, based on the emergence of the optical layer in transport networks, provide higher capacity and reduced costs for new applications such as the Internet, video and multimedia interaction, and advanced digital services.

Optical Networks

In the early 1980s, a revolution in telecommunications networks began that was spawned by the use of a relatively unassuming technology, fiber-optic cable[2]. Since then, the tremendous cost savings and increased network quality has led to many advances in the technologies required for optical networks, the benefits of which are only beginning to be realized.

History

Telecommunication networks have evolved during a century-long history of technological advances and social changes. The networks that once provided basic telephone service through a friendly local operator are now transmitting the equivalent of thousands of encyclopedias per second. Throughout this history, the digital network has evolved in three fundamental stages: asynchronous, synchronous[3], and optical.

Asynchronous

The first digital networks were asynchronous networks. In asynchronous networks, each network element's internal clock source[4] timed its transmitted signal. Because each clock had a certain amount of variation, signals arriving and transmitting could have a large variation in timing, which often resulted in bit errors.

---

[1] routing **路由选择**
[2] fiber-optic cable **光缆**
[3] asynchronous **异步的；**synchronous **同步的**
[4] clock source **时钟源**

More importantly, as optical-fiber deployment increased, no standards existed to mandate how network elements should format the optical signal. A myriad of proprietary methods appeared, making it difficult for network providers to interconnect equipment from different vendors.

Synchronous

The need for optical standards led to the creation of the synchronous optical network (SONET)[1]. SONET standardized line rates[2], coding schemes[3], bit-rate[4] hierarchies, and operations and maintenance functionality. SONET also defined the types of network elements required, network architectures that vendors could implement, and the functionality that each node must perform. Network providers could now use different vendor's optical equipment with the confidence of at least basic interoperability.

Optical

The one aspect of SONET that has allowed it to survive during a time of tremendous changes in network capacity needs is its scalability. Based on its open-ended[5] growth plan for higher bit rates, theoretically no upper limit exists for SONET bit rates. However, as higher bit rates are used, physical limitations in the laser sources and optical fiber begin to make the practice of endlessly increasing the bit rate on each signal an impractical solution. Additionally, connection to the networks through access rings has also had increased requirements. Customers are demanding more services and options and are carrying more and different types of data traffic. To provide full end-to-end connectivity, a new paradigm was needed to meet all the high-capacity and varied needs. Optical networks provide the required bandwidth and flexibility to enable end-to-end wavelength services.

Optical networks began with wavelength division multiplexing (WDM)[6], which arose to provide additional capacity on existing fibers. Like SONET, defined network elements and architectures provide the basis of the optical network. However, unlike SONET, rather than using a defined bit-rate and frame structure as its basic building block, the optical network will be based on wavelengths. The components of the optical network will be defined according to how the wavelengths are transmitted, groomed, or implemented in the network. Viewing the network from a layered approach, the optical network requires the addition of an optical layer. To help define network functionality, networks are divided into several different physical or virtual layers. The first layer, the services layer, is where the services, such as data traffic, enter the telecommunications network. The next layer, SONET, provides restoration, performance monitoring, and provisioning that is transparent to the first layer.

Emerging with the optical network is a third layer, the optical layer. Standards bodies are still defining the optical layer, but it will eventually provide the same functionality as the SONET layer, while operating entirely in the optical domain. The optical network also has the additional requirement of carrying varied types of high bit-rate nonSONET optical signals that bypass the SONET layer altogether. Just as the SONET layer is transparent to the services layer, the optical layer will ideally be transparent to the SONET layer,

[1] the synchronous optical network (SONET) 异步光纤网标准
[2] line rate 线路速率
[3] coding scheme 编码法，编码方案
[4] bit-rate 位速率
[5] open-ended 开端式的，可扩充的
[6] wavelength division multiplexing (WDM) 波分多路复用

providing restoration, performance monitoring, and provisioning of individual wavelengths instead of electrical SONET signals.

Reading Materials B

How Fiber Works

The operation of an optical fiber is based on the principle of total internal reflection. Light reflects (bounces back) or refracts (alters its direction while penetrating a different medium), depending on the angle at which it strikes a surface.

One way of thinking about this concept is to envision a person looking at a lake. By looking down at a steep angle, the person will see fish, rocks, vegetation, or whatever is below the surface of the water (in a somewhat distorted location due to refraction), assuming that the water is relatively clear and calm. However, by casting a glance farther out, thus making the angle of sight less steep, the individual is likely to see a reflection of trees or other objects on an opposite shore. Because air and water have different indices of refraction, the angle at which a person looks into or across the water influences the image seen.

This principle is at the heart of how optical fiber works. Lightwaves are guided through the core of the optical fiber in much the same way that radio frequency (RF) signals are guided through coaxial cable. The lightwaves are guided to the other end of the fiber by being reflected within the core. Controlling the angle at which the light waves are transmitted makes it possible to control how efficiently they reach their destination. The composition of the cladding glass relative to the core glass determines the fiber's ability to reflect light. The difference in the index of refraction of the core and the cladding causes most of the transmitted light to bounce off the cladding glass and stay within the core. In this way, the fiber core acts as a waveguide for the transmitted light.

The Design of Fiber

Core, Cladding, and Coating

An optical fiber consists of two different types of highly pure, solid glass, composed to form the core and cladding. A protective acrylate coating then surrounds the cladding. In most cases, the protective coating is a dual layer composition.

A protective coating is applied to the glass fiber as the final step in the manufacturing process. This coating protects the glass from dust and scratches that can affect fiber strength. This protective coating can be comprised of two layers: a soft inner layer that cushions the fiber and allows the coating to be stripped from the glass mechanically and a harder outer layer that protects the fiber during handling, particularly the cabling, installation, and termination processes.

Single-Mode and Multimode Fibers

There are two general categories of optical fiber: single-mode and multimode.

Multimode fiber was the first type of fiber to be commercialized. It has a much larger core than single-mode fiber, allowing hundreds of modes of light to propagate through the fiber simultaneously. Additionally, the larger core diameter of multimode fiber facilitates the use of lower-cost optical transmitters (such as light emitting diodes [LEDs] or vertical cavity surface emitting lasers [VCSELs]) and connectors.

Single-mode fiber, on the other hand, has a much smaller core that allows only one mode of light at a time to propagate through the core. While it might appear that multimode fibers have higher capacity, in fact the opposite is true. Single-mode fibers are designed to maintain spatial and spectral integrity of each optical signal over longer distances, allowing more information to be transmitted.

Its tremendous information-carrying capacity and low intrinsic loss have made single-mode fiber the ideal transmission medium for a multitude of applications. Single-mode fiber is typically used for longer-distance and higher-bandwidth applications (see *Figure 3*). Multimode fiber is used primarily in systems with short transmission distances (under 2 km), such as premises communications, private data networks, and parallel optic applications.

Optical Fiber Sizes

The international standard for outer cladding diameter of most single-mode optical fibers is 125 microns (μm) for the glass and 245 μm for the coating. This standard is important because it ensures compatibility among connectors, splices, and tools used throughout the industry.

Standard single-mode fibers are manufactured with a small core size, approximately 8 to 10 μm in diameter. Multimode fibers have core sizes of 50 to 62.5 μm in diameter.

技 巧 篇

第 1 章　口语句型

一、学校面试

1．As a young boy, I dreamed of becoming a police officer.
儿时我就梦想成为一名警官。

2．In retrospect, I know these early admirations laid the foundation for my future interest in computer.
回顾往事，我知道正是早期的这种钦慕，为我日后对计算机产生兴趣奠定了基础。

3．I know that I will be able to receive a top-notch education that will allow me to fulfill my potential as a contributing member of society.
我知道自己将会接受一流的教育，从而可以使我实现自己的潜力，为社会做出贡献。

4．Another strong influence in my life has been the work of my father.
另一个对我人生具有重要影响的因素就是我父亲的工作。

5．During the course of my studies in high school I became more interested in mathematics.
在我高中的学习过程中，我对数学越来越感兴趣。

6．During my college years I felt with increasing certainty that I would be a lawyer.
在大学的时候，我更加坚定了要成为一名律师的信念。

7．I will be able to forge ahead with the confidence that I will achieve what I have set out to do.
我一定会坚定信心，稳步前进，来实现我已开始着手的目标。

二、公司面试

1．Why do you want to work for this company?
你为什么希望在这家公司工作呢？
【回答范例】the opportunities it offers, the working conditions, its reputation, etc.
提供的机会、工作条件、公司的声誉等。

2．Give me a summary of your current job description.
对你目前的工作，请给我一个概括的说明。
【回答范例】I have been working as a system engineer for two years.
两年以来我一直做的是系统工程师。

3．What are your greatest strengths?

你最大的强项是什么？

【回答范例】I can organize my time efficiently.

我可以有效地组织时间。

4．What are you greatest weakness?

你最大的弱点是什么？

【回答范例】I like to see a job done quickly, and I am critical if it isn't.

我很愿意看到工作能很快完成，如果工作进展缓慢我会非常不满。

5．What makes you think you would be a success in this position？

什么使你认为自己能胜任这个职位？

【回答范例】I am hardworking, responsible and diligent in any project I undertake.

我对所从事的每一个项目都很努力、负责、勤勉。

6．Why did you leave your last job？

你为什么离开上一份工作呢？

【回答范例】I feel I have reached the "glass ceiling" in my last job.

我觉得上一份工作已经到了顶峰阶段。

7．What are your salary expectations?

你期望的薪水是多少？

【回答范例】Can you discuss your salary range with me?

您能告诉我贵公司的薪水范围么？

三、网上聊天

1．What are you studying?

你主修什么呢？

2．You got that right.

你说的对。

3．I can pretty much understand what you are talking about.

我非常能了解你在说什么。

4．I have no idea what that is.

我不知道那是什么。

5．Beats me.

考住我了。

6．Are you kidding me?

你是在开玩笑么？

7．You are very supportive.

你很支持我。

8．My country is rich in natural resources.

我国自然资源丰富。

9．The biggest festival in my country is the Spring Festival.

我国最大的节日是春节。

10. What do you do in your spare time?

空闲时间你干什么？

四、外企工作

1. I would like to talk to you for a minute.

我想和你谈一下。

2. I'm supposed to get a raise.

我应该涨工资了。

3. Let me explain why I was late.

请让我解释迟到的理由。

4. Here is my card.

这是我的名片。

5. I enjoy working with you very much.

我很高兴和您一起工作。

6. I just heard that seven people are going be laid off next month.

我刚听到公司下个月要裁七位员工。

7. What are you up to?

你正在做什么?

五、英语角

1. What's your favorite sport?

你最喜欢什么运动？

2. Football is my favorite.

足球是我最喜欢的。

3. I like collecting stamps.

我喜欢收集邮票。

4. I prefer tea to coffee.

和咖啡相比，我更喜欢茶。

5. Where are you from?

你来自哪儿？

6. I major in Computers.

我主修计算机。

7. As a senior, I am writing my thesis.

作为大学四年级学生，我正在写毕业论文。

8. Do you have any plan for your career?

你对未来有什么计划吗？

9．I have an interview next week.

我下周要参加面试。

10．Do you go on picnics?

你常去郊游吗？

11．I hate Jazz. It’s too noisy.

我讨厌爵士，太吵了。

12．On Sundays I often spend some time reading in the library.

星期天我经常在图书馆里看些书。

第 2 章　实用写作

一、简历

【简历结构】

简历一般包括如下内容。可根据提供简历的目的，有重点的选择其中某些部分。

（1）**姓名、地址、联系方式（电话及电子信箱等）**

（2）**工作经历**

（3）**学历**

（4）**个人信息**

（5）**求职目标**

（6）**技能（如外语技能）**

（7）**所参加的学术团体**

（8）**著作和论文出版与发表情况**

（9）**业余爱好**

（10）**证明材料**

【例文】

RESUME

Wu You
47 Fangbei Road
Xi’an, Shaanxi Province 710038
P.R.China
Telephone:029-83547888
E-mail: wuyou@yahoo.com.cn

Position applied for

System Engineer

Education

1995—1999 **年**　Computer Science at Dalian University of Technology (DUT)
1992—1995 **年**　Rongyi High school in xi’an, Shaanxi Province, P.R.China

Working Experiences

Oct.1999—present

Employee at Beyond Co., Ltd

Position: Senior System Engineer

Working Environment

- Operating System: PC's with UNIX and Linux
- Programming Language: C
- Script Language: Korn Shell, etc.

Projects

- Modifying Customer Care Server (CCS)
- Developing Customer Care Client Emulator (CCCE)
- Developing Test-Script of Customer Care Server (test_ccs)
- Writing Documentation of test_ccs

Oct.1995—July.1999

Employed by DUT Computer Center

Position: Student Assistance in Computer Room

Working Environment

- Programming Language: Java/J++, C/C++, HTML, X-Window
- Operating System: UNIX, Linux, Window NT/9x/3.1, Mac OS

Language Skill

English (fluent in writing and speaking)

【参考译文】

简　历

吴佑

中国陕西省西安市纺北路 47 **号**

电话：029-83537888

电子信箱：wuyou@yahoo.com.cn

应聘职位

系统工程师

教育经历

1995—1999 **年　大连理工大学　计算机科学专业**

1992—1995 **年　陕西省西安市容一高中**

工作经历

1999 年 10 月至今

超越有限公司

职位：高级系统工程师

工作环境

- **操作系统：**Linux, UNIX
- **编程语言：**C
- **脚本语言：**Korn Shell **等**

参与项目

- **修改** CCS
- **开发** CCCE
- **开发** CCS **的测试脚本**
- **编写** CCS **测试脚本的文档**

1995 年 10 月至 1999 年 7 月

大连理工大学计算机中心

职位：机房学生助理

工作环境

- **编程语言：**Java/J++, C/C++, HTML, X-Window
- **操作系统：**UNIX, Linux, Window NT/9x/3.1, Mac OS

语言技能

英语口语流利，擅长写作

【简历形式】

按编写形式划分，简历可分为记叙式、功能式和分解式。主要区别在于经历部分。

（1）**记叙式简历以时间为主线，采用倒叙的方式来反映经历。记叙式简历结构简单、层次清楚、反映全面，所以被广泛采用。**

（2）**功能式简历不受时间顺序限制，可以突出表现经历中的一部分，使其更具有针对性。例如可以将** Working Experiences (**工作经历**) **分成两部分来介绍。一部分称为** Summary of Skills**，重点介绍与工作有关的技能、资格和经验等；另一部分称为** Employment History**，罗列工作时间、单位名称和职责等。如下例所示：**

Summary of Skills

- Over five years of computer experiences.
- Special expertise in system evaluation.
- Proficient in Java and C programming languages.

Employment History

1999-present Sida Co., Ltd

Position: Technical Engineer

参考译文

技能

- **五年多的计算机行业经验**
- **专长于系统评估**
- **擅长** Java **和** C **语言**

工作史

1999 **年至今**　**思达有限公司**

职位：技术工程师

（3）**分解式简历是按工作的不同性质来分别进行介绍，主要适合曾从事过不同职业的人。不同类型的经历分属不同的标题。如：**Teaching Experiences （**教师经历**），Management Experience (**管理经历**) **等。如下例所示：**

Teaching Experiences

Designed, organized, and implemented two-semester hour courses in Computer English.

Management Experiences

Team Leader of System & Network group.

参考译文

教师经历

设计、组织和完成计算机英语的两学期课程

管理经历

系统网络小组组长

【常用表达：求职目标】

1．“**应聘职位**”**的几种英文表达方式**

position applied for	position desired
job objective	objective

2．**与计算机行业有关的职位名称**

Programmer	**程序员**
Computer Operator	**计算机操作员**
Hardware Engineer	**硬件工程师**
Project Manager	**项目经理**
Technical Engineer	**技术工程师**
Systems Engineer	**系统工程师**
Computer Technician	**电脑技术员**
Developmental Engineer	**开发工程师**
LAN Administrator	**局域网管理员**
Systems Analyst	**系统分析员**
Product Support Manager	**产品支持经理**

【常用表达：姓名、地址和联系方式】

1．**姓名**

name **姓名**	pen name **笔名**	alias **别名**

2．**地址**

address **地址**	current address **目前住址**	permanent address **永久住址**
P.R.China **中国**	province **省**	city **市**
county **县**	autonomous region **自治区**	street **街**
district **区**	road **路**	lane **胡同，巷**
post code **邮编**		

3．**联系方式**

BP **传呼**	home phone **住宅电话**	E-mail **电子信箱**
Mobile **手机**	office phone **办公电话**	Homepage **主页**

【常用表达：个人情况】

nationality **民族**	native place **籍贯**	health **健康状况**
height **身高**	ID number **身份证号**	marital status **婚姻状况**
weight **体重**	birth date **出生日期**	single **未婚**
age **年龄**	blood type **血型**	married **已婚**
sex **性别**	male **男**	female **女**

【常用表达：教育】

major **主修**	minor **辅修**
part-time jobs **兼职**	vocation jobs **假期工作**
scholarship **奖学金**	student union **学生会**
social practice **社会实践**	social activities **社会活动**
excellent leader **优秀干部**	excellent leader member **优秀团员**
in-job training **在职培训**	educational system **学制**
academic year **学年**	semester **学期（美）**
term **学期（英）**	supervisor **论文导师**
marks **分数**	degree **学位**
bachelor **学士**	master **硕士**
doctor **博士**	post doctorate **博士后**
graduate student **研究生**	aboard student **留学生**
undergraduate **大学生（尚未毕业）**	graduate **毕业生**

【常用表达：工作经历】

responsible for **负责**	assist in **辅助**
test **测试**	design and implement **设计与实现**
develop **开发**	train and supervis **培训与指导**
accomplish **完成**	direct **指导**
design **设计**	be promoted to **被提升为**

【常用表达：其他】

1．**“擅长、精通、专长”的几种表达**

good at **擅长**
versed in **精通**
special expertise in **专长于**
excellent … skills **擅长……技能**
proficient in **精通**

2．**业余爱好**

hobbies **业余爱好**
reading **阅读**
long distance running **长跑**
collecting stamps **集邮**
traveling **旅游**
listening to symphony **听交响乐**
listening to music **听音乐**

二、电子邮件

在信息时代，传统的书信往来已渐渐被电子邮件所代替。二者在写作规范上大同小异，只是电子邮件更加口语化，在表达上也比较直接简洁。

【地址】

传统书信对地址的写法有一定的要求，但电子邮件就简单多了。只要在收信人一栏中键入形如 wwcjl@sina.com **的电子邮箱地址即可。**

【常用收信人称呼】

Dear Sir	Dear Sirs	Dear Mr. Wang
Dear Mrs. Wang	Dear Miss Wang	Dear Ms. Wang
Dear Dr. Wang	Dear Professor Wang	Dear Customer

【常用的致谢用语】

1．Thank you very much / most sincerely/ from the bottom of my heart.
2．Please accept my sincere appreciation for ...
3．I sincerely appreciate ...
4．I cannot tell you how much your mail delighted me.

【常用祝愿语】

1．I wish you a happy New Year.
2．Pray accept my best and sincerest wishes for the New Year.
3．Congratulate you most heartily.
4．I wish you still further success.

【结束语】

1．Looking forward to a prompt reply.
2．With kind regards to your family.
3．As the season grows colder, I hope you will take good care of yourself.

4．Pray give my best remembrances to Mr. Brown.

【信尾客套语】

正式：Yours faithfully, Yours very truly, Faithfully yours.

半正式：Sincerely yours, Yours sincerely, Cordially yours, Very cordially yours.

非正式：Sincerely, Cordially, Yours truly, Best regards.

【例文】

Dear Professor Liu,

I hope that this letter finds you and your family well. Are you still busy for the development of removable storage?

I am writing to request you for permission to use your name as reference. Would you be prepared to write a letter of recommendation for my new position?

ABC Co. are considering my application for a job as a system engineer. As some of the information may be helpful in preparing to write a letter of recommendation, I am attaching a copy of my resumes.

My interest in an IT career is stronger than ever. I shall certainly appreciate the time you spend in responding to a request for information about me.

With kind regards to your family.

Yours sincerely

Wu You

【注意事项】

1．**明确对象**

电子邮件的收信人有两种。一种是只有收信人才能看的，就只需要考虑对方的身份以及他所想要了解的内容即可；另一种是如果在抄送一栏中也有若干个邮件地址，那这封邮件就是一封公共邮件，要给很多人看的，因此要考虑的问题就要多些，要考虑他们共同感兴趣的内容。

2．**明确目的**

在写电子邮件时一个非常重要的问题就是要达到或实现什么目的。最好的表达方法就是开门见山。达芬奇在 1942 **年写的申请信中，一开始就写道：**I have plans for bridges, very light and strong. **虽然这不是一封电子邮件，但这种简明扼要的写法则非常适用于电子邮件的写作。**

3．**避免玩弄文字游戏**

在电子邮件的写作中，要尽量避免使用一些生僻的词语，也不要采用冗长的表达方式。例如 in view of the fact that**，就可用** as **来代替。**

4．**文字简短**

电子邮件不能过长。要尽量的使用短句。

三、英文摘要

【概述】

摘要（Abstract**）也称为内容提要，经常放在正文的前面。一般在科技论文中都必须附有摘要。**

【学位论文摘要】

学位论文摘要也叫内容提要(summary)，一般单独占一页，装订在学位论文目录之前。学位论文摘要一般都要求用中、英文两种语言写，400 字左右，根据需要可以分为几个段落。内容一般包括研究目的、研究对象、研究方法、研究结果、所得结论、结论的适应范围等 6 项内容。其中，研究的对象与结果是任何一篇摘要都必须有的内容，其他则可根据论文的具体内容灵活运用。

【常用句型】

1．**研究目的**

常用主语

第一类： this paper /study/project/research…

第二类： The goal of this study/ The aim of this paper/ The purpose of this project/ The objective of this research…

常用谓语

第一类： concerns/tests/investigates/reports/discusses/describes/explains/examines/ analyses/proposes/evaluates…

第二类： aims to do/is designed to do…

2．**研究结果**

Results indicated/showed that…

It can be concluded/acknowledged that…

The examination/investigation proves that…

The paper concludes that…

Data suggested that…

3．**总结**

as has been noted/to sum up/in summary/in brief/in short/in a word…

【注意事项】

1．**精炼。不要使用繁杂的表达方式。**

2．**抓住重点、表达完整。在写论文摘要时，要明确哪些内容是论文的重点。**

【例文】

The purpose of this Master’s-degree project was to develop a computer program used for management of book rental stores. The development process consisted of 5 steps. The first step was to study of an existing system of the book rental stores. The second step was to identify the problems, which were usually found in book rental stores. The third step was to analyze the new system in order to solve the problems in the existing system. The fourth step was to design a database system and interactive screens of the new system. And the last step was to develop the new system by the use of Visual Basic 6.0 as a software tool, Windows 2000 as a platform, and Microsoft SQL server 2000 as database management system. The new system offered the operation system for book rent, book return, and book sale. This system applied the database management system to process the data for the book inquiries and making the reports such as the reports for due date of the members, the reports for rental book history of the members, the reports for the favorite books, and the reports for incomes/outcomes/accounts. Furthermore, the system was designed to print out member cards and receipts, calculate rental cost and fines, search for the book or member data from ID numbers or names, calculate bonus for each member collected points, and it was possible to use with a barcode system. The efficiencies of the system were evaluated by a panel of experts using an evaluation form. The results indicated that the efficiency of this program was at an acceptable level. It was able to be applied to book rental stores efficiently.

第 3 章　翻译技巧

一、计算机英语特点

- 总的特点：客观、严谨、准确、精炼
- 词汇：专业术语多；缩略语经常出现；合成新词多
- 短语：介词短语、分词短语和名词性词组使用频繁
- 句式：长句、祈使句与被动语态使用较多
- 方程式、插图、表格、数字占有一定比例

二、专业知识背景

计算机英语与其他的专业英语的最大差别在于它的“日新月异”。由于计算机技术的迅速发展，从而使计算机英语不仅在内容上的更新较快，而且也会不断出现新的专业词汇。因此，若要对计算机类英语文章进行正确的分析与理解，首先就要不断的学习新的计算机技术，这样才能对内容有很好的理解；另外还要具有一定的专业词汇量。

三、词汇的翻译技巧

1．词义的确定

由于英语词汇来源复杂，经常会出现一词多义和一词多性的现象。这就需要根据上下文来进行选择，下面就以 work 一词进行说明。work 既可以用作名词，也可以用作动词。work 有多种意思，如工作、作业、要做的事情、行为、作品、起作用等等。

A．一词多义

We **work** hard for a better life. 我们为了更好的生活而努力**工作**。

The medicine **worked**. 药物**奏效**了。

B．一词多性

be hard at **work**　**工作**努力　（work 这里是**名词**）

work hard　努力**工作**　（work 这里是**动词**）

2．词义的引申

在翻译中，不能按照词典的解释原样照搬，而必须根据语言环境，对词义进行适当的引申。例如：

How far can a radio signal be **sent**? 无线电信号能**传送**多远？

在词典中，并不能找到 send 解释为“传送”，send 的一般意思就是“发送”。但如果将该句翻译为“无线电信号能发送多远”，并不能表达该句话的准确含义。因此，在这里对词义进行适当的延伸，将 send 翻译为“传送”。

3．词语的增加与减少

汉语和英语在表达方法和语法结构中都有很大的差别，因此在翻译中，可能会将一些词不进行翻译，或对原句的内容进行补译。例如：

a．The more programs **we** want to use, the more memory **we** need.

想要使用的程序越多，内存也就要越大。（没有翻译 we**）**

b．This hard disk is of higher capacity than is actually needed.

这个硬盘的容量比实际所需要的硬盘容量大。（补译省略的 capacity**）**

4．词序的变动

在词语的翻译中，还要注意根据汉语的语言特点来改变词序，尤其要注意修饰语的位置。英语中的短语或定语从句做修饰语的时候，一般都后置，而汉语中则需要前置。另外，翻译倒装句时，也要注意将词序还原。例如：

Such is the case. **情况就是这样。（倒装句还原）**

5．词性的改变

在翻译的过程中，有时候要根据汉语的表达习惯，将词性进行改变。例如：

be out because of sickness　**因病缺席**

（句中的 out **是形容词，翻译时则译为动词“缺席”）**

四、特殊句式的翻译

1．被动句

在被动句的翻译中，常用的有以下几种特殊方法：

a．**根据上下文添加主语，一般是“我们、人们”等。例如：**

I was referred to the information desk. **有人让我到问讯处。**

b．**有时候也可将** by **后面的成分译成主语。例如：**

The house is destroyed by fire. **火将房子烧毁了。**

c．**以** it **作形式主语的被动句**

It is well known that…	**众所周知……**
It is said that…	**据说……**
It is announced that…	**据称……**
It has been proved that…	**已证明……**
It is reported that…	**据报道……**
It is estimated that…	**据估计……**

2．否定结构

英语和汉语在否定的表达上有很大的差别，如果翻译不当，就会造成整个意思的改变。

a．**肯定形式的否定翻译**

有些句子表面上是肯定形式，但内容却是否定的意思，这时就要根据实际意思进行翻译。例如：

I am full of vigor, but fails in carefulness. **我精力充沛，细心不足。**

b．**否定形式的肯定翻译**

有些句子虽然看上去是否定形式，但却要翻译成肯定句。例如：

This is nothing else than a miracle. **这完全是一个奇迹。**

c．**双重否定表示肯定意思。例如：**

There is nothing unexpected about it. **一切都在预料之中。**

3．定语从句

定语从句的翻译主要有两种方法：

a．**前置法**

将定语从句翻译成带“的”的定语词组，放在被修饰的词之前。例如：

The man who told me this story refused to give his name.

告诉我这个故事的那个人拒绝说出他的名字。

b．**后置法**

如果定语从句较长，可将定语从句翻译成并列的分句，放在被修饰的词后面。例如：

This book is about a boy who never gave up a thing because it was hard or inconvenient.

这本书的主人公是一个男孩，他从不因为事情艰难或麻烦而放弃不做。

第 4 章　语法快餐

一、冠词

【a/an 的某些特殊用法】

1．**用在两件配在一起的东西前。**

a knife and fork　**一副刀叉**

2．**用在专有名词前，表示某一个，或表示某人的一部作品等。**

A Mr. Smith is looking for you. **一位史密斯先生在找你。**

A complete Mao Zedong. **毛泽东全集。**

3．**三餐名称前有形容词修饰，则加不定冠词** a/an **；如果没有形容词，则不加。**

She gave me a good breakfast. **她请我吃了一顿丰盛的早餐。**

I have breakfast at six. **我六点钟吃早饭。**

4．**在下列短语中，注意** a/an **的位置不同。**

how difficult a book / what a difficult book

so difficult a book / such a difficult book

too difficult a book

【the 的某些特殊用法】

1．**用在形容词或副词的最高级前面。**

the best novel **最好的小说**

2．**用在** first, second **等词前面。**

the first day **第一天**

3．**用在** only **前面。**

the only way **惟一的办法**

4．**用在独一无二的事物前面。**

the earth **地球**

5．**用在带有后置限制性定语的名词前。**

the woman you talked to **你跟她谈过话的那人**

6．the+**形容词，表示一类人。**

the young **年轻人**

7．the+**姓氏的复数姓氏，表示一家人。**

the Smiths **史密斯夫妇（及孩子们）**

二、名词

【名词的复数形式】

1．**如果名词以** y **结尾，且** y **前面为辅音，在变复数时，将** y **去掉再加** ies**；如果名词以** y **结尾，但** y **前面为元音，则直接加** s **构成复数。**

Baby—babies **婴儿**　　　　boy—boys **男孩**

2．12 **个以** f **或** fe **结尾的名词，在变复数时，变** f **或** fe **为** v**，加** es。

calf **小牛**；half **半**；knife **刀**；leaf **叶子**；life **生命**；loaf **条/只（一般指面包）**；self **自身**；sheaf **捆**；shelf **架子**；thief **贼**；wife **妻子**；wolf **狼**

3．**如果名词以** ch, sh, ss **或** x **结尾，直接加** es **构成复数。**

church, churches；brush, brushes；kiss, kisses; box, boxes

4．**如果名词以** o **结尾，在构成复数时，一般直接加** es**；如果该名词是外来词或者缩写词，则只加** s。

Tomato—tomatoes **西红柿**　　photo—photos **照片**

5．**复合名词在变复数时，一般是将最后一个词变成复数形式。如果复合名词形如：动词**+er+**副词，则在** er **后面直接加** s。**如果复合名词形如：名词**+**介词**+**名词，则将第一个词变为复数。**

girl-friend—girl-friends **女朋友**　　looker-on—lookers-on **旁观者**

sister-in-law—sisters-in-law **嫂子，弟媳**

6．**还有一些特殊的复数形式，需单独记忆，这里就不一一列举。**

【名词后面的单复数动词】

1．**集合名词如果表示一个群体，用单数动词；如果表示所有成员，则用复数动词。**

Your team is the best. **你们队是最好的。**

Our team are wearing blue jerseys. **我们队的队员们都穿着蓝色运动衫。**

2．**有些名词是由两部分组成，总是复数形式，并与复数动词连用。**

trousers **裤子**　　spectacles **眼睛**

3．**某些名词以** ics **结尾，一般也跟复数动词。**

physics **物理学**　　acoustics **音响效果**

三、形容词

【形容词的次序】

1．**多个形容词连用时，一般按照下面的先后次序排列：**

形体大小→一般描述→年龄和 little**→形状→颜色→材料→来源→目的**

a short sharp knife **一个短的快刀**　　yellow velvet curtains **黄丝绒窗帘**

small blue riding boots **蓝色小马靴**

2．**修饰人或动物的形容词，一般按如下次序排列：**

身体形状→性格/感情→肤色

a small kindly black doctor **一个身材矮小、好心的黑人医生**

3．little, young, old 如果并不是独立的提供一种信息，一般要紧挨在名词前面。

a nice little girl 一个很可爱的小女孩

【各种表示比较的句子结构】

1．as…as… 和……同样……

not as/so…as… 不如……那样……

I am as tall as you. 我和你一样高。

I am not as/so tall as you. 我不如你那样高。

2．形容词比较级+than，用于两者比较。

She makes fewer mistakes than I. 她犯的错比我少。

3．the+形容词最高级，用于三个或三个以上的人或物进行比较。

It was the most happiest day I had ever spent.

这是我度过的最快乐的日子。

4．the+比较级……the+比较级，表示两个事物彼此相应增长。

the bigger the better 越大越好

5．比较级+and+比较级，表示一个事物的逐渐增长或减少。

I became less and less interested in mathematics.

我对数学越来越不感兴趣。

四、副词

【常用时间副词】

afterwards 后来	eventually 最后，终于	lately 最近
now 目前	recently 最近	soon 立刻，不久
before 以前	early 早，在初期	yet 仍，至今

【常用频度副词】

always 总是	often 经常	sometimes 有时
continually 不断地	frequently 频繁地	occasionally 偶而
periodically 周期性地	repeatedly 重复地	usually 通常
ever 曾经	never 从未	seldom 很少

【某些副词的倒装】

为了表示强调可将某些副词或副词短语放在句首，这时后面应跟动词的倒装形式。常用的这类副词或副词短语如下：

hardly ever, on no account, hardly…when, only by, in no circumstances, only in this way, neither/nor, only then/when, never, scarcely ever, no sooner…when, not only, seldom, not till, so, no where

五、代词

【what 的一些特殊用法】

1．what…for? **为什么**

What did you do that for? **你为什么要那样做？**

2．what+be…like **要求对方对人或物进行描述。**

What was the weather like? **天气怎么样？**

3．what…look like? **仅指外表。**

What does his teacher look like? **他的老师长得什么样？**

4．what is+sb. **表示询问某人从事什么职业？**

What is your mother? **你妈妈是干什么的？**

【宾语代词的位置】

1．**间接宾语一般在直接宾语的前面；如果直接宾语是人称代词，则直接宾语紧接在动词之后，且在间接宾语的前面使用** to **或** for。

I sent Jack some photos. **我给杰克寄去一些照片。**

I sent them to Jack. **我将它们寄给了杰克。**

2．**与短语动词连用时，一般宾语可位于动词短语的中间或末尾；但是如果宾语是代词，就需要放在短语动词的中间。**

Take your shoes off. / Take off your shoes. **把你的鞋脱掉。**

Take them off. **把它们脱掉。**

六、介词

【at 和 on】

at **表示某一时刻，或者表示在……岁时；**on **表示在星期几/某日。**

at seven **在** 7 **点钟**　　She went to school at six. **她六岁上学。**

on Wednesday **在星期三**　　on 1 April **在** 4 **月** 1 **日**

几种特殊情况：

at night **在晚上**　　at Christmas **在圣诞节期间**

on the morning/afternoon/evening/night of +**某个具体日期**

在某个具体日期的早上/下午/傍晚/夜里

【常用介词分类列举】

1．**原因目的：**for, from , with

2．**除了：**except, besides, but

3．**关于：**about , regarding, with regard to, as to, concerning

4．**手段方式：**with, by, in

5．**反对：**against

6. **让步：**in spite of, despite
7. **条件：**considering, without
8. **对于：**to, with, for, at
9. **根据：**according to, on

七、连词

【when】

1. **表示一个动作接着另一个动作；或者表示一个动作发生在另一个动作的延续时间范围内。**

   When I pressed the button the machine stopped. **我按下按钮，机器就停了。**

   He often went to the museum when he was a child. **他还是个孩子的时候，就经常去博物馆。**
2. **虽然，可是。**

   I often walk when I might ride. **虽然可以骑车，我还是经常步行。**
3. **既然。**

   Why come here when you can stay at home. **既然可以呆在家里，为什么要来这儿呢？**

【as】

1. **表示两个动作同时发生或进行。**

   She sang as she worked. **她边工作边唱歌。**
2. **表示原因。**

   As he was tired, I decided to go without him. **因为他太累了，所以我决定自己去。**
3. **尽管，虽然。**

   Sick as he was, he offered to carry her. **虽然他有病，他还提出要背她。**

八、动词

【have】

1. have+**宾语**+**过去分词 表示主语让某人做事。**

   I have the computer repaired. **我请人把电脑修好了。**
2. **表明，坚持说。**

   Legend has it that…**传说……**
3. **表示吃（饭）。**

   have lunch **吃午饭**
4. **表示举行（聚会）。**

   have a party **举行聚会**
5. **常用短语。**

   have a good time **玩得高兴**　have it over sb. **胜过某人**

   have only to …to… **只要……就能……**　have sb. in **请某人进来**

   have sth. back **把某物要回**　have sth. in **在屋里备有某物**

【used】

1．used to+**动词原形，表示过去常常。**

I used to go there. **我过去常常去那儿。**

2．be/become/get used to+**名词/代词/动名词，表示已习惯于某事。**

I am used to working more than ten hours a day. **我习惯于每天工作十个小时以上。**

九、现在时态

【现在时态的用法】

1．**表示动作正在进行。**

It is snowing. **正在下雪。**

2．**表示现在这个阶段正在进行的动作。**

He is teaching English and learning French. **他在教英语，又在学法语。**

3．**表示目前打算。**

I'm meeting your teacher tomorrow. **明天我要跟你的老师会面。**

4．**与** always **连用。**

I am always losing my books. **我老是丢书。**

【通常不用于进行时的动词】

1．**表示感觉的动词。**

如 feel, hear, see, smell **等。**

2．**表示感情和情绪的动词。**

如 desire, detest, admire, adore **等。**

3．**表示精神活动的动词。**

如 agree, assume, believe, expect **等。**

4．**表示拥有的动词。**

如 belong, owe, possess, own **等。**

5．**助动词。**

如 is, am, are **等。**

十、一般现在时

【一般现在时的用法】

1．**表示习惯动作。**

My father smokes. **我的爸爸抽烟。**

2．**引用书籍、信件、通知等内容时，常用** say **的一般现在时。**

That notices says, "No smoking." **那个通告说不准抽烟。**

3．**表示计划好的一系列行动。**

We leave Beijing at 7:00 and arrive in Xi'an at 21:00.

我们 7 **点离开北京，晚上** 9 **点到达西安。**

4．**用于条件句中。**

If it rains tomorrow, he won't come here.

如果明天下雨，他就不会来这儿。

十一、过去时态

【一般过去时的用法】

1．**表明过于某一个特定时间所发生的动作，现在已经结束。**

I went to the library yesterday. **我昨天去图书馆了。**

2．**表示过去的习惯。**

He always carried an umbrella when he was in Shanghai.

他在上海时总带着一把伞。

3．**在** as if, as though **等词组后面，表示虚拟过去时。**

He talks as though he was our teacher. **他说话的语气就好象他是我们的老师似的。**

【过去进行时的用法】

1．**在过去延续了一段时间，该动作的开始或结束不是很明确。**

2．**表示逐渐发展。**

It was getting darker. **天越来越黑了。**

3．**时间状语用一般过去时，如果主句的动作发生在时间状语动作之前，并可能延续下去，则主句可用过去进行时。**

When she arrived, I was talking with my father. **她到的时候，我正在和爸爸交谈。**

4．**间接引语。**

Our teacher said she was living in Luoyang. **我们老师说她那时住在洛阳。**

5．**表示在过去对将来的安排。**

He couldn't meet his wife, for he was leaving that night.

因为他那天晚上就要走了，他不能和他妻子见面了。

十二、完成时态

【与完成时态连用的一些词语与词组】

1．just

He has just gone out. **他刚出去。**

2．yet

He hasn't come yet. **他还没有来。**

3．lately/recently

There have been some changes lately. **最近发生了一些变化。**

4．since+**某一具体时间** / for+**一段时间**

I have been here for three days. **我在这儿呆了三天。**

I have been here since Monday. **从星期一起我就在这儿了。**

5．all day/night/week/my life **等**

We have lived here all our lives. **我们一辈子都住在这里。**

十三、将来时态

【不同形式的将来时态比较】

1．**已经约好或已经决定做某事。**

I'm playing/going to play table-tennis with my brother tomorrow.

我明天要和哥哥去打乒乓球。

2．**取决于某个条件。**

If it is fine I am going to /I'll do some shopping tomorrow.

如果明天天气好，我就会去购物。

3．**只是一种可能，并未确定。**

Perhaps I'll stay at home tomorrow. **我明天可能呆在家里。**

4．**表示陈述一件事实。**

Tomorrow I'll be working as usual. **明天我将照常工作。**

第 5 章　应试技巧

计算机水平考试英文试题

从供选择的答案中，选出应填入下面叙述中__内的最确切的解答，把相应编号写在__内。

I. The relational database model requires the data be__A__through programs that don't rely on the position of the data in the database. This is in direct__B__to the other database mode, where the program has to follow a series of pointers to the data it seeks. A program__C__a relational database simply asks for the data it seeks; the DBMS performs the necessary searches and __D__the information. The__E__on how the search is done are specific to the DBMS and vary from product to product.

A:	① accessed	② moved	③ read	④ wrote
B:	① conduct	② contract	③ contrast	④ construct
C:	① consulting	② containing	③ querying	④ queuing
D:	① erases	② provides	③ proves	④ values
E:	① details	② documents	③ tails	④ tenants

II. When most people refer to multimedia, they generally mean the combination of two or more continuous media, usually with some user__A__. In practice, the two media are normally audio and video , this is ,__B__plus moving__C__.

It should be obvious by now that transmitting multimedia material in uncompressed form is completely out of__D__. The only hope is that massive compression is possible. Fortunately, a large body of research over the past few decades has led to many compression techniques and algorithms that make multimedia transmission__E__.

A～C:	① display	② games	③ help	④ interaction
	⑤ pictures	⑥ sound	⑦ web	
D、E:	① impossible	② fearful	③ feasible	④ program
	⑤ question	⑥ ting		

III. Many word processing programs include spell checker. It checks the spelling of every word in a A__by looking up each word in its dictionary. If the word does not appear in the dictionary the user is__B to a possible misspelling and possible corrections are often__C__. Spell checker does not recognize unusual people names or specialized terms, but it will often allow you to create your own personal dictionary of specialized words you often use.Spell checker is a valuable aids to proofreading,but it can not catch the__D of one correctly spelled word for another (such as form for from). Thus it does not__E__a document is free of spelling errors.

A：	① document	② equipment	③ program	④ statement
B、C：	① alerted	② alternate	③ guessed	④ guided
	⑤ suggested	⑥ surprised	⑦ feasible	⑧ program
D：	① addition	② condition	③ notation	④ substitution

点 睛 篇

第 1 章　计算机概述

Key Terms

计算机基本术语	
中央处理器	CPU（Central Processing Unit）
存储器，内存	memory
数据	data
指令	instruction
程序	program
硬件	hardware
操作系统	operating system
软件	software
二进制的	binary
计算机发展	
真空管	vacuum tube
晶体管	transistor
大规模集成电路	LSI (Large Scale Integration)
超大规模集成电路	SLSI (Super Large-Scale Integration)
计算机类型	
台式计算机	desktop computer
膝上型计算机	laptop computer
笔记本式计算机	notebook computer
个人计算机	PC (Personal Computer)
个人数字助理	PDA (Personal Digital Assistant)
大型机	mainframe
超级计算机	supercomputer
网络计算机	NC (Network Computer)
麦金塔个人计算机（苹果）	Macintosh

计算机基本组成

机箱	case
键盘	keyboard
鼠标	mouse
监视器，显示器	monitor
打印机	printer
调制解调器	modem

Key Sentences

【What is a Computer?】

A computer is a fast and accurate data manipulating[1] system that is organized to accept, store, and process data and produce output results under the direction of a stored program of instructions.

【Computer System】

Hardware

Hardware consists of the physical components and all associated equipment—integrated circuits[2], printed circuit boards[3], cables, power supplies, memory, and terminals[4]—rather than abstract ideas or instructions.

Software

Software is a complex series of instructions telling the computer what to do. The instructions are very detailed because they have to tell the computer every single step to be performed.

Operating System

The operating system allocates the resources of the PC to the software and hardware in an organized way. The resources include things like memory storage space, access to the hard disk and what is displayed on the monitor.

【The History of Computers】

In the first generation, computers used vacuum tubes to conduct electricity. In the second generation, transistors replaced tubes, followed in the 1970s by integrated circuits in the third generation. The fourth generation saw the advent of large-scale, integrated circuit chips.

【Types of Computers】

Supercomputer

Supercomputer processes trillions of instructions per second.

---

[1] manipulate **操作，处理**
[2] integrated circuit **集成电路**
[3] printed circuit board **印刷电路板**
[4] terminal **终端**

Mainframe

Mainframes are capable of processing data at very high speeds—millions of instructions per second—and have access to billions of characters of data.

Personal Computer

Most often called personal computers, or just PCs, these desktop computers are also known as microcomputers or sometimes home computers.

Notebook Computer (Laptop Computer)

Notebook computers are wonderfully portable and functional, and they are popular with travelers who need a computer that can go with them.

Personal Digital Assistant (PDA)

A handheld computer[1] called a personal digital assistant (PDA) can be used to keep track of appointments and other business information such as customer names and orders.

[1] handheld computer **手持式计算机**

第 2 章　硬　件

Key Terms

CPU	
微处理器	microprocessor
协处理器	coprocessor
对称式多处理器	SMP (Symmetric Multi-Processor)
芯片	chip
指令计数器	instruction counter
控制单元	control unit
算术逻辑单元	ALU (Arithmetic/Logic Unit)
寄存器	
寄存器	register
指令寄存器	instruction register
存储寄存器	storage register
地址寄存器	address register
标志寄存器	flag register
存储器	
存储器	memory
主存储器	primary memory
内部存储器	internal memory
外部存储器	external memory
随机存储器	RAM (Random Access Memory)
静态存储器	SRAM (Static RAM)
动态存储器	DRAM (Dynamic RAM)
只读存储器	ROM (Read Only Memory)
可擦除可编程只读存储器	EPROM (Erasable Programmable ROM)
电可擦除可编程只读存储器	EEPROM (Electrically EPROM)
闪存	flash memory
辅助存储器	auxiliary (secondary) storage
硬盘、软盘和光盘	
驱动器	drive
硬盘	hard disk
软盘	floppy disk

光盘	CD (Compact Disc)
磁光式光盘	CD-MO (Compact Disc-Magneto Optical)
只读光盘	CD-ROM (CD-Read-only Memory)
一次写入性光盘	WORM (Write Once, Read Many Times)
磁盘	magnetic disk
磁鼓	magnetic drum
磁带机	magnetic tape drive
柱面	cylinder
磁道	track
扇区	sector
读/写头	read/write head
调节器；驱动臂	actuator

输入设备

输入设备	input device
键盘	keyboard
触摸屏	touch screen
鼠标	mouse
话筒	microphone
终端	terminal
数字扫描仪	digital scanner
语音输入设备	voice input devices
光学字符识别	optical character recognition
游戏杆	joystick
感应设备	sensing device

输出设备

输出设备	output device
显示器	monitor
显示屏	display screen
液晶显示器	LCD (Liquid Crystal Display)
视频显示终端	video display terminal
像素	pixel
分辨率	resolution
视频带宽	video bandwidth
打印机	printer
激光打印机	laser printer
点阵打印机	matrix printer

喷墨打印机	ink jet printer
总线	
总线	bus
地址总线	address bus
控制总线	control bus
数据总线	data bus
扩展总线	expansion bus

Key Sentences

【CPU】

The CPU is responsible for the manipulation of symbols, numbers, and letters and also controls the other parts of the computer system. The CPU has two major sections: an arithmetic-logic unit (ALU) and a control unit.

【Register】

An important factor that affects the speed and performance of a processor is the size of the registers.

【Bus】

A bus line is a set of parallel electrical paths, that transports data from one place to another within the computer system.

【Microprocessor】

A central processing unit on a single chip. A microprocessor's speed is expressed in megahertz (MHZ). The higher the number, the faster—and more expensive—the microprocessor.

【Memory】

Memory, or RAM, is measured in bytes, with each byte representing a character of data. The amount of memory you need in your computer is determined by the amount of memory required by the application programs that you want to use.

【Flash Memory】

Flash memory chips are smaller than a disk drive and require only half the power.

【Case】

The computer case holds the electronic circuitry and has external receptors[1] called ports[2] to which the monitor, printer and other devices are connected.

【Motherboard】

The motherboard has a series of slots, sockets and connectors[3] for connecting the various components

---

1 receptor 外部接收器
2 port 接口
3 slot 插槽；socket 插座；connector 连接器

of a PC. The memory, accessory cards, and CPU are installed directly onto the motherboard in most cases. The drives and peripherals communicate with the motherboard through wired connections.

【Power Supply】

The power supply converts AC[1] current from the wall outlet to the appropriate DC[2] voltages for the various components of the computer.

【Hard Disk】

A hard disk (also called a “hard disk drive”) is much like a filing cabinet[3]. The programs and data are stored on the hard disk and the computer accesses them as needed.

【Floppy Disk】

Floppy disks are the most basic storage medium for data. However their limited capacity, typically 1.44 megabytes, makes them of limited use.

【CD-ROM Drive】

A CD-ROM drive reads information stored in compact discs (CDs). The smoothness of a CD-ROM video presentation is indicated by the “X factor”—8X, 12X, 16X, 24X—the higher the better.

【Expansion Card[4]】

An expansion card lets you add new features to a computer.

【Video Adapter[5]】

The electronic components that generate the video signal sent through a cable to a video display.

【Sound Card[6]】

A type of expansion card that allows playback and recording of sound, such as from a WAV or MIDI file or a music CD-ROM.

【Port】

A port is a connector at the back of a computer where you plug in an external device such as a printer or modem.

【Monitor】

A key factor affecting screen quality is resolution, a measure of the number of dots, or pixels, that can appear on the screen. The higher the resolution, the more solid the text characters appear.

【Keyboard】

Most keyboards follow the standard QWERTY[7] layout of typewriter[8] keyboards. Many have a

---

[1] AC (Alternating Current) **交流电**
[2] DC (Direct Current) **直流电**
[3] filing cabinet **档案柜**
[4] expansion card **扩展卡**
[5] video adapter **视频适配卡**
[6] sound card **声卡**
[7] QWERTY **标准的传统键盘**
[8] typewriter **打字机**

separate numeric keypad[1].

【Mouse】

A mouse is a device that you roll on a tabletop to move the cursor on the screen to make selections.

【Printers】

Laser printer, which use technology similar to copying machines[2], are the top-of-the line printers for quality and speed.

【Modem】

Modem converts outgoing computer data into signals that can be transmitted over telephone lines, and does the reverse for incoming data.

【Joystick】

A joystick allows you to manipulate a cursor on the screen, and it looks similar to the stick shift[3] on a car.

【Scanner】

A scanner can convert text or even a drawing or picture into computer-recognizable.

---

[1] keypad **小键盘，键区**
[2] copying machine **复印机**
[3] stick shift **操纵杆**

第 3 章　操作系统

Key Terms

概述

多道程序设计	multiple programming
批处理系统	batch processing system
分时系统	time sharing system
实时系统	real-time system
程序状态字	PSW (Program Status Word)
中断	interrupt
特权指令	privileged instruction
图形用户界面	GUI (Graphics User Interface)
时钟	clock

进程

线程	thread
进程	process
就绪状态	ready
运行状态	running
阻塞状态	blocked
进程控制块	PCB (Process Control Block)
原语	primitive
创建原语	create primitive
撤消原语	destroy primitive
阻塞原语	block primitive
挂起原语	suspended primitive
临界区	critical section
信号量	semaphore
信箱	box
消息缓冲	message buffering
作业	job
作业调度	job scheduling
进程调度	process scheduling
先进先出	FIFO
优先级	priority

时间片	time slice
输入输出管理	
块设备	block device
字符设备	character device
设备控制器	device controller
直接存储器访问	DMA
通道	channel
设备无关性	device independence
死锁	deadlock
存储管理	
分区	partition
分页	paging
分段	segmentation
虚拟存储器	virtual memory
文件系统	
系统文件	system file
库文件	library file
用户文件	user file
符号文件系统	SFS (Symbolic File System)
基本文件系统	BFS (Basic File System)
存取控制验证	ACV (Access Control Verification)
逻辑文件系统	LFS (Logical File System)
物理文件系统	PFS (Physical File System)
分配策略模块	ASM (Allocation Strategy module)
设备策略模块	DSM (Device Strategy module)

Key Sentences

【What is an Operating System?】

Resource allocator

It manages and allocates resources, such as memory, I/O.

Control program

It can be defined as a control program, which controls the execution of user programs and operation of I/O devices.

Kernel[1]

[1] kernel **内核**

Operating System is the one program running at all times, usually called KERNEL (all else being application programs).

【Thread】

In computer programming, a thread is placeholder[1] information associated with a single use of a program that can handle multiple concurrent users.

【Task】

In computer programming, a task is a basic unit of programming that an operating system controls.

【Job】

In certain computer operating systems, a job is the unit of work that a computer operator (or a job scheduler) gives to the operating system.

【Multitasking】

Multitasking is allowing a user to perform more than one computer task (such as the operation of an application program) at a time.

【Multithreading】

Multithreading is the ability of a program or an operating system process to manage its use by more than one user at a time and to even manage multiple requests by the same user.

【Real-time Operating System】

A real-time operating system (RTOS) is an operating system that guarantees a certain capability within a specified time constraint.

【File System】

A file system is the way in which files are named and where they are placed logically for storage and retrieval[2].

【Deadlock】

A deadlock is a situation in which two computer programs sharing the same resource are effectively preventing each other from accessing the resource, resulting in both programs ceasing to function.

【Interrupt】

An interrupt is a signal from a device attached to a computer or from a program within the computer that causes the main program that operates the computer (the operating system) to stop and figure out[3] what to do next.

【Critical Section[4] Routine】

A critical section routine is an approach to the problem of two or more programs competing for the same resource at the same time.

---

[1] placeholder **占位符**
[2] retrieval **检索，取出**
[3] figure out **解决，了解**
[4] critical section **临界区**

【Microsoft Windows】

All Microsoft Windows operating systems provide a GUI[1]. Pre-XP Windows runs only on IBM-compatible PCs. Most users run Windows 98, Windows 2000, or Windows XP.

【UNIX】

UNIX is traditionally used on servers and on client machines maintained by technically skilled individuals. UNIX provides a CUI[2], not a GUI.

【Linux】

Linux is a UNIX variant that runs on virtually any PC. Linux is often cited as being faster and more stable than Windows. However, given its UNIX heritage, Linux often requires more customization and maintenance than Windows.

---

[1] GUI (Graphics User Interface) **图形用户界面**

[2] CUI (Character-based User Interface) **基于字符的用户界面**

第 4 章　数据结构

Key Terms

概述

数据	data
数据元素	data element
数据结构	data structure
逻辑结构	logical structure
存储结构	storage structure
直接前趋	immediate predecessor
直接后继	immediate successor
顺序存储结构	sequential storage structure
链式存储结构	linked storage structure
稠密索引	dense index
稀疏索引	sparse index
时间复杂度	time complexity
空间复杂度	space complexity

线形结构

线形表	linear list
顺序表	sequential list
链表	linked list
单链表	single linked list
循环链表	circular linked list
双链表	double linked list
栈	stack
后进先出	Last In First Out
队列	queue
队头	front
队尾	rear
先进先出	First In First Out

树结构

树	tree
根	root
子树	subtree

度	degree
路径	path
层数	level
有序树	ordered tree
无序树	unordered tree
二叉树	binary tree
满二叉树	full binary tree
完全二叉树	complete binary tree
遍历	traverse

图

图	graph
有向图	digraph
无向图	undirected graph
无向完全图	undirected complete graph
有向完全图	directed complete graph
入度	in-degree
出度	out-degree
子图	subgraph
连通分量	connected component
邻接矩阵	adjacency matrix
邻接表	adjacency list
深度优先搜索	depth-first search
广度优先搜索	breadth-first search

查找与排序

顺序查找	sequential search
二分查找	binary search
分块查找	block search
二叉排序树	binary sort tree
散列法	hashing
插入排序	insertion sort
交换排序	exchange sort
冒泡排序	bubble sort
快速排序	quick sort
选择排序	selection sort
堆排序	heap sort
归并排序	merge sort

Key Sentences

【Description】

A data structure is a data type whose values are composed of component elements that are related by some structure.

【Stack】

The only element that can be deleted or removed is the one that was inserted most recently. Such a structure is said to have a last-in/first-out (LIFO[1]) behavior.

【Queue】

The main feature of queues is that they follow a first-come/first-served rule.

【List】

A collection of items accessible one after another beginning at the head and ending at the tail.

【Tree】

A data structure accessed beginning at the root node. Each node is either a leaf or an internal node. An internal node has one or more child nodes and is called the parent of its child nodes. All children of the same node are siblings[2]. Contrary to a physical tree, the root is usually depicted[3] at the top of the structure, and the leaves are depicted at the bottom.

【Graph】

A set of items connected by edges. Each item is called a vertex[4] or node. Formally, a graph is a set of vertices and a relation between vertices, adjacency[5].

【Tree Traversal】

A technique for processing the nodes of a tree in some order.

【Search】

Binary Search

Search sorted items by repeatedly dividing the search interval[6] in half. Begin with an interval covering the whole array. If the value of the key is less than the item in the middle of the interval, narrow the interval to the lower half. Otherwise narrow it to the upper half. Repeatedly check until the value is found or the interval is empty.

Block Search

An algorithm to search sorted items by checking jth item until the right area is found, then doing jumps or a sequential search.

---

1 LIFO (Last-In First-Out) **后进先出**
2 sibling **兄弟**
3 depict **画**
4 vertex **顶点，其复数形式是** vertices
5 adjacency **邻接**
6 interval **区间**

Sequential Search

Search an array or list by checking items one at a time.

【Sort】

Bubble Sort

Sort by comparing each adjacent pair of items in a list in turn, swapping[1] the items if necessary, and repeating the pass through the list until no swaps are done.

Heap Sort

A sort algorithm which builds a heap, then repeatedly extracts the maximum (or minimum) item.

Insertion Sort

Sort by repeatedly taking the next item and inserting it into the final data structure in its proper order with respect to items already inserted.

Merge Sort

A sort algorithm which splits the items to be sorted into two groups, recursively[2] sorts each group, and merges them into a final, sorted sequence.

Quick Sort

An in-place sort algorithm that uses the divide and conquer[3] paradigm[4]. It picks an element from the array (the pivot[5]), partitions the remaining elements into those greater than and less than this pivot, and recursively sorts the partitions.

Selection Sort

An algorithm which orders items by repeatedly looking through remaining items to find the least one and moving it to a final location.

---

1 swap **交换**
2 recursively **循环地，递归地**
3 divide and conquer **分治**
4 paradigm **范式**
5 pivot **基准**

第 5 章　软件工程

Key Terms

经典软件生命周期	
系统工程和分析	system engineering and analysis
软件需求分析	software requirement analysis
设计	design
编码	coding
测试	testing
维护	maintenance
软件需求分析	
数据流	data flow
数据字典	data dictionary
软件设计	
流程图	flowchart
可维护设计	maintainable design
自上而下的功能设计	top-down functional design
数据驱动设计	data-driven design
软件测试	
模块测试	module test
单元测试	unit test
功能测试	function test
性能测试	performance test
验收测试	acceptance test
安装测试	installation test

Key Sentences

【Description】

Software Engineering is a discipline that encompasses the process associated with software development, the methods used to analyze, design and test computer software, the management techniques associated with the control and monitoring of software projects and the tools used to support process, methods, and techniques.

【Classic Life Cycle Model】

System Engineering and Analysis

System engineering and analysis encompass requirements gathering at the system level with a small amount of top-level design and analysis.

Software Requirements Analysis

The requirements gathering process is intensified and focuses specifically on software.

Design

Software design is actually a multistep process that focuses on three distinct attributes of the program: data structure, software architecture, and procedural detail.

Coding

The design must be translated into a machine-readable form. The coding step performs this task.

Testing

The testing process focuses on the logical internals of the software, assuring that all statements[1] have been tested, and on the functional externals, that is, conducting tests to assure that defined input will produce actual results that agree with required results.

Maintenance

Software maintenance applies each of the preceding life cycle steps to an existing program rather than a new one.

[1] statement **语句**

第 6 章　网　络

Key Terms

网络类型	
局域网	LAN (Local Area Network)
广域网	WAN (Wide Area Network)
城域网	MAN (Metropolitan Area Network)
对等网络	peer-to-peer network
基于服务器的网络	server-based network
OSI **模型**	
物理层	physical layer
数据链路层	data link layer
网络层	network layer
传输层	transport layer
会话层	session layer
表示层	presentation layer
应用层	application layer
传输介质	
非屏蔽双绞线	UTP (Unshielded Twisted-Pair)
屏蔽双绞线	STP (Shielded Twisted-Pair)
同轴电缆	coaxial cable
光缆	optical fiber cable
网络设备	
网络接口卡	NIC (Network Interface Card)
网桥	Bridge
路由器	Router
网关	Gateway
集线器	Hub
中继器	Repeater
基本概念	
全双工	full-duplex
半双工	half-duplex
基带传输	baseband transmission
宽带传输	broadband transmission

网络协议

传输控制协议	TCP (Transfer Control Protocol)
互联网协议	IP (Internet Protocol)
用户数据报协议	UDP (User Datagram Protocol)
地址解析协议	ARP (Address Resolution Protocol)

网络互联

综合业务数字网	ISDN (Integrated Service Digital Network)
宽带综合业务数字网	Broadband ISDN
数字用户环路	DSL (Digital Subscriber Loop)
异步数字用户环路	ADSL (Asynchronous Digital Subscriber Loop)
专用小交换机	PBX (Private Branch eXchange)
异步传输模式	ATM (Asynchronous Transfer Mode)
帧中继	Frame Relay

Key Sentences

【Introduction】

A network is a system of interconnected[1] communication stations. These stations can be personal computer (PCs), mainframe computers[2], terminals[3], or access points of other networks.

【Topologies】

A topology is a description of the physical composition of a system or network.

Star Network

A star network has a hub computer that is responsible for managing the network.

Ring Network

A ring network links all nodes together in a circular chain.

Bus Network

A bus network has a single line to which all the network nodes are attached.

【OSI Architecture】

The concept of an open-systems[4] approach to networking allows any device or system operating with any protocol to communicate with another device or system using its own protocol.

---

[1] interconnected **互相连接的**
[2] mainframe computer **大型计算机**
[3] terminal **终端**
[4] open-system **开放系统**

【Transmission Medium】

Twisted Pairs

Twisted pairs are wires twisted together to form a cable, which is then insulated[1].

Coaxial Cable

A coaxial cable is a single conductor wire within a shielded[2] enclosure.

Fiber Optic Cable

Instead of using electricity to send data, fiber optics uses light.

Microwave Transmission

Microwave transmission uses what is called line-of-sight transmission of data signals through the atmosphere.

Satellite Transmission

The basic components of satellite transmission are earth stations, which send and receive signals, and a satellite component called a transponder[3].

【Devices】

NIC

A network interface card, sometimes called a NIC, connects each computer to the wiring in the network.

Bridge

Similar networks can be connected by a bridge that recognizes the messages on a network and passes on those addressed to nodes in other networks.

Router

A router is a special computer that directs communication traffic when several networks are connected together.

Gateway

A gateway lets a node communicate with a computer on another dissimilar network.

Hub

A hub is a wiring concentrator for a LAN or WAN that provides a central attachment point for network cabling.

Repeater

Repeaters deal with attenuation[4] by receiving and evaluating the data then immediately re-transmitting a clean copy of the signal on to the next segment[5] of the network cable.

---

1 insulated **绝缘的**
2 shielded **屏蔽了的**
3 transponder **脉冲转发器**
4 attenuation **衰减**
5 segment **段**

【Protocol】

Definition

A protocol is a set of rules for the exchange of data between a terminal and a computer or between two computers.

IP

IP interprets Internet addresses and guide transport-layer packets through the system.

TCP

The transmission control protocol (TCP) is a transport-layer protocol that carries application-layer packets and services between two users.

【Network Connection】

ISDN

ISDN services are transported on two different types of channels, the bearer (B) channel[1] for data, voice, and video information; and the signal channel[2], used for control signaling or low-speed packet switching[3] transmissions.

Broadband ISDN

Data transfers to and from the BISDN network may be asymmetric[4]. That is, access on and off the BISDN network may be done at different rates depending on system requirement.

DSL

DSL describes modems that are used to carry digital information onto existing telephone lines. DSL is used to replace the local loop between telephone switching[5] stations and the subscriber[6].

ADSL

ADSL was a technique called discrete multitone technology (DMT) to increase the utilization of the system bandwidth.

ATM

ATM was a fixed packet size of 53 bytes called a cell[7] to encapsulate[8] upper-level payloads.

Frame Relay

Frame Relay, unlike the fixed cell format of ATM, segments payloads into frames that do not have a fixed size.

1 bearer channel **荷载通道，B 通道**
2 signal channel **信号通道**
3 packet switch **包交换，分组交换**
4 asymmetric **不对称的**
5 telephone switching **电话交换**
6 subscriber **用户**
7 cell **信元**
8 encapsulate **封装**

第 7 章　计算机维护

Key Terms

人类工程学	ergonomics
电力电缆	power cable
扁平电缆	flat cable
平均寿命	life expectancy
控制器	controller
适配器	adapter

Key Sentences

Quick Troubleshooting Steps

Step 1: Define the Problem

Sounds easy enough. First, find out what the device should be doing, what it is doing now, and then you're on your way to resolving the problem. If you don't know which device is causing the problem examine each device independently.

Step 2: Investigate the Problem

Can you show someone else the problem? Does this problem happen every day? Has any new software been added to your computer? Have any other major changes happened with your equipment recently? Asking the right questions will help you resolve the problem.

Step 3: Reverse the Problem

If you've added additional hardware recently, chances are the additional hardware is conflicting with the device. Will removing the hardware cause the problem to go away? Check your BIOS for IRQ[1] conflicts; check the new device to see if it's working properly.

Step 4: Restart the Peripheral

Sometimes just by powering down all of your computer equipment and then starting them back up again, one device at a time, will solve the computer problem. If you are using Windows 98 or Windows 2000, plug and play may launch to detect or fix the hardware problem for you—but not always.

[1] IRQ(Interrupt ReQuest) **中断请求**

第 8 章　数据库

Key Terms

概述	
数据库管理系统	DBMS (database management system)
数据库管理员	DBA (database administrator)
冗余	redundancy
共享	share
完整性	integrity
外模式	external schema
概念模式	conceptual schema
内模式	internal schema
数据采掘	data mining
数据仓库	data warehouse
实体关系图（E-R 图）	entity-relationship diagram
结构化查询语言	SQL (Structured Query Language)
数据模型	
实体	entity
属性	attribute
语义	semantic
关系	relation
候选关键字	candidate key
主关键字	primary key
关系代数	relational algebra
关系演算	relational calculus
元组	tuple
数据库管理系统	
数据定义语言	DDL (Data Definition Language)
数据操作语言	DML (Data Manipulation Language)
数据控制语言	DCL (Data Control Language)
数据库设计	
逻辑数据库	logical database
关系数据库	relational database
第一范式	1NF (First Normal Form)

物理数据库	physical database

分布式数据库

分布式数据库	distributed database
事务	transaction
分段透明性	fragmentation transparency
位置透明性	location transparency
本地映射透明性	local mapping transparency

Key Sentences

【Database】

A database is a collection of information organized into interrelated[1] tables of data and specifications of data objects.

【Key】

A database key is a attribute utilized to sort and/or identify data in some manner. Each table has a primary key which uniquely[2] identifies records. Foreign keys are utilized to cross-reference[3] data between relational tables.

Candidate Key

A candidate key is a combination of attributes that can be uniquely used to identify a database record without any extraneous data. Each table may have one or more candidate keys. One of these candidate keys is selected as the table primary key.

Foreign Key

A foreign key is a field in a relational table that matches the primary key column of another table. The foreign key can be used to cross-reference tables.

Primary Key

The primary key of a relational table uniquely identifies each record in the table. It can either be a normal attribute that is guaranteed to be unique or it can be generated by the DBMS (such as a globally unique identifier, or GUID[4], in Microsoft SQL Server).

【Attribute】

A single data item related to a database object. The database schema[5] associates one or more attributes with each database entity.

---

[1] interrelated **相关的**
[2] uniquely **惟一地**
[3] cross-reference **交叉引用的**
[4] GUID (Globally Unique Identifier) **全球惟一确认号码**
[5] database schema **数据库模式**

【Index】

An index is a database feature used for locating data quickly within a table. Indexes are defined by selecting a set of commonly searched attribute(s) on a table and using the appropriate platform-specific[1] mechanism to create an index.

【Record】

A database record consists of one set of tuples for a given relational table. In a relational database, records correspond to rows in each table.

【Data】

Data consists of a series of facts or statements that may have been collected, stored, processed and/or manipulated but have not been organized or placed into context. When data is organized, it becomes information. Information can be processed and used to draw generalized conclusions or knowledge.

【Data Mining】

Data mining is the use of automated data analysis techniques to uncover previously undetected relationships among data items. Data mining often involves the analysis of data stored in a data warehouse. Three of the major data mining techniques are regression[2], classification and clustering[3].

【Data Warehouse】

A data warehouse is a centralized database that captures information from various parts of an organization's business processes. This information can later be analyzed to determine predictive relationships through the use of data mining techniques.

【Entity】

An entity is a single object about which data can be stored. It is the "subject" of a table. Entities and their interrelationships[4] are modeled through the use of entity-relationship diagrams.

【Relation】

A database relation is a predefined row/column format for storing information in a relational database. Relations are equivalent to tables.

【Entity-Relationship Diagram】

An entity-relationship diagram is a specialized graphic that illustrates the interrelationships between entities in a database.

【Normalization】

Normalization[5] is the process of structuring relational database schema such that most ambiguity[6] is removed. The stages of normalization are referred to as normal forms and progress from the least restrictive (First Normal Form) through the most restrictive (Fifth Normal Form). Generally, most database designers

---

[1] platform-specific **特定平台**
[2] regression **回归，分类**
[3] clustering **群集，聚类**
[4] interrelationship **相互关系，相互联系**
[5] normalization **规范化**
[6] ambiguity **歧义，不明确**

do not attempt to implement anything higher than Third Normal Form.

First Normal Form (1NF)

A relation is said to be in First Normal Form (1NF) if and only if each attribute of the relation is atomic. More simply, to be in 1NF, each column must contain only a single value and each row must contain the same columns.

Second Normal Form (2NF)

In order to be in Second Normal Form, a relation must first fulfill the requirements to be in First Normal Form.

Third Normal Form (3NF)

In order to be in Third Normal Form, a relation must first fulfill the requirements to be in Second Normal Form. Additionally, all attributes that are not dependent upon the primary key must be eliminated.

【Structured Query Language (SQL)】

The structured query language is an industry-standard language used for manipulation of data in a relational database. The major SQL commands of interest to database users are SELECT, INSERT, JOIN and UPDATE.

SELECT

The SELECT statement in SQL is the primary mechanism for retrieving information from a relational database.

INSERT

The INSERT SQL command is used to add records to a table within a database.

JOIN

The SQL JOIN statement is used to combine the data contained in two relational database tables based upon a common attribute.

UPDATE

The UPDATE statement in SQL is used to edit values for attributes in one or more records of a relational table.

第 9 章　人工智能

Key Terms

语音识别	speech recognition
专家系统	expert system
常识	common sense
模式识别	pattern recognition
表示	representation
认识学	epistemology
本体论	ontology

Key Sentences

【Search】

AI programs often examine large numbers of possibilities, For example moves in a chess game or inferences by a theorem proving program.

【Pattern Recognition】

When a program makes observations of some kind, it is often programmed to compare what it sees with a pattern. For example, a vision program may try to match a pattern of eyes and a nose in a scene in order to find a face.

【Representation】

Facts about the world have to be represented in some way. Usually languages of mathematical logic are used.

【Inference[1]】

From some facts, others can be inferred. Mathematical logical deduction is adequate for some purposes, but new methods of non-monotonic inference have been added to logic since the 1970s. The simplest kind of non-monotonic reasoning is default reasoning in which a conclusion is to be inferred by default, but the conclusion can be withdrawn if there is evidence to the contrary.

【Common Sense Knowledge and Reasoning】

This is the area in which AI is farthest from human-level, in spite of the fact that it has been an active research area since the 1950s.

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[1] inference **推理**

【Planning】

Planning programs start with general facts about the world (especially facts about the effects of actions), facts about the particular situation and a statement of a goal. From these, they generate a strategy for achieving the goal. In the most common cases, the strategy is just a sequence of actions.

【Epistemology】

This is a study of the kinds of knowledge that are required for solving problems in the world.

【Heuristics】

A heuristic is a way of trying to discover something or an idea imbedded in a program.

【Genetic Programming】

Genetic programming is a technique for getting programs to solve a task by mating random Lisp programs and selecting fittest in millions of generations.

第 10 章　互联网

Key Terms

电子邮件	E-mail
账号	account
地址簿	address book
附件	attachment
匿名 FTP	anonymous FTP
文件传输协议	FTP (File Transfer Protocol)
布告牌系统	BBS (Bulletin Board System)
新闻组	Newsgroup
登录	log in
下载	download
免费软件	freeware
主页	home page
超文本标识语言	HTML (Hypertext markup Language)
超媒体	hypermedia
超文本	hypertext
消息	message
在线	online
万维网	World Wide Web
远程登录	Telnet
超文本传输协议	HTTP (HyperText Transport Protocol)
统一资源地址	URL (Uniform Resource Locator)
Web **浏览器**	Web browser

Key Sentences

【Introduction】

The Internet user needs a computer with a modem and its related software, and Internet service provider, and a browser.

【Internet History】

The Internet as an information-sharing collection of networks began in 1969 as a Department of Defense network for allowing research institutions to quickly share data.

【Uses for the Internet】

The major uses for the Internet are:

E-mail; research; information; entertainment; Electronic Commerce; downloading and uploading files and software; education; chatting with people of like interest; game playing.

【Browser】

A browser is software used to explore the Internet.

【URL】

A web page URL (Uniform Resource Locator) begins with the protocol http, which stands for Hyper Text Transfer Protocol. Next comes the domain name.

【Accessing the Internet】

More direct connections can be used if you have a TCP/IP interface, a modem or cable modem and the appropriate software to connect directly to an ISP[1].

【Internet Address】

The Internet addresses known as universal resource locations (URL) are translated from one form to the other using an address resolution protocol[2].

【Frame[3]】

Several browsers support a concept called frames, which allow a given page to be divided into rectangular sections, each of which can operate independently of[4] others.

【Plug-in】

In addition to the browsers themselves, various vendors offer plug-in[5], software that enhances the value of a browser by increasing its functionality of features.

【HTML】

Web pages are often written directly in a language called Hypertext Makeup Language, more commonly known as HTML.

【Push[6] Technology】

Push technology refers to software that automatically sends-pushes-information from the Internet to a user’s computer.

【Usenet[7]】

Usenet (Newsgroups) is an informal network of computers that allows the posting and reading of messages in newsgroups that focus on specific topics.

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[1] ISP (Internet Service Provider) **互联网服务供应商**
[2] ARP(Address Resolution Protocol) **地址转换协议**
[3] frame **框架**
[4] independent of **不依赖于**
[5] plug-in **插件**
[6] push **推（向客户发送数据而不需请求）**
[7] Usenet **世界性的新闻组网络系统**

【Gopher[1] Searches】

The Gopher software, also accessed by a click on your browser menu, uses a hierarchical[2] menu structure to organize, search, and deliver information on the Internet.

【FTP】

A FTP site arranges files hierarchically by subject matter, but the various layers are linked so that you need only click repeatedly in your area of interest to narrow down to a specific file name.

【Intranets[3]】

Intranets use the same network facilities that the Internet does, but access is restricted to a limited sphere.

【Extranet[4]】

An extranet is a network that connects a number of intranets into a truly mini-Internet.

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[1] Gopher **信息查询服务器**
[2] hierarchical **分等级的**
[3] Intranet **企业内部互联网**
[4] Extranet **外联网**

第 11 章　电子商务

Key Terms

企业对企业	B2B (Business-to-Business)
企业对消费者	B2C (Business-to-Consumer)
电子数据交换	EDI (Electronic data interchange)
购物车	shop cart
安全套接层	SSL (Secure Socket Layers)
安全电子交易	SET(Secure Electronic Transactions)
智能卡	smart card
电子汇兑	EFT (Electronic Funds Transfer)
推技术	push technology

Key Sentences

【E- Commerce】

E-commerce can be defined as any kind of business-related activity (an exchange of goods or services).

【Business-to-Business (B2B)】

Transactions involve retailers, distributors, manufacturers, producers, and suppliers.

Transactions are typically with established customers, and may include online ordering, order tracking, and invoice payment.

【Emerging Systems for B2B】

Open Buying on the Internet (OBI) — defines standardized procedures so that different e-commerce systems can talk to each other.

Open Trading Protocol (OTP) — developed as competition for OBI; it standardizes payment-related activities, such as purchase agreements, receipts for purchases, and payments.

【Electronic Data Interchange (EDI)】

Enables businesses to carry out transactions electronically following structured standards which govern the presentation and processing of data.

【Business-to-Consumer (B2C)】

Products and services sites — has an online catalog, sells a product.

Advertising Sites — generates traffic by providing information, sells advertising.

Service Providers — Provide access services to e-commerce services. Also includes bringing services and providers together, like an e-bay.

Multi vendor environments — Online shopping malls[1], Provide storefronts[2] for various merchants.

【The Online Catalog】

Presentation of content — Attractive; user-friendly.

Comprehensive[3] and hierarchical[4] system — Beginning with general categories, moving to subcategories.

Front-end systems — Online search capability, secure payment system, customer service support.

Back-end systems — Databases involving inventory[5], pricing, payment systems.

【The Processing Services for a Merchant Account】

1. Credit card authorization.
2. Settlement of funds through various credit card organizations.
3. Depositing of funds.
4. Merchant billing.
5. Reporting of account activity.

【Secure Socket Layers (SSL)】

A cryptographic[6] protocol used for securing bi[7]-directional TCP/IP communications.

【Secure Electronic Transactions (SET)】

Protocol used for securing payment information sent over the Internet.

【Smart Card[8]】

Functions similar to SSL and SET. Unlike SSL and SET, the "smart card" is a card device that contains all the data, none is left on the computer.

【Electronic Funds Transfer — EFT】

EFT is often the means by which automated teller machines (ATM[9]s) query financial networks to execute deposits, withdrawals, transfers, and balance[10] inquiries for bank accounts.

【Push / Pull[11] Technology】

A customer who downloads a web page and views it through a browser is pulling the information to his or her computer.

The traditional pull method is enhanced by push technology that automatically pushes or delivers information — such as news headlines — to the customer's computer.

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[1] mall **购物商场**
[2] storefront **店铺**
[3] comprehensive **广泛的**
[4] hierarchical **分等级的**
[5] inventory **商品目录**
[6] cryptographic **密码的**
[7] bi- **表示有"二"、"两"、"双"等意思**
[8] smart card **智能卡**
[9] ATM(Automated Teller Machine) **自动取款机，自动出纳机**
[10] deposit **存款**；withdraw **取款**；transfer **转账**；balance **结余**
[11] push **推（向客户发送数据而不需请求）**；pull **接收（从服务器检索或下载数据的过程）**

第 12 章　通讯技术

Key Terms

移动通信	mobile communication
电路交换网	circuit-switched network
频分多路存取	FDMA (Frequency Division Multiple Access)
时分多路存取	TDMA (Time Division Multiple Access)
码分多路存取	CDMA (Code Division Multiple Access)
全球移动通信系统	Global System for Mobile communications
综合业务数字网	ISDN(Integrated Services Digital Network)
数字用户线	DSL (Digital Subscriber Line)
非对称数字用户线	ADSL (Asymmetrical Digital Subscriber Line)

Key Sentences

【Date Communication System】

Data sent from one station to another usually originates in parallel binary from one or more peripheral devices connected to that station through a link control unit.

【Data Communication Link】

The simplest link contains a single primary and a single secondary station connected to node end points of the link.

【Data Transmission】

Data transmission can be characterized as simplex, half duplex, or full duplex[1], depending on permissible directions of traffic flow.

【Character Codes[2]】

Text characters—alphabetic, numeric, punctuation, formatting, attribute, etc.—use selected combinations of 1s and 0s in a fixed binary word size, which is tabulated into a set known as a character code.

【Digital Data Rates】

Digital information in serial form is transferred at a distinct data rate.

【Serial Data Formats】

Whether data are sent as bits or symbols, it is transmitted serially in one of two forms, synchronous or

[1] simplex **单工**；half duplex **半双工**；full duplex **全双工**

[2] character code **字符码**

asynchronous[1] framing bits[2].

【Encoded Data Formats】

Each data signal format, sent as a serial stream of data may be interpreted as generating square wave whose frequency varies according to the changing bit pattern.

【Error Detection and Correction】

Asynchronous Data Error Methods

Parity works by adding an additional bit to each character word transmitted.

Synchronous Data Error Methods

One of the most frequently used error-detection methods for synchronous data transmissions is cyclic redundancy check (CRC)[3]. This method uses a pseudo-binary-division process to create the error or CRC character, which is appended to the end of the message.

[1] synchronous **同步的；**asynchronous **异步的**
[2] framing bit **成帧位**
[3] cyclic redundancy check (CRC) **循环冗余检验码**

课 外 篇

Reading Materials 1

Developments of Computers

Nothing epitomizes modern life better than the computer. For better or worse, computers have infiltrated every aspect of our society. Today computers do much more than simply compute: computerized telephone switching centers play traffic cop to millions of calls and keep lines of communication untangled; and automatic teller machines (ATM) let us conduct banking transactions from virtually anywhere in the world. But where did all this technology come from and where is it heading? To fully understand and appreciate the impact computers have on our lives and promises they hold for the future, it is important to understand their evolution.

Modern electronic computers didn't appear until the 1940's. Research workers in America produced a working computer in 1946. The first models were very bulky because they depended on vacuum tubes similar to those you have seen in old radio sets. Later machines used transistors and at present we use integrated circuits which take up very little space.

Now, let's get a clearer picture of the development of computers.

1. First-generation Computers (1946 — 1959)

First generation computers were characterized by the fact that operating instructions were made-to-order for the specific task for which the computer was to be used. Each computer had a different binary-coded program called a machine language that told it how to operate. This made the computer difficult to program and limited its versatility and speed. Other distinctive features of first generation computers were the use of vacuum tubes (responsible for their breathtaking size) and magnetic drums for data storage.

2. Second-generation Computers (1959 — 1964)

It was the stored program and programming language that gave computers the flexibility to finally be cost effective and productive for business use. The stored program concept meant that instructions to run a computer for a specific function (known as a program) were held inside the computer's memory, and could quickly be replaced by a different set of instructions for a different function. A computer could print customer invoices and minutes later design products or calculate paychecks. More sophisticated high-level languages such as COBOL (Common Business Oriented-Language) and FORTRAN (Formula Translator) came into common use during this time, and have expanded to the current day. These languages replaced cryptic binary machine code with words, sentences, and mathematical formulas, making it much easier to program a computer. New types of careers (programmer, analyst, and computer systems expert) and the entire software industry began with second generation computers.

3. Third-generation Computers (1964 — 1971)

Though transistors were clearly an improvement over the vacuum tube, they still generated a great deal of heat, which damaged the computer's sensitive internal parts. The quartz rock eliminated this problem. Jack Kilby, an engineer with Texas Instruments, developed the integrated circuit (IC) in 1958. The IC combined three electronic components onto a small silicon disc, which was made from quartz. Scientists later managed to fit even more components on a single chip, called a semiconductor. As a result, computers became ever smaller as more components were squeezed onto the chip. Another third-generation development included the use of an operating system that allowed machines to run many different programs at once with a central program that monitored and coordinated the computer's memory.

4. Fourth-generation Computers (1971 — Present)

After the integrated circuits, the only place to go was down — in size, that is. Large scale integration (LSI) could fit hundreds of components onto one chip. By the 1980's, very large scale integration (VLSI) squeezed hundreds of thousands of components onto a chip. Ultra-large scale integration (ULSI) increased that number into the millions. The ability to fit so much onto an area about half the size of a U.S. dime helped diminish the size and price of computers. It also increased their power, efficiency and reliability. The Intel 4004 chip, developed in 1971, took the integrated circuit one step further by locating all the components of a computer (central processing unit, memory, and input and output controls) on a minuscule chip. Whereas previously the integrated circuit had had to be manufactured to fit a special purpose, now one microprocessor could be manufactured and then programmed to meet any number of demands. Soon everyday household items such as microwave ovens, television sets and automobiles with electronic fuel injection incorporated microprocessors.

5. Fifth Generation (Present and Beyond)

Defining the fifth generation of computers is somewhat difficult because the field is in its infancy. Many advances in the science of computer design and technology are coming together to enable the creation of fifth-generation computers. Two such engineering advances are parallel processing, which replaces von Neumann's single central processing unit design with a system harnessing the power of many CPUs to work as one. Another advance is superconductor technology, which allows the flow of electricity with little or no resistance, greatly improving the speed of information flow. Computers today have some attributes of fifth generation computers. For example, expert systems assist doctors in making diagnoses by applying the problem-solving steps a doctor might use in assessing a patient's needs. It will take several more years of development before expert systems are in widespread use.

Reading Materials 2

The Processor

The processor (really a short form for microprocessor and also often called the CPU or central processing unit) is the central component of the PC. This vital component is in some way responsible for every single thing the PC does. It determines, at least in part, which operating systems can be used, which software packages the PC can run, how much energy the PC uses, and how stable the system will be, among other things. The processor is also a major determinant of overall system cost: the newer and more powerful the processor, the more expensive the machine will be.

When the Hungarian born John von Neumann, first suggested storing a sequence of instructions — that's to say, a program — in the same memory as the data, it was a truly innovative idea. That was in his "First Draft of a Report on the EDVAC", written in 1945. The report organized the computer system into four main parts: the Central Arithmetical unit, the Central Control unit, the Memory, and the Input/Output devices.

Today, more than half a century later, nearly all processors have a "von Neumann" architecture.

Historical Perspective

The 4004 was the forerunner of all of today's Intel offerings and, to date, all PC processors have been based on the original Intel designs. The first chip used in an IBM PC was Intel's 8088. This was not, at the time it was chosen, the best available CPU, in fact Intel's own 8086 was more powerful and had been released earlier. The 8088 was chosen for reasons of economics: its 8-bit data bus required less costly motherboards than the 16-bit 8086. Also, at the time that the original PC was designed, most of the interface chips available were intended for use in 8-bit designs. These early processors would have nowhere near sufficient power to run today's software.

The third generation chips, based on Intel's 80386SX and DX processors, were the first 32-bit processors to appear in a PC. The main difference between these was that the 386SX was only a 32-bit processor on the inside, because it interfaces to the outside world through a 16-bit data bus. This meant that data moved between an SX processor and the rest of the system at half the speed of a 386DX.

Fourth generation processors were also 32-bit. However, they all offered a number of enhancements. First, the entire design was overhauled for Intel's 486 range, making them inherently more than twice as fast. Secondly, they all had 8K of cache memory on the chip itself, right beside the processor logic. This cached data transfers from main memory meaning that on average the processor needed to wait for data from the motherboard for only 4% of the time because it was usually able to get the information it required from the cache.

The 486DX model differed from the 486SX only in that it brought the maths co-processor on board as well. This was a separate processor designed to take over floating-point calculations. It had little impact on everyday applications but transformed the performance of spreadsheets, statistical analysis, CAD and so forth.

An important innovation was the clock doubling introduced on the 486DX2. This meant that the circuits inside the chip ran at twice the speed of the external electronics. Data was transferred between the processor, the internal cache and the math co-processor at twice the speed, considerably enhancing performance. The 486DX4 took this technique further, tripling the clock speed to run internally at 75 or 100MHz and also doubled the amount of Level 1 cache to 16KB.

The Pentium is the defining processor of the fifth generation and provides greatly increased performance over the 486 chips that preceded it, due to several architectural changes, including a doubling of the data bus width to 64 bits. The P55C MMX processor made further significant improvements by doubling the size of the on-board primary cache to 32KB and by an extension to the instruction set to optimize the handling of multimedia functions.

The Pentium Pro, introduced in 1995 as the successor to the Pentium, was the first of the sixth generation of processor and introduced several unique architectural features that had never been seen in a PC processor before. The Pentium Pro was the first mainstream CPU to radically change how it executes instructions, by translating them into RISC-like micro-instructions and executing these on a highly advanced internal core. It also featured a dramatically higher-performance secondary cache compared to all earlier processors. Instead of using motherboard-based cache running at the speed of the memory bus, it used an integrated Level 2 cache with its own bus, running at full processor speed, typically three times the speed that the cache runs at on the Pentium.

Intel's first new chip since the Pentium Pro took almost a year and a half to produce, and when it finally appeared the Pentium II proved to be very much an evolutionary step from the Pentium Pro. This fuelled the speculation that one of Intel's primary goals in making the Pentium II was to get away from the expensive integrated Level 2 cache that was so hard to manufacture on the Pentium Pro. Architecturally, the Pentium II is not very different from the Pentium Pro, with a similar x86 emulation core and most of the same features.

The Pentium II improved on the Pentium Pro architecturally by doubling the size of the Level 1 cache to 32KB, using special caches to improve the efficiency of 16-bit code processing (the Pentium Pro was optimized for 32-bit processing and did not deal with 16-bit code quite as well) and increasing the size of the write buffers. However, the most talked about aspect of the new Pentium II was its packaging. The integrated Pentium Pro secondary cache, running at full processor speed, was replaced on the Pentium II with a special small circuit board containing the processor and 512KB of secondary cache, running at half the processor's speed. This assembly, termed a single-edge cartridge (SEC), was designed to fit into a 242-pin slot (Socket 8) on the new style Pentium II motherboard.

Intel's Pentium III — launched in the Spring of 1999 — failed to introduced any architectural improvements beyond the addition of 70 new Streaming SIMD Extensions. This afforded rival AMD the opportunity to take the lead in the processor technology race, which it seized a few months later with the launch of its Athlon CPU — the first seventh-generation processor.

Intel's seventh-generation Pentium 4 represented the biggest change to the company's 32-bit architecture since the Pentium Pro in 1995. One of the most important changes was to the processor's internal pipeline, referred to as Hyper Pipeline. This comprised 20 pipeline stages versus the ten for the P6 microarchitecture and was instrumental in allowing the processor to operate at significantly higher clock speeds than its predecessor.

Basic Structure

A processor's major functional components are:

Core: The heart of a modern processor is the execution unit. The Pentium has two parallel integer pipelines enabling it to read, interpret, execute and dispatch two instructions simultaneously.

Branch Predictor: The branch prediction unit tries to guess which sequence will be executed each time the program contains a conditional jump, so that the Prefetch and Decode Unit can get the instructions ready in advance.

Floating Point Unit: The third execution unit in a Pentium, where non-integer calculations are performed.

Level 1 Cache: The Pentium has two on-chip caches of 8KB each, one for code and one for data, which are far quicker than the larger external secondary cache.

Bus Interface: This brings a mixture of code and data into the CPU, separates the two ready for use, and then recombines them and sends them back out.

All the elements of the processor stay in step by use of a "clock" which dictates how fast it operates. The very first microprocessor had a 100KHz clock, whereas the Pentium Pro uses a 200MHz clock, which is to say it "ticks" 200 million times per second. As the clock "ticks", various things happen. The Program Counter (PC) is an internal memory location which contains the address of the next instruction to be executed. When the time comes for it to be executed, the Control Unit transfers the instruction from memory into its Instruction Register (IR).

At the same time, the PC is incremented so that it points to the next instruction in sequence; now the processor executes the instruction in the IR. Some instructions are handled by the Control Unit itself, so if the instruction says "jump to location 2749", the value of 2749 is written to the PC so that the processor executes that instruction next.

Many instructions involve the arithmetic and logic unit (ALU). This works in conjunction with the General Purpose Registers — temporary storage areas which can be loaded from memory or written to memory. A typical ALU instruction might be to add the contents of a memory location to a general purpose register. The ALU also alters the bits in the Status Register (SR) as each instruction is executed; this holds information on the result of the previous instruction. Typically, the SR has bits to indicate a zero result, an overflow, a carry and so forth. The control unit uses the information in the SR to execute conditional instructions such as "jump to address 7410 if the previous instruction overflowed".

Reading Materials 3

Device Management

Architectures

This is where the various different kernel architectures become apparent. There are two main categories:

Microkernel

Examples: Minix, QNX

Device drivers are isolated from the kernel, and are usually in their own user-mode address spaces. They communicate with the main kernel and with each other by means of messaging. Passing a message from, say, the kernel to a driver usually involves a process switch (switching address spaces) and a context switch (switching threads) which incurs a relatively high speed penalty. Microkernels ' main advantage is stability: if one buggy device driver crashes, all that is affected is access to that device (until the driver is restarted).

Monolithic Kernel

Examples: Linux, Windows NT.

Device drivers run as part of the kernel, either compiled in or as run-time loadable modules. Monolithic kernels have the advantage of speed and efficiency: calls to driver functions are simple local calls instead of whole address space switches. However, because it is running in kernel mode, a buggy device driver has the capability to crash the entire system.

The monolithic architecture is probably the most common in today's operating systems because it is usually more efficient. Monolithic kernels can have access to all the kernel's code and data, making it possible to share internal functions and data with device drivers: Windows NT use this to allow drivers to access the kernel run-time library and Linux allows drivers to access pretty much any non-static kernel symbol. By contrast, microkernel drivers are fully self-contained applications, which makes it a lot harder for them to share common functions. Note that the microkernel separation between the kernel and the rest of the OS components isn't restricted to device drivers: for example, Minix has its file system driver and memory manager as separate tasks too. I'll be concentrating on monolithic architectures in this tutorial.

Specifications

Your device manager will be the interface between the device drivers and both the rest of the kernel and user applications. It needs to do two things:

Isolate devices drivers from the kernel so that driver writers can worry about interfacing to the hardware and not about interfacing to the kernel.

Isolate user applications from the hardware so that applications can work on the majority of devices the user might connect to their system.

In most operating systems, the device manager is the only part of the kernel that programmers really see. Writing a good interface will make the difference between an efficient and reliable OS which works with a variety of devices and an OS which you spend all your own time writing and debugging drivers for.

Here's the capabilities our device manager will have:

Asynchronous I/O: that is, applications will be able to start an I/O operation and continue to run until it terminates. This is instead of blocking I/O, whereby applications are stalled while I/O operations execute. Blocking I/O can be easily implemented as a special case of asynchronous I/O.

Plug and Play: drivers will be able to be loaded and unloaded as devices are added to and removed from the system. Devices will be detected automatically on system startup, if possible.

Drivers

Because we want our kernel to be plug-and-play capable, it isn't enough for drivers to be added to the kernel at compile time, as Minix and old Linux do. We must be able to load and unload them at run time. This isn't difficult: it just means we have to extend the executable file interface to kernel mode.

You can implement kernel driver modules any way you like. Linux uses object files (.o) which are linked to the kernel at load time: references and relocations are patched as if the module was being linked by a linker. Windows NT (and WDM, the Windows Driver Model used by Windows since Windows 98/2000) uses full PE dynamic link libraries with the .sys extension. Drivers are loaded into kernel space just like DLLs are loaded into user space. The kernel needs some kind of entry point into the driver; once it has been loaded, the kernel will be able to see all of the driver's code and data (and vice versa). It needs some way of invoking the driver's code and starting the ball rolling.

This is where device enumeration comes in. How does the kernel know which drivers to load? The same driver could be used for several devices: how does the driver know which devices to implement? Linux, Minix and pre-WDM Windows NT avoid this problem by requiring drivers to know how to detect their own hardware. This makes sense, particularly for the pre-PnP systems which were around when these operating systems were designed. The kernel loads all the drivers which it expects to be needed (often via a user-configurable script or Registry) and the drivers take care of notifying the kernel of which devices actually are present.

Today's PCs have more sophisticated hardware:

A PCI bus makes hardware detection easily: each type of device responds to a unique combination of a 16-bit vendor ID and a device ID.

An ISA PnP chipset, together with a PnP BIOS, allows a list of installed ISA PnP devices to be compiled.

An ACPI chipset provides consistent access to all the motherboard devices.

A USB hub allows the devices connected to it to be queried for their types and capabilities.

So it is possible to write bus drivers for each type, each of which is able to detect the devices connected to that bus. Old-fashioned jumpered devices can even have their own virtual bus driver which stores configuration information on disk instead of getting it from the hardware.

If you write bus drivers for each type you need to put an interface in device drivers which defines a callback to be called for each device supported: an "add-device" routine. If not, you need a "main" routine in each driver which is called by the kernel when the driver is loaded and which detects the devices supported.

Interfaces

Once we've detected the devices installed in the system we need to keep a record of them somewhere. The standard Unix model, employed by Minix and Linux, is to keep a /dev directory somewhere in the file system. This directory is filled with special directory entries — directory entries which don't point to any data — each of which refers to a specific device via major and minor device numbers. The major device number specifies the device type or driver to use, and the minor number specifies a particular device implemented by that driver. For example, all IDE devices in the system might share one major device number, and each of the minor numbers would refer to one of the machine's hard disks, CD-ROMs or tape drives. Because entries in the /dev directory are persistent between reboots (since they are stored on disk), major device numbers never change and minor device numbers are always allocated the same way. The advantage of keeping device links in a directory on disk is that devices appear as files, making it easy to, say, record waveform data from the microphone (/dev/dsp) , pipe it through a filter, and play it back through the speakers. All of this could be accomplished on one command line. BeOS also uses a format similar to this — it has a /dev file system — although devices are stored dynamically and are organized in a tree of directories. Although Linux's use of a static /dev directory doesn't encourage the ability to dynamically add and remove devices, the BeOS devfs is fully dynamic and reflects the current configuration of the system without having to tweak the special directory entries.

On the face of it, Windows NT doesn't expose its devices to the user in the same way as Unix does; a user browsing through Explorer would only see the old MS-DOS-style C:, D: etc. volumes. Internally, however, Windows NT makes its devices available in a way similar to Unix. There exists a kernel namespace separate to the file system through which the system's devices can be accessed like ordinary files (actually, the normal file system can be accessed via the kernel namespace – the everyday C: drive names are simply links to the physical disk device names) . The Unix and Windows NT systems have one thing in common: once you know the name, a device can be opened and manipulated from user applications: not only with the stream-orientated read() and write() (or ReadFile() and WriteFile() under Win32) but as a device in its own right, with ioctl() (or DeviceIoControl()).

This leads us to the interface between user applications and device drivers. Typically a user app will issue commands to a specific device via the APIs I mentioned just now. It traps into the kernel via a syscall and the kernel picks up the device requested via the file handle given (the kernel will have recorded the device requested somehow when the file was opened). It is then ready to pass the request onto the driver responsible for that device.

The interface between the kernel and the driver is usually that of a table of function pointers. Linux and Windows NT both use a structure representing a device which contains a series of pointers to functions for handling requests to open, close, read, write, etc. On Linux, each pointer generally corresponds to an individual device syscall, right down to the function prototype; on Windows NT, each pointer points to generic device control routines. Different routines can be used for each function, but usually similar tasks (e.g. reading and writing) go to the same routine: the driver can tell the requests apart by the information in the I/O Request Packet (IRP) passed to the function.

Reading Materials 4

The Software Life Cycle Models

The software life cycle is a general model of the software development process, including all the activities and work products required to develop a software system. A software life cycle model is a particular abstraction representing a software life cycle. Such a model may be:

activity-centered — focusing on the activities of software development;

entity-centered — focusing on the work products created by these activities.

These are complementary views: activities produce work products.

A software life cycle model is often referred to as a software development life cycle (SDLC).

Code and Fix

A simple and widely used software life cycle model: Repeat the following steps until the solution is good enough.

- Code.
- Compile and execute.

- Detect errors.
- Fix.

Waterfall Model

The waterfall model prescribes a sequential execution of a set of development and management processes, with no return to an earlier activity once it is completed. Some variants of the waterfall model allow revisiting the immediately preceding activity ("feedback loops") if inconsistencies or new problems are encountered during the current activity.

V-Model

Another variant of the waterfall model — the V-model — associates each development activity with a test or validation at the same level of abstraction. Each development activity builds a more detailed model of the system than the one before it, and each validation tests a higher abstraction than its predecessor.

Spiral Model

Barry Boehm devised the spiral model to address the weaknesses of the waterfall model, especially its lack of resilience in the face of change. The spiral model focuses on addressing risks incrementally by repeating the waterfall model in a series of cycles or rounds:

- Concept of Operation.
- Software Requirements.
- Software Product Design.
- Detailed Design.
- Code.
- Unit Test.
- Integration and Test.
- Acceptance Test.
- Implementation.

Each round consists of four phases:

1. Determine objectives: product definition, determination of business objects, specification of constraints, generation of alternatives.

2. Evaluate alternatives: risk analysis, prototyping.

3. Develop product: detailed design, code, unit test, integration.

4. Plan next cycle: customer evaluation, design planning, implementation, customer delivery.

The spiral model is an improvement on the waterfall model, as it provides for multiple builds and provides several opportunities for customer involvement. However, it is elaborate, difficult to manage, and does not keep all workers occupied during all phases.

Synch-and-Stabilize

Synch-and-stabilize is Microsoft's attempt to scale-up a loosely structured small-team ("hacker") style of product development.

- many small teams (3 - 8 developers per team) work in parallel.
- changes are synchronize frequently so components will work together.

1. developers check-in their code by a particular time so a new build is done by the end of the day or the next morning.

2. a defect that “breaks” the build must be fixed immediately.

● features are evolved incrementally, with occasional innovations.

1. start with a “vision statement”.

2. select features and establish priority of features with user input.

3. developers are free to innovate or adapt to unforeseen competitive opportunities or threats.

4. continual testing during development.

● the product is stabilized at 3 or 4 milestone junctures in the project lifetime.

1. thorough internal and external testing (beta sites).

2. fix almost all errors detected.

3. “zero-bug” release at the last milestone.

The process is also called a “milestone”, “daily build”, “nightly build”, and “zero-defect” process.

The overall strategy is to quickly introduce products that are “good enough” to capture a mass market, then improve the product, selling multiple product versions and upgrades.

Reading Materials 5

Stacks

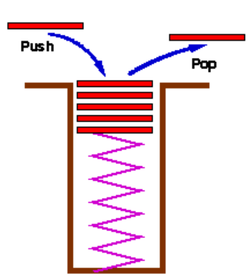
Another way of storing data is in a stack. A stack is generally implemented with only two principle operations (apart from a constructor and destructor methods):

push	adds an item to a stack
Pop	extracts the most recently pushed item from the stack

Other methods such as:

Top	returns the item at the top *without removing it*
Isempty	determines whether the stack has anything in it

are sometimes added.



A common model of a stack is a plate or coin stacker. Plates are “pushed” onto to the top and “popped” off the top.

Stacks form Last-In-First-Out (LIFO) queues and have many applications from the parsing of algebraic expressions to ...

A formal specification of a stack class would look like:

```
typedef struct t_stack *stack;
    stack ConsStack( int max_items, int item_size );
    /* Construct a new stack
```

```
        Pre-condition: (max_items > 0) && (item_size > 0)
      Post-condition: returns a pointer to an empty stack
    */
void Push( stack s, void *item );
    /* Push an item onto a stack
    Pre-condition: (s is a stack created by a call to ConsStack) &&
                   (existing item count < max_items) &&
                   (item != NULL)
    Post-condition: item has been added to the top of s
    */
void *Pop( stack s );
    /* Pop an item of a stack
   Pre-condition: (s is a stack created by a call to
                   ConsStack) &&
                   (existing item count >= 1)
   Post-condition: top item has been removed from s
    */
```

Points to note:

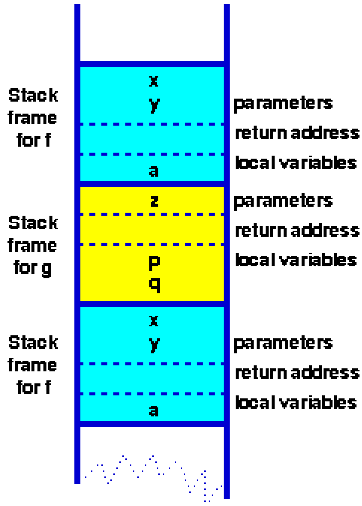
A stack is simply another collection of data items and thus it would be possible to use exactly the same specification as the one used for our general collection. However, collections with the LIFO semantics of stacks are so important in computer science that it is appropriate to set up a limited specification appropriate to stacks only.

Although a linked list implementation of a stack is possible (adding and deleting from the head of a linked list produces exactly the LIFO semantics of a stack), the most common applications for stacks have a space restraint so that using an array implementation is a natural and efficient one (In most operating systems, allocation and de-allocation of memory is a relatively expensive operation, there is a penalty for the flexibility of linked list implementations.).

Stack Frames

Almost invariably, programs compiled from modern high level languages make use of a stack frame for the working memory of each procedure or function invocation. When any procedure or function is called, a number of words — the stack frame — is pushed onto a program stack. When the procedure or function returns, this frame of data is popped off the stack.

As a function calls another function, first its arguments, then the return address and finally space for local variables is pushed onto the stack. Since each function runs in its own "environment" or context, it becomes possible for a function to call itself — a technique known as recursion. This capability is extremely useful and extensively used — because many problems are elegantly specified or solved in a recursive way.



Program stack after executing a pair of mutually recursive functions:

```
function f(int x, int y) {
    int a;
    if ( term_cond ) return ...;
    a = .....;
    return g(a);
    }
function g(int z) {
    int p,q;
    p = ...; q = ...;
    return f(p,q);
    }
```

Note how all of function f and g's environment (their parameters and local variables) are found in the stack frame. When f is called a second time from g, a new frame for the second invocation of f is created.

Reading Materials 6

Networking

Home Networking

With the price of PCs falling at the same time the advantages for consumers to being connected — online investing and shopping, keeping in touch with long-distance friends and relatives, enjoying multiplayer games and tapping the vast resources of the Internet — continued to multiply, it was no surprise that by the late 1990s computer networking was being propelled from its traditional corporate base into a brave new world — the home.

However, with an increasing number of households owning two or more PCs — forecasts predicted that more than 30 million North American households would own two or more computers by the end of 2002 — they found themselves experiencing the same limitations that confronted businesses almost 20 years earlier: the inability to share computing and peripheral resources or to share information easily between computer users.

The four most compelling home network market drivers are:

Simultaneous high-speed Internet access using a single ISP account: As the Internet becomes an essential tool in business, education, medicine and government, as well as our personal lives, the demand for high-speed, convenient, easily accessible Internet access is mushrooming. Cable, ISDN, and digital subscriber line (DSL) modems provide the fastest Internet connections and allow family members to talk on the phone and use the Internet simultaneously.

Peripheral sharing: Families want to get the most out of their computer equipment investments by sharing the same printers, modems, or other peripherals from any PC in the home.

Sharing files and applications: Families also want to maximize the value of their software investments by sharing applications, and they want the convenience of sharing files easily, without having to transfer from machine to machine via floppies or CDs.

Entertainment: The new wave of multiplayer computer games, with their advanced graphics and exciting audio tracks, are beginning to grab consumer interest. Many analysts believe that PC games and entertainment software represent the swiftest long-term growth segment of the overall U.S. electronic gaming marketplace, with a combined unit annual growth rate of 24% being predicted between 1997 and 2002. The two biggest growth factors are the continuing price drop in home PCs and the opportunity for multiplayer gaming.

The solution for home users in the late 1990s is the same as it had been for corporate users more than a decade earlier: networking.

While consumer demand has swelled, recent advances have overcome the technological and complexity barriers that once prevented networking from migrating into nontechnical environments. Component prices have dropped, available network speeds have accelerated, and signal attenuation and noise problems have been addressed using low-cost, high-performance signal processing. However, success in the consumer market requires that home networks be inexpensive, easy to install and easy to use. Essentially, that means the technology must be transparent to the user.

By the early 2000s, home networking technologies had made significant progress towards meeting these requirements, providing consumers with an impressive array of options. The wired network technologies use some form of physical cabling to connect computing devices, the choice being between Ethernet, phoneline and powerline. Wireless networks, on the other hand, use electromagnetic airwaves — infrared or radio — to transmit information from one point to another.

Ethernet Networks

To adapt the technology for the consumer market, Ethernet home network vendors have designed networking kits — consisting of low-cost network adapters, an inexpensive non-managed hub and simple configuration software — to make the technology easier to set up and use.

The Category 3 or 5 UTP copper wire cabling required by Ethernet networks is readily available in computer stores and home improvement stores, and is preinstalled in many new homes. The task of cabling is not difficult, particularly in situations where all the PCs are located in the same room, such as in a home-based office.

Internal or external network adapters are installed in each PC. Peripheral devices without direct Ethernet connection options — such as printers — are shared through a networked PC. Each PC is then connected to the Ethernet hub over Category 3 or Category 5 cabling. The hub manages the communication between the devices on the network. A single 56 Kbit/s analogue, ISDN, cable or DSL modem provides a shared Internet connection.

Phoneline Networks

Phoneline networking takes advantage of unused transmission capacity to transmit data over existing telephone wires. They transmit information at frequencies well above that of plain old telephone service (POTS) or digital services like ISDN and DSL, so the network does not interfere with the normal use of the phone line for voice, fax or Internet services running over the same telephone circuit. Nor do these other phoneline services affect network data transmission quality.

The technology used to divide up shared bandwidth is frequency division multiplexing (FDM). This well-established technique divides up the total bandwidth into different frequency bands, called channels, using frequency-selective filters. Each of the different types of traffic — power, analogue voice and digital information (including data, audio and video) — use different channels.

The initial Home Phoneline Networking Alliance (HomePNA) specification — released in the autumn of 1998 — adopted the IEEE 802.3 media access method, essentially delivering 1 Mbit/s Ethernet over phone lines. The subsequent HomePNA 2.0 specification — finalized in late 1999 — takes advantage of digital signal processing (DSP) technology embedded in silicon to offer consistently higher performance, better adapt to poor line conditions by continuously boosting signal strength and improve filtering of noise (interference) from nearby appliances. HomePNA 2.0-based products can support transfer speeds of up to 10 Mbit/s, ten times faster than HomePNA 1.0- based products.

In a typical home phoneline network internal or external network adapters are installed in each PC, which are plugged into a nearby phone jack. Printers or other peripherals — including simultaneous access to the Internet via a single 56 Kbit/s analogue, ISDN, cable or DSL modem — can then be shared through a connected PC.

Phoneline networking works best in homes where the computers are located in different rooms near phone jacks on the same circuit — that is, using the same telephone number. The fact that each home has a unique phone circuit from the telephone company’s central office ensures a high level of network security.

Powerline Networks

Powerline networking is another technology to take advantage of unused bandwidth on an existing system of home circuitry. It operates similarly to a phoneline network. Internal or external network adapters are installed in each PC, which are plugged into a nearby power outlet. Printers or other peripherals can be shared through a connected PC, a modem of some sort providing the shared Internet connection.

Powerline technologies use a variety of media access methods, from CSMA/CD and token passing to datagram sensing multiple access (DSMA) and centralized token passing (CTP). DSMA acts much like Ethernet to mediate multiple access contentions on the wire, by sensing and randomly backing off if traffic is detected. In some powerline home network implementations, once a network device has gained access, it switches to a dynamic, centrally distributed, token passing scheme so that it has control of the network until it finishes transmission. This dual method reduces the incidence of transmission collisions while preserving limited bandwidth.

Powerline technology also employs a modulation technology called frequency shift keying (FSK) to send digital signals over the powerline. FSK uses two or more separate frequencies in narrow band; one is designated “1” the other “0” for binary transmission.

Powerline networking boasts many of the same benefits as phoneline networking. However, some powerline networks are not as fast as other networking choices. Powerlines tend to be very “noisy” and consequently slower (compared to phonelines). Bandwidth speed tops out at much less than 1 Mbit/s: rates typically range from 50 Kbit/s to 350 Kbit/s.

Powerline networking works best in homes where the computers are located in different rooms near power outlets, but on the same circuit. There are potential security issues, however, due to the way power is distributed. A single power line from the utility company goes to multiple homes; a power meter at each house measures actual usage. Like an old party telephone line, anyone can potentially “listen in” on the shared bandwidth. A powerline network relies on encryption, or data scrambling, to prevent others from accessing the data running over the home network.

Because of these limitations, powerline home networking is not expected to be as viable an option as competing home networking technologies. The expectation is that it is more likely be deployed in home automation and home security applications.

Reading Materials 7

Working Inside a PC

Before you open up a PC for fault-finding, performing an upgrade or repair, certain points should be made concerning both your personal safety and the safety of your PC components.

Safe Working Practices

The first consideration should be electrical safety:

- Switch off all power before removing or assembling any part of the computer.
- Wherever possible, remove power by unplugging the power cable; an on/off switch may be faulty and can be inadvertently switched on.
- Wear an anti-static wrist band or some other precaution to prevent any chips or circuits getting a potentially fatal shock from you or the tools you are using.

If you must work on equipment that has live electrical circuits, you should observe the following precautions:

- Do not work alone. Make sure that the person with you knows how to switch off the power if necessary.
- Remove all jewellery, metal-framed spectacles and other metal objects.
- Use insulated equipment where the insulation is in good condition.

As far as General Safety is concerned:

- Do not wear loose clothing when operating equipment with moving parts, such as printers and disk drives. Tie back long hair and remove or clip ties. Fasten or roll up loose sleeves.
- Take care when lifting heavy equipment. Lift by pushing with your leg muscles to reduce strain to the back. Do not lift equipment on your own if you suspect that it will be heavy for you.
- Keep your work area tidy and free from hazards such as moisture and trailing cables.

- After completing maintenance work, ensure that all safety devices are correctly reinstalled. Such devices include machine covers, shields, warning labels and ground wires.

Determining the PC's Configuration

Before you attempt to perform any maintenance on a PC it is wise to find out what you currently have installed in terms of monitor adapter, memory, disk drives etc. There are several methods for doing this as follows:

- For ISA machines use the Hardware configuration program which is part of your PCs BIOS. You can normally enter the configuration program when the PC is switched on (but before DOS starts) with a key stroke—typically the Delete key. However, the exact key stroke depends upon your BIOS manufacturer. For example, an Elonex PC with a BIOS written by Microid Research uses the Esc key. Check your PC documentation to find out how to get into your PC BIOS.
- For EISA or MCA machines you will need the reference or setup floppy disk that came supplied with the machine. Boot up from this disk and follow the menus.
- For any machine. You can run certain utilities which can report what your current hardware configuration is. Examples of these are Checkit from Touchstone software, and MSD which comes supplied as part of DOS from version 5 on wards.
- Open up the case and have a look!

Tools Required

Unless you are working on a PS/2 machine, in which case you will be able to take the machine completely to pieces with your bare hands, you will need a basic toolkit. This should consist of the following:

- A small flat bladed screwdriver.
- A couple of Phillips screwdrivers.
- A Torx driver (if working on Compaq machines).
- Weezers.
- Chip removers.
- A tube for keeping loose screws safe.
- Anti-static wrist band.
- Anti-static bags.
- Compressed air can, or PC Vacuum cleaner, or natural bristle brush.
- Small torch.
- Spare 3.5 inch floppy disks for backup (a tape streamer is better if possible).
- Useful utilities (Virus checkers, different version of DOS boot disks, CHECKIT, NORTON Utilities or similar).

Before You Begin Dismantling the PC

Some set-up configurations and fault finding activities require your full attention. To ensure you get it right observe the following:

- Make sure that you have all the relevant tools to hand.
- Ensure you are working in as clean an environment as possible.

- Try to take the PC away from the users' workplace so you are working under the minimum amount of pressure and interference.
- Remember—a rushed job is a botched job and will cost you more in time in the future.

General Maintenance

If you have a PC opened up in front of you, perhaps to install a network card or memory, it may be worth performing some routine maintenance tasks that could prolong the lifespan of the PC.

Cleaning

A build up of dust can occur on the motherboard, this causes excessive heating and possible shorting.

Chip Seating

Give any socketed chips a firm press to make sure they are seated correctly. "Thermal creep" can cause this (chips working themselves loose due to expansion and contraction caused by heating/cooling).

Visual Check

Make sure that chips are not displaying signs of overheating (discoloring or cracking) as this may be symptomatic of something fairly serious. Check that the capacitors are not overheating: they should all be about the same color.

Reading Materials 8

Data Warehouse

What is a Data Warehouse?

A data warehouse has several processes that require several technology components. Batch and transaction processing data first has to be extracted from operational databases and then cleaned up to remove redundant data, fill in blank and missing fields and organized into consistent formats. The data is then loaded into a relational database. Business analysts can then dig into the data using data access and reporting software including On-Line Analytical Processing (OLAP) tools, statistical modeling tools, geographic information systems (GIS) and data mining tools.

What are These Different Kinds of Analyses?

They range from the most basic (query and reporting) to the more complex (OLAP and statistical analysis) to the most complex (data mining). Basic queries and reports are usually performed by functional managers who use pre-defined queries to look up such things as average monthly sales, total regional expenses and daily totals. OLAP and multi-dimensional analysis tools are designed more for business analysts who need to look at data across multiple dimensions. These tools let them drill down from summary data sets into the specific data underlying the summaries. Statistical analysis tools provide summary information too and help determine the degree of relationship between two factors, such as zip code and sales. Data mining tools analyze very large data sets to highlight hidden patterns, such as what items grocery shoppers buy as a pair.

What is a Data Warehouse Used for?

Many things. Data warehouses are the basis for customer relationship management systems because they can be used for consolidating customer data and identifying areas of customer satisfaction and frustration. Warehouses are also used for fraud detection, product repositioning analysis, profit center discovery and corporate asset management. For retailers, a data warehouse can help identify customer demographic characteristics, identify shopping patterns, and improve direct mailing responses. For banks, it can assist in spotting credit card fraud, help identify the most profitable customers, and highlight the most loyal customers. Telecommunications firms use data warehousing to predict which customers are likeliest to switch and then target them with special incentives to stay. Insurance companies use data warehousing for claims analysis to see which procedures are claimed together and to identify patterns of risky customers. Manufacturers can use data warehousing to compare costs of each of their product lines over the last several years, determine which factors produced increases and see what effect these increases had on overall margins.

Is It Hard to Set up a Data Warehouse?

Setting up a data warehouse isn't easy. Just identifying where all a business's data comes from, how it gets entered into a system and where it is all stored can be difficult, and setting up a data cleansing processes is quite complicated. It all depends on how large and complex the data collecting and storing operation is. Large data warehousing projects take years and millions of dollars to implement.

Is There Such a Thing as a Small Data Warehouse?

Yes. Some companies begin with a data mart, a scaled-down warehouse that focuses on just one functional department area, such as finance. Data marts often can be implemented in a couple of months and later be linked together into a confederated warehouse.

Half a century ago, Manny Fingerhut was making and selling protective seat covers for automobiles in a small garage in Minneapolis when a tie catalog arrived in the mail. Getting the catalog suggested new ways to Manny to attract customers to his own business. An idea formed. Recognizing that his products sold best to folks who had just bought a new car, he rented a list of auto registrations and mailed a modest advertising circular to the people on the list. Within four years, he had converted his business strictly to a mail order channel—a move that allowed him to expand business well beyond his immediate area—and annual sales were approaching $1 million.

Today, Fingerhut Corp., which is headquartered in Minnetonka, Minn., is a $2 billion business whose survival depends on its enormous data warehouse, 50 years in the making. "We've never done business without some form of database marketing," says Andy Johnson, senior vice president of market development. "It's the heart and soul of this company, and we wouldn't be in business without it."

Johnson's group, split between roughly 200 market analysts, 300 creators (who write, design and produce the catalogs) and 40 statistical scientists, looks to the database for the insights that help the company differentiate itself from competitors. Fingerhut marketing uses several hundred intricate, proprietary mathematical formulas to segment markets into niches and to make decisions on everything, such as product pricing and creative copywriting in product descriptions.

Most businesses that venture into database marketing do so to sell to myriad customers one at a time.

Fingerhut's success in pulling this off—sales have grown steadily since the late 1980s, surging 23 percent in 1995—is the result of a concerted effort to turn marketing into a group of tech-savvy power users.

That's where Fingerhut's IT shop comes in. Of the division's 550 members, 16 are dedicated to the data warehouse, and they're as much a training operation as a technical one, according to Tom Bozlinski, senior vice president of operations and network services. By helping marketing grow in its comfort and sophistication with the technology, Bozlinski's division makes a direct and conspicuous contribution to the company's bottom line: The faster marketers can identify significant new niches in demographics and nuances in behavior, the faster Fingerhut can reach customers with the right offerings at the right time.

Data Warehouse Uses

If you've bought an item or two through the mail, especially items Fingerhut sells—anything from slippers to stereos to swing sets—the company probably understands your spending habits better than you do. Its aim is to place all its own customers and those it learns about by buying information from other mail-order houses into groups large enough to justify print, production and mailing costs. Since every member of the group interacts with direct marketing in the same way, Fingerhut can tailor its efforts to increase business with that group as a whole. Data mining helps Fingerhut compete with store-based competitors.

For example, Fingerhut marketing recently found that customers who change their residence triple their purchasing in the 12 weeks after their move, with a peak in buying the first four weeks. Their selections follow a pattern—they go for furniture, telecommunications equipment and decorations but stay away from jewelry and home electronics. Not a revolutionary finding, but a key one to Fingerhut. The company used the discovery not only to tailor a new "mover's catalog" to entice customers who moved but to save money by not sending certain other catalogs during that 12-week window. The lesson? If a customer subset exists, no matter how geographically dispersed it may be, marketing needs to ferret it out.

What Five Questions Should be Asked in the Data Warehouse Planning Stage?

What data is needed to make business decisions?

Which business units will use it?

What kind of data analysis will be done?

How granular will the data be and what is the oldest data to be archived in it?

What are the security requirements?

Reading Materials 9

How Intelligent is Deep Blue?

IBM's chess computer, Deep Blue, has shocked the world of chess by defeating Garry Kasparov in a six-game match. It surprised many in computer science as well. Last year, after Kasparov's victory against the previous version, I told the students in my class, "Introduction to Artificial Intelligence," that it would be many years before computers could challenge the best humans. Now that I and many others have been proved wrong, there are a lot of people rushing to assure us that Deep Blue is not actually intelligent, and that its victory this year has no bearing on the future of artificial intelligence as such. I agree that Deep Blue is not actually intelligent, but I think the usual argument for this conclusion is quite faulty, and shows a basic misunderstanding of the goals and methods of artificial intelligence.

Deep Blue is unintelligent because it is so narrow. It can win a chess game, but it can't recognize, much less pick up, a chess piece. It can't even carry on a conversation about the game it just won. Since the essence of intelligence would seem to be breadth, or the ability to react creatively to a wide variety of situations, it's hard to credit Deep Blue with much intelligence.

However, many commentators are insisting that Deep Blue shows no intelligence whatsoever, because it doesn't actually "understand" a chess position, but only searches through millions of possible move sequences "blindly". The fallacy in this argument is the assumption that intelligent behavior can only be the result of intelligent cogitation. What the commentators are failing to acknowledge is that if there ever is a truly intelligent computer, then the computations it performs will seem as blind as Deep Blue's. If there is ever a nonvacuous explanation of intelligence, it will explain intelligence by reference to smaller bits of behavior that are not themselves intelligent. Presumably *your brain* works because each of its billions of neurons carry out hundreds of tiny operations per second, none of which in isolation demonstrates any intelligence at all.

When people express the opinion that human grandmasters do not examine 200 000 000 move sequences per second, I ask them, "How do you know?" The answer is usually that human grandmasters are not *aware* of searching this number of positions, or *are* aware of searching many fewer. But almost everything that goes on in our minds we are unaware of. I tend to agree that grandmasters are not searching the way Deep Blue does, but whatever they are doing would, if implemented on a computer, seem equally "blind". Suppose most of their skill comes from an ability to compare the current position against 10 000 positions they've studied. (There is some evidence that this is at least partly true.) We call their behavior insightful because they are unaware of the details; the right position among the 10 000 "just occurs to them". If a computer does it, the trick will be revealed; we will see how laboriously it checks the 10 000 positions. Still, if the unconscious version yields intelligent results, and the explicit algorithmic version yields essentially the same results, then they will be intelligent, too.

Another example: Most voice-recognition systems are based on a mathematical theory called Hidden Markov Models. Consider the following argument: "If a computer recognizes words using Hidden Markov Models, then it doesn't recognize words the way I do. I don't even know what a Hidden Markov Model is. I simply hear the word and it sounds familiar to me." I hope this argument sounds silly to you. The truth is that we have no introspective idea how we recognize spoken words. It is perfectly possible that the synaptic connections in our brains are describable, at least approximately, by Hidden Markov Models; if they aren't, then some other equally counterintuitive model is probably valid. Introspection is a lousy way to theorize about thinking. There are fascinating questions about why we are unaware of so much that goes on in our brains, and why our awareness is the way it is. But we can answer a lot of questions about thinking before we need to answer questions about awareness.

I hope I am not taken as saying that all the problems of artificial intelligence have been solved. I am only pointing out one aspect of what a solution would look like. There are no big breakthroughs on the horizon, no Grand Unified Theory of Thought. Doing better and better at chess has been the result of many small improvements (as was the proof of a novel theorem last year by a computer at Argonne Lab). There have been other such developments, such as the speech-recognition work I referred to earlier, and many results in computer vision, but few “breakthroughs”. As the field has matured, it has focused more and more on incremental progress, while worrying less and less about some magic solution to all the problems of intelligence. A good example is the reaction by AI researchers to neural nets, which are a kind of parallel computer based on ideas from neuroscience. Although the press and some philosophers hailed these as a radical paradigm shift that would solve everything, what has actually happened is that they have been assimilated into the AI toolkit as a technique that appears to work some of the time—just like Hidden Markov Models, game-tree search, and several other techniques. Of course, there may be some breakthroughs ahead for the field, but it is much more satisfying to get by on a diet of solid but unglamorous results. If we never arrive at a nonvacuous theory of intelligence, we will no doubt uncover a lot of useful theories of more limited mental faculties. And we might as well aim for such a theory.

So, what shall we say about Deep Blue? How about: It’s a “little bit” intelligent. It knows a tremendous amount about an incredibly narrow area. I have no doubt that Deep Blue’s computations differ in detail from a human grandmaster’s; but then, human grandmasters differ from each other in many ways. On the other hand, a log of Deep Blue’s computations is perfectly intelligible to chess masters; they speak the same language, as it were. That’s why the IBM team refused to give game logs to Kasparov during the match; it would be equivalent to bugging the hotel room where he discussed strategy with his seconds. Saying Deep Blue doesn’t really think about chess is like saying an airplane doesn’t really fly because it doesn’t flap its wings.

It’s entirely possible that computers will come to seem alive before they come to seem intelligent. The kind of computing power that fuels Deep Blue will also fuel sensors, wheels, and grippers that will allow computers to react physically to things in their environment, including us. They won’t seem intelligent, but we may think of them as a weird kind of animal—one that can play a very good game of chess.

Reading Materials 10

A Brief History of the Internet and Related Networks

Introduction

In 1973, the U.S. Defense Advanced Research Projects Agency (DARPA) initiated a research program to investigate techniques and technologies for interlinking packet networks of various kinds. The objective was to develop communication protocols which would allow networked computers to communicate transparently across multiple, linked packet networks. The system of networks which emerged from the research was known as the “Internet”. The system of protocols which was developed over the course of this research effort became known as the TCP/IP Protocol Suite, after the two initial protocols developed: Transmission Control Protocol (TCP) and Internet Protocol (IP).

In 1986, the U.S. National Science Foundation (NSF) initiated the development of the NSFNET which, today, provides a major backbone communication service for the Internet. With its 45 megabit per second facilities, the NSFNET carries on the order of 12 billion packets per month between the networks it links. The National Aeronautics and Space Administration (NASA) and the U.S. Department of Energy contributed additional backbone facilities in the form of the NSINET and ESNET respectively. In Europe, major international backbones such as NORDUNET and others provide connectivity to over one hundred thousand computers on a large number of networks. Commercial network providers in the U.S. and Europe are beginning to offer Internet backbone and access support on a competitive basis to any interested parties.

"Regional" support for the Internet is provided by various consortium networks and "local" support is provided through each of the research and educational institutions. Within the United States, much of this support has come from the federal and state governments, but a considerable contribution has been made by industry. In Europe and elsewhere, support arises from cooperative international efforts and through national research organizations. During the course of its evolution, particularly after 1989, the Internet system began to integrate support for other protocol suites into its basic networking fabric. The present emphasis in the system is on multiprotocol interworking, and in particular, with the integration of the Open Systems Interconnection (OSI) protocols into the architecture.

Both public domain and commercial implementations of the roughly 100 protocols of TCP/IP protocol suite became available in the 1980's. During the early 1990's, OSI protocol implementations also became available and, by the end of 1991, the Internet has grown to include some 5 000 networks in over three dozen countries, serving over 700 000 host computers used by over 4 000 000 people.

A great deal of support for the Internet community has come from the U.S. Federal Government, since the Internet was originally part of a federally-funded research program and, subsequently, has become a major part of the U.S. research infrastructure. During the late 1980's, however, the population of Internet users and network constituents expanded internationally and began to include commercial facilities. Indeed, the bulk of the system today is made up of private networking facilities in educational and research institutions, businesses and in government organizations across the globe.

The Coordinating Committee for Intercontinental Networks (CCIRN), which was organized by the U.S. Federal Networking Council (FNC) and the European Reseaux Associees pour la Recherche Europeenne (RARE), plays an important role in the coordination of plans for government-sponsored research networking. CCIRN efforts have been a stimulus for the support of international cooperation in the Internet environment.

Internet Technical Evolution

Over its seventeen year history, the Internet has functioned as a collaboration among cooperating parties. Certain key functions have been critical for its operation, not the least of which is the specification of the protocols by which the components of the system operate. These were originally developed in the DARPA research program mentioned above, but in the last five or six years, this work has been undertaken on a wider basis with support from Government agencies in many countries, industry and the academic community. The Internet Activities Board (IAB) was created in 1983 to guide the evolution of the TCP/IP Protocol Suite and to provide research advice to the Internet community.

During the course of its existence, the IAB has reorganized several times. It now has two primary components: the Internet Engineering Task Force and the Internet Research Task Force. The former has primary responsibility for further evolution of the TCP/IP protocol suite, its standardization with the concurrence of the IAB, and the integration of other protocols into Internet operation (e.g. the Open Systems Interconnection protocols). The Internet Research Task Force continues to organize and explore advanced concepts in networking under the guidance of the Internet Activities Board and with support from various government agencies.

A secretariat has been created to manage the day-to-day function of the Internet Activities Board and Internet Engineering Task Force. IETF meets three times a year in plenary and its approximately 50 working groups convene at intermediate times by electronic mail, teleconferencing and at face-to-face meetings. The IAB meets quarterly face-to-face or by videoconference and at intervening times by telephone, electronic mail and computer-mediated conferences.

Two other functions are critical to IAB operation: publication of documents describing the Internet and the assignment and recording of various identifiers needed for protocol operation. Throughout the development of the Internet, its protocols and other aspects of its operation have been documented first in a series of documents called Internet Experiment Notes and, later, in a series of documents called Requests for Comment (RFCs). The latter were used initially to document the protocols of the first packet switching network developed by DARPA, the ARPANET, beginning in 1969, and have become the principal archive of information about the Internet. At present, the publication function is provided by an RFC editor.

The recording of identifiers is provided by the Internet Assigned Numbers Authority (IANA) who has delegated one part of this responsibility to an Internet Registry which acts as a central repository for Internet information and which provides central allocation of network and autonomous system identifiers, in some cases to subsidiary registries located in various countries. The Internet Registry (IR) also provides central maintenance of the Domain Name System (DNS) root database which points to subsidiary distributed DNS servers replicated throughout the Internet. The DNS distributed database is used to associate host and network names with their Internet addresses and is critical to the operation of the higher level TCP/IP protocols including electronic mail.

There are a number of Network Information Centers (NICs) located throughout the Internet to serve its users with documentation, guidance, advice and assistance. As the Internet continues to grow internationally, the need for high quality NIC functions increases. Although the initial community of users of the Internet were drawn from the ranks of computer science and engineering, its users now comprise a wide range of disciplines in the sciences, arts, letters, business, military and government administration.

Related Networks

In 1980-81, two other networking projects, BITNET and CSNET, were initiated. BITNET adopted the IBM RSCS protocol suite and featured direct leased line connections between participating sites. Most of the original BITNET connections linked IBM mainframes in university data centers. This rapidly changed as protocol implementations became available for other machines. From the beginning, BITNET has been multi-disciplinary in nature with users in all academic areas. It has also provided a number of unique services to its users (e.g., LISTSERV). Today, BITNET and its parallel networks in other parts of the world (e.g., EARN in Europe) have several thousand participating sites. In recent years, BITNET has established a backbone which uses the TCP/IP protocols with RSCS-based applications running above TCP.

CSNET was initially funded by the National Science Foundation (NSF) to provide networking for university, industry and government computer science research groups. CSNET used the Phonenet MMDF protocol for telephone-based electronic mail relaying and, in addition, pioneered the first use of TCP/IP over X.25 using commercial public data networks. The CSNET name server provided an early example of a white pages directory service and this software is still in use at numerous sites. At its peak, CSNET had approximately 200 participating sites and international connections to approximately fifteen countries.

In 1987, BITNET and CSNET merged to form the Corporation for Research and Educational Networking (CREN). In the Fall of 1991, CSNET service was discontinued having fulfilled its important early role in the provision of academic networking service. A key feature of CREN is that its operational costs are fully met through dues paid by its member organizations.

Reading Materials 11

The Elements of Commerce

When you get down to the actual elements of commerce and commercial transactions, things get slightly more complicated because you have to deal with the details. However, these details boil down to a finite number of steps. The following list highlights all of the elements of a typical commerce activity. In this case, the activity is the sale of some product by a retailer to a customer:

- If you would like to sell something to a customer, at the very core of the matter is the something itself. You must have a **product or service** to offer. The product can be anything from ball bearings to back rubs. You may get your products directly from a producer, or you might go through a distributor to get them, or you may produce the products yourself.
- You must also have a **place** from which to sell your products. Place can sometimes be very ephemeral—for example a phone number might be the place. If you are a customer in need of a back rub, if you call "Judy's Backrubs, Inc." on the telephone to order a back rub, and if Judy shows up at your office to give you a backrub, then the phone number is the place where you purchased this service. For most physical products we tend to think of the place as a store or shop of some sort. But if you think about it a bit more you realize that the place for any traditional mail order company is the combination of an ad or a catalog and a phone number or a mail box.
- You need to figure out a way to get people to come to your place. This process is known as **marketing**. If no one knows that your place exists, you will never sell anything. Locating your place in a busy shopping center is one way to get traffic. Sending out a mail order catalog is another. There is also advertising, word of mouth and even the guy in a chicken suit who stands by the road waving at passing cars!
- You need a way to accept **orders**. At Wal-mart this is handled by the check out line. In a mail order company the orders come in by mail or phone and are processed by employees of the company.
- You also need a way to accept **money**. If you are at Wal-mart you know that you can use cash, check or credit cards to pay for products. Business-to-business transactions often use purchase

orders. Many businesses do not require you to pay for the product or service at the time of delivery, and some products and services are delivered continuously (water, power, phone and pagers are like this). That gets into the whole area of **billing** and **collections**.

- You need a way to deliver the product or service, often known as **fulfillment**. At a store like Wal-mart fulfillment is automatic. The customer picks up the item of desire, pays for it and walks out the door. In mail-order businesses the item is packaged and mailed. Large items must be loaded onto trucks or trains and shipped.
- Sometimes customers do not like what they buy, so you need a way to accept **returns**. You may or may not charge certain fees for returns, and you may or may not require the customer to get authorization before returning anything.
- Sometimes a product breaks, so you need a way to honor warranty claims. For retailers this part of the transaction is often handled by the producer.
- Many products today are so complicated that they require **customer service** and **technical support** departments to help customers use them. Computers are a good example of this sort of product. On-going products like cell phone service may also require on-going customer service because customers want to change the service they receive over time. Traditional items (for example, a head of lettuce), generally require less support than modern electronic items.

You find all of these elements in any traditional mail order company. Whether the company is selling books, consumer products, information in the form of reports and papers, or services, all of these elements come into play.

In an E-commerce sales channel you find all of these elements as well, but they change slightly. You must have the following elements to conduct E-commerce:

- A product.
- A place to sell the product — in the E-commerce case a web site displays the products in some way and acts as the place.
- A way to get people to come to your web site.
- A way to accept orders — normally an on-line form of some sort.
- A way to accept money — normally a merchant account handling credit card payments. This piece requires a secure ordering page and a connection to a bank. Or you may use more traditional billing techniques either on-line or through the mail.
- A fulfillment facility to ship products to customers (often outsource-able). In the case of software and information, however, fulfillment can occur over the Web through a file download mechanism.
- A way to accept returns.
- A way to handle warrantee claims if necessary.
- A way to provide customer service (often through email, on-line forms, on-line knowledge bases and FAQs, etc.).

In addition, there is often a strong desire to integrate other business functions or practices into the E-commerce offering. An extremely simple example—you might want to be able to show the customer the exact status of an order.

Reading Materials 12

Serial Communications

The need to communicate between distant computers led to the use of the existing phone network for data transmission. Most phone lines were designed to transmit analogue information—voices, while the computers and their devices work in digital form—pulses. So, in order to use an analogue medium, a converter between the two systems is needed. This converter is the “modem”, which performs Modulation and Demodulation of transmitted data. It accepts serial binary pulses from a device, modulates some property (amplitude, frequency, or phase) of an analogue signal in order to send the signal in an analogue medium, and performs the opposite process, enabling the analogue information to arrive as digital pulses at the computer or device on the other side of connection.

PCs have always provided the means to communicate with the outside world—via a serial communications port—but up until the 1990s, it was a facility that was little used. The ability to access bulletin boards and to communicate via fax did attract some domestic users, but in general a modem was considered as a luxury item that could be justified only by business users. The tremendous increase in the popularity of the Internet has changed all that in recent years and nowadays the ability to access the World Wide Web and to communicate via email is regarded as essential by many PC users.

Modems

A modem allows a PC to connect to other computers and enables it to send and receive files of data over the telephone network. At one end it converts digital data into a series of analogue signals for transmission over telephone lines, at the other it does the opposite, converting an analogue signal into digital data.

Modems come in two types, internal, fitting into an expansion slot inside the PC’s system case or external, connected to the PC via one of its serial ports (COM1 or COM2).

Early modems were asynchronous devices, operating at slow rates of up to 18 000bit/s in FSK modulation, using two frequencies for transmission and another two for receiving. Asynchronous data is not accompanied by any clock, and the transmitting and receiving modems know only the nominal data rate. To prevent slipping of the data relative to the modems’ clocks, this data is always grouped in very short blocks (characters) with framing bits (start and stop bits). The most common code used for this is the seven-bit ASCII code with even parity.

Synchronous modems operate at rates up to 56 Kbit/s in audio lines, using synchronous data. Synchronous data is accompanied by a clock signal and is almost always grouped in blocks. It is the responsibility of the data source to assemble those blocks with framing codes and any extra bits needed for error detecting and/or correcting according to one of many different protocols (BISYNC, SDLC, HDLC, etc.). The data source and destination expect the modem to be transparent to this type of data, conversely, the modem can ignore the blocking of the data. The usual modulation methods are the phase modulation and integrated phase and amplitude.

Fax Modems

Nearly all modems now include some sort of fax capability and usually come with bundled software which provides a PC with most of the functionality of a fax machine. Digital documents can be converted to analogue, ending up as an image file (if the receiver is another fax/modem), or a printed document (if received by a facsimile machine). Incoming faxes received as image files are saved to the PC's hard disk.

Fax-modems exploit the intelligence of the PC at their disposal to do things standalone fax machines can't. For instance, faxes can be scheduled to be sent when the phone rates are cheaper. Also, since the data they receive is in digital form, it is immediately available on the PC for editing or retouching before printing. One of the common features in fax software is a cover-sheet facility which allows the definition of a fax cover-sheet. There's often a quick-fax facility, too, which allows a single page fax to be created without the hassle of loading a word processor.

Group 3 fax/modems provide various levels of processing based upon their service class. Class 1 devices perform basic handshaking and data conversion and are the most flexible, because much of the work is done by the computer's CPU. Class 2 devices establish and end the call and perform error checking. There are a variety of de facto Class 2 implementations and one Class 2.0 standard. As PCs have become more powerful, future service classes with more features are unlikely.

One problem with scanned images and received faxes is that they hog large amounts of disk space. Some bundled fax software includes an optical character recognition facility (OCR) which allows received faxes or scanned images to be converted from bitmap format to normal text. This not only reduces document sizes but also allows them to be edited in a word processor.

Voice Modems

Voice modems are part of the current communications convergence trend—the merging of voice, data, fax, and even video—which is affecting all aspects of data communications. Consider the Internet, originally a file transfer system, which is now transmitting radio signals, real-time audio, telephone conversations and, for those who have the bandwidth, live video. Now, a number of modem manufacturers have produced modems which can answer phones and record voice messages.

Such multi-purpose modems perform as anything from a simple answering machine (recording messages on the hard disk) to a complete voicemail system with hundreds of boxes, message forwarding, and fax retrieval service. Incoming data or fax calls are automatically directed to the appropriate software module and voice calls passed through to the answering machine/voicemail software.

工 具 篇

计算机常用术语解释

索 引

正 文

【ALU (Arithmetic Logic Unit) 算术逻辑部件】

An arithmetic-logic unit (ALU) is the part of a computer processor (CPU) that carries out arithmetic and logic operations on the operands[1] in computer instruction words[2]. In some processors, the ALU is divided into two units, an arithmetic unit (AU) and a logic unit (LU). Some processors contain more than one AU—for example, one for fixed-point operations[3] and another for floating-point operations[4] (In personal computers floating point operations are sometimes done by a floating point unit on a separate chip called a numeric coprocessor[5]).

Typically, the ALU has direct input and output access to the processor controller, main memory[6] (random access memory or RAM[7] in a personal computer), and input/output devices. Inputs and outputs flow along an electronic path that is called a bus[8]. The input consists of an instruction word (sometimes called a machine instruction[9] word) that contains an operation code[10] (sometimes called an “op code”), one or more operands, and sometimes a format code[11]. The operation code tells the ALU what operation to perform and the operands are used in the operation (For example, two operands might be added together or compared logically). The format may be combined with the op code and tells, for example, whether this is a fixed-point or a floating-point instruction. The output consists of a result that is placed in a storage register[12] and settings that indicate whether the operation was performed successfully (If it isn’t, some sort of status will be stored in a permanent place that is sometimes called the machine status word[13].).

In general, the ALU includes storage places for input operands, operands that are being added, the accumulated result (stored in an accumulator[14]), and shifted results. The flow of bits and the operations performed on them in the subunits of the ALU is controlled by gated circuits. The gates in these circuits are controlled by a sequence logic unit that uses a particular algorithm or sequence for each operation code. In the arithmetic unit, multiplication and division[15] are done by a series of adding or subtracting and shifting[16] operations. There are several ways to represent negative numbers. In the logic unit, one of 16 possible logic operations can be performed—such as comparing two operands and identifying where bits don’t match.

The design of the ALU is obviously a critical part of the processor and new approaches to speeding up instruction handling are continually being developed.

【artificial intelligence 人工智能】

AI or artificial intelligence is the simulation of human intelligence processes by machines, especially

[1] operand **操作数**
[2] instruction word **指令字**
[3] fixed-point operation **定点运算**
[4] floating-point operation **浮点运算**
[5] numeric coprocessor **算术协处理器**
[6] main memory **主存储器，主存**
[7] RAM (Random Access Memory) **随机存取存储器**
[8] bus **总线**
[9] machine instruction **机器指令**
[10] operation code **操作码**
[11] format code **格式码**
[12] storage register **存储寄存器**
[13] status word **状态字**
[14] accumulator **累加器**
[15] multiplication and division **乘法和除法**
[16] subtract **减；**shift **移位**

computer systems. These processes include learning (the acquisition[1] of information and rules for using the information), reasoning (using the rules to reach approximate or definite conclusions), and self-correction. Particular applications of AI include expert systems[2], speech recognition[3], and machine vision[4].

【ASCII 美国信息交换标准码】

ASCII (American Standard Code for Information Interchange) is the most common format for text files in computers and on the Internet. In an ASCII file, each alphabetic, numeric, or special character is represented with a 7-bit binary number (a string of seven 0s or 1s). 128 possible characters are defined.

Unix and DOS-based operating systems use ASCII for text files. Windows NT and 2000 uses a newer code, Unicode[5]. IBM's S/390 systems use a proprietary 8-bit code called EBCDIC[6]. Conversion programs[7] allow different operating systems to change a file from one code to another.

ASCII was developed by the American National Standards Institute (ANSI[8]).

【assembler 汇编程序】

An assembler is a program that takes basic computer instructions and converts them into a pattern of bits that the computer's processor can use to perform its basic operations. Some people call these instructions assembler language[9] and others use the term assembly language.

Here's how it works:

Most computers come with a specified set of very basic instructions that correspond to the basic machine operations that the computer can perform. For example, a "Load" instruction causes the processor to move a string of bits from a location in the processor's memory to a special holding place called a register[10]. Assuming the processor has at least eight registers, each numbered, the following instruction would move the value (string of bits of a certain length) at memory location 3 000 into the holding place called register 8:

```
L        8,3000
```

The programmer can write a program using a sequence of these assembler instructions.

This sequence of assembler instructions, known as the source code or source program[11], is then specified to the assembler program when that program is started.

The assembler program takes each program statement[12] in the source program and generates a corresponding bit stream or pattern[13] (a series of 0's and 1's of a given length).

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1 acquisition **获取**
2 expert system **专家系统**
3 speech recognition **语音识别**
4 machine vision **机器视觉**
5 Unicode **统一字符编码**
6 EBCDIC (Extended Binary-Coded Decimal Interchange Code) **扩充的二—十进制交换码**
7 conversion program **转换程序**
8 ANSI (American National Standards Institute) **美国国家标准协会**
9 assembler language **汇编语言**
10 register **寄存器**
11 source code **源代码；**source program **源程序**
12 statement **语句**
13 bit stream **位流，比特流；**bit pattern **位模式**

The output of the assembler program is called the object program[1] relative to the input source program. The sequence of 0's and 1's that constitute the object program is sometimes called machine code[2].

The object program can then be run (or executed) whenever desired.

In the earliest computers, programmers actually wrote programs in machine code, but assembler languages or instruction sets[3] were soon developed to speed up programming. Today, assembler programming is used only where very efficient control over processor operations is needed. It requires knowledge of a particular computer's instruction set, however. Historically, most programs have been written in "higher-level" languages such as COBOL, FORTRAN, PL/I, and C. These languages are easier to learn and faster to write programs with than assembler language. The program that processes the source code written in these languages is called a compiler[4]. Like the assembler, a compiler takes higher-level language statements and reduces them to machine code.

A newer idea in program preparation and portability is the concept of a virtual machine[5]. For example, using the Java programming language, language statements are compiled into a generic form of machine language known as bytecode[6] that can be run by a virtual machine, a kind of theoretical machine that approximates most computer operations. The bytecode can then be sent to any computer platform that has previously downloaded or built in the Java virtual machine. The virtual machine is aware of the specific instruction lengths and other particularities of the platform and ensures that the Java bytecode can run.

【ATM 异步传输模式/自动取款机】

ATM (asynchronous transfer mode) is a dedicated-connection[7] switching technology that organizes digital data into 53-byte cell[8] units and transmits them over a physical medium using digital signal technology. Individually, a cell is processed asynchronously relative to other related cells and is queued before being multiplexed[9] over the transmission path.

Because ATM is designed to be easily implemented by hardware (rather than software), faster processing and switch speeds are possible. The prespecified bit rates[10] are either 155.520 Mbps or 622.080 Mbps. Speeds on ATM networks can reach 10 Gbps. Along with Synchronous Optical Network (SONET[11]) and several other technologies, ATM is a key component of broadband ISDN (BISDN).

ATM also stands for automated teller machine, a machine that bank customers use to make transactions without a human teller.

【backup 备份】

Backup is the activity of copying files or databases so that they will be preserved in case of equipment

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1 object program **目标程序**
2 machine code **机器码**
3 instruction set **指令集，指令系统**
4 compiler **编译器**
5 virtual machine **虚拟机**
6 bytecode **字节码**
7 dedicated-connection **专用连接**
8 cell **存储单元、信元**
9 multiplex **多路复用，多路转换**
10 bit rate **位速率**
11 SONET (Synchronous Optical Network) **光纤同步网**

failure or other catastrophe. Backup is usually a routine part of the operation of large businesses with mainframes as well as the administrators of smaller business computers. For personal computer users, backup is also necessary but often neglected. The retrieval of files you backed up is called restoring them.

Personal computer users can consider both local backup and Internet backup.

Local Backup

These are some options, with the least expensive approach listed first.

- Backing up critical files to diskettes. This approach is commonly used by people who keep their checkbooks[1] and personal finance data on the computer. Programs like Quicken and Managing Your Money always remind users when they quit the program to backup their data. If your hard disk crashes, you'll be able to reconstruct your checkbook balances. If you have other files (for example, chapters of a book you're working on), you'll want to backup every single day's work. Copying it to a diskette is quick and economical.
- Backing up to a Zip drive, Jaz,[2] or similar hard disks. Once a week or so, you should back up your files (at least your own data files and perhaps the entire contents of your hard drive) to an alternative storage device, such as a Zip drive. These devices hold at least one million bytes on a special hard disk. Backing up usually takes a while.
- There are also easily removable drives that you can back up to, especially if you have other reasons to use these (for example, for large graphic images that you store offline).

Internet Backup

You can also consider sending your files to another site for safekeeping. In case your hard disk crashes, you'll be able to download them from the safekeeping site.

【bandwidth 带宽】

Bandwidth has a general meaning of how much information can be carried in a given time period (usually a second) over a wired or wireless communications link. For example, a link with a broad bandwidth—that is, a broadband[3] link—is one that may be able to carry enough information to sustain the succession of images in a video presentation.

More technically, bandwidth is the width of the range of frequencies that an electronic signal occupies on a given transmission medium. Any digital or analog signal[4] has a bandwidth.

In digital systems, bandwidth is expressed as bits (of data) per second (bps). Thus, a modem that works at 57 600 bps has twice the bandwidth of a modem that works at 28 800 bps. In analog systems, bandwidth is expressed in terms of the difference between the highest-frequency signal component and the lowest-frequency signal component. frequency is measured in the number of cycles of change per second, or hertz. A typical voice signal has a bandwidth of approximately three kilohertz (3 KHz); an analog television (TV) broadcast video signal has a bandwidth of six megahertz (6 MHz) — some 2,000 times as wide as the voice signal.

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[1] checkbook **支票簿**
[2] Jaz **一种活动盘驱动器** Syquest
[3] broadband **宽带**
[4] digital signal **数字信号；**analog signal **模拟信号**

It should be remembered that a real communications path usually consists of a succession of links, each with its own bandwidth. If one of these is much slower than the rest, it is said to be a bandwidth bottleneck[1].

【batch 批处理】

In a computer, a batch job[2] is a program that is assigned to the computer to run without further user interaction. Examples of batch jobs in a PC are a printing request or an analysis of a Web site log. In larger commercial computers or servers, batch jobs are usually initiated by a system user. Some are defined to run automatically at a certain time.

In some computer systems, batch jobs are said to run in the background and interactive programs run in the foreground. In general, interactive programs are given priority over batch programs, which run during the time intervals when the interactive programs are waiting for user requests.

The term originated with mainframe computers when punched cards were the usual form of computer input and you put a batch of cards (one batch per program) in a box in the sequence that they were to be fed into the computer by the computer operator (Hopefully, you got the output back the next morning).

【BBS (Bulletin Board System) 布告板系统，公告牌系统】

A bulletin board system (BBS) is a computer or an application dedicated to the sharing or exchange of messages or other files on a network. Originally an electronic version of the type of bulletin board found on the wall in many kitchens and work places, the BBS was used to post simple messages between users. The BBS became the primary kind of online community through the 1980s and early 1990s, before the World Wide Web arrived.

A BBS may be accessible from a dial-up modem, Telnet[3], or the Internet. Because it originated before the graphical user interface (GUI[4]) became prevalent, the BBS interface was text-based. Although recent Web-based versions have a graphical, interactive user interface, the text-only interface preferred by BBS purists can often be accessed by Telnet.

Most BBSes are devoted to a particular subject, although some are more general in nature. Among special interests represented on BBSes are dentistry, law, multi-player games, Druidic practices, and information for the disabled. A significant number of BBS sites offer “adult-oriented” chat and images that can be downloaded. The BBS is often free, although some charge a membership or use fee. Many BBSes have Web sites, and many Internet access providers have bulletin board systems from which new Internet users can download the necessary software to get connected. The BBS has its own culture and jargon. For example, a sysop is the person who runs the site. Online chat became widely popular through the BBS and many chat acronyms originated there.

The first BBS, called the Computerized Bulletin Board System (CBBS), was created in 1978 by Ward Christensen and Randy Suess. Although ARPANET was in operation at that time, it was restricted to institutions funded by the U.S. Department of Defense. When CBBS went online, it became the first

[1] bottleneck **瓶颈**
[2] batch job **批作业**
[3] Telnet **远程登录**
[4] GUI (Graphical User Interface) **图形用户界面**

non-military computer-based community, other than timesharing systems[1] (which allotted portions of mainframe processing time to a group of computers). An article by Christensen and Suess published in Byte magazine described CBBS and outlined the technology they had used to develop it, sparking the creation of many tens of thousands of BBSes all over the world.

Despite the vastly greater reach of the Internet, the BBS is still fairly common in parts of the world where the Internet is less established and is still valued by many with Internet access for its ability to foster a sense of community.

【binary 二进制】

Binary describes a numbering scheme in which there are only two possible values for each digit: 0 and 1. The term also refers to any digital encoding/decoding[2] system in which there are exactly two possible states. In digital data memory, storage, processing, and communications, the 0 and 1 values are sometimes called "low" and "high," respectively.

Binary numbers look strange when they are written out directly. This is because the digits' weight increases by powers of 2, rather than by powers of 10. In a digital numeral, the digit furthest to the right is the "ones" digit; the next digit to the left is the "twos" digit; next comes the "fours" digit, then the "eights" digit, then the "16s" digit, then the "32s" digit, and so on. The decimal equivalent of a binary number can be found by summing all the digits. For example, the binary 10101 is equivalent to the decimal 1 + 4 + 16 = 21:

DECIMAL = 21 64 32 16 8 4 2 1

BINARY = 10101 0 0 1 0 1 0 1

【bug 隐错】

In computer technoly, a bug is a coding error in a computer program (Here we consider a program to also include the microcode[3] that is manufactured into a microprocessor). The process of finding bugs before program users do is called debugging[4]. Debugging starts after the code is first written and continues in successive stages as code is combined with other units of programming to form a software product, such as an operating system or an application. After a product is released or during public beta testing[5], bugs are still apt to be discovered. When this occurs, users have to either find a way to avoid using the "buggy" code or get a patch[6] from the originators of the code.

A bug is not the only kind of problem a program can have. It can run bug-free and still be difficult to use or fail in some major objective. This kind of flaw is more difficult to test for. It is generally agreed that a well-designed program developed using a well-controlled process will result in fewer bugs per thousands of lines of code.

【bus 总线】

In a computer or on a network, a bus is a transmission path on which signals are dropped off or picked

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1 timesharing system **分时系统**
2 encoding/decoding **编码/译码**
3 microcode **微码**
4 debugging **调试**
5 beta testing **软件中的** beta **测试**
6 patch **补丁，修补码**

up at every device attached to the line. Only devices addressed by the signals pay attention to them; the others discard the signals.

In general, the term is used in two somewhat different contexts:

(1) A bus is a network topology[1] or circuit arrangement in which all devices are attached to a line directly and all signals pass through each of the devices. Each device has a unique identity and can recognize those signals intended for it.

(2) In a computer, a bus is the data path on the computer's motherboard that interconnects the microprocessor with attachments to the motherboard in expansion slots[2] (such as hard disk drives, CD-ROM drives, and graphics adapters).

【CAD (Computer-aided Design) 计算机辅助设计】

CAD (Computer-aided Design) software is used by architects, engineers, drafters, artists, and others to create precision drawings or technical illustrations. CAD software can be used to create two-dimensional (2-D) drawings or three-dimensional (3-D) models.

CAD/CAM[3] (computer-aided design/computer-aided manufacturing) is software used to design products such as electronic circuit boards in computers and other devices.

【CISC (Complex Instruction Set Computer) 复杂指令系统计算机】

The term "CISC" (complex instruction set computer) refers to computers designed with a full set of computer instructions that were intended to provide needed capabilities in the most efficient way. Later, it was discovered that, by reducing the full set to only the most frequently used instructions, the computer would get more work done in a shorter amount of time for most applications. Since this was called reduced instruction set computing(RISC)[4], there was now a need to have something to call full-set instruction computers—thus, the term CISC.

The PowerPC microprocessor, used in IBM's RISC System/6000 workstation and Macintosh computers, is a RISC microprocessor. Intel's Pentium microprocessors are CISC microprocessors. RISC takes each of the longer, more complex instructions from a CISC design and reduces it to multiple instructions that are shorter and faster to process.

【client/server 客户机/服务器】

Client/server describes the relationship between two computer programs in which one program, the client, makes a service request from another program, the server, which fulfills the request. Although the client/server idea can be used by programs within a single computer, it is a more important idea in a network. In a network, the client/server model provides a convenient way to interconnect programs that are distributed efficiently across different locations. Computer transactions using the client/server model are very common. For example, to check your bank account from your computer, a client program in your computer forwards your request to a server program at the bank. That program may in turn forward the request to its own client program that sends a request to a database server at another bank computer to

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[1] topology 拓扑结构
[2] expansion slot 扩展槽
[3] CAM (Computer-aided Manufacturing) 计算机辅助制造
[4] reduced instruction set computing (RISC) 精简指令系统计算

retrieve your account balance. The balance is returned back to the bank data client, which in turn serves it back to the client in your personal computer, which displays the information for you.

The client/server model has become one of the central ideas of network computing. Most business applications being written today use the client/server model. So does the Internet's main program, TCP/IP. In marketing, the term has been used to distinguish distributed computing by smaller dispersed computers from the "monolithic" centralized computing of mainframe computers. But this distinction has largely disappeared as mainframes and their applications have also turned to the client/server model and become part of network computing.

In the usual client/server model, one server is activated and awaits client requests. Typically, multiple client programs share the services of a common server program. Both client programs and server programs are often part of a larger program or application. Relative to the Internet, your Web browser is a client program that requests services (the sending of Web pages or files) from a Web server (which technically is called a Hypertext Transport Protocol[1] or HTTP server) in another computer somewhere on the Internet. Similarly, your computer with TCP/IP installed allows you to make client requests for files from File Transfer Protocol (FTP)[2] servers in other computers on the Internet.

Other program relationship models included master/slave[3], with one program being in charge of all other programs, and peer-to-peer[4], with either of two programs able to initiate a transaction.

【CLI (Command Line Interface) 命令行界面】

A CLI (command line interface) is a user interface to a computer's operating system or an application in which the user responds to a visual prompt by typing in a command on a specified line, receives a response back from the system, and then enters another command, and so forth. The MS-DOS Prompt application in a Windows operating system is an example of the provision of a command line interface. Today, most users prefer the graphical user interface (GUI[5]) offered by Windows, Mac OS, BeOS, and others. Typically, most of today's Unix-based systems offer both a command line interface and a graphical user interface.

【compiler 编译程序】

A compiler is a special program that processes statements written in a particular programming language and turns them into machine language or "code" that a computer's processor uses. Typically, a programmer writes language statements in a language such as Pascal or C one line at a time using an editor. The file that is created contains what are called the source statements. The programmer then runs the appropriate language compiler, specifying the name of the file that contains the source statements.

When executing (running), the compiler first parses (or analyzes) all of the language statements syntactically one after the other and then, in one or more successive stages or "passes", builds the output code, making sure that statements that refer to other statements are referred to correctly in the final code.

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[1] HTTP (Hypertext Transport Protocol) **超文本传输协议**
[2] FTP (File Transfer Protocol) **文件传输协议**
[3] master/slave **主/从**
[4] peer-to-peer **对等**
[5] graphical user interface (GUI) **图形用户界面**

Traditionally, the output of the compilation has been called object code or sometimes an object module. (Note that the term “object” here is not related to object-oriented programming.) The object code is machine code that the processor can process or “execute” one instruction at a time.

More recently, the Java programming language, a language used in object-oriented programming, has introduced the possibility of compiling output (called bytecode) that can run on any computer system platform for which a Java virtual machine or bytecode interpreter is provided to convert the bytecode into instructions that can be executed by the actual hardware processor. Using this virtual machine, the bytecode can optionally be recompiled at the execution platform by a just-in-time compiler.

Traditionally in some operating systems, an additional step was required after compilation— that of resolving the relative location of instructions and data when more than one object module was to be run at the same time and they cross-refered to each other’s instruction sequences or data. This process was sometimes called linkage editing[1] and the output known as a load module.

A compiler works with what are sometimes called 3GL and higher-level languages . An assembler works on programs written using a processor’s assembler language[2].

【computer 计算机】

A computer is a device that accepts information (in the form of digital data) and manipulates it for some result based on a program or sequence of instructions on how data is to be processed. Complex computers also include the means for storing data (including the program, which is also a form of data) for some necessary duration. A program may be invariable and built into the computer (and called logic circuitry[3] as it is on microprocessors) or different programs may be provided to the computer (loaded into its storage and then started by an administrator or user). Today’s computers have both kinds of programming.

Most histories of the modern computer begin with the Analytical Engine envisioned by Charles Babbage following the mathematical ideas of George Boole, the mathematician who first stated the principles of logic inherent in today’s digital computer. Babbage’s assistant and collaborator, Ada Lovelace, is said to have introduced the ideas of program loops and subroutines and is sometimes considered the first programmer. Apart from mechanical calculators, the first really useable computers began with the vacuum tube[4], accelerated with the invention of the transistor[5], which then became embedded in large numbers in integrated circuits[6], ultimately making possible the relatively low-cost personal computer.

Modern computers inherently follow the ideas of the stored program laid out by John von Neumann in 1945. Essentially, the program is read by the computer one instruction at a time, an operation is performed, and the computer then reads in the next instruction, and so on. Recently, computers and programs have been devised that allow multiple programs (and computers) to work on the same problem at the same time in parallel. With the advent of the Internet and higher bandwidth data transmission, programs and data that are

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[1] linkage editing **连接编辑，链接编辑**

[2] assembler language **汇编语言**

[3] logic circuitry **逻辑电路**

[4] vacuum tube **真空管**

[5] transistor **晶体管**

[6] integrated circuit **集成电路**

part of the same overall project can be distributed over a network and embody the Sun Microsystems slogan: “The network is the computer.”

【courseware 课件】

Courseware, a term that combines the words course with software, is educational material intended as kits for teachers or trainers or as tutorials for students, usually packaged for use with a computer. Courseware can encompass any knowledge area, but information technology subjects are most common. Courseware is frequently used for delivering education about the personal computer and its most popular business applications, such as word processing and spreadsheet programs. Courseware is also widely used in information technology industry certification programs, such as the Microsoft Certified Systems Engineer (MCSE[1]) and the Computing Technology Industry Association’s A+ examination.

Courseware can include:

- Material for instructor-led classes.
- Material for self-directed computer-based training (CBT).
- Web sites that offer interactive tutorials.
- Material that is coordinated with distance learning, such as live classes conducted over the Internet.
- Videos for use individually or as part of classes.

The CD-ROM is the most common means of delivering courseware that is not offered online. For teachers and trainers, courseware content may include set-up information, a course plan, teaching notes, and exercises.

【CPU (Central Processing Unit) 中央处理器】

CPU (central processing unit) is an older term for processor and microprocessor, the central unit in a computer containing the logic circuitry that performs the instructions of a computer’s programs.

【cryptography 密码术】

Cryptography is the science of information security. The word is derived from the Greek kryptos, meaning hidden. Cryptography is closely related to the disciplines of cryptology and cryptanalysis[2]. Cryptography includes techniques such as microdots[3], merging words with images, and other ways to hide information in storage or transit. However, in today’s computer-centric world, cryptography is most often associated with scrambling plaintext[4] (ordinary text, sometimes referred to as cleartext) into ciphertext[5] (a process called encryption[6]), then back again (known as decryption[7]). Individuals who practice this field are known as cryptographers[8].

Modern cryptography concerns itself with the following four objectives:

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[1] Microsoft Certified Systems Engineer (MCSE) 微软系统工程师认证
[2] cryptology and cryptanalysis 密码学和密码分析
[3] microdot 微粒照片
[4] plaintext 纯文本
[5] ciphertext 密文
[6] encryption 加密
[7] decryption 解密
[8] cryptographer 译解密码者

（1）Confidentiality[1] (the information cannot be understood by anyone for whom it was unintended)

（2）Integrity[2] (the information cannot be altered in storage or transit between sender and intended receiver without the alteration being detected)

（3）Non-repudiation[3] (the creator/sender of the information cannot deny at a later stage his or her intentions in the creation or transmission of the information)

（4）Authentication[4] (the sender and receiver can confirm each other's identity and the origin/destination of the information)

Procedures and protocols that meet some or all of the above criteria are known as cryptosystems[5]. Cryptosystems are often thought to refer only to mathematical procedures and computer programs; however, they also include the regulation of human behavior, such as choosing hard-to-guess passwords, logging off unused systems, and not discussing sensitive procedures with outsiders.

【database 数据库】

A database is a collection of data that is organized so that its contents can easily be accessed, managed, and updated. The most prevalent type of database is the relational database[6], a tabular database in which data is defined so that it can be reorganized and accessed in a number of different ways. A distributed database[7] is one that can be dispersed or replicated among different points in a network. An object-oriented programming database is one that is congruent[8] with the data defined in object classes and subclasses.

Databases contain aggregations[9] of data records or files, such as sales transactions, product catalogs and inventories, and customer profiles. Typically, a database manager provides users the capabilities of controlling read/write access, specifying report generation, and analyzing usage. Databases and database managers are prevalent in large mainframe systems, but are also present in smaller distributed workstation and mid-range systems such as the AS/400 and on personal computers. Structured Query Language[10] is a standard language for making interactive queries[11] from and updating a database such as IBM's DB2, Microsoft's Access, and database products from Oracle, Sybase, and Computer Associates.

【data dictionary 数据字典】

A data dictionary is a collection of descriptions of the data objects or items in a data model for the benefit of programmers and others who need to refer to them. A first step in analyzing a system of objects with which users interact is to identify each object and its relationship to other objects. This process is called data modeling[12] and results in a picture of object relationships. After each data object or item is given a

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[1] confidentiality **机密性、秘密性**
[2] integrity **完整性**
[3] non-repudiation **不可抵赖**
[4] authentication **认证**
[5] cryptosystem **密码系统**
[6] relational database **关系数据库**
[7] distributed database **分布式数据库**
[8] congruent **适合的，一致的**
[9] aggregation **聚合，集合，聚集**
[10] structured query language **结构化查询语言**
[11] query **查询**
[12] data modeling **数据建模**

descriptive name, its relationship is described (or it becomes part of some structure that implicitly describes relationship), the type of data (such as text or image or binary value) is described, possible predefined values are listed, and a brief textual description is provided. This collection can be organized for reference into a book called a data dictionary.

When developing programs that use the data model, a data dictionary can be consulted to understand where a data item fits in the structure, what values it may contain, and basically what the data item means in real-world terms. For example, a bank or group of banks could model the data objects involved in consumer banking. They could then provide a data dictionary for a bank's programmers. The data dictionary would describe each of the data items in its data model for consumer banking (for example, "Account holder" and "Available credit").

【data structure 数据结构】

A data structure is a specialized format for organizing and storing data. General data structure types include the array, the file, the record, the table, the tree, and so on. Any data structure is designed to organize data to suit a specific purpose so that it can be accessed and worked with in appropriate ways. In computer programming, a data structure may be selected or designed to store data for the purpose of working on it with various algorithms.

【data warehouse 数据仓库】

A data warehouse is a central repository[1] for all or significant parts of the data that an enterprise's various business systems collect. The term was coined by W. H. Inmon. IBM sometimes uses the term "information warehouse."

Typically, a data warehouse is housed on an enterprise mainframe server. Data from various online transaction processing (OLTP[2]) applications and other sources is selectively extracted and organized on the data warehouse database for use by analytical applications and user queries. Data warehousing emphasizes the capture of data from diverse sources for useful analysis and access, but does not generally start from the point-of-view of the end user or knowledge worker who may need access to specialized, sometimes local databases. The latter idea is known as the data mart[3].

【DBMS (Database Management System) 数据库管理系统】

A database management system (DBMS[4]), sometimes just called a database manager, is a program that lets one or more computer users create and access data in a database. The DBMS manages user requests (and requests from other programs) so that users and other programs are free from having to understand where the data is physically located on storage media and, in a multi-user system, who else may also be accessing the data. In handling user requests, the DBMS ensures the integrity of the data (that is, making sure it continues to be accessible and is consistently organized as intended) and security (making sure only those with access privileges can access the data). The most typical DBMS is a relational database management system (RDBMS). A standard user and program interface is the Structured Query Language

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1 repository 储存库，知识库
2 online transaction processing (OLTP) 联机事务处理
3 data mart 数据集市
4 database management system (DBMS) 数据库管理系统

(SQL). A newer kind of DBMS is the object-oriented database management system (ODBMS).

A DBMS can be thought of as a file manager that manages data in databases rather than files in file systems. In IBM's mainframe operating systems, the nonrelational data managers were (and are, because these legacy application systems are still used) known as access methods.

A DBMS is usually an inherent part of a database product. On PCs, Microsoft Access is a popular example of a single- or small-group user DBMS. Microsoft's SQL Server is an example of a DBMS that serves database requests from multiple (client) users. Other popular DBMSs (these are all RDBMSs, by the way) are IBM's DB2, Oracle's line of database management products, and Sybase's products.

IBM's Information Management System (IMS) was one of the first DBMSs. A DBMS may be used by or combined with transaction managers, such as IBM's Customer Information Control System (CICS).

【debugging 调试】

In computers, debugging is the process of locating and fixing or bypassing bug (errors) in computer program code or the engineering of a hardware device. To debug a program or hardware device is to start with a problem, isolate the source of the problem, and then fix it. A user of a program that does not know how to fix the problem may learn enough about the problem to be able to avoid it until it is permanently fixed. When someone says they've debugged a program or "worked the bugs out" of a program, they imply that they fixed it so that the bugs no longer exist.

Debugging is a necessary process in almost any new software or hardware development process, whether a commercial product or an enterprise or personal application program. For complex products, debugging is done as the result of the unit test for the smallest unit of a system, again at component test when parts are brought together, again at system test when the product is used with other existing products, and again during customer beta test[1], when users try the product out in a real world situation. Because most computer programs and many programmed hardware devices contain thousands of lines of code, almost any new product is likely to contain a few bugs. Invariably, the bugs in the functions that get most use are found and fixed first. An early version of a program that has lots of bugs is referred to as "buggy[2]."

Debugging tools help identify coding errors at various development stages. Some programming language packages include a facility for checking the code for errors as it is being written.

【distance education 远程教育】

Distance education is a formalized teaching system specifically designed to be carried out remotely. The students and the teacher are in different locations and lectures are transmitted through some type of technology such as closed-circuit[3] or public television or an interactive Web site.

Distance education methods include:

- Voice-centered techniques, such as recordings, audioconferencing, and short-wave radio.
- Video techniques, such as video cassettes, videoconferencing, or Web cameras.
- Computer-centered techniques, such as computer-assisted instruction (CAI[4]), which uses the

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1 beta test **β测试**
2 buggy **错误成堆的**
3 closed-circuit television **闭路电视**
4 computer-assisted instruction (CAI) **计算机辅助教学**

computer as a teaching machine to present individual lessons, computer-mediated education (CME), which uses computer applications (e-mail, fax, or online chatting, for example) for delivery of instruction.

- Print, such as books and hand-outs.

Because distance education is less expensive to support and is not constrained by geographic considerations, it offers opportunities in situations where traditional education has difficulty operating. Students with scheduling or distance problems can benefit, as can workers, because distance education can be more flexible in terms of time and can be delivered virtually anywhere. Studies indicate that distance learning can be as effective as the traditional format when the methods are appropriate to the teaching tasks, there is student-teacher interaction, and the teachers provide students with appropriate and timely feedback.

【distributed computing 分布式计算】

In general, distributed computing is any computing that involves multiple computers remote from each other that each have a role in a computation problem or information processing.

（1）In business enterprises, distributed computing generally has meant putting various steps in business processes at the most efficient places in a network of computers. In the typical transaction using the 3-tier model, user interface processing is done in the PC at the user’s location, business processing is done in a remote computer, and database access and processing is done in another computer that provides centralized access for many business processes. Typically, this kind of distributed computing uses the client/server communications model.

The Distributed Computing Environment (DCE[1]) is a widely-used industry standard that supports this kind of distributed computing. On the Internet, third-party service providers now offer some generalized services that fit into this model.

（2）More recently, distributed computing is used to refer to any large collaboration in which many individual personal computer owners allow some of their computer’s processing time to be put at the service of a large problem. The best-known example is the SETI@home project in which individual computer owners can volunteer some of their multitasking processing cycles (while concurrently still using their computer) to the Search for Extraterrestrial Intelligence (SETI) project. This computing-intensive problem uses your computer (and thousands of others) to download and search radio telescope data.

One of the first uses of distributed computing was the breaking of a cryptographic code by a group that is now known as distributed.net.

【E-commerce 电子商务】

E-commerce (electronic commerce or EC) is the buying and selling of goods and services on the Internet, especially the World Wide Web. In practice, this term and a newer term, E-business, are often used interchangeably. For online retail selling, the term E-tailing is sometimes used.

E-commerce can be divided into:

- E-tailing or “virtual storefronts” on Web sites with online catalogs, sometimes gathered into a “virtual mall”.

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[1] Distributed Computing Environment (DCE) **分布式计算机环境**

- The gathering and use of demographic data through Web contacts.
- Electronic Data Interchange (EDI[1]), the business-to-business exchange of data.
- E-mail and fax and their use as media for reaching prospects and established customers (for example, with newsletters).
- Business-to-business buying and selling.
- The security of business transactions.
- E-tailing or The Virtual Storefront and the Virtual Mall.

As a place for direct retail shopping, with its 24-hour availability, a global reach, the ability to interact and provide custom information and ordering, and multimedia prospects, the Web is rapidly becoming a multibillion dollar source of revenue for the world's businesses. A number of businesses already report considerable success. As early as the middle of 1997, Dell Computers reported orders of a million dollars a day. By early 1999, projected E-commerce revenues for business were in the billions of dollars and the stocks of companies deemed most adept at E-commerce were skyrocketing. Although many so-called dotcom retailers disappeared in the economic shakeout of 2000, Web retailing at sites such as Amazon.com, CDNow.com, and CompudataOnline.com continues to grow.

Market Research

In early 1999, it was widely recognized that because of the interactive nature of the Internet, companies could gather data about prospects and customers in unprecedented amounts -through site registration, questionnaires, and as part of taking orders. The issue of whether data was being collected with the knowledge and permission of market subjects had been raised (Microsoft referred to its policy of data collection as "profiling" and a proposed standard has been developed that allows Internet users to decide who can have what personal information).

Electronic Data Interchange (EDI)

EDI is the exchange of business data using an understood data format. It predates today's Internet. EDI involves data exchange among parties that know each other well and make arrangements for one-to-one (or point-to-point) connection, usually dial-up. EDI is expected to be replaced by one or more standard XML formats, such as ebXML.

E-mail, Fax, and Internet Telephony

E-commerce is also conducted through the more limited electronic forms of communication called E-mail, facsimile or fax, and the emerging use of telephone calls over the Internet. Most of this is business-to-business, with some companies attempting to use E-mail and fax for unsolicited ads (usually viewed as online junk mail or spam[2]) to consumers and other business prospects. An increasing number of business Web sites offer E-mail newsletters for subscribers. A new trend is opt-in E-mail in which Web users voluntarily sign up to receive E-mail, usually sponsored or containing ads, about product categories or other subjects they are interested in.

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[1] Electronic Data Interchange (EDI) **电子数据交换**
[2] junk mail **垃圾邮件；**spam **垃圾信息，与垃圾邮件同义**

Business-to-Business Buying and Selling

Thousands of companies that sell products to other companies have discovered that the Web provides not only a 24-hour-a-day showcase for their products but a quick way to reach the right people in a company for more information.

The Security of Business Transactions

Security includes authenticating business transactors, controlling access to resources such as Web pages for registered or selected users, encrypting communications, and, in general, ensuring the privacy and effectiveness of transactions. Among the most widely-used security technologies is the Secure Sockets Layer (SSL[1]), which is built into both of the leading Web browsers.

【E-mail 电子邮件】

E-mail (electronic mail) is the exchange of computer-stored messages by telecommunication. (Some publications spell it E-mail; we prefer the currently more established spelling of E-mail.) E-mail messages are usually encoded in ASCII text. However, you can also send non-text files, such as graphic images and sound files, as attachments[2] sent in binary streams. E-mail was one of the first uses of the Internet and is still the most popular use. A large percentage of the total traffic over the Internet is E-mail. E-mail can also be exchanged between online service provider users and in networks other than the Internet, both public and private.

E-mail can be distributed to lists of people as well as to individuals. A shared distribution list can be managed by using an E-mail reflector. Some mailing lists allow you to subscribe by sending a request to the mailing list administrator. A mailing list that is administered automatically is called a list server.

E-mail is one of the protocols included with the Transport Control Protocol/Internet Protocol (TCP/IP) suite of protocols. A popular protocol for sending E-mail is Simple Mail Transfer Protocol[3] and a popular protocol for receiving it is POP3[4]. Both Netscape and Microsoft include an E-mail utility with their Web browsers.

【embedded system 嵌入式系统】

An embedded system is some combination of computer hardware and software, either fixed in capability or programmable, that is specifically designed for a particular kind of application device. Industrial machines, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines[5], and toys (as well as the more obvious cellular phone[6] and PDA[7]) are among the myriad possible hosts of an embedded system. Embedded systems that are programmable are provided with a programming interface, and embedded systems programming is a specialized occupation.

Certain operating systems or language platforms are tailored for the embedded market, such as EmbeddedJava and Windows XP Embedded. However, some low-end consumer products use very

1 Secure Sockets Layer (SSL) **安全套接层**
2 attachment **附件**
3 Simple Mail Transfer Protocol (SMTP) **简单邮件传输协议**
4 POP3 (Post Office Protocol) **邮局协议** 3
5 vending machine **自动贩卖机**
6 cellular phone **便携式电话**
7 PDA (Personal Digital Assistant) **个人数字助理**

inexpensive microprocessors and limited storage, with the application and operating system both part of a single program. The program is written permanently into the system's memory in this case, rather than being loaded into RAM (random access memory), as programs on a personal computer are.

【encryption 加密】

Encryption is the conversion of data into a form, called a ciphertext[1], that cannot be easily understood by unauthorized people. Decryption[2] is the process of converting encrypted data back into its original form, so it can be understood.

The use of encryption/decryption is as old as the art of communication. In wartime, a cipher[3], often incorrectly called a "code," can be employed to keep the enemy from obtaining the contents of transmissions (Technically, a code is a means of representing a signal without the intent of keeping it secret; examples are Morse code[4] and ASCII). Simple ciphers include the substitution of letters for numbers, the rotation of letters in the alphabet, and the "scrambling" of voice signals by inverting the sideband frequencies. More complex ciphers work according to sophisticated computer algorithms that rearrange the data bits in digital signals.

In order to easily recover the contents of an encrypted signal, the correct decryption key is required. The key is an algorithm that "undoes" the work of the encryption algorithm. Alternatively, a computer can be used in an attempt to "break" the cipher. The more complex the encryption algorithm, the more difficult it becomes to eavesdrop on the communications without access to the key.

Encryption/decryption is especially important in wireless communications. This is because wireless circuits are easier to "tap" than their hard-wired counterparts. Nevertheless, encryption/decryption is a good idea when carrying out any kind of sensitive transaction, such as a credit-card purchase online, or the discussion of a company secret between different departments in the organization. The stronger the cipher — that is, the harder it is for unauthorized people to break it—the better, in general. However, as the strength of encryption/decryption increases, so does the cost.

In recent years, a controversy has arisen over so-called strong encryption. This refers to ciphers that are essentially unbreakable without the decryption keys. While most companies and their customers view it as a means of keeping secrets and minimizing fraud, some governments view strong encryption as a potential vehicle by which terrorists might evade authorities. These governments, including that of the United States, want to set up a key-escrow arrangement. This means everyone who uses a cipher would be required to provide the government with a copy of the key. Decryption keys would be stored in a supposedly secure place, used only by authorities, and used only if backed up by a court order. Opponents of this scheme argue that criminals could hack into the key-escrow database and illegally obtain, steal, or alter the keys. Supporters claim that while this is a possibility, implementing the key escrow scheme would be better than doing nothing to prevent criminals from freely using encryption/decryption.

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[1] ciphertext **密文**
[2] decryption **解密**
[3] cipher **密码**
[4] Morse code **莫尔斯码**

【DVD (Digital Versatile Disc) 数字通用光盘】

DVD (digital versatile disc) is an optical disc technology that is expected to rapidly replace the CD-ROM disc (as well as the audio compact disc) over the next few years. The digital versatile disc (DVD) holds 4.7 gigabyte of information on one of its two sides, or enough for a 133-minute movie. With two layers on each of its two sides, it will hold up to 17 gigabytes of video, audio, or other information. (Compare this to the current CD-ROM disc of the same physical size, holding 600 megabyte. The DVD can hold more than 28 times as much information!)

DVD-Video is the usual name for the DVD format designed for full-length movies and is a box that will work with your television set. DVD-ROM is the name of the player that will (sooner or later) replace your computer's CD-ROM. It will play regular CD-ROM discs as well as DVD-ROM discs. DVD-RAM is the writable version. DVD-Audio is a player designed to replace your compact disc player.

DVD uses the MPEG-2 file and compression standard. MPEG-2 images have four times the resolution of MPEG-1 images and can be delivered at 60 interlaced fields[1] per second where two fields constitute one image frame. (MPEG-1 can deliver 30 noninterlaced frames per second.) Audio quality on DVD is comparable to that of current audio compact discs.

【firmware 固件】

Firmware is programming that is inserted into programmable read-only memory (programmable ROM), thus becoming a permanent part of a computing device. Firmware is created and tested like software (using microcode[2] simulation). When ready, it can be distributed like other software and, using a special user interface, installed in the programmable read-only memory by the user. Firmware is sometimes distributed for printers, modems, and other computer devices.

【flash memory 闪存】

Flash memory (sometimes called "flash RAM") is a type of constantly-powered nonvolatile memory[3] that can be erased and reprogrammed in units of memory called blocks. It is a variation of electrically erasable programmable read-only memory (EEPROM[4]) which, unlike flash memory, is erased and rewritten at the byte level, which is slower than flash memory updating. Flash memory is often used to hold control code such as the basic input/output system (BIOS[5]) in a personal computer. When BIOS needs to be changed (rewritten), the flash memory can be written to in block (rather than byte) sizes, making it easy to update. On the other hand, flash memory is not useful as random access memory (RAM) because RAM needs to be addressable at the byte (not the block) level.

Flash memory is used in digital cellular phones, digital cameras, LAN switches, PC Cards for notebook computers, digital set-up boxes, embedded controllers, and other devices.

【FTP (File Transfer Protocol) 文件传输协议】

File Transfer Protocol (FTP), a standard Internet protocol, is the simplest way to exchange files

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[1] interlaced field **隔行扫描场**
[2] microcode **微码**
[3] nonvolatile memory **非易失性存储器**
[4] electrically erasable programmable read-only memory (EEPROM) **电可擦除只读存储器**
[5] basic input/output system (BIOS) **基本输入输出系统**

between computers on the Internet. Like the Hypertext Transfer Protocol (HTTP[1]), which transfers displayable Web pages and related files, and the Simple Mail Transfer Protocol (SMTP[2]), which transfers E-mail, FTP is an application protocol that uses the Internet's TCP/IP protocols. FTP is commonly used to transfer Web page files from their creator to the computer that acts as their server for everyone on the Internet. It's also commonly used to download programs and other files to your computer from other servers.

As a user, you can use FTP with a simple command line interface[3] (for example, from the Windows MS-DOS Prompt window) or with a commercial program that offers a graphical user interface[4]. Your Web browser can also make FTP requests to download programs you select from a Web page. Using FTP, you can also update (delete, rename, move, and copy) files at a server. You need to logon to an FTP server. However, publicly available files are easily accessed using anonymous FTP.

Basic FTP support is usually provided as part of a suite of programs that come with TCP/IP. However, any FTP client program with a graphical user interface usually must be downloaded from the company that makes it.

【gateway 网关】

A gateway is a network point that acts as an entrance to another network. On the Internet, a node or stopping point can be either a gateway node or a host (end-point) node. Both the computers of Internet users and the computers that serve pages to users are host nodes. The computers that control traffic within your company's network or at your local Internet service provider (ISP[5]) are gateway nodes.

In the network for an enterprise, a computer server acting as a gateway node is often also acting as a proxy server[6] and a firewall server. A gateway is often associated with both a router[7], which knows where to direct a given packet of data that arrives at the gateway, and a switch, which furnishes the actual path in and out of the gateway for a given packet.

【GIS (geographic information system) 地理信息系统】

A GIS (geographic information system) enables you to envision the geographic aspects of a body of data. Basically, it lets you query or analyze a database and receive the results in the form of some kind of map. Since many kinds of data have important geographic aspects, a GIS can have many uses: weather forecasting, sales analysis, population forecasting, and land use planning, to name a few.

In a GIS, geographic information is described explicitly in terms of geographic coordinates (latitude and longitude or some national grid coordinates[8]) or implicitly in terms of a street address, postal code, or forest stand identifier. A geographic information system contains the ability to translate implicit geographic data (such as a street address) into an explicit map location. GIS developers sometimes obtain the map data from public sources or companies that specialize in collecting and organizing geographic information. The

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1 Hypertext Transfer Protocol (HTTP) **超文本传输协议**
2 Simple Mail Transfer Protocol (SMTP) **简单邮件传输协议**
3 command line interface **命令行界面**
4 graphical user interface **图形用户界面**
5 Internet service provider (ISP) **互联网服务供应商**
6 proxy server **代理服务器**
7 router **路由器**
8 grid coordinate **方格坐标**

process of converting implicit geographic data into explicit or map-form images is called geocoding[1].

Geographic data can be stored in a vector graphics or a raster graphics[2] format. Using a vector format, two-dimensional data is stored in terms of x and y coordinates. A road or a river can be described as a series of x,y coordinate points. Nonlinear features such as town boundaries can be stored as a closed loop of coordinates. The vector model is good for describing well-delineated features. A raster data format expresses data as a continously-changing set of grid cells. The raster model is better for portraying subtle changes such as soil type patterns over an area. Most geographic information systems make use of both kinds of data.

GISs do these kinds of things:

- They accept geographic input in the form of scanned-in and digitized map images. Often this data is supplied by a source that may own maps and has already digitized them.
- They rescale or otherwise manipulate geographic data for different purposes.
- They include a database manager, usually a relational database management system (RDBMS).
- They include query and analysis programs so that you can retrieve answers to simple questions such as the distance between two points on a map or more complicated questions that require analysis, such as determining the traffic pattern at a given intersection.
- They provide answers visually, usually as maps or graphs.

【GUI (Graphical User Interface) 图形用户界面】

A GUI (usually pronounced GOO-ee) is a graphical (rather than purely textual) user interface to a computer. The term came into existence because the first interactive user interfaces to computers were not graphical; they were text-and-keyboard oriented and usually consisted of commands you had to remember and computer responses that were infamously brief. The command interface of the DOS operating system (which you can still get to from your Windows operating system) is an example of the typical user-computer interface before GUIs arrived. An intermediate step in user interfaces between the command line interface and the GUI was the non-graphical menu-based interface, which let you interact by using a mouse rather than by having to type in keyboard commands.

Today's major operating systems provide a graphical user interface. Applications typically use the elements of the GUI that come with the operating system and add their own graphical user interface elements and ideas. A GUI sometimes uses one or more metaphors for objects familiar in real life, such as the desktop, the view through a window, or the physical layout in a building. Elements of a GUI include such things as: windows, pull-down menus[3], buttons, scroll bars[4], iconic images, wizards, the mouse, and no doubt many things that haven't been invented yet. With the increasing use of multimedia as part of the GUI, sound, voice, motion video, and virtual reality interfaces seem likely to become part of the GUI for many applications. A system's graphical user interface along with its input devices is sometimes referred to as its "look-and-feel".

The GUI familiar to most of us today in either the Mac or the Windows operating systems and their

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[1] geocoding **地理编码**

[2] vector graphics **矢量图；**raster graphics **光栅图**

[3] pull-down menu **下拉菜单**

[4] scroll bar **滚动条**

applications originated at the Xerox Palo Alto Research Laboratory in the late 1970s. Apple used it in their first Macintosh computers. Later, Microsoft used many of the same ideas in their first version of the Windows operating system for IBM-compatible PCs.

When creating an application, many object-oriented tools exist that facilitate writing a graphical user interface. Each GUI element is defined as a class widget from which you can create object instances for your application. You can code or modify prepackaged methods that an object will use to respond to user stimuli.

【groupware 组件】

Groupware refers to programs that help people work together collectively while located remotely from each other. Groupware services can include the sharing of calendars, collective writing, E-mail handling, shared database access, electronic meetings with each person able to see and display information to others, and other activities.

Some product examples of groupware include Lotus Notes and Microsoft Exchange, both of which facilititate calendar sharing, E-mail handling, and the replication of files across a distributed system so that all users can view the same information. Electronic "face-to-face" meetings are facilitated by CU-SeeMe and Microsoft NetMeeting.

【hacker 黑客】

Hacker is a term used by some to mean "a clever programmer" and by others, especially journalists or their editors, to mean "someone who tries to break into computer systems."

（1）Eric Raymond, compiler of The New Hacker's Dictionary, defines a hacker as a clever programmer. A "good hack" is a clever solution to a programming problem and "hacking" is the act of doing it. Raymond lists five possible characteristics that qualify one as a hacker, which we paraphrase here:

- A person who enjoys learning details of a programming language or system.
- A person who enjoys actually doing the programming rather than just theorizing about it.
- A person capable of appreciating someone else's hacking.
- A person who picks up programming quickly.
- A person who is an expert at a particular programming language or system, as in "Unix hacker".

Raymond deprecates the use of this term for someone who attempts to crack someone else's system or otherwise uses programming or expert knowledge to act maliciously. He prefers the term cracker for this meaning.

（2）Journalists or their editors almost universally use hacker to mean someone who attempts to break into computer systems. Typically, this kind of hacker would be a proficient programmer or engineer with sufficient technical knowledge to understand the weak points in a security system.

【handheld 手持式计算机】

A handheld computer is a computer that can conveniently be stored in a pocket (of sufficient size) and used while you're holding it. Today's handheld computers, which are also called personal digital assistants (PDAs[1]), can be divided into those that accept handwriting as input and those with small keyboards. The original handheld that accepted handwriting was Apple's Newton, which was later withdrawn from the

[1] personal digital assistants (PDAs) **个人数字助理**

market. Today, the most popular handheld that accepts handwritten input is the PalmPilot from 3Com. Philips, Casio, NEC, Compaq, and other companies make handhelds with small keyboards.

Windows CE and EPOC are two of the most widely used operating systems in handheld computers.

Handheld computers are typically used for personal information manager (PIM[1]) types of applications: maintaining schedules, keeping names and phone numbers, doing simple calculations, taking notes, and, with a modem, exchanging E-mail and getting information from the Web. Keyboards have tiny keys that take getting used to. Those that handle handwriting also impose constraints and require some learning. Nevertheless, this class of computer is widely sold and appreciated by many users.

【hard disk 硬盘】

A hard disk is part of a unit, often called a “disk drive”, “hard drive”, or “hard disk drive”, that stores and provides relatively quick access to large amounts of data on an electromagnetically charged surface or set of surfaces. Today’s computers typically come with a hard disk that contains several billion bytes (gigabytes) of storage.

A hard disk is really a set of stacked “disks,” each of which, like phonograph records[2], has data recorded electromagnetically in concentric circles or “tracks” on the disk. A “head” records (writes) or reads the information on the tracks. Two heads, one on each side of a disk, read or write the data as the disk spins. Each read or write operation requires that data be located, which is an operation called a “seek.” (Data already in a disk cache, however, will be located more quickly.)

A hard disk/drive unit comes with a set rotation speed varying from 4500 to 7200 rpm. Disk access time is measured in milliseconds. Although the physical location can be identified with cylinder, track, and sector[3] locations, these are actually mapped to a logical block address (LBA) that works with the larger address range on today’s hard disks.

【hardware 硬件】

Hardware is the physical aspect of computers, telecommunications, and other information technology devices. The term arose as a way to distinguish the “box” and the electronic circuitry and components of a computer from the program you put in it to make it do things. The program came to be known as the software.

Hardware implies permanence and invariability. Software or programming can easily be varied. You can put an entirely new program in the hardware and make it create an entirely new experience for the user. You can, however, change the modular configurations that most computers come with by adding new adapters or card that extend the computer’s capabilities.

Like software, hardware is a collective term. Hardware includes not only the computer proper but also the cables, connectors, power supply units, and peripheral devices[4] such as the keyboard, mouse, audio speakers, and printers.

Hardware is sometimes used as a term collectively describing the physical aspects of telephony and

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[1] personal information manager (PIM) **个人信息管理程序**

[2] phonograph record **唱片**

[3] cylinder **柱面；**track **磁道；**sector **扇区**

[4] cables **电缆；**connector **连接器；**power supply unit **供电设备；**peripheral device **外部设备**

telecommunications network infrastructure.

【HTML (Hypertext Markup Language) 超文本标记语言】

HTML (Hypertext Markup Language) is the set of markup symbols or codes inserted in a file intended for display on a World Wide Web browser page. The markup tells the Web browser how to display a Web page's words and images for the user. Each individual markup code is referred to as an element (but many people also refer to it as a tag). Some elements come in pairs that indicate when some display effect is to begin and when it is to end.

HTML is a formal Recommendation by the World Wide Web Consortium (W3C) and is generally adhered to by the major browsers, Microsoft's Internet Explorer and Netscape's Navigator, which also provide some additional non-standard codes. The current version of HTML is HTML 4.0. However, both Internet Explorer and Netscape implement some features differently and provide non-standard extensions. Web developers using the more advanced features of HTML 4 may have to design pages for both browsers and send out the appropriate version to a user. Significant features in HTML 4 are sometimes described in general as dynamic HTML. What is sometimes referred to as HTML 5 is an extensible form of HTML called Extensible Hypertext Markup Language (XHTML).

【hub 集线器】

In general, a hub[1] is the central part of a wheel where the spokes come together. The term is familiar to frequent fliers who travel through airport "hubs[2]" to make connecting flights from one point to another. In data communications, a hub[3] is a place of convergence where data arrives from one or more directions and is forwarded out in one or more other directions. A hub usually includes a switch of some kind. (And a product that is called a "switch" could usually be considered a hub as well.) The distinction seems to be that the hub is the place where data comes together and the switch is what determines how and where data is forwarded from the place where data comes together. Regarded in its switching aspects, a hub can also include a router[4].

(1) In describing network topologies, a hub topology consists of a backbone (main circuit) to which a number of outgoing lines can be attached ("dropped"), each providing one or more connection port for device to attach to. For Internet users not connected to a local area network[5], this is the general topology used by your access provider. Other common network topologies are the bus network and the ring network[6] (Either of these could possibly feed into a hub network, using a bridge[7]).

(2) As a network product, a hub may include a group of modem cards for dial-in users, a gateway[8] card for connections to a local area network (for example, an Ethernet[9] or a token ring[10]), and a connection

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[1] hub 这里的意思是"毂"
[2] hub 这里的意思是"中心，枢纽"
[3] hub 这里的意思是"集线器"
[4] router 路由器
[5] local area network 局域网
[6] bus network 总线网络；ring network 环形网络
[7] bridge 网桥
[8] gateway 网关
[9] Ethernet 以太网
[10] token ring 令牌环

to a line (the main line in this example).

【hypermedia 超媒体】

Hypermedia, a term derived from hypertext[1], extends the notion of the hypertext link to include links among any set of multimedia objects, including sound, motion video, and virtual reality. It can also connote a higher level of user/network interactivity than the interactivity already implicit in hypertext.

【input/output 输入/输出】

I/O (input/output), pronounced "eye-oh", describes any operation, program, or device that transfers data to or from a computer. Typical I/O devices are printers, hard disks, keyboards, and mouses. In fact, some devices are basically input-only devices (keyboards and mouses); others are primarily output-only devices (printers); and others provide both input and output of data (hard disks, diskettes, writable CD-ROMs).

【Internet 互联网】

The Internet, sometimes called simply "the Net," is a worldwide system of computer networks—a network of networks in which users at any one computer can, if they have permission, get information from any other computer (and sometimes talk directly to users at other computers). It was conceived by the Advanced Research Projects Agency (ARPA)[2] of the U.S. government in 1969 and was first known as the ARPANET. The original aim was to create a network that would allow users of a research computer at one university to be able to "talk to" research computers at other universities. A side benefit of ARPANet's design was that, because messages could be routed or rerouted in more than one direction, the network could continue to function even if parts of it were destroyed in the event of a military attack or other disaster.

Today, the Internet is a public, cooperative, and self-sustaining facility accessible to hundreds of millions of people worldwide. Physically, the Internet uses a portion of the total resources of the currently existing public telecommunication networks. Technically, what distinguishes the Internet is its use of a set of protocols called TCP/IP[3] (for Transmission Control Protocol/Internet Protocol). Two recent adaptations of Internet technology, the intranet and the extranet,[4] also make use of the TCP/IP protocol.

For many Internet users, electronic mail (E-mail) has practically replaced the Postal Service for short written transactions. Electronic mail is the most widely used application on the Net. You can also carry on live "conversations" with other computer users, using Internet Relay Chat (IRC[5]). More recently, Internet telephony hardware and software allows real-time voice conversations.

The most widely used part of the Internet is the World Wide Web[6] (often abbreviated "WWW" or called "the Web"). Its outstanding feature is hypertext[7], a method of instant cross-referencing. In most Web sites, certain words or phrases appear in text of a different color than the rest; often this text is also underlined. When you select one of these words or phrases, you will be transferred to the site or page that is

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1 hypertext **超文本**
2 Advanced Research Projects Agency (ARPA) **高级研究计划署**
3 TCP/IP (Transmission Control Protocol/Internet Protocol) **传输控制协议/网际协议**
4 intranet **内联网**；extranet **外联网**
5 Internet Relay Chat (IRC) **互联网中继聊天，在线聊天系统**
6 World Wide Web **万维网**
7 hypertext **超文本**

relevant to this word or phrase. Sometimes there are buttons, images, or portions of images that are "clickable." If you move the pointer over a spot on a Web site and the pointer changes into a hand, this indicates that you can click and be transferred to another site.

Using the Web, you have access to millions of pages of information. Web browsing is done with a Web browser, the most popular of which are Microsoft Internet Explorer and Netscape Navigator. The appearance of a particular Web site may vary slightly depending on the browser you use. Also, later versions of a particular browser are able to render more "bells and whistles" such as animation, virtual reality, sound, and music files, than earlier versions.

【internetworking 网络互连】

Internetworking is a term used by Cisco, BBN, and other providers of network products and services as a comprehensive term for all the concepts, technologies, and generic devices that allow people and their computers to communicate across different kinds of networks. For example, someone at a computer on a token ring local area network may want to communicate with someone at a computer on an Ethernet local area network in another country using a Wide Area Network[1] interconnection. The common internetwork protocols, routing tables[2], and related network devices required to achieve this communication constitute internetworking.

The standard reference model for internetworking is Open Systems Interconnection (OSI[3]), which could also be used as a model for intranetworking as well. OSI enables any technology to be related to another technology because each can be related to the standard communication model. OSI provides a layering approach to the problem of exchanging data across a network or a network of networks so that the problem can be broken down into easier-to-understand components and so that boundaries between components can be more easily determined.

【intranet 内联网】

An intranet is a private network that is contained within an enterprise. It may consist of many interlinked local area networks and also use leased lines in the Wide Area Network. Typically, an intranet includes connections through one or more gateway computers to the outside Internet. The main purpose of an intranet is to share company information and computing resources among employees. An intranet can also be used to facilitate working in groups and for teleconferences[4].

An intranet uses TCP/IP, HTTP, and other Internet protocols and in general looks like a private version of the Internet. With tunneling[5], companies can send private messages through the public network, using the public network with special encryption/decryption and other security safeguards to connect one part of their intranet to another.

Typically, larger enterprises allow users within their intranet to access the public Internet through firewall servers that have the ability to screen messages in both directions so that company security is

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1 Wide Area Network **广域网**
2 routing table **路由选择表**
3 Open Systems Interconnection (OSI) **开放系统互连**
4 teleconference **远程会议**
5 tunneling **隧道技术**

maintained. When part of an intranet is made accessible to customers, partners, suppliers, or others outside the company, that part becomes part of an extranet[1].

【IP address　IP 地址】

This definition is based on Internet Protocol[2] Version 4. Note that the system of IP address classes described here, while forming the basis for IP address assignment, is generally bypassed today by use of Classless Inter-Domain Routing (CIDR)[3] addressing.

In the most widely installed level of the Internet Protocol (IP) today, an IP address is a 32-bit number that identifies each sender or receiver of information that is sent in packets across the Internet. When you request an HTML page or send E-mail, the Internet Protocol part of TCP/IP includes your IP address in the message (actually, in each of the packets if more than one is required) and sends it to the IP address that is obtained by looking up the domain name in the Uniform Resource Locator[4] you requested or in the E-mail address you're sending a note to. At the other end, the recipient can see the IP address of the Web page requestor or the E-mail sender and can respond by sending another message using the IP address it received.

An IP address has two parts: the identifier[5] of a particular network on the Internet and an identifier of the particular device (which can be a server or a workstation) within that network. On the Internet itself—that is, between the router that move packets from one point to another along the route—only the network part of the address is looked at.

The Network Part of the IP Address

The Internet is really the interconnection of many individual networks (it's sometimes referred to as an internetwork). So the Internet Protocol (IP) is basically the set of rules for one network communicating with any other (or occasionally, for broadcast messages, all other networks). Each network must know its own address on the Internet and that of any other networks with which it communicates. To be part of the Internet, an organization needs an Internet network number, which it can request from the Network Information Center (NIC[6]). This unique network number is included in any packet sent out of the network onto the Internet.

The Local or Host Part of the IP Address

In addition to the network address or number, information is needed about which specific machine or host in a network is sending or receiving a message. So the IP address needs both the unique network number and a host number (which is unique within the network). (The host number is sometimes called a local or machine address.)

Part of the local address can identify a subnetwork or subnet address, which makes it easier for a network that is divided into several physical subnetworks (for examples, several different local area networks or) to handle many devices.

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[1] extranet **外联网**
[2] Internet Protocol **网际协议**
[3] Classless Inter-Domain Routing (CIDR) **无级域间寻径**
[4] Uniform Resource Locator (URL) **统一资源定位器**
[5] identifier **标识符**
[6] Network Information Center (NIC) **网络信息中心**

IP Address Classes and Their Formats

Since networks vary in size, there are four different address formats or classes to consider when applying to NIC[1] for a network number:

Class A addresses are for large networks with many devices.

Class B addresses are for medium-sized networks.

Class C addresses are for small networks (fewer than 256 devices).

Class D addresses are multicast addresses[2].

The first few bits of each IP address indicate which of the address class formats it is using. The address structures look like this:

Class A 0 Network (7 bits) Local address (24 bits).

Class B 10 Network (14 bits) Local address (16 bits).

Class C 110 Network (21 bits) Local address (8 bits).

Class D 1110 Multicast address (28 bits).

The IP address is usually expressed as four decimal numbers, each representing eight bits, separated by periods. This is sometimes known as the dot address[3] and, more technically, as dotted quad[4] notation. The number version of the IP address can (and usually is) represented by a name or series of names called the domain name[5].

The Internet's explosive growth makes it likely that, without some new architecture, the number of possible network addresses using the scheme above would soon be used up (at least, for Class C network addresses). However, a new IP version, IPv6, expands the size of the IP address to 128 bits, which will accommodate a large growth in the number of network addresses. For hosts still using IPv4, the use of subnets[6] in the host or local part of the IP address will help reduce new applications for network numbers. In addition, most sites on today's mostly IPv4 Internet have gotten around the Class C network address limitation by using the Classless Inter-Domain Routing (CIDR) scheme for address notation.

Relationship of the IP Address to the Physical Address

The machine or physical address used within an organization's local area networks may be different than the Internet's IP address. The most typical example is the 48-bit Ethernet address. TCP/IP includes a facility called the Address Resolution Protocol (ARP[7]) that lets the administrator create a table that maps IP addresses to physical addresses. The table is known as the ARP cache[8].

Static versus Dynamic IP Addresses

The discussion above assumes that IP addresses are assigned on a static basis. In fact, many IP

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[1] NIC (Network Interface Card) **网络接口卡**
[2] multicast address **广播地址**
[3] dot address **点地址**
[4] dotted quad **点分四元组**
[5] domain name **域名**
[6] subnet **子网**
[7] Address Resolution Protocol (ARP) **地址解析协议**
[8] ARP cache **地址解析协议缓存**

addresses are assigned dynamically from a pool[1]. Many corporate networks and online services economize on the number of IP addresses they use by sharing a pool of IP addresses among a large number of users. If you're an America Online user, for example, your IP address will vary from one logon session to the next because AOL is assigning it to you from a pool that is much smaller than AOL's base of subscribers.

【ISDN (Integrated Services Digital Network) 综合业务数字网】

ISDN (Integrated Services Digital Network) is a set of CCITT[2]/ITU[3] standards for digital transmission over ordinary telephone copper wire as well as over other media. Home and business users who install an ISDN adapter[4] (in place of a modem) can see highly-graphic Web pages arriving very quickly (up to 128 Kbps). ISDN requires adapters at both ends of the transmission so your access provider also needs an ISDN adapter.

There are two levels of service: the Basic Rate Interface (BRI[5]), intended for the home and small enterprise, and the Primary Rate Interface (PRI[6]), for larger users. Both rates include a number of B-channels and a D-channels. Each B-channel carries data, voice, and other services. Each D-channel carries control and signaling information.

The Basic Rate Interface consists of two 64 Kbps B-channels and one 16 Kbps D-channel. Thus, a Basic Rate user can have up to 128 Kbps service. The Primary Rate consists of 23 B-channels and one 64 Kpbs D-channel in the United States or 30 B-channels and 1 D-channel in Europe.

Integrated Services Digital Network in concept is the integration of both analog or voice data together with digital data over the same network. Although the ISDN you can install is integrating these on a medium designed for analog transmission, broadband ISDN (BISDN[7]) will extend the integration of both services throughout the rest of the end-to-end path using fiber optic[8] and radio media. Broadband ISDN will encompass frame relay[9] service for high-speed data that can be sent in large bursts, the Fiber Distributed-Data Interface (FDDI)[10], and the Synchronous Optical Network (SONET[11]). BISDN will support transmission from 2 Mbps up to much higher, but as yet unspecified, rates.

【ISP(Internet Service Provider) 互联网服务供应商】

An ISP (Internet service provider) is a company that provides individuals and other companies access to the Internet and other related services such as Web site building and virtual hosting. An ISP has the equipment and the telecommunication line access required to have a point-of-presence[12] on the Internet for the geographic area served. The larger ISPs have their own high-speed leased lines so that they are less

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1 pool **缓冲池**
2 CCITT (International Telephone and Telegraph Consultative Committee) **国际电话电报咨询委员会**
3 ITU (International Telecommunication Union) **国际电信联盟**
4 adapter **适配器**
5 Basic Rate Interface (BRI) **基本速率接口**
6 Primary Rate Interface (PRI) **基群速率接口**
7 ISDN (BISDN) **宽带** ISDN
8 fiber optic **光纤**
9 frame relay **帧中继**
10 Fiber Distributed-Data Interface (FDDI) **光纤分布式数据接口**
11 Synchronous Optical Network (SONET) **异步光纤网**
12 point-of-presence (POP) **电话接入网点**

dependent on the telecommunication providers and can provide better service to their customers. Among the largest national and regional ISPs are AT&T WorldNet, IBM Global Network, MCI, Netcom, UUNet, and PSINet.

ISPs also include regional providers such as New England's NEARNet and the San Francisco Bay area BARNet. They also include thousands of local providers. In addition, Internet users can also get access through online service providers (OSP[1]) such as America Online and Compuserve.

The larger ISPs interconnect with each other through MAE (ISP switching centers run by MCI WorldCom) or similar centers. The arrangements they make to exchange traffic are known as peering agreements. There are several very comprehensive lists of ISPs world-wide available on the Web.

An ISP is also sometimes referred to as an IAP[2] (Internet access provider). ISP is sometimes used as an abbreviation for independent service provider to distinguish a service provider that is an independent, separate company from a telephone company.

【IT (information technology) 信息技术】

IT (information technology) is a term that encompasses all forms of technology used to create, store, exchange, and use information in its various forms (business data, voice conversations, still images, motion pictures, multimedia presentations, and other forms, including those not yet conceived). It's a convenient term for including both telephony and computer technology in the same word. It is the technology that is driving what has often been called "the information revolution."

【mainframe 大型机】

Mainframe is an industry term for a large computer, typically manufactured by a large company such as IBM for the commercial applications of Fortune 1000 businesses and other large-scale computing purposes. Historically, a mainframe is associated with centralized rather than distributed computing. Today, IBM refers to its larger processors as large servers and emphasizes that they can be used to serve distributed users and smaller servers in a computing network.

【memory 内存】

Memory is the electronic holding place for instructions and data that your computer's microprocessor can reach quickly. When your computer is in normal operation, its memory usually contains the main parts of the operating system and some or all of the application programs and related data that are being used. Memory is often used as a shorter synonym for random access memory (RAM)[3]. This kind of memory is located on one or more microchips that are physically close to the microprocessor in your computer. The more RAM you have, the less frequently the computer has to access instructions and data from the more slowly accessed hard disk form of storage.

Memory is sometimes distinguished from storage, or the physical medium that holds the much larger amounts of data that won't fit into RAM and may not be immediately needed there. Storage devices include hard disks, floppy disks, CD-ROM, and tape backup systems. The terms auxiliary storage, auxiliary memory,

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1 online service providers (OSP) 在线服务提供商
2 IAP (Internet access provider) 互联网访问供应商
3 random access memory (RAM) 随机存取存储器

and secondary memory[1] have also been used for this kind of data repository.

Additional kinds of integrated and quickly accessible memory are read-only memory (ROM), programmable ROM (PROM), and erasable programmable ROM (EPROM)[2]. These are used to keep special programs and data, such as the basic input/output system, that need to be in your computer all the time.

【microprocessor 微处理器】

A microprocessor is a computer processor on a microchip[3]. It's sometimes called a logic chip. It is the "engine" that goes into motion when you turn your computer on. A microprocessor is designed to perform arithmetic and logic operations that make use of small number-holding areas called registers[4]. Typical microprocessor operations include adding, subtracting, comparing two numbers, and fetching numbers from one area to another. These operations are the result of a set of instructions that are part of the microprocessor design. When the computer is turned on, the microprocessor is designed to get the first instruction from the basic input/output system (BIOS[5]) that comes with the computer as part of its memory. After that, either the BIOS, or the operating system that BIOS loads into computer memory, or an application program is "driving" the microprocessor, giving it instructions to perform.

【middleware 中间件】

In the computer industry, middleware is a general term for any programming that serves to "glue together" or mediate between two separate and often already existing programs. A common application of middleware is to allow programs written for access to a particular database to access other databases.

Typically, middleware programs provide messaging services so that different applications can communicate. The systematic tying together of disparate applications, often through the use of middleware, is known as enterprise application integration (EAI).

【modem 调制解调器】

A modem modulates[6] outgoing digital signals from a computer or other digital device to analog signals for a conventional copper twisted pair[7] telephone line and demodulates the incoming analog signal and converts it to a digital signal for the digital device.

In recent years, the 2400 bits per second modem that could carry E-mail has become obsolete. 14.4 Kbps and 28.8 Kbps modems were temporary landing places on the way to the much higher bandwidth devices and carriers of tomorrow. From early 1998, most new personal computers came with 56 Kbps modems. By comparison, using a digital Integrated Services Digital Network[8] adapter instead of a conventional modem, the same telephone wire can now carry up to 128 Kbps. With Digital Subscriber Line (DSL[9]) systems, now being deployed in a number of communities, bandwidth on twisted-pair can be in the

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[1] auxiliary storage, auxiliary memory, and secondary memory **指的都是辅助存储器**

[2] ROM **只读存储器；**PROM **可编程只读存储器；**EPROM **可擦除可编程只读存储器**

[3] microchip **微芯片**

[4] register **寄存器**

[5] basic input/output system (BIOS) **基本输入输出系统**

[6] modulate **调制；**demodulate **解调**

[7] twisted pair **双绞线**

[8] Integrated Services Digital Network (ISDN) **综合业务数字网**

[9] Digital Subscriber Line (DSL) **数字用户线路**

megabit range.

【monitor 监视器】

In computers, a monitor is a computer display[1] and related parts packaged in a physical unit that is separate from other parts of the computer. Notebook computers don't have monitors because all the display and related parts are integrated into the same physical unit with the rest of the computer. In practice, the terms monitor and display are used interchangeably.

【motherboard 主板】

A motherboard is the physical arrangement in a computer that contains the computer's basic circuitry and components. On the typical motherboard, the circuitry is imprinted or affixed to the surface of a firm planar surface and usually manufactured in a single step. The most common motherboard design in desktop computers today is the AT, based on the IBM AT motherboard. A more recent motherboard specification, ATX, improves on the AT design. In both the AT and ATX designs, the computer components included in the motherboard are:

The microprocessor

(Optionally) coprocessors[2]

Memory

basic input/output system (BIOS)

Expansion slot

Interconnecting circuitry

Additional components can be added to a motherboard through its expansion slot. The electronic interface between the motherboard and the smaller boards or cards in the expansion slots is called the bus[3].

【mouse 鼠标】

A mouse is a small device that a computer user pushes across a desk surface in order to point to a place on a display screen and to select one or more actions to take from that position. The mouse first became a widely-used computer tool when Apple Computer made it a standard part of the Apple Macintosh. Today, the mouse is an integral part of the graphical user interface (GUI[4]) of any personal computer. The mouse apparently got its name by being about the same size and color as a toy mouse.

The most conventional kind of mouse has two buttons on top: the left one is used most frequently. In the Windows operating systems, it lets the user click once to send a "Select" indication that provides the user with feedback that a particular position has been selected for further action. The next click on a selected position or two quick clicks on it causes a particular action to take place on the selected object. For example, in Windows operating systems, it causes a program associated with that object to be started. The second button, on the right, usually provides some less-frequently needed capability. For example, when viewing a Web page, you can click on an image to get a popup menu that, among other things, lets you save the image on your hard disk. Some mouses have a third button for additional capabilities. Some mouse manufacturers

[1] display **显示器，在实际应用，**monitor **和** display **可以互换**

[2] coprocessors **协处理器**

[3] bus **总线**

[4] graphical user interface (GUI) **图形用户界面**

also provide a version for left-handed people.

Although the mouse has become a familiar part of the personal computer, its design continues to evolve and there continue to be other approaches to pointing or positioning on a display. Notebook computers include built-in mouse devices that let you control the cursor by rolling your finger over a built-in trackball. IBM's ScrollPoint mouse adds a small "stick" between two mouse buttons that lets you scroll a Web page or other content up or down and right or left. Users of graphic design and CAD applications can use a stylus and a specially-sensitive pad to draw as well as move the cursor. Other display screen-positioning ideas include a video camera that tracks the user's eye movement and places the cursor accordingly.

【multimedia 多媒体】

Multimedia is more than one concurrent presentation medium (for example, on CD-ROM or a Web site). Although still images are a different medium than text, multimedia is typically used to mean the combination of text, sound, and/or motion video. Some people might say that the addition of animated images (for example, animated GIF on the Web) produces multimedia, but it has typically meant one of the following:

Text and sound

Text, sound, and still or animated graphic images

Text, sound, and video images

Video and sound

Multiple display areas, images, or presentations presented concurrently

In live situations, the use of a speaker or actors and "props" together with sound, images, and motion video

Multimedia can arguably be distinguished from traditional motion pictures or movies both by the scale of the production (multimedia is usually smaller and less expensive) and by the possibility of audience interactivity or involvement (in which case, it is usually called interactive multimedia). Interactive elements can include: voice command, mouse manipulation, text entry, touch screen, video capture of the user, or live participation (in live presentations).

Multimedia tends to imply sophistication (and relatively more expense) in both production and presentation than simple text-and-images. Multimedia presentations are possible in many contexts, including the Web, CD-ROMs, and live theater. Since any Web site can be viewed as a multimedia presentation, any tool that helps develop a site in multimedia form can be classed as multimedia software and the cost can be less than for standard video productions.

For multimedia Web sites, popular multimedia (sound or sound and motion video or animation) players include: MPEG, Quicktime, and Shockwave.

【multitasking 多任务处理】

It is easy to confuse multitasking with multithreading, a somewhat different idea.

In a computer operating system, multitasking is allowing a user to perform more than one computer task (such as the operation of an application program) at a time. The operating system is able to keep track of where you are in these tasks and go from one to the other without losing information. Microsoft Windows 2000, IBM's OS/390, and Linux are examples of operating systems that can do multitasking (almost all of today's operating systems can). When you open your Web browser and then open word at the same time, you are causing the operating system to do multitasking.

Being able to do multitasking doesn't mean that an unlimited number of tasks can be juggled at the same time. Each task consumes system storage and other resources. As more tasks are started, the system may need to slow down or begin to run out of shared storage.

【multithreading 多线程】

Multithreading is the ability of a program or an operating system process to manage its use by more than one user at a time and to even manage multiple requests by the same user without having to have multiple copies of the programming running in the computer. Each user request for a program or system service (and here a user can also be another program) is kept track of as a thread with a separate identity. As programs work on behalf of the initial request for that thread and are interrupted by other requests, the status of work on behalf of that thread is kept track of until the work is completed.

【network 网络】

In information technology, a network is a series of points or nodes interconnected by communication paths. Networks can interconnect with other networks and contain subnetworks.

The most common topology[1] or general configurations of networks include the bus, star, and token ring[2] topologies. Networks can also be characterized in terms of spatial distance as local area networks (LAN), metropolitan area networks (MAN), and wide area networks (WAN)[3].

A given network can also be characterized by the type of data transmission technology in use on it (for example, a TCP/IP or Systems Network Architecture network); by whether it carries voice, data, or both kinds of signals; by who can use the network (public or private); by the usual nature of its connections (dial-up or switched, dedicated or nonswitched, or virtual connections); and by the types of physical links (for example, optical fiber, coaxial cable, and Unshielded Twisted Pair[4]). Large telephone networks and networks using their infrastructure (such as the Internet) have sharing and exchange arrangements with other companies so that larger networks are created.

【network operating system 网络操作系统】

A network operating system (NOS) is a computer operating system that is designed primarily to support workstation, personal computer, and, in some instances, older terminal that are connected on a local area network (LAN). Artisoft's LANtastic, Banyan VINES, Novell's NetWare, and Microsoft's LAN Manager are examples of network operating systems. In addition, some multi-purpose operating systems, such as Windows NT and Digital's OpenVMS come with capabilities that enable them to be described as a network operating system.

A network operating system provides printer sharing, common file system and database sharing, application sharing, and the ability to manage a network name directory, security, and other housekeeping aspects of a network.

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[1] topology **拓扑结构**
[2] bus **总线**；star **星形**；token ring **令牌环**
[3] LAN **局域网**；MAN **城域网**；WAN **广域网**
[4] optical fiber **光纤**；coaxial cable **同轴电缆**；Unshielded Twisted Pair **非屏蔽双绞线**

【newsgroup 新闻组】

A newsgroup is a discussion about a particular subject consisting of notes written to a central Internet site and redistributed through Usenet[1], a worldwide network of news discussion groups. Usenet uses the Network News Transfer Protocol (NNTP)[2].

Newsgroups are organized into subject hierarchies, with the first few letters of the newsgroup name indicating the major subject category and sub-categories represented by a subtopic name. Many subjects have multiple levels of subtopics. Some major subject categories are: news, rec (recreation), soc (society), sci (science), comp (computers), and so forth (there are many more). Users can post to existing newsgroups, respond to previous posts, and create new newsgroups.

Newcomers to newsgroups are requested to learn basic Usenet netiquette and to get familiar with a newsgroup before posting to it. A frequently-asked questions is provided. The rules can be found when you start to enter the Usenet through your browser or an online service. You can subscribe to the postings on a particular newsgroup.

Some newsgroups are moderated by a designated person who decides which postings to allow or to remove. Most newsgroups are unmoderated.

【NIC (network interface card) 网络接口卡】

A network interface card (NIC) is a computer circuit board or card that is installed in a computer so that it can be connected to a network. Personal computers and workstations on a local area network (LAN) typically contain a network interface card specifically designed for the LAN transmission technology, such as Ethernet or token ring. Network interface cards provide a dedicated, full-time connection to a network. Most home and portable computers connect to the Internet through as-needed dial-up connection. The modem provides the connection interface to the Internet service provider.

【notebook computer 笔记本计算机】

A notebook computer is a battery- or AC-powered personal computer generally smaller than a briefcase that can easily be transported and conveniently used in temporary spaces such as on airplanes, in libraries, temporary offices, and at meetings. A notebook computer, sometimes called a laptop computer, typically weighs less than 5 pounds and is 3 inches or less in thickness. Among the best-known makers of notebook and laptop computers are IBM, Apple, Compaq, Dell, Toshiba, and Hewlett-Packard.

Notebook computers generally cost more than desktop computers with the same capabilities because they are more difficult to design and manufacture. A notebook can effectively be turned into a desktop computer with a docking station[3], a hardware frame that supplies connections for peripheral input/output devices such as a printer or larger monitor. The less capable port replicator[4] allows you to connect a notebook to a number of peripherals through a single plug.

Notebooks usually come with displays that use thin-screen technology. The thin film transistor[5] or

[1] Usenet **世界性的新闻组网络系统**
[2] Network News Transfer Protocol (NNTP) **网络新闻传输协议**
[3] docking station **坞站**
[4] port replicator **端口复制器**
[5] thin film transistor **薄膜晶体管**

active matrix[1] screen is brighter and views better at different angles than the STN or dual-scan screen. Notebooks use several different approaches for integrating a mouse into the keyboard, including the touch pad, the trackball, and the pointing stick. A serial port[2] also allows a regular mouse to be attached. The PC Card is insertable hardware for adding a modem or network interface card to a notebook. CD-ROM and DVD drives may be built-in or attachable.

【object-oriented database management system 面向对象的数据库管理系统】

An object-oriented database management system (OODBMS), sometimes shortened to ODBMS for object database management system), is a database management system (DBMS) that supports the modeling and creation of data as objects. This includes some kind of support for classes of objects and the inheritance of class properties and methods by subclasses and their objects. There is currently no widely agreed-upon standard for what constitutes an OODBMS, and OODBMS products are considered to be still in their infancy. In the meantime, the object-relational database management system (ORDBMS), the idea that object-oriented database concepts can be superimposed on relational databases, is more commonly encountered in available products.

In their influential paper, The Object-Oriented Database Manifesto, Malcolm Atkinson and others define an OODBMS as follows:

An object-oriented database system must satisfy two criteria: it should be a DBMS, and it should be an object-oriented system, i.e., to the extent possible, it should be consistent with the current crop of object-oriented programming languages. The first criterion translates into five features: persistence, secondary storage management, concurrency, recovery and an ad hoc[3] query facility. The second one translates into eight features: complex objects, object identity, encapsulation[4], types or classes, inheritance, overriding combined with late binding, extensibility and computational completeness.

【object-oriented programming 面向对象编程】

A revolutionary concept that changed the rules in computer program development, object-oriented programming (OOP) is organized around "objects" rather than "actions," data rather than logic. Historically, a program has been viewed as a logical procedure that takes input data, processes it, and produces output data. The programming challenge was seen as how to write the logic, not how to define the data. Object-oriented programming takes the view that what we really care about are the objects we want to manipulate rather than the logic required to manipulate them. Examples of objects range from human beings (described by name, address, and so forth) to buildings and floors (whose properties can be described and managed) down to the little widgets on your computer desktop (such as buttons and scroll bars).

The first step in OOP is to identify all the objects you want to manipulate and how they relate to each other, an exercise often known as data modeling[5]. Once you've identified an object, you generalize it as a class of objects and define the kind of data it contains and any logic sequences that can manipulate it. Each

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1 active matrix 有源阵列
2 serial port 串行端口
3 ad hoc 特别地
4 encapsulation 封装
5 data modeling 数据建模

distinct logic sequence is known as a method. A real instance of a class is called (no surprise here) an "object" or, in some environments, an "instance of a class." The object or class instance is what you run in the computer. Its methods provide computer instructions and the class object characteristics provide relevant data. You communicate with objects—and they communicate with each other—with well-defined interfaces called messages.

The concepts and rules used in object-oriented programming provide these important benefits:

The concept of a data class makes it possible to define subclasses of data objects that share some or all of the main class characteristics. Called inheritance[1], this property of OOP forces a more thorough data analysis, reduces development time, and ensures more accurate coding.

Since a class defines only the data it needs to be concerned with, when an instance of that class (an object) is run, the code will not be able to accidentally access other program data. This characteristic of data hiding provides greater system security and avoids unintended data corruption.

The definition of a class is reusable not only by the program for which it is initially created but also by other object-oriented programs (and, for this reason, can be more easily distributed for use in networks).

The concept of data classes allows a programmer to create any new data type that is not already defined in the language itself.

One of the first object-oriented computer languages was called Smalltalk. C++ and Java are the most popular object-oriented languages today. The Java programming language is designed especially for use in distributed applications on corporate networks and the Internet.

【packet-switched 分组交换】

Packet-switched describes the type of network in which relatively small units of data called packets are routed through a network based on the destination address contained within each packet. Breaking communication down into packets allows the same data path to be shared among many users in the network. This type of communication between sender and receiver is known as connectionless (rather than dedicated). Most traffic over the Internet uses packet switching and the Internet is basically a connectionless network.

Contrasted with packet-switched is circuit-switched[2], a type of network such as the regular voice telephone network in which the communication circuit (path) for the call is set up and dedicated to the participants in that call. For the duration of the connection, all resources on that circuit are unavailable for other users. Voice calls using the Internet's packet-switched system are possible. Each end of the conversation is broken down into packets that are reassembled at the other end.

Another type of digital network that uses packet-switching is the X.25 network, a widely-installed commercial wide area network protocol. Internet protocol packets can be carried on an X.25 network. The X.25 network can also support a virtual circuit[3] in which a logical connection is established for two parties on a dedicated basis for some duration. A permanent virtual circuit (PVC)[4] reserves the path on an ongoing basis and is an alternative for corporations to a system of leased lines[5]. A permanent virtual circuit is a

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1 inheritance **继承**
2 circuit-switched **电路交换**
3 virtual circuit **虚电路**
4 permanent virtual circuit (PVC) **永久虚电路**
5 leased line **租用线路**

dedicated logical connection but the actual physical resources can be shared among multiple logical connections or users.

【parallel processing 并行处理】

In computers, parallel processing is the processing of program instructions by dividing them among multiple processors with the objective of running a program in less time. In the earliest computers, only one program ran at a time. A computation-intensive program that took one hour to run and a tape copying program that took one hour to run would take a total of two hours to run. An early form of parallel processing allowed the interleaved[1] execution of both programs together. The computer would start an I/O operation, and while it was waiting for the operation to complete, it would execute the processor-intensive program. The total execution time for the two jobs would be a little over one hour.

The next improvement was multiprogramming[2]. In a multiprogramming system, multiple programs submitted by users were each allowed to use the processor for a short time. To users it appeared that all of the programs were executing at the same time. Problems of resource contention first arose in these systems. Explicit requests for resources led to the problem of the deadlock[3]. Competition for resources on machines with no tie-breaking instructions lead to the critical section[4] routine.

Vector processing[5] was another attempt to increase performance by doing more than one thing at a time. In this case, capabilities were added to machines to allow a single instruction to add (or subtract, or multiply, or otherwise manipulate) two arrays of numbers. This was valuable in certain engineering applications where data naturally occurred in the form of vectors or matrices. In applications with less well-formed data, vector processing was not so valuable.

The next step in parallel processing was the introduction of multiprocessing. In these systems, two or more processors shared the work to be done. The earliest versions had a master/slave[6] configuration. One processor (the master) was programmed to be responsible for all of the work in the system; the other (the slave) performed only those tasks it was assigned by the master. This arrangement was necessary because it was not then understood how to program the machines so they could cooperate in managing the resources of the system.

Solving these problems led to the symmetric multiprocessing (SMP)[7] system. In an SMP system, each processor is equally capable and responsible for managing the flow of work through the system. Initially, the goal was to make SMP systems appear to programmers to be exactly the same as single processor, multiprogramming systems. However, engineers found that system performance could be increased by someplace in the range of 10-20% by executing some instructions out of order and requiring programmers to deal with the increased complexity. (The problem can become visible only when two or more programs simultaneously read and write the same operands; thus the burden of dealing with the increased complexity

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[1] interleave **交错、交插**
[2] multiprogramming **多道程序设计**
[3] deadlock **死锁**
[4] critical section **临界段**
[5] vector processing **向量处理**
[6] master/slave **主/从**
[7] symmetric multiprocessing (SMP) **对称多处理**

falls on only a very few programmers and then only in very specialized circumstances.) The question of how SMP machines should behave on shared data is not yet resolved.

As the number of processors in SMP systems increases, the time it takes for data to propagate from one part of the system to all other parts grows also. When the number of processors is somewhere in the range of several dozen, the performance benefit of adding more processors to the system is too small to justify the additional expense. To get around the problem of long propagation times, message passing systems were created. In these systems, programs that share data send messages to each other to announce that particular operands have been assigned a new value. Instead of a broadcast of an operand's new value to all parts of a system, the new value is communicated only to those programs that need to know the new value. Instead of a shared memory, there is a network to support the transfer of messages between programs. This simplification allows hundreds, even thousands, of processors to work together efficiently in one system. (In the vernacular of systems architecture, these systems "scale well.") Hence such systems have been given the name of massively parallel processing (MPP)[1] systems.

The most successful MPP applications have been for problems that can be broken down into many separate, independent operations on vast quantities of data. In data mining[2], there is a need to perform multiple searches of a static database. In artificial intelligence[3], there is the need to analyze multiple alternatives, as in a chess game. Often MPP systems are structured as clusters of processors. Within each cluster the processors interact as in a SMP system. It is only between the clusters that messages are passed. Because operands may be addressed either via messages or via memory addresses, some MPP systems are called NUMA machines, for Non-Uniform Memory Addressing.

SMP machines are relatively simple to program; MPP machines are not. SMP machines do well on all types of problems, providing the amount of data involved is not too large. For certain problems, such as data mining of vast data bases, only MPP systems will serve.

【PDA (Personal Digital Assistant) 个人数字助理】

PDA (personal digital assistant) is a term for any small mobile hand-held device that provides computing and information storage and retrieval capabilities for personal or business use, often for keeping schedule calendars and address book information handy. The term handheld is a synonym. Many people use the name of one of the popular PDA products as a generic term. These include Hewlett-Packard's Palmtop and 3Com's PalmPilot.

Most PDAs have a small keyboard. Some PDAs have an electronically sensitive pad on which handwriting can be received. Apple's Newton, which has been withdrawn from the market, was the first widely-sold PDA that accepted handwriting. Typical uses include schedule and address book storage and retrieval and note-entering. However, many applications have been written for PDAs. Increasingly, PDAs are combined with telephones and paging systems.

【peer-to-peer 对等】

(1) Peer-to-peer is a communications model in which each party has the same capabilities and either

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[1] massively parallel processing (MPP) **大规模并行处理**

[2] data mining **数据采掘**

[3] artificial intelligence **人工智能**

party can initiate a communication session. Other models with which it might be contrasted include the client/server model and the master/slave model. In some cases, peer-to-peer communications is implemented by giving each communication node both server and client capabilities. In recent usage, peer-to-peer has come to describe applications in which users can use the Internet to exchange files with each other directly or through a mediating server.

(2) On the Internet, peer-to-peer (referred to as P2P) is a type of transient Internet network that allows a group of computer users with the same networking program to connect with each other and directly access files from one another's hard drives. Corporations are looking at the advantages of using P2P as a way for employees to share files without the expense involved in maintaining a centralized server and as a way for businesses to exchange information with each other directly.

How Does Internet P2P Work?

The user must first download and execute a peer-to-peer networking program. After launching the program, the user enters the IP address of another computer belonging to the network. (Typically, the Web page where the user got the download will list several IP addresses as places to begin). Once the computer finds another network member on-line, it will connect to that user's connection (who has gotten their IP address from another user's connection and so on).

Users can choose how many member connections to seek at one time and determine which files they wish to share or password protect.

【personal computer 个人计算机】

(1) In its more general usage, a PC (personal computer) is a computer designed for use by one person at a time. Prior to the PC, computers were designed for (and only affordable by) companies who attached terminals for multiple users to a single large computer whose resources were shared among all users. Beginning in the late 1980s, technology advances made it feasible to build a small computer that an individual could own and use.

(2) The term "PC" is also commonly used to describe an "IBM-compatible" personal computer in contradistinction to an Apple Macintosh computer. The distinction is both technical and cultural. The "IBM-compatible" PC is one with an Intel microprocessor architecture and an operating system such as DOS or Windows that is written to use the Intel microprocessor. The Apple Macintosh uses a Motorola microprocessor architecture and a proprietary operating system. The "IBM-compatible" PC is associated with business (as well as home) use. The "Mac," known for its more intuitive user interface, is associated with graphic design and desktop publishing.

【portable computer 便携式计算机】

A portable computer is a personal computer that is designed to be easily transported and relocated, but is larger and less convenient to transport than a notebook computer. The earliest PCs designed for easy transport were called portables. As the size and weight of most portables decreased, they became known as laptop computer and later as notebook computer. Today, larger transportable computers continue to be called portable computers. Most of these are special-purpose computers—for example, those for use in industrial environments where they need to be moved about frequently.

【printer 打印机】

In computers, a printer is a device that accepts text and graphic output from a computer and transfers the information to paper, usually to standard size sheets of paper. Printers are sometimes sold with computers, but more frequently are purchased separately. Printers vary in size, speed, sophistication, and cost. In general, more expensive printers are used for higher-resolution[1] color printing.

Personal computer printers can be distinguished as impact or non-impact printers[2]. Early impact printers worked something like an automatic typewriter, with a key striking an inked impression on paper for each printed character. The dot-matrix printer[3] was a low-cost personal computer printer. It's an impact printer that strikes the paper a line at a time. The best-known non-impact printers are the inkjet printer and the laser printer[4]. The inkjet sprays ink from an ink cartridge at very close range to the paper as it rolls by. The laser printer uses a laser beam[5] reflected from a mirror to attract ink (called toner) to selected paper areas as a sheet rolls over a drum[6].

The four printer qualities of most interest to most users are:

Color: Color is important for users who need to print pages for presentations or maps and other pages where color is part of the information. Color printers can also be set to print only in black-and-white. Color printers are more expensive to operate since they use two ink cartridges[7] (one color and one black ink) that need to be replaced after a certain number of pages. Users who don't have a specific need for color and who print a lot of pages will find a black-and-white printer cheaper to operate.

Resolution: Printer resolution (the sharpness of text and images on paper) is usually measured in dots per inch (dpi). Most inexpensive printers provide sufficient resolution for most purposes at 600 dpi.

Speed: If you do much printing, the speed of the printer becomes important. Inexpensive printers print only about 3 to 6 sheets per minute. Color printing is slower. More expensive printers are much faster.

Memory: Most printers come with a small amount of memory (for example, one megabyte) that can be expanded by the user. Having more than the minimum amount of memory is helpful and faster when printing out pages with large images or tables with lines around them (which the printer treats as a large image).

【processor 处理器】

A processor is the logic circuitry that responds to and processes the basic instructions that drive a computer.

The term processor has generally replaced the term central processing unit (CPU). The processor in a personal computer or embedded in small devices is often called a microprocessor.

【program 程序】

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[1] resolution 分辨率
[2] impact printer 击打式打印机；non-impact 非击打式打印机
[3] dot-matrix printer 点阵打印机
[4] inkjet printer 喷墨打印机；laser printer 激光打印机
[5] laser beam 激光束
[6] drum 磁鼓
[7] ink cartridge 墨水盒

In computing, a program is a specific set of ordered operations for a computer to perform. In the modern computer that John von Neumann outlined in 1945, the program contains a one-at-a-time sequence of instructions that the computer follows. Typically, the program is put into a storage area accessible to the computer. The computer gets one instruction and performs it and then gets the next instruction. The storage area or memory can also contain the data that the instruction operates on. (Note that a program is also a special kind of “data” that tells how to operate on “application or user data.”)

Programs can be characterized as interactive or batch in terms of what drives them and how continuously they run. An interactive program receives data from an interactive user (or possibly from another program that simulates an interactive user). A batch program[1] runs and does its work, and then stops. Batch programs can be started by interactive users who request their interactive program to run the batch program. A command interpreter or a Web browser is an example of an interactive program. A program that computes and prints out a company payroll is an example of a batch program. Print jobs are also batch programs.

When you create a program, you write it using some kind of computer language. Your language statements are the source program. You then “compile” the source program (with a special program called a language compiler[2]) and the result is called an object program (not to be confused with object-oriented programming). There are several synonyms for object program, including object module and compiled program. The object program contains the string of 0s and 1s called machine language that the logic processor works with.

The machine language of the computer is constructed by the language compiler with an understanding of the computer’s logic architecture, including the set of possible computer instructions and the length (number of bits) in an instruction.

【protocol 协议】

In information technology, a protocol is the special set of rules that end points in a telecommunication connection use when they communicate. Protocols exist at several levels in a telecommunication connection. There are hardware telephone protocols. There are protocols between each of several functional layers and each corresponding layer at the other end of a communication. Both end points must recognize and observe a protocol. Protocols are often described in an industry or international standard.

On the Internet, there are the TCP/IP protocols, consisting of:

- Transmission Control Protocol (TCP), which uses a set of rules to exchange messages with other Internet points at the information packet level.
- Internet Protocol (IP), which uses a set of rules to send and receive messages at the Internet address level.

- Additional protocols that are usually packaged with a TCP/IP suite, including the Hypertext Transfer Protocol (HTTP) and File Transfer Protocol (FTP)[3], each with defined sets of rules to

[1] batch program **批处理程序**
[2] compiler **编译程序**
[3] TCP **传输控制协议；**IP **网际协议；**HTTP **超文本传输协议；**FTP **文件传输协议**

use with corresponding programs elsewhere on the Internet.

【RAM (Random Access Memory) 随机存取存储器】

RAM (Random Access Memory) is the place in a computer where the operating system, application programs, and data in current use are kept so that they can be quickly reached by the computer's processor. RAM is much faster to read from and write to than the other kinds of storage in a computer, the hard disk, floppy disk, and CD-ROM. However, the data in RAM stays there only as long as your computer is running. When you turn the computer off, RAM loses its data. When you turn your computer on again, your operating system and other files are once again loaded into RAM, usually from your hard disk.

RAM can be compared to a person's short-term memory and the hard disk to the long-term memory. The short-term memory focuses on work at hand, but can only keep so many facts in view at one time. If short-term memory fills up, your brain sometimes is able to refresh it from facts stored in long-term memory. A computer also works this way. If RAM fills up, the processor needs to continually go to the hard disk to overlay old data in RAM with new, slowing down the computer's operation. Unlike the hard disk which can become completely full of data so that it won't accept any more, RAM never runs out of memory. It keeps operating, but much more slowly than you may want it to.

【real-time operating system 实时操作系统】

A real-time operating system (RTOS) is an operating system that guarantees a certain capability within a specified time constraint. For example, an operating system might be designed to ensure that a certain object was available for a robot on an assembly line. In what is usually called a "hard" real-time operating system, if the calculation could not be performed for making the object available at the designated time, the operating system would terminate with a failure. In a "soft" real-time operating system, the assembly line would continue to function but the production output might be lower as objects failed to appear at their designated time, causing the robot to be temporarily unproductive. Some real-time operating systems are created for a special application and others are more general purpose. Some existing general purpose operating systems claim to be a real-time operating systems. To some extent, almost any general purpose operating system such as Microsoft's Windows 2000 or IBM's OS/390 can be evaluated for its real-time operating system qualities. That is, even if an operating system doesn't qualify, it may have characteristics that enable it to be considered as a solution to a particular real-time application problem.

In general, real-time operating systems are said to require:

- multitasking[1].
- Process threads[2] that can be prioritized.
- A sufficient number of interrupt levels[3].

Real-time operating systems are often required in small embedded operating systems that are packaged as part of microdevices. Some kernels can be considered to meet the requirements of a real-time operating system. However, since other components, such as device drivers, are also usually needed for a particular solution, a real-time operating system is usually larger than just the kernel.

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[1] multitasking **多任务**
[2] thread **线程**
[3] interrupt level **中断级**

【relational database 关系数据库】

A relational database is a collection of data items organized as a set of formally-described tables from which data can be accessed or reassembled in many different ways without having to reorganize the database tables. The relational database was invented by E. F. Codd at IBM in 1970.

The standard user and application program interface to a relational database is the structured query language (SQL)[1]. SQL statements are used both for interactive queries for information from a relational database and for gathering data for reports.

In addition to being relatively easy to create and access, a relational database has the important advantage of being easy to extend. After the original database creation, a new data category can be added without requiring that all existing applications be modified.

A relational database is a set of tables containing data fitted into predefined categories. Each table (which is sometimes called a relation) contains one or more data categories in columns. Each row contains a unique instance of data for the categories defined by the columns. For example, a typical business order entry database would include a table that described a customer with columns for name, address, phone number, and so forth. Another table would describe an order: product, customer, date, sales price, and so forth. A user of the database could obtain a view of the database that fitted the user's needs. For example, a branch office manager might like a view or report on all customers that had bought products after a certain date. A financial services manager in the same company could, from the same tables, obtain a report on accounts that needed to be paid.

When creating a relational database, you can define the domain of possible values in a data column and further constraints that may apply to that data value. For example, a domain of possible customers could allow up to ten possible customer names but be constrained in one table to allowing only three of these customer names to be specifiable.

The definition of a relational database results in a table of metadata[2] or formal descriptions of the tables, columns, domains, and constraints.

【RISC (Reduced Instruction Set Computer) 精简指令集计算机】

RISC (reduced instruction set computer) is a microprocessor that is designed to perform a smaller number of types of computer instructions so that it can operate at a higher speed (perform more millions of instructions per second, or MIPS). Since each instruction type that a computer must perform requires additional transistors and circuitry, a larger list or set of computer instructions tends to make the microprocessor more complicated and slower in operation.

John Cocke of IBM Research in Yorktown, New York, originated the RISC concept in 1974 by proving that about 20% of the instructions in a computer did 80% of the work. The first computer to benefit from this discovery was IBM's PC/XT in 1980. Later, IBM's RISC System/6000, made use of the idea. The term itself (RISC) is credited to David Patterson, a teacher at the University of California in Berkeley. The concept was used in Sun Microsystems' SPARC microprocessors and led to the founding of what is now MIPS Technologies, part of Silicon Graphics. A number of current microchips now use the RISC concept.

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[1] structured query language (SQL) **结构化查询语言**

[2] metadata **元数据**

The RISC concept has led to a more thoughtful design of the microprocessor. Among design considerations are how well an instruction can be mapped to the clock speed of the microprocessor (ideally, an instruction can be performed in one clock cycle); how “simple” an architecture is required; and how much work can be done by the microchip itself without resorting to software help.

Besides performance improvement, some advantages of RISC and related design improvements are:

A new microprocessor can be developed and tested more quickly if one of its aims is to be less complicated.

Operating system and application programmers who use the microprocessor’s instructions will find it easier to develop code with a smaller instruction set.

The simplicity of RISC allows more freedom to choose how to use the space on a microprocessor.

Higher-level language compilers produce more efficient code than formerly because they have always tended to use the smaller set of instructions to be found in a RISC computer.

After the introduction of RISC, any “full-set” instruction computer was said to use complex instruction set computing (CISC)[1].

【ROM (Read-only Memory) 只读存储器】

ROM is “built-in” computer memory containing data that normally can only be read, not written to. ROM contains the programming that allows your computer to be “booted up” or regenerated each time you turn it on. Unlike a computer’s random access memory (RAM), the data in ROM is not lost when the computer power is turned off. The ROM is sustained by a small long-life battery in your computer.

If you ever do the hardware setup procedure with your computer, you effectively will be writing to ROM.

【server 服务器】

（1）In general, a server is a computer program that provides services to other computer programs in the same or other computers.

（2）The computer that a server program runs in is also frequently referred to as a server (though it may contain a number of server and client programs).

（3）In the client/server programming model, a server is a program that awaits and fulfills requests from client programs in the same or other computers. A given application in a computer may function as a client with requests for services from other programs and also as a server of requests from other programs.

Specific to the Web, a Web server is the computer program (housed in a computer) that serves requested HTML pages or files. A Web client is the requesting program associated with the user. The Web browser in your computer is a client that requests HTML files from Web servers.

【shell[2]】

Shell is a Unix term for the interactive user interface with an operating system. The shell is the layer of programming that understands and executes the commands a user enters. In some systems, the shell is called

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1 complex instruction set computing (CISC) **复杂指令集计算**

2 shell **命令解释程序，外壳**

a command interpreter. A shell usually implies an interface with a command syntax (think of the DOS operating system and its “C:>” prompts and user commands such as “dir” and “edit”).

As the outer layer of an operating system, a shell can be contrasted with the kernel[1], the operating system’s inmost layer or core of services.

【SQL (Structured Query Language) 结构化查询语言】

SQL (Structured Query Language) is a standard interactive and programming language for getting information from and updating a database. Although SQL is both an ANSI[2] and an ISO[3] standard, many database products support SQL with proprietary extensions to the standard language. Queries take the form of a command language that lets you select, insert, update, find out the location of data, and so forth. There is also a programming interface.

【supercomputer 巨型计算机】

A supercomputer is a computer that performs at or near the currently highest operational rate for computers. A supercomputer is typically used for scientific and engineering applications that must handle very large databases or do a great amount of computation (or both). At any given time, there are usually a few well-publicized supercomputers that operate at the very latest and always incredible speeds. Most supercomputers are really multiple computers that perform parallel processing. In general, there are two parallel processing approaches: symmetric multiprocessing (SMP) and massively parallel processing (MPP)[4].

Perhaps the best-known builder of supercomputers has been Cray Research, now a part of Silicon Graphics. Some supercomputers are at “supercomputer center,” usually university research centers, some of which, in the United States, are interconnected on an Internet backbone known as vBNS or NSFNet. This network is the foundation for an evolving network infrastructure known as the National Technology Grid. Internet2 is a university-led project that is part of this initiative.

【TCP/IP 传输控制协议/网际协议】

TCP/IP (Transmission Control Protocol/Internet Protocol) is the basic communication language or protocol of the Internet. It can also be used as a communications protocol in a private network (either an intranet or an extranet[5]). When you set up with direct access to the Internet, your computer is provided with a copy of the TCP/IP program just as every other computer that you may send messages to or get information from also has a copy of TCP/IP.

TCP/IP is a two-layer program. The higher layer, Transmission Control Protocol, manages the assembling of a message or file into smaller packets that are transmitted over the Internet and received by a TCP layer that reassembles the packets into the original message. The lower layer, Internet Protocol, handles the address part of each packet so that it gets to the right destination. Each gateway computer on the network

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1 kernel 内核

2 ANSI (American National Standards Institute) 美国国家标准协会

3 ISO (International Organization for Standardization) 国际标准化组织

4 SMP 对称多处理；MPP 大规模并行处理

5 intranet 内联网；extranet 外联网

checks this address to see where to forward the message. Even though some packets from the same message are routed differently than others, they'll be reassembled at the destination.

TCP/IP uses the client/server model of communication in which a computer user (a client) requests and is provided a service (such as sending a Web page) by another computer (a server) in the network. TCP/IP communication is primarily point-to-point, meaning each communication is from one point (or host computer) in the network to another point or host computer. TCP/IP and the higher-level applications that use it are collectively said to be "stateless" because each client request is considered a new request unrelated to any previous one (unlike ordinary phone conversations that require a dedicated connection[1] for the call duration). Being stateless frees network paths so that everyone can use them continuously. (Note that the TCP layer itself is not stateless as far as any one message is concerned. Its connection remains in place until all packets in a message have been received.)

Many Internet users are familiar with the even higher layer application protocols that use TCP/IP to get to the Internet. These include the World Wide Web's Hypertext Transfer Protocol (HTTP[2]), the File Transfer Protocol (FTP), Telnet (Telnet) which lets you logon to remote computers, and the Simple Mail Transfer Protocol (SMTP). These and other protocols are often packaged together with TCP/IP as a "suite."

Personal computer users usually get to the Internet through the Serial Line Internet Protocol (SLIP)[3] or the Point-to-Point Protocol (PPP)[4]. These protocols encapsulate the IP packets so that they can be sent over a dial-up phone connection to an access provider's modem.

Protocols related to TCP/IP include the User Datagram Protocol (UDP)[5], which is used instead of TCP for special purposes. Other protocols are used by network host computers for exchanging router information. These include the Internet Control Message Protocol (ICMP[6]), the Interior Gateway Protocol (IGP), the Exterior Gateway Protocol (EGP), and the Border Gateway Protocol (BGP).

【Telnet 远程登录】

Telnet is the way you can access someone else's computer, assuming they have given you permission. (Such a computer is frequently called a host computer.) More technically, Telnet is a user command and an underlying TCP/IP protocol for accessing remote computers. On the Web, HTTP and FTP protocols allow you to request specific files from remote computers, but not to actually be logged on as a user of that computer. With Telnet, you log on as a regular user with whatever privileges you may have been granted to the specific application and data on that computer.

A Telnet command request looks like this (the computer name is made-up):

telnet the.libraryat.whatis.edu

The result of this request would be an invitation to log on with a user id and a prompt for a password. If accepted, you would be logged on like any user who used this computer every day.

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1 dedicated connection **专用连接**

2 HTTP **超文本传输控制协议**；FTP **文件传输协议**；Telnet **远程登录**；SMTP **简单邮件传输协议**

3 Serial Line Internet Protocol (SLIP) **串行线路网际协议**

4 Point-to-Point Protocol (PPP) **点对点协议**

5 User Datagram Protocol (UDP) **用户数据报协议**

6 ICMP **互联网控制消息协议**；IGP **内部网关协议**；EGP **外部网关协议**；BGP **边界网关协议**

Telnet is most likely to be used by program developers and anyone who has a need to use specific applications or data located at a particular host computer.

【terminal 终端】

(1) In data communications, a terminal is any device that terminates one end (sender or receiver) of a communicated signal. In practice, it is usually applied only to the extended end points in a network, not central or intermediate devices. In this usage, if you can send signals to it, it's a terminal.

(2) In telephony, the term Data Terminal Equipment (DTE[1]) is used to describe the computer end of the DTE-to-DCE (Data Communications Equipment) communication between a computer and a modem.

(3) In computers, a terminal (sometimes qualified as a "dumb" terminal[2]) is an end-use device (usually with display monitor and keyboard) with little or no software of its own that relies on a mainframe or another computer (such as a PC server) for its "intelligence." IBM's 3270 Information Display System was a widely-installed system of such terminals in corporations. Many applications designed for the 3270 or other "dumb" terminals are still in use at PCs that emulate or act like a 3270. The VT-100 from Digital Equipment Corporation is another example of a widely-used so-called "dumb" terminal. A variation of this kind of terminal is being revived in the idea of the thin client[3] or network computer.

(4) The term is sometimes used to mean any personal computer or user workstation that is hooked up to a network.

【Unix】

Unix (often spelled "UNIX," especially as an official trademark) is an operating system that originated at Bell Labs in 1969 as an interactive time-sharing system[4]. Ken Thompson and Dennis Ritchie are considered the inventors of Unix. The name (pronounced YEW-nihks) was a pun based on an earlier system, Multics. In 1974, Unix became the first operating system written in the C language. Unix has evolved as a kind of large freeware product, with many extensions and new ideas provided in a variety of versions of Unix by different companies, universities, and individuals.

Unix operating systems are used in widely-sold workstation products from Sun Microsystems, Silicon Graphics, IBM, and a number of other companies. The Unix environment and the client/server program model were important elements in the development of the Internet and the reshaping of computing as centered in networks rather than in individual computers. Linux, a Unix derivative available in both "free software" and commercial versions, is increasing in popularity as an alternative to proprietary operating systems.

【virus 病毒】

A virus is a piece of programming code usually disguised as something else that causes some unexpected and usually undesirable event. A virus is often designed so that it is automatically spread to other computer users. Viruses can be transmitted as attachments to an E-mail note, as downloads, or be present on

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1 DTE **数据终端设备；**DCE **数据通信设备**
2 dumb terminal **哑终端**
3 thin client **瘦客户机**
4 time-sharing system **分时系统**

a diskette or CD. The source of the E-mail note, downloaded file, or diskette you've received is often unaware of the virus. Some viruses wreak their effect as soon as their code is executed; other viruses lie dormant until circumstances cause their code to be executed by the computer. Some viruses are playful in intent and effect ("Happy Birthday, Ludwig!") and some can be quite harmful, erasing data or causing your hard disk to require reformatting.

Generally, there are three main classes of viruses:

- File infectors. Some file infector viruses attach themselves to program files, usually selected .COM or .EXE files. Some can infect any program for which execution is requested, including .SYS, .OVL, .PRG, and .MNU files. When the program is loaded, the virus is loaded as well. Other file infector viruses arrive as wholly-contained programs or scripts sent as an attachment to an E-mail note.
- System or boot-record[1] infectors. These viruses infect executable code found in certain system areas on a disk. They attach to the DOS boot sector on diskettes or the Master Boot Record on hard disks. A typical scenario (familiar to the author) is to receive a diskette from an innocent source that contains a boot disk virus. When your operating system is running, files on the diskette can be read without triggering the boot disk virus. However, if you leave the diskette in the drive, and then turn the computer off or reload the operating system, the computer will look first in your A drive, find the diskette with its boot disk virus, load it, and make it temporarily impossible to use your hard disk. (Allow several days for recovery.) This is why you should make sure you have a bootable floppy.
- Macro viruses[2]. These are among the most common viruses, and they tend to do the least damage. Macro viruses infect your Microsoft Word application and typically insert unwanted words or phrases.

The best protection against a virus is to know the origin of each program or file you load into your computer or open from your E-mail program. Since this is difficult, you can buy anti-virus software that can screen E-mail attachments and also check all of your files periodically and remove any viruses that are found. From time to time, you may get an E-mail message warning of a new virus. Unless the warning is from a source you recognize, chances are good that the warning is a virus hoax.

【WAN (Wide Area Network) 广域网 】

A wide area network (WAN) is a geographically dispersed telecommunications network. The term distinguishes a broader telecommunication structure from a local area network (LAN). A wide area network may be privately owned or rented, but the term usually connotes the inclusion of public (shared user) networks. An intermediate form of network in terms of geography is a metropolitan area network (MAN[3]).

【Windows】

Windows is a personal computer operating system from Microsoft that, together with some commonly used business applications such as Microsoft Word and Excel, has become a de facto "standard" for

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[1] boot-record 引导记录
[2] Macro virus 宏病毒
[3] LAN 局域网；MAN 城域网

individual users in most corporations as well as in most homes.

The original 1985 version of Windows introduced to home and business PC users many of the graphical user interface (GUI)[1] ideas that were developed at an experimental lab at Xerox and introduced commercially by Apple's Lisa and Macintosh computers. Some of the well-known versions of Windows have included:

Windows 286

Windows 386

Windows 3.0 and 3.11

Windows 95

Windows 98

Windows NT

Windows 2000

Windows CE for use in small mobile computers

Windows Me

Windows XP

With the advent of the Internet, Microsoft has repositioned Windows as a kind of "window to the world," and its efforts to take the lead in Web browsers have made Internet Explorer the most popular browser.

【workstation 工作站】

(1) A workstation is a computer intended for individual use that is faster and more capable than a personal computer. It's intended for business or professional use (rather than home or recreational use). Workstations and applications designed for them are used by small engineering companies, architects, graphic designers, and any organization, department, or individual that requires a faster microprocessor, a large amount of random access memory (RAM), and special features such as high-speed graphics adapters. Historically, the workstation developed technologically about the same time and for the same audience as the Unix operating system, which is often used as the workstation operating system. Among the most successful makers of this kind of workstation are Sun Microsystems, Hewlett-Packard, DEC, and IBM.

(2) In IBM and other corporations, the term "workstation" is sometimes used to mean "any individual personal computer location hooked up to a mainframe computer." In today's corporate environments, many workers have such workstations. They're simply personal computers attached to a local area network (LAN) that in turn shares the resources of one or more large computers. Since they are PCs, they can also be used independently of the mainframe assuming they have their own applications installed and their own hard disk storage. This use of the term "workstation" (in IBM, sometimes called a "programmable workstation") made a distinction between the earlier "terminal" or "display terminal" (or "dumb terminal") of which the 3270 Information Display System is an example.

【World Wide Web 万维网】

A technical definition of the World Wide Web is: all the resources and users on the Internet that are

[1] graphical user interface (GUI) **图形用户界面**

using the Hypertext Transfer Protocol (HTTP).

A broader definition comes from the organization that Web inventor Tim Berners-Lee helped found, the World Wide Web Consortium (W3C)[1]:

“The World Wide Web is the universe of network-accessible information, an embodiment of human knowledge.”

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[1] World Wide Web Consortium (W3C) **万维网联盟**

附　录

参考答案

课文练习：判断对错

	1	2	3	4
第 1 **课　计算机概述**	F	T	T	T
第 2 **课　硬件**	F	F	T	T
第 3 **课　操作系统**	F	T	F	T
第 4 **课　软件工程**	F	T	F	F
第 5 **课　数据结构**	T	F	F	T
第 6 **课　网络**	T	T	T	F
第 7 **课　计算机维护**	F	T	F	F
第 8 **课　数据库**	T	F	T	T
第 9 **课　人工智能**	F	F	F	F
第 10 **课 互联网**	F	F	T	F
第 11 **课 电子商务**	T	F	F	F
第 12 **课 通信技术**	F	F	F	F
第 13 **课 计算机组装**	F	T	T	F
第 14 **课 计算机系统结构**	F	F	F	T
第 15 **课 网络安全**	F	F	T	T
第 16 **课 网页设计**	T	F	T	T
第 17 **课 网络编程**	F	T	T	F
第 18 **课 网络维护**	F	T	F	F
第 19 **课 多媒体技术**	T	F	F	F
第 20 **课 远程教育**	F	T	F	F

测试：选择题

01. A	02. D	03. C	04.B	05. D	06. B	07. D	08. A	09. D	10. A
11. A	12. D	13. D	14. D	15. C	16. A	17. D	18. C	19. C	20. A
21. B	22. D	23. B	24. D	25. A	26. A	27. D	28. D	29. B	30. D
31. B	32. B	33. D	34. D	35. D	36. A	37. B	38. B	39. C	40. B
41. D	42. A	43. C	44. D	45. D	46. D	47. B	48. D	49. B	50. D
51. D	52. B	53. D	54. C	55. A	56. D	57. D	58. D	59. C	60. C

测试：完形填空

01. C A D A B	02. B C D D B	03. C B D A A
04. C A D B A	05. A C D A B	06. C B A A B
07. D D A C B	08. C A B B D	09. A C D A B
10. B C A A D	11. C D A A C	12. C B D A B
13. A C D D B	14. D C B D A	15. B D A C B
16. A B D B C	17. A D C C B	

测试：匹配

(1)

1—o 2—q 3—p 4—d 5—g 6—j 7—r 8—b

(2)

a—14	b—12	c—32	d—17	e—33	f—8	g—18
h—19	I— 6	j—24	k—10	l— 30	m—7	n—29
o—16	p—2	q—1	r—22	s—26	t—21	u—28
v—11	w—34	x— 20				

测试：问题

Questions 1:

network devices, e.g. computer, communication channels, e.g. cables, network interface card and network software.

Questions 2:

a. electronic junk mail

b. delete, send a warning to the sender; do not accept information at face value; check the source of the information.

Questions 3:

a. resolution, color depth, refresh rates.

b. use alcohol, turn monitor off and make sure it is cold.

Questions 4:

The number of registers that a CPU has and the size of each help determine the power and speed of a CPU. A 32-bit CPU is one in which each register is 32 bits wide. Therefore each CPU instruction can manipulate 32 bits of data.

Questions 5:

a. not at peak periods and not during ‘normal’ charging time , in off peak periods.

b. scan the pictures and send it as an email attachment—(must have scan and E-mail).

c. delete the file in the printer queue or line (not switch the printer off), click abort print.

d. mouse is dirty, clean the mouse.

e. attach it to an E-mail and send home that way, put on disk and carry it home.

Questions 6:

a. BIOS.

b. normal primary memory.

c. data or instructions likely to be used by the processor.

d. store data in cache, cache memory.

e. nothing.

f. BIOS—system programs.

g. able to read and write to memory 10%～15% faster, pipeline burst mode.

h. temporary storage of memory.

i. Dynamic RAM.

Questions 7:

a. expansion slot.

b. transistor, semi conductor.

c. buses.

测试：翻译练习

1．指令流水线与工厂里的装配线有些相似。装配线利用了产品要经过不同的生产阶段这样一个事实，通过将生产过程都安排在一条装配线上，从而可以同时生产不同阶段的产品。这一过程也被称为流水线。这是因为在流水线上，在前一个输入经过加工处理输出到另一端之前，新的输入又被接收进来。为了将这一概念应用于指令的执行中，我们必须明白，实际上一条指令包括了很多步骤。流水线就是这样的一种技术，它认识到一条指令在执行中并没有占用全部的处理器。因此，它将一条指令的执行过程分成了若干阶段，这些阶段与处理器执行指令的方式相匹配。

2．Linux 几乎对所有的 DOS/Windows 病毒都具有免疫力。Linux 非常稳定，极少崩溃。全世界有数千家公司将其用于 24 小时运作的系统中。已经开发了很多种用于 Linux 下的应用程序、实用软件和游戏，由于 Linux 是基于开放行业标准的，因此用户不必从同一家公司购买所有组件。许多大型的软件开发公司已经支持 Linux，越来越多的公司也正在加入。用户甚至可以免费下载供个人使用的办公软件。

3．两个有序的子表可以将其合并为一个有序表。这种简单而有效的排序过程称为归并排序，首先从每个子表中各取一个元素，进行两两比较。将最小的元素追加到有序表中，再从该元素所在子表内取出下一个元素，再进行比较。依次进行下去，直到其中的一个子表没有元素为止。再将另一个子表中余下的元素追加到有序表里，则排序完成。

4．文件是由操作系统定义和实现的一种抽象的数据类型，是一序列的逻辑记录。逻辑记录可以是一个字节、一行（固定长度或可变长度）或更复杂的数据项。操作系统需要解决的问题是如何将逻辑文件概念映射到磁带或磁盘等物理存储设备上。因为这些设备的物理记录的大小可能与逻辑记录的大小并不一致，就需要将逻辑记录按照物理记录的大小分成若干块。

5．创建 Web 页面的基本语言是 HTML（超文本标识语言）。它为网页设计提供了一种标准格式，来生成链接、规定页面更新的刷新周期、嵌入声音文件、嵌入 JavaScript、布局组合方框和将页面编排成不同的帧等。HTML 是一种标记语言。有很多编辑器可以用来帮助摆放标记来生成所需的网页，而不必知道页面是如何被创建的。另外一种就是 CGI（公共网关接口）。当用户向由 HTML 标记形成的输入框里键入参数并提交给 CGI 后，CGI 动态地向用户反馈回一个网页，从而使页面具有了动态性。CGI 与 C 语言或 shell 脚本语言相似。它将用户在网页中输入的参数或信息作为变量值来进行接收和处理，并将结果反馈到屏幕上和嵌入到 HTML 页面里。

6．实施网络安全措施需要四个阶段。首先，必须评估公司现有的网络安全系统，并确定安全策略。其次，确定并使用满足所需的安全产品和服务。之后，建立一套管理程序，来保证机构内所有因特网的安全性。这包括管理安全服务台、防火墙、虚拟专用网络、加密、系统检查、清除病毒和回收密钥等过程。最后，即维护阶段，安全措施要适应业务和技术上的需要。

7．中继器也有若干不足之处，其中最大的缺陷就是它无法区分出完整的数据帧。当中继器在一段线路上接收电子信号，并将其转发到另一段时，它无法将有效帧的信号和其他电信号区分开来。因此，当在某一段线路上出现冲突，中继器仍会将所有信号都复制转发到另一段上，其中包括导致冲突的重迭信号。与此类似，当一段线路上由于受到干扰（如雷电）而产生无用的电噪音，中继器也会将电噪音复制转发到另一段上。关键点是：中继器不仅将有效的信号复制传输到另一段上，也会将其他的电信号都进行复制，结果一段线路上出现电冲突，会由于中继器而使其他所有的线路都出现同样的问题。

8．RISC（精简指令计算机）是一种新的设计方法学，它指出了硬件与软件之间一种新关系，而不是一系列技术特性。实际上 RISC 方法对计算机设计的影响远不止是使 CUP 运行速度更快的各种手段的集合。在这种意义上，“精简指令系统”一词就有些使人误解。RISC 设计的真正目的一定不是任意减少指令的数量。相反，其主要目的是通过使编译系统与硬件相适应来产生一种高速的计算机。CISC（复杂指令计算机）设计的主要目的是减少用于执行程序的指令数量，而 RISC 则主要减少每条指令时钟周期（CPI）的平均数。两种结构均希望通过使用高速技术来提高时钟频率，然而，由于 RISC 降低了复杂程度，使其能更早地采用这种高速技术，从而它在性能上也就有了更大的提高。

9．数据的完整性指的是数据库中数据的准确度、正确性或合法性。在数据库系统中，数据的完整性就是指使数据免受非法修改或破坏。在大型联机数据库系统中，数据的完整性则更为重要，而且还存在着另外两个复杂的问题。第一个是关于多个用户同时访问数据库的问题。例如，如果上千个旅行社代理人和航班订票处职员正在同时访问同一个数据库，其中两个旅行社代理人预定了同一航班的同一座次，则第一个代理人的预定将会丢失。在这种情况下，采用锁住记录或字段的技术，就可以避免用户去访问某一记录的同时其他用户正在更新该记录。第二个复杂问题与硬件、软件、或处理过程中的人为错误有关，包括使数据库始终保持完整性的数据库事务。数据库事务是一组被视为整体的数据库修改操作。例如一个代理人预定一航班，该过程就包括了几个数据库的更新操作（如加入乘客的姓名和地址，并修改剩余座位的字段），这些操作就构成了一个事务。只有完成所有的更新操作，该事务才结束，否则不允许再进行其他的更新。

10．要理解 MP3 是如何工作的，就要记住声音是以连续变化的波长进行传播的。为了将声音保存在 PC 机内或光盘上，计算机以“快照”的形式记录很短间隔内的波形，这种技术被称为采样。回放这些样本，就会重新生成原始声音。样本越多，声音也就越逼真。要想达到电话里的声音质量，就需要每秒采集 2 500 个样本。对于更高质量的 CD 音乐，每秒要采集的样本数达 44 100 之多。猫王 Elvis Presley 演唱的 137 秒长的“Hound Dog”，其原声要占用 24.1 MB 硬盘空间，但用 MP3 的格式进行保存，则只需要 2.1 MB。

11．计算机可以使用户与其他人分享或不分享应用程序和文件。一般可能会在四个级别上对信息的访问进行限制：PC 级、文件级、服务器级和消息级。许多 PC 机都有受密码保护的屏幕保护程序，当计算机启动时或有几分钟处于不活动状态后，就会弹出该程序。只有知道密码的用户才能获得屏幕保护程序的认可。许多类型的文件都可以受密码保护，用户只有知道该文件特定的密码，才可以去访问文件。用户在局域网上，或在访问受到限制的站点上，必须登录后才能获权去访问网络。可以用不同的方法来实现登录，这包括密码、令牌等。通常，用户的身份会决定用户可以访问哪些应用程序和文件。就基于服务器的访问限制而言，银行的 ATM 机提供了一个很好的例子，该机器使用了信物（卡）和密码（PIN）。消息可以被加密，这样包含在消息里的信息除了指定的接受方外，对其他任何人来说，都是无法破译的杂乱信息。例如，电子商务站点经常将用户的信用卡信息进行加密。就消息级的访问限制而言，这是一个很好的例子。在这四种主要的访问限制方法中，基于服务器和消息级的方法可以提供更好的安全保证。如果将这几种方法结合起来，非内部成员要访问受保护的信息，实际上是不可能的（从技术和/或成本角度上）。

12．处理器的工作原理是对 0 和 1 的输入值以某种特定的方式重新进行处理，然后再基于判断返回一个输出值。判断本身是在一个称为逻辑门的电路上进行的，每一个逻辑门至少需要一个晶体管，通过对输入输出数据施加不同的操作来将其区分。处理器的逻辑门利用布尔逻辑来共同进行判断，布尔逻辑基于数学家布尔创建的代数系统。主要的布尔运算符是“与”,“或”,“非”，以及“与非”。也可能对这些运算符进行许多种组合。“与”门只有在两个输入值都是 1 的时候才输出 1。“或”门在两个输入值中至少有一个为 1 时，则输出 1。“非”门接收信号后取其相反值，如果输入为 0 则输出为 1，反之亦然。“与非”门非常普遍，因为它们仅使用两个晶体管就可以实现“与”门相同的功能，而在“与”门中则要使用三个晶体管。另外，处理器还可以将这些逻辑门进行组合，来实现算术功能；处理器也可以利用逻辑门来触发内存中的数据存储。

13．用来表示每一个像素的位数决定了可以显示多少种颜色或灰度。例如，在 8 位颜色模式中，彩色显示器使用 8 个字节来表示一个像素，从而就可以显示 2 到 2 的 8 次幂（256）种不同的颜色或

灰度。在彩色显示器上，每一个像素实际上包括三种像点——红、蓝和绿。理想情况下，这三种像点应该全部会聚在同一点上，但是所有显示器都有一些会聚误差，这种误差使得颜色像素显得有些模糊。在设计 Web 图片时，图像分辨率是要考虑的一个重要的概念，原因很简单，无论你将图片设计得多么完美，最终是由用户的显示器来决定图像最后的输出效果。显示系统的性能主要取决于它的分辨率，也就是能显示多少像素，每个像素用多少位来表示。VGA 系统显示 640×480，或大约 300 000 个像素。相反，SVGA 系统显示 1 024×768，或大约 800 000 个像素。真彩系统每个像素使用 24 位，从而就可以显示 1 600 万多种颜色。

14．许多病毒驻存在电脑的内存中，其方式与终止并驻留程序（TSR）相同或相似。这就意味着病毒可以等待某个外部事件的发生，然后再感染其他程序。病毒可以默默的潜伏在内存中，等你访问一个磁盘、复制一个文件、或执行一个程序之后，才开始进行感染。这就使病毒更难以分析，因为很难猜出病毒要使用什么样的触发条件来进行感染。在一些旧系统中，标准（640 KB）内存并不是易受病毒感染的惟一内存。也可能在上位内存（在 640 KB 和 1 MB 之间的空间）或高端内存（1 024 KB 和 1 088 KB 之间的一小部分）上安设病毒。而且，在 Windows 中，病毒可以有效的驻留在内存的任何部分。驻留的病毒经常利用部分电脑系统软件来隐藏它们的存在。这种技术称为窃用。多形态技术也有助于病毒来进行感染而不被发现。

15．局域网可以基于对等结构或客户机-服务器结构进行创建。小型局域网经常构建于简单对等关系。在对等式网络中，用户可以彼此共享资源和进行交流，但没有一台计算机对对等网络进行控制，对等式网络的用户一般也不将文件集中在一台机器上。通常对等网络往往缺少组织性和足够的安全控制。客户机-服务器结构经常用于大型局域网和/或对安全性要求很高的局域网中。在客户机-服务器网络中，服务器控制网络的访问和网络的资源。客户机向服务器请求资源，服务器向客户机提供资源。从大型机到 PC 机，服务器的复杂程度各有不同。从 PC 机到显示终端（DTs），客户机的复杂程度也各不相同。客户机-服务器网络提供强大的中央安全控制，集中进行文件的组织和存储，并对数据的保护集中化。与对等网络相比，客户机-服务器网络需要更多的集中管理和专门管理。

测试：应试技巧

计算机水平考试历年英文试题

I.	1 3 3 2 1	II.	4 6 5 5 3
III.	1 1 5 4 3	IV.	4 7 2 8 1
V.	2 1 4 1 2	VI.	3 1 2 1 2

参考译文

第 1 课　计算机概述

课文　计算机是如何工作的？

计算机最简单的定义就是一种对信息（有时也称为数据）进行操作的设备。信息可以也的确是表现出多种形式。每一次使用计算机的时候都能够看到这些不同的形式。在键盘上按键所传送的符号，保存在硬盘中的文件——所有这些都是计算机所处理的不同类型的信息。

1．数字信息和模拟信息

有两种方法来表示信息。所谓连续的信息，就是可以用无穷数集来表示的信息，也就是常说的模拟信息。例如时间、温度、汽车的速度——这些都具有连续的数值范围。例如，当你说外面的温度是 55 度时，事实上可能是 55.12492 度，或任何在 55 度和 55.12492 度之间的数值。

数字信息只限于用有穷数集表示。例如，交通灯一般是红色、黄色或绿色，而不是“黄绿色”或橙色。计算机采用的是一种称为二进制信息的数字信息形式。这种信息只能取两个数值：0 或 1。计算机之所以使用二进制信息有如下几个原因：

简明性：二进制信息是描述某事物的一种最简单、最严谨、最明确的方式：例如用 0 来代表关，1 代表开，就可以表示一个正常电灯泡的状态。

扩展性：二进制信息很容易创建和扩展：你可以用两个二进制数值来表示两个电灯泡的状态。

明确性：如果一个数值只能用 0 或 1 表示，就会减少错误；计算机知道 0 和 1 之间不会再有其他值，当电信号出错时，这一点就很有用处。如果一个 0.95 数值出现在你的调制解调器线路中，因为 0.95 不是一个有效值，计算机就会知道该数值可能是 1。它就会将 0.95 作为 1 进行译码，于是就不会丢失数据。

速度：计算机每秒钟要进行上百万次的决策，如果数值小，这些决策就会容易些。

尽管数字信息经常用二进制形式来表示，但并不需要一定如此。一个典型的例子就是小型光盘数字音响系统，在该系统中，声音信息是按照数字样本进行存储。数字取样的优点就是每一次读取的信息都是相同的，因此就不会像传统的磁性模拟存储材料那样，随时间推移会出现音质有所下降的现象。

2．计算中的数字符号

人类用十进法来表示数字：即每一位数字可以是 0 到 9 这十个值中的一个。当然二进制信息只能使用 0 和 1。就象对于一般数字，你从 0 开始数到 9，然后再重新将 9 置为 0，并在“十”位上加 1，对于二进制信息，你从 0 数到 1，然后再重新将 1 置为 0，并在“二”位上加 1。所以二进制计数就是如此进行：0, 1, 10, 11, 100, 101, 110, 111, 1000 等。二进制数的每一位数字就是一比特，所谓比特（bit）就是二进制位（binary digit）的缩写。

二进制数 111 就等同于十进制数 7。这是怎么回事呢？就比如十进制数 111 指的是 100（10 的二次幂）加 10（10 的一次幂）加 1，那么二进制数 111 就指的是 4（2 的二次幂）加 2（2 的一次幂）加 1，也就是 7。正如你可能观察到的，二进制数可能会非常长。例如十进制数 181 用二进制表示就是 10110101。这可能会非常麻烦，大的数字经常要用 32 位、64 位、或更多位来表示。

二进制数字的一种速记方法就是十六位记数法。每一位可以取 0 到 15 之间的任何一个数值。既然 16 是 2 的四次幂，四个比特位可以表示 0 到 15 之间的一个数值。这意味着四个二进制数位等价于一个 16 进制数位。因此二进制数 10110101 可以分成两组，每组是四位，即 1011 和 0101。这两组数字各自是 11 和 5，因此二进制数 10110101 用十六位法表示就是（11）5。

当然你能够发现这里有个问题：在我们的语言中只有 10 个不同的符号来表示数字，但是十六进制需要 16 个符号！在一个数位上采用（11）的表示方法是很容易混淆的。为了回避这个问题，十六进制数字用字母 A 到 F 来表示 10 到 15（0 到 9 当然还是用 0 到 9 来表示）。因此我们在十六位记数法（或简写成 hex）中用“ B5 ” 而不是（11）5 来表示十进制数字 181。

有时候单凭观察是很难区分十进制数和十六进制数：如果你只看到“ 44 ”，这究竟指的是 44（十进制数“ 44 ”），还是 68（十六进制数“ 44 ”）呢？为了解决这个问题，我们用两个普通的符号来表示十六进制数。第一个是小写字母 h 作为后缀。第二个是前缀“ 0X ”。所以“ 十六进制数 B5 ”，“ B5h ”，以及“ 0XB5 ”都表示同一个意思（当然显得有些多余的“ 0XB5h ”也是同一个意思）。八个比特位，或两个十六进制数位，就叫做一个字节。“ B5h ”就是一个字节的信息。当我们用多少信息来表示某事物时，通常就采用字节，这是因为在大多数情况下一个字节就是一个字符。你在屏幕上所看到的每一个字符都是用一个字节表示的（大多数情况下），这些字符都是 ASCII 字符集的一部分。

计算机地址一般用十六位记数法来表示。例如，计算机与打印机进行通话的 I/O 端口地址通常是 378h。请注意“ h ”是如何帮助你来辨别出这是一个十六进制数，而不是十进制数“ 378 ”。

阅读材料 A　个人数字助理（PDAs）

概述

20 世纪 80 年代，没有任何人可以去任何地方都不随身携带备忘记事本的。到 20 世纪 90 年代末，这种备忘记事本已经被具有相同作用的数字产品——个人数字助理（PDA）所取代。PDA 实际上是一种手持式个人计算机，它的那些用皮革包边的先辈们，如地址簿、记事本、电话簿等，所能处理的所有正常任务，PDA 都可以实现。然而，大多数 PDA 还另外提供了很多其他的应用程序，如电子工作表、字处理程序、数据库、财务管理软件、时钟、计算器和游戏等。

对于很多的个人计算机用户来说，PDA 的魅力就在于它能够在手持设备和桌面电脑之间交换数据，并对现有的应用程序进行数据的输入和输出——换句话说，就是可以使数据在移动和桌面环境下实现同步。早期通过串行电缆来进行内部连接。现在的 PDA 可以通过红外端口或特殊的坞站来进行连接。

PDA 在商业领域中受到欢迎并不难理解。体积小、易携带以及高科技含量使它总可以保持巨大的吸引力。有些时尚的用户追求最时髦和功能最强的新发明，对于他们而言，PDA 是 90 年代手机等其他商业必备品的一种正常的附属品。PDA 的功能不断增强，在企业界也引起了越来越浓厚的兴趣。在一些应用环境下，如果所要求的是简单的数据操作以及基本的互联网接入能力，PDA 则是一个很具有吸引力的选择。

由于体积大小所限，向 PDA 输入数据需要一个很小的键盘或者某种形式的手写识别系统。前者

的问题是键盘太小，以致于无法按指法来进行键入。后者的问题则在于难以有效地进行识别。Graffiti手写系统则解决了手写识别的问题。该系统的数据输入依靠触摸屏和一种简化的字目表，该字母表只需 20 分钟左右就可以掌握。通常，带有 Graffiti 系统的 PDA 提供了直接写入显示屏的选项，该选项可以将输入的内容转换成文本，或者开启某一指定的写入区，在该区域中，也可以提供在线的样例和帮助。

最终的结果就是，到 90 年代末，PDA 市场在两种主要类型的用户之间进行划分；有键盘的设备和基于触针、手掌大小、不带键盘的设备。用户根据个人的喜好以及所需功能的层次来进行选择。

到 2001 年末，对具有内置键盘的 PDA 设备的需求大幅度减少，除了 Psion，几乎很少有厂家支持这种类型。看来消费者不愿意用与买一台功能更强大用途更广的低端笔记本产品同样的价格，来买一部具有键盘的 PDA。这种 PDA 受欢迎程度下降的另一原因就是掌状大小的 PDA 在内置键盘上的发展。

手写识别

像 PDA 键盘那样，在空间有限的地方，打字会很慢，也很令人沮丧。将数据写入 PDA 很明显是一个更明智的想法，但是要使手写识别行之有效，则会非常复杂。

问题是矢量的线条形状不能形成文字。例如，画一个房子和画单词“womba”的形状，这两者的区别是什么呢？当然人眼会将一个看成是图形，而另一个则是单词。计算机可以采用两种方法来解决这个问题。容易的方法就是 Graffiti 识别系统所采用的方法。该系统将每个字母的形状都理解成该字母的一个惟一图形，并将每一个形状转换成相应的字母。而不必去试图理解词的含义或上下文。为了更方便使用，Graffiti 采用了一些特殊的字符形状，系统的使用者必须要掌握这些字符形状。

Newton 所采用的方法试图实现更强的功能。Newton 试图辨别用户的书写内容，并将其转化为文字。它基于一些标准的供测试用的手写体和一些具有交互性的辅导资料，来设法“学会”用户书写的方式。随着系统可以识别出越来越多的用户书写风格，该方法也越来越有效。利用 Newton 系统，就可能创建多用户的书写个性，因此要确保 Newton 对特定用户总使用正确的书写个性，以免知识库被“污染”，这一点非常重要。

苹果对牛顿来说是关键因素，但不幸的是，Newton 对 Apple 公司而言却是一个代价很大的错误。由于它过分夸大事实，由于它在解决手写识别问题上大胆但最终却以失败告终的尝试，Newton 将会被人们记住。另一方面，Graffiti 方法的成功，也带来了其他开发商的效仿。

最初，基于 Windows CE 的袖珍型个人计算机平台提供了两种数据输入的方法，一种是通过软件盘来进行录入，或对于那些更愿意用铁笔来进行书写的用户，可以通过字母识别/转换应用程序来输入数据。如果选择前者，就会出现传统的标准键盘形式的字母表，只要用铁笔点击所需要的字母，就可以将其输入到文档窗口中。后者可以识别出用铁笔书写的字母，并支持快速数据录入的单词识别。而且还允许将全部单词用剪切和粘贴的方法进行移动。后来的袖珍个人计算机 2002 版本则增加了两种新的文本输入的选择：支持掌型 Graffiti 系统的块识别器和可以识别草书的转换器。

第 2 课　硬　件

课文　计算机硬件概述

许多人在考虑购买计算机硬件的时候，都会感觉到不同程度的眼花缭乱。决定购买哪种硬件已经够麻烦了，而硬件制造商对市场的竞争不仅没有使硬件的选购变得清楚明了，反而使其变得更加难以抉择。在选择计算机硬件的时候，记住几条原则是很有帮助的。首先，计算机只是将一些部件安装在一起，这些部件是根据行业标准来进行设计的，因此它们很容易被集成在一起，从而形成计算机系统。不同公司生产不同的部件（如硬盘、中央处理器和磁盘驱动器等），不同厂商所生产的同一种部件的质量也是参差不齐。通常，品牌机的部件很少是由该公司生产的——该公司使用其他厂家生产的部件，并将自己的商标贴在机箱上。

在选购计算机时，购买者应该仔细查看，确保计算机里面都是高质量的部件。经过几年的使用后，质量低劣的部件更有可能出现故障。如果一个关键部件有问题，那么计算机在该部件被更换的过程中，可能会有几周都无法使用。如果出现故障的部件已经不再使用，并已停销，则计算机通常要用新部件来重新进行组装。如果硬盘出现问题，则硬盘里的内容就会丢失。尽管品牌机里面往往都是高质量的部件，但也并不总是如此。购买者最终一定要确保计算机里面是高质量的部件。

计算机用户一般都希望计算机在特定应用环境下具有良好的性能（例如速度快）。低速计算机可能会极大的降低用户的工作效率。在单机（非联网）应用环境下，计算机的性能很大程度上是由三个计算机部件所决定：CPU，随机存取存储器（RAM）和计算机显示器。

CPU

CPU 通过处理计算机的指令来进行工作，就好像汽车发动机利用燃料来产生动力。CPU 的性能是以处理器每秒可执行的最大指令数（MHz）来进行衡量的。1 MHz 等于每秒一百万个指令周期。现代 CPU 速度快得让人难以置信。如果 CPU 的运行速度等于或高于 350 MHz，即使再提高速度，大多数用户并不能感觉到太大的区别。当然，区别是存在的，但是很小，不太明显。在语音识别环境中，CPU 的速度则非常重要，但是即使 CPU 的速度达到最大，仍然不能使大多数的语音识别软件正常运行。

RAM

操作系统、应用程序和文件在使用前都必须从磁盘移到 RAM 中。计算机 RAM 的大小很大程度上决定了在不降低计算机性能的前提下，能够同时运行的程序数量。RAM 的大小以 MB 为单位。1MB 等于（大约）100 万字节。一字节存储 1 个字符（如一个字母或一个数字）。许多程序都非常消耗内存——它们占用了大量的 RAM， 而且当其他程序需要的时候也不会释放内存空间。RAM 速度对决定计算机整体速度也有一定影响，但一般不如 CPU 速度重要。RAM 速度以纳秒为单位。目前，有三种类型的 DRAM（动态随机存取存储器）被用于计算机中：EDO（扩展数据输出） DRAM，SDRAM （同步 DRAM）和 RDRAM （内存总线 DRAM）。

EDO DRAM 是三种类型中最便宜但也是速度最慢的，大多用在老式计算机中。RDRAM 是三种类型中速度最快也是最贵的。当计算机的 RAM 利用率接近 100%时，计算机的整体性能就会突然急剧下降。在这种情况下，用户有三种选择：用户可以再增加 RAM，用户可以关闭某些程序，或者

用户可以继续缓慢的进行操作。目前，RAM 价格已相当便宜，如果在 RAM 上吝音，则是不明智的。今天，计算机的选购者应该仅考虑购买那些至少提供 128M RAM 的机器。

计算机显示器

在用户对计算机的操作中，三种显示器特性对使用效果起着很大的决定作用，对用户的工作效率可能也有着重要的影响。这三种特性是：屏幕大小，像素点和刷新率。

屏幕大小按对角线来进行测量，以寸为单位。对一定的屏幕分辨率，较大的屏幕可以使用户不必滚动屏幕就可以看见一个文件的更多内容。较低的分辨率可以有效地应用在较大的屏幕上，这有利于那些近视的用户，并可以使用户从较远的距离来看屏幕上所显示的内容。

显示器产生彩色像素点，我们的大脑给这些像素点一定的意义（如曲线、线、字母和数字）。像素点以毫米为单位，表示屏幕上相同颜色的磷光点之间的对角线距离。一般来说，间距越小，显示效果越好（例如 0.22mm 就比 0.28mm 好）。

刷新率表示显示器每秒钟重复显示屏幕图像的次数。刷新率以赫兹（Hz）为单位。1 赫兹等于每秒钟重复显示一次。显示器的刷新率经常取决于显示器目前使用的分辨率。较高的刷新率要比较低的刷新率好。如果刷新率太低，屏幕则会出现非常明显的闪烁，这通常会妨碍用户正常使用并使其感到疲劳。在荧光灯下闪烁现象往往会更加明显。

阅读材料 A　主板

主板是电脑中主要的电路板，其上安有处理器、内存和扩展槽，并直接或间接地与电脑的各个部件相连。主板包括芯片、ROM 中的一些代码以及各种不同的内部连线或总线。今天的电脑设计使用了不同的总线来连接各种不同的部件。多位、高速总线很难生产，其成本也很高：信号在这样的速率下传送，即使仅是几厘米的距离，也会产生同步的问题，同时电路板上的金属轨道还充当了微型无线电天线，传送电磁噪音，从而对系统其他地方的信号产生干扰。由于这些原因，电脑设计工程师试图将最快的总线安装在主板上最小的区域里，其他部分则使用速度较慢，但抗干扰性较强的总线。

发展

最初电脑的集成设备的数量相当少。其他的任何部件，包括显示适配器、软盘或硬盘控制器，都是附加部件，通过扩展槽进行相连。

随着时间的推移，更多的设备被集成到主板上。然而这种趋势发展缓慢，直到 1995 年，输入/输出端口和磁盘控制器还经常安装到扩展槽上。其他部件——主要是图形、网络、SCSI 和声音设备——通常是保持独立的。许多厂商曾尝试过不同程度的集成，将一些甚至全部这些设备都安装在主板上。然而，缺点也同样存在。如果被集成的部件不能被移动，则很难升级产品规格，而且高度集成的主板经常需要非标准机箱。另外，更换一个有故障的部件也许意味着要买一个完全新的主板。

因此，为了便于更换，系统中那些规格变化较快的部件——RAM，CPU 和图形设备——往往依然安装在插座或插槽上。同样道理，并不是所有用户都需要的部件，如网络设备或 SCSI，则通常按照基本规格留在主板上，以降低成本。

主板的发展主要在于将关键的部件与速度慢的部件分开。随着高速设备的出现，这些设备用较快的总线进行连接——而速度较低的总线则降为只起支持的作用。在 90 年代末，也有趋势要将外部设备设计成集成芯片，直接安装到主板上。最初这只限于音频芯片和视频芯片，但后来用这种方式

集成的外部设备越来越多样化，包括 SCSI，LAN，以及 RAID 控制器等。这种方法在降低成本的同时，最大的缺点就是对未来升级的限制。

BIOS

所有的主板都包括了一小块的只读存储器 ROM，它与用于载入和运行软件的主系统内存分离。ROM 中装有电脑的基本输入输出系统（BIOS)。这有两个优点：在 ROM BIOS 中的代码和数据在每一次计算机启动时不需要再重新载入，这些代码和数据不会被写入内存错误位置的应用程序所破坏。可以升级的快擦写 BIOS 可以通过软盘进行升级，从而可以确保将来与新的芯片、扩充卡等相兼容。

BIOS 包含有几个独立的例程，分别执行不同的功能。机器一旦通电，第一部分例程就开始运行。该例程对计算机进行检测，来确定计算机所安装的硬件，然后再进行一些简单的测试，检查是否一切运行正常——该过程叫做通电自检。如果有任何外部设备是即插即用型，则在这个时候 BIOS 要为它们分配资源。BIOS 还提供了可以进入到安装程序的选项。这就允许用户来告诉电脑要安装哪个硬件，但是由于有了可以自动自配置的 BIOS，这个选项现在并不经常使用。

如果所有的测试都得到通过，ROM 就要设法确定要从哪个驱动器来启动机器。大多数装有 BIOS 的电脑先开始检测软盘驱动器中是否存在操作系统，然后再检测主硬盘驱动器。现在所有的 BIOS 都允许将软盘驱动器在检测列表中向后移，从而可以将正常的启动时间减少几秒钟。为了适应装有可启动光盘的电脑，一些 BIOS 还允许将光驱指定为启动驱动器。一些 BIOS 也允许不从主 IDE 驱动器启动，而从硬盘驱动器启动。在这种情况下，可能在不同的驱动器上有不同的操作系统。如果没有检测到可以启动的驱动器，就会显示一条信息，表明计算机系统需要一个系统盘。一旦机器启动，BIOS 就有了不同的用途，显示具有针对电脑硬件的标准应用程序编程接口的 DOS 系统。在 Windows 以前，这是一个非常重要的功能，但是 32 位的“保护模式”软件不使用 BIOS，因此今天这个功能的用途就更少了。

Windows 98 （以及以后的版本）提供了多种显示支持。因为大多数电脑只有一个 AGP 插槽，想要利用这个插槽的用户一般还要在 PCI 插槽中再安装一块图形卡。在这种情况下，大多数 BIOS 在缺省情况下将 PCI 卡作为主图形卡。但是也有一些 BIOS 既允许将 AGP 卡指定为主图形卡，也允许将 PCI 卡指定为图形卡。

PCI 接口可以使共享 IRQ 更加容易，这对解决电脑中可用 IRQ 设置数量有限的情况有一定帮助，但对许多用户而言这仍然是一个问题。因此，大多数 BIOS 允许将不被使用的端口设置为禁用。随着电缆和 ADSL 互联网连接越来越流行，使用 USB 接口的外部设备也越来越多，常常有可能不需要串行或并行端口来进行连接。

第 3 课　操作系统

课文　分页

基本思想

将物理内存分成大小相同的若干块（称为页帧）分配给进程。将应用程序的地址空间分成大小相同的若干块（称为页）。页和页帧的大小相同。将页存在页帧中。当进程产生一个地址时，就会动

态地将其转换为存储该页数据的物理页帧。

因此，现在一个虚拟地址就包括了两个部分：页号和在该页中的偏移量。页的大小一般是 2 的乘方；这就简化了对页号和偏移量的提取。要存取某一指定地址的数据，系统会自动执行下列操作：

提取页号。

提取偏移量。

将页号转换为物理页帧的序号。

在物理页帧的偏移量处存取数据。

系统如何进行转换

最简单的解决方法：采用一个页表。页表是以虚拟页号为索引的单列数组，通过该数组，就可以找到包含有该页的物理页帧。

- 怎样进行查表？

提取页号。

提取偏移量。

检查页号是否在进程的地址空间。

在页表中查找页号。

将偏移量与得到的物理页号相加。

访问内存中的相应位置。

注意：处理器需要访问两次物理内存，才相当于以前访问一次内存。

- 利用高速缓冲存储器来加快查找过程。

将最近查找的几页内容放在快表中。快表设计可以有如下选择：完全相关、直接映射、成组相联等等。

- 现在如何进行查表呢？

提取页号。

提取偏移量。

在快表中查找页号。

如果该页号在快表中，则将偏移量与物理页号相加，来访问内存中的相应位置。

如果不在快表中，则对操作系统设陷，操作系统查找物理页号，并将转换结果放入快表中。再重新开始执行指令。

进程如何共享内存

操作系统将页表指向同一个物理页帧。对快速进程间通信机制是很有效的。这种方法非常好，因为它可以实现高速的透明共享。

保护措施如何

- 有多种不同的保护措施：

防止一个进程读取或写入另一个进程所在的内存单元。

防止一个进程读取另一个进程所在的内存单元。

防止一个进程读取或写入它自己所在的内存单元中的某部分。

防止一个进程读取它所在的内存单元中的某部分。

- 这种保护措施如何与上述方案结合在一起？

防止一个进程读取或写入内存空间：操作系统拒绝创建从虚拟地址空间到包含受保护内存单元的物理页帧的映射。如果程序试图访问这个内存单元，操作系统往往会产生一个错误提示。如果用户进程获得该提示，就会采取措施来解决这个问题。

防止一个进程写入内存单元，但允许进程读取内存单元：操作系统在快表的表目中设置一个写保护位。如果进程试图要写入内存，操作系统就会产生一个错误信息。但是，读操作则会畅通无阻。

虚拟存储器简介

当分段系统需要更多内存时，它将某些段换回到磁盘上，需要的时候再换回内存中。分页系统与此类似，只是以页为基础。

基本思想：当操作系统需要一个物理页帧来存储一页时，如果没有空闲页帧，它就会选择一页并将其调出存储到磁盘上。然后就可以使用新增的空闲页来存储新页了。

阅读材料 A　实用 Unix 命令

ls 命令的高级应用

通过在 ls 后面加上不同的字母（称为选择项或命令行参数），你可以获得当前目录的更多信息。例如：

```
[username@mysite]$ ls -l
```

将会以长列表格式进行显示，包括了每个文件的权限、所有者、所在组、大小和修改日期：

```
drwxrwxr-x    3 matt    users    4096 Jun 27 17:17 images
-rw-rw-r--    1 matt    users    228 Jun 27 19:29 index.html
-rw-rw-r--    1 matt    users    272 Jun 27 19:30 index2.html
```

选择项 a 还包括了隐藏文件（在 UNIX 中，隐藏文件在列表中以 . 开头），以及当前目录项和父目录项（分别是 . 和 ..）。而且，你可以将这些选择项组合起来，将它们连在一起使用。例如：

```
[username@mysite]$ ls -al
drwxrwxr-x    3 matt    users    4096 Jun 27 19:32 .
drwxrwxr-x    5 matt    users    4096 Jun 27 17:09 ..
-rw-rw-r--    1 matt    users    23 Jun 27 19:31 .hidden_file
drwxrwxr-x    3 matt    users    4096 Jun 27 17:17 images
-rw-rw-r--    1 matt    users    228 Jun 27 19:29 index.html
-rw-rw-r--    1 matt    users    272 Jun 27 19:30 index2.html
```

用 mkdir 命令来创建文件夹

mkdir （“make directory 创建目录”的缩写）命令可以让你在 Web 服务器上创建新的目录（文件夹），与 Windows 个人计算机和苹果机的“新文件夹”选项非常相似。

要在当前目录下创建一个目录，键入 mkdir，然后再键入目录名称。例如要在你的站点上创建一个叫做 coolstuff 的新目录，你可以键入与下面类似的内容：

```
[username@mysite]$ cd mysite.com
[username@mysite]$ cd htdocs
[username@mysite]$ mkdir coolstuff
```

用 cp 命令来拷贝文件和文件夹

cp（“copy 复制”的缩写）命令可以使你将文件拷贝到新文件中，或将文件和目录拷贝到新目录中。例如，要将 index.html 拷贝到 index2.html 中，你应使用：

[username@mysite]$ cp index.html index2.html

将 index.html 拷贝到已经存在的 coolstuff 目录中，使用：

[username@mysite]$ cp index.html coolstuff

将整个目录，包括其中所有内容，都拷贝到一个新目录中，使用 cp-r 命令：

```
[username@mysite]$ ls
coolstuff     images     index.html
[username@mysite]$ cp -r coolstuff coolstuff2
[username@mysite]$ ls
coolstuff     coolstuff2     images     index.html
```

将整个目录，包括其中所有内容，拷贝到一个已经存在的目录中：

```
[username@mysite]$ cp -r coolstuff2 coolstuff
[username@mysite]$ cd coolstuff
[username@mysite]$ ls
index.html    coolstuff2
```

用 rm 命令来进行删除

rm 是用来删除文件的 UNIX 命令，有时候也可以删除目录。rm 是 “remove 去掉”的缩写。用这个命令进行删除的时候要非常小心，因为 UNIX 通常没有回收站——一旦你删除了某个文件或目录，则是无可挽救的。

要删除一个文件，用 rm 加上文件名。例如，要删除 index.html 文件，将会使用命令：

[username@mysite]$ rm index.html

要删除一个目录及其所有内容，就用 rm-r 加上要删除的目录名。例如：

[username@mysite]$ rm -r coolstuff

注意如果目录是空的，你也可以使用命令 rmdir 来进行删除，如下所示：

[username@mysite]$ rmdir coolstuff

如果用命令 rm 进行删除，尤其是使用 rm-r，最好再加上一个 -i 选择项，例如：

[username@mysite]$ rm -ir coolstuff

这样就会确保在删除文件或目录之前，系统会进行提示。

UNIX 的联机帮助手册

大多数 UNIX 服务器都会提供一种有效的联机帮助，称为 man。通过键入 man 再加上命令名称，你可以获得大多数常用命令的帮助。例如，试着键入：

[username@mysite]$ man ls

在 Linux 上阅读一页帮助的时候，你可以用键盘上的 Page Up 和 Page Down 来进行翻页，用上下箭头键来进行滚动。按 q 键，即可退出帮助文档的阅读。要查找某个文本，按正斜杠键，再键入想要查找的文字，例如 / file，然后按回车键即可。

在非 Linux 系统中，你经常需要按回车键来换行，按空格键来翻页，而且你不能滚动阅读。

运行脚本和程序

通常你会希望在你的 Web 服务器上运行一些程序，如 Perl 脚本，就如同在 Windows 的开始菜单中运行一个程序。

在 UNIX 中，运行程序非常容易——你通常仅需要键入程序名即可。实际上，我们上面所讲的所有命令都已经是程序了。

如果你想在当前目录中运行一个程序，你通常需要在程序名之前加上一个 ./ 符号，来告诉 UNIX 应在当前目录中查找程序，例如：

[username@mysite]$ ./myprog

如果你对 Perl CGI 脚本并不是很熟悉，通过从 Telnet 上的 UNIX 提示符下运行脚本程序，通常可以发现确切的错误信息，而 Web 浏览器则无法提供。比如说你想测试文件名为 formmail.cgi 的一段脚本。在提示符下，在脚本名的前面加上 perl，形式如下：

[username@mysite]$ cd cgi-bin

[username@mysite]$ perl formmail.cgi

脚本将立刻运行，就好像从 Web 浏览器调用一样，但是你会看到在 Telnet 窗口中出现了脚本的输出内容（浏览器则非如此，在浏览器中你也许只能看到一些无用的信息，例如“Internet 服务器错误”!）

拥有这些命令和技巧，你应该可以有效地管理你的站点和 Web 服务器。

第 4 课　软件工程

课文　项目管理的 10 条成功经验法则

1．项目管理者必须将重点放在使项目成功的三个方面

简单说，项目的成功意味项目的完成要准时、在预算以内，以及达到一定的质量标准，可以被出资商和合作商所接受。项目管理者必须使团队的注意力集中在如何实现这些主要目标上。

2．计划就是一切，而且要不断地发展

所有与项目管理有关的文章以及这方面的权威达到共识的一点就是：项目管理者所从事的一个最重要的活动就是计划——详细的、系统化的、涉及到整个团队的计划是项目成功的惟一基石。当现实世界的一些事情导致计划有所改变，项目管理者必须制定出新的计划来反映这些变化。

3．项目管理者必须有一种紧迫感，并使团队成员有同样的感觉

项目是一种有一定限制的活动，时间、资金和其他可用资源都是有限的，因此必须要使项目不断运作下去来保证完成。由于大多数团队成员都有许多其他优先考虑的事情，项目管理者有责任来使他们集中于应交付的项目内容和最终期限。经常检查项目进行情况、开会和提醒是很有必要的。

4．成功的项目采用经受时间考验的，经过验证的项目生存周期

好的模型可以使我们的项目计划含有最好的实践经验。这些模型不仅有助于项目质量的保证，还可以帮助将重做的几率降低到最小。因此当时间和预算的压力要求必须走捷径时，就要由项目管理者来确定和维持工作所需的最好的项目生存周期。

5．所有的项目内容和活动都必须具体化，并详细而清楚地进行传达

简而言之，项目管理者和项目团队必须在早期就要使每个相关的人都对项目最后要交付的内容在脑海中有一个清楚的概念和描绘，从而将全部的精力都集中在同一个方向。无论如何都要避免含糊的描述，要对项目清楚地进行说明，用图来表示，设计样品，并确保所有的人赞成。

6．项目必须要逐步地进行，不断接近最后目标

用两只脚跳着前进，一开始就要着手进行所要交付的所有项目内容，这样做只会将太多的时间都耗费在重做上。一次做一点，不断接受审核和认可，使项目的进展处于控制之中。

7．项目的成功与对项目任务需求的详尽分析有关

我们的研究表明，如果项目最后所交付的内容是按照文档化的详尽的项目需求来设计的，则更有可能使项目获得成功。因此管理者一定要在对项目有一个文档化的商业需求后，才可以同意利用在编的资源来实现需求。

8．项目管理者必须争取时间来将事情做好

在我们与项目管理者共事的时候，我们经常会听到这样的抱怨："我们总是似乎有时间来完成项目；我只是希望我们花些时间一开始就将事情做好。"项目必须应该有足够可用的时间来"第一次就将事情做好"。项目经理必须向出资商和高层领导证明为什么多些时间是有必要的，以及如何利用这段时间来保证最后的质量，通过这种方式来争取这个时间。

9．项目管理者必须责权相当

项目管理者只对项目结果负责是不够的；必须要求和得到足够的授权来履行他们的责任。明确的说，管理者必须有权获取和协调资源，以及做出适当且有约束力的决策，该决策对项目成功有一定影响。

10．项目管理者必须尽可能的吸收最好的人才

通过吸收最好的人才——最有技能的，经验最丰富的，最能干的——项目管理者通常可以弥补时间或资金的紧缺或其他对项目的限制。对于这些重要的团队成员，项目经理应该大力支持他们的工作，来帮助他们免于外界的干扰，并帮助他们获得那些有利于施展才华的工具和工作条件。

阅读材料 A　典型的测试错误

在测试的时候，你必须要先决定如何来运行程序，然后再付诸于行动。实际运行的过程要比决定如何运行的过程有趣得多。测试者急于执行程序与编程人员急于写代码一样强烈——而且造成同样的后果：设计工作草率行事，质量上受到了影响。更重视测试本身而不是设计测试过程，这是一个典型的错误。如果一个测试者做事没有条理性，没有提前花时间来设计各种可能性，就会忽略一些特殊情况。这些特殊情况也可能是编程人员所忽视的细微之处。

将全部重点都集中在执行过程，也会导致无法对测试设计进行复查。就像编程人员一样，测试者也可以受益于第二双眼睛。对测试设计的复查没有必要像对产品设计复查一样的精细，但是对测试方法与其相应测试结果进行简单的核查，可以用较低的成本来发现重要的疏忽之处。

什么是测试设计

测试设计应该描述如何进行设置、如何向产品输入数据，以及对期望结果的描述。一个普遍的

错误是测试的输入和执行过程过于具体化。

假设你正在测试一个银行的应用程序。这里有两种可能的测试设计方案：

设计方案 1

设置：将账户 12 的余额初始化为 100 美元。

过程：

启动程序。

在账户窗口中键入 12。

按 OK。

单击“取款”工具栏按钮。

在弹出的对话框中，单击“所有”按钮。

按 OK。

期望看到一个进行确认的弹出对话框，写着“你要从这个账户提取所有的钱，继续？”

按 OK。

期望在账户窗口中看到余额为 0。

另外再查询数据库，看是否已将余额登记为 0。

用“文件”菜单中的“退出”命令来退出程序。

设计方案 2

设置：将余额初始化为一个正数。

过程：

启动程序，进入已经初始化的账户。

单击“全部”按钮，从该账户中提取所有的钱。

如果没有出现进行确认的弹出对话框，交易却已完成，这就是一个错误。

接着应立刻：

——期望显示余额为 0。

——另外再查询数据库，看是否已将余额登记为 0。

第一种设计风格有这些优点：

- 测试总可以用同样的方式进行。错误更可能再现。对编程人员也是如此。
- 它将所有要检查的重要的期望结果都进行了详细的说明。对期望结果的含糊说明将会使错误难以发现。例如，使用第二种方法的测试者将会发现很容易忽略了确认框的拼写错误，甚至不能发现这是个错误的弹出框。
- 与第二种方法不同，你总能非常明确地知道你已经测试的内容。而在第二种方法中，你无法确定你是否通过工具栏进入了“取钱”对话框。也许总是使用菜单，也许工具栏按钮根本无法使用。
- 通过清楚的说明所有的输入内容，第一种方法可以防止测试者总是使用简单的数值。例如，测试者可能总测试余额为 100 元的账户，而不是采用或小或大的不同余额（任何一种方法都应该包括对临界值和特殊值的明确测试）。

然而，第一种方法也有一些不足：

- 第一种方法的设计成本更高。

● 对用户界面必然要有一些细小的变化，这就会破坏该方案，因此维护成本也很高。
● 因为每一轮测试都是完全相同的， 所以就没有机会由于操作过程的不同而偶然发现一个错误。
● 对测试者而言，很难完全按照操作过程来进行。当一名测试者出现操作上的失误——例如按下错误的按钮——难道她真的要重头开始操作么？

与对测试过程进行细化相比，对期望结果进行细化所出现的问题会少一些，但是过多的细节会使测试者太专注于按照他所遵循的测试方案进行检查。这可能会产生另一类的典型错误：没有注意和探究“ 不相关 ”的怪现象。好的测试者善于注意到“ 古怪的现象 ”并进行相应的测试。

第 5 课　数据结构

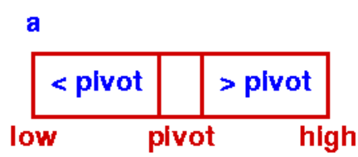
课文　快速排序

快速排序是由 C.A.R. Hoar 发明的一种非常有效的排序算法。它包括两个阶段：划分阶段和排序阶段。

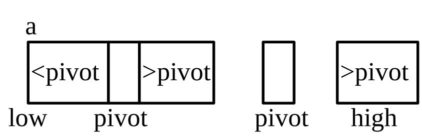
正如我们将要看到的，大多数工作都是在划分阶段完成的，它决定在何出划分的问题。排序阶段仅仅解决了在划分阶段所产生的两个较小的问题。

这就使快速排序成为分治法策略的一个很好的例子。在快速排序中，我们将要排序的数组元素划分为两个区域，然后递归地调用快速排序过程分别对两个区域进行排序，也就是我们将问题“ 分 ”为两个较小的部分，通过解决这两个较小的问题来实现排序。因此，快速排序例程的主程序部分就与此相似：

```
quicksort( void *a, int low, int high )
  {
  int pivot;
  /*Termination condition! */
  if ( high > low )
    {
    pivot=partition(a,low,high );
    quicksort(a,low,pivot-1 );
    quicksort(a,pivot+1,high );
    }
}
```



Initial Step—First Partition



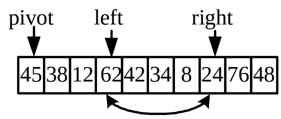
Sort Left Partition in the same way

为了使该策略生效，划分阶段必须保证一部分的所有元素（低端）都小于另一部分（高端）的所有元素。

为此，我们选择了一个基准元素，并进行排列，使较小部分的所有元素都小于基准，较大部分的所有元素大于基准。在多数一般情况下，我们对要排序的元素一无所知，因此可以选择任何基准元素——选择第一个元素就很方便。

在适当的地方进行划分

大多数快速排序的实现都利用了一个事实，即可以通过设置两个指针来实现在适当的地方进行划分：一个指针从左端向里前进，而另一个指针则从右端向里进。它们向中间移动，直到左指针发现了一个大于基准的元素，右指针发现了一个小于基准的元素。然后交换这两个元素。这两个指针于是继续向里移动直到它们交叠到一起。基准于是就交换到右指针所指向的位置，划分就此完成。




```
int partition( void *a, int low, int high )
    {
        int left, right;
        void *pivot_item;
        pivot_item = a[low];
        pivot = left = low;
        right = high;
        while ( left < right ) {
        /* Move left while item < pivot */
        while( a[left] <= pivot_item ) left++;
        /* Move right while item > pivot */
        while( a[right] > pivot_item ) right--;
        if ( left < right ) SWAP(a,left,right);
        }
        /* right is final position for the pivot */
        a[low] = a[right];
        a[right] = pivot_item;
        return right;
    }
```

注意到以上的代码并没有对左指针不能超越数组界限进行检查。你需要在进行交换之前加上这个检查——既包括循环内的交换，又包括最后的循环外的交换。

划分保证了所有小于基准的元素都在基准的前面，并返回基准的位置。这就符合了我们对问题进行划分的条件：所有低端的元素都小于基准，所有高端的元素都大于基准。

阅读材料 A　链表

链表

链表是一种非常灵活的动态数据结构：可以任意向表中添加元素或从表中删除元素。在链表中，当每一个元素添加到表中的时候，就被分配给相应的存储空间。每一个元素与表中的下一个元素用“链”连接起来。

表中的每一个结点都包括两个部分：存储在表中的元素和指向表中下一个元素的指针。表中的最后一个结点包含了一个空指针，表明该结点是表的终端或表尾。

当向表中增加结点的时候，就会动态为结点分配存储空间。因此可以向表中添加元素的个数仅受限于可用存储空间的大小。

循环链表

通过使表尾结点总是指向表头结点，我们就能创建一个循环链表。如果外部指针指向当前的表尾，那么通过 tail->next 就可以找到表头，从而使我们只需要一个外部指针就可以得到 LIFO 或者 FIFO 表。

双链表

双链表既有指向前趋结点的指针，又有指向后续结点的指针。它们允许在两个方向对表进行扫描和查找。许多应用程序都需要对表的某部分向前或向后查找：例如，在一个韩国的电话号码簿中，如果查找“Kim”之类普通的名字，就可能需要在整个表的一个小范围内向前和向后进行查找，因此反向链就很有用处。在这种情况下，改变结点结构，使它有两个链域：

```
struct t_node {
    void *item;
    struct t_node *previous;
    struct t_node *next;
    } node;
```

数组中的链表

尽管这似乎是没有意义的，然而这正是内存分配程序管理可用存储空间所采用的手段。内存就是以字为单位的数组。在对存储空间进行一系列分配和再分配后，在可用的堆空间里，到处都有空闲的内存块。为了能够重新利用这种内存块，内存分配程序在内存块中，写入指向下一个空闲块的指针，通过这种方式将空闲块链接成空闲表。外部空闲表指针指向空闲表的第一块。当需要一个新的内存块的时候，分配程序通常对整个空闲表进行扫描，查找具有合适大小的空闲块，并将它从空闲表中删除（在被删除的空闲块周围重新链接空闲表）。

第 6 课　网　络

课文　网络概览

第一代网络是利用大型机及与其相连的终端所构成的分时网络。IBM 的系统网络体系结构和 Digital 的网络体系结构都实现了这种网络环境。局域网随着 PC 革命而获得发展，它提供了高速、容错的数据网络，覆盖了一个相对较小的地理区域，或局限于一栋楼或一个楼群。局域网向与之相连的用户提供了对设备和应用程序的共享访问，并允许他们通过电子邮件来交换文件或进行交流。广域网覆盖了较广的地理区域，通常使用电话公司等公共电讯公司所提供的传输设备，将许多局域网连接在一起。

局域网和广域网构成了网络的绝大部分——事实上，Internet 可以被看成现有的最大的广域网

——根据许多不同的特性，可以将网络分为许多种不同的类型：

拓扑结构：计算机系统在地理位置上的布局。一般拓扑结构包括总线形、星形和环形结构。

标准/协议：规定了计算机在网络上进行通信交流的一套通用的规则和符号。以太网和令牌环网就是网络布线标准的典范，而 TCP/IP 则是主要的网络通信协议。

体系结构：网络可按使用对等结构或客户机/服务器结构来进行划分。

计算机有时候也被称为结点，除此之外，网络的实现还包括：

在彼此相连的计算机上安装可使其与网络进行通信的设备，这种设备通常被称为网络接口卡。

不同的专用网络硬件，包括在不同结点之间作为连接点的设备，通常指的是集线器或交换机。

连接介质，通常是电线或电缆，尽管联网的计算机之间的无线通信正越来越普遍。

OSI 模型

OSI 参考模型描述了信息如何从一台计算机的软件应用程序中通过网络介质传到另一台计算机的软件应用程序中。OSI 参考模型是一种概念上的模型，包括七层，每一层都规定了特定的网络功能。该模型是国际标准化组织于 1984 年研究制定的，目前被认为是计算机间进行通信的主要的体系结构模型。OSI 模型将传递信息所涉及到的任务分成了七个较小的、更容易管理的任务组。并为 OSI 模型七层中的每一层都指定了一个或一组任务。每一层都具有比较好的独立性，因为被指派给每一层的任务可以独立完成。这就使由某一层所提供的解决方案在进行升级的同时，不会给其他层带来负面影响。

OSI 参考模型的七层可以分为两类：高层和低层。OSI 模型的高层处理应用方面的问题，一般只用软件实现。最高层，即应用层，是最接近终端用户的。用户和应用层的进程都和含有通讯元素的软件应用程序进行交互。高层一词在 OSI 模型中，有时候也指任何在另外一层之上的一层。OSI 低层处理数据传输方面的问题。物理层和数据链路层用硬件和软件实现。最低层，即物理层，最接近物理网络介质，负责将信息放到介质中。

阅读材料 A　网络硬件

网络接口卡

网络接口卡（通常被称为 NIC）用于将 PC 机与网络相连。网络接口卡提供了网络传输介质之间与计算机内部总线之间的物理连接，并使对网络（OSI 第一层和第二层）的“访问方法”变得容易。大多数网络接口卡专门针对某一特定类型网络、协议和传输介质而进行设计，尽管有一些可以同时用于多个网络中。几乎所有的网络标准都有支持它们的网卡，包括最新的快速以太网环境。

集线器/中继器

集线器/中继器用于连接任何类型传输介质的两段或多段网络。在大型网络设计中，当某网段超过最大长度时，信号质量就开始下降。集线器对信号进行了扩大，从而使网段可以延长一段距离。无源集线器仅仅将由一个端口所收到的来自一个工作站的所有数据包都转发到集线器上所有其他的端口。有源集线器有时候也称为多端口中继器，为了维持强信号，对数据位重新进行生成。

尽管中继器可以使局域网跨越一般的距离限制而得到延伸，但它们仍然限制了可以支持的节点个数。然而，网桥、路由器和交换机则可以允许局域网凭借自身的能力获得较大范围的扩充。

网桥

网桥于 20 世纪 80 年代早期出现于商业中。最初，它们的功能是将不相连的同类网络连接在一起。后来对于在不同的网络之间的连接——例如，以太网和令牌环网——也进行了定义和标准化。网桥是数据通讯设备，主要运用在 OSI 参考模型的第 2 层。正因为如此，人们一般称网桥为数据链路层设备。

路由器

在 20 世纪 80 年代中期路由选择开始在商业中流行——当时大规模网络互联开始取代曾经一直是标准的相当简单的同类网络环境。路由选择是将信息从一个信息源通过网络传输到目的地址的行为。经常与实现相似功能的桥连接进行对比。两者主要的区别在于桥连接主要出现在 OSI 参考模型的第二层（链路层），而路由选择则出现在第三层（网络层）。这种区别使路由选择和桥连接在将信息从信息源传输到目的地址的过程中使用不同的信息，因此这两种功能用不同的方式来实现它们的任务。

交换机

局域网的交换机是局域网桥连接在概念上的扩展。它们应用于 OSI 参考模型的第二层（链路层），控制数据流量、处理传输中的错误、提供物理（与逻辑相反）寻址，以及管理对物理传输介质的访问。交换机通过使用不同的链路层协议来提供这些功能——例如以太网、令牌环和 FDDI——这些协议规定了特定的数据流量控制、错误处理、寻址以及传输介质访问算法。

第 7 课 计算机维护

课文 解决硬件问题

将计算机的各个独立的部分在脑海中分成几个组件，然后把每个组件作为一个整体进行测试。通过排除你所知道的运行正常的部件，这种方法会使你需要处理的对象在数量上最小化。

硬盘驱动器组件

硬盘驱动器组件包括硬盘驱动器、电力电缆、数据电缆、控制卡等。如果错误信息提示有硬盘故障，试按下列步骤进行操作：

关闭计算机，硬盘停止旋转大概需要等 20 秒钟直到硬盘停止旋转，然后再开机。打开计算机或正在使用计算机的时候，都可能有很小的电源电压波动。即使仅有 1/200 秒（4 ms）的电源电压波动，也会使计算机内存几个字节的内容出现混乱，使其无法正常工作。这种电压过高或过低可能是一个相当普遍的现象，取决于与计算机共用同一电路的设备数量和类型。只要重新启动计算机就可以解决这个问题。

试着用启动盘来启动计算机，看是否能访问硬盘驱动器。如果可以，那么最可能的就是有一两个坏文件，或硬盘驱动器上有坏扇区，从而导致无法正常启动。尽管这不是一个普遍的问题，但的确会发生的。从这点考虑，就需要对目前没有副本的硬盘信息进行备份。接着就要试着用 SYS 命令来重新对驱动器进行初始化，但愿该命令是在你的启动盘里，在 A:驱动器下键入 SYS C:。如果该命令可行，则从磁盘驱动器中取出磁盘，然后再重新启动计算机。

如果仍出现相同的错误，则关掉计算机，打开机盖。检查连接硬盘驱动器和计算机控制器的数据电缆（大的扁平电缆）。确保插紧电缆，对连接硬盘驱动器和计算机电源的电力电缆也要进行检查。尽管这些电缆很少出现问题，尤其是电力电缆，但我已经换了一两条数据电缆了。安好机盖，再启动计算机。

如果问题仍然出现，你的硬盘驱动器可能是坏了。硬盘驱动器并不可能永远不坏。目前硬盘驱动器的平均寿命被认为是三至五年。但我曾用过一些刚安装不久就坏掉的，也有一些已经运转了10年以上。如果有另外一个可用的硬盘驱动器，就将有故障的硬盘换掉，另外，如果你正打算再给系统加一个硬盘驱动器，或者升级到较大容量的驱动器，现在可能正是好时机。

如果换一个硬盘驱动器仍然不起作用，那么就可以将范围缩小到硬盘驱动控制器。如果控制器是适配卡，就换个新的。如果控制器是内置在主板上，那么惟一的选择就是换一个主板。在后一种情况下，除非你很愿意插卸自己的计算机，否则你可能会希望当地的维修中心来替你做这件事情。

视频显示组件

视频显示组件包括显示器、连接显示器和计算机视频适配卡的电缆、视频适配卡（除非视频电路内置在主板上）。如果错误信息提示计算机显示有问题，则可按下列步骤进行操作：

如果显示器没有图像显示，首先确保正确设置亮度和对比度的调整进行正确的设置。

检查连接显示器和计算机视频输出端的电缆。我从来没有见过视频电缆出现问题，但我认为在特殊情况下那也是种可能。

如果你手边有另一台计算机，可以将出现问题的显示器与该台计算机相连，看是否能显示。如果可以，那么剩下的问题就是你计算机中的视频适配卡。打开机盖，取出视频适配卡，确保其触点清洁。重新安装适配卡，安好机盖，重新连接显示器，看是否有作用。

一些新式的显示器有一个断路器，如果电源出现问题则会断开。如果你的显示器有一个断路器或复位开关，试着重新复位看是否能解决问题。

在旧式显示器中，在显示器里的电源电路上有一个保险丝可能会发光。如果保险丝发光，则一定要用同一型号的保险丝来进行替换，不然就会对显示器中的其他电路造成破坏。

第8课　数据库

课文　Oracle 和 SQL Server 的比较选择

我不得不决定是使用 Oracle 数据库及其数据库开发系统，还是选择配有 Visual Studio 的 Microsoft SQL Server。这个决策将决定我们今后 Web 项目的方向。这两种组合各有什么优势和劣势呢？

Lori：决定选择哪种方案将取决于你目前的工作平台。例如，如果你想实现一种基于 Web 的数据库应用，而且你的工作平台只是 Windows，那么 SQL Server 和 Visual Studio 组件就是一个不错的选择。但是对于混合平台，则最好选择 Oracle 解决方案。

还要考虑一些其他的因素，例如你可以获得哪些额外的功能以及需要哪些技术。WebDB 是一种内容管理和开发工具，即使没有任何编程经验的内容创建员、数据库管理员和开发员也都可以使用这种开发工具。WebDB 是一种基于浏览器的工具，有利于方便地创建内容，以及提供导航和维护工

具。这对于已经使用 Oracle 的机构则是一个很好的解决方案。Oracle 比 SQL Server 更易于调整，但你需要身边有一个称职的 Oracle 管理员。

SQL Server/Visual Studio 方法相对来说较难使用，需要一个有经验的面向对象的编程人员或一些全面的训练。但是，你只要花上 1 619 美元就可以获得许多 Visual Studio 的开发工具：Visual Basic, Visual C++, 以及 Visual InterDev。另外，你需要再加上 SQL Server 的费用，1 999 美元就可以拥有 10 个客户端，或用 3 999 美元获得 25 个客户端——与 Oracle 的费用相比则便宜些。

Oracle 也有一个组件解决方案，根据所选择平台的不同，费用也不同，最低为 6 767 美元。Oraccle.com 套件不仅包括 WebDB 和 Oracle8i，还包括其他的开发工具，如 Oracle 应用服务器、JDeveloper 和 iWorkplace 模板，该套件与 Microsoft 方案相比能运行在更多的平台上。如果你刚创业或是一个小型或中型企业，则 Oracle 套件是一个很好的选择方案。以组件的形式购买这些工具要比单独采购的花费要少些。

对这两种方案的选择主要取决于你的技术水平、硬件资源和资金预算。我希望以上所说的能对你的决策有一定帮助。

Brooks: 我完全同意对这两种方案的选择在很大程度上取决于你目前所配有的基础设施和所具有的专门技术。如果很难做出抉择，你就需要考虑由谁来做这项工作，以及你的重点是什么。

这两种产品采用不同的方法，并反映出这两个开发商的不同特点。Oracle 是为那些优秀的程序员和项目负责人所进行的专业化开发而设计的产品。学习时间较长，该方案的费用也较高；但是如果你坚持下去，最终就会获得更好的灵活性，以及更高的可靠性。

如果你的项目时间很紧，而且你没有时间或金钱来雇佣一个花销很大、经验非常丰富的开发队伍，你也许会发现选择 Oracle 方案会很容易使你陷入困境。没有比开发一个质量很差的 Oracle 应用程序更糟糕的了。

Microsoft 所提供的解决方案则致力于快速开发和低成本实现。开发工具、服务器、以及你所需要的开发人员的花费都比较少。若要使项目快速启动，选择 SQL Server 和 Visual Studio 则是很好的方式。

当然，有得必有失。在使用 Visual Studio 和 SQL Server 的过程中，我所遇到的主要问题就是，只能使用 Microsoft 操作系统和 Intel 硬件。如果有一天你需要支持成百上千个用户，你除了购买上百个服务器而外别无他法，这会给管理带来很大的麻烦。

如果你采用 Microsoft 方法，就表明你可能只需要 Visual Interdev 即可。如果你已经知道你将开发 Visual Basic 或 Visual C++里的 ActiveX 组件，这就是一个预示，表明你需要更多的来考虑 Oracle 的解决方案。

我想强调的是，尽管这两种平台有它们各自的优点和缺点，如果你使用正确，你用任何一个都可以设计出具有世界水平的应用程序。如果你的组织倾向于某种产品，一定要跟随这种趋向。如果你是从零起点开始，就需要问问自己，你的组织是更倾向于完美主义还是实用主义，并要清楚这两种主义都有缺点。

第 9 课　人工智能

课文　人工智能基本问题

问：什么是人工智能？

答：人工智能是制造智能机器，尤其是智能计算机程序的科学与工程。人工智能与利用计算机来理解人类智能的任务相似，且有一定联系，但它并不局限于生物学所观察到的方法。

问：人工智能不就是模仿人类智能么？

答：有些时候是，但并不总是，甚至不是经常是。一方面我们可以通过观察其他人，或仅仅通过观察我们自己的方法，来了解如何制造机器来解决问题。另一方面，人工智能所涉及的大多数工作都是研究人类所表现的智能问题，而不是研究人或动物。人工智能研究者可以任意使用那些在人类身上所没有观察到的方法，或那些涉及到人类所不能及的大量计算方法。

问：人工智能都有哪些应用？

答：博弈。

你花上几百美元就可以购买大师级别的下象棋的机器。在这些机器中，就应用了一些人工智能技术，但它们之所以能够很好的与人类进行对弈，主要通过大量机械的计算——探究成百上千个位置。要通过这种强力计算和可靠的探试程序来打败世界冠军，就需要每秒钟能够探究 20 亿个位置。

语音识别

在 20 世纪 90 年代，计算机语音识别在有限的几种用途上达到了实用水平。因此联合航空公司就用一种对航号和城市名称进行语音识别的系统，来代替应用于航行信息的键盘树。这种语音识别系统非常方便。然而，另一方面，尽管有可能对一些采用语音技术的计算机发布指令，但大多数用户还是回到键盘和鼠标上，因为这两种方式仍然更方便些。

自然语言理解

仅将一连串字母输入计算机是不够的。从语法上分析句子也是不够的。需要为计算机提供对文本所涉及领域的理解，目前只在非常有限的几个领域里才有可能实现自然语言理解。

专家系统

一位“知识工程师”采访某个领域的专家，试图将他们的知识都嵌入在一个计算机程序中，从而来执行一些任务。这种方案的效果取决于该任务所需的智能机制是否是目前人工智能技术的能力所及。如果并非能力所及，就会有许多令人失望的结果。1974 设计的 MYCIN 是第一批专家系统中的一个，该系统对血液的细菌感染进行诊断，并提供治疗建议。如果能够注意到它的一些不足之处，该系统会比医科学生或实习医生做得更好些。也就是说，该系统的技术包括细菌、症状、治疗方案，但并不包括病人、医生、医院、死亡、恢复，以及随时都有可能出现的事件。它的交互仅依靠在治疗过程中所接触到的病人。既然知识工程师所咨询的专家了解病人、医生、死亡和恢复等，则很明显知识工程师将专家们所提供的内容硬性地输入到某个提前确定好的框架中。在人工智能目前的能力范围内，这一点已经成为现实。专家系统的实用性取决于它们的使用者具有一定的判断力。

第 10 课　Internet

课文　Internet 基础知识导读

Internet 是由遍及全世界的成千上万的网络所构成的计算机网络。没有人能够准确地知道能有多少台计算机与 Internet 相连。然而，可以肯定的是，这个数字一定上百万，而且快速增加。

Internet 组件

World Wide Web

World Wide Web（简写为 Web 或 WWW）是一种 Internet 服务器系统，支持可以在一个接口访问几种 Internet 协议的超文本。目前 Internet 上几乎所有的协议类型都可以在 Web 上使用。这包括电子邮件、FTP、Telnet 以及 Usenet 新闻。除了这些，万维网还有自己的协议，超文本传输协议，或简写为 HTTP。

Web 操作主要靠超文本作为它信息检索的方式。超文本是一种文档，含有与其他文档相链接的文字。这些文字称为链接，是可以由用户进行选择的。一个简单的超文本文档里面可以有许多文档的链接。在 Web 环境中，文字和图片可以作为其他文档、图片、视频和声音的链接。链接可以沿着逻辑路径前进，也可以不沿，因为每个连接都是由源文档的设计者来编写代码的。总之，万维网包含大量文档、图片、视频和声音的复杂虚拟网上连接。

Web 上的超文本是用一种被称为超文本标记语言（HTML）所编写的文档。在 HTML 文档中，通过在文本中放置标签，来实现对文本格式的设计，以及字体大小、斜体和粗体等视觉效果，还有超文本链接的创建。图片也可以被加到 HTML 文档中。HTML 是一个不断发展的语言，随着每一次对语言所进行的升级，都会添加新的标签。由 Web 创建者 Tim Berners-Lee 所领导的万维网联盟，对标准化 HTML 的各种尝试进行了统一的协调。

电子邮件

电子邮件（E-mail） 可以使计算机用户在本地或世界范围内交换信息。每一个电子邮件用户都有一个用来接收信息的信箱地址。通过 E-mail 发送信息大约几秒钟就可以到达。

电子邮件的一个强大的功能就是可以向一个人的电子邮件地址发送电子文件。非 ASCII 文件，也就是所谓的二进制文件，可以附加在 E-mail 信息中。这些文件被称为 MIME 附件。MIME 的含义是多用途互联网邮件扩展服务，其用途是帮助电子邮件程序处理多种文件类型。例如，在 Microsoft Word 中创建的文档可以被附加在一个电子邮件信息上，接收方可以通过相应的电子邮件程序来进行获取。许多电子邮件程序，如 Eudora, Netscape Messenger, 和 Microsoft Outlook Express 等，提供了对用 HTML 编写的文件进行阅读的能力，这种文件本身就是 MIME 类型。

Telnet

Telnet 是一种程序，这种程序可以使你登录到互联网上的计算机，并使用在线数据库、图书目录和聊天服务等内容。远程登录到一台计算机上，你必须知道它的地址。该地址既可以用词来组成（locis.loc.gov），也可以用数字来表示（140.147.254.3）。一些服务要求连接到远程计算机上的特定端口。在这种情况下，在 Internet 地址后面键入端口值。例如：telnet nri.reston.va.us 185。

Telnet 也可用在万维网上。与 Telnet 资源的链接与其他任何链接看起来都很相似，但是它会启

动一次 Telnet 对话来创建连接。Telnet 软件必须安装在你的本地计算机上，并根据你的 Web 浏览器来进行配置，以便能够运行。

FTP

FTP 的意思是文件传输协议。这既是一种程序，又是用来在计算机之间传输文件的方法。匿名 FTP 可以使用户从 Internet 成千上万台主机上将文件传输到他们的个人计算机账号中。FTP 站点中包括书、文章、软件、游戏、图片、声音、多媒体、课程论文等内容。

如果你的计算机直接通过以太网电缆与 Internet 相连，你可以使用一种 PC 软件程序（如用于 Windows 的 WS_FTP）来进行文件传输。

在万维网上进行 FTP 传输，可以不需要任何特殊软件。在这种情况下，只需要 Web 浏览器即可。无论什么时候你从一个站点下载软件到你的本地计算机上，你使用的都是 FTP。

第 11 课　电子商务

课文　数字证书

数字证书是一种数据文件，用来确定人们的身份和 Internet 上的电子资产。数字证书可以实现安全而加密的联机通信，并经常用来保护联机事务处理。

定义

随着电子交易的盛行，越来越需要第三方以数字证书的形式进行认证和授权。数字证书由被称为认证机构（CA）的可信任的第三方进行签发。认证机构对证书持有者的身份进行确认，并在证书上“签字”，来证明该证书未曾被伪造或改变。

当某证书被认证机构进行数字化签名后，该证书的持有者就将其作为电子通行证来证明他的身份。持有者可以向要求安全访问的站点、网络或个人出示证书。

证书中的识别信息包括持有者的姓名、电子邮件地址、认证机构的名称、序列号，以及证书的生效日期和失效日期。当用户的身份由认证机构确认后，证书就使用持有者的公钥来保护数据。

Web 服务器也可以用使用公钥的证书来向用户的浏览器确认站点的真实性。当用户向某一个 Web 服务器发送机密信息，例如联机事务处理所需要的信用卡号，浏览器就会从服务器的数字证书中取出公钥来确认该服务器的身份。

公钥加密

公钥是公钥加密所使用的一对密钥中的一个，是数字认证的基础。

公钥加密利用一对公钥和私钥来进行加密和解密。这两种密钥都有数值，将该数值用于某种算法中，可将信息置乱，并只有拥有相应解密密钥的用户才能看懂信息。

一个人的公钥被其他人用来对只发给那个人的信息进行加密。当他收到信息时，就使用不被别人所知的相应密钥来对数据进行解密。一个人的公钥可以被分发给其他人，而不使私钥的保密性受到破坏。

使用数字证书的 Web 服务器可以利用私钥，来确保只有它能对由 Internet 发给它的机密信息进行解密。

Web 服务器的证书是由自签的 CA 证书来确认，这种 CA 证书对发证机构进行标识。包括 Microsoft Internet Explorer 和 Netscape Navigator 在内的大多数主要的 Web 浏览器中，都提前安装了 CA 证书。

当某一 Web 服务器证书向浏览器出示时，CA 证书就向用户表明该服务器证书是否可以信任。如果 Web 服务器证书的有效性得到确认，对于采用 SSL 技术的服务器，该证书的公钥就可用于保护信息。

SSL 安全协议使用数字证书为需求私下交流的双方创造一种安全的“通道”。在大多数主要的 Web 浏览器和商业 Web 服务器上都使用了 SSL 技术。

第 12 课　通信技术

课文　移动通信

蜂窝状移动无线电系统的构想是在 20 世纪 70 年代初期出现于美国的贝尔实验室中。然而，直到十年后，这种系统才开始用于商业中。在 20 世纪 80 年代早期，蜂窝状电话系统在欧洲的发展非常迅速，尤其是在斯堪的纳维亚和英国。模拟蜂窝状电话系统使用 800 MHz （806 to 902 MHz） 和 1.9 GHz （1 850 to 1 990 MHz）的波段。1.9 GHz 的频率分配给个人通信服务，但是许多蜂窝系统在将 PCS 捆绑到以语音为中心的服务上时，也使用这些频率。

最初，第一代蜂窝状系统是一种模拟系统，在 800 MHz 的频率下进行工作。后来则进一步增加为 1.8GHz，在北美部分地区达到 1.9 GHz。大约 10 年后，随着第一代数字移动、电路交换网络的出现，第二代（2G）也相应而生。这些系统提供更好的语音质量、更高的容量、更低的电源需求、以及全球漫游的功能。它们可以同时在 800 MHz 和 PCS 波段下工作。

蜂窝系统使用三种不同的技术来共享一种射频频谱：

- 频分多路存取。
- 时分多路存取。
- 码分多路存取。

在这三种技术中，TDMA 和 CDMA 是主要的技术。

尽管这种系统发展迅速，但由于缺少标准化，也导致了各公司分别开发自己的系统。这种状况的不利之处就是整个市场分成了若干部分，其中任何一台设备都只能在制造国的范围内使用。为了解决这些问题，1982 年，欧洲邮政电讯会议制定出群组专用移动通信机制（GSM），以便发展整个欧洲的移动蜂窝状无线电系统。这种标准化系统需要满足一定的标准：

- 频谱的有效性。
- 国际漫游。
- 移动站和基站的成本低。
- 话音质量高。
- 与 ISDN（综合业务数字网）等其他系统的兼容性。
- 能够支持新的服务。

该会议决定使用数字技术来开发 GSM 系统，后来 GSM 就成为全球移动通讯系统的首字母缩写

词。1989 年，制定 GSM 规约的责任由 CEPT 转到欧洲远程通讯标准协会（ETST）。在第二年就发布了第一期 GSM 规约，但该系统直到 1991 年才开始用在商业中。1995 年，第二期规约将范围扩大到乡村，年底接近 120 个网络运行在大约 70 个地理区域中。

到新千年初，尽管在发展的路上还存在很多困难，已经在被称为第三代（3G）服务上取得了巨大的进展：

- 全世界 GSM 用户数量已经增长到大约 165 000 000。
- 第一代 GPRS 网（是过渡到 3G 网的关键一步）获得发展。
- 在欧洲进行了第一次 WAP 试用。

到 2001 年，更有希望实现无线世界和计算/互联网世界之间的无缝操作，并使视频点播等新的服务获得发展。

第 13 课　计算机组装

课文　攒机与系统测试

攒机

通常这一过程是最费时和费神的。我究竟要买哪些部件？哪种部件是最好的呢？

有很多合适的地方来购买计算机零部件。你可以去所在地区的计算机零售商店。这种商店的技术支持通常不错，并且可以提供可靠的质量保证。缺点是与其他地方相比花费会更高，有些时候，甚至会高出很多。

大多数城镇都有销售和维修计算机部件的小型商店。这些小型商店与大型零售商店不同，通常位于商厦中的一个办公套间。然而，无论这些小型商店位于何处，一般价格会较低，并且可以提供个性化服务。这些商店所出售的硬件通常是从厂家进货并带有包装，所有相关物件都在一个盒子中。但是，小型商店也会销售 OEM 硬件，通常只用塑料包装，并且几乎没有任何说明文档。对于这种类型的硬件，你需要进行权衡。

让我们看一看每一种硬件的具体情况：

机箱：要确保你所购买的机箱适合放在所要放置的位置上。留有空间以待扩充：备用的驱动器仓以及足够大的空间来满足内部工作的需要。确保机箱中装有电源。机箱是否干净。

主板：主板要能够安装在所选择的机箱中，并支持你所要使用的所有硬件。确保有详细的说明文档。

处理器：检查处理器是否有弯曲的引脚。不要接触引脚。

内存条：确保主板完全支持你所购买的内存。并考虑内存的奇偶性和类型。在拿内存的时候，要避免触摸到触点。另外，如果你的主板没有安装缓存，还要买一个高速缓存模块。

视频卡：要获得高性能，可以购买 PCI 视频卡。要考虑系统的主要用途：商业软件或是三维游戏。如果该系统是用于图形处理或游戏，你应该买一个中端或高端的视频卡。

软驱：关于软驱的购买和安装非常简单。要确保软驱表面良好，引脚完好无损。

硬盘驱动器：确保表面良好。通常要购买新的硬盘驱动器。确定有使用说明书。

光驱：确定有驱动程序的安装光盘。需要光驱运转速度快，这样就可以安装操作系统。

键盘和鼠标：不需多加说明。但要确定键盘的插头与主板上的插头相符，否则可能会需要一个适配器。并要确保鼠标可以正常工作。选择与系统相配的类型：串口或 PS/2 口。

散热片或风扇：选取散热片和风扇，要适用于你要使用的处理器。如果 CPU 没有安装散热片，你就需要购买散热器填料。

驱动器电缆：确保所有用于将硬驱、软驱和光驱与主板上的 I/O 端口或 I/O 卡相连的电缆齐全。这些电缆通常与主板一起提供给用户，但也并非总是如此，也许并不够你所需要的数量。

音频线：通常与光驱一起提供，音频线将光驱与声卡直接相连。

螺丝钉：要确定有足够的螺丝钉。通常，在购买机箱的时候，就会带有足够数量的螺丝钉。要确保螺丝钉的大小合适。连接板卡的螺丝钉与连接驱动器的螺丝钉的大小并不相同，如果你试图将较大的螺丝钉安在驱动器上，就会使驱动器受损。

系统测试

现在系统已经建成并在运行中，你可以通过几个测试来确保所有部件运行正常。检查如下内容：

检查机箱前面的发光二极管指示灯。在启动时，硬盘指示灯应该闪烁。如果的确闪烁，则硬盘与主板正确相连。如果不闪烁，试着将发光二极管插头上的引线翻转或仅仅将插座换个方向。

检查硬盘驱动器。确保旋转。

检查风扇。确保 CPU 风扇、电源风扇和机箱风扇（如果有）都可旋转，没有与任何电线缠绕。

通过按下弹出按钮看是否弹出光驱，来确保光驱有电源。

按下重启动按钮确保正常运行。在重启动时，要检查屏幕上所显示的数据是否与系统相符。

如果有键锁装置，现在就测试一下。

让系统运行 10 到 15 分钟。

现在，关闭计算机，小心地接触 CPU 和硬盘驱动器。你正在检查温度以确保正常冷却。

第 14 课　计算机系统结构

课文　CPU 设计

相关指令

假设你要做三个数的加法：

5+22+7

人和计算机程序都会首先将 5 与 22 相加得 27。然后再将 27 与 7 相加得 34。这里执行了两次加法操作。因为第二次操作要用到第一次操作的结果（27），所以这两次操作必须按顺序进行。

现在考虑做四个数的加法：

5+22+7+18

人会再追加一次加法操作，将前两次操作的结果 34 与 18 相加得 52，从而实现四个数的加法运算。然而，只要两个操作彼此独立，计算机程序就可以同时执行多个数字运算。因此，如果你希望对一台现代计算机进行优化，你要按下面方法来对指令进行安排：

5 与 22 相加（得 27）

7 与 18 相加（得 25）

将前两步的结果相加，27 加上 25（得 52）

因为第一步和第二步的结果互不相关，所以这两步可以同时执行。第三步需要前两步的结果，因此要在下一个时钟周期运行。因此，计算机用两个时钟周期来完成三个数的加法，同样是两个周期，计算机还可以完成四个数的加法，这是因为前两个运算可以同时在第一个周期运行。

最初的 Pentium 芯片可以同时执行两条指令，只要这两条指令互不相关。这就需要程序员或编译者对指令按最优顺序排列。最近几年所生产的 CPU 芯片具有更巧妙的设计，即使程序没有对指令进行优化，CPU 芯片仍会在内部重新对指令进行排列以使指令的执行得到优化。

内存存取延迟

对内存的存取速度要远远慢于 CPU 的执行速度。如果一条指令所需的数据不在主存中，这条指令就不得不等一段时间后才能执行，这段时间等价于数百条指令的执行。因为后面指令的执行与前面运算的结果相关，所以 CPU 就要因为等待内存的存取而产生延迟。

为了解决这个问题，CPU 具有两种类型的内部高速存储器来存放最近用到的指令和数据。这种高速存储器就称为“ 高速缓存 ”。

最好的内部存储器就是 Level 1（L1）高速缓存。该存储器属于 CPU 内核的一部分并带有对指令进行译码和执行算术运算的部件。如果指令和数据都在 L1 高速缓存中，CPU 就可以高速度地执行指令。

当指令或数据不在 L1 高速缓存中，现代处理器在芯片上还集成了大量的 L2 高速缓存。根据成本和技术的不同，不同的芯片可以具有 128 KB、256 KB 或 512 KB 的 L2 高速缓存。Pentium IV 芯片通常要比同代的较便宜的 Celeron 芯片带有更多的 L2 缓存。对 L2 高速缓存的访问会使指令延迟几个时钟周期，但是 CPU 芯片通常可以对指令重新排列，在这段时间也不会闲置。

RISC 体系结构

第一代 Intel“ 芯片上的 CPU ”是 4004 处理器。该处理器并不像一台真正的计算机，而更像一部便携式计算器。该处理器所操作的对象是按四位比特位进行编码的十位数字。以后芯片的处理能力进一步增强，可以处理 8 位、16 位和 32 位数字。因此，在现代的 Intel CPU 芯片上并没有简单的加法指令。而是设置有不同的加法操作，分别针对数字、字节以及其他任何大小的数。这就是典型的“ 复杂指令集 ”计算机芯片。

使所有的指令具有大小。仅使用一种大小的数据。将指令以及译码过程简化。这就是典型的“ 精简指令集 ”计算机芯片。

两三年前，人们可能会认为未来属于 RISC 计算机。就当时的技术而言，RISC 计算机与传统计算机芯片相比，体积更小，速度更快，价格更低，而且更易于制造。IBM，Apple 以及 Motorola 联合开发了 PowerPC 芯片，Apple 公司并进一步将整个的苹果机生产线转为使用该芯片技术。DEC 开发了 Alpha CPU 系列，Sun 则开发了 SPARC 系列。

于是，其他所有的生产厂商都静观其变，等待 Intel 体系最终也实现 RISC 结构，他们认为这一举措是不可避免的。然而，每过 18 个月，技术的发展就会使芯片的功能增强一倍。如果每个月可以销售数百万的芯片，其经济效益就很可观。

当芯片具有两三百万的晶体管（晚期的 486 芯片和早期的 Pentium 芯片），这时精简指令集的优势才得以发挥。当 PowerPC 最初发布时，被冠以具有“ 486 的价格，Pentium 的功能 ”。由于软件问题，IBM 延迟了对 PowerPC 系统的广泛发行，从而失去了机会。除了 Apple 之外的系统开始使用 PowerPC 时，这时候 Pentium 芯片的价格已经比过去 486 芯片的价格要低，Pentium Pro 将 RISC 的

精髓与传统芯片设计结合在一起。

RISC 芯片仍然广泛用在 Unix 系统中，也可以运行在 Windows NT 下。如果芯片的原始性能相对于价格更重要些，也许某种类型的 RISC 多处理器仍然会是某专有文件和数据库服务器的最佳选择，然而，从目前状况可以看出 Intel 公司不会停滞不前，RISC 系统将不会占有很大的比例。

第 15 课　网络安全

课文　电子邮件的安全问题

电子邮件具有几个固有的安全问题。在商务沟通中，这些问题就会限制电子邮件的发展，使之难以成为一种重要的商务工具。例如，一种限制就是个人隐私问题。通常电子邮件是用一般的文字进行发送，也就是信息是以明文的形式进行发送。因此，无论是在传输过程还是存储中，任何人只要可以访问电子邮件，就能够阅读信息。显然，这就是一个安全问题，这种问题可能会使公司不使用电子邮件来传送商业机密信息。

影响电子邮件的安全问题

这里列出了影响电子邮件的一些主要的安全问题

- 缺乏机密性

  电子邮件以明文形式进行发送，任何人只要可以获取电子邮件就能够阅读信息。

- 缺乏完整性

  无法提供保护措施，以防止有人在保存或传输过程中修改电子邮件信息的内容。

- 缺乏真实性

  任何人都可以伪造电子邮件信息，假称该信息是由另外一个人所写。

- 缺乏认可

  任何电子邮件信息并不一定是由发送者所写，因此任何一个发送者都可以否认曾经给你发送过信息。

- 病毒

  电子邮件信息可能会含有实际上由病毒伪装的附件；当你打开附件，病毒就会传播到你的电脑中。

- 垃圾信息

  电子邮件账号对垃圾信息是敞开的,这些垃圾信息就是那些扰人的电子邮件演说和广告等。

另一个基本的安全问题与电子邮件的完整性有关。如上所说，可能在电子邮件存储或传输的过程中，有人会访问或截取电子邮件。因为大多数电子邮件信息是以明文形式进行传送的，任何人只要可以访问信息，就也能够改变信息的内容——而电子邮件的所有者并不知道信息已经被改动。在这种情况下，信息的完整性就受到破坏。更为复杂的安全问题是真实性。目前，还没有方法可以用在电子邮件上，来让信息的接受者可以确认发送者正是信息所表明的人。结合完整性问题，这种缺乏认证性意味着电子邮件是一种无法信赖的系统。相关的安全问题就是缺乏认可，在这种情况下发送者可以否认曾经发送过信息。另外，如果发送者声称他或她的信息被篡改而导致意图改变，就没有办法来进行驳斥。

电子邮件发送者的标识

目前，有几种方案在寻求解决电子邮件安全问题的方法，尤其是机密性、完整性、认证和认可等问题。这些解决方案都由公钥加密技术发展而来。

如果你对公钥技术不太熟悉，这里我就简单加以概述。在公钥系统中，用户被分配给一对相匹配的密钥。其中一个密钥是用户的私钥，只专属于该用户一人。另一个密钥是用户的公钥，可以自由向公众发布。两个密钥都可以对数据进行加密和解密。然而，用一个密钥所加密的内容，只有与该密钥匹配的另一个密钥才可以进行解密。它们不能与其他密钥一起使用。

这就是该系统保证电子邮件安全性的方法，当用户 A 想要向用户 B 发送机密的电子邮件信息，用户 A 就用用户 B 的公钥来对邮件进行加密。能够对信息解密的惟一密钥就是专属于用户 B 的私钥。于是，其他任何人都无法阅读信息。这样就解决了机密性和完整性问题。

该系统也可以解决真实性和认可问题。当用户 A 想要向用户 B 发送电子邮件信息，并要使接受者确信该信息来自用户 A，用户 A 可以用他或她的私钥对信息进行加密。接收者要阅读信息，需要用用户 A 的公钥进行解密。因为只有用户 A 的公钥才能对信息进行解密，接收者知道能够对信息进行加密的密钥就只有用户 A 的私钥。既然只有用户 A 才享有该私钥，这个信息就一定来自用户 A。

然而，要使该系统能够运行，用户必须能够信任该用户的密钥是有效的，这就是一个关键点。为了提供这种认证，就需要有一个被信任的实体，通常称为认证机构，来为每一个用户提供其独有的数字认证，从而保证某一公钥属于某一特定用户。

解决方案

如上所说，有几种方案已经可以被用来保证电子邮件的安全性。所有这些方案都基于公钥加密。然而，这些方案在实现这种技术的方式上有所不同；确切地说，这些方案最大的差别就在于它们如何处理密钥认证。

解决电子邮件安全问题的最困难的部分就是建立每个人都可以访问的有效的发证机构。目前，还不存在一个中央发证机构，使公众可以来确认公钥。如果没有一个充当管理角色的发证机构，用户该向谁去确认某一个公钥是否属于某个特定的人？一些采用公钥系统的组织只是在内部作为他们用户自己的发证机构。然而，这些组织不能对一般公众的认证进行管理。

加密邮件（PEM）标准，也就是互联网工程部处理机密电子邮件的标准，该标准建议使用一种被信任机构的分层机制，来使用户确信某一电子邮件信息的有效性。在最顶层的就是互联网政策登记机构（IPRA），该机构将成为被所有人所信任的证书管理机构。IPRA 将为第二层的被信任机构（称为政策认证机构）签发认证。这些机构依次将为下一层的机构（称为发证机构）授予证书。这些发证机构将负责为公众提供认证。

当用户收到 PEM 模型下的电子邮件信息，在电子邮件的标题中就会列出对发送者进行认证的机构。这样，接受者就会知道电子邮件发送者的身份已经得到该机构的认证。

第 16 课　网页设计

课文　网页中的多媒体（一）

多媒体在网页设计中越来越受到欢迎，有些技术可以支持在网页中使用动画、视频和音频，形

成了对传统的文字和图片表现形式的补充。这些新的表现形式提供了更多的设计选择，但也要求一定的设计准则。 在用户界面上滥用多媒体表现形式就会使用户感到困惑， 比较难以理解网页中的信息。

动画

移动的图像会给在人的周围视觉上留有深刻的印象。在剑齿虎偷偷走进你之前，就要感觉到它的存在，这一点非常重要，从此，这种对移动图像的感觉就成为了一种生存本能。目前，对虎的提防是次要问题，但是任何在你周围视觉范围内移动的物体仍然会引起你的注意：也就是说，如果在网页上角有一旋转的标识，人们很难集中注意力来阅读网页中间的文字。在网页中不要含有总是在移动的动画，这样就很难使你的用户专心阅读文字内容。

动画的优势：

- 显示连续变换。当某物具有两种或多种状态时，如果用动画的形式来表现变换过程，而不是瞬间变换，用户将更容易理解状态之间的变换。用动画形式表现变换过程可以使用户通过感知系统来探究不同的子部分之间的映射关系，而不需要利用认知系统来演绎出这种映射关系。一个很好的例证就是第一届 Java 编程比赛的获胜者：用动画的形式来表现不同的正方形和三角形的运动，证明两个面积相同，从而证明了勾股定理（遗憾的是，这个本来是很出色的网页却使用了不相称的动态文字：文字不断移动，很难与主动画所表现的内容联系起来）。
- 表明时间上的变化。因为动画是随时间变化而显示的，对于随着时间而变化的现象，动画就提供了一种一对一的映射。例如，对雨林的砍伐情况，就可以通过一幅地图来进行说明，在该幅地图中，雨林所覆盖的区域会随时间变化而产生动画效果。
- 显示多样性。动画可以被用来在同一空间中表现多重信息对象。典型的例子就是客户端的图像映射，当用户将鼠标指针移动到不同的超文本锚位置上，就会弹出相应的解释。也可能通过闪烁来表明活动区域。通常，对象应该仅仅在恰当的时候移动（例如当鼠标指针移到图像上）。
- 使三维结构形象化。因为计算机屏幕是二维的，无论示意图设计得多么详尽的示意图，都无法使用户全面了解三维结构。动画可以用来强化对象的三维本质，便于用户对它们的空间结构有个形象的认识。动画并不需要将对象旋转一周：只要慢慢地向后向前转一点就足够了。对象应该缓慢移动，从而使用户可以将注意力集中在对象的结构上。三维对象可以在用户的控制下移动，但通常最好由设计者提前决定如何使移动达到最好的动画效果，从而能够更好地理解对象 :用户只要将鼠标指针移到对象上，就能开始播放提前确定的动画。但是由用户控制的移动需要用户了解如何操作对象（对于大多数计算机所使用的鼠标之类的二维控制设备，这很难达到——坦白说，只有拥有真正的三维设备，才会使三维在用户界面上大发光彩）。
- 吸引注意力。最后，在有些情况下，动画效果可以控制用户的视觉，这种能力在界面上就成为了一种优势。如果为了将用户的注意力从几个元素中集中到一个元素上，或者提醒用户最近更新的信息，使用具有动画效果的标题就会收到良好的效果。动态文字应该通过一维时间的动画来表现（例如，文字从右边滑入，从第一个字母开始逐渐显示，或者逐步地变大），不要采用连续的动画效果，因为移动的文字比静态文字更难以阅读。通过最开始的动画将用户吸引到新的文字内容上，然后应该让用户静静的进行阅读，而不要再有分散

注意力的动画效果。

第 17 课　网页编程

课文　函数和对象（JavaScript）

函数

函数是 JavaScript 的一个基本的构建块。函数包括一些代码，在某一事件发生或函数的调用时，这些代码可以被执行。实际上，函数是一组语句。在同一个脚本或其他脚本中，可以反复使用函数。你可以在文件的开始部分定义函数，在后面进行调用。

函数可以有任意多个参数或没有参数。函数的定义包括关键字 function，后面是：

- 函数名。
- 括号内以逗号相隔的函数参数。
- 波形括号中定义函数的 JavaScript 语句。函数语句中可以调用在当前应用程序中已经定义的其他函数。

```
function basicFunction () {
 // function body ...
}
function basicFunction ( someValue ) {
        // function body ...
}
```

return 语句确定了函数所返回的数值。

```
function basicFunction (a,b) {
 // function body ...
  return (a + b)
}
```

使用对象

你可以创建、修改和删除对象。你可以在对象的生命周期中使用它的方法和属性。

创建新的对象

在 JavaScript 中，如果只需要一个对象的一个实例，可利用对象初始化语句来进行创建。如果需要创建一个对象的多个实例，还可以首先创建一个构造函数，然后利用该函数和新的算子来创建对象实例。

使用对象初始化语句

在浏览器的早期版本中，你只需使用构造函数就可以来创建对象。

使用对象初始化语句的语法为：

```
objectName = {property1:value1, property2:value2,..., propertyN:valueN}
```

- objectName 是新对象的名称。

- property1 是一个标识符（一个名字、或一个数字、或一串字符）。
- value1 是一个表达式，表达式的数值被赋给 property1。
- 并不一定需要 objectName 和赋值语句。如果你不需要在其他地方引用该对象，就不需要赋值给变量。

如果在脚本的开始部分就用对象初始化语句来创建对象，JavaScript 就会在每一次执行含有对象名称的表达式时解释对象代码。

下例用三个属性创建了 myHonda 对象。注意 engine 属性也是一个对象，具有自己的属性。这种类型的对象称为内部对象。

```
myHonda = {color:"red",wheels:4,engine:{cylinders:4,size:2.2}}
```

使用构造函数

另外，你还可以通过下面两个步骤来自己创建对象。

- 通过编写构造函数来定义对象类型。
- 用新关键字来创建对象实例。

要定义对象类型，需要为对象类型创建函数，该函数规定了对象的名称、属性和方法。例如，假设你定义一个称为 person 的对象，如下所示：

```
function person(name, age) {
    this.name = name
    this.age = age
}
```

然后创建两个 new person 对象的实例，如下所示：

```
john = new person("John McLaud", 33)
barby = new person("Barby Jones", 39)
```

接着定义 car 对象，如下所示：

```
function car(model, year, owner) {
    this.model = model
    this.year = year
    this.owner = owner
}
```

可以采用如下的方法来创建新对象的实例：

```
car1 = new car("VOLVO", 1993, john)
car2 = new car("FORD", 1992, barby)
```

注意在创建新对象的时候，上述语句将对象 john 和 barby 作为参数传递给对象 owners，而不是传递一串字符或数值。如果你要查找 car2 的 owner 的 name，你可以通过下面的属性进行查找：

```
car2.owner.name
```

注意你始终可以对前面定义的对象增加新的属性。这个语句

```
car1.color = "black"
```

就给对象 car1 增加了属性 color，并赋值为“black”。但是，这个语句并不会影响其他对象。要给同一类型的所有对象增加新的属性，你需要在 car 对象类型的定义中增加属性。

第 18 课　网络维护

课文　网络故障排除

用户机与客户机的标准机器检测

当一台机器出现网络问题时，通常与软件没有关系。在认为网络已经瘫痪，或问题严重以前，记住要检查一下网络的基本情况。如果可能，在用户机和目标机上进行机器检测。

基本情况包括：

- 检查电源：机器是否打开，电源是否接通。
- 检查连接情况：网络电缆和收发器（连接器）是否正常相连。（在现代计算机中，收发器在计算机的机箱内，但在老式计算机中，收发器是一种在机箱后面的盒子。）物理线路是否一端和计算机相连，另一端与墙上插座相连。

  如果机器有“双绞线”（10BaseT）以太网收发器，要确定线路指示灯发亮。如果线路指示灯没有发亮，通常是物理线路上的问题。可能的问题包括：

  - ✧ 连接机器与墙上插座的线路有故障——试着更换线缆。
  - ✧ 以太网电缆或收发器损坏、松动或没有打开开关（大多数情况下电线不会分离，但有些时候也会有这种状况）或有其他问题。
  - ✧ 插座绕线错误，或没有通电。
- 重新启动有问题的机器：重新启动机器是否能够解决问题？如果是打印问题，试着重新启动打印机和要进行打印的机器。如果该问题只出现一次，重新启动即可解决，记录下来但不要汇报问题。如果重新启动机器后，问题仍然出现，与用户的计算机管理员联系。
- 试试打印其他形式的内容（只针对打印问题）。如果是打印机的问题，试着按如下步骤进行操作：
  - ✧ 打印另一份文档。有时候文档会损坏从而无法打印，如果在同一个打印机上可以打印其他的文档，则无法打印的文档可能已经损坏。试着将正文内容复制到一个新的文档中，再进行打印。
  - ✧ 在另一台机器上打印。如果在另外一台机器上打印成功，这就表明问题出在最初的打印机上或者是打印机的连接线路。试进行 IP 网络检测。

交换用户机和另一台机器的网络部件

一般情况下并不知道是用户机上还是网络插座出现问题。将机器故障与网络连接故障区分开的最直接方法就是交换网络部件。

- 换上新的电缆：如果没有第二台机器可以利用，试着用另外一条临时连接电缆。如果第二条临时连接电缆运行正常则表明第一条电缆有问题。
- 交换网络插座：如果机器离另外一个可以使用的网络插座很近（或是机器很容易移动），试着将运行不正常的机器连接到第二个网络插座上。
  - ✧ 如果机器在第二个插座上可以运行，则说明第一个插座有网络上的问题。
  - ✧ 如果机器在第二个插座上无法运行，则表明机器是故障所在，尽管也有可能是网络的问题。如果有另外一台机器，则使用“第二台机器”测试。如果没有可用的机器，

就采用 IP 网络测试的方法。

- 测试第二台机器：如果可以使用或附近有另外一台机器，测试这台机器的网络连接（假设知道第二台机器在测试以前可以运行）。
  - ✧ 如果第二台机器在自己的插座上无法运行，就有可能是网络问题。
    - ➢ 如果两台机器在与同一台远程机器相连时都出现问题，则很可能远程机器有问题。利用 IP 网络测试来检查远程机器。
    - ➢ 如果两台机器都无法与任何网络服务相连，则有可能是网络问题。试用 IP 网络测试。
  - ✧ 如果第二台机器在自己的插座上运行正常，将这台机器与第一台机器的插座相连。
    - ➢ 如果第二台机器无法在第一台机器的插座上运行，则插座出现问题。
    - ➢ 如果第二台机器可以在第一台机器的插座上运行，则既有可能是第一台机器出现故障，也有可能是电缆有问题。交换两台机器的网络临时连接电缆看是否是电缆的问题。
      - ◇ 如果换上新电缆后第一台机器可以运行，则电缆是故障所在。更换电缆即可。
      - ◇ 否则，第一台机器就是问题所在。需要与用户的计算机管理员联系。

第 19 课　多媒体设计

课文　什么是多媒体？

“多媒体是利用不同媒体来进行娱乐或交流信息、思想或理念。”

我们认为多媒体是一种交流系统。这个系统可以交流思想、市场战略、公司目标、教育或各种信息，无论是历史的，还是最新的新闻。我们也将多媒体视为一种娱乐平台，可以进行交互和交流。

我们认为多媒体的开发是使用众多不同的可行的通讯媒体、技术和传输平台或从中进行选择。

对于多媒体的开发者而言，颜色、文本、图片、音乐、声音、解说、视频、二维动画、三维动画等都是可以选择使用的通信媒体。

对于我们而言，多媒体设计者/开发者可以使用所有这些媒体，并可以设计、创建和实现某些理念和策略，从而可以充分利用这些媒体以及那些制作和传输最终系统的技术。

什么是美术设计？

美术设计者接受到一个信息，并将其从视觉上表现出来；无论这个信息是一种想法、一个观念或产品的优势。

美术设计者必须有一定的艺术美感和敏锐的观察力，能够迅速地对一种状况进行分析，并正确地将视觉理念付诸于实际。他或她必须领会客户和可能的用户群的需求。美术设计者应该可以清楚并自信地与可能的用户群进行交流，他们需要充分了解目前社会的流行趋势以及相关的市场和行业。

有时候美术设计者也独立工作；他们既是原稿作者、图解者、摄影师，又是设计者。

通常你仅仅是因为设计的独特才会留意图片和阅读文字。设计者转移读者的注意力并使其集中于他们的作品，他们营造了各种情绪，孕育着不同的情感，他们利用符号、编排、颜色、形状、图解、摄影、结构和平衡，来有效地表达信息内容。通常你会有意识地注意到这些方面，有些时候则

不然，但当读者的注意力被吸引，他们就已经接受到了所表达的信息，则设计者完成了使命。

与艺术家不同，美术设计者必须设计出具有视觉表达效果的作品，该作品要针对某一特定的用户群。美术设计者要将相同的观念、思想或情感传达给所有的读者，同时还要具有艺术感染力。为了成功地实现这个目标，设计者既要理解传达的内容，又要懂得艺术美学。

通常设计者会戴两个帽子。一顶帽子具有艺术性和创造性，主要针对美学问题，一顶帽子是用于传达信息的，主要针对读者的心理。许多设计者会忘记戴上第三顶帽子，不过仍然可以设计出好的作品，这第三顶帽子主要涉及实际中的领域，如时间、技术和生产上的问题等。

设计者必须要能够领会作品的目的——如销售更多的帽子，获得更多的选票——并帮助客户来实现目标。更多的精力投入在这个过程中，而不是追求艺术性。

随着技术的日新月异，许多设计者都接触到了新的技术，为了保持竞争力，他们必须学会新技术，然而，这种新技术使设计者具有了新的设计理念，并掌握用新的方法来设计作品。

尽管传统的美术设计者的工作领域是印刷，然而，美术设计者并不一定仅仅是桌面印刷者。如果设计者具有必要的才能、培训和天分，就可以重新选择工作领域。

什么是数字化设计？

数字化设计是仅仅通过数字技术，如电脑、扫描仪、数码相机等，来进行设计工作，而不管终端产品的归宿。因此使用 Photoshop 来设计的印刷工作就是数字化设计。用笔、尺和一套画图铅笔来完成同样的工作内容，这并不是数字化设计。

技术的发展为我们提供了有利的工具，从而可以很快地完成产品设计，并具有高水平的专业化程度。由于科技发展迅速，用户也可以获得这些工具，从而到处都有业余美术设计师。

由于互联网和电子出版物的发展，通过这些传输方式来观看所设计的文档和图片，这种需求也日益增多。早期的互联网是由代码编写者来控制的，目前在一定程度上仍然如此。这些代码编写者希望互联网能够正常运行，他们希望可以控制通过互联网所流通的信息，而几乎没有考虑美学上的要求，他们更感兴趣于如何使互联网能够完全发挥作用，而不是互联网的形式如何。

现在仍然有很多人将互联网仅仅用来进行数据的传输以及高标准的非可视化工作。他们当中很多人都认为在互联网上滥用图片会浪费带宽，并使“重要的”用户数据传输速度变慢。

也有一些人认为令人印象深刻的广告或教育宣传会比传送一条信息更为有效，它可以改变读者的行为方式。如果不让人们开始使用某个产品，而是告诉他们这个产品是如何的好，这有意义么？如果不让人们佩带安全带，而是告诉他们安全带如何挽救人们的生命，这有意义么？

第 20 课　多媒体设计

课文　远程教育概述

对学生施教的方法将会有根本的变化。这些变化表现为教师要了解基于计算机的工具如何能满足目前的教学方法理论以及日益科技化的社会发展需求。例如，在远程教育中使用电视会议可以使一种新类型的学生在不影响其工作的情况下同样可以受益于波士顿大学的教育基础设施。随着教育工作者认识到这种技术的优势和局限，可以预料将会出现更大的变化。随着通讯和计算机的发展，以及信息传输服务的费用已经在人们的承受范围之内，这种影响将进一步扩大。到 2010 年，教育将

大不同于今天。内容仍然很重要，但教学工具与方法将会有所改变。在这篇文章中，我们主要将重点放在远程教育上，但我们相信这些技术将会与基本的教育方法相辅相成。

在过去，远程教育是一种教育模式，在这种模式下，学生与辅导教师进行交流，而辅导教师并不在地理位置上受传统教室所限。以邮寄为途径的函授课程就是一种远程教育实例。学生定期会收到邮寄过来的课程资料。练习必须再邮给辅导教师，接着辅导教师进行评分并返回资料。学生与辅导教师之间的交流仅仅局限于通过书面资料来进行交互，或者偶尔打电话。通常，学生很难获得其他的对课程有所帮助资料。总之，这种体系的最大缺点就是交流的等待时间，有限的交互方式，以及获得辅导资料的局限性。

电视和广播技术已经在很大程度上改进了函授课程的模式。利用这些技术，很多学生可以获得实时辅导，另外还从广播和电视课程中受益。然而，与辅导教师的交互只能局限于“私人渠道”交流方式。传真和电子邮件的使用提出了一种与教师之间进行异步交流的模式，从而可以极大地减少等待时间。所有这些技术都在高等教育中得到广泛应用。

在传统的远程教育中，课程资料通常比匆忙中所记下的笔记准备得更加充分。这是因为需要将同样的内容准确地传达给许多学生，这些学生可能不会很快发现资料中的错误。这种技术的局限性同样也在于要求辅导教师需要进行备课。例如，通过电视所看到的视频内容如果使用打印稿而不是手写稿，将会更加清晰。但遗憾的是，这种不灵活性会有损于辅导的自发性。不断发展的多媒体计算机和通信技术为减少这些局限提供了有利的条件。课程内容可以通过万维网进行创建和传播；音频和视频资料可以通过 Internet 传播给众多学生。学生可以通过价格较低的视频会议硬件与辅导教师进行交流。

当这个全数字化的信息世界来临时，在实现普遍的数字化远程教育之前，还有一些基本的技术问题有待解决。例如：如何调整目前的视频会议服务，在成本低，接收稳定可靠的条件下，可以支持成百上千的学生的使用？如何使信息的创建、搜集和索引简单化，从而可以支持学生的直接访问？如何根据学生个人的需求在很大的信息空间中进行搜索和过滤？