Chapter 2  Introduction to IT

Upon completion of this lecture note, you will be able to understand:

1. Different types of hardware
2. Different types of operating systems
1. The Components of a Computer

A computer contains many electric, electronic, and mechanical components known as hardware. These components include motherboard, central processing unit (CPU), hard drives for long-term storage, random-access memory (RAM), the video and sound cards, CD- or DVD-ROM drives, and the floppy drive.

The Motherboard

The motherboard, or primary circuit board, is the nerve center of the machine, connecting to the power supply and distributing electricity to all the other parts of the computer. It is also where many of the most critical elements of a computer are located. The motherboard contains several openings or sockets where computer chips are installed. Among the chips housed on the motherboard is the most important one, the CPU, and the computer’s memory. There are also expansion slots for attaching a variety of special circuit boards or cards (like a video card, sound card, and an internal modem) directly into the motherboard.

The Brain on the Motherboard: Central Processing Unit

The brain that runs everything inside your computer is a microprocessor called the central processing unit or CPU. Everything a computer does, whether word processing or digital imaging, is executed by this microprocessor. While other components can be very important to the overall performance of your system, the CPU is without a doubt the single most important one. Among the common names for CPUs are the Intel Pentium series, the AMD Athlon, and the Motorola PowerPC microprocessors.

A key element of the microprocessor is the control unit. The control unit interprets a program’s instruction and then launches the action that will carry it out. It does this in four steps: first, it gets the instruction; second, it decodes the instruction; third, it executes the instruction; and fourth, it writes the result to temporary memory. The time it takes to get the instruction and execute the instruction is referred to as a machine cycle.

A CPU’s speed is normally measured in megahertz (MHz). One megahertz is equal to 1,000,000 clock ticks (cycles) per second. A 2.2 gigahertz processor can process 2,200,000,000 clock ticks per second. Generally, the CPU’s hertz rating is the most important indication of how fast the processor is. However, other factors, like extra instructions written into the code of the chip, can affect its speed. For example, to speed up the handling of multimedia data, a special instruction set called MMX (multimedia extensions) has become standard in all Intel Pentium 2, Pentium 3, and Pentium 4 processors.
Memory on the Motherboard

A. ROM Memory

There are several different types of memory used in computers, and they differ in significant ways. Read-only memory, or ROM, is relatively slow and can only be read, not written to (changed). However, ROM memory is relatively permanent and far more secure for certain types of small programs. A good example of this is the BIOS ROM, which begins the start-up or boot process for the computer. The BIOS ROM is a permanent part of the system.

Electrically erasable programmable ROM, or EEPROM, is the type of ROM that is used most often in motherboards today. It allows the user to “flash” or upgrade the BIOS to take advantage of processor improvements or bugs found in earlier releases of the BIOS ROM.

B. RAM Memory

Random-access memory, or RAM, is what most users think of when discussing computer memory. This short-term kind of memory is used by a computer for holding data and programs while working on the computer. It sends information to the computer’s CPU at high speed so there is a minimum of time the process must wait for it. Unlike ROM, RAM can be read and written to.

However, the reason you lose work when your computer suddenly crashes is RAM, unlike ROM, is a temporary storage medium. It only stores information while the computer is running. When RAM stops receiving power, everything contained in the RAM is lost. Therefore, unless the data is written to a more permanent storage medium, or saved (for example, to a hard or floppy drive), whatever was contained in the RAM will vanish when the power is turned off.

The type of RAM most often referred to is actually dynamic randomly access memory (DRAM). While the underlying technology of DRAM is fundamentally the same, the small circuit boards they are installed on come in a variety of types and sizes. A single inline memory module or SIMM (housing 4, 8, 16, 32, 64, or 128 megabytes of RAM or even higher) must be installed in matching pairs in order to work. Motherboards designed for SIMMs come equipped with multiple memory expansion slots for SIMMs. A more recent development in DRAM technology called dual inline memory modules, or DIMMs, use the same RAM found on SIMMs but are designed to allow a single DIMM board to work alone.

Synchronous DRAM (SDRAM) is a type of RAM that is much faster than regular DRAM because it is synchronized to the system clock and transfers data once per clock cycle.
DDR-SDRAM is Double Data Rate-Synchronous DRAM, a type of SDRAM that supports data transfers on both edges of each clock cycle (the rising and falling edges), effectively doubling the memory chip’s data throughput. It consumes less power, which makes it well-suited to notebook computers. DDR-SDRAM is also called SDRAM II and DDRAM.

L2 cache stands for Level 2 cache memory. In general, it resides on a separate chip from the microprocessor chip, but more and more microprocessors are including L2 caches into their architectures. It is also called secondary cache.

Bus

Electrical channel that transfers electronic bits internally within the circuitry of a computer, allowing the devices inside the system unit and the devices attached to the system unit to communicate with each other.

System bus is part of the motherboard and connects the processor to the main memory. It is also called frontside bus (FBS), memory bus, local bus, or host bus.

10/100/1000 Network Interface

Integrated 10/100/1000 Gigabit LAN port for network or broadband.

TV Tuner

A hardware device that allows live video content, such as from cable or broadcast television, to display on a computer.

Permanent Storage

A. Hard Drives

Today, hard drives commonly range in size from 20 to 120 gigabytes (a gigabyte is 1,000 megabytes) and larger in capacity and are approximately 4” X 6” X 1” is size. (Twenty gigabytes is the equivalent of nearly 14,000 standard floppy disks.)

Most current hard disk drives spin at 5,400, 7,200, or 10,000 RPM, with 15,000 RPM drives emerging as technology continues to develop.

B. CD-ROM

Compact disc read-only memory, or CD-ROM, devices have all but replaced floppy drives for installing programs. They are not only a lot faster, but contain far more data than a floppy disk – 650MB to a floppy disk’s 1.44 MB.
CD recordable, or \textit{CD-R} drives give you the opportunity of writing information to a blank, recordable, CD-R media. Due to the chemical composition of their coating, CD-R discs can be written to only once.

Rewritable CD, or \textit{CD-RW}, is similar to CD-R, but it allows you to change or overwrite material on the disc.

C. DVD

Digital versatile disc, or DVD, is very similar to CD-based media with several notable exceptions. Like a CD, the disc is read with a laser. However, the DVD has two sides instead of one, and each side can have up to two layers. It has a capacity of about 22GB of data compared with 650MB for a conventional CD-ROM. DVD drives are \textit{backward compatible}; in other words, they can also read older, conventional CDs. However, CD-ROM drives cannot read DVD discs.

D. Removable Hard Disks

Removable Hard Disks are disk systems with removable media that have much larger capacities than a standard floppy disk. The media can resemble a floppy disk or be in a thicker plastic cartridge.

The most common removable drives on the market today are the Iomega \textit{Zip} and \textit{Jaz} drives. The Zip comes in two disk sizes – 100 MB and 250 MB – while the Jaz comes in both 1 GB and 2 GB sizes.

\textbf{Video Adapter}

Most video cards allow you to choose the color depth by selecting the number of colors you wish to display on screen. Four-bit color results in no more than sixteen colors, while eight-bit color gives you 256 colors. Most digital artists want all the color they can get and so work at twenty-four-bit depth, which provides 16.7 million colors to work with.

While older video cards didn’t need built-in memory to do an adequate job, today’s requirements of increased resolution and color depth demand dedicated memory on the card itself. In addition, newer 3-D technologies and faster bus speeds have resulted in a need not only for more, but faster memory. The earliest form of this faster RAM was known as VideoRAM or VRAM. Synchronous graphics RAM or SGRAM is much faster and was designed for graphics-intensive application.

Today’s video cards are more accurately called graphics accelerators. In addition to RAM, they have a dedicated processor to boost performance beyond that of a simple video card. Newer and faster chipsets handle everything from decoding MPEG movies to special features of 3-D graphics and games.
Monitor

Dot pitch is measured by the distance between similar colored phosphors on the inner surface of the cathode-ray tube (CRT). The closer together the phosphors are, the smaller the dot pitch and the finer the screen image will be. For a 17” monitor, a dot pitch of .26 to .28 millimeter (smaller is better) is considered essential for detailed images.

The most common monitor sizes are 14, 15, 17, 19, 20, and 21 inches. However, despite these measurements, a 17-inch monitor might have a screen that only measures 12 ½” or so horizontally and perhaps only 15 ½” vertically. This is because the screen size is measured on a diagonal and part of the monitor’s tube is hidden by the bezel surrounding the screen.

Screen resolution is important to a comfortable working environment. Screen resolution that is set too low will appear coarse and pixilated, while screen resolution that is set too high may make things uncomfortably small on screen. Most video cards today can handle resolutions of 1,280 by 1,024 (and higher) at 16.7 million colors quite easily, so choosing the right screen resolution for your monitor is simply a matter of personal preference.

2. Operating Systems

An operating system is a set of programs that coordinates all the activities among computer hardware devices. The operating system also contains instructions that allow users to run application software.

A. Macintosh

Apple’s newest operating system, OSX, while maintaining the user friendliness of earlier systems, is a departure in many ways. It is not only aesthetically similar to Unix, but is based on a variation of Unix and Linux designs. It provides greater stability and even greater multitasking capability. The new Mac operating system includes many new features, such as e-mail client and address book, Internet Explorer, and FTP server.

B. The PC

Microsoft followed the introduction of their new Windows 2000 operating system with Windows ME (Millennium) for the individual home user. It includes, among other enhancements, many new multimedia features including an automated video editor, automated scanner and video camera installation, simplified home networking and broadband access, and system protection features. Windows ME has borrowed some features from Windows 2000, which helps Windows ME run faster on the Web.

However, it is still an upgrade to Windows 98 and doesn’t offer the robust networking, security, and stability that Windows 2000 does.
Microsoft’s newest operating system, XP, has several new versions, including XP Home Edition, XP Professional for business, and XP 64 Bit Edition for developers. Based solidly on the Windows 2000 core, XP offers a new user interface, better connectivity and security features, and stronger multitasking capability.

C. Unix

Unix was developed in 1969 by AT&T labs as an improvement on a still earlier operating system, Multics (multiplexed information and computing service), in an attempt to create an operating system that could accommodate up to a thousand simultaneous users.

The strength of Unix lies in its multitasking capability, which allows the computer to do several things at the same time. Users can start a new task while a previous one is finishing. By the late 1980s, Unix users could print a document while simultaneously editing a file and formatting a floppy disk. In addition, this same design allows the computer to be used by more than one person at a time. It even allows multiple users to access the same files.

Another of Unix’s many strengths is its portability. It can move from one type or brand of computer to another with minimal difficulty. Unix can be easily upgraded to newer versions, and is organized so that new tools or programs can be easily added.

D. Linux

In 1991, Linus Torvolds was interested in running Unix on his home computer but found it cost over $5,000 and was designed to run on workstations costing $10,000. In order to bring the power of Unix to his PC, Torvolds began to develop his own operating system based on Unix.

Estimates place Linux on over 8 million computers throughout the world. Today there are numerous companies selling their version of Linux, including support and upgrades as they become available. One of the earliest (1994) and best known is Red Hat, a company that markets a packaged version of Linux complete with full documentation and a host of software – games included. Linux already has a following among those proficient in computer use. However, it is growing in popularity as new ways of customizing its shell (user interface) makes it easier for the novice to take advantage of its powerful features.
References
