

Introduction to Computers

Basic Concepts

(Lecture 1)

September 2005

1. Introduction

1.1 What is a Computer?

A computer can be defined in several ways: first, it was defined as **Electronic Data Processor (EDP)** to emphasize that it processes data to produce information; another definition is that a **Computer is machine that can perform four operations: input, processing, output, and storage.** These four operations in order were called *Information Processing Cycle*. It is important to notice that computers perform a fifth function also: communications.



Figure 1.1

1.2 Data

Is essentially raw unorganized facts used to describe an object (car – item in store – bank account – air flight) or Event (Bank transaction – sales order – production operation). This representation can be done using numbers, letters, or symbols (e.g., #, \$, %, *)

Computer systems can handle several types of data:

- Text – consists of standard alphabetic, numeric, and special characters.
- Graphic – consists of pictures such as drawings, or photographs. Graphic data requires more processing power and more storage capacity than text data.
- Audio – involves any type of sound such as music and voice.
- Video – consists of motion pictures, and sound such as movie clips, animation, and live video.

1.3 Information

Information is the output of the processing operation. Information is more useful for users since they can use it for decision making.

1.4 Data Processing

It is the process of converting data into information using some basic arithmetic (addition, subtraction, multiplication, and division) and logic (comparison) operations according to some instructions stored in a program.

1.5 Computer Systems

The term *computer systems* is more general than the term *computer* where it refers to both *hardware* (the physical components of the computer) and *software* (the programs).

1.6 Computer program

A computer program is a set of instructions written in one of the computer programming languages and used to accomplish a certain task by telling the computer how to process certain data into information.

1.7 Computer Hardware

Computer Hardware refers to the physical components of the computer system such as the keyboard, mouse, display unit, memory, storage devices and processor.



Figure 1.2

1.8 Computer Software

Computer Software refers to computer programs and can be classified into two basic categories *System software* and *Application software*.

System Software includes:

- 1- **Operating Systems** which provide at least the following functions: start the computer, manage programs, manage memory, handle input and output, and provide the user interface.
- 2- **Utilities** which are programs that keep the computer system running smoothly such as anti-virus programs, disk defragmenter, disk cleanup, disk scanning, and file compression.
- 3- **Language Translators** which translates programs from high level languages such as C, C++, and Java into the machine language; the only language that the processor understands.

Application Software includes:

- 1- **Prewritten software** which is also called packaged software or off-the-shelf software. These programs are developed by software houses such as Microsoft, IBM, SPSS, and SAS and they can be customized to user needs.
- 2- **Custom Application Software** which are created for business organizations either by their Information Services unit or developed specially for the organization by some software house.

2 Basic Computer Operations

As mentioned before, the performs four basic operations.

2.1 Input

In this operation the computer accepts data from the user. The input operation can be described as converting data from the human form (e.g., letters, and images) to the computer form (zeros and Ones).

2.2 Processing

In processing the computer converts data into information according to a program. Programs are usually written to follow an algorithm¹ (a procedure for solving a specific problem). In general, computers can perform very basic arithmetic and logic operations.

2.3 Output

After processing, the computer displays the results (the information) on the screen (monitor) or prints them on a printer. Output on the screen is referred to as *soft copy* while output on a printer is referred to as *hard copy*.

2.4 Storage

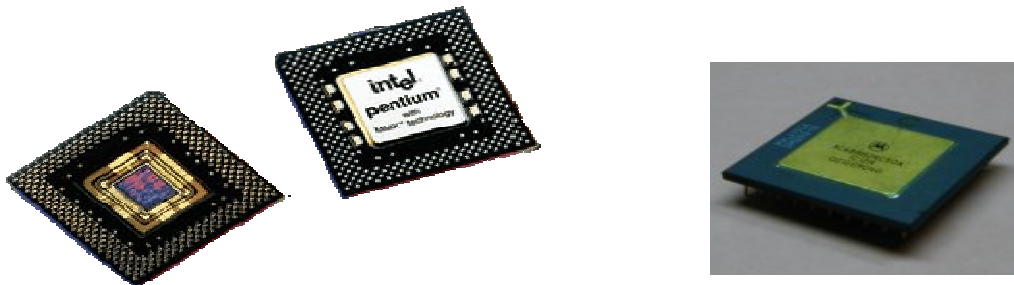
The results of processing can be stored for future use on different types of permanent storage media such as hard disks, floppy disks, flash memory, and optical disks.

¹ Called after the scientist Abou Moussa Mohamed Ebn Abdou Allah Alkhwarezmy

3 Components of a Computer

A computer consists of several basic components called **hardware**. This will include the following:

1. Input devices are any equipment that supplies data to the computer. These typically include: keyboards, mice, scanners, digital cameras, microphones (need a sound card), and digital video cameras.
2. Output devices are any equipment that is used to output information from the computer. These include: graphic displays , printers, speakers (need a sound card), and video projectors.
3. Central Processing unit which includes the processor and the main memory (RAM). The processor is responsible of performing arithmetic and logic operations and RAM is responsible for storing data, programs, and information during the processing (temporarily).



Processors

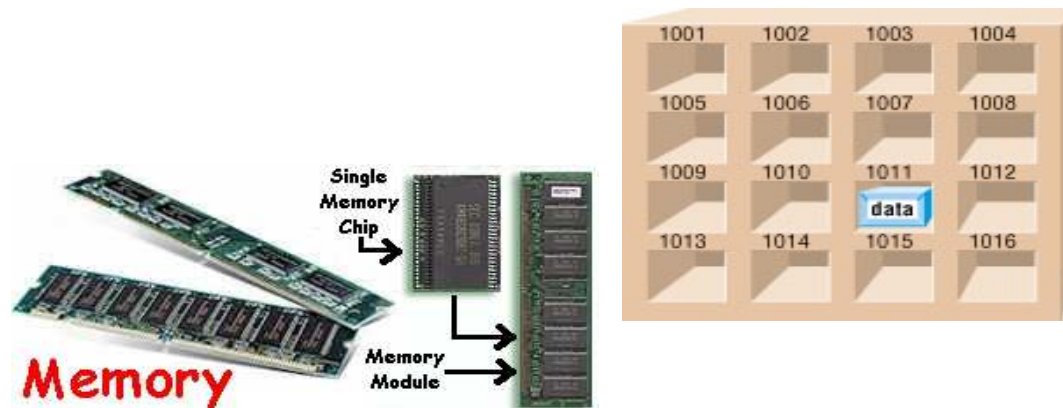


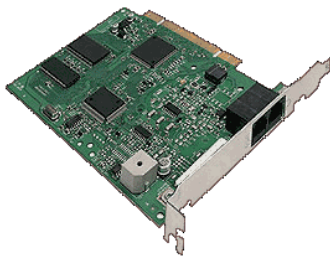
Figure 1.3

4. Secondary storage devices such as hard disks, ZIP drives, CD-ROM drives, floppy drives, and flash memory.

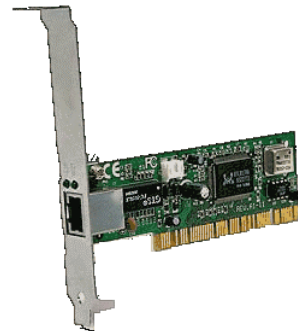


Figure 1.4

5. Communication devices that connect the computer to other computers to form a network. These devices include *modems* and *Network Interface Cards (NICs)*.



Internal Modem



Network Interface Card (NIC)

Figure 1.5

4. Computer Types

Computers come in all sizes, from small to large. It is convenient to classify them into two main categories: computers for individuals and computers for organizations.

4.1 Computers for individuals

4.1.1 Personal computers

The invention of microprocessors allows for the creation computers small enough to fit on the top of a desk, they are called desktop or laptop computers. Personal computers were built around a single-chip processor and designed to be used by a single user. Processing speed is measured in MHz (pronounced Mega Hertz)

4.1.2 Mobile devices

Very small computing devices such as wireless phones or pagers and may have limited Internet access.

4.1.3 Portable computers

This type of computers is small enough to fit in a briefcase. They are as powerful as desktop computers and include all of the PC components.

4.1.4 Workstations

Designed to provide powerful processing power and input/output capabilities. Workstations are normally used by Scientists, Engineers, Financial Analysts, Graphics Designers, and Architects.

4.2 Computers for organizations

4.2.1 Mainframes

Mainframe is a multi-user large-scale computer system which is suitable for almost all large organizations. The main feature is its high-volume processing of business transactions as well as high storage capabilities.

4.2.1 Midrange computers

Medium sized multi-user computer system, fall between microcomputers and mainframes. Can handle more than one user and usually fit the needs of a small organization. Can also be used as a server for a network (a collection of PC's connected together so that they share and exchange data).

4.2.3 Super computers

Used in organizations that has extraordinary demands of processing power. This type of computers offers a very high processing speeds and extreme degrees of accuracy as well as very large storage capabilities. The processing speed is measured in GFLOPS (Gega Floating Point Operations per Second).