1. Introduction

1.1. Definition of a Computer:

A computer is an electronic device that can perform calculations and analysis at very high speeds.

1.2 Types of Computers:

- Supercomputers (shown in Figure 1 below)
  - Most power type of computer.
  - High-capacity computers.
  - Fastest processing.
  - Used by large organizations, usually research facilities.

Figure 1 A supercomputer
• Mainframes (shown in Figure 2 below)
  o Do not have as high of capacity or a fast processing as supercomputers.
  o Capable of storing large amounts of data.
  o Large corporations use them.

Figure 2 A mainframe

• Minicomputers (shown in Figure 3 below)
  o Slower processing speed and less storage capacity than a mainframe.
  o Used by medium-sized companies or departments of large corporations.
  o Used for specialized purposes.
2. System Software

- System Software is a collection of programs that handle hundreds of technical details with little or no user intervention.
- There are four types of programs that makeup system software
  - Operating systems - coordinate computer resources, provide an interface between users and the computer, and run applications.
  - Utilities - perform specific tasks related to managing computer resources.
  - Device drivers - specialized programs that allow particular input or output devices to communicate with the rest of the computer system.
  - Language translators - convert the programming instructions written by programmers into a language that computers understand and process.
2.1 Operating Systems

- An operating system is a collection of programs that handle many of the technical details related to using a computer.
- An operating system is the most important type of computer program.
- Famous operating systems: Microsoft Windows (most common), UNIX, Linux, and Macintosh.
- Functions:
  - Managing resources - memory, processing, storage, and devices such as printers and monitors.
  - Provide user interface – How the user interacts with the computer. Almost all newer operating systems use a graphical user interface (GUI).
  - Running applications - load and run applications such as word processors and spreadsheets. Most operating systems support multitasking, or the ability to switch between different applications stored in memory.

2.2 Utilities

- Specialized programs designed to make computing easier.
- Essential programs:
  - Troubleshooting or diagnostic programs that recognize and correct problems, ideally before they become serious.
  - Antivirus programs that guard your computer system against viruses or other damaging programs that can invade your computer system.
  - Uninstall programs that allow you to safely and completely remove unneeded programs and related files from your hard disk.
  - Backup programs that make copies of files to be used in case the originals are lost or damaged.
  - File compression programs that reduce the size of files so they require less storage space and can be sent more efficiently over the Internet.
- Some Windows Utilities
  - **Backup** is a utility program included with the many versions of Windows that makes a copy of all files or selected files that have been saved onto a disk. It helps to protect you from the effects of a disk failure. (Figure 5-10 on page 129 illustrates the Backup utility)
  - **Disk Cleanup** is a trouble-shooting utility that identifies and eliminates nonessential files. This frees up valuable disk space and improves system performance. (Figure 5-11 on page 130 illustrates the Disk Cleanup utility)
  - **Disk Defragmenter** is a utility program that locates and eliminates unnecessary fragments and rearranges files and unused disk space to optimize operations.
3. The Binary System and the System Unit

3.1 The Binary System

- The binary system consists of two digits – 0 and 1
- Each 0 or 1 is called a bit – short for binary digit
- In order to represent numbers, letters, and special characters, bits are combined into groups of eight called bytes. Each byte typically represents one character.

3.2 The System Unit

Also known as the system cabinet (shown in Figure 6 below) is a container that houses most of the electrical components that make up a computer system.

![Figure 6 The System Unit](image)

There are many components in the system unit. The main ones are:

- **The System Board (The motherboard)**
  - It is the communications medium for the entire computer system because every component of the system unit connects to the system board.
- A large flat circuit board covered with a variety of different electronic components.
- **Connecting lines** called **bus lines** provide pathways that support communication among the various electronic components that are either located on the system board or attached to the system board.

  o **The Microprocessor**
    - The central processing unit (CPU) or processor is contained on a single chip called the microprocessor. The microprocessor is the “brains” of the computer system.

  o **Memory**
    - Memory is a holding area for data, instructions, and information.
    - There are three well-known types of memory chips: random-access memory (RAM), read-only memory (ROM), and complementary metal-oxide semiconductor (CMOS).
    - **RAM**
      - Random-access memory (RAM) chips hold the program (sequence of instructions) and data that the CPU is presently processing.
      - RAM is temporary or volatile storage because everything in most types of RAM is lost as soon as the microcomputer is turned off. Memory capacity is in bytes.
    - **ROM**
      - Read-only memory (ROM) chips have programs built into them at the factory.
      - ROM chips are not volatile and cannot be changed by the user.
      - ROM chips typically contain special instructions for detailed computer operations.
    - **CMOS**
      - The chip supplies such information as the current date and time, amount of RAM, type of keyboard, mouse, monitor, and disk drives.
      - It is powered by a battery and does not lose its contents when the power is off.

  o **Expansion slots and cards**
    - Expansion cards plug into slots located on the system board.
    - Ports on the cards allow cables to be connected from the expansion cards to devices outside the system unit.
    - Some of the more common devices are video cards, sound cards, modem cards, network interface cards, and TV Tuner cards.
4. The Input and Output Devices

4.1 Input and Input Devices

- Any data or instructions that are used by a computer.
- Input devices are hardware used to translate words, sounds, images, and actions that people understand into a form that the system unit can process.
- Some commonly used input devices are:
  - **The keyboard**: used to key in characters.
  - **The mouse**: used to point to or click on a certain area of the screen.
  - **The microphone**: used to input sound into the computer.
  - **The scanner**: moves across text and images (shown in Figure 8). It converts scanned data into a form the system unit can process.
### 4.1 Output and Output Devices

- Output is processed data or information, and typically takes the form of text, graphics, photos, audio, and/or video.
- Output devices are any hardware used to provide or to create output.
- They translate information that has been processed by the system unit into a form that humans can understand.
- Some commonly used output devices are:
  - **Monitors**: Present visual images of text and graphics. The clarity of a monitor refers to the quality of the displayed images. Two main types of monitors are:
    - **Cathode-Ray Tubes (CRT)**: similar to televisions.
    - **Flat-panel monitors**: much thinner such as Liquid Crystal Display (LCD).
  - **Printers**: Present the information on paper. Two main features of printers are:
    - **Resolution** - the clarity of images produced and measured in dpi (dots per inch). The higher the dpi, the better the quality of images produced.
    - **Speed** – measured in the number of pages printed per minute (ppm).

### 5. The Secondary Storage

#### 5.1 Introduction

Secondary storage provides permanent or nonvolatile storage. Using secondary storage devices data and programs can be retained after the computer has been shut off. The capacity of such devices is measured by bytes, kilobytes (1KB=1000 B), megabytes (1MB=1000KB), gigabytes (1GB=1000MB), and terabytes (1TB=1000GB). The main types of secondary storage devices are: hard disks, floppy disks, optical disks (compact disks, digital video disks, and blu ray disks), and solid state storage devices.

#### 5.2 Hard Disks

- Hard disks save files by altering the magnetic charges of the disk’s surface.
- Thick, rigid metallic platters (see Figure 10) that are stacked one on top of another.
- Hard disks store and organize files using tracks, sectors, and cylinders.
- There are two main types of hard disks:
  - **Internal hard disk (fixed disk)**: Located inside the system unit.
  - **External hard disk**: Removable. Useful for backup and transferring files.
5.3 Optical Disks

- A laser beam alters the surface of a plastic or metallic disc to represent data.
- The 1s and 0s are represented by flat areas called lands and bumpy areas called pits on the disc surface.
- The amount of reflected light determines whether the area represents a 1 or a 0.
- Rotational speed determines how fast data can be transferred from the CD. (e.g. 56X)
- Compact Disc (CD) – Stores 650 MB up to 1GB
  - Read only—CD-ROM - it cannot be written on or erased by the user.
  - Write once—CD-R - it can be written to once.
  - Rewriteable—CD-RW – can be written to many times.
- Digital Video Disk (DVD) – Stores 4.7 GB to 17 GB
  - Read only—DVD-ROM - it cannot be written on or erased by the user.
  - Write once—DVD +R and DVD -R - can be written to once.
  - Rewriteable—DVD +RW, DVD -RW, and DVD-RAM – Rewriteable
- Hi-Definition Discs
  - Even greater capacity than CD and DVD
  - HD DVD = 15 GB to 45 GB
  - Blu-Ray = 25 GB to 50 GB

5.4 Solid State Devices

- Have no moving parts. There are two types:
  1. Flash memory cards (also known as SD cards) – used in cameras and some laptops.
  2. Flash USB disk – plugged into the USB port of the computer.
6. Computer Communications and Networks

6.1 Introduction

- Communication is the process of sharing data, programs, and information between two or more computers.
- A network is a group of connected computers.
- The communications system (shown in figure 13) is an electronic system that transmit data from one location to another and it consists of:
  - Sending and receiving devices: send as well as receive messages (e.g. computer).
  - Communication channel: the medium that carries the message (e.g. cable).
  - Connection devices: convert messages into packets that can travel across the communication channel (e.g. modem).
  - Protocols: rules that coordinate the sending and receiving devices (e.g. TCP/IP).

6.2 Communications Channels

They are either physical such as Twisted pair, Coaxial cable, and Fiber-optic cable, or wireless such as Infrared, Microwave (e.g. Bluetooth), and Satellite (see figure 14).
6.3 Connection Devices

**Modems:** They connect computers over analog phone lines. They convert the computer’s digital signals to analog signals to send over the phone line (modulation) and then re-convert them to digital when receiving information from the phone lines (demodulation). The transfer rate is measured in bits-per-second. There are four types: Internal, external, PC card, and Wireless

**Network interface cards (NIC):** expansion cards located within the system unit that connect the computer to a network

6.4 Network Types

**Local Area Networks** - Networks with nodes that are in close physical proximity
**Home Networks** – networks being used by individuals in their homes and apartments.
**Metropolitan Area Networks** - span distances up to 100 miles. links between office buildings that are located throughout a city.
**Wide Area Networks** - countrywide and worldwide networks.
6.5 Firewall

It is a security system designed to protect an organization’s network against external threats. It consists of hardware and software that control access to a company’s intranet or other internal networks.

7. The Internet and the Web

7.1 Introduction

The Internet (Launched in 1969) is often referred to as the Information Superhighway because it connects millions of people across the globe. Unlike a typical highway, the Internet moves idea and information.

The Web (Introduced in 1992) provides an easy-to-use multimedia interface to connect to the Internet and is used by millions of people every day.

Uses of the Internet and the Web: Communicating, Shopping, Searching, Entertainment, and Education (e-Learning).

The most common way is through ISP – Internet Service Providers.

7.2 HTML

HyperText Markup Language: A language to create a document that is found online (on the internet). Such documents are called are called html documents and have the extension .htm and .html.

7.3 Websites and webpages

A webpage is an html page and a collection of webpage form a website. For example: http://www.yahoo.com is a website and http://sports.yahoo.com is a webpage from that website. The homepage is the first page displayed when you visit a website.

7.4 Browsers

Browsers provide a user interface to the web and allow you to visit websites. The most well known browsers: Microsoft Internet Explorer, Mozilla Firefox, Netscape Communications. Allow connections to remote computers. To access a website we need its location/address (URL - Uniform Resource Locator). URLs have two parts domain name and a domain code. For example: in http://www.yahoo.com the domain name is yahoo and the domain type. Examples of domain types are: .com (commercial), .edu (education), .gov (government), .tv, .net, .org(organization), .com.lb (commercial in Lebanon) where lb is a country code.

7.5 Electronic Mail

E-mail is the most common form of Internet communications. The e-mail message can contain text, graphics, photos, and file attachments. To send an e-mail you need an e-mail account,
access to the Internet, and an e-mail software. Common e-mail software packages are Microsoft’s Outlook Express. Some e-mail softwares are web based such as homtail and gmail. Three basic elements: 1. Header (includes the addresses, the subject, and the attachments which files that can be sent along with the e-mail but are separate from the message), 2. Message body, and 3. Signature line – Provides additional information about the sender. Spam: Unsolicited and unwanted e-mails.

7.6 Search Engines

There billions of webpages online and around two billion pages are added daily to the Internet. A number of search engines help users locate the needed information. These engines maintain huge databases of the pages on the Internet. There are two ways to search for data: 1. Keyword search engines – uses words and phrases to find information. 2. Directory search engines – Also known as an index search organizes information by topic. Examples: Google and Yahoo. Metasearch engines automatically send requests to several search engines simultaneously. Metacrawler is an example.