

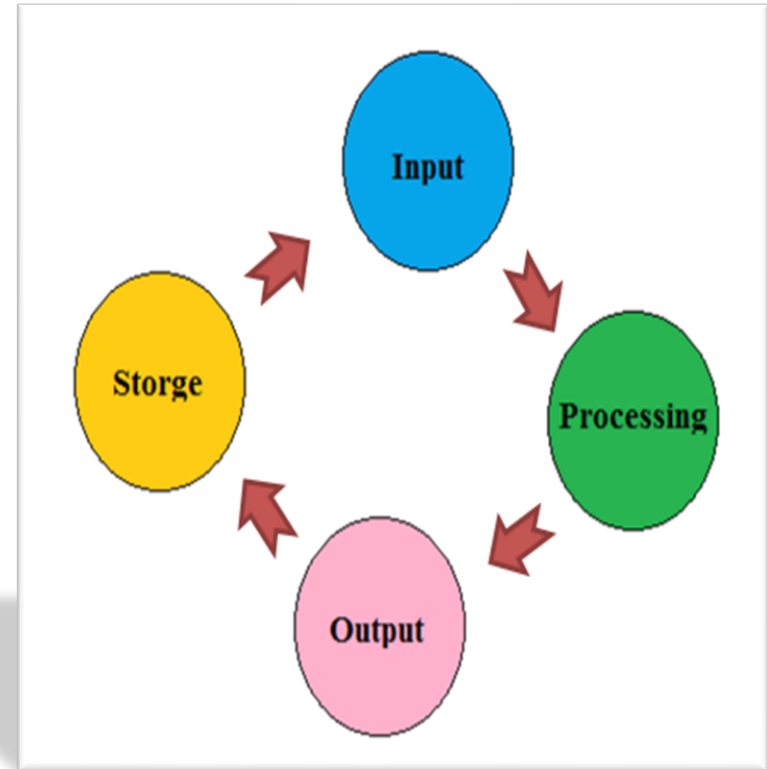


Part 2

Computer System Components

Every computer system is made up of multiple electronic components. These components fall into four broad categories that serve different purposes in the information processing cycle.

- **Input:** Components that help humans put data into the computer. Examples include a keyboard, mouse, and touch screen.
- **Processing:** Components that move and process the data inside the computer. The motherboard and its processor and memory chips fall into this category.
- **Output:** Components that provide the results of the processing to humans. The monitor is the primary output device; other examples include printers and speakers.
- **Storage:** Components that store software and data until it is needed. Storage components include hard drives, USB flash drives, and DVDs.



Selecting and Using Input Devices

Whenever you **type a letter in a word processor or issue the command to open or close the word processing program**, you use an **input device**. **Input devices** allow the **user to communicate with the operating system and applications**.

In this section, you will learn about several types of input devices.



Keyboards

A keyboard enables you to **enter typed data** (letters, numbers, and symbols). A **keyboard** can be a **separate device** that plugs into the system unit (as with a desktop PC) or a **built-in** keyboard (as with a notebook PC).

There are **many sizes and types of keyboards**, but most English-language keyboards use the same key arrangement, called **QWERTY**.

- The **name comes from the first six-letter keys** on the top row, from left to right. Figure below shows a QWERTY keyboard.
- This type of **keyboard** has a **number of specialty keys** as well as **numbers, letters, and symbols**. Specialty keys include:

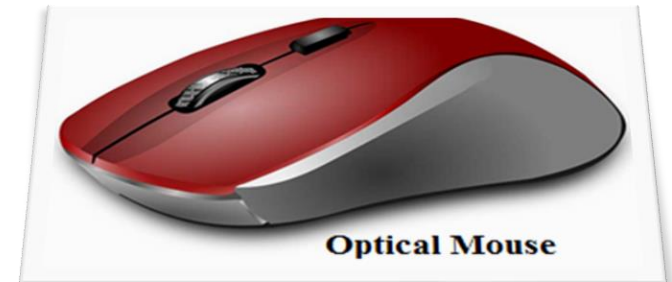
1. **Function keys (F1 through F12)**
2. **Toggle keys**
3. **Modifier keys**
4. **Positional keys**



Pointing Devices

A pointing device is a piece of hardware that enables you **to move an onscreen pointer in a graphical user interface** like **Microsoft Windows**. A **mouse** is the **most common pointing device**. It is a palm-sized object that you **move across a flat surface to move the pointer on the display**. A mouse **has one or more buttons on it**; you press the buttons to act upon whatever the pointer is pointing at.

- A **mouse** can be either mechanical or optical.
- **Many notebook computers** have a built-in touchpad, which is a small rectangular touch-sensitive pad with buttons below it.
- A **touch screen** can enable you to use your finger as a pointing device
- A **joystick** is a specialized pointing device used primarily in gaming.



Scanning Devices

A scanner digitizes hard-copy photos and documents and stores them electronically. Scanners work by:

- **shining a bright light on the surface of the page and measuring the amount of light that bounces back from it using a photosensitive charge-coupled device (CCD).**
- **Lighter areas bounce back more light than darker areas.**
- **For color scanning, multiple sensors are used, each one picking up a different color: red, green, and blue.**

- **When you scan text, you can use optical character recognition (OCR) software to convert the scanned image to text that you can work with in a text editing program.**
- **One very simple type of scanner is a bar code reader.**



Capture Devices

A capture device can capture either still images or motion video. Some devices do both, but most are designed primarily for one type or another.

- A **digital camera** is designed primarily for still photos, and looks much like a film camera.
- A **digital video camera** is designed primarily for motion video.



Audio Input Devices

Most personal computers support **audio input**, either through a **built-in audio adapter on the motherboard** or through an **add-on sound card**. A computer's audio ports may support **speakers, headphones, microphones**, and both analog and digital external audio device input.

- If you have a **microphone and voice input software**, you can speak into the microphone to issue commands to the computer and to input text into a word processing program.
- There are two kinds of voice input software: **voice recognition** and **speech recognition**.



Selecting and Using Output Devices

Output devices make the computer's processed information available to a human user. Without output devices, there would be little reason to have a computer, because it wouldn't produce anything you could use. The most common types of output devices are display screens, printers, and speakers.



Display Screens

A display screen is a video screen that the computer uses to provide information to a human user. A display screen can be built into a device, as it is with smartphones, tablets, and notebook PCs, or it can be a separate unit (a monitor), as it is with the majority of desktop PCs.

Display screens create their images by filling in tiny dots called pixels with different colors. The pixels are so small and so close together that the human eye sees them as continuous color gradients rather than individual blocks.

- Most modern stand-alone monitors are LCD
- Cathode ray tube (CRT) is an older monitor technology that uses a large vacuum tube and electron guns to create a display image on a phosphor-covered glass



Printers

Printers generate hard copy that is, physical printed pages you can hold in your hands. Over the years there have been many different printer technologies, each with its own characteristics and benefits.

Printer Features

When selecting a printer, there are a number of factors to consider:

1. Initial cost.
2. Per-page cost.
3. Resolution.
4. Speed.
5. Color.
6. Paper handling.
7. Interface.
8. Multi-function



Impact versus Non-Impact Printers

A printer can be either **impact** or **non-impact**.

An **impact printer** creates the image on the page by striking the page through an inked ribbon.

A **non-impact printer** places the ink on the page in some other way (for example, using heat or electricity), without striking the paper.

Audio Output Devices

The audio adapter in a computer handles both input and output.

The most common audio output devices are **speakers** and **headphones**

Speaker systems designed for computers are somewhat different from speaker systems designed for home stereo and home theater systems.



Choosing Appropriate Storage Devices

When a computer processes data, **RAM** (Random Access Memory) holds that data temporarily.

- **RAM** is known as **primary storage** because it's **where the data must be in order to interact with the CPU**.
- Data waits for the CPU's attention in memory, and then it waits again in memory when the CPU has finished processing it.

For data to be **safely and permanently stored**, however, it must be placed in **secondary storage**.

Secondary storage devices are nonvolatile, so **they don't lose their contents when the computer's power is turned off**.

- **Secondary storage** can include **hard disk drives, CDs, DVDs, and network and cloud-based storage**.

Storage devices are evaluated in these ways:

- 1. Capacity: How much can it hold?**
- 2. Cost: How much does the storage cost per megabyte or gigabyte?**
- 3. Access speed: How quickly can the data be written and retrieved?**
- 4. Interface: How does it connect to the computer, and how fast is that connection?**
- 5. Media type: Is it magnetic, optical, or solid-state?**
- 6. Portability: Is the storage inside the system unit, or connected to it externally?**
- 7. Removability: Is the disc removable from the drive that reads and writes it, or are they one inseparable unit?**

Data Storage Basics

A **file** is a **named collection of bits that work together to represent a single object**, such as an executable program, a spreadsheet, a picture, or a system file.

Folders are logical organizing units for files.

For example, a **Windows-based computer** has a

- 1- Windows folder** containing the system files needed to run Windows,
- 2- Users folder** containing the data files and settings for each user account,
- 3- Program Files folder** containing the files needed for each installed application.

A **folder within a folder** is called a **subfolder**; each of the aforementioned folders contains multiple subfolders. **Files and folders are stored on volumes**. Each volume has a letter followed by a colon, such as **C:** or **D:**.

Hard Disk Drives

A hard disk drive (HDD) is the **most popular type of secondary storage for personal computers**. Although newer technologies are emerging, HDDs remain the standard because of their high capacity and low cost.



- An HDD can be **internal or external**, but most are internal, installed inside the system unit. **An internal HDD connects to the motherboard.**
- An **external HDD connects to a port on the outside of the system unit.**

Optical Drives

An optical drive uses a light beam and sensor to read the data. The surface of a blank optical disc is shiny and reflects light strongly. When data is written to an optical disc, certain areas are burned with a laser so they are **less reflective**. The **shiny areas** are called **land**, and the **less-shiny areas** are called **pits**.

There are **several types of optical drives and discs**.

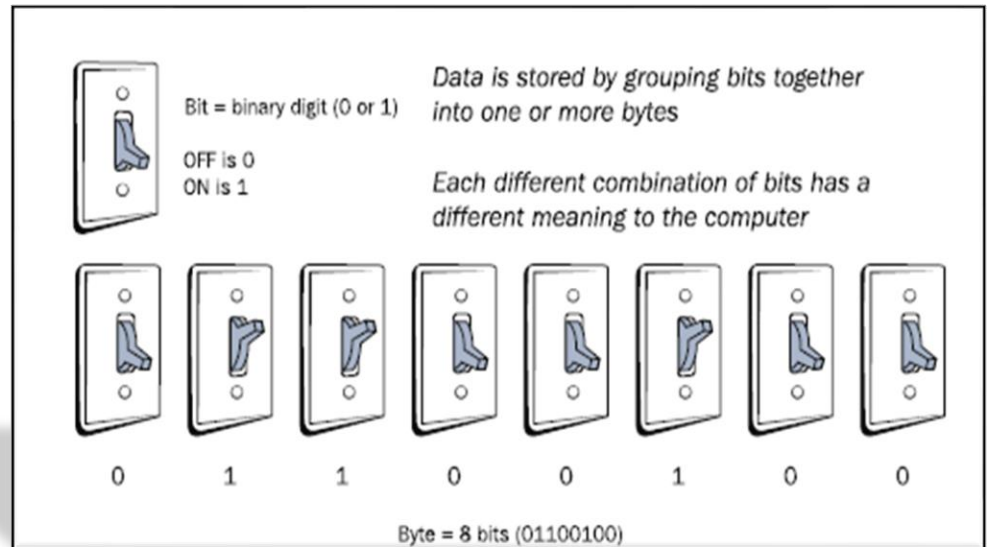
1. The **oldest and most basic type is a compact disc (CD)**, which holds up to 900MB of data. CDs are used for small amounts of data and also for audio recordings
2. **DVDs** are used to distribute large applications, large amounts of data, and standard definition movies.
3. **Blu-ray discs (BD)** can store up to 128GB in up to four layers. They are used to distribute even larger amounts of data, or high-definition movies.

All three types of discs can be read-only (ROM), recordable once (R), or rewriteable (RW). To record or rewrite a disc, you must have a drive with that capability that supports the type of disc you are using.

How Data Is Represented on a Computer

The smallest unit of data in a computer is a bit. A bit is a single binary digit, with either a 1 (on) or 0 (off) value. Eight bits can combine to make a byte, which is an 8-digit binary number

Modern systems work with thousands, millions, and even billions of bytes at a time. Table below lists the names for certain multiples of bytes.



| Term | Number of Bytes |
|---------------|--|
| Kilobyte (KB) | 1024 (approximately one thousand) |
| Megabyte (MB) | 1,048,576 (approximately one million) |
| Gigabyte (GB) | 1,073,741,824 (approximately one billion) |
| Terabyte (TB) | 1,099,411,627,776 (approximately one trillion) |

How Computers Communicate

Early computers did not communicate easily with one another. Data was typically carried between computers on floppy disks and other low capacity removable disks, or using slow dial-up modems.



- Network connections were difficult to set up and transferred data very slowly.
- Nowadays, however, communication technology has advanced greatly, and there are many choices for making computers connect to one another.



1- Ethernet Networking

Most computers today are **part of one or more networks**. A **network is a group of computers that share resources** (such as printers or Internet service) and/or data (such as files).

- The **most common** network standard is **Ethernet**. **Ethernet networks can be either wired or wireless** (or a combination of the two), but the term **Ethernet** is most often applied to the **wired kind of connection**.
- **Most PCs have a network adapter**, which provides **network connectivity services** and a **port** into which you can plug an Ethernet cable.

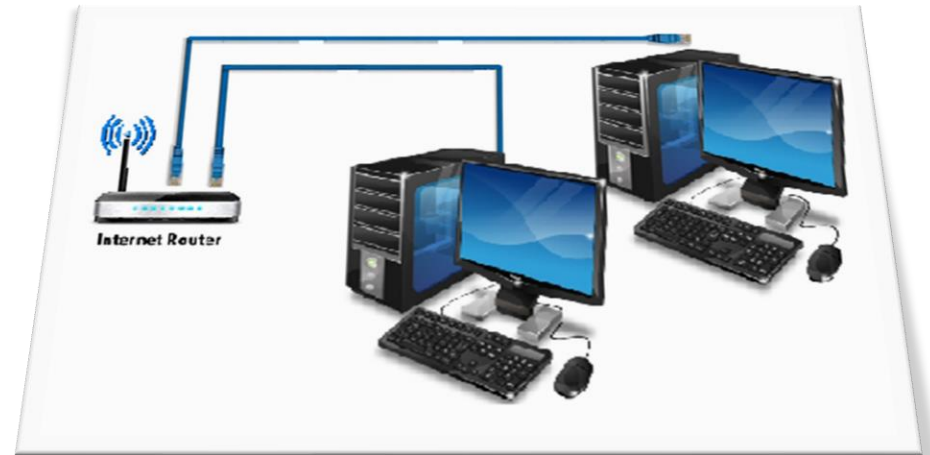


The most common kind of **Ethernet cable** uses **twisted pairs of copper wiring** and an **RJ-45 connector**, which is like a telephone connector except slightly wider.

- **Wireless Ethernet** is more often called **Wi-Fi, or 802.11**. That number refers to the standard number assigned to it by the **Institute of Electrical and Electronics Engineers (IEEE**, pronounced “eye-triple-ee”). Different **Wi-Fi sub-types** have different letter designations, such as **802.11g** or **802.11n**.
- Most **portable devices** such as **tablets** and **phones** use **wireless connections** and do not have the capability for wired networking



- In a **small network**, such as in a **home or small business**, one end of an Ethernet cable plugs into the computer, and the other end plugs into a controller box called a **router** that manages the **network traffic between the connected devices**.



- If you have broadband (always on) Internet access, the device that brings that service into your home or business is frequently called the **router**, and then the router shares the Internet connection among all the computers.



If you have a **Wi-Fi wireless router** and a **wireless network adapter in the computer**, the computer can connect to the router **via radio frequency (RF) waves**, so no cables are required.



In large-scale networks, Ethernet is still the standard, but some different hardware is employed. Large panels of switches can connect hundreds of computers into a central network system. Cables with fiber optic technology are used in the network's backbone to carry large amounts of network traffic faster and more efficiently.



2- Bluetooth Networking

Bluetooth is a **short-range wireless alternative to wireless Ethernet (Wi-Fi), used primarily to connect wireless devices directly to specific computers.**

For example, you might have a Bluetooth wireless headset for your cell phone, or a Bluetooth speaker for your MP3 player.

Bluetooth's limited range (10 meters) makes it impractical as a replacement for Wi-Fi, but it provides an easy and economical way for one device to connect with another within a limited space without Ethernet hardware.



3- The Internet

The Internet is the world's largest network. When you use the Internet, your computer becomes a member of this giant network, and you can communicate with any other computer on the Internet, to the extent that its owner has chosen to make it available.

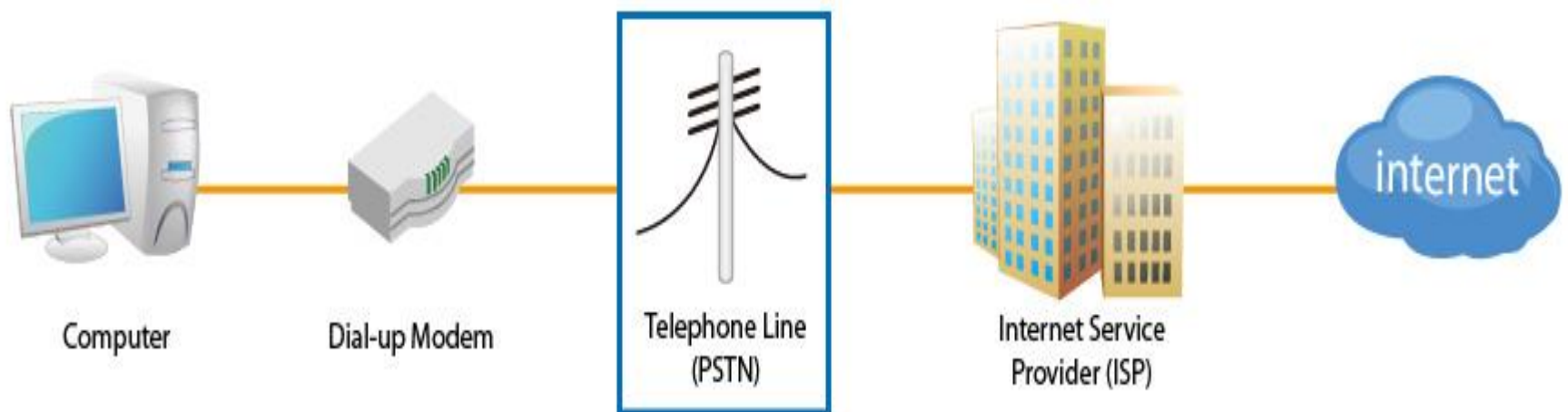
For example, you can exchange email messages, download files, and view web pages stored anywhere in the world.



Individual computers don't connect directly to the Internet, however; they go through an **Internet service provider (ISP)**, a company that provides a connection to the Internet for a fee.

- Your ISP may be your local phone or cable TV company, or at work it may be a service that your school or employer partners with.

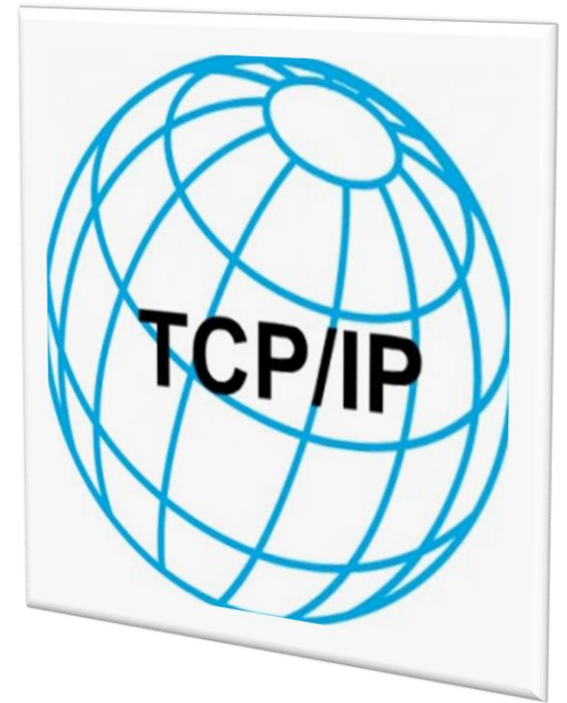
An ISP provides a device (a modem or terminal adapter) that translates your computer's requests into Internet-compatible data.



The Internet functions using a set of standards called **Transmission Control Protocol/Internet Protocol (TCP/IP)**. It is **this shared communication language that makes global communication possible.**

TCP/ IP defines

How data will be treated as it is broken up into packets for transmission, sent through a series of routers across the world, reassembled into its original form at the receiving end.



The End