**System unit**

- **System unit (system chassis):** is a container that houses electronic components that make up a computer system.

- **Example of electronic components:** System Board (Motherboard), Microprocessor, Memory, Socket, Bus Lines, and Expansion Slots.

**There are six types of microcomputer system unit:**

- **Desktop system units:** Contain electronic components and selected secondary storage devices. Input and output devices located outside the system unit.

- **Media center system units:** Dedicated entertainment devices. Use powerful desktop system hardware with graphics cards for interfacing with home entertainment devices.

- **Notebook system units (laptops):** Contain electronic components and selected secondary storage devices. Input devices located outside the system unit. The monitor is attached by hinges.

- **Netbook system units:** Similar to Notebook system units. Designed to support Web browsing and e-mail access. They reuse space and weight by leaving out optical drivers.

- **Tablet PC system units:** Similar to Notebook system units. There are two types, one type is accept stylus pen input and monitor swivels and folds onto keyboards. Other type has a removable keyboard.

- **Handheld computer system unit:** Contain an entire computer system, including electronic components, selected secondary storage, and input and output devices.

- **Each type of system unit has the same basic components including system board, microprocessor, and memory.**
**Electronic Data and Instructions**

Human voice creates analog (continuous) signals; computer only recognizes digital electronic signals.

**Numeric Representation**

Data and instruction can be represented electronically with two-state or binary system of numbers (0, 1).

Each 0 or 1 is called a bit (bit short for binary digit). A byte consists of eight bits.

Hexadecimal system (hex) uses 16 digits to represent binary numbers. Each hex digit represents four binary digits, and two hex digits are commonly used together to represent 1 byte (8 binary digits).

**Character Encoding (nonnumeric)**

Character encoding standards assign unique sequences of bits to each character.

**There are 3 standards are:**

**ASCII** (American Standard Code for Information Interchange).
Microcomputer used it.

**EBCDIC** (Extended Binary Coded Decimal Interchange Code).
Maintain comparer used it. (Uses only 7 bits to represent each Character).

*ASCII and EBCDIC were quite effective and limited.*

**Unicode** (uses a variable number of bits to represent each Character).
Recognized by virtually every computer system.

**System Board**

**System board (main board or mother board):**
- Connects all system components and allows input and output devices to communicate with the system unit.

- It is flat circuit board covered with these electronic components:
  - **Sockets**: provide connection points for chips. Sockets are used to connect the system board to microprocessor and memory chips.
  - **Chips**: (silicon ships, semiconductors, integrated circuits). Chips mounted on carrier package.
  - **Slots**: provide connection points for specialized cards or circuit’s board.
  - **Bus lines (connection lines)**: provide pathways to support communication among electronic components.
Microprocessor

Microprocessor: is a signal chip that contains the central processing unit (CPU) or microprocessor.

It has two basic components:

- **Control unit:**
  - Tells the computer system how to carry out program instructions.
  - Directs electronic signals between memory and arithmetic-logic unit.
  - Directs electronic signals between the CPU and input & output devices.

- **Arithmetic-logical unit (ALU):**
  - Performs two types of operation:
    - Arithmetic (fundamental math operation)
    - Logical (consists of comparison)

Microprocessor chips

- **A word** is the number of bits that can be accessed by the CPU at one time. The more bits in a word, the more data a computer can process.
- **Clock speed:** represents the number of times the CPU can fetch and process data or instructions in a second.
- Older microprocessor process data and instructions in microseconds, newer ones process in nanosecond, supercomputers process in picoseconds.
- The two most signification developments are 64-bit processor and the multicore chip.
- New types of **multicore chip** provide two or more separate and independent CPUs. These chips allow a single computer to run two or more operations at the same time. (Like dual-core process)
- **Parallel processing** requires programs that allow multicore processor to work together to run large complex programs.
Chapter 1
The System Unit
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Specialty Processors

- **Coprocessor**: are specialty chips designed to improve specific computing operations. Like **graphics Coprocessor** also called **GPU (graphics processing unit)**, displaying 3-D images, and encrypting data.

- **Smart cards**: are plastic cards the size of a regular credit card that has an embedded specialty chip.

- **Processor in automobiles** (monitor fuel efficiency, satellite entertainment, and tracking systems).

- **RFID tags**: are specialty chips embedded in track merchandise)

Memory

- **Memory**: is a holding area for data, instructions, and information

Memory like microprocessors is contained on chips connected to the system bored.

There are three types of memory chips:

1. **RAM (random-access memory) chips**:
   - Hold the program (sequence of instructions) and data that the **CPU** is presently processing.
   - **RAM** are called temporary or volatile storage because their contents are lost if power is disruption.
   - **Cache memory**: is a high-speed holding area between memory and the **CPU** for frequently used data and information.
   - **DIMM (dual-in-line-memory)**: is used to expand memory.
   - **Virtual memory**: divides large programs into parts that are read into **RAM** as needed.
   - Other types of **RAM**: **DRAM – SDRAM – DDR – Direct RDRAM**

2. **ROM (read-only memory) chips**:
   
   Are nonvolatile storage have information stored in them by manufacture and cannot changed by user. The CPU can read and retrieve information, and cannot write it.

   **ROM** control essential system operation (start a computer, access memory, and handle keyboard input.

3. **Flash Memory**:
   - Is type of memory that does not lose its contents when power is removed (like **ROM**).
   - It can be updated to store new information (like **RAM**).
   - It is used to store information about a computer’s configuration.
**Expansion Slots and Cards**

Most computers allow users to expand their system by providing *expanding slots* on their system boards to accept *expansion cards*. *Ports* on the cards allow cables to be connected from *expansion card* to devices outside the system.

- **Commonly Used Expansion Cards:**
  - **Advanced graphics cards:** provide high-quality 3D graphics and animation.
  - **Sound cards:** accept audio input.
  - **Network interface cards (NIC)(Network adapter cards):** used to connect to a computer to a network.
  - **Wireless network cards:** allow computer to be connected without cables.
  - **TV tuner cards:** watch TV and surf to internet at the same time.

- **Plug and play:**
  Is the ability for a computer to recognize and configure a device without human interaction.

- **PC card and Expressed card:**
  
  PC cards & Express Card slots accept credit card-sized expansion cards in notebook computer. These cards plug into PCMCIA.

**Bus Lines**

- **Bus lines (buses):** connects parts of the CPU to each other, and the CPU to other components on the system board.

- **Bus width:** is the number of bits that can travel simultaneously.

There are 2 categories of buses:

- **System buses:** connect CPU and memory.
- **Expansion buses:** connect CPU and expansion slots.
Expansion Buses

There are 5 principal expansion buses types are:

1) Peripheral component interconnect (PCL) buses:
   Are mostly 64-bit; common on older computer.

2) Universal serial bus (USB):
   Widely used today; combines with PCL bus to support several external devices.

3) FireWire buses:
   Similar to USB bus; used to support specialized application.

4) Serial advanced technology attachment (SATA) bus:
   Newer; much faster than USB and FireWire.

5) PCI Express (PCie) bus:
   Provides a dedicated path for each connected device; much faster.

Ports

- A port: is a socket for external devices to connect to the system unit.

Standard ports

- There are 4 standard ports are:

  1) VGA (Video Graphics Adapter) and DVI (Digital Video Interface) ports:
     Provide connection to analog and digital monitor respectively. DVI commonly used, VGA provide for older/lower-cost monitor.

  2) Universal serial bus (USB) ports:
     Widely used to connect keyboards, mice, printers, and storage devices; one port can connect to several devices to system unit.

  3) FireWire ports:
     Provide high-speed connection to specialized FireWire buses devices (camcorders and storage devices).

  4) Ethernet ports:
     High-speed networking port that has become a standard for many today's computers, allow connecting multiple computers or DSL or cabling modem.
Specialized ports

There are numerous specialty parts including:

- **Sony/Philips Digital Interconnect Format (S/PDIF) ports (optical audio connections):** For high-end audio and home theatre system.
- **High Definition Multimedia Interface (HDMI) ports:** For high-definition audio and video.
- **Musical instrument digital interface (MIDI) ports:** For digital music.

Legacy ports

**Legacy ports:** have largely been replaced by faster, more flexible ports such as the universal serial bus (BUS).

These ports include:

- **Serial ports:** connect many devices to the system unit. Sent data one bit at a time, good for sending information over long distance.
- **Parallel ports:** connect external devices that needed to send or receive data over short distance. Sent eight bits of data simultaneously across eight parallel wires.
- **Keyboards and mouse ports:** connect keyboards and mice to the system unit.
- **Infrared Date Association (IrDA) ports:** provide a wireless mechanism for transferring data between devices by infrared light waves were used to transmit data
- **Game ports:** connect video game controllers and joystick.

Cables

Cables are used to connect external devices to the system unit via the ports.

Power Supply

**Power supply units:**

Convert AC(alternating current) to DC (direct current)and provides the power to drive all of the system unit components. They are located within the desktop computer's system unit.

**AC adapter:**
Convert AC(alternating current) to DC (direct current)and provide the power to drive the system unit components, and can recharge the batteries. Power notebook computer and tablet PCs.

Netbook and handheld computers use AC adapters to recharge the batteries.