

Introduction to Computer Concepts

Computer Hardware and Software

Two Major Parts of a Computer System

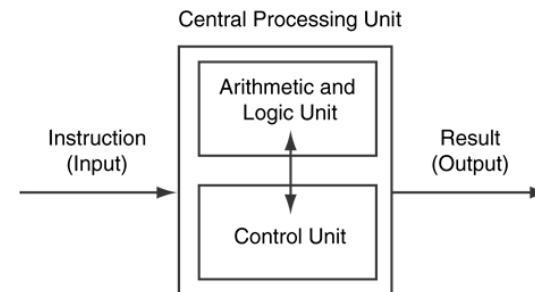
- A computer system consists of two major parts:
 - Hardware
 - Software
- Hardware refers to all visible components. They perform the actual data processing work.
- Software refers to programs which are instructions that describe how to do the processing work.

Computer Hardware Components

- A computer consists of the following main hardware components:
 1. Central Processing Unit (CPU)
 2. Main Memory
 3. Secondary Memory / Storage
 4. Input Devices
 5. Output Devices

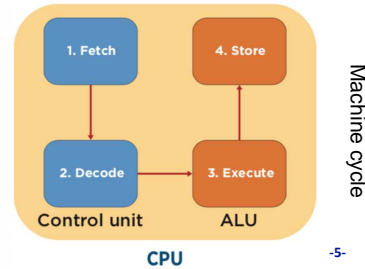
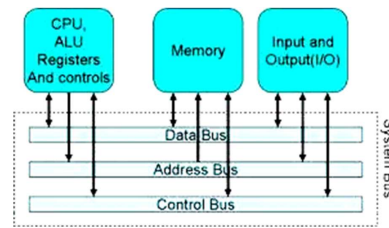
Central Processing Unit (CPU)

- The brain of the computer
- A complex integrated circuit consisting of millions of electronic parts and is primarily responsible for converting input (data) into meaningful output (information)



Central Processing Unit (CPU)

- Data travels in and out of the CPU through a **bus** – a communication system that transfers data between components inside the computer system
- CPU processes the data by repeatedly following the machine cycle



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Main Memory

- Responsible for holding data and programs as they are being processed by the CPU
- **Random access memory (RAM)**
 - OS files
 - Running programs
 - Fast but volatile
- **Read-only memory (ROM)**
 - BIOS
 - Power-on self test (POST)
 - Firmware
 - Holds built-in system data, not for running programs, non-volatile

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Common Types of RAM

Table 3-1: Types of RAM

Type of RAM	Description	Volatile or nonvolatile
Dynamic RAM (DRAM)	Memory needs to be constantly recharged or contents will be erased	Volatile
Static RAM (SRAM)	Memory can be recharged less frequently than DRAM, but can be more expensive than DRAM	Volatile
Magnetoresistive RAM (MRAM)	Memory uses magnetic charges to store contents, and can retain its contents in the absence of power	Nonvolatile
Flash memory	Fast type of memory that typically is less expensive than some other types of RAM, and can retain its contents in the absence of power	Nonvolatile

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Secondary Storage Devices

- Non-volatile and relatively cheaper than main memory
- Designed to store data for extended periods of time
- The type and amount of data helps to determine the most appropriate storage device to use

Figure 3-5: Storage devices



Internal hard drive for a laptop

External hard drive

Memory cards

USB flash drive

Sources: SanDisk

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Storage Solutions (1 of 2)

Hard Drives

- Internal hard drives
 - Magnetic hard disk drives (HDDs)
 - Solid State Drive (SDD)
- External hard drives
 - Magnetic hard disk drives
 - Solid State Drive (SDD)
 - USB flash drive
 - Optical media

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Storage Solutions (2 of 2)

Cloud Storage

- Storing electronic files on the Internet instead of a local computer
 - Google Drive
 - Microsoft OneDrive
 - Dropbox

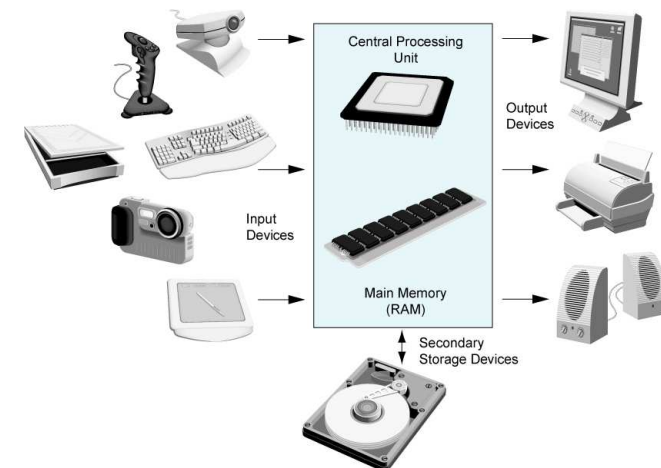
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Input and Output Devices

- **Input device:** communicates instructions and commands to a computer
 - Examples: keyboard, mouse
- **Output device:** conveys information from the computer to the user
 - Examples: monitors, speakers, printers

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Computer hardware Components Summary



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How Computers Represent Data

➤ A computer is a Binary System

- All data are represented as binary numbers (a sequence of 1s and 0s).
- Bit: smallest piece of data. Has value 0 (off) or 1 (on).
- Byte: 8 consecutive bits.
- Other units for measuring data sizes:
 - Kilobyte (KB) = 1024 bytes
 - Megabyte (MB) = 1024 KB
 - Gigabyte (GB) = 1024 MB
 - Terabyte (TB) = 1024 GB

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How Computers Represent Data

- Integer numbers are stored as binary

decimal	0	1	2	3	4	5	6	7
binary	0	1	10	11	100	101	110	111
decimal	8	9	10	11	12	13	14	15
binary	1000	1001	1010	1011	1100	1101	1110	1111

- Text coding scheme
 - ASCII (8 bits) A -> 01000001
 - Unicode (16 bits) A -> 0000000001000001
- Other data
 - Images
 - Video
 - Audio

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Pros and Cons of Different Types of Computers (1 of 3)

Desktop Computer

- Typically consists of a system unit, monitor, keyboard, and mouse
- More powerful, more storage
- Hardware components can be easily upgraded
- Can't be moved easily



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Pros and Cons of Different Types of Computers (1 of 3)

Laptop Computer

- Very portable due to its compact size
- Less powerful than desktop
- Memory and hard drive are about the only components that can be upgraded



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Pros and Cons of Different Types of Computers (2 of 3)

All-in-One Computer

- Monitor and system unit are housed together
- Take up less space and easier to transport
- Typically more difficult to service or upgrade
- More expensive than desktops



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Pros and Cons of Different Types of Computers (3 of 3)

Mobile Device

- Smartphone, Tablet, etc.
- Portable or handheld computing device
- Less powerful
- Not upgradeable



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Categories of Software

- **System Software:** The software that runs a computer, including the operating system and the utilities
- **Operating System (OS):** a program that manages the complete operation of your computer or mobile device and lets you interact with it.
 - *Windows, MacOS, Unix, Android OS*
 - Most operating systems come installed on your computer or device
- **Application Software:** programs that provide services to the user. They solve specific problems, such as word processing, browsing the web, games, etc.
 - *Microsoft Office*
 - *Google Chrome*

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Standard Operating System Functions

- Starting and shutting down a computer or device
- Managing programs
- Managing memory
- Coordinating tasks
- Configuring devices
- Establishing an Internet connection
- Monitoring performance
- Providing file management
- Updating operating system software
- Monitoring security
- Controlling network access

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Operating System Features

- Graphical user interface (GUI)
- Utilities: software developed to help maintain the computer
- Software as a Service (SaaS): software accessed online via a subscription
 - *Google Apps*
 - *DocuSign*
- Open/closed source: software whose original source code is made freely (or not freely) available and may (or may not) be redistributed and modified
 - *Android OS (open source)*
 - *Microsoft Office (closed source)*

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Desktop Operating Systems

OS	Available for	Notable features
Windows	Desktop computers, laptops, and some tablets	Supports the Cortana virtual assistant, touchscreen input, HoloLens headsets, and built-in apps such as the Microsoft Edge browser
macOS	Macintosh desktop computers and laptops	Includes the Siri virtual assistant, coordination with Apple mobile devices, and cloud file storage
UNIX	Mainframes, web servers, workstations	Multitasking operating system with many versions, as the code is licensed to different developers
LINUX	Desktop computers, laptops, and some tablets	Distributed under the terms of a General Public License (GPL), which allows you to copy the OS for your own use, to give to others, or to sell
Chrome OS	Chromebook laptops	Based on Linux, uses the Google Chrome browser as its user interface, and primarily runs web apps (an app stored on an Internet server that can be run entirely in a web browser)

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Server Operating Systems

OS	Notable features
Windows Server	The server version of Windows. It includes advanced security tools and a set of programs called Internet Information Services that manage web apps and services.
macOS Server	Supports all sizes of networks and servers. One unique feature is that it lets authorized users access servers their iPhones or other Apple devices.
UNIX	A multipurpose operating system that can run on a desktop PC or a server. Many web servers , which are Internet computers that store webpages and deliver them to your computer or device, use UNIX because it is a powerful, flexible operating system.

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Mobile Operating Systems

OS	Notable features
Android	Developed by Google based on LINUX, and designed to be run on many types of smartphones and tablets
iOS	Runs only on Apple devices, including the iPhone, iPad, and iPod; derived from macOS

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