COMPUTER HARDWARE

Introduction

The computer hardware topic introduces learners to the fundamental concepts of computer hardware, focusing on its components and their functions. It explains how input, processing, storage, and output devices work together to process and manage data in a computer system.

Audience

The course is designed for high school students, college freshmen, and beginners interested in Information Technology or Computer Science.

Length of topic

The topic will take 2-week, with 1 hours of study per week.

Course Outcome

By the end of this topic, learners will be able to:

1. Identify and explain the four main categories of computer hardware.
2. Differentiate between input and output devices.
3. Describe the roles of the CPU, GPU, and storage devices.
4. Compare volatile and non-volatile storage systems.

Technology Requirements

- Access to an internet-enabled computer or mobile device.

Introduction to Computer Hardware

Computer hardware encompasses the physical components that form a computer system. These tangible parts collaborate to execute instructions and process data. Hardware is generally divided into four primary categories:

1. **Input Devices**: Devices like keyboards, mice, and scanners that facilitate user interaction with the computer and data input.

2. **Processing Units**: The central processing unit (CPU) serves as the computer's brain, performing calculations and controlling data flow, while the graphics processing unit (GPU) specializes in handling graphical data and resource-heavy visual tasks.

3. **Storage Devices**: Computers utilize both temporary (RAM) and permanent (hard drives, SSDs) storage solutions. Temporary storage offers fast access but is volatile, whereas permanent storage retains data for prolonged periods.

4. **Output Devices**: Monitors, printers, and speakers allow users to visually, audibly, or physically experience the results of computer operations.

Input Devices

Input devices are hardware components that send data to a computer or digital system, enabling users to interact with and control the machine. They play a vital role in gathering information from users or the external environment and converting it into a format the computer can process.

Examples: Keyboard, mouse, trackpad, touchscreen, joystick, microphone, light pen, webcam, and voice input devices.

Output Devices

Output devices are hardware components that deliver information from a computer to the user or another machine. They convert processed data into forms such as visuals, sounds, or physical outputs.

Examples: Monitor, printer, scanner, speakers, display screens (e.g., tablets, smartphones), projectors, and headphones.

Processing Units

Central Processing Unit (CPU)

The CPU is the primary component responsible for executing the majority of a computer's processing tasks. Often referred to as the brain of the computer, the CPU performs calculations, manages logical operations, and

controls data flow between system components such as RAM and storage devices. It runs software applications, enabling tasks like document creation, gaming, and web browsing. The performance of a CPU measured by its speed and efficiency directly impacts the computer's overall functionality, with high-end CPUs offering superior processing capabilities


Central Processing Unit (CPU)

Graphics Processing Unit (GPU)

The GPU is a specialized processor designed for managing visual and graphical data. Essential for applications requiring high-quality graphics and rapid processing, GPUs offload specific tasks from the CPU, enhancing overall efficiency and speed. When running graphics-intensive applications like video games or 3D modeling software, the GPU handles much of the processing workload, allowing the CPU to focus on other tasks. GPUs,

optimized for complex calculations related to visual data, typically outperform integrated graphics processors and are commonly found in desktop computers and high-performance laptops.

Graphic Processing Unit (GPU)
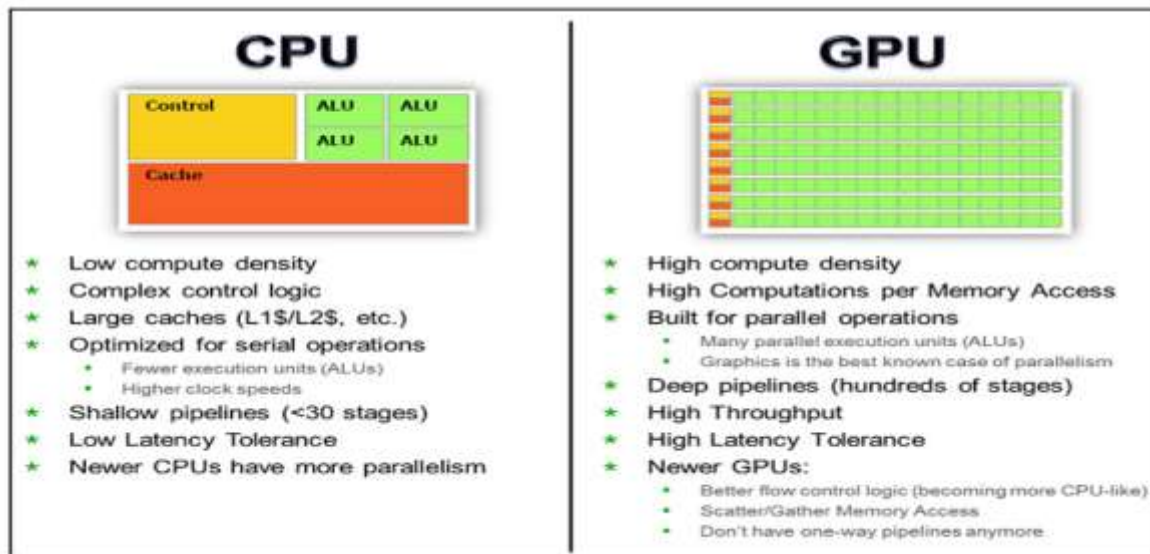
Storage Devices

A storage device is hardware that stores digital information, such as documents, media, applications, and operating systems, for future use. These devices fall into two main categories based on functionality:

1. **Primary Storage (Volatile)**
   - ○ Purpose: Temporarily stores data for immediate use by the computer.
   - ○ *Examples*: RAM (Random Access Memory) and cache.
   - ○ Characteristics:
     - ▪ Volatile: Data is lost when power is turned off.
     - ▪ Offers fast data access for quick processing.

2. **Secondary Storage (Non-Volatile)**
   - ○ Purpose: Provides long-term data storage, retaining information even when powered off.
   - ○ *Examples*:
     - ▪ Hard Disk Drive (HDD): Uses magnetic disks for reading and writing data.
     - ▪ Solid-State Drive (SSD): Employs flash memory for faster access than HDDs.
     - ▪ Optical Discs: CDs, DVDs, and Blu-rays for media storage and backups.
     - ▪ USB Flash Drives: Compact and portable for data transfer.
     - ▪ Memory Cards: Used in cameras, smartphones, and similar devices.
     - ▪ Cloud Storage: Online platforms like Google Drive and Dropbox.

Key Characteristics of Storage Devices*:*

- **Capacity**: Measured in gigabytes (GB) or terabytes (TB), indicating the data the device can hold.
- **Speed**: The rate of data read/write operations.
- **Portability**: Some devices are portable (e.g., USB drives), while others are stationary (e.g., internal hard drives).
- **Durability**: Resistance to physical damage and data loss.

Review questions

- Define computer hardware.
- List the four main categories of computer hardware.
- Differentiate between input devices and output devices with examples.
- What is the role of input devices in a computer system?
- Name five examples of input devices and explain their functions.
- How does a touchscreen act as both an input and output device?
- Describe the primary purpose of an output device.
- Provide examples of output devices and specify the type of output each produces.
- Why are output devices crucial for user interaction with a computer?
- Explain the function of the central processing unit (CPU).
- How does the GPU differ from the CPU in terms of functionality?
- Why is a GPU important for gaming and video editing applications?
- Discuss how the CPU and GPU complement each other in processing tasks.
- What is the difference between primary and secondary storage?
- Define volatile and non-volatile storage with examples.

- Compare the characteristics of hard disk drives (HDDs) and solid-state drives (SSDs).
- List three examples of portable storage devices and their common uses.
- How does cloud storage differ from physical storage devices?
- What are the key factors to consider when choosing a storage device?
- How does the efficiency of the CPU impact a computer's performance?
- Describe the role of RAM in a computer system.
- What are some common characteristics of high-performance GPUs?
- Why is it important to have both temporary (RAM) and permanent storage in a computer?
- Discuss the importance of durability in portable storage devices.

References:

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