

Internal Computing Components

Objective: *Explain the purpose of common internal computing components.*

We've covered how you get data into and out of computer systems and using peripherals. Now, let's look inside the computer and learn about its internal components. In this lesson, you learn everything you need to know about the following topics:

- Motherboard/System Board
- Firmware/Bios
- RAM
- CPU
- Storage
- GPU
- Cooling
- NIC

CPU

The central processing unit, otherwise known as the CPU, is the brain of the computer. It performs most of the processing that happens inside the computer. Different computers have different types of CPUs, and those CPUs may be manufactured by different companies.



The typical Windows computer contains a processor manufactured by one of two companies: Intel or AMD. These two companies create most of the processes used by laptop and desktop computers, and you will generally be fine with either option. If you have a specialized use case with unique computer power needs, you want to analyze the kitchens of the available processes, but generally speaking, Windows runs fine on both Intel and AMD processes.

Mac devices also use processors made by two different companies, Intel and Apple itself. From until 2020, Mac computers used the same Intel processes found in many Windows computers. In 2020, apple released their own M1 processor, and they offer many of their products with either processor installed. Mobile devices such as smartphones and tablets also have CPU's but they use a different type of CPU, arm processors are designed specifically for these devices and they are specifically designed to use as little power as possible, extending the battery life of mobile devices.

CPU Performance

When you're measuring a CPU there are a few characteristics you should consider:

- Clock Speed is measured in gigahertz (GHz), and the faster the clock, the faster the computer can process data.
- CPUs are also measured in terms of their number of processing cores. Each core is a separate processing unit within the same chip. Having multiple cores allows a computer to perform more than one task at the same time. Modern computers may have eight or more cores and supercomputers may have thousands or millions of cores.
- We also measure CPU in terms of how much memory they can manage at the same time period we measure this by describing the number of bits that may be in a memory address. 32 bit processes are common in years past, and they could manage up to 4 gigabytes of memory. That was plenty a decade ago, but modern computers can support much more than that because they use 64 bit processes. A 64 bit processor can manage 16 exabytes of memory. That's far more than any computer we will be using anytime soon so expect a 64 bit processor to stick around for a while.

Motherboard

Inside the computer, the CPU lives on the motherboard, also known as the system board. This is a printed circuit board that connects the CPU to memory interfaces and other system components.



Firmware

When the computer starts up, it uses a very small program that's stored on the motherboard that has the basic job of getting the system up and running and loading the real operating system from this. This operating system is stored as firmware a type of software that is permanently written onto chips so that it may be accessed before any other software is loaded from disk. The chips that store firmware are also known as read only memory rom. There are two major options for the code stored in firmware.

- The basic input-output system, also known as (BIOS), is an older approach that has been largely phased out.
- The unified extendable firmware interface (UEFI) is a more modern approach that has largely replaced BIOS.

Computers can boot over the network, receiving software from a centralized server. This capability is known as the pre-boot execution environment (px).

Memory

The motherboard also contains slots where computer builders and technicians can insert memory chips known as dual-in-memory modules (DIMM). These memory chips contain the random access memory (RAM) that the computer uses to store software and data that it is actively using. The contents of memory are temporary and go away when the computer is turned off. This characteristic is known as volatility: volatile storage (such as RAM) is erased when the computer is turned off, while nonvolatile storage (such as a hard drive) retains its contents when turned off.



Disk Drives

Data that we want to keep around must be stored in a more permanent, nonvolatile storage, and that's the role of disk drives. These drives may use magnetic media or solid-state storage. Hard disk drives (HDDs) are older and slower but less expensive than solid-state drives (SSDs), which are newer, faster, and more expensive than HDDs.



Network Interface Cards (NIC)

Most computers also contain a network interface card nick. The term nick comes from the days when network interfaces were commonly add-on cards inserted into computers as they were built, such as the one shown below. Today add-on cards are still available that may be inserted directly into a computer or attached by a USB cable. Modern Nicks are often directly on the motherboard and provide the ability to connect to both wired and wireless networks. These NICs are known as on board because they are on the motherboard.



Graphical User Interface (GUI)

Some computers also contain specialized graphics processing units GPUs. These powerful processes are designed to perform the intensive calculations required to render complex graphics on the screen. They are used by graphic designers, video editors, and gamers to speed up processing GPUs are also quite useful for data scientists, analytics, and blockchain applications that require a lot of math. GPUs are expensive, however, so you won't find them in every computer. There are costs that's only necessary for specialized applications.



Power & Cooling

The components of a computer system require a steady supply of power to operate. Specifically, they use a type of electric power called direct current DC. DC power is the type of power provided by batteries and it is different from alternating current AC power that is available in wall units. For this reason computers must have power supply units PSU's that plug into the wall and convert the AC power supplied by electric utilities into the DC power used by computer components.



All these components that we cram into a computer system generate a lot of heat but computer components also don't like to be hot. Running electronic components in an overheated environment can result in errors and equipment failures, some computers and data centers contain cooling equipment that draws out the hot air and replaces it with cool air. Computers contain fans, and you can often hear those fans turn on when the computer is working hard. The whirling noise that you may hear is an actual fan inside the computer trying to cool it down. Data centers with many computers use massive air conditioning systems to keep everything inside cool.

- Computers perform everyday processing using the central processing unit CPU. Graphics processing units GPU supplement CPUs capacity for complex mathematics
- the motherboard holds ACPU in addition to the random access memory (RAM) read only memory ROM and other computing components. OK

- Long term storage is provided by hard disk drives HDD and solid-state drives SSDs. SSDs are faster and more expensive than HDDs.

Practice Question 1

You are upgrading an old computer and find that it is not able to support high speed networking. What component of the computer should you consider upgrading?

- A. NIC
- B. CPU
- C. GPU
- D. RAM

Practice Question 2

You are helping to configure a new computer that will be used by an executive and are selecting a long-term storage option for the executive's files. Which one of the following options will provide the fastest possible long-term storage?

- A. RAM
- B. ROM
- C. SSD
- D. HDD

Practice Question 1 Explanation

Any of the upgrades listed here may have the effect of speeding up the computer, but the question is asking specifically about the networking speed. The computer component that controls networking is the network interface card Nick, and you should consider upgrading that card to support higher-speed networking.

The central processing unit (CPU) is the main processing hub of the computer where it executes instructions, and the graphics processing unit (GPU) provides a supplementary computing capability in support of graphics, data science, and other applications that require complex mathematics. Random access memory (RAM) is used to store programs and data being actively used by the computer. The correct answer is **A: NIC**

Practice Question 2 Explanation

You can eliminate options by examining the requirements as you approach this question. First, you are looking for an option that will allow the executive to store files for long-term use. Random access memory RAM is temporary working memory for the computer and does not store data for a long-term period; therefore, it is unsuitable for this purpose. Similarly, read-only memory ROM is not suitable because users cannot write data to ROM.

That leaves us with the two types of drives commonly used in computer systems—hard drive drives (HDDs) and Solid-State Drives (SSDs). Of these, SSDs are often faster than HDDS, making an SSD the best option. The correct answer is **C: SSD.**

a detailed breakdown!

1. Central Processing Unit (CPU)

- **Role:** Known as the brain of the computer, it performs most of the data processing tasks.
- **Manufacturers:** Most CPUs are produced by Intel or AMD. Apple also creates its own processors for Macs.
- **Performance Measures:**
 - **Clock Speed:** Measured in GHz; higher speeds allow faster processing.
 - **Cores:** More cores enable parallel processing.
 - **Memory Addressing:** Modern processors handle 64-bit addresses, managing up to 16 exabytes of memory.

2. Motherboard (System Board)

- **Function:** Houses the CPU and other key components, acting as the main circuit board that connects all parts of the computer.

3. Firmware (BIOS/UEFI)

- **BIOS/UEFI:** These are embedded software that helps the system start by initializing the hardware and loading the operating system.
- **UEFI** is the modern replacement for BIOS and offers more features and better performance.

4. Random Access Memory (RAM)

- **Role:** Stores data and programs that are actively in use.
- **Volatility:** RAM is volatile, meaning it loses data when the computer is turned off.

5. Storage (HDD and SSD)

- **HDD (Hard Disk Drive):** Uses magnetic media, slower but more affordable.
- **SSD (Solid-State Drive):** Uses flash memory, faster but more expensive.

6. Network Interface Card (NIC)

- **Role:** Enables network connectivity. Older systems had NICs as add-ons, while modern systems often have them integrated into the motherboard.

7. Graphics Processing Unit (GPU)

- **Role:** Specialized for rendering complex graphics and performing mathematical calculations. Used heavily in graphic design, gaming, data science, and blockchain applications.

8. Power & Cooling

- **Power Supply Unit (PSU):** Converts AC power to DC power, which the computer components use.
 - **Cooling:** Heat is managed with fans or advanced cooling systems, especially in data centers where heat buildup is significant.
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Matching: Internal Computing Components

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Hangman: Internal Computing Components

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Image Match: Internal Computing Components

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Crossword: Internal Computing Components

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