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Student Engagement &
Mentoring in Technology

Internal Computing Components

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Internal Computing Components

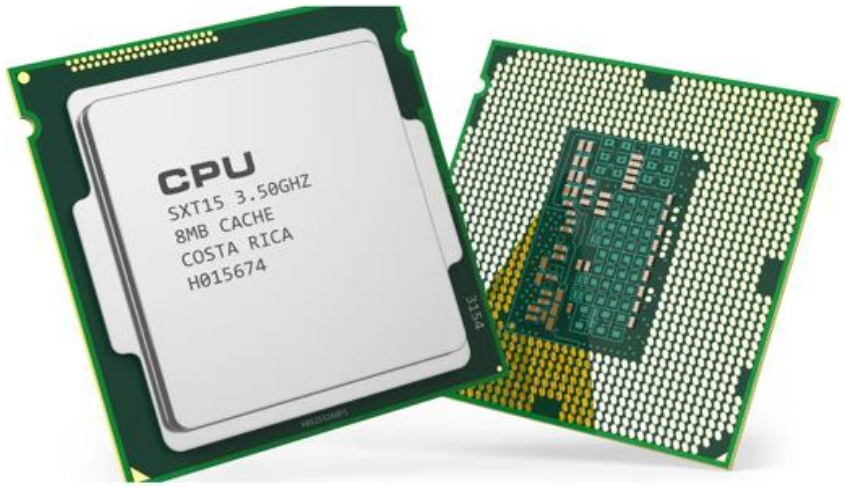
- **Objective:** *Explain the purpose of common internal computing components.*

- 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 computer's brain. It performs most of the processing that happens inside the computer. Different computers have different types of CPUs, which may be manufactured by different companies.



Additional Info...

- 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. Still, generally speaking, Windows runs fine on both Intel and AMD processes.

- Mac devices also use processors made by two different companies, Intel and Apple. Since 2020, Mac computers have used the same Intel processes as many Windows computers. In 2020, apple released its own M1 processor, offering many of its products with either processor installed. Mobile devices such as smartphones and tablets also have CPUs, but they use different types of CPUs. 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.

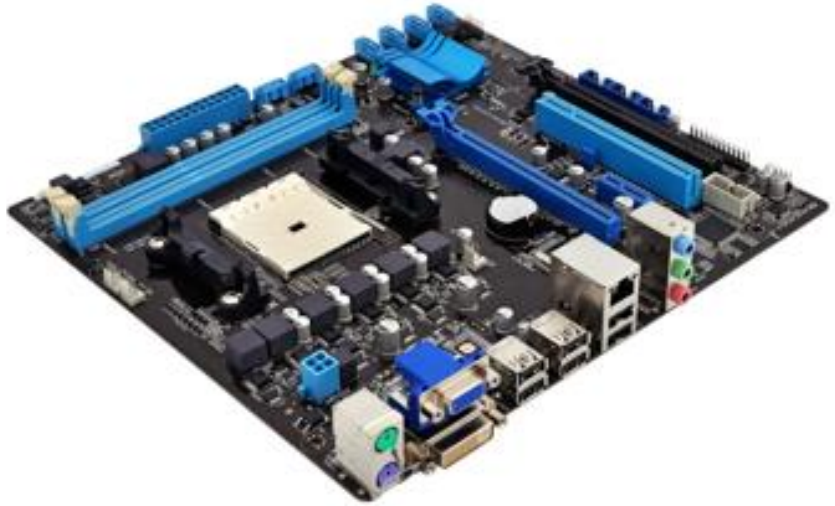
CPU Performance

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 CPUs 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 were 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.

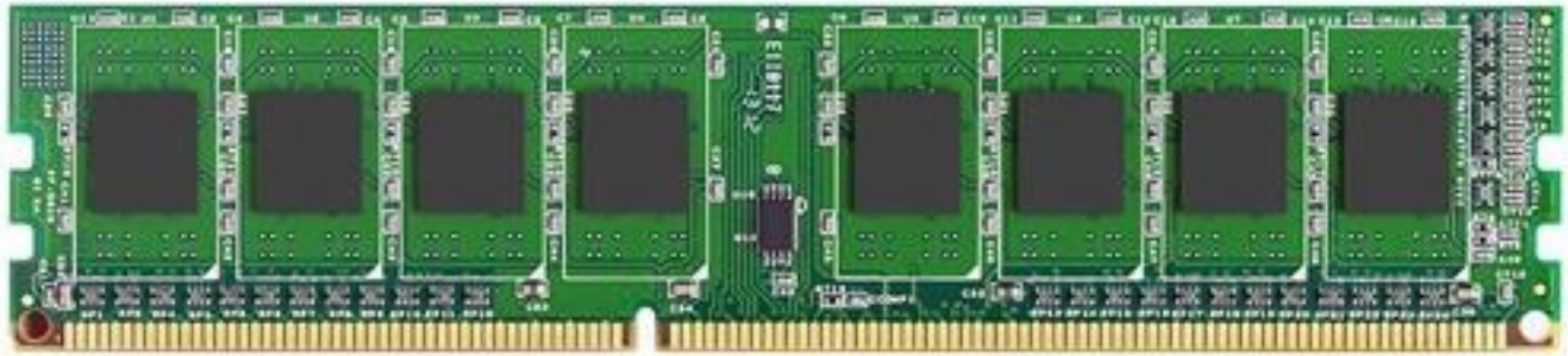


Firmware

- When the computer starts up, it uses a very small program stored on the motherboard that has the basic job of getting the system up and running and loading the real operating system. This operating system is stored as firmware, a type of software permanently written onto chips so that it may be accessed before any other software is loaded from the disk. The chips that store firmware are also known as read-only memory (ROM). There are two primary 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) represents a significant leap in the evolution of computer firmware. This modern approach, with its advanced features and capabilities, has largely replaced the older, more limited basic input-output system (BIOS). The transition from BIOS to UEFI underscores the continuous progress and innovation in the field of computer hardware and software.

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

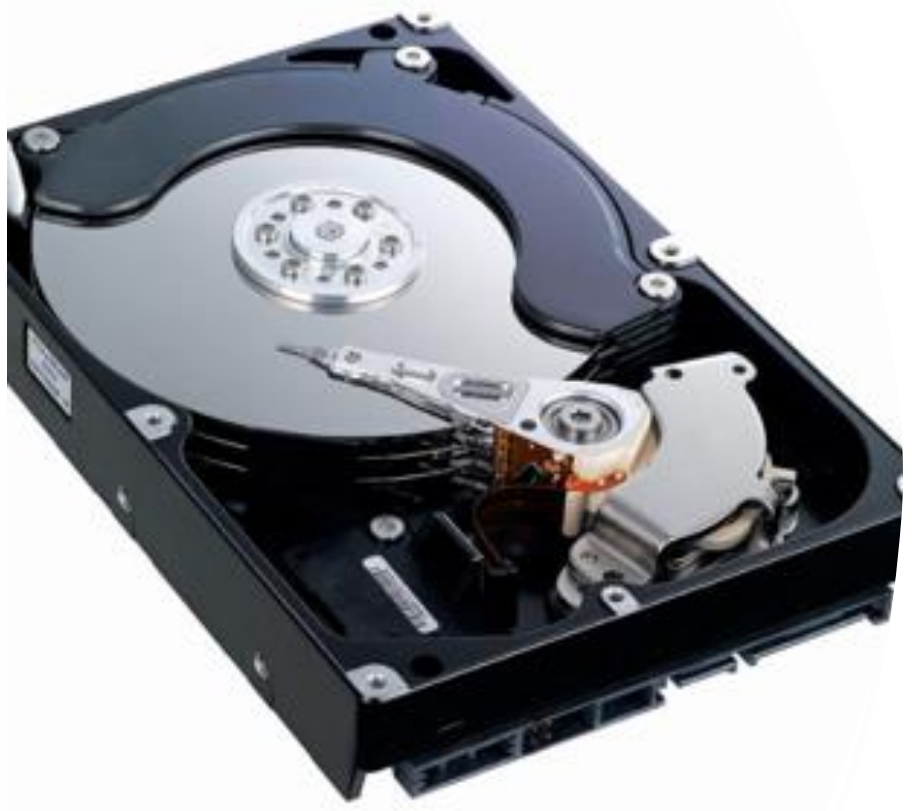


Memory

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 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.

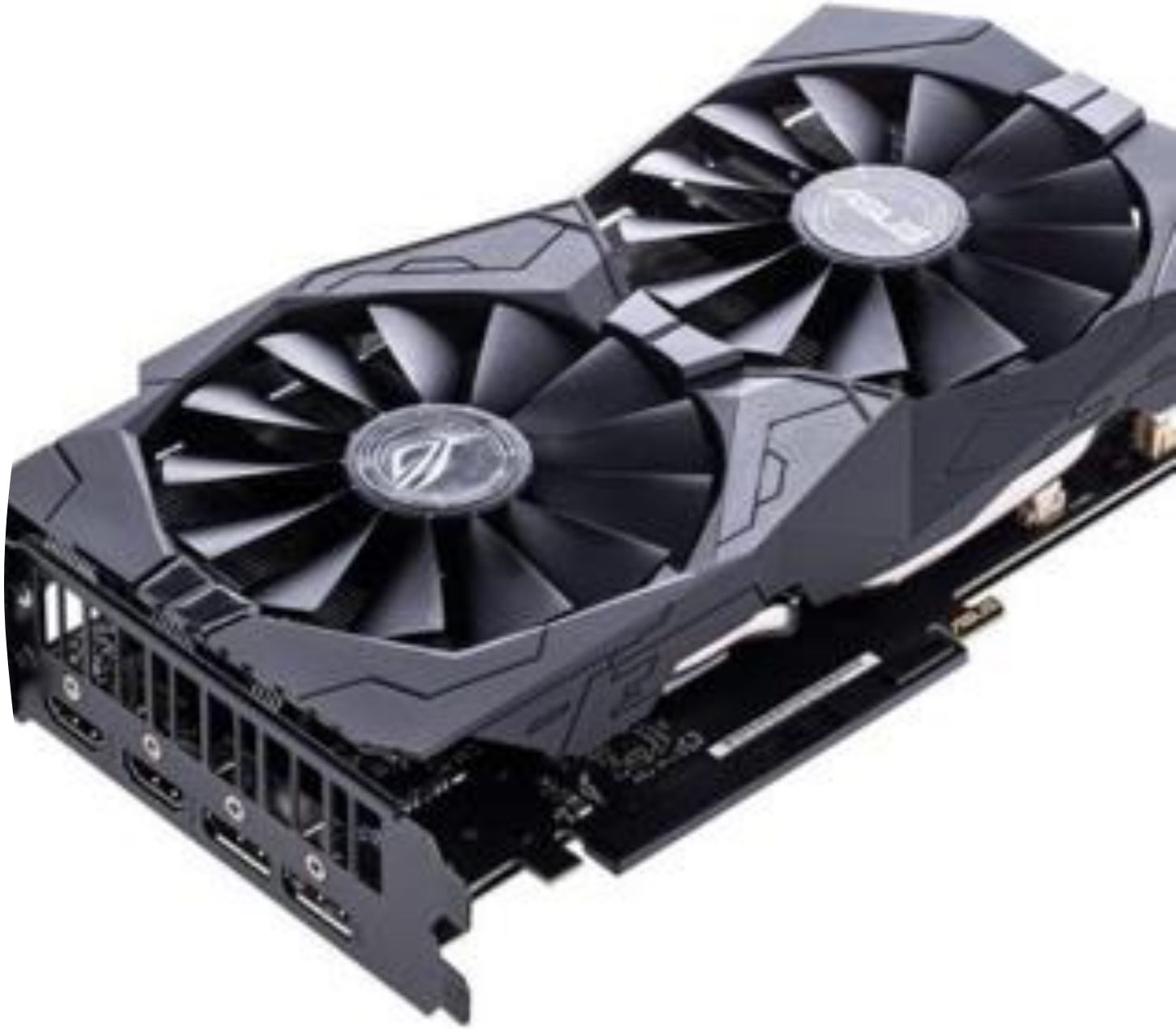


Network Interface Cards (NIC)

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 onboard because they are on the motherboard.

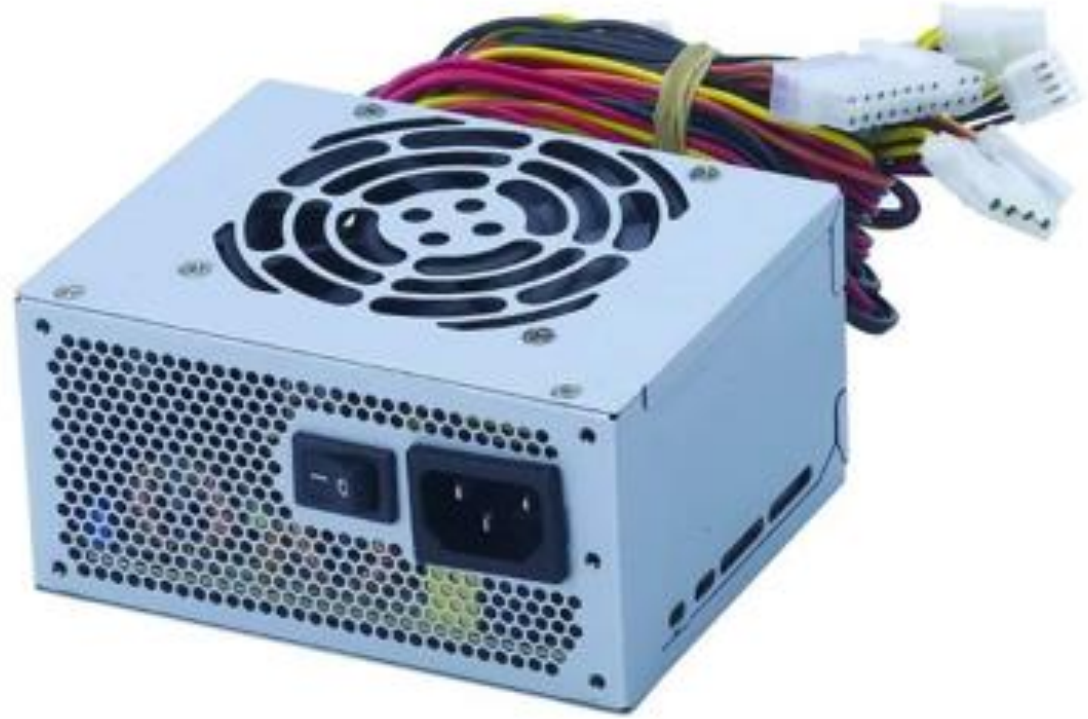
Graphical User Interface (GUI)

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 GP us 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

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



Things to remember

Computers perform everyday processing using the central processing unit (CPU). Graphics processing units (GPUs) supplement CPUs' capacity for complex mathematics

The motherboard holds the ACPU and the random access memory (RAM), read-only memory (ROM), and other computing components.

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

Questions!

- **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

Explanations

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.

Links for Study!

- **Matching: Internal Computing Components**
- https://wordwall.net/play/77451/251/440

- **Hangman: Internal Computing Components**
- https://wordwall.net/play/77452/428/822

- **Image Match: Internal Computing Components**
- https://wordwall.net/play/77453/330/220

- **Crossword: Internal Computing Components**
- https://wordwall.net/play/77454/124/508

Conclusion

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 works 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.

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