

Technical Description

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Content

1. Introduction
 - History of Invention
 - The Need for the Invention
2. Different Components Used for CPU (Central Processing Unit)
 - Control Unit (CU)
 - Arithmetic Unit (AU)
 - Registers
 - Cache
 - Buses
 - Motherboard
3. Conclusion
4. Reference Page

Introduction

The Central Processing Unit was a technology introduced in the 1970s that would be known as the heart of the computer. The CPU was invented by the company called Intel which manufactures chips for computers. Federico Fagin, an Italian physicist, created the first business computer. It was the Intel 4004 that the company launched in 1971. Then, in 1972, the Intel 8008 was released, and in 1974, the 4040, was a better variant of the 4004 (Study). In 1971 it is known to be the “Era of Integrated Electronics” due to the release of the Intel 4004 CPU. Intel 4004 became the first commercially available general-purpose programmable CPU, serving as a "building block" that engineers could buy and then modify using software to carry out various tasks in a variety of electronic devices (Intel).

As technology started to advance more during this era, the CPU was a tool that was needed the most in our time. The CPU is continually executing computer programs that give it instructions on which data to process and in what order. We would not be able to use a computer to manage programs without a CPU. As you are using the computer, the CPU performs calculations and interprets commands as you browse the internet, write documents, play games, or use software. A CPU receives instructions from memory by being requested by address. In a simplified interpretation, a CPU only sends instructions to the memory to deliver data and instructions to Input/Output buses to run Input/Output devices. Buses are known to be like a highway where they can transfer data inside a computer or between the computer (Superuser). Before the invention of modern CPUs (Central Processing Unit), computers like the ENIAC required physical rewiring to carry out various duties. Since these devices required physical

reconfiguration to run a new program, they are frequently referred to as fixed-program computers.

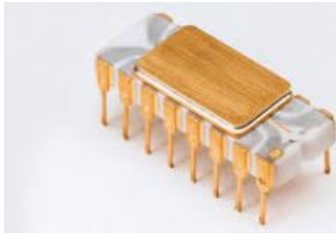


Figure 1.1: Example of first CPU

Figure 1.2: ENIAC in an industry in 1945

Figure 1.3: Fagin Creator of CPU

Different Components Used in A CPU

When being able to understand the components of the CPU. The processor has many components that will be needed inside so it can work properly on a computer. The components are Control Unit, Arithmetic Unit, Registers, Cache, Buses, and a Motherboard.

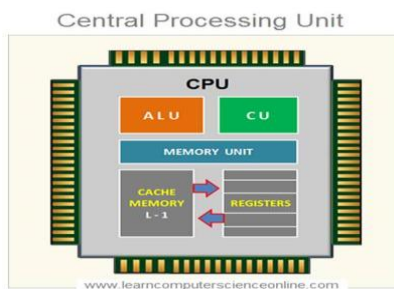


Figure 1.4: Shows a CPU with all its components

Control Unit and Arithmetic Unit

The Control Unit in the CPU is within its processor that allows direction in an ongoing operation. The CU is a hardware device that is directly inside the CPU processor. It guides how

to process commands from the program for the computer's memory, logic module, and input and output devices. To transform coded instructions into timing and control signals that govern the operation of the other units, a CU often uses a binary decoder. In other words. The control unit directs the flow of data within the CPU, the exchange of data and control signals across external interfaces, and all Arithmetic unit (ALU) processes. (System bus). The CPU has high-speed internal memory storage components called registers (Science Direct). Since the language of a computer is binary or a number language, it follows the ones of zeros that follow within a number in the binary system. Due to this matter, the CPU also has the Arithmetic Unit or the ALU. The ALU conducts both arithmetic and logical operations, which are its two primary tasks. (decisions). Decisions are taken and calculations are performed in the ALU. Within the ALU it has logical operations where it is a binary variable that is produced by a function on binary variables. The purpose of logic gates in digital circuits is to perform logical calculations. The AND, OR, and NOT, are examples of logical operations. AND is true only if both operands are true, OR true if either operand is true, NOT, changes true to false and false to true. With this, the ALU will perform addition, subtraction, multiplication, and division.

The Difference between CU and ALU is that ALU and CPU are electronic circuits that execute arithmetic and logical operations, respectively, but ALU is a subsystem of the CPU, whereas CPU is an electronic circuit that manages instructions to run the computer. Each component of a computer system—hardware and software—is separate. Both are in the same processor of the CPU but have different workloads.

Registers, Cache, and Buses

With more components that are involved within a CPU, a register is a processor that is especially important for the follow-up of data in the CPU. Computer processors contain a small number of data holding places (CPU register). Many kinds of data can be stored in a register,

including instructions, storage addresses, and individual characters. It is common for instructors to mention registers in their instructions. An efficient way to execute programs and other main operations is to use the register, a fast memory of computers. Registers are a particularly important part of a CPU on how fast and reliable they are and do not need another hardware device. The central processor unit (CPU) of a computer uses a CPU cache as a hardware cache to lower the average expense (time or energy) of accessing data from the main memory. Copies of the data from commonly used main memory locations are kept in a cache, which is a smaller, faster memory that is situated closer to a processor core (TechTarget). In addition to the CPU's cache memory, the registers hold data most frequently accessed by the CPU. There are multiple registers in the register file of the CPU cache, which is the fastest sector of the cache. Inputs and outputs are stored in registers on the CPU. Buses in a CPU are a freeway for the computer since it is a high-speed connection. They are used to send control signals and data within the computer's processor. The three types of buses are the Data bus, Address bus, and Control bus. Within these buses, communication is important so information can be sent to each other.

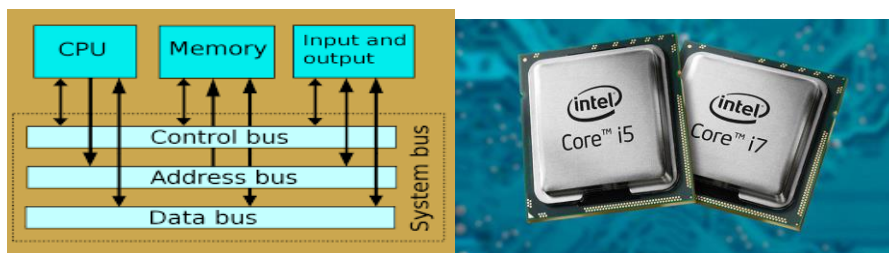


Figure 1.5: Explain what each bus controls Figure 1.6: Modern-day CPU

Motherboard

Computer motherboards are the main printed circuit boards. All computer components and external peripherals connect to the motherboard, which serves as the central communications backbone. Motherboards can be found in all computers, desktops, and laptop PCs. For a CPU to be able to work with all its functions it needs to be paired to a motherboard that has the same

socket. With the motherboard and CPU connected, it is like the brain of the computer with its heart doing all its necessary actions. The motherboard was invented in 1981 to have everything on one board where all actions can be made. Being able to save space and everything is wired together (Total Phase).

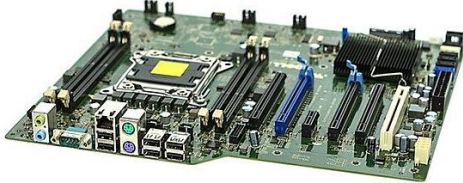


Figure 1.7: Motherboard of today



Figure 1.8: Motherboard of 1981

Conclusion

Overall, the CPU is an important piece of technology that has been invented since it is a chip that is used every day. Every technology company makes its CPU, but it all has the same purpose to be able to transmit information to the computer. Without the CPU we will be manually using wires to reroute where we would want our information to go. The CPU is made up of six important components for it to work. The control unit allows direction in ongoing operations. An algorithmic unit is where it does calculations with binary to act. Registers allow the flow of data with the processor, cache lowers its time of response making it faster reaction time, and buses as a freeway of communication. For all this to work the motherboard needs to be present to have a good connection.

Reflection

When starting this research for my technical description, it was difficult to find out what I wanted to write about and research about. There are many good pieces of hardware that make it

good for people to understand more about. When producing a topic, I decided to choose hardware for a computer for two main reasons. One, it is a device that we use daily, and two I have a good background with computers since I am certified. The CPU was the best piece of hardware because it is a technology that gives its performance to the computer.

When starting this piece, I did not find it too difficult to find sources that can explain what a CPU was. What was difficult was to explain it in a way that the reader will be able to understand its function since the reader has no idea what a CPU is and what its components are. The CPU is based on many different components and when describing them it has many acronyms, so I need to explain it in more detail. Using evidence from the articles but always adding my own twist to make sure when the reader finishes the piece, they can explain what a CPU is.

I found it interesting and helpful being able to add images to my descriptions. I was able to add captions and explain to the reader what they were looking at and how it connected to the topic. When doing my peer review, my peers were able to understand by looking at the images provided and show how each component flows together. This piece was fun to write and helpful as well as to explain more in detail what a product is and its main functions.

References

Bus line type. Bus Line Type | Toshiba Electronic Devices & Storage Corporation | Asia-English. (n.d.). Retrieved March 29, 2023, from <https://toshiba.semicon-storage.com/ap-en/semiconductor/knowledge/e-learning/micro-intro/chapter2/types-of-bus-lines.html>

Verbeke, S., Simon VerbekeSimon Verbeke 3, BreakthroughBreakthrough Lie RyanLie Ryan 4. (1958, May 1). *How does a CPU 'know' what commands and instructions mean?* Super User. Retrieved March 29, 2023, from <https://superuser.com/questions/307116/how-does-a-cpu-know-what-commands-and-instructions-actually-mean>

Wilson, M. (2020, February 25). *What is a CPU and how to monitor its usage: HP® Tech takes.* What Is a CPU And How to Monitor Its Usage | HP® Tech Takes. Retrieved March 29, 2023, from <https://www.hp.com/us-en/shop/tech-takes/what-is-cpu>

Central Processing Unit. Visit the main page. (n.d.). Retrieved March 29, 2023, from https://www.newworldencyclopedia.org/entry/Central_processing_unit

Cass, S. (2021, October 22). *Chip hall of fame: Intel 4004 microprocessor.* IEEE Spectrum. Retrieved March 29, 2023, from <https://spectrum.ieee.org/chip-hall-of-fame-intel-4004-microprocessor>

Lithium. (2018, May 9). *Difference between alu and CPU.* Compare the Difference Between Similar Terms. Retrieved March 29, 2023, from <https://www.differencebetween.com/difference-between-alu-and-cpu/>

Logical operator. Logical Operator - an overview | ScienceDirect Topics. (n.d.). Retrieved March 29, 2023, from <https://www.sciencedirect.com/topics/engineering/logical-operator>