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Elevator Talk : 05 minutes talk.

Title: CPU Computers.

I. Introduction

The CPU, or Central Processing Unit, is often considered the brain of the computer. The introduction of the microprocessor in the United States in the 1970s significantly influenced the design and implementation of central processing units. It is the primary component responsible for executing instructions and processing data in a computer system. The CPU is essential to the operation of any computer system. It executes programs, performs calculations, manipulates data, and coordinates the operations of various hardware components. In this presentation, we will explore in detail the operation of computer CPUs, their components, architectures, as well as the challenges and prospects for the future.

II. Operation of the CPU

A typical CPU comprises several components, including an Arithmetic Logic Unit (ALU), a Control Unit, registers, and a data and address bus. Each component of the CPU has a specific role. For example, the ALU performs arithmetic and logical operations, the control unit coordinates operations and manages the flow of instructions, and the registers temporarily store data and instructions. Cache memory is fast memory located on the CPU that stores frequently used data to accelerate access to main memory. It contributes to improving performance by reducing memory access times.

III. The Different Stages of Instruction Execution

The instruction is retrieved from memory and placed into an instruction register. The control unit decodes the instruction to determine the operation to be performed and the data involved. The ALU or other CPU components perform the operation specified by the instruction. The results of the operation are written to the appropriate registers or to memory.

IV. Types of CPU Architectures

Single-core CPUs can execute only one instruction at a time. Multi-core CPUs include several independent processing cores, allowing them to execute multiple instructions simultaneously. SIMD CPUs can perform a single operation on multiple data simultaneously. SMT CPUs can execute multiple threads simultaneously on a single processing core.

V. Clock Frequency and CPU Performance

The clock frequency is the speed at which the CPU executes clock cycles, measured in Hertz (1 hertz equals one cycle per second). A higher clock frequency allows the CPU to execute instructions more quickly, resulting in better performance. Physical and thermal limits impose constraints on increasing the clock frequency, leading to the development of alternative technologies to improve performance.

VI. CPU Performance Enhancement Technologies

The CPU can anticipate upcoming instructions and fetch them before they are needed to accelerate execution. Instructions are broken down into multiple stages and executed in parallel to improve efficiency. The CPU can predict the outcomes of branch instructions to avoid delays during execution. The CPU uses sophisticated algorithms to effectively manage cache memory and minimize memory access times.

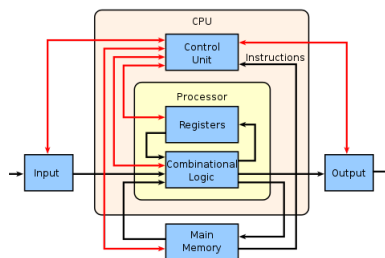
VII. Current and Future Challenges for CPUs

The limits of transistor miniaturization and heat dissipation pose challenges for designing faster and more efficient CPUs. High-performance CPUs tend to consume a lot of energy, posing issues in terms of cooling and battery life. Technologies such as quantum computing and neuromorphic computing could open new perspectives for CPUs and computer architectures.

VIII. Conclusion

We have examined in detail the operation of CPUs, their components, architectures, as well as the challenges and prospects for the future. The CPU remains a crucial element of modern computing and will continue to evolve to meet the growing computational demands. Technological advancements will continue to drive innovation in CPU design, paving the way for new applications and advancements in computing. Some CPU manufacturers are: AMD, QUALCOMM, Intel, Samsung Semiconductor, CML Microcircuit, e2v scientific instruments, ...

Operation of the CPU :



The CPU or Central Processing Unit :



References :

- https://en.wikipedia.org/wiki/Central_processing_unit
- <https://aws.amazon.com/fr/what-is/cpu/>
- <http://www2.ift.ulaval.ca/~marchand/ift17583/Acetates/17583-Acetates08.pdf>
- <https://www.google.com/search?client=firefox-b-d&q=cpu+image>