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TOPLC: Computer Architecture

GITHUP LINK: <https://github.com/mohamedhussein12/html-project-New-Repository>

GITHUP PAGE(website): <https://mohamedhussein12.github.io/html-project-New-Repository/>

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APPLICATION BRIEF:

computer architecture is a set of rules and methods that describe the functionality, organization, and implementation of computer systems. Some definitions of architecture define it as describing the capabilities and programming model of a computer but not a particular implementation. In other definitions computer architecture involves instruction set architecture design, microarchitecture design, logic design, and implementation.

Computer architecture is a specification describing how hardware and software technologies interact to create a computer platform or system. When we think of the word architecture, we think of building a house or a building. Keeping that same principle in mind, computer architecture involves building a computer and all that goes into a computer system. Computer architecture consists of three main categories

System design – This includes all the hardware parts, such as CPU, data processors, multiprocessors, memory controllers and direct memory access.

This part is the actual computer system.

Instruction set architecture – The includes the CPU's functions and capabilities, the CPU's programming language, data formats, processor register types and instructions used by computer programmers. This part is the software that makes it run, such as Windows or Photoshop or similar programs.

Microarchitecture – This defines the data processing and storage element or data paths and how they should be implemented into the instruction set architecture. These might include DVD storage devices or similar devices



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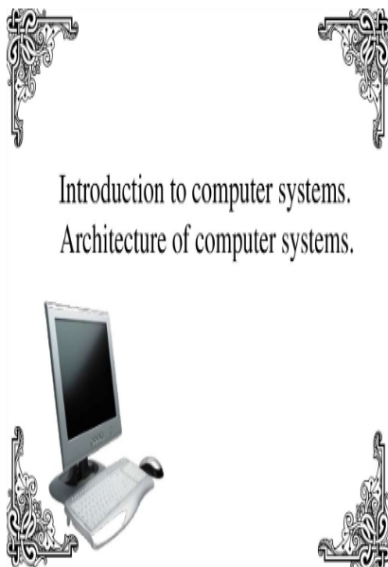


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Computer engineering (CE) is a branch of engineering that integrates several fields of computer science and electronic engineering required to develop computer hardware and software. Computer engineers usually have training in electronic engineering (or electrical engineering), software design, and hardware-software integration instead of only software engineering or electronic engineering. Computer engineers are involved in many hardware and software aspects of computing, from the design of individual microcontrollers, microprocessors, personal computers, and supercomputers, to circuit design. This field of engineering not only focuses on how computer systems themselves work but also how they integrate into the larger picture. Computer systems fall into essentially two separate categories. The first, and most obvious, is that of the desktop computer. When you say "computer" to someone, this is the machine that usually comes to her mind. The second type of computer is the embedded computer, a computer that is integrated into another system for the purposes of control and/or monitoring. Embedded computers are far more numerous than desktop systems, but far less obvious. Ask the average person how many computers he has in his home, and he might reply that he has one or two. In fact, he may have 30 or more, hidden inside his TVs, VCRs, DVD players, remote controls, washing machines, cell phones, air conditioners, game consoles, ovens, toys, and a host of other devices. Both have a processor, memory, and often several forms of input and output. The primary difference lies in their intended use, and this is reflected in the system design and their software. Desktop computers can run a variety of application programs, with system resources orchestrated by an operating system. By running different application programs, the functionality of the desktop computer is changed. One moment, it may be used as a word processor; the next it is an MP3 player or a database client. Which software is loaded and run is under user control. In contrast, the embedded computer is normally dedicated to a specific task. In many cases, an embedded system is used to replace application-specific electronics. The advantage of using an embedded microprocessor over dedicated electronics is that the functionality of the system is determined by the software, not the hardware. This makes the embedded system easier to produce, and much easier to evolve, than a complicated circuit. What do you mean by computer architecture? Computer architecture in computer engineering is a collection of laws and techniques describing software systems features, organisation, and execution. Some architecture terms describe it as defining a computer's capacities and programming model, but not a specific execution.



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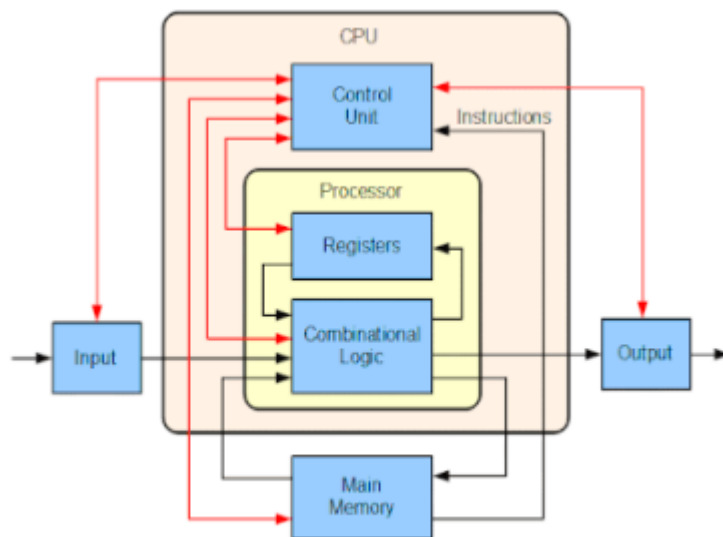
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Advantages of computer Architecture	disadvantages of computer Architecture
1-Multitasking is one of the major advantage of computer. Person can perform multiple task, multiple operation, calculate numerical problems within few seconds. Computer can perform trillion of instructions per second.	1-Virus is a worm and hacking is simply an unauthorized access over computer for some illicit purpose. Virus is being transferred from email attachment, viewing an infected website advertisement, through removable device like USB etc. once virus is transferred in host computer it can infect file, overwrite the file etc.
- 2-Now computer is not just a calculating device. Now a day's computer has very important role in human life. One of the main advantages of computer is its incredible speed, which helps human to complete their task in few seconds. All the operations can be performed very fast just because of its speed otherwise it takes a long time to perform the task.	2-Online cyber-crime means computer and network may have used in order to commit crime. Cyberstalking and Identity theft are the points which comes under online cyber-crimes. For example: one may get the access of the access to your shopping account like amazon account now that person will be able to know your personal details like debit card or credit card number which can be than misused.
3-It is a low cost solution. Person can save huge data within a low budget. Centralized database of storing information is the major advantage that can reduce cost.	3-Mainly past generation was not used of the computer or they have the knowledge of computer they faced a big problem when computer came in field. As we have seen in banking sector senior bank employees faced this problem when computer came to the banking sector.
4-One of the root advantage of computer is that can perform not only calculations but also with accuracy.	4-When there are frequent simultaneous client requests, server severely get overloaded, forming traffic congestion.
5-Computer Technology helps to keep in contact with our family and re-connect with old friends or make new friends by using any services such as Facebook, Viber, WhatsApp, Skype and many more. People are using online dating to socialise and connect with others also.	5-Thinking ability. Stops us from thinking about solving problems.

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The first documented computer architecture was in the correspondence between Charles Babbage and Ada Lovelace, describing the analytical engine. When building the computer Z1 in 1936, Konrad Zuse described in two patent applications for his future projects that machine instructions could be stored in the same storage used for data, i.e., the stored-program concept. Two other early and important examples are:

John von Neumann's 1945 paper, First Draft of a Report on the EDVAC, which described an organization of logical elements;[5] and Alan Turing's more detailed Proposed Electronic Calculator for the Automatic Computing Engine, also 1945 and which cited John von Neumann's. The term "architecture" in computer literature can be traced to the work of Lyle R. Johnson and Frederick P. Brooks, Jr., members of the Machine Organization department in IBM's main research center in 1959. Johnson had the opportunity to write a proprietary research communication about the Stretch, an IBM-developed supercomputer for Los Alamos National Laboratory (at the time known as Los Alamos Scientific Laboratory). To describe the level of detail for discussing the luxuriously embellished computer, he noted that his description of formats, instruction types, hardware parameters, and speed enhancements were at the level of "system architecture", a term that seemed more useful than "machine organization".

Subsequently, Brooks, a Stretch designer, opened Chapter 2 of a book called Planning a Computer System: Project Stretch by stating, "Computer architecture, like other architecture, is the art of determining the needs of the user of a structure and then designing to meet those needs as effectively as possible within economic and technological constraints"[8]

Brooks went on to help develop the IBM System/360 (now called the IBM zSeries) line of computers, in which "architecture" became a noun defining "what the user needs to know".[9] Later, computer users came to use the term in many less explicit ways.[10]

The earliest computer architectures were designed on paper and then directly built into the final hardware form. Later, computer architecture prototypes were physically built in the form of a transistor-transistor logic (TTL) computer—such as the prototypes of the 6800 and the PA-RISC—tested, and tweaked, before committing to the final hardware form. As of the 1990s, new computer architectures are typically "built", tested, and tweaked—inside some other computer architecture in a computer architecture simulator; or inside a FPGA as a soft microprocessor; or both—before committing to the final hardware form



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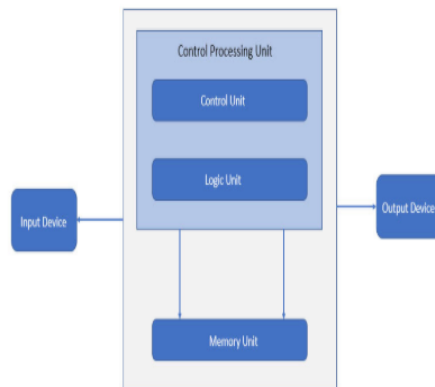
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types of computer architecture

1. Von-Neumann Architecture

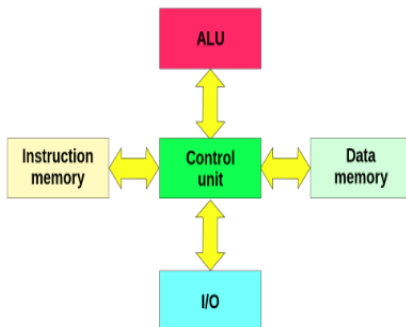
There is a bus (address bus/data bus/control bus) used for the instruction and data code execution. Input device takes data or instruction and the Central processing unit (CPU) performs one operation at a time, either fetching data or instruction in/out of the memory. Once the operation is done it is sent to the output device. Control and logic units for processing operations are within the central processing unit. 24-byte value and data address zero identifies 8-byte



Activate Windows

2. Harvard Architecture

Harvard architecture is used when data and code is present in different memory blocks. A separate memory block is needed for data and instruction. Data can be accessed by one memory location and instruction can be accessed by a different location. It has data storage entirely contained within the central processing unit (CPU). A single set of clock cycles is required. The pipeline is possible. It is complex to design. CPU can read and write instructions and process data access. Harvard architecture has different access codes and data address spaces that is, the instruction address zero is not the same as data address zero. Instruction address zero identifies



3. Instruction Set Architecture

To make up the architecture, instruction set architecture is needed because it has a set of instructions that the processor understands. It has two instruction set one is RISC (reduced instruction set computer) and the second is CISC (complex instruction set computer).

Reduced instruction set computer architecture was realized in the 90's by IBM. Instruction has multiple address modes, but programs do not use all of them that is the reason multiple address modes were reduced. This helps the compiler to easily write the instructions, performed is increased.

Complex instruction set architecture is the root of compilers because earlier compilers were not there to write programs, to ease programming instructions are added. The best performance is obtained by using simple instruction from ISA

4. Microarchitecture

Microarchitecture is known as computer organizations and it is the way when instruction set architecture is a built-in processor. Instruction set architecture is implemented with various microarchitecture and it varies because of changing technology.

Microarchitecture performs in a certain way. It reads the instruction and decodes it, will find parallel data to process the instruction and then will process the instruction and output will be generated.

It is used in microprocessors, microcontrollers. Some architectures overlap multiple instructions while executing but this does not happen in microarchitecture. Execution units like arithmetic logic units, floating-point units, load units, etc are needed and it performs the operation of the processor. There are microarchitecture decisions within the system such as size, latency, and connectivity of the memories.

5. System Design

The name defines itself, the design will satisfy user requirements such as architecture, module, interfaces and data for a system and it is connected to product development. It is the process of taking marketing information and creating product design to be manufacture. Modular systems are made by standardizing hardware and software.

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References

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2. A.J Vande Goor, Computer Architecture and Design, Addison Wesley; Wokingham, UK, 1989