

Computer Architecture and Design

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Abstract:

The Computer Organization can be well stated as the components from which the computers are built. Considering the case of computer architecture, it is the science of integrating the components to a higher level to achieve functionality and performance.

Keywords —Computer Architecture, Computer Organization, Instruction Set.

I. INTRODUCTION

The Computer organisation and architecture is the art of determining the needs of users. Computer architecture then redesigns to meet user needs more effectively. Computer architecture involves instruction set architecture, microarchitecture design, logic and implementation design. It also consists of set of rules and methods that describe functionality, organisation and implementation. In case of design, computer architects and computer programmers required to invent techniques to make themselves more predictive.

II. COMPONENTS OF COMPUTER SYSTEM

Components of computer system based on hardware part consists of input unit, output unit, arithmetic logic unit, control unit. On the software side there will be system software and application software. The system software consists of operating system, assembler, linker, locator, interpreter, compiler, and debugger. Application software consists of word processing, spread sheets, image editors and DBMS.

III. NEED OF COMPUTER ARCHITECTURE

Based on the computer architecture and design better understand what's inside and how it works will help you design, develop and implement applications by making it faster, easier, cheaper and better. The discipline of computer architecture has three main subcategories, instruction set architecture, microarchitecture and system design. Instruction set architecture defines the machine code. Microarchitecture describes how a particular processor will implement ISA. System design consists of all the other hardware components with in a computer system.

A. Computer Organisation

It helps to optimize performance-based products. Computer organisation also helps to plan the selection of processor based on a particular project. In computer design section instruction set and microarchitecture are designed based on the development of practical machine. This design process is known as implementation.

B. Elements of Instruction

Elements of instruction mainly consists of five types – operation code, source and destination operand, source operand address, destination

operand, and next instruction address. Operation code specifies the operation to be performed. Source and destination operand specifies operand field of source and destination. Source operand address require one or more operands. Destination operand is usually executed by CPU. Next instruction address is the next executable instruction after completion of next instruction.

C. Types of Instruction

Types of instructions are divided in to five types.

1) **According to Operation:** According to the type of instruction operation instruction can be differentiated.

2) **Data Processing and Data Storage:** Arithmetic and logical instruction performs both arithmetic and logical operations and memory instruction performs operation using register.

3) **Data Movement:** The data transfer instructions hold the transfer of data from CPU register and I/O devices.

D. Instruction Format

Instruction format include memory size, memory organisation, bus structure, and processor speed. Allocation of bits for various fields is based on number of addressing modes, number of operands, register and memory, and number of register sets.

IV. CONCLUSIONS

Computer architecture is based on the design of family of computers and defines its logical interface. The organization determines the functional units of system and their structural interconnectivity. The architecture semantics is based on what the system do under the user directions. Also, how the user controls their functional units. The main advantages include providing flexibility for addressing modes, reduce the count of instruction fetch cycles and reduce the amount of space taken by the program. Sometimes decoding of instruction will be little difficult may be the one disadvantage.

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REFERENCES

- [1] Johnson and Lyle, *A Description of Stretch*, p 1 march 2018
- [2] System 360, *From Computers to Computer Systems*. IBM100 march 2018
- [3] Hennessy, John, Patterson, David, "Computer Architecture: A quantitative Approach," fifth edition p11, June 1994