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A STUDY ON COMPUTER ARCHITECTURE

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ABSTRACT

"Computer Architecture is the science and art of selecting and interconnecting hardware components to create computers that meet functional, performance and cost goals."

This paper presented an amazing opportunity to learn a level of detailed about microprocessors that was heretofore unimagined. Being given a basic series of steps, in the form of parts, gave me a fantastic foundational understanding of the design, implementation, and operation of microprocessors, and of computer operation in general. this socio – economic real world health venture.

Keywords: ***computer architecture, Micro Processor, revolution of microprocessors***

1. INTRODUCTION

1.1.Computer Organisation and Architecture

- The components from which computers are built, i.e., computer organization.
- In contrast, computer architecture is the science of integrating those components to achieve a level of functionality and performance.
- It is as if computer organization examines the lumber, bricks, nails, and other building material
- While computer architecture looks at the design of the house.

This paper discusses the computer hardware, software and their interconnection, and it also discusses concepts like computer types, evolution of computers, functional units, basic operations.

2. MATERIALS AND METHODS

2.1. History of Computer Generation

Two phases

- Before VLSI 1945 – 1978
  (Very Large Scale Integration)
  - ENIAC
  - IAS
  - IBM
  - PDP – 8
- VLSI 1978 → present day
  - Microprocessor!

Generation	Dates	Technology	Principal New Product
1	1950 - 1959	Vaccum tubes	Commercial electronic computers
2	1960 – 1968	Transistors	Cheaper computers
3	1969 – 1977	Integrated circuits	Mini Computers
4	1978 - ??	LSI , VLSI and ULSI	Personal computers

			and workstations

Beyond the Fourth Generation

- E – Commerce , E –banking, home office
- ARM, AMD, INTEL, MOTOROLA
- High speed processor like GHz speed
- Because of submicron IC technology lot of added features in small size

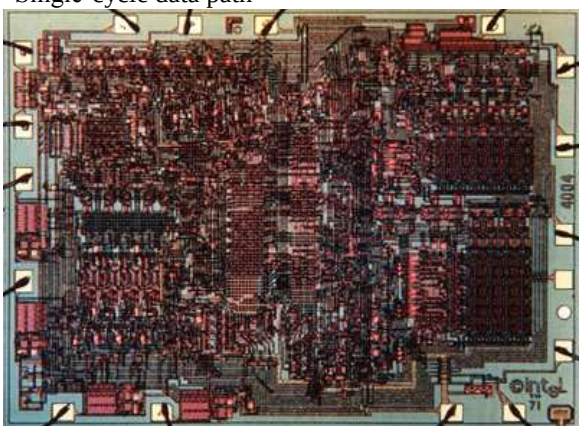
2.2. Basic Terminology

Computer - A device that accepts input, processes data, stores data, and produces output, all according to a series of stored instructions.
Hardware - Includes the electronic and mechanical devices that process the data; refers to the computer as well as peripheral devices.
Software - A computer program that tells the computer how to perform particular tasks.
Network - Two or more computers and other devices that are connected, for the purpose of sharing data and programs.
Peripheral Devices - It is used to expand the computers input, output and storage capabilities.
Input - Whatever is put into a computer system.
Data - Refers to the symbols that represent facts, objects, or ideas.
Information - The results of the computer storing data as bits and bytes; the words, numbers, sounds, and graphics.
Output - Consists of the processing results produced by a computer.
Processing - Manipulation of the data in many ways.
Memory - Area of the computer that temporarily holds data waiting to be processed, stored, or output.
Storage - Area of the computer that holds data on a permanent basis when it is not immediately needed for processing.
Assembly language program (ALP) –Programs are written using mnemonics
Mnemonic –Instruction will be in the form of English like form
Assembler – is a software which converts ALP to MLL (Machine Level Language)
HLL (High Level Language) – Programs are written using English like statements
Compiler - Convert HLL to MLL, does this job by reading source program at once.
Interpreter – Converts HLL to MLL, does this job statement by statement
System software – Program routines which aid the user in the execution of programs eg: Assemblers, Compilers
Operating system – Collection of routines responsible for controlling and coordinating all the activities in a computer system.

3. REVOLUTION OF MCROPROCESSORS

3.1. First Microprocessor

- Intel 4004 (1971)
  - Application: calculators
  - Technology: 10000 nm
  - 2300 transistors
  - 13 mm2
  - 108 KHz
  - 12 Volts
  - 4-bit data
  - Single-cycle data path

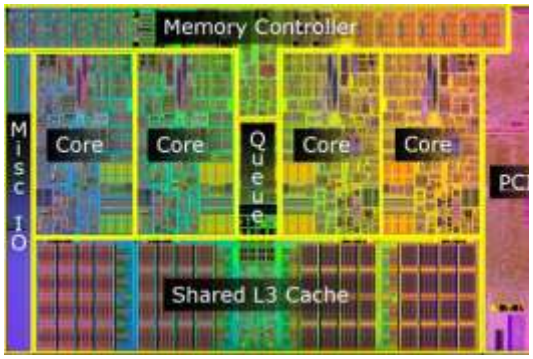


3.2. Single – Core Microprocessors

- Intel Pentium4 (2003)
  - Application: desktop/server
  - Technology: 90nm (1/100x)
  - 55M transistors (20,000x)
  - 101 mm2 (10x)
  - 3.4 GHz (10,000x)
  - 1.2 Volts (1/10x)
  - 32/64-bit data (16x)
  - 22-stage pipelined datapath
  - 3 instructions per cycle (superscalar)
  - Two levels of on-chip cache
  - data-parallel vector (SIMD) instructions, hyperthreading

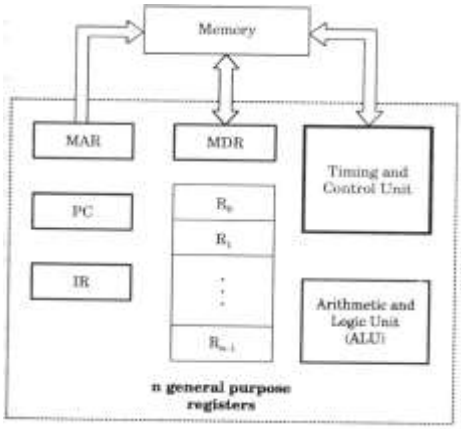
3.3. Modern Multicore Processor

- Intel Core i7 (2009)
  - Application: desktop/server
  - Technology: 45nm (1/2x)
  - 774M transistors (12x)
  - 296 mm2 (3x)
  - 3.2 GHz to 3.6 Ghz (~1x)
  - 0.7 to 1.4 Volts (~1x)
  - 128-bit data (2x)
  - 14-stage pipelined datapath (0.5x)
  - 4 instructions per cycle (~1x)
  - Three levels of on-chip cache
  - data-parallel vector (SIMD) instructions,hyperthreading
  - **Four-core multicore** (4x)



3.4. Basic Function of Computer

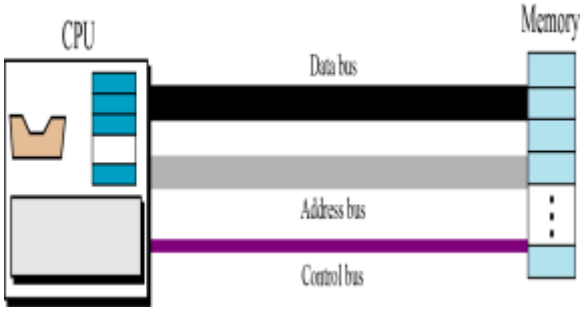
- To execute a given task as per the appropriate program
- Program consists of list of instructions stored in memory



Interconnection between Processor and Memory

3.5. Bus Structure Connecting CPU and Memory

The CPU and Memory are normally connected by three groups of connections, each called a bus: data bus, address bus and control bus.

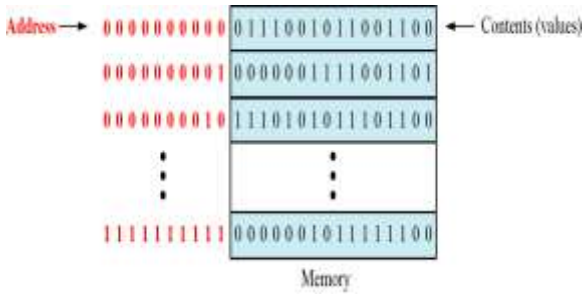


Connecting CPU and Memory using three buses

3.6. Memory Locations and Addresses

- **Main Memory** is the second major subsystem in a computer. It consists of a collection of storage locations, each with a unique identifier, called an **address.**
- Data is transferred to and from memory in groups of bits called **words.** Aword can be a group of 8 bits, 16 bits, 32 bits or 64 bits(and growing).
- If the word is 8 bits, it is referred to as a **byte**. The term "byte" is so common in computer science that sometimes a 16 – bit word is referred to as a 2 – byte

word, or a 32 – bit word is referred to as a 4 – byte word.



Main memory

3.7. Processing the Instructions :

- Simple computer, like most computers, uses machine cycles.
- A cycle is made of three phases: fetch, decode and execute.
    - During the fetch phase, the instruction whose address is determined by the PC is obtained from the memory and loaded in to the IR. The PC is then incremented to point to the next instruction.
    - During the decode phase, the instruction in IR is decoded and the required operands are fetched from the register or from memory.
    - During the execute phase, the instruction is executed and the results are placed in the appropriate memory location or the register.
    - Once the third phase is completed, the control unit starts the cycle again, but now the PC is pointing to the next instruction.
    - The process continues until the CPU reaches a HALT instruction.

4. CONCLUSION

Given the opportunity to complete this paper again I would only ask/ recommend a couple of change. First, that more class time be dedicated to discussing the paper and whatever problems or concerns are associated with it. Overall, this paper was a great learning experience and even somewhat enjoyable. I would gladly do this paper again and recommend that any who take this paper do so with an eye toward learning.

REFERENCES

[1] Carl Hammacher,"Computer Organization,"Fifth Edition,McGrawHill International Edition,2002.

[2] P.Pal Chaudhuri,"Compter Organization and Design",2ndEdition ,PHI,2003

[3] William Stallings,"Computer organization and Architecture-Designing for Performance",PHI,2004

[4] Birman, M., A. Samuels, G. Chu, T. Chuk, L. Hu, J. McLeod, and J. Barnes [1990]. "Developing the WRL3170/3171 SPARC floating-point coprocessors," *IEEE Micro* 10:1, 55–64.

[5] Kohn, L., and S.-W. Fu [1989]. "A 1,000,000 transistor microprocessor," *IEEE Int'l. Solid-State Circuits Conf. Digest of Technical Papers*, 54–55.

[6] Goldberg, I. B. [1967]. "27 bits are not enough for 8-digit accuracy," *Comm. ACM* 10:2, 105–106.

[7] Hwang, K. [1979]. *Computer Arithmetic: Principles, Architecture, and Design*, Wiley, New York.

[8] Markstein, P. W. [1990]. "Computation of elementary functions on the IBM RISC System/6000 processor," *IBM J. of Research and Development* 34:1, 111–119.

[9] Swartzlander, E., ed. [1990]. *Computer Arithmetic*, IEEE Computer Society Press, Los Alamitos, Calif.

[10] Taylor, G. S. [1981]. "Compatible hardware for division and square root," *Proc. Fifth IEEESymposium on Computer Arithmetic*, May 18–19, 1981, Ann Arbor, Mich., 127–134. *Good discussion of a radix-4 SRT division*