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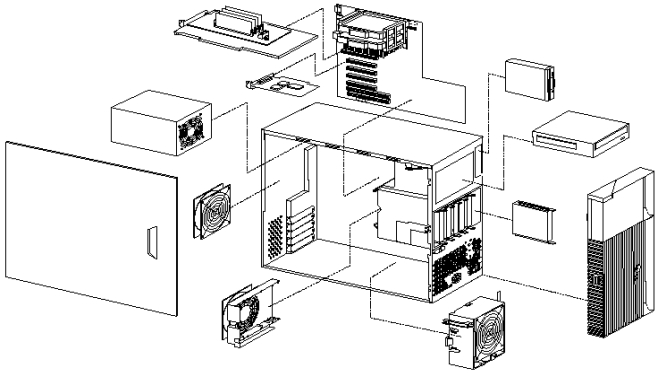
Department of Computer Science and Engineering
School of Science, Engineering & Technology



CSE 317: Computer Organization & Architecture

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Topic 1 - Introduction

- Computer Architecture
- Computer Organization
- Structure and Function

- Single-Processor Computer
- Multicore-Processor Computer

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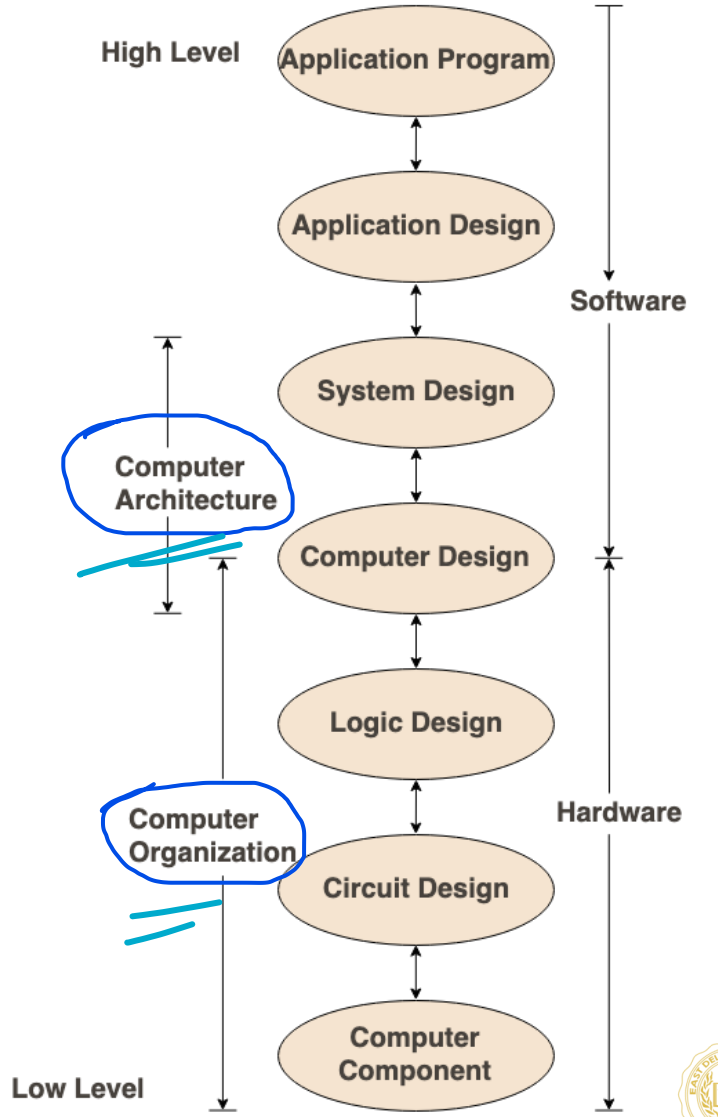
Computer Architecture

Computer Architecture refers to those attributes of a system that have a direct impact on the logical execution of a program.

Examples:

- The instruction set
- The number of bits used to represent various data types
- I/O mechanisms → Input/ Output
- Memory addressing techniques

Architecture describes what the computer does.



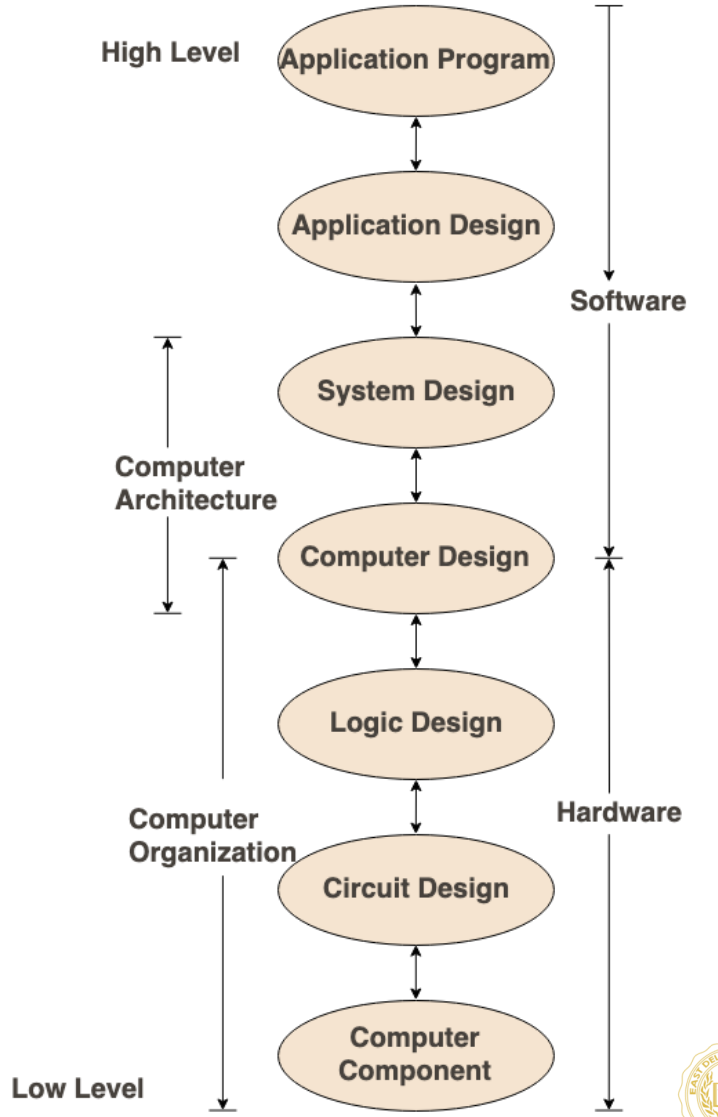
Computer Organization

Computer Organization refers to the operational units and their interconnections that realize the architectural specifications. Examples are things that are transparent to the programmer:

- Control signals
- Interfaces between computer and peripherals
- The memory technology being used

Organization describes how it does it.

So, for example, the fact that a multiply instruction is available is a **computer architecture** issue. How that multiply is implemented is a **computer organ**ization issue.



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Computer Architecture vs Computer Organization

SL	Computer Architecture	Computer Organization
1.	Architecture describes what the computer does.	The Organization describes how it does it.
2.	Computer Architecture deals with the functional behavior of computer systems.	Computer Organization deals with a structural relationship.
3.	It deals with high-level design issues.	It deals with low-level design issues.
4.	Architecture indicates its hardware.	Where Organization indicates its performance.
5.	For designing a computer, its architecture is fixed first.	For designing a computer, an organization is decided after its architecture.
6.	Computer Architecture is also called instruction set architecture.	Computer Organization is frequently called microarchitecture.
7.	Computer Architecture comprises logical functions such as instruction sets, registers, data types, and addressing modes.	Computer Organization consists of physical units like circuit designs, peripherals, and adders.
8.	Architecture coordinates between the hardware and software of the system.	Computer Organization handles the segments of the network in a system.

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Structure and Function

Structure is the way in which components relate to each other.

Function is the operation of individual components as part of the structure.

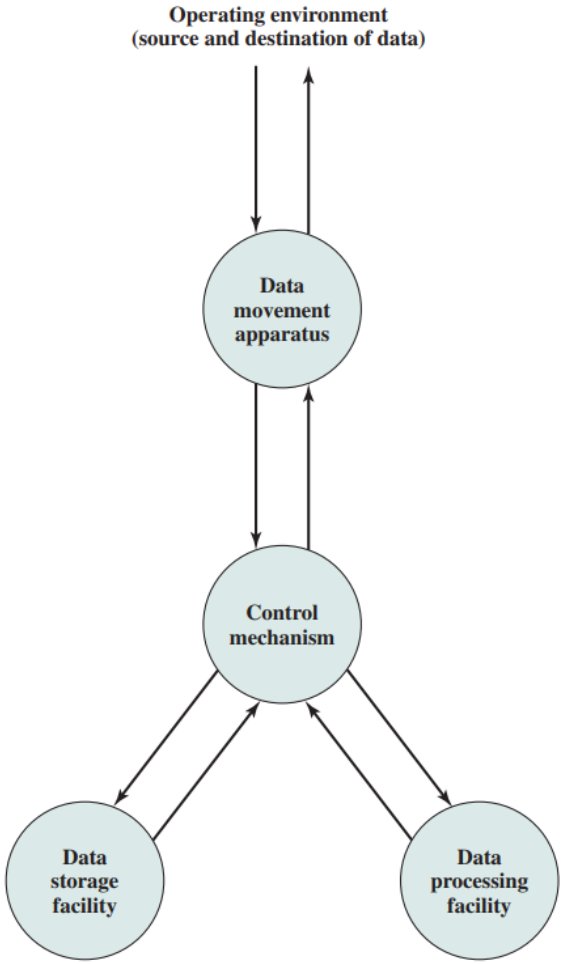
All computer functions are:

Data processing: Computer must be able to process data which may take a wide variety of forms and the range of processing.

Data storage: Computer stores data either temporarily or permanently.

Data movement: Computer must be able to move data between itself and the outside world.

Control: There must be a control of the above three functions.



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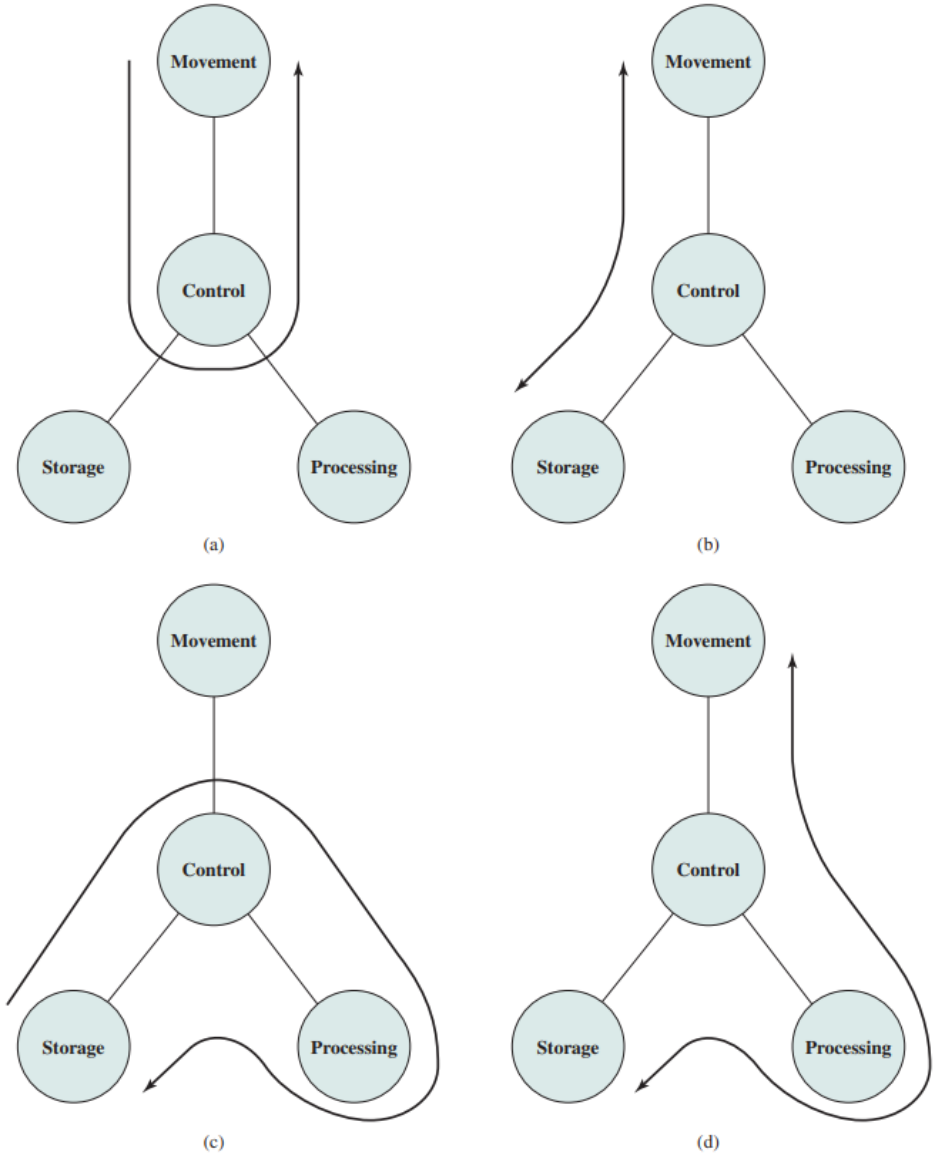
Structure and Function

- The computer can function as a data movement device (Fig: a), simply transferring data from one peripheral or communication line to another.
- It can also function as a data storage device (Fig: b), with data transferred from the external environment to computer storage (read) and vice versa (write).
- Data processing, on data either in storage (Fig: c) or route between storage and the external environment (Fig: d).



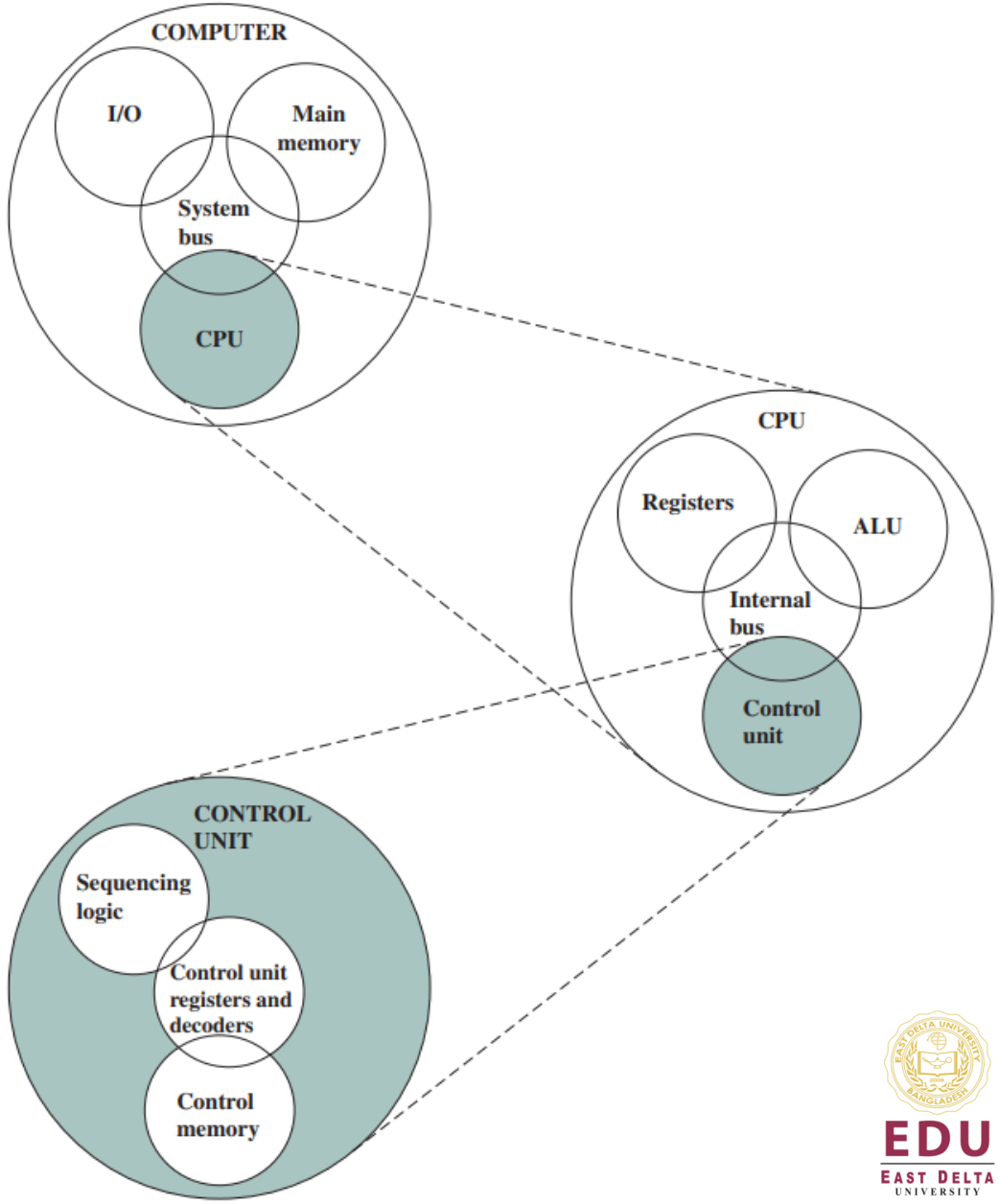
Single-Processor Computer

Four main structural components:

- Central processing unit (CPU)
- Main memory
- I / O
- System interconnections

CPU structural components:

- Control unit
- Arithmetic and logic unit (ALU)
- Registers
- CPU interconnections



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Multicore-Processor Computer

Computers generally have multiple processors. When these processors all reside on a single chip.

Central Processing Unit (CPU): That portion of a computer that fetches and executes instructions. It consists of an ALU, a control unit, and registers. In a system with a single processing unit, it is often simply referred to as a processor.

Core: An individual processing unit on a processor chip. A core may be equivalent in functionality to a CPU on a single-CPU system.

Processor: A physical piece of silicon containing one or more cores. The processor is the computer component that interprets and executes instructions. If a processor contains multiple cores, it is referred to as a multicore processor.

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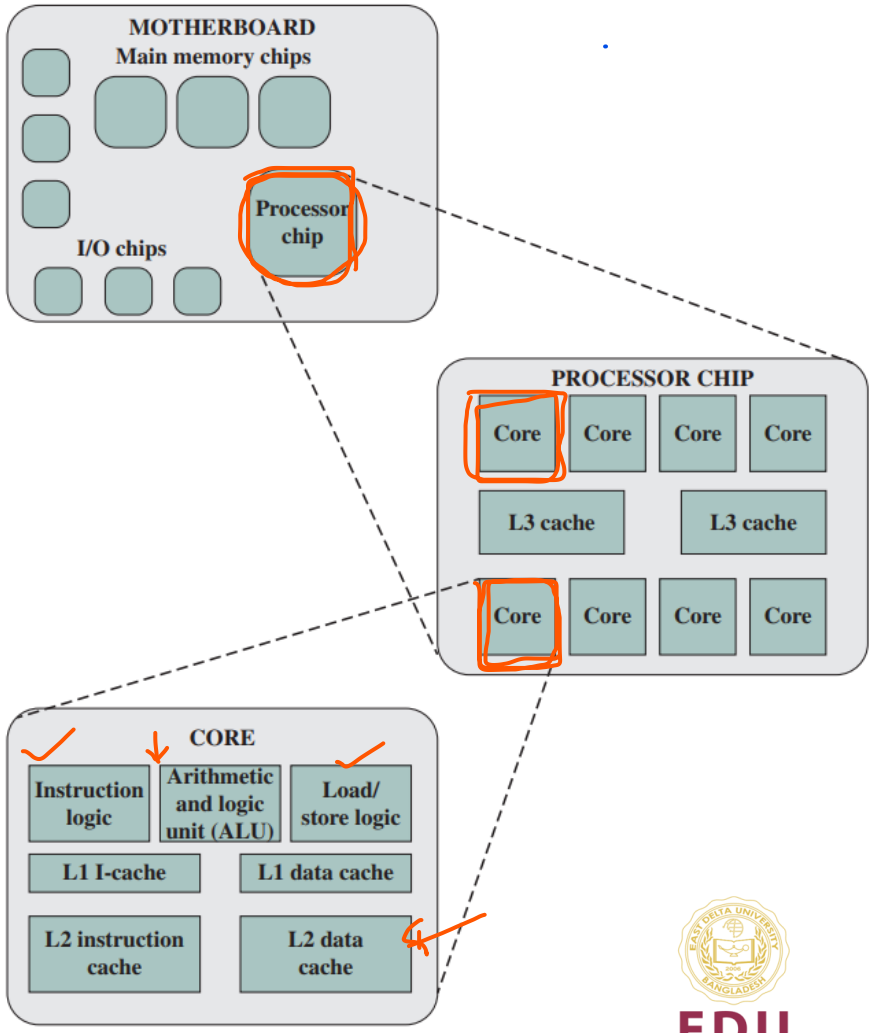
Multicore-Processor Computer

- Another prominent feature of contemporary computers is the use of multiple layers of memory, called cache memory, between the processor and main memory.

- A printed circuit board (PCB) is a rigid, flat board that holds and interconnects chips and other electronic components. The board is made of layers, typically two to ten, that interconnect components via copper pathways that are imprinted into the board. The main printed circuit board in a computer is called a system board or motherboard.

- The most prominent elements on the motherboard are the chips. A chip is a single piece of semiconducting material, typically silicon, upon which electronic circuits and logic gates are fabricated. The resulting product is referred to as an integrated circuit.



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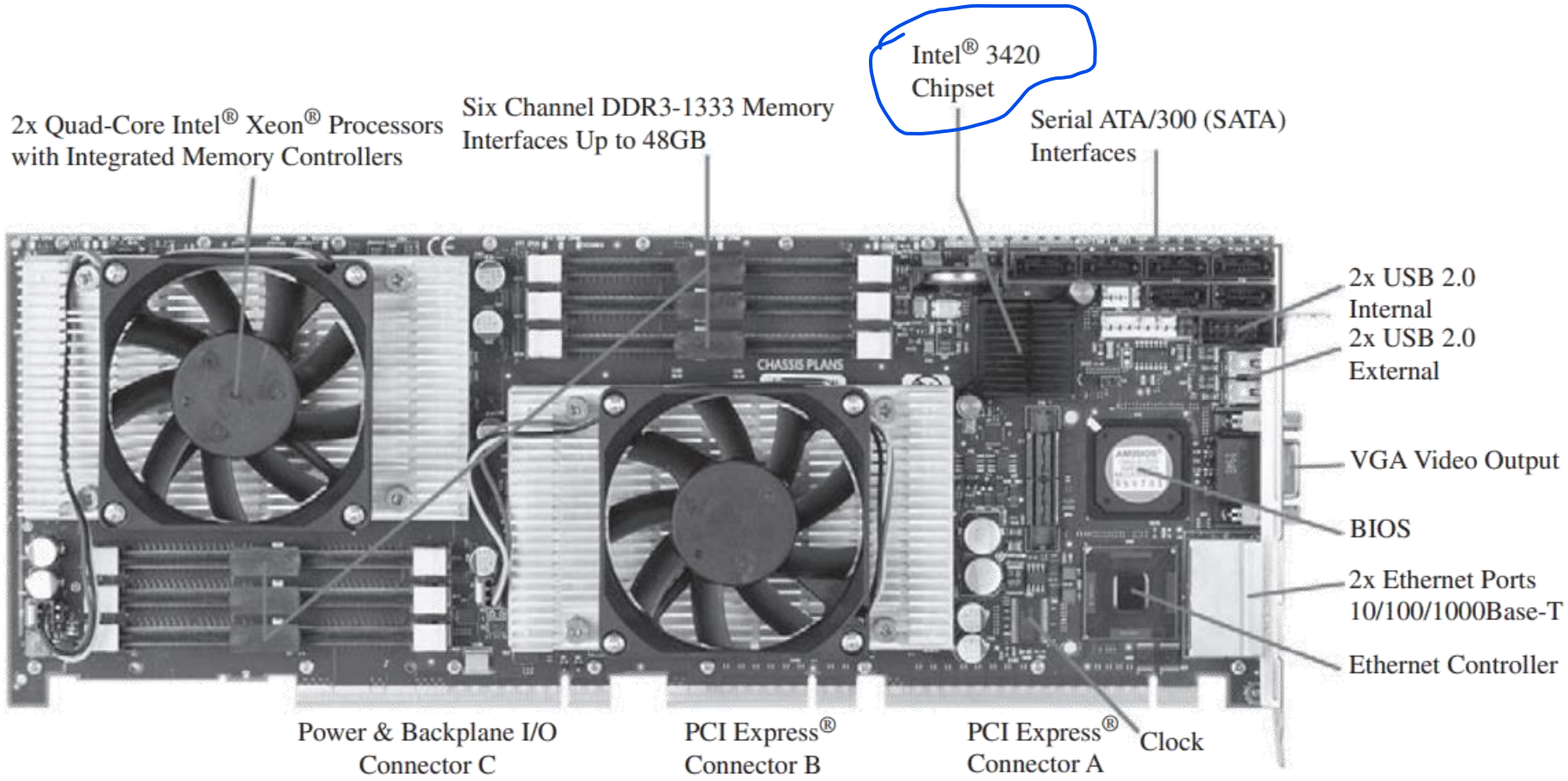
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