

Computer Architecture

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Computer Organization and Architecture 10th Edition

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Objectives:

By the end of this course, you will be aware of the following:

1. Describe the interface between hardware and software and explain how software instructs hardware to accomplish desired functions.
2. Explain computer arithmetic hardware blocks and floating-point representation.
3. Explain how a hardware programming language is executed on hardware and how hardware and software design affect performance.
4. Explain the factors that determine the performance of a program.
5. Explain the techniques designers use to improve the performance of programs running on hardware.
6. Explain the importance of memory hierarchy in computer design and how memory design impacts overall hardware performance.

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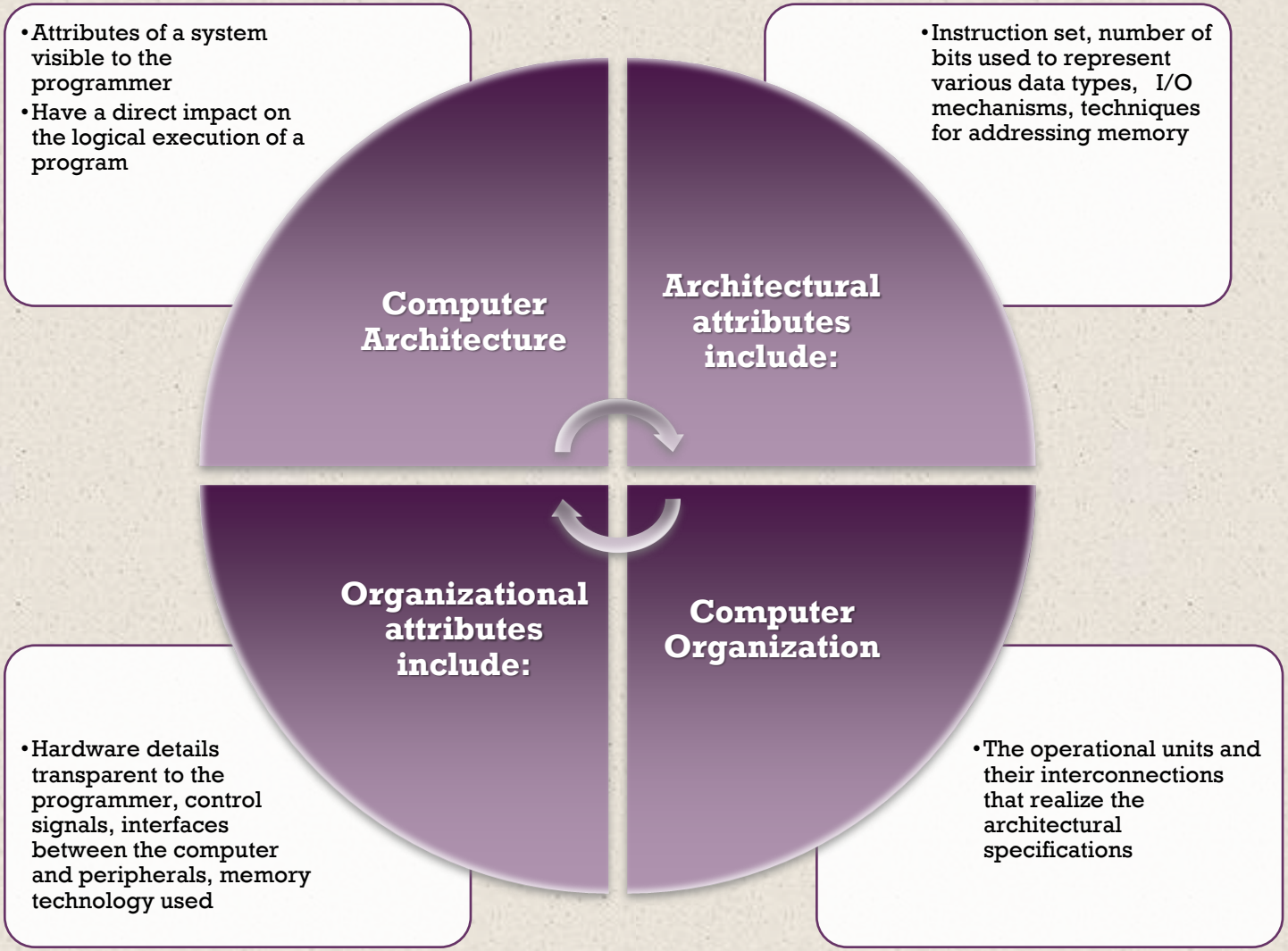
Chapter 1

Basic Concepts and Computer Evolution

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Computer Architecture

Computer Organization



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Computer Architecture VS Computer Organization

Computer Architecture	Computer Organization
Concerned with the way hardware components are connected together to form a computer system.	Concerned with the structure and behaviour of a computer system as seen by the user.
Acts as the interface between hardware and software.	Deals with the components of a connection in a system.
Helps us to understand the functionalities of a system.	Tells us how exactly all the units in the system are arranged and interconnected.
A programmer can view architecture in terms of instructions, addressing modes and registers.	Whereas Organization expresses the realization of architecture.
While designing a computer system architecture is considered first.	An organization is done on the basis of architecture.
Deals with high-level design issues.	Deals with low-level design issues.
Architecture involves Logic (Instruction sets, Addressing modes, Data types, Cache optimization)	Organization involves Physical Components (Circuit design, Adders, Signals, Peripherals)

Why study computer organization and architecture?

- Design better programs, including system software such as compilers, operating systems, and device drivers.
- Optimize program behavior.
- Evaluate (benchmark) computer system performance.
- Understand time, space, and price tradeoffs.

Structure and Function

- Hierarchical system
  - Set of interrelated subsystems
- The hierarchical nature of complex systems is essential to both their design and their description
- The designer need only deal with a particular level of the system at a time
  - Concerned with structure and function at each level
- Structure
  - The way in which components relate to each other
- Function
  - The operation of individual components as part of the structure



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Function

- There are four basic functions that a computer can perform:
  - Data processing
    - Data may take a wide variety of forms, and the range of processing requirements is broad
  - Data storage
    - Short-term
    - Long-term
  - Data movement
    - Input-output (I/O) - when data are received from or delivered to a device (peripheral) that is directly connected to the computer
    - Data communications – when data are moved over longer distances, to or from a remote device
  - Control
    - A control unit manages the computer's resources and orchestrates the performance of its functional parts in response to instructions

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Functions

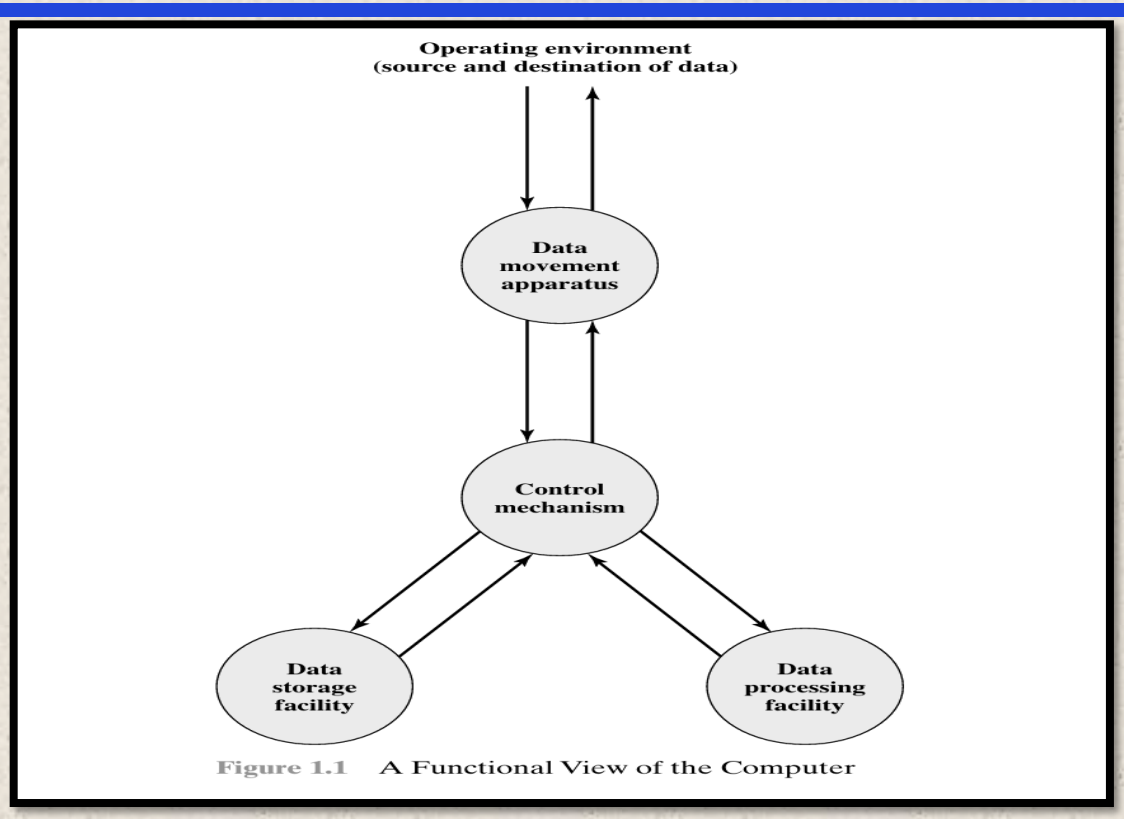


Figure 1.1 A Functional View of the Computer

Functions

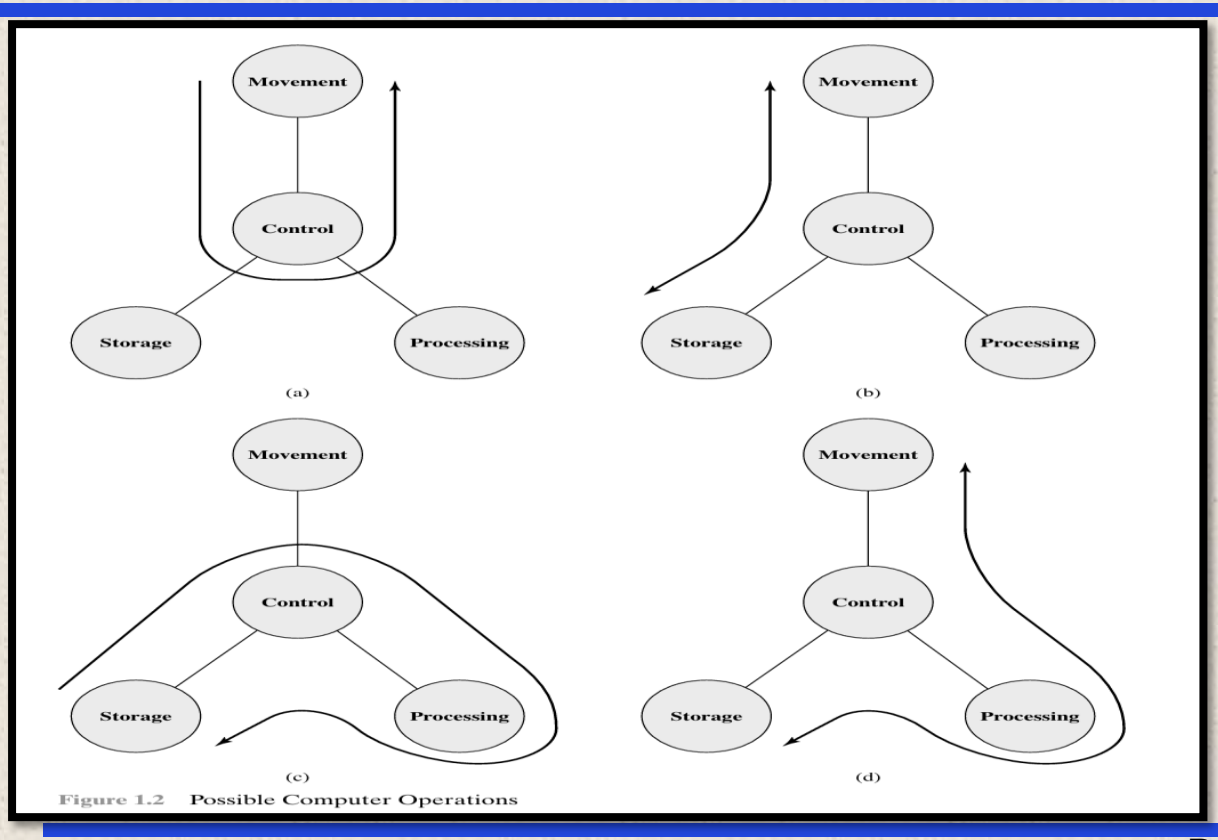


Figure 1.2 Possible Computer Operations

Thank You

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