Computer Architecture

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Computer Organization and Architecture

Chapter 1
Introduction

Architecture & Organization 1

- Architecture is those attributes visible to the programmer like logical execution.
- Instruction set, number of bits used for data type representation (number, characters), I/O mechanisms, addressing memory techniques.
- Organization is how features are implemented
  - Control signals, interfaces, memory technology.

Architecture & Organization 2

- All Intel x86 family share the same basic architecture.
- The IBM System/370 family share the same basic architecture.
- This gives code compatibility.
- Organization differs between different versions.

Structure & Function

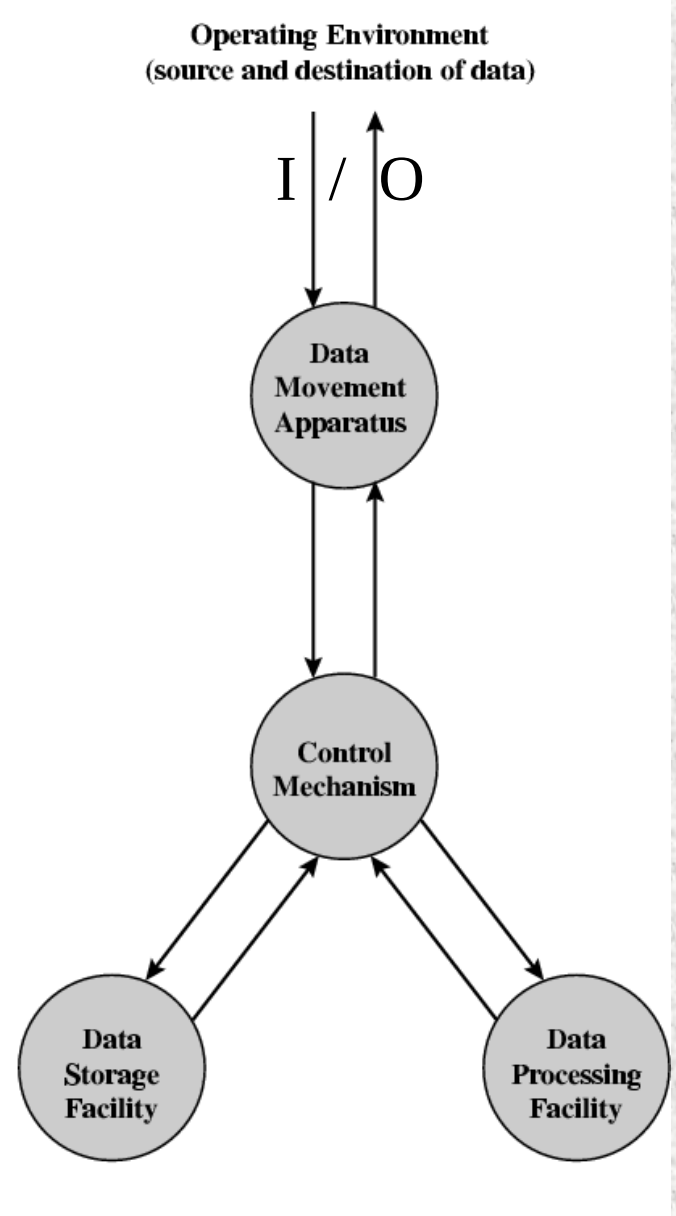
- Structure is the way in which components relate to each other.

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

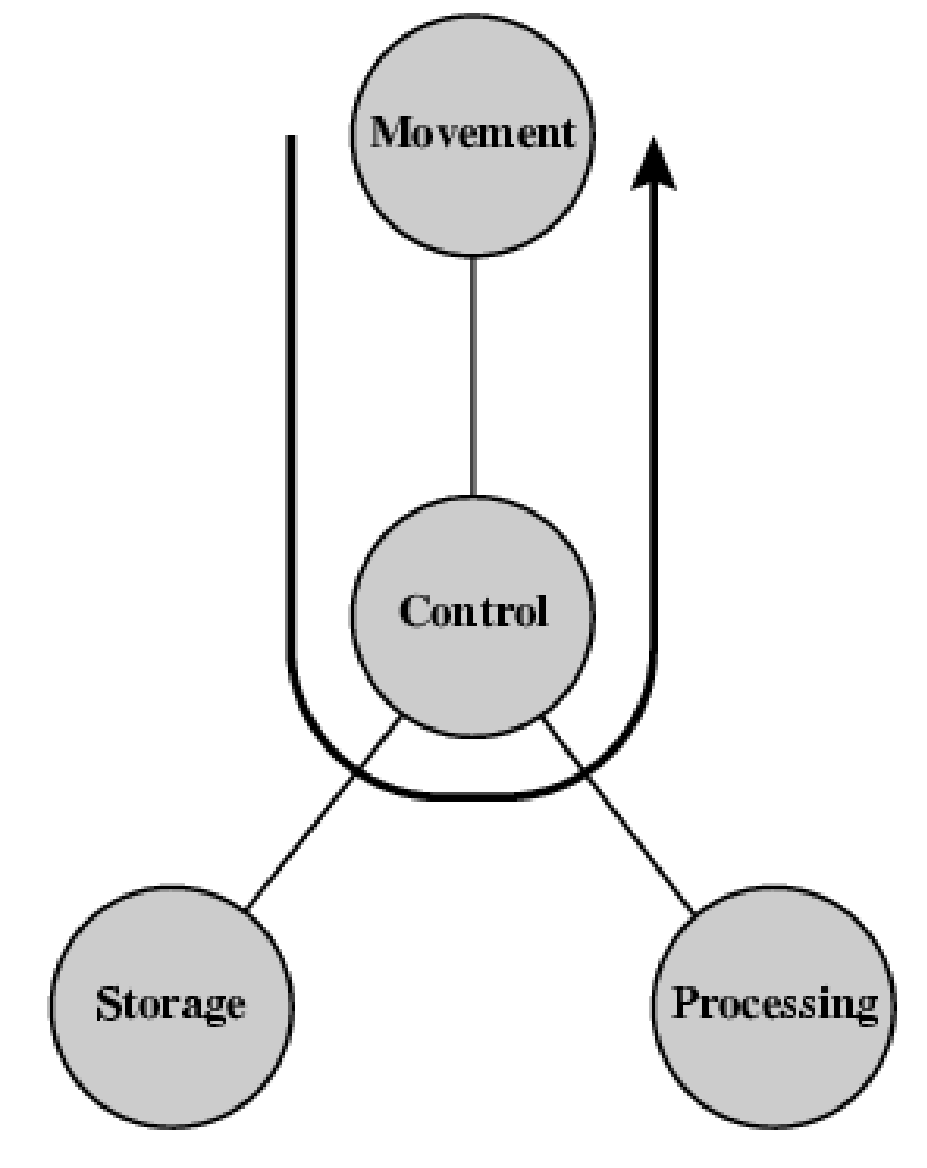
Function

- All computer functions are:
  - Data processing
  - Data storage
  - Data movement
  - Control

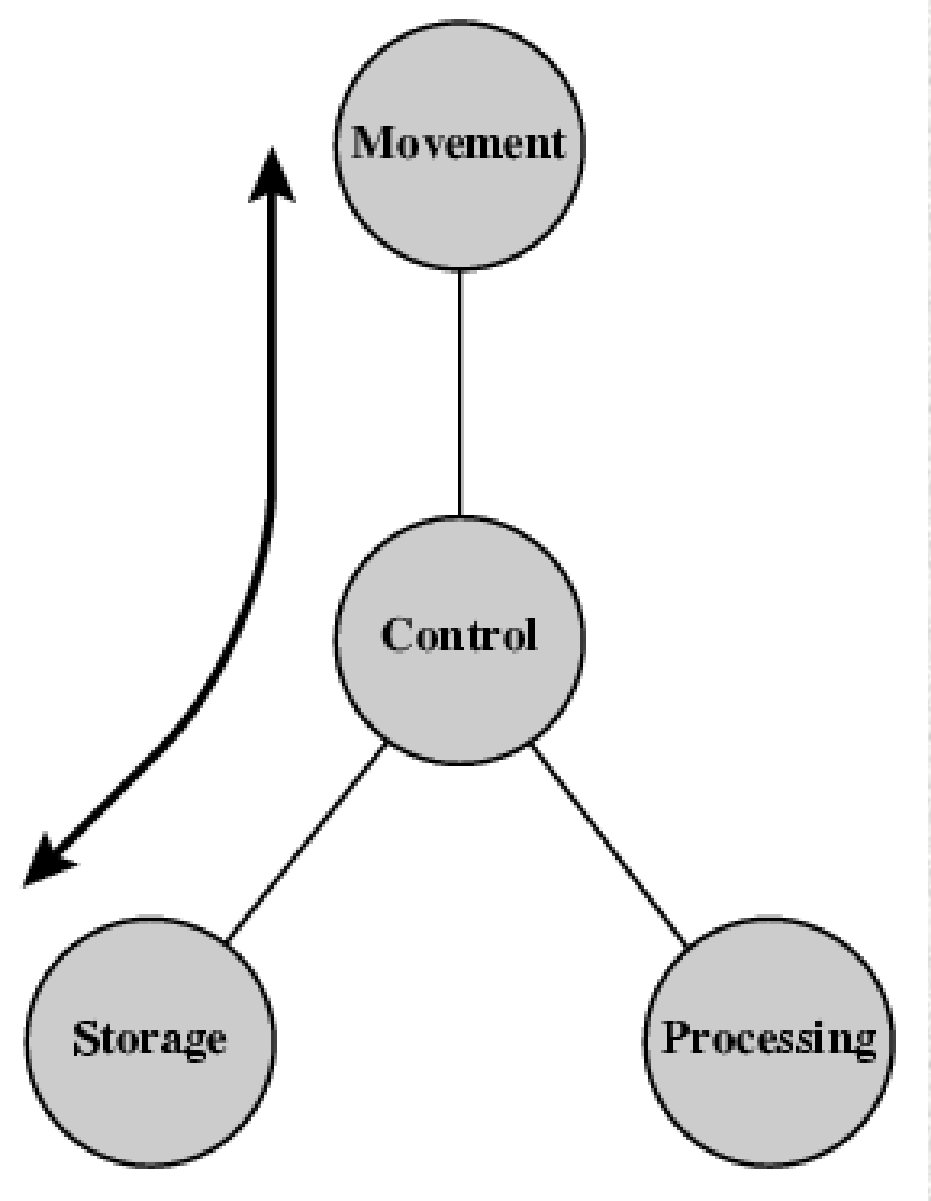
Functional view



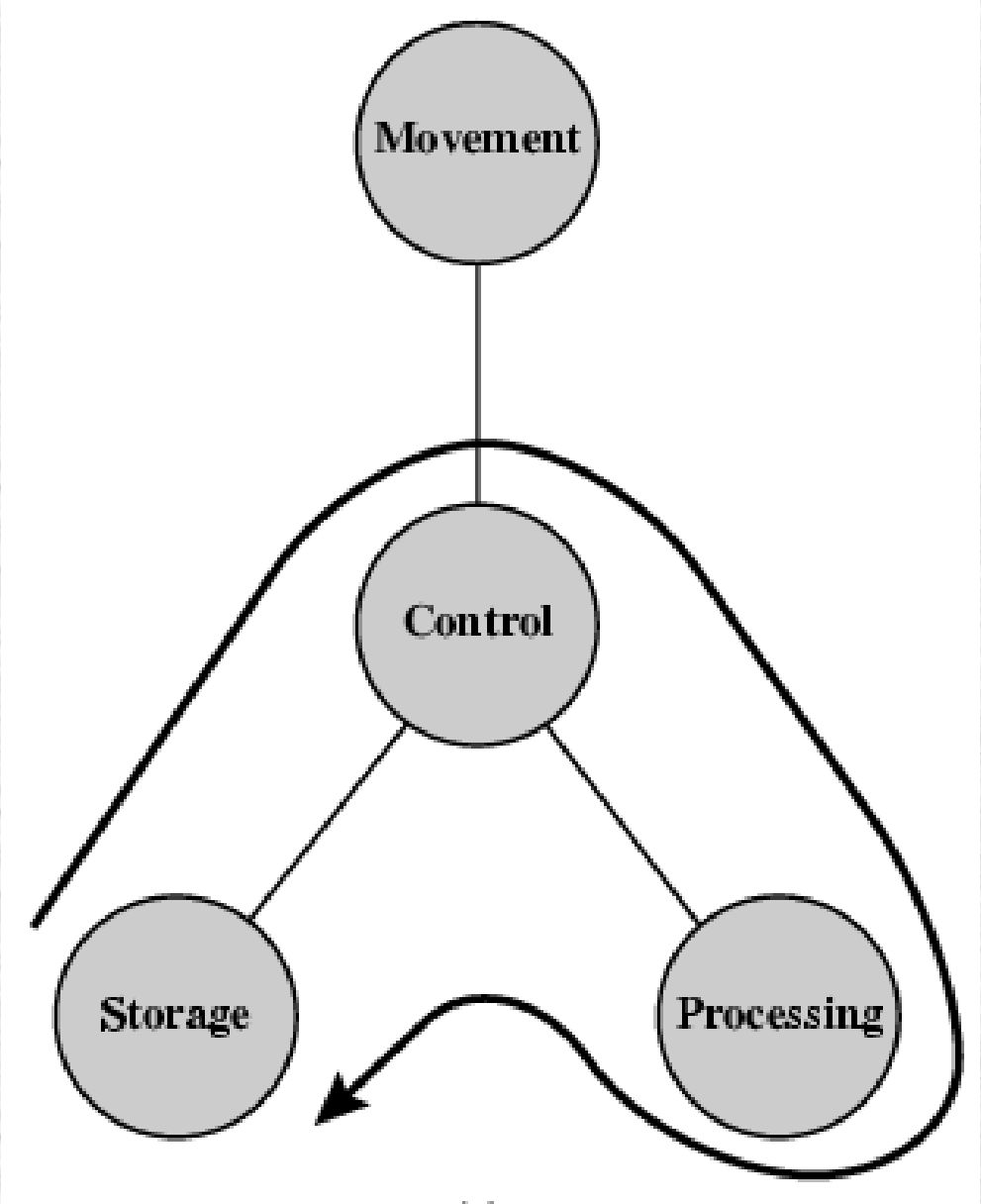
Operations (1) Data movement



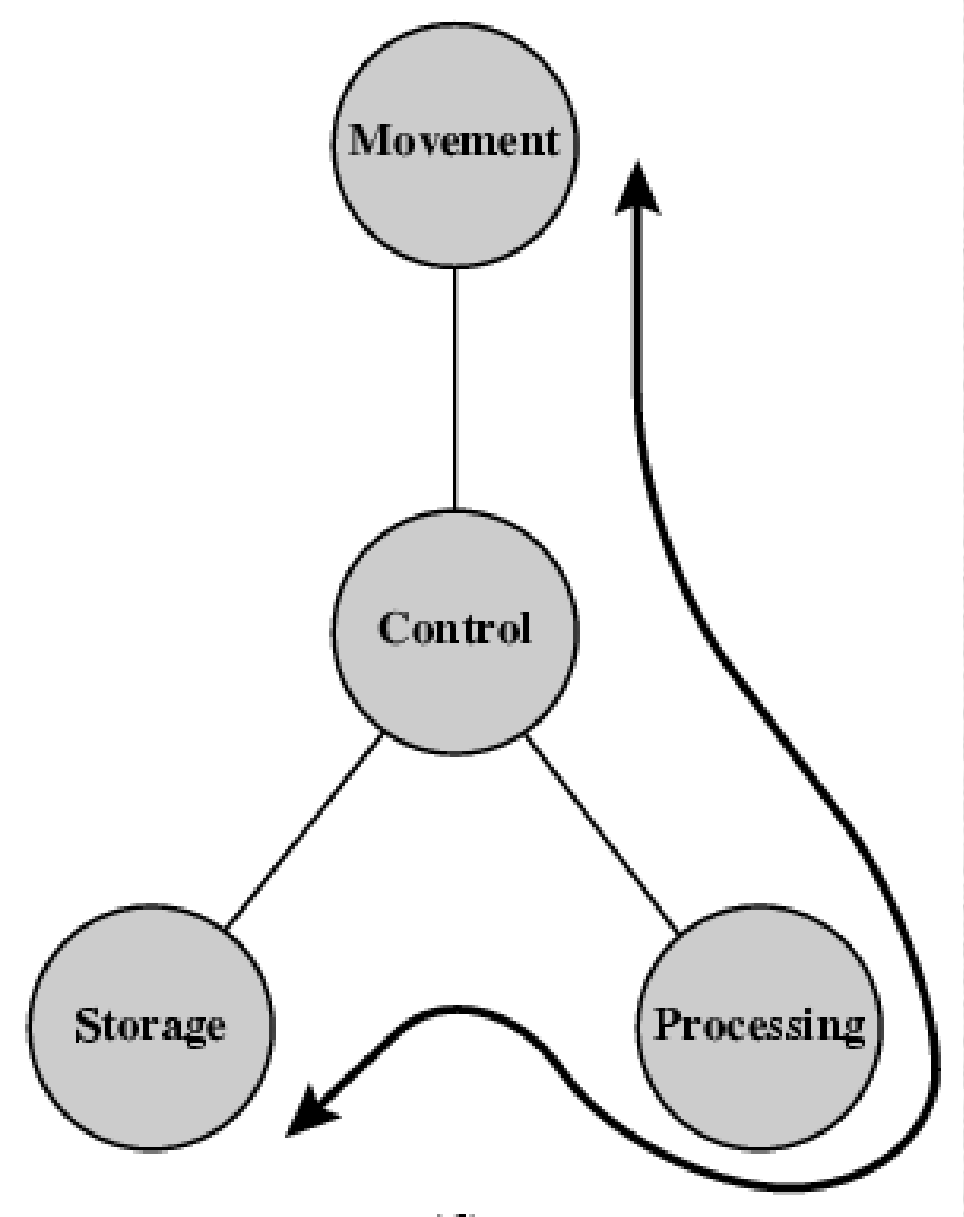
Operations (2) Storage



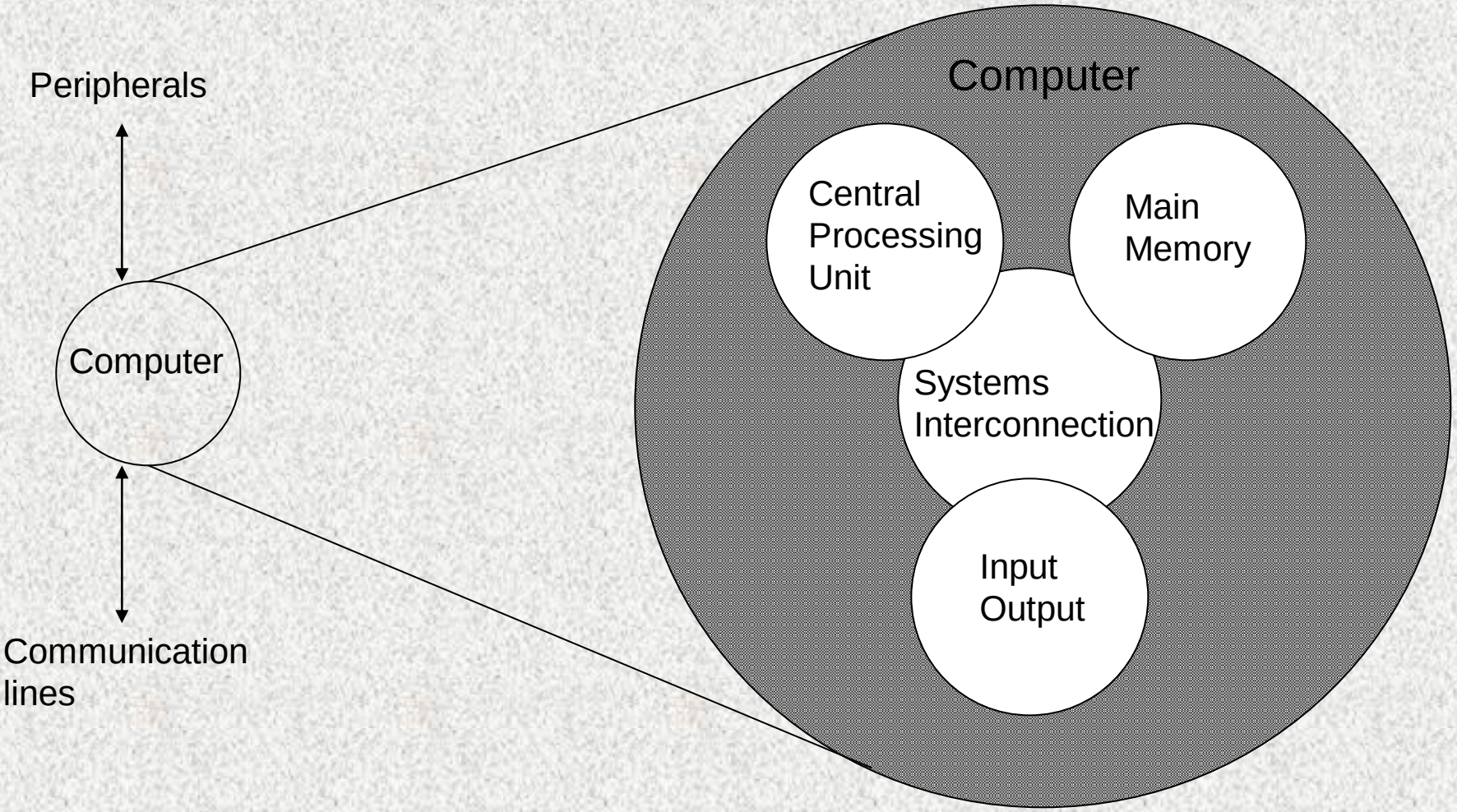
Operation (3) Processing from/to storage



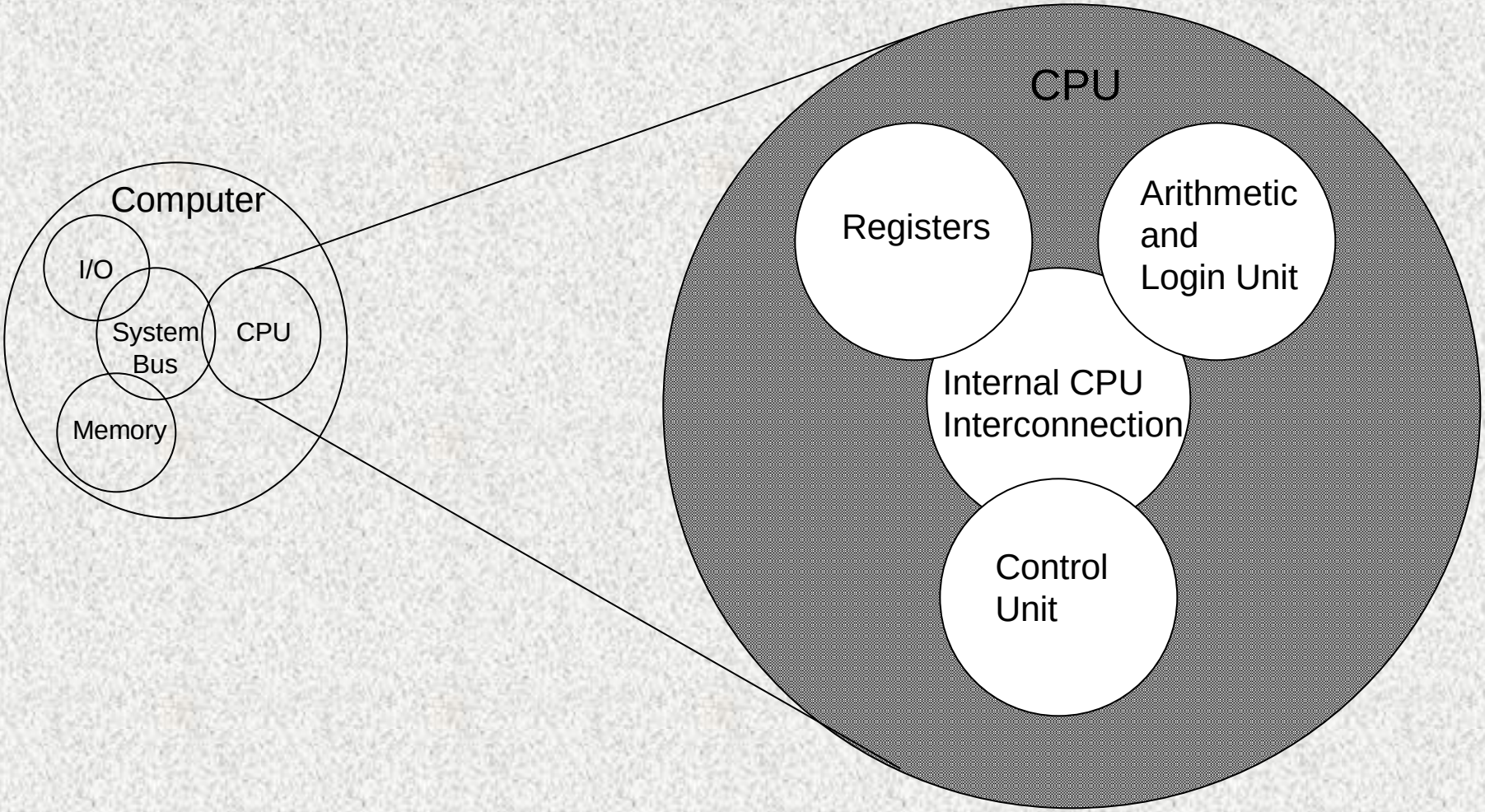
Operation (4)
Processing from storage to I/O



Structure - Top Level structure



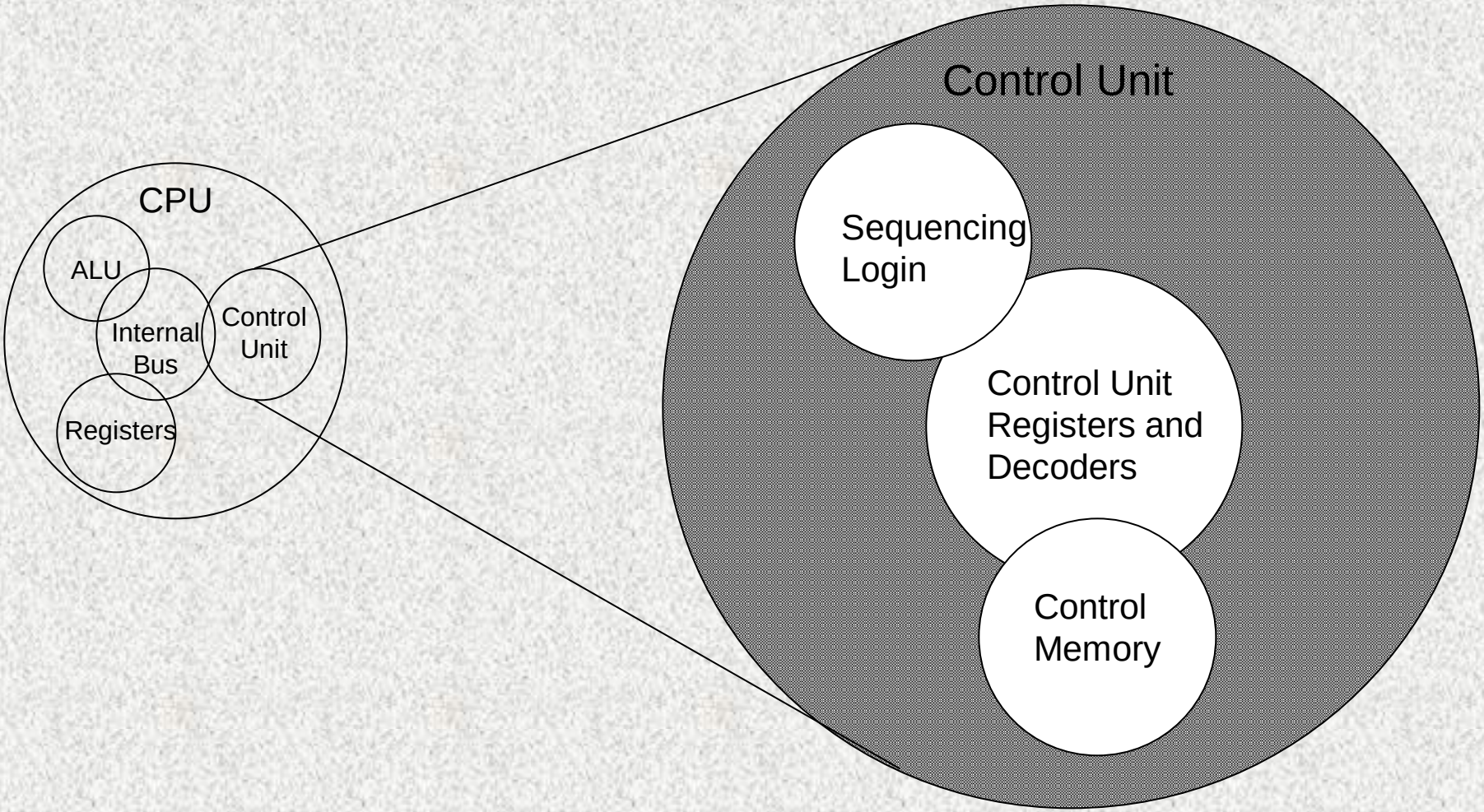
Structure - The CPU



The computer

- **Central processing unit (CPU):** controls the operation of the computer and performs its data processing functions.
- **Main memory:** stores data.
- **I/O:** moves data between the computer and its external environment.
- **System interconnection**: some mechanisim that provides for communication among CPU, main memory and I/O.

Structure - The Control Unit



- **Control unit:** controls the operation of the CPU and the Computer.
- **Arithmetic and Logic Unit (ALU):** performs the computer's data processing funcions.
- **Registers:** provides storage internal to the CPU.
- **CPU interconnection:** its some mechanism that provides for communication among the control unit, ALU, and register

Outline of the Book (1)

- Computer Evolution and Performance
- Computer Interconnection Structures
- Internal Memory
- External Memory
- Input/Output
- Operating Systems Support
- Computer Arithmetic
- Instruction Sets

Outline of the Book (2)

- CPU Structure and Function.
- Reduced Instruction Set Computers.
- Control Unit Operation.
- Multiprocessors and Vector Processing.
- Digital Logic.

Internet Resources
- Web site for book

- http://WilliamStallings.com/COA6e.html
  - links to sites of interest
  - links to sites for courses that use the book
  - errata list for book
  - information on other books by W. Stallings

Internet Resources
- Web sites to look for

- WWW Computer Architecture Home Page
- CPU Info Center
- ACM Special Interest Group on Computer Architecture
- IEEE Technical Committee on Computer Architecture
- Intel Technology Journal
- Manufacturer's sites
  - Intel, IBM, etc.