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William Stallings Computer Organization and Architecture 6th Edition

Chapter 1 Introduction

low-level
Assembly language

PC
• Register

Hardware
• Register

- quality
- speed
- full control

Hardware

High-level language

HC
— Pascal
— MATLAB

python
• net

Architecture & Organization 1

- ✓ Architecture is those attributes visible to the programmer

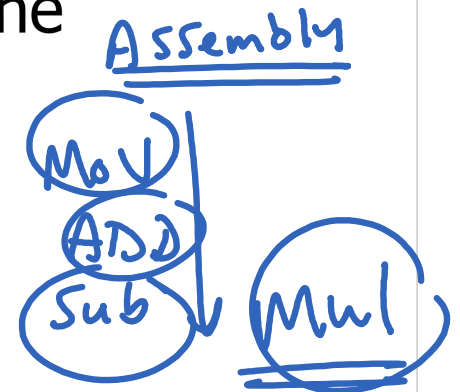
- Instruction set, number of bits used for data representation, I/O mechanisms, addressing techniques.

- e.g. Is there a multiply instruction?

- Organization is how features are implemented

- Control signals, interfaces, memory technology.

- e.g. Is there a hardware multiply unit or is it done by repeated addition?



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
 - At least backwards
- 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

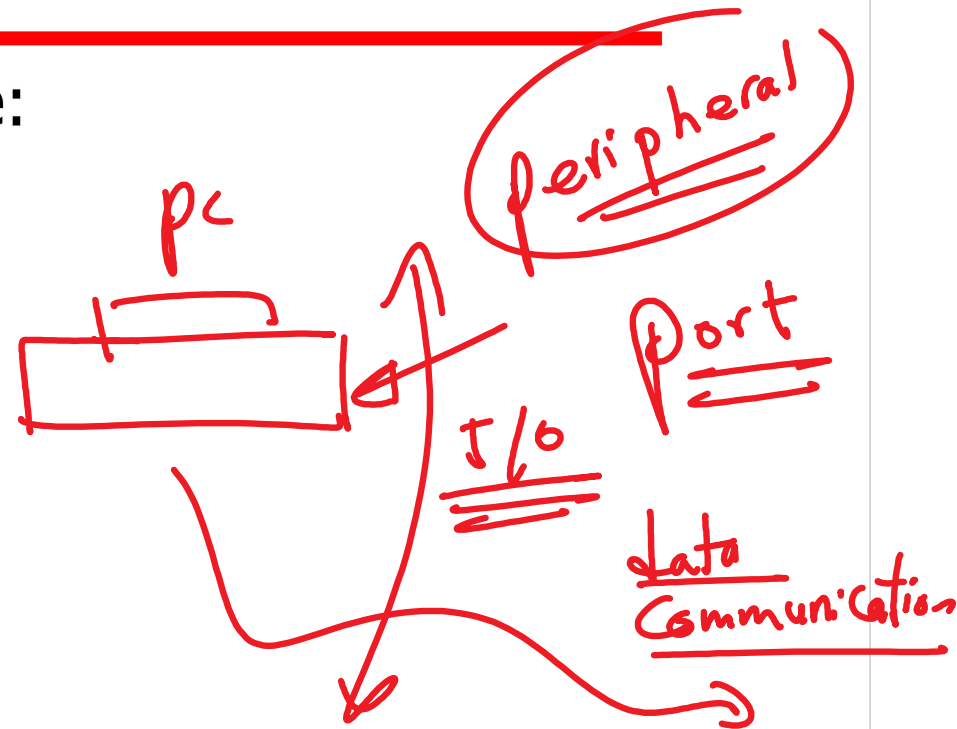
Function

- All computer functions are:

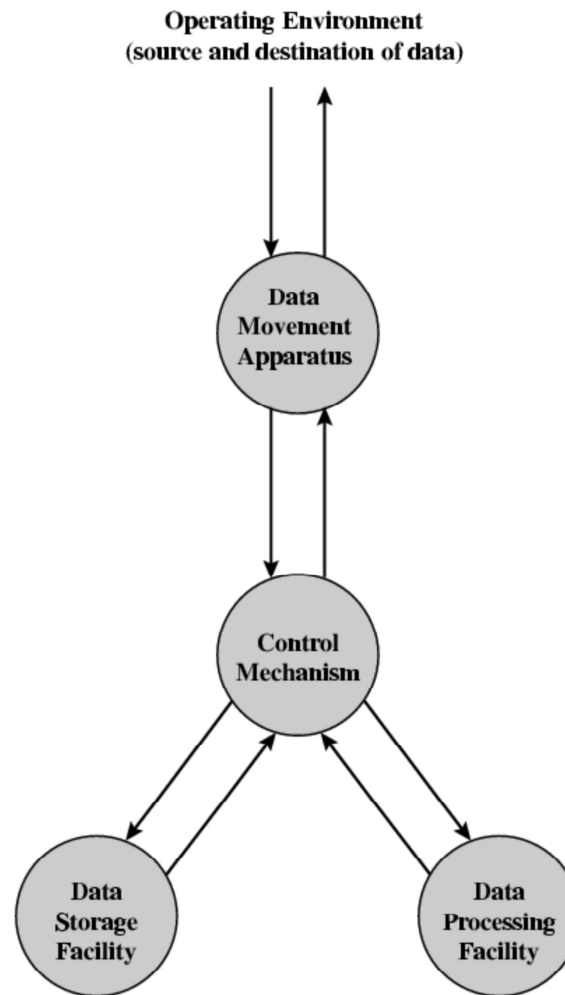
- Data processing
- Data storage
- Data movement
- Control

↓ Control unit

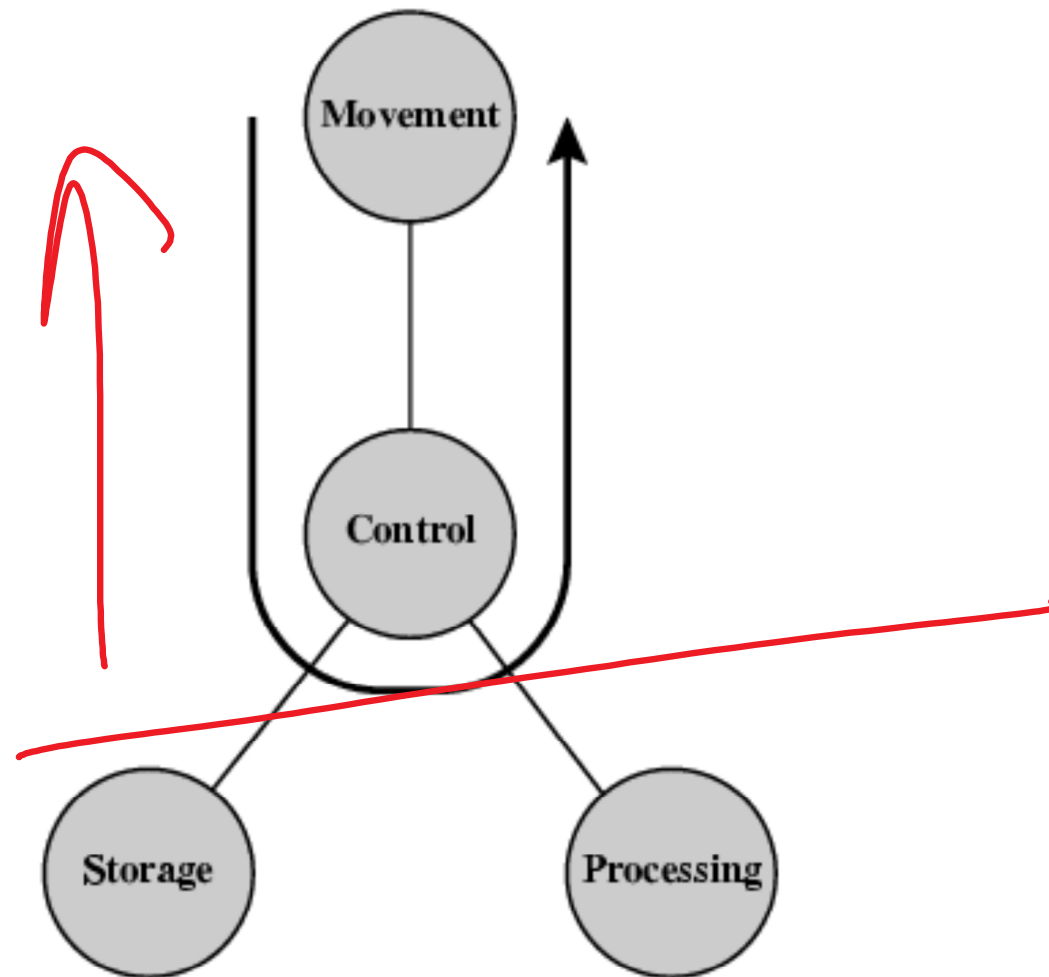
↓ Instruction
أوامر



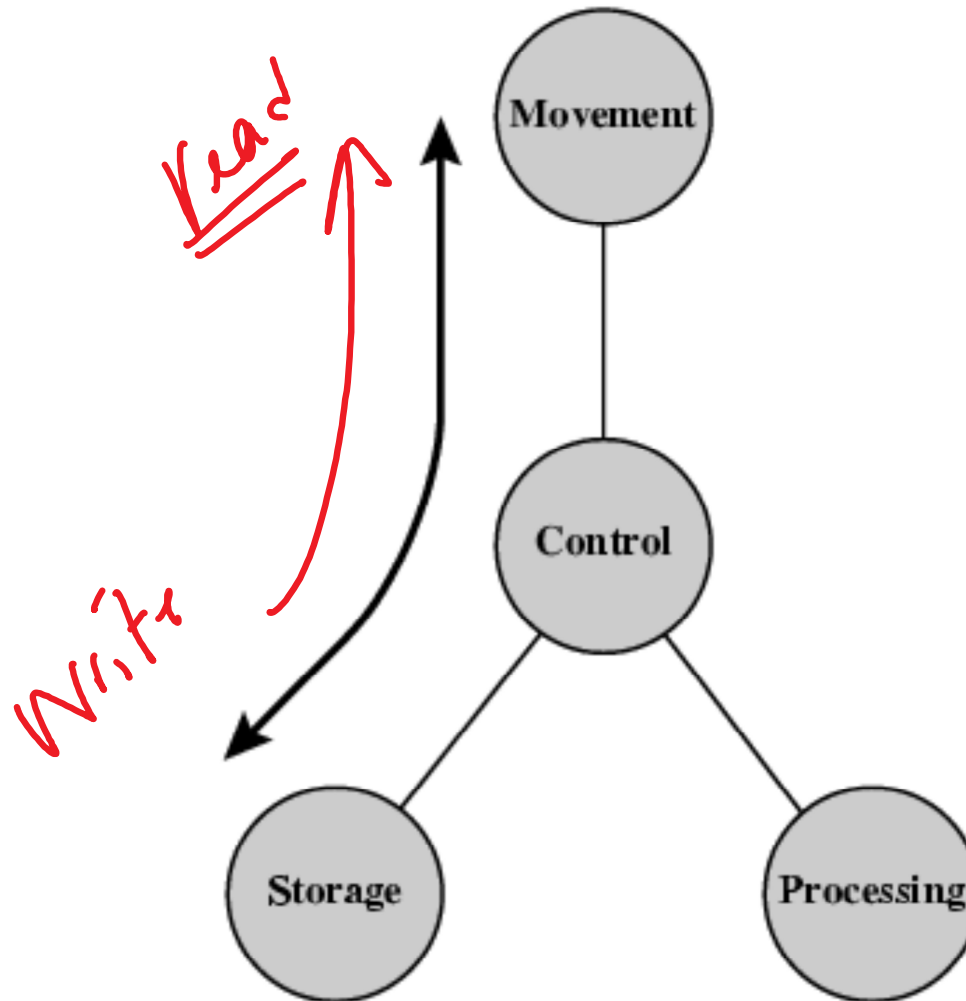
Functional view



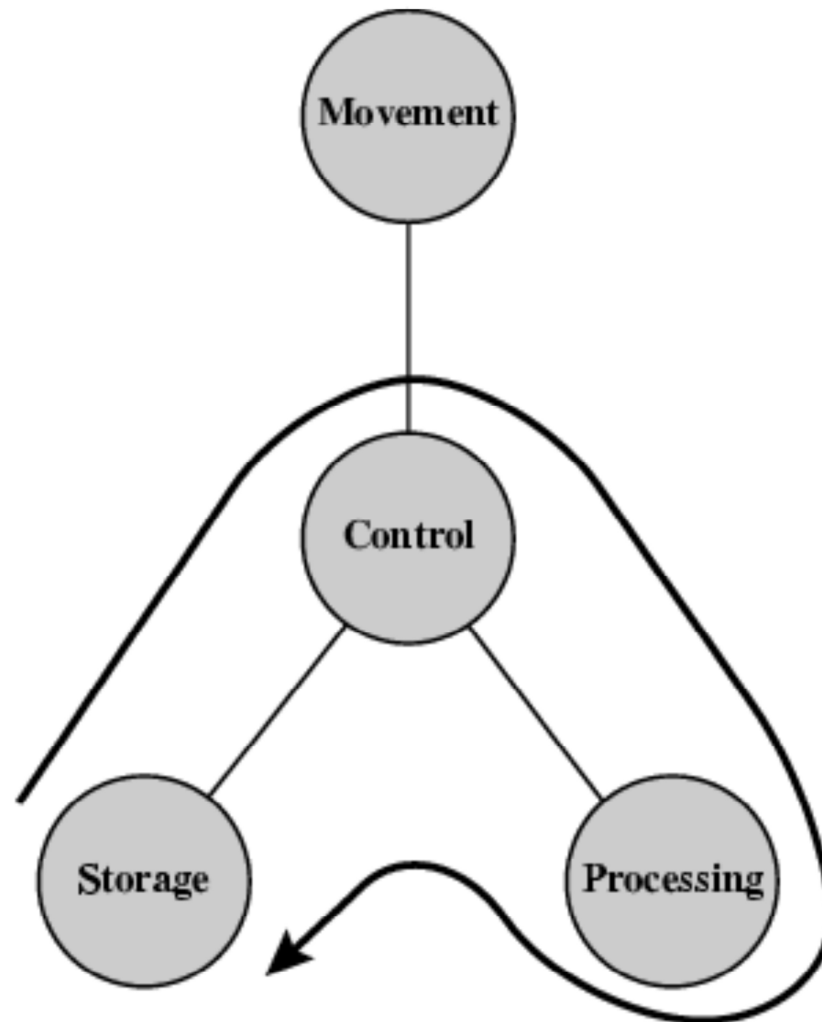
Operations (1) Data movement



Operations (2) Storage

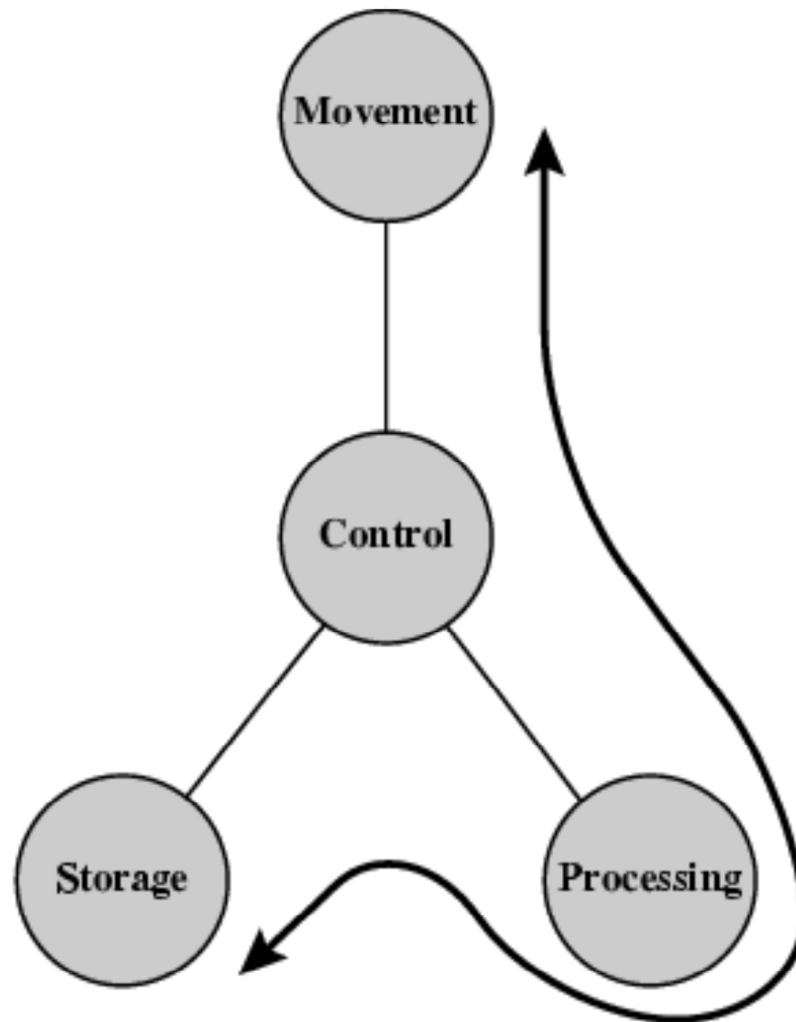


Operation (3) Processing from/to storage

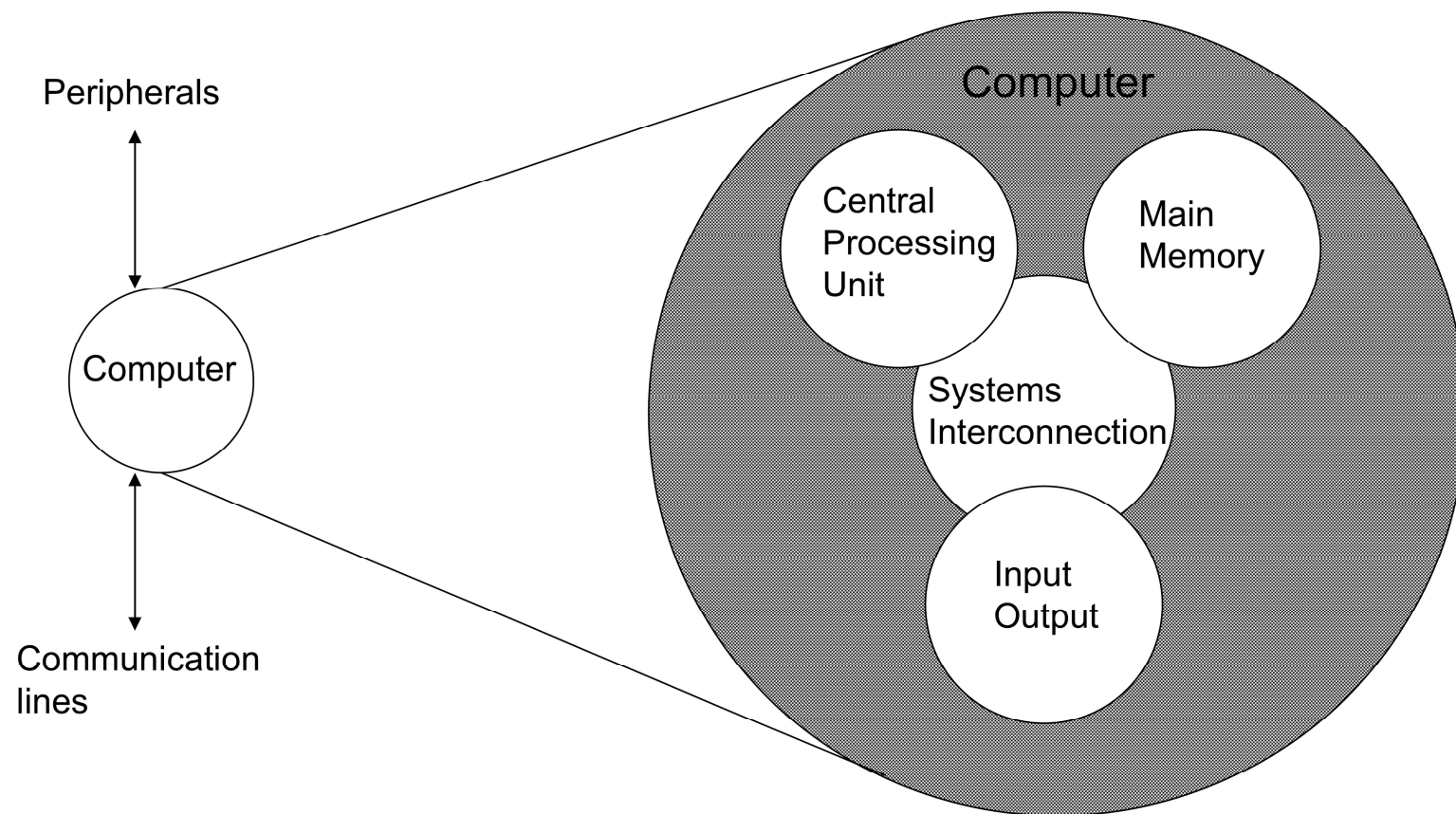


Operation (4)

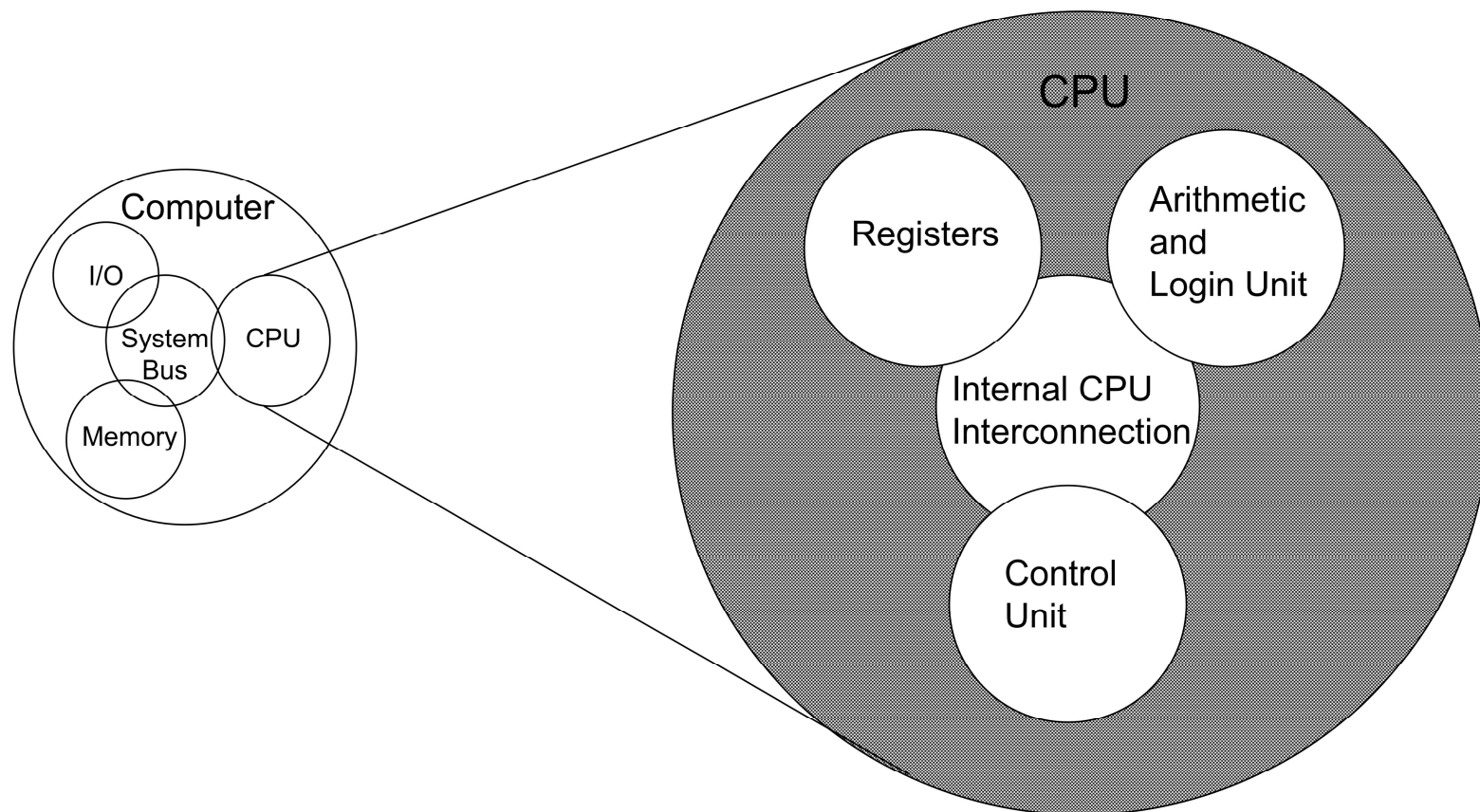
Processing from storage to I/O



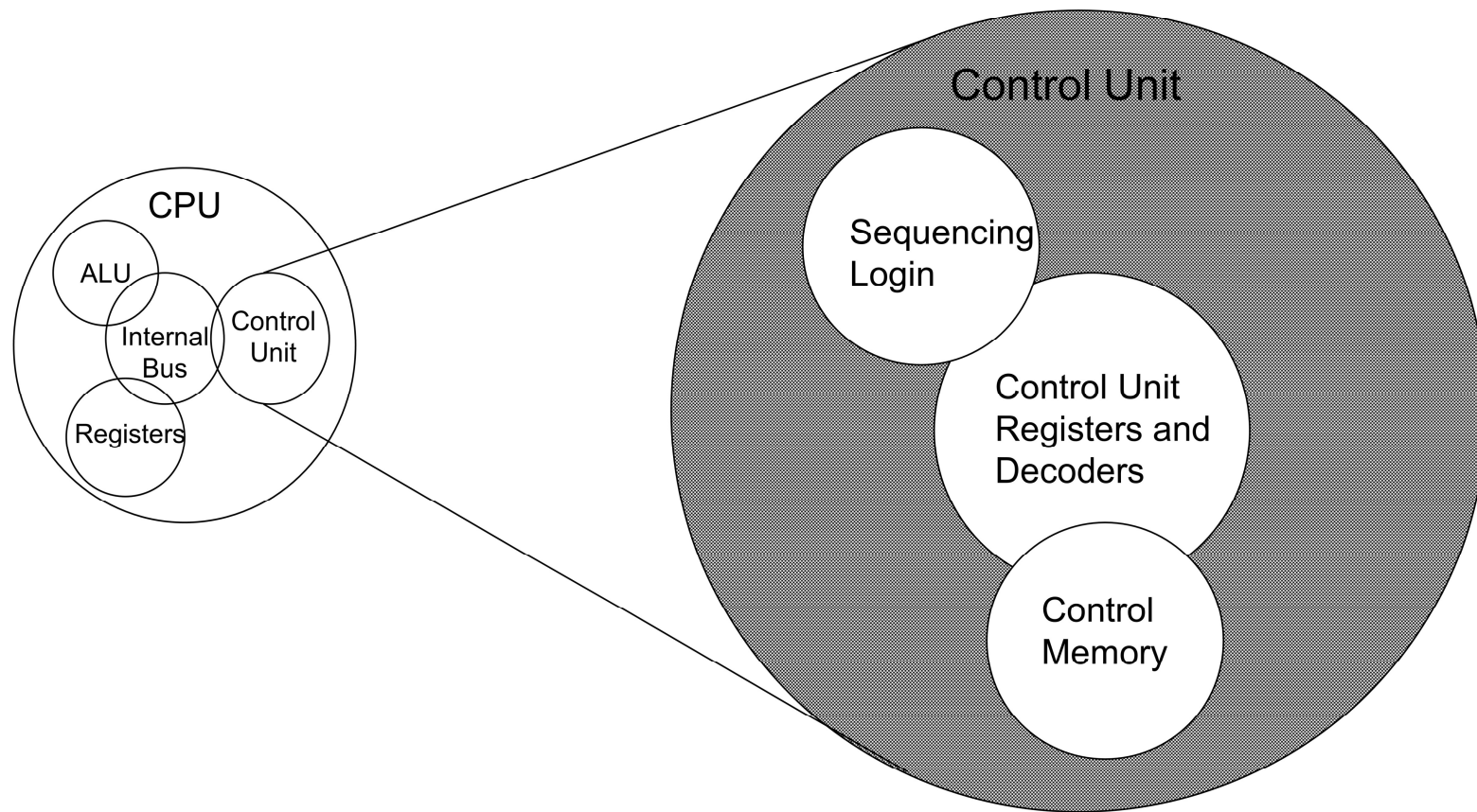
Structure - Top Level



Structure - The CPU



Structure - The Control Unit



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
- Superscalar Processors
- Control Unit Operation
- Microprogrammed Control
- Multiprocessors and Vector Processing
- Digital Logic (Appendix)