

CS 223 Computer Architecture & Organization

Computer Fundamentals



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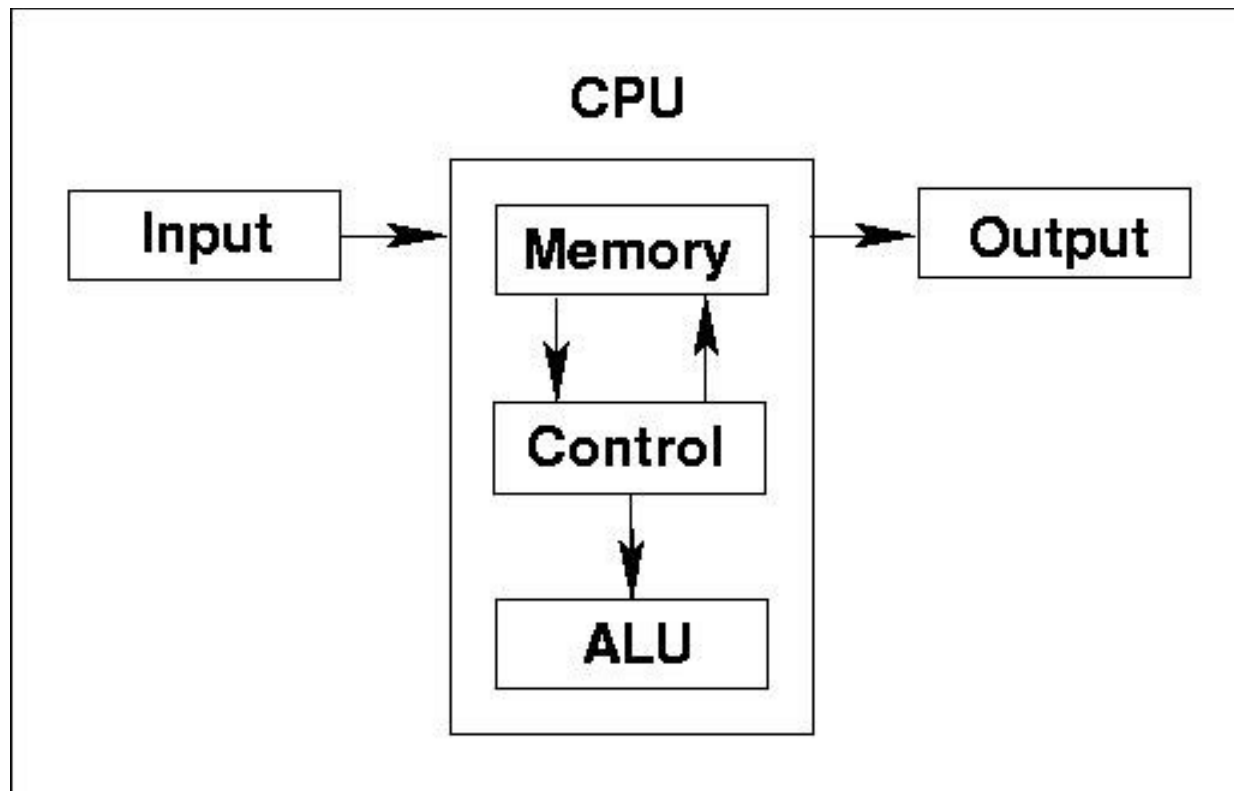
Model of Computer

Why do we use Computer?

How Computer Works?

-- Model of Computer

Computer Model



Computer Model

Algorithm: Procedure/Method to achieve desired result

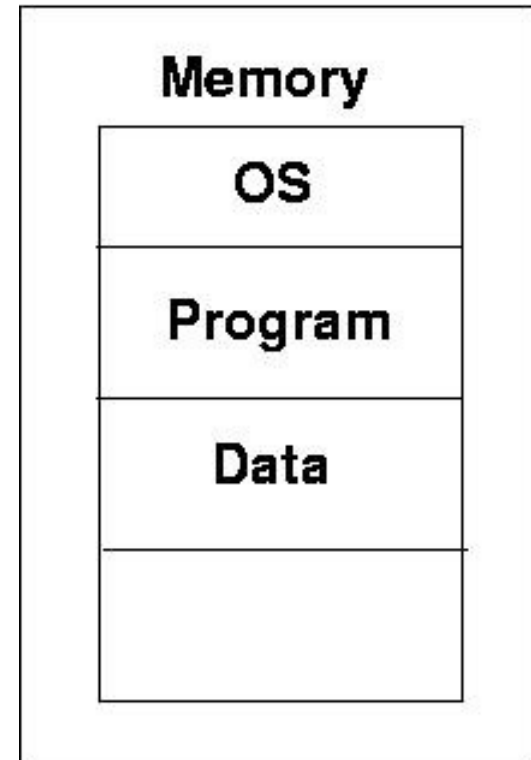
Computer Program:

- Set of Instructions
- Executes in Sequence

Body --- Hardware

Life --- Software

- Operating System, Compiler, editor, other tools



Computer Programming Languages

High Level Language: User Readable and understandable
(C, Pascal, Java, Cobol.....)

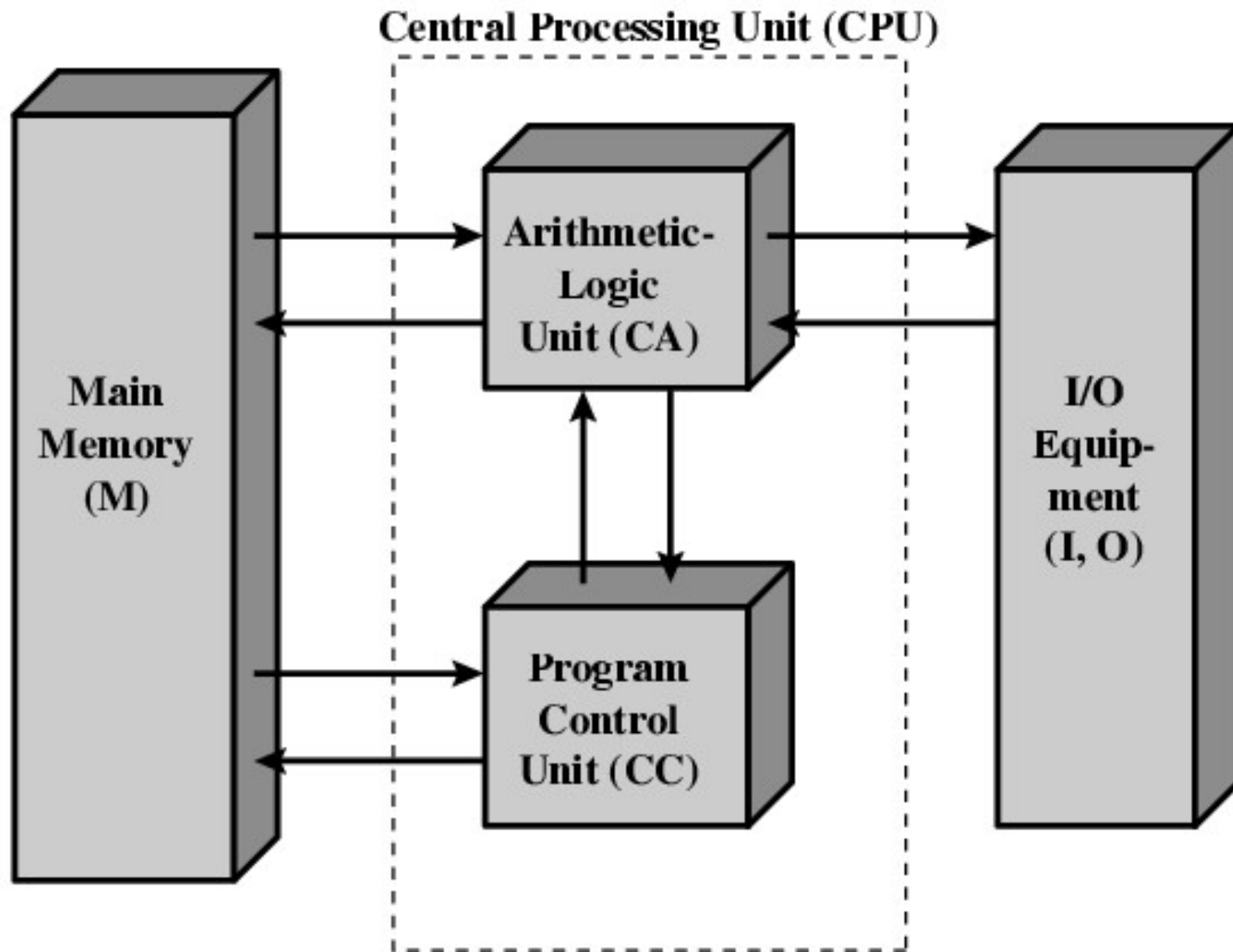
Assembly Language: (instruction as: add, mov, mul, div, etc...)

Machine Language: sequence of 0s & 1s

Von Neumann Principle

- Stored Program concept
- Main memory storing programs and data
- ALU operating on binary data
- Control unit interpreting instructions from memory and executing
- Input and output equipment operated by control unit
- Princeton Institute for Advanced Studies
 - IAS
- Completed 1952

Structure of Von Neumann machine



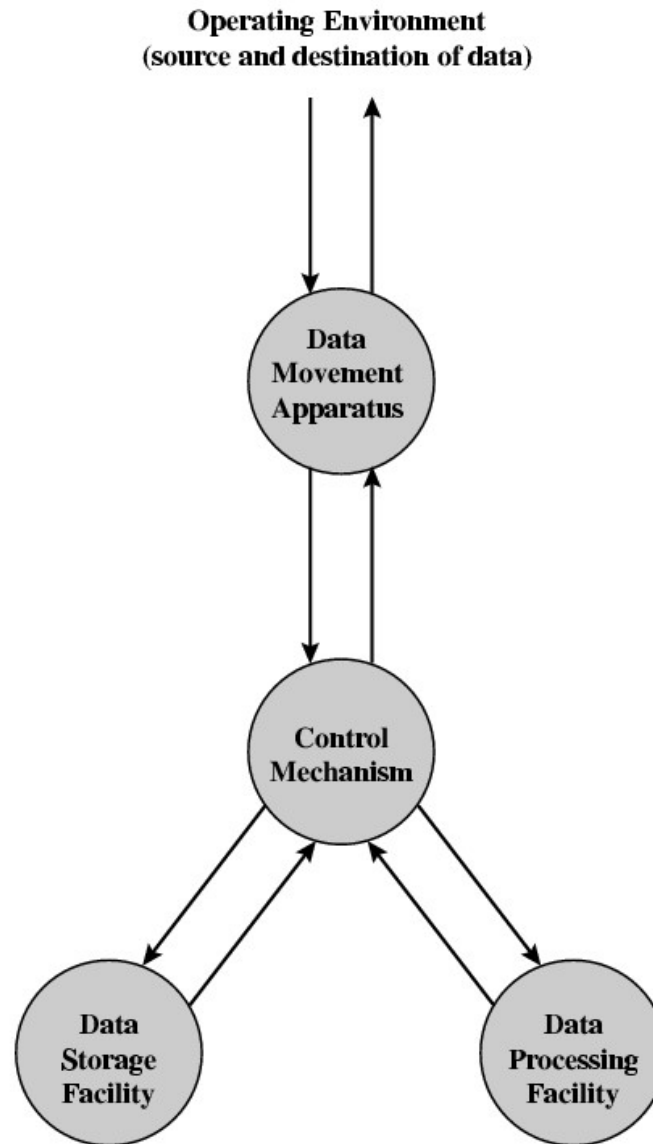
Computer : Structure & Function

- Structure is the way in which components relate to each other
- Function is the operation of individual components as part of the structure

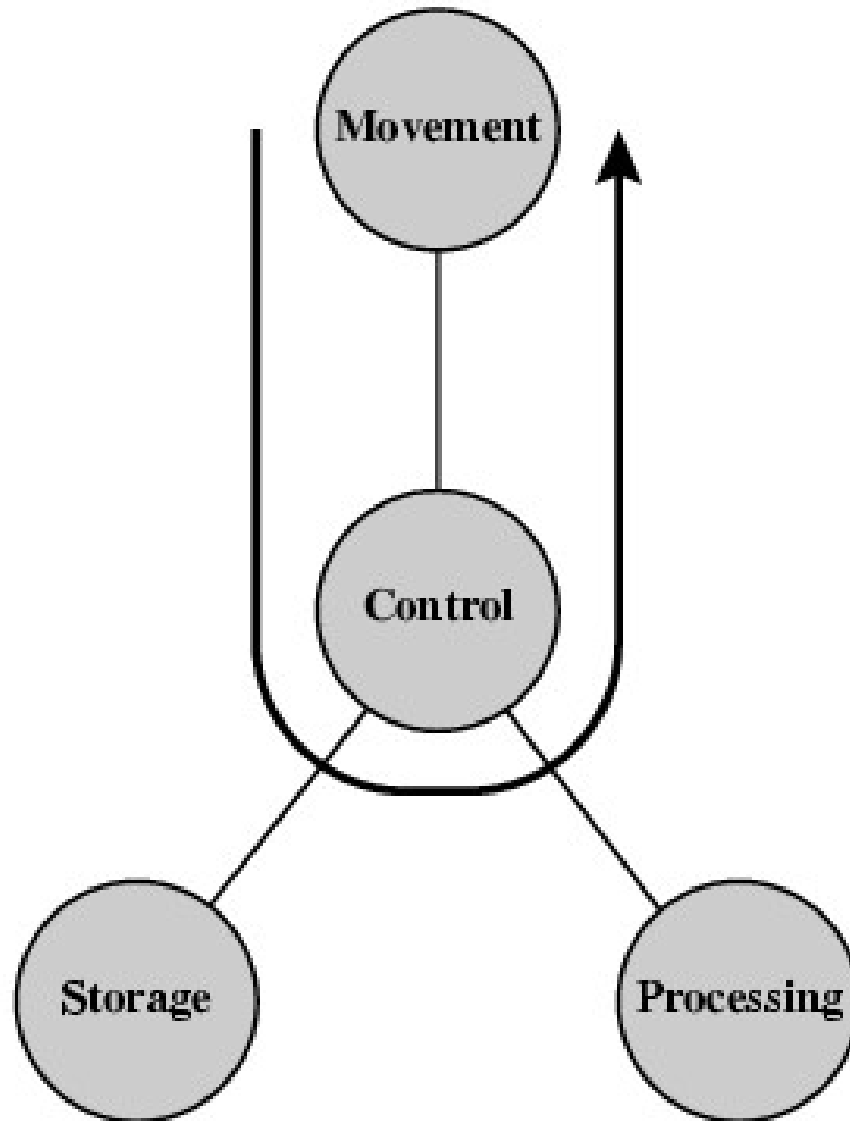
Function

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

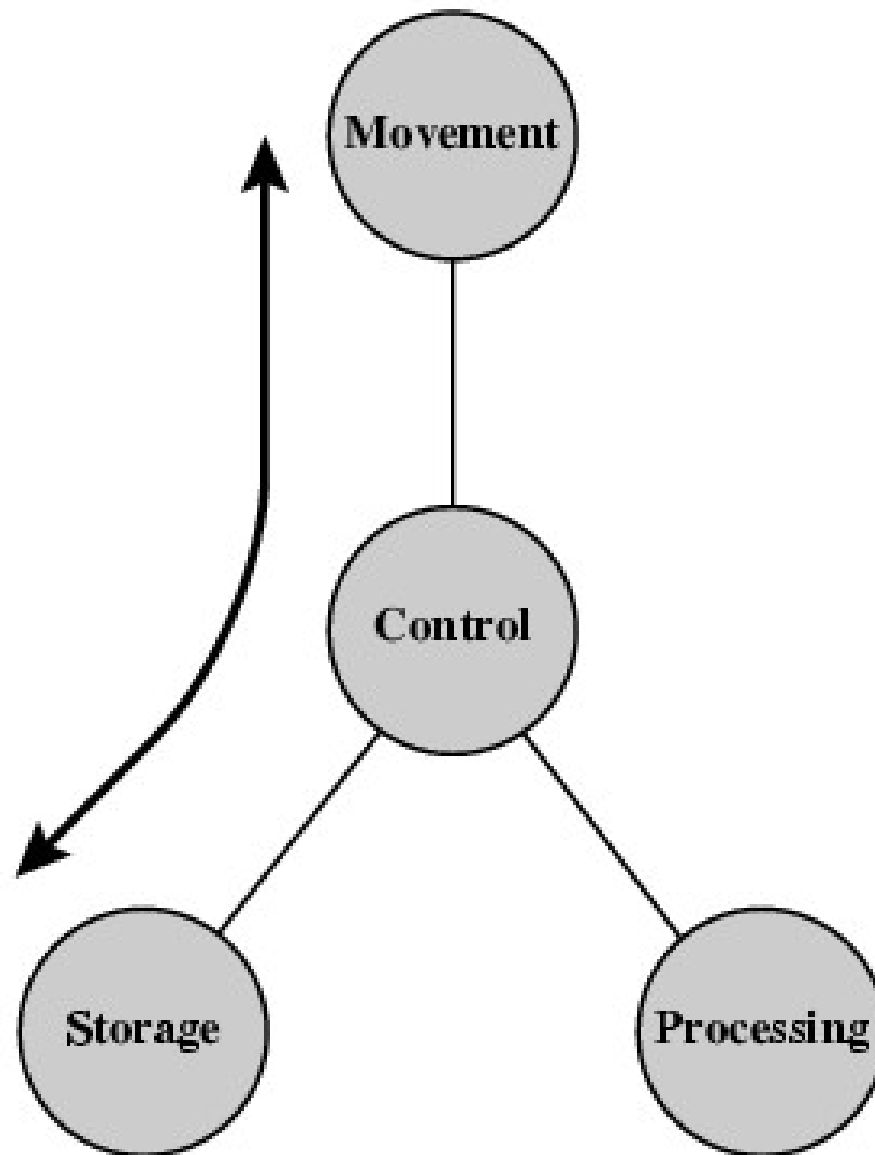
Functional View



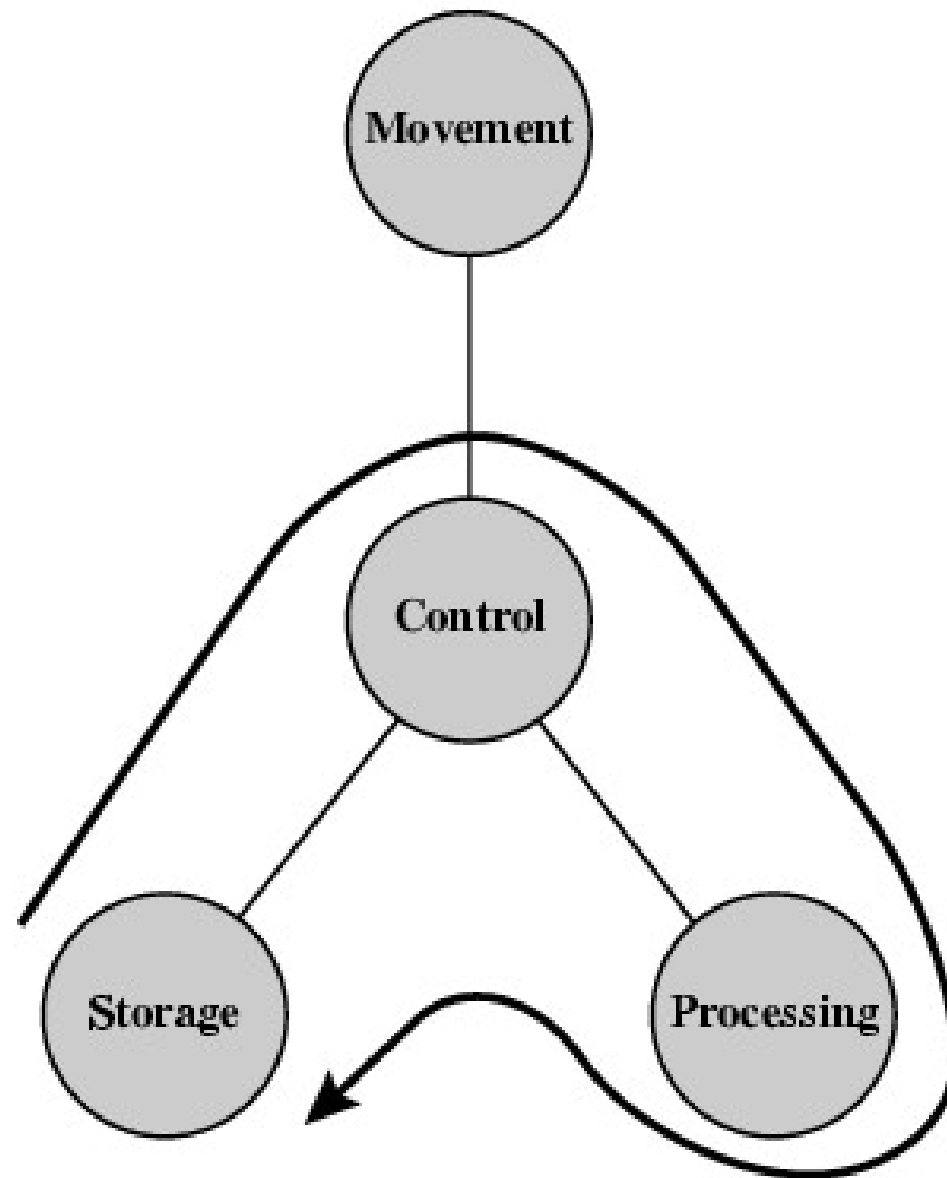
Operations (a) Data movement



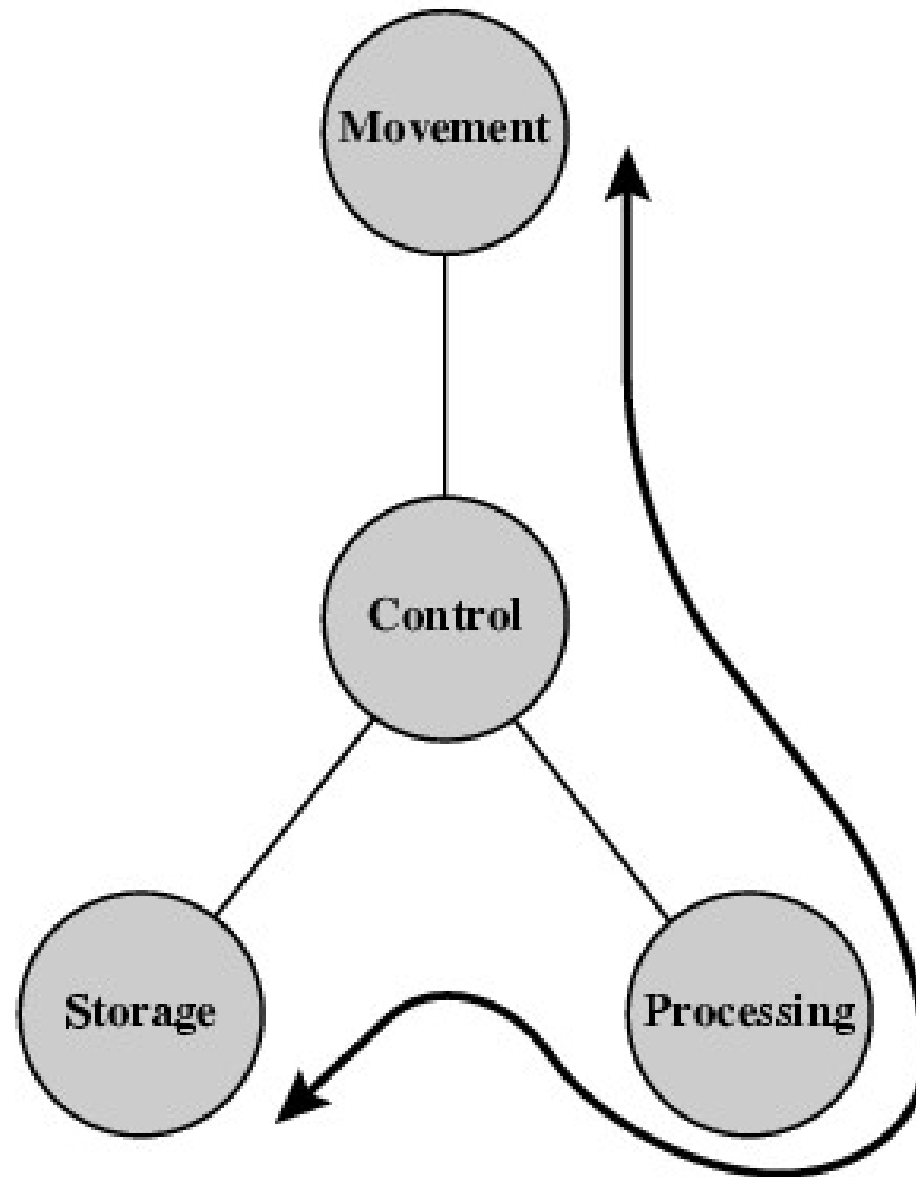
Operations (b) Storage



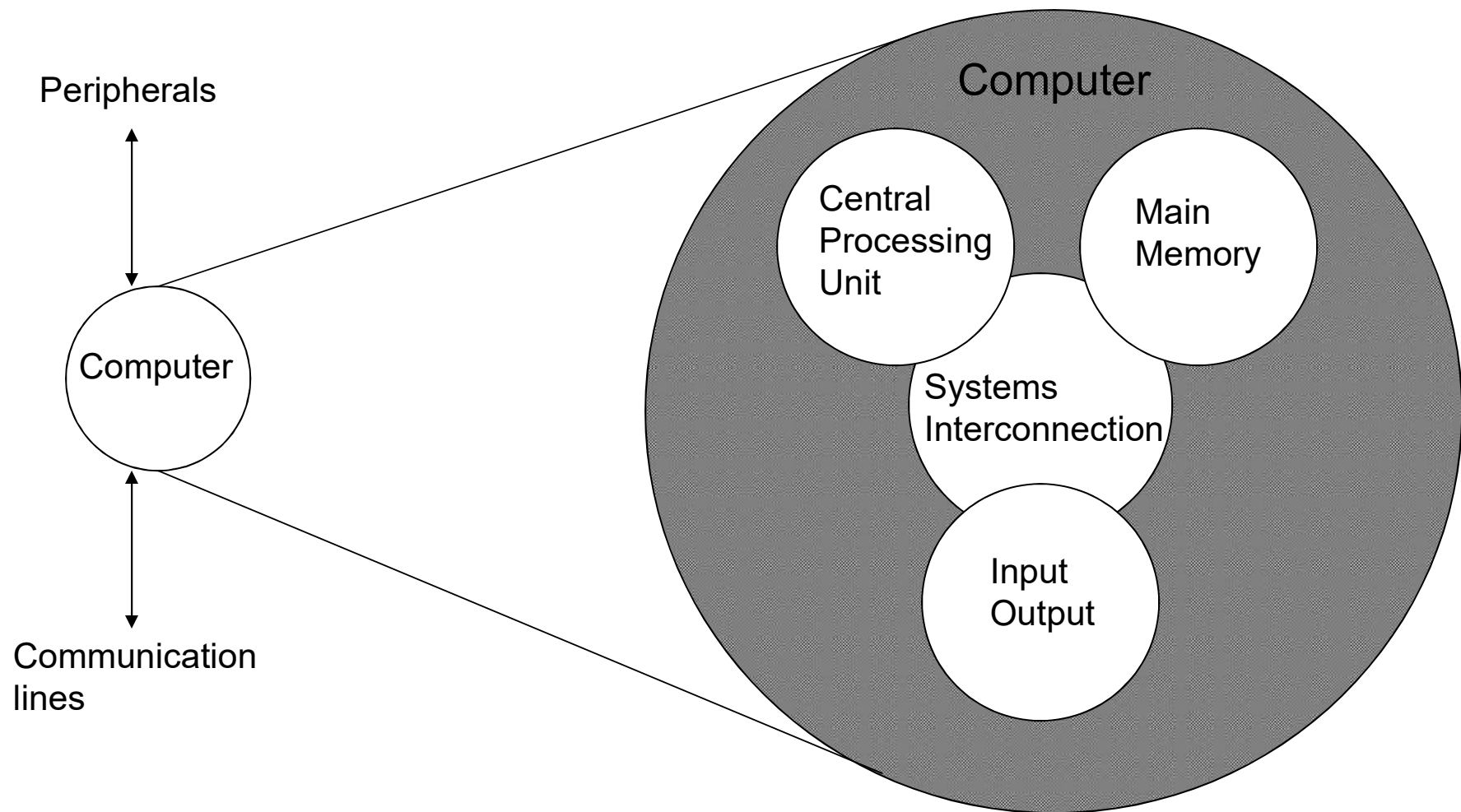
Operation (c) Processing from/to storage



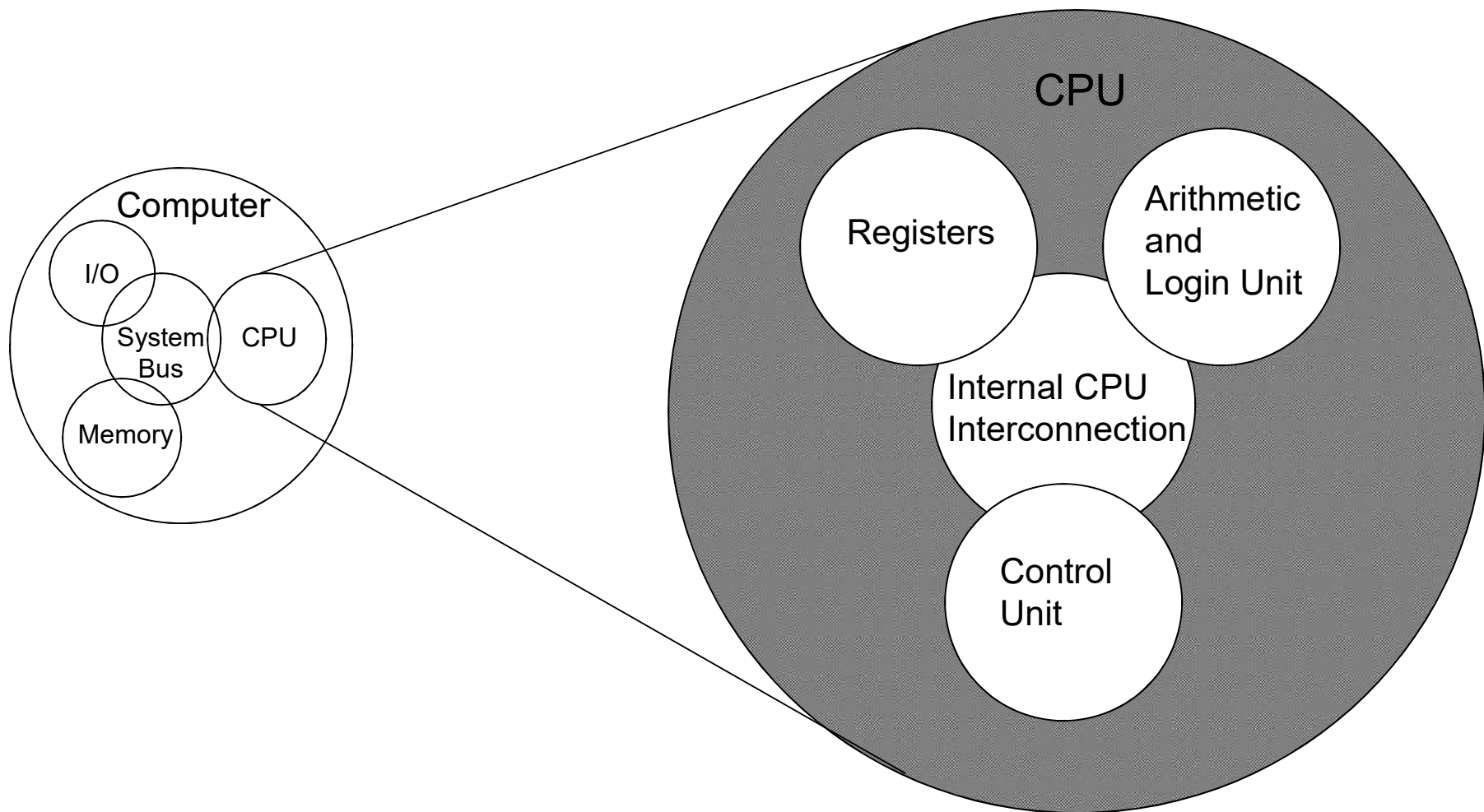
Operation (d) Processing from storage to I/O



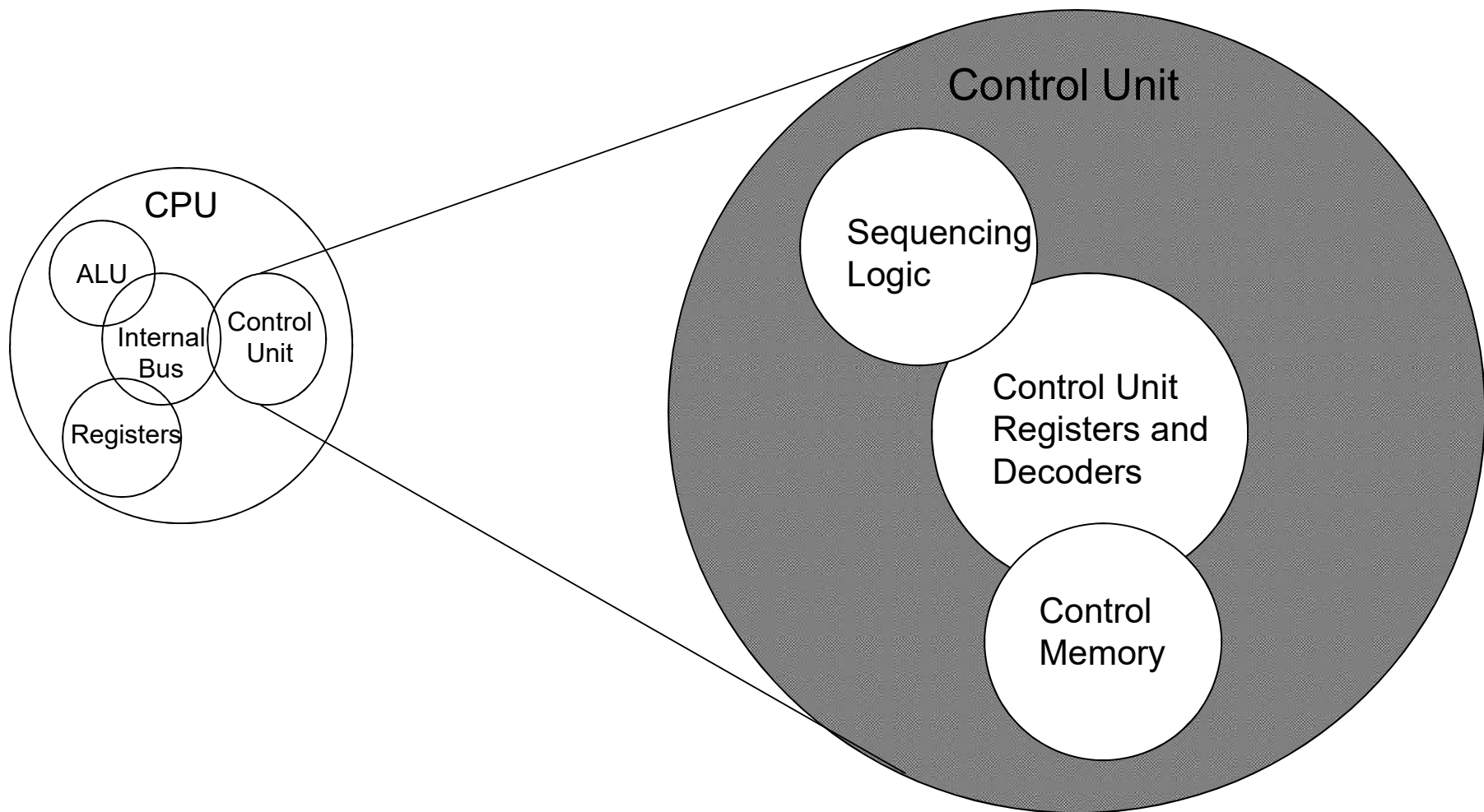
Structure - Top Level



Structure - The CPU



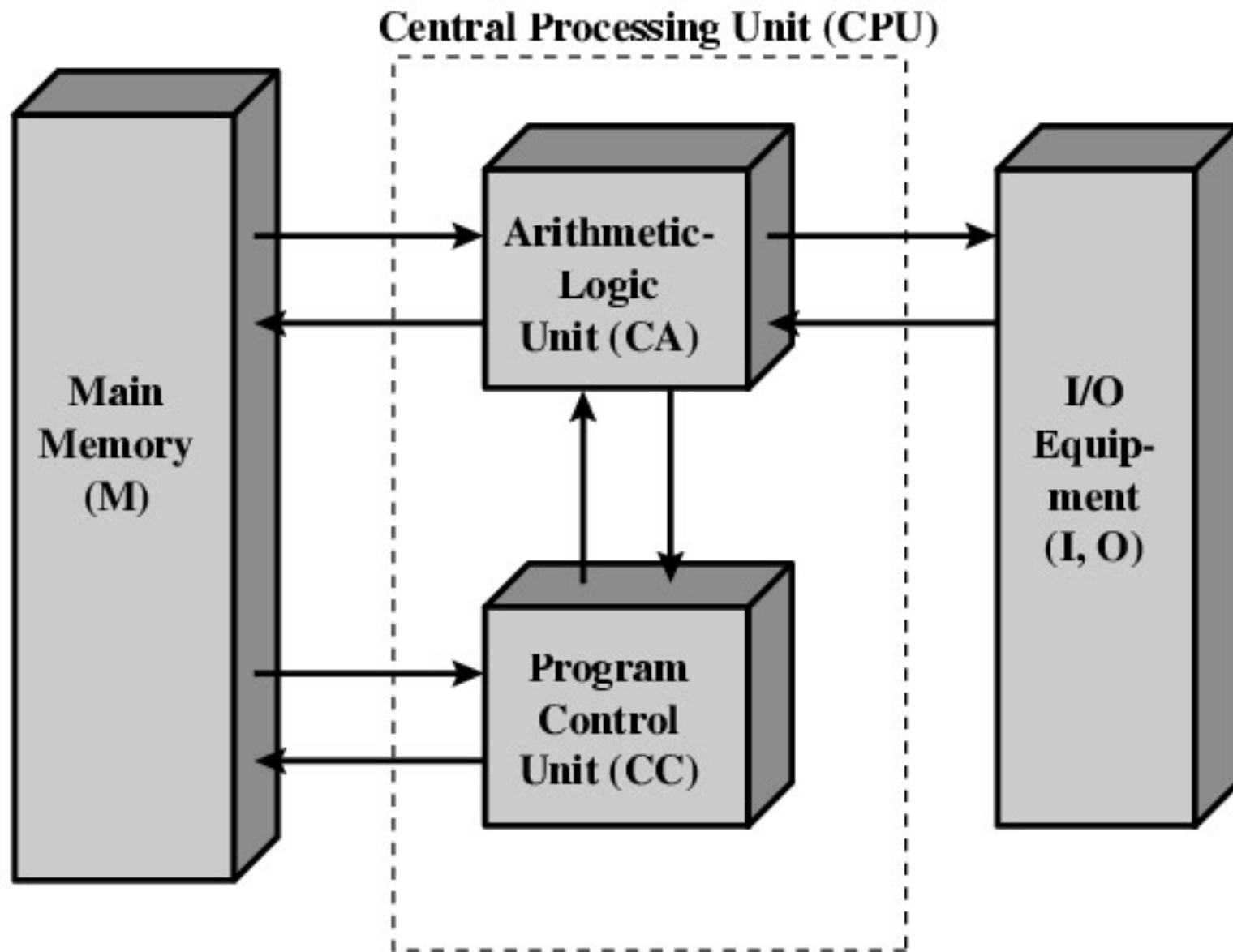
Structure - The Control Unit



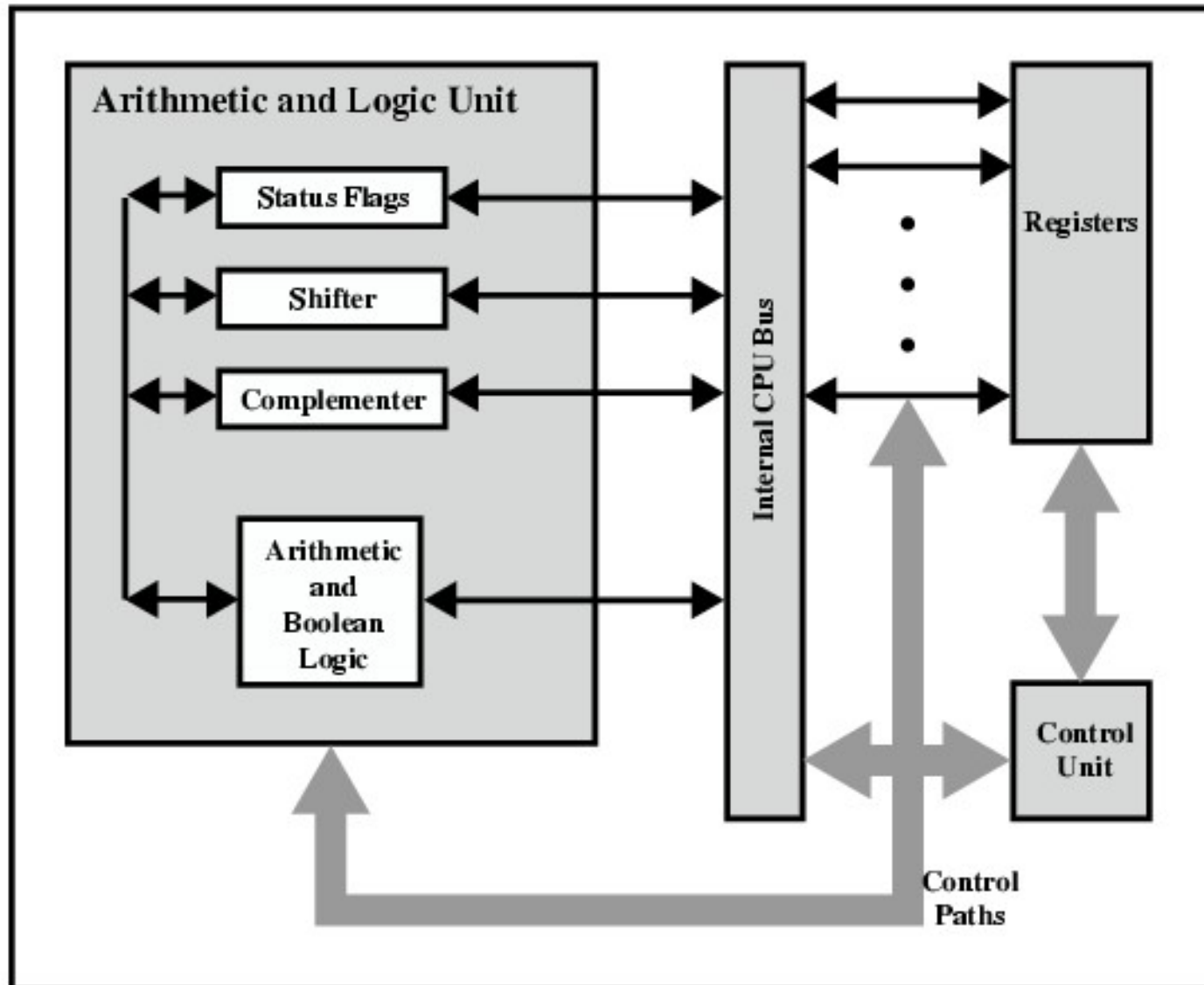
Von Neumann Principle

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Structure of Von Neumann machine



CPU Internal Structure

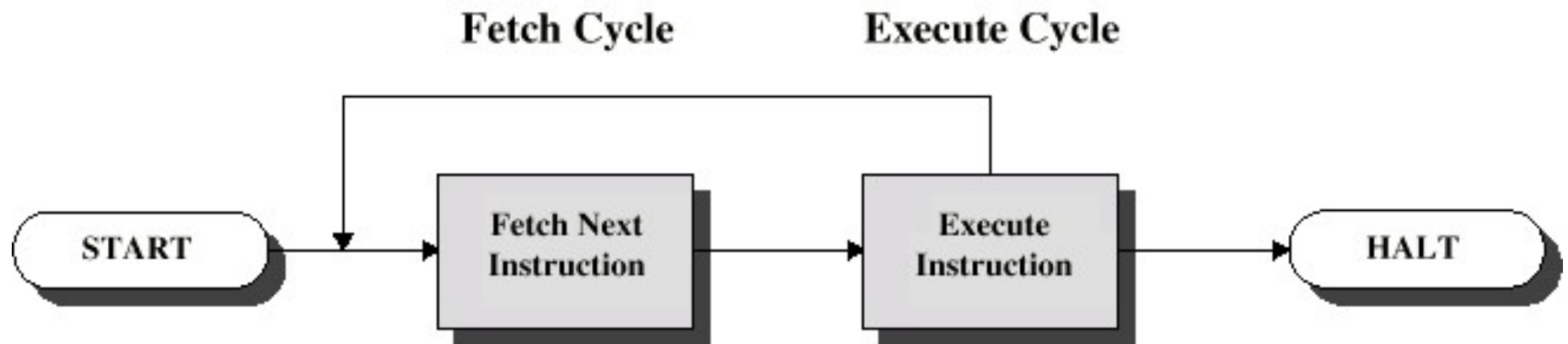


What is a program?

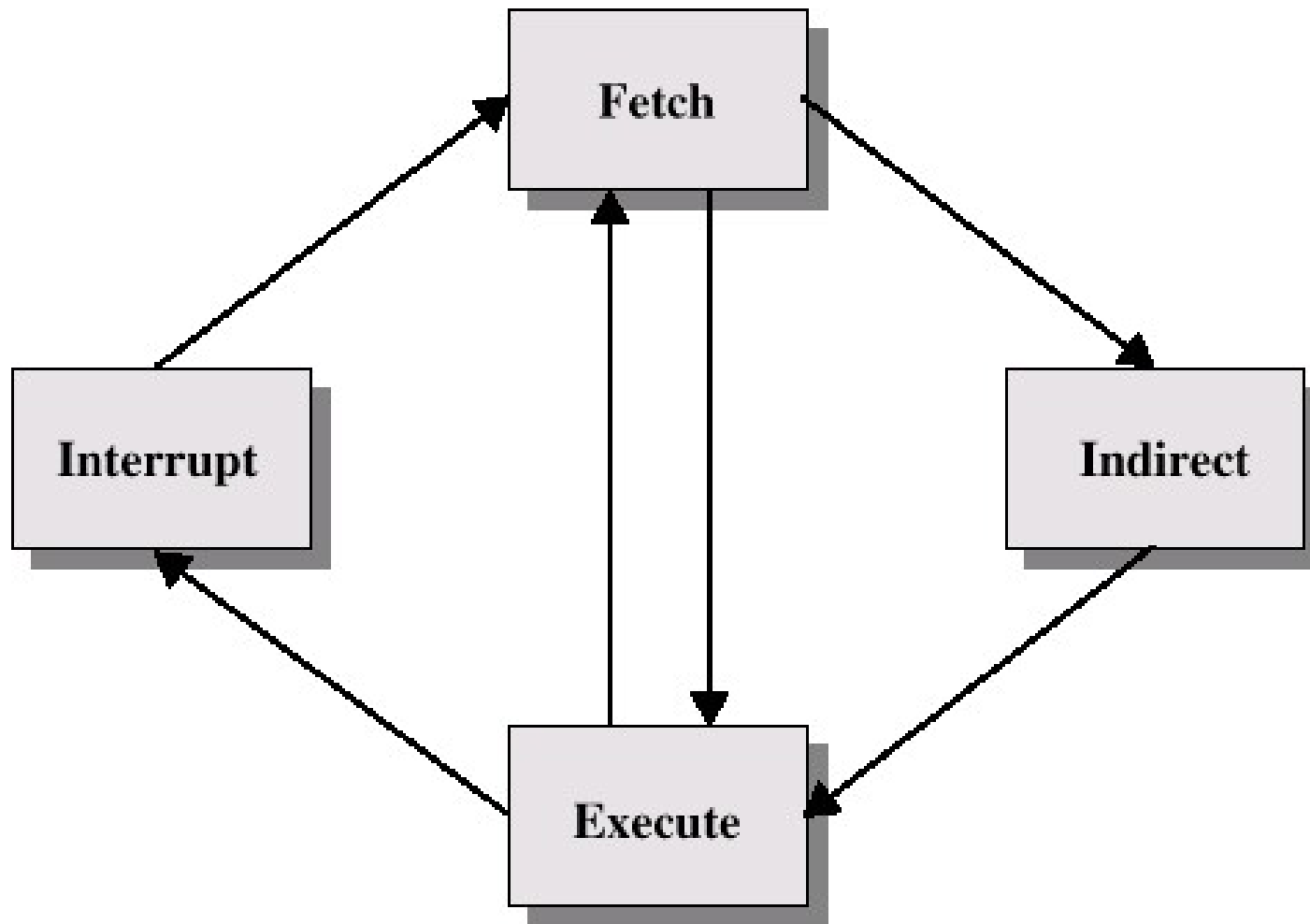
- A sequence of steps (instructions)
- For each step, an arithmetic or logical operation is done
- For each operation, a different set of control signals is needed

Instruction Cycle

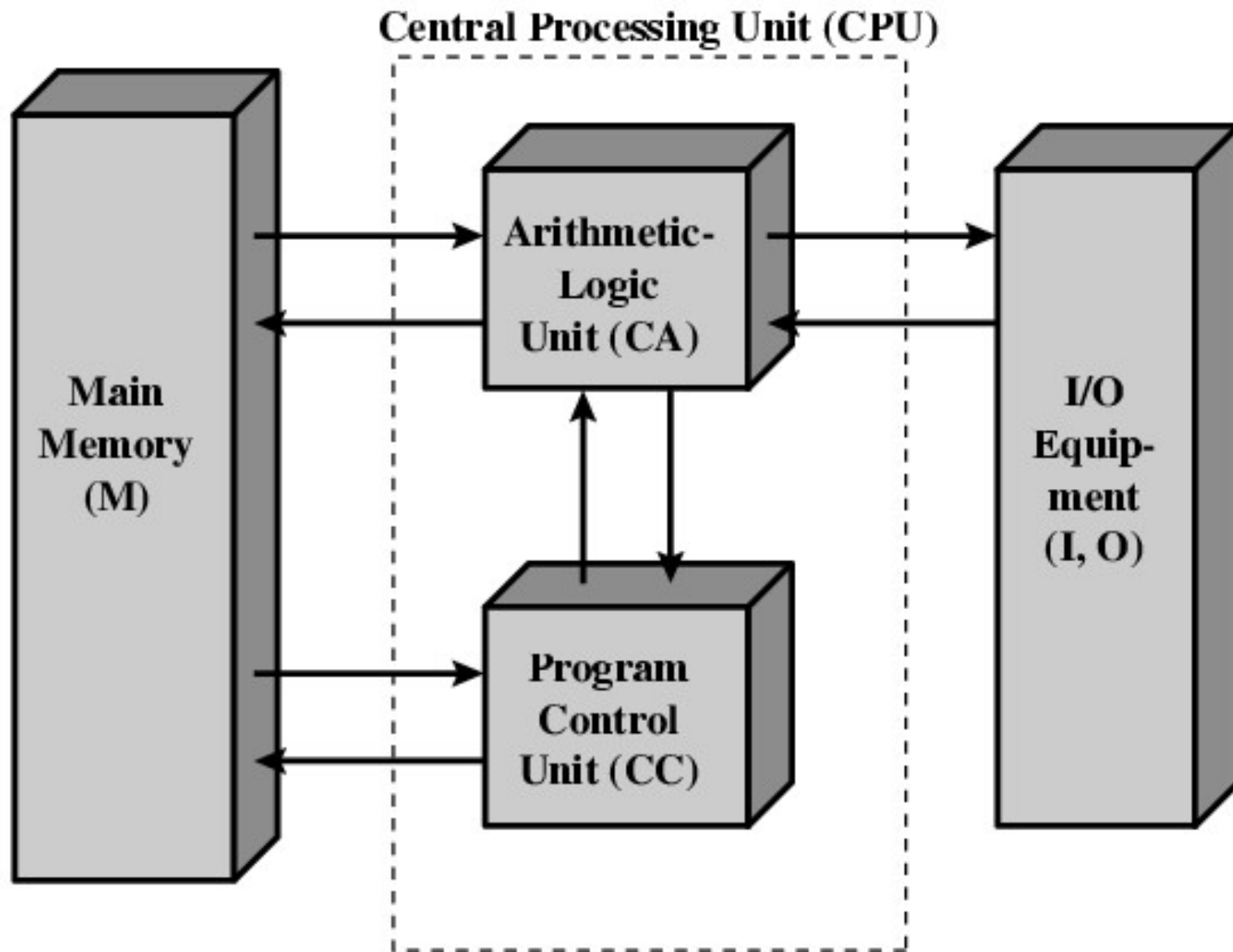
- Two steps:
 - Fetch
 - Execute



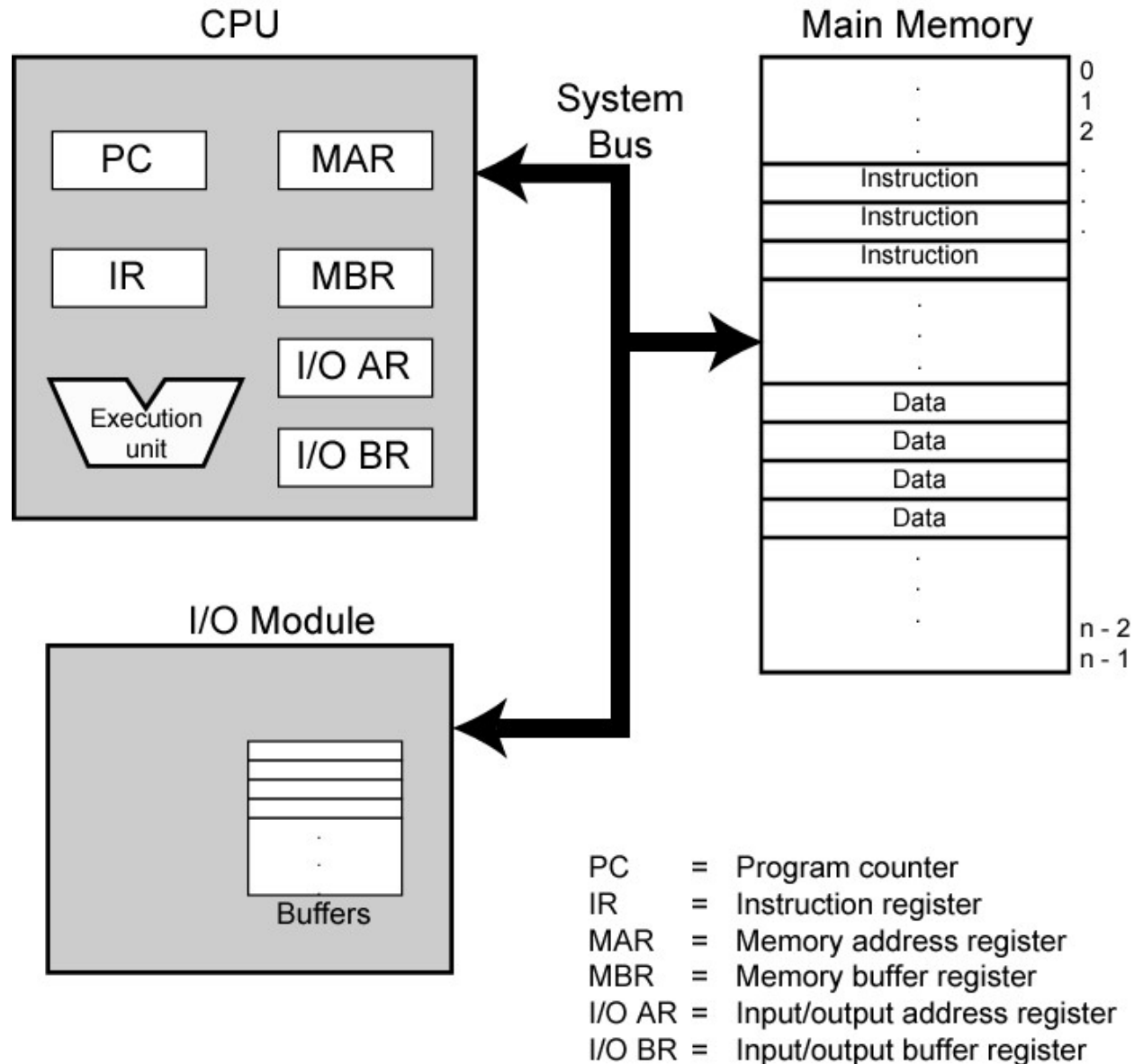
Instruction Cycle with Indirect



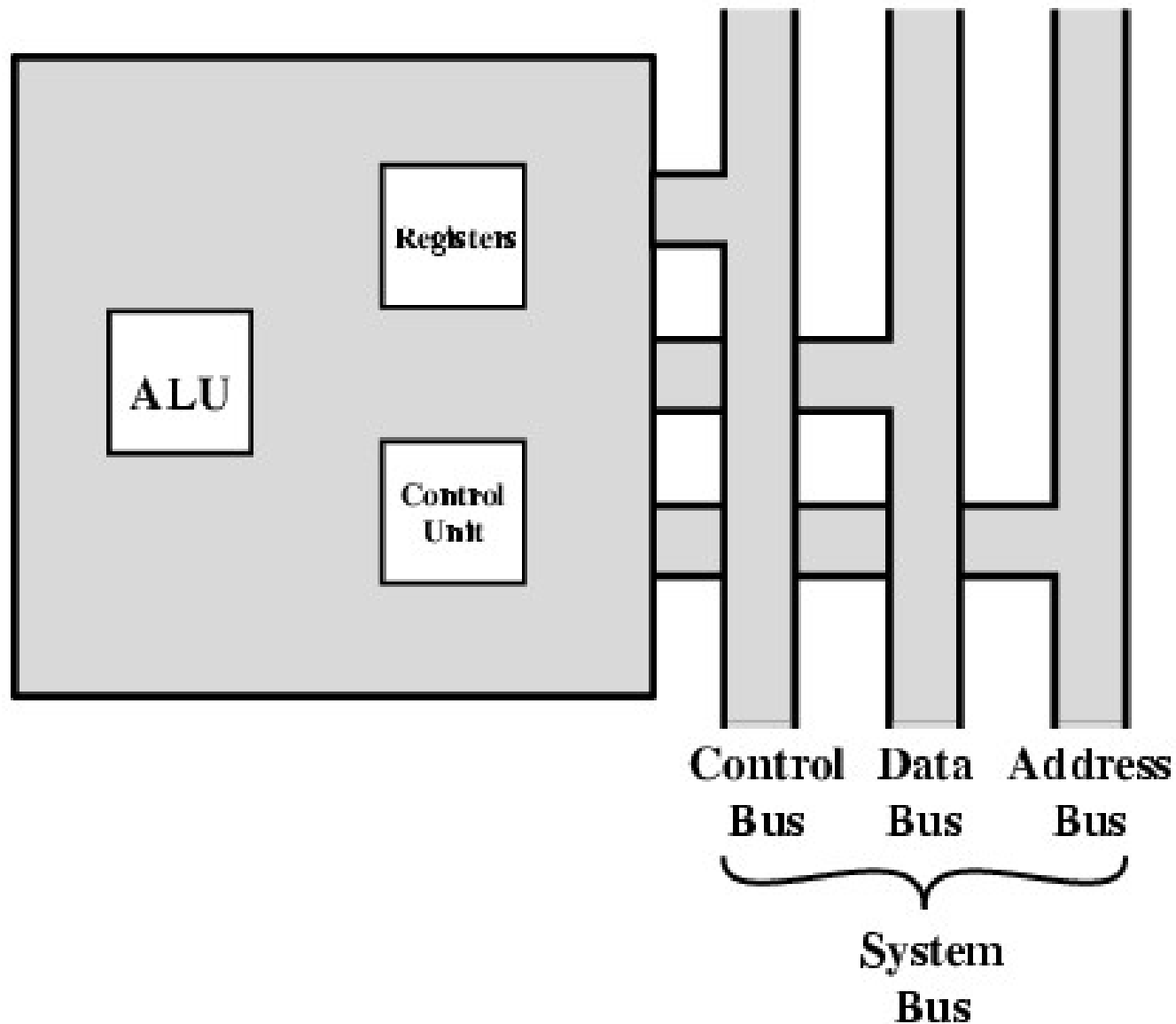
Structure of Von Neumann machine



Computer Components: Top Level View



CPU With System Bus



Reference

Computer Organization and Architecture –
Designing for Performance
William Stallings

Chapter 1: Page no. 7 – 15 (Seventh Edition)
Page No.: 9 – 15 (Eighth Edition)