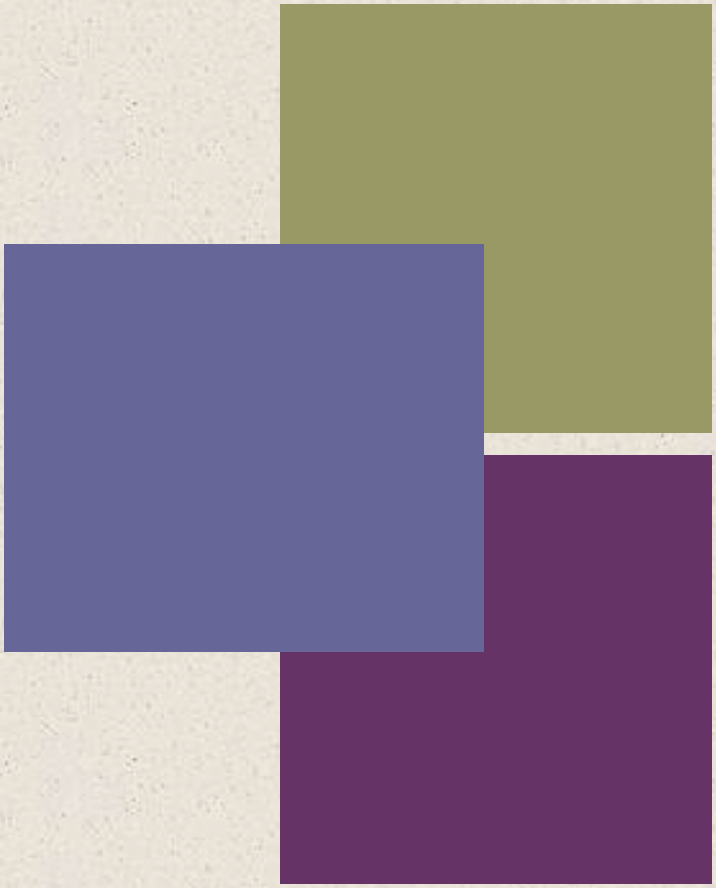
William Stallings Computer Organization and Architecture 9th Edition

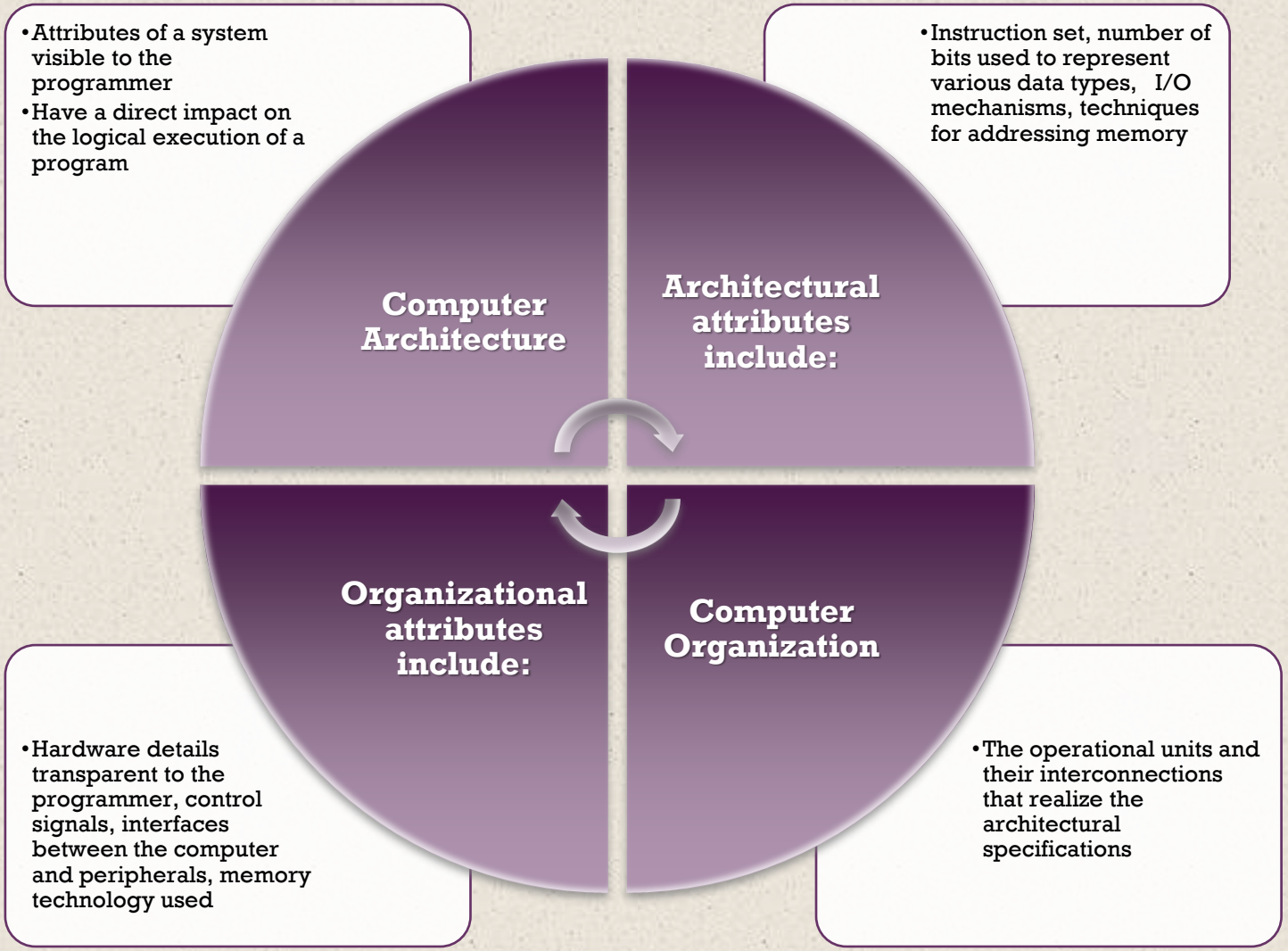


Chapter 1

Introduction

Computer Architecture

Computer Organization



IBM System 370 Architecture

- IBM System/370 architecture
  - Was introduced in 1970
  - Included a number of models
  - Could upgrade to a more expensive, faster model without having to abandon original software
  - New models are introduced with improved technology, but retain the same architecture so that the customer's software investment is protected
  - Architecture has survived to this day as the architecture of IBM's mainframe product line

Structure and Function

- Hierarchical system
  - Set of interrelated subsystems
- Hierarchical nature of complex systems is essential to both their design and their description
- 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

Function

A computer can perform four basic functions:

- Data processing
- Data storage
- Data movement
- Control

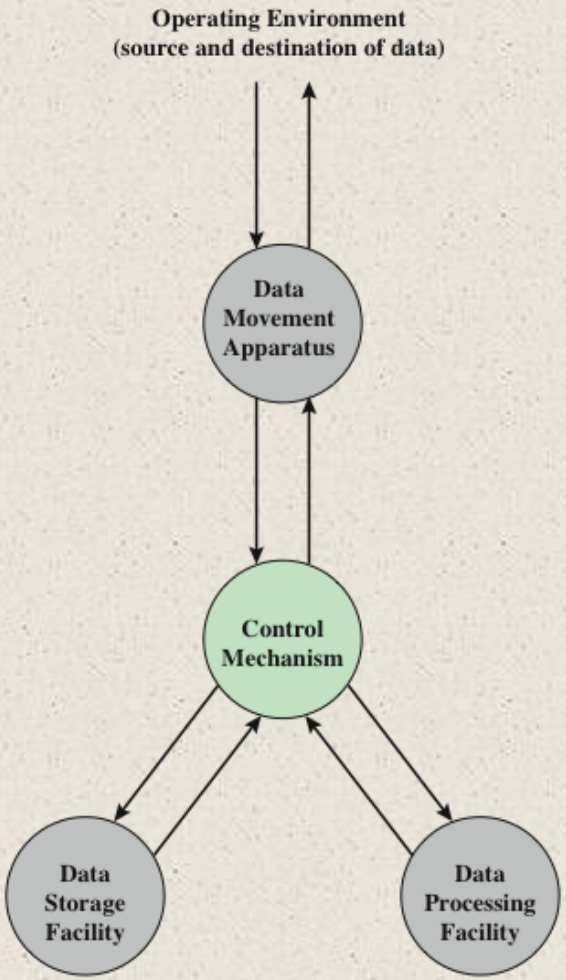


Figure 1.1 A Functional View of the Computer

Operations

(a)
Data movement

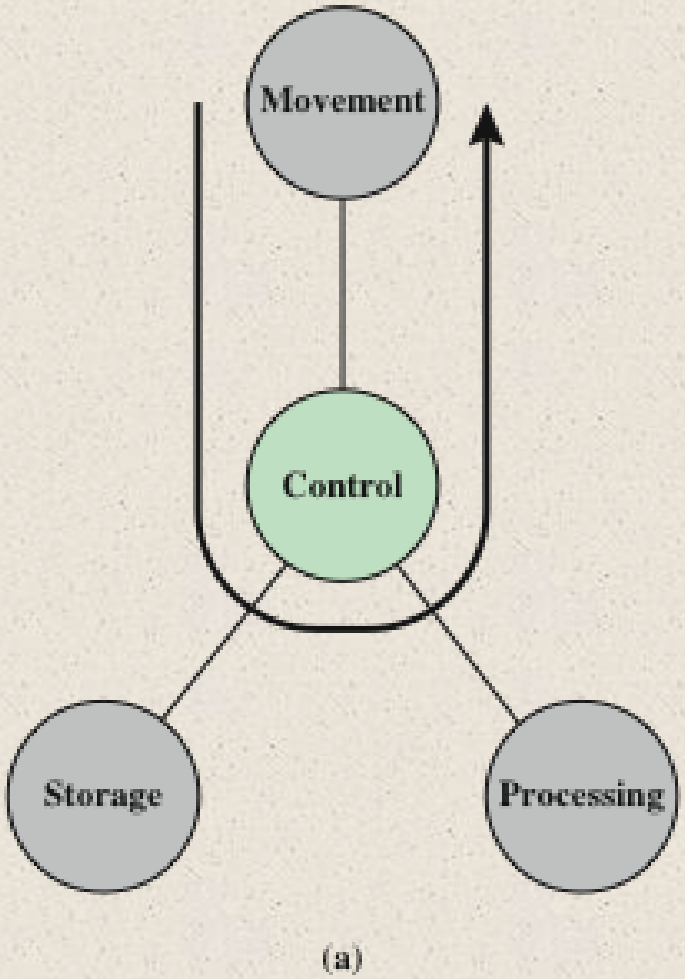


Figure 1.2 Possible Computer Operations

Operations

(b)
Data storage

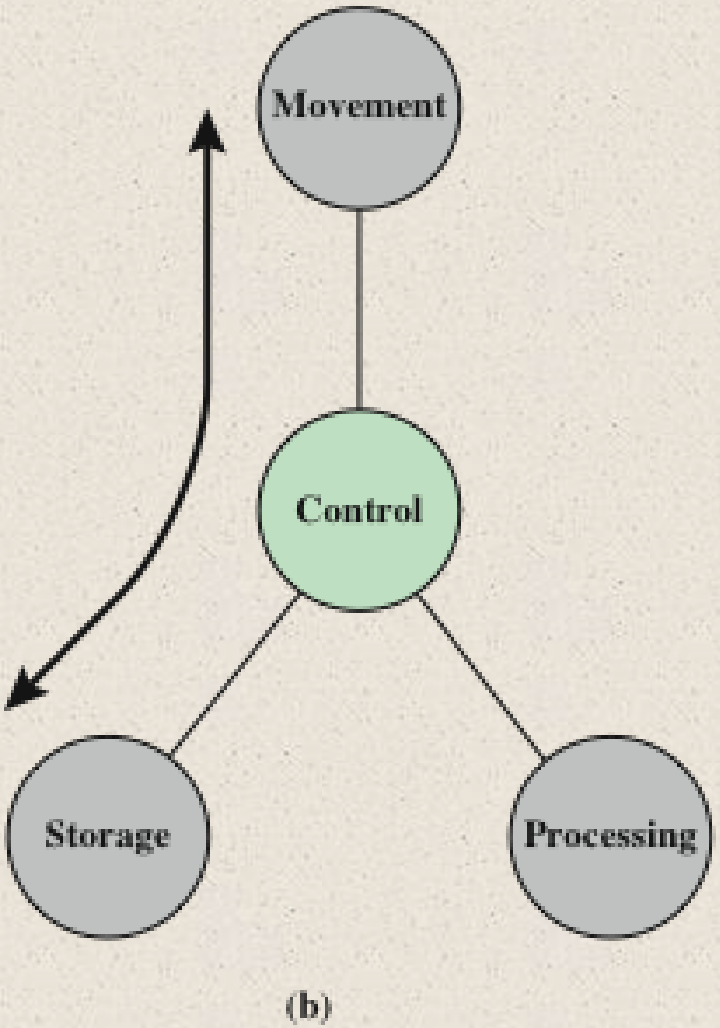


Figure 1.2 Possible Computer Operations

Operations

(c)

Data processing (1)

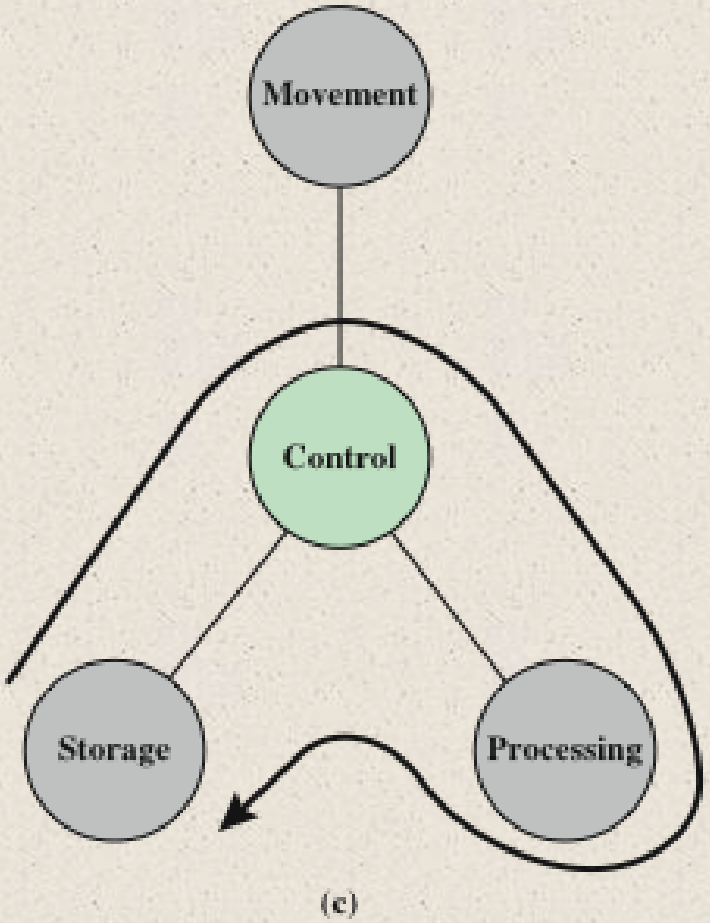


Figure 1.2 Possible Computer Operations

Operations

(d)
Data processing (2)

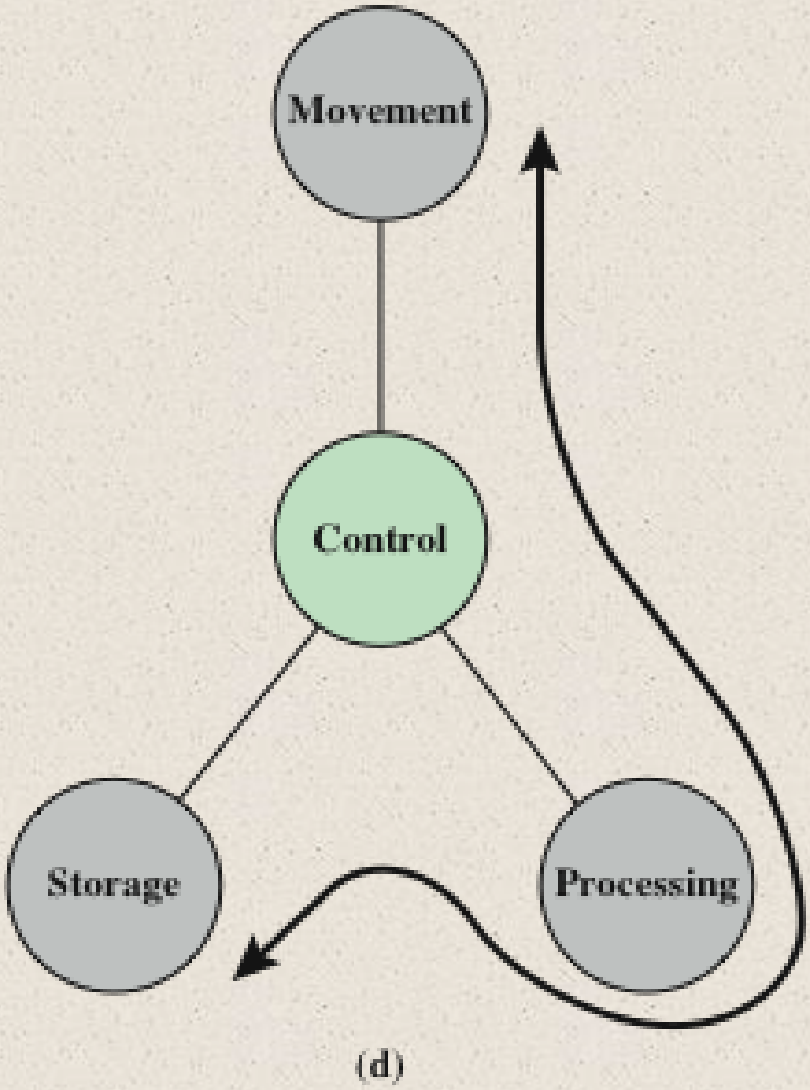


Figure 1.2 Possible Computer Operations

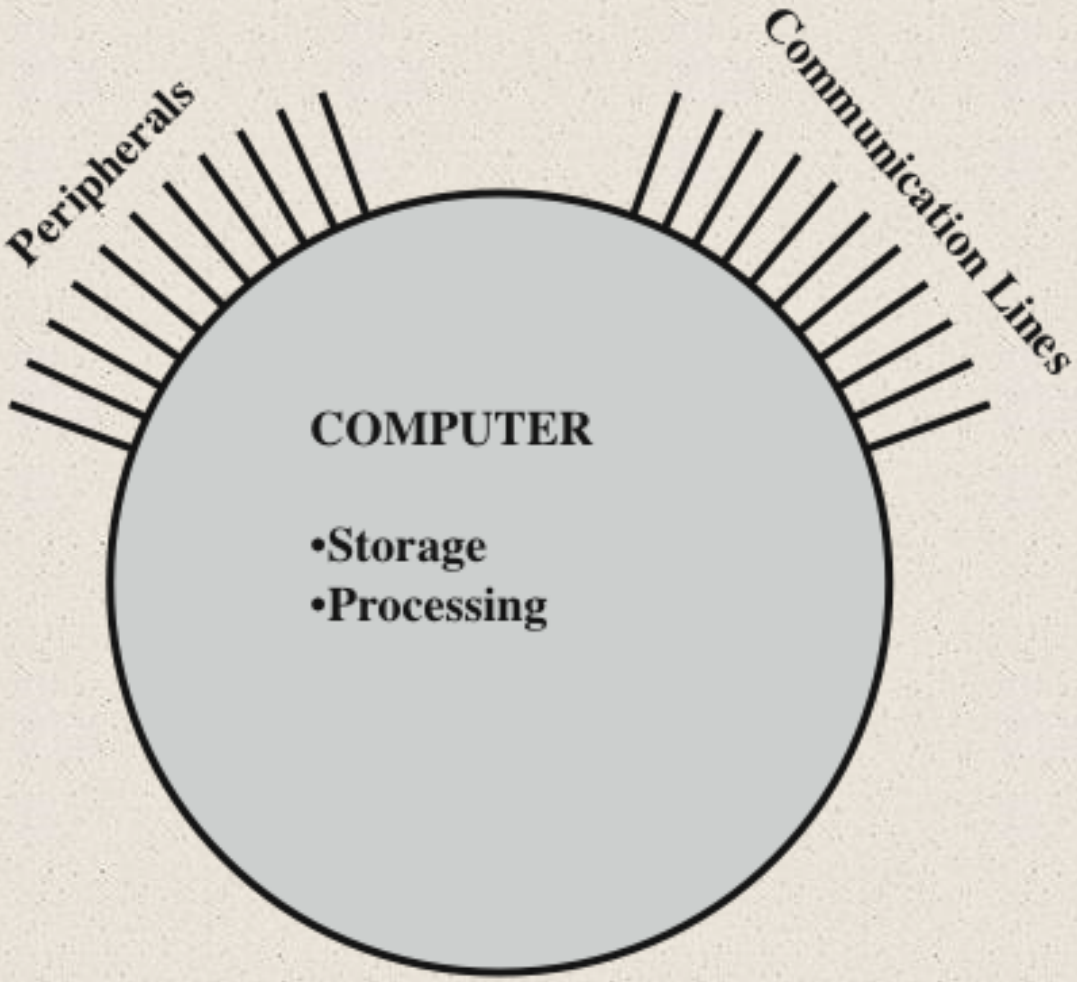


Figure 1.3 The Computer

The Computer

Structure

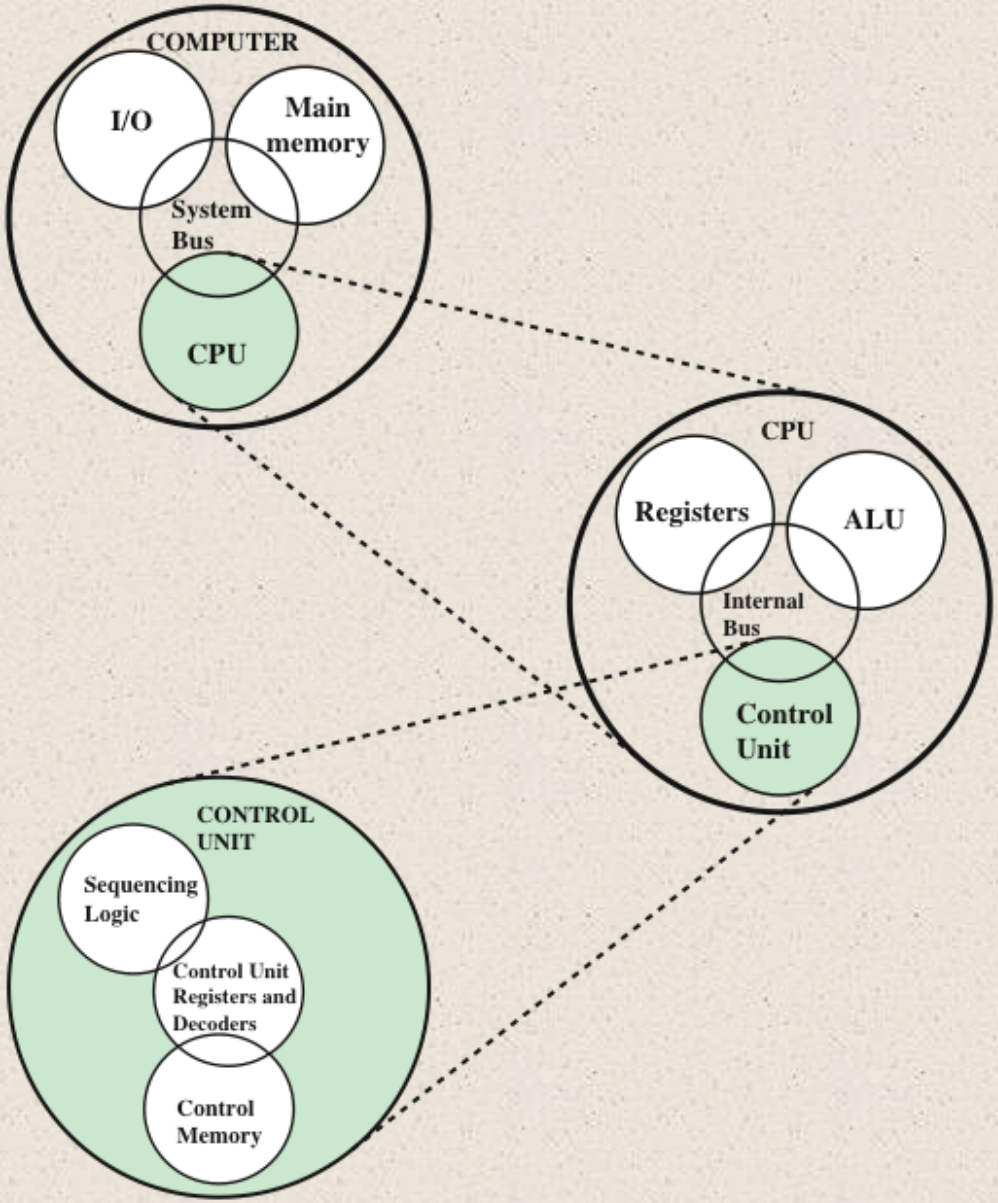
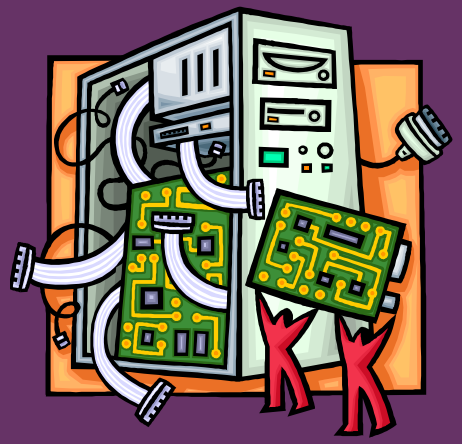


Figure 1.4 A Top-Down View of a Computer

There are four main structural components of the computer:



- CPU – controls the operation of the computer and performs its data processing functions

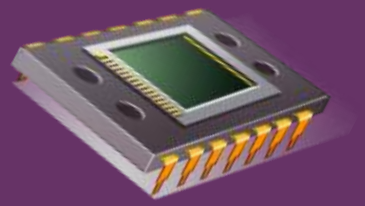
- Main Memory – stores data

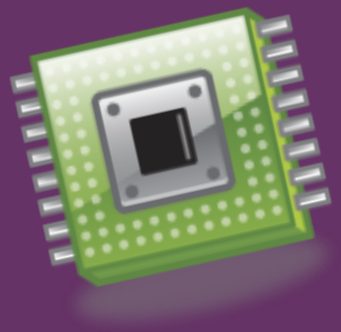
- I/O – moves data between the computer and its external environment

- System Interconnection – some mechanism that provides for communication among CPU, main memory, and I/O

CPU

Major structural components:





- Control Unit
  - Controls the operation of the CPU and hence the computer
- Arithmetic and Logic Unit (ALU)
  - Performs the computer's data processing function
- Registers
  - Provide storage internal to the CPU
- CPU Interconnection
  - Some mechanism that provides for communication among the control unit, ALU, and registers

Summary

Chapter 1

Introduction

- Computer Organization
- Computer Architecture
- Function
  - Data processing
  - Data storage
  - Data movement
  - Control
- Structure
  - CPU
  - Main memory
  - I/O
  - System interconnection
- CPU structural components
  - Control unit
  - ALU
  - Registers
  - CPU interconnection

Chapter 1

Key Terms

- arithmetic and logic unit (ALU)
- central processing unit (CPU)
- computer architecture
- computer organization
- control unit
- input–output (I/O)
- main memory
- processor
- registers
- system bus

Chapter 1

Recommended reading

- How a CPU Works - https://www.youtube.com/watch?v=cNN_tTXABUA
- Fujitsu TS Mainboard Production Augsburg HD - https://www.youtube.com/watch?v=ylk6VMBLrvM