Introduction to Computer System

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- 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?

- 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
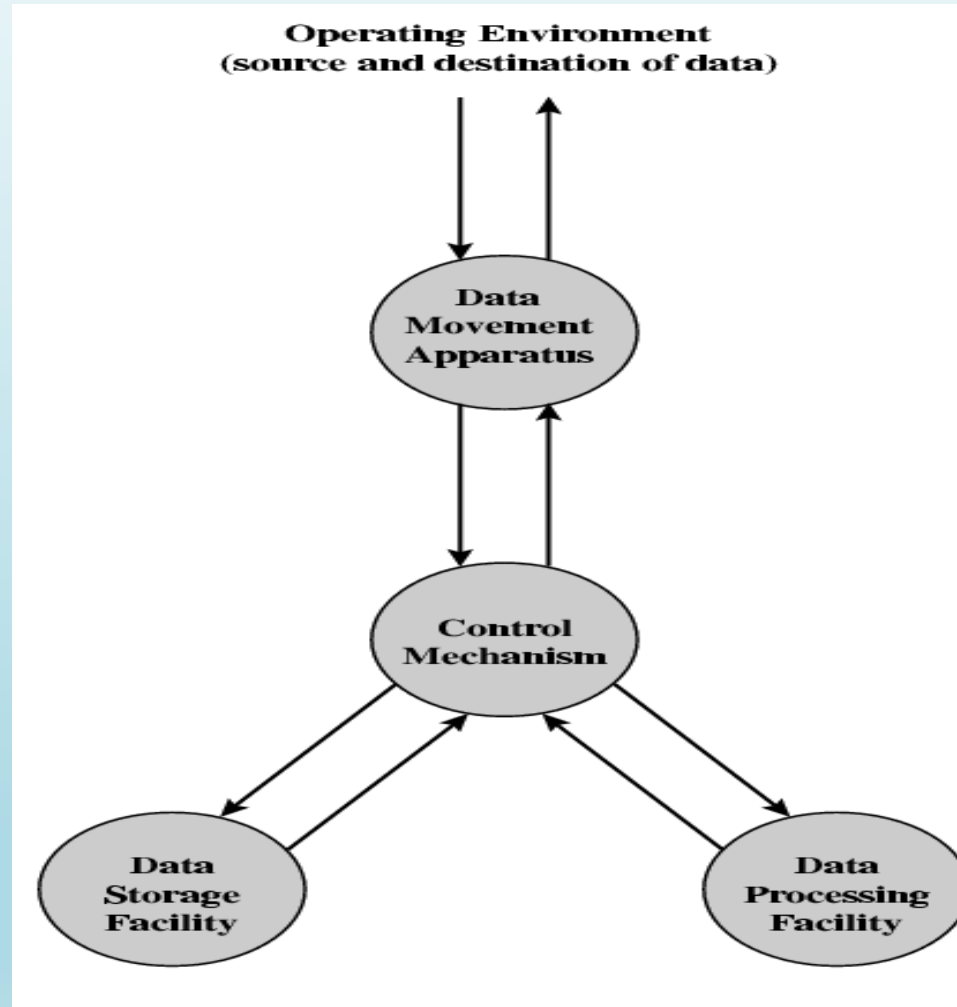 - Data movement
  - Control

Functional View

Fig. 1.1: Functional View

Computer Function

Both the structure and functioning of a computer are, in essence, simple. Figure 1.1 depicts the basic functions that a computer can perform. In general terms, there are only four:

• Data processing

• Data storage
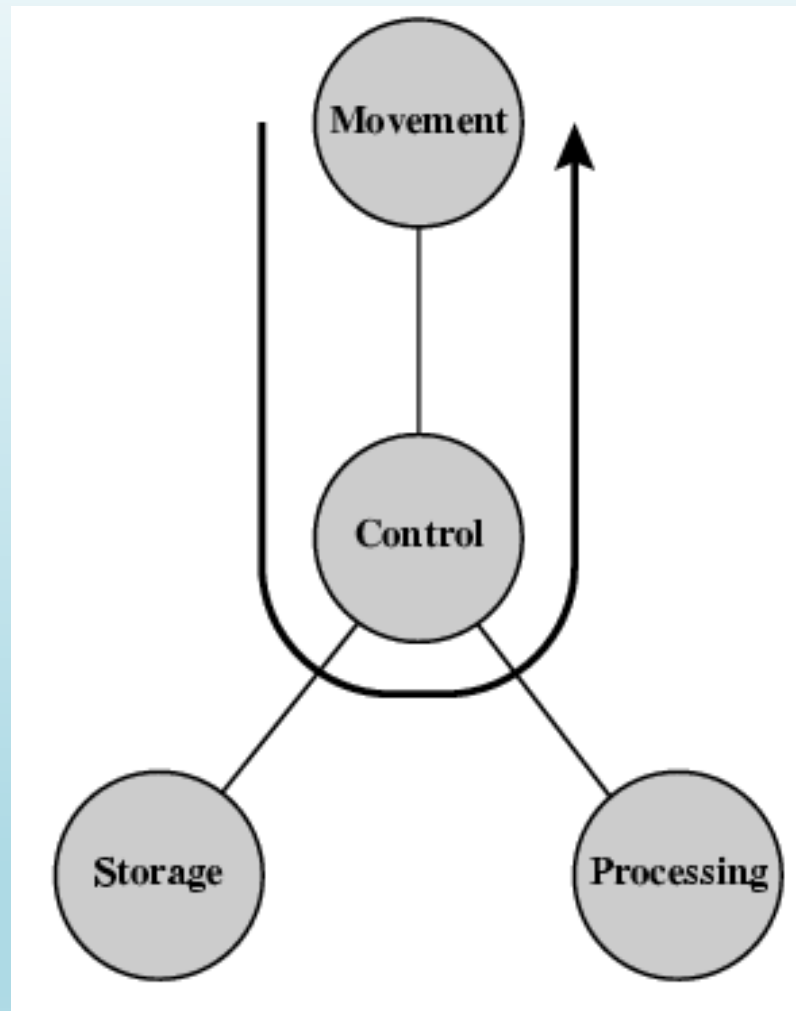
• Data movement

• Control

Fig.1.2: Data Movement

Fig.1.3: Storage
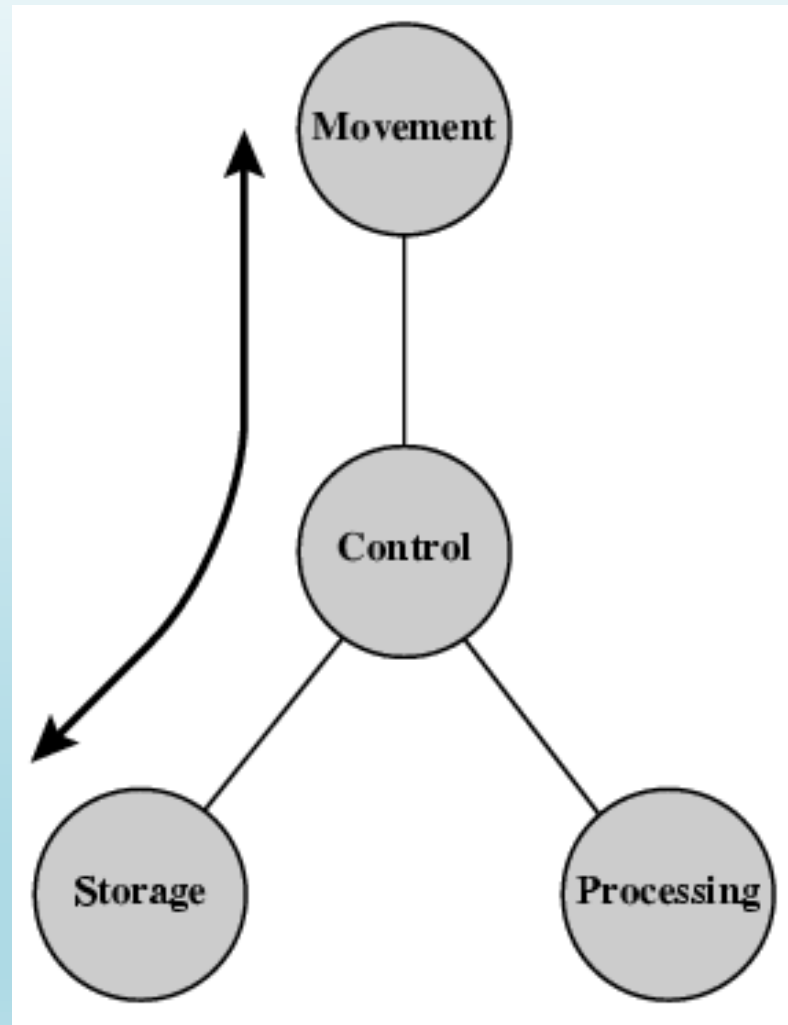
Fig.1.4: Processing from/to storage

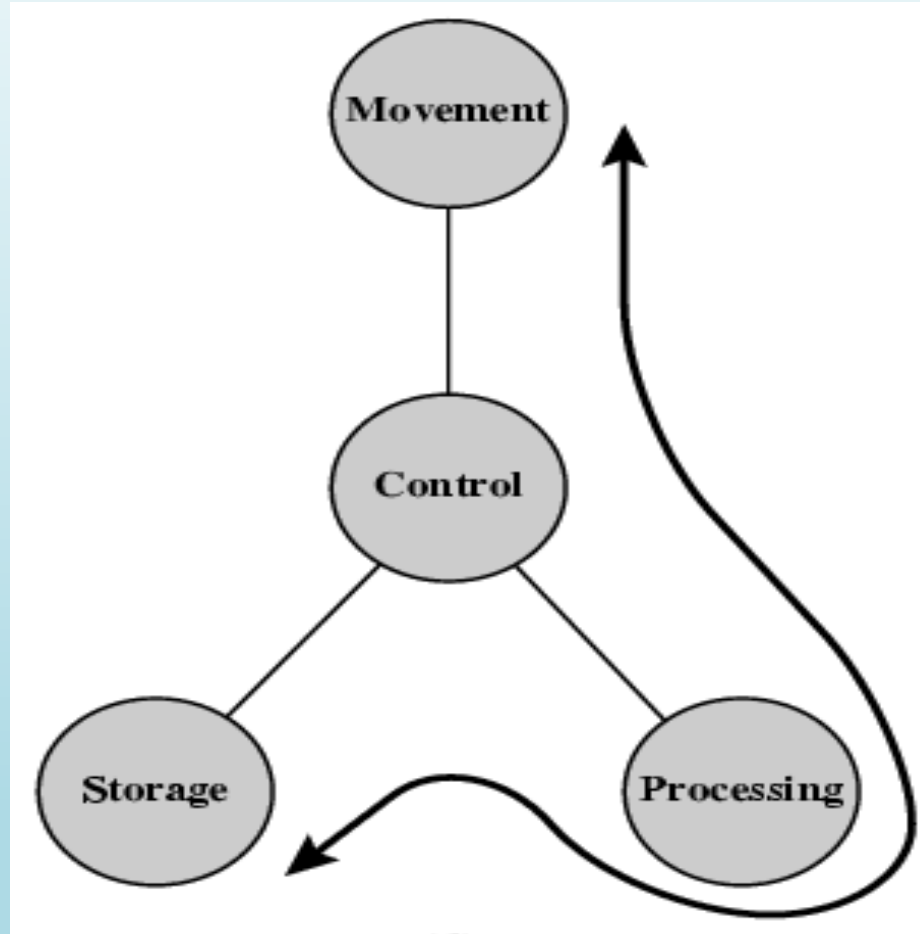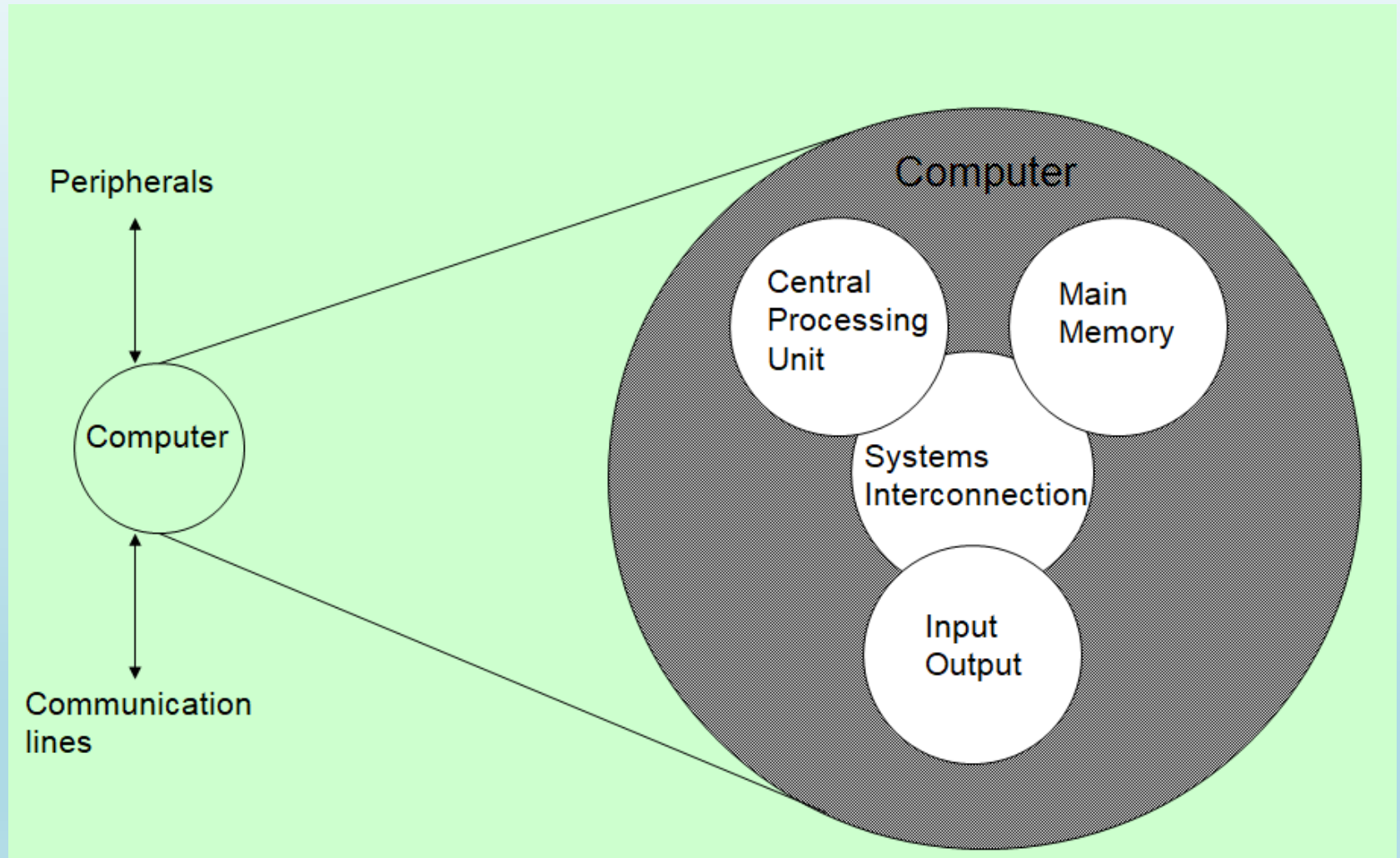**Fig.1.5: Processing from storage to I/O**

Fig.1.6: Structure-Top Level

Top Level Structure

There are four main structural components:

• **Central processing unit (CPU):** Controls the operation of the computer and performs its data processing functions; often simply referred to as **processor**.

• **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. A common example of system interconnection is by means of a **system bus**, consisting of a number of conducting wires to which all the other components attach.
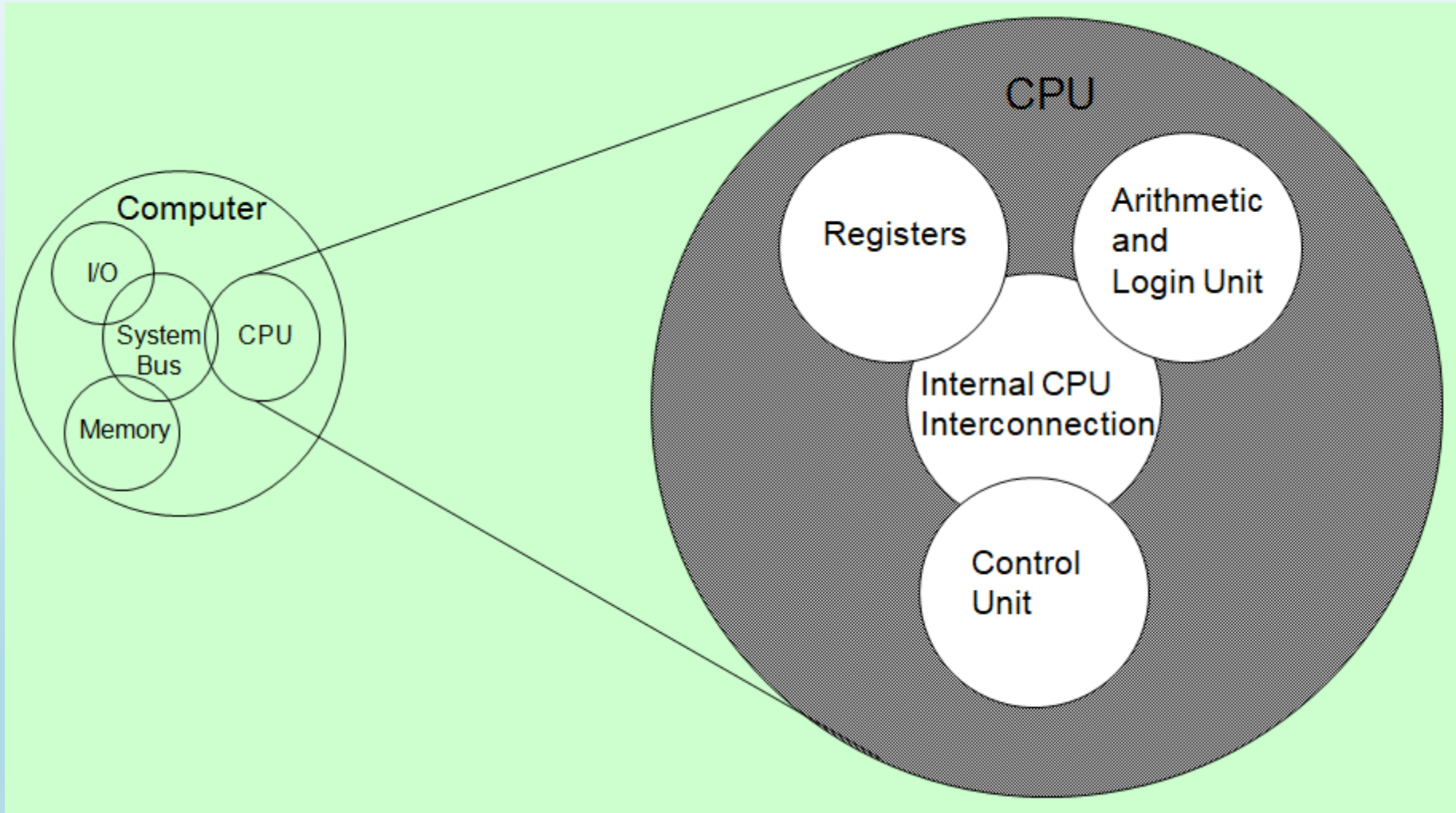
Fig.1.7: Structure-The CPU

The CPU

CPU's major structural components are as follows:

• **Control unit:** Controls the operation of the CPU and hence the computer

• **Arithmetic and logic unit (ALU):** Performs the computer's data processing functions

• **Registers:** Provides storage internal to the CPU

• **CPU interconnection:** Some mechanism that provides for communication among the control unit, ALU, and registers.
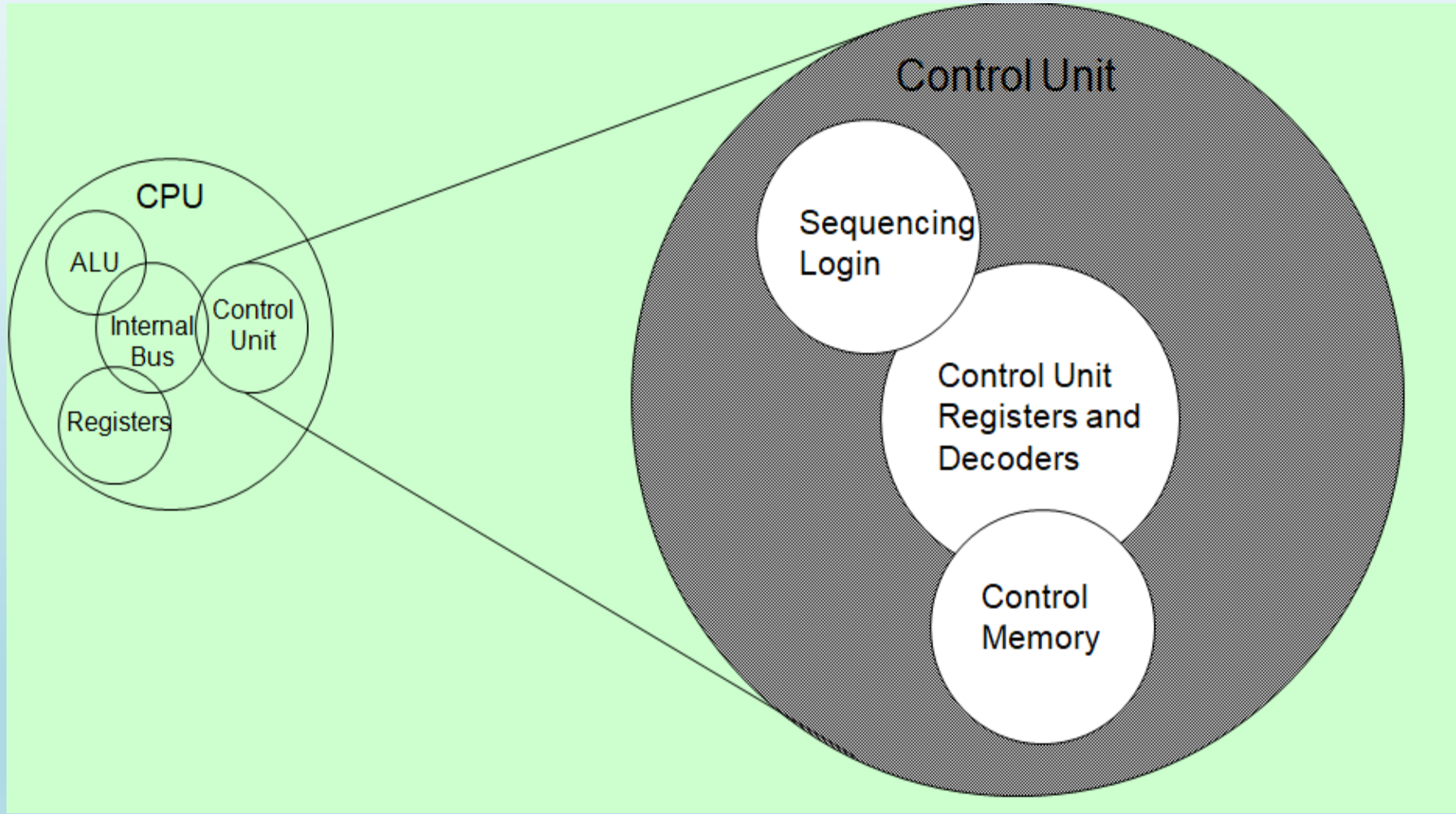
Structure - The Control Unit

Fig.1.8: Structure-The Control Unit

Review Questions

- **1.1.** What, in general terms, is the distinction between computer organization and computer architecture?

- **1.2.** What, in general terms, is the distinction between computer structure and computer function?

- **1.3.** What are the four main functions of a computer?

- **1.4.** List and briefly define the main structural components of a computer.

- **1.5.** List and briefly define the main structural components of a processor.

Thank You.
Any question(s)?