# Digital Logic Design

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## Lecture 1
## Introduction and Background

**provided by Sameer Akram**

# 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

The computer interacts in some fashion with its external environment.

In general, all of its linkages to the external environment can be classified as peripheral devices or communication lines.
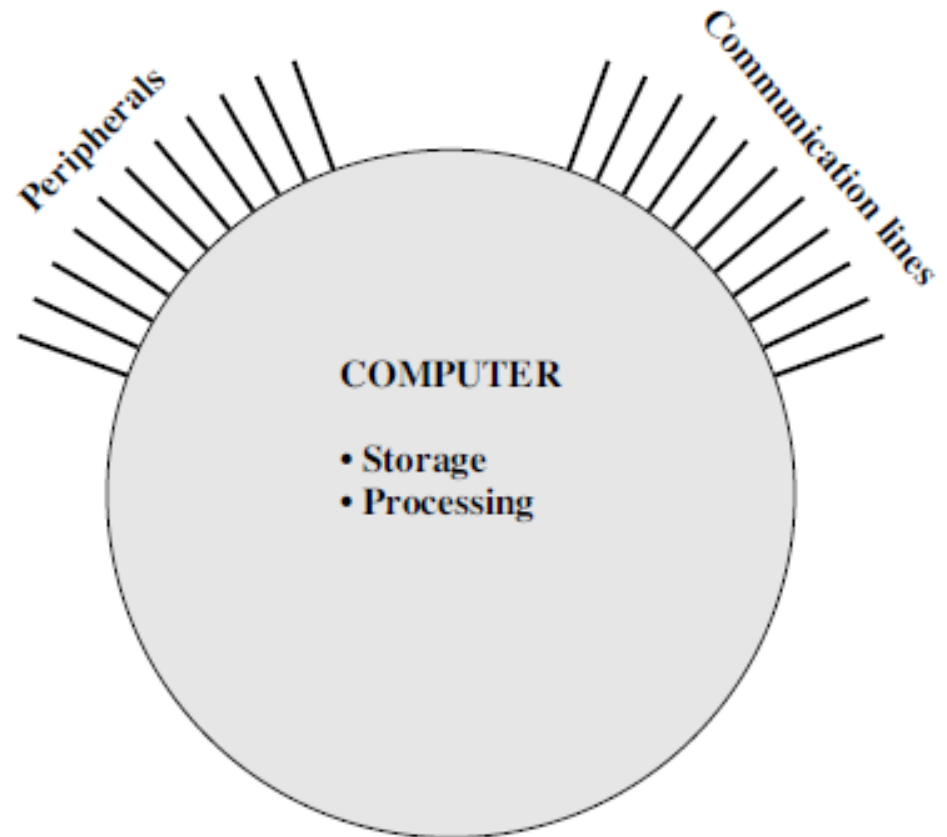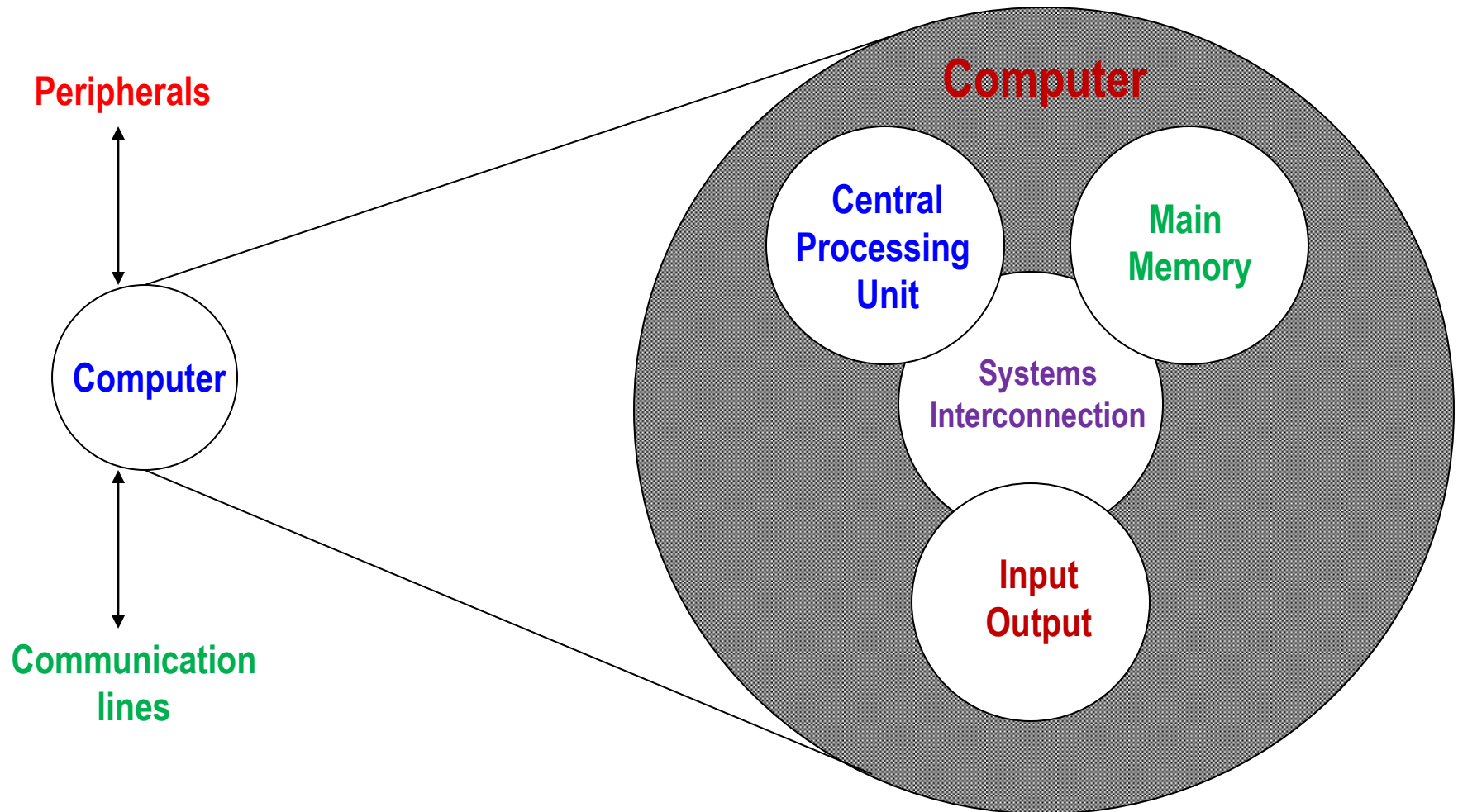
Figure 1.3   The Computer

# Structure - Top Level



Peripherals

Computer

Communication lines

Computer

Central Processing Unit

Main Memory

Systems Interconnection

Input Output

# Structure - Top Level (Contd.)

- **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.

# Structure - The CPU
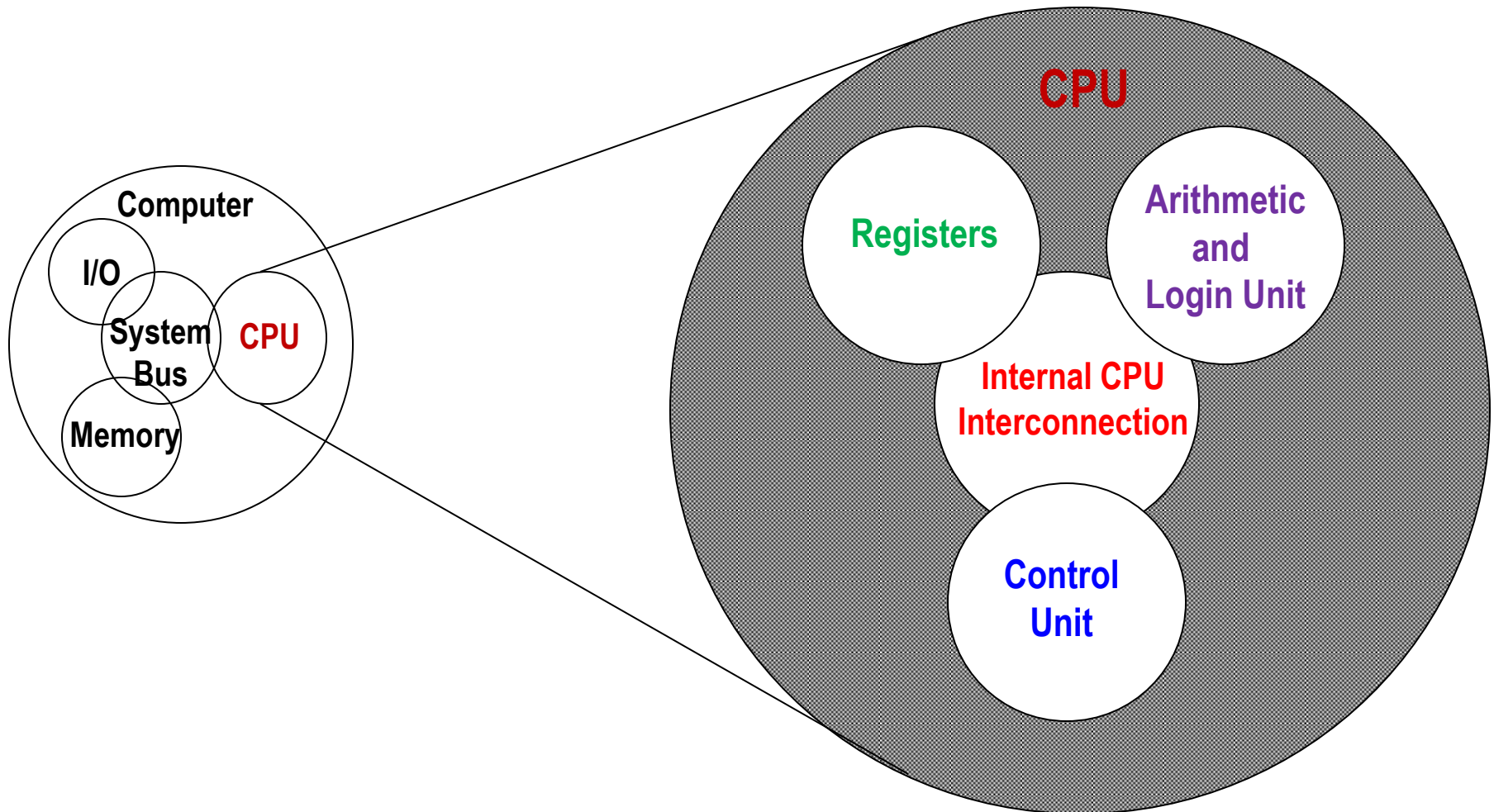
# System Bus
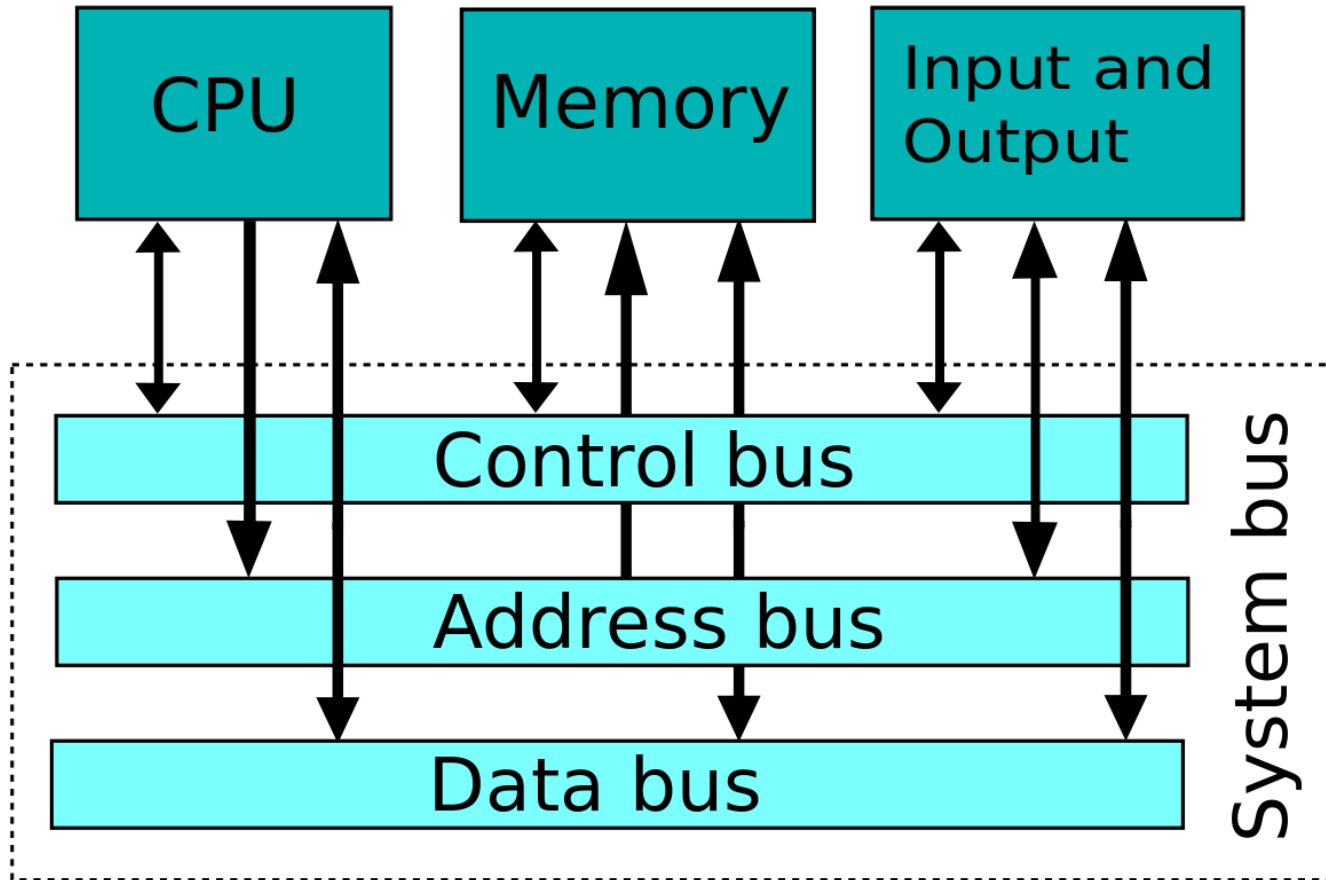
# Structure - The CPU (Contd.)

- **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
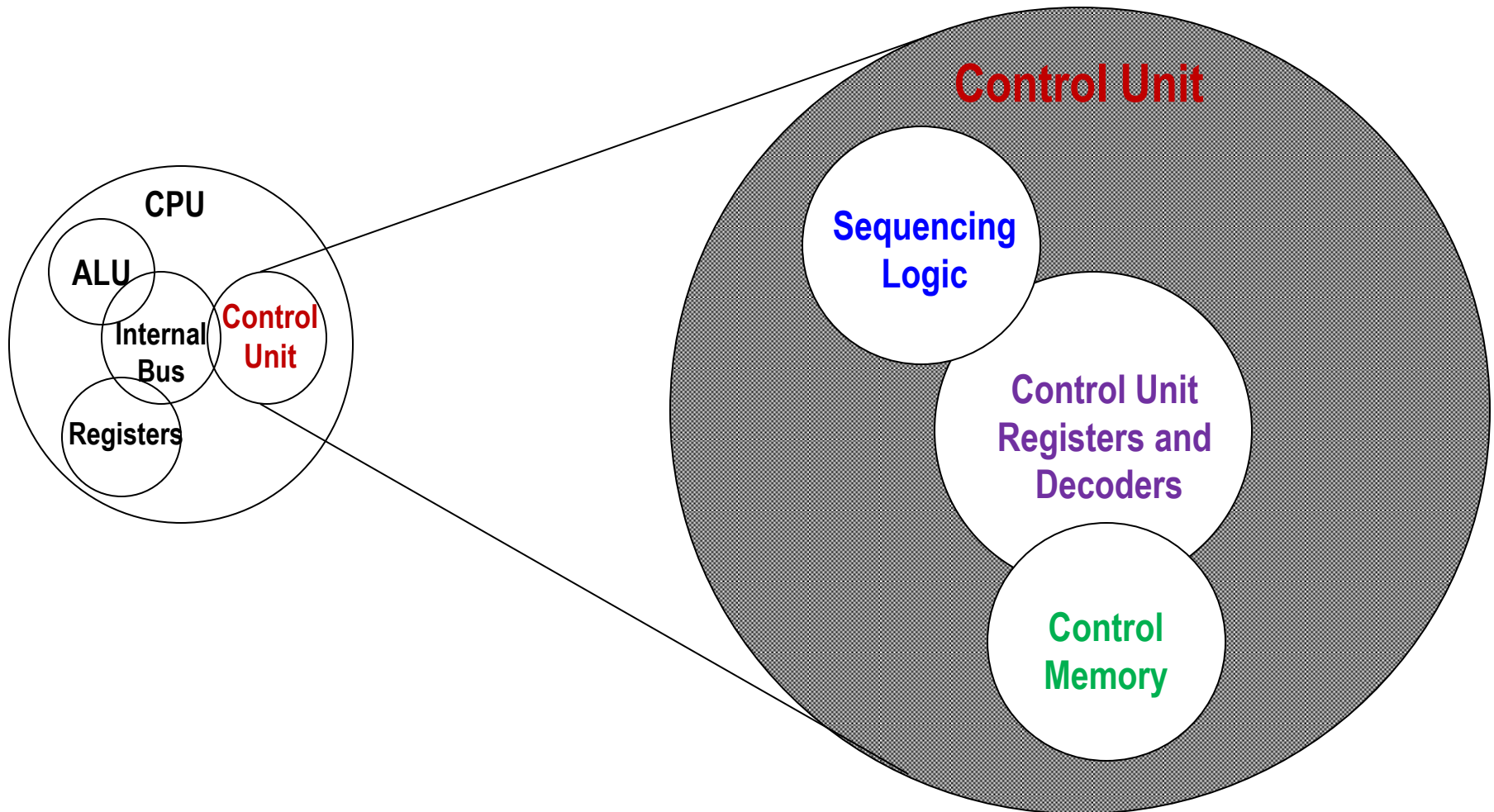
# The Control Unit (Contd.)

- The **control unit** (CU) is a component of a computer's central processing **unit** (CPU) that directs the operation of the processor. It tells the computer's memory, arithmetic/logic **unit** and input and output devices how to respond to a program's instructions.

- **CU** contains the **Instruction Set** of a micro-processor.

- The **instruction set** or the **instruction set architecture** (**ISA**) is the set of basic instructions (micro-instructions) that a processor understands. The instruction set is a portion of what makes up an architecture