Introduction to Computer Architecture

101

Confession

- Most of the materials have been collected from Internet.
- Images are taken from Internet.
- Various books are used to make these slides.
- Various slides are also used.
- References & credit:
  - Atanu Shome, Assistant Professor, CSE, KU.
  - Computer Organization and Design: the Hardware/Software Interface - Textbook by David A Patterson and John L. Hennessy.
  - Computer Organization and Architecture - Book by William Stallings

Architecture and Organization

- **Computer architecture** refers to those attributes of a system visible to a programmer or, put another way, those attributes that have a direct impact on the logical execution of a program.
  - Instruction set, number of bits used for data representation,
  - I/O mechanisms, addressing techniques.

- **Computer organization** refers to the operational units and their interconnections that realize the architectural specifications.
  - Control signals, interfaces, memory technology

Architecture and Organization

- Many computer manufacturers offer a family of computer models, all with the **same architecture but with differences in organization**.

- Same architecture provides backward compatibility.
  - BUT the organization can be different.

Why?

- A professional in any field of computing should not regard the computer as just a **black box** that executes programs by magic.
- Students should've understanding and appreciation of a computer system's functional components, their **characteristics**, their **performance**, and their **interactions**.
- **Complex trade-offs** between CPU clock speed, cache size, bus organization, number of core processors, and so on.
- Acknowledging the **complexity of existing commercial systems**.

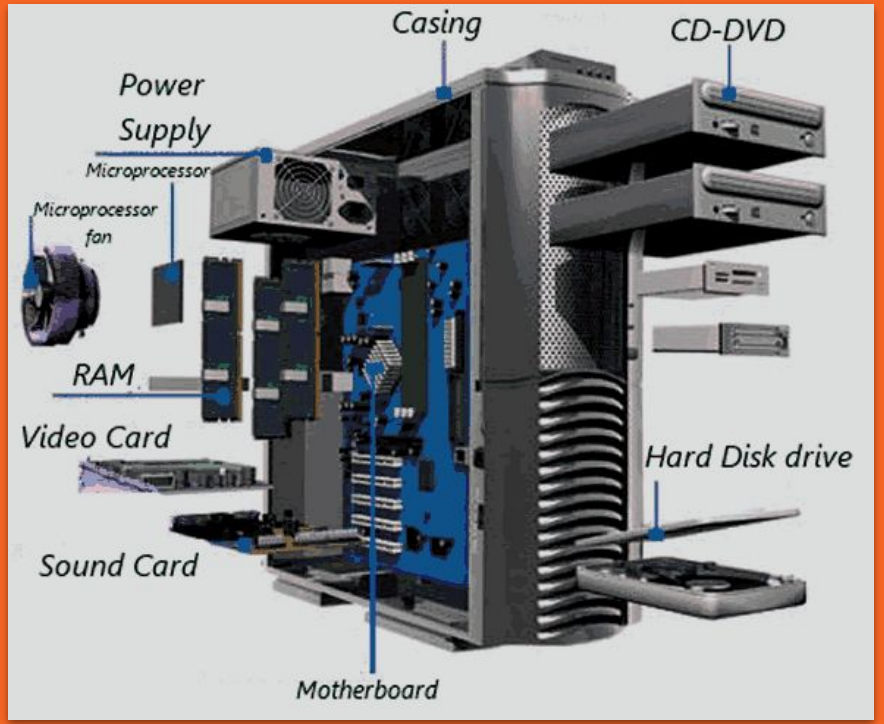
? Question

- How are programs written in a high-level language ?
- What is the interface between the software and the hardware ?
- What determines the performance of a program ?
- What techniques can be used by hardware designers to improve performance?
- What are the reasons for and the consequences of the recent switch from sequential processing to parallel processing?

Structure and Function

Structure is the way in which components relate to each other

Function is the operation of individual components as part of the structure



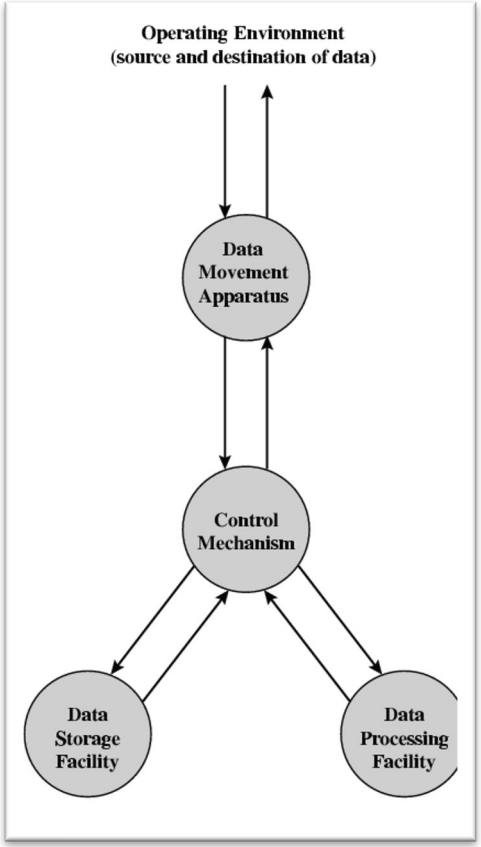
Structure and Function

Data Processing

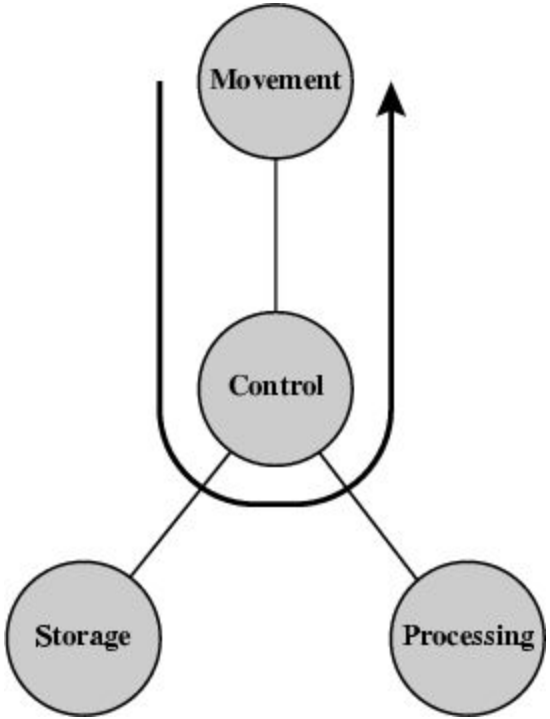
Data Storage

Data Movement

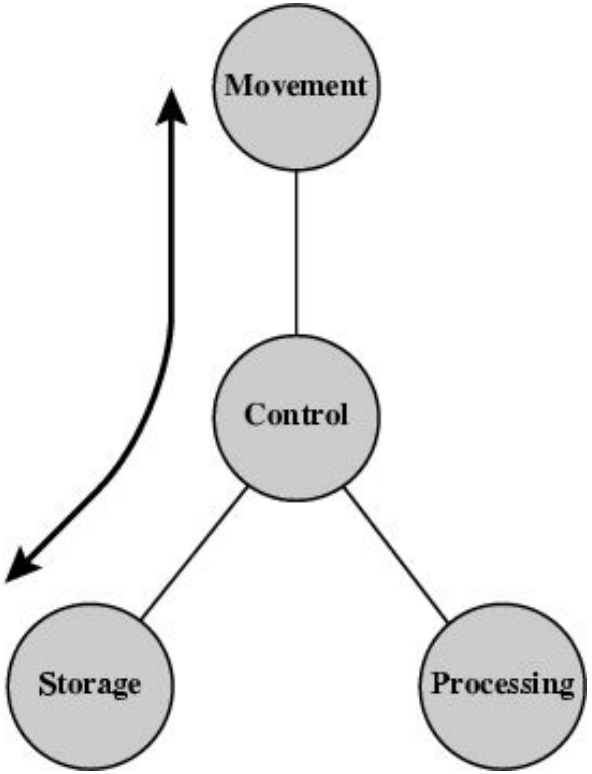
Control



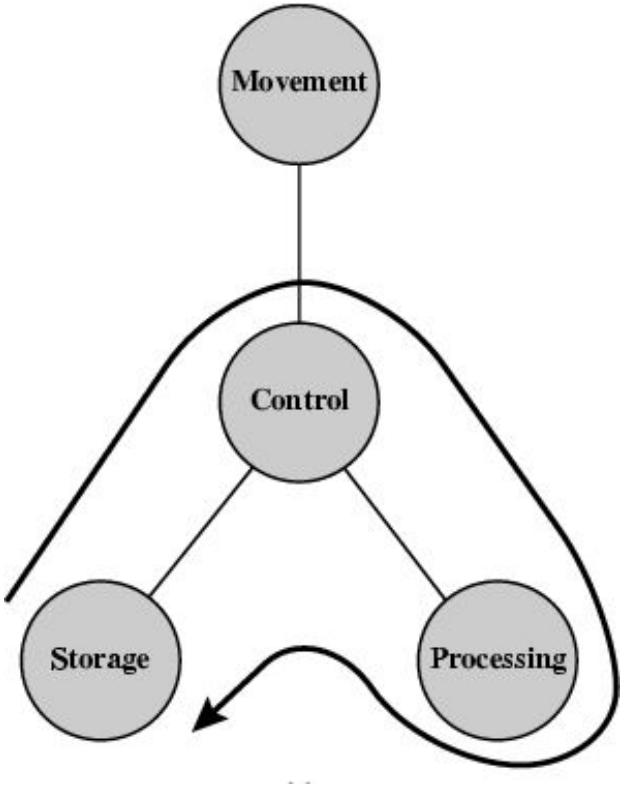
Functional view



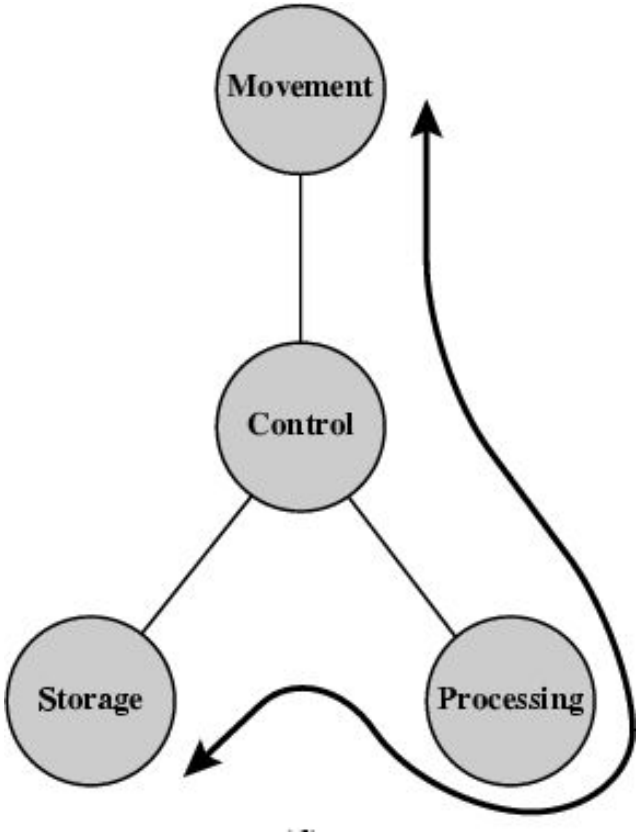
(1)
Data movement



(2) Storage

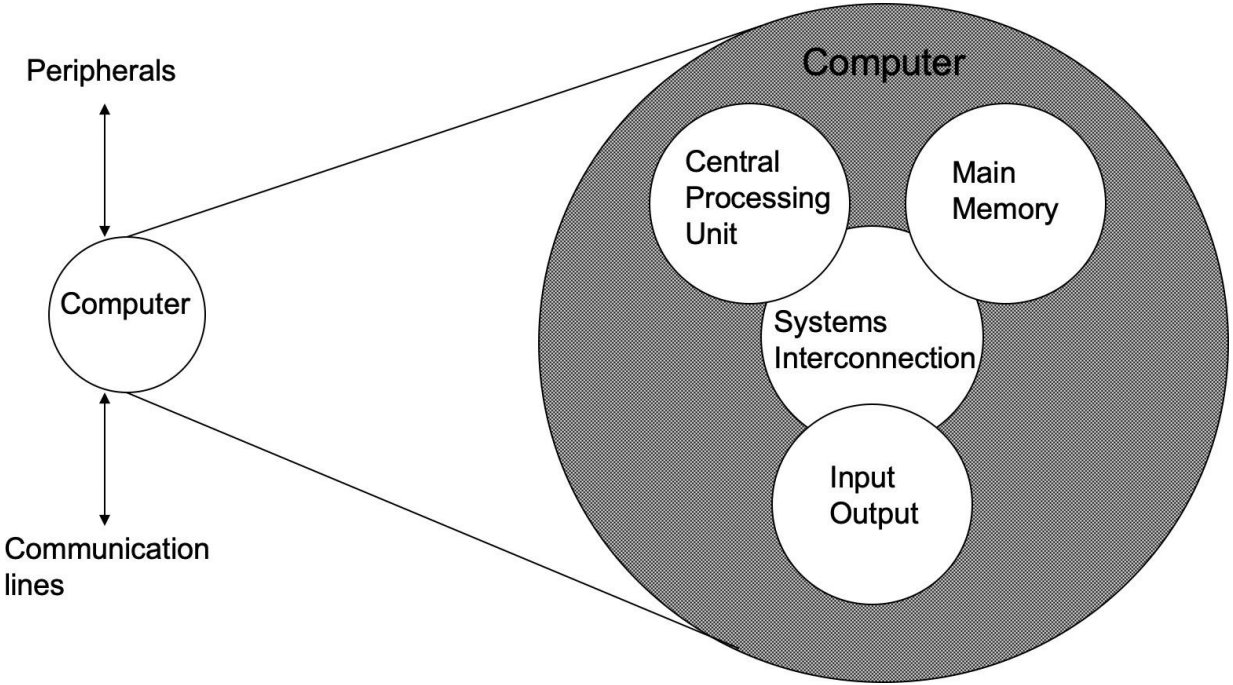


(3) Processing from/to storage

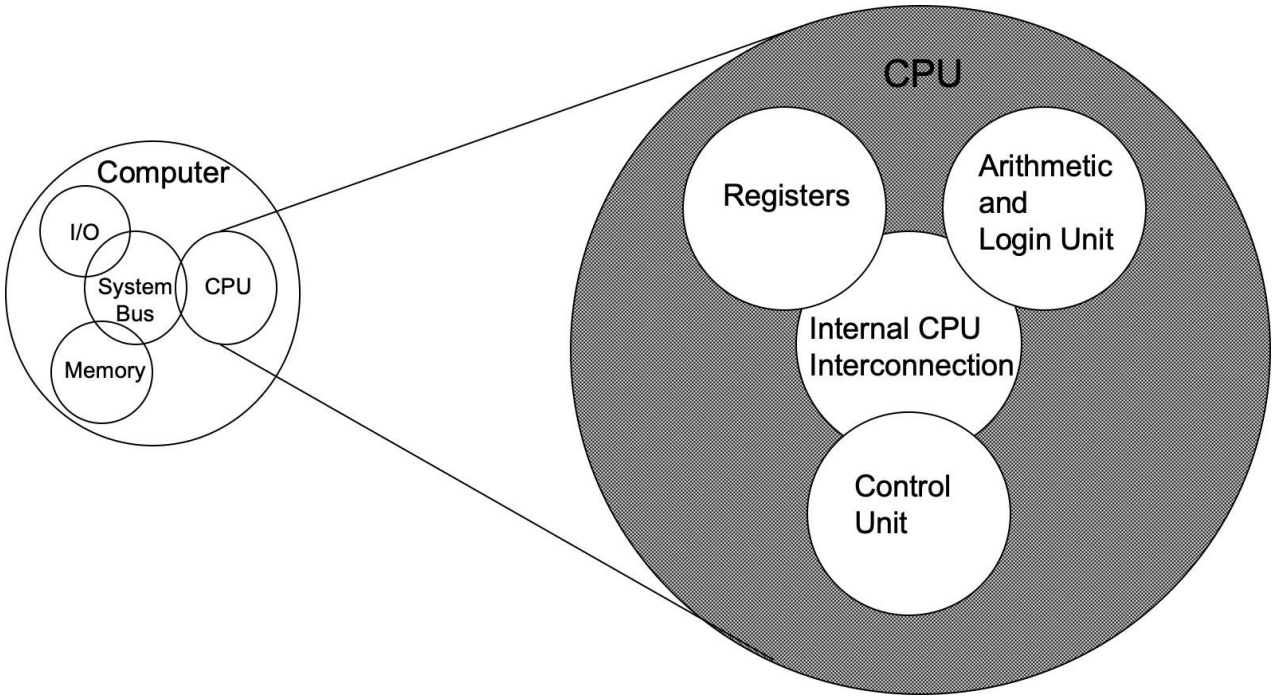


(4)
Processing from storage to I/O

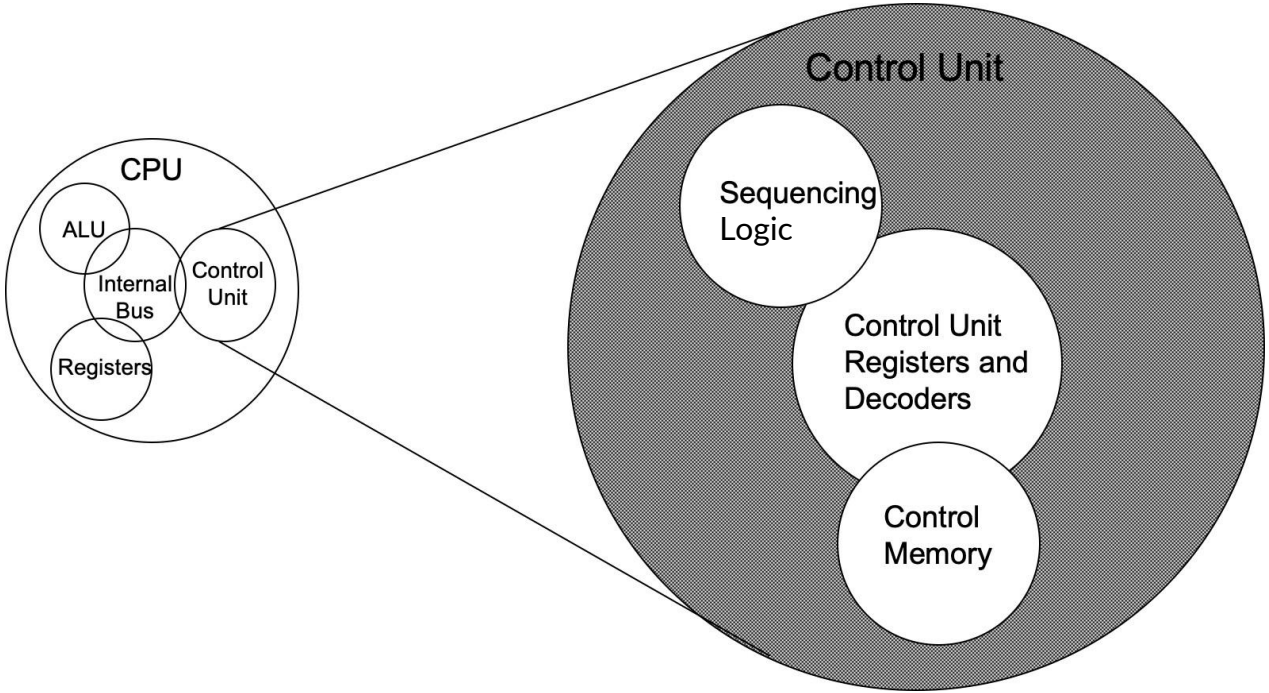
Structure - Top Level



Structure - The CPU



Structure - The Control Unit



Thank You