Introduction

Why Study Computer Architecture

- Makes it possible to write computer programs that are:
  - Faster
  - Smaller
  - Less prone to error
- Allows programmers to appreciate relative cost of operations and the effect of programming choices
- Helps programmers debug

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- It's a required course!!

The Bad News

- Digital hardware
  - is complex
  - cannot be understood in one course
  - requires background in electricity and electronics

The Good News

- It is possible to understand architectural components without knowing low-level technical details.
- Programmers only need to know the essentials
  - Characteristics of major components
  - Role in overall system
  - Consequences for programmers

Computer Architecture

- Refers to overall organization of computer system
- Analogous to a blueprint
- Specifies
  - Functionality of major components
  - Interconnection among components
- Abstracts away details

Design

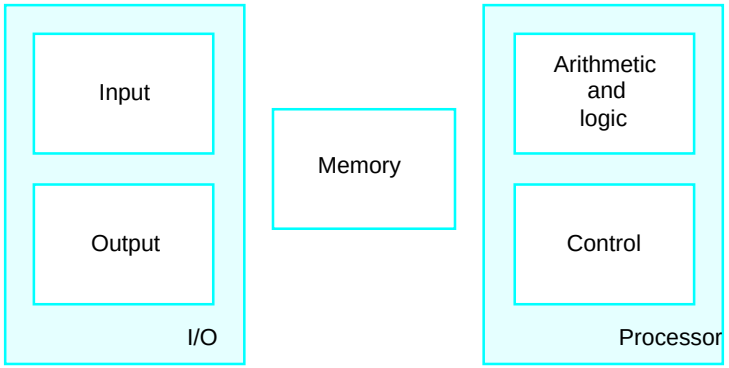
- Needed before a computer can be built
- Translates architecture into practice
- Fills in details that architectural specification omits
- Specifies items such as
  - How components are grouped onto boards
  - How power is distributed to boards
- Many designs can satisfy a given architecture

Summary

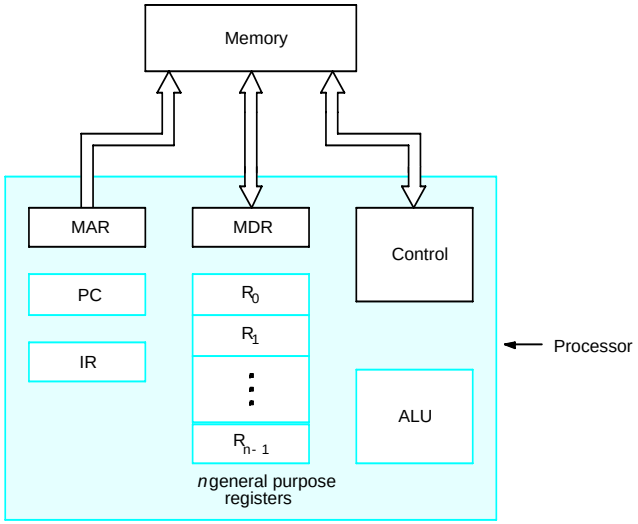
- Understanding architecture helps programmers
- Course covers essentials of computer architecture
  - Digital logic
  - Processors, memory, I/O
  - Advanced topics such as parallelism and pipelining
- We will omit most details and focus on concepts.

Basic Structure of Computers

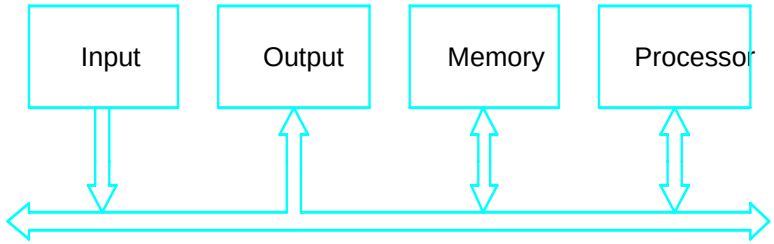
Basic Functional Units of a Computer



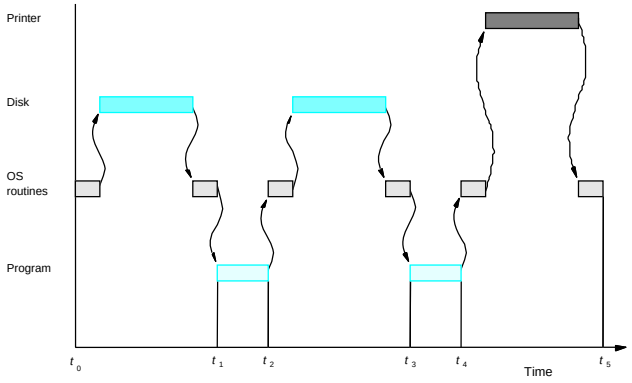
Connections Between Processor and Memory



Single-Bus Structure



Sharing of the Processor



Processor Cache