CSE 305: Computer Architecture

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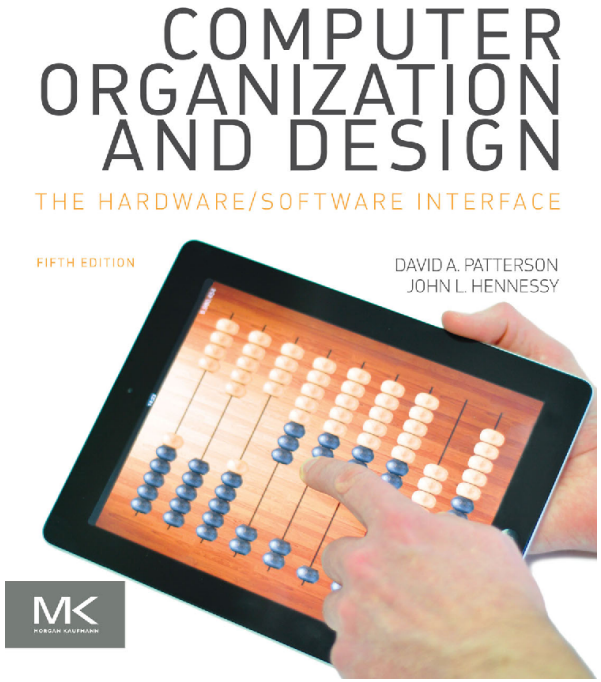
Recap

My Topics

- introduction to computer architecture
- measuring performance
- instructions
- arithmetic for computers
- datapath
- control unit design

Reference Books

- Computer Organization and Design: The Hardware/Software Interface, *Fifth Edition*
  - David A. Patterson
  - John L. Hennessy
- Computer Organization, *Fifth Edition*
  - Carl Hamacher
  - Zvonko Vranesic
  - Safwat Zaky



and other materials

Eight Great Ideas in Computer Architecture

1. **design for Moore's Law**
2. use abstraction to simplify design
3. make the common case faster
4. performance via parallelism
5. performance via pipelining
6. performance via prediction
7. hierarchy of memories
8. dependability via redundancy

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COMMON CASE FAST

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15

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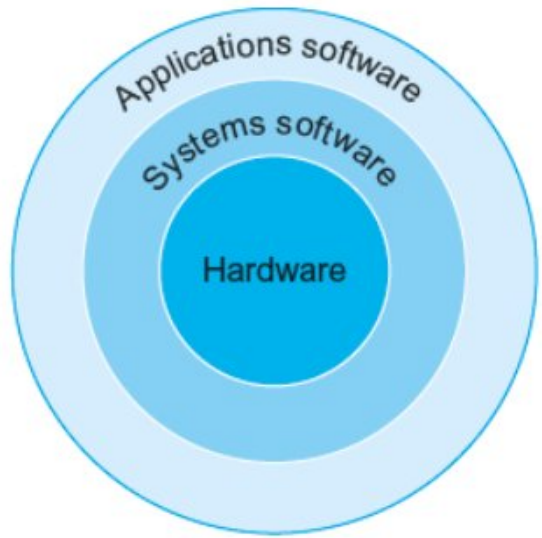
Today's Topic

Outline

- What really is happening below our program
- Organization of a computer, the big picture
- Technologies for Building Processors and Memory

Below Our Program

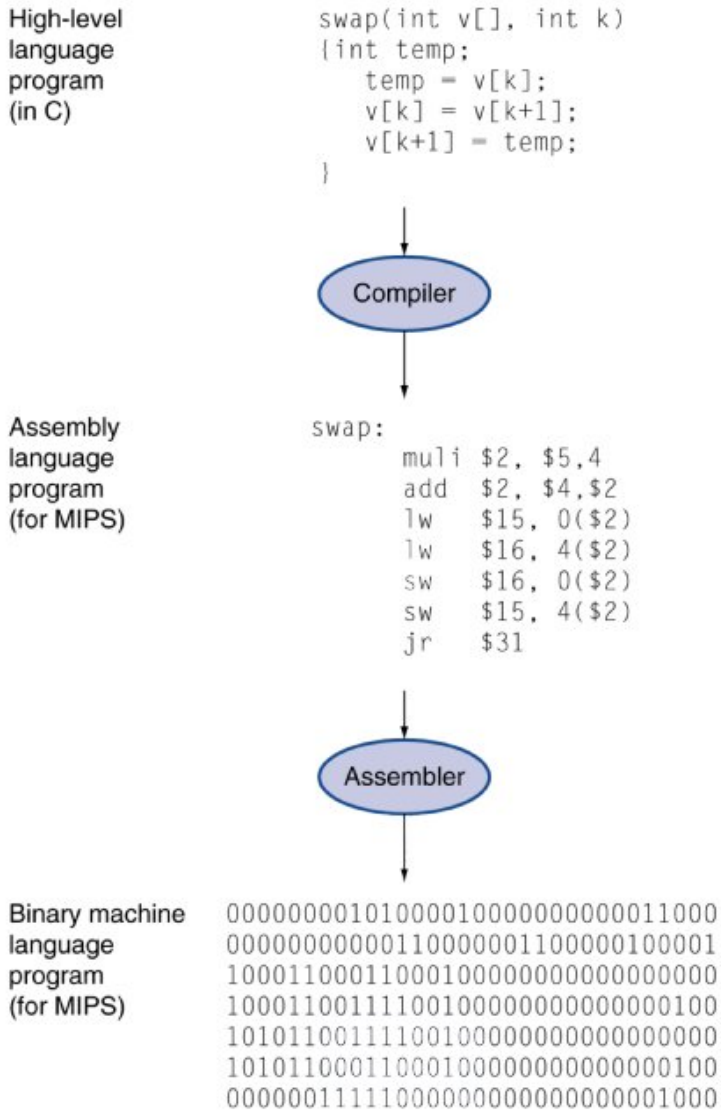
- application software
  - written in high-level language
- system software
  - operating system
    - handles basic I/O
    - allocates storage and memory
    - provides protected sharing of computer amoung multiple applications
  - compiler
    - translates HLL code to machine code
- hardware
  - processor
  - memory
  - I/O



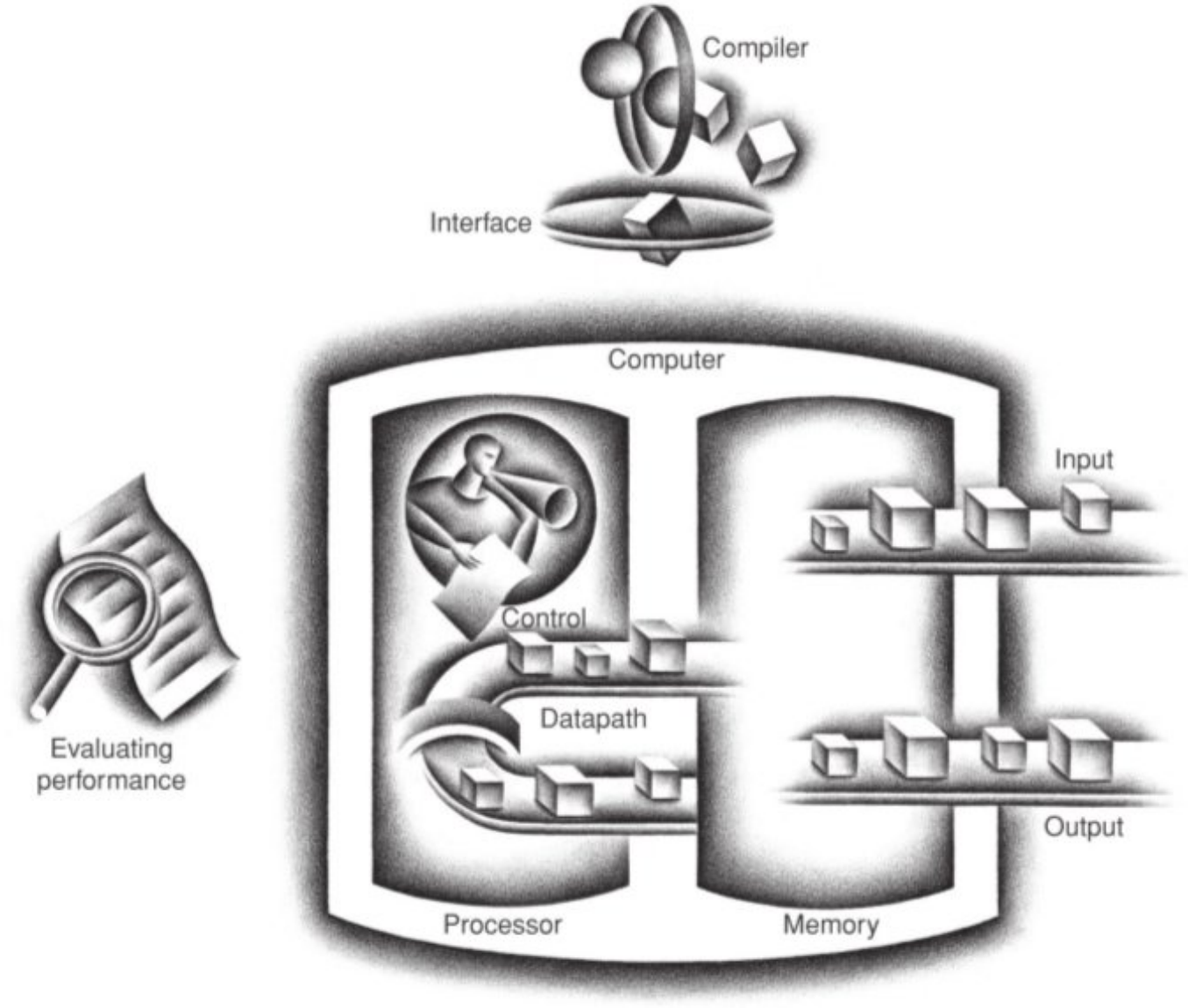
Below Our Program

From a High-Level Language to the Language of Hardware

- Why use high-level programming languages?
  - thinking in a more natural language
  - domain specific languages designed accordingly
  - conciseness
  - portability



Organization of a Computer



Organization of a Computer

Opening the Box

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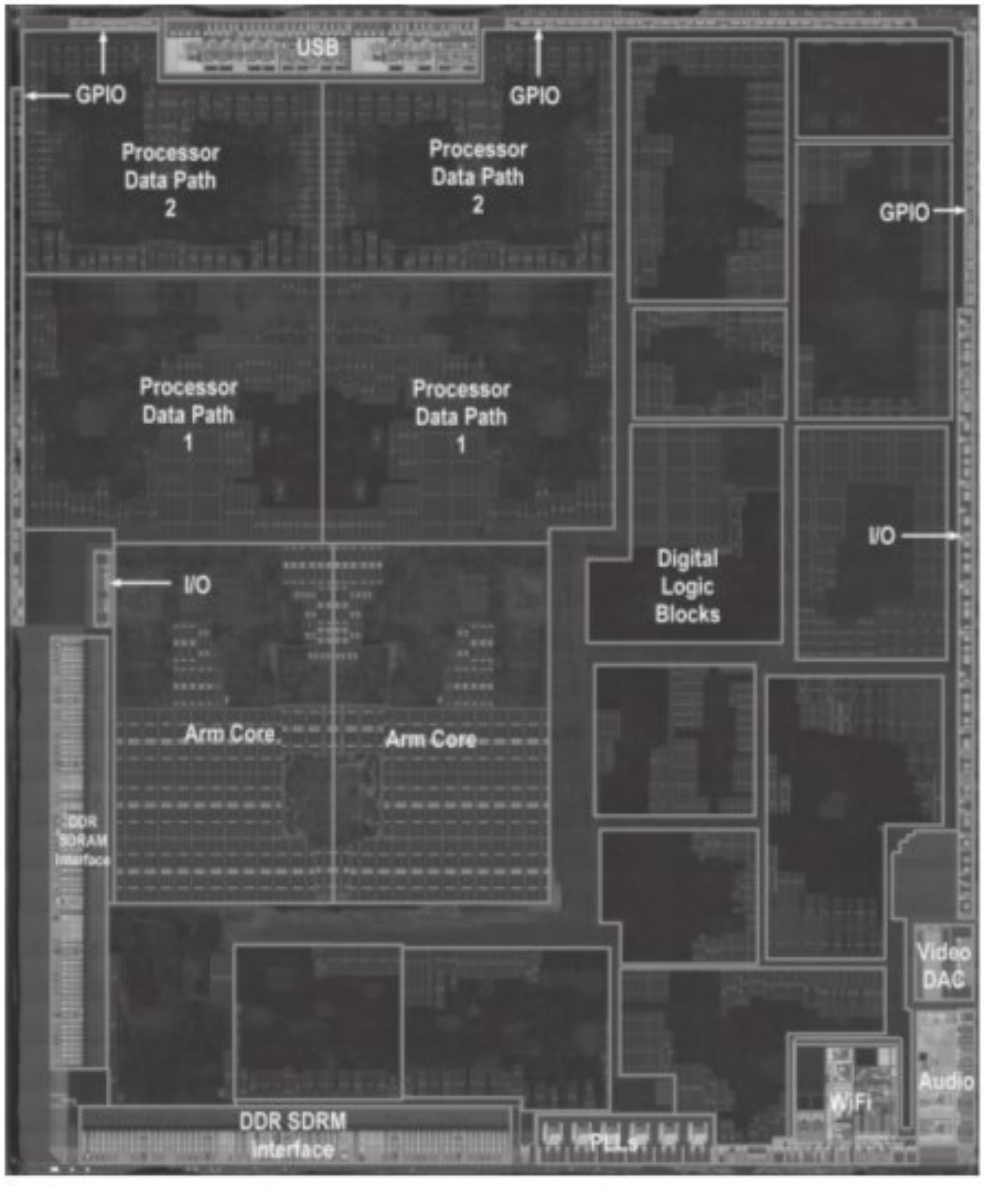
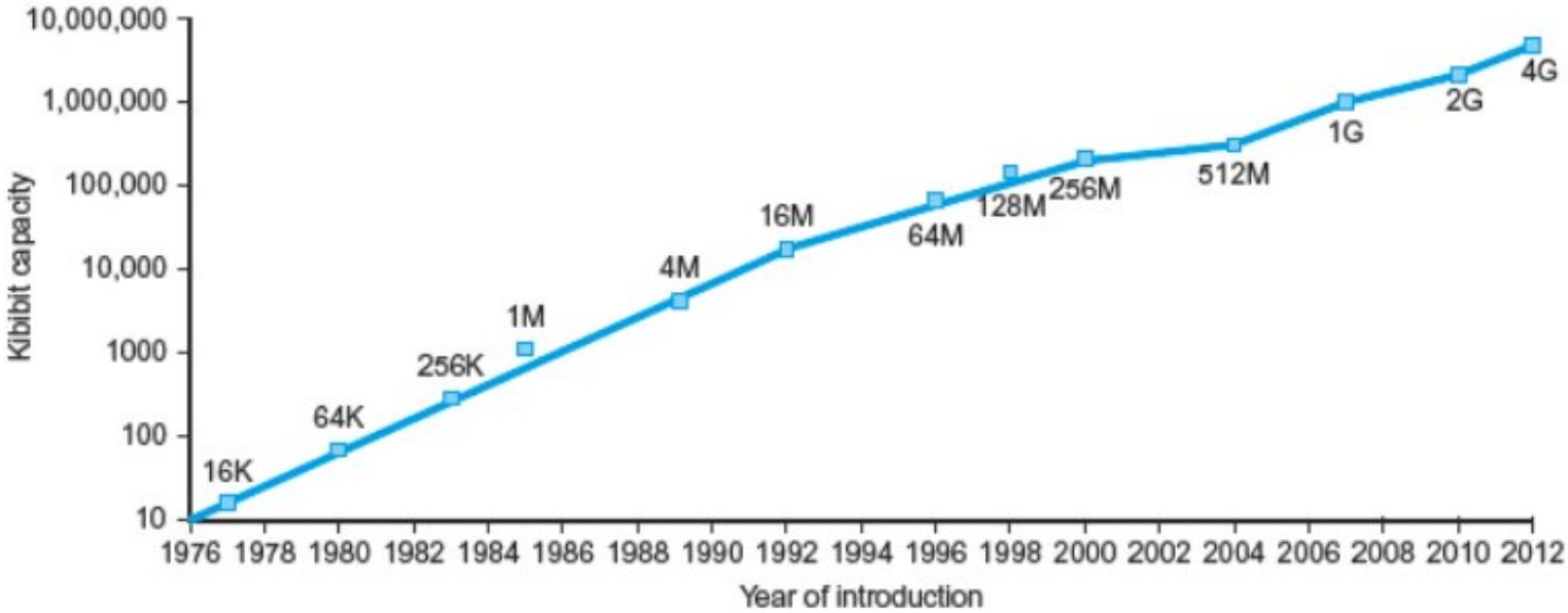


Technologies for Building Processors and Memory

Year	Technology used in computers	Relative performance/unit cost
1951	Vacuum tube	1
1965	Transistor	35
1975	Integrated circuit	900
1995	Very large-scale integrated circuit	2,400,000
2013	Ultra large-scale integrated circuit	250,000,000,000

Technologies for Building Processors and Memory



What's Next

Measuring Computer Performance

Reference

- Computer Organization and Design: The Hardware/Software Interface, *Chapter 1, 1.2-1.5*
  - David A. Patterson
  - John L. Hennessy