IC220
Computer Architecture and Organization

Spring 2008
Asst. Prof. Luke McDowell

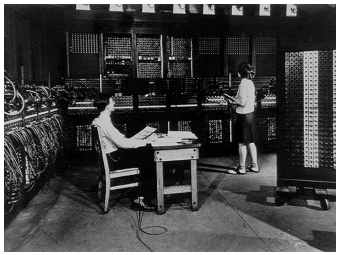
http://www.cs.usna.edu/~lmcdowel/courses/ic220/S08/

Outline

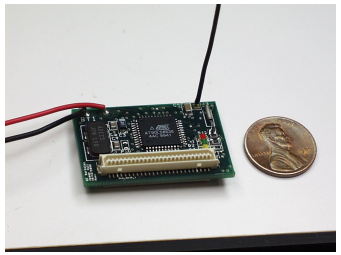
- Class Survey / Role Call
- What is:
  - a computer?
  - computer architecture?
  - this class?
- Course Admin
  - Policy Letter
  - Syllabus

Computers over time

1940s -- ENIAC

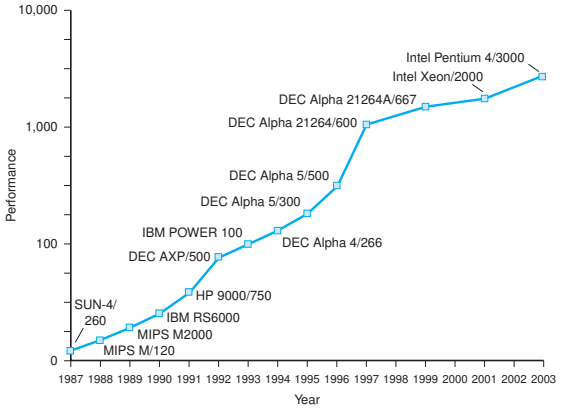


Today – UCLA "mote"



- Rapidly changing field:
  - vacuum tube -> transistor -> IC -> VLSI
  - doubling every 1.5 years:

Performance over time



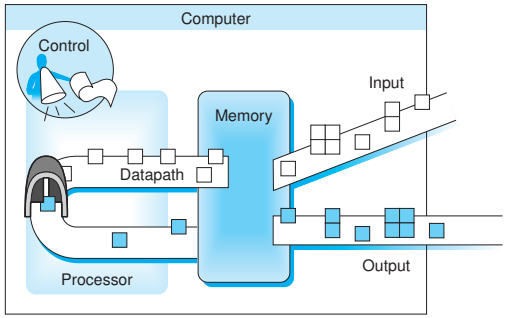
What We'll Learn

- How do computers really work?
- How to analyze performance (and not to!)
- Issues affecting modern processors (caches, pipelines, wire delay, parallelism…)
- Constant tradeoffs:
  - Speed vs. Capacity vs. Cost
- Insight into complexity of easy/hard operations
- Comment from prior student on "how much learned":
  "*A great deal. One of those classes where you don't realize how much you learned- you just come out understanding a lot of things that nobody else does.*"

Why learn this stuff?

- You want to call yourself a "computer scientist" or "information technologist"
- You want to build software people use (need performance)
- You need to make a purchasing decision or offer "expert" advice

What is a computer?



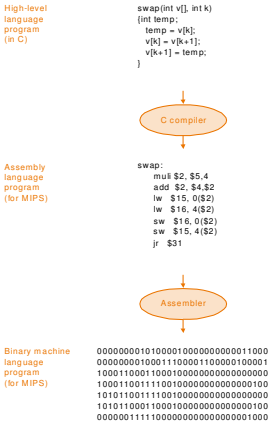
What is a computer, continued

- Our primary focus:
  - implemented using millions of transistors
  - Impossible to understand by looking at each transistor
  - We need...

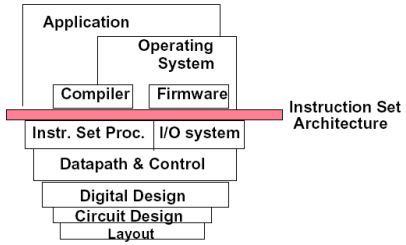
Abstraction

- An abstraction helps us cope with complexity by:

- Delving into the depths reveals more information



What is Computer Architecture?



Computer Architecture =

Instruction Set Architecture

- A very important abstraction
  - interface between hardware and low-level software
  - defines how a program interacts with the machine
  - standardizes instructions, machine language bit patterns, etc.
  - advantage:
  - disadvantage:
- Modern instruction set architectures:
  - 80x86/Pentium/K6, PowerPC, DEC Alpha, MIPS, SPARC, HP

Where we are headed

- Today – Chapter 1
- A specific instruction set architecture (Chapter 2)
- Logic Design (Appendix B)
- Arithmetic and how to build an ALU (Chapter 3)
- Performance issues (Chapter 4)
- Constructing a processor to execute our instructions (Chapter 5)
- Pipelining to improve performance (Chapter 6)
- Memory: caches and virtual memory (Chapter 7)
- I/O (Chapter 8)
- A few advanced topics

Admin

- Pet Peeves
- Policy
- Collaboration
- Syllabus
- Homeworks
  - *Some* exercises completed in class
  - *All* exercises must be completed & turned in
  - Expect less points for exercises done in class
- All assignments must be turned in to possibly earn a passing grade

Assignments

- Get the textbook
- Get a binder to keep track of notes
- Read Chapter 1 (1.7 optional)
- Homework #1 due Friday

Success in IC220

- In Class – Participate
  - You **must** bring relevant slides/homework
  - Ask & answer questions
  - Be prepared to interact
  - Take notes – provided slides are not enough!
- On your own – Keep Up
  - Review/finish exercises after class
  - Read the book – lecture won't cover everything
  - See me for help and/or talk to friends