

SI232 Introduction to Computer Architecture

Spring 2006
Asst. Prof. Luke McDowell

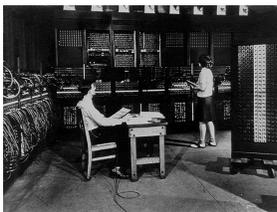
<http://www.cs.usna.edu/~lmcowell/courses/si232/S06/>

Outline

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

Computers over time

1940s -- ENIAC

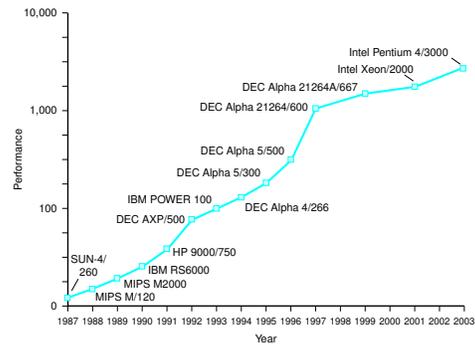


Today -- UCLA "mote"



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

Performance over time



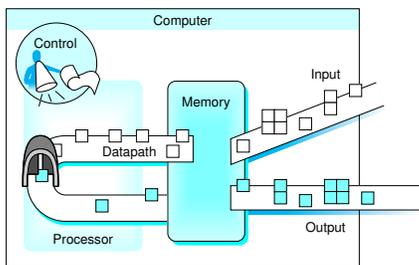
What We'll Learn

- 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

Why learn this stuff?

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

What is a computer?

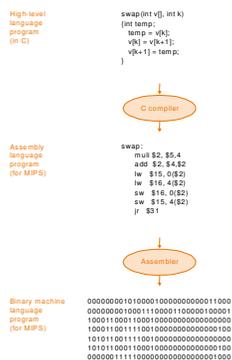


What is a computer, continued

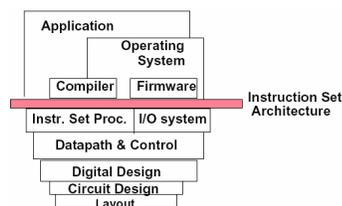
- Our primary focus:
 - implemented using millions of transistors
 - Impossible to understand by looking at each transistor
 - We need...

Abstraction

- An abstraction helps us cope with complexity by:
- Delving into the depths reveals more information



What is Computer Architecture?



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

Classroom Pet Peeves

Admin

- Pet Peeves
- Policy
- Collaboration
- Syllabus

Assignments

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

Success in SI232

- In Class – Participate
 - 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