

CSci 370: Computer Organization

Course Overview

Instructor:

Professor Stephen P. Carl

Quote of the Day

640 Kbytes [of main memory] ought to be enough for anybody.

– Bill Gates, 1981

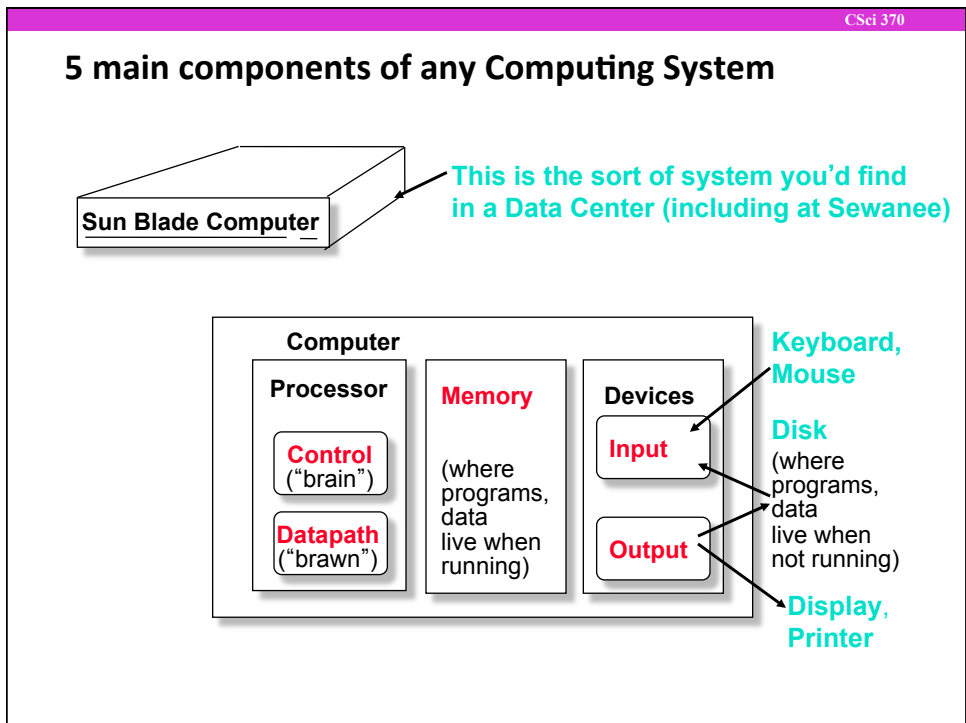
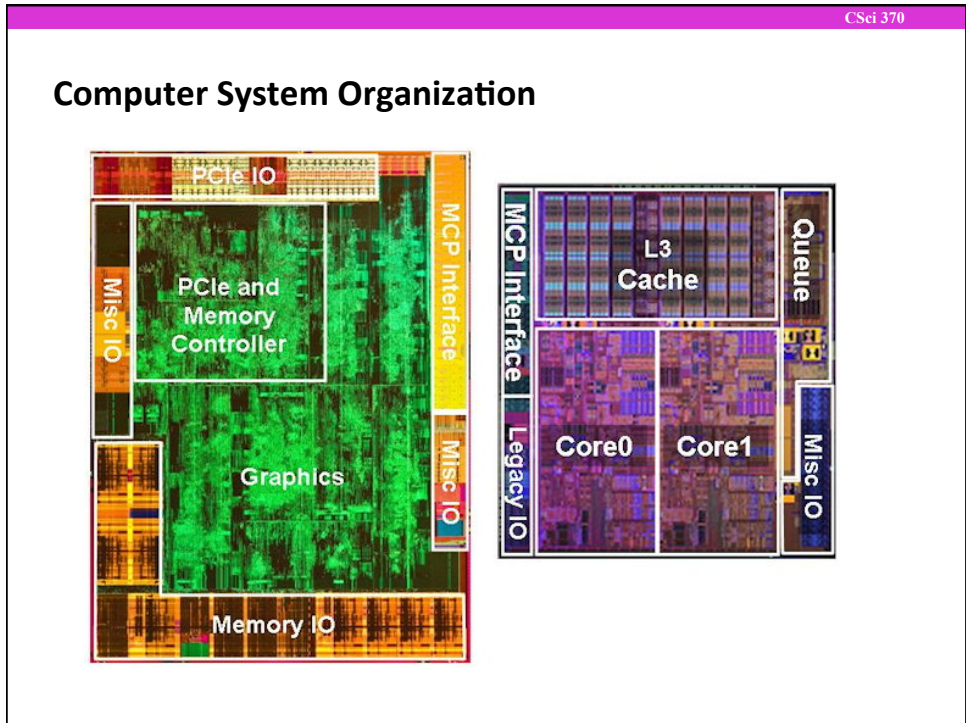
Course Perspective

Most Systems Courses are Builder-Centric; this Course is Programmer-Centric

- You can become a more effective programming by knowing more about the underlying system
- Goal is to enable you to:
 - Write programs that are more reliable and efficient
 - Incorporate features that require hooks into OS
 - E.g., concurrency, signal handlers (in CS 428)
- Not just a course for dedicated hackers
(But it might just bring out the hidden hacker in you!)
- You won't see most of this material in any other course

Introduction: Themes and Concepts

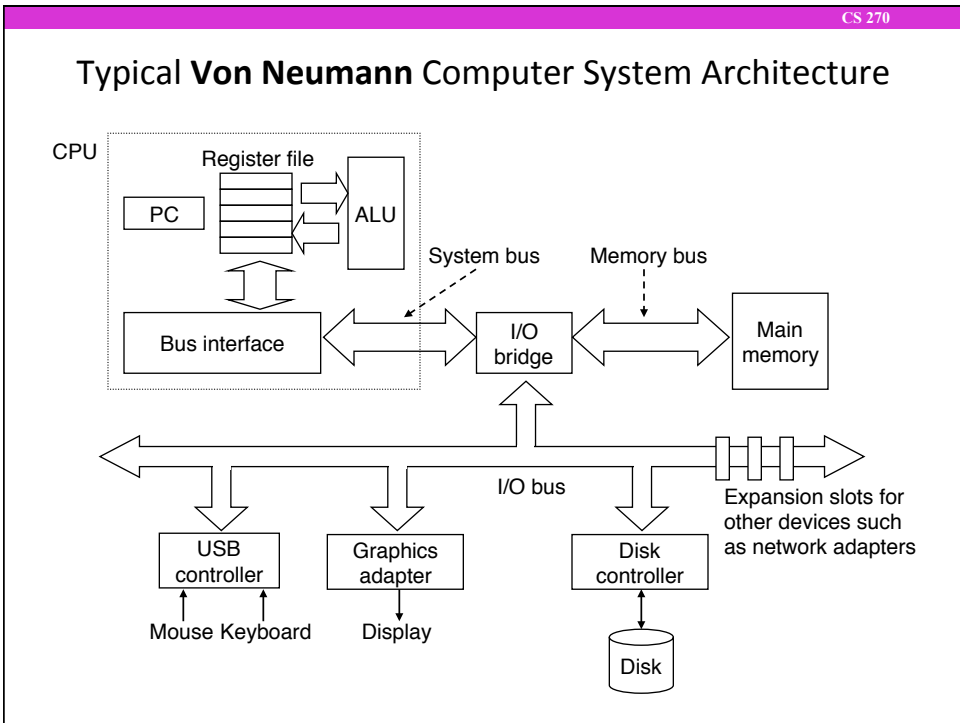
- **Take a bird's eye view of computer system organization**
- **Processor technology and “the march of progress”**
- **Abstraction vs. Reality**
 - Internal data representations – All Is Number
 - Why knowing Assembly language is a Good Thing
 - Computer storage is large but not infinite
 - Asymptotic complexity is only part of the story
 - Computers compute, but they also communicate



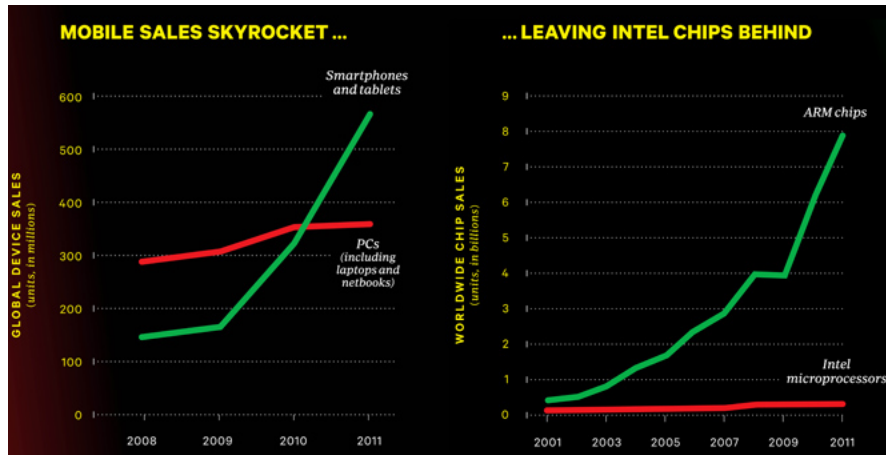
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5 main components of Computer Systems

- **Datapath**
Performs operations on signals moving through the CPU
- **Control Circuitry**
Routes signals into, through, and out of the CPU
- **Memory**
 - Volatile (RAM)
 - Permanent Storage (hard drives, DVD-ROM, etc.)
 - (newer SSD devices blur the distinction)
- **Input devices**
Mouse, keyboard...what else counts?
- **Output devices**
Monitor, printers...what else counts?



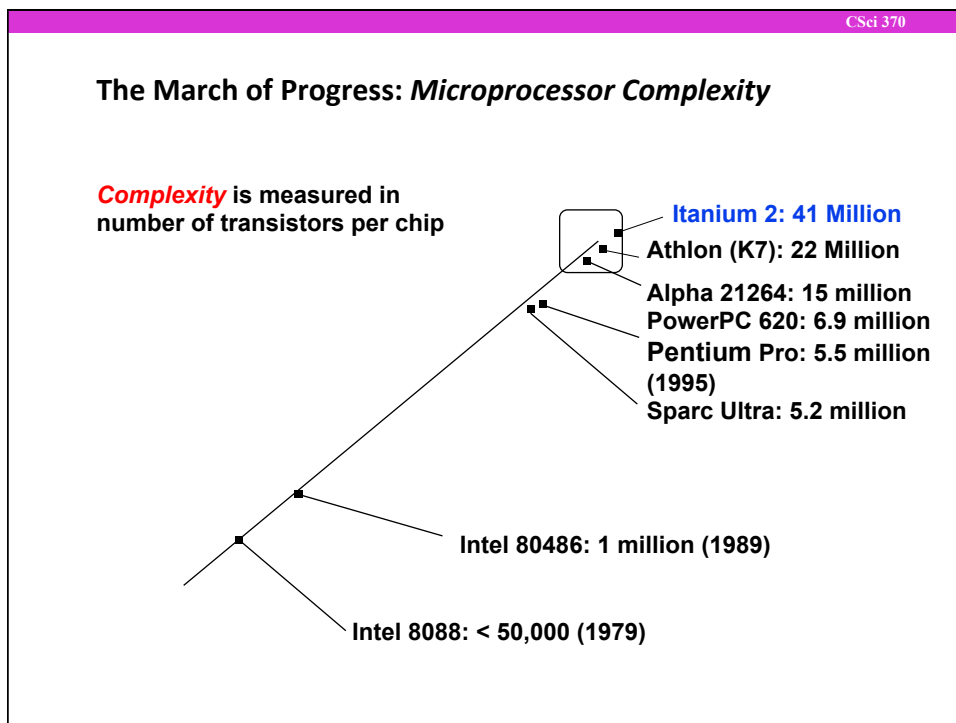
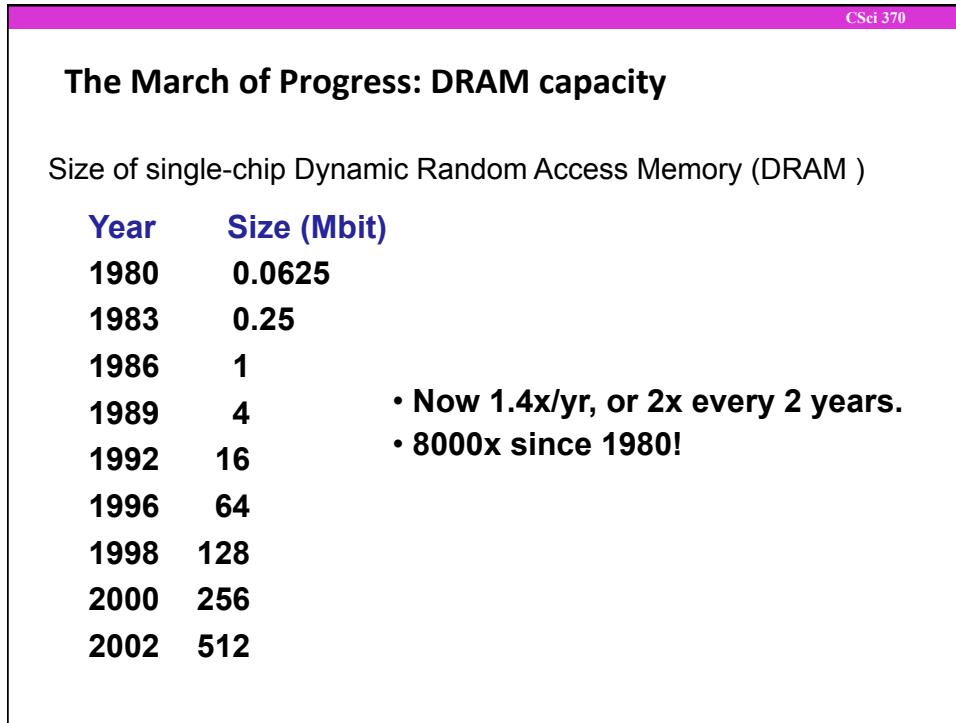
More Recent Sales Trends

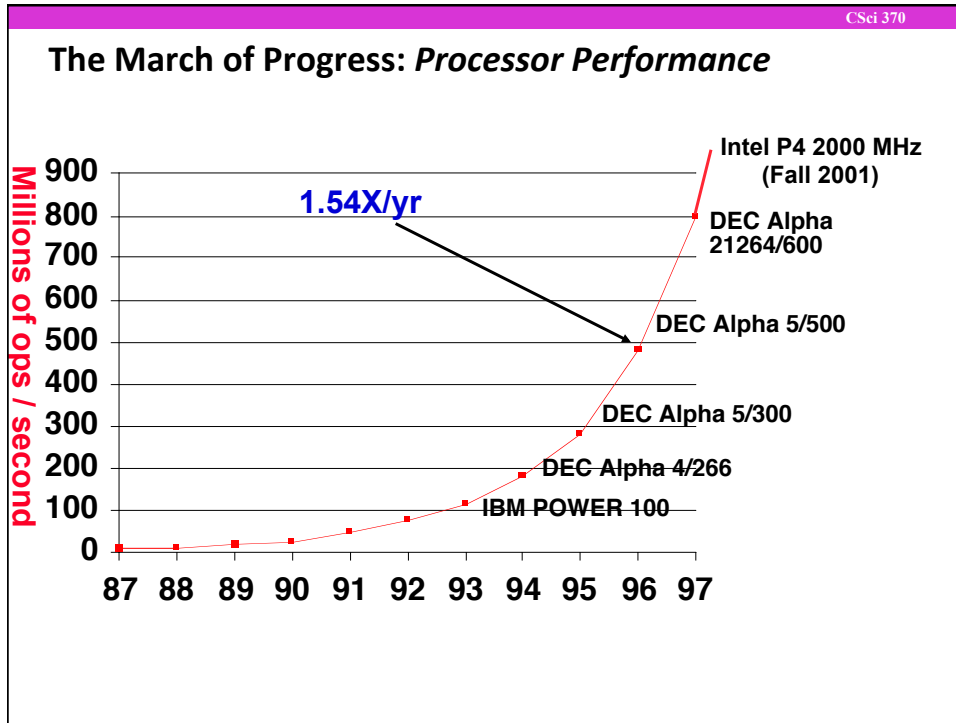


[From Wired Magazine](#)

March of Progress: Moore's Law

- **Moore's Law:** the number of transistors on a single integrated circuit, also called *chip density*, doubles every 18 months
- This applies to any kind of semiconductor chip: memory (RAM), microprocessors, GPUs, etc.
- Trend first described by Intel co-founder Gordon Moore way back in 1965.





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The March of Progress: Dramatic Changes

Memory
 DRAM capacity: 64x size improvement in last decade.

Processor
 Speed: 100X performance in last decade.

Disk
 Capacity doubled every year since 1997: 250X in last decade.

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The March of Progress: Dramatic Changes

What will be state-of-the-art in PCs when you graduate?

- Processor clock speed: 5000 **Mega**Hertz (5.0 **Giga**Hertz)
- Memory capacity: 4096 **Mega**Bytes (4.0 **Giga**Bytes)
- Disk capacity: 2024 **Giga**Bytes (2.0 **Tera**Bytes)

Time to learn some new SI units!

- 1000 **Mega** => **Giga** = 10^9
- 1000 **Giga** => **Tera**
- 1000 **Tera** => **Peta**
- 1000 **Peta** => **Exa**
- 1000 **Exa** => **Zetta**
- 1000 **Zetta** => **Yotta** = 10^{24}

