CS2422 Assembly Language & System Programming

September 12, 2006

Announcement

- Two sessions for this course:
  - CS2422-01 (張鈞法教授)
  - CS2422-02 (金仲達教授)

Textbooks

- Kip Irvine, "Assembly Language for Intel-Based Computers" 5th ed.
- Leland Beck, "System Software"
  - Using the first 4 chapters.
- Other good books:
  - Patterson & Hennesey, "Computer Organization and Design" (not Intel-based)
  - The Art of Assembly (freely available online)

Honor Code

- University code will be followed strictly to handle the cheating in assignments and exams.
- You are allowed (and in fact encouraged) to discuss the assignments, but the work must be your own.

Early Bonus & Late Penalty

- Early bonus: +2% for each day early, up to two days.
- Late penalty: -20% for each day (or partial day) late.

Why Learning Assembly?

- A great way to learn how a computer really works:
  - To talk in the languages of the processors.
  - To see how a computer talks to the other devices.
- To build solid background for other courses:
  - Computer Architecture, Compilers, Operating Systems…etc.

Even More Important Now

- A few examples:
  - The SOC (System-On-Chip) and embedded system trend.
  - The era of ubiquitous computing.
  - For graphics folks: The DirectX and OpenGL shading langauges.
- The hardware/software boundary is blurring.

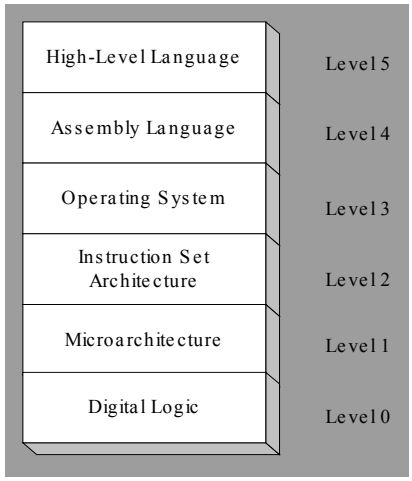
What Exactly Is a PC?

A machine to…

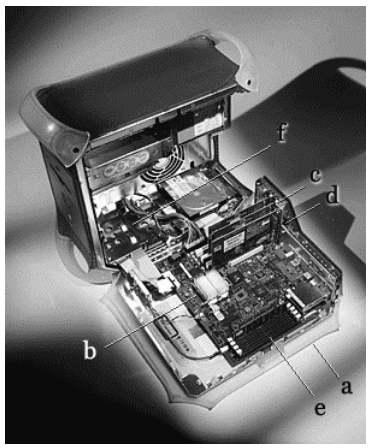
- "…use email and surf the web" (Grandma)
- "…run MS-Office" (said Mom & Dad)
- "…play games and watch movies" (Kids)
- "…to write programs for Linux or Bill Gates' DOS/Windows" (CS Students)
- "…to show you the BIOS Screen" (EE Students)

Virtual Machine Concept

Section 1.2, Figure 1-1



Inside the case

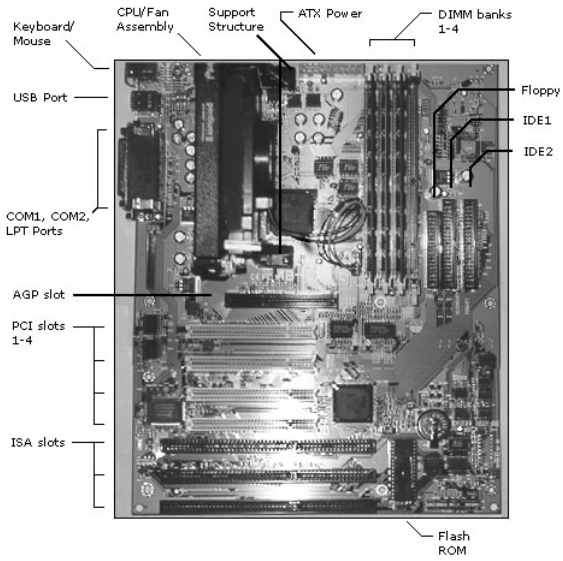


b. Processor

c. PCI slots (for I/O)

e. Memory slots

Motherboard



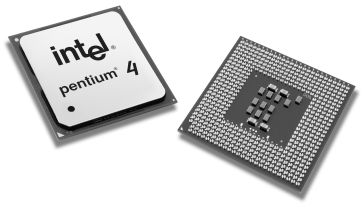
Memory

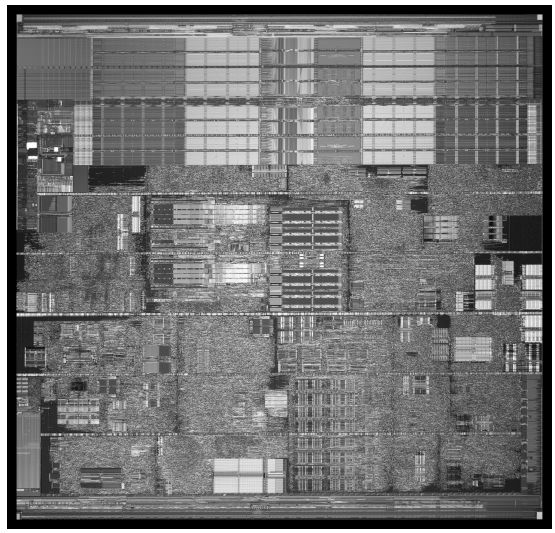
- RAM
- DRAM
- SRAM
- ROM
- Volatile / Non-Volatile
- Magnetic

Processor

Pentium 4

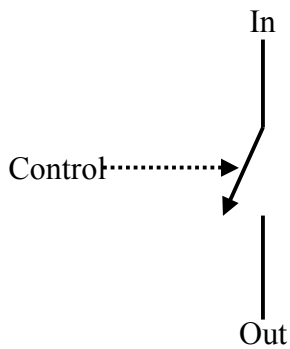
(Prescott 90nm)



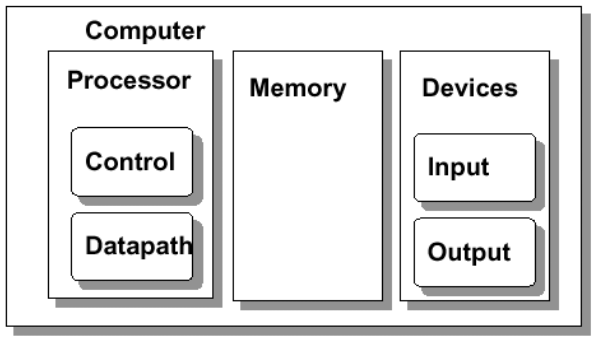


You only need switches and wires!

- Relays
- Vacuum tubes
- Transistors
- Integrated Circuits
- VLSI
- Nanotubes?
- Quantum Effect Devices?



5 Classic Computer Components



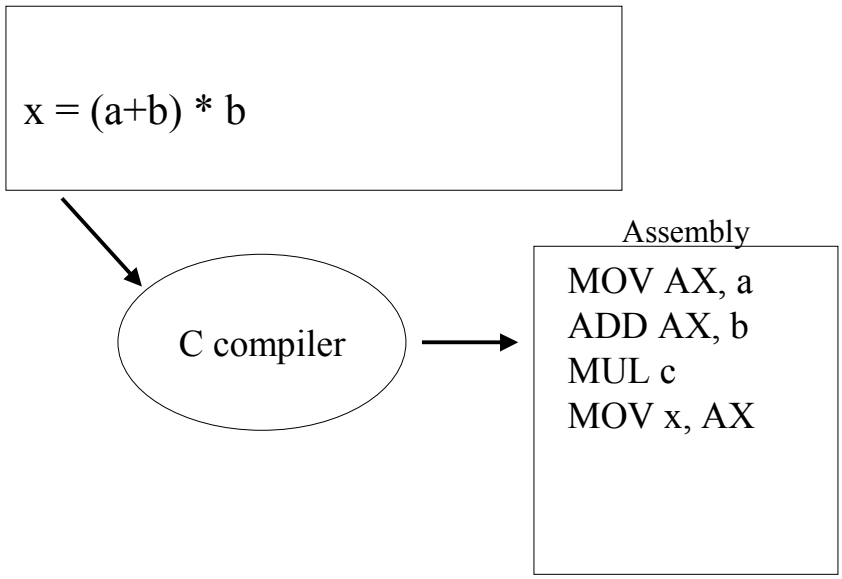
Instruction and Operands

- Example:

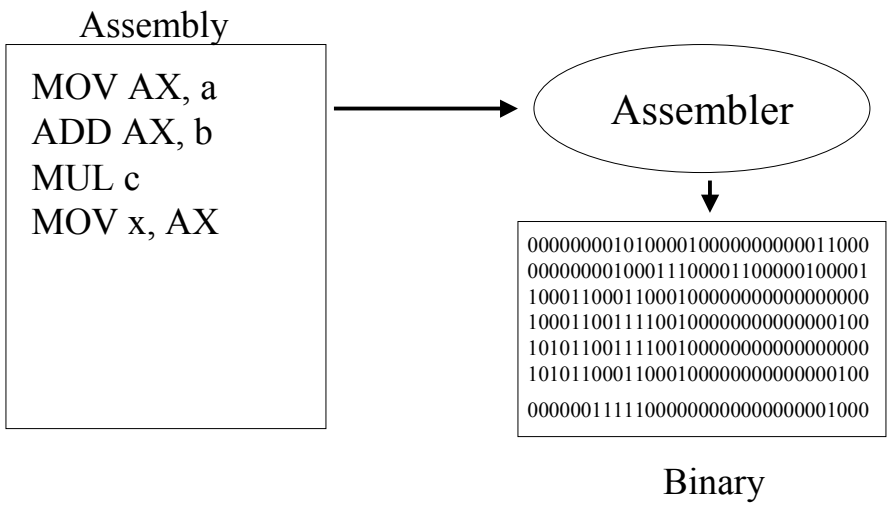
  MOV CX, 25

  ADD AX, CX
- Data are in registers or memory.
- For now, we will focus on CPU, Registers, and Memory only.
- I/O will be discussed later.

Abstraction: C to ASM



Abstraction: ASM to Binary



Acknowledgement

- Many slides in this lecture are borrowed from Prof. Gary Bishop's COMP120 course at UNC-Chapel Hill.