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Announcements

- Project Turn-In Process
  - Put name, lab, UW NetID, student ID, and URL for project on a Word doc
  - Upload to Catalyst Collect It
- Project 1A:
  - Turn in before 10pm tomorrow
- Project 1B
  - Turn in before 10pm a week from tomorrow

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Announcements

- Labs the next two weeks
  - Monday and Tuesday labs:
    - Work on projects
- Reflections
  - We will begin adding comments and grading your reflections (10 points)
- Quiz
  - Wednesday or Thursday lab this week
  - Chapters 3–7 of *Fluency* (8 next week)

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Quiz Review

Chapter 3

- Types of networks
  - The Internet, Wide Area Network (WAN), Local Area Network (LAN)
- Protocols
  - Transmission Control Protocol/Internet Protocol (TCP/IP), File Transfer Protocol (FTP), Ethernet Protocol, Hypertext Transport Protocol (HTTP)
- How to Read a Domain Name!
  - Network addresses, IP addresses, domain names, Domain Name Service (DNS)

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Quiz Review

Chapter 3

- Deconstruct URLs
  - http://www.cs.washington.edu/education/courses/100/07au/index.html
  - Identify TLD, domain, server, folder structure, file

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Quiz Review

Chapter 4

- The language in which web pages are written
- The filename extension is generally .html or .htm
- Plain text with a special structure defined by a set of tags
- Tags are used to encode structure and formatting

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Quiz Review

- “root” of a files system is specified with a single “/” slash (C:/)
  - Absolute pathnames start from the root
  - Relative pathnames start from the current directory
- Separating directories and filenames
  - UNIX: “/” (slash)
  - Windows: “\” (backslash)
- Parent directory: “..”
- Current directory “.”

```
$pwd
$/samspade/fit100/project1
$cd ../..
$pwd
/samspade
```

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Quiz Review

- HTML Page Structure

```
<!DOCTYPE definition… >
<html>
  <head>
      <title>Title text</title>
    </head>
    <body>
    Body text goes here…
    </body>
</html>
```

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Quiz Review

- Anatomy of an HTML tag
  - <ELEMENT attribute="value"></ELEMENT>
  -
- Types of tags
  - Normally has an open AND a close element
  - Open and close at the same time
  - Some tags do not close at all (ex. Comment tag)
- Attributes
  - Name-value pairs, values in quotes
  - Some are required, some optional

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Quiz Review

- Styles Tags
  - <b> bold, <i> italic, <big> big, <small> small
- Spacing Tags
  - <p> paragraph, <br /> line break, <hr /> horizontal rule
- Heading tags
  - <h1>, <h2>, <h3>.. <h8> header format
- Table tags
  - <table> table, <th>table header, <tr> table row, <td> table data
- References
  - < a href="http://www.cnn.com"> anchor reference
  - <img src="…" alt="…"> image reference

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Quiz Review

Chapter 5

- Search Engines like Google & Yahoo provide large piles of (unorganized) information
- Index is generated by crawling the web and following all the links and indexing words
- Not every page can be indexed!
  - If there are no links to it from other pages
  - Its dynamically created from a database

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Quiz Review

- Be as specific as you can when searching the web!
  - Eliminate common words (a, the, but)
  - Use rare words
  - Try using longer queries
  - Don't forget about advanced search
- Employ Boolean operators
  - AND = both words must be included (any order)
  - OR = one or the other word (but not both)
  - AND NOT = do not include this word
  - "quotes" to guarantee word order

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Quiz Review

Chapter 6

- Public domain
  - Expired copyright
  - Governmental works
- Copyleft vs. copyright
- Copyright rules
- Primary vs. secondary sources

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Quiz Review

Chapter 7

- Verify that its reproducible!!!
- Determine exactly what the problem is
- Eliminate obvious causes by double-checking
- Divide the process into smaller working parts
- Use tools to help you program (like colored text editor)
- Use techniques to help you program (like indenting, adding comments, etc...)

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Computer Basics

How exactly does a computer work?

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Integrated Circuits

Integrated circuits (ICs) are the power source of the information revolution

- When computers were made of discrete parts, wires of every transistor (3), capacitor (2), resistor (2), etc. had to be hand-connected
- Labor intensive, expensive, error prone, unreliable, cumbersome, ... even with robots!
- Integrated circuits solved that by 2 ideas
  - Integration -- circuits built as a unit from like parts
  - Photolithography -- printing process to make chips

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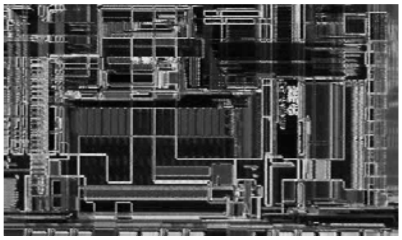
Intel Pentium Processor



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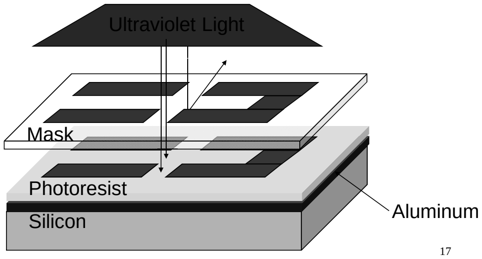
Photolithography

Consider process for depositing wires


Ultraviolet Light
Mask
Photoresist
Silicon
Aluminum

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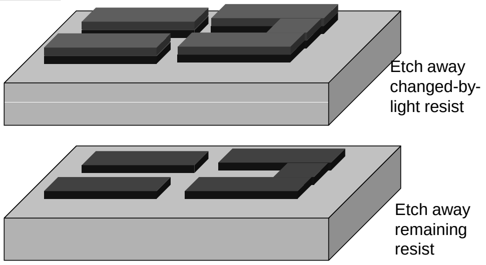
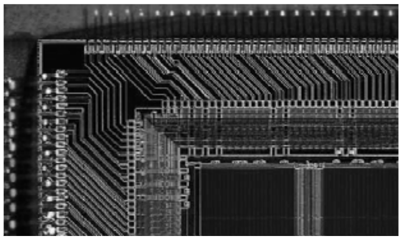
Remove Resist


Etch away changed-by-light resist
Etch away remaining resist

The cost of the circuit is not related to complexity

R4400 NEC/MIPS Processor



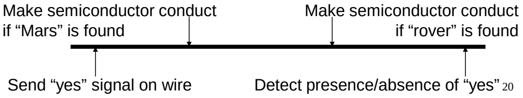
Semiconductors

Silicon, a semiconductor -- sometimes it conducts and sometimes it doesn't

- It's possible to control when semiconductors do and don't conduct

Compute by controlling conducting

Ex.: Use control to test **`Mars AND rover`**



Make semiconductor conduct if "Mars" is found

Make semiconductor conduct if "rover" is found

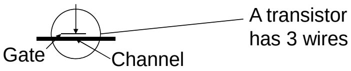
Send "yes" signal on wire

Detect presence/absence of "yes"

Field Effect

Charged objects are familiar -- use a nylon comb on a dry day

- A charged field can control whether a semiconductor conducts or not

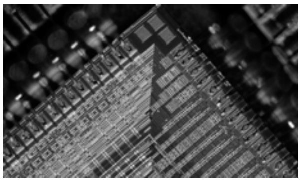


A transistor has 3 wires
Gate
Channel

The charge of the control wire (gate) is key

- Neutral gate, channel doesn't conduct
- Charged gate, channel conducts

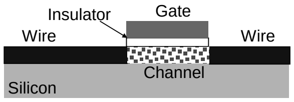
MIPS R10000 Processor



Notice that wires cross over other wires ...

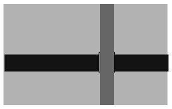
MOS Transistors

The field effect idea is implemented in metal-oxide-semiconductor transistors



Insulator
Gate
Wire
Wire
Channel
Silicon

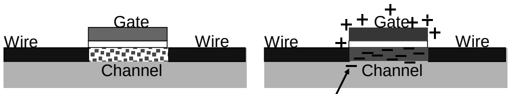
Cross section view



View from above

Operation

The two cases: the gate is neutral or the gate is charged



Gate
Wire
Wire
Channel
Gate
Wire
Wire
Channel

Charged gate attracts electrons to channel

Notice key points of integrated circuits:
Constructed as a unit of compatible parts
Fabricated in layers by photolithography

Computers ...

Deterministically execute instructions to process information

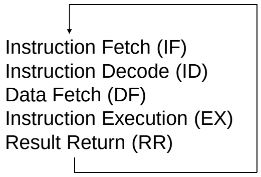
"Deterministically" means that when a computer chooses the next instruction to perform it is required by its construction to execute a specific instruction based only on the program and input it is given

Computers have no free will and they are not cruel

Fetch/Execute Cycle

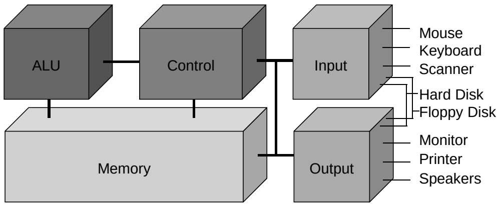
Computer = instruction execution engine

- The fetch/execute cycle is the process that executes instructions



Instruction Fetch (IF)
Instruction Decode (ID)
Data Fetch (DF)
Instruction Execution (EX)
Result Return (RR)

Anatomy of a Computer

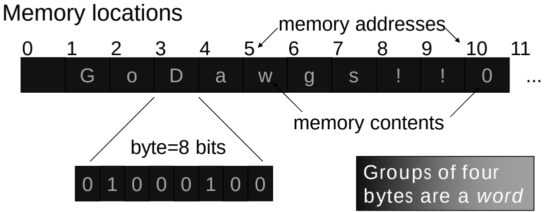

ALU
Control
Input
Memory
Output
Mouse
Keyboard
Scanner
Hard Disk
Floppy Disk
Monitor
Printer
Speakers

The Hard Disk is the α-device

Memory ...

Programs and their data must be in the memory while they are running

Memory locations


memory addresses
0 1 2 3 4 5 6 7 8 9 10 11
G o D a w g s ! ! 0 ...
memory contents
byte=8 bits
0 1 0 0 0 1 0 0

Groups of four bytes are a *word*

Control

The Fetch/Execute cycle is hardwired into the computer's control, i.e., it is the actual "engine"

The instructions executed have the form
ADDB 10, 16, 20

10	11	12	13	14	15	16	17	18	19	20	21
6						12				18	...

Put in memory location 20 the contents of memory location 10 + contents of memory location 16

Indirect Data Reference

Instructions tell *where* the data is, not *what* the data is ... contents change

One instruction has many effects
ADDB 10, 16, 20

10	11	12	13	14	15	16	17	18	19	20	21
8						7				15	...

10	11	12	13	14	15	16	17	18	19	20	21
60						-55				5	...

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ALU

The Arithmetic/Logic Unit does the actual computation

Each type of data has its own separate instructions

ADDB	: add bytes	ADDBU	: add bytes unsigned
ADDH	: add half words	ADDHU	: add halves unsigned
ADD	: add words	ADDU	: add words unsigned
ADDS	: add short decimal numbers		
ADDD	: add long decimal numbers		

Most computers have only about 100-150 hard-wired instructions

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Input/Output

Input units bring data to memory from outside world; output units send data to outside world from memory

- Most peripheral devices are “dumb” meaning that the processor assists in their operation
- Disks are *memory* devices because they can output information and input it back again

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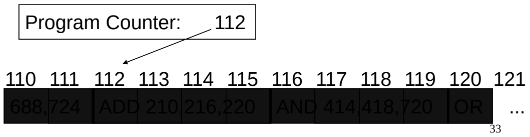
The PC’s PC

The program counter (PC) tells where the next instruction comes from

- Instructions are a *word* long
  - – Recall that 4 bytes is a word
- Add 4 to the PC to find the next instruction



Program Counter: 112

110 111 112 113 114 115 116 117 118 119 120 121

688,724 ADD 210,216,220 AND 414,418,720 OR ...

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Clocks Run The Engine

The rate a computer “spins around” the Fetch/Execute cycle is controlled by its clock

- Current clocks run 2-3 GHz
- In principle, the computer should do one instruction per cycle, but often it fails to
- Modern processors try to do more than one instruction per cycle, and often succeed

Clock rate is not a good indicator of speed

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Summary

Semiconductors made Info Revolution

- ∗ Semiconductor properties ...
  - Fields control when semiconductor conducts
  - On/off of conductors allows us to compute

Fetch/execute cycle runs instructions

- ∗ 5 steps to interpret machine instructions
- ∗ Programs must be in the memory
- ∗ Data is moved in and out of memory

Instructions, data are represented in binary