

INFM 603: Information Technology and Organizational Context

Session 2: HTML and CSS

(And Networking, Computing Tradeoffs)



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Ways to characterize computing

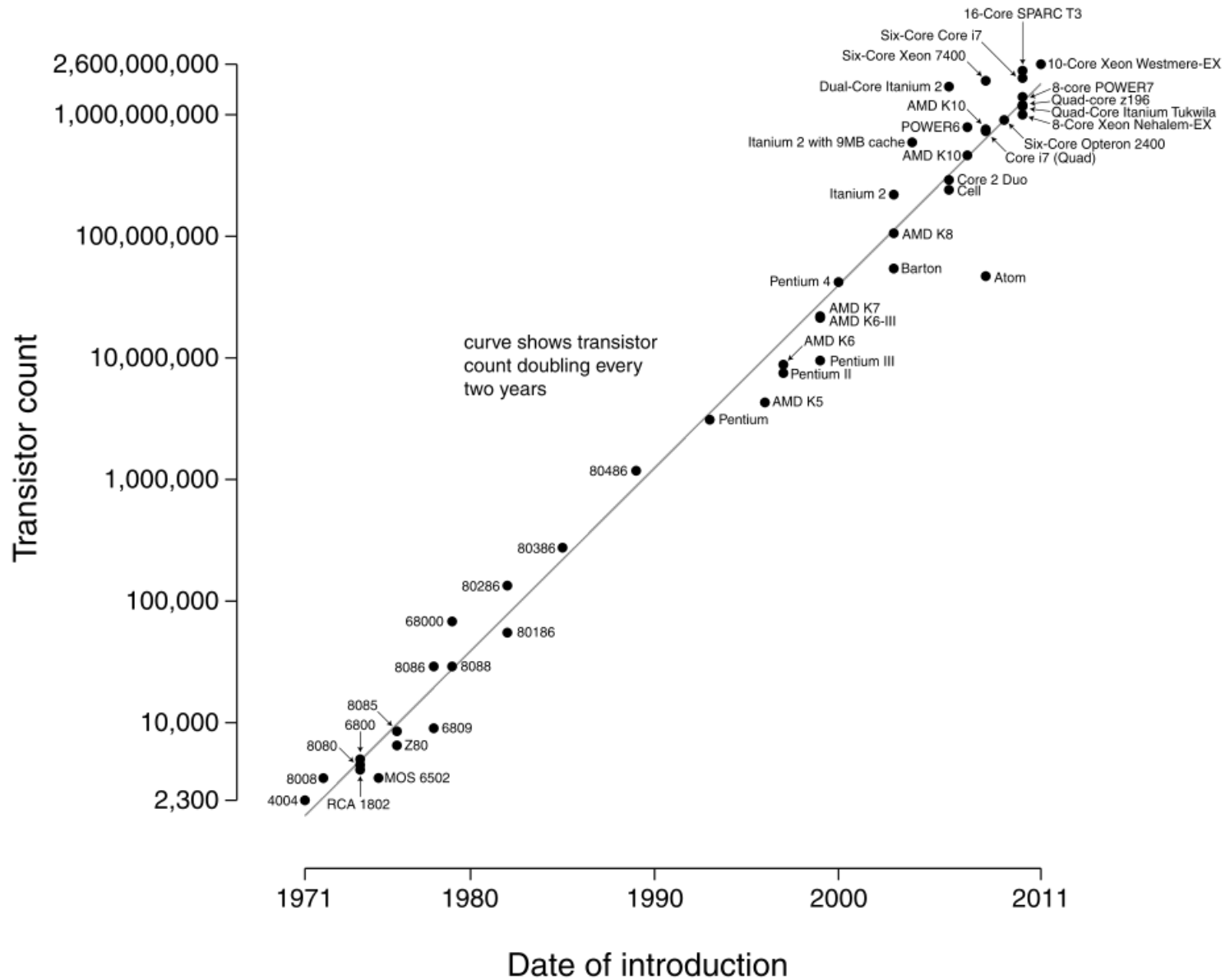
- How big?
- How fast?
- How reliable?

Computing is fundamentally about tradeoffs!

Example 1: Multi-Core



Microprocessor Transistor Counts 1971-2011 & Moore's Law





About This Mac



OS X

Version 10.8.1

[Software Update...](#)

Processor 2.7 GHz Intel Core i7

Memory 16 GB 1600 MHz DDR3

[More Info...](#)

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PENTIUM® 4

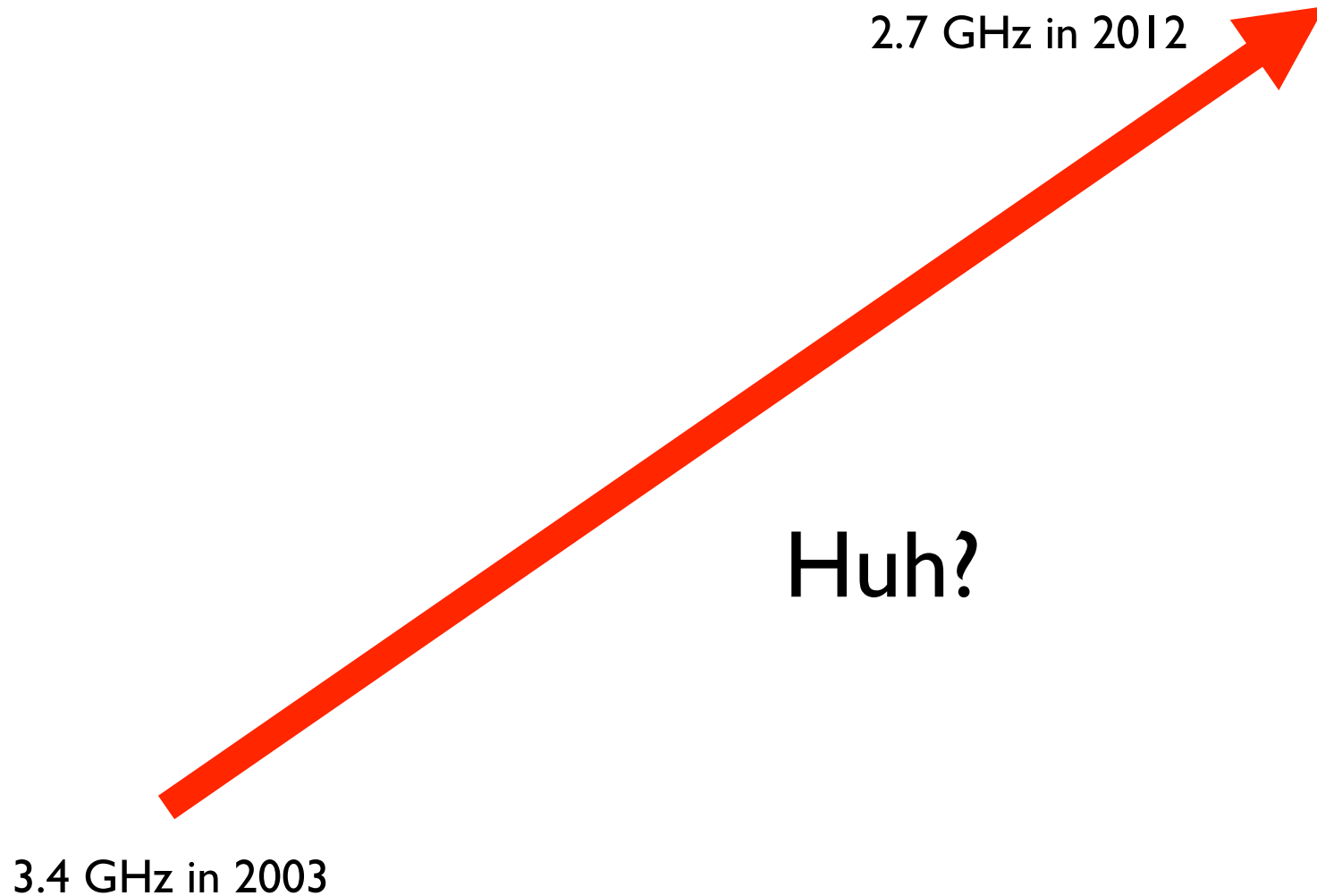
3.40GHZ/LM/800

SL7J8 COSTA RICA

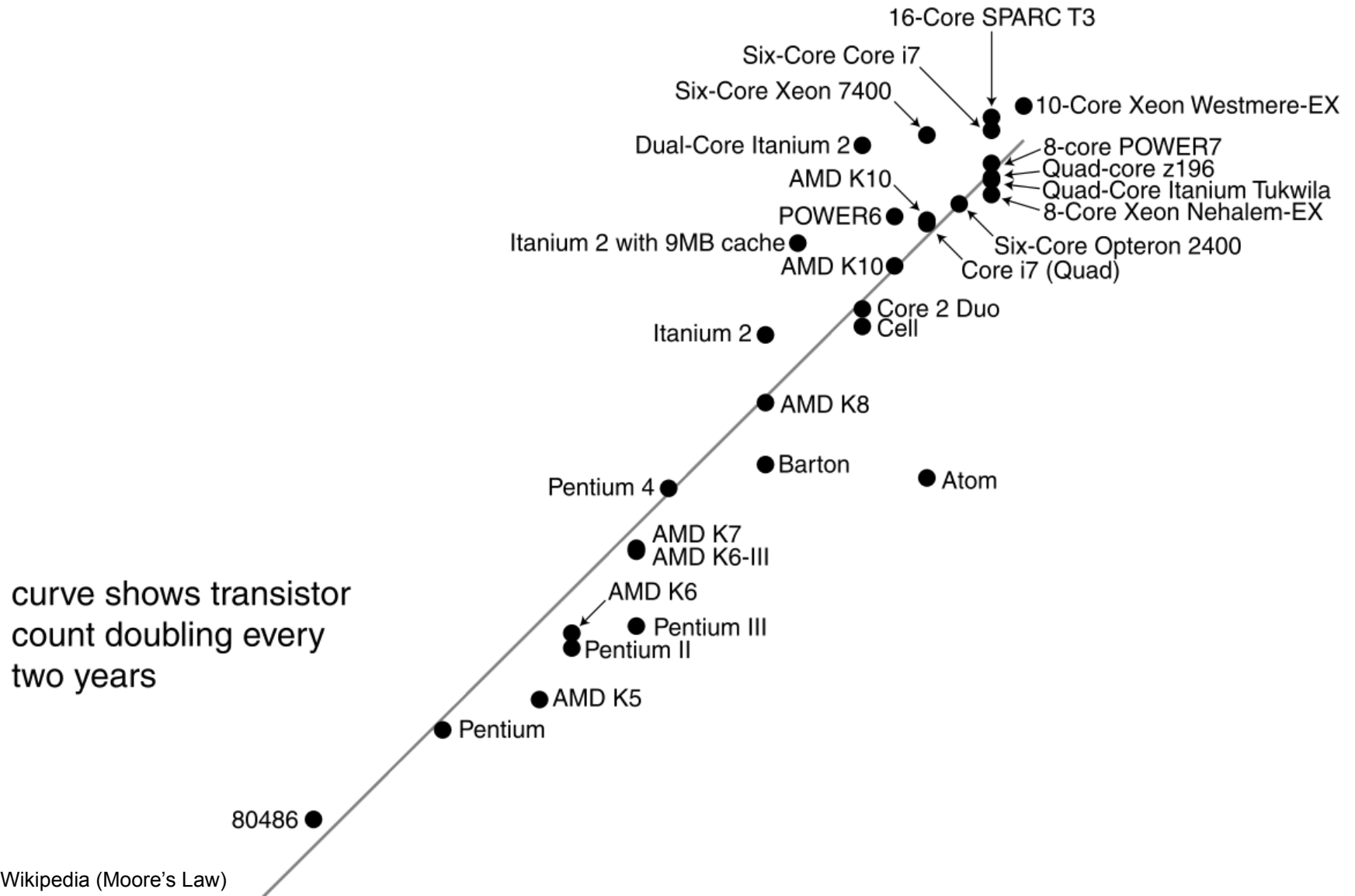
3429A551

3.00GHZ/LM/800
SL8BM COSTA RICA
3429A551T

Trends in Computing: #1



Transistor Counts 1971-2011 & Moore's Law



What's big shift?

- From single to multiple cores:
 - Increasing speed of single processor reached point of diminishing returns
 - Solution: put more cores on a processor!
- Important issues:
 - Power
 - Cool
 - Parallelism

Example 2: Caching



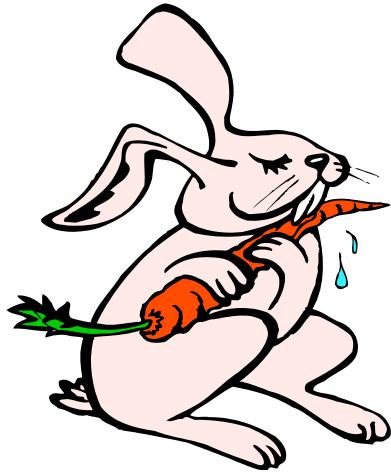
Typical Access Time: 100 ns



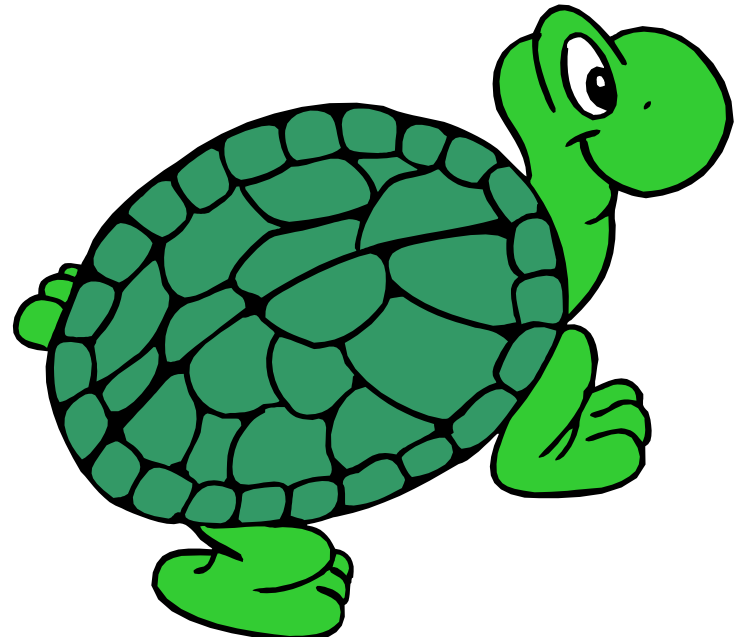
Typical Access Time: 10 ms
(10,000x slower than RAM!!!)

Pick two

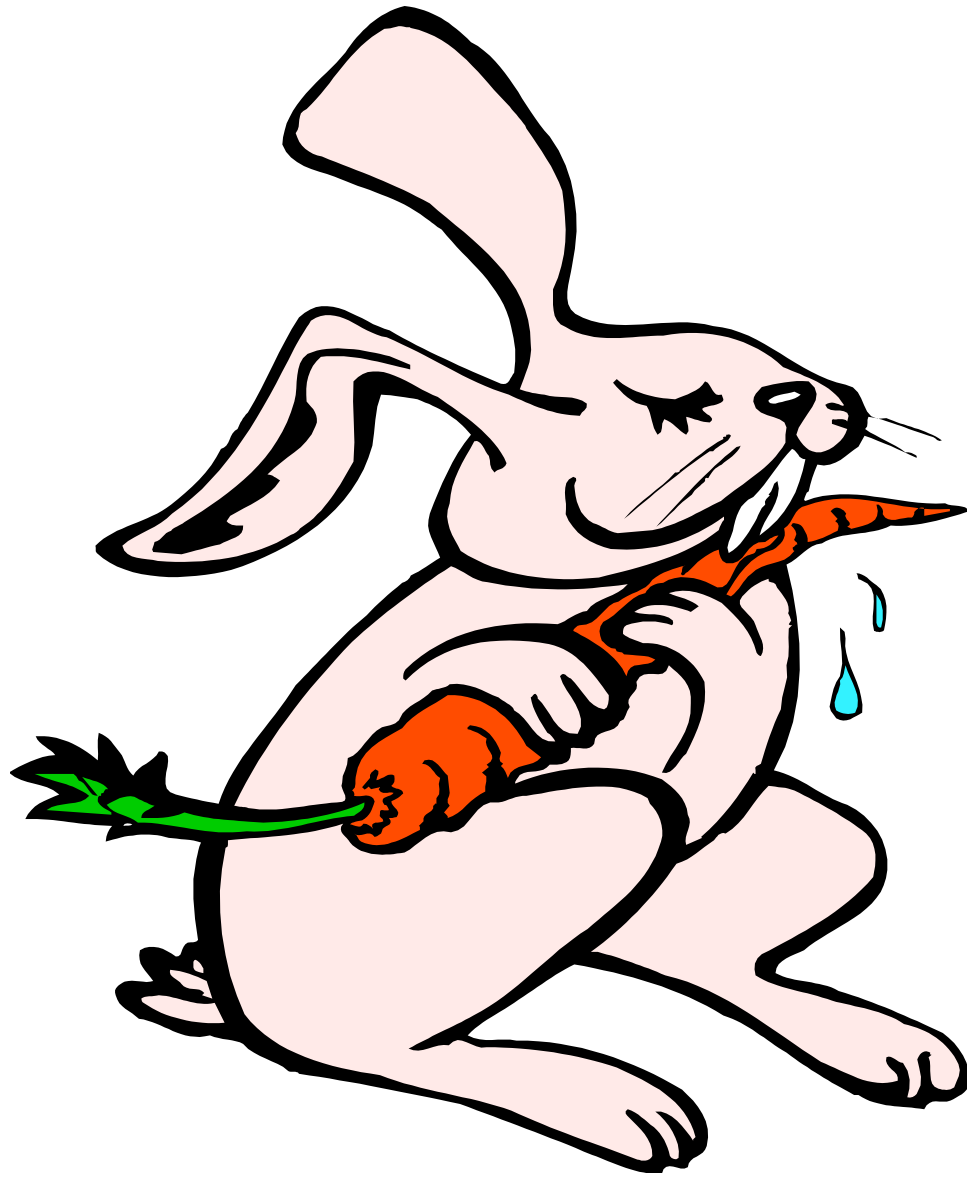
- Speed
- Capacity
- Cost



RAM: small, expensive, fast



Hard drives: big, cheap, slow



Best of both worlds? cheap, fast, and big

Caching

- **Idea:** move data you're going to use from slow memory into fast memory
 - Slow memory is cheap so you can buy lots of it
 - Caching gives you the illusion of having lots of fast memory
- Physical analogy?
- How do we know what data to cache?
 - Spatial locality: If the system fetched x , it is likely to fetch data located near x (Why?)
 - Temporal locality: If the system fetched x , it is likely to fetch x again (Why?)

Example 3: Replication

Characterizing Reliability

“Nines”	Availability	Downtime (per year)
One nine	90%	36.5 d
Two nines	99%	3.65 d
Three nines	99.9%	8.76 h
Four nines	99.99%	52.56 m
Five nines	99.999%	5.256 m
Six nines	99.9999%	31.536 s

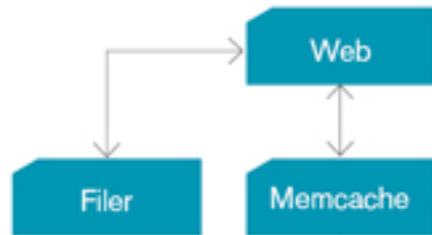
How do you ensure reliability?

- Keep multiple copies:
 - On different machines
 - On different machines far apart
- What are the challenges with this?
 - Synchronous vs. Asynchronous
 - Active-Active vs. Active-Passive
 - ...

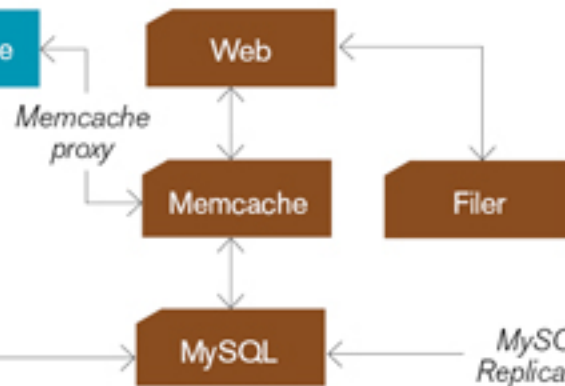
FACEBOOK ARCHITECTURE



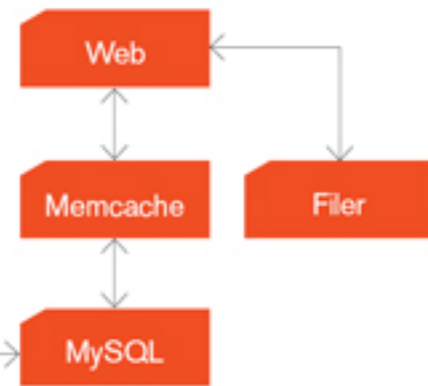
San Francisco



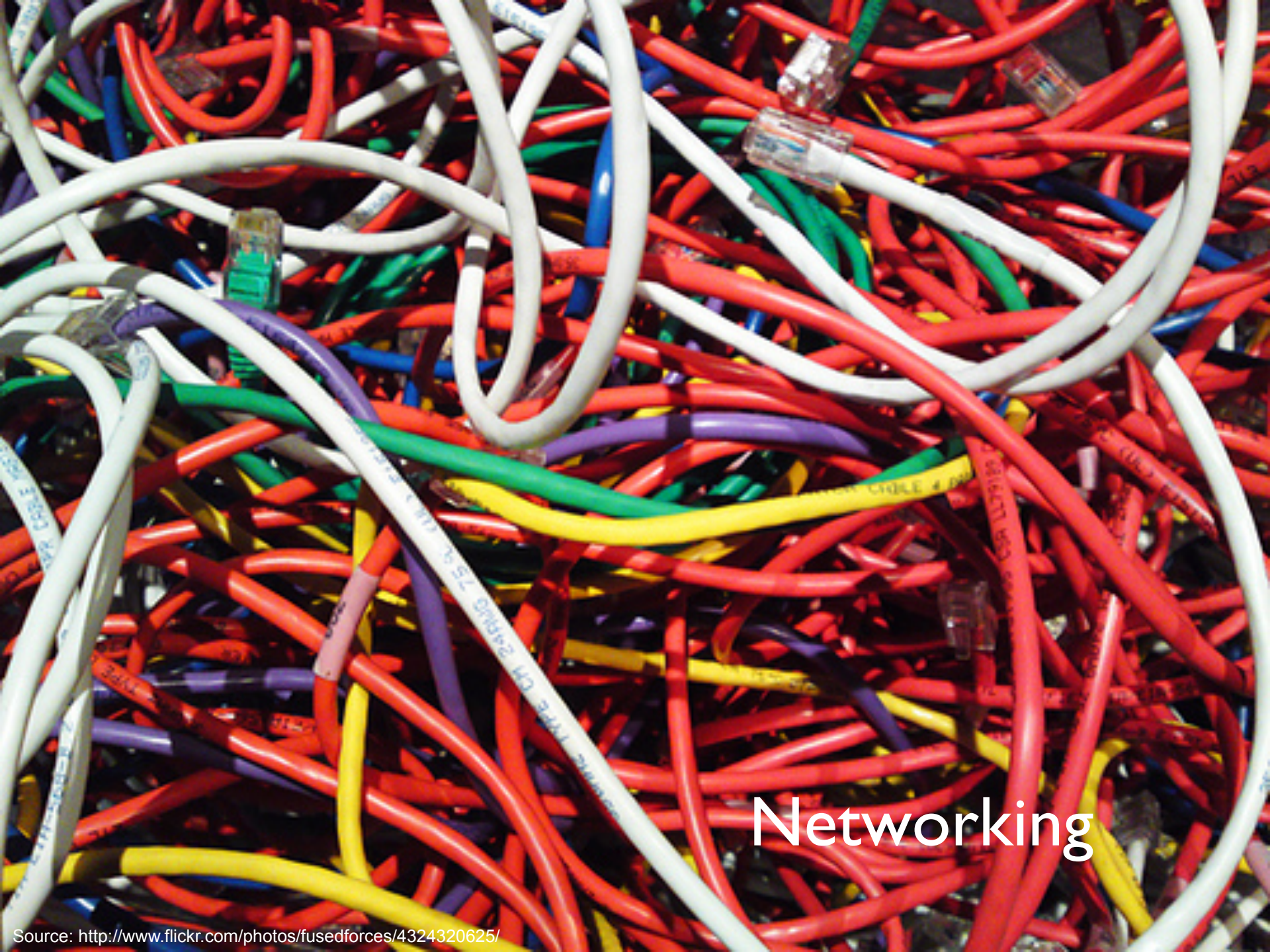
Santa Clara



Virginia



Facebook architecture
(circa 2008)

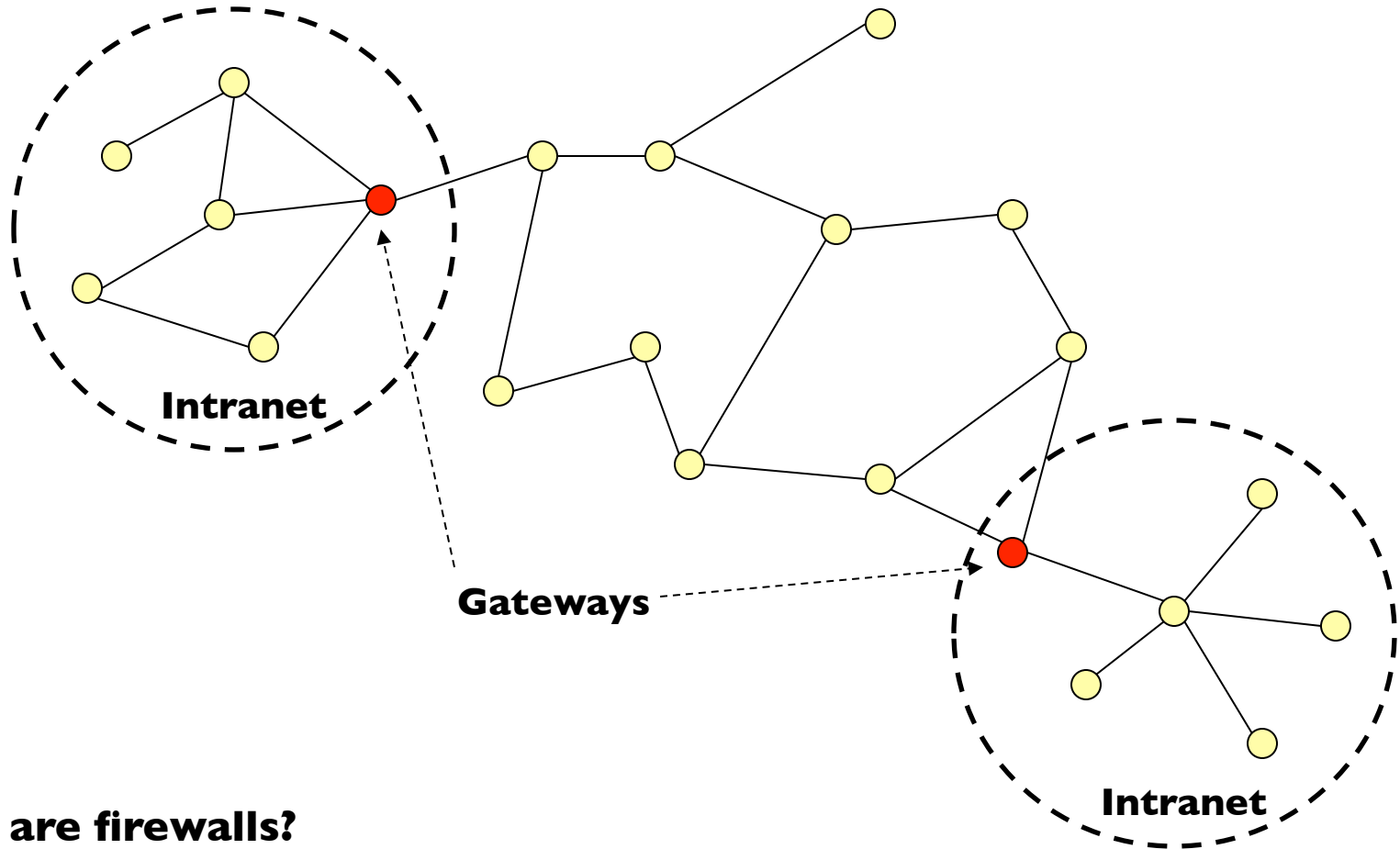


Networking

Internet ≠ Web

- Internet = collection of global networks
- Web = particular way of accessing information on the Internet
 - Uses the HTTP protocol
- Other ways of using the Internet
 - Usenet
 - FTP
 - email (SMTP, POP, IMAP, etc.)
 - Internet Relay Chat

Intranets

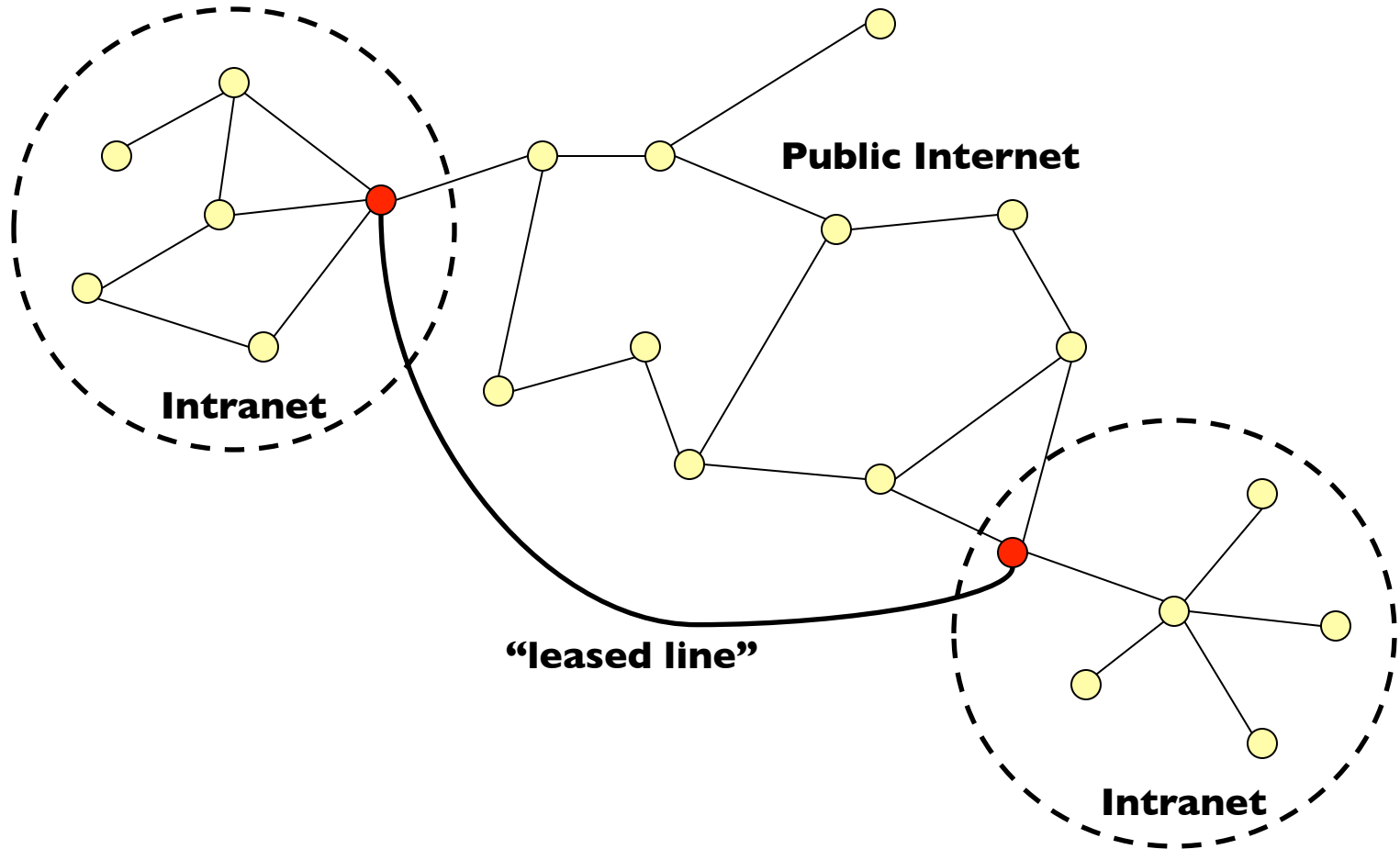


What are firewalls?

Why can't you do certain things behind firewalls?

Intranets

Problem: How do you securely connect separate networks?



VPN = Virtual Private Network
a secure private network over the public Internet

Foundations

- Basic protocols for the Internet:
 - TCP/IP (Transmission Control Protocol/Internet Protocol):
basis for communication
 - DNS (Domain Name Service):
basis for naming computers on the network
- Protocol for the Web:
 - HTTP (HyperText Transfer Protocol):
protocol for transferring Web pages

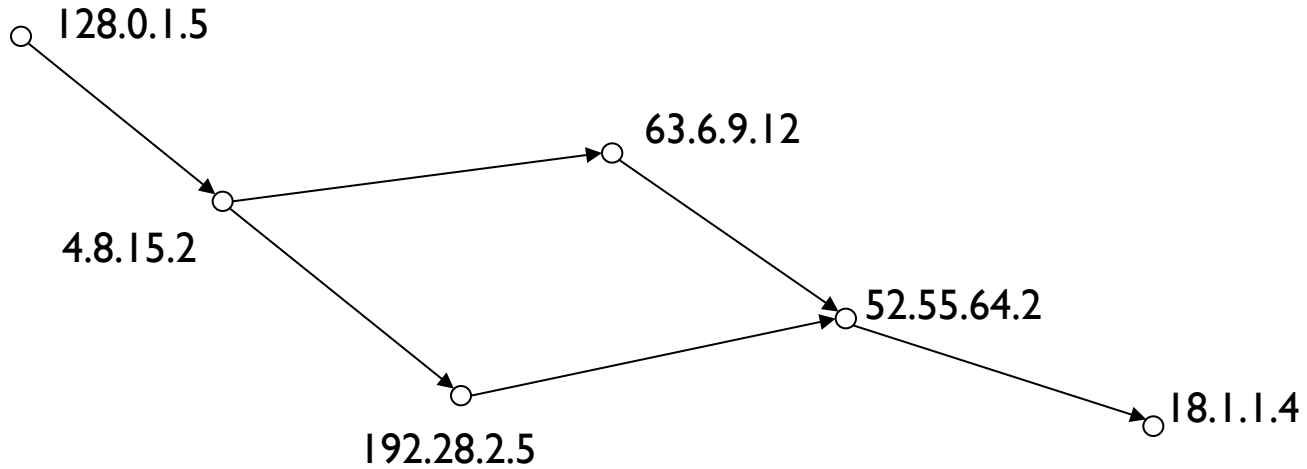
IP Address

- Every computer on the Internet is identified by a address
- IP address = 32 bit number, divided into four “octets”
 - Example: go in your browser and type “http://74.125.131.147/”

Are there enough IP addresses to go around?

What is the difference between static and dynamic IP?

Packet Routing (TCP/IP)



(Much simplified) Routing table for 4.8.15.2

Destination	Next Hop
52.55.*.*	63.6.9.12
18.1.*.*	192.28.2.5/63.6.9.12
4.*.*.*	225.2.55.1
...	

Domain Name Service (DNS)

- Domain names improve usability
 - Easier to remember than IP addresses
 - DNS provides a lookup service
- Each name server knows one level of names
 - “Top level” name server knows .edu, .com, .mil, ...
 - .edu name server knows umd, mit, stanford, ...
 - .umd.edu name server knows ischool, wam, ...

Demo

- Play with various utilities at
 - <http://network-tools.com/>
 - <http://www.yougetsignal.com/tools/visual-tracert/>
 - <http://en.dnstools.ch/visual-traceroute.html>

HyperText Transfer Protocol

- Send request

```
GET /path/file.html HTTP/1.0  
From: someuser@somedomain.com  
User-Agent: HTTPTool/1.0
```

- Server response

```
HTTP/1.0 200 OK  
Date: Fri, 31 Dec 1999 23:59:59 GMT  
Content-Type: text/html  
Content-Length: 1354  
<html><body> <h1>Happy New Millennium!</h1> ... </body> </html>
```

Tell me what happens...

- From the moment you click on “check messages” to the moment you start reading your email
- From the moment you click “send” to the moment the other party receives the email
- From the moment you type a URL and hit “enter” to the moment you see the Web page

Tables



Tables

```
<table>  
<tr><td>  eenie  </td><td>  mennie </td><td>  miney  </td></tr>  
<tr><td>  mo    </td><td>  catch  </td><td>  a tiger </td></tr>  
<tr><td>  by    </td><td>  the    </td><td>  toe    </td></tr>  
</table>
```

eenie	mennie	miney
mo	catch	a tiger
by	the	toe

CSS



What's a Document?

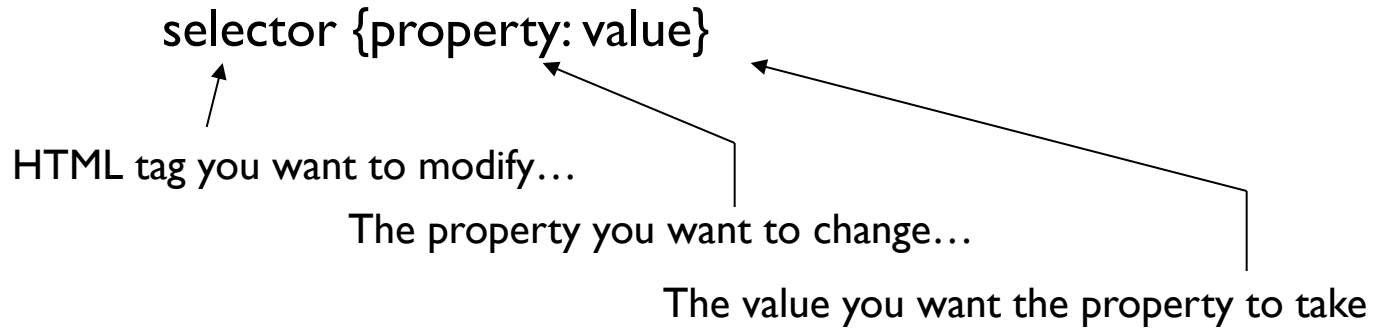
- Content
- Structure
- Appearance
- Behavior

CSS: Cascading Style Sheets

- Separating content and structure from appearance
- Rules for defining styles “cascade” from broad to narrow:
 - Browser default
 - External style sheet
 - Internal style sheet
 - Inline style

Basics of CSS

- Basic syntax:



- Example:

```
p { text-align: center;  
  color: black;  
  font-family: arial }
```

Causes

- Font to be center-aligned
- Font to be Arial and black

Different Ways for Using CSS

- Inline style:

- Causes only the tag to have the desired properties

```
<p style="font-family:arial; color:blue">...</p>
```

- Internal stylesheet:

- Causes all tags to have the desired properties

```
...  
<head>...  
<style type="text/css">  
p { font-family:arial; color:blue}  
</style>  
</head>  
<body>  
<p>...</p>  
...
```

Customizing Classes

- Ability to define customized styles for standard HTML tags:

```
...  
<head>...  
<style type="text/css">  
p.style1 { font-family:arial; color:blue}  
p.style2 { font-family:serif; color:red}  
</style>  
</head>  
<body>  
<p class="style1">...</p>  
<p class="style2">...</p>  
...
```

External Style Sheets

- Store formatting metadata in a separate file

```
p.style1 { font-family:arial; color:blue}
p.style2 { font-family:serif; color:red}
```

```
...
<head>...
<link rel="stylesheet" href="mystyle.css" type="text/css" />
</head>
<body>
<p class="style1">...</p>
<p class="style2">...</p>
...
```

Why Use CSS?

- What are the advantages of CSS?
- Why have three separate ways of using styles?