

# CSC 551: Web Programming

Spring 2004

See online syllabus at:

<http://www.creighton.edu/~davereed/csc551>

Course goals:

- understand the technology and protocols underlying the World Wide Web
- become familiar with common tools and techniques for developing Web-based applications, both client-side and server-side
- develop a working knowledge of HTML, JavaScript, Java, and PHP as languages for developing Web applications

1

## Reasonable questions

What is the World Wide Web?

Is it the same thing as the Internet?

Who invented it?

How old is it?

How does it work?

What kinds of things can it do?

What does it have to do with programming?

2

## Web ≠ Internet

**Internet:** a physical network connecting millions of computers using the same protocols for sharing/transmitting information (TCP/IP)

- in reality, the Internet is a network of smaller networks

**World Wide Web:** a collection of interlinked multimedia documents that are stored on the Internet and accessed using a common protocol (HTTP)

**Key distinction: Internet is hardware; Web is software**

**Many other Internet-based applications exist**

e.g., email, telnet, ftp, usenet, Instant Messenger, Napster, ...

3

## History of the Internet

**the idea of a long-distance computer network traces back to early 60's**

- Licklider at M.I.T.
- Baran at Rand
- National Physics Laboratory in U.K.

**in particular, the Department of Defense was interested in the development of distributed, decentralized networks**

- survivability (i.e., network still functions despite a local attack)
- fault-tolerance (i.e., network still functions despite local failure)

*contrast with phone system, electrical system*

**in 1969, Advanced Research Project Agency funded the ARPANET**

- connected computers at UCLA, UCSB, SRI, and Utah
- allowed researchers to share data, communicate  
56Kb/sec communications lines (vs. 110 b/sec over phone lines)

4

## Internet growth

throughout the 70's, the size of the ARPANET doubled every year

- decentralization made adding new computers easy
- ~1000 military & academic computers connected by 1984

in 80', U.S. government took a larger role in Internet development

- created NSFNET for academic research in 1986
- ARPANET was retained for military & government computers

by 90's, Internet connected virtually all colleges & universities

- businesses and individuals also connecting as computing costs fell
- ~1,000,000 computers by 1992

in 1992, control of the Internet was transferred to a non-profit org

- Internet Society: Internet Engineering Task Force  
Internet Architecture Board  
Internet Assigned Number Authority  
World-Wide-Web Consortium

...

5

## Internet growth (cont.)

Internet has exhibited exponential growth – doubling in size every 1-2 years (stats from *Internet Software Consortium*)

estimated >600 million Internet users in 2002 ([www.nua.ie](http://www.nua.ie))

Year	Computers on the Internet
2002	162,128,493
2000	93,047,785
1998	36,739,000
1996	12,881,000
1994	3,212,000
1992	992,000
1990	313,000
1988	56,000
1986	5,089
1984	1,024
1982	235

6

## History of the Web

the idea of hypertext (cross-linked and inter-linked documents) traces back to Vannevar Bush in the 1940's

- online hypertext systems began to be developed in 1960's
  - e.g., Andy van Dam's FRESS, Doug Englebert's NLS
- in 1987, Apple introduced HyperCard

in 1989, Tim Berners-Lee at the European Particle Physics Laboratory (CERN) designed a hypertext system for linking documents over the Internet

- designed a (Non-WYSIWYG) language for specifying document content
  - which evolved into HyperText Markup Language (HTML)
- designed a protocol for downloading documents and interpreting the content
  - which evolved into HyperText Transfer Protocol (HTTP)
- implemented the first browser -- text-based, no embedded media

the Web was born!

7

## History of the Web (cont.)

the Web was an obscure, European research tool until 1993

in 1993, Marc Andreessen (at the National Center for Supercomputing Applications) developed Mosaic, the first graphical Web browser

- the intuitive, clickable interface made hypertext accessible to the masses
- made the integration of multimedia (images, video, sound, ...) much easier
- Andreessen left NCSA to found Netscape in 1994
  - cheap/free browser popularized the Web (75% market share in 1996)
  - in 1995, Microsoft came out with Internet Explorer
  - Netscape bought by AOL in 1999 for \$10 billion in stock

today, the Web is the most visible aspect of the Internet

8

## Web growth

Stats from  
Netcraft Web Server Survey.

IE →  
Netscape →  
Mosaic →

Year	Computers on the Internet	Web Servers on the Internet
2002	162,128,493	33,082,657
2000	93,047,785	18,169,498
1998	36,739,000	4,279,000
1996	12,881,000	300,000
1994	3,212,000	3,000
1992	992,000	50

recent estimates suggest 40-50 M Web sites, with 4-5 B Web pages!

9

## Static vs. dynamic pages

most Web pages are *static*

- contents (text/links/images) are the same each time it is accessed

*e.g., online documents, most homepages*

HyperText Markup Language (HTML) is used to specify text/image format

as the Web moves towards online services and e-commerce, Web pages must also provide *dynamic* content

- pages must be fluid, changeable (e.g., rotating banners)
- must be able to react to the user's actions, request and process info, tailor services

*e.g., amazon.com, www.thehungersite.com*

this course is about applying your programming skills to the development of dynamic Web pages and applications

10

## Client-side programming

can download program with Web page, execute on client machine

- simple, generic, but insecure

### JavaScript

- a scripting language for Web pages, developed by Netscape in 1995
- uses a C++/Java-like syntax, so familiar to programmers, but simpler
- good for adding dynamic features to Web page, controlling forms and GUI
- see [www.creighton.edu/~davereed/Memory](http://www.creighton.edu/~davereed/Memory)

### Java applets

- can define small, special-purpose programs in Java called applets
- provides full expressive power of Java (but more overhead)
- good for more complex tasks or data heavy tasks, such as graphics
- see [www.creighton.edu/~davereed/csc107.F03/Labs/MontePI.html](http://www.creighton.edu/~davereed/csc107.F03/Labs/MontePI.html)

11

## Server-side programming

can store and execute program on Web server, link from Web page

- more complex, requires server privileges, but secure

### CGI programming

- programs can be written to conform to the *Common Gateway Interface*
- when a Web page submits, data from the page is sent as input to the CGI program
- CGI program executes on server, sends its results back to browser as a Web page
- good if computation is large/complex or requires access to private data

### Active Server Pages, Java Servlets, PHP, Server Side Includes

- vendor-specific alternatives to CGI
- provide many of the same capabilities but using HTML-like tags

12

## Exercise

pick some of your favorite Web sites and try to identify

- static components?
- dynamic components?
  - client-side? JavaScript? Java applet?
  - server-side? CGI? ASP?

e.g., [www.creighton.edu/~davereed/csc551](http://www.creighton.edu/~davereed/csc551)

[www.creighton.edu](http://www.creighton.edu)

[www.thehungersite.com](http://www.thehungersite.com)