Midterm exam on Tuesday, October 23
The format of the midterm exam is multiple-choice.

Questions will be both concept- and code-based.

You should be familiar with material from the lectures, slides, and reading.

You should also be able to read and answer questions about HTML, CSS, and SVG code.

Be sure to arrive on time and bring your NYU ID and a pencil.
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Class 1
Introduction and Overview
What is the Internet?

A computer network consisting of a worldwide network of computer networks that use standardized network protocols to facilitate data transmission and exchange.
1964, On Distributed Communications
A decentralized network represents a less-hierarchical structure than a centralized network. Complete reliance on a single point is not required.

The foundational concept of decentralized networks would be deployed in tandem with what came to be known as “packet-switching,” which entails breaking up communications into small parts, sending them along, and reconstructing them at the end.
The Internet and the World Wide Web
The Internet and the World Wide Web

The Internet and the Web are separate but related things.

The Internet is a massive network of networks, a networking infrastructure that connects computers globally.

The Web is a way of accessing information over the medium of the Internet, an information sharing model that is built on top of the Internet.

The Web is just one of the ways that information can be disseminated over the Internet but it is the one we are focused on in this class.
Internet Access
1980s–Present

- Personal Computing
- Portable Computing
- Mobile Computing
- Ubiquitous Computing
IBM 5150
1981
Apple PowerBook 540c
1993
Apple iPhone
2007
Ubiquitous Computing
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Class 1

Introduction and Overview
The Open Web and its Discontents

In many ways we are experiencing the afterglow of the technological promise of freedom and openness.

Networked tools and digital media still offer lots of possibilities but also significant problems.

What are some of the dystopian aspects of the Internet and the Web today?
Re-Decentralization

“A new Decentralized Web has the potential to be open, empowering users around the globe to control and protect their own personal data better than before.”

Decentralized Web Summit
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Class 1
Introduction and Overview
Digital Media Storage

Modern vernacular of 1s and 0s

On/Off

Electrical impulses (+5v / -5v)

• Single 0 or 1 = 1 “bit”
• A group of 8 bits = 1 “byte”
• 1 million bytes ≈ 1 “megabyte”
• 1,024 megabytes = 1 “gigabyte”
• 1,000 gigabytes = 1 “terabyte”
00101011
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Class 1
Introduction and Overview
12.3 Megabits per second

Testing upload...
Digital Media Transfer

Megabits (Mb)

Internet connection speed is normally measured in megabits.

Megabits (Mb) are not the same as megabytes (MB).

8 bits = 1 byte; therefore, a megabyte is 8 times the size of a megabit.

The average Internet connection speed in the United States in 2015 was 12.6 Mb/second.
curve shows transistor count doubling every two years
Moore’s Law

Describes a constant rate of change in computer processor speed

The number of transistors that can be placed inexpensively on an integrated circuit doubles every two years.

The number of transistors is closely connected to processor speed, memory, etc.

Computer processor speed has doubled approximately every two years

Moore’s Law seems to be plateauing but has held steady for the past 40 years.

Digital media is in a constant state of flux.
Guiding Principles

Open Source

• Anyone is free to use it
• Usually free of charge
• Source code is made available
• Can be modified and redistributed
Guiding Principles

Net Neutrality

The principle that Internet service providers should enable access to all content and applications regardless of the source, and without favoring or blocking particular products or websites.
Guiding Principles
Web Standards

The formal, non-proprietary standards and technical specifications that define and describe aspects of the World Wide Web and its interoperability.

These include:
• HTML5
• CSS
• JavaScript
• SVG
• WOFF
Operating Systems

Software that manages a computer’s resources
Allocates resources among other programs
Resources include the central processing unit (CPU), computer memory, file storage, input/output (I/O) devices, and network connections
Runs indefinitely and terminates only when the computer is turned off
## Operating Systems

### Examples

- DOS (Generic term)
- Microsoft OS
- Mac OS
- Linux
- iOS
- Android
- Symbian OS
Operating Systems

History

First digital computers had no operating systems

Ran one program at a time, which had command of all system resources

A human operator would provide any special resources needed

First operating systems were developed in the mid-1950s
Command Line Interface / Graphical User Interface
Unix

Operating system by AT&T Bell Labs
Originally developed in 1969
Command line interface
Portable, multi-tasking, multi-user
Free distribution, open system
Servers, workstations, mobile devices
Basis of Linux and MacOS
Unix

Commands

See Reading section of course site for basic Unix commands.
Chmod

Chmod sets permissions

Every file and directory has nine permissions associated with it.

Files and directories have three types of permissions (or none):
- r (read)
- w (write)
- x (execute)
- - (no permission)

The above permissions occur for each of the following classes or users:
- u (user/owner)
- g (group)
- o (other/world)
<table>
<thead>
<tr>
<th>Permission</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>UG W</td>
<td>chmod 777 filename</td>
</tr>
<tr>
<td>rwx rwx rwx</td>
<td>chmod 775 filename</td>
</tr>
<tr>
<td>rwx rwx r-x</td>
<td>chmod 755 filename</td>
</tr>
<tr>
<td>rwx r-x r-x</td>
<td>chmod 664 filename</td>
</tr>
<tr>
<td>rw- rw- r--</td>
<td>chmod 644 filename</td>
</tr>
</tbody>
</table>
Chmod
Files and folders

Standard file permission:
644
Owner can read and write file;
group can read file;
others can read file

Standard directory permission:
755
Owner can read, write and execute file;
group can read and execute file;
others can read and execute file
HTML

HyperText

Markup Language

A language for describing Web pages

HTML is not a programming language, it is a markup language

A markup language is a set of markup tags

HTML uses markup tags to describe Web pages
HTML

Early history key dates

1990: Original HTML specification written by physicist, Tim Berners-Lee for cross-referencing documents

1993: First text-based browser, Lynx, released

1993: Mosaic browser released, adding images, nested lists, forms

1994: First World Wide Web conference held in Geneva

1994: Netscape is formed

1994: The World Wide Web Consortium is formed, w3.org
HTML Tag
Opening/Closing

Keywords surrounded by angle brackets, for example: <html>

HTML tags normally come in pairs, like <h1> and </h1>

The first tag in a pair is the “start tag,” the second tag is the “end tag”

Start and end tags are also called “opening” and “closing” tags
**HTML Element**
Everything from the start tag to the end tag

Example:

```
<p>This is a paragraph.</p>
```

Start tag:

```
<p>
```

Element content:

```
This is a paragraph.
```

End tag:

```
</p>
```
Web Pages

HTML Documents

HTML documents describe Web pages
Contain HTML tags in plain text
HTML documents are Web pages
Recommended plain text editors:
Sublime Text, Brackets, and Atom
Web Browsers

Render HTML Documents

Reads HTML documents and displays them as Web pages

Web browsers do not display HTML tags, but use them to interpret the content of the page

Recommended browsers:
Firefox, Chrome, Safari, Edge
Example
Bare minimum

<!DOCTYPE html>
<html>
<head>
  <meta charset="utf-8">
  <title>Page Title</title>
</head>
<body>
</body>
</html>
Example Explained

<!DOCTYPE html> tells browsers that they are interpreting an HTML document

Text between <html> and </html> describes the Web page

Text between <title> and </title> is displayed as the page title

Text between <body> and </body> is the visible page content
SFTP

SSH (Secure) File Transfer Protocol

Web pages are usually created “locally” on a personal computer, then uploaded to a web server

A web page is not publicly accessible until it’s published to a web server

An FTP client is used to transfer files from a personal computer to a server

Cyberduck, Fetch, WinSCP, Transmit, and FileZilla are good SFTP clients

“Local” files are those on a personal computer, “remote” files are those on a web server—“live”
HTML5

New standard for HTML

- First version published in 2008
- An official W3C recommendation as of October 2014
- New Elements
- New Attributes
- Full CSS3 Support
- Video and Audio
- 2D/3D Graphics
- Web Applications
- Smartphone Apps
CSS
Cascading Style Sheets

Defines a Web page’s appearance

CSS separates style and content

Consists of a plain text file with rules for the display of HTML elements

Formatting includes fonts and colors as well as layout and position

Can be created outside of your HTML and applied to multiple Web pages

Well-formed HTML is important for your CSS to work properly
CSS

History

Prior to CSS, Web pages were commonly styled with HTML tags and structured with tables

This was both tedious and inefficient

Nine different style sheet languages were proposed, two were chosen as the foundation

CSS Level 1 emerged as a W3C Recommendation in December 1996

Browsers began to support CSS over the next few years
CSS Application

CSS can be applied in three different ways to a Web page:

• In an external .css file

• In the <head> section of an HTML document

• Inline with HTML code
CSS

Rule Set

Selector: Indicates which HTML element will be formatted

Declaration block: Describes the formatting to apply

Property/value pair: Specifies format

Style rules are separated by a semicolon

h1 {
  color: green;
  background: yellow;
}

The principle of the “cascade” is applied when style rules are in conflict. Three primary factors determine which style rule wins out:

- Inheritance
- Specificity
- Location
Elements in HTML are primarily “inline” or “block” elements.

- An inline element allows content to flow around its left and right sides.
- A block element fills the entire line and nothing is displayed on its left or right side.

The CSS display property allows you to specify the type of box used for an HTML element.
CSS
Box Model

In a web page, every element is rendered as a rectangular box.

This box includes the following, changeable properties.

• Content
• Padding
• Border
• Margin
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CSS
Cascading Style Sheets
CSS

Units of Length

There are two types of length units in CSS, relative and absolute.

Relative units of length include:
• em (relative to font size)
• % (relative to the containing element)

Absolute units of length include:
• px (pixels)

Alternatively specifications:
• auto (browser calculates length)
• inherit (from the parent element)
CSS3

Latest standard for CSS

CSS2 is best supported

CSS3 is still evolving but offers new features for designers and developers

Modern browsers support many aspects of CSS3

Backwards compatible with CSS2
Raster Graphics

Also known as “bitmap” graphics

A grid of picture elements, “pixels,” each of which contain color and brightness information

Pixels can be changed individually or as a group with program algorithms

Contrast vector graphics which describe points and lines
Raster Graphics

Web Formats

JPEG
“Joint Photographic Experts Group”

PNG
“Portable Network Graphics”

GIF
“Graphic Interchange Format”

WebP
Up-and-coming image format but not well supported yet
Photoshop
1987

Created by Thomas Knoll, then a PhD student at the University of Michigan

Originally called “Display”

For displaying grayscale images, scanned into a computer

Acquired by Adobe in 1988

Released as Photoshop 1.0 for Macintosh in 1990

Layer support introduced in version 3 (c. 1993)
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SVG
Scalable Vector Graphics
SVG
Scalable Vector Graphics

SVG is a language for describing two-dimensional graphics in XML.

SVG allows for three types of graphic objects: vector graphic shapes, images, and text.

SVG drawings can be interactive and even styled with CSS.
SVG

Scalable

To be scalable means to increase or decrease uniformly

In terms of graphics, means not being limited to a single, fixed, pixel size

On the Web, scalable means that a particular technology can grow

SVG is scalable in both senses of the word
SVG

Vector

Vector graphics contain geometric objects such as lines and curves. This gives greater flexibility compared to raster-only formats. Since all modern displays are raster-oriented, the difference between raster-only and vector graphics comes down to where they are rasterized. Vector graphics are rasterized client side; raster graphics are, by nature, already rasterized on the server.
SVG Graphics

Most existing XML grammars represent either textual information or raw data

They typically provide only rudimentary graphical capabilities

SVG provides a rich, structured description of vector and mixed vector/raster graphics

Scalable Vector Graphics (SVG) 1.1 Concepts
http://www.w3.org/TR/SVG/concepts.html
SVG

Advantages

- SVG images can be created and edited with any text editor
- SVG images can be searched, indexed, scripted, and compressed
- SVG images are scalable, can be printed at any resolution, and are zoomable without degradation
- SVG is an open standard
- SVG files are pure XML

SVG Introduction
http://www.w3schools.com/svg/svg_intro.asp
XML stands for Extensible Markup Language

XML is a markup language much like HTML

XML was designed to carry data, not to display data

XML tags are not predefined. You must define your own tags

XML is designed to be self-descriptive

SVG is written in XML

Introduction to XML
http://www.w3schools.com/xml/xml_whatis.asp
SVG

Styleable

The advantages of style sheets are now generally accepted, certainly for use with text

SVG extends this control to the realm of graphics

It allows for script-based manipulation of the document tree and the style sheet

Scalable Vector Graphics (SVG) 1.1 Concepts
http://www.w3.org/TR/SVG/concepts.html
SVG

On the Web

There are a variety of ways in which SVG content can be included within a Web page:

- A stand-alone SVG Web page
- Embedding by reference, using the HTML ‘img’ element
- Embedding inline
- External link, using the HTML ‘a’ element
- Referenced from a CSS property

Scalable Vector Graphics (SVG) 1.1 Concepts
http://www.w3.org/TR/SVG/concepts.html
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