ATLS 4630/5630: Web Front-End Development
Week 1: Web Refresher

As a web developer it's important to understand how computers communicate on the Internet and how data is requested and delivered.

What is the Internet?

- A collection of interconnected computer networks
- TCP/IP (Transmission Control Protocol/Internet Protocol)
- Each computer has a unique IP address
- Domain Name System (DNS)
- Routers

What is DNS?

- Domain Name System
- A domain is a related group of computers
- DNS translates computer names into IP addresses
- DNS server keeps a list of DNS names and their corresponding IP addresses
- Routers direct a request or message to the correct computer

What is TCP/IP?

- transmission control protocol/internet protocol
- Protocols are a set of rules and standards that computers communicate and share data with another, regardless of software or operating system
- Other protocols?
    - HTTP
    - FTP, SFTP

World Wide Web

How is the Web different than the Internet?
The Web is built on top of the Internet like other Internet services such as email.

- Internet: the network (wires and routers) connecting the computers
- WWW: web servers and the files that make up web sites

Tim Berners-Lee – WWW 1989-1991, command line interface, inspired by Ted Nelson
Marc Andreesen and others at Univ of Illinois – Mosaic GUI browser 1993

What is HTTP?

- HyperText Transport Protocol
- Stateless protocol – once a request has been sent and received, it's forgotten. So tasks such as logins, browsing sessions or shopping carts aren't remembered from request to request
    - Cookies -- small text files stored in the browser
    - JavaScript programs run in the browser
    - Server-based session management

Browsers

- Use HTTP to request files from a web server
- Use refresh to request file from the server even if it's cached in the browser

    - Sometimes need a hard refresh: command shift 5 (mac)
- Browsers have 3 different engines
    - Browser engine
        - Handles communication between the rendering engine and the user interface
    - Rendering engines
        - WebKit – used in Safari
        - Blink – based on WebKit but being developed separately by Google. Used in Chrome, Opera, and the new Microsoft Edge (being rebuilt in 2019)
        - Gecko – open sourced to Mozilla and used in Firefox (upgrading to Quantum)
    - JavaScript engine
        - Runs JavaScript in the browser
- Local storage can store pages and cookies
    - browser cache
- Document Object Model
    - The browsers object model of the web page

Servers

- Computer with web server software installed
- IP address registered with DNS so its site can be found

HTML

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It's important to have well structured and semantic HTML

- Conveys meaning
- Helps comprehension
- Enhances ease of use
- Used by search engines
- Improves accessibility
- Improper structure can make content unreachable and cause errors

An HTML document has three basic parts:

- <html> HTML element
- <head> HEAD element (about the document)
- <body> BODY element (document text)

HTML elements have three parts:

- Opening tag, content, closing tag
- Tags act as containers for their content
- All tags should be closed . . .
- Tags need to be properly nested
    - <h4>text</h4>

Attribute values must be in quotation marks

-

Valid characters in HTML are A-Z, a-z, 0-9 and some symbols and punctuation

- Reserved symbols: & " < >

Valid HTML

- Make sure your HTML is valid

    - W3C Validator http://validator.w3.org
- Always check all your links after you publish
    - W3C Link Checker http://validator.w3.org/checklink
- You should run every page you publish through the HTML validator.
- Just because your page looks ok in one browser does not mean it's valid HTML.
- Invalid HTML can cause problems in other browsers, search engines, or screen readers.

Hyperlinks

- Hyperlinks link web pages using a web address (URL).
- Link label – clickable element on a web page
    - text or image
- Link destination – target destination
    - another html file or any file
- This is a link
    - anchor tag: <a> link label
    - href attribute specifies the link destination
- University of Colorado
    - Univ of Colorado is the link label
    - http://www.colorado.edu is the link destination
- Absolute URL
    - Linking to other web sites use the full web address
    - Specifies entire location
- Relative URLs link to other pages on the same site
    - the location is relative to the URL of the current page
    - Don't need to specify the full URL

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How would you link to the official star wars page? `http://www.starwars.com/`

How would you link to the FAQ page?

What could you do to get the second link on a new line?

Instead of the <h1>Star Wars tag how would you link to the starwarslogo400.png image in the images folder?

From index.html how would I make Leia a link to the leia.html page?

From leia.html how would I link to characters.html?

From leia.html how would I link to index.html?

Relative URLs make a web site portable – can move pages to a new server without changing all the links, since they are relative

- Move all pages to the new site
- Replicate same directory structure

More efficient – DNS doesn't need to look up the server location again, just the file being requested

Relative links are shorter in your HTML

Images

Images should

- Be relevant
- Convey information

- Add value based on the goal of your web site
- Target your users
- Enhance your design

The <img> tag embeds an image in a web page and has two required attributes:
- src: the source of the image
- alt: alternate text for an image

The <img> tag has two optional attributes that you should not use:
- height: the height of the image (pixels)
- width: the width of the image (pixels)
- Pros
    - Space specified for the image is reserved while the rest of the page is rendered
- Cons
    - Forces the size of the image making it not responsive on different size devices
    - Enables developers to be lazy and use large files when not needed
    - Too easy to distort images

There are 3 rules to remember when creating/editing images for the web
- Use the right format (slide)
    - JPEG
        - Photos, lots of colors, lots of gradients, shading
        - Text can sometimes look bad
    - PNG
        - Logos, page elements, backgrounds
        - Graphics with transparency
    - GIF
        - Animation, otherwise PNG
    - SVG
        - Logos, page elements, backgrounds
        - Retina displays
- Save images in the right dimensions
    - Maintain the image's aspect ratio
- Use the correct resolution
    - The higher the resolution of an image, the larger the file size
    - 72 ppi (pixels per inch) is a good resolution for web images that are bitmap/raster
    - Vector images are resolution independent and are scalable
        - SVGs are supported by all modern browsers

Be thoughtful in your use and creation of images on web pages
Keep your total page size < 1MB(1024KB)

Identifying Elements

How do the id and class attributes differ?
The id attribute is used to uniquely identify an element
- Can be used with any element
- No two elements can have the same id in a page
- Use an id when you want to be able to refer to that element

The class attribute lets you group together several elements on a page
- Can be used with any element

Identifying elements on page is useful for

- styling
- interactivity
- links within a document(ids)

CSS

- CSS controls the style and presentation of elements
- CSS associates style rules with HTML elements
- selector {property: value; property: value; property: value; }
    - The selector is the element the style is for
    - The property is a style effect
    - The value is being assigned to that property
- p {color: blue; font-size: 120%; }
    - All text in and tags would be blue and sized 120% of the default font size
- How do you select a class named assignment?
    - . assignment
- How do you select an id named intro?
    - #intro
- You can group them by creating a list using commas
- You can be more specific by chaining them
    - p.assignment
- Descendent selectors don't use a comma
    - section p a
- Selectors with a higher specificity ranking take precedence
    - IDs (highest)
    - Class
    - Type (lowest)
- For identical selectors order matters, the later rule applies
- Guideline - start with more general selectors then get more specific as needed
    - Type selectors
    - Class selectors
    - ID selectors
    - Descendant selectors
- There are 3 ways to implement CSS on your site:
    - Create an external style sheet to hold all your CSS rules that all your pages can use
    - Define CSS rules in the <head> section of a page
    - Use the style attribute to put CSS rules directly into a HTML element
- Cascading style sheets mean that your rules can cascade.
    - Rules from your external style sheet will be applied first
    - Rules in the <head> section of a document will override those
    - Rules in the style attribute will override all others

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How do we link to the external stylesheet?
How do we give our whole page a background color?

- Be careful of making your background-color black, black text won't show up!

How do we make our Star Wars heading a different color (pick a color)

How would I make all the trilogy names a different color? (pick a color)
What if I had other h4 tags on the page?
What if I wanted to make my favorite character bold?
HTML and CSS work together and affect each other so they need to be planned together as well
What if I wanted all the trilogy movie names to be italic?
Add another rule for the same selector

CSS Box model (slide)
The CSS box model describes how the size of elements are calculated.
To the browser, every HTML element is a rectangular box.
An element's default box size is based on its content.
The developer tools shows you the box model for each element.

Block vs inline elements

- Block elements start on a new line so their box model is the full width of the window
- Inline elements stay on the same line so their box model is the size their content needs

There are five CSS properties used to determine the size and spacing of the elements.

- width and the height are used to set a specific width or height value to the content box
    - The display property is required for inline elements in order to apply width and height properties
- min-width and max-width enable a box's width to be flexible
- Border adds a border between the padding and the margin of an element
    - Every box has a border that separates one box from another
    - controls the border width, style, and color
    - Shorthand lists these width style color
        - border: 2px dashed yellow
- Padding adjusts the space inside of the element.
    - Padding is the space between the border of the box and the content in the box
    - Use padding when you don't want the content within an element to go to the edge of the box
- Margin controls the amount of space around the outside of the element
    - Block elements stack on top of each other by default
    - Use margins to add space between boxes

Padding and margin shorthand are in clockwise order starting at the top

- Top right bottom left
    - padding: 10px 5px 3px 2px
    - margin: 1px 2px 3px 4px

Padding and border add to the overall size of an element's box.

Units

- Pixels are fixed units and offer control, but they're not very flexible.
    - Doesn't take into consideration screen size or user font size
- Percentages are relative to the size of the component's containing element
    - 100% is the browser's default type size
    - Needed to design and develop for different screen sizes

    - Used in responsive web design
- Em
    - 1em is the browser's default type size
- 16px is the default font size in most cases
    - 1.5em would be equivalent to 24px
    - 0.875em would be equivalent to 14px

To visualize the box model let's put a border around all of our li elements.
Padding adds space between the element and its box

- shorthand: top right bottom left
  padding: 20px 20px 5px 5px;

Margin adds space between boxes

- If we add margin-bottom: 20px; we don't see a difference
- The top and bottom margins of blocks are combined (collapsed) into a single margin whose size is the largest of the individual margins

CSS Layout
CSS was originally for formatting but not really layout.
The float property was added for simple layouts involving an image floating inside a column of text, with the text wrapping around the left or right of it. It was not meant to handle the layout of an entire page.
Flexbox was added to CSS in 2016 and is a one-dimensional layout method for laying out items in rows or columns. Items flex to fill additional space and shrink to fit into smaller spaces.
You set an element up as a flexbox container by assigning display to be flex.
All children of a flexbox container are flex items that you can set flex properties for.

There's a link to a great flexbox tutorial on canvas.

Grid was added to CSS in 2017 and handles two-dimension layout using rows and columns.
It already has a good adoption rate https://caniuse.com/
You set display to grid and the first-level descendants get applied to the grid.
Developer tools will show you the grid lines.
And it works with flexbox.

Flexbox vs grid:
Flexbox is good for smaller components, single access layout.
Grid handles two-dimensional web pages better.
Use grid for full page layout, use flexbox for individual components

Responsive Web Design
If your web site doesn't look and work well on a mobile device, you're losing over half your viewers.

Design issues:

- Smaller screen and display size
- Lower resolution
- Interface limitations
    - Harder to click on links, form elements, hovers, etc
- Many different size devices with varying capabilities and features (slides)

- Interaction on mobile devices is different
- Reduced support for video and animation
    - Flash does not work on iOS
- Bandwidth limitations
    - Keep total page size under 200K (3G and 4G)
- Reduced processing power and memory
- Distracted users

Design goals:

- Simplicity
- Speedy
- Useful
- Provide immediate information
- Limit scrolling
- Limit page sizes
- Rethink multimedia
- Large and easy to use clickable objects
- Focus on your target users and their usage patterns

Responsive Web Design let's you have one web site that adapts to different screen sizes and resolutions

- Can't make any assumptions about the device your site will be viewed on
    - Screen resolution
    - Browser window width
    - Default font size
    - Portrait or landscape
- Same content, different presentation (usually)
- Avoids major changes

Responsive web design is a set of techniques and ideas that enable the technology to respond to the user's environment

- Fluid grids (slide)
    - Design using proportions instead of fixed pixels
    - Express an element's size in relationship to its container
    - Flexbox and Grid layouts are responsive in nature
- CSS3 Media queries conditionally apply CSS styles
    - min-width sets a minimum browser/screen width
    - max-width sets a maximum width

@media screen and (max-width: 60em){ styles}
@media screen and (min-width: 60em) and (max-width: 85em){ styles}

- Conditionally load a different CSS stylesheet

<link rel="stylesheet" media="screen and (max-width: 60em)" href="small.css" />
<link rel="stylesheet" media="screen and (min-width: 60em)" href="large.css" />

    - Can also target orientation
- Flexible images and media
    - Don't set the height and width properties
    - Use CSS or dynamic sizing
    - img {max-width: 100%} lets the browser resize the image as needed
        - Full size image is still downloaded
        - Use the <picture> tag to specify different image sources based on the page layout

Viewport

- On many mobile devices web sites are automatically scaled to fit the smaller screen so a full-sized design shrinks and lets the user choose to zoom in and out. If you have a responsive web site you don't want this.
- Override the default to resize images

<meta name="viewport" content="width=device-width, initial-scale=1.0" />

These concepts are implemented using open web standards like HTML, CSS and JavaScript.

Examples

Flexbox http://creative.colorado.edu/~apierce/samples/alice_flexbox.html

- <meta name="viewport" content="width=device-width, initial-scale=1.0">
- display: flex
- percentages instead of fixed size
    - font
    - width
- If you assume the default font size to be 16px then 16px = 1em. 16x30=480 so that would be targeting 480 pixels
- max-width for image

Flexbox w/media queries http://creative.colorado.edu/~apierce/samples/alice_flexbox_media.html

- picture tag https://developer.mozilla.org/en-US/docs/Web/HTML/Element/picture
    - https://caniuse.com/#search=picture
- media queries

Creative server

Create a web page that will be the index page for your class portal

- Files must have a .htm or .html extension
- File names
    - no spaces, use camel case, underscore or dash
    - descriptive but not too long
    - File names are case sensitive
    - Home page default is index.htm
    - Use a consistent file naming scheme
- Create a folder in the workspace and save your file there
- Connect to the creative server
    - The public_html folder holds your public files
    - Create a fwd folder on the server in public_html
    - http://creative.colorado.edu/~*identikey*/fwd
- Publish to the server
    - File Transfer Protocol (FTP) transfers files from your local computer to the server
        - Fetch, FUGU, Cyberduck
- Always keep a backup of your site on a flash drive
- Always work from your local file in the Workspace
- Never edit directly on the server; make a local copy first