Comp 324/424 - Client-side Web Design

Spring Semester 2017 - Week 1

Dr Nick Hayward

course details

Lecturer

- Name: Dr Nick Hayward
- Office: 531 Lewis Towers (WTC)
- Office hours
  - *Monday afternoon by appointment (WTC)*
- Faculty Page

Important dates for this semester

- Spring break: 6th to 11th March 2017
  - ***n.b.*** *no formal class: 6th March 2017*
- DEV week: 6th March to 13th March 2017
  - *DEV week presentation due on Monday 13th March 2017 @ 4.15pm*
- Final class: Monday 24th April 2017
  - *Final presentation due on Monday 24th April 2017 @ 4.15pm*
- Exam week: 1st May to 6th May 2017
  - *Final assessment due on Monday 1st May 2017 @ 4.15pm*

Initial Course Plan - Part 1

(up to ~ DEV Week)

- Build and publish a web app from scratch
  - *general setup and getting started*
  - *maintenance and publication*
  - *basic development and manipulation (HTML, CSS, JS...)*
  - *add some fun with Ajax, JSON, server-side...*
  - *useful data storage techniques and options*
  - *testing...*

Initial Course Plan - Part 2

(Up to the end of the semester)

- Augment and develop initial app
- Explore other options
  - *further libraries and options*
  - *tools and workflows*
  - *visualisations, graphics...*
  - *publish (again...)*
- data options
  - *MongoDB, Redis...*
  - *APIs*
  - *cloud services (Firebase...)*
- React...

Assignments and Coursework

Course will include

- weekly bibliography and reading (where applicable)
- weekly notes, examples, extras...

Coursework will include

- quizzes or group exercises at the end of each section (Total = 30%)
  - *based on course notes, reading, and examples*
- development and project assessment (Total = 70%)
  - *mid-semester assessment (Total = 30%)*
    - end of DEV week
    - demo due Monday 13th March 2017 @ 4.15pm
  - *final assessment (Total = 40%)*
    - demo due 24th April 2017 @ 4.15pm
    - report due Monday 1st May 2017 @ 4.15pm

Quizzes, group exercises...

Course total = 30%

- at least one week notice before quiz
  - *average time ~40 minutes (can be extended...)*
  - *taken towards the end of class*
- group exercises
  - *help develop course project*
  - *test course knowledge at each stage*
  - *get feedback on project work*

Development and Project Assessment

Course total = 70% (Parts 1 and 2 combined total)

Initial overview

- combination project work
  - *part 1 = mid-semester **DEV Week** work (30%)*
  - *part 2 = final demo and report (40%)*
- group project (max 5 persons per group)
- design and develop a web app
  - *purpose, scope &c. is group's choice*
    - **NO** blogs, to-do lists, note-taking...
    - chosen topic requires approval
    - **NO** PHP, Python, XML, SQL, Bootstrap...
  - *must implement data from either*
    - MongoDB, Redis...
    - APIs
    - cloud services (Firebase...)

DEV Week Assessment

- web app developed from scratch
  - *examples, technology &c. outlined during first part of semester*
  - *e.g. HTML5, CSS, JS...*
  - ***NO** PHP, Python, XML, SQL, Bootstrap...*
- demo and project report
  - *due on Monday 13th March 2017 @ 4.15pm*
- anonymous peer review
  - *similar to user comments and feedback*
  - *chance to respond to feedback before final project*

Final Assessment

- working final app
  - **NO** *PHP, Python, XML, SQL, Bootstrap...*
- presentation can be a live demo, slides, video...
  - *due on Monday 24th March 2017 @ 4.15pm*
  - *show and explain implemented differences from DEV week project*
  - *where and why did you update the app?*
  - *benefits of updates?*
- how did you respond to peer review?
- final report
  - *due on Monday 1st May 2017 @ 4.15pm*

Goals of the course

A guide to developing and publishing interactive client-side web applications and publications.

Course will provide

- guide to developing client-side web applications from scratch
- guide to publishing web apps for public interaction and usage
- best practices and guidelines for development
- fundamentals of web application development
- intro to advanced options for client-side development
- ...

Course Resources

Website

Course website is available at https://csteach424.github.io

- timetable
- course overview
- course blog
- weekly assignments & coursework
- bibliography
- links & resources
- notes & material

GitHub

Course repositories available at https://github.com/csteach424

- weekly notes
- examples
- source code (where applicable)

Trello group

Group for weekly assignments, DEV week posts, &c.

- Trello group - COMP 424

Slack group

Group for class communication, weekly discussions, questions, &c.

- Slack group - COMP 424

Group projects

- add project details to course's Trello group, *COMP 424 - Spring 2017 @ LUC*
  - *Week 1 - Project Details*
- create channels on Slack for group communication
- start working on an idea for your project
- plan weekly development up to and including DEV Week
  - *6th to 13th March*
  - *DEV week demo on 13th March*

Intro to Client-side web design

- allows us to design and develop online resources and publications for users
  - *both static and interactive*
- restrict publication to content
  - *text, images, video, audio...*
- develop and publish interactive resources and applications
- *client-side scripting* allows us to offer
  - *interactive content within our webpages and web apps*
- interaction is enabled via code that is downloaded and compiled, in effect, by the browser
- such interaction might include
  - *a simple mouse rollover or similar touch event*
  - *user moving mouse over a menu*
  - *simple but effective way of interacting*

Client-side and server-side - Part 1

Client-side

- scripts and processes are run on the user's machine, normally via a browser
  - *source code and app is transferred to the user's machine for processing*
- code is run directly in the browser
- predominant languages include HTML, CSS, and JavaScript (JS)
  - *HTML = HyperText Markup Language*
  - *CSS = Cascading Style Sheets*
  - *many compilers and transpilers now available to ease this development*
    - e.g. *Go to JavaScript...*
- reacts to user input
- code is often visible to the user (source can be read in developer mode etc...)
- in general, cannot store data beyond a page refresh
  - *HTML5 and local web APIs are changing this...*
- in general, cannot read files directly from a server
  - *HTTP requests required*
- single page apps create rendered page for the user

Client-side and server-side - Part 2

Server-side

- code is run on a server
  - *languages such as PHP, Ruby, Python, Java, C#...*
  - *in effect, any code that can run and respond to HTTP requests can also run a server*
- enables storage of persistent data
  - *data such as user accounts, preferences...*
- code is not directly visible to the user
- responds to HTTP requests for a given URL
- can render the view for the user on the server side

and so on...

Getting started

- basic building blocks include HTML, CSS, and JS
- many tools available to work with these technologies
- three primary tools help with this type of development
- web browser
  - *such as Chrome, Edge (IE?), Firefox, Opera, Safari...*
- editor
  - *such as Atom, Sublime, Microsoft's Visual Studio Code...*
- version control
  - *Git, (Mercurial, Subversion)*
  - *GitHub, Bitbucket...*

Getting started - Web Browsers

- choose your favourite
  - *Chrome, Firefox, Safari, Edge...*
  - *not IE*
- developer specific tools
  - *Chrome etc view source, developer tools, JS console*
  - *Firefox also includes excellent developer tools*
  - *Firebug*
- cross-browser extension for web developers
  - *Web Developer*

Video - Microsoft Edge

Source - YouTube - Introducing Microsoft Edge

Getting started - Editors

Many different choices including

Linux, OS X, and Windows

- Atom
- Sublime
- Visual Studio Code

OS X specific

- BBEdit
  - *TextWrangler*

and so on.

Video - Atom 1.0

Source - YouTube - Introducing Atom 1.0

Browser technologies

- browser rendering engines
- web standards
  - *HTML*
  - *CSS*
  - *XML*
  - *XHTML*
- application foundations
- open web platform

Browser rendering engines

- Until 2013, *WebKit* was the default rendering engine for both Safari and Chrome
- Google switched to the open source alternative, *Blink*, whilst Safari continues to use *WebKit*
- Firefox continues to use the *Gecko* rendering engine
- Microsoft's new Edge browser uses a new proprietary engine called *EdgeHTML*
  - *fork of the Trident rendering engine*
  - *Microsoft notes that EdgeHTML will largely behave like Chrome and Safari*

Web standards

- many disparate web standards
  - *include the broader internet beyond www...*
  - *subset of particular interest to web developers*
- primary web standards
  - ***Recommendations*** *published by the W3C (World Wide Web Consortium)*
  - ***Unicode*** *standards published by the Unicode Consortium*
  - ***ECMA*** *standards now published by ECMA International*
  - *more to come later in the semester...*

W3C Recommendations - part 1

Recommendations of the W3C of particular interest includes

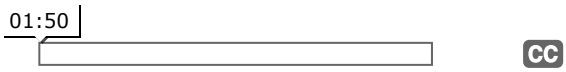
- HTML (HyperText Markup Language)
  - *key building block of the web*
  - *stored as plain text*
  - *includes selection of tags*
  - *e.g. headings, images, links, lists, paragraphs, tables...*
- CSS (Cascading Style Sheet)
  - *commonly used with HTML*
  - *controls rendering and stylistic characteristics of a web page*
  - *CSS concerned with presentation of the structure and data*

W3C Recommendations - part 2

Recommendations of the W3C of particular interest includes

- XML (Extensible Markup Language)
  - *often considered a meta-language*
  - *follow-on from SGML (Standard Generalised Markup Language)*
  - *used to describe data & not presentation, rendering of data*
  - *element tags not inherently pre-defined*
  - *foundation for many XML languages such as RSS, MathML, MusicML...*
- XHTML (Extensible HyperText Markup Language)
  - *attempt to update and rewrite HTML based on experience from XML*
  - *very similar to HTML with stricter rules*
  - *e.g. HTML lapse in enforcing case sensitivity, closing tags...*
  - *strict rules structure inherited from XML style languages*

Video - W3C Web standards for the future



Source - Vimeo - W3C

Application foundations - Part 1

W3C, on the occasion of HTML5 achieving the status of W3C Recommendation, proposed

> *a set of technologies for developing distributed applications with the greatest interoperability in history.*
> *Application Foundations for the Open Web Platform*

- known as the OWP (Open Web Platform)
- driven by a blog post by Jeff Jaffe in October 2014
  - *suggested W3C's next priority should be Open Web Platform*
  - *OWP should be easier to use for developers*

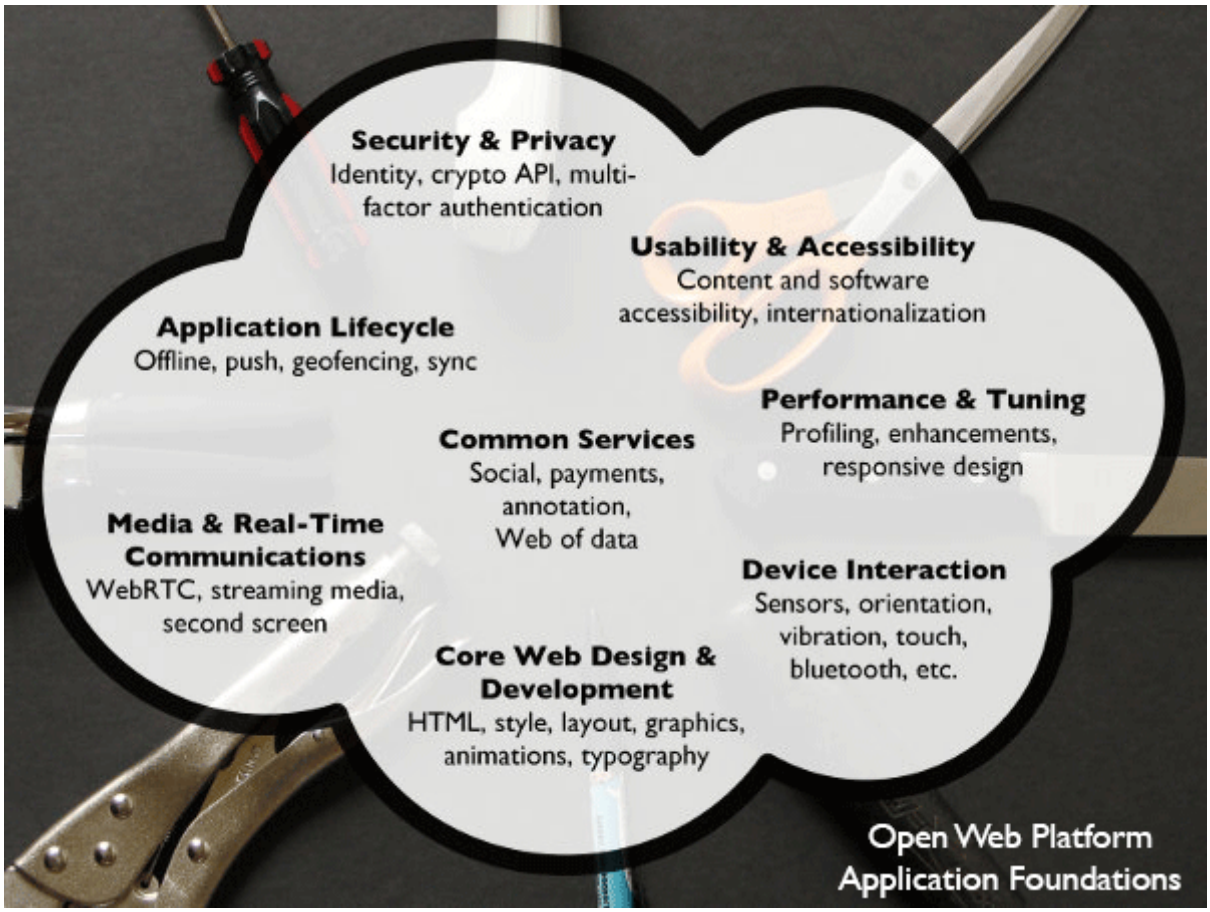
Application foundations - Part 2

Jaffe defined eight **Foundations** in that particular post, which include the following

- Security and Privacy
- Core Web Design and Development
- Device Interaction
- Application Lifecycle
- Media and Real-Time Communications
- Performance and Tuning
- Usability and Accessibility
- Services

Further information and updates can be found at the W3C's App Foundations website.

Image - Open Web Platform



Source - W3C

HTML - Intro

- acronym for *HyperText Markup Language*
- simple way to structure visual components of a website or web application
- HTML also uses keywords, or element tags
  - *follow a defined syntax*
- helps us to create web pages and web applications
  - *web browsers, such as Chrome or Firefox, may render for viewing*
- an error can stop a web page from rendering
  - *more likely it will simply cause incorrect page rendering*
- interested in understanding the core of web page designing
  - *understand at least the basics of using HTML*

HTML - Element syntax - part 1

Constructed using elements and attributes, which are embedded within an HTML document.

Elements should adhere to the following,

- start with an opening element tag, and close with a matching closing tag
  - *names may use characters in the range* ***0-9***, ***a-z***, ***A-Z***
- content is, effectively, everything between opening and closing element tags
- elements may contain empty or *void* content
- empty elements should be closed in the opening tag
- most elements permit attributes within the opening tag

HTML - Element syntax - part 2

An element's *start* tag adheres to a structured pattern, which may be as follows,

1. a **<** character
2. tag name
3. optional **attributes**, which are separated by a space character
4. optional space characters (one or more...)
5. optional **/** character, indicating a **void** element
6. a **>** character

For example,

```
<!-- opening element tag -->
<div>
<!-- void element -->
<br />
```

HTML - Element syntax - part 3

An element's *end* tag also adheres to a pattern, again exactly as defined as following,

1. a **<** character
2. a **/** character
3. element's tag name (i.e. name used in matching start tag)
4. optional space characters (one or more...)
5. a **>** character

For example,

```
<!-- element's matching end tag -->
</div>
```

NB: void elements, such as `<br />` or `<img />`, do *not* specify end tags.

HTML - Element syntax - part 4

- HTML, XHTML, can be written to follow the patterns and layouts of XML
- HTML elements can also be nested with a parent, child, sibling...
  - *relationship within the overall tree data structure for the document*
- as the HTML page is loaded by a web browser
  - *the HTML DOM (document object model) is created*
- basically a tree of objects that constitutes the underlying structure
  - *the rendered HTML page*
- DOM gives us an API (application programming interface)
  - *a known way of accessing, manipulating the underlying elements, attributes, and content*
- DOM very useful for JavaScript manipulation

References

- Jaffe, Jim., *Application Foundations For The Open Web Platform*. W3C. 10.14.2014. http://www.w3.org/blog/2014/10/application-foundations-for-the-open-web-platform/
- The Unicode Consortium
- Unicode Information
- Unicode examples
- W3 Docs for further details