Comp 388/422 - Software Development for Wireless and Mobile Devices

Fall Semester 2016 - Week 1

Dr Nick Hayward

Course Details

Lecturer

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

Course Schedule

Important dates for this semester

- Friday @ 2.45pm to 5.15pm (5pm with no break)
  - *Cuneo Hall, Room 302, LSC*
- DEV week: 7th to 14th October 2016
  - *n.b. no formal class: 7th October 2016*
  - *presentation & demo: 14th October 2016 @ 2.45pm*
- Thanksgiving break: 23rd to 26th November 2016
  - *n.b. no formal class: 25th November 2016*
- Final class: 9th December 2016
  - *presentation & demo: 9th December 2016 @ 2.45pm*
- Exam week: 12th December to 17th December 2016
  - *Final assessment due on 16th December 2016 by 2.45pm*

Initial Course Plan - Part 1

Up to ~ DEV Week

- begin development of a mobile application using Apache Cordova
  - ***not*** *a responsive website viewed on a mobile device*
- can be platform agnostic (cross-platform) or specific targeted OS
  - *e.g. Android, iOS, Windows Phone using Cordova APIs*
    - **HINT**: Android will probably be the easiest for most groups...
  - *consider choice, and explain why?*
- outline concept, research conducted to date
- consider applicable design patterns
- are you using any sensors, hardware features etc?
  - *how, why?*
- prototyping
  - *demo current prototypes*
  - *any working tests or models etc*

Initial Course Plan - Part 2

Up to the end of the semester

- continue to develop your app concept and prototypes
  - *develop application using either Apache Cordova or native Android SDK*
- if the app uses Apache Cordova
  - *implement a custom Cordova plugin for a native mobile OS*
  - *Android*
- produce a working app
  - *as far as possible try to create a fully working app*
  - *explain any parts of the app not working...*
- explain design decisions
  - *outline what you chose and why?*
  - *what else did you consider, and then omit? (again, why?)*
- which platform/s did you choose, and why?
- which concepts could you abstract for easy porting to other platform/OS?
- describe patterns used in design of UI and interaction

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*
- mid-semester assessment (Total = 30%)
  - *DEV week: 7th to 14th October 2016*
  - *demo due 14th October 2016 @ 2.45pm*
- end of semester assessment (Total = 40%)
  - *demo due 9th December 2016 @ 2.45pm*
  - *report due 16th December 2016 @ 2.45pm*

Quizzes, group exercises...

Course total = 30%

- at least one week notice before quiz
  - *average time ~30 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)

Initial overview

- project developed throughout semester
  - *part 1 includes DEV week (30%)*
  - *part 2 is after DEV week to final assessment (40%)*
- development can be individual or group (max 3 persons per group)
- design and develop a cross-platform mobile application
  - *develop using Apache Cordova and UI (jQuery Mobile, Ionic...)*
- update app using either native Android SDK or Cordova with custom plugin
- purpose, scope, and target audience is group's choice
  - ***no** to-do lists, note-taking, flashlights etc*
  - *chosen project topic needs approval*
  - *data, structure etc is group's choice...*

DEV Week Assessment

- cross-platform mobile app from scratch
  - *can be basic demo of intended final app*
  - *build using Apache Cordova and UI (jQuery Mobile, Ionic...)*
- presentation and demo
  - *demo due 14th October 2016 @ 2.45pm*
  - *app assessed for functionality, implementation of Cordova API, design, aesthetics...*
  - *peer review of presentation and demo*

Final Assessment

- continued development of DEV week project
  - *must work, i.e. I need to be able to test and use the application*
- update to native Android SDK or Cordova with custom plugin...
  - *why switch to native Android SDK? (if applicable)*
  - *clearly explain how and why you developed a custom Cordova plugin (if applicable)*
- how did you respond to DEV week feedback?
- outline design choices and influences
- presentation can be a live demo, video, storyboard...
  - *demo due 9th December 2016 @ 2.45pm*
- final report
  - *report due 16th December 2016 @ 2.45pm*

Goals of the course

An overview and demonstration of building cross-platform applications for mobile and wireless devices.

Course will provide

- guide to developing and implementing mobile applications from scratch
- cross-platform design and development
    - *using Apache Cordova & UI options*
- best practices and guidelines for cross-platform development
- outline of example mobile design patterns
- comparisons with native SDKs and development
- guide to deploying and publishing final mobile app
- ...

Course Resources

Website

Course website is available at https://csteach422.github.io

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

GitHub

Course repositories available at https://github.com/csteach422

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

Getting started

A few questions...

What is mobile?

- what exactly do we mean by **mobile**?
- may seem like a simple question to answer
  - *do we categorise mobile based on the OS*
  - *is it Android, iOS, Windows Phone...*
- where do we draw the line for software development?
- 2010 Wired magazine interview with Mark Zuckerberg
  - *iPad is not a mobile device, it is a computer*

Video - iPad not mobile

Source - YouTube - iPad isn't mobile...

Merging technologies

- merging of technology and traditional environments and interactions
  - *definition of mobile will alter and update as well*
- will we perceive in-car devices as mobile?
  - *e.g. touchscreen panels and consoles*
  - *same as phones, tablets?*
- these differences are important
  - *they help us consider designs, UIs, interactions*
  - *different motivations for development*
- currently best to consider *mobile* relative to OS
  - *e.g. associated with phones and tablets*

Mobile considerations

- surge in popularity for mobile devices, apps
  - *associated interactions and usage patterns*
- concept of **mobile first** entered broader lexicon
  - *developers and designers think in terms of **mobile first***
- encouraged to think in terms of mobile use cases, scenarios...
- think beyond standard desktop app or website

A few facts and figures

- by spring 2015 smartphone ownership in the US
  - *had hit ~64% of all adults*
  - *a rise from 35% in Spring 2011*
- research published by Pew Research Center, Washington
  - *at least 19% of US adults rely on smartphones*
  - *to access online services and information*
  - *due to lack of other broadband options*
  - *or they simply do not own an alternative device*
  - *perceived sub-class of 7%*
  - *solely reliant on smartphones for online access...*
  - *high level of smartphone ownership amongst younger Americans*
  - *at least 15% of young Americans between 18 and 29 yrs old*
    - heavily dependent on a smartphone for online access

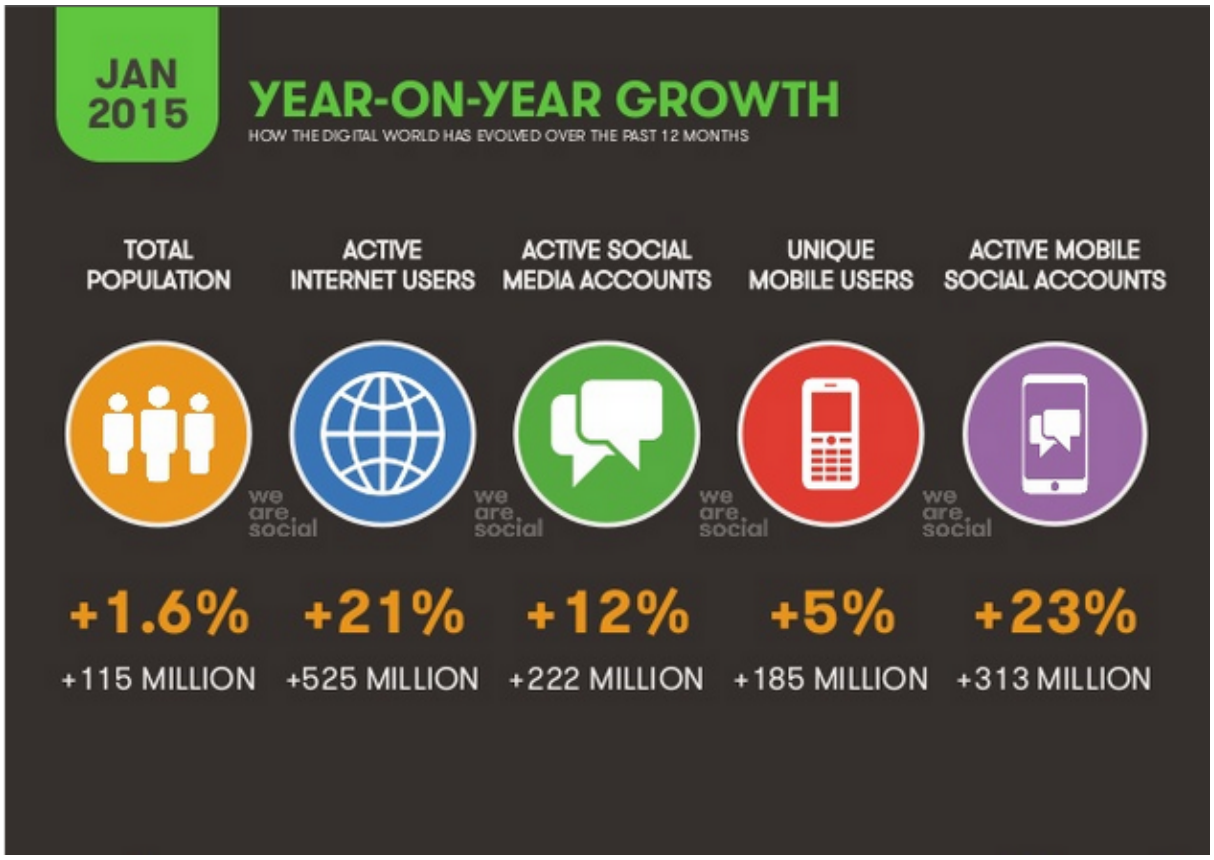
Usage stats

- usage stats are also v.interesting for developers
- e.g. many users now use smartphones for less frivolous activities, including
  - *62% have used their smartphones to query information about their health or a medical condition*
  - *57% have used their smartphones to complete online banking*
  - *44% have used their smartphones to search real estate listings or other housing information*
  - *43% searched for job listings and availability*
  - *40% to view and check government listings and information*
  - *30% to take an online course or class*
  - *18% to actually submit a job application*

Image - Global Digital Snapshot

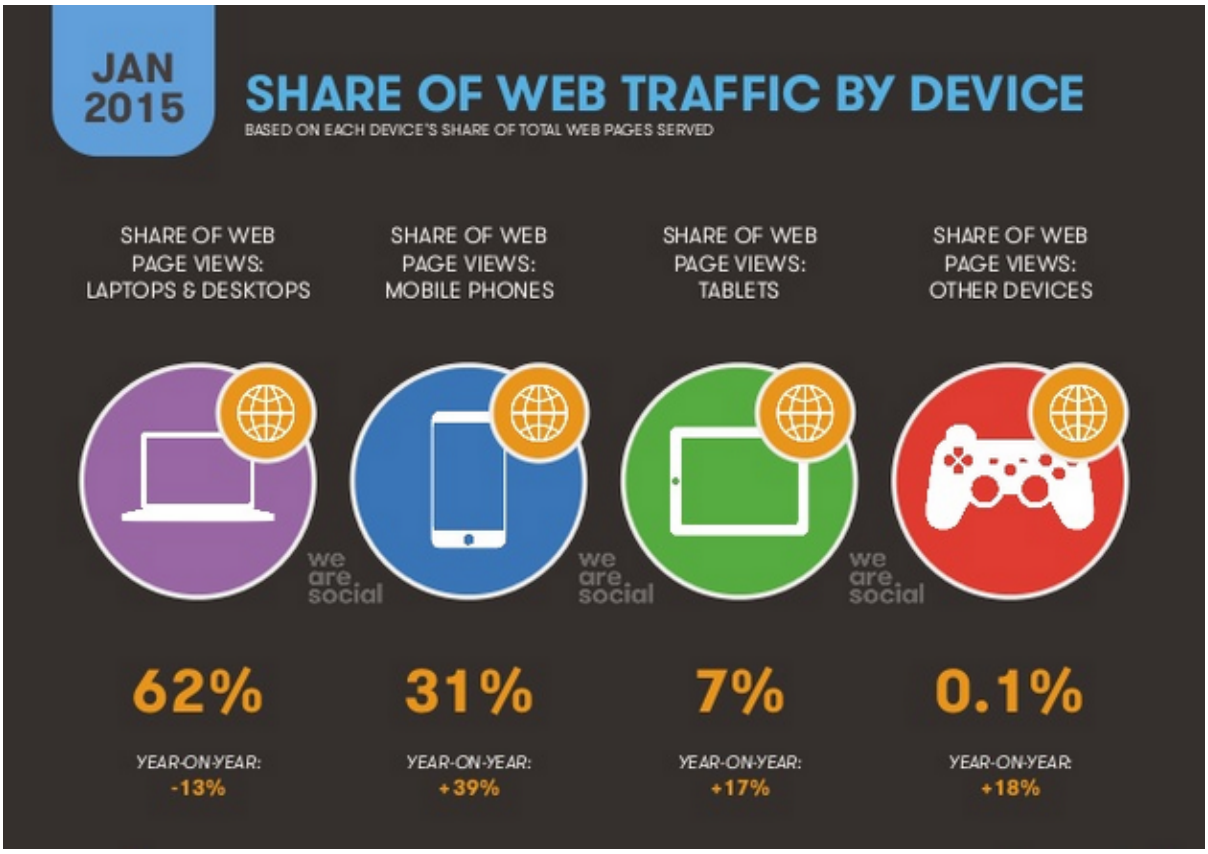
Source - We Are Social - Singapore

Image - Year on Year Growth



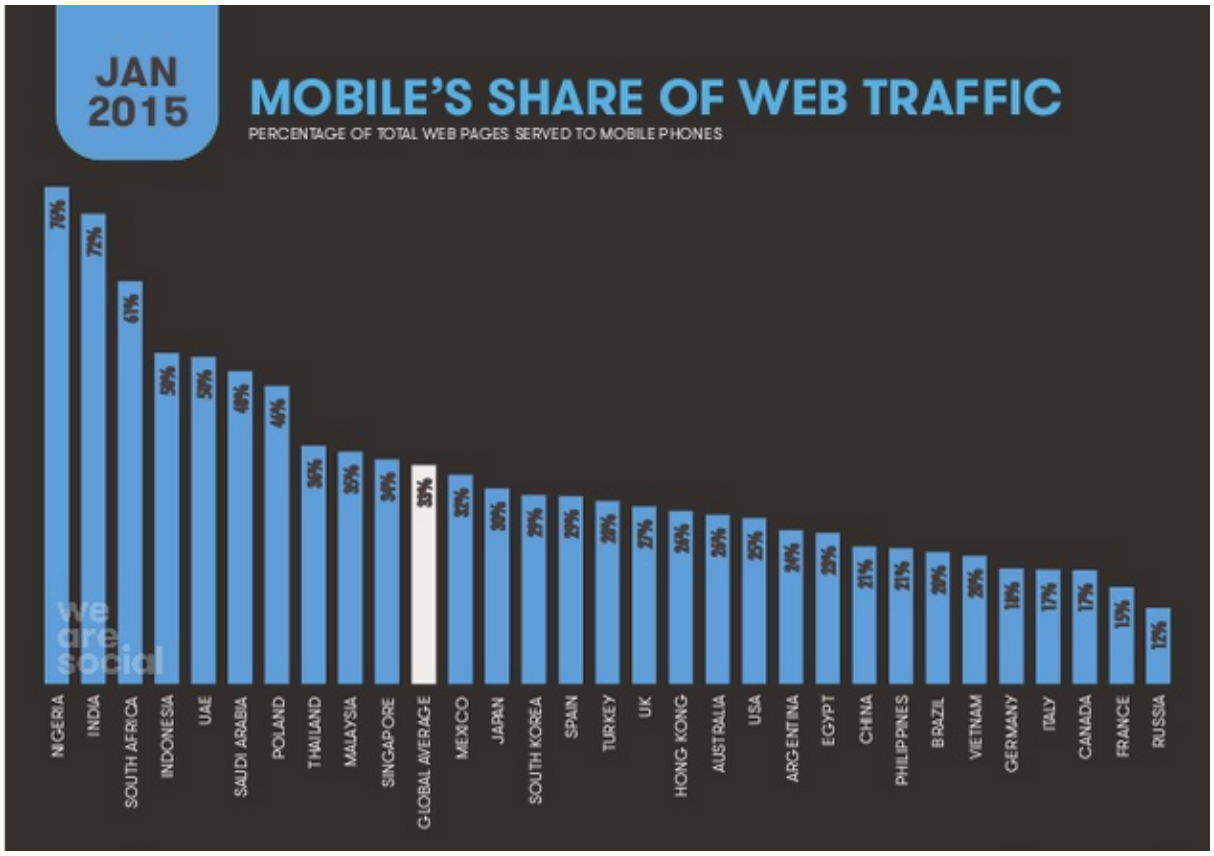
Source - We Are Social - Singapore

Image - Share of Web Traffic By Device



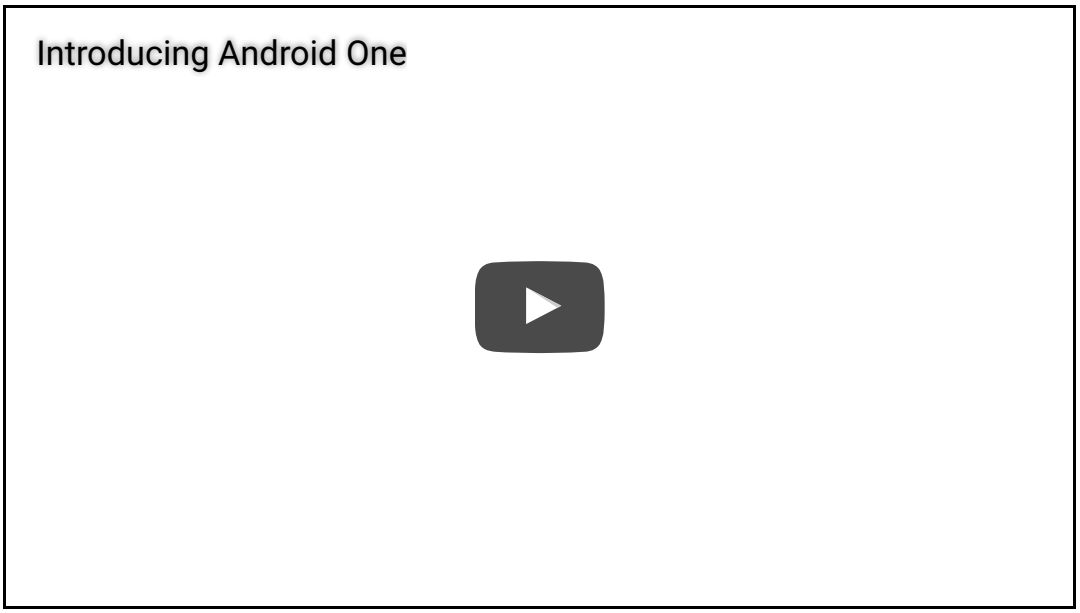
Source - We Are Social - Singapore

Image - Mobile's Share of Web Traffic



Source - We Are Social - Singapore

Video - Android One



Source - YouTube - Android One

Growing market

- optimistic point for developers
  - *growing market for mobile devices, apps, and services*
- developer's job to fill this need with apps, data, design...
- apps need to be
  - *useful, easy to use, aesthetically pleasing...*
  - *engaging, fun...*
- developers need to be able to develop apps quickly
  - *develop for multiple OSs and devices*
  - *largest markets*

Different types of mobile

- we need to be clear about the differences between mobile types
  - *mobile web*
  - *native mobile*
  - *hybrid mobile*
- each has its place in mobile development
- each has its own particular advantages and disadvantages

Mobile web

- apps viewed and run using a web browser
  - *usually, but not exclusively, a mobile device web browser*
- designed as *responsive* web apps or sites
  - *new generation of progressive apps becoming available*
- in this context *responsive* understood as adaptive views
  - *enables correct rendering on different resolutions of mobile and tablet devices*
- apps normally require user to be online with active data connection
- not true mobile apps
  - *may reflect same look and feel as native mobile OS app*
- apps not uploaded to mobile app stores
- unable to interact at the native, low-level of the mobile OS

Native mobile

- native mobile app development often perceived as *real deal*
  - *rightly or wrongly dependent upon your perspective*
- development of apps using SDKs and APIs for specific mobile OS
  - *Java for Android*
  - *Objective-C & Swift for iOS*
  - *.Net for Windows Phone (Mobile...)*
- learn and develop different SDK etc for each native OS
- developer will need to implement code and logic for each platform
  - *both mobile OS implementation and desktop development*
- issue with modified app design and logic
  - *need to meet requirements and restrictions*
  - *limits imposed by each mobile OS...*

Hybrid mobile - Part I

- hybrid mobile apps share a lot with native mobile apps
  - *e.g. characteristics, design traits, functionality*
- however, they are developed using different tools, technologies, methods...
- Apache Cordova apps developed using common web technologies
  - *HTML (HyperText Markup Language)*
  - *CSS (Cascading Style Sheet)*
  - *JS (JavaScript)*

Hybrid mobile - Part 2

- attempt to leverage ease and speed of development
  - *due to web technologies*
  - *larger developer base for web development*
- and power of native functionality and hardware
  - *using plugins*
- benefit compared to native mobile
  - *option to use same code base for single app*
  - *same code across multiple mobile OSs*
- inherent benefit and grace of web stack for mobile app development
  - *ability to code once, run across multiple mobile platforms*
- still need to make changes to port an app from platform to platform
  - *often minor and trivial changes*
  - *in particular when compared with native OS development*
- other benefit is use of same languages across multiple platforms
  - *until development of custom plugins...*

Considerations for mobile web

- many benefits to native app development
- obvious benefit is optimised nature of compiled code
- native apps will often be slightly faster than hybrid apps
- choice of development route will depend upon many factors
  - *time*
  - *cost*
  - *development expertise and experience*
  - *chosen platform(s)*
  - *scale of application*
- often a case of personal development preference

Summary of options

Here is a useful table summarising your options for mobile development.

Technology	App Store	Technologies	Cross-platform	Native support	Performance (best practices)
Mobile web	No	HTML, CSS, & JS	Yes	Partial at best	Very good (most of the time)
Native	Yes	Native SDK & APIs	No (requires porting)	Full	Excellent (depends on developer)
Hybrid	Yes	HTML, CSS, & JS	Yes (modifications)	Full (using plugins)	Very good to excellent

Cross-platform - intro

- inexorable rise in popularity of mobile devices
  - *rise in number of mobile OSs*
  - *each competing for market space*
  - *in particular in the consumer space*
- each OS offers similar options and features
- many mobile OS options, including
  - *Android*
  - *iOS*
  - *Windows 10 Universal platform*
  - *Ubuntu Convergence*
  - *BlackBerry 10*
  - ...

Cross-platform - issues and concerns

- mobile market largely dominated by big two
  - *Android and iOS*
- reduced field still introduces issues and concerns for developers
- each mobile OS implements their own
  - *SDK (software development kit)*
  - *API (application program/programming interface)*
- similarities exist but
  - *they use different programming languages*
  - *whilst achieving the same end goals*
  - *Java for Android & Objective-C (Swift) for iOS*
- each mobile OS has its own peculiarities
  - *differing design philosophies etc*

Cross-platform - common issues and solutions

- common issues might include
  - *permissions*
  - *access to underlying services within an OS*
  - *e.g. SMS rights and logic for different mobile OSs*
- cross-platform alternatives allows us consider unified development environment
  - *access and harness native device*
  - *leverage native functionality, performance, features...*
- leverage common tools and web technologies
  - *HTML, CSS, JavaScript*
  - *create easier cross-platform apps*

References

- Carmody, Tim., *Fighting Words: Defining "Mobile" and "Computer"* Wired. 11.08.2010. http://www.wired.com/2010/11/fighting-words-defining-mobile-and-computer/
- Smith, Aaron., *U.S. Smartphone Use in 2015* PewResearchCenter. 04.01.2015.http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/
- Various., *Digital, Social & Mobile in 2015* We Are Social Singapore. 01.20.2015. http://www.slideshare.net/wearesocialsg/digital-social-mobile-in-2015