CmpSci 491IP
iOS Programming
Seminar

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Office Hours: Monday 10:30 - 11:45,
More will be added, appointments welcome

Seminar

seminar |ˈseməˌnär|

noun
a class at a college or university in which a topic is discussed by a teacher and a small group of students.

ORIGIN late 19th cent.: from German ***Seminar***, from Latin ***seminarium*** (see **seminary**)

Motivations

* Mobile is cool, programming it is too
* I have this app I want to build…
* Get rich and retire early
* I've wanted to learn Swift since I was 4!
* Mobile environments are a major software engineering segment

Breakout Discussion

Interview each other for the following information

* Motivations
* Background
* Goals

On return, introduce the class to another member of your group
Group turns on video for their turn - everyone else turns off

Course Structure

* Some initial lectures to get started
* Mix of student presentations/experimentation/lectures
* Individual and group work on apps, demos, problem solving
* Team project to build an app of your own choosing

What You Will Need

- Access to an Intel-based computer running OSX 10.15
    - Can use hackintosh, but be aware…
- Preferably a machine you can use in class
- Apple ID (e.g., Appstore ID), developer.apple.com account
- Latest XCode and simulator
    - Version 11.6 (don't go to 12 — likely to release mid-semester)

What You Will Do

* Two in-class API presentations, as part of a group
* Some warm-up projects to get familiar with Xcode, Swift
* Business plan for your team's app
* Proposal presentation, two milestone demos
* Final presentation and report on your app

Grading

NO EXAMS
(this is a seminar)

* Two API presentations 10% each: Depth, quality, engagement with class, use of time
  * Basic one in 1st half of semester, more advanced one in 2nd half
* Homework
  * Complete two warm-up exercises, keeping a journal of your experience (4% each)
  * "Business plan" consisting of six draft pieces (4% each) and a revised complete final version (8%)
* App implementation
  * Presentation of plan and app design (6%)
  * Two milestone demos (7% each) and a final demo (10%)
  * Final written report (10%) of what you learned, problems you overcame, and who did what

Grading Philosophy

- Participation - the value of the seminar is in having everyone engage with it
  - If participation is strong, I won't grade for attendance
- The purpose of the homework is to get you thinking in new ways - I want to see where you are in your thinking, even if it's not fully formed, so I can give you feedback
- I am generous with partial credit, but can only do that if you submit something! So late homework will have a 30% deduction (because that's probably more than I would take off for being incomplete)

Books

- Book: Beginning iPhone Development with Swift 5, Wallace Wang, Apress
  - Available as e-book, $30 - watch for sales
- Optional Reference: Pro iPhone Development with Swift 5, Wallace Wang, Apress (I can supply chapters)
- The Swift Programming Language (Apple - free)

Back to the Future

* iOS 14, XCode 12, about to be released
* DON'T go there
* XCode is flaky enough in "stable" versions, and 12 has major changes
* Every time this class runs, they update mid-semester
    * Once you do, you're on your own, and Apple won't let you go back
    * Best if we all stay with the same version - turn off auto-update
* Thankfully Swift 5 was a major update and won't change soon

Other Resources

* XCode contextual help
* https://developer.apple.com/documentation/xcode
    * Get XCode 11.6 from App Store ("stable" version)
* https://developer.apple.com/swift/resources/
    * Significant changes in Swift 5

App Projects

* Two will be assigned as homework
    * Exploring APIs, getting familiar with Swift and Xcode
* Main project is your own choice
    * Team of two preferred - can be individual, particularly if prior experience
    * Project plan presentation with UI mockup, to get class feedback
    * Two milestone demos, with class feedback, then final demo and report
    * Will begin with business/project plan

What Makes a Good App?

* https://developer.apple.com/design/human-interface-guidelines/ios/overview/themes/
* Out of hundreds of pages, basic ideas are in Themes, User Interaction, and Visual Design sections
    * The Mobile HIG is a result of many years of actual experience and scientific study — it could be the basis of an entire course
    * Sections after Visual Design illustrate the catalog of UI API elements that are available — a great intro to UI design options in iOS

What Makes a Good App?

Focusing on the needs of the user

The App is its UI

* Users experience the app through its interface
* The most incredible app will be seen as worthless if its UI is poor
* A great UI creates a positive feeling
* The UI affects how much people actually use the app, and recommend it

Metaphors

- Model the UI and the actions of the app on a familiar real-world analogy
- A natural UI shouldn't require a user manual for the most common tasks
- Can extend a metaphor at deeper levels
  - But don't overdo it
- Use standard controls when possible
- Metaphor is the basis of OOP

Direct Manipulation

* Touch interface allows direct control of objects on the screen
* Objects respond to gestures naturally
* Objects stay on screen while touched
* Responses should be immediate
* Orientation, motion also affect UI

See and Point

* Avoid keypad entry
* Present choices, tables, controls
* Easier for user to pick than to type
* Avoids extra error checking

Feedback

* Respond visually to every user action
* Show status progress for lengthy ops
* Audible feedback can't be primary
  * Could be noisy environment, or sounds off
* Animation enhances experience, but isn't the feedback focus of most tasks

User Control

* Let the user initiate actions
* Keep actions simple
* Allow cancellation
* Confirm anything irreversible
* Allow stopping at any point (it's also a phone)

Aesthetics

- The appearance should fit the task
  - Simple and unembellished engineering app
  - Beautiful menu planning guide with food photos
- Keep it simple
  - Use controls in familiar ways
  - Follow iOS standard patterns
  - Aim for intuitiveness, minimal cognitive effort

Consistency

- Be consistent: logically arrange controls and keep in similar places across views
  - Don't make users hunt for the same control on different views
- Similar controls should do similar things on different views
  - Use different controls for different behaviors

iPhone vs. iPad

- Small screen requires multiple views
  - Transitions have lower cognitive effort
- Larger screen can split view, obtain effect of multiple views with one
  - Full screen transitions have higher cognitive effort
- Cogito ergo some parts of UI design will be different between iPhone and iPad

Examples

* Adjust settings
    * iPhone app flips to back view
    * iPad app uses popover
* Select from list
    * iPhone app switches to list view
    * iPad app shows list in split view

Size and Resolution

* Goal of iOS is resolution independence
  * UI elements drawn with vectors, but some require multiple images (selected automatically)
  * High resolution on small screen = better quality. Not more elements. Fingers don't get smaller
* Screen size change requires UI redesign
  * Increases developer effort, code size, user confusion -- keep number of formats small

Screen Sizes

* In most cases, extra space on different iPhone models is used to automatically improve UI experience:
    * Bigger entry area
    * More options in scroll list visible
    * More space between elements
    * Avoid feature differences between models
* Some larger screens have extra features

The App is also its Data Source

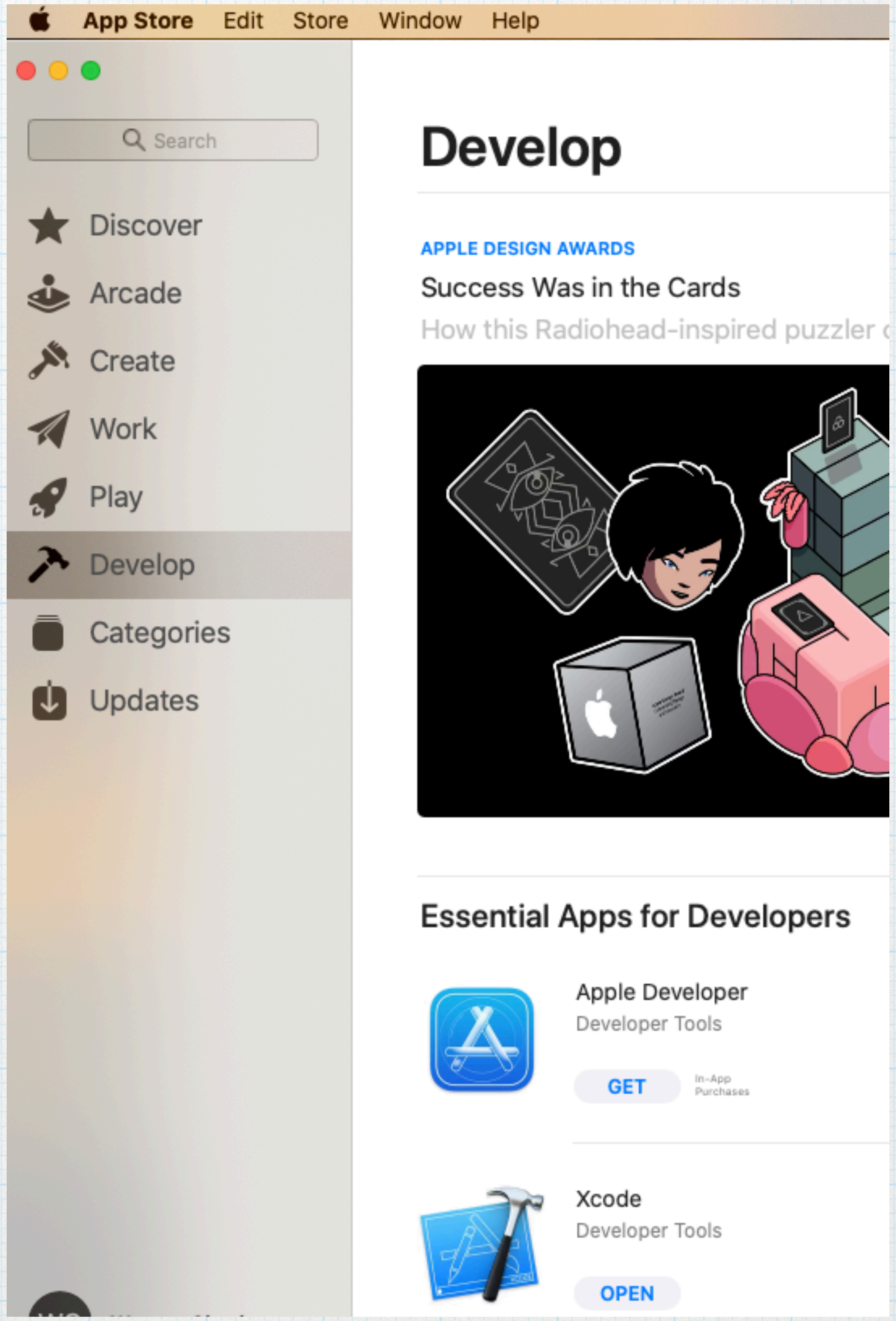
- For some apps, a large part of the value is in the back end
- Having a database or model that nobody else has
  - Example: Access to UMTA bus locations
  - Example: Detailed model of solar system orbits
- Updating the data/model can be a huge (i.e., valuable) effort — making that manageable can be a big deal

For Next Time

- Start thinking about ideas for apps you would like to build
  - Be prepared to discuss one at start of class
- Get set up for starting development

Get Xcode

* Open App Store
* Select Develop
* Get and install



Develop

APPLE DESIGN AWARDS

Success Was in the Cards

How this Radiohead-inspired puzzler

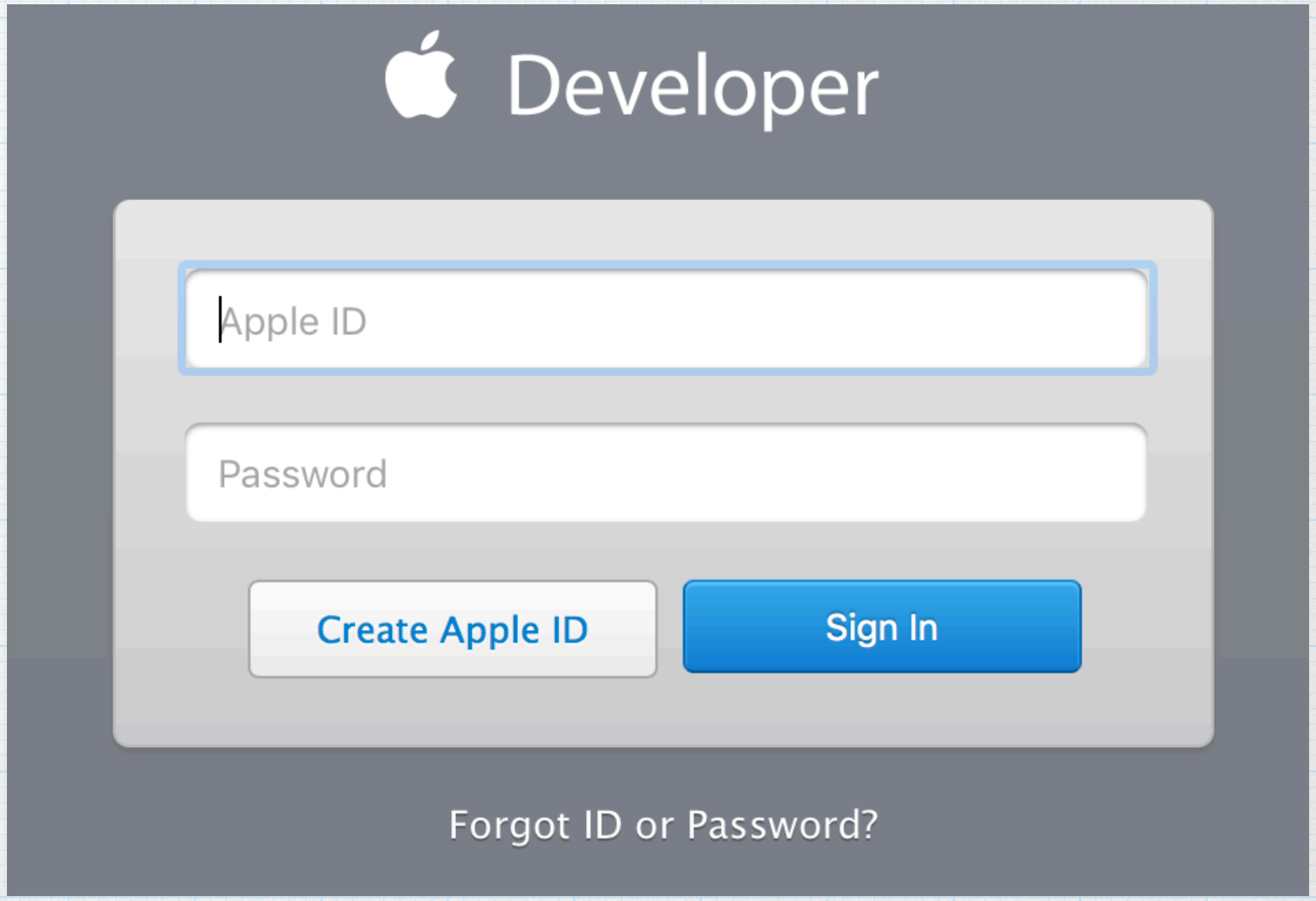
Essential Apps for Developers

Apple Developer
Developer Tools
GET
In-App Purchases

Xcode
Developer Tools
OPEN

Developer Access

- https://developer.apple.com
- Select Account -- can use AppStore or iCloud ID



Developer Resources

* Go to https://developer.apple.com/documentation/technologies
* Top-level index to developer technologies and APIs
* Swift, UIKit, SwiftUI, and Foundation cover much of what we'll use
    * But browse through and see if anything look especially interesting