

Building An

Open-Source iOS App

Wojciech Adam Koszek · <http://www.koszek.com> ·  wkoszek

Silicon Valley Mobile Developers & Designers, Dec 12th, 2016

Building An
Open-Source iOS App

EVERYTHING (opinions, thoughts,
feelings, projects) in this talk are my own
and **NOT** my employer

Wojciech Adam Koszek · <http://www.koszek.com> ·  wkoszek

Silicon Valley Mobile Developers & Designers, Dec 12th, 2016

Today's talk is about

Sensorama

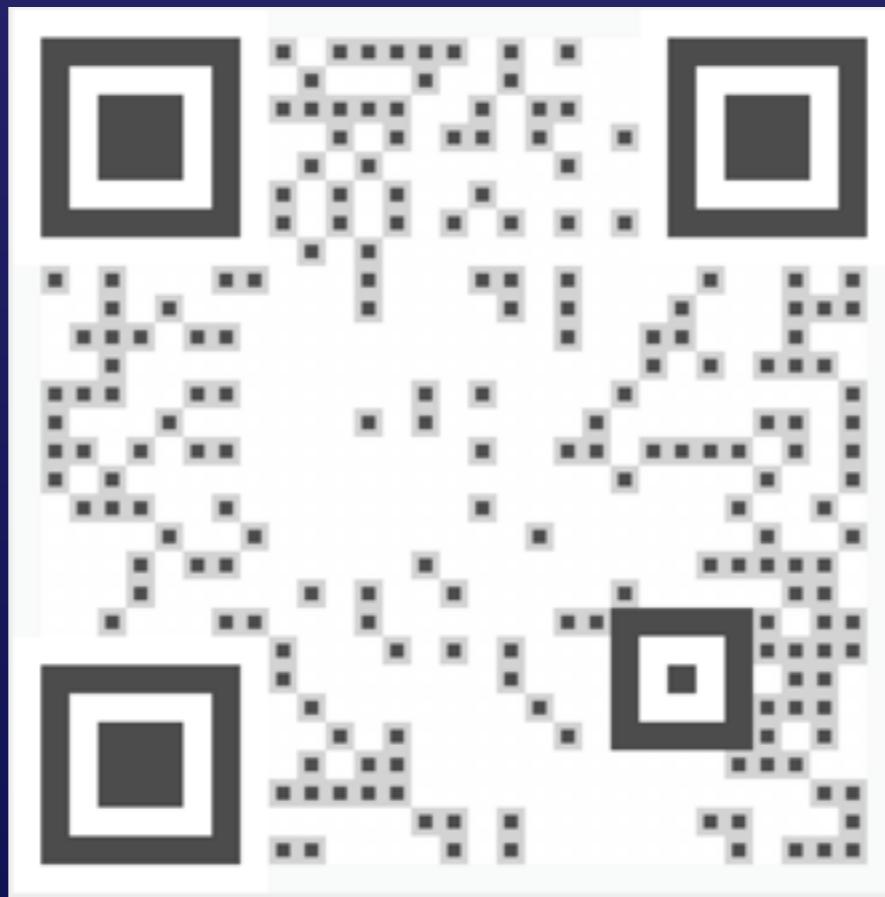
Open Source Sensor Platform for Data Science

<http://www.sensorama.org>

As I talk...

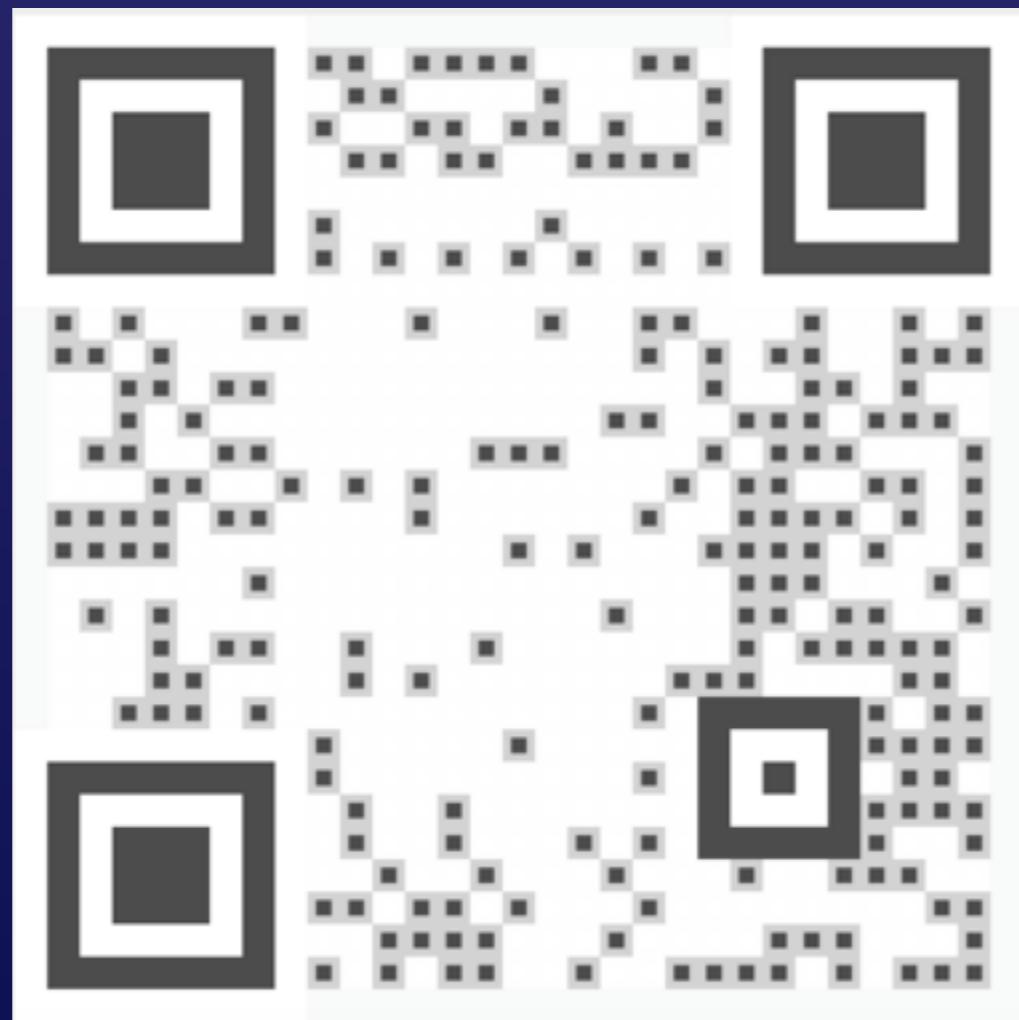


Visit website



<http://www.sensorama.org>

Install...



...on App Store



Quick Q/A

to the audience

Developers of

iOS or Android?

Favourite

Open Source?

Have you ever

Contributed to
the Open Source?

How many

Apps submitted
to the Apple or
Play Store?

Do you

Plan to publish
an App?

Do you

Plan to publish an
Open-Source
App?

My agenda

6 parts

Questions and discussion
afterwards

6 parts

Questions and discussion
afterwards

OK to interrupt and disagree!

Motivation

Why/how/who/what/when

Design & App Concept

First app look and feel

Usability tests

How people liked it?

Implementation

Which tools I've used and how I've used them.

Open Source: good and BAD parts

What to do and what NOT to do

Summary

Q/A

Motivation

Why/how/who/what/when

Design & App Concept

First app look and feel

Usability tests

How people liked it?

Implementation

Which tools I've used and how I've used them.

Open Source: good and BAD parts

What to do and what NOT to do

Summary

Q/A

Motivation

Why/how/who/what/when

Design & App Concept

First app look and feel

Usability tests

How people liked it?

Implementation

Which tools I've used and how I've used them.

Open Source: good and BAD parts

What to do and what NOT to do

Summary

Q/A

...and convince you that
doing OSS development
is something you
should try

My background

1 Motivation

SETI...



...for Sensors



Data science research

Data science research

Nice to be able to use your own data for your education

"Product Manager" Exercise

Dealing with users, their
feedback, design and look,
code, etc...

Real-world "app"
experience

Very different from
UNIX stuff I'm used to

Open-Source Development Exercise

Open-Source Development Exercise

Open code design, development and
maintenance done in GitHub

Making practical stuff is a

Great way to learn

From 0 to...

iTunes Connect My Apps Sensorama Wojciech Adam

Apple Inc. [US] https://itunesconnect.apple.com/WebObjects/iTunesConnect.woa/ra/ng/app/1159788831/i... Apps GOOGLE_PLAY Crash reports not vi... 111_PLYTKI My Library | Audible... Stanford Wireless Vi... TeX MacTeX - TeX Users...

Wojciech Koszek Wojciech Koszek

iTunes Connect My Apps Sensorama Wojciech Koszek

App Store Features TestFlight Activity App Analytics Sales and Trends

APP STORE INFORMATION

iOS App 1.01 Save Release This Version

Pending Developer Release

App Information

Pricing and Availability

iOS APP

1.01 Pending Developer ...

VERSION OR PLATFORM

English (U.S.)

You can only edit some information while your version is pending developer release. To edit all information, [cancel this release.](#)

Version Information

App Preview and Screenshots

iPhone iPad

5.5-Inch Display

The screenshot shows the iTunes Connect interface for managing an app named "Sensorama". The main navigation bar includes links for "iTunes Connect", "iOS Provisioning Pr...", "wkoszek/sensorama", "Issues · fastlane/fa...", "[frameit] Fix offsets", and "Wojciech Adam". Below the bar, the URL is https://itunesconnect.apple.com/WebObjects/iTunesConnect.woa/ra/ng/app/1159788831/i... and the page title is "iTunes Connect My Apps". On the right, the user "Wojciech Koszek" is logged in. The main content area shows the "iOS App 1.01" entry, which is currently "Pending Developer Release". A note states: "You can only edit some information while your version is pending developer release. To edit all information, [cancel this release.](#)". Below this, there's a "Version Information" section with tabs for "App Preview and Screenshots" (set to "iPhone") and "5.5-Inch Display". Three placeholder screens are shown for the iPhone 5.5-inch display, labeled "Record", "File", and "Settings". Navigation links like "App Store", "Features", "TestFlight", "Activity", "App Analytics", and "Sales and Trends" are also visible.



Design and
App concept

General idea

Sensor data recorder

Tap to start recording

Tap to stop recording

Easily export data out of
the phone

Just e-mail the file to the
user

Open data format

Open data format

Everyone can open and parse the
data

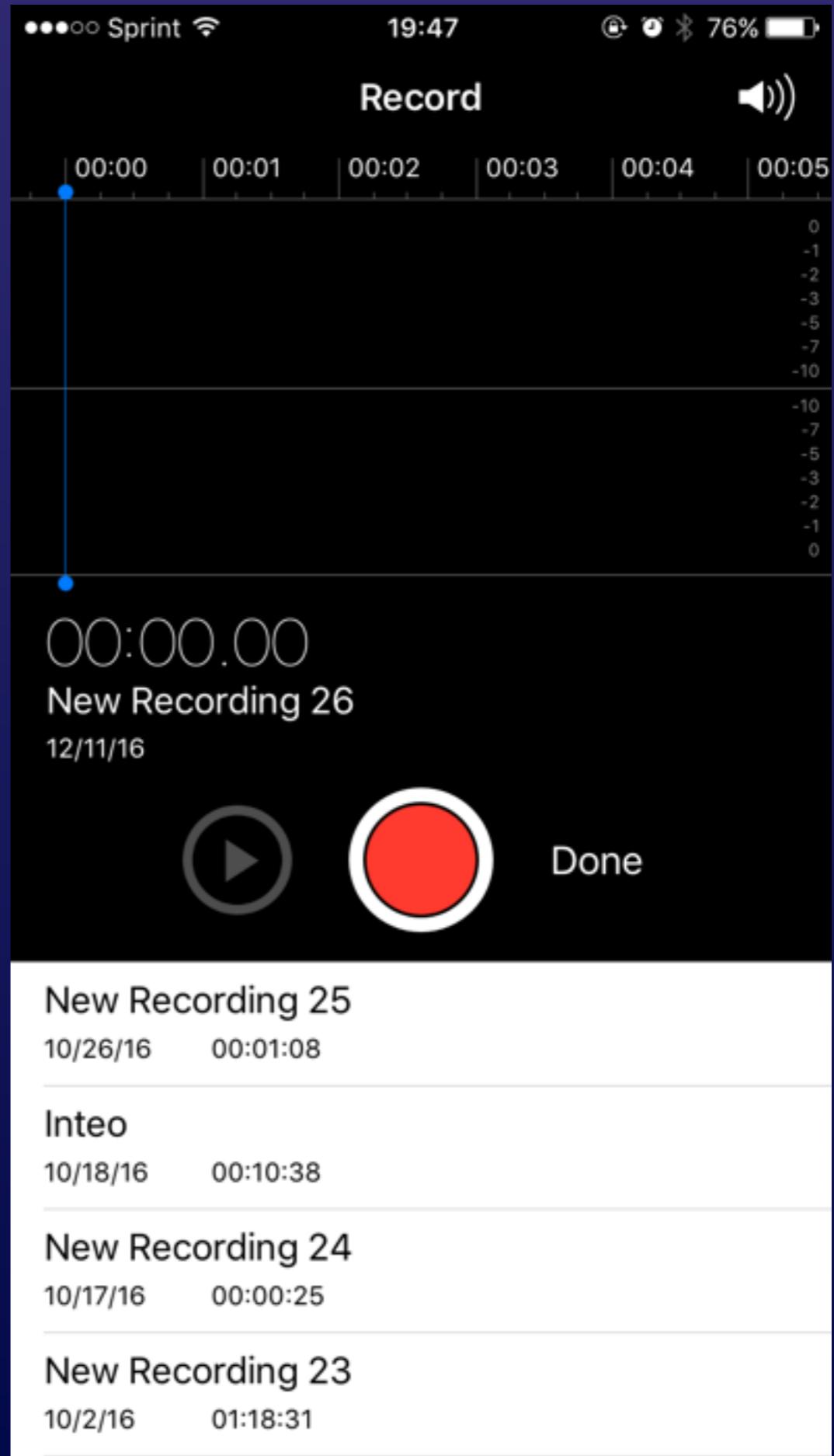
JSON

Looked at other similar apps

"Good artists borrow, great artists steal"

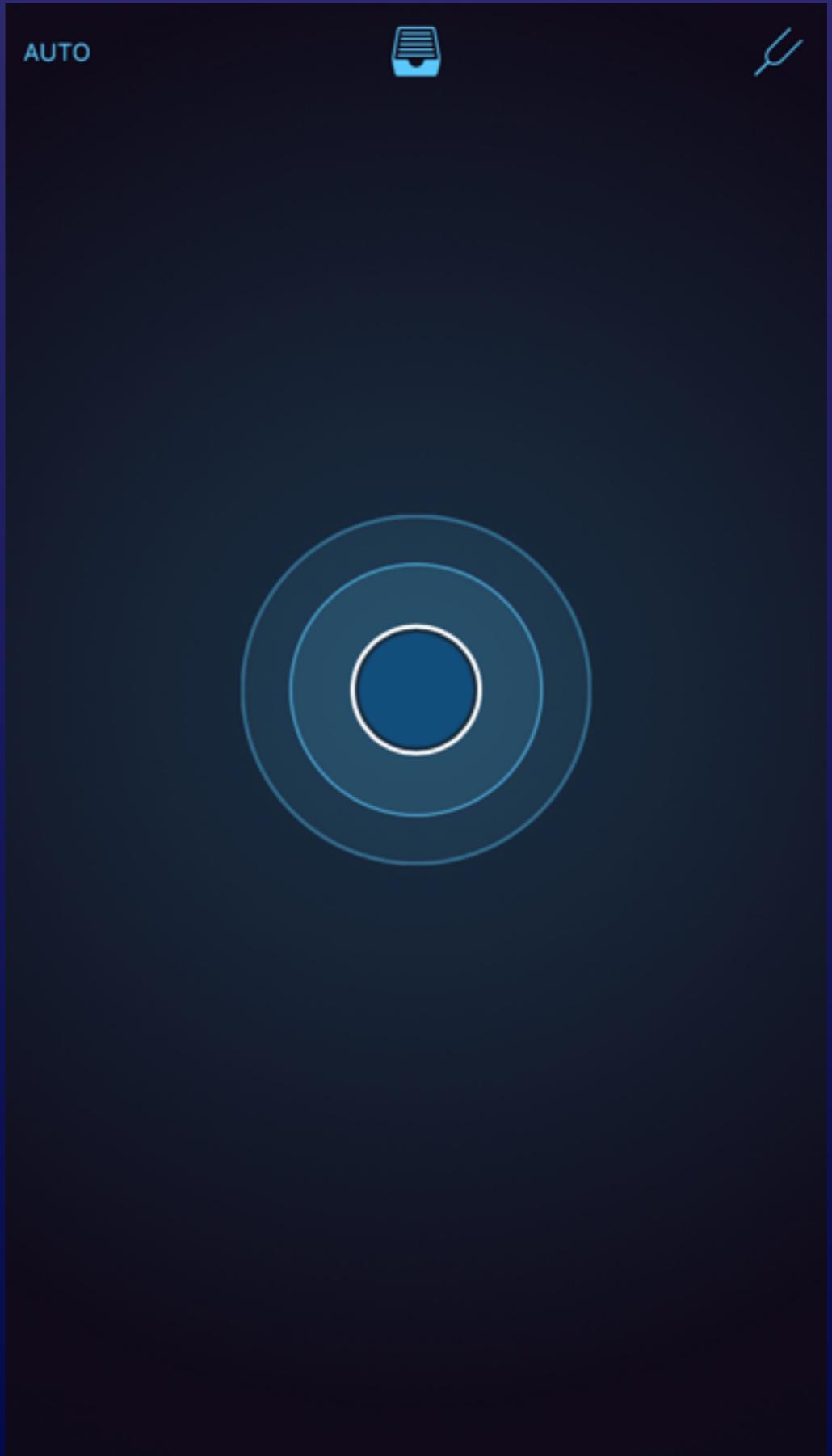
Voice recorder

Recording interface



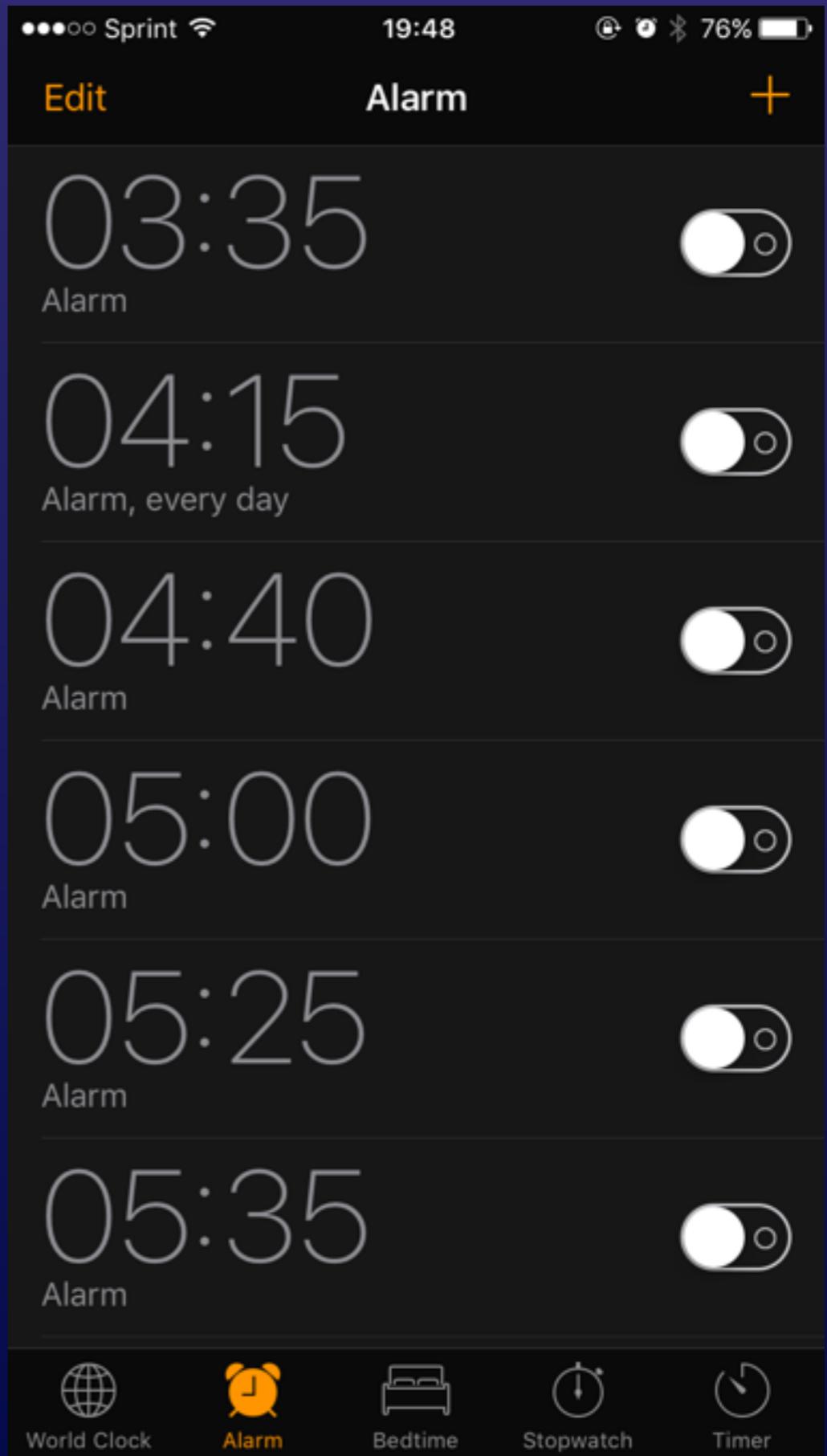
Apple's Voice Memos

Recording interface



Clock

Nice Table Views



WWDC App

Nice Table Views

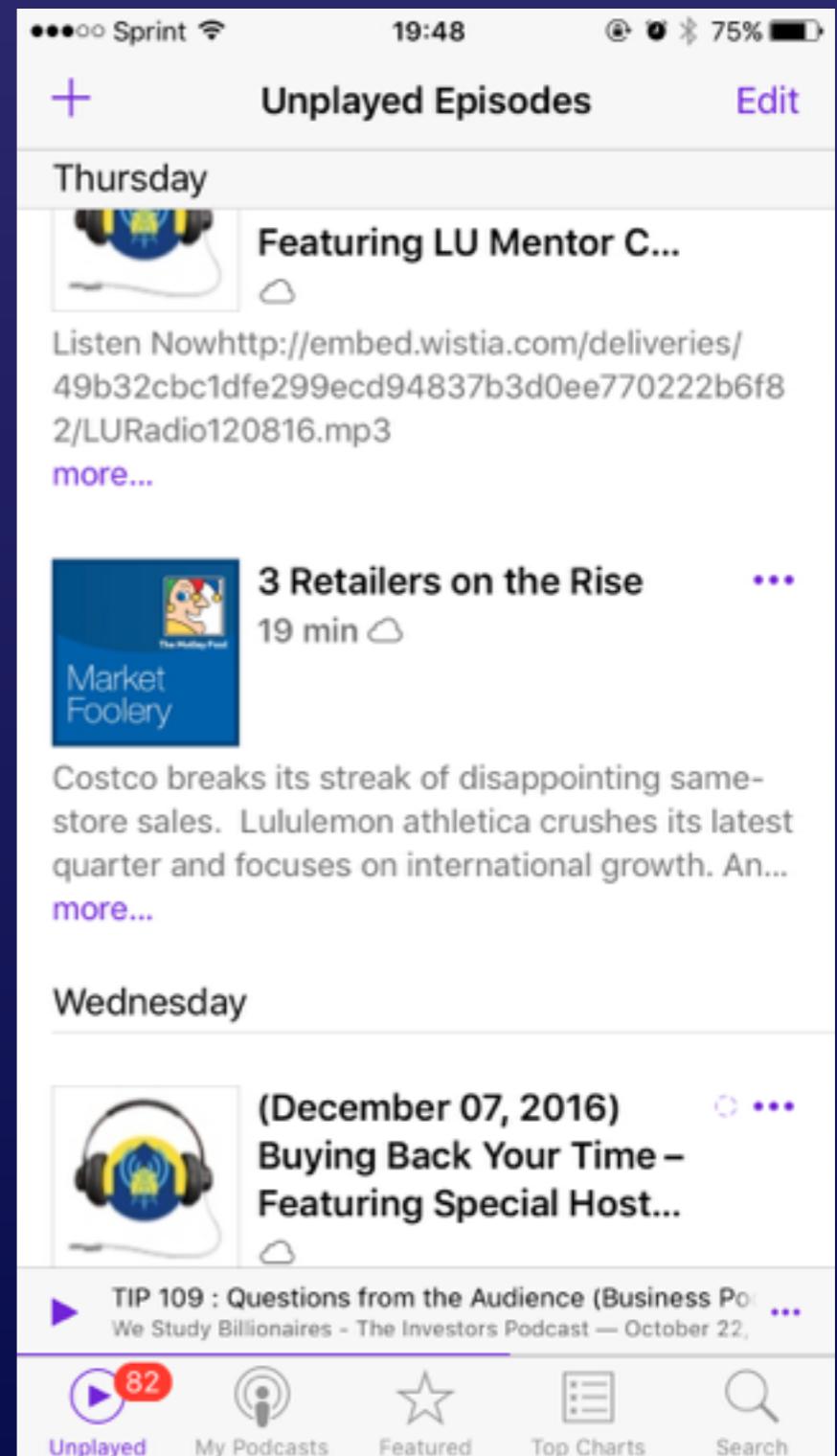
The screenshot shows the WWDC app's schedule interface. At the top, there are navigation buttons for 'Filter' (white), 'All' (blue), and 'Favorites' (white). Below that is a search bar with the placeholder 'Search Schedule'. The main content area displays a table of events with the following data:

| Date / Time | Event Name | Location |
|------------------|-------------------------------------|--|
| Monday, 10:00 PT | Keynote | 10:00 AM - 12:00 PM – Bill Graham Civic Auditorium |
| Monday 14:30 | Platforms State of the Union | 2:30 - 4:00 PM – Bill Graham Civic Auditorium |
| Monday 16:30 | Apple Design Awards | 4:30 - 5:30 PM – Bill Graham Civic Auditorium |
| Tuesday 09:00 | What's New in Swift | 9:00 - 9:40 AM – Presidio |
| | Internationalization Best Practices | 9:00 - 9:40 AM – Mission |
| | What's New in Accessibility | 9:00 - 9:40 AM – Pacific Heights |
| | What's New in Xcode App Sianina | |

At the bottom, there are four navigation icons: 'Schedule' (calendar icon), 'Maps' (location pin icon), 'News' (newspaper icon), and 'Videos' (monitor icon).

Podcast App

Decent colors/views



Decided to use 3 screens

As simple as that!

Carrier 

10:21 AM



Record



Record



Files



Settings

Carrier

10:21 AM



Files

No files yet. You didn't record anything?

To see some files go to 'Record' tab and start recording



Record



Files



Settings

Carrier



10:21 AM



Settings



Logout
with subtitle



SENSORS

Accelerometer



Gyroscope



Magnetometer



Pedometer



Record



Files



Settings

Early prototypes

Paper is much better

Very easy way to iterate

No need to draw much of complex stuff

Just rectangles, squares and circles

Picking tools?

Picking tools?

For Open-Source they must be
reproducible + automated

Started with designing in
InkScape

Started with designing in
InkScape
Android

Started with designing in InkScape

Too much work for early design

Too few people use it to make it practical

Open Source: less availability for design tools

There are some, but most of designers don't use them

Commercial tools:
much better for now

You probably already
have them

Keynote

Some design/prototyping inspiration Apple's

"Fake It Till You Make It"

WWDC presentation



<https://developer.apple.com/videos/play/wwdc2014/223>

Some design/prototyping inspiration Apple's

Designing for Future Hardware

WWDC presentation



<https://developer.apple.com/videos/play/wwdc2015/801/>

PowerPoint

Software I paid for

Affinity Designer

Affinity Designer

Not enough community yet. **VERY** promising

Affinity Designer

Not enough community yet. **VERY** promising

Flat rate pricing

Affinity Designer

Not enough community yet. **VERY** promising

Flat rate pricing (\$50)

NO scripting yet....

Graphic

Graphic

(used to be iDraw)

Graphic

(used to be iDraw)

Nice and simple

Graphic

(used to be iDraw)

Nice and simple

Scriptable (uses <http://jstalk.org/>)

Powerful but WEIRD

No real ecosystem (templates, stencils)

Software I recommend

Adobe Creative Suite

Adobe Creative Suite

If \$50/month is OK with you

Adobe Creative Suite

If \$50/month is **OK** with you

All their tools work well within the suite

Sketch

Sketch

Somewhat popular recently

Sketch

Somewhat popular recently

Easy

Sketch

Somewhat popular recently

Easy

Flat pricing (\$50/once)

Sketch

Somewhat popular recently

Easy

Flat pricing (\$50/once)

Some scripting!

Sketch Winner for now!

Easy

Flat pricing (\$50/once)

Some scripting!

Sketchtool for command line interface

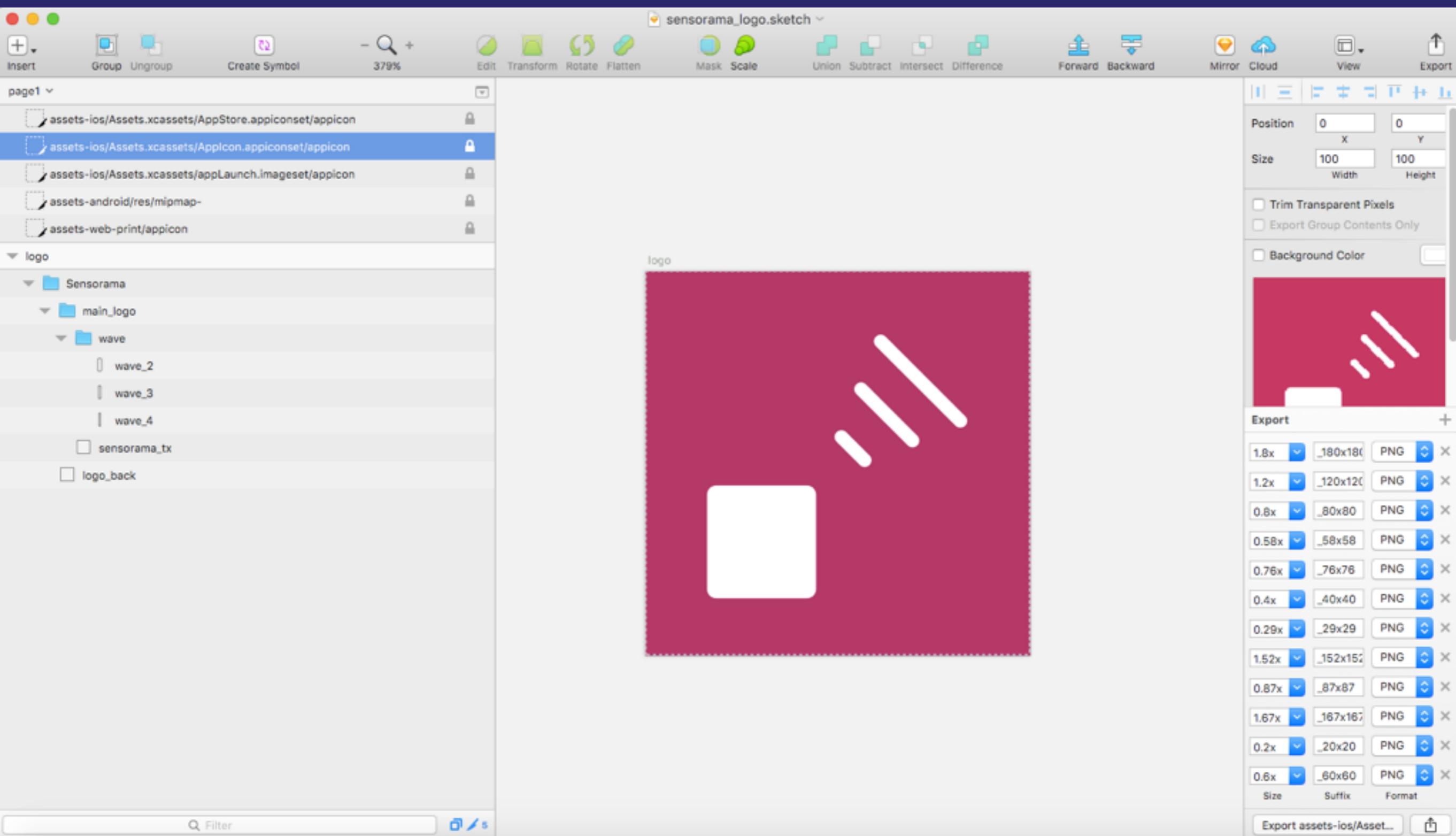
Sketchtool for command line interface

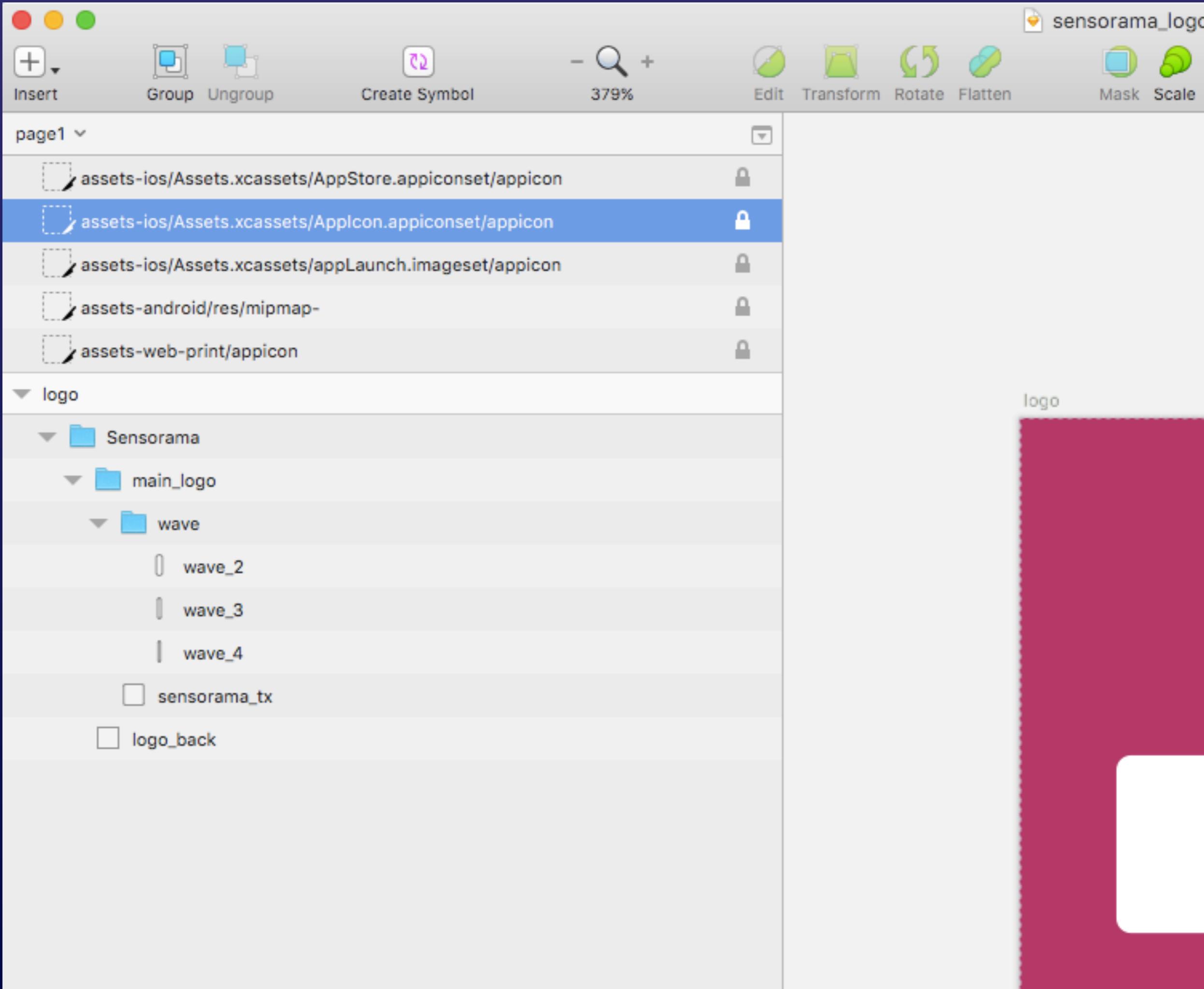
My artwork = 1 sketch file

Sketchtool for command line interface

My artwork = 1 sketch file

<https://github.com/wkoszek/sensorama-artwork>





Union Subtract Intersect Difference

Forward Backward

Mirror

Cloud

View

Export



Position X Y
Size Width Height

Trim Transparent Pixels
 Export Group Contents Only

Background Color



Export

| | | | |
|-------|----------|-----|---|
| 1.8x | _180x180 | PNG | X |
| 1.2x | _120x120 | PNG | X |
| 0.8x | _80x80 | PNG | X |
| 0.58x | _58x58 | PNG | X |
| 0.76x | _76x76 | PNG | X |
| 0.4x | _40x40 | PNG | X |
| 0.29x | _29x29 | PNG | X |
| 1.52x | _152x152 | PNG | X |
| 0.87x | _87x87 | PNG | X |



Rendering is
completely automated

./regen.sh

Updating is completely automated

```
./update.sh  
git commit ..../sensorama-ios
```

Let me know how your
flow works like!

OSS truth about design tools

OSS truth about design tools

Imperfect for GitHub work (binary formats)



Usability
tests

Asking people to tell you how
to make stuff work is great

**Users getting confused:
great feedback for you**

Users give a lot of "I
don't get it" feedback

Users give a lot of
"I don't get it" feedback

Especially for a geeky app like this

See my YouTube channel "Building
Real-World iOS App"



<https://github.com/wkoszek/sensorama-ios>

Implementation

1st version

Android!

Android tools - fine for
smaller OSS projects

Bigger projects: you
feel like Java/Gradle
compilers should be
3-5x faster

Android tools - fine for
smaller OSS projects

Main IDE not
Open-Source

Gradle (build system)
= Open Source

Tools

Android vs iOS

Tools

Android vs iOS

Tie

Tools

Android vs iOS

Tie

Too much XML

Tools

Android vs iOS

Tie (XCode = Android Studio in problems)

e.g.: Too much XML

```
commit 2e312665b79ac83a6672128b2f1fac31960c91c4
Author: Wojciech A. Koszek <wojciech@koszek.com>
AuthorDate: Sat Jul 25 09:57:21 2015 -0700
Commit: Wojciech A. Koszek <wojciech@koszek.com>
CommitDate: Sat Jul 25 09:57:21 2015 -0700

        Recreate the project in Android Studio, because some files were wrong.

        Resulting in project now being able to compile.

app/android/Sensorama/.idea/gradle.xml | 3 +-
app/android/Sensorama/.idea/misc.xml | 102 ++++++-----
app/android/Sensorama/app/app.iml | 1 -
3 files changed, 101 insertions(+), 5 deletions(-)

diff --git a/app/android/Sensorama/.idea/gradle.xml b/app/android/Sensorama/.idea/gradle.xml
index fe865d3..736c7b5 100644
--- a/app/android/Sensorama/.idea/gradle.xml
+++ b/app/android/Sensorama/.idea/gradle.xml
@@ -3,9 +3,8 @@
<component name="GradleSettings">
    <option name="linkedExternalProjectsSettings">
        <GradleProjectSettings>
-            <option name="distributionType" value="LOCAL" />
+            <option name="distributionType" value="DEFAULT_WWRAPPED" />
            <option name="externalProjectPath" value="$PROJECT_DIR$" />
-            <option name="gradleHome" value="$APPLICATION_HOME_DIR$/gradle/gradle-2.2.1" />
            <option name="modules">
                <set>
                    <option value="$PROJECT_DIR$" />
diff --git a/app/android/Sensorama/.idea/misc.xml b/app/android/Sensorama/.idea/misc.xml
index 9076de5..92209e6 100644
--- a/app/android/Sensorama/.idea/misc.xml
+++ b/app/android/Sensorama/.idea/misc.xml
@@ -1,10 +1,108 @@
<?xml version="1.0" encoding="UTF-8"?>
<project version="4">
-    <component name="EntryPointsManager">
-        <entry_points version="2.0" />
+    <component name="DaemonCodeAnalyzer">
+        <disable_hints />
+    </component>
+    <component name="ProjectLevelVcsManager" settingsEditedManually="false">
```



Open Source
Good and BAD parts

Good stuff

A lot of functionality

A lot of functionality
for FREE !

Sensorama is using

23

OSS modules

Too many to
mention them all,
but lets looks at
what I've put into
it quickly

Fabric/Crashlytics
Must have for
debugging

NSLogger for
convenient
debugging

Realm for
data model

AWS SDK for storage

Auth0 for authorization

Mailgun for
e-mail
handling

BZIP2 for
very good
compression

InAppSettings
for the
settings screen

All this stuff is
Open Source!!!

Just go on GitHub and
search for things you
need

I have 2
takes on it

Take 1

Without OSS
building app like
Sensorama wouldn't
be possible

Take 2

Using only my
own stuff would
make it more fun

Using only my
own stuff would
make it more fun

but would take more time

Using only my
own stuff would
make it more fun

but would take more time
or NOT?

Take 3

Use it
"as expected"
and you'll be fine

If you deviate from
normal use case, you're
completely alone

Cool thing

Basically \$0 for
code development

Many companies
offer tools for FREE
to Open-Source
projects

e.g.: Auth0 has a nice,
fully-featured version of
their product available
to Open-Source projects

You project is OSS?

No need to pay for GitHub or Travis-CI

JetBrains gave me
their tools to try out
for free too

Some lessons
learned

OSS modules:
CocoaPods

Repository for all
cool iOS stuff

SEARCH*

* Type here to search by name, version, author, keywords, summary, and dependencies.

WHAT IS COCOAPODS

CocoaPods is a dependency manager for Swift and Objective-C Cocoa projects. It has over 26

CocoaPods is great!

CocoaPods is great!

Sort of

CocoaPods is great!

Sort of

Takes your XCode project and modifies it

CocoaPods is great!

Sort of

Takes your XCode project and modifies it
in ... unreadable ways (XML)

CocoaPods is great!

Conclusion 1

Conclusion 1

You need to know how to use it well

CocoaPods is Ruby

CocoaPods is Ruby

Podfile is like Gemfile

CocoaPods is Ruby

Podfile is like Gemfile

Use specific version of the modules

CocoaPods is Ruby

Podfile is like Gemfile

Use specific version of the modules

Will help you stay out of trouble

CocoaPods is adding
more complexity

CocoaPods is adding more complexity

and dependency on network, GitHub and other people
repositories

CocoaPods is adding more complexity

and dependency on **network**, **GitHub** and other **people**
repositories

CocoaPods is adding more complexity

and dependency on **network**, **GitHub** and other **people**
repositories

Matters if you work over the tethered connection

Conclusion 2

Conclusion 2

Commit files from Cocoa

Conclusion 2

Commit files from Cocoa

At least you'll be able to see what changes

Might be tons of MBs of code, but at
least you can "git diff" it

Some modules are
hundreds of lines of code

Conclusion 3

My next project will use Carthage

Carthage

Carthage

Building you frameworks which you
later integrate

Conclusion 4

Most stuff just works

Most stuff sometimes works

1st Android version was using
Parse SDK

1st Android version was using
Parse SDK

Shutdown

Travis-CI

Travis-CI

Great and free continuous integration
solution!

Travis-CI

Great and free continuous integration
solution!

Stuff changes fairly often

Slow and *Sometimes* continuous integration solution!

Great and free *Continuous* integration solution!

Travis-CI

Out of date

Other stuff needs monitoring

Other stuff needs monitoring

3rd parties you depend on become your
"failure chain"

Be prepared for a lot of documentation
reading

(all following images have been made by other great people who put it on imgur.com)

Conclusion 5

Update stuff only when necessary

Updates are when the most breakages
happened

Easy to get help from companies

Harder from volunteers/free projects

How to communicate?

Do due diligence, be
clear and post exact data

[Edit comment](#)



wkoszek commented on Aug 3 • edited



- I've read and understood the *CONTRIBUTING guidelines and have done my best effort to follow.

Report

What did you do?

I've upgraded to the 1.0.1 CocoaPods. I'm able to build my project fine, however I can no longer build unit tests. XCode complains that several header files from the Pods I'm using are missing.

What did you expect to happen?

I expected that upon an upgrade I'll be able to build both the app scheme, and the tests scheme.

What happened instead?

Regression has been introduced from 0.39.0 version, which used to work fine for me, and with 1.0.1 there are issues with finding header files.

CocoaPods Environment

Stack

CocoaPods : 1.0.1

Ruby : ruby 2.2.4p230 (2015-12-16 revision 53155) [x86_64-darwin15]

RubyGems : 2.4.8

Remember:
volunteers!



This repository

Search

Pull requests Issues Gist



CocoaPods / CocoaPods

Watch ▾

531

Unstar

8,881

Fork

1,689

Code

Issues 190

Pull requests 5

Projects 0

Wiki

Pulse

Graphs

Filters ▾

is:issue wkoszek

Labels

Milestones

New issue

X Clear current search query, filters, and sorts

! 0 Open ✓ 5 Closed

Author ▾

Labels ▾

Milestones ▾

Assignee ▾

Sort ▾

ⓘ [CocoaPods 1.0.1] Can't build *Tests scheme for pods; header files missing

14

#5710 by wkoszek was closed on Aug 9

1 of 1

ⓘ `pod repo update` keeps cloning master-1/2/3 repos

3

#5656 by wkoszek was closed on Jul 24

1 of 1

ⓘ Invalid lock file after install/update s2:confirmed



24

#4740 by djbe was closed on Feb 26

ⓘ Unable to satisfy the following requirements with Podfile, but they required a higher minimum deployment target. s1:awaiting input

26

#4373 by bf3400 was closed on Oct 20, 2015

ⓘ CocoaPods is unable to read YAML files when Psych 2.0.13 is installed d1:easy t2:defect

16

#3539 by kylef was closed on May 2

Report bugs in code
and documentation

Search

org:auth0 wkoszek

Search

[Repositories](#)

[Code](#)

[Issues](#)

[Wikis](#)

[Users](#)

States

[Closed](#)

3

[Auth0 doesn't build correctly with CocoaPods 1.0.0beta6](#) #253

[Objective-C](#)

2

[GCC Machine Description](#)

1



["Use your own UI page" references wrong resource](#)

#1153

Hello @ **wkoszek** thank you for reporting this issue. Not sure what went wrong there, but the download link works now.

auth0/docs Opened by wkoszek on Apr 10 1 comment



[E-mail field in the login widget should show correct keyboard type](#)

#251

auth0/Lock.iOS-OSX Opened by wkoszek on Apr 9 4 comments



[Auth0 doesn't build correctly with CocoaPods 1.0.0beta6](#)

#253

auth0/Lock.iOS-OSX Opened by wkoszek on Apr 10 2 comments

Languages

Talk to people

Add Travis to the project #356

[Edit](#)[Open](#)wkoszek wants to merge 4 commits into `futuretap:master` from `wkoszek:travis`[Conversation 4](#)[Commits 4](#)[Files changed 4](#)[+18 -38](#)

wkoszek commented on Jul 7 • edited

Contributor



We should see if the pull requests are fine through the Travis wiring.

Example of the successful build:

<https://travis-ci.org/wkoszek/InAppSettingsKit/builds/143246550>

@futuretap Unsure if you guys use Travis, so just in case: you'd have to setup and account and wire the futuretap's InAppSettingsKit repo in there. The README.md already has a badge pointing to your repo.

wkoszek added some commits on Jul 7

- Refactor Makefile. LogicTests=OK; AppTest=almost.. 65d3ce8
- Modernize tests and make it run in XCode 7 799cd8d
- Bring a skeleton of my .travis. 64ab44a
- Add the Travis badge. ... c739658



futuretap commented on Jul 8

Owner



I've never used it so I don't know how this all works and what implications it has. For instance, does it automatically build & test each pull request?



wkoszek commented on Jul 8

Contributor



@futuretap Yeah. If you decide to integrate Travis in the repo, you'll see Travis building IASK on each commit (and executing whatever is in .travis.yml) and pull requests will get built too.

Reviewers

No reviews

Assignees

No one assigned

Labels

None yet

Projects

None yet

Milestone

No milestone

Notifications

[Unsubscribe](#)

You're receiving notifications because you authored the thread.

2 participants

 Allow edits from maintainers.[Learn more](#)



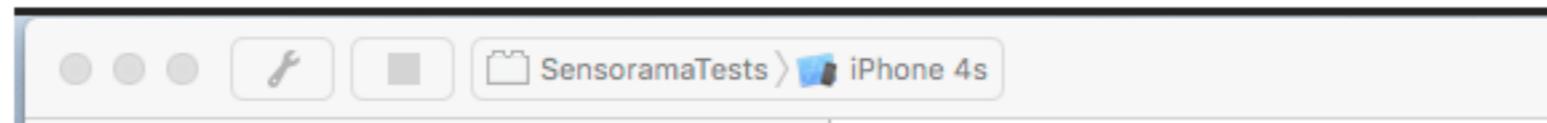
wkoszek commented on Apr 22



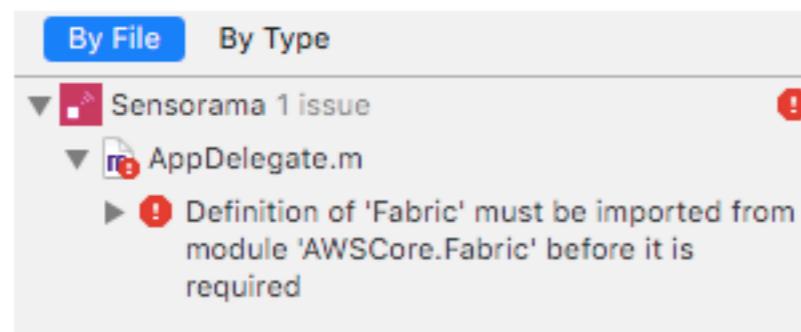
@yosuke-matsuda I was not running into this problem at all in 2.3.6 at all, but I have upgraded my AWS Pods recently to 2.4.0 :

wkoszek/sensorama-ios@ 0f6e314

I'm hitting this problem. Symptom is the same as guys explained above. However there is a weird behaviour for unit tests in my case. I build them with CMD+SHIFT+u:



Sometimes it fails, and if it fails, it's always with:



But when I rebuild it several times by hitting the same keystrokes, it can actually build fine. This helped:

wkoszek/sensorama-ios@ 195042c

Would be nice to understand why it's happening.

Help with sample code

Commits on Sep 5, 2016



Fixed deprecation warning #340

Ortwin Gentz committed on Sep 5



[9b15626](#)



IASKSegueIdentifier/IASKViewControllerClass: catch undefined segue/class ...

Ortwin Gentz committed on Sep 5



[eba87af](#)



Simplified Storyboard Sample ...

Ortwin Gentz committed on Sep 5



[98f87ba](#)



Show how to use neverShowPrivacy... and credits.

wkoszek committed with Ortwin Gentz on Jul 7



[7b8ba3a](#)



Fix the statement. ...

wkoszek committed with Ortwin Gentz on Jul 7



[5964b74](#)



Add 1 more sampleSwitch.

wkoszek committed with Ortwin Gentz on Jul 7



[5465c44](#)



Bring some more documentation.

wkoszek committed with Ortwin Gentz on Jul 7



[6c7a8ed](#)



Bring the sample app.

wkoszek committed with Ortwin Gentz on Jul 7



[140f7eb](#)



Merge pull request #358 from kristian/master ...

futuretap committed on GitHub on Sep 5



[650630d](#)



-o Commits on Jul 8, 2016



Merge pull request #354 from wkoszek/improved_docs2 ...

wkoszek committed on GitHub on Jul 8



c6f2948



-o Commits on Jul 7, 2016



Move subclassing stuff above. No need for chapter.

wkoszek committed on Jul 7



9e3fa6e



Fix formatting.

wkoszek committed on Jul 7



8b8705b



Merge pull request #351 from wkoszek/improved_docs ...

wkoszek committed on GitHub on Jul 7



253407d



Merge pull request #350 from wkoszek/patch-1 ...

wkoszek committed on GitHub on Jul 7



fea1758



Add some more documentation.

wkoszek committed on Jul 7



d84de74



Move the license to the end.

wkoszek committed on Jul 7



acdc4c9



Improve formatting.

wkoszek committed on GitHub on Jul 7



a554321



-o Commits on Jul 6, 2016



Clarify the intro a bit more. ...

wkoszek committed on GitHub on Jul 6



cf2281a



Other than that -
business as usual

Software can be chaotic, but we make it work



Expert

Trying Stuff Until it Works

O RLY?

The Practical Developer
@ThePracticalDev

tabs except this one
Cutting corners to meet arbitrary management deadlines



Essential

Copying and Pasting from Stack Overflow

O'REILLY®

The Practical Developer
@ThePracticalDev

The internet will make those bad words go away



Essential

Googling the Error Message

O RLY?

*The Practical Developer
@ThePracticalDev*

If there is documentation

BAD stuff

(all following images have been made by other great people who put it on imgur.com)

Who are you kidding?



“Temporary” Workarounds

O RLY?

@ThePracticalDev

Does it run? Just leave it alone.

Click to close this tab, Option
tabs except this one



Writing Code that Nobody Else Can Read

The Definitive Guide

O RLY?

@ThePracticalDev

You must do your homework before
asking

But also ask early to understand
if you're doing the right thing

A LOT of work

AUTOMATE

ALL THE THINGS

memegenerator.net

Using Fastlane for iOS

Single-command build and
deploy to Fabric and AppStore

Pain to get to work

(Ruby dependencies breaking)

but **GREAT** once it works

Harder than non-OSS
projects

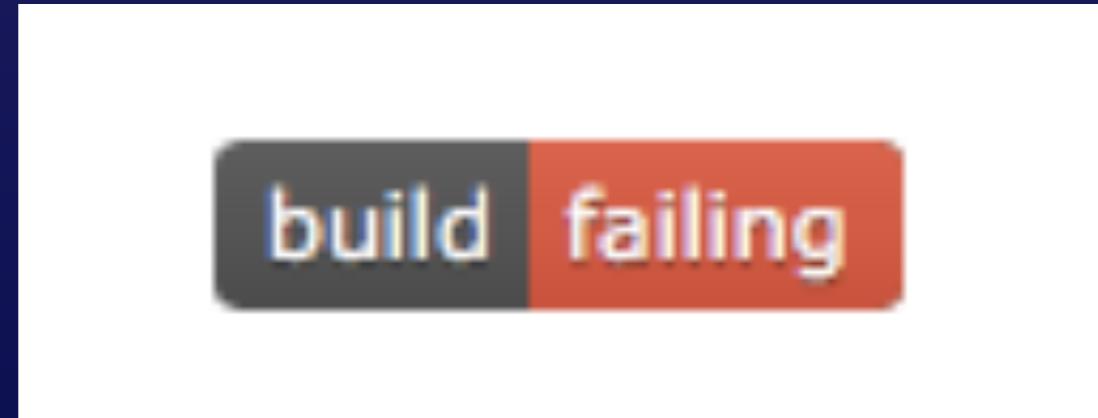
Others are looking, so you want to
get to a certain decent code quality

Easy to publish too much
(e.g.: your API keys)

Easy to publish too much
(e.g.: your API keys)

Regenerating = painful

Prepare to unexpected breakages



Follow your vendors

Example of Apple's 2-factor authentication



Summary

Star Sensorama on GitHub

<http://www.sensorama.org>

Q/A

Building An

Open-Source iOS App

Wojciech Adam Koszek · <http://www.koszek.com> ·  wkoszek

Silicon Valley Mobile Developers & Designers, Dec 12th, 2016