307: Architecting for Multiple Platforms

iPhone, iPad, Watch, TV

raywenderlich.com

2010-2015

- You probably programmed apps for iPhone.
- You might have programmed apps for iPad.
- Life was simple.

Today

Rented
Top Films
LOOPER
breaking dawn
LAWLESS
SEARCHING FOR SUGAR MAN
THE IMPOSTER
Films
TV Programmes
Music
Computers
Settings
NETFLIX
MLB.com
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Activity
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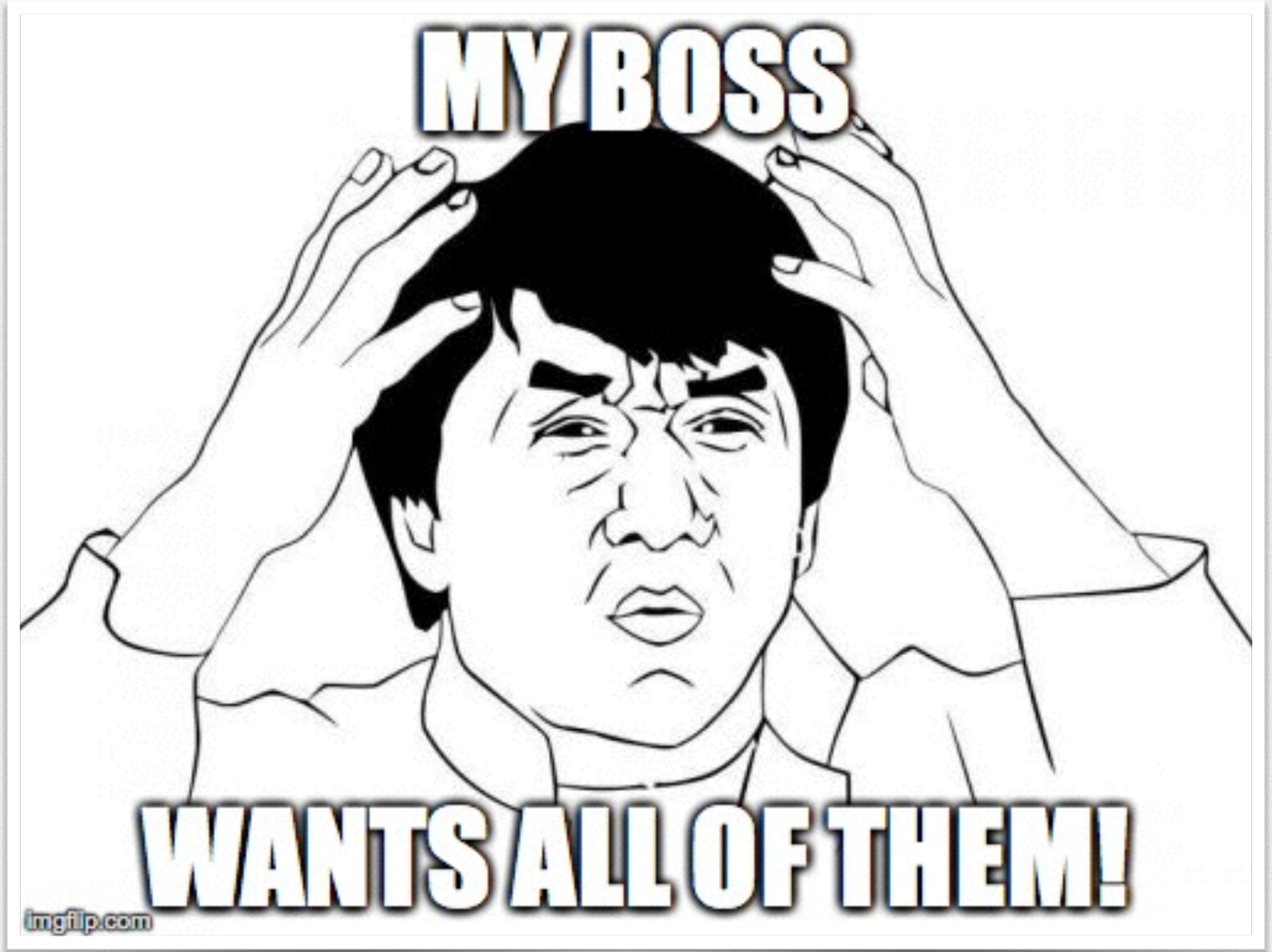
MY BOSS
WANTS ALL OF THEM!
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Cross Platform Themes
* What you'll learn today

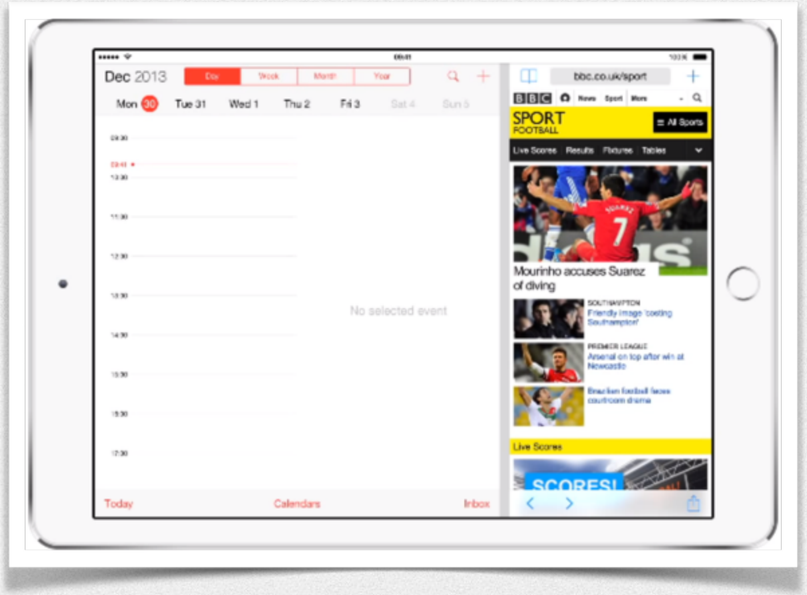
- Sharing Code
- Sharing Bits (i.e. Frameworks)
- Don't Repeat Yourself (DRY)
- Minimize Code/Debug Cycles

Cross Platform Concerns

- Screen Sizes
- Shared Code and Consistency - DRY (Don't Repeat Yourself)
- App vs Extension
- Code/Debug Cycle

Cross Platform Concerns
Screen Sizes

- Current generation iPhones and iPads now come in many sizes
- Some support landscape (iPhone 6+)
- Some iPads support split-screen



Cross Platform Concerns
Sharing Code

- Your apps may share **very** similar behaviors
- Sometimes difficult when platform **X** has slightly different behavior than platform **Y**
- Temptations to “copy/paste/tweak”.

```
class VoteViewController: UIViewController {
  override func viewDidLoad() {
    button.backgroundColor = .greenColor()
  }
}
```

```
class TVVoteViewController: UIViewController {
  override func viewDidLoad() {
    button.backgroundColor = .greenColor()
  }
}
```

```
class VoteInterfaceController: WKInterfaceController {
  override func awakeWithContext(context: AnyObject?) {
    button.setBackgroundColor(.greenColor())
  }
}
```

Cross Platform Concerns
Platform Capabilities

- Limited API's for app extensions
  - `sharedApplication`
  - Camera APIs
- iPhones can't use an Apple Pencil.
- TV's can't use the camera or notifications.
- ... But they can all (except watch!) use `UIViewController`!

Cross Platform Concerns
Code Debug Cycle

- Write once, ~~run everywhere~~ break everything!
- Building iPhone in a debug environment won't build TV or Watch.
- Code/debug cycles scale up with number of targets.
- May code for hours on one platform without realizing what broke on another.

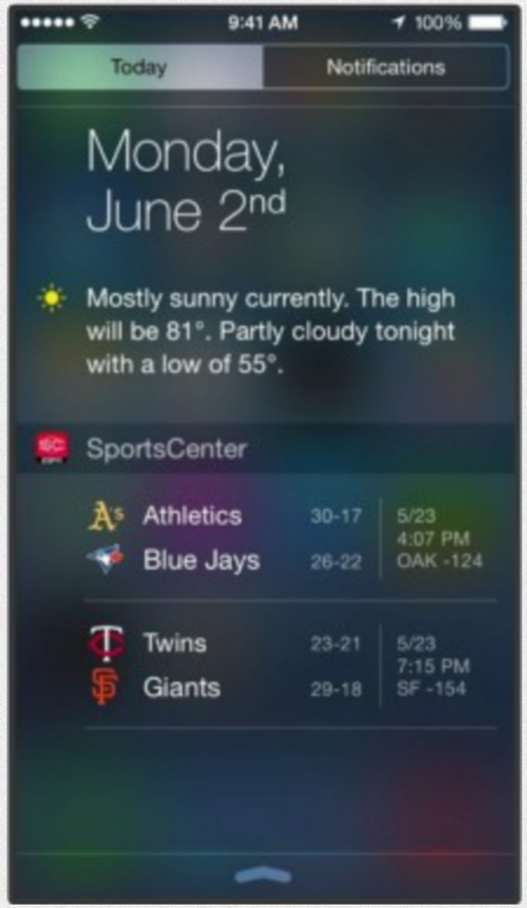
A Tour of the iOS Family

Start with iPhone and iPad

- What you're (likely) used to!
- Shared views, view controllers, models, networking etc.
- Single **target** and **bundle ID.**
- Use AutoLayout and Size Classes

App Extensions

- iOS and UIKit
- Packaged with “containing” app
- Limited APIs
- Code sharing with iPhone/iPad



Apple TV

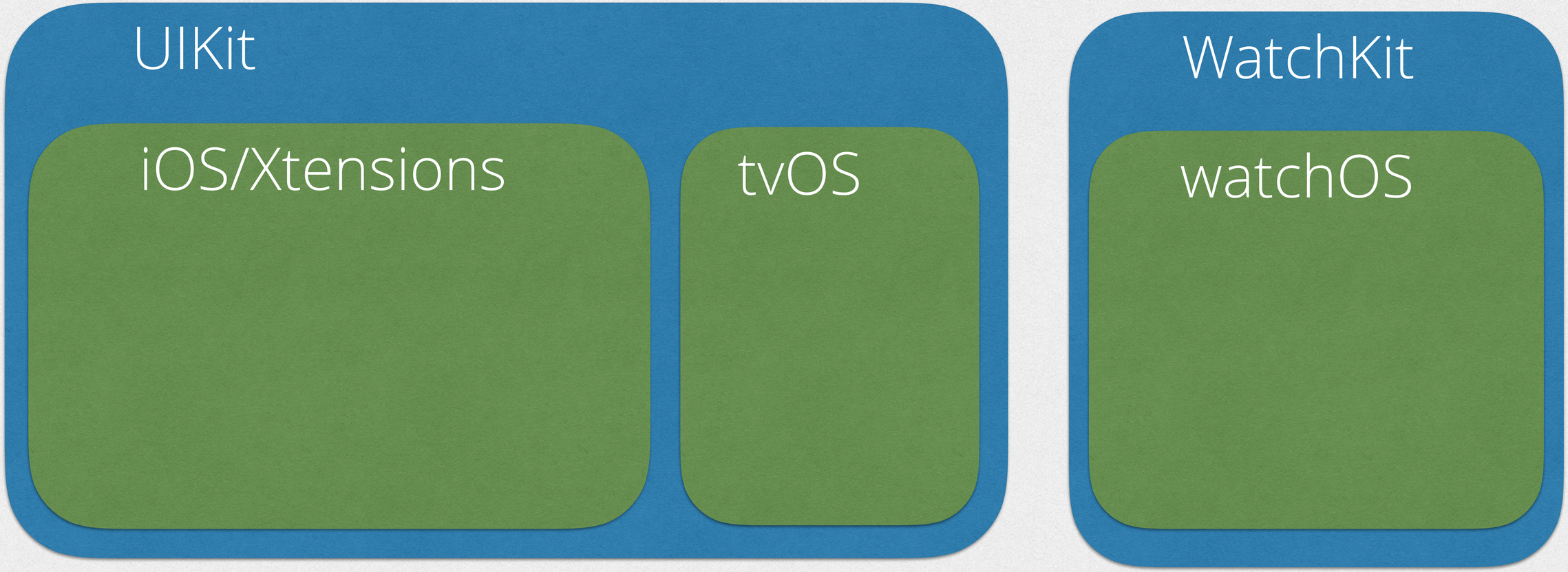
- **tvOS** and **UIKit**
- **Very large** overlap between **iOS** and **tvOS**.
- tvOS ≠ iOS
- Binary Compatibility

Apple Watch

- **watchOS and WatchKit**
- The least-like every other platform
- No UIKit
- Not binary compatible with iOS

Quick Recap

Compatibility Map



Binary Compatible

Code Compatible

Code Compatibility
Plain-Old-Swift-Objects (POSO's!)

- iOS - ✅
- iOS Extensions - ✅
- tvOS - ✅
- watchOS - ✅

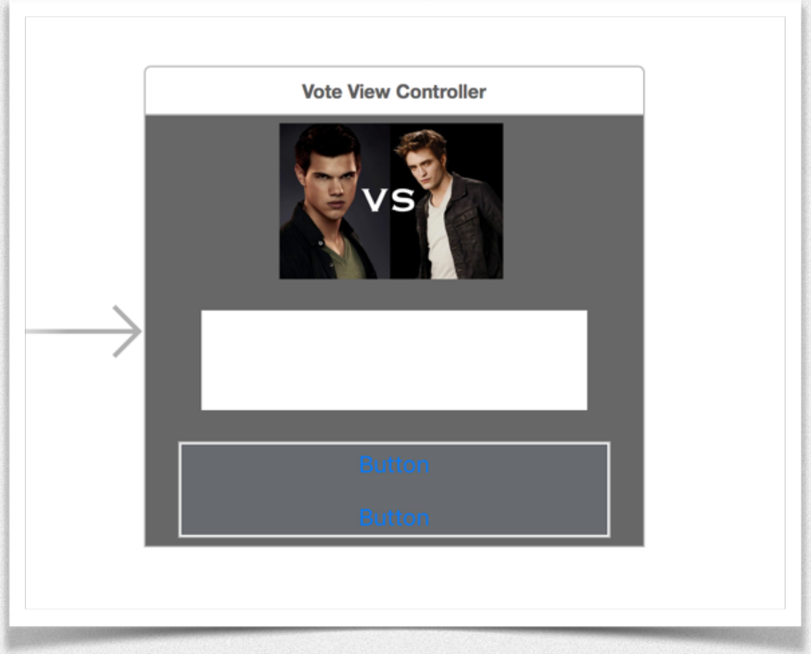
```
import Foundation

struct Answer {
  let answer: String
  let answerId: Int
}
```

Code Compatibility
UIKit

- iOS - ✅
- iOS Extensions - ✅
- tvOS - ✅
- watchOS - ❌
  - (Some UIKit namespace overlap)

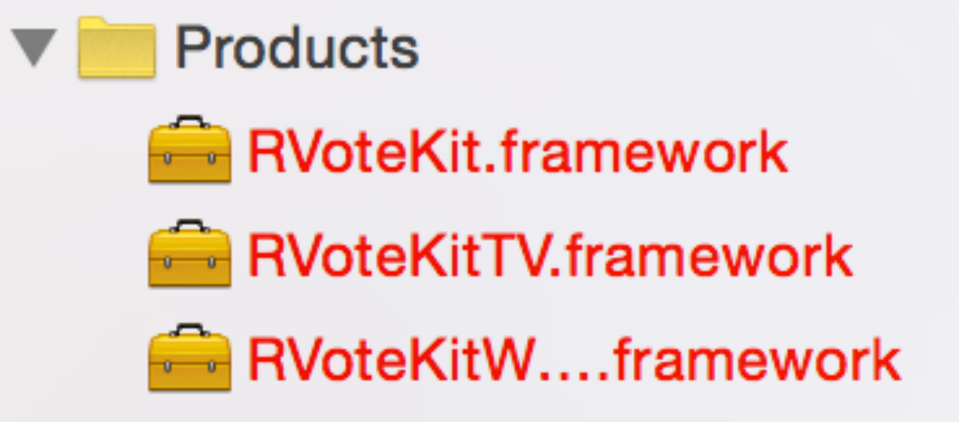
Storyboard Compatibility

- iOS - ❌
- iOS Extensions - ❌
- tvOS - ❌
- watchOS - ❌
- **Storyboards cannot be shared across any platform :[**



Binary Compatibility

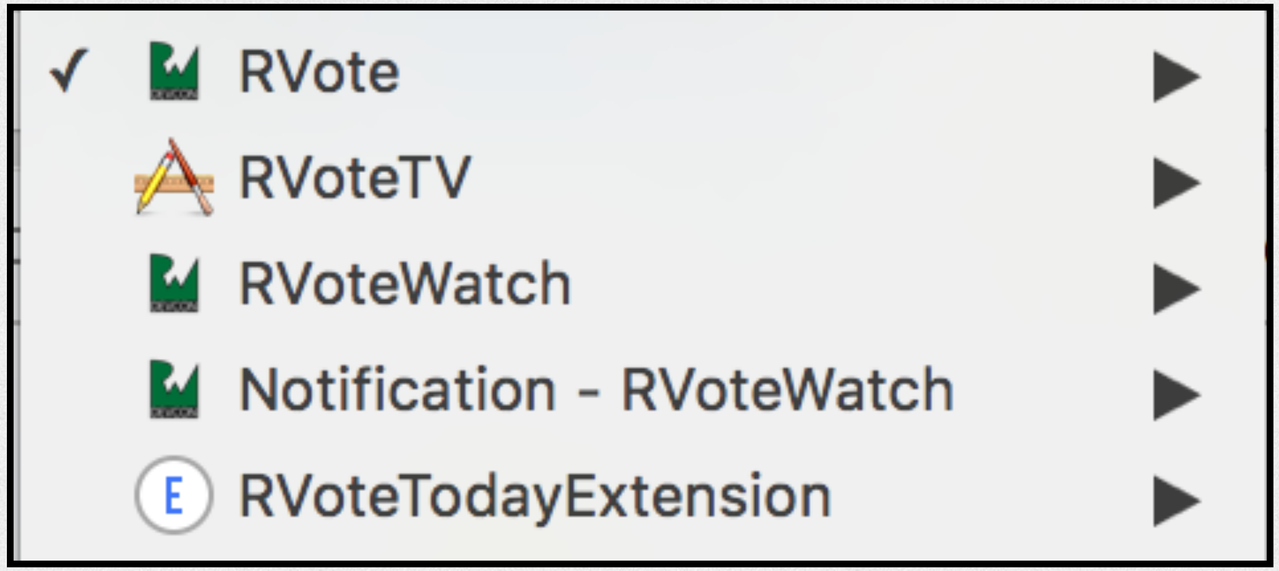
- iOS -
- iOS Extensions -
- tvOS -
- watchOS -



Consequences

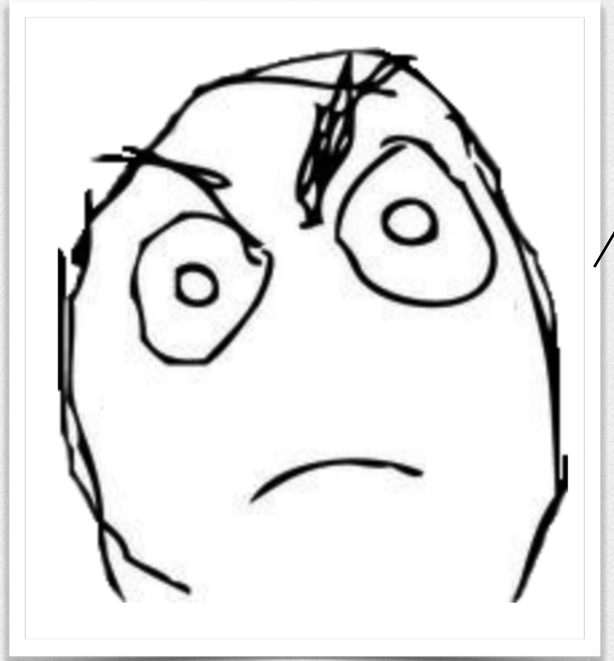
Consequences

- Hit “Play” = ~~*Runs your app*~~ Runs one of your 5 targets
- “Surprise” build errors :[



Consequences

- Hit “Play” = ~~*Runs your app*~~ Runs one of your 5 targets



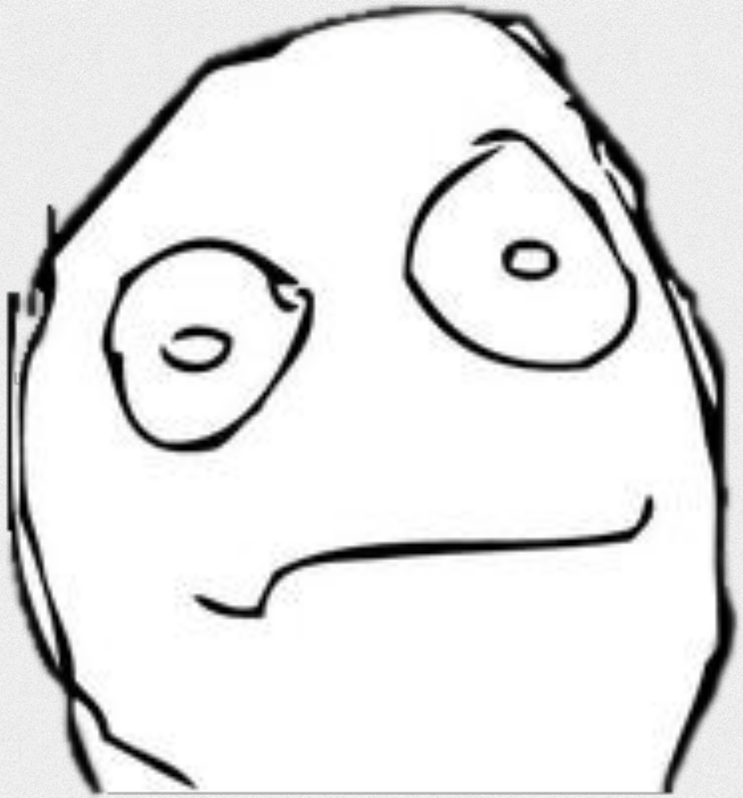
~~*Bill, you broke the build!*~~

Bill, you broke 4 builds!

Consequences
UI

- Some **common** language and frameworks (Foundation, Swift/Obj-C)
- Some **somewhat common** frameworks (UIKit)
- Multiple UI paradigms (touch, focus, watch)

Yikes!



How To Manage?

How to Manage?

- How to maintain **consistent visual design**?
- How to **maximize code reuse**?
  - ...while leveraging **platform-specific features**?
- How to **safely** write reusable code?

Maximize Code Reuse

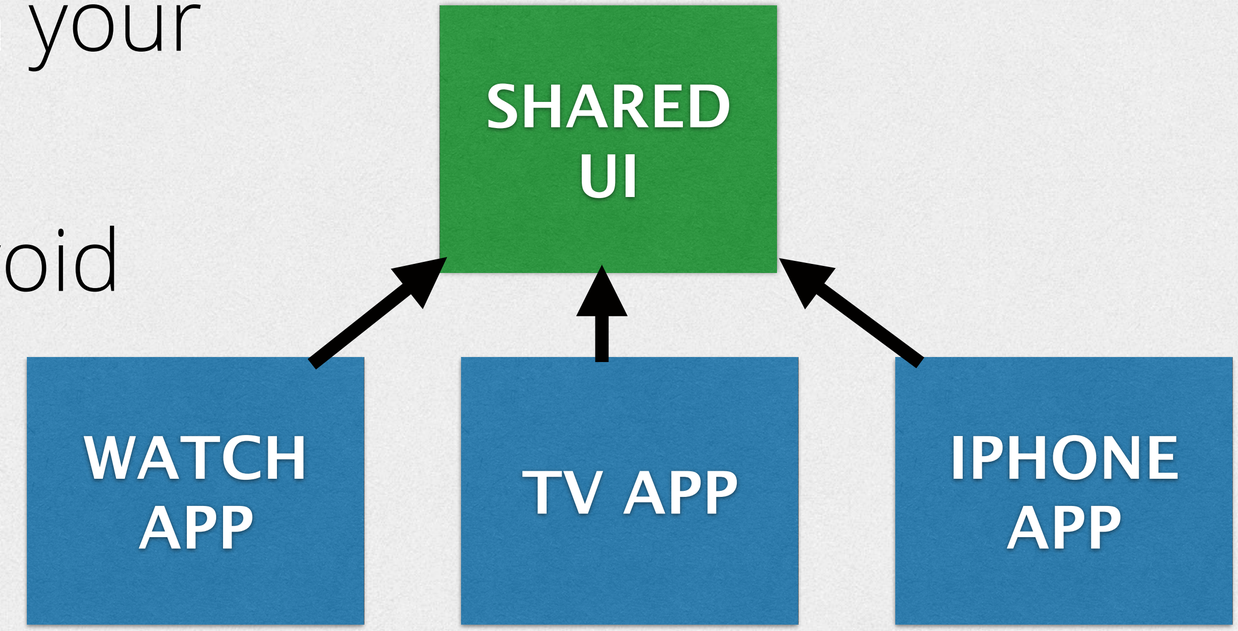
Maximize Code Reuse

- All of **Foundation** can be used across all platforms.
  - Share networking and model code!
- **View Controllers** can be shared across iOS, tvOS, and (some) extensions.
- Of course, ordinary Swift / Objective-C code can be shared across all platforms.

Visual Consistency

Visual Consistency

- Leverage a shared UI framework
- Build UI separate from your core app
- Minimize repeating, avoid bugs!



Playgrounds

- Playgrounds allow you to render your interface in a (mostly) platform-agnostic environment.
- Preview controls, color themes, or even entire view controllers.
- Minimal code/debug cycles. Just edit code and watch the updates!
- (BONUS!) Forces you to write decoupled UI code.

Playgrounds!

```
import UIKit
import RVoteKit
import XCPlayground

let button = NSBundle(forClass: VoteButton.self).
    loadNibNamed("VoteButton", owner: nil, options: nil).
    first as! UIButton

button.frame = CGRect(x: 0, y: 0, width: 100, height: 50)

let view = UIView(frame: CGRect(x: 0, y: 0, width: 100,
    height: 50))
view.backgroundColor = UIColor.whiteColor()

view.addSubview(button)

XCPlaygroundPage.currentPage.liveView = view
```

Playgrounds!

```
8  Clay.dark                    r 0.051 g 0.076 b 0.13 a 1.0
9  Clay.cream                   r 1.0 g 0.926 b 0.87 a 1.0
10 Clay.green                   r 0.772 g 0.85 b 0.425 a 1.0
11 Clay.brown                   r 0.53 g 0.385 b 0.366 a 1.0
12 Clay.teal                    r 0.686 g 0.88 b 0.809 a 1.0
13
14 UIColor.text                 r 0.051 g 0.076 b 0.13 a 1.0
15 UIColor.background           r 1.0 g 0.926 b 0.87 a 1.0
16 UIColor.highlight            r 0.772 g 0.85 b 0.425 a 1.0
17 UIColor.buttonEnabled        r 0.772 g 0.85 b 0.425 a 1.0
```

Safely Writing Reusable Code

Carefully Decorate with Platform Specific Capabilities

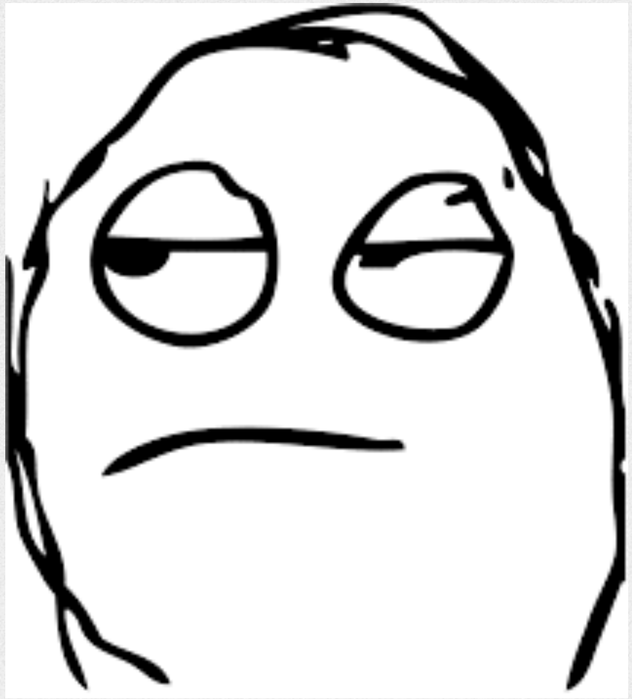
- Reference **sharedApplication()** - **Bad :[**

```
func scheduleVoteReminder() {
  let notification = UILocalNotification()
  notification.fireDate = NSDate()
  notification.alertBody = "Check out your new polls!"
  UIApplication.sharedApplication()
    .scheduleLocalNotification(notification)
}
```

Carefully Decorate with Platform Specific Capabilities

- Guard with preprocessor - **Better**

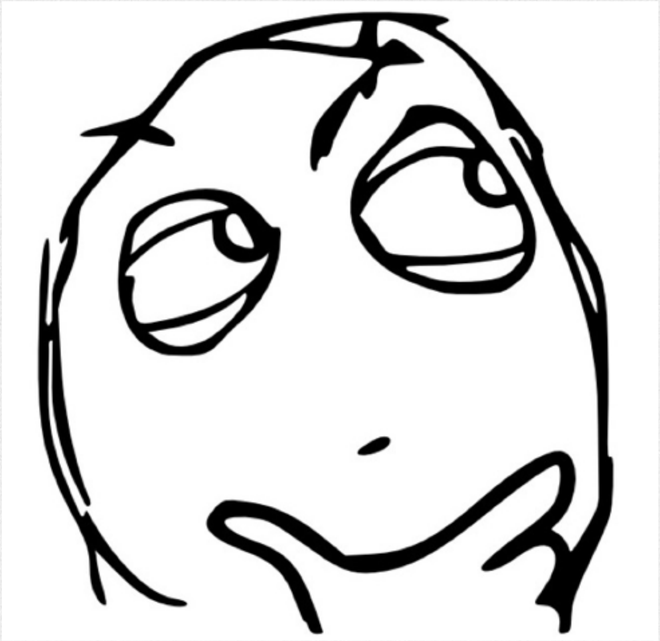
```
  func scheduleVoteReminder() {
#if IOS
    let notification = UILocalNotification()
    notification.fireDate = NSDate()
    notification.alertBody = "Check out your new polls!"
    UIApplication.sharedApplication()
      .scheduleLocalNotification(notification)
#endif
  }
```



Carefully Decorate with Platform Specific Capabilities

- What about protocol extensions?

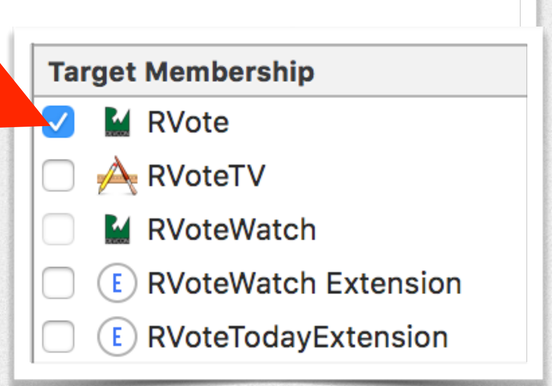
```
protocol VoteSchedulable {
  func scheduleVoteReminder()
}

extension VoteSchedulable {
  func scheduleVoteReminder() {
    // No action by default
  }
}

class MyViewController: VoteSchedulable {
  func vote() {
    // Code to record vote
    // ...

    scheduleVoteReminder()
  }
}
```

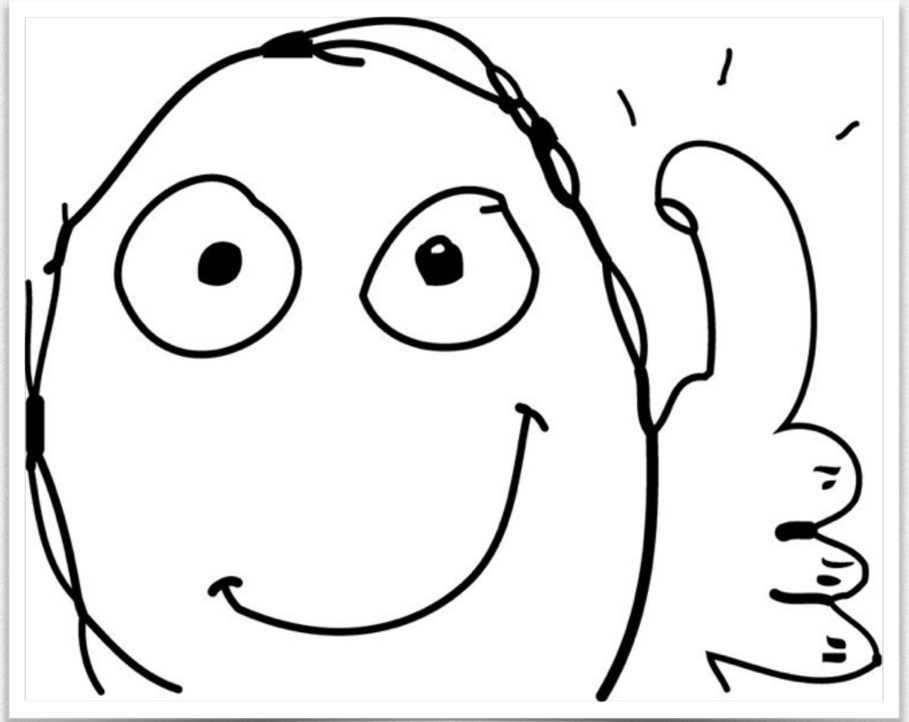


Carefully Decorate with Platform Specific Capabilities

- Implement on an extension - **Best!**

```
extension MyViewController {
  func scheduleVoteReminder() {
      let notification = UILocalNotification()
      notification.fireDate = NSDate()
      notification.alertBody = "Check out your new polls!"
      UIApplication.sharedApplication()
        .scheduleLocalNotification(notification)
  }
}
```

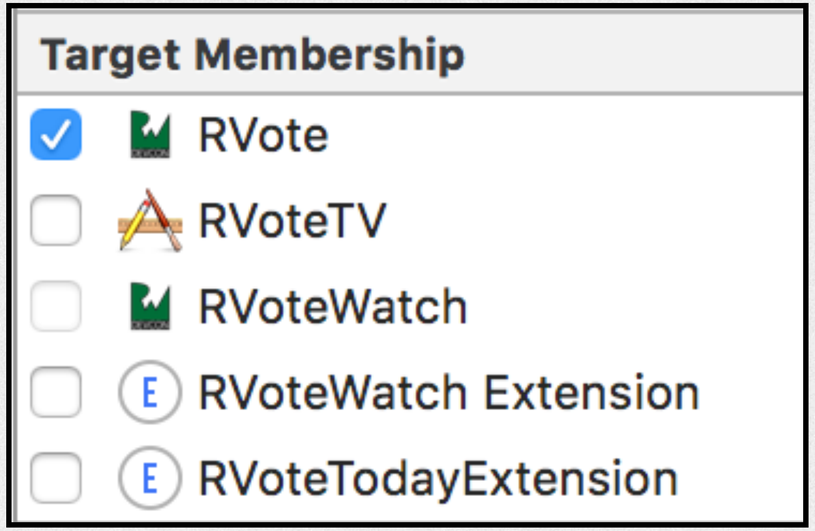




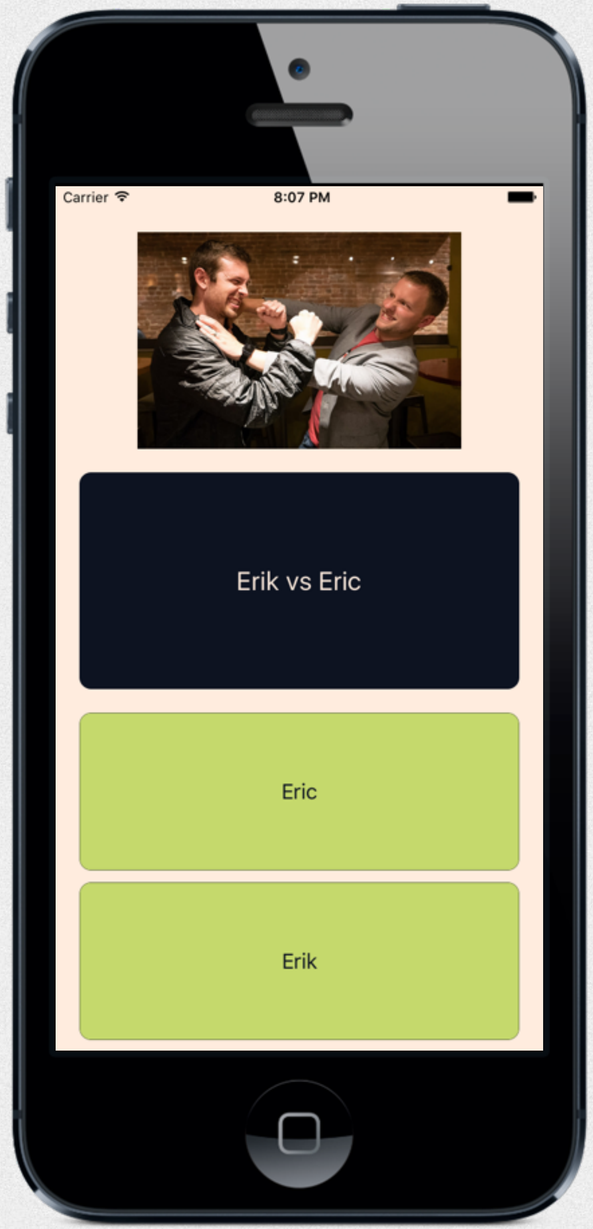
Protocol Oriented Programming To The Rescue!

- Protocol extensions - and Protocol-Oriented Programming - allow you to “decorate” a target with specific behaviors.

- Write an extension, and include it only in the targets you want to use that extension in!



Demo


Carrier
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Erik vs Eric
Eric
Erik

307: Architecting for Multiple Platforms

Conclusion

What You Learned

- That there were probably more targets than you thought!
- How to share code between many targets.
- How to minimize code/debug time with playgrounds.

Where To Go From Here?

- Twitter: @erikkerber
- RWDevCon
  - 305: App Architecture
  - 301: Advanced Auto Layout & Adaptive Layout
- App Extension Guide: http://apple.co/1Ffdhqe
- Watchkit By Tutorials: http://www.raywenderlich.com/store/watchkit-by-tutorials
- tvOS Apprentice: http://www.raywenderlich.com/store/tvos-apprentice