10 Things I learned from building a server side Swift web app

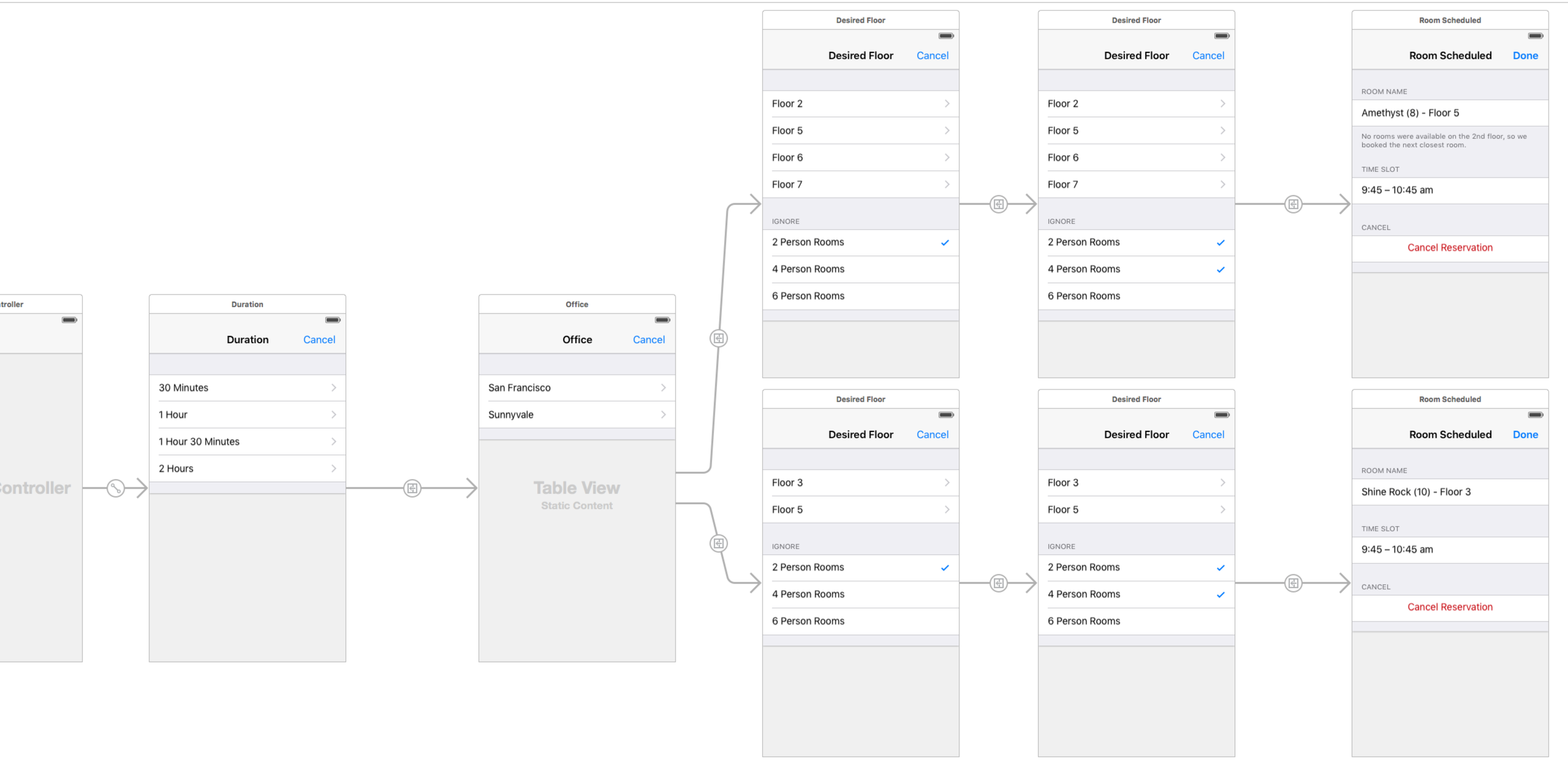
Pithy... I know

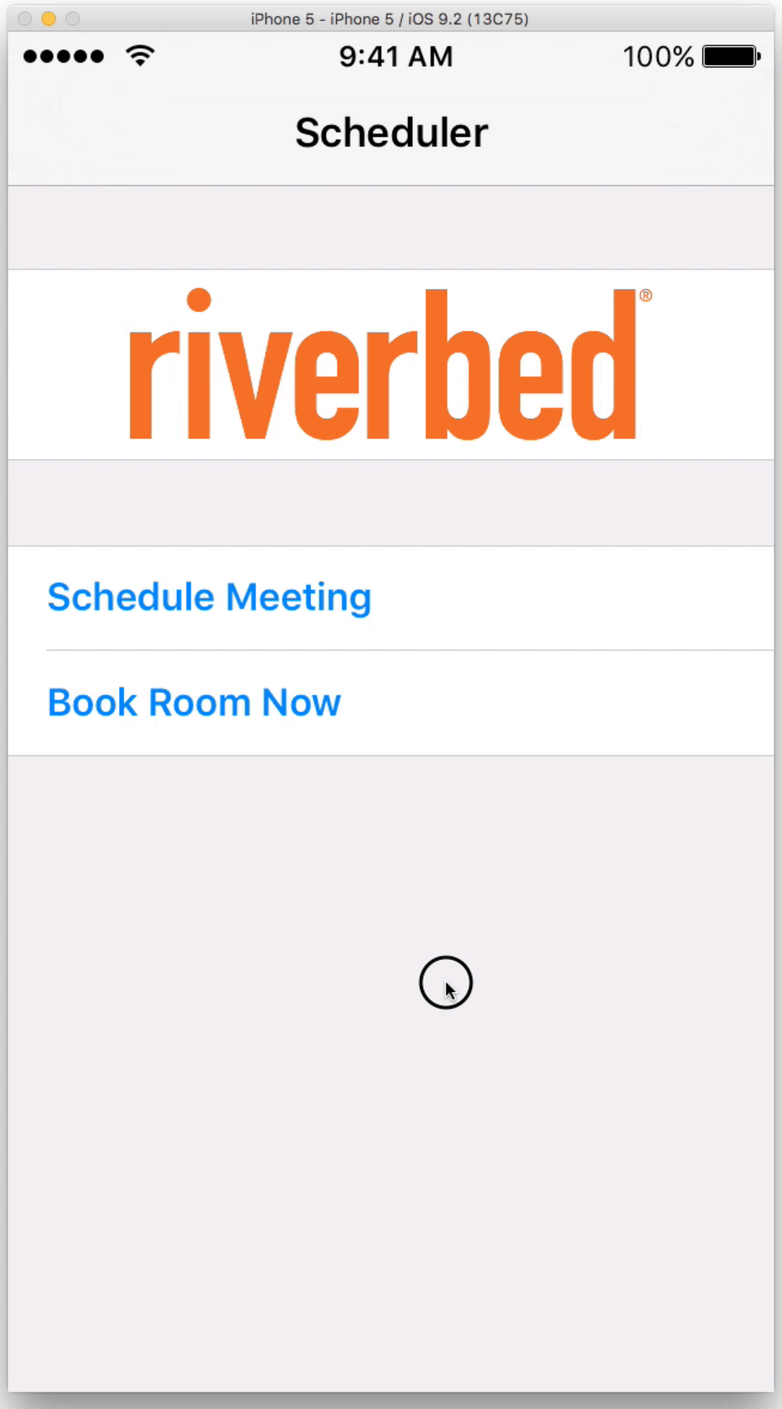
Who Am I?

- Jeffrey Bergier
  - UX Designer for Riverbed
  - iOS Developer for Fun
- @jeffburg
- jeffburg.com
- github.com/jeffreybergier/SwiftServerSlugTalk

What is the App?

- A super quick way to reserve a conference room w/o Outlook
- Started as a storyboard prototype


Duration
Duration
Cancel
30 Minutes
1 Hour
1 Hour 30 Minutes
2 Hours
Office
Office
Cancel
San Francisco
Sunnyvale
Table View
Static Content
Desired Floor
Desired Floor
Cancel
Floor 2
Floor 5
Floor 6
Floor 7
IGNORE
2 Person Rooms
4 Person Rooms
6 Person Rooms
Desired Floor
Desired Floor
Cancel
Floor 3
Floor 5
IGNORE
2 Person Rooms
4 Person Rooms
6 Person Rooms
Desired Floor
Desired Floor
Cancel
Floor 2
Floor 5
Floor 6
Floor 7
IGNORE
2 Person Rooms
4 Person Rooms
6 Person Rooms
Desired Floor
Desired Floor
Cancel
Floor 3
Floor 5
IGNORE
2 Person Rooms
4 Person Rooms
6 Person Rooms
Room Scheduled
Room Scheduled
Done
ROOM NAME
Amethyst (8) - Floor 5
No rooms were available on the 2nd floor, so we booked the next closest room.
TIME SLOT
9:45 – 10:45 am
CANCEL
Cancel Reservation
Room Scheduled
Room Scheduled
Done
ROOM NAME
Shine Rock (10) - Floor 3
TIME SLOT
9:45 – 10:45 am
CANCEL
Cancel Reservation


iPhone 5 - iPhone 5 / iOS 9.2 (13C75)
9:41 AM
100%
Scheduler
riverbed
Schedule Meeting
Book Room Now

What is the App?

- A super quick way to reserve a conference room w/o Outlook
- Started as a storyboard prototype
- Turned into a Swift playground to test Exchange ‘EWS’ API

GetUserAvailability request example: Get availability information

The following example of a **GetUserAvailability** operation request shows how to get detailed availability information for two users in the Pacific Time time zone.

XML

```
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
               xmlns:xsd="http://www.w3.org/2001/XMLSchema"
               xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
               xmlns:t="http://schemas.microsoft.com/exchange/services/2006/types">
  <soap:Body>
    <GetUserAvailabilityRequest xmlns="http://schemas.microsoft.com/exchange/services/2006/messa
                xmlns:t="http://schemas.microsoft.com/exchange/services/2006/types">
      <t:TimeZone xmlns="http://schemas.microsoft.com/exchange/services/2006/types">
        <Bias>480</Bias>
        <StandardTime>
          <Bias>0</Bias>
          <Time>02:00:00</Time>
          <DayOrder>5</DayOrder>
          <Month>10</Month>
          <DayOfWeek>Sunday</DayOfWeek>
        </StandardTime>
        <DaylightTime>
          <Bias>-60</Bias>
          <Time>02:00:00</Time>
          <DayOrder>1</DayOrder>
```

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```
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
               xmlns:xsd="http://www.w3.org/2001/XMLSchema"
               xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
               xmlns:t="http://schemas.microsoft.com/exchange/services/2006/types">
  <soap:Body>
    <GetUserAvailabilityRequest xmlns="http://schemas.microsoft.com/exchange/services/2006/messa
                xmlns:t="http://schemas.microsoft.com/exchange/services/2006/types">
      <t:TimeZone xmlns="http://schemas.microsoft.com/exchange/services/2006/types">
        <Bias>480</Bias>
        <StandardTime>
          <Bias>0</Bias>
          <Time>02:00:00</Time>
          <DayOrder>5</DayOrder>
          <Month>10</Month>
          <DayOfWeek>Sunday</DayOfWeek>
        </StandardTime>
        <DaylightTime>
          <Bias>-60</Bias>
          <Time>02:00:00</Time>
          <DayOrder>1</DayOrder>
          <Month>4</Month>
          <DayOfWeek>Sunday</DayOfWeek>
        </DaylightTime>
      </t:TimeZone>
      <MailboxDataArray>
        <t:MailboxData>
          <t:Email>
            <t:Address>user1@example.com</t:Address>
          </t:Email>
          <t:AttendeeType>Required</t:AttendeeType>
          <t:ExcludeConflicts>false</t:ExcludeConflicts>
        </t:MailboxData>
        <t:MailboxData>
          <t:Email>
            <t:Address>user2@example.com</t:Address>
          </t:Email>
          <t:AttendeeType>Required</t:AttendeeType>
          <t:ExcludeConflicts>false</t:ExcludeConflicts>
        </t:MailboxData>
      </MailboxDataArray>
      <t:FreeBusyViewOptions>
        <t:TimeWindow>
          <t:StartTime>2006-10-16T00:00:00</t:StartTime>
          <t:EndTime>2006-10-16T23:59:59</t:EndTime>
        </t:TimeWindow>
        <t:MergedFreeBusyIntervalInMinutes>60</t:MergedFreeBusyIntervalInMinutes>
        <t:RequestedView>DetailedMerged</t:RequestedView>
      </t:FreeBusyViewOptions>
    </GetUserAvailabilityRequest>
  </soap:Body>
</soap:Envelope>
```

What is the App?

- A super quick way to reserve a conference room w/o Outlook
- Started as a storyboard prototype
- Turned into a Swift playground to test Exchange ‘EWS’ API
- First written as a Python web app during work Hackathon

DOWNLOAD DOCUMENTATION COMMUNITY DEVELOPMENT

CherryPy

A Minimalist Python Web Framework

CHERRYPY IS AS EASY AS...

```
import cherrypy

class HelloWorld(object):
    def index(self):
        return "Hello World!"
    index.exposed = True

cherrypy.quickstart(HelloWorld())
```

What is the App?

- A super quick way to reserve a conference room w/o Outlook
- Started as a storyboard prototype
- Turned into a Swift playground to test Exchange ‘EWS’ API
- First executed as a Python web app during work Hackathon
- Rewritten in Swift and Javascript in my spare time

announcing

perfect 2.0

THE NEW CODE PERFECT TOOLKIT
FOR SWIFT 3.0

Meet Perfect 2.0

Demo Time

Why?

- Python works fine
- Any non-Swift solution will have better support


BETA
XCODE


TYPE SAFETY

Why?

- Xcode debugging is awesome
- Xcode autocomplete is awesome
- Swift type safety is awesome
  - I don’t know how JS/Ruby/Python people sleep at night
- Safari’s Javascript debugging tools are very similar to Xcode

How is it built?

- Its a “modern” web app
- The HTML executes a javascript function that makes a POST request to ‘/‘
- The Swift app responds with a JSON string that represents the UI to display
- The javascript parses the JSON file and converts it into HTMLElements and replaces the Body with them

The Front End

- Bootstrap (because CSS is the worst)
- Javascript (because I wanted to learn it)
- JSON -> UI (because I didn’t want my Swift tainted by HTML)
- Cookies store 3 random tokens that decrypt credentials

The Back End

- Router object listens for all POST requests on ‘/‘
- Custom session manager to encrypt / decrypt credentials
- Router parses JSON from request to determine current step and needed information
- Queries Exchange server live to verify login, check for available rooms, and to create new reservation
- Generates new UI JSON to finish the response

Xcode Time

(Well, almost. First we need lesson #1)

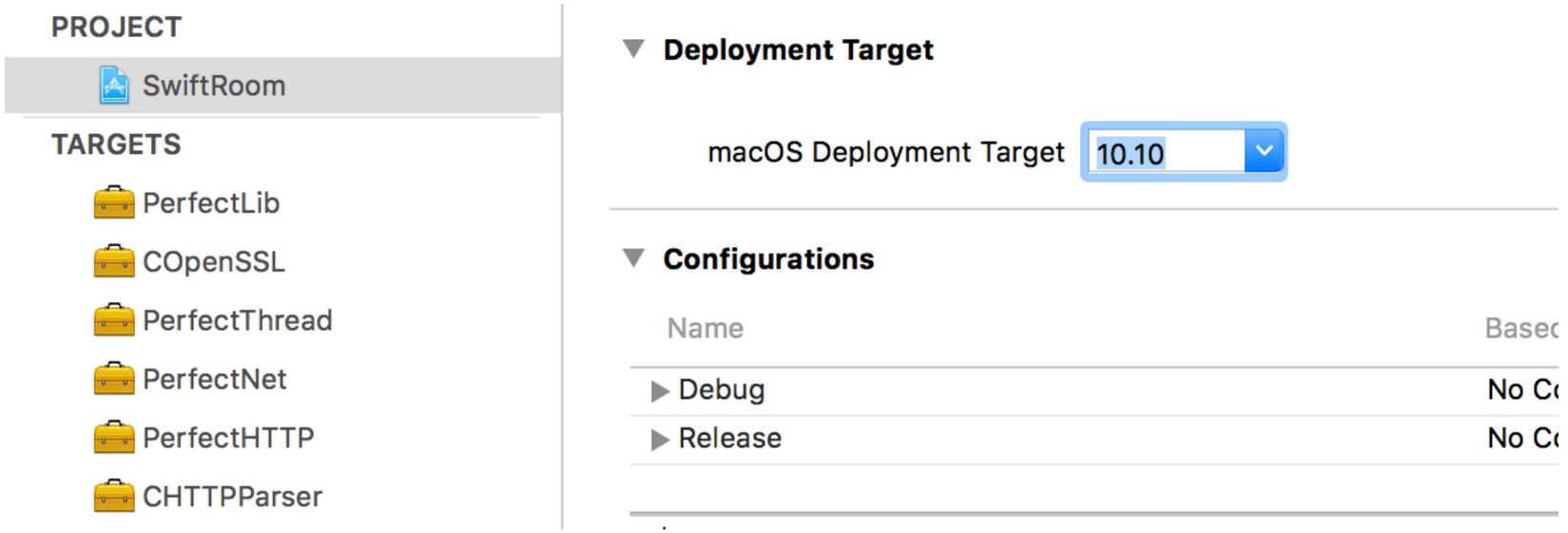
1. Forget about the .XcodeProj

- The Xcode Project file is now something generated for you
- Changes in the Xcode Project are NOT reflected in your project
- Swift Package Manager is the new source of truth
- It revolves around a Package.swift file

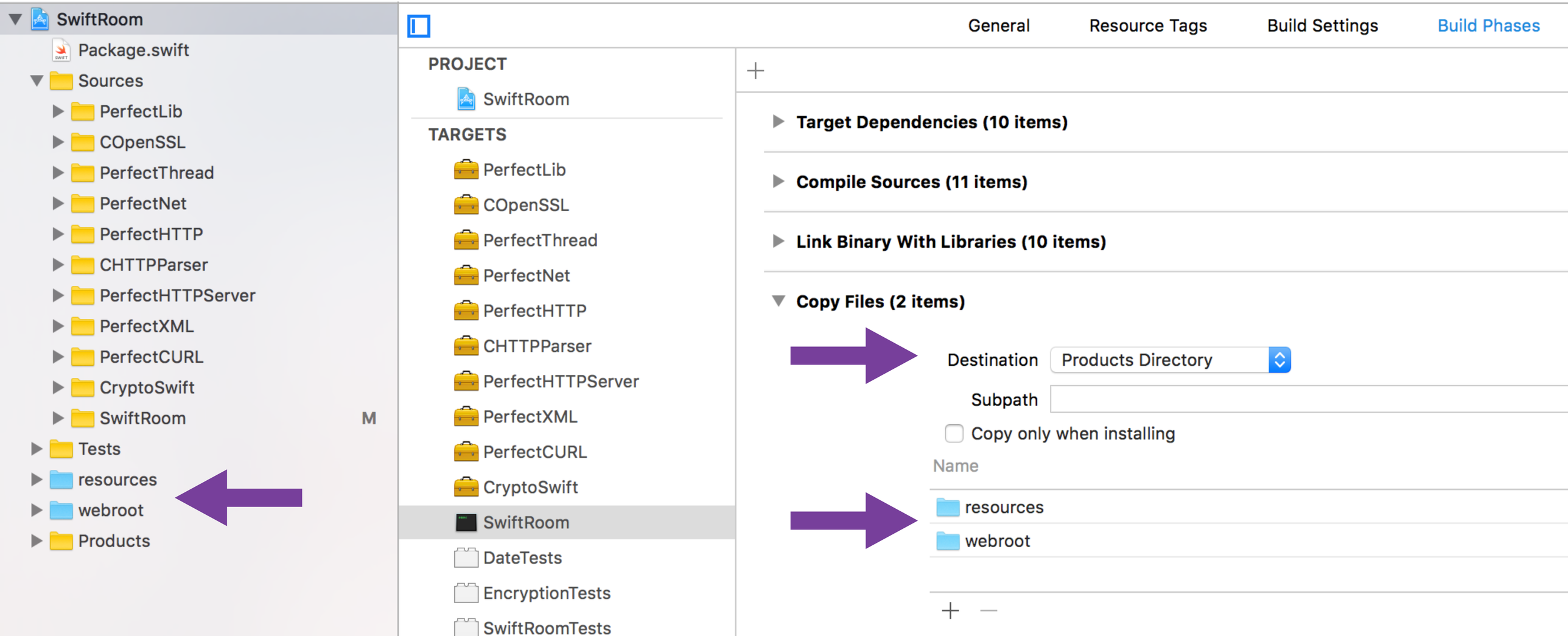
XcodeProj Gotcha #1

```
91
92      init() {
93          Timer.scheduledTimer(withTimeInterval: 5, repeats: true) { timer in
94              print("this is cool!")
95          }
96      }
97
```

'scheduledTimer(withTimeInterval:repeats:block:)' is only available on OS X 10.12 or newer



XcodeProj Gotcha #2



SPM Demo

(Init a new project)
(Show SteelReserve package)
(Generate xcode-project)
(Open in Xcode)

Xcode Time

(For Real This Time)
(Show main.swift, router, credentials, curl, xml)

2. Foundation is mostly there

- Foundation exists on Linux ✨
- Simple Foundation types are fine
  - NSDate, NSDateFormatter, NSDateComponents
- Complex ones are not fully implemented*
  - NSURLSession, NSXMLParser

```swift
extension Date {

    private static func roundedTimeInterval(from date: Date) -> TimeInterval {
        let dc = Calendar.current.dateComponents([.minute, .second], from: date)
        let originalMinute = Double(dc.minute ?? 0)
        let originalSeconds = Double(dc.second ?? 0)
        let roundTo = 15.0
        let roundedMinute = round(originalMinute / roundTo) * roundTo
        let interval = ((roundedMinute - originalMinute) * 60) - originalSeconds
        return interval
    }

    mutating func roundMinutes() {
        let timeInterval = type(of: self).roundedTimeInterval(from: self)
        self += timeInterval
    }

}
```

How to Tell

```
public struct DateComponents : ReferenceConvertible, Hashable, Equatable, _MutableBoxing {
    public typealias ReferenceType = NSDateComponents

    internal var _handle: _MutableHandle<NSDateComponents>

    /// Initialize a `DateComponents`, optionally specifying values for its fields.
    public init(calendar: Calendar? = nil,
                timeZone: TimeZone? = nil,
                era: Int? = nil,
                year: Int? = nil,
                month: Int? = nil,
                day: Int? = nil,
                hour: Int? = nil,
                minute: Int? = nil,
                second: Int? = nil,
                nanosecond: Int? = nil,
                weekday: Int? = nil,
                weekdayOrdinal: Int? = nil,
                quarter: Int? = nil,
                weekOfMonth: Int? = nil,
                weekOfYear: Int? = nil,
                yearForWeekOfYear: Int? = nil) {
        _handle = _MutableHandle(adoptingReference: NSDateComponents())
        if let _calendar = calendar { self.calendar = _calendar }
        if let _timeZone = timeZone { self.timeZone = _timeZone }
        if let _era = era { self.era = _era }
        if let _year = year { self.year = _year }
        if let _month = month { self.month = _month }
        if let _day = day { self.day = _day }
        if let _hour = hour { self.hour = _hour }
        if let _minute = minute { self.minute = _minute }
        if let _second = second { self.second = _second }
        if let _nanosecond = nanosecond { self.nanosecond = _nanosecond }
        if let _weekday = weekday { self.weekday = _weekday }
        if let _weekdayOrdinal = weekdayOrdinal { self.weekdayOrdinal = _weekdayOrdinal }
        if let _quarter = quarter { self.quarter = _quarter }
        if let _weekOfMonth = weekOfMonth { self.weekOfMonth = _weekOfMonth }
        if let _weekOfYear = weekOfYear { self.weekOfYear = _weekOfYear }
        if let _yearForWeekOfYear = yearForWeekOfYear { self.yearForWeekOfYear = _yearForWeekOfYear }
    }
```

```
open class URLAuthenticationChallenge : NSObject, NSSecureCoding {

    static public var supportsSecureCoding: Bool {
        return true
    }

    public required init?(coder aDecoder: NSCoder) {
        NSUnimplemented()
    }

    open func encode(with aCoder: NSCoder) {
        NSUnimplemented()
    }


    /*!
     @method initWithProtectionSpace:proposedCredential:previousFailureCount:failureResponse:error:
     @abstract Initialize an authentication challenge
     @param space The NSURLProtectionSpace to use
     @param credential The proposed NSURLCredential for this challenge, or nil
     @param previousFailureCount A count of previous failures attempting access.
     @param response The NSURLResponse for the authentication failure, if applicable, else nil
     @param error The NSError for the authentication failure, if applicable, else nil
     @result An authentication challenge initialized with the specified parameters
     */
    public init(protectionSpace space: URLProtectionSpace, proposedCredential credential: URLCredential?, previousFailureCount:
        NSUnimplemented()
    }
```

But there are subtleties

```swift
import Foundation

// get date and components
var dc = Calendar.current.dateComponents(
    [.year, .month, .day, .hour, .minute, .second, .calendar, .timeZone],
    from: Date()
)

// get originals and do rounding
let originalMinute = Double(dc.minute ?? 0)
let roundTo = 15.0
let roundedMinute = Int(round(originalMinute / roundTo) * roundTo)

// modify components
dc.minute = roundedMinute
dc.second = 0

// generate new date
let roundedDate = dc.date! // crashes on linux
// fatal error: copy(with:) is not yet implemented: file Foundation/NSCalendar.swift, line 1434
```

3. Test on Linux Often

- At least before every commit, but probably more often
- I've been using Veertu
  - Free, sandboxed Mac App Store app
  - Autodownloads and installs Linux
  - Option to run headless 👌
- There are Docker based solutions

4. JSON is Way Easier

```
import PerfectLib

let data: [String : Any] = [
    "date" : "2016-01-01T12-12-00",
    "name" : "Billy",
    "age" : 22,
    "emails" : [
        "something@something.com",
        "somethingelse@something.com"
    ]
]

let json = try data.jsonEncodedString()
```

4. JSON is Way Easier

- And it needs to be (its a web app)
- No need for NSJSONSerialization any more
- Every String has .jsonDecode()
- Collections and most built-in types have .jsonEncodedString()

5. Random is Hard

```
#if os(Linux)
import Glibc
#else
import Darwin
#endif

for i in 1 ... 5 {
    #if os(Linux)
    let randomNumber = random()
    #else
    let randomNumber = Int(arc4random_uniform(UInt32.max))
    #endif
    print("Round \(i): \(randomNumber)")
}
```

```
steelreserve@steelreserve-swift ~/RandomDontWork> swift build
```

5. Random is Hard

- The easiest way is to open /dev/random and read bytes off it
- TurnStileCrypto
  - Relatively light library that has an easy to use random class
- CryptoSwift
  - Massive crypto framework that also generates random numbers this way.

6. Avoid `#if os(Linux)`

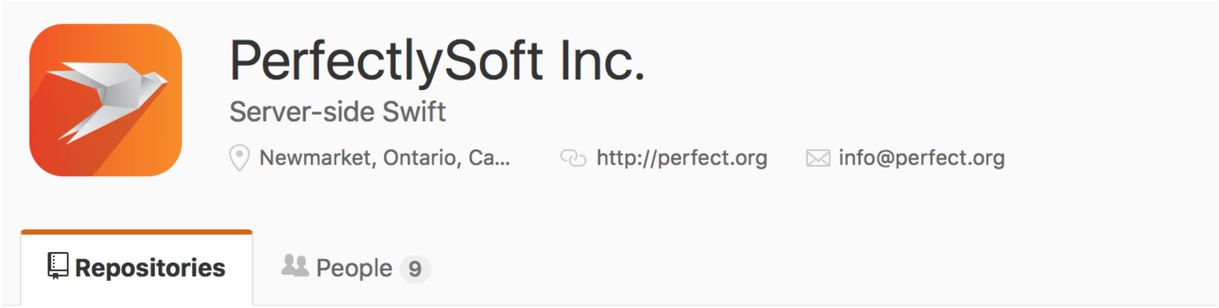
```
func roundingMinutes() -> Date {
    var dc = Calendar.current.dateComponents([.year, .month, .day, .hour, .minute, .calendar, .timeZone], from: self)
    let originalMinute = dc.minute ?? 0
    let roundedMinute = (((originalMinute - 8) / 15) * 15)
    dc.minute = roundedMinute
    dc.second = 0

    #if os(Linux)
        // DateComponents copy(with: zone) is NSUnimplemented on Linux
        // Lets build a date with strings :)
        let df = Date.linuxDateRoundingFormatter
        let year = dc.year ?? 0
        let month = dc.month ?? 1
        let day = dc.day ?? 1
        let hour = dc.hour ?? 0
        let minute = dc.minute ?? 0
        let second = dc.second ?? 0
        let timeZone = dc.timeZone ?? TimeZone(secondsFromGMT: 0)!
        let dateString = "\(year.leftPaddedString(totalCharacters: 4))-\(month.leftPaddedString())-\(day.leftPaddedString())T\(hou
        let roundedDate = df.date(from: dateString)!
        return roundedDate
    #else
        let roundedDate = dc.date! // crashes on Linux
        return roundedDate
    #endif
```

6. Avoid `#if os(Linux)`

- You lose all help from Xcode
  - No autocomplete, syntax highlighting, compiler errors
- Won’t run into compile errors or bugs bugs until running on Linux
- Sometimes its needed, but make sure you test it heavily with Linux specific tests.

7. Perfect is the new Foundation



PerfectlySoft Inc.

Server-side Swift

Newmarket, Ontario, Ca... http://perfect.org info@perfect.org

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Filters Find a repository...

PerfectDocs HTML ★92 27

Reference and documentation for Perfect Server Side Swift

Updated 2 hours ago

Perfect-HTTP Swift ★3 10

Base HTTP Support for Perfect Server Side Swift

Updated a day ago

Perfect-MySQL Swift ★23 13

A stand-alone Swift wrapper around the MySQL client library, enabling access to MySQL servers.

Perfect-HTTPServer Swift ★6 5

HTTP 1.1 Server for Perfect Server Side Swift

Updated 2 days ago

Perfect-Turnstile-PostgreSQL Swift ★0 0

This project integrates Stormpath's Turnstile authentication system into a single package with Perfect, and a PostgreSQL ORM.

Updated 3 days ago

Perfect-Turnstile-SQLite Swift ★2 0

This project integrates Stormpath's Turnstile authentication system into a single package with Perfect, and a SQLite ORM.

Updated 3 days ago

Perfect Swift ★8,950 615

Server-side Swift. The Perfect library, application server, connectors and example apps. (For mobile back-end development, website and web app development, and more...)

Updated 3 days ago

7. Perfect is the new Foundation

- If Foundation is letting you down, browse the repositories for Perfect (or whatever framework you chose)
- I spent a lot of time debugging NSXMLParser when there was a Perfect-XML library that was easier and better.
- Same goes with NSURLSession. Perfect has Perfect-CURL that is a light wrapper around LibCURL.
    - Its not pretty, but it works.

8. Threading is a little “different”

```
92      init() {
93          Timer.scheduledTimer(withTimeInterval: 5, repeats: true) { timer in
94              print("This is so awesome!")
95          }.fire()
96      }
97
```


```
This is so awesome!
[INFO] Starting HTTP server on 127.0.0.1:8181 with document root ./webroot
```

8. Threading is a little “different”

```
92      private func printAwesome() {
93          print("This is awesome!")
94          let queue = DispatchQueue.global(qos: .background)
steelreserve@steelreserve-swift ~/S/swiftroom> swift build
Compile Swift Module 'SwiftRoom' (11 sources)
/home/steelreserve/SwiftServer/swiftroom/Sources/CookieCredentialsManager.swift:94:21:
error: use of unresolved identifier 'DispatchQueue'
        let queue = DispatchQueue.global(qos: .background)
                    ^~~~~~~~~~~~~ me()
<unknown>:0: error: build had 1 command failures
error: exit(1): /usr/local/swift/swift-3.0.1-PREVIEW-3-ubuntu15.10/usr/bin/swift-build-
tool -f /home/steelreserve/SwiftServer/swiftroom/.build/debug.yaml
```

```
This is awesome!
[INFO] Starting HTTP server on 127.0.0.1:8181 with document root ./webroot
This is awesome!
This is awesome!
This is awesome!
Program ended with exit code: 9
```

8. Threading is a little “different”

```
92      private func printAwesome() {
93          print("this is awesome")
94          Threading.sleep(seconds: 5)
95          self.printAwesome()
96      }
97
98      init() {
99          Threading.getQueue(name: "SteelReserve::CredentialCheckingThread", type: .concurrent).dispatch {
100             self.printAwesome()
101         }
102     }
103
```

SwiftRoom

```
this is awesome
[INFO] Starting HTTP server on 127.0.0.1:8181 with document root ./webroot
this is awesome
this is awesome
this is awesome
this is awesome
this is awesome
this is awesome
```

8. Threading is a little “different”

- No GCD on Linux
  - NSTimer doesn’t appear to work
  - No Dispatch_After
- Import PerfectThread library to make Queues
  - Call sleep on them if you want to simulate a timer
  - Don’t sleep a Queue you did not create! 😴

9. Force Unwrapping is Bad

```
private let allRooms: [RoomJSON] = {
    let jsonFile = File("./resources/webmail.riverbed.com.json")
    let jsonFileString = try! jsonFile.readString()
    let json = try! jsonFileString.jsonDecode()
    let array = json as! [Any]
    let rooms = RoomJSON.array(from: array)
    return rooms
}()
```

9. Force Unwrapping is Bad

- In Cocoa/Touch development, force unwrapping nil crashes one person's app
  - In a Swift server, ALL your users rely on this app not crashing
  - This changes the calculus quite a bit
- I made the decision that only things that could crash on Server startup are allowed to crash
  - Everything else must fail "gracefully"

10. Its a Ton of Fun!

Thank You!

Q&A

@jeffburg

github.com/jeffreybergier/SwiftServerSlugTalk