

Get Your Code Under Control

Renaissance 2014

About Me

- Co-founder & Engineering Lead at AppOrchard
- Worked at Apple (at the turn of the century)
- Latest Author of More iOS 6 Development
- Asked Apple JVM team to add poseAs to Java

Overview

- Why Code Coverage?
- Why Continuous Integration?
- Xcode and Code Coverage
- Xcode Server and Code Coverage
- More Xcode Server

Why Code Coverage?

- Measure what code has been executed by tests
- See what code is and is not tested
- See how to improve tests
- 100% coverage \neq everything is tested

“Testing never proves the absence of faults, it only show their presence.”

- Edsger Dijkstra

Why Continuous Integration?

- Merge developer branches *several times a day*
- Avoid “Integration Hell”
- Automate execution of (unit) tests
- Catch problems quickly and automatically

Xcode and Code Coverage

- gcov - GCC coverage tool
- lcov - gcov wrapper and report generator
- Depends on two files:
 - **.gcno** - generated on compilation
 - **.gcda** - generated on execution

Xcode and Code Coverage (cont.)

- Coverage Build Settings

Under **Apple LLVM 5.0 Code Generation** Section

- **Generate Test Coverage Files** (-ftest-coverage)

This generates .gcno files

Generate Position-Dependent Code	No ▾
▼ Generate Test Coverage Files	<Multiple values> ▾
Debug	⊕ Yes ▾
Release	No ▾
Inline Methods Hidden	Yes ▾

- **Instrument Program Flow** (-fprofile-arcs)

This generates .gcda files

► Inline Methods Hidden	Yes ▾
▼ Instrument Program Flow	<Multiple values> ▾
Debug	⊕ Yes ▾
Release	No ▾
Kernel Development Mode	No ▾

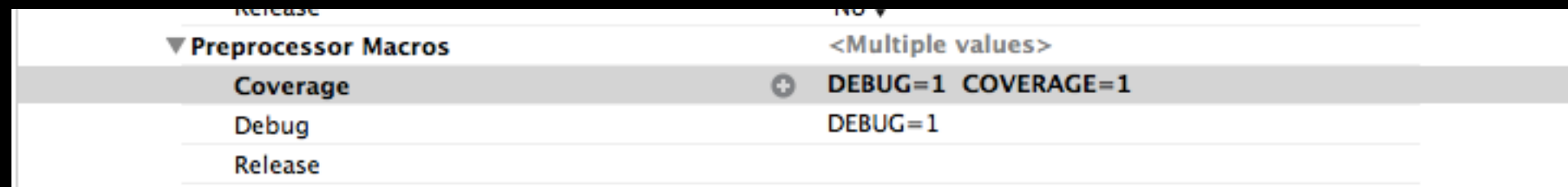
Xcode and Code Coverage (cont.)

- Prior to Xcode 5, just build and test.
- Broken in Xcode 5 - .gcda's not generated
- Function **__gcov_flush()** needs to be called at **application** level, not test level

Xcode and Code Coverage (cont.)

- Create a new Build Configuration
- Create a new Preprocessor Macro

Add to Application and Test Targets!



- Create a custom XCTestObserver
- Call **__gcov_flush()** from AppDelegate - applicationWillResignActive:

Xcode and Code Coverage (cont.)

```
#ifdef COVERAGE
#import <XCTest/XCTest.h>

@interface RenDemoTestObserver : XCTestObserver
@end

@implementation RenDemoTestObserver

+ (void)load
{
    [[NSUserDefaults standardUserDefaults] setValue:@"XCTestLog,RenDemoTestObserver" forKey:XCTestObserverClassKey];
}

- (void)stopObserving
{
    [super stopObserving];
    UIApplication *application = [UIApplication sharedApplication];
    id <UIApplicationDelegate> delegate = [application delegate];
    [delegate applicationWillResignActive:application];
}

@end

#endif
```

Xcode and Code Coverage (cont.)

```
#import "AppDelegate.h"

#ifdef COVERAGE
extern void __gcov_flush();
#endif

@implementation AppDelegate

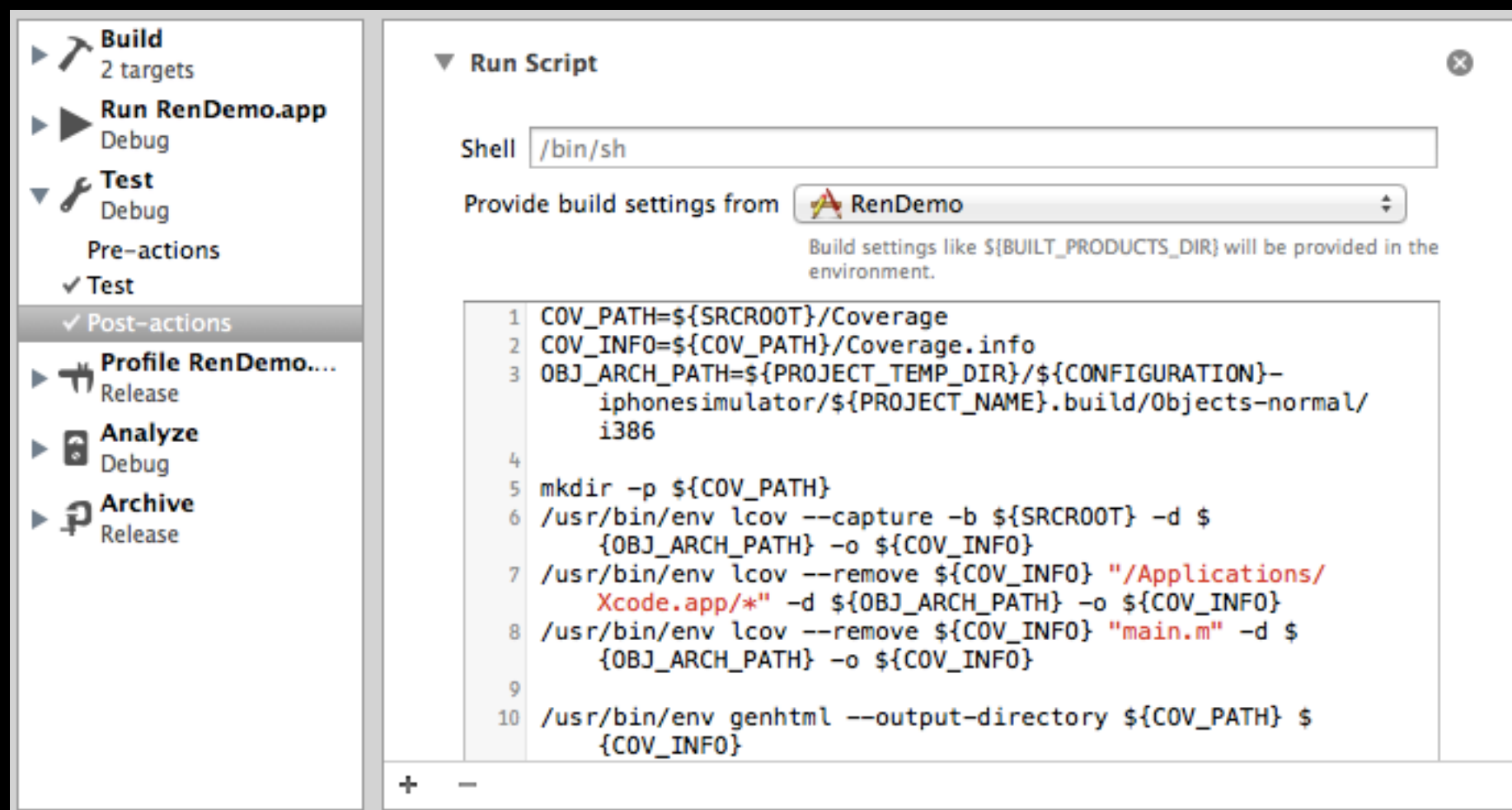
- (BOOL)application:(UIApplication *)application didFinishLaunchingWithOptions:(NSDictionary *)launchOptions
{
    // Override point for customization after application launch.
    return YES;
}

- (void)applicationWillResignActive:(UIApplication *)application
{
    // Sent when the application is about to move from active to inactive state. This can occur for certain types of
    // temporary interruptions (such as an incoming phone call or SMS message) or when the user quits the application
    // and the system begins the transition to the background state.
    // Use this method to pause ongoing tasks, disable timers, and throttle down OpenGL ES frame rates. Games should use
    // this method to pause the game.
#ifdef COVERAGE
    __gcov_flush();
#endif
}

}
```

Xcode and Code Coverage (cont.)

- Generate reports via **gcov/lcov** using Xcode Scheme Post-Action



LCOV - code coverage report

Current view: [top level](#)

Test: [Coverage.info](#)

Date: [2014-01-27](#)

	Hit	Total	Coverage
Lines:	21	87	24.1 %
Functions:	8	28	28.6 %

Directory	Line Coverage ↕	Functions ↕
RenDemo	 24.1 % 21 / 87	28.6 % 8 / 28

Generated by: [LCOV version 1.10](#)


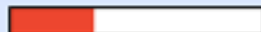



LCOV - code coverage report

Current view: [top level](#) - [RenDemo](#)

Test: [Coverage.info](#)

Date: [2014-01-27](#)

	Hit	Total	Coverage
Lines:	21	87	24.1 %
Functions:	8	28	28.6 %

Filename	Line Coverage ↕	Functions ↕
AppDelegate.h	 100.0 % 1 / 1	100.0 % 2 / 2
AppDelegate.m	 33.3 % 5 / 15	28.6 % 2 / 7
DetailViewController.h	 0.0 % 0 / 2	0.0 % 0 / 3
DetailViewController.m	 0.0 % 0 / 19	0.0 % 0 / 5
MasterViewController.m	 30.0 % 15 / 50	36.4 % 4 / 11

Generated by: [LCOV version 1.10](#)

LCOV - code coverage report

Current view: [top level](#) - [RenDemo](#) - [MasterViewController.m](#) (source / [functions](#))

Test: [Coverage.info](#)

Date: 2014-01-27

	Hit	Total	Coverage
Lines:	15	50	30.0 %
Functions:	4	11	36.4 %

Line data	Source code
1	: //
2	: // MasterViewController.m
3	: // RenDemo
4	: //
5	: // Created by Kevin Y. Kim on 1/27/14.
6	: // Copyright (c) 2014 kykim, inc. All rights reserved.
7	: //
8	:
9	: #import "MasterViewController.h"
10	:
11	: #import "DetailViewController.h"
12	:
13	: @interface MasterViewController () {
14	: NSMutableArray *_objects;
15	: }
16	: @end
17	:
18	0 : @implementation MasterViewController
19	:
20	1 : - (void)awakeFromNib
21	: {
22	1 : [super awakeFromNib];
23	1 : }
24	:
25	1 : - (void)viewDidLoad
26	: {
27	1 : [super viewDidLoad];
28	: // Do any additional setup after loading the view, typically from a nib.
29	1 : self.navigationItem.leftBarButtonItem = self.editButtonItem;
30	:
31	1 : UIBarButtonItem *addButton = [[UIBarButtonItem alloc] initWithBarButtonSystemItem:UIBarButtonSystemItemAdd target:nil];
32	1 : self.navigationItem.rightBarButtonItem = addButton;
33	1 : }
34	:
35	0 : - (void)didReceiveMemoryWarning
36	: {
37	0 : [super didReceiveMemoryWarning];
38	: // Dispose of any resources that can be recreated.
39	0 : }
40	:

Xcode Server

- Apple's Continuous Integration Server
- Integrated with Xcode 5
But I prefer to use the Server.app and Web Application
- Two Concepts to understand
 - Bot
Configuration for Building, Analyzing, Testing, and Archiving
 - Integration
Single Execution of a Bot

Xcode Server Operation

- Xcode Server runs as user **_teamsserver**
- Application built as user **_teamsserver**
- Tests run as user **_xcstest**
- Permissions problem creating coverage files!

Xcode Server Compiling

- Xcode 5: object files under \$HOME
~/Library/Developer/Xcode/DerivedData/...
- Xcode Server: object files under /Library/Server
/Library/Server/Xcode/Data/BotRuns/Cache/...

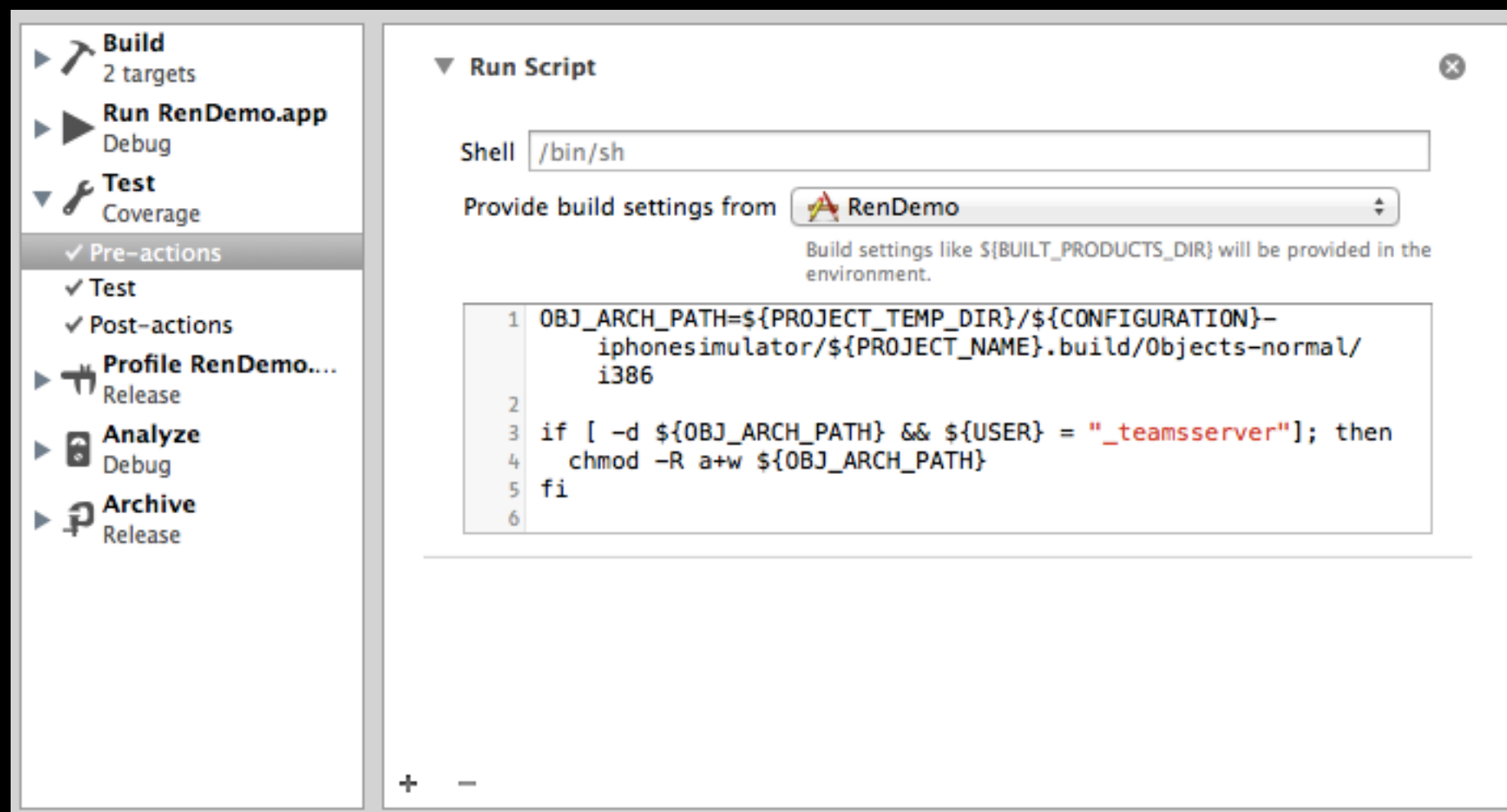
Xcode Server

Compiling Issues

- Object directory owned by **_teamsserver**
- Permissions are **drwxr-xr-x**
- Testing run as **_xcstest**, can't write **.gcda** files

Xcode Server Test Pre-Action

- Fix permissions via Xcode Scheme Pre-Action

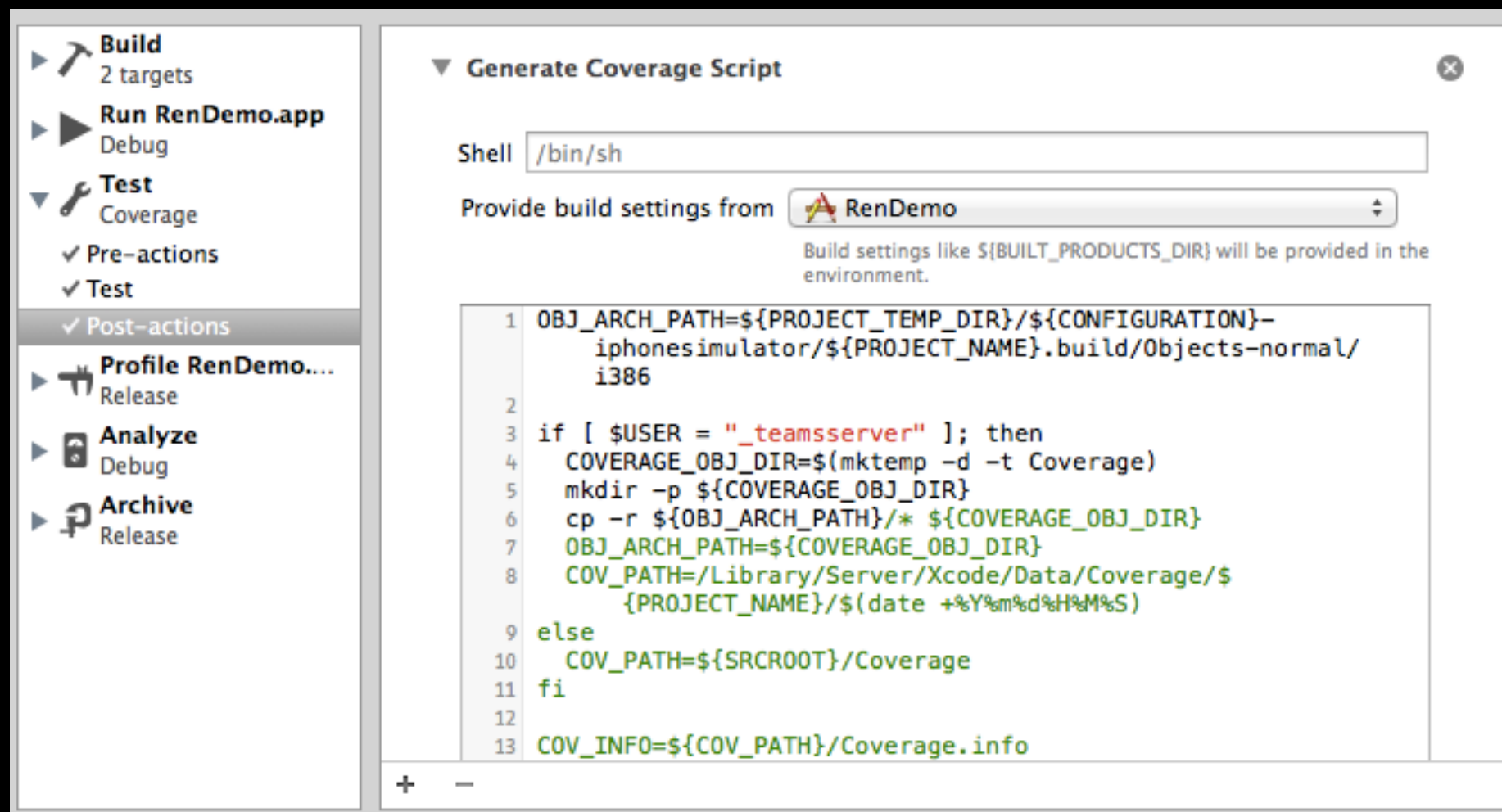


Xcode Server Coverage Generation

- Coverage Reports end up with source
- In Xcode Server, source is
`/Library/Server/Xcode/Data/BotRuns/Cache/
<botrun-uuid>/source`
- No permission problem
- Better to put reports somewhere else

Xcode Server Test Post-Action

- Updated Test Post-Action script



More Xcode Server

- Server Processes
- Server Application Bundle
- Server Data
- PostgreSQL Database

More Xcode Server Server Processes

- Web Server
git server, Xcode server web application
- Xcode Build Daemon
xcsbuildd
- Credentials Service
xcscredd, xcscredhandler
- Device Monitor
xcsdevicesnifferd_trampoline, xcsdevicesnifferd
- Other
xcsxcodeappwatcher

More Xcode Server Server.app bundle

- `/Applications/Server.app/Contents/ServerRoot`
 - `.../System/Library/LaunchDaemons`
 - `.../System/Library/ServerSetup`
 - `.../usr/libexec`
 - `.../usr/sbin`

More Xcode Server Server Data

- `/Library/Server/Xcode`
 - `.../Data/BotRuns`
 - `.../Logs`
 - `.../Repositories`

More Xcode Server PostgreSQL Database

- `psql`
 - `-h /Library/Server/Wiki/PostgresSocket`
 - `-U _teamsserver`
 - `collab`
- `sudo to root`

More Information

- WWDC 2013
412: Continuous Integration with Xcode 5
- gcov - GCC coverage tool
<http://gcc.gnu.org/onlinedocs/gcc/Gcov.html>
- lcov - gcov wrapper and report generator
<http://ltp.sourceforge.net/coverage/lcov.php>
- Martin Fowler
<http://martinfowler.com/bliki/TestCoverage.html>
<http://martinfowler.com/articles/continuousIntegration.html>
- The Way of Testivus
<http://www.artima.com/weblogs/viewpost.jsp?thread=203994>