Continuous Integration and Code Coverage in Xcode

Session 410

Matt Moriarity Xcode Engineer
Agenda

What is Xcode Server
What's new in Xcode 7
Code coverage
Extending Xcode Server
Demos
What Is Xcode Server
What Is Xcode Server

Continuous integration
What Is Xcode Server

Continuous integration
Enhances collaboration and improves software quality
What Is Xcode Server

Continuous integration
Enhances collaboration and improves software quality
Builds and tests projects on a schedule
What Is Xcode Server

Continuous integration
Enhances collaboration and improves software quality
Builds and tests projects on a schedule
Easy to set up with Xcode and OS X Server
What Is Xcode Server

Continuous integration
Enhances collaboration and improves software quality
Builds and tests projects on a schedule
Easy to set up with Xcode and OS X Server
Deep integration with Xcode
What Is Xcode Server

Terminology
What Is Xcode Server

Terminology

Scheme
Recipe for building your project
What Is Xcode Server

Terminology

**Scheme**
Recipe for building your project

**Bot**
Analyze, build, test, and archive on a schedule
What Is Xcode Server

Terminology

Scheme
Recipe for building your project

Bot
Analyze, build, test, and archive on a schedule

Integration
A single run of a bot
New in Xcode Server
Better bot editing
New in Xcode Server
Choosing repositories and branches

Edit CoffeeBoard Bot:

<table>
<thead>
<tr>
<th>Info</th>
<th>Repositories</th>
<th>Schedule</th>
<th>Devices</th>
<th>Triggers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CoffeeBoard</td>
<td></td>
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<tr>
<td></td>
<td>ssh://localhost/Users/Shared/CoffeeBoard.git</td>
<td>master</td>
<td></td>
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<td></td>
<td>CoffeeBoardExtras</td>
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<td><a href="https://localhost/git/CoffeeBoardExtras.git">https://localhost/git/CoffeeBoardExtras.git</a></td>
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</tr>
</tbody>
</table>
New in Xcode Server
Source control security

Xcode can’t verify the identity of a repository hosted on “localhost”.

The certificate for this repository is invalid. The bot might be connecting to a repository that is pretending to be “localhost”, which could put your confidential information at risk. Would you like the bot to connect to the repository anyway?

- Show Certificate
- Cancel
- Trust
New in Xcode Server

Updated reports
New in Xcode Server

Updated reports
New in Xcode Server

Improved issue tracking
Integration 5

Summary: 0 ERRORS, 2 WARNINGS, 0 ISSUES, 1 TESTS

New issues:

- **Test Failure** XCTAssertEqual failed: ("3") is not equal to ("2") -
  Test case: -[TransactionStoreTests testBalanceForPerson:] in CoffeeBoard/CBFoundationTests/TransactionStoreTests.swift:52
  Introduced by Eric Dudiaik (82dbae2)

Unresolved Issues (2 warnings):

- **Warning** Prototype table cells must have reuse identifiers
  In CoffeeBoard/CoffeeBoard/Base.lproj/Main.storyboard
  Claimed by eric, introduced 4 integrations ago by Eric Dudiaik (4ae382e, b4b95c7, 585e747)

- **Warning** Scene is unreachable due to lack of entry points and does not have an identifier for runtime access via instantiateViewControllerWithIdentifier:.
  In CoffeeBoard/CoffeeBoard/Base.lproj/Main.storyboard
  Introduced 4 integrations ago by Eric Dudiaik (4ae382e, b4b95c7, 585e747)

Build Results:

2 Files (Product & Archive)

- Product: CoffeeBoard.ipa
- Archive: Archive.xcarchive
New Issues

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Build Results

- **2 Files (Product & Archive)**
  - **Product** CoffeeBoard.ipa
    - **17.2 MB**
  - **Archive** Archive.xcarchive
    - **27.2 MB**

Device Testing

...
New Issues

❌ Test Failure XCTAssertEqual failed: ("3") is not equal to ("2")
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Build Results

2 Files (Product & Archive)
  Total: 44.4 MB

Product
  CoffeeBoard.ipa
  17.2 MB
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Device Testing
New in Xcode Server
Xcode 7 features
New in Xcode Server
Xcode 7 features
User Interface Testing
New in Xcode Server
Xcode 7 features

On Demand Resources
New in Xcode Server

Xcode 7 features

Code Coverage
Code Coverage
Code Coverage

A tool for measuring the value of tests
Code Coverage

A tool for measuring the value of tests
Shows which code is exercised by unit tests
Code Coverage

A tool for measuring the value of tests
Shows which code is exercised by unit tests
Exposes areas of your code that are untested
Code Coverage
Code Coverage

Tightly integrated with LLVM
Counts each **expression** that is executed
Code Coverage
Hierarchical coverage report
Code Coverage
In the editor
Code Coverage
In Xcode Server
## Code Coverage

### Multiple devices

<table>
<thead>
<tr>
<th>Integration 10</th>
<th>Summary</th>
<th>Tests</th>
<th>Coverage</th>
<th>Commits</th>
<th>Logs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Coverage</td>
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<td>CBFoundation.framework</td>
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<td>PersonStore.swift</td>
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<td>static == infix(Transaction.PersonPair, Transaction.PersonPair)</td>
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<td>static Transaction.transactionTotals([Transaction])</td>
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<td>Transaction._allocating_Init(from: Person, to: Person)</td>
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<td>Transaction._allocating_Init(from: Person, to: Person, amount: Int)</td>
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<td>Transaction.canBeMergedWith(Transaction)</td>
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<td>Transaction.PersonPair.hashValue, getter: Int</td>
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<td>Transaction.isEqual(AnyObject)</td>
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<td>Transaction.PersonPair.reversed, getter: Transaction.PersonPair</td>
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<td>AppDelegate.swift</td>
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<td>DetailViewController.viewDidLoad()</td>
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<td>Function</td>
<td>Coverage</td>
<td>Change</td>
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<td>canBe_merged_with(Transaction) -&gt; Bool</td>
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<td>PersonPair.hashValue.getter : Int</td>
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<tr>
<td>isEqual(AnyObject!) -&gt; Bool</td>
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<td>83%</td>
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</tbody>
</table>
Code Coverage

Coverage trends
Demo

Code coverage in Xcode

Eric Dudiak Xcode Engineer
Extending Xcode Server
Extending Xcode Server

Triggers
Extending Xcode Server

Triggers

Custom actions: Email notifications or scripts
Extending Xcode Server

Triggers

Custom actions: Email notifications or scripts

Use your language of choice

• Include a #! in your script, otherwise Bash is assumed
Extending Xcode Server

Triggers

Custom actions: Email notifications or scripts
Use your language of choice
- Include a #! in your script, otherwise Bash is assumed
Before and after integrations run
Custom actions: Email notifications or scripts
Use your language of choice
• Include a #! in your script, otherwise Bash is assumed
Before and after integrations run
Gated on the result of the integration
Extending Xcode Server

Environment variables in triggers

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XCS</td>
<td>Always set to 1, use to detect Xcode Server</td>
</tr>
<tr>
<td>XCS_BOT_NAME</td>
<td>The name of the current bot</td>
</tr>
<tr>
<td>XCS_BOT_ID</td>
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</tr>
<tr>
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<tr>
<td>XCS_INTEGRATION_RESULT</td>
<td>The overall result of the integration</td>
</tr>
<tr>
<td>XCS_SOURCE_DIR</td>
<td>Location where your project’s code was checked out</td>
</tr>
<tr>
<td>XCS_OUTPUT_DIR</td>
<td>Location where logs and assets for the integration are stored</td>
</tr>
<tr>
<td>XCS_DERIVED_DATA_DIR</td>
<td>Location where derived data is stored for this bot</td>
</tr>
<tr>
<td>XCS_PRODUCT</td>
<td>Path to an .ipa or .app, if the bot produced one</td>
</tr>
<tr>
<td>XCS_(TYPE)_COUNT</td>
<td>Number of issues of each type (error, warning, failed test, etc.)</td>
</tr>
<tr>
<td>XCS_(TYPE)_CHANGE</td>
<td>Change in number of issues from previous integration</td>
</tr>
</tbody>
</table>
## Extending Xcode Server

### Environment variables in triggers

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Extending Xcode Server

Open standards
Extending Xcode Server

Open standards

• Secure communication over HTTPS
Extending Xcode Server

Open standards

• Secure communication over HTTPS
• REST pattern of resources and actions
Extending Xcode Server

Open standards

- Secure communication over HTTPS
- REST pattern of resources and actions
- Data exchanged using JSON
Extending Xcode Server

Open standards

• Secure communication over HTTPS
• REST pattern of resources and actions
• Data exchanged using JSON

Compatible with most scripting languages
Extending Xcode Server
API example: bots

GET  https://my-server:20343/api/bots

{
  "count": 3,
  "results": [{
    "_id": "2787279335349c6fad1f8c0477eaf3df",
    "name": "CoffeeBoard Bot",
    "configuration": {
      "builtFromClean": 0,
      "schemeName": "CoffeeBoard",
      "performsAnalyzeAction": true,
      "performsTestAction": true,
      "performsArchiveAction": true,
      "exportsProductFromArchive": false,
      "triggers": [],
      "scheduleType": 2,
    }
  },

  {
    "_id": "c6fad1f8c0477eaf3df",
    "name": "Bot 2",
    "configuration": {
      "builtFromClean": 0,
      "schemeName": "Bot 2",
      "performsAnalyzeAction": true,
      "performsTestAction": true,
      "performsArchiveAction": true,
      "exportsProductFromArchive": false,
      "triggers": [],
      "scheduleType": 2,
    }
  },

  {
    "_id": "eaf3df",
    "name": "Bot 3",
    "configuration": {
      "builtFromClean": 0,
      "schemeName": "Bot 3",
      "performsAnalyzeAction": true,
      "performsTestAction": true,
      "performsArchiveAction": true,
      "exportsProductFromArchive": false,
      "triggers": [],
      "scheduleType": 2,
    }
  }]
}
Extending Xcode Server

API example: integrations
Extending Xcode Server
API example: integrations

GET /bots/2787279335349c6fad1f8c0477eaf3df/integrations
Extending Xcode Server

API example: integrations

GET  .../bots/2787279335349c6fad1f8c0477eaf3df/integrations

{
  "count": 30,
  "results": [{
    "_id": "93040d36151067716da6ff05a20032bc",
    "bot": { ... },
    "number": 23,
    "currentStep": "completed",
    "result": "build-errors",
    "buildResultSummary": {
      "errorCount": 3,
      "errorChange": -1,
      "warningCount": 11,
      "warningChange": 0,
      "analyzerWarningCount": 1
    }
  }
}
Extending Xcode Server

API example: integrating a bot
Extending Xcode Server

API example: integrating a bot

POST .../bots/2787279335349c6fad1f8c0477eaf3df/integrations
Extending Xcode Server

API example: integrating a bot

POST .../bots/2787279335349c6fad1f8c0477eaf3df/integrations

{
    "_id": "93040d36151067716da6ff05a20032bc",
    "bot": { ... },
    "number": 23,
    "currentStep": "pending"
}
Extending Xcode Server

API example: integrating a bot

POST .../bots/2787279335349c6fad1f8c0477eaf3df/integrations

{  "shouldClean": true }

{
  "_id": "93040d36151067716da6ff05a20032bc",
  "bot": { ... },
  "number": 23,
  "currentStep": "pending"  
}
Demo
Extending Xcode Server

Eric Dudiak Xcode Engineer
# Extending Xcode Server

## Available endpoints

<table>
<thead>
<tr>
<th>Method</th>
<th>Endpoint</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GET</td>
<td>/bots</td>
<td>List bots on server</td>
</tr>
<tr>
<td>POST</td>
<td>/bots</td>
<td>Create a new bot</td>
</tr>
<tr>
<td>GET</td>
<td>/bots/(id)</td>
<td>Retrieve a bot by ID</td>
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<tr>
<td>PATCH</td>
<td>/bots/(id)</td>
<td>Update a bot’s configuration</td>
</tr>
<tr>
<td>GET</td>
<td>/bots/(id)/integrations</td>
<td>Get the most recent integrations for a bot</td>
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<tr>
<td>POST</td>
<td>/bots/(id)/integrations</td>
<td>Enqueue a new integration</td>
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<tr>
<td>GET</td>
<td>/integrations</td>
<td>List integrations on server</td>
</tr>
<tr>
<td>GET</td>
<td>/integrations/(id)</td>
<td>Retrieve an integration by ID</td>
</tr>
<tr>
<td>GET</td>
<td>/integrations/(id)/commits</td>
<td>List the commits included in an integration</td>
</tr>
<tr>
<td>GET</td>
<td>/integrations/(id)/issues</td>
<td>List the build issues produced by an integration</td>
</tr>
<tr>
<td>GET</td>
<td>/devices</td>
<td>List devices connected to server</td>
</tr>
<tr>
<td>GET</td>
<td>/repositories</td>
<td>List hosted repositories on server</td>
</tr>
<tr>
<td>POST</td>
<td>/repositories</td>
<td>Create a new hosted repository</td>
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</table>
Summary

Xcode Server improvements
New testing features
Code coverage
Triggers
Xcode Server API
More Information

Xcode Server and Continuous Integration Guide
http://developer.apple.com/library

Apple Developer Forums
http://developer.apple.com/forums

Stefan Lesser
Swift Evangelist
slesser@apple.com
## Related Sessions

<table>
<thead>
<tr>
<th>Session</th>
<th>Room</th>
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<tbody>
<tr>
<td><strong>UI Testing in Xcode</strong></td>
<td>Presidio</td>
<td>Wednesday 11:00AM</td>
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<tr>
<td>Continuous Integration with Xcode 6</td>
<td>WWDC 2014</td>
<td></td>
</tr>
<tr>
<td>Testing and Continuous Integration</td>
<td>Developer Tools Lab B</td>
<td>Thursday 1:30PM</td>
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