iOS4 Introduction

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iOS Instructor
Cogswell Technical College
Sunnyvale CA

Class Rules

- No video and audio recording
- Questions after each session
- Course material not transferable
- Keep your mobile in silence mode
- Rotate to charge your laptop

Time Keeper

Give me signal 10min before end of each session

Need a volunteer to track the time

Class

- Never coded in Objective-C
- Never developed an iOS app
- Never published an iOS app in the App Store

Solutions

- Relief pain most beginners suffered from getting started in iPhone
- Practical knowledge not mentioned in developer books
- Information not available in any Documentation
- How to avoid beginner’s mistakes

Course Requirements

- Intel-based Mac OSX Snow Leopard
- Latest iTunes version
- Apple Developer Account
- iOS4 SDK

Internet Access

WiFi

Distribute Sample Codes

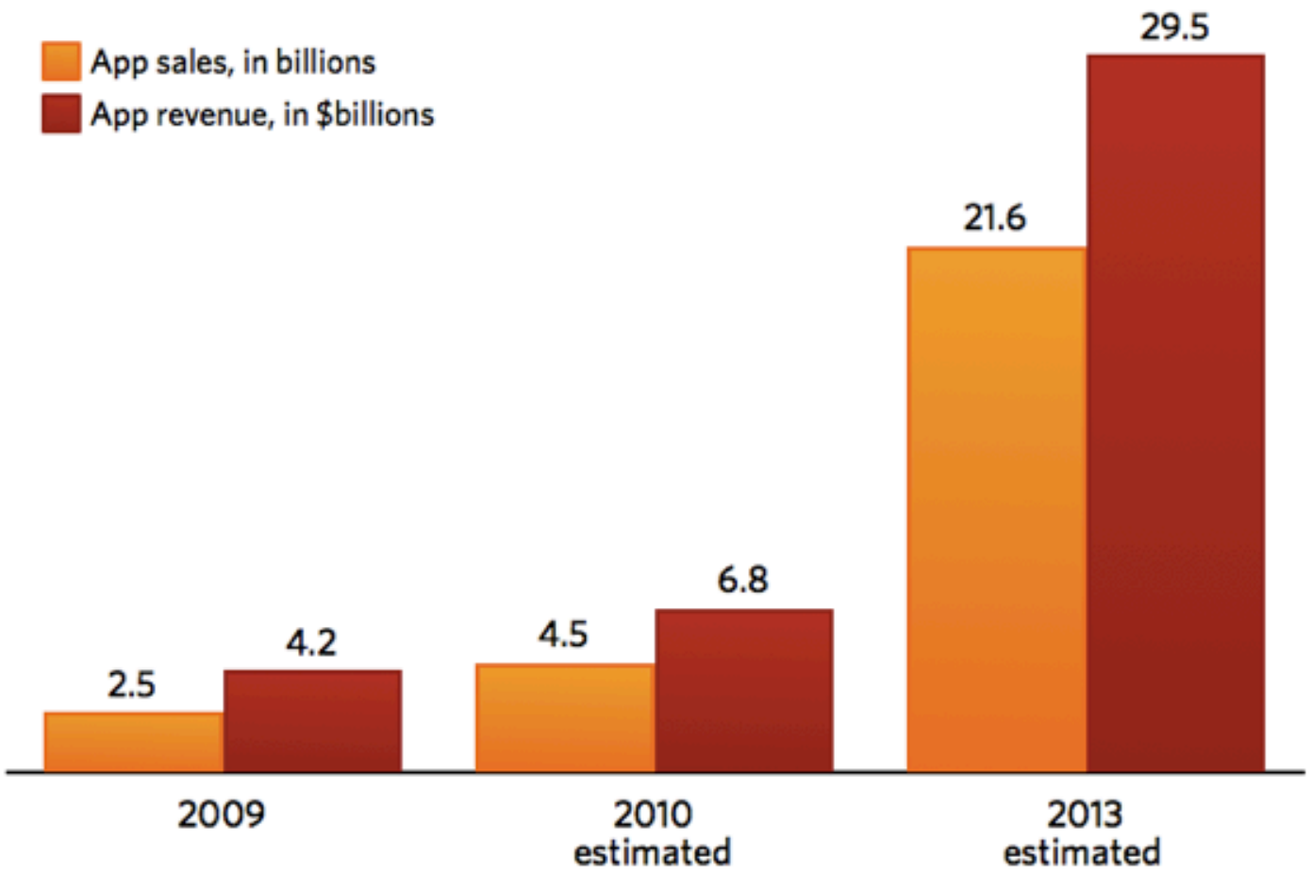
USB Keys or CDs

Agenda

- Hour 1 (10 min break)
- Hour 2 (10 min break)
- Hour 3 (15 min Q&A)

Market Size & Share

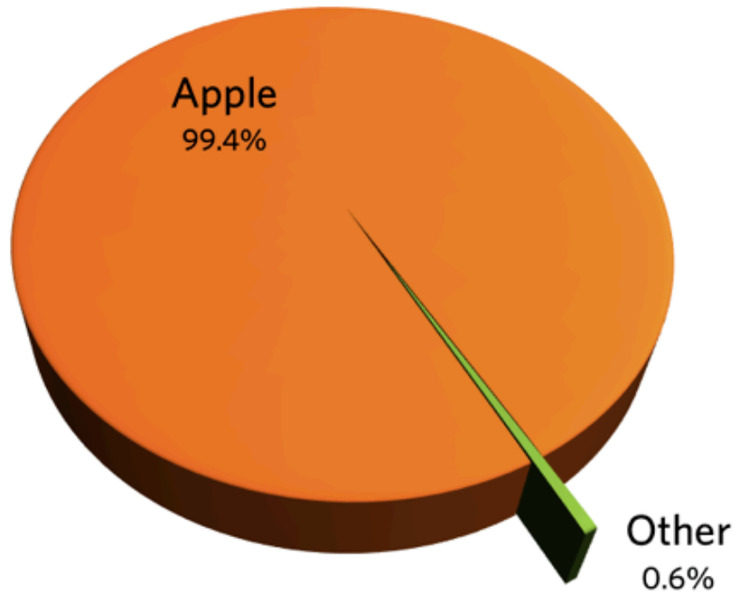
Mobile App Sales and Revenue



Source: Gartner

App Store Market Share, 2009

Percent



Source: Gartner, Apple

Arstechnica.com Jan 2010

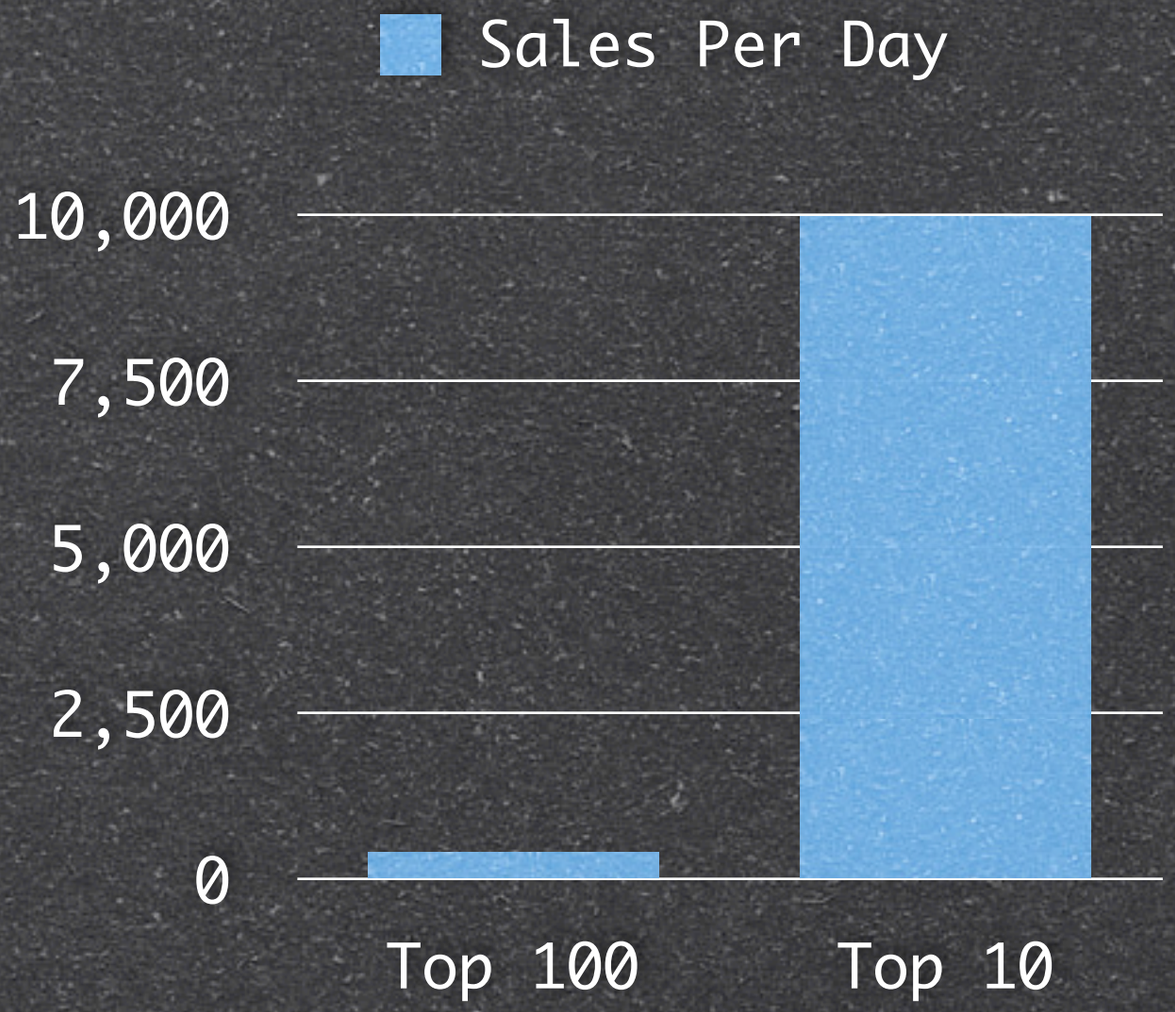
What's new on iOS4

Paid Application Market Size Estimate[3]

	Estimated Number of Users	% Who Buy Paid Apps	Average $/Month Spent on Paid Apps	Est. August 2009 Paid App Market Size
Android	3M	19%	$8.63	**$5M**
iPhone	26.4M	50%	$9.49	**$125M**
iPod touch	18.6M	40%	$9.79	**$73M**

AdMob Report in 2009

What's new on iOS4



	Top 10	Top 100
Average Price	$1.99	$3.18

- Takes about 400 Sales per day to break into Top 100
- Takes about 10,000 Sales per day to break into Top 10

AdMob Report in 2009

Incentive

Top 100 App

Revenue	Total
$3.18 X 1,000 app	$3,180 / day
$3,180 x 30 days	$95,400 / month
$95,400 x 12 months	**$1,160,700 / year**

$116 Million

Top 100 App

What's new on iOS4

iPhone 4

What's new on iOS4

Game Center

Multitasking

iPhone 4

Game Center

- Multiplayer platform
- Invite
- Automatic match up
- Support iPhone or iTouch running iOS 4.1
- Tap Game Center App & Sign in with Apple ID

iPhone 4

Game Center

- Create different nickname visible to friend and the gaming community
- Assign several email addresses increase search visibility
- Tap links to download games. Play game in the Game Center

iPhone 4

Game Center

- Leaderboard
- Achievements

iPhone 4

Multitasking

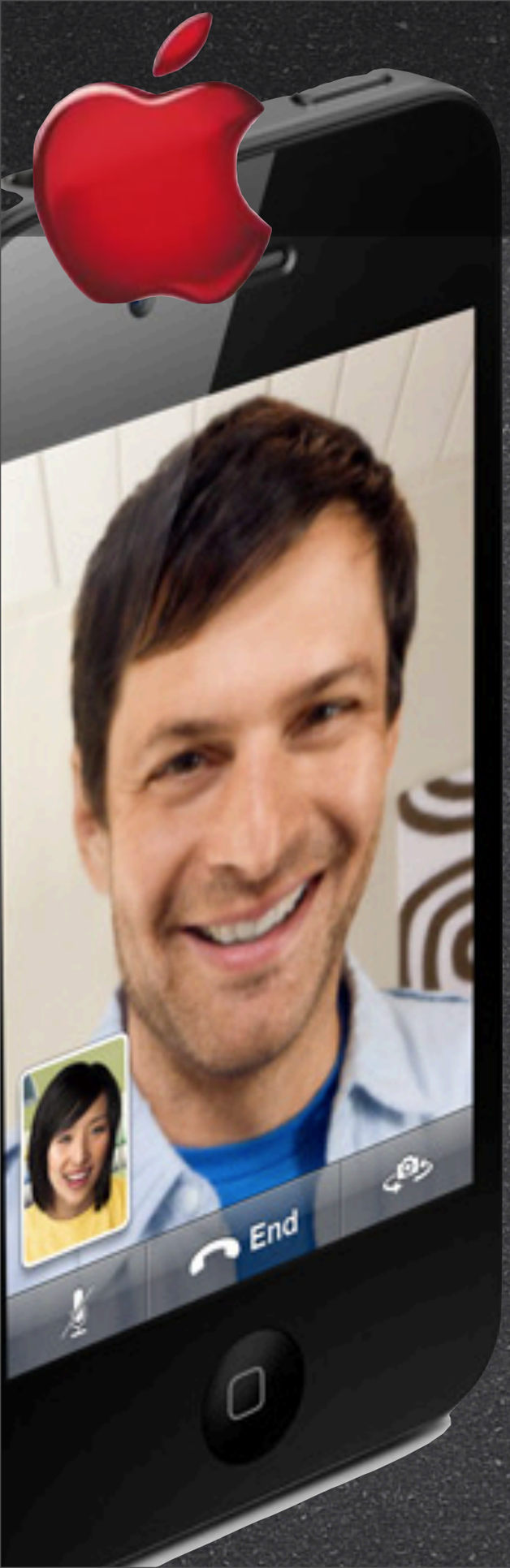
- Switch between used apps without waiting for the app to reload
- Listen to audio in the background
- Receive Skype or VoIP calls while running on other app

iPhone 4

Multitasking

- Keep GPS running in the background to update your position and give spoken turn-by-turn direction while listening to music
- Receive push and local noticiations
- Complete tasks in the background

iPhone 4



FaceTime

- Retina Display
- 2 Cameras: Front-facing camera + Backside camera
- 2 Microphones: Main Microphone + 2nd Microphone

iPhone 4

Multitasking

- 40+ language-specific keyboard
- built-in dictionaries support 40 languages and dialects
- VoiceOver reads screens in 33 languages and VoiceControl supports 24 languages

iPhone 4

Engineered Glass

- Two glossy panels of aluminosilicate glass
- Same material used in the windshields of helicopters and high-speed trains.
- 20 times stiffer. 30 times harder than plastic
- More scratch resistant & Recyclable

iPhone 4

Retina Display

- 960 x 640 backlit LCD display
- pixel density: 326 pixels per inch
- Each pixel is 78 micrometer
- 4 times pixel counts of other models
- Human eye can’t see individual pixel
- Excellent color & Contrast from any viewing angle

iPhone 4

Gyro

- Built-in three-axis gyroscope
- Gyro + Accelerometer => advanced motion sensing
- User acceleration, full 3D attitude, rotation rate
- Support more motion gestures and better precision for gaming experience

iPhone 4

Camera + LED

- 5-megapixel photos
- HD video
- Backside illumination sensor
- Captures image in low-light settings
- Built-in LED flash
- Built-in camera for FaceTime calls & self-portraits

iPhone 4

Mic + Speaker

- Two Microphones
- Main mic - located on the bottom
- 2nd mic - built into the top near headphone jack for FaceTime and regular calls
- Dual-mic suppress noise

iPhone 4

Multi-Touch

- Laminated glass senses touch using electrical fields
- Advanced geatures: two-finger tap
- Tap, Drag, Swipe, Pinch, Flick, Twist

Apple Developer Acct

http://developer.apple.com/programs/register/

FREE

Requirements

- Intel-based Mac OSX Snow Leopard
- Latest iTune version
- Apple Developer Account
- iPhone SDK iOS4

Check your software

1. Mac OSX

2. iTunes

Everyone?

SDK 4

iPhone-Only

iPad-Only

Universal App

Select matching simulator & device

OS 4.0

OS 3.2

OS 3.2 & 4.0

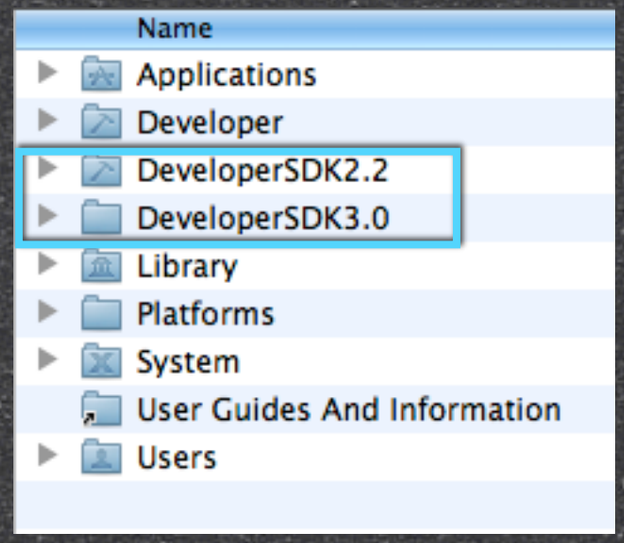
Requirements

- iPhone SDK iOS4
- Download < 3GB
- After install > 6GB
- Require 9.0 GB free disk space
- Multiple SDK install such as beta SDK requires another > 6GB

Apple Store won’t be able to add additional Hard Drive on mac

HD Management

Easier fill up 40 GB



Default Install Directory

Before Install

SDK 4.1
3.2 GB

After Install

SDK 4.1
8.9 GB

Custom Install Directory

Before Install

SDK 3
< 3 GB

After Install

SDK 3
> 6 GB

Custom Install Directory

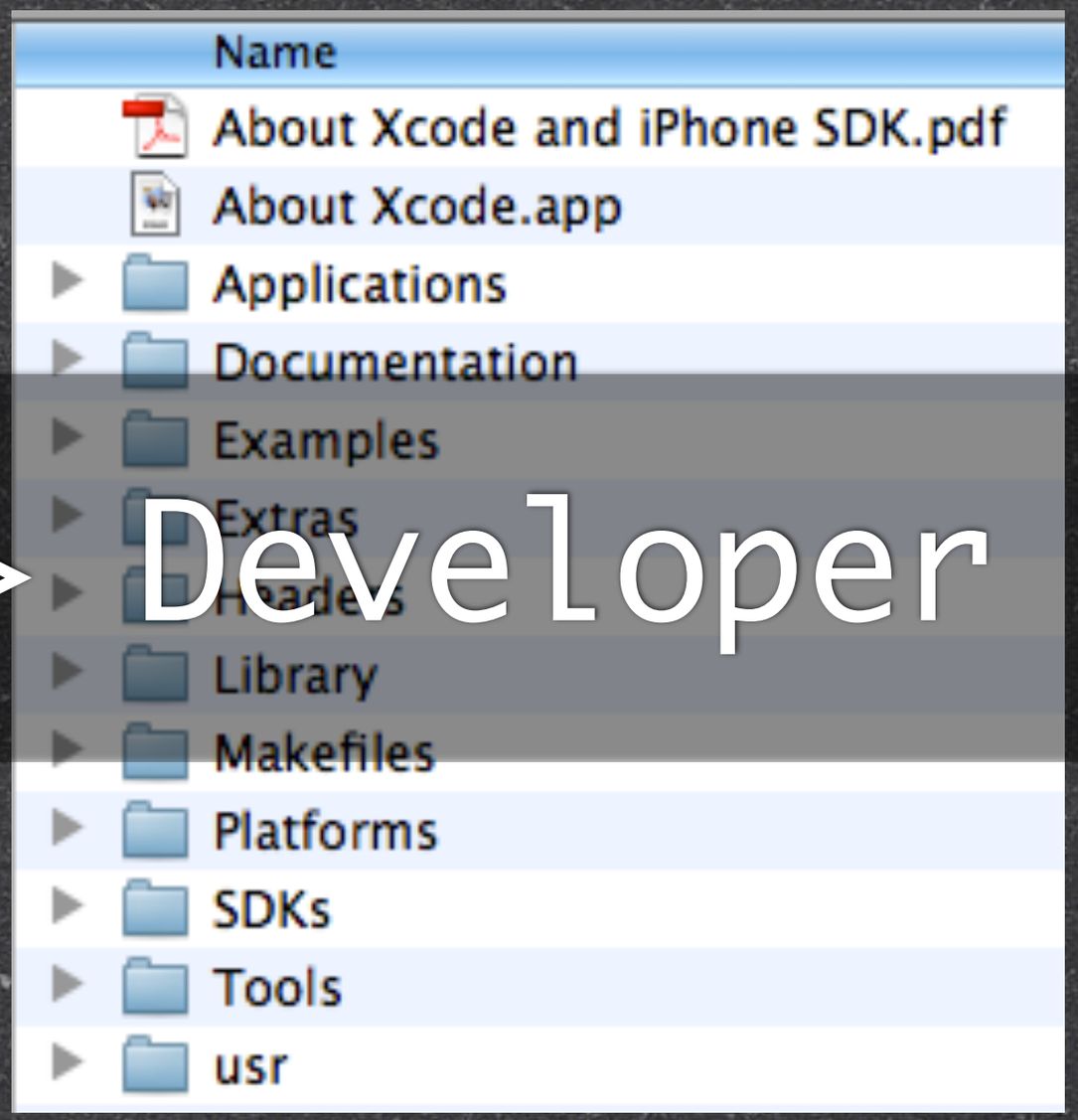
Before Install

Beta
3+ GB

After Install

Beta
9+ GB

Macintosh HD > Developer



Login

Everyone?

Apple Developer Acct

http://developer.apple.com/programs/register/

FREE

iOS Developer

http://developer.apple.com/programs/iphone/

$99/YR

$99

- [x] Vibration
- [x] Location Manager
- [x] Mail Application
- [x] Map Application
- [x] Safari Application
- [x] Device Orientation
- [x] Accelerometer
- [x] Audio Performance
- [x] Overall Performance

iOS Developer Program

iOS Developer Program

$99/YR

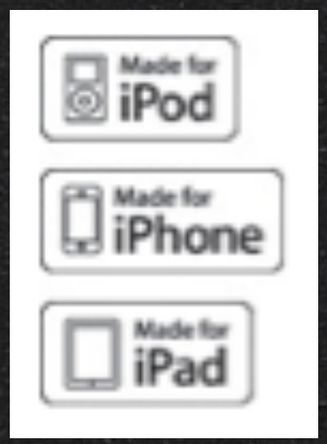
iOS Enterprise Program

$299/YR

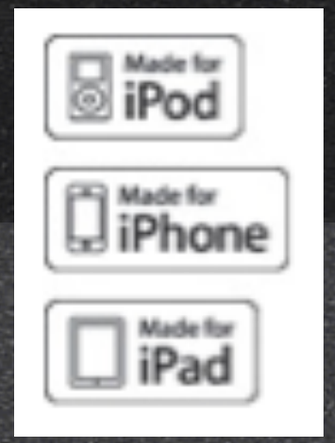
iOS Developer Enterprise

- Proprietary in-house applications to authorized users.
- Available to companies with 500+ employees and a Dun & Bradstreet Number.

MFi Program

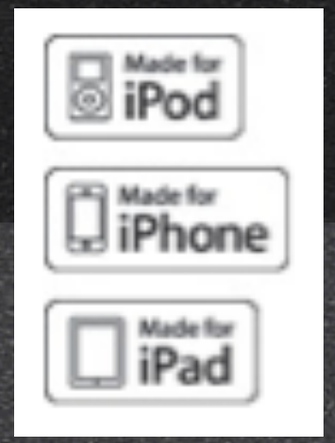


MFi Program



- Bluetooth, USB, Serial
- Once approved you purchase authorization co-processor IC
- Use chip to authenticate connection with device
- Establish pipe from device to app

Without MFi



- WiFi, Bluetooth, Audio
- WiFi and Bluetooth are high latency and Bluetooth are unreliable
- iPhone ships with 44.1kHz audio
- iPhone limits the maximum resolution to 44 steps per channel
- 3.5mm audio plugs

Network Performance

Network	Bandwidth
WiFi	54 Mbps
EDGE	70-135 Kbps, 200 Kbps burst

View: iOS SDK 4 | iOS SDK beta

Search iOS Reference Library

Resources for iOS 4

Downloads
Download the latest build of iOS SDK

Getting Started Videos
Watch Apple experts discuss a range of introductory concepts for iOS development.

Getting Started Documents
Learn the fundamental concepts and best-practices for iOS development.

iOS Reference Library
Select from a range of technical documentation on iOS development.

iAd JS Reference Library
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Coding How-To's
Learn how to incorporate features of iOS in your application.

Sample Code
Use these samples to inspire development of your own great applications.

Apple Developer Forums
Discuss iOS development with other developers and Apple engineers.

Featured Content

- What's new in iOS 4
- Supporting Multitasking In Your Applications
- iAd Framework Reference
- Start Developing iPad Apps
- Apple Push Notification Service Programming Guide
- In App Purchase Programming Guide
- Getting Started with In App Purchase

Downloads

Read Me Before Downloading Hide details

- If you have updated your iPhone to iOS 4.0.1 or your iPad to iOS 3.2.1 you will need to download and install iOS SDK 4.0.1 to continue your development.

iOS SDK 4.0.1
iOS SDK 4.0.1 includes the Xcode IDE, iPhone Simulator, and a suite of additional tools for developing applications for iPhone, iPad and iPod touch.

Posted: July 15, 2010
Snow Leopard Build: 10M2262a

Snow Leopard Downloads
- Xcode 3.2.3 and iOS SDK 4.0.1
- Xcode 3.2.3 Readme

Other Downloads
- iOS SDK Agreement
- iPhone Configuration Utility

iAd JS 1.1.1
iAd JS, combined with the power of iOS 4 and its WebKit-based browser, makes it easy for you to create high-impact, motion-rich ads.

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- iPhone Provisioning Portal
- iTunes Connect
- Apple Developer Forums
- Developer Support Center

App Store Resource Center

- Prepare for App Submission
- App Store Approval Process
- Managing Apps on the App Store
- Marketing Resources
- iAd Network

RSS News & Announcements

Remove Apps Using App Delete in iTunes Connect
Jul 30, 2010

See What's New in the Xcode 4 Developer Preview
Jul 29, 2010

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Exciting New Features in iTunes Connect
Jul 28, 2010

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iTunes Connect Mobile App Available
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iPhone Dev Center

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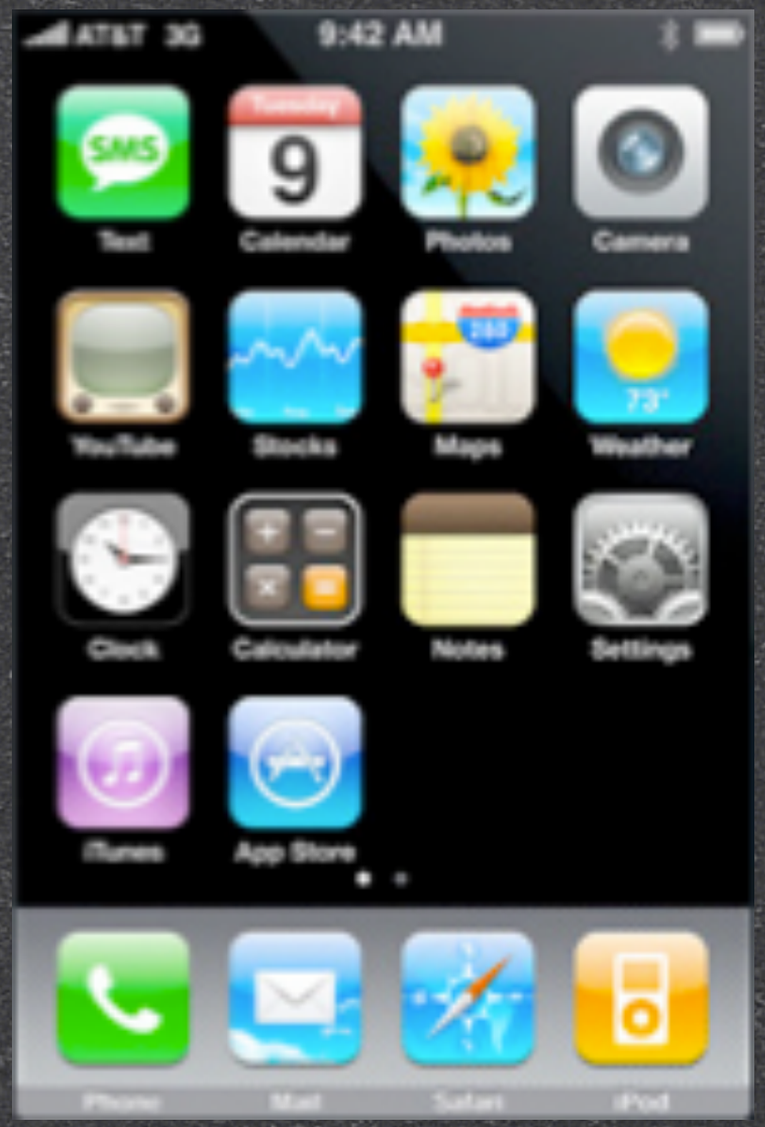
iPhone Resources

- iPhone Documentation
- iPhone Dev Center
- Apple Developer Forum
- iTunes University
- Stack Overflow
- Mailing List
- Meetup.com Group

320 pixel

480 pixel



iPhone / iTouch Screen Size

640 pixel

960 pixel

iPhone 4 Screen Size

768 pixel

1024 pixel

iPad Screen Size

1

2

3

iPhone

iPad

Universal App

Native App

Design Rules

- **App Icon**
- **Background**

App Icon

- **Most important critical investment**
- **Simple & Clear**
- **Details: gradients, highlights, reflections**
- **Apple layout app store icon in a rainbow wall based on icon background color**

Background

- **Use launch image as background to enhance user experience**
- **Loading time can hurt user experience**

Icon.png

Icon@2x.png

iTunesArtwork

Icon-72.png

Icon-Small.png

Icon-Small-50.png

Icon-Small@2x.png

iPhone Only App

Icon.png

57 x 57 pixel

App Store & Home Screen

Required

iPhone Only App

Icon@2x.png

114 x 114 pixel

Home screen for iPhone 4 High Resolution

Optional but recommended

iPhone Only App

Icon-72.png

72 x 72 pixel

Home screen for iPad compatibility

Optional but recommended

iPhone Only App

Icon-Small.png

29 x 29 pixel

Spotlight and Settings

Optional but recommended

iPhone Only App

File is in PNG but name
it without PNG extension

iTunesArtwork

512 x 512 pixel

Ad Hoc iTunes

Optional but recommended

iPhone Only App

Spotlight for iPad compatibility

Recommended for Settings Bundle

Icon-Small-50.png

iPhone Only App

Spotlight and Settings for iPhone 4 High Resolution

Recommended for Settings Bundle

Icon-Small@2x.png

iPhone Only App

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57 x 57 pixel

Icon@2x.png

114 x 114 pixel

iTunesArtwork

512 x 512 pixel

Icon-72.png

72 x 72 pixel

Icon-Small.png

29 x 29 pixel

Icon-Small-50.png

50 x 50 pixel

Icon-Small@2x.png

58 x 58 pixel

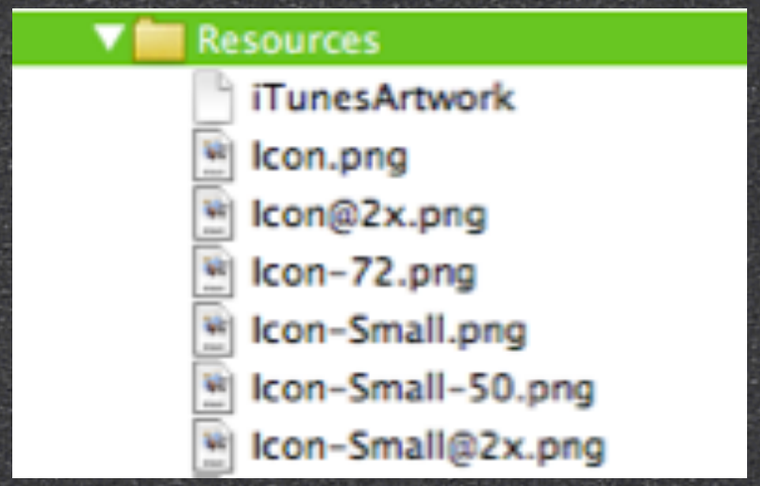
iPhone Only App

All icon files should go to Resources group

Include in application bundle

Add files in this order

- iTunesArtwork
- Icon.png
- Icon@2x.png
- Icon-72.png
- Icon-Small.png
- Icon-Small-50.png
- Icon-Small@2x.png



iPhone Only App

List icon files in Info.plist

Except for iTunesArtWork Icon

- Icon.png
- Icon@2x.png
- Icon-72.png
- Icon-Small.png
- Icon-Small-50.png
- Icon-Small@2x.png

Icon files	(6 items)
Item 0	Icon.png
Item 1	Icon@2x.png
Item 2	Icon-72.png
Item 3	Icon-Small-50.png
Item 4	Icon-Small.png
Item 5	Icon-Small@2x.png

iPhone Only App

iTunesArtwork

Icon-72.png

Icon-Small.png

Icon-Small-50.png

iPad Only App

Icon.png

Icon@2x.png

iTunesArtwork

Icon-72.png

Icon-Small.png

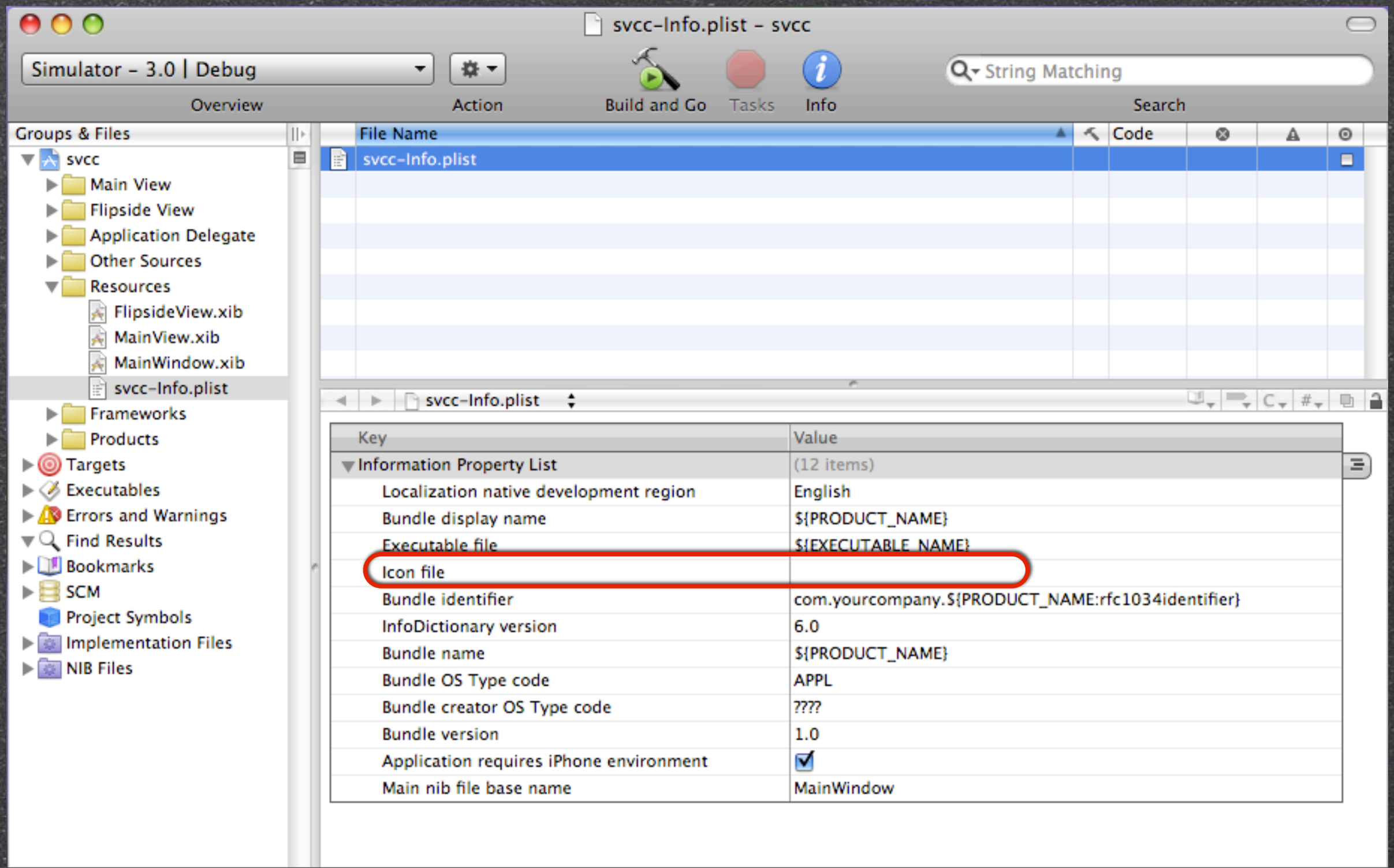
Icon-Small-50.png

Icon-Small@2x.png

Universal App

.plist

Resources > <project name>-Info.plist

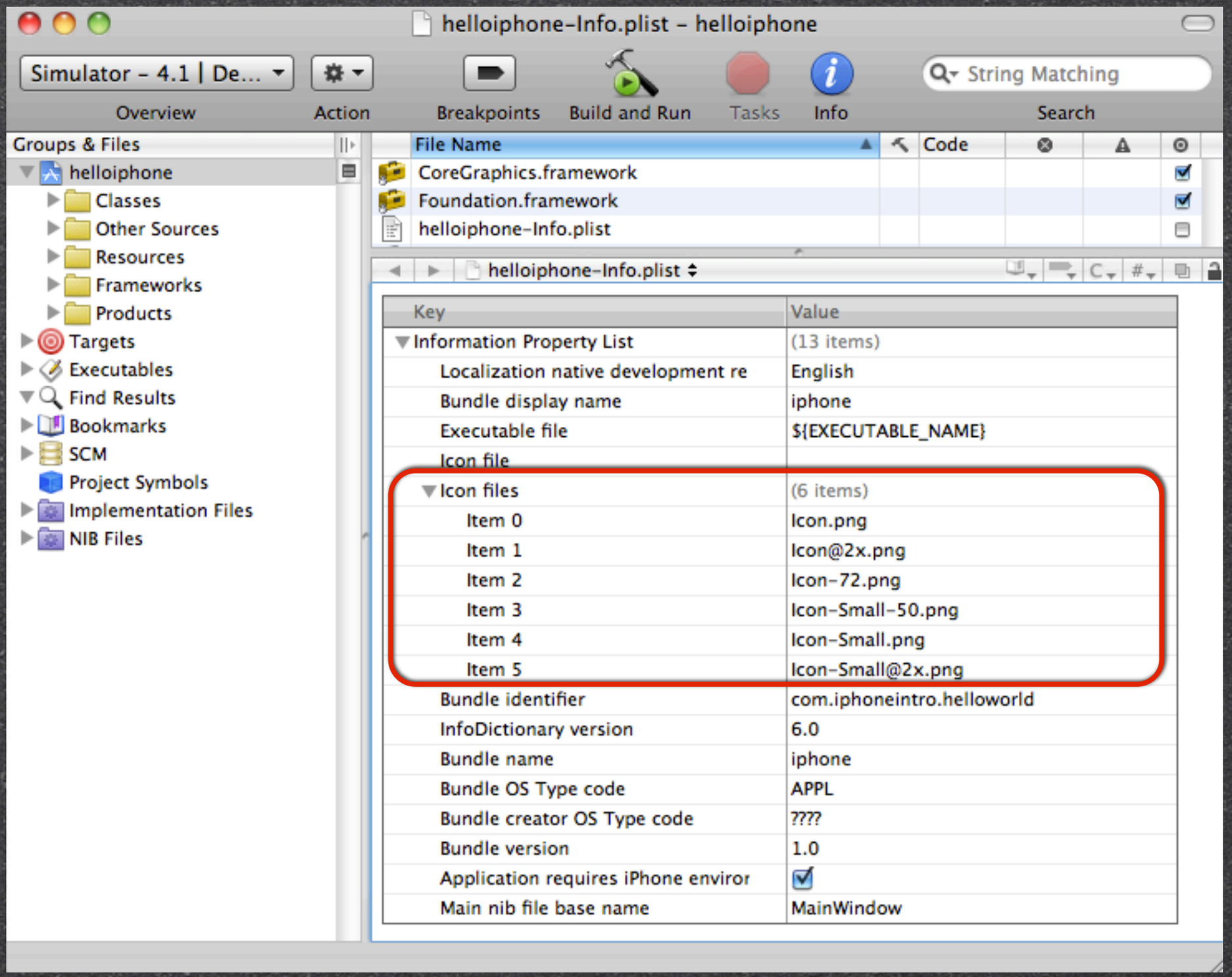


Add Icon files in Info.plist

- Open Info.plist in Xcode
- Locate “Icon file” entry
- Click on (+) button to add a new entry in “Icon file” key
- Enter “Icon files” in the key column
- Click on down disclosure triangle on Icon files” and add the entries for the icon files

.plist

Resources > <project name>-Info.plist



Add Icon files in Info.plist

6 Items for iPhone only app

3 Items for iPad only app

6 Items for Universal app

`info.plist`

Everyone?

Device-Specific Resources

Use bundle-loading routines to select device-specific resources

Instead of creating code paths to separate iPhone to iPad

<basename><device>.<filename_extension>

imagename

.png

~ipad

~iphone

Device-Specific Resources

```
// Create image but using Bundle-loading routine handle
device images
UIImage* myImage = [UIImage imageNamed:@"image.png"];
```

<basename><device>.<filename_extension>

imagename

.png

~ipad

~iphone

Device-Specific Resources

1. Include launch image
2. Update info.plist settings
3. Implement `shouldAutorotateToInterfaceOrientation:` method

All launch image file names are case sensitive

1

- Only one image
- Must be PNG
- 320 x 480 pixels
- Default.png

iPhone 4 Support

- Must be PNG
- 640 x 960 pixels
- Default@2x.png

iPhone App

1

- Must be PNG
- 1004 x 768 pixels (landscape)
- 748 x 1024 pixels (portrait)

- Default-PortraitUpsideDown.png
- Default-LandscapeLeft.png
- Default-LandscapeRight.png
- Default-Portrait.png
- Default-Landscape.png
- Default.png

iPad App

1

iPhone Support

- Default.png
- Default@2x.png

iPad Support

- Default-Portrait.png

Universal App

2

Update info.plist

- `UISupportedInterfaceOrientations` key for the supported orientations
- `UIInterfaceOrientation` key for the initial launch orientation.

info.plist

Method

- In your UIViewController class, implement the -(BOOL) shouldAutorotateToInterfaceOrientation: (UIInterfaceOrientation) interfaceOrientation method to return the supported UIInterfaceOrientation constants. This method should return YES to support all orientations.

shouldAutorotateToInterfaceOrientation:

Major Releases

SDK4.1 Game Center

SDK4.0 iPhone 4

SDK3.2 iPad

SDK3.0 Major updates

SDK2.0

Not good for 2010

SDK3+ ✓

SDK4+ ✓

Good for 2010

2011

SDK4.0

SDK3.0

SDK2.0

2008 2009 2010 2011

SDK5.0

SDK4.0

SDK3.0

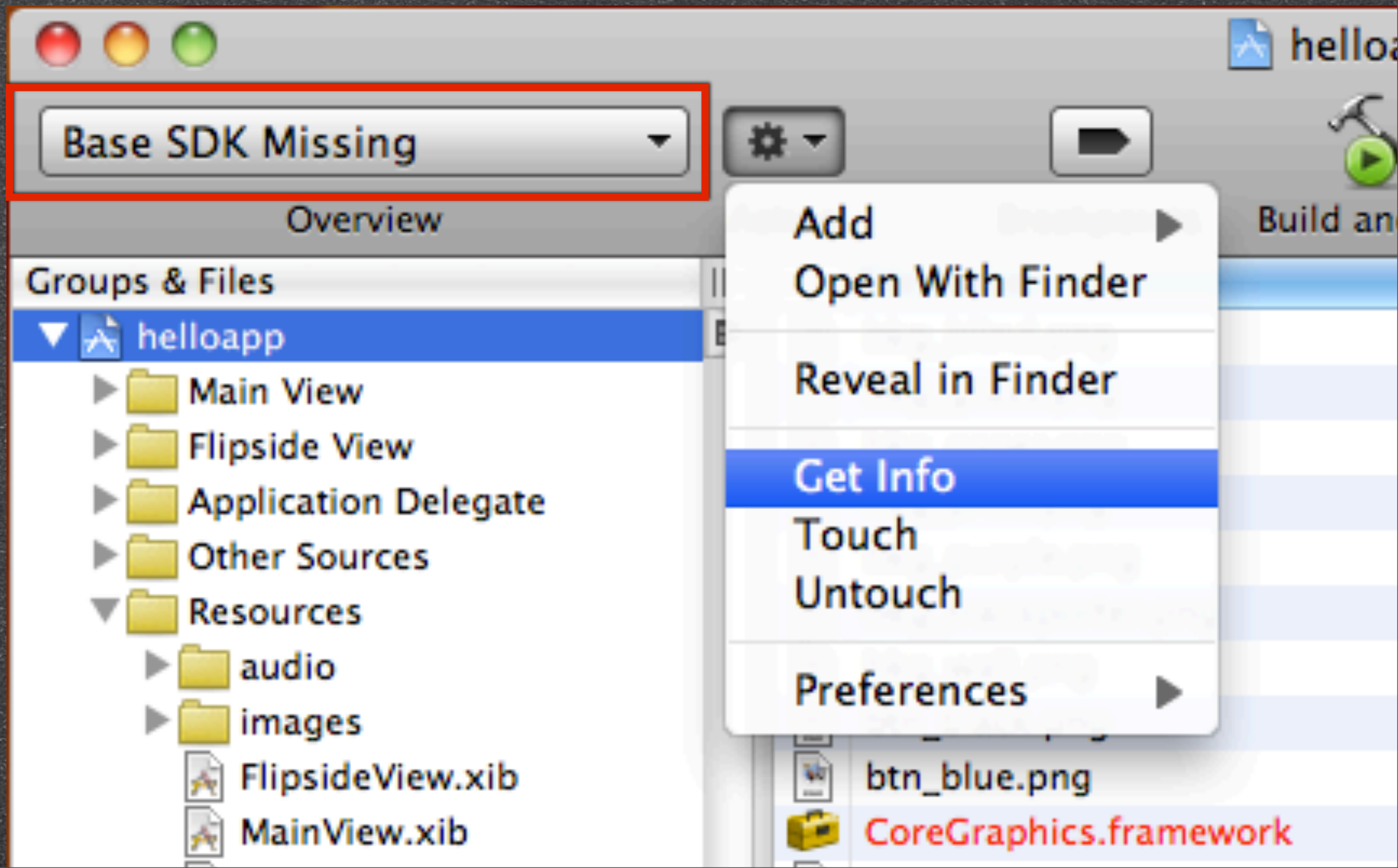
SDK3.0

SDK2.0

SDK2.0

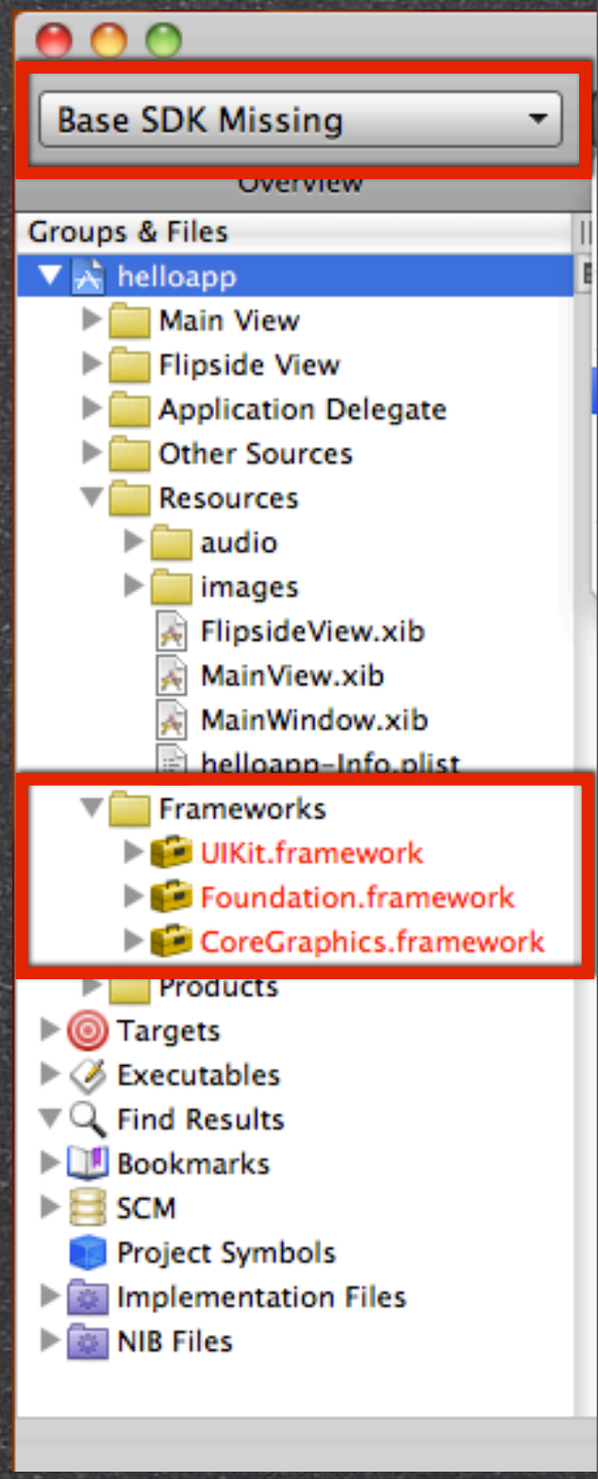
2008 2009 2010 2011

Major Upgrade Problems



OS4.0 => OS4.1

1) Base SDK Missing
2) Missing frameworks
3) Build & Run Error
4) Code Sign Error

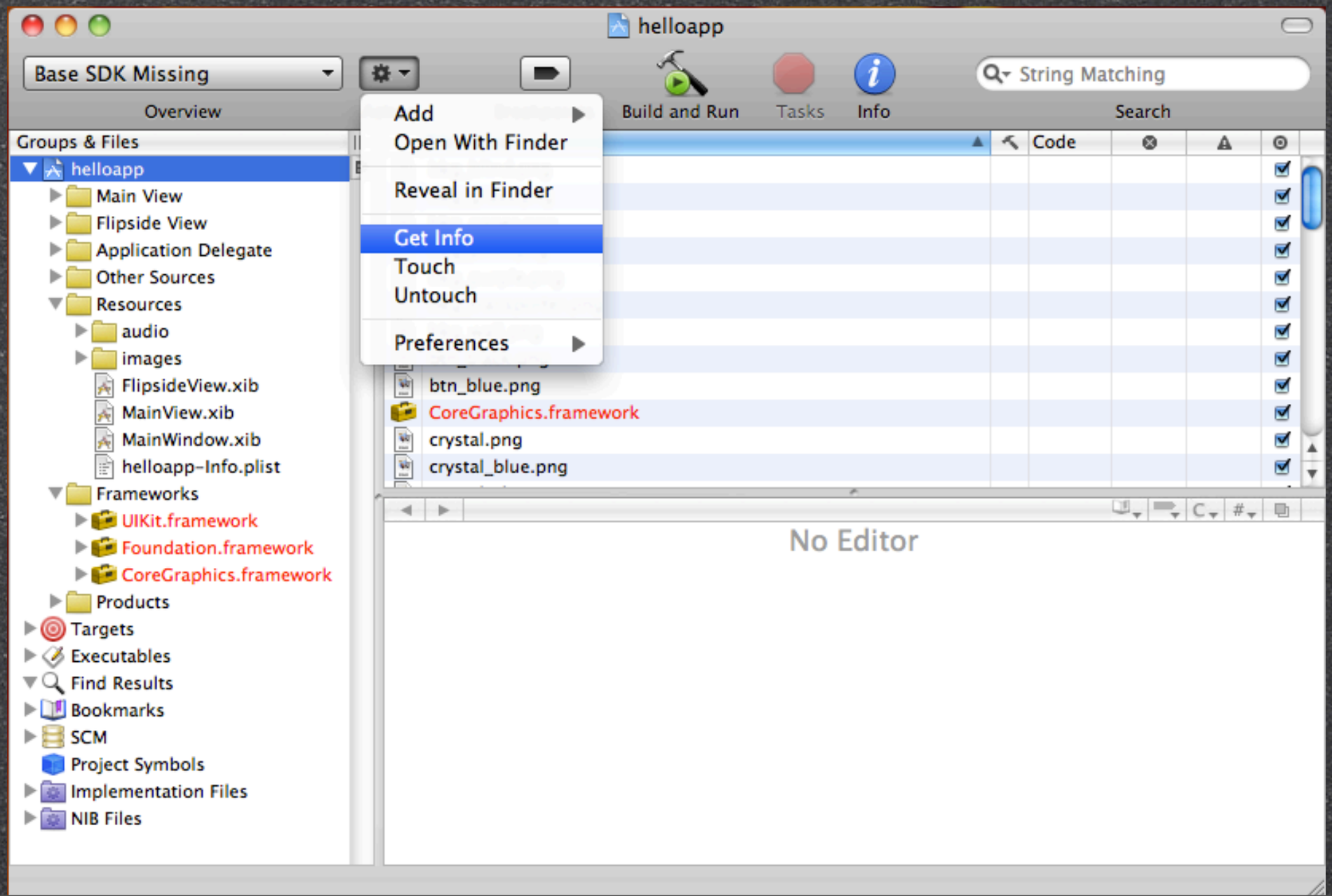



```
Code Sign error: a valid provisioning
profile matching the application's
Identifier 'com.yourcompany.helloapp'
could not be found
```

OS4 => OS4.1

1

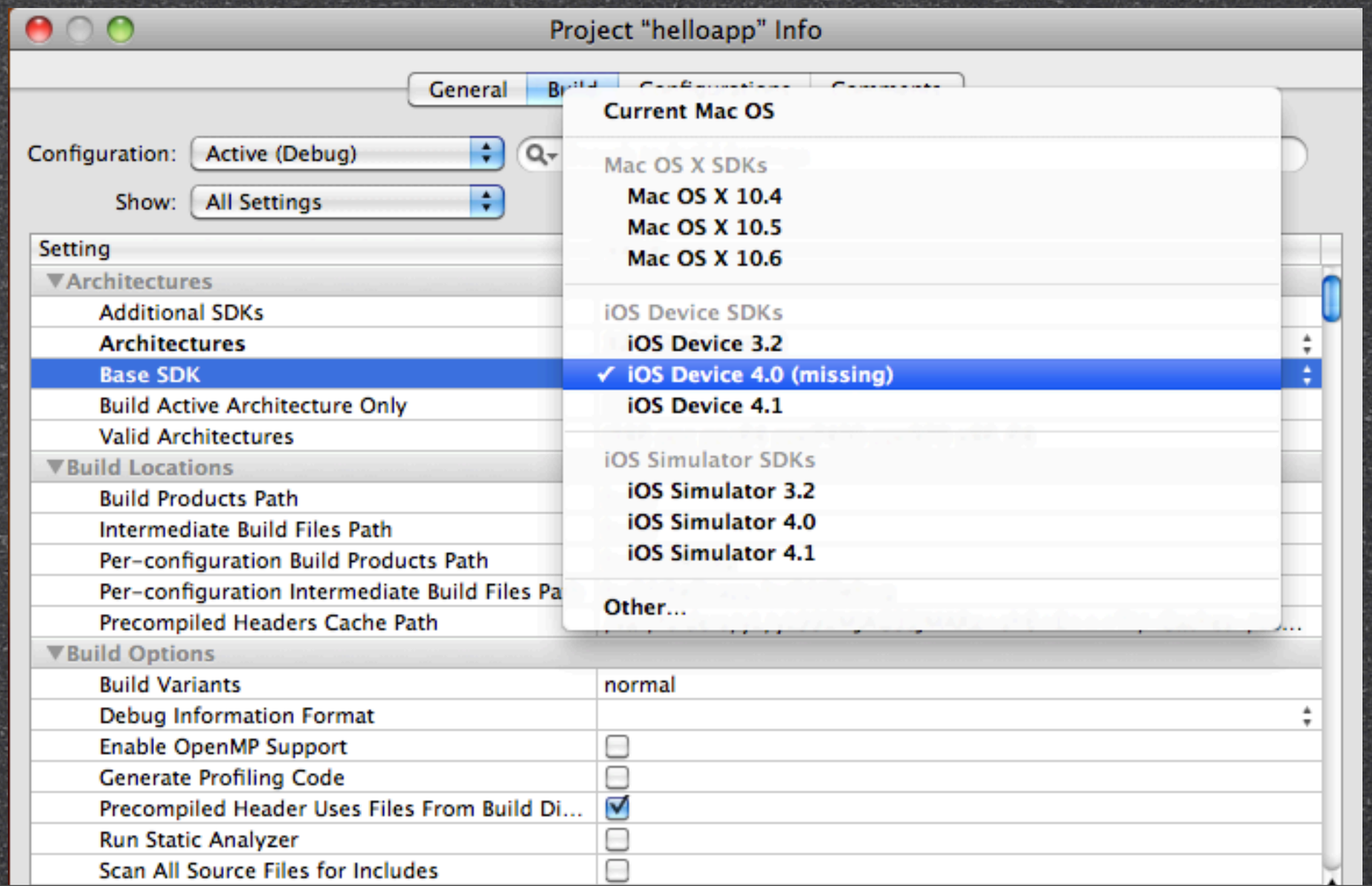
Select Project
Action > Get Info



OS4 => OS4.1

2

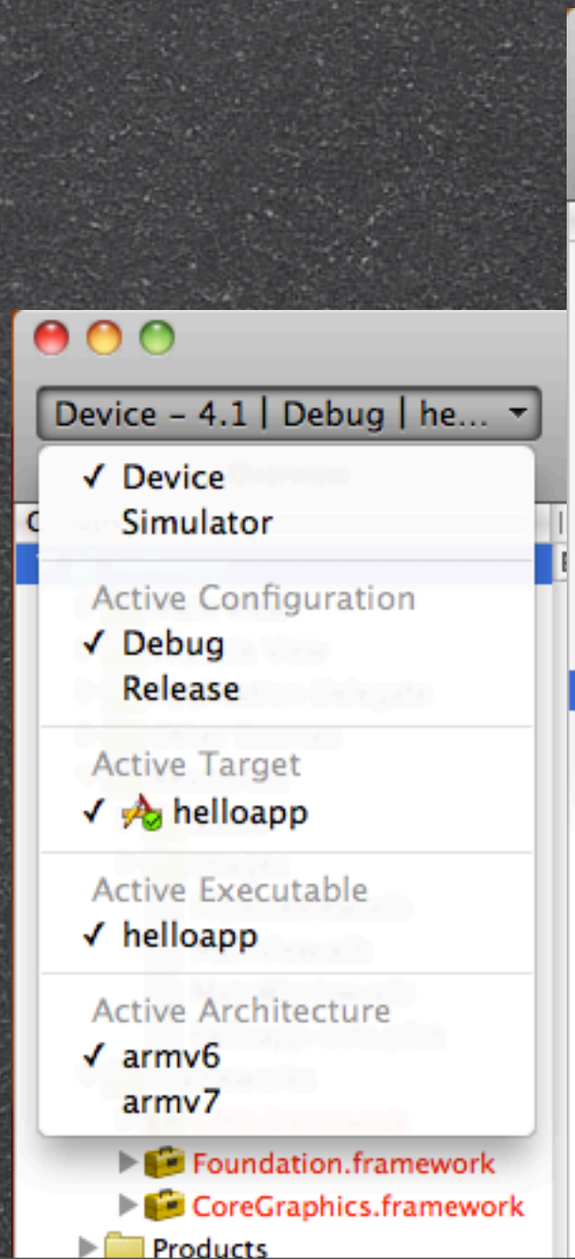
Select Build tab
Architectures > Base SDK
Select iS0 Device 4.1

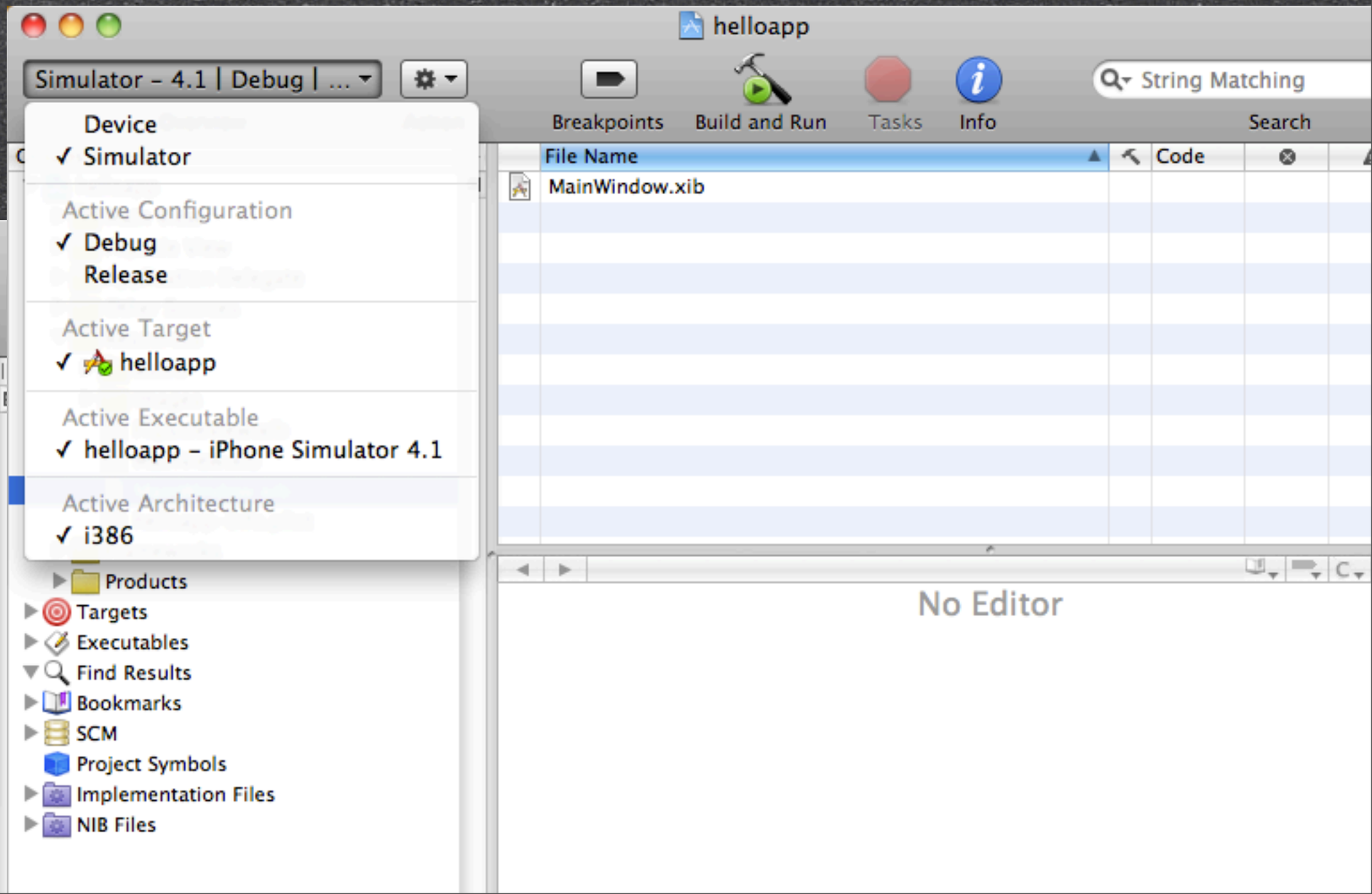


OS4 => OS4.1

3

Select Simulator instead of Device





OS4 => OS4.1

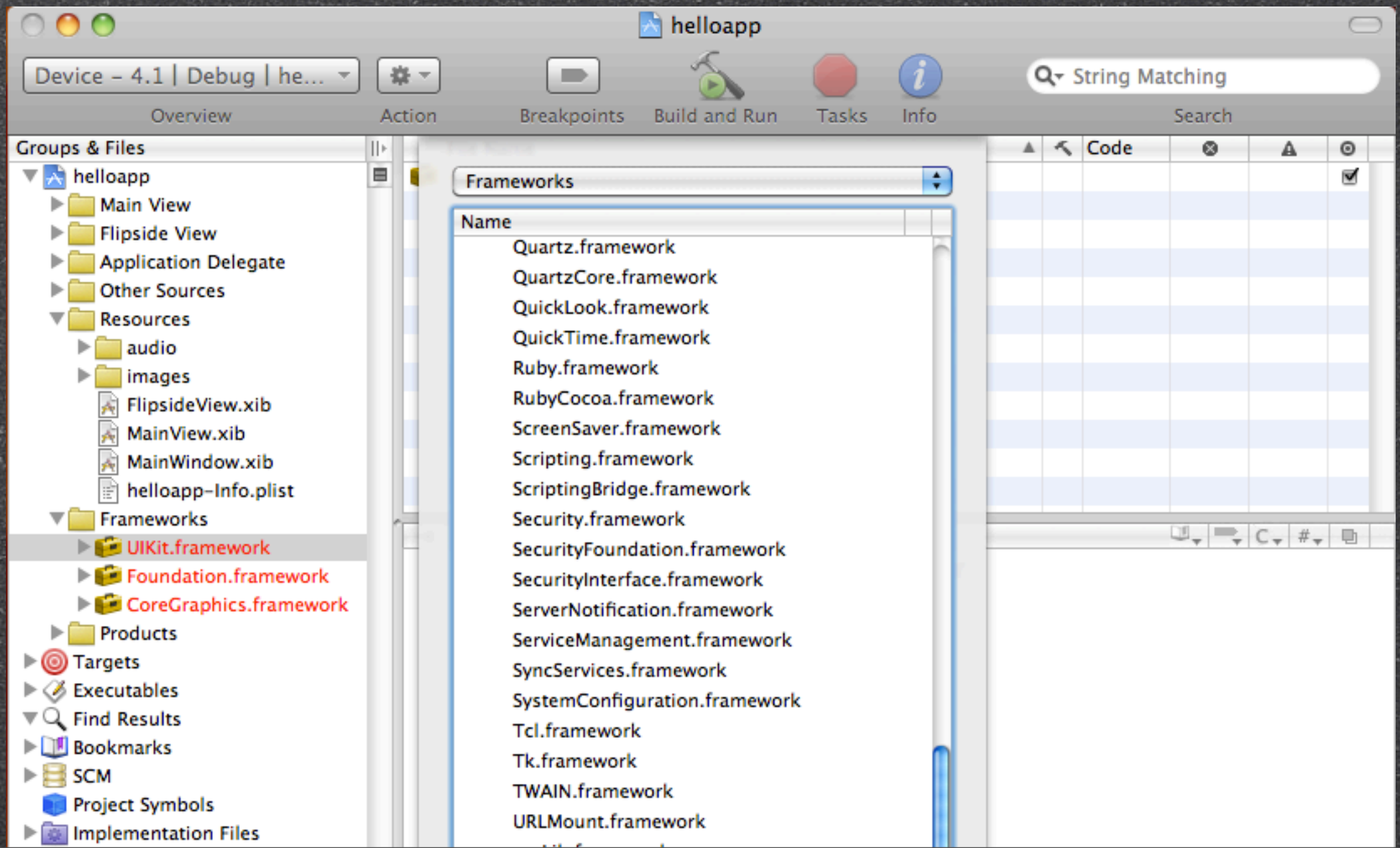
1. Select Project
   Action > Get Info

2. Select Build tab
   Architectures > Base SDK
   Select iSO Device 4.1

3. Select Simulator instead
   of Device

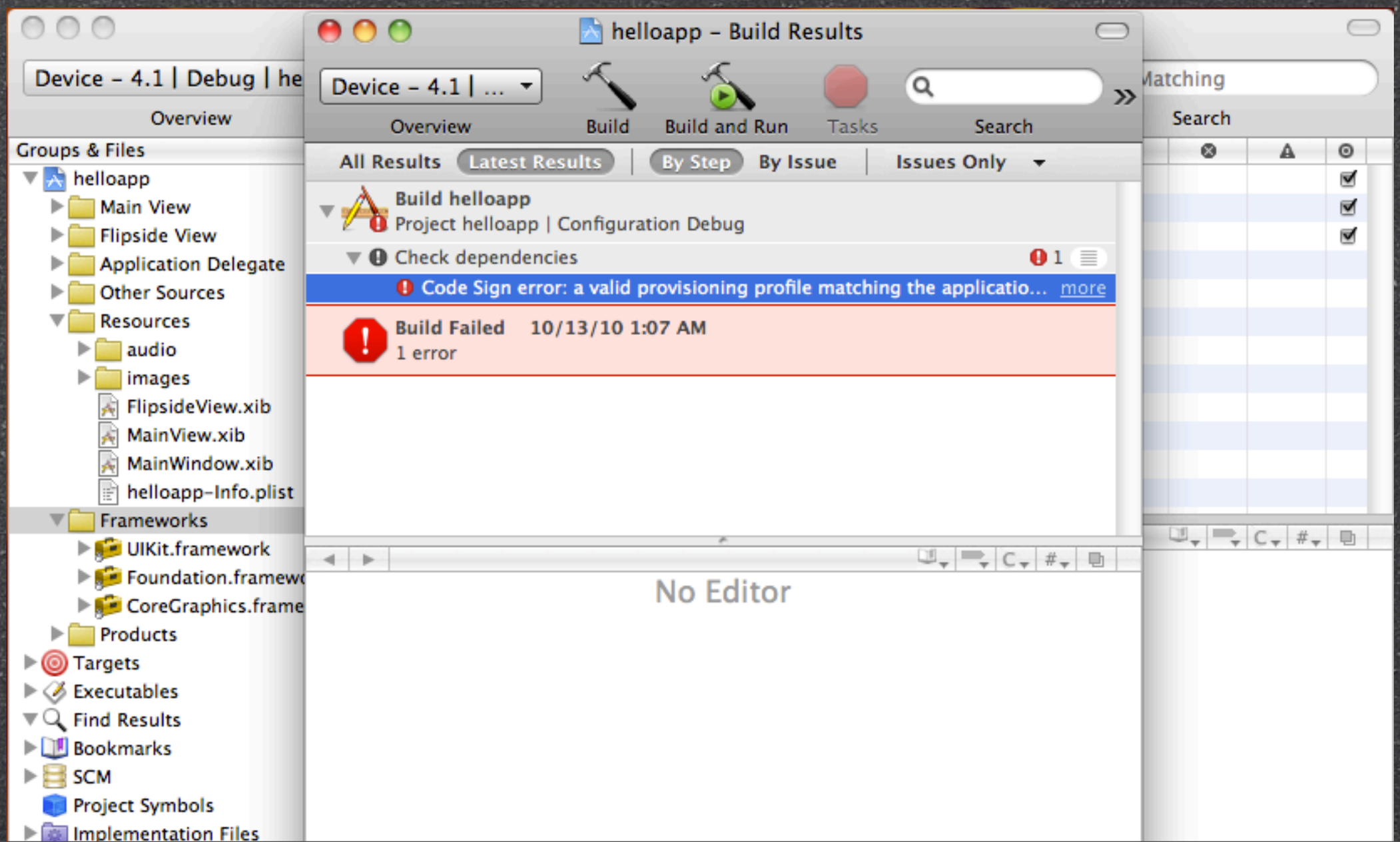
OS4 => OS4.1

Base SDK Missing cause missing Frameworks



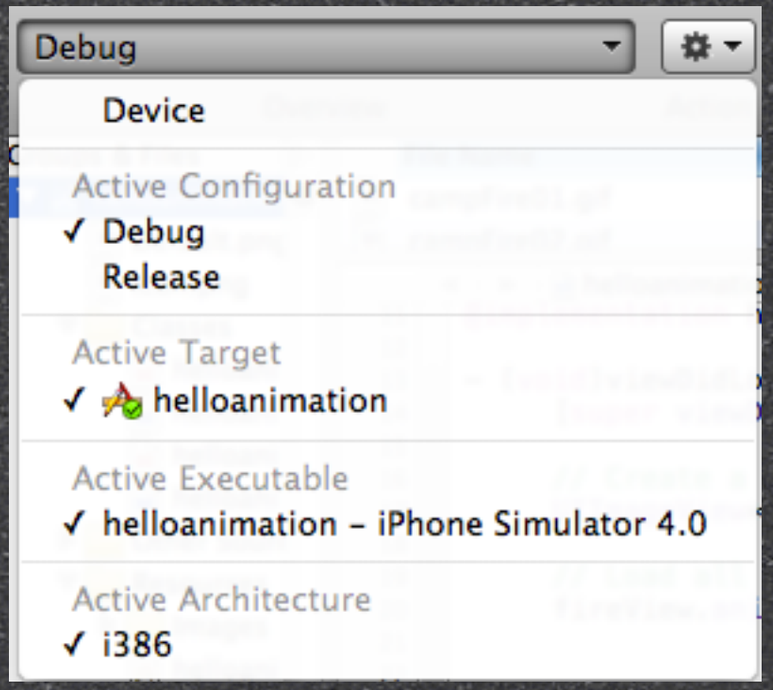
OS4 => OS4.1

Switch Architectures > Base SDK cause Code Sign Error

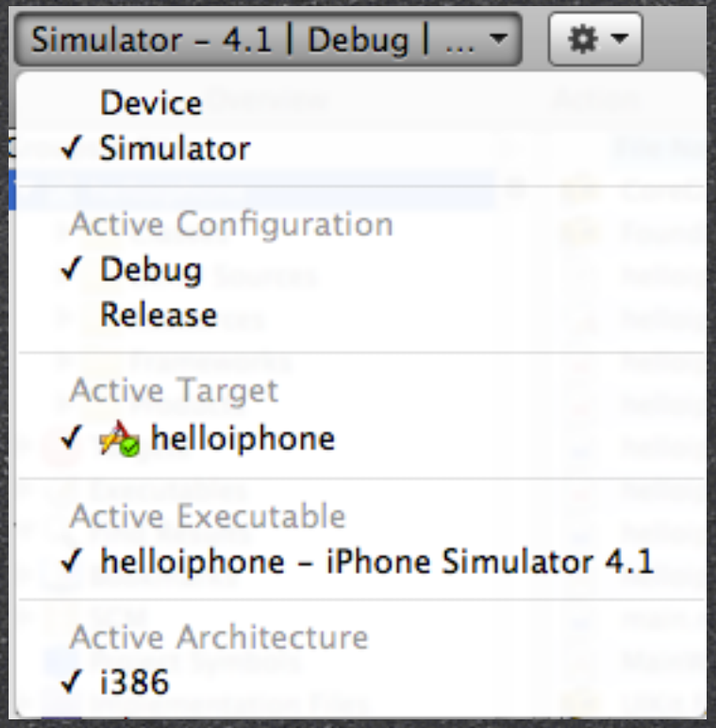


OS4 => OS4.1

Must select valid OS Device rather than OS Simulator esp OS 4.0 Device is missing in OS 4.1



Select OS Device 4.0

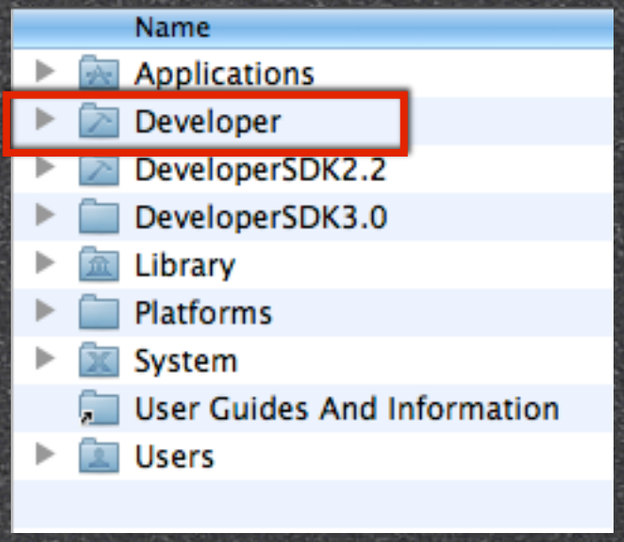


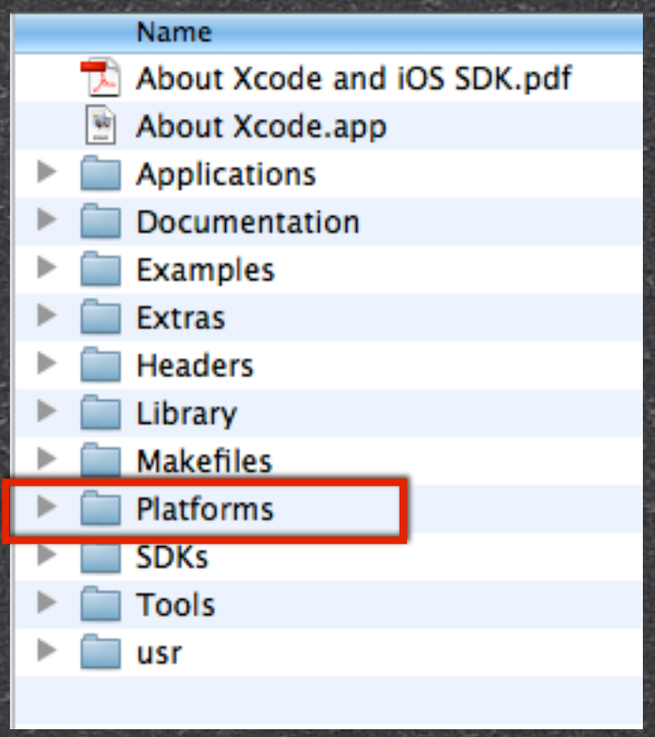
Select OS Device 4.1

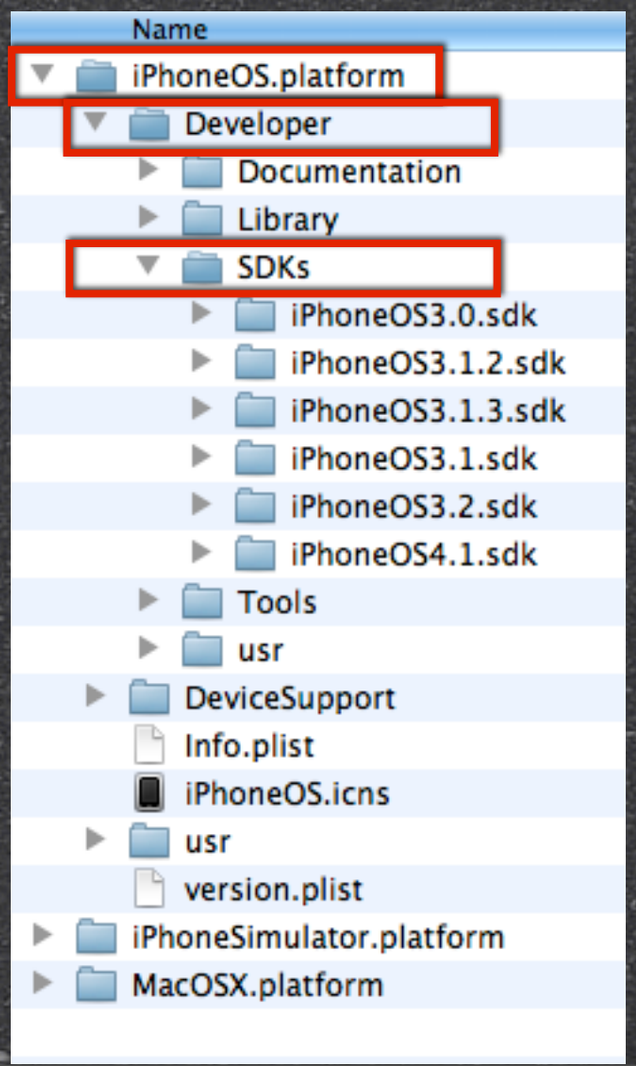
Support < OS4.1

Copy iPhoneOSX.X.X.sdk from previous iOS SDK version

Macintosh HD > Developer > Platforms > iPhoneOS.platform > Developer > SDKs



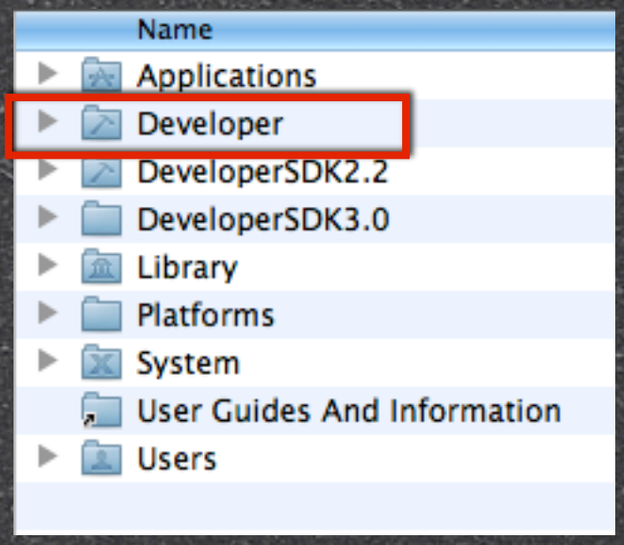


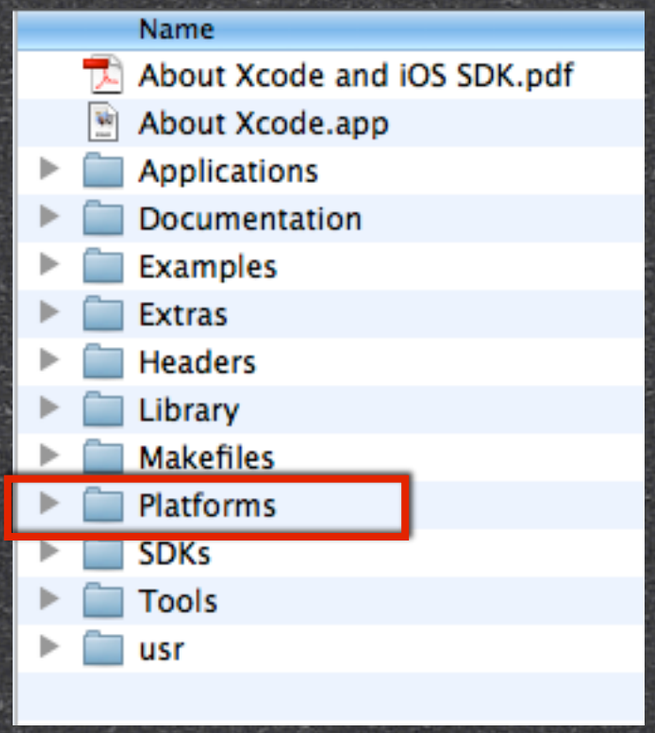


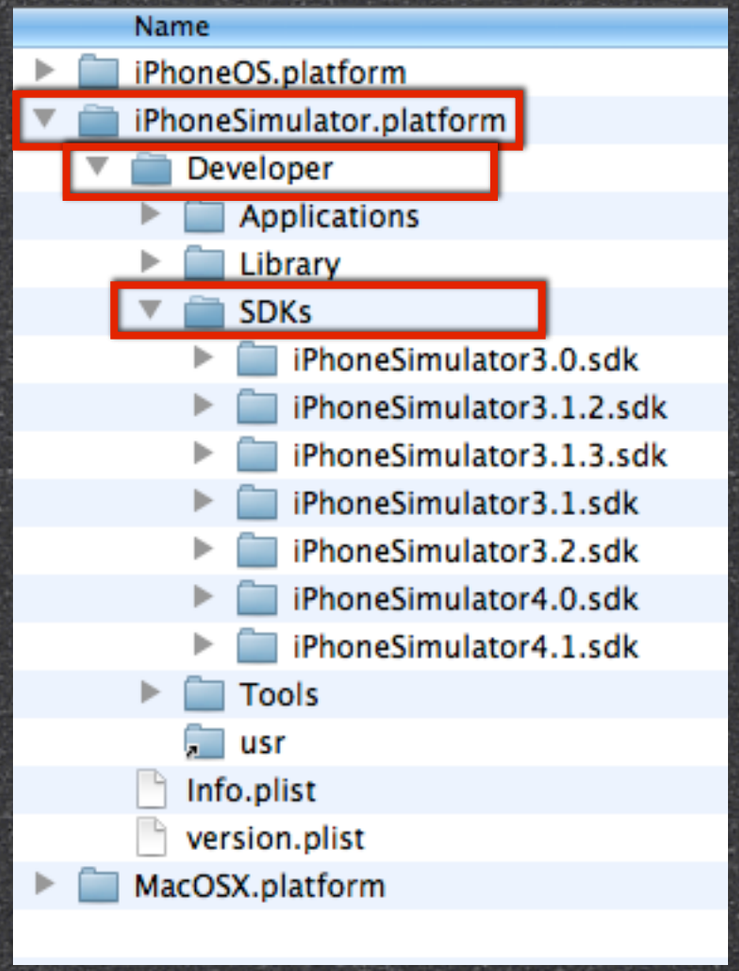
Support < OS4.1

Copy iPhoneSimulatorX.X.X.sdk
from previous iOS SDK version

Macintosh HD > Developer > Platforms >
iPhoneSimulator.platform > Developer > SDKs



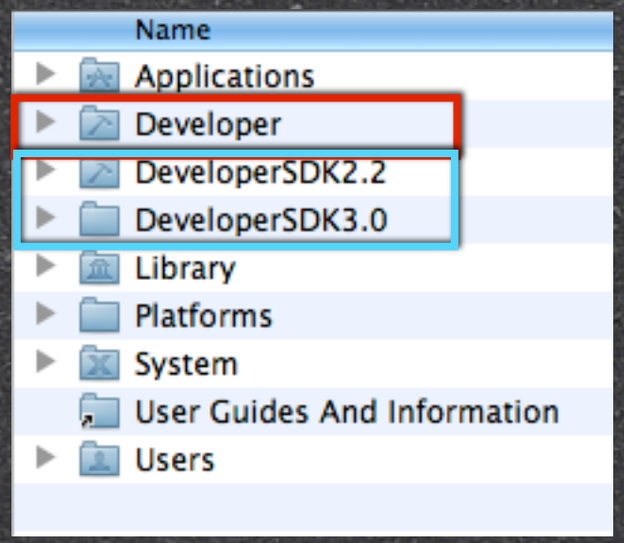




Support < OS4.1

Default Install Directory: Developer

Custom Install Directory: DeveloperSDKX.X



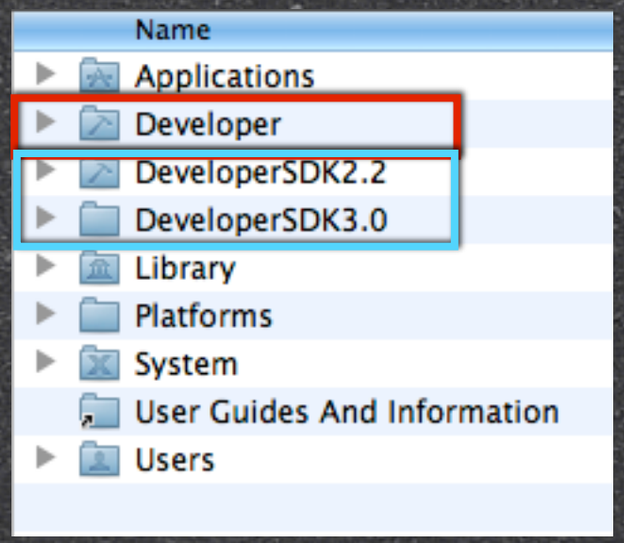
Support < OS4.1

Default Install Directory

One

Custom Install Directory

Many



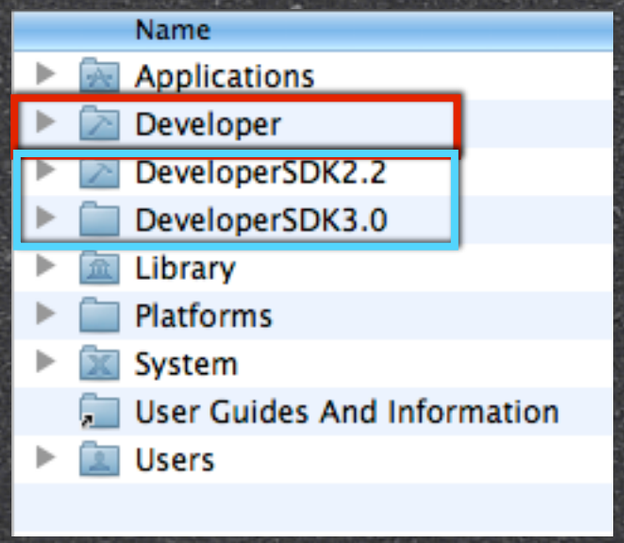
Support < OS4.1

Default Install Directory

Refactoring Required

Custom Install Directory

Deprecated APIs

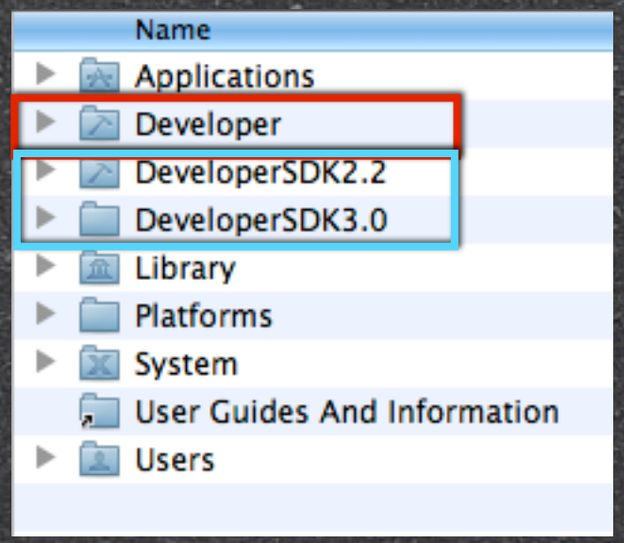


Support < OS4.1

Default Install Directory

Refactoring Required

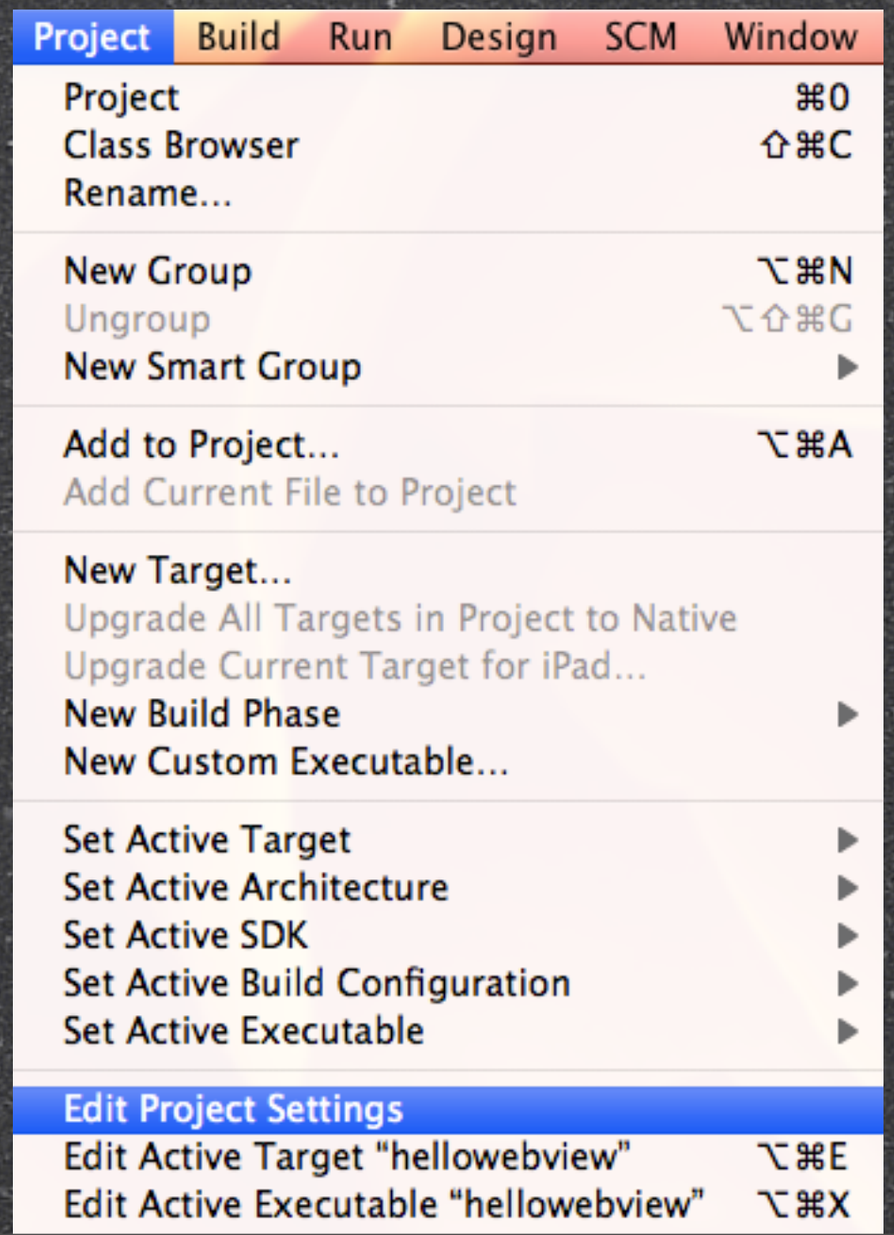
Build Xcode Projects that support older versions



Target Older SDK Version

1. Default compilation settings is to the latest version of SDK

XCode > Project > Edit Project Settings

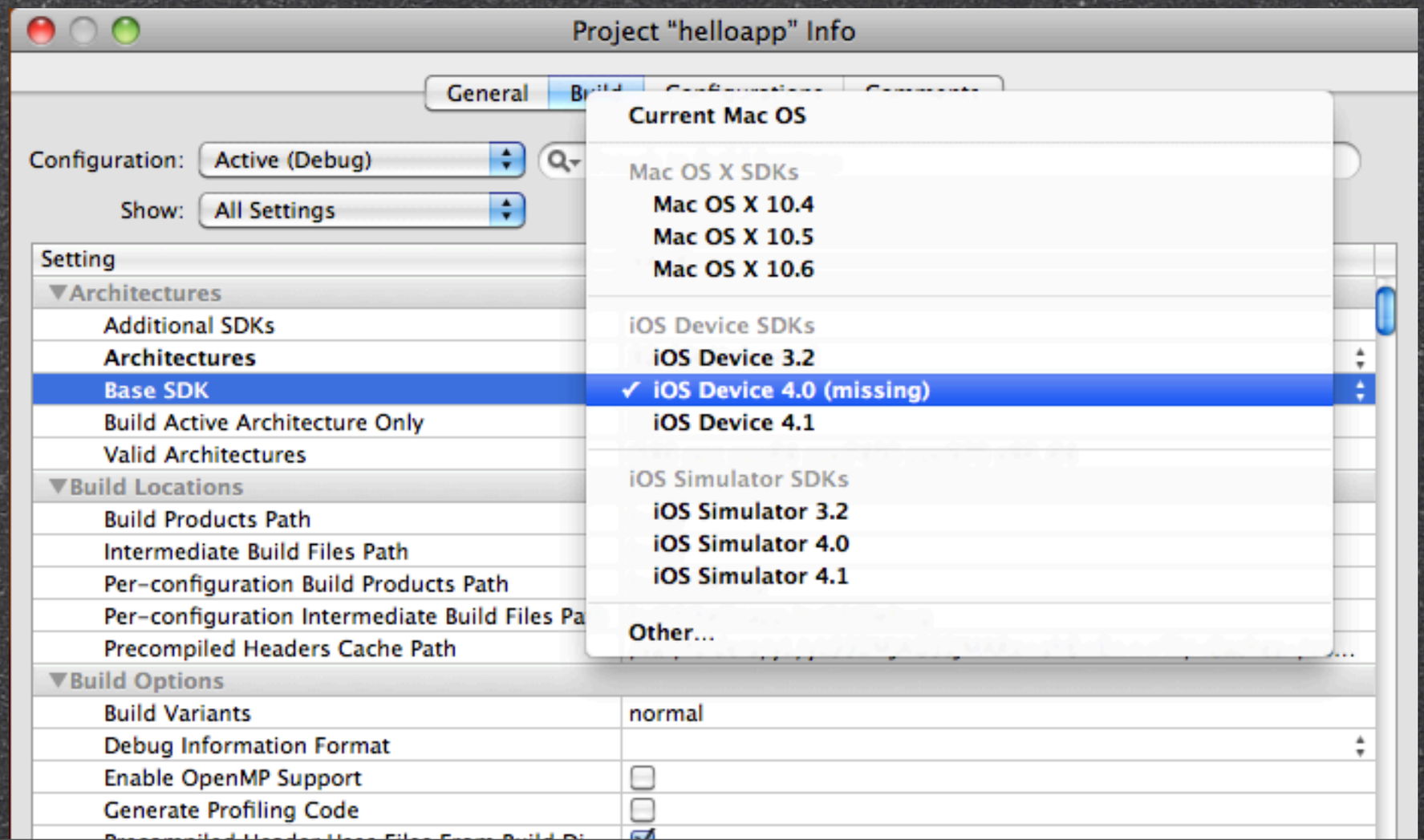


Target Older SDK Version

2

In the Build tab, select the "Base SDK" to target version

Build > Base SDK > iPhone Device X.X.X

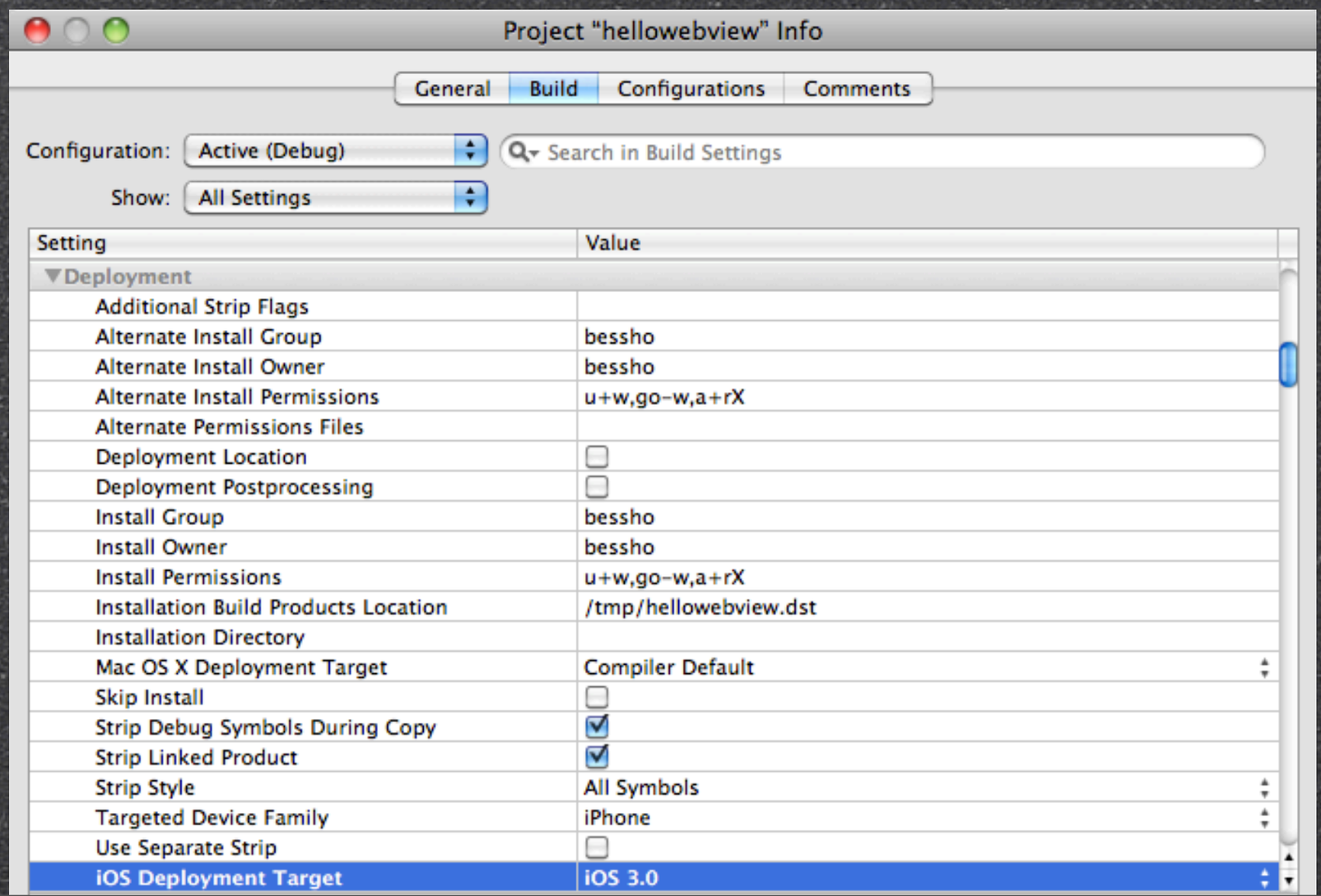


Target Older SDK Version

3

In the Build tab, select the “iPhone OS Deployment Target” to target version

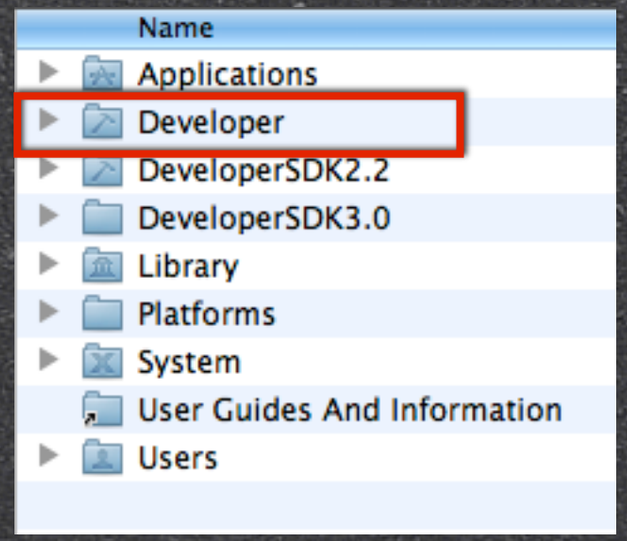
Build > iPhone OS Deployment Target > iPhone Device X.X.X



Target Older SDK Version

4 Set Active SDK to target OS

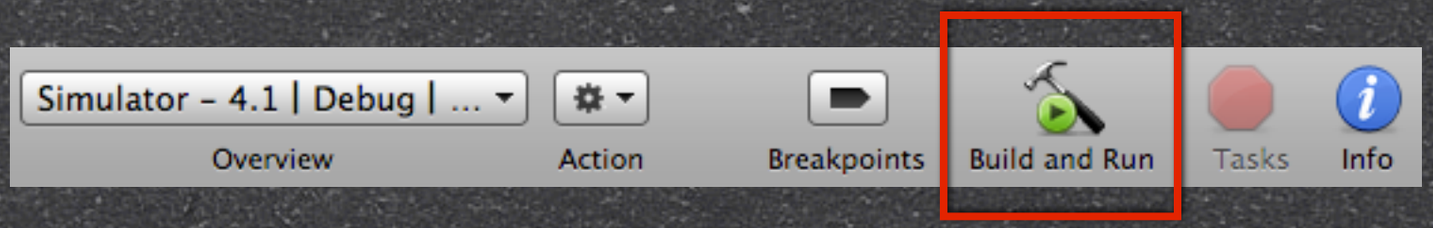
Project > Set Active SDK > iPhone Device X.X.X

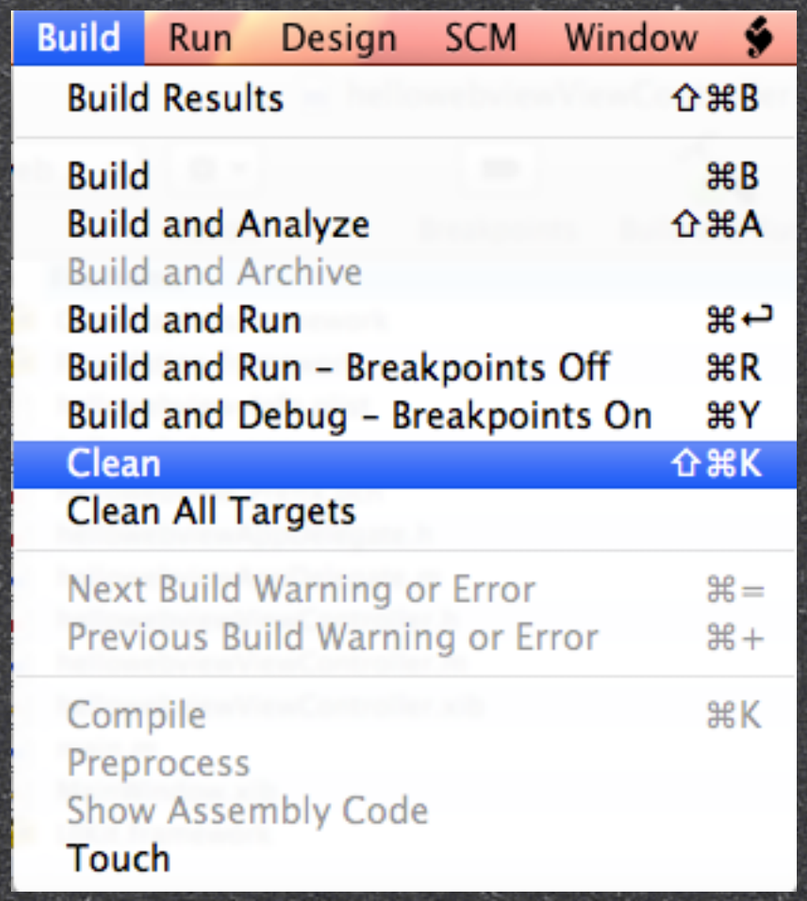


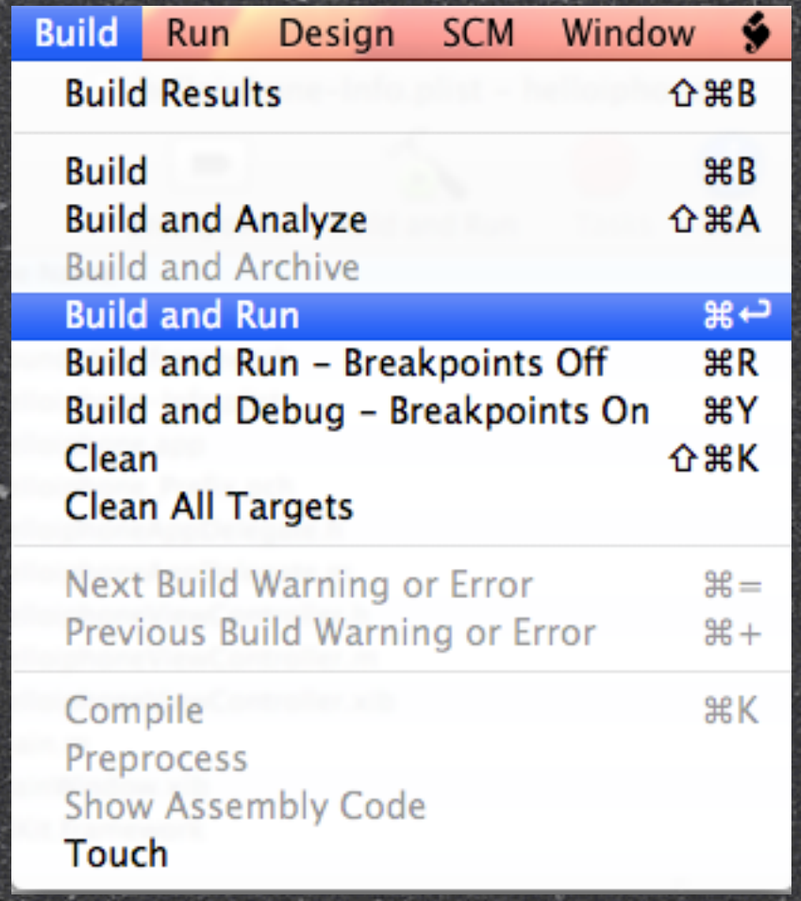
Target Older SDK Version

5

Clean & Re-Build the project







Target Older SDK Version

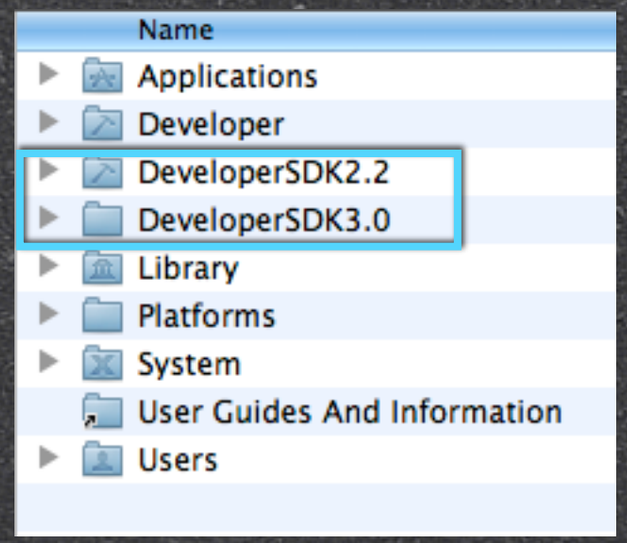
1. Default compilation settings is to the latest version of SDK
2. “Base SDK” to target version
3. “iPhone OS Deployment Target” to target version
4. Set Active SDK to target OS
5. Clean & Re-Build the project

Build & Run Older Xcode

Build & Run Older Xcode Projects

Custom Install Directory

Deprecated APIs



Build & Run Older Xcode

Log into ADC Program

Downloads > Developer Tools

http://connect.apple.com

Custom Install Directory

Deprecated APIs

Developer

Downloads & ADC Program Assets

Welcome, BESS HO | Member Center | Log out

Developer Tools

Warning: Pre-release software is Apple confidential information. Your unauthorized distribution of pre-release software or disclosure of information relating to pre-release software (including the posting of screen shots) may subject you to both civil and criminal liability and result in immediate termination of your ADC Membership.

Software Licensing for UDIF

Mac OS X has the ability to display a multi-lingual software license agreement (SLA) before mounting a disk image. The image will not be mounted unless the user indicates agreement with the license. This document explains how to add license agreements to Mac OS X-native disk images.

Download Name	File Size	Date Posted
SLAs for UDIF 1.0 (Disk Image)	34 KB	26 Aug 2010

Kernel Debug Kit 10.6.4 build 10F569

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- History

Downloads

- Applications
- Audio
- Developer Mailing
- Developer Tools
- Documentation
- FireWire
- Internationalization
- iPhone
- iTunes Producer

Xcode Tools v1.5

The Xcode Tools 1.5 release is a full update of the Xcode development tools suite. It requires Mac OS X v10.3.x and is able to upgrade previous installations of Xcode Tools 1.0.x, 1.1, and 1.2. See the Read Me document for more information.

Download Name	File Size	Date Posted
Xcode Tools 1.5 - CD Image (MacBinary)	372.4 MB	06 Aug 2004
Xcode Tools 1.5 Read Me-Updated (PDF)	52 KB	09 Sep 2004

Xcode Tools v1.2

The Xcode Tools 1.2 release is a full update of the Xcode development tools suite. It requires Mac OS X v10.3.x to install, and can be installed directly over an Xcode Tools 1.0.x and 1.1 installation. See the Read Me document for more information.

Download Name	File Size	Date Posted
Xcode Tools 1.2 CD (Disk Image)	613.10 MB	27 Oct 2004
Xcode Tools 1.2 READ ME (PDF)	69 KB	22 Apr 2004

Xcode Tools v1.0

Xcode Tools version 1.0 include gcc 3.3, Interface Builder 2.3.4, AppleScript Studio, updated documentation, performance tools. NOTE: Requires Mac OS X v 10.3 or later.

Download Name	File Size	Date Posted
Xcode Tools v1.0 CD (Disk Image)	584 MB	27 Oct 2004

Submission & Approval

- Prepare for application submission
- iPhone Provisioning Portal
- Submit an iPhone application
- How to handle rejections
- Increase your acceptance on approval and updates
- 15 min Q&A

Assets & Materials

Everyone?

Submission & Approval

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- How to handle rejections
- Increase your acceptance on approval and updates
- 15 min Q&A

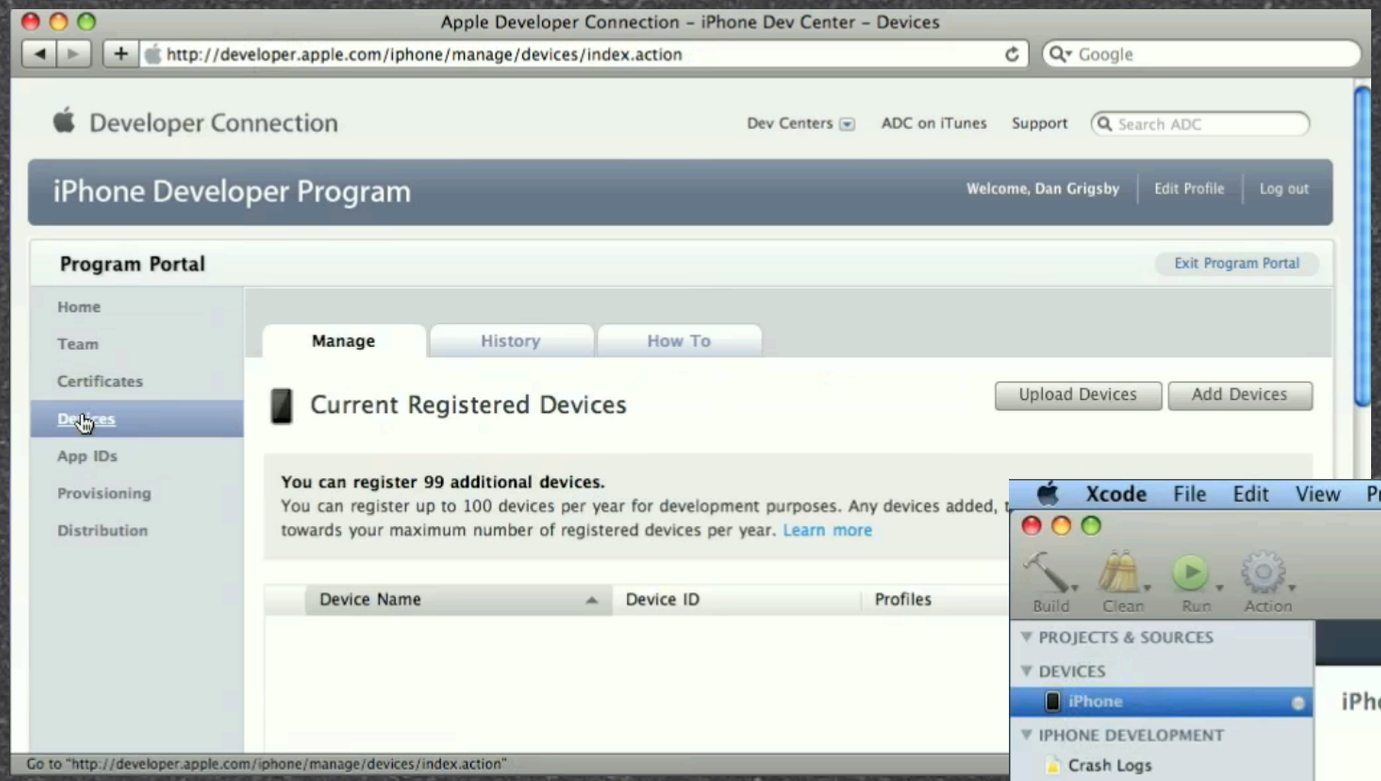
Login

iPhone Provisioning Portal

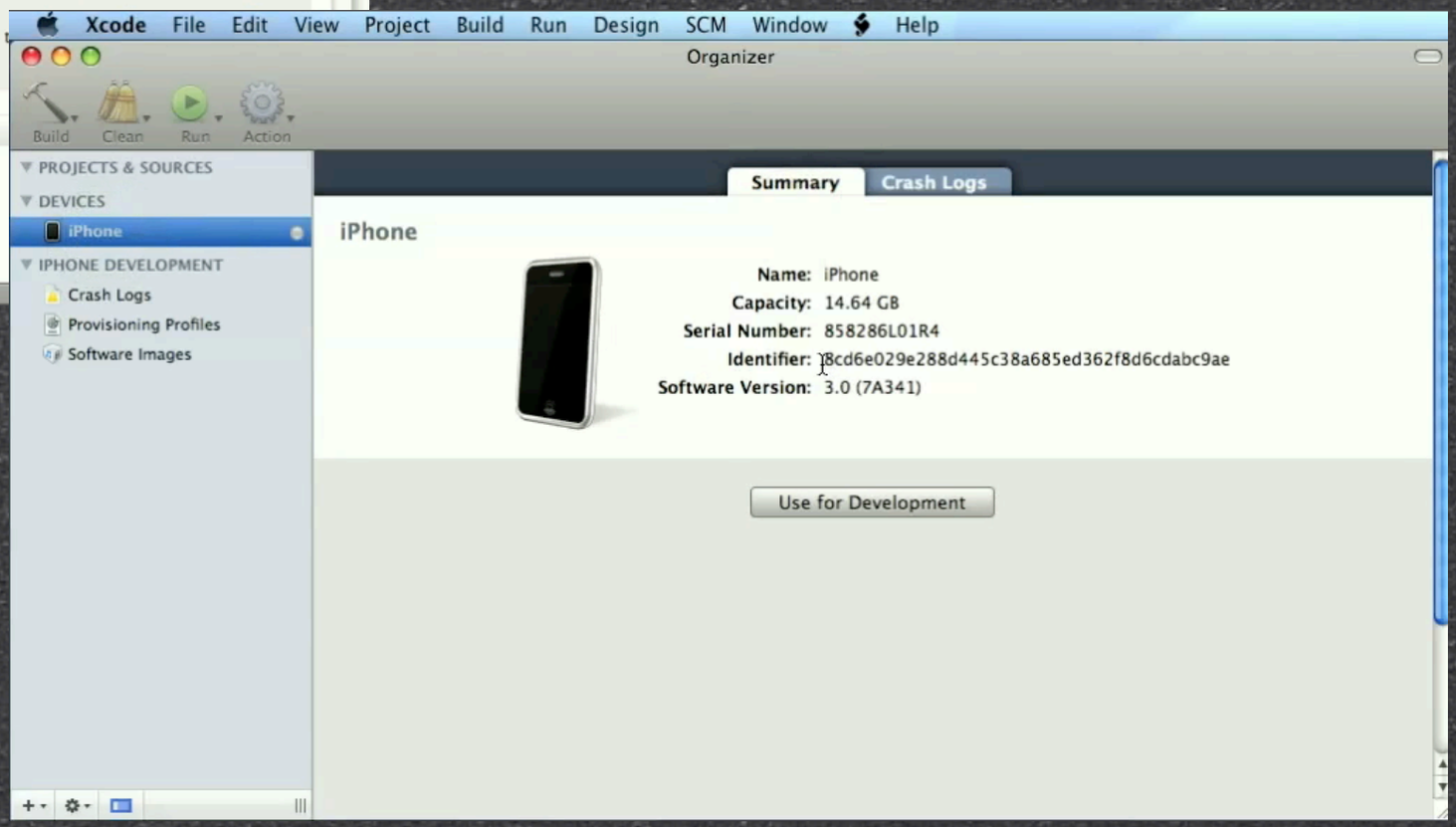
Everyone?

iPhone Provisioning Portal

1. Add Device

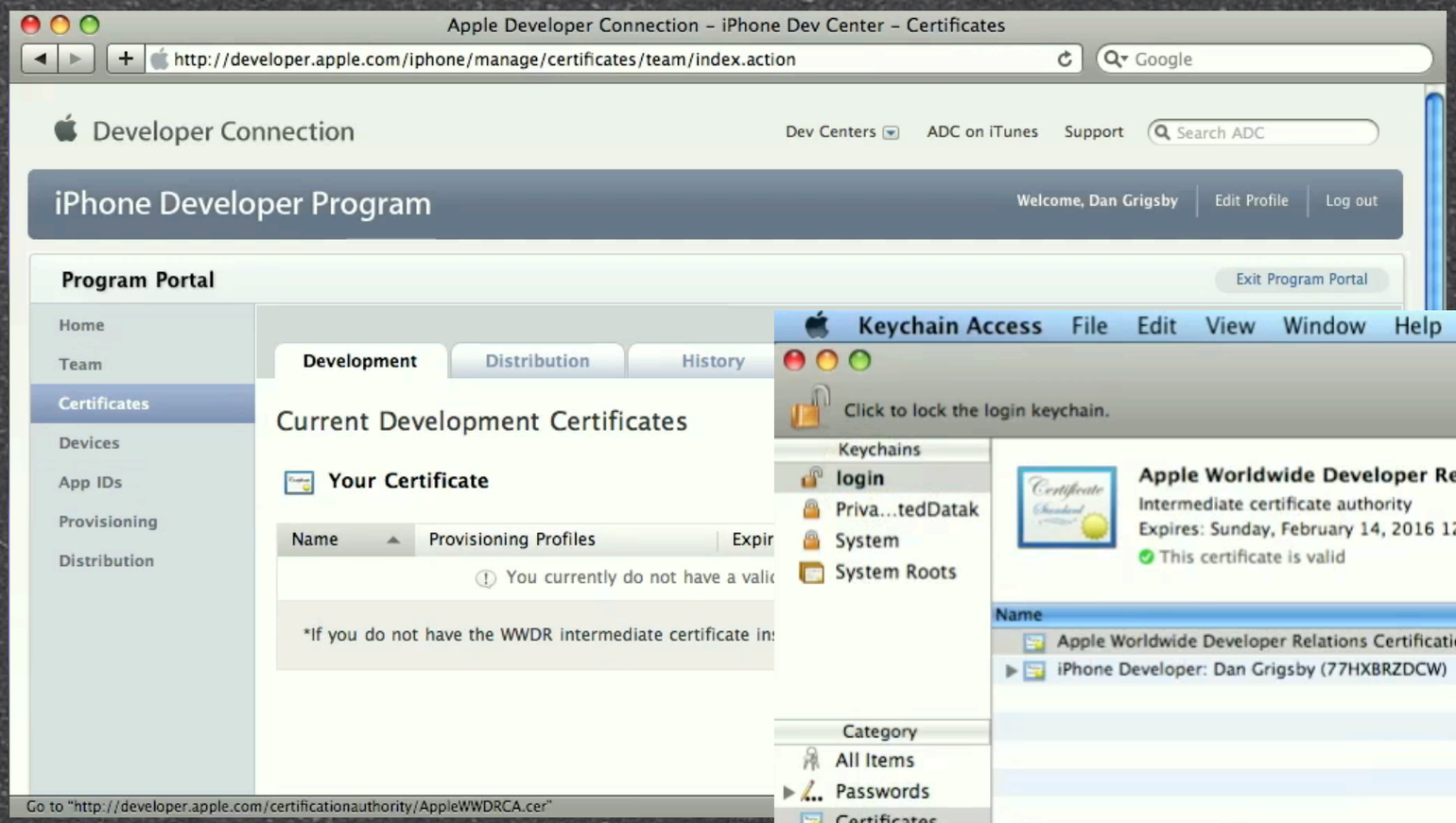


2. Xcode's Organizer

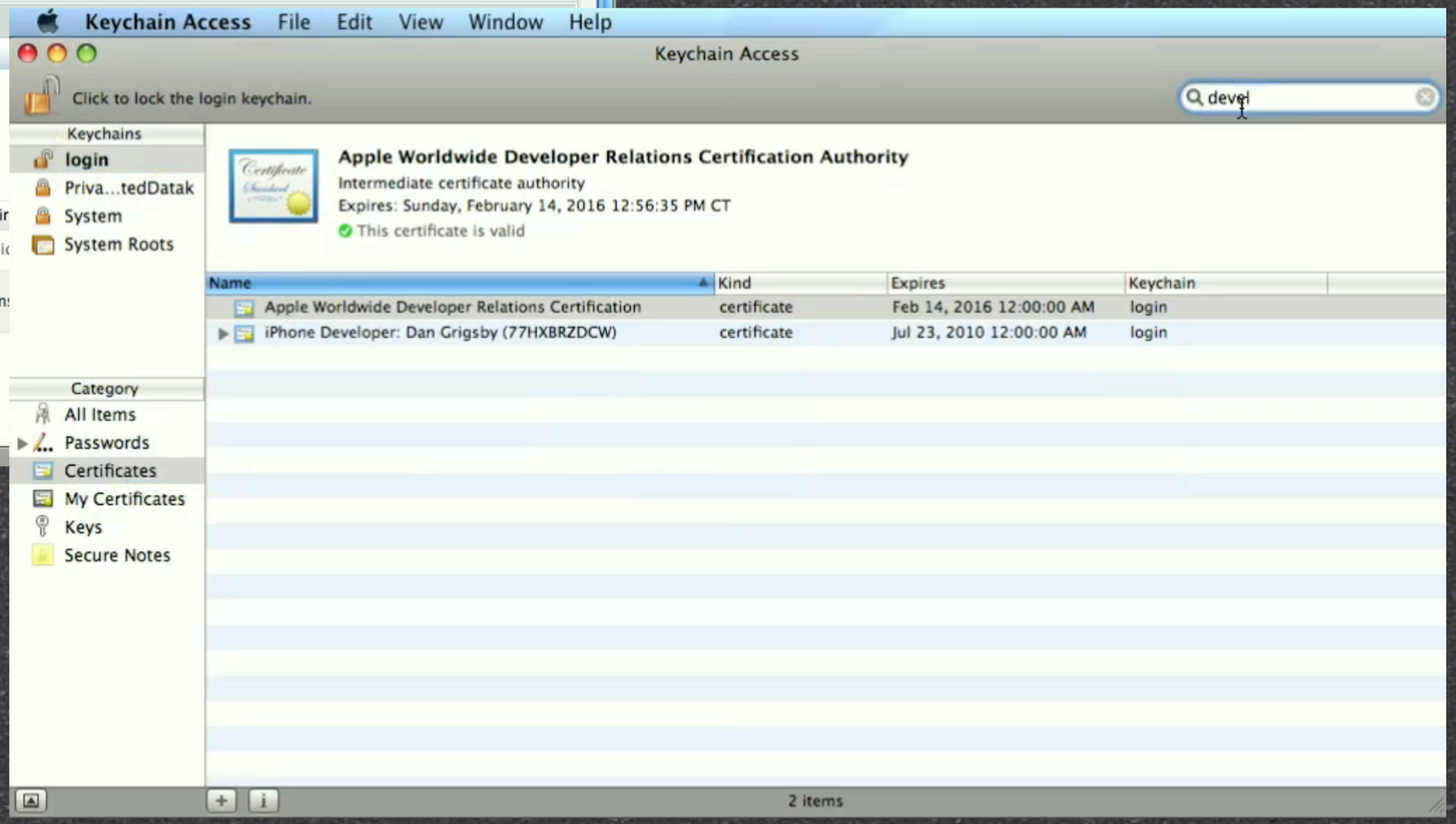


Device Deployment

3. Create Developer Certificate

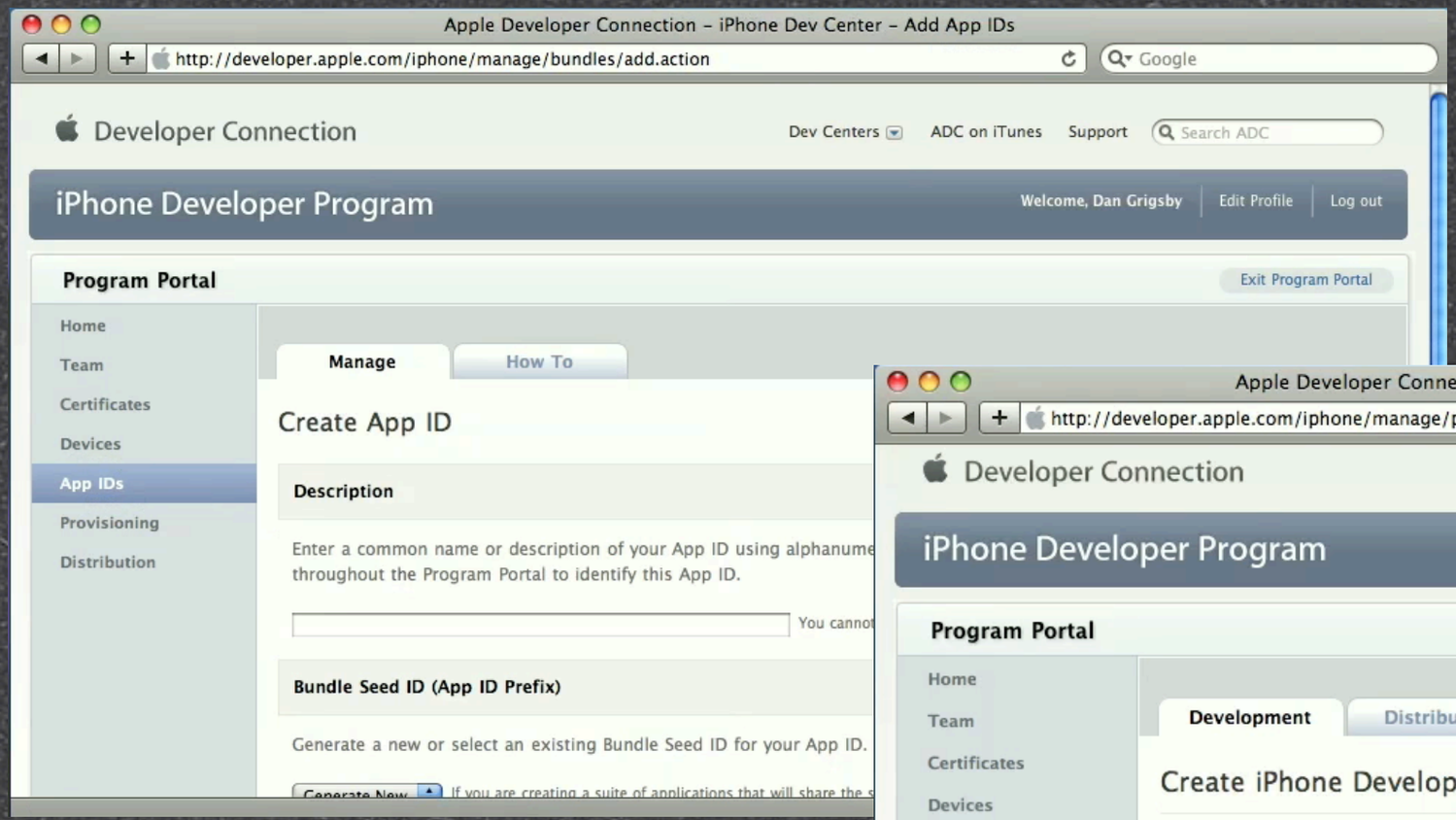


4. Add to Keychain

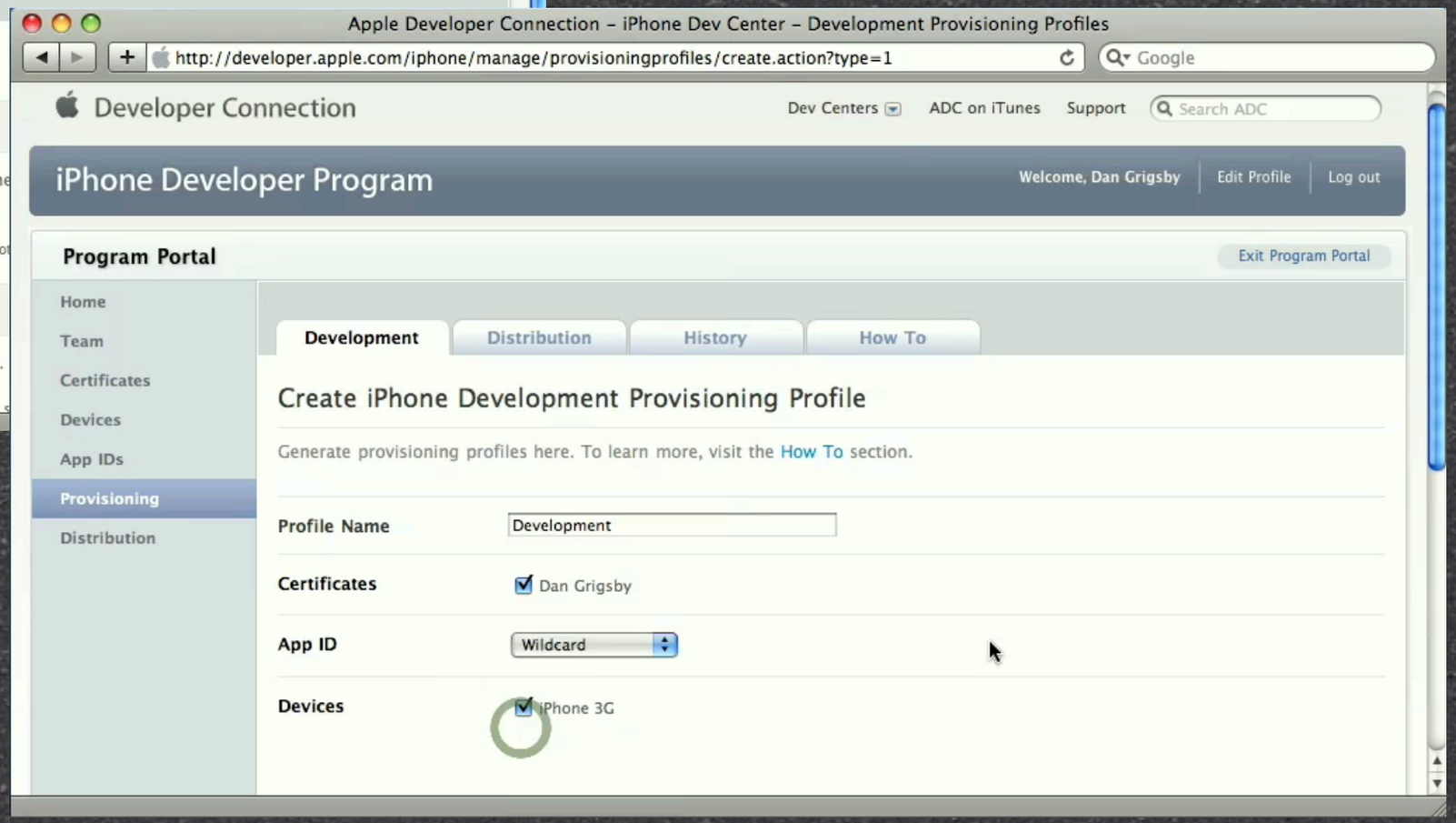


Device Deployment

5. Create Apple ID

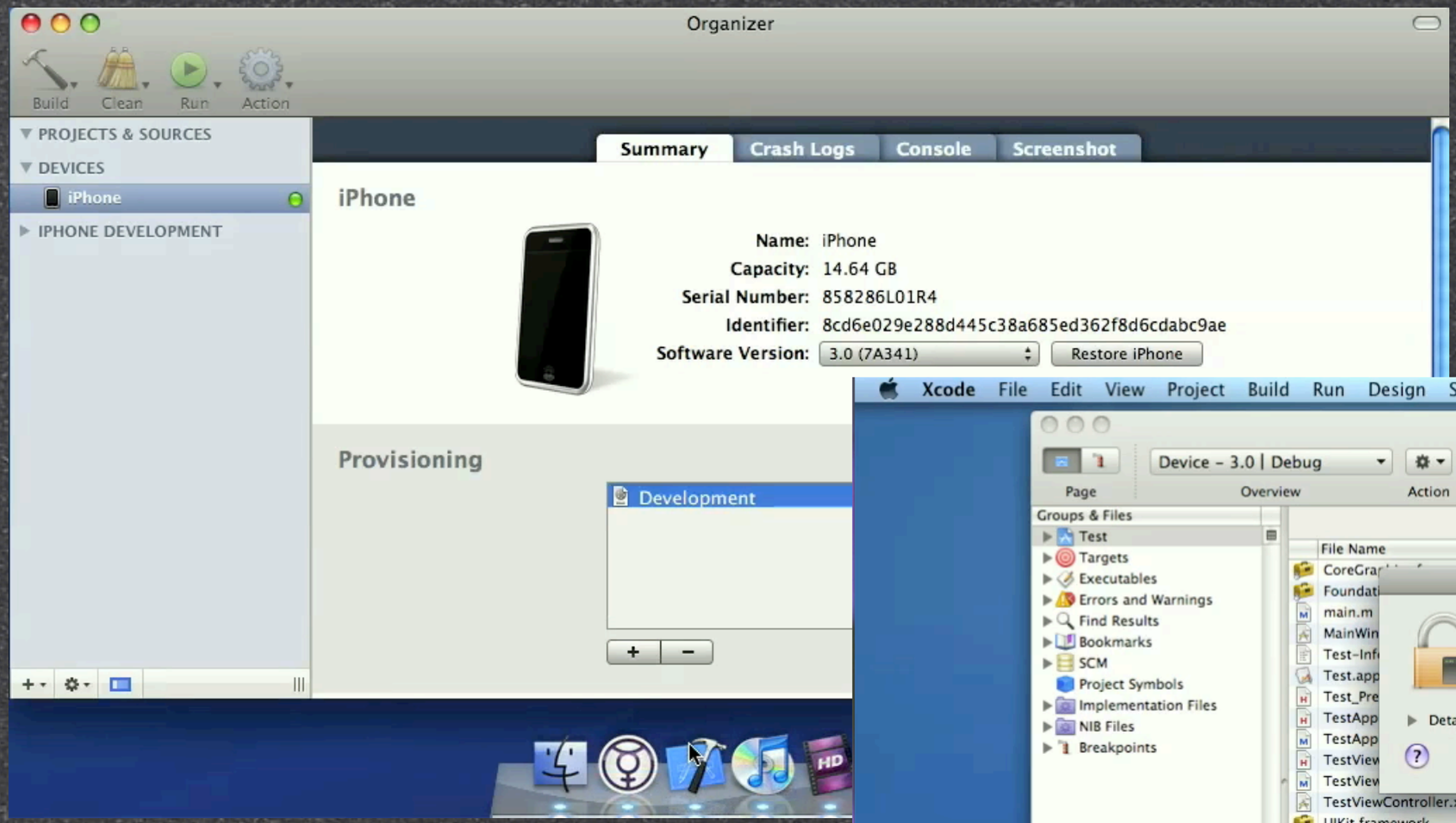


6. Create Provisioning Profile

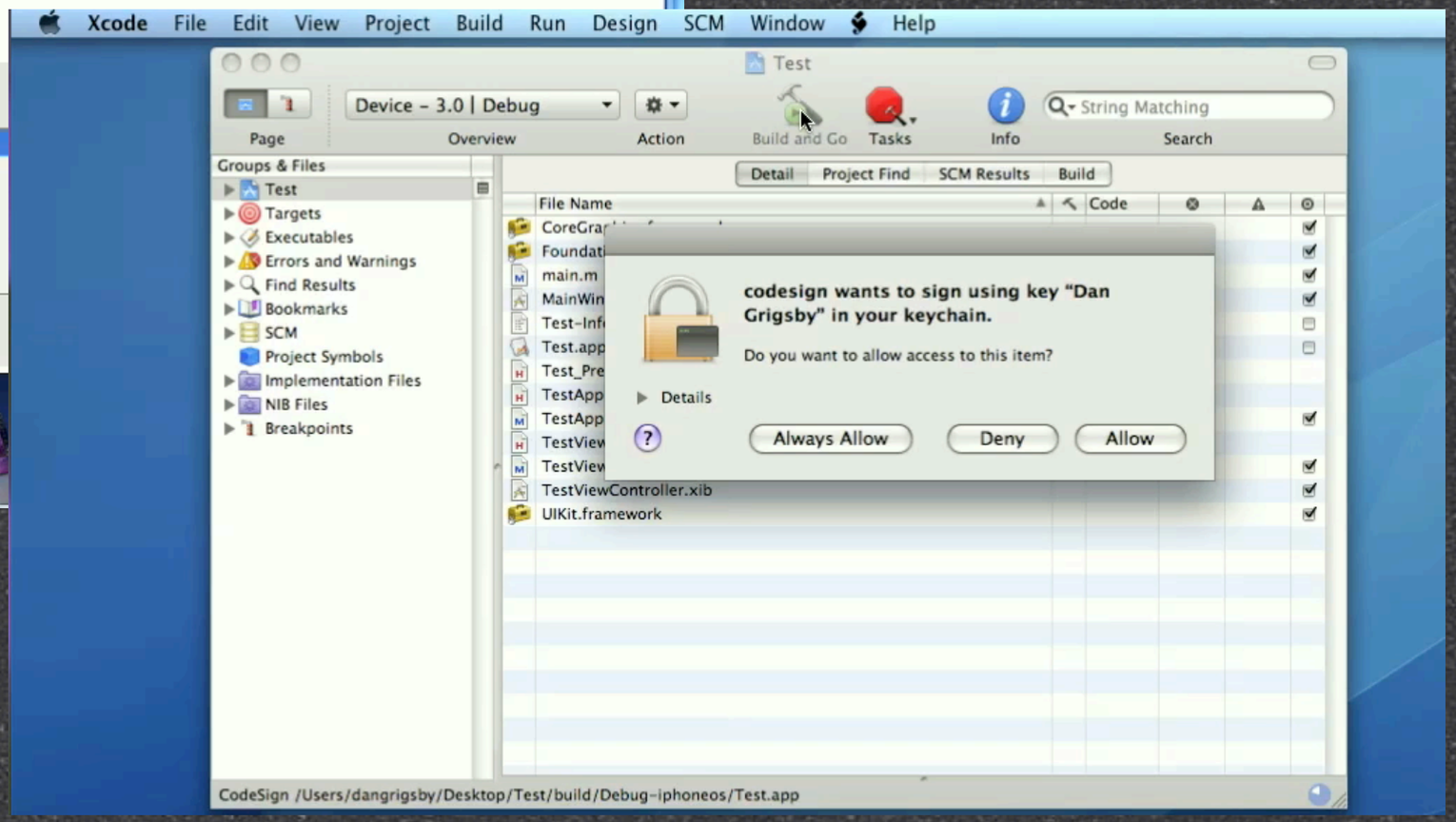


Device Deployment

7. Add Provisioning Profile to Xcode Organizer



8. Test Code



Device Deployment

Login

iTunes Connect

Everyone?

Add New Application

iTunes Connect

Everyone?

Submission & Approval

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Waiting Period

Lucky 1-2 Days

Normal 7-10 Days

Usual 2-3 Weeks

> 1 Month

> 2 Months

> 3 Months

Publish Your 1st App

Inexperience

Lucky 1-2 Days

Normal 7 10 Days

Usual 2-3 Weeks

> 1 Month

> 2 Months

> 3 Months

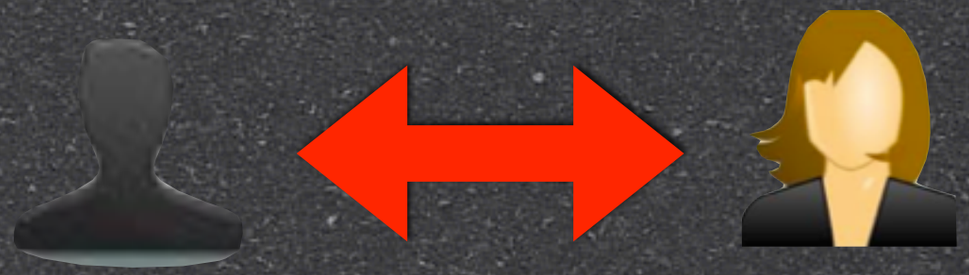
Technical Objections

Non-Technical Objections

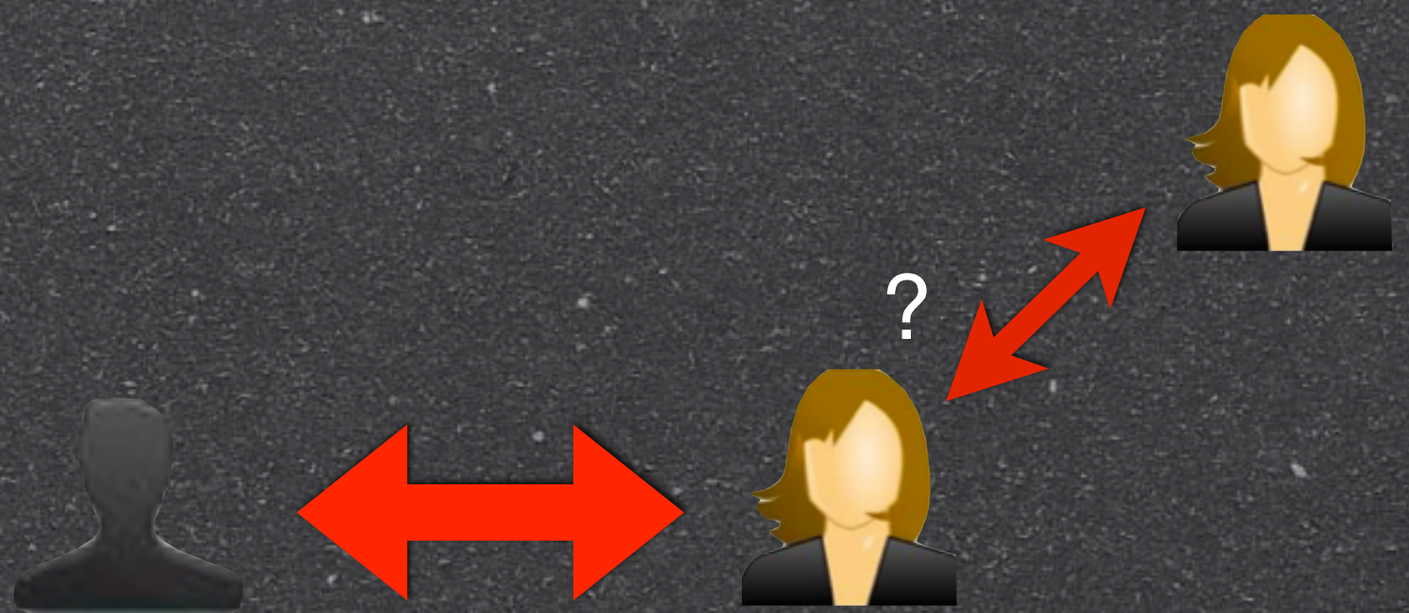
Easy & Fast

Slow

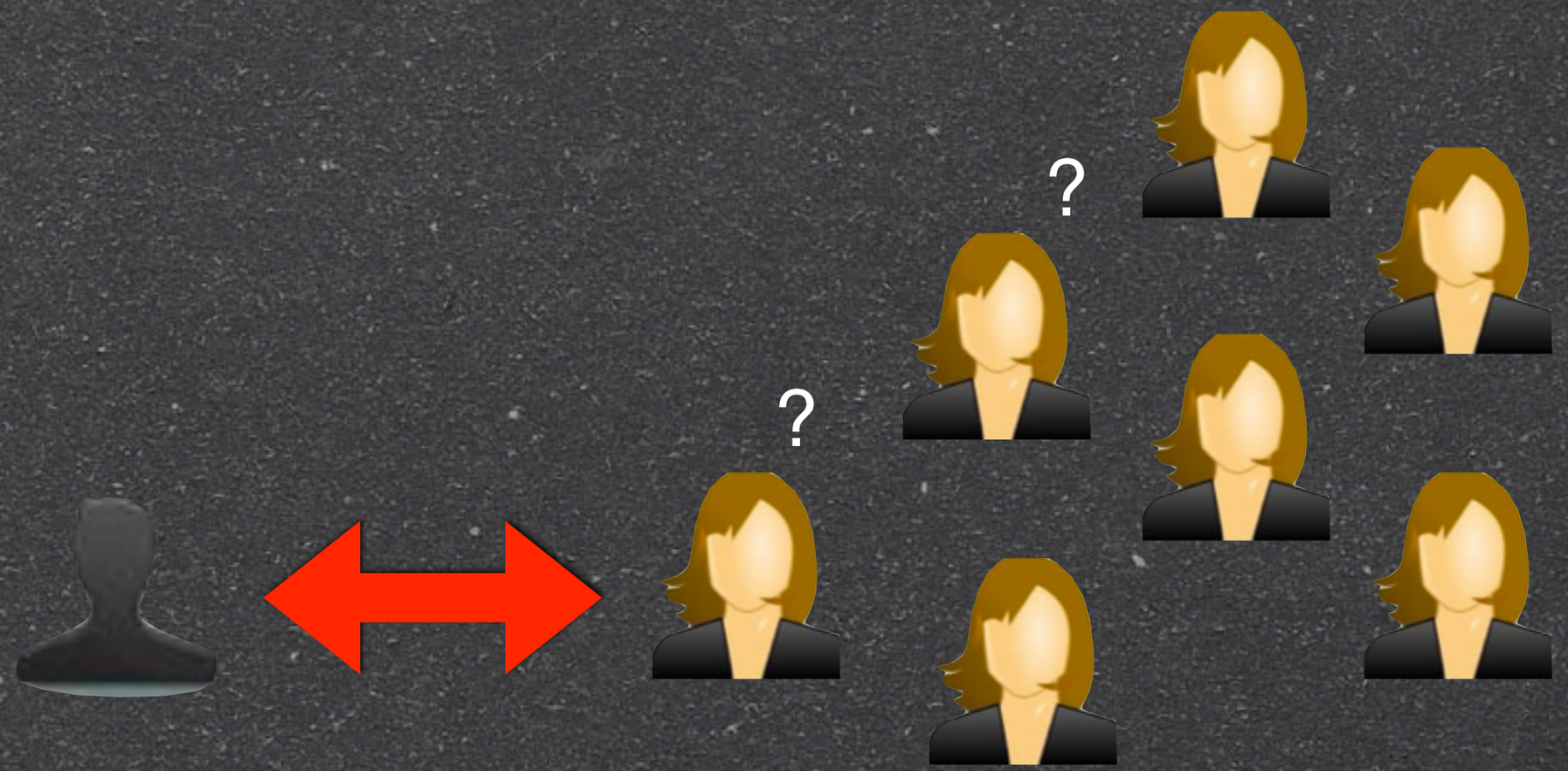
Dating Rules



Dating Rules



Dating Rules



Approval Process

- 95% apps are approved within 14 days of submission
- Apple has 40 Full Time trained reviewers studying 8,500 new apps a week
- 20% “not approved as original submitted” but sent back to developer for tweaks & changes

> Based on filing to the US Federal Communication Commission (FCC) in 2009

Controversial Apps

- “established an App Store executive board that determines procedures and sets policy for the review process, as well as reviews applications that are escalated to the board because they raise new or complex issues.”
- The board meets once a week.

Based on filing to the US Federal Communication Commission (FCC) in 2009

Icon Design

App Ideas

UI & UXP

Business Model

Product Design

Architecture

Release Plan

Technical Objections

Non-Technical Objections

Do Not Copy. Do Your Homework

Technical

Objections

deprecated APIs

undocumented APIs

warnings

Website

errors

Forum

Books

Blog

Non-Technical

Objections

Content

Audio

Video

UXP

Image

Icon

Unwritten Rules

undocumented APIs
deprecated APIs

1 Release

Many Update(s)

Release != Update(s)

Errors & Warnings

No reason you can’t eliminate errors and remove warnings

Guidelines

- **DO NOT** use license materials unless you have written documents to prove your ownership
- **DO NOT** use any Brand or Trademark names
- **DO NOT** use any images too similar to device system icons
- **DO NOT** treat Apple Review Team as your QA

Debug, Test & Audit

- Test your app in both Simulator & Device
- Test your app in both iPhone & iPod Touch

50% users are on iTouch

Bible Standards

- Cocoa Fundamentals Guide
- iOS Application Programming Guide
- iPhone Human Interface Guidelines
- iPad Human Interface Guidelines
- iOS Development Guide

Submission & Approval

- Prepare for application submission
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- How to handle rejections
- Increase your acceptance on approval and updates
- 15 min Q&A

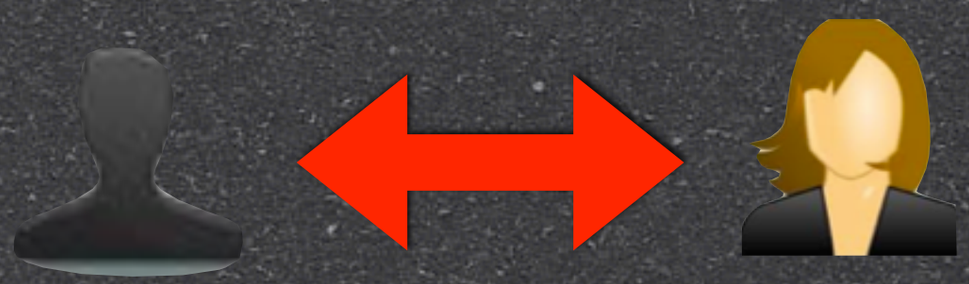
Increase Your Acceptance

- Good Manner
- Positive Attitude
- Response promptly
- Be Prepare & Presentable
- Take correctible actions
- Build strong reputation
- Be flexible to adjust any plans

Increase Your Acceptance

- Find & consult with your Master Yoda
- Sometimes their Domain Expertise will save your life
- Just can’t fight the darkness alone by yourself

Submission Approved



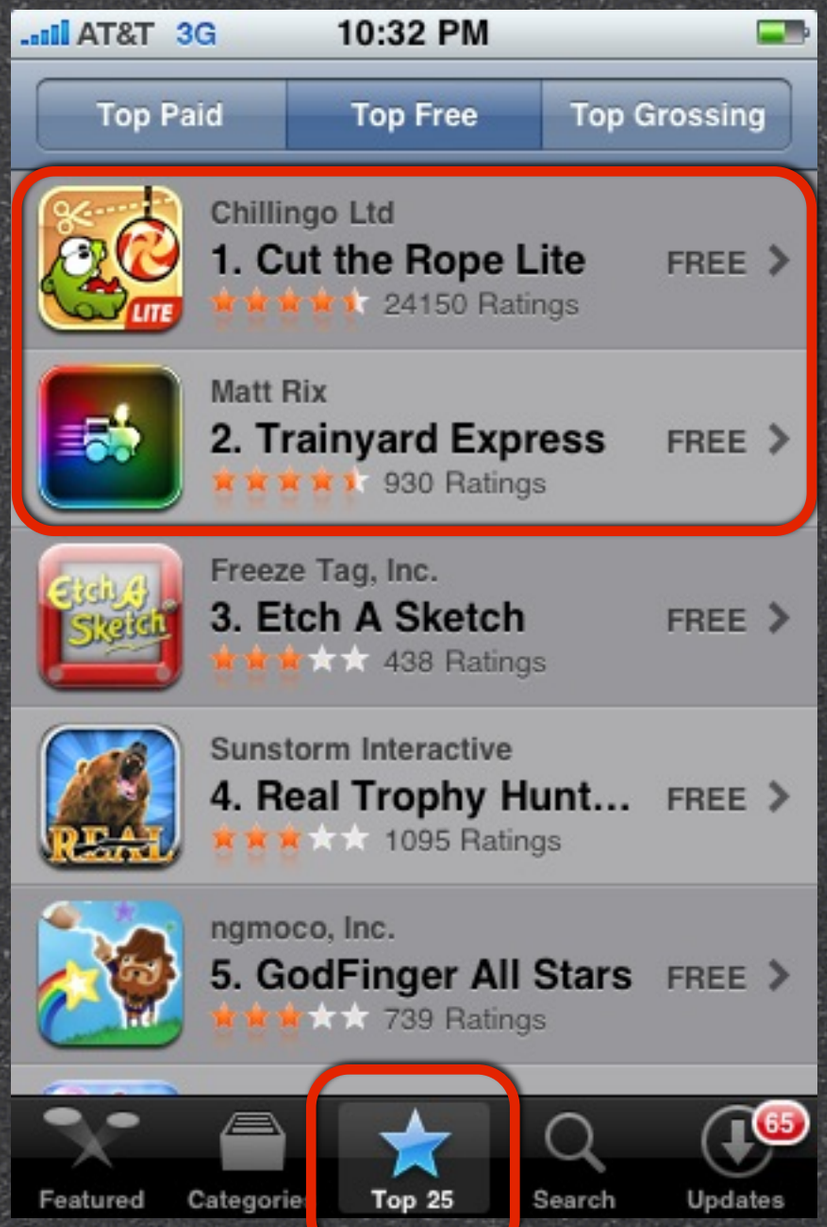
Release Date

⚠ Release != Update(s)

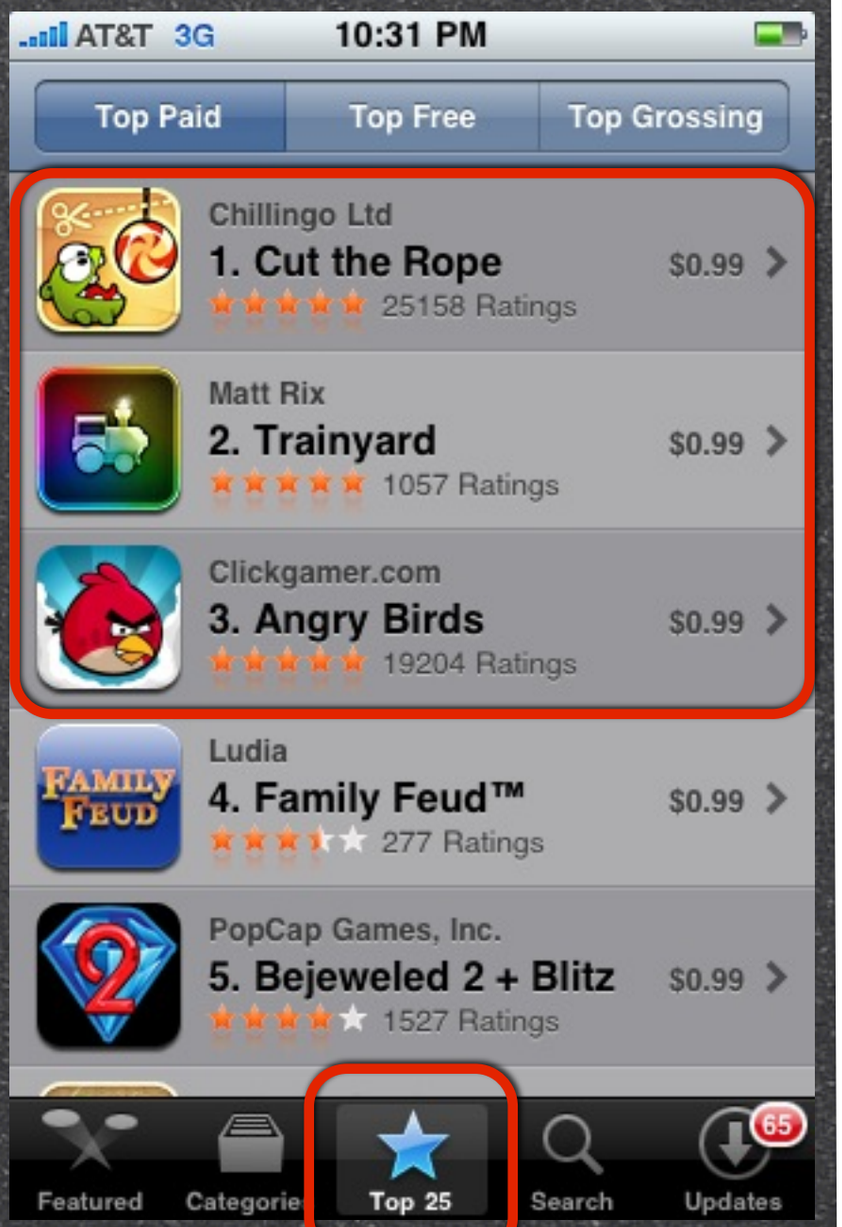
Paid

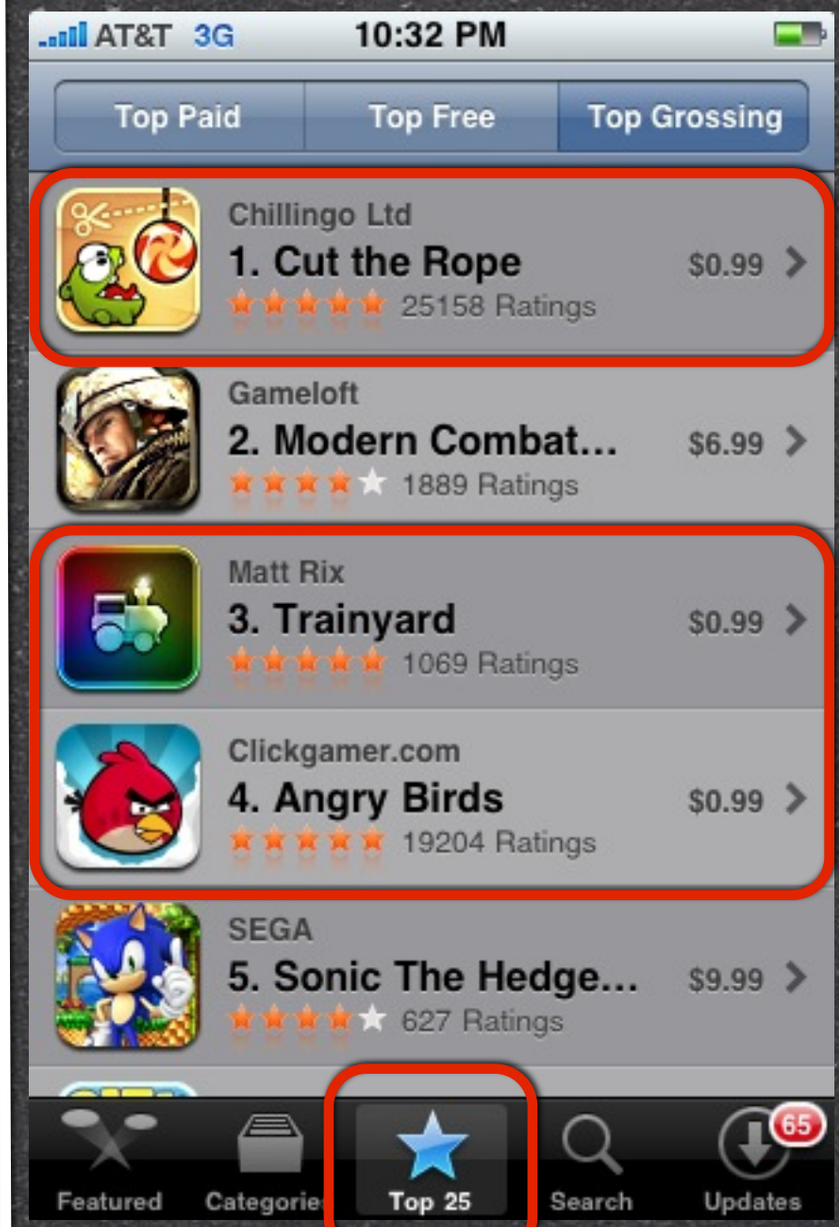
AT&T 3G
10:31 PM
Top Paid
Top Free
Top Grossing
Chillingo Ltd
1. Cut the Rope
$0.99
25158 Ratings
Matt Rix
2. Trainyard
$0.99
1057 Ratings
Clickgamer.com
3. Angry Birds
$0.99
19204 Ratings
Ludia
4. Family Feud™
$0.99
277 Ratings
PopCap Games, Inc.
5. Bejeweled 2 + Blitz
$0.99
1527 Ratings
Featured
Categories
Top 25
Search
Updates
65

Free


AT&T 3G
10:32 PM
Top Paid
Top Free
Top Grossing
Chillingo Ltd
1. Cut the Rope Lite
FREE
24150 Ratings
Matt Rix
2. Trainyard Express
FREE
930 Ratings
Freeze Tag, Inc.
3. Etch A Sketch
FREE
438 Ratings
Sunstorm Interactive
4. Real Trophy Hunt...
FREE
1095 Ratings
ngmoco, Inc.
5. GodFinger All Stars
FREE
739 Ratings
Featured
Categories
Top 25
Search
Updates
65

Paid Free Gross





Paid

Top 10

Top 25

Top 50

Top 100

Free

Top 10

Top 25

Top 50

Top 100

New

Hot

Genius

Category

1. Games
2. Entertainment
3. Utilities
4. Social Networking
5. Music
6. Productivity
7. Lifestyle
8. Reference
9. Travel
10. Sports
11. Navigation
12. Healthcare & Fitness
13. News
14. Photography
15. Finance
16. Business
17. Education
18. Weather
19. Books
20. Medical

New Rules

N = 1

1 Release

N >= 1

Many Update(s)

Release != Update(s)

Is Freemium Good Idea?

Law of Total Probability

FREE 1 Release

\+ Many Update(s)

PREMIUM 1 Release

Double P(E)

Dual Channels

Release != Update(s)

Return to Instructor

USB Keys

15 Min Q&A

END of Class

Thank you

Ask questions in Twitter, Quora or Linkedin