

Sharing Code Between iOS and OS X

Lessons learned from iWork

Session 233

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iWork Software Engineer

Table of Contents

What code can we share?

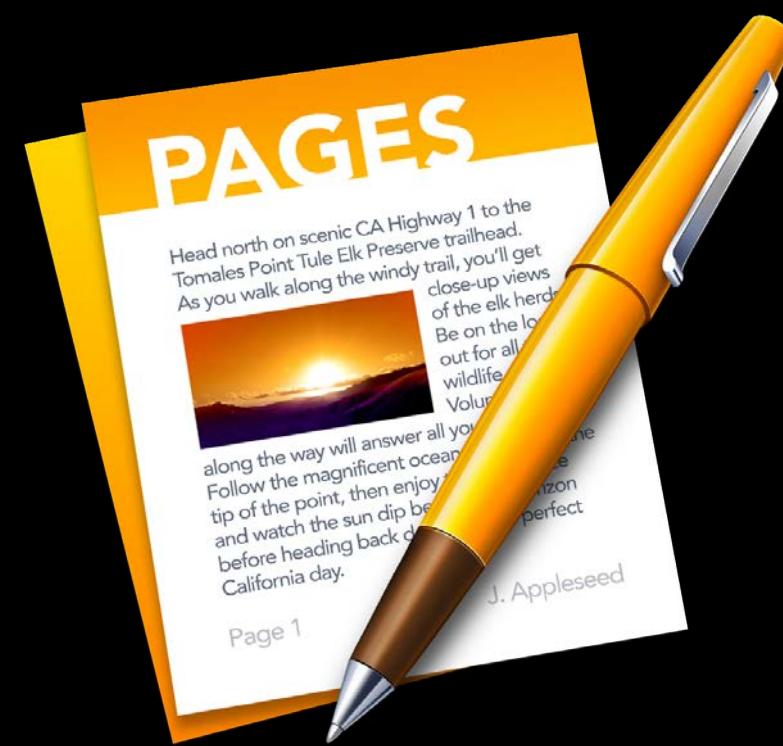
Using Frameworks to share more code

Shared rendering

File formats

Cross-platform projects in Xcode





1,000,000+

Lines of code in iWork

10,000+

Unique classes in iWork

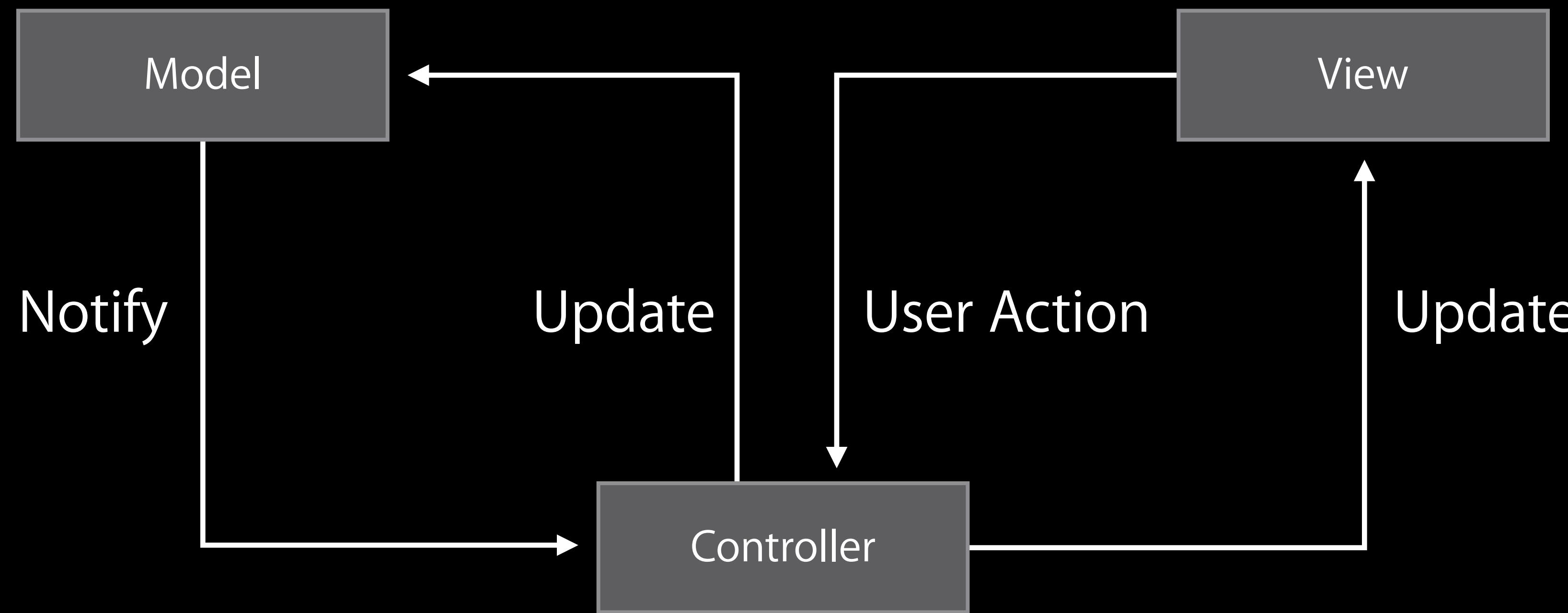
>75%

Classes shared in iWork





Model View Controller



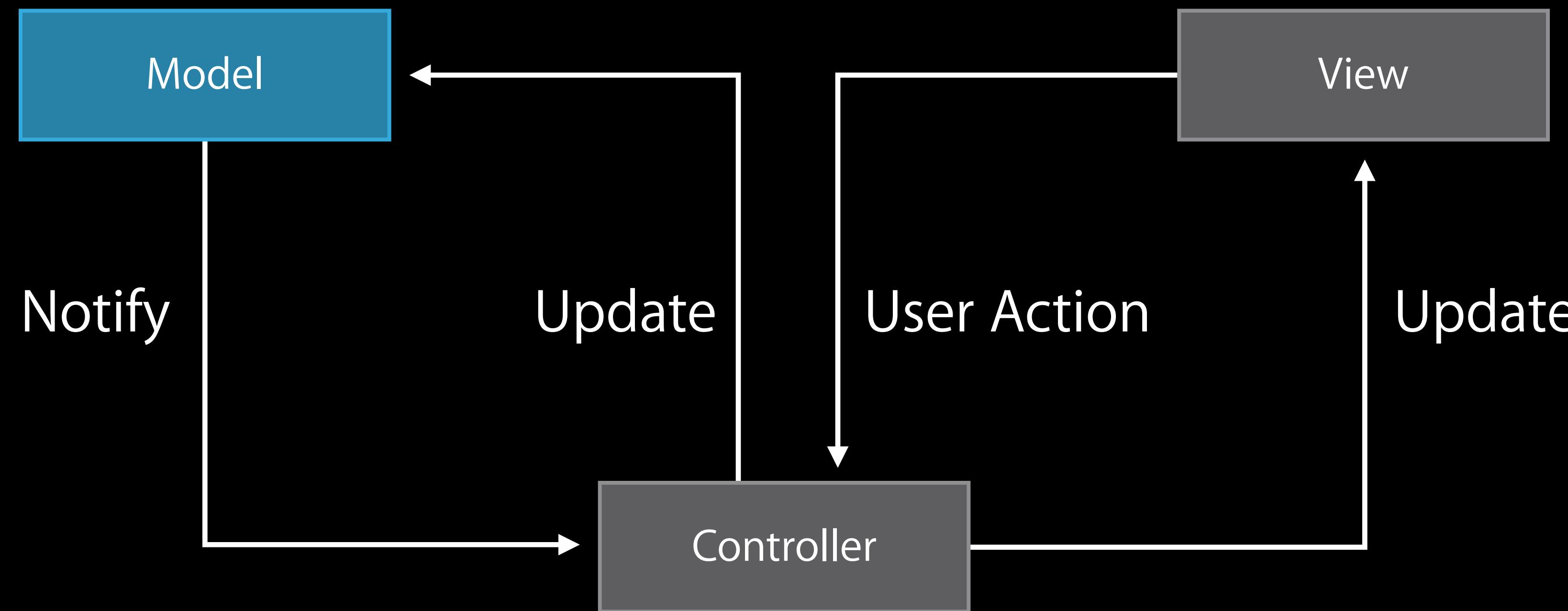
Model

Can we share it?

Documents should open the same way everywhere

No conversion, no data loss

Model View Controller



View

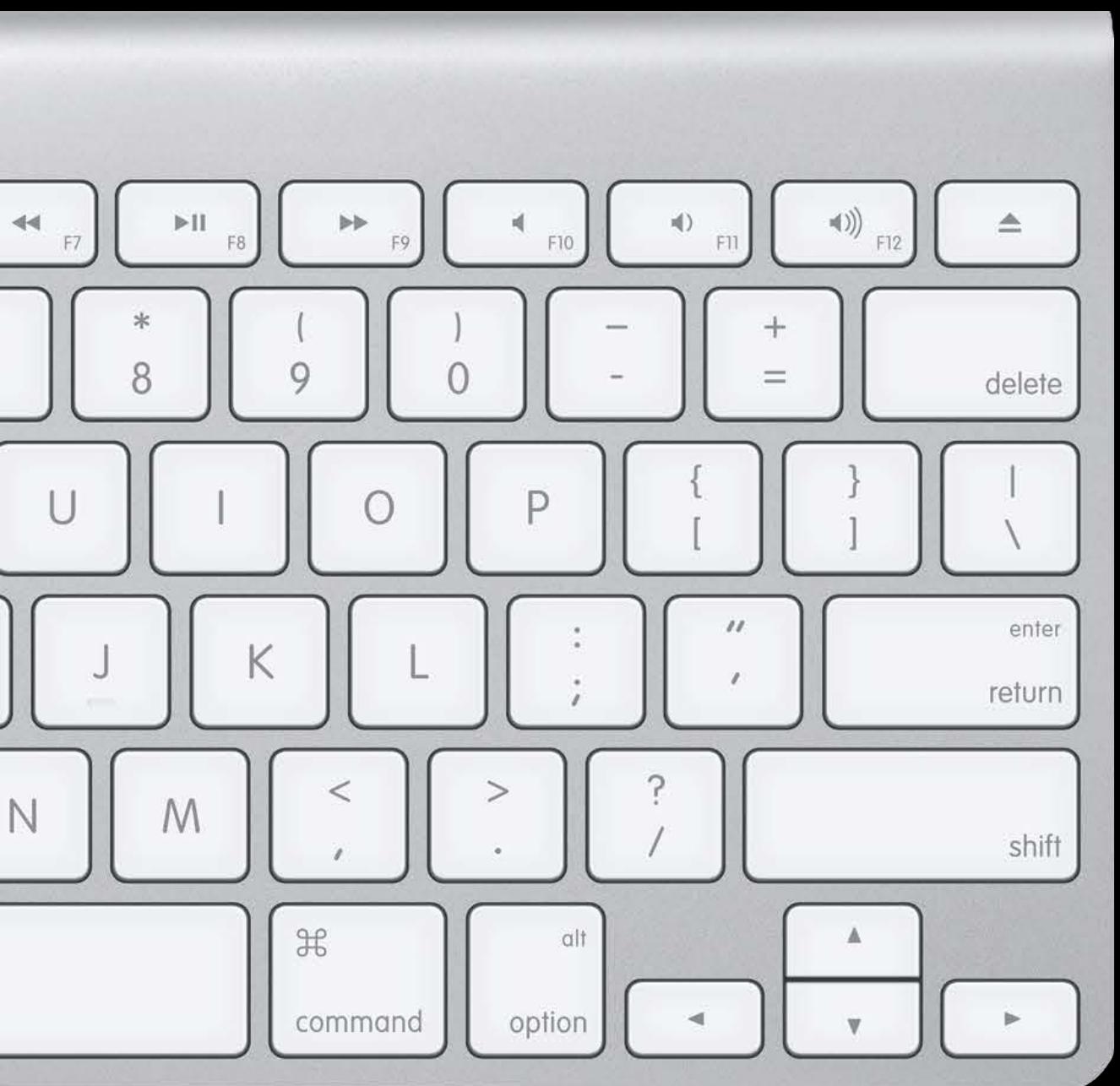
Can we share it?

Want the documents to look the same too!

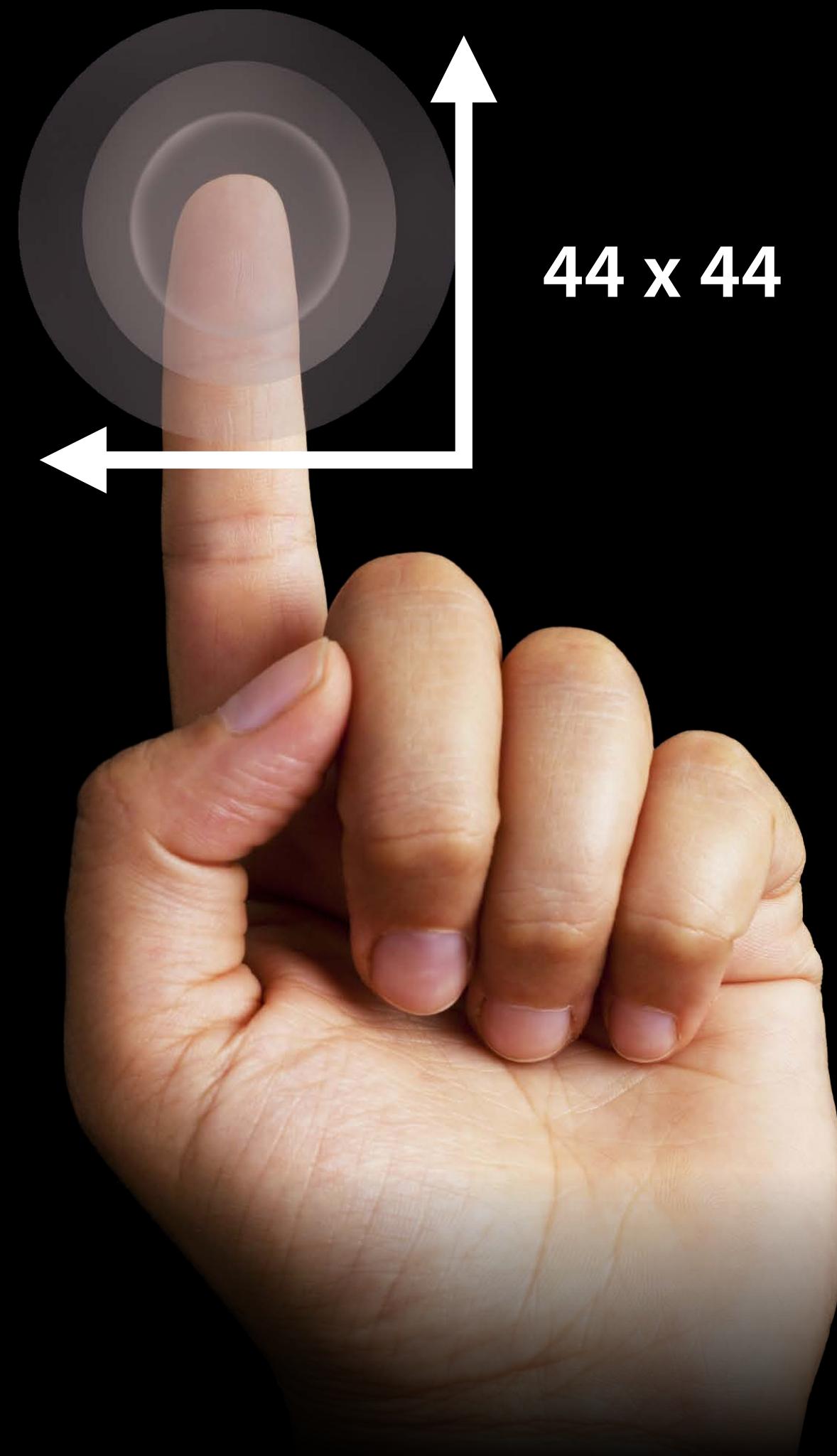
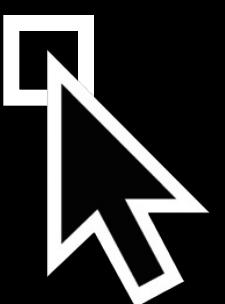
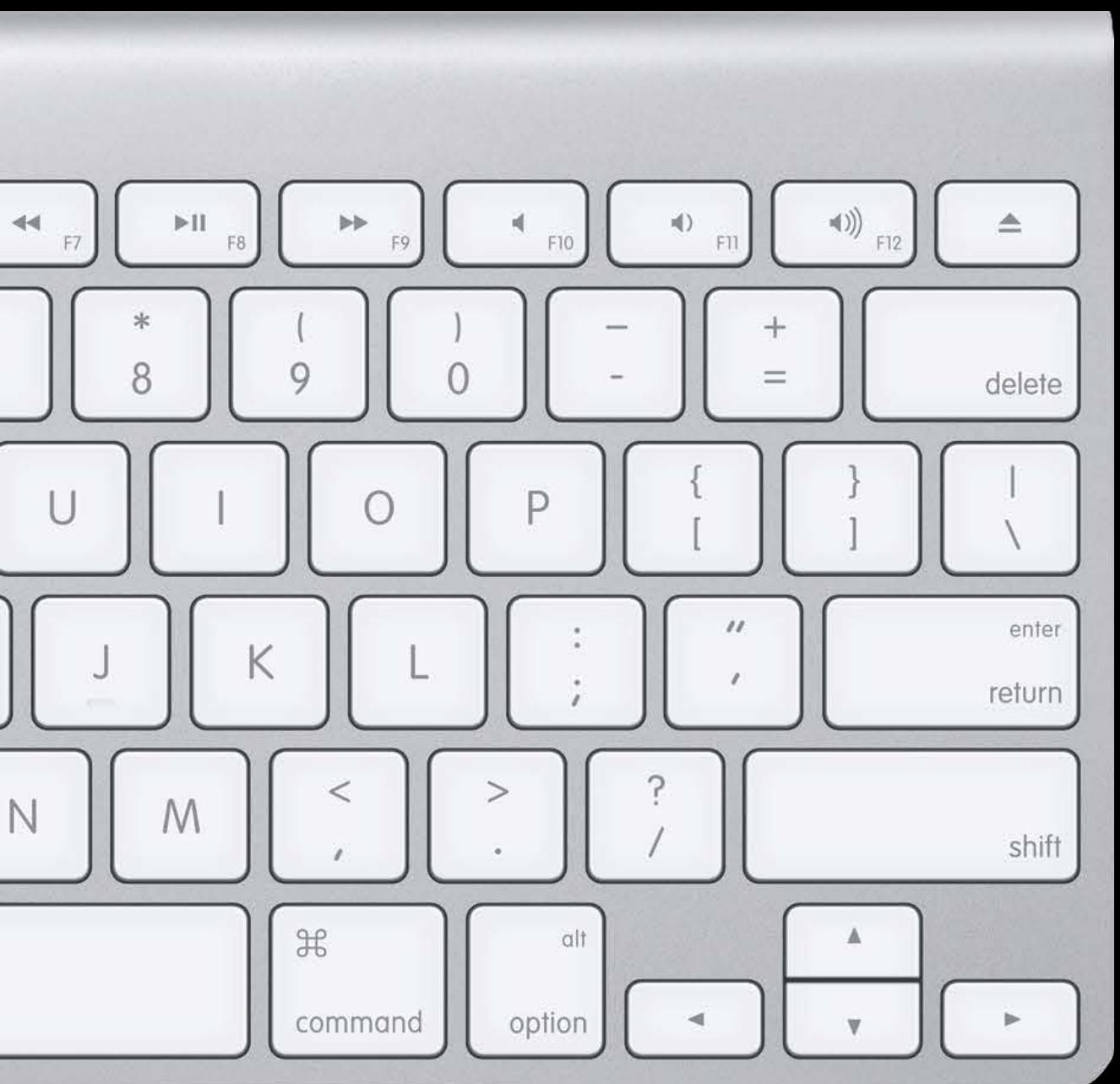
Can we share our view code?

Interaction

Interaction



Interaction



44 x 44

Display Size



iOS



OS X

Multiple Windows

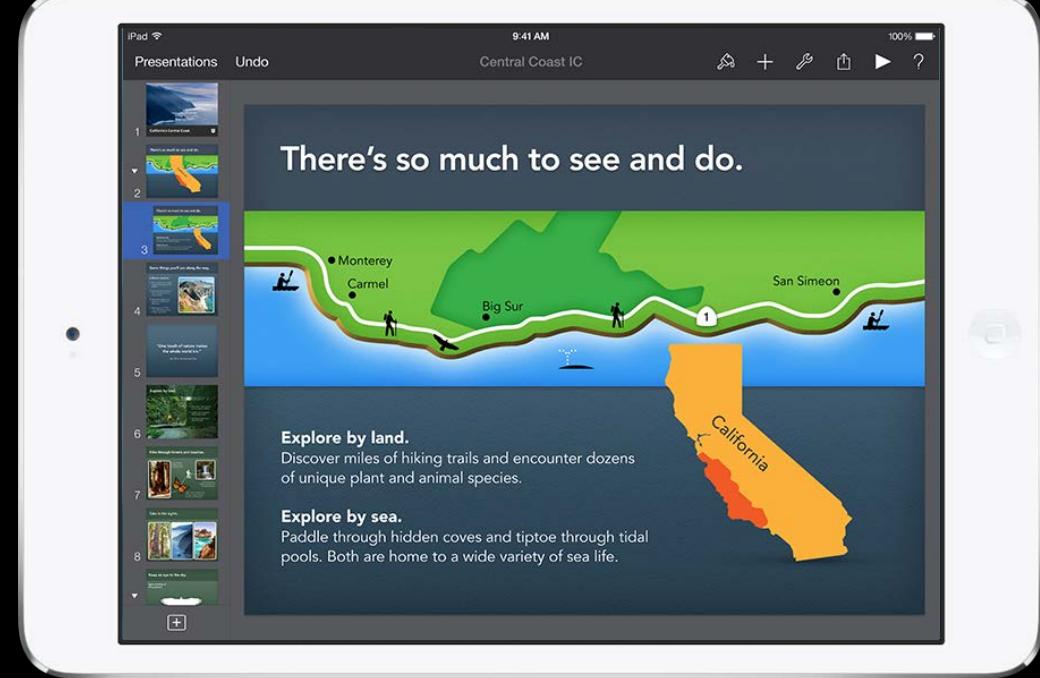


iOS

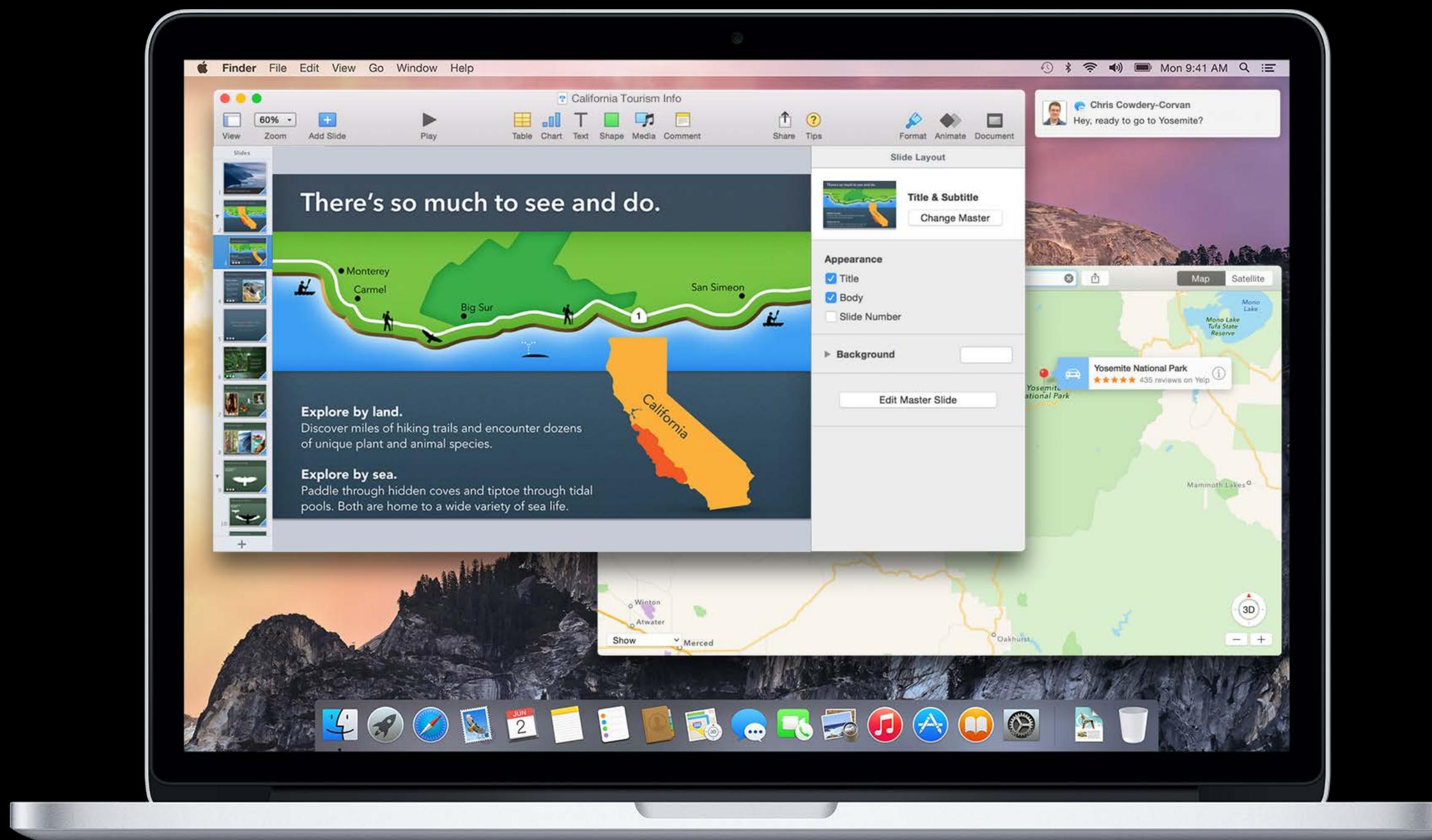


OS X

Multiple Windows



iOS



OS X

NSView/UIView

```
9 #import <Cocoa/Cocoa.h>
10
11 @interface MyView : UIView
12                                     ○ Cannot find interface declaration for 'UIView', superclass of 'MyView'; did you mean 'NSView'?
13 @end
14
```

Shimming

Objective-C

Shimming Objective-C

```
#if TARGET_OS_IPHONE
@interface MyAwesomeView : UIView
#else
@interface MyAwesomeView : NSView
#endif
{
}
@end
```

NSView and UIView

UIView

Receives and handles events

Responsible for drawing

NSView

Receives and handles events

Responsible for drawing

NSView and UIView

UIView

Receives and handles events

Responsible for drawing

Always backed by Core Animation Layer

Origin in top left

Subviews can draw outside view bounds

Gesture Recognizers

Animation APIs

NSView

Receives and handles events

Responsible for drawing

Layer-backed views optional

Origin in bottom left

Subviews clip to view bounds

Mouse event handling

Drag and Drop

Tooltip support

Cons of Shimming

Cons of Shimming

Commonly breaks builds

Cons of Shimming

Commonly breaks builds

Hard to target fixes

Cons of Shimming

Commonly breaks builds

Hard to target fixes

Requires `#if TARGET_OS_IPHONE` by design

Cons of Shimming

Commonly breaks builds

Hard to target fixes

Requires `#if TARGET_OS_IPHONE` by design

- Hard to read

Cons of Shimming

Commonly breaks builds

Hard to target fixes

Requires `#if TARGET_OS_IPHONE` by design

- Hard to read
- Hard to maintain

Cons of Shimming

Commonly breaks builds

Hard to target fixes

Requires `#if TARGET_OS_IPHONE` by design

- Hard to read
- Hard to maintain

Behaviors and UI will take on the look of the original platform by default

Shimming

Shimming

Helpful in select cases

Shimming

Helpful in select cases

- A class can mean different things on different platforms

Shimming

Helpful in select cases

- A class can mean different things on different platforms

Pushes complexity onto clients

Shimming

Helpful in select cases

- A class can mean different things on different platforms

Pushes complexity onto clients

- Try to keep it contained

Shimming

Swift



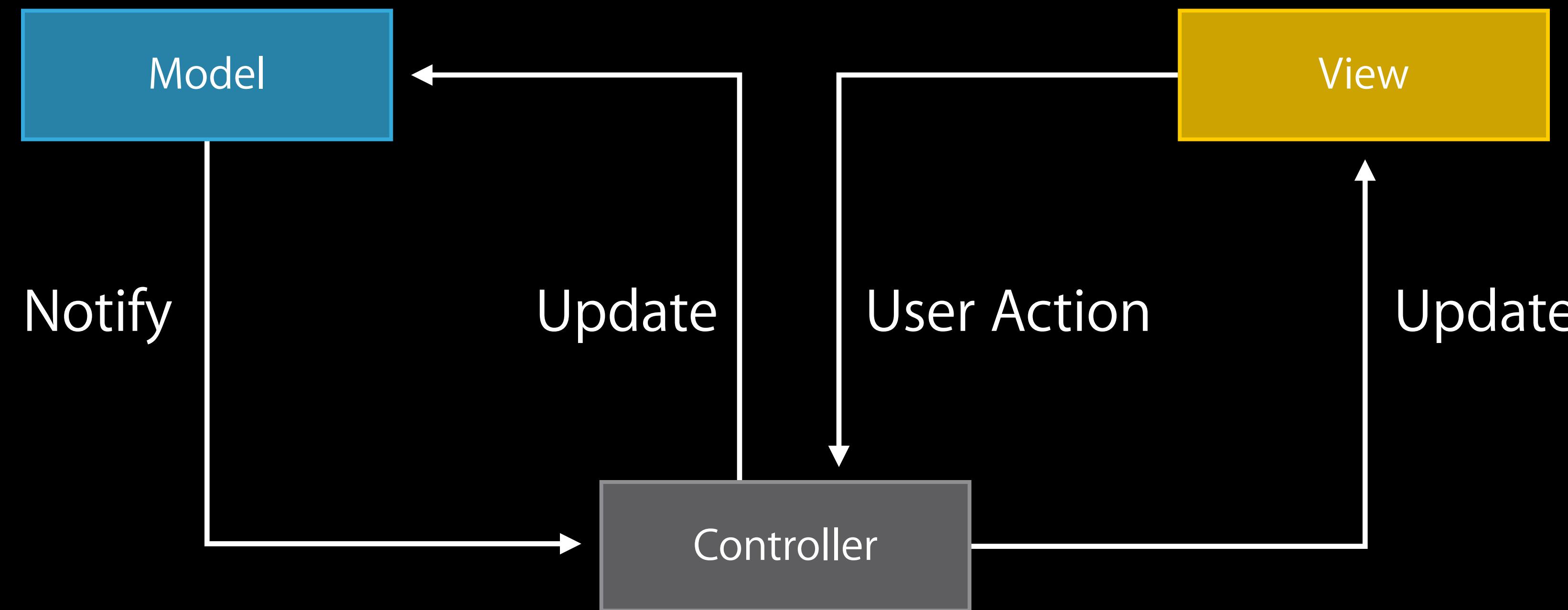
Shimming Swift



```
#if os(iOS)
import UIKit
class MyAwesomeView : UIView {
#else
import AppKit
class MyAwesomeView : NSView {
#endif

}
```

Model View Controller



Controller

Can we share it?

Controller

Can we share it?

Depends on the controller

Controller

Can we share it?

Depends on the controller

- View controllers

Controller

Can we share it?

Depends on the controller

- View controllers
- User interactions, hotkeys, mouse handling

Controller

Can we share it?

Depends on the controller

- View controllers
- User interactions, hotkeys, mouse handling

Lots of common controller logic

Controller

Can we share it?

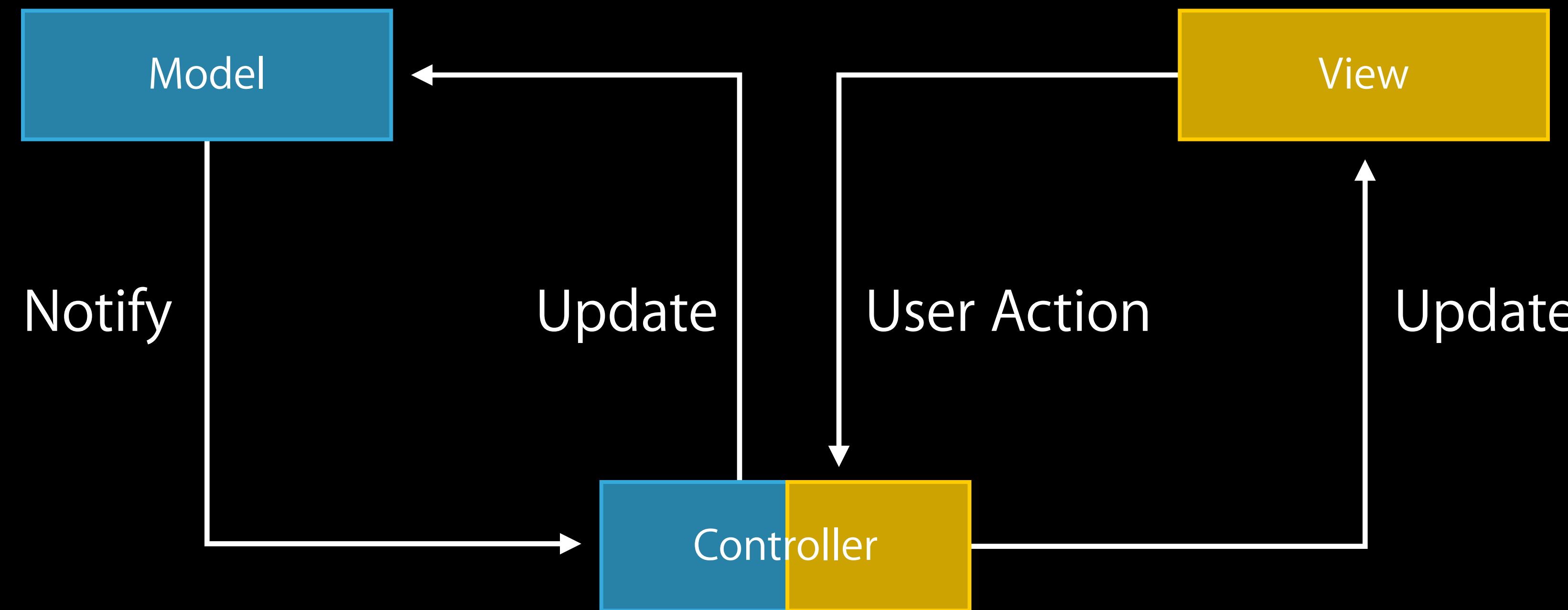
Depends on the controller

- View controllers
- User interactions, hotkeys, mouse handling

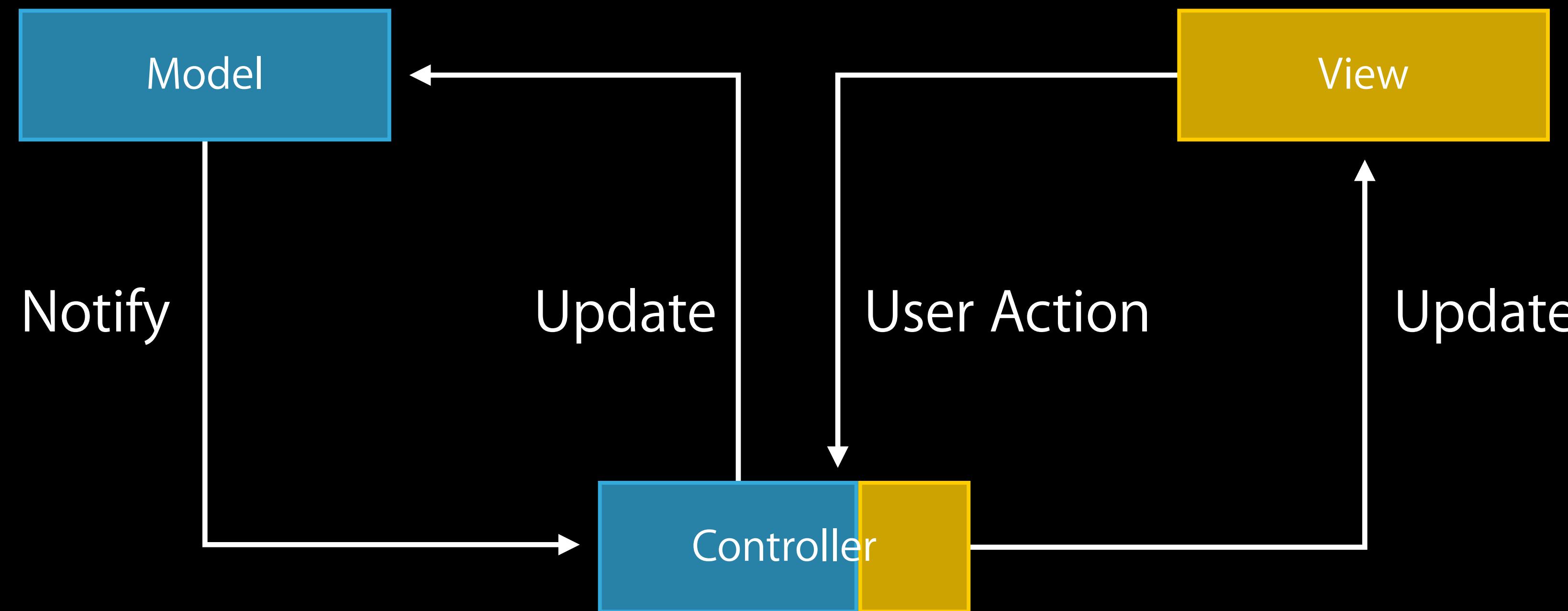
Lots of common controller logic

- Model controllers

Model View Controller



Model View Controller



Canvas View Controller



Canvas View Controller

Canvas View
Controller

Canvas View Controller

Shared Canvas Controller

iOS
Canvas View
Controller

Canvas View Controller

Shared Canvas Controller

iOS
Canvas View
Controller

Canvas View Controller

OS X
Canvas View
Controller

Shared Canvas Controller

iOS
Canvas View
Controller

Rotation

UI conventions differ

Same model, different interaction idioms

Rotation

UI conventions differ

Same model, different interaction idioms



Rotation

UI conventions differ

Same model, different interaction idioms

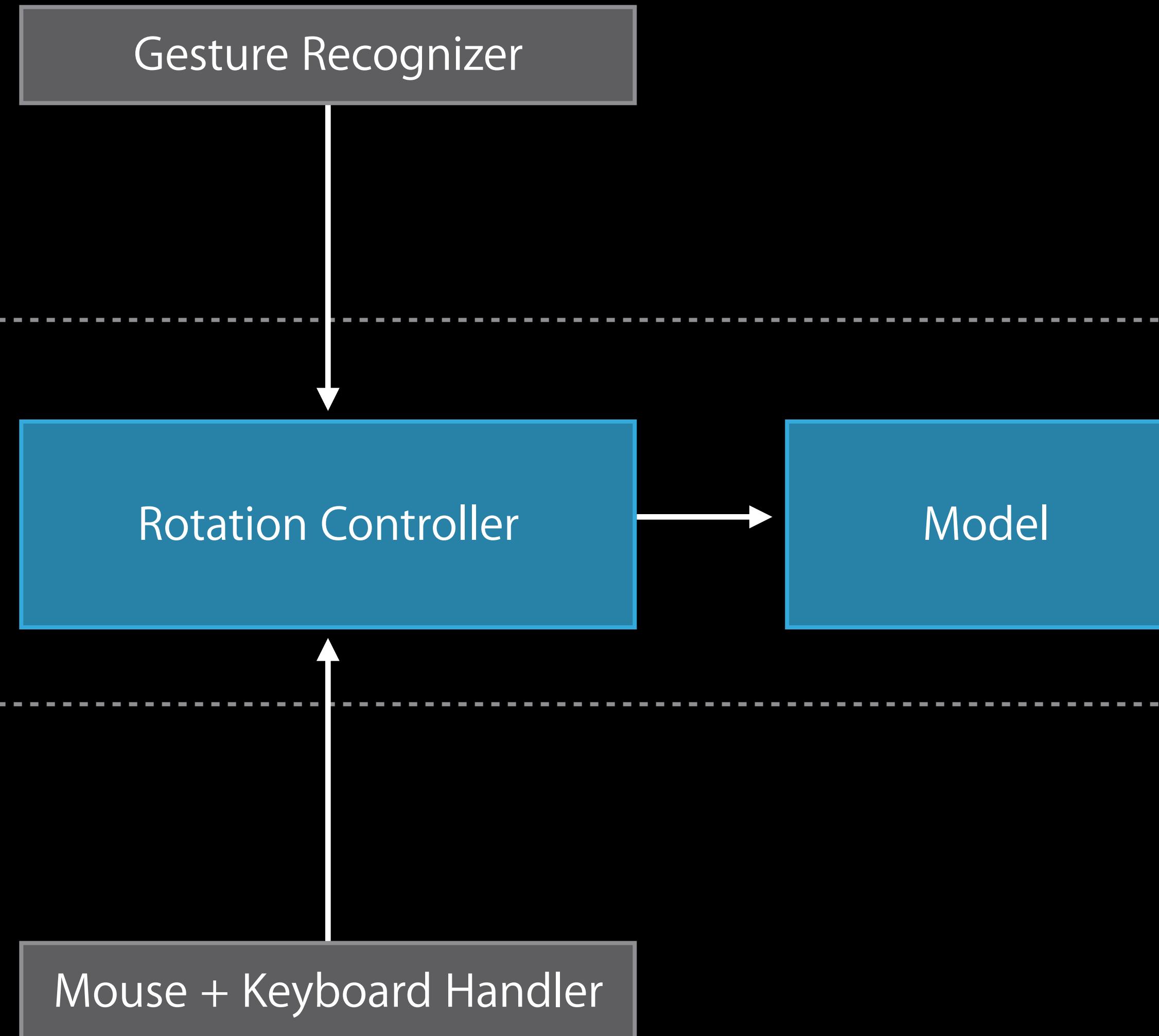


Rotation

iOS

Shared

OS X



Rotation

iOS

Shared

OS X

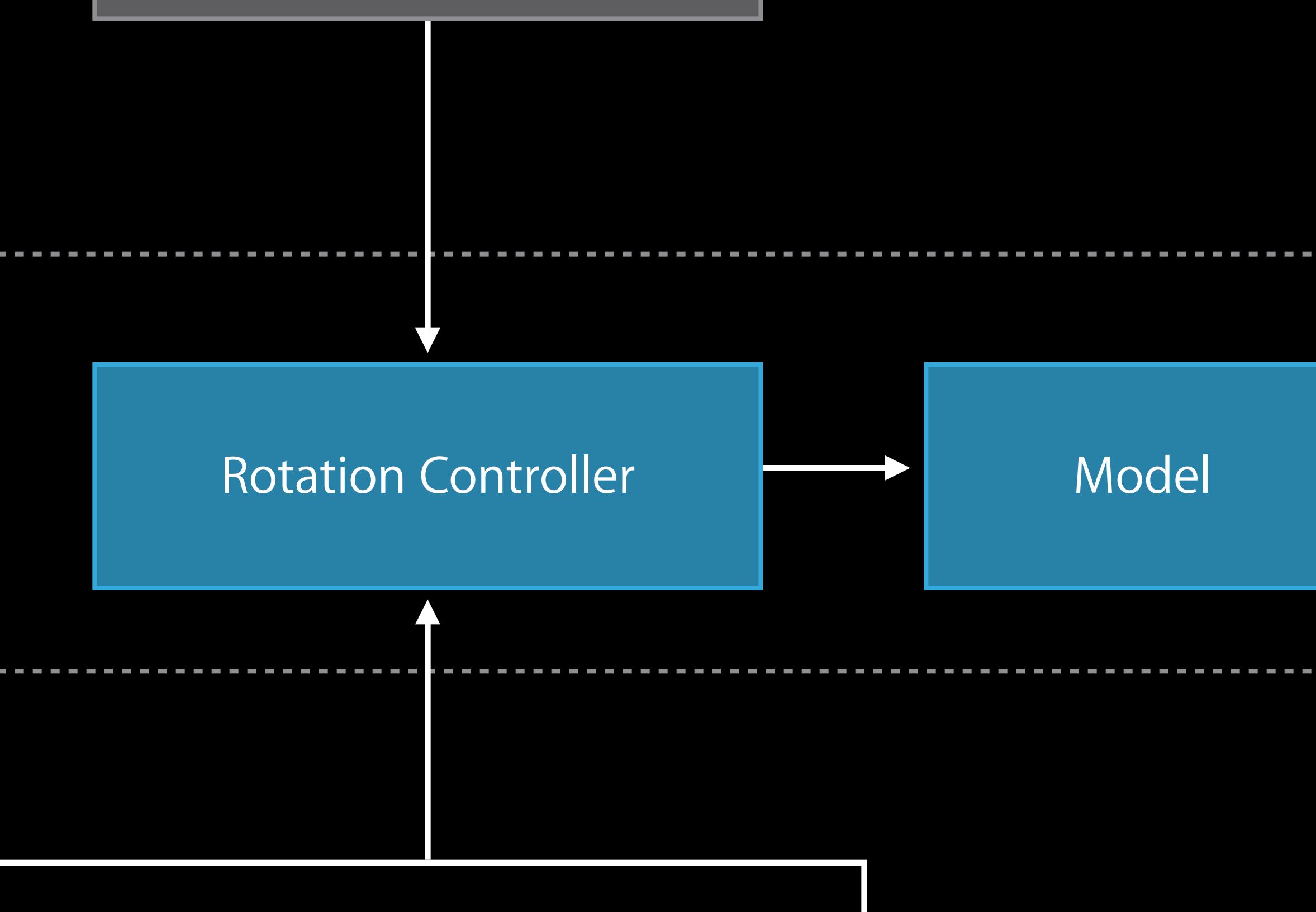
Gesture Recognizer

Rotation Controller

Model

Mouse + Keyboard Handler

Inspector Text Field



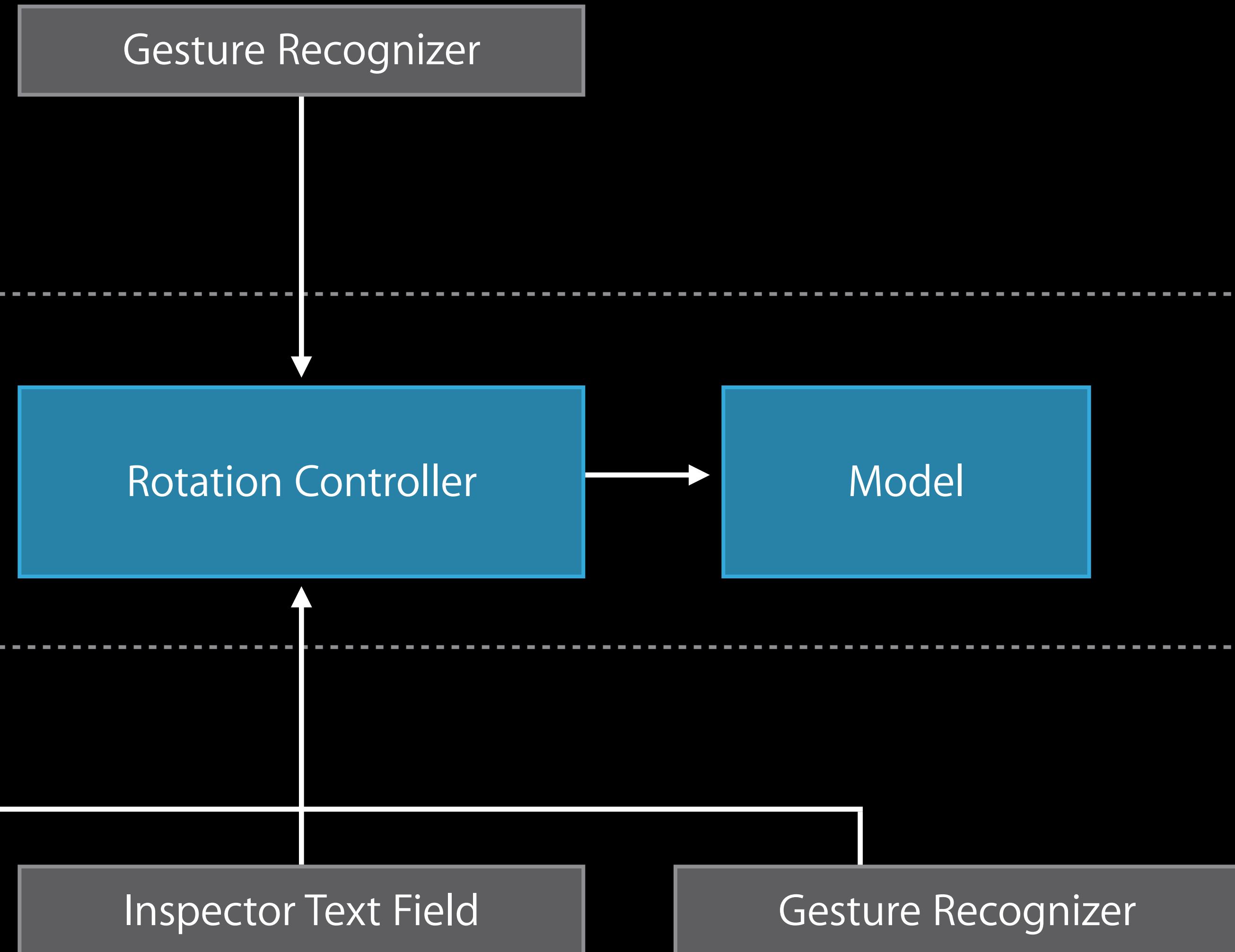
Rotation



iOS

Shared

OS X

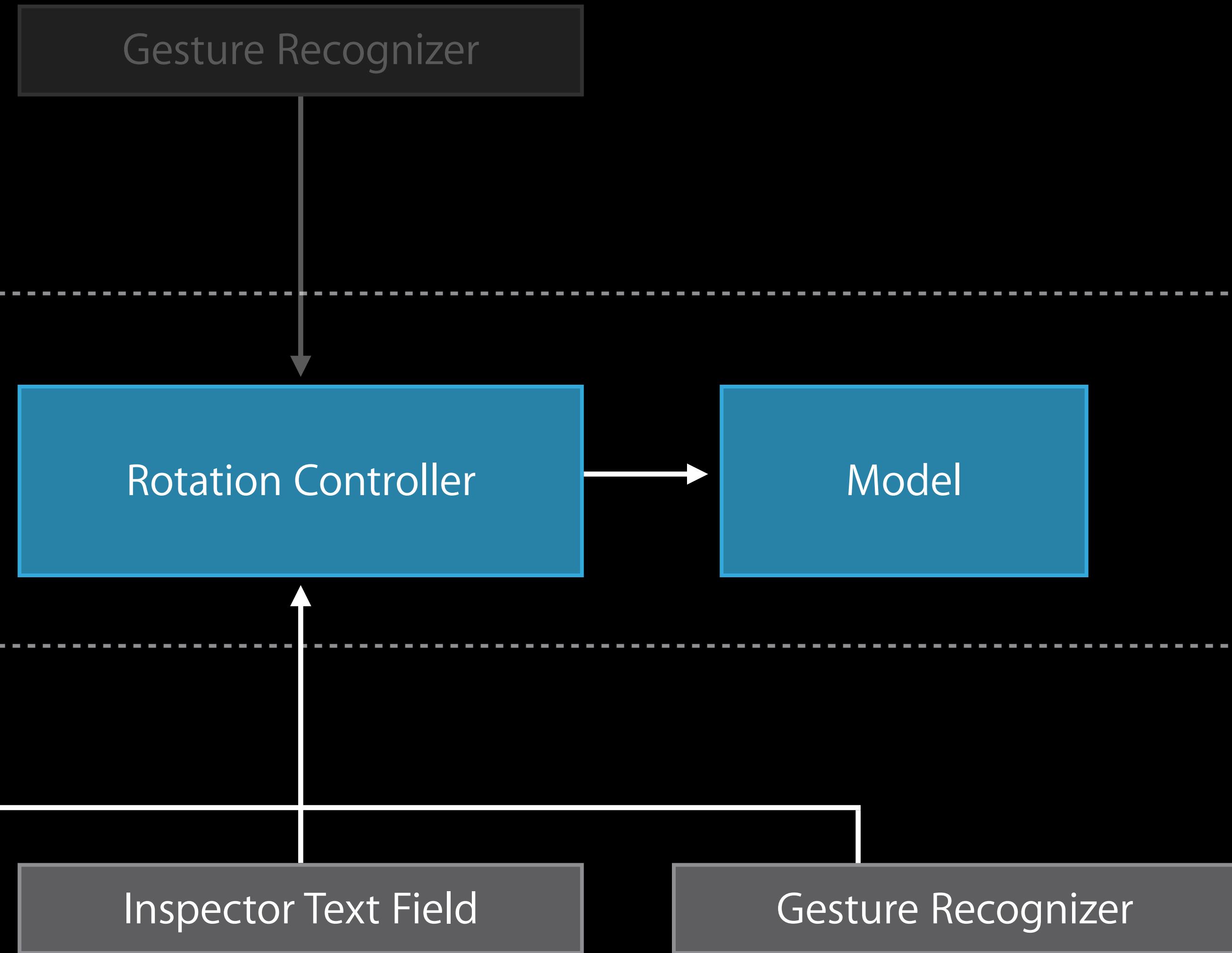


Rotation

iOS

Shared

OS X



Frameworks



Foundation	Core Foundation Foundation	Core Foundation Foundation
Persistence	Core Data CloudKit	Core Data CloudKit
Text	Core Text	Core Text
	Core Animation	Core Animation
	Core Graphics	Core Graphics
Media	Core Image Core Audio	Core Image Core Audio
	AVFoundation	AVFoundation
	QTKit	AVFoundation
UI	AppKit	UIKit

Frameworks



Foundation

Core Foundation

Persistence

Foundation

Core Data

Text

CloudKit

Core Text

Media

Core Animation

Core Graphics

Core Image

Core Audio

AVFoundation

UI

QTKit

AppKit

≠

Core Foundation

Foundation

Core Data

CloudKit

Core Text

Core Animation

Core Graphics

Core Image

Core Audio

AVFoundation

AVFoundation

UIKit

Frameworks



Foundation	Core Foundation Foundation	Core Foundation Foundation
Persistence	Core Data CloudKit	Core Data CloudKit
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Frameworks



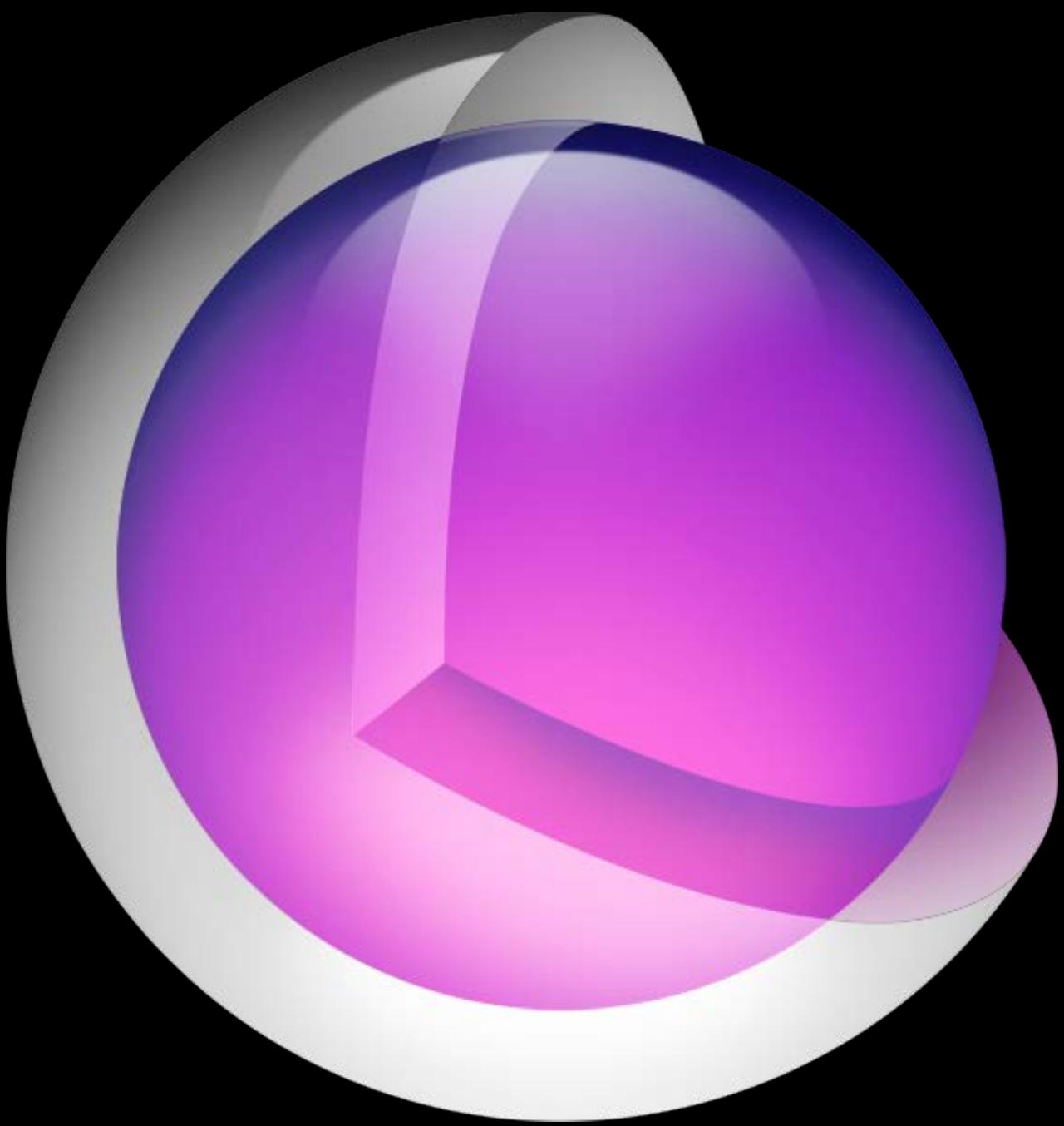
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Media	Core Image Core Audio	Core Image Core Audio
	AVFoundation	AVFoundation
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UI	AppKit	UIKit

Frameworks



Foundation	Core Foundation Foundation	Core Foundation Foundation
Persistence	Core Data CloudKit	Core Data CloudKit
Text	Core Text	Core Text
Media	Core Animation Core Graphics	Core Animation Core Graphics
	Core Image Core Audio	Core Image Core Audio
UI	AVFoundation QTKit	AVFoundation AVFoundation
	AppKit	UIKit

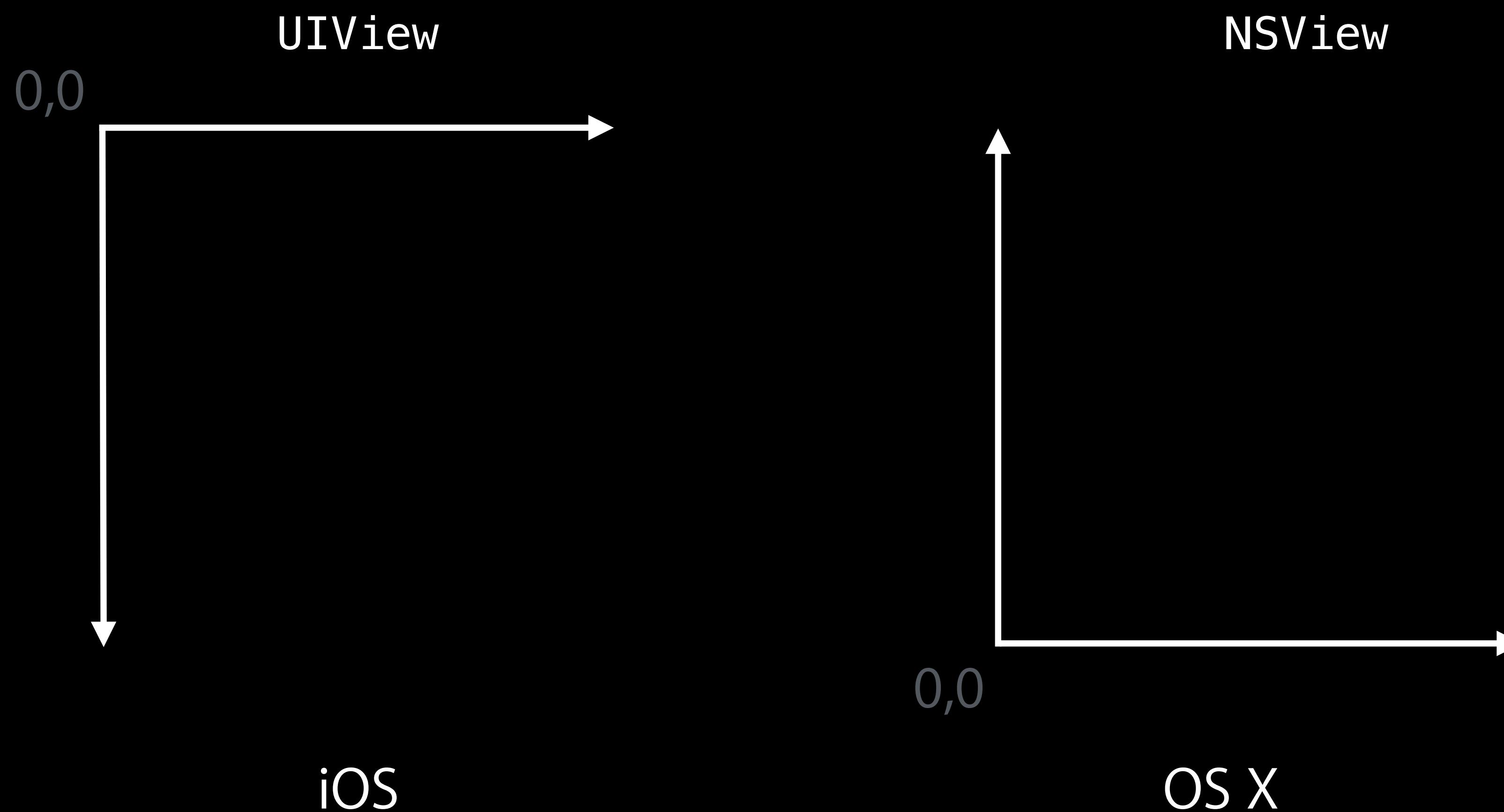
Core Animation



Core Graphics

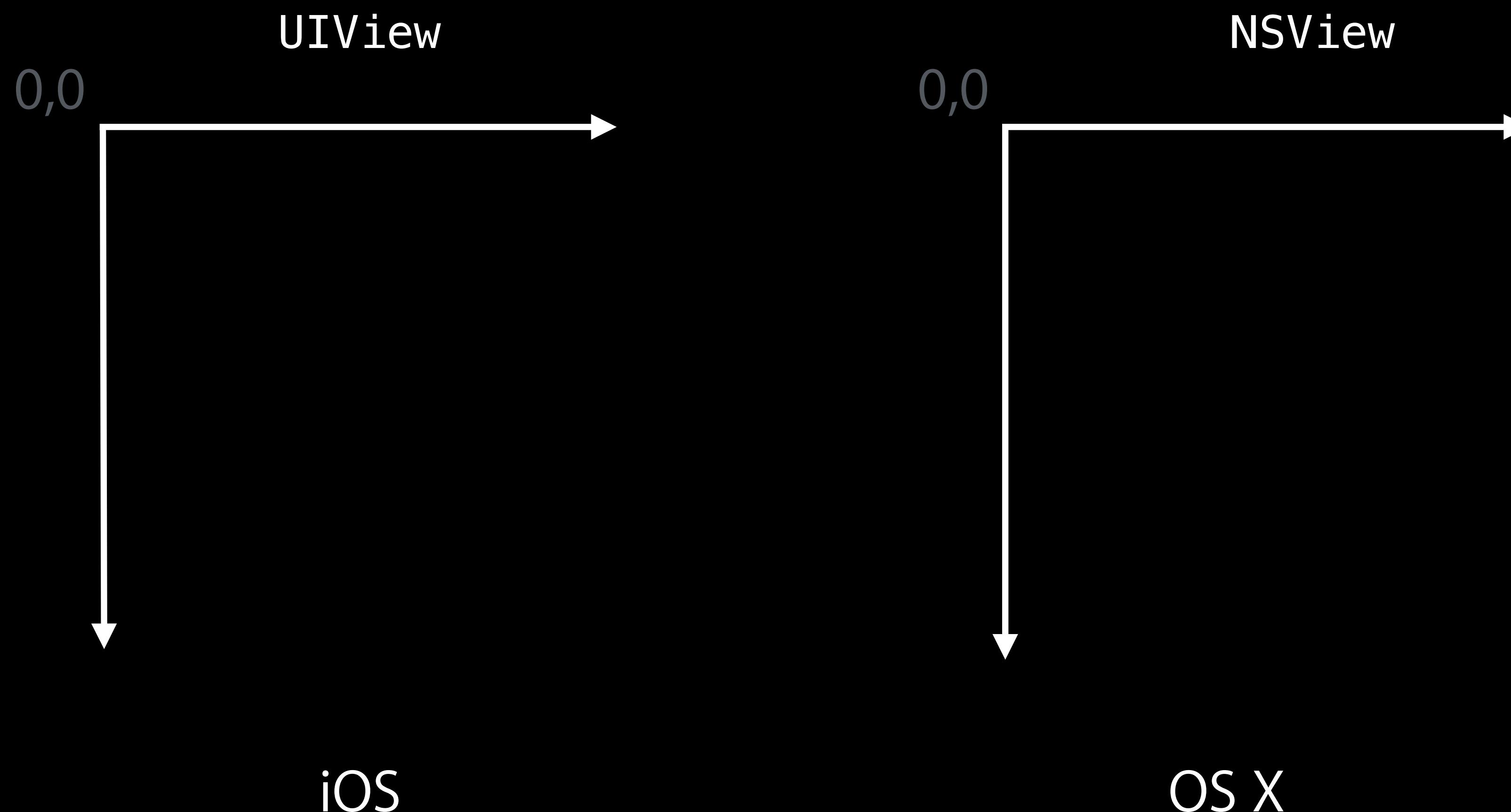


Core Graphics



Core Graphics

```
- (BOOL)isFlipped {  
    return YES;  
}
```









Model View Controller

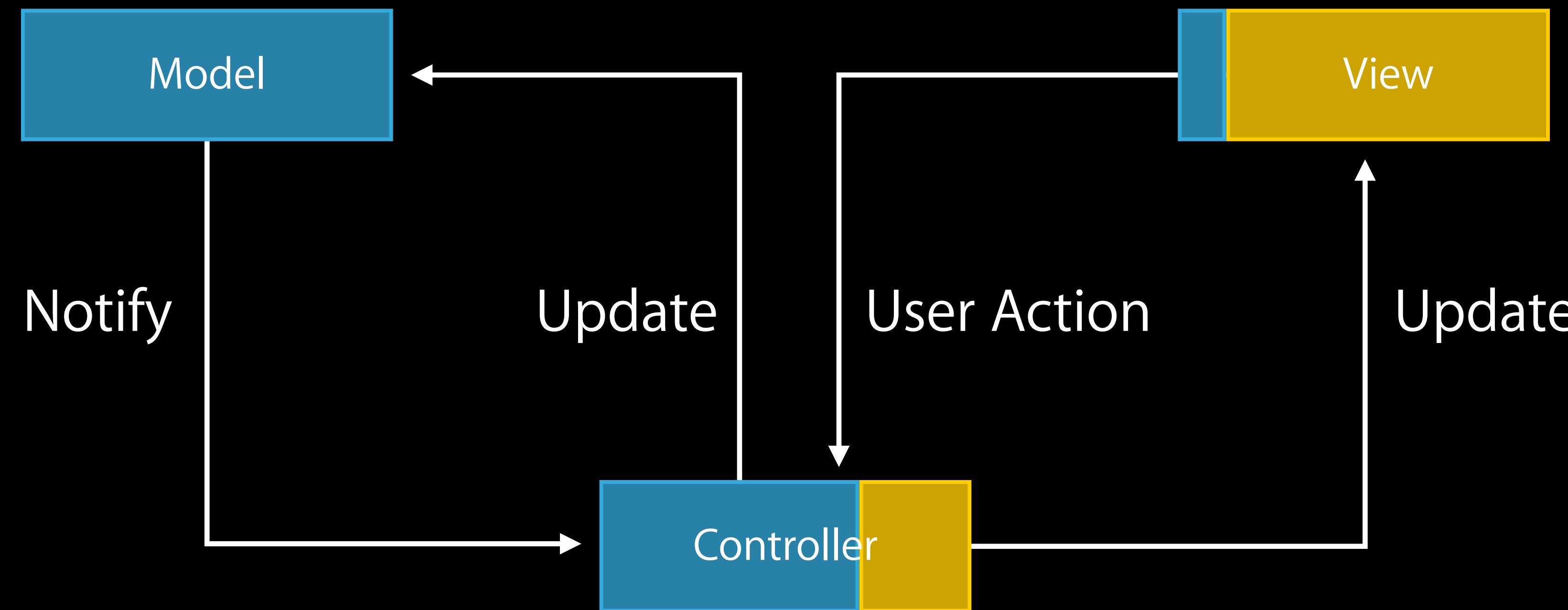
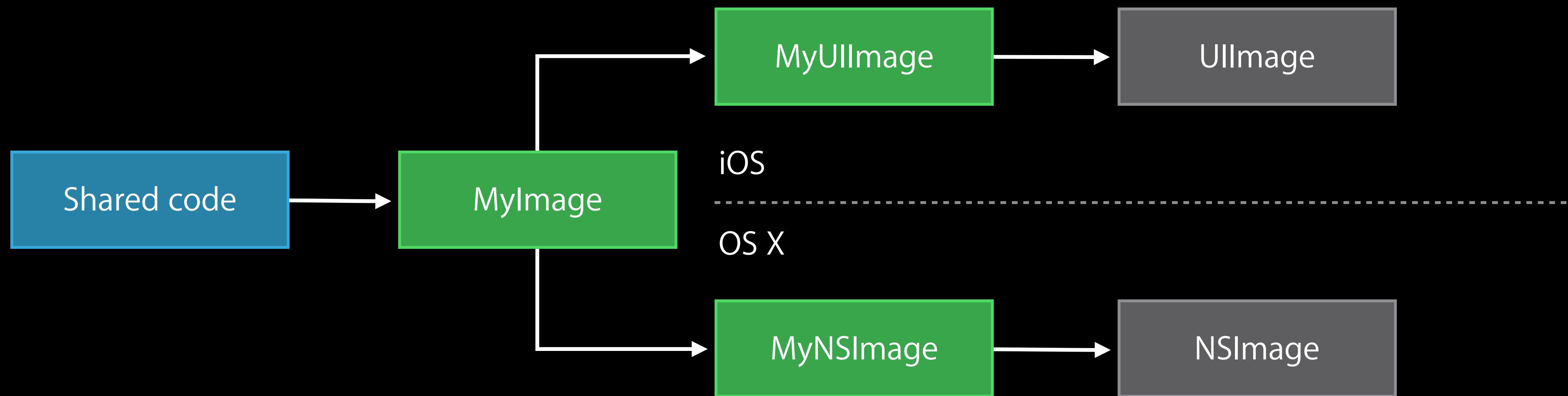


Image Wrapper

Adapt shared interface to platform APIs

Class cluster

Inherits from **NSObject**







Cross-platform Images

Color models



Cross-platform Images

Color models



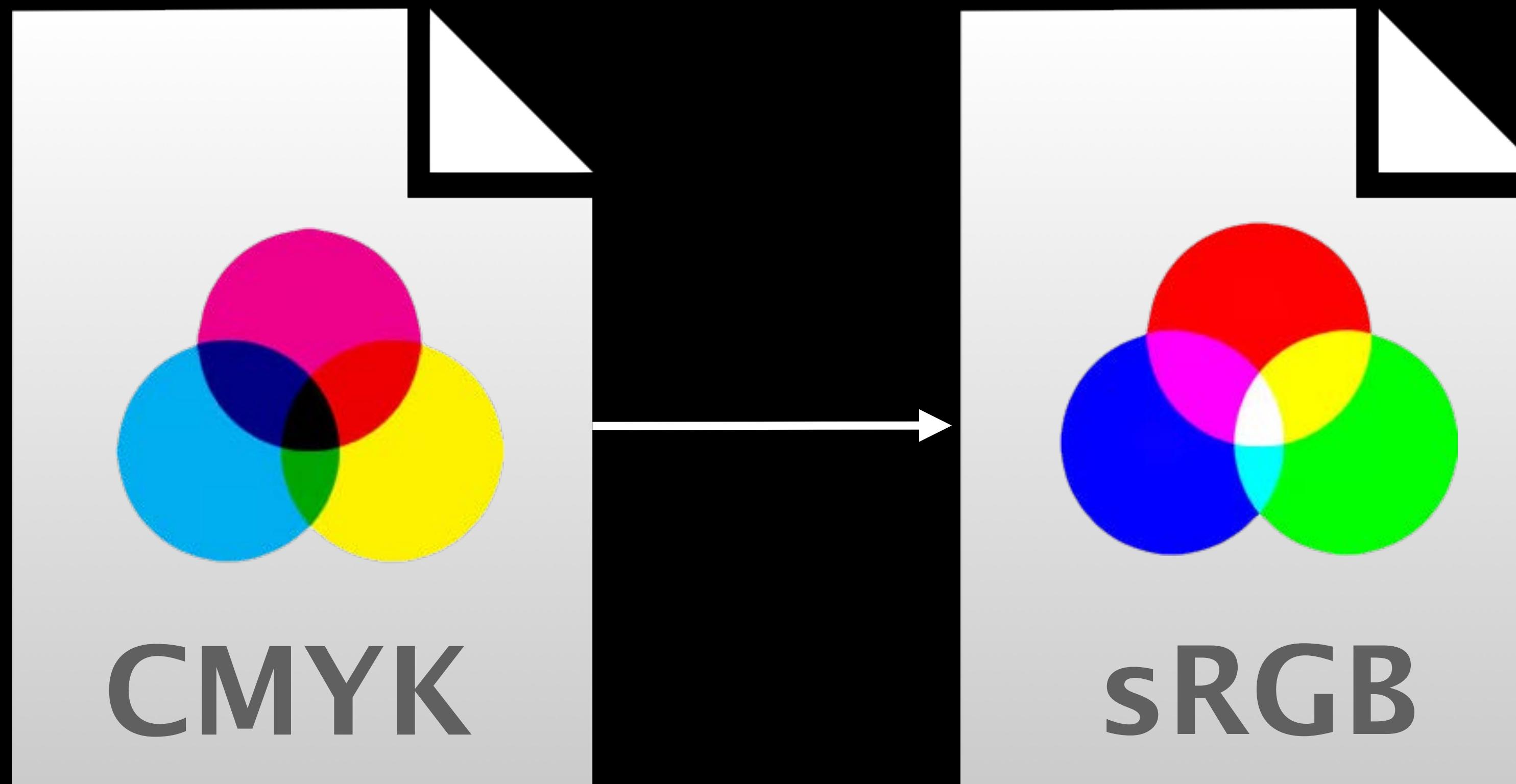
Cross-platform Images

Color models



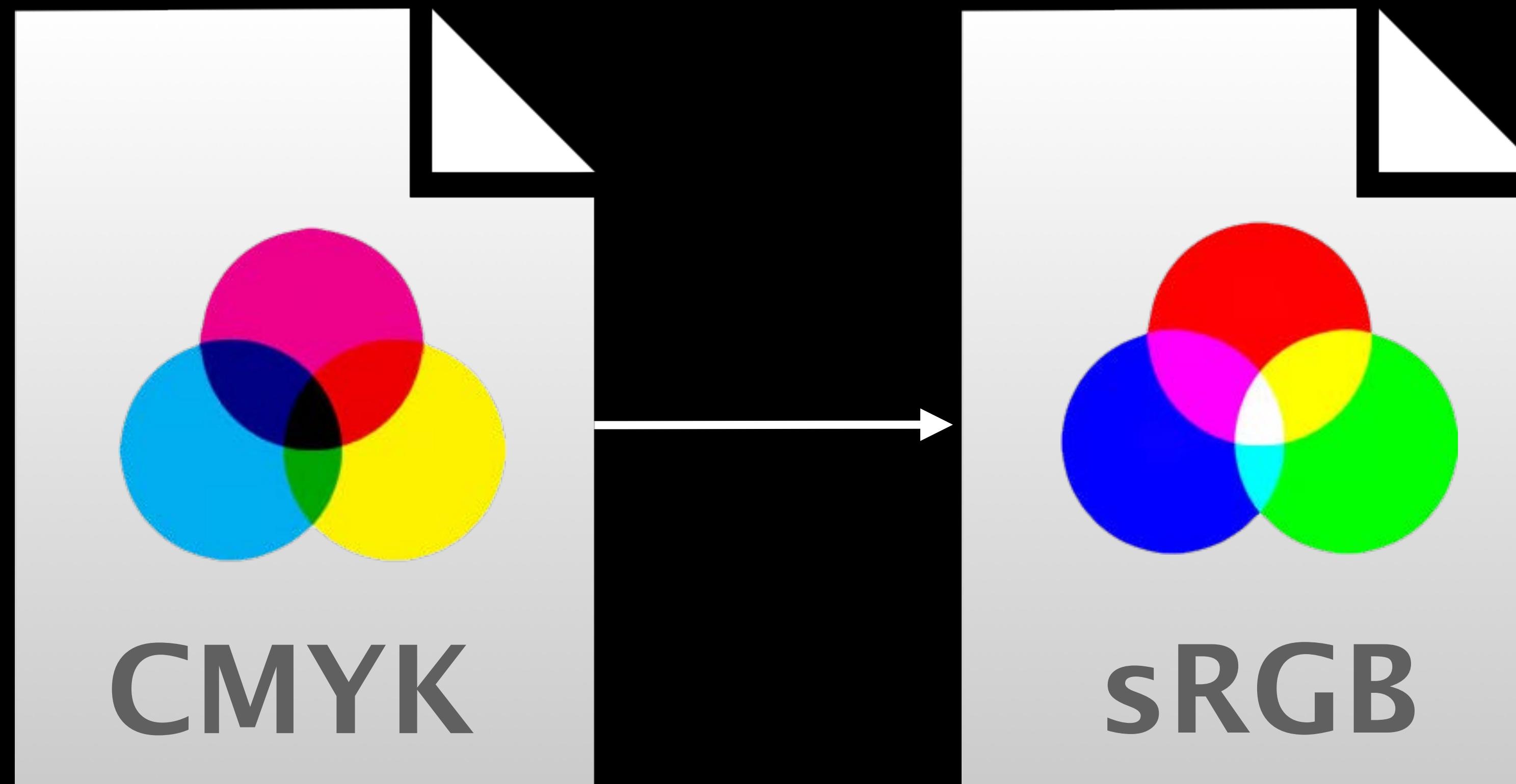
Cross-platform Images

Color models



Cross-platform Images

Color models



- Best Practices for Color Management

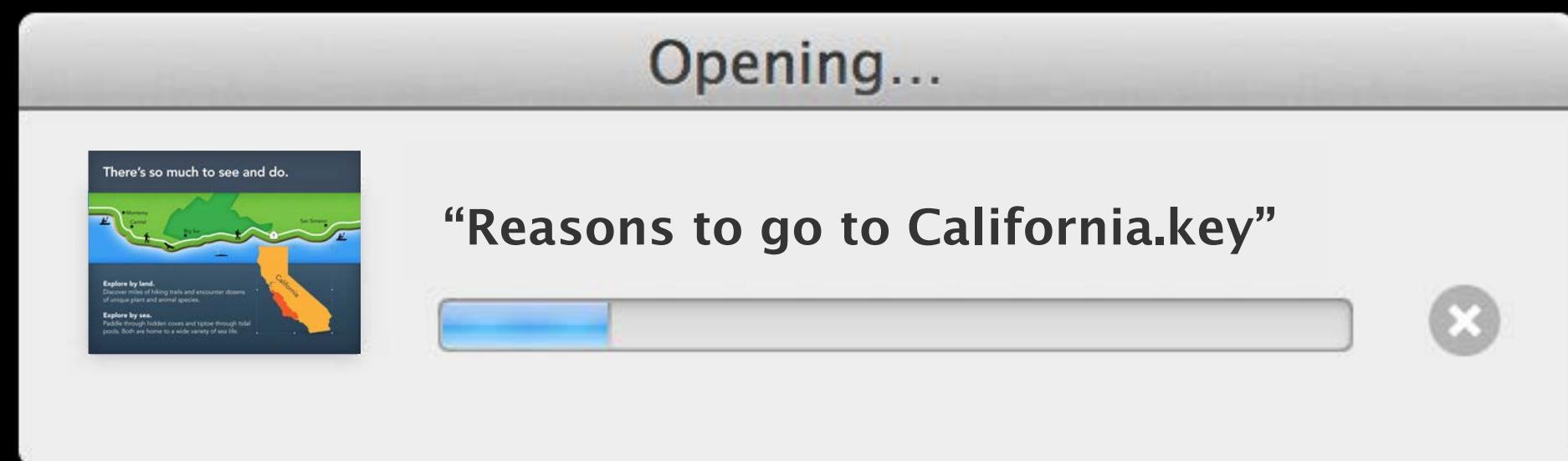
WWDC 2012

Available Online



Opening Documents

Performance



Platform Differences

Hardware



Lazily Loaded Model

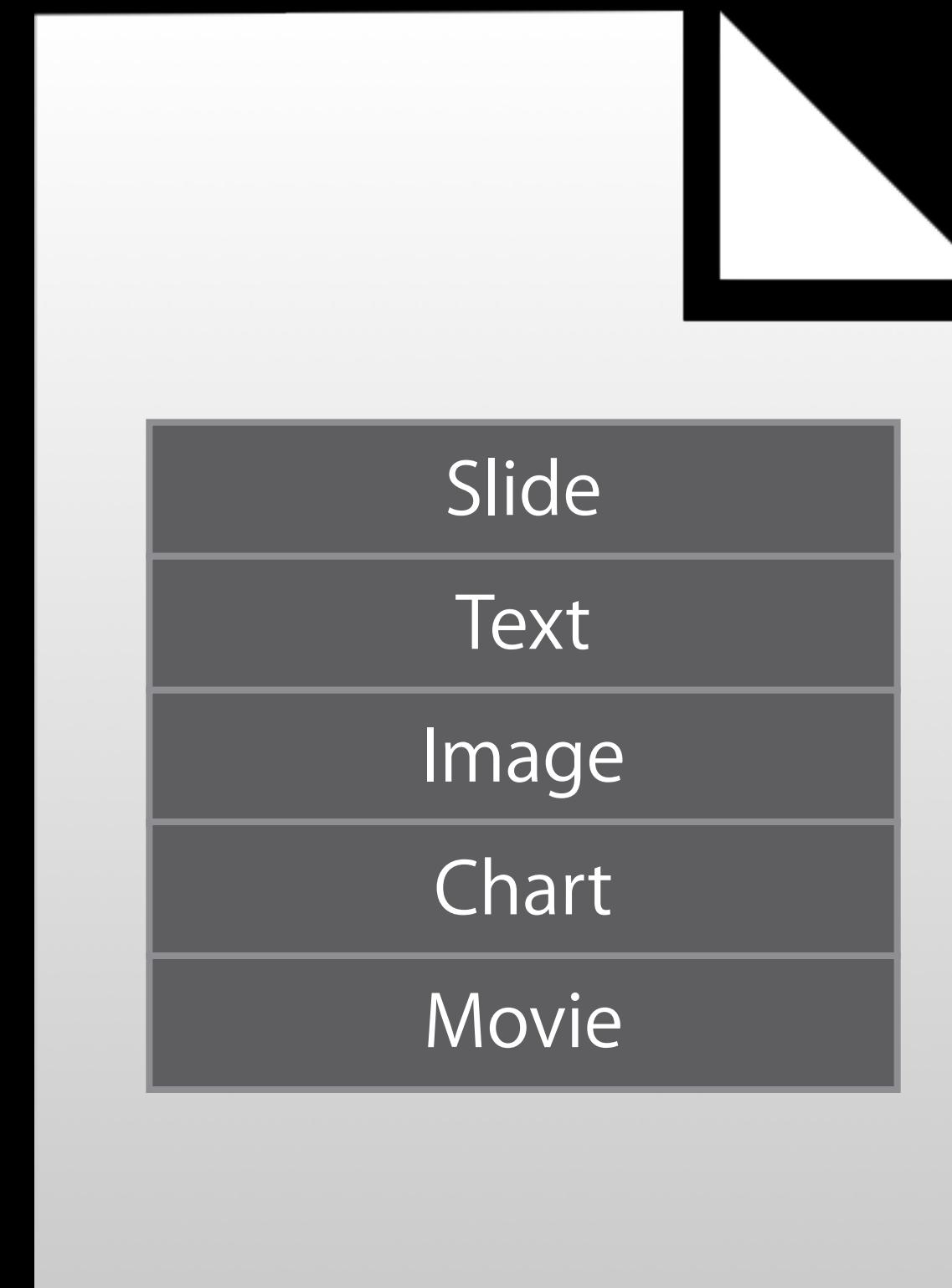
Sections of model are self-contained

Only load what the user needs

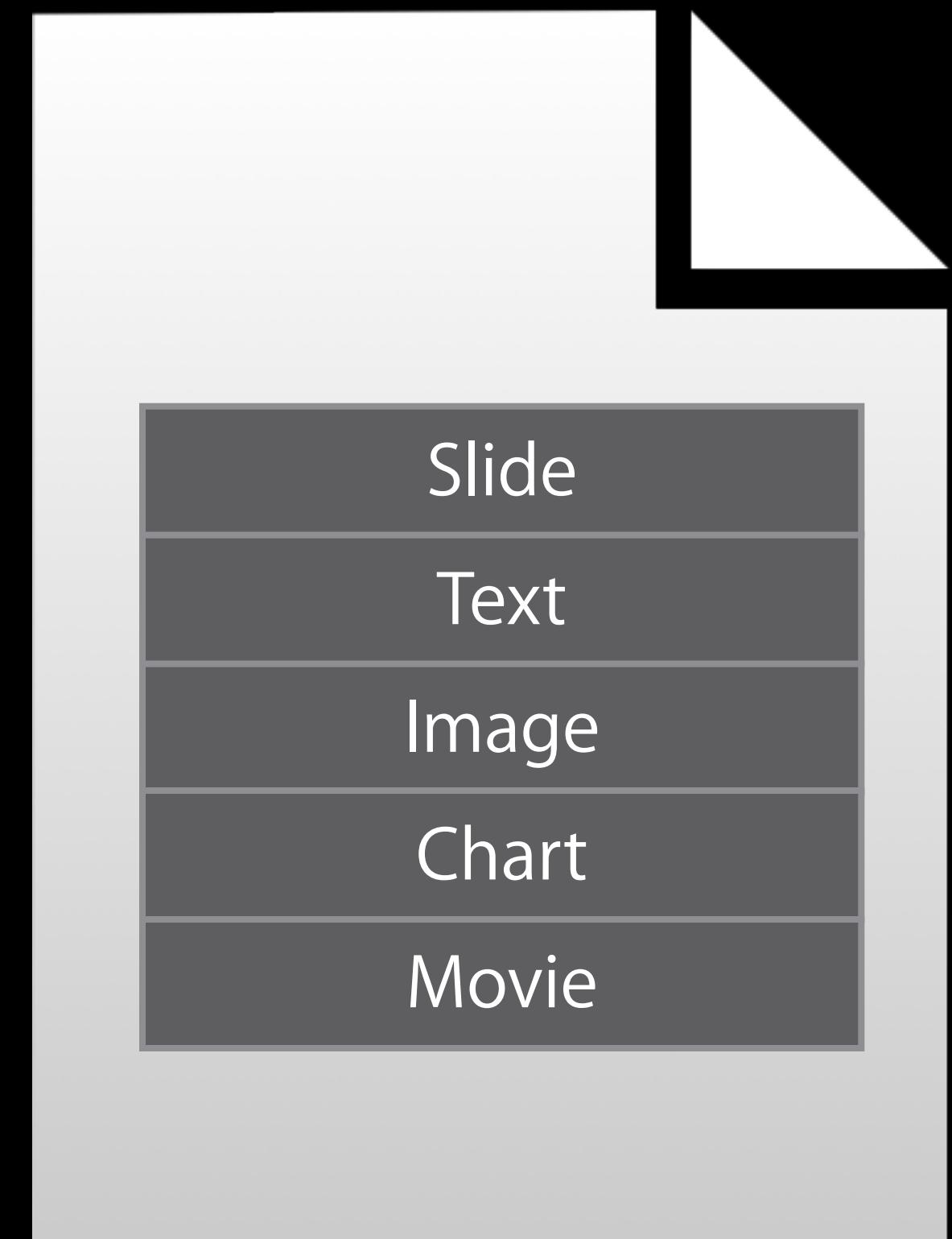
Load in parallel

Faster to open documents

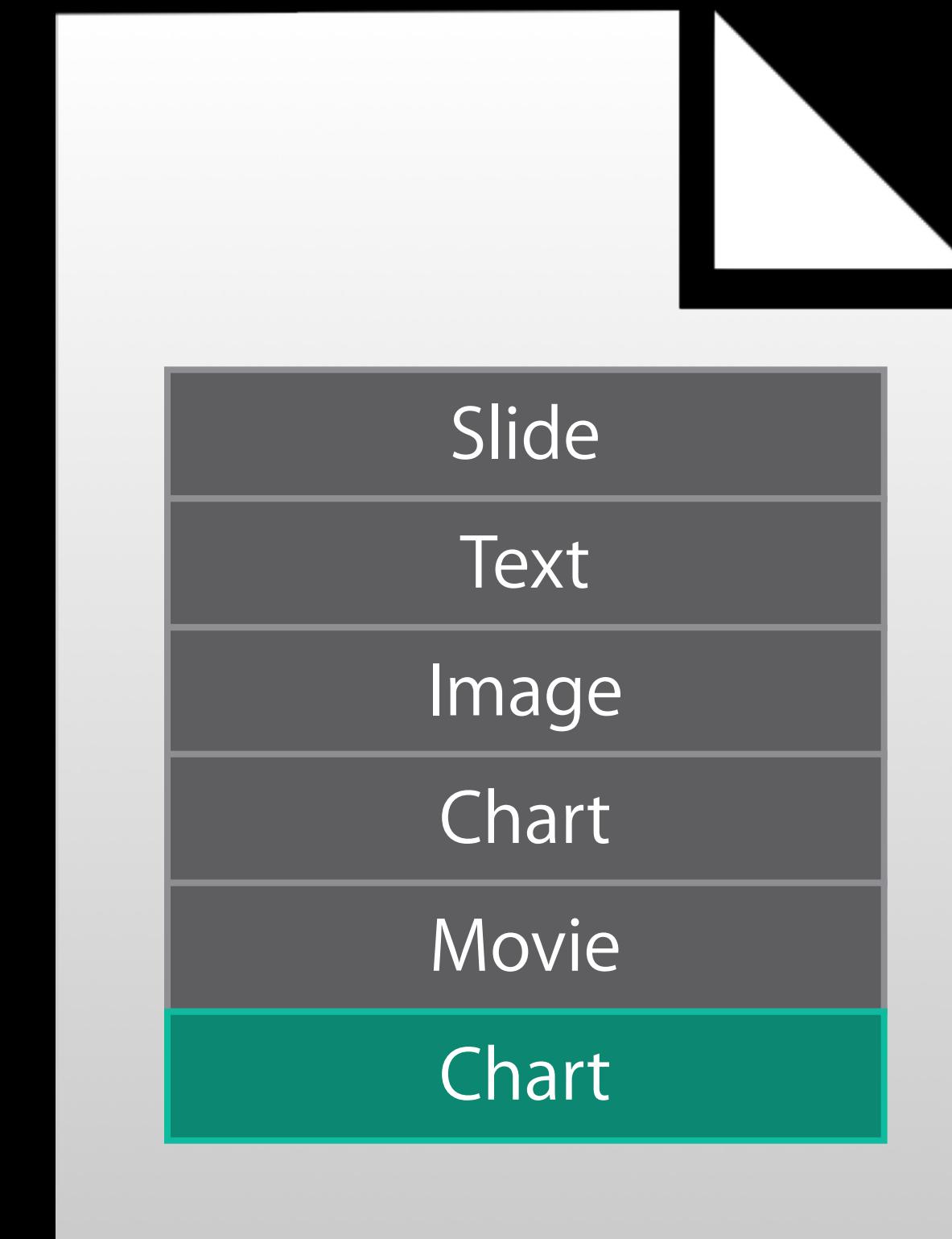




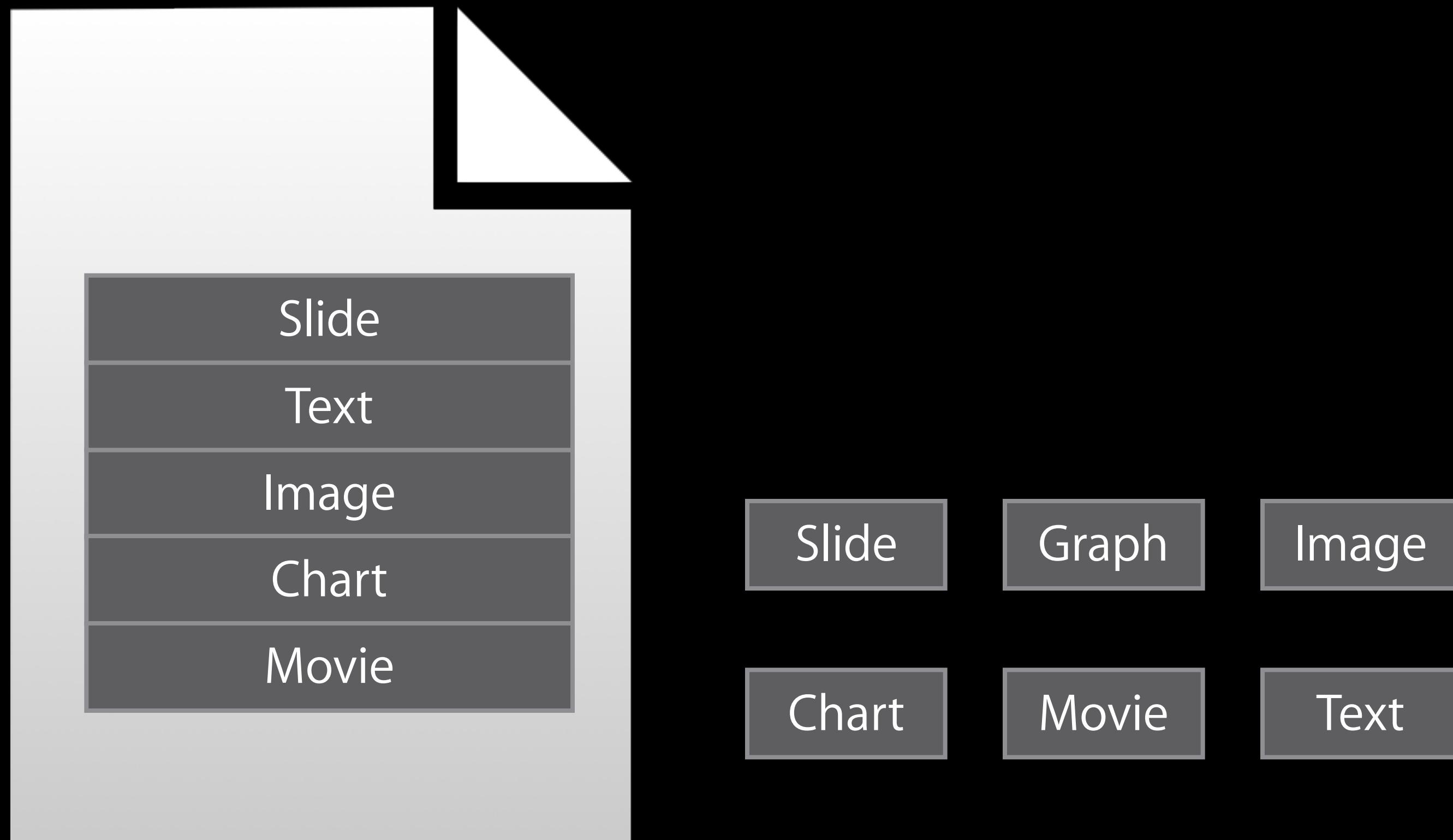
OldDocument.key



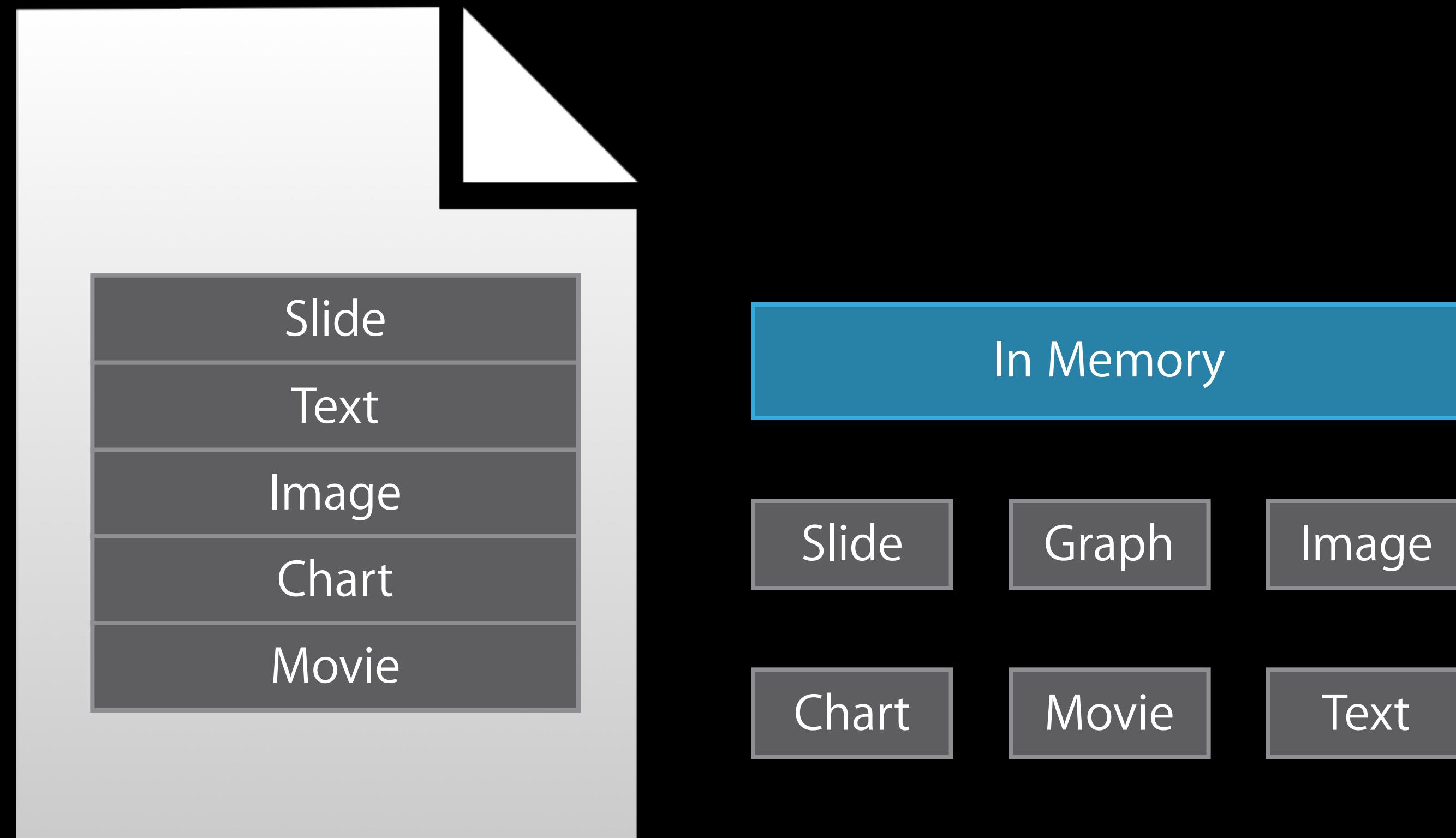
OldDocument.key



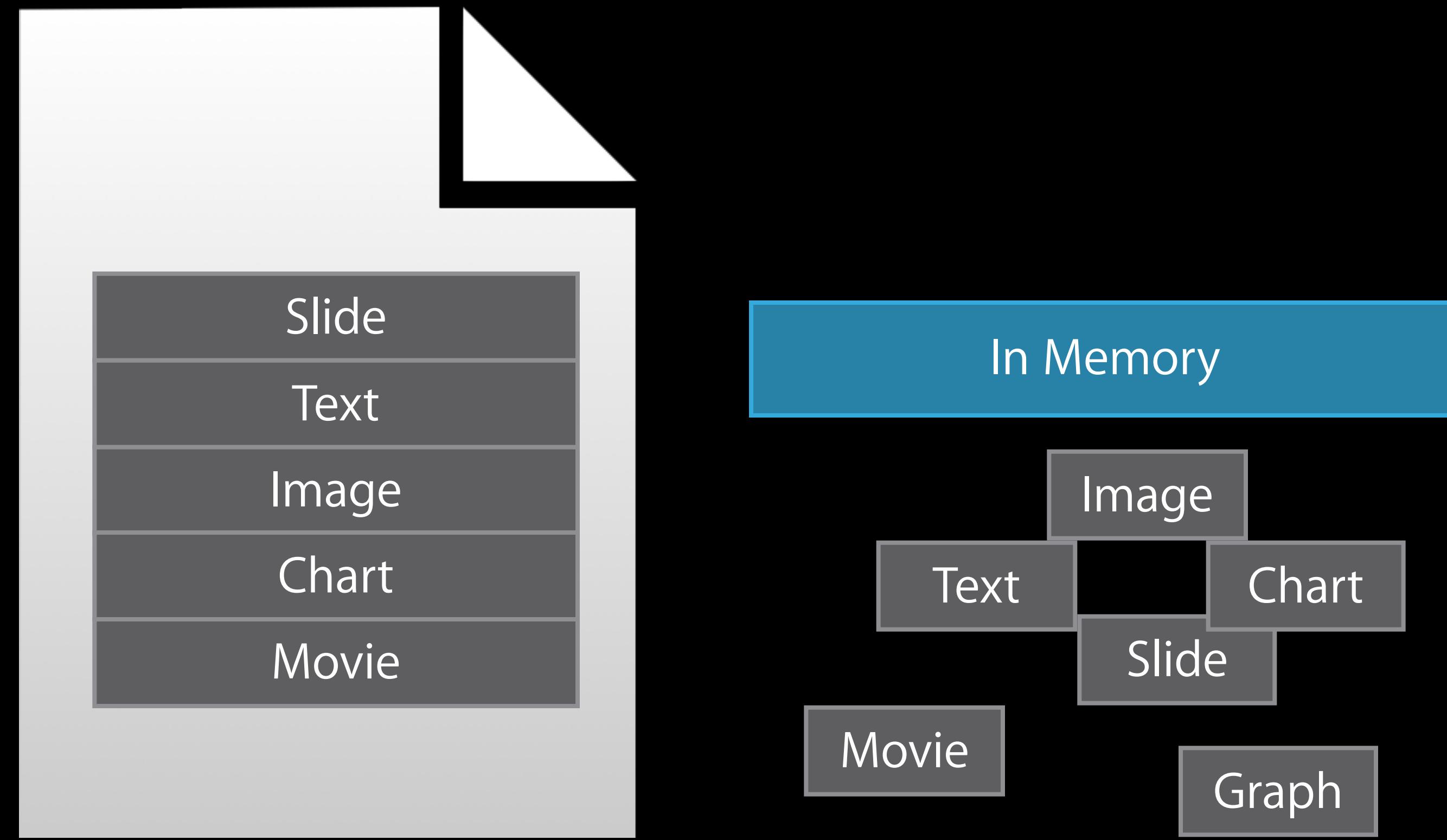
NewDocument.key



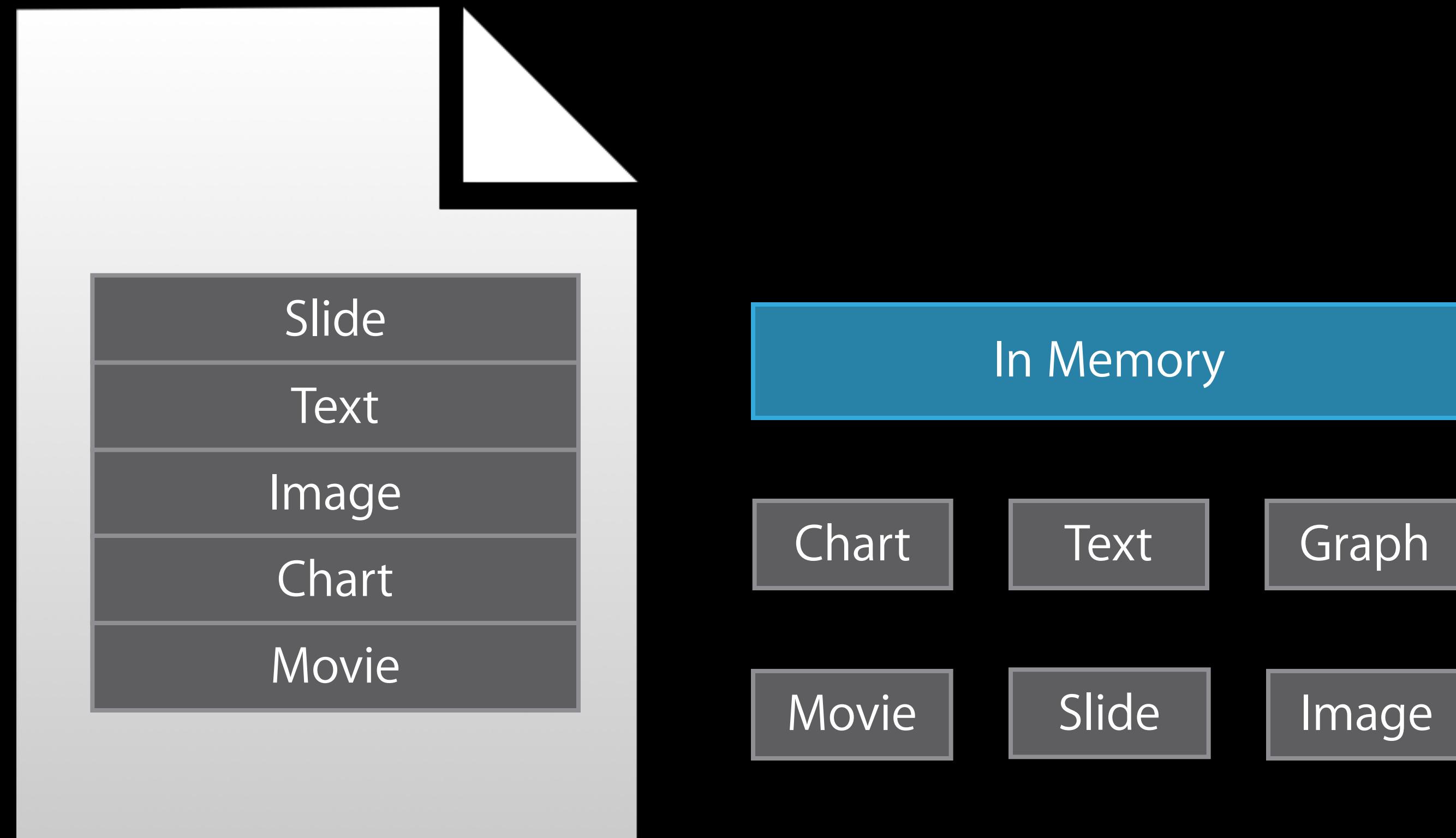
Document.key



Document.key



Document.key



Document.key



- Building a Document-based App

Marina

Thursday 11:30AM

How to Split Your Code

Summary

How to Split Your Code

Summary

Look at how code is used

How to Split Your Code

Summary

Look at how code is used

Recognize differences in platforms

How to Split Your Code

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Look at how code is used

Recognize differences in platforms

Consider using shared frameworks

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Look at how code is used

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Investigate design patterns

- Model View Controller

How to Split Your Code

Summary

Look at how code is used

Recognize differences in platforms

Consider using shared frameworks

Investigate design patterns

- Model View Controller
- Wrappers

No Silver Bullet

No Silver Bullet

iWork apps aren't your apps

No Silver Bullet

iWork apps aren't your apps

Works for us ≠ works for you

No Silver Bullet

iWork apps aren't your apps

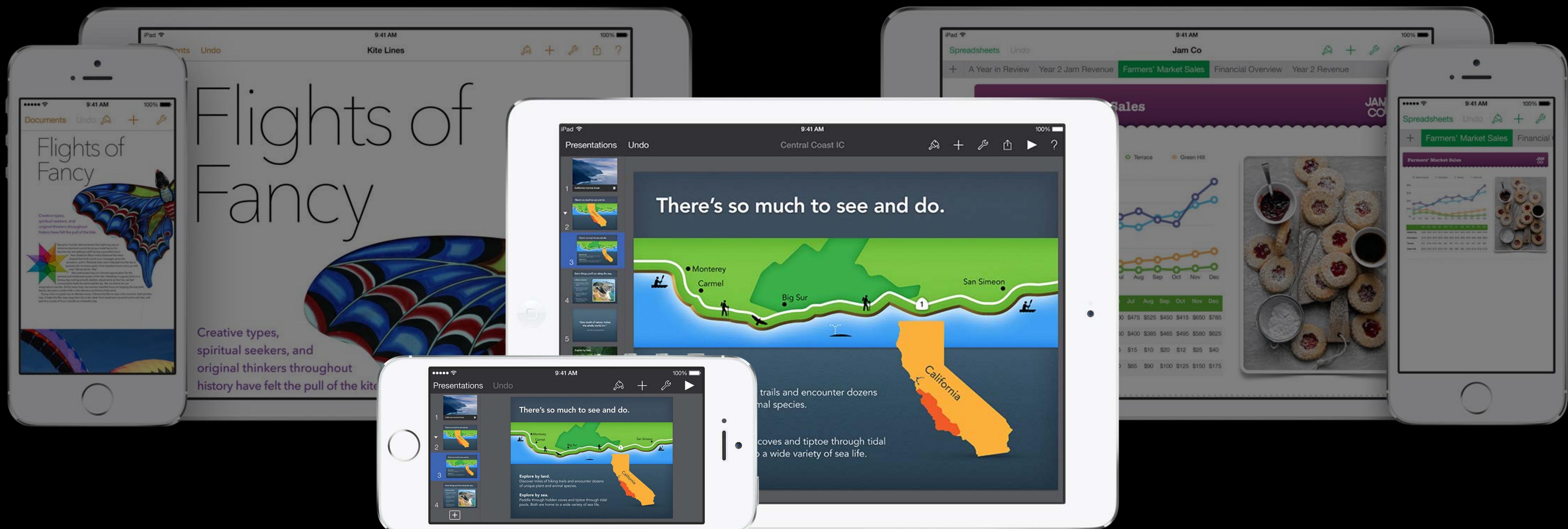
Works for us ≠ works for you

Universal concepts, not universal solutions

Cross-platform Projects in Xcode

Chris Cowdery-Corvan
iWork Software Engineer







Keynote iOS



Keynote iOS



Keynote Mac

Targets



Targets

Defines a single product to build



Targets

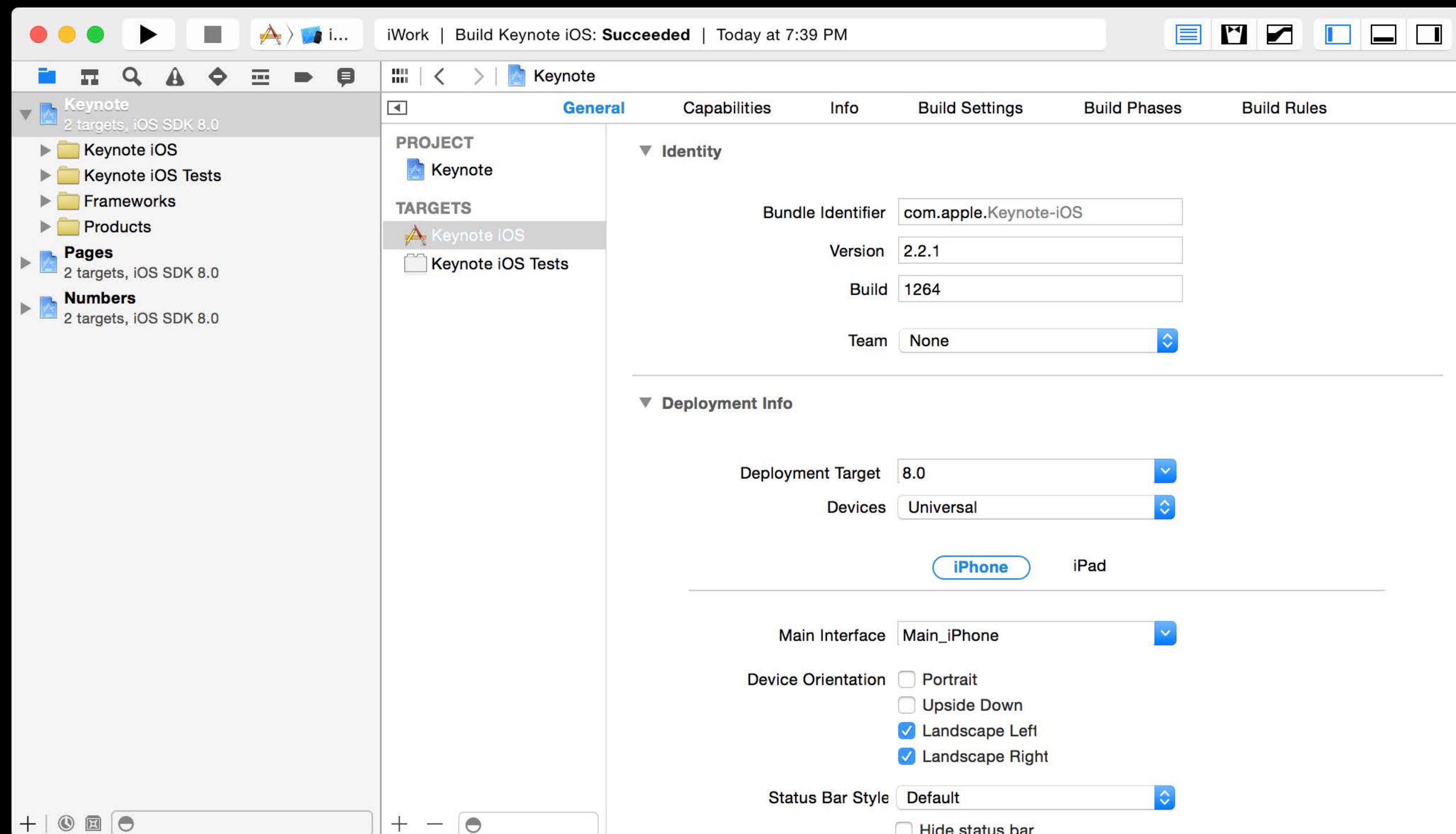
Defines a single product to build
Organizes inputs into build system

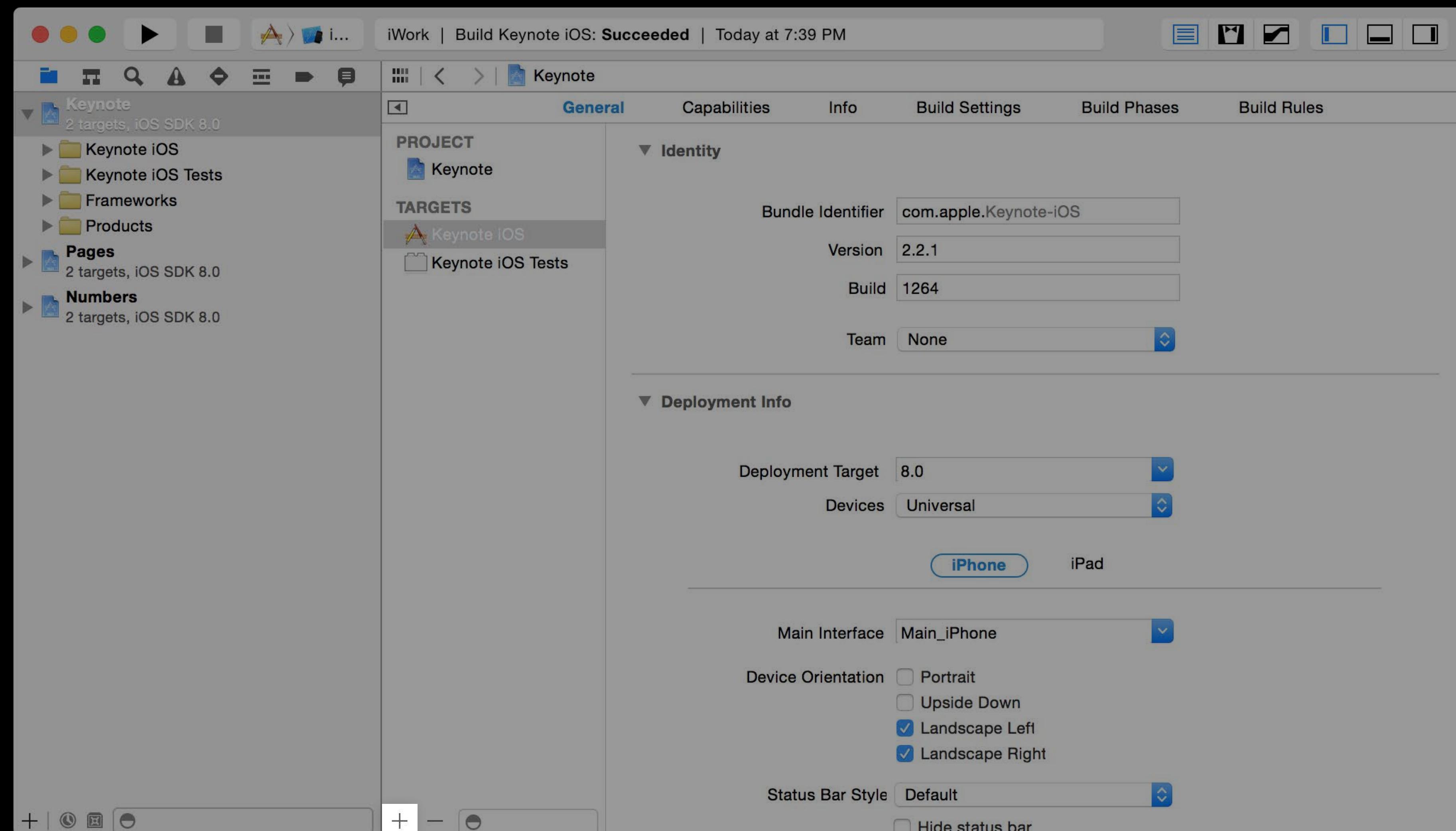


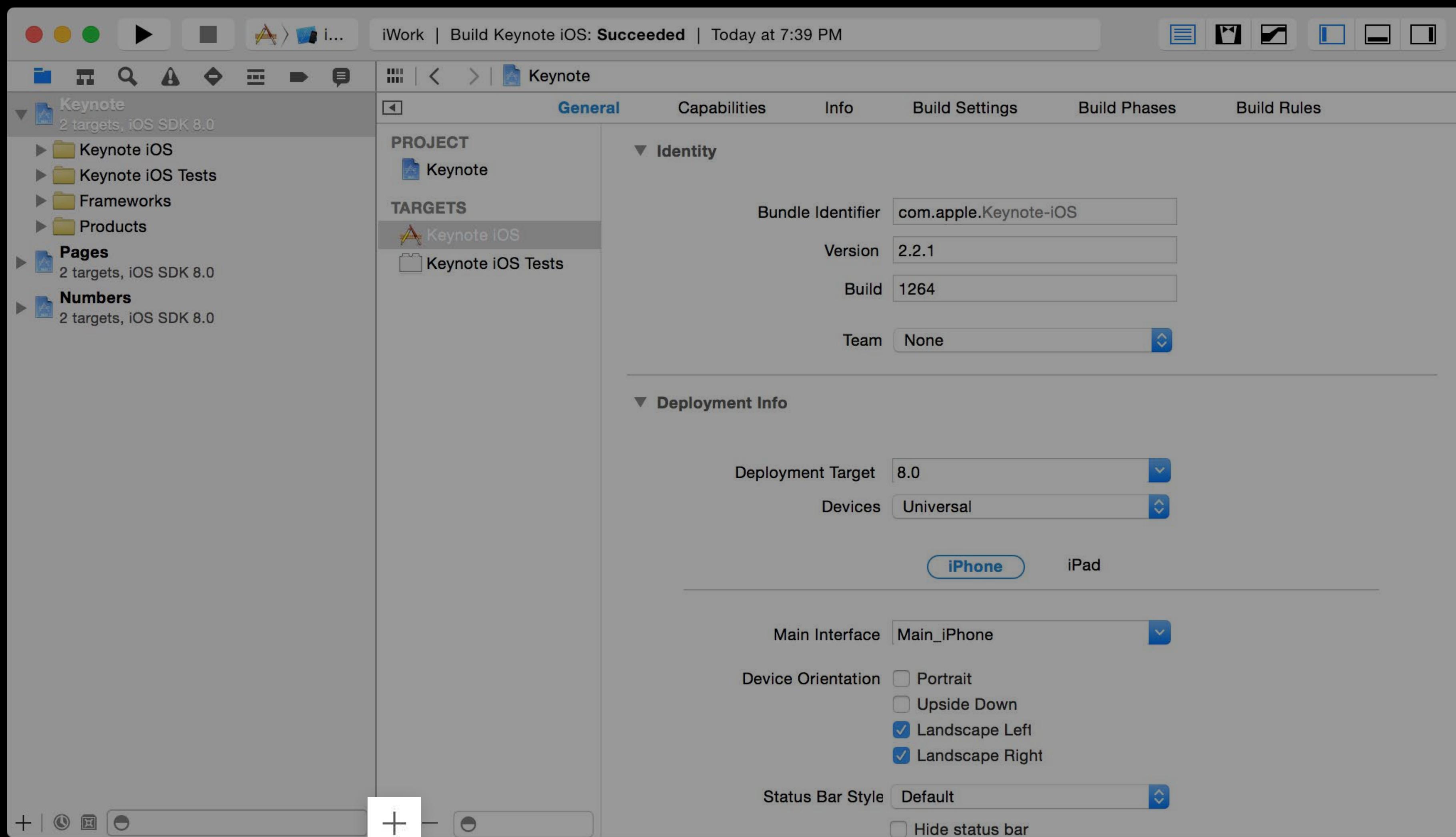
Targets

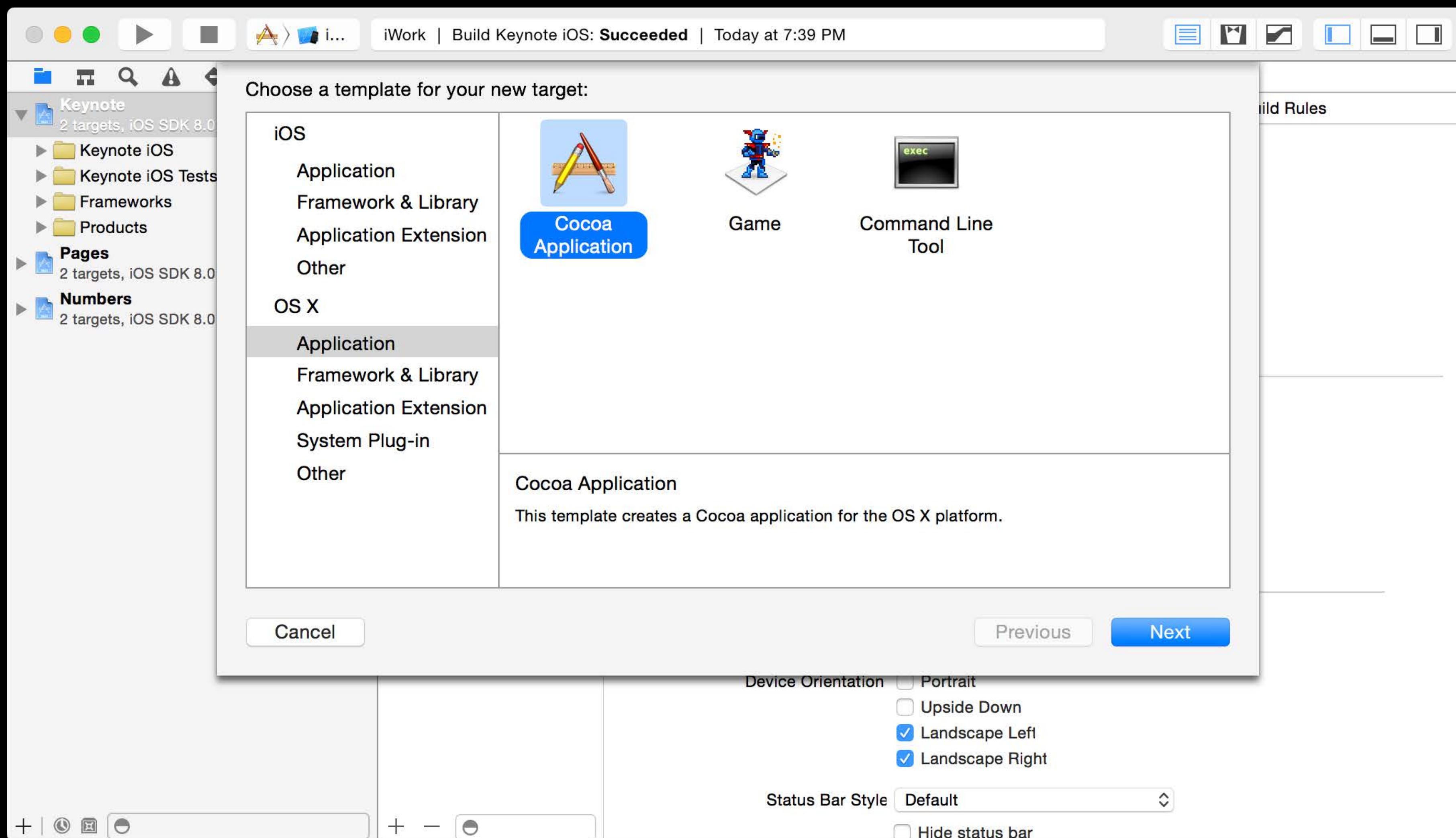
Defines a single product to build
Organizes inputs into build system
Owned by projects

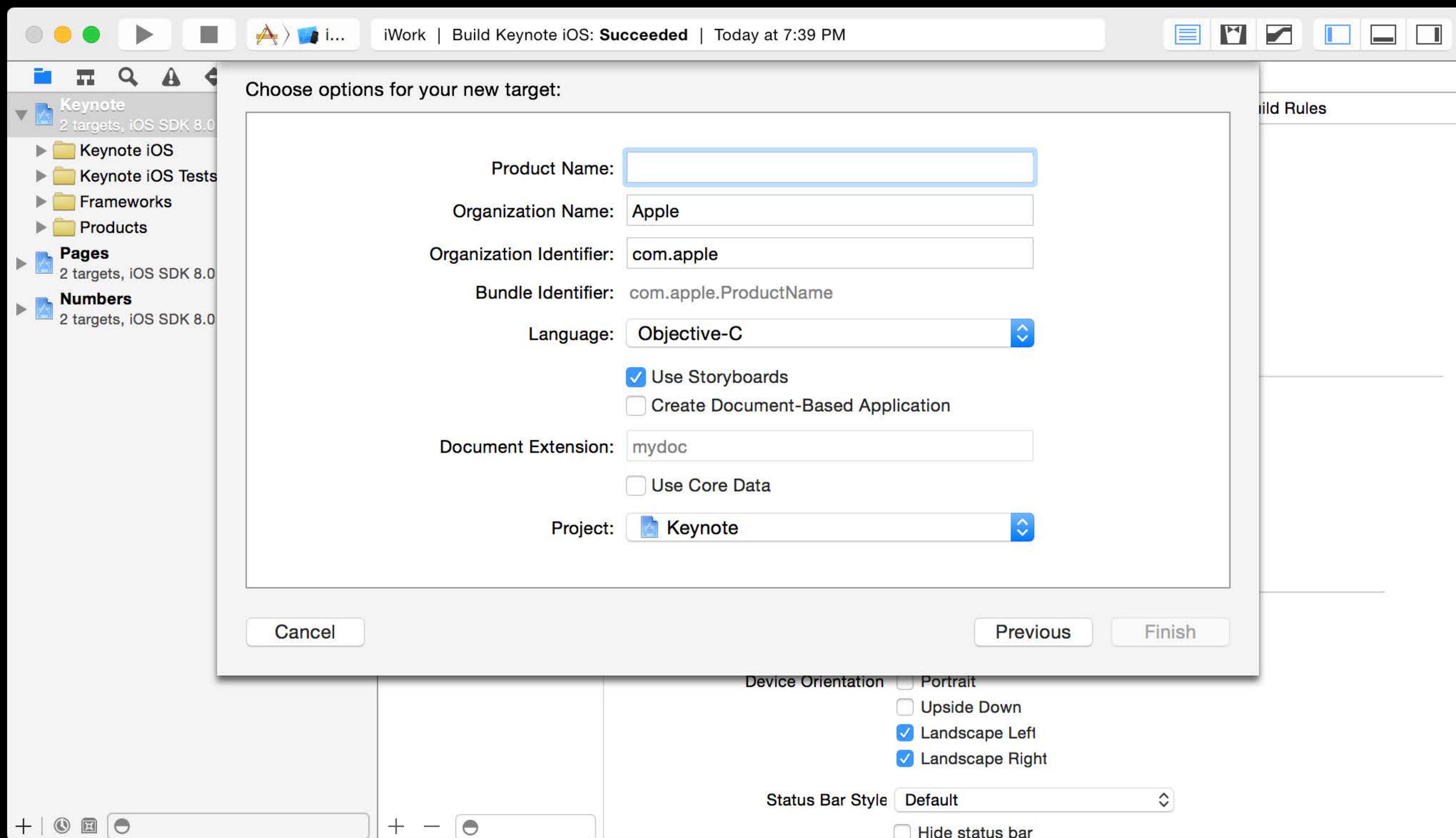


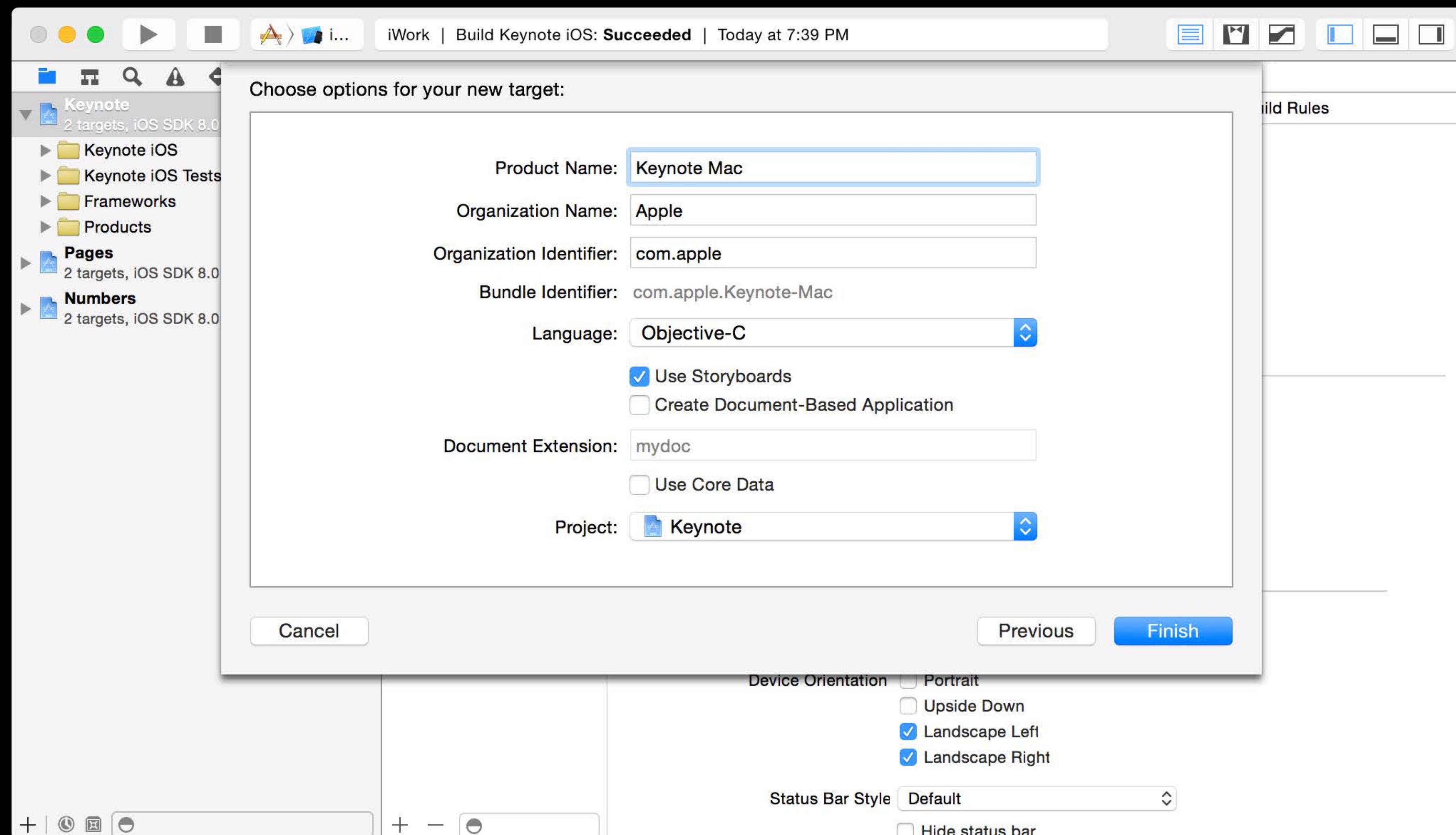


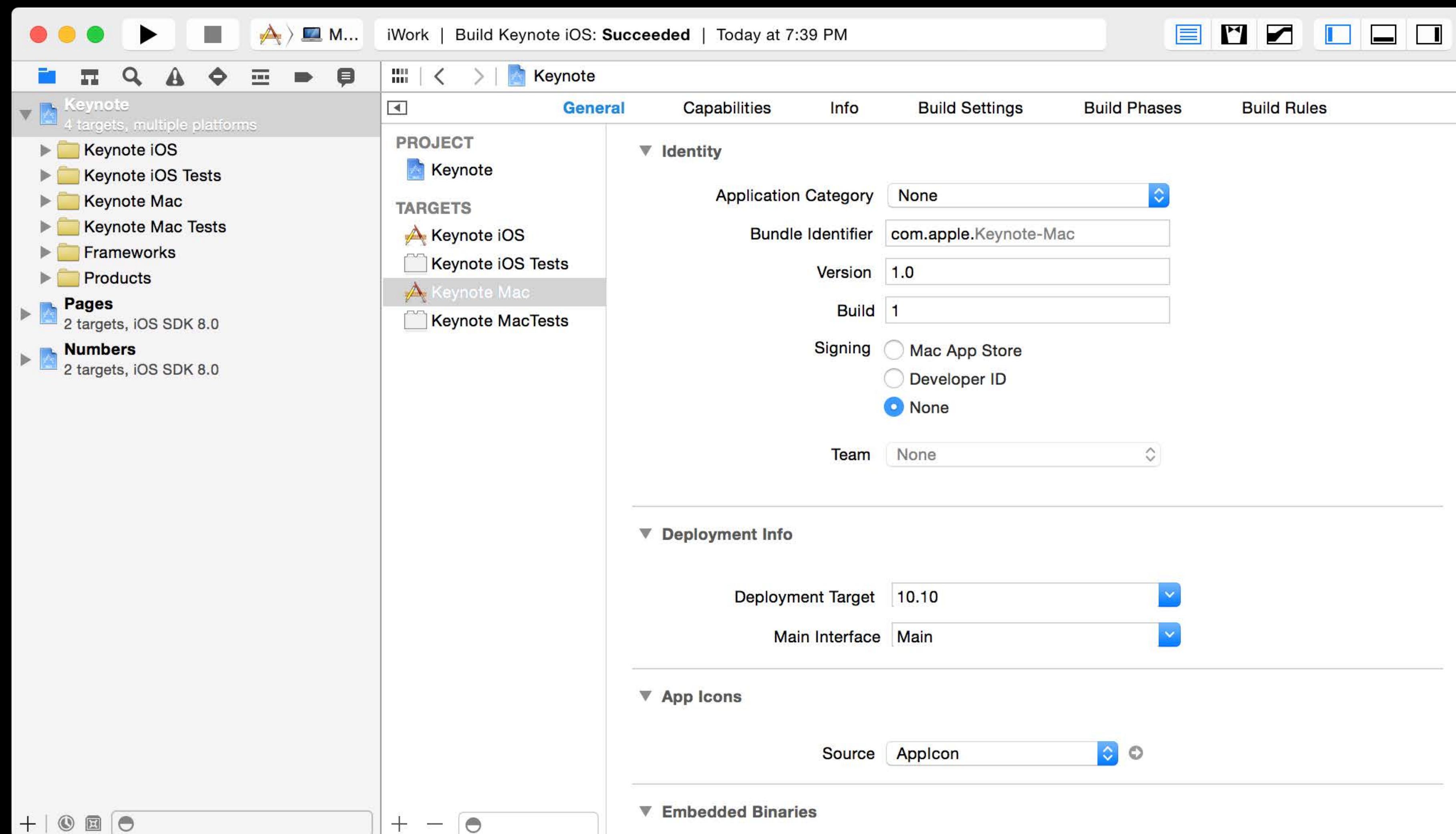


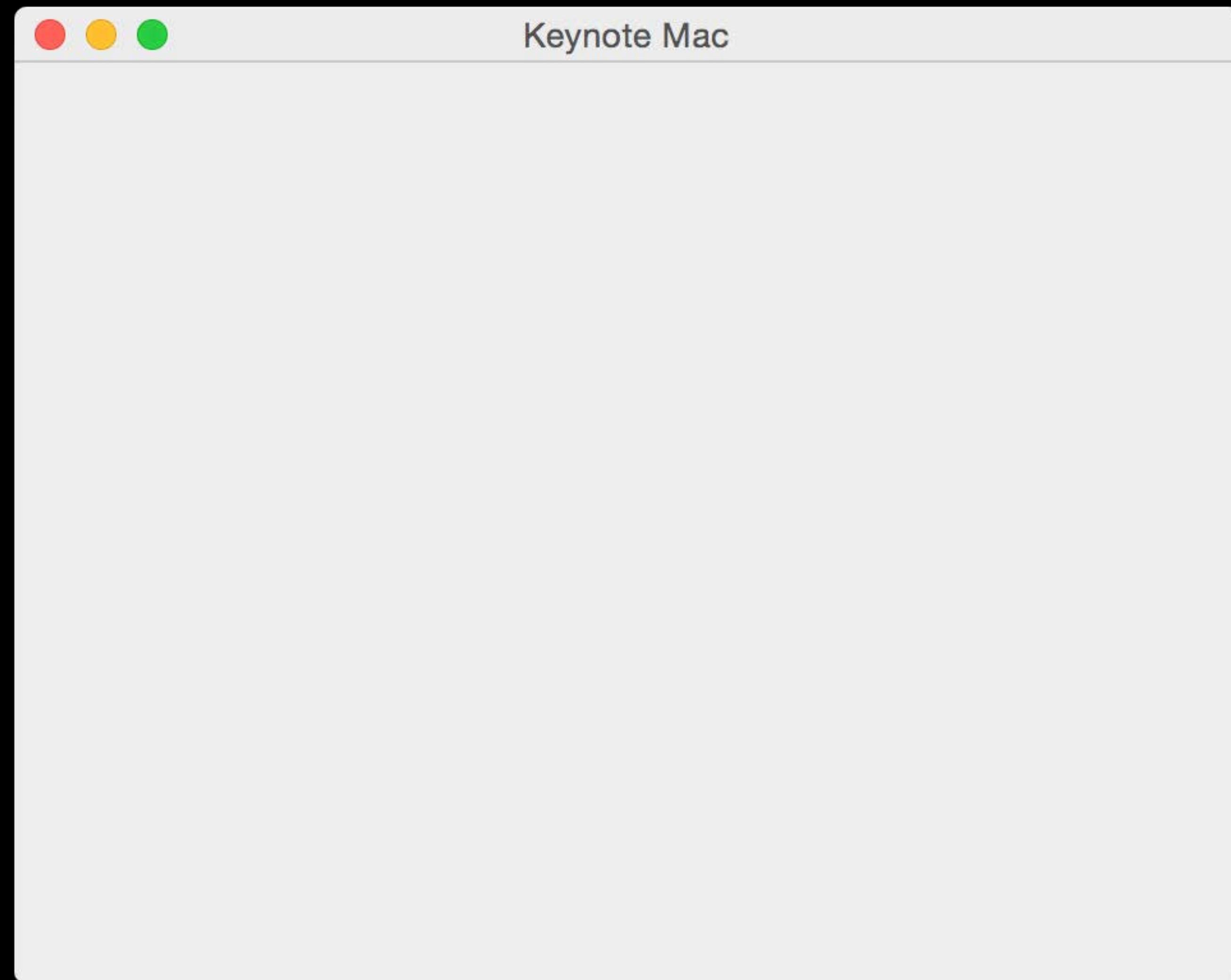


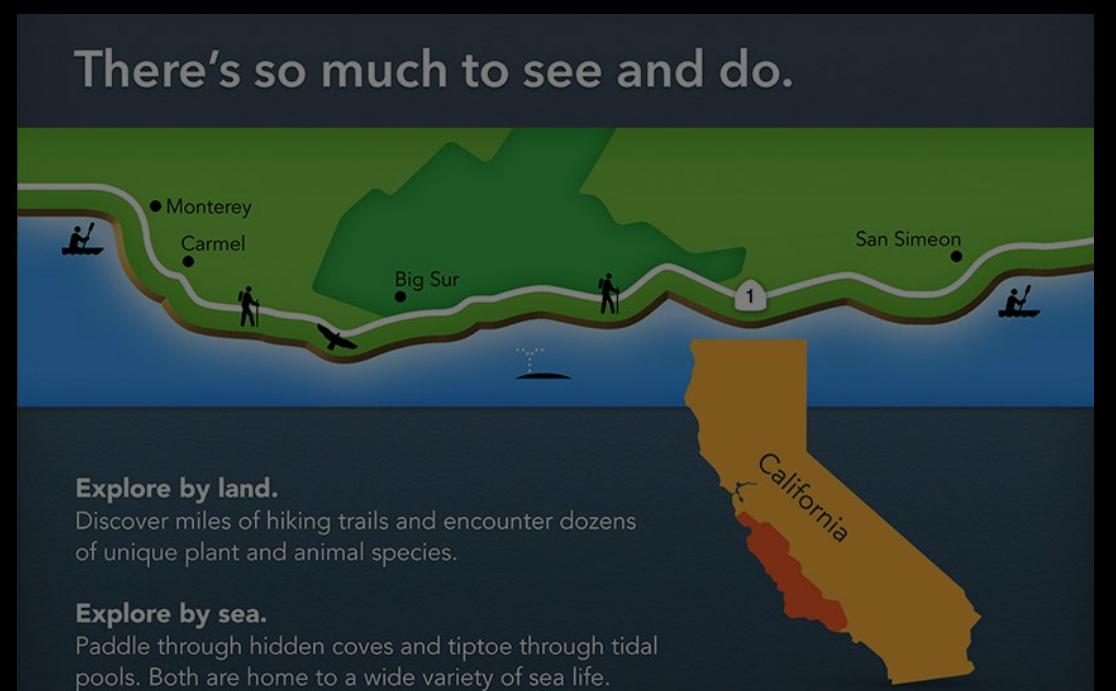












Canvas



Persistence



Common Utilities



Canvas



Persistence



Common Utilities



Canvas



Persistence



Common Utilities



Canvas



Persistence



Common Utilities

Libraries



Libraries

Contains shared code



Libraries

Contains shared code

Useful when sharing between projects

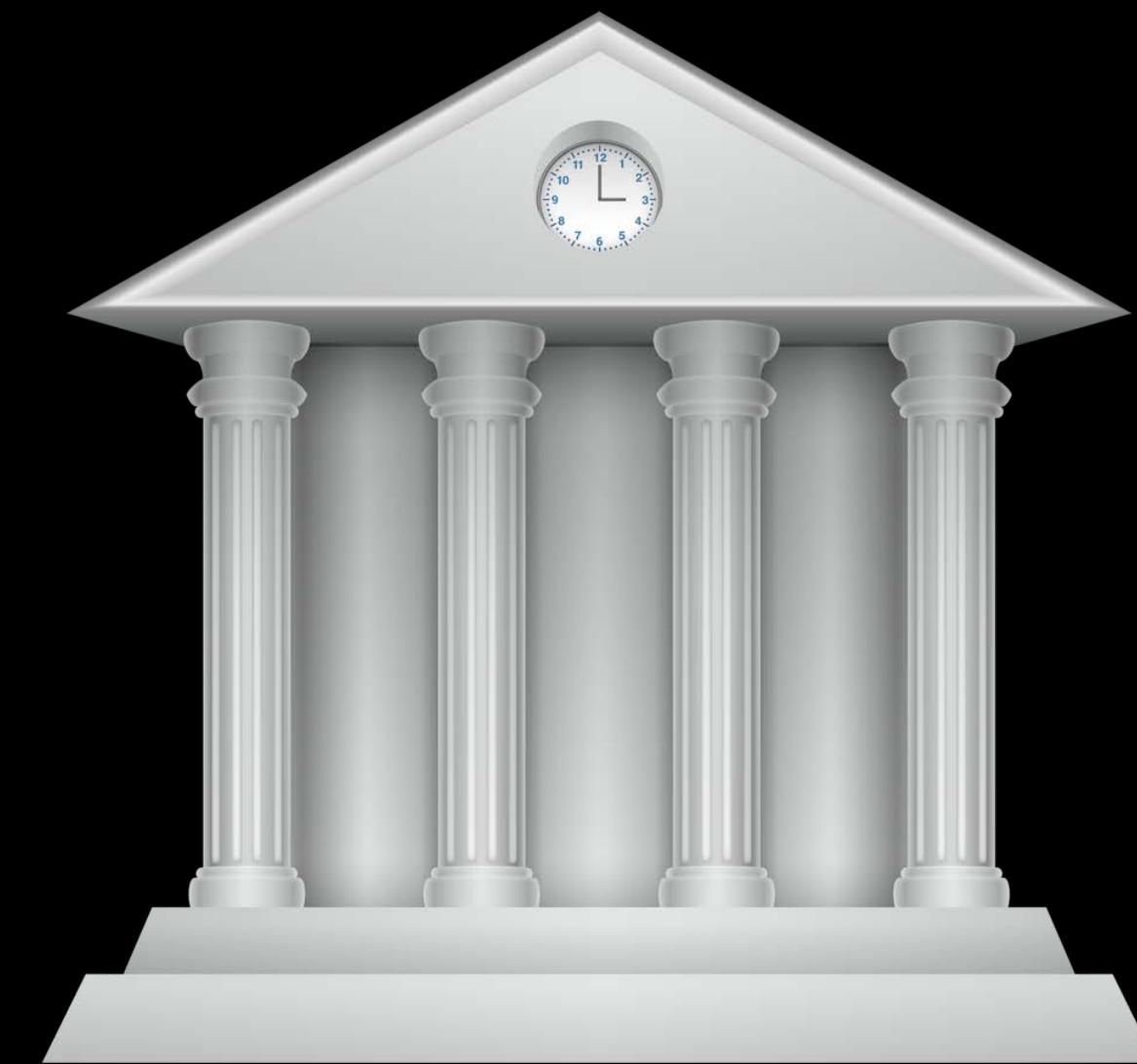


Libraries

Contains shared code

Useful when sharing between projects

Static or dynamic



Static vs. Dynamic Libraries

Static vs. Dynamic Libraries

Static libraries are

- Built with the project

Static vs. Dynamic Libraries

Static libraries are

- Built with the project
- Included as part of the executable

Static vs. Dynamic Libraries

Static libraries are

- Built with the project
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Dynamic libraries are

Static vs. Dynamic Libraries

Static libraries are

- Built with the project
- Included as part of the executable

Dynamic libraries are

- Optionally built with the project

Static vs. Dynamic Libraries

Static libraries are

- Built with the project
- Included as part of the executable

Dynamic libraries are

- Optionally built with the project
- Excluded from the executable

Frameworks

NEW



Frameworks



Packaged dynamic library



Frameworks



Packaged dynamic library

Compiled binary and headers



Frameworks



Packaged dynamic library

Compiled binary and headers



- Building Modern Frameworks



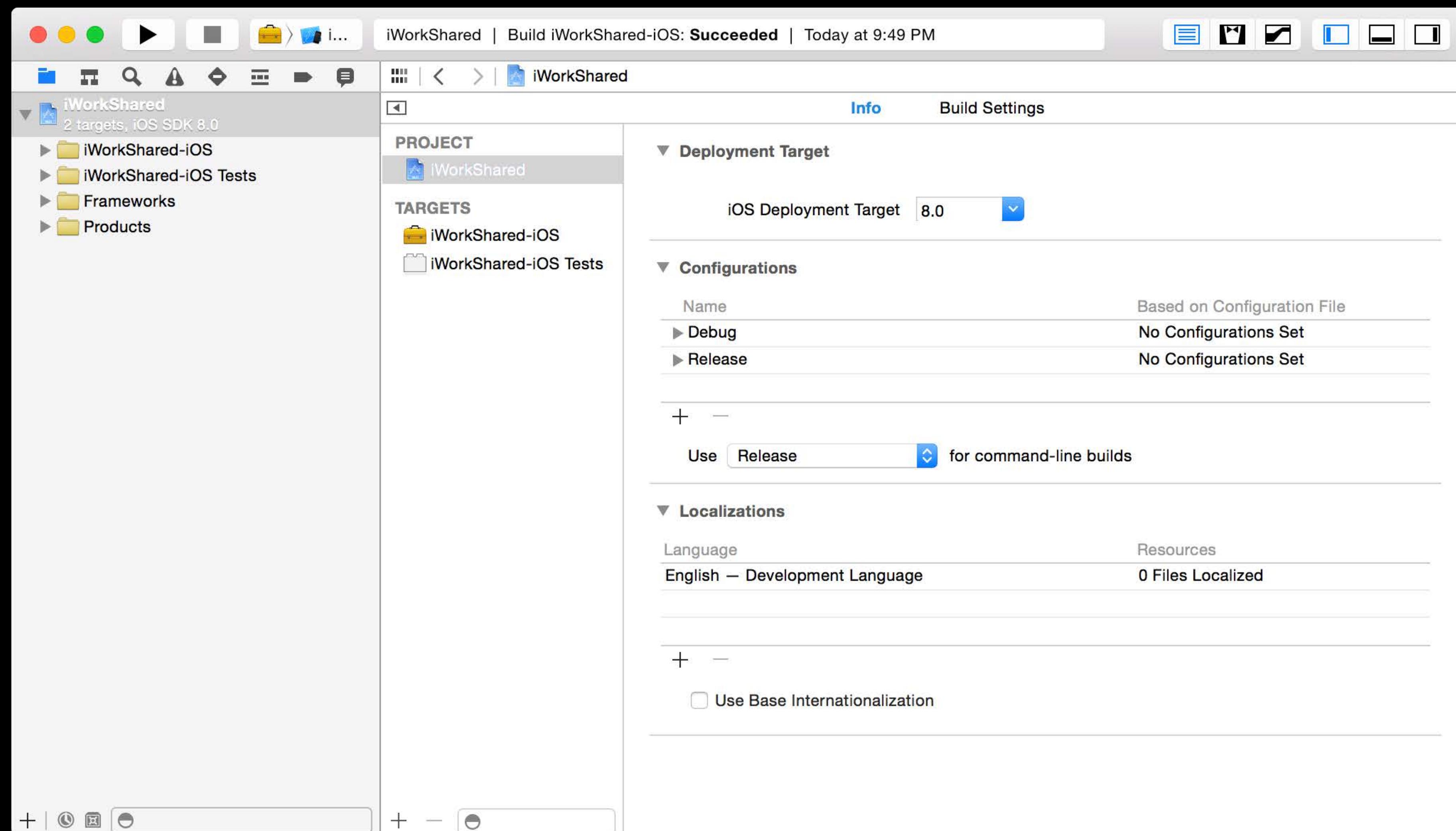
iWorkAppShared-iOS

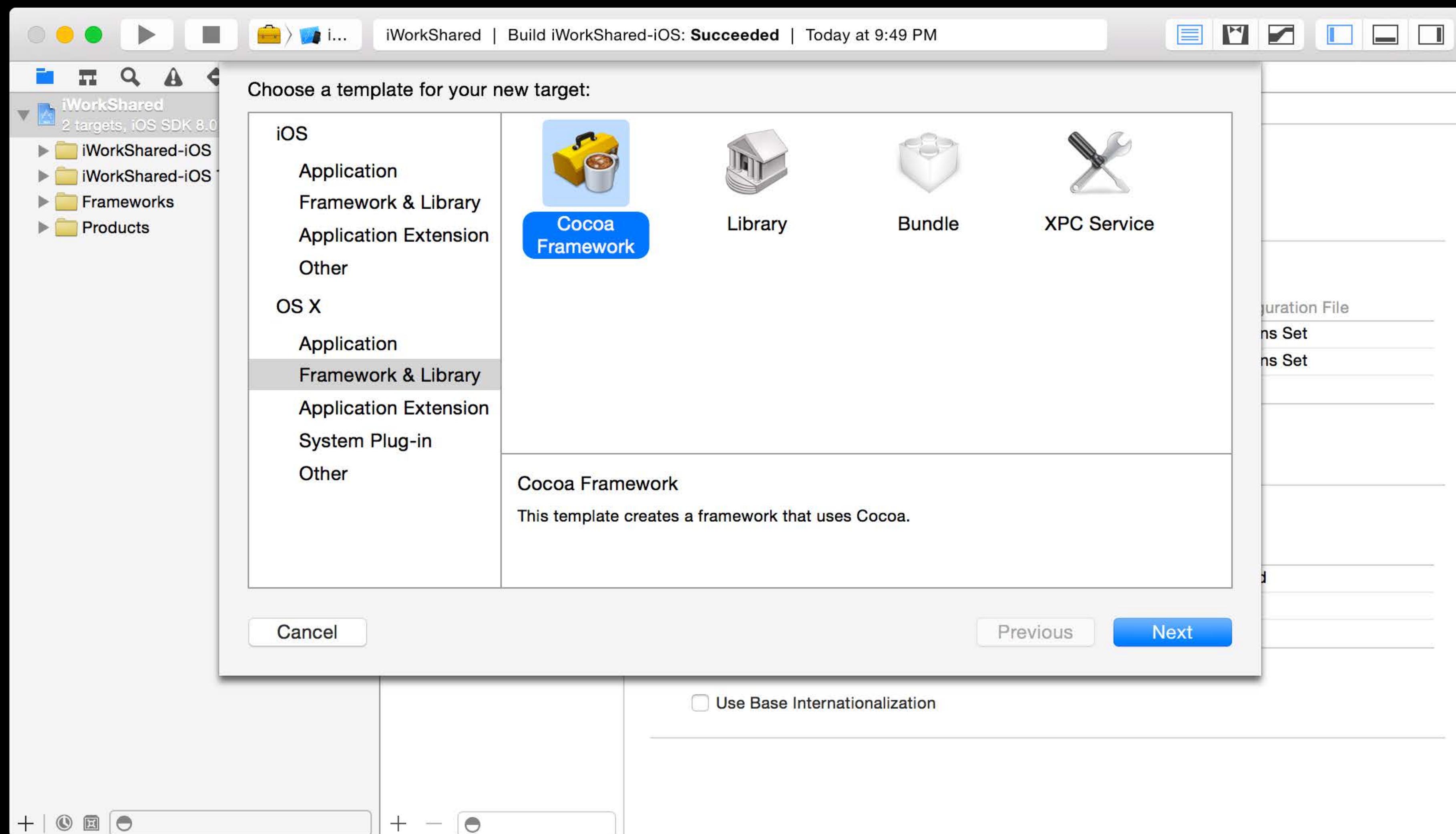


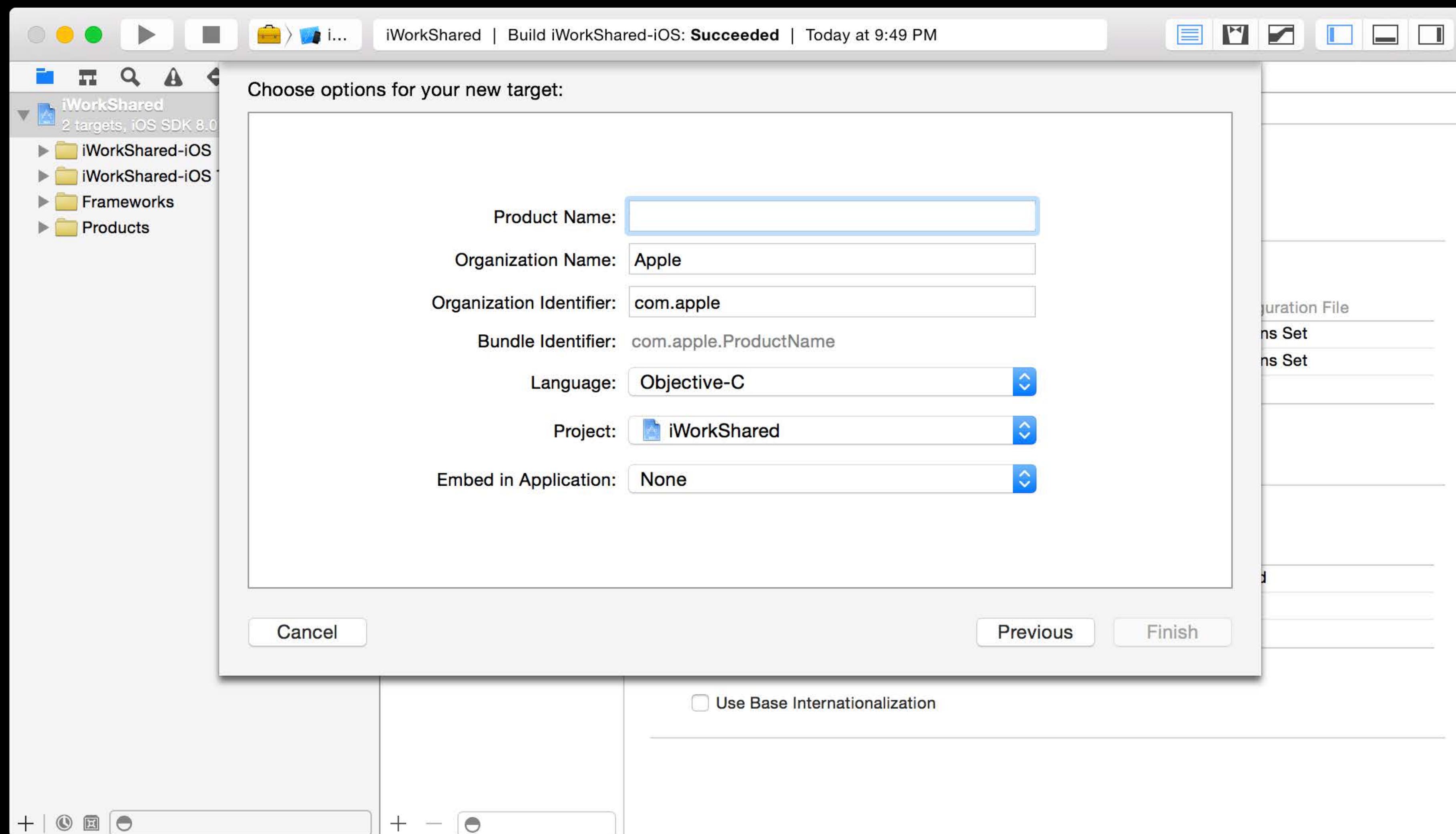
iWorkAppShared-iOS

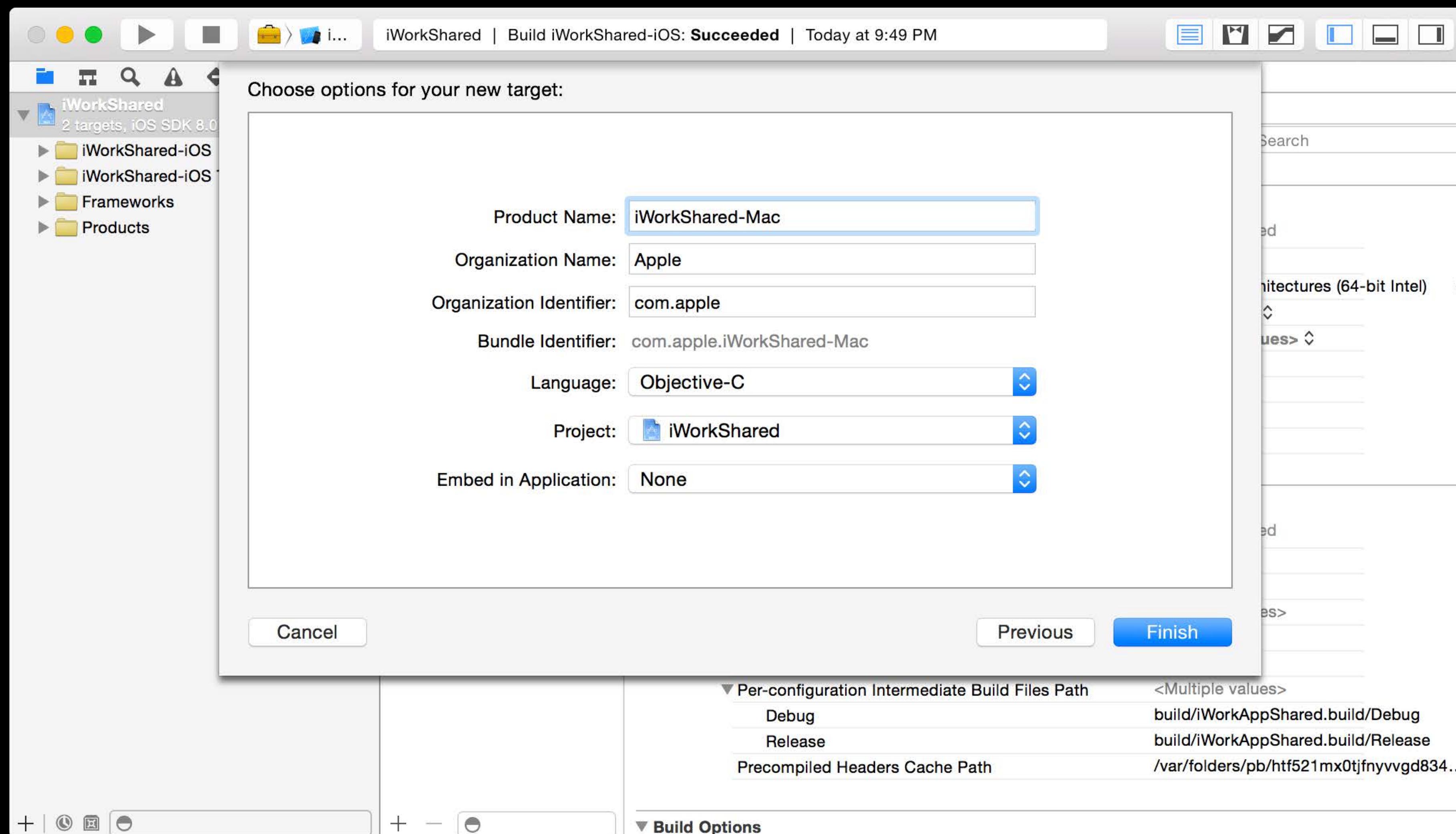


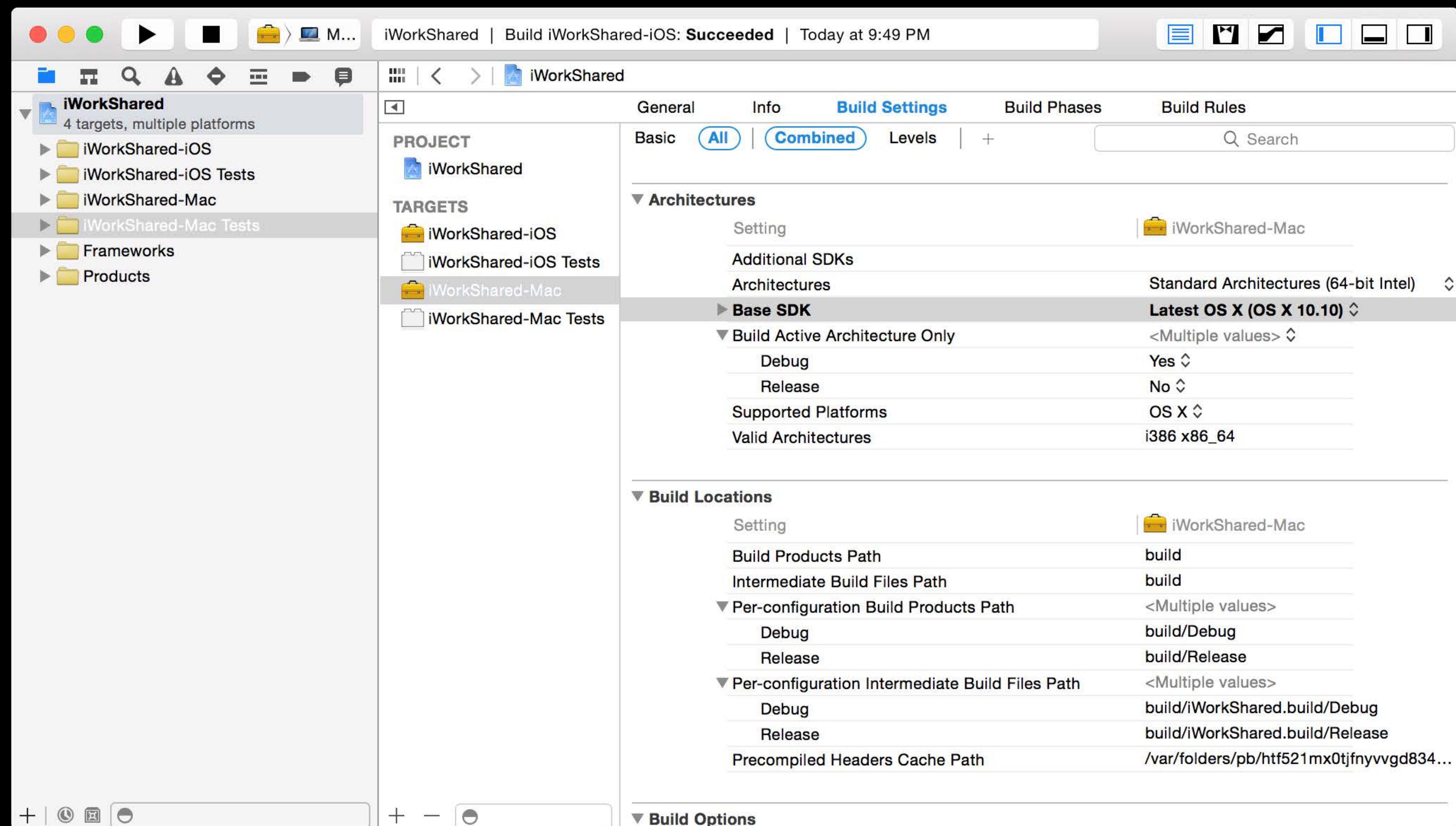
iWorkAppShared-Mac

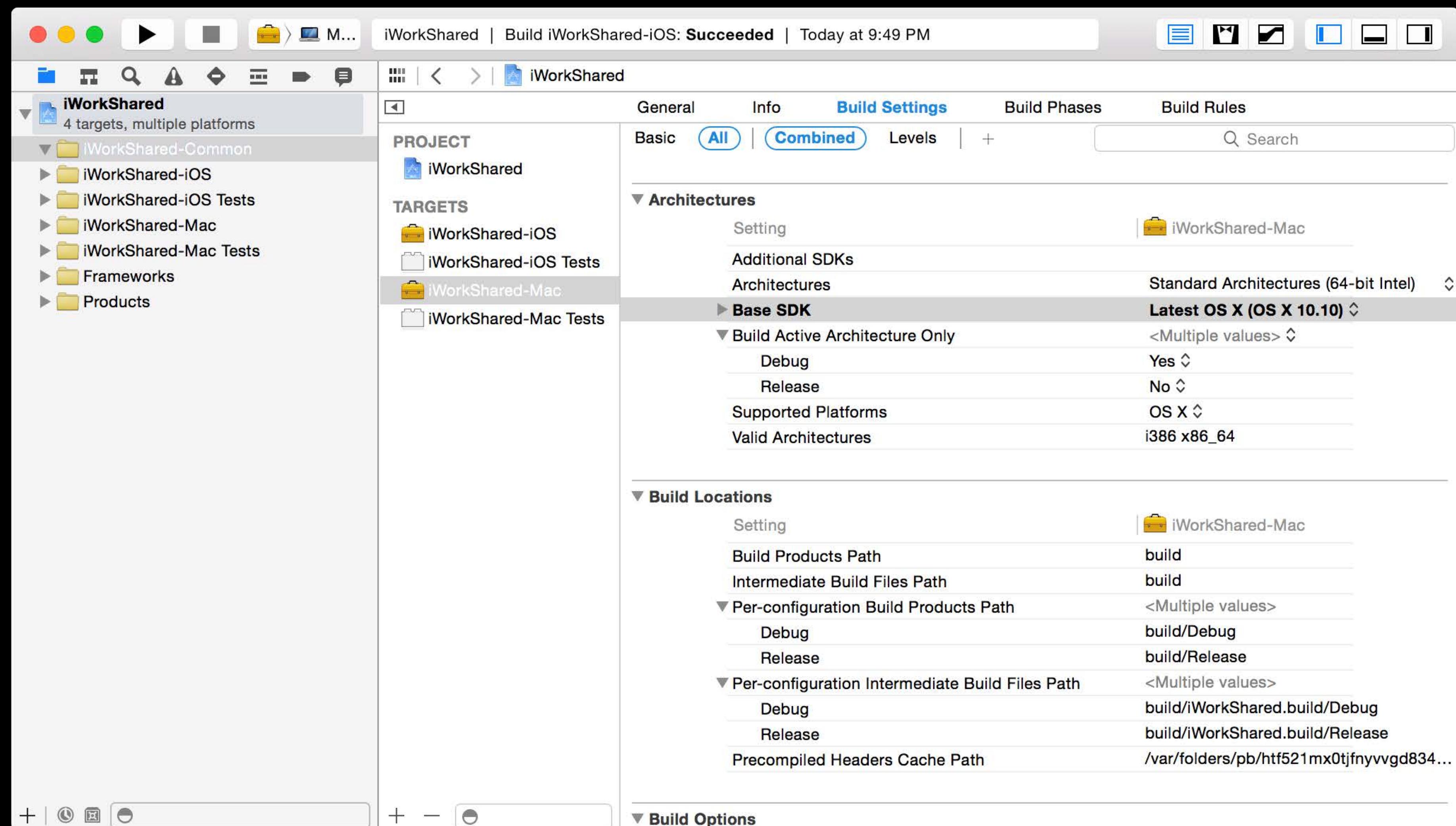


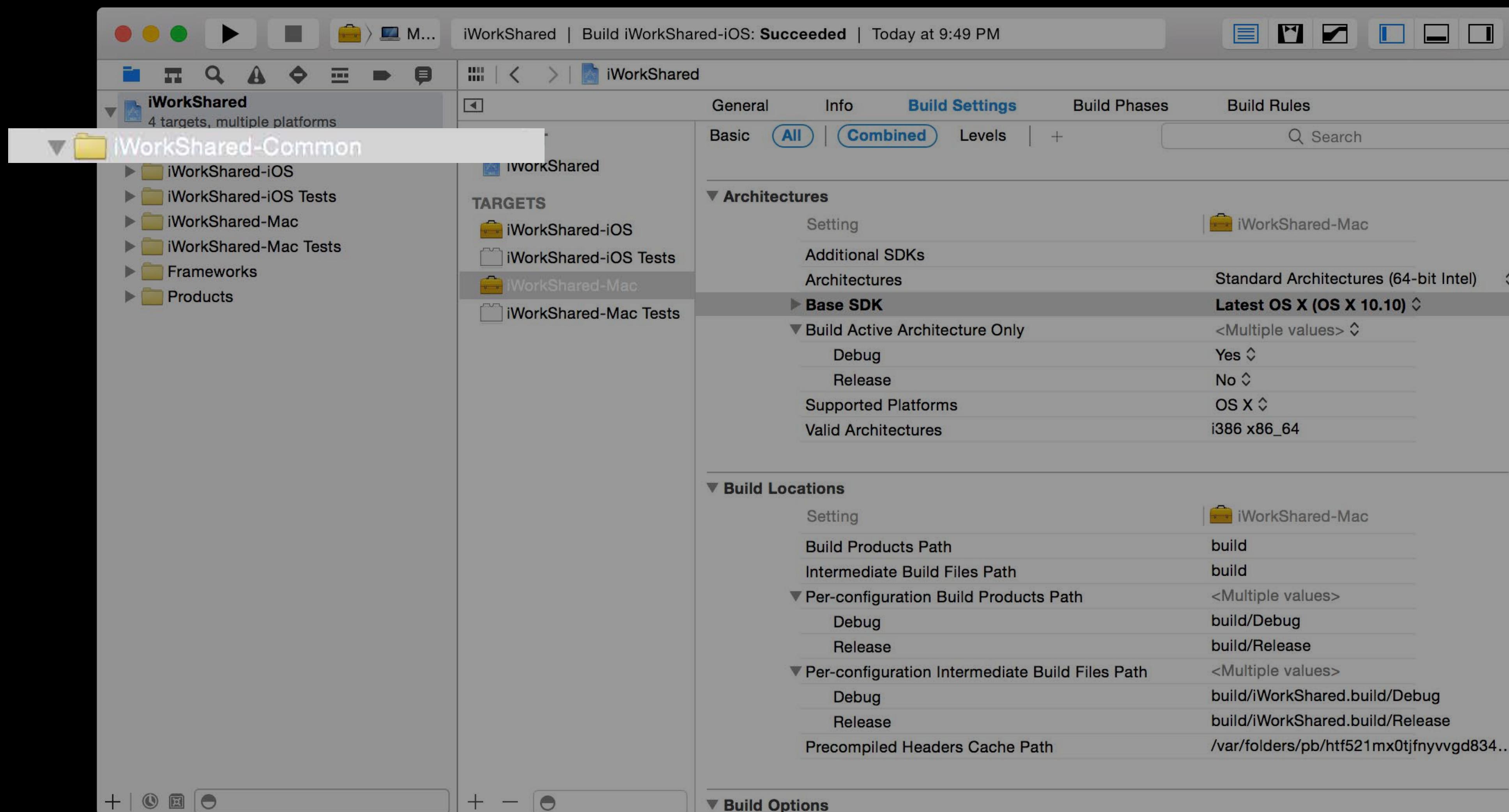












iWorkiOSDocument

iWorkiOSDocument

iWorkMacDocument

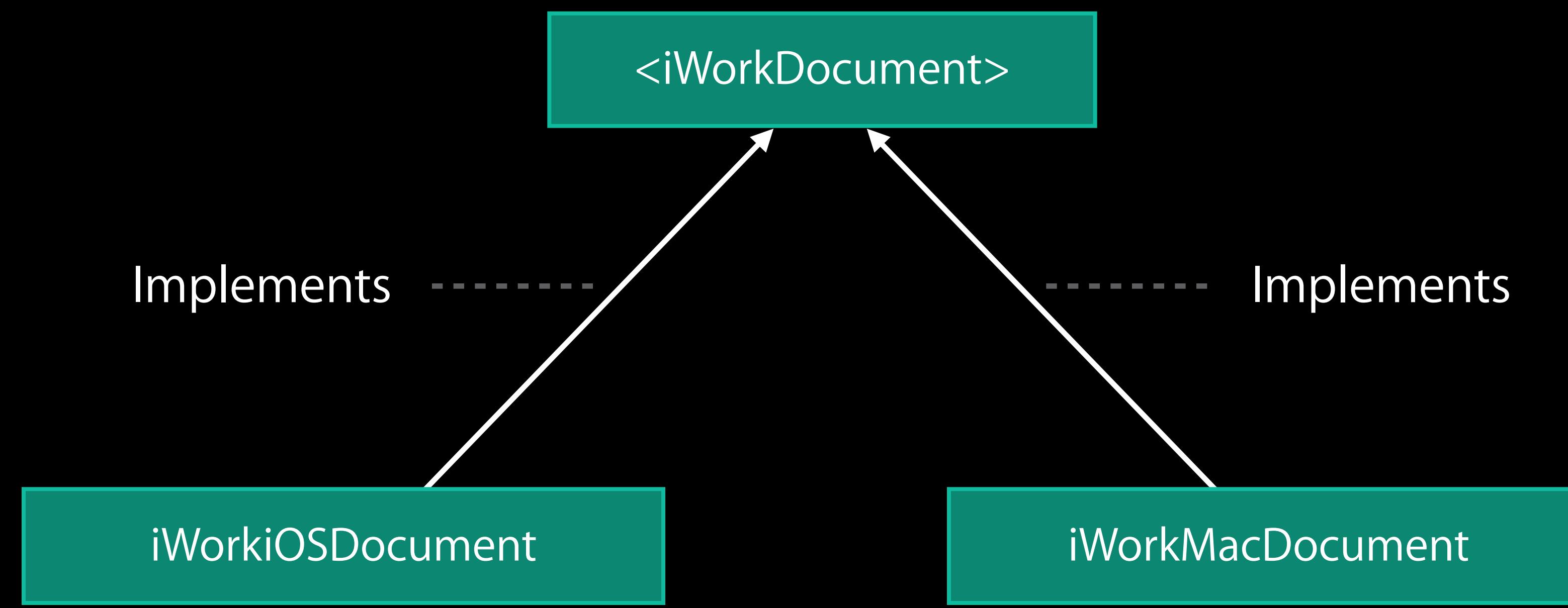
iWorkiOSDocument

iWorkMacDocument

<iWorkDocument>

iWorkiOSDocument

iWorkMacDocument



The screenshot shows the Xcode interface with the following details:

- Project Navigator:** Shows the project structure under "iWorkShared".
 - iWorkShared**: 4 targets, multiple platforms.
 - iWorkShared-Common**: Contains **iWorkDocument.h**, **iWorkDocumentObject.h**, and **iWorkDocumentObject.m**.
 - iWorkShared-iOS**
 - iWorkShared-iOS Tests**
 - iWorkShared-Mac**
 - iWorkShared-Mac Tests**
 - Frameworks**
 - Products**
- Editor Area:** Displays the content of **iWorkDocument.h**. The file is a header file for the **iWorkDocument** protocol, defining properties for document URL and UUID, and methods for adding and removing document objects, as well as saving the document.
- Toolbar:** Standard Xcode toolbar with icons for file operations, search, and build status.
- StatusBar:** Shows the build status as "Succeeded" and the date/time as "Today at 10:32 PM".

```
1 //  
2 // iWorkDocument.h  
3 // iWorkShared  
4 //  
5 // Created by Chris Cowdery-Corvan on 6/2/14.  
6 // Copyright (c) 2014 Apple Inc. All rights reserved.  
7 //  
8  
9 #import "iWorkDocumentObject.h"  
10  
11 @protocol iWorkDocument <NSObject>  
12  
13 /// Location of the document. Can be either on disk or iCloud.  
14 @property(readonly, nonatomic) NSURL *documentURL;  
15  
16 /// Unique identifier for this document.  
17 @property(readonly, nonatomic) NSUUID *documentUUID;  
18  
19 /// Add an object to the document. This ensures it will be saved when the document is written.  
20 - (void) addDocumentObject:(iWorkDocumentObject*)documentObject;  
21  
22 /// Remove an object from the document.  
23 - (void) removeDocumentObject:(iWorkDocumentObject*)documentObject;  
24  
25 /// List of all objects present in the document;  
26 - (NSOrderedSet*)documentObjects;  
27  
28 /// Saves the document to its associated URL.  
29 - (void) save;  
30  
31 @end
```

The screenshot shows the Xcode interface with the following details:

- Project Navigator:** Shows the project structure under "iWorkShared".
 - iWorkShared:** 4 targets, multiple platforms.
 - iWorkShared-Common:** Contains `iWorkDocument.h`, `iWorkDocumentObject.h`, and `iWorkDocumentObject.m`.
 - iWorkShared-Mac:** Contains `iWorkShared-Mac.h`, `iWorkMacDocument.h` (selected), and `iWorkMacDocument.m`.
 - Supporting Files:** Contains `Info.plist`.
 - iWorkShared-iOS:**
 - iWorkShared-iOS Tests:**
 - iWorkShared-Mac Tests:**
 - Frameworks:**
 - Products:**- Editor:** Displays the content of `iWorkMacDocument.h`.

```
// iWorkMacDocument.h
// iWorkShared
//
// Created by Chris Cowdery-Corvan on 6/2/14.
// Copyright (c) 2014 Apple Inc. All rights reserved.

#import "iWorkDocument.h"

#import <AppKit/AppKit.h>

@interface iWorkMacDocument : NSDocument <iWorkDocument>
@end
```
- Toolbar:** Standard Xcode toolbar with icons for file operations, search, and build status.
- Status Bar:** Shows "iWorkShared | Build iWorkShared-Mac: Succeeded | Today at 10:50 PM".

The screenshot shows the Xcode interface with the following details:

- Project Navigator:** Shows the project structure under "iWorkShared".
 - iWorkShared:** 4 targets, multiple platforms.
 - iWorkShared-Common:** Contains `iWorkDocument.h`, `iWorkDocumentObject.h`, and `iWorkDocumentObject.m`.
 - iWorkShared-Mac:** Contains `iWorkShared-Mac.h`, `iWorkMacDocument.h`, and `iWorkMacDocument.m`. The `iWorkMacDocument.m` file is selected.
 - Supporting Files**
 - iWorkShared-Mac Tests**
 - Frameworks**
 - Products**
- Editor:** Displays the code for `iWorkMacDocument.m`. The code is a stub implementation for a Mac document class.

```
// iWorkMacDocument.m
// iWorkShared
//
// Created by Chris Cowdery-Corvan on 6/2/14.
// Copyright (c) 2014 Apple Inc. All rights reserved.

#import "iWorkMacDocument.h"

@implementation iWorkMacDocument

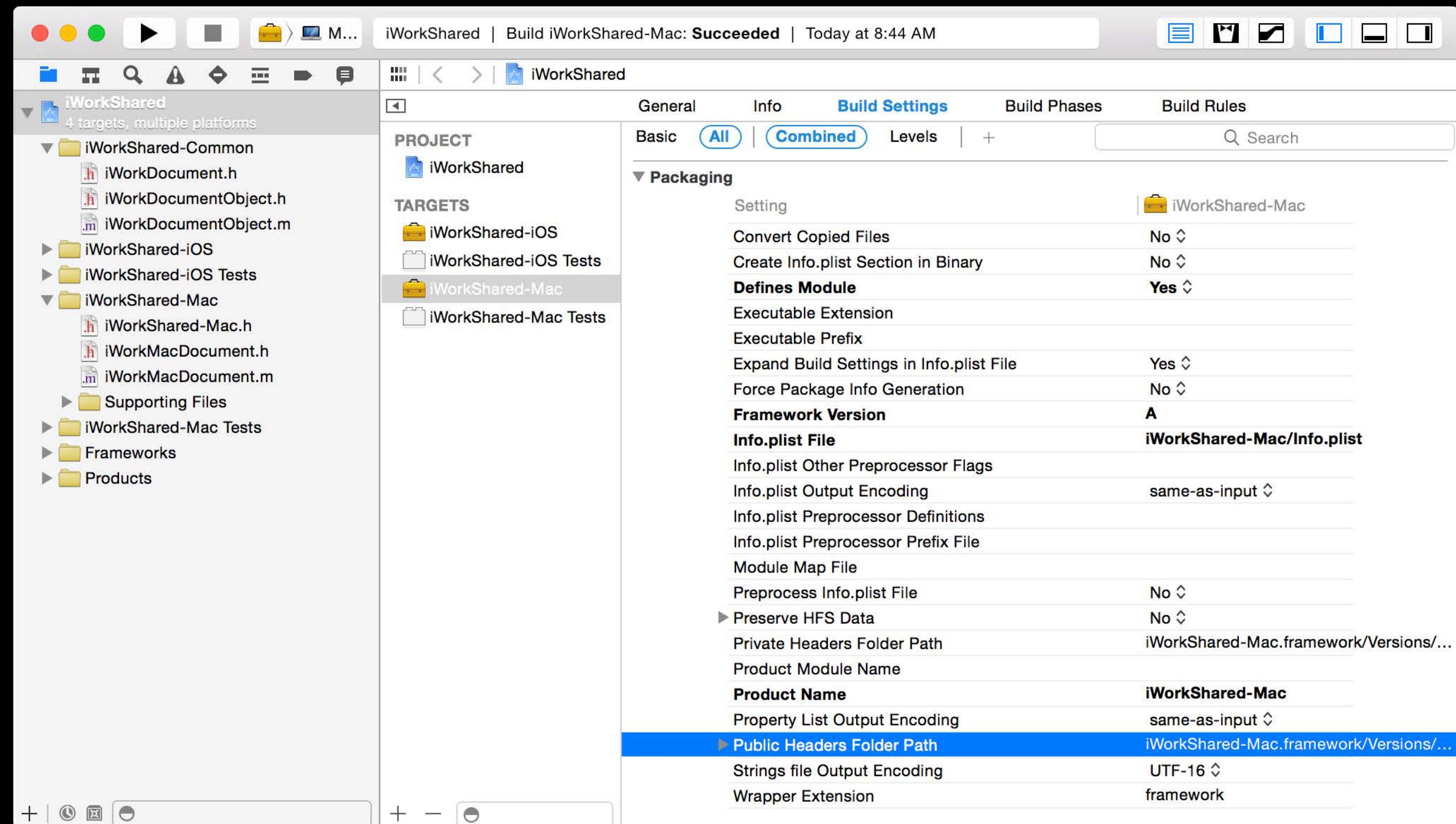
- (NSURL*) documentURL
{
    return NSSomethingRespectable();
}

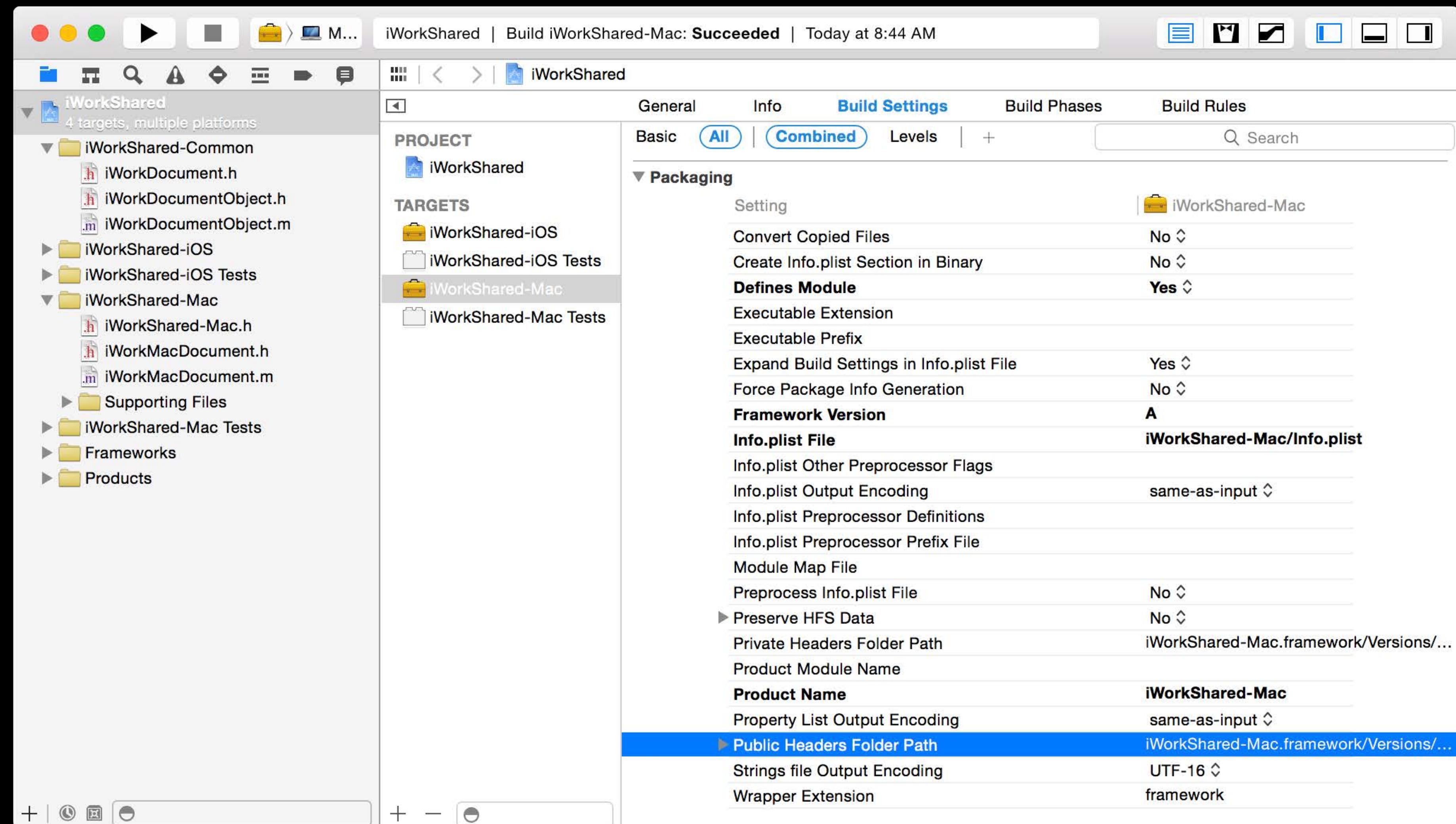
- (NSUUID*) documentUUID
{
    return NSIThinkThatsMyDocument();
}

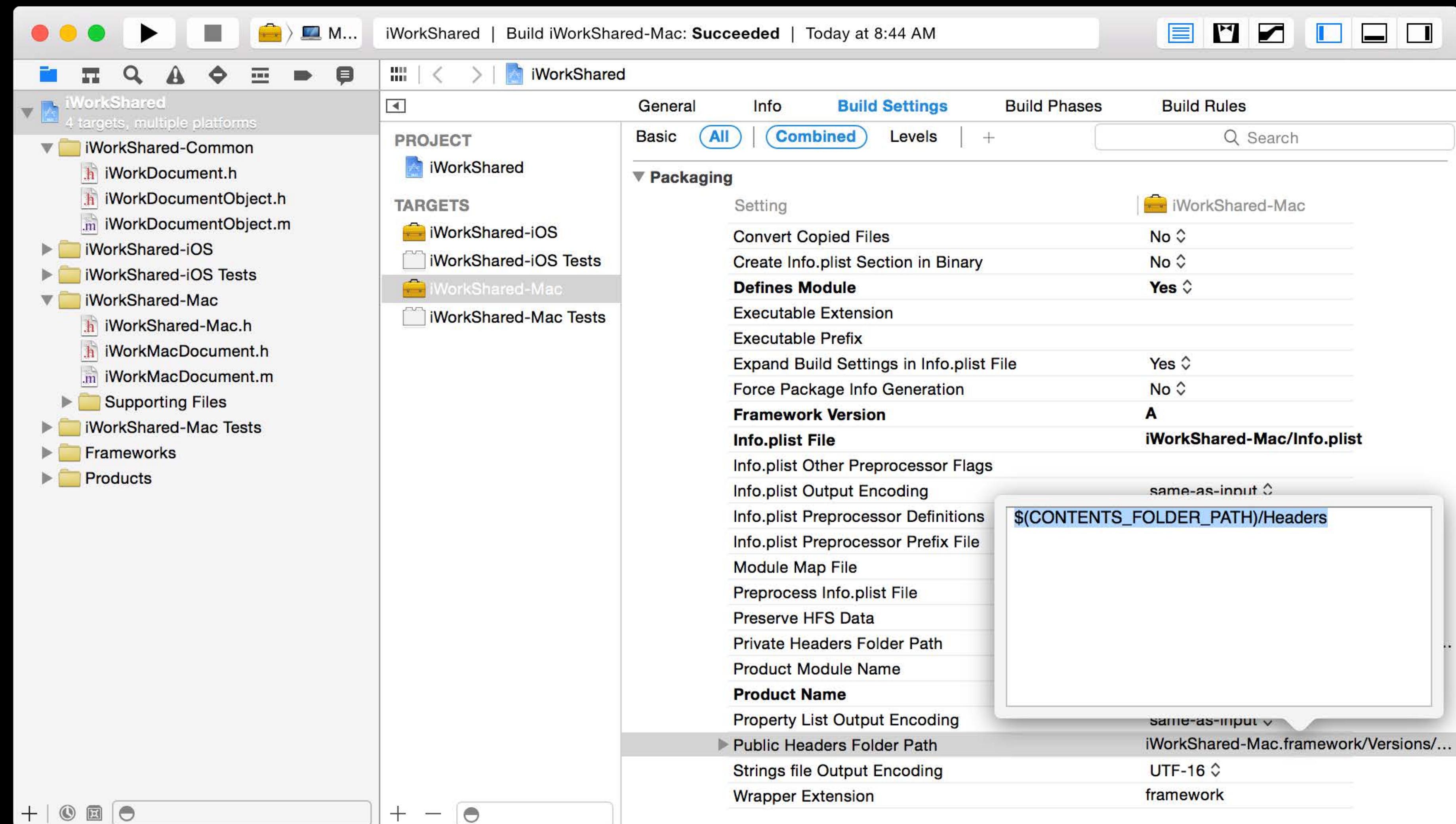
- (void) addDocumentObject:(iWorkDocumentObject *)documentObject
{
    NSNothingToDoHere();
}

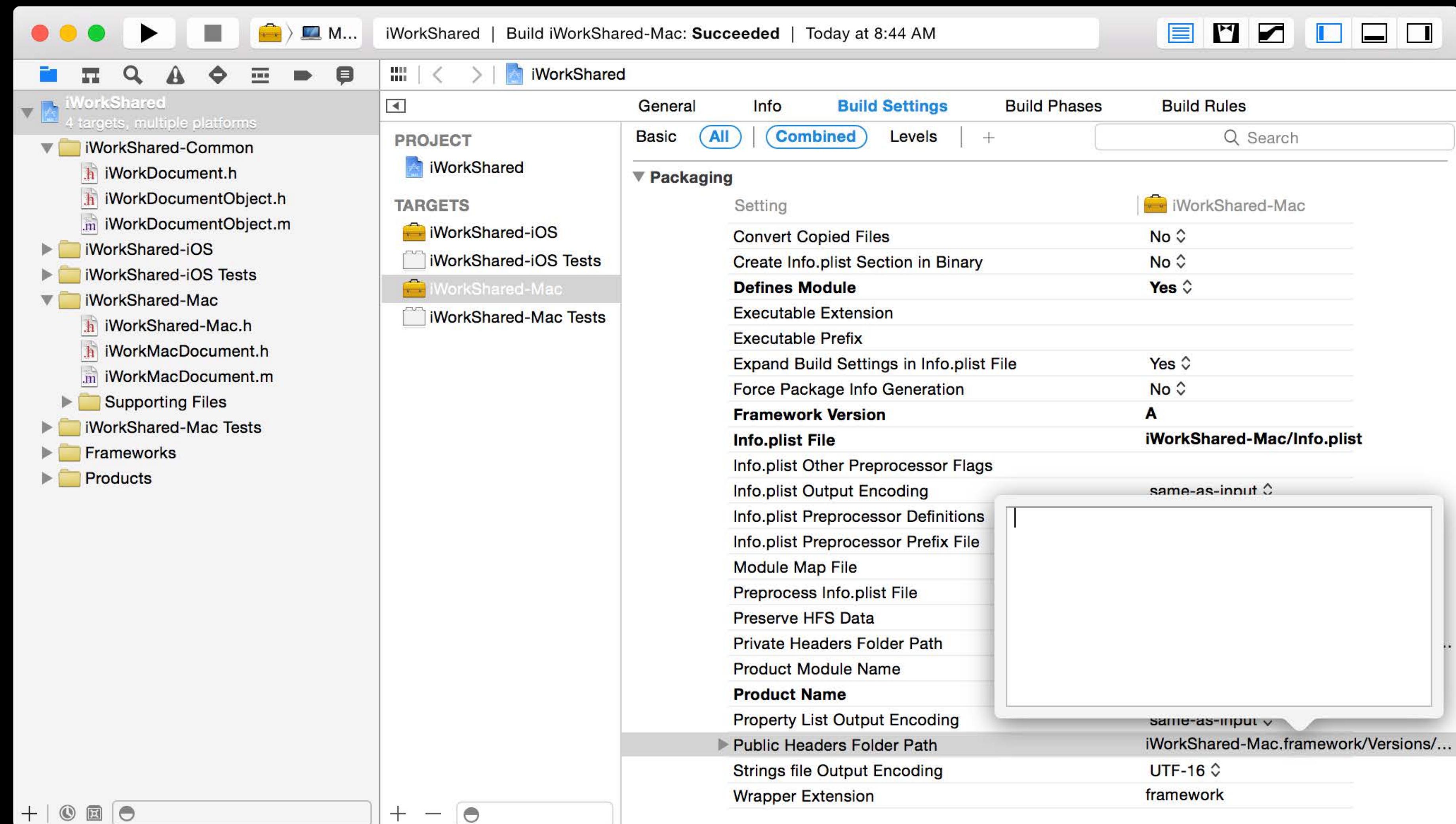
- (void) removeDocumentObject:(iWorkDocumentObject *)documentObject
{
    NSJazzHands();
}

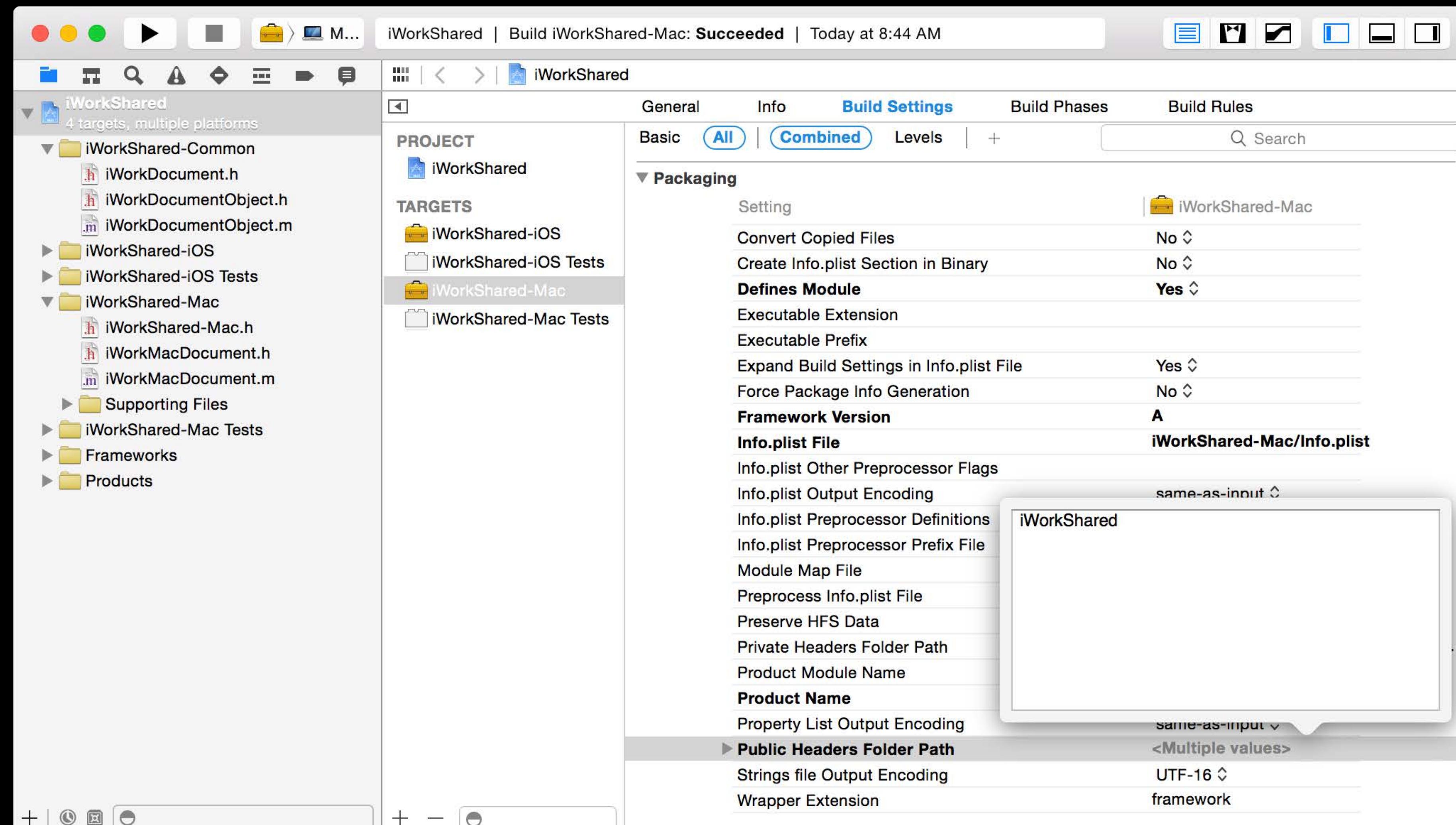
- (NSOrderedSet*) documentObjects
{
    return NSAllTheThings();
}
```
- Toolbar:** Standard Xcode toolbar with icons for file operations, search, and build status.
- Status Bar:** Shows "iWorkShared | Build iWorkShared-Mac: Succeeded | Today at 10:50 PM".

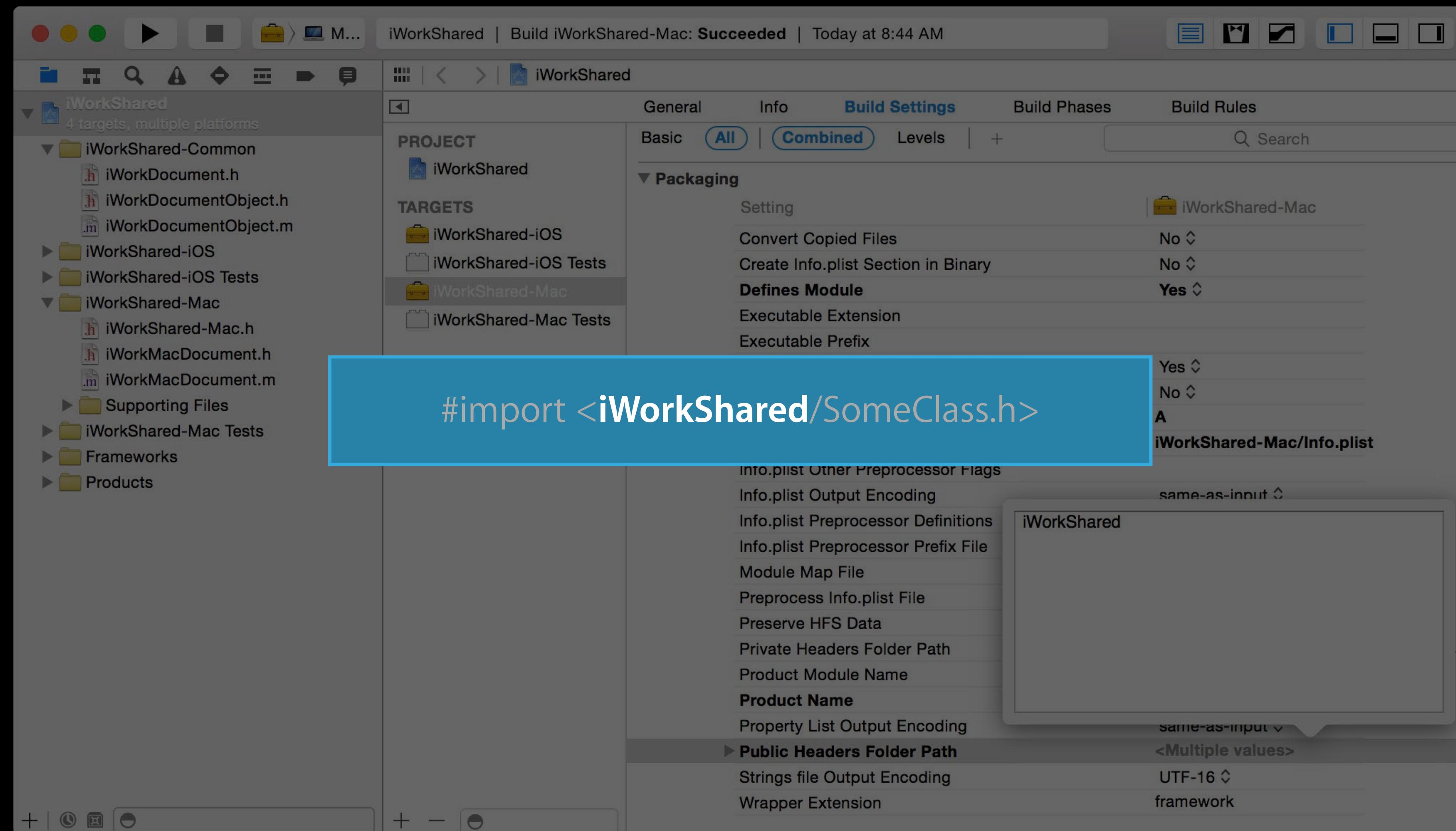


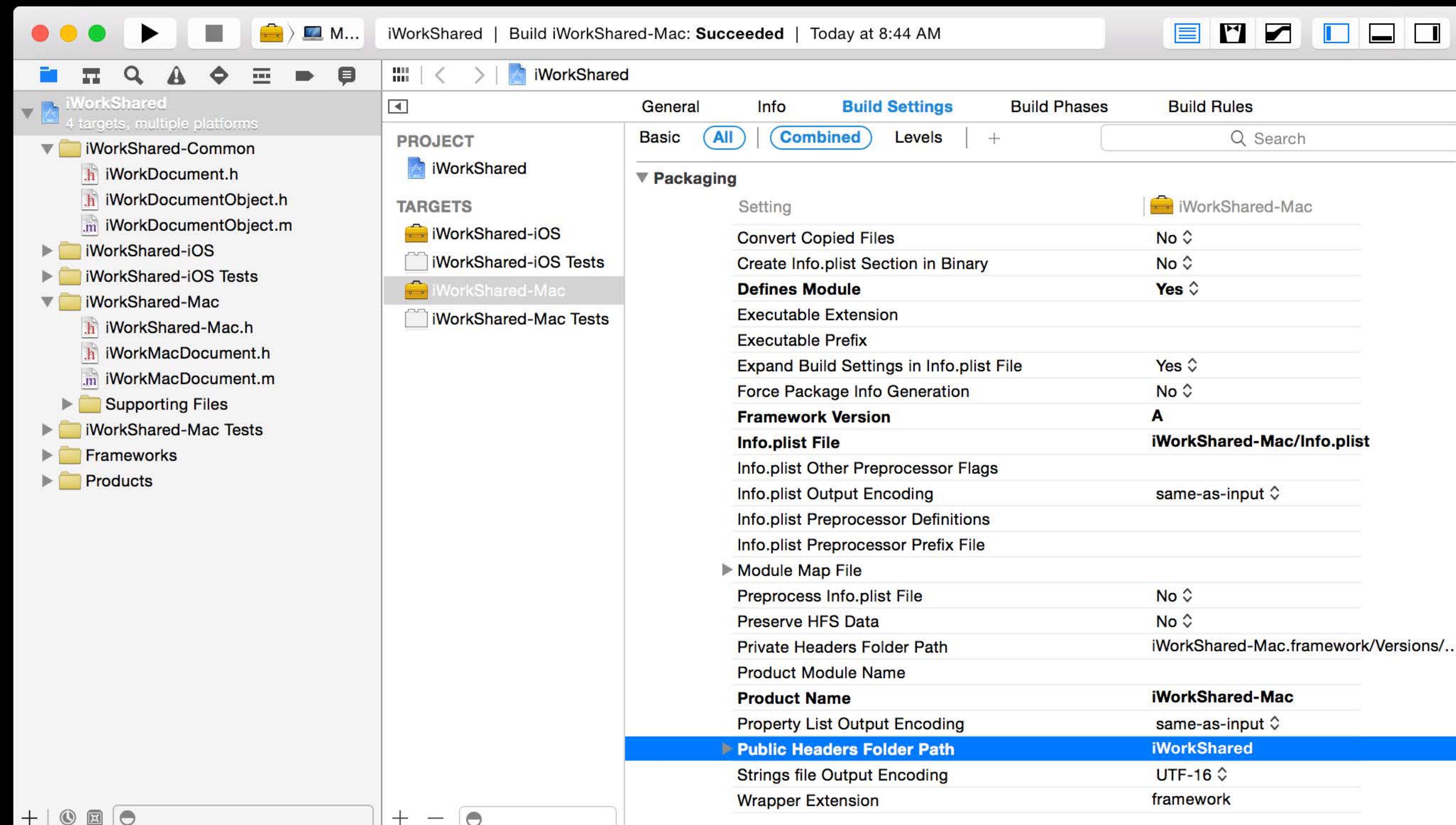












The screenshot shows the Xcode interface with the following details:

- Project Navigator:** Shows the "Keynote" project structure. The "Keynote Mac" target is selected, displaying its files:
 - KNMacDocumentWindowController.h
 - KNMacDocumentWindowController.m
 - ViewController.h
 - ViewController.m
 - AppDelegate.h
 - AppDelegate.m
 - Images.xcassets
 - Main.storyboard
- File Navigator:** Shows the file "KNMacDocumentWindowController.h" is currently open.
- Editor:** Displays the content of the "KNMacDocumentWindowController.h" file:

```
// KNMacDocumentWindowController.h
// Keynote
//
// Created by Chris Cowdery-Corvan on 6/3/14.
// Copyright (c) 2014 Apple Inc. All rights reserved.

#import <Cocoa/Cocoa.h>

@interface KNMacDocumentWindowController : NSWindowController

@end
```
- Toolbar:** Standard Xcode toolbar with icons for file operations, search, and build status.
- StatusBar:** Shows "iWork | Build Keynote Mac: Succeeded | Today at 9:12 AM".

The screenshot shows the Xcode interface with the following details:

- Project Navigator:** Shows the "Keynote" project structure. The "Keynote Mac" target is selected, displaying its files:
 - KNMacDocumentWindowController.h
 - KNMacDocumentWindowController.m
 - ViewController.h
 - ViewController.m
 - AppDelegate.h
 - AppDelegate.m
 - Images.xcassets
 - Main.storyboard
- File Navigator:** Shows other targets and shared projects:
 - Keynote iOS
 - Keynote iOS Tests
 - Keynote Mac Tests
 - Frameworks
 - Products
 - iWorkShared.xcodeproj
 - Pages
 - Numbers
- Editor:** Displays the content of the selected file, `KNMacDocumentWindowController.h`. The code is as follows:

```
// KNMacDocumentWindowController.h
// Keynote
//
// Created by Chris Cowdery-Corvan on 6/3/14.
// Copyright (c) 2014 Apple Inc. All rights reserved.

#import <Cocoa/Cocoa.h>
#import <iWorkShared/iWorkMacDocument.h>

@interface KNMacDocumentWindowController : NSWindowController
@end
```

The screenshot shows the Xcode interface with the following details:

- Project Navigator:** Shows the "Keynote" project structure. The "Keynote Mac" target is selected, displaying files like KNMacDocumentWindowController.h, KNMacDocumentWindowController.m, ViewController.h, ViewController.m, AppDelegate.h, AppDelegate.m, Images.xcassets, Main.storyboard, Supporting Files, Keynote Mac Tests, Frameworks, Products, iWorkShared.xcodeproj, Pages, and Numbers.
- Editor:** Displays the content of KNMacDocumentWindowController.h. The code includes comments about the file being created by Chris Cowdery-Corvan on 6/3/14 and copyright (c) 2014 Apple Inc. All rights reserved. It also includes imports for `<UIKit/UIKit.h>` and `#import <iWorkShared/iWorkMacDocument.h>`. A red error highlight is present on the second import line, indicating "'iWorkShared/iWorkMacDocument.h' file not found".
- Toolbar:** Standard Xcode toolbar with icons for file operations, search, and build status.
- Status Bar:** Shows "iWork | Build Keynote Mac: Failed | Today at 3:00 PM".

```
// KNMacDocumentWindowController.h
// Keynote
//
// Created by Chris Cowdery-Corvan on 6/3/14.
// Copyright (c) 2014 Apple Inc. All rights reserved.

#import <UIKit/UIKit.h>
#import <iWorkShared/iWorkMacDocument.h> // 'iWorkShared/iWorkMacDocument.h' file not found
@interface KNMacDocumentWindowController : NSWindowController
@end
```

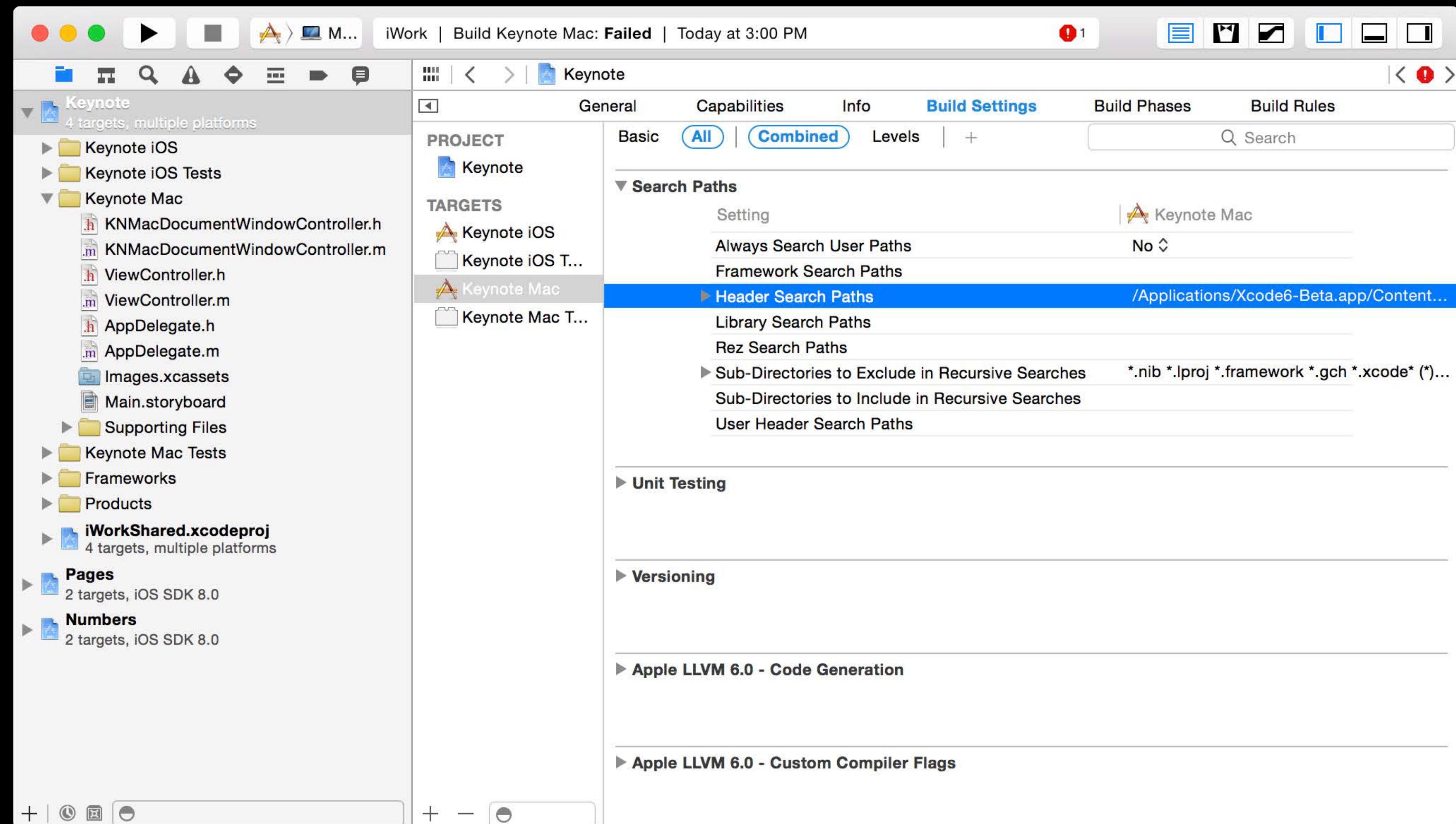
iWork | Build Keynote Mac: Failed | Today at 3:00 PM

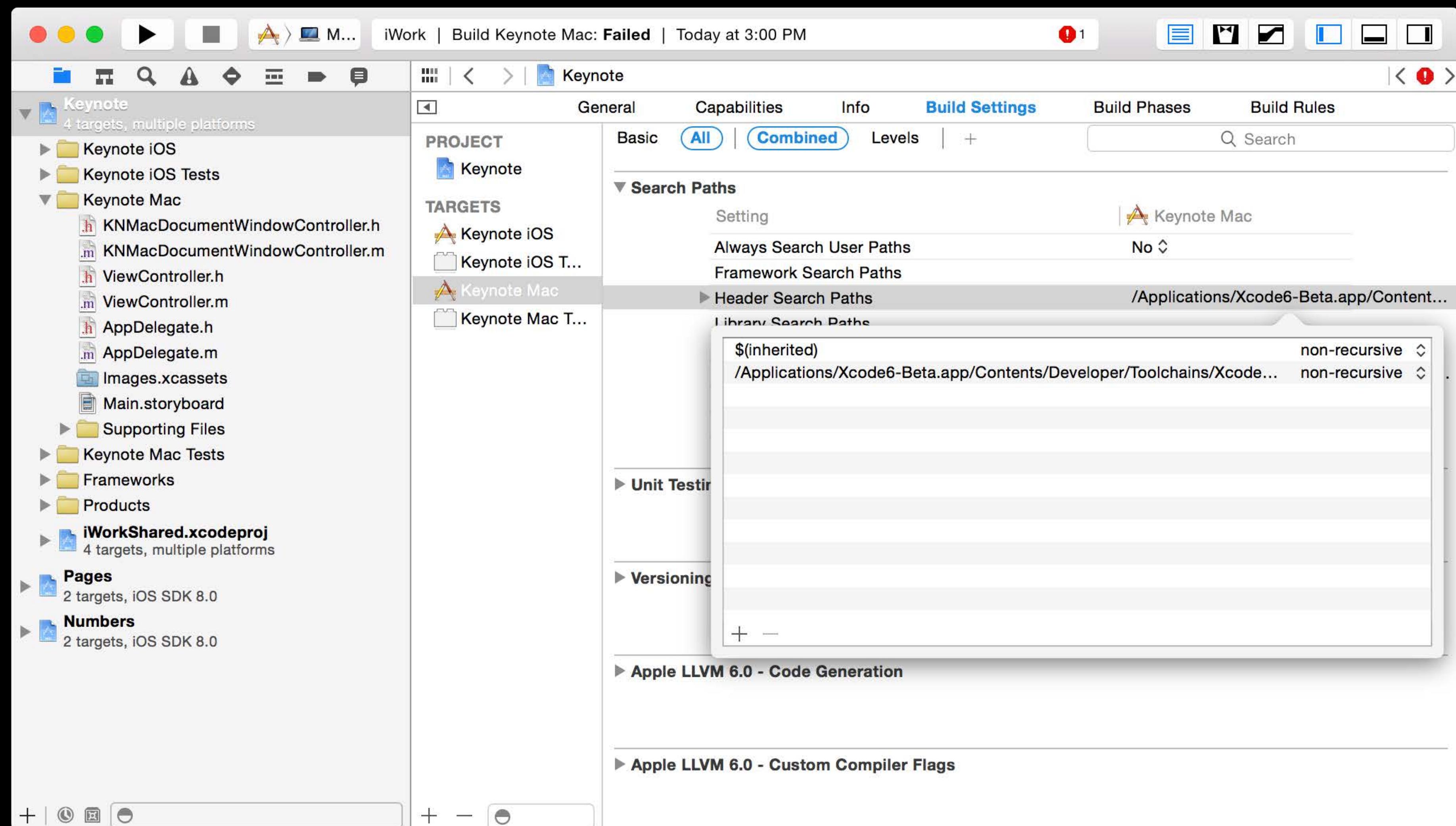
Keynote > Keynote Mac > KNMacDocumentWindowController.h > No Selection

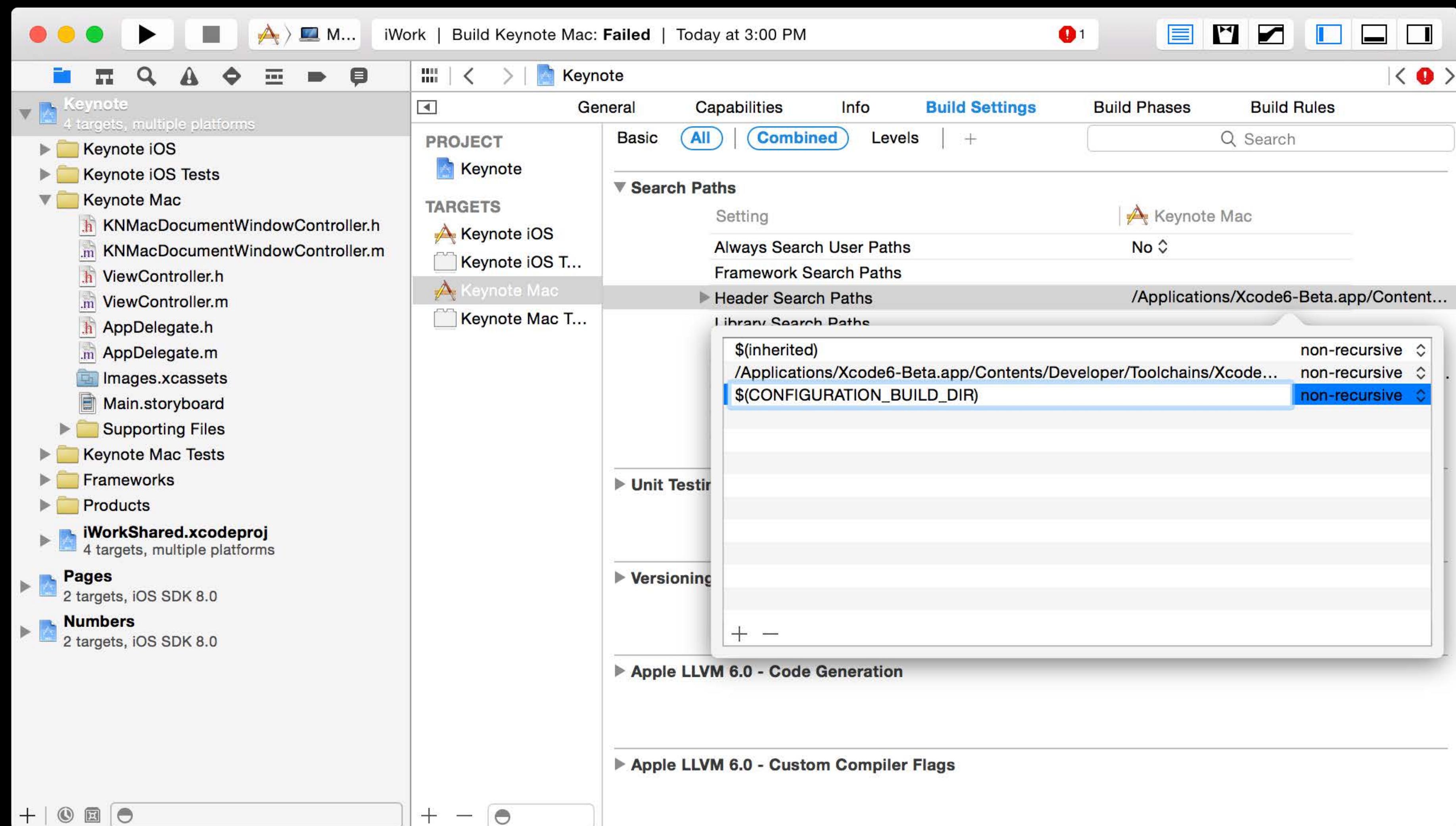
```
// KNMacDocumentWindowController.h
// Keynote
//
// Created by Chris Cowdery-Corvan on 6/3/14.
// Copyright (c) 2014 Apple Inc. All rights reserved.

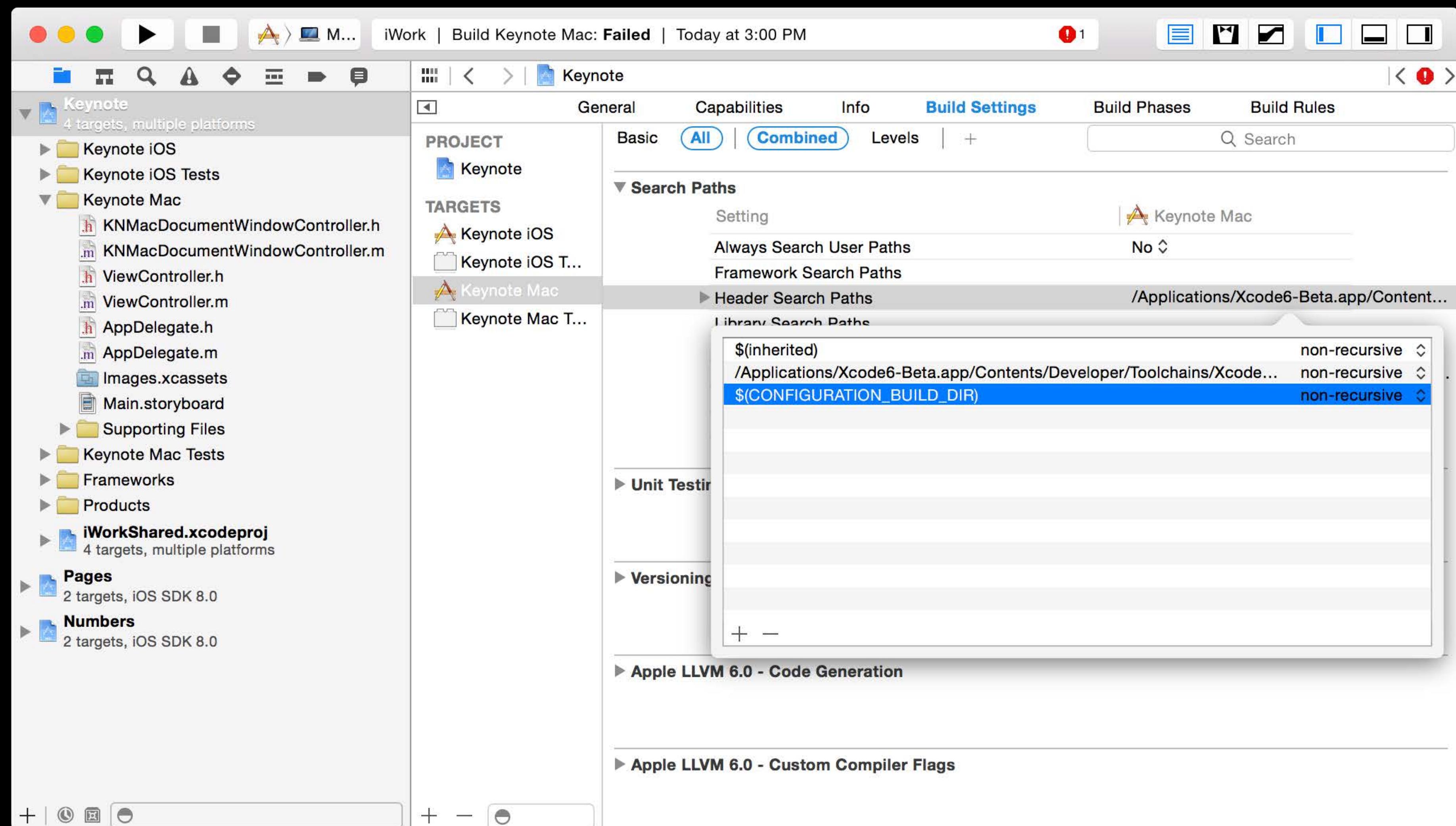
#import <Cocoa/Cocoa.h>
#import <iWorkShared/iWorkMacDocument.h> // 'iWorkShared/iWorkMacDocument.h' file not found
@interface KNMacDocumentWindowController : NSWindowController
@end
```

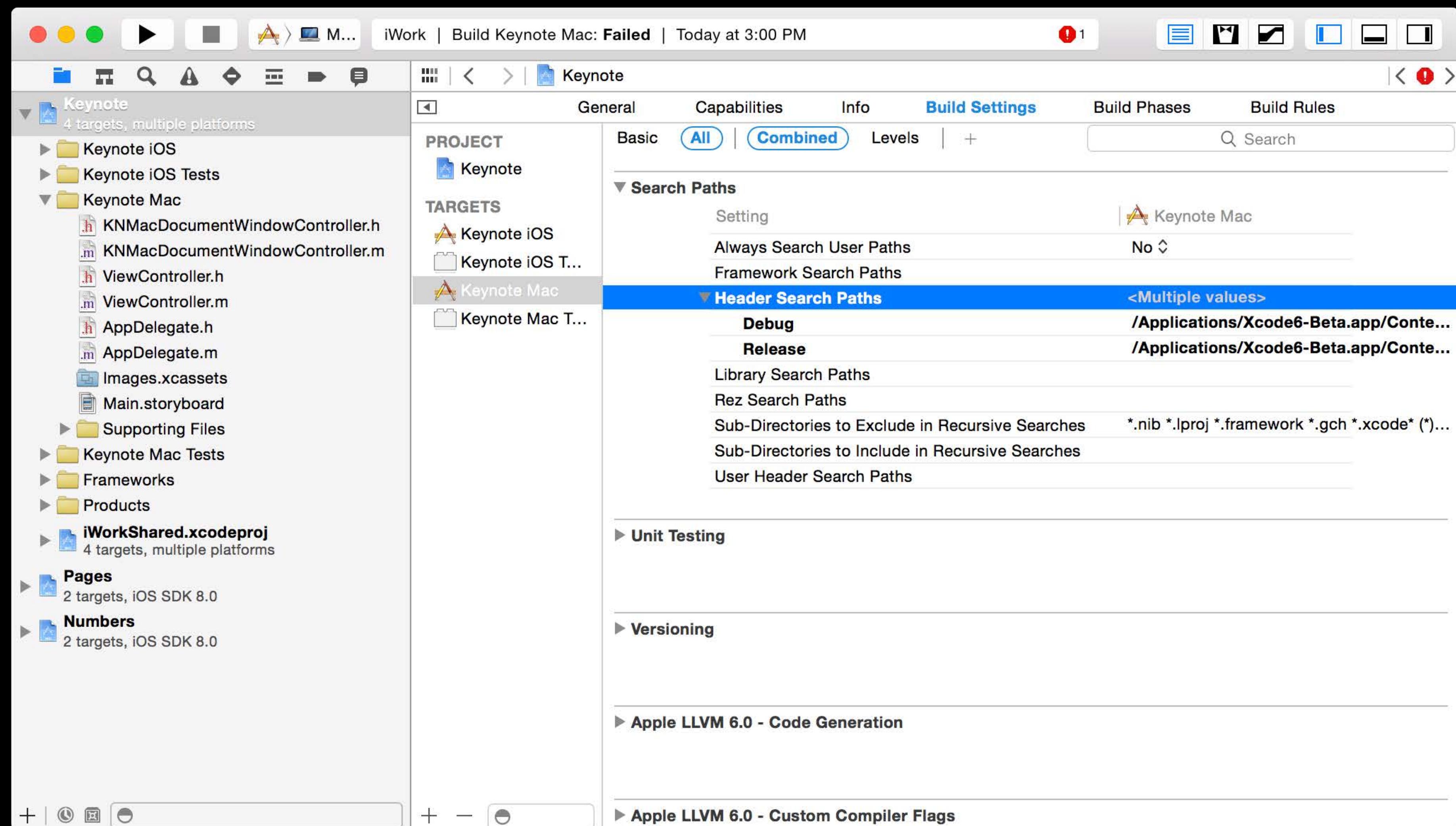
 Build Failed











The screenshot shows the Xcode interface with the following details:

- Toolbar:** Standard Mac OS X window controls (red, yellow, green buttons), build status "iWork | Build Keynote Mac: Succeeded | Today at 7:27 PM", and a set of icons for file operations.
- Project Navigator:** Shows the "Keynote" project structure:
 - Keynote (4 targets, multiple platforms)
 - Keynote iOS
 - Keynote iOS Tests
 - Keynote Mac
 - KNMacDocumentWindowController.h
 - KNMacDocumentWindowController.m (selected)
 - ViewController.h
 - ViewController.m
 - AppDelegate.h
 - AppDelegate.m
 - Images.xcassets
 - Main.storyboard
 - Supporting Files
 - Keynote Mac Tests
 - Frameworks
 - Products
 - iWorkShared.xcodeproj (4 targets, multiple platforms)
 - Pages (2 targets, iOS SDK 8.0)
 - Numbers (2 targets, iOS SDK 8.0)
- Editor:** Displays the content of the selected file, `KNMacDocumentWindowController.m`. The code is as follows:

```
// KNMacDocumentWindowController.m
// Keynote
//
// Created by Chris Cowdery-Corvan on 6/3/14.
// Copyright (c) 2014 Apple Inc. All rights reserved.

#import "KNMacDocumentWindowController.h"
#import "KNSlide.h"

@implementation KNMacDocumentWindowController
{
    iWorkMacDocument *_document;
}

- (instancetype) initWithWindow:(NSWindow *)window document:(iWorkMacDocument *)document
{
    self = [super initWithWindow:window];
    if (self != nil) {
        _document = document;
    }
    return self;
}

- (IBAction) addShape:(iWorkShape *)shape toSlide:(KNSlide *)slide
{
    // Add the shape to the document first, then associate it with the slide.
    [_document addDocumentObject:shape];
    [slide addShape:shape];
}

- (IBAction) removeShape:(iWorkShape *)shape fromSlide:(KNSlide *)slide
{
    // Remove the shape from the slide, then remove it from the document.
}
```

The screenshot shows a Mac OS X desktop with an Xcode window open. The title bar reads "iWork | Build Keynote Mac: Failed | Today at 7:29 PM". The status bar indicates there are 2 issues. The left sidebar shows a project structure with "Keynote Mac" selected, showing 2 issues:

- Apple Mach-O Linker (ld) Error: "_OBJC_CLASS_\$_iWorkMacDocument", referenced from:
- Apple Mach-O Linker (ld) Error: Linker command failed with exit code 1 (use -v to see invocation)

The main editor area displays the source code for `KNMacDocumentWindowController.m`:

```
// KNMacDocumentWindowController.m
// Keynote
//
// Created by Chris Cowdery-Corvan on 6/3/14.
// Copyright (c) 2014 Apple Inc. All rights reserved.

#import "KNMacDocumentWindowController.h"
#import "KNSlide.h"

@implementation KNMacDocumentWindowController
{
    iWorkMacDocument *_document;
}

- (instancetype) initWithWindow:(NSWindow *)window document:(iWorkMacDocument *)document
{
    self = [super initWithWindow>window];
    if (self != nil) {
        _document = document;
    }
    return self;
}

- (IBAction) addShape:(iWorkShape *)shape toSlide:(KNSlide *)slide
{
    // Add the shape to the document first, then associate it with the slide.
    [_document addDocumentObject:shape];
    [slide addShape:shape];
}

- (IBAction) removeShape:(iWorkShape *)shape fromSlide:(KNSlide *)slide
{
    // Remove the shape from the slide, then remove it from the document.
}
```

iWork | Build Keynote Mac: Failed | Today at 7:29 PM

Keynote Mac

2 issues

Apple Mach-O Linker (ld) Error
"OBJC_CLASS_\$_iWorkMacDocument",
referenced from:
Apple Mach-O Linker (ld) Error
Linker command failed with exit code 1 (use
-v to see invocation)

```
// KNMacDocumentWindowController.m
// Keynote
//
// Created by Chris Cowdery-Corvan on 6/3/14.
// Copyright (c) 2014 Apple Inc. All rights reserved.

#import "KNMacDocumentWindowController.h"
#import "KNSlide.h"

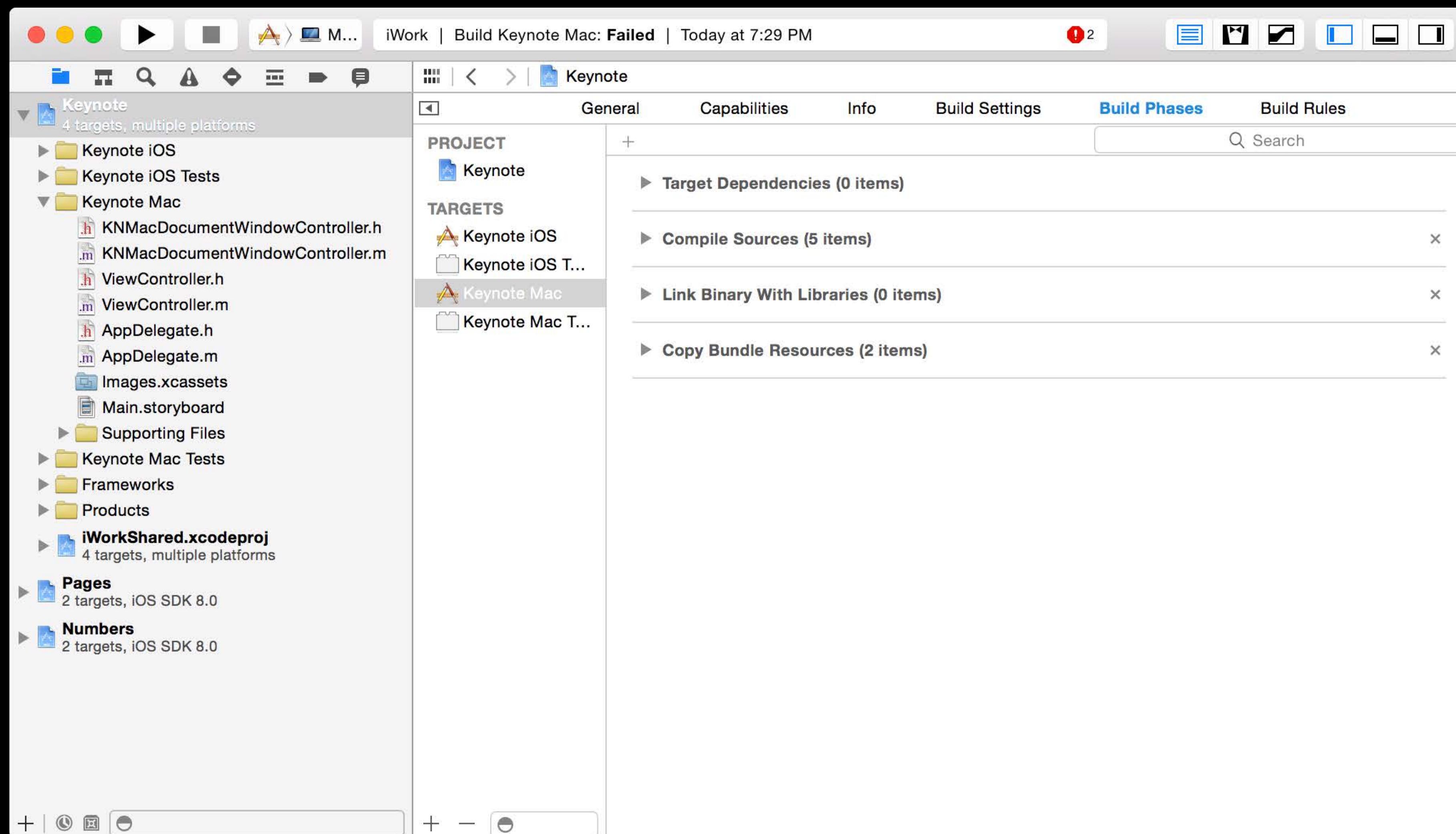
@implementation KNMacDocumentWindowController
{
    iWorkMacDocument *_document;
}

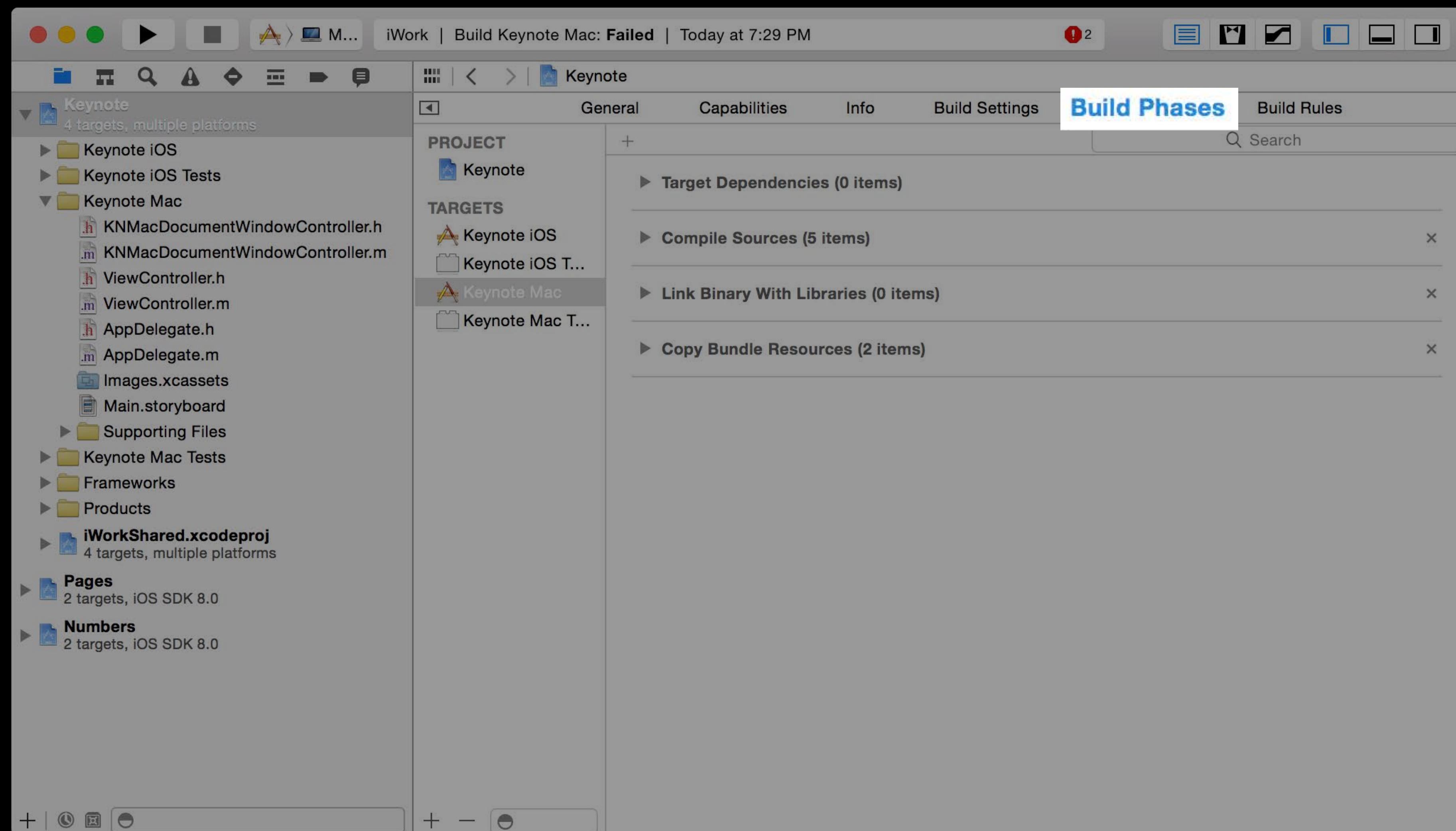
- (instancetype) initWithWindow:(NSWindow *)window document:(iWorkMacDocument *)document
{
    self = [super initWithWindow>window];
    if (self != nil) {
        _document = document;
    }
    return self;
}

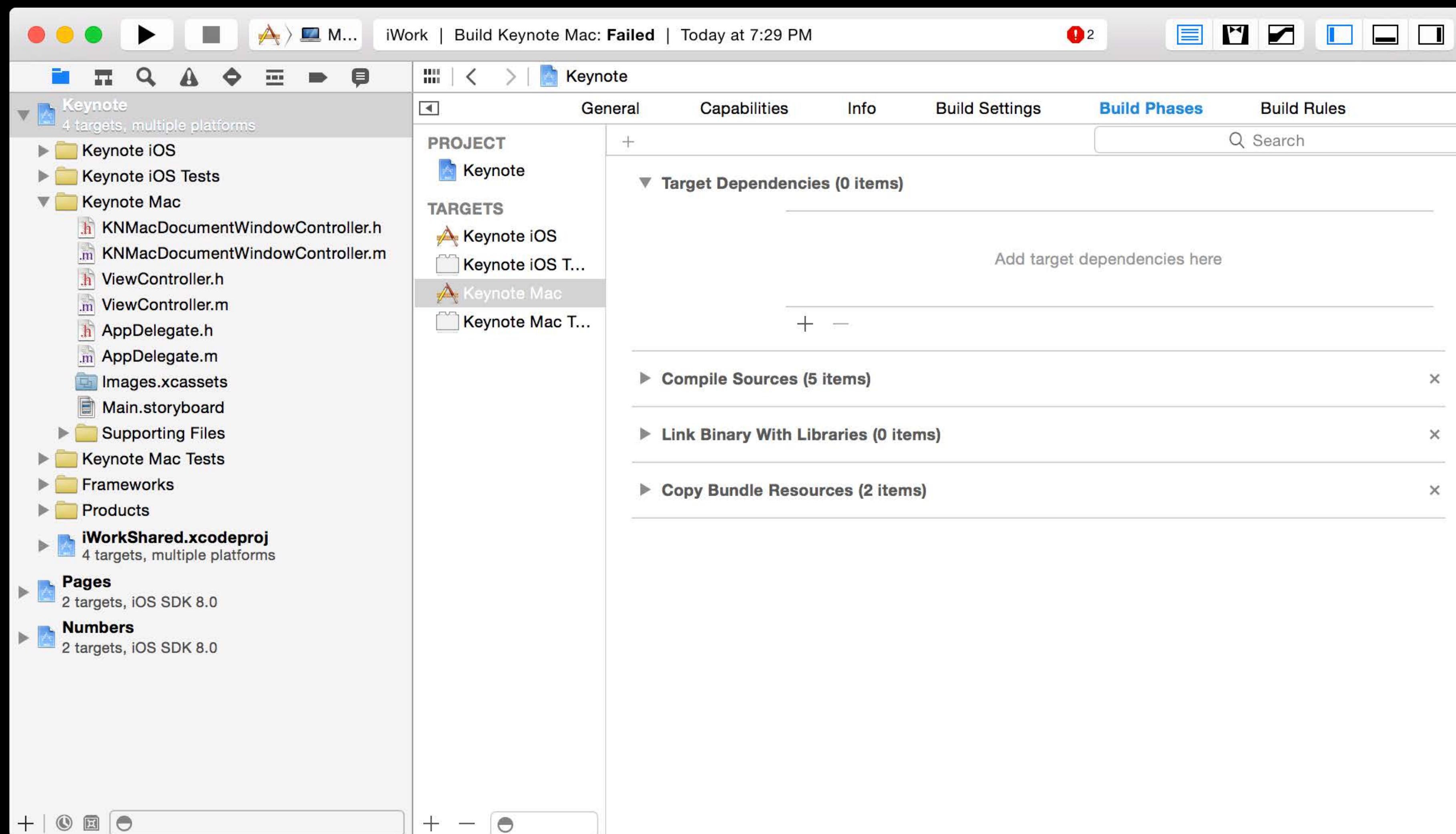
- (IBAction) addShape:(iWorkShape *)shape toSlide:(KNSlide *)slide
{
    // Add the shape to the document first, then associate it with the slide.
    [_document addDocumentObject:shape];
    [slide addShape:shape];
}

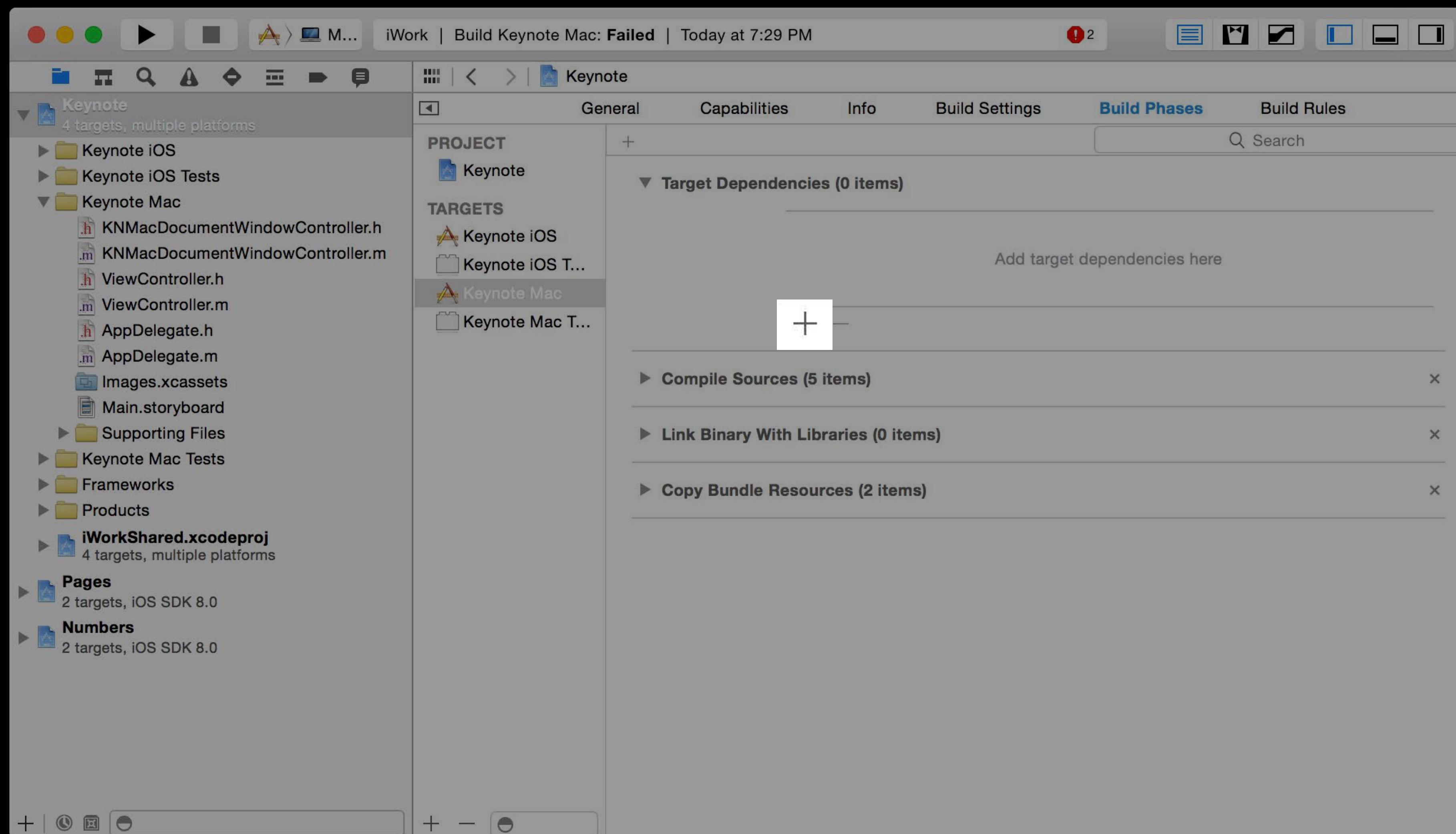
- (IBAction) removeShape:(iWorkShape *)shape fromSlide:(KNSlide *)slide
{
    // Remove the shape from the slide, then remove it from the document.
}
```

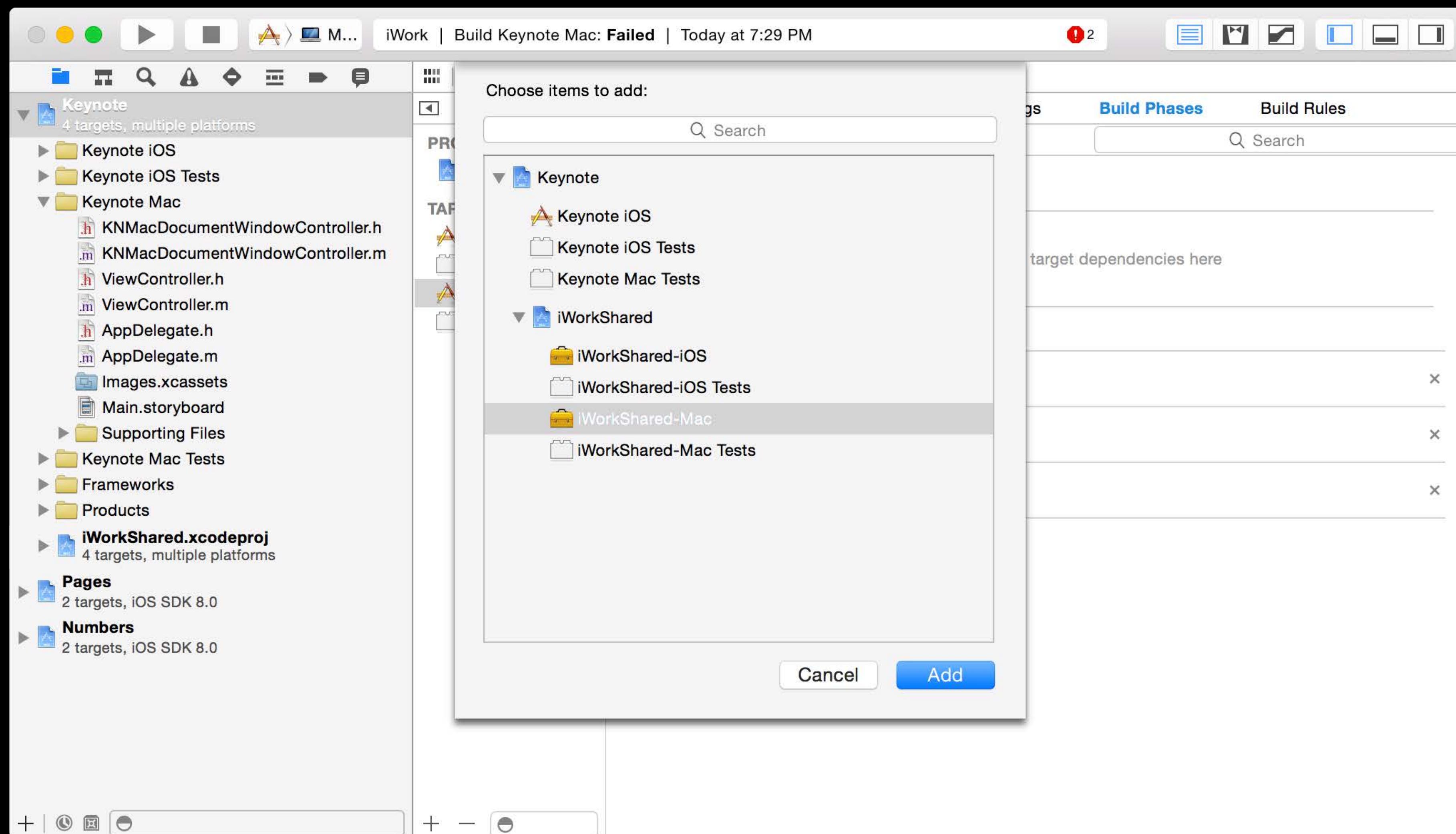
Build Failed

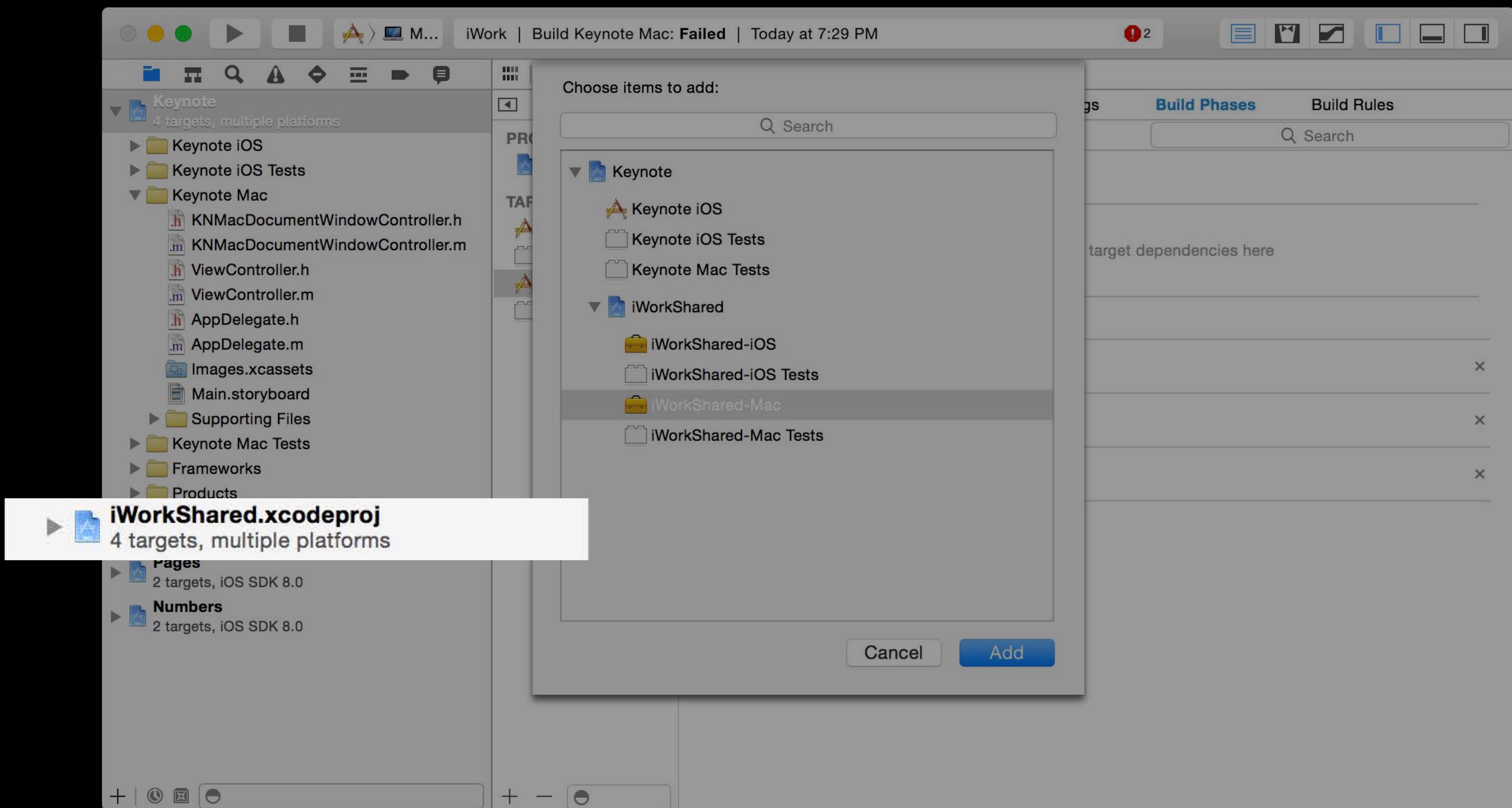


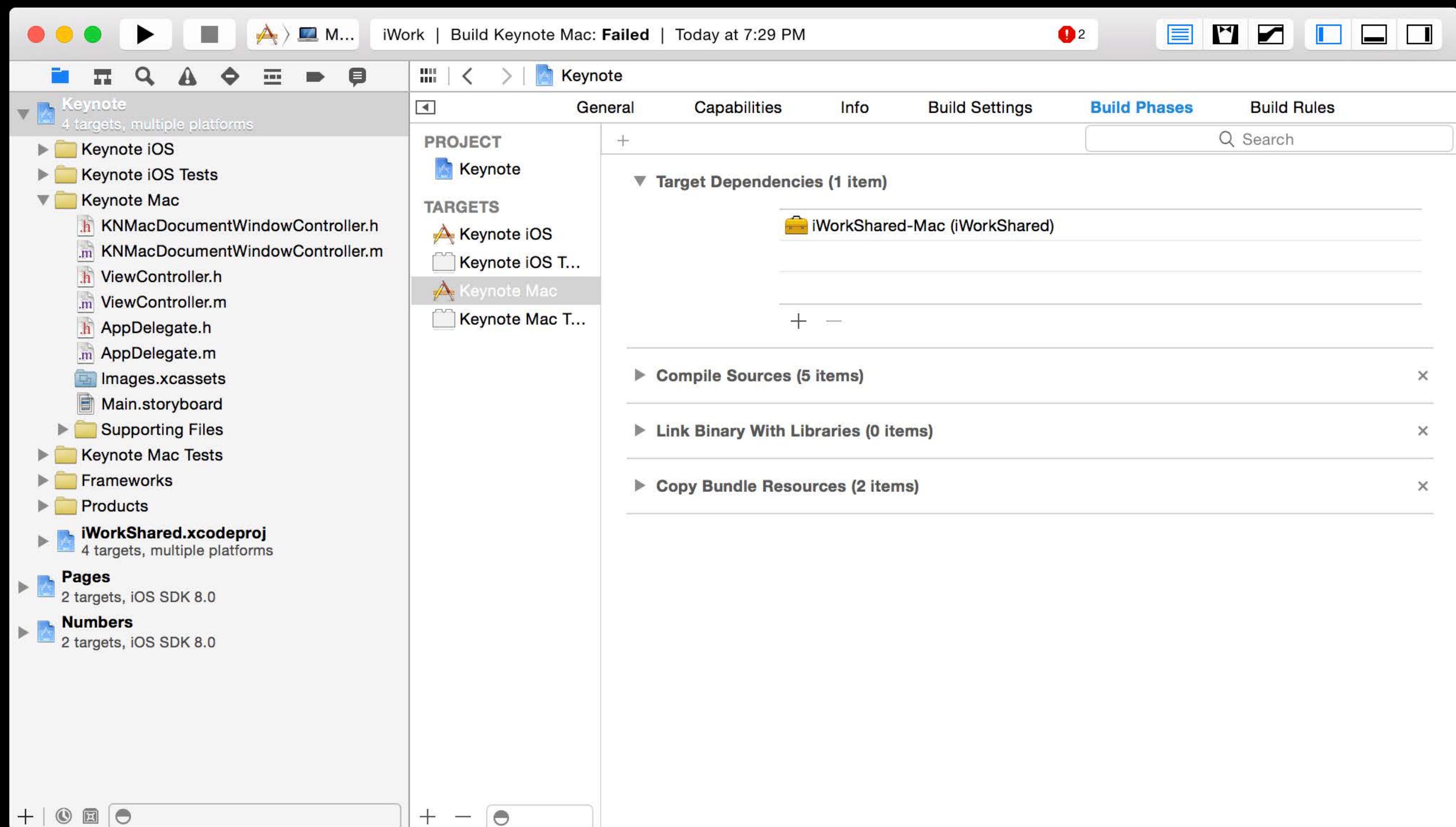


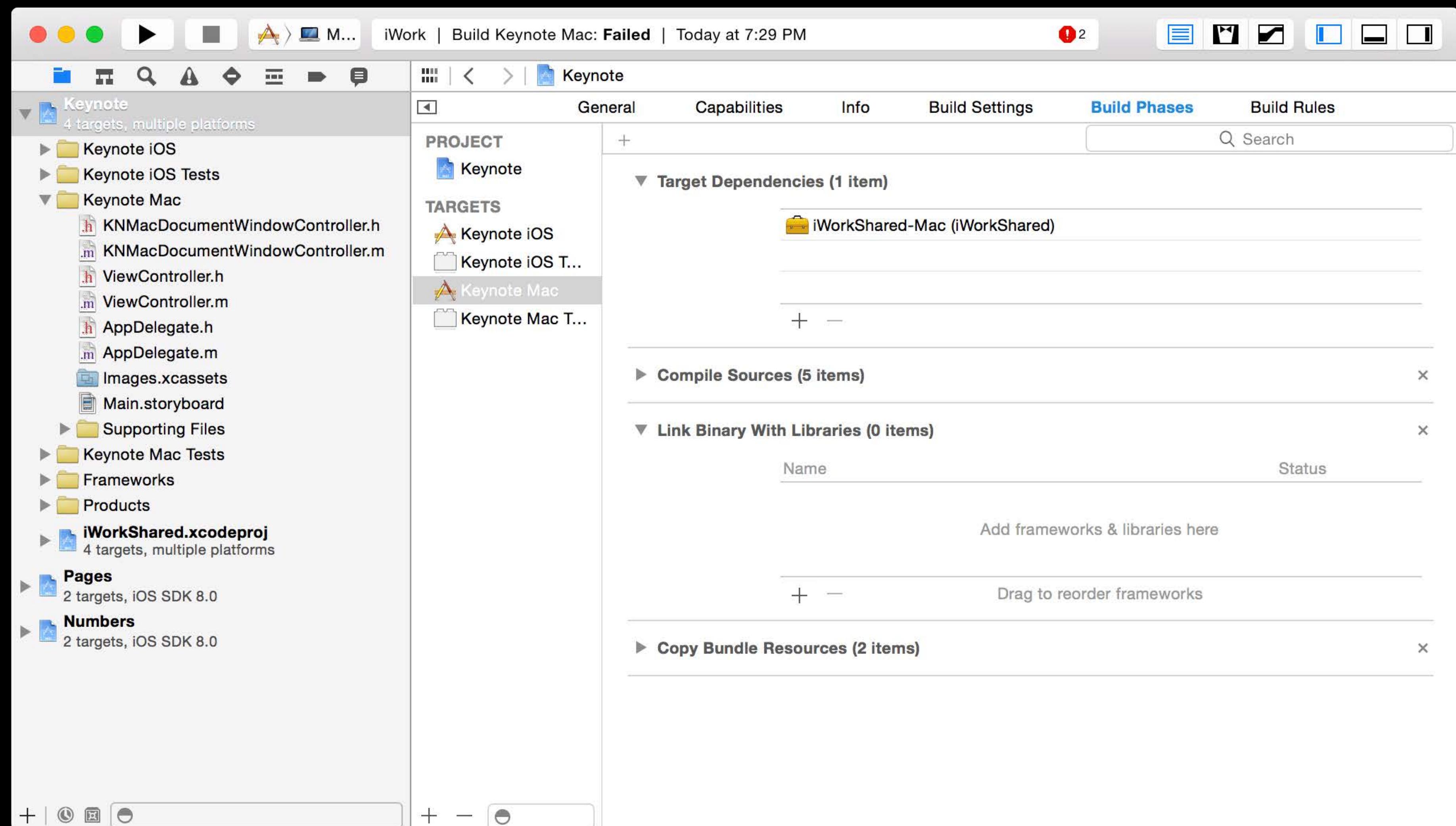


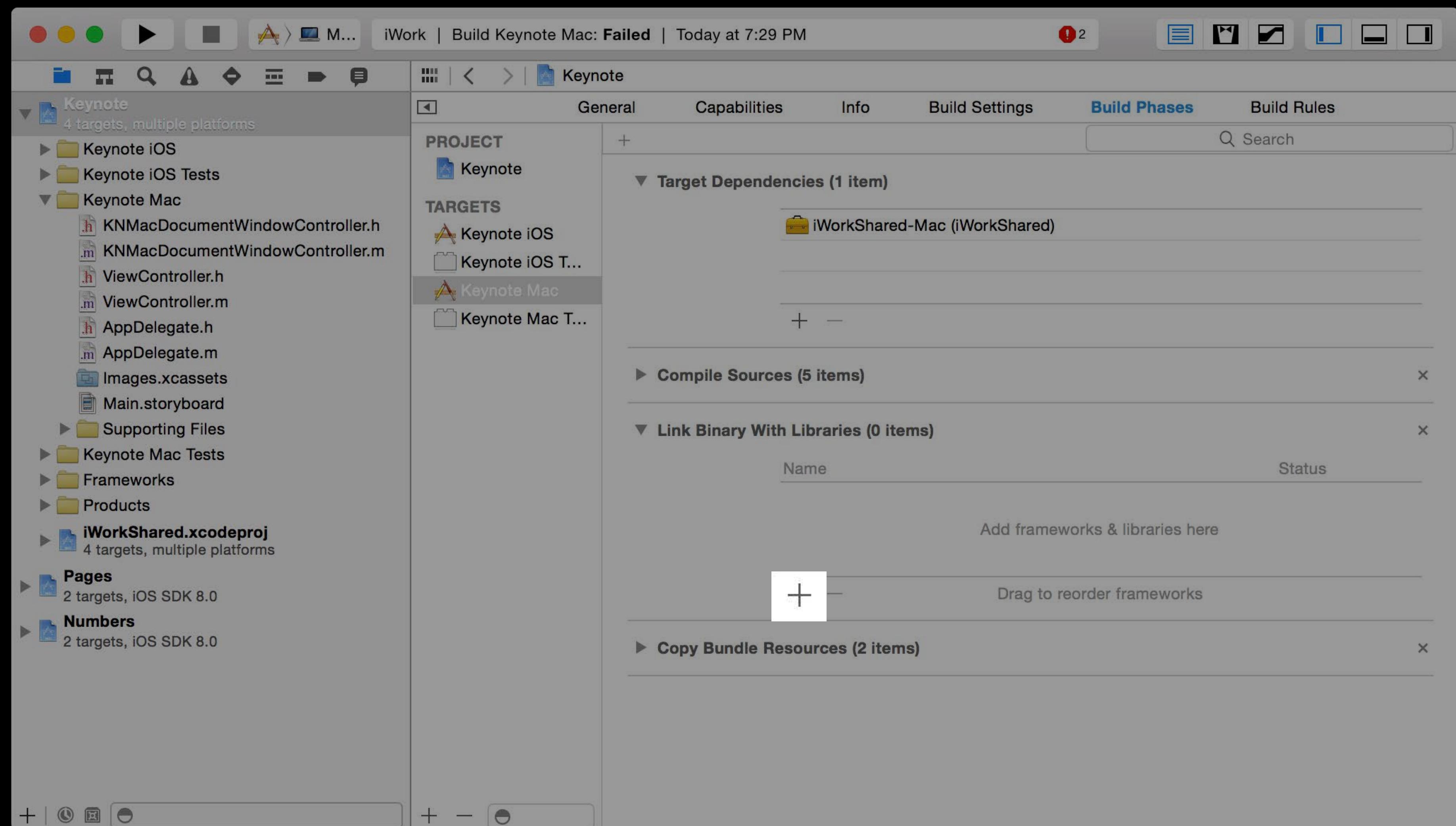


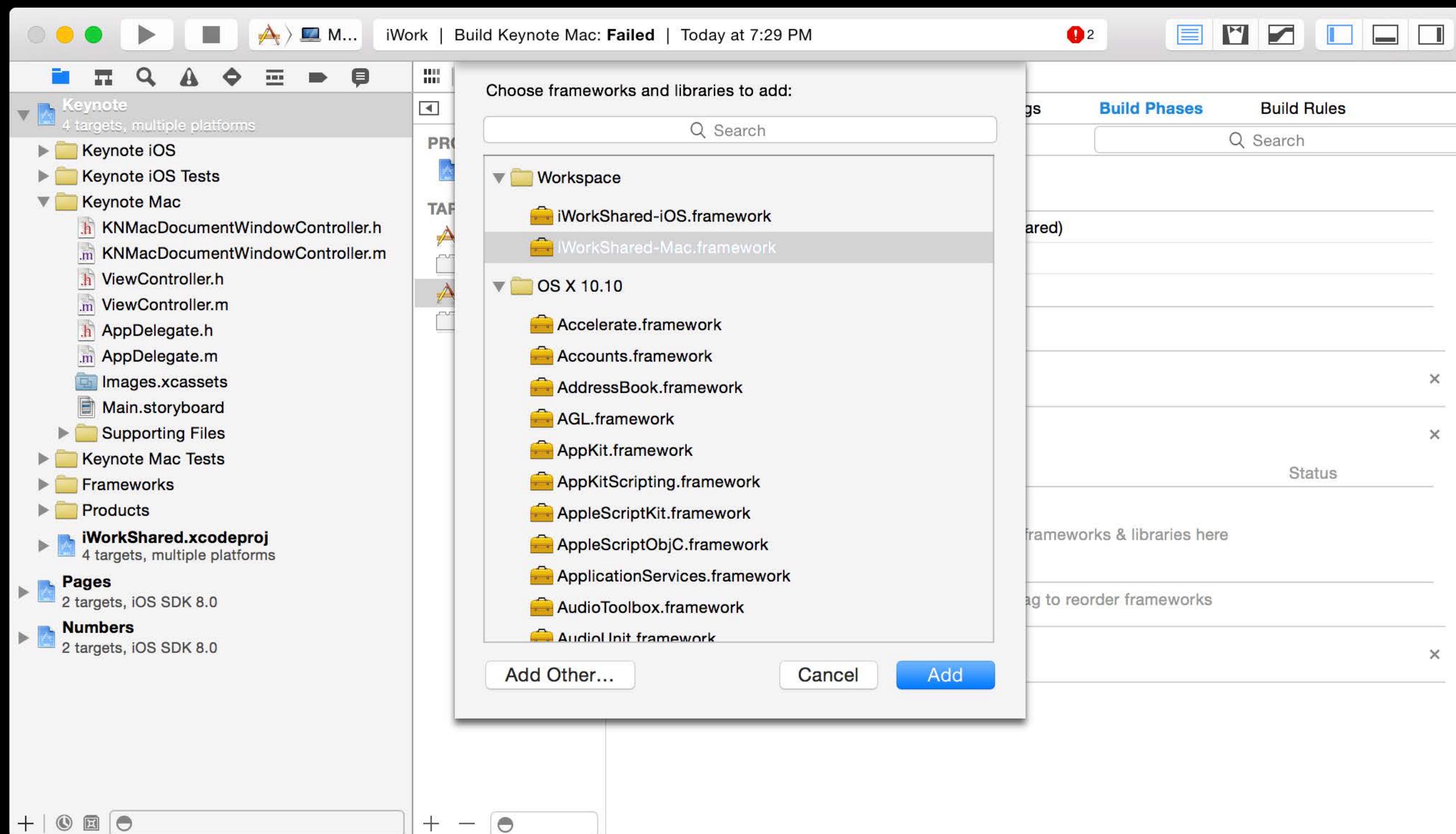


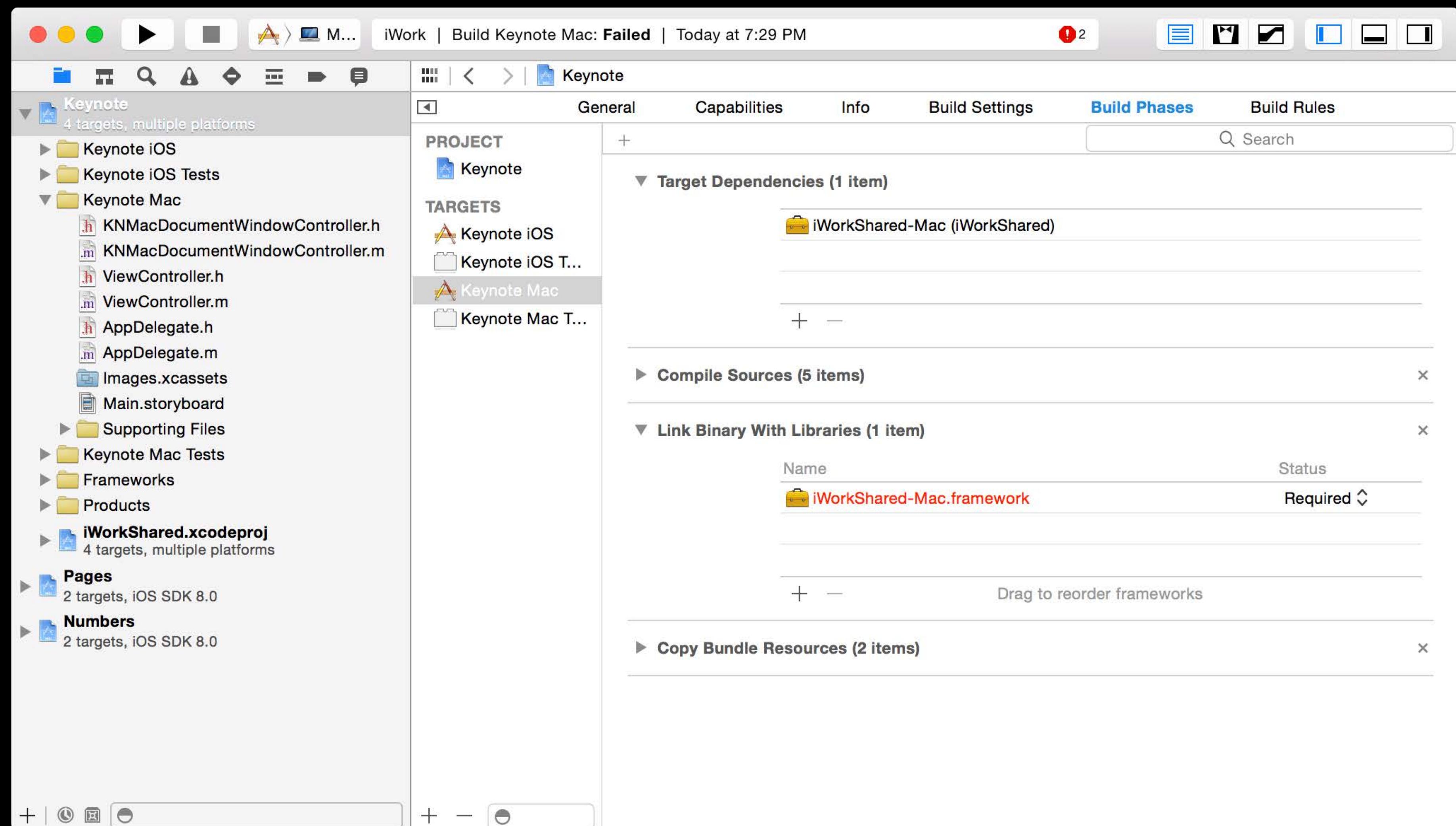


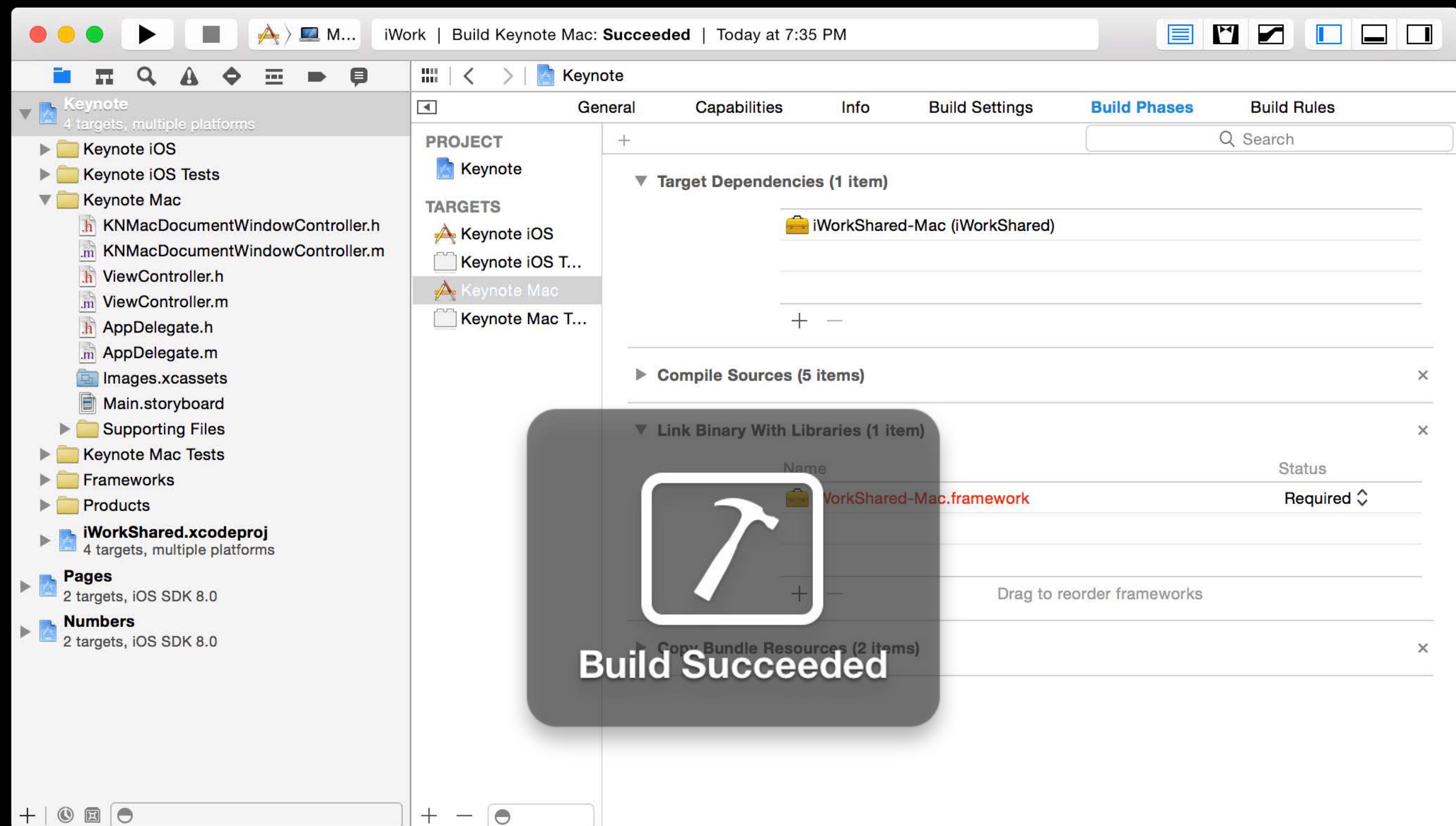


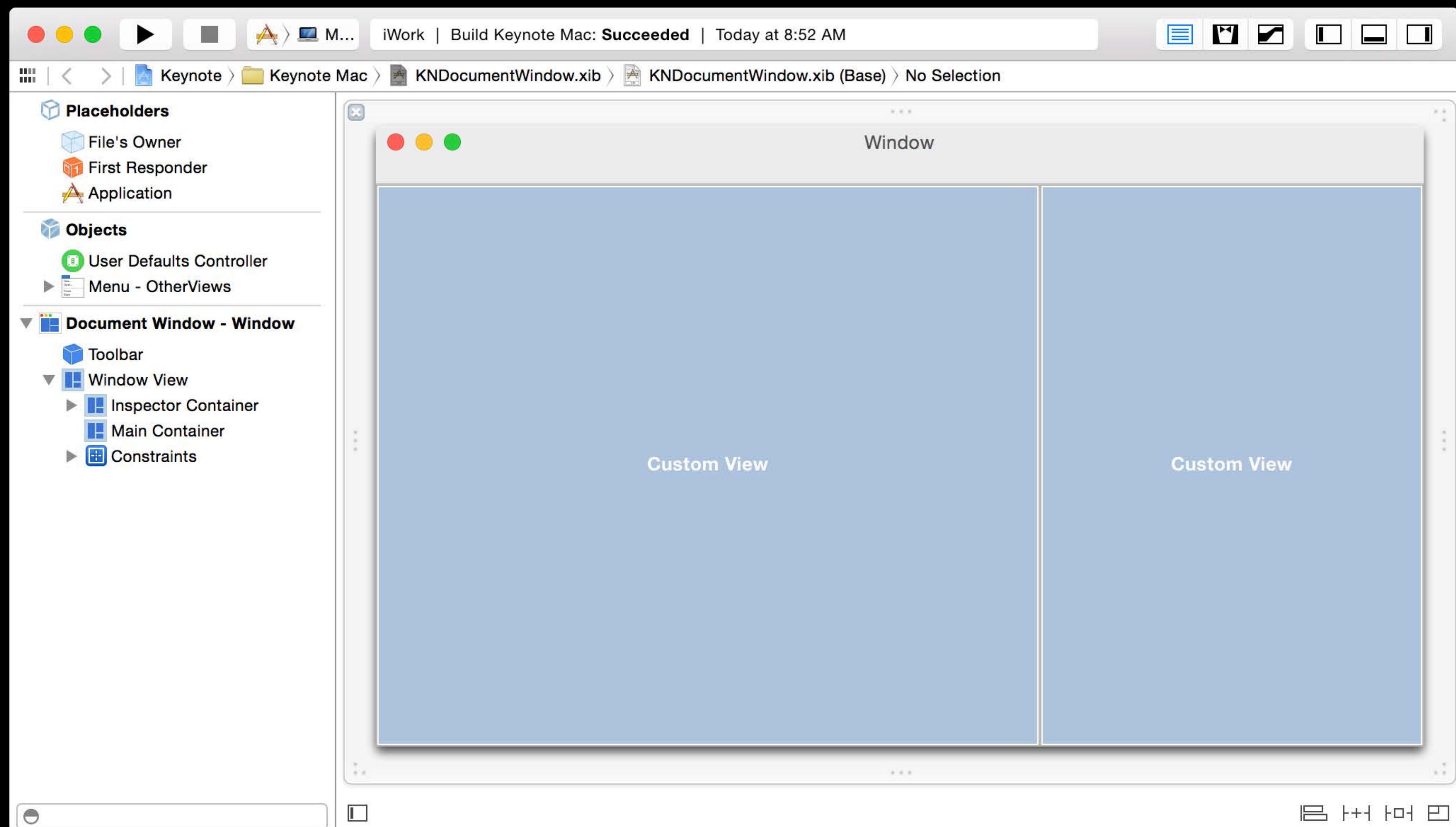












129% View Zoom Play

Table Chart Text Shape Media Comment Share ? Format Animate Setup

Slides

1 Monterey

2 Carmel

3 Big Sur

4

5

6

7

8

9

10

+

There's so much to see and do.

Explore by land.

Discover miles of hiking trails and encounter dozens of unique plant and animal species.

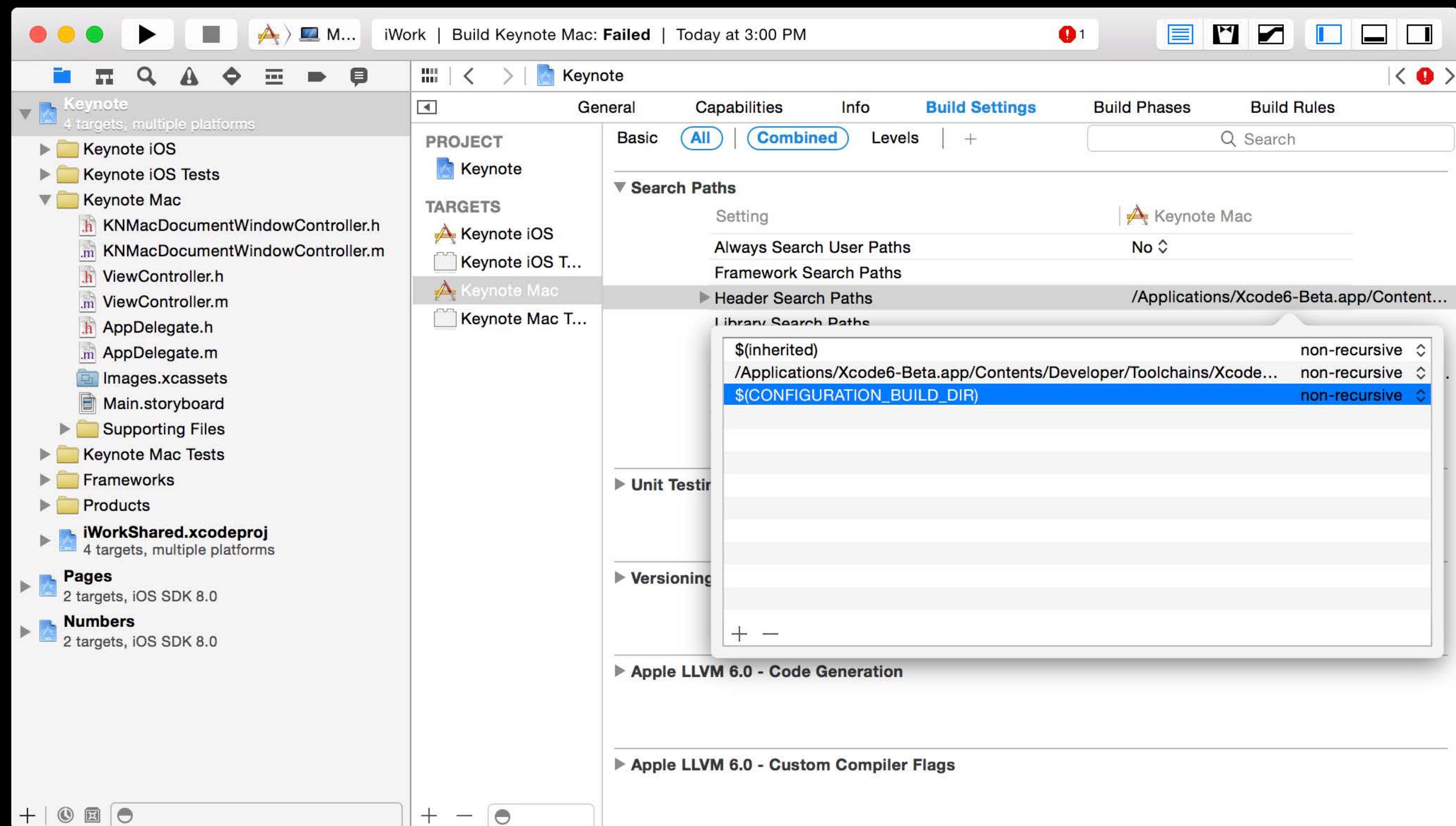
Explore by sea.

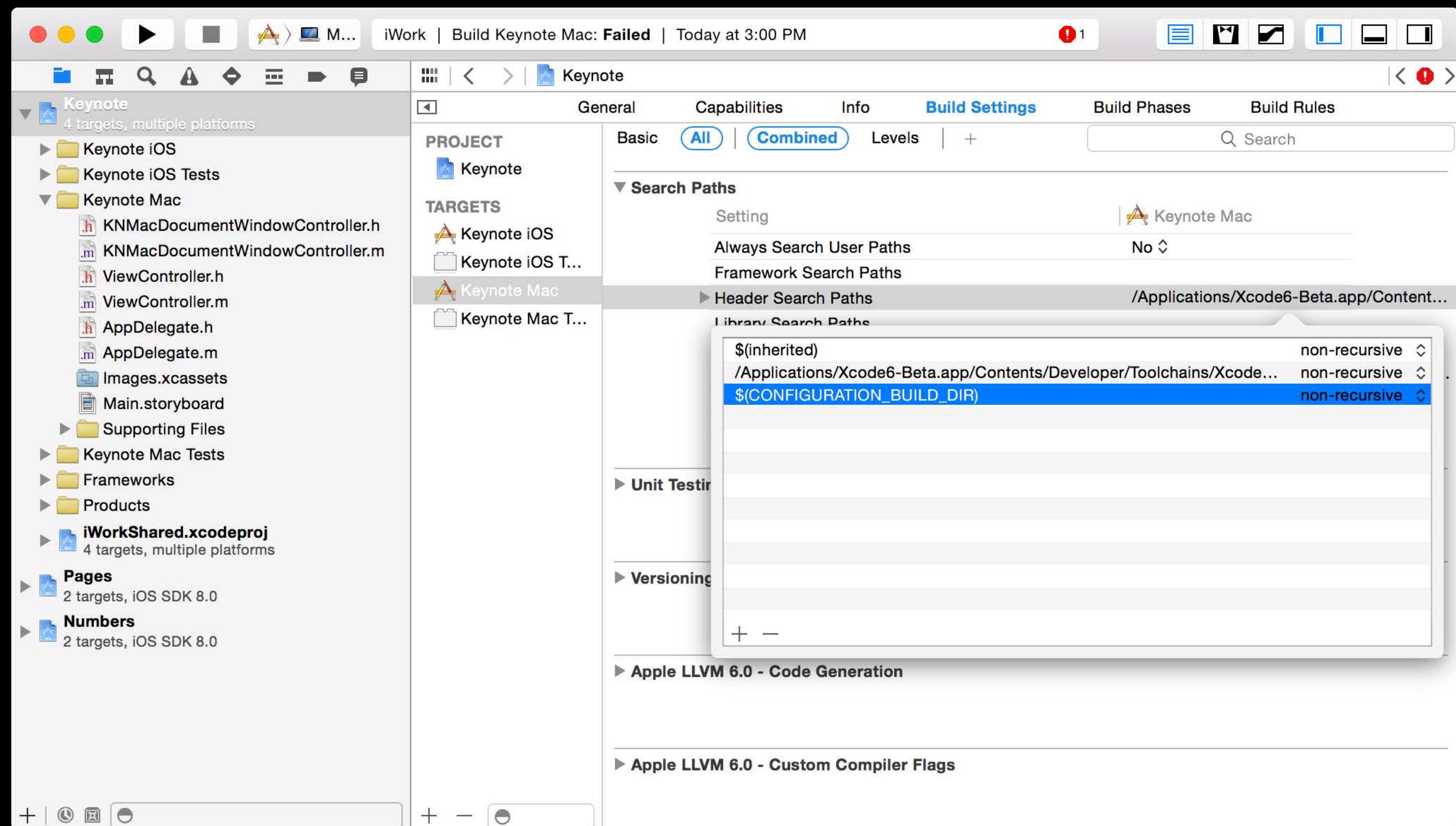
Paddle through hidden coves and tiptoe through tidal pools. Both are home to a wide variety of sea life.

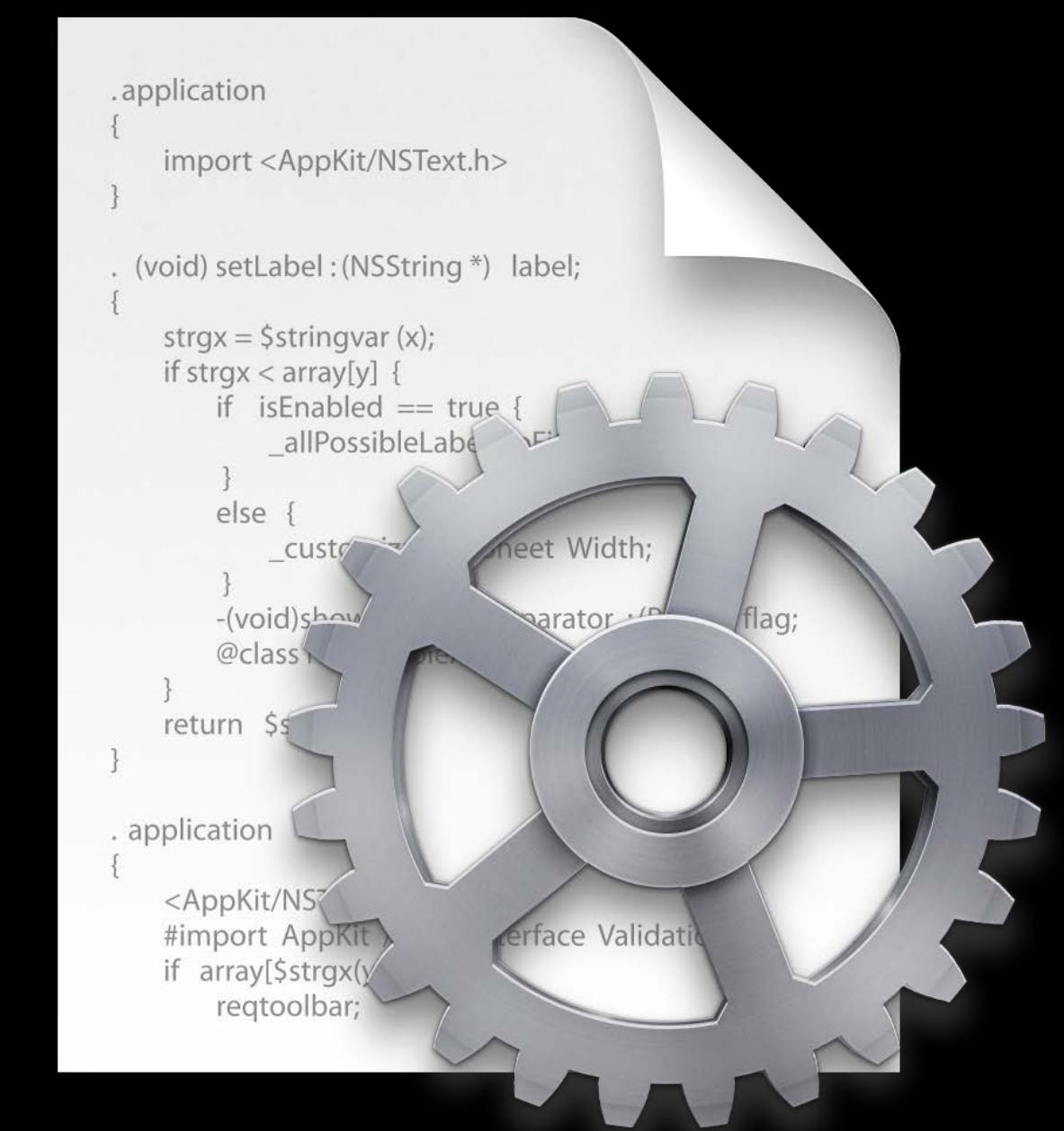
Top-level	Pages.xcodeproj	Numbers.xcodeproj	Keynote.xcodeproj				
Target	iOS	Mac	iOS	Mac	iOS	Mac	
Platform Library	iOS Shared	Mac Shared	iOS Shared	Mac Shared	iOS Shared	Mac Shared	
Common Libraries		Canvas		Persistence		Shared Core Utilities	

Top-level	Pages.xcodeproj	Numbers.xcodeproj	Keynote.xcodeproj				
Target	iOS	Mac	iOS	Mac	iOS	Mac	
Platform Library	iOS Shared	Mac Shared	iOS Shared	Mac Shared	iOS Shared	Mac Shared	
Common Libraries		Canvas		Persistence		Shared Core Utilities	









Xcode Config

iWork — Common.xcconfig

Keynote > Common.xcconfig > No Selection | < ▲ >

```
1 //  
2 // Common.xcconfig  
3 // iWorkAppShared  
4 //  
5 // Created by Chris Cowdery-Corvan on 5/26/14.  
6 // Copyright (c) 2014 Apple Inc. All rights reserved.  
7 //  
8  
9 WARNING_CFLAGS = $(value) -Wno-error=unused-function  
10  
11 HEADER_SEARCH_PATHS = $(inherited) $(CONFIGURATION_BUILD_DIR)
```

Xcode Configuration Files

Parameters

Xcode Configuration Files

Parameters

Header search paths

`HEADER_SEARCH_PATHS`

Xcode Configuration Files

Parameters

Header search paths

`HEADER_SEARCH_PATHS`

Compiler warnings

`WARNING_CFLAGS`

Xcode Configuration Files

Parameters

Header search paths

`HEADER_SEARCH_PATHS`

Compiler warnings

`WARNING_CFLAGS`

Architectures

`ARCHS`

Xcode Configuration Files

Parameters

Header search paths

`HEADER_SEARCH_PATHS`

Compiler warnings

`WARNING_CFLAGS`

Architectures

`ARCHS`

SDKs

`SDKROOT`

Xcode Configuration Files

Parameters

Header search paths

`HEADER_SEARCH_PATHS`

Compiler warnings

`WARNING_CFLAGS`

Architectures

`ARCHS`

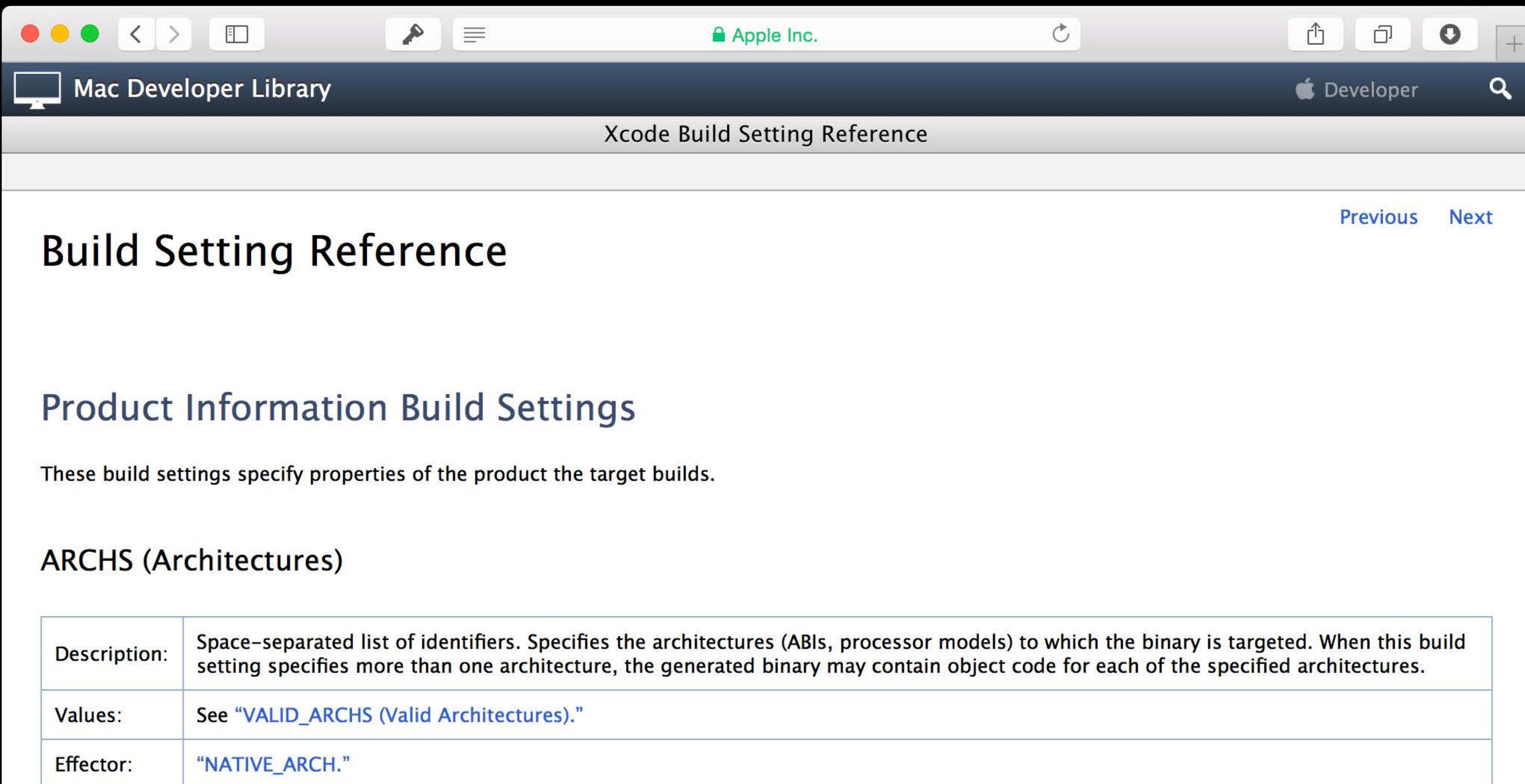
SDKs

`SDKROOT`

Deployment Targets

`MACOSX_DEPLOYMENT_TARGET, IPHONEOS_DEPLOYMENT_TARGET`

Xcode Configuration Files



The screenshot shows a web browser window with the following details:

- Address Bar:** Shows "Apple Inc." and the URL "Mac Developer Library".
- Page Title:** "Xcode Build Setting Reference".
- Section Header:** "Build Setting Reference".
- Section Subtitle:** "Product Information Build Settings".
- Description:** "These build settings specify properties of the product the target builds."
- Table:** Describes the "ARCHS" (Architectures) build setting.

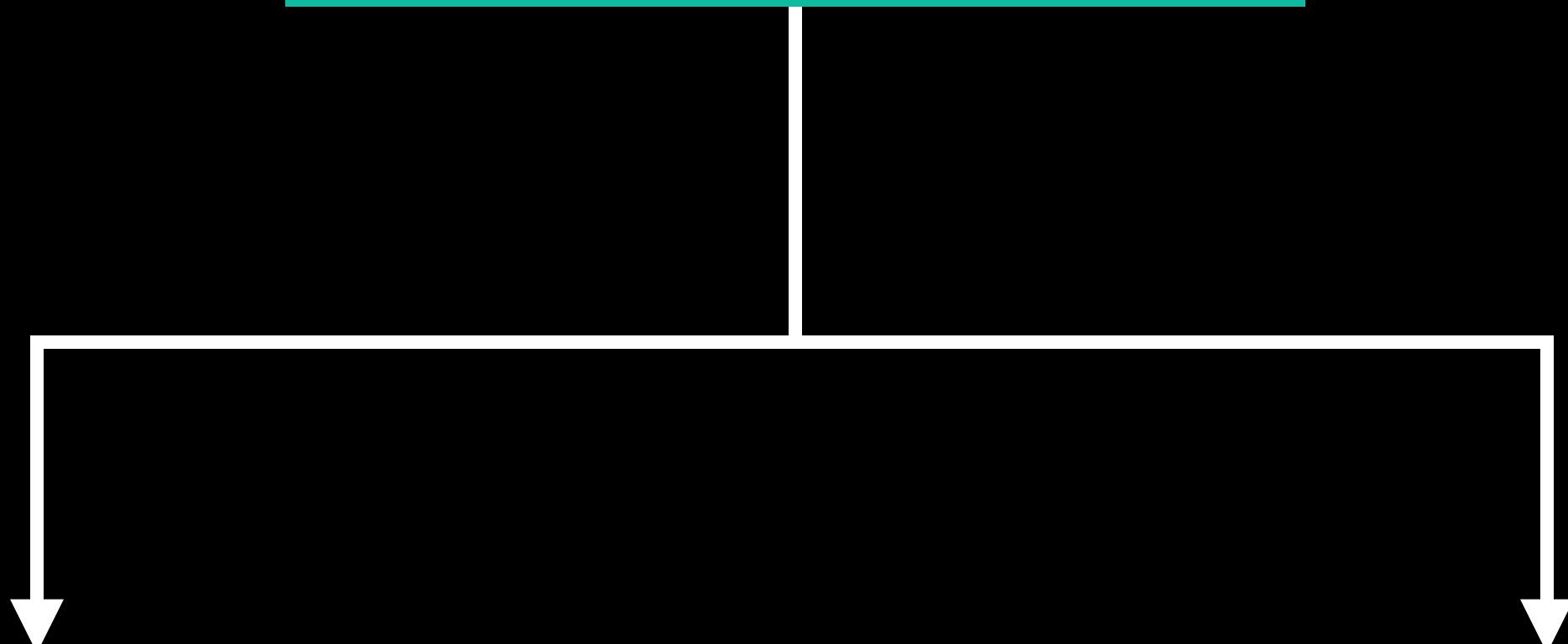
Description:	Space-separated list of identifiers. Specifies the architectures (ABIs, processor models) to which the binary is targeted. When this build setting specifies more than one architecture, the generated binary may contain object code for each of the specified architectures.
Values:	See " VALID_ARCHS (Valid Architectures) ."
Effector:	"NATIVE_ARCH."

Common.xcconfig

Common.xcconfig

iOS.xcconfig

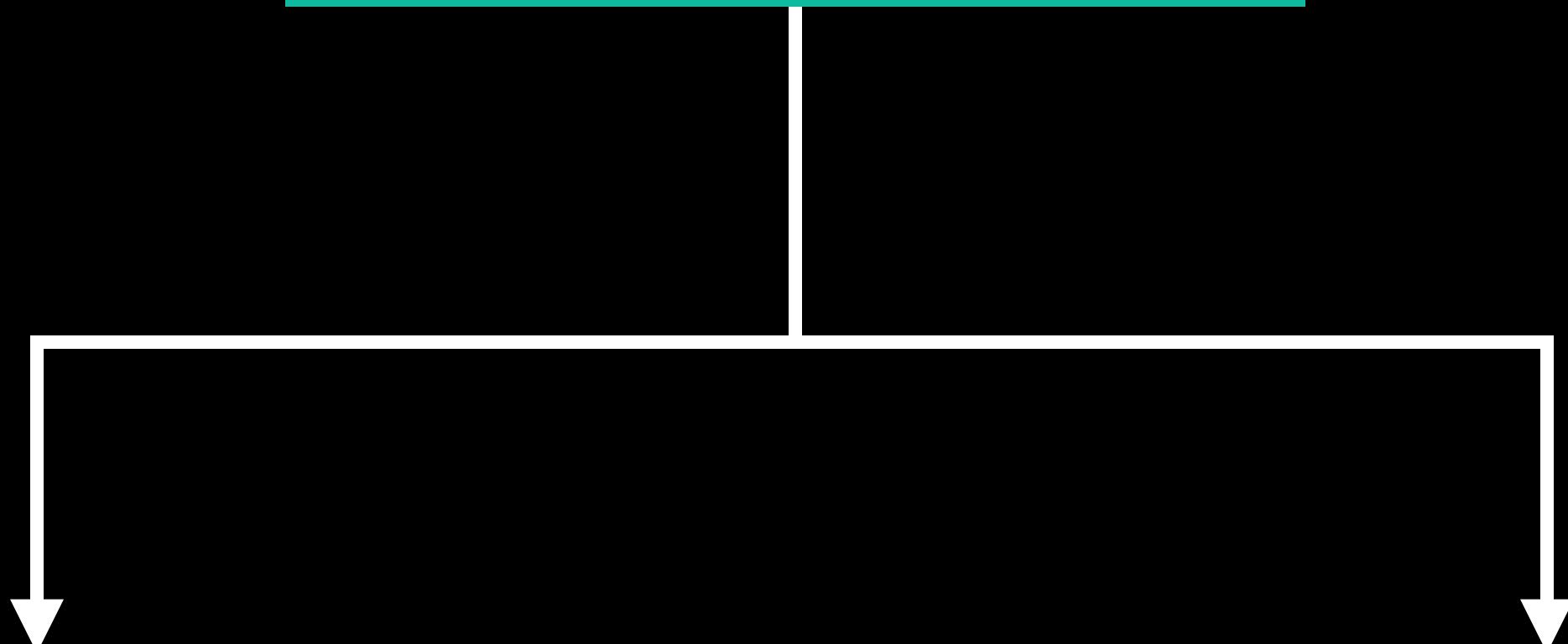
OSX.xcconfig

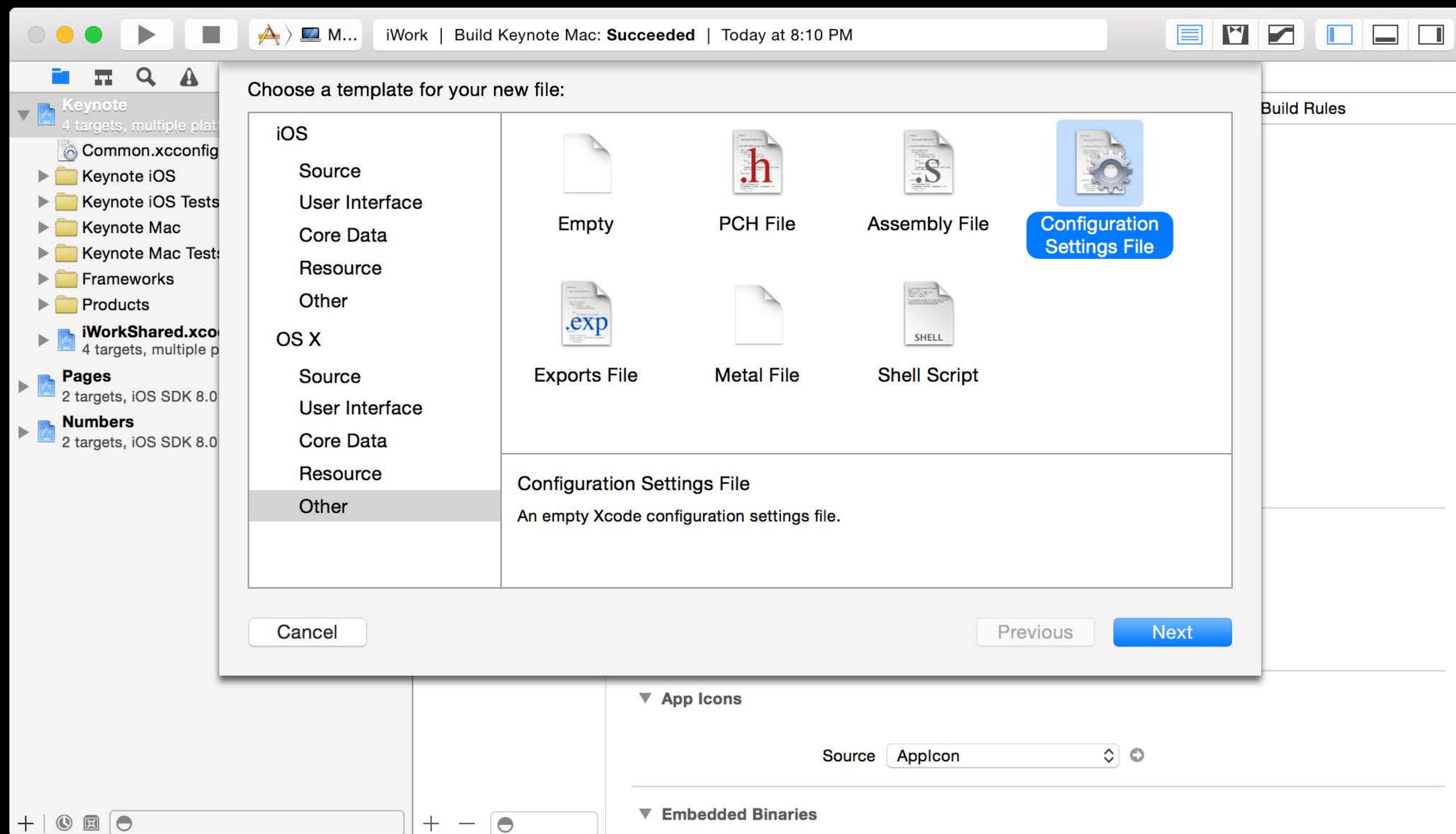


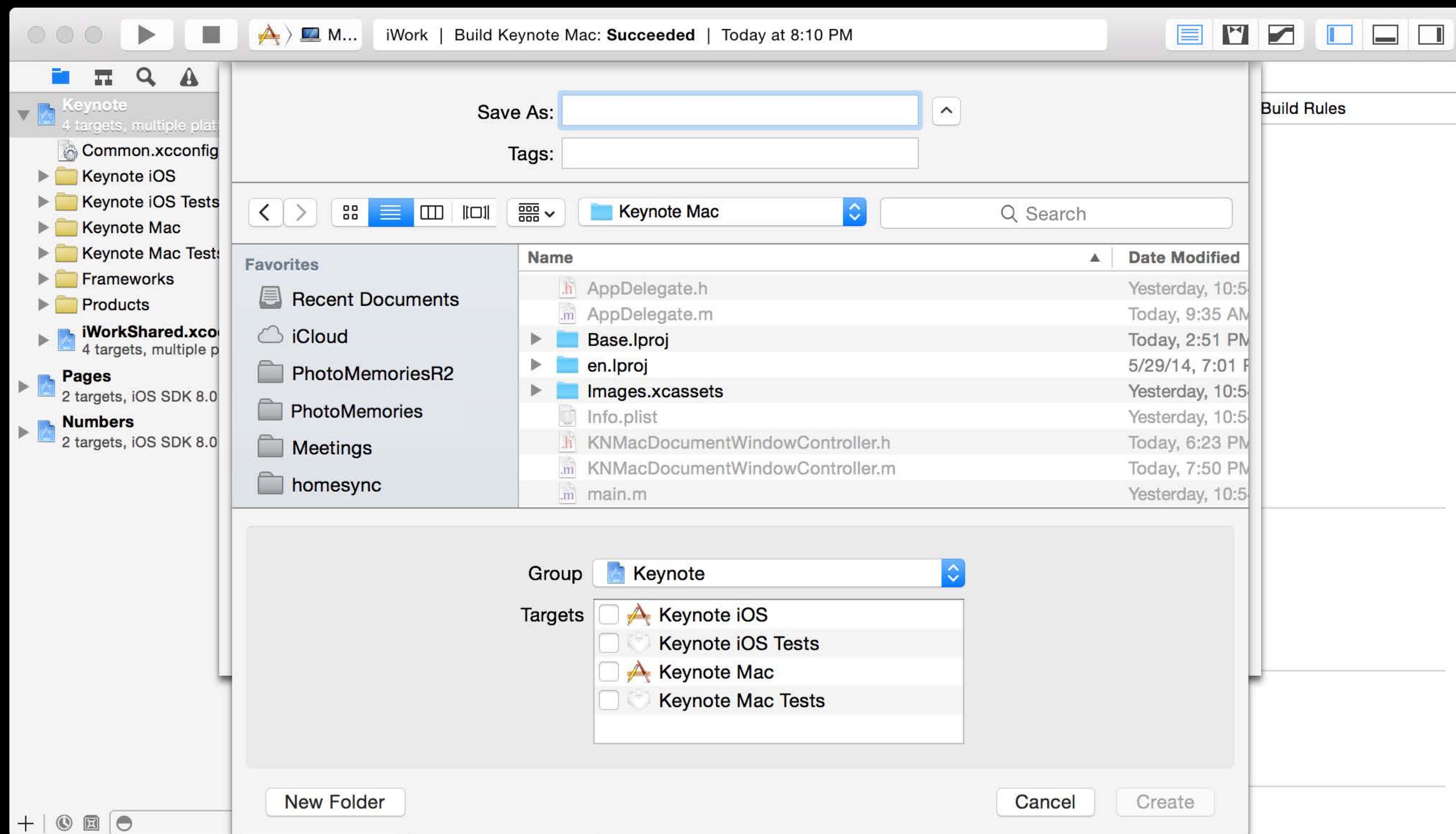
Common.xcconfig

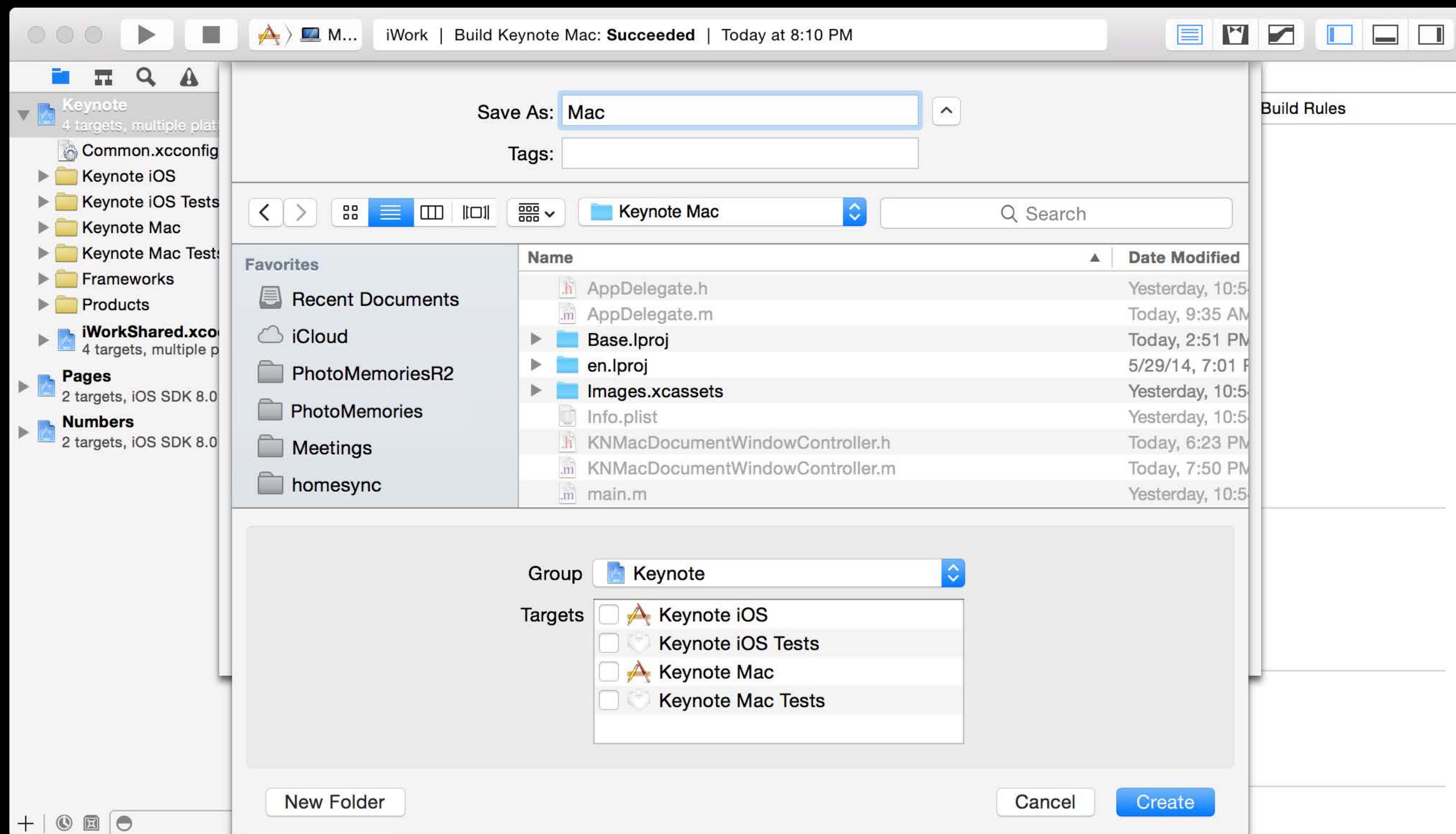
iOS.xcconfig

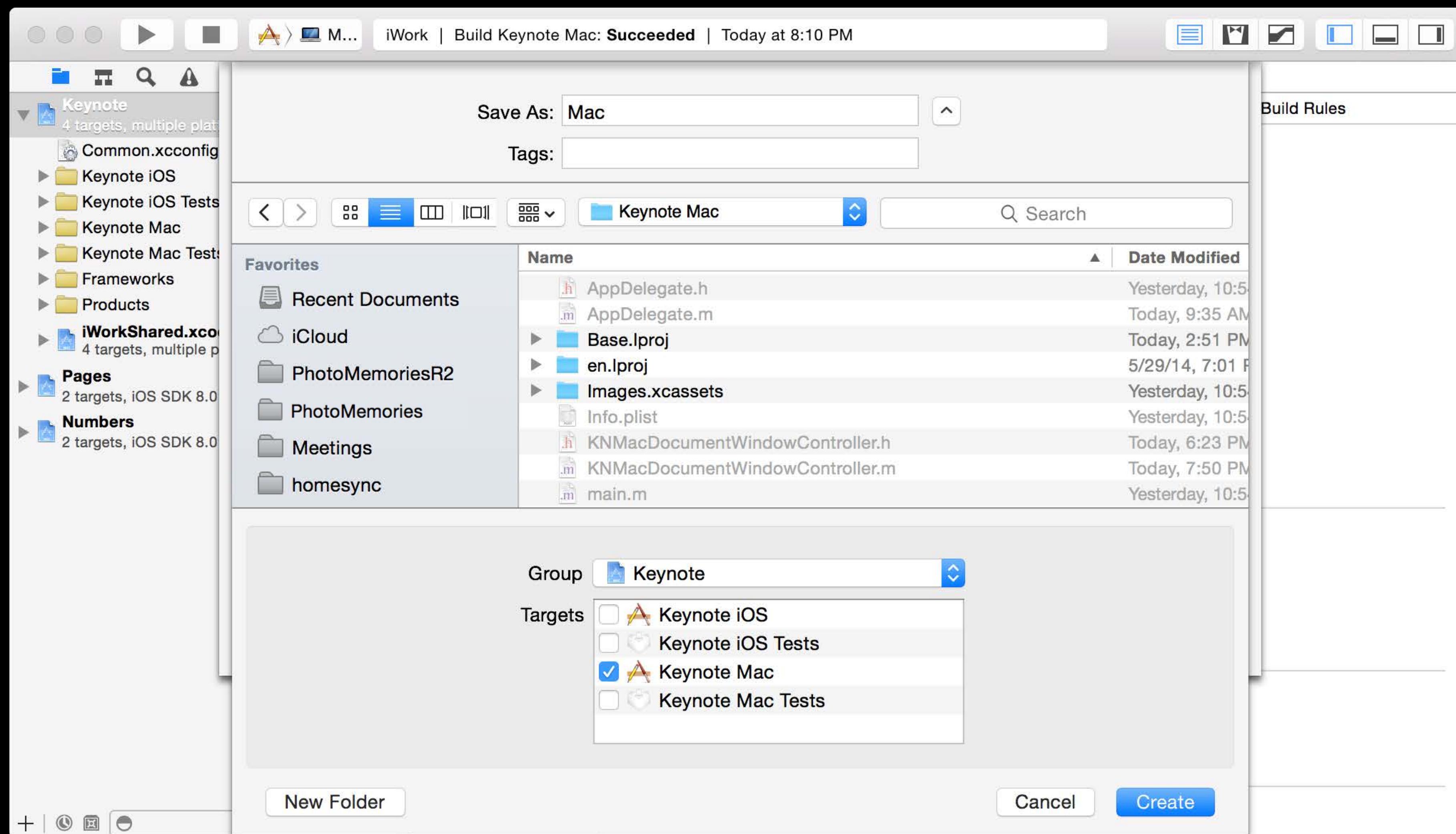
OSX.xcconfig











The screenshot shows the Xcode interface with the following details:

- Toolbar:** Standard Mac OS X window controls (red, yellow, green buttons), search, and various document-related icons.
- Status Bar:** iWork | Build Keynote Mac: **Succeeded** | Today at 8:10 PM
- File Navigator:** Shows the project structure:
 - Keynote** (4 targets, multiple platforms):
 - Mac.xcconfig** (selected)
 - Common.xcconfig
 - Keynote iOS
 - Keynote iOS Tests
 - Keynote Mac
 - Keynote Mac Tests
 - Frameworks
 - Products
 - iWorkShared.xcodeproj** (4 targets, multiple platforms)
 - Pages** (2 targets, iOS SDK 8.0)
 - Numbers** (2 targets, iOS SDK 8.0)
- Editor Area:** The selected file is **Mac.xcconfig**. The code content is:

```
1 //  
2 // Mac.xcconfig  
3 // Keynote  
4 //  
5 // Created by Chris Cowdery-Corvan on 6/3/14.  
6 // Copyright (c) 2014 Apple Inc. All rights reserved.  
7 //  
8 |
```

The screenshot shows the Xcode interface with the following details:

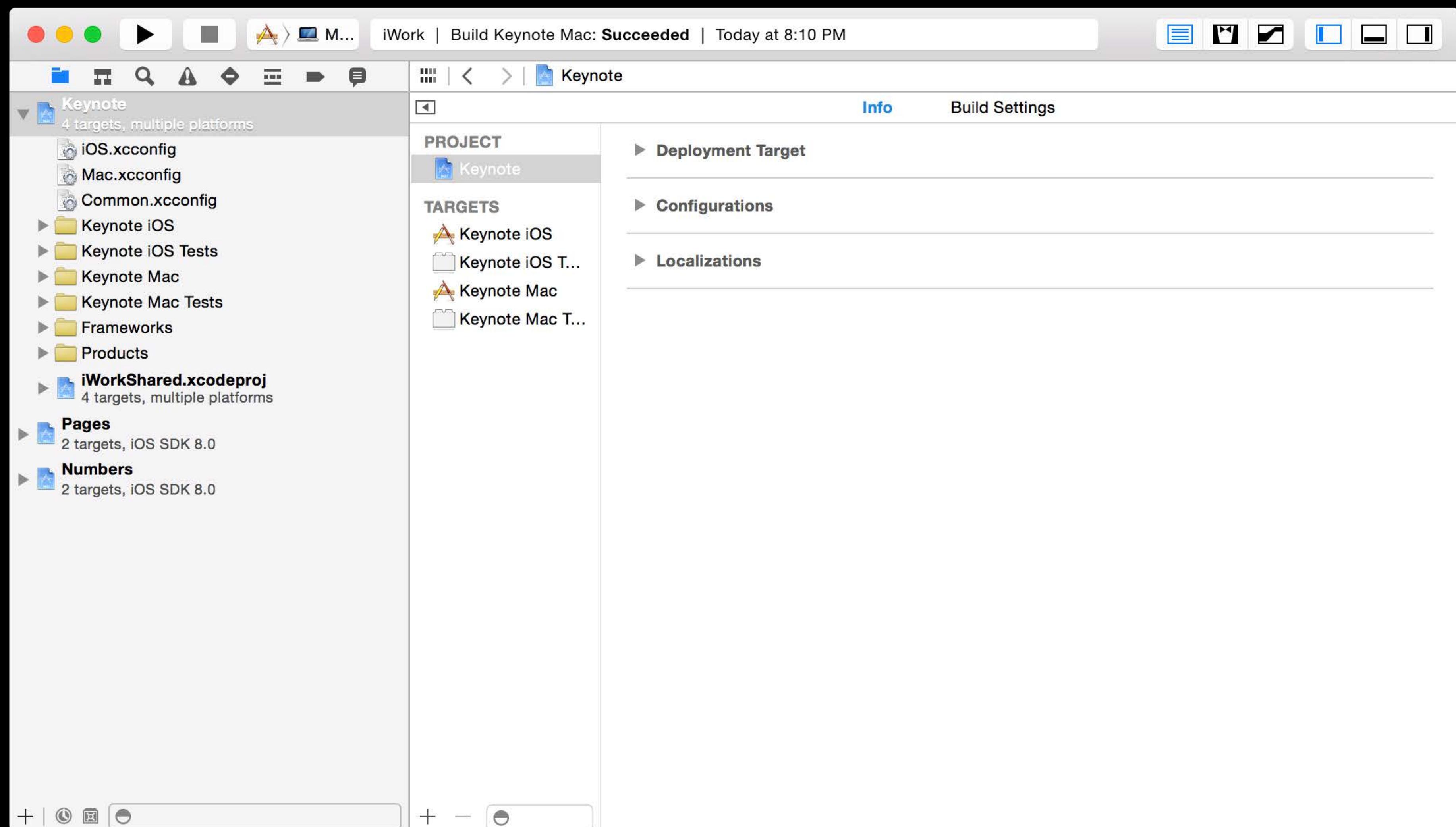
- Toolbar:** Standard Mac OS X window controls (red, yellow, green buttons), search, and various document-related icons.
- Status Bar:** Shows "iWork | Build Keynote Mac: Succeeded | Today at 8:10 PM".
- File Navigator:** Displays the project structure:
 - Keynote** (4 targets, multiple platforms):
 - Mac.xcconfig** (selected)
 - Common.xcconfig
 - Keynote iOS
 - Keynote iOS Tests
 - Keynote Mac
 - Keynote Mac Tests
 - Frameworks
 - Products
 - iWorkShared.xcodeproj** (4 targets, multiple platforms)
 - Pages** (2 targets, iOS SDK 8.0)
 - Numbers** (2 targets, iOS SDK 8.0)
- Editor Area:** The selected file is "Mac.xcconfig" under the "Keynote" project. The code content is:

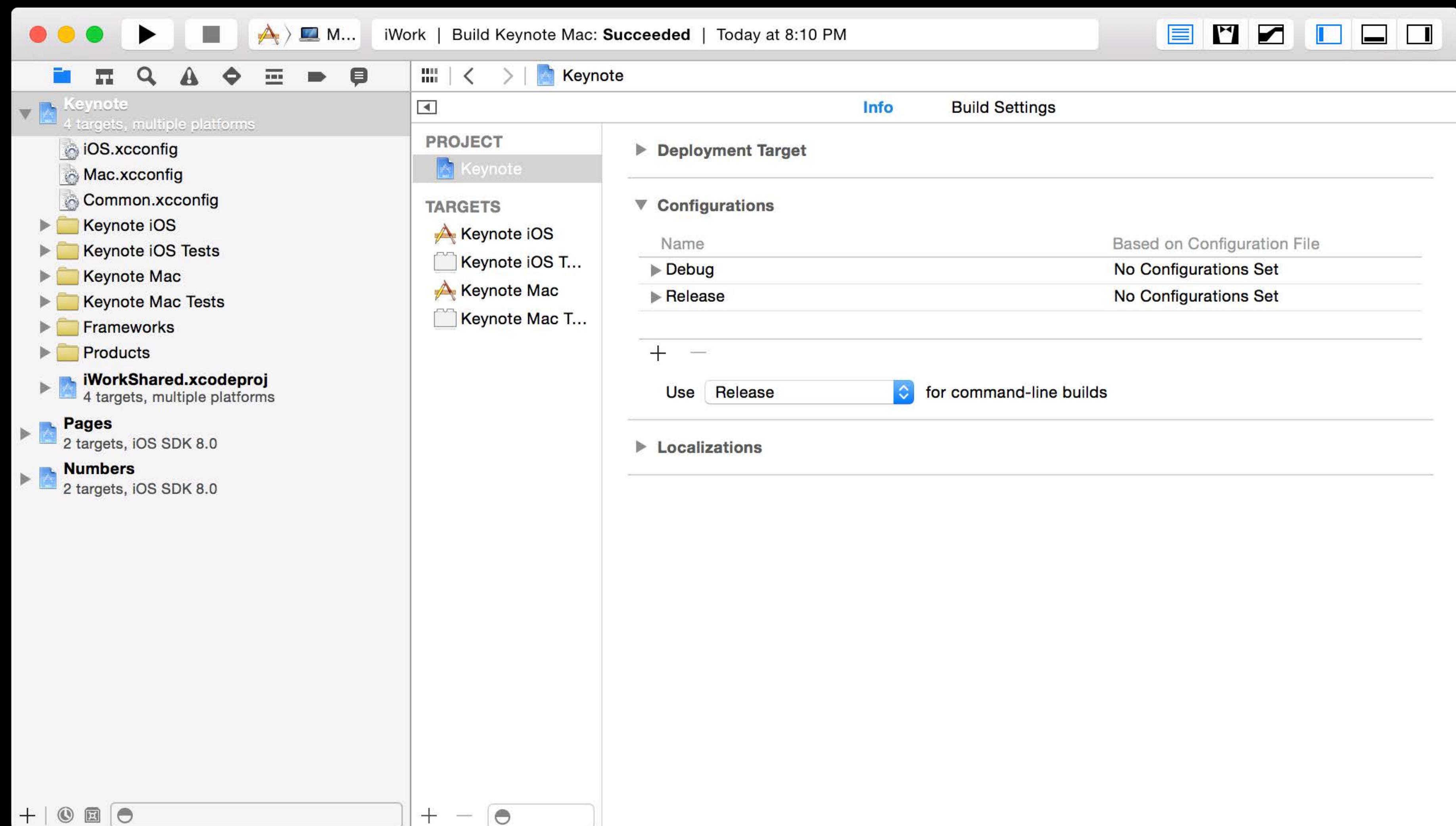
```
1 //  
2 // Mac.xcconfig  
3 // Keynote  
4 //  
5 // Created by Chris Cowdery-Corvan on 6/3/14.  
6 // Copyright (c) 2014 Apple Inc. All rights reserved.  
7 //  
8  
9 #include "Common.xcconfig"
```

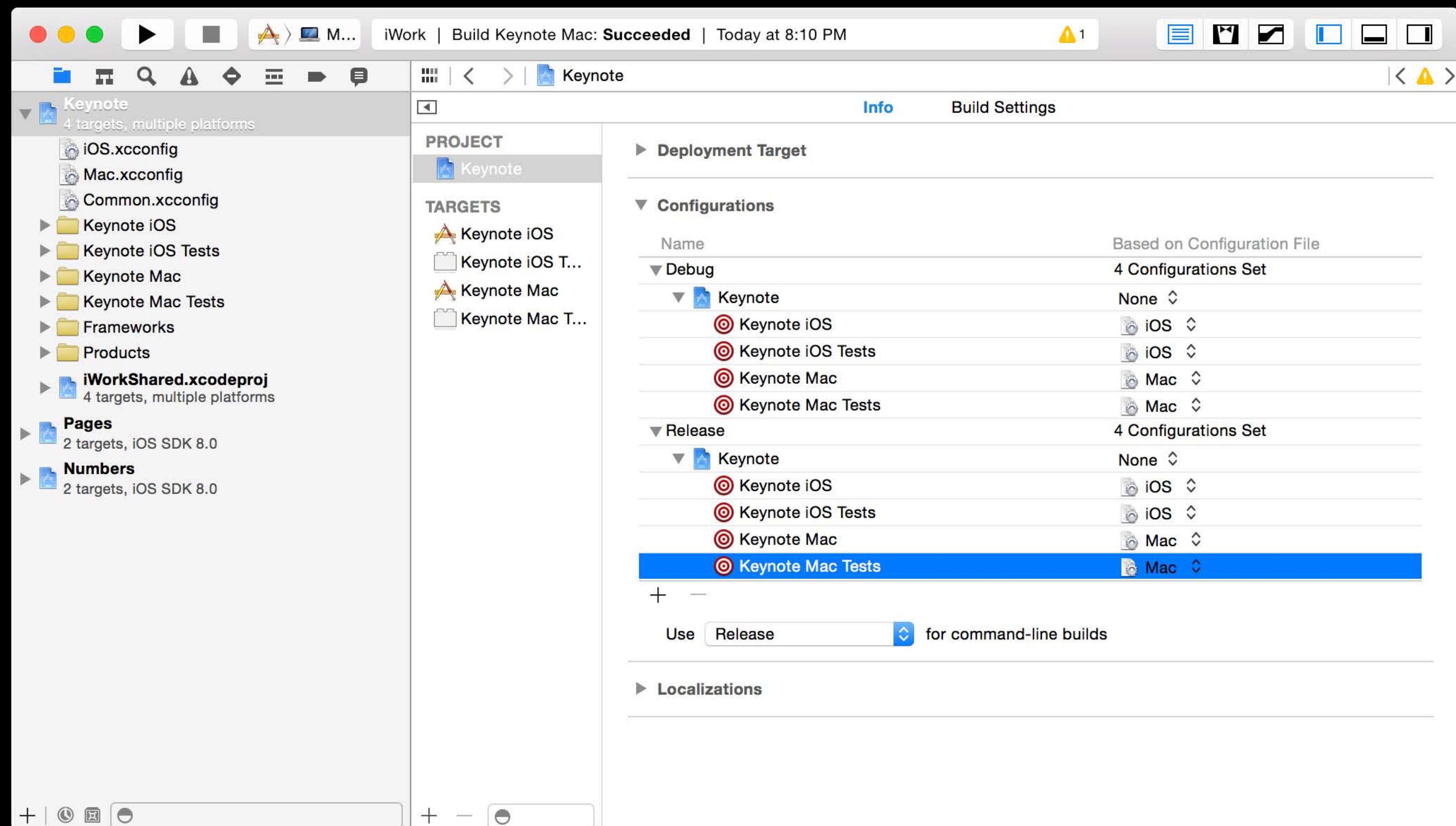
The screenshot shows the Xcode interface with the following details:

- Toolbar:** Standard Mac OS X window controls (red, yellow, green buttons), search, and file navigation.
- Status Bar:** iWork | Build Keynote Mac: **Succeeded** | Today at 9:19 PM
- File Navigator:** Shows the project structure:
 - Keynote** (4 targets, multiple platforms):
 - Mac.xcconfig (selected)
 - Common.xcconfig
 - Keynote iOS
 - Keynote iOS Tests
 - Keynote Mac
 - Keynote Mac Tests
 - Frameworks
 - Products
 - iWorkShared.xcodeproj (4 targets, multiple platforms)
 - Pages** (2 targets, iOS SDK 8.0)
 - Numbers** (2 targets, iOS SDK 8.0)
- Editor Area:** The Mac.xcconfig file content is displayed:

```
1 //  
2 // Mac.xcconfig  
3 // Keynote  
4 //  
5 // Created by Chris Cowdery-Corvan on 6/3/14.  
6 // Copyright (c) 2014 Apple Inc. All rights reserved.  
7 //  
8  
9 #include "Common.xcconfig"  
10  
11 SDKROOT = macosx  
12 SUPPORTED_PLATFORMS = macosx  
13 MACOSX_DEPLOYMENT_TARGET = 10.10  
14 VALID_ARCHS = $(ARCHS_STANDARD_64_BIT)
```







iWork | Build Keynote Mac: **Succeeded** | Today at 9:19 PM

Keynote

General Capabilities Info Build Settings Build Phases Build Rules

PROJECT Basic All Combined Levels + Search

TARGETS Keynote

Keynote iOS Keynote iOS T... Keynote Mac Keynote Mac T...

Architectures

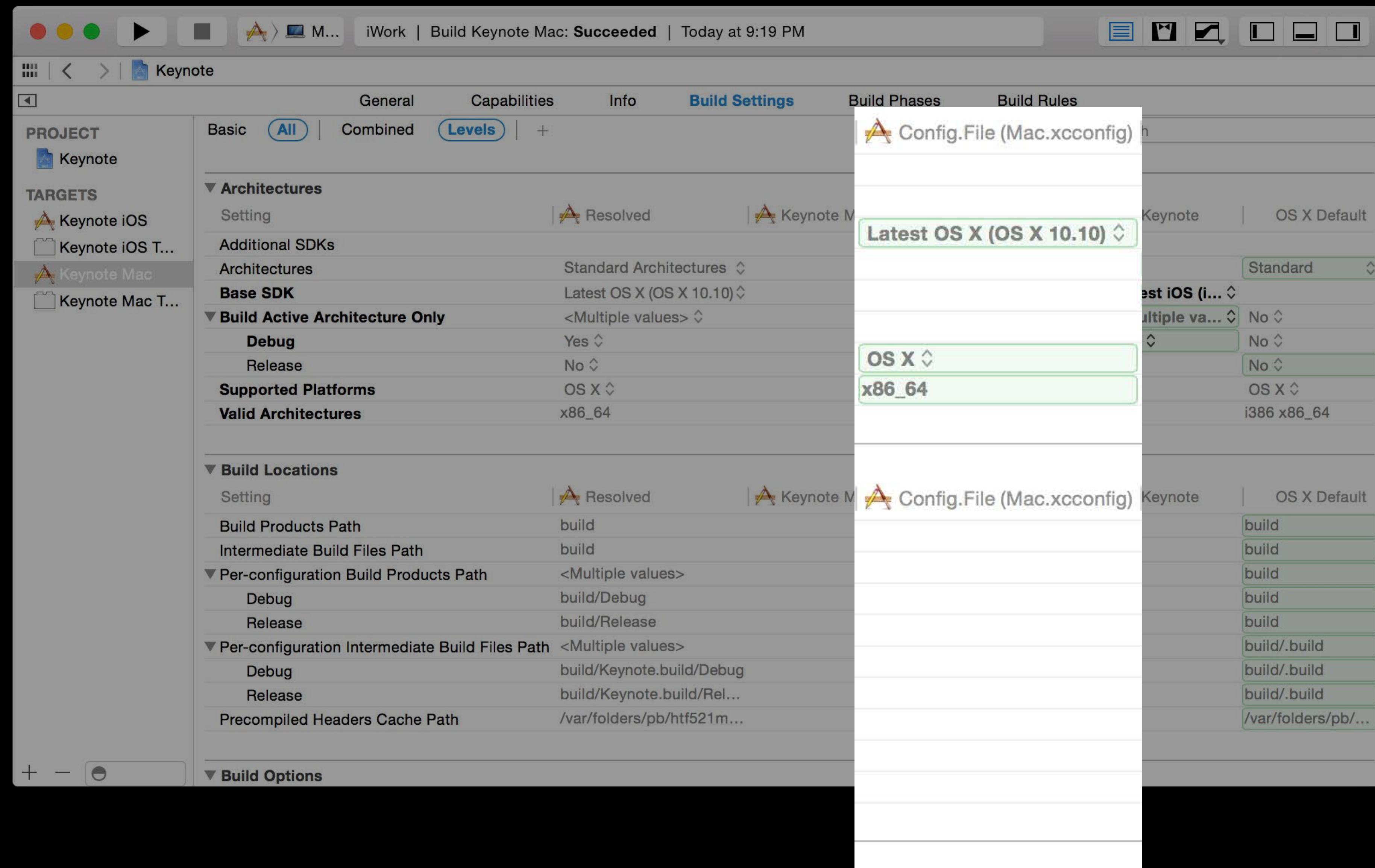
Setting	Resolved	Keynote Mac	Config.File (Mac.xcconfig)	Keynote	OS X Default
Additional SDKs					
Architectures	Standard Architectures				Standard
Base SDK	Latest OS X (OS X 10.10)	Latest OS X (OS X 10.10)	Latest iOS (i...)		
Build Active Architecture Only	<Multiple values>		<Multiple va...>	No	
Debug	Yes			Yes	No
Release	No				No
Supported Platforms	OS X	OS X			OS X
Valid Architectures	x86_64	x86_64			i386 x86_64

Build Locations

Setting	Resolved	Keynote Mac	Config.File (Mac.xcconfig)	Keynote	OS X Default
Build Products Path	build				build
Intermediate Build Files Path	build				build
Per-configuration Build Products Path	<Multiple values>				build
Debug	build/Debug				build
Release	build/Release				build
Per-configuration Intermediate Build Files Path	<Multiple values>				build/.build
Debug	build/Keynote.build/Debug				build/.build
Release	build/Keynote.build/Rel...				build/.build
Precompiled Headers Cache Path	/var/folders/pb/htf521m...				/var/folders/pb/...

+

Build Options



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There's so much to see and do.

Explore by land.
Discover miles of hiking trails and encounter dozens of unique plant and animal species.

Explore by sea.
Paddle through hidden coves and tiptoe through tidal pools. Both are home to a wide variety of sea life.

Cross-platform Projects

Summary

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Make a target for each platform

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Break common logic into libraries and frameworks

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Use same header directories

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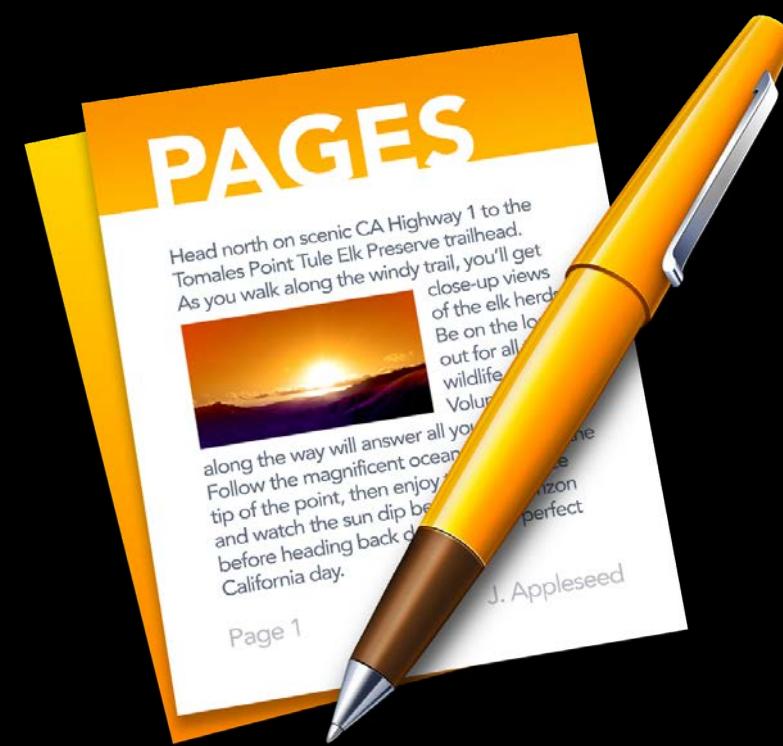
Summary

Make a target for each platform

Break common logic into libraries and frameworks

Use same header directories

Incorporate Xcode config files





Related Sessions

Labs

- Color Management Lab

Graphics and Games Friday 10:15AM

More Information

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