Developer Tools

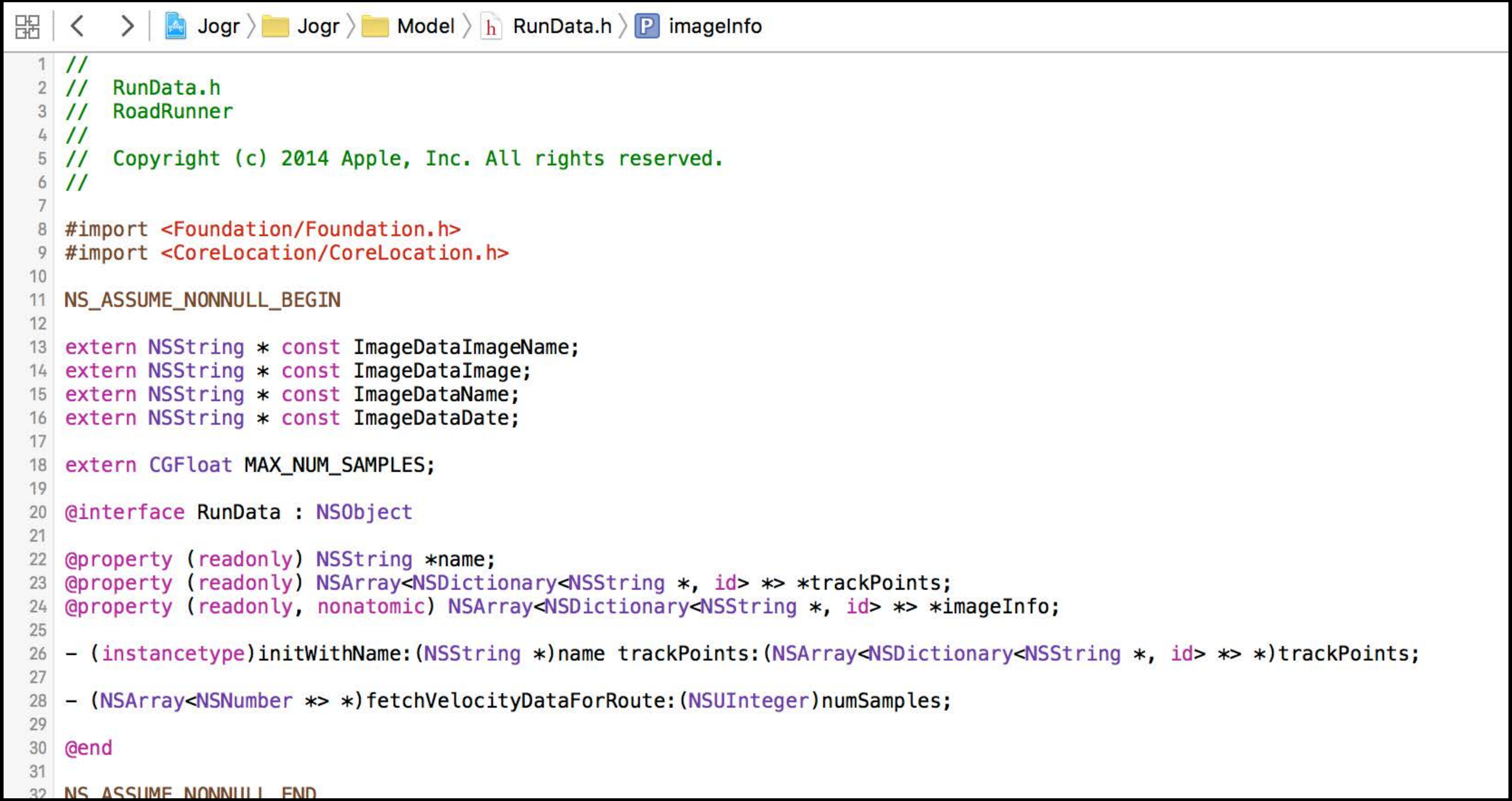
#WWDC15

Swift and Objective-C Interoperability

Session 401

Jordan Rose Compiler Engineer
Doug Gregor Compiler Engineer

Objective-C APIs Are Available in Swift



```
//
//  RunData.h
//  RoadRunner
//
//  Copyright (c) 2014 Apple, Inc. All rights reserved.
//

#import <Foundation/Foundation.h>
#import <CoreLocation/CoreLocation.h>

NS_ASSUME_NONNULL_BEGIN

extern NSString * const ImageDataImageName;
extern NSString * const ImageDataImage;
extern NSString * const ImageDataName;
extern NSString * const ImageDataDate;

extern CGFloat MAX_NUM_SAMPLES;

@interface RunData : NSObject

@property (readonly) NSString *name;
@property (readonly) NSArray<NSDictionary<NSString *, id> *> *trackPoints;
@property (readonly, nonatomic) NSArray<NSDictionary<NSString *, id> *> *imageInfo;

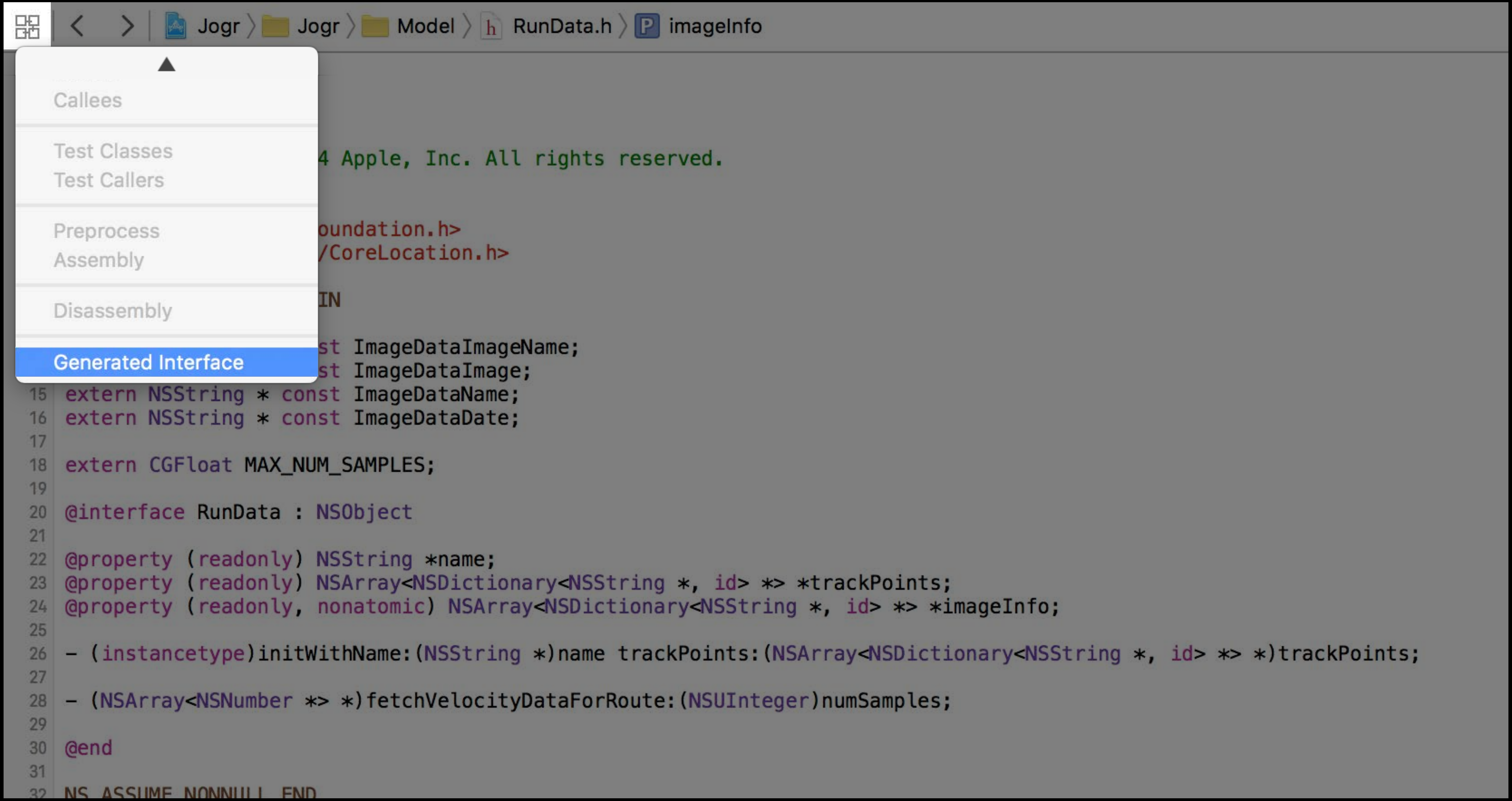
- (instancetype)initWithName:(NSString *)name trackPoints:(NSArray<NSDictionary<NSString *, id> *> *)trackPoints;

- (NSArray<NSNumber *> *)fetchVelocityDataForRoute:(NSUInteger)numSamples;

@end

NS_ASSUME_NONNULL_END
```

Objective-C APIs Are Available in Swift



```
4 Apple, Inc. All rights reserved.

oundation.h>
/CoreLocation.h>

IN

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@property (readonly, nonatomic) NSArray<NSDictionary<NSString *, id> *> *imageInfo;

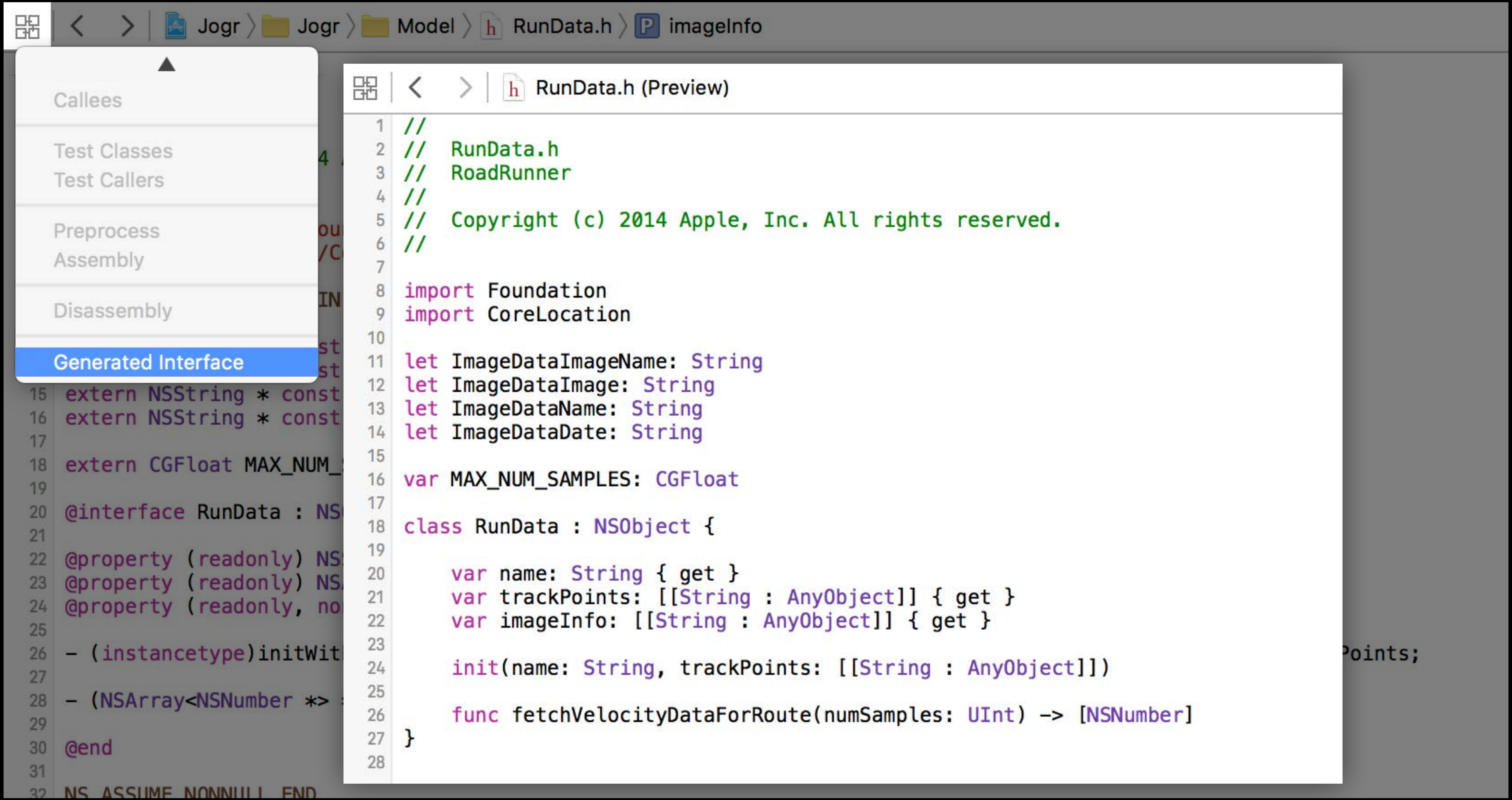
- (instancetype)initWithName:(NSString *)name trackPoints:(NSArray<NSDictionary<NSString *, id> *> *)trackPoints;

- (NSArray<NSNumber *> *)fetchVelocityDataForRoute:(NSUInteger)numSamples;

@end

NS_ASSUME_NONNULL_END
```

Objective-C APIs Are Available in Swift



```
//
//  RunData.h
//  RoadRunner
//
//  Copyright (c) 2014 Apple, Inc. All rights reserved.
//

import Foundation
import CoreLocation

let ImageDataImageName: String
let ImageDataImage: String
let ImageDataName: String
let ImageDataDate: String

var MAX_NUM_SAMPLES: CGFloat

class RunData : NSObject {

    var name: String { get }
    var trackPoints: [[String : AnyObject]] { get }
    var imageInfo: [[String : AnyObject]] { get }

    init(name: String, trackPoints: [[String : AnyObject]])

    func fetchVelocityDataForRoute(numSamples: UInt) -> [NSNumber]
}
```

Roadmap

Working with Objective-C

Error Handling

Nullability Annotations

Lightweight Generics

“Kindof” Types

Working with Objective-C

When Are Methods Exposed to Objective-C?

When Are Methods Exposed to Objective-C?

Subclasses of NSObject

```
class MyController : UIViewController {
  func refresh() {
    // ...
    // ...
  }
}
```

When Are Methods Exposed to Objective-C?

Subclasses of NSObject

- Not `private`

```
class MyController : UIViewController {
  private func refresh() {
    // ...
    // ...
  }
}
```

When Are Methods Exposed to Objective-C?

Subclasses of NSObject

- Not `private`
- Not using Swift features

```
class MyController : UIViewController {
  func refresh() -> (Int, String)? {
    // ...
    return (status, response)
  }
}
```

When Are Methods Exposed to Objective-C?

Subclasses of NSObject

- Not `private`
- Not using Swift features

Not for `@objc` protocols

```
class MyController : UIWebViewDelegate {
  func webViewDidStartLoad(v: UIWebView) {
    // ...
    // ...
  }
}
```

When Are Methods Exposed to Objective-C?

Subclasses of NSObject

- Not `private`
- Not using Swift features

Not for `@objc` protocols

```
class MyController : UIWebViewDelegate {
  func webViewDidStartLoad(v: UIWebView) {
```

```
warning: non-@objc method 'webViewDidStartLoad'
cannot satisfy optional requirement of @objc
protocol 'UIWebViewDelegate'
```

```
  }
}
```

When Are Methods Exposed to Objective-C?

Being explicit

When Are Methods Exposed to Objective-C?

Being explicit

```
class MyController : UIViewController {
  private func refresh() {
    // ...
    // ...
  }
}
```

When Are Methods Exposed to Objective-C?

Being explicit

@IBOutlet, @IBAction, @NSManaged

```
class MyController : UIViewController {
  @IBAction private func refresh() {
    // ...
    // ...
  }
}
```

When Are Methods Exposed to Objective-C?

Being explicit

`@IBOutlet`, `@IBAction`,
  `@NSManaged`

`dynamic`

```
class MyController : UIViewController {
  dynamic private var title: String? {
    get { /* ... */ }
    set { /* ... */ }
  }
}
```

When Are Methods Exposed to Objective-C?

Being explicit

`@IBOutlet`, `@IBAction`,
  `@NSManaged`

`dynamic`

`@objc`

```
class MyController : UIViewController {
  @objc private func refresh() {
    // ...
    // ...
  }
}
```

When Are Methods Exposed to Objective-C?

Being explicit

`@IBOutlet`, `@IBAction`, `@NSManaged`

`dynamic`

`@objc`

```
class MyController : UIViewController {
  @objc func refresh() -> (Int, String)? {
    // ...
    // ...
  }
}
```

When Are Methods Exposed to Objective-C?

Being explicit

`@IBOutlet`, `@IBAction`,
`@NSManaged`

`dynamic`

`@objc`

```
class MyController : UIViewController {
  @objc func refresh() -> (Int, String)? {
```

```
error: method cannot be marked @objc because
its result type cannot be represented in
Objective-C
```

```
  }
}
```

When Are Methods Exposed to Objective-C?

Being explicit

`@IBOutlet`, `@IBAction`,
  `@NSManaged`

`dynamic`

`@objc`

```
class MyController : UIViewController {
   @objc func refresh() -> (Int, String)? {
```

```
error: method cannot be marked @objc because
its result type cannot be represented in
Objective-C
```

```
   }
}
```

Selector Conflicts

```
class CalculatorController : UIViewController {
  func performOperation(op: (Double) -> Double) {
    // ...
  }


  func performOperation(op: (Double, Double) -> Double) {
    // ...
  }
}
```

Selector Conflicts

```
class CalculatorController : UIViewController {
  func performOperation(op: (Double) -> Double) {
    // ...
  }


  func performOperation(op: (Double, Double) -> Double) {
    //
  }
}
```

```
error: method 'performOperation' with
Objective-C selector 'performOperation:'
conflicts with previous declaration with the
same Objective-C selector
```

Selector Conflicts

```
class CalculatorController : UIViewController {
  func performOperation(op: (Double) -> Double) {
    // ...
  }

  @objc(performBinaryOperation:)
  func performOperation(op: (Double, Double) -> Double) {
    // ...
  }
}
```

Selector Conflicts

NEW

```
class CalculatorController : UIViewController {
  func performOperation(op: (Double) -> Double) {
    // ...
  }

  @nonobjc
  func performOperation(op: (Double, Double) -> Double) {
    // ...
  }
}
```

Function Pointers

Function Pointers

Used in C for callbacks

Function Pointers

Used in C for callbacks

Like closures, but can’t carry state

Function Pointers

Used in C for callbacks

Like closures, but can’t carry state

```
let fd = funopen(nil, nil, {
  [weak self] ctx, data, length in
  self?.appendData(data, length)
  return length
}, nil, nil)
```

Function Pointers

Used in C for callbacks

Like closures, but can't carry state

```
let fd = funopen(nil, nil, {
  [weak self] ctx, data, length in
  self?.appendData(data, length)
  return length
}, nil, nil)
```

```
error: C function pointer cannot be
formed from a closure that captures
context
```

Function Pointers

In Swift 1.2

```
typedef void (*dispatch_function_t)(void *);
```

```
typealias dispatch_function_t =
    CFunctionPointer<(UnsafeMutablePointer<Void>) -> Void>
```

Function Pointers

In Swift 2.0

NEW

```
typedef void (*dispatch_function_t)(void *);
```

```
typealias dispatch_function_t =
    @convention(c) (UnsafeMutablePointer<Void>) -> Void
```

Error Handling

Error Handling

Objective-C

```
- (id)contentsForType:(NSString *)typeName
                error:(NSError **)outError;
```

Swift

```
func contentsForType(typeName: String) throws -> AnyObject
```

Error Handling

Objective-C

```
- (id)contentsForType:(NSString *)typeName
                error:(NSError **)outError;
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Swift

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func contentsForType(typeName: String) throws -> AnyObject
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Error Handling

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Error Handling

Objective-C

```
- (id)contentsForType:(NSString *)typeName
                error:(NSError **)outError;
```

Swift

```
func contentsForType(typeName: String) throws -> AnyObject
```

Error Handling

Return types

Objective-C

```
- (id)contentsForType:(NSString *)typeName
                error:(NSError **)outError;
```

Swift

```
func contentsForType(typeName: String) throws -> AnyObject
```

Error Handling

Return types

Objective-C

```
- (BOOL)readFromURL:(NSURL *)url
              error:(NSError **)outError;
```

Swift

```
func readFromURL(url: NSURL) throws -> Void
```

Error Handling

"AndReturnError"

Objective-C

```
- (BOOL)checkResourceIsReachableAndReturnError:(NSError **)error;
```

Swift

```
func checkResourceIsReachable() throws -> Void
```

Error Handling

Callbacks?

Objective-C

```objc
- (void)moveToURL:(NSURL *)url
completionHandler:(void (^)(NSError *))handler;
```

Swift

```swift
func moveToURL(url: NSURL,
               completionHandler handler: (NSError?) -> Void)
```

“What if I call a Swift method from Objective-C and it throws an error?”

Error Handling

The secret life of ErrorType

```
@objc enum RequestError : Int, ErrorType {
  case Incomplete = 9001
}
```

Error Handling

The secret life of ErrorType

```
@objc enum RequestError : Int, ErrorType {
  case Incomplete = 9001
}
```

```
func sendRequest(request: Request) throws {
  if !request.isComplete {
    throw RequestError.Incomplete
  }
  // …
}
```

Error Handling

The secret life of ErrorType

```
@objc enum RequestError : Int, ErrorType {
  case Incomplete = 9001
}
```

```
NSError *error;
id result = [controller sendRequest:request error:&error];
```

Error Handling

The secret life of ErrorType

```swift
@objc enum RequestError : Int, ErrorType {
  case Incomplete = 9001
}
```

```objc
NSError *error;
id result = [controller sendRequest:request error:&error];
```

Error Handling

The secret life of ErrorType

```
@objc enum RequestError : Int, ErrorType {
  case Incomplete = 9001
}
```

```
NSError *error;
id result = [controller sendRequest:request error:&error];
if (!result) {
  NSLog(@"failure %@: %ld", error.domain, error.code);
  return nil;
}
```

Error Handling

The secret life of ErrorType

```
@objc enum RequestError : Int, ErrorType {
  case Incomplete = 9001
}
```

```
NSError *error;
id result = [controller sendRequest:request error:&error];
if (!result) {
  NSLog(@"failure %@: %ld", error.domain, error.code);
  return nil;
}
```

```
failure MyApp.RequestError: 9001
```

Error Handling

The secret life of ErrorType

```
@objc enum RequestError : Int, ErrorType {
  case Incomplete = 9001
}
```

```
// Generated by Swift 2.0.
typedef NS_ENUM(NSInteger, RequestError) {
  RequestErrorIncomplete = 9001
};
```

Error Handling

The secret life of ErrorType

```
@objc enum RequestError : Int, ErrorType {
  case Incomplete = 9001
}
```

```
// Generated by Swift 2.0.
typedef NS_ENUM(NSInteger, RequestError) {
  RequestErrorIncomplete = 9001
};
static NSString * const RequestErrorDomain = @"...";
```

Handling Cocoa Errors

Handling Cocoa Errors

```swift
func preflight() -> Bool {
  do {
    try url.checkResourceIsReachable()
    resetState()
    return true
  } catch NSURLError.FileDoesNotExist {
    return true // still okay
  } catch {
    return false
  }
}
```

Handling Cocoa Errors

```
func preflight() -> Bool {
  do {
    try url.checkResourceIsReachable()
    resetState()
    return true
  } catch NSURLError.FileDoesNotExist {
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}
```

Handling Cocoa Errors

```
func preflight() -> Bool {
  do {
    try url.checkResourceIsReachable()
    resetState()
    return true
  } catch NSURLError.FileDoesNotExist {
    return true // still okay
  } catch {
    return false
  }
}
```

NSCocoaError

NSURLError

AVError

CKErrorCode

CLError

GKErrorCode

HMErrorCode

POSIXError

WKErrorCode

WatchKitErrorCode

Nullability for Objective-C

Which Pointers Can Be **`nil`**?

Objective-C

```
@interface UIView
@property(nonatomic,readonly) UIView       *superview;
@property(nonatomic,readonly,copy) NSArray *subviews;
- (UIView *)hitTest:(CGPoint)point withEvent:(UIEvent *)event;
@end
```

Which Pointers Can Be **`nil`**?

Objective-C

```
@interface UIView
@property(nonatomic,readonly) UIView       *superview;
@property(nonatomic,readonly,copy) NSArray *subviews;
- (UIView *)hitTest:(CGPoint)point withEvent:(UIEvent *)event;
@end
```

Swift 1.0

```
class UIView {
  var superview: UIView!
  var subviews: [AnyObject]!
  func hitTest(point: CGPoint, withEvent: UIEvent!) -> UIView!
}
```

Nullability Audit

Objective-C

```
@interface UIView
@property(nonatomic,readonly) UIView       *superview;
@property(nonatomic,readonly,copy) NSArray *subviews;
- (UIView *)hitTest:(CGPoint)point withEvent:(UIEvent *)event;
@end
```

Swift 1.1

```
class UIView {
  var superview: UIView?
  var subviews: [AnyObject]
  func hitTest(point: CGPoint, withEvent: UIEvent?) -> UIView?
}
```

Nullability Qualifiers for Objective-C

Indicate whether Objective-C/C pointers can be `nil`

- Better communicates the intent of APIs
- Allows improved static checking
- Improves usability of APIs in Swift

Nullability Qualifiers

Qualifier	Usage	Swift
`nullable`	Pointer may be `nil`	`UIView?`
`nonnull`	`nil` is not a meaningful value	`UIView`
`null_unspecified`	Neither `nullable` nor `nonnull` applies	`UIView!`

Nullability in the SDK

Nullability qualifiers used throughout the SDKs

New warnings for misuses of APIs with non-null parameters

```
[tableView deselectRowAtIndexPath: nil animated: false];
```

Nullability in the SDK

Nullability qualifiers used throughout the SDKs

New warnings for misuses of APIs with non-null parameters

```
[tableView deselectRowAtIndexPath: nil animated: false];
```

```
warning: null passed to a callee
that requires a non-null argument
```

Audited Regions

Objective-C

```
NS_ASSUME_NONNULL_BEGIN
@interface UIView
@property(nonatomic,readonly) UIView       *superview;
@property(nonatomic,readonly,copy) NSArray *subviews;
- (UIView *)hitTest:(CGPoint)point withEvent:(UIEvent *)event;
@end
NS_ASSUME_NONNULL_END
```

Audited regions make default assumptions about some pointers:

- Single-level pointers are assumed to be `nonnull`
- `NSError**` parameters are assumed to be nullable for both levels

Audited Regions

Objective-C

```
NS_ASSUME_NONNULL_BEGIN
@interface UIView
@property(nonatomic,readonly,nullable) UIView       *superview;
@property(nonatomic,readonly,copy) NSArray *subviews;
- (nullable UIView *)hitTest:(CGPoint)point withEvent:(nullable UIEvent *)event;
@end
NS_ASSUME_NONNULL_END
```

Audited regions make default assumptions about some pointers:

- Single-level pointers are assumed to be `nonnull`
- `NSError**` parameters are assumed to be nullable for both levels

Only annotate the `nullable` or `null_unspecified` cases

C Pointers

Double-underscored variants of nullability qualifiers can be used anywhere

Write the nullability qualifier *after* the pointer

```
CFArrayRef __nonnull CFArrayCreate(
                       CFAllocatorRef __nullable allocator,
                       const void * __nonnull * __nullable values,
                       CFIndex numValues,
                       const CFArrayCallBacks * __nullable callBacks);
```

C Pointers

Double-underscored variants of nullability qualifiers can be used anywhere

Write the nullability qualifier *after* the pointer

```
CFArrayRef __nonnull CFArrayCreate(
                       CFAllocatorRef __nullable allocator,
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                       const CFArrayCallBacks * __nullable callBacks);
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C Pointers

Double-underscored variants of nullability qualifiers can be used anywhere

Write the nullability qualifier *after* the pointer

```
CFArrayRef __nonnull CFArrayCreate(
                       CFAllocatorRef __nullable allocator,
                       const void * __nonnull * __nullable values,
                       CFIndex numValues,
                       const CFArrayCallBacks * __nullable callBacks);
```

Nullability for Objective-C

Used throughout the SDKs

Use it to improve your Objective-C APIs

Lightweight Generics for Objective-C

Collections

Objective-C

```
@interface UIView
@property(nonatomic,readonly,copy) NSArray *subviews;
@end
```

Collections

Objective-C

```
@interface UIView
@property(nonatomic,readonly,copy) NSArray *subviews;
@end
```

Swift

```
class UIView {
  var subviews: [AnyObject] { get }
}
```

Typed Collections

Allow collections to be parameterized by element type

- “An array of views”
- “A dictionary mapping strings to images”

Typed Collections

Allow collections to be parameterized by element type

- “An array of views”
- “A dictionary mapping strings to images”

Lightweight generics for Objective-C

- Improve expressivity of APIs
- Make collections easier to use
- Enable better static type checking

Typed Collections

Objective-C

```
@interface UIView
@property(nonatomic,readonly,copy) NSArray *subviews;
@end
```

Typed Collections

Objective-C

```
@interface UIView
@property(nonatomic,readonly,copy) NSArray<UIView *> *subviews;
@end
```

Typed Collections

NEW

Objective-C

```
@interface UIView
@property(nonatomic,readonly,copy) NSArray<UIView *> *subviews;
@end
```

Typed Collections

NEW

Objective-C

```
@interface UIView
@property(nonatomic,readonly,copy) NSArray<UIView *> *subviews;
@end
```

Swift

```
class UIView {
  var subviews: [UIView] { get }
}
```

Type Safety for Typed Collections

```
NSURL *url = …;
NSArray<NSURL *> *components = url.pathComponents;
```

Type Safety for Typed Collections

```
NSURL *url = …;
NSArray<NSURL *> *components = url.pathComponents;
```

```
warning: incompatible pointer types initializing
'NSArray<NSURL *> *' with 'NSArray<NSString *> *'
```

Type Safety for Typed Collections

```
NSURL *url = …;
NSArray<NSURL *> *components = url.pathComponents;
```

```
warning: incompatible pointer types initializing
'NSArray<NSURL *> *' with 'NSArray<NSString *> *'
```

```
NSMutableArray<NSString *> *results = …;
[results addObject: @17];
```

Type Safety for Typed Collections

```
NSURL *url = …;
NSArray<NSURL *> *components = url.pathComponents;
```

```
warning: incompatible pointer types initializing
'NSArray<NSURL *> *' with 'NSArray<NSString *> *'
```

```
NSMutableArray<NSString *> *results = …;
[results addObject: @17];
```

```
warning: incompatible pointer types sending
'NSNumber *' to parameter of type 'NSString *'
```

Type Safety for Typed Collections

```
NSArray<UIView *> *views;
NSArray<UIResponder *> *responders = views;
```

Type Safety for Typed Collections

```
NSArray<UIView *> *views;
NSArray<UIResponder *> *responders = views;
```

```
NSMutableArray<UIView *> *storedViews;
NSMutableArray<UIResponder *> *storedResponders = storedViews;
```

Type Safety for Typed Collections

```
NSArray<UIView *> *views;
NSArray<UIResponder *> *responders = views;
```

```
NSMutableArray<UIView *> *storedViews;
NSMutableArray<UIResponder *> *storedResponders = storedViews;
[storedResponders addObject: myViewController];
```

Type Safety for Typed Collections

```
NSArray<UIView *> *views;
NSArray<UIResponder *> *responders = views;
```

```
NSMutableArray<UIView *> *storedViews;
NSMutableArray<UIResponder *> *storedResponders = storedViews;
[storedResponders addObject: myViewController];
```

```
warning: incompatible pointer types initializing
‘NSMutableArray<UIResponder *> *’ with
‘NSMutableArray<UIView *> *’
```

Defining Lightweight Generics

```
@interface NSArray : NSObject



@end
```

Defining Lightweight Generics

```
@interface NSArray<ObjectType> : NSObject



@end
```

Defining Lightweight Generics

NEW

```
@interface NSArray<ObjectType> : NSObject



@end
```

- Type parameters specified in <…>

Parameterized Classes

NEW

```
@interface NSArray<ObjectType> : NSObject
- (ObjectType)objectAtIndex:(NSUInteger)index;



@end
```

- Type parameters specified in <…>
- Type parameters can be used throughout that interface

Parameterized Classes

NEW

```
@interface NSArray<ObjectType> : NSObject
- (ObjectType)objectAtIndex:(NSUInteger)index;
- (instancetype)initWithObjects:(const ObjectType [])objects
                          count:(NSUInteger)cnt;
- (NSArray<ObjectType> *)arrayByAddingObject:(ObjectType)anObject;
@end
```

- Type parameters specified in <…>
- Type parameters can be used throughout that interface

Categories and Extensions

NEW

```
@interface NSDictionary<KeyType, ObjectType> (Lookup)
- (nullable ObjectType)objectForKey:(KeyType)aKey;
@end


@interface NSDictionary (Counting)
@property (readonly) NSUInteger count;
@end
```

Backward Compatibility

Type erasure model provides binary compatibility

- No changes to the Objective-C runtime
- Zero impact on code generation

Backward Compatibility

Type erasure model provides binary compatibility

- No changes to the Objective-C runtime
- Zero impact on code generation

Implicit conversions provide source compatibility:

```
NSArray<NSString *> *strings = …;
NSArray *array = …;
array = strings; // okay, drops type arguments
strings = array; // okay, adds type arguments
```

“Kindof” Types for Objective-C

A Problem of Evolution

```
@interface UIView
@property(nonatomic,readonly,copy) NSArray *subviews;
@end



 [view.subviews[0] setTitle:@“Yes” forState:UIControlStateNormal];
```

A Problem of Evolution

```
@interface UIView
@property(nonatomic,readonly,copy) NSArray<UIView *> *subviews;
@end



 [view.subviews[0] setTitle:@“Yes” forState:UIControlStateNormal];
```

A Problem of Evolution

```
@interface UIView
@property(nonatomic,readonly,copy) NSArray<UIView *> *subviews;
@end



 [view.subviews[0] setTitle:@“Yes” forState:UIControlStateNormal];
```

```
warning: ‘UIView’ may not respond to ‘setTitle:forState:’
```

`id` is a Weak API Contract

Many `id`-producing APIs mean “some subclass of `NSFoo`”:

```
extern id NSApp; // NSApplication instance
```

id is a Weak API Contract

“Kindof” types express “some kind of X”

NEW

Many id-producing APIs mean “some subclass of NSFoo”:

```
extern id NSApp; // NSApplication instance
```

id is a Weak API Contract

NEW

“Kindof” types express “some kind of X”

Many id-producing APIs mean “some subclass of NSFoo”:

```
extern __kindof NSApplication *NSApp; // NSApplication instance
```

`id` is a Weak API Contract

NEW

“Kindof” types express “some kind of X”

Many `id`-producing APIs mean “some subclass of `NSFoo`”:

```
extern __kindof NSApplication *NSApp; // NSApplication instance
```

`__kindof` types implicit convert to superclasses and subclasses:

```
NSObject *object = NSApp;     // convert to superclass
MyApplication *myApp = NSApp; // convert to subclass
NSString *string = NSApp;
```

id is a Weak API Contract

NEW

“Kindof” types express “some kind of X”

Many `id`-producing APIs mean “some subclass of `NSFoo`”:

```
extern __kindof NSApplication *NSApp; // NSApplication instance
```

`__kindof` types implicit convert to superclasses and subclasses:

```
NSObject *object = NSApp;      // convert to superclass
MyApplication *myApp = NSApp; // convert to subclass
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```
warning: incompatible pointer types initializing
‘NSString *’ from ‘__kindof NSApplication *’
```

`id` is a Weak API Contract

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NSString *string = NSApp;
```

Allows messaging subclass methods:

```
[NSApp praiseUser];            // invokes -[MyApplication praiseUser]
```

“Kindof” Types Are a More Useful **id**

Objective-C

```
@interface NSTableView : NSControl
-(nullable id)viewAtColumn:(NSInteger)column
                        row:(NSInteger)row
            makeIfNecessary:(BOOL)makeIfNecessary;
@end
```

Swift

```
class NSTableView : NSControl {
  func viewAtColumn(column: Int, row: Int, makeIfNecessary: Bool)
         -> AnyObject?
}
```

“Kindof” Types Are a More Useful **id**

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        -> NSView?
}
```

“Kindof” Types with Lightweight Generics

Objective-C

```
@interface UIView
@property(nonatomic,readonly,copy) NSArray<UIView *> *subviews;
@end
```

```
[view.subviews[0] setTitle:@“Yes” forState:UIControlStateNormal];
UIButton *button = view.subviews[0];
```

“Kindof” Types with Lightweight Generics

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Should I Use `id` in an API?

Most idiomatic uses of `id` can be replaced with a more precise type

- `instancetype` for methods that return "`self`"
- Typed collections for most collections
- `__kindof X *` for "some subclass of `X`"
- `id<SomeProtocol>` for any type that conforms to `SomeProtocol`

Should I Use **`id`** in an API?

Most idiomatic uses of `id` can be replaced with a more precise type

- `instancetype` for methods that return "`self`"
- Typed collections for most collections
- `__kindof X *` for "some subclass of `X`"
- `id<SomeProtocol>` for any type that conforms to `SomeProtocol`

Use `id` when you truly mean "an object of any type":

```
@property (nullable, copy) NSDictionary<NSString *, id> *userInfo;
```

Summary

Swift and Objective-C are co-designed to work together

- Xcode helps you move between the two languages

Modernize your Objective-C!

- New Objective-C language features improve API expressiveness
- Find problems faster with better type safety in Objective-C
- Makes your Objective-C interfaces beautiful in Swift

More Information

Swift Language Documentation
http://developer.apple.com/swift

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

Stefan Lesser
Swift Evangelist
slesser@apple.com

Related Sessions

What's New in Swift	Presidio	Tuesday 11:00AM
What's New in Cocoa	Presidio	Tuesday 1:30PM
Improving Your Existing Apps with Swift	Pacific Heights	Tuesday 3:30PM
Swift in Practice	Presidio	Thursday 2:30PM
Building Better Apps with Value Types in Swift	Mission	Friday 2:30PM

Labs

Swift Lab	Developer Tools Lab A	Tuesday 1:30PM
Cocoa Lab	Frameworks Lab B	Tuesday 2:30PM
Swift Lab	Developer Tools Lab A	Wednesday 9:00AM
Foundation Lab	Frameworks Lab A	Wednesday 9:00AM
Swift Lab	Developer Tools Lab A	Wednesday 1:30PM
Swift Lab	Developer Tools Lab A	Thursday 9:00AM
Swift Lab	Developer Tools Lab A	Thursday 1:30PM

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