从OC到Swift

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码拉松

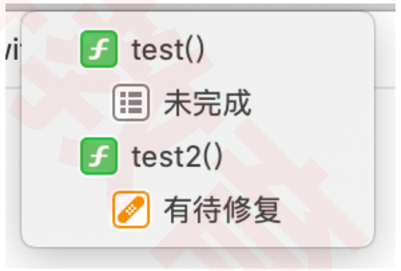
小码哥教育
SEEMYGO

实力IT教育 www.520it.com

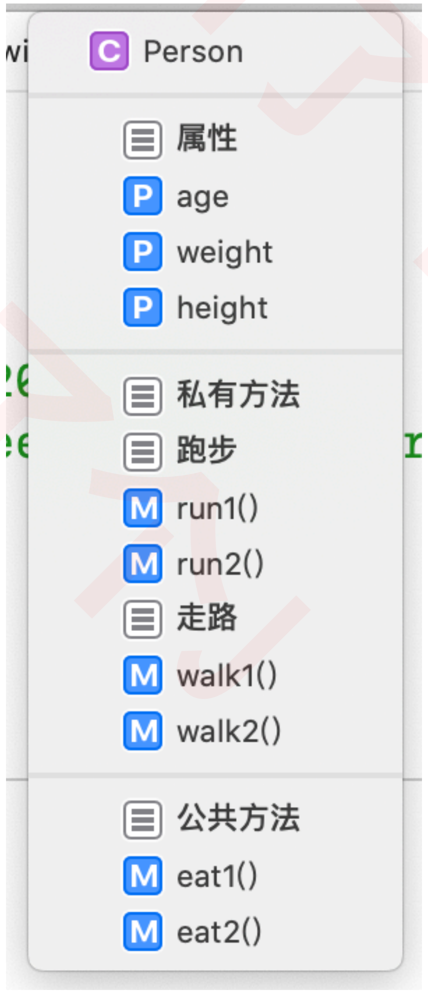
MARK、TODO、FIXME

- // MARK: 类似于OC中的 #pragma mark
- // MARK: - 类似于OC中的 #pragma mark -
- // TODO: 用于标记未完成的任务
- // FIXME: 用于标记待修复的问题

```swift
func test() {
    // TODO: 未完成
}

func test2() {
    var age = 10
    // FIXME: 有待修复
    age += 20
}
```


test()
未完成
test2()
有待修复

```swift
public class Person {
    // MARK: - 属性
    var age = 0
    var weight = 0
    var height = 0

    // MARK: - 私有方法
    // MARK: 跑步
    private func run1() {}
    private func run2() {}
    // MARK: 走路
    private func walk1() {}
    private func walk2() {}

    // MARK: - 公共方法
    public func eat1() {}
    public func eat2() {}
}
```


Person
属性
age
weight
height
私有方法
跑步
run1()
run2()
走路
walk1()
walk2()
公共方法
eat1()
eat2()

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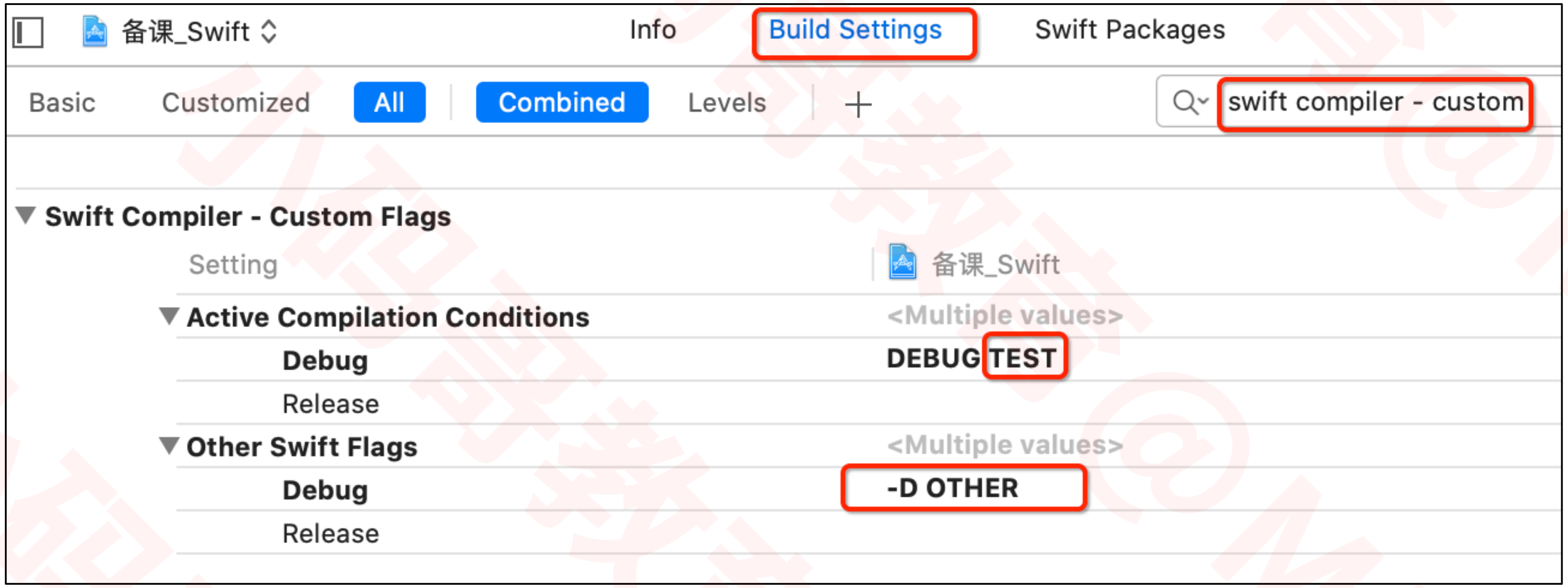
条件编译

```
// 操作系统：macOS\iOS\tvOS\watchOS\Linux\Android\Windows\FreeBSD
#if os(macOS) || os(iOS)
// CPU架构：i386\x86_64\arm\arm64
#elseif arch(x86_64) || arch(arm64)
// swift版本
#elseif swift(<5) && swift(>=3)
// 模拟器
#elseif targetEnvironment(simulator)
// 可以导入某模块
#elseif canImport(Foundation)
#else
#endif
```

条件编译



备课_Swift

Info | Build Settings | Swift Packages

Basic | Customized | All | Combined | Levels | +

swift compiler - custom

Swift Compiler - Custom Flags

Setting	备课_Swift
Active Compilation Conditions	<Multiple values>
Debug	DEBUG TEST
Release	
Other Swift Flags	<Multiple values>
Debug	-D OTHER
Release	

```
// debug模式
#if DEBUG
// release模式
#else
#endif
```

```
#if TEST
print("test")
#endif

#if OTHER
print("other")
#endif
```

打印

```
func log<T>(_ msg: T,
            file: NSString = #file,
            line: Int = #line,
            fn: String = #function) {
    #if DEBUG
    let prefix = "\(file.lastPathComponent)_\(line)_\(fn):"
    print(prefix, msg)
    #endif
}
```

系统版本检测

```
if #available(iOS 10, macOS 10.12, *) {
    // 对于iOS平台，只在iOS10及以上版本执行
    // 对于macOS平台，只在macOS 10.12及以上版本执行
    // 最后的*表示在其他所有平台都执行
}
```

API可用性说明

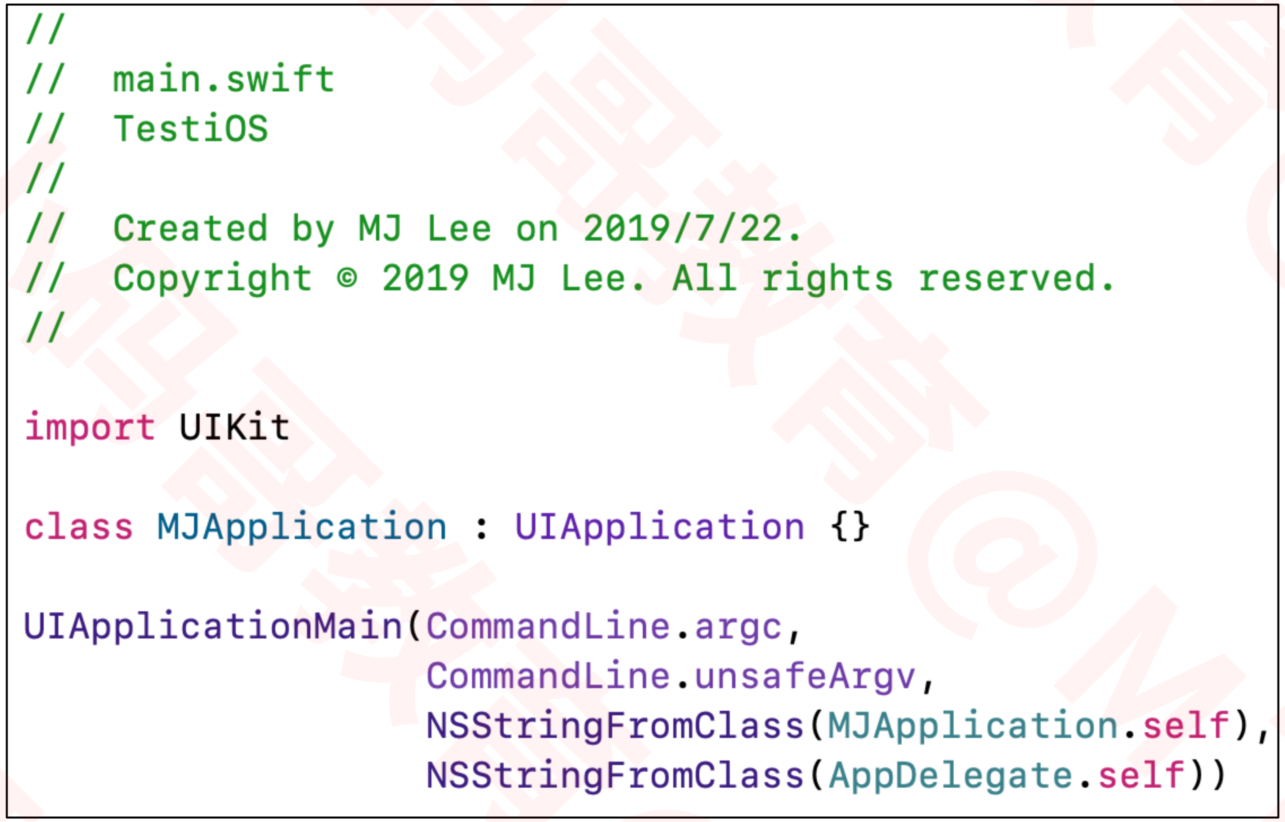
```
@available(iOS 10, macOS 10.15, *)
class Person {}

struct Student {
    @available(*, unavailable, renamed: "study")
    func study_() {}
    func study() {}

    @available(iOS, deprecated: 11)
    @available(macOS, deprecated: 10.12)
    func run() {}
}
```

■ 更多用法参考：https://docs.swift.org/swift-book/ReferenceManual/Attributes.html

iOS程序的入口

- 在AppDelegate上面默认有个@UIApplicationMain标记，这表示
  - 编译器自动生成入口代码（main函数代码），自动设置AppDelegate为APP的代理

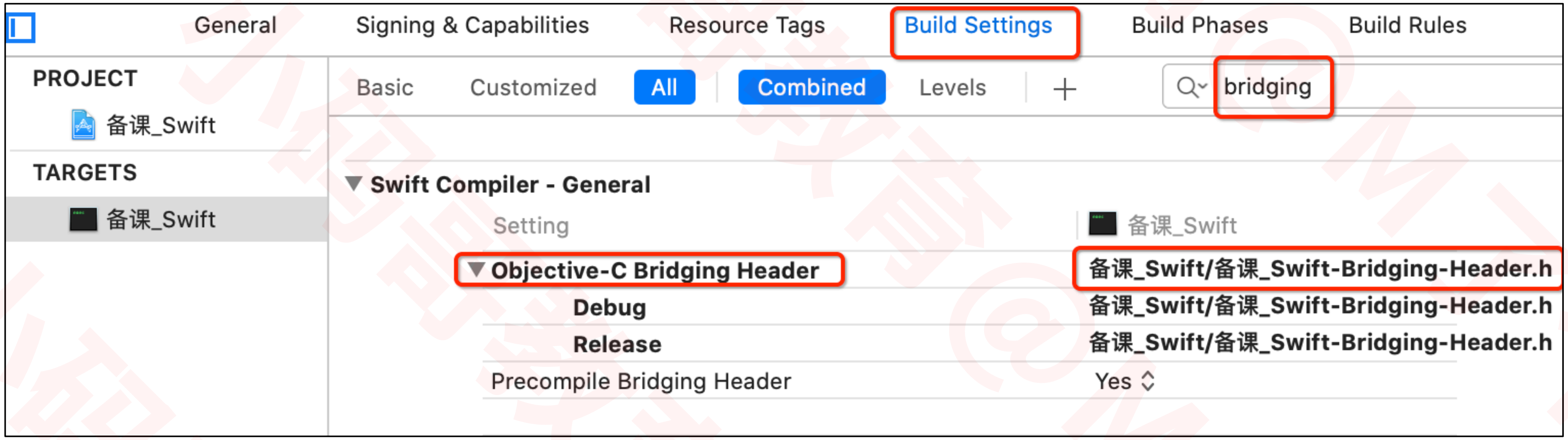
- 也可以删掉@UIApplicationMain，自定义入口代码：新建一个main.swift文件



```swift
//
//  main.swift
//  TestiOS
//
//  Created by MJ Lee on 2019/7/22.
//  Copyright © 2019 MJ Lee. All rights reserved.
//

import UIKit

class MJApplication : UIApplication {}

UIApplicationMain(CommandLine.argc,
                  CommandLine.unsafeArgv,
                  NSStringFromClass(MJApplication.self),
                  NSStringFromClass(AppDelegate.self))
```

Swift调用OC

- 新建1个桥接头文件，文件名格式默认为：**{targetName}-Bridging-Header.h**



General | Signing & Capabilities | Resource Tags | Build Settings | Build Phases | Build Rules

PROJECT: 备课_Swift
TARGETS: 备课_Swift

Basic | Customized | All | Combined | Levels | + | bridging

▼ Swift Compiler - General

Setting	备课_Swift
▼ Objective-C Bridging Header	备课_Swift/备课_Swift-Bridging-Header.h
Debug	备课_Swift/备课_Swift-Bridging-Header.h
Release	备课_Swift/备课_Swift-Bridging-Header.h
Precompile Bridging Header	Yes

- 在 **{targetName}-Bridging-Header.h** 文件中 #import OC需要暴露给Swift的内容

```
#import "MJPerson.h"
```

Swift调用OC – MJPerson.h

```
int sum(int a, int b);

@interface MJPerson : NSObject
@property (nonatomic, assign) NSInteger age;
@property (nonatomic, copy) NSString *name;

- (instancetype)initWithAge:(NSInteger)age name:(NSString *)name;
+ (instancetype)personWithAge:(NSInteger)age name:(NSString *)name;

- (void)run;
+ (void)run;

- (void)eat:(NSString *)food other:(NSString *)other;
+ (void)eat:(NSString *)food other:(NSString *)other;
@end
```

Swift调用OC – MJPerson.m

```
@implementation MJPerson
- (instancetype)initWithAge:(NSInteger)age name:(NSString *)name {
    if (self = [super init]) {
        self.age = age;
        self.name = name;
    }
    return self;
}
+ (instancetype)personWithAge:(NSInteger)age name:(NSString *)name {
    return [[self alloc] initWithAge:age name:name];
}

+ (void)run { NSLog(@"Person +run"); }
- (void)run { NSLog(@"%zd %@ -run", _age, _name); }

+ (void)eat:(NSString *)food other:(NSString *)other { NSLog(@"Person +eat %@ %@", food, other); }
- (void)eat:(NSString *)food other:(NSString *)other { NSLog(@"%zd %@ -eat %@ %@", _age, _name, food, other); }
@end

int sum(int a, int b) { return a + b; }
```

Swift调用OC – Swift代码

```swift
var p = MJPerson(age: 10, name: "Jack")
p.age = 18
p.name = "Rose"
p.run() // 18 Rose -run
p.eat("Apple", other: "Water") // 18 Rose -eat Apple Water

MJPerson.run() // Person +run
MJPerson.eat("Pizza", other: "Banana") // Person +eat Pizza Banana

print(sum(10, 20)) // 30
```

Swift调用OC – Swift代码

```swift
var p = MJPerson(age: 10, name: "Jack")
p.age = 18
p.name = "Rose"
p.run() // 18 Rose -run
p.eat("Apple", other: "Water") // 18 Rose -eat Apple Water

MJPerson.run() // Person +run
MJPerson.eat("Pizza", other: "Banana") // Person +eat Pizza Banana

print(sum(10, 20)) // 30
```

Swift调用OC – @_silgen_name

■ 如果C语言暴露给Swift的函数名跟Swift中的其他函数名冲突了

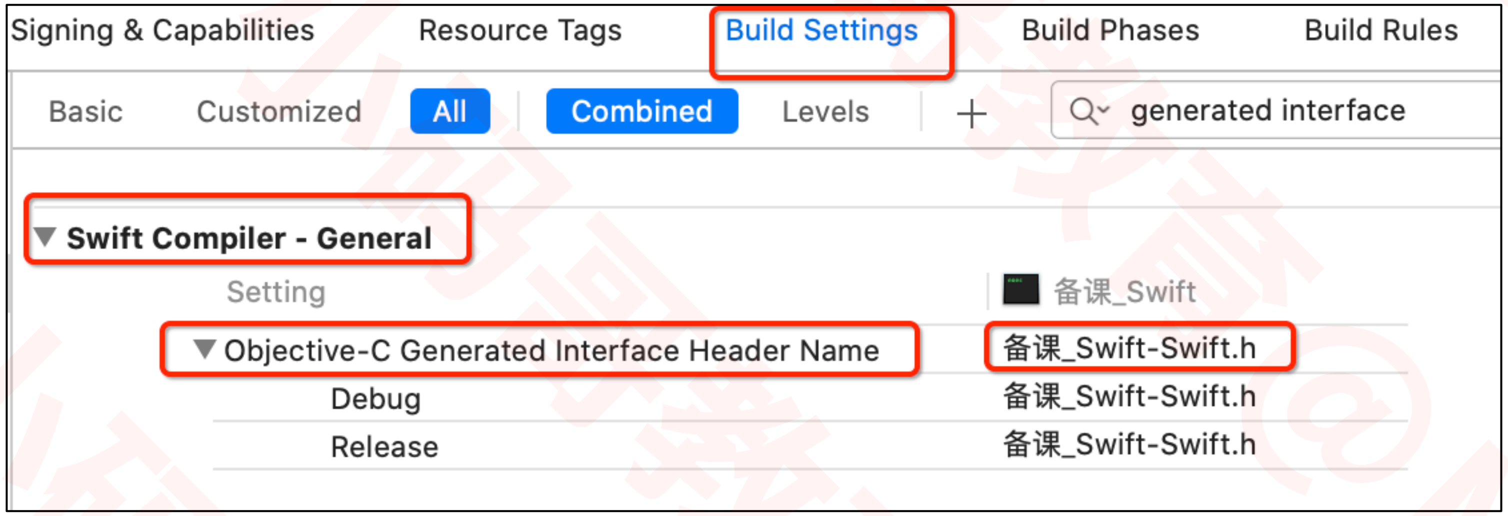
□ 可以在Swift中使用 @_silgen_name 修改C函数名

```
// C语言
int sum(int a, int b) {
    return a + b;
}
```

```
// Swift
@_silgen_name("sum") func swift_sum(_ v1: Int32, _ v2: Int32) -> Int32
print(swift_sum(10, 20)) // 30
print(sum(10, 20)) // 30
```

OC调用Swift

- Xcode已经默认生成一个用于OC调用Swift的头文件，文件名格式是： **`{targetName}-Swift.h`**



▼ Swift Compiler - General

Setting	备课_Swift
▼ Objective-C Generated Interface Header Name	备课_Swift-Swift.h
Debug	备课_Swift-Swift.h
Release	备课_Swift-Swift.h

OC调用Swift – Car.swift

```swift
import Foundation

@objcMembers class Car: NSObject {
    var price: Double
    var band: String
    init(price: Double, band: String) {
        self.price = price
        self.band = band
    }
    func run() { print(price, band, "run") }
    static func run() { print("Car run") }
}

extension Car {
    func test() { print(price, band, "test") }
}
```

- Swift暴露给OC的类最终继承自NSObject

- 使用@objc修饰需要暴露给OC的成员

- 使用@objcMembers修饰类
  - 代表默认所有成员都会暴露给OC（包括扩展中定义的成员）
  - 最终是否成功暴露，还需要考虑成员自身的访问级别

OC调用Swift – {targetName}-Swift.h

- Xcode会根据Swift代码生成对应的OC声明，写入 **{targetName}-Swift.h** 文件

```
@interface Car : NSObject
@property (nonatomic) double price;
@property (nonatomic, copy) NSString * _Nonnull band;
- (nonnull instancetype)initWithPrice:(double)price band:(NSString * _Nonnull)band OBJC_DESIGNATED_INITIALIZER;
- (void)run;
+ (void)run;
- (nonnull instancetype)init SWIFT_UNAVAILABLE;
+ (nonnull instancetype)new SWIFT_UNAVAILABLE_MSG("-init is unavailable");
@end

@interface Car (SWIFT_EXTENSION(备课_Swift))
- (void)test;
@end
```

OC调用Swift – OC代码

```
#import "备课_Swift-Swift.h"
int sum(int a, int b) {
    Car *c = [[Car alloc] initWithPrice:10.5 band:@"BMW"];
    c.band = @"Bently";
    c.price = 108.5;
    [c run]; // 108.5 Bently run
    [c test]; // 108.5 Bently test
    [Car run]; // Car run
    return a + b;
}
```

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OC调用Swift – @objc

- 可以通过 @objc 重命名Swift暴露给OC的符号名（类名、属性名、函数名等）

```swift
@objc(MJCar)
@objcMembers class Car: NSObject {
    var price: Double
    @objc(name)
    var band: String
    init(price: Double, band: String) {
        self.price = price
        self.band = band
    }
    @objc(drive)
    func run() { print(price, band, "run") }
    static func run() { print("Car run") }
}
extension Car {
    @objc(exec:v2:)
    func test() { print(price, band, "test") }
}
```

```objc
MJCar *c = [[MJCar alloc] initWithPrice:10.5 band:@"BMW"];
c.name = @"Bently";
c.price = 108.5;
[c drive]; // 108.5 Bently run
[c exec:10 v2:20]; // 108.5 Bently test
[MJCar run]; // Car run
```

选择器（Selector）

- Swift中依然可以使用选择器，使用#selector(name)定义一个选择器
  - 必须是被@objcMembers或@objc修饰的方法才可以定义选择器

```
@objcMembers class Person: NSObject {
    func test1(v1: Int) { print("test1") }
    func test2(v1: Int, v2: Int) { print("test2(v1:v2:)") }
    func test2(_ v1: Double, _ v2: Double) { print("test2(_:_:)") }
    func run() {
        perform(#selector(test1))
        perform(#selector(test1(v1:)))
        perform(#selector(test2(v1:v2:)))
        perform(#selector(test2(_:_:)))
        perform(#selector(test2 as (Double, Double) -> Void))
    }
}
```

String

■ Swift的字符串类型String，跟OC的NSString，在API设计上还是有较大差异

```
// 空字符串
var emptyStr1 = ""
var emptyStr2 = String()
```

```
var str = "123456"
print(str.hasPrefix("123")) // true
print(str.hasSuffix("456")) // true
```

```
var str: String = "1"
// 拼接，jack_rose
str.append("_2")
// 重载运算符 +
str = str + "_3"
// 重载运算符 +=
str += "_4"
// \()插值
str = "\(str)_5"
// 长度，9，1_2_3_4_5
print(str.count)
```

String的插入和删除

```swift
var str = "1_2"
// 1_2_
str.insert("_", at: str.endIndex)
// 1_2_3_4
str.insert(contentsOf: "3_4", at: str.endIndex)
// 1666_2_3_4
str.insert(contentsOf: "666", at: str.index(after: str.startIndex))
// 1666_2_3_8884
str.insert(contentsOf: "888", at: str.index(before: str.endIndex))
// 1666hello_2_3_8884
str.insert(contentsOf: "hello", at: str.index(str.startIndex, offsetBy: 4))
```

```swift
// 666hello_2_3_8884
str.remove(at: str.firstIndex(of: "1")!)
// hello_2_3_8884
str.removeAll { $0 == "6" }
var range = str.index(str.endIndex, offsetBy: -4)..<str.index(before: str.endIndex)
// hello_2_3_4
str.removeSubrange(range)
```

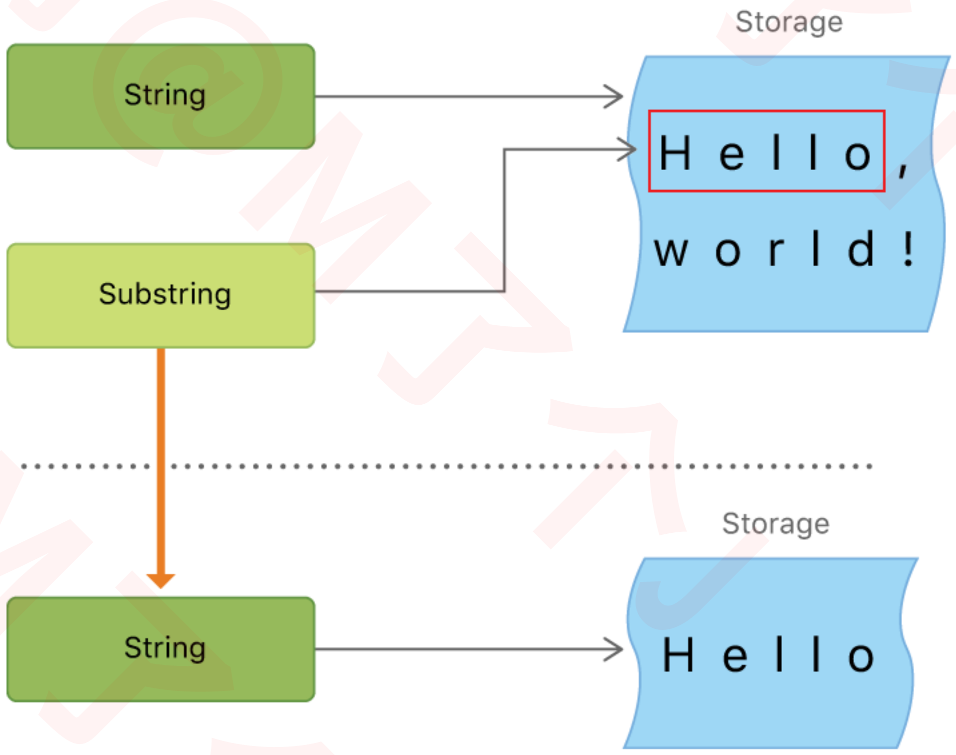
Substring

- String可以通过下标、 prefix、 suffix等截取子串，子串类型不是String，而是Substring

```swift
var str = "1_2_3_4_5"
// 1_2
var substr1 = str.prefix(3)
// 4_5
var substr2 = str.suffix(3)
// 1_2
var range = str.startIndex..<str.index(str.startIndex, offsetBy: 3)
var substr3 = str[range]

// 最初的String，1_2_3_4_5
print(substr3.base)

// Substring -> String
var str2 = String(substr3)
```



- Substring和它的base，共享字符串数据
- Substring发生修改 或者 转为String时，会分配新的内存存储字符串数据

String 与 Character

```swift
for c in "jack" { // c是Character类型
    print(c)
}

var str = "jack"
// c是Character类型
var c = str[str.startIndex]
```

String相关的协议

- BidirectionalCollection 协议包含的部分内容
  - startIndex 、 endIndex 属性、index 方法
  - String、Array 都遵守了这个协议

- RangeReplaceableCollection 协议包含的部分内容
  - append、insert、remove 方法
  - String、Array 都遵守了这个协议

- Dictionary、Set 也有实现上述协议中声明的一些方法，只是并没有遵守上述协议

多行String

```
let str = """
1
    "2"
3
    '4'
"""
```

```
1
    "2"
3"""
    '4'
```

```
// 如果要显示3引号，至少转义1个引号
let str = """
Escaping the first quote \"""
Escaping two quotes \"\""
Escaping all three quotes \"\"\"
"""
```

```
Escaping the first quote """
Escaping two quotes """
Escaping all three quotes """
```

```
// 缩进以结尾的3引号为对齐线
let str = """
        1
            2
    3
        4
    """
```

```
    1
        2
3
    4
```

```
// 以下2个字符串是等价的
let str1 = "These are the same."
let str2 = """
These are the same.
"""
```

String 与 NSString

■ String 与 NSString 之间可以随时随地桥接转换

□ 如果你觉得String的API过于复杂难用，可以考虑将String转为NSString

```
var str1: String = "jack"
var str2: NSString = "rose"

var str3 = str1 as NSString
var str4 = str2 as String

// ja
var str5 = str3.substring(with: NSRange(location: 0, length: 2))
print(str5)
```

■ 比较字符串内容是否等价

□ String使用 == 运算符

□ NSString使用isEqual方法，也可以使用 == 运算符（本质还是调用了isEqual方法）

Swift、OC桥接转换表

String	⇌	NSString
String	←	NSMutableString
Array	⇌	NSArray
Array	←	NSMutableArray
Dictionary	⇌	NSDictionary
Dictionary	←	NSMutableDictionary
Set	⇌	NSSet
Set	←	NSMutableSet

只能被class继承的协议

```
protocol Runnable1: AnyObject {}
protocol Runnable2: class {}
@objc protocol Runnable3 {}
```

- 被 @objc 修饰的协议，还可以暴露给OC去遵守实现

可选协议

- 可以通过 @objc 定义可选协议，这种协议只能被 class 遵守

```swift
@objc protocol Runnable {
    func run1()
    @objc optional func run2()
    func run3()
}

class Dog: Runnable {
    func run3() { print("Dog run3") }
    func run1() { print("Dog run1") }
}
var d = Dog()
d.run1() // Dog run1
d.run3() // Dog run3
```

dynamic

- 被 @objc dynamic 修饰的内容会具有动态性，比如调用方法会走runtime那一套流程

```
class Dog: NSObject {
    @objc dynamic func test1() {}
    func test2() {}
}
var d = Dog()
d.test1()
d.test2()
```

```
movq    -0x70(%rbp), %rcx
movq    (%rcx), %rdx
andq    (%rax), %rdx
movq    %rcx, %r13
callq   *0x50(%rdx)
```

test2

```
movq    0x8fb4(%rip), %rsi              ; "test1"
movq    -0x60(%rbp), %rax
movq    %rax, %rdi
callq   0x100007c5e                     ; symbol stub for: objc_msgSend
```

KVC\KVO

- Swift 支持 KVC \ KVO 的条件
  - 属性所在的类、监听器最终继承自 NSObject
  - 用 @objc dynamic 修饰对应的属性

```swift
class Observer: NSObject {
    override func observeValue(forKeyPath keyPath: String?,
                               of object: Any?,
                               change: [NSKeyValueChangeKey : Any]?,
                               context: UnsafeMutableRawPointer?) {
        print("observeValue", change?[.newKey] as Any)
    }
}
```

```swift
class Person: NSObject {
    @objc dynamic var age: Int = 0
    var observer: Observer = Observer()
    override init() {
        super.init()
        self.addObserver(observer,
                         forKeyPath: "age",
                         options: .new,
                         context: nil)
    }
    deinit {
        self.removeObserver(observer,
                            forKeyPath: "age")
    }
}
var p = Person()
// observeValue Optional(20)
p.age = 20
// observeValue Optional(25)
p.setValue(25, forKey: "age")
```

block方式的KVO

```
class Person: NSObject {
    @objc dynamic var age: Int = 0
    var observation: NSKeyValueObservation?
    override init() {
        super.init()
        observation = observe(\Person.age, options: .new) {
            (person, change) in
            print(change.newValue as Any)
        }
    }
}
var p = Person()
// Optional(20)
p.age = 20
// Optional(25)
p.setValue(25, forKey: "age")
```

关联对象（Associated Object）

- 在Swift中，class依然可以使用关联对象
- 默认情况，extension不可以增加存储属性
- 借助关联对象，可以实现类似extension为class增加存储属性的效果

```swift
class Person {}
extension Person {
    private static var AGE_KEY: Void?
    var age: Int {
        get {
            (objc_getAssociatedObject(self, &Self.AGE_KEY) as? Int) ?? 0
        }
        set {
            objc_setAssociatedObject(self,
                                     &Self.AGE_KEY,
                                     newValue,
                                     .OBJC_ASSOCIATION_ASSIGN)
        }
    }
}
```

```swift
var p = Person()
print(p.age) // 0
p.age = 10
print(p.age) // 10
```

资源名管理

```swift
let img = UIImage(named: "logo")

let btn = UIButton(type: .custom)
btn.setTitle("添加", for: .normal)

performSegue(withIdentifier: "login_main", sender: self)
```

```swift
let img = UIImage(R.image.logo)

let btn = UIButton(type: .custom)
btn.setTitle(R.string.add, for: .normal)

performSegue(withIdentifier: R.segue.login_main, sender: self)
```

```swift
enum R {
    enum string: String {
        case add = "添加"
    }
    enum image: String {
        case logo
    }
    enum segue: String {
        case login_main
    }
}
```

- 这种做法实际上是参考了Android的资源名管理方式

资源名管理

```
extension UIImage {
    convenience init?(_ name: R.image) {
        self.init(named: name.rawValue)
    }
}

extension UIViewController {
    func performSegue(withIdentifier identifier: R.segue, sender: Any?) {
        performSegue(withIdentifier: identifier.rawValue, sender: sender)
    }
}

extension UIButton {
    func setTitle(_ title: R.string, for state: UIControl.State) {
        setTitle(title.rawValue, for: state)
    }
}
```

资源名管理的其他思路

```swift
let img = UIImage(named: "logo")

let font = UIFont(name: "Arial", size: 14)
```

```swift
let img = R.image.logo

let font = R.font.arial(14)
```

```swift
enum R {
    enum image {
        static var logo = UIImage(named: "logo")
    }
    enum font {
        static func arial(_ size: CGFloat) -> UIFont? {
            UIFont(name: "Arial", size: size)
        }
    }
}
```

- 更多优秀的思路参考
  - https://github.com/mac-cain13/R.swift
  - https://github.com/SwiftGen/SwiftGen

多线程开发 – 异步

```
public typealias Task = () -> Void

public static func async(_ task: @escaping Task) {
    _async(task)
}

public static func async(_ task: @escaping Task,
                         _ mainTask: @escaping Task) {
    _async(task, mainTask)
}

private static func _async(_ task: @escaping Task,
                           _ mainTask: Task? = nil) {
    let item = DispatchWorkItem(block: task)
    DispatchQueue.global().async(execute: item)
    if let main = mainTask {
        item.notify(queue: DispatchQueue.main, execute: main)
    }
}
```

多线程开发 – 延迟

```
@discardableResult
public static func delay(_ seconds: Double,
                         _ block: @escaping Task) -> DispatchWorkItem {
    let item = DispatchWorkItem(block: block)
    DispatchQueue.main.asyncAfter(deadline: DispatchTime.now() + seconds,
                                  execute: item)
    return item
}
```

多线程开发 – 异步延迟

```
@discardableResult
public static func asyncDelay(_ seconds: Double,
                              _ task: @escaping Task) -> DispatchWorkItem {
    return _asyncDelay(seconds, task)
}

@discardableResult
public static func asyncDelay(_ seconds: Double,
                              _ task: @escaping Task,
                              _ mainTask: @escaping Task) -> DispatchWorkItem {
    return _asyncDelay(seconds, task, mainTask)
}

private static func _asyncDelay(_ seconds: Double,
                                _ task: @escaping Task,
                                _ mainTask: Task? = nil) -> DispatchWorkItem {
    let item = DispatchWorkItem(block: task)
    DispatchQueue.global().asyncAfter(deadline: DispatchTime.now() + seconds,
                                      execute: item)
    if let main = mainTask {
        item.notify(queue: DispatchQueue.main, execute: main)
    }
    return item
}
```

多线程开发 – once

- dispatch_once在Swift中已被废弃，取而代之
  - 可以用类型属性或者全局变量\常量
  - 默认自带 lazy + dispatch_once 效果

```swift
fileprivate let initTask2: Void = {
    print("initTask2---------")
}()

class ViewController: UIViewController {
    static let initTask1: Void = {
        print("initTask1---------")
    }()

    override func viewDidLoad() {
        super.viewDidLoad()

        let _ = Self.initTask1

        let _ = initTask2
    }
}
```

多线程开发 – 加锁

■ gcd信号量

```
class Cache {
    private static var data = [String: Any]()
    private static var lock = DispatchSemaphore(value: 1)
    static func set(_ key: String, _ value: Any) {
        lock.wait()
        defer { lock.signal() }

        data[key] = value
    }
}
```

■ Foundation

```
private static var lock = NSLock()
static func set(_ key: String, _ value: Any) {
    lock.lock()
    defer { lock.unlock() }
}
```

```
private static var lock = NSRecursiveLock()
static func set(_ key: String, _ value: Any) {
    lock.lock()
    defer { lock.unlock() }
}
```